Draft

Comanche Creek Vegetation Management Plan

Submitted to

The City of Chico | January 2008

DESIGN, COMMUNITY & ENVIRONMENT

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1 INTRODUCTION

The City of Chico has undertaken the preparation of this Vegetation Management Plan for a 0.6-mile long segment of the Comanche Creek riparian corridor. The plan area includes a 15-acre parcel along the Creek between the Union Pacific right-of-way and Park Ave/Midway, and approximately five acres along the creek channel to the west of the right-of-way. Figure 1 illustrates the location of the plan area in relation to the City of Chico.

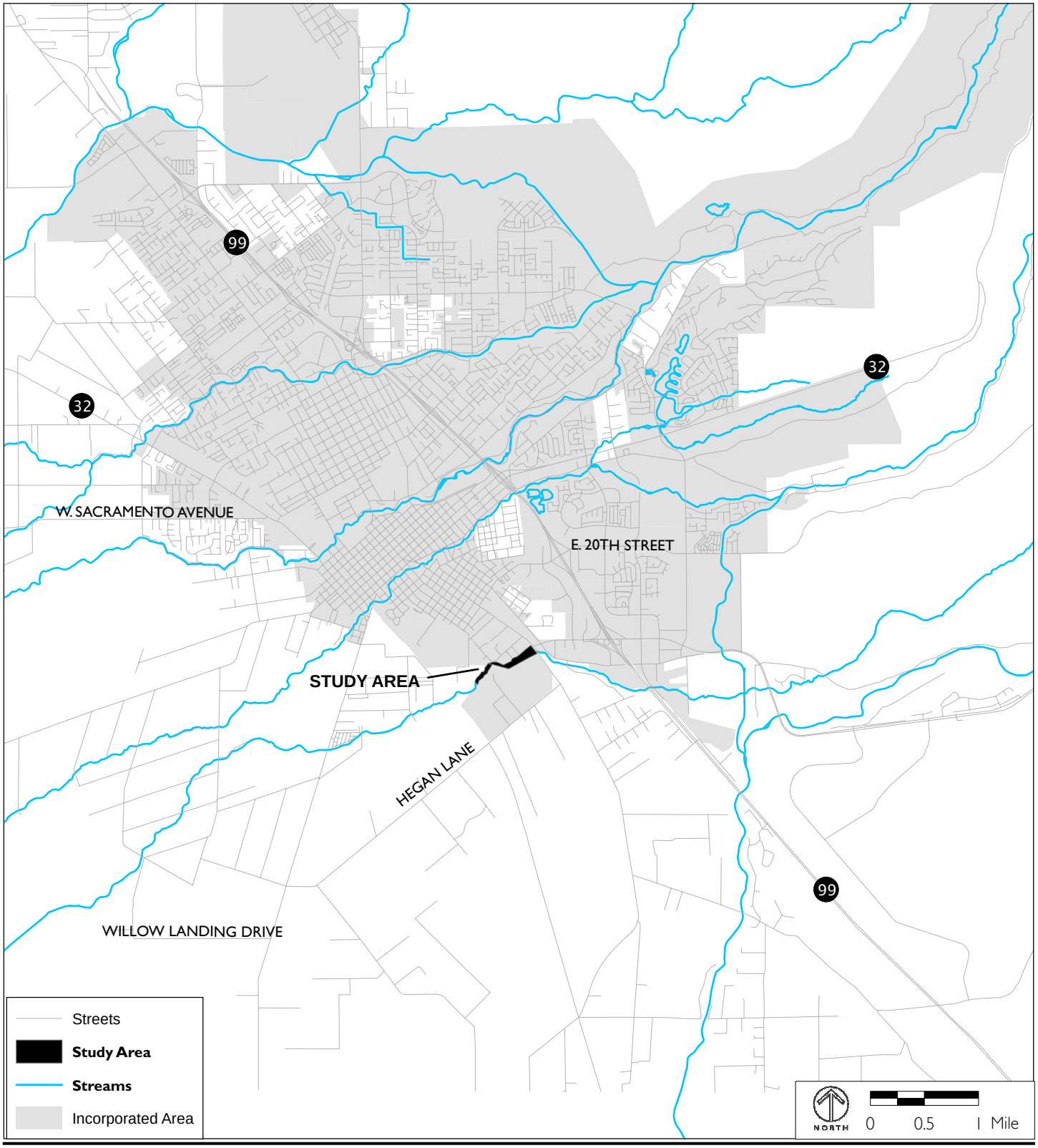
A. Goals and Objectives

The goal of this Vegetation Management Plan is to create a management framework to conserve, rehabilitate, enhance and protect the native resources of Comanche Creek. Specifically, the Plan aims to meet the following objectives:

- Preserve existing habitat
- Increase regeneration and recruitment of native plants within vegetation communities
- Identify and protect special status plant species
- Identify and protect special status animal species
- Provide wildlife habitats that enhance the opportunities for essential wildlife activities in the creek corridor (e.g. nesting, foraging, etc.)
- Eliminate non-native plants that are degrading habitat or out-competing native plant species
- Control the negative impacts of human use
- Utilize maintenance methods that minimize adverse impacts on the native vegetative habitats

This Vegetative Management Plan was prepared to provide the City of Chico with background information on existing conditions and special-status species within the Comanche Creek Corridor and guidance for the enhancement of native vegetation communities. The Plan consists of four chapters. Following this introduction, chapter 2 provides background information on existing natural resources and plan area conditions, and the regulatory framework related to the protection of sensitive biological and wetland resources. Chap-

ter 3 defines goals and management measures for each vegetation zone in the plan area. Chapter 4 provides information on phasing of invasive species removal and revegetation, as well as long-term maintenance strategies.



Source: City of Chico

FIGURE 1

SITE CONTEXT

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2 BACKGROUND

A. Description of Plan Area

The Comanche Creek Vegetation Management Plan area consists of a largely undeveloped creek corridor which supports a cover of dense riparian woodland and scrub along the Comanche Creek channel, and is bordered by valley oak woodland and nonnative grassland. The Plan area is surrounded by largely urbanized lands to the north, east, and southwest, agricultural land to the west, and ruderal (weedy) grasslands and woodlands to the immediate south of the central reach.

Prior to the construction of the Parrott-Phelan agricultural diversion (No. 50) on Butte Creek, Comanche Creek was an intermittent stream draining the Doe Mill Ridge. Today, Comanche Creek receives additional water from this diversion as well as from stormwater run-off from Chico's urban areas. Water that is not diverted into the Parrott Canal (downstream of the Plan area), continues into Edgar Slough.

B. Planning Context

The Plan area is subject to various federal, State and local regulations that have been enacted to provide for the protection and management of sensitive biological and wetland resources. This section describes these regulations as they pertain to enhancement of the Comanche Creek riparian corridor.

1. Federal

A number of federal agencies are responsible for protection of terrestrial and freshwater organisms through implementation of the Federal Endangered Species Act (ESA) and the Migratory Bird Treaty Act. The goal of these laws is to protect and recover plant and animal species in danger of becoming extinct. Species that are legally protected under the State and/or Federal Endangered Species Acts or other regulations and species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration are referred to as "special status species." Species with legal pro-

tection under the Federal and/or State Endangered Species Acts often represent major constraints to development, particularly when they are wide ranging, highly sensitive to habitat disturbance, or where proposed development would result in a "take" of the species. Special status species are further discussed below in Section E.

The U.S. Army Corps of Engineers has primary responsibility for protecting wetlands under Section 404 of the Clean Water Act. Below the Ordinary High Water Mark (OHWM), the Comanche Creek channel is considered regulated waters under Section 404 of the Clean Water Act and is also subject to State control under Section 1600 of the California Fish and Game Code.

2. State

On the State level, the California Endangered Species Act (CESA) is intended to conserve, protect, restore, and enhance listed species and their habitat. The CESA is similar to the Federal ESA both in process and substance, yet provides additional protection to listed species in California. In addition, California maintains informal lists of "Californian Special Concern" species. These species are broadly defined as animals that are of concern to the California Department of Fish and Game because of population declines and restricted distribution, and/or because they are associated with habitats that are declining in California.

The primary information source on the distribution of special-status species is the California Natural Diversity Database (CNDDB) inventory. The CNDDB inventory provides the most comprehensive statewide information on the location and distribution of special-status species and sensitive natural communities. The occurrence of a species of concern in a particular region is an indication that an additional population may occur at another location if habitat conditions are suitable.

Sensitive natural communities have no legal protective status under the State or Federal Endangered Species Acts, although they are provided some level of protection under the California Environmental Quality Act (CEQA).

CEQA Guidelines identify potential impacts on a sensitive natural community as one of six significance criteria. Where determined to be significant, any potential impact would require mitigation through avoidance, minimization of disturbance or loss, or some type of compensatory mitigation when unavoidable.

3. Local

Regulations applicable to the biological and wetland resources within the vicinity of the Vegetation Management Plan area include the Open Space and Conservation Element of the City of Chico General Plan and the City of Chico Tree Preservation Regulations. Goals from the Open Space and Conservation Element and the City of Chico Tree Preservation Regulations are described below:

a. Open Space and Conservation Element

- OS-Goal-5 Protect habitats that are sensitive, rare, declining, unique or represent valuable biological resources
- OS-Goal-6 Preserve and protect populations supporting habitat of special status species
- OS-Goal-7 Minimize impacts to sensitive natural habitats
- OS-Goal-8 Preserve and protect areas determined to function as regional wildlife corridors
- OS-Goal-9 Provide for no net loss of overall wetland acreage
- Os-Goal-10 Ensure that all new developments restrict the use of fencing in locations essential for wildlife movement
- OS-Goal-22 Ensure that open space corridors along creeks include protective buffers to preserve existing riparian vegetation through the environmental review process, and continue to require a minimum of 25-foot dedication and acquisition of 75-feet for a total of 100-foot setback from top-of-bank along creeks.

b. Tree Preservation Regulations

City Ordinance 16.66 Tree Preservation Regulation controls the removal and preservation of trees within the city limits. Under this ordinance, trees afforded protection include "any live woody plant having a single perennial stem of 24-inches or more in diameter, or multi-stemmed perennial plant greater than 15-feet in height having an aggregate circumference of 40-inches or more, measured at four feet six inches above adjacent ground" with the exception of the following tree species: tree of heaven, Chinese tallow, privet, and box elder. Removal of any tree that is subject to this ordinance requires a tree removal permit.

C. *Background and Methodology*

Background information used in preparing this Vegetation Management Plan was based primarily on a *Biological and Wetland Resource Assessment* conducted by Environmental Collaborative. The assessment provided information on vegetation types, wildlife habitat, invasive species and their management implications, and the potential for special-status species, jurisdictional wetlands and other important biotic features.

The *Biological and Wetland Resources Assessment* involved the review of available information, existing mapping, and a reconnaissance level survey of the Plan area. Review of literature and resource maps included past environmental studies for projects in the Plan area vicinity, the occurrence records of the CNDDB, the California Native Plant Society (CNPS) *Inventory of Rare and Endangered Plants* (2005), and numerous other information sources. Following the information review a field reconnaissance survey of the Plan area was conducted by the project biologist and wetland specialist on June 4, 2007. General vegetative cover types were mapped on an aerial photograph of the Plan area, and wildlife observations recorded. Lists of special-status species suspected to possibly occur in the Chico vicinity were compiled prior to conducting the field survey, and were used in evaluating habitat suitability and potential for occurrence in the Plan area. Additional field mapping and re-

connaissance was conducted by DC&E on November 6, 2006 to identify target areas for invasive species removal.

D. Existing Habitat and Vegetation

The aquatic and terrestrial habitats of the creek corridor and woodlands support a diverse assemblage of plant and animal species, providing important protective cover and serving as movement corridors for fish and wildlife. The grasslands also provide habitat for a variety of wildlife species, although the establishment and spread of several highly invasive species such as Himalayan blackberry and areas of soil compaction, caused by human activity, compromise their habitat value. While most of the Plan area contains a mixture of native and non-native species which reflect the relatively high degree of past disturbance, segments of the creek corridor remain in excellent condition with an almost exclusive cover of native species.

Existing vegetation types and related habitat are described below as vegetation zones. These vegetation zones provide a framework for the Management Plan discussed in Chapter 3. Figure 2 shows the distribution of the vegetation zones and other important biological features.

1. Riparian Woodland and Scrub

Riparian woodland and scrub occurs along Comanche Creek, supporting a dense cover of native and non-native trees, shrubs, vines, and groundcovers. Plant species that occur within this vegetation zone are listed in Table 1.

Although dense thickets of Himalayan blackberry and other non-native species currently limit the diversity of the shrub and understory plant species along much of the Creek, the riparian habitat continues to provide important wildlife resources to a wide variety of species.

Surface water is available for aquatic-dependent organisms, and is a source of drinking water for terrestrial mammals and birds. The Creek serves as a

movement corridor for aquatic and terrestrial species, including resident and possibly anadromous fish, western pond turtle, river otter, and beaver. Wildlife that is dependent on protective vegetation cover include grey fox, raccoon, black-tailed deer, black-tailed jackrabbit, brush rabbit, rufous-sided towhee, flycatchers, and warblers. The fish and other aquatic organisms provide foraging opportunities for egrets, herons, and waterfowl.

Acorns from the oaks provide a source of food in the fall for black-tailed deer, grey squirrels, acorn woodpeckers, scrub jays, and other birds. The mature trees provide important perching, roosting, and suitable nesting habitat for numerous species of birds. Although no large stick nests were observed during the field survey in June 2007, the mature trees could provide nesting locations for several species of raptors, such as red-tailed hawk, red-shouldered hawk, Cooper's hawk, sharp-shinned hawk, and possibly the State-threatened Swainson's hawk.

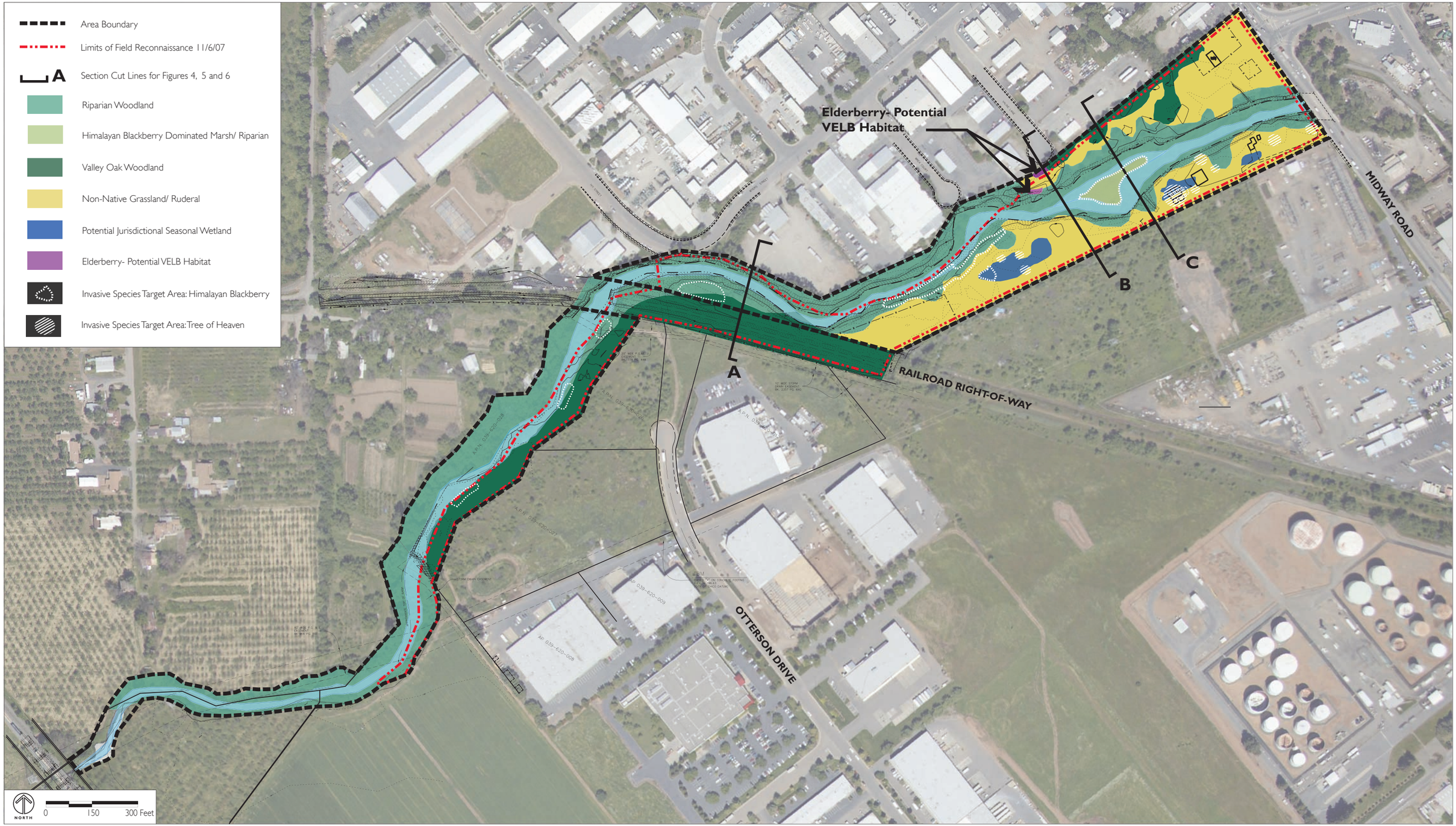


FIGURE 2

EXISTING VEGETATION AND BIOTIC FEATURES

TABLE 1 **RIPARIAN WOODLAND AND SCRUB EXISTING PLANT TYPES**

Common Name	Scientific Name	Type	Native
Native willow	*Salix gooddingii and Salix exigua*	Tree	Native
Valley oak	*Quercus lobata*	Tree	Native
Live oak	*Quercus agrifolia*	Tree	Native
Sycamore	*Platanus racemosa*	Tree	Native
Fremont cottonwood	*Populus fremontii*	Tree	Native
California buckey	*Aesculus californica*	Tree	Native
Blue elderberry	*Sambucus mexicana*	Shrub/ Tree	Native
Velvet ash	*Fraxinus velutina*	Tree	Native
California black walnut	*Juglans californica*	Tree	Native
Almond	*Prunus sp.*	Tree	Non-native
Wild grape	*Vitus californica*	Vine	Native
Mugwort	*Artemisia douglasiana*	Perennial Herb	Native
Wild rose	*Rosa californica*	Shrub	Native
Tree of heaven	*Ailanthus altissima*	Tree	Non-native Highly Invasive
Himalayan blackberry	*Rubus discolor*	Shrubby Weed	Non-native Highly Invasive
Giant reed	*Arundo donax*	Perennial Herb	Non-native Highly Invasive
Periwinkle	*Vinca major*	Ground-cover	Non-native Highly Invasive

2. Himalayan Blackberry Dominated Freshwater Marsh

An area of freshwater marsh occurs within the eastern portion of the creek corridor as indicated in Figure 2. Although the marsh is dominated by an overstory of introduced Himalyan blackberry, it continues to support native species such as Cattail and Smartweed. Plant species occurring within this vegetation zone are listed in Table 2.

TABLE 2 **HIMALAYAN BLACKBERRY DOMINATED FRESHWATER MARSH EXISTING PLANT TYPES**

Common Name	Scientific Name	Type	Native
Himalayan blackberry	*Rubus discolor*	Shrubby Weed	Non-native Highly Invasive
Cattail	*Typha latifolia*	Perennial Herb (aquatic)	Native
Smartweed	*Polygonum amphibium*	Perennial Herb	Native
Dallis grass	*Paspalum dilatatum*	Perennial Grass	Non-native
Verbena	*Verbena bonariensis*	Annual Herb	Non-native Invasive
Japanese iris	*Iris ensata*	Perennial Rhizome	Non-native

3. Valley Oak Woodland

Valley oaks form a dense to open woodland beyond the dense growth of the riparian corridor along Comanche Creek. Valley oak is the dominant tree species and is spreading successfully along the margins of riparian habitat. The woodlands are dominated by a few scattered mature trees and numerous saplings and younger trees, particularly along the former railroad right-of-way. Understory vegetation is composed largely of non-native grasses, non-native forbs, and thickets of Himalyan blackberry. Some locations contain very dense stands of sapling and young oaks. Specific plant species found within this vegetation zone are listed in Table 3.

The trees and open groundcover of the Valley Oak Woodlands provide perching, foraging, roosting, and possibly nesting habitat for numerous species of birds. Small mammals, reptiles, and insects found in the grassland provide foraging opportunities to birds and larger mammals, including striped skunk and grey fox. However, due to limited cover this zone does not contain the same diversity of species as the riparian habitat.

TABLE 3 **VALLEY OAK WOODLAND EXISTING PLANT TYPES**

Common Name	Scientific Name	Type	Native
Valley oak	*Quercus lobata*	Tree	Native
Himalayan Blackberry	*Rubus discolor*	Shrubby weed	Non-native Highly Invasive
Grasses and Forbs (described below)			

4. Non-Native Ruderal Grassland

The open areas in the Plan area support a cover dominated by non-native grasses and forbs. Species composition in the grasslands varies, depending on the extent of past disturbance, depth to groundwater and frequency and duration of soil saturation. Past grazing and other agricultural activities, construction of structures and roadways and other disturbance has eliminated most of the native species from the grasslands in the Plan area. Highly invasive species, particularly Himalayan blackberry and poison hemlock, are beginning to dominate large areas of the grasslands. These species tend to crowd out other grassland species, and eventually limit habitat values unless carefully controlled. As woodland cover spreads, sapling trees and shrubs are beginning to establish throughout the grasslands. Plants occurring within this vegetation zone are listed in Table 4.

TABLE 4 **NON-NATIVE GRASSLANDS EXISTING PLANT TYPES**

Common Name	Scientific Name	Type	Native
Slender oats	*Avena barbata*	Annual Herb	Non-native Invasive
Soft brome	*Bromus hordeaceus*	Annual herb	Non-native Invasive
Bur Clover	*Medicago polymorpha*	Annual Herb	Non-native Invasive
Annual ryegrass	*Lolium multiflorum*	Annual Grass	Non-native Invasive
Vulpia	*Vulpia bromoides*	Annual Grass	Non-native Invasive
Curly dock	*Rumex crispus*	Perennial Herb	Non-native Invasive
Storksbill filaree	*Erodium cicutarium*	Annual Herb	Non-native Invasive
Common vetch	*Vicia sativa ssp. nigra*	Annual Herb/Vine	Non-native
Wild radish	*Raphanus sativus*	Annual Herb	Non-native Invasive
Yellow-star thistle	*Centaurea solstitialis*	Annual Herb	Non-native Invasive
Cocklebur	*Xanthium strumarium*	Annual Herb	Non-native Invasive
Prickly ox-tongue	*Picris echioides*	Perennial Herb	Non-native Invasive
Himalayan blackberry	*Rubus discolor*	Shrubby weed	Non-native Highly Invasive
Poison hemlock	*Conium maculatum*	Perennial Herb	Non-native Highly Invasive
Bindweed	*Convolvulus arvensis*	Perennial Herb/Vine	Non-native Invasive

The grasslands in the Plan area and surrounding undeveloped lands and field margins provide important foraging opportunities for numerous small mammals, passerine birds, and insects. Species that utilize these areas include the California vole, pocket gopher, fence lizard, alligator lizard, black-tailed jack-

rabbit, western meadowlark, western kingbird, savannah sparrow, white-crowned sparrow, and American goldfinch. These species provide abundant prey opportunities for predatory birds, mammals, and reptiles, such as gopher snake, raccoon, stripped skunk, grey fox, red-tailed hawk, red-shouldered hawk, American kestrel, great-horned owl, white-tailed kite, northern harrier, and barn owl. No evidence of seasonal ponding in the grasslands was observed that would allow for establishment of any aquatic dependent animal species.

5. Potential Seasonal Wetlands

The grasslands in the Plan area include indicators of potential seasonal wetlands in a few locations, as shown in Figure 2. The vegetation in these locations is different than the surrounding grasslands, dominated by Johnsongrass, bur-chervil, and perennial ryegrass (Table 5). None of these species are particularly strong wetland indicators, but they do provide an indication of possible jurisdictional waters in these scattered depressions. Additional detailed assessment of possible wetland conditions would be necessary to accurately determine whether these areas qualify as jurisdictional waters regulated by the U.S. Army Corps of Engineers and the Regional Water Quality Control Board (RWQCB).

TABLE 5 **POTENTIAL SEASONAL WETLANDS EXISTING PLANT TYPES**

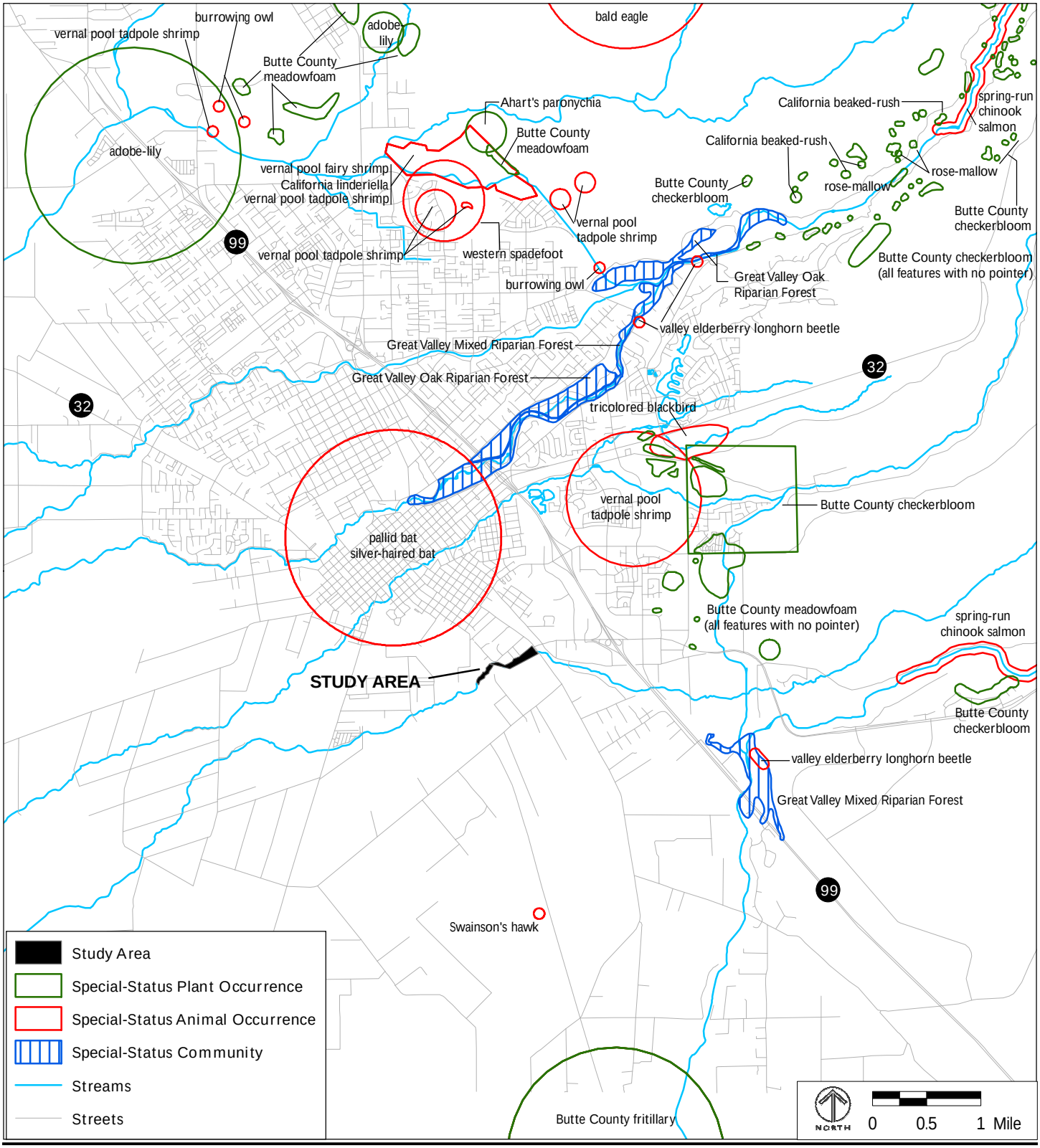
Common Name	Scientific Name	Type	Native
Johnsongrass	*Sorghum halepense*	Perennial Herb	Non-native Invasive
Bur-chervil	*Anthriscus caucalis*	Annual Herb/Vine	Non-native
Perennial ryegrass	*Lolium perenne*	Perennial Grass	Non-native

E. Special-Status Species

A number of special-status plant and animal species have been reported or are suspected to occur in the Chico vicinity. However, there have not been any reports of special-status species in the Plan area according to CNDDB records and past studies conducted in the vicinity. Figure 3 illustrates occurrence records for special-status species and sensitive natural communities maintained by the CNNDB within approximately five miles of the Plan area. Information on special-status plant and animal species considered to have the highest potential for occurrence in the Plan area vicinity is summarized below. These species may have implication on management and maintenance activities in the Plan area. Further study or preconstruction surveys may be appropriate to confirm their presence or absence or to ensure proper avoidance of sensitive habitat as discussed further in Chapter 4.

1. Special-Status Plants

Based on a review of the U.S. Fish and Wildlife Service (USFWS) list for species from the Chico vicinity, a records search of the CNDDB, the CNPS *Inventory*, and documents pertaining to biological resources of the Plan area's vicinity, there are a number of special-status plant species that could potentially occur in open grasslands, vernal pools, and mesic areas of the southeastern Chico vicinity. Table 6 indicates special-status plants that could potentially occur in the Plan area based on these studies. The plants are listed on CNPS List 1B, meaning they are considered as rare or threatened and/or as Federal Species of Concern (FSC). FSC refers to species that are declining or appear to be in need of concentrated conservation actions, but is not an official listing. Although no occurrences of these species have been reported by the CNDDB within the immediate vicinity of the Plan area, habitat along the riverine features and the potential seasonal wetland features is considered to have a remote to low potential for occurrence.



Source: California Natural Diversity Database, May, 2007.

FIGURE 3

CNDDB SPECIAL-STATUS SPECIES/
SENSITIVE NATURAL COMMUNITY OCCURRENCES

TABLE 6 **SPECIAL-STATUS PLANTS TO BE CONSIDERED FOR VEGETATION MANAGEMENT PLAN**

Common Name	Scientific Name	Listing*	Potential for Occurrence Within Plan area**
Adobe lily	*Fritilaria pluriflora*	CNPS List 1B	Remote
Ahart's Paronychia	*Paronychia ahartii*	CNPS 1B FSC	Low
California beaked rush	*Rhynchospora californica*	CNPS List 1B FSC	Remote
Columbian water-meal	*Wolffia brasiliensis*	CNPS List 2	Low
Red Bluff dwarf rush	*Juncus leiospermus* var. *leiospermus*	CNPS List 1B	Low

* CNPS List 1B: Considered rare, threatened, or endangered in California and elsewhere FSC: Federal Species of Concern. **Potential for occurrence based on conditions encountered during field reconnaissance survey in June 2007 and habitat requirements of specific species. "High" rating considered to have a high potential for occurrence, "moderate" considered to have a moderate possibility, "low" considered to have little or no potential for occurrenc,e, and "remote" considered highly unlikely.

2. Special-Status Animals

Based on a review of records maintained by the CNDDB, documents pertaining to the biological resources in the Chico vicinity and the field reconnaissance survey and habitat assessment, a total of 18 special–status animal species (listed in Table 7) could potentially occur within the Plan area. These include valley elderberry longhorn beetle, Central Valley fall/late fall-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, foothill yellow-legged frog, giant garter snake, northwestern pond turtle, ferruginous hawk, greater sandhill crane, Lawrence's goldfinch, Lewis' woodpecker, loggerhead shrike, Swainson's hawk, western burrowing owl, white-tailed kite, greater western mastiff bat, pacific western big-eared bat, pale Townsend's big-eared bat, and yuma myotis bat. In addition, raptors and

other migratory birds could potentially occur within the Plan area. Information on these species is summarized below.

The species included in Table 7 are listed either as California Species of Concern (CSC), Federal Species of Concern (FSC), Federal Candidate Species (FCS), and/or Federally Threatened Species (FTS). Federal Candidate Species are defined by the U.S. Fish and Wildlife Service as species that are eligible to be listed as endangered or threatened under the Endangered Species Act, but for which listing has been precluded by higher priority listing activities. Federally Threatened Species are defined by the U.S. Fish and Wildlife Service as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

F. Sensitive Natural Communities

Sensitive natural communities in the Plan area that are of particular concern to the CDFG include the riparian woodland and scrub and the valley oak woodlands. These are recognized as sensitive natural communities for the following reasons:

- The riparian woodland and scrub has been compromised by the abundance of invasive exotics, yet native tree species still form the dominant cover along most of the Creek. The middle reach contains an almost completely native cover in some locations in both the overstory and understory vegetation.
- Valley oak woodlands are spreading along the periphery of the riparian corridor, dominated by young valley oak trees. Although not yet recorded by the CNDDB, valley oak woodlands are typically monitored because of their continuing loss as a result of clearing for urban and agricultural development, flood control improvements, and other land modifications.

TABLE 7 **SPECIAL-STATUS ANIMALS WITH POTENTIAL TO OCCUR IN THE PLAN AREA**

Common Name	Scientific Name	Listing*	Potential for Occurrence Within Plan area**
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FTS	High
Central Valley fall/late fall-run chinook salmon	*Oncorhynchus tshawytscha*	FCS CSC	Moderate
Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	FTS CSC	Moderate
Central Valley steelhead	*Oncorhynchus mykis)*	FTS	Moderate
Ferrugious hawk	*Buteo regalis*	FSC CSC	Moderate
Greater sandhill crane	*Grus canadensis tabida*	CTS that is fully protected by CDFG	Low
Lawrence's goldfinch	*Carduelis lawrencei*	Nesting as a FSC	Low
Lewis' woodpecker	*Melanerpes lewis*	Nesting as a FSC	Low
Loggerhead shrike	*Lanius ludovicianus*	Nesting as a FSC and CSC	Moderate
Swainson's hawk	*Buteo swainsoni*	CTS Nesting as a FSC	Moderate
Western burrowing owl	*Athene cunicularia hypugaea*	FSC and CSC	Low
White-tailed kite	*Elanus leucurus*	FSC Fully protected by CDFG	High
Greater Western Mastiff Bat	*Eumops perotis californica*	FSC and CSC	Moderate
Pacific Western Big-Eared Bat	*Corynorhinus townsendii townsendii*	FSC and CSC	Moderate

Common Name	Scientific Name	Listing*	Potential for Occurrence Within Plan area**
Pale Townsend's Big-eared Bat	*Corynorhinus townsendii pallescens*	FSC and CSC	Moderate
Yuma Myotis Bat	*Myotis yumanensis*	FSC and CSC	Moderate
Giant Garter Snake	(*Thamnophis gigas*)	FTS CTS	Low
Foothill Yellow-legged frog	*Rana boylii*	CSC	Moderate
Northwestern pond Turtle	*Clemmys marmorata marmorata*	CSC	Moderate

*FTS: Federal Threatened Species; FCS: Federal Candidate Species; CTS: California Threatened Species; CSC: California Species of Concern

**Potential for occurrence based on conditions encountered during field reconnaissance survey in June 2007 and habitat requirements of specific species. "High" rating considered to have a high potential for occurrence, "moderate" considered to have a moderate possibility, and "low" considered to have little or no potential for occurrence.

G. Potential Jurisdictional Waters

A preliminary wetland assessment was conducted as part *of the Biological and Wetland Resource Assessment* to provide an initial estimate of the likely extent of waters subject to Section 404 of the Clean Water Act. While the preliminary estimates presented below appear reasonable, there is a possibility that the Corps may consider additional locations to be jurisdictional, or that locations identified in preliminary estimates in fact do not qualify as a regulated waters.

As mentioned above, the Comanche Creek channel below the Ordinary High Water Mark is a regulated waters under Section 404 of the Clean Water Act and is subject to State control under Section 1600 of the California Fish and Game Code.

Several areas in the non-native grasslands are potential seasonal wetlands that may meet the Corps definition of wetlands. These areas are discussed above and diagrammed in Figure 2, and are generally composed of transitional wetland species such as Johnsongrass, perennial ryegrass, and dallisgrass. Additional detailed assessment of the potential for these areas to qualify as jurisdictional waters would be required to confirm whether they in fact meet the criteria as wetland. In addition, the Corps would have to verify whether they fall under their jurisdiction as they may be considered hydrologically isolated from the regulated waters of the Creek channel. The Corps holds the responsibility of making a final determination on the extent of jurisdictional waters.

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3 GOALS AND MANAGEMENT MEASURES FOR VEGETATION ZONES

Vegetation management along the Comanche Creek riparian corridor will focus on restoration and enhancement of the existing natural vegetation zones described in Chapter 2 and delineated in Figure 2. Management measures included in the plan are designed to heighten the unique aesthetics and habitat functions of each zone, and decrease long-term maintenance requirements for the Plan area as a whole by enabling it to reach a natural equilibrium. Emphasis is placed on protecting intact areas of native vegetation, controlling and working to eradicate highly invasive exotic plants, and encouraging the spread and natural succession of native communities in the Plan area. This chapter discusses vegetation management measures as they relate to unique vegetation zones. Chapter 4 offers a unified plan for implementation of the vegetation management plan.

The information provided in Tables 8 and 9, included at the end of this chapter, is referred to throughout the discussion of vegetation management measures. Table 8 describes appropriate techniques for the removal of invasive, non-native species. Table 9 indicates suitable species for use in enhancement plantings. In addition, Figures 4, 5 and 6 provide cross-sections which diagram existing vegetation zones and recommended management measures.

1. Riparian Woodland

Enhancement recommendations for the riparian woodland focus on control and eradication of invasive species and the planting of native vegetation. Such measures have the potential to greatly improve the existing habitat values of the Comanche Creek riparian corridor.

a. Control and Eradication of Invasive Plants

This measure is intended to control and ideally eliminate non-native vegetation from the sensitive riparian corridor in order to improve native habitat values and encourage the further establishment of native riparian woodland and scrub plant species.

Targeted invasive species in the riparian woodland zone include Himalayan blackberry, periwinkle, English ivy, arundo, and tree of heaven. Limited herbicide application may be required to effectively control resprouting of these target species, although non-toxic removal through repeated mechanical methods is generally preferred and will be used whenever feasible. Techniques for the treatment of target species in the riparian woodland zone are listed in Table 8 and summarized below:

- *Himalayan Blackberry.* The extensive roots of this plant make burning and root removal the most plausible methods for control. As burning is not an appropriate management technique for this relatively urban area, efforts will focus on root and vegetative removal.
- *Periwinkle and English Ivy.* Periwinkle and English ivy also possess extensive root systems, and ivy can spread up trunks into the canopy of trees and shrubs. Non-toxic approaches to their removal are preferable, including hand pulling of vegetative growth and roots and tarping of infestations. However, foliar spraying prior to tarping may be necessary for effective control. Tarping should begin after the rainy season has ended and continue until the next rainy season begins.
- *Giant Reed.* Giant reed (Arundo) is known to destabilize streambanks and cause significant degradation to streamside habitats. Techniques for removal of arundo include tarping and hand removal. Since arundo spreads rapidly downstream, eradication efforts should begin in the upper reaches of the drainages.
- *Tree of Heaven.* Above-ground growth of this plant can be removed by manually cutting. Repeated cutting and possible treatment with herbicide may be required to prevent regeneration of stump and root sprouts. Herbicide treatment of trunks and roots may be necessary to control this aggressive sprouting species.

b. Native Riparian Vegetation Enhancement Plantings

Removal of invasive species should be followed by revegetation with native plants. This is necessary to prevent the establishment of other invasive and

ruderal (weedy) species that prefer disturbed areas for germination and establishment. Table 9 provides a list of appropriate tree, shrub, and groundcover species to be used in revegetating the riparian woodland. The following list summarizes key plants to be used in revegetation efforts:

- *Native Willows and Cottonwoods.* These species are well adapted to channel environments, and can be installed as sprigs or dormant cuttings. Plant material will be harvested as close to the Plan area as possible, and include a variety of parent plants so as to ensure genetic diversity.
- *Large Seeded Trees.* Large seeded trees that are native to the Plan area include valley oak, live oak, buckeye, black walnut, and bay. These trees can be planted from seedlings that are contract-grown from seed collected on-site, or from locally available native nursery stock. Larger specimens can be planted when structure and immediate impact are desired.
- *Other Riparian Shrub and Groundcover Species.* A number of native shrubs and groundcovers are appropriate for planting in the riparian woodland zone to improve species diversity, complexity of the understory, and help prevent re-establishment of targeted invasive species. Appropriate native species for understory revegetation include California blackberry, California rose, and mugwort. Open areas that result from invasive tree and shrub removal can also be seeded with the grassland seed mix indicated in Table 9 in order to establish a continuous groundcover and minimize the potential for erosion and sedimentation in the nearby creek.

c. Monitor

Removal of invasive plants typically entails several years of careful monitoring and re-growth removal. Therefore, riparian habitat should be carefully monitored and managed for several years after initial invasive species removal and native species revegetation.

2. Himalayan Blackberry Dominated Freshwater Marsh

The freshwater marsh occurring in Comanche Creek is dominated by non-native plants, predominately Himalayan blackberry. Management goals for

the freshwater marsh are to eliminate invasive species and replace them with native freshwater marsh plants.

a. Control and Eradication of Invasive Plants

Emphasis will be placed on the control of Himalayan blackberry. Removal of this plant is discussed above in relation to the riparian woodland zone. Complete removal of all root materials of this species in the marsh zone may be difficult if not impossible, and tarping will not be an option in the limits of jurisdictional waters. Any herbicide application must be severely controlled and limited to an aquatic approved herbicide.

b. Enhancement Plantings

Cattail and bulrush will regenerate naturally in the freshwater marsh zone, although plug plantings of native emergent species may facilitate natural marsh cover in areas that were formerly covered by dense thickets of Himalayan blackberry.

c. Monitor

As with the other vegetation zones, removal of invasive plants requires several years of careful monitoring and re-growth removal. Therefore, marsh and lower banks of the creek habitat should be carefully monitored and managed after initial invasive species removal and native species revegetation.

3. Valley Oak Woodland

Goals for the valley oak woodland are to ensure its sustainable future by maintaining the mature trees and creating the opportunity for the younger trees and saplings to mature. This entails protecting the existing oaks and implementing responsible maintenance measures.

a. Control and Eradication of Invasive Plants

Existing invasive non-native species should be controlled and/or eradicated. The dominant non-native species to control in the valley oak woodland is the Himalayan blackberry. However, existing stands of periwinkle and poison hemlock should also be controlled.

b. Thinning of the Valley Oak Woodland

Areas of Valley Oak Woodland that contain over-dense stands of sapling and young oaks may require thinning as part of future vegetation management. However, this must be carefully controlled to maintain the habitat values of the expanding native woodland in upland areas, and balanced with the desire to retain open areas along the creek corridor.

c. Enhancement Plantings

Removal of invasive species and thinning of over-dense stands should be followed by revegetation with native plants to prevent the establishment of other invasive and ruderal species. Table 9 provides a list of appropriate plant species to be used in revegetating the valley oak woodland.

d. Preventative Maintenance

Preventative maintenance measures should be taken to encourage long-term health of the valley oak woodland zone. These measures include the removal of accumulated brush and woody debris from the understory to decrease the potential for fire, and avoidance of any maintenance that involves soil compaction. Avoidance of soil compaction is critical because the majority of an oak's roots occur within the top two feet of soil.

4. Non-Native Grassland

As discussed in Chapter 2, native grassland species are rapidly being lost to thickets of Himalayan blackberry, poison hemlock, johnsongrass, and dallisgrass, and the spread of native and non-native saplings. The habitat value of the non-native grassland can be enhanced by implementing the following recommendations.

a. Invasive Plant Control and Removal

Removal and control of non-native and invasive plants will focus on highly invasive species that are replacing the grasslands with dense thickets. These species include Himalayan blackberry and poison hemlock. Mechanical removal of root and vegetative growth, routine mowing and other non-toxic

methods of removal and control should be utilized whenever feasible. Table 8 provides a description of removal and control techniques for the non-native and invasive species in the non-native grassland zone.

- *Himalayan Blackberry.* Removal of this plant is discussed in the riparian woodland zone above. Areas disturbed by mechanical and chemical treatment will be revegetated with grassland cover through seeding as specified in Table 9. Rototilling followed by root removal may be a feasible option in the level open areas of the Plan area to be revegetated as grassland.
- *Hemlock and Other Tall Weeds.* Techniques for tall weed removal include root, stalk, and seedling pulling, and routine mowing. As the Plan area is heavily vegetated with invasive weeds, mowing will take place at specified intervals during the growing season to remove hemlock and other weedy species, and to control non-native grasses which can also become problematic. Poison hemlock is highly toxic to humans, and thus care must be exercised in all methods used for its removal.
- *Native and Non-Native Saplings.* Some control on the continued spread of trees and shrubs in the Plan area may be desired to keep large open areas of grassland intact. Routine mowing of selected opening to control invasive species and reduce fire fuels would serve to control the establishment of valley oak and live oak seedlings.

b. Native Grass Revegetation and Enhancement

Native grasses will be hydroseeded in areas disturbed during initial grading and site improvements, or invasive species control and management. Table 9 provides a seed mix to use in revegetating disturbed areas in the grassland zone and open areas of the riparian woodland and valley oak woodland zones.

5. Potential Valley Elderberry Long-horn Beetle Habitat

The Valley Elderberry Long-horn Beetle (VELB) is listed as a Federally Threatened species, and thus measures should be taken to avoid any adverse effects on VELB habitat. The following measures are recommended to con-

serve and enhance existing VELB habitat in the Comanche Creek riparian corridor:

a. Avoidance

The use of herbicides and intensive maintenance activity is prohibited within within 100-feet of the mapped VELB habitat.

b. Control and Eradication of Invasive Plants

Weeds and non-native plants must be removed by hand from VELB habitat once a year.

c. Enhancement Planting

Elderberry stands should be enhanced as part of future vegetation management efforts. The goal for enhancement planting is to achieve a dense mixture of mature elderberry and native understory plants, as is preferred by the VELB. This will be accomplished through protection of the existing elderberry plants, removal of invasive exotics, and natural regeneration and spread of elderberry plants along the riparian corridor.

TABLE 8 **DOMINANT INVASIVE PLANT SPECIES MANAGEMENT DETAILS**

Invasive Species	IPI Rating	Control and Management
Tree of Heaven (*Alianthus altissima*)	Moderate	**Treatment** - Cut and immediately treat all trunks/shoots with herbicide glyphosate, with repeat treatment of any resprouts; Cut in spring (before May) when cambium is active to prevent seed production, and a second time at the end of the growing season (June or July) to exhaust energy reserve of tree. Pull all remaining seedlings when soil is moist before taproot establishes. **Disposal –** All seeds, pulled seedlings, and root material should be collected, bagged and disposed of properly. Slash from trees with no seeds may be used as wildlife cover and bank reventment. **Follow-Up –** Cut and retreat any resprouts with glyphosate every spring (before May) until stand is eliminated, and continue retreatment at least one year following placement of fill cap. Pull all seedlings and root suckers annually when soil is moist until seed source is exhausted.
Poison hemlock (*Conium maculatum*)	Moderate	**Treatment –** Grub all woody material and flowering heads prior to site grading within the limits of construction to prevent spread of seed and roots of this species. Hand pull/dig out any plants outside limits of scraping to remove existing stands. **Disposal –** All seeds, pulled seedlings, and root materials should be collected, bagged and disposed of properly. **Follow-Up –** Mow four times a year about every three months beginning in March-April until seed source is exhausted. Hand bag and dispose of any plants that have set seed prior to mowing to prevent dispersal of seed. Possibly consider use of foliar spray as necessary in spring with broadleaf specific herbicide that will not affect grasses to supplement mowing regime.
Giant Reed (*Arundo donae*)		**Treatment –** Successful elimination requires completely killing or removing the root system. Pulling and cutting can be effective if all rhizomes and above ground vegetation are removed. Herbicide treatment may be required to kill all rhizomes. **Disposal –** Both treated and non-treated stems can be left on-site to decompose. All root material should be collected and disposed of properly as it could resprout. **Follow-Up –** Cut and retreat any resprouts, and remove any remaining root systems. Pull or dig younger plants annually, ideally after heavy rains loosen soil.

TABLE 8 **DOMINANT INVASIVE PLANT SPECIES MANAGEMENT DETAILS** (CONTINUED)

Invasive Species	IPI Rating	Control and Management
*English ivy (*Hedera helix*)	High	**Treatment –** Pull and remove all stem material, accessible stolons and deeper roots from trees, shrubs, and ground surfaces. Consider applying broadleaf-specific herbicide by foliar spray prior to placement of tarp over infestation area to supplement hand removal. If herbicide is used, restrict foliar spray within 15 feet of surface water to appropriate aquatic approved herbicide. **Disposal –** All seeds, pulled seedlings, stolons, and root material should be collected, bagged and disposed of properly. **Follow-Up –** Hand-pull all seedlings, stem material, accessible stolons and deeper roots. Consider spot treatment with broadleaf specific herbicide by foliar spray as necessary in spring and late summer to supplement hand removal, but carefully control use and application to prevent loss of native grassland, riparian, and upland enhancement plantings.
Himalayan blackberry (*Rubus discolor*)	High	**Treatment –** Pull and remove all stem material and accessible root balls from ground surfaces. Consider applying broadleaf-specific herbicide by foliar spray over infestation area to supplement hand removal. If herbicide is used, restrict any foliar spray within 15 feet of surface water to appropriate aquatic approved herbicide. Alternative chemical treatment is to cut stems to about 1-foot and treat stumps with glyphosate immediately after cutting, which may be a more realistic treatment method on channel banks where root removal could destabilize the area. Any herbicide treatment must be carefully controlled to avoid timing when fruit may be ripe to avoid possible ingestion. **Disposal –** All seeds, pulled seedlings, and root material should be collected, bagged and disposed of properly. **Follow-Up –** Hand-pull all seedlings, stem material, accessible root balls. Consider spot treatment with broadleaf specific herbicide by foliar spray as necessary in spring and late summer to supplement hand removal, but carefully control use and application to prevent loss of native grassland, riparian, and upland enhancement plantings.

TABLE 8 **DOMINANT INVASIVE PLANT SPECIES MANAGEMENT DETAILS** (CONTINUED)

Invasive Species	IPI Rating	Control and Management
Periwinkle (*Vinca major*)	Moderate	**Treatment** – Pull and remove all stem material, accessible stolons and deeper roots from ground surfaces. Consider applying broadleaf-specific herbicide by foliar spray prior to placement of tarp over infestation area to supplement hand removal. If herbicide is used, restrict any foliar spray within 15 feet of surface water to appropriate aquatic approved herbicide. **Disposal** – All seeds, pulled seedlings, stolons, and root material should be collected, bagged and disposed of properly. **Follow-Up** – Hand pull all seedlings, stem material, accessible stolons and deeper roots. Consider spot treatment with broadleaf specific herbicide by foliar spray as necessary in spring and late summer to supplement hand removal, but carefully control use and application to prevent loss of native grassland, riparian, and upland enhancement plantings.

Notes:

IPI Ratings Definitions (California Invasive Species Council, 2006, *Invasive Plant Inventory, "The Weed List"*).

High: These species have severe ecological impacts on ecosystems, plant and animal communities, and vegetational structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. These species are usually widely distributed ecologically, both among and within ecosystems.

Moderate: These species have substantial and apparent – but generally not severe – ecological impacts on ecosystems, plant and animal communities, and vegetational structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but either their ecological impacts are minor on a statewide level or information on them is insufficient to justify a higher rating, although they may cause significant problems in specific regions or habitats. Their reproductive biology and other attributes result in low to moderate rates of invasion. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Evaluated But Not Listed: In general, this designation is for species for which information is currently inadequate to respond with certainty to the minimum number of criteria question, or for which the sum effects of ecological impacts, invasiveness, and ecological amplitude and distribution fall below the threshold for ranking. Many such species are widespread but are not known to have substantial ecological impacts (though such evidence may appear in the future).

TABLE 9 **SUITABLE NATIVE PLANT SPECIES**

Species	Rate/Size	Treatment Details
Grassland Zone Seed Mix		
Creeping wildrye (*Leymus triticoides*)	15 lbs per acre	Seed shall be applied over all graded surfaces (except in areas of new paving, new trails, and areas to be enhanced as seasonal wetlands, specified below) before onset of fall rains, prior to October 15. Seed source shall be as local as possible, supplied on a basis of Pure Live Seed (PLS), and not contain an excess of one percent (1%) of weed seed. Seed shall preferably be applied by hydroseeding particularly for larger areas and slopes, rather than by hand broadcast. Hydroseed may include seed, dye, fertilizer, lime, mulch, and synthetic binder.
California brome (*Bromus carinatus*)	15 lbs per acre	
California poppy (*Eschscholzia californica*)	2 lbs per acre	
Lupine (*Lupinus nanus*)	2 lbs per acre	
Seasonal Wetland Zone Seed Mix		
Creeping wildrye (*Leymus triticoides*)	15 lbs per acre	Enhancement and expansion of potential seasonal wetlands shall be accomplished through creation of shallow topographic depressions and heavy seeding with suitable plant cover. Seed shall be applied by hydroseeding or broadcast seeding adjacent to the existing potential seasonal wetland. Following localized grading and possible soil enhancement, seed shall be installed in the early fall before onset of fall rains, prior to October 15. Seed source shall be as local as possible, supplied on a basis of Pure Live Seed (PLS), and not contain an excess of one percent (1%) of weed seed. Hydroseed may include seed, dye, fertilizer, lime, mulch, and synthetic binder.
California oatgrass (*Danthonia californica*)	10 lbs per acre	
California brome (*Bromus carinatus*)	10 lbs per acre	
Meadow barley (*Hordeum brachyantherum*)	10 lbs per acre	
Spreading rush (*Juncus patens*)	5 lbs per acre	

TABLE 9 **SUITABLE NATIVE PLANT SPECIES** (CONTINUED)

Species	Rate/Size	Treatment Details
Riparian Zone, Oak Savanna Zone, and Seasonal Wetland Zone Plantings:		
Willow (*Salix lasiolepis* and *S. laevigata*)	Riparian Zone – Pole cuttings installed from stems collected on-site, taken from a minimum of ten trees to increase likelihood that poles collected from both make and female plants. Cuttings from one-year-old branches, with minimum length of 3 feet, maximum length of five feet, minimum cut-end basal diameter of ¾ inch, maximum diameter of 1.5 inches, and continuous bark and stems that are not split. A minimum of three cuttings will be planted in each planting hole.	Each pole will kept moist at all times, soaked in water for a minimum of seven days prior to installation, with butt end of each pole soaked in a bucket of water to a minimum depth of 24 inches immediately preceding planting. Planting holes will be excavated during backhoe operations or by an auger, with holes having a minimum diameter of nine inches and depth of 24 inches. Holes back-filled with native soil material in 12 inch lifts, compacting and watering with each lift. A watering basin will be created at each planting location and covered with four inches of oak leaf mulch no less than six inches surrounding each cutting.
Box elder (*Acer negundo* var. *californicum*)	Riparian Zone – planting spaced no closer than 10-foot centers, from tree pot or 1-gallon containers.	Install during start of wet period between November 15 and January 15. Provide appropriate browse protection as required with staked 4'-high poultry mesh fencing where monitoring indicates a loss of plant material due to deer and rodents. Provide summer irrigation for a minimum of two years until established.
California buckeye (*Aesculus californica*)	Riparian and Valley Oak Woodland Zones – spaced no closer than 10-foot centers, from tree pot or 1-gallon containers.	
Mugwort (*Artemiisia californica*)	Riparian Zone – grouped mosaics, from tree pots or 1-gallon containers within 15 feet of drainage on 5-foot centers.	
California Black Walnut *(Juglans californica)*	Riparian and Valley Oak Woodland Zones – spaced no closer than 10-foot centers, from tree pot or 1-gallon containers.	
Spreading rush (*Juncus patens*)	Riparian and Seasonal Wetland Zone – from tree pot or 1-gallon containers, spaced randomly along channel bank and open areas on 5-foot centers.	
Fremont cottonwood (*Populus fremontii*)	Riparian Zone – space no closer than 20-foot centers, from tree pot or 1-gallon containers.	

TABLE 9 **SUITABLE NATIVE PLANT SPECIES** (CONTINUED)

Species	Rate/Size	Treatment Details
Valley oak (*Quercus lobata*)	Riparian and Valley Oak Woodland Zones – space no closer than 20-foot centers, from tree pot or 1-gallon containers.	
Live oak (*Quercus agrifolia*)	Riparian and Valley Oak Woodland Zones – space no closer than 20-foot centers, from tree pots or 1-gallon containers.	
Flowering currant (*Ribes sanguineum*)	Riparian Zone – grouped mosaics of 3 to 7 plants from 1-gallon containers on 10-foot centers.	
California rose (*Rosa californica*)	Riparian Zone – grouped mosaics of 3 to 7 plants from tree pots or 1-gallon containers on 5-foot centers.	
Snowberry (*Symphoricarpos albus*)	Riparian Zone – grouped mosaics of 3 to 7 plants, from tree pots or 1-gallon containers on 5-foot centers.	
Sycamore *(Platanus racemosa)*	Riparian Zone – space no closer than 20-foot centers, from tree pot or 1-gallon containers.	

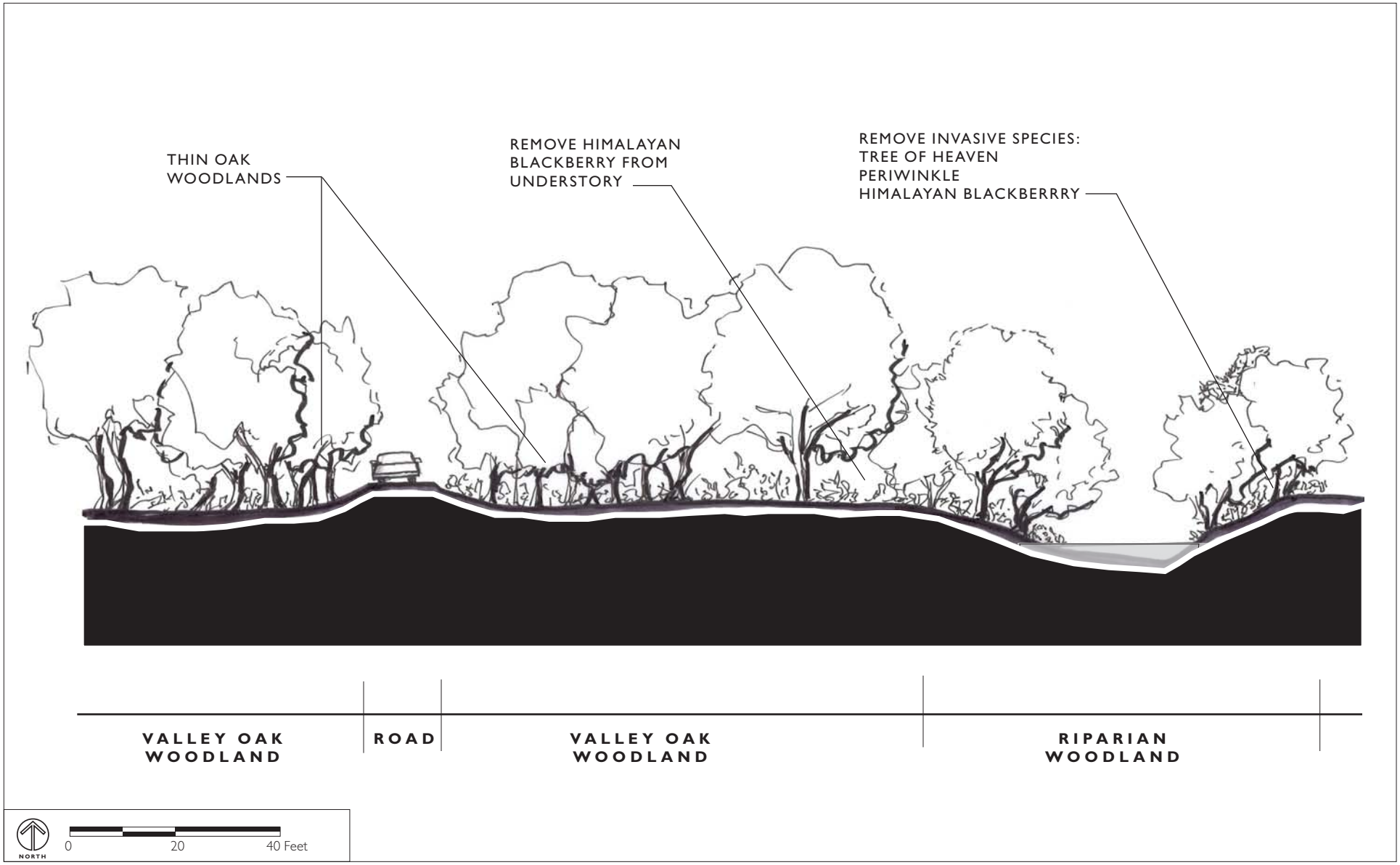


FIGURE 4

SECTION A

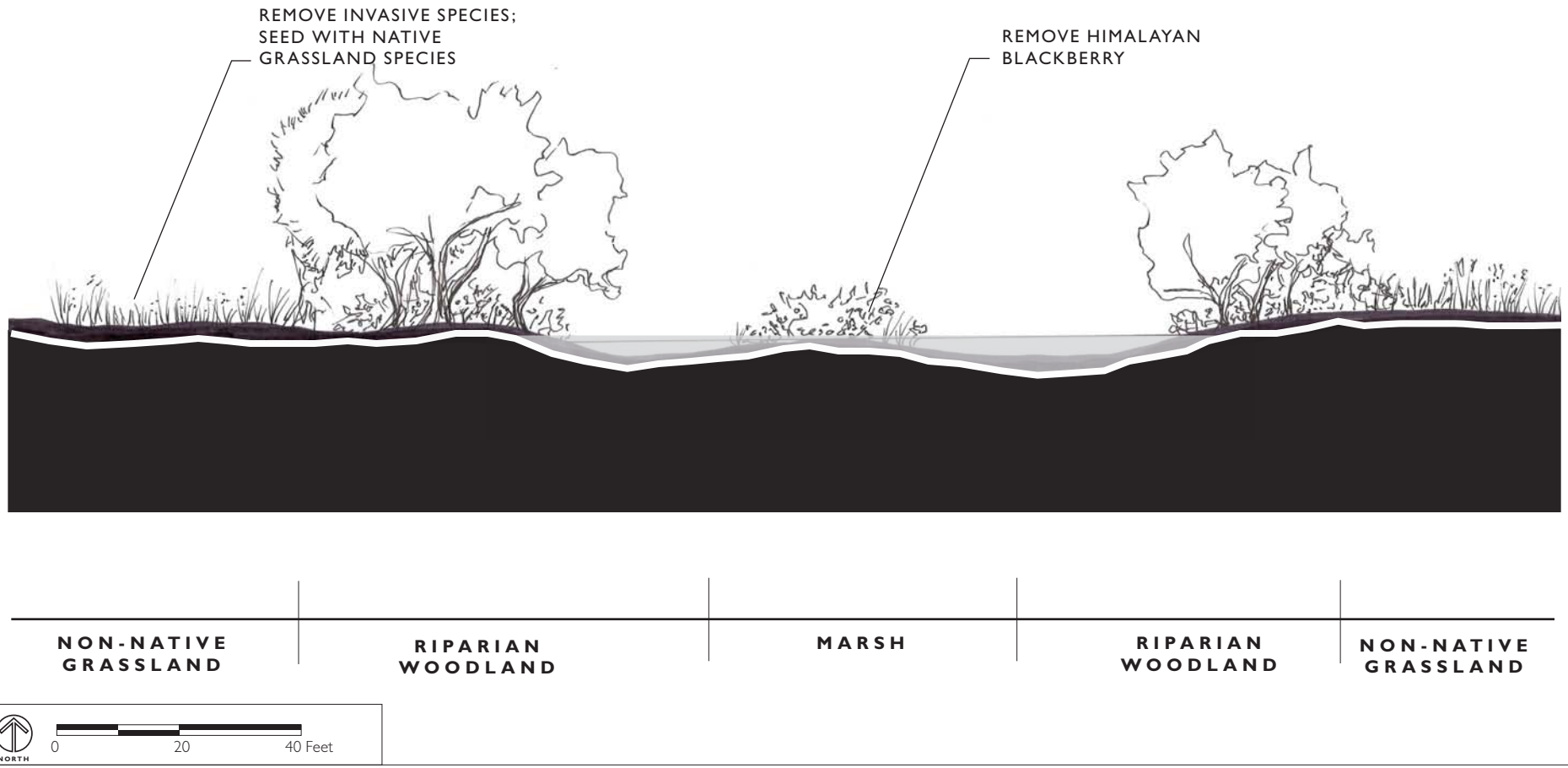


FIGURE 6

SECTION C

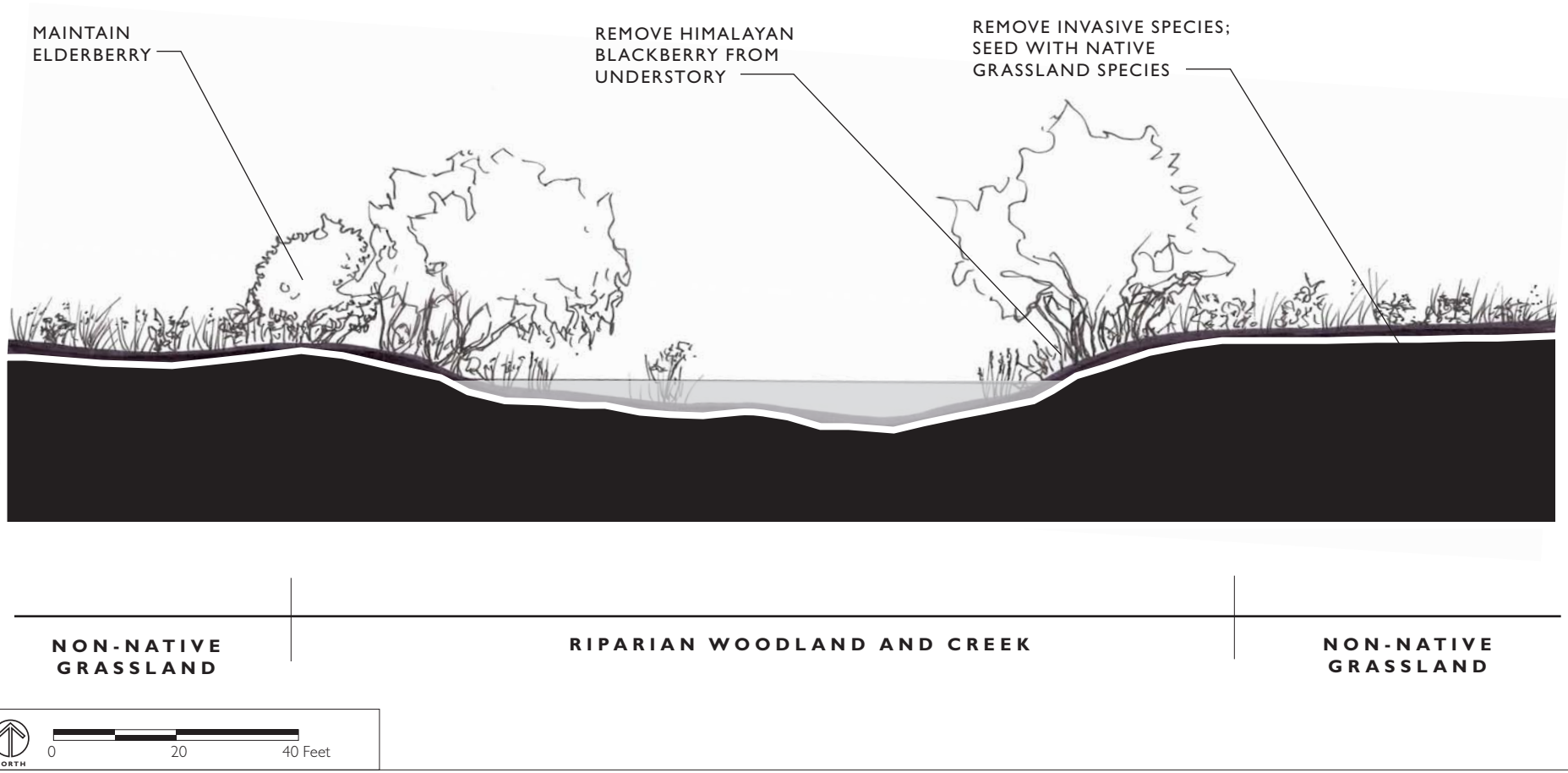


FIGURE 5

SECTION B

4 PROVISIONS FOR VEGETATION MANAGEMENT

This chapter includes information on phasing, invasive species eradication and control, new plantings, avoidance of sensitive resources and the provision of labor.

A. Phasing

Phasing associated with implementation of the Vegetation Management Plan is critical to the successful control of invasive species and re-establishment of native cover in the plan area. The plan will be implemented according to the following phases for short, medium and long-term vegetation management.

1. Phase 1 (Short-Term Recommendations)

The first phase will involve a concerted effort to remove invasive species. Short-term monitoring should be provided on a quarterly basis as part of routine inspection of invasive species management and required adjustments to watering and other maintenance requirements for enhancement plantings for at least three years. Short-term monitoring will also be required following any intensive effort for follow-up invasive species removal and control, and for successive native species enhancement plantings.

2. Phase 2 (Medium-Term Recommendations)

The second phase will involve revegetation, including the planting of native trees and shrubs, and seeding of ground cover species. This should begin immediately following removal of invasive species in order to encourage the spread of native communities. Continued monitoring during this phase should inform maintenance measures.

3. Phase 3 (Long-Term Recommendations)

On-going management will involve routine mowing of the grasslands to prevent re-establishment of Himalayan blackberry and poison hemlock, pulling of invasive trees, shrubs, and groundcovers, and possible successive treatments of a broadleaf-specific herbicide that won't affect the seeded native grasslands and other native plantings. Annual reports should be prepared which sum-

marize major improvements, maintenance activities, and the results of monitoring efforts evaluating invasive species control and enhancement plantings.

B. Invasive Species Eradication and Control

This section provides instructions for the control and removal of invasive species. Any herbicide application must be carefully controlled to protect desired native vegetation, avoid native plantings and protect the aquatic habitat of Comanche Creek.

1. Invasive Species Management

Effective control of the highly invasive species in the plan area will require an effective Integrated Pest Management (IPM) program. The IPM program will involve short-term, intensive mechanical and possibly chemical eradication efforts, followed by on-going monitoring and maintenance practices that select for native species and less invasive, naturalized species. The IPM program must address possible resprouting or re-establishment of highly invasive species through successive annual treatment by mechanical removal, and possibly herbicide application, for a period of two to four years. Table 8 in Chapter 3 provides major steps in the initial treatment of targeted highly invasive species, disposal of seed, stem, stolon, and root materials, and necessary follow-up activities necessary to ensure successful control and ideally eradication of highly invasive species from the plan area. Key points from Table 8 are summarized below:

- A major mechanical removal and possible chemical treatment of target invasive species is outlined in the table.
- All seed, pulled seedlings, stolons, and root material of target invasive species should be bagged and disposed of in a landfill.
- Caution should be used in all handling of poison hemlock, given that it is toxic to humans and requires use of gloves and mask for all handling.

- The initial removal and possible herbicide treatment of invasive plants should be accomplished in spring (before May) when the cambium is active and to prevent additional seed production of target species.
- If chemical treatment is used, tree trunks should be treated with herbicide within one minute of cutting.
- Any foliar spray should be applied in the spring following removal and disposal of groundcover species.
- Any foliar spray application within 15-feet of surface waters should be restricted to an aquatic-approved herbicide.
- Subsequent treatment includes cutting and possible herbicide retreatment of tree trunks/shoots, pulling seedlings, saplings, stolons, and accessible root material, spot treatment with foliar spray, and tarping to eradicate ground cover and young growth.

Some non-native and invasive plants such as dallisgrass can be introduced into areas on equipment that have been used in contaminated sites and then moved to non-native free sites. Cleaning any equipment after use in a potentially contaminated site should reduce the chance of invasion into new areas.

2. Provisions for Herbicide Use

Trained professionals with appropriate certification and licensing as a Pest Control Operator for use of non-restricted materials registered for use in Butte County must be employed to perform all herbicide applications. Best Management Practices shall be used during all herbicide applications, with consideration of the latest standards for products used for target species. Factors to be considered during herbicide application include wind and weather conditions, timing of initial and subsequent treatments, specific product and concentrations, and protection of aquatic habitat and native cover to be preserved or established in the plan area.

Notice will be given for treated areas prior to herbicide application through use of temporary signage posted no less than 24-hours in advance of application, identifying product to be used, explaining health risks, and including a

contact person and phone number to answer any questions. Signs should be posted at the entrance to the plan area and the perimeter of any treatment area at 50-foot intervals or as necessary to visibly delineate the boundaries of the treatment area. Herbicide application of Himalayan blackberry will not occur when this species is in fruit, unless all fruiting stems have been removed and there is no possibility of animals ingesting treated fruits.

C. New Plantings

This section provides instructions for hydroseeding and stock planting. Table 9 in Chapter 3 provides supplemental information on suitable species.

1. Hydroseeding

- Apply hydroseeded mixture of native grasses and wildflowers on all graded and cleared areas throughout the plan area as specified in Table 9.
- Seeding should occur in late fall or early winter, preferably before October 15, to coincide with the natural rainfall period and to allow for germination and grass establishment before heavy winter rains.
- Hydroseeding should be performed by a professional hydroseeder.
- Prior to hydroseeding, the seed mixture should be pre-mixed by a mechanical mixer.
- Prior to application of the hydroseed/mulch mixture, the applicator should clean and rinse all equipment to preclude the introduction of weeds or other species not intended for the plan area.
- The hydroseeding application should follow a two or three-step process depending on slope and proximity to the drainages. For relatively level ground a two step process is adequate involving: 1) hydro-spraying a mixture of the seed mix and 500 lbs. per acre of hydraulic fiber mulch; and 2) applying 1,500 lbs. per acre of hydraulic fiber mulch, fertilizer, any additives such as lime, and the tackifier. For graded slopes in excess of ten percent or within 25-feet of the top of bank to the river and creek, an

added step is necessary to provide additional slope protection. Following completing of the hydroseeding, rice straw should be applied at a rate of 3,000 lbs. per acre. A hydromulch mixture, consisting of 100 lbs. per acre with tackifier, should then be applied over the straw.

2. Stock Planting

- *Plant Selection.* Select plant species that are native to the plan area or indigenous to the region. Plant material used for revegetation will be collected from as close to the plan area as possible, including any plant material used by nurseries for propagation.

- *Installation.* Install native shrubs and trees by hand in a phased program to re-establish a more natural gradation of habitats. Additional native riparian species may be suitable, but must consider short-term absence of shade along the riparian corridor until canopy cover is re-established and the ultimate height of trees.

  The spacing and treatment details identified in Table 9 should be followed, including provisions for installation during the winter months when successful establishment is more likely, adequate browse protection, and short-term irrigation during the summer months through installation of a temporary drip-irrigation system.

- *Irrigation.* Supplemental irrigation of container plantings will be required for the first two- to three-years following installation, no less than three times a month. Approximately 5- gallons of water should be applied to each container stock planting during each watering event, and each watering should be of such a quantity as to provide optimum growth conditions. If drought stress is noted during monitoring, the quantity and interval of watering should be increased until plants are successfully established. By year three, the frequency and duration of watering should be successively curtailed to force young plants to adapt to summer conditions. Infrequent watering may still be necessary during the summer months on a by-monthly basis in the fourth and fifth year.

D. Avoidance Measures for Sensitive Resources

Avoidance measures for sensitive resources are described below as they relate to jurisdictional wetlands and special-status species.

1. Jurisdictional Wetlands and Other Waters

Potential wetlands and other waters in the plan area represent one of the most significant constraints to vegetation management, as well as an opportunity for substantial habitat enhancement and restoration. Any modification or fill of jurisdictional waters would require review and authorization from permitting agencies, including the U.S Army Corps of Engineers, the Regional Water Quality Control Board (RWQCB), and possibly California Department of Fish and Game (CDFG). The following measures are recommended in relation to jurisdictional wetlands and other waters in the Comanche Creek riparian corridor:

a. The extent of potential jurisdictional waters should be verified and mapped as part of this survey to determine if these areas are in fact jurisdictional waters
b. Jurisdictional wetlands and other waters should be avoided to the extent feasible.
c. Where avoidance of any jurisdictional waters is not feasible, modifications of loss to wetlands will likely require detailed mitigation as part of agency authorization. Such mitigation might include:
    - Enhanced and expanded seasonal wetlands in areas of grassland.
    - Additional native riparian tree and shrub planting along the creek.
    - Removal and control of non-native invasive species along the creek corridor.

2. Special-Status Species

Although no special-status plant species were encountered during the field reconnaissance survey in June 2007, there remains a varying potential for a number of species to occur in the plan area. The habitat suitability analysis

conducted in June of 2007 indicates that a number of special-status animal species may occur on or frequent the plan area. Most of this activity is probably limited to dispersal along the creek corridors by fish, amphibians, and reptiles, foraging and possibly nesting by bird species, and foraging and possibly roosting by bat species. Protection of the creek habitat and of nest and roost locations would be the primary constraint poised by these species, particularly during the breeding season. The following are general recommendations for special-status species:

- *Supplemental Surveys.* Conduct a supplemental detailed survey in the spring and early summer months to confirm absence of any populations of special-status plant species in the plan area.
- *Pre-Construction Surveys.* Perform preconstruction surveys to determine the presence or absence of any nesting or roosting locations, special-status reptiles and fish species, and define appropriate development or construction-related restrictions. As necessary, informal consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service, formerly the National Oceanic and Atmospheric Administration (NOAA) Fisheries, should be conducted to determine any concerns and possible authorization prior to habitat modifications. This may include supplemental trapping and exclusion provisions, training of construction personnel, restrictions on timing of any in-channel modifications, and other measures.
- *Interpretive Program.* Create a comprehensive interpretive program to ensure that harassment and any possible "takings" of special-status species and common wildlife species does not occur as a result of public access to the plan area. This may include wildlife-friendly fencing, barrier plantings, and interpretive signage around possible access points to the plan area.

Avoidance Measures for specific special-status species are described below, with the exception of Potential Valley Elderberry Long-horn Beetle Habitat. Potential Valley Elderberry Long-horn Beetle Habitat is discussed as a vegeta-

tion zone in Chapter 3, and thus enhancement measures were identified in Chapter 3, Section A.

a. Northwestern Pond Turtle

Northwestern pond turtle has been reported near the Comanche Creek in the past, and marginally suitable habitat was observed along the creek. It is possible that this species disperses along Comanche Creek. It is also possible that where channel banks are less steep, turtles may occasionally disperse into the surrounding uplands to establish nests during the breeding season. Recommendations for this species are as follows:

i. Preconstruction nesting surveys should be required if construction is proposed during the nesting season from April through November

ii. Preconstruction surveys would also be necessary where in-channel construction activities are proposed in order to avoid take of individual turtles

iii. Any capture and relocation of turtles would have to be authorized by the CDFG as part of their Streambed Alteration Agreement process or other program.

b. Spring-Run and Fall-Run Chinook Salmon and Habitat

There is a possibility that spring-run and fall-run Chinook salmon disperse along the creek, although the historic intermittent nature of Comanche Creek most likely precluded presence of anadromous species. Fishery resources could be adequately protected by implementing the following measures:

i. Restrict any improvements away from the creek

ii. Implement water quality control measures that are typically required to address non-point source pollution of surface waters

iii. Implement an interpretive program

iv. Set restrictions for the timing of any disturbance along the channel bank as part of the removal of invasive vegetation or planting of native vegetation.

c. Yellow-legged Frog

There is a remote possibility that foothill yellow-legged frog and other amphibians may occur in or disperse along Comanche Creek. Although these species have not been reported in the immediate vicinity or the up-gradient watersheds, marginally suitable habitat occurs where the creek provides pools, riffles, and retreat habitat. Foothill yellow-legged frog is completely restricted to aquatic habitat. The following measures should be taken:

i. Minimize any construction activities in or near the creek

ii. Conduct pre-construction surveys prior to nonnative vegetation removal

iii. Implement the comprehensive interpretive program to avoid potential inadvertent take of this an other aquatic-dependent amphibians and reptile species

d. Special-Status Bat Species

There is a remote possibility that a number of special-status bat species occur in the abandoned building at the eastern edge of the plan area. Additional surveys should be conducted to determine whether bats occupy the structures, and appropriate measures should be taken to allow for relocation if used for roosting by any special-status bat species.

e. Giant Garter Snake

Although the potential for occurrence of this species along the project reach of Comanche Creek is low, there remains a possibility that this species could occasionally disperse along the creek corridor or occur in the marshland. Further informal consultation with the USFWS should be performed in advance of any in-channel habitat modifications to determine the need for protocol surveys or avoidance measures, in the remote instance that this species is present in the plan area. Supplemental protective measures may include implementation of a preconstruction trapping and exclusion provisions, training of construction personnel, restrictions on timing of both in-channel and upland habitat modifications and other measures.

E. Implementation Recommendations

The following are recommendations for successful implementation of the Vegetation Management Plan:

- Hire professional consultants and contractors to coordinate or perform the initial major invasive species removal, re-contouring, and native seeding and planting efforts. Possible chemical treatment of the invasive species must be carefully controlled according to the California Department of Pesticide Regulations and the Butte County Agricultural Commissioner using Best Management Practices to prevent exposure to plan area users, avoid sensitive aquatic habitat, and utilize the most effective and appropriate products available at the time field work is performed.
- Hire public groups such as California Conservation Corps (CCC) to assist with removal and planting under direction of selected contractor.
- Use volunteer participation for the initial invasive species removal and the bulk of ongoing removal, planting, and management efforts. Volunteers should be directed and coordinated by experienced restoration specialists.

APPENDIX A

PRELIMINARY HYDROLOGY ASSESSMENT

Kamman Hydrology & Engineering, Inc.
7 Mt. Lassen Drive, Suite B250, San Rafael, CA 94903
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: Greg@KHE-Inc.com

November 26, 2007

Ms. Isabelle Minn
Design, Community & Environment
1625 Shattuck Avenue, Suite 300
Berkeley, CA 94709

Subject: Comanche Creek Geomorphic Assessment

Dear Isabelle:

On November 6, 2007, staff from Kamman Hydrology & Engineering, Inc. completed a site reconnaissance and qualitative geomorphic site assessment of Comanche Creek over a length of 3660-feet downstream of Park/Midway Avenue (the project site). This work was completed on behalf of Design, Community & Environment (DCE) in support of the City of Chico's Vegetation Management Plan. Within the project site, Comanche Creek takes on two distinct geomorphic forms – constrained and unconstrained channel reaches. The unconstrained reach occurs upstream of the Union Pacific Railroad ROW and covers approximately 1790-linear feet between the ROW and the Park/Midway Avenue bridge (upstream). The constrained reach (1870-feet) occurs downstream of the unconstrained reach where the creek is bordered by the Union Pacific Railroad ROW berm and/or bank-top levees. Characteristics of each reach-type are described below.

In general, the creek channel and channel banks through the entire project reach appear stable. There are several localized areas of hard-bank stabilization as indicated on the attached field map – treatments that delineate areas of former bank instability. Throughout the entire reach, we encountered only one area (within the unconstrained reach) where the channel bank was actively eroding (see attached field map). This oversteepened earthen bank (10-foot high vertical scarp) is in a state of likely bank failure. This area of instability is also threatening a concrete wall found at the top of the bank between the creek and Wrex Court.

Unconstrained Reach

The Unconstrained Reach extends from Park/Midway Avenue downstream to the Union Pacific Railroad ROW. Within this reach, the creek corridor consists of an active low flow channel measured at 23- to 29-feet wide bordered by an inset floodplain terrace ranging up to 95-feet wide. The inset floodplain terrace is populated by heritage size/age sycamores and cottonwoods and other riparian species, suggesting the floodplain and channel are in healthy contact. A higher (5-feet) terrace surface is found outside of the inset floodplain terrace and is characterized by non-native grassland/ruderal species (see Figure 2 of DCE's Draft Vegetation Management Plan (October 2007). The inset floodplain narrows and tapers-out at the downstream end of the unconstrained reach due to encroachment of the Union Pacific Railroad berm.

The unconstrained reach displays a moderately meandering active flow channel with alternating riffle-pool morphology. There are few to no signs of active channel deepening (incision) or filling (sediment deposition) in the unconstrained reach. The channel bed substrate consists of sand and gravel coated in a thin layer of fine-grained sediment. There was a noticeable lack of aquatic insect life and small (1-cm wide) freshwater clams appeared to be the dominant aquatic species. Creek flow was estimated at 4 cubic feet per second during the site visit with water temperature of 53 degrees Fahrenheit (air temperature of 77 degrees F).

The unconstrained reach appears noticeably devoid of large woody debris and there was a limited amount of live riparian vegetation encroaching into the active channel. A central portion of the unconstrained reach is hypothesized to have widened by as much as 100-feet in response to active channel migration away from the historic channel alignment, creating the large blackberry wetland area (see attached field map). The south (left) bank of the channel in this area has been stabilized using a combination of rock/concrete-rubble and a single large log revetment, effectively halting active bank retreat. A channel spanning log jam is located immediately downstream of this location.

The single eroding and unstable channel bank described above occurs within the unconstrained reach at the south end of Wrex Court. Further bank retreat at this site may threaten a concrete retaining wall and possibly other structures. It is recommended that this site be a priority location for bank repair if bank top structures are threatened. Repair of this bank is not constrained by space as there is suitable inset floodplain on the opposite bank that could accommodate channel realignment and bank stabilization measures on the unstable (northern) bank.

Because of the presence of a floodplain and healthy interface between channel and floodplain, the unconstrained reach offers good opportunities for riparian vegetation enhancement. The unconstrained reach also provides opportunities to enhance aquatic habitat with the introduction of instream wood structure and cover, characteristics that appear lacking in this reach.

Constrained Reach

In contrast to the upstream unconstrained reach, the downstream constrained reach is characterized by a steeply-sided trapezoidal-shaped channel inset into the higher terrace. The constrained reach lacks an intervening inset floodplain surface and there appears to be a large volume of fill (railroad berm and levee) placed along the entire length of the top of the right (south) bank. As a result, the channel takes on an incised and constrained character. Although banks are relatively steep, they do not appear to be unstable or actively eroding.

The active channel also appears overly straight with a constant width and depth, resulting in uniform runs with a low flow velocity. The channel substrate is dominated by mud and organics. Relative to the upstream unconstrained reach, there is a significantly larger volume of large woody debris throughout the constrained reach, especially the downstream half.

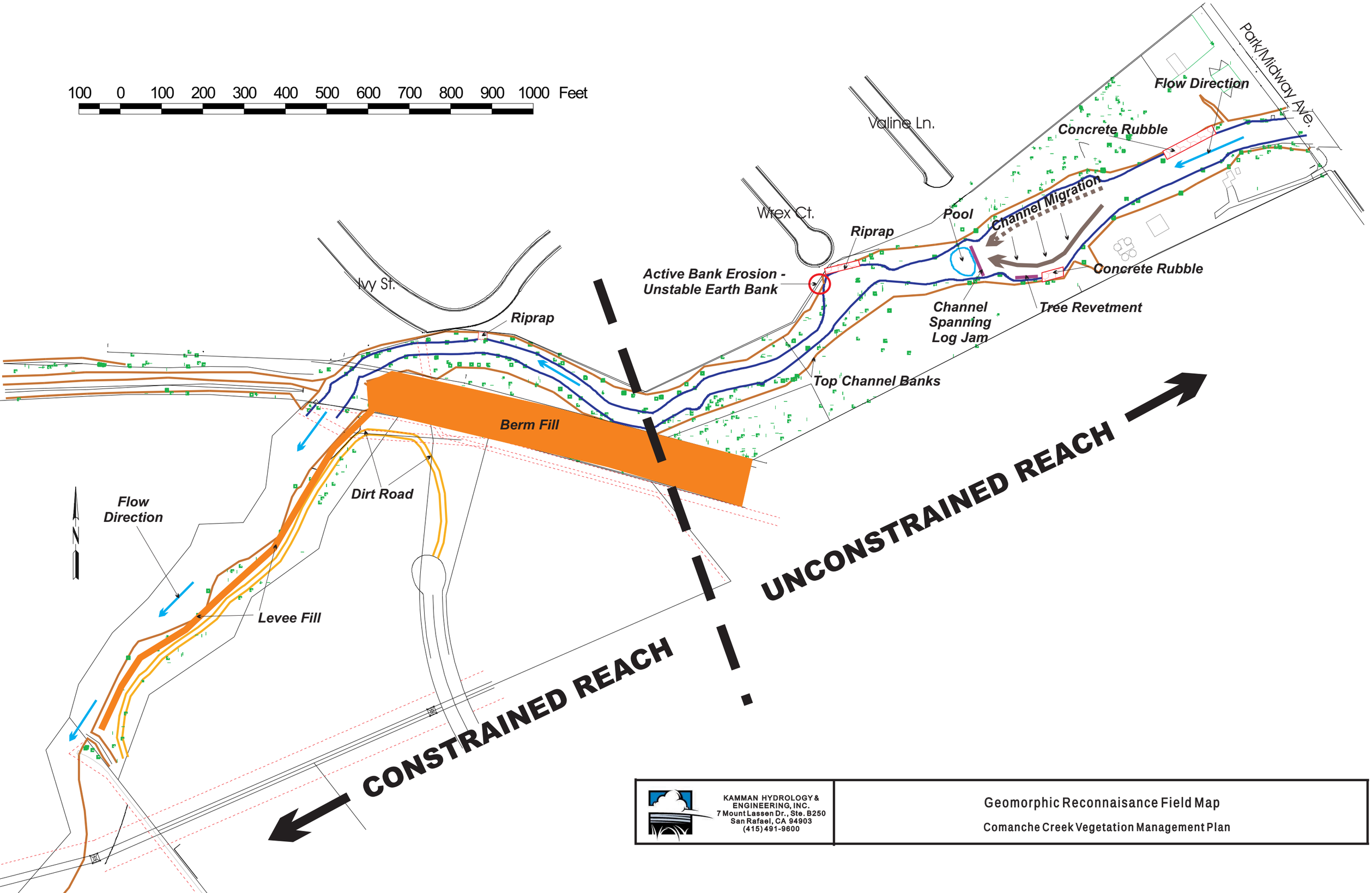
The opportunities for riparian vegetation and aquatic enhancement are limited through the constrained reach due to the incised nature and lack of floodplain. Restoring this reach would require greater effort and construction expense relative the unconstrained reach in order to create the necessary bank set-backs and associated floodplain.

If you have any questions or concerns, please call me.

Sincerely,

Greg Kamman
Principal Hydrologist

Attachment: Geomorphic Reconnaissance Field Map



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Geomorphic Reconnaisance Field Map

Comanche Creek Vegetation Management Plan