

**Putah Creek Riparian Reserve  
Experimental Ecosystem and North Fork  
Supplemental Management Plan**

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# Introduction

## Experimental Ecosystem Overview

The Putah Creek Riparian Reserve Experimental Ecosystem Facility (Ecosystem) is a 2007 addition to the Putah Creek Reserve. It is located on the western edge of the University of California, Davis (UC Davis), and north of Putah Creek (Figure 1). The Putah Creek Riparian Reserve (Reserve) is managed as a teaching and research area, consistent with the mission of the University of California. The area south of the Ecosystem which is adjacent to Putah Creek was the previous extent of the Reserve in this Reach. The Ecosystem is approximately 65 acres, north of Putah Creek, west of Road 98, located within Reach 2 (Figure 2). The Ecosystem is not open to the general public.

Prior to assignment to the Reserve, the Ecosystem was a research area for the Wildlife, Fish, and Conservation Biology Department. Though it was unused by the department immediately before assignment to the Reserve, it historically housed a deer herd, geese within a flight pen, and the basins were kept full of water.

The Ecosystem provides wildlife habitat for wildlife such as ducks, geese, hawks, river otter, raccoons, beaver, perch, and other fish, birds, and mammals. The variety of habitat types within the Ecosystem allows for a variety of wildlife to find food and nesting areas. The Ecosystem presents a unique opportunity to conduct field research in an area that has a variety of natural resource habitat types that allow for landscape manipulation outside of the regulatory constraints found within the Putah Creek corridor. The perimeter security fencing and close proximity to the central campus are also attractive features of the Ecosystem.

## North Fork Overview

The Putah Creek Riparian Reserve North Fork (North Fork) is located on UC Davis-owned and managed lands near Putah Creek (Figure 1), and is designated as Reach 7.

The 2005 Management Plan included the North Fork. Since 2005, an additional 15 acres were added to the Reserve, necessitating an update in the planning for the North Fork.

The North Fork is approximately 36 acres, north of Putah Creek, west of Highway 113. Within the 36-acres, the North Fork property includes a 2-acre parcel south of the centrifuge facility and another 2-acre parcel to the east of this, in the old creek channel. These parcels are disconnected from the remainder of the North Fork property. The North Fork is not open to the general public, but is open for classes and researchers.

Prior to assignment to the Reserve, the North fork has been home to a diversity of uses. The western 23-acres were previously known as the Speith Reserve, but had been unused for an unknown number of years prior to 2002. The eastern 13-acres had been used by Animal Science as cattle pens until 2009.

The western 23-acres of the North Fork provides wildlife habitat for wildlife such as ducks, geese, hawks, perch, and other fish, birds, and mammals. The eastern 13 acres of former cattle pens presents an opportunity for restoration. The North Fork presents opportunities to conduct field research in an area that has a variety of natural resource habitat types within a fenced area. Like the Ecosystem, close proximity to the central campus is an attractive feature of the North Fork.

## Need for a Supplemental Management Plan

In 2005, a Management Plan Proposal was prepared for the Putah Creek Riparian Reserve. The plan outlined the proposed future direction of the Reserve.

In 2007, management responsibility for the Experimental Ecosystem was transferred to the Putah Creek Riparian Reserve. In 2009, management responsibility for an additional 13 acres of the North Fork, and 2 acres of land south of the centrifuge were transferred to the Putah Creek Riparian Reserve. The 2005 Management Plan did not directly address these properties.

This document is supplemental to the overall Management Plan, and was prepared by the Reserve Manager with review and comment by the Putah Creek Reserve Advisory Committee.

## Definition of Terms

A 'goal' is a broad, generalized expression of a desired end toward which effort is directed. For example, a goal might be 'protection and enhancement of ecosystem health.'

An 'objective' is something toward which an effort is to be directed. An objective is similar to a goal, but more narrowly focused. Related to the example above, an objective might be: 'removal of invasive species from the Reserve.' A goal may imply numerous objectives.

A 'planning issue' is recognition of current or projected conditions which are at variance with stated goals and objectives. Planning issues reflect goals and objectives. For example, if vegetation removal due to floodway management is seen as an issue due to subsequent habitat loss, certain natural resource goals and objectives are implied.

A 'policy' is a high-level overall plan embracing the general goals and objectives of this document. For example, a policy related to the above goals and objectives might be: 'allow for removal of invasive vegetation along the creek, especially where it can benefit flood flow carrying capacity.'

An 'implementation action' is a specific measure with measurable results. Implementation actions are concerned with the specific actions necessary to carry out policy within a definite time period. For example, an implementation action might be: 'remove all Tamarisk from the north bank of the creek between County Road 98 and the Fire Ring, by spring 2006.'

## Plan Organization and Use

This plan is organized to present a logical process by which management policies and actions are implemented. Goals and objectives are identified, planning issues are identified, and specific policies and implementation actions are presented.

Policies listed in the report outline the management program for the Ecosystem and North Fork, consistent with the adopted overall Management Plan for the Reserve. These policies were generated utilizing background information summarized in the introductory sections of this report and are responsive to the plan goals and objectives.

Implementation actions outline specific measures to implement the proposed policies. These are listed at the end of the document and are the realization of the policies.

The goals, objectives, issues, policies and implementation actions in the plan are the result of planning meetings held by the Reserve Advisory Committee, and observations by the Reserve Manager.

This supplemental management plan is a living document. The plan will be reviewed annually by the Reserve Manager and Reserve Steward to determine if the outlined actions are successful, or need modification and adaptation to new situations or circumstances. It is intended to serve as a roadmap for the future ecological health of the Ecosystem and North Fork properties and should be used as guidance toward that end.



# Background Information

## Site Conditions

### Boundaries and ownership

The Ecosystem is located on University-owned land north of Putah Creek, west of Road 98, adjacent to the Campus landfill (Figure 1). The 65-acre site is predominantly grassland, and includes a 1.25-acre shop and yard facility, 1.5-acres of permanent open water, a 6.4-acre hill, and 11.3-acres of basins. The basins are dry, but have the ability to be filled with water purchased from the Campus' Lake Berryessa supply.

The North Fork is located on University-owned land north of Putah Creek, west of Highway 113 (Figure 1). The 36-acre site is predominantly grassland, and includes the 1-acre Jameson Pond, as well as the former channel of Putah Creek. The creek channel is currently dry and disconnected from the adjacent South Fork of Putah Creek.

### Topography

The Ecosystem has a range of topography, from almost flat to a small hill in the center of the facility. Beaver Pond and Curve Pond (Figure 2) are perennial ponds that are fed from discharge water from the Center for Aquatic Biology and Aquaculture (CABA).

There are six basins within the facility that were designed to be used as research ponds when funds were available for purchase of Berryessa water, but only one held water. All basins are currently dry, and form low spots within the facility.

Topography within the North Fork ranges from almost flat to small mounds around Jameson Pond. The old alignment of Putah Creek is visible from along the edges of Brooks and Garrod roads.

Jameson Pond is a perennial pond, supplied by water discharged from CABA. This water can be controlled from a valve near the edge of Jameson pond, allowing for fluctuation in water levels or a drying of the pond.

## Geology/Soils

Both the Ecosystem and North Fork soil types have USDA designation as Class A soils, which are deep, rich, and have few limitations on types of plants that can be grown (Figures 2 and 3). The USDA/NRCS soil classifications for the Ecosystem include Yolo silt loam and Brentwood Silty clay loam. The USDA/NRCS soil classifications for the North Fork include Yolo silt loam and Reiff very fine sandy loam.

## Biological resources

### Native vegetation

Vegetation communities within the Ecosystem include ruderal annual grasslands, open water ponds, and valley-foothill riparian woodland (Figure 4). Most of the vegetation within the Ecosystem is comprised of non-native exotic plants. The grasslands are comprised of annual exotic grasses and broadleaf weeds, but there are important elements of native vegetation in the ecosystem.

Around Beaver and Curve ponds, large stands of sandbar willow (*Salix exigua*) have established. Sandbar willow has also formed a dense thicket along the south end of the facility along the canal that feeds the two ponds. Small stands of tules (*Scirpus acutus*) have established on the edges of Curve pond.

A former research project established a one-acre perennial grassland, comprised mostly of creeping wildrye (*Leymus triticoides*) and blue wildrye (*Elymus glaucus*). This stand of native grasses has persisted and has little infestation from the surrounding annual grasses.

Vegetation communities within the North Fork include open water ponds and valley-foothill riparian woodland with an annual grassland understory (Figure 5).

Around Jameson pond, large willows have established. The perimeter of the pond is almost exclusively native cattails (*Typha spp.*). Larger Valley oaks (*Quercus lobata*) have also established on the higher edges of the ponds, as well as the center island. Elderberry shrubs (*Sambucus mexicana*) have also established around the pond. A large stand of sandbar willow is spreading out from the southern discharge area, near the drop-inlet to the storm water system.

A former research project established small pockets of native perennial grassland west of the pond near the western boundary, comprised mostly of creeping wildrye and blue wildrye. It is too soon after the project implementation to know if this stand will persist.

## Invasive vegetation

Most of the vegetation within the Ecosystem is comprised of non-native exotic plants. The grasslands are comprised of annual exotic grasses and broadleaf weeds. The Ecosystem upland vegetation contains non-native eucalyptus (*Eucalyptus spp.*), Himalayan blackberry (*Rubus discolor*), Tree of Heaven (*Ailanthus altissima*), and invasive annual grasses. The predominant invasive annual weeds within the grasslands include star thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and wild oats (*Avena fatua*).

The perimeter of each pond has large unbroken stands of Yellow-flag iris (*Iris pseudacorus*). The iris forms thick mats which spread out over the water surface. If left unchecked, they would eventually fill in the ponds. This weed has spread into an adjacent basin and a few patches have been eradicated on Putah Creek.

The perimeter of Beaver pond includes other invasive plants, including Himalayan blackberry, tree of heaven, and eucalyptus.

The North Fork contains non-native eucalyptus, Tree of Heaven, and invasive annual grasses. The predominant invasive annual weeds within the grasslands include star thistle, Italian thistle, milk thistle, and wild oats.

The bulk of the Tree of Heaven had been removed prior to 2008, and only a few individual stands remain. Some of the larger trees are located on the eastern section of the North Fork, near Highway 113.

## Terrestrial wildlife

Smaller wildlife, such as raccoons (*Procyon lotor*), tree and ground squirrels (*Spermophilus spp.*), are present at both the Ecosystem and North Fork, with

raccoons seen frequently at the Ecosystem. Beaver (*Castor canadensis*) are abundant along the creek, and the Reserve has several beaver dams along its length. Appendix B of the 2005 Putah Creek Riparian Reserve Management Plan lists native and introduced mammals of the Sacramento River Valley Riparian Communities. This species list was originally presented in the 1986 Reserve Management Plan. Beaver frequent their namesake Beaver pond as well as Curve pond.

Non-native wildlife, including feral cats (*Felis catus*) and black and Norway rats (*Rattus spp.*), squirrels, wild turkeys, and peacocks have the potential to cause significant damage to native bird and reptile populations. Efforts must be made to assess the potential impact from these species and determine appropriate measures to control their populations. Feral cats are frequently seen at the Ecosystem.

## Birds

The 1986 Reserve Management Plan species lists (Appendix B in the 2005 Management Plan) identified 129 existing or potential bird species within the Reserve. Of those species, 38 are very commonly found within the Reserve. Maintaining a mosaic of habitat types within the reserve will help with sustaining the native bird populations.

## Fisheries

Within the Ecosystem and North Fork, only Jameson, Beaver, and Curve ponds have a perennial water supply. The ponds are used for fisheries research and the species of fish may change as research dictates. At present, they are used as a research pond for Sacramento perch (*Archoplites interruptus*).

## Water Resources

The Ecosystem facility has two perennial ponds. These ponds are fed by discharge water from the CABA Putah Creek facility, running through a canal along the access road south of the facility fence. Water level in the ponds has some measure of control, primarily between Beaver Pond and Curve Pond. A new drop-inlet was installed in 2009, giving additional control over water levels. Overflow water from the ponds empties into an outfall which drains into Putah Creek.

The Ecosystem also has a plumbing system in place to deliver Berryessa water to each basin, as needed. This water is available for use, but must be purchased. A single domestic water line is located near the northeast corner of the facility. This line was previously used to irrigate a landscape buffer between the Ecosystem and the landfill.

The North Fork has one perennial pond, Jameson Pond, fed by discharge water from the CABA main facility. The pond empties into a small channel lined with riparian vegetation, and then ends at a drop-inlet that drains to Putah Creek.

## Infrastructure

The primary above-ground infrastructure within the Ecosystem facility is the shop building. This building has an office room and a shop with roll-up doors. A restroom with sink and toilet is accessible through its own exterior door, without having to enter either of the other rooms. The building is wired for 120v and 220v electrical service. There is no potable water at the building.

The plumbing system which delivers water to the basins has numerous gate valves, allowing each pond to be independently filled. This water is from the Berryessa waster system and is not potable. One potable water line is located at the northeastern corner of the Ecosystem, and was used to irrigate the northern berm between the Ecosystem and Landfill (Figure 6).

Infrastructure within the North Fork includes water lines that were used to service research within the facility, as well as underground and overhead Campus utilities, including fiber optic cables, outfalls, electrical and telephone lines (Figure 7).

Underground domestic water lines that were historically used as water supplies for animal cages are still in place. These lines may prove to be useful for future experiments that require water.

The plumbing system which delivers water to Jameson Pond has a gate valve, allowing water flow into the pond to be controlled. The outfall has slots which allow flash boards to be inserted to control the elevation of the pond.

There are dirt and gravel roads within both the Ecosystem and North Fork. These provide vehicle access to the majority of lands within each facility (Figure 8).

## Research activities

The Ecosystem provides a nearby research area that allows for larger-area landscape manipulation within a gated and locked facility (Figure 8). Existing research activities at the Ecosystem are few, due to inadequate vegetation management and the facility being closed for many years to outside researchers. After the Reserve acquired management of the facility several projects were added.

The North Fork also is located behind fences and gates (Figure 8), and provides an area that is relatively more secure than the publicly-accessible areas of the Reserve along Putah Creek proper. Current and past research activities within the Ecosystem and North Fork include:

- Research on establishing native grasses and forbs.
- Studies on eradication of Yellow-flag iris.
- Research on bird calls and their directionality.
- Fisheries research on Sacramento perch, lead predominantly by Dr. Peter Moyle

The potential for future use of the Ecosystem and North Fork as teaching and research resources is very high. The variety of natural resources present within the facilities, coupled with the increased security and proximity to main Campus, make these attractive research locations.

## Educational Use

Educational use of the Ecosystem and North Fork has been less than Putah Creek proper. This is expected to change as restoration projects get underway, and the Ecosystem and North Fork become more visible as places for classes to visit. As of spring, 2009, Environmental Horticulture 160L - Restoration Ecology has been using the Ecosystem for field classes.

## Other Campus use

The Ecosystem and North Fork are first and foremost teaching and research areas. However, there are other Campus uses which could be compatible with teaching and research. One current user is the UC Davis Cross Country team. In 2008, the Putah Creek Reserve and Cross Country team developed an operating agreement allowing the team to use the Ecosystem's service roads and a portion of a field for training and meets. Continued and future use of the Ecosystem by

other Campus groups will be dependent upon the needs of classes and researchers, and will be monitored by Reserve staff for potential conflicts. Currently the North Fork does not have non-academic users. Future uses of the North Fork could include a trail at the edge of the road outside of the fence, connecting West Village to Putah Creek.

# Historical Setting

## Historical use and management

Prior to transfer of management to the Putah Creek Riparian Reserve, the Ecosystem was managed by the Department of Wildlife, Fish, and Conservation Biology until late 2007. The western portion of the North Fork was managed by the Reserve since 2001, with the eastern portion managed by Animal Science until late 2009.

The Ecosystem facility had been largely shuttered prior to 2007, without full-time staff to manage the facility. Prior to the shuttering of the facility, individual researchers had control over portions of the property, with the ponds used for fisheries research, and several large pastures containing reindeer. The Putah Creek Reserve used the shop facility for several years before taking over management of the surrounding lands.

The western portion of the North Fork had been known as the Speith Reserve and was administered by the John Muir Institute for the Environment prior to transfer to the Putah Creek Riparian Reserve. The eastern portion of the North Fork was managed as a cattle pen and pasture under the Department of Animal Science, until the cattle were relocated in 2009. Prior management of the eastern portion consisted primarily of fence repair and fall seeding of oats for cattle feed.



# Issues

## Management issues

### Windblown trash

Windblown trash from the UC Davis Landfill enters the Ecosystem during north winds. Landfill staff removes as much trash as they can reach on land. Some trash, mostly plastic bags, enters Curve and Beaver ponds. This trash can be harmful to aquatic life and potentially disrupt research. Trash removal policies will be developed to deal with this issue.

### Wildfire

The Ecosystem has had several wildfires in recent history. The Ecosystem is difficult to access by firefighting equipment and the surrounding fencing makes fire crews wary of getting trapped once inside. Measures will need to be taken to reduce fire risk to users, facility infrastructure including the shop and yard, and surrounding uses.

Large sections of the North Fork are located between the CABA and Centrifuge facilities. Prevention of wildfires within the North Fork is important in protecting these facilities. The North Fork is difficult to access by firefighting equipment and the surrounding fencing makes fire crews wary of getting trapped once inside. Measures will need to be taken to reduce fire risk to users, facility infrastructure including the CABA water monitoring equipment, and surrounding uses.

## Security

The Ecosystem can only be accessed through locked gates (Figure 8). Once inside there is no visibility from outside the facility. This presents a security issue in relation to equipment stored at the shop and yard, as well as the potential for illegal activities to occur within the Ecosystem. Since the transfer of management to the Reserve, there have been two trespassing incidents. The remoteness of the facility will require that locks be checked and users be made aware to help keep the facility safe by locking the gates after leaving.

The North Fork can only be accessed through locked gates (Figure 9). Much of the North Fork is visible from the adjacent Brooks and Garrod roads, so most activity within the North Fork can be seen by authorities. The area around Jameson Pond is visible from the University Airport and CABA. The presence of the fence and visibility of the area makes it fairly safe from illegal activities. The perimeter will need to be posted to make it clear it is not open to the general public.

## Invasive plants

Most of the vegetation within the Ecosystem is comprised of non-native exotic plants. The grasslands are comprised of annual exotic grasses and broadleaf weeds. Milk thistle, Italian thistle, and star thistle are prevalent. There are a number of eucalyptus trees within the grassland as well as around the ponds. The bulk of the non-native woody vegetation is located around the ponds. Himalayan blackberry is mixed with native sandbar willows around the ponds, in the dry basins, and along the southern fence line.

Managing invasive weeds to prevent their spread within and outside of the Ecosystem is an area of concern. Researchers may also wish to study some of these exotic weeds so their control will need to be balanced with the potential for their use in research projects.

Much of the woody vegetation within the North Fork is comprised of native plants. The grasslands are comprised of annual exotic grasses and broadleaf weeds. Milk thistle, Italian thistle, ripgut brome and wild oats are present.

Managing invasive weeds to prevent their spread within and outside of the North Fork is an area of concern. Researchers may also wish to study some of these exotic weeds so their control will need to be balanced with the potential for their use in research projects.

# Planning issues

## Research

The North Fork provides research opportunities nearest to campus for investigations of natural systems. Research must be coordinated to ensure it does not interfere with or impact CABA's water quality monitoring, existing ongoing uses within the site, such as the rodent cages used by the Animal Communications Lab, or existing nearby research on adjacent assigned lands.

## Education

The North Fork provides a nearby area for natural resource science education. The smaller size of the North Fork and close spatial proximity of the various habitat types contained within, relative to Putah Creek, makes this an attractive area for classes to use within a typical lecture or lab period.

## Outreach

Due to the historic lack of Campus-wide use of the Ecosystem and North Fork, along with the historic lack of access to the facilities behind the gates, the Ecosystem and North Fork are not very well known as teaching and research facilities. Outreach will need to be conducted to make academic units aware of the resources and how to use them.

## Habitat and ecosystem management

Habitat management within the Ecosystem will differ from the overall Reserve. The Ecosystem is designed to allow for manipulation of ecosystems. There will be much more potential disturbance within the grasslands, riparian areas, and ponds for research than there would be along Putah Creek. The Ecosystem was originally created with this intention. The water is discharged from the Aquaculture facility, the hill was created when the ponds and basins were excavated, and the native grasslands were planted. These resources will need to be managed for habitat, with the understanding that they may not be permanent.

While this facility does allow for landscape manipulation, consideration of potential wildlife impacts must be considered when designing a research project to avoid unintended wildlife impacts that are not related to the research.

Habitat management of the North Fork will vary by segment. The former cattle pens east of Brooks Road are being restored as Swainson's Hawk foraging habitat. This eastern parcel will focus on native prairie restoration.

The western parcel, which includes Jameson Pond, will focus on maintaining the diversity of existing habitat types, including open water, riparian, grassland, and valley oak woodland. The grassland is presently dominated by exotic annual grassland and will be converted to native perennial prairie in conjunction with ongoing grazing trials and related research.

## Other Campus use

The Ecosystem and North Fork are primarily teaching and research areas. There may be other Campus uses that request to use the facilities on a temporary or long-term basis. Use of the facilities will be allowed by other campus users on a case-by-case basis, so long as the use does not adversely impact existing teaching and research or the resources within the area. An exception to this is the creation of a multi-use trail along the edge of the North Fork, which allows for a connection to Putah Creek from the west end of the Arboretum.

## Constraints

The variety of ecosystem types and potential users within the facility will present management challenges. Such constraints include:

- **Water quality requirements in ponds.** Actions which have the potential to add pollutants to the waterway and are covered under the Center for Aquaculture and Aquatic Biology's discharge permit will not be allowed.
- **Existing Research.** Areas where studies on invasive species are taking place may preclude removal of these species.
- **Financial limitations.** Managing the Ecosystem and North Fork must be done within the existing Reserve budget. However, additional work to restore, enhance, or alter the habitat areas and to respond to researcher requests may require additional funds or creative partnerships. Portions of the North Fork will be able to draw from mitigation funds for Swainson's Hawk foraging habitat.
- **Invasive species from offsite.** The Ecosystem is south of the Campus Landfill and weed seeds which are present within the Landfill (and other surrounding land) will disperse into the Ecosystem. Staff will need to monitor fallow lands to the north of the Ecosystem to identify any potentially

aggressive weeds prior to their spread onto the Ecosystem, and work with the Landfill on eradication.

- **Existing infrastructure.** The Ecosystem has an abundance of derelict infrastructure, including old fences, material stockpiles, and plumbing. Some of the plumbing, while not currently used, is still pressurized and would rupture if disrupted during grading. Material stockpiles, such as large cobble piles, present hazards when trying to maintain weeds, mow grasses, or restore prairies. The North Fork has several sets of underground infrastructure, including telephone, water, and fiber optic lines. Future projects will need to avoid these utilities.

## Opportunities

The security, proximity to Central Campus, and diversity of resource types make the Ecosystem and North Fork unique segments of the Reserve. Such opportunities include:

- **Aquatic research.** The two ponds and feeder ‘creek’ at the Ecosystem and Jameson Pond and the outlet ‘creek’ on the North Fork are areas where researchers can perform experiments on aquatic plants, manipulate edges of the ponds and ‘creek’, perform research on native fish, and have a measure of control of pond levels.
- **Large areas for landscape manipulation research.** The expansive lands within the Ecosystem provide the only area within the Reserve where manipulation of water and earth are possible, with fewer or no regulations than if the same actions were proposed within Putah Creek itself. Most notable is the ability to perform grading activities without requiring authorization from the State Reclamation Board or Department of Fish and Game, due to being outside of the creek corridor.
- **Many habitat types in close proximity.** The North Fork in particular has many habitat types in close proximity to one another. This makes it an attractive location for close-in research or class use.
- **Variety of topography.** The Ecosystem has a central hill and a variety of slopes that face different aspects. This gives researchers more options as to the types of exposure they desire for their experiments. The North Fork has small mounds, the old creek channel, and a variety of slopes of different aspect.
- **Secure areas for equipment.** Fencing surrounds the entirety of the Ecosystem and North Fork and access is controlled through locked gates. Researchers who wish to leave monitoring equipment in the field where it will be more secure than on the publicly accessible portions of the Reserve can use these facilities. For those that wish to store equipment indoors

between field uses, the office portion of the shop at the Ecosystem has the potential for short-term storage for researchers.

- **North Fork Connection to the Arboretum and Equestrian Center.** The eastern end of North Fork abuts Highway 113. Across from the highway is the west end of the Arboretum and the Equestrian Center. The Garrod Road bridge over the highway has a separated crossing for non-motorized vehicles and pedestrians. A multi-use trail along the North Fork, adjacent to Garrod Road, could provide a connection from Central Campus to Putah Creek. Residents from West Village will also be able to use this route to Putah Creek, as they travel south from the development.

# Ecosystem and North Fork Vision, Goals, and Objectives

## Vision

The Vision for the Experimental Ecosystem and North Fork portions of the Reserve is to build on the vision articulated in the Management Plan, and to create secure spaces for researchers and classes which allow for research on manipulation of land and water resources. The Vision includes using the North Fork to strengthen the connection (both physical and social) with the rest of the campus, including the Arboretum and West Village.

## Goals

G-1: The Ecosystem and North Fork will provide secure facilities for more intensive land manipulation research than is otherwise provided on Putah Creek.

G-2: The Ecosystem and North Fork will provide for native habitat and biodiversity.

G-3: The North Fork will provide space for a future multi-use, non-motorized path connecting the Arboretum pathways to the trails along Putah Creek.

## Objectives

O-1: Removal and control of invasive species within the Ecosystem and North Fork.

O-2: Install native prairie within the North Fork, to provide Swainson's Hawk foraging habitat.

O-3: Expand research use of Reserve through addition of research to the Ecosystem and North Fork areas.

O-4: Replace fencing along eastern portion of North Fork, leaving room for a future multi-use path.



# Ecosystem and North Fork Use Guidelines

## General Guidelines

The Putah Creek Riparian Reserve has been established to support the University of California's research and teaching mission and, where appropriate, public service programs. Use of the Ecosystem and North Fork facilities will be allowed if the proposed activity and level of use, after review by the reserve manager (or other designated University official), is lawful and is consistent with:

- Management Plan vision, goals and objectives,
- Ecosystem and North Fork Use Guidelines,
- Management policies,
- Management and restoration actions, and
- Education and outreach actions.

Activities that will or are highly likely to irreversibly harm the natural values, ecosystem functions, and native biodiversity of the reserve, or preclude its possible future use for University-level research or instruction will not be allowed. Thus, the number and duration of stay by visiting researchers, classes, and members of the public may be limited. Similarly, research infrastructure development at the reserve may be allowed only in certain areas on a case-by-case basis and may be limited in size so that natural and cultural values are not adversely affected.

## Process

The Reserve manager has primary responsibility for approving proposed uses under the Ecosystem and North Fork Use Guidelines, and will coordinate management and all other uses of the reserve. In difficult cases, the reserve manager will consult the Putah Creek Reserve Advisory Committee or faculty

with appropriate areas of expertise before approving or rejecting an application. If a user fails to comply with any of the requirements, the Reserve manager, after proper consultation, could restrict or terminate ongoing reserve use, and the user's subsequent use applications may be rejected. This appeals process will consist of dispute resolution by the Putah Creek Riparian Reserve Advisory Committee.

## Reserve Use

### Research Use

All researchers using the reserve must have valid academic qualifications and any necessary permits. Research in any subject area may be allowed if the researcher can demonstrate that the natural resources available at the reserve are reasonably necessary for the proposed research project. The reserve will not function simply as a place to set up infrastructure to conduct research unrelated to the natural resources within the reserve.

### Research Application

All researchers should discuss their proposed research project with the reserve manager before formally applying for permission to conduct their studies. All researchers must complete a Research Application (Appendix F in the 2005 Management Plan, available at <http://putahcreek.ucdavis.edu>) and agree to comply with all reserve-specific regulations. The applicant must specify the proposed project duration, dates of reserve use, contract and funding information, and provide a statement of purpose describing prospective research site(s), and animal and plant populations that may be affected by the proposed research. Applicants desiring the use of housing or facilities must include estimated arrival and departure dates, whereas day-use applicants should provide approximate dates of use. Any potential disturbances to the reserve's ecosystem or cultural resources must be clearly described. Any equipment, flags and markers, or other related research infrastructure must be removed by the researcher upon termination of use of the reserve.

### Class use

The Ecosystem and North Fork may be available for class use by K-12, college, University extension, or other instructional users. Classes in any subject may be

allowed on site if the instructor can adequately demonstrate that unique resources at the Reserve are reasonably necessary for the class.

## **Class Use Application**

All instructors should discuss their proposed class visit with the reserve manager before formally applying for permission to visit the reserve. All instructors must complete a Class Use Application (Appendix F in the 2005 Management Plan) and agree to comply with all reserve specific regulations. The instructor must specify the requested arrival and departure dates, the number of class participants, and a statement of purpose describing prospective teaching site(s), planned activities, animal and plant populations that may be affected by the proposed class visit, and housing and other resources that will be needed during the visit. Any potential disturbances to the reserve's ecosystem or cultural resources must be clearly described. If applicable, the instructor must provide an approved animal care and use protocol from his/her home institution and all required state and federal permits.

## **Other Campus Use**

Where appropriate, other Campus uses may be allowed within the Ecosystem and North Fork. One example is use by the Cross Country team for training and meets, which take place primarily on the access roads within the Ecosystem facility. Another example is the multi-use path between the Arboretum and the trails along Putah Creek.

## **Operating Agreements**

When non-academic Campus user groups have a need for use of the Ecosystem or North Fork that is specifically related to the resources provided by the Ecosystem, and that use is long-term, an Operating Agreement will be developed.

Operating Agreements will cover the range of activities desired by the user, terms, conditions, and duration of the activity.

# Management Policies

## Ecosystem and North Fork Management Policies

### Administration

MP-1: The Ecosystem and North Fork will be available for research or class use during day or night as needed by the researcher or class, as approved in a research or Reserve use application.

### Security

MP-2: Ecosystem and North Fork gates shall be locked at all times, with the exception of group events and official work requiring access to the facilities.

MP-3: All users of the Ecosystem or North Fork will first call or email the Reserve Manager or Steward prior to entering the facility.

### Research, habitat protection, enhancement, and restoration

MP-4: No infrastructure shall be placed in either facility by departments or individual researchers unless the infrastructure is related to research. At the conclusion of any research activity, all placed infrastructure shall be removed by the researcher, at their cost, unless otherwise directed by the Reserve manager.

MP-5: While the facilities are open to research which manipulates land and water, research will not impact endangered, threatened, or species of special concern without approval of the appropriate regulatory agency.

MP-6: Research projects which require introduction of invasive species into the Ecosystem will be allowed so long as the researcher monitors the subject species to prevent spread beyond the research area, and remove them after conclusion of the research.

MP-7: Ecosystem use and management will promote ecosystem health rather than only focus on single-species management of natural resources, with the understanding that disturbance and manipulation of the landscape is one of the primary uses of the Ecosystem.

MP-8: Trash that is discovered to have blown into the Ecosystem will be removed as soon as possible.

### **Education and Outreach**

MP-9: The Reserve staff will spread knowledge of the resources within the Ecosystem and North Fork to potential on-Campus users through the use of brochures, presentations, and the Reserve website.

MP-10: Signs will be placed along pathways, welcoming visitors and reminding them of the rules to be followed when visiting the public portions of the Reserve. For those areas closed to the public, signs will make it clear the area is open for research use only.

### **Recreation**

MP-10: Recreation within the Ecosystem or North Fork will be limited to organized Campus groups with prior approval. Recreation will not impact habitat or research projects within the facilities. Examples of possible recreational activities include use of the Ecosystem access roads by the UC Davis Cross Country team, or organized birding events through the Wildlife, Fish, and Conservation Biology Department. If recreational activities impact research, class use, or ecological resources, that recreational use will be discontinued.

MP-11: Space along the edges of the North Fork which are adjacent to Garrod and Brooks roads, will be reserved for construction of a future multi-use path which would connect the Arboretum to the trails along Putah Creek.

# Management and Restoration Actions

## Plan implementation

The following sections include a list of actions to ensure policies are reflected on the ground. Implementation of the supplemental management plan will take place according to the timeline shown in Appendix A.

## Management and restoration

The following are management and restoration actions for the Ecosystem and North Fork facilities within the Putah Creek Riparian Reserve.

### Administration

MR-1: Create a native plant nursery at the Ecosystem.

The Ecosystem has an existing shade structure that is in disrepair after fire damage and will require removal. Replacement of the shade structure with a pre-fabricated greenhouse will allow continuation of native plant propagation for use on the Reserve.

MR-2: Coordinate with Transportation and Parking Services regarding parking along the side of the road adjacent to the eastern section of the North Fork. Parking may need to be restricted along the south side of the road in order to allow for a pedestrian path.

MR-3: Perimeter fire control measures will be taken. These measures may include spraying, disking, grazing, mowing, or other measures needed to control fuel along the perimeter of the facilities.

## Habitat Restoration and Management

MR-4: Removal and control of invasive species within the Ecosystem and North Fork.

Wherever possible, invasive grasses and weeds will be controlled, removed, or replaced with native species. Removal and control methods may include herbicide, mowing, disking, hand-pulling, grazing, or burning. There may be research projects that require retention of some non-native weed areas, and those will be evaluated on a case-by-case basis.

MR-5: Establish native grasses and forbs within the Ecosystem and North Fork. Native grasses will be planted in phases within the Ecosystem, using funds provided by WFCB upon re-assignment of the facility, as well as the Reserve's annual project funds. The east end of the North Fork will have native prairie installed as part of Swainson's Hawk mitigation. The remainder of the North Fork will be restored using Putah Creek Reserve operating funds. All of these areas have potential to include research as part of the prairie implementation and establishment, including research on forb establishment and maintenance. The 2-acre parcel south of the centrifuge will also have native grasses established, to complement the existing native oaks and Hydraulics Lab wave machine detention basin.

MR-6: Design restoration plantings within the North Fork to not impede visibility into the facility. Police patrols along Garrod and Brooks roads need to see into the facility to prevent illegal activities so woody plants must be placed so as not to impede visibility. Restoration of vegetation within the eastern North Fork area will include native prairie understory, with valley oak as the predominant over story tree. The prairie vegetation will include a forb component, and be designed in conjunction with researchers. MR-7: Preserve and establish native trees and shrubs within the Ecosystem and North Fork.

Native trees and shrubs within the Ecosystem and North Fork will be preserved from disturbance to the extent possible. Areas that have been cleared of invasive trees and shrubs will be planted with native trees and shrubs as appropriate.

MR-8: Improve aquatic habitat within Beaver, Curve, and Jameson ponds.

Beaver, Curve, and Jameson ponds are perennial water bodies, fed by discharge water from CABA facilities. Beaver and Curve ponds are surrounded by several noxious weeds, including yellow-flag iris, Himalayan blackberry, and Eucalyptus. These plants will be removed and replaced with native sedges and rushes. Research projects looking at the efficacy of various eradication methods would be considered. Jameson pond has mostly native plants around the perimeter, but has dense stands of cattails which can impede efforts to control

mosquitoes. The cattails will be removed and replaced with tules, which have broader spacing between stems allowing small fish to eat mosquito larvae.

If additional measures would increase the favorability of the aquatic habitat, such as increasing woody debris or pond depth, they will be considered if Faculty find these options to be beneficial for both habitat and research.

MR-9: Re-align CABA discharge from along the road to inside the Ecosystem.

The current CABA discharge runs along an access road south of the fence around the Ecosystem. A new channel would be constructed inside the fence, allowing water to flow inside the facility and ultimately back to the ponds. The existing water course would be maintained to allow for maintenance flexibility. Having the channel inside the facility will allow for researchers to experiment with a simulated 'creek' system. They will have the ability to create artificial floodplains, marshes, control flows, create riparian habitat, and other stream-related research. Construction of this new channel will not impact CABA's facilities or monitoring stations.

MR-10: Protect native ant populations. The North Fork is home to native ant species that could be displaced by the non-native Argentine ant. Argentine ants can spread into an area that receives summer irrigation. Restoration projects should emphasize non-irrigated plantings of higher density with expected higher mortality to protect existing native ant species.

## Recreation

MR-11: Allow organized Campus groups to use the Ecosystem and North Fork for recreational purposes, with prior approval, so long as they do not impact research, class use, and wildlife.

In 2007, an Operating Agreement was developed between the Putah Creek Reserve and the UC Davis Cross Country team. The agreement allowed the team to use the Ecosystem access and service roads for training and meets. All use will be supervised by the team coach and would require the team to provide portable restrooms for meets.

Other Campus units, such as the Wildlife, Fish, and Conservation Biology department, have used the Ecosystem for public events such as birding. Such nature-based recreational use is also allowed, so long as it is pre-approved, supervised by the Campus unit requesting the use, and does not interfere with research, class use, and wildlife. As of June, 2009, no Campus groups have used or requested use of the North Fork for recreation. General, non-Campus public recreational use will not be allowed within the Ecosystem or North Fork.



MR-12: Allow for creation of a pedestrian path along Garrod and Brooks roads. Circulation from the Equestrian Center, Arboretum, Main Campus, and West Village to the Putah Creek Reserve is most direct along Garrod and Brooks road. To improve circulation along this route, a path may need to be developed along the edge of the road. When designing fencing or restoration within the North Fork, space for a future pathway will be reserved.

# Education and Outreach Actions

## Education and Outreach

### Website

EO-1: Include the Ecosystem and North Fork on the Reserve website.

The Reserve website will add a section on the Ecosystem and North Fork, the resources contained therein, and the process for researchers and classes to gain access.

### Brochures

EO-2: Brochure development.

A downloadable brochure will be developed for the Ecosystem and North Fork. The brochure will be useful for researchers interested in learning more about the opportunities for projects within the facilities.

### Research Coordination

EO-3: Coordinate with researchers.

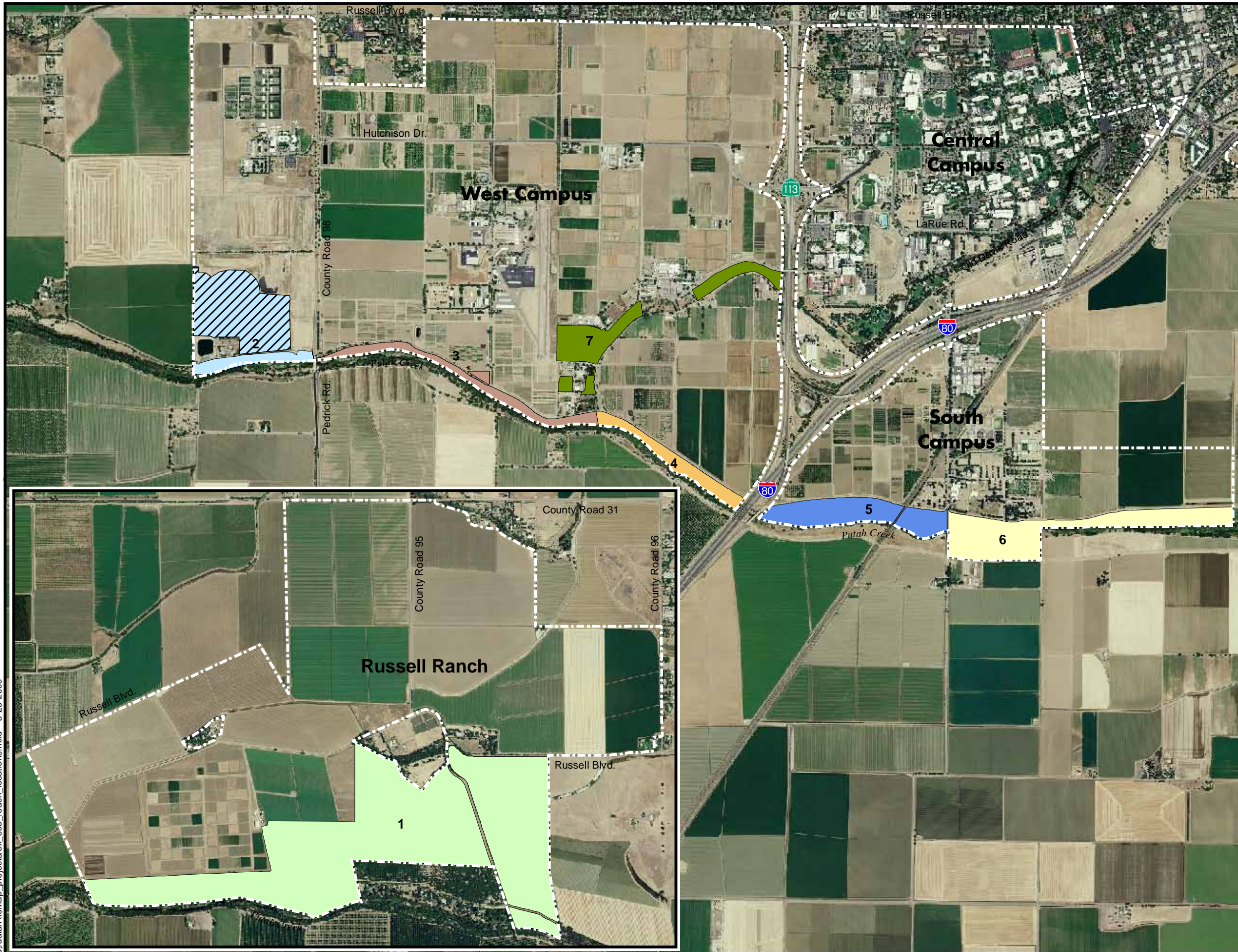
The Reserve Manager will coordinate with Campus researchers to identify and coordinate research opportunities and projects within the Ecosystem and North Fork. This coordination will include presentations during orientation for new Graduate Group in Ecology students.



# Figures



**Figure 1**  
**Putah Creek Riparian Reserve Reach Locations**



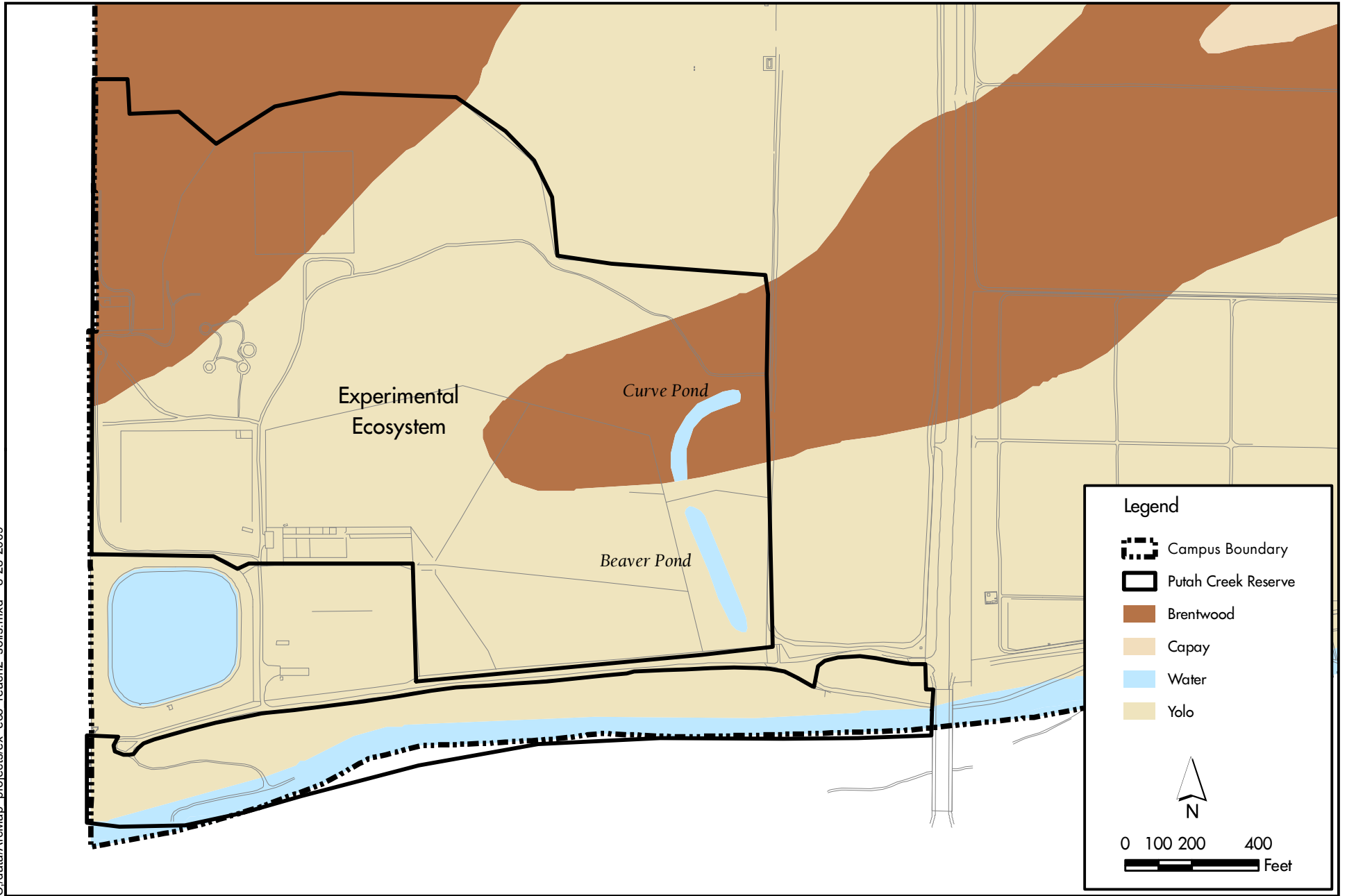
**Legend**

- 1 Reach 1
- 2 Reach 2
- 3 Reach 3
- 4 Reach 4
- 5 Reach 5
- 6 Reach 6
- 7 Reach 7 (North Fork Cutoff)
- Experimental Ecosystem

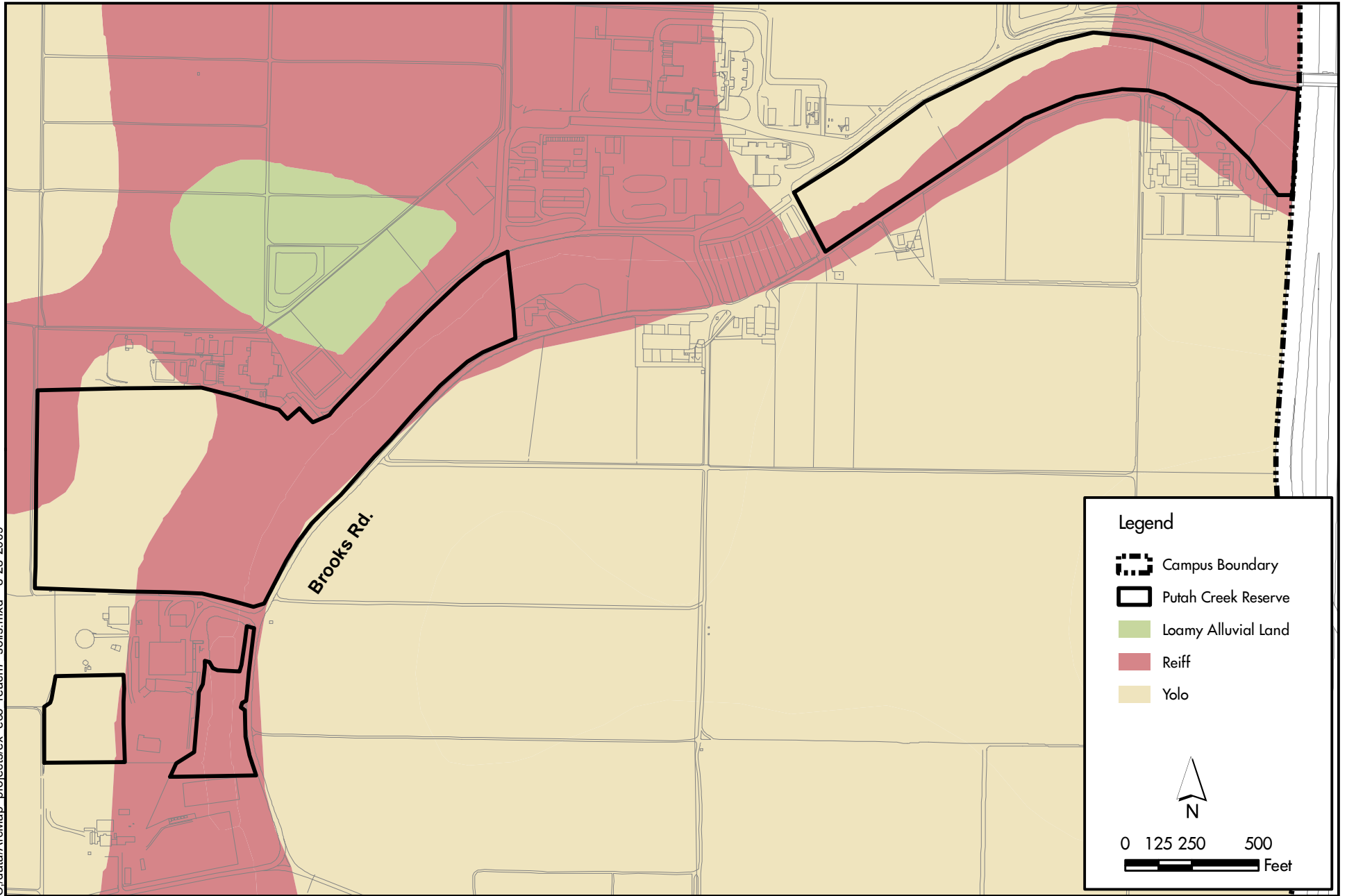


0 1,000 2,000  
 Feet

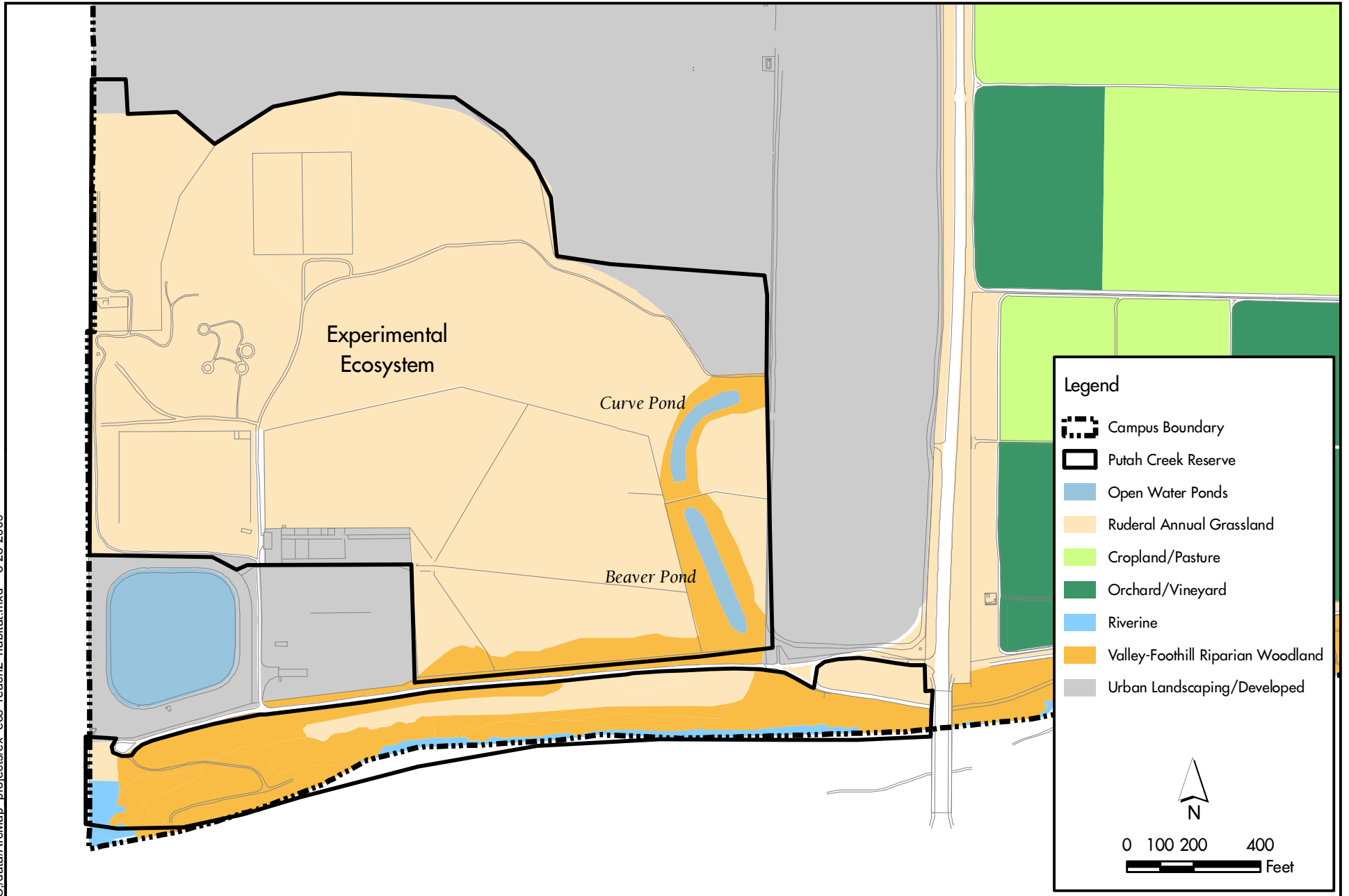




**Figure 2**  
**Reach 2 - Experimental Ecosystem Soils**

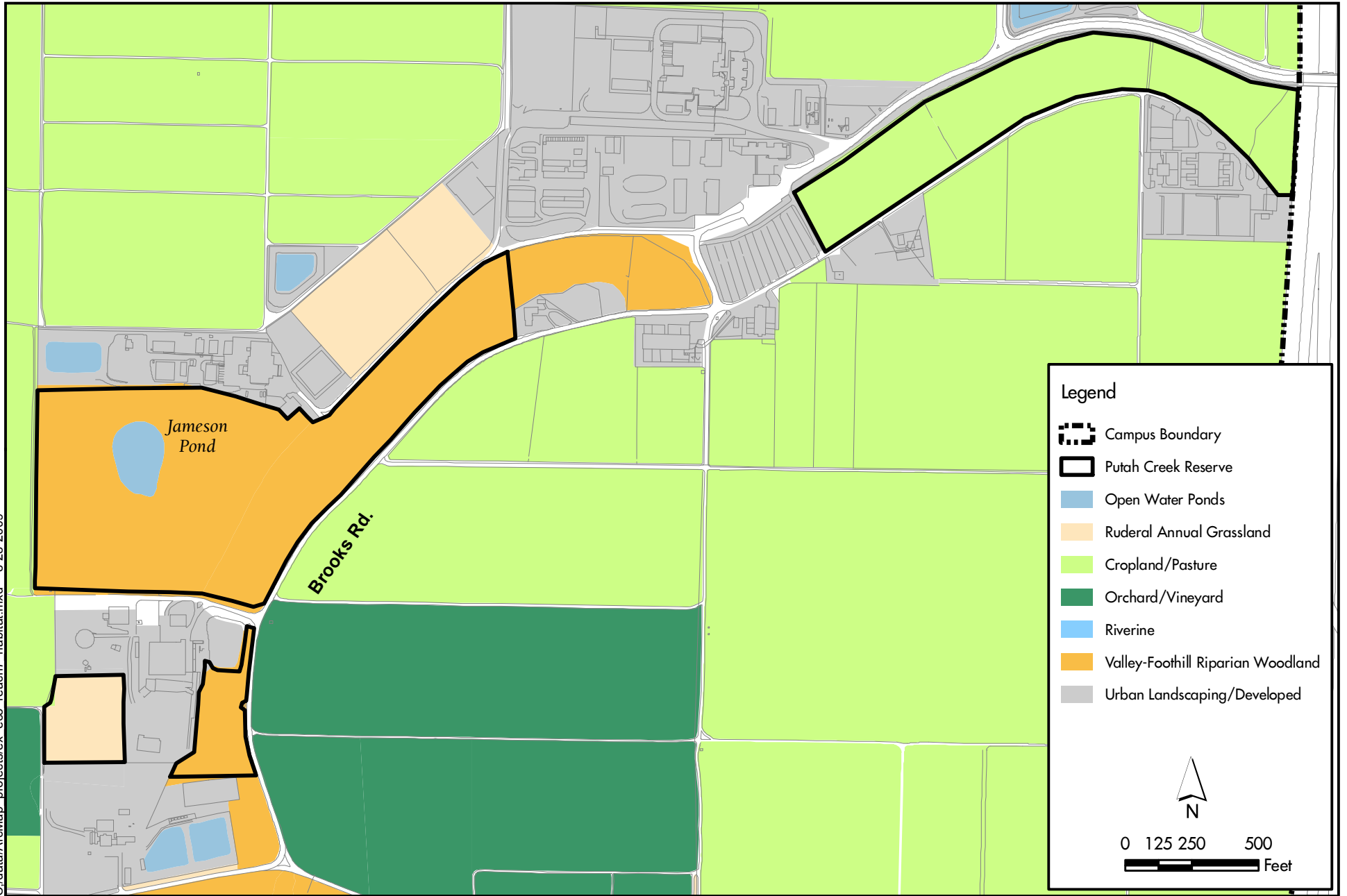


**Figure 3**  
**Reach 7 - North Fork Soils**

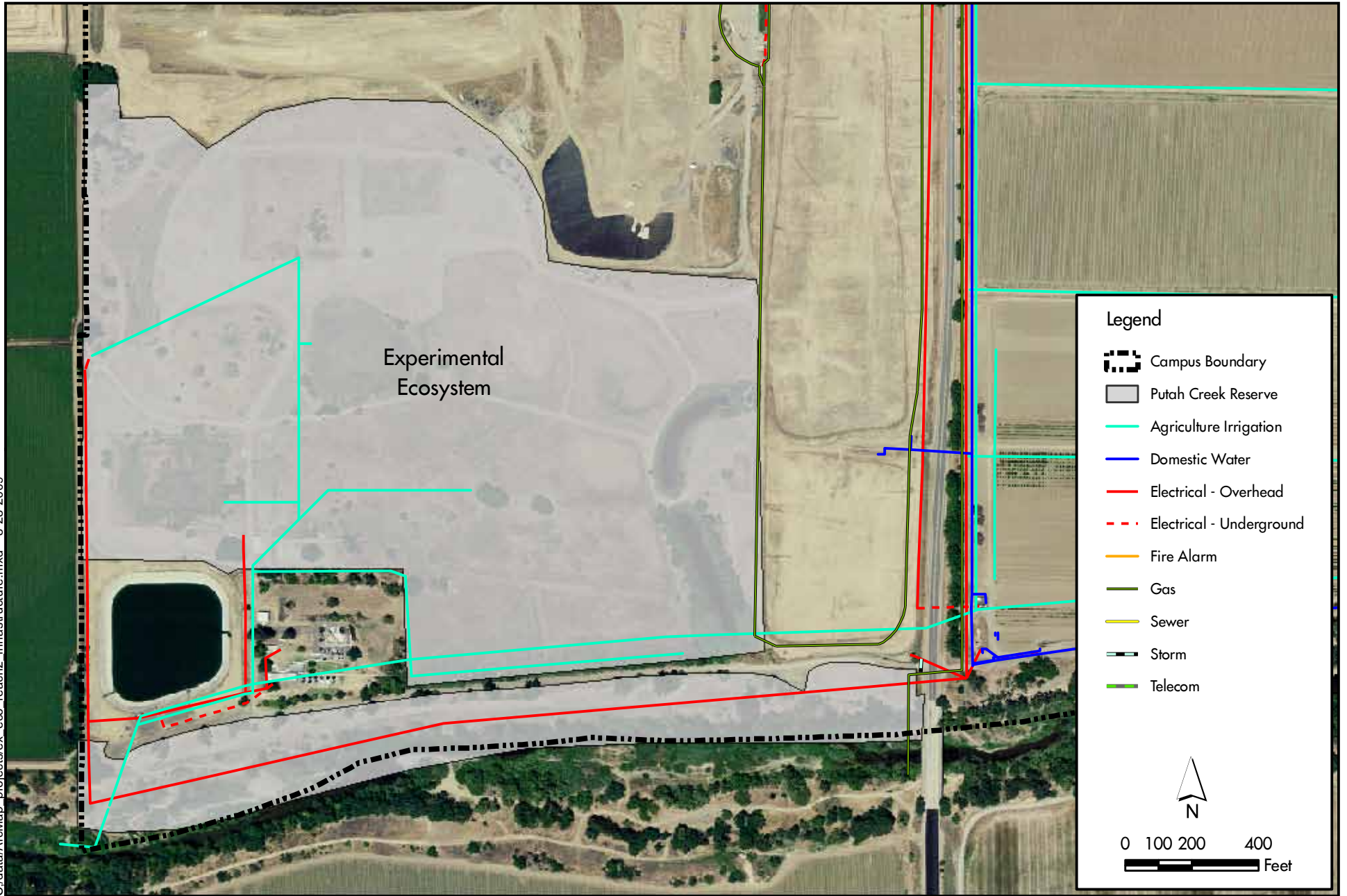




C:/data/ArcMap/projects/eco\_reach7\_habitat.mxd 8-28-2009

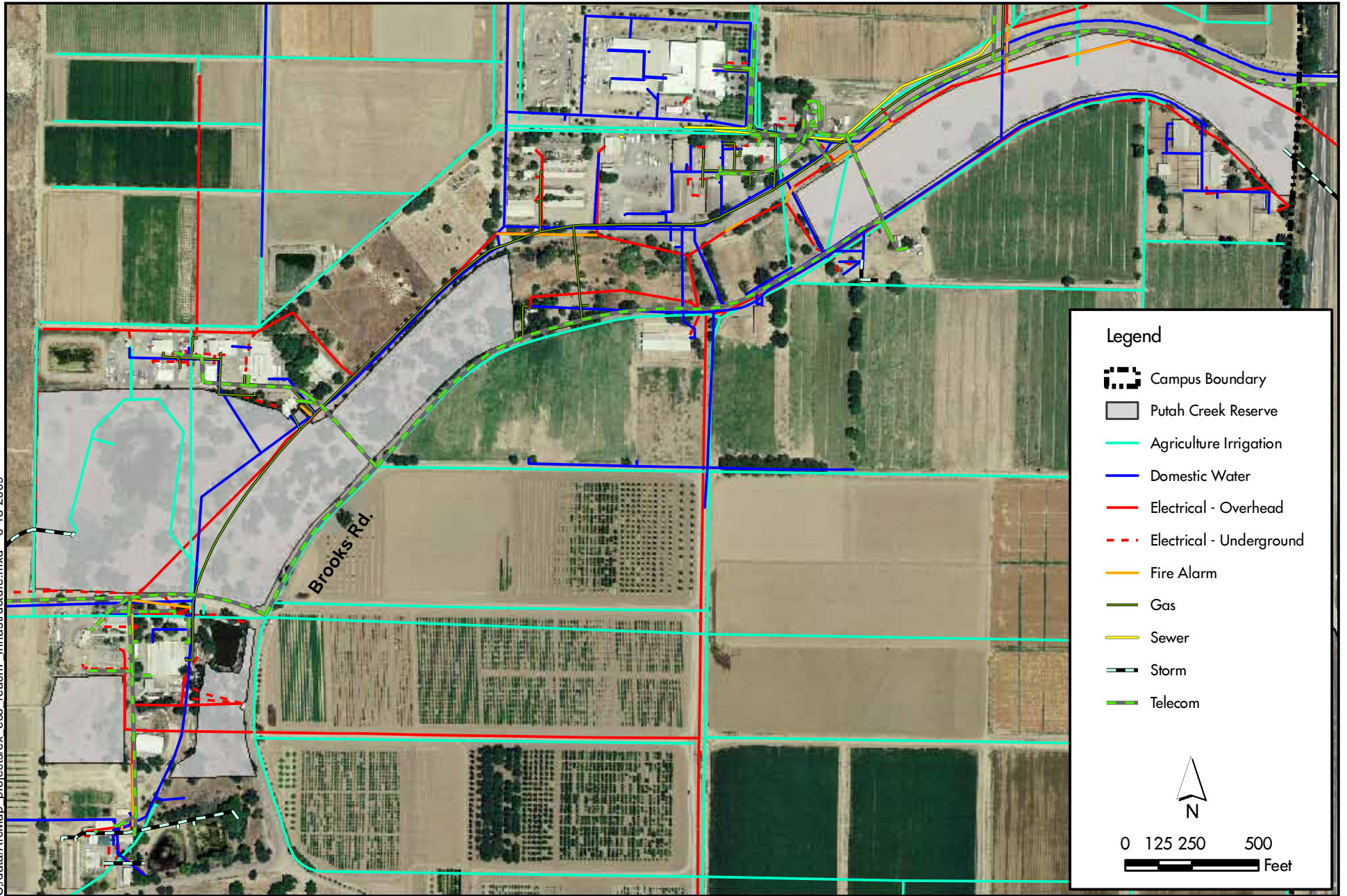


**Figure 5**  
**Reach 7 - North Fork Habitat**



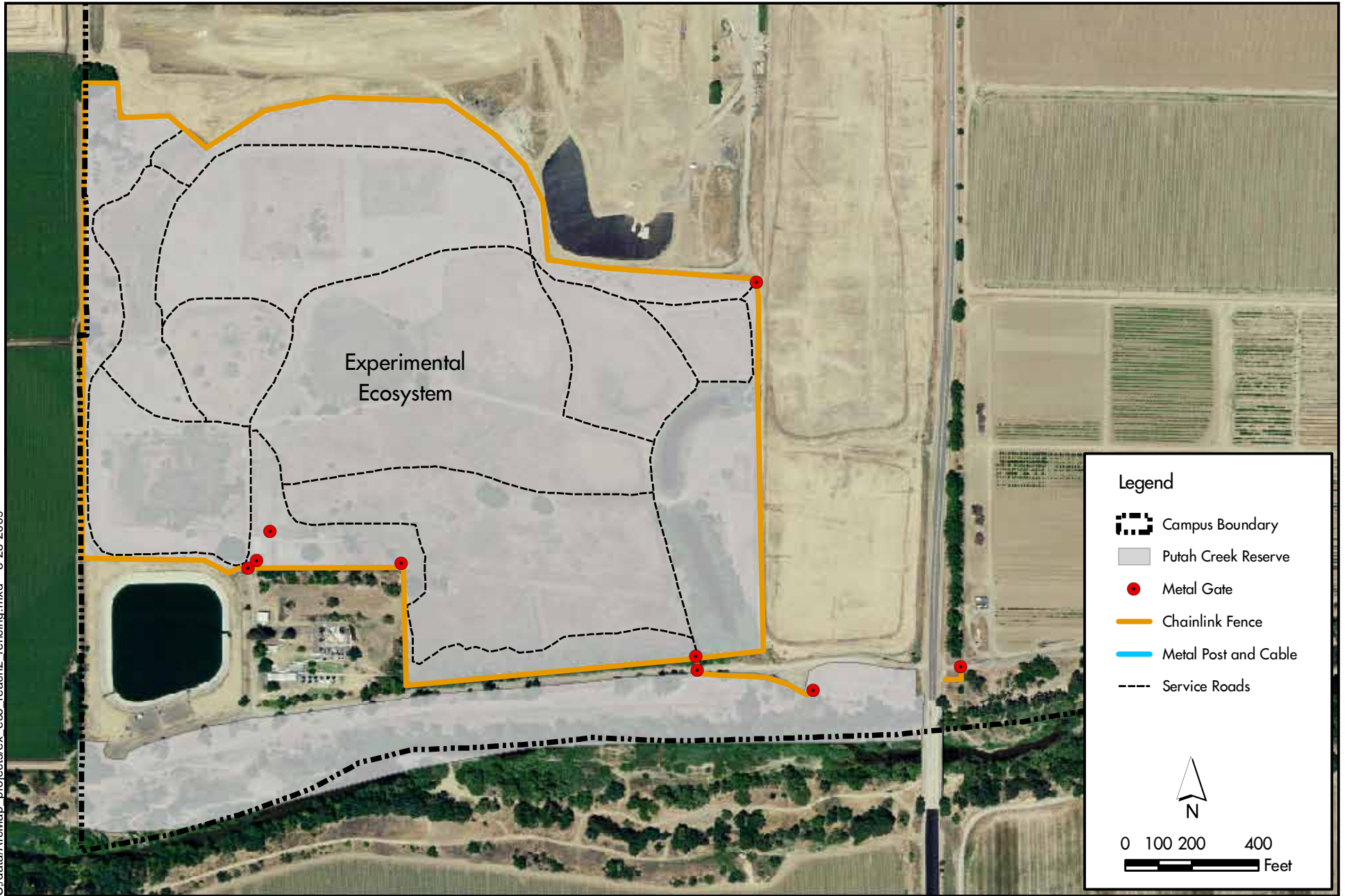
**Figure 6**  
**Reach 2 - Experimental Ecosystem Infrastructure**





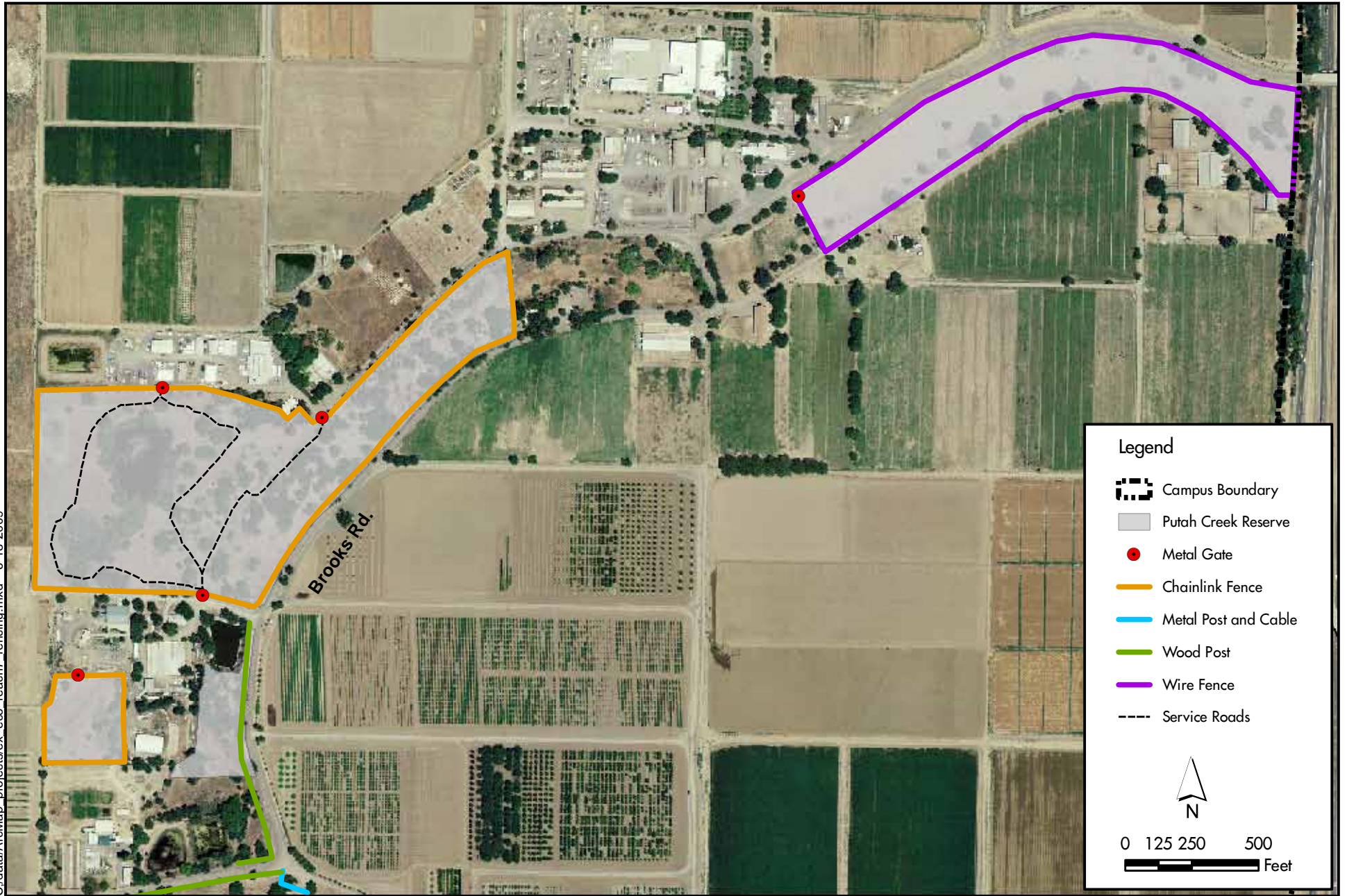
**Figure 7**  
**Reach 7 - North Fork Infrastructure**





**Figure 8**  
**Reach 2 - Experimental Ecosystem**  
**Fencing and Improvements**





**Figure 9**  
**Reach 7 - North Fork**  
**Fencing and Improvements**

# Appendices

Appendix A  
**Implementation Timeline**

# Management Plan Implementation Timetable

ID	Task Name	2009		2010		2011		2012		2013		2014	
		2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half
1	<b>Management and Restoration Actions</b>												
2	<b>Management and restoration – Ecosystem and North Fork</b>												
3	MR-1: Create a native plant nursery at the Ecosystem												
4	MR-2: Coordinate with TAPS on parking adjacent to the North Fork.												
5	MR-3: Fire control measures will be taken												
6	MR-4: Removal and management of invasive species within the Ecosystem and North Fork.												
7	MR-5: Establish native grasses within the Ecosystem and North Fork.												
8	MR-6: Design restoration plantings in the North Fork to not impede visibility.												
9	MR-7: Preserve and establish native trees and shrubs within the Ecosystem.												
10	MR-8: Improve aquatic habitat within Beaver, Curve, and Jameson ponds.												
11	MR-9: Realign CABA discharge from along the road to inside the Ecosystem.												
12	MR-10: Protect native ant populations												
13	MR-11: Allow organized Campus groups to use the Ecosystem and North Fork for recreational purposes with prior approval.												
14	MR-12: Allow for creation of pedestrian path along Garrod and Brooks roads.												
15	<b>Education and Outreach Actions</b>												
16	<b>Education</b>												
17	EO-1: Include the Ecosystem and North Fork on the Reserve website												
18	EO-2: Brochure development for Ecosystem and North Fork.												
19	EO-3: Coordinate with researchers for use of the Ecosystem and North Fork.												