



**Habitat Restoration Opportunities Summary Report  
Petaluma River Park  
Sonoma County, California  
September 2023**

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## Table of Contents

	Page
<b>1 Introduction .....</b>	<b>2</b>
<b>2 Setting.....</b>	<b>2</b>
<b>3 Existing Habitats .....</b>	<b>5</b>
Brackish Marsh .....	6
Vernal Pool and Wet Meadow .....	7
Grassland .....	9
Coyote Brush Scrub .....	10
<b>4 Special-status Species and Habitats .....</b>	<b>13</b>
Special-status Plant Species .....	13
Special-status Animals.....	13
<b>5 Habitat Restoration Opportunities .....</b>	<b>13</b>
General Considerations .....	13
Habitat Opportunity – Preserve and Enhance Vernal Pool .....	15
Habitat Opportunity – Restore Tidal Marsh Habitat .....	16
Habitat Opportunity – Enhance Shoreline Native Vegetation .....	17
Habitat Opportunity – Incorporate Biotechnical Bank Stabilization .....	19
Habitat Opportunity – Incorporate Native Grasses into Park Design.....	20
Habitat Opportunity – Plant Native Trees.....	21
<b>6 References.....</b>	<b>22</b>

# 1 Introduction

The Petaluma River Park Foundation (PRPF) acquired the McNear Peninsula property in Petaluma, California (Figure 1) in 2001 with the goal of developing a community park that provides a space for public art, environmental education, community gatherings, native habitat restoration, and outdoor recreation. Prunuske Chatham, Inc. (PCI) is providing ecological restoration and enhancement planning and design services for the Petaluma River Park. The purpose of this report is to describe existing habitats on the site, and to identify opportunities and constraints for enhancing and restoring habitat on the site in conjunction with public recreation amenities. The site offers many opportunities for stewardship and ecological enhancement, and this report has been prepared to assist with programming and conceptual design of habitat creation, restoration and enhancement as part of the overall site design.

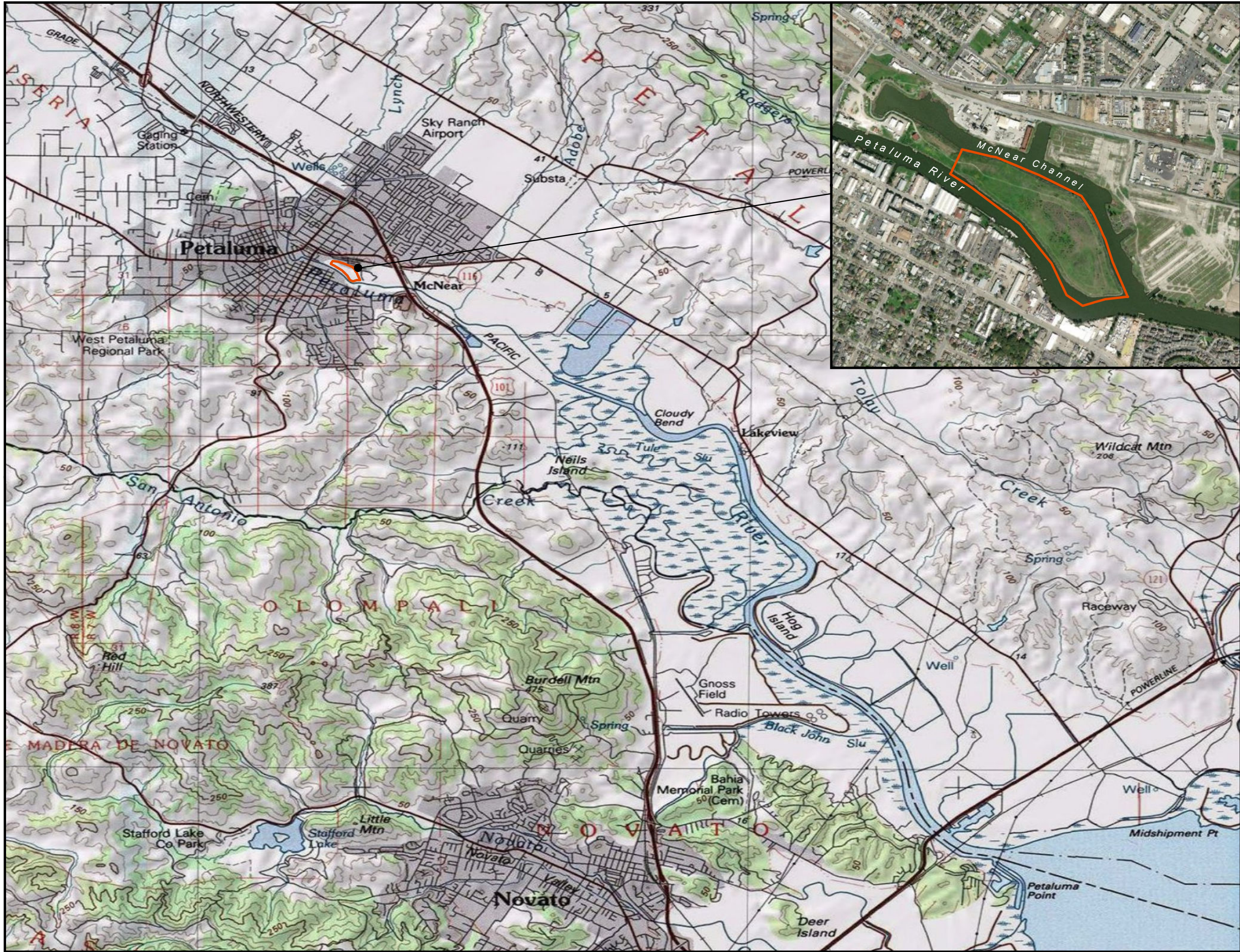
In 2022, PCI prepared a biological assessment to be used to support permit applications to county, state, and federal resource agencies as necessary. PCI also prepared an aquatic resources assessment as a separate document that has a detailed description of aquatic features and a preliminary determination of jurisdictional wetlands and waters. This report draws on those studies to provide a concise description of existing habitats and the potential to preserve, restore and enhance those habitats.

# 2 Setting

The project site is located on a peninsula bordered by the Petaluma River and the McNear Channel, southeast from the intersection of Copeland and E D Street in Petaluma, California. It is mapped on the Petaluma USGS 7.5' quadrangle (38.23192°N and 122.62791°W) at 5 to 24' in elevation, and encompasses approximately 24 acres. Historically, fill from adjacent river dredging has been placed on the site, elevating it above tidal extent. Site terrain is relatively level to gently undulating, with steep banks along the Petaluma River and McNear Channel. The property boundary extends into the river and channel. Land uses surrounding the site include tidal marsh, open water, residential and commercial development, a concrete plant, and undeveloped open lots. The City of Petaluma's Steamer Landing Park is adjacent to the west, and extensive protected tidal marsh lands occur downstream, including Shollenberger Park and California Department of Wildlife's Petaluma Marsh lands.

The McNear Channel is a remnant of the historic McNear Canal used for the transportation of goods between the Petaluma River and the Santa Rosa and Petaluma Railroads. The Petaluma River watershed encompasses approximately 140 square miles. Its headwaters originate on Sonoma Mountain and the river flows into the northwest section of San Pablo Bay, approximately 13 miles downstream of the site. Tidal influence extends upstream of the confluence with Lynch Creek, approximately one mile above the

Study Area. The lower 12 miles of the Petaluma River flow through extensive salt marsh habitat.



# Figure 1

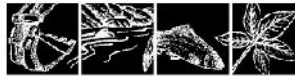
**Project Location**  
 Petaluma River Park  
 Biological Resources Assessment

 Petaluma River Park



0 1 2  
 Miles

Imagery: ESRI  
 Project Boundary, City Limit,  
 County Line: County of Sonoma GIS  
 March 2022



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### 3 Existing Habitats

The site supports primarily grassland habitat, with areas of coyote brush scrub, a narrow periphery of tidal wetland, one large vernal pool and a small depressional wetland. These conditions reflect the site’s history of fill placement and disturbance, and the influence of tidal hydrology around the perimeter. The grassland habitat is dominated by common non-native species, but the vernal pool and tidal wetland support primarily native species. The table below lists the vegetation types and alliances present and is followed by more detailed descriptions. See Figure 3 for a map of vegetation types. For discussion of agency jurisdiction over wetland and aquatic habitat types, see PCI’s Aquatic Resources Report (2022).

**Table 1. Vegetation Types within the Project Area**

Map Class	Manual of California Vegetation Alliance <sup>1</sup>	Sensitive? <sup>2</sup>	Location within project site
<b>Brackish Marsh</b>	Gum plant patches ( <i>Grindelia [camporum, stricta]</i> Provisional Alliance)	Y	Periphery of site, tidal marsh fringe habitat. These alliances typically occur in distinct bands but on this site are compressed into a small area.
	Salt grass flats ( <i>Distichlis spicata</i> Alliance)	Y	
	Pickleweed mats ( <i>Sarcocornia pacifica</i> Alliance)	Y	
<b>Vernal Pool/ Wet Meadow</b>	Popcorn flower – seaside barley vernal pools ( <i>Plagiobothrys bracteatus – Hordeum marinum</i> Provisional Alliance)	Y	Vernal pool in the southeast end of the area; depressional wetland and wet meadow area in the middle of site.
	Seaside barley – brome fescue wet meadow ( <i>Hordeum marinum</i> and <i>Festuca bromoides</i> Provisional Alliance)	N	Wet meadow area in the middle of site. Occurs in slightly more upland areas compared to the previous alliance.
<b>Grassland</b>	Creeping wildrye turf ( <i>Leymus triticoides</i> Alliance)	Y	Southwestern edge of site.
	Perennial rye grass fields ( <i>Lolium perenne</i> Semi-Natural Alliance)	N	Throughout mapped perennial and annual grassland areas, in slightly moister areas.

<sup>1</sup> Alliances based on the Manual of California Vegetation Online (CNPS 2022a) and Sonoma County Classification (Klein et al. 2015). Provisional alliances were created by PCI to address alliances that have not been identified or verified by CNPS and CDFW.

<sup>2</sup> Sensitivity based on federal (U.S. Army Corps of Engineers; Section 404), state (CDFW), and local (Sonoma County) regulations.

Map Class	Manual of California Vegetation Alliance <sup>1</sup>	Sensitive? <sup>2</sup>	Location within project site
	Wild oats and annual brome grasslands ( <i>Avena</i> spp. – <i>Bromus</i> spp. Semi-natural Alliance)	N	Throughout mapped perennial and annual grassland areas, in dryer areas.
<b>Scrubland</b>	Coyote brush scrub ( <i>Baccharis pilularis</i> Alliance)	N	Central uplands.

A brief description of each map class within the project area is found below. At the end of each section, overall habitat quality for each community type is broadly summarized as low, moderate, or high. This qualitative characterization is based on PCI’s assessment of the plant community’s ecological health and biodiversity. For instance, community types are described as of relatively low quality if they are extensively invaded by weedy species, support minimal native biodiversity, and/or display major degradations to soil, water resources, or key ecological processes. Habitats that support a mixture of native and non-native species are typically considered of moderate quality, while habitats with diverse native vegetation and signs of healthy ecological processes, such as natural regeneration, are described as high quality. The main purpose of this summary description is to help call attention to community types within the project area that merit special protection, or should be targeted for restoration, enhancement, creation or improved management efforts.

### **Brackish Marsh**

Brackish marsh is located in a narrow band along the periphery of the entire McNear Peninsula. The dominant species present here are common natives adapted to tidal, brackish conditions: gumplant, salt grass, and pickleweed. Species diversity is relatively low, likely due to the very narrow extent of the habitat. The banks of the peninsula are relatively steep, leaving little room for marsh development. Gumplant, salt grass, and pickleweed alliances often form distinct bands in brackish marsh conditions but on this site the bands are compressed into a small area and intergrade with one another. Stands of tule (*Schoenoplectus* sp.) and an individual arroyo willow (*Salix lasiolepis*) are also present. Habitat quality in this narrow band is moderate, as it is dominated by native species, but the extent is very constrained and plant diversity is low.

The fringe of tidal brackish marsh habitat provides valuable but limited resources for birds, small mammals, and aquatic species. Many different bird species are likely to utilize this habitat for foraging, including herons, egrets, hawks, ducks, shorebirds, and passerines. Species endemic to this type of habitat, and known to occur downstream along the Petaluma River, include the salt-marsh harvest mouse, saltmarsh common yellowthroat, California black rail, California Ridgway’s rail, and San Pablo song sparrow.

Mammals likely to use this habitat are species of shrews, bats, and common species of mice, as well as raccoon and river otter. Jackrabbits were observed in the gumplant stands.

While this fringe of marsh currently provides limited habitat value due to its narrow extent, it is within proximity of extensive downriver (approximately one mile) salt marsh adjacent to the Petaluma River including Shollenberger Park. Restoration and expansion of marsh habitat on this site could attract species currently utilizing downriver marsh habitat including birds and fish adapted to shallow brackish conditions like the Sacramento splittail. Steelhead could use restored wetlands as they migrate to and from freshwater habitats upstream. Additional fish species, from the native three-spine stickleback to non-native sport fish such as striped bass, also use the adjacent river setting itself.



*Narrow band of brackish marsh, periphery of the project site (March 2022).*

Several egret and heron colonies (snowy egret, great blue heron, great egret) are reported nearby, including at Shollenberger Park, at Ellis Creek near Lakeville Highway, and the McNear Colony just south of the McNear Peninsula on the eastern shore of the Petaluma River (Petaluma Wetlands Alliance 2022). While the project site lacks suitable nesting trees for these species, expansion of the marsh and wetlands habitats would provide foraging habitat to support these populations.

### ***Vernal Pool and Wet Meadow***

Seasonal, freshwater wetlands are also present on the site, including a well-developed vernal pools and another, less distinct depressional wetland. A diffuse area of wet meadow, not found to qualify as jurisdictional wetland in PCI’s Aquatic Resources Assessment (2022), is also present. Each of these habitats, like the brackish marsh, has relatively low species diversity, but the vernal pool and wet depression do support a small number of distinctive native wetland plants.



The vernal pool is located at the southeastern end of the project area. Vernal pools are isolated, depressional wetlands that fill primarily from direct precipitation and very local runoff in the winter and dry down by early summer, and often support a unique suite of species adapted to these conditions. The vernal pool at this site is relatively extensive (1.4 acre) and shallow (appears to be less than 12" at center), with a very gradual elevation gradient separating it from the uplands. The pool was inundated at the February 2022 visit but dry at the March 2022 visit. Vegetation is dominated by common seasonal wetland non-native grass and forb species. At the edge of the vernal pool, the vegetation begins to transition into upland grassland. Habitat quality in this vernal pool is moderate, as it is low in diversity and supports a mixture of native and non-native species.



*Above: Vernal pool with Canada geese, February 2022.  
Below: Vernal pool, April 2022 (right side of photo). Pool has dried and supports abundant native popcornflower (small white flower) and other wetland-adapted herbaceous plants.*



The depressional wetland and wet meadow are located northwest of the vernal pool. The elevation differences that form these habitats are even more subtle and diffuse than for the vernal pool. Wetland development is limited for the small depressional feature, and the wet meadow does not meet jurisdictional criteria to qualify as a wetland. Both are dominated by mostly upland, weedy species. Popcorn flower and smooth goldfields (*Lasthenia glaberrima*) are found in the area, and are often indicators of vernal pools in Sonoma County. The wet meadow area was dominated by non-native species common in wet grassland areas in Northern California. Habitat quality

in the depressional wetland and wet meadow is low, as it is low in diversity and supports mostly non-native species, and hydrology appears very limited. However, the presence of the two vernal pool indicator species reflects that some vernal pool habitat value is still present here, and the location might have potential for future restoration.

The vernal pool and depressional wetland on the property provide resources for both terrestrial and aquatic wildlife. The wetlands contribute to a more heterogeneous landscape which supports a greater diversity of wildlife. Wetlands are likely to support breeding habitat for the Sierran treefrog, but due to the timing of the survey, were not observed by PCI. California red-legged frog (CRLF), a federally listed species, are not likely to be present as the wetlands do not support the deep persistent pools and emergent vegetation required for breeding; additionally, the development surrounding the site creates a significant movement barrier between known nearby CRLF populations and the site. The vernal pool could support common aquatic invertebrates, important food sources for a variety of species. Mammals and birds utilize the wetlands as a source of drinking water and to prey on other wildlife using these resources or graze on the shoreline vegetation.

### ***Grassland***

Grassland is the dominant vegetation throughout the site, and is composed of two non-native grassland types, and one stand of native grasses. One swath of native creeping wildrye (*Elymus triticoides*) is present in the southwest end of the project, along the top of the bank. This alliance is considered sensitive by CDFW and is the only native grass species found on the site. This may have been planted or seeded during a past restoration effort. This species is rhizomatous and forms dense stands, typically in slightly moist grassland settings.

Non-native species dominate the rest of the site's grasslands. Perennial rye grass patches usually occur in slightly moister areas adjacent to the wetlands, while the wild oat and brome patches are present in more upland areas. Weedy non-native forbs are also present in upland areas along with few native forbs. A few small non-native trees are present at the grassland edge on the northern central part of the peninsula.

Overall, the habitat quality of grassland on the site is low; most are dominated by non-native and invasive species, with very limited presence of native grass and forb species. The stand of creeping wildrye, and occasional native forbs, provide some habitat diversity and illustrate possible species that could be expanded with restoration.

Grassland provides cover for species such as birds, small and medium-size mammals, and reptiles, and food sources in the form of seeds, other plant parts, and insects. Small vertebrates and invertebrates within the grasslands are a key food source for owls and other predatory species. Grassland songbirds, including song sparrow, gold-crowned sparrow, and savannah sparrow may use the property for nesting. Western bluebird and lesser goldfinch are also likely to use the grasslands especially along the interface between grassland and coyote brush scrub. Hawks and owls forage over the grasslands; PCI observed red-tailed hawk, red-shouldered hawk, white-tailed kite, and northern harrier on the site. The abundant small mammals present provide valuable food resources for raptors.



Subterranean foragers, such as Botta's pocket gopher, occur on the property; underground digging and mounds were seen throughout the site. In addition, small mice (e.g., deer and harvest) and California

*Large swath of native grass creeping wildrye (right side of photo) on southern edge of property (March 2022).*

vole are likely to be present, and potentially river otter, striped skunk, black-tailed jackrabbit and coyote. Western fence lizards are present and other reptiles likely to occur here include alligator lizard, western skink, gopher snake and garter snake. The presence of a few trees and brush nearby provide key habitat for birds and other wildlife. These features increase habitat complexity of the grasslands, providing additional perching, foraging, and nesting opportunities.

### ***Coyote Brush Scrub***

Coyote brush (*Baccharis pilularis*) scrub is present in patches throughout the central uplands in the project site. Native coyote brush forms an intermittent canopy within a

grassy matrix, which is similar in composition to the grasslands described above. Non-native annual grasses (e.g. wild oats, bromes, and Mediterranean barley) and other non-native herbaceous species are present in the coyote brush scrub. Coyote brush is relatively tolerant of site disturbance, and stands often represent a landscape in recovery from past disturbance such as grading. Over time, coyote brush can often facilitate the establishment of other native species such as oaks.



*Coyote brush scrub, central portion of property.*

Habitat quality in the coyote brush scrub is moderate. This habitat is relatively low in plant diversity, but coyote brush provides useful cover for wildlife such as jackrabbits and birds.

**Figure 2**  
**Restoration Opportunities**  
 Petaluma River Park

- Existing Vegetation Type**
- Non-native Trees
  - Coyote Brush Scrub
  - Creeping Wildrye Stand
  - Grassland
  - Brackish Marsh
  - Tidal Panne
  - Water
  - Vernal Pool/Wet Depression



Consider incorporating native grass and wildflower stands into park design, supporting pollinators and protecting soil from erosion.

Opportunity to plant stands of native trees and shrubs, providing habitat diversity for songbirds, raptors and other wildlife; shade for park visitors; and reflecting the beauty of the natural landscapes of the Petaluma area.

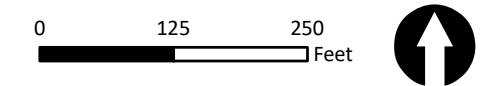
Consider management of invasive plants, present throughout site, with a phased approach prioritizing species with highest impacts and potential for control; opportunity to engage community in land stewardship.

Consider expansion of brackish marsh to improve habitat for steelhead, shorebirds, and other species, and improve climate resiliency.

Potential to expand and enhance seasonal wetland, improving native plant diversity and bird habitat.

Protect vernal pool and consider interpretive signage to support visitor education and appreciation of unique habitat type.

Consider installing log and rootwad structures for biotechnical bank stabilization and refugia for steelhead and other native fish.



Imagery: ESRI  
 Vegetation: Sonoma Veg Map 2013, PCI  
 September 2023

## 4 Special-status Species and Habitats

### ***Special-status Plant Species***

No special-status plant species were observed by PCI within the project area, and none were determined to have significant potential to occur. Most special-status plant species in the project region occur in extensive, well-developed tidal marsh to the south; vernal pool habitats of the Santa Rosa Plain to the north; and more intact grassland settings.

### ***Special-status Animals***

A number of special-status animal species were identified as having the potential to occur within the site. For this review, PCI included riverine species because the project boundary encompasses some riverine habitat and some potential project elements (e.g. boat launches, marsh restoration) would occur in or immediately adjacent to riverine habitat and restoration elements could improve habitat for some of these species. The only special status species known to be present on the site is the northern harrier (*Circus cyaneus*). Species with a high potential to occur are western pond turtle (*Actinemys marmorata marmorata*) and white-tailed kite (*Elanus leucurus*). Fish species with a moderate potential to occur on the site are green sturgeon (*Acipenser medirostris*), steelhead (*Oncorhynchus mykiss irideus*) and Sacramento splittail (*Pogonichthys macrolepidotus*). Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) and San Pablo song sparrow (*Melospiza melodia samuelis*) are bird species that have a moderate potential to use the site along with pallid bat (*Antrozous pallidus*) and Townsend's big-eared bat (*Corynorhinus townsendii*). Salt-marsh harvest mouse (*Reithrodontomys raviventris*) is not likely to occur on the site currently, but is known to occur in the extensive salt marsh habitat to the south; salt marsh habitat restoration on the site could potentially provide suitable habitat for this species on the site in the future.

## 5 Habitat Restoration Opportunities

Preserving and restoring high quality habitat is a major program element for the Petaluma River Park. (For the purposes of this report, the terms restoration and restore are used broadly to characterize efforts to both create new and enhance existing habitat.) The ecological imperative is to preserve and restore habitats for a range of wildlife species that currently or could potentially occur on the site in a manner that maximizes habitat value while integrating public access that encourages visitors to feel that they are an interconnected part of the natural environment. Habitats recommended for restoration and preservation are those that have high habitat value; those with moderate and low value, such as annual grasslands and coyote brush scrub are generally not targeted for restoration.

### ***General Considerations***

To help guide the integration of preservation and restoration efforts with the proposed park design, the following considerations are offered.

Restore a mosaic of habitat types – Creating an interconnected mosaic of complementary habitats will offer both increased diversity and higher habitat values than disconnected patches. Connected patches are often more beneficial to wildlife than isolated stands, and the natural transition zones (ecotones) between adjacent habitats are typically some of the most diverse settings, since they include elements of both adjacent plant communities. Park visitors will also have an enhanced experience viewing the diversity of continuous natural areas where distinct habitats transition seamlessly into one another. As an example, restored tidal marsh habitats would transition gradually to grassland, which then transitions to oak savannah.

Plan for climate change – The site is in an area and landscape position that make it vulnerable to the effects of changes in climate. Rising sea levels are projected, and the relatively low elevation of the site and the fact that the site is surrounded on three sides by tidal waters make rising water levels a concern for the longevity of the site. Another potential impact of climate change is increased variability in rainfall patterns, with extended periods of drought and higher intensity storms. Site design should include management of drainage within the site, preferably to benefit habitat restoration areas, and protecting the banks of the Petaluma River and McNear Channel. Restoring tidal wetlands and riparian areas on the site will meet the dual purpose of habitat restoration and enhancing resilience.

Preserve existing high and moderate value habitat –Existing habitat areas, including the vernal pool/wetland area and native grassland, should be preserved and/or enhanced. Public access amenities and restoration areas should be located in areas of greatest pre-existing disturbance and lowest habitat value.

Use native species – Native plant species should be considered for all plantings within the park. Species native to the area are suited to California’s Mediterranean climate, and generally do not require supplemental watering after becoming established. Native plants should be used in all restoration areas, and should also be used in more formal areas of the park. In addition, species known to be noxious or invasive, such as blue gum and tree-of-heaven should not be used on the site. Non-native invasive species occurring on the site should be managed to prevent impacts to native plants and habitats. We recommend developing an invasive management plan using a multi-year phased approach, which prioritizes the species having the greatest impact on the site and those that are most feasible to control. This can often be a great opportunity for community groups and volunteers to come together and provide long term stewardship of the park.

Include restoration/preservation areas in long term park planning – Restoration and preservation areas will evolve over time and may require some ongoing maintenance and management. Maintaining a transition zone between public access areas and

restoration/preservation areas where some vegetation management, such as pruning shrubs and trees or weed removal, is performed on a routine basis may be desired. Use strategic park design, park use policies, and monitoring to ensure that human activity in the park does not negatively impact wildlife usage. Restoration areas should be properly sited to avoid locating areas that are potential habitat for species sensitive to activity and noise near areas of high human usage. These restoration/preservation areas provide an excellent opportunity for environmental education on the importance of native plants, local wildlife and traditional cultural and habitat usage of the various plant communities.

### ***Habitat Opportunity – Preserve and Enhance Vernal Pool***

The existing vernal pool areas should be preserved. This feature provides unique and specialized habitat, which has experienced dramatic loss in the region. The depressional seasonal wetland adjacent to the vernal pool could also be enhanced through carefully designed grading and both areas could be enhanced through inoculation with seed and duff from nearby natural vernal pool areas to incorporate more of the specially-adapted plant diversity found in other local vernal pool ecosystems. A physical or visual barrier should be provided around the vernal pool, and native grassland species should be planted in the transition zone between the vernal pool and adjacent public access areas.

Educational signage about the unique feature and plant community can be provided at viewing areas.



*Enhancement of the depressional wetland on site could expand habitat for native vernal pool flowers, like this popcornflower in the main pool.*

#### Pros:

- Provides a rare opportunity for the public to visit and learn about a unique and threatened habitat once found throughout the Petaluma Valley and Santa Rosa Plain.
- Cost would be minimal for preservation.



- Low-growing vernal pool vegetation allows for an open viewshed, and the area could aid in framing desirable views within and from the park.
- Environmental regulations may prohibit filling of the vernal pool or create added cost to the permitting process, and mitigation for the loss of the wetland by restoring habitat off-site or purchasing credits from a mitigation bank would be costly.

Cons:

- Periodic maintenance may be required to maintain high quality habitat. Vernal pool species are often small, low growing plants that, in certain soil conditions, benefit from grazing by large mammals to reduce competition from non-native grasses and other forbs. Mowing or weed whacking at targeted times throughout the year can mimic grazing patterns to benefit native species and will help the area from looking “weedy.”
- Dogs chasing waterfowl and other wildlife may be a consideration, depending on barrier used and park dog policies.

***Habitat Opportunity – Restore Tidal Marsh Habitat***

Restoring and expanding tidal marsh habitat is highly recommended. Tidal marsh in the local area has diminished greatly due to development along the river, and the site has a long but very narrow perimeter of brackish marsh that offers excellent opportunities for restoration. Expanding the tidal marsh should include grading that provides a horizontal levee approach, where slopes transitioning upslope are designed at a gradual slope to



*Native bulrushes and sedges in restored marsh habitat would improve habitat for birds and protect banks from erosion.*

mimic natural tidal marsh conditions, provide adequate space for marsh development, and allow for transition of tidal marsh zones as sea levels rise. Long traditional slopes of 30:1 are preferred though 20:1 slopes can be considered where space is limited to allow adequate space for low marsh, middle marsh, upper marsh, upland transition, and upland habitat transitions. It may be possible where

space is limited to create sloping benches at varying elevation to create different marsh habitats with a range of tidal access, providing diverse salinity and inundation regimes. Upper slopes of the marsh should be planted with native grassland species to increase the extent of that habitat on the site.

Where feasible, wide buffer zones (greater than 100 feet) between marsh and areas planned for heavy human use should be established, as many bird species that utilize tidal marsh habitats are sensitive to human activities and noise. Some areas with smaller buffers should be located at strategic points to allow for public viewing of restored tidal marsh areas with minimal disturbance to wildlife. Ideas include bridges or walkways and higher areas adjacent to the tidal marsh.

Pros:

- Historical mapping from the San Francisco Estuary Institute (SFEI 2015 – 2018) shows that the site area was historically tidal marsh. Fill on the site is likely placed over bay mud, and removal of fill is expected to expose bay mud, which is critical for establishment of tidal marsh species. It should be noted that a geotechnical investigation should verify subsurface conditions.
- Restoring tidal marsh on the site will help expand the wildlife habitat in an area where it is currently lacking, providing continuity and corridors for shorebird and waterfowl migration, in addition to listed species including saltmarsh common yellowthroat and San Pablo song sparrow that are known to be in the area.
- Juvenile steelhead and Sacramento splittail, both federally protected fish species known to be in the area, use tidal marsh habitats at various life stages; restoration could increase foraging and refugia habitat for these species.
- Expanding tidal marsh and creating low-slope transition zones will protect the site from erosion due to wave action, and enhance resiliency by allowing for gradual transition of habitats as sea levels rise and providing stabilization to protect against extreme storm events.

Cons:

- All restoration of tidal marsh would require excavation on the site, and with wide buffers will reduce the amount of useable space for public access features.
- Some protected species known to be in the region, including California black rail and California Ridgeway's rail are sensitive to noise and disturbance and would likely not utilize restored tidal marsh in a park setting.

### ***Habitat Opportunity – Enhance Native Vegetation***

Native woody vegetation should be planted in selected areas of the site. Patches of native vegetation could be used as buffers between uses within the site, where no grading will occur on the banks and in targeted locations adjacent to tidal wetlands and bank

stabilization measures. Woody vegetation suitable for planting includes willows, toyon, coffeeberry, blue elderberry, coast live oak, California rose and ceanothus in addition to native grasses and forbs. Willows and other riparian trees can be planted to reinforce other bank stabilization measures while adding habitat value for birds and providing natural screening and softening of views.



*Plantings of native shrubs such as California rose along banks will diversify habitat for wildlife and contribute to bank stabilization.*

Pros:

- Including patches of woody vegetation adjacent to other restoration areas provides valuable variability in habitat. Bird and small animal species that feed in grasslands and other open areas use areas with trees and shrubs for refuge from predators and for nesting and alternative sources of food.
- Root mass from woody species provides bank stability that helps protect against erosion during storm events.
- Many native species have flowers, fruits and branching habits that provide an aesthetic suitable for a park environment. Careful selection of native species with ornamental characteristics for use in both shoreline plantings and developed areas of the park will provide unity in the park design.
- Taller riparian woody habitats will block views but can also be used as strategic visual screens and wind breaks on the peninsula.

Cons:

- Large areas of dense plantings can become an attractive nuisance. The size of shrubby planting areas should be limited to avoid creating areas that could be used as camp sites or for illicit activities.

### ***Habitat Opportunity – Incorporate Biotechnical Bank Stabilization***

Along with restoring tidal marsh, incorporating biotechnical bank stabilization measures along the banks of the site will increase habitat and provide resiliency. Biotechnical bank stabilization would include installing log and rootwad structures on the edge of the Petaluma River and McNear Channel. The structures are normally accompanied by placement of smaller woody branches and tree tops, commonly referred to as slash, and planting of native willow poles. The structures are normally built using redwood logs and root balls that are pinned together, buried into the bank and/or strategically placed such that they remain in place during high flows. Vertical log anchors – redwood logs driven deep into the river bottom – are often used to secure the structures. The structures are placed such that they are above and below the water surface.



*Example biotechnical bank stabilization, with willows and log structures, along a tidally-influenced channel.*

#### Pros:

- Biotechnical structures provide excellent refugia and foraging habitat for juvenile fish, including federally protected steelhead as well as other native fishes. Adult steelhead can also utilize the structures for refuge from high velocities during storm events as they migrate upstream to spawn.
- Installing biotechnical bank stabilization will add to habitat diversity by providing more coarse-scale aquatic habitat than tidal marsh.
- The structures will provide protection against erosion from high flows in the Petaluma River without removing usable area for park amenities.
- Anchored large woody debris also provide aquatic habitat by providing cover and high flow refugia.
- Park pathways and overlooks onto the river and channel could be designed to give users a vantage point out onto biotechnical structures, with interpretive signage to explain the features' purpose.

#### Cons:

- Engineering design, regulatory compliance, the import of logs, and the need to excavate to place the structures can be costly.

- The structures could be seen as a safety hazard by some, and measures may be needed to limit human access to areas with structures to prevent climbing. Structures should also be designed to avoid creating boating hazards.
- The design will need to consider impacts to views onto the site. Log structures should be designed to blend in with the surrounding area to the extent feasible.

### ***Habitat Opportunity – Incorporate Native Grasses into Park Design***

Native grasses, including purple needlegrass in dry areas and creeping wildrye in more mesic areas, along with native wildflowers, should be used to the extent feasible in the design. Native grasses and forbs can be used in transition zones upslope of tidal marsh areas, in open areas, or in combination with native tree plantings to create oak savannahs. Native grasses such as red fescue could be used as turf grass in areas with low to moderate traffic, but would require irrigation.



*Including native perennial grasses in park design will protect soil and provide habitat structure for birds and small mammals. Planting wildflower stands would support pollinators and add visual beauty.*

#### Pros:

- Native grasses are deep rooted, and provide excellent soil stability to protect against erosion.
- Native grasses and wildflowers, and their seeds, provide an important food source for birds and small mammals that use the site; the varied habitat structure of native grassland stands also provides improved habitat for wildlife relative to the existing non-native annual grassland.
- Stands of native wildflowers would add visual beauty and diversity to the landscape, and also support an array of native pollinators including butterflies, bees, and hummingbirds.



- Native grasses are adapted to California’s climate and do not require irrigation after becoming established.

Cons:

- Native grasses generally do not work well as turf, and would not be expected to perform well in areas with moderate to high foot traffic without irrigation.
- Establishing native grasslands can be more expensive than establishing traditional turf grasses. Native grasses generally need to be planted as plugs, and require supplemental watering in the first two to three years of establishment. Maintenance is usually required to minimize competition from annual grasses and other weeds.

**Habitat Opportunity – Plant Native Trees**

Native trees are lacking on the site. The biological evaluation of the site (PCI, 2022) noted a single native willow on the property, but there are native tree plantings (primarily coast live oak) on the adjacent Steamer Landing property that are establishing well. Native trees should be considered for all tree plantings on the site, both in restoration areas (as noted above) and in park areas programmed for public access. Planting some areas with clusters of trees (e.g., coast live oak, buckeye, valley oak), and others with scattered individual trees, will provide habitat diversity and mimic the countryside around Petaluma.



*Native oak plantings, like these at Steamer Landing, link the park visually and ecologically to nearby Petaluma open space and provide valuable shade and habitat.*

Pros:

- Native trees are adapted to California’s Mediterranean climate, and will not need irrigation after becoming established.
- Planting native oaks and buckeyes will help give the site a sense of local place by recreating the landscape of the surrounding countryside.
- Native trees provide important sources of food for native wildlife, nesting habitat for a range of bird and bat species, and provide areas for raptors to perch while hunting.

- Trees of various sizes will create vertical habitats for cover for song birds and small mammals.
- Native trees will ultimately provide valuable shade for park visitors.

Cons:

- None.

## 6 References

California Native Plant Society (CNPS). 2022a. A Manual of California Vegetation Online. California Native Plant Society. Sacramento, CA. <http://vegetation.cnps.org/>

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