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Rewilding the Urban University Campus

Creating a more environmentally and socially sustainable university campus

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UC Davis, LDA Program 2009
Senior Project

Rewilding the Urban University Campus

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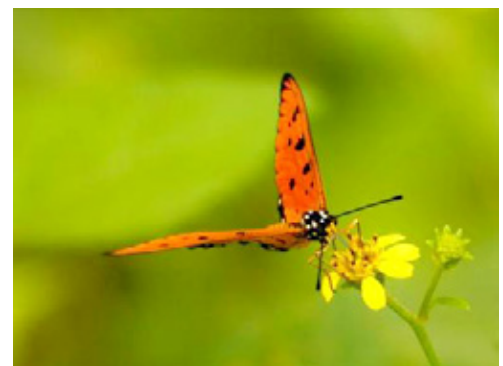


TABLE OF CONTENTS

Acknowledgements	i
Table of Contents	ii
Preface	1
Introduction	3
Chapter 1: Benefits and Limitations of Rewilding	6
Benefits of Rewilding	7
Limitation of Rewilding	10
Chapter 2: Case Studies	13
Methodology	14
University of California/Davis	16
California State University/Sacramento	23
University of California/Berkeley	29
Results of Survey	34
Chapter 3: Rewilding Guidelines	35
Chapter 4: Redesign the San Francisco State University	37
Site Analysis	38
Western Campus Conceptual Plan	44
Children’s Center Garden Plan	45
Bridge Garden Plan	46
Propose Plant List	48
Conclusion	53
Works Cited	54
Photos and Graphics Credits	55
Appendix: Questionnaire for the Case Study on UCD, CSUS, and UCB	57

PREFACE

As the human population has shifted from centering on rural activities to revolving around urban activities, urbanization has become a global trend. When addressing urbanization, it not only corresponds to the growth of the population but also relates to human social activities in the given region. All changes brought by humans have caused a direct impact on the previous environment, including its flora and fauna; for example, to satisfy the need for transportation, complex infrastructures consumed the open spaces and biodiversity, introducing a higher level of resource consumption. As an area begins urbanization, it leads to alteration of landscapes, urban development, and exploitation of species, toxic contamination of the environment, and climate change (Reiff Page 2). Non-native invasive species begin to multiply as local species gradually decline at an alarming rate, facing extinction. Why it is that human society cannot coexist with wildlife habitat? Is it possible to establish a mutually beneficial relationship between the natural environment and the urban environment?

After decades of uncontrolled urbanization, the natural environment has suffered the loss of sustainable conditions that embrace human dwellings. People start to recognize the harm to their environment done through urbanization. This leads to the rise of environmental awareness, followed by a modification in human activities such as conserving and protecting the existing ecosystem and its resources. This research project provides possible solutions and guidelines for how we could restore nature—rewilding—back into developed urban settings. This idea is not only to passively maintain the current damaged environment but also to initiate actions to restore previous species in the region.



Figure 1: Urbanization has become a global trend

*“Wilderness without animals is dead—dead scenery.
Animals without wilderness are a closed book.”*

Disney cinematographer Lois Crisler

INTRODUCTION

This project used the environment of the university campus as the model to carry out a small scale of the rewilding process. The word rewilding literally means to put the wildlife back in an urban area. It is the process of creating a natural system that provides a suitable habitat for wildlife in an already urbanized setting. Instead of creating an environment only for wildlife, it seeks a balance between nature and human dwelling.

Society ascribes a high value to education, and a university is an institution that provides high-level education and makes a prominent impact on society. It cultivates most of the managing level human resources in the future society (Orr Page 8). Interestingly, the university campus is like a micro city; it has a high-density population, complex infrastructure, and limited nature resources. For this reason, this small-scale community has a high exemplary value to us. Whenever it successfully implements an environmentally friendly approach, it serves as a role model to lead society to responsible behavior and coexist with the natural environment. The rewilding process at a university level will educate students about the native ecology, the fundamental concepts of ecosystem health, the importance of biodiversity, and the idea that the human habitat can be in harmony with the wildlife habitat. This idea of rewilding then can spread to the community.

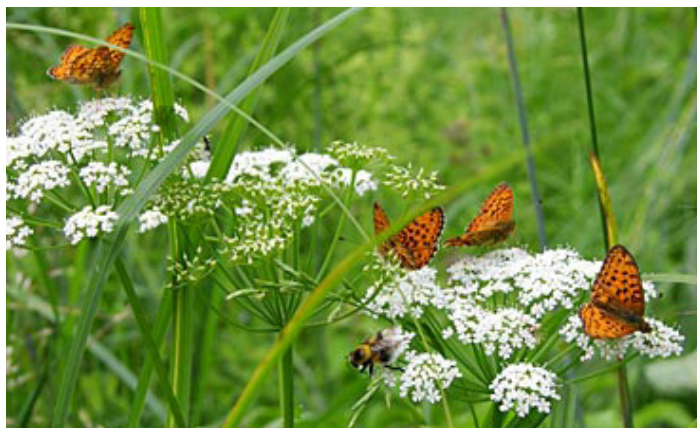


Figure 2: Rewilding is creating a natural system that provides a suitable habitat for wildlife

For this rewilding project, this paper will look at the university campus in different areas and apply final guidelines to a university campus that has the potential for rewilding. A university campus located in an urban terrain that is adjacent to a relatively undeveloped and restored ecosystem has the most potential to proceed with rewilding. These ecosystems can be deserts, forests, swamps, lakes, rivers, or creeks. A suitable landscaping


design or a combination of approaches can be used in different environments; examples are constructing arboretums or parkways, monitoring native plants, and removing invasive species. These changes allow us to preserve and encourage biodiversity while offering urban dwellers a natural space for educational, recreational, social, and individual activities. The process of rewilding creates a more environmentally and socially sustainable university campus that is beneficial to both human residents and wildlife.

The first part of the study discusses the benefits and limitations of rewilding. The rise of environmental awareness causes an increase in the need and interest in natural elements for urban dwellers. Depending on the intensity of urbanization, the level of wildlife loss varies. For a place located in the center of the city or a downtown area, it is more difficult to apply rewilding because of the high level of civic advancement; few local natural resources or open spaces are left for rewilding. Therefore, rewilding is easier to apply in places located farther away from urban activities or adjacent to a relatively undeveloped and restored ecosystem.

Subsequently, the second part of the project focuses on three different case studies at California university campuses: the main campuses of the University of California/Davis



Figure 3: The Arboretum at University of California, Davis



(UCD), California State University/Sacramento (CSUS), and the University of California/Berkeley (UCB). Among these universities, CSUS and UCB are typical urban university campuses; both are located in the center of their cities, surrounded by complex transportation networks and commercial and residential infrastructures. Both campuses have limited space for natural habitat. Similarly, although UCD is a more suburban campus, its space for nature habitat is limited because of its land usage by surrounding farmlands and residential buildings. These campuses may not seem conducive to rewilding, yet the universities made efforts for many years to conserve their natural resource systems. Those strategies act as references to this rewilding project. Moreover, these universities share similar water bodies on campus: SSU has the American River, UCB has Strawberry Creek, and UCD has the Arboretum. These bodies of water are relatively undeveloped and can be restored ecosystems in the rewilding project because they attract the wildlife back to the area. Through observing how human beings and wildlife use and interact on the site, this study will ascertain the different degrees of restoration in the natural habitat and how they influence civic activities. The third part of the project will summarize the pros and cons of these three universities' landscaping approaches and create a set of rewilding guidelines.

Finally, after analyzing these different cases, the fourth part of this study applies the rewilding guideline onto any urban university campus to help install a better natural habitat. San Francisco State University (SFSU) campus is the urban university campus model, and this project applies the rewilding guidelines to it. Like many other well-developed urban campuses, SFSU campus is located in the center area of San Francisco and has limited space for natural habitat because of its urban development. It has a nearby water body, Lake Merced, so it has the potential for a successful rewilding project. The final section provides a practical landscaping design on the campus to show how the rewilding project can work.

Based on the research, the case studies and redesigning a university campus, this study shows that rewilding an urban university campus is a benefit for both the wildlife and the urban dwellers. Ultimately, by its success at the university level, the rewilding project can be expanded to a community scale.

CHAPTER 1

Benefits and Limitations of Rewilding

Benefits of Rewilding

Rewilding helps protect biodiversity and sustain a healthy, functional ecosystem.

Biodiversity means diversity of life. This can refer to diversity in a particular region or on Earth as a whole. A healthy biodiversity is created by a healthy functional ecosystem. However, today's urban development has expanded into natural space and causes a serious impact on the original environment. There are about 145 square miles of rainforest, and another 72 square miles of vegetation that are encroached by deserts every second. As a result, many local species have lost their suitable natural habitat and reached an alarming diminishing population or even extinction; each day, 40 to 250 species disappear from Earth (Orr Page 3).

Rewilding restores the wild nature back into a developed urban setting. This is done by adding natural landscaping, such as cultivating native plants, to create a habitat for local wildlife. These native wildlife can maintain the native plants and balance ecosystem at the same time; for example, seed dissemination and control of the population of each species.



Figure 4. and 5. Wildlife in American River Parkway

A healthy biodiversity is important for all life, including humans. For instance, there are numerous plants and animals that can be used in medicine, agriculture, and industry. However, relative to the more than 250,000 species of plants on earth, only a few

have been thoroughly studied for the potential value as a source of useful drugs (Adams and Dove Page 2). The rest of species are hidden treasures, needing to be protected, found, and used. Rewilding effectively protects and manages wildlife and other natural resources, saving biodiversity from harm. Through rewilding, people can use natural resources with multiple benefits and value.



Figure 6. A study group at UC, Davis Arboretum

Rewilding in urban areas has the value of recreation, relaxation, and education.

Rewilding in urban areas can provide opportunities for human recreation and relaxation. The natural setting will make people less stressed, more comfortable, and invigorated. Any plan should contain trails that are friendly for walking, jogging, and bicycling. People can walk close to the nature and be surrounded by natural species. Rewilding has aesthetic and educational value as well. A healthy nature habitat maintains numerous species of plants and animals. It is a huge nature library, allowing people to observe and study the wild species and the ecosystem.

Rewilding can satisfy people's interest in wildlife.

The limitation of nature resources in urban areas offers urban dwellers less opportunities to get close to wildlife compared to those who live outside the city. In Adams and Dove's report *Wildlife Reserves and Corridors in the Urban Environment*, many stud-

ies show that many if not most urban dwellers want to know more about or be closer to wildlife. For instance, in a 1985 national survey of Americans (U.S. Dep. Inter., Fish and Wildlife Serv. and U.S. Dep. Commerce, Bur. of the Census, in press), it was estimated that more than half of Americans 16 years old and older maintain an active interest in wildlife around their home. They love to observe, identify, photograph, or feed wildlife. Furthermore, some 65% of the adult population enjoy seeing or hearing wildlife while pursuing other activities around the home such as lawn care. They maintain natural areas



Figure 7. People are interested in wildlife.

or plantings such as shrubs and other vegetation to attract wildlife to their gardens. In a survey of residents of New York State residents in New York City, Buffalo, Rochester, Syracuse, Utica-Roe, and Binghamton, about three-fourths of respondents expressed interest in programs to learn how to encourage wildlife in their backyard or neighborhood (Adams and Dove Page 2). In this researcher's 2009 study, a survey of the users—18 years old and older, included students, staff and visitors—of three urban or suburban universities of California shows that more than 76% of the respondents consider themselves interested in wildlife such as butterflies, bees, hummingbirds, and squirrels. They describe these as “cute” and “fun to watch”. Some say it was delightful even to listen to birds sing. These data from the studies are evidence for a great number of urban dwellers interested in wildlife.

Limitations of Rewilding

Rewilding is not easy to apply to any corner of the city.

Rewilding should be utilized at the right place, where there is a greater opportunity for habit enhancement and increased species diversity. Downtown areas of the city cause the more damage to the natural habitat; the further away from the city, more nature habitat remains. The three zones of urban areas—metropolitan centers, suburban areas, and rural-urban interface—contain three levels of suitable wildlife habits (Adams and Dove Page 5):

1. Metropolitan centers, inner city, or downtown.
 - a. Highest density population and housing, holding most of urban activities such as busy traffic.
 - b. Highly modified and typically contain few wildlife species and little wildlife habitat.

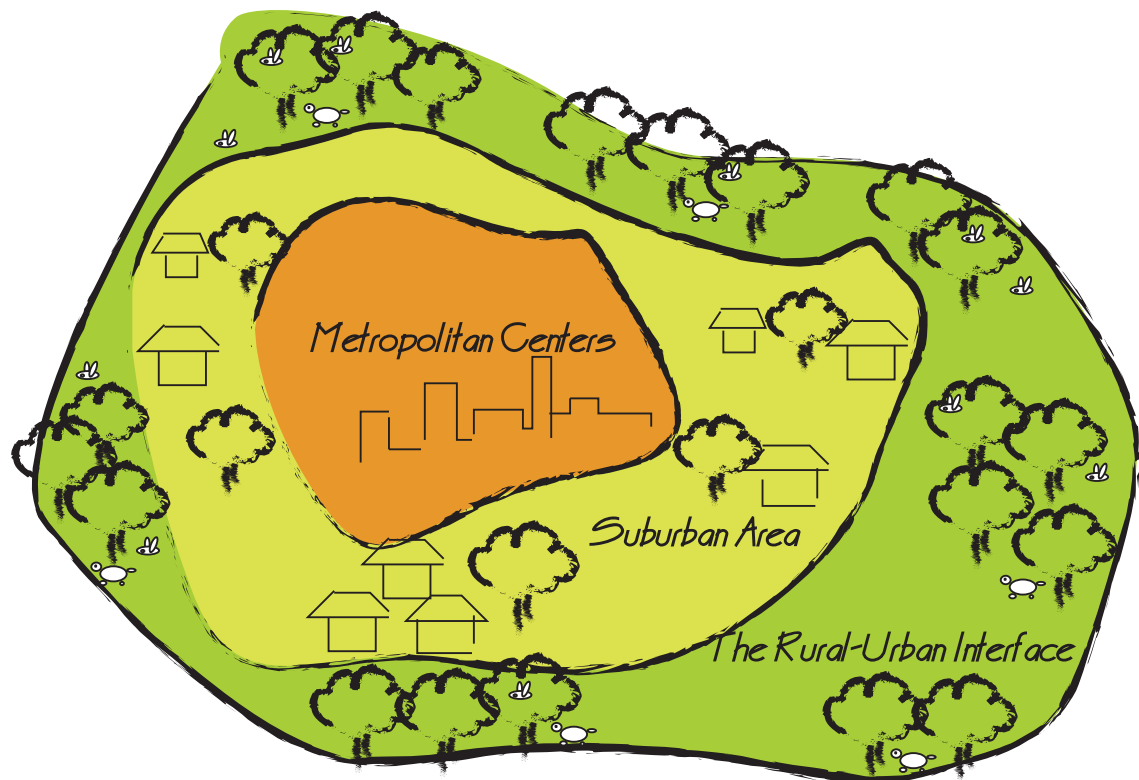


Figure 8. The three zones of Urban Areas

- c. Starlings, pigeons, sparrows, and a few other species may be common, although small-scale opportunities for habitat enhancement can increase species diversity.
- 2. Suburban areas such as backyards, community parks, cemeteries, and open land associated with industrial or business parks, and with schools, churches, hospitals, and other institutions.
 - a. Areas are less densely developed than the city center and possess more open space.
 - b. A greater diversity of wildlife may be found here, depending on how the various areas are managed.
- 3. The rural-urban interface.
 - a. Lower population and fewer urban activities compared to other zones.
 - b. Area offers the greatest opportunity for thoughtful planning to consider wildlife in the development process.
 - c. Areas of natural habitat can be preserved here; consequently, more wildlife species are present.

From these analyses, we can say that the rural-urban interface has the most potential to apply and develop rewilding compared to other zones of urban areas.

Competition of native plants and the existing non-native habitat.

Although the rural-urban interface has the most area of natural habitat compared to metropolitan centers and suburban areas, even it has suffered ecological damage as a result of human land use. Habitats of many local species have been destroyed or modified. New habitats of non-native species have been created (Reiff Page 13). Since some of these non-native species provide habitats and are valuable to the urban biodiversity, they cannot be destroyed completely. As a result, rewilding and reapplying native plants reapplying can be limited for a time.

Consideration of human beings' use.

Rewilding of rural-urban interfaces has to consider human beings' current use.

Rewilding in an urban area should be safe and comfortable for humans and not bring back harmful wildlife. Any wildlife population has to be managed and controlled.

In addition to the university's educational role mentioned in the introduction of this study, a university campus located in a rural-urban interface that is nearby a relatively undeveloped and restored ecosystem has the greatest opportunities to proceed with rewilding. In the next chapter, this paper will discuss case studies on three urban university campuses for the pros and cons of nature preservation.

CHAPTER 2

CASE STUDIES

Methodology

These case studies took place from April 2009 to the first week of May 2009. It included three study sites that were all the important nature landscape features for each campus: the arboretum in University of California/Davis (UC Davis), American River Parkway in California State University/Sacramento (CSUS), and the riparian corridors of Strawberry Creek at the University of California/Berkeley (UC Berkeley). Their landscape features were designed beneficially for natural diversity and offer recreation and educational areas. These campuses can help find the right strategies as guidelines for rewilding. These case studies were divided into two major parts: research and observation. An additional survey is included.

Research.

The main method used for this research section was searching existing reports of the study sites on the Internet. For UC Davis and UC Berkeley, official school Web sites offered reports or plans about the study sites. However, the information about the American River Parkway was found on its own official Web site. The finding from this research included general information about the study sites, their original design goals for the natural environment and use by people, and their present challenges.

Observation.

For each campus, I studied on-site one weekend day and one weekday. Friday was not considered a typical weekday in this study because most university class schedules have fewer classes, so fewer students would be on campus compared to Monday through Thursday. On a weekend, I went to the sites whenever it fit my schedule. On weekdays, I picked a morning hour and a noon hour.

At each visit, I spent 45 minutes to an hour to observe the site; 20 minutes of the visit was used for counting the number of users. Users in this study represented whoever was staying on the site or just passing by. The rest of the time, I marked down activities of the users and the wildlife I saw on the site. In addition, attention was paid to positions and materials of seating.

Survey.

A questionnaire survey was part of the case studies, used to discover how many people would prefer the natural landscape rather than lawn or open space on campus, their preferred seating, their interest in wildlife, and so on. The one-page survey form (see Appendix) was distributed to those who attended the study site campuses: both undergraduate and postgraduate students, alumni, staff, and visitors. Some of the surveys were campus surveys; some were online surveys. A total of 39 survey forms were deemed valid for analysis.

CASE 1:

THE UNIVERSITY OF CALIFORNIA, DAVIS

This campus area has a population of 34,000. It is a suburban campus that owns 5,300 acres of land. The natural feature I focused on was its Arboretum, founded in 1936. It is committed to providing a wildlife habitat and supporting native pollinators. Furthermore, the arboretum manages insect pests by using beneficial insects and other biological controls, and it balances the needs of the wildlife population with the needs of the plant collections.

Research

Location of the UC Davis Arboretum: The eastern-southern campus.

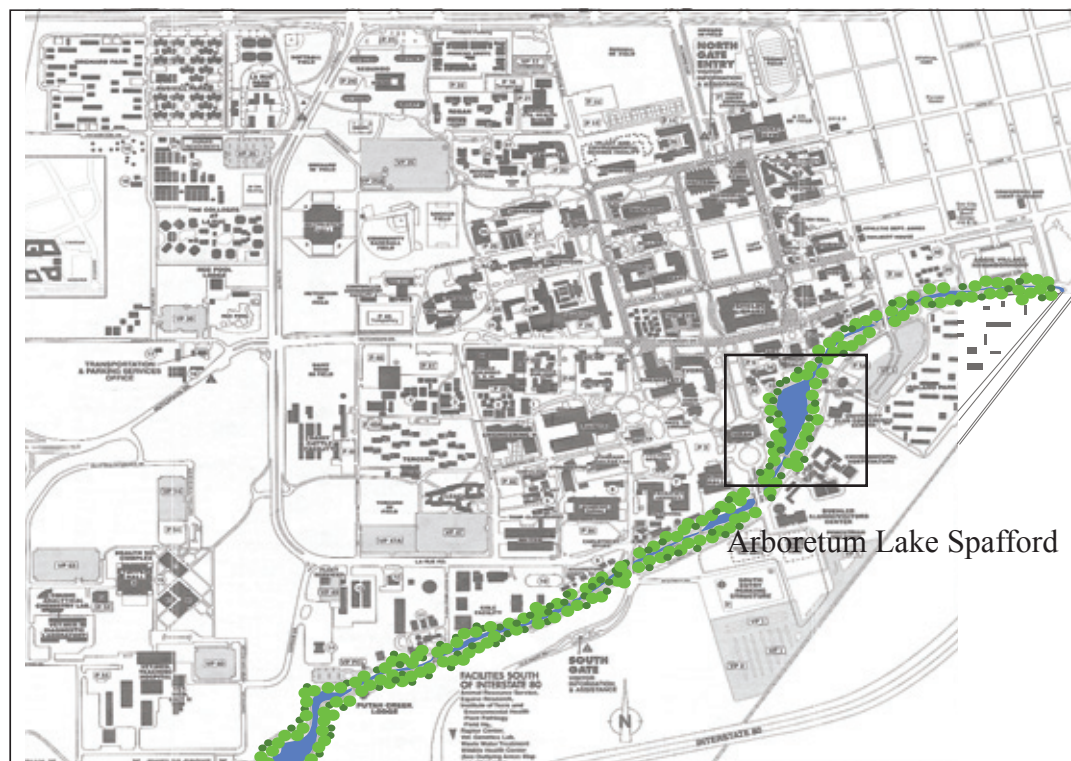


Figure 9. UC Davis campus and its arboretum

Occupied area: A hundred acres along the banks of the old north channel of Putah Creek, which is in California's Central Valley.

Plant collection: The 22,000 trees and plants have adapted to a Mediterranean climate, with hot, dry summers and cool, wet winters. To represent different geographic areas, plant groups or horticultural themes, the plants are arranged in a series of gardens. Some of the plants are native to the Davis area, and most of them are native to California.

Wildlife: There are at least 31 species of mammals, 7 species of fish, 3 species of amphibians, 19 species of reptiles, 45 species of butterflies, 18 species of ants, and hundreds of species of other insects and invertebrates (confirmed and expected) living in the UC Davis Arboretum. More than 135 species of birds have been observed nesting or roosting here.

Human use: The Arboretum provides winding paths for walkers, joggers, and bicyclists. There are benches where visitors can sit and enjoy the view, and picnic tables for casual gatherings. Documented plant collections are along the paths for teaching and research use. Lake Spafford is a place that can hold the population of the big campus, such as a marching band performance on Picnic Day.

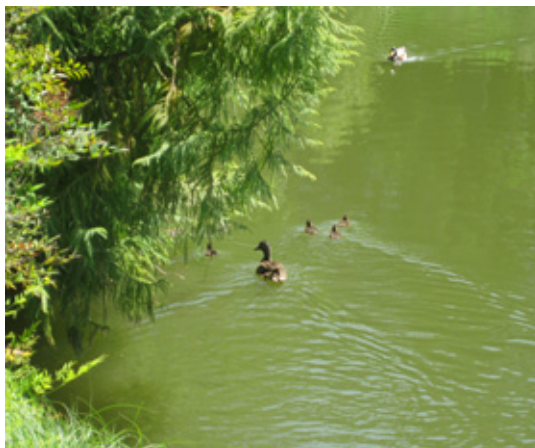



Figure 10. The ducks swam on the lake.



Figure 11. Redwoods in UC, Davis Arboretum



Present challenge: The heron and egret have been overgrowing at the Peter J. Shields Oak Grove, UCD Arboretum’s most scientifically significant collection. These large birds damage or kill the trees in which they breed and to pose health risks to humans. (Wildlife in the Arboretum. UC Davis Arboretum. Web)

Observation

Observation spot: Arboretum Lake Spafford, the most well known area of the Arboretum, near the central campus.

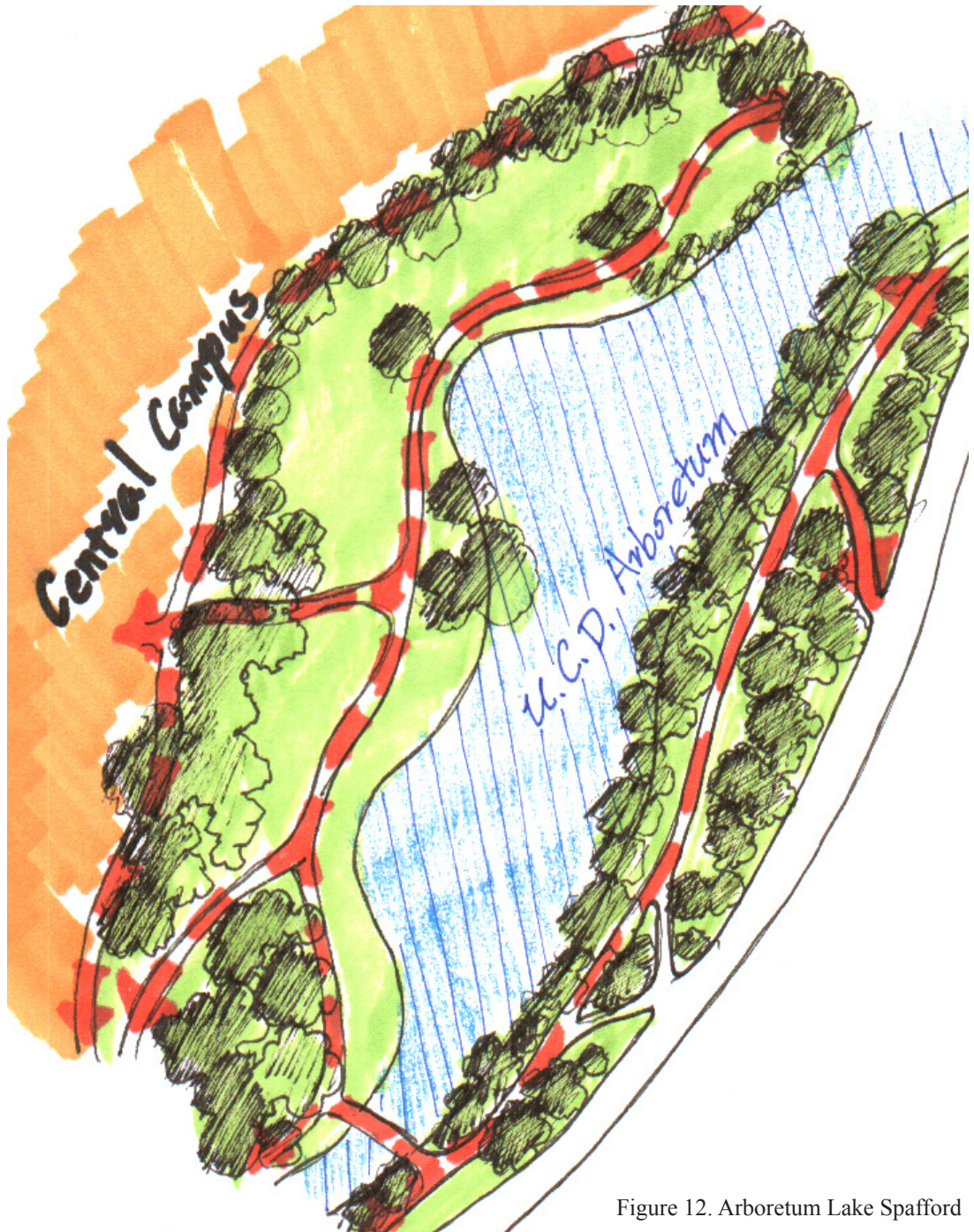


Figure 12. Arboretum Lake Spafford

Day 1: April 25, Saturday (6:20 p.m. to 6:40 p.m.)

Weather: Sunny

Number of Users: 38

Human Activities: Reading, playing guitar, sitting, bicycling, running, walking with or without dogs, families walking, site viewing (some taking photos), and scientific study.

Notes: This was a Saturday evening, so there were not many students on central campus, but there were some people at the UC Davis Arboretum. I was sitting on the lawn, watching the people and the birds. It was still light outdoors. A few young people were lying or sitting on the lawn and reading books. Some were sitting on the wooden benches. A man was playing his guitar by the lake. A group of students were observing the ducks and making notes in their notebooks. Families from the community were also visiting the Arboretum. The parents pointed out and identified animals and plants to their children. Some even feed the ducks. The ducks seemed unafraid of human beings. Some ducks walked or sat on the lawn in groups. Some were swimming in the lake. Other visitors came for the beautiful view. They walked along the water and took photos on the way. Some visitors ran or bicycled.



Figure 13. A man and the ducks were resting on the grass.

Day 2: April 29, Wednesday (9:30 a.m. to 9:50 a.m.)

Weather: Sunny

Number of Users: 47

Human Activities: Reading, sitting, biking, running, walking with or without dogs, site viewing, drawing sketches.

Notes: This was a typical school day. More students came to the Arboretum compared to the weekend. I was sitting on the grass. An aerobic group and a printing class were holding their classes at the Arboretum. The runners ran on the paved path along the Lake Spaford, and the art students were sitting on the grass, sketching the scenery of the Arboretum. Some students were studying on the grass with their bikes parked next to them. Small animals were very active: ducks were walking around, even lying down next to human beings; birds were singing loudly everywhere.

Day 2: April 29, Wednesday (11:50 a.m. to 12:10 p.m.)

Weather: Sunny

Number of Users: 89

Human Activities: Reading, sitting, biking, running, walking with or without dogs, site viewing, holding a class outdoors, having lunch.

Notes: At this lunchtime, the Arboretum was at its most crowded. Most people were staying on the site, lying on the grass, or sitting on the benches. Some preferred to sit under the sun, and others chose a shaded area. They were reading, studying, having their lunch, or taking a nap. Some drama class students used the Arboretum as an outdoor classroom to practice their performance.

Conclusion

The Arboretum works as a backyard garden of UC Davis. The study site provides plenty of sitting space; the majority of seating at the Arboretum is the large, beautiful lawn. In addition, there are seven wooden benches along the site. Most of the time, these benches were occupied. The large, beautiful American elms provide shading for the area. With such plentiful seating and easy access to the central campus, the Arboretum is well used by those who seek a quiet outdoor space. The Arboretum's multiple habitats support a rich biodiversity and are beneficial to the environment. It also provides a large amount of nature resources for scientific studies. However, some wildlife have become overpopulated. Some even snatch human food, which has a negative effect to this wildlife.



Figure 14. People had their lunch at Arboretum.

CASE 2:

CALIFORNIA STATE UNIVERSITY, SACRAMENTO

CSU Sacramento is located in Sacramento, the capital of California. This urban university campus is about 580 acres and has a population of about 29,500. The campus is adjacent to the Campus Commons Area of the American River Parkway. The American River Parkway is a 23-mile stretch of land along the American River. It is one of the most beautiful public parkways in the United States. It preserves the natural, archaeological, historical, and recreational resources of the river. It is easily accessible to Parkway visitors. The Guy West Footbridge, a 600-foot long bicycle/pedestrian bridge, connects the Parkway and the campus.

Research

Location of the American River Parkway and its Campus Commons Area: The American River Parkway is on the north side of the campus. As an open space greenbelt, the American River Parkway extends 29 miles, starting at the Folsom Dam and ending at the Sacramento River. The Campus Commons area is part of the parkway. It includes the area on the right bank (north side) of the river between Howe Avenue and the extension

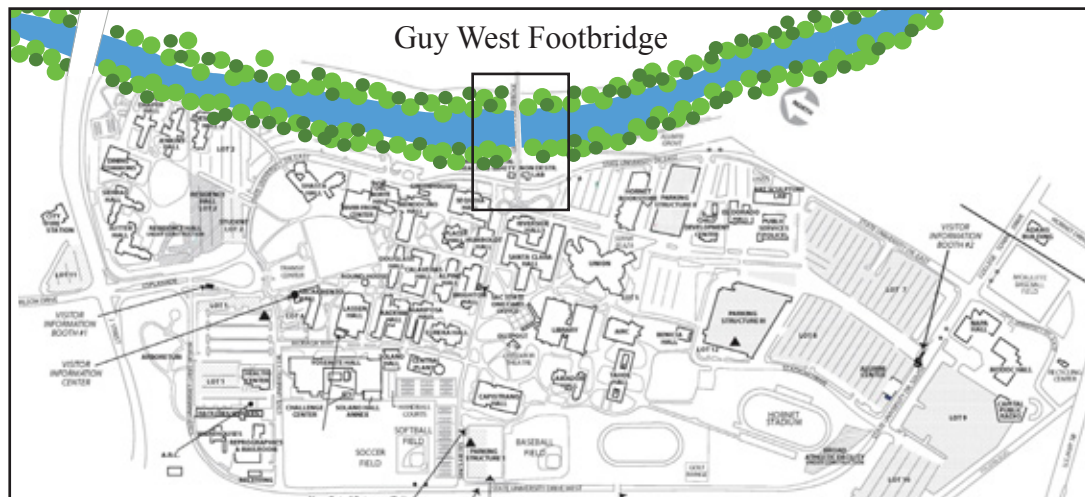


Figure 15. CSUS Campus and the Campus Commons Area of the American River Parkway

of Ethan Way and the area on the left bank (south) side of the river between the H Street Bridge and the Howe Avenue Bridge.

Occupied area: The Campus Commons is approximately 152 acres in size. (Sacramento County American River Parkway Plan 2008. page)

Habitat types: The American River Parkway is rich in outdoor resources. It passes through six distinct vegetation units: riparian, freshwater marsh, oak woodland, grassland, oak grassland, and shrub grassland. In the Campus Commons Area, the river has abundant riparian vegetation along the river's edge, but most of this area is sparsely vegetated grassland. (Sacramento County American River Parkway Plan 2008. page)

Plant species: A great variety of plants inhabit the Parkway. However, non-native invasive plants species occur throughout these areas, with infestations in every habitat type. The native riparian vegetation along the American River Parkway represents a plant community that is becoming rare in California.

In the Campus Commons Area, the natural habitat of the area became disrupted when the Regional Sanitation trunk line was installed. Sycamore trees were planted to mitigate the damage. At the same time, some exotic non-natives have also established themselves. This area has been designated as a Native Plant Restoration Area. (Sacramento County American River Parkway Plan 2008. page)

Wildlife: More than 220 bird and 30 mammal species have been observed in the Parkway, including 45 species of nesting birds. Habitats in the Parkway support resident and migratory wildlife and fish and are used as migration and travel corridors. The Parkway also supports habitat for several special-status species such as those species that are state or federally listed as endangered or threatened. (Sacramento County American River Parkway Plan 2008. page)

Human use: The Campus Commons Area contains trails that are popular for walking, jogging, and bicycling. There are two alignments of the bicycle trail: The lower route winds through the trees and bushes, with occasional views of the river, but it is subject to annual

flooding. The other trail alignment is at the base of the levee. This section is on higher ground and remains usable year-round. An equestrian/hiking trail is also located in this section. An unpaved trail runs along the base of the levee. (Sacramento County American River Parkway Plan 2008. page)

Present challenge: Infestations of weed species increase hydraulic roughness during high-flow events, decrease the capacity of the floodway, and adversely affect bank erosion and sedimentation processes. Areas dominated by non-native weeds prevent native plants from establishing, provide poor habitat quality for wildlife, and discourage recreational uses. (Sacramento County American River Parkway Plan 2008. page 9-10,16-17)



Figure 16. View of the American River Parkway from West Guy Footbridge

Observation

Observation spot: Guy West Footbridge in the Campus Common Area

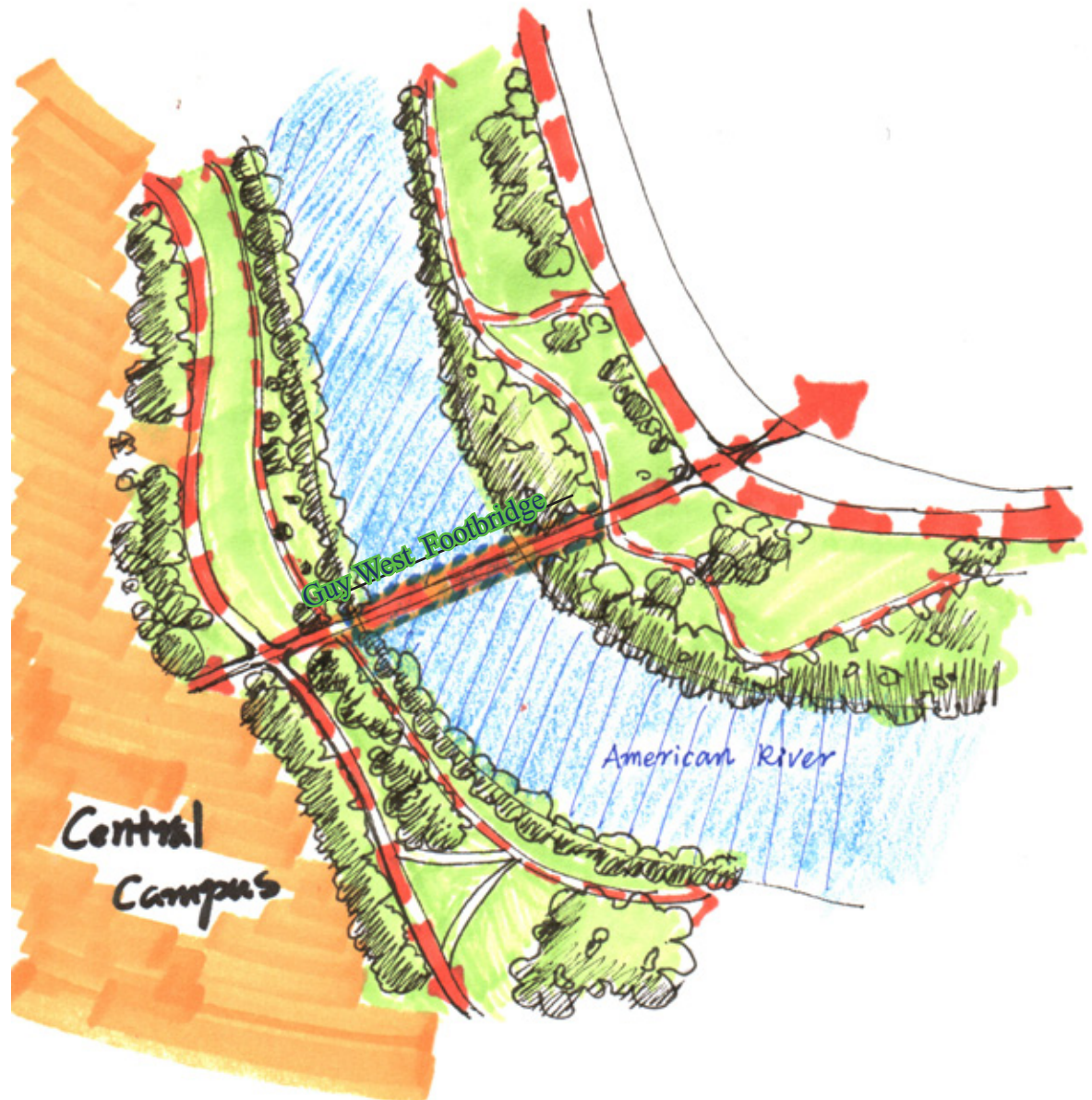


Figure 17. West Guy Footbridge and the Campus Commons Area

Day 1: April 25, Saturday (12:05 p.m. to 12:25 p.m.)

Weather: Sunny, slight wind

Number of Users: 84

Human Activities: Biking, running, walking with or without dogs, visiting, and playing Taiji.

Notes: This was a beautiful Saturday noon. There were no classes on campus, but some people came to the Parkway for recreation. On the bridge, some people walked slowly to enjoy the view of the river; some ran or bicycled. There were no benches around this area. The grassland was not comfortable for sitting, and there was not much shaded area. Not many people stayed on the site. There was only a middle-aged man playing Taiji in the grassland. Many birds appeared on the site and sang loudly.



Figure 18. Guy West Footbridge

Day 2: April 27, Monday (9:07 a.m. to 9:27 a.m.)

Weather: Sunny, slight wind

Number of Users: 107

Human Activities: Bicycling, running, walking with or without dogs, educational observation

Notes: This was a Monday morning. The weather was still very nice. Most people hurriedly crossed the bridge toward campus. Some people came for recreation. They rode bikes,

ran, fast-walked and walked their dogs. On this morning, there was a group of students at the site for scientific study with outdoor measurement tools and notebooks. There were two ducks swimming on the American River, which was fun to watch.

Day 2: April 27, Monday (11:50 a.m. to 12:10 p.m.)

Weather: Sunny, slight wind

Number of Users: 150

Human Activities: Bicycling, running, walking with or without dogs

Notes: The Guy West Footbridge became busy at lunchtime. People crossed the bridge from both sides. Some went to the campus as others left the campus. Most carried backpacks and looked like students. Others looked like they came for exercise. This noon, there were two boats on the American River.

Conclusion

The Guy West Footbridge connects the campus to the other side of the American River, and it induces the nature beauty of American River Parkway to the campus. The multiple walking routes give choices to users to experience different views of the river. However, benches would provide resting areas for the users and make it friendlier to the community.



Figure 19. Most of the Campus Commons Area is sparsely vegetated grassland.

CASE 3:

University of California, Berkeley

UC Berkeley is one of the oldest universities in California. It is an urban university located in downtown Berkeley. It currently has about 35,000 undergraduates and post-graduates. Its central campus owns approximately 200 acres of land. Strawberry Creek is an irreplaceable natural resource for the university and the community. The riparian corridors along the creek are the focus of central campus open space. These areas offer natural contrast to the urban hardscape, acting as a buffer zone to visual amenity and variety. They are also essential places for educational, recreational, social, and individual activities. Strawberry Creek corridors are my study sites in UC Berkeley.

Research

Location of the riparian corridors of Strawberry Creek at UC Berkeley: Through the central campus.

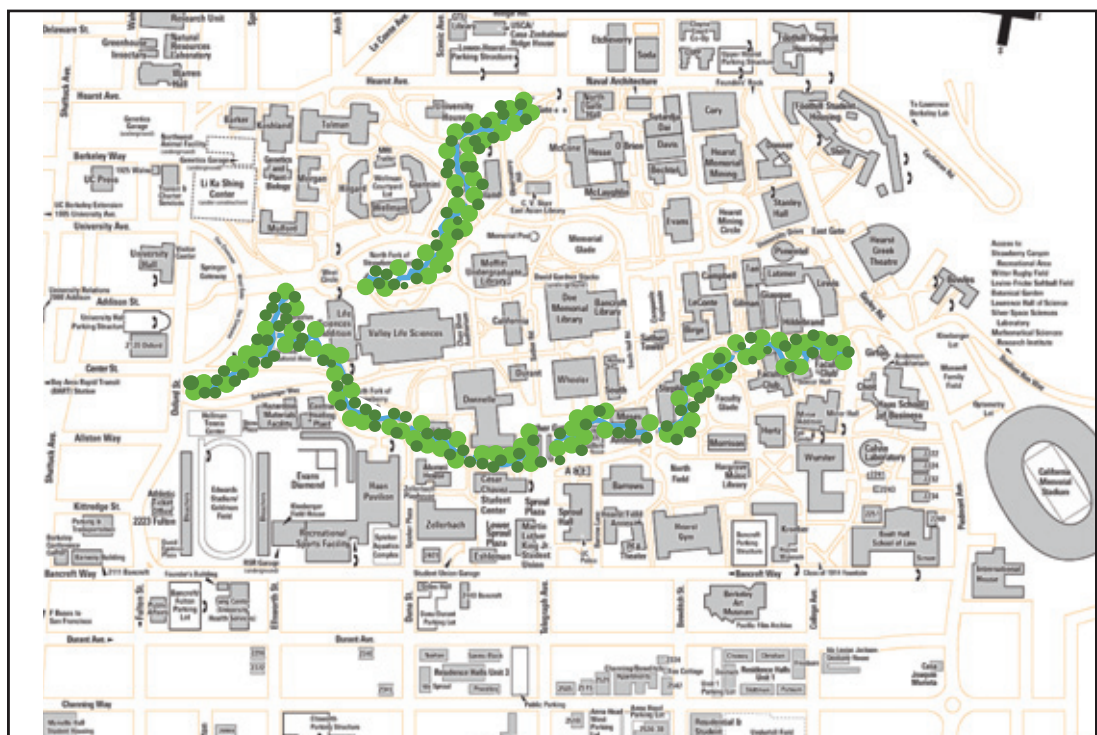


Figure 20. UC Berkeley Campus and the riparian corridors of Strawberry Creek

Plant and wildlife: The diversity of animal life on the central campus has consistently diminished with the increased campus urbanization over the years. Wildlife found on campus today consists primarily of birds, but small mammals and nocturnal scavengers can also be found. Fox, squirrels, mice, and Norway rats make up the small mammalian population. Transient nocturnal animals include raccoons, opossums, and even deer that occasionally wander down from the hills. Resident birds on the central campus include scrub jays, Stellar jays, robins, chickadees, brown towhees, mourning doves, house finches, black phoebes, starlings, and various sparrows. Migratory birds also utilize the campus area during the winter (Charbonneau Page).

Habitat: Since the College of California moved from Oakland to the present campus site, urbanization has begun to affect Strawberry Creek. The creek had been neglected; subsequently, the environmental quality of the creek and its associated riparian areas continued to deteriorate. This caused the absence of diverse flora and fauna in the creek itself and along its banks. Until 1987, the campus has attempted to restore the natural quality of the creek. Today, the natural quality of the creek has been improved (Charbonneau Page).

Human use: After the restoration of the nature quality of the creek, the riparian corridors of Strawberry Creek provide essential places for educational, recreational, social, and individual activities. Each year, more than 3,000 undergraduates take classes ranging from



Figure 21. Strawberry Creek

biology to engineering along the creek. At certain times of the year, art students stand alongside or even in the creek itself (Charbonneau Page 1-2, 72).

Observation

Observation spot: To observe Strawberry Creek, I decided to walk along the stream instead of staying in one place, because I found there was no particular spot on the creek that was designed for people's gathering.

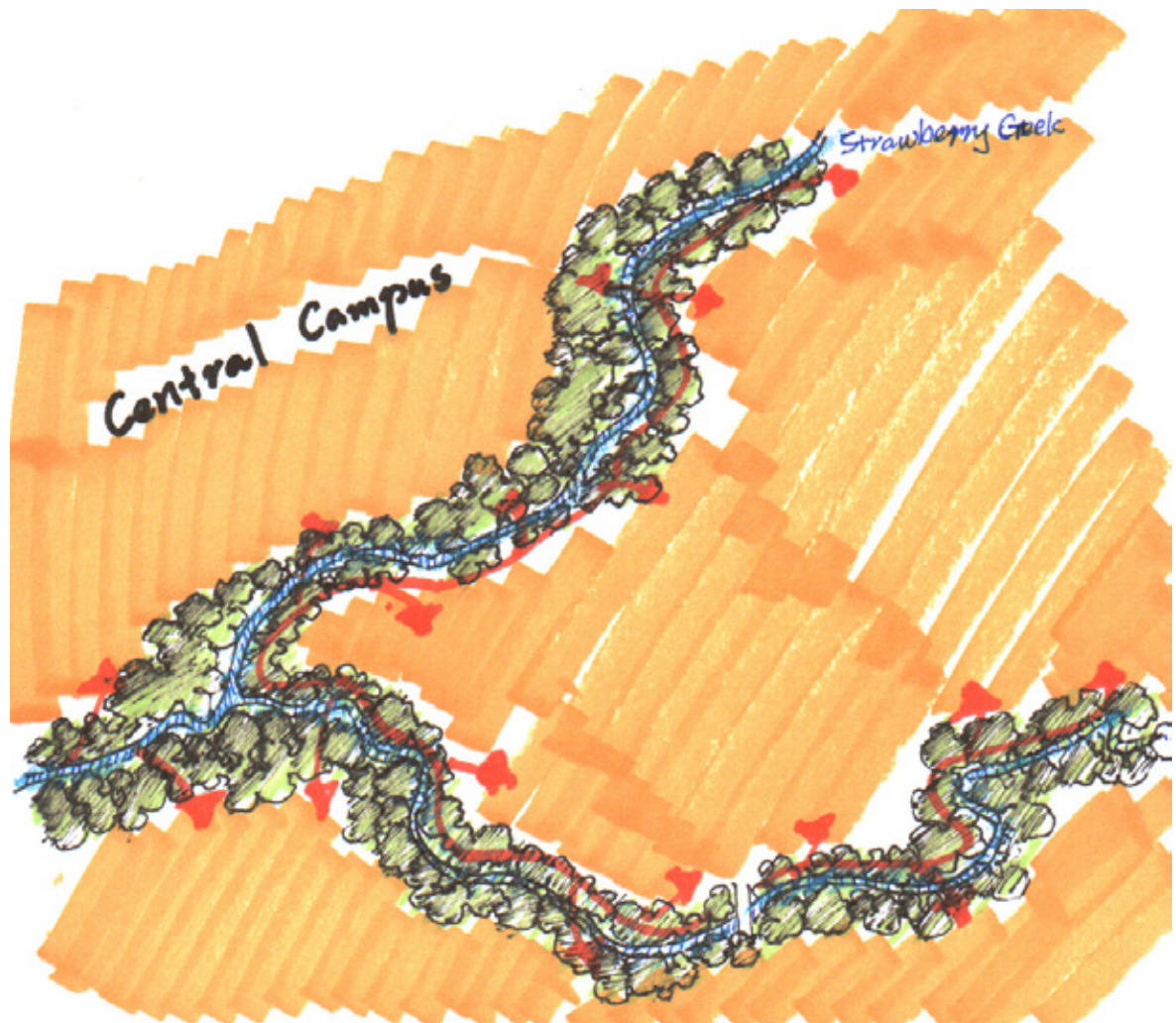


Figure 22. The riparian corridors of Strawberry Creek

Day 1: April 30, Thursday (10:05 a.m. to 12:30 p.m.)

Weather: Sunny, slightly cloudy

Number of Users: Did not count users at this time because most people only walked by the creek and did not stop.

Human Activities: Walking, smoking

Notes: Some parts of the creek were planted with dense vegetation. These areas were quite, cold, and in shade. There were more birds in these areas. However, there were not many people on the site. There were a few benches along the stream, and most of the time, these benches were used by individuals. These people sat next to the creek, smoked, or chatted on phones. Since the creek is located on the central campus, most of people just walked by or crossed the creek. At lunchtime, this creek did not attract many people to stay.

Day 2: May 2, Saturday (10:30 a.m. to 11:30 a.m.)

Weather: Cloudy

Number of Users: No count

Human Activities: Walking, resting

Notes: There were fewer students on campus on Saturday, and fewer people used the creek.

Conclusion

The riparian corridors of Strawberry Creek have limited seating space, especially benches for group use. Most areas were in the shade of the large trees. Parts of the creek still has pollution. Not many different wildlife species appeared on the site. However the walking routes along the stream allowed pedestrian and bikers easy access to different part of the campus.



Figure 23. and 24. A squirrel and trees at the riparian corridors of Strawberry Creek



Survey Results Analysis

From the 39 survey forms returned, one-third of the respondents describe that they would prefer to use the study sites (the nature landscape features) compared to the open lawn spaces on campus; two-thirds would still prefer to use the open lawn space, which is much closer to their class buildings. More than half the respondents prefer a quiet outdoor space. Thirty out of 39 note that they are interested in wildlife, such as butterflies, bees, hummingbirds, and squirrels. Two-thirds of the respondents would like to use wooden benches compared to benches of other material; recycled plastic benches are the second choice.

CHAPTER 3

REWILDING GUIDELINES

After reviewing case studies on three urban university campuses for the pros and cons of nature preservation, guidelines of rewilding were summarized as below:

1. Discover the original ecosystem, local plants and wildlife of the project site
2. Get a reference ecosystem near by
3. Create multiple diversities through approaches such as planting native plants, constructing arboretums or parkways
4. Aware the balance of the existing non-native ecosystem and the original ecosystem
5. Maximize opportunities for connecting to the surrounding community
6. Offer a choice of several multiple-use routes
7. Provide different seating arrangements
8. Manage insect pests and balance the population of plants and wildlife
9. Prevent environment pollution

CHAPTER 4

REDESIGN

**CALIFORNIA STATE
UNIVERSITY**

SAN FRANCISCO

Site Analysis

California State University, San Francisco (SFSU), a 134-acre campus, is an urban terrain in the southwest of San Francisco, California. SFSU lies adjacent to Lake Merced. Lake Merced Boulevard is the only construction separating the land on which SFSU stands and the mesa area of the lake. Before humans altered the land, SFSU and Lake Merced shared the same ecosystem (Reiff Page 1).



Figure 25. SFSU is next to Lake Merced

The original ecological sub region.

The Coastal Scrub community—also called a Dune Scrub or Soft Chaparral community—is the original ecological sub region that existed on the land now occupied by SFSU. This plant community can be found directly adjacent to the beach. It consists of densely packed shrubs grasses and wildflowers interspersed with areas of open sand. In addition to a Coastal Scrub community, a Coastal Prairie plant community also likely existed. This ecological subregion is marked by bunch grasses and wildflowers (Reiff Page 3).

The following is a list of plants native to the Coastal Scrub community that were likely found in the historical ecosystem of the SFSU campus. This list, which by no means is exhaustive, will be useful when planning restoration work:

Bush Lupine	<i>Lupinus Arboreus</i>
Bush Monkeyflower	<i>Mimulus Aurantiacus</i>
California Coffeeberry	<i>Rhamnus Californica</i>
Silver Bush Lupine	<i>Lupinus Chamissonis</i>
Coyote Bush	<i>Baccharis Pilularis</i>
Lizard Tail	<i>Eriophyllum Staechadifolium</i>
Mock Heather	<i>Ericameria Eriocoides</i>
Poison Oak	<i>Toxicodendron Diversilobum</i>
California Sagebrush	<i>Artemisia Californica</i>
Cliff Buckwheat	<i>Eriogonum Parvifolium</i>
California Buckwheat	<i>Eriogonum Fasciculatum</i>
California Aster	<i>Corethrogyne Filaginifolia</i>
Golden Bush	<i>Isocoma Menziesii</i>
Encelia	<i>Encelia Californica</i>
Black Sage	<i>Salvia Mellifera</i>
Purple Sage	<i>Salvia Leucophylla</i>
White Sage	<i>Salvia Apiana</i>
Fuchsia-flowered Gooseberry	<i>Ribes Speciosum</i>
Beach-bur	<i>Franseria Chamissonis/ Franceria Bipinnatifida</i>
Yellow Sand Verbena	<i>Abronia Latifolia</i>
Evening Primrose	<i>Oenothera Spiralis</i>
Indian Paintbrush	<i>Castilleja</i>
Cobweb Thistle	<i>Cirsium Occidentale</i>
RARE / ENDANGERED SPECIES:	
Delores Campion	<i>Silene Verecunda</i>
Dune Gilia	<i>Gilia Capitata ssp. Chamissonis</i>
San Francisco Lessingia	<i>Lessingia Germanorum var. Germanorum</i>
San Francisco Spineflower	<i>Chorizanthe Cuspidate</i>
San Francisco Wallflower	<i>Erysimum Franciscanum</i>



Figure 26. *Lupinus Arboreus*

Following is a list of plants native to the Coastal Prairie community, which will also be useful for planning restoration work; again, this is not an exhaustive list:

Coast Red Onion	<i>Allium Dichlamydeum</i>
Ithuriel's Spear	<i>Triteleia Taxa</i>
Blue Wild Rye	<i>Elymus Glaucus</i>
Purple Needlegrass	<i>Nassella Pulchra</i>
Douglas Iris	<i>Iris Douglasiana</i>
Crowfoot Buttercup	<i>Ranunculus Californicus</i>
Blue-eyed Grass	<i>Sisyrinchium Bellum</i>
Yarrow	<i>Achillea Millefolium</i>
Cliff Buckwheat	<i>Eriogonum Parvifolium</i>
California Buckwheat	<i>Eriogonum Fasciculatum</i>
California Poppy	<i>Eschscholzia Californica Maritima</i>
RARE / ENDANGERED SPECIES:	
San Francisco Owl's Clover	<i>Triphysaria Floribunda</i>
Presidio Clarkia	<i>Clarkia Franciscana</i>
Marin Dwarf Flax	<i>Hesperolinon Congestum</i>
San Francisco Gum Plant	<i>Grindelia Hirsutula</i>

After humans altered the land, many native animal species such as the Thickettail Chub, Strohbeen's Parnassian Butterfly, the Sooty Crayfish, and the San Francisco Horseshoe Shrimp had been declining in numbers and becoming extinct. Many endemic animal species, however, still exist, such as Desert Cottontail and Deer Mouse. They are either on the San Francisco Peninsula itself or in the greater Bay Area (Reiff Page 7).



Figure 26. Desert Cottontail

Current SFSU Campus Landscape and Challenges of Rewilding.

In many years of development, the land of the campus have been occupied by the current SFSU campus landscape, such as landscape fragmentation by buildings and walkways, shade created by tall buildings, expensive and heavily irrigated lawns, and non-native plantings. These features have become the challenge to reenact the exact historic ecological trajectory. One of the biggest challenges is the non-native trees; these large trees that now dominate the campus landscape change the habitat by altering wind, shade, moisture, and soil condition. However, these trees also prove to be prime nesting and roosting habitat for raptors, which are valued to the urban biodiversity (Reiff Page 12).



Figure 27. A view of the western campus

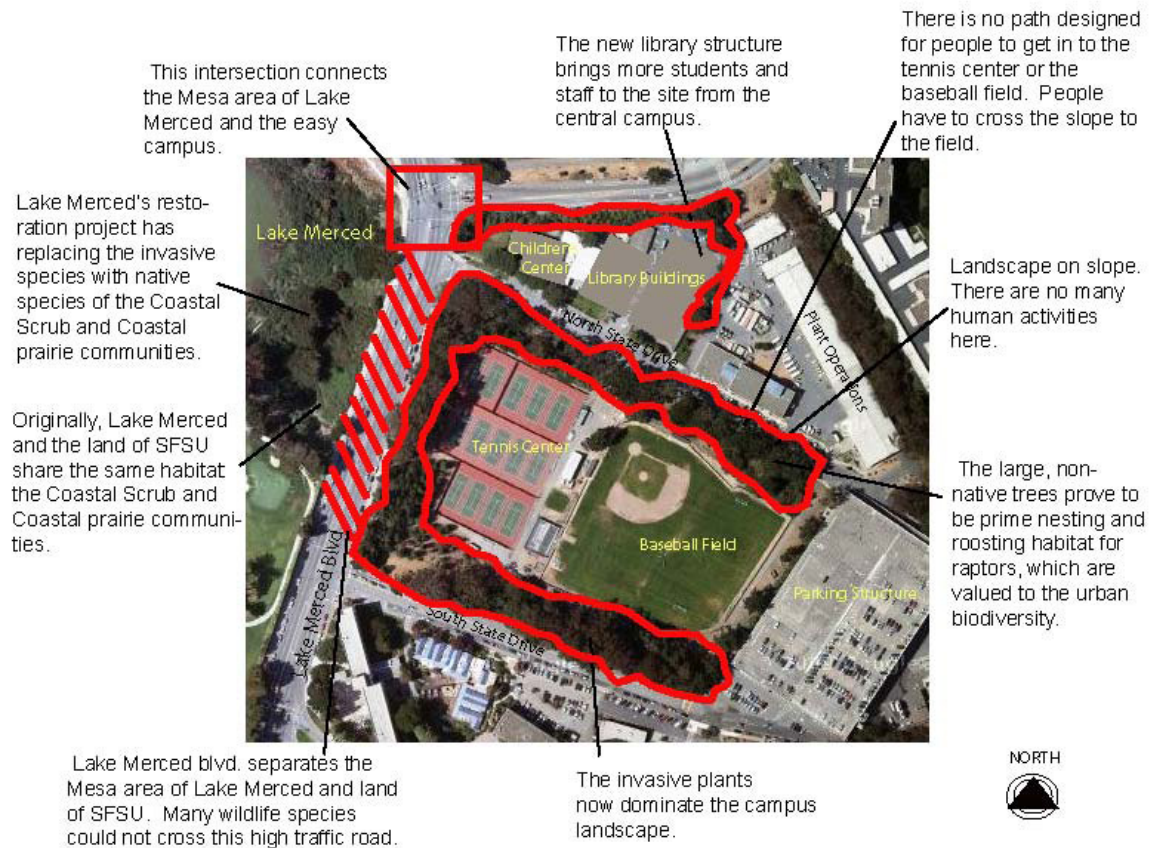
Restoration of Lake Merced can be a reference ecosystem for the project site.

Much like areas of the SFSU campus, the mesa area of Lake Merced suffered ecological damage as a result of human land use. It contains numerous non-native invasive plants such as Ice plant, Cape Ivy and large trees such as Monterey pine, cypress, and eucalyptus. Restoration projects, however, have removed the invasive species, replacing them with native species of the Coastal Scrub and Coastal prairie communities. The level of biodiversity, especially of insects and birds, has sharply risen since the restoration projects were executed and maintained. The non-native large trees such as Monterey pine, cypress, and eucalyptus have value in providing nesting and roosting habitat, and these have been kept on the mesa area of the Lake Merced. While the ground directly beneath the trees is unsuitable to many native shrubs grasses and wildflowers for the aforementioned reasons, substantial tracts of restored areas, vegetated with native flora, are thriving around and between stands of these non-native trees (Reiff Page 15). The mesa area of Lake Merced can be used as a model for setting the goals and standard for the restoration project.



Figure 28. Lake Merced

In this design section, this project would redesign the western campus, just across Lake Merced Boulevard from the lake. The western campus is currently used for tennis courts, a baseball field, ground faculties, a temporary library, and a children’s center. This study chose the Children’s Center and the Bridge Garden for detailed plans.



The Western Campus Conceptual Plan

In the conceptual plan I had designed for the western campus, many native plants will be restored in the planting area (shown in light green). Some of the non-native trees, which provide the habitat for its local biodiversity, will remain (dark green circles). Many walking paths will be built around the west campus to make the environment more friendly to the students and the communities (blue dash lines). A bridge garden across the Lake Merced Boulevard on the west side of the campus will be constructed. This design will connect the ecosystem of the SFSU campus and the Mesa Area of Lake Merced. It also provides a safe and delightful crossing for those passing over the boulevard.

The Children's Center Garden Plan

Children's Center Garden will be designed as a small arboretum. It was inspired by the arboretum in UC Davis to create a space that can be enjoyed by both nature and people. The colorful plants here could attract small insects such as butterflies and hummingbirds. This arboretum will encourage children's interests of nature and help them understand that human habitat can be in harmony with the wildlife habitat.

The Bridge Garden Plan

The main purpose for this Bridge Garden, which crosses over Lake Merced Boulevard is to connect SFSU Campus and the Mesa Area of Lake Merced; a connection between the campus and nature environment. The idea of a bridge is inspired by the Guy West Footbridge from CSUS. On the bridge, native shrubs will be planted. It will give the bridge a colorful and delightful view. Seating benches will be settled along the paths and the planting. It will create a nice resting area for those passing over the boulevard.

This birdge garden can be used for walking, jogging and ADA accessible.



Figure 46: 3 D Model of the Bridge Garden

For the Children Center Garden and the Bridge Garden, plant selections will be focused to provide a habitat for bees, butterflies, and hummingbirds; the plants belong either to the Coastal Scrub community or the Coastal Prairie community. A propose plant list is listed below:

Botanical Name	Common Name	Plant Type	Height	Notes
<i>Artemisia californica</i>	California sagebrush	Shrubs	3'-4'	Good cover plant for birds, but pollen and seed dispersal is via wind, good for full slope.
<i>Encelia californica</i>	California sunflower	Shrubs	2-4'	High shrub covers in yellow daisy flowers. May-June, native to coastal bluffs and foothills, good for slope, tolerate clay likes summer water, may e short lived. Attracts bees and butterflies.
<i>Eriogonum fasciculatum</i>	California buckwheat	Shrubs	1'-3'	Good for stabilizing slopes
<i>Lupinus albifrons</i>	Silver bush lupine	Shrubs	3'-5'	Needs full sun. Host plant for the Mission Blue butterfly.
<i>Lupinus arboreus</i>	Bush lupine	Shrubs	Up to 6'	Very fast growing, yellow or purple flowers May - July, native to coast.
<i>Rhamnus californica</i>	Coffee berry	Shrubs	Up to 10'	Sun to part shade, evergreen, drought tolerant, berries attract birds. Larval food plant for Pale swallowtail butterfly, also attractive to beneficial insects.
<i>Ribes speciosum</i>	Fuchsia-flowered gooseberry	Shrubs	4'	Sun to shade, drought tolerant, prefers no summer water, blooms Jan – May. Very thorny and dormant from late summer - early fall, so best planted in the back of a bed. Especially attractive to hummingbirds.

Botanical Name	Common Name	Plant Type	Height	Notes
<i>Salvia leucophylla</i>	Purple sage	Shrub	3'-6'	Needs sun and no water once established, native to coastal scrub. All <i>Salvia</i> spp. attract bees, butterflies, and hummingbirds.
<i>Salvia mellifera</i>	Black sage	Shrub	3'	Evergreen, pale flowers from March – July, native to sunny dry coastal slopes.
<i>Abronia latifolia</i>	Yellow sand verbena	Perennials		Stress deciduous, needs very sandy soil with a minimum of organic matter, does not tolerate regular water or extreme drought, attracts butterflies.
<i>Achillea millefolium</i>	Common yarrow	Perennials	Up to 2'	Grows near coast, up to 2' tall, spreads rhizomatously, blooms May – June. Grows with <i>Eriogonum parvifolium</i> , <i>Erigeron glaucus</i> , good for a butterfly garden, attracts bees and beneficial insects.
<i>Corethrogyne filaginifolia</i> (syn. <i>Lessingia filaginifolia</i>)	California aster	Perennials		1" diameter lavender daisy flowers, spring blooming, often summer deciduous. Attracts many butterflies, host plant for Gabbs checkerspot.
<i>Eriophyllum staechadifolium</i>	Lizard tail	Perennials	1'	Locally native, silvery foliage, blooms May-Sept.

Botanical Name	Common Name	Plant Type	Height	Notes
<i>Erysimum franciscanum</i>	San Francisco wallflower	Perennials		Endemic to coastal serpentine bluffs of SF, larval host for <i>Pieris</i> butterflies, pollinated by bees, wasps.
<i>Iris douglasiana</i>	Douglas iris	Perennials		likes full sun at the coast, evergreen, drought tolerant to occasional water, “a borer that tunnels into the flower stalks and rhizomes is cyclically troublesome in the SF area but vigorous plants usually rebound.” Lavender blooms March – May. <i>Iris</i> spp. attracts hummingbirds, butterflies, and bees.
<i>Mimulus aurantiacus</i>	Sticky monkeyflower	Perennials		Grows at Lake Merced. Attracts hummingbirds, host plant for Chaldeon checkerspot. Many hybrids available in the trade.
<i>Sisyrinchium bellum</i>	Blue-eyed grass	Perennials		Drought tolerant but accepts water. Attracts hummingbirds, bees, and butterflies.
<i>Festuca idahoensis</i>	Blue Fescue	Bunch grass		Full sun. host plant for Lindsey’s skipper.
<i>Eschscholzia californica</i> var. <i>maritima</i>	Coastal CA poppy	Annuals		Pollinated by beetles and bees. Present on campus, can be aggressive (may be out-competing the <i>maritima</i> variety).
<i>Gilia capitata</i>	Globe gilia	Annuals		Attracts bees, butterflies.



Abronia latifolia
Yellow sand verbena



Achillea millefolium
Common yarrow



Artemisia californica
California sagebrush



Corethrogyne filaginifolia
(syn. *Lessingia filaginifolia*)
California aster



Encelia californica
California sunflower



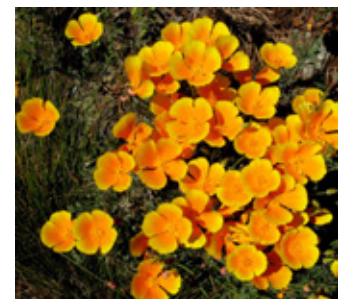
Eriogonum fasciculatum
California buckwheat



Eriophyllum staechadifolium
Lizard tail



Erysimum franciscanum
San Francisco wallflower



Eschscholzia californica var.
maritima
Coastal CA Poppy



Festuca idahoensis
Blue fescue



Gilia capitata
Globe gilia



Iris douglasiana
Douglas iris



Lupinus albus
Silver bush lupine



Lupinus arboreus
Bush lupine



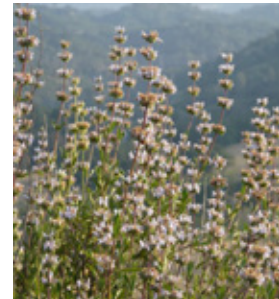
Rhamnus californica
Coffeeberry



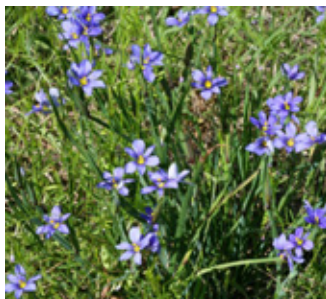
Ribes speciosum
Fuchsia-flowered gooseberry



Salvia leucophylla
Purple sage



Salvia mellifera
Black sage



Sisyrinchium bellum
Blue-eyed grass

Figure 29-45: Plants

CONCLUSION

Rewilding, is a process of creating a natural system that provides a suitable habitat for wildlife in an urbanized setting. It is also a process to seek a balance between nature and human dwelling. Based on the research, it shows the important benefits and limitation of rewilding. The case studies of three different urban university campuses help us to summarize a guideline for rewilding. Redesigning a university campus in San Francisco, shows that rewilding is a practical plan that can improve the natural environment on any urban university campus, and is beneficial for both the wildlife and the urban dwellers. Ultimately, by its success at the university level, the rewilding project can be expanded to a community scale. One day, human beings can understand the fundamental concepts of ecosystem health, the importance of biodiversity, and the idea that the human habitat can be in harmony with the wildlife habitat.

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Acknowledgement Photo: Butterfly

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Figure 1 Urbanization

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Figure 2: Butterfly and white flower

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Figure 4: American river clean bird

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Figure 5: American river eagle

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Figure 7: Girl with wildlife

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Figure 27: Desert Cottontail

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Figure 29 – 45 Plant List

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Figure 3, Figure 6, Figure 8-25, Figure 27,28, and 46
Xiaojun Xu

Rewilding Design Project for SFSU: Conceptual Plan

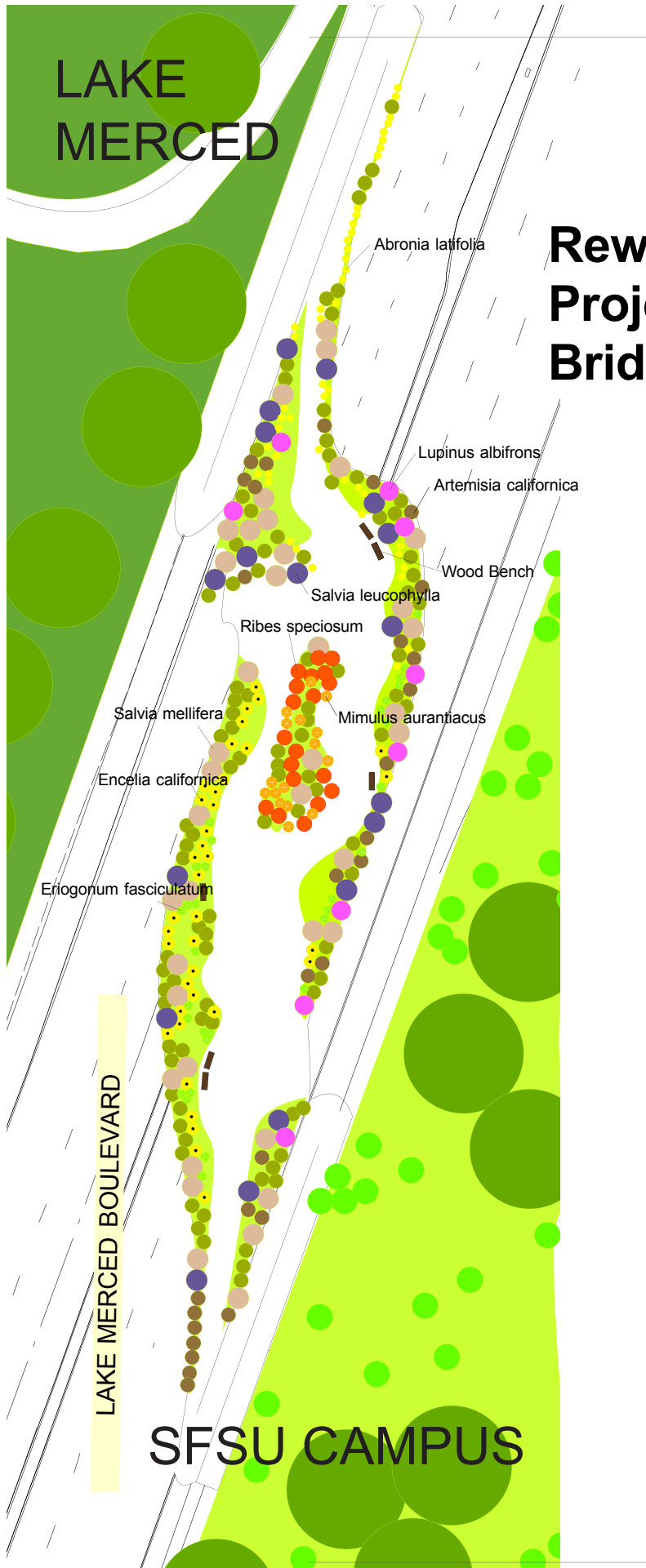


Rewilding Design Project for SFSU: Children's Center Garden Plan



LAKE
MERCED

Rewilding Design Project for SFSU: Bridge Garden Plan



Abronia latifolia

Lupinus albifrons

Artemisia californica

Wood Bench

Salvia leucophylla

Ribes speciosum

Salvia mellifera

Mimulus aurantiacus

Encelia californica

Eriogonum fasciculatum

LAKE MERCED BOULEVARD

SFSU CAMPUS

- Mimulus aurantiacus
- Eriogonum fasciculatum
- Abronia latifolia
- Festuca idahoensi
- Artemisia californica
- Encelia californica
- Ribes speciosum
- Salvia leucophylla
- Salvia mellifera
- Lupinus albifrons

NORTH



NOT IN SCALE