

# **BIOLOGICAL RESOURCES AND ECOSYSTEM VALUES OF THE VAN BUSKIRK GOLF COURSE**

**VAN BUSKIRK GOLF COURSE RE-USE STUDY  
STOCKTON, CALIFORNIA**



**This page intentionally left blank.**

# BIOLOGICAL RESOURCES AND ECOSYSTEM VALUES OF THE VAN BUSKIRK GOLF COURSE

## VAN BUSKIRK GOLF COURSE RE-USE STUDY STOCKTON, CALIFORNIA

Submitted to:

**DESIGNWORKSHOP**

4825 J Street, Suite 200  
Sacramento, California 95819

Prepared by:

LSA  
157 Park Place  
Pt. Richmond, California 94801  
510.236.6810

Project No. DEW2102

**This page intentionally left blank.**

## EXECUTIVE SUMMARY

### S.1 INTRODUCTION

The Van Buskirk Park (“Park”) is a 192.71-acre former golf course located at 1740 Houston Avenue, Stockton, CA 95206, along the north bank of Walker Slough, French Camp Slough, and the San Joaquin River (Figure 1). The City of Stockton (City) is planning the rehabilitation and reuse of the Park for active and passive outdoor recreational facilities, programs, and activities. The City’s core vision for the Park is to enhance the public space to provide opportunities for residents and visitors to engage and to provide quantifiable economic and social justice benefits<sup>1</sup> to the City and neighborhood.

DesignWorkshop and LSA have been tasked to develop a Master Plan for the Van Buskirk Park. The purpose of this assessment is to provide a comprehensive evaluation of the Park’s Biological Resources that may be relevant to permitting or mitigation pursuant to Federal (ESA) or State Law (CESA, CEQA).

This report is structured in three Parts. Part 1 contains relevant data, analysis and conclusions for biological resources pursuant to the CEQA “Checklist”. This section is intended to inform subsequent CEQA analyses and documents. Part 2 contains additional analyses regarding the Park’s unique ecosystem values, current risks, and opportunities for mitigation and restoration. Part 3 contains recommendations for future management of the natural resources of the Park.

Consideration of flood risk and opportunities to address climate change and carbon sequestration is also a goal of this report. The Park is located in a Federal Emergency Management Agency (FEMA) X-Flood Zone, and climate change hydrology in concert with the predicted sea level rise is likely to cause more than a 7-foot increase in future water surface elevation. It is unlikely that the existing levees at the Park will be able to protect the adjoining neighborhoods from flooding of that magnitude.

### S.2 METHODS

For planning purposes, the Park was divided into two planning strata. The “west” stratum includes 81.6 acres beginning at the eastern edge of the central parking area (including the former golf club buildings) and extending to the western border of the site (Figure 2). The “east” stratum comprises 78 acres and extends from the parking lot eastwards to the fence line of the Van Buskirk Community Center. LSA conducted field surveys, mapping, database review, and modeling to evaluate the Park’s environmental conditions and functions. A breeding bird and wildlife habitat survey was conducted to characterize the habitat types and wildlife species in the Park, including wetlands or special-status species.

<sup>1</sup> Social justice benefits of urban forests and parks include filtering air pollution, absorbing flood and rainwater and providing shade/cooling. Urban trees also may reduce stress and blood pressure, and increase mental engagement, attentiveness and happiness. Communities with large street trees often have lower crime and slower traffic.

LSA conducted a complete vegetation and habitat inventory of the Park. Tree inventory data were analyzed using the i-Tree Eco<sup>®</sup> software program, to quantify the current conditions at the Park, including urban forest structure, environmental effects, and value to communities. The i-Tree Eco software program provides estimates of the urban forest structure, such as species composition; number of trees, tree density, tree health condition, leaf area, total tree biomass, total carbon stored, and net carbon annually sequestered by the urban forest. The program also allows for calculation of the hourly amount of pollution removed by the urban forest, and associated percent air quality improvement throughout a year; as well as public health benefits and the economic value that is associated with the incidence of adverse health effects. Other parameters evaluated include oxygen production, avoided runoff, and bio-emissions (e.g., volatile organic compounds, ozone and carbon monoxide).

### **S.3 PART1: BIOLOGICAL RESOURCES REPORT**

#### **S.3.1.1 Wildlife**

Mammalian wildlife present at the Park includes California pocket gophers (*Thomomys bottae*), California voles (*Microtus californicus*), and California ground squirrels. California ground squirrels are considered keystone species and are the primary natural source of burrows for burrowing owls. Ground squirrel burrows are also important for providing subterranean habitat for amphibians and many species of invertebrates, including native bumblebees. Expanding ground squirrel distribution in the Park provides additional opportunities to support burrowing owl populations. The site is also frequented by common mammals, such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), grey fox (*Urocyon cinereoargenteus*), American mink (*Neovison vison*) and river otter (*Lontra canadensis*) – the latter predominantly using habitats on the waterside of the levees. Feral domestic cats (*Felis catus*) are observed frequently on the site (LSA observations). The species of bat that will most likely occupy the Park are the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*), the Mexican free-tailed bat (*Tadarida brasiliensis*), and the Yuma myotis (*Myotis yumanensis*).

The ponds at the Park may contain non-native red-eared sliders (*Trachemys scripta*). Since the ponds have fallen dry, these non-native turtles have moved to the banks of French Camp Slough. The red-eared slider is a popular pet turtle and is introduced primarily through pet releases and escapes; it is an invasive species in California and considered as one of the “World's Worst Invasive Alien Species” by the World Conservation Union (IUCN) Invasive Species Specialist Group (Lowe et al. 2000). During field surveys, LSA also observed pacific tree frogs (*Pseudacris regilla*), also known as the Pacific chorus frog, a wide ranging species that occupies many types of habitats, reproducing in aquatic settings. American Bullfrog (*Lithobates catesbeianus*) has also been observed on the Park site. This non-native, invasive species compete with native species for space and food. They are voracious predators of turtle hatchlings and other amphibians.

The Park currently has an abundance of flowering non-native eucalyptus trees, although other flowering forbs and shrubs are rare. LSA biologists observed numerous bees and butterflies (mainly Western Swallowtail, *Papilio rutulus*). With restoration and habitat enhancement, the site could provide an ideal habitat area to contribute to monarch butterfly (*Danaus plexippus*, federally classified as a Candidate for listing) and pollinator conservation. Pollinator and monarch populations

have declined significantly over the past 20 years due to habitat loss, pesticides, and intensifying climate events. The eastern portion of the Park provides the greatest opportunity to establish pollinator habitat through the planting of pollinator and butterfly gardens, hedgerows and other native areas.

### **S.3.2 Potential Impacts to biological resources**

#### **S.3.2.1 Special-Status Plant and Animal species**

Species listed/candidate under the California Endangered Species Act (CESA) or listed/proposed the federal Endangered Species Act (ESA) require special protection to avoid “take” or cause other adverse effects upon their habitat. Additionally, impacts to other non-listed special status species, such as those classified as Species of Special Concern by the California Department of Fish and Wildlife should be avoided and mitigated under CEQA. Some rare plant species also require protection pursuant to the California Native Plant Protection Act. The following species could potentially occur at the park (Figure 5):

The **monarch butterfly** (*Danaus plexippus*) is a migratory butterfly that has been listed as a candidate for inclusion on the USFWS list of endangered and threatened wildlife since December 2020. Monarch butterflies are listed by the State of California as a California Special Resource because their overwintering habitat is threatened by disturbance and by alteration and destruction of habitat. Monarch butterfly overwintering sites are typically found in a narrow stretch of land within 3 miles of the Pacific coastline. **The likelihood that the monarch butterfly is overwintering in the project site is considered to be none.** Monarch butterfly relies exclusively on milkweed species as a larval host plant. No milkweed plants have been identified during biological surveys of the site. Milkweed plants, however, may be present in the project action area; therefore, monarch larvae may be present as well. **The likelihood that monarch butterfly is present in the project area is considered to be moderate.** The Mitigation Measures for Monarch butterfly (BIO-6) are designed to avoid impacts to milkweed and monarch butterfly to a less than significant level. With restoration and habitat enhancement (Measure BIO-9), the site could provide an ideal habitat area to contribute to monarch butterfly (*Danaus plexippus*) and pollinator conservation. The eastern section of the Park provides the greatest opportunity to establish pollinator habitat through the planting of pollinator and butterfly gardens, hedgerows, and other areas where nectar plants could be established. Therefore, the **proposed project may affect, but is not likely to adversely affect, monarch butterfly. The overall impact is Less Than Significant with Mitigation Incorporation.**

The **Valley Elderberry Longhorn Beetle** (*Desmoderus californicus*) has been observed to occur at the Park (LSA unpubl. observations) and at the nearby VELB conservation bank (CNDDDB 2022).. **The likelihood that valley elderberry longhorn beetle is present in the project area is considered to be high.** The project will avoid all elderberry shrubs, and construction activities will keep a minimum distance of 20 feet from the drip lines of the shrubs. Mitigation measure BIO-7 is designed to avoid impacts to elderberry bushes and the VELB. **The proposed project may affect, but is not likely to adversely affect, this species. The overall impact is Less Than Significant with Mitigation Incorporation.**

**Western Bumble Bee** (*Bombus occidentalis*) and **Crotch Bumble Bee** (*Bombus crotchii*) are California candidate species and thus receive the same legal protection afforded to endangered or threatened

species (Fish & G. Code, §§ 2074.2 & 2085. There is suitable bumble bee foraging and nesting habitat and nectar plants within the project site, and therefore **the potential for Crotch's and western bumble bees to occur in the project area is moderate**. The implementation of Mitigation Measures BIO-1 through BIO-4 will avoid potential impacts to Western and Crotch's bumble bee. In addition, Mitigation Measure BIO-9 (Pollinator Habitat Restoration) limits all herbaceous vegetation removal activities from September 1 through February 28. **The overall impact is Less Than Significant with Mitigation Incorporation**

**Burrowing owl** (*Athene cunicularia*) is a California Species of Special Concern. There is suitable habitat present at the Park, but no owls have been observed. Records of burrowing owls exist from within a 1-mile radius around the Park (CNDDDB 2022). **The likelihood that burrowing owl is present in the project area is considered to be low**. Measure BIO-4 is designed to reduce any potential adverse effect on burrowing owl from implementing the project. **The overall impact is Less Than Significant with Mitigation Incorporation.**

The **Swainson's hawk** (*Buteo swainsonii*) is State-listed as threatened and Bird of Conservation Concern. **The likelihood that Swainson's hawk is present in the project area is considered very high**. The implementation of Measures BIO-1 through 4 will avoid and minimize effects on Swainson's hawk during habitat restoration and maintenance activities associated with the project. Therefore, the project **may affect, but is not likely to adversely affect, Swainson's hawk**. **The overall impact is Less Than Significant with Mitigation.**

**Tricolored blackbird** (*Agelaius tricolor*) is state-listed as threatened and a CDFW Species of Special Concern. No recent observations have been recorded, therefore **the potential of tricolored blackbird being present is low**. Measures BIO-1-4 avoid impacts to tricolored blackbirds. This will reduce any potential impacts to **Less Than Significant with Mitigation Incorporation**.

**Other Birds:** Birds protected under the California Fish and Game Code and the Migratory Bird Treaty Act (MBTA) could potentially nest on or near the property; however, as long as the project complies with provisions of the MBTA, California Fish and Game Code Section 3513 and Measures Bio-1 through Bio-4, the project will not affect any protected nesting birds or violate the MBTA or California Fish and Game Code. Therefore, the project **may affect, but is not likely to adversely affect, nesting birds**. **The overall impact is Less Than Significant with Mitigation.**

The **western pond turtle** (*Actinemys marmorata*) is the only native freshwater turtle of the Pacific coastal states. Suitable habitat for foraging, nesting, and hibernation occurs on and adjacent to the Park, but the presence of non-native red-eared sliders may have affect Western pond turtle use of any potential habitat. Currently, **the potential of Western Pond turtle being present is low**. Measures BIO-1- through BIO-5 avoid impacts to western pond turtle. This will reduce any potential impacts to **Less Than Significant with Mitigation Incorporation**.

**Bats.** Currently, there are no records of various bat observations at the Park, but bats are highly likely to occur at the site. Implementation of Mitigation Measure BIO-6 would reduce this impact to less-than significant by first identifying the presence or absence of roosting bats, and if present, preventing disturbance or loss of roosting habitat. **The proposed project may affect but is not**



**likely to adversely affect various bat species. The overall impact is Less Than Significant with Mitigation Incorporation.**

**Critical habitat** areas are defined in the Endangered Species Act and used by US Fish and Wildlife Service and the National Marine Fisheries Service as an area that is essential for the conservation and recovery of a federally threatened or endangered species that requires special management and protection. The following species have designated critical habitat or adjacent to the Park:

- The southern Distinct Population Segment (DPS) of **Green Sturgeon**. Project actions are limited to terrestrial and aquatic habitat behind the levees and therefore, **Therefore, the project will have no adverse effect on critical habitat for green sturgeon.**
- the **Central Valley steelhead** is currently listed as threatened under the ESA. Because the project will not include actions that are outside the levees, **there will be no adverse effect on critical habitat for Steelhead.**

#### S.3.2.2 Wetlands

There are five ponds within the former golf course, of which some or all may be historical oxbows associated with French Camp Slough. Four of these ponds are on the western stratum of the Park (Figure 3). Pond 5 is isolated from Ponds 1 through 4. All ponds at the Park are isolated from the floodplain of French Camp Slough by a levee and are considered managed water features that are jurisdictional Waters of the U.S. and the State of California. The total area of these ponds is approximately 11.25 acres (Table C). The Conceptual Plan does not specify any changes to existing ponds. **Therefore, the proposed project would have no effect on any federally protected wetlands.**

#### S.3.2.3 Tree Protection

The City of Stockton has a Heritage Tree Ordinance that requires a permit for the removal of any “Heritage Tree” (i.e., *Quercus lobata*, *Quercus agrifolia*, and *Quercus wislizenii*) which is located on public or private property within the limits of the City, and which has a trunk diameter of 16 inches or more, measured at 24 inches above actual grade. There are a total of nine mature California valley oak (*Quercus lobata*) trees on the project site ( 4 on the eastern side, 5 on the western side). All five valley oak trees on the western side of the Park and three out of four oaks on the eastern side meet this requirement. **The City will need to authorize the removal of these oaks if it is determined that they are located within the footprint of a planned development.**

#### S.3.2.4 Habitat conservation plans

The Park is within the coverage area of the San Joaquin County Multi-Species Open Space and Habitat Conservation Plan (SJMSCP). Certain portions of the Conceptual Master Plan would qualify as conversion of open space to non-open space (e.g., parking lots, event facilities, skate park and other hardscape features, and therefore may require compliance with the SJMSCP mitigation fee policy. On the other hand, the available mitigation opportunities at the Park may also constitute on-site mitigation opportunities or offer to implement mitigation for impacts incurred. Therefore, the

Project would have a **less than-significant impact on local policy compliance. The degree to which mitigation is required would need to be determined once a development plan has been finalized.**

## **S.4 PART 2: ECOSYSTEM VALUES OF VAN BUSKIRK PARK**

### **S.4.1.1 Forest Condition**

LSA inventoried 977 live trees of 35 different species with the Park's urban forest. Species exotic to North America make up 82 percent of the population. The most abundant tree species are river red gum (*Eucalyptus camaldulensis*), cork oak (*Quercus suber*) and Canary Pine (*Pinus canariensis*). The overall tree density is 2.5 trees per acre, or 6 percent tree cover (i.e., 9.6 acres of the entire site), which is low for urban forests in general. The species contributing the largest proportions of total leaf area were red river gum (54.38 acres) red ironbark gum (*Eucalyptus sideroxylon*, 30.71 acres), and cork oak (15.62 acres). The most abundant native California species surveyed is valley oak (*Quercus lobata*).

The urban forest at the Park provides a number of significant environmental benefits to the surrounding community. For example, it stores a significant amount of carbon, providing a gross sequestration of about 17.71 tons of carbon per year with an associated value of \$3,020 per year. The amount of carbon stored in the forest is estimated at 991 tons of carbon at a value of \$169,000, or the equivalent of the annual carbon dioxide (CO<sub>2</sub>) emissions from 701 vehicles or 287 single-family homes. Additionally, the trees and shrubs of the Park help to reduce stormwater runoff by an estimated 1,240 cubic meters (approximately 1 acre-foot) a year with an associated value of \$2,900.

Another environmental benefit of the Park's urban forest is oxygen production and removal of air pollutants. It produces an estimated 42.85 metric tons of oxygen per year. Cork oak is the most prolific oxygen producer in the Park with an annual production of over 6 metric tons, exceeding the oxygen production of the more numerous eucalyptus species. Pollution removal was greatest in the months of April through September. Trees at the Park remove 1,604 pounds of air pollution, including ozone (O<sub>3</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), particulate matter less than 2.5 microns (PM<sub>2.5</sub>), and sulfur dioxide (SO<sub>2</sub>) with an associated value of \$3,550 per year. The annual nitrogen dioxide removal is equivalent to emissions from 20 vehicles or nine single-family houses. The sulfur dioxide removal is equivalent to the annual sulfur dioxide emissions from 450 vehicles. Particulate matter is being filtered primarily during the rainy season. The Park's canopy also contributes to urban cooling by providing shade and evaporative cooling.

However, the urban forest can also contribute to air pollution. Its trees emit an estimated 3.425 metric tons of volatile organic compounds (VOCs) annually, which are important precursor chemicals to ozone formation. Furthermore, VOCs affect tree flammability and may contribute to accelerating forest fires. Fifty-five percent of the forest's VOC emissions were from the eucalyptus species, primarily red river gum and red ironbark.

The potential for wildfires at the Park has increase in recent years. Historically, the Park's management as a golf course has kept the fire risk low by extensive mowing, pruning and irrigation; however, these conditions no longer exist. As a result, fuel loads have increased. In the future, dense clumps of invasive tree saplings are expected to emerge underneath many of the eucalyptus trees. Coupled with highly flammable trees, these invasive saplings are likely to cause a significant

fire risk associated with longer flames, quicker surface fires, and crowning of fires in closed canopies. The abundance of highly flammable species is greater in the west stratum (72 percent highly flammable species) compared to the east stratum (51 percent of highly flammable species; Figure 6). Given the close proximity of residential structures that are often less than 30 feet from the canopy's dripline, there is limited defensible space for the adjoining community. A potential wildfire in the urban forest at the Park under current conditions will pose a substantial fire risk to the community. Implementing a fire break along Houston Avenue should be considered a high priority. This fire-break should be free of large flammable vegetation and be at least 120 feet wide, measured from the edge of the pavement.

#### S.4.1.2 Forest Restoration

Three forecasting models were designed to simulate future management options for the Park's urban forest:

**Option 1: The Baseline Scenario** forecasts future conditions without forest restoration or replanting of trees. Under this scenario, about 600 trees will disappear due to natural mortality over 30 years, resulting in a reduction of tree cover by 52 to 58 percent, respectively, for the east and west stratum. The forest structure at the Park will become more open and savannah-like, with large gaps between trees becoming the prevalent characteristic of the urban forest. This will reduce the shaded areas and allow more sunlight to penetrate the canopy, enhancing weed and brush encroachment. The remaining forest will likely be dominated by those species that continue to thrive, and even reproduce under the predicted future conditions.

Species that reproduce naturally at the Park include the majority of eucalyptus species. Recruitment and expansion of willows will also occur naturally and is already underway in many of the drying ponds. Most likely, future composition of trees at the Park will be dominated by the two most drought-tolerant species, river red gum and red ironbark. It is also expected that most oaks will persist, although not likely reproduce. Simulations suggest that under the baseline conditions, carbon storage will decline from 991 tons to 548 tons, which amounts to a total loss of 45 percent of the stored carbon. Thus, without active replacement of dying or dead trees, the Park will convert from an active sequestration of carbon to a net emitter of CO<sub>2</sub>. Pollution removal will likewise decline, with the most drastic reduction in ecosystem services being a 55 percent loss in particulate matter interception (PM<sub>2.5</sub>) and ozone removal. The monetary value of the pollution removal services of the Park will decline by almost \$2,000 per year.

**Option 2: The "Maintain Ecosystem Benefits" Scenario** includes planting 100 replacement trees annually in each stratum for 10 years. Option 2 is designed to require minimum effort and cost to maintain the forest at a similar density and distribution, reduce fire risk, and ensure that most of the ecosystem services continue to be available into the future.

Tree species will be limited to native, site-appropriate species, and management actions will entail control of ladder fuels and other fine fuels by pruning, mowing, and/or grazing. Planting of 100 saplings per year for 10 years will not immediately compensate for the loss of biomass and ecosystem services; the total tree biomass will decline from an initial value of 4,250 to approximately 2,800 metric tons. However, the percent tree cover will decline only marginally from 6

percent to 5.75 percent during the 30-year forecasting period. Only 10 percent of the existing non-native trees will remain after 30 years, many of which will be long-lived and fire-resilient species, such as cork oak and shamel ash.

Carbon storage will decline by approximately 10 percent by year 13 and then increase as young trees increase stored carbon. At the end of the forecasting period, the total carbon stored in the forest at the Park is expected to reach 108 percent of current, or equivalent to the emissions from 763 vehicles per year. Pollution removal will likewise decline initially but increase to approximately 175 percent of the current value. In addition, removing species with high-VOC emissions and replacing them with native species of low-VOC emission potential will further reduce the air pollution burden on the neighborhood of the Park. The fire-resilience of the native-species dominated forest resulting from Option 2 will be significantly higher, despite a more uneven-even-aged stand structure and more ladder fuels reaching into the canopy. Although ladder fuels will be more prevalent due to the abundance of young trees, the tree species themselves are less flammable and thus reduce the overall fire risk. Management actions to eliminate regrowth of non-native species (e.g., eucalyptus) and selective removal of highly flammable species will further drive the trajectory towards a native-species-dominated system.

**Option 3: The “Restoration and Enhancement” Scenario** aims to recreate a native riparian forest ecosystem with increased tree cover throughout most of the west stratum and native forest conditions in the east. The strategy involves planting approximately 300 young native trees annually in each stratum for 10 years. Under this scenario, the existing forest at the Park will be largely converted into a drought-tolerant, fire-resistant native vegetation community with high structural and biotic diversity. The resulting semi-natural forest will effectively serve as a fire modification zone and serve as an outdoor classroom for students learning about native plants and animals. It will provide substantial ecosystem benefits to local residents and visitors. Tree cover will increase from 6 percent to 11 percent after 30 years. Depending on the management of existing wetlands (see below and Section 3.2) the recruitment of riparian species may resemble the natural condition of the Great Valley Riparian Forest.

The total tree biomass will initially decline slightly from 4,252 to about 3,200 metric tons by year 13 and then increase to reach 4,100 metric tons by year 30 (i.e., 96 percent of current total tree biomass). Tree cover will increase steadily from 6 percent to almost 11 percent during the 30-year forecasting period. At the end of the forecasting period, the total carbon stored in the forest at the Park is expected to reach 190 percent of current or the equivalent of the emissions from more than 1,700 vehicles per year. The increase in carbon sequestration will continue beyond the 30-year forecasting horizon at a steady rate, at approximately 56 metric tons per year, or the equivalent of the emissions from 44 vehicles per year.

Pollution removal under Option 3 will remain stable for about five years and then increase to approximately 420 percent of the current value. Although the number of trees will only have doubled over this period, the monetary value of the resulting forest’s removal of air pollution will have quadrupled. Most of the value of the forest’s annual pollution removal is due to interception of particulate matter (PM<sub>2.5</sub>); that ecosystem service alone is worth over \$12,900 per year and would have significant benefits for public health. In addition, removing species with high-VOC emissions and replacing them with native species of low-VOC emission potential will further reduce the air

pollution burden on the neighborhood of the Park. Under Option 3, the fire risk will be greatly reduced due to more site-adapted and less-flammable species making up the bulk of the forest. This will create a “Fire Modification Zone” where fire behavior will likely change, and fires will be less intense and threatening.

#### S.4.1.3 Wetlands Conditions

There are five ponds within the former golf course, some or all of which may be historical oxbows associated with French Camp Slough. Four of these ponds are located in the western section of the Park. Pond 5 is located in the east stratum and is isolated from Ponds 1-4. During the operation of the golf course, river water was pumped into Pond 5 from a different diversion than for Ponds 1 through 4. Ponds 1 through 4 are currently connected via pipes and culverts, many of which are in poor condition.

All ponds at the Park are isolated from the floodplain of French Camp Slough by a levee. They are considered a managed water feature and jurisdictional wetlands of the U.S. by the Army Corps of Engineers (ACOE) and of the State of California. The total area of these wetlands is approximately 11.25 acres. The ponds are generally shallow and current inundation is mainly due to seasonal winter rains. Pond bottoms consist of a substantial layer of river sediment (e.g., fine silts and clays) and during dry periods excessive cracking of the pond bottoms has been noted. Sediment accumulations in the ponds is generally associated with sediment toxicity caused by pyrethroid pesticides, primarily Bifenthrin discharges originating from farmland. In addition, runoff from the golf course greens may have contributed additional urban toxic contaminants (e.g., herbicides, fertilizers, algaecides) that were applied during the operation of the golf course. As discussed later in this report (Section 3.2.1 below), sediment removal from these ponds is the preferred method to detoxify these types of wetlands.

The primary vegetation at the Park’s wetlands is a remnant wetland community that is currently undergoing a rapid transition into ruderal characteristics due to the lack of inundation. Wetland plants, such as cattails and other pond vegetation, are declining and disappearing rapidly, while the former ponds are being invaded by herbaceous weeds and young saplings of willows and eucalyptus tree species. If left unmanaged, the ponds are likely to become dense stands of young trees of undesirable species. The fire risk associated with such dense stands of young, highly flammable trees is substantial. In addition, the ponds in their current condition do not provide quality wildlife habitat.

#### S.4.1.4 Wetland Restoration

The primary goal of wetland restoration is to restore native ecosystem functions and values to promote resilience, biodiversity, and species conservation. The challenges associated with restoring natural ecosystem processes in wetlands at the Park include: 1) the current hydrological separation from adjacent stream flows; 2) the lack of a continuous stream channel linking the individual ponds to convey water; and 3) the existing shallow ponds that are not deep enough to maintain sufficient inundation to support wetland vegetation communities. Channel restoration only applies to Ponds 1 through 4, as they are disconnected from Pond 5.

#### S.4.1.5 Ponds 1 Through 4

Ponds 1 through 4 were originally created as golf course features interlinked by pipes and culverts. Since abandonment of the golf course, the ponds have been maintained as individual water bodies without interlinking connections. This has resulted in the ponds silting in. The ponds' proximity to each other and the past hydrological connection via pipes and culverts make them suitable to be considered as part of one cohesive, connected wetland complex. Restoring a functional wetland complex from Ponds 1 through 4 could include:

- Removing river sediment from the ponds to a depth that will allow the storage of rainwater for at least several months, and possibly recharging connection to the groundwater table.
- Establishing natural channels linking the ponds with each other to establish functional flow regimes and to reduce siltation. Removal of all pipes and creating meandering open channels with natural banks and bottom substrate will establish a natural surface water connection between the ponds and can aid in increasing the functionality and extent of the wetlands. Creating a connected wetland complex may generate significant wetland credits for mitigation.
- Restoring natural riparian vegetation along the functioning wetlands. Re-establishing a riparian forest along the restored wetlands will aid in promoting biodiversity, special-status species habitat, and fire resilience.

Reconnecting the wetlands with high-water flows from French Camp Slough and the San Joaquin River to enhance the river's floodplain. Originally, the site of the Park was located within the expansive floodplain of French Camp Slough and the San Joaquin River. However, subsequent creation of the RD 404 levee system resulted in isolation of the Park from the river floodplain. Furthermore, the levee along French Camp Slough has hemmed-in the river and reduced its ability to disperse floodwaters across its former floodplain, thus increasing flows and energy during flood events. Two options for restoration of wetlands, hydrology, and floodplain include:

**Option 1: Oxbow.** Oxbows are remnant former stream channels that are no longer connected to the main flows of the river and are normally part of a dynamic and healthy stream/floodplain system. A restoration of a fully functional oxbow system at the Park would include the creation of connecting channels as well as removal of artificial structures such as berms, concrete weirs, culverts, pipes and other remnant infrastructure. Additionally, removal of sediment to deepen the ponds would be essential. The removed dredge materials could be used onsite for creating burrowing owl habitat mounds and for potentially filling in Pond 5. Nutrient removal and water quality enhancements are the primary benefits of a functioning oxbow wetland complex. Existing levees along French Camp Slough and the San Joaquin River would be maintained in their current configuration.

**Option 2: Floodplain.** Creating a fully functional floodplain at the Park would require removing, breaching or modifying the existing levee along the western portion of the Park and creating a setback levee to protect the adjoining neighborhoods. Channels would be excavated to connect to French Camp Slough and the San Joaquin River to accommodate peak flows that would spill into the oxbow wetlands, recharging water levels and providing nutrient flows. Depending on the design, such a floodplain could accommodate 2-year to 10-year floods, but generally an inundation

frequency of less than 5 years would best maintain ecological integrity and nutrient transport capacity of the floodplain.

Maintaining a functioning riparian belt along the restored wetlands would also be desirable. Riparian vegetation could reduce the currently high fire risk to the neighboring communities. Fires in riparian areas are considered to be of lower intensity and occur less frequently than in the surrounding uplands. Penetration of upland fires also depends on the width of riparian zones; therefore, riparian forest can act as a buffer against fire. In addition, this restoration would provide additional effective protection from anticipated flooding in the future.

#### S.4.1.6 Pond 5

Pond 5 is the only wetland on the eastern portion of the Park. This irregularly shaped 2.6-acre feature is located approximately equidistant from the Community Center and the central parking lot (Figure 2). Pond 5 is sustainable as a wetland only if it can be deepened to retain moisture longer in years of sufficient rainfall. This option could also include reducing the footprint of the pond, deepening the remaining portion and restoring the hydrological function of the pond as seasonal wetland habitat. Removal of non-native vegetation, maintenance and periodic de-sedimentation would also be needed. A reduction in the overall surface of the pond would require compensatory mitigation for the loss of wetlands (which could be provided by restoring Ponds 1 through 4). Removal of invasive weeds and the date palms along its fringes would create better wildlife habitat and aesthetic values.

Options for Pond 5 include:

- **Option 1: Restore, consider creating a recreational fishing pond.** Restoration of Pond 5 to a seasonal pond would require de-sedimentation and management of invasive vegetation along its edges. If native Western pond turtles use the pond, their presence could require additional permitting before maintenance activities could be conducted. If a public fishing pond is considered, this option would incur high maintenance demands and frequent restocking of the pond with live, catchable fish. In addition, occasional draining would likely be required to remove sediment, invasive weeds, and other non-native species (e.g., bullfrogs, released pet turtles). Periodic testing of water quality for toxic components would also be required. Risks of public fishing ponds are primarily related to safety, especially for small children, and to the likelihood of vandalism.
- **Option 2: Reconfiguration as a skateboard or BMX park.** Creating a skateboard or BMX park would entail installing hardened surfaces (concrete for a skatepark, decomposed granite for a BMX park) and would require the installation of drains to remove standing water after a rain event. If the pond is reconfigured as a skate/BMX park, the resulting loss of a jurisdictional wetland will require mitigation pursuant to Section 404 of the Clean Water Act (CWA). It should be noted that the regulatory agencies (i.e., Corps of Engineers, Regional Water Quality Control Board, California Department of Fish and Wildlife) might oppose the conversion of a jurisdictional wetland into an upland use.

- **Option 3: Complete fill and re-use as terrestrial area.** The pond could serve as a depository for excavated soils (e.g., from levee reconfiguration, wetland creation) and thus could be filled in to create a terrestrial area. Compensatory mitigation for the loss of the entire 2.6-acre wetland would be required. The wetland restoration in the west stratum could provide onsite self-mitigation. For the same reason stated above, the regulatory agencies might oppose this filling and re-use.

## S.5 PART 3: MANAGEMENT RECOMMENDATIONS

### S.5.1 Fire Prevention

The Park's existing urban forest is comprised of highly flammable, water-stressed trees. This vegetation, if left unmanaged, will increasingly consist of fine fuels, ladder fuels, and drought stressed trees, making a conflagration likely. Therefore, conversion of these current fire-prone conditions to more fire-resistant vegetation types is of utmost importance. The Park's western stratum is uniquely suited to restoring the native floodplain, wetlands, and riparian forest conditions that originally existed in this location. In the eastern stratum, the prevalence of recreational uses and to the proximity to the Community Center requires a forest conversion strategy that is compatible with these uses. Recommendations for fire prevention measures include:

- **Hazard tree removal** and fine fuel management (short-term, mid-term). Hazard trees, especially those of highly flammable species provide large amounts of fuel. They should be removed wherever necessary and be replaced with groups of saplings of native species that are less fire prone (e.g., oaks, sycamores, buckeye etc.).
- **Fine fuel management.** Grasses and weeds can provide fine fuels that allow fires to start and traverse over open, treeless terrain. Goat or sheep grazing should be implemented to remove herbaceous vegetation (grasses and weeds) after they have cured (dried). The best time to start grazing the Park is at the end of May. Stubble height after grazing should be approximately 4 to 6 inches.
- **Fuel breaks.** Installing a fuel break along the Park boundary could increase the defensible space and threat to residential areas. Removing all trees and shrubs along the Park boundary should be implemented to create a fire break that is at least 100 feet wide. Setback levees can also be used as effective fire breaks where they are constructed for flood control. Implementing a fire break may also alleviate security concerns by increasing the visibility along the Park boundary.
- **Conversion from fire prone to fire resilient,** native species composition. Underplanting the existing forest canopy with native species will enhance sapling survival and facilitate maintaining the ecosystem service benefits (e.g., urban cooling, carbon sequestration, pollution removal). Resulting changes in the forest structure and composition towards a native Great valley Riparian Forest will contribute to fire resilience and lower management costs.
- **Fire action plan.** Creating fire-safe conditions at the Park will require the development a prescriptive action plan incorporating ecological assessment, fire behavior and fuel modeling.



### **S.5.2 Wetland Restoration**

Currently, the Park is at risk of 7-foot increases in flood water above existing conditions, which will stress levees and may result in overtopping and extensive flooding. Wetland restoration at the western portion of the Park could abate this risk. Wetland restoration activities include the following modifications to Ponds 1 through 4:

- Deepening and removing river sediment to allow the storage of rainwater for at least several months, and possibly recharging connection to the groundwater table.
- Establishing natural channels instead of the existing culverts to reverse the alteration of channel form, changes in flow regimes, and siltation.
- Restoring natural riparian vegetation along the functioning wetlands for promoting biodiversity, special-status species habitat and fire resilience.
- Reconnecting the wetlands with high-water flows from French Camp Slough and the San Joaquin River to enlarge the river's floodplain, accommodating predicted peak flows. To maintain high ecological integrity and nutrient transport capacity, the frequency of inundation of the floodplain should be less than five years.

Channel restoration only applies to Ponds 1 through 4, as they are disconnected from Pond 5. Restoration of Pond 5 would create a seasonal wetland without a hydrological connection to other wetlands. Alternative options to restoring pond 5 include: a) converting Pond 5 to a public fishing pond; b) creating a skate or BMX park by installing hardened surfaces (concrete for a skatepark, decomposed granite for a BMX park); or c) filling in Pond 5 to create a terrestrial area. Compensatory mitigation for the loss of the entire 2.6-acre wetland would be required.

### **S.5.3 Wildlife Conservation**

Major wildlife conservation objectives to consider in the redevelopment of the Van Buskirk Golf Course include:

- Support of rare, special-status and other protected species, including grassland and burrowing owl restoration, protection and enhancement of Swainson's hawk foraging and nesting habitat, enhancement of Valley Elderberry Longhorn Beetle habitat, bat habitat conservation and enhancement of pollinator and butterfly habitat.
- Habitat enhancement through the management of urban forests, floodplains and riparian habitats that could create a multi-story canopy with high diversity. Retention of snags and "dead and down" woody debris (wherever possible) is important to maintain a functioning forest habitat. Habitat enhancement would increase biodiversity and support the goal of "Keeping common species common".
- Aggressive management of invasive species throughout all areas of the Park, in particular wetlands should be kept free of invasive species as much as possible, including non-native animals such as released pet turtles, goldfish, bullfrogs, and feral domestic animals. Public information on the detrimental effects of these species should be provided in informational signage and interpretive displays.

#### **S.5.4 Mitigation Credit Generation**

An important element of the wildlife conservation strategy is the creation of habitat mitigation credits for use by the City or the San Joaquin Habitat Conservation Plan (HCP). The goal of mitigation is to replace the exact function and value of specific habitats (e.g., biodiversity, flood abatement, fish habitat) that would be adversely affected by a proposed development project ideally on land within the same watershed. Mitigation projects often will restore the mitigation site and provide funding for in-perpetuity management and monitoring. This guaranteed funding makes mitigation projects the ideal vehicle to create sustainable and functioning habitat at the Park. Thus, mitigation for wetland impacts could be an integral part of the Master Plan for the Park. Potential mitigation credits generated from restoration of natural habitat at the Park include:

- Wetlands
- Riparian vegetation
- Elderberry bushes
- Delta smelt habitat
- Swainson's hawk breeding and foraging habitat
- Burrowing owl breeding and foraging habitat

Once the preferred options for restoration at the Park have been determined, a detailed mitigation plan should be developed, identifying opportunities for on-site mitigation of project impacts and opportunities for mitigating off-site impacts.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	i
FIGURES AND TABLES .....	xv
<b>1.0 INTRODUCTION.....</b>	<b>1-1</b>
<b>2.0 PART 1: BIOLOGICAL RESOURCES REPORT .....</b>	<b>2-7</b>
2.1 Purpose .....	2-7
2.2 Proposed Action .....	2-8
2.2.1 Project Location, Zoning .....	2-8
2.3 Methods .....	2-9
2.3.1 Database Review .....	2-9
2.3.2 Wildlife Surveys .....	2-10
2.3.3 Vegetation Inventory.....	2-10
2.4 Regulatory Background .....	2-11
2.4.1 Sensitive Land Cover Types .....	2-11
2.4.2 Special-status Species.....	2-12
2.5 Environmental Setting.....	2-14
2.5.1 Climate.....	2-14
2.5.2 Geology.....	2-14
2.5.3 Topography and Hydrology .....	2-18
2.5.4 Vegetation .....	2-19
2.5.5 Wetlands.....	2-21
2.5.6 Wildlife.....	2-22
2.6 Plan Development.....	2-24
2.6.1 Interested Parties .....	2-24
2.6.2 Conceptual Plan.....	2-24
2.6.3 Potential Actions: .....	2-24
<b>3.0 POTENTIAL IMPACTS TO BIOLOGICAL RESOURCES .....</b>	<b>3-26</b>
3.1 Biological Resources.....	3-26
3.2 Mitigation Measures.....	3-1
<b>4.0 PART 2: ECOSYSTEM VALUES OF THE VAN BUSKIRK PARK.....</b>	<b>4-6</b>
4.1 Introduction .....	4-6
4.2 Project Area.....	4-7
4.2.1 History .....	4-7
4.2.2 Neighborhood Characteristics and Project Context .....	4-7
4.2.3 Environmental Risk Setting.....	4-9
4.2.4 Ecosystem Services .....	4-10
4.3 METHODS .....	4-13
4.3.1 Vegetation Communities And Tree Inventory.....	4-13
4.3.2 i-Tree Eco .....	4-14
4.4 Urban Forest Assessment .....	4-17
4.4.1 Current Conditions .....	4-17
4.4.2 Future Conditions Analysis .....	4-23
4.5 Wetlands .....	4-34

4.5.1	Wetland Restoration.....	4-34
4.5.2	Ponds 1 Through 4.....	4-34
4.5.3	Pond 5.....	4-40
4.6	MANAGEMENT RECOMMENDATIONS .....	4-41
4.6.1	Prioritization .....	4-41
4.6.2	Fire Prevention .....	4-41
4.6.3	Wetland Restoration.....	4-43
4.6.4	Wildlife Conservation .....	4-45
<b>5.0</b>	<b>REFERENCES .....</b>	<b>5-1</b>

## FIGURES AND TABLES

### FIGURES

Figure 1: Regional Location .....	1-3
Figure 2: USGS Topographic Map.....	1-4
Figure 3: Study Area on Aerial Imagery.....	1-5
Figure 4: Master Plan .....	2-17
Figure 5: CNDDDB Occurrences within 1 Mile.....	3-1
Figure 6: Ecosystem Services and their relations to constituents of human well-being (Source: Millennium Ecosystem Assessment 2005).....	4-11
Figure 7: Monthly Pollution Removal (kg) of the Current Forest at Van Buskirk Park, Stockton, California .....	4-21
Figure 8: Proportion of Trees in Three Flammability Categories for the West and East Stratum, respectively, at Van Buskirk Park, Stockton, California.....	4-28
Figure 9: Projected Diameter at Breast Height (dbh) of Trees over a 30-Year Forecasting Period with Replanting.....	4-29
Figure 10: Trunk Diameter Distribution (dbh) for the Urban Forest at Van Buskirk Park under Scenario 3 (Planting of 3,000 Saplings over 10 Years). .....	4-31
Figure 11: Carbon Storage Forecasted under the Baseline, Option 2 and Option 3 Scenarios .....	4-32
Figure 12: Pollution Removal Value for Three Scenarios of Forest Restoration at Van Buskirk Park, Stockton, California .....	4-33
Figure 13: Conceptual rendering of a fully functional floodplain ecosystem at Van Buskirk Park, Stockton (Option 2, West stratum) .....	4-37
Figure 14: Estimated Carbon sequestration (metric tons) of restoring 1 ha (2.4 ac) of riparian forest at Van Buskirk Park, Stockton, California (Source CREEC). .....	4-39

### TABLES

Table A: Soils of the Van Buskirk Park, San Joaquin County, California .....	2-15
Table B: Ponds at Van Buskirk Park, Stockton, California .....	2-21
Table C: Special-Status Species and Sensitive Natural Communities Occurring within 1 Mile of the Project Site.....	3-1
Table D: Neighborhood Characteristics, SB 535 Disadvantaged Communities Using CalEnviro Screen 3.0.....	4-9
Table E: Species Composition and Leaf Area for the 12 Most Abundant Tree Species in the Urban Forest at Van Buskirk Park, Stockton, California .....	4-18
Table F: Tree Health and Average Crown Dieback at Van Buskirk Park, Stockton, California.....	4-18
Table G: Carbon Storage of Various Tree Species at Van Buskirk Park, Stockton, California.....	4-20
Table H: Volatile Organic Compound Emissions of Trees at Van Buskirk Park, Stockton, California .....	4-22
Table I: Air Quality Health Impacts and Values of trees at Van Buskirk Park.....	4-23
Table J: Natural Recruitment and Fire Risk Potential for the 10 Most Abundant Tree Species in the Urban Forest at Van Buskirk Park, Stockton, California .....	4-27

**This page intentionally left blank.**

## 1.0 INTRODUCTION

The Van Buskirk Park, (“Park”) is a 192.71-acre former golf course (San Joaquin County APN: 16307036) located at 1740 Houston Avenue, Stockton, California 95206, along the north bank of Walker Slough, French Camp Slough, and the San Joaquin River (Figures 1-3). In 1957, Charles and Bertha Van Buskirk donated the property to the City of Stockton with a deed restriction limiting its use to “public recreation or public park purposes.” Most of the Park was developed as a golf course, completed in 1969. The 18-hole course featured 6,928 yards of golf from the longest tees for a par of 72. The golf course closed in 2019 due to declining golf use, increasing and unsustainable subsidy of operations, and significant unfunded deferred maintenance and repairs.

The City of Stockton is planning the rehabilitation and reuse of the Park for active and passive outdoor recreational facilities, programs, and activities. The City aims to develop a financially sustainable use of the Park that focuses on activities and facilities which improve the quality of life for Stockton’ residents and support City Council goals and strategies while staying in alignment with the City’s Long Term Financial Plan. The City’s core vision for the Park is to enhance the public space to provide opportunities that engage residents and visitors and will provide quantifiable economic and social justice<sup>2</sup> benefits to the City and neighborhood.

This report is divided into three parts. Part 1 details the biological resources at the Park and the potential regulatory context of any modification of the Park’s features. The purpose of this Biological Resources Report (Report) is to evaluate the potential effects of the project on federally and State listed and proposed species and designated and proposed critical habitat, and to determine whether these species or habitats are likely to be adversely affected by the project pursuant to 50 Code of Federal Regulations [CFR] §402.12 and the California Environmental Quality Act (CEQA).

Part 2 of this document provides an in-depth review of the ecosystem values and benefits of the current conditions at the Park to the residents of the surrounding neighborhoods. The analysis summarizes a variety of tangible benefits and develops 3 scenarios how the delivery of these benefits may be affected by future management options. Part 3 contains recommendations for future management of the natural resources of the Park.

Consideration of flood risk and opportunities to address climate change and carbon sequestration is also a goal of this report. The Park is located in a Federal Emergency Management Agency (FEMA) X-Flood Zone, and climate change hydrology in concert with the predicted sea level rise is likely to cause more than a 7-foot increase in future water surface elevation. It is unlikely that the existing levees at the Park will be able to protect the adjoining neighborhoods from flooding of that magnitude.

<sup>2</sup> Social justice benefits of urban forests and parks include filtering air pollution, absorbing flood and rainwater and providing shade/cooling. Urban trees also may reduce stress and blood pressure, and increase mental engagement, attentiveness and happiness. Communities with large street trees often have lower crime and slower traffic.

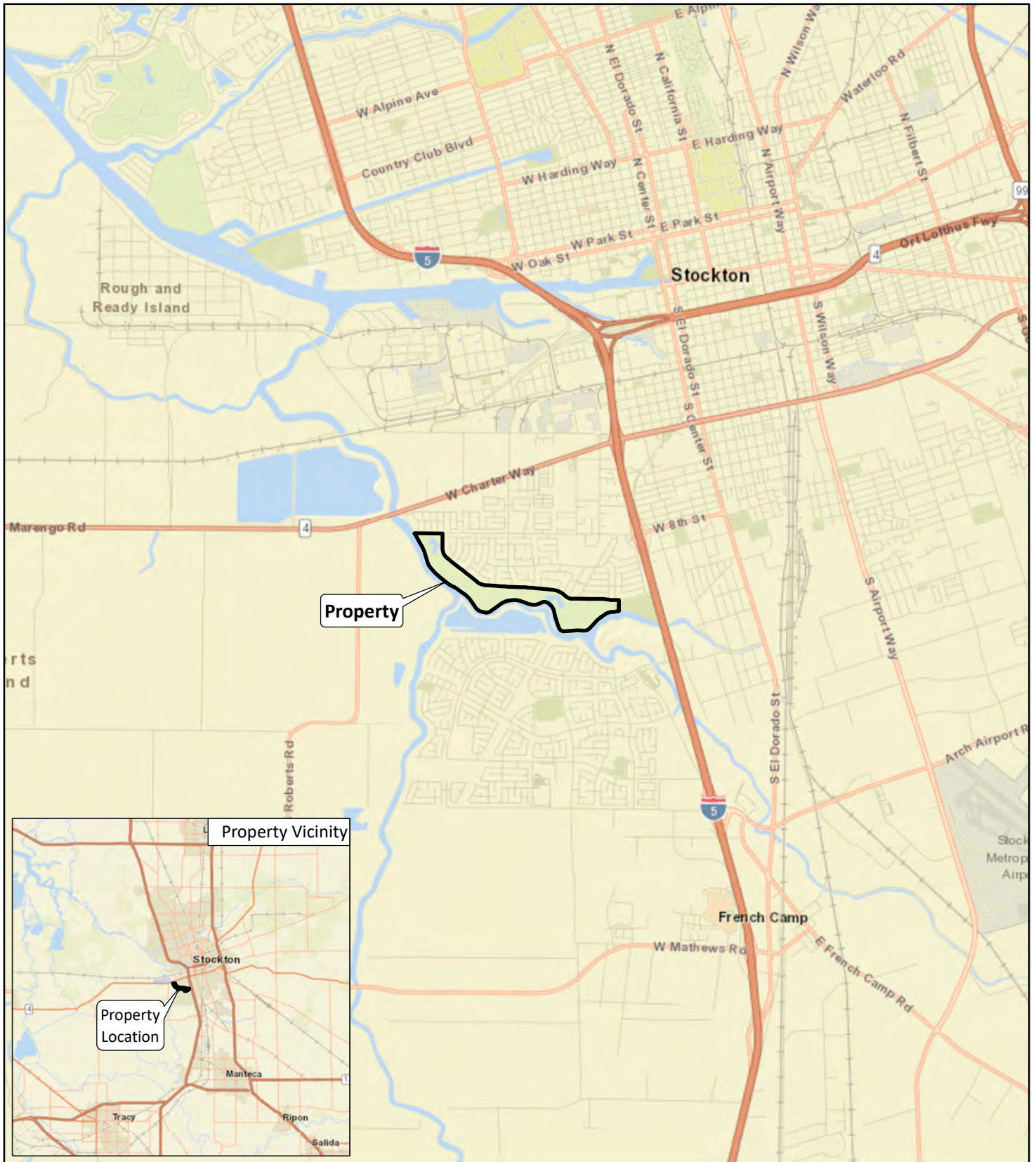

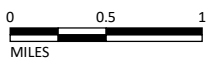


FIGURE 1

LSA

LEGEND

 Study Area



SOURCE: Esri World Street Map (2021).

I:\DEW2002\GIS\Maps\Ecosystem Values Report\Figure 1\_Regional Location.mxd (4/22/2021)

*Van Buskirk Golf Course Re-Use Study*  
 Stockton, San Joaquin County, California  
 Regional Location



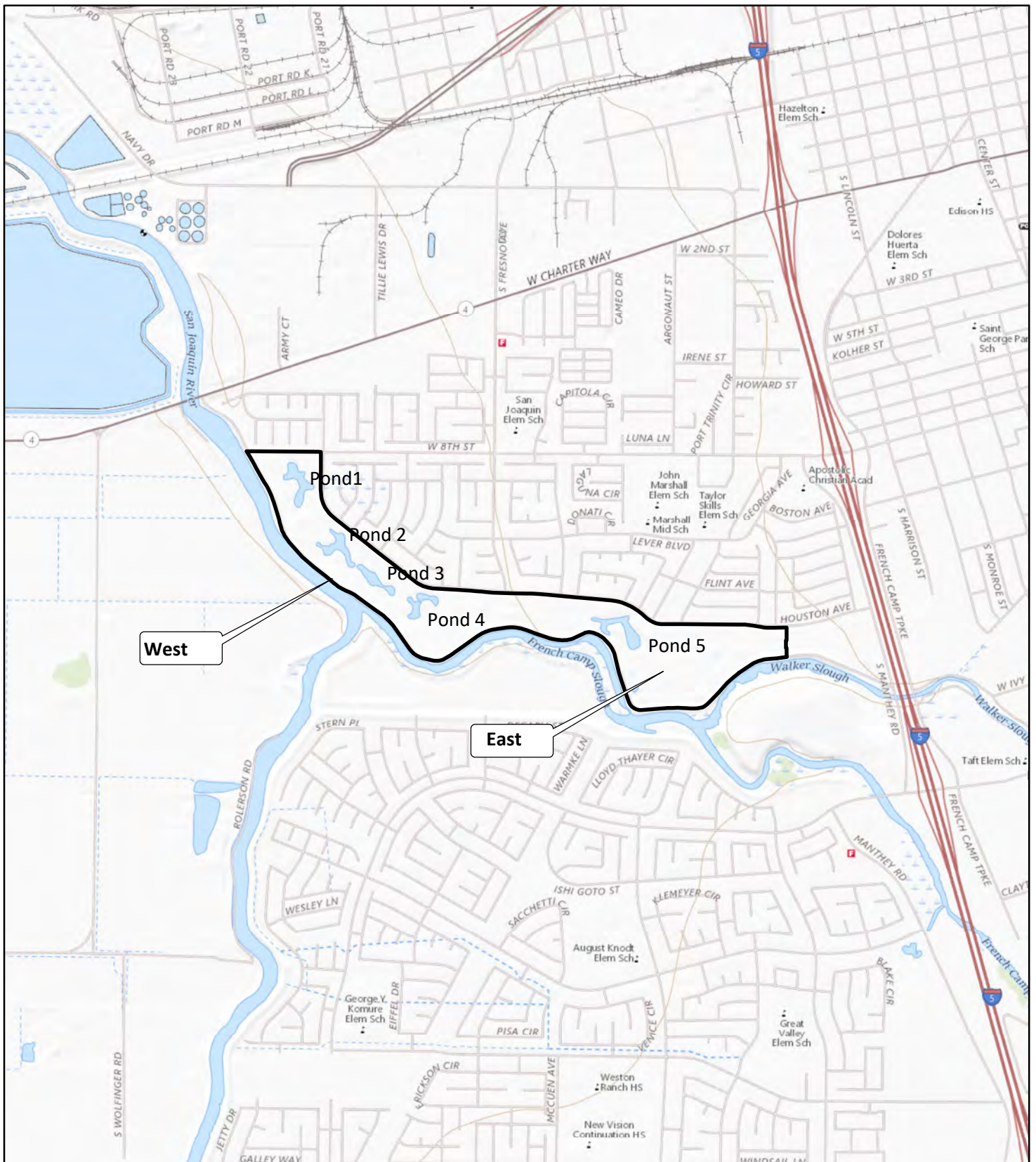

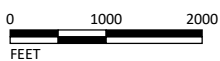


FIGURE 2

LSA

LEGEND

 Study Area



SOURCE: USGS: The National Map (05/2020).

I:\DEW2002\GIS\Maps\Ecosystem Values Report\Figure 2\_USGS Topographic Map.mxd (4/22/2021)

Van Buskirk Golf Course Re-Use Study  
 Stockton, San Joaquin County, California  
 USGS Topographic Map



LSA

LEGEND


 Study Area

FIGURE 3



0 500 1000  
FEET

SOURCE: Nearmap (07/2020).

I:\DEW2002\GIS\Maps\Ecosystem Values Report\Figure 3\_Study Area on Aerial Imagery.mxd (4/22/2021)

*Van Buskirk Golf Course Re-Use Study  
Stockton, San Joaquin County, California  
Study Area on Aerial Imagery*

**This page intentionally left blank.**

## 2.0 PART 1: BIOLOGICAL RESOURCES REPORT

### 2.1 PURPOSE

The purpose of this Biological Resources Report (Report) is to evaluate the potential effects of the project on federally and State listed and proposed species and designated and proposed critical habitat, and to determine whether these species or habitats are likely to be adversely affected by the project pursuant to 50 Code of Federal Regulations [CFR] §402.12 and the California Environmental Quality Act (CEQA). The essential elements of this Report are:

- **Project Description:** The report describes the nature of the project, its location, and the timing of the proposed effort as much as it presently known or can be anticipated. It also describes the conservation measures that will be implemented to avoid, reduce, or eliminate adverse effects or that will benefit the protected species or critical habitat.
- **Project Area:** The project area is the area where the project will be implemented. This includes the “action area” (i.e., where the actual project activities such as grading, excavating, and planting will occur). This analysis is general in nature, because the exact locations of activities and their spatial context to the physical, biotic, and other conditions are presently unknown.
- **Listed Species:** The potentially affected species are discussed in this Part and are listed in Appendix D. This includes all federally and state listed species, including candidate species, that “may be present” in the action area or may be affected by the project. It also includes other special status plant and animal species. Using a variety of sources and the official species list from the California Department of Fish and Wildlife (CDFW), the United States Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS), this list provides the documentation for the Project’s administrative record.
- **Effects Determination:** Finally, this report evaluates the possible effects the project may have on a listed species that potentially could be present and the supporting rationale. Pursuant to CEQA Guidelines Section 15382, a significant effect on the environment means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project. This will also include the consideration of effects that may occur later in time as well as cumulative effects.

## 2.2 PROPOSED ACTION

The City of Stockton intends to develop a Conceptual Master Plan (Plan) for the former Van Buskirk Golf Course. The City aims to develop a financially sustainable use of the Park that focuses on activities and facilities which improve the quality of life for Stockton' residents and support City Council goals and strategies while staying in alignment with the City's Long Term Financial Plan. The City's core vision for the Park is to enhance the public space to provide opportunities that engage residents and visitors and will provide quantifiable economic and social justice<sup>3</sup> benefits to the City and neighborhood.

### 2.2.1 Project Location, Zoning

The Park property is located within the urban boundary of the City of Stockton, south of the center of Stockton, adjacent to the confluence of the San Joaquin River, French Camp Slough, and Walker Slough (Figures 1-3). The site is shown on the USGS Stockton West, California, 7.5-minute quadrangle map as located within the Moss Tract in Township 1 North, Range 6 East, Mt. Diablo Base and Meridian. Approximate latitude is 37° 55' 04" North, and approximate longitude is 121° 18' 20" West.

The 192-acre parcel includes approximately 12,100 feet of levee along Walker Slough, French Camp Slough and the San Joaquin River. The area within the levee measures approximately 167 acres. This area houses the existing Van Buskirk Community Center, park, and ballfields (approximately 27 acres) and approximately 5 acres of parking area, buildings and walkways associated with the former golf course. The balance of the remaining acreage is approximately 11.25 acres of existing wetlands, and approximately 125 acres of natural areas. The acreages of the levee (including the area from the water's edge to the levee's inward foot slope) and the existing Van Buskirk Community Center, park, and ballfields are not subject to this evaluation.

The Park is located along the eastern border of Sacramento-San Joaquin Delta as delineated under the Delta Protection Act (Section 12220 of the Water Code) passed in 1959. The Sacramento-San Joaquin Delta Reform Act of 2009 (Delta Reform Act) provides for coordination and oversight of State and local agencies proposing to fund, carry out, and approve Delta-related activities. The legally enforceable Delta Plan aims to achieve the State's coequal goals of a reliable statewide water supply and a protected, restored Delta ecosystem.

The Park is currently zoned as "Parks and Recreation" in the Stockton General Plan (City of Stockton 2018). The predominant land use on surrounding parcels is urban residential development to the north and east and water/riparian habitat to the south and west, along French Camp Slough and the San Joaquin River. The Park and adjacent areas are not zoned for agricultural use, consequently they are not subject to Williamson Act contracts. Lands across French Camp Slough from the eastern portion of the Park are residential subdivisions.

<sup>3</sup> Social justice benefits of urban forests and parks include filtering air pollution, absorbing flood and rainwater and providing shade/cooling. Urban trees also may reduce stress and blood pressure, and increase mental engagement, attentiveness and happiness. Communities with large street trees often have lower crime and slower traffic.

## 2.3 METHODS

### 2.3.1 Database Review

LSA evaluated multiple existing databases regarding the potential special-status species that may be present at the site. In particular, LSA accessed the following databases:

- **California Native Plant Society (CNPS) Online Inventory.** LSA accessed the CNPS Online Inventory of Rare and Endangered Vascular Plants of California for all rare plant records on the U.S. Geological Survey (USGS) Stockton West Quadrangle.
- **California Natural Diversity Database (CNDDDB).** LSA queried the CNDDDB for occurrences of all special-status wildlife and plant species subject to CEQA within a 5-mile radius of the property boundary. A 10-mile buffer area was determined to be sufficient due to the predominantly urban nature of the surrounding areas. In addition, the assessment includes any potentially occurring sensitive natural communities. A sensitive natural community is a biological community that is regionally rare, provides important habitat opportunities for wildlife, is structurally complex, or is in other ways of special concern to local, State, or federal agencies. CEQA identifies the elimination or substantial degradation of such communities as a significant impact. The CDFW tracks sensitive natural communities in the CNDDDB.
- **USFWS Information for Planning and Conservation (IPaC) Online System.** LSA used the USFWS IPaC online system to determine if the property is in any designated critical habitat. The IPaC online system was also used to generate a list of special-status plant and wildlife species that the USFWS suggests may occur within or near the property or be affected by a project on the property. The search area was defined by drawing the property boundaries onto the IPaC online mapper.
- **The California Essential Habitat Connectivity Project** which identified the network of connected wildlands. The Essential Connectivity Map depicts large, relatively natural habitat blocks that support native biodiversity (Natural Landscape Blocks) and areas essential for ecological connectivity between them (Essential Connectivity Areas).
- **The Vegetation and Land Use Classification and Map Update of the Sacramento-San Joaquin River Delta**, produced by CDFW (2019). This report describes the vegetation classification and mapping of the Legal Delta portion of the Sacramento-San Joaquin River Delta based on 2016 imagery, for use in conjunction with the Delta Regional Ecosystem Restoration Implementation Plan. Vegetation and land use are mapped for the 737,621 acres constituting the Legal Delta portion of the Sacramento and San Joaquin River Delta area. Vegetation mapping is to alliance level when possible, otherwise it is left at group level. The map classification is based on a vegetation classification derived from field data collected in summer and fall of 2005 produced by the Vegetation Classification and Mapping Program (VegCAMP) of CDFW.
- **Other Sources:** LSA reviewed the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP) for information on protected biological resources that could potentially occur on the property. The SJMSCP (2000) was adopted by the San Joaquin Transportation Authority on November 14, 2000. The key purpose of the SJMSCP is to provide a strategy for balancing the need to conserve open space and the need to convert open space to

non-open space uses while protecting the region's agricultural economy; preserving landowner property rights; providing for the long-term management of plant, fish, and wildlife species, especially those that are currently listed, or may be listed in the future, under the Federal Endangered Species Act (ESA) or the California (CESA); providing and maintaining multiple open-spaces which contribute to the quality of life of the residents of San Joaquin County; and accommodating a growing population while minimizing costs to Project Proponents and society at large.

### **2.3.2 Wildlife Surveys**

A breeding bird and wildlife habitat survey was conducted to characterize the habitat types and wildlife species on the Park, including wetlands or special-status species habitats that may be present on the site. On April 20, by foot and with the aid of binoculars, LSA staff biologists Gretchen Zantzinger and Michelle Nicoles conducted a preliminary survey for nesting birds and special-status wildlife species. LSA surveyed both the east and west strata of the Park to search for biological resources, such as the presence of special-status animals and their habitats, and sensitive habitats such as wetlands or drainages. The survey included searching trees for occupied nests of passerine and raptor species, such as Swainson's hawk, and the ground for California ground squirrel burrows that could provide refuge for burrowing owls. The potential presence of rare, threatened, or endangered species was determined based on an evaluation of the habitat types present on the property, the CNDDDB records, and other occurrence information from the vicinity of the property.

Plant and animal species observed during the survey were recorded in field notes. Weather conditions during the survey consisted of temperatures ranging from the 50s to the high 70s degrees F. Binoculars (10 x 40) were used to aid in identification of bird species, behavioral observations, and investigation of suitable habitats. Following the guidance provided in the CDFW 2012 Burrowing Owl Staff Report (CDFW 2012), the survey assessed the project area for burrowing owl habitat (e.g., burrows, structures), with particular attention to habitat suitability and utilization (e.g., whitewash, prey remains, pellets). The survey also identified suitable habitat for Swainson's hawk and evaluated the presence of active bird nests that are protected under the California Fish and Game Code. Finally, the survey provided observations on the potential for restoration and enhancement of the Park to support pollinators (butterflies, bees).

### **2.3.3 Vegetation Inventory**

LSA conducted a complete vegetation and habitat inventory. From February 17 through 25, 2021, a team of biologists and botanists conducted a comprehensive tree inventory of the entire site. Each tree was identified by species, georeferenced by its location and given a unique waypoint in a GIS database. The tree's diameter at breast height (dbh in inches), crown health (percent of crown damaged or dead) and total height (in meters) was recorded. A tree's condition was evaluated by the amount of crown damage (dieback) and condition classes were as follows:

- Excellent = 0 percent dieback
- Good = 1 - 10 percent dieback
- Fair = 10 - 25 percent dieback
- Poor = 25 - 50 percent dieback

- Critical = 50 - 75 percent dieback
- Dying = 75 - 99 percent dieback
- Dead = 100 percent dieback

The height of each tree was determined either by a laser-range finder with a tree height measuring function (LaserTech TruPulse 360R Laser Rangefinder) or by combining linear distance measurement with a common laser range finder and a clinometer. For the latter method, correction for the eye level height of the observer was necessary to obtain correct tree height measurements. All data were recorded in field data sheets and later transcribed in Microsoft Excel spreadsheets.

## 2.4 Regulatory Background

The following sections explain the regulatory context of the biological resources report, including applicable laws and regulations that were applied to the field investigations and analysis of potential project impacts.

### 2.4.1 Sensitive Land Cover Types

Land cover types are defined as areas covered by a particular vegetation type, soil or bedrock formation, aquatic features, and/or development (urban, roads etc.). Typically, land cover types have identifiable boundaries that can be delineated based on changes in plant assemblages, soil or rock types, soil surface or near-surface hydroperiod, anthropogenic or natural disturbance, topography, elevation, etc. Land cover types that are considered or protected under one or more environmental regulations are discussed below.

**Waters of the United States:** The United States Army Corps of Engineers (Corps) regulates "Waters of the United States" under Section 404 of the Clean Water Act (CWA). Waters of the United States are defined in the Code of Federal Regulations (CFR) as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the Corps Wetlands Delineation Manual (Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated at a sufficient depth and for a sufficient duration to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as "other waters" and are often characterized by an ordinary high-water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into Waters of the United States generally requires an individual or nationwide permit from the Corps under Section 404 of the CWA.

**Waters of the State:** The term "Waters of the State" is defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope and has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes "isolated" wetlands and waters that may not be regulated by the Corps



under Section 404. Waters of the State are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact Waters of the State, are required to comply with the terms of the Water Quality Certification determination. If a project does not require a federal permit but does involve dredge or fill activities that may result in a discharge to Waters of the State, the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

**Streams, Lakes, and Riparian Habitat:** Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by CDFW under Sections 1600-1616 of California Fish and Game Code (CFGC). Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term "stream", which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life [including] watercourses having a surface or subsurface flow that supports or has supported riparian vegetation" (14 CCR 1.72). In addition, the term "stream" can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFG 1994). "Riparian" is defined as "on, or pertaining to, the banks of a stream." Riparian vegetation is defined as "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFG 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFW.

**Sensitive Natural Communities:** Sensitive natural communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFW. CDFW ranks sensitive communities as "threatened" or "very threatened" (CDFG 2010, CDFW 2018a) and keeps records of their occurrences in its California Natural Diversity Database (CNDDDB; CDFW 2019a). CNDDDB vegetation alliances are ranked 1 through 5 based on NatureServe's (2019) methodology, with those alliances ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified in local or regional plans, policies, or regulations or those identified by the CDFW or U.S. Fish and Wildlife Service (USFWS) must be considered and evaluated under CEQA (CCR Title 14, Div. 6, Chap. 3, Appendix G).

#### 2.4.2 Special-status Species

Special-status species are those plants and animals that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized by federal, State, or other agencies. Some of these species receive specific protection that is defined by federal or State endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. For the purposes of this assessment, the term "special status" includes those species that are:

- Federally listed or proposed for listing under the Federal Endangered Species Act (50 CFR 17.11- 17.12);
- Candidates for listing under the Federal Endangered Species Act (61 FR 7596-7613);
- State listed or candidate for listing under the California Endangered Species Act (14 CCR 670.5);
- Species by the CDFW as a Species of Special Concern;
- Fully protected animals, as defined by the State of California (California Fish and Game Code Section 3511, 4700, and 5050);
- Species that meet the definition of threatened, endangered, or rare under the California Environmental Quality Act (CEQA; CEQA Guidelines Section 15380);

The federal Bald and Golden Eagle Protection Act provides relatively broad protections to both of North America's eagle species (bald [*Haliaeetus leucocephalus*] and golden eagle [*Aquila chrysaetos*]) that in some regards are similar to those provided by ESA. Species of Special Concern (species that face extirpation in California if current population and habitat trends continue) are given special consideration under CEQA and are therefore considered special-status species.

In addition to regulations for special-status species, most native birds in the United States, including non-status species, have baseline legal protections under the Migratory Bird Treaty Act of 1918 and CFGC, i.e., sections 3503, 3503.5 and 3513. Under these laws/codes, the intentional harm or collection of adult birds as well as the intentional collection or destruction of active nests, eggs, and young is illegal. For bat species, the Western Bat Working Group (WBWG) designates conservation status for species of bats, and those with a high or medium-high priority are typically given special consideration under CEQA.

Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.), or plants listed by the California Native Plant Society (CNPS) as rare, threatened, or endangered (List 1A and List 2 status plants). Special-status plants include taxa that have been listed as endangered or threatened, or are formal candidates for such listing, under the federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA). The California Native Plant Protection Act (CNPPA) lists 64 "rare" or "endangered" and prevents "take", with few exceptions, of these species. Plant species on the California Native Plant Society (CNPS) Rare and Endangered Plant Inventory (Inventory) with California Rare Plant Ranks (CRPR) of 1, 2, and 3 are also considered special- status plant species and must be considered under CEQA. Rank 4 species are typically only afforded protection under CEQA when such species are particularly unique to the locale (e.g., range limit, low abundance/low frequency, limited habitat) or are otherwise considered locally rare.

**Critical Habitat, Essential Fish Habitat, and Wildlife Corridors:** Critical habitat is a term defined in the ESA as a specific and formally designated geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management

and protection. The ESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. Note that designated critical habitat areas that are currently unoccupied by the species, but which are deemed necessary for the species' recovery are also protected by the prohibition against adverse modification.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended (16 United States Code [USC] 1801), mandates that Essential Fish Habitat (EFH) be identified and described in federal Fishery Management Plans (FMPs). Federal action agencies must consult with the NMFS on any activity that they fund, permit, or carry out that may adversely affect EFH. The EFH regulations require that federal action agencies obligated to consult on EFH also provide NMFS with a written assessment of the effects of their action on EFH (50 CFR Section 600.920). NMFS is required to provide EFH conservation and enhancement recommendations to the federal action agency. The statute also requires federal action agencies receiving NMFS EFH Conservation Recommendations to provide a detailed written response to NMFS within 30 days upon receipt, detailing how they intend to avoid, mitigate, or offset the impact of the activity on EFH. Any federal agency that authorizes, funds, or undertakes action that may adversely affect EFH is required to consult with NMFS.

Movement and migratory corridors for native wildlife (including aquatic corridors) as well as wildlife nursery sites are given special consideration under CEQA.

## **2.5 ENVIRONMENTAL SETTING**

### **2.5.1 Climate**

The climate of the Park is sub-humid with hot dry summers and cool moist winters. Dense ground fog often occurs in the winter months. Mean annual precipitation is 17 inches. The mean January low temperature is 38 degrees Fahrenheit (degrees F); the mean July high temperature is 93 degrees F. The frost-free period ranges from 260 to 280 days. According to California's Fourth Climate Assessment 2019 (Bedsworth et al. 2018), rising global temperatures will produce more frequent and intense heat waves in the Sacramento Valley with fewer cooling degree days that are essential to certain crops, optimal human health conditions, and the longevity of transportation and electrical infrastructure – trends that are expected to continue. Warming air temperatures will increase soil moisture loss and lead to seasonal summer dryness that may become prolonged due to earlier spring drying that lasts longer into the fall and winter. Drought conditions will likely increase due to the increasing variability of precipitation and frequency of dry years.

### **2.5.2 Geology**

Stockton is located at the northern end of the San Joaquin Valley, bordered by the Coast Ranges on the west and the foothills of the Sierra Nevada to the east. The San Joaquin Valley basin has been filled over time with up to a 6-mile-thick sequence of interbedded clay, silt, sand, and gravel deposits. The sediments range in age from more than 144 million years old (Jurassic Period) to less than 10,000 years (Holocene). The most recent sediments consist of coarse-grained (sand and

gravel) deposits along river courses and fine-grained (clay and silt) deposits located in low-lying areas or flood basins and are referred to as alluvial deposits. These deposits are loose and not well consolidated.

### 2.5.2.1 Soils

As shown in Table A, the soils of the Park are predominantly clays and loams primarily characterized by stratified primarily fluventic sediments, ranging from coarse- to fine-textured, derived from alluvial and eolian sediments from mixed rock sources. These are moderately deep, somewhat poorly drained soils. Native soils were primarily organic soils with historically emergent wetland vegetation. Creation of levees, drainage, and the removal of annual flooding have reduced seasonal nutrient provision to soils, drying of soils, and largescale loss of organic contents.

The original ecological site of the native flood plain is R016XA001CA. Drainage ranges from very poorly to somewhat poorly drained. Salinity is limited and should not have any influence on the vegetation response or dynamics of the site. The California Department of Conservation publishes maps of “Important Farmland” as part of the Farmland Mapping and Monitoring Program (FMMP, California Department of Conservation, 2021). According to the 2012 Important Farmland Map of San Joaquin County, the project site and the water side of the levee is classified as Nonagricultural and Natural Vegetation. The land side of the levee is classified as Urban and Built-Up Land.

**Table A: Soils of the Van Buskirk Park, San Joaquin County, California**

Map Unit Symbol	Map Unit Name	Acres	Percent
169	Guard clay loam, drained, 0 to 2 percent slopes	.7	.46
181	Jacktone-Urban land complex, 0 to 2 percent slopes	9.5	6.28
227	Rioblancho-Urban land complex, drained, 0 to 2 percent slopes	141.0	93.25
<b>Totals</b>		<b>151.2</b>	<b>100.00</b>

Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at the following link: <http://websoilsurvey.sc.egov.usda.gov/> (accessed July/13/2021).

### 2.5.2.2 Paleontological Resources

The project site itself does not contain any known paleontological resources or unique geological features. However, remains of extinct animals, such as mammoth, can be found virtually anywhere in San Joaquin County, especially along watercourses such as the San Joaquin River and its tributaries. The vast majority of paleontological specimens from the County have been found in rock formations in the foothills of the Diablo Mountain Range (San Joaquin County 2016). Geological materials underlying the project area include the recent (Quaternary) sedimentary deposits of the Modesto Formation (Wagner et al. 1991). Numerous vertebrate fossil sites have been associated with the Modesto Formation in the Central Valley, including land mammals, birds, reptiles, and amphibians.

### 2.5.2.3 Seismic Activity

Active faults affecting San Joaquin County include the San Andreas, Hayward, Calaveras, midland, Green Valley-Concord, and Tracy-Stockton Faults. These faults are capable of producing earthquakes

of a maximum probable magnitude between 6.3 and 8.25 on the Richter scale. Several potentially active faults that may affect the Park include the San Joaquin Fault Zone, Midway-Black Butte Fault, the Tesla Fault, and Tracy-Stockton Fault. Liquefaction can result in water-saturated sandy soil materials during strong ground shaking in an earthquake. The shaking causes the pore-water pressure in the soil to increase, thus transforming the soil from a stable solid to a more liquid form. The depth to groundwater can control the potential for liquefaction. The shallower the groundwater, the higher the potential for liquefaction. Due to its high-water table and location within the former flood plain of the French Camp Slough and the San Joaquin River, the potential for liquefaction during a major earthquake is high at the Park site.



Figure 4: Conceptual Master Plan

### 2.5.3 Topography and Hydrology

The site is located within an alluvial flood plain with minimal topographical relief. Ground elevations range from 4 to 6 feet at the level of French Camp Slough and the San Joaquin River to approximately 16.7 to 22.3 feet at the levee crown. The majority of the site is located at an elevation that ranges from 4 to 8 feet, primarily due to relief associated with artificial mounds within the former golf greens and depressions associated with water features. The site is within the 11,312-acre Burns Cutoff-San Joaquin River watershed (HUC 180400030501) and adjacent to the lower reach of the 20,687-acre Walker Slough-French Camp Slough watershed (HUC1804005103). The existing ponds at the site are possibly remnants of oxbows or former channels of French Camp Slough. Walker and French Camp Sloughs and the San Joaquin River are jurisdictional Waters of the U.S. subject to Section 404 of the Clean Water Act (CWA) as well as jurisdictional Waters of the State of California subject to the Porter-Cologne Act. The limit of federal jurisdiction is high tide, which is a few feet above mean sea level. These waterways also fall under the jurisdiction of the California Department of Fish and Wildlife (CDFW), the State Regional Water Quality Control Boards (RWQCB), and the Central Valley Flood Protection Board. The property relies on a potable water connection with the Housing Authority, and riparian irrigation water rights guided by State RWQCB requirements.

There are five ponds within the former golf course, of which some or all may be historical oxbows associated with French Camp Slough. Four of these ponds are on the western stratum of the Park (Figure 2, Table B). Pond 5 is isolated from Ponds 1 through 4. During the operation of the golf course, river water was pumped into Pond 5 from a different diversion than for Ponds 1 through 4. Ponds 1 through 4 are currently connected via pipes and culverts, many of which are in poor condition.

The current inundation of the Park's ponds is mainly seasonal after winter rains and therefore does not support permanent aquatic communities.<sup>4</sup> The current hydrology of the ponds is characterized by their shallow configuration and the absence of pumped water, causing them to be dry for most of the year. Ponds have likely experienced high sedimentation from being filled with river water. Pond bottoms consist of fine silts and clays, and during dry periods excessive cracking of the pond bottoms has been noted. The bottom of all ponds has a substantial layer of river sediment, estimated to be 2 feet or more. The sediment is very fine, causing pond bottoms to crack in deep fissures as the soil dries out. LSA measured some of these fissures to exceed 26 inches and standing water could be observed at the bottom of the cracks during early spring.

Sediment accumulations in the ponds are up to 4 feet deep. These bottom sediments originate from suspended particles in pumped slough water. Suspended solids consist of an inorganic fraction (e.g., silts, clays) and an organic fraction (e.g., algae, zooplankton, bacteria, and detritus) that are transported by water as it runs off the land. Most suspended solids come from accelerated erosion from agricultural lands adjacent to French Camp Slough and the San Joaquin River. The inorganic portion of suspended materials is usually considerably higher than the organic, but both contribute to turbidity. French Camp Slough, a 7-mile waterway in an agricultural watershed has relatively high sediment toxicity caused by pyrethroid pesticides, primarily Bifenthrin discharges originating from farmland.

<sup>4</sup> Ponds currently support seasonal aquatic vegetation types.

In addition, runoff from the golf course greens may have contributed additional urban toxic contaminants (e.g., herbicides, fertilizers, algaecides) that were applied during the operation of the golf course. These toxicants are hydrophobic, non-soluble, have a strong affinity for organic matter, and bind, adsorb or otherwise become attached to sediment particles. In addition, both sediments and toxicants are relatively inert, persistent and have low rates of biodegradation. Thus, sediment removal is the preferred method to detoxify the ponds. The effectiveness and longevity of the sediment removal depends on retarding eutrophication and reducing the impacts of toxic sediments. Sediment removal is usually undertaken to enhance wildlife habitat, to remove nutrient rich sediment and to remove toxic or hazardous material. Sedimentary phosphorus generally creates a nuisance by periodic infusion of nutrients and stimulating over-abundant growth of unwanted phytoplankton causing reduced water transparency and depletion of dissolved oxygen. Toxic materials in sediment must be removed without reintroducing toxicants into the water column and without causing secondary pollution problems at the disposal sites.

## 2.5.4 Vegetation

### 2.5.4.1 Natural Vegetation

The primary native vegetation community along all major streams in the Sacramento-San Joaquin Delta is Great Valley Riparian Forest. This forest type will grow on any portion of a streambed and its banks if the soil or other substrate is exposed long enough during the growing season. The fertile loam soils of the Sacramento River riparian land coupled with favorable ground water conditions and a long growing season provide near optimum conditions for the establishment of the extensive riparian forests. These extensive riparian woodlands occurred on the natural levees formed by the Sacramento, Lower Feather, American, and other streams. These levees rose from 5 to 20 feet above the streambed and ranged in width from 1 to 10 miles. It is likely that these conditions prevailed along the San Joaquin River near the current location of the Park.

Riparian woodlands in California probably exceeded 775,000 acres between 1848 and 1850 (Smith 1977). Early explorers describe these as lush forests of oak, sycamore, ash, willow, walnut, alder, poplar, and wild grape, forming almost impenetrable walls of vegetation on both sides of all the major valley rivers and their tributaries. Riparian forests were relatively free from fire, due to their moist growing conditions and green foliage throughout the year. They varied greatly in the spacing of the trees from irregular open to crowded stands. Giant sycamore of up to 100 feet tall and oaks with a circumference of 27 feet were common. By 1952, only about 20,000 acres of riparian forests remained. Today's riparian forest continue to shrink due to lowered water tables across the valley and reduced the extent of wetland and riparian systems.

California's riparian environments provide diverse habitat and account for a disproportionate share of the State's biodiversity (Holstein 1984). The importance of these environments has long been acknowledged in both the scientific literature (e.g., Warner and Hendrix 1984) and in State law (California Riparian Habitat Conservation Act 1991).

### 2.5.4.2 Current Vegetation Communities

Vegetation communities were delineated using the classification of the existing CDFW vegetation map (Delta Vegetation and Land Use Update 2016), but only vegetation types on the landside of the



levee were examined and classified in detail. Based on that classification, the site only had four broad upland vegetation communities, and two aquatic communities:

1. **California Annual Grassland.** California annual grassland series (Sawyer et al. 2009) best describes the vegetation along the landside levee slope. Patchy stands dominated by upland annual introduced grasses including oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), perennial ryegrass (*Lolium perenne*), and foxtail barley (*Hordeum murinum*). Other grassland species such as black mustard (*Brassica nigra*), common mallow (*Malva neglecta*), and filaree (*Erodium botrys*) are intermixed with the grasses. This vegetation community also occurs where the irrigation of the former golf course did not support perennial species.
2. **Urban Grassland.** Most of the grassland vegetation at the former golf course is dominated by turf grasses, which are perennial or rhizomatous species (e.g., Bermuda grass, *Cynodon dactylon*; Kentucky bluegrass, *Poa pratensis*, Perennial Ryegrass,). With the abandonment of the irrigation system, the turf has undergone a transition to a more drought-resistant non-native grassland. Mowing still occurs, but fertilization and herbicide applications have stopped. The cessation of herbicide applications has resulted in a non-native grassland with intermixed invasive, non-native weeds and bare ground.
3. **Urban Forest.** An urban forest is a collection of trees that have been planted within a built-up area. The mature trees at the Park are distinct features of the site. The most common tree species are non-native trees, primarily river red gum (*Eucalyptus camaldulensis*), cork oak (*Quercus suber*) and Canary Pine (*Pinus canariensis*). Urban forests moderate local climate, slowing wind and stormwater, and filter air and sunlight. They are critical in cooling urban heat islands and potentially reducing the number of unhealthy ozone days that plague major cities in peak summer months. Urban forests are composed of a mix of native and exotic tree species and often have a tree diversity that is higher than surrounding native landscapes.
4. **Riparian Forest- Fremont Cottonwood Series.** A few native riparian trees occur along the water-side levee slope, including Fremont cottonwood (*Populus fremontii*), valley oak, box elder (*Acer negundo*), and willows (*Salix* spp.). There are some widely spaced patches of Himalayan blackberry (*Rubus discolor*) and wild rose (*Rosa californica*) along the waterside of the levee. Blue elderberry shrubs (*Sambucus mexicana*) occur both on the water side of the levee and the former golf course.
5. **Aquatic Vegetation Alliance** (*Lemna minor* - *Wolffia borealis* - *Wolffia Columbiana* [Common Duckweed - Northern Watermeal - Columbian Watermeal]). This alliance of aquatic floating vegetation is dominated by duckweed species floating at the surface of quiet streams and ponds. Biomass can be abundant under eutrophic conditions. Total cover may be continuous, intermittent or open. These small floating plants may float on the water's surface or become stranded and possibly rooted during drawdown periods. Emergent plants may be present, including Cattails (*typha* spp.), Bulrushes (*Schoenoplectus* spp.), and other wetland plants (*Potamogeton*, *Sagittaria*, or *Polygonum*). The extent of this community depends on the amount and persistence of standing water.

6. **Open Water.** These areas consist of standing water, either permanently or seasonally inundated. Open water habitats generally have little vegetation due to the depth of the inundation. The site has five former irrigation ponds that comprise approximately 11.25 acres, but very little open surface water area remains. Ponds are shallow due to sedimentation associated with the former pumping of river water as a source of irrigation. LSA did not conduct a jurisdictional wetland delineation as part of this project.

#### 2.5.4.3 Fire Regime

There are no studies on pre-settlement fire regimes of the Central Valley's riparian systems as tree ring data are not reliable for riparian hardwoods. Sediment cores cannot be used for fire histories on floodplains because floodplain sediment is not stable. This is especially true for the Park site where the floodplain has been dredged, drained, and altered with levees.

The Central Valley was a large population center for California Indigenous People in pre-settlement times, and they lived and used fire in riparian areas of the Central Valley. Indigenous People of the Central Valley also used fire to control insects, benefit game animals, clear vegetation, and reduce fire hazard in riparian areas. Deliberate burning of riparian plant species at regular intervals produced stems suitable for making baskets and other implements (e.g., willows, red-osier dogwood, and blue elderberry stems) or to stimulate fruit production (e.g., blue elderberry, California blackberry, California wild grape, and California wild rose fruits).

Historically, most ignitions in the riparian zone were anthropogenic as lightning strikes are rare in the Central Valley. Most fires were probably set in summer and fall. However, Wills (2006) suggested that wildfires were historically uncommon in riparian communities of the Central Valley; most often, these communities functioned as fuel breaks. Great Valley Riparian Forests burn less frequently than surrounding uplands because of their greater fuel moisture (Bendix and Commons 2017). In the Central Valley, fire frequency in riparian systems is less than 0.1 percent per year.

#### 2.5.5 Wetlands

All ponds at the Park are isolated from the floodplain of French Camp Slough by a levee and are considered managed water features that are jurisdictional wetlands that are Waters of the U.S. and the State of California. The total area of these ponds is approximately 11.25 acres (Table B).

**Table B: Ponds at Van Buskirk Park, Stockton, California**

Pond ID	Stratum	Size (ac)	Depth	Location (Lat / Long)
1	W	2.83	<3 feet	37.925387° / -121.322000°
2	W	2.54	<3 feet	37.922865° / -121.319915°
3	W	1.82	< 3feet	37.921404° / -121.318229°
4	W	1.54	<3 feet	37.920411° / -121.315940°
5	E	2.62	<3 feet	37.919700° / -121.305171°

Source: LSA (2021).

The ponds of the Park are generally shallow (Table B). Golf course ponds are created for aesthetic and irrigation purposes. During the operation of the golf course, these ponds were used as water storage for irrigation water and were refilled with riparian water pumped directly from French Camp Slough and the San Joaquin River. Even with proper maintenance, ponds will eventually accumulate bottom sediments. The pumps and water lines are still existent but are in poor repair. Since the closure of the golf course, no water has been pumped into the ponds.

The Park's ponds contain a remnant wetland vegetation community that is currently undergoing a rapid transition into ruderal characteristics due to the lack of inundation. Wetland plants in the ponds, such as willows, cattails and other species are declining and disappearing rapidly, and are being invaded by herbaceous weeds and young saplings of willows and eucalyptus tree species. If left unmanaged, the ponds are likely to become dense stands of young trees of undesirable species.

The fire risk associated with such dense stands of young highly flammable trees is high. The current condition of the wetlands, and future conditions if left unmanaged, is undesirable due to the high fire risk, excessive weed infestations, undesirable aesthetics (e.g., trash accumulation) and potential risk to the public.

#### 2.5.6 Wildlife

LSA's bird survey on 04/20/2021 resulted in the observation of American Pipit (*Anthus rubescens*), American Robin (*Turdus migratorius*), Anna's Hummingbird (*Calypte anna*), Barn Swallow (*Hirundo rustica*), Belted Kingfisher (*Megaceryle alcyon*), Black Phoebe (*Sayornis nigricans*), Brewer's Blackbird (*Euphagus cyanocephalus*), California Scrub-Jay (*Aphelocoma californica*), California Towhee (*Melospiza crissalis*), Canada Goose (*Branta canadensis*), Cliff Swallow (*Petrochelidon pyrrhonota*), Cooper's Hawk (*Accipiter cooperii*), Double-crested Cormorant (*Nannopterum auritum*), Eurasian Collared-Dove (*Streptopelia decaocto*), European Starling (*Sturnus vulgaris*), Golden-crowned Sparrow (*Zonotrichia atricapilla*), Great Blue Heron (*Ardea herodias*), Great Egret (*Ardea alba*), House Sparrow (*Passer domesticus*), House Wren (*Troglodytes aedon*), Lesser Goldfinch (*Carduelis psaltria*), Northern Flicker (*Colaptes auratus*), Northern Mockingbird (*Mimus polyglottos*), Nuttall's Woodpecker (*Picoides nuttallii*), Red-breasted Nuthatch (*Sitta canadensis*), Red-tailed Hawk (*Buteo jamaicensis*), Red-winged Blackbird (*Agelaius phoeniceus*), Rock pigeon (*Columba livia*), Ruby-crowned Kinglet (*Corthylio calendula*), Snowy Egret (*Egretta thula*), Song Sparrow (*Melospiza melodia*), Swainson's Hawk (*Buteo swainsonii*), Tree Swallow (*Achycineta bicolor*), Western Bluebird (*Sialia mexicana*), Western Kingbird (*Tyrannus verticalis*), White-crowned Sparrow (*Zonotrichia leucophrys*), and Yellow-rumped Warbler (*Dendroica coronata*).

Mammalian wildlife present at the Park includes California pocket gophers (*Thomomys bottae*), California voles (*Microtus californicus*) and California ground squirrels. These rodents are abundant and provide a large percentage of prey for higher trophic species, primarily raptors and owls. California ground squirrels are considered keystone species and are the primary natural source of burrows for burrowing owls. Ground squirrel burrows are also important for providing subterranean habitat for amphibians and many species of invertebrates, including native bumblebees. Expanding ground squirrel distribution in the Park provides additional opportunities to support burrowing owl populations. The site is also frequented by common mammals, such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon locator*), grey fox (*Urocyon cinereoargenteus*), American mink (*Neovison*

vison) and river otter (*Lontra canadensis*); the latter species predominantly using habitats on the waterside of the levees.

Bats occur in a variety of habitats and can utilize large trees, cavities, tunnels, buildings, or other human-made structures for roosting. Open grasslands, ponds and open water habitats provide excellent foraging habitat. Bats are nocturnal feeders on insects in flight. Prey includes moths, flies, beetles, and other insects. Most bats require a nearby water source. In the Central Valley, the species of bats that will most likely occupy the Park are the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*), the Mexican free-tailed bat (*Tadarida brasiliensis*), the pallid bat, and the Yuma myotis (*Myotis yumanensis*). Bat maternity roosts are considered native wildlife nursery sites and are protected under CEQA.

The Park's wetlands contain non-native red-eared sliders (*Trachemys scripta*). Since the ponds have fallen dry, these non-native turtles have moved to the banks of French Camp Slough. The red eared slider is a popular pet turtle and is introduced primarily through pet releases and escapes. Red-eared sliders compete with indigenous species for food and basking sites (Salzberg 2000). They are considered a significant threat to the western pond turtle due to disease transmission, aggressive displacement from basking site, and competition for food. The red eared slider is an invasive species in California and considered as one of the "World's Worst Invasive Alien Species" by the World Conservation Union's (IUCN) Invasive Species Specialist Group. LSA biologists also observed pacific tree frogs (*Pseudacris regilla*) at the Park. This species, also known as the Pacific chorus frog, occupies many types of habitats, reproducing in aquatic settings. American Bullfrog (*Lithobates catesbeianus*) has also been observed on the Park site. This non-native, invasive species compete with native species for space and food. They are voracious predators of turtle hatchlings and other amphibians.

The Park currently has an abundance of flowering non-native eucalyptus trees, although other flowering forbs and shrubs are rare. LSA biologists observed numerous bees and butterflies (mainly Western Swallowtail, *Papilio rutulus*). With restoration and habitat enhancement, the site could provide an ideal habitat area to contribute to monarch butterfly (*Danaus plexippus*) and pollinator conservation. Pollinator and monarch populations have declined significantly over the past 20 years due to habitat loss, pesticides, and intensifying climate events. The eastern stratum of the Park provides the greatest opportunity to establish pollinator habitat through the planting of pollinator and butterfly gardens, hedgerows, and other native areas.

Four species of native bumble bees, Franklin's bumble bee (*Bombus franklini*), Crotch's bumble bee (*Bombus crotchii*), Suckley cuckoo bumble bee (*Bombus suckleyi*) and the Western bumble bee (*Bombus occidentalis*) were listed by the California Fish and Game Commission (Commission) in 2019 under CESA. Recent data indicates that any of the considered bumble bee species are absent from large parts of the San Joaquin Valley due to extensive agricultural pesticide use and urbanization. There are no current CNDDDB records (from 1999 through 2023) for these species within the vicinity of the Park (California Natural Diversity Database 2023). However, bumble bees could potentially occur or be re-established upon habitat restoration and enhancement.

## 2.6 PLAN DEVELOPMENT

### 2.6.1 Interested Parties

Over the course of two years, the public engagement process included five public meetings, two online surveys, several meetings with stakeholders and interested public agencies. Meetings with fourteen stakeholder groups that represented diverse interests provided the design team with specific needs and uses to consider in the programming and site design for the park. One virtual public meeting and four in person public meetings were held with 126 attendees. The public was engaged at various stages of the project from initial programming discussions to park design discussions. Joint meetings were held with the US Army Corp of Engineers (USACE) for the community to learn about the potential use of much of the western portion of the property for future flood control, wetland and habitat mitigation. Throughout the project the design team and city staff have worked with the USACE and San Joaquin Area Flood Control Agency (SJAFC) working on a potential partnership and future use of Van Buskirk Park. Currently city staff is working with USACE to determine what flood mitigation measures and restoration may be at Van Buskirk and the final design of these measures. The analyses contained in Part 2 of this report are intended to support and inform these deliberations.

### 2.6.2 Conceptual Plan

Based on the community input, discussions with USACE, SJAFC and City staff, the Conceptual Master Plan for the Van Buskirk Park (Figure 4) includes the following components:

- **Existing (29 acres):** Parking Areas, Community Park, Community Center and Levee with walking trail. Activities related to the Plan consist primarily of upgrading, repair and maintenance of existing structures.
- **New Development (85 acres):** Expanded Parking, Basketball Courts, Skate Park, Splash Pad/Water Play Area, Multi-Purpose Lawn/Fields, Disc Golf Course, Golf Academy, Event Lawn/Group Gathering, Adventure Playground/Playground, Pickle Ball Courts, Dog Park, Community Building/Restrooms, River Access, Linear Park, Trails/Exercise Course, Neighborhood Park, Bike Trails, BMX Track, Community Garden.
- **Conservation (55 acres):** Approximately 55 acres of the western portion of the Park is anticipated to be preserved and restored as a potential flood control and wetland mitigation area.

### 2.6.3 Potential Actions:

Currently, the design stage of the Plan is at a conceptual level, focusing on features desired by the community. The overall design level is not sufficient to assess potential impacts in detail. Thus, the primary impact to be discussed pertains to the loss of habitat acres. The extent of project actions, such as wetland modifications, drainage, grading and other construction has not been determined. The following impacts to biological resources may be anticipated:

1. **Removal of existing vegetation, including tree removal.** In addition to removal of hazard trees and naturally occurring tree mortalities, new development will necessitate the

removal of mature trees. It is estimated that the most trees will be removed within the eastern half of the property. The total number of trees removed will be between 100-250 (20-50 percent of existing trees). Many trees to be removed are non-native, fire prone and in various stages of decline. Plantings of replacement trees of more suitable (drought-adapted, native) species is also anticipated.

2. **Surface grading and construction.** Although the location, extent and exact nature of the new development features are currently not determined, project activities are likely to include:
  - a. Construction of recreational facilities including ball fields, trails, hardscape and buildings
  - b. Grading, leveling and installing subsurface utilities.
3. **Wetlands Modification:** The extent of wetland impacts cannot be assessed at this early stage of plan development. Of the total 11.25 acres of potential jurisdictional wetlands, only 2.62 acres (e.g., Pond 5 in the eastern half of the property) would be potentially modified, partially or completely filled.
4. **Wildlife Habitat Loss.** Approximately 80 acres of wildlife habitat will be removed or altered. The exact location, nature of impact and timing of these activities is unknown at this time. Wildlife habitat loss includes terrestrial and aquatic habitat.

### 3.0 POTENTIAL IMPACTS TO BIOLOGICAL RESOURCES

The following section addresses the proposed project’s potential to result in significant impacts on biological resources, including vegetation and wildlife resources. This section identifies listed and proposed species and designated and proposed critical habitat (referred to as listed resources) and that “may be present” in the action area. The likelihood of a documented special-status species or rare natural community to occur in the project area is based on the distribution of the species (i.e., its overlap with the project area) and the presence of the species’ required or preferred habitat elements in the project area (e.g., associated plant species, vegetation types, soil types, and hydrologic conditions). For each species that may be present under the current habitat conditions within the action area, this section describes the effects that the proposed project may have on the respective species. The following CEQA checklist summarizes potential impacts from the proposed project on biological resources on the project site. Each item is addressed in detail on the following pages.

#### 3.1 BIOLOGICAL RESOURCES

Topics	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Not Applicable
<b>Would The Project:</b>					
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Topics	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Not Applicable
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

*a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service ? (Less Than Significant with Mitigation Incorporated)*

Species listed under the California Endangered Species Act (CESA) or the federal Endangered Species Act (ESA) require special protection to avoid “take” or cause other adverse effects upon their habitat. Additionally, impacts to other non-listed special status species, such as those classified as Species of Special Concern by the California Department of Fish and Wildlife should be avoided and mitigated under CEQA. Some rare plant species also require protection pursuant to the California Native Plant Protection Act, although there are no rare plants present or potentially present at the Park due to lack of habitat. Table C and Figure 5 show special-status species records and/or observations within 1 mile of the Park.



**Table C: Special-Status Species and Sensitive Natural Communities Occurring within 1 Mile of the Project Site**

Common Name/Scientific Name	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank	CDFW Status	Habitat	Potential to Occur
<b>Plants</b>								
Alkali milk-vetch <i>Astragalus tener</i> var. <i>tener</i>	None	None	G2G1	S1	1B.2		Occurs in playas, vernal-pools, freshwater wetlands, alkali sink, valley grassland, wetland-riparian	No suitable habitat
Heartscale <i>Atriplex cordulata</i> var. <i>cordulata</i>	None	None	G3T2	S2	1B.2		Shadscale Scrub, Valley Grassland, wetland-riparian	No suitable habitat
Big tarplant <i>Blepharizonia plumosa</i>	None	None	G1G2	S1S2	1B.1		Valley and foothill grassland, Clay (usually)	No suitable habitat
Watershield <i>Brasenia schreberi</i>	None	None	G5	S3	2B.3		Marshes and swamps (freshwater),	No suitable habitat
Palmate-bracted bird's-beak <i>Chloropyron palmatum</i>	FE	CE	G1	S1	1B.1		Chenopod scrub, Valley and foothill grassland, Alkaline	No suitable habitat
San Joaquin spearscale <i>Extriplex joaquinana</i>	None	None	G2	S2	1B.2		Chenopod scrub, Meadows and seeps, Playas, Valley and foothill grassland, Alkaline	No suitable habitat
Woolly rose-mallow <i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	None	None	G5T3	S3	1B.2		Marshes and swamps (freshwater), Often in riprap on sides of levees.	No suitable habitat
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	None	None	G5T2	S2	1B.2		Marshes and swamps (brackish, freshwater)	No suitable habitat
Sanford's arrowhead <i>Sagittaria sanfordii</i>	None	None	G3	S3	1B.2		Marshes and swamps (shallow freshwater)	No suitable habitat

Common Name/Scientific Name	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank	CDFW Status	Habitat	Potential to Occur
Suisun Marsh aster <i>Symphotrichum lentum</i>	None	None	G2	S2	1B.2		Marshes and swamps (brackish, freshwater)	No suitable habitat
Saline clover <i>Trifolium hydrophilum</i>	None	None	G2	S2	1B.2		Marshes and swamps, Valley and foothill grassland (mesic, alkaline), Vernal pools, ,	No suitable habitat
<b>Insects</b>								
Monarch butterfly <i>Danaus plexippus</i>	Candidate		G4	None			Milkweed species ( <i>Asclepias</i> spp.) are the sole larval host plants	High to Moderate
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	Threatened	None	G3T2	S2			Riparian habitat, requires elderberry bushes	No suitable habitat
Crotch Bumble Bee <i>Bombus crotchii</i>	None	Candidate Endangered	G2	S1			open grassland and scrub habitats. Nesting occurs underground.	No suitable habitat
Western Bumble Bee <i>Bombus occidentalis</i>	None	Candidate Endangered	G2	S1			open grassland and scrub habitats. Nesting occurs underground.	No suitable habitat
<b>Fish</b>								
Steelhead (Central valley DPS) <i>Oncorhynchus mykiss</i>	Threatened	None	G5T2Q	S2			Inland streams and rivers	No suitable habitat, but Critical habitat adjacent to project area
Green Sturgeon (Southern DPS) <i>Acipenser medirostris</i>	Threatened	None	G2T1	S1			Inland streams and rivers	No suitable habitat, but Critical habitat adjacent to project area
<b>Amphibians</b>								
Western Spadefoot toad <i>Spea hammondi</i>	Threatened	Threatened	G2G3	S2S3		WL	Vernal pool grasslands	No suitable habitat

Common Name/Scientific Name	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank	CDFW Status	Habitat	Potential to Occur
<b>Reptiles</b>								
Western Pond Turtle <i>Emys marmorata</i>	None	None	G3	none		SSC	permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches and reservoirs. Turtles bask on land or near water on logs, branches or boulders. Nesting and overwintering in uplands.	Suitable habitat is present, no observations.
<b>Birds</b>								
Burrowing Owl <i>Athene cunicularia</i>	None	None	G4	S3		SSC	open, dry, sparsely vegetated land with available burrows, adequate food supply, and perches for horizontal visibility.	Suitable habitat Present, no observations
Swainson's Hawk <i>Buteo swainsoni</i>	None	Threatened	G5	S3			Needs open habitats for foraging; adjusted well to agricultural settings (e.g., hay and alfalfa fields, pastures, grain crops, and row crops). Nests in riparian woodlands and scattered stands of trees near agricultural fields and grasslands.	Present
Tricolored Blackbird <i>Agelaius tricolor</i>	None	Threatened	G1G2	S1S2		SSC	Nests in wetlands with cattails, bulrushes, and willows, tritcale fields, patches of Himalayan blackberry near stock ponds or irrigated pastures. Foraging habitats include cultivated fields, feedlots associated with dairy farms, and wetlands.	No suitable habitat
Source: California Native Plant Society (2020). California Department of Fish and Wildlife. (2020), US Fish and Wildlife Service (2020).								

<b>Status Codes:</b>		
<u>Federal</u> (USFWS)	<u>State</u> (CDFW)	<u>California Native Plant Society Rare Plant Inventory</u>
FE = Listed as Endangered (in danger of extinction) by the Federal Government.	CE = Listed as Endangered by the State of California	Rank 1A: Plants Presumed Extinct in California
FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the Federal Government.	CSC = California Species of Special Concern	Rank 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
FC = Candidate to become a proposed species.	CT = Listed as Threatened by the State of California	Rank 2: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
FSC = Federal Species of Concern. May be Endangered or Threatened, but not enough biological information has been gathered to support listing at this time.	CR = California Rare	Rank 3: Plants About Which We Need More Information—A Review List
FC = Candidate to become a proposed species.	CC = State Candidate for listing as an Endangered Species	Rank 4: Plants of Limited Distribution—A Watch List

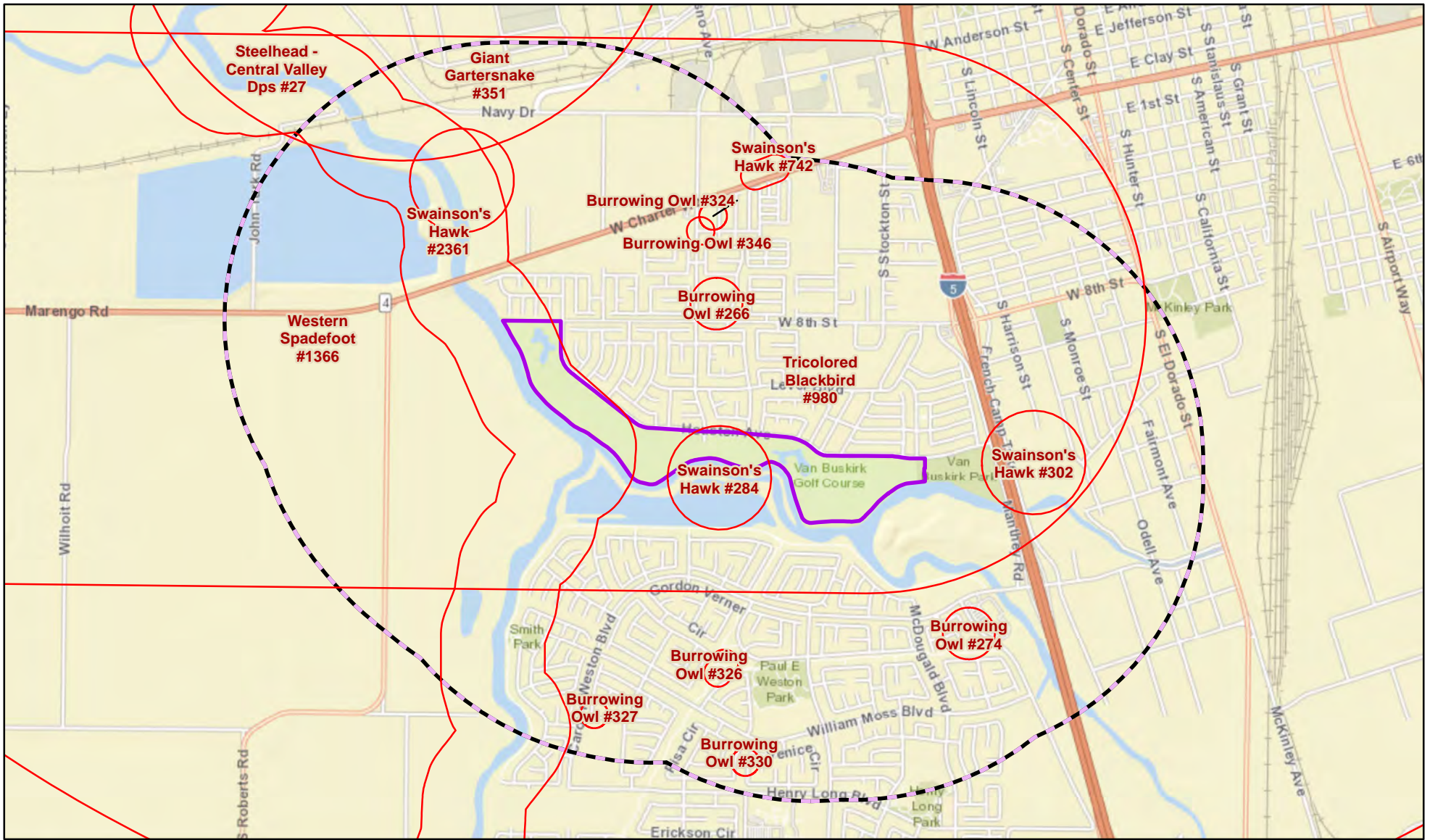
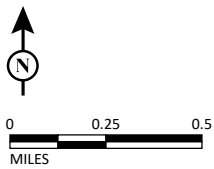


FIGURE 5

LSA

LEGEND

- Study Area
- 1-mile Buffer of Study Area
- CNDDDB Occurrence



SOURCE: CDFW CNDDDB (04/2021); Esri World Street Map (2021).

I:\DEW2002\GIS\Maps\Ecosystem Values Report\Figure 5\_CNDDDB Occurrences within 1 Mile.mxd (4/27/2021)

Van Buskirk Golf Course Re-Use Study  
 Stockton, San Joaquin County, California  
 CNDDDB Occurrences within 1 Mile

The following species are unlikely to occur at the Park either because the Park is outside their current distribution, or due to a lack of suitable habitat. In addition, fish species are not considered because aquatic habitat in French Camp Slough and the San Joaquin River are outside the project area. Therefore, the following species are not considered in detail in this analysis:

- Alkali milk-vetch
- Heartscale
- Big tarplant
- Watershield
- Palmate-bracted bird's-beak
- San Joaquin spearscale
- Woolly rose-mallow
- Delta tule pea
- Sanford's arrowhead
- Suisun Marsh aster
- Saline clover
- Steelhead
- Green sturgeon (Southern DPS)
- Western Spadefoot Toad

The following species could potentially occur at the park and therefore are discussed in greater detail as follows:

The **monarch butterfly** (*Danaus plexippus*) is a migratory butterfly that has been listed as a candidate for inclusion on the USFWS list of endangered and threatened wildlife since December 2020. The U.S. Fish and Wildlife Service has concluded that listing monarchs under the Federal Endangered Species Act would be warranted but is precluded due to other high priority species. Currently, the monarch is scheduled to be federally listed in 2024. Monarchs are currently not listed as threatened or endangered under the California Endangered Species Act (CESA), but they are listed by the State of California as a California Special Resource because their overwintering habitat is threatened by disturbance and by alteration and destruction of habitat. Monarch butterfly overwintering sites are typically found in a narrow stretch of land within 3 miles of the Pacific coastline. **The likelihood that the monarch butterfly is overwintering in the project site is considered to be none.**

The Western Monarch Milkweed Mapper (Xerces Society 2021) shows several recent observations of monarch adults and larvae in the city of Stockton. Monarch butterfly is known to occur in all natural communities, including open space areas as well as disturbed and developed lands (e.g., residential areas, vacant lots, rights-of-way, and firebreak zones). Monarch butterfly relies exclusively on milkweed species as a larval host plant. No milkweed plants have been identified during biological surveys of the site. Milkweed plants, however, may be present in the project action area; therefore, monarch larvae may be present as well. **The likelihood that monarch butterfly is present in the project area is considered to be moderate.** Mitigation Measure BIO 1 through 4 and

the specific Measure for Monarch butterfly (BIO-6) are designed to avoid impacts to milkweed and monarch butterfly to a less than significant level. The Park currently has an abundance of flowering non-native eucalyptus trees, although other flowering forbs and shrubs are rare. LSA biologists observed numerous bees and butterflies (mainly Western Swallowtail, *Papilio rutulus*). With restoration and habitat enhancement (Measure BIO-9), the site could provide an ideal habitat area to contribute to monarch butterfly (*Danaus plexippus*) and pollinator conservation. The eastern section of the Park provides the greatest opportunity to establish pollinator habitat through the planting of pollinator and butterfly gardens, hedgerows, and other areas where nectar plants could be established. Therefore, the **proposed project may affect, but is not likely to adversely affect, monarch butterfly. The overall impact is Less Than Significant with Mitigation Incorporation.**

The **Valley Elderberry Longhorn Beetle** (*Desmoderus californicus*) has been observed to occur at the Park (LSA unpubl. observations) and at the nearby VELB conservation bank (CNDDDB 2022). The beetle is dependent on blue elderberry shrubs (*Sambucus mexicana*), which is its host plant. Elderberry is a common shrub near and on the project area. The project area was completely inventoried on February 17 through 25, 2021 and again on April 20, 2021, by LSA. Since elderberry is the host plant for this species, habitat and environmental conditions that support a robust elderberry community will also benefit valley elderberry longhorn beetles. Non-fragmented stands of elderberries are essential for dispersal corridors for this species and may be necessary to maintain long-term gene flow over large areas. The 84-acre FCCB directly opposite of the Park across French Camp Slough is devoted to habitat conservation for the VELB and provides such a non-fragmented connectivity to the Park. The Park provides habitat for the beetle and occupied blue elderberry bushes (evidenced by exit boreholes on stems) have been observed throughout the Park (LSA observations). **The likelihood that valley elderberry longhorn beetle is present in the project area is considered to be high.** Currently, no direct conflicts between planned development actions and the locations of elderberry bushes are apparent, but once the project design is more specific, impacts to VELB could occur. Mitigation measure BIO-7 is designed to avoid impacts to elderberry bushes and the VELB. **The proposed project may affect, but is not likely to adversely affect, this species. The overall impact is Less Than Significant with Mitigation Incorporation.**

**Western Bumble Bee** (*Bombus occidentalis*) and **Crotch Bumble Bee** (*Bombus crotchii*) were once common bumble bees. Bumble bees play a crucial role in the pollination of native flowering plants and commercially important crops. The Xerces Society for Invertebrate Conservation now considers the species in steep decline. In 2018 the California Fish and Game Commission advanced the western and Crotch's bumble bee to Candidate status. This was challenged in court, but a California court of appeals ultimately upheld the Commission's determination and Candidacy was reinstated on September 30, 2022. As candidate species, the Western and Crotch's bumble bee receive the same legal protection afforded to endangered or threatened species (Fish & G. Code, §§ 2074.2 & 2085). In 2016, the USFWS found that listing the western bumble bee may be warranted. The species status assessment for western bumble bee is scheduled to be released in 2024. These species inhabit open grasslands and meadows and use underground cavities to nest. Western bumble bees have been documented nesting in logs. Riparian forest is not considered suitable habitat. Any surface or subsurface disturbance of grasslands or linear features like hedgerows, ditches and unmanaged weed patches can be harmful to bumble bees. No records of observations of Western or Crotch's bumble bee have been verified for the project area or its vicinity. There is suitable

bumble bee foraging and nesting habitat and nectar plants within the project site, and therefore **the potential for Crotch's and western bumble bees to occur in the project area is moderate**. Field studies have shown that some bumblebee species forage at least several hundred meters and even kilometers from the nest (See Osborne et al 2007). Walther-Hellwig and Frankl (2000) found 25% of resightings between 1.5 km and 1.75 km from the colony. In Oregon, bumble bees foraging distance was estimated to be at least 11.6 km (Rao and Strange 2012). There is a moderate potential that bumble bees nesting off-site could visit the project area to forage. In that case, ground disturbance and vegetation removal may impact foraging habitat. The implementation of Mitigation Measures BIO-1 through BIO-4 will avoid potential impacts to Western and Crotch's bumble bee. In addition, Mitigation Measure BIO-9 (Pollinator Habitat Restoration) limits all herbaceous vegetation removal activities from September 1 through February 28, guides habitat restoration and thus will avoid adverse effects on pollinators. **The overall impact is Less Than Significant with Mitigation Incorporation**

**Burrowing owl** (*Athene cunicularia*) is a California Species of Special Concern. Burrowing owl is a small ground-dwelling owl that generally inhabit gently sloping areas, characterized by low, sparse vegetation. Burrowing owls nest in ground burrows, often squirrel burrows. Burrowing owls are also known to use artificial burrows including pipes, culverts, and nest boxes. There is suitable habitat present at the park, but no owls have been observed in recent history. Records of burrowing owls exist from within a 1-mile radius around the park (CNDDDB 2022). **The likelihood that burrowing owl is present in the project area is considered to be low**. However, there is suitable habitat at the Park, which may require mitigation or could be further improved to provide mitigation for burrowing owl impacts elsewhere. Measures BIO 1-4 are designed to reduce any potential adverse effect on burrowing owl from implementing the project. In addition, mitigation for loss of foraging habitat may be required. **The overall impact is Less Than Significant with Mitigation Incorporation**.

The **Swainson's hawk** (*Buteo swainsoni*) is State-listed as threatened and Bird of Conservation Concern. Approximately 95 percent of California's Swainson's hawk population (approximately 1,770 to 2,393 breeding pairs) resides in the Central Valley. The Swainson's hawk occurs widely in the lowlands of the Central Valley. There are hundreds of records of Swainson's hawks for San Joaquin County, including many nests in isolated trees. Swainson's hawks have adapted well to agricultural landscapes with crop types that provide abundant foraging opportunities, particularly alfalfa. The best habitat is concentrated along permanent waterways with a more or less continuous canopy of trees with grassland, irrigated pasture, alfalfa or grain fields nearby. Most Swainson's hawk winter in Central and South America, primarily in northern Argentina, Uruguay, and southern Brazil. Swainson's hawk nest sites are typically located in riparian woodlands, lone trees, or groves of trees, including cottonwoods, oaks, willows (*Salix* sp.), walnuts, eucalyptus, pines, and Deodar cedar. Urban nesting by Swainson's hawks has been documented in the Central Valley. Swainson's hawks are frequently observed foraging at the Park and at least one nest has been verified to be within 500 yards of the Park in 2021. Up to four individuals were observed in active courtship, including copulations, during bird surveys in the spring of 2021 at the Park (LSA observations). **The likelihood that Swainson's hawk is present in the project area is considered very high**. Construction of recreational facilities at the park could disturb Swainson's hawk during courtship, incubation, and the rearing of young. The increased use of the eastern half of the Park by human visitors and the conversion of grassland to recreational facilities could reduce the availability of

rodents and may reduce the quality of foraging habitat. Impacts to Swainson's hawk from project activities could include:

- Disruption of courtship, nesting, incubation, and rearing of young during the breeding season due to disturbance from equipment and human presence. However, Swainson's hawks frequently select roadside tree rows, isolated trees, and rural residential trees as nesting trees and exhibit a remarkable tolerance to human presence, noise and disturbance. This species is also highly responsive to farming activities that expose and concentrate prey, such as cultivating, harvesting, and disking. During these activities, particularly late in the season, Swainson's hawks will hunt behind tractors searching for exposed prey.
- Loss of nest trees (if they choose to nest in tree earmarked for removal); and
- Predation of young due to nest predators (ravens, crows) being attracted to the construction site.

The implementation of Measures BIO 1-4 will avoid and minimize effects on Swainson's hawk during habitat restoration and maintenance activities associated with the project. In addition, mitigation for loss of foraging habitat may be required. Therefore, the project **may affect, but is not likely to adversely affect, Swainson's hawk. The overall impact is Less Than Significant with Mitigation.**

**Tricolored blackbird** (*Agelaius tricolor*) is state-listed as threatened and a CDFW Species of Special Concern. This species is a year-round resident in California, where it is largely endemic. The species is common locally throughout the Central Valley and in coastal areas from Sonoma County south through Monterey County. It nests in large colonies, typically between February 1 and August 31 within stands of cattails, tules, blackberry brambles, or willows, and within 490 m (1600 ft) of open, accessible water. Tricolored blackbirds forage in a variety of habitats, including agricultural fields (such as cut grain fields, rice, and alfalfa), dairies and feedlots, irrigated pastures, annual grasslands, ephemeral pools and ponds, wetlands, riparian scrub, and freshwater marsh. There may be suitable nesting habitat in expansive marsh vegetation or large blackberry thickets along the San Joaquin river, Frech Camp or other wetlands in the area. The project site does not provide suitable nesting habitat for tricolored blackbird, but there is considerable suitable foraging habitat within the wetlands and urban grasslands of the Park. There is at least on historic record (1972) of a breeding colony of approximately 5000 birds 3.6 miles south of the Park. However, no recent observations have been recorded, therefore **the potential of tricolored blackbird being present is low**. Project activities, such as noise, dust, machinery and staging along access roads could disturb foraging tricolored blackbirds if they were present at the park. Measures BIO-1-4 avoid impacts to tricolored blackbirds. In addition, mitigation for loss of foraging habitat may be required. This will reduce any potential impacts to **Less Than Significant with Mitigation Incorporation.**

**Other Birds:** Birds protected under the California Fish and Game Code and the Migratory Bird Treaty Act (MBTA) could potentially nest on or near the property; however, as long as the project complies with provisions of the MBTA, California Fish and Game Code Section 3513 and the recommended avoidance and minimization measures indicated below, the project will not affect any protected nesting birds or violate the MBTA or California Fish and Game Code. Measures BIO 1-4 will avoid and minimize effects on all nesting birds during habitat restoration and maintenance activities



associated with the project. Therefore, the project **may affect, but is not likely to adversely affect, nesting birds. The overall impact is Less Than Significant with Mitigation.**

The **western pond turtle** (*Actinemys marmorata*) is the only native freshwater turtle of the Pacific coastal states. Western pond turtles have a low olive or brown upper shell, are between 3.5 to 8.5 inches in length, and have dark flecks and lines radiating from center of shields. Populations of western pond turtles are in decline due to disease, upland and aquatic habitat alterations and destruction, and the introduction of predators and non-native pet turtle releases. It is a thoroughly aquatic turtle and may be found in lakes, ponds, rivers, marshes, streams, and irrigation ditches, especially where rocky or muddy bottom, and growing watercress, cattails, or other vegetation. Western pond turtles may be seen basking along logs, cattail mats and mud banks. Suitable habitat for forage, nesting, and hibernation for these species occurs on and adjacent to the Park, but the presence of non-native red-eared sliders may have affected Western pond turtle use of any potential habitat. Currently, **the potential of Western Pond turtle being present is low.** Project activities, such as construction in and near the existing wetlands could disturb western pond turtles, their nests or hatchlings if they are present at the park. Measures BIO-1-4, and specifically BIO-5 avoid impacts to western pond turtle. This will reduce any potential impacts to **Less Than Significant with Mitigation Incorporation.**

**Bats.** There are 23 bat species found in California. Ten species listed by the state of California and the Federal Government can be found in northern California. There are several bat species that may occur at the Park, including:

- Yuma myotis (*Myotis yumanensis*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered.
- long-eared myotis (*Myotis evotis*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered.
- fringed myotis (*Myotis thysanodes*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered.
- long-legged myotis (*Myotis volans*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered.
- small-footed myotis (*Myotis ciliolabrum*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered.
- spotted bat (*Euderma maculatum*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered, and a California Department of Fish and Game "Species of Special Concern".
- two subspecies of the big-eared bat: (*Plecotus townsendii townsendii* and *Plecotus townsendii pallascens*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered, and a California Department of Fish and Game "Species of Special Concern".

- pallid bat (*Antrozous pallidus*) a California Department of Fish and Game "Species of Special Concern" and very sensitive to disturbance of roosting sites. No observations of pallid bats are available for the park, but their presence is likely.
- western mastiff bat (*Eumops perotis californicus*) a Federal Category 2 candidate for listing by the U.S. Fish and Wildlife Service as Threatened or Endangered, and a California Department of Fish and Game "Species of Special Concern".

In addition, the park may also provide habitat for red bat (*Lasiurus blossevilli*) and Mexican free-tailed bat (*Tadarida brasiliensis*). Currently, there are no records of various bat observations at the park, but bats are highly likely to occur at the site. Bats occur in a variety of habitats and can utilize large trees, cavities, tunnels, buildings, or other human-made structures for roosting. Open grasslands, ponds and open water habitats provide excellent foraging habitat. Bats are nocturnal feeders on insects in flight. Prey includes moths, flies, beetles, and other insects. Most bats require a nearby water source. The species of bats that will most likely occupy the Park are the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*), the Mexican free-tailed bat (*Tadarida brasiliensis*), the pallid bat, and the Yuma myotis). Bat maternity roosts are considered native wildlife nursery sites and are protected under CEQA. If bats are roosting in buildings or trees within the project area or in the trees that are planned to be removed, potential disturbance or loss of roosting habitat could occur as a result of construction activity. Implementation of the general Measures Bio 1-4, and the Bat Mitigation Measure BIO-8 would reduce this impact to less-than significant by first identifying the presence or absence of roosting bats, and if present, preventing disturbance or loss of roosting habitat. **The proposed project may affect but is not likely to adversely affect various bat species. The overall impact is Less Than Significant with Mitigation Incorporation.**

Critical habitat areas are defined in the Endangered Species Act and used by US Fish and Wildlife Service and the National Marine Fisheries Service as an area that is essential for the conservation and recovery of a federally threatened or endangered species that requires special management and protection. Under Section 7 of the ESA, all federal agencies are required to use their authorities to ensure that the Federal government does not contribute to the decline of endangered and threatened species or their potential for recovery. Federal agencies are prohibited from destroying or adversely modifying designated critical habitat. This means they must consult with the Service about actions that they carry out, fund, or authorize to ensure that they will not destroy or adversely modify critical habitat. Therefore, potential impacts to designated critical habitat must be analyzed through a consultation process.

The following species have designated critical habitat or adjacent to the Park:

- The southern Distinct Population Segment (DPS) of **Green Sturgeon** are protected as a Threatened species under the Federal Endangered Species Act. Southern DPS green sturgeon are found in the Sacramento and San Joaquin rivers and the Delta. They primarily spawn in the upper main stem of the Sacramento River. The extent to which the species uses the San Joaquin River is unclear at this time, although an adult fish was recently found in a major tributary, the Stanislaus River, indicating at least some use of that system. Project actions are limited to

terrestrial and aquatic habitat behind the levees and therefore, **Therefore, the project will have no adverse effect on critical habitat for green sturgeon.**

- the **Central Valley steelhead** is currently listed as threatened under the ESA. Steelhead and rainbow trout are the same species. In general, steelhead refers to the anadromous form of the species. Central Valley steelhead are considered “ocean-maturing,” also known as winter steelhead. They enter fresh water from August through April to spawn and rear, with juvenile steelhead migrating to the ocean primarily during the spring. Because the project will not include actions that are outside the levees, **there will be no adverse effect on critical habitat for Steelhead.**

*b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? (No Impact)*

No riparian habitat or other sensitive natural communities are present on the project site. Therefore, the proposed project would have no effect on any riparian habitat or other sensitive natural community.

*c. Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? (No Impact)*

There are five ponds within the former golf course, of which some or all may be historical oxbows associated with French Camp Slough. Four of these ponds are on the western stratum of the Park (Figure 2). Pond 5 is isolated from Ponds 1 through 4. During the operation of the golf course, river water was pumped into Pond 5 from a different diversion than for Ponds 1 through 4. Ponds 1 through 4 are currently connected via pipes and culverts, many of which are in poor condition. Pumping of river water has stopped since 2202. All ponds at the Park are isolated from the floodplain of French Camp Slough by a levee and are considered managed water features that are jurisdictional wetlands that are Waters of the U.S. and the State of California. The total area of these ponds is approximately 11.25 acres (Table C). The Conceptual Plan does not specify any changes to existing ponds. **Therefore, the proposed project would have no effect on any federally protected wetlands.**

*d. Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? (Less Than Significant with Mitigation Incorporated)*

The project site consists of an existing City park that is surrounded by residential and commercial development. No identified linkages or movement corridors are connected with the project site. Improvements planned as part of the project are not expected to interfere with the migration of wildlife species, such as birds and bats. However, there is a potential for bat maternity roosts to be present in the large, mature trees on the site. These roosts would be classified as nurseries, which

require additional protection. Implementation of Mitigation Measure BIO- 8 would reduce potential impacts to bat maternal roosts by requiring bat surveys prior to the removal of trees where bats may roost. **The proposed project may affect but is not likely to adversely affect a native wildlife nursery. The overall impact is Less Than Significant with Mitigation Incorporation.**

*e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? ? (Less Than Significant with Mitigation Incorporated)*

The City of Stockton has a Heritage Tree Ordinance that requires a permit for the removal of specific types of oak trees. Per Section 16.240.020 of the City Municipal code, a Heritage Tree is “Any *Quercus lobata* (commonly known as “Valley Oak”), *Quercus agrifolia* (Coast Live Oak), and *Quercus wislizenii* (Interior Live Oak) tree which is located on public or private property within the limits of the City, and which has a trunk diameter of 16 inches or more, measured at 24 inches above actual grade. For Oak trees of the species mentioned above, with multiple trunks, the combined total trunk diameter shall be used for all trunks measuring six (6) inches or greater measured at 24 inches above actual grade.” Trees on the project site are predominantly non-native species. However, there are a total of nine mature California valley oak (*Quercus lobata*) trees on the project site ( 4 on the eastern side, 5 on the western side). All five valley oak trees on the western side of the Park and three out of four oaks on the eastern side meet this requirement. The City will need to authorize the removal of these oaks if it is determined that they are located within the footprint of a planned development. **The proposed project may affect but is not likely to adversely affect Heritage Trees. The overall impact is Less Than Significant with Mitigation Incorporation.**

*f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan? (TBD)*

The Park is within the coverage area of the San Joaquin County Multi-Species Open Space and Habitat Conservation Plan (SJMSCP), a habitat conservation plan adopted by San Joaquin County and its incorporated cities and managed by the San Joaquin Council of Governments (SJCOG). The Plan provides compensation (mitigation) for the conversion of open space to non-open space uses that impact covered plant, fish, and wildlife species. The SJMSCP assesses a habitat conservation fee on participating projects that convert open space land to an urban or industrial use. The SJMSCP also sets forth Incidental Take Minimization Measures that participating projects must implement to prevent impacts to special-status species (SJCOG 2000) and to protect the region’s agricultural economy. Two agricultural habitat preserves of the SJMSCP are located across the San Joaquin River, one directly opposite of the western end of the Park, and one approximately 1.9 miles (3.1 km) to the southwest of the Park. Pursuant to the SJMSCP, certain portions of the Conceptual Master Plan would qualify as conversion of open space to non-open space (e.g., parking lots, event facilities, skate park and other hardscape features, and therefore may require compliance with the SJMSCP mitigation fee policy. On the other hand, the available mitigation opportunities at the Park may also constitute on-site mitigation opportunities or offer to implement mitigation for impacts incurred. Therefore, the Project would have a **less than-significant impact on local policy compliance. The degree to which mitigation is required would need to be determined once a development plan has been finalized.**

## 3.2 MITIGATION MEASURES

Below is a description of the potential mitigation measures proposed to avoid, minimize and mitigate potential effects on the special status species addressed in this Report. Implementation of the following measures would ensure that the proposed project minimizes and avoids effects on the environment, federally listed species, and their habitat within the action area.

**Mitigation Measure BIO-1: Biological Monitor.** A qualified biologist shall be present on site as a Biological Monitor to survey and monitor for special-status species during all work within the proposed action area. The Biological Monitor will conduct all preconstruction surveys and will ensure that any construction barrier fencing and work exclusion zones around elderberry bushes are established and maintained. The Biological Monitor shall furthermore supervise and monitor all project activities to ensure that appropriate protective measures are implemented. The Biological Monitor shall conduct clearance surveys at the beginning of each day within or adjacent to suitable special-status species habitat, including wetlands and riparian habitats. The Biological Monitor shall have the authority to halt work activities that may affect special-status species at any life stage. If a special-status species enters the work site, all work shall stop until it leaves of its own volition. If the Biological Monitor finds that any special-status species are present at the work site, all project work shall stop, and the United States Fish and Wildlife Service (USFWS) shall be notified. If there is imminent danger of injury to special-status species from project-related activities, and the special-status species individual(s) do not move out of the work site on their own, the Biological Monitor shall relocate the animal to the nearest suitable habitat outside the work zone and notify the USFWS within 24 hours.

**Mitigation Measure BIO-2: Worker Environmental Awareness Training (WEAT).** During construction of the project, before any work occurs in the action area, including grading, vegetation removal, and equipment staging, all construction personnel shall participate in WEAT regarding special-status species and sensitive habitats present in the project area. Any additional construction personnel that are employed following the initial start of construction shall receive the mandatory training before beginning work. As part of the training, an environmental awareness handout will be provided to all personnel that describes and illustrates sensitive resources (i.e., special-status species and habitat, nesting birds/raptors) to be avoided during the proposed project construction and lists measures to be followed by personnel for the protection of biological resources.

**Mitigation Measure BIO-3: Implement General Wildlife Protection Measures During Construction.** The City) and its contractors' employees and volunteers will implement general wildlife protection measures during construction that will include, but may not be limited to, the following:

- Limit construction activities to daylight hours to the extent feasible. Conduct all in-water construction activities between May 1 and November 30.
- Confine clearing to the minimal area necessary to facilitate construction activities.
- Clearly delineate the action area limits by using fencing, flagging, or other means prior to the start of construction activities.

- Avoid wildlife entrapment by completely covering or providing escape ramps for all excavated steep-walled holes or trenches more than 1 foot deep at the end of each workday.
- Inspect the work area and any equipment or material left on site overnight for listed species prior to the start of construction activities each day.
- Dispose of garbage in wildlife-proof containers and remove the garbage from the construction area regularly during the construction period.
- Check under equipment and in staging areas for wildlife species each morning prior to work.
- Stay within designated work areas.
- Maintain exclusion/silt fencing.
- No pets or firearms on site.

**Mitigation Measure BIO-4: Preconstruction and Construction Monitoring.** The City will avoid and minimize effects on Swainson's hawk (*Buteo swainsoni*) and breeding migratory birds during habitat restoration and maintenance activities associated with the project. Surveys will include a 0.25 mile radius outside the project area for nesting Swainson's Hawk, following the "Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in the California's Central Valley" (Swainson's Hawk Technical Advisory Committee, 2000). Bumble bee surveys shall be conducted in all grassland areas at least 14 days prior to construction, following non-lethal survey protocols and current State and federal guidelines (see USFWS 2019). Breeding bird surveys will be conducted within 14 days prior to the start of construction. If there is a break in construction of one week or more, surveys will be conducted prior to the re-initiation of construction. If birds or nests are located within this buffer, USFWS will be contacted for further guidance to ensure birds or nests are not disturbed. If surveys determine that the species is present and nesting within this area an appropriate nest protection buffer will be established by a qualified biologist based on the species, type of construction or maintenance activities, and line of sight to the work area. Under this measure, nesting birds and offspring would not be disturbed or killed, and nests and eggs would not be destroyed. Work will be conducted no less than 500 feet from an active raptor nest and 100 feet from an active migratory bird nest, though buffer distances for all nesting birds may differ based on consultation with CDFW and USFWS. To prevent encroachment, the established buffer(s) will be clearly marked by high-visibility material if it has been determined by the qualified biologist that high-visibility material would not attract predators to the nest site. No construction activities, including tree removal, will occur within the buffer zone until the young have fledged or the nest is no longer active, as confirmed by the qualified biologist. If construction or maintenance activities must occur within established buffer zones, a qualified biologist will establish monitoring measures, including frequency and duration, based on species, individual behavior, and type of construction activities. If birds are showing signs of distress within the established buffer(s), construction or maintenance activities will be modified or the buffer(s) will be expanded to prevent birds from abandoning their nest. At any time, the biologist will have the authority to halt work if there are any signs of distress or disturbance that may lead to nest abandonment. Work will not resume until corrective measures have been taken or it is determined that continued activity would not adversely

affect nest success. The monitor shall continue monitoring the nest until construction within 0.5-mile of the nest is completed, or until all chicks have completely fledged and are no longer dependent on the nest.

**Mitigation Measure BIO-5: Western Pond Turtle Avoidance.** The western pond turtle shall be protected from Project Area staging and operations areas through monitoring by a qualified biologist. The Project Area shall be inspected daily for the presence of western pond turtles. If necessary, with consultation with CDFW, barriers shall be used when needed to direct the turtles and move them to an area of suitable habitat outside of the construction activity. If any pond turtles or their nests are found, the biologist shall prepare a relocation plan and submit it to CDFW for written acceptance prior to starting Project activities, and then implement the plan. Construction activities shall avoid all pond turtles and their nests including an appropriate buffer as determined by the qualified biologist.

**Mitigation Measure BIO-6: Monarch Butterfly Avoidance.** Preconstruction surveys shall be conducted during the monarch breeding season (March 16 through November 30) to determine if milkweed is present in the site and is being used for monarch breeding. Surveys will be conducted by a qualified biologist no more than 14 days prior to ground or vegetation disturbance activities. The biologist will search for evidence of monarch eggs, caterpillars, chrysalises, and adults. If active monarch breeding is identified, the milkweed stand shall be avoided until the applicant develops and implements a salvage and relocation plan that has been reviewed and approved by the City and the applicable Resource Agencies.

**Mitigation Measure BIO-7: Valley Elderberry Longhorn Beetle (VELB) Avoidance.** All elderberry plants (with stems greater than 1-inch in diameter at ground level) occurring within the project area shall be marked with flagging and avoided. Orange fencing and appropriate signage will be installed 20 feet from the drip line of all elderberry shrubs located within 100 feet of the action area. No construction will occur within the protected 20-foot buffer area. All activities that could occur within 165 feet of the elderberry shrub will be conducted outside the flight season of the VELB (March–July). Herbicides shall not be used within 100 feet of elderberry plants but hand removal of invasive weeds may be conducted from August through February..

**Mitigation Measure BIO-8: Roosting Bat Protection Measures.** Before the spring breeding season and prior to construction, a qualified biologist shall conduct a survey for roosting bat habitat. The survey shall include work areas adjacent to appropriate roosting habitat that are accessible from public or project areas within 200 feet of a work area. For trees considered to have a high or moderate probability for bat roosting, acoustic monitoring shall be conducted before any construction activities begin during the breeding season to determine if there are any roosting sites present. Surveys shall be conducted at the appropriate times to maximize detectability. If an active roost or maternity roost is found within 100 feet of a work area, the limits of the work area will be clearly marked and a qualified biological monitor shall remain onsite during construction activities within the vicinity of the roost or maternity roost.

The biologist shall ensure that construction activities do not encroach upon the 100 foot buffer around an active roost or maternity colony site. Buffers shall remain in place until the qualified biologist has determined that bats have vacated the occupied roost sites. If buffer reductions are

requested and approved, a monthly report shall be submitted to CDFW with all of the information in the buffer reduction requests, monitoring results, and effects on bats. Reports shall be submitted for the duration of construction activities within buffer areas.

Trees containing maternity roosts shall not be removed during the breeding season (March 1 through August 31) to avoid disturbing females with young that cannot fly. No trees containing maternity roosts may be removed until the qualified biologist determines that breeding is complete and young are able to fly.

If fall/winter hibernacula cannot be avoided, humane techniques may be implemented to passively vacate bats from roosts. Methods to passively evict bats from tree roosts may include incrementally trimming limbs to alter the air flow and temperature around the roost feature where slight changes to the surrounding environment of roost features encourage bats to vacate roost features on their own. If acoustic monitoring detects that bats are using trees that need to be cut down, these trees shall be removed only after it has been confirmed that roosting bats have departed.

**Mitigation Measure BIO-9: Pollinator Habitat Restoration.** To limit any potential adverse effects on pollinators, all herbaceous vegetation removal activities shall be conducted from September 1 through February 28. This includes any vegetation control with herbicides. When using herbicides, application shall be implemented by a person holding a Qualified Applicator License from the State of California. Any application of pesticides shall be completed in a manner that avoids drift and contamination of non-target plants and areas. Ecologically invasive weeds shall be treated with spot spraying of an approved herbicide only. Targeted application of herbicides may be used in conjunction with removal of nonnative invasive weeds. Restoration of natural areas shall include establishing native seed mixes containing a diversity of native wildflowers, including milkweed, as appropriate. Native seed mixes should be applied in bare soil areas, including those recently cleared, graded, or disturbed. Nesting needs of ground nesting bees and bumble bees should be taken into consideration when restoring this habitat.



**This page intentionally left blank.**

## 4.0 PART 2: ECOSYSTEM VALUES OF THE VAN BUSKIRK PARK

### 4.1 Introduction

The Park is a tremendous asset for the City of Stockton and the local residents. This asset's benefits are primarily the various ecological services provided to people, which extend far beyond the availability of open space to recreate or exercise. Understanding the Van Buskirk asset from an Ecosystem Services perspective is the main goal of this analysis.

This assessment presents a comprehensive evaluation of the Park's Ecosystem Services in the context of climate change adaptation, sustainability, and social justice. The purpose of this report is to:

- Assess the Ecosystem Service and their economic values of the Park in its current condition. The primary focus of this analysis is to evaluate the site's contribution to local and regional air and water quality, recreation and public health, carbon stocks and climate change adaptation, and biodiversity; and provide options for multi-use planning, including evaluation of the site for public access, high-intensity and low-intensity recreation, conservation, mitigation of impacts to aquatic resources, habitat, and special-status species. Consideration of flood risk and opportunities to address climate change and carbon sequestration are also a part of this report.
- Recommend management strategies for the Park, taking into consideration the current conditions, risk of fire and flooding and the expected dynamics of the Park's forest into the future. Goals and Targets

The following goals guide the restoration and management of the Park:

- Provide opportunities for low-impact recreation, nature education and exercise. The Park should provide public access to a broad diversity of stakeholders and should accommodate a range of activities, from active sports to low-impact hiking, bird watching and photography. Educational resources – such as informational kiosks, a nature trail or native plant gardens – could enhance educational opportunities for nearby elementary schools.
- Restore a functioning native riparian forest to counteract the forecasted decline of the forest conditions and extreme future fire risk. As discussed in Section 2.5.4.3, the native Central Valley Riparian Forest provides a suitable model for creating a drought- and fire-resilient ecosystem. The conversion of the current forest will require a sequential approach and will likely take decades. Planting of native trees, restoring wetlands and other native habitats should be phased over multiple years and in concert with development of recreational infrastructure.
- Opportunities for mitigating impacts of development within San Joaquin County – such as loss of wetlands, special-status species habitat or riparian forest vegetation – should be considered as the means to restore the site to a climate resilient state. In addition, mitigation revenues may provide additional resources for managing and enhancing the Park.

- Finally, the Park is uniquely suited to enhance carbon stocks and pollution removal benefits to local residents. Ecosystem services that the Park currently provides (i.e., carbon sequestration, pollution removal and health benefits) should be managed to exceed their current levels. This will help offset anticipated losses in these services as the Park undergoes ecological change due to droughts, flooding and natural tree mortality. Ecosystem Service credits created at the Park may be of interest to public agencies or private companies as they seek offsets for their own climate impacts.

## **4.2 PROJECT AREA**

### **4.2.1 History**

Humans have lived in California for at least 19,000 years. Prior to contact with Europeans, the California region contained the highest Native American population density north of what is now Mexico. Early Native Californians were hunter-gatherers, with seed collection becoming widespread around 9,000 BC. The local tribe that occupied the Central Valley in the vicinity of the Park were Yokuts, who populated the San Joaquin Valley from the Sacramento-San Joaquin Delta south to Bakersfield and into the adjacent foothills of the Sierra Nevada mountain range. The Yokuts had one of the highest regional population densities in pre-contact North America. Yokuts narratives constitute one of the most abundantly documented oral literatures in the state. From 1850 through the early 1900s, settlers and eventually the California State Militia engaged in genocidal warfare against the Yokuts and other native tribes, resulting in a decimation of the Yokuts by over 93 percent and enslavement of the survivors under the California State Act for the Government and Protection of Indians. Today, a few Valley Yokuts remain, the most prominent tribe among them being the Tachi.

The Central Valley was first visited by Anglo-American fur trappers, Russian scientists, and Spanish-Mexican expeditions during the first half of the 19th century. By the late 1830s and early 1840s, small permanent European-American settlements had settled in the Central Valley and surrounding foothills. The discovery of gold in the Sierra Nevada in 1848 triggered a massive influx of people. Demand for commodities from the mining communities led quickly to the expansion of ranching and agriculture throughout the Central Valley, followed by permanent communities along major transportation corridors. The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines began intensive projects in the late 1860s, eventually connecting Stockton with other cities. French Camp, a community located southwest of the project site, is one of the first permanent settlements in the Stockton area and first occupied in 1832 by employees of the Hudson's Bay Company. In 1841, Charles Weber arrived in California and subsequently settled on a point of land in present-day downtown Stockton. In 1844, Weber and others received a tract of land called "Rancho del Campo de los Franceses". The project site is located within the boundaries of this land grant.

### **4.2.2 Neighborhood Characteristics and Project Context**

San Joaquin County is a multi-cultural community with a population comprised of almost 40 percent Hispanic/Latino, 7.6 percent African American, 14.4 percent Asian, and 38 percent non-Hispanic white residents. More than 10 percent of residents are unemployed, 28.5 percent are under age 18, and the median household income is \$53,253. In the County Health Rankings Report, San Joaquin

County ranks 39th out of 58 counties on overall health outcomes (lower middle range of counties in California).

The Park is located in South Stockton, an area with a population of about 100,000 residents, of which over 80 percent are minorities and over 20 percent live below the poverty level. South Stockton has severe multi-generational challenges of crime, poverty, low educational attainment, and socioeconomic disparity. Educational outcomes in South Stockton are characterized by high truancy rates and lower test scores and graduation rates than the city as a whole. One in four students drop out of high school in the Stockton Unified School District—almost twice the State average.

The Park is situated within a California Disadvantaged Community (Census blocks 6077000801, 6077002504, and 6077002503), a neighborhood of approximately 12,000 residents. Minority population percentages range from 74 to 86 percent across these three census blocks, and 16 to 42 percent of residents live in poverty. Household income is lowest in the areas immediately surrounding the Park site. Table B shows the overall percentile score for several disadvantaged community indicators (a higher percentile indicates a higher relative burden). To the northeast of the Park is the Conway Homes public housing property. Two elementary schools (Marshall ES K-8, and Taylor ES K-8) are within 500 meters of the Park, and a third elementary school (San Joaquin ES K-8) is less than 900 meters from the Park boundary. Almost 4,000 children under age 18 (including 1,000 children under age 5) live within the census blocks closest to the Park and thus would be immediate beneficiaries of public access to the Park.

Stockton has the least green space per resident of any metro area in California, suggesting that children and youth may not have adequate space for healthy recreational activities. The Park is located in an area of low public access to green spaces. In a citywide assessment of green space access for Stockton's residents, The Trust for Public Land (TPL; ParkServe 2021) estimated that 74 percent of all Stockton residents live within a 10-minute walk of a public park. Currently 84 parks (3 percent of Stockton's area) serve a total population of 291,364 residents. However, the vicinity of the Park has been identified as one in high need of public park access (The Trust for Public Land 2021). According to the TPL ParkServe® interactive mapping tool, the impact of public access to the Park property would allow an additional 4,200 residents access to a public park within a 10-minute walk (TPL ParkServe 2021). Public health is a major concern in this neighborhood. According to CalEnviroScreen (Table B), the Park vicinity is among California's most pollution-burdened and vulnerable communities. Common health issues include those associated with pulmonary and cardiovascular disease, which is caused by poor air quality. The re-use strategy for the Park can have far-reaching implications on environmental quality and public health.

**Table D: Neighborhood Characteristics, SB 535 Disadvantaged Communities Using CalEnviro Screen 3.0<sup>5</sup>**

Neighborhood Characteristic	Census Tract		
	6077000801	6077002504	6077002503
Population	6,692	3,982	2,560
Pollution Burden Percentile	100	75	75
Population Characteristics Percentile	98	84	96
Ozone	53	61	61
PM <sub>2.5</sub>	84	69	69
Diesel	74	74	72
Pesticides	61	74	67
Toxic Releases	70	65	62
Traffic	78	26	83
Drinking Water	29	29	29
Cleanup	96	13	0
Groundwater Threats	98	50	15
Hazardous Waste	84	18	0
Impaired Water	99	94	94
Solid Waste	99	24	20
Asthma	98	97	97
Low Birth Weight	81	61	71
Cardiovascular Disease	97	97	97
Education	88	84	88
Linguistic Isolation	75	49	71
Poverty	86	72	99
Unemployment	95	63	98
Housing Burden	64	36	40

Source: Office of Environmental Health Hazard Assessment (OEHHA; June 2018).

#### 4.2.3 Environmental Risk Setting

The Park is located in the riparian zone, where flooding is often an important driver of succession. In the Central Valley, annual flooding was the primary natural disturbance affecting riparian vegetation. Periodic flooding and sediment relocation were critical for the reproduction and growth of many riparian species and for the successional dynamics of riparian zones. Scouring likely helped control growth of understory shrubs. The Park is located in a FEMA X-Flood Zone with the potential for greater than 10 feet of flooding in a 200-year flood event.

Flooding of the Park site is currently prevented by the levee along French Camp, maintained by Reclamation District 404, also known as Boggs Tract. RD 404 was established in 1881, pursuant to federal legislation that authorized the transfer of federal swamplands to private ownership provided

<sup>5</sup> CalEnviroScreen was developed by the Office of Environmental Health Hazard Assessment (OEHHA) at the request of CalEPA to identify California’s most pollution-burdened and vulnerable communities. Using data from federal and State sources, the tool consists of four components in two broad groups. The Exposure and Environmental Effects components comprise a Pollution Burden group, and the Sensitive Populations and Socioeconomic Factors components comprise a Population Characteristics group. The four components are made up of environmental, health, and socioeconomic data from 20 indicators.

that the swamplands be drained and made productive. Owners of reclaimed land were authorized to organize special districts to acquire, build, and operate reclamation works. Originally established for agriculture, RD 404 now contains substantial urban development, primarily residential and industrial. RD 404 maintains approximately 4.8 miles of levees that provide flood protection for the Boggs Tract area. Approximately 4.1 miles of levees maintained by RD 404 are part of the ACOE National Levee Safety Program and are classified as “Project levees.” The levee along the north bank of French Camp Slough is a Project levee. Past seepage events have resulted in the construction of a cutoff wall, approximately 1,200 linear feet long, within the earthen levee on the eastern portion of the Park (BaseCamp Environmental 2017).

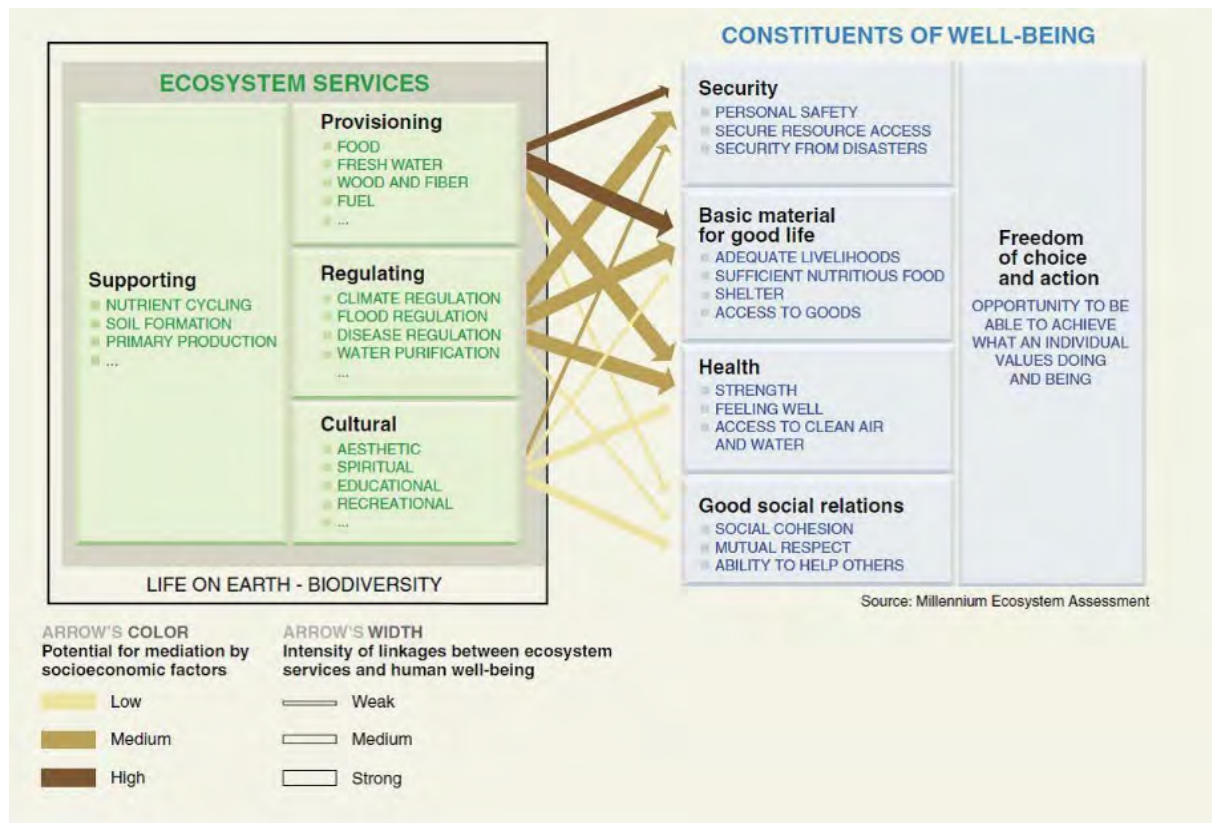
Recent geotechnical analysis and evaluation of historical performance during past flood events have resulted in a greater understanding of under-seepage and a revision of levee design criteria. Geomorphologic and geotechnical studies identified subsurface features, such as former river channels, and meanders. The potential for seepage problems to occur along the existing levees in the Park site is created by discontinuous layers of coarse-grained pervious soils (i.e., sands and gravels). These are found at varying depths of up to 100 feet. During high-water events, water from the river can enter the pervious soil layers and then move laterally through these layers under/through the levee. Excessive seepage can erode soil within the levee and lead to a rapid collapse and subsequent breach. Historically, foundation conditions were evaluated assuming homogeneous materials, but the floods of 1986 and 1997 and the resulting levee failures throughout the Central Valley resulted in a revision of the criteria for the evaluation of under-seepage. The levees that protect the Park site do not meet current ACOE levee design criteria and are at risk of breach failure at stages considerably less than levee crest elevations. This is evidenced by historical levee boils and heavy seepage at river stages less than design flows.

California’s Fourth Climate Assessment (Bensworth et al. 2018) predicts that climate change will have a profound impact on the current flooding regime. In the Sacramento Valley, annual precipitation is expected to remain about the same on average, or to increase slightly this century. However, the increased intensity of extreme storms makes an extreme flood event more likely, even probable in the next 40 years (Swain et al. 2018). New extremes will challenge water storage and flood control systems that were designed for the historical climate patterns. On the San Joaquin River under the 200-year return period flood, sea level rise is projected to increase the water surface elevation by 0.8 feet at Burns Cut Off. More significantly, climate change hydrology plus sea level rise causes more than a 7-foot increase in water surface elevation above existing conditions upstream of the confluence with French Camp Slough (i.e., the location of the Park; Maendly 2018). This is caused by significantly increased flow in the system under climate change hydrology in the San Joaquin River system, which is exacerbated by a change in flood-flow routing with the higher flows. It is unlikely that the existing levees at the Park will be able to effectively protect the adjoining neighborhoods from flooding of that magnitude.

#### **4.2.4 Ecosystem Services**

The Millennium Ecosystem Assessment (2005) defines Ecosystem Services as “the benefits people derive from ecosystems.” All Ecosystem Services have a direct link and influence on human well-being (Figure 4). Given the projected dramatic increase in urbanization and the potential climatic change around the world, optimizing urban Ecosystem Services delivery is critical for social and

ecological sustainability and climate adaptation. The Millennium Ecosystem Assessment identified four major categories of ecosystem services:



**Figure 6: Ecosystem Services and their relations to constituents of human well-being**  
(Source: Millennium Ecosystem Assessment 2005)

1. **Provisioning Services** include primarily food and fiber, such as fruits, vegetables, trees, fish, and livestock. A provisioning service is any type of benefit to people that can be extracted from nature.
2. **Regulating Services** include decomposition, water purification, erosion and flood control, and carbon storage and climate regulation. Plants clean air and filter water, bacteria decompose wastes, bees pollinate flowers, and tree roots hold soil in place to prevent erosion.
3. **Cultural Services** are non-material benefits, including spiritual values, natural beauty, inspiration, a sense of place, or recreational opportunities from their surrounding ecosystems. They promote the building of knowledge and the spreading of ideas; creativity born from interactions with nature (e.g., music, art, architecture); and recreation.

4. **Supporting Services** include natural processes, such as photosynthesis, nutrient cycling, the creation of soils, and the water cycle. These processes allow the Earth to sustain basic life forms, ecosystems and people.

Specifically, the Ecosystem Service Assessment is a multilayer evaluation of ecosystem services provided by the greenspace within the Park. Based on a comprehensive inventory, this allows the identification of essential Ecosystem Services that are available, including:

- **Biodiversity.** The relative abundance and diversity of plant and animal species as an indication the Park's resilience to climate change
- **Biological Carbon Sequestration Potential,** based on existing vegetation. This includes current carbon storage and the annual sequestration of carbon.
- **Air quality improvement and health benefits,** such as pollution removal, oxygen generation
- **Hydrological effects,** including evaporation, water interception, and avoided runoff.

The City has the unique opportunity to create a re-use strategy for the Park that addresses multiple, interrelated societal problems, such as climate change, biodiversity conservation, and social inequality. The majority of ecosystem services can be described and quantified, at least in categorical terms. Leveraging Ecosystem Service Values created and preserved through the implementation of the Master Plan will offer the City several benefits, including:

- **Impact Mitigation.** The ecosystem benefits created through implementation of the Van Buskirk Master Plan may be used to offset impacts by other City projects or to create tradeable/marketable credits for mitigation by other agencies. Mitigation could include special-status species habitat, wetlands, flood control, water and aquifer recharge, or temperature offsets (both aquatic and terrestrial/heat island).
- **Public Health.** Managing the Park re-use with an eye to public health benefits will reduce the burden of local residents in regard to typical health issues associated with air-pollution, such as asthma, low birth weight and cardiovascular disease. Creating opportunities for physical activity also relieves symptoms of depression and anxiety, improves mood, and enhances psychological well-being.
- **Education and Community Identity.** For children and adolescents, parks and playgrounds provide an opportunity for imagination and creativity, cognitive and intellectual development, and negotiating social relationships. Educational opportunities for local schools, clubs and after-school programs are important benefits of open space. Parks have important social and community development benefits. They make urban neighborhoods more livable and provide a place where both adults and children can socialize, increasing people's sense of community,
- **Climate Adaptation and Biodiversity.** Biologically diverse communities are more resilient to ecosystem change. Managing and restoring the Park's biodiversity will support the ecological resiliency and ecological adaptation to climate change. The quantification of tangible metrics



may aid in the evaluation of climate goal targets and how the City may achieve them. Carbon sequestration, air quality (e.g., particulate matter, ozone), and other greenhouse gas emissions and capture are examples of climate-related metrics.

- **Third-Party Funding.** Placing an emphasis on the human community context, especially SB535 (Disadvantaged Communities) and their vulnerabilities will leverage State and private partnership funding opportunities for the City. By clearly identifying the community benefits of management and restoration activities, the City can leverage these benefits in seeking outside funding.

### 4.3 METHODS

The methods outlined in this chapter address the various conservation values and services of the Park site. LSA's approach included field surveys, mapping, database review and modeling to evaluate the Park's Ecosystem Service values.

For planning purposes, the Park was divided into two planning strata. The "west" stratum included 81.6 acres beginning at the eastern edge of the central parking area (including the former golf club buildings) and extending to the western border of the site (Figure 3). The "east" stratum comprised 78 acres and extended from the parking lot eastwards to the fence line of the Van Buskirk Community Center. This stratification was selected to account for differences in proximity to recreation sites, underserved neighborhoods, and accessibility. All survey data collection and analyses were conducted separately for each stratum.

#### 4.3.1 Vegetation Communities And Tree Inventory

The primary vegetation communities at the Park are:

1. **Urban Grassland.** Most of the grassland vegetation at the former golf course is dominated by turf grasses, which are perennial or rhizomatous species (e.g., Bermuda grass, *Cynodon dactylon*; Kentucky bluegrass, *Poa pratensis*, Perennial Ryegrass,). With the abandonment of the irrigation system, the turf has undergone a transition to a more drought-resistant non-native grassland. Mowing still occurs, but fertilization and herbicide applications have stopped. The cessation of herbicide applications has resulted in a non-native grassland with intermixed invasive, non-native weeds and bare ground.
2. **Urban Forest.** An urban forest is a collection of trees that have been planted within a built-up area. The mature trees at the Park are distinct features of the site. The most common tree species are non-native trees, primarily river red gum (*Eucalyptus camaldulensis*), cork oak (*Quercus suber*) and Canary Pine (*Pinus canariensis*). Urban forests moderate local climate, slowing wind and stormwater, and filter air and sunlight. They are critical in cooling urban heat islands and potentially reducing the number of unhealthy ozone days that plague major cities in peak summer months. Urban forests are composed of a mix of native and exotic tree species and often have a tree diversity that is higher than surrounding native landscapes.

From February 17 through 25, 2021, a team of biologists and botanists conducted a comprehensive tree inventory of the entire site. Each tree was identified by species, georeferenced by its location and given a unique waypoint in a GIS database. The tree's diameter at breast height (dbh in inches), crown health (percent of crown damaged or dead) and total height (in meters) was recorded. A tree's condition was evaluated by the amount of crown damage (dieback) and condition classes were as follows:

- Excellent = 0 percent dieback
- Good = 1 - 10 percent dieback
- Fair = 10 - 25 percent dieback
- Poor = 25 - 50 percent dieback
- Critical = 50 - 75 percent dieback
- Dying = 75 - 99 percent dieback
- Dead = 100 percent dieback

The height of each tree was determined either by a laser-range finder with a tree height measuring function (LaserTech TruPulse 360R Laser Rangefinder) or by combining linear distance measurement with a common laser range finder and a clinometer. For the latter method, correction for the eye level height of the observer was necessary to obtain correct tree height measurements. All data were recorded in field data sheets and later transcribed in Microsoft Excel spreadsheets.

## 4.3.2 i-Tree Eco

### 4.3.2.1 Current Conditions Model

Tree inventory data were analyzed using the i-Tree Eco software<sup>6</sup> to quantify the current conditions at the Park, including urban forest structure, environmental effects, and value to communities. The i-Tree Eco software outputs provide estimates of:

- Urban forest structure: Species composition, number of trees, tree density, tree health condition, etc. Leaf area and total biomass of trees was estimated by the model.
- Carbon: Total stored carbon and net carbon annually sequestered by the urban forest. Carbon storage is the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation. To calculate current carbon storage, biomass for each tree was calculated using equations from the literature and measured tree data. Open-grown, maintained trees tend to have less biomass than predicted by forest-derived biomass equations (Nowak 1994). To adjust for this difference, biomass results for open-grown urban trees were multiplied by 0.8. No adjustment was made for trees found in natural stand conditions. The average carbon content is generally 50% of the tree's dry weight total volume. Therefore, tree dry-weight biomass was converted to stored carbon by multiplying by 0.5. Carbon sequestration is the removal of carbon dioxide from the air by plants. To estimate the gross amount of carbon sequestered annually,

<sup>6</sup> Since 2006, i-Tree has been a cooperative effort between the USDA Forest Service, Davey Tree Expert Company, The Arbor Day Foundation, Society of Municipal Arborists, International Society of Arboriculture, Casey Trees, and SUNY College of Environmental Science and Forestry. More info at: [www.itreetools.org/tools/i-tree-eco](http://www.itreetools.org/tools/i-tree-eco)

average diameter growth from the appropriate genera and diameter class and tree condition was added to the existing tree diameter (in year x) to estimate tree diameter and carbon storage in year x+1. Carbon storage and carbon sequestration values were based on estimated or customized local carbon values within the i-Tree Eco software. For this analysis, carbon storage and carbon sequestration values were calculated based on \$171 per ton.

- **Pollution reduction:** Hourly amount of pollution removed by the urban forest, and associated percent air quality improvement throughout a year. Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter less than 2.5 microns (PM<sub>2.5</sub>).<sup>7</sup> Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multi-layer canopy deposition models. The number of adverse health effects and associated economic value is calculated for ozone, sulfur dioxide, nitrogen dioxide, and PM<sub>2.5</sub> using data from the USEPA Environmental Benefits Mapping and Analysis Program (BenMAP). For this analysis, pollution removal value was calculated based on the prices of \$1,327 per ton (carbon monoxide); \$1,107 per ton (ozone); \$220 per ton (nitrogen dioxide); \$51 per ton (sulfur dioxide); and \$89,798 per ton (particulate matter less than 2.5 microns).
- **Public health impacts:** Health incidence reduction and economic benefit based on the effect of trees on air quality improvement for the United States only. The health benefits were calculated according to the USEPA Environmental Benefits Mapping and Analysis Program. Incidence is defined as the total number of adverse health effects avoided in a year due to a change in pollution concentration. The program also quantifies the economic value that is associated with the incidence of adverse health effects.
- **Oxygen Production:** The amount of oxygen produced is estimated from carbon sequestration based on atomic weights: net O<sub>2</sub> release (kg/yr) = net C sequestration (kg/yr) × 32/12. To estimate the net carbon sequestration rate, the amount of carbon sequestered as a result of tree growth was reduced by the amount lost resulting from tree mortality. Thus, net carbon sequestration and net annual oxygen production of the urban forest account for decomposition. For complete inventory projects, oxygen production was estimated from gross carbon sequestration and did not account for decomposition.
- **Avoided runoff:** Yearly avoided runoff attributed to trees summarized by tree species or strata. Annual avoided surface runoff was calculated based on rainfall interception by vegetation, specifically the difference between annual runoff with and without vegetation. Although tree leaves, branches, and bark may intercept precipitation and thus mitigate surface runoff, only the precipitation intercepted by leaves is accounted for in this analysis. In the i-Tree model, the value of avoided runoff is based on an estimated value of \$0.07 per foot.

<sup>7</sup> The i-Tree Eco software analyzes particulate matter less than 2.5 microns (PM<sub>2.5</sub>) which is a subset of particulate matter less than 10 microns (PM<sub>10</sub>). Although PM<sub>10</sub> is another significant air pollutant, it has not been included in this analysis. PM<sub>2.5</sub> is generally more relevant in discussions concerning air pollution effects on human health.

- **Bio-emissions:** Urban forest volatile organic compound emissions and the relative impact of tree species on net ozone and carbon monoxide formation throughout the year. Maximizing use of low VOC-emitting trees reduces ozone and carbon monoxide formation.

#### 4.3.2.2 Options Analysis

An analysis of options and their feasibility serves to identify and explore the most effective alternative approaches to be included in a Master Plan for the Park. The i-Tree software provides the opportunity to forecast stand conditions and ecosystem service provisions 30 years into the future. Three forecasting models were designed to simulate potential management options and desired conditions. Options selected for this assessment include:

1. **Option 1: The Baseline Scenario** (i.e., a forecast of the future without forest restoration or management) uses projections that comprise operational and maintenance activities within already existing infrastructure and practices (i.e., limited mowing, removal of hazard trees only). It is essentially a “do-nothing” or “null model” scenario.
2. **Option 2: The “Maintain Ecosystem Benefits” Scenario** defines management actions that require minimum effort and cost to maintain the forest at a similar density and distribution as current and ensures that most of the ecosystem services continue to be available. This scenario assumes that species composition will shift to native trees in the future based on limited planting of native, site-appropriate replacement trees beyond the existing operational and maintenance activities. The primary objective would be to maintain the current tree cover and ecosystem services of the Park. Under this option, managers would replace dead and dying trees by planting 100 replacement trees in each stratum annually for 10 years. This would result in approximately 2,000 native trees planted, although not all will survive. Under this scenario, Park managers would also need to control ladder fuels and other fine fuels by pruning, mowing, and grazing. The “**Maintain Ecosystem Benefits**” option provides the least-cost solution for the Park while achieving some of the Parks goals, albeit with limited ecosystem benefits.
3. **Option 3: The “Restoration and Enhancement” Scenario** aims to double the overall tree cover and the extent of the forested area. The scenario would involve planting approximately 300 young trees annually in each stratum for 10 years. All plantings would be limited to site-adapted species of trees with low fire risk. To meet the goal of a low fire-risk and climate-resilient urban forest, future stand conditions at the Park would need to include a preponderance of native species that are long-lived, site adapted and resilient to climate extremes. Creating such a forest would require planting of trees in suitable locations, adjacent to existing trees groves and including a mix of species. In addition, recruitment of undesirable non-native species, such as eucalyptus, would need to be controlled and eliminated if possible. Weeds and fine fuels would need to be managed by mowing and/or grazing, but the area for weed management and mowing would be reduced due to the expanded tree cover. Under this scenario, the existing forest at the Park would be largely converted into a drought-tolerant, fire resistant native vegetation community with high structural and biotic diversity. The resulting semi-natural forest would effectively serve as a fire modification zone and serve as an outdoor classroom for students learning about native plants and animals. It would provide substantial ecosystem services to local residents and visitors.

## 4.4 URBAN FOREST ASSESSMENT

### 4.4.1 Current Conditions

#### 4.4.1.1 Density, Species Composition and Diversity

LSA inventoried 977 live trees on the Park property, belonging to 35 species. At the Park, about 18 percent of the trees are species native to North America, while 9 percent are native to California. Species exotic to North America make up 82 percent of the population. Most of the exotic tree species have an origin from Australia (27 percent of the species). The 10 species with the greatest importance values (IV) are listed in Table C. The most abundant tree species are river red gum (*Eucalyptus camaldulensis*, n=126), cork oak (*Quercus suber*, n=117) and Canary Pine (*Pinus canariensis*, n=95). The overall tree diversity (Shannon Index)<sup>8</sup> was 2.9 +/- 0.0970 (SD).

The overall tree density is 2.5 trees/acre, or 6 percent tree cover (i.e., 9.6 acres of the entire site), which is low for urban forests in general (Nowak et al 2010). Tree density in the east stratum was slightly higher (2.6 trees/acre) compared to west stratum (2.4 trees/acre). Many tree benefits equate directly to the amount of healthy leaf surface area of the plant. Trees at the Park provide 190 acres of leaf area, or approximately 20 times the actual tree cover. The species contributing the largest proportions of total leaf area were red river gum (54.38 acres) red ironbark gum (*Eucalyptus sideroxylon*, 30.71 acres), and cork oak (15.62 acres). The most important California native species was valley oak (*Quercus lobata*, n=9, leaf area =1.03 acres). Overall, the leaf area in the west stratum was slightly higher than in the EAST stratum (98.8 acres vs 91.7 acres, respectively).

The tree community at the Park is dominated by large, mature trees. The distribution of trunk dbh varied among tree species. The tree species with the largest dbh was Aleppo Pine (*Pinus halepensis*, mean dbh = 33 inches) followed by red ironbark gum (mean dbh = 28 inches). Similarly, tree height varied among species. The largest tree was an Italian pine (*Pinus pinea*) at 122 feet. On average, the tallest trees were Italian pines (mean height=73 feet), red river gum (mean height = 69 feet) and red ironbark gum (mean height = 62 feet). Tree diameter and height distribution was similar across the two strata.

The urban forest at the Park extends to the Park's boundary along Houston Avenue (Figure 2). Given the close proximity of residential structures of often less than 30 feet from the canopy's dripline, there is limited defensible space for the community. A potential wildfire in the urban forest at the Park will pose a substantial fires risk to the community. Embers spread a fire quickly and when they land on a home, they can ignite flammable items in roofs, eaves, and landscaping. In addition, burning trees may fall across Houston Ave, igniting and damaging houses on the opposite side of the street and blocking access by emergency vehicles. Implementing a fire break along Houston Avenue should be considered a high priority.

<sup>8</sup> The Shannon index (H) is commonly used to characterize species diversity in a community by accounting for both abundance and evenness of the species present. The index ranges typically from 1.5 to 3.5; tropical rainforests systems can exceed the upper limit.

**Table E: Species Composition and Leaf Area for the 12 Most Abundant Tree Species in the Urban Forest at Van Buskirk Park, Stockton, California**

Species Name	Percent Population	Percent Leaf Area	IV
River red gum	12.9	28.6	41.5
Red ironbark	7.9	16.2	24.1
Cork oak	12.0	8.2	20.2
Canary pine	9.6	7.7	17.3
Aleppo pine	9.3	6.9	16.2
Shamel ash	7.2	5.1	12.3
Holly oak	5.9	4.0	10.0
Silver dollar gum	3.2	6.2	9.4
Coast redwood	4.6	3.0	7.7
Deodar cedar	6.0	1.4	7.4

Source: i-Tree-Eco model output (2021)

#### 4.4.1.2 Tree Health

The tree inventory recorded the percent dieback of each tree’s crown and thus provides a health assessment for the tree’s general health and its likelihood to die within the next decades. Trees with 50 to 75 percent crown mortality were considered sick, while those exceeding 75 percent were considered dying. Currently, 98 percent of trees (n=968) are considered healthy. Average crown mortality varied by tree species, with trees requiring more soil moisture experiencing higher crown dieback (see Table D). It should be noted that this estimation of tree health did not consider trees that have already died or are scheduled to be removed due to their health status. Thus, the overall tree health conditions at the Park are probably poorer than Table D indicates.

**Table F: Tree Health and Average Crown Dieback at Van Buskirk Park, Stockton, California**

Species Name	Average Percent Dieback	Percent Sick or Dying
Babylon weeping willow	21.6	17
Manna Gum	6.4	5
Cork oak	11.3	3
Aleppo Pine	9.9	3
Silver dollar gum	5.7	3
Red ironbark	6.9	1
Deodar Cedar	7.7	1
Coast redwood	11.9	0

Source: i-Tree-Eco model output (2021)

#### 4.4.1.3 Carbon Storage and Sequestration

Urban trees can help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in tissue. Trees sequester carbon in new growth every year. When a tree performs photosynthesis, carbon dioxide is extracted from the air and converted into sugar, while the tree

releases oxygen. Wood is the tree's biggest "carbon sink" because it is almost entirely made of carbon. While trees mainly store carbon, they do release some carbon, such as when their leaves decompose, or their roots consume sugar to capture nutrients and water.

Carbon capture of trees depends on the age of trees in an urban forest. Young forests have many trees and pull in carbon rapidly. Middle-aged trees grow slower than young trees, but the amount of carbon captured and stored is relatively greater. As a tree dies and decays, it releases much of the stored carbon back into the atmosphere. Decomposition of wood and leaf litter can offset the carbon capture of the remaining trees. Thus, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose. Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions due to the use of vehicles and gas-powered tools. When a tree dies, using the wood in long-term wood products, to heat buildings, or to produce energy from biomass will help reduce carbon emissions from wood decomposition or from fossil-fuel based power plants.

The amount of carbon annually sequestered increases with the size and health of the trees. The gross sequestration of the Park's trees is about 17.71 tons of carbon per year with an associated value of \$3,020 per year. The urban forest at the Park is estimated to store 991 tons of carbon at a value of \$169,000. Table E shows the amount of carbon stored by species. Cork oak stores and sequesters the most carbon (530 tons of CO<sub>2</sub> equivalent, or approximately 14.7 percent of the total carbon stored). The annual carbon storage at the Park is equivalent to the annual carbon dioxide (CO<sub>2</sub>) emissions from 701 vehicles or 287 single-family homes.

#### 4.4.1.4 Avoided Runoff

Surface runoff is a concern in many urban areas as it can contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff. Urban trees and shrubs are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees and shrubs of the Park help to reduce runoff by an estimated 1,240 cubic meters (approximately 1 acre-foot) a year with an associated value of \$2,900. Avoided runoff is based on local weather and precipitation data from the Stockton Metropolitan Airport.

#### 4.4.1.5 Air Pollution Removal

Poor air quality is a common problem in many urban areas and can lead to decreased human health, damage to landscape materials and ecosystem processes, and reduced visibility. The urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from the power sources. Oxygen production is one of the most commonly cited benefits of urban trees. The annual oxygen production of a tree is directly related to the amount of carbon sequestered by the tree, which is tied to the accumulation of tree biomass. Trees in the Park are estimated to produce 42.85 metric tons of oxygen per year. Cork oak is the most prolific oxygen producer in the Park with an annual production of over 6 metric tons, exceeding the oxygen production of the more numerous eucalyptus species.

**Table G: Carbon Storage of Various Tree Species at Van Buskirk Park, Stockton, California**

Species	N	Carbon Storage (ton)	Carbon Storage (%)	CO <sub>2</sub> Equivalent (ton)
Cork oak	117	145.40	14.7	533.30
Canary pine	95	126.90	12.8	465.30
Aleppo pine	91	109.90	11.1	403.10
Italian pine	38	94.10	9.5	345.00
Shamel ash	70	86.80	8.8	318.20
Red river gum	126	70.90	7.2	260.10
Red ironbark	77	59.80	6.0	219.30
Holly oak	58	54.20	5.5	198.60
Babylon weeping willow	6	42.70	4.3	156.70
Coast redwood	45	37.70	3.8	138.20
Deodar cedar	59	37.10	3.7	135.90
Australian pine	11	27.60	2.8	101.20
Silver dollar gum	31	19.90	2.0	72.80
Red pine	8	14.80	1.5	54.10
Chinese pistache	22	12.60	1.3	46.30
Manna gum	21	7.10	0.7	26.20
Black locust	6	6.40	0.6	23.60
Red willow	1	6.20	0.6	22.80
Arizona cypress	2	5.60	0.6	20.60
Trident maple	13	5.50	0.6	20.10
Callery pear	7	5.20	0.5	19.00
Valley oak	9	3.70	0.4	13.50
Argyle apple	4	2.20	0.2	8.20
Sweetgum	7	1.90	0.2	7.00
Canary island date palm	8	1.70	0.2	6.10
Japanese black pine	1	1.50	0.2	5.50
Desert fan palm	13	1.30	0.1	4.80
Blue jacaranda	3	0.90	0.1	3.20
Western red cedar	16	0.60	0.1	2.30
Southern magnolia	2	0.30	0.0	1.10
Plantane	3	0.30	0.0	1.00
Spanish bayonet	1	0.30	0.0	0.90
Glossy privet	1	0.10	0.0	0.40
Mousehole tree	1	0.10	0.0	0.30
Crepe myrtle	4	0.00	0.0	0.20
<b>Total</b>	<b>977</b>	<b>991.30</b>	<b>100.0</b>	<b>3,634.90</b>

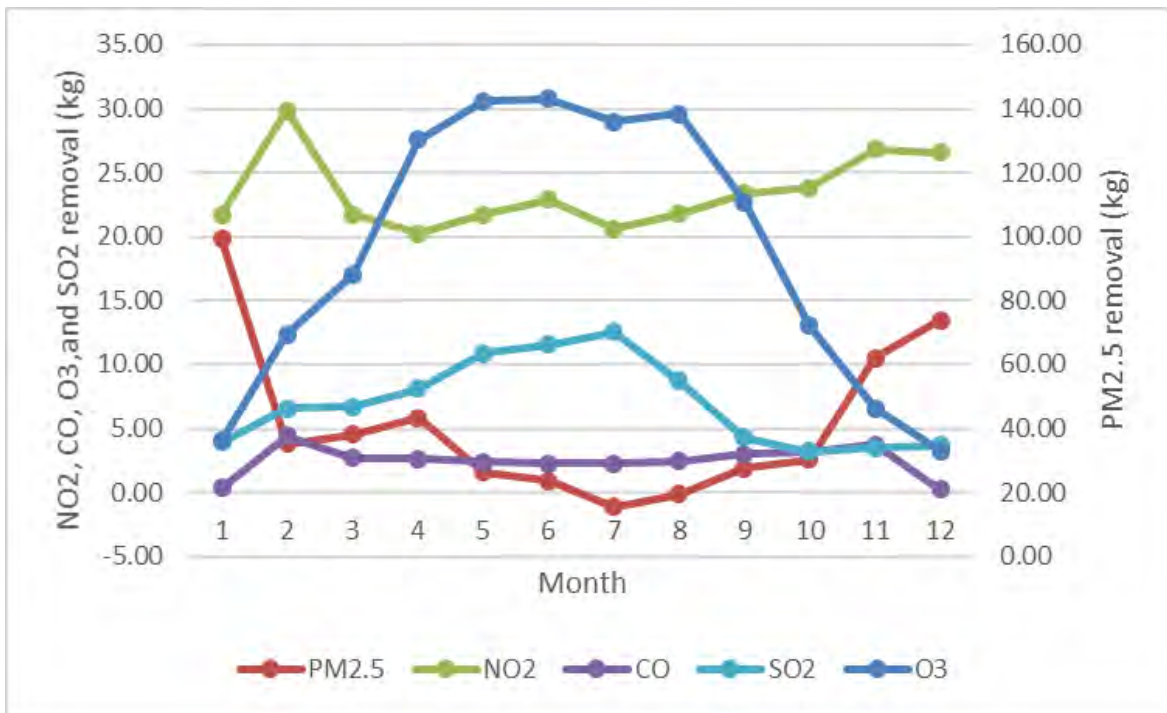
Source: i-Tree-Eco model output (2021)

Trees also emit volatile organic compounds that can contribute to ozone formation. However, studies have revealed that an increase in tree cover leads to reduced ozone formation (Nowak and Dwyer 2000). In 2021, trees in the Park emitted an estimated 3.425 metric tons of volatile organic compounds (VOCs, 1.793 metric tons of isoprene and 1.632 metric tons of monoterpenes, Table F). These VOCs are precursor chemicals to ozone formation. VOCs furthermore affect flammability of



the tree and may contribute to accelerating forest fires (Courty et al. 2010). Emissions vary among species based on species characteristics (i.e., some genera such as oaks are high isoprene emitters) and amount of leaf biomass. Fifty-five percent of the forest's VOC emissions were from the eucalyptus species, primarily red river gum and red ironbark.

Pollution removal by trees at the Park was estimated using field data and recent available pollution and weather data available (Stockton Metropolitan Airport, WBAN 23237). Pollution removal was greatest for ozone, peaking in the months of April through September (Figure 6). It is estimated that trees at the Park remove 1,604 pounds of air pollution, including ozone (O<sub>3</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), and particulate matter less than 2.5 microns (PM<sub>2.5</sub>), and sulfur dioxide (SO<sub>2</sub>) with an associated value of \$3,550 per year. Particulate matter is being filtered primarily during the rainy season. The annual nitrogen dioxide removal is equivalent to emissions from 20 vehicles or 9 single-family houses. The sulfur dioxide removal is equivalent to the annual sulfur dioxide emissions from 450 vehicles.



**Figure 7: Monthly Pollution Removal (kg) of the Current Forest at Van Buskirk Park, Stockton, California**

**Table H: Volatile Organic Compound Emissions of Trees at Van Buskirk Park, Stockton, California**

Species Name	Monoterpene (kg <sup>9</sup> /yr)	Isoprene (kg/yr)	Total VOCs (kg/yr)
Red river gum	484.10	730.20	1214.30
Red ironbark	271.00	408.70	679.70
Cork oak	350.60	273.60	624.20
Silver dollar gum	98.60	148.70	247.20
Holly oak	113.40	88.50	202.00
Manna gum	52.00	78.40	130.40
Canary pine	78.20	0.00	78.20
Aleppo pine	70.00	0.00	70.00
Italian stone pine	34.20	0.00	34.20
Agyle apple	12.90	19.50	32.40
Valley oak	15.80	12.30	28.10
Coast redwood	16.60	0.00	16.60
Red pine	11.90	0.00	11.90
Australian pine	0.10	10.60	10.70
Deodar cedar	10.20	0.00	10.20
Babylon weeping willow	0.30	9.50	9.80
American sweetgum	2.00	6.10	8.10
Black locust	2.30	2.80	5.10
Trident maple	3.30	0.00	3.30
Chinese pistache	2.30	0.00	2.30
Red willow	0.00	1.30	1.30
Southern magnolia	1.20	0.00	1.20
Glossy privet	0.00	0.70	0.70
Plantane	0.00	0.70	0.70
Canary island date palm	0.00	0.60	0.60
Callery pear	0.60	0.00	0.60
Desert fan palm	0.00	0.60	0.60
Arizona cypress	0.40	0.00	0.40
Japanese black pine	0.20	0.00	0.20
Western red cedar	0.10	0.00	0.10
Shamel ash	0.00	0.00	0.00
Blue jacaranda	0.00	0.00	0.00
Crepe myrtle	0.00	0.00	0.00
Mousehole tree	0.00	0.00	0.00
Spanish bayonet	0.00	0.00	0.00

Source: i-Tree-Eco model output (2021)

#### 4.4.1.6 Public Health

Table G shows the overall public health burden for the neighborhoods surrounding the Park, suggesting that air pollution is a major source of health complications in the affected Census Tracts. By removing air pollution, the forest at the Park reduces the incidence of common public health conditions (Table G). The estimated monetary value of this service exceeds \$3,500 per year

<sup>9</sup> 1 kg = 2.2 lbs.

(Table G). However, quantification and monetization of public health benefits of urban trees is difficult and likely underestimated.

**Table I: Air Quality Health Impacts and Values of trees at Van Buskirk Park**

	NO <sub>2</sub>		O <sub>3</sub>		PM <sub>2.5</sub>		SO <sub>2</sub>	
	Incidence	Value (\$)	Incidence	Value (\$)	Incidence	Value (\$)	Incidence	Value (\$)
Acute Bronchitis	–	–	–	–	0.00	0.03	–	–
Acute Myocardial Infarction	–	–	–	–	0.00	5.72	–	–
Acute Respiratory Symptoms	0.02	0.52	0.16	13.53	0.13	12.49	0.00	0.05
Asthma Exacerbation	0.24	20.27	–	–	0.13	10.83	0.01	1.05
Chronic Bronchitis	–	–	–	–	0.00	29.63	–	–
Emergency Room Visits	0.00	0.06	0.00	0.03	0.00	0.06	0.00	0.02
Hospital Admissions	0.00	10.02	0.00	6.24			0.00	1.02
Hospital Admissions, Cardiovascular	–	–	–	–	0.00	1.39	–	–
Hospital Admissions, Respiratory	–	–	–	–	0.00	1.08	–	–
Lower Respiratory Symptoms	–	–	–	–	0.00	0.19	–	–
Mortality	–	–	0.00	606.04	0.00	2,794.56	–	–
School Loss Days	–	–	0.09	8.55			–	–
Upper Respiratory Symptoms	–	–	–	–	0.00	0.14	–	–
Work Loss Days	–	–	–	–	0.02	3.80	–	–
<b>Total</b>	<b>0.26</b>	<b>30.88</b>	<b>0.25</b>	<b>634.39</b>	<b>0.29</b>	<b>2,859.91</b>	<b>0.02</b>	<b>2.14</b>

Source: i-Tree-Eco model output (2021)

Notes:

Incidence = The total number of adverse health effects avoided in a year due to a change in pollution concentration.

Value = The economic value in USD that is associated with the incidence of adverse health effects.

#### 4.4.1.7 Urban Heat Island mitigation

Tree canopies can lower surface and air temperatures by providing shade and through evapotranspiration associated with photosynthesis. Shaded surfaces, including pavement, trails and buildings may be 20–45°F cooler than the peak temperatures of unshaded surfaces (Akbari et al 1997). Evapotranspiration, alone or in combination with shading, can help reduce peak summer temperatures by 2–9°F. The Park’s tree density currently is only 6 percent; hence its shading effectiveness is moderate when considering the Park’s entire surface. However, shade is an important component when planning recreation facilities, such as dog parks, picnic sites, playgrounds, and hiking trails. Increasing tree cover is most useful as an urban heat island mitigation strategy when trees are planted in strategic locations around facilities, trails and buildings or to shade pavement in parking lots.

#### 4.4.2 Future Conditions Analysis

An important part of this assessment is the evaluation of the potential future conditions at the Park as they relate to overall forest structure, species diversity, ecosystem service provisioning, and fire

and drought risk. Managing the transition of the current stands towards a fire-, drought- and flood-resilient system is of the highest priority in the Park's vegetation management strategy. In the absence of thoughtful vegetation restoration, it is highly likely that the Park will rapidly become a fire-prone system that could pose significant dangers to the surrounding neighborhoods. In addition, the general projected decline of the forest will provide progressively fewer ecosystem services to visitors and residents of the neighborhood. An analysis of options serves to identify and explore the most effective alternative approaches to be included in a Master Plan for the Park. The i-Tree software provided the opportunity to forecast stand conditions and ecosystem service provisions of the Park into the future.

Three forecasting models were designed to simulate the three options above (Section 2.2.3.2):

- **Option 1: The Baseline Scenario**, i.e., a forecast of future conditions without forest restoration or replanting of trees.
- **Option 2: The “Maintain Ecosystem Benefits” Scenario** includes planting 100 replacement trees in each stratum for 10 years. Tree species would be limited to native, site-appropriate species and management actions would entail control of ladder fuels and other fine fuels by pruning, mowing, and grazing.
- **Option 3: The “Restoration and Enhancement” Scenario** aims to recreate a native riparian forest ecosystem with increased tree cover. The strategy would involve planting approximately 300 young trees annually in each stratum for 10 years. Like Option 2, selected trees for planting would be native, site-appropriate species. Vegetation management would entail control of fuels by pruning, mowing, and grazing. However, due to the greater amount of shading, bush and grass (fuels) management would generally be less intensive than under Option 2 to maintain fire safe conditions. The resulting forest conditions would double the provided ecosystem services and provide a fire modification zone.

#### 4.4.2.1 Option 1: Baseline Scenario Forecast

**Forest Structure, Tree Cover, and Species Composition.** Under the Baseline Scenario, no replacement of dead or dying trees would be implemented. Model results suggests that natural mortality will greatly reduce the number of trees in the Park. Over this period, almost 600 trees are projected to die, resulting in a reduction of tree cover by 52 to 58 percent, respectively, for the east and west stratum. Total leaf area is expected to decline by almost 60 percent and total tree biomass reduction will exceed 62 percent over 30 years. Likewise, the overall basal area of the urban forest will decline by 56 percent from 306 square meters (m<sup>2</sup>) to 132 m<sup>2</sup> due to natural mortality of trees. Considering the predicted high mortality over the next 30 years, the forests structure at the Park will become more open and savannah-like, with large gaps between trees becoming the prevalent characteristic of the urban forest. This will reduce the shaded areas and allow more sunlight to penetrate the canopy, enhancing weed and brush encroachment.

Although the i-Tree model does not make predictions of future tree composition by species, it is likely that species with high crown dieback rates (Table D) will experience higher mortality. Field observations during the 2021 tree inventory suggest that most redwoods and deodar cedars are

showing signs of water stress and reduced vitality. Thus, the future diversity of trees will decline due to higher mortality of less-drought-tolerant species.

The remaining forest will likely be dominated by those species that continue to thrive, and even reproduce under the predicted future conditions. The i-Tree model does not consider naturally occurring recruitment by some of the tree species, hence future forest conditions are likely to differ from those predicted by the model. Many tree species at the Park are drought tolerant, notably eucalyptus, pine and Chinese pistache. In addition, many species will tolerate periodic flooding (e.g., red river gum and shamel ash). Species less adapted to drought are those already showing water stress, such as sequoia, deodar cedars, magnolia and sweetgum. As environmental extremes (e.g., heat, drought) occur, these species are likely to disappear rapidly.

Some tree species will naturally reproduce during that time, exacerbating the shift in the species distribution and the overall decline in diversity. Species that reproduce naturally at the Park include the majority of eucalyptus species. Eucalyptus grow readily from seed and in several locations throughout the Park young trees can be observed sprouting underneath the canopy of a mature specimen. Eucalyptus produce seed crops at intervals of several years and seeds are small and dispersed by wind. Each tree produces about 700,000 viable seeds/kg and seeds remain viable for more than 10 years (Dean et al. 1986). The California Invasive Plan Council therefore has rated red river gum as “limited invasive.”

Recruitment and expansion of willows will also occur naturally and is already underway in many of the drying ponds. Species that will not likely reproduce significantly include pine species and *Casuarina*, which produce allelopathic leaf secretions that inhibit the germination of seeds. Cork oak, although capable of reproducing, will be limited by seed predation by birds and small mammals. Most likely, the future composition of trees at the Park will be dominated by the two most drought-tolerant species, river red gum and red ironbark. It is also expected that most oaks will persist, although will not likely reproduce.

**Ecosystem Services.** The forecasted reduction of tree cover and number of trees at the Park will have a significant impact on the ecosystem services provided to local residents and visitors to the area. Simulations suggest that under the Baseline Scenario (no replacement plantings), carbon storage will decline from 991 tons to 548 tons, which amounts to a total loss of 45 percent of the stored carbon or the equivalent of emissions from 381 vehicles and an annual value of \$89,000. In addition, the mortality of over 600 trees will create emissions due to removal (e.g., vehicles, chainsaws) and disposal of the removed trees. The biomass of removed trees in year 30 alone is over 120 metric tons (or 60 metric tons of pure carbon), which would most likely be chipped, composted, or used as firewood, amounting to an additional carbon emission of 14.7 tons per year. Motorized tree removal equipment (e.g., chain saws, vehicles) would add significant emissions, causing the annual emissions under the Baseline Scenario to exceed the annual sequestration (8.71 metric tons of carbon). Thus, without active replacement of dying or dead trees, the Park would convert from active sequestration of carbon to a net emitter of CO<sub>2</sub>. Pollution removal<sup>10</sup> will likewise decline, with the most drastic reduction in ecosystem services being a 55 percent loss in particulate

<sup>10</sup> Pollution removal value is calculated based on the prices of \$1.46 per kilogram (CO), \$1.22 per kilogram (O<sub>3</sub>), \$0.24 per kilogram (NO<sub>2</sub>), \$0.06 per kilogram (SO<sub>2</sub>), \$98.99 per kilogram (PM<sub>2.5</sub>).

matter interception (PM<sub>2.5</sub>) and ozone removal. The monetary value of the pollution removal services of the Park would decline by almost \$2,000 per year. Finally, shading and cooling of recreational areas will decline concurrently with tree cover. The most effective trees producing shade will be those species with large crowns (e.g., Fremont Cottonwood, valley oak, boxelder, shamel ash and sycamore).

**Fire and Drought.** A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of weather and climate extremes, and can result in unprecedented weather events. Drought frequency and severity is likely to increase in the next 30 years due to climate change. Droughts and associated biotic and abiotic disturbances such as fire and pest outbreaks have become one of the most important drivers of forest mortality events across the globe. Increased drought and a longer fire season are increasing wildfire risk. For much of the Western U.S., climate models predict that an average annual 1 degree Celsius temperature increase would increase the median burned area per year as much as 600 percent in some types of forests (Vose et al. 2012). Furthermore, droughts are increasingly coinciding with heat waves. The number of dry, warm, and windy days in California has more than doubled since the 1980s, giving rise to greatly increased wildfire risk. Such hot, dry conditions promote stand-replacing catastrophic fires that threaten nearby communities and are difficult to control.

Historically, the Park's management as a golf course has kept the fire risk low by extensive mowing, pruning, and irrigation. However, these conditions no longer exist, and current management no longer includes irrigation or widespread mowing. As a result, fuel loads have increased. In the future, dense clumps of recruitment samplings will emerge underneath many of the eucalyptus trees. Over time, these saplings will grow into a dense understory, providing "ladder fuels" (i.e., saplings underneath the canopy of mature trees). Thus, the recruitment potential of a tree (i.e., whether it will readily regenerate from seeds or roots) is a predictor of future fire risk. In addition, the excessive mortality of mature trees will increase the surface where grasses and weeds will grow, adding to fine fuels throughout the Park. These areas will expand as trees die over the years, and weeds, shrubs and recruitment of aggressive invasive trees (mainly eucalyptus) will provide a greatly exacerbated fire risk. Coupled with highly flammable trees, these conditions will likely cause longer flames, quicker surface fires, and crowning of fires in closed canopies.

Eucalyptus and pines are highly flammable trees, especially during the hot summer months when their VOC emission increase flammability and when dry weeds and grasses provide additional fuel. These conditions occurred during the famous "Oakland Firestorm" of 1991, where eucalyptus stands maintained and intensified a fire in the hillsides of Oakland and Berkeley in Northern California.

There is no ranking system that universally quantifies the flammability of all tree species. Flammability ratings were derived from the VOC production potential for each species of tree, the tree's condition, and whether the tree was deciduous or evergreen. Physical plant properties that contribute to high flammability include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. For example, eucalyptus species are known for their extremely high flammability in New Zealand (Wyse et al. 2015). According to the Orange County Fire Authority (2020), the following trees have high flammability and are not suited for planting in Fire Modification Zones (i.e., areas managed to reduce, slow or

stop fires): Eucalyptus, , and all species of palms and cypress (*Cupressus* sp.). Among the western conifers, coast redwood has the third most flammable litter, behind only ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (Fonda et al. 1987). Cedars also fall into the highly flammable risk category. At the Park, trees belonging to high-risk species make up 63 percent of the entire forest.

The flammability of the tree itself and its propensity for regrowth are primary risk factors for the Park. Table H shows the most dominant tree species, their flammability and their natural recruitment potential (i.e., ability to create ladder fuels). Thus, future conditions under the Baseline Scenario will most likely be dominated by a) high fire risk due to highly flammable species; b) an increase in fine fuels due to reducing mowing and shading by trees; and c) ladder fuels by regenerating saplings.

**Table J: Natural Recruitment and Fire Risk Potential for the 10 Most Abundant Tree Species in the Urban Forest at Van Buskirk Park, Stockton, California**

Species Name	Percent of Population	Natural Recruitment Potential	Flammability
Red river gum	12.9	high	high
Cork oak	12.0	low	low
Canary Pine	9.6	low	high
Aleppo pine	9.3	low	high
Red ironbark	7.9	high	high
Shamel ash	7.2	low	low
Deodar cedar	6.0	low	high
Holly oak	5.9	low	low
Coast redwood	4.6	high	high
Italian stone pine	3.9	low	high
Silver dollar gum	3.2	high	high
Chinese pistache	2.3	low	low
Manna gum	2.2	high	high

Source: LSA 2021.

The abundance of highly flammable species differs significantly between the two strata. Although the west stratum has fewer trees, a greater proportion of them are highly flammable species (predominantly eucalyptus). Over 72 percent of the trees in the west stratum fall into the “highly flammable” category, while the east stratum has roughly 51 percent of highly flammable species (Figure 7).



**Figure 8: Proportion of Trees in Three Flammability Categories for the West and East Stratum, respectively, at Van Buskirk Park, Stockton, California**

#### 4.4.2.2 Option 2: Maintain Ecosystem Benefits Scenario Forecast

The challenge of managing the Park forest vegetation in the future is primarily related to fire risk and the need for more site-adapted and fire-resistant species that can tolerate drought conditions better than the current species composition. The goal of this scenario is to maintain the total number of trees, the percent tree cover (to shade out grasses, weeds, and other undergrowth) and the total tree biomass (to avoid large deficits in ecosystem services). Under this option, managers would replace dead and dying trees by planting 100 native replacement trees annually in each stratum for 10 years. This would result in approximately 1,000 native trees planted, although not all would survive.

Species that are suitable to be planted in fire modification zones include valley oak, Fremont cottonwood, western sycamore (*Platanus racemosa*), boxelder, blue elderberry, California Laurel (*Umbellularia californica*), California black walnut (*Juglans californica*), Coast Live Oak (*Quercus agrifolia*) and willows along wetlands. Existing Crape Myrtle, Texas privet, American Sweet Gum, Chinese Pistache, shamel ash, and Cork Oak can be retained due to their low flammability. Park managers also will need to control ladder fuels and other fine fuels by pruning, mowing, or possibly grazing.

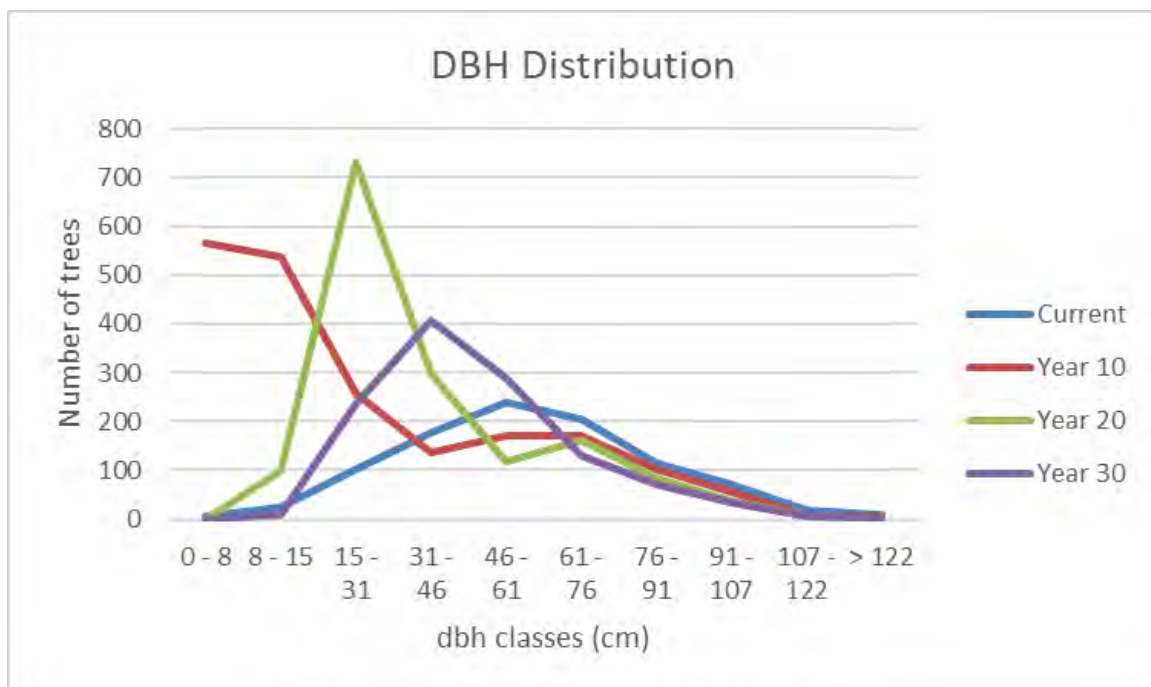
**Forest Structure, Tree Cover, and Species Composition.** Option 2 is designed to require minimum effort and cost to maintain the forest at a similar density and distribution, reduce fire risk and ensure that most of the ecosystem services continue to be available into the future. As natural mortality removes mature trees under Option 2, planting of saplings would not immediately compensate for the loss of biomass and ecosystem services. For example, the median diameter of trees would shift to smaller diameters early on and increase as the planted trees mature (Figure 8). The number of trees would initially increase to about 2,000 trees, but then decline due to mortality, reaching approximately 1,200 trees after 30 years. The total tree biomass would decline from an initial value of 4,250 to about 2,800 metric tons. However, the percent tree cover would decline only marginally from 6 percent to 5.75 percent during the 30-year forecasting period.

Under Option 2, the species composition of the Park after 30 years would likely be very different from current conditions, where only 8.8 percent of all trees are native to California. After planting 1,000 young native trees, the resulting forest would likely be dominated by native species at the end



of the forecasting period. Based on the dbh distribution (Figure 8), only about 10 percent of the existing non-native trees would remain, many of which would be long-lived and fire-resilient species, such a cork oak and shamel ash. Management actions to eliminate regrowth of non-native species (e.g., eucalyptus) and selective removal of highly flammable species would further drive the trajectory towards a native-species dominated system.

Option 2 would result in a forest structure at the Park that will be uneven-aged and less homogenous and “open” compared with the current conditions. The canopy would increasingly have larger gaps where individual trees died and understory development would be aided by increasing sunlight on the ground. However, careful management of the understory and the prevalence of native species would greatly reduce the overall risk of fire in this forest.



**Figure 9: Projected Diameter at Breast Height (dbh) of Trees over a 30-Year Forecasting Period with Replanting**

**Ecosystem Services.** Two major ecosystem services of the Park are carbon sequestration and air pollution removal. The forecasted provisioning of ecosystem services under Option 2 are outlined below. Figure 8 shows the predicted reduction in carbon storage and pollution removal value under Option 2, compared with the baseline scenario (Option 1).

Under Option 2, carbon storage would decline by approximately 10 percent by year 13 and then increase as young trees are increasing stored carbon. At the end of the forecasting period, the total carbon stored in the forest at the Park would be 108 percent of current, or the equivalent of the emission of 763 vehicles per year. Emissions due to removal and vegetation management (e.g., vehicles, chainsaws) and disposal of the removed trees would be compensated, and the final carbon balance would be positive. Initially, the annual carbon sequestration would drop by 7.5 percent by

year 4 but would exceed the current annual levels by year 8. From then on, carbon sequestration rates would increase annually and would have more than doubled by the end of the 30-year period. Planting young trees to mitigate for the decline and mortality of existing trees in the next 30 years would almost completely compensate for the loss of carbon storage in the Van Buskirk forest. The increase in carbon sequestration, however, would level off toward the end of the forecasting period, indicating that the system would likely be reaching some type of equilibrium.

Pollution removal would likewise decline initially but increase to approximately 175 percent of the current value. The monetary value of the pollution removal services of the Park would increase to over \$6,000 per year and then would likely stabilize. In addition, removing species with high VOC emissions and replacing them with native species of low VOC emission potential would further reduce the air pollution burden on the neighborhood of the Park. Carbon sequestration would remain roughly stable, while the value of pollution removal would increase by about 40 percent.

Shading and evaporative cooling of the Park would initially be reduced concurrently with the loss of canopy, but will increase over time, especially if trees are planted strategically to shade recreational areas, buildings, parking lots and trails.

**Fire and Drought.** As discussed above, the fire-resilience of the native-species-dominated forest resulting from Option 2 will be significantly higher, despite a more uneven-aged stand structure and more ladder fuels reaching into the canopy. Where necessary, management actions would need to be implemented to remove regenerating eucalyptus trees. As planted young saplings fill canopy gaps left by dying trees, ground shading would increase, thus limiting weed and brush encroachment. Although ladder fuels would be more prevalent due to the abundance of young trees, the tree species themselves are less flammable and thus would reduce the overall fire risk.

#### 4.4.2.3 Option 3: Restoration and Enhancement Scenario Forecast

This option aims to double the overall tree cover and the extent of the forested area. The reason for expanding the forest footprint is that maintenance of forested landscapes is generally less intensive and the shading by tree canopies tends to reduce the amount of mowing and brush clearance required to maintain fire safe conditions. The option would involve planting approximately 300 young trees annually in each stratum for 10 years.

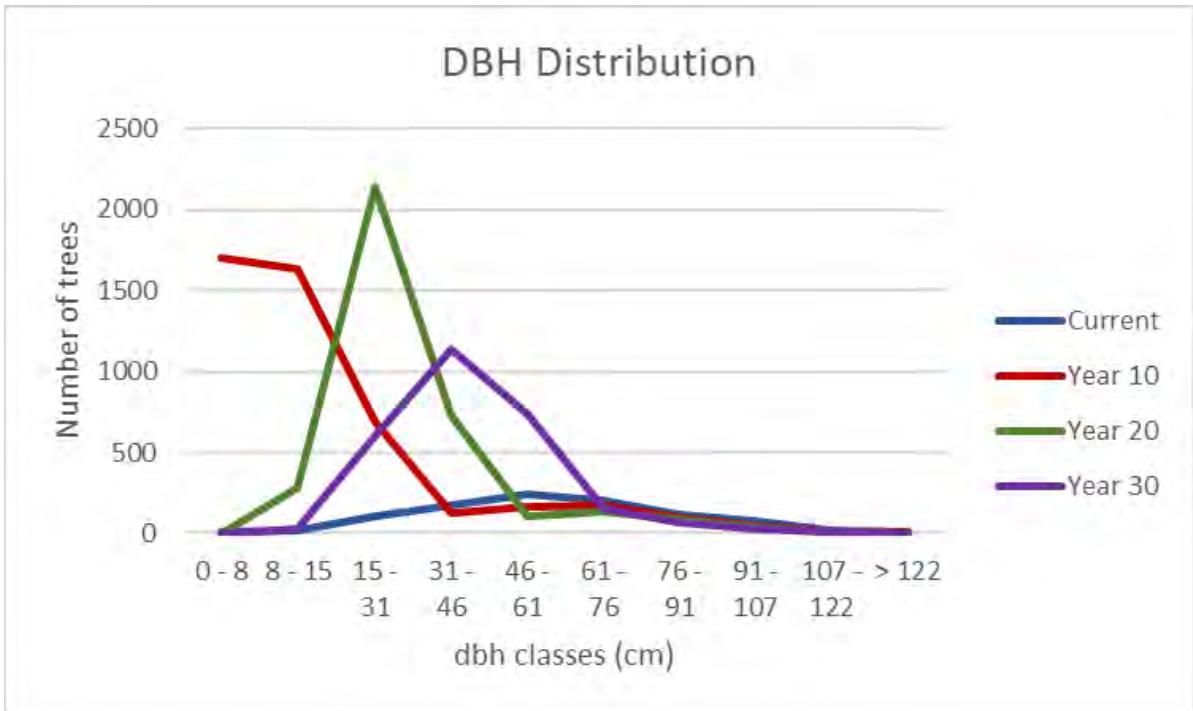
To meet the goal of a low fire risk and climate-resilient urban forest, future stand conditions at the Park must include a preponderance of native species that are long-lived, site-adapted and resilient to fire and climate extremes. Creating such a forest would require planting of trees in suitable locations, adjacent to existing trees groves and including a mix of species. Temporary irrigation would probably be necessary to ensure high initial survival of saplings. In addition, recruitment of undesirable non-native species, such as eucalyptus, would need to be controlled and possibly eliminated. Weeds and fine fuels would need to be managed by mowing and/or grazing.

Under Option 3, the existing forest at the Park would be largely converted into a drought-tolerant, fire-resistant native vegetation community with high structural and biotic diversity. The resulting semi-natural forest would effectively serve as a fire modification zone as well as an outdoor

classroom for students learning about native plants and animals, providing substantial ecosystem services to local residents and visitors.

**Forest Structure, Tree Cover, and Species Composition.** Under Option 3, the goal is to double the extent of the forest and to recreate native riparian forest conditions with corresponding gains in Ecosystem Services and a high degree of fire resistance. Planting approximately 3,000 young trees over 10 years would immediately increase the tree density and number, thereby compensating for any trees that might be lost due to natural mortality.

Tree cover would increase from 6 percent to 11 percent after 30 years. As with Option 2, the diameter distribution of trees would shift dramatically to lower dbh dimensions and to a denser, more diverse structure, giving the forest a decidedly more natural look of a riparian forest, instead of the current “savannah-like” conditions (Figure 9). It is likely that this forest, which would eventually consist of over 90 percent native species, would also exhibit some recruitment, and hence the number of saplings in the lowest diameter class may be underestimated. Natural recruitment in most riparian species requires open gaps in the canopy and moist soil conditions, so the recruitment would probably be limited to wetlands and areas with higher soil moisture. Depending on the management of existing wetlands (see Section 3.2) the recruitment of riparian species would probably resemble the natural condition of the Great Valley Riparian Forest.



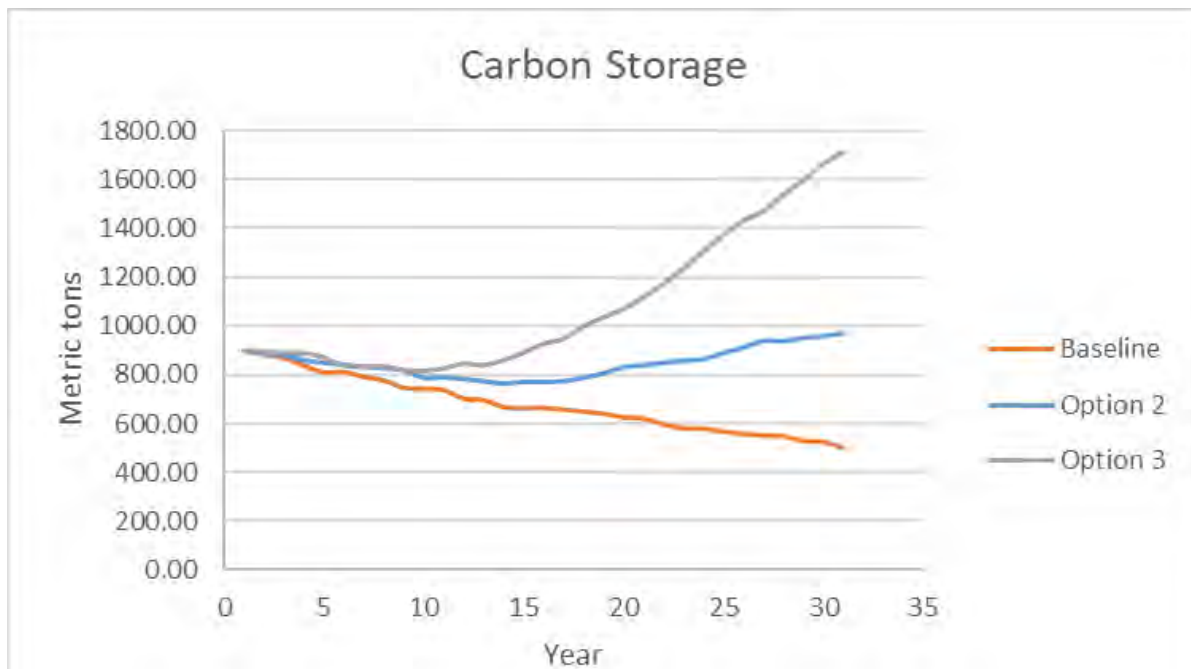
**Figure 10: Trunk Diameter Distribution (dbh) for the Urban Forest at Van Buskirk Park under Scenario 3 (Planting of 3,000 Saplings over 10 Years).**

Under Option 3, the median diameter of trees would shift to smaller diameters early on and increase as the planted trees mature (Figure 9). The number of trees would initially increase to about 4,600 Trees by year 10, and then decline slightly due to mortality until it reaches 2,700 trees

after 30 years (283 percent of current). However, since the forecasting model does not consider naturally occurring regeneration, this is likely an underestimate. The total tree biomass would initially decline slightly from 4,252 to about 3,200 metric tons by year 13, and then increase to reach 4,100 metric tons by year 30 (i.e., 96 percent of current). Tree cover would incline steadily from 6 percent to almost 11 percent during the 30-year forecasting period. These figures are minimal estimates and could change upwards if natural regeneration were to occur to a significant degree over the forecasting period.

Under Option 3, the species composition of the Park after 30 years would likely be very different from current conditions, where only 8.8 percent of all trees are native to California. After planting 300 young native trees annually for 10 years, the resulting forest condition would be dominated by native species at the end of the forecasting period. Based on the dbh distribution (Figure 9) only about 10 percent of the existing non-native trees would remain, many of which would be long-lived and fire-resilient species, such a cork oak and shamel ash. Management actions to eliminate regrowth of non-native species (e.g., eucalyptus), selective removal and natural regeneration of native species would likely further drive the trajectory towards a native-species dominated system.

**Ecosystem Services.** The forecasted provisioning of ecosystem services under Option 3 (enhancement) are outlined below. Figure 10 shows the predicted reduction in carbon storage and pollution removal value under this option, compared with the Baseline Scenario (Option 1) and Option 2.

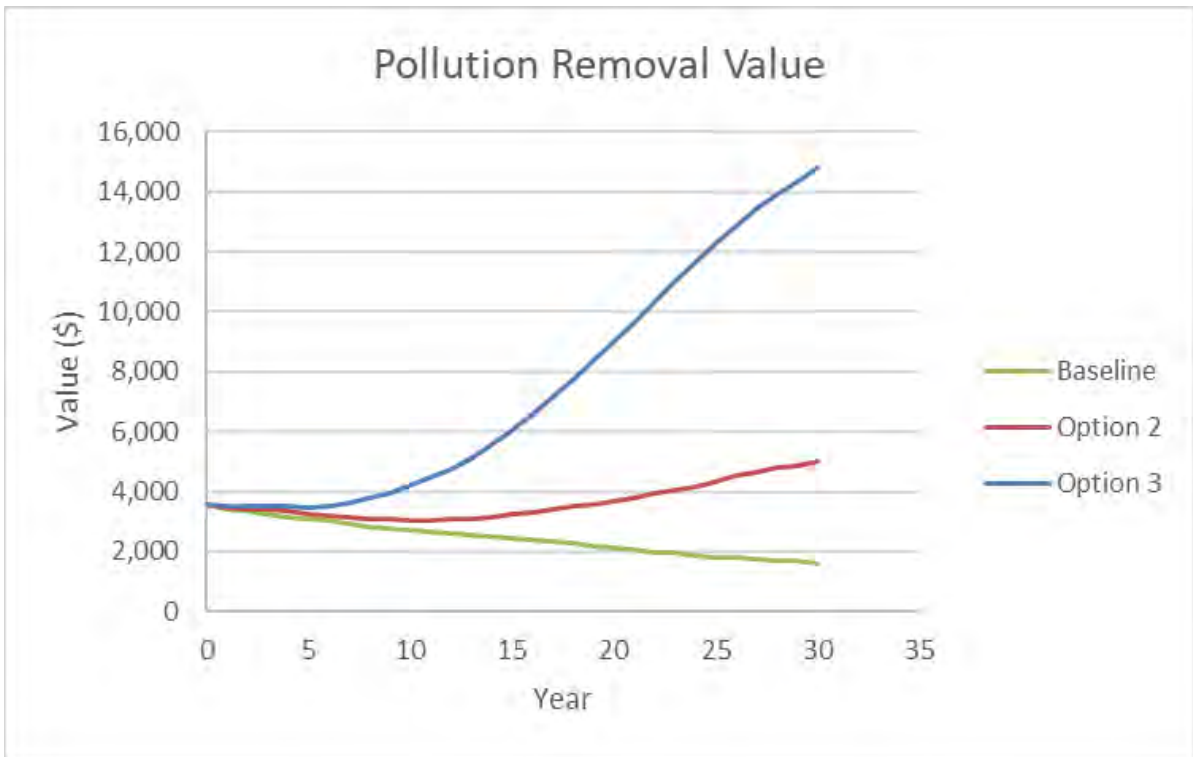


**Figure 11: Carbon Storage Forecasted under the Baseline, Option 2 and Option 3 Scenarios**

Carbon storage will increase as planted trees are growing. At the end of the forecasting period, the total carbon stored in the forest at the Park would be 190 percent of current or the equivalent of emissions from more than 1,700 vehicles per year. Emissions due to tree removal and vegetation

management (e.g., vehicles, chainsaws) and disposal of the removed trees would be only a small portion of that storage, and hence the final carbon balance would remain positive. Initially, the annual carbon sequestration would drop by 10 percent by year 8 but would exceed the current annual levels by year 15. Carbon sequestration rates would increase annually thereafter and would have almost doubled at end of the 30-year period. The increase in carbon sequestration would continue beyond the 30-year forecasting horizon at a steady rate, approximately 56 metric tons per year, or the equivalent of the emissions from 44 vehicles per year.

Pollution removal under Option 3 would remain stable for about 5 years and then increase to approximately 420 percent of the current value (Figure 11). Although the number of trees would only double over this period, the monetary value of the resulting forest's removal of air pollution would quadruple; it would increase to over \$14,800 per year and would increase annually beyond the end of the forecasting period. Most of the value of the forest's annual pollution removal would be due to interception of particulate matter (PM<sub>2.5</sub>); that ecosystem service alone would be worth over \$12,900 per year and would have significant benefits for public health. In addition, removing species with high VOC emissions and replacing them with native species of low VOC emission potential would further reduce the air pollution burden on the neighborhood of the Park.



**Figure 12: Pollution Removal Value for Three Scenarios of Forest Restoration at Van Buskirk Park, Stockton, California**

Shading and cooling services of the forest under this scenario will at least double due to the increase of the overall trees canopy and leaf area. However, creating a riparian forest along a functional oxbow in the western stratum will stimulate rapid growth and expansion of a native riparian forest

ecosystem, which will exceed the canopy area of existing and planted trees within a decade. It is anticipated that this natural recruitment, especially of fast-growing trees and shrubs will provide additional cooling and shading. Coupled with generally moister conditions in a functioning floodplain this will likely exceed the shading and cooling effectiveness two or threefold compared with current (baseline) conditions. Strategic planting of trees (primarily in the eastern stratum) will likewise increase the cooling and shading effectiveness of trees to benefit recreational areas.

**Fire and Drought.** As indicated above (Section 3.1.2.2), the current forest at the Park is highly fire prone. Under Option 3, the fire risk would be greatly reduced due to more site-adapted and less flammable species making up the bulk of the forest. Thus, Option 3 would provide the additional benefit of creating a “Fire Modification Zone” where fire behavior would likely change and fires would be less intense and threatening. Having a forest consisting of over 90 percent of site-adapted species would result in a more-drought resilient stand that would be less affected by the effects of climate change (i.e., drought).

## 4.5 WETLANDS

Wetlands are one of the most threatened ecosystems in the United States. Wetlands retain and control floodwaters. Wetland plants absorb nutrients and chemicals from the water, and they act as a natural filtration system. Wetland plants and soils store large amounts of carbon that, if released, would contribute to climate change. Wetlands are also a vital habitat for migratory birds, fish, and mammals, and their loss impacts recreation and biodiversity.

### 4.5.1 Wetland Restoration

The primary goal of wetland restoration is to restore native ecosystem functions and values to promote resilience, biodiversity and species conservation. Existing, relatively intact ecosystems are the keystone for conserving biodiversity, and provide the biota and other natural materials needed for the recovery of impaired systems. Restoration focuses on reestablishing the ecological integrity of degraded aquatic ecosystems, particularly the systems’ structure, composition and natural processes. Ecosystems with high integrity are resilient and self-sustaining natural systems that are able to accommodate drought stress and climate change.

The challenges associated with restoring natural ecosystem processes in wetlands at the Park include: 1) the current hydrological separation of the ponds from adjacent stream flows; 2) the lack of a continuous stream channel linking the individual ponds to convey water, and 3) the existing shallow conditions in the ponds that cause them to be unsuitable for maintaining sufficient inundation to support wetland vegetation.

Restoration of Ponds 1 through 4 (discussed below Section 3.2.3) will include re-establishment of inter-linking channels. Pond 5, which is not connected to Ponds 1 – 4, is discussed in Section 3.2.4.

### 4.5.2 Ponds 1 Through 4

Since the creation of the golf course, Ponds 1 through 4 have been maintained as individual ponds that have silted in. Their proximity to each other and the past hydrological connection via pipes and culverts make them suitable to be considered as part of one cohesive, connected wetland complex.

Restoring a functional wetland complex from Ponds 1 through 4 could include the following:

- Removing river sediment from the ponds to a depth that would allow the storage of rainwater for at least several months, and possibly recharging connection to the groundwater table.
- Establishing natural channels linking the ponds with each other to create new natural flow regimes. Removal of all pipes and creating meandering open channels with natural banks and bottom substrate would establish a natural surface water connection between the ponds and could aid in increasing the functionality and extent of the wetlands. Hydrological connectivity between the ponds through surface water flows would be a prerequisite for plants and animals to move across the landscape and reach suitable habitats. This movement would help sustain wetland biodiversity because it would enable species to colonize new habitats, escape adverse conditions, and recolonize shallower ponds after they have fallen dry for a few months. Creating a connected wetland complex would likely generate significant wetland credits for mitigation.
- Restoring native riparian vegetation along the restored pond- wetland complex. Re-establishing a riparian forest along the restored wetlands would aid in promoting biodiversity, special-status species habitat, and fire resilience.
- Reconnecting the restored pond- wetland complex with high-water flows from French Camp Slough and the San Joaquin River to enhance the river's floodplain. Originally, the site of the Park was located within the expansive floodplain of French Camp Slough and the San Joaquin River, and the creation of the RD 404 levee system isolated the Park from the floodplain of the river. Furthermore, the levee along French Camp Slough hemmed-in the river and reduced its ability to disperse floodwaters across its former floodplain, thus increasing flows and energy during flood events. Based on predicted flood stages of 7 feet or more due to climate change, the existing levees most likely will fail to protect the residences north of the Park from catastrophic flooding. Setting back the levee and expanding the flood plain should be evaluated as a potential flood abatement strategy.

#### 4.5.2.1 Option 1: Oxbows

Ponds 1 through 4 originally may have been remnant meanders (oxbows) of French Camp Slough. Restoring the original physical attributes of an oxbow would help attain the success of other aspects of the project, such as improving water quality and bringing back native biota. A fully functional oxbow system would include the creation of connecting channels as well as removal of artificial structures (i.e., berms, concrete weirs, culverts and pipes, and other remnant infrastructure). Removal of sediment to deepen the ponds would also be essential. The removed dredge materials could be used on-site for creating burrowing owl habitat and for potentially filling in Pond 5 (see below).

Nutrient removal and water quality enhancements are the primary benefits of a functioning wetland complex. Nitrates are a common nutrient load resulting from agricultural production, and oxbows that intercept agricultural tile drainage can filter nearly 100 percent of nitrates from the water. They can also capture and treat a variety of urban contaminants when linked to stormwater discharge.

#### 4.5.2.2 Option 2: Oxbows plus Floodplain Restoration

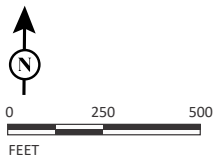
When hydrologically connected to a stream or river, oxbows become a part of a floodplain that stores millions of gallons of water per acre. During and after precipitation events, floodplains containing oxbows can intercept some of the flood waters and slowly release it back into the stream, helping to reduce the peak flows. As precipitation events become extreme due to climate change, this role for floodplains and oxbow wetlands will lead to significant reductions in flooding.

Creating a fully functional floodplain at the Park would require modifying the existing levee along the western portion of the Park and creating a setback levee. Channels could be excavated to connect to French Camp Slough and the San Joaquin River to accommodate peak flows that would spill into the oxbow wetlands, recharging water levels and providing nutrient flows. Depending on the design, such a floodplain could accommodate 2-year to 10-year floods. To maintain high ecological integrity and nutrient transport capacity, the frequency of inundation of the floodplain should be less than five years. A conceptual drawing of a restored floodplain at the Park is presented in Figure 12.





LSA



SOURCE: Google Earth (2021)

I:\DEW2002\G\Setback Levee\Setback\_Levee\_All.ai (7/20/2021)

FIGURE 12

*Strategic Plan for the Reuse of Van Buskirk Park*  
Conceptual rendering of a fully functional  
floodplain ecosystem at Van Buskirk Park,  
Stockton. (Option 3, West stratum)

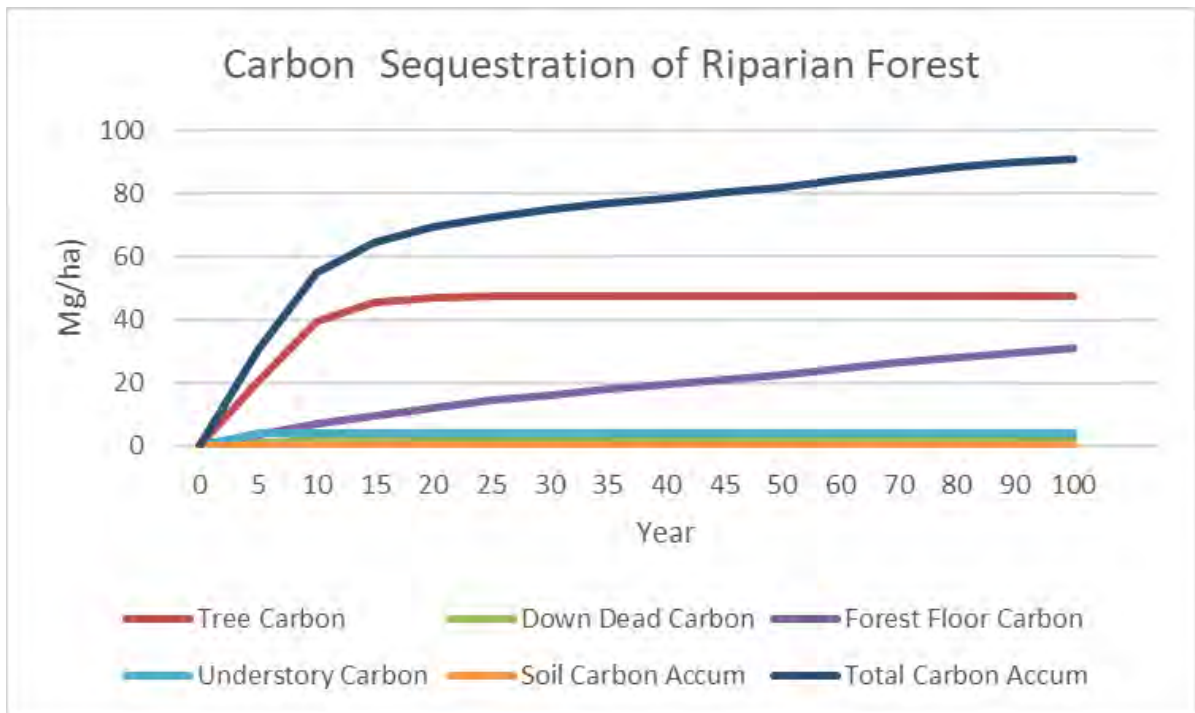
#### 4.5.2.3 Ecosystem Benefit of Restoration Options

Restoring Ponds 1 through 4 as inter-connected oxbows, in combination with floodplain restoration in the western stratum of the Park could provide significant ecosystem services, including:

- Water Flow Regulation, Storage and Quality Improvement. Complex and dynamic channel patterns in floodplains are critical for regulating flood peaks and increasing water storage. Floodplains and associated wetlands act as a sponge to regulate water volume, releasing water during low-flow conditions. Reduction in flow velocity also causes deposition of sediments, which improves water quality, supports nutrient cycling, increases productivity, and improves fish habitat. Riverine wetlands further improve water quality by reducing nitrogen, phosphorus and sulfur concentrations through plant growth, soil adsorption, and anaerobic processes (Ewel 1997, MEA 2005). Adding channel sinuosity and connectivity would increase surface and subsurface flow as well as groundwater recharge. Restoring this structure would enhance the ability of the system to regulate flows, provide habitat and improve water quality.
- Nutrient Cycling and Food Webs. Seasonal fluctuations in water flows distribute sediment, nutrients, seeds, and aquatic organisms longitudinally through river and stream systems and laterally across active channels and floodplains. These processes are critical for sustaining trophic interactions. Nutrient deposition supports aquatic plant production, which is in turn consumed by invertebrates, a critical food source for fish. Riparian forest vegetation is also crucial in providing fine organic inputs that benefit macro-invertebrate production. River and floodplain restoration has proven to be effective in increasing the abundance and diversity of macrophyte (aquatic plant) populations, which is a foundational for sustaining food webs (Lorenz et al. 2012).
- Biodiversity and Bioproduction. Floodplains are among the most biologically productive and diverse ecosystems on earth. Given the continual deposition and retention of nutrient-rich sediments, they tend to be more productive than adjacent uplands and are critical for maintaining aquatic and riparian biodiversity (Tockner and Stanford 2002). This diversity strengthens the ability of systems to resist disease and disturbance, which is particularly important in the face of climate change and other stressors on riparian systems. Restored floodplains containing oxbow wetlands provide important habitat for young fish to mature before entering the stream as adults and provide vital refuge to smaller fish seeking protection from larger, predatory fish. This could benefit special-status species such as Delta Smelt. Oxbow wetlands are also used by reptiles (e.g., western pond turtle), migratory birds and waterfowl as feeding grounds and nesting sites. Ducks and geese often begin using newly restored oxbows as soon as water is restored to them. Swainson's hawks and other raptors are often found nesting in riparian trees (Estep 1989).
- Carbon. Carbon sequestration is a strong co-benefit of riparian restoration. Worldwide, riparian forests are some of the most effective carbon sinks. Likewise, their capacity for filtering air pollutants exceeds that of urban forest due to the multi-layer canopy and higher leaf area. Establishment of a riparian forest would more than triple the baseline, unforested soil carbon stock. Riparian forests hold an average of 168 to 390 tons of Carbon per acre in biomass at maturity. The planting of riparian forest could substantially jump-start the biomass carbon

accumulation, with initial growth rates more than double those of naturally regenerating riparian forest (Dybala et al 2018). Using the CREEC estimator (Carbon in Riparian Ecosystems Estimator for California, developed by the California Department of Conservation, 2018), adding 25 acres of riparian forest along a connected wetlands complex could result in a rapid accumulation of Carbon within 15 years (Figure 13). At year 30, 750 tons/hectare (1850 tons/acre) of Carbon would be sequestered by this forest. This is the equivalent of the emissions of 160 vehicles. In addition, wetlands would sequester additional carbon.

- **Cultural and Aesthetic Services.** Residents of nearby communities would benefit from restored wetland and riparian forest through improved biodiversity perception, recreation, education, as well as spiritual and therapeutic values associated with nature and exercise. For example, a nature center and /or educational facilities (such as interpretive kiosks and signage) and a nature trail could greatly enhance the educational offerings of the site. Trails surrounding the restored wetland and riparian forests could be placed on top of the levee along with observations platforms, blinds or other infrastructure to enhance the site’s use for education and observation.
- **Fire Regimes.** Fires in riparian areas are considered to be of lower intensity and to occur less frequently than in the surrounding uplands. Penetration of upland fires can be attenuated by riparian zones; therefore, riparian forest can act as a buffer against fire. Maintaining a functioning riparian belt along restored wetlands at the Park can reduce the currently high fire risk to the neighboring communities.



**Figure 14: Estimated Carbon sequestration (metric tons) of restoring 1 ha (2.4 ac) of riparian forest at Van Buskirk Park, Stockton, California (Source CREEC).**

### 4.5.3 Pond 5

Pond 5 is the only wetland on the eastern portion of the Park. This irregularly shaped 2.6-acre feature is located approximately equidistant from the Community Center and the central parking lot (Figure 2). The pond is surrounded by a number of trees and on the eastern side is fringed by several large date palms. The pond is silted-in with weeds growing in the former pond bottom. The pond was originally supplied with water from French Camp Slough; the intake is located on the south side of the levee and provided water through a pipe connecting underneath the levee. The primary constraint on the future use of Pond 5 will be maintenance (e.g., weed and tree removal) and fire risk abatement. Options for Pond 5 include:

- **Option 1: Restore Pond 5.** Pond 5 is suited as a wetland only if it could be deepened to retain moisture longer in years of sufficient rainfall. Removing river sediment from the pond to a depth would allow the storage of rainwater for at least several months. De-sedimentation would also remove much of the toxins contained in the deposited silt and river sediment. This option could also include reducing the footprint of the pond, deepening the remaining portion and restoring the hydrological function of the pond as seasonal wetland habitat. Removal of non-native vegetation, maintenance and periodic de-sedimentation would be also needed. A reduction in the overall surface of the pond would require compensatory mitigation for the loss of wetlands (which could be provided by restoring Ponds 1 through 4). Removal of invasive weeds and the date palms along its fringes would create better wildlife habitat and aesthetic values.

Although there is virtually unfettered access to fishing in French Camp Slough along the southern border of the Park, creating a public fishing pond might be requested by some members of the public. Converting Pond 5 to a permanent pond that holds water at sufficient depth year-round to support fish would require deepening, shore hardening, installing drains, aeration, and a domestic water supply. Treated water from a public water supply will need to be cleaned to remove additives that may interfere with aquatic organisms (algae, zooplankton) and fish health. Periodic testing of water quality for toxic components will likely be required. In addition, benches, hardened trails, shade structures and other access features would be needed to make the fishing pond attractive to families. Stocking the pond with warm water fish would require a stocking permit from the CDFW. Maintenance demands of public fishing ponds are generally high and typically involve annual vegetation management, repair of hardened shore and trails, and restocking of the pond with live, catchable fish. In addition, draining would be required occasionally to remove sediment, invasive weeds, and other harmful non-native species (e.g., bullfrogs, released pet turtles etc.). Most likely, a permanent fishing pond would attract native Western pond turtles. It also may entice the public to release unwanted pets (pet turtles, goldfish etc.). Western Pond turtles would be impacted by these actions, and their presence in Pond 5 could require additional permitting and restrictions of maintenance activities. Risks of public fishing ponds are primarily related to safety, especially for small children, and to the likelihood of vandalism. For these reasons, creating a public fishing pond at Pond 5 would likely be costly and maintenance intensive.

- **Option 2: Reconfiguration as a skateboard or BMX Park.** Creating a skateboard or BMX park would entail installing hardened surfaces (concrete for a skatepark, decomposed granite for a BMX park) and would require the installation of drains to remove standing water after a rain

event. Use as a skate or BMX park would reduce fire risk only if the highly flammable date palms are removed and weed and shrub invasion can be controlled. If the pond is reconfigured as a skate/BMX park, the resulting loss of a jurisdictional wetland would require mitigation pursuant to Section 404 of the CWA). It should be noted that the regulatory agencies (i.e., Corps of Engineers, Regional Water Quality Control Board, California Department of Fish and Wildlife) might oppose the conversion of a jurisdictional wetland into an upland use if there are other locations in the Park that this same use could be accommodated.

- **Option 3: Complete fill and re-use as terrestrial area.** The pond could serve as a depository for excavated soils (e.g., from levee reconfiguration, wetland creation etc.) and thus could be filled in to create a terrestrial area. Compensatory mitigation for the loss of the entire 2.6-acre wetland would be required. Assuming an average fill depth of 3 feet, the restoration and connecting Ponds 1 through 4 in the western portion of the Park could require up to 409,000 cubic feet of fill. The wetland restoration in the eastern stratum could provide onsite self-mitigation. For the same reason as stated above, the regulatory agencies might oppose this filling and re-use.

## 4.6 MANAGEMENT RECOMMENDATIONS

### 4.6.1 Prioritization

Implementing a successful re-use strategy for the former Van Buskirk Golf Course as a public park will require careful consideration of prioritization and sequencing of events. Prioritization criteria consider the strategic importance (i.e., a measurement focused on value to be delivered to the stakeholders) and the ease of implementation (i.e., a focus on how feasible and costly implementation would be). Part of the feasibility is the explicit consideration of constraints (i.e., how easy is it to do) and of the benefits (Ecosystem Service delivery), costs, and risks. In the following sections, each management recommendation will be evaluated for the following elements of prioritization:

- Strategic Importance and Values to Stakeholders
- Constraints, Cost and Benefits
- Risks

### 4.6.2 Fire Prevention

Conversion of the current fire-prone conditions at the Park is of utmost importance. The existing forest is comprised of highly flammable, water stressed trees. The vegetation, if left unmanaged, will increasingly consist of fine fuels, ladder fuels and stressed trees, making a conflagration increasingly likely. The primary goal of forest restoration at the Park is the conversion towards a sustainable urban forest that is adapted to drought and climate change and poses a low fire risk to the neighboring communities. Conversion targets should reflect the different conditions and recreational uses. The western stratum of the Park is uniquely suited to restoring the native floodplain, wetlands and riparian forest conditions that originally existed in this location. In the eastern stratum, the prevalence of recreational uses (due to the proximity to the Community Center) requires a forest conversion strategy that is compatible with these uses.

The City will need to reexamine various forest management activities to reduce wildfire risk. These activities include:

1. Hazard tree removal and coarse fuel management (short-term, mid-term). Hazard trees, especially those of highly flammable species provide large amounts of fuel. They should be removed wherever necessary and be replaced with groups of saplings of native species that are less fire prone (e.g., oaks, sycamores, buckeye etc.).
2. Fine fuel management. Grasses and weeds can provide fine fuels that allow fires to start and traverse over open, treeless terrain. Depending on the height of these fine fuels, they may create flame lengths that reach into the crowns of trees exacerbating the speed and intensity of wildfires. Goat or sheep grazing should be implemented to remove herbaceous vegetation (grasses and weeds) after they have cured (dried). The best time to start grazing the Park is at the end of May. Stubble height after grazing should be approximately 4 to 6 inches.
3. Fuel breaks. Installing a fuel break along the Park boundary could increase the defensible space and threat to residential areas. Removing all trees and shrubs along the Park boundary should be implemented to create a fire break that is at least 100 feet wide. Setback levees can also be used as effective fire breaks where they are constructed for flood control. Implementing a fire break may also alleviate security concerns by increasing the visibility along the Park boundary.
4. Conversion from fire prone to fire resilient, native species composition. Underplanting the existing forest canopy with native species will enhance sapling survival and facilitate maintaining the ecosystem service benefits (e.g., urban cooling, carbon sequestration, pollution removal). Where possible, improvements to the hydrology of the site should be considered as the most resilient and least management-intensive long-term strategy. The City may want to consider establishing a natural floodplain and a series of connected wetlands in the western portion of the Park, where conditions are most conducive to this kind of restoration. Resulting changes in the forest structure and composition towards a native Great valley Riparian Forest will contribute to fire resilience and lower management costs.
5. Creating fire-safe conditions at the Park will require the development a prescriptive action plan incorporating ecological assessment, fire behavior and fuel modeling. The plan should make recommendations for where initial fuel treatments should be focused and emphasizes the importance of repeated treatments over the long term to ensure undesirable vegetation does not grow back.

**Strategic Importance and Values to Stakeholders.** Urban parks have the potential of creating a fire risk and liability for municipalities unless managed properly to reduce fuels and increase fire resilience. Triggered by an increasing frequency of devastating or catastrophic fires in the Wildland-Urban Interface, wildfire fuel management is shifting rapidly in the western United States. Due to drought and climate change, wildfires are burning faster and hotter, are behaving more unpredictably than ever before and are often occurring year-round in the West. Large public landowners, such as cities and park districts must adjust their investments and roles in meeting this new challenge.

**Constraints, Costs and Benefits.** Urban environments create challenging conditions for tree growth. Exposure to pollutants, high temperatures, and extreme drought reduce growth and tree health. Vandalism and incompatible recreational uses may reduce tree survival. Proper maintenance is critical to a thriving urban forest, but it demands time, resources, and coordination from municipal governments. It may also be difficult to prioritize among multiple competing projects when funds are limited. A commitment to year-round sustainable forest management and fire risk prevention is expensive and an ongoing cost, for which the City may seek voter-approved funding, state and federal grants, and partnerships. Urban trees are often viewed as a financial burden or risk, but the benefits they provide may be poorly understood and undervalued by the public and by decision-makers. Thus, it is important to clearly identify the Ecosystem Service benefits associated with each management action.

**Risks.** The risk of maintaining the status quo is high. Current drought conditions, a changing climate, and an increased public presence at the Park will all contribute to an elevated risk of a catastrophic fire originating from the Park. Conversely, reducing the fire risk and increasing the resilience of the urban forest at the Park will enhance public safety.

### 4.6.3 Wetland Restoration

The primary goal of wetland restoration is to restore native ecosystem functions and values to promote resilience, biodiversity and species conservation. Relatively intact wetland and floodplain ecosystems are the keystone for managing multiple natural hazards, such as flooding, drought and fire. Currently, the area of the Park is at risk of 7-foot increases in water surface elevation above existing conditions, which will stress levees and result in overtopping and extensive flooding within the next decades (Maendly 2018).

#### 4.6.3.1 Ponds 1 Through 4

Wetland restoration at the western portion of the Park is recommended and would include the following modifications to Ponds 1 through 4:

- **Remove river sediment from the ponds** to a depth that will allow the storage of rainwater for at least several months, and possibly a recharging connection to the groundwater table.
- **Establish natural channels instead of the existing culverts.** The purpose of creating natural channels in the between Ponds 1 through 4 is to reverse the alteration of channel form, changes in flow regimes and siltation.
- **Restore natural riparian vegetation along the functioning wetlands.** Re-establishing a riparian forest along the restored wetlands will aid in promoting biodiversity, special-status species habitat and fire resilience.
- **Reconnect the wetlands with high-water flows from French Camp Slough and the San Joaquin River** to enlarge the river's floodplain, accommodating predicted peak flows. Creating a fully functional floodplain at the Park will require breaching or modifying the existing levee along the western portion of the Park and creating a setback levee along the northern boundary of the Park along Houston Avenue. Channels could be excavated to connect to French Camp Slough

and the San Joaquin River to accommodate peak flows that would spill into the oxbow wetlands, recharging water levels and providing nutrient flows. Depending on the design, such a floodplain could accommodate 2-year to 10-year floods.

**Strategic Importance and Values to Stakeholders.** Wetlands at the Park should be enhanced to provide major flood protection, enhanced hydrological processes and biodiversity benefits. The benefits translate in direct Ecosystem Services to the visitors and neighbors of the Park, including protection from flood and fire, urban cooling, pollution removal, recreational values, aesthetic and spiritual enrichment, and carbon sequestration. In addition, mitigation opportunities could aid the City in effectively offsetting impacts of other projects (onsite and offsite).

**Constraints, Costs and Benefits.** Wetlands have numerous and widespread benefits. However, many of the goods and services wetlands provide have little or no market value. Because of this, the benefits produced by wetlands accrue primarily to the general public. The challenges associated with restoring natural ecosystem processes in wetlands at the Park include:

1. the current hydrological separation from adjacent stream (i.e., French Camp Slough) flows and the location and condition of the current levee.
2. the lack of a continuous stream channel linking the individual ponds to convey water; and
3. the existing shallow ponds that are not suitable to maintain sufficient inundation to support wetland vegetation communities.

Channel restoration only applies to Ponds 1 through 4, as they are disconnected from Pond 5. Alteration of the current wetlands will require extensive review and permitting, and potential mitigation pursuant to Section 404 of the CWA. Early involvement of the ACOE; the USEPA; the Department of the Interior, USFWS; the Department of Commerce, National Oceanic and Atmospheric Administration, the CDFW, and the California Department of Water Resources will be advantageous. Many federal and State priorities related to flood control, water quality and wetland conservation overlap with a potential restoration of wetlands and/or floodplains at the Park and federal and State funding is available.

#### 4.6.3.2 Options for Pond 5

Restoration of Pond 5 would entail removing sediment and invasive species along its edges. Converting Pond 5 to a public fishing pond would require costly shore hardening, installing drains, aeration and a domestic water supply. Maintenance demands of public fishing ponds is generally high and will likely involve annual vegetation management, repair of hardened shore and trails, and restocking of the pond with live, catchable fish. A preferred alternative would create a skate or BMX park, by installing hardened surfaces (concrete for a skatepark, decomposed granite for a BMX park). This would require the installation of drains to remove standing water after a rain event. Compensatory mitigation for the loss of the entire 2.6-acre wetland would be required. Reducing the footprint of Pond 5 might be desirable. It is likely that the restoration of Ponds 1 through 4 in the western portion of the Park could produce the required amounts of fill from de-sedimentation, and channel creation.



#### 4.6.4 Wildlife Conservation

Conservation strategies guide conservation efforts for target species in a given area. At the Park, the wildlife conservation strategy focuses on a) native plants and animals; b) establishment of suitable habitat; and c) implementation of beneficial management practices. The overall goal of the wildlife conservation strategy is to restore, enhance and maintain wildlife habitat for native species to increase the resilience, biotic integrity and public viewing enjoyment. A secondary goal is to enhance wildlife habitat for special-status species with the goal of providing mitigation opportunities for the city, to offset impacts to these species elsewhere.

Major wildlife conservation objectives to consider in the redevelopment of the Van Buskirk Golf Course include:

- Support of rare, special-status and other protected species, including grassland and burrowing owl restoration, protection and enhancement of Swainson's hawk foraging and nesting habitat, enhancement of Valley Elderberry Longhorn Beetle habitat, bat habitat conservation and enhancement of pollinator and butterfly habitat.
- Habitat enhancement. Management of urban forests, floodplains and riparian habitats should create a multi-story canopy with high diversity. Retention of snags and "dead and down" woody debris (wherever possible) is important to maintain a functioning forest habitat. Habitat enhancement will increase biodiversity and support the goal of "Keeping common species common."
- Aggressive management of invasive species. All areas of the Park, but primarily wetlands should be kept free of invasive species as much as possible. That includes non-native animals such as released pet turtles, goldfish and feral domestic animals. Public information on the detrimental effects of these species should be provided in informational signage and interpretive displays.

An important element of the wildlife conservation strategy is the creation of habitat mitigation credits for use by the City or the San Joaquin HCP. Habitat mitigation is the preservation, enhancement, restoration or creation of wetlands or streams to offset, or compensate for, expected adverse impacts to similar habitat types due to land development activities within the city or county. The goal of mitigation is to replace the exact function and value of specific habitats (e.g., biodiversity, flood abatement, fish habitat) that would be adversely affected by a proposed development project ideally on land within the same watershed. Many habitat mitigation projects are linked to transportation projects where habitat was impacted due to road work. Typically, mitigation must be achieved prior to creating any impacts. Therefore, mitigation is often needed on a short term to not impact project implementation. Mitigation projects often will restore the mitigation site and provide funding for in-perpetuity management and monitoring. This guaranteed funding makes mitigation projects the ideal vehicle to create sustainable and functioning habitat at the Park. Thus, mitigation for wetland impacts could be an integral part of the Master Plan for Van Buskirk Park.

U.S. federal and State regulations in California require compensatory mitigation for impacts to aquatic resources, including wetland restoration. The federal CWA includes Sections 404 and 401,

which regulate dredge and fill into Waters of the U.S. The ACOE is the implementing agency of Section 404 of the CWA. In California, implementation of Section 401 of the CWA is delegated to the State RWQCB. State regulations that protect aquatic resources include the Porter Cologne Water Quality Act or California Water Code, implemented by the State RWQCBs and Section 1600 of the Fish and Game Code, implemented by CDFW. The ACOE, RWQCB, and CDFW, in enforcing the respective regulations, require compensation (mitigation) for loss or impact to aquatic resources acreage and functions.

To achieve the goal of “no net loss” of aquatic resources, the ACOE requires compensatory mitigation for impacts to aquatic resources that cannot be avoided or minimized. The State RWQCBs and CDFW will often require compensatory mitigation for unavoidable impacts to aquatic resources similar to what is required by the ACOE because they have not developed a current formal mitigation rule. Overall, regulatory agencies require some form of compensatory mitigation for unavoidable impacts to aquatic resources, including riparian wetlands. Forms of compensatory mitigation include permittee-responsible mitigation, purchasing credits from an agency-approved mitigation bank, and paying into an in-lieu fee program (in which fees collected are to fund future large-scale mitigation projects). Potential mitigation credits generated from restoration of natural habitat at the Park include:

- Wetlands
- Riparian vegetation
- Elderberry bushes
- Delta smelt habitat
- Swainson’s hawk breeding and foraging habitat
- Burrowing owl breeding and foraging habitat

Restoration of wildlife habitat could provide important benefits to the City for creating mitigation “credits.” For example, establishing burrowing owl nesting habitat at the Park could be used to offset impacts to burrowing owl nesting habitat by other development projects within the city. Valley Elderberry Longhorn beetle is already at the site; hence, planting valley elderberry bushes as part of the restoration may create credits for impacts elsewhere on this species. In addition, the site could be an attractive recovery site (upon restoration) for the riparian brush-rabbit (*Sylvilagus bachmani riparius*), a species listed under CESA since 1994 and listed endangered by the USFWS since 2000. The riparian brush-rabbit is a small, brownish cottontail-like rabbit with a white belly, relatively short ears, and small inconspicuous tails. The riparian brush rabbit can be distinguished from other subspecies by the relatively pale color, gray sides, and darker back. The threats impacting their decline include habitat loss to agricultural development, rodenticides, environmental elements such as catastrophic floods and fires, and deleterious genetic trends associated with small populations. Herbaceous forbs at the edge of shrub cover appear to be an important habitat feature, providing both cover and forage. Important forb species include mugwort (*Artemisia douglasiana*), stinging nettle (*Urtica dioica*), and gumplant (*Grindelia camporum*). Critical to their survival is the presence of trees and shrubs that grow to varying heights above periodic floods during temporary high-water conditions. Habitat modifications at the Park to benefit the

riparian brush rabbit include the creation of newly constructed high elevation earthen mound refugia and efforts to plant vegetation on upper slopes of levees to provide cover and forage for rabbits retreating from flooded lowlands.

Once the preferred options for restoration at the Park have been determined, a detailed restoration and mitigation concept plan should be developed, identifying opportunities for on-site mitigation of project impacts and opportunities for mitigating off-site impacts.

## 5.0 REFERENCES

- BaseCamp Environmental. 2017. Initial Study/ Mitigated Negative Declaration for the Rd 404 Van Buskirk Levee Cutoff Wall Stockton. Available online at: [www.basecampenv.com/uploads/3/4/7/8/34784969/rd\\_404\\_van\\_buskirk\\_levee\\_cutoff\\_wall.pdf](http://www.basecampenv.com/uploads/3/4/7/8/34784969/rd_404_van_buskirk_levee_cutoff_wall.pdf) (accessed July 29, 2021).
- Bedsworth, L., D. Cayan, G. Franco, L. Fisher, and S. Ziaja. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission). 2018. Statewide Summary Report. California's Fourth Climate Change Assessment. California Department of Conservation. 2021. Farmland mapping and Monitoring Program. Website: [www.climateassessment.ca.gov/](http://www.climateassessment.ca.gov/) (accessed August 19, 2021).
- Bendix, J. and M. G. Commons. 2017. Distribution and frequency of wildfire in California riparian ecosystems. *Environ. Res. Lett.* 12.
- California Department of Conservation. 2018. Carbon in Riparian Ecosystems Estimator for California (CREEC). Online tool available at [creec.conservacion.ca.gov/home](http://creec.conservacion.ca.gov/home).
- California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available online at: [nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83843](http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83843) (accessed July 29, 2021).
- California Fish and Game Code – FGC 1385 – 1391; California Riparian Habitat Conservation Program.
- California Native Plant Society, Rare Plant Program. 2020. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.38). Website: [www.rareplants.cnps.org](http://www.rareplants.cnps.org) (accessed November 19, 2020).
- Courty, L. & Chetehouna, Khaled & Garo, J.P. & Viegas, Domingos. 2010. A volatile organic compounds flammability approach for accelerating forest fires. *WIT Transactions on Ecology and the Environment.* 137. 10.2495/FIVA100201.
- Dean S.J., P.M. Holmes, P.W. Weiss. 1986. Seed biology of invasive alien plants in South Africa and Southwest Africa/Namibia. In: Macdonald IAW, Kruger FJ, Ferrar AA (eds.), *The Ecology and Management of Biological Invasions in Southern Africa*. Cape Town, South Africa: Oxford University Press, 157-170.
- Dybala, Kristen & Matzek, Virginia & Gardali, Thomas & Seavy, Nathaniel. (2018). Carbon sequestration in riparian forests: A global synthesis and meta-analysis. *Global Change Biology*.
- Estep, J.A. 1989. Biology, Movements, and Habitat Relationships of the Swainson's Hawk in the Central Valley of California, 1986–1987. California Department of Fish and Game, Nongame Bird and Mammal Section, Sacramento, CA. USA.
- Fonda, R.W., L.A. Belanger, L.L. Burley. 1998. Burning characteristics of western conifer needles. *Northwest Science.* 78: 322–333.

- Holstein G. 1984. California Riparian Forests: deciduous islands in an evergreen sea California Riparian Systems: Ecology, Conservation, and Productive Management ed. R E Warner and K M Hendrix (Berkeley, CA. University of California Press) pp 2–22.
- Lorenz, A.W., T. Korte, A. Sundermann, K. Januschke, P. Haase. 2012. Macrophytes respond to reachscale river restorations. *Journal of Applied Ecology* 49: 202-212.
- Lowe, S., M. Browne, S. Boudjelas, and M. DePoorter. 2000. *100 of the World's Worst Invasive Alien Species: A selection from the Global Invasive Species Database*. A publication of the Invasive Species Specialist Group (ISSG) of the world Conservation Union (IUCN) 12pp. Available online at: [www.issg.org/pdf/publications/worst\\_100/english\\_100\\_worst.pdf](http://www.issg.org/pdf/publications/worst_100/english_100_worst.pdf) (accessed August 19, 2021).
- Maendly, R. 2018. Development of Stage-Frequency Curves in the Sacramento-San Joaquin Delta for Climate Change and Sea Level Rise. California's Fourth Climate Change Assessment. August. Available online at [www.energy.ca.gov/sites/default/files/2019-12/Water\\_CCCA4-EXT-2018-011\\_ada.pdf](http://www.energy.ca.gov/sites/default/files/2019-12/Water_CCCA4-EXT-2018-011_ada.pdf) (accessed July 29, 2021).
- Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, D.C.
- Nowak, David J.; Hoehn, Robert E. III; Crane, Daniel E.; Stevens, Jack C.; Leblanc Fisher, Cherie. 2010. Assessing urban forest effects and values, Chicago's urban forest. *Resour. Bull. NRS-37*. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 27 p.
- Nowak, David. 1994. Air pollution removal by Chicago's urban forest. *Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*. 63-81.
- Office of Environmental Health Hazard Assessment (OEHHA). CalEnviroScreen, 3.0. Website: [oehha.ca.gov/calenviroscreen/report/calenviroscreen-30](http://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30) (accessed May 4, 2021).
- Orange County Fire Authority. 2020. *Vegetation Management Guideline: Technical Design for New Construction Fuel Modification Plans and Maintenance Program*. Guideline C-05. Available online at [www.ocfa.org/Uploads/CommunityRiskReduction/OCFA%20Guide-C05-Fuel%20Modification.pdf](http://www.ocfa.org/Uploads/CommunityRiskReduction/OCFA%20Guide-C05-Fuel%20Modification.pdf) (accessed July 29, 2021).
- San Joaquin Council of Governments. 2000. *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP)*. November 14. Available online at [www.sjcog.org/DocumentCenter/View/5/Habitat-Planpdf?bidId=](http://www.sjcog.org/DocumentCenter/View/5/Habitat-Planpdf?bidId=) (accessed July 29, 2021).
- Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation*, Second Edition. California Native Plant Society, Sacramento, CA. 1300 pp.
- Skinner, M.W., and B.M. Pavlik, eds. 1994. *Inventory of rare and endangered vascular plants of California*. CNPS Special Publication No. 1 (Fifth Edition). Sacramento. CA. vi + 338 pp.

- Smith, F. 1977. A short review of the status of Riparian Forests in California. in: Riparian Forests in California, Anne Sand, editor. University of California, Davis. Available online at: [www.fs.fed.us/rm/boise/AWAE/labs/awae\\_flagstaff/Hot\\_Topics/riphreatbib/sands\\_howe\\_overviewripfrestsca.pdf](http://www.fs.fed.us/rm/boise/AWAE/labs/awae_flagstaff/Hot_Topics/riphreatbib/sands_howe_overviewripfrestsca.pdf) (accessed July 29, 2021).
- Stockton, City of. 2018. Envision Stockton 2040 - General Plan. December 4. Available online at: [www.stocktongov.com/files/Adopted\\_Plan.pdf](http://www.stocktongov.com/files/Adopted_Plan.pdf) (accessed July 29, 2021).
- Swain, D.L., B. Langenbrunner, J.D. Neelin, and A. Hall. 2018. Increasing precipitation volatility in twenty-first century California. *Nature Climate Change*, 8(5), 427– 433.
- The Trust for Public Land. 2021. Stockton, CA 2021 ParkScore® ranking: #84. Website: [www.tpl.org/city/stockton-california](http://www.tpl.org/city/stockton-california) (accessed July 29, 2021).
- Tockner, K and J.Stanford, Jack. 2002. Riverine Flood Plains: Present State and Future Trends. *Environmental Conservation*. 29, pp 308-330.
- United States Environmental Protection Agency. 2015. EPA Fact Sheet, Social Cost of Carbon. Available online at: [archive.epa.gov/epa/production/files/2016-07/documents/social-cost-carbon.pdf](http://archive.epa.gov/epa/production/files/2016-07/documents/social-cost-carbon.pdf) (accessed July 29, 2021).
- United States Environmental Protection Agency. 2021. Environmental Benefits Mapping and Analysis Program - Community Edition (BenMAP-CE). Website: [www.epa.gov/benmap](http://www.epa.gov/benmap) (accessed July 29, 2021).
- United States Fish and Wildlife Service. N.D. IPaC (Information for Planning and Consultation). Website: [ecos.fws.gov/ipac](http://ecos.fws.gov/ipac) (accessed July 29, 2021).
- Vose, James M.; Peterson, David L.; Patel-Weynand, Toral, eds. 2012. Effects of climatic variability and change on forest ecosystems: a comprehensive science synthesis for the U.S. Forest Sector. Gen. Tech. Rep. PNW-GTR-870. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 265 p.
- Wagner, D.L., E.J. Bortugno, and R.D. McJunkin. 1991. Geologic Map of the San Francisco-San Jose Quadrangle, California. California Division of Mines and Geology, Regional Geologic Map 5A. Map Scale 1:250,000.
- Warner, R.E. and K.M. Hendrix. 1984. California Riparian Systems: Ecology, Conservation, and Productive Management (Berkeley, CA: University of California Press).
- Wills, Robin. 2006. Central Valley bioregion. In: Sugihara, Neil G.; van Wagendonk, Jan W.; Shaffer, Kevin E.; Fites-Kaufman, Joann; Thode, Andrea E., eds. Fire in California's ecosystems. Berkeley, CA: University of California Press: 295-320.
- Wyse, S.V.; L.W. Perry George; D.M. O'Connell; P.S. Holland; J. Monique Wright; C.L. Hosted; S.L. Whitelock; I.J. Geary; K.J.L. Maurin; and T.J. Curran. 2015. A quantitative assessment of shoot flammability for 60 tree and shrub species supports rankings based on expert opinion. *International Journal of Wildland Fire* 25, 466-477.