

# Putah Creek Path

Envisioning Opportunities for a Community

Senior Project by Sophie Sears  
UC Davis Landscape Architecture  
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Envisioning Opportunities for a Community

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# Abstract

This project focuses on a section of Putah Creek between Interstate 505 and the Yolo Housing Authority. It examines the possibility of creating a path near the creek along this stretch of the waterway. Current plans for a Winters Putah Creek Nature Park are in the process of being implemented to the west of the trail site. This trail represents an extension of the current Nature Park project which is located between Railroad Avenue and Interstate 505. However, there is a major concern over the safety of pedestrian travel from Yolo Housing to Winters. This project aims to evaluate safe and enjoyable solutions to address this problem while instilling environmental stewardship and providing educational opportunities. Restoration of channel morphology and native vegetation are included in the plan. The restoration of the channel form will additionally mitigate an erosion site that is threatening Putah Creek Road. In addition to the linear path, the project aims to redevelop an area at the west end of the site that is located on the Yolo Housing Property. Development of this site provides opportunity for expanded use by the community of Yolo Housing. The Entire Putah Creek Path will start at the Winters Community Center and take the user on a one and a half mile walk through the Putah Creek Nature Park, along Putah Creek to Yolo Housing.

# The Author

Sophie Sears grew up in the town of Winters and has been greatly influenced by the natural and cultural world around her. Having a passion for Science and Art made her feel fulfilled with her current studies of Landscape Architecture. She is perpetually asking questions and perpetually trying to find the answers from the world around her.



# Acknowledgements

I would like to thank my senior project committee members for their tremendous help. They all provided me with their knowledge, time and encouragement. I appreciate this and feel the project has benefited immensely from their advise.

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# Preface

Growing up in the communities of Winters offered me a great many opportunities to experience the modestly beautiful nature of the area. I enjoyed going on hikes in the Stebbins Cold Canyon Reserve and in the hot summers I swam in Lake Berryessa or Putah Creek. As a college student studying Landscape Architecture, I have developed a broadened perspective on these experiences. In addition to human relationships with nature, I have realized the importance of the relationships between different parts of an ecosystem and this has brought me to new conclusions about my experiences as a youth. In my final year at UC Davis, I decided to focus my final project on selected parts of the things that interest me: my home town, nature and creating opportunities for others to enjoy what I have appreciated.

A goal of this project is to provide an opportunities for the community of Winters to embrace the natural heritage of the region. I decided to work with Putah Creek and the promotion of its beautiful heritage by involving people into its revitalization.

However, as I began the project, my research quickly revealed that even these ideals are not without controversy. Legitimate concerns were raised about giving people access to un-policed areas that are adjacent to private property. Clearly, there is potential for conflict depending on point of view.

My goal is to provide a reasonable proposal and to offer potential solutions that at least partially address negative impacts. With the above in mind I include the following caveat:

***This is a conceptual project completed as a graduation requirement for the University of California, Davis. No further action on behalf of this project can be taken without approval and willing participation of effected private and public landowners. This project is not intended for publication or open distribution. No legal review has been conducted.***

# Introduction

Putah Creek is beautiful. Riparian habitat in California has been reduced to only 5% of its original extent and river resources such as Putah Creek are fast diminishing. The riparian habitat is valuable to every resident of California representing a mostly undeveloped wild land resource among developed agriculture and urban development. Riparian habitat is also important to the wildlife of California. There is an absence of thick vegetation in the low grasslands and agriculture of the open Central Valley. For many wildlife species, riparian habitat is very important for cover, foraging and acts as conduit for passage between areas. Putah Creek is a valuable riparian corridor that surrounds flowing water in the valley and connects not only wildlife habitats, but also communities of people.

Within the watershed of Putah Creek lies the small city of Winters. Historically, the community has reshaped the nature of Putah Creek for use as a water source for agriculture, protection from flooding as well as recreational opportunities. In the past, there has been limited interest in maintaining Putah Creek at its natural state. However, over the years there has been a realization that this resource is much more valuable as a riparian habitat in a sustainable state. This Creek is of benefit to farmers by attracting pollinators to crops, of benefit to wildlife by providing habitat, and of benefit to

people as it brings an appreciation and enjoyment of nature.

Currently the City of Winters is implementing a Putah Creek Nature Park (PCNP) on a one mile stretch of the creek that borders the town. The Putah Creek Nature Park aims to integrate Putah Creek into the community by providing access to native riparian habitat and related recreational opportunities. Plans for the PCNP include improvements to the ecological functions of the Creek. The proposal for the PCNP was adopted in 1995. The idea for such a park was realized earlier in 1989, by Cheryl Sullivan when completing her Landscape Architecture senior project. She was asked to continue her involvement in development of the park when the City of Winters decided that the PCNP would be a great benefit to the community. The Winters PCNP aims to maximize open space and habitat value for the Winters community by enhancing recreational uses while at the same time restoring native habitat (Cunningham 1).

The PCNP has the potential to be a very substantial asset to the local residents of Winters. However, there are further advantages the community can gain from embracing this small strip of nature that lies in the backyard of the community. Less than a mile downstream from the PCNP is a small community for low income residents of Yolo County which is managed

by the Yolo County Housing Authority. Yolo Housing is disconnected from the amenities of the larger town of Winters by almost up to 2 miles. This project looks at the potential to continue the pedestrian access from the PCNP to Yolo Housing. This would provide residents an amenity that can be used for enjoyment of nature or as a travel route to the facilities of Winters. Currently the travel route takes residents of Yolo Housing down busy Highway 128 which lacks sidewalks for a mile into Winters. Many citizens have voiced concerns for pedestrian safety along Hwy 128. However, there are plans to redevelop this street.

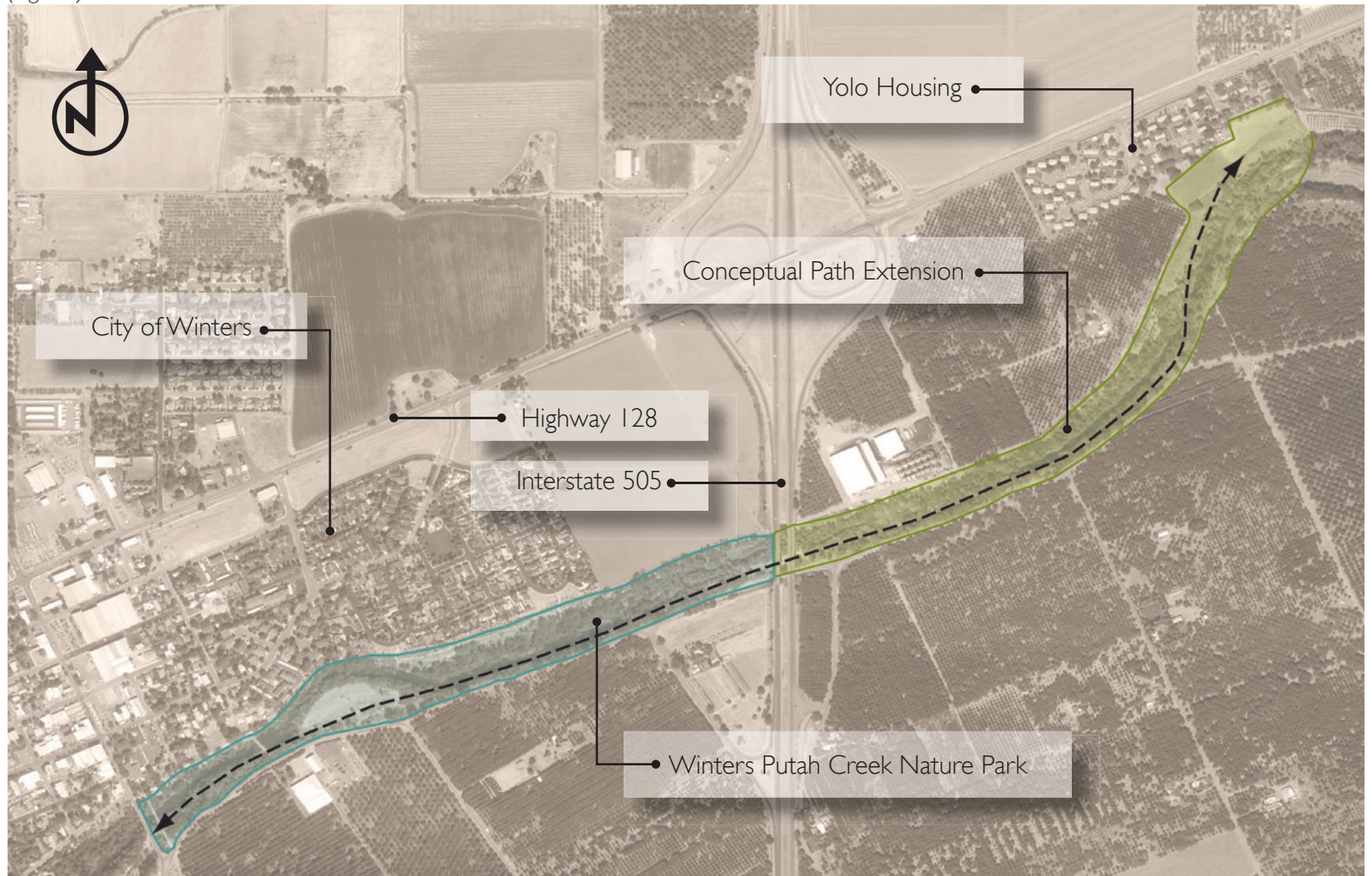
Putah Creek Path would also provide a recreational space for Winters that would promote environmental stewardship and awareness through the use of volunteers and the incorporation of education and community events. Users of the path would find themselves educated about riparian habitat, wildlife and river dynamics. Many of the same goals and objectives set forth for the Winters Putah Creek Nature Park are relevant to the goals and objectives for the path addition to Yolo Housing.

## Introduction to the Site

The length of the site is 1.75 miles. The Putah Creek Nature Park on the west end and the Putah Creek Path extension are both the same length, bisected in the middle by Highway 505. Highway 128 runs north and parallel to Putah Creek. Hwy 128

turns into Grant Avenue for 2 miles as it runs through Winters. This is the route currently used for travel between Yolo Housing and Winters. Pedestrian use is unaccommodated as seen by the lack of sidewalks.

(Fig. 1.1)



## Goals

### ***Provide access for the community***

The project aims to make available easier means of travel to and from the town of Winters to the community of Yolo Housing. In addition, intend to provide more access to nature. How? Accomplished by creek structure changes, path implementation and removal of thick, invasive vegetation.

### ***Promote outdoor enjoyment and environmental education***

The proximity of Putah Creek to Winters allows for local residents to potentially take advantage of the unique nature. If this wild land resource became more easily available, users would enjoy environmental education and the enjoyment. How? Conduct habitat restoration of the riparian environments to provide an accurate natural state that is worthy of learning from.

### ***Restore Riparian Habitat***

It is important to provide a riparian habitat that is accurate for user education and sustainable for wildlife. How? Locate areas where creek morphology is damaged due to erosion and changed hydrology. Regrade banks to a sustainable and natural form that still provides flood protection and terraces for a path. This regrading will mitigate erosion which is threatening Putah Creek Road.

Also locate as much of the invasive vegetation as possible. Primary removal will be associated with path clearing and particularly damaging invasive plant communities. Replace invasive vegetation with native species.

### ***Promote positive relationship between users and adjacent landowners***

Provide easy means of open communication between landowners and the potential managers of the Putah Creek Nature Park and the Yolo Housing Path Extension.

How? Prevent criminal activity through barriers such as thick and barbed vegetative hedgerows. Promote “eyes on the path” ideals where users feel they are part of a collective ownership of the area and also feel they have a responsibility for the safety of people and property of the area.

### ***Implement management and monitoring***

It is important to think past the initial implementation phase of a project. Without considering how the project will function in the future and over time the project will experience a fast demise due to lack of maintenance and oversight.

How? Make available management positions that monitor the area and report any issues. This may be possible through extension of PCNP management.

## Challenges

This project is not without challenges. Highlighted below are some challenges that would need to be addressed.

### ***Property Issues***

Portions of the path abut private property. This can cause concern with the landowners due to increased public access near private home and property. Public access may mean an increase in criminal activity such as trespassing, vandalism and theft.

### ***Accessibility***

Constraints due to variability in bank structure may make it difficult to provide universal access to people that may find traveling the path difficult. It would be a challenge to provide ADA (Americans with Disability Act) accessibility that adheres to the guidelines, such as providing a maximum of an 8% slope.

### ***Multiple Jurisdictions/Property Owners***

Putah Creek marks the boundary between Yolo and Solano counties. This may cause challenges when negotiating use that crosses this boundary. Also negotiations between multiple adjacent landowners may precipitate issues if the landowners have differing opinions about the project.

### ***Money***

Many proposals in the project are time and resource intensive. These are associated with creek re-alignment, removal of invasive vegetation, path construction and monitoring. Lack of funds may mean the project will need to be constructed over a prolonged period of time with implementation of levels of phasing as money becomes available.

### ***Safety***

Due to the isolated characteristic of the riparian habitat safety may be a concern. Emergency services will take longer to arrive if an emergency were to occur. Solutions may include emergency phone boxes or low lighting that is unobtrusive to wildlife.





# Historical Imagery

The Putah Creek we see today has been shaped by its history and in turn Putah Creek has also shaped the communities around it. (EDAW/AECOM 12). Human interactions with Putah Creek have long affected wildlife, hydrology and morphology. Living here first were the Patwin Indians who tended much of the surrounding vegetation including riparian habitat and vegetation. They reduced overgrowth and in turn promoted healthy regrowth. By 1920 there were no remaining Patwin. They had been decimated over the previous century due to disease brought by explorers ( EDAW/AECOM 21).

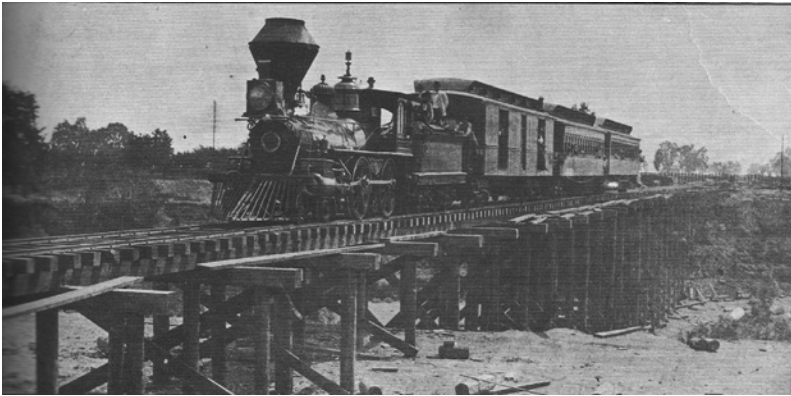
Historically the wildlife and vegetation was abundant, diverse and thriving. Grizzly bears, mountain lions and mule deer frequented the region (EDAW/AECOM 17). Salmon and other shoals of fish would migrate through Putah creek annually. The vegetation was thick, dominated by tules, cottonwood and willows. In the mid 1800's new people settled in the region and by 1854 most of the 1 to 2 mile wide riparian forest had been cut from the banks (EDAW/AECOM 17; 23). The wildlife was hugely reduced due to hunting and habitat destruction.

As explorers settled and the population of the area increased so did the influence people had on Putah Creek. Also with the increase in population seasonal flooding affected more people. The City of Winters was founded on the banks of Putah Creek in 1875 (Larkey 24). Farmers

of the area needed the water from Putah Creek to hydrate the crops and Winters residences also used the Creek's water. The town's location near the banks of Putah Creek was a disadvantage during winter storms when the Creek would often overflow its banks into the infrastructure of Winters. For these two reasons, water availability and flood control, there was a strong opinion that the flows should be controlled. To accomplish this the Monticello Dam at Devils Gate, 8 miles upstream on Putah Creek was completed in 1957, flooding the Berryessa Valley and the town of Monticello. In partner with the Monticello Dam project, downstream construction of the Solano Diversion Dam and the Putah South Canal were also completed, diverting water south to Solano county farmers.

These dams and water control canals completely changed Putah Creek (EDAW/AECOM 27). The dam holds back gravel eroded from the coastal hills causing Putah Creek channels to have more exposed soft alluvial soils. These soils are easily eroded and the channel becomes overly fast, straight and deep (EDAW/AECOM 24). Since 1957, Putah Creek has not escaped its banks or been able to spill onto historical floodplains. Due to this fact groundwater is not frequently recharged and riparian vegetation suffers. This also affects agricultural practices. Despite these changes Putah Creek still supports rich wildlife and vegetation despite all that has been altered (EDAW/AECOM 29).

## 1875 - Vaca Valley Railroad over Putah Creek



(Fig. 2.1)

Historically many people said that The Vaca Valley Railroad could be credited with bringing prosperity and growth to the Winters area. Unlike its ghost town neighbor to the north, the former town of Buckeye which never received a rail line, Winters was able to benefit from increased transportation and distribution of local agricultural produce. As seen during its opening excursion on August 26, 1875 the Winters rail and wagon bridge provided access across Putah Creek. Notice the lack of vegetation surrounding the creek as the value of riparian habitat was not given significant attention (Larkey 27).

## 1908 - Construction of New Bridges



(Fig. 2.2)

In 1906 the Southern Pacific Railroad company funded a new steel truss rail bridge over Putah Creek. This same bridge still crosses Putah Creek today but has been renovated and converted into a pedestrian bridge. The concrete road bridge also remains today, although plans for a replacement are scheduled. It was built to accommodate the growing automobile craze and at the time and was described as "the largest bridge of its kind west of the Mississippi River." Believe that or not, the community was very proud of its twin bridges which were both open by 1908 (Larkey 55).

The first percolation dam as seen from the west side during the 1911 July 4th celebrations which included a carnival of aquatic sports. Notice the steel truss railroad bridge in the background. Wooden boards placed across the flowing channel created this percolation dam. The dam increased the water level behind it by 4 feet and the community called it Lake Winters. It was rebuilt with concrete in 1938. In 1952, it failed and since then had become rubble in the creek but was still a popular swimming area (Larkey 57). In 2009, the concrete rubble was removed to restore hydrologic function and allow for aquatic wildlife migration (Larsen, com).

## Civic Pride on Putah Creek - 1911



(Fig. 2.3)

As the City of Winters grew so did the damage that occurred with every flood sufficient to break the banks of Putah Creek. Over two days in the winter of 1940, 16 inches of rain fell and flooded most of the City of Winters to the depth of 3 feet. This was the last major flood the city would encounter as the Monticello dam was constructed between 1953 and 1957. The picture shows the farm labor camp, El Rio Villa located on the banks of Putah Creek inundated by storm flows. This site today is the location of the low income housing owned by The Yolo County Housing Authority (Larkey 75).

## Putah Creek Floods - 1940



(Fig. 2.4)

## 1937 - Prior to Creek Alterations

This aerial image shows the developing town of Winters in 1937. During this time there were no permanent structures altering the flow of Putah Creek. It wasn't until a year later that the concrete percolation dam was completed and two decades until the Monticello dam project was completed.



(Fig. 2.5)

## Changes to Creek Hydrology - 1971

As technology increased, new projects had been implemented along Putah Creek to provide flood control and water access for farmers. At this point the Monticello Dam, Solano Diversion Dam and the Winters Percolation dam had all been built. Another interesting cultural use of Putah Creek can be seen in

this photo. The sewage ponds are seen filled just east of the Winters double bridges. The community would store sewage and it would be washed away during winter high flows. You can also see that by this time Interstate 505 has been constructed.



(Fig. 2.6)

## 1999 - Controversy on Putah Creek

In 1999, Putah Creek Stakeholders were just concluding a decade long legal dispute over restricted flows in Putah Creek. It began in 1989-90 after a 7 year drought. The lower stretches of Putah Creek were going dry due to water being pumped to Solano county farmers by the Solano Diversion dam. Many native fish and habitat were critically threatened.

This litigation over the flows of Putah Creek led to formation of the Lower Putah Creek Coordinating Committee (LPCCC) which monitors fish and wildlife, manages vegetation, seeks grant funds and employs a permanent stream keeper, Rich Marovich. Today Putah Creek is required to have permanent surface flows for the 23 miles below the diversion dam (EDAW/AECOM 32).



(Fig. 2.7)

## Embracing Nature in Winters' Backyard - 2009

As of 2008, Winters had a population of 6,977 and Yolo Housing had a few hundred residents. Yolo Housing is 1.5 miles east of Winters and there is no continuous and safe pedestrian route between the two. Highlighted below is the location of the study site

for this project. This area will be an alternative way for residents of Yolo Housing to reach the community resources of Winters. Additionally, it would function as a community resource to foster environmental stewardship and outdoor education.



(Fig. 2.8)

## Putah Creek Today



(Fig. 2.9)

The west end of the study site is flanked by the steel truss bridge that has been converted for pedestrian use. The Winters Putah Creek Nature Park (WPCNP) will begin here. Behind the photographer is the Winters community center that has had some landscape redevelopment such as the construction of a small amphitheater.



(Fig. 2.10)

Putah Creek is a hidden jewel. One does not realize the natural beauty that is behind the thickets of riparian vegetation.



Interstate 505 crossing at Putah Creek is at the west end of this proposed project further west is the Winters Putah Creek Nature Park.



(Fig. 2.11)

The habitat along Putah Creek is very healthy and picturesque at times. Portions of Putah Creek are in good condition for wildlife habitat and also accessibility for people.



(Fig. 2.12)



# The Site

This project focuses on three levels of scale for focusing research and analysis.

## **Context**

This site looks at how the trail will work as a whole. It establishes a connection to the currently planned Winters Putah Creek Nature Park and the conceptual extension to Yolo Housing.

## **Path**

The East half of the context site will be the location of the Trail. This section examines the following:

- Property boundaries with potential barriers due to private property and landowner restrictions. This section provides recommendations for obtaining property rights if necessary.
- Creek morphology on this site is examined for accessibility and recommendations for bank realignment proposed.
- Vegetation state is examined for areas of particular concern due to invasive vegetation and proposed recommendations for native riparian replacements.

## **Yolo Housing**

A smaller area further down on the most eastern end of the context site where the path connection to Yolo Housing is examined.

## Context

Yolo Housing is located 1.5 miles east of Winters and there is no continuous and safe pedestrian route between the two. Almost exactly in the middle of the study site lies Interstate 505. The City of Davis is 12 miles east and another 13 miles brings you to the capital.

Weather patterns generally come from the West with additional strong winter winds coming from the North.

(Fig. 3.1)



This stretch of Putah Creek is less than a mile. It is bounded on the south side by Putah Creek Road. The large white buildings and silos on the north side are part of the Mariani Nut Company.

(Fig. 3.2)



# Yolo Housing Site

Currently Yolo Housing has large open space to south of the residences. This area has great potential for the residences of Yolo Housing. Its proximity to Putah Creek allows for recreational use and educational opportunities. This open space contains a highly used soccer field.

(Fig. 3.3)



*Traveling through the site...*



(Fig. 3.4)





# Considerations

It is important to consider various factors than may affect decision and planning of a project. Highlighted below are key considerations that reveal information vital for the design and implementation of the project.

## ***Property Analysis***

There are many limiting factors due to property boundaries. Decisions on where to place the path are made with ownership information in mind. It is generally easier to negotiate with land owned by public entities regarding public access. Private landowners are less inclined to allow public access through their property. This is due to the fact that many private landowners live on their land whereas public entities do not have this type of association with their land.

## ***Creek Structure Analysis***

Creek morphology is an important issue to consider when working with water ways. With this particular project, creek morphology is important when deciding where, and if you even can place an accessible path on the stream banks. It is also important when considering where native vegetation may be best suited to survive. It may also reveal where invasive vegetation may be most pervasive.

## ***Invasive Vegetation Analysis***

The project aims to make native riparian habitat sustainable and strives to provide users with the most accurate natural environment. It is important to take an inventory of invasive vegetation on site and consider if any of the invasions will expand. Removal of invasive vegetation near the path locations is of primary concern for educational and habitat accuracy.

## ***Native Vegetation Analysis***

An inventory should be taken of the native vegetation that is existing on site and the native vegetation that should be present on site. This will aid in the implementation of revegetation after the removal of invasive vegetation.

# Property

(Fig. 4.1)



## Recommendations

The property analysis looks at who owns the properties that the conceptual trail would transverse. The new path addition would extend from the end of the City of Winters owned property where the Putah Creek Nature Park (PCNP) will be located. Interstate 505 is the eastern boundary of the plans for the PCNP. East of Interstate 505 the north and south banks of Putah Creek are owned by different landowners. The center line of the creek is the boundary between the two. The south bank is publicly owned by Solano County but north of this property is private land owned by the Mariani Nut Company. This landowner's preferences should be taken into consideration when path planning and implementation are taking place, even though the path will not be located on this private property. Since the land on the south banks is already publicly owned this is where the path can most likely be implemented with the least amount of negotiations. The Yolo County Housing Authority property is on the north side of the bank so there will need to be a crossing from the south to north bank. The Solano County property and the Yolo Housing property do not sit adjacent to each other. There is a small portion of private property owned by the McNamara family that would need to be crossed in order to complete the trail and cross the creek. A property easement would need to be obtained and liability transferred to the public entity in charge of the Putah Creek Path.

Property owners are rightfully worried about having publicly accessible areas near their properties. In this site what makes this issue especially hard to deal with is the fact that the area is not easily accessible for emergency services. Some of the issues include: trespassing, vandalism, theft, liability and other criminal activity. Solutions to these problems include stopping any trespassing through fences or barriers. A good solution may be the implementation of vegetative hedgerow barriers.

**Hedgerows:** Hedgerows are groups of plant species growing closely and tightly together. In this application, hedgerows provide vegetative barriers between publicly accessible areas and adjacent landowner properties. They would also increase habitat for beneficial insects and even filter agricultural contaminants before they reach the main Putah Creek waterway. (Earnshaw 4; 6) The hedgerows would be planted with native vegetation that become a natural barrier due to density and barbed nature. Trespassing, vandalism, theft and criminal activity on adjacent private property would be prevented or hugely reduced. Species that could be implemented in a hedgerow may include:

- Wild rose (*Rosa californica*) - barbed
- California Blackberry (*Rubus ursinus*) - barbed
- Coyote Brush (*Baccharis pilularis*) - dense
- Toyon (*Heteromeles arbutifolia*) - dense

# Creek Structure

(Fig. 4.2)



## Recommendations

Channel morphology has been heavily influenced by man made changes to the creek hydrology. Due to the construction of the Monticello dam and the Solano diversion dam flow has been tightly regulated to prevent flooding and flood-related damage. There is a resultant lack of flood plain and may reduce groundwater recharge near the creek. The dams also prevent larger pieces of eroded gravel travelling downstream from the upper Putah Creek watershed in the Coastal Mountains. The lack of gravel resulted in the water down cutting deeper into the soft alluvial soils. Normally the sediment slows and drops, increasing the elevation of the floodplain. The gravel was also historically used by migrating salmon for spawning and larger rocks would have provided shelter. The decrease in flow rate due to gravel friction would also create pools of slower flowing water and providing a wide variety of natural habitats where a more diverse wildlife population could thrive.

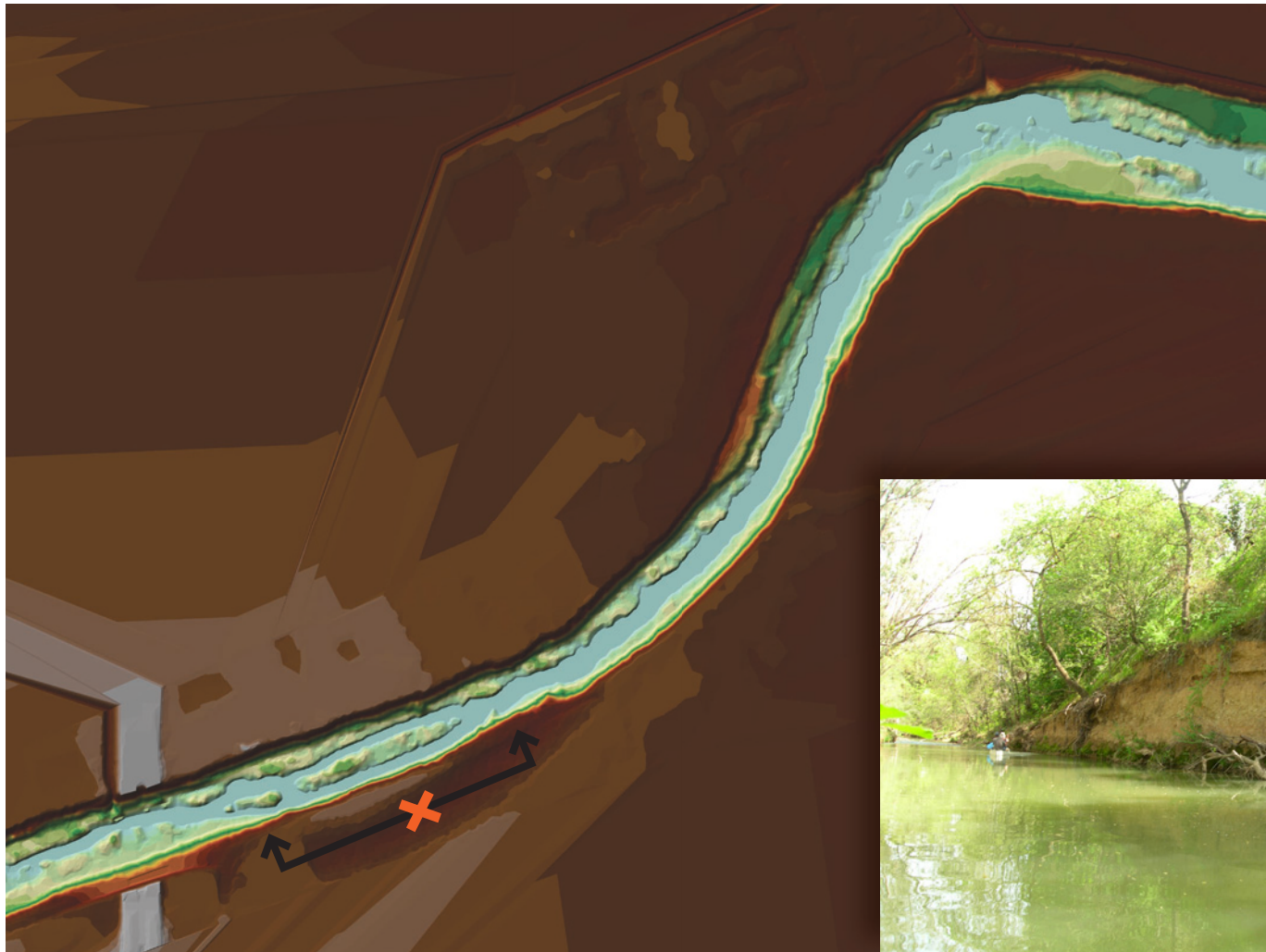
The current state of the creek structure on site has some problems that may need to be addressed before a safe and accessible path can successfully be implemented. In many areas sedimentation has occurred and portions of the creek are re-routing due to fast growing invasive plants. The re-routing has caused an increase in erosion sites. This has become a problem on the erosion site where the channel splits east of Interstate 505. This is of concern considering that the

erosion is occurring closer and closer to Putah Creek Road. This erosion site and the causes for the re-routing should be addressed. This will improve path accessibility and prevent further erosion that may jeopardize the use of Putah Creek Road.

The channel has been recommended for realignment in two areas that are particularly eroded or where there is insufficient space for a path. The larger realignment will aid in preventing damage to Putah Creek Road. Cut and fill amounts may be accommodated on site due to a large island of deposited sediment. This large island could essentially be moved to the south bank with anticipated reduction in erosion and an increase in natural channel morphology. The smaller channel alignment may also be accommodated with the cut from the larger realignment. This realignment aims to widen the floodplains and prevent further erosion that could become a threat for similar reasons as at the current erosion site. A further detailed topographic analysis should be conducted before final recommendations are made..

In addition to channel realignment, gravel and rock should be imported to provide pools and ripples that provide wildlife habitat and also help to counteract the damaging flows that cause erosion and down cutting. The addition of This will also benefit wildlife such as aquatic animals and invertebrates. The addition of gravel may also help the creek increase its natural meander.

## Erosion Site



A majority of the south banks are very steep and eroding. This particular erosion site is threatening Putah Creek Road and should be regraded for vehicular safety, path accessibility and channel hydrology.

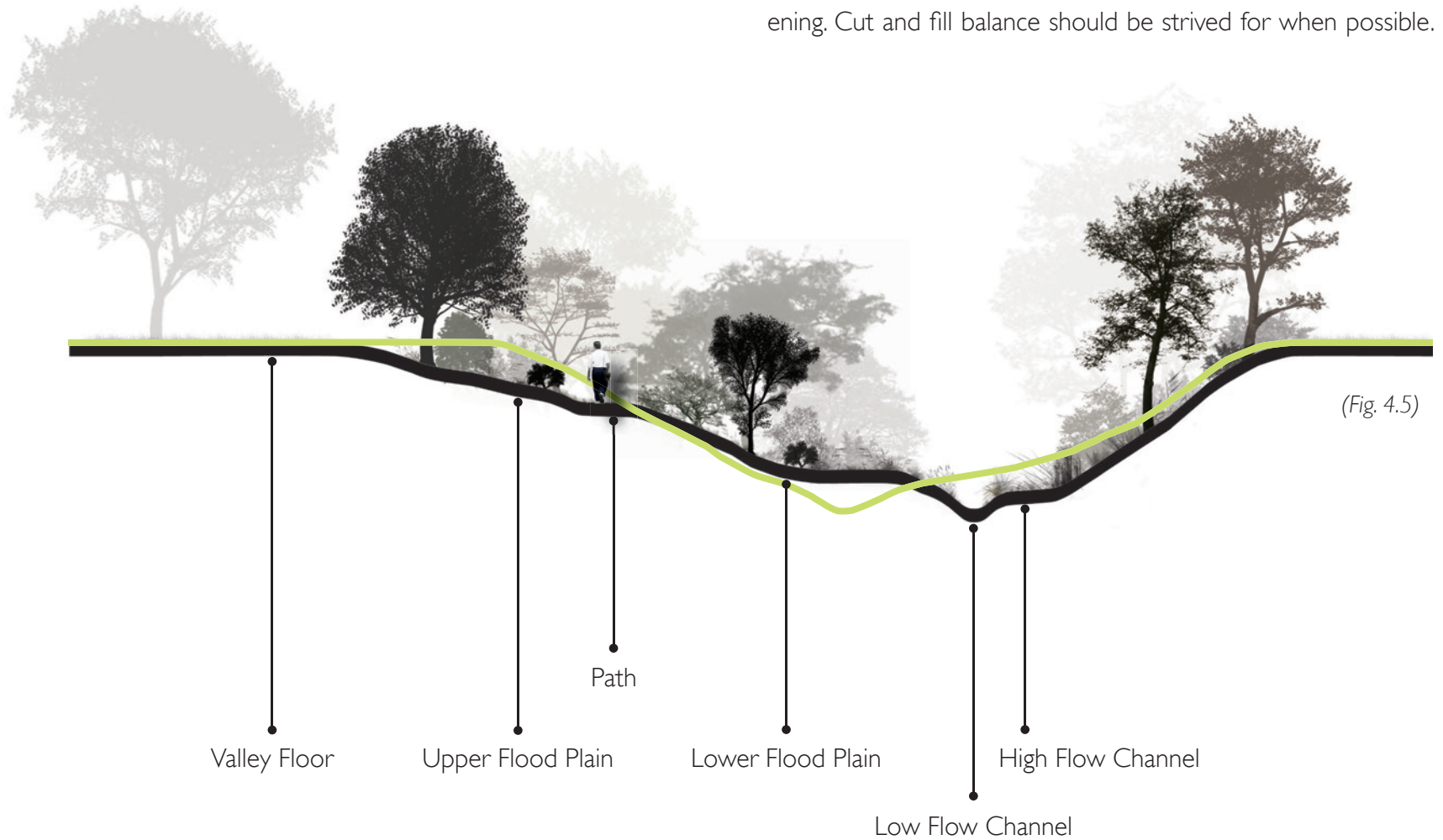


(Fig. 4.3) Topographic Analysis

(Fig. 4.4)

- Current Average Creek Transect on site
- Ideal Creek Transect

The overly wide and deep Putah Creek transect is a result of the altered hydrology of Putah Creek that occurred after damming farther upstream. Optimal regrading of the creek channel would widen flood plain where possible.. The channel center could be moved to accommodate more flood plain on the south side where Putah Creek Road restricts amount of widening. Cut and fill balance should be strived for when possible.



(Fig. 4.5)

# Invasive Vegetation

(Fig. 4.6)





## Recommendations

The changed morphology has influenced the vegetative composition with a reduction in biodiversity and native habitat for wildlife. The decrease in flood plains and ground water recharge has made it easier for non-native invasive plant species to gain a strong foothold. Historically invasive species that grew in the riparian habitat would not be able to survive large, long and fast winter flooding. Many native plants have evolved to stay low, surviving under the fast winter flows. Most invasive species would historically die out or be washed away during winters storms due to their inability to survive the extremes of the riparian habitat.

Lack of groundwater recharge due to flood control has greatly diminished the potential area where riparian habitat can grow. Riparian vegetation is classified by its water intensive nature and without the groundwater many riparian species cannot survive without the creek's year round water supply. This areas has now been greatly over run by non-native invasive vegetation.

Eradication of all invasive vegetation is an ambitious goal that involves more strategies than manual weeding. Weeding should be done to an extent that is reasonable. For removal that is not short lived, the flood plains should be restored to an extent that is not detrimental to property. With this restoration may come an increase in winter eradication due to high and strong flows within the improved channel.

Removal of the following invasive species should be considered in the vegetation and restoration plan.

### High Priority:

- Eucalyptus (*Eucalyptus spp.*) - Common species found along Putah Creek are River Red Gum (*E. camaldulensis*) which are large trees growing 80 to 120 feet. Evergreen, hardwood native to Australia. Leaf litter decomposes, releasing toxic compounds into the soil preventing undergrowth. Typically highly flammable. Trees get large and seed prolifically. The cost of removal is very high.
- Himalayan Blackberry (*Rubus discolor*) - Large sprawling vine imported from Europe in the late 1800's for cultivation. Propagates through its vegetation, spreading wildly. Many problems of *Arundo* (see below) are also seen with Himalayan Blackberry. It grows so thick that flows slow and drop sediment beneath, creating levees that may reroute the channel causing high amounts of erosion of bank sides. It has impenetrable thickets that don't allow for larger mammal movement and harbour rats that prey on native birds. It does provide cover for riparian wildlife, but consider replacing with CA Wild Rose or native blackberry.
- Arundo (*Arundo donax*) - Native to Eastern Asia. Also known as Giant Reed it resembles bamboo and is found growing water

side. Commonly used as an ornamental and to prevent erosion. Use for erosion control has proven insufficient and even exacerbates the problem. It grows so dense and thick it has been known to change the course of water ways.

- Tamarisk (*Tamarix spp.*) - Deciduous shrub from Southern Europe and Asia. Thought to have been introduced for erosion control, just as Arundo. Propagates by seed and through vegetation. Tamarisk alters the soil chemistry by depositing salt rich leaf litter, hindering growth of salt-intolerant native plants. Just as Arundo and Himalayan Blackberry, it alters flood flows causing further erosion and changes to stream morphology.
- Tree of Heaven (*Ailanthus altissima*) - Native to Eastern China it is often mistaken with Black Walnut for the similarity in leaf form. Medium sized deciduous tree with incredibly prolific growth and propagation through seed and vegetative propagation. Produces dense stands of monoculture vegetation, insufficient for native wildlife habitat. Emits bad smell.
- Eurasian Milfoil (*Myriophyllum spicatum*) - This aquatic species is native to Europe, Asia, North Africa and Greenland, it closely resembles the native Siberian Milfoil (*M. sibiricum*). It spreads prolifically through vegetative reproduction. It chokes and shades out other native aquatic species. It also reduces habitat value and recreational opportunities. Creates stagnate areas of high temperature water perfect for mosquitoes.

**Other invasives of concern:** Black locust (*Robinia pseudoacacia*), Catalpa (*Catalpa speciosa*), Domestic Almond (*Prunus dulcis*), English Ivy (*Hedera helix*), Fig (*Ficus carica*), Milk Thistle (*Silybum marianum*), Ripgut broom (*Bromus diandrus*), Water Hyacinth (*Eichhornia spp.*), Yellow star thistle,

(EDAW [Resource] 7-10)



(Fig. 4.7) Pink Flower of Tamarisk



(Fig. 4.8) Himalayan Blackberry



(Fig. 4.9) Arundo



(Fig. 4.10) Eurasian Milfoil



(Fig. 4.11) Eucalyptus

# Native Vegetation

(Fig. 4.12)



## Recommendations

On average 25% of the vegetation along Putah Creek corridor is native (EDAW 3-6). Starting in the 1940's continuing to 1975, vegetation clearing in the Riparian corridor was excessive. Policies changed and when revegetation naturally occurred the cover increased benefited wildlife and reduced excessive warming of the water. The vegetation also help to create a more natural stream channel (EDAW [Resource] 4-21).

There are many benefits to revegetating riparian habitat with native vegetation for a variety of reasons. Native vegetation provides habitat for wildlife and at the same time contributes to water cleansing by removing nutrients from agricultural run off that may end up in urban drinking water. The vegetation increases aeration to the soil and creates places where water can slowly percolate, recharging the groundwater. This is an important fact since much groundwater recharge has been decreased by flood control. Native vegetation can also have benefits relating to flood control. This is done by slowing bank erosion and directing flows away from structures and roads. This is an important fact to take into consideration for the revegetation the erosion site adjacent to Putah Creek road (Griggs 3). Clearing of native riparian vegetation should be limited to path and areas adjacent to path, where accessibility is needed or where debris may jam bridges. Thinning may be the conducted at a greater amount (EDAW 4-21).

**Mixed Riparian Forest:** Frequently the uppermost canopy consists of Valley Oak (*Quercus lobata*), Oregon Ash (*Fraxinus latifolia*), Goodings Willow (*Salix goodingii*) and Box Elder (*Acer negundo* ssp. *californicum*). Subcanopy of dense riparian scrub present, contains Arroyo Willow (*Salix lasiolepis*) and Sandbar Willow (*Salix exigua*). Shrub layer consists of Blue Elderberry (*Sambucus mexicanas*), Button Bush (*Cephalanthus occidentalis*), California Blackberry (*Rubus ursinus*), California Wild Rose (*Rosa californica*) and California Wild Grape (*Vitis californica*). Ground layer hosts Creeping Wild Rye (*Leymus triticoides*) and Mugwort (*Artemisia douglasiana*).

**Cottonwood Riparian Forest:** Much of the same vegetation found in mixed riparian also found in Cottonwood riparian forests but with the addition of large Fremont Cottonwood (*Populus freemontii*) stands.

**Riparian Scrub:** Adjacent to creek channel and consisting of Sandbar Willow, Arroyo Willow and Red Willow (*Salix laevigata*). Found as sub-canopy in mixed riparian forests (EDAW 6-16).

**Open Forb/Grass:** often dominated by invasives but should be naturally restored to contain Purple Needle Grass (*Nassella pulchra*), Creeping Wild Rye,

**Elderberries:** Blue Elderberries have a unique role in riparian habitat and are protected from removal by law. This is due to the endangered status of the Valley Elderberry Longhorn Beetle which lives solely on these elderberries. Removal of existing elderberries requires high degree of mitigation and costs. Therefore removal of these plants on this site is highly discouraged.

**Other Native Vegetation found near Riparian Habitat:** White Alder (*Alnus rhombifolia*), California Pipevine (*Artstolochia californica*), Cattails (*Typha angustifolia*), Tules (*Scripus actutus*), California Black Walnut (*Juglans californica*), Red Bud (*Cercis occidentalis*), Toyon (*Heteromeles arbutifolia*), Black Oak (*Quercus kelloggii*), California Sycamore (*Platanus Racemosa*), Interior Live Oak (*Quercus wizlizenii*), Mulefat (*Baccharis salicifolia*), California nettle (*Urtica dioica*), Sticky Monkey Flower (*Mimulus aurantiacus*), California Fuchsia (*Epilobium canum*). (EDAW [Resource] 6-14)



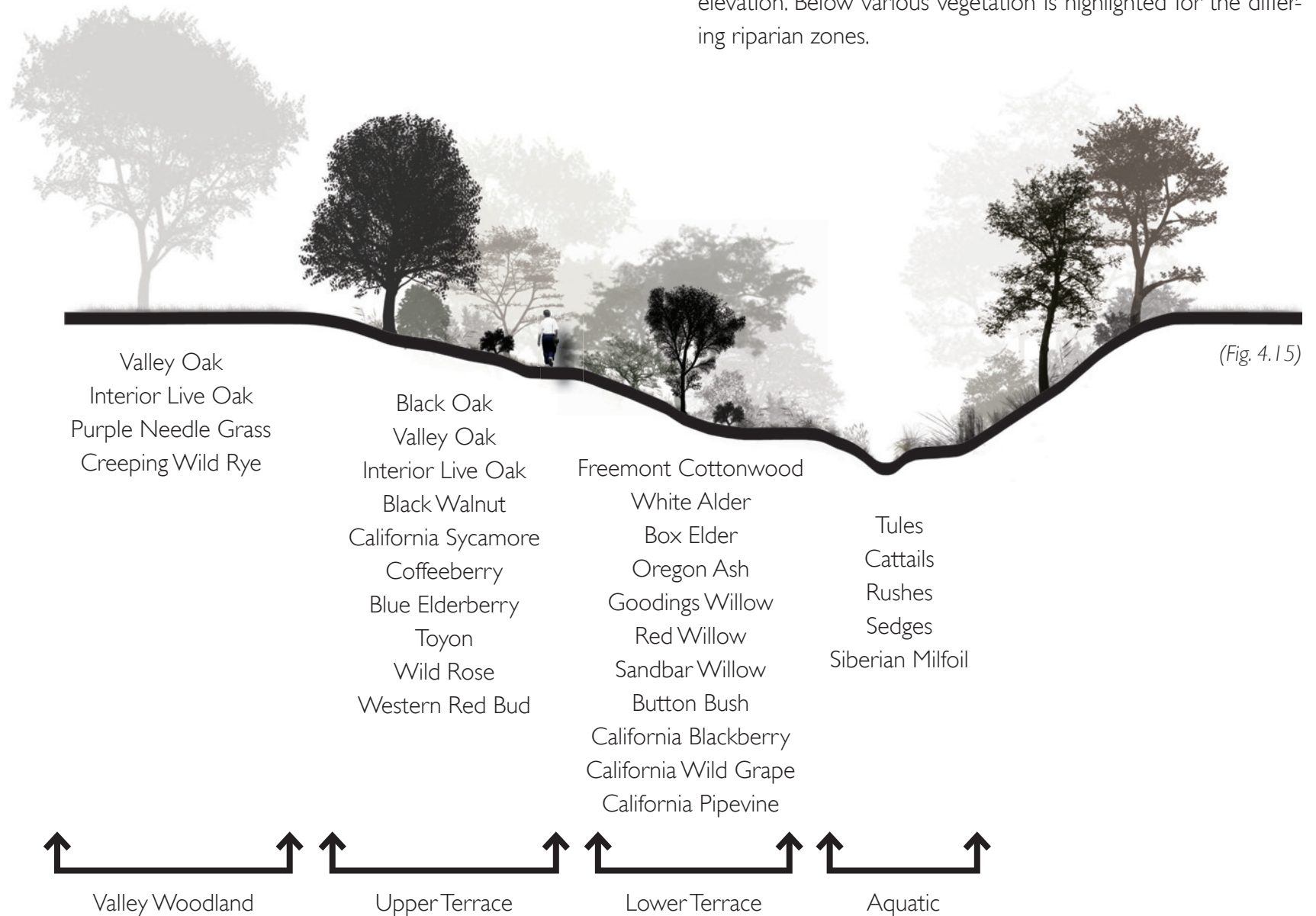
(Fig. 4.13) Tules



(Fig. 4.14) Willow Thicket

# Vegetation Gradient

Riparian vegetation often grows in a gradient from low to high elevation. Below various vegetation is highlighted for the differing riparian zones.







# Master Plan

The Master Plan shows the fully rendered design for the Putah Creek Nature Park, the Yolo Housing extension and the Yolo Housing Connection. Many of the design decisions were made according to the considerations and recommendations providing in the previous section.

Path placement took into consideration sites of erosion and steep slopes. Recommendations included restoring the erosion site threatening Putah Creek Road. Additionally recommended is re-grading of rough terrain in order to prepare the terraces for the ability to accommodate a pedestrian path.

Current opportunities for a community garden are being pursued on the Yolo Housing design site. The proposal of the Yolo Housing design took into consideration and designed a path transition that also protects the community gardens of the Yolo Housing residents.

The designs that follow illustrate the plans for the Putah Creek Path and the Putah Creek Nature Park within the context, in addition to the Yolo Housing connection.

# Winters Putah Creek Nature Park

Currently the City of Winters is implementing a Putah Creek Nature Park on a one mile stretch of the creek that borders the town. The Putah Creek Nature Park aims to integrate the Creek into the community by providing access to native riparian habitat and related recreational opportunities.

The idea for such a park was realized in 1989 by Cheryl Sullivan when completing her Landscape Architecture senior project. She was asked to continue her involvement in development of the park when the City of Winters decided that the PCNP would be a great benefit to the community.

(Fig. 5.1)



## Putah Creek Path Extension

The addition of the Putah Creek Path would extend the pedestrian access less than an additional mile to Yolo Housing. This channel is recommended for re-alignment of the

channel near the large white building to the north of Putah Creek. This re-alignment would mitigate erosion on the south bank that is currently threatening Putah Creek Road.

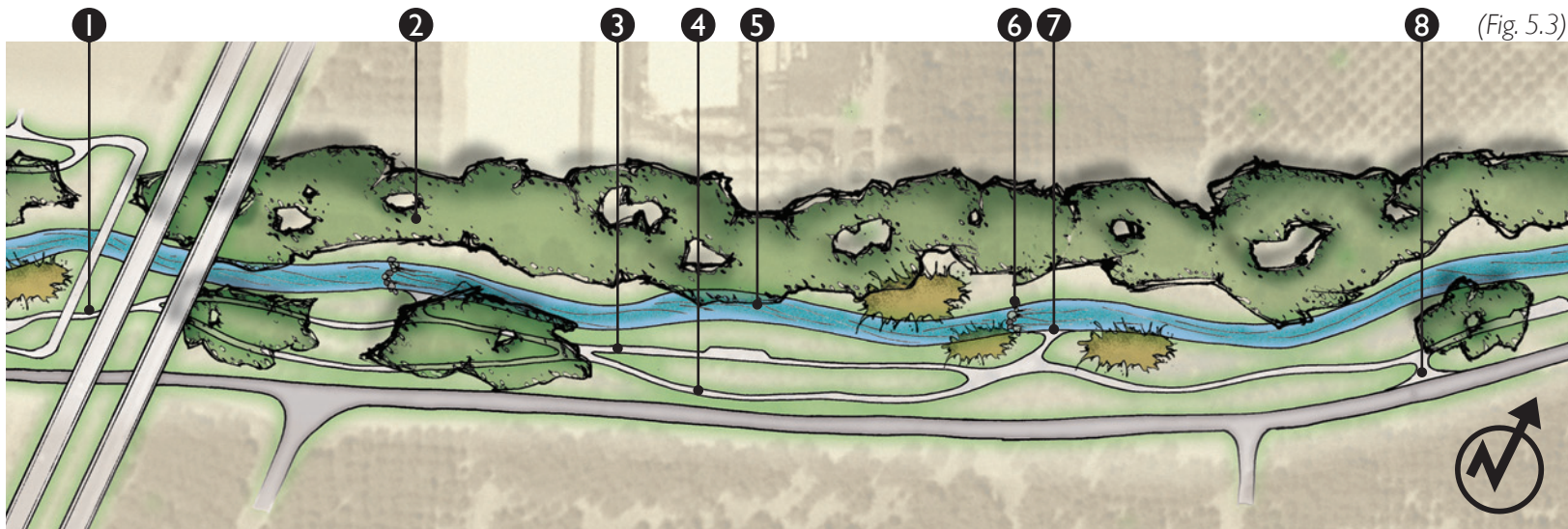
(Fig. 5.2)



## Extension - West Stretch

- 1 - Connection between PCNP and Yolo Housing Path Extension
- 2 - Unaccessible North Bank
- 3 - Lower Terrace Path
- 4 - Upper Terrace Path
- 5 - Realigned Stretch
- 6 - Rock Weir
- 7 - Creek Access
- 8 - Road Access

The first half of the path begins at the end of the Putah Creek Nature Park on the south bank. The path continues under Interstate 505 and splits into an upper and lower terrace trail. This is possible due to the larger flood plain beneath the highway. The proposed realignment will also increase the flood plain in this area. There are two creek water access areas just downstream of the two rock weirs. The north bank is private property therefore is inaccessible to users of the path. There is one access point out of the channel onto Putah Creek Road. It will be possible for emergency services to access the path in the case of an emergency.



## Extension - East Stretch

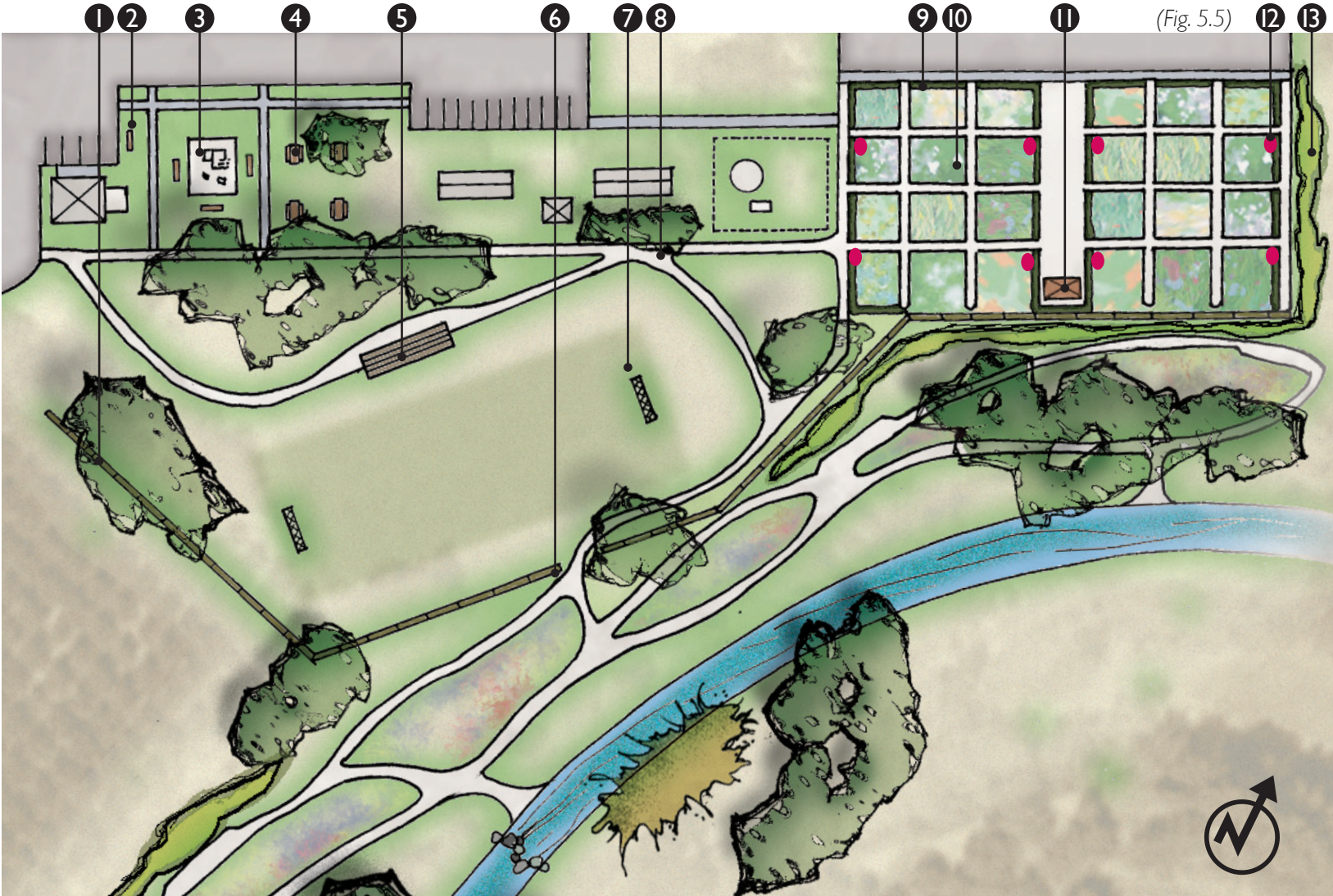
- 9 - Single Upper Terrace Path
- 10 - Bench Pull Out
- 11 - Putah Creek Low Flow Crossing
- 12 - Vegetative Hedgerow Barriers
- 13 - Native Flower Garden
- 14 - Yolo Housing Gateway

The second half of the path consists of a single upper terrace path. This is due to the steeper and narrower south banks which will not have any major realignments. Re-grading of the slope will need to be conducted to accommodate path. The publicly accessible portion of the path ends at the entrance into Yolo Housing.

A fence has been proposed to separate the private Yolo Housing residences, gardens and facilities from the openly accessible Putah Creek Path. Bench pull outs along the path are proposed as rest stops that will provide seating and water fountains. Hedgerows barriers are implemented in areas where the path is adjacent to private landowner properties. Included in the design is a creek simple crossing constructed of concrete and wood, a further discussion found in the implementation section. Located at the end of the publicly accessible portion will be a native flower garden with species like CA Fuchsia, Sticky Monkey Flower and Lupine among CA wild rose. Included will be interpretive signage about the garden and other interesting things along the way.



# Connection at Yolo Housing



- 1 - Boundary Fence
- 2 - Benches
- 3 - Existing Children Playground
- 4 - Picnic Tables
- 5 - Improved Bleachers
- 6 - Exit to the Putah Creek Path
- 7 - Existing Soccer Field
- 8 - Additional Path Circulation
- 9 - Community Gardens
- 10 - Low Barrier Shrubs
- 11 - Equipment Storage
- 12 - Water Faucets
- 13 - Vegetative Hedgerow Barriers

The connection at Yolo Housing aimed to provide a smooth transition between Yolo Housing and the Putah Creek Path. However, the connection needs to also respect the private homes of Yolo Housing residents. A four foot wooden ranch style fence is proposed to mark the boundary between property that is not be accessible to the general public. Within the boundaries of the

fence lies the existing soccer field which is widely used by Yolo Housing residents. Site observations revealed a lack of seating so benches and picnic tables were implemented near the existing children's playground. Path circulation was extended throughout the open space. A large community garden was included. This design decision for this community garden was based on current goals of implementing a community garden that supports self sustaining food production. This will benefit the community immensely. It will decrease need to buy produce and provide a source of provisions that are not currently available since Yolo Housing is quite far away from stores of Winters. A young girls 4H group and leader Megan Harns of the John Muir Institute for the Environment are hoping to start a small preliminary garden. The garden aims to promote the young girls growing knowledge and at the same time gain support from the whole community for a larger garden that can be used by any residents of Yolo Housing. The gardens are bisected by decomposed granite paths. The perimeter gardens are protected from the higher traffic main paths by low shrubs. The garden contains a tool shed where various equipment can be stored publicly or in private storage for residents.





# Implementation

## ***Phasing***

Completing a project on a scale this large requires a plan for implementation over a period of time. Before any trail can be placed on this site some major creek realignment changes need to be made. This increases natural hydrologic function to the creek which will not only benefit habitat and wildlife but will provide safer access for people.

After the morphology has been corrected the next phase includes revegetating the landscape with native riparian vegetation. It is important to consider what niche habitat the vegetation contributes to in order to provide the maximum and ideal habitat for various wildlife.

Once natural processes have been restored then the site will be adequate for implementation of path construction. The upper terrace is the ideal location for the path since high flows will rarely reach this elevation. However, path closure may be required during winter months due to safety concerns.

The final phase includes use and enjoyment by local citizens. The energy put into the first three phases will be greatly appreciated as users observe and learn about the natural and healthy riparian habitat that is sometimes literally in their backyards.

## ***Volunteers***

The implementation of the project would benefit from the involvement of local volunteers to help with revegetation and path implementation. This will also generate environmental stewardship and promote local citizens to “keep an eye out” for this valuable amenity.

## ***Hedgerows***

It is crucial to create a path that is respectful of the neighboring landowners concerns. Preventative measures against criminal activity on private property adjacent to the conceptual trail site are proposed. Craig McNamara who owns property adjacent to the site and has given his landowner perspective on the idea. He indicated that the uncertain outcome of what problems a project like this may create is a strong factor in why many landowners disagree with public access so near their often isolated private property. Many problems mentioned by landowners include criminal activity such as trespassing, theft and vandalism to their property.

Conventional solutions to problems of trespassing include erecting fences. A simple fence can mark a boundary but often cannot keep people out if they want to get through. The fences also creates an eye sore in an area that is striving for natural

restorations. Instead of purchasing and installing fences that may not prevent trespassing effectively, hedgerows are proposed as vegetative barriers between publicly accessible areas and adjacent landowner properties. The hedgerows would be planted with native vegetation that grows into a natural barrier due to density and barbed nature. This solution provides a barrier that

is even more impenetrable than most fences. In addition, the hedgerows also follow with the project goals of creating access to nature within a highly developed landscape of urban and agricultural uses. Some recommended plants for hedgerows with the purpose of vegetative barriers include native vegetation that has thorns or grows so dense that penetration is almost impossible.

- **Wild rose** (*Rosa californica*) - barbed

(Fig. 6.1)



- **California Blackberry** (*Rubus ursinus*) - barbed

(Fig. 6.2)



- **Coyote Brush** (*Baccharis pilularis*) - dense

(Fig. 6.3)



- **Toyon** (*Heteromeles arbutifolia*) - dense

(Fig. 6.4)



### ***Safety***

Even if crime is not prevalent in the community of Winters it is always best to prepare and provide methods that limit the chances for occurrences of crime. In order to achieve this it is important to promote path use since the presence of more users discourages the undesirable behavior. Implementation of patrols may be a possibility but issues over cost may prevent extensive patrolling (Morris 10).

It is also necessary to construct the Path that is safe for travel without the chances for accidental injury. A flat grade of 8% or less is required for the path to be accessible by ADA standards. Adhering to the ADA standards will provide universal access to many more people.

### ***Monitoring and Management***

It is important to put in place a plan for ongoing monitoring and management. This will ensure that the resource will stay a positive and safe assets to the community. Management will also increase the success of the restoration projects such as the revegetation. Monitoring can ensure invasive vegetation does not take over again.

### ***Path Design***

The construction of the Putah Creek Path will take place after channel realignment and revegetation has taken place. Terraces should be fairly compact in order to prevent paths to be washed away in winter storms. The paths may benefit from increased stabilization with in ground metal honeycomb buried within the top layer of path soil where additional support may be needed.. See below.

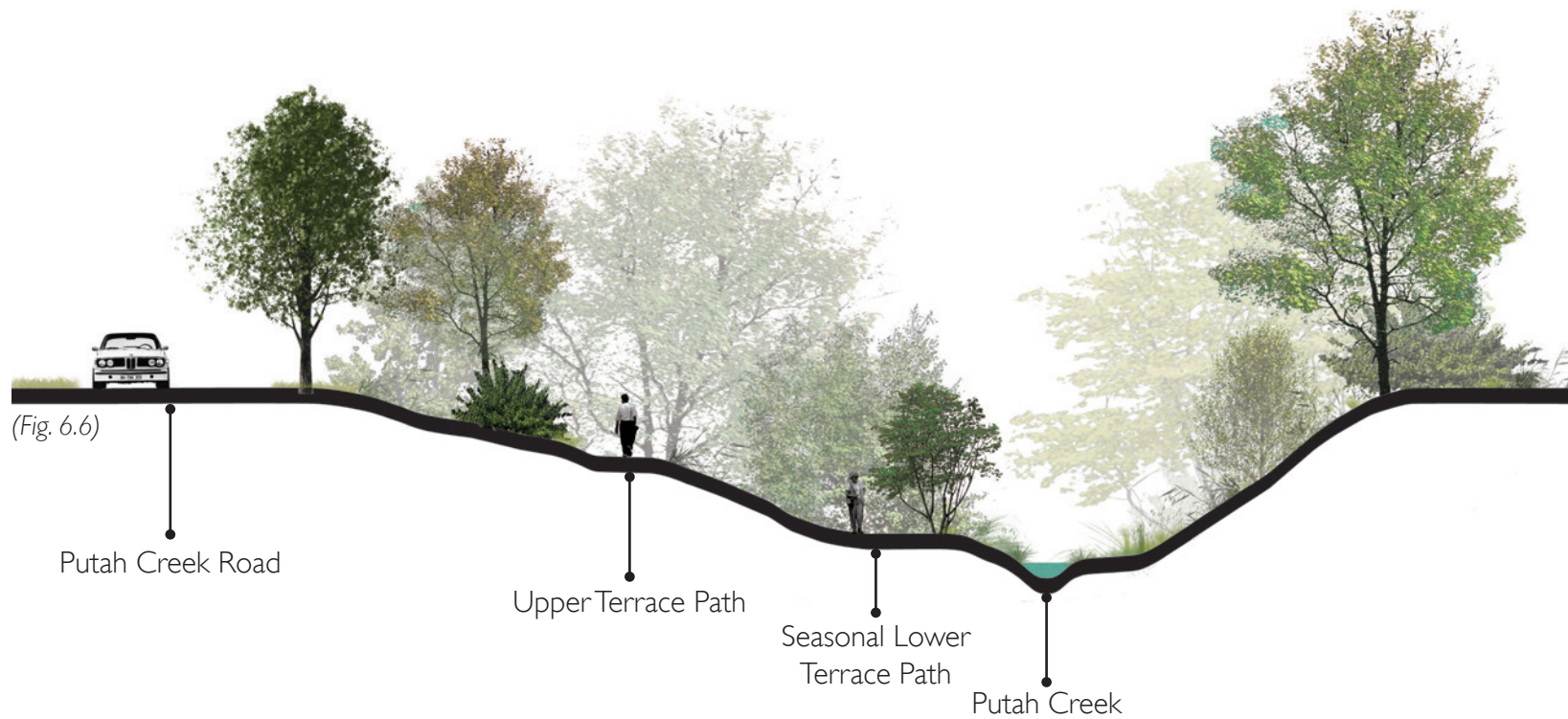
(Fig. 6.5)



The material placed on the path should be if possible local materials of decomposed granite or stabilized soils. Slopes of the path should not exceed 8% to accommodate ADA accessibility and provide universal access to more residents of the area. The path pull outs will, if need, require small retaining walls to create a flat surface on a slope bank side.

## Path Placement

This cross section shows the elevation and placement of both the upper and lower terrace paths. The lower terrace path will close in winter due to possibility of high flows inundating the lower flood plain terrace.



## Bridge Design

The design of the bridge needs to be simple and natural. Proposed are materials of wood and concrete modular blocks. The modular nature of the bridge is beneficial to reduce damage to the bridge during

strong winter flows that carry large debris. During winter the bridge can be opened or removed in the middle. This will also prevent travel along the path when conditions are unsafe.

(Fig. 6.7)





# Conclusions

Putah Creek is beautiful. It is an amenity that should be experienced by all that will appreciate or learn from its nature. Although implementation of a path extension from the Winters Putah Creek Nature Park has challenges the path would provide a significant benefit to the surrounding communities. It would be an amenity that provides access to nature and education. It would become an alternative connection between the city of Winters and the community of Yolo Housing. In addition, mitigation measures taken for trail construction would provide protection against erosion of Putah Creek Road.

Environmental stewardship although often overlooked and neglected would increase along with pride and caring for Putah Creek. This ideal would extend to other areas of natural beauty, as many users would find themselves with a greater appreciation of the environment and of how humans can interact with the environment





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