Yreka Creek Greenway

Master Plan Update 2016

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Yreka Creek Greenway

SISKIYOU GARDENS, PARKS, & GREENWAY ASSOCIATION

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EXECUTIVE SUMMARY

This Master Plan provides guidance for development of a comprehensive greenway system in the City of Yreka that reduces flood hazards, improves water quality, restores fish and wildlife habitat, and creates a network of streamside trails with related recreational facilities. Full implementation will yield up to 15 miles of restored stream corridors, 13 miles of restored seasonal drainages, and 20 miles of new trails.

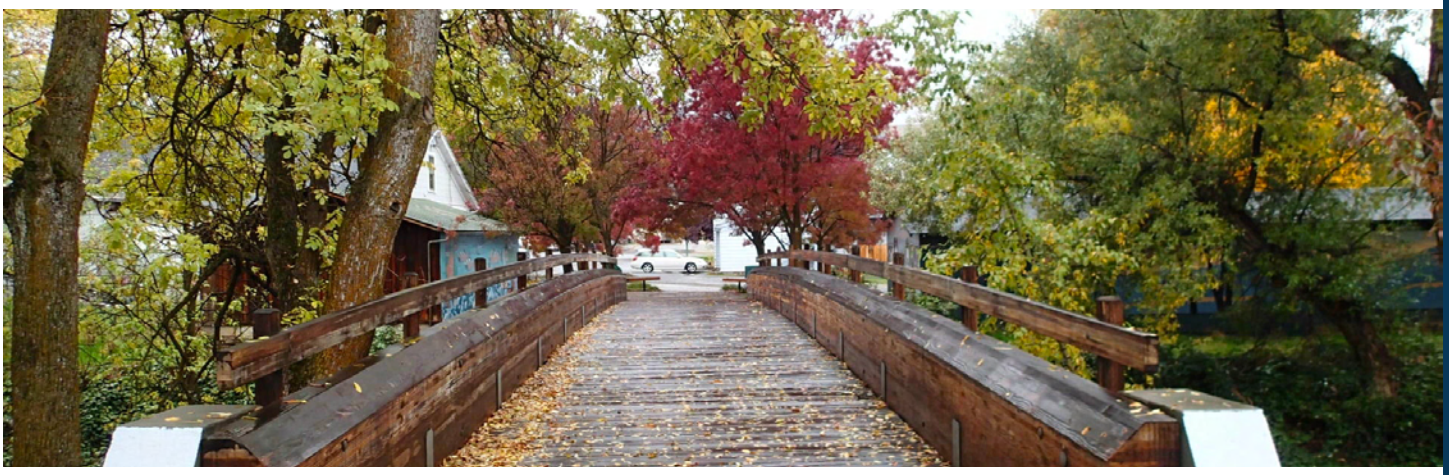
An innovative urban stream restoration approach has been developed that consists of lowering adjacent lands along deeply incised channels to create new accessible floodplains close to existing stream levels. Modeling has shown that this approach can potentially contain up to 100-year or larger flood events completely within the newly-created greenways, thereby substantially reducing flood hazards, while also yielding ecological, recreational, and economic benefits.

Economic benefits will include reduced property damage and flood insurance, increased property values and development potential, increased revenues into the local economy from grant funds and tourism, and increased quality of life for local residents. Ecological benefits will include improved compliance with existing regulations pertaining to species of concern and water quality. Great care was taken in development of this Master Plan to balance competing interests such as stream corridor restoration versus adjacent development, hard versus soft infrastructural solutions, and flood capacity versus ecological and recreational goals.

Much has been accomplished since the inception of the Greenway in the 1980's, including completion of 1/8 mile of Greenway at the Visitor Center behind the Siskiyou County Museum, 1/3 mile at Upper Greenhorn Park, and 1/4 mile along Deer Creek Way at the north end of town. Another 1/2 mile of Greenway between East Oberlin Road and Main Street will be completed later this fall, and a bioswales network will be completed at Evergreen School next year. Coming soon will be the completion of 1/4 mile of Greenway behind the KNF Service Center, 1/2 mile between East Lennox Street and Deer Creek Way, and 1/2 mile between Sharps Road and East Oberlin Road. Over $14 million in grant funding has been obtained to date for Greenway build-out.

Due to the large size and complexity of the proposed Greenway network, implementation will require a phased approach and numerous funding sources over many years. It will also involve a win-win approach with private landowners and businesses, and substantial help from community organizations such as the Siskiyou Gardens, Parks, and Greenway Association.

1.0 INTRODUCTION



Bridge at Visitor Center

1.1 Background

Yreka Creek is situated at the interface of the Klamath Mountains, Cascade Range, and Great Basin, and is an important spawning stream for salmon and steelhead in the Klamath River watershed. It is believed that the name "Yreka" is derived from "Waiiaka," the Shasta Tribe's name for Mount Shasta. The Shasta Tribe inhabited the region around Yreka Creek for thousands of years before gold was discovered in 1851, leading to the founding of the present-day City of Yreka, nestled in a small valley with Yreka Creek running through it.

The concept of a greenway and trail along Yreka Creek began in the 1980's, leading to the preparation of first Yreka Creek Greenway Master Plan in 1989. The purpose for the Greenway, as expressed in that Master Plan, was to "develop a Yreka Creek Linear Parkway as a model of civic pride with a theme of restoration of aquatic and fisheries resources." An interpretive plan was completed in 1990 and incorporated into the Master Plan in 1993.

The Yreka Creek Greenway Master Plan was updated in 2005, in order to:

- Address the imminent listing of coho salmon and Klamath steelhead trout.
- Add a greater emphasis on ecological restoration.
- Comply with new state water quality standards regarding Total Maximum Daily Load (TMDL).
- Identify and prioritize specific projects associated with Greenway build-out.
- Add trail linkages to areas adjacent to the Greenway corridor.
- Incorporate GIS technology into Greenway planning and data management.

As part of the greater emphasis on ecological restoration, an Aquatic Needs Assessment was completed in 2010, and an Implementation Plan pertaining to aquatic and upland restoration was completed in 2011. That same year, a restoration and trails plan was prepared for the portion of Yreka Creek flowing through the Klamath National Forest Service Center.

Although Yreka has a dry climate, it has experienced major floods over the years. Stormwater planning to resolve flooding problems began with the preparation of a Master Plan of Drainage in 2005. That Plan identified the worst problem areas and recommended conventional infrastructure solutions that included enlarging storm drains and installing stormwater attenuation basins. Planning for ecological stormwater solutions (often called "green infrastructure") was initiated in 2007, and includes floodplain restoration, bioswales, small retention basins, and vegetative filter areas.

1.2 Purpose, Goals, and Objectives

Over the years, the concept of the Yreka Creek Greenway has evolved from a single linear greenway along Yreka Creek to a network of greenway corridors along Yreka Creek and its tributaries throughout the City. Within these corridors, flood hazard reduction, water quality improvement, fish and wildlife habitat restoration, and trail development are being integrated into a single cohesive Master Plan. Current planning includes Greenhorn Park, since the Park includes over 2 miles of Greenhorn Creek which is the largest tributary to Yreka Creek.
In response to these changes, the purpose, goals, and objectives of the Master Plan are hereby updated as follows:

Purpose

The purpose of the Yreka Creek Greenway is to create an inter-connected network of open space corridors along Yreka Creek and its tributaries, many with trails and related facilities, that provide multiple social and ecological benefits as a model of civic pride.

Goals

The goals of the Yreka Creek Greenway are:

1. **Flood Hazard Reduction**--Reduce flood hazards throughout Yreka by containing floodwaters within greenway corridors to the extent feasible.

2. **Water Quality Improvements**--Improve water quality of urban runoff entering Yreka Creek and its tributaries.

3. **Fish and Wildlife Habitat Restoration**--Restore and protect fish and wildlife habitat, and integrate this habitat into the developed landscape.

4. **Trails and Other Recreational Facilities**--Create a network of creekside trails and related facilities that provide opportunities for non-motorized transportation, recreation, exercise, learning, and enjoyment of nature, while also enhancing the local economy.

Objectives

- Ensure public safety and quality of experience.
- Incorporate interpretative, educational, and art appreciation opportunities.
- Seek win-win solutions with private landowners during Greenway implementation.
- Ensure long-term sustainability of Greenway operations and maintenance.
- Reduce the time and complexity of obtaining construction permits for Greenway build-out.
- Incorporate Clean Water Act requirements pertaining to Municipal Separate Storm Sewer Systems (MS4s) and Total Maximum Daily Load (TMDL).

1.3 Greenway Benefits

The 2016 Yreka Creek Greenway Master Plan will provide guidance for implementing projects that will greatly reduce flood hazards, improve water quality, and restore fish and wildlife habitat along up to 15 miles of Yreka, Greenhorn, Little Humbug, and Juniper Creeks. The Plan's benefits will extend further into ephemeral streams and bioswales for up to another 13 miles. The resulting network of Greenway corridors will total up to 27 miles in length within and around the City of Yreka, and will benefit coho salmon, Klamath steelhead, and many other aquatic, riparian, and upland species by providing valuable habitat in an otherwise developed setting.

Residents and visitors alike will benefit from the Greenway by having a network of non-motorized multi-use trails along Yreka and Greenhorn Creeks and selected bioswales. The Plan envisions nearly 14 miles of paved primary and secondary trails and 6 miles of unpaved trails. The resulting 20-mile network of streamside trails will provide outstanding opportunities for walking, jogging, cycling, and enjoyment of nature, and will include picnic areas, benches, interpretive panels, and various forms of outdoor art.

The economic benefits of having a greenway network in Yreka will be substantial. Outside funding from various grants used to build-out the Greenway will bring much-needed money into the local economy. After build-out, tourism and related benefits to local businesses will increase due to the draw of having exciting hiking and cycling opportunities along miles of streamside trails. Increases in quality of life resulting from the Greenway will not only benefit current residents, but may entice others to move to Yreka. Studies have shown that property values go up significantly for those properties located along greenways (Lindsey et al 2004).

Property owners currently affected by periodic flooding will benefit from Greenway components that restore natural floodways and thereby reduce the height and extent of flooding. Not only will flood-related risks to human health and property be reduced, but affected landowners may also save money if their properties no longer require flood insurance. Once flood reduction components of the Plan are completed, formal letters of map revision could be submitted to the Federal Emergency Management Agency (FEMA) which may result in the removal of affected properties from the 100-year flood zone, thereby eliminating the requirement for private property flood insurance.

The recommended improvements included in the Plan are also intended to help meet various state and federal water quality requirements associated with runoff from existing and future development. These recommendations will assist commercial and industrial property owners and land developers in complying with those requirements.

By the end of 2018, at least 1-1/2 miles of Greenway will have been designed, approved, and implemented at a cost of around $16 million, including land acquisition. Based on this, it is anticipated that the remaining 4-1/2 miles of Greenway will cost around $36 million, and will take at least another 20 years to complete. Benefits are already being realized, however, and will continue to increase and Greenway build-out proceeds.

With Greenway build-out will come increased maintenance work. It is anticipated that at full build-out, 2 additional Public Works staff positions will be required. Critical assistance in master planning, grant writing, and volunteer recruitment and oversight has been provided to date by the Siskiyou Gardens, Parks, and Greenway Association (SGPGA), and assistance has also been provided by the Shasta Valley Resource Conservation District (SVRCD). It is anticipated that these organizations will continue to assist the City in remaining Greenway build-out and ongoing maintenance.

Locations of implemented and pending Greenway projects

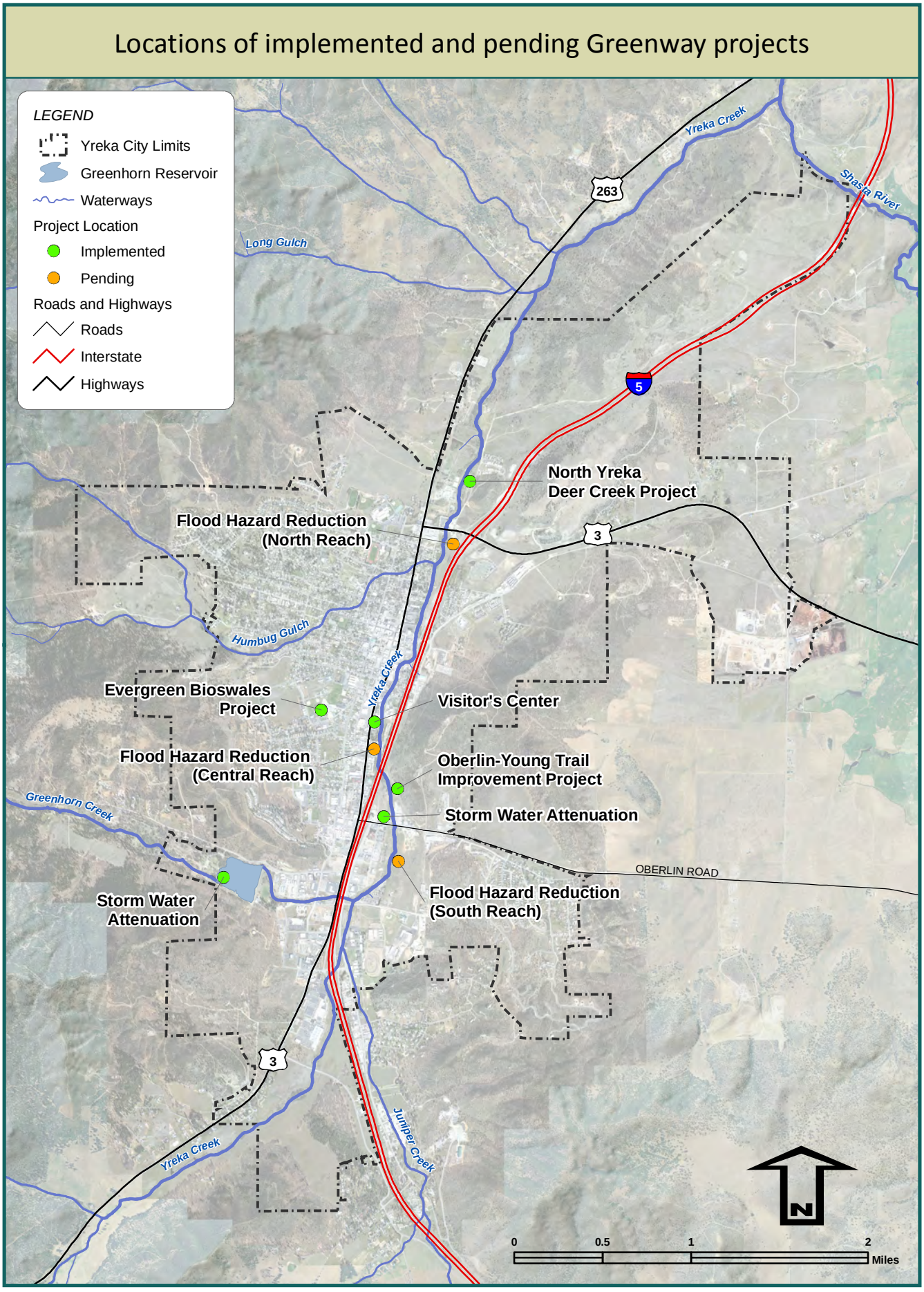


Figure 1 - Locations of completed and pending Greenway projects

1.4 Projects Already Completed or In Progress

Much has been accomplished since the completion of the first Yreka Creek Greenway Master Plan in 1989. Projects related to Greenway goals that have already been constructed or are currently underway are described below and summarized in Table 1:

A. Visitor Center Project (1993). This was the first portion of the Greenway to be constructed, and is located behind the Siskiyou County Museum. It consists of trails, bridges, picnic tables, benches, murals, and interpretive panels along 1/8-mile of Yreka Creek. An outdoor classroom with a sound wall, benches, interpretive sculptures, and native plants was added to the Visitor Center in 2015 as part of the North Yreka Creek Project (see below).

B. Storm Water Attenuation (SWA) Project (2007). This project consisted of enlarging and adding several key storm drains under City streets, installing hydrodynamic separators to filter out trash near outfalls into Yreka Creek, installing two large attenuation basins on tributary drainages to intercept and slow down runoff, deepening a portion of Greenhorn Reservoir to increase its stormwater retention capacity, and constructing a sediment basin just upstream from Greenhorn Reservoir. The project also included ecological restoration along 1/3 mile of Yreka Creek north of Oberlin Road, consisting of lowering and widening the floodplain, constructing overflow channels, constructing interim unpaved trails along the creek, re-vegetating with native species, and removing invasive non-native plant species.

C. Greenhorn Reservoir Trail Project (2009). This project consisted of installing a trail bridge at the Reservoir spillway, completing the paving for a 1-mile ADA-compliant trail around Greenhorn Reservoir, and installing restroom facilities at Upper and Lower Greenhorn Park. The Reservoir Trail provides a link between Lower and Upper Greenhorn Creek, and a proposed trail along Lower Greenhorn Creek will provide a future link to Yreka Creek.

D. Upper Greenhorn Creek Floodplain Restoration and Trail Project—Phase 1 (2009-2012). This project began with the design of floodplain lowering and widening, overflow channels, bank stabilization, upgrading of existing trails, re-vegetation with native plants, and removal of non-native invasive plant species along 1 mile of Upper Greenhorn Creek, broken into 3 implementation phases. Phase 1 of the project has been constructed along the first 1/4 mile of creek corridor above Greenhorn Reservoir.

E. North Yreka Creek Floodplain Restoration and Trail Project (2015). This project consisted of lowering and widening the floodplain, constructing overflow channels, installing an ADA-compliant paved trail, picnic area, parking area, and restroom, re-vegetating with native species, and removing invasive non-native plant species along 1/4-mile of Yreka Creek at Deer Creek Trailhead at the north end of town.

Bioswale and retention basin at Evergreen School

Greenway Visitor Center

Deer Creek Trailhead

Protecting shade trees from beavers

F. Evergreen School Bioswales Project (2015+). This project is consists of several large bioswales with retention basins at Evergreen Elementary School, designed to capture storm runoff from school buildings and parking areas that previously flowed onto the street. The first phase was completed in 2015 and the second phase will be completed in 2016. The third and final phase will be constructed in 2017. The bioswales are being re-vegetated with native species by students and volunteers. This project is on school district land outside City jurisdiction and is being undertaken by SGPGA.

G. Oberlin Trail Improvement Project (2016). This project is currently under construction, and consists of additional floodplain lowering and widening (where not previously lowered during the SWA Project), constructing a bioswale, re-vegetating with native species, removing non-native invasive plant species, and installing paved main and secondary trails, unpaved tertiary trails, trail bridges and boardwalks, picnic areas, interpretive panels, and trailhead facilities along 1/2-mile of Yreka Creek north of Oberlin Road. A paved spur trail will connect the Greenway to Main Street next to Mount Shasta Title.

H. Flood Hazard Reduction (FHR) Project—Central Reach (2016+). The Central Reach of the FHR Project, located at the Greenway Visitor Center and Klamath National Forest Service Center along the east side of Main Street, will consist of building and retaining wall removal/relocation, floodplain lowering and widening, vehicular bridge replacement, main channel re-routing, overflow and side channel construction, unpaved trail construction, re-vegetation with native species, and removal of invasive non-native plant species along 1/4-mile of Yreka Creek. The FHR North Reach, located between East Lennox Street and Montague Road (Highway 3), and the FHR South Reach, located between East Oberlin Road and Sharps Road, are expected to consist of floodplain lowering and widening, main channel re-routing, overflow and side channel construction, interim unpaved trail construction, and re-vegetating with native species along 1/2-mile of Yreka Creek at each location (totaling 1 mile of creek corridor).

I. Lower Yreka Creek Restoration Project—Phase 1 (2016+). This project is located on private land along the lower 2 miles of Yreka Creek above its confluence with the Shasta River. Phase 1 of the project will consist of 650 lineal feet of side channel installation and 2 acres of floodplain restoration to provide spawning and rearing habitat for coho salmon. Future phases of the project may consist of main channel re-routing, side channel and overflow channel installation, and up to 125 acres of floodplain restoration. This project is outside City Limits and is being undertaken by SGPGA.

Table 1-

Completed and pending Greenway implementation projects and funding sources (including portions of projects shown in parentheses for which existing funding covers land acquisition, planning, and design, but not construction)

Project	Stream Miles	Year	Primary Funding Sources	Amount
Visitor Center Project	0.1	1993	McConnell Foundation	$200,000
			PacifiCorp/CDFW	$50,000
Storm Water Attenuation Project (includes basins and storm drains)	0.3	2007-2008	Prop 40 (SWRCB)	$4,713,502
			Prop 40 (DPR)	$300,000
			Partners (USFWS)	$95,000
Greenhorn Reservoir Trail Project	0.5	2008	Roberti Zberg (DPR)	$296,000
	(equiv)		City of Yreka	$215,000
Upper Greenhorn Creek Floodplain Restoration and Trail Project—Phase 1 (+ Phases 2 and 3 planning/design)	0.25	2011	NAWCA (Ducks Unlimited)	$150,000
	(+0.75)		Partners (USFWS)	$133,000
			FEMA	$80,000
			Shasta Regional Foundation	$25,000
North Yreka Creek Floodplain Restoration and Trail Project	0.25	2015	River Parkways (DPR)	$1,429,000
			Partners (USFWS)	$120,000
Evergreen School Bioswales Project (SGPGA)	N/A	2015-2016	Partners (USFWS)	$118,000
Oberlin Trail Improvement Project	0.25	2016	River Parkways (DPR)	$1,118,000
Flood Hazard Reduction (FHR) Project—Central Reach (+ North/South Reaches land acquire, planning, and design)	0.25	2016+	Prop 84 (DWR)	$5,000,000
	(+1.1)			
Lower Yreka Creek Restoration Project—Phase 1 (SGPGA) (+ remaining phases planning/design)	0.1	2016+	Partners (USFWS)	$62,000
	(+1.9)		National F&W Foundation	$96,000
Total	**2.0 (+3.8)**			**$14,200,502**

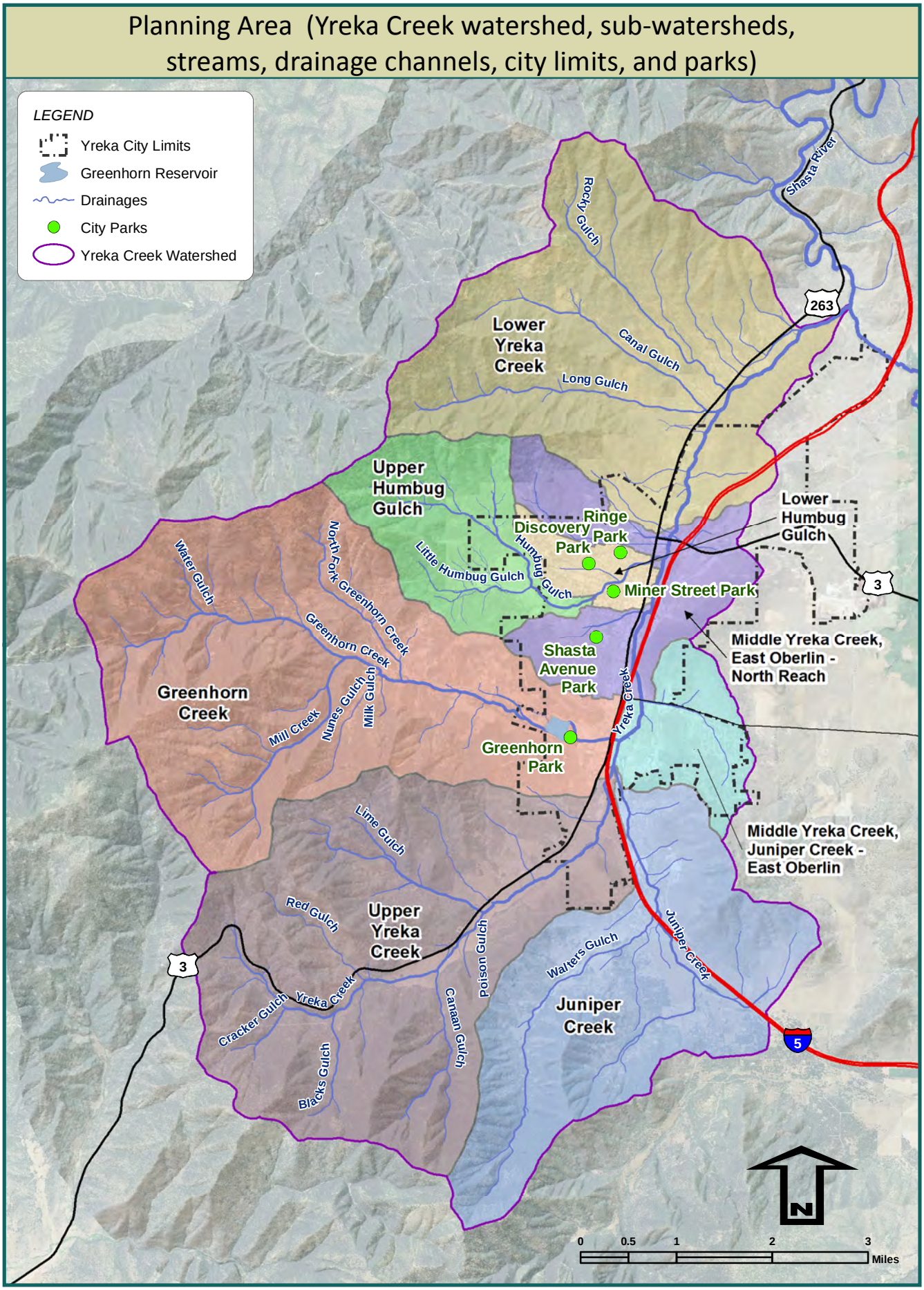


Figure 2 - Planning Area Sub-watersheds

2.0 METHODS

2.1 Planning Approach

Urban runoff impacts on both flood height and water quality are cumulative in nature, resulting from a combination of extensive impervious surfaces throughout the City and very efficient storm drain systems that intercept and convey runoff to Yreka and Greenhorn Creeks without slowing it down, filtering it, or inducing infiltration into the ground to recharge aquifers. The Greenway planning approach includes recommendations for extensive bioswales and re-watering of ephemeral streams where feasible to lessen these cumulative stormwater impacts and utilize runoff as an important resource for aquifer recharge.

In order to design and obtain approvals for this comprehensive approach to Greenway build-out, the following steps were taken:

- High-resolution photogrammetry and mapping of the entire City and vicinity.
- Break-down of drainages into reaches (23 total) and sub-reaches (53 total).
- Extensive on-the-ground surveys, including drainage and ecological features.
- Hydrologic and geomorphologic modeling of existing and proposed conditions.
- Conceptual design of entire Greenway network based on Greenway goals.
- Preparation of interactive Google Earth program of Greenway design for public outreach.
- Preparation of programmatic EIR for entire Greenway Master Plan Update to streamline CEQA process for future project-by-project implementation.

Hydrologic and geomorphologic modeling reports and detailed Greenway design recommendations by sub-reach are provided in the Appendices. That information, along with the programmatic EIR and associated environmental documentation, will facilitate obtaining regulatory permits for Greenway build-out. The expectation is that implementation will occur as funding allows, based on priorities set by the City and SGPGA. An adaptive management approach will be taken during implementation, in which the Master Plan may be updated as technology and information change, and as we better understand which methods best achieve Greenway goals.

2.2 Planning Area

The primary planning area consists of perennial, intermittent, and ephemeral stream corridors and associated 100-year flood zones within the Yreka Creek watershed that are within or adjacent to the City of Yreka. Named streams consist of Yreka Creek, Greenhorn Creek, Little Humbug Creek, and Juniper Creek. In addition, there are 10 unnamed ephemeral streams that are cumulatively significant to Greenway goals. To a lesser extent, the planning area also considers stream corridors elsewhere in the Yreka Creek watershed that are outside City jurisdiction, in order to assess their relationship to Greenway goals.

2.3 Reaches and Sub-reaches

For planning and design purposes, Yreka Creek and its tributaries were broken down into stream reaches and sub-reaches. Reaches were classified on the basis of whether they were perennial (and fish-bearing), intermittent, or ephemeral, and on confluences where flows significantly increase. Sub-reaches were based on the following criteria:

- Having similar features along a given length.
- Having similar benefits to program goals along a given length.
- Keeping sub-reach length to a manageable size for implementation (under 1/2 mile).

Table 2 - Greenway reach and sub-reach numbers and total miles

Note: Sub-reaches are nested within reaches.

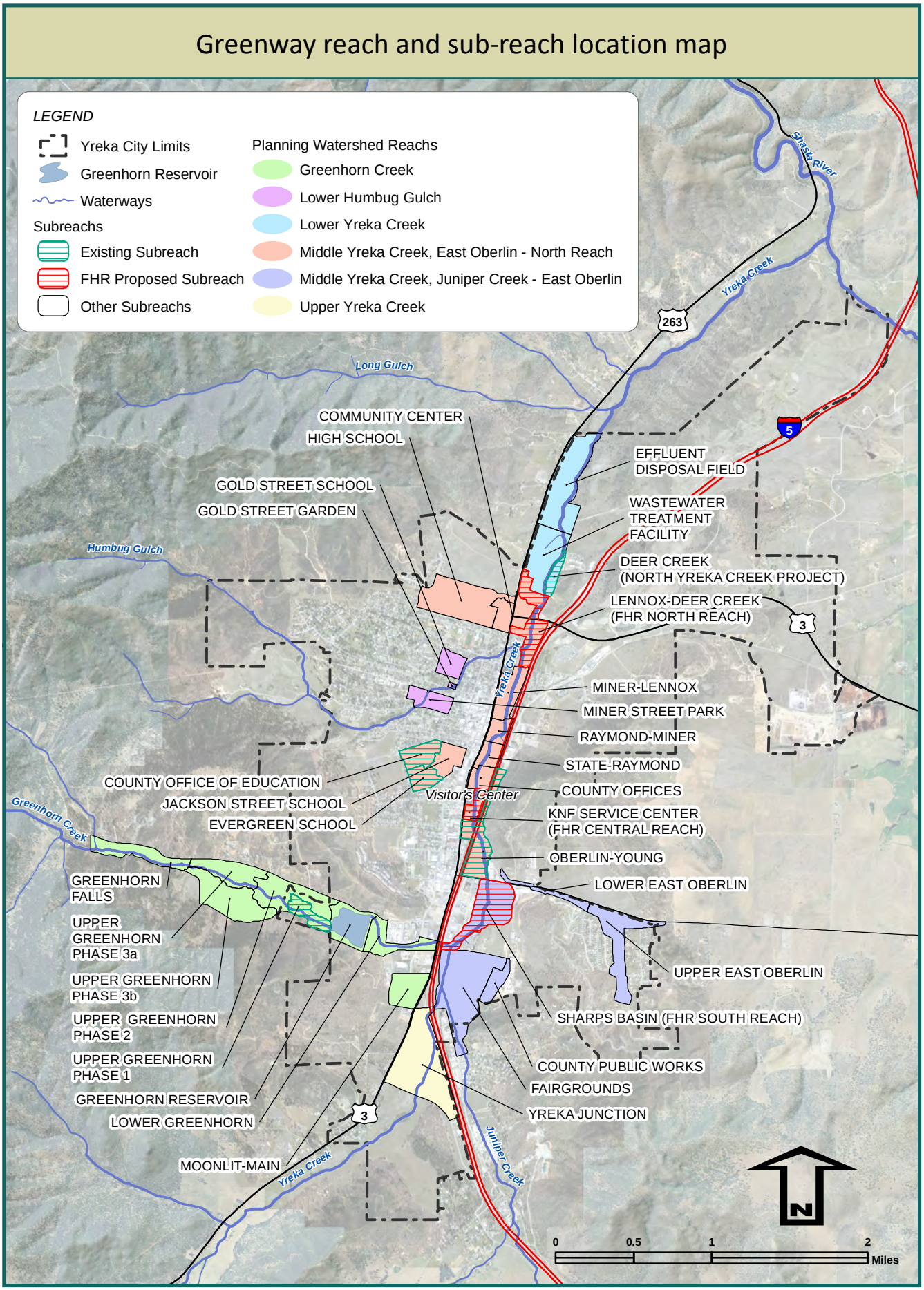
Planning Component	Perennial Streams (Yreka, Greenhorn)	Intermittent Streams (Juniper, Humbug)	Existing Ephemeral Streams Proposed for Restoration	Former Ephemeral Streams Proposed for Bioswales	Totals
Reaches	9	3	5	6	23
Sub-reaches	23	9	11	10	53
Total Length	**10.7 miles**	**3.7 miles**	**4.7 miles**	**7.8 miles**	**26.9 mi**

2.4 Base Mapping

Cessna 310 used for aerial photography

High-resolution air photos were taken in March 2014 covering a 12,000-acre area including the City of Yreka and vicinity. Various features were derived from these photos including topography, buildings, roads, drainages, etc. An air photo approach (orthophotogrammetry) was used in lieu of LiDAR (a laser-based technology) in order to capture more detail associated with buildings, retaining walls, utilities, streets, and other developed features of an urbanized setting. The result is that this Plan has excellent visual and survey data from which to base the technical reports and design recommendations for implementation. Base mapping will also be available for future projects.

Figure 3 - Greenway reach and sub-reach location map.



2.5 Field Reconnaissance

In addition to using field data collected during previous planning efforts, a field reconnaissance was undertaken as part of current Greenway planning. Fieldwork was limited to those stream segments that are either on public lands or where landowner permission was obtained to enter private lands. The purpose of the current field reconnaissance was to collect data not readily evident on air photos and/or had not been collected in the past, including:

- Stream channel characteristics (pools, eroding banks, etc.)
- Retaining walls / other bank armoring hidden under vegetation
- Culvert outlets
- Beaver activity
- Invasive plants (most notably Himalayan blackberry)

Himalayan blackberry vines in creek bed

2.6 Hydrologic and Geomorphologic Modeling

Field reconnaissance work also included data collection for hydrologic and geomorphologic modeling. Hydrologic field data consisted of surveyed cross sections, and geomorphologic field data included stream channel width and depth, bankfull indicators, substrate composition, and floodplain characteristics. These data were subsequently used to model existing and proposed conditions. Hydrology and geomorphology reports are provided in Appendices B and C, respectively.

2.7 Public Involvement

Public involvement in the current Greenway Master Plan Update planning process includes the following:

- Inclusion of public input from previous planning efforts.
- Ongoing participation of the Siskiyou Gardens, Parks, and Greenway Association.
- Public input during CEQA and NEPA processes.
- Community meetings focused on the Master Plan Update.
- Individual meetings with public and private landowners and public agencies.
- Presentations to civic and business groups.
- Posting of the draft Master Plan Update on City and SGPGA websites.

Initial involvement in Greenway master planning was through the Yreka Creek Committee. This group merged in 2010 with the Friends of Greenhorn Park, Siskiyou Arboretum, Yreka Community Gardens Project, and various City park citizen groups to create the Siskiyou Gardens, Parks, and Greenway Association (SGPGA). As a 501(c)(3) non-profit organization, SGPGA increases the capacity of all member groups to support community interests and perform non-profit fiscal transactions. The Yreka Creek Committee of SGPGA is still the primary community group involved in Greenway master planning, but due to the more comprehensive nature of current master planning, other member groups of SGPGA are also involved, most notably the Friends of Greenhorn Park.

Project review and approval requirements under CEQA (California Environmental Quality Act) and NEPA (National Environmental Policy Act) have been satisfied to date on a project-by-project basis. Similar to the reason for master planning for the entire Greenway, the Environmental Impact Report (EIR) being prepared for this Plan is intended to serve as a base document from which future individual projects can be approved. The EIR evaluates specific construction impacts of three FHR reaches (North, Central and South) to be implemented in 2017, as well as a programmatic evaluation of the Greenway Master Plan as a whole. The Central Reach affects land owned by Klamath National Forest which also requires environmental analysis under NEPA. The environmental process affords numerous additional opportunities for public input.

3.0 DESIGN RECOMMENDATIONS

A general discussion on recommended Greenway design is provided below that corresponds to the Greenway goals and objectives presented in Section 1. Design recommendations specific to each sub-reach are provided in Appendix D.

3.1 Flood Hazard Reduction

Recommended flood hazard reduction design solutions include:

- Increasing floodway capacity
- Increasing stormwater attenuation
- Installing bypasses
- Installing offset levees

3.1.1 Floodway Capacity

The primary design solution for flood hazard reduction takes advantage of existing down-cut (incised) stream channels by lowering the adjacent land on one or both sides of the channel to create a wider and more accessible floodplain near the level of the down-cut stream. This approach greatly increases the capacity (cross-sectional area) of the floodway, resulting in a lowering of flood height and horizontal extent (size of inundation area), and potential containment of large floods within the lowered/widened area. This new floodway corridor becomes the Greenway, by design, with trails and other recreational facilities incorporated into the new floodway. The extent to which floodplain lowering and widening is recommended depends on the presence of adjacent buildings, parking areas, roads, and other improvements, and on design parameters provided by hydrologic and geomorphologic modeling.

Courtesy Siskiyou County Museum

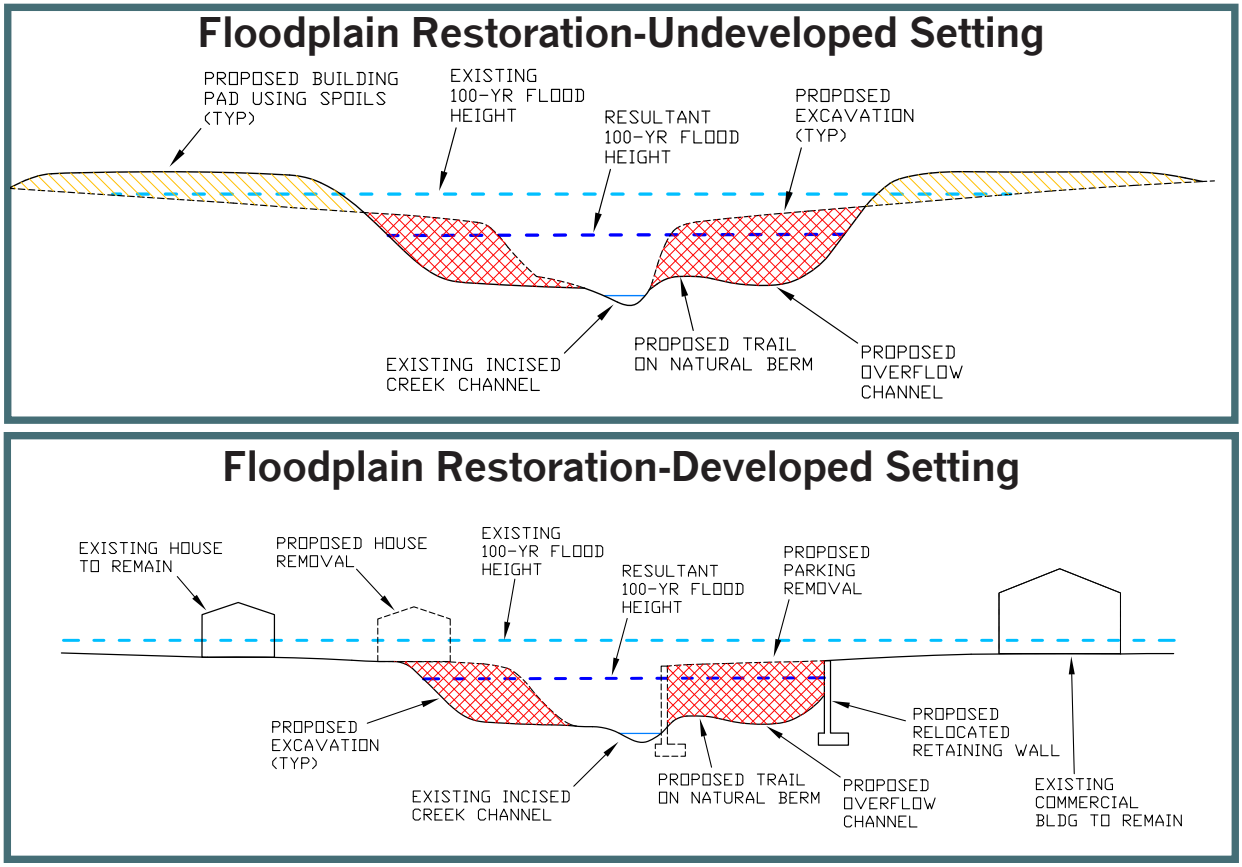
This design approach has been utilized to date on Upper Greenhorn Creek, on Yreka Creek north of Oberlin Road, and on Yreka Creek along Deer Creek Way. The main focus in the current Greenway Master Plan Update is on Yreka and Greenhorn Creeks, since they are perennial fish-bearing streams and are mostly within City jurisdiction. Little Humbug Creek, an intermittent stream, is largely constrained by residential development, but there are localized sub-reaches that would benefit from floodplain widening and lowering. Other sub-reaches could be included in the future as opportunities allow. Juniper Creek is also an intermittent stream and is mostly outside the City Limits, but the lowest sub-reach extending from Rolling Hills Drive into the Fairgrounds is recommended for near-future floodway improvements. Restoration of other sub-reaches along Juniper Creek outside the City Limits may be pursued by SGPGA, contingent upon landowner support.

Hydrologic modeling of proposed lowered and widened creek sub-reaches indicates that the flood height and horizontal extent of 100-year or greater flood events can potentially be reduced to the point of being contained within those modified sub-reaches (see Appendix B). Geomorphic modeling (referring to the geometry of creek channels and floodplains) shows that where new lowered floodplains can be made wide enough, the stream channel and its new floodplain can potentially function as a stable system, maintaining healthy channel structure and dissipating the energy of large events, while also moving coarse and fine sediment through the system in a steady-state manner.

Within these wider, restored sub-reaches, the proposed design also includes side channels and bottomland beaver habitat, which are important for coho salmon spawning and rearing. Along the most urbanized sub-reaches of Yreka Creek, however, only the hydrologic minimum width can be achieved due to the proximity of existing commercial and residential development. This minimum width will still allow for containment of most large storm events, but those flows will still have significant hydraulic energy and may require localized bank armoring (to be determined by subsequent project-specific engineering).

Recommended armoring methods include vertical or battered retaining walls, and boulder rip-rap infused with topsoil and planted with native vegetation. When using retaining walls, large boulders should be placed in groupings at the base of the walls to create roughness so that the creek channel doesn't migrate to the base of the walls. Aesthetics should be considered with armoring, as with new bridges and other crossings. For example, concrete retaining walls could be darkened and/or textured, and boulders used for retaining wall roughening and rip-rap could consist of dark-colored angular rock (not light-colored granite or limestone). In

Figure 4 - Cross sections of typical lowering/widening along incised channels.



most cases, however, native vegetation alone, coupled with energy dissipation provided by enlarged floodways, is likely to provide adequate bank protection.

Lowering and widening of floodplains will generate a considerable amount of excavated material (hundreds of thousands of cubic yards City-wide). Yreka and Greenhorn Creeks are incised by as much as 12 feet, which means that adjacent land will need to be lowered by up to around 10 feet to create accessible floodplains. The most cost-effective way to dispose of excavated material is to utilize the material next to the newly-excavated floodplains to construct building pads that elevate future development above the 100-year flood zone (see Figure 4). This technique is a win-win solution, reducing Greenway construction costs and creating buildable areas on adjacent private property. At some locations, sound berms can also be constructed with excavated material, thereby reducing freeway noise for Greenway users and adjacent residents. Most excavated material will contain the seeds and roots of invasive non-native plant species, requiring post-construction treatments in fill areas utilizing this material.

Existing bridges and other road crossings over streams may require retro-fitting or replacement to increase flood passage. In some cases, permanent removal of existing crossings might be the best course of action if they are no longer needed. Types of new and added crossings include clear-span bridges, multi-span bridges, arch culverts, and box culverts. Design of new and retro-fitted crossings should take into account the goal of reducing flood height in adjacent lowered/widened floodplain areas, the hydraulics associated with water velocity through the crossing, fish passage requirements, geomorphologic requirements for sustainable stream channel and floodplain geometry above and below the crossing, adequate room from Greenway trails under or within crossings, and the aesthetics of crossing design and materials.

In certain areas, underground utilities such as water, sewer, gas, and/or power will need to be re-routed. Some existing utility crossings under streams are armored by poured concrete, and this technique may be necessary for some re-routed utilities.

Table 3 -
Summary of proposed hydrologic and geomorphological design parameters by reach

Stream and Reach	Existing 100-Year Discharge (cfs)	Proposed Minimum Floodplain Width (ft)	Proposed Bankfull Channel Width (ft)	Proposed Bankfull Channel Depth (ft)
Yreka Creek:				
Westside Road to Juniper Creek	1564	100	40	3.0
Juniper Creek to Greenhorn Creek	2535	150	55	3.5
Greenhorn Creek to East Oberlin Drainage	4105	150	65	4.4
East Oberlin Drainage to Little Humbug Creek	4484	160	67	4.5
Little Humbug Creek to Long Gulch	5389	175	78	4.8
Lower Juniper Creek	962	55	25	2.0
Lower Greenhorn Creek	1495	80	32	3.0
Lower Little Humbug Creek	476	55	18	2.0

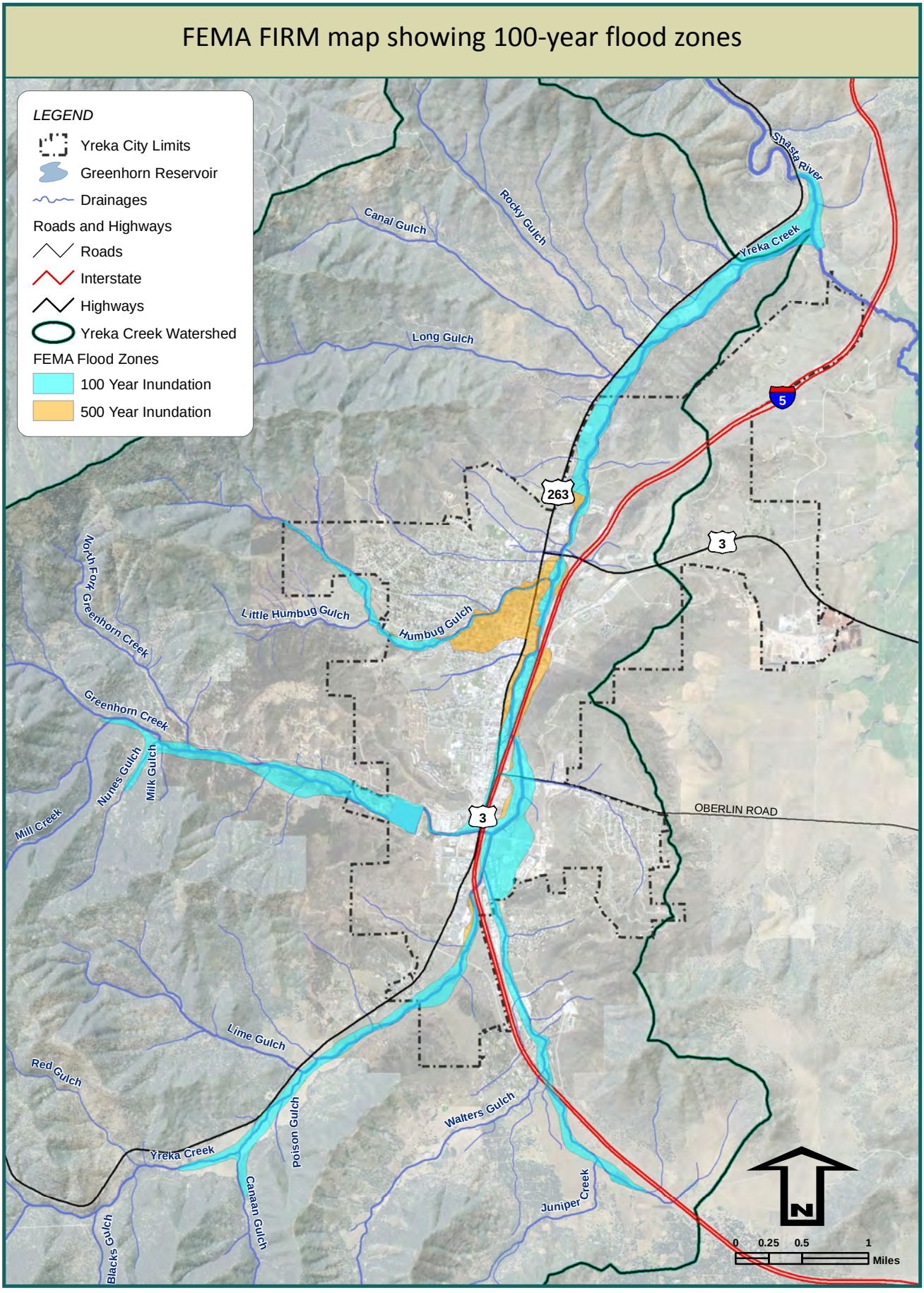


Figure 5- Federal Emergency Management Agency (FEMA) 2011 Flood Insurance Rate Map (FIRM) for Yreka showing existing 100-year and 500-year flood zones

Map of proposed floodplain lowering/widening and flooding reduction Southern portion of planning area

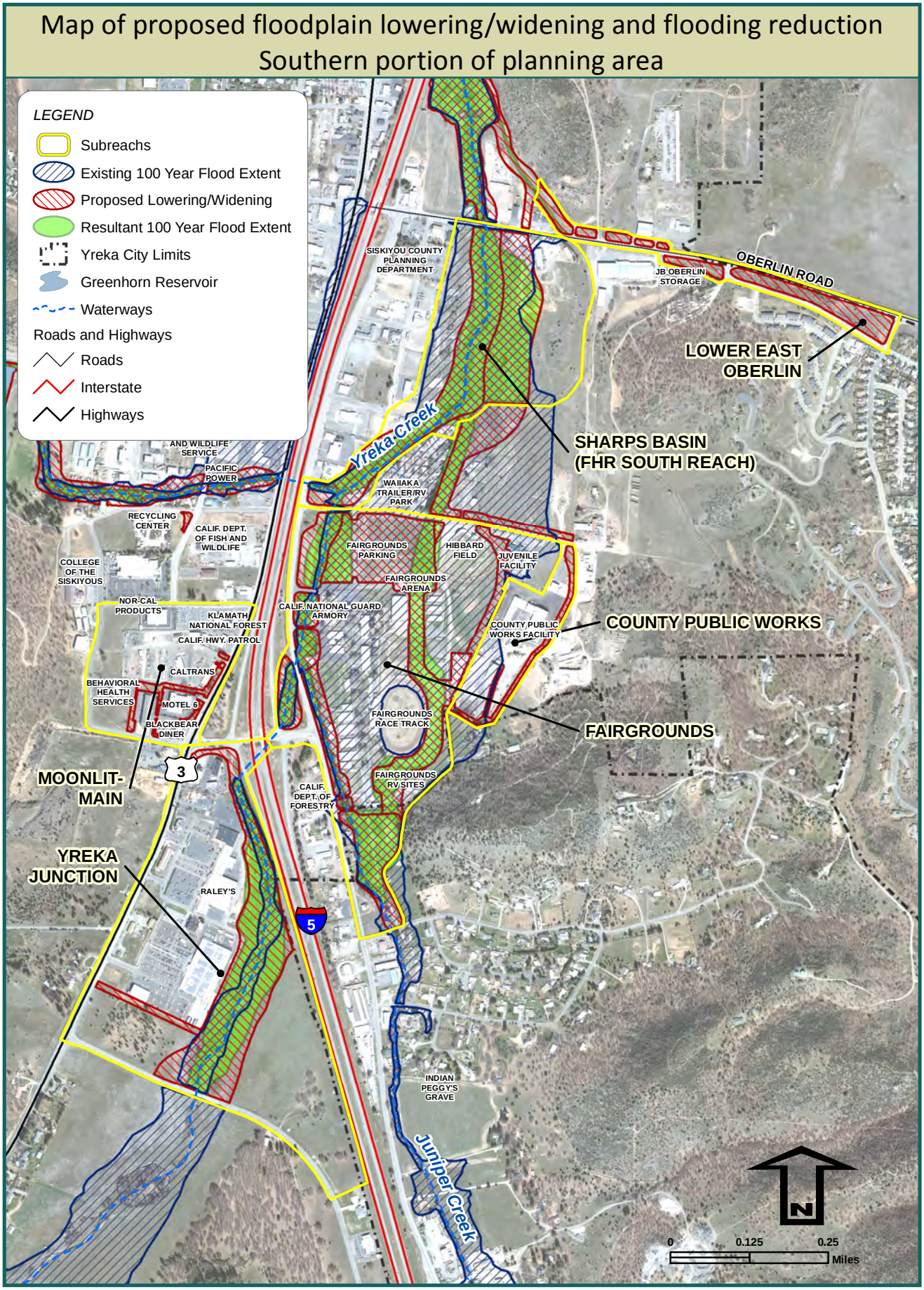


Figure 6 -
Map of proposed floodplain lowering/widening and flooding reduction—south portion

Map of proposed floodplain lowering/widening and flooding reduction Central portion of planning area

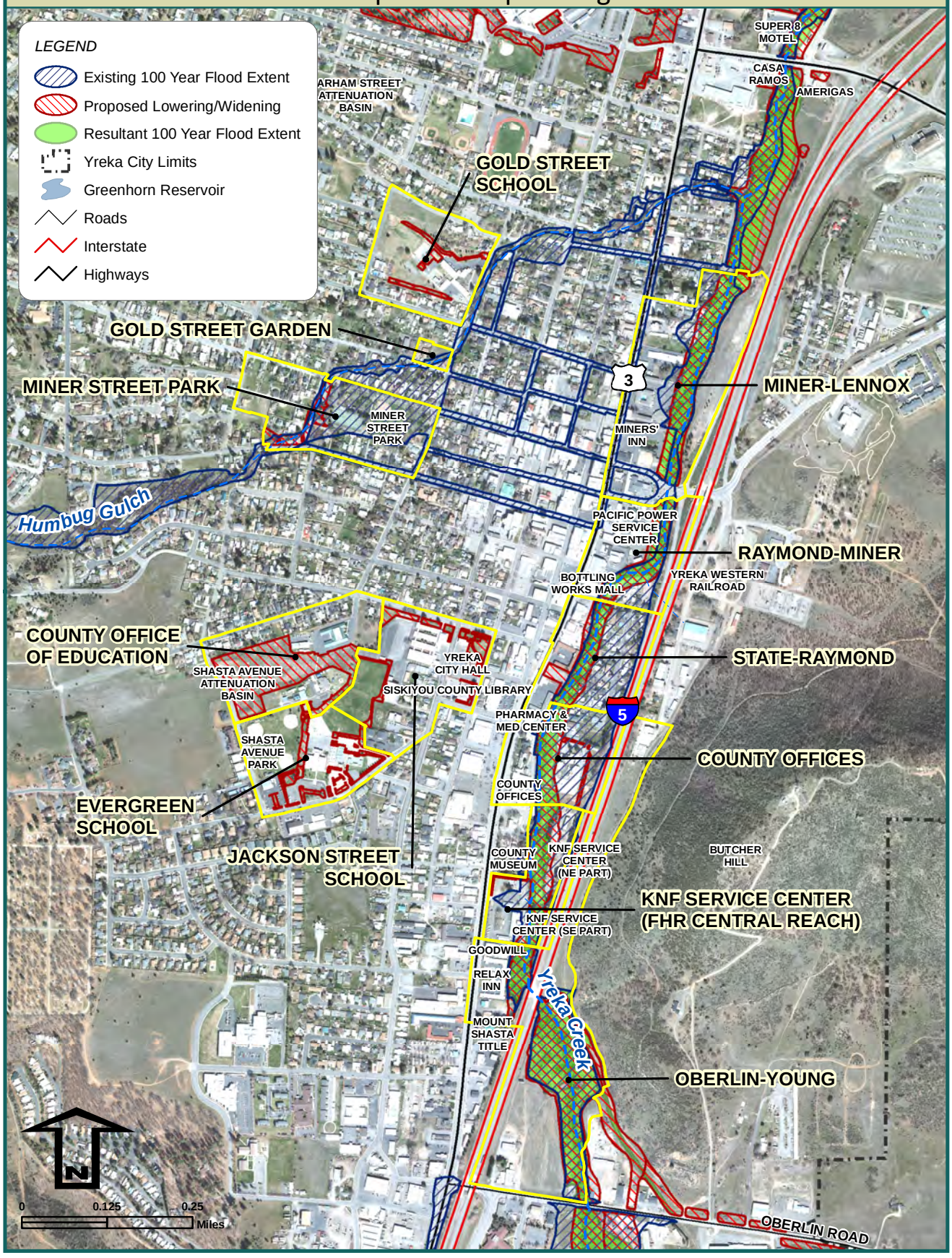


Figure 7 -
Map of proposed floodplain lowering/widening and flooding reduction—central portion

Map of proposed floodplain lowering/widening and flooding reduction Northern portion of planning area

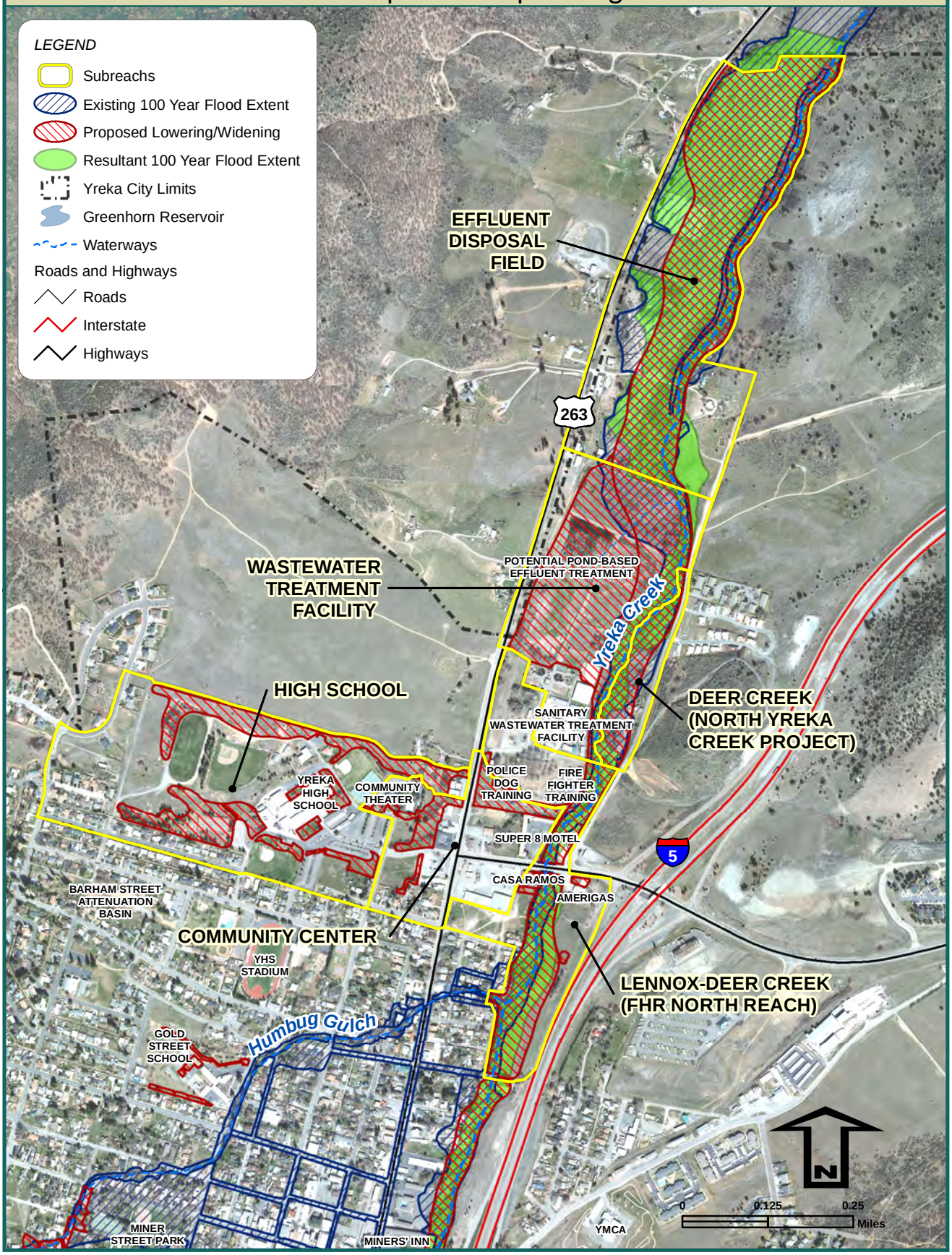


Figure 8 -
Map of proposed floodplain lowering/widening and flooding reduction—north portion

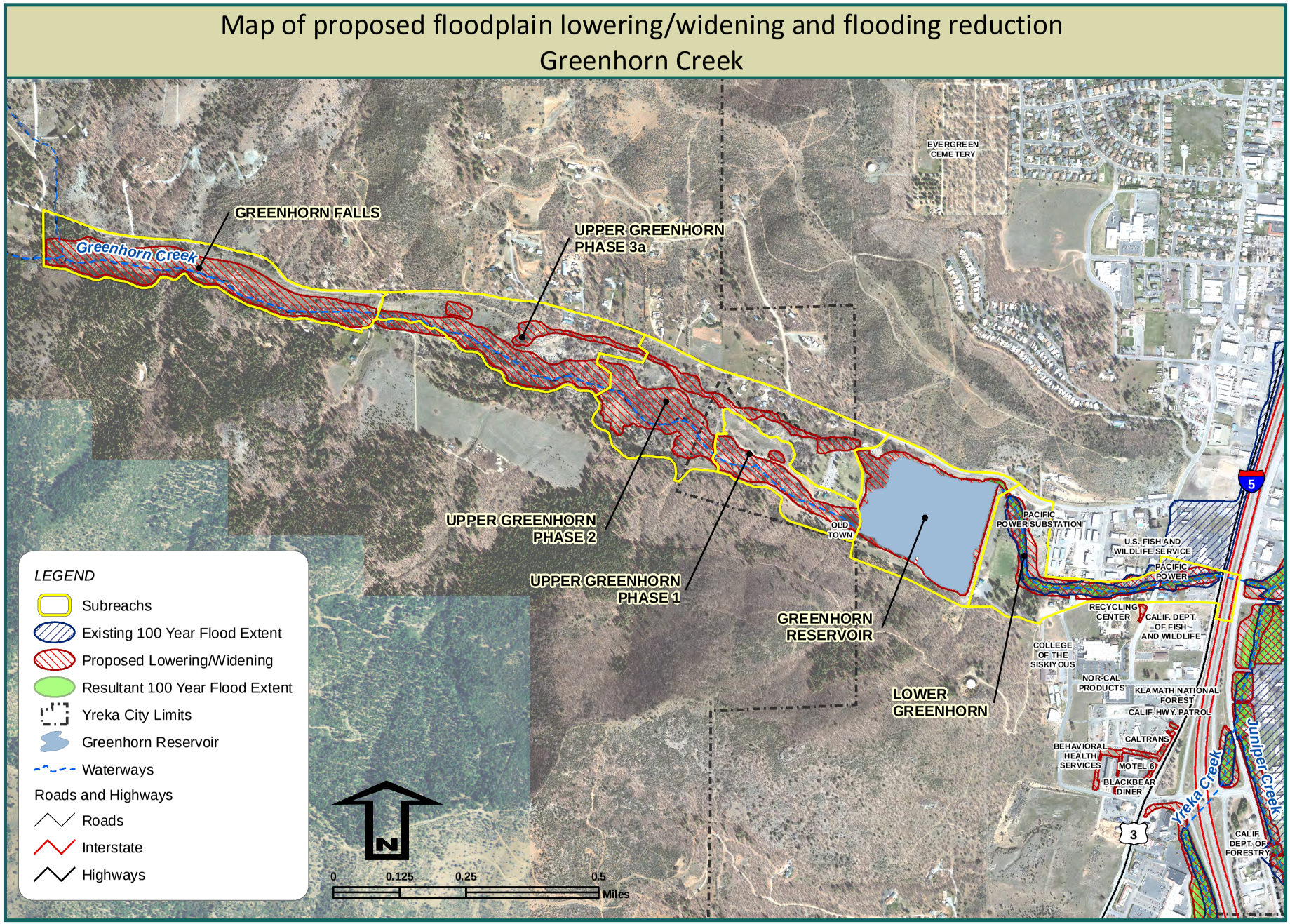


Figure 9 - Map of proposed Greenhorn Creek floodplain lowering/widening and flood reduction

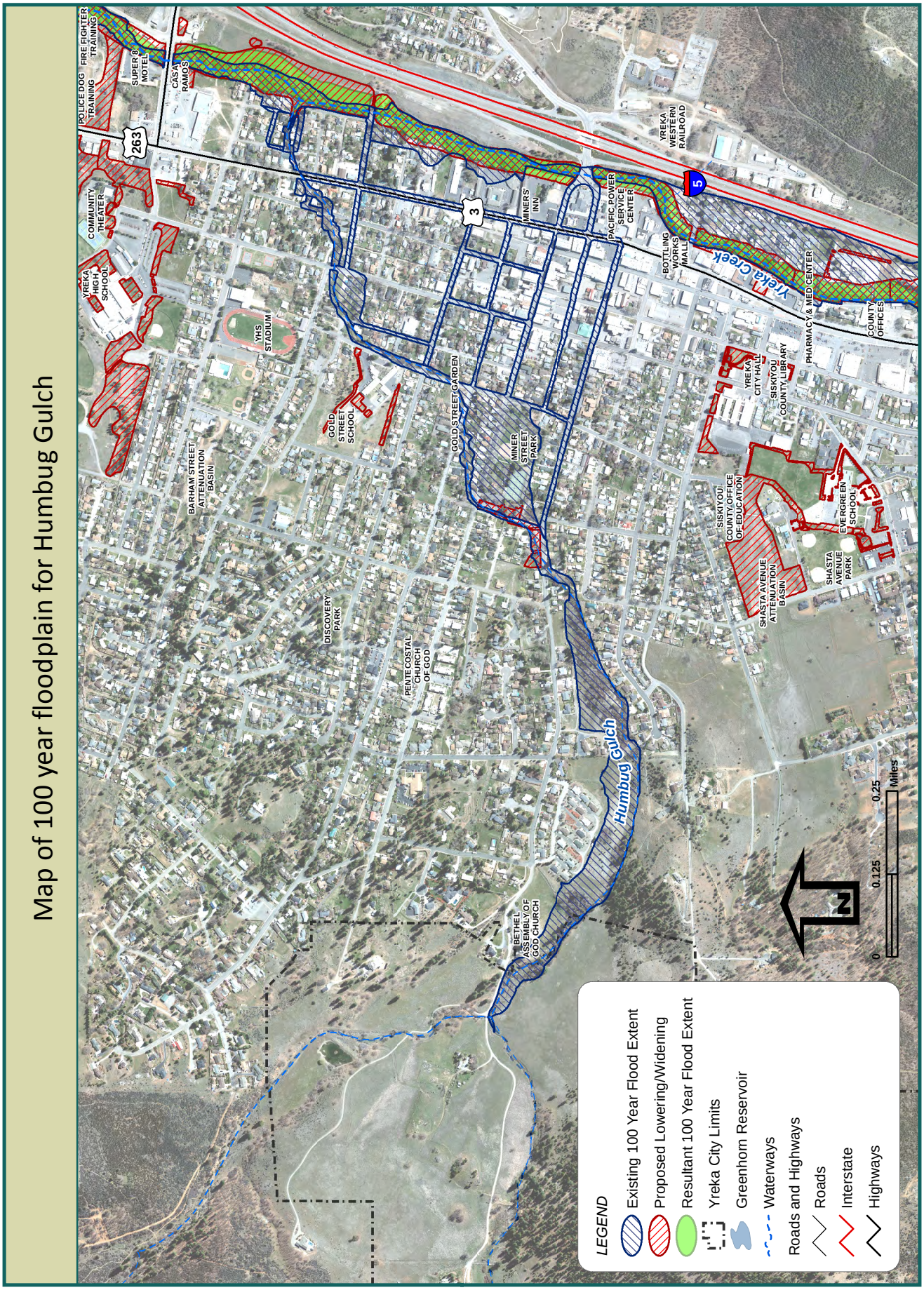


Figure 10 -
100 year floodplain for Humbug Gulch

3.1.2 Stormwater Attenuation

Another recommended design solution is to keep runoff from smaller storm events at the ground surface where it can move slowly through bioswales, small retention basins, and natural ephemeral streams. Developed areas have extensive impermeable surfaces (paving, buildings, etc.), and stormwater tends to run off quickly. Conventional storm drain systems are designed to reduce localized flooding from this runoff by quickly and efficiently intercepting and conveying it offsite. By doing so, they increase peak flows in receiving streams, most notably Yreka and Greenhorn Creeks, thereby contributing to increased flooding and related erosion along those streams. Conventional stormwater systems are essential in developed areas during large storm events, but they can be modified to keep runoff from smaller events above ground while still intercepting and conveying runoff from larger events. This design cumulatively contributes to reducing peak flows downstream by slowing down runoff and allowing some of it to soak into the ground, and it also yields water quality and fish and wildlife benefits discussed in more detail in the water quality and fish/wildlife subsections below. This solution has been utilized to date on the Evergreen School Bioswales Project.

Small retention basin and outflow device at Evergreen School

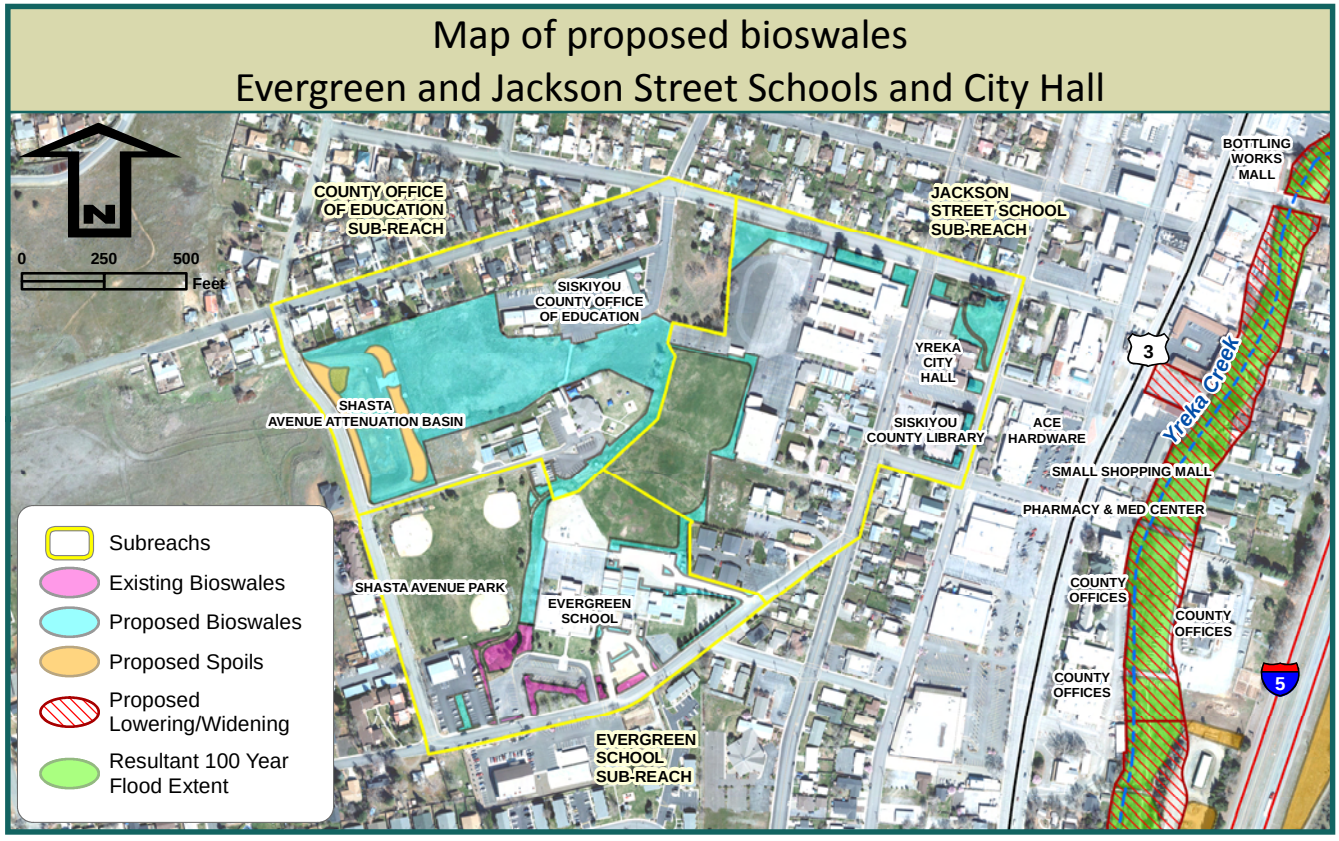


Figure 11 -
Existing and proposed bioswales for elementary schools and City Hall area

Flood hazards can also be reduced by utilizing large retention basins, such as the basins at Shasta Avenue and Barham Street constructed as part of the SWA Project. Greenhorn Reservoir storage capacity was enlarged through the same project, and now provides some stormwater retention when it is low at the beginning of the wet season. Stormwater attenuation (peak flow reduction) at Greenhorn Reservoir could be increased by retrofitting the existing spillway to facilitate lowering of the reservoir water level between storm events. This is discussed in more detail in the fish and wildlife subsection.

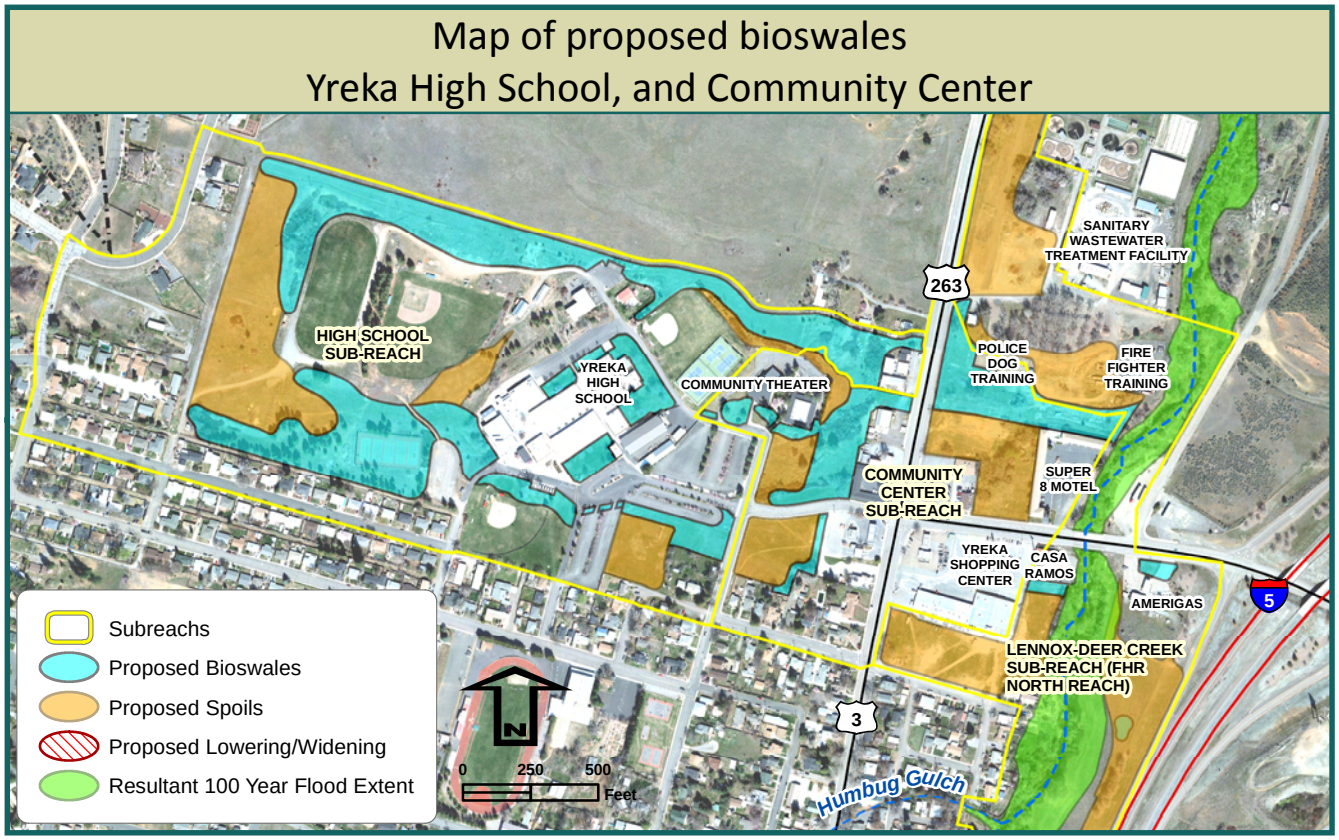


Figure 12 - Proposed bioswales at Yreka High School and Community Center

3.1.3 Bypasses

The portion of Little Humbug Creek located within the developed portion of the City is constricted to the point that it jumps its banks even during relatively small storm events and floods a significant portion of the City (mainly City streets—see Figure 10). The creek shows signs of past re-routing, because it follows the side slope rather than the fall line at some locations, causing the creek to spill mostly along its lower eastern side. Due to dense residential development and undersized road crossings along this portion of creek, full restoration via floodplain lowering and widening and associated capacity increases at road crossings would be very expensive and logistically challenging. Floodway improvements are recommended at specific sites as opportunities allow and a large bypass culvert is recommended at Humbug Hollow just upstream from dense development to intercept large flows and divert them to Yreka Creek. This bypass culvert could be associated with several small retention basins inset into the landscape at Humbug Hollow, the lowest of which could also serve as the intake for the bypass culvert. Humbug Hollow is also large enough to accommodate significant floodplain lowering and widening in combination with the retention basins, which would help protect nearby homes.

Flooding along Little Humbug Creek near Gold Street Garden in 2005

3.1.4 Offset Levees

The existing FEMA map (see Figure 5) and hydrologic modeling show that Lower Greenhorn Creek will spill out of its north bank and flow down Main Street all the way to Miners Inn during a 100-year storm event, even though the twin box culverts where Greenhorn Creek goes under Main Street and Interstate 5 are large enough to carry the flows. Floodplain lowering and widening upstream from the box culverts will help, but in order to keep floodwaters in the new floodway, a low retaining wall is recommended on the north and east sides of the approach to the inlets. This wall will function as an offset levee.

Greenhorn Creek box culvert inlets.

A similar situation exists along the east side of I-5 at the bridge over Yreka Creek north of Oberlin Road. FEMA and project modeling show that during a 100-year event, some water will flow northward along the east side of the freeway and end up flooding businesses and residences along Foothill Drive. An existing sound berm just north of the bridge can be augmented to function as a small offset levee to prevent this from happening.

At the Waiiaka mobile home and RV park along Sharps Road, hydrologic modeling shows that even if all recommended floodplain lowering and widening and the Juniper Creek bypass are implemented, the facility will still be barely above the 100-year flood height. For this reason, the property owner may want to consider modest augmentation of the existing low offset levees around the facility.

3.2 Water Quality Improvements

Issues that may affect water quality, stream function, and ecological health along Yreka Creek and its tributaries include:

- Increased peak flows due to impervious surfaces and conveyance-based storm drain systems.
- Decreased base flows due to reduced aquifer recharge.
- Increased erosion due to increased peak flows and incised stream channels.
- Decreased native vegetation due to development, erosion, and invasive plant species.
- Increased water temperatures due to decreases in base flows and shade.
- Increased pollutants from street and parking runoff.

Water quality can best be improved by taking a watershed approach that includes the following recommended design solutions:

- Flood hazard reduction, most notably through floodplain lowering and widening.
- Bioswales, including small retention basins and vegetated filter areas.
- Low Impact Development (LID) solutions.
- Restoration of natural ephemeral streams where opportunities allow.
- Modified effluent disposal system at the wastewater treatment facility.
- Modified Storm Water Pollution Protection Plan (SWPPP) practices.

These techniques also help the City comply with new regulations under the Clean Water Act pertaining to Municipal Separate Storm Sewer Systems (MS4) of cities with less than 20,000 residents. The updated Greenway Master Plan is intended to serve as an overall watershed improvement plan. As such, it will help the City comply with Total Maximum Daily Load (TMDL) requirements implemented to protect water quality and fish habitat (i.e. coho salmon) in the Shasta River and its tributaries.

3.2.1 Flood Hazard Reduction Benefits to Water Quality

Lowering and widening floodplains as described above will benefit water quality in the following ways:

- Reducing soil erosion by lowering flood heights and reducing hydraulic forces.
- Capturing fine sediment by spreading out high flows over restored floodplains.
- Filtering out contaminants by having runoff flow through vegetated floodplains.
- Increasing filtering and infiltration by moving storm drain outfalls to far edge of floodplains.
- Avoiding contaminant-producing flood damage to buildings and other infrastructure.
- Increasing ground water recharge, thereby increasing base flows and lowering stream temperatures.

Floodplain lowering and widening also benefits water quality by initiating a natural process to undo substrate stratification caused by past gold dredging. Most of Yreka and Greenhorn Creeks within the City were dredged. A natural stream substrate consists of mixed particle sizes, but gold dredging results in the creation of 3 distinct substrate layers: the smallest particles are at the bottom (the slickens layer); a sand layer is in the middle; and a coarse gravel and cobble layer is at the top. As a result, the water table drops to the sand layer. Creating a lower and wider floodplain within dredged areas allows high flows to spread out and fine sediment to drop out of suspension. This sediment will gradually clog spaces in the cobble and gravel layer, resulting in a gradual raising of the water table. Fine sediment accumulation will also re-establish good topsoil for riparian vegetation.

Gold dredge on Greenhorn Creek.

3.2.2 Bioswales and Small Retention Basins

Bioswales with small retention basins are recommended where there is room and as opportunities allow, as a means of intercepting and naturally processing stormwater runoff from buildings, parking lots, large lawn areas, equipment and storage areas, and other impervious or compacted surfaces. Several large bioswale projects are specifically included in the Master Plan where natural ephemeral streams had existed prior to development. One of these projects is at Evergreen School, which serves as an excellent example of how a site can be retrofitted in a manner that resolves localized flooding and ice problems, eliminates stormwater disposal onto an adjacent City street, adds a landscape amenity and teaching opportunities, and does so without reducing or interfering with the functionality of the site.

3.2.3 Low Impact Development Solutions

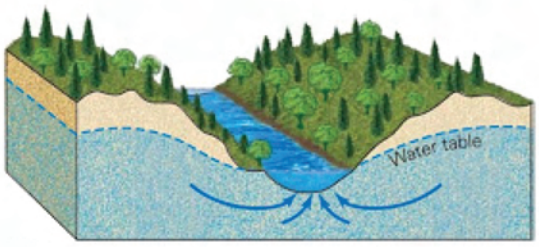
In addition to bioswales and small retention basins, other Low Impact Development (LID) solutions include the following, which may vary in applicability depending on the constraints and opportunities of a given site:

- Permeable paving
- Infiltration trenches and dry wells
- Oversized culverts
- Filtering solutions (vegetated filter strips, tree box filters, hydrodynamic separators, etc.)
- Rain gardens (isolated small vegetated retention basins not connected to bioswales)
- Rainwater catchment and re-use systems

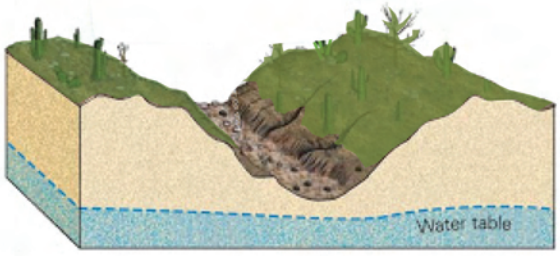
3.2.4 Ephemeral Stream Restoration

Ephemeral streams are natural drainage features that only flow during and shortly after storms. Some ephemeral streams in Yreka have been largely obliterated by development and are recommended for re-establishment as a series of bioswales, and others are relatively intact topographically but have been de-watered due to interception of flows by conventional storm drain facilities. Some of these drainages flow across public lands, but most are in residential areas and pass through numerous small back yards. Although individually of lower significance than perennial or intermittent streams, they are cumulatively very important for slowing down peak flows, allowing infiltration to occur (thereby recharging aquifers), filtering urban runoff through vegetation, and providing wildlife habitat and dispersal corridors through urbanized areas. They can also be a very positive landscape feature. As envisioned by this Plan, restoration efforts on these streams would be implemented by willing landowners or contingent upon resolving public funding and access constraints. Full functionality will depend upon retrofitting a number of storm drain inlets so that smaller storm flows stay above-ground and flow through the ephemeral stream channels, while large storm flows are still intercepted and bypassed into the existing underground storm drain system. Most urban runoff pollutants come from smaller storm events, which makes this solution particularly effective.

The difference between permanent and ephemeral streams



The floor of a permanent stream in a temperate climate lies below the water table. Springs add water from below, so the stream contains water even between rains.



The channel of an ephemeral stream lies above the water table, so the stream flows only when water enters the stream faster than it can infiltrate into the ground.

3.2.5 Wastewater Treatment
Effluent Disposal Modifications

The treated effluent from Yreka's sanitary wastewater treatment facility is currently injected into the ground in a large disposal field located downstream from the treatment facility in the floodplain of Yreka Creek. This disposal system resembles a giant drip irrigation system. A levee was built along Yreka Creek to protect the system. This levee works well during smaller storm events, but during larger more damaging events like the 2005 Flood (a 25-year storm event), high flows have breached the levee and damaged the system.

Marshlands

Restoring floodplain function in this area could reduce impacts to the effluent disposal system and provide an opportunity for additional natural filtration of treated wastewater. Potential restoration options could include removal of the protective levee along the Creek, re-establishing the levee further away from the Creek, or redesigning the effluent disposal system to flow through a series of ponds located out of the active floodplain. If one or more of these options are pursued, riparian vegetation, which is currently lacking due to the need to keep the disposal field free of roots, could be re-established. Any changes to the effluent disposal system must enable it to continue to function effectively.

The inclusion of ponds would provide extensive freshwater marsh habitat, benefitting migratory birds along the Pacific Flyway and other wildlife species such as the Northwestern Pond Turtle (a species of concern). Spur trails could be built around the ponds to provide bird watching and other wildlife observation opportunities. (See Subsection 3.3.4 regarding mosquitos.)

3.2.6 SWPPP Modifications

Storm Water Pollution Protection Plans (SWPPPs) are required by the Water Board for earth-moving projects larger than 1 acre, including floodplain restoration. SWPPPs include temporary erosion control measures and water quality monitoring until vegetation can be re-established. When using restoration techniques that involve lowering and widening of areas to create easily accessible floodplains, including overflow and side channels, some of the

standard Best Management Practices (BMPs) included in SWPPPs, such as silt fencing and straw rolls, are not necessarily compatible with the design approach. These BMPs are intended to intercept sediment from disturbed areas before it enters waterways. On newly-constructed floodplains, the flow of water is in the opposite direction (onto and across the floodplain from the creek rather than toward the creek). As a result, silt fencing and straw rolls are dislodged during high flows and carried downstream where they end up littering the streambank and sometimes clogging the channel, potentially causing more erosion.

Similarly, the standard definition as to when a project is considered complete is when at least 70 percent vegetative cover has been re-established. This is moot on floodplains, because they are going to be underwater during high flows by design, regardless of when re-vegetation goals are achieved. In dredged areas, the soil is mostly gravel and cobble, which is very difficult to re-vegetate but is also inherently resistant to erosion. Additionally, floodplains by definition allow water to spread out and slow down. As the water velocity slows, fine sediment drops out of suspension which contributes to topsoil development and healthy riparian vegetation (thereby increasing shade over streams and lowering water temperature, a Shasta River TMDL benefit).

Straw rolls along creek

Modifications in SWPPP protocol that address the above concerns would avoid unintended resource damage from failed BMPs, and would lower SWPPP-related costs of compliance. The cost savings would enable more Greenway restoration work to be undertaken. A SWPPP Reference Document is included in Appendix E to provide guidance for SWPPP preparation and implementation associated with build-out of the Yreka Creek Greenway.

3.3 Fish and Wildlife Habitat Restoration

The design of the Yreka Creek Greenway as a network of stream and drainage corridors throughout the City provides fish and wildlife habitat, creates wildlife dispersal corridors, and brings more nature into the urbanized environment than would be the case with the original concept of a single linear greenway along Yreka Creek.

Foothill Yellow-legged Frog

Yellow Warbler

Coho Salmon

Fish and wildlife species of concern that will benefit from restoration and habitat protection associated with the expanded Yreka Creek Greenway include:

- Coho Salmon
- Steelhead Trout
- Northwestern Pond Turtle
- Foothill Yellow-legged Frog
- Neotropical Migratory Bird Species

Recommended design solutions for fish and wildlife habitat restoration include:

- Greenhorn Reservoir modifications for anadromous fish (salmon and steelhead) passage
- Stream channel restoration
- Beaver habitat restoration
- Wetland and riparian restoration
- Adjacent upland restoration, including oak woodland
- Bioswale installation and ephemeral stream restoration
- Ecological landscaping in developed areas
- Invasive species management

Northwestern Pond Turtles

3.3.1 Greenhorn Reservoir Modifications

Spillway at Greenhorn Dam

Greenhorn Reservoir impedes salmon and steelhead passage to 1-1/2 miles of potential high-quality spawning and rearing habitat above the Reservoir and below Greenhorn Falls, all on City-owned land. By coincidence, the spillway at Greenhorn Dam was designed as mostly a gently-sloped ramp such that it could be retrofitted as a spillway-wide fish ladder. At the top where there is a 6-foot headwall, an extension could be installed through an adjacent retaining wall and into the reservoir, not only completing the fish ladder but also providing a lake-level control structure to keep the reservoir low during the wet season for improved stormwater attenuation. Opportunities for watching migrating salmon and steelhead would be outstanding, as viewed from the existing trail bridge at the spillway, where the fish ladder extension would enter the lake near the western end of the bridge.

Potential negative impacts on recreational fishing in Greenhorn Reservoir could be avoided by adipose fin-clipping of all trout planted in the reservoir and requiring release of all non-clipped salmonids. There would be no impact on bass fishing; to the contrary, the more bass harvested the better for young salmonids.

Greenhorn Reservoir also blocks downstream movement of spawning gravel. A sediment basin was installed at the head of the Reservoir as part of the SWA Project, and coarse sediment that is periodically removed could be placed below the Dam. During ongoing floodplain restoration above the Reservoir and in tailings areas along Yreka Creek, the tailings material removed could be processed offsite to produce clean spawning gravel, which could then be placed at selected locations below the Dam.

Location of adipose fin on trout

Greenhorn Reservoir could be used to augment downstream flows during the driest part of the late summer by slowly drawing down the reservoir by several feet, in preparation for wet season stormwater attenuation.

Figure 13 - Drawing of fish ladder retrofit

3.3.2 Stream Channel Restoration

Re-routes of Yreka Creek at selected locations are recommended in order to increase channel meander where the existing channel is too straight (due to gold dredging and other past alternations), and where there is enough room to accommodate re-routes. The re-routed channels will correspond to stable channel geometry determined by the geomorphology study. Existing channel segments remaining after re-routing can be modified to function as either wetted side channels (for juvenile salmonid rearing) or as floodplain overflow channels (dry except during high flows). Existing vegetation along portions of channels to be re-routed can be left in place. Construction of additional side channels and overflow channels is also recommended where appropriate.

The installation of instream structures such as rock vanes, large woody debris, beaver dam analogues, and individual boulders and logs is recommended along existing and re-routed stream segments where fish habitat will be enhanced. Streambank structures such as rootwads, engineered log jams, and transplanted masses of vegetation, and boulders, most notably along the outsides of bends, are also recommended along existing and constructed stream channel segments where appropriate. Great care needs to be taken in designing and installing instream and streambank structures so that they are not likely to wash downstream and impair flood passage at bridges or culverts.

3.3.3 Beaver Habitat Restoration

Beaver historically played a key role in stream and floodplain geomorphology and associated fish and wildlife habitat across North America prior to being almost completely eradicated by trapping for pelts in the 1800's. Their numerous small dams, ponds, and canals attenuate floods, trap fine sediment and gravel, increase water storage, support extensive wetland and

riparian vegetation, and provide spawning and rearing habitat for salmonids, most notably coho salmon. Beaver are still present in Yreka, although in low numbers. It is recommended that stream channel and floodplain restoration be designed in such a way as to facilitate expansion of their local populations in locations where extensive beaver habitat will be compatible with surrounding development. This can best be accomplished where new floodplains might be wide enough to accommodate beaver activities (such as at Sharps Basin).

Beaver dam in creek

One downside of beavers is that they have a tendency to chew on large trees, even though there are plenty of smaller trees available for food and dam construction. This problem has been kept in check by an aggressive tree-wrapping program undertaken by SGPGA volunteers, using wire screen. It is recommended that tree wrapping continue until riparian restoration has progressed far enough that there are a sufficiently large number of large trees to accommodate occasional loss to beavers.

3.3.4 Wetland and Riparian Restoration

Types of wetland and riparian habitat recommended for incorporation into Greenway design include:

- Ponds (functioning as fresh water marshes)
- Wet meadows
- Riparian woodland
- Snags and logs in floodplain areas
- Existing tree retention (even if non-native)
- Wetland and riparian mitigation

Ponds are recommended along Upper Greenhorn Creek (enlarged remnant dredger ponds), in wide floodplain areas along Yreka Creek to encourage more beaver activity (such as at Sharps Basin), at one or more of the public school campuses for learning opportunities, and potentially at the City's Wastewater Treatment Plant (as discussed above). These ponds should be designed to be naturally-appearing and ecologically functional as freshwater marshes, with a mix of open water, emergent aquatic vegetation (cattails, tules), nesting islands, and haul-out logs and boulders for turtles and waterfowl.

Many people equate ponds with mosquitoes, but mosquitoes typically breed in small isolated pockets of water, as often found in old tires and other discarded junk, cemetery flower vases, tree cavities, hoof prints in flood-irrigated pastures, and clasping leaves of some plant species. In larger water bodies, predators are usually present that eat mosquito larvae. The best way to ensure that constructed ponds do not breed mosquitoes is to stock them with fish. Bluegill

work well because they are adapted to our local climate, they successfully breed within ponds, and they do not prey upon native fish species. Bass are not desirable because they eat other fish, as well as amphibians and sometimes even ducklings. Some ponds, such as dredger ponds along Greenhorn Creek, will have enough cold groundwater flowing through them to support trout.

Wet meadows are recommended around ponds, as well as in several large open areas along Upper Greenhorn Creek and in the bottoms of attenuation basins and bioswales. There are existing wet meadows in Yreka, most notably between the Shasta Avenue Attenuation Basin and Jackson Street School. Native plant species found in these meadows and along existing streams are recommended for use in constructed wet meadows. Regarding mosquitoes, it is important that constructed wet meadows be sloped or drained in such a way as to not retain surface water long enough for successful mosquito breeding to occur.

Native riparian woodland species are recommended for the majority of stream channel and floodplain re-vegetation areas. Riparian trees are essential to beavers, and by facilitating beaver activities and generating large woody debris, riparian woodland vegetation contributes to restored channel and floodplain geomorphology and associated fish and wildlife habitat. It is also important for providing shade and insect habitat along streams, and providing nesting habitat for a variety of neotropical migratory bird species.

Floodplain lowering and widening will result in the new ground surface being much closer to the water table (which typically drops when streams become down-cut). This will facilitate perpetuation of desired wetland and riparian species once plant materials become established. Some form of interim irrigation will be important for plant establishment, however.

Snags and logs should be kept in areas where they do not pose a danger to trail users or to bridges and culverts. To date, large logs (6 inches in diameter or larger) generated during floodplain lowering and widening have been scattered on the new floodplains rather than removed, in order to provide habitat for a variety of wildlife species that use logs for foraging and cover. In some areas, logs may be staked down to prevent them from washing downstream during high flows. When the option exists, it is recommended that large equipment be used to break the ends of logs rather than cutting them with a chainsaw. This is purely for aesthetic reasons to help make restored areas look more natural.

In situations where the base of a large tree is not close to desired final grade during floodplain lowering and widening, especially when the tree is providing shade for the creek, it is recommended that the tree be retained and left on a raised gently-sloping mound that corresponds to the root crown of the tree. This will not impair floodplain function, and has been done to date along Yreka Creek and Upper Greenhorn Creek. This approach is recommended even if the tree in question is non-native (such as a black locust or European plane tree), given the importance of large trees for shade and habitat. Research has shown that if at least 25 percent of vegetative cover can be retained on a given site, viable bird habitat can be retained. It is interesting to note that in projects to date where thickets of narrow-leaf willow and choke-cherry have been removed to achieve desired final ground surface elevation, they very actively root-sprout and quickly recolonize, even if the grade has been lowered by up to 4-5 feet.

3.3.5 Adjacent Upland Restoration

Re-vegetation with native upland species is recommended on newly-constructed floodplain banks adjacent to new riparian areas. These banks will for the most part be too dry to support riparian vegetation, and by providing upland vegetation, wildlife habitat diversity and the edge effect will be enhanced. It will also provide natural slope armoring along enlarged floodways. Particular attention should be given to restoring oak woodland habitat in these areas, given its importance to wildlife.

3.3.6 Bioswale Installation and Ephemeral Stream Restoration

Restored ephemeral streams, and bioswales that replace lost ephemeral streams, will generally occur in upland settings but may include riparian and wetland areas in channel bottoms. They will not only contribute to flood reduction and water quality improvements, they also benefit fish and wildlife species. Fish benefit from improved water quality, and from increases in base flows and decreases in water temperature due to aquifer recharge. Wildlife benefit from habitat corridors through urbanized areas. In cases where existing lawn areas are converted to bioswales, there will be the added benefit of reducing water use for landscape irrigation.

Bioswales and restored ephemeral streams should be vegetated with native plant species in natural assemblages that provide functional wildlife habitat (mainly food and cover). These species can be selected to retain sight distance (for safety reasons), maximize aesthetics, and minimize maintenance. Sedges, rushes, bunchgrasses, spirea, skunk bush, snowberry, and cluster rose make good groundcovers. Golden current, Oregon grape, mock-orange, elderberry, choke-cherry, and redtwig dogwood make good landscape shrubs. Big-leaf maple, Oregon ash, and box elder make good landscape trees. A list of native plant species recommended for all aspects of Greenway build-out is provided in Appendix F.

It also helps to add natural-looking boulders and logs, and to initially cover the ground with a native seed mix followed by some form of top dressing such as mulch or wood chips. Large decorative bark won't stay in place and does not look natural. Gravel and cobbles can be used in the bottom of drainage channels and small retention basins, but do not look natural elsewhere. Porous weed barriers can be useful in formal landscaped areas, but in natural areas it is better to establish native vegetation that becomes resistant to invasion of non-native species over time. Weed barriers and materials placed over them are also not likely to stay in place within active floodplain areas. Bioswales and ephemeral streams should be visually attractive but they also need to function as drainage facilities and wildlife habitat.

3.3.7 Ecological Landscaping

The planting approach recommended for bioswales and ephemeral streams can also be applied to residential and commercial landscapes. Although this goes beyond the geographic extent of the branching Greenway concept, it promotes additional urban wildlife habitat and reduces irrigation, which is consistent with Greenway goals and it benefits residents and businesses.

Manmade pond with mostly native landscaping

This planting approach is increasingly referred to as ecological landscaping, and consists of the following:

- Using locally native soils.
- Using locally native plant species in natural assemblages or plant communities.
- Reducing watering needs while also considering wildfire danger in plant selection and density.
- Including plant species that are beneficial to native wildlife.
- Including boulders, logs, snags, etc., that provide habitat and look natural.
- Including water features such as small ponds, seasonal streams, rain gardens, etc.
- Using natural top dressings such as ground bark mulch or wood chips without a weed barrier.

Ecological landscaping is not the same as drought-resistant landscaping (sometimes called xeriscaping), which may or may not use natives and is designed to minimize or avoid irrigation. Xeriscaping does not create very usable wildlife habitat. Minimizing or avoiding irrigation may also increase the risk of fire danger unless mostly succulent plant species are used. A compromise that uses less water than lawns but provides wildlife habitat and some sense of lushness without creating a fire hazard is to use mostly riparian plant species with some supplemental irrigation.

3.3.8 Invasive Species Management

Invasive plant species of greatest concern are Himalayan blackberry, Marlahan mustard (dyer's woad), white top, poison hemlock, star thistle, scotch thistle, and teasel. It is recommended that these species continue to be actively controlled.

Himalayan blackberry displaces native riparian species and it can change floodplain hydrology and geomorphology in a very detrimental way by restricting the passage and spreading-out of high flows, raising flood heights, and causing localized erosion in some areas and over-accumulation of sediment in other areas. Active ongoing control is strongly recommended, consisting of a mix of mechanical removal, authorized herbicide use, and shading by the planting of native riparian trees and shrubs.

Invasive animal species include feral cats, non-native ducks and geese, and overly tame and abundant native Canada geese. Feral cats have the greatest impact by preying on native birds, small mammals, reptiles, and amphibians. The largest population of feral cats is currently along Yreka Creek behind the Yreka Junction Shopping Center (Raleys and Walmart). A local group has been feeding these cats and has undertaken a sterilize-and-release program. This practice may help control population levels to some extent, but not predation on native wildlife species. Both feral cats and house cats hunt because it is instinctual. Greenway corridors are wildlife corridors that should be managed as natural areas.

Feral cats can be devastating to native birds and other wildlife

Occasionally non-native ducks and geese are abandoned at Greenhorn Reservoir by people who are unaware that hybridization with native species results in the weakening of the native gene pool. It is recommended that the release of any non-native species within Greenway corridors and City parks be prohibited. When possible, existing non-natives and hybrids should be removed.

The City of Yreka Animal Control and other interested groups may consider participating with Siskiyou County Animal Control, which sponsors a humane program that pairs unwanted cats with ranchers and farmers who utilize them for rodent control. Other options for "re-homing" unwanted pets can be found online.

Native Canada geese are a great example of adaptability and survival to the point of becoming a pest. They used to migrate seasonally from the Arctic tundra to southern regions, but adapted quickly to the tundra-like park lawns, golf courses, and pastures of our region. As a result, they have become full-time residents. They are prolific breeders and can become very aggressive, especially if they are being fed. An ongoing educational program is in place at Greenhorn Park to discourage park users from feeding the geese or other waterfowl. This approach should be expanded to the Greenway as it builds out, since it is likely that wet meadow and freshwater marsh areas of the Greenway will be colonized by geese.

3.4 Trails and Other Recreational Facilities

3.4.1 Overall Approach and Materials Theme

Streamside trails are a key component of Greenway design, and will provide exciting opportunities for non-motorized transportation, recreation, exercise, and connecting with nature. The recommended overall design approach for trails and related recreational facilities is to provide them primarily along Yreka and Greenhorn Creeks, with connections to business and residential areas, places of work, schools, and parks and other public areas. Much like the design approach of providing a network of drainages and wildlife corridors, it is also recommended to provide a network of people corridors. There are portions of the proposed Greenway network, however, that are not appropriate for trails, most notably along ephemeral streams that pass through small residential lots.

The recommended approach to the selection of various materials to be used for Greenway facilities is that they are primarily low-maintenance, consistent with existing parks, and adhere to a rustic theme comprised of native stone, rusting steel, and rough-sawn lumber. This theme harkens back to early mining days and complements the natural components of the Greenway. The specific materials involved are also very affordable and durable, thereby minimizing installation and maintenance costs.

Restrooms and parking at the Deer Creek Trailhead

3.4.2 Trailheads

It is recommended that some form of trailhead be located approximately every half-mile along Greenway routes that have trails. Some of these trailheads could share portions of existing parking facilities and others will be specific to the Greenway. Some trailheads will be primary,

some will be shared, and others will play a smaller secondary role. Recommended trailheads are summarized in Table 4.

Primary trailheads should be paved and ADA-compliant. Shared trailheads are already paved, and most already meet ADA compliance although not necessarily at the start of the trail. Secondary trailheads may be unpaved (compacted base material only), and according to ADA guidelines they need not be ADA compliant since equivalent facilities are available.

The Deer Creek Trailhead has an RV hook-up for Greenway hosts. Similar facilities are being installed at Upper Greenhorn Park for a park host. Host facilities are not recommended elsewhere along the Greenway, other than perhaps at the Fairgrounds where they would be part of a Fairgrounds maintenance and security program.

Table 4 - Recommended trailhead names, locations, and type

Corridor	Proposed Trailhead Name	Trailhead Location	Trailhead Type
Yreka Creek	Westside	Westside Road	Secondary
Yreka Creek	Yreka Junction	Yreka Junction Shopping Center	Shared
Yreka Creek	Fairgrounds	Sharps Road	Shared
Yreka Creek	Oberlin	East Oberlin Road	Primary
Yreka Creek	Visitor Center	Siskiyou County Museum (S. Main St.)	Shared
Yreka Creek	Miner's Inn	Miners Inn Convention Center (N. Main St.)	Shared
Yreka Creek	Kusta	Yreka Shopping Center	Shared
Yreka Creek	Deer Creek	Deer Creek Way (N. Yreka Creek Project)	Primary
Yreka Creek	Hawkinsville	Highway 263 at City Limit	Secondary
Greenhorn Creek	Lower Greenhorn	Ranch Lane	Shared
Greenhorn Creek	Upper Greenhorn	Greenhorn Road	Shared
Greenhorn Creek	Greenhorn Falls	Gravel Road (1 mile from Upper Park)	Secondary
Greenhorn Creek	West Greenhorn	Greenhorn Road at upstream end of Park	Secondary
Linkages	Broadway	Broadway Street (street closure)	Shared
Linkages	Shasta Avenue Park	Evergreen School	Shared
Linkages	Miner Street Park	Miner and West Streets	Shared
Linkages	Ringe Park	Knapp Street at YHS Stadium	Shared
Linkages	Community Center	North end of Oregon Street by YHS	Shared

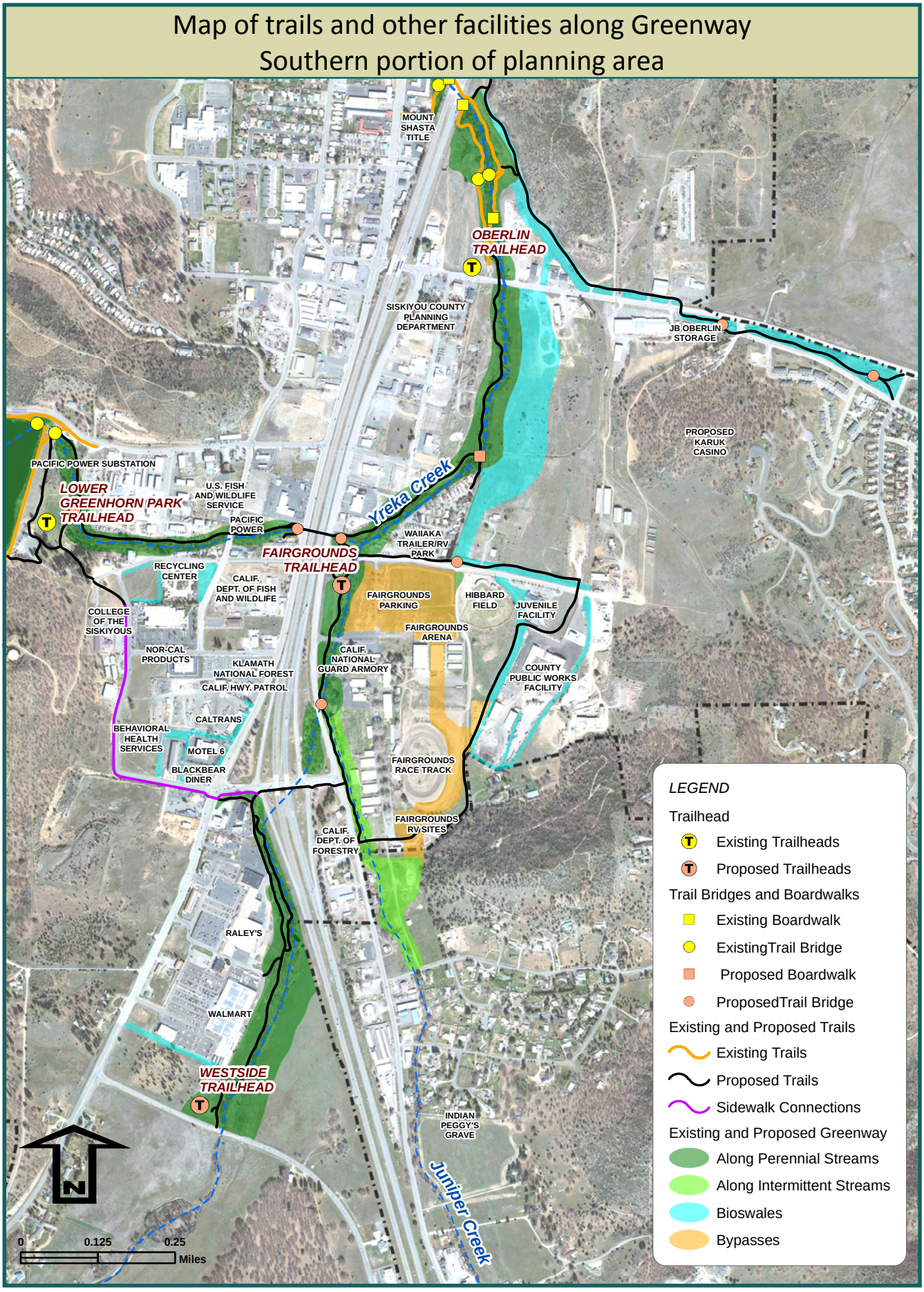


Figure 14 - Map of trails and other facilities along Greenway—south portion

Map of trails and other facilities along Greenway
Central portion of planning area

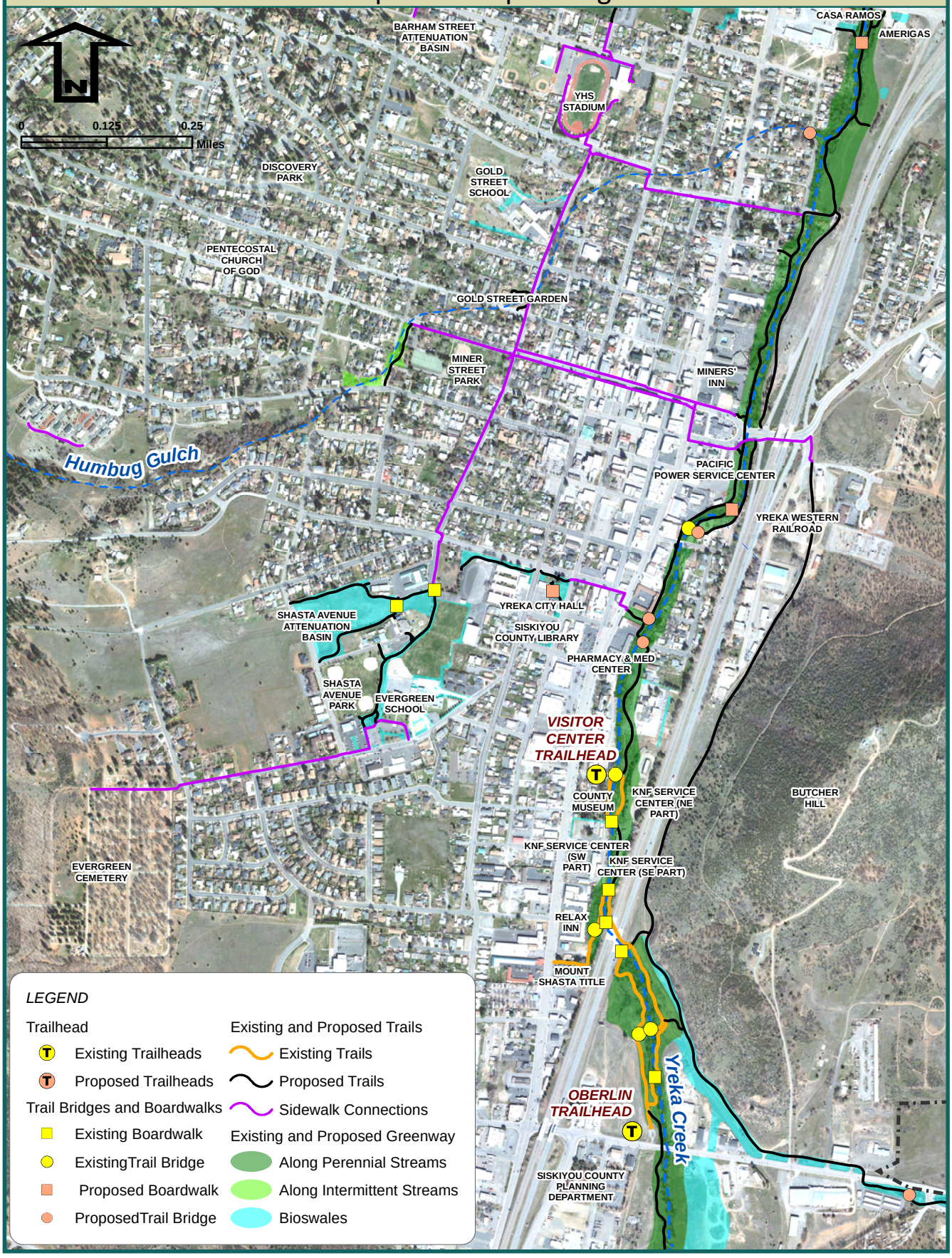


Figure 15 - Map of trails and other facilities along Greenway—central portion

Map of trails and other facilities along Greenway
Northern portion of planning area

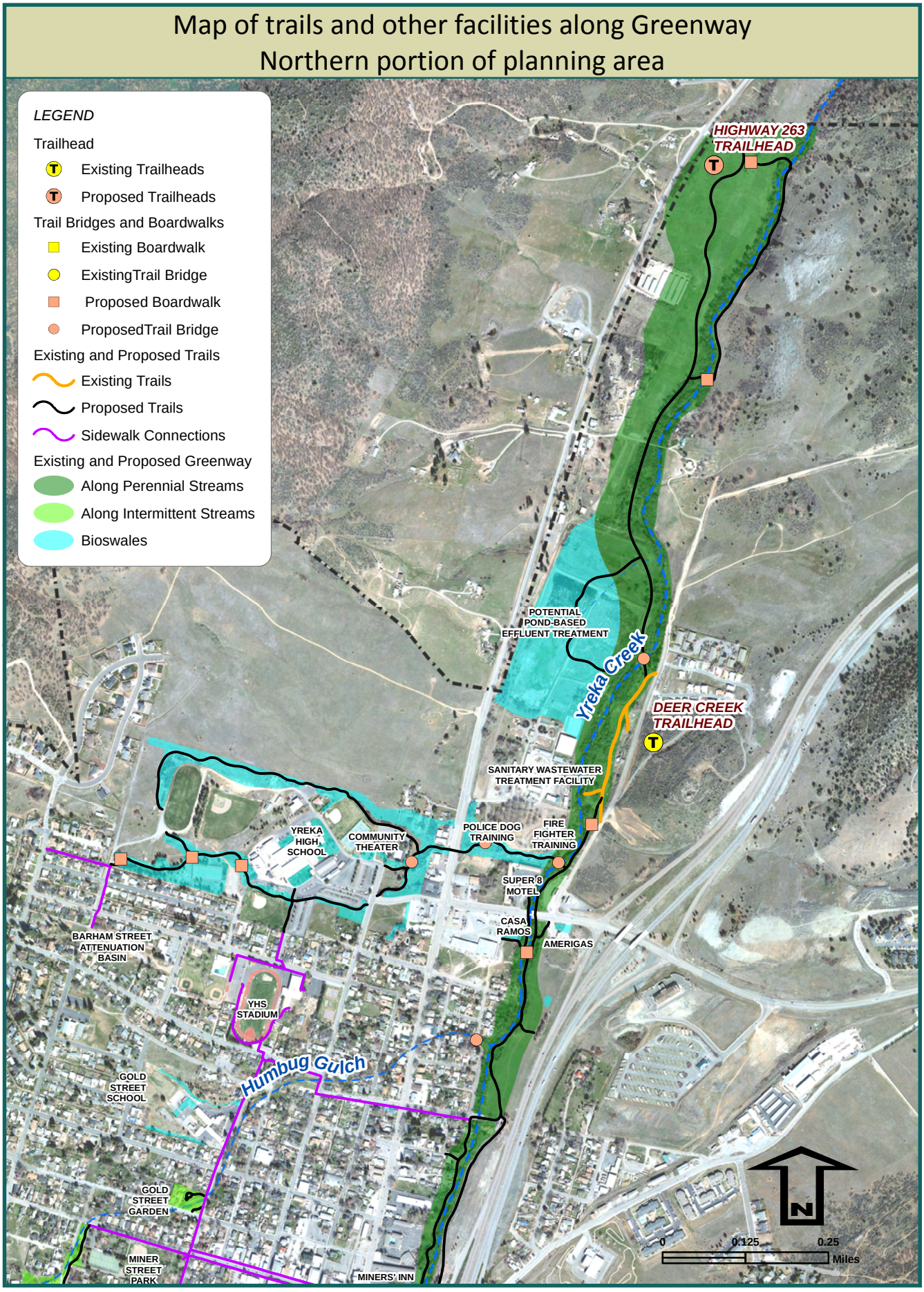
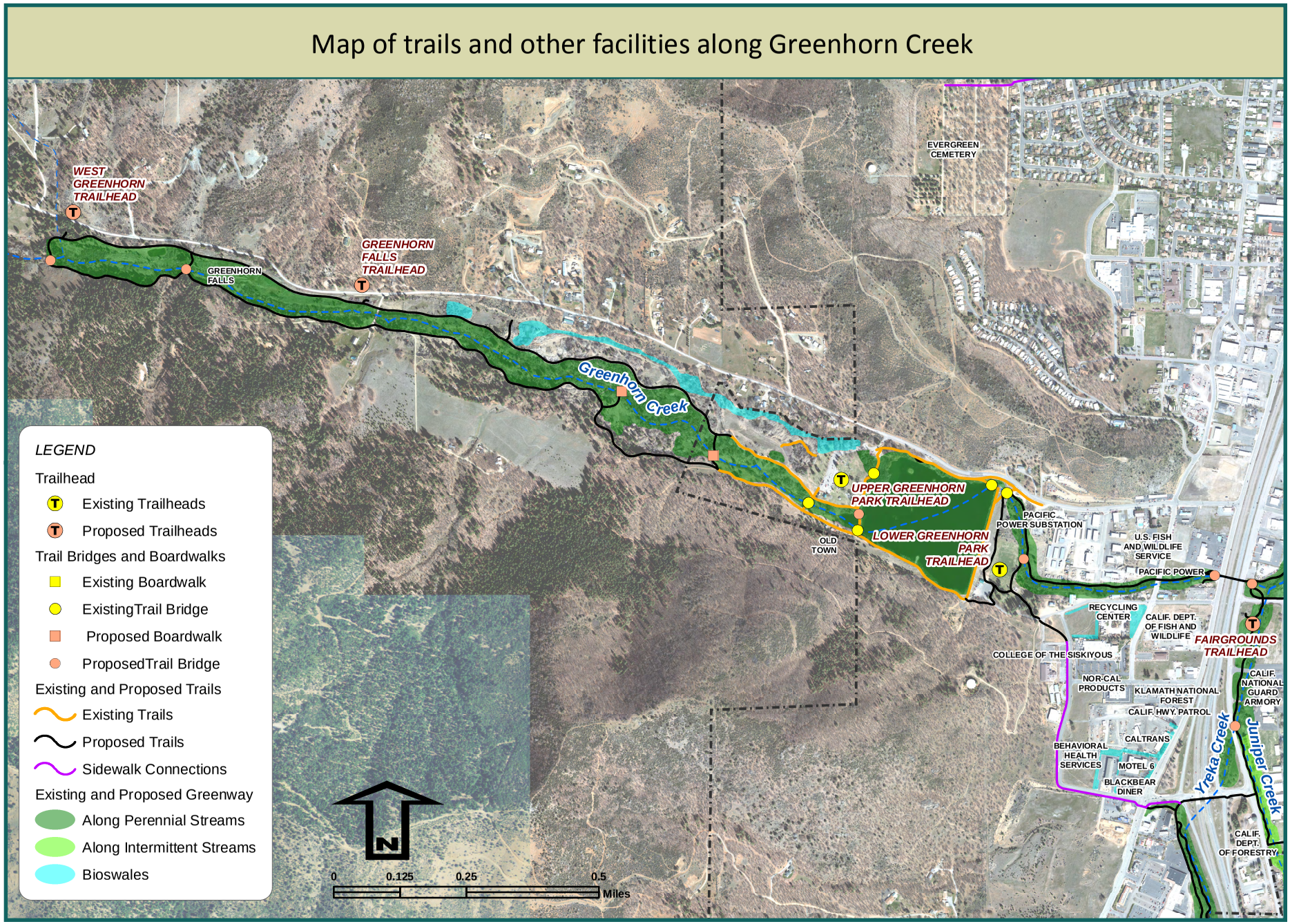


Figure 16 - Map of trails and other facilities along Greenway—north portion

Figure 17 - Map of trails and other facilities along Greenhorn Creek



3.4.3 Trailhead Site Furnishings

Site furnishings used at trailheads will vary depending on whether a given trailhead is primary, secondary, or shared. Each type of a given site furnishing, however, for example the type of trash receptacles, restroom fixtures, or paint colors, should be identical between trailheads as much as possible in order to maintain a consistent design theme throughout the Greenway network and to make maintenance and replacement easier. They should also be matched as closely as possible to site furnishings at City parks, for the same reasons. The following site furnishings are recommended for primary trailheads:

Bear-proof recycle and trash receptacles

- Entrance signs
- ADA signs
- Signboards (kiosks)
- Restrooms or vault toilets
- Bicycle racks
- Picnic tables
- Benches
- Trash and recycling receptacles (bear-proof in outlying areas)
- Drinking fountains
- Dog litter bag stations


Greenway Logo at Outdoor Classroom

The following site furnishings are recommended for secondary trailheads:

- Entrance signs
- Picnic tables (optional)
- Benches
- Trash and recycling receptacles
- Dog litter bag stations

Shared trailheads will vary in types of existing site furnishings provided. Recommended site furnishings specific to the Greenway are:

- Trailhead signs to identify start of trail
- Dog litter bag stations at start of trail
- Restrooms, but only if already at nearby businesses and shared use is allowed

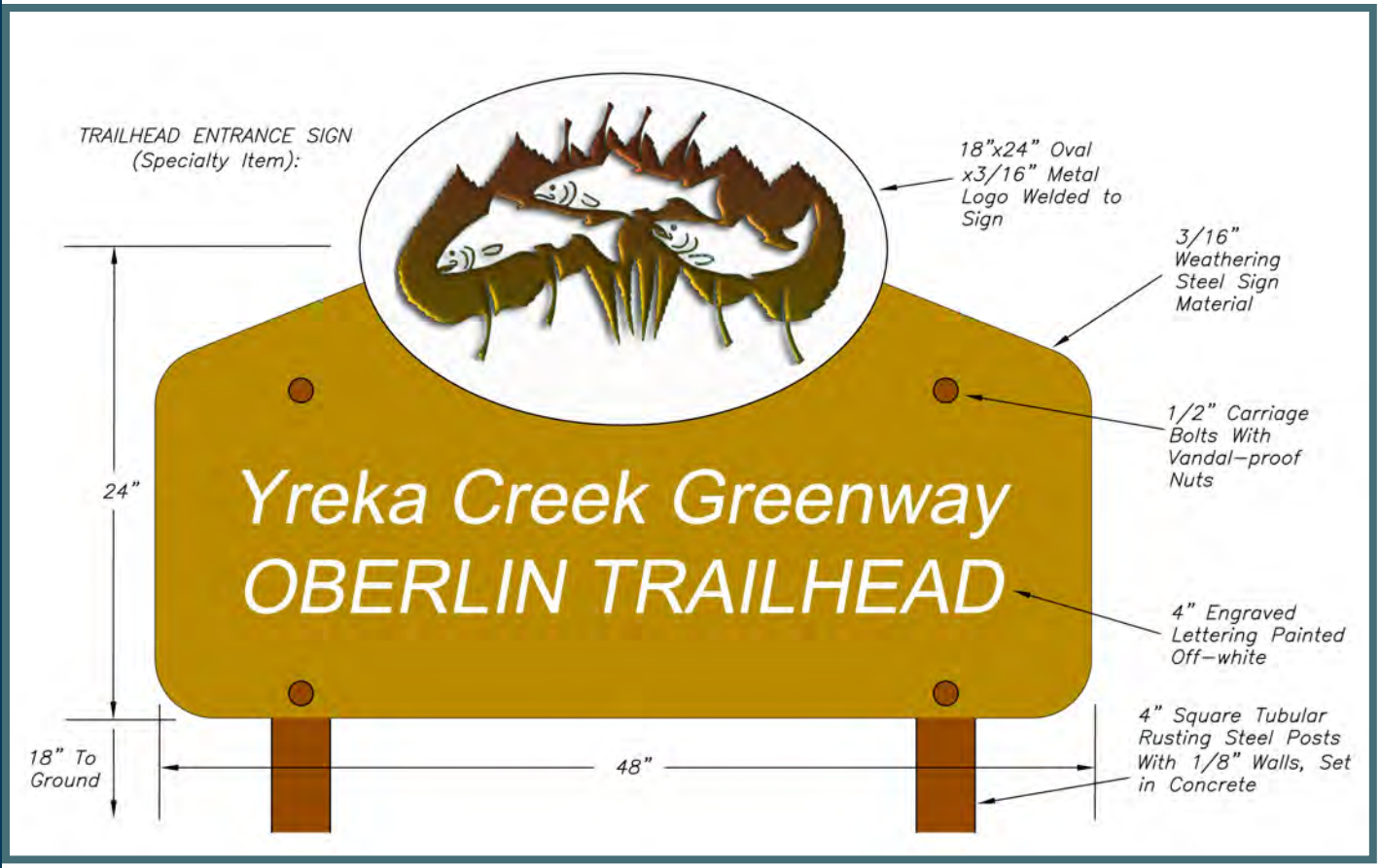


Figure 18 - Oberlin Trailhead entrance sign

Dog litter station

Design recommendations for entrance signs involve a distinctive rendition of the Greenway logo on top, with the trailhead name in bold letters large enough (6" minimum) to be read by passing motorists. All components are metal in order to be consistent with the Greenway materials theme and ensure that the entrance signs are fairly vandal-resistant.

A recommended signboard (kiosk) design is illustrated in Figure 19. This type of signboard will be installed at the Oberlin Trailhead this year. Three panels in an angled arrangement were considered, but it was concluded that the resultant grouping would be too large for its intended purpose. A multi-sided pillar design was also considered, but it was concluded that it would be too small to fully convey a sense of arrival, and also it would not provide shade for those reading posted information.

A restroom facility was recently installed at Deer Creek Trailhead. Shared trailheads with existing restroom facilities include the Visitor Center (in Siskiyou County Museum—although hours are limited) and Upper and Lower Greenhorn Park. Oberlin Trailhead,

Pre-cast restroom at Deer Creek Trailhead

which already has sewer, water, and power close by, could accommodate a future restroom facility if ever deemed to be desirable, in which case it should be identical to the facility at Deer Creek Trailhead.

Bicycle racks are recommended only for primary trailheads. Racks have already been installed at Deer Creek Trailhead, and are scheduled for installation at Oberlin Trailhead.

Picnic tables are recommended for primary trailheads, perhaps some secondary trailheads, and at various creekside picnic areas along Greenway trails. Pre-cast concrete tables surfaced in exposed aggregate are recommended, since they are much more durable than wooden tables, and when placed along trails in floodplain areas they will not wash away during high flows. Pre-cast tables are ADA-compliant, reasonably priced, and visually pleasing, as illustrated here. They have the rectangular shape of a wooden table, and the exposed aggregate surfaces complement the natural stream channels along the Greenway. Wooden picnic tables are already in use in some areas, however, and are also consistent with a rustic theme.

Recommended trail benches consist of 2 types: cut-and-polished native boulders like those at Parker Plaza in Mount Shasta City; and oak or cedar planks attached to rusting steel frames set in concrete like those at the Outdoor Classroom of the Visitor Center and at Oberlin Trailhead. The cut-and-polished boulder benches could double as an interpretive feature by being made from a diversity of local rock types found at our intersection of the Klamath Mountains, Cascade Range, and Great Basin. These benches could be engraved to identify rock types that could include Yreka quartzite, Gazelle marble, McCloud limestone, Scott Valley conglomerate, Hornbrook sandstone (blocks from old Yreka High School), Trinity River peridotite, Castle Crags granite, Shasta Valley basalt, Shasta Valley rhyolite, Mount Shasta dacite, and Happy Camp jade. Both types

Exposed aggregate picnic table

Cut native stone bench

Exposed aggregate drinking fountain

Wooden bench with handrails

of benches are proposed for trailheads. Along trails, the cut-and-polished boulder benches are proposed in floodplain areas and the wooden benches would be more suitable for upland areas, as described in more detail in the following Trails subsection.

As with picnic tables, the enclosures for trash and recycling receptacles and the pedestals for drinking fountains are recommended to be constructed of pre-cast exposed aggregate concrete, as illustrated here. In outlying areas, however, steel bear-proof trash enclosures are recommended.

Figure 19 - Signboard examples

Signboard - Lake Siskiyou

Signboard - Sisson Meadow

3.4.4 Trails

Three types of Greenway trails are recommended:

- Primary trails, which also serve as Class 1 Bikeways.
- Secondary trails, to provide linkages to nearby destinations.
- Tertiary trails, which provide more rustic alternate routes along streams.

Recommended specifications for these types of trails are:

- Primary: 8 feet wide, paved, with 1-foot shoulders; multi-use, ADA compliant
- Secondary: 6 feet wide, paved, with 2-foot shoulders; mostly ADA compliant
- Tertiary: 4 feet wide, unpaved, with 2-foot vegetated shoulders; some ADA compliant

It is recommended that all trails be limited to non-motorized uses by the general public, but designed to be drivable by maintenance, police, and emergency vehicles.

The ideal trail surfacing on primary and secondary trails would be dyed concrete with a rough broom finish, since it is very durable and low-maintenance, especially in a cold-winter climate. Concrete is more expensive to install and more difficult to repair than asphalt, so asphalt is likely to be the paving material of choice on most Greenway trails. Depending on cost, another type of trail surfacing worth considering is native earth mixed with a polymer to create a hard durable surface.

Some secondary trails may require stairs or ADA ramps, most notably at Raymond Street, Center Street, and Montague Road, in which case they will need to be constructed of poured concrete. This concrete should be dyed and textured with a rough broom finish.

Recommended trail surfacing solutions on tertiary trails are dark-colored compacted base material, available at several gravel quarries in the area, or polymer-bonded native soil.

Most trails are designed to be close to streams, which means that they will be in the floodplain. Low natural berms tend to occur along healthy streams, and this can be imitated during floodplain lowering and widening as a means of providing somewhat higher ground for trails, with overflow and side channels located further away in the restored floodplain. The

approach to date has been to locate trails at least above the 10-year flood height, in some cases higher. During high flows through restored areas, water will spread out and slow down, which should minimize damage to trails. There may be deposited sediment and/or woody debris on the trails that will need to be cleaned up after the storm event.

Table 5 - Total trail lengths by type at full built-out

Location	Primary (mi)	Secondary (mi)	Tertiary (mi)	Total (mi)
Yreka Creek	5	2	2	9
Greenhorn Creek	1	0	4	5
Linkages	6	0	0	6
Totals	**12**	**2**	**6**	**19**

3.4.5 Trail Bridges, Boardwalks, and Wet Crossings

Permanent trail bridges are required to be located above the 100-year flood zone. These are recommended to consist of pre-fabricated steel truss bridges with rusting steel for structural members and non-treated tropical hardwood for decking. This type of bridge is very durable and low-maintenance, very rustic-looking, very cost-effective, and lacking a wood preservative smell. These bridges should be a minimum of 10 feet wide and designed to support maintenance trucks, police cars, ambulances, and small fire-fighting vehicles.

Boardwalks that provide secondary and tertiary trail crossings in active floodplains are recommended to consist of wooden beams cabled to concrete abutments that are designed to allow the beams to slide off the abutments and float aside during high flows. There is an existing example at the Visitor Center which has washed out and been re-set many times without damage to the beam or abutments. The Visitor Center boardwalk has been re-set with a backhoe to date, but in the future it would be desirable to re-set boardwalks with a rubber-tracked mini-excavator.

Pre-fab steel truss bridge across Greenhorn Creek

Float-aside boardwalk at Visitor Center

Permanent wet crossings are proposed at locations along streams where gentle slopes and a firm gravel bottom allow for occasional crossing by construction equipment and maintenance and emergency vehicles. They are generally located next to float aside boardwalks where the approach trails are drivable but the boardwalks are not. Trail crossings across overflow channels are also proposed at various locations. Where paved trails cross overflow channels, armored dips are recommended using thicker reinforced concrete with boulder armoring placed on the downstream side. Where unpaved tertiary trails cross overflow channels, armored dips using imported cobble or local dredge tailings are recommended.

3.4.6 Road Crossings, Lighting, and Security Cameras

Greenhorn Creek I-5 box culverts

Greenway trails are currently designed to cross under Interstate 5 at Moonlit Oaks Avenue, Greenhorn Creek, and north of Oberlin Road, and under various City streets. In some cases, such as at Sharps Road and Oregon Street, there is currently not sufficient head room for passing under streets, and Greenway trails will need to cross at street elevation ("at-grade") until such time that existing stream crossings are upgraded for flood passage (which will also provide room for trails).

The Moonlit Oaks undercrossing under I-5 would require at-grade crossings at the southbound I-5 on-ramp, the northbound I-5 off-ramp, and at Fairlane Road. The Moonlit Oaks route is very open, and traffic at the crossing locations is generally light. If used, this route would need to be upgraded to provide adequate sidewalk width, striped pedestrian crossings, and signage. Work within the I-5 right-of-way would require Caltrans approval and they may have significant design input based on current facility standards. It would be very desirable for a widened sidewalk to also serve as a Class 1 Bikeway.

The Greenhorn Creek crossing involves 160-foot twin box culverts that pass under Main Street and Fairlane Road as well as I-5. Since the Moonlit Oaks and Oberlin Road undercrossings under I-5 are each about 1/2 mile away from Greenhorn Creek, use of one of the box culverts for a trail is recommended as a means of linking Yreka Creek Greenway to Greenhorn Park. Lighting will be required, and a surveillance camera is recommended. The box culvert to be used as a trail route can be kept dry by installing a small weir upstream to direct low flows into the adjacent box culvert. This will also provide an opportunity to install improvements that would facilitate fish passage in the wetted culvert. Skylights could also be installed to provide light in median areas between paved roadways. According to Caltrans, there could also be a requirement for an air circulation fan within the box culvert being used as the trail route.

An alternative to crossing under I-5 in a box culvert at Greenhorn Creek is to construct a pedestrian bridge over I-5. Although very expensive, such bridges are common in larger cities and may be warranted in Yreka given safety considerations, the benefit of having a usable crossing at higher flows, and the importance of connecting the trail along Yreka Creek to the trail leading to Greenhorn Park. If a pedestrian bridge over I-5 is built, it could provide an outstanding opportunity to mount steel salmon sculptures on the bridge to draw attention to the Greenway and Klamath fishery.

The trail crossing under I-5 north of Oberlin Road is currently being constructed as part of the Oberlin Project, and is replacing an informal user trail that became established after I-5 was constructed in the 1960's. The bays under the bridge are roomy but somewhat dark and are often used by transients, so lighting is included in this project. A surveillance camera is also recommended. This undercrossing will be subject to closure and may be damaged during very large storm events (at and above a 25-year storm interval), but will be usable most of the time.

There is no reasonable alternative to this undercrossing.
Trail crossings under other vehicular bridges will require being in the active floodplain to varying degrees, but in most cases there is sufficient height, distances will be short, and lighting is not needed. Spur trails to nearby streets can be used as detours during flood events. The crossing under Center Street needs sediment removed to provide enough headroom, and a crossing along Greenhorn Creek at Oregon Street will need to be at-grade unless that bridge is replaced with a higher bridge. The crossing at Sharps Road will also need to be at grade unless the existing arch culvert is replaced with a bridge.

At-grade crossings are recommended only when there are no practical alternatives. Some of the recommended at-grade crossings are at intersections having stop signs, but some do not have stop signs and some may involve mid-block crossings. Warning signs may be warranted at those locations as pedestrian use increases.

Pedestrian Bridge over Eastshore Freeway in Berkeley, California

Interstate 5 Bridge at Yreka Creek

Pedestrian bridge over railroad in San Luis Obispo, California

3.4.7 Trail Signs and Interpretive Panels

All trail signs except interpretive panels are recommended to be mounted on rusting 4-inch-square tubular steel posts extending around 4 feet above ground, consistent with the recommended materials theme. They should be located several feet to the side of trails for safety reasons and to avoid being in the way of authorized vehicles. Interpretive panel bases are recommended to be constructed of 2-3 inch brown tubular steel, and angled so that the panels are kept low to not block the view of the subject matter. Recommendations for signage materials vary by sign type. Recommended types of signs include the following:

- Directional signs
- Post barrier signs
- Tertiary trail marker posts
- Warning signs
- Warning stickers on sign and marker posts
- Interpretive panels

Directional signs are recommended to consist of 1-inch laser-routed letters on an oak sign with dog-eared corners (see Figure 20), bolted to a 4-foot tall tubular steel post. The signs will be approximately 8-12 inches high and 12-18 inches wide. The goal is to provide important navigation information while not having too many signs. They should blend-in with the surroundings yet be legible.

Post barrier signs should be of similar size and height as directional signs, except that they can be removed to allow authorized vehicles to pass. The signs should be made from 1/8-inch aluminum. Two signs can be mounted in opposite directions on each post barrier, for example, one stating "authorized vehicles only" and the other a stop sign where the trail is intersecting a roadway.

Warning signs may be warranted at float-aside boardwalks and bridge undercrossings to warn against use during high flows, although none to date have been installed. Advisory signs regarding camera surveillance should be installed at such time that surveillance cameras are installed. Similar to the post barrier signs, the warning and advisory signs should be made from 1/8-inch aluminum.

At the intersections of tertiary trails with primary and secondary trails, instead of using directional signs, it is recommended that marker posts be used instead, in order to avoid cluttering the trail routes with too many signs while still having some means of identifying trail intersections. The marker posts should be the same type of rusting tubular steel as the sign posts, with a small metal Greenway logo affixed at the top of the posts.

Interpretive panels are recommended at various locations along trail routes where topics of interest are located. The potential subject matter of these panels is discussed in the interpretive subsection below. From a visual quality point of view, it is important that there are not too many panels along trails. It helps to cluster them at specific relevant locations.

Figure 20 - Oberlin trail sign detail concept

Example of a commemorative bench

3.4.8 Picnic Tables and Trailside Benches

Picnic tables are recommended at larger locations of interest along trails where shade and creek views are present. Most sites will accommodate single picnic tables, as is the case on the Oberlin Project, but some sites warrant multiple tables, as were installed at the North Yreka Creek Project. The key will be to not have too many, so that those that are installed will have the best locations and will get reasonable use. Most of the best picnic sites are within the 100-year flood zone (but above the 10-year flood zone). Pre-cast concrete picnic tables are recommended in these locations because they are flood-resilient, in addition to being low-maintenance and vandal-resistant.

As discussed in the Trailhead Site Furnishings subsection above, recommended trail benches consist of 2 types: boulder and wooden. Boulder benches are recommended in floodplain locations where they will withstand occasional inundation, and wooden benches are recommended in upland sites.

Benches are important for providing opportunities to sit, relax, and socialize at specific viewpoints along trails, and they provide opportunities for people with mobility challenges to rest at relatively frequent intervals. Some pathway design specifications call for benches every 250 feet, but this might be too frequent for the Greenway since the trails are mostly level. A recommended frequency for the Yreka Creek Greenway is every 400-500 feet, including picnic tables. Costs could be reduced by developing a funding mechanism for memorial benches, in which the City would provide design and location specifications and the donor would pay for the bench, a small plaque, and installation costs

Black-colored chainlink fence

Wrought iron fence example

3.4.9 Fencing, Railings, and Other Barriers

Types of fencing and barriers recommended for the Greenway include:

- Chainlink fencing
- Wrought iron fencing and railings
- Smooth wire fencing
- Rope barriers (temporary)
- Post barriers
- Boulder barriers

Chainlink fencing is recommended at most locations where a barrier is needed to prevent trespassing onto adjacent private property. Using a black vinyl coating will make chainlink fencing less visually obtrusive. Chainlink fencing should be 6 feet high to discourage climbing. This type of fencing is not recommended in areas where it could impede wildlife movement. Wrought iron fencing is too expensive to justify along most of the Greenway, but may have merit at specific locations, for example, on top of a retaining wall in a high-use area or where it contributes to better visual appeal than chainlink fencing. Rusting steel (preferred) or flat black wrought iron fencing is recommended, and welded steel rather than riveted aluminum will ensure strength and longevity of the fencing.

Rusting wire mesh fencing supported by rusting tubular steel posts and top rail is a less expensive solution than wrought iron or chainlink, and yet more in keeping with the Greenway's rustic theme than chainlink.

Smooth wire fencing is a low-visibility, wildlife-friendly, and relatively inexpensive way to delineate property lines and block off-road vehicle use where needed. Rope strung along T-stakes is another low-cost fence option. Post barriers are discussed in the Trail Signs subsection above. Boulder barriers can be a very effective, visually-pleasing, rustic, and low-cost way to block vehicular access. The boulders should be at least 2 feet high and 3 feet wide, and spaced close enough to each other to block cars (less than 6 feet) but wide enough to not look like a continuous wall. Where there is room, semi-clustering is recommended in lieu of a straight line, in order to make the barrier look more natural. They should also be buried in the ground about 6 inches to further enhance a natural appearance.

Boulders should be dark in color, representative of local geology, and angular in shape. Weath-

Boulder barrier

ered lichen-covered boulders are ideal when they are available and not too costly. That type of boulder is better-used in bioswales where a completely natural and aesthetically pleasing outcome is desired.

3.4.10 Sound Barriers Along Interstate 5

An earthen berm sound barrier using floodplain spoils was constructed along the east side of I-5 north of Oberlin Road, and an opportunity exists to construct another berm along the west side of I-5 on County land just north of the KNF Service Center. Substantial spoils disposal is also proposed along the Caltrans right-of-way between Center Street and Montague Road (State Route 3). The existing topography along the southern portion of that reach, between Center Street and Lennox Street, includes a large flat area away from the freeway where a sound berm could be constructed without interfering in freeway operations or maintenance.. The northern portion of that reach, between Lennox Street and Montague Road, would not effectively accommodate a sound berm because the existing topography drops away from the freeway fairly abruptly.

A vertical wall sound barrier was recently constructed between Yreka Creek and the KNF Service Center as part of an outdoor classroom at the Greenway Visitor Center. That wall only attenuates noise in the immediate vicinity of the outdoor classroom, however. A much longer wall is recommended along the freeway in that vicinity and could be considered in other locations as uses may dictate. Lack of available space precludes installing an earthen berm at that location. A sound wall could extend the entire length of the Service Center and tie-in to the proposed sound berm on adjacent County property. A sound wall is also recommended that would extend from the north end of the County property to Raymond Street, in order to reduce freeway noise in the adjacent residential area. Sound walls are expensive and will need to be contingent upon receiving adequate grant funding or being installed by Caltrans.

3.4.11 Compatible Facilities and Uses Within Greenway

In addition to trail-related facilities within the Yreka Creek Greenway, a number of potential other facilities and uses have been considered, including:

- Mountain bike facilities
- Disc golf course
- Horseback riding staging area
- Other developed park facilities
- RV park
- Green waste sites
- Parking and other non-Greenway uses
- Dog parks
- Ball fields
- Community gardens

Upper Greenhorn Park is a good location for a number of uses that could be located in the spoils disposal areas adjacent to floodplain restoration areas. Compatible uses include a bicycle pump track and beginner track (recently installed), a disc golf course (currently under consideration), a horseback riding staging area (located upstream away from existing parking areas), and additional developed park facilities such as a small amphitheater and an RV park/campground.

A primitive horseback riding staging area had been established a number of years ago about a mile west of the Upper Park entrance, but has not been used. Some staging has occurred at the Upper Park parking area which is not permitted. The staging area further west will likely need more improvements such as better parking, a hitching post, and a small corral to make it more functional for riders.

Yreka, like most communities, would benefit from an ongoing green waste program that involves composting herbaceous material like leaves and lawn clippings and chipping woody materials from trees and shrubs. Fees from initial disposal and income from the sale of resulting compost and wood chips for landscaping uses could help pay for the program. There is room for such a composting facility on proposed spoils disposal areas along the north side of Greenhorn Creek in Upper Greenhorn Park, although water quality protection and permitting constraints are factors that will need to be considered in selecting a final location. It could be that the County transfer station on East Oberlin Road would be a better location, where green waste recycling could be done away from streams and could be more easily incorporated into the existing waste disposal program.

Parking and other non-Greenway uses are included in a major floodwater bypass proposed at the County Fairgrounds to reduce flood height so that the existing buildings will be above the 100-year flood zone. The suggested approach involves lowering the existing parking area, RV

campsites, and arena facilities by about 2 feet, then re-establishing all of these uses at their original locations.

A similar approach for existing parking areas on private commercial properties could also be considered, since this would retain existing land use while helping to achieve flood hazard reduction. This approach does not contribute to other Greenway goals, however, so alternative solutions would be preferred. Commercial and industrial parking adjacent to the Greenway is a compatible use as long as water quality concerns associated with parking runoff are addressed.

Dog parks were considered but were deemed to not be compatible with Greenway goals. Potential conflicts include fencing in floodplain areas that would trap debris or wash out, conversion of native vegetation to lawn, displacement of wildlife, disruption of other Greenway users due to a concentrated number of barking dogs, parking requirements, and the potential for creek contamination if dog waste is not completely picked up on a regular basis. Dispersed dog use is currently allowed at Greenhorn Park and on public lands adjacent to Yreka. A dog park might be suitable at one of the nearby upland areas at Greenhorn Park, well away from the floodplain and trail users, as long as it doesn't conflict with other potential uses at that location such as disc golf and a horseback riding facility.

Ballfields within Greenway corridors would also not be compatible due to fencing, lawns, potential use of chemicals, and parking areas. There are a considerable number of ballfields in Yreka already, many of which are adjacent to Greenway corridors. Additional ballfields are under consideration, and are best located away from the Greenway.

The existing community garden is located on Yreka High School property. It is in a good location but could benefit from a proposed adjacent bioswale for drainage. Since community gardens are relatively small in size and can be located out of the floodplain, there could be upland areas in greenways that could accommodate additional community gardens. Being located within wildlife areas could lead to more problems with various critters than in more developed settings, however, even with deer fencing. Additional considerations are the use of chemical pesticides and fertilizers, and the availability of water for irrigation.

3.5 Interpretive Plan

A detailed interpretive plan is included as Appendix G that includes the following components:

- Overall themes and approach
- Place name suggestions (trailheads, trail segments, etc.)
- Topics to be interpreted (ecological, cultural/historical, urban impacts/solutions, etc.)
- Trailhead signboard panel content
- Trailside panel locations and content
- Interpretive graphics and art
- School involvement
- Updated website (including an interactive map of the Greenway Master Plan)
- Utilization of common device technologies to share information with trail users
- Presentation materials (Powerpoint, poster, large-scale maps)

Interested parties consulted to be consulted with during implementation of the Interpretive Plan will include Native American tribal members (Shasta and Karuk), Siskiyou County Historical Society, Klamath National Forest, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and Yreka Chamber of Commerce.

3.6 Public Safety and Quality of Experience

The number of transients camping along Yreka Creek has increased in recent years, reflecting a general trend in many cities. Yreka Creek has become a focal point of transient activity because it is close to I-5 and businesses yet provides flowing water for drinking and bathing, privacy in dense vegetation, and shelter under bridges. Also, the winters are relatively snow-free.

The transient problem is understandably a major concern to local businesses and residents due to break-ins and thefts, trash, fire, human waste, and safety. Proposed Greenway routes overlap with transient areas, which creates an added challenge for Greenway build-out, but the Greenway can also contribute very significantly to reducing transient problems. Clearing vegetation will reduce privacy and thereby discourage camping and reduce fire danger. It will also increase sight distance for trail users. Having trail users will further decrease privacy and provide more eyes on the ground to report violations. Main trails will also be drivable by patrol cars, thereby making frequent patrolling possible, and trail crossings under large bridges will having lighting.

Debris removed during a Yreka Creek workday

Other recommended solutions include:

- Volunteer trail patrollers
- Surveillance cameras at key locations
- Ordinances prohibiting camping, fires, littering, unleased dogs, etc.
- Referral of transients to available County and other social services

Transient camp along unimproved portion of Yreka Creek

3.7 Win-Win Solutions for Private Landowners

A key approach in the implementation of the Yreka Creek Greenway has been and will continue to be to seek win-win solutions regarding private landowners. These solutions include:

- Flood hazard reduction due to lowering and widening floodplains.
- Reduced and avoided flood insurance due to containing 100-year events within Greenway.
- Flexible floodplain widening design that minimizes impacts on existing development.
- Maintaining private land uses such as parking in lowered floodplain areas where needed.
- Providing fill material from floodplain excavation for nearby commercial development.
- Creative property line adjustments and road access improvements.
- Improved regulatory environment for development along stream corridors.
- Reduced transient problems.
- Trail routing that provides adequate setbacks from private residential properties.
- Increased property values along Greenway corridors.
- Bioswales and natural drainages on private lands that help mitigate stormwater runoff.
- Jobs and other economic benefits, including increased tourism.

Creekside dining

Public and private lands that are proposed for inclusion in the Greenway design are listed in Appendix H. Methods by which land tenure can be secured from willing landowners include:

- Fee title full purchase (in some cases possibly involving life estates).
- Fee title partial purchase via property line adjustment or lot split.
- Easement purchase (drainage, conservation, trail access, or some combination thereof).
- Lease of public lands (10-20+ years typically required by grant makers).
- Memorandum of Understanding on public lands (10-20+ years typically required).

4.0 IMPLEMENTATION

4.1 Phasing and Costs

Due to the size and complexity of the proposed Greenway network, implementation requires a phased approach and numerous funding sources over many years (see Table 6). Greenway segments recommended for highest-priority implementation, based on Greenway goals, are those that:

- Are adjacent to segments already completed or underway.
- Contribute to making connections between completed segments of the Greenway.
- Provide significant flood hazard reduction and water quality benefits.
- Provide significant ecological benefits (such as contributing to coho salmon recovery).
- Provide recreational connectivity, most notably between the Visitor Center and Greenhorn Park, and between the Visitor Center and Deer Creek Trailhead.

Priorities should also be based on opportunities, most notably regarding funding and willing landowners. However, the City does not have the resources for implementation without assistance. The timetable for implementation in Table 6 assumes the continued availability of relevant grant funding. Incrementally, Greenway improvements will benefit the community even if not completed in large projects.

The City of Yreka will continue to take the lead on the coordination and implementation of Greenway components under City jurisdiction within the City Limits or under City ownership outside City Limits (i.e. at Greenhorn Park). The City is also coordinating with other public agencies that own or manage land along the Greenway within city limits, and those agencies that provide Greenway-related services such as the County Agricultural Department which assists with invasive plant species control. The City will continue to rely on the efforts of community

groups such as the Siskiyou Gardens, Parks, and Greenway Association (SGPGA) who have been instrumental in developing this plan. Areas in which SGPGA may take the lead are on properties owned by school districts (not under City jurisdiction), private lands outside the City Limits, and small residential properties along seasonal drainages. The Shasta Valley Resource Conservation District (SVRCD) is also a partner in Greenway build-out and it is anticipated that it will continue to be involved where Greenway improvements can further their mission.

Due to high costs and funding uncertainties associated with increasing flood passage at existing road bridges and culverts, they are not included in Table 6. It is recommended that these upgrades be undertaken as separate public works projects that are associated with needed maintenance or replacement work and available funding, but that their design and engineering be consistent with Greenway design and goals.

Table 6 - Recommended implementation phasing and estimated costs

Greenway Component (listed roughly by priority)	Lead Agency	Est Time Table	Est Cost ($ mil)
Oberlin-Young Trail Improvements (and remaining restoration)*	City	2016	1.4
Lower Yreka Creek Restoration	SGPGA/ RCD	2016-2021	2.0
FHR Central Reach Restoration*	City	2017-2018	2.0
FHR Central Reach Trail Improvements	City	2017-2020	1.0
Center-Lennox Streets Eastside Trail (Caltrans ROW)	City	2017-2020	0.1
Raymond-Center Streets Eastside Trail (Caltrans ROW)	City	2017-2020	0.1
FHR North Reach Restoration**	City	2017-2020	0.5
FHR North Reach Trail Improvements	City	2018-2023	1.0
Lower Greenhorn Creek Restoration and Trail Improvements	City	2018-2023	2.0
FHR South Reach Restoration and Trail Improvements**	City	2019-2024	1.0
Community Center Tie-in Restoration and Trail Improvements	City	2019-2024	1.0
Wastewater Facility Restoration and Trail Improvements	City	2020-2025	2.0
Upper Greenhorn Phases 2-4 Restoration and Trail Improvements	City	2021-2026	1.0
Greenhorn Spillway Retrofit for Fish Passage	City	2021-2026	1.0
Juvenile-State Streets Restoration and Trail Improvements	City	2022-2027	2.0
State-Raymond Streets Restoration and Trail Improvements	City	2022-2027	2.0
Humbug Hollow Restoration and Bypass Culvert	City	2022-2027	2.0
Raymond-Center Streets Restoration and Westside Trail	City	2023-2028	1.0
Center-Lennox Streets Restoration and Westside Trail	City	2024-2029	3.0
Fairgrounds Creek Corridor Restoration and Trail Improvements	City	2025-2030	1.0
Juniper Creek Restoration (above Rolling Hills Drive)	SGPGA/ RCD	2025-2030	2.0
Shopping Center Restoration and Trail Improvements	City	2026-2031	1.0
Fairgrounds Bypass Earthwork and Replacement of Improvements	City	2027-2032	1.0
East Oberlin-Foothill Tie-in Restoration and Trail Improvements	City	2028-2033	1.0
City Hall/Library Tie-in Restoration and Trail/Street Improvements	City	2029-2034	1.0
Barham Street-Ringe Park Restoration and Trail Improvements	City	2030-2035	0.5
YHS Bioswales and Trails Installation	SGPGA	2016-2021	2.0
Evergreen/Jackson/Gold Street Schools Bioswales/Trails Installation	SGPGA	2016-2021	1.0
Commercial Area Bioswales (demonstration retrofits)	City	2016-2035	0.5
Private Residential Seasonal Stream Restoration	SGPGA	2016-2035	1.0
Approximate Total Years and Cost		20 Years+	38.1

* = Already fully funded
** = Land acquisition portion already funded

4.2 Funding Sources

Grant funding for Yreka Creek Greenway implementation and related projects to date are summarized in Table 1. There have also been significant donations of land (most notably the Kimball and Janson-Davis Properties), trail access easements, and thousands of hours of donated professional services (grant writing and design) and on-the-ground volunteer labor (mainly planting, weeding, and trash removal). Direct costs to the City for Greenway implementation have been and will continue to be managed in such a way as to not negatively impact the City's overall annual budget.

Most projects to date have been funded by grants, and this is anticipated to continue. Grant sources are typically focused on specific benefits, including fish and wildlife habitat restoration, flood hazard reduction and water quality improvements, and park and trail facilities. Likely future sources will include, but are not limited to:

- State bond act grants administered by state agencies (Department of Water Resources, Department of Parks and Recreation, Department of Fish and Wildlife, Caltrans)
- Federal grants (U.S. Fish and Wildlife Service Partners Program, Resource Advisory Council, North American Wetlands Conservation Act, Transportation Enhancement Act, etc.)
- Private foundation grants (Ford Family, McConnell, Shasta Regional, Corporations)

Funding could also come in the form of selling spoils or discounting the cost of their removal during floodplain lowering and widening in which dredge tailings are involved. These tailings may have economic value for producing sand and gravel products and/or containing commercially valuable rare earth elements. Lab tests have shown that Yreka tailings are suitable for use in producing base material, asphalt, and concrete.

The sale or trading of wetland and riparian mitigation credits may also be a source of funding for Greenway implementation. The large extent of wetland and riparian areas to be created during Greenway build-out will greatly outweigh any Greenway filling required (for example filling associated with trail construction). In this respect Greenway projects will not only be self-mitigating, they will also generate considerable surplus mitigation "credits." There could be some instances where private developers would be allowed to build-out the ecological portion of a specific segment of Greenway (i.e., not including trail improvements) at the developer's expense and count it as mitigation. This could also include a contribution of any private land involved in the mitigation. It could also involve a situation in which Greenway spoils are used for the fill required by the private developer.

Major donors could also be a significant source of funding for Greenway build-out, as they already have been. It is also hoped that as the Greenway continues to develop as a highly visible and valuable local resource, additional major donors will rise to the challenge and contribute more lands and funding needed to complete the Greenway. Most grants require matching funds, as cash or in-kind contributions, and this is an excellent way to satisfy match requirements and demonstrate local support.

4.3 Maintenance and Monitoring

Interim maintenance includes weeding, watering, plant replacement, and erosion repairs. Interim monitoring includes periodic site visits to take photos, check on plant health, observe channel and floodplain function during high flows, and look for any erosion that may be occurring. As funding allows, streamflow and water quality monitoring could also be added. Maintenance and monitoring should be included in grant-funded project budgets for each phase of implementation where these are eligible activities. Interim maintenance can either be part of the project contractor's scope of work, performed by the City and/or SGPGA staff after construction has been completed, or contracted separately. Monitoring could be included in scopes of work for those consultants who are involved in project implementation, or conducted by Shasta Valley RCD staff. SGPGA volunteers will also play a key role in the interim maintenance and monitoring of completed projects.

Scout Troop 13107 cleans up

An ongoing operations and maintenance plan is included as Appendix I. Ongoing maintenance will be the primary responsibility of City staff, combined with park maintenance and other public works maintenance responsibilities. Maintenance responsibilities will progressively increase with phased Greenway implementation, and it is anticipated that 2 additional year-round staff positions will ultimately be needed after full build-out. Maintenance staff members of other jurisdictions such as school districts, the Fairgrounds, other County lands, and the KNF Service Center may contribute, and ongoing maintenance MOUs between the City and these other jurisdictions is recommended. SGPGA contributes by providing native plant materials through the Siskiyou Arboretum and by recruiting and overseeing volunteers as needed. The County inmate crew and the California Conservation Corps have been available to assist with maintenance on occasion, and County Agricultural Department personnel have been instrumental in helping with invasive plant species control. It is critical for long-term maintenance that the City look at collaborative strategies with multiple community partners to share maintenance.

Ongoing maintenance of bioswales and ephemeral streams on private commercial and residential properties is anticipated to be provided by the applicable landowners, unless drainage easements have been conveyed to the City, in which case the City assumes responsibility for maintenance.

A draft monitoring plan is included as Appendix J. Recommendations for ongoing monitoring include:

- Periodic qualitative inspections by the City and SGPGA to look for erosion, sediment accumulation, debris accumulation, and damage to Greenway facilities during and after high flows, invasive plant species problem areas, transient camps, litter accumulation, and vandalism and wear-and-tear regarding trail-related facilities.
- Periodic photographs at pre-determined photo-monitoring points by SGPGA to monitor vegetative, channel, and floodplain changes over time.
- Installation and periodic data downloading of electronic flow gauges by Shasta Valley RCD. Key locations along Yreka Creek where flow monitoring would contribute to measuring watershed health include Yreka Creek (I-5 box culverts at Yreka Junction, I-5 bridge north of Oberlin, and North Highway 3 bridge at Montague Road), Greenhorn Creek (I-5 box culverts at Main Street or at the Fairlane or Oregon Street crossings), Juniper Creek (Rolling Hills Drive bridge), and Little Humbug Creek (future bypass culvert and Main Street bridge).
- Periodic collection of water quality samples and testing by Shasta Valley RCD, SGPGA, and volunteers along Yreka Creek (Westside Road Trailhead and Deer Creek Way Trailhead), Greenhorn Creek (Upper Greenhorn Park and Fairlane Road), Juniper Creek (Westside Road and Rolling Hills Drive), Little Humbug Creek (Humbug Hollow and Burgess Street), and above and below selected bioswales and ephemeral drainages.
- Seasonal salmonid monitoring by NOAA Fisheries, Klamath National Forest, and CDFW using redd counts, above-water visual surveys, snorkeling surveys, netting, trapping, and electroshocking.
- Occasional trail-use monitoring by the City using portable electronic devices that count the number of pedestrians and cyclists passing by.
- Occasional community polls by SGPGA to get feedback on Greenway facilities, operations, and maintenance.

5.0 CONCLUSION

Full implementation of the 2016 Updated Yreka Creek Greenway Master Plan will greatly reduce flood hazards, improve water quality, provide low-cost community recreation, and restore fish and wildlife habitat along approximately 14 miles of Yreka's stream corridors. Additional flood hazard, water quality, and habitat benefits will be achieved along up to 10 miles of seasonal drainages and major bioswales. The resulting network of Greenway corridors will total up to 24 miles in length. Coho salmon, Klamath steelhead, and other species of concern will greatly benefit from this restored habitat.

Up to 14 miles of paved trails and 6 miles of unpaved trails will be constructed, mostly along Yreka and Greenhorn Creeks, providing a total of up to 20 miles of streamside trail opportunities for local residents and visitors to enjoy. Related recreational facilities such as streamside picnic areas, benches, and interpretive panels will be included.

Restored drainage corridors and inclusion of trails and related recreational facilities will provide significant social benefits, including increased recreational and educational opportunities, increased tourism, increased property values, and decreased flood hazards and related flood insurance costs. Grant funding brought into the local area for Greenway construction and implementation yields job benefits and contributes to the local economy.

Total Greenway build-out will take many years and will require considerable grant funding, on top of 30 years and $12 million invested to date. Community interest in the Greenway continues to grow, and numerous major donors and volunteers have pitched in to make it a success. Volunteer community groups working on individual Greenway components through the Siskiyou Gardens, Parks, and Greenway Association have been and will continue to be a major force in grant writing, recruiting volunteers, and guiding Greenway design. From it's inception in the 1980's, the Yreka Creek Greenway is indeed a model of civic pride.

Photo and Graphics Credits

Section	Photo Description	Photo Credit
1.1	Bridge at Visitor Center	Jerry Mosier
1.2	Grassy banks along creek	Jerry Mosier
1.2	Fish	Jerry Mosier
1.2	Outdoor Classroom and Interpretive Area	Jerry Mosier
1.2	Flooding	Jerry Mosier
1.2	Creek south of Oberlin	Jerry Mosier
1.3	Clean-up Crew on footbridge	Jerry Mosier
1.3	Forked Path	Victoria LaPlante
1.3	Flooded culvert bridge	Jerry Mosier
1.4	Bioswale at Evergreen School	Jerry Mosier
1.4	Visitor Center	Jerry Mosier
1.4	Deer Creek Trailhead	Jerry Mosier
1.4	Man wrapping tree with chickenwire	Jerry Mosier
2.4	Aerial photography plane	GeoTerra
2.5	Blackberries along creek	Victoria LaPlante
3.1.1	Historic Flooding	Siskiyou Museum
3.1.2	Photo of small retention basin and outflow device at Evergreen School	Jerry Mosier
3.1.3	Flooding along Little Humbug at Gold just below Garden	Jerry Mosier
3.1.4	Photo of Greenhorn Creek box culvert inlets	Jerry Mosier
3.2.1	Gold dredge	Siskiyou Museum
3.2.4	Comparison of permanent and ephemeral streams	Stephen Marshak, Dept of Geology, University of Illinois
3.2.5	Marshland	unknown from Internet
3.2.6	Straw rolls along creek	Jerry Mosier
3.3	Foothill Yellow-legged Frog	Wikimedia Commons
3.3	Wilson's Warbler	Wikipedia Commons
3.3	Coho Salmon	SpawnUSA.com
3.3	Northwestern pond turtle	Wikimedia Commons
3.3.1	Greenhorn spillway	Tom Hesseldenz
3.3.1	Location of adipose fin on trout	Victoria LaPlante
3.3.3	Beaver dam	Jerry Mosier
3.3.7	Manmade pond with mostly native landscaping	Tom Hesseldenz
3.3.8	Feral cat after bird	Wikimedia Commons
3.4.1	Deer Creek Trailhead amenities	Jerry Mosier
3.4.3	Bear-proof trash and recycling containers	trashcontainers.com
3.4.3	Metal sculpture of Greenway logo	Jerry Mosier
3.4.3	Dog litter station photo	yuckos.com
3.4.3	Restrooms at Deer Creek Trailhead	Jerry Mosier
3.4.3	Picnic table	Tom Hesseldenz
3.4.3	Stone bench	Tom Hesseldenz
3.4.3	Wooden bench	theparkcatalog.com

Section	Photo Description	Photo Credit
3.4.3	Drinking fountain	hawsco.com
3.4.4	People using trail along creek	Victoria LaPlante
3.4.5	Pre-fab steel truss bridge across Greenhorn Creek	Tom Hesseldenz
3.4.5	Float-aside boardwalk at Visitor Center	Victoria LaPlante
3.4.6	Greenhorn Creek I-5 box culverts	Jerry Mosier
3.4.6	Berkeley pedestrian bridge over I-80	Daniel Ramirez, Honolulu
3.4.6	Photo of I-5 Yreka Creek Bridge.	Victoria LaPlante
3.4.6	SLO pedestrian bridge over railroad.	RRM Design Group
3.4.7	Grasses, clouds, tree photo used behind trail sign detail for concept (Figure 20)	Jerry Mosier
3.4.8	Commemorative bench	Tom Hesseldenz
3.4.9	Black chainlink fencing	Tom Hesseldenz
3.4.9	Bottling Works wrought iron fencing	Tom Hesseldenz
3.4.9	Boulder barrier	unknown from Internet
3.4.10	Outdoor classroom soundwall	Jerry Mosier
3.5	Interpretive painting visitor center entire	Victoria LaPlante
3.5	Interpretive painting visitor center salmon	Victoria LaPlante
3.5	Interpretive panel along path	Victoria LaPlante
3.5	Interpretive painting visitor center watershed	Victoria LaPlante
3.6	Trash	Jerry Mosier
3.6	Transient camp	Jerry Mosier
3.7	Creekside dining	Tom Hesseldenz
4	Graphic for Implementation Section break	Victoria LaPlante
4.1	Flooded bridge behind Human Resources	Jerry Mosier
4.1	Flooded culvert	Jerry Mosier
4.3	Girl Scout Troop 13107 cleaning up 4-11-2015	Jerry Mosier
5.0	Boy next to Yreka Creek	Jerry Mosier
Various	All Mapping (Figures)	Dave LaPlante, NRG GIS