Roseville Creek and Riparian Management and Restoration Plan

Prepared for:
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Roseville, California
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Submitted by:
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Roseville Creek and Riparian Management and Restoration Plan

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1.0 EXECUTIVE SUMMARY

The Roseville Creek and Riparian Management and Restoration Plan (RCRMRP) provides direction for stewardship of more than 60 miles of creeks located in the City of Roseville. These creeks, comprising portions of the Dry Creek and Pleasant Grove/Curry Creek watersheds, are an integral part of the City's character and serve many important functions. The creek system is the primary means by which flood waters are conveyed away from developed areas ensuring protection of property and lives. The creeks also provide valuable habitat for a variety of aquatic and wildlife species, and are a central, defining feature of the City's system of public trails, open space for passive recreation, and preserve areas.

The City of Roseville has developed this Plan as a means of enhancing the creeks and preserving these values for future residents. The measures contained in this plan are based on a consideration of existing ecosystem conditions and developed environment. To ensure the Plan goals and recommendations are responsive to community needs and values, Plan development was guided by a Citizens' Advisory Committee (CAC) consisting of 12 local residents appointed by the City Council. Funding to develop the RCRMRP was provided by the CalFed Watershed program.

The RCRMRP addresses the following objectives of the CALFED Watershed Program:

- Facilitate cooperation among organizations,
- Develop watershed monitoring and assessment protocols,
- Support education and outreach,
- Integrate the Watershed Program with other CALFED programs,
- Relate watershed processes with goals and objectives of CALFED, and
- Ensure long-term support and sustainability of local watershed activities.

The RCRMRP also includes specific measures that are consistent with the CALFED Watershed Program implementation actions. Further guidance for implementation measures is provided by a comprehensive list of RCRMRP management goals pertaining to:

Public Health and Safety,
Maintenance,
Water Quality,
Ecosystem Function (local and watershed),
Regulatory and Planning Considerations, and
Stakeholder Interests.

The RCRMRP is intended to complement and be consistent with the City of Roseville General Plan, Stormwater Management Program, and Revitalization Plan, and the Dry Creek Watershed Coordinated Resources Management Plan (CRMP). The Ecosystem Restoration Plan (ERP) for the Pleasant Grove/Curry Creek watershed is still pending development but will reflect the findings from and the management approach of the RCRMRP. The RCRMRP preparation was initiated prior to the approval of the West Roseville Specific Plan (WRSP) and sphere of influence annexation project. Consequently the RCRMRP does not specifically address the WRSP and sphere of influence annexation area, although many of the RCRMRP's concepts for the Pleasant Grove watershed can be applied within the WRSP area.

A preliminary phase of developing the RCRMRP included conducting a field-based review of existing creek conditions and assessing the potential for enhancing the multiple beneficial uses of the creeks. The findings from this effort are compiled in the Existing Conditions and Assessment Report (ECAR), and referenced throughout this plan. A generalized assessment for the entire creek system was also conducted, using aerial imagery and calibrated from the sites visited during the ECAR studies. One of the most significant results of this initial assessment was a clarification of the distinctly different character of the City's two major creek systems. Reference reach descriptions have been developed in this plan to reflect this diversity, recognizing that preservation of this diversity will result in a more robust and biologically rich ecosystem.

Restoration opportunities have been identified by reach for all ten of the major tributaries addressed by this plan, along with the types of recommended restoration activities and relative priority. The location of existing preserve areas and restoration sites is also documented in the plan.

Since the RCRMRP is intended to provide guidance for future restoration and maintenance activities, the plan includes a comprehensive list of restoration methods and techniques to improve wildlife habitat, fish habitat, channel stability, and water quality. The design of future projects may refer to this list to get information on appropriate methods and to help determine which techniques are useful in addressing the specific goals of their restoration efforts.

Maintenance of the City's creek corridors is a critical consideration since they must continue to effectively convey flood waters while supporting other beneficial uses such as habitat, recreation, and water quality. The RCRMRP discusses some of the most significant maintenance issues and reviews the approaches the City currently uses for creek maintenance. It also recommends maintenance practices to address these issues in a manner that will help protect these multiple uses of the creek in an attempt to balance public health, safety, and resource needs.

Monitoring and assessment are included as a component of the RCRMRP. Monitoring of creek conditions should include a broad array of parameters that indicate water quality, habitat, channel conditions, and impacts of public use. Data collected through monitoring efforts needs to be organized in a central database that can be accessed for future reference, trend analysis, and used by teachers and other community groups. Assessing the monitoring data will help to ascertain the extent to which measures recommended in the RCRMRP are effective, to identify potential problems, and to provide additional information needed to design appropriate restoration measures. Monitoring should be undertaken as a cooperative effort involving the City, local community groups, and schools. This will facilitate greater coverage and help foster a sense of stewardship among citizen volunteers.

Activities related to the restoration, maintenance, and management of Roseville's creeks are subject to a number of regulatory reviews and approval. The City reviews floodplain encroachment and impacts to native oaks. State and federal agencies review projects or actions that may have impacts to fish, wildlife, their habitats, and water quality. While these regulatory reviews are essential to protecting the creek resource values, the process to secure these reviews is often complex and can discourage beneficial projects. The City has a programmatic agreement for routine creek maintenance with the California Department of Fish and Game. The RCRMRP provides recommendations for expanding that agreement to include comprehensive strategies for management of beaver and invasive plant species. Consolidated permitting is also proposed as a mechanism to facilitate and reduce costs of approvals for creek management projects such as restoration and flood control. The degree to which recommended optional maintenance practices are implemented will depend on commitments made as part of securing a Consolidate Permit for Plan implementation.

One of the most important goals of the RCRMRP is to actively engage Roseville residents in the stewardship of the City's creeks. A broad-based approach to education, outreach and participation is proposed that acknowledges the diverse abilities and interests of the City's residents.

The implementation of the RCRMRP will be a cooperative effort involving the City, community groups, residents, and regional partners. The plan is comprehensive in nature and includes specific implementation measures in five key areas: restoration, maintenance, monitoring and assessment, regulatory compliance, and education and stewardship. The sequence of implementation for any given measure will be driven by a number of factors such as the availability of human and financial resources, relative value of the measure in attaining the plan goals, and public support for the measure.

Funding implementation of Roseville's creek management and restoration plan will require resources from a variety of sources. The multifunctional nature of the City's creeks, their regional significance, and the City's past success with grant management can be used to strengthen future pursuit of grant finding. General fund revenues, fees, grants, volunteerism, sponsorships, and donations will all play an important role in supporting the implementation of the recommended measures. However, the rate of plan implementation will correspond to the ability of the City and its partners to attract the needed funding and non-financial resources.

2.0 INTRODUCTION

2.1 Project Overview

The City of Roseville is a community of older neighborhoods and newer development areas incorporated in 1909. The City has over 60 miles of creeks that provide important habitat, water quality, recreation, and open space resources to the community and the region. These creeks are located in portions of two distinct watersheds: Pleasant Grove and Dry Creek. The purpose of this Roseville Creek and Riparian Management and Restoration Plan (RCRMRP) is to characterize the condition of the City's riparian habitat and creek channels and to develop a comprehensive approach to management, restoration and community-based stewardship of these resources. Implementation of this plan will help to balance the City's public health and safety needs with the need to preserve and enhance the ecological value and function of the creeks and surrounding habitat while increasing community awareness and stewardship.

The City of Roseville is located at the western edge of the foothills of the Sierra Nevada mountains within the County of Placer (Figure 2-1). Three watersheds drain the city: Dry Creek, Pleasant Grove and Curry Creek (Figure 2-2). The Dry Creek watershed contains a small portion of North Central Roseville, and encompasses Northeast Roseville, Stoneridge, Southeast Roseville and the Infill planning areas. The Pleasant Grove watershed covers portions of North Roseville, North Central Roseville, Highland Reserve North, Del Webb, North Industrial and Northwest Roseville planning areas. The Curry Creek watershed contains a small portion of the North Roseville planning area. This study focuses on the major creeks within the City of Roseville, which are contained within the Dry Creek and Pleasant Grove watersheds. Even though the Curry Creek watershed collects runoff from North Roseville, this is mostly through overland flow and constructed underground drainage facilities. Intermittent and perennial streams in the Curry Creek watershed do not fall within City limits.

The major creeks addressed by this plan include Dry Creek, Cirby Creek, Linda Creek, Strap Ravine, Miners Ravine, False Ravine, Secret Ravine, and Antelope Creek within the Dry Creek watershed and Pleasant Grove Creek, South Branch Pleasant Grove Creek and Kaseberg Creek within the Pleasant Grove Creek watershed (Figure 2-2). Not all of the tributaries to the study streams are covered by this plan. For Pleasant Grove Creek, three main branches are included. For South Branch Pleasant Grove Creek, only the main stem is covered, and for Kaseberg Creek, three tributaries are included. Within the Dry Creek watershed, the main stem of each of the named creeks is addressed by this plan.

This study began in March 2003 and was completed in January 2004. Data collection was conducted during summer and fall of 2003 and is presented in the Existing Conditions Assessment Report[1]. A brief summary of these findings are also included in this RCRMRP. While the Plan was under preparation, the City Council approved the WRSP and sphere of influence annexation project located west of Fiddyment Road. Because these areas were added to the City after Plan development was substantially underway, they were not specifically addressed although many of the Plan's general concepts for the Pleasant Grove watershed can be applied with in the WRSP area.

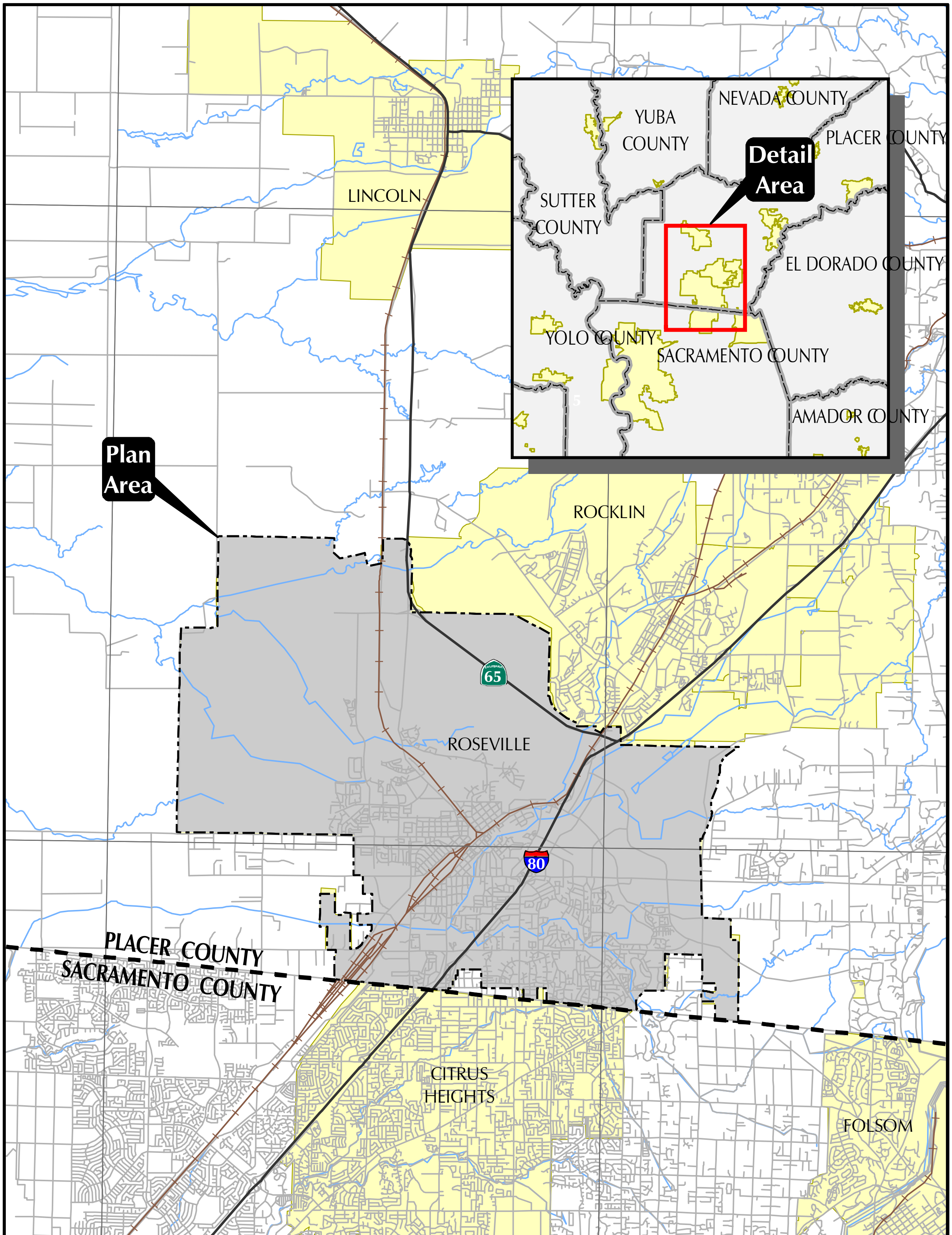
[1] Foothill Associates, 2003.

This plan is organized into eleven sections, beginning with the Executive Summary. This introduction is section 2. The third section summarizes the findings of the Existing Conditions Assessment Report that was released in September 2003. This report assessed conditions at sixteen selected sites located on the study streams, identified major causes of degradation to the streams and formulated initial recommendations for restoration actions to improve the condition of these sites.

The fourth section of the RCRMRP identifies restoration opportunities on each creek, including those reaches most needing restoration and those that have a high potential to result in significant improvement to the stream system. The restoration techniques that are recommended, which are developed more fully in section 5, generally fall into four categories: water quality improvement, riparian habitat enhancement, improvement of stream channel diversity and stability, and enhancement of aquatic habitats. In addition to providing specific guidelines for restoration, section 5 also discusses restoration on private vs. public property.

Section 6 presents maintenance practices within the stream corridors, including vegetation management, trails and channel maintenance, wildlife management, and use of heavy equipment. Public participation in the maintenance process is also discussed, as well as opportunities for cooperative maintenance. Monitoring and assessment techniques are presented in section 7, including existing monitoring efforts, interpretation of results and relationship to adaptive management. Recommendations for monitoring activities and responsibility for monitoring are also included in this section. Section 8 addresses regulatory requirements for restoration and monitoring, including existing agreements with California Department of Fish and Game (CDFG) and the National Marine Fisheries Service (NMFS), as well as the permit process for performing work within the creek corridor.

Community stewardship programs are discussed in section 9, such as current and potential stakeholder groups, public participation in monitoring, maintenance and restoration, and public education and assistance. Balancing private property interests with public beneficial uses is a challenge that must be met in implementing an environmentally sound restoration and management plan that is acceptable to the local residents, homeowners, landowners and developers. The tenth section addresses implementation of this plan in the areas of restoration, maintenance, monitoring and assessment, policies and procedures, and education and stewardship. The final section discusses opportunities for funding, including City resources, grants, volunteers and donations.



CITY OF ROSEVILLE CREEK PLAN AREA AND VICINITY

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

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0 1 2
SCALE IN MILES

FIGURE 2-1

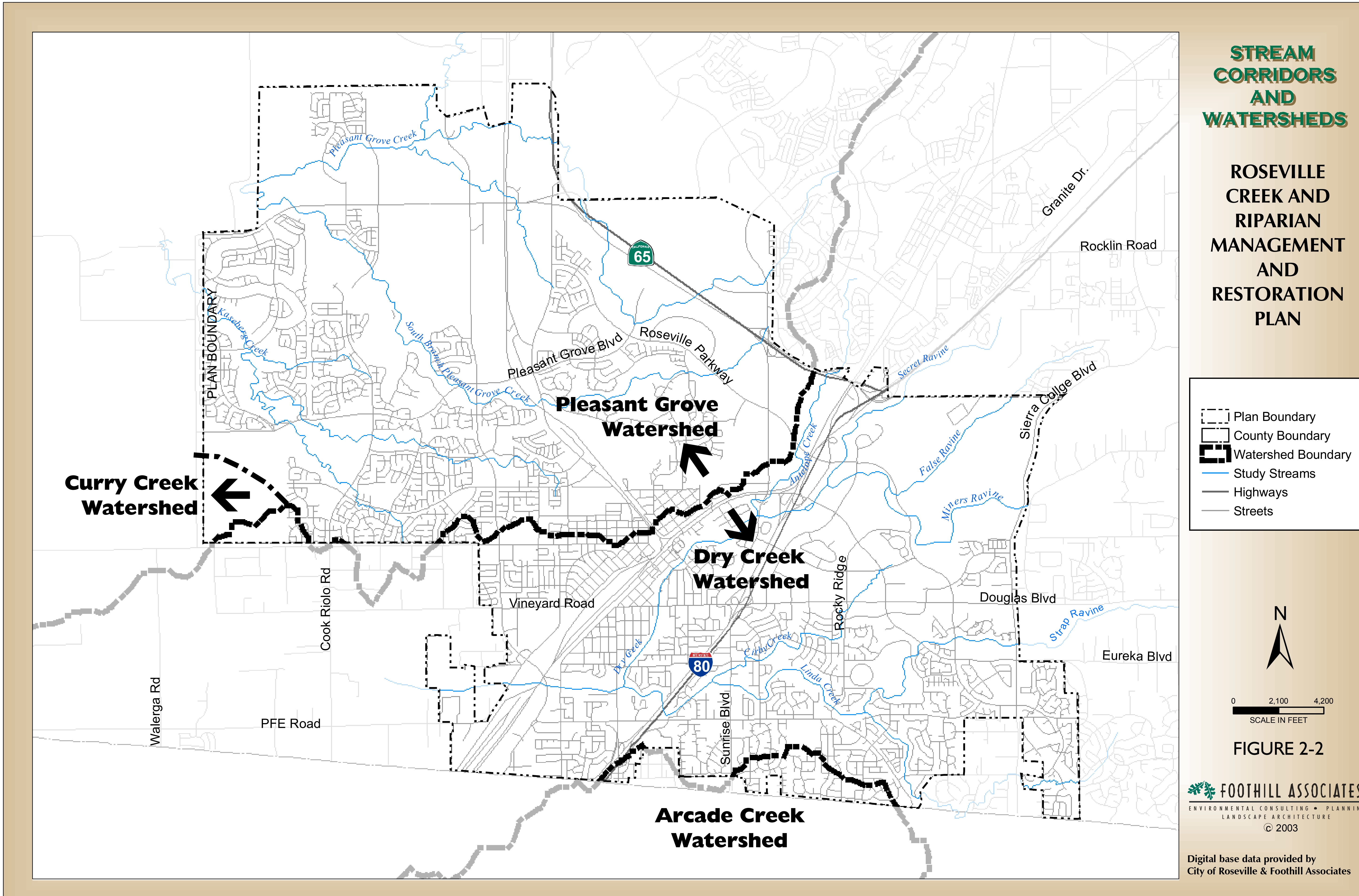


FIGURE 2-2

stream corridors.mxd

2.2 CALFED Watershed Program Goals

Preparation of the Roseville Creek and Riparian Management and Restoration Plan (RCRMRP) is funded through the California Bay-Delta Authority's CALFED Watershed Program. The CALFED Watershed Program is overseen by the California Bay-Delta Authority, whose mission is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta. Additional information on the CALFED program is provided later in this section and can also be found at the Bay-Delta Authority's website at http://calwater.ca.gov/.

The RCRMRP supports the Watershed Program's ecosystem restoration element. The other elements of the Watershed Program Plan include levee system integrity, water quality, water transfers, water use efficiency, watershed storage, and delta conveyance. The primary overall objectives of CALFED address ecosystem quality, water supply, water quality, and levee system integrity. The primary objective for ecosystem quality is to improve and increase aquatic and terrestrial habitats.

The objectives of the CALFED Watershed Program are as follows:

- Facilitate cooperation among organizations,
- Develop watershed monitoring and assessment protocols,
- Support education and outreach,
- Integrate the Watershed Program with other CALFED programs,
- Relate watershed processes with goals and objectives of CALFED, and
- Ensure long-term support and sustainability of local watershed activities.

The RCRMRP directly supports three of the CALFED Watershed program goals: 1) facilitate cooperation among organizations, 2) develop watershed monitoring and assessment protocols and 3) support education and outreach. The RCRMRP identifies and recommends cooperation between the City of Roseville, Placer County, the City of Rocklin and the Town of Loomis in protecting and restoring the streams within the Dry Creek and Pleasant Grove Creek watersheds. Many problems affecting the creek, such as sedimentation and invasive species control, must be undertaken at a watershed wide level to be effective. If one jurisdiction, for instance, adopts programs for invasive species eradication and replanting of native vegetation, yet upstream jurisdictions do not take similar steps to control the same non-native invasive plant species, the jurisdiction that spent considerable time and effort to perform the eradication may find that it is reinfested by waterborne seeds carried downstream in floods.

The CALFED Watershed Program has five elements. These are 1) coordination and assistance, 2) adaptive management and monitoring which includes developing biophysical parameters and monitoring and assessment protocols, 3) education and outreach, 4) integration with other CALFED programs, and watershed processes and relationships, including describing the basic biological and physical functions of a watershed and 5) identifying examples of watershed activities that improve the basic biological or physical functions and processes of a watershed.

Implementation of these CALFED Watershed Program elements includes the following actions:

- Improving coordination and assistance,
- Developing monitoring protocols and application of adaptive management processes,
- Improving and expanding watershed education and outreach,
- Maximizing multiple benefits of common programs,
- Improving watershed stewardship, and
- Improving watershed planning and management.

Restoration objectives are contained in several of these implementing actions, but primarily in the area of *improving watershed stewardship*. Specific actions for improving watershed stewardship include enhancing stream flow through sediment balance, geomorphic stabilization, fire management, water quality enhancement, maintaining and improving biological diversity, managing and protecting groundwater, and conserving water. Actions to improve water quality include improving drinking water, protecting wildlife, aquatic species and humans, and improving spawning habitat.

A critical part of developing the RCRMRP was the identification and application of appropriate protocols to assess the health of the stream corridor. The results of this assessment have been presented in the Existing Conditions Assessment Report (ECAR)[2], along with the protocols used. These protocols were adapted from the US Department of Agriculture (USDA) Modified Stream Visual Assessment Protocol, the California Department of Fish and Game (CDFG) California Stream Bioassessment Protocol and the California Native Plant Society (CNPS) Vegetation Rapid Assessment Field Form. Because the data collected was based upon standard protocols, meaningful comparisons can be drawn with other assessments that are also based upon these forms.

The RCRMRP recommends education and outreach as a vital component of the restoration and management plan. In many areas where the creeks are constrained by encroaching land use, two of the most effective means of improving habitat are planting native riparian vegetation and controlling sources of water quality degradation. Since the land use adjacent to the creeks is residential in many areas of Roseville, this can most effectively be accomplished by educating homeowners on the benefits of planting riparian trees and shrubs and the potential detriments of landscape and home maintenance chemicals on the streams. Because some amount of landscape fertilizers, pesticides and herbicides are washed into the local waterways in stormwater and irrigation runoff, one way to improve the water quality for fish and wildlife habitat is to reduce the use of potentially harmful chemicals by homeowners. This is more easily accomplished through public education than by attempting to regulate the substances themselves.

[2] Foothill Associates, 2003.

2.3 Consistency with Existing Plans and Watershed Activities

2.3.1 Dry Creek Coordinated Resource Management Plan (CRMP)

The Dry Creek CRMP, released November 2003[3], identifies the following major water resources issues within the Dry Creek watershed:

- Loss of riparian habitat leading to increased sedimentation, bank erosion, reduction in aquatic food sources and cover, and increased stream temperatures,
- Stream channelization resulting in increased bank erosion, channel incision, increased sediment transport and reduced habitats,
- Sedimentation leading to degraded aquatic habitats,
- Modified geomorphology resulting in reduced stream complexity, limited flood plains and flooding, and increased bank instability,
- Water quality impacts from high fecal counts, high nutrient loading, toxicity and degraded habitat,
- Non-native invasive plants,
- Other resource issues associated with loss of wildlife habitats.

The plan recommends actions to help mitigate impacts under the major areas of land use, geology and soils, ground water, surface water, geomorphology and sedimentation, water quality, vegetation, and fisheries. These recommendations are summarized in Table 2-1.

The plan also lists stressors, potential impacts and specific management goals for the functional areas of land use, water quality, flood storage and conveyance, surface water, population growth, geomorphology, and vegetation. Management goals that are supported by the RCRMRP include preservation and restoration of riparian habitat, in-stream management and restoration, water quality restoration of shaded riparian habitat, floodplain and channel complexity restoration, public education, geomorphology restoration and design, eradication of non-native invasive species, and others.

[3] ECORP Consulting, Inc, 2003.

Table 2-1. Mitigation Recommendations of the Dry Creek CRMP

Issue	Recommendations
Land Use	• Prepare a detailed comprehensive map of current land use. • Prepare a comprehensive map of full build-out based on current zoning. • Develop guidelines or regulations for development Best Management Practices (BMPs).
Geology and Soils	• Identify and implement mitigation for local soil constraints.
Ground Water	• Maintain water flow in streams above pre-development minimum levels. • Maintain surface water quality.
Surface Water	• Retrofit structures for under-designed conveyances to carry actual flood flows. • Implement flood detention measures. • Restore floodplains. • Develop guidelines for local resident/homeowner BMPs to manage flow and structures to minimize degradation of in-stream habitat and minimize flood potential, • Monitor stream flow in tributaries both at base flow in the dry season and during storm events. • Map canals and other water features and identify management and operations. • Update the Flood Control Plan model.
Geomorphology and Sedimentation	• Restore floodplain area and mitigate channelized sections. • Restore channel complexity. • Restore riparian vegetation. • Develop BMP guidelines for local residents/owners to help maintain natural riparian corridors.
Water quality	• Monitor water quality on a long-term basis. • Develop BMPs for local residents to help maintain a natural riparian corridor and reduce contributions to water quality degradation.
Vegetation	• Study non-native invasive vegetation species for extent and management of the threat. • Restore riparian habitat. • Develop BMPs for home/landowners and developers to protect native species and encourage riparian restoration. • Educate the public on the dangers of non-native invasive plants.
Fisheries	• Continue in-stream habitat, channel structure and geomorphology restoration. • Mitigate barriers to migration. • Restore riparian vegetation. • Retain in-stream debris. • Develop BMPs for home/landowners and developers to protect native species and encourage restoration. • Educate the public on the value of fish habitat and impacts.

2.3.2 *Pleasant Grove/Curry Creek Ecosystem Restoration Plan (ERP)*

The Pleasant Grove/Curry Creek (PG/CC) watershed group meets monthly, and the ERP is in the process of being developed. The results of the RCRMRP will be used in the development of the ERP to facilitate a coordinated effort between the City of Roseville, Placer County, and the PG/CC watershed group.

2.3.3 *City of Roseville General Plan*

General management issues, including objectives, appropriate uses, and policies for open space and natural areas within the City of Roseville are outlined in the City of Roseville General Plan. These goals are also captured and refined in the Specific Plans developed for the nine specific planning areas within the City. These existing City plans and relevant policies are summarized below. The RCRMRP serves as an implementation measure of these policy documents.

The City General Plan includes a special designation for open space areas that specifies the following goal:

"Reserve and protect public and private lands including wildlife habitat, natural features, or flood hazard areas, including the 100-year floodplain in new development areas and sensitive or unique natural features such as wetlands, vernal pools and oak woodlands."

Primary human uses of open space areas include passive recreation and minor recreation facilities, walking and bike trails and resource interpretive facilities. Secondary uses allowed include resource mitigation, drainage detention, flood control improvements and utilities. The City General Plan also includes a combining designation for lands within the 100-year floodplain that only permits uses that minimize impacts on upstream and downstream areas.

Open Space

The Open Space and Conservation Element of the General Plan identifies the following creeks as Open Space/Parks and Recreation: Dry Creek, Cirby Creek, Linda Creek, Strap Ravine, Antelope Creek, Secret Ravine, False Ravine, Miners Ravine, Pleasant Grove Creek downstream of Foothills Boulevard and from the City of Rocklin limits to Stanford Ranch Road, South Ravine Pleasant Grove Creek[4] to Harding Boulevard, and Kaseberg Creek to Foothills Boulevard. Specific goals established for these areas are as follows:

Goal 1. Establish a comprehensive system of public and private open space forming interconnected corridors and including oak woodlands, riparian areas, grasslands, wetlands, and other open space resources.

Goal 2. Utilize the open space system to connect neighborhoods and separate development areas.

[4] The City's General Plan refers to South Branch Pleasant Grove Creek as South Ravine Pleasant Grove Creek.

Goal 3. Provide access to public open space through managed and protected linkages.

Goal 4. Integrate where feasible passive recreation and education opportunities with protection of wildlife and vegetation habitat areas.

The RCRMRP supports these open space goals by identifying and assessing the quality of the riparian open space corridors, and making recommendations for restoring and managing these resources for protection of wildlife and vegetation habitat.

Vegetation and Wildlife

Some of the goals specified in the General Plan that are applicable for management of vegetation and wildlife within stream corridors are as follows:

Goal 1. Preserve, protect and enhance a significant system of interconnected natural habitat areas, including creek and riparian corridors, oak woodlands, wetlands, and adjacent grassland areas.

Goal 2. Maintain healthy and well managed habitat areas, maximizing potential for open space, recreation and visual experiences.

Goal 3. Protect special status species and other species that are sensitive to human activities.

Specific Policies related to these goals include:

Policy 3. Require dedication of the 100-year floodplain or comparable mechanism to protect habitat and wildlife values in perpetuity.

Policy 4. Require preservation of contiguous areas in excess of the 100-year floodplain as merited by special resources or circumstances, including, but not limited to:

- Sensitive wildlife or vegetation,
- Wetland habitat,
- Oak woodlands,
- Grassland connections in association with other habitat areas,
- Slope or topography,
- Recreation opportunities,
- Maintenance access requirements

Policy 6. Provide for the protection and enhancement of native fishery resources, including continued coordination with the California Department of Fish and Game to release water into Linda Creek.

Policy 12. Consider use of City property for habitat preservation and mitigation requirements resulting from development proposals, when such efforts do not conflict with existing resources, recreational opportunities or other City goals, policies or programs.

The RCRMRP strongly supports these Vegetation and Wildlife goals and policies by identifying and assessing the quality of wildlife and fish habitat within the stream corridors, and developing recommendations for management and restoration of these areas.

Groundwater Recharge and Water Quality

Specific Goals defined in the General Plan for groundwater recharge and water quality are as follows:

Goal 1. Continue to improve surface water quality and accommodate water flow increases.

Goal 2. Enhance the quality and quantity of ground water resources.

Specific Policies related to these goals include:

Policy 1. Utilize cost effective urban runoff controls, including BMPs, to limit urban pollutants from entering watercourses.

Policy 2. Implement erosion control and topsoil conservation measures to limit sediments within water courses.

Policy 3. Ensure buffer between waterways and urban development to protect water quality and riparian areas.

Policy 6. Where feasible, locate storm water retention ponds in areas where subsoil is suitable for ground water recharge.

The RCRMRP in consistent with the Groundwater Recharge and Water Quality goals of the Roseville General Plan by identifying water quality stressors, including outfalls, nonpoint source pollution and sedimentation sources and developing environmentally sensitive management strategies for improving water quality in the City's streams. The plan also recommends public education and stewardship programs to help eliminate nonpoint source pollutants such as pesticides, herbicides and fertilizers.

Recreation

Recreational use of the City's creek corridors is directed by the goals and policies in the Parks and Recreation element of the City's General Plan. The goals call for providing adequate resources to support diverse recreational opportunities for residents.

Goal 1. Provide adequate park land, recreational facilities and programs within the City of Roseville through public and private resources.

Goal 2. Provide residents with both active and passive recreation opportunities by maximizing the use of dedicate park lands and open space areas.

Several of the specific policies related to these goals direct how much land is needed to meet the recreation demand, and suggest how the target acreage may be achieved by recognizing the passive recreation opportunities provided by creek corridors.

Policy 1. The City shall ensure the provision of 9 acres of park land per 1,000 residents.

Policy 3. Consider allocating park credits for lands that provide active and passive recreation value.

Park land includes developed parks, recreational open space, and joint-use park-school facilities. However, non-recreational open space may be substituted for traditional park land at a ratio ranging from 5:1 and 10:1 as long as adequate acreage has been secured for traditional park uses. Thus 5 to 10 acres of non-recreational open space such as riparian areas or oak woodlands may be substituted for the required dedication of one acre of traditional park land. Where creek corridors are dedicated in this manner, additional policies provide direction on management of the corridors to support recreational uses.

Policy 9. Continue to maintain and upgrade as necessary City parks and open spaces through the Parks and Recreation Department, to assure safe, clean and orderly facilities.

Policy 10. Continue to provide a wide variety of programs, activities, and education opportunities for the community.

The General Plan also proposes bikeways along Linda and Cirby Creek, Pleasant Grove Creek, South Ravine Pleasant Grove Creek, Dry Creek, False Ravine, Antelope Creek, and Secret and Miners Ravines. These bikeways, as constructed in accordance with the City's Bikeway Master Plan, will be designed to minimize impacts on the creeks and discourage bicycle and pedestrian access off of the designated route.

The RCRMRP in consistent with the City's General Plan goals for Recreation by identifying areas where the creeks flow through parks and developing recommendations for improving public access while protecting habitat and water quality.

Public Safety, Floodplain Protection

General Plan objectives for floodplain protection for public safety are to minimize the potential for flood damage by providing for the safe movement of floodwater, and to preserve, protect, and enhance the natural habitat, open space, and recreational values found along Roseville's floodplain and creek environments. The General Plan designation for floodplain only applies where the floodplain is greater than 200 feet wide and associated drainage area is at least 300 acres, however the precise determination of boundaries shall be as determined by the Public Works Director. Specific City goals for flood protection are as follows:

Policy 2. Minimize potential for loss of life & property due to flooding.

Policy 3. Pursue flood control solutions that are cost effective and minimize environmental impacts.

Specific policies related to these goals are as follows:

Policy 7. Continue to implement the Storm Maintenance Program to keep creeks & storm drains free of debris.

Policy 11. Where feasible, maintain natural stream courses and adjacent habitat and combine flood control, recreation, water quality and open space functions.

The RCRMRP is consistent with the General Plan Public Safety and Floodplain Protection goals and policies by recommending environmentally sensitive flood protection solutions and recognizing the role of City streams as a floodwater conveyance system in addition to their value as fish and wildlife habitat.

2.3.4 City of Roseville Municipal Code

Regulations pertaining to open space areas are contained in the Municipal Code under sections of Title 8 (Parks and Recreation), Title 10 (Public Peace, Morals, and Welfare), and Title 19 (Zoning). These regulations address various limitations on floodplain activities, protection of wildlife, and tree preservation. The uses and management of creek corridors as described in the RCRMRP is consistent with the Municipal Code and does not amend or replace any of its provisions.

2.3.5 City of Roseville Specific Plans

The City of Roseville has established nine specific plans for areas within the City. In addition to regulating land use within each specific planning area, these plans establish policy for management of the open space around the major creeks and regulate what activities can occur within this open space system. In general, the specific plans include designation of open space areas and regulations for those areas (Table 2-2).

Table 2-2. Relationship of Specific Plans to Creeks and Open Space

Specific Plan Area	Relationship to Creeks and Open Space
North Roseville	The North Roseville Specific Plan preserves 103 acres of open space along Pleasant Grove and South Pleasant Grove Creeks in two phases of development.
Del Webb	The Del Webb Specific Plan provides regulations for protecting natural resources and sensitive species. While some areas of Kaseberg Creek are protected in City parks within the Del Webb Specific Plan, the majority of the creek flows through golf course designated land upon which the Sierra Pines Golf Course has been built.
Northwest Roseville	The Northwest Roseville Specific Plan designates 22 acres along Kaseberg Creek as Floodway/Fringe Areas with additional land reserved within the Sierra Pines Golf Course.
North Central Roseville	The North Central Roseville Specific Plan designates 117 acres of land along Pleasant Grove Creek, South Branch Pleasant Grove Creek and Antelope Creek as "lower watershed", preserving those lands as undevelopable open space. This plan also specifies resource management objectives and regulations for wetlands, intermittent drainages, perennial creeks, vernal pools, including wetland preserve policies, maintenance and monitoring, and oak woodland policies.
Highland Reserve North	The Highland Reserve North Specific Plan includes information on resource management of open space and sets aside 29.5 acres along upper Pleasant Grove Creek.

Stoneridge	The Stoneridge Specific Plan designates 263 acres of open space along False, Miners and Secret Ravines, amounting to 24% of the total area covered by the plan.
Northeast Roseville	The Northeast Roseville Specific Plan preserves 67 acres of open space along Miners and Secret Ravines and also contains goals and policies for open space and resource management, including preservation of natural open space, oak woodlands, Miner's and Secret Ravine creeks, and vernal pools.
West Roseville[5]	The West Roseville Specific Plan sets aside approximately 20% of the plan area for open space, including the Pleasant Grove, Kaseberg and Curry creek corridors. The Pleasant Grove corridor is identified as an oak mitigation planting area
Southeast Roseville	The Southeast Roseville Specific Plan sets aside 56 acres of open space along Cirby Creek and Strap Ravine. Specific regulations are directed towards natural surface drainage channels, vernal pools and oak woodlands.

The area to the east of the North Roseville Specific Plan is referred to as the North Industrial Planning Area. It does not have an associated Specific Plan, but instead conforms to the General Plan. 134 acres of open space along Pleasant Grove and South Pleasant Grove Creeks are preserved in this area.

2.3.6 City of Roseville Revitalization Plans

The Roseville City Council has placed a high priority on downtown revitalization efforts. In response, the City, in partnership with Central Roseville businesses, property owners and the Roseville Chamber of Commerce, has developed a Revitalization Strategy for Central Roseville. Major improvements completed to date include the Atlantic Street widening and the Vernon Streetscape projects. In addition, the Tower Theater and several other private buildings have been renovated. As a result there are now two performing arts theaters located on Vernon Street and additional off street parking is being planned as part of a public/private redevelopment project partnership. A streetscape project is also being developed for the historic/old town district.

As part of the next phase of downtown redevelopment work, the City has initiated efforts to better link Royer Park and Dry Creek to the City's downtown. The goal of these efforts is to take advantage of these amenities as an attraction to help create a dynamic and interesting "Public Place" where people want to gather for markets, festivals and other civic functions. The following vision for the area was developed to guide this revitalization effort:

> *A welcoming, pleasant place of shops and offices, restaurants and cafes, parks and plazas, parades and street-fairs, theater, arts and civic services. A place offering a variety of ever changing activities, goods, and services to Roseville's families, businesses and visitors.*

[5] Creek corridors within this plan area were not included in the field assessments and analysis conducted for the RCRMRP.

At this time it is envisioned that downtown redevelopment activities may include the introduction of hardscape elements along the north or downtown side of the creek, possibly creating a "river walk" or similar promenade. Planners are hopeful that such projects will increase tourism and promote economic development in Central Roseville. Other improvements may include removal of the existing Oak Street parking lot to expand the green edge of Royer Park to the north side of the creek, repositioning of the Ice House Pedestrian Bridge to improve circulation between downtown and the park, and possibly relocation of the public safety building and other structures to reclaim the historic floodplain, improve the relationship between the creek and downtown area, and provide opportunities for a Class I trails, interpretive signage and/or creek side "overlooks." The City of Santa Rosa completed a similar project on Santa Rosa Creek in their downtown area. While conditions in Santa Rosa are not the same as in downtown Roseville, the Santa Rosa project provides an excellent example of how another jurisdiction implemented a similar project. Appendix I provides more information on the Santa Rosa experience. Future creek restoration efforts in the downtown area should be guided by the soon to be updated Downtown Revitalization Plan

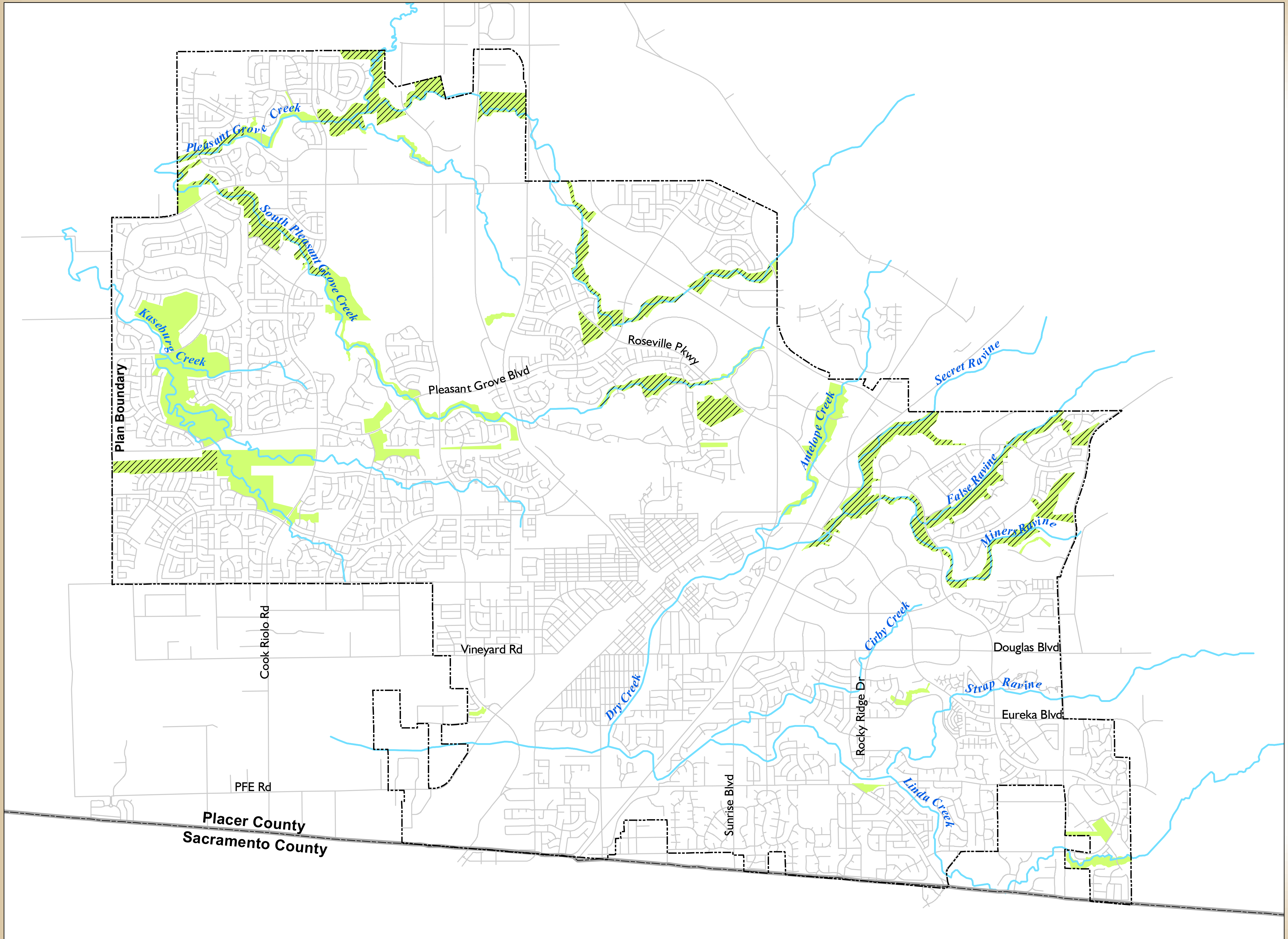
2.3.7 Roseville Preserve Areas

Figure 2-3 shows open space preserve areas within the RCRMRP area. These open space preserves include over 1,100 acres of publicly and privately owned wetland and vernal pool preserve areas which are located throughout the City and have been preserved in compliance with permit requirements issued by the U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers. The permit conditions required deed restrictions to ensure the preserve areas will remain undeveloped in perpetuity, management plans to identify how the preserve areas will be managed, and a funding mechanism for management in perpetuity.

The operation and management plans include:

- Monitoring and biologic survey requirements;
- Prohibited and allowable uses within the preserve area, including:
    - Management techniques for non-native plant species/thatch management,
    - Restrictions associated with adjacent construction activities, and off-site drainage into the preserve areas,
    - Locations of required fencing,
    - Bike trail location (if applicable), and
    - Locations of fire breaks.

These open space preserves are important both because they protect valuable habitats and sensitive lands and because they provide examples of relatively undisturbed wildlands that can be used as models for restoration projects.



OPEN SPACE PRESERVE AREAS

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN

Wetland Preserves

Wetland Preserves with O&M Plans currently administered or to be administered by the City

County Boundary

Plan Boundary

Creeks

Streets

N

0 2,000 4,000
SCALE IN FEET

FIGURE 2-3

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

Digital base data provided by City of Roseville & Foothill Associates

wetland preserves.mxd

2.3.8 Secret Ravine Adaptive Management Plan

This plan was developed by the Dry Creek Conservancy and focused on Secret Ravine from its confluence with Miners Ravine to Rock Springs Road. It identifies potential restoration opportunities and strategies specific to this reach. The portion of the study area that is in the City of Roseville includes the creek from the Miners Ravine confluence to the Roseville city limits. The plan addressed restoration of in-stream and riparian habitats for native terrestrial and aquatic species, particularly salmonids.

The plan was completed in 2001and included the following elements:

1. Summary of Existing Conditions Report
    a. Hydrologic and Physiographic Geomorphology
    b. Channel Morphology
    c. Vegetation
    d. Creek Habitat
2. Recommendations for vegetation restoration, creek channel restoration, homeowner/landowner education, additional information gathering and assessment efforts to better understand creek conditions such as water quality, temperature, sediment sources, and educational actions and adaptive management studies.
3. Recommendations for inclusion of elements of the Adaptive Management Plan in the Dry Creek Watershed Plan and the RCRMRP.

2.3.9 Existing Restoration Projects

In addition to setting aside creek corridors for preserve and/or open space uses, enhancement of creek corridors is also a priority for the City. The following sections describe restoration projects that have been done within the City since 1995. Project locations are shown in Figure 2-4.

Royer Park Riparian Reforestation Project (Urban Streams)

This project, funded by a Department of Water Resources Urban Streams Restoration Grant, involved reforestation and bank stabilization of Dry Creek near Royer Park. The work was completed in 2000. It involved repair of a severely eroding stream bank, including invasive non-native weed eradication, installation of erosion control fabric, rock and biotechnical erosion control, and planting of wetland plugs and grasses and riparian trees and shrubs.

Dry Creek Restoration Project (Urban Streams) – includes the Adelante H.S. site; Cherry/Willow site; and Darling to Riverside site

This project included restoration of a 1.4 mile stretch of Dry Creek from the Riverside Bridge upstream to Adelante High School. The project was initiated in 2000 and completed in early 2004. The goals of this project included:

- Reducing erosion,
- Replacing exotic invasive plant species with native riparian and upland species,
- Reducing urban flooding through bioengineering techniques,
- Restoring fisheries and wildlife habitat,

- Accommodating future recreational and educational opportunities.

The project occurred in two phases. Phase One included two sites, and addressed restoration of severely eroded areas, replanting of native plant species on three reaches where invasive exotic species had previously been removed, and maintenance. Phase Two included one site and involved stabilization of degraded and eroding banks, creation of in-stream fish habitat, and modifications to an existing sewer line to improve opportunities for fish migration.

The first site in Phase One (Site 1) is at Cherry and Willow Streets. Activities proposed included regrading of the bank to reduce erosion by introducing a bench at the toe of the slope and armoring of the bank with boulders laid atop synthetic erosion control fabric and cobbles.

The second site in Phase One (Site 2) included gabion blow-outs, large scour pool and massive bank erosion at Adelante High School. The gabions were disassembled and the removed cobble was placed upon erosion control fabric and used to fill the scour pool and line the toe of the slope. Three to four foot boulders were placed on top of the cobble, and soil was placed between the boulders and the slope to form a bench. Boulders were also placed on the bench to reduce water velocity. The stream bank was then revegetated with native riparian and upland species. The Vortex weirs and excavation were used to realign the thalweg to the center of the channel and create in-stream fish habitat. A scour channel from a 36" storm drain was filled and stepped to reduce erosional force.

Phase One also included three revegetation sites between Sutter Street Bridge and Adelante High School. Arundo, red sesbania, tree of heaven, Himalayan blackberry and ivy were removed from these sites in Spring 2002. These areas were replanted with native riparian and upland trees. The three reaches are as follows:

- Reach 1 – downstream from Adelante site to Folsom Street bridge on the northwest bank
- Reach 2 – the northwest bank between the Sutter Street bridge and the Folsom Street bridge
- Reach 3 – the southeast bank upstream from the Sutter Street bridge to the end of the Lyons Club parking lot

Phase Two included one site (Site 3) located at Darling Way on the west side of the creek. The goals of this phase include removal of riprap and exotic vegetation, bank stabilization and restoration of shaded riverine habitat. The objectives to meet these goals include the following:

- Widening of the narrowest portion of the creek,
- Developing a low flow terrace,
- Regrading banks to a maximum 2:1 slope,
- Creating swales to allow flooding of terraces,
- Removal of some trees.

Fish passage improvements were created over a 36" sewer pipe that blocks fish migration during low flows at the downstream side of site 3. This included rearranging the boulders on the downstream side of the pipe to form a clear zone in the center of the span over which water falls and creates a plunge pool. The greater depth at this pool improves the ability of fish to leap the pipe.

As part of this project, a comprehensive hydrologic study was also completed for the 1.4 mile section of Dry Creek and contains additional specific restoration planning recommendations for this reach. [6]

Cirby-Linda-Dry Creek Flood Control Project Mitigation Plantings

This project was performed as mitigation for the flood control improvements along Linda and Cirby Creeks in 1999-2000. The mitigation plan required the revegetation of 306 valley, interior live and blue oaks within the creek corridor. To ensure survival of 306 oaks, 1000 acorns were planted. Additionally, 300 other riparian trees, including Sycamore, White Alder, Oregon Ash and Fremont Cottonwood were installed. Success criteria required that yearly monitoring confirm the survival of 80% of the planted trees. If these criteria were not met, additional plantings would be required to replace the losses and new restoration prescriptions would be considered[7].

Some of these initial plantings were not successful, and replacement plantings were installed in Summer 2003.

Secret Ravine Spawning Enhancement

This project was implemented in November of on a reach of Secret Ravine approximately 1,200 feet upstream of the Roseville Parkway over crossing. The project included placement of about 150 tons of river rock to create an alternate channel, excavation and removal of channel deposits, and back recontouring. Revegetation of the project area and access road were done with native and local plants.

The project has been monitored to evaluate its effectiveness. Some plantings have been successful and others have not. Some alders, cottonwoods, willows, grasses, and rushes have been established. The acorns sprouted but died after several years. Some of the alders and cottonwoods survived. In general the site is more stable than before the project. Vegetation along the entry road didn't establish itself apparently due to lack of water and illegal vehicle traffic. Vehicle traffic entering from the hospital entrance road remains a problem. Other issues include the failure of a new permanent channel to become established due to the lack of large storms in the first years following installation, and the felling of a large oak that diverted flows and prevented the desired scouring. The site has been resurveyed and is part of new designs to improve channel morphology in the area. The imported cobble can be used for future projects.

[6] Swanson, 2003.

[7] Ganda,1998.

EXISTING RESTORATION SITES

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN

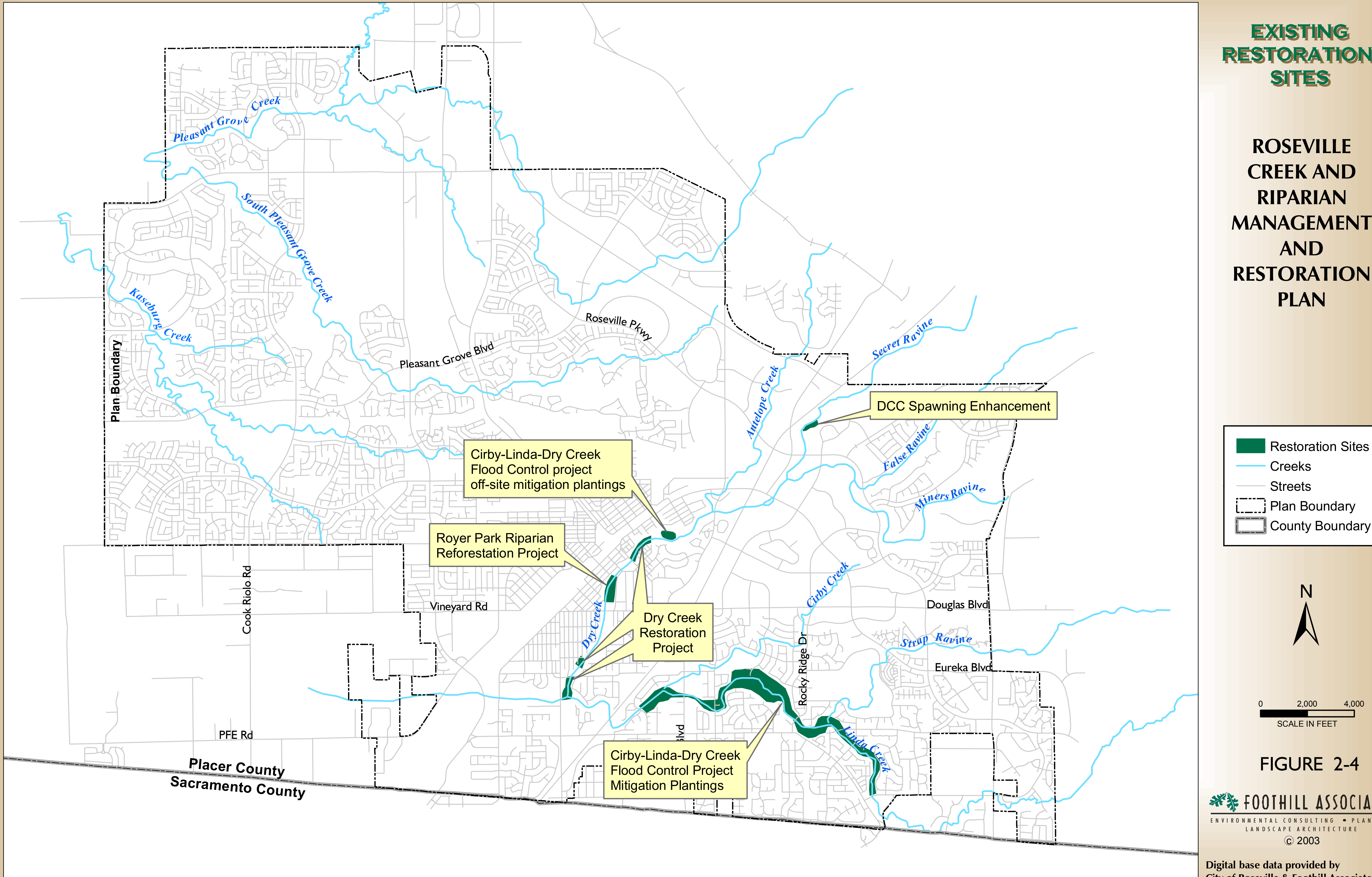


FIGURE 2-4

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

Digital base data provided by City of Roseville & Foothill Associates

2.3.10 Memoranda of Understanding

The City of Roseville has entered into two Memoranda of Understanding (MOU) related to management of the City's creek corridors. One MOU is with the California Department of Fish and Game (DFG) and provides direction on routine maintenance in improved and unimproved channels. The MOU describes mitigation measures associated with certain types of maintenance activities as well as timing and reporting requirements. The management and maintenance strategies described in the RCRMRP are consistent with the MOU and the plan does not modify or replace the agreement.

The second MOU is with NOAA Fisheries (formerly National Marine Fisheries Service) and was developed as part of the regulatory approval process for the construction of the bridge over Miners Ravine at East Roseville Parkway. Development of the RCRMRP was initiated in part to satisfy a requirement of this MOU, and is thus consistent with the terms of this agreement.

2.3.11 City of Roseville Stormwater Management Program

The City of Roseville's Stormwater Management Program (SMP) contains concepts and recommendations on how the city should manage their stormwater program. The program is organized into six areas: public outreach, public involvement, illicit discharge detection and elimination, construction site runoff, new development and redevelopment, and municipal operations. The program identifies minimum control measures in each area and monitoring and reporting requirements. The City is in the process of developing an ordinance to authorize implementation of the SMP.

The RCRMRP is consistent with the City's Stormwater Management Program in recognizing the City creeks as part of the stormwater conveyance system and formulating management strategies for protecting water quality and floodwater capacity while enhancing habitat values.

2.3.12 City of Roseville Bicycle Master Plan and EIR

The City's Bicycle Master Plan (BMP) provides direction on both on-street and off-street bicycle trails in the City as well as links to surrounding areas. The RCRMRP recommendations for managed trails within the creek open space areas are consistent with the BMP objectives for recreation and commuting. Trails in the creek corridor take advantage of scenic qualities, provide links to public open spaces and recreational facilities, and provide a viable transportation alternative to the automobile.

2.4 Creek Plan Purpose

The purpose of preparing the City of Roseville Creek and Riparian Management and Restoration Plan is to provide a vision for the future appearance and function of Roseville creeks. The Plan provides the link between creek management and other related City goals, responsibilities and commitments. This involves providing direction for the stewardship of Roseville creeks to ensure that an appropriate balance is stuck between public health and safety needs and the natural functions and values of creek resources.

To provide appropriate management direction for Roseville creeks, this plan integrates several City goals and fulfills certain regulatory commitments. For example, this Plan considers the interrelationship among the City's General Plan, related specific plans, Stormwater Management Plan, Preserve area management plans and downtown redevelopment plans. It provides creek resource management recommendations that assimilate and advance the collective goals of these planning efforts as they relate to Roseville creeks. Per an existing Monitoring Agreement between NOAA Fisheries and the City of Roseville, Plan preparation also fulfills a City commitment to prepare a comprehensive creek management plan that addresses critical habitat for Chinook salmon, a candidate species, and Central Valley steelhead, a species listed as "threatened" under the federal Endangered Species Act. The City recognizes the importance of maintaining historic fishery resources and the role the salmon run can play as an ecotourism attraction that can be a component of downtown revitalization.

Another Plan purpose is to position the City to competitively compete for grant funding to implement various aspects of the Plan including: restoration, education and outreach to further build community capacity for creek stewardship, and to advance the goals of the above described related planning documents. The Plan accomplishes this by providing a platform to aid in the formation of partnerships with public non-profit and community groups interested in creek restoration. The Plan facilitates creek restoration by identifying appropriate restoration techniques and prioritizing restoration projects. The goal to secure a Consolidated Permit for Plan implementation would further facilitate restoration efforts by streamlining permit processes and fostering cooperative relationships with regulatory agencies.

2.5 Creek and Riparian Management and Restoration Goals and Objectives

This section presents the goals and objectives for creek and riparian management and restoration within the City of Roseville to support implementation of the Plan's purpose as described above. The goals and objectives were developed from the goals of the CALFED Watershed Program with input from the Citizens Advisory Committee (CAC) and the public through community workshops. There are six major goal areas each with supporting objectives: 1) Public health and safety, 2) Maintenance, 3) Ecosystem functions, 4) Water quality, 5) Regulatory and planning considerations, and 6) Stakeholder interests.

These goals and objectives are intended to provide direction for future policy, planning, and land use management decisions that involve the City's creeks and to guide implementation of the specific measures recommended by this Plan.

2.5.1 Goal 1 - Public Health and Safety

Manage Roseville's creek corridors in a manner that protects public health and safety.

Objectives

1. Maintain and/or optimize the flood storage and conveyance capacity of the City's creeks.

2. Improve the understanding of the creek systems' response to flood events

and support the data needs of emergency response programs and biological evaluation.

3. Develop new and maintain and improve existing flood prediction tools and models that provide early warning response and assist in post-flood assessment.

4. Ensure the public is informed of local emergency action plans related to extreme flooding events.

5. Provide trails with adequate width, grade, visual clearance, and surface materials to provide safe passage for anticipated users of all abilities.

6. Provide trails that also serve as emergency vehicle access routes and service routes for infrastructure maintenance as needed.

7. Provide safe access to designated overlook points in a limited number of appropriate locations.

8. Take a comprehensive approach to the regulatory enforcement of creek activities that includes signage, patrols, and a telephone hotline for reporting violations.

9. Manage human activities and wildlife populations within the creek corridors to preserve the safety of both humans and wildlife.

10. Manage vegetation in the creek corridors to reduce fuel load as necessary for fire protection and to allow adequate flood conveyance.

2.5.2 Goal 2 – Maintenance

Conduct creek maintenance activities in a manner that preserves the multiple beneficial uses of the corridor including flood conveyance capacity, habitat, and recreational uses.

Objectives

1. Utilize the most environmentally beneficial methods feasible for channel management and modifications required for flood control.

2. Manage and maintain channel debris and large in-stream woody vegetation in a balanced approach that promotes its ecological benefit and reduces its impact upon flood conveyance.

3. Control erosion using the most environmentally beneficial methods feasible while maintaining a complex and structurally diverse riverine habitat.

4. Reduce the potential for bank and bed scour that could lead to channel instability.

5. Ensure equipment operators and maintenance personnel are well trained regarding the goals of flood control and ecosystem restoration.

6. As appropriate, include community participation in creek maintenance activities and limit public access and activities that degrade the creek corridor.

7. Use an adaptive management approach to creek maintenance wherein activities will be adjusted over time to respond to the changing conditions in the corridors and continually improve the multiple beneficial uses of the creeks.

8. Incorporate into maintenance activities recommendations of the Creek Maintenance Guidelines Document prepared for the City by GANDA (2001).

9. Discourage unnecessary stream flow diversions, temporary dams and other artificial obstructions.

2.5.3 Goal 3 - Ecosystem Functions (Local and Watershed)

Identify, preserve, protect and enhance a significant system of interconnected natural habitat areas, including creek and riparian corridors, oak woodlands, wetlands, and adjacent grassland areas.

Objectives

1. Establish reference creek conditions for both the Pleasant Grove and Dry Creek systems to use as a benchmark for evaluating restoration potential, designing restoration projects, and to guide maintenance activities.

2. Identify and prioritize specific areas where creek and riparian restoration and enhancement opportunities exist.

3. Provide conceptual improvement guidelines to direct future restoration and maintenance projects creek-side development, and decision making.

4. Manage non-native invasive plants to limit their establishment and spread within the City's creek corridors especially when their presence adversely impacts the beneficial uses of the creek, such as habitat, water quality, recreation, or flood control.

5. Establish specific goals and implementation measures for riparian vegetation and aquatic habitat as they relate to the City's two watersheds for critical factors such as vegetative diversity, percent canopy cover, and in-stream structure.

6. Preserve and enhance the native oak community and habitat within and adjacent to the City's creek corridors.

7. Manage creeks to accomplish non-habitat goals such as flood conveyance, fuel load control, property protection, etc. while restoring creek habitat and enhancing the biodiversity of the creek ecosystem.

2.5.4 *Goal 4 - Water Quality*

Preserve and enhance water quality in the City's creeks to benefit humans and wildlife.

Objectives

1. Consider the use of buffer areas or wetland filters to decrease urban runoff pollutants.

2. Consider ways to increase DO (dissolved oxygen), decrease water temperatures through increased riparian cover, decrease BOD (biological oxygen demand), decrease nutrients, hydrocarbons, and urban runoff to improve water quality for aquatic habitat.

3. Consider removing diversions that create undesirable conditions such as, backed up, stagnant water with excessive algae or floating aquatic macrophytes to improve creek aesthetics.

4. Consider ways to decrease sediment sources, such as excessive bank erosion, and transport to protect salmon spawning gravel.

5. Improve extent and frequency of monitoring to better characterize water quality and sources of water quality impacts.

2.5.5 *Goal 5 - Regulatory and Planning Considerations*

Coordinate local creek management with related planning initiatives and regulatory requirements.

Objectives

1. Streamline City, state, and federal project review and approval for restoration projects located within the creek corridor, including:

    - Emergency Projects,
    - Public Works Improvements,
    - Passive Recreation Facilities, and
    - Community-based Restoration Projects.

2. Manage the City of Roseville creeks in a manner that is consistent with the larger CALFED Watershed Program Plan and advances the program's primary objectives.

3. Manage the City of Roseville creeks in a manner that is consistent with the efforts of the Dry Creek and Pleasant Grove/Curry Creek watershed CRMPs.

4. Encourage the proactive establishment of additional programmatic agreements whenever feasible.

5. Conduct creek management, restoration, outreach, and public involvement activities in a manner that is consistent with and compliments the City of

Roseville's Stormwater Management Plan.

2.5.6 *Goal 6 - Stakeholder Interests*

Creek stewardship will be fostered by encouraging community involvement and managing the creeks with consideration for the needs and interests of all stakeholders.

Objectives

1. The flora and fauna that depend on the creek habitat are regarded as stakeholders and their welfare will be a consideration in management decisions.

2. Increase the community's capacity to preserve and enhance the beneficial uses of the City of Roseville creek corridors through education about creek ecosystem function and understanding ways in which the community can benefit the ecosystem.

3. Foster partnerships with complimentary organizations, businesses, individuals, and public agencies for creek stewardship and education.

4. Encourage a variety of opportunities for individuals of all ages and abilities, neighborhoods, and organizations to participate in creek stewardship through monitoring, maintenance, and restoration.

5. Manage access to and maintenance of the creeks in a manner that balances the interests of private creekside property owners with the public beneficial uses of the creeks such as recreation, habitat preservation, and flood control.

6. Make education and assistance available to creekside property owners to encourage land use management practices that preserve and/or enhance the beneficial uses of the creek corridors.

7. Manage the creek corridors as a multifunctional resource providing local and regional educational, recreation, aesthetic and open space values such as flood control and habitat.

3.0 EXISTING CONDITIONS ASSESSMENT

3.1 Existing Conditions Assessment Report Findings

The Existing Conditions and Assessment Report (ECAR)[8] prepared as part of the Roseville Creek and Riparian Management and Restoration Plan (RCRMRP) project presents the results of the inventory and review of baseline information and plans, the hydrologic and geomorphic study, and the riparian vegetation and habitat characteristics phases of this project. Health of the stream system was examined in three areas: channel structure and stability, riparian vegetation and wildlife habitat, and aquatic habitat. Field protocols were adapted from standard United States Department of Agriculture (USDA), California Department of Fish and Game (CDFG), and California Native Plant Society (CNPS) protocols to collect data in each of these areas to aid in assessing the health of the stream ecological systems, determining major causes of degradation, identifying particularly degraded sites, and laying the groundwork for the restoration and management plan. Field assessments were conducted at 16 representative sites throughout the City (Figure 3-1) and combined with a more generalized assessment based on aerial photo interpretation to develop a comprehensive classification of the plan area.

The ECAR describes Pleasant Grove and Dry Creek Watersheds as highly diverse systems providing a multitude of beneficial resources subject to rapid change of the surrounding environment. Historical and present land uses, mining, flood control projects, and general urban development have altered the system and the existing potential of the system to provide benefits to humans and wildlife. Due to the varied conditions and status of ecological health observed throughout both watersheds, successful management and enhancement of the current resources must take into consideration the uniqueness of each stream corridor as well as the potential transformation of the corridor as urban development continues.

This chapter provides a summary of the results presented within the ECAR and uses both qualitative and quantitative assessments to prioritize restoration opportunities and identify reference conditions for several management areas.

3.2 Indicators of Stream Degradation and Site Impairment

The ECAR found the following indicators of stream ecosystem degradation:

- excessive sedimentation
- elevated water temperature
- altered stream flow conditions
- abundance of non-native invasive plant species
- barriers to fish passage
- poor water quality
- degraded riparian vegetation
- channel and floodplain alteration

[8] Foothill Associates, 2003.

Table 3-1 identifies the relative extent to which each of these indicators of degradation was considered an impairment in the major creeks within the planning area. A description of each indicator and the ecological significance are provided in the following paragraphs.

3.2.1 Excessive Sedimentation

Excessive sedimentation typically comes from erosion that has been accelerated by a reduction in streamside vegetation, past mining activities, and increased runoff from development. An overload of fine sediment, primarily silts and sands, causes degradation of salmonid spawning gravels, as well as possible channel aggradation and reduced flood flow capacity in downstream reaches.

Although sedimentation was observed to be a problem on all streams within the City of Roseville, the lower portion of the Dry Creek is most severely impacted. Sedimentation within the Pleasant Grove watershed creeks is merely a symptom of development and does not have the ecological impact, as does sedimentation in the Dry Creek watershed where salmonid spawning and rearing habitat is present.

Suspended solids (particles of material suspended in the water column or deposited in the stream bed) are a natural component of rivers and streams. Artificially increased loads of sediment, resulting from human activity and urbanization, can have adverse affects on the aquatic habitat and species. When this suspended material settles out of the water column, sedimentation occurs. The major effect of sedimentation is the blanketing of the substrate which fills the interstitial spaces of gravel and cobble stream bottoms, greatly decreasing the quality of spawning areas for many fish species and the habitat for benthic macroinvertebrates, which serve as food for many species[9]. Maintaining the interstitial spaces between gravel and cobble in streams is critical to rearing and spawning habitat for chinook salmon and steelhead trout.

Eggs and fry depend upon waters moving through the spaces to wash away metabolic wastes and provide oxygenated water. High percentages of fine sediments have been found to cause decreased embryo survival, smaller salmonid fry, and emergence before yolk-sac absorption was complete. [10] Sedimentation can also affect habitat quality by filling in pools, creating high turbidity levels, and increasing water temperature which can result in reduced levels of dissolved oxygen. The major sources of sedimentation in the City of Roseville are reduced streamside vegetation, past mining activities, and increased runoff from surrounding urbanized areas, which increase stream bank erosion and add to sediment loading.[11] Past mining operations have had a significant impact on the creeks in the study area, disrupting the alluvial processes and exposing sands and silts.

Surveys conducted in Secret Ravine by the Dry Creek Conservancy (1999) found that sand was the dominant substrate component in most of the observations. Excess fines (silt and sand) degrade the riffle habitats and thereby the invertebrate community (i.e.,

[9] GANDA, 2002
[10] Tappel and Bjorn, 1983
[11] GANDA, 1998

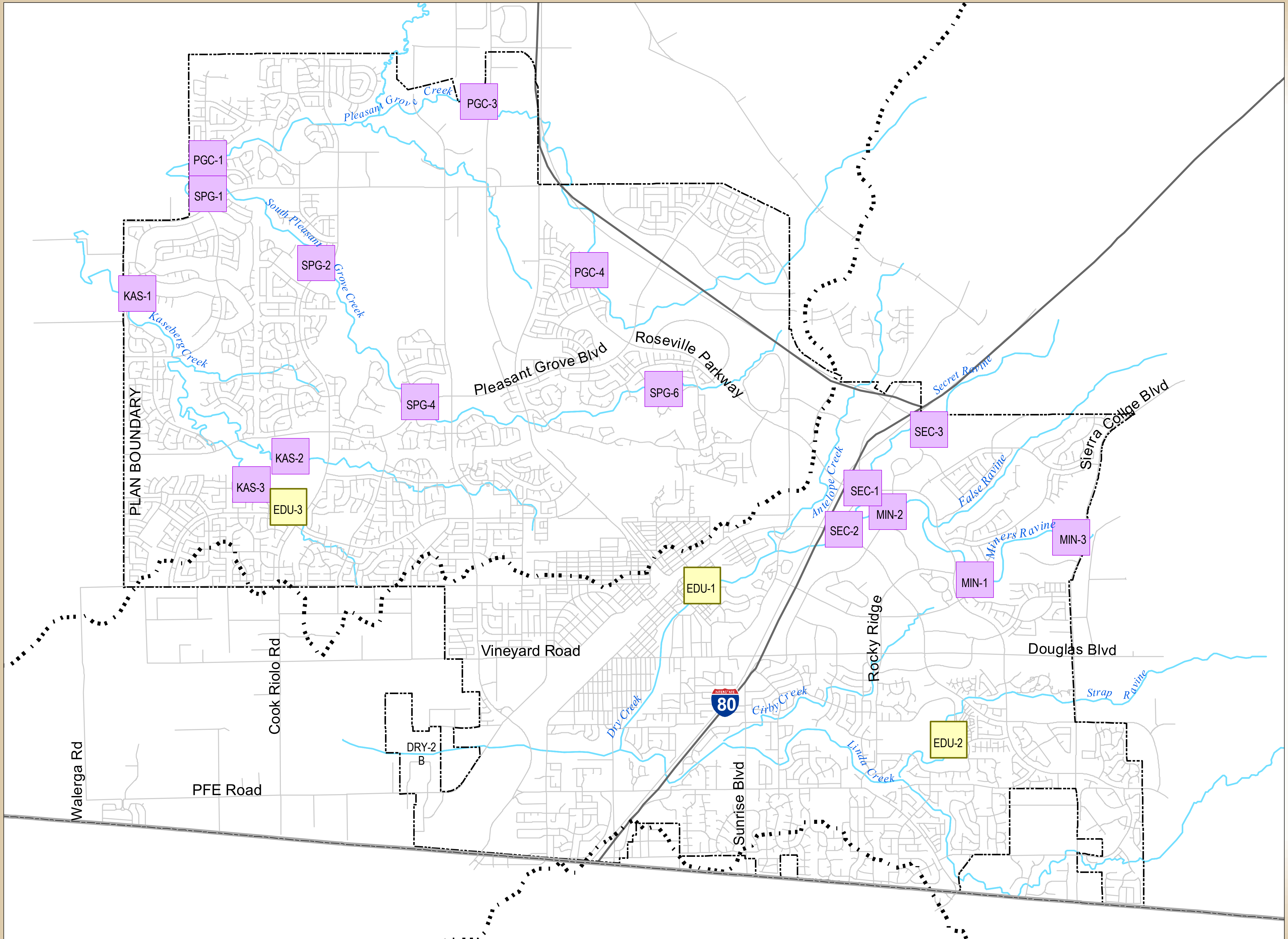
the prey base for fish). Fines contribute to unhealthy warming of the stream by making the stream shallower, which allows greater solar penetration and more rapid warming. [12]

A stream habitat assessment conducted by GANDA (1998) indicated that the majority of the areas surveyed on Linda and Cirby creeks were unsuitable for spawning due to the lack of gravels, accumulated sediment, and an abundance of fines (i.e., sand) that can limit oxygen availability for the developing eggs and fry. Egg survival and emergence of young are negatively affected under these conditions.

Field observations by the ECAR reconnaissance team and an evaluation of existing literature has indicated that the major source of fine-grained sediments within the Secret and Miners Ravine systems is a combination of the following:

- Historic placer mining throughout the floodplains of Secret and Miners Ravine has upturned much of the alluvium within alluvial valleys, exposing sands and fine-grained material to the erosive forces of the stream channel. Existing channels flow through many areas where tailings have been left behind and continue to erode these materials from bed and banks, transporting them downstream.
- Off road vehicle use has denuded some bank and overbank areas throughout the Pleasant Grove and Dry Creek Watersheds. Where denuded areas are subjected to overland or concentrated flow from urban or natural runoff sheet erosion and scour occurs, transporting fine-grained sediments into the stream channel.
- Untreated overland flow and concentrated flow from urban development continue to erode the banks and transport sediments within the main channel. Lack of protection from stormwater outfalls and concentrated flows from stormwater run-off increase the potential for erosion along overbank areas, banks, and within channels.
- The underlying geology within the Dry Creek Watershed contains vast amounts of natural fine-grained decomposed granite particles. In a system that exhibits a changing hydrologic regime due to urbanization, the sediment transport capability of the stream channel is increased. The result can be observed through excessive bank or bed erosion and the increase in fine-grained sediments throughout the stream system.

[12] DCC, 2001



SAMPLING LOCATIONS AND PRIORITY EDUCATIONAL OPPORTUNITIES

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN

Sampling Locations
Priority Educational Opportunities
Creeks
Streets
County Boundary
Plan Boundary
Watershed Boundary

N

0 2,000 4,000
SCALE IN FEET

FIGURE 3-1

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

Digital base data provided by
City of Roseville & Foothill Associates

sampling sites.mxd

Table 3-1. Summary of Impacts to Creeks from Site Impairments[13]

	IMPAIRMENT							
REACH	**Sediment**	**Temp**	**Altered Flow**	**Invasive Species**	**Fish Passage**	**Water Quality**	**Vegetation Removal**	**Channel Alteration**
Dry Creek	High	Low	High	High	Med	Med	Med	High
Antelope Creek	High	Low	High	Med	Med	High	Med	Med
Miners Ravine	Med	Low	High	High	Med	Low	Low	Low
Secret Ravine	High	Low	High	High	Low	Low	Med	Med
False Ravine	Med	Low	Med	Low	Low	Low	Low	Low
Linda Creek	High	Med	High	High	Low	High	High	High
Cirby Creek	High	Med	High	High	Low	High	High	High
Strap Ravine	Low	Med	Med	Med	Low	Med	High	High
Pleasant Grove Creek	Low	Low	High	Med	Low	High	Med	High
South Pleasant Grove Creek	Low	Low	High	Low	Low	High	Med	High
Kaseberg Creek	Low	Low	High	Low	Low	High	Med	High

[13] Based on field and aerial photo assessment as documented in the ECAR. Rankings are relative and indicate level of impairment associated with a given impact.

3.2.2 *Water Temperature*

Water temperature is an important habitat characteristic when considering watershed quality in the City of Roseville. Water temperature determines what organisms will survive due to temperature tolerance. Temperature can be adversely influenced by reduction of streamside vegetation or shading, discharges into the water, soil erosion (high turbidity absorbs more sunlight) and alteration of flow.[14]

Elevated water temperatures (>22.7°C) may negatively affect the habitat conditions for both chinook salmon and steelhead trout during the fall/winter upstream migration period for adults and during the spring emigration period for juveniles. High water temperatures can promote disease because of induced stress, reduced growth and increased predation rates in chinook salmon.[15]

Steelhead trout are confined to the uppermost portions of the watershed (e.g. Miners and Secret Ravine) for rearing due to the consistently cooler summer temperatures. GANDA measured water temperature in Cirby and Linda creeks, at nine sites, as part of the reasonable and prudent measures outlined in the NMFS Biological Opinion for the Cirby-Linda Flood Control Project from 1998 to 2003.[16]

The following ranges were used for mean daily temperatures between acceptable and unacceptable for normal, daily, metabolic processes of salmonids: 20 to 22.8°C (stressful); 22.8 to 26.1°C (reducing scope for growth); and 26.1°C and above (lethal). On average the mean daily water temperatures in Linda Creek remained below 20°C after October/December, which is within the thermal tolerances for chinook salmon and steelhead trout.

Mean daily water temperatures in Linda Creek on average reached 20°C in May and exceeded 20°C through the summer months. In general, the high water temperatures (mean, maximum, and minimum daily values) would be detrimental to any salmonids rearing in Linda and Cirby creeks after early June.[17]

The Pleasant Grove watershed and the lower portions of Dry Creek are low grassland streams that are characterized by warmer temperatures and populated with temperature tolerant native and non-native fish populations. The tributaries in upper Dry Creek, especially Secret and Miners Ravine, have relatively cooler temperatures and represent the only tributaries that steelhead trout can survive during the summer months.

3.2.3 *Altered Stream Flows*

Changes in the hydrologic regime and resultant stream flows have been observed throughout the creeks within the Pleasant Grove and Dry Creek watersheds. Changes in flows are expected to continue as development increases.[18] Increases in peak flows and decreases in peak flow duration impact channel stability, channel geometry, bed substrate composition, and available salmonid spawning and rearing habitat. Changes

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[14] Dry Creek Conservancy, 2001

[15] Moyle, 2002

[16] GANDA, 1998, 1999b, 2000, 200a, and 2002

[17] GANDA, 2002

[18] JMM, 1992

in low flow conditions provide a significant constraint to aquatic organisms, fish migration, and the community structure of fishes.

Increases in peak flows affect stream channels by increasing sediment transport capacity. As sediment transport capacity increases, channel incision and bank erosion occurs, thus altering existing channel geometries over several high flow events. Secondary impacts that may be observed during the process of channel incision and bank erosion include increased sedimentation within stream channels. This occurs as sediments are scoured or eroded from stream banks and channels and are transported downstream. The result includes a highly entrenched stream channel with substrates that contain a high concentration of fine-grained sediments or a clean bedrock channel bottom where all of the sediments have been removed.

Increases in peak flows due to urbanization typically coincide with the steepening of the recession limb of the local flood hydrograph. In about 25% of Roseville, notably the very upper drainages of Pleasant Grove, South Pleasant Grove, and Cirby creeks, and most of the Secret, Miners, and False Ravine drainages this is not a critical issue since the underlying Merhten formation geology sheds stormwater runoff at nearly the same rate as developed hardscape. In the remaining 75% of the City increased hardscape associated with development can be expected to contribute to the steepening of the recession limb since flows will peak sooner than they would if they had traveled over pervious, vegetated surfaces. During the wet season, the receding limb of the hydrograph generally provides the most stable flow conditions available for salmonid spawning. A steeper recession limb causes the dewatering of available spawning habitat at a more rapid pace, forcing spawning fish to more confined areas of the channel. This shortening of the recession limb of the hydrograph has been linked to redd superimposition in many systems throughout the Sacramento / San Joaquin Bay Delta system, and could be an issue for salmonid spawning success in the Dry Creek system. (The Pleasant Grove system is currently too warm and lacks the proper channel structure to support salmonids.)

Peak flows occurring during storm events have been estimated to increase by 10 to 30 % over time due to the urbanization of the Dry Creek Watershed.[19] If not mitigated for, the changing hydrologic regime may alter channel and substrate characteristics within Secret Ravine, Miners Ravine, and Dry Creek. Further investigation is needed to evaluate the cumulative impacts of these hydrologic changes.

Salmonid spawning and rearing success are dependent upon adequate flow during several important life stages, and their initiation is influenced or triggered by flow. Low fall flows affect the ability of salmonid adults to migrate to tributary spawning sites, consequently, controlling the timing of spawning cycles. Many of the valley streams and creeks do not have sufficient flows to allow adult migration until rains have increased discharge during the fall months. Storm water events can also affect reproduction and juvenile survival by introducing higher sediment loads and pollutants at critical periods. Winter floods can result in sedimentation or scouring of redds, or can wash rearing fry downstream.[20]

When low flow conditions exist in streams, salmonids may become less abundant, while slow flowing-adapted species such as bluegills may increase in abundance.[21] Another

[19] Poff and Allan, 1995

[20] GANDA, 1999b

[21] JMM, 1992

adverse factor of low flow conditions is the blocking of migration routes caused by obstacles in a stream (e.g. pipes that intersect the stream and large beaver dams) that can become barriers to migration if there is not sufficient water flowing over the structure to allow fish passage.

GANDA calculated relative flow for Cirby-Linda Flood Control Project by using the Champion Oak Drive gauge from 1998 to 2001 and the Indian Creek Drive gauge for 2001 to 2002. Yearly flow results from 1998 to 2002 can be found in GANDA 1999b, 2000, 2001a, and 2002. The distribution and abundance of non-salmonids from 1998 to 2003 between January and May generally was associated with flow. Large precipitation events combined with natural basin morphology and urban development result in flash flooding in Linda and Cirby creeks that displace resident fish populations from the exposed juvenile salmon sampling sites to protected areas (i.e., pools with deep undercuts) on nearly a per-storm basis. The trend of resident fish displacement from GANDA sampling sites during high flow events is also apparent for catch numbers of hitch, pike minnow, sucker, and mosquito fish by species, in addition to total catch numbers.

3.2.4 Non-native Invasive Plant and Animal Species

A variety of non-native invasive plant and animal species have become established in Roseville's creek corridors and threaten the balance of the ecosystem. Locations for known populations of some of the most problematic species are mapped in Figure 3-2. These non-natives compete aggressively for resources to the detriment of many native species. Since ecosystem function is interdependent across species, an unbalance in the native vegetation can also adversely impact native fish and wildlife. An overabundance of certain non-native fish and wildlife species can similarly affect certain plants species.

Non-native fish have radically changed the nature of California’s fish assemblages and have become the most abundant fishes in many waterways. Predation by non-native species on salmonid fry and juvenile fish is contributing to the decline of salmonid populations and is a major limiting factor affecting other native species. Other effects of non-native species on native populations include habitat interference, disease, and hybridization.[22]

Non-native fish are most commonly found in waterways modified by human activity (e.g., the Pleasant Grove Creek watershed and the lower tributaries of the Dry Creek watershed) in comparison to locally adapted native fish that persist in less disturbed habitat such as the upper tributaries of the Dry Creek watershed. Many non-native species which include mosquitofish, bullhead, green sunfish, golden shiner, bluegill, and largemouth, smallmouth and spotted bass are found throughout the City, although temperature tolerant native fish including hitch, Sacramento sucker, and Sacramento pikeminnow also dominate much of the Dry Creek watershed.[23]

A number of non-native, invasive plant species can also be readily found in Roseville creek corridors. Arundo (*Arundo donax*), commonly called giant cane or giant reed, is a fast growing plant resembling bamboo. It can grow up to four inches a day and up to 30 feet tall. Arundo grows in moist places, usually along streams and ditches. It was

[22] Moyle, 2002.

[23] GANDA, 2002

introduced in California by Spanish missionaries and was originally used for building material. It is still used for reeds in musical instruments and as an ornamental plant. Arundo is alien to North America and provides little food or habitat value for insects, birds and other wildlife.[24]

Arundo spreads quickly even in thickly vegetated areas, and crowds out native plants. When sections of the stem or root break off, they float downstream to start new colonies. Eventually the colonies merge into a single, large infestation. Arundo out competes other streamside plants because it grows quickly, provides little forage and survives fire. It displaces shade trees that cool the stream, such as willows, cottonwoods, and alders. An unchecked Arundo infestation can reduce a rich streamside ecosystem to a monotypic stand of pure Arundo. This process of Arundo infestation has completely dominated some streams in many states and in southern California. Within the City's creek systems Arundo is found in Linda Creek and other streams throughout both watersheds. Arundo adds yet another stress to the City's creeks and riparian ecosystem. Arundo has a huge thirst and sucks up water that could be supplying the native plants that benefit fish and wildlife. Arundo creates erosion and flooding problems. Its shallow roots are easily undercut by stream flow. The roots slump and break away from stream banks, taking soil with them. Clumps of Arundo float downstream and clog culverts and channels causing flooding. Large Arundo infestations can alter stream flows by re-directing the water against stream banks and eroding them.

Red sesbania (*Sesbania punicea*), also known as Scarlet Wisteria or Rattlebrush, is another problematic invasive plant in the City's creek corridors. Red sesbania has escaped ornamental cultivation and is rapidly becoming established along creek banks throughout Sacramento and Placer counties. In the Dry Creek watershed, the most significant populations are downstream from the City of Roseville, but the species produces abundant quantities of highly viable seed that are readily transported throughout the waterways. Red sesbania grows very rapidly and develops into thick clusters that can crowd out native riparian plant species. Mature specimens may be up to 15' tall with 6" diameter trunks. Masses of these large plants growing along the creek edges can constrain flood conveyance, and redirect flow in a manner that contributes to erosion.

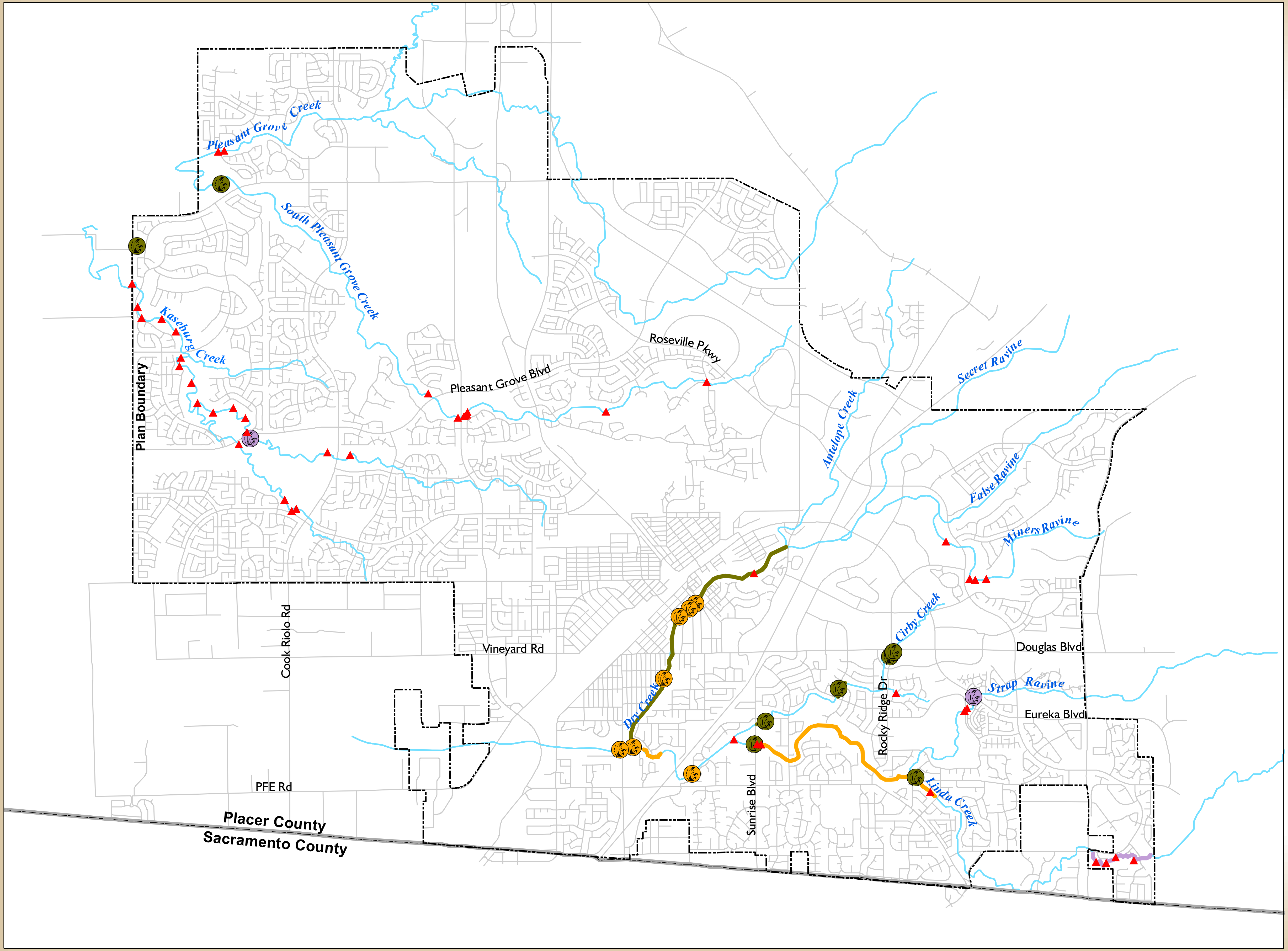
Water hyacinth (*Eichhornia cassipes*) is an aquatic non-native invasive plant species. It forms dense, free-floating mats that can quickly eliminate other native aquatic plant and animal communities competing for nutrients, oxygen, and light. As a free-floating organism, water hyacinth can easily be spread throughout the creek system. It is extremely hardy and can tolerate a wide range of water levels, flow velocity, temperature, nutrient levels and toxicity. Its substantial quantity of biomass can cause flood control problems by choking culverts and constricting channel flow. As the biomass decomposes, there is an increased amount of organic material in the creek sediment which can substantially damage fish spawning and water fowl habitats by altering the water oxygen balance and substrate conditions. Control of water hyacinth is very challenging since the species reproduces both vegetatively and by seed. Manual control requires complete removal of all roots, which is a difficult standard to achieve. Herbicides are effective but will also damage or kill other beneficial aquatic organisms.

Other invasive plant species with potentially negative impacts include Himalayan blackberry, vinca spp., pampas grass, tree of heaven, and others. Cattails, while they are

[24] www.ceres.ca.gov/tadn

a native species, may also need controls because they are a very aggressive species and quickly establish monocultures that can choke the creek flows and reduce channel capacity. A City-wide non-native invasive plant management plan is needed to ensure an efficient and effective control program. Such a plan would need to be properly coordinated with adjacent jurisdictions so that it reflects a regional strategy and consensus. During the summer of 2004, the City of Roseville participated with SAFCA in a red sesbania removal project that targeted the species throughout the Dry Creek watershed.

Another significant non-native specie found in Roseville's creeks corridors is the American beaver. Beaver are one of the most evident modifiers of ecosystem conditions in the creek corridors in both the Dry Creek and Pleasant Grove watersheds. At naturally managed population levels, they contribute to habitat diversity by creating open water habitats, and creating dams that can trap sediment. However, beavers have direct impact on riparian vegetation both by culling healthy trees and by creating dams that detain water and inundate sections of riparian woodland. Inundation will often kill healthy trees, and oaks are particularly susceptible. Additionally, the slow moving water behind beaver dams is prime habitat for invasive aquatic plant species such as water hyacinth. Since the natural predators of beaver, such as coyote and bobcat, are uncommon in the urban context the potential for these impacts to occur is significant.



INVASIVE SPECIES LOCATIONS

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN

County Boundary
Plan Boundary
Creeks
Streets

Invasive Species

Arunda
Cattails
Hyacinth
Beaver Dams

N

0 2000 4000
SCALE IN FEET

FIGURE 3-2

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

Digital base data provided by City of Roseville & Foothill Associates

3.2.5 Fish Barriers

Fish barriers are obstacles that prevent or delay fish from moving either upstream or downstream and can include dams, weirs, floodgates, roads, utility crossings (pipelines), beaver dams, bridges, causeways and culverts.[25] Adult and young fish need to migrate throughout a stream system year-round in order to find suitable habitat. As stream flow increases and decreases, fish search for areas that meet their needs for feeding, resting, spawning, rearing, etc. The presence of artificial or natural created fish barriers can deny or delay access to critical spawning and rearing habitat for salmonids. Consequently, loss of access to habitat reduces overall salmonid productivity and may result in loss of salmonid populations.[26] Partial barriers, as a result of rainfall patterns and other sources of stream flow, influence run timing and geographical distribution, and have the potential to divert adult chinook salmon to less suitable habitats, or to induce overcrowding, which results in adults superimposing their redds on top of the redds of previous spawners.[27] Barriers can also cause fish to congregate in areas below or above the barrier leaving them vulnerable to predators, including humans, and can create unsuitable living and breeding conditions that can increase disease incidence.[28]

In many places on Linda creek sewer pipes encased in concrete are potential barriers to fish passage during some flows.[29] Other examples of barriers were documented by Mr. Steven Thomas (2001) of the National Marine Fisheries Service who evaluated potential fish passage barriers in the Roseville area. Mr. Thomas reports that Cottonwood Dam on Miners Ravine above the city limits poses a certain barrier to fish passage under all imaginable flow conditions. The sheer face of the dam, rising 10 to 15 feet, presents a substantial barrier for up-migrating salmonids. Additionally, the dam prevents sediments from moving downstream; instead they fill the pond above. Mr. Thomas suggests that options for dam removal be investigated. Other observations in Roseville include utility pipe crossings on Secret Ravine and Dry Creek that are obstacles to migrating adult salmonids during low flow conditions. Mr. Thomas recommends modifications to these utility pipe crossings to avoid delay to upstream migrating fish and to prevent possible injury from abrasion as fish negotiate past the concrete casings. Conceptual plans for fish passage improvements for these two low flow barriers located in Roseville are included in Appendix E.

3.2.6 Water Quality

Storm water runoff from road surfaces and urban land uses, such as residential, commercial, and industrial development, contain many harmful contaminants that affect water quality, which in turn affects fish health and habitat quality.[30] Road surfaces and parking lot discharges are often heavily laden with semi-volatile organic compounds such as oil and gas residues. Runoff from golf courses and residential lawns may contain

[25] Moyle, 2002

[26] Dry Creek Conservancy, 2001

[27] Ayres, 2003

[28] Dry Creek Conservancy, 2001

[29] GANDA, 1999a

[30] Roseville is on a city-wide sewer system so the potential for adverse impacts to humans associated with pathogens and bacteria is minimal. No public drinking water is derived from untreated creek flow.

contaminants from herbicide, pesticide and fertilizers. Kaseberg Creek and South Branch Pleasant Grove Creek both contain reaches that flow through golf course land. South Branch Pleasant Grove Creek just above its confluence with the main stem of Pleasant Grove Creek shows significant summertime flows indicating urban runoff, most likely from residential irrigation and/or the upstream golf course.

Discharges from outfalls or culverts are a major source of contaminants and water quality degradation. It is difficult to treat water flowing from outfalls or culverts before it enters the stream system. Source controls are often the best methods to reduce the amount of contaminants entering the water bodies from adjacent land uses.

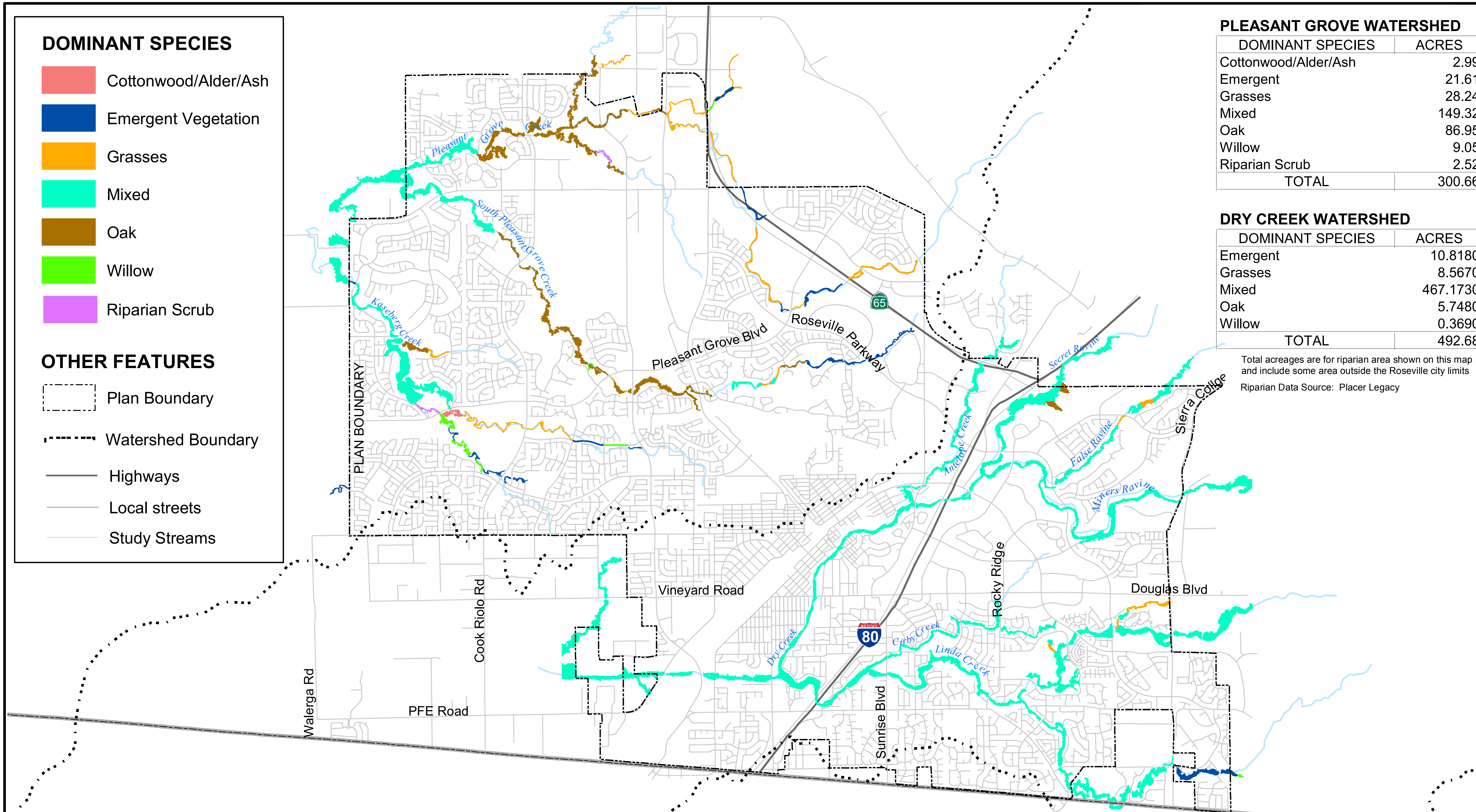
GANDA is currently assisting the City of Roseville with a three-year water quality and sediment monitoring program. The monitoring program is consistent with the City's commitments made during the National Marine Fisheries Service (NMFS) Section 7 Consultation for the East Roseville Parkway/Miners Ravine Bridge project. Analytical samples are being collected at six locations and evaluated to determine is any trends are evident.

Heavy metal analysis will be conducted on arsenic, barium, cadmium, chromium III, chromium IV, copper, iron, lead, magnesium, mercury, nickel, selenium, silver and zinc. Organic water quality analysis will include gasoline, methyl-tert-butylether (MTBE) and benzene, toluene, ethylbenzene, and xylene (BTEX). Inorganic water quality analysis will include Nitrate/Nitrite and Total Phosphorous. Pesticide analysis will include carbaryl, diazinon, endosulfan (alpha & beta), 2,4-D, and malathion. These samples will be taken between the period April and September 2003, 2004, and 2005 and during the first annual precipitation event for each year of monitoring. Sediment monitoring will be conducted for a period of three years commencing in 2004, 2005, and 2006.

3.2.7 Riparian Vegetation

Figure 3-3 and Figure 3-4 show the classification of riparian vegetation in the City's creek corridors by dominant species and percent canopy cover. Creekside riparian vegetation improves fish habitat by stabilizing the banks against erosion and by shading the water from the heat of the sun. Terrestrial insects dropping from overhanging bank vegetation may be an important source of food for fish in some seasons of the year, and vegetal detritus contributes to the flow of nutrients which sustain the invertebrate population of a stream. Streamside trees and shrubs provide shade and help to keep the water cool. The root systems of riparian vegetation help prevent erosion, while large organic debris (such as fallen logs) in the stream channel protect fish from predators and floods.[31] Healthy riparian vegetation helps maintain water quality by filtering sediment and nutrients, and by moderating the duration and magnitude of storm runoff.

[31] http://www-heb.pac.dfo-mpc.gc.ca/water



PLEASANT GROVE WATERSHED

DOMINANT SPECIES	ACRES
Cottonwood/Alder/Ash	2.99
Emergent	21.61
Grasses	28.24
Mixed	149.32
Oak	86.95
Willow	9.05
Riparian Scrub	2.52
TOTAL	300.66

DRY CREEK WATERSHED

DOMINANT SPECIES	ACRES
Emergent	10.8180
Grasses	8.5670
Mixed	467.1730
Oak	5.7480
Willow	0.3690
TOTAL	492.68

Total acreages are for riparian area shown on this map and include some area outside the Roseville city limits

Riparian Data Source: Placer Legacy

DOMINANT SPECIES IN RIPARIAN AREAS

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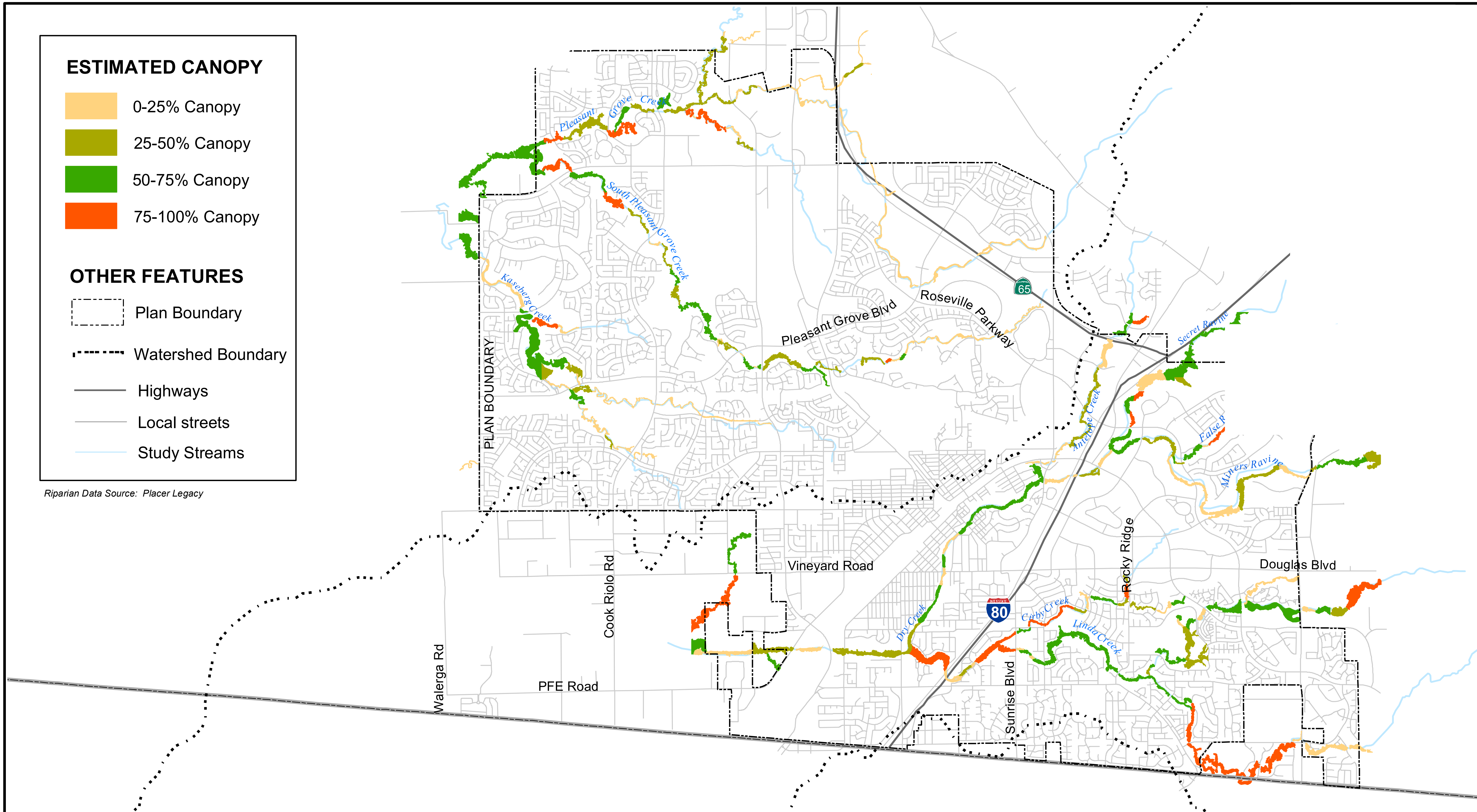
N

SCALE 0 2250 4500 Feet

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT RESTORATION PLAN

FIGURE 3-3

riparian species.mxd



PERCENT CANOPY COVER IN RIPARIAN AREAS

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ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

N

SCALE 0 2250 4500 Feet

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT RESTORATION PLAN

FIGURE 3-4

westrip canopy.mxd

In developed areas with little riparian vegetation such as the Pleasant Grove watershed and the lower tributaries of the Dry Creek watershed, runoff flows through gutters, storm drains, or off roadways, bypassing the naturally intended riparian filter. Although stream bank erosion is a natural process, it is greatly accelerated when development moves into the riparian zone, confining creek channels and greatly reducing floodplains and wetlands. This impacts the force of water and where sediments are deposited.[32] Secret Ravine and Miners Ravine currently have the healthiest aquatic habitat and most intact riparian vegetation in the City of Roseville, and are, therefore, the most viable habitat for salmonid success. Bank stability, low erosion and sediment input, and cooler water temperatures are all associated with healthy riparian vegetation found in these upper tributaries.

3.2.8 Channel and Floodplain Alteration

Stream straightening, or channelization, occurs when activities associated with urbanization, mining, or agricultural practices have encroached into the existing floodplain or where stream realignments/alterations have taken place. Stream straightening is very destructive to the habitat in and around the stream and disruptive of the hydrologic functioning of the system. In many historical cases, stream straightening has occurred in an effort to increase flood conveyance, reclaim a floodplain for agricultural uses, or otherwise reconfigure the stream to better suit the adjacent land uses. Straightening is not performed as often today as it was in the past because the detrimental effects are better understood. Extreme disruption of riparian and aquatic vegetation occurs in the process of constructing the new stream channel. Additionally, an increase of floodwater flow through a channel increases the potential for erosion on creek beds and banks. In order to counteract the increased potential for erosion, banks and creek beds are often armored with concrete or rip-rap. If left untreated, incision of the stream channel occurs, further degrading riparian vegetation due to increased depth to groundwater. Increased erosion also results in increased siltation downstream of the straightened section where the water slows and deposits its sediment load. This causes aggradation to occur in the downstream channel while the increased sediment transport capacity often causes the straightened section to downcut, often forming a nick-point that progresses upstream over time.

Straightening or channelization has affected virtually all of the streams within the Pleasant Grove and Dry Creek watersheds at some point in time. Kaseberg Creek at the western City limits has been encroached by residential development and adjacent golf courses. Near the city limits, the channel has been altered and is now a straight trapezoidal channel. Near Country Club Drive, Kaseberg Creek has been completely covered by a residential development. The creek now runs within a culvert beneath the ground. Pleasant Grove Creek shows signs of channelization near its upstream agricultural areas. Within the Dry Creek watershed both Miners and Secret Ravines have been channelized by urban development, construction of flood control facilities, and historical placer mining activity. Evidence of channelization and straightening is exhibited on Secret Ravine near the City limit and downstream of its confluence with Miners Ravine, and on Miners Ravine near Sierra College Boulevard. Further, Dry Creek, Linda Creek, and Cirby Creek have been significantly affected by the encroachment of residential development and other impacts related to urbanization and construction.

[32] GANDA, 2001b

3.3 Desired/Ideal Conditions

3.3.1 Fishery Habitat Requirements

The Dry Creek and Pleasant Grove watersheds provide sufficient habitat for two distinctly different types of fish communities. Within Dry Creek, much of the aquatic habitat is suitable for a cold-water fishery, able to support populations of resident and anadromous species of salmonids in addition to a variety of other fishes. Within the Pleasant Grove Watershed, the aquatic habitat is suitable for a warm-water fishery and is able to support a variety of warm-water fishes found in the Dry Creek Watershed and other types of fishes that are not suited to the cooler conditions of the Dry Creek Watershed.

Within the Dry Creek Watershed, a variety of habitat requirements are necessary for cold-water anadromous salmonids such as chinook salmon and steelhead trout. Initially salmonids must be allowed access to spawning grounds (dams, small openings, and low flow levels can all prevent access). Suitable habitat requirements for salmonids also consist of appropriate substrate types including gravel and cobble to provide adequate spawning substrate and microhabitat for fry emergence. Consequently sediment free substrate is important. Gravel size preferred by steelhead trout is generally 2 to 3 inches in diameter and 4 to 6 inches for chinook salmon. Suitable salmonid juvenile habitat requires a mixture of epifaunal substrate, cover (e.g. undercut banks, logs, tree roots, pools) riffles and pools.

Water temperature must also be relatively cool during juvenile growing periods. Chinook salmon and steelhead trout prefer cool water temperatures between 4.4 - 15.5°C and become stressed in water above 18.3°C. Riparian cover is an important element for salmonid habitat because it shades the water creating cooler water temperatures and can provide shelter for juvenile salmonids.

Chinook salmon and steelhead trout are both sensitive to water quality levels such as dissolved oxygen, pH, turbidity and low levels of toxins in the water.[33] A description of the natural history, distribution and current status of steelhead trout and chinook salmon is included in Appendix A of the ECAR. In the Dry Creek watershed MIN- 1 and SEC-1 demonstrated the best habitat for salmonids with a mixture of favorable conditions (good in-stream cover and a viable spawning substrate). In general, Miners Ravine and Secret Ravine represent the highest quality habitat for salmonids within the Dry Creek watershed. Native and non-native warm water fish persist in the same areas as salmonids but also thrive in areas that are unsuitable salmonid habitat. Although favorable warm water habitat is a mixture of epifaunal substrate, in-stream cover (e.g. undercut banks, logs, tree roots, pools) riffles and pools, warm water fish can thrive in situations not conducive for salmonids due to a wider range of environmental tolerances. For example, Largemouth bass can persist in water temperatures up to 36.1-37.2°C, with optimal temperatures between -3.9 to - 1.1°C. Several of the native and non-native warm water fish within the City's creek system can tolerate high water temperatures typical of summer conditions, lower riparian shading, and substrate that is filled with fine sediment.

In general, much of the Pleasant Grove watershed possesses substrate that is generally sandy with minimal riparian vegetation cover. This area is suitable warm water habitat and supports a variety of native and nonnative species that are also important to the

[33] GANDA, 2001b

City's creek diversity. This situation also exists in the Dry Creek watershed (e.g., Linda and Cirby creeks and stretches of lower Dry Creek) where large sections of these creeks have been filled in with sediment or where large pools have formed (e.g. under Atkinson Street Bridge) creating higher temperatures and suitable warm water fish habitat.

3.3.2 Riparian Habitat and Hydro-Geomorphic Requirements

In defining the desired conditions for streams within the City of Roseville, the field reconnaissance team selected reference sites that exhibited the most representative characteristics of healthy, diverse, and properly functioning stream systems. From these select reference sites, the desired attributes associated with their biological and physical form and function were measured. Morphological and biological relationships were evaluated and the most beneficial channel and riparian characteristics were recorded. Due to the differences in hydrology, gradient, geology, and habitat communities of the Pleasant Grove and Dry Creek Watersheds slightly different benchmarks were identified for each watershed.

Positive factors with respect to aquatic and riparian habitat and hydro-geomorphic function included healthy riparian vegetation having multiple canopy layers and providing shade to the stream surface over 40% of its area or greater, large woody debris in the creek channel, standing snags, stable banks exhibiting little or no erosion and having good vegetative cover, a well connected and established floodplain, absence of conflicting land uses, no evidence of contaminants in the water, presence of pools and riffles, good substrate with low embeddedness, and overhanging root masses.

Beneficial hydro-geomorphic stream parameters were identified for the Pleasant Grove and Dry Creek Watershed. Parameters were chosen based upon the sites ability to provide adequate aquatic habitat, good hydraulic diversity, functional maintenance mechanisms, and stable geometric relationships. These parameters included sinuosity ratios (ratio of channel length to valley length), bankfull width-to-depth ratios, bed substrate characterizations, channel gradient, and bankfull characteristics with respect to drainage area.

In the Dry Creek watershed, sites Secret Ravine 1 (SEC-1) and Miners Ravine 2 (MIN-2) exhibited most of these factors. Vegetation communities were generally healthy and diverse and streambed substrate was good.

In addition to the beneficial biological features of reference site MIN-2, many functional morphologic relationships were represented as well. A healthy riffle pool sequence was observed with several alternating point bar features. Riffles along the MIN-2 reach occurred approximately every 7 to 12 bankfull widths. Pool size and depth varied. Many pools were 2.5 to 3 feet in depth. Limited to no channel incision was identified at these reference sites. Floodplains in this reach were relatively narrow but seemed as if they would be accessed during flows slightly above the bankfull discharge. The channel banks appeared to be well vegetated and very stable along this reach. Channel width-to-depth ratios at MIN-2 were very similar to other less impaired locations along Miners Ravine, indicating a stable channel configuration. Although this section of Miners Ravine possessed sinuosity ratios of 1.1, other sections of Miners Ravine (i.e. MIN-1) exhibited a sinuosity ratio of 1.7.

For many of the stream systems within the Dry Creek Watershed, sinuosity ratios ranging from 1.3 to 1.5 would be beneficial. In several areas within Linda, Cirby, and Miners Ravine sinuosity ratios approaching 2.0 would be appropriate.

Along the reference reach SEC-1, other very beneficial attributes were observed. Again the pool riffle sequence was well established with riffles spaced, on average, every 5 to 10 bankfull widths apart. Relatively new alternating point bars were present indicating adequate sediment transport mechanisms and continuity with upstream reaches. The newly deposited material ranged from sands to fine gravels and was not excessive. Instream woody material such as logs, snags, and root-wads were present throughout the reach providing additional hydraulic diversity. All of the hydraulic regimes were present: fast shallow; slow shallow; fast deep; and slow deep. Near these roughness objects it was apparent that gravels and small cobbles were better separated from fine-grained sediments such as sand, leaving riffles much less embedded than in other reaches. Pools were sporadic with depths ranging from 1.5 to 3.5 feet. The channel itself showed little to no sign of incision along this reach.

In the Pleasant Grove watershed South Pleasant Grove Creek 2 (SPG-2) exhibited many desired characteristics. The sinuosity ratio was measured to be 1.9. In many of the tributary streams within Pleasant Grove watershed, sinuosity ratios approaching 2.0 provide good habitat opportunities. However in Pleasant Grove Creek the target sinuosity ratios should approach 1.3 since it is a larger creek. SPG-2 exhibited healthy bankfull channel geometry. Entrenchment ratios along South Pleasant Grove Creek ranged from 2.0 to 4.8 and are indicative of the stream type and its transition during the surrounding urbanization. Width-to-depth ratios range from 8 to 10. Bed substrates within SPG-2 range from well-graded small gravels in riffle sections to very fine gravels, sands, and silts in pool sections. Smaller material sizes than observed within the Dry Creek Watershed are representative of the South Pleasant Grove, Kaseberg, and Pleasant Grove Creek channels. This is due to the lower gradients and less severe flood regime of the watershed.

3.4 Site Specific Assessment and Prioritization

During the development of the ECAR, 16 sites felt to be most representative of the diversity of the two creek systems sites were assessed in the field (Figure 3-1) using field protocols adapted from standard United States Department of Agriculture (USDA), California Department of Fish and Game (CDFG), and California Native Plant Society (CNPS) protocols. The conditions of these sites were then scored as presenting poor, marginal, suboptimal, or optimal habitat conditions according to the protocol scoring scheme in which 1 represented the worst conditions and 20 represented the best conditions based on resource values. Of the 16 sites evaluated, 6 were felt to provide significant opportunities for restoration and were classified as either a High or Medium priority restoration site. A brief discussion of these sites is provided here and a summary of the results documented in the ECAR is presented in Table 3-2. Chapter 5 of this Plan discusses these sites in more detail, and includes specific recommendations for restoration to improve the ecological functioning of these sites while maintaining flood conveyance capacity. Chapter 5 also discusses other factors that should be considered in the overall prioritization of restoration sites, such as the City's vision for downtown redevelopment related to Dry Creek, goals of the City's Stormwater Management Plan, education, and available funding opportunities.

Table 3-2. Summary Results of Protocol Surveys

Protocol	PGC-1	PGC-3	PGC-4	SPG-1	SPG-2	SPG-4	SPG-6	KAS-1	KAS-2	KAS-3	SEC-1	SEC-2	SEC-3	MIN-1	MIN-2	MIN-3
1. Epifaunal Substrate/ Available Cover	13	0	1	11	6	6	5	8	10	9	17	13	11	13	17	1
2. Embeddedness	5	0	4	3	4	1	4	19	3	3	13	8	7	13	14	1
3. Velocity/ Depth Regimes	11	6	1	11	0	0	1	9	7	3	19	15	10	14	14	1
4. Sediment Deposition	5	0	1	8	1	0	1	15	2	2	10	7	2	18	15	n/a
5. Channel Flow Status	8	1	0	8	0	0	1	13	11	2	19	19	12	18	19	18
6. Channel Alteration	13	3	1	17	17	12	1	4	19	18	15	11	14	19	16	3
7. Frequency of Riffles (or Bends)	0	0	1	14	0	0	2	1	2	1	18	10	12	13	18	0
8. Bank Stability	7	13	16	14	14	12	12	15	18	12	15	14	8	16	18	16
9. Vegetation Protection	16	3	8	13	12	14	10	15	18	12	18	16	8	16	18	1
10. Riparian Vegetation Zone Width	13	1	8	7	10	4	10	5	4	2	16	13	8	8	17	1
CDFG Total	**91**	**27**	**41**	**106**	**64**	**49**	**47**	**104**	**94**	**64**	**160**	**126**	**92**	**148**	**166**	**42**
11. Hydrologic Alteration	11	10	19	15	14	12	19	17	18	15	16	16	13	18	18	2
12. Water Appearance	8	3	8	9	n/a	1	5	9	12	14	15	17	15	11	16	2
13. Nutrient Enrichment	9	8	9	5	9	5	6	11	11	15	17	17	17	14	14	1
14. Barriers to Fish Movement	18	n/a	15	13	15	12	13	19	11	13	18	12	20	3	19	5
15. Instream Fish Cover	15	5	5	12	10	9	6	8	14	9	20	18	7	14	19	2
16. Pools	9	n/a	6	10	10	6	8	10	6	8	12	9	7	9	10	1
17. Coldwater Fishery Canopy Cover	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12	11	11	6	17	n/a
18. Warmwater Fishery Canopy Cover	18	1	2	18	5	5	4	1	19	16	17	17	17	19	16	3
19. Riffle Embeddedness	n/a	n/a	n/a	n/a	n/a	n/a	n/a	19	n/a	n/a	13	6	5	15	13	n/a
20. Local Erosion	15	16	6	7	6	11	3	13	16	13	19	11	2	14	19	15
USDA Total	**103**	**43**	**70**	**89**	**69**	**61**	**64**	**107**	**107**	**103**	**159**	**134**	**114**	**123**	**161**	**31**
USDA and CDFG Total	**194**	**70**	**111**	**195**	**133**	**110**	**111**	**211**	**201**	**167**	**319**	**260**	**206**	**271**	**327**	**73**
Total/ # of protocols	**11**	**4**	**6**	**11**	**8**	**6**	**6**	**11**	**11**	**9**	**16**	**13**	**10**	**14**	**16**	**4**
Reach Scoring	**S**	**P**	**M**	**S**	**M**	**M**	**M**	**S**	**S**	**M**	**O**	**S**	**M**	**S**	**O**	**P**

Reach Ranking: 0-5=Poor (**P**), 6-10-Marginal (**M**), 11-15=Suboptimal (**S**), 16-20=Optimal (**O**)

3.4.1 High Priority Sites

Two sites were identified as having high priority for restoration because they present significant opportunities to achieve a high level of post-restoration ecosystem value. The sites are currently considered to be marginal (SEC-3) and poor (MIN-3).

SEC-3

This site is located on Secret Ravine just south of the City limits. Major problems at the site include off-road vehicle use, channel incision, and lack of riparian diversity. Recommended solutions include prohibiting off-road vehicles, establishing regular policing to ensure regulations are followed, restoring the floodplain by laying back the channel banks and creating terraces, realigning the low-flow channel in some areas, and revegetating the stream banks using grasses and sedges or willow stakes, followed by shrubs and trees once the banks are stabilized. A monitoring plan will need to be implemented to ensure the restoration is successful. Temporary irrigation may also be required. Key factors in the potential for a successful restoration project at this site include the relatively high potential for hydraulic variability in the channel and access to floodplain.

MIN-3

Miners Ravine at this site is adjacent to abandoned wastewater treatment ponds west of Sierra College Boulevard. The Placer County Flood Control District is currently exploring the feasibility of implementing an off-channel detention/wetlands restoration project in this location. The detention area would be connected to the channel at the upstream end by a weir that would allow creek flows to enter the detention area in storm events. A second weir at the downstream end of the detention area would gradually release flows back into the channel after the peak of the event had passed. It is anticipated that this hydrologic regime would result in the establishment of significant seasonal wetland habitat and open water habitat. Access to a relatively wide floodplain and the presence of some mature riparian vegetation are positive factors in evaluating the restoration potential for this site.

3.4.2 Medium Priority Sites

The following four sites also present important restoration opportunities, but are somewhat less of a priority than the two described above due to constraints at each site. All four of these sites are currently rated as marginal based on the field survey protocol.

KAS-1

Upstream of the golf course, Kaseberg Creek needs revegetation. The creek has good sinuosity in this area and a well-defined, low-flow channel. Through the golf course, the stream has a trapezoidal channel and is narrow. Revegetation is probably the only restoration technique that can be applied here, due to the narrowness of the available land.

SPG-6

South Branch Pleasant Grove Creek in general needs revegetation. The creek is adjacent to a large retaining wall at site SPG-6, and there is little riparian vegetation in this area. Some of these areas may not be appropriate for riparian trees due to the presence of Mehrten formations. Prior to developing a restoration plan for this site, it will be important to identify Mehrten formation locations and depths of soil to determine the vegetation appropriate for restoration efforts.

PGC-3

Upstream of Woodcreek Oaks, Pleasant Grove Creek is channelized with little or no large riparian vegetation. Restoration efforts appropriate here include widening of stream banks, realigning the stream channel, and revegetation.

SEC-2

Behind the United Artists' theater complex, habitat on Secret Ravine is poor, with a wide and straight stream channel having a rectangular cross-section and an absence of pools and riffles. The goals for restoration of this section should be to realign the channel to increase sinuosity and narrow the channel, as well as add structures and shelter for fish such as in-stream large woody material and/or large boulders. The purpose of narrowing the channel is to blow out the fine sediments and expose the gravel substrates. Any restoration to the channel would need to be consistent with the flood control strategy developed by the Placer County Flood Control and Water Conservation District and the City of Roseville.

3.4.3 Priority Educational Opportunities

Three additional sites have been identified as priority restoration sites due to their potential educational value and the stewardship desires of the adjacent landowners. These sites are also shown on Figure 3-1.

EDU-1

The first of these sites is located behind Adelante High School on Dry Creek. Restoration at this site should be given priority due to the proximity of the site to the school, the recently completed Urban Streams Restoration project downstream, and the interest of Adelante High School students and faculty to assist with project implementation and stewardship.

EDU-2

The second site is located on Strap Ravine next to the Maidu Interpretive Center. The primary goal of restoration at this location would be to eliminate the invasive non-natives (Himalayan blackberry, fig, etc.) from the creek channel and restore the native riparian community to illustrate the plant species that were an essential part of the lives of the Native Americans in this region. The Maidu Interpretive Center provides docent led tours and host field trips for local elementary schools. This site provides excellent opportunities for public education about the issue of non-native invasive plant species and their impacts on the creek habitat, as well as wetlands and associated endangered species habitat.

EDU-3

The third site is associated with the Woodcreek Nature Center immediately upstream of KAS-3. This area of the creek provides valuable environmental educational opportunities and is included in the docent led tours given by Woodcreek High School students to visiting elementary school groups. The Woodcreek Nature Center is the result of a partnership between the City of Roseville, the Roseville Joint Union High School District, and other local and environmental education organizations.

3.5 Generalized Assessments

In an effort to qualitatively map the Pleasant Grove and Dry Creek watersheds within the City's jurisdiction, generalized assessments were conducted to supplement the more detailed analyses of the ECAR. These assessments were made based upon a combination of the survey team's knowledge of these watersheds and interpretation of aerial photography. The generalized assessments of the quality of the creek and riparian corridors included extrapolation of specific metrics chosen from the CDFG and USDA assessment protocols as described in section 3.2 of the ECAR.

3.5.1 Methodology for Generalized Assessments

Three composite parameters were selected that were considered to be reliable indicators of ecosystem function, and the distribution and abundance of creek and riparian resources in the Pleasant Grove and Dry Creek systems. The three parameters were used to extrapolate the relative quality of creek and riparian conditions in the creek sections where fieldwork could not be accomplished between the ECAR sites. The three parameters used were as follows.

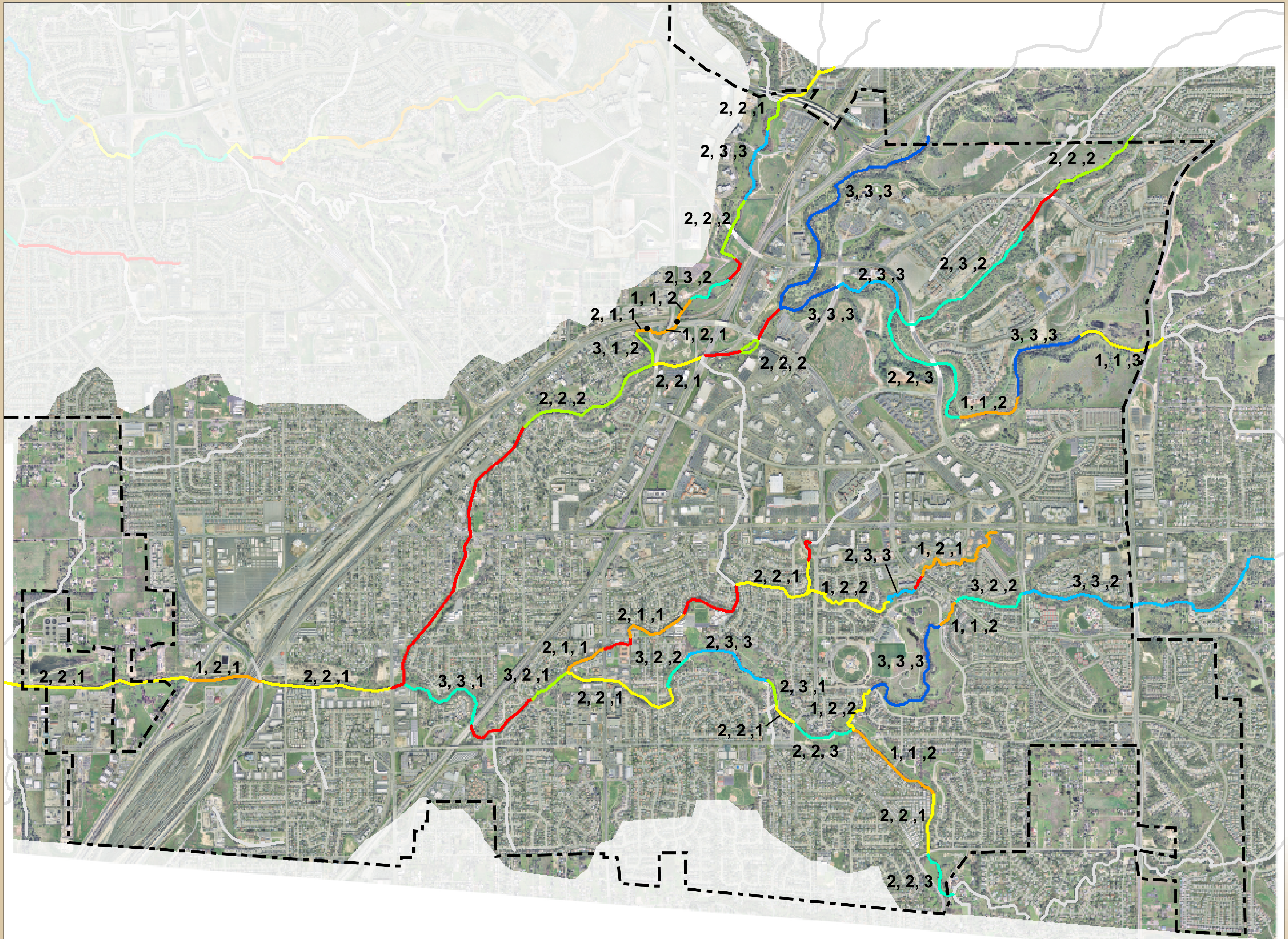
- Riparian Vegetation
  - Extent of Riparian Vegetation and Diversity
  - Channel Cover
  - Apparent Removal of Vegetation for Adjacent Land Use
- Channel Condition
  - Sinuosity and Potential for Hydraulic Variability
  - Apparent Channel Alteration
- Access to Floodplain
  - Degree of Encroachment by Structures and/or Developments

With the use of aerial photography, creeks were divided into reaches with similar characteristics. The multi-disciplinary team reviewed each reach individually. For each reach, a set of scores was assigned to represent the quality of each metric. The scores ranged from 1 to 3, with 3 being of the highest quality. For example, if a reach was given a score of 1-2-3 then the reach exhibited low quality riparian vegetation, moderate channel conditions, and high access to its' adjacent floodplain. To summarize the results, the scores were added together and each reach assigned a rating that corresponded to this sum. Thus reaches with higher scores were considered to have better existing or potential for ecosystem function. The reach scores were assigned to a GIS creek data layer and then overlaid on the aerial photograph (Figure 3-5 and Figure 3-6).

The level of confidence associated with the generalized assessments is less than the degree of confidence associated with the sampling sites where quantitative measurements were taken. Confidence in the generalized assessments is also subject to the variability of each watershed. For example, the confidence in the accuracy of generalized conclusions made for the Dry Creek watershed would be slightly less than those made for the Pleasant Grove watershed. This is due to the highly varied conditions observed in the Dry Creek watershed as compared to the more homogeneous conditions found in the Pleasant Grove watershed. Within the Pleasant Grove watershed, the survey teams generalized assessment is believed to be within a confidence range of 80%. In the Dry Creek watershed, the survey team's ability to produce a representative generalized statement was reduced slightly and the confidence level is in the range of 75%. In addition, the confidence level within the Dry Creek watershed was further affected due to the level of riparian cover obscuring channel conditions within the aerial photography.

3.5.2 Results of Generalized Assessments

Results obtained from the generalized assessments were used to identify high and low quality reaches and to evaluate where enhancement and restoration opportunities might be implemented quickly and economically to preserve high quality reaches. Constraints governing restoration strategies along a reach that scored low may be more prohibitive than along a reach that scored relatively high. For example, reaches possessing the highest possible score of 9 were identified as higher quality reaches. Restoration strategies may be implemented very quickly and easily to preserve their inherent benefit to wildlife and community. This is possible due to the fact that the level of degradation is more limited rather than extremely severe. As such, reach prioritization and implementation of restoration strategies are evaluated on a case-by-case basis later in this document. Prioritization and implementation of restoration strategies are discussed in Section 4 and 5.



STREAM CLASSIFICATION

DRY CREEK WATERSHED

ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN

COMBINED CLASSIFICATION

- Not Classified
- 3-Poor habitat/structure
- 4
- 5
- 6
- 7
- 8
- 9-Good habitat/structure
- Plan Boundary

See section 3.5.1 for classification methodology

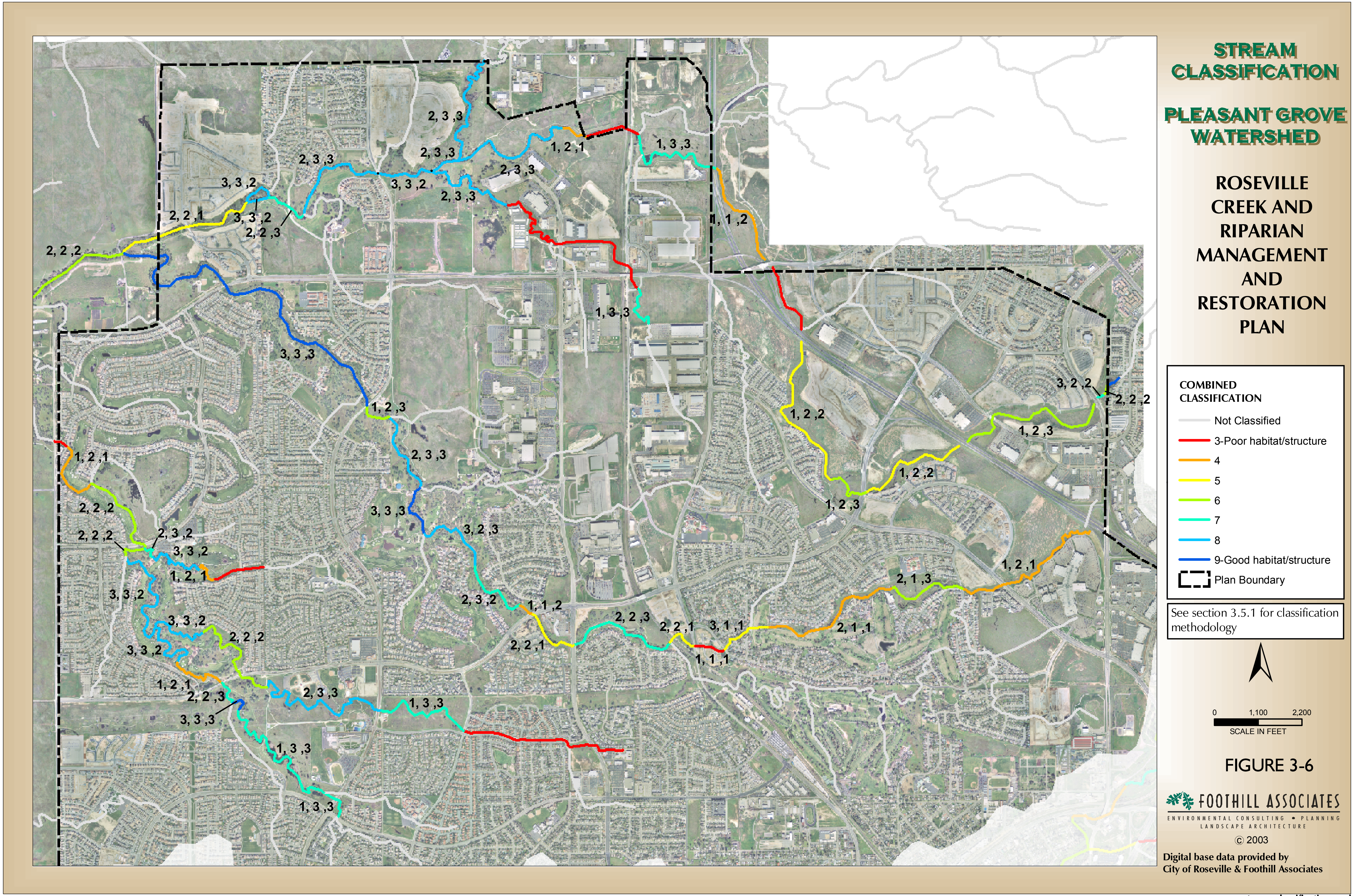
N

0 1,200 2,400
SCALE IN FEET

FIGURE 3-5

FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING
LANDSCAPE ARCHITECTURE

Digital base data provided by
City of Roseville & Foothill Associates


STREAM CLASSIFICATION
PLEASANT GROVE WATERSHED
ROSEVILLE CREEK AND RIPARIAN MANAGEMENT AND RESTORATION PLAN
COMBINED CLASSIFICATION
Not Classified
3-Poor habitat/structure
4
5
6
7
8
9-Good habitat/structure
Plan Boundary
See section 3.5.1 for classification methodology
0
1,100
2,200
SCALE IN FEET
FIGURE 3-6
FOOTHILL ASSOCIATES
ENVIRONMENTAL CONSULTING • PLANNING LANDSCAPE ARCHITECTURE
© 2003
Digital base data provided by City of Roseville & Foothill Associates

3.6 Data Gaps

The following is a summary of additional information that should be collected on the creeks in the City of Roseville to better support informed decision making and restoration planning. While all of these data gaps represent significant opportunities to improve understanding of how the City's creeks are functioning and evolving, it is assumed that the ability to gather additional information will be largely dependent on the future availability of resources expressly available for such purposes. Any monitoring and/or data collection on private land will also require the permission of the property owner.

3.6.1 Stream Flow Data

The City of Roseville and Placer County Flood Control and Water Conservation District maintain a number of stream level gauges in the Dry Creek and Pleasant Grove Creek watersheds which are used as part of the flood alert and management system. However, there are no flow data available for the Pleasant Grove watershed because the stream does not have any flow gauging stations installed. Increased development is dramatically impacting the hydrology and ecosystem of the Pleasant Grove watershed as evidenced by changes in channel morphology and vegetation. No comprehensive data are available to characterize the impacts. The flow data available for the Dry Creek Watershed is limited to a single gauging station located at the Vernon Street bridge and flood hazard warning gauges, which only record stream stage during high flows. The Dry Creek Conservancy is currently working to install flow gauges at two locations in Roseville: on Dry Creek just below the confluence of Miners Ravine and Antelope Creek, and on Linda Creek near Eastwood Park.

3.6.2 Vegetation Classification

Ground investigations of riparian vegetation classification for areas outside of the sampled study sites as well as data collection on additional study sites are recommended. Remote sensing applications could be used to better characterize the vegetation in and around the streams.

3.6.3 Water Quality Data

No historic data currently exists on the Pleasant Grove system. Better information on sediment loads, herbicides and pesticides, heavy metals and semi-volatile organic compounds would promote better decision making on point source and non-point source pollution management. The new Regional Pleasant Grove Wastewater Treatment Plant (PGWWTP) located near the western City limits will soon provide better water quality data. The Pleasant Grove/Curry Creek Ecosystem Restoration Plan, presently under development by Placer County, will include some water quality monitoring that will help provide a baseline water quality assessment for the watershed.

3.6.4 Sediment Transport Monitoring

At a minimum, a sediment budget for the Dry Creek Watershed should be conducted. This would provide additional information on source inputs, source control, channel aggradation/degradation rates, substrate composition. Tests to identify potential sediment toxicity problems should also be conducted.

3.6.5 Additional Fish Surveys on Pleasant Grove/Kaseberg Creek

Because the Pleasant Grove watershed fishery is significantly different than that found in the Dry Creek watershed, additional data characterizing the existing fish communities should be conducted. Flow changes associated with operation f the Regional PGWWTP should also be considered. This will also assist in providing accurate benchmarks for enhancement and/or restoration activities.

3.6.6 *Riparian Habitat Surveys*

Establishment of permanent trend sites to develop green-lines and cross-sections (based upon a protocol by the USDA) read every 2-5 years are recommended. These sampling methods can be used to indicate how much change has occurred in a particular riparian complex and can allow for an early evaluation of the effects of management on a particular area.

3.6.7 *Non-Native Invasive Species Surveys*

Non-native plant and wildlife species have historically affected the re-establishment of native riparian vegetation and the abundance of native wildlife within the watersheds. While some of the locations non-native populations are known, a comprehensive inventory of non-native species should be conducted and maintained to assist in developing effective management strategies. In 2004, large stands of red sesbania were inventoried and removed throughout the Dry Creek watershed, including the City of Roseville, through a grant funded project implemented by SAFCA.

3.7 Reference Reaches

Using observations and data obtained during the development of the ECAR and conclusions developed from the generalized assessments described previously, five reference reach descriptions have been developed for the unique conditions exhibited by the creeks in the City of Roseville. A reference reach description has been established for each of the following:

- Reference Reach A: Miners Ravine, Secret Ravine, False Ravine, and Antelope Creeks,
- Reference Reach B: Linda, Cirby, and Strap Ravine Creeks,
- Reference Reach C: Upper Pleasant Grove and Kaseberg Creeks
- Reference Reach D: Lower Pleasant Grove and Kaseberg Creeks, and
- Reference Reach E: Urbanized Stream Conditions.

The purpose of the reference reach description is to present a vision of the most beneficial and functional creek reach that could be obtained given the existing and potential future conditions of each creek system. Assumptions about existing conditions are based upon the results of the ECAR, observations made while conducting field surveys, and the professional judgment of the multi-disciplinary data collection and assessment team. Assumptions in association with future conditions are based upon the knowledge obtained from studies and plans that address development within the Pleasant Grove and Dry Creek watersheds. Both existing and future conditions were considered to the fullest extent possible while developing each reference reach description. The reference reach conditions should be revised continuously in an effort to adapt to results of future studies and/or alternations in the development of each watershed.

3.7.1 Reference Reach A: Miners Ravine, Secret Ravine, False Ravine, and Antelope Creek

Miners Ravine, Secret Ravine, and Antelope Creek provide for some of the most beneficial habitats available to wildlife and the community of the two studied watersheds. As a resource, this area should be managed as a cold-water fishery combined with rich diversity and thick riparian cover. This complex of creeks is composed of moderately sinuous, meandering, channels that are subject to underlying geology. When substrates are composed of loose, fine-grained sands and gravels, sinuosity ratios may increase to values approaching 1.5. In areas where substrates are dominated by bedrock, channel meanders are governed by underlying geological formations (i.e. Mehrten outcroppings and small alluvial pockets). Sediment continuity with upper reaches is considered to be moderate and bottom substrates are composed of cobbles, gravels, and fine gravels within riffle structures and composed of fine gravels and sands within pools and glides. Sufficient instream structures are present in the form of boulders, instream woody material, and bedrock outcroppings. The hydraulic diversity developed by the variety of instream structures sorts materials on a regular basis forming alternating point bars and continually cleans pockets of cobbles and gravels of fine-grained sediments such as sand and silt. Dense riparian and emergent vegetation prevent mass wasting and rapid movement of the channel alignment in the form of bank erosion. Sediment inputs are low to moderate.

Floodplains are wide in alluvial valleys and are narrower within steeper valley walls. Year-round water supplies provide for dense riparian understory and overstory near the water's edge. High cover values provide shaded riverine aquatic habitat limiting temperature increases from the sun's radiation. The cool year-round temperatures and sufficient substrate types provide habitat for various terrestrial and aquatic organisms. Many of the higher quality reaches are sufficient for salmonid spawning and rearing. High quality benthic macroinvertebrates are present. Higher floodplains and terraces provide mixed oak savannah habitat. Specific reach parameters are provided in Table 3-3.

Table 3-3. Reference Reach A Parameters

Parameter	Target Condition
Riffle Frequency	Riffles present every 5 to 10 bankfull widths. Increased opportunity for salmonid spawning habitat. Higher variation in channel gradient.
Pool Depth	Optimum pool depths should range from 2.5 to 5 feet to enhance hydraulic and habitat diversity while providing adequate conditions for salmonid resting and rearing.
Riffle Depth	Riffle depth is dependant upon position in watershed. Should range from 1.5 to 3.5 feet. Width should range from 15 to 30 feet.
Sinuosity and Morphology	Sinuosity ratio should range from 1.2 to 1.5.
Hydraulic Variability	All four hydraulic regimes should be present: Deep Fast; Deep Slow; Shallow Fast; and Shallow Slow. Gravel sorting mechanisms should be present.
Embeddedness and Sedimentation and Substrate Conditions	Riffles should be less than 25% embedded to support salmonid spawning and BMI habitat. D84 ranges from 60 to 75 mm. D50 ranges from 30 to 45 mm. D30 ranges from 20 to 30 mm. New formation of alternating point bars should be present.
Instream Structure and Epifaunal Substrate	Riffles, pools, glides, runs, IWM, emergent vegetation, bedrock outcroppings, boulders, and bifurcated channels present.
Riparian Canopy and Diversity	Abundant diverse understory containing a variety of native woody and herbaceous plants. Coverage greater than 40% provides optimal SRA habitat.
Aquatic Habitat Type	Cold water fishery supportive of salmon and steelhead. WQ and BMI quality good. Backwater habitat debris dams and beaver dams located in upper reaches only.

3.7.2 Reference Reach B: Linda, Cirby and Strap Ravine Creeks

The Linda and Cirby Creek complex is subject to much higher density urbanization than currently found in Reference Reach A. This area, which includes Strap Ravine, should be managed as a warm-water fishery combined with small pockets of cold-water habitat and rich diversity and thick riparian cover present in areas where floodplains are present. As is the case with the Miners/Secret/Antelope area, this complex of creeks is composed of moderately sinuous, meandering, channels that are subject to underlying geology. However, this area is highly urbanized resulting in a decrease in available floodplain and channel alignment variations. Substrates are composed of loose, fine-grained sands and gravels resulting in sinuosity ratios ranging from 1.3 to 1.8. Channel meanders tend to be confined by local encroachment of development into the floodplain. Fine-grained sediment loads are present and support the need for occasional channel structure elements. Riffles occur sparsely and glides dominate the channel planform. Dense riparian and emergent vegetation prevent mass wasting and rapid movement of the channel alignment in the form of bank erosion. Sediment input is significant.

Where floodplains exist, the riparian corridor ranges from 150 to 200 feet in width. Most of the channels are threaded between adjacent developments and possess very narrow, if any, floodplain. Year-round water supplies provide for some riparian understory and overstory near the water's edge. When present, adjacent floodplains and terraces provide mixed oak savannah habitat. Specific reference reach parameters are provided in Table 3-4.

Table 3-4. Reference Reach B Parameters

Parameter	Target Condition
Riffle Frequency	Riffles limited to no more than once every 25 bankfull widths. Limited variation in channel gradient.
Pool Depth	Optimum pool depths should range from 6 to 8 feet supporting warm water fish.
Riffle Depth	Riffle depth is dependant upon position in watershed. Should range from 0.5 to 1.5 feet. Bankfull width should range from 15 to 30 feet.
Sinuosity and Morphology	Sinuosity ratio should range from 1.3 to 1.8. Generally restricted due to existing flood control projects and facilities.
Hydraulic Variability	Limited hydraulic variability. Two to three hydraulic regimes present: Deep Slow; Shallow Fast; and Shallow Slow. Deep slow dominates.
Embeddedness and Sedimentation and Substrate Conditions	Highest potential riffle condition ranges from 50 to 80 % embedded. D84 ranges from 2 to 30 mm. D50 ranges from 2 to 15 mm. D30 ranges from 2 to 10 mm. New formation of alternating point bars should be present.
Instream Structure and Epifaunal Substrate	Some woody debris present in discrete areas. Pools and glides dominate with moderate presence of emergent vegetation.
Riparian Canopy and Diversity	Urbanized creek conditions with sparse emergent wetlands, sparse communities of mixed woody vegetation providing 20 to 40% cover, dominated by native species.
Aquatic Habitat Type	Warm water fishery supportive of a multitude of organisms and warm water fishes. Generally, not adequate for year-round habitation by salmonids. Spawning and rearing limited to available substrate conditions.

3.7.3 Reference Reachs C and D for Pleasant Grove and Kaseberg Creeks

Two distinctly different reference reaches have been identified for the Pleasant Grove/Kaseberg Creek system. Since the definitions of both reaches were developed in response to the hydrological changes occurring throughout the watershed as a result of urban development, information on the evolving hydrology is provided here for both reaches. The reaches are conceptual since neither is found in its ideal condition in the existing creek system. The two reference reaches generally correlate to the upper and lower topographic extents of the system, and changes in the underlying geology. The most evident attributes that distinguish the two reference reaches are differences in plant communities and channel morphology. The reference conditions for these reaches was developed based on a consideration of the historic ecology of the landscape and assumptions about how the ecology will respond to the changing conditions associated with the anticipated increased urbanization.

Two significant moderators of ecological change in the Pleasant Grove/Kaseberg system are the increased quantity and longer duration of flow resulting from urban development and land management practices. No data are currently available that provide a comprehensive analysis of either of these phenomena as they relate to the development that has occurred in the last 20 years or for anticipated development in the future. The available flood modeling is focused mainly on predicting flow associated with the 10, 25, 50 and 100-year storm events and does not address either the magnitude or duration of low flows.

As pervious undeveloped land is replaced with paved development, less storm water will infiltrate into the ground resulting in increased flows and shorter time to reach peak flows. The City typically requires mitigation measures to be implemented to prevent post-development flows from exceeding the capacity of the 100-year flood plain. However, this does not prevent the potential for changes to channel structure since flows associated with more frequent, smaller storm events may be of greater volume and velocity than in pre-development conditions. Over time, these lesser events may have cumulative impacts such as increased channel erosion, bank failure, and incision.

The duration of flow in Pleasant Grove and Kaseberg creeks also exerts a critical influence on ecosystem function. The City of Roseville General Plan, adopted in 1992, describes the Pleasant Grove system (which includes Kaseberg Creek) as "intermittent in nature with only seasonal flows." [34] However, field studies conducted during the "dry" season, anecdotal evidence from residents, and historical accounts all indicate that increased development has significantly changed the low flow hydrology of the Pleasant Grove system. Summer flows are now a common occurrence throughout the Pleasant Grove system. This change in hydrology is resulting in corresponding response in the distribution and condition of vegetation.

Reference Reach C: Upper Pleasant Grove/Kaseberg Creeks

The upper reaches of Pleasant Grove and Kaseberg Creek are undergoing significant ecological changes in response to the surrounding development. Aerial photography of the area from 1938 shows a small, meandering channel with virtually no trees and some adjacent agricultural land use. In the upper Branch Pleasant Grove Creek area, the establishment of trees and other woody vegetation was probably limited by the underlying Mehrten formation and lack of water. While there is no Mehrten formation in the Kaseberg Creek area, a lack of water was probably a constraint on the development of woody vegetation here as well. Historically, flows were limited to the rainy season, and the channels were completely dry in the summer. Such a condition would be classified as a riverine intermittent streambed. [35] Today, there is water in the system year round, and well-established stands of emergent vegetation such as cattails (*Typha latifolia*), and willows (*Salix spp.*) are common. Due to the low gradient of the

[34] Roseville General Plan, 1992.

[35] Cowardin, 1979.

channel in this area, overtopping occurs frequently in storm events and seasonal wetlands are becoming established in the floodplain. These features are more characteristic of a palustrine emergent classification.

The hydrological changes associated with development have actually created a much more biologically diverse ecosystem than was found in pre-development conditions. The open water of the channel and the wetland features along with the associated vegetation provide attractive habitat for a wide variety of migratory and non-migratory birds. A warm water fishery is also becoming established as the extent and duration of the channel flow expands.

Based on the anticipated development in the watershed, it is likely that the year round flow of water will continue and may even increase. Therefore, the vision for the optimal condition of this portion of Pleasant Grove/Kaseberg system is one which combines elements from both the riverine and palustrine emergent conditions in order to optimize habitat opportunities, without compromising the flood management function of the corridor (Table 3-5).

While some of these characteristics are found in sections of upper Pleasant Grove/Kaseberg system, no one reach displays all the desired conditions. Reaches that display many of the reference conditions include South Branch Pleasant Grove Creek upstream of Diamond Oaks Golf Course, and South Branch Kaseberg Creek behind Mahany Park. Restoration and improvements to these reaches that could be implemented to bring them closer to the reference reach condition are discussed in Chapter 4.

Table 3-5. Reference Reach C Parameters

Parameter	Target Condition
Riffle Frequency	Presence of riffles limited to equal to or greater than once every 25 bankfull widths. Generally riffles submerged in backwater. Lower variation in channel gradient.
Pool Depth	Optimum pool depths should range from 3 to 6 feet to enhance variety of terrestrial and aquatic organisms. During dry weather conditions glides and riffles generally submerged by 1.5 to 3 feet.
Riffle Depth	When riffles present, riffle depth ranges from 1 to 2.5 feet.
Sinuosity and Morphology	Sinuosity ratio should range from 1.2 to 1.8. A permanent low flow is present with side channels and/or or access to floodplain to allow overtopping.
Hydraulic Variability	Hydraulic variability limited to 2 to 3 hydraulic regimes: Deep Slow; Shallow Slow; and Shallow Fast less frequent.
Embeddedness and Sedimentation and Substrate Conditions	Substrate conditions vary. Riffles, pools, and glides are 60 to 100% embedded. D84 ranges from 2 to 30 mm. D50 ranges from 2 to 15 mm. D30 ranges from 2 to 10 mm. Generally point bar formation is stunted due to presence of thick mats of herbaceous plants.
Instream Structure and Epifaunal Substrate	Generally woody debris present in areas, sometimes extensive to provide cover for aquatic species and trap sediment. Pools and glides dominate with large presence of emergent vegetation/emergent wetlands.
Riparian Canopy and Diversity	Meadow dominated by emergent and herbaceous vegetation. 25 – 90% canopy cover distributed irregularly throughout reach. Mixture of native emergent and woody species that will tolerate summer water (willows, alders, cottonwoods, Oregon ash). Well-established native vegetation to stabilize banks.
Aquatic Habitat Type	Warm water habitat supportive of a wide variety of terrestrial and aquatic organisms. Backwater habitat with emergent wetlands and one or more large open water areas.

Reference Reach D: Lower Pleasant Grove/Kaseberg Reference Reach

Hydrological changes related to development are also beginning to impact the ecosystem in the lower reaches of the Pleasant Grove/Kaseberg system, but the changes are less evident. The 1938 aerial photographs show a narrow, meandering creek channel with extensive riparian, oak dominated canopy. The densest woody vegetation is adjacent to the creek channel, and becomes more dispersed into oak grassland further away from the creek. This is quite similar to contemporary conditions, except that the extent of the oak grasslands is greatly reduced having been replaced by urban development in many areas. Many mature oaks continue to shade the creek, as they have done for many years, as evidenced by the relative lack of Himalayan blackberry, willows, and other understory species that would thrive in unshaded riparian conditions.

However, field investigations reveal that some significant changes are beginning to occur in the hydrology of this ecosystem. The channel geomorphology is responding to these changes in several ways. The channel appears to be both down cutting, and widening in places where bedrock has been exposed. There are several places where small secondary overflow channels are becoming established, by a process of erosion and bank undercutting. Sedimentation is evident in the channel downstream of some of these locations.

Changes in the channel geomorphology are also impacting the condition of the mature riparian oak woodland. In a few places mature oaks may be found in the middle of the creek channel and are showing serious decline. These trees would not have been able to reach maturity in the year round flows that are now present. This is further evidence that prior to development Pleasant Grove was an intermittent creek, virtually dry in the summer. There are also places where mature oak root systems are fully exposed, or oaks are falling into the creek due to undercutting of the bank. In areas where the oak canopy has been eliminated, a few willows are beginning to establish. This is evidence that the character of the mature riparian oak woodland is entering a new successional stage.

If the recent hydrological changes continue as expected, the oak-dominated riparian vegetation will be dramatically changed through a natural process of succession. The channel will widen, oaks will recede away from the centerline of the channel exposing areas to sunlight and creating conditions that will favor other species. As the channel widens, it will develop primary and secondary terraces. The species and distribution of vegetation that will become established on these terraces will reflect the frequency and period of inundation and access to ground water.

Such changes are not intrinsically detrimental when they occur within an intact ecosystem. However, in the largely urban context of the City of Roseville, there are some adverse impacts that will arise. Most notable will be the loss of the mature, native oaks that are currently growing immediately adjacent to the channel. Native oaks are a cherished element in the Roseville landscape. The Open Space and Conservation Element of the City's General Plan call for the protection of oak woodlands, and regulates protection through the Tree Preservation Ordinance. The distribution of the oaks will eventually be concentrated in the more upland areas, to the extent that such areas are not developed. Loss of canopy cover will also provide conditions favorable to establishment of non-native invasive plant species, such as Himalayan blackberry, and red sesbania. Sediment resulting from bank erosion and downcutting may accumulate in the downstream reaches and eventually find its way to the Sacramento River. Excess sediment may be an issue for flood management and may have detrimental impacts on aquatic species and habitat in the Sacramento River.

It is likely that the quantity and duration of flow in the Pleasant Grove/Kaseberg system will not be reduced, and may well increase with additional urban development. As with the upper Pleasant Grove/Kaseberg system, conditions in the lower part of the system support a warm water fishery. Therefore, the reference reach for the lower part of this system is designed to respond to anticipated changes in hydrology, while helping to preserve the positive ecological functions and mitigate the potential adverse impacts described above (Table 3-6).

The reference reach for the lower Pleasant Grove/Kaseberg system will be most likely attained over time through restoration and protection projects that include techniques such as recontouring the channel and revegetation in places where bank failure is chronic. However, by implementing methods to limit the amount of urban runoff entering the system, the City may also be able to slow down the rate of successional change and thus better manage and/or limit the impacts associated with the hydrologic impacts. Techniques to detain/retain urban runoff onsite that are consistent with flood management strategies, such as rainwater cisterns, better irrigation management, and aquifer recharge wells using treated runoff, may play an important role in reducing channel flows and helping to preserve the nature of the existing oak dominated riparian woodland.

Table 3-6. Reference Reach D Parameters

Parameter	Target Condition
Riffle Frequency	Presence of riffles limited to equal to or greater than once every 25 bankfull widths. Lower variation in channel gradient.
Pool Depth	Optimum pool depths should range from 3 to 6 feet to enhance variety of terrestrial and aquatic organisms. During dry weather conditions glides and riffles generally submerged by 1.5 to 3 feet.
Riffle Depth	When riffles present, riffle depth ranges from 1 to 2.5 feet.
Sinuosity and Morphology	Sinuosity ratio should range from 1.6 to 2.0. A permanent low flow channel is present with access to floodplain via primary and secondary terraces of varying widths to allow overtopping.
Hydraulic Variability	Hydraulic variability limited to 2 hydraulic regimes: Deep Slow and Shallow Slow.
Embeddedness, Sedimentation and Substrate Conditions	Riffles, Pools, and Glides are 90 to 100% embedded. Substrates are composed of sands and silts.
Instream Structure and Epifaunal Substrate	Generally woody debris present in dispersed areas, to provide cover for aquatic species and trap sediment.
Riparian Canopy and Diversity	Diversity of native vegetation with tree and shrub species that can tolerate longer and more frequent inundation (willows, poplars, alders, cottonwoods, etc.) in the lowest terrace areas and oaks in the upper terraces. 25 – 90% canopy cover distributed irregularly throughout reach. Well-established native vegetation to stabilize banks. Healthy population of native oak seedlings for regeneration
Aquatic Habitat Type	Warm water habitat supportive of a wide variety of terrestrial and aquatic organisms.

3.7.4 Reference Reach E: Urbanized Stream Conditions

The City of Roseville requires preservation of the entire floodplain in new developments and most of the City's creek channels are surrounded by relatively naturalistic, undeveloped lands. However, there are a few reaches where the channel is significantly confined by streets, commercial development, or active use public park areas. It is not realistic to expect that these reaches are going to support the same level of habitat function as reaches that have greater access to a wider floodplain, and are buffered from development impacts by preserve areas or open spaces used only for passive recreation. Examples of urban creek reaches are Dry Creek in Royer Park, Saugstad Park, and through downtown Roseville above Royer Park.

These urbanized creek reaches are, nevertheless, an important element in the City's creek system. They provide residents with an opportunity to interact with the creek ecology by observing the way the hydrology changes throughout the year, the various aquatic species that rely on the creek for habitat, and the plants that grow in or adjacent to the channel. For many people who do not live on or near a creek, bike trail or open space preserve, their only direct experience of the City's creeks comes when they visit a park. Such exposure is crucial to building a sense of public stewardship. The urban creek reaches provide a valuable aesthetic element to enrich the City's parks and to provide visual relief in the design of the developed landscape. They also offer an attractive element that can be leveraged to further the City's redevelopment goals within City infill areas.

The City Council has indicated that downtown redevelopment is a high priority and that Dry Creek and Royer Park should form the foundation of and serve as catalyst elements for a downtown redevelopment plan. The redevelopment vision for the area calls for a vibrant "public place" that blends the natural features of Dry Creek and the adjacent riparian habitat with the urban environment via the use of appropriately linked compatible edge uses.

The target condition for the urban reaches should include measures to optimize the habitat function of the creek while also providing opportunities for human interaction and aesthetic enhancement of the surrounding urban area (Table 3-7). The habitat functions that should be supported to the extent feasible in the urban reach may be derived from the reference reach conditions that apply to the reaches upstream and downstream of the urban reach. It is critical that the design of any improvements in the channel consider and respond to the need to preserve flood conveyance, habitat function, and visual character of the creek.

Examples of features that would be appropriate for urban creek reaches include access platforms constructed to function as instream structure for enhancing aquatic habitat, low flow channel crossings, public art works that respond to and celebrate the hydrology or other aspects of the ecosystem, and interpretive elements. Proposed restoration activities within the downtown and other redevelopment areas should be considered within the redevelopment goals for the area.

As such it is recognized that redevelopment may include the introduction of hardscape elements immediately adjacent to Dry Creek on the creek's north (or downtown) side. While this can be accomplished in a more environmentally sensitive manner than occurs today, urban improvements may result in impacts to creek related resources. Mitigation or compensation for these impacts can occur upstream and downstream of the urbanized creek section in accordance with the restoration recommendations of this plan. This is the environmental "tradeoff" that would be necessary to implement downtown redevelopment goals that encourage public access to the creek corridor. On the positive side, creating access and highlighting creek resources in a high profile public "place" provides opportunities for outreach, education, and ecotourism type events (such as winter salmon festival), which help to build awareness and community capacity for improved creek stewardship.

Table 3-7. Reference Reach E Parameters

Parameter	Target Condition
Physical Access	Constructed improvements provide safe access to and in some cases across the channel.
Visual Access	View of the creek area are optimized and/or preserved when locating buildings, picnic areas, trails, or other improvements
Interpretation	Signage, structures, or other features are incorporated into the creek channel and surrounding area to provide interpretive information on channel function
Vegetation	Focus on native species managed for flood control, bank stability, habitat, public safety, and esthetic value.
Channel Form	Flood conveyance and habitat values are maintained.

4.0 RESTORATION STRATEGIES & CONCEPTUAL IMPROVEMENT TECHNIQUES

This section presents restoration strategies for creeks within the City of Roseville and presents conceptual improvement techniques that may be used to implement these strategies. These strategies and techniques have been selected because they provide an approach to creek management and restoration that supports improvements to multiple resources, specifically water quality, aquatic habitat, wildlife habitat, and channel stability. The degree to which these strategies and techniques are implemented will depend on individual site conditions, specific goals of the restoration project, and commitments that may be made as part of a securing a consolidated permit for Plan implementation.

Table 4-1 lists each recommended strategy and indicates which of these four resource values benefit from implementing the strategy. This table helps to illustrate the fact that restoration decisions intended to address any one aspect of ecosystem health are very likely to impact other aspects of ecosystem function. Thus, any restoration strategy should be implemented with regard for the full range of impacts it may generate, and be designed to maximize its potential for beneficial impacts on as many creek resources as possible.

Table 4-1. Restoration Strategies and Benefits

Strategy	WQ	Aquatic Habitat	Channel Stability	Wildlife Habitat
Revegetation	■	■	■	■
Bank Recontouring	■	■	■	■
Bank Stabilization	■	■	■	■
Channel Realignment		■	■	■
In-stream Structures		■	■	■
Grade Control		■	■	■
Removal of Fish Barriers		■		■
Beaver Management	■	■	■	■
Invasive Plant Management		■	■	■
Runoff Controls	■	■	■	■
Access Management	■	■	■	■

The implementing techniques for each of these restoration strategies were selected based upon a comprehensive review of restoration techniques that have been proven to be successful and the applicability of those techniques to the issues identified in the Pleasant Grove and Dry Creek watersheds. It is important to recognize that the science of creek restoration is continually evolving as more projects are implemented and lessons are learned about how certain techniques perform and respond to varying conditions. Therefore, an adaptive approach to planning for creek restoration and management should be adopted in which the list of available techniques is updated to reflect the best available science.

Techniques are described here at a conceptual level of detail. Prior to implementing any of these techniques, a detailed assessment of site conditions should be conducted by a team with expertise in geomorphology, revegetation, civil and/or geotechnical engineering, and fish/wildlife biology. The specific manner in which techniques are implemented will need to be tailored to each individual site to account for variations in characteristics such as bank slope and condition, creek flow, adjacent land uses, soils, and existing vegetation.

Chapter 5 of this Plan describes the City's creek reaches that were identified through the ECAR as needing the application of restoration strategies, and the specific strategies needed for each reach. The particular technique(s) used to implement the strategy at a given site should be identified following the site assessment described above in order to pick the techniques that are most appropriate for the localized conditions and available resources.

4.1 Revegetation

4.1.1 Benefits

Revegetation of creek corridors provides important benefits in many areas of ecosystem function. Healthy riparian vegetation stabilizes creek banks, helps prevent erosion, provides wildlife habitat, and improves aquatic habitat by shading and contributing vegetative matter to support aquatic macroinvertebrate species.

4.1.2 Where Appropriate

Revegetation should be implemented where any of the following conditions exist:

- Banks are exposed and/or eroding (additional bank stabilization techniques described below may also be)

- After eradication of existing non-native vegetation

- Existing vegetation is sparse, disturbed, and/or lacking structural or biological diversity

- In conjunction with any restoration activity that disturbs vegetation such as bank stabilization or bank recontouring

4.1.3 Standard Practices

When establishing or enhancing riparian plantings, the following standard practices should be incorporated in the planting plans and specifications to increase the likely success of the project.

Plant Selection

- Native plant species should be selected that are consistent with the objectives for the revegetation project. If the project includes a buffer that is intended to intercept surface flow from adjacent land uses it should include dense plantings of grasses or other herbaceous species that stabilize the soil, slow down the flow, and trap sediments. If the buffer is intended to improve habitat, the target type of plant community should provide the basis for developing the planting plan for the buffer. The determination of the type of the species to use in the revegetation project should be made collectively by the project Landscape Architect, Revegetation Specialist, Engineer, and/or Wildlife Biologist when the planting plan is developed.

- Revegetation projects may include plants in a variety of conditions such as bareroot, vegetative cuttings, containerized, balled and burlapped (B&B), plugs, and seed. The type of condition and size to be used depend on time of year, species, available budget, site conditions, and who will perform the planting. The determination of the condition and size of plants to use in the revegetation project should be made by the project Landscape Architect and/or Revegetation Specialist when the planting plan is developed.

- When feasible, purchase or collect plants and seeds that were harvested or grown in the Sacramento or western Placer County area.

Spacing

- Groups of like plants should be interspersed with groups of other species to create a more naturalistic pattern. Trees should be planted in groups of 2-3 with shrubs planted in groups of 3 – 9 between the tree groups.

- Plant densities should be determined using the triangular spacing method because it results in a denser planting area than the square grid method.

- The spacing of individual plants will vary with each site and species. In general, the spacing between plants should increase with the mature size of the plant. For example, species that form a large canopy such as valley oak and California sycamore should be planted further apart than willows or elderberries. Spacing for large trees should range from 10 ft. – 25 ft. on center, with spacing for smaller trees and shrubs being from 5 ft. – 10 ft. on center.

Plan Review

- A plan of the proposed revegetation project should be prepared and reviewed by the City before implementation. The plan should show species, number, condition, bank location, planting method, success criteria, and irrigation requirements for all plants.

- The project plan should also address specific erosion control measures need to insure that any disturbed soil will be stabilized to prevent soil erosion during the rainy season. Stabilizing methods include mulch, hydroseed, and erosion control blankets. These methods may be used in combination as needed to properly secure the site.

- The proposed planting design should be evaluated by the City's Department of Public Works for consistency with flood control plans.

Site Preparation

- Non-native invasive species should be removed or reduced to the extent feasible to enhance establishment of native species. See discussion in this section on techniques for invasive species management for more information.

- Use manual methods or equipment that exerts low ground pressure whenever possible to accomplish site grading without damaging soil structure.

- If extensive grading by heavy equipment is required to prepare the site, try to limit this activity to the dry season to avoid damaging soil structure.

- If site has become heavily compacted, prepare soil by ripping to a depth of 12" in two perpendicular passes. Smooth to an even grade. This technique may only be used where site grades allow safe operation of the equipment.

- Planting holes should be at least twice the diameter of the root ball with a pedestal in the bottom to prevent root balls from settling below the finished grade.

- Revegetation should occur in native soil with little or nor amendment whenever possible. If topsoil has been lost, it may be necessary to work organic matter and amendments into the soil before planting to improve fertility and drainage. In this situation, a soil analysis should be conducted to determine what, if any, amendments are needed.

Installation

- Make sure that project area is secured from public access to prevent accidents and injury and appropriately signed to inform the public of the project purpose and goals.

- Identify any vegetation adjacent to the project area that is to be protected and provide protective fencing around the critical root zone.

- Harvest any native plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- All plants should be inspected prior to installation to insure they are healthy, free of pests, have good root formation, and are of the proper species. Containerized and B&B stock should be inspected for girdling roots.

- In general, revegetation should occur in the fall shortly before the onset of the rainy season (except bareroot stock and dormant cuttings as noted below). This will reduce the amount of supplemental irrigation required during the first 6 months of the plants' establishment period. This is also the time of year when most plant species are entering dormancy or a period of slower growth, and the stress associated with transplanting is better tolerated.

- It is preferable to have all planting completed with the onset of the rainy season to avoid exposing disturbed soil to the erosive forces of the rain. If it becomes apparent that it will be necessary to plant during the rainy season, the site should be seeded with a native erosion control grass mix in late September or early October to stabilize the site as much as possible. Soil disturbance at planting time should be limited to the minimum necessary to install plants, and disturbed areas should be mulched when planting is completed.

- Bareroot stock should be planted while it is fully dormant, typically between December and early February. Cuttings should be collected and planted during this same time frame since they will be dormant and more likely to survive the transplant stresses.

- When planting containerized or B&B stock, the root crown should be at or slightly above (1/2") the soil surface after planting, settling, and irrigation. Build a berm around the plant to create an irrigation basin with a minimum diameter of 3 times the diameter of the rootball and cover the area with 2"-3" of biodegradable mulch.

- Water all plants thoroughly immediately after planting.

- Vegetative cuttings may require some form of pretreatment, such as soaking or application of a rooting hormone to encourage root development. Always plant cuttings so that at least three nodes are below the surface.

Plant Protection and Irrigation

- Measures such as cages, root protection baskets, tree shelters with wire covers, and/or trunk wrapping should be incorporated into the revegetation project to protect young plants from browsing by species such as voles, deer, rabbits, and beaver. The type of measure to be used should be determined in consultation with the project wildlife biologist and installed per the manufacturer's specifications. All protection measures need to be carefully removed before they constrict plant growth and disposed of offsite. Replacement protective measures may need to be installed if the plant is still small enough to be susceptible to predation or other threats.

- A wooden stake at least 14" tall should be placed nest to all plants to make their locations visible for future monitoring and maintenance.

- Supplemental soil moisture may be required during an establishment period until plants have developed sufficient root mass and are adapted to naturally available moisture. Three years is a reasonable period for maintaining supplemental irrigation, but a longer time may be needed if plants are growing slowly and/or annual variations in climate are unusually extreme.

- The type of irrigation (drip, bubblers, hand watering, etc.) should be determined by the project Landscape Architect/Revegetation Specialist to reflect site conditions, such as proximity to a public water supply, access to the site, moisture requirement of the plants, and anticipated establishment period. In no case should irrigation result in overspray or surface runoff.

- If a gel-type soil wetting agent is used instead of traditional irrigation, the product may need to be replaced every few months after the effectiveness diminishes.

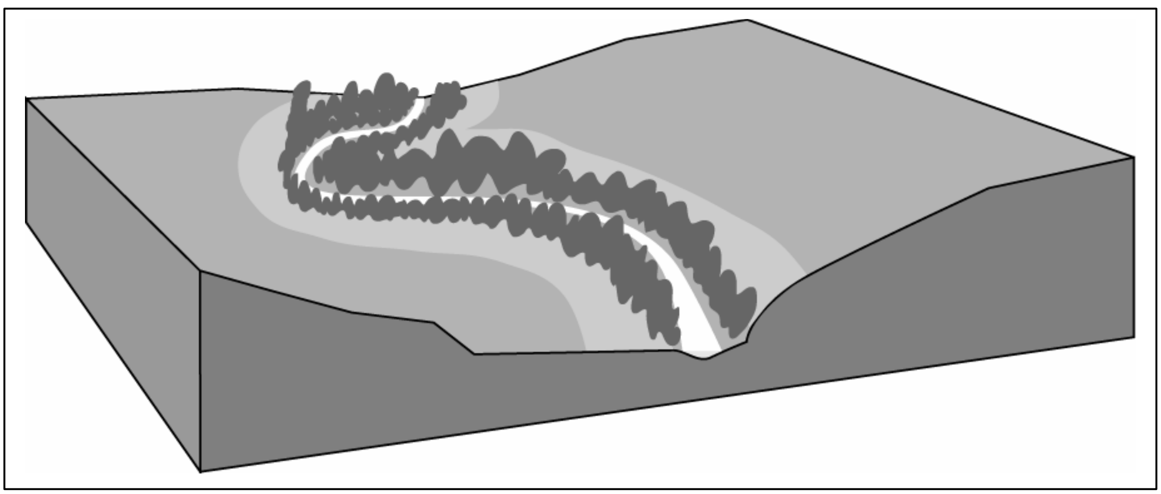
4.1.4 Techniques

Vegetative Buffers

A vegetative buffer is a band of vegetation (trees, shrubs and herbaceous plants) between a waterway and an adjacent land use. In addition to benefiting water quality, vegetative buffers and swales provide habitat opportunities for terrestrial species that live, forage or breed in riparian areas where seasonal fluctuating water levels and high groundwater tables support a diverse community of vegetation. Riparian zones provide habitat for up to 80 percent of wildlife species in the west[36].

Riparian buffers should be wide enough to reduce the amount of pollutants and sediment in overland stormwater runoff and to provide some interior habitat for species that are intolerant of human activity. While exact requirements for adequate buffer widths have not been established, current City of Roseville General Plan policies specify the preservation of the 100-year floodplain and contiguous areas in excess of the 100-year floodplain as merited by special resources or circumstances. These special circumstances may include sensitive wildlife or vegetation, wetland habitat, oak woodland areas, grassland connections in association with other habitat areas, slope or topographical considerations, etc. In areas where preservation of the 100-year floodplain results in a buffer of less than 100 feet on each stream bank for perennial streams, opportunities should be sought for preservation to increase the size of these buffers.

Figure 4-1. Riparian Buffer Diagram



Increasing Vegetation and Structural Diversity

One of the primary goals of riparian restoration is to increase the diversity of vegetation species and structure to meet the lifecycle needs of a greater number of mammals, reptiles, amphibians, birds and other terrestrial riparian species. Species diversity describes the variety of native plant species found within an area of vegetation that is relatively uniform in composition. Canopy or structural diversity refers to the presence or absence of three canopy layers: a tree or overstory, a shrub or understory, and an herbaceous layer. A healthy riparian zone should have all three canopies well represented, with plant material at various stages of development in each.

The recommended way to increase species and structural diversity is through a coordinated approach that includes the following three components.

[36] Riley, 1998.

1. Remove non-native vegetation to create a more favorable condition for a variety of native species to become established. (See4.9 Invasive Plant Management below)

2. Plant native riparian tree, shrub and herbaceous species consistent with the naturally occurring vegetation community for the site. The CNPS Manual of California Vegetation classifies vegetation communities according to the dominant species within the community. CNPS series associated with Plan area are listed in table Table 4-2. Each series includes a list of commonly associated species and should be used as the basis for developing a planting palette for a particular site. Where native vegetation is already partially established, consider planting species to augment a missing or sparse canopy layer or to increase species diversity.

3. Manage riparian vegetation to prevent reestablishment of non-natives and to increase species and structural diversity. Specific creek corridor vegetation maintenance methods are described in Chapter 6.

Table 4-2. CNPS Series for Roseville Watersheds

Watershed Location	Dominant Species for CNPS Series
Upper Pleasant Grove[37]	Mixed Willow (*Salix spp.)* Fremont Cottonwood *(Populus fremontii)* Spikerush (*Eleocharis spp.*) Cattail *(Typha latifolia)* Arroyo Willow (*Salix lasiolepis*)
Lower Pleasant Grove[38]	Interior Live Oak *(Quercus wislizenii)* Valley Oak *(Quercus lobata)* Mixed Oak Fremont Cottonwood *(Populus fremontii)* White Alder *(Alnus rhombifolia)*
Dry Creek[39]	Blue Oak *(Quercus douglasii)* Fremont Cottonwood *(Populus fremontii)* Interior Live Oak *(Quercus wislizenii)* Mixed Willow (*Salix spp.)* Valley Oak *(Quercus lobata)* White Alder *(Alnus rhombifolia)*

Snag Management

Dead trees or snags should be allowed to remain standing as long as they are not a threat to public safety because they provide important shelter, nest and/or forage opportunities for riparian species such as raptors, woodpeckers, owls, and kingfishers. Where feasible, large snags of 15" diameter at breast height and larger should be left standing for bird habitat. Smaller snags, which may pose a greater threat to fire safety,

[37] Foothill Associates, 2003.
[38] Foothill Associates, 2003.
[39] ECORP, 2003.

should be evaluated for their habitat potential prior to removal. The number and density of snags to be left standing should be determined for each site by a qualified biologist with consideration for the habitat needs of the existing or anticipated resident species.

Riparian Corridor Connectivity

When planning for revegetation projects, sites should be selected that have the potential to enhance the connectivity of habitat opportunities within the corridor. If reaches adjacent to a proposed restoration site are in good condition, the project will provide a connection between the adjacent reaches and improve the overall habitat value of all three reaches. If the adjacent reaches are in poor condition, the restored reach will function as either a habitat 'island' or a 'link'.

A habitat island is a small, isolated patch having desirable habitat characteristics. While an island may provide valuable habitat for birds, it is less desirable for other terrestrial species since they are unprotected as they travel through uncovered areas to reach the resources found in the island. Islands should be made as large as possible since their habitat value increases proportionally with size.

A habitat link differs from an island in that it is located in close proximity to other reaches with similar habitat conditions. Terrestrial species may then use the link as a sort of stepping stone to move through the creek corridor, with minimal exposure. In general, creating habitat links will result in greater overall habitat value for the creek system than creating small, isolated habitat islands.

4.2 Bank Recontouring

4.2.1 Benefits

Bank recontouring is the practice of modifying the profile of a creek bank to create a less steep interface between the creek and the bank to reduce average velocities and shear stresses, and reestablish frequent overbank flows across a wider floodplain. Terraces may be introduced that are similar to those found along natural waterways and support a diversity of hydrologic regimes for vegetation growth. Increasing riparian vegetative diversity also improves habitat for riparian species. Bank recontouring can be used for prevention and remediation of bank erosion, stabilizing the channel, and/or increasing channel capacity.

When widening of the channel increases the capacity of the channel to carry floodwater, additional woody vegetation can grow within the channel and large woody debris (LWD) can remain without compromising the floodwater capacity. The increased vegetation provides additional habitat for riparian and aquatic species and permits the growth of trees and shrubs at the water's edge, which shades the surface of the water, provides sheltering habitat for fish, and contributes to aquatic food sources. Additionally, woody vegetation within the channel can slow the downstream flow of floodwater.

4.2.2 Where Appropriate

Bank recontouring should be considered where any of the following conditions exist:

- Bank face angle is in excess of 3:1 horizontal to vertical and is showing evidence of erosion

- Flows are constricted and causing flood management problems

- Creek is undercutting bank and/or bank is collapsing

- Channel has become so incised that riparian vegetation is becoming stranded above level of available soil moisture

- Increased flows are causing channel to migrate laterally and eroding banks in the process of establishing a new channel

- Riparian vegetation lack species diversity due to absence of floodplain terraces

- Surface flow from adjacent land uses is causing head cutting at the bank edge

- Surface flow from adjacent land uses requires additional vegetative filtering or flow velocity controls

4.2.3 Standard Practices

All bank contouring projects, regardless of their magnitude, require certain standard implementation practices.

Planning

- All bank recontouring projects should include a native species revegetation component since the disturbance associated with bank contouring will destroy the riparian vegetation on the site. (See 4.1 Revegetation above.)

- When designing the recontouring project consider if some form of bank stabilization beyond revegetation is needed. (See 4.3 Bank Stabilization below.)

- A bank contouring project must include a hydraulic study to determine the best configuration of the bank given the hydraulic forces of the stream. Bank contouring is often done in combination with channel realignment projects to reintroduce meander bends and a more ecologically stable channel condition.

- Before a bank contouring project is undertaken, a hydrologic study must be performed to assess the impact of the new channel configuration on floodwater conveyance in the regional stormwater system.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Plan Review

- A plan of the proposed bank recontouring project should be prepared and reviewed by the City before implementation. The plan should include the extent of the project, description of impacts to existing vegetation, timing, plan views and cross sections of the proposed grade changes, cut and fill calculations, diversion strategies, the results of any hydraulic/hydrologic analyses, specific erosion control measures, and information on any stabilization or revegetation techniques included in the project.

Installation

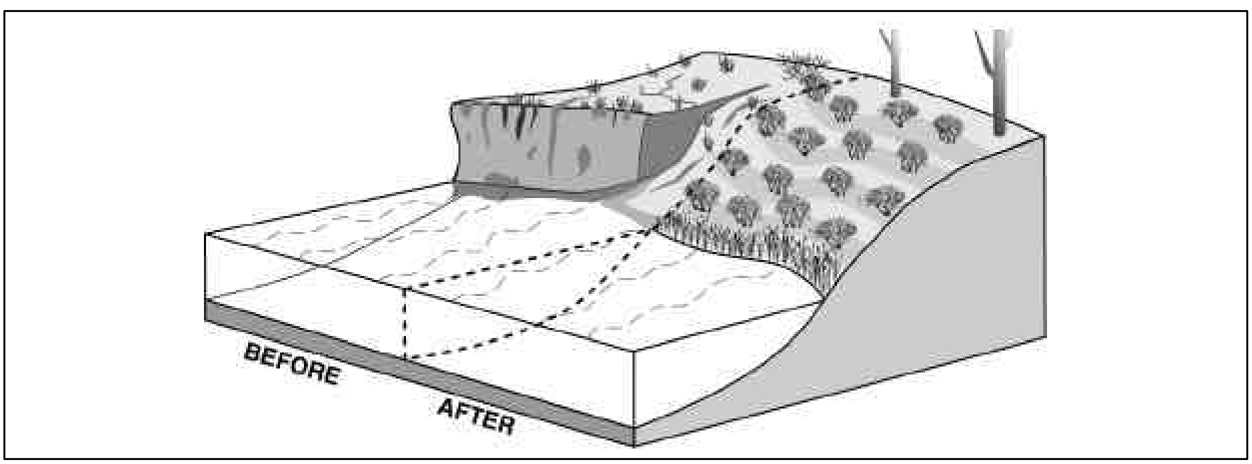
- Make sure that project area is secured from public access to prevent accidents and injury.
- Identify any vegetation adjacent to the project area that is to be protected and provide protective fencing around the critical root zone.
- Harvest any native plants that are to be replanted in the finished project and establish them in a suitable temporary location.
- Stockpile topsoil to be redistributed on finished grade.
- Implement bank protection and stabilization such as erosion control fabric, geotextile materials, willow wattles, or hydroseeding to prevent erosion both during construction and until newly installed plantings are established.

4.2.4 Techniques

Laying Back Banks

Bank contouring that involves relatively moderate changes to the bank profile is also known as laying back the banks. In these types of projects, the ordinary low-flow channel often not modified. Laying back creek banks involves reshaping the banks to a more gradual slope, and may include the introduction of several small terraces that correspond to different flood stage elevations and vegetative communities. As the bank is laid back, the erosive potential of the creek is decreased because water can spread out over a greater area thus reducing velocity and associated sheer stresses. This technique is effective for addressing localized erosion or habitat issues along isolated reaches.

Figure 4-2. Laying Back Creek Bank Cross Section



Floodplain Restoration

Floodplain restoration is a method of bank contouring that involves much more extensive corridor changes than simply laying back the creek banks. The intent of floodplain restoration is to reconnect the channel to the larger floodplain. It may be implemented in conjunction with a channel realignment technique (see 4.4 Channel Realignment below).

Floodplain restoration can only be implemented where access to sufficient open space is available. Floodplain restoration may involve physically modifying the channel to create terraces that can flood, or it may involve removal or relocation of levees. The primary goals of floodplain restoration are to increase the carrying capacity of the creek channel, reduce average velocities and shear stresses, and reestablish frequent overbank flows across a wide floodplain and/or series of riparian terraces.

Separate terraces may be created for the bankfull channel, the 2 to 10-year floodplain and the 10 to 100-year floodplain. The low-flow channel carries the dry-season flow, and frequent floods use the 2-year terrace. Larger flood events will utilize the successively larger terraces with the 100-year flood occupying the full width of the channel. Floodplain restoration can also be designed to provide backwater and emergent wetland habitat during the winter.

4.3 Bank Stabilization

4.3.1 Benefits

Bank stabilization is one of the most critical creek restoration and management strategies for the City of Roseville as creek flows increase in magnitude and duration due to development. Bank stabilization is directly tied to the protection of property, public safety, erosion, and the quality of aquatic and wildlife habitat.

4.3.2 Where Appropriate

Bank stabilization should be considered where any of the following conditions exist:

- After eradication of existing non-native vegetation and simple planting or seeding as described in section 4.1 Revegetation above will not adequately address erosion
- A bank recontouring project results in banks that cannot be stabilized by simple planting or seeding as described in section 4.1 Revegetation above
- Bank slopes are in excess of 3:1 horizontal to vertical and cannot be flattened through recontouring due to adjacent land use constraints or the need to avoid impacts to valuable riparian vegetation
- Hardscape armoring needs to be removed to improve habitat, aesthetics, and/or channel hydraulics
- Surface flow or outfall discharges are eroding the creek bank
- Banks are exposed and/or eroding for any reason

4.3.3 General Practices

A wide variety of techniques are available to prevent bank erosion, and research into new methods and products is ongoing. However, there are some general practices that should be incorporated into the planning and design of any bank stabilization project.

Planning

- The right stabilization technique(s) must be selected for the particular hydrologic conditions of the project area. Different stabilization techniques are generally required to address erosion related to surface flow from adjacent land uses versus erosion resulting from creek flows.

- Multiple techniques may be required to provide both immediate and long term stabilization, and to stabilize all sections of the slope profile. Decisions about which techniques to use should be made by the project engineer and geomorphologist in consultation with the City's Public Works department.

- Bank stabilization projects should include an evaluation of the potential for downstream hydraulic impacts and of the localized hydrologic conditions.

- If bank stabilization projects involve plant materials, determine if supplemental irrigation will be needed, how it will be delivered, and for what period of time.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

- If the bank stabilization technique(s) selected don't result in revegetation, include a vegetative element whenever possible to increase habitat value and mitigate aesthetic impacts.

- Consider whether bank contouring and/or channel realignment may be needed in conjunction with bank stabilization to achieve the greatest long term benefit.

Plan Review

- A plan of the proposed bank stabilization project should be prepared and reviewed by the City before implementation. The plan should include the extent of the project, description of impacts to existing vegetation, timing, plan views and cross sections of the proposed stabilization techniques, diversion strategies, the results of any hydraulic/hydrologic analyses, and specific erosion control measures to be implemented during the construction phase.

Installation

- Where bank erosion presents an imminent threat to property and/or public safety, the use of temporary hardscape stabilization techniques may be required. A strategy should be developed for replacement of these techniques with a more ecologically appropriate technique when/if the imminent threat passes.

- Proper anchoring of stabilization materials is necessary to prevent dislodgement of materials that could cause flow obstructions, injuries to wildlife, hydraulic impacts, or downstream hazards. The project engineer and geomorphologist should identify anchoring methods.

- Make sure that project area is secured from public access to prevent accidents and injury.

- Identify any vegetation adjacent to the project area that is to be protected and provide protective fencing around the critical root zone.

- Harvest any native plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- Stockpile topsoil to be redistributed on finished grade.

4.3.4 Techniques

Biotechnical Stabilization

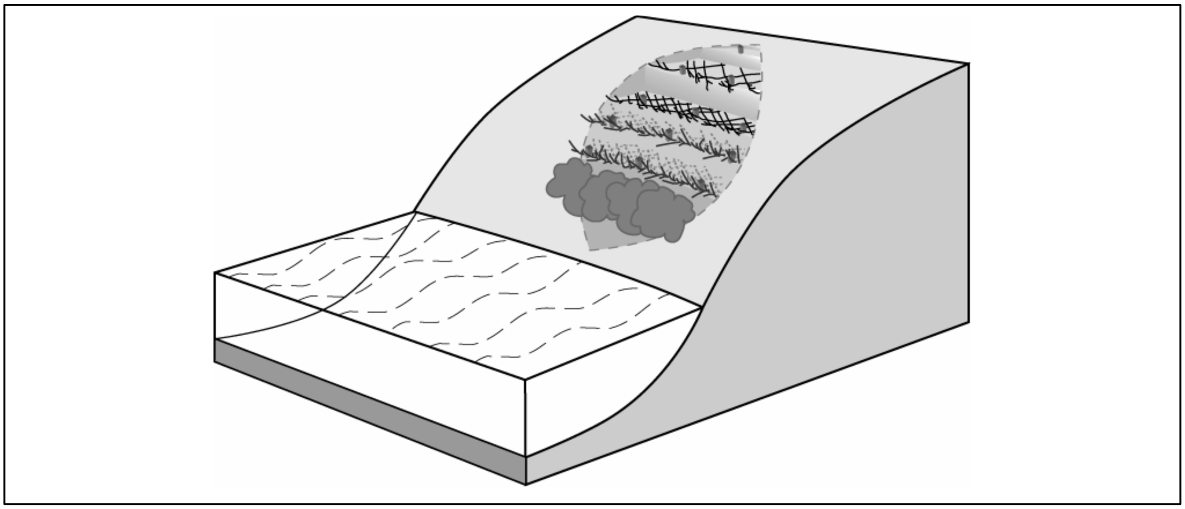
Biotechnical techniques for bank stabilization utilize plant materials to create an erosion control structure. Woody plants such as willows, buttonbush, coyote bush, alders, ash, box elder, and cottonwoods provide dense networks of roots that hold soils together. Herbaceous plants such as sedges and rushes also provide erosion protection, but limited slope stability. These types of native plants tolerate frequent inundation over long periods of time and therefore are appropriate for the water's edge. In addition to their ability to hold soils together, thick mats of vegetation near the bank tend to increase roughness and produce a boundary layer of slower water, reducing the potential for bank erosion. When overtopped, many of these plants lean over, limiting their overall effect on water surface elevations.

Biotechnical methods for bank stabilization also enhance creek corridor habitat values because the resultant vegetation provides shelter, food, and nesting opportunities. The vegetation provides shade over the surface of the creek, which lowers summertime water temperatures and creates overhanging root masses for fish shelter.

The following biotechnical methods of biotechnical stabilization are appropriate for application in the Roseville Creek corridors.

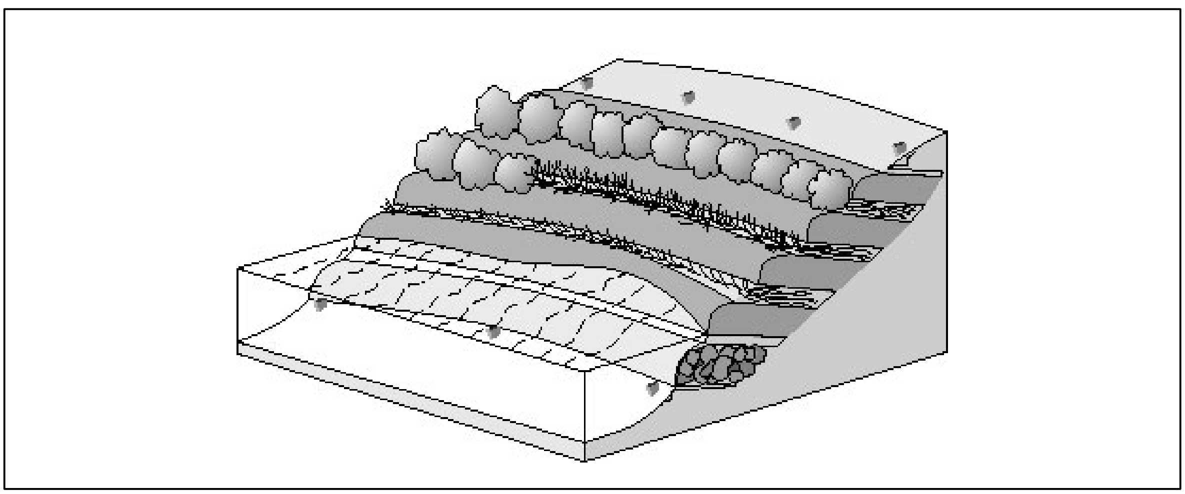
- **Brush Packing**: Alternating layers of live branches and compacted soil are incorporated into a washed out bank to repair a small slump or gully not larger than 4 feet deep or 4 feet wide.

Figure 4-3. Brush Packing



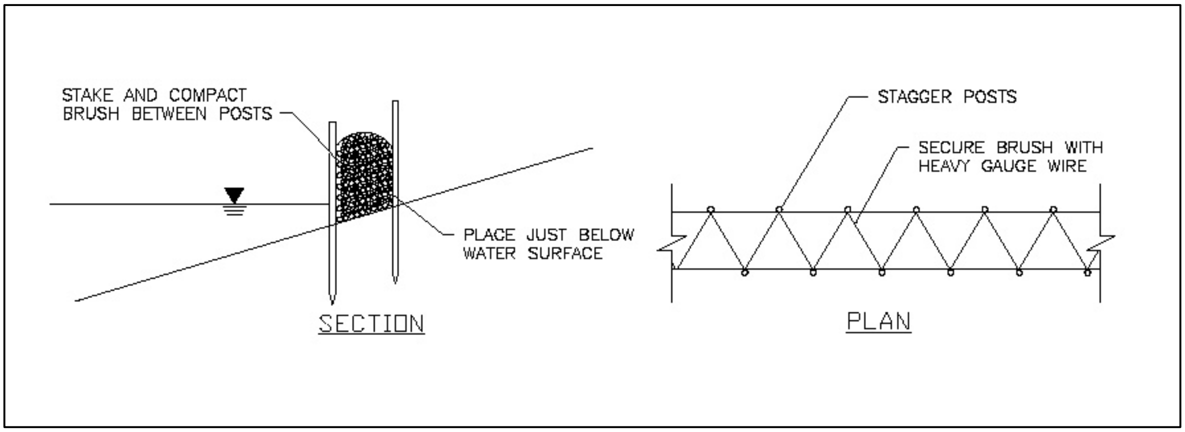
- **Brush Layers:** Brush layers (or vegetated geogrids) are very similar to branch packing except that the technique is applied across the entire face of a bank to be stabilized. The cut ends of live branches are inserted into bank terraces with just the tops extending approximately 12 inches beyond the surface of the slope. Each terrace typically consists of 3 layers of branches separated by 3 - 5 inches of soil between each layer. The next terrace is built by placing 3 - 5 feet of soil on top of the first terrace and sloping it back to meet the design grade. Soil layers may be wrapped in a biodegradable blanket for additional erosion protection. Brush layers are best used on slopes with 2:1 horizontal run to vertical rise or flatter.

Figure 4-4: Brush Layers



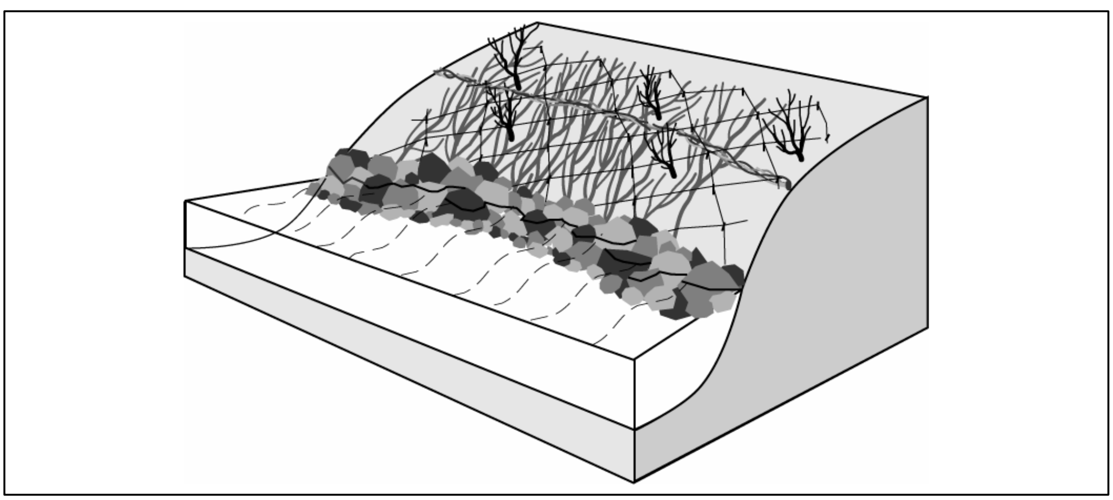
- **Brush Boxes**: Compacted piles of brush cuttings are stacked between parallel rows of stakes located on the bank right at the creek's edge. The stakes are secured with heavy wire to maintain the rigidity of the structure. Brush boxes trap sediment from surface flow, protect the bank from stream sheer stresses, and optimize establishment of vegetation by maintaining contact between cuttings and moist soil. However, stakes and wire should be removed once vegetation is established to prevent it from entering the channel or injuring wildlife.

Figure 4-5. Brush Boxes



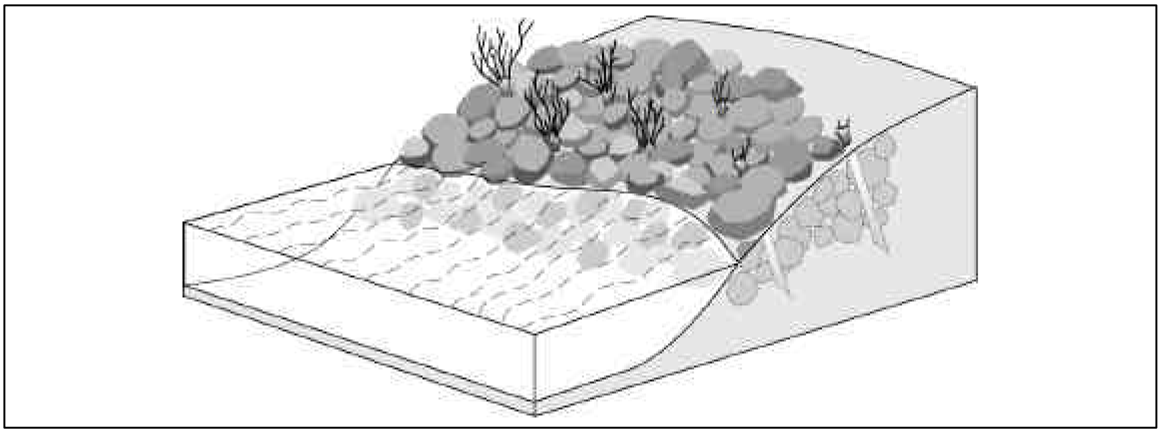
- **Brush Mattresses**: A combination of live stakes, live fascines and/or dormant branch cuttings are laid over the creek bank and secured with a grid of stakes and wire or rope to provide immediate cover and to eventually take root in the slope. Good soil contact is important for the success of this method so additional soil is placed on the mattress and worked down into the spaced between the plant materials. Since this method is applied to the slope above base flow levels, additional protection for the slope toe may required. Brush mattresses are suitable for protecting 2:1 horizontal run to vertical rise or flatter banks from the erosive forces of both creek and surface flows but are not appropriate for slopes experiencing mass movement. The mattresses can be constructed around larger plants. Wire and/or rope needs to be anchored and removed once plantings are established. Since dormant cuttings are used this techniques must be installed in the late fall or early winter.

Figure 4-6. Brush Mattresses



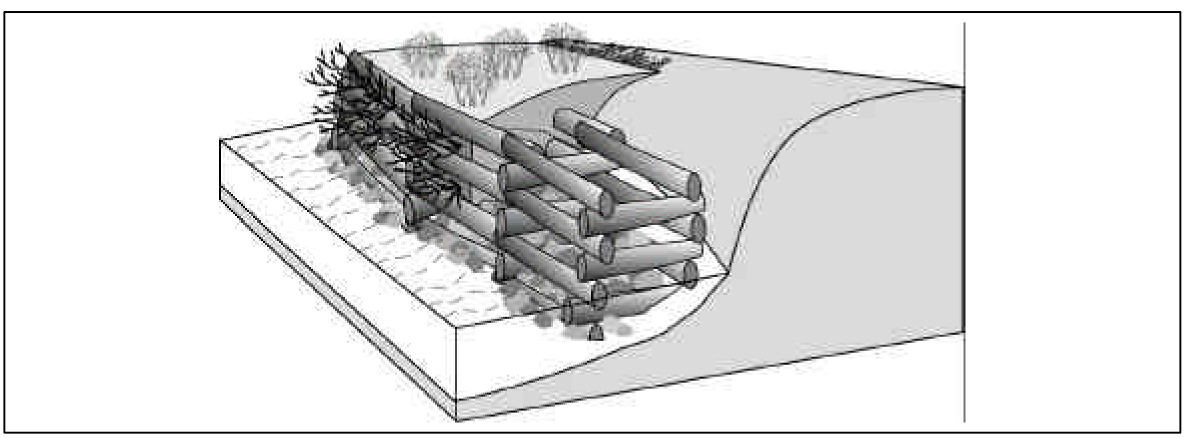
- **Joint Plantings**: Live stakes are inserted into the creek bank in the spaces between rock rip-rap to facilitate establishment of a root mat underneath the rock and to improve the aesthetic and habitat value of the rip-rap. Planting collars should be used to protect plant tissue from damage and abrasion.

Figure 4-7. Joint Planting



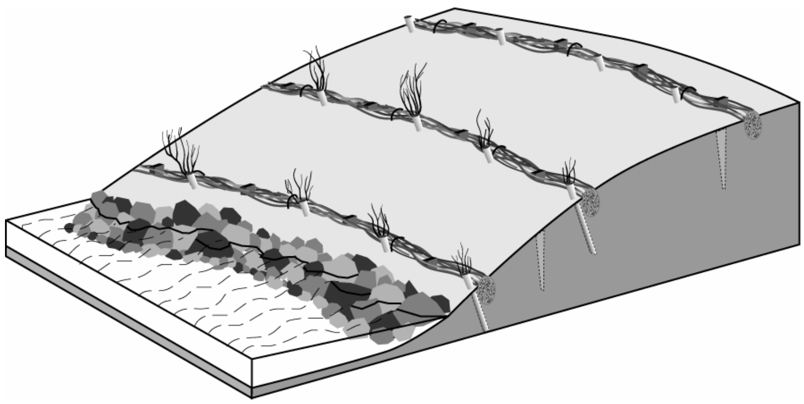
- **Live Cribwalls**: Untreated logs or timber members made from rot resistant species are constructed into interconnecting boxes situated above the base flow level and filled with alternating layers of soil and live branch cuttings. Root wads may also be incorporated into the structure. This method is relatively expensive but provides immediate structural stability for nearly vertical banks and accelerates the establishment of woody species.

Figure 4-8. Live Cribwalls



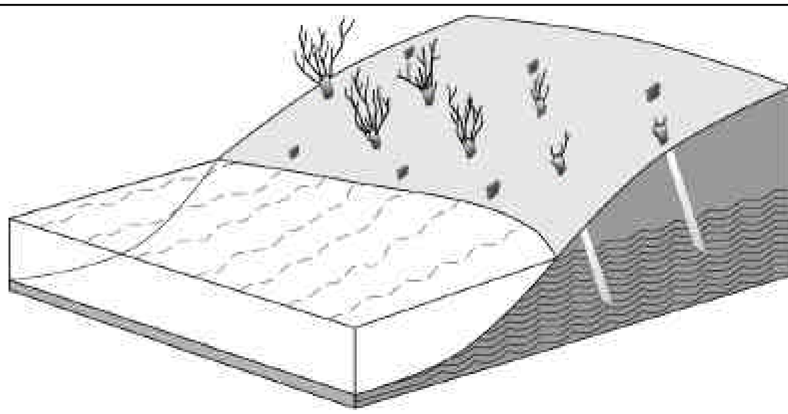
- **Live Fascines/Wattles**: Bundles of long, straight dormant branch cuttings (typically willow or alder) are bound together with wire or twine in cylindrical bundles about 6-8 inches in diameter and 8-10 feet long. The bundles are placed in shallow trenches parallel to the slope of the bank and staked into place with live or dead stakes. This technique is best used on slopes of 2:1 horizontal run to vertical rise or flatter, and is intended mainly to address erosion related to surface flow. Since dormant cuttings are used this techniques must be installed in the late fall or early winter.

Figure 4-9. Live Fascine/Wattles



- **Live Stakes**: Living woody plant cuttings from willow or other riparian species are tamped into the ground and eventually take root. Stakes must have access to soil moisture to root and be long enough so that several nodes are underground. This is a relatively inexpensive method that does not require significant site disturbance. Live stakes can also be used to pin down surface erosion control materials. Slope should be 2:1 horizontal run to vertical rise or flatter. Slope toe protection may be required. This technique can be used where creek flows are slow with relatively little shear stress.

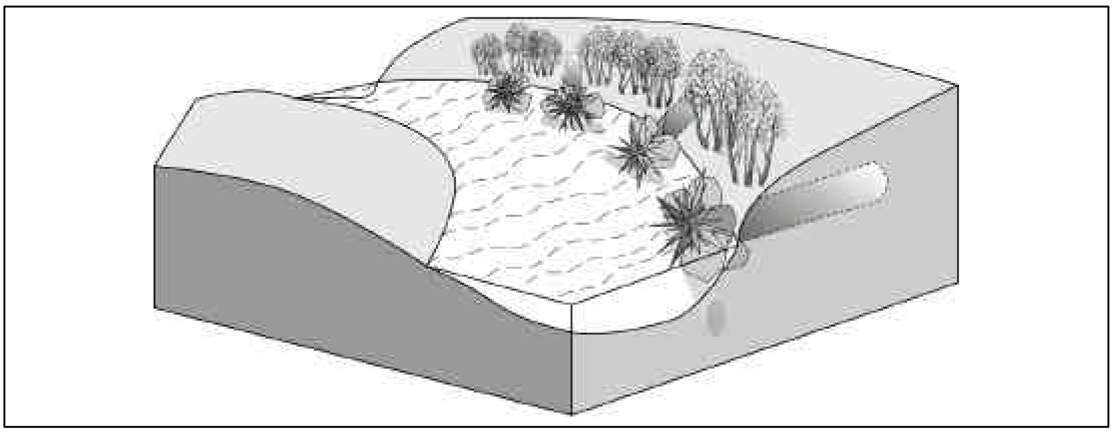
Figure 4-10. Live Stakes



- **Live Cutting Fences**: This technique is similar to the live stake method (described and illustrated above) except that the cutting are installed parallel to the contours at intervals several feet apart to form low retaining walls. The fences trap surface flow and sediment and eventually take root to establish riparian vegetation. This method is best used for protection from surface flow and is not intended by itself to address erosion resulting from channel flow. Slope toe protection may be required.

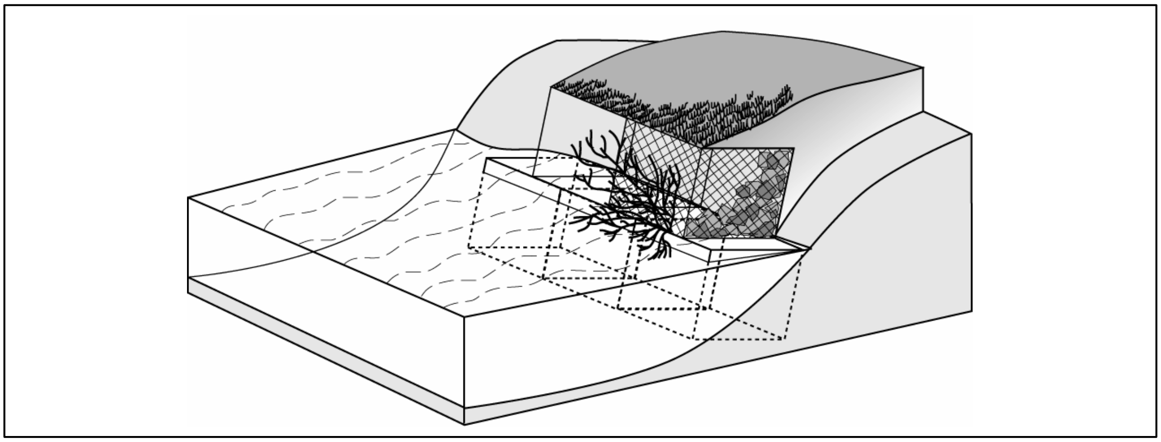
- **Log, Boulder and Root Wad Revetments**: Boulders, logs and/or root wads are attached together and anchored along the creek bank. Correct placement and orientation to flow is critical to prevent unwanted scour. Revetments trap sediment and provide cover for aquatic species, but may biodegrade before permanent vegetation is established. Heavy equipment is usually required to position the revetments. This technique may be used where access for heavy equipment is practical. Revetment placement and anchoring is a function of the specific channel structure and hydraulic conditions and as such should be determined in the project planning phase by the project engineer and geomorphologist. Use care to provide adequate anchoring when revetments are placed upstream of bridges or other areas of constricted flow.

Figure 4-11. Log, Boulder and Root Wad Revetments



- **Vegetated Gabions:** Rectangular wire mesh baskets filled with soil and small to medium sized rocks are stacked along the bank in a receding terrace and live cuttings of native woody species are inserted in the spaces between the baskets. Larger planting pockets can also be left in the upper tiers of the gabion terrace to accommodate the placement of rooted plant materials provided they have time to become well-established before high water events are expected. Supplemental irrigation will be required in these situations. Vegetated gabions are used for very steep bank stabilization.

Figure 4-12. Vegetated Gabions



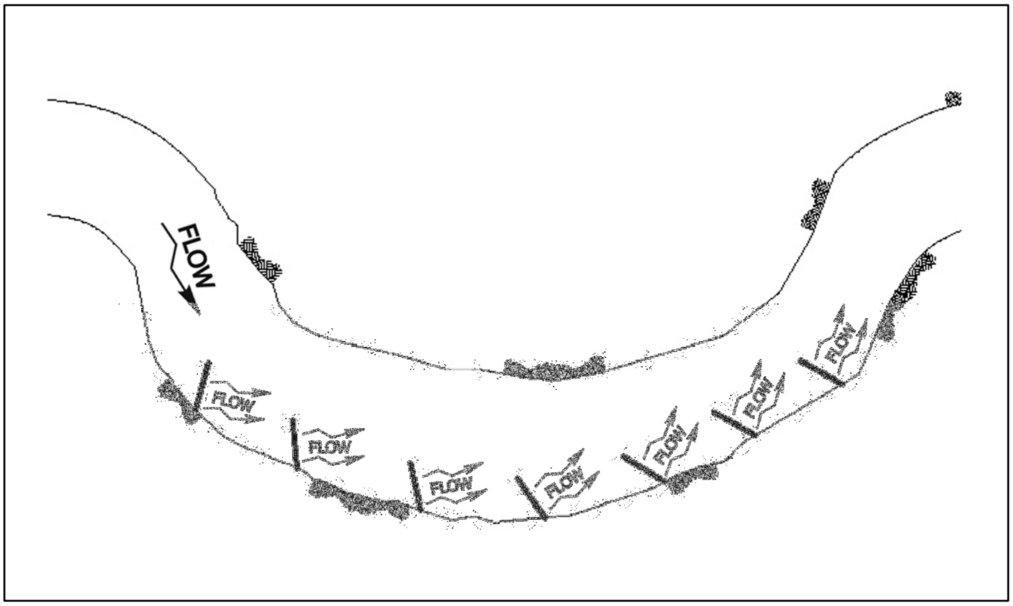
Flow Deflection

Flow deflection structures include those types of instream structures that tend to deflect erosive forces away from areas of bank instability. The general premise is to alter the course of the highest velocities by directing them inward towards the center of the channel. Benefits include increasing hydraulic variability and sediment sorting mechanisms. Along the downstream backside of the structures, a leave is created where sediments tend to accumulate, allowing emergent, herbaceous, and woody materials to regenerate, heal degraded stream banks, and grow outward towards the channel. This process results in increased sinuosity and an increase in riparian cover.

These types of structures are, however, less reliable than biotechnical methods applied directly to banks and are subject to the specific types of flood events and forces inherent in that particular system. In addition, great care must be taken to ensure that flanking along the backside of the structure does not occur during higher flood flows. The following in-stream flow deflection methods are appropriate for application in the Roseville Creek corridors.

- **Bendway Weir:** A bar of submerged rock is placed in the bend of the channel with one end anchored to the bank and the other end extending into the channel. The structure is usually angled from 0 to 30 degrees toward the upstream direction. The specific location, angle, and number of weirs are based on site conditions. The weir(s) should be high enough to intercept enough flow to reduce bank erosion on the outside bank of the bend but not so high as to impede flood conveyance. Bendway weirs alter secondary currents on the outside of a bend by redirecting high velocity flow and dissipating energy in the area of the bend.

Figure 4-13. Bendway Weir Placement



- **Log, Rock or J-Rock Vane:** A vane is a linear structure that extends from the stream bank approximately 1/3 of the bankfull width into the channel and is angled toward the upstream direction at 20 to 30 degrees. The downstream end is set at the bankfull elevation and the upstream end at the bottom of the channel. Vanes are used to redirect flow towards the center of the channel thereby reducing erosion of the bank. They are commonly used to address erosion at the toe of banks. Either rock or logs can be used to construct a vane. Both must be properly anchored and/or keyed to the bank and channel bottom to keep them in place. Proper design and installation is very important so that the features do not cause eddy scour of the bank on the upstream side or excessive pool scour on the downstream side. J-rock vanes are the same as regular rock banes except the end in the creek curves around in a "J" shape to enhance the formation of downstream scour pools.

Figure 4-14. Log Vane

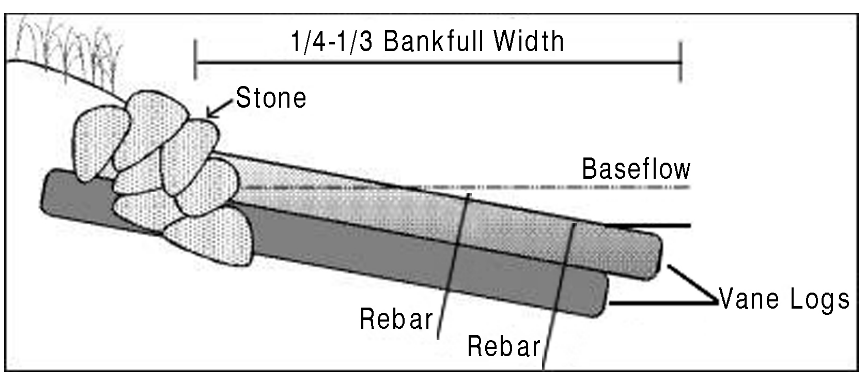
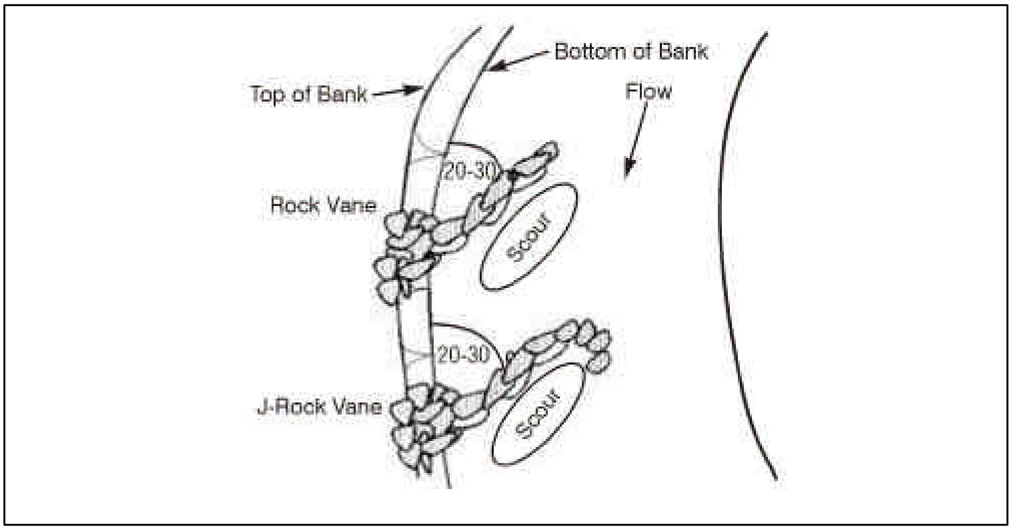


Figure 4-15. Rock and J-Rock Vane



Hardscape

Hardscape refers to the placement of rock (i.e. cobbles, large boulders, angular rock, and non-vegetated gabions) or concrete (i.e. articulated block, retaining walls, and deflection walls) into reaches where banks are steep, erosion is imminent, and velocities exceed 7 to 10 feet per second. Of all of the erosion/stabilization measures, hardscape is the most reliable and longest lasting form of protection. However, its negative impact on the biological value of the creek is severe. Placement of rock or concrete bank stabilization measures generally results in the loss of riparian habitat. Wherever possible, some provision should be made to include a vegetative element in the design of bank stabilization projects that rely on hardscape techniques. Some examples of such improvements are terracing retaining walls and leaving a planting pocket behind each level, or placing live stakes in the spaces between cobbles or riprap.

As a general rule, and in the interest of creek habitat preservation, hardscape should be used as a last resort and where other options are deemed infeasible. However, if a hardscape approach is required, boulder revetments and imbricated rip-rap may provide a marginally more naturalistic appearing solution than manufactured block, retaining walls, traditional rip-rap or non-vegetated gabions.

- **Boulder Revetment:** A boulder revetment is constructed by placing a series of boulders along the toe of a creek bank or extending part of the distance up the bank. Single boulder revetments have one row of stone above a row of keyed in footer stones. If additional bank protection is needed a double layer boulder revetment can be used. Alternatively, a single row of very large boulders 3 feet to 4 feet tall can be used to create the revetment. In this application no footer stones are used and the large boulders are entrenched below the creek bottom to prevent scour and dislodgement.

Figure 4-16. Single Boulder Revetment

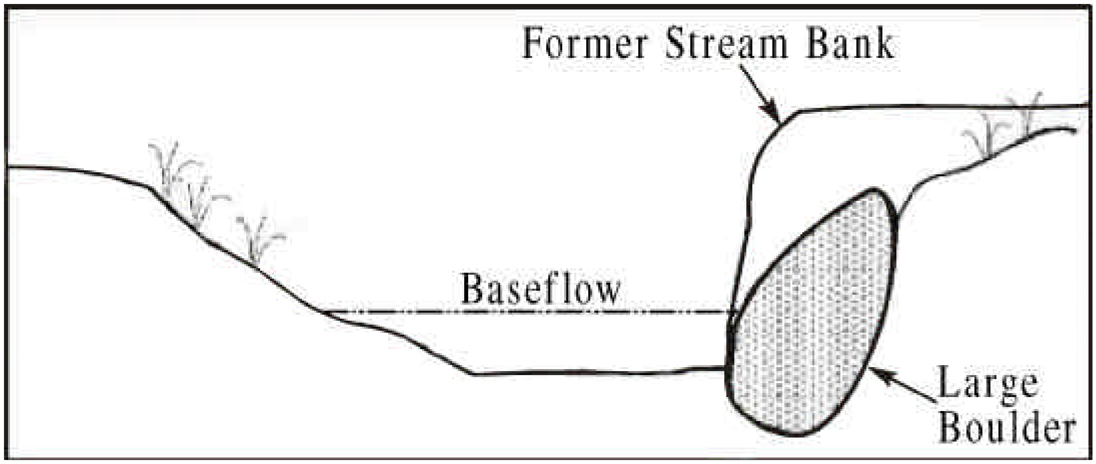
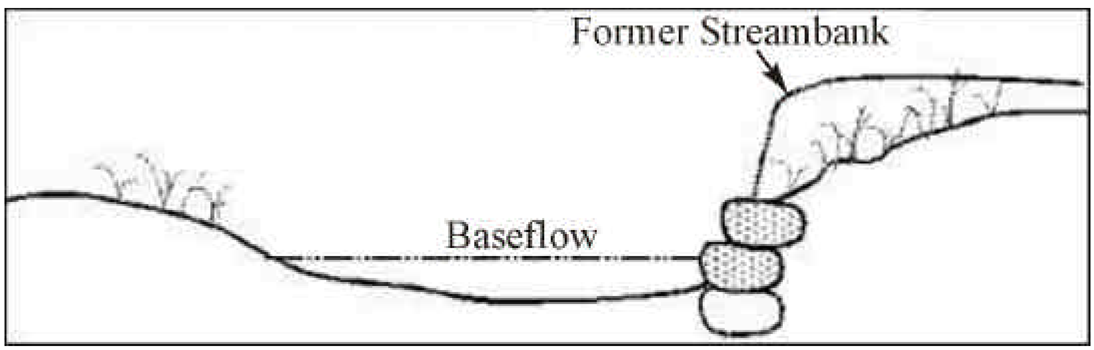
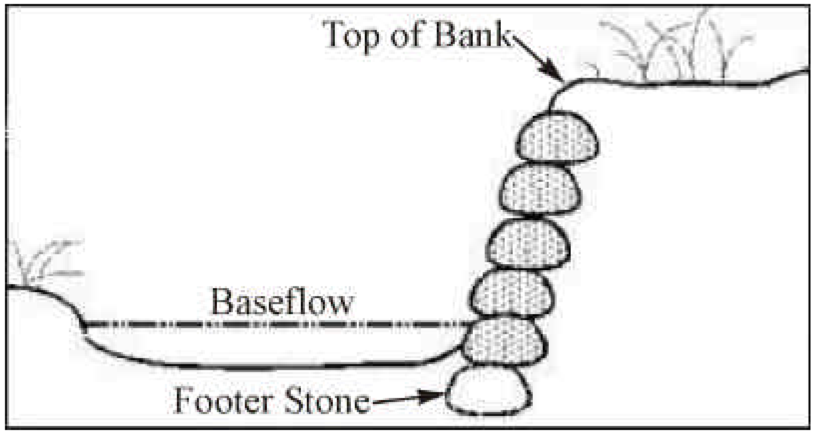


Figure 4-17. Double Boulder Revetment



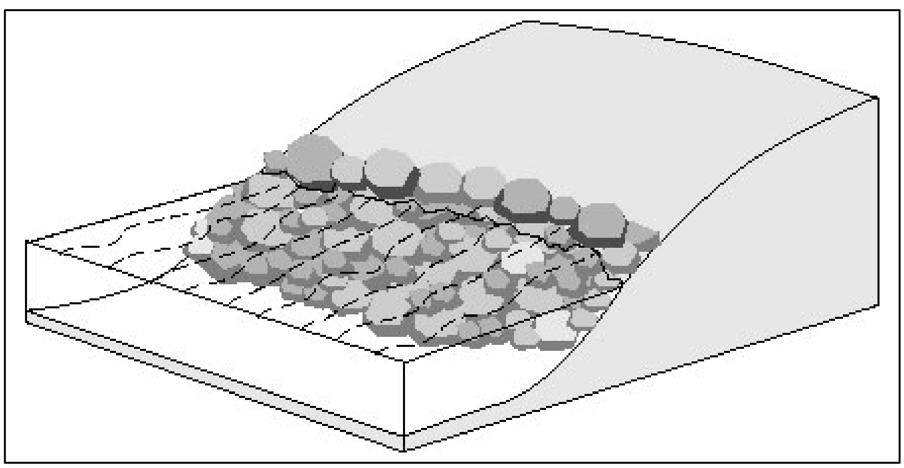
- **Imbricated Rip-rap:** This technique is similar to a boulder revetment but uses large two to three foot long flat or rectangular boulders staked up the entire face of the creek bank with a slight batter for stability. A layer of geotextile fabric is usually placed behind the stones to reduce erosion. This technique is one of the few stabilization options for nearly vertical banks where there is not adequate room to lay back the bank to a more stable angle.

Figure 4-18. Imbricated Rip-rap



- **Stone Toe Protection:** In some situations, a limited amount of hardscape may need to be situated at the toe of the slope to provide stabilization either by itself or in combination with other methods. In these situations, stream cobble or similarly sized quarried rock is placed at the toe of the stream bank and slightly below the water line to deflect flow and to potentially promote sediment deposition.

Figure 4-19: Stone Toe Protection



Stabilization Materials

Stabilization materials are often used to control bank erosion while revegetation is becoming established. The natural materials such as coir will biodegrade over time, but the synthetic materials will not. Some apparently natural materials (wood fibers) also use nylon mesh to hold the fibers in place and this mesh will not biodegrade. Synthetic materials are best suited to temporary applications where the intention is to eventually remove the product.

Many synthetic and natural materials, fabrics, and components are being developed, introduced, and tested for projects in association with erosion protection and bank stabilization. These types of measures provide a wide variety of physical and biological benefits and vary in reliability, effectiveness, and cost. Some of the most commonly used materials are:

- Geotechnical Soil Stabilizing Components and Networks,
- Synthetic Geotextiles,
- Synthetic Erosion Control Blankets,
- Synthetic Filter Fabrics,
- Natural Jute or Coir Fabrics,
- Natural Jute, Coir, or Straw Components, and
- Synthetic and Natural Fibers.

It is important to obtain the manufacturer's current specifications for use and installation instructions before selecting any of these products for a bank stabilization project since they are constantly being redesigned and improved.

4.4 Channel Realignment

4.4.1 Benefits

Channel realignment is used to intentionally direct the channel forming forces of the creek. Realignment efforts aim to establish a creek system that will accommodate the range of anticipated vertical and lateral channel movements in a manner that protects property, public safety and enhances habitat conditions. Channel realignment can be used specifically to create more sinuosity, address incision, prevent erosion, and to create a more well-defined low flow channel. More sinuosity increases aquatic habitat diversity and can increase channel capacity. Spreading out flows from deeply incised channels increases the diversity of riparian vegetation. A well defined low-flow channel decreases the water surface area thereby decreasing the amount of solar radiation transferred to the water, reducing the rate of increase in creek temperatures. The narrower channel will also allow vegetation to establish itself closer to the channel centerline or thalweg, providing increased shading that will aid in maintaining reduced temperatures.

4.4.2 Where Appropriate

Bank realignment should be considered where any of the following conditions exist:

- Banks are exposed and/or eroding
- Hardscape stabilization measures have been used to protect property and adequate access open space makes realignment feasible
- Low flow channel is absent or poorly defined

- Channel is deeply incised and riparian vegetation is losing hydrologic connection to creek

- Creek channel lacks sinuosity

- Channel sections lack topographic diversity (terracing)

4.4.3 General Practices

Planning

- Design realignment to minimize disruption of existing valuable riparian vegetation.

- Utilize existing topography and remnant channel features when feasible.

- Look for opportunities to provide a diversity of habitat types through the realignment of the channel, such as seasonal wetlands, side channels, etc.

- All channel realignment projects should include an evaluation of the potential for upstream and downstream hydraulic impacts and of the localized hydrologic conditions. The project must be consistent with the City's flood management requirements.

- The objective(s) for the realignment project need to be clearly defined and evaluated for overall consistency with the ecological objectives of the larger creek system.

- The channel realignment design should be evaluated for consistency with projected future flow conditions and sustainability of the resultant ecosystem.

- Schedule project activities to avoid disruption of fish migration or include provisions for bypass measures in project design.

- Include measures to prevent siltation of downstream reaches during construction.

- Identify other restoration strategies that need to be included with the realignment project such as bank stabilization, bank recontouring, in-stream structures, grade controls, and/or revegetation. Design all components as part of an integrated approach to restoration using a multi-disciplinary team with expertise in hydrology/hydraulics, geomorphology, civil engineering, revegetation, and habitat enhancement.

- Try to balance cut and fill requirements to minimize need for offsite disposal and/or importation of soil and rock.

- If soil and rock must be imported, use materials that have been collected from the local watershed or that are geologically comparable to local materials.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Plan Review

- A plan of the proposed channel realignment project should be prepared and reviewed by the City before implementation. The plan should include the extent of the project, description of impacts to existing vegetation, timing, grading plan, cut and fill calculations, diversion strategies, the results of any hydraulic/hydrologic analyses, and specific erosion control measures to be implemented during the construction phase. Information as required by this Plan for any other restoration strategies (revegetation, bank stabilization, etc.) should also be included.

Installation

- Make sure that project area is secured from public access to prevent accidents and injury.

- Identify any vegetation adjacent to the project area that is to be protected and provide protective fencing around the critical root zone.

- Harvest any native plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- Stockpile topsoil to be redistributed on finished grade.

- Where bank erosion presents an imminent threat to property and/or public safety, the use of temporary hardscape stabilization techniques may be required. A strategy should be developed for replacement of these techniques with a more ecologically appropriate technique when/if the imminent threat passes.

- Proper anchoring of stabilization materials is necessary to prevent dislodgement of materials that could cause flow obstructions, injuries to wildlife, hydraulic impacts, or downstream hazards. The project engineer and geomorphologist should identify anchoring methods.

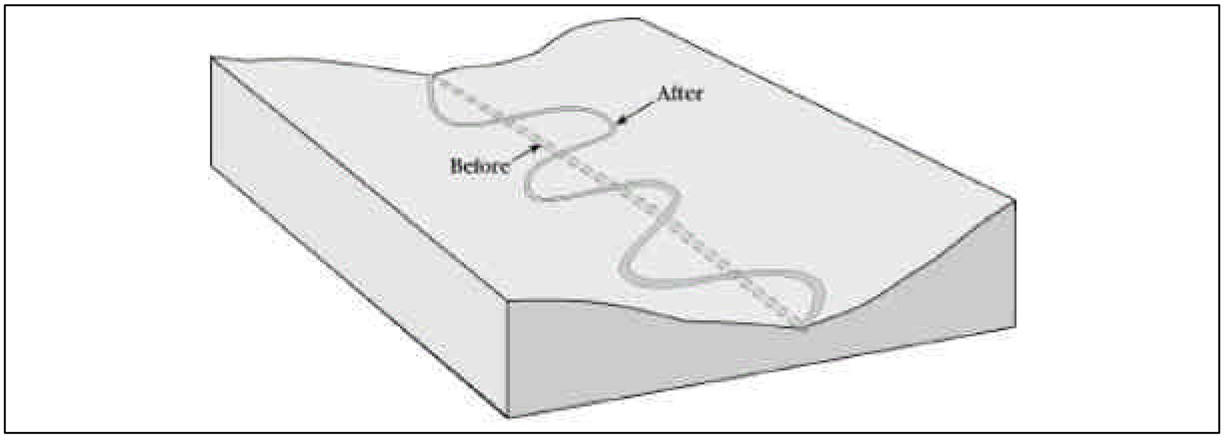
4.4.4 Techniques

Excavation & Grading

Channel realignment can be accomplished by physically grading the existing channel and adjacent floodplain to the desired topographic configuration. This technique can be highly disruptive of existing vegetation, require extensive measures to protect downstream areas from siltation, complicated to execute properly, and expensive. However, it also provides the ability to quickly and precisely implement major changes in the creek geometry on a large scale. This method should be used when in-stream structures or grade controls (discussed below) alone are not adequate to create the required magnitude of change in the desired timeframe. For example, projects that require a major modification to the profile of the channel or relocation of the thalweg may best be accomplished by excavation and grading

Excavation and grading may be used alone or in conjunction with in-stream structures and grade controls to define the topographic features of the channel, including the low-flow channel, thalweg, terraces, pools, and meanders. Excavated channel realignment projects require careful planning for heavy equipment access to minimize soil compaction and disturbance in areas that are not to be graded.

Figure 4-20. Channel Realignment



Non-excavation

A lesser degree of channel realignment can be accomplished by installing structures in the channel that influence sediment deposition, scouring, and flow velocity. These measures include in-stream structures and grade controls and are discussed in sections 4.5 and 4.6 below. These types of measures are less disruptive of existing vegetation and result in more modest and gradual changes to creek geometry. These measures should typically be used to address specific and discrete areas where the desired adjustment to the creek can be accommodated within the existing bankfull channel, and the overall alignment is to be retained.

4.5 In-stream Structures

4.5.1 Benefits

In-stream structures provide opportunities to improve hydraulic diversity and sediment management mechanisms, produce riffles or pools, develop different types of epifaunal substrate, redirect erosive flows, improve the low-flow channel, increase sinuosity, and (especially in the Dry Creek watershed) provide clean pockets of spawning gravels suitable for chinook salmon and steelhead. In-stream structures can also act as sediment traps and attenuate storm peak flows.

4.5.2 Where Appropriate

In-stream structures should be considered for implementation where any of the following conditions exist:

- Banks are exposed and/or eroding
- Low-flow channel lacks definition

- Base flow is overly shallow or shifting

- Thalweg lacks sinuosity

- Reach lacks diversity of flow/depth regimes (slow-deep, slow-shallow, fast-deep, fast-shallow)

- Occurrence of riffles is infrequent with distance between riffles divided by reach width greater than 7.

- Cobble and gravel particles forming riffles are more than 20% embedded.

- Pools are absent, sparse or shallow. Less than 30% of pool bottom is obscured due to depth and/or pools are less than 3 feet deep.

- Fish cover is sparse and/or fewer than 5 types of cover are present.

- Heavy sediment deposits are filling pools and blanketing substrate.

- Channel has down cut to bedrock and/or substrate shows little diversity.

4.5.3 General Practices

Planning

- Design of in-stream structures requires consideration of the full range of potential hydraulic and hydrologic impacts at the project site, upstream and downstream.

- Consider the type of structure(s) to use to best meet the overall ecosystem benefit for the creek system. Some structures may improve conditions for certain species while adversely impacting others.

- Be sure that the project plan addresses the potential for in-stream structures to deflect flows against an unstable bank or to increase undesirable scour.

- The selection and placement of in-stream techniques should be made by a team with expertise in geomorphology, hydraulics, engineering, and aquatic ecosystem function.

- Multiple in-stream techniques may be needed in concert with other types of strategies (such as bank contouring, revegetation, and/or bank stabilization) to accomplish the full range of restoration objectives.

- Schedule project activities to avoid disruption of fish migration or include provisions for bypass measures in project design.

- Include measures to prevent siltation of downstream reaches during construction.

- When feasible, use naturally occurring materials found on or near the project site to construct the in-stream features.

- If soil, root wads, logs, rock, etc. must be imported, use materials that have been collected from the local watershed or that are comparable to local materials.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Plan Review

- A plan of the proposed in-stream structure(s) should be prepared and reviewed by the City before implementation. The plan should include the extent of the project, description of impacts to existing vegetation, timing, diversion strategies, plan and section details for the structures, anchoring specifications, the results of any hydraulic/hydrologic analyses, and specific erosion control measures to be implemented during the construction phase.

Installation

- Make sure that project area is secured from public access to prevent accidents and injury.

- Harvest any native aquatic plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- Proper anchoring of materials is necessary to prevent dislodgement of materials that could cause flow obstructions, injuries to wildlife, hydraulic impacts, or downstream hazards. The project engineer and geomorphologist should identify anchoring methods.

4.5.4 Techniques

Cut-off Sill

A cut-off sill is a low row of rock that extends from the bank toe into the creek channel in an upstream direction at approximately 20 - 30 degrees from the bank. This type of structure is very similar to a rock vane (see Figure 4-15) but its profile is lower and is usually well below the bankfull water surface elevation. Cut-off sills are used to narrow a channel and better define the low-flow channel by encouraging deposition and bar formation along the channel's edge. This technique may also be used to stabilize existing bars by installing the sills directly in the bar and with the top of the structure extending only slightly above the top of the bar.

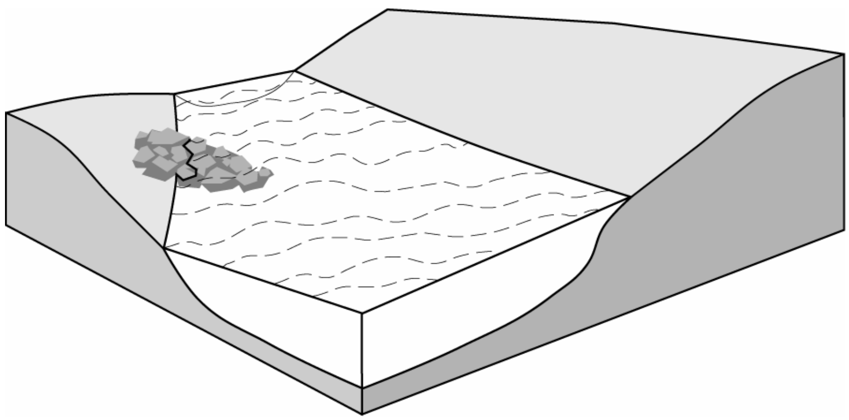
Linear Deflector

A linear deflector consists of a line of boulders placed in the creek channel parallel to the bank and at some distance away from the bank for the purpose of narrowing, deepening and better defining the low-flow channel. The tops of the boulders are usually well below the bankfull water surface elevation. The area between the deflector and the bank may include cut off sills and be left to fill in with sediment naturally, or it may be backfilled at the time of construction. Since this technique concentrates flows in a smaller area care needs be taken to insure that the opposite bank is stable or has some form of stabilization in place.

Boulder Wing Deflector (Single or Double)

A triangular structure consisting of a rock filled log frame or entirely of rock is placed with the wide end at the bank and the pointed end extending into the channel (single wing). A double wing deflector consists of the same structure placed on bath sides of the channel. Wing deflectors are used to narrow and/or deepen the base flow channel and to create sinuosity. Double wing structures can also enhance riffle habitat above and between the structures and scour pools downstream. The wide end of the wing is placed at the higher of the bankfull elevation or the top of bank. The pointed end grades down to the channel bottom and about 1/3 of the way across the channel. Single wing deflectors have the potential to cause erosion on the opposite bank so careful design and analysis of hydraulic impacts is important.

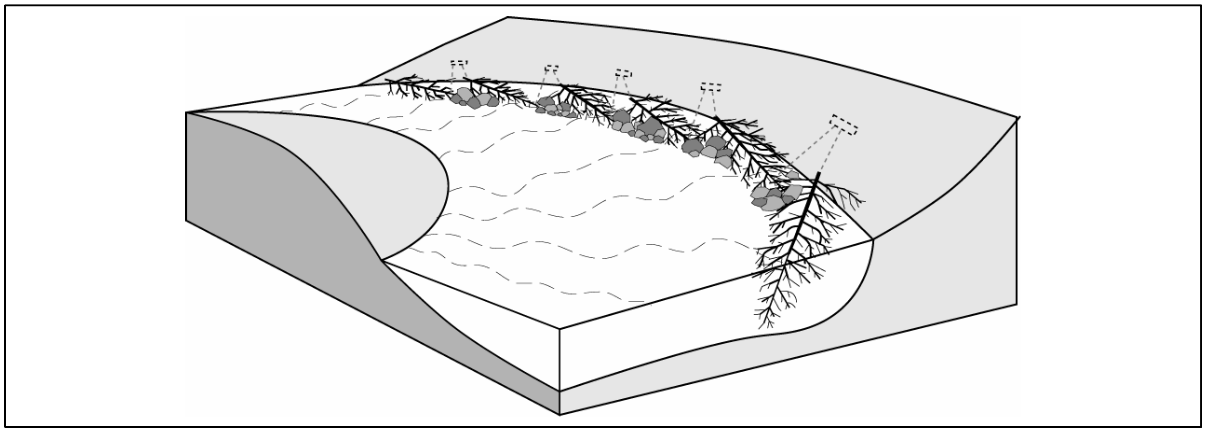
Figure 4-21. Single Wing Deflector



Large Woody Debris (LWD)

If LWD falls within the stream channel, it should be realigned parallel to the flow of water and left in place, unless it increases the risk of flood damage to neighboring or upstream properties. If the LWD poses a threat to downstream structures, it should be anchored to the bank sufficiently to prevent it from moving downstream during floods. The amount of LWD left resident in a channel cannot be allowed to compromise the flood conveyance requirements for that reach.

Figure 4-22. Large Woody Debris



Deflection Structures

Several in-stream techniques used for bank stabilization are also suited for making changes to the channel itself. See the discussion in section 4.3.4above on **bendway weirs** and **log, rock and j-rock vanes**.

4.6 Grade Control

4.6.1 Benefits

The purpose of grade controls is to maintain a desired streambed elevation by either preventing incision or by encouraging deposition, and to introduce hydraulic diversity in the channel. Designing the low-flow and bankfull channels to have some turbulent waters such as small waterfalls or cascading riffles will help to oxygenate the water and increase hydraulic diversity within the creek system. Well mixed waters have fewer problems with stagnation and anoxic effects, and are more efficient at removing nutrients and decreasing the biological oxygen demand (BOD). One very important benefit of the grade control structure is its ability to maintain a riffle in a designated space within an increasing flow regime.

In areas where channel incision is occurring or has occurred, grade control structures may be constructed to ensure that vertical channel movement ceases. In many cases where sediment transport characteristics are sufficient, the channel thalweg can be trained and the elevation of the channel bottom can increase, thereby reducing the effects of historic channel incision and reconnecting the hydrologic connection to the riparian vegetation.

4.6.2 Where Appropriate

Grade controls should be implemented where any of the following conditions exist:

- Reach lacks diversity of flow/depth regimes (slow-deep, slow-shallow, fast-deep, fast-shallow)
- Cobble and gravel particles forming riffles are more than 20% embedded.

- Heavy sediment deposits are filling pools and blanketing substrate.

- Pools are absent, sparse or shallow. Less than 30% of pool bottom is obscured due to depth and/or pools are less than 3 feet deep.

- Extreme vertical changes in existing creek bottom are causing excessive scour and or erosion

- Extreme vertical changes in existing creek bottom are creating migration barriers for fish

- Discharge from a culvert or outfall is degrading the channel

- A nick point has formed and is migrating headward

4.6.3 General Practices

Planning

- Design of grade control structures requires consideration of the full range of potential hydraulic and hydrologic impacts at the project site, upstream and downstream.

- Consider the type of structure(s) to use to best meet the overall ecosystem benefit for the creek system. Some structures may improve conditions for certain species while adversely impacting others.

- Be sure that the project plan addresses the potential for grade control structures to increase undesirable scour.

- The selection and placement of grade control techniques should be made by a team with expertise in geomorphology, hydraulics, engineering, and aquatic ecosystem function since these decisions must respond to individual site constraints such as flow level, velocity, channel width, and sinuosity.

- Multiple grade control techniques may be needed in concert with other types of strategies (such as bank contouring, revegetation, and/or bank stabilization) to accomplish the full range of restoration objectives.

- Schedule project activities to avoid disruption of fish migration or include provisions for bypass measures in project design.

- Include measures to prevent siltation of downstream reaches during construction.

- When feasible, use naturally occurring materials found on or near the project site to construct the in-stream features.

- If soil, logs, rock, etc. must be imported, use materials that have been collected from the local watershed or that are comparable to local materials.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Installation

- Make sure that project area is secured from public access to prevent accidents and injury.

- Harvest any native aquatic plants that are to be replanted in the finished project and establish them in a suitable temporary location.

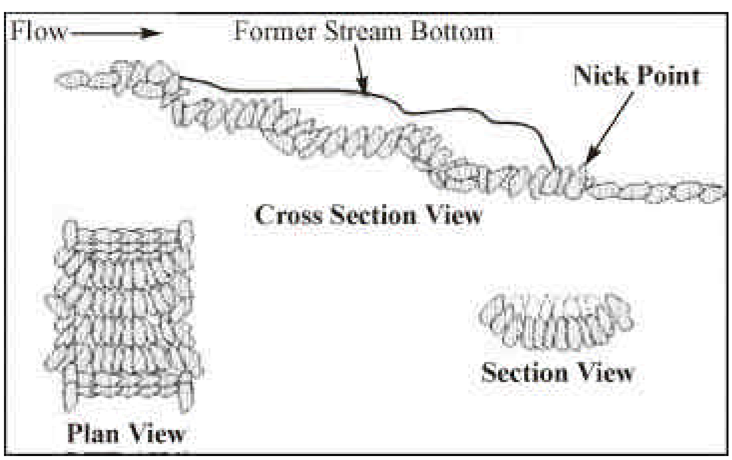
- Proper anchoring of materials is necessary to prevent dislodgement of materials that could cause flow obstructions, injuries to wildlife, hydraulic impacts, or downstream hazards. The project engineer and geomorphologist should identify anchoring methods.

4.6.4 Techniques

Step Pools

Step pools are used to dissipate energy in steep sections of the creek to control erosion and scouring. They are good techniques to use to stop headward migrating of a nick or to address channel degradation below an outfall or culvert. The structure consists of placing large rock in alternating short, steep sections with longer low or reverse grade sections. The rock used must be large enough to be immobile, and the drops should be low enough to allow migration of aquatic species. Some step pools include sections of open creek bottom (no rock) between the rock sections to allow development of scour pools or to provide glides after the riffles. The specific dimensions of the steps and size of rock to be used are determined by the conditions of the specific reach, such as existing grade, flow velocity, extent scour occurring, etc.

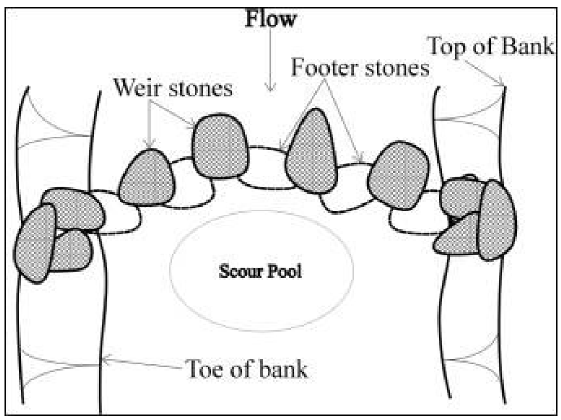
Figure 4-23. Step Pools



Rock Vortex Weirs

A rock vortex weir consists of a curved row of stones positioned across the creek channel and pointing upstream with the legs of the weir oriented 15 to 30 degrees relative to the stream bank. The weir structure includes a base layer of large 2 – 3 foot boulders placed as a footing in a trench excavated in the creek bottom. Large stones are then placed in the trench behind and against the footing stones to the desired elevation. The weir stones do not touch each other but are separated by about 1/3 to ½ the diameter of the stones. The legs of the weir extend to just above the bankfull elevation and the weir stones in the channel are kept to about 10 to 15% of the bankfull height. During baseflows, the creek passes through the openings between the stones and creates diversity of flow velocity and depths. At high flows, water passes over the stones and creates a scour pool on the downstream side of the weir while still allowing bed load sediments to pass through. Rock vortex weirs are best used to prevent grade changes than to stop active changes such as migrating nick points.

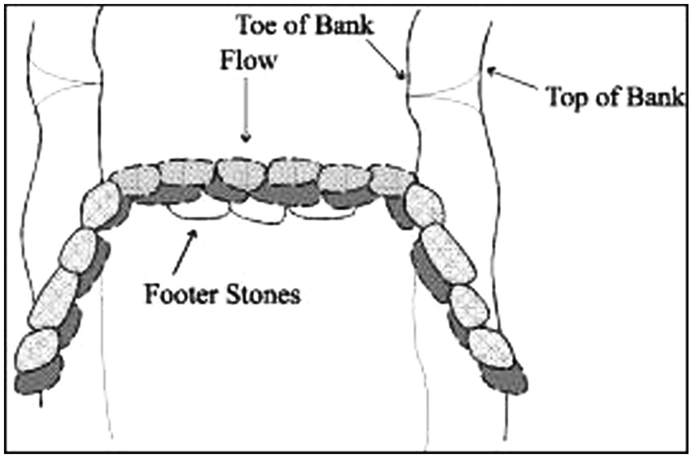
Figure 4-24. Rock Vortex Weir



Rock Cross Vanes

A rock cross vane is similar to a rock vortex weir but the stones extend very little if at all above the creek invert. This technique is used to narrow the base flow channel and to provide grade control. The vane is constructed perpendicular to the flow with legs extending downstream and rising gradually to the bankfull elevation. The width of the sill portion of the structure is determined based on the desired width of the channel. Depending on how much channel width reduction is created, scour pools may form below the structure. The number of courses and size of stone is determined based on the size of the creek, potential for scouring, and substrate characteristics.

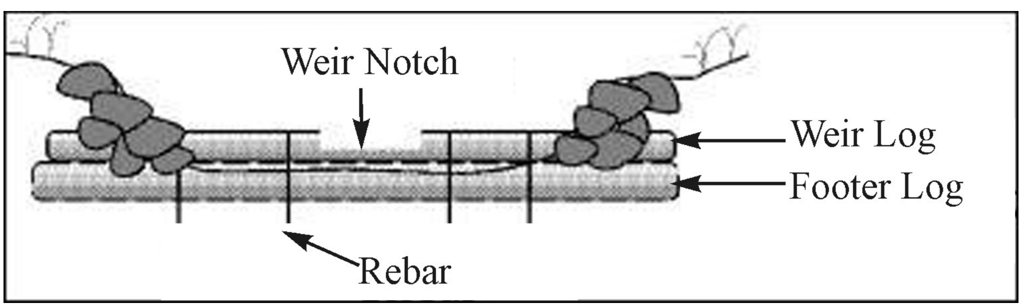
Figure 4-25. Rock Cross Vane



Log and V-Log Drops

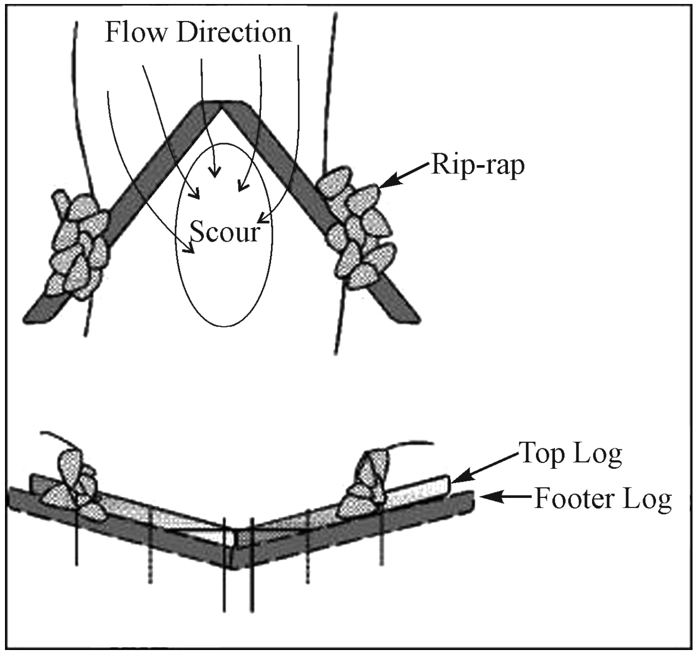
Log drops are used to form pools and to provide grade control in a manner that imitates the influence of large wood debris (LWD). Two large (16" diameter or greater) logs are placed one on top of the other, with the bottom log situated in a trench cut across the creek channel. The top of the upper log should be just below the base flow level of the creek. A weir notch is cut in the upper log to concentrate flow to scour out a pool below the structure. The use of log drops should be very carefully assessed because they can result in upstream sedimentation and a reduction of the channel cross sectional area. If flows exceed the capacity of the notch, their may be potential for bank erosion as the flow spreads out over the entire length of the structure. If this type of structure is only used for grade control, the upper log should not rise above the invert of the creek.

Figure 4-26. Log Drop



V-log drops are a variation of the log drop in which the logs are oriented in a V pointing upstream. The low point is at the apex and the legs rise into the bank. This approach does not create a fish barrier or result in upstream sedimentation. It also more effectively concentrates flows towards the center of the channel, thus reducing reduces the potential for bank erosion and channel widening, and enhancing scour pool formation. Both variations of the log drop approach require anchoring and bank stabilization.

Figure 4-27. V-Log Drop



4.7 Removal of Fish Barriers

4.7.1 Benefits

Fish barriers are obstacles that prevent or delay fish from moving either upstream or downstream. They may be in the form of physical objects located in the channel, the result of inadequate water levels, or a combination of both. The removal of fish barriers is more of a concern in the Dry Creek watershed than in the Pleasant Grove watershed because the Dry Creek system provides more favorable salmonid habitat.

Removing barriers improves the potential for the migrating adults to access the desirable spawning and rearing reaches, and facilitates the exodus of the juveniles when they are ready to leave the freshwater system. Consequently, loss of access to habitat reduces overall fisheries productivity. Barriers can also cause fish to congregate in areas below or above the barrier leaving them vulnerable to predators and can create unsuitable living and breeding conditions that can increase disease incidence.

4.7.2 Where Appropriate

Fish barrier removal should be considered where any of the following conditions exist:

- Channel obstructions/flow levels prevent migration of adult salmonids to potential spawning/rearing habitat.

- Channel obstructions/flow levels prevent emigration of juvenile salmonids out of the system.

- In situations where implementation of the passage improvement will not adversely impact other aquatic species and creek function.

4.7.3 General Practices

The City is aware of several fish passage issues in the Dry Creek watershed and has either corrected the problems or is in the process of developing plans to do so (Appendix E.)

Planning

- Since spawning and emigration occur at different times, barriers need to be identified relative to the flow levels associated with both life stages. It is important to remember there is the potential for adverse impacts to other species by removing barriers that may provide desirable cover or hydraulic conditions for these other species.

- Fish barriers are typically eliminated by construction of some type of passage improvement(s) (see Techniques below), actual physical removal of the barrier, or a combination of these two methods. Consider the approach that best meets the overall ecosystem benefit for the creek system. Some structures may improve conditions for certain species while adversely impacting others.

- Through migration/emigration surveys and field assessment identify where and when barriers exist and where the spawning/rearing reaches are located. Prioritize improvements to maximize habitat benefits. For example, upstream improvements should typically proceed after downstream improvements.

- Since channel conditions can change over time, periodically resurvey the channel to detect new barriers.

- Make sure that improvement design will function as intended with the flows anticipated at the critical times of the year.

- For culverts or other type of flow conducting improvements, make sure that adequate capacity is provided to account for future embeddedness.

- Consider the full range of potential hydraulic and hydrologic impacts at the project site, upstream and downstream, including the ability of the improvement to successfully pass storm flows, sediment and woody debris.

- The design and location of fish passage improvements should be made by a team with expertise in aquatic ecology, fisheries, geomorphology, hydraulics, and engineering since the improvements must respond to individual site constraints such as flow profile at various flow ranges, velocity, channel width, and substrate conditions as well as particular habitat requirements for the anticipated species.

- Schedule project activities to avoid disruption of fish migration or include provisions for bypass measures in project design if disruption cannot be avoided.

- Include measures to prevent siltation of downstream reaches during construction.

- When feasible, use naturally occurring materials found on or near the project site to construct the in-stream features. Use materials that provide the most naturalistic looking improvement while still accomplishing the design intent of the project.

- If soil, logs, rock, etc. must be imported, use materials that have been collected from the local watershed or that are comparable to local materials.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Installation

- Make sure that project area is secured from public access to prevent accidents and injury.

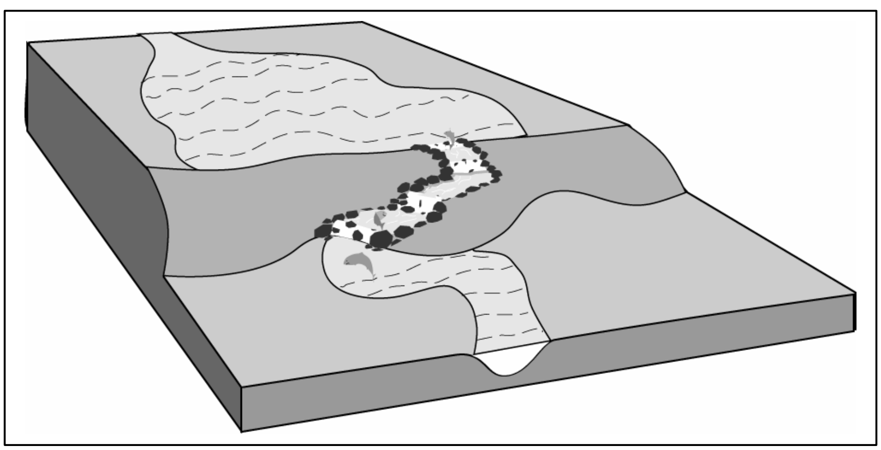
- Harvest any native aquatic plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- Proper anchoring of materials is necessary to prevent dislodgement of materials that could cause flow obstructions, injuries to wildlife, hydraulic impacts, or downstream hazards. The project engineer and geomorphologist should identify anchoring methods.

4.7.4 Techniques

Fish passage improvement techniques are designed to eliminate barriers by providing a route with the flow, slope, water quality, and channel structure characteristics that are compatible with the target species needs. For migrating adults, the improvement is typically needed to provide a gradual upstream change in elevation and may be accomplished using the grade control techniques, such as step pools, described in the prior section.

Figure 4-28. Fish Passage Step Pools



Fish Ladders

A fish ladder (also known as a fish way or fish pass) is an inclined structure consisting of a series of weirs or baffles placed in the creek channel that facilitates upstream migration of fish by correcting conditions that might otherwise function as barriers, such as overly steep gradient or lack of flow. There are many different types of fish ladders ranging from simple step pools to complex manufactured concrete structures. Fish ladders may be recommended when blocking structures are as low as 1 to 2 feet in height. Critical components to determine when a ladder is necessary include flows, energy dissipation, resting areas, drop between pools, attraction velocities, entrance eddies, pool capacity, the fish species that need to pass, and potential impacts on other aquatic species.

Bypass Channels

Bypass channels are constructed to provide a passage route by which migrating fish can circumvent some type of barrier in the main channel. The placement and design of the bypass channel requires all of the same considerations as any channel realignment project (discussed above) as well as an in depth understanding of the habitat and passage requirements of the specie(s) expected to use the channel. The bypass channel may be designed to operate only at certain times of the year with access controlled by weirs, gates, or other methods. Flow and egress are key considerations in the design of bypass channels to avoid stranding.

Screens

Fish screens are used to protect fish from hazards such as pump intakes and in some cases to prevent fish from moving into undesirable habitat via false attraction. There are many types of fish screens, and their effective use requires consideration of various factors such as water velocity, angle of approach, size of openings, anticipated species, time of operation, impacts on other aquatic species, maintenance costs, and possible flood management concerns since screens can trap debris and become blocked.

Culverts

When a creek passes beneath a road it is preferable to create a bridge crossing that is wide enough to accommodate the natural channel profile. However, in some cases this is not feasible and culverts are used to convey the flow from one side of the road to the other. Culverts can be serious fish passage barriers because of their gradient, length, limited volume, velocity of flow within the culvert, and hydrologic conditions at the upstream and downstream ends. In particular, it is common for the invert elevation of the downstream end of the culvert to become higher than the water surface elevation as the channel bottom drops over time from scour associated with the culvert discharge.

If culverts are the only solution for passing flows beneath a road, the project should be carefully designed to:

- maximize the cross sectional area of the opening at the water line and minimize length,
- provide adequate flood conveyance capacity,
- limit scour associated with concentrating the flow,
- have adequate energy dissipating measures at the outfall,
- make sure the invert elevation is set low enough that fish can still enter the culvert even when flows are low,

- set the culvert at the correct gradient for the capabilities of the expected species,
- and maintain a channel profile as close to the natural condition as possible.

Box and arch culverts are generally better choices than traditional round culverts because they provide a wider cross sectional area. Open bottom culverts are preferred over closed bottom culverts because they allow the natural substrate, some in-channel habitat, and the natural gradient of the channel to remain in place. Where closed bottom culverts are used, non-angular boulders may be placed in the culvert to create some low-velocity micro-habitats and to help capture some stream bedload in the culvert. Culverts must be adequately sized to accept these types of components while still passing flood flows. Culvert maintenance must be performed on a regular basis to remove debris that may be impeding passage.

4.8 Beaver Management

4.8.1 Benefits

Beaver activity has the potential to make significant changes to ecosystem conditions in the creek corridors in both the Dry Creek and Pleasant Grove watersheds. With virtually no natural predators remaining, control of beaver populations presents a significant challenge. The goal of beaver management is to establish populations at an optimal level that balances the benefits of their presence with the associated adverse impacts. Beaver activity can be a positive force in the creek ecosystem by increasing aquatic habitat diversity and trapping sediment in their dams. However, an overabundance of beaver can lead to destruction of riparian vegetation, fish passage barriers, erosion, and flood control issues.

4.8.2 Beaver Management Policy

The City's Beaver Management Policy addresses criteria for determining if a management action is warranted, a progressive approach to management, and a population management protocol. The text of this policy is included as Appendix F to this Plan.

It is envisioned that this policy will be accompanied by a comprehensive Beaver Management Plan that addresses public education and outreach, the carrying capacity of the streams for beaver, remediation steps to prevent significant beaver impacts on local waterways, and monitoring beaver dam location and populations. Approval of this plan could serve as the basis for the programmatic approach outlined in Section 8.3.2 to facilitate beaver management in a balanced manner that would maintain the health of both the beaver population and the riparian habitat.

4.9 Invasive Plant Management

4.9.1 Benefits

Management of invasive plant species will help to increase the vigor and diversity of native plant species in the creek corridors by limiting competition for light and nutrients. As the native plant community becomes more robust, its value as habitat for native species of birds and wildlife will also increase. Flood control is another important reason to manage invasive plant populations. Many of the exotic species that proliferate in the creek corridors, such as giant reed (*Arundo donax*), red sesbania (*Sesbania punicea*), and water hyacinth (*Eichhornia cassipes*), produce significant quantities of biomass that reduce channel capacity and conveyance. As the biomass decomposes, there is an increased amount of organic material in the creek sediment which can substantially damage fish spawning and water fowl habitats.

4.9.2 Where Appropriate

- Invasive plant species management should be implemented anywhere populations of invasive non-natives are beginning to or have already become established in the creek corridor.
- Since these species are characterized by rapid colonization, it is most effective to begin management as soon as the species is detected and to provide for follow-up maintenance to prevent or at least control future establishment.
- Invasive non-natives may occur throughout the entire corridor, from the highest transitional upland terraces to within the creek itself.
- Consider including removal of invasive non-native plants into all restoration, revegetation, and maintenance activities.

4.9.3 General Practices

Planning

- Prior to beginning an invasives removal project, inventory all non-native invasive species to determine the extent, condition, and age of the population.
- Assess the potential area that will require revegetation once the non-native species are removed, and include a revegetation strategy as part of the project.
- Try to identify the local source for the species and establish a project boundary that is large enough to include individuals that could provide seed for future re-establishment. For aquatic species this may not be practical since they may spread rapidly floating great distances downstream.
- Identify any adverse impacts the removal project may have on wildlife or aquatic species and develop mitigation measures.
- Establish targets for post-project conditions such as percent removal, degree of control, or consistency with some visual standard.
- Based on the target species for removal, identify which removal methods will be used.
- Be sure staff or volunteers who will be participating in the removal effort are properly trained on plant identification and the proper way to implement the selected methods.

- Schedule the project so that the control methods selected will be coordinated with the species natural growth cycles for added efficiency. For example, If the species spreads by seed, conduct the project before seed is set.

Implementation

- Dispose of cut or harvested invasives outside of the creek corridor in a manner that assures the decomposition of the biomass and destruction of any viable seed.

- If a sizeable amount of invasive material is removed, make sure that native revegetation, erosion control, and slope stabilization measures are implemented immediately.

- Implement any measures that may be required to mitigate for temporary habitat loss while the native species are becoming established.

- Perform periodic monitoring to catch any germination or root sprouting of individual plants that may not have been successfully treated in the initial removal project.

4.9.4 Techniques

Many of the invasive species found in the City's creek corridors are described in Appendix C with an indicator of where they commonly grow, their nuisance factors, and preferred management techniques. In general, management requires the use of one or more of the following methods.

Manual Removal

Manual removal is used when heavy equipment would be impractical or cause damage to the creek channel. Manual removal provides a high degree of precision and selectivity, and is a good choice for relatively small areas or where isolated individual non-native plants are growing among other native species that are to be preserved. In some cases, manual removal is necessary to make sure that all portions of the plant structure are removed, including roots, seed pods, or vegetative shoots. Manual removal is also a good technique for volunteers since they can usually be easily trained to use the requisite tools.

Mechanical Removal

Mechanical removal employs the use of heavy equipment. This may be the only practical strategy if the infestation is very large or involves especially deep-rooted, heavy plants. Since mechanical methods are not very precise, it may be necessary to follow-up with other techniques to make sure that all of the invasive biomass was removed. Erosion control, protection of desirable plants, and access routes must be carefully planned if heavy equipment if to be used.

Herbicide

Herbicides are less desirable for non-natives species management than manual or mechanical methods because of their potential for adverse environmental and water quality impacts if they are not used properly. However, for some species, this is the only effective means of control. If herbicides must be used, it is critical that the correct formulation be chosen that will accomplish the intended result with the least impact on other species. When available, selective herbicides that target a particular plant are preferred over non-selective products that will kill everything. Any removal strategy that includes the use of herbicides must be carefully planned, and comply with the recommendation of a Pest Control Adviser to make sure that the minimal amount of the correct type of chemical is applied, at the optimal time, according to the label instructions to protect waterways and wildlife.

Cut and Paint

The cut-and-paint technique is a combination of manual and herbicide controls. When plants are putting out new shoots or actively growing, the branches are cut off near the ground and the cut surfaces painted with a system herbicide. The herbicide is translocated trough the plant tissue and the plant will eventually die. This method can be effective for some woody species, such as red sesbania, and provides a great deal of control over where the herbicide goes. Other species are so hardy that several applications may be required over successive years to achieve control.

Cutting Shoots and Root Removal

Cutting shoots and root removal is an environmentally safe way to remove woody non-natives but requires a great deal of effort over a period of years to see results. Cutting off shoots and removing as much root as possible substantially stresses the non-native plant. If this regime is kept up faithfully throughout successive growing seasons, the plant will eventually die. However, this technique may not be practical for large areas or if the human resources required to implement it are not available.

4.10 Runoff Controls

4.10.1 Benefits

Runoff controls are used to intercept and/or slow down surface flow coming from outside of the creek corridor before it enters the channel. These flows may originate from storms or from non-storm sources such as irrigation, car washing, hosing off driveways, etc. While these latter sources do not have much of an impact on flood conveyance, their cumulative impacts can degrade water quality. In the Pleasant Grove system, it is likely that these flows are also contributing to increased channel widening and the associated erosion and loss of mature oak trees. Controlling storm and non-storm runoff into the creek corridor will help to reduce erosion of banks, the associated sediment loading and loss of vegetation, and the amount of pollutants that enter the creek.

4.10.2 Where Appropriate

Runoff controls should be implemented where any of the following conditions exist:

- Sheet flow from adjacent areas is entering the creek channel
- Point discharge, such as from storm drain outfalls, is entering the creek channel, or the creek corridor

4.10.3 General Practices

Planning

- Work with the City of Roseville's Environmental Utilities Department to identify the source of the runoff and characterize its volume, quality, and frequency.

- Work with the City of Roseville's Environmental Utilities Department Determine if the discharge is regulated by the City's SMP Ordinance and can be reduced or eliminated.

- Based on the characterization of the runoff, identify the objectives for the control. Is the control intended to simply reduce or to completely eliminate the discharge? Does it need to slow down velocity and/or improve water quality? In what situations or time of year is the control needed?

- Identify the technique(s) that will best meet the control objectives.

- If a grassy swale, pre-treatment wetland, or settling basin is desired, evaluate how much physical area is available in the floodplain to determine if the approach is feasible.

- Identify any temporary or permanent impacts the control may have on flood conveyance, channel hydrology, or habitat and design appropriate mitigation measures.

- If a runoff control structure is to be built in the floodplain, design and locate it to minimize disruption of existing valuable riparian vegetation.

- Utilize existing topography and remnant channel features when feasible.

- Look for opportunities to provide a diversity of habitat types through construction of the control feature, such as seasonal wetlands, side channels, etc.

- All runoff control projects that include changes within the floodplain should include an evaluation of the potential for upstream and downstream hydraulic impacts and of the localized hydrologic conditions. The project must be consistent with the City's flood management requirements.

- If the runoff control will include instream work, schedule project activities to avoid disruption of fish migration or include provisions for bypass measures in project design.

- Include measures to prevent siltation of downstream reaches during construction.

- Identify how any required flow diversion will be handled and the period of time the diversion will be required. Make sure to address hydraulic impacts of the flow diversion approach to prevent erosion and damage to the channel, and any potential impacts to aquatic species. The decision as to the type of flow diversion method(s) to be used should be made by the project engineer, aquatic biologist, and geomorphologist in consultation with the City's Public Works department.

Plan Review

- For runoff control projects that involve construction within the floodplain, a plan of the proposed project should be prepared and reviewed by the City before implementation. The plan should include the extent of the project, description of impacts to existing vegetation, timing, grading plan, cut and fill calculations, diversion strategies, the results of any hydraulic/hydrologic analyses, and specific erosion control measures to be implemented during the construction phase.

Implementation

- For runoff controls involving revegetation, incorporate the Standard Practices outlined above in section 4.1 Revegetation.

- Make sure that project area is secured from public access to prevent accidents and injury.

- Identify any vegetation adjacent to the project area that is to be protected and provide protective fencing around the critical root zone.

- Harvest any native plants that are to be replanted in the finished project and establish them in a suitable temporary location.

- Stockpile topsoil to be redistributed on finished grade.

- Where bank erosion presents an imminent threat to property and/or public safety, the use of temporary hardscape stabilization techniques may be required. A strategy should be developed for replacement of these techniques with a more ecologically appropriate technique when/if the imminent threat passes.

4.10.4 Techniques

On-site Retention and Treatment

One of the most effective ways to avoid the need for runoff control is the on-site retention and treatment of both storm and non-stormwater flows. The City's new Stormwater Management Plan (SMP) provides comprehensive direction for management of stormwater as well as a Minimum Control Measure (MCM) and Best Management Practices (BMPs) that specifically call for detection of and addressing non-stormwater discharges. The SMP further specifies that such discharges will be within the scope of the City's new Stormwater Ordinance. The treatment of stormwater and urban runoff through on-site methods not only reduces the quantity of untreated flow entering the creeks, but also provides potential for aquifer recharge.

Education and Outreach

Another method to reduce the need for runoff controls is to limit the amount and improve the quality of water coming into the creek corridor at its source by educating homeowners and commercial property managers on the impacts of landscape care products, over irrigation, hosing down sidewalks, car washing, etc. on stream systems. Golf course maintenance departments should have a program for integrated pest management that reduces the amount of pesticide and herbicide used on turf grass, and manages irrigation levels to avoid runoff.

Passive Treatment Systems and Detention Basins

Where stormwater from potentially polluting land uses such as roads, parking lots, railroads and heavy industry drains directly into the storm drainage system, vegetated swales, oil/water separator vaults and other techniques are used to capture and treat the runoff at the source. Since it is often the first flush from a storm event that carries the heaviest pollutant load, these systems should be designed to treat the first major incidence of rain. Passive treatment systems such as grassy swales, filtration wetlands, and detention ponds create habitat for wetland species in or near the riparian fringe. A combination of a settling pond and filtration/detention wetland is an effective means for polishing runoff coming from an outfall before discharge into a creek if adequate space is available in the floodplain terraces. Instead of discharging storm drain outfalls directly into the creeks, they are positioned to discharge parallel to the creek in the downstream direction. A wetland can be designed such that it expands the riparian habitat into the upper floodplain but gradually slopes down to the creek elevation so that discharged water does not cause increased erosion. The wetland plants supported by such a system can provide valuable habitat for both riparian and other species.

Bank Vegetation

At a minimum, all creek banks that convey sheet flow should be well vegetated with a diverse mix of grasses and forbs to reduce flow velocity and erosive force. Grassland buffers, which were once native in this area, help to reduce overland sheet flow by acting as a kind of filtration system. The roots help hold the soil in place while at the same time providing sub-surface biological activity that increases the porosity of the surface soil allowing for greater water infiltration. The additional infiltration reduces overland flow thereby removing a major erosion mechanism. Infiltrated water carries pollutants, such as excessive nutrients or hydrocarbons, and draws them in the soil where they are stored and eventually either absorbed by the grasses or broken down by microbial action. During larger storm events where the infiltration rate or capacity is exceeded, the above ground portion of the grasses create a kind of maze that surface water must move through, effectively increasing the total travel path, decreasing slope angles and velocities, and resulting in reduced erosion potential. Particulate matter can also adhere to the vegetation, thus creating a sort of filter effect that reduces the quantity of pollutants that reach the creek.

A mixture of grasses with woody shrubs and trees provides additional control for runoff since the larger plants can uptake and evapotranspire larger volumes of water, and their deeper roots help to intercept and retain some of the subsurface flow, and increase bank stability.

Erosion Protection on Adjacent Lands

Where unimproved stormwater or urban runoff is carried directly into the creek corridor via overland flow through adjacent fields and/or concentrated flow through small-eroded bare earth channels or unpaved trails, sediment can be transported directly into the creek. This impact can be controlled by revegetating denuded areas adjacent to the creek corridor with native grasses, sedges, and rushes. For unpaved trails, a series of water bars which divert water off the trail at controlled points can effectively eliminate erosion. Water bars need regular maintenance to ensure that excess soil and debris that may build up at the down slope end of the water bar are removed. Drainage dips are also effective in dissipating and diverting water flow across trail surfaces to prevent erosion. These, too, require maintenance to keep them unplugged.

4.11 Access Management

4.11.1 Benefits

Access management includes the provision of properly design access features sited in appropriate locations as well as the exclusion of activities that are detrimental to the creek corridor. Providing appropriate access will allow residents to safely recreate in the creek corridor, facilitate environmental education, and allow maintenance and emergency services the ability to effectively work in the corridor when necessary. Controlling detrimental access will reduce erosion, sedimentation, wildlife disturbance, the destruction of valuable riparian vegetation, homeowner concerns about privacy and safety, and vandalism.

4.11.2 Where Appropriate

Access management should be implemented where any of the following conditions exist:

- Informal, undesignated trails are becoming established by people trying to reach a destination within the creek corridor,
- Off road vehicles (ORVs) are being ridden in the creek corridor,
- Schools and parks are adjacent to the creek corridor,
- Scenic views or significant natural features provide opportunities for visual access,
- Additional access to the creek is desired and no controlled access means currently exists, or
- Private property is adjacent to the creek corridor.

4.11.3 General Practices

- Determine what level of access is required for a particular location based on habitat character and sensitivity, topography, safety, and connectivity to other access features.
- Identify who the anticipated users will be so access measures can be designed to accommodate the various abilities and modes of use.
- Select the technique(s) required for the desired access management. Several methods may be needed in combination to be most effective (such as bollards and signage.)
- Verify that the planned provision or restriction of access to public lands within the creek corridor is consistent with City ordinance.
- For access barriers, determine which uses are to be excluded and design barriers accordingly. For example, pedestrian access may be acceptable in certain preserve areas while bicycle access is not.

- For any constructed access amenities or barriers in the creek corridor, evaluate potential impacts to flood conveyance, hydrology, and habitat, and design appropriate mitigation measures.

- Design any constructed access amenities or barriers in the creek corridor to visually blend in with the natural character of the open space as much as possible.

- Include signage to indicate any access restrictions or regulations, and to remind people about what access controls are important to maintaining the health of the creek corridors.

- Provide public education about new access opportunities or access barriers as they are implemented.

- Provide adequate ordinance enforcement to make sure that access barriers are effective.

- Provide adequate maintenance so that access features are safe and attractive.

4.11.4 Techniques

Signage

Signage should provide directions, limitations of use, and interpretive information about the features of the creek corridor. In general, signage should have a similar style throughout the City's public open spaces so that the public readily recognizes the signs as conveying official City information. Opportunities for signage occur anywhere the public interfaces with the creek corridor such as along trails, at overlooks, parks, and at road crossings.

Bollard and Gates

Bollards, used separately or with gates, limit vehicular access, while allowing access for pedestrians and bicyclists. Bollards should be removable to allow access for emergency or maintenance vehicles.

Berms and Boulders

Access can be discouraged by building berms and/or situating large boulders across an informal access point. This method can provide effective access control and still blend in visually with the natural character of the corridor. Boulder groupings should include several sizes and should be placed in an informal arrangement to achieve a more naturalistic appearance. Berms should tie gradually into the existing grade and be vegetated with the same species as the surrounding landscape.

Vegetated Barriers

Certain types of plants, such as dense, woody shrubs or those with thorns, can provide effective access barriers once they are established. This approach to access management may also enhance habitat. It is important to protect the plants as they are becoming established and to use large enough plants for the barrier to be effective.

Trails

Where creek bank stability, topography, habitat sensitivity, corridor width, and public safety allow, consider building trails to provide managed recreational access to the creek corridor for the public. Trails may be either paved or unimproved, depending on the character of the corridor, anticipated users, and connections to other elements of the City's trail system.

Open Fencing

In some locations, corridor conditions are not suitable for trails or overlooks. However, open fencing, such as wrought iron or split rail, may be used to preserve visual access to the corridor while excluding unsafe physical access.

Boardwalks

Boardwalks are similar to trails except that they are suspended on piers above the ground to preserve sensitive habitat and/or to allow water to flow underneath. Boardwalks may require side rails if they are elevated more than 30" above the ground or if they cross open water.

Viewing Platforms/Overlooks

Viewing platforms and overlooks are constructed to provide visual access to a scenic area while controlling the degree of physical access. They may include benches and interpretive signage, and should have rails if they extend out over open water or the creek bank.

Ordinance Enforcement

Regular patrols and oversight of the creek corridor are needed to ensure that access violations are prevented. The public can be a critical partner in this oversight by reporting access violations to the City for enforcement.

5.0 RESTORATION PRIORITIES

The following restoration priorities have been established based primarily on a consideration of habitat related criteria. However, many other criteria must also be considered when selecting specific restoration projects for implementation priorities. These include the ability of the project to achieve the broader goals of the Plan (sections 1.4 and 1.5), conditions of related permit(s) as discussed in Chapter 10, funding availability, education/outreach potential, consistency with the City's Stormwater Management Plan, redevelopment opportunities, flood control benefits, maintenance effectiveness, and erosion and flood damage protection.

5.1 Summary of Major Habitat Restoration Opportunities by Creek

All of the major creeks within the City of Roseville have been affected to some degree by urbanization. Non-native plants and animals, particularly beaver, have had a detrimental affect on the health of the native ecosystem. Loss of riparian cover due to historic agricultural practices and encroaching land uses has occurred along many sections of the creeks. Changes in the quantity and timing of creek flows related to increased development have contributed to bank erosion and the declining health of native oaks growing in areas that used to be drier in the summer months. While the conclusive results of water quality analyses currently being performed by the City and Placer County are not yet available, runoff that is draining to the City's creeks is becomingly increasingly urban in nature. Constituents of typical urban runoff include excess nutrients from fertilizers, and petrochemicals and sediment washed off streets, driveways and parking lots. Barriers such as sewer crossings, utility pipes, and dams on some of the creeks prevent migratory fish from reaching spawning grounds in the upper Dry Creek watershed. Additionally, many creek segments have been straightened along some of their length to accommodate urban land uses or past agricultural and mining practices. This is readily apparent along upper Kaseberg Creek, Pleasant Grove Creek, Cirby Creek, Antelope Creek, Secret Ravine, and others.

All creeks experience increased siltation due to bank erosion, non-cohesive mining deposits and sediment carried by runoff, but this is particularly serious in lower Dry Creek, Cirby Creek, Secret Ravine and Linda Creek. Increased sediment loads reduce available salmonid spawning habitat, cause aggradation of creek channels, increase water temperatures, and have other detrimental affects. Dry Creek, Cirby Creek and Linda Creek also exhibit degraded salmonid habitat due to warm water temperatures, predation by non-native fish species, and flashy water flows that reduce the effective inundation periods of available spawning habitat, making them unavailable to adults or dewatering redds prior to fry emergence.

Miners Ravine and Secret Ravine have the highest quality salmonid habitat of the creeks within the City of Roseville. They generally have good in-stream cover, viable spawning substrate, healthy pool-riffle sequences and point bars. Even thought these creeks exhibit the best structure and habitat, they still exhibit negative impacts associated with excessive sediment loading, bank erosion and lack of riparian cover along some sections.

The creeks in the Pleasant Grove watershed, Pleasant Grove, South Branch Pleasant Grove, Kaseberg Creeks, all exhibit high sediment loads, sandy substrates, low riparian cover, non-native fish populations, flashy flows, and excessive summer water levels. Some of these issues, such as water temperature and sediment, are not as significant as they are in the Dry Creek watershed, since the Pleasant Grove system is not expected to support salmonids, due to low flows, high temperatures and lack of spawning gravels.

The following section examines the most degraded reaches along each of the City's major creeks, notes opportunities for restoration to improve these degraded sections, and further identifies areas that are degraded that present the greatest opportunities for restoration. Specific reach locations are identified in Figure 5-1.

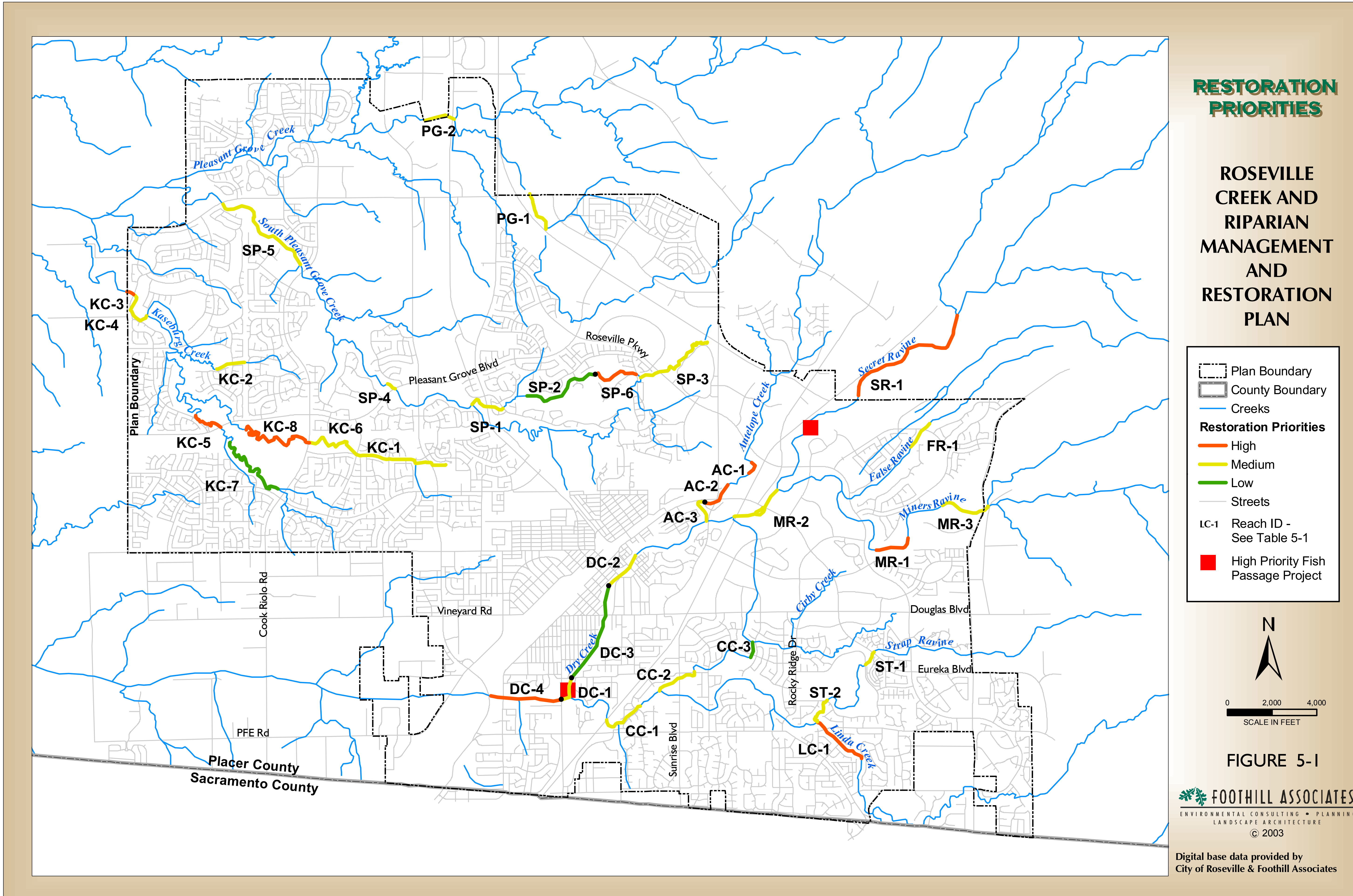


FIGURE 5-1

RCRMRP

restoration sites.mxd

5.1.1 Dry Creek

Reaches Requiring Restoration

Lower Dry Creek offers many opportunities for restoration. Areas that have healthy, wide riparian buffers, good channel structure and wide available floodplain are few. The best conditions probably occur just downstream of the Antelope Creek/Miners Ravine confluence. In this reach, the available floodplain opens up to several hundred feet wide. Mature riparian trees shade the surface of the water, and the channel meanders within its floodplain.

DC-1

- Revegetation
- Bank Stabilization

Several restoration measures were implemented in the Summer of 2003 in the reach from Riverside to Darling Way (DC-1), including overbank excavation to increase hydraulic capacity, removal of invasive non-natives, revegetation, and fish passage improvements. Additional fish passage improvements are also planned (Appendix E). If erosion hotspots develop in this area, biotechnical techniques of bank stabilization should be employed. The specific methods chosen should employ woody vegetation, as much as possible, to provide cover habitat for fish, birds and wildlife.

DC-2

- Revegetation
- Bank Recontouring

From Lincoln Street to Almond Street (DC-2), north of Royer Park, the channel is again constrained by the Roseville Central Business District land uses to the northwest and residential properties to the southwest. Due to constraining land uses, little can be done to improve the channel structure or available floodplain in this area except in isolated spots. Additionally, habitat could be marginally improved by planting of native riparian trees and shrubs, although the space to do this is extremely limited between Royer Park and Folsom Road. Just upstream of Folsom Rd on the west side, invasive non-native removal and restoration of channel vegetation was completed in early 2004.

A detailed hydrological study of Dry Creek upstream of DC-2 from Riverside Avenue to Adelante High School was completed in 2003 as part of the DWR Urban Streams project and includes additional specific restoration recommendations.[40]

Other Major Opportunities for Restoration

DC-3

- Access Management
- Bank Stabilization
- Bank Recontouring

Between the two degraded reaches noted above, Dry Creek flows through Royer Park and Saugstad Park. In this area (DC-3), the creek is a valuable recreational asset to the City and surrounding communities. Currently, park visitor access to the creek is limited. Improving public access to the water would create an opportunity for park users to play in, explore and develop a better understanding of the creek as it passes through this

[40] Swanson, 2003.

highly urbanized area. Improved access could be accomplished by laying back the creek bank on the southeast side to form a series of landscaped terraces, or creating a switchback trail to the waters edge. Such public access has been successful in Eugene, Oregon on the Willamette River in Alton Baker Park, in Portland, Oregon's Waterfront Park. Restoration design in this area should be coordinated with the applicable redevelopment plans and the City's parks Master Plan.

Severe bank erosion has also occurred along the west back of Dry Creek immediately downstream of Douglas Boulevard near the Roseville Chamber of Commerce building. This location could benefit from bank recontouring and/or stabilization improvements. The Chamber of Commerce has expressed a willingness to partner with others to address bank erosion in this area.

DC-4

- Runoff Controls
- Bank Stabilization
- In-stream Structures
- Bank Recontouring

Below the confluence of Cirby Creek (DC-4), changes in the gradient of Dry Creek create a zone of sediment accumulation. Excess sediment carried in flood flow from higher in the watershed is deposited on the creek bed as the water slows. The segment of Dry Creek at Vernon Street presents an opportunity to apply some restoration strategies to better manage sediment loading. The general strategy for managing sediment on Dry Creek should be three fold: 1) Improve source control to prevent sediment from entering the creeks. 2) Reduce bank erosion through biotechnical bank stabilization of hot-spots and revegetation. 3) Use in-stream structures to create hydraulic diversity, create a low-flow channel free of excess sediments, and direct sediment accumulation in appropriate areas. Additionally, further studies should be conducted on the effectiveness of cleaning sediments in areas such as below culverts and outfalls. In-stream structures may be combined with bank widening/recontouring projects to maintain flood capacity in the channel.

5.1.2 Cirby Creek

Reaches Requiring Restoration

Cirby Creek is generally degraded due to encroaching urban land use and past realignment projects. The Cirby Creek watershed is completely urbanized, draining residential properties and the commercial area around Douglas and Eureka Boulevards and East Roseville Parkway. It is especially degraded in three areas: I-80 to Coral Drive (CC-1), Linda Creek to Sierra Gardens Park (CC-2), and in the vicinity of Loretto Drive (CC-3).

CC-1

- Revegetation
- Bank Stabilization

Between I-80 and Coral Drive, the creek is tightly constrained by residential development, except for the area just upstream of I-80. Vegetation in this reach is very sparse on the north creek bank, with a few trees growing on the south bank. Even though several meanders are present in this area, they appear to be the result of channel realignments as a response to land use. Restoration strategies for this reach are limited, but may include planting of riparian trees and shrubs. Geotechnical controls such as bank stabilization may be the most effective restoration in this reach, controlling sediment sources and reducing sedimentation downstream.

A footbridge in this reach allows the public to cross the creek just downstream of the end of Coral Boulevard.

CC-2

- Revegetation
- Bank Stabilization

Cirby Creek is also significantly degraded from its confluence with Linda Creek to Sierra Gardens Park, with the lowest quality area being from Sunrise to Coloma Way. In this reach, it is so tightly confined by encroaching commercial land use that channel structure and available floodplain are very poor. Restoration opportunities for this stretch are very limited. Stream bank revegetation is the most promising option for improving habitat in this reach.

CC-3

- Revegetation

In the vicinity of Loretto Drive, the creek is constrained by residential development on both banks. Average distance between residential backyard fences is fifty to sixty feet, including the creek. This leaves little room for improving channel structure or floodplain. The creek appears to have a sinuous low-flow channel through this area, and moderate vegetation exists on the west bank. Additional native trees and shrubs could be planted on the east bank between the fences and the water's edge. This would improve shading of the water surface and provide some habitat for mammals and birds.

Other Major Opportunities for Restoration

Cirby Creek - All

- Runoff Controls
- Invasive Plant Management
- Revegetation

Opportunities for restoration along Cirby Creek should be focused on water quality. Removal of non-natives and replanting with native species will improve riparian wildlife habitat. Runoff controls to improve both sediment and surface water pollution management both along the creek and in the watershed will improve water quality in Cirby Creek and downstream waterbodies. Use of oil/water separators in parking lots that are adjacent to the creek, and in catch basins that drain to the creek would help reduce the amounts of volatile organic compounds in the water.

5.1.3 Linda Creek

Reaches Requiring Restoration

LC-1

- Revegetation
- Bank Recontouring
- Invasive Plant Management

Linda Creek generally presents greater opportunities for restoration than Cirby. This is primarily because more open space has been preserved around the creek. The poorest quality section is upstream of Strap Ravine (LC-1). From the confluence to the cul-de-sac that ends Lora Way on the north, riparian vegetation is sparse and channel structure is generally low quality. Available floodplain, however, ranges from 200 to 300 feet. This creates an opportunity for laying back of creek banks and recontouring slopes to create lower floodplain terraces within the available open space. Lowering floodplain terraces results in healthier riparian vegetation which shades the creek surface and lowers summertime water temperatures. Additional flood capacity within the channel allows large woody debris (LWD) to remain in the channel without compromising floodwater conveyance. Current City of Roseville maintenance practice is to leave LWD in place, but to align it parallel to the water flow. Approximately 1,800 trees and shrubs were recently planted along the reach of Linda Creek as part of the City's flood control project. The project also included stream bank excavation in the upstream section of this reach to create benches for emergent riparian vegetation.

Since significant flood control work has already been done on much of the Linda Creek channel between the confluence with Cirby Creek and Old Auburn Road, any additional changes to this system should be a long-term, rather than a short-term goal. Short term improvements to the channel in this reach should focus on removal of invasives and maintenance of the restoration plantings. The rest of Linda Creek should focus on additional revegetation and removal of invasives.

5.1.4 Strap Ravine

Reaches Requiring Restoration

ST-1

- Revegetation
- Bank Recontouring
- Channel Realignment
- Invasive Plant Management

Habitat quality along Strap Ravine is high for an urban creek. In general, riparian buffers are wide, available floodplain ranges from 150 feet to over a thousand feet in Maidu Park, with averages between 200 and 300 feet. Channel structure is generally good, with meanders and braided channels present. One reach that is of lower quality is between Johnson Ranch Drive and Eureka Boulevard (ST-1). In this section, large woody vegetation is sparse and channel structure heavily influenced by Eureka Boulevard and runoff from adjacent communities. The quality of this section could be significantly improved by a number of restoration techniques, including planting of native riparian trees and shrubs, removal of non-native plants, introduction of large woody debris, bank recontouring to create a first flood terrace, and channel realignment to introduce additional meanders. Two drainage channels enter Strap Ravine in this reach. One conveys runoff from Eureka Boulevard, and the other carries drainage from the residential community to the southeast. These tributaries should be evaluated for potential detention or treatment of nonpoint source pollutants carried in stormwater prior to discharge into the main channel. The hydrology at the confluences of these drainages with Strap Ravine should be studied in greater detail to determine if the current configuration is stable and if channel/habitat improvements in this area are feasible.

Other Major Opportunities for Restoration

ST-2

- Revegetation
- Bank Recontouring
- Channel Realignment
- In-stream Structures

The reach of Strap Ravine from the confluence with Linda Creek upstream to Maidu Park presents an opportunity for significant restoration work (ST-2). Sufficient space exists in this reach to lay back the stream banks and create a floodplain terrace. The creek is severely incised in this section, and widening the channel will create opportunities for improving the riparian vegetation, creating a low-flow channel and introducing in-creek structures. The average width of the open space in this corridor is 150 feet. This should allow sufficient room to create a low-flow channel, a first flood terrace to handle the two to ten-year flood, and a higher terrace for the ten to 100 year flood. A bicycle path could be incorporated into the 10 to 100 year floodplain.

The Maidu Interpretive Center is located upstream of ST-2 along Strap Ravine in Maidu Park and provides educational programs focusing on local Native American cultural and natural resources. The Center has indicated a willingness to partner on potential grants that would include creek restoration done in a manner that advances educational opportunities for the Center's docent tours. Priority restoration activities at this site (EDU-2) are described further in Section 3.4.3 of this Plan.

5.1.5 Antelope Creek

Reaches Requiring Restoration

AC-1

- Removal of Fish Barrier (culvert replacement)
- Bank Stabilization
- Bank Recontouring
- Revegetation
- Beaver Management

As with Miners and Secret Ravines, habitat, available flood plain and channel condition along Antelope Creek is generally good; however, there are many portions of the creek that are significantly incised. An area that is degraded is just downstream of Roseville Parkway where the creek flows through twin 36-inch culverts under a gravel road adjacent to the power substation and an old land-fill site (AC-1). Debris from upstream obstructs 50% of the culvert inlets on a year-to-year basis and prevents fish passage upstream. The City is planning to replace these culverts in the future as part of the Antelope Creek Bike Trail project. This will improve the hydraulic regime upstream of the road crossing

In this section, large riparian trees are sparse and the floodplain is constrained by the Union Pacific railroad tracks and I-80 to the east and an on old landfill on the west. The eastern creek bank appears to be riprapped adjacent to the railroad tracks. A large, 4-foot tall beaver dam exists approximately 1,000 feet downstream of the existing culverts. This beaver dam is a significant barrier to upstream passage. Restoration actions in this reach might include planting of trees and shrubs and replacement of the existing riprap with biotechnical bank stabilization techniques that employ woody vegetation. Beaver management in this reach should also be a priority. Bank recontouring using floodplain restoration would be very beneficial to the reach just upstream of the Union Pacific Railroad track crossing.

AC-2

- Invasive Plant Management
- Bank Recontouring
- Revegetation

The section of Antelope Creek just downstream from the above reach in the vicinity of Atlantic and Harding is also generally in poor condition (AC-2). This reach varies from having good vegetation in some areas to good channel condition in others, but these factors are not coincident. This reach could be improved by a variety of techniques such as bank recontouring; invasive species control, primarily of Himalayan Blackberry and Black Locust; and planting of native trees and shrubs would improve habitat and channel structure in this area.

Other Major Opportunities for Restoration

AC-3

- Invasive Plant Management
- Revegetation
- Bank Recontouring
- Beaver Management

In the reach from the confluence with Dry Creek upstream to the Harding Boulevard onramp (AC-3), restoration activities such as laying back of banks, invasive species management of Himalayan Blackberry, and replanting with native species would be beneficial. Better beaver management upstream would also improve habitat and hydrologic function of the creek.

5.1.6 Miners Ravine

Reaches Requiring Restoration

MR-1

- Invasive Plant Management
- Beaver Management

Miners Ravine has generally good riparian habitat, channel structure and connection to its floodplain within the City of Roseville. One area that is currently exhibiting problems is just upstream of the bike path bridge near East Roseville Parkway and Lead Hill Boulevard (MR-1). Beavers have built dams along this section of the creek, and the resulting ponds have promoted a significant growth of duckweed. Duckweed is a small aquatic plant that grows in slow-moving or still water. While it is not on the list of California invasive non-natives, its presence can clog waterways and reduce dissolved oxygen in the water as individual plants age and die, although this is not as significant a problem with duckweed as it is with algae, since dead duckweed fronds tend to float. The presence of duckweed indicates an environment rich in nitrates and phosphates, so lowering of these factors in creek runoff through public education could reduce the presence of this species. Removal of beaver dams should also lead to decrease in the duckweed infestation, since this plant cannot survive in moving water. Long-term management of beaver will be needed to address similar problems in the future.

MR-2

- Runoff Controls
- Invasive Plant Management
- In-stream Structures
- Revegetation

Another area of Miners Ravine that is impacted is the reach between the confluence of Secret and Miners Ravines and I-80 (MR-2). This section has poor riparian habitat, uniform channel structure and little available floodplain. Strategies to improve this reach include better pollution control of runoff from large adjacent parking lots, perhaps using oil/water separation vaults; removal of nonnative invasive plant species and replanting of native riparian vegetation, and installation of in-stream structures such as boulders or rock vanes in the reach upstream of the island to create riffles. In the vicinity of the island, improvements may include channel modifications to increase diversity and riparian plantings to reduce summertime temperatures.

MR-3

- Bank Recontouring
- Channel Realignment
- Revegetation
- Beaver Management

Near the upstream limits of the study area, Miners Ravine crosses Sierra College Boulevard and travels past an abandoned holding pond (MR-3). Here the channel alignment is forced up against steep valley wall and has been straightened significantly. The adjacent bank is made up of a 15-foot tall levee that was, at one time, used to separate the creek from the holding pond. Here, restoration measures would include bank recontouring by setting back the levee 200 feet and restoring the accessible floodplain. The channel could be reconfigured to provide higher sinuosity ratios and more hydraulic variability. Riparian vegetation could be planted to provide shade and ultimately provide recruitment of woody debris. The PCFCWCD is currently conducting the engineering and environmental review required for this project. In addition, downstream beaver dams could be removed to eliminate standing backwater and water quality issues currently present throughout the year.

Other Major Opportunities for Restoration

Miners Ravine - All

- Beaver Management
- Invasive plant management
- Revegetation

Additional opportunities for restoration on Miners Ravine include development of an improved beaver management program. Beavers are impacting many of the creeks in the Dry Creek and Pleasant Grove Creek watersheds, and this is especially problematic in the creeks that are currently functioning as salmonid spawning grounds. The section of Miners Ravine in the vicinity of the East Roseville Parkway crossing needs beaver control and dam removal to assist salmonid migration. The City of Roseville is conducting water quality monitoring in this area for three years, which will provide some valuable baseline data to help to track effectiveness of restoration in this reach. Invasive species removal, followed by native species replanting, would benefit terrestrial species here.

5.1.7 False Ravine

Reaches Requiring Restoration

FR-1

- Revegetation
- In-stream Structures

Habitat along False Ravine is generally moderate to good. However, immediately upstream and downstream of Secret Ravine Parkway (FR-1), riparian vegetation is sparse and channel structure is uniform. Potential restoration measures to improve this reach include revegetation and the introduction of in-stream structures to improve channel diversity. The creek in this section is incised and stream banks are high, making major improvements to channel alignment unlikely.

Other Major Opportunities for Restoration

False Ravine - All

- Invasive Plant Management
- Runoff Control

Restoration along False Ravine should focus on invasive species control and runoff controls to improve water management, reduce sediment sources, and reduce pollutants and sediments coming from culverts and outfalls. Given the urbanization of the False Ravine watershed, the flow in this water body should be monitored over the long-term to identify any changing trends in the hydrologic regime, and the impacts of these changes on the health of the native oaks. Increased summertime flow, beaver dams and greater inundation with increased runoff associated with development is having a deleterious effect on oaks in the Pleasant Grove watershed, and False Ravine should be monitored for similar impacts.

5.1.8 Secret Ravine

Reaches Requiring Restoration

Quality of the fish and wildlife habitat and channel structure along Secret Ravine within the City of Roseville is generally high. In contrast with other creek reaches throughout both watersheds and within City limits, there are no reaches that were classified as significantly degraded. Although various forms of channel degradation are prevalent throughout many portions of the creek, existing biological and physical functions are observed to be healthier than elsewhere in the Pleasant Grove and Dry Creek watersheds. A significant fish passage barrier is located on Secret Ravine approximately 3,000 feet downstream of the City limit. Elimination of this barrier is a high priority and is addressed by the conceptual plans in Appendix E.

Other Major Opportunities for Restoration

SR-1

- Access Management (ORVs)
- Bank Stabilization
- Revegetation
- Bank Recontouring
- Grade Controls

- Runoff Controls

The largest impacts to habitat on Secret Ravine are sedimentation, channel incision, and bank erosion due to historical mining activities and increases in peak flood flows. Since Secret Ravine is a primary salmonid spawning ground within the Dry Creek watershed, control of fine-grained sediment is critical to protecting these protected species. A significant sediment source is introduced by off-road vehicle (ORV) use just upstream of the City limits (SR-1). This reach of Secret Ravine was recently studied by PCFCWCD as a potential floodplain restoration site with restoration and flood control benefits.[41] The City of Roseville should work with the City of Rocklin on access management to prohibit ORV access to areas where disturbed sediment can wash into the creek. This increased regulation should be done in concert with additional policing to ensure prohibition enforcement. Revegetation should take place in areas where ORV use has destroyed the riparian vegetation. Erosion management should include better upstream control of bank erosion through biotechnical stabilization to reduce total sediments entering the creek. Bank recontouring using floodplain restoration would provide additional relief to eroding banks and channel degradation. In several reaches grade controls may be implemented to eliminate further channel incision and stabilize existing riffle structures. In addition, implementation of runoff controls using combined sedimentation and stormwater detention basins from commercial and residential developments would be effective in reducing sediment inputs and would mitigate for increases in peak flood flows and narrowing of the flood hydrograph.

5.1.9 Pleasant Grove Creek

Reaches Requiring Restoration

PG-1

- Access Management (ORVs)
- Channel Realignment
- Revegetation

There are two notable reaches on the upper part of the main stem Pleasant Grove Creek which have poor channel structure and little vegetation, and present potential restoration opportunities. One of these reaches (PG-1) is between State Route 65 and Blue Oaks Boulevard (approximately 0.6 miles). Immediately downstream, the creek crosses briefly into the City of Rocklin before veering westerly and reentering the City of Roseville. This reach is experiencing serious erosion impacts due to ORVs. Improved ORV management would reduce sedimentation in the channel downstream. Revegetation is needed to repair ORV damage. This reach would also benefit from some reintroduction of channel meanders but the degree to which this is feasible may be constrained by existing engineering of the channel for flood passage and vested property rights.

PG-2

- Channel Realignment
- Revegetation

The second (approximately 0.25 miles) is downstream of Industrial Avenue west of the Union Pacific rail line and is actually located in Placer County (PG-2). While this reach is not in the City of Roseville, the reaches immediately upstream and downstream are in the City limits. It has been included in this analysis since the condition of the reach is

[41] HDR and Foothill Associates, 2003.

important to the connectivity of the overall Pleasant Grove system within the City of Roseville. This reach would benefit significantly from the planting of riparian vegetation such as willows and cottonwoods and realignment of the channel to introduce meanders.

Other Major Opportunities for Restoration

Pleasant Grove - All

- Runoff Controls
- Revegetation

In general, the upper reaches of Pleasant Grove Creek should be managed as willow and cottonwood riparian habitat. Native riparian tree and shrub plantings should be planted to improve fish and wildlife habitat, cool summertime water temperatures, and stabilize stream banks. The lower creek reaches should be managed as a valley oak riparian mix. Strategies including runoff controls should be developed to preserve existing oaks from increased flow in the creek. Runoff controls may also be needed if pollutants and sediment carried into the creeks by stormwater outfalls associated with the existing and future development are excessive.

5.1.10 South Branch Pleasant Grove Creek

Reaches Requiring Restoration

SP-1

- Revegetation

Degraded reaches along South Pleasant Grove Creek also occur primarily in the upper watershed. In the reach from the UPRR to Diamond Oaks Road (SP-1), the creek is little more than an open channel between box culverts. Four roads cross the creek within 800 feet, and it is bounded by residential properties. The available floodplain in this area is less than 100 feet. Probably the most that can be done to improve habitat along this stretch is revegetation to plant some willows and cottonwoods, although studies will be needed to determine the potential effect of woody vegetation on floodwater conveyance within the channel.

SP-2

- In-stream Structure
- Revegetation

Further upstream, where South Branch Pleasant Grove Creek flows through Diamond Oaks Golf Course (SP-2), channel structure could benefit by the use of in-stream structures to create diversity. Riparian vegetation in this section is moderate, but could still benefit from additional willow and cottonwood plantings.

SP-3

- Revegetation

Revegetation of limited riparian vegetation in the reach between Roseville Parkway and the headwaters (SP-3), adjacent to the Galleria Mall, would enhance habitat by providing cover and roosting for birds, and would help protect the creek banks from erosion. The geology of this area is dominated by the Mehrten formation, and the effective rooting depth is only about 8”-20”.[42] However, with the increasing amount of runoff resident in this system year round, species such as willows and cottonwoods may reasonably be expected to become established in the immediate riparian zone.

Other Major Opportunities for Restoration

SP-4

- Runoff Controls

The reach downstream of Pleasant Grove Boulevard (SP-4) presents an additional restoration opportunity. In this reach, overland flow from residential yards enters the creek. Runoff from residential property has been found to carry pesticides such as diazinon[43] and fertilizers from yard maintenance and soaps used in washing cars. These outfalls should be studied to determine if some runoff controls can be installed to treat or slow runoff before it enters the creek system. These measures may take the form of detention ponds or swales.

SP-5

- Runoff Controls

Downstream of Woodcreek Oaks Boulevard (SP-5), South Branch Pleasant Grove Creek has high quality habitat, good channel structure and generous available floodplain. Even so, the creek quality could be further enhanced through runoff controls to improve sediment management from residential properties. Outfalls in this area dump directly into the creek, and source controls are the best methods for improving water quality in these outfalls.

SP-6

- Revegetation
- In-stream Structure
- Channel Realignment
- Beaver Management

Between Heritage Drive and Chipshot Way (SP-6), South Branch Pleasant Grove Creek flows through approximately 20 acres of open space. Riparian vegetation is sparse in this reach, and channel structure has been heavily modified. A flood control structure 950 feet upstream of Chip Shot Way backs up water into this area. Beaver dams are also problematic in this area and been known to cause backwatering that floods the open space bike trails. Improvements to this reach include riparian plantings, in-stream structures and channel realignment to improve channel diversity and connectivity to the floodplain.

5.1.11 Kaseberg Creek

Reaches Requiring Restoration

KC-1

[42] Soil Survey of Placer County, USDA

[43] Schiff, 2001

- Revegetation
- Runoff Controls

Upstream of County Club Drive, the middle fork of Kaseberg Creek has been channelized (KC-1). This concrete lined channel flows between residential neighborhoods and has little habitat value for fish or wildlife, and little can be done to improve this section due to space constraints and the existing flood control structures. One small section east of Foothills Boulevard remains unchannelized, but development of the southern half of this parcel was recently approved. While it would benefit local bird species and other wildlife to keep this channel remnant in a natural state, especially if it were replanted with native riparian species, the total benefit to the Kaseberg Creek system would be minor. A significant benefit to this channelized creek reach would be realized by implementation of runoff controls, including homeowner outreach that targets reduction of household and landscape maintenance chemicals in the creek by educating residents on the effects of landscape and household maintenance chemicals on creek systems. Additional improvement of water quality could come from controlling runoff through reducing irrigation, installing cisterns at the base of downspouts, and increasing permeable paving and treating street runoff with oil/water separators, vegetated swales or filtration devices.

KC-2

- Revegetation
- Channel Realignment
- In-stream Structure

The headwaters of the north branch of Kaseberg Creek (KC-2), at the east end of Timber Creek Golf Course, have been channelized for 1,300 feet starting from where it exits the culvert 600 feet east of Green Grove Lane and extending west into the golf course. The channel is not armored in this stretch, and the creek could be restored to a more natural configuration through channel realignment and in-stream structures. Revegetation with willows and cottonwoods planted along the banks will make a more attractive and more ecologically sound creek.

KC-3

- Revegetation
- In-stream Structure

The segment of Kaseberg between Timeberrose Way and Fiddyment Road (KC-3) is denuded of riparian trees and shrubs, has little floodplain, and uniform channel structure. In-stream structures to create channel diversity and revegetation to improve riparian cover would increase habitat in this short reach.

Other Major Opportunities for Restoration

KC-4, KC-5, KC-6, KC-7

- Revegetation
- Beaver Management (KC-5)

In general, channel structure on Kaseberg Creek is moderate to good. Several areas on the creek would benefit from planting of native riparian trees and shrubs. In addition to those mentioned above, reaches that would benefit from revegetation include the main stem between Timberrose Lane and Del Web Boulevard (KC-4), the south branch just downstream of Pleasant Grove Boulevard (KC-5), the middle branch between Woodcreek Oaks Boulevard and Country Club Drive (KC-6), and the south branch between Pleasant Grove Boulevard and Woodcreek Oaks Boulevard (KC-7). Woodcreek Nature Center is located along reach KC-7 and enhancement of the habitat in this area would benefit the environmental education programs conducted at the Center. For this reason, site EDU-3 within this reach is designated a high priority for restoration in Section 3.4.3 of this Plan. In addition, KC-5 could benefit from continued beaver management to control backwater that has inundated native oaks and created wetlands that were installed as mitigation for development within the Del Web Specific Plan area.

KC-8

- Revegetation
- Channel Realignment
- In-stream Structures

On the middle branch of Kaseberg Creek, the reach near Mahany Park (KC-8) is close to a reference reach condition for the creeks in the upper Pleasant Grove watershed. Restoration activities on this reach will help it significantly toward this goal, which will then provide a condition by which other upper watershed creeks can be compared. Activities that should be undertaken on this reach include revegetation with riparian trees and shrubs, channel realignment to enhance sinuosity, and the introduction of in-stream structures to improve channel structural diversity.

5.2 Priority Restoration Reaches Classification

Table 5-1 presents potential restoration projects by creek, reach, restoration strategies and priority. Priorities are set at High, Medium and Low based upon their overall importance in improving habitat conditions, creek channel stability or water quality along the respective creek, and their general feasibility based on existing flood control structures, magnitude of the project and other factors. While certain reaches may be assigned a lower restoration priority as a whole, specific sites within the reaches may be designated as high priorities for restoration. These specific site restoration priorities were identified in the ECAR and are summarized in Chapter 3 of this Plan.

Table 5-1. Restoration Reach Priority Classification

Creek	Reach ID	Reach	Restoration Strategies	Priority
Dry Creek	DC-1	Riverside to Darling	Revegetation, bank stabilization	M
Dry Creek	DC-2	Lincoln to Almond	Bank recontouring, revegetation	M
Dry Creek	DC-3	Royer Park	Access management, bank recontouring, bank stabilization	L
Dry Creek	DC-4	Cirby Creek to UPRR	Runoff controls, bank stabilization, in-stream structures, bank recontouring	H
Cirby Creek	CC-1	I-80 to Coral Drive	Revegetation, bank stabilization	M
Cirby Creek	CC-2	Linda Creek to Sierra Gardens Park	Revegetation, bank stabilization	M
Cirby Creek	CC-3	Loretto Drive	Revegetation	L

Creek	Reach ID	Reach	Restoration Strategies	Priority
Cirby Creek	N/A	All	Runoff controls, invasive plant management, revegetation	M
Linda Creek	LC-1	Lora Way to Strap Ravine	Revegetation, bank recontouring, invasive plant management	H
Linda Creek	N/A	All	Revegetation	H
Strap Ravine	ST-1	Johnson Ranch to Eureka	Revegetation, bank recontouring, in-stream structures, channel realignment	M
Strap Ravine	ST-2	Linda Creek to Maidu Park	Bank recontouring, revegetation, in-stream structures, channel realignment	M
Antelope Creek	AC-1	D/S of Roseville Parkway	Removal of fish barrier, bank stabilization, revegetation, beaver management, bank recontouring	H
Antelope Creek	AC-2	Atlantic and Harding	Bank recontouring, invasive plant management, revegetation	H
Antelope Creek	AC-3	Dry Creek to Harding	Bank recontouring, invasive plant management, beaver management, revegetation	M
Miners Ravine	MR-1	U/S of Roseville Parkway	Beaver management, invasive plant management	H
Miners Ravine	MR-2	Secret Ravine to I-80	Runoff controls, invasive plant management, in-stream structures, revegetation	M
Miners Ravine	MR-3	D/S Sierra College Blvd.	Bank recontouring, revegetation, beaver management, channel realignment	H
Miners Ravine	N/A	All	Revegetation, beaver management, invasive plant management	M
False Ravine	FR-1	Secret Ravine Parkway	Revegetation, in-stream structures	M
False Ravine	N/A	All	Invasive plant management, runoff controls	M
Secret Ravine	SR-1	U/S of City limits	Access management (ORVs), bank stabilization, grade control, bank recontouring, runoff controls, revegetation	H
Pleasant Grove Creek	PG-1	SR65 to Blue Oaks Blvd	Revegetation, channel realignment, access management (ORVs)	M
Pleasant Grove Creek	PG-2	D/S of UPRR crossing	Revegetation, channel realignment	M

Creek	Reach ID	Reach	Restoration Strategies	Priority
Pleasant Grove Creek	N/A	All	Revegetation, runoff controls	H
South Pleasant Grove Creek	SP-1	UPRR to Diamond Oaks	Revegetation	M
South Pleasant Grove Creek	SP-2	Diamond Oaks Golf Course	In-stream structures, revegetation	L
South Pleasant Grove Creek	SP-3	Roseville Parkway to Headwaters	Revegetation	M
South Pleasant Grove Creek	SP-4	D/S of Pleasant Grove Blvd	Runoff controls	M
South Pleasant Grove Creek	SP-5	D/S of Woodcreek Oaks	Runoff controls	M
South Pleasant Grove Creek	SP-6	Chipshot Way to Heritage Dr	Revegetation, in-stream structures, channel realignment, beaver management	H
Kaseberg Creek	KC-1	U/S of Country Club Dr	Runoff controls, revegetation	M
Kaseberg Creek, N. branch	KC-2	U/S of Sierra Pines GC	Channel realignment, in-stream structures, revegetation	M
Kaseberg Creek	KC-3	Timberrose Way to Fiddyment Rd	In-stream structures, revegetation	H
Kaseberg Creek	KC-4	Timberrose Way to Del Web Blvd	Revegetation	M
Kaseberg Creek, S. branch	KC-5	D/S of Pleasant Grove Blvd	Revegetation, beaver management	H
Kaseberg Creek, middle branch	KC-6	Woodcreek Oaks to County Club Dr	Revegetation	M
Kaseberg Creek, S. branch	KC-7	Pleasant Grove Blvd to Woodcreek Oaks	Revegetation	L
Kaseberg Creek, middle branch	KC-8	Near Mahany Park	Revegetation, in-stream structures, channel realignment	H

6.0 MAINTENANCE PRACTICES

Establishing appropriate methods to maintain the City's creeks is complicated by the need to support the beneficial uses of the creek system, including flood control, habitat, recreation, and water quality. This chapter discusses the approaches the City currently uses for creek maintenance and recommends maintenance practices that will help protect these multiple uses of the creek.

6.1 Existing Maintenance Agreements

6.1.1 California Department of Fish and Game Memorandum of Understanding for Creek Maintenance Activities

The City of Roseville's Park Maintenance Division and Street Maintenance Division carry out creek maintenance activities, as needed, each summer at various locations throughout the City. Creek maintenance activities are necessary to maximize flow conveyance and ensure adequate storm drainage and public safety. These activities are conducted according to a Memorandum of Understanding (MOU) between the City and the California Department of Fish and Game (CDFG) regarding Routine Maintenance Activities in Unimproved and Improved Channels. The CDFG Creek Maintenance MOU is updated every three years. All supervisors and field crew leaders must be familiar with the contents of the MOU, and crews must have a copy available when conducting creek maintenance activities. In addition, all supervisors must ensure that the mitigation monitoring program for creek maintenance activities is completed as needed prior to, during, and after any maintenance activities.

For example, raptor nest surveys must be conducted prior to maintenance activities during the breeding season typically between May and August. If special status species are found in the potential area of maintenance activity the City must consult with the appropriate agencies regarding the correct procedure for protecting the species. Wildlife encountered during the course of routine maintenance activities must be allowed to leave the area unharmed or herded a safe direction away from the project site. In addition, if unidentified cultural resources, or fossils, are discovered during creek maintenance activities all work must cease and the appropriate agencies notified.

6.1.2 Creek Maintenance Guidelines

The City has also developed a Creek Maintenance Guidelines document that defines routine maintenance activities and establishes procedures to minimize impacts to natural resources within or adjacent to the various creeks within the City limits. Maintenance activities described in the Guidelines must be conducted according to the MOU between the City and CDFG described above. The Creek Maintenance Guidelines are designed to assist City-supervised field crews with methods to minimize adverse affects to the environment from creek maintenance activities and to satisfy the City's obligation to protect special status species. The practices described in the Creek Maintenance Guidelines also save the City revenue as they identify maintenance activities that may be hydrologically unnecessary for flood control.

6.2 Existing Routine Maintenance Activities

In Roseville, creek maintenance is currently conducted for the purpose of flood conveyance, public safety, to promote efficient stormwater discharge, and fire control. Bank stabilization is undertaken when necessary to protect public improvements. The types of maintenance practices used vary by the channel type. Improved channels are those that include significant manmade alterations designed to facilitate flood conveyance. Improved channels may have or lack significant riparian vegetation, or may include mitigation plantings. An unimproved channel has no significant manmade alterations, and may have or lack significant riparian vegetation.

Periods of implementation of maintenance activities within unimproved channels are June 1st to October 30th. Implementation of maintenance activities within improved channels without significant riparian vegetation is not restricted to a specific time period, but should be conducted during low stream flow. The frequency of creek and riparian maintenance programs depends on several factors including severity of storm events, degree of fallen woody debris and sediment deposition that can hinder flow conveyance, and/or distribution and abundance of undesirable plant species.

While hand equipment including chain saws and pruning tools is typically used during riparian maintenance activities, heavy equipment is sometimes required. When heavy equipment is used, it should be positioned on a road surface. The CDFG MOU stipulates that no heavy equipment is permitted in the creeks. Noise pollution from heavy equipment and chain saws that disrupt wildlife should be kept to a minimum. Emissions from heavy machinery should also be kept to a minimum. All creek and riparian maintenance activities should be limited by the City's Municipal Code to daytime hours (7:00 a.m. to 7:00 p.m., Monday through Friday, and 8:00 a.m. to 8:00 p.m., Saturday, Sunday and holidays).

The City's Park Maintenance Division and Street Maintenance Division carry out reconnaissance surveys each spring to determine what creek and/or riparian maintenance activities might be needed in the coming summer. The public may also inform the City of areas that require creek and/or riparian maintenance. Unanticipated emergency creek and/or riparian maintenance may also need to be conducted at any time. In such cases crews should try to use the repair technique that will have the least environmental damage while still providing the necessary protection. If the short-term response is not the environmentally optimal solution, crews should look for opportunities to use short-term repair techniques that do not preclude subsequent implementation of more environmentally friendly long-term techniques. Creek maintenance routinely performed by the City includes the following activities.

6.2.1 Floodplain Debris and Obstruction Removal

The Parks Maintenance Division focuses mainly on the removal of downed trees, debris, trash, and vegetation in the open space floodplain that have the potential to impede flow. These activities are conducted with hand tools only and no heavy equipment is allowed into the creeks. All cleared vegetation must be hauled away from each site and deposited outside the 100-year floodplain.

6.2.2 Flow Obstruction Removal

The Streets Maintenance Division is responsible for removing accumulations of silt, sand, cobble, or other flow obstructions in the vicinity of manmade structures, such as outlets or abutments, to protect flow conveyance. This work may require the use of heavy machinery such as backhoes or excavators. All cleared vegetation, sediment, cobble, and other flood debris must be hauled away from each site and deposited outside the 100-year floodplain. Precautions to minimize turbidity and/or siltation must be implemented during silt, sand, and cobble removal activities including the placement of hay bales and/or silt fences.

In improved channels, maintenance is permitted to the extent necessary to restore proper operation of the channel. In unimproved channels, however, there are limitations on this type of work.

- Excavation and removal of vegetation or other flow restricting materials is restricted to the area 100 linear feet upstream or downstream of the blocked culvert or structure.

- Supervisors must provide approval for the use of heavy equipment in the channel.

- Trees greater than four (4) inches diameter at breast height (DBH) must be avoided, or trimmed only as needed to gain access.

- Where small trees line both sides of the channel, CDFG must authorized any trimming or thinning required to gain access, and the City's Environmental Coordinator should be contacted before activity begins.

- Vegetation removal along extended reaches of the creek bank to gain access is not allowed.

6.2.3 Vegetation Control

Vegetation control is the shared responsibility of the Parks and Streets Maintenance staff, and should be conducted only to the extent required to maintain the design capacity and structural integrity of the channels. In improved channels, aquatic and upland vegetation may generally be removed as needed to eliminate obstructions. In unimproved channels, vegetation removal is limited to the area from the toe of slope to the top of bank.

Where tree removal is required, the City attempts, where possible, to maintain root balls in place to provide bank stability. Root wads do not create a major impediment to stream flow and their removal accelerates the rate of erosion leading to increased sedimentation which affects both the creek channel morphology and aquatic resources. Low hanging branches of trees growing on the lower banks may be trimmed to six (6) feet above ground level.

In cases where woody riparian vegetation must be cleared, the vegetation is trimmed rather than uprooted. Where public safety is not at risk, woody vegetation is cut no more than one foot above ground level to encourage re-sprouting. Trees greater than four (4) inches diameter breast height (DBH) cannot be removed without prior authorization from

CDFG. The City considers oak trees an important resource and their removal is regulated under the City's Tree Preservation Ordinance.[44]

Maintenance crews must also ensure that any work area left barren of vegetation as a result of the maintenance activities must be restored to its natural state by seeding, or other City and CDFG agreed upon means with native species of trees, shrubs, and grasses, within 30 days, or by October 30th of the year the activity occurred.

Invasive non-natives, such as red sesbania, arundo, pampas grass, etc. may be removed from the toe to the top of bank provided their removal does not create slope instability or potential for erosion.

Control of riparian vegetation may be performed with the use of mechanical devices, chemicals, or hand labor. Only herbicides registered with the California Department of Pesticide Regulation (copy available from the City's EC) can be used for vegetation control and labeled instructions for the herbicide must be on hand during the application process.

Methods currently used for vegetation control include hand labor, mechanical devices, and chemicals. The use of herbicides in Dry Creek, Secret Ravine, and Miners Ravine is kept to a minimum to avoid impacts to juvenile steelhead that may be present. Herbicides used must be registered with the California Department of Pesticide Regulation, and crews are required to have the label instructions for proper use of the herbicide on-site when the chemicals are applied.

6.2.4 Repair of Previous Erosion Control Work

Failed sections of rock, sacked concrete, or gabions may be repaired using similar materials but activities must be confined to the failed section and the immediately adjacent area. The adjacent area may not exceed twenty (20) feet.

6.2.5 Minor Erosion Control Work

Erosion control activities of a limited nature are included as routine maintenance. The activity must not extend more than thirty (30) feet vertically above the channel invert from the toe of the slope. The linear distance is limited to fifty (50) feet unless CDFG provides prior authorization. Placement of erosion control measures must comply with accepted engineering practices and City development standards.

In order to coordinate protection of water quality and habitat value during erosion control work, the City's Environmental Coordinator should be contacted well in advance. When possible, work should be done when creek flows are low. If a diversion is needed, the flows are to be conveyed for as short duration as possible using gravity flow through temporary culverts or pipes, or pumped around the work site with hoses. If a dam or dewatering is required, provision must be made to pass enough water downstream to maintain aquatic habitat below the project.

[44] Roseville Municipal Code, 19.66

6.3 Recommendations for Optional Maintenance Practices

While the City's main focus of creek corridor maintenance is flood management and public safety, there are opportunities to enhance other beneficial uses of the creek resources by incorporating supplemental practices into routine maintenance activities. Many of these practices can be implemented with the staff resources currently dedicated to creek maintenance through changes in maintenance planning and staff training. In addition, some of these practices may improve flood management and public safety, and reduce maintenance costs by eliminating unnecessary work.

Implementation of optional maintenance practices in most instances requires a level of effort above standard practices. This has a corresponding cost but also creates resource benefits. Therefore, the degree to which optional maintenance practices are implemented will be defined as part of developing a Consolidated Permit for RCRMRP implementation.

6.3.1 Vegetation Management for Habitat Value

The discussion in Chapter 3 of this plan identifies the desired riparian canopy and diversity characteristics associated with the reference reach conditions for all of the City's major creeks (Tables 3-2 through 3-7). These conditions reflect the optimal type of vegetation for habitat value that can be anticipated in a given area, considering limitations such as soil, geology, channel morphology, and adjacent land uses. The descriptions of desired riparian vegetation conditions address which species are expected to occur in the area, percent of canopy cover, and distribution. Maintenance crews should become familiar with these reference conditions so that their vegetation management activities can be implemented in a manner that increases similarity to the reference condition whenever possible.

Specific maintenance practices that may be used to improve habitat conditions include:

- Remove overly dense canopy with selective thinning to encourage natural regeneration and greater age class diversity.
- Thin very dense stands of unhealthy, even aged plants to increase the vigor of a few selected individual plants.
- Use selective thinning of very large monocultural stands to allow other species to become established.
- Remove diseased or damaged trees first when thinning vegetation. Only remove as much vegetation as necessary to achieve maintenance objectives.
- Keep heavy equipment out of the root zone of trees or use sheets of plywood to disperse the weight to reduce soil compaction.
- Become familiar with the wildlife species that are likely to use the available habitat, and learn how they use riparian vegetation in their various life stages (nesting, cover, food, etc.). This knowledge will be helpful when making decisions about which vegetation to remove and when to remove it.

- Leave a few dead trees (snags) standing in areas where they do not create a potential hazard. Snags provide roosting habitat and contain insects that are a valuable food source for birds.

- When feasible, schedule removal of native plants after they have set fruit and seed in order to encourage regeneration and to provide food for wildlife.

- When thinning vegetation, take care to leave seedlings of native species that are poorly represented in the existing mix of species. Place stakes near the seedlings to alert maintenance crews of the location so that the plants can be avoided during future maintenance.

- If willows are removed from an area to facilitate flow, look for opportunities to use the cuttings to expand the extent of riparian vegetation into other parts of the reach where flood conveyance will not be restricted.

- When desirable native seedlings are found in the course of routine maintenance, encourage their success by removing surrounding grasses that compete for light and nutrients, mulching to suppress regrowth of competing plants, and/or providing browse protection.

6.3.2 Invasive Plant Management

Several invasive species of plants and animals have been introduced into the City's riparian corridors through passive dispersal and human activities. Many of these species are identified in Appendix C along with recommended removal methods. However, because invasive plants may recolonize a site after removal, an on-going maintenance program is required. The frequency of maintenance depends on which species are present and the severity of the infestation. Maintenance crews should be provided with guidelines for all of the major invasive species that describe the threshold at which removal is required and how thoroughly the species is to be eradicated based on the species and location in the creek corridor. This could range from removal of all plants anytime a plant is seen to simply thinning in key locations when populations reach a certain coverage and distribution. A set of photographs should supplement the guidelines illustrating the threshold condition at which removal is required and how the post-removal target condition appears. Since not all reaches will have the same objectives for invasive plant management, the guidelines will need to be associated with particular reaches.

6.3.3 Boulder Placement

When a boulder has to be removed to prevent flow obstruction, there may be opportunities to reposition the boulder somewhere in the reach to:

- help stabilize or prevent erosion at the toe of the bank,

- help reduce scour at a culvert outfall, or

- improve aquatic habitat by providing shelter, instream structure, and/or stabilizing spawning gravels.

By leaving the boulders in the corridor, the cost associated with hauling the boulders off-site is avoided. Since boulder placement will impact channel hydrology, maintenance staff will need education about how to identify appropriate sites to reposition boulders.

6.3.4 Removal of Gravels

Gravels should only be removed if they are clearly compromising the design capacity of the channel. In some reaches, a limited amount of gravel may have been deposited on the stream bed following seasonal high flows, but the flow dynamics of the creek keep the amount of gravel at a relatively steady state that has minimal impact on conveyance. Routine removal of such deposits provides little benefit, and utilizes limited maintenance resources. Maintenance crews can be trained through field observations conducted over several seasons to become aware of locations where this is occurring and can adjust their activities accordingly.

6.3.5 Placement of Gravels

Gravels are an important element in the aquatic ecosystem. They facilitate benthic macroinvertebrate productivity in the creeks in general and are especially critical in the Dry Creek system for spawning salmonids.   When gravels must be removed to facilitate creek flow, there may opportunities to relocate these materials to other locations to improve habitat and to reduce the cost of disposal. As additional surveys and mapping of spawning habitat in the Dry Creek system evolve, the City could maintain an inventory of specific sites where such relocation is beneficial.

6.3.6 Wildlife Reporting

The MOU between the City and CDFG stipulates measures for avoiding and protecting wildlife encountered during maintenance activities. In addition to these practices, sitings of unusual or significant wildlife species should be reported to the City's Environmental Coordinator to improve the City's understanding of what species are using the creek habitat and where they are located. This information will be useful in developing restoration, corridor management, and environmental education strategies, and in conducting the review of the CDFG MOU every three years. The Environmental Coordinator should establish and update the list of species to be reported.

6.3.7 Fish Barrier Removal

Prior to spawning season, maintenance crews should consult with the Environmental Coordinator to learn of barriers that may have been reported to the City and then perform a comprehensive review of passage on the Dry Creek, Secret Ravine and Miners Ravine corridors to make sure that new barriers have not developed since the prior season. In addition, maintenance crews routinely working in these corridors during the period of spawning and juvenile migration should be trained to notice of channel obstructions that could act as passage barriers and appropriate methods to remove them. Communication with the City's Environmental Coordinator for removal of barriers during this period is critical to assure that impacts to the fish are avoided.

6.3.8 Domestic Animal Control

Abandoned and/or stray dogs and cats pose threats to the creek and riparian wildlife diversity through predation and can also affect water quality by urinating and/or defecating within the creek corridors. Stray animals wandering along the creeks and riparian corridors also pose a public safety hazard and should be reported by maintenance staff to the City's Animal Control Department.

6.3.9 Corridor Conditions Checklist

When maintenance crews are working on a particular project in the creek corridor, they can also observe overall conditions, note any problems that are developing, and report them to the appropriate City department before the situation worsens. This type of preventive maintenance helps to reduce long-term costs and improves public safety. In order to remind crews about what types of things to observe, a routine checklist should be provided listing issues such as erosion, polluted discharges or runoff, trash, unsafe trail conditions, damage to vegetation, vandalism, and presence of nuisance species (wildlife and/or invasive plants). Contact information for the appropriate City department and/or the Environmental Coordinator should be included on the checklist.

6.3.10 Maintenance Crew Assignments

As noted in Chapter 3 of this plan, conditions vary a great deal throughout the extent of the City's creek corridors. For this reason, it may be advantageous to routinely assign the same maintenance personnel to work in a given section of corridor. Crews may thus become more familiar with the dynamics of that section throughout the year and be better able to integrate maintenance activities with overall stewardship of the corridor. Alternatively, a single person may be designated as the lead individual for a particular area, and be available to oversee and assist crews who are working in the area. Such assignments should be focused on particularly sensitive corridors first, and then expanded to include all corridors as feasible. Sensitive corridors may include those with reaches that provide habitat for special status species (such as Dry Creek), are prone to serious flooding or erosion, or have significant vegetation, mitigation or restoration projects.

6.3.11 Public Involvement and Participation

While many creek maintenance activities require the expertise of trained staff, certain other tasks, such as those carried out during the annual Creek Week event, are suitable for community members to perform on a regular basis. Activities such as trash pick-up and the removal of certain invasive non-native plants could be conducted by citizens with minimal supervision from City staff. With assistance from the City's Environmental Coordinator, scheduled work days could be established for volunteer crews to assist with these types of activities in creek reaches where City maintenance staff has identified opportunities.

6.3.12 Adaptive Maintenance

Since the creek ecosystem is highly complex and dynamic, it is not always possible to predict how certain maintenance activities will perform over time given all the variables (hydrology, climate, human uses, soil conditions, etc.) that must be considered.

Adaptive maintenance is a strategy for addressing this uncertainty within the structure of a routine maintenance program. Adaptive maintenance incorporates two concepts:

- Current practices should be regularly reviewed to see how well they are meeting an objective, and any practices that are not accomplishing the desired goal should be modified, and

- Standard practices should be tailored to fit the demands of the particular site.

To implement adaptive maintenance, maintenance supervisors should routinely evaluate whether or not the standard practices they are using are effectively meeting their maintenance goals and revise the practices as needed. To facilitate this process, supervisors should encourage crews to observe maintenance activities that have been implemented in the past whenever they are out in the field, and to routinely report any issues.

In addition, when specifications for standard maintenance practices are established they should include both qualitative and quantitative criteria. Quantitative criteria include information such as dimensions, volumes, sizes, rates, areas, and densities. Qualitative criteria are more performance based and provide direction about what the practice is intended to accomplish.

Qualitative criteria are important because they help crews adjust how standard maintenance practices are implemented at a particular site. This can help to reduce the costs of unnecessary labor and materials, and increase maintenance efficiency. For example, a revegetation practice may quantify a particular spacing distance for plants, while the qualitative criterion indicates that 80% coverage is to be achieved in 2 years. However, in a particular site with favorable soil conditions, available moisture, and exposure a less dense planting may be adequate. Another example is the standard practice of removing the lower limbs of trees that are within 6' of the ground to improve flood conveyance. This may not be necessary on any/every tree at a given location if the site topography, channel configuration, vegetation density and/or type of trees are such that this activity would provide little or no benefit.

6.3.13 Pre-season Street Sweeping

Regular street sweeping is effective at removing accumulated sediments and other contaminants which can impact the creek ecosystem. In addition to the normal schedule for street sweeping, a thorough sweeping pass should be conducted prior to the onset of fall-winter rain events. The use of vacuum street sweeping is more effective in removing fine particulate matter and polluting substances than brush sweeping.

7.0 MONITORING AND ASSESSMENT

The effort required for monitoring and assessment activities has associated costs, but it also has the potential to result in significant resource benefits. The degree to which these activities are conducted and encouraged will be defined as part of developing a Consolidated Permit for RCRMRP implementation, and will also reflect availability of funding, stakeholder participation, and other forms of support.

7.1 National Marine Fisheries Service (NMFS) Monitoring Agreement

The City is conducting a three-year (2003-2006) water quality and sediment monitoring program consistent with its commitments made during the National Marine Fisheries Service (NMFS) Section 7 Consultation for the East Roseville Parkway/Miners Ravine Bridge Crossing project.

The water quality of outflow from Miners Ravine, False Ravine, and Secret Ravine below the Bridge crossing is being monitored and compared to the water quality flowing into the City in these watercourses. The monitoring program will allow the City to determine if runoff from the East Roseville Parkway Bridge crossing and projects within the Stoneridge Specific Plan area are contributing to a cumulative degradation of water quality or an increase in sediment loading.

Specific heavy metal constituents being analyzed include Arsenic, Barium, Cadmium, Chromium, Chromium, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Selenium, Silver and Zinc. Organic water quality analysis includes gasoline, methyl-tert-butyl-ether (MTBE) and benzene, toluene, ethylbenzene, and xylene (BTEX). Inorganic water quality analysis includes Nitrate/Nitrite and Total Phosphorous. Pesticide analysis includes Carbaryl, Endosulfan, 2,4-D, and Malathion.

Sediment sampling commenced in 2004 below the East Roseville Parkway/Miners Ravine Bridge crossing and will be compared to sediment samples collected above the Sierra College Boulevard crossing of Miners Ravine that reflect conditions not associated with the bridge.

If the City's monitoring reveals that runoff from the East Roseville Parkway/Miners Bridge crossing and projects within the Stoneridge Specific Plan area results in stream conditions that are contributing to a cumulative degradation of water quality or an increase in sediment loading, the City will confer with NMFS and develop and implement an appropriate, mutually agreeable, adaptive management response to attempt to minimize the impacts attributable to the runoff to the greatest extent practicable.

7.2 Purpose of Monitoring and Assessment

An effective ecosystem monitoring program includes elements beyond simply collecting data on an interval or semi-regular basis. The collection of data by itself has no real importance or meaning until it has been analyzed, interpreted and reported. The result of this analysis then provides a snapshot of the current conditions, often referred to as an assessment, with multiple assessments performed over time showing trends that are occurring within the ecosystem.

Each assessment is designed to analyze the data in such a way as to address a specific issue, such as the condition of the native oaks, or the degree to which stream bank protection projects have reduced stream sediment input. For a comprehensive ecosystem assessment, issues must be addressed from many different disciplines including botany, geomorphology, hydrology, and landscape ecology.

The monitoring component of the RCRMRP should be designed to both collect data and perform the assessments that lead to useful information. The first step in developing such a program is to identify the questions that the City would like to answer. Based upon the proposed questions, data analysis techniques can be identified, and then a specific monitoring project can be designed to provide the necessary data required for the analyses.

Two fundamentally different categories of monitoring projects arise depending upon the type of question asked, each requiring a different scope and extent for the required monitoring activity. These categories can be differentiated as questions that address:

1. Cumulative impacts due to management or planning decisions; and

2. Site-specific conditions such as local erosion problems or restoration projects.

Category 1 deals with the creek systems as a whole, which involves comparing conditions upstream and downstream of the City as well as monitoring changes in conditions occurring at pre-determined study areas such as those already assessed by the ECAR[45]. The upstream and ECAR assessment conditions provide a baseline from which to compare and measure impacts and changes associated with activities that occur within the City limits. This type of monitoring should be done on a continual and ongoing basis, and is covered in more detail later on in this section.

Category 2 deals with specific and/or local areas of interest. Examples of these types of projects will include assessing the success of a particular restoration project or identifying the downstream impacts of a new residential development. Typically, a more localized area is monitored for a shorter length of time, usually defined by pre-project requirements. These types of monitoring projects should be fostered by the City and used to help supplement the category one monitoring data.

7.3 Interpretation of Monitoring Results

Crucial to the overall monitoring process is the ability to efficiently and effectively store and retrieve the collected data. This will require a central citywide database that allows for the warehousing of all ecosystem related data. A well designed database will allow for the retrieval of only those data required for a specific analysis, thereby making the process more efficient. It will also allow for new questions to be addressed that may draw from data originally collected for other purposes, and will facilitate the sharing of data with other interested stakeholders such as local educators, regulatory agencies, and other jurisdictions. This is perhaps one of the most beneficial uses of storing all of the data in a single database.

The citywide database should be designed with a maximum amount of flexibility to allow all types of data to be stored within it. This flexibility in the design of the database will

[45] Foothill Associates, 2003.

make it a very powerful and useful tool for the city's monitoring program. In addition, to help secure future funding and inter-agency cooperation, it is important that the database be able to share data with other regionally recognized databases such as the State Water Resources Control Board's (SWRCB's) SWAMP database[46] and the Environmental Protection Agency's (EPA's) STORET database[47]. Data collected for other programs, such as the City's National Pollutant Discharge Elimination System (NPDES) Phase 2 Permit, can be stored within the database as well. This can help reduce overhead and maintenance costs, while at the same time increasing the usefulness and power of the data set.

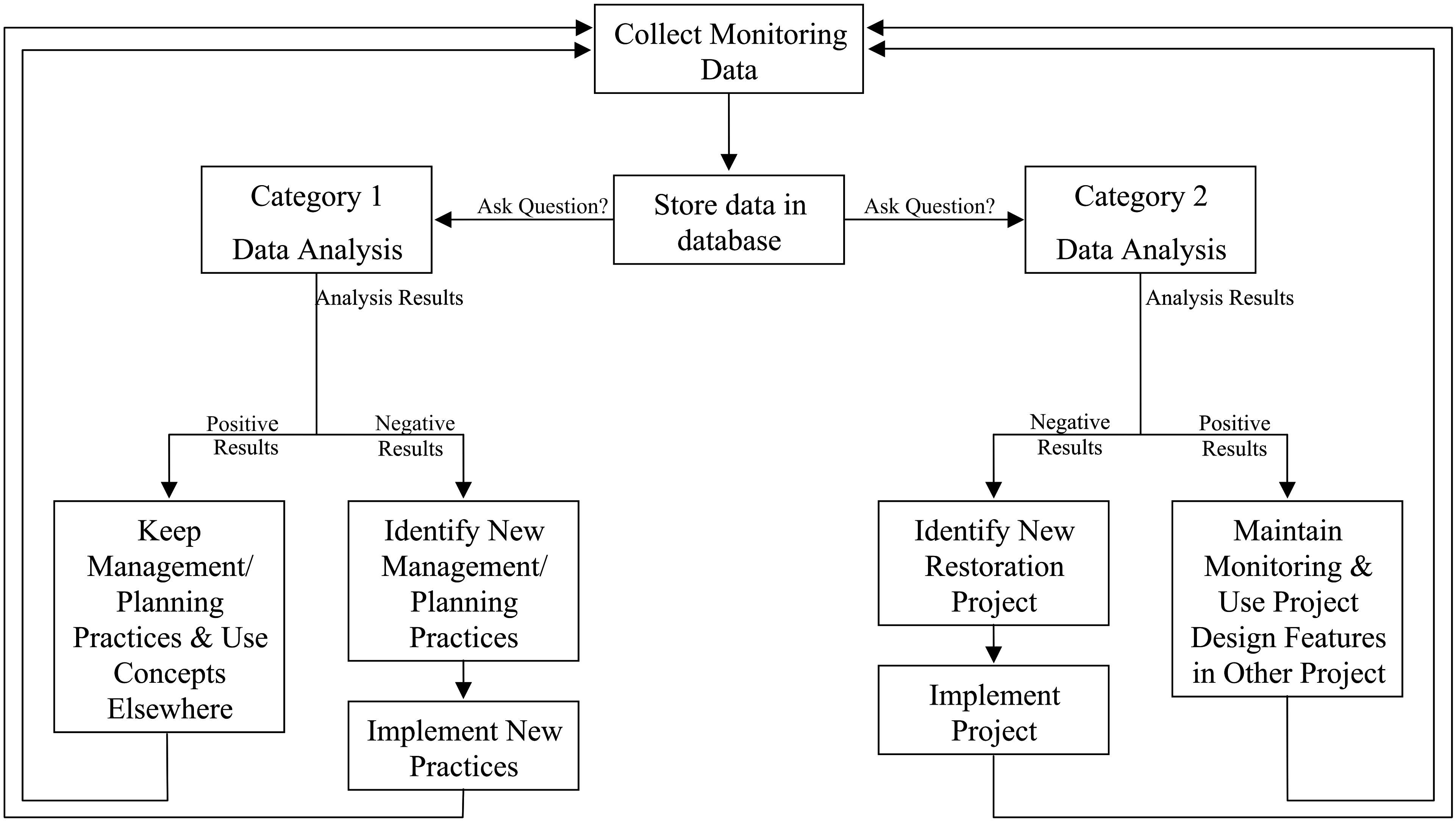
The data analysis frequency, like the data collection frequency, is dictated by the questions to be addressed by the monitoring project. However, once the analysis has been completed a reporting process should be put into place to convey the analysis results to managers and planners within the City to help them make informed and enhance their ability to make appropriate decisions concerning the creek and riparian corridors.

7.4 Relationship to Adaptive Management

The ability to provide decision makers within the City the most current information regarding the condition of the riparian ecosystem, including the health and trends, is crucial for success if adaptive management techniques are to be employed. The process for integrating monitoring data with management of the City's creeks is illustrated in Figure 7-1. Adaptive management for environmental resources is a concept wherein specific management strategies that are adopted at the onset are expected to be adjusted or adapted based upon changes that occur within the ecosystem. This concept is based upon the theory that a healthy ecosystem is constantly in a state of fluctuation, responding to conditions that occur within and around it, and that the complexity of factors that influence ecosystem change cannot be entirely predicted. The idea of adaptive management has been developed In order to manage such a dynamic system in as natural a state as possible.

[46] SWRCB SWMP Database

[47] EPA STORET Database



FOOTHILL ASSOCIATES

MONITORING AND ADAPTIVE MANAGEMENT PROCESS FLOW CHART

FIGURE 7-1

As the information provided to the decision makers becomes more reliable and informative, the adaptive management strategies for the ecosystem can then become more highly tailored to the current conditions and projected responses of the system. This can then lead to better managed environments that maximizes all the available resources and beneficial uses of the ecosystem. The quality of information used by this process is directly related to the monitoring project, specifically, if the proper data is being collected to address the specific questions needing answers. Because of this tight relationship between effective management and the monitoring program, it is very important to consider future data needs at the onset of any monitoring program development.

7.5 Relationship to Stormwater Management Program (SWMP)

Urban stormwater runoff is one of the largest causes of non-point source pollution in our surface waters, which makes it an important factor in the health and management of the City's creek system. The City of Roseville is currently implementing their Storm Water Management Program (SWMP), which includes reporting and monitoring. Monitoring that may be required in association with the SWMP should be coordinated with the RCRMRP monitoring program for increased efficiency and better allocation of the City's financial and personnel resources. As stated earlier, stormwater plays an important role in the geomorphology, hydrology, and overall health of the City's creek systems. Combining the two monitoring efforts where appropriate would provide increased benefits beyond those obtained on the administrative level.

7.6 Recommended Monitoring Activities

7.6.1 Water Quality

Current water quality monitoring within the city limits consists primarily of:

1. The Dry Creek WWTP monitoring of effluent and receiving waters as required by its NPDES permit;

2. The Pleasant Grove Creek WWTP monitoring of effluent and receiving waters as required by its NPDES permit (when operational);

3. Monitoring performed by the Dry Creek Conservancy (DCC);

4. Monitoring performed by the City of Roseville in accordance with NMFS Biological Opinion issued for the East Roseville Parkway/Miners Ravine bridge crossing,

5. Monitoring performed by the City of Roseville in accordance with NMFS Biological Opinion issued for the East Cirby-Linda-Dry Creek flood control project,

6. Monitoring performed by the Central Valley Regional Water Quality Control Board (CVRWQCB) on Roseville creeks through the Surface Water Ambient Monitoring Program (SWAMP) including: bioassessments on various creeks, testing for zinc toxicity on Miner's Ravine, aquatic toxicity and sediment-bound pesticides in South Branch Pleasant Grove Creek and Kaseberg Creek, and a

pilot study for estrogenic endocrine disrupting chemicals on Dry Creek below the City WWTP at Cook Riolo Road,[48] and

7. Monitoring performed by Placer County as part of the Pleasant Grove Creek and Curry Creek Watershed Ecosystem Restoration Plan (PG/CC ERP).

At a minimum, regular water quality monitoring should be done upstream as each creek enters the city boundaries and downstream as they exit the city. Since the City has a WWTP located on the downstream side of both Dry Creek and Pleasant Grove Creek that already have monitoring programs in place, it would make sense to build from this established program. In addition to the NPDES data collected, on a quarterly or seasonal basis, samples should be analyzed for additional parameters (Table 7-1). Samples should also be collected upstream and downstream on Kaseberg Creek. Additional monitoring sites within the city boundaries would also be helpful, such as some of the PG/CC ERP monitoring locations, but should be selected based upon available funding and the suitability of a given site to provide meaningful ecosystem information.

The City has a unique opportunity with the DCC monitoring the Dry Creek watershed, and Placer County is conducting a water quality monitoring program which involves the formation of a citizen monitoring group in the Pleasant Grove Creek watershed. By working with and supporting these two citizen-based volunteer groups, and utilizing the WWTPs' current monitoring programs, the City could quickly and economically develop and maintain an excellent water quality monitoring program.

Table 7-1. Recommended Water Quality Monitoring Parameters

Recommended Monitoring Parameters
Nitrate (NO_3)
Phosphate (PO_4)
Ammonia (NH_4)
Total Suspended Solids (TSS)
Specific Conductance (SC)
pH
Temperature
Calcium (Ca)
Magnesium (Mg)
Chloride (Cl)
Alkalinity
Turbidity
Dissolved Oxygen (DO)
Dissolved Organic Carbon (DOC)
Total Organic Carbon
Oil and Grease
Herbicides and Pesticides

[48] Robert Holmes, CVRWQCB, personal correspondence May 6, 2005.

7.6.2 Habitat

The riparian habitat is the cumulative result of a stream's hydrology and geomorphology, the underlying geology, vegetation, and human induced impacts. Simply having mature vegetative cover does not necessarily correlate to having high quality habitat if other structural elements are missing. Because of this, it is important to identify what habitat is desired for each creek reach, and then monitor the reach accordingly. The reference reach concept is used to describe the general ecology that is desired for a reach, with the expectation that attaining the desired conditions will result in the presence of fauna adapted to that ecosystem. In the Dry Creek system, the reference reach parameters also specifically address habitat requirements for steelhead and salmon.

A variety of habitats are represented in the reference reach conditions. Managing the City's creeks towards the reference reach conditions will result in a matrix of ecosystem types that will support a wide diversity of aquatic species, birds, and small mammals. Monitoring activities should focus on data that provide an indication of how well a reach corresponds to the reference conditions. The parameters for each reference reach listed in Chapter 3 can generally focus on either vegetation or channel hydrology and geomorphology. These two areas require very different types of expertise for monitoring. Therefore, the monitoring recommendations for each are discussed separately in this plan.

Vegetation Monitoring

Vegetation monitoring provides valuable information about an ecosystem's current condition as well as evidence of factors that may lead to future degradation. As with all monitoring activities, it should occur frequently enough to detect emerging trends so that adverse impacts can be prevented. This is especially critical for vegetation because ongoing damage to mature vegetation cannot easily be mitigated. Information on the parameters listed in Table 7-2 should be collected and assessed to identify how well a given site is emulating or trending towards the associated reference reach conditions.

Table 7-2. Recommended Vegetation Monitoring Parameters

Recommended Vegetation Monitoring Parameters
Species
Size (height, spread, diameter at breast height (DBH))
Abundance
Distribution
% Canopy cover
Vigor
Growth since last observation
Evidence of disease or damage
Instream structure (root wads, logs, etc.)
Snags or other vegetative habitat features
Representative photographs
Native or non-native
Special status species

Stream Hydrology and Geomorphology Monitoring

The hydrology and geomorphology of the creeks are the fundamental underlying natural processes which have formed the riparian corridor and its associated habitat. Unfortunately, the hydrology data collected for both watersheds is minimal. While the Dry Creek watershed has been studied more than the Pleasant Grove Creek watershed, this is still one of the largest data gaps within the City's creek system. Because of the general lack of data, almost all monitoring activities would result in beneficial information.

To perform many of the desired stream calculations it is important to have stream velocities and discharge information. This is often times done by installing and maintaining USGS gauging stations along the creeks that record stage height and water velocity, and use these measurements with previously measured cross sectional area to calculate stream discharges. Dry Creek already has a gauging station, and the Dry Creek Conservancy will soon be installing additional flow monitoring equipment, but the Pleasant Grove Creek system has no such monitoring station installed. It is important to have low flow hydrology data because it aids in constituent load calculations and helps with the calibration of hydrologic flow modeling used for flood studies.

Other parameters to monitor would include sand, which is an important degrading geomorphic factor in the Dry Creek watershed because it covers valuable salmon spawning gravels. Monitoring bed loads throughout both watersheds would be a key way of assessing the success for restoration projects designed to reduce and control sediment sources.

Creek walks with visual assessments would also provide valuable information as to the hydrology and geomorphology of the creeks. Identifying high water marks for flooding, sinuosity, and pool to riffle ratios are qualitative monitoring results that can be easily collected by volunteers or City staff during regular maintenance activities. Recommended parameters are listed in table 7-3.

Table 7-3. Recommended Hydrology/Geomorphology Parameters

Recommended Hydrology/Geomorphology Monitoring Parameters
Flow rates (velocities) for all creeks
Creek discharge rates
High flow (flood) water marks
Pool to Riffle ratios
Riffle Frequency
Pool Depth
Riffle Depth
Sinuosity and Morphology
Hydraulic Variability
Embeddedness and Sedimentation and Substrate Conditions

7.6.3 Wildlife

There are several important reasons why periodic monitoring of wildlife should be conducted. The first is to assess how well a given reach is functioning as habitat, and to identify the need for any remedial measures that may be required to improve habitat function. For example, spawning surveys such as those conducted by the Dry Creek Conservancy provide a good indication of where instream barriers may be an issue. Wildlife surveys also provide information on the presence of special status species, such as steelhead and salmon, or valley elderberry longhorn beetle. Special avoidance measures are warranted to protect these species once their presence has been detected.

The presence of species that may be a nuisance in urban conditions, such as coyote and skunk, will also be detected through regular monitoring. Public outreach and management measures can then be used to mitigate the potential conflicts between animals and humans. Lastly, monitoring provides an excellent indication when wildlife populations may be reaching levels that exceed the capacity of the ecosystem. Species such as Canada geese and beaver can have a significant adverse impact on the ecological balance of a creek reach in a very short time if their presence is left unchecked. Modifications to habitat can be used to discourage their presence and thus preserve the value of the habitat to a variety of species. Table 7-4 provides a list of recommended general wildlife monitoring parameters. However, focused surveys such as those conducted for salmon and steelhead will incorporate additional parameters.

Table 7-4. Recommended Wildlife Monitoring Parameters

Recommended Wildlife Monitoring Parameters
Species
Size
Age or life stage
Number of individuals
Behavior (feeding, nesting, etc.)
Vigor
Representative photographs
Native or non-native
Special status species

7.6.4 Public Uses

While monitoring physical characteristics of the streams and riparian habitat are necessary to assess the health of the ecosystem, equally important are monitoring those anthropogenic impacts caused by the direct public use of the stream corridors (Table 7-5). These impacts can include visual degradations such as litter and graffiti, safety hazards like broken glass or discarded appliances, or damage to riparian resources.

The formation of informal trails should also be monitored because they result in decreased infiltration rates, increased runoff, and increased sedimentation. Informal trails also adversely affect the habitat as a whole by creating a continual disturbance regime that may favor the establishment of invasive non-native species. Properly designed and built permanent trail systems will allow public access to the creeks without the added degradation associated with informal trails.

Another important condition to monitor is the presence of homeless encampments or shelters. Streams and riparian corridors tend to attract homeless people because of the cover and protection that the canopy provides. Unfortunately, the use of the riparian corridors as homeless encampments can contribute to water quality degradation, trash, safety, and fire hazard concerns.

Table 7-5. Recommended Public Use Monitoring Parameters

Recommended Public Use Monitoring Parameters
Trash, litter, and debris
Illegal structures
Informal trails
Homeless encampments
Evidence of fires
Damage to public infrastructure
Condition of fences and signage

7.6.5 Restoration Projects

Restoration projects should be monitored several times each year during different seasons to evaluate the success of the project with respect to its performance criteria and objectives. Monitoring results should be used to implement remedial action, such as replanting of failed revegetation efforts, or alternative restoration techniques if the original design is not performing adequately.

7.6.6 Reference Reaches

Reference reaches are identified and characterized for each of the City's major creek systems in Chapter 3 of this Plan. Since the creek corridors are constantly evolving in response to natural ecosystem processes and development related influences, reference reach conditions should be revisited and potentially revised on a regular basis to better reflect the changing watershed conditions.

7.7 Responsibility for Monitoring

7.7.1 City Staff and Maintenance Crews

City staff and maintenance crews that work in and around the creeks on a daily basis are an excellent resource for performing basic monitoring, such as noting impacts from public use, presence of wildlife, and water appearance. Daily or weekly monitoring of basic stream hydrologic parameters such as stage height, temperature, and specific conductance could easily be done with little extra effort. In addition, training staff to perform even basic monitoring tasks will help them to identify potential issues and respond before a problem gets out of control, making them more effective at their jobs.

City WWTP staff could also be utilized to perform more advanced water quality monitoring tasks. Much of the infrastructure is already in place, requiring little or no additional training. This will require an increased scope of responsibility and associated funding to monitor and process water quality samples from the entire creek systems instead of just at the WWTPs' discharge points.

7.7.2 Development Community

Increasing levels of regulation at the federal, state, and city levels are being placed upon land developers in an attempt to mitigate the impacts of increased urban development on natural resources. One outcome of these additional regulations is that some developments are being required to monitor and mitigate for stormwater impacts both during and after the construction process. City ordinances and the Roseville SWMP can be used to require, define, and enforce creek monitoring for new developments.

An alternative would be to have a City Ecosystem Monitoring Fund to collect in lieu funds from developers to satisfy their monitoring requirements. This would allow the City to manage the monitoring process, proving a faster and more efficient system that would allow regulators quick and easy access to the data. The fund could be used to pay for more than site-specific Category 2 projects, but also larger Category 1 monitoring projects as defined above in section 7.2. The City could also use the fund to help maintain an internal monitoring program, hire external professionals, and/or support citizen based monitoring groups.

7.7.3 Industrial Property Owners

Industrial sites such as manufacturing plants, WWTPs, and railroad yards require coverage under multiple permits including NPDES and WDR permits. Similar to the new development permit requirements, monitoring and mitigation are usually associated with industrial permits. While individual permit holders may not be required to conduct spatially expansive monitoring such as what the City could accomplish under this Plan, highly localized long-term data sets can be obtained through these types of monitoring projects. Because of its intent, industrial site monitoring can be used to show temporal variations in local water quality. Adding this type of data to the citywide ecosystem monitoring database could potentially help in the effort understand the creek systems.

7.8 Citizen Involvement in Monitoring and Assessment

Local watershed groups such as the Dry Creek Conservancy and the Pleasant Grove Creek/Curry Creek Watershed Group can help provide the City with a cost efficient means of collecting ecosystem data. The visual assessment protocol used for the ECAR to support development of this plan was intentionally formatted so that it could be implemented by citizen volunteers with a minimal amount of training (Appendix B). This type of an approach will also help foster community stewardship and awareness. The City should also sponsor creek walks and monitoring events in addition to Creek Week as a means of getting people involved in creek stewardship while meeting the need for ecosystem data.

8.0 REGULATORY REQUIREMENTS

Many activities that occur within the City's creek corridors are subject to regulatory reviews and approvals. Proposed restoration, maintenance, or monitoring actions must comply with these regulations to protect the many beneficial uses of the creeks, such as flood conveyance, habitat, recreation, and water quality. However, the complexity of the regulatory compliance process can sometimes discourage proponents of positive management and restoration projects. This chapter of the RCRMRP includes an overview of the existing regulatory process in order to help applicants better understand the process. It also recommends implementation measures related to regulatory actions that will facilitate compliance without compromising the protection of the creek resources.

8.1 Required Regulatory Approvals

Oversight of creek related projects occurs at several jurisdictional levels. The reviewing entities and the types of activities they typically review are summarized in Table 8-1. The process of securing all necessary permits and approvals can be quite time and resource consuming depending on the complexity of the project and the availability of regulatory staff. Even though restoration, maintenance, and monitoring projects are designed to ultimately benefit creek function, they must still go through the required review process to make sure that appropriate methods are used and that the results of the project will be positive.

8.1.1 City of Roseville

The Safety and Open Space and Conservation elements of the City's General Plan contain goals and policies related to the management of creek corridors. The City implements these goals and policies through the adoption and enforcement of ordinances, design standards, and project review procedures. The Entitlement "Permit" Review Process is used to review most projects within the City limits such as construction projects, requests for subdivision, and rezoning. There are two levels of review under this process. Smaller projects requiring minor permits that can be approved by the Planning Director go through the Administrative Process. The Public Hearing Process is used for larger projects that require approval of the City Planning Commission or Design Committee. Information on the steps required to complete either process, including estimated time to completion and which City departments will participate in the review may be found in Appendix B.

Creek restoration, maintenance(except routine maintenance conducted by the City), and monitoring projects are also subject to City review if the project will result in impacts to the creek corridor, floodplain encroachment, or impacts to tree species protected under the City's Tree Preservation Ordinance. In such cases, a Flood Encroachment Permit (FEP) and/or a Tree Permit may be required. The application checklists for both of these permits as of the time this Plan was prepared are included in Appendix B. Applicants should check with the City Permit Center or web site to obtain the most up-to-date applications. Additional approvals from other entities described below may also be required depending on the nature of the project.

Routine creek maintenance conducted by the City is performed under the terms of a Memorandum of Understanding (MOU) with the California Department of Fish and Game (CDFG). This agreement describes the type of maintenance practices that are allowed and the period of the year during which they can be performed. In some cases, emergency work beyond the scope of the MOU must be undertaken in the Creek channel to protect public infrastructure, public and private property, and to prevent or remove hazards. In such situations, the City contacts CDFG to coordinate an acceptable approach to address the situation.

The City of Roseville also regulates activities governed by the Stormwater Management Plan, as discussed in Chapter 2 of this plan. While many of the activities regulated by the SMP actually occur outside of the creek corridors, they have a direct impact on water and habitat quality in the City's creeks.

8.1.2 State of California

Three state agencies regulate activities in creeks and floodplains. The CDFG is responsible for reviewing and approving projects that could have a negative impact on existing fish or wildlife. Their jurisdiction includes the creek channel as well as the adjacent riparian habitat. In reviewing projects, CDFG considers such things as when the work will take place, the degree of temporary and permanent disruption to habitat, the potential for fish or wildlife to be injured, and the efficacy of proposed mitigation measures. CDFG is concerned with impacts to all species, not just those that are protected under the California Endangered Species Act (CESA).

The Reclamation Board review is focused mainly on creek channels that provide critical flood conveyance capacity. In Roseville, these creeks are Dry Creek, Linda Creek, Secret Ravine and Miners Ravine. City projects that have the potential to compromise flood function in these creeks must secure a Flood Encroachment Permit from the Reclamation Board. Private projects are required to obtain an FEP from the City.

The Regional Water Quality Control Board (RWQCB) may also be involved in reviewing creek projects if the project involves construction in waters of the U.S. or wetlands, and consequently requires a permit from the U.S. Army Corps of Engineers (Corps). The RWQCB is responsible for assuring that projects meet the state's standard for water quality protection, while the Corps addresses compliance with federal standards.

8.1.3 Federal

There are two federal agencies that are typically involved in the review of creek related projects. The U.S. Fish and Wildlife Service (FWS) is similar to the CDFG because it also focuses an wildlife and habitat. However, the FWS is specifically concerned with species that have special status under the Federal Endangered Species Act. The FWS will look at direct impacts to animals and well as indirect impacts such as habitat destruction that could compromise the survival of the species.

The U.S. Army Corps of Engineers (Corps) regulates activities in "waters of the U.S." under section 404 of the federal Clean Water Act. The definition of this term at this time includes all of the creeks addressed by the RCRMRP. In an effort to streamline the 404 permitting process, the Corps has developed a number of "Nationwide" permits that address common types of projects such as road crossings. If a Nationwide permit is available for the particular project under consideration, it should be pursued since it will normally expedite the review and approval process.

The National Marine Fisheries Service (NOAA Fisheries) may also be involved in restoration projects if a Corp permit or other federal action is required. NOAA Fisheries will typically work under the Section 7 permitting process for the Endangered Species Act if they have jurisdiction.

Table 8-1. Creek Activity Regulation

Agency/Jurisdiction	Trigger	Process/Permit Used
City of Roseville		
Planning Commission	Native oak tree removal or work within the dripline of a protected oak tree (i.e., >6" DBH)	Native Oak Tree Permit
Planning Commission	Construction in the zoned floodway or floodway fringe	Floodplain Encroachment Permit
State		
CA Department of Fish and Game	Any construction within a creek or adjacent riparian woodland that may adversely affect existing fish and wildlife resources.	Section 1602/03 Streambed Alteration Agreement
CA Reclamation Board	Construction in the floodplain of regulated streams (Dry Creek, Linda Creek, Secret Ravine, and Miners Ravines).	Floodplain Encroachment Permit
Regional Water Quality Control Board	Certification is required for all 404 Permits (see below). Issued upon approval of a Clean Water Act 404 permit.	Water Quality Certification or Waiver of Certification
Federal		
U.S. Fish and Wildlife Service	Direct or indirect impacts to potential habitat for endangered species.	Section 7 or 10 Permit for Endangered Species
US Army Corps of Engineers	Construction in waters of the U.S. or wetlands.	404 Permit; various Nationwide permits may be applicable.
NOAA Fisheries	Corps permit or other federal action	Section 7 for Endangered Species

8.2 Existing Programmatic Agreements

The City of Roseville negotiated a programmatic agreement (MOU) with the CDFG that regulates routine maintenance performed by the City within the creek corridors. This agreement is described in more detail in Chapter 6 of this plan. Such agreements benefit both the City and the CDFG by reducing the amount of administrative staff oversight and communication required to assure compliance. The CDFG still retains regulatory authority over the covered activities, and the City works closely with the local CDFG warden to make sure that any maintenance activities that may not specifically be addressed in the MOU are conducted in a manner that is consistent with the intent of the agreement.

8.3 Recommended Programmatic Agreements

The characteristics of the regulatory process that are perhaps the most confounding to both public and private creek enhancement efforts are the number of approvals required, the need to prepare separate applications and materials for each agency, and the agencies' inability to respond in a timely manner due to the number of pending requests for review. Developing a multi-agency, programmatic approach to certain types of maintenance and restoration projects would help to address all of these issues. There are at least three specific opportunities that the City of Roseville could pursue to implement such agreements, as described below.

8.3.1 Consolidated Permitting for Restoration Projects

The consolidated approach for permitting restoration projects has been successfully implemented in a number of coastal watersheds in California. Under this approach, a group of specific projects or a description of a class of projects is presented to a cooperating group of regulatory agencies for review. The agencies identify and adopt a streamlined process that reduces the extent of redundant documentation, coordinates the sequence and degree of review, and still satisfies their individual accountabilities. A lead agency or jurisdiction may be designated to drive the process and to serve as the liaison for project proponents.

The project definition presented for approval by the agencies may include a group of commonly accepted restoration strategies or "best management practices" (BMPs). The participating agencies review these BMPs and offer revisions or conditions that are then incorporated into the program. As long as projects use these approved methods, the approval process can be streamlined.

In addition to expediting the regulatory approval process and reducing permitting costs, consolidated permitting also strengthens partnerships between agency personnel and the local jurisdiction. Agency staff are also better able to identify funding and other implementation support for jurisdictions because they have a better understanding of restoration goals and the methods to be used.

This Plan has been used as the foundation for seeking consolidated permitting for creek restoration projects in the City of Roseville since the Plan includes both specific proposed restoration projects and a list of restoration methods or "BMPs". The approach to this Consolidated Permit is included in Appendix H.

8.3.2 Beaver Management Agreement

As noted in the ECAR and throughout this plan, beaver management is a significant challenge for the City of Roseville. At some population level, beaver add diversity and richness to the City's creek ecosystems. However, when populations exceed this level or are concentrated in especially sensitive locations, they can lead to a net degradation of the desired range of ecosystem function and threaten public safety. Some of the adverse impacts of beaver include:

- culling of valuable riparian vegetation, including heritage oaks;
- creation of backwater environments that favor invasive non-native plants and threaten native plants such as valley or interior live oaks;
- creation of barriers to salmonid migration;
- impacts to floodwater capacity of creek channels; and
- damage to restoration projects, particularly bank stabilization and riparian plantings.

Controlling beaver populations is a sensitive issue. Some residents regard them as a valuable wildlife resource, while others regard them as a destructive pest. To date, the City has tried to manage the impact of beavers by removing dams when they are creating problems, such as flood hazards or backed up flows that overtop bike trails. This is something of a stop gap maintenance measure, however, since the beaver are free to reconstruct the dam in the same location or to relocate to another reach and build new dams. The beavers have no significant natural predator, and have the potential to dramatically change character of the City's riparian vegetation if left unchecked.

In order to better manage the overall health of the City's creeks, a more comprehensive approach to beaver management is needed and should be developed as an addition to the City's Beaver Management Policy (Appendix F) and the programmatic creek maintenance agreement with CDFG. The goal of such an approach would be to identify the population of beaver that can be sustained without creating adverse impacts on the other beneficial uses of the creek, and to secure regulatory approval of a management strategy that would allow the City to keep populations at or below this threshold. The steps needed to develop the comprehensive beaver management plan include:

- Establish quantitative and qualitative "carrying capacity" measures that support preservation of the beneficial uses of a creek reach and of the creek system. Carrying capacity measures could include such metrics as percent of riparian vegetation lost to culling, number of upland oaks inundated by ponds, or acre feet of flood capacity lost. Some of these measures will vary from creek to creek as the habitat functions and ecosystems vary.

- Implement a standard monitoring and reporting process to track beaver locations, population levels, and impacts.

- Consistent with the City's Beaver Management Policy, gain regulatory approval for the graduated controls designed to prevent impacts that exceed the carrying capacity measures. Application of controls should be modeled after the Integrated Pest Management (IPM) approach. IPM addresses long-term prevention of pests or their damage through a combination of techniques such as biological control and habitat manipulation, using the most benign options first.[49] Successively more aggressive techniques are used until the problem is

[49] University of California Statewide Integrated Pest Management Program

alleviated. Potential beaver control measures might include dam modifications such as maintaining an opening in the crest of the dam to facilitate salmonid migration, dam removal, tree protection through trunk armoring, beaver relocation, or depredation. This is the approach prescribed by the current Beaver Management Policy.

8.3.3 Invasive Plant Species Management Agreement

Invasive plant species are a significant threat to the health of riparian habitat in both the Dry Creek and the Pleasant Grove Creek watersheds. Potential troublesome species have been noted in section 5.1.6 of this plan. Giant reed (*Arundo donax*), water hyacinth (*Eichhornia crassipes*), red sesbania (*Sesbania punicea*) and cattail (*Typha latifolia)* are especially problematic. Piecemeal attempts to control and/or eradicate these species can consume a great deal of maintenance resource, with very little permanent removal actually being accomplished. A more comprehensive management approach is needed in order to protect ecosystem function and to more effectively use maintenance resources.

Management techniques for invasive plant species include mechanical, biological, and chemical controls. As such, regulatory approval for a programmatic approach to management will need to be developed in collaboration with multiple agencies, including the CDFG, RWQCB, FWS, and the Corps. The management plan should include the following elements:

- Conduct a comprehensive inventory of the City's creek systems to map locations of problem plant species, and where possible, identify source populations.
- Identify species and locations that are the highest priority for control based on factors such as degree of adverse ecosystem impact and potential for successful eradication.
- Develop an IPM-based, graduated control strategy for each species that describes the threshold for moving from one control to another. Secure programmatic regulatory approval for implementation of the control strategies.
- Undertake initial removal of priority species.
- Integrate ongoing inventory and application of control strategies with routine creek maintenance practices.
- Undertake a public education program to discourage ornamental use and retail distribution of invasive species.
- Work cooperatively with other jurisdictions in the Dry Creek and Pleasant Grove watersheds to secure funding for regional management of invasive plant species.

Appendix C contains additional information on potentially invasive plant species for the Dry Creek and Pleasant Grove watersheds, including zones where each plant is most likely to occur and control methods with the highest probability for success.

9.0 COMMUNITY STEWARDSHIP PROGRAMS

The quality of life enjoyed by residents in the City of Roseville is greatly enhanced by the recreation, scenic, and open space amenities associated with the local creek corridors. The City of Roseville encourages residents to become active stakeholders in the care and protection of these resources by participating in stewardship activities. Through such activities, residents can play an important role in preserving, restoring, and maintaining the City's creeks. Funding for stewardship activities is expected to come primarily for grants that encourage community involvement and environmental education.

9.1 Existing Stewardship Opportunities

There are some excellent opportunities available to residents to participate in creek stewardship through programs and events sponsored by local community groups. The Dry Creek Conservancy (DCC) is the most active such organization in the City of Roseville. DCC and the City of Roseville coordinate an annual "Creek Week" stewardship event every April that includes educational and creek maintenance activities focused on the Dry Creek watershed. DCC also sponsors creek restoration events, educational workshops, and coordination for citizen based water quality monitoring and fish counts throughout the year.

Other organizations, such as the Audubon Society and the Sierra Club, sponsor nature walks and other events on an infrequent basis that provide residents with opportunities to learn more about creek resources. These events occur in both the Dry Creek and Pleasant Grove creeks.

The City of Roseville Stormwater Program coordinated by the Environmental Utilities Department is another resource for building creek stewardship. The Stormwater Management Plan includes specific Best Management Practices (BMPs) for Public Outreach and Public Involvement. These BMPs include the dissemination of educational materials, a public web site, and a storm drain stenciling program. As residents learn more about stormwater management, the will become better educated about how their actions can impact water quality and aquatic habitat in the City's creeks. The RCRMRP assumes that these measures outlined in the SMP will be implemented and therefore does not address these issues.

Some of the Roseville schools also provide stewardship opportunities through environmental curricula and/or community service projects. These opportunities are generally limited to student participation, and their success relies on the motivation and interests of the individual teacher.

9.2 Potential Stakeholder Partnerships

There is great potential to expand creek stewardship within the City of Roseville by involving other partners in the effort. Specific partners that should be targeted include individual businesses, the Chamber of Commerce, professional organizations, students, garden clubs, social clubs, the Roseville Coalition of Neighborhood Associations (RCONA), the Maidu Interpretive Center Restoration Team, and natural resource advocacy groups (Duck Unlimited, Granite Bay Flycasters, Roseville Urban Forestry

Foundation, California Indian Basketweavers Association, etc.) The goal of building partnerships with these entities is to increase both the variety and number of stewardship opportunities available to achieve a higher level of participation among City residents. It is critical to recognize that Roseville residents have widely divergent perspectives on many social, political, and environmental issues. Education and outreach are needed to help residents understand that creek stewardship provides benefits to the entire community, and that all residents can play a meaningful role regardless of these differences.

9.3 Participation in Monitoring, Maintenance, and Restoration Programs

Involving residents in "hands-on" creek activities is an important tool for building a sense of stewardship. Such events provide participants with a keen awareness of the character of the creeks as they physically interact with the water, plants, and wildlife. Residents who participate in activities like planting trees, counting fish, removing invasive species, and cleaning up debris also become more vested in the condition of the creek while learning important lessons about creek ecology.

While these types of events are very important, they are also sometimes difficult to coordinate because they may require a significant degree of planning and oversight. Projects that are actually occurring within the creek channel may also require consideration of permitting and technical design issues. The City should continue to take an active role in helping to coordinate and sponsor such events to ensure that they are well-managed, effective, and result in positive experiences for participants.

9.4 Balancing Private Property Interests with Public Beneficial Uses

One of the objectives of a creek stewardship program is to increase appreciation for the many beneficial public uses of the City's creeks including recreation, habitat preservation, flood control, aesthetics, and open space. However, it is important for residents to also understand that some creek corridors pass through private property and are not accessible to the public. These corridors still function to provide flood control and habitat values, but they are not available for public recreation. It is especially important that individual property owners living along these creek sections be provided with information on how best to manage their own private property in order to be good stewards of the creek.

9.5 Recommended Measures

In order for the City of Roseville to have an effective creek stewardship program there are several challenges that must be addressed. The variety of stewardship opportunities available to residents must correspond to their diverse interests, abilities, and time constraints. Not all residents are willing or able to participate in organized creek restoration events or workshops. For some people, stewardship may be expressed simply by improving the way they manage their own yard or by picking up trash the next time they visit a preserve area. Residents must also have a clear sense of how their participation in creek stewardship is benefiting them as individuals and as a community. These benefits must be significant enough to motivate participation. Finally, the City needs a way to evaluate the level of participation in stewardship activities, and determine which stewardship opportunities are the most effective and most popular. This information is necessary to create and sustain a creek stewardship program that is vital, and responsive to the community.

The following are specific measures that may be implemented to strengthen and expand creek stewardship within the community in a manner that responds to these issues.

9.5.1 Creek Stewardship Coordinator

Establish a position for a Creek Stewardship Coordinator. The position may be either a City staff position or filled by a contractor. The role of the Coordinator would be to implement this Community Stewardship Program, act as the primary liaison for the City with the public on creek issues, and coordinate with Environmental Utilities to leverage resources and integrate creek stewardship with the Public Outreach and Involvement elements of the Stormwater Management Plan.

9.5.2 Stewardship Advisory Committee

Establish a Stewardship Advisory Committee made up of citizen volunteers serving one to two year terms on a rotating basis. The membership of the committee should consist of individuals who are able to advise the City's Creek Stewardship Coordinator on ways to enhance program effectiveness and who are willing to actively promote stewardship within their neighborhood and organizations. Membership should also reflect the diverse interests of the City's residents in order to encourage a broad-based and inclusive approach to stewardship.

9.5.3 Creek Stewardship Resource Directory

Create and maintain an online directory of creek stewardship resource information. The directory should function as the clearinghouse for creek stewardship by providing a way for residents to identify specific stewardship opportunities and for groups to publicize activities. The directory should include a calendar of events, listings from local organizations offering stewardship opportunities, contact numbers for City departments, information on individual stewardship BMPs, information on creek ecology, and links to curricula for teachers.

9.5.4 City Media Education and Outreach

Coordinate with the Stormwater Management Plan BMP PO-1 for Early Implementation to include creek stewardship information in existing City communications with residents such as the Roseville Reflections, Newcomer packets, tax bills, etc.

9.5.5 Creek Features

Develop regular feature articles for the paper and programs for public access television highlighting creek oriented events or stories. Features should appeal to a wide range of audiences and demonstrate how Roseville's creeks are an integral part of community life.

9.5.6 RCONA Participation

Encouraging creek stewardship is one way in which RCONA could work towards its stated mission to, "improve the social, physical, and economic health in the Roseville community." RCONA should be encouraged to help the member neighborhood associations develop specific creek stewardship opportunities that reflect the unique issues and needs of the individual neighborhoods.

9.5.7 Creekside Landowner Education

Develop and disseminate BMP information to private property owners whose land is adjacent to a creek describing the stewardship opportunities that are available to them and their role in preserving the beneficial uses of the creek. Offer a workshop to provide more in-depth information such as photos of demonstration projects, techniques for creek friendly design, and how to create backyard habitat.

9.5.8 Adopt-a-Creek

Implement an Adopt-a-Creek program in coordination with the Stormwater Management Program. Develop "adoption contracts" with neighborhoods, organizations, businesses, etc. describing the level of stewardship they will assume and the term of the "adoption". Publicize these activities through the online Resource Directory and other media to encourage participation.

9.5.9 Annual Creek Stewardship Report

Prepare an annual report documenting the types of stewardship activities that the City helped to organize, the number of people who participated in these activities, the effectiveness of the activities, issues, and goals for the following year. The assessment of effectiveness should seek to quantify specific benefits to the community such as dollars saved through volunteer clean up, reduction in vandalism or crime due to patrolling, reduction in sedimentation due to restoration projects, tons of trash removed, etc. Goals should address the number and variety of participants, and creek stewardship objectives such as habitat enhancement, maintenance, education, etc. The report will help document the City's commitment to creek stewardship, quantify benefits for residents, and demonstrate capacity when the City seeks stewardship grants.

9.5.10 The Arts and Creeks

Work with the libraries, schools, and the art community to sponsor exhibitions and contests that focus on the work of writers and artists who derive their inspiration from the City's creeks. Such events are an important way to publicize the creeks, promote local artists, and remind residents of how the creeks can be a source of personal inspiration as well as community identity.

9.5.11 Education Partnerships

Work with the Roseville City School District and the Roseville Joint Union High School District to promote creek oriented curricula and stewardship activities. Identify resource and administrative barriers that may be limiting schools abilities to more actively participate in stewardship, and work collaboratively to identify solutions.

9.5.12 Interpretive Program

Develop a comprehensive interpretive program including trail and preserve signage, signs at road crossings, creek corridor trail maps, coordination with local schools, and public stewardship events to increase public awareness of the need to preserve and restore creek corridors, and provides a sense of civic identity and pride. Interpretive signage is particularly important along the many trails that are adjacent to or provide access the City's creek corridors (see the City of Roseville Bicycle Master Plan for location of trails). Signage may also be added to enhance existing interpretive programs such as those offered at the Maidu Interpretive Center in Maidu Park.

9.5.13 Annual Stewardship Recognition Event

Provide an annual Steward of the Year award to a citizen or organization whose stewardship activities were exemplary. Recognize the recipient in a City Council meeting and publicize the accomplishment through local media and the City's web site.

9.5.14 Watershed Planning

The City of Roseville is an active participant in the Dry Creek Watershed Council and the recently formed Pleasant Grove/Curry Creek Coordinated Resource Management Plan (CRMP) group. It is important that the City continues in this role to represent the stakeholder interests of the community as watershed plans are developed and implemented, and to coordinate stewardship activities with other watershed organizations.

9.5.15 Regional Partnerships for Creek Stewardship

Since the City's creeks are part of larger, regional system it is important that the City collaborate with other local jurisdictions to identify regional funding and stewardship opportunities. The City should work with the County of Placer, the County of Sacramento, and the City of Rocklin to develop stewardship programs and approaches to creek management that are consistent with preserving and enhancing the health of their common watersheds.

9.5.16 Parks and Recreation Programs

Work with the City's Parks, Recreation and Libraries Department to develop and implement programs that focus on environmental education and stewardship, such as docent led tours that utilize local creeks as outdoor classrooms. The City's Reason Farms Environmental Preserve project in the Pleasant Grove watershed provides an excellent opportunity to develop such programs.

10.0 PLAN IMPLEMENTATION

The following is a summary of specific implementation measures that support the management and restoration goals of the Roseville Creek and Riparian Management and Restoration Plan. Plan implementation will be contingent on funding availability, with the expectation that state and federal grants will provide the majority of funding for restoration projects. The sequence of implementation for any given measure will be driven by a number of factors that cannot be reliably assessed at this time. These include:

- Restoration, management and maintenance commitments made as part of regulatory agency negotiations leading to a Consolidated Permit for Plan implementation,
- Availability of human and financial resources,
- relative value of the measure in attaining the plan goals,
- public support for the measure,
- ease of and/or barriers to implementation, and
- the successful completion of any required technical studies, assessments, permitting, or regulatory approvals.

Implementation measures are identified in five major areas: restoration, maintenance, monitoring and assessment, regulatory compliance, and education and stewardship. Each of these topics is addressed in detail by a separate chapter in this plan, which provides background on the rationale for the recommended measures. Measures described in these chapters have been restated here to provide a comprehensive list of all implementation strategies. While this list shows each measure under only one of the five issue areas for the sake of organization and clarity, implementation of any single measure is likely to provide benefits in multiple areas.

10.1 Restoration

10.1.1 High Priority Restoration Projects

Seek approval and permitting for the high priority restoration projects listed in

Table 10-1. Implement each restoration project as funding is available and approval and permitting are completed. See Chapters 3 and 5 for more detail on these projects.

10.1.2 Additional Restoration Projects

Implement the medium and low-priority restoration projects identified in Chapter 5 of this plan as funding, approval, and permitting processes allow.

10.1.3 Fish Barriers

Based on an analysis of existing barriers, reduce barriers to fish passage through removal, redesign or installation of in-stream structures that mitigate blockage to fish migration.

10.1.4 *Restoration Planning and Design*

Implement the following measures for all restoration projects:

- When restoration projects are proposed, determine the potential changes in flow regimes, current velocity, and substrate in downstream creek reaches.
- Conduct site specific pre-project creek assessments prior to all restoration projects to measure their post-implementation success.
- Institute periodic monitoring of restoration project performance and implement corrective measures such as replacement plantings as needed to meet project performance criteria.
- Ensure that City of Roseville Engineers and/or consulting engineers are provided with the City's preferred techniques for various restoration options as described in Chapter 5 of this plan during the restoration planning phase.
- Utilize nonstructural solutions to flood control and stream bank protection whenever feasible.

Table 10-1. High Priority Restoration Projects

Creek	ID	Location	Restoration Methods
Dry Creek	DC-4	Cirby Creek to UPRR	Runoff controls, bank stabilization, in-stream structures, bank recontouring
Dry Creek	EDU-1	Behind Adelante High School	Revegetation, invasive plant management
Linda Creek	LC-1	Lora Way to Strap Ravine	Revegetation, bank recontouring, invasive plant management
Linda Creek	N/A	Throughout	Revegetation
Strap Ravine	EDU-2	Maidu Park	Revegetation, invasive plant management
Antelope Creek	AC-1	D/S of Roseville Parkway	Removal of fish barrier, bank stabilization, revegetation, beaver management, bank recontouring
Antelope Creek	AC-2	Atlantic and Harding	Bank recontouring, invasive plant management, revegetation
Miners Ravine	MR-1	U/S of Roseville Parkway	Beaver management, invasive plant management
Miners Ravine	MR-3, MIN-3	D/S Sierra College Blvd.	Bank recontouring, revegetation, beaver management, channel realignment

Creek	ID	Location	Restoration Methods
Secret Ravine	SR-1	U/S of City limits	Access management (ORVs), bank stabilization, grade control, bank recontouring, runoff controls, revegetation
Secret Ravine	SEC-3	D/S of City limits	Access control, revegetation, bank recontouring, channel realignment
Miners Ravine	SEC-2	Behind United Artists Theater complex	Channel realignment, in-stream structures, revegetation
Pleasant Grove Creek	PGC-3	U/S of Woodcreek Oaks	Revegetation, bank recontouring, channel realignment
Pleasant Grove Creek	N/A	Upper reaches	Revegetation, runoff controls
South Pleasant Grove Creek	SP-6, SPG-6	Chipshot Way to Heritage Dr	Revegetation, in-stream structures, channel realignment, beaver management
Kaseberg Creek, middle branch	KC-8	Near Mahany Park	Revegetation, in-stream structures, channel realignment
Kaseberg Creek, S. branch	KC-5, EDU-3	D/S of Pleasant Grove Blvd	Revegetation, beaver management
Kaseberg Creek	KC-3, KAS-1	Timberrose Way to Fiddyment Rd	In-stream structures, revegetation

10.2 Maintenance and Operations

10.2.1 Maintenance Monitoring Program

Develop a maintenance monitoring program to ensure that annual maintenance activities are consistent with flow conveyance and habitat preservation goals and any commitments made as part of obtaining a Consolidated Permit for Plan implementation. Adaptively manage maintenance activities by collecting monitoring data, and conducting work product evaluations.

10.2.2 Review and Update of Existing Plans

Conduct a periodic review and update of the City's Creek Maintenance Guidelines to ensure continued compliance with current management goals and to incorporate new techniques and methods as they become available.

10.2.3 Maintenance Personnel Training

Develop and implement an ongoing training program for all creek maintenance personnel and equipment operators to educate them on:

- the contents of the CDFG Memorandum of Understanding,
- preferred methods of conducting maintenance activities,
- environmental disturbance avoidance techniques
- identification and protection of cultural resources and/or fossils that are discovered during creek maintenance activities,
- identification and removal of invasive species, and
- basic creek condition monitoring.

Ensure that project engineers and/or creek maintenance crews are aware of the City of Roseville Creek Maintenance Guidelines when planning activities within the creek system and use methods suggested by the Guidelines whenever feasible

10.2.4 Encourage Public Involvement

Include information on how the public can participate in and help reduce the need for creek maintenance in all creek outreach materials.

10.2.5 Annual Report

Prepare an annual report on creek management that both summarizes prior year's management activities and proposed priorities for the coming year. As part of this process, identify how the past and future activities are consistent with and advance the CALFED program objectives.

10.2.6 Interagency and Departmental Coordination

Hold annual or semi-annual meetings with key contacts from other regional jurisdictions such as Placer County Flood Control and Water Conservation District, the County of Placer, the Sacrament Area Flood Control Agency, the County of Sacramento, the City of Rocklin, and the Placer County Water Agency to provide a comprehensive overview of the City's creek management activities and to seek input on issues of a regional nature

Include staff from the City's Environmental Utilities, Planning, and Public Works departments in planning and review of all creek education, restoration, and management projects to make sure stormwater issues are addressed in a manner that is consistent with and compliments the City of Roseville's Stormwater Management Plan and Improvement Standards.

10.2.7 Access Controls

Construct barriers or establish setbacks as needed to prevent access to hazardous or sensitive areas. Barriers should be as visually unobtrusive as possible while still providing adequate access control.

Develop and install signage for all publicly accessible creek corridors to instruct visitor to remain on trails, highlight potential hazards or sensitive habitat, and advise against feeding or touching wildlife. Develop and install a system of signage and access controls to clearly indicate where public access is limited and to preserve privacy of homeowners living next to the creeks.

10.2.8 Inspections

Conduct biological monitoring before and during maintenance activities. Identify and protect sensitive species.

Conduct a pre-flood readiness evaluation or checklist to ensure that all CEQA, MOU, training, and adaptive management procedures and requirements have been completed prior to October 1 of every year.

Inspect creek corridors to identify erosion problems on a regular basis during the rainy season. Consider including this activity in the maintenance monitoring program.

Regularly inspect stormwater outfalls and culverts for potential creek maintenance problems associated with debris accumulation and/or bed and bank erosion.

10.2.9 Other Regulation Enforcement

Implement a comprehensive ordinance enforcement program including signage in the creek corridors describing use restrictions, police and volunteer patrols, and a telephone hotline for reporting violations.

10.2.10 Off Road Vehicle Management

Prohibit and enforce restrictions on ORV access to riparian areas. Work with Placer County to designate an allowed area for ORV activities within the County away from sensitive riparian areas.

10.2.11 Sediment Reduction Practices

Coordinate street cleaning practices with the creek maintenance program so that street cleaning occurs prior to first flush and large storm events.

Inspect erosion control work on a regular basis and repair as needed. This activity includes the repair of failed rock, sacked concrete, or gabion section. Maintenance activities must be confined to the failed section and immediate adjacent areas.

Identify areas where excess sediment is entering the creek system, such as from road runoff, and coordinate with Environmental Utilities and Public Works to develop management strategies to reduce sediment load.

Identify locations within the creek channels where excess erosion is contributing to habitat degradation and implement environmentally friendly bank stabilization measures.

10.2.12 Emergency Response

Evaluate emergency response access routes and identify areas where additional access for emergency vehicles is needed. The assessment should consider the type of terrain, vegetation, adjacent land uses, and degree of public access.

Identify trails to be accessible to emergency vehicles and provide map to local emergency response providers.

Prepare Public Releases in advance that can be provided to the media during an emergency.

Ensure all hazard response plans are current and are distributed and understood by emergency response providers

Identify sensitive creek resource areas and develop emergency response plans for these areas that are sensitive to habitat preservation.

10.2.13 Trail and Vegetation Maintenance

Continue to conduct regular inspections and maintenance of trail surfaces, adjacent vegetation, and signage to make sure trails are safe, visual access is appropriate, and signs are legible and in place. This work is currently performed by a Natural Resources Specialist in the Parks, Recreation and Libraries Department.

Work with the City of Roseville Fire Department to develop vegetation management guidelines for the creek corridors and adjacent properties that provides an acceptable level of fuel management while minimizing adverse impacts to habitat quality, channel stability, and flood conveyance.

Consider expansion of the pilot grazing program initiated in 2005.

Use only herbicides registered with the California Department of Pesticide Regulation for vegetation control according to labeled instructions.   Labeled instructions for the herbicide must be on hand during the application process and made available at the request of CDFG.

Continue to restrict the removal of any native oak trees within the City's publicly owned creek corridors with the exception of trees that have been uprooted by storm events and are affecting flow conveyance, or creating a hazard.

Where vulnerable to beaver damage, trunks of oaks and other significant riparian trees should be wrapped at the base with environmentally suitable material consistent with the City's Beaver Management Policy.

10.3 Monitoring and Assessment

Monitoring and assessment implementation measures focus on one-time studies needed to better characterize and manage the City's creeks, and to evaluate ongoing activities, conditions, and results of management actions as part of the adaptive management process.

10.3.1 Fish Barriers Inventory

Inventory, map, and prioritize barriers for redesign/removal/mitigation.

10.3.2 Floodplain Encroachment

Identify unapproved structures encroaching into floodplain or creek preservation easements and prioritize removal.

10.3.3 Spatial Accuracy of Existing Hydrologic Data

Refine the City of Roseville creeks GIS data layer to accurately represent the location of City streams based upon the most accurate base data available, for example the 2003 high resolution orthorectified aerial photography.

Develop handheld GPS capabilities to improve resource management monitoring and assessment.

10.3.4 Stream Assessment

Conduct a field-based stream assessment to gather geomorphology and habitat data using the CDFG Rapid Bioassessment and the USDA Visual Assessment protocol for the portions of the City's creek system that were not surveyed for the ECAR. Assessment could be conducted by experienced professionals or trained volunteers with oversight. Incorporate findings in creeks database to be used in prioritizing future restoration and management activities, such as bank stabilization, opportunities for terracing, buffers, and creek realignment. Assessments on private property must not be conducted without property owner permission.

10.3.5 Hydraulic/Hydrologic Modeling

Update existing or develop new hydrologic and hydraulic models to develop an accurate understanding of the City's creek system, better manage impacts related to future land changes, support the data needs of emergency response programs, and enhance understanding of biological function.

Commit to review and update models on a regular basis (time, development, or methodology changes) to maintain accuracy.

10.3.6 Creek Diversions and Dams

Develop a comprehensive inventory of all creek system diversions and dams and identify those that may be contributing to undesirable water quality conditions. Recommend measures to remove or replace those dams and diversions that are causing significant problems.

10.3.7 Riparian Buffer Acquisition

Identify areas where width of existing riparian buffer is inadequate and prioritize long term property/easement acquisitions as needed to establish sufficient riparian vegetative zones to protect water bodies and enhance migratory corridors.

10.3.8 Water Quality Sampling

In cooperation with the Dry Creek Watershed Council and the Pleasant Grove/Curry Creek CRMP group, identify areas where additional water quality sampling is needed in order to have an accurate picture of conditions in the City's creek corridors. Work with these groups to identify ways to gather the data on a regular basis in a manner that may be integrated with the State Water Quality Control Board's Surface Water Ambient Monitoring Program (SWAMP).

10.3.9 Creek Data Management System

In cooperation with the Dry Creek Watershed Council and the Pleasant Grove/Curry Creek CRMP group, develop a comprehensive database to store data related to the restoration and management of the City's stream system. This system should be spatially based using GIS and contain data on streams and stream reach morphology, water quality, riparian habitat, existing and proposed project locations and priorities, and in-channel structures such as fish barriers.

Include monitoring data associated with City's maintenance activities in the database.

Require that all creek study data developed by consultants be provided in a format that can easily be integrated with the database.

Provide public access to the Creek Data Management System and monitoring reports through the web.

Coordinate with community based volunteer groups (e.g., Dry Creek Conservancy) to provide the City of Roseville Community Development Department with a copy of all creek assessment and/or aquatic resource data so the City can incorporate this information into the Data Management System.

10.3.10 Seasonal Flows

Expand monitoring program to record seasonal flows in streams, including low-flows in the dry season. Install additional stream gages at key locations to record both low and peak flows.

10.3.11 Native Oak Tree Health

Actively monitor the health of native oaks in riparian areas, particularly along Pleasant Grove, South Branch Pleasant Grove, and Kaseberg Creeks and False Ravine to assess impact of changing hydrologic regime on oak health. Develop a remediation plan to protect native oaks in the event that changing hydrology adversely impacts these trees.

10.4 Regulation and Policy

10.4.1 Consolidated Permitting for Restoration Projects

Implement a consolidated approach for permitting restoration projects consistent with the Draft Consolidated Permitting Strategy (Appendix H). Under this approach, a group of specific projects or a description of a class of projects is presented to a cooperating group of regulatory agencies for review. The agencies identify and adopt a streamlined process that reduces the extent of redundant documentation, coordinates the sequence and degree of review, and still satisfies their individual accountabilities. A lead agency or jurisdiction may be designated to drive the process and to serve as the liaison for project proponents.

10.4.2 Beaver Management Agreement

Consistent with the City's Beaver Management Policy (Appendix F), implement a comprehensive approach to beaver management in coordination with CDFG. The goal of such an approach would be to identify the population of beaver that can be sustained without creating adverse impacts on the other beneficial uses of the creek, and to secure regulatory approval of a management strategy that would allow the City to keep populations at or below this threshold.

10.4.3 Invasive Plant Species Management Agreement

Implement a comprehensive approach to management of invasive plant species in collaboration with multiple agencies, including SAFCA, CNPS, CDFG, RWQCB, FWS, and the Corps. The management plan should a comprehensive inventory, public education, multi-jurisdictional coordination, and an IPM based approach to control.

10.4.4 CDFG Rules and Regulations

Ensure that the City of Roseville Community Development staff and/or their environmental consultants stay abreast of changes in CDFG rules and regulations by periodically reviewing the CDFG website and/or through phone and email contacts.

10.4.5 City of Roseville Creek Maintenance Guidelines

Ensure that the City of Roseville's Creek Maintenance Guidelines including Best Management Practices (BMP'S) are implemented on all creek maintenance projects whether public or private.

10.4.6 Floodplain Encroachment

Consistent with the City's Flood Damage Prevention Ordinance, where unapproved structures or hardscape encroach on the floodplain and adversely affect habitat and/or compromise the flood capacity of the channel, implement actions to enforce removal or relocation of the structures, or devise modifications to the channel to mitigate adverse impact.

10.4.7 Permitting Handbook

Develop a permitting handbook to guide residents and volunteer groups through the process of securing the necessary approvals to implement maintenance, construction and restoration projects located within the creek corridor. Include information on the Consolidated Permit if applicable, a process flow chart, glossary of basic terms, fee schedule, sample forms and maps, how to obtain technical assistance, and contact information for regulatory agencies or departments.

10.4.8 Regulatory Education

Through public meetings and/or workshops periodically provide education to City staff and interested community groups on the state and federal regulations outlined in the existing agreements and any future agreements with the regulatory agencies.

10.4.9 Developer Sponsored Education

Look for opportunities during the Development Agreement process for future residential and commercial projects to require developers to provide informational materials to new property owners on BMPs to preserve the City's creek resources.

10.5 Outreach and Stewardship

10.5.1 Creek Stewardship Coordinator

Establish a position for a Creek Stewardship Coordinator. The position may be either a City staff position or filled by a contractor. The role of the Coordinator would be to implement this Community Stewardship Program, act as the primary liaison for the City with the public on creek issues, and coordinate with Environmental Utilities and Public Works to leverage resources and integrate creek stewardship program with the Public Outreach and Involvement elements of the Stormwater Management Plan.

10.5.2 Stewardship Advisory Committee

Establish a Stewardship Advisory Committee made up of citizen volunteers serving one to two year terms on a rotating basis. The membership of the committee should consist of individuals who are able to advise the City's Creek Stewardship Coordinator on ways to enhance program effectiveness and who are willing to actively promote stewardship within their neighborhood and organizations. Membership should also reflect the diverse interests of the City's residents in order to encourage a broad-based and inclusive approach to stewardship.

10.5.3 Creek Stewardship Resource Directory

Create and maintain an online directory of creek stewardship resource information. The directory should function as the clearinghouse for creek stewardship by providing a way for residents to identify specific stewardship opportunities and for groups to publicize activities. The directory should include a calendar of events, listings from local organizations offering stewardship opportunities, contact numbers for City departments, information on individual stewardship BMPs, information on creek ecology, and links to curricula for teachers.

10.5.4 City Media Education and Outreach

Coordinate with the Stormwater Management Plan BMP PO-1 for Early Implementation to include creek stewardship information in existing City communications with residents such as the Roseville Reflections, Newcomer packets, tax bills, etc.

10.5.5 Creek Features

Develop regular feature articles for the paper and programs for public access television highlighting creek oriented events or stories. Features should appeal to a wide range of audiences and demonstrate how Roseville's creeks are an integral part of community life.

10.5.6 RCONA Participation

Encouraging creek stewardship is one way in which RCONA could work towards its stated mission to, "improve the social, physical, and economic health in the Roseville community." RCONA should be encouraged to help the member neighborhood associations develop specific creek stewardship opportunities that reflect the unique issues and needs of the individual neighborhoods.

10.5.7 Creekside Landowner Education

Develop and disseminate BMP information to private property owners whose land is adjacent to a creek describing the stewardship opportunities that are available to them and their role in preserving the beneficial uses of the creek. Offer a workshop to provide more in-depth information such as photos of demonstration projects, techniques for creek friendly design, and how to create backyard habitat.

10.5.8 Adopt-a-Stream

Implement an Adopt-a-Stream program in coordination with the Stormwater Management Program. Develop "adoption contracts" with neighborhoods, organizations, businesses, etc. describing the level of stewardship they will assume and the term of the "adoption". Publicize these activities through the online Resource Directory and other media to encourage participation.

10.5.9 Annual Creek Stewardship Report

Prepare an annual report documenting the types of stewardship activities that the City helped to organize, the number of people who participated in these activities, the effectiveness of the activities, issues, and goals for the following year. The assessment of effectiveness should seek to quantify specific benefits to the community such as dollars saved through volunteer clean up, reduction in vandalism or crime due to patrolling, reduction in sedimentation due to restoration projects, tons of trash removed, etc. Goals should address the number and variety of participants, and creek stewardship objectives such as habitat enhancement, maintenance, education, etc. The report will help document the City's commitment to creek stewardship, quantify benefits for residents, and demonstrate capacity when the City seeks stewardship grants.

10.5.10 The Arts and Creeks

Work with the libraries, schools, and the art community to sponsor exhibitions and contests that focus on the work of writers and artists who derive their inspiration from the City's creeks. Consider developing ecotourism or festivals that focus attention on creek resources (for example, a Winter Salmon Festival). Such events are an important way to publicize the creeks, promote local artists, and remind residents of how the creeks can be a source of personal inspiration as well as community identity.

10.5.11 Education Partnerships

Work with the Roseville City School District and the Roseville Joint Union High School District to promote creek oriented curricula and stewardship activities. Identify resource and administrative barriers that may be limiting schools abilities to more actively participate in stewardship, and work collaboratively to identify solutions.

10.5.12 Annual Stewardship Recognition Event

Provide an annual Steward of the Year award to a citizen or organization whose stewardship activities were exemplary. Recognize the recipient in a City Council meeting and publicize the accomplishment through local media and the City's web site.

10.5.13 Watershed Planning

The City of Roseville is an active participant in the Dry Creek Watershed Council and the recently formed Pleasant Grove/Curry Creek Coordinated Resource Management Plan (CRMP) group. It is important that the City continues in this role to represent the stakeholder interests of the community as watershed plans are developed and implemented, and to coordinate stewardship activities with other watershed organizations.

10.5.14 Regional Partnerships for Creek Stewardship

Since the City's creeks are part of larger, regional system it is important that the City collaborate with other local non-governmental (NGO) and governmental organizations. Entering into these partnerships has many benefits. Involving multiple agencies in the process facilitates consensus in the goals and objectives of the project, increases the overall level of expertise applied to the problem, and enhances the public's perception of the validity of the plan. Having endorsements from multiple NGOs and local jurisdictions also increases the chances to receive funding from grant sources, since granting agencies prefer watershed and creek planning/restoration projects with coordinated efforts that are part of a larger plan. Coordination between jurisdictions through which a creek flows can improve the overall effectiveness of a restoration project by increasing the overall scope. This is especially true in invasive species eradication programs, because a site where non-native invasives have been eradicated may be reinfested from upstream seed sources.

The list below includes some of the NGO and governmental agencies active in the Dry Creek and Pleasant Grove Creek watersheds that may be willing to form cooperative partnerships for restoration projects. This list is by no means exhaustive, but includes some of the agencies that have been involved in projects on the Dry Creek and Pleasant Grove watersheds in the past.

Non-governmental Agencies

- Dry Creek Conservancy
- Pleasant Grove/Curry Creek Watershed Group
- Friends and Lovers of Miners Ravine
- Roseville Coalition of Neighborhood Associations (RCONA)
- Sierra Foothills Audubon Society

- West Placer Municipal Advisory Committee (MAC)
- Granite Bay MAC
- Placer Land Trust
- Sierra Club
- Boy & Girl Scouts of America
- Ducks Unlimited
- Granite Bay Flycasters
- Adelante Projects for the Environment (APE)

Public Agencies

- Placer County,
- City of Rocklin,
- Town of Loomis,
- Placer County Flood Control and Water Conservation District,
- California Environmental Protection Agency,
- Cal EPA, Office of Environmental Health and Hazard Assessment,
- Sacramento County,
- California Bay-Delta Commission (formerly CalFED),
- California Department of Water Resources Urban Streams Program and Fish Passage Improvement Program,
- Sacramento Area Flood Control Agency,
- American River Flood Control Agency,
- California Department of Fish and Game,
- National Marine Fisheries Service (NOAA Fisheries)
- Trust for Public Lands
- U.S. Fish and Wildlife Service
- Department of Water Resources Urban Streams Program

10.5.15 Native American Cultural Uses

Work with representatives of local Native American groups such as CIBA to identify, enhance, and preserve areas within the creek corridors that can provide a source for limited gathering of native plant materials for basketry and other cultural activities, consistent with the health of the ecosystem and City ordinance.

10.5.16 Personal Creek Stewardship Education

Provide homeowners with information they can use to individually contribute to creek stewardship, such as 1) reducing stormwater and other runoff from their properties, 2) reducing pollution contained in any runoff, 3) proper disposal of unwanted plants and animals, and 4) invasive species that should not be planted.

10.5.17 Increase Creek Awareness

Raise local awareness of the City's creeks through measures such as installing distinctive signage at road crossings, and creating overlook points to provide visual access to creek reaches that are not safe for physical access.

10.6 Stormwater Management Program Implementation

Many of the initiatives contained in the City's Stormwater Management Program address issues that are relevant to creek management and restoration. The following are specific measures that will benefit the City's creeks, and should be implemented consistent with the SWMP as noted.

10.6.1 Outfall Improvement

Supplement the visual water quality monitoring the City currently does at major outfalls, with sampling to identify and prioritize outfalls with significant quantities of common constituents of concern such as diazinon, malathion, volatile organic compounds, fecal coliform bacteria, etc. If sufficient space exists to install water filtration systems such as wetlands, add potential projects to the implementation plan. If insufficient space exists for a filtration system, target neighborhoods for public education to reduce pollutants and investigate source controls such as oil/water separators, grassy swales, etc.

10.6.2 On-site Sediment Management (SWMP)

Develop/strengthen policies or incentives to encourage new development to incorporate best available technologies for settling of fine-grained sediment in stormwater runoff prior to runoff entering the creek system.

10.6.3 Vegetative Buffers (SWMP)

Conduct a feasibility study to Identify areas where potential exists to filter urban runoff through vegetated buffer zones. The feasibility study should include analysis of costs, methods, potential benefits, funding sources, and a prioritized implementation plan.

10.6.4 Detention/Infiltration Facilities

Develop/strengthen guidelines, policies and incentives for creation of detention and infiltration facilities that meet the multiple objectives of this plan.

10.6.5 Pervious Pavement Testing

Identify locations for pilot projects to test the feasibility of using pervious pavement to limit off-site runoff. Select at least one residential, commercial, and public site for initial implementation.

10.6.6 Non-stormwater Management (SWMP)

Implement measures to address water quality and habitat protection issues resulting from contributions to dry-season and non-stormwater flows. The City is currently developing a new ordinance to better manage these flows and encourage on-site retention and aquifer recharge.

10.6.7 SWPPP Enforcement (SWMP)

Continue to support enforcement of Stormwater Pollution Plans to ensure protection of creeks from sedimentation and other contaminants resulting from new development.

11.0 FUNDING AND RESOURCES

It is expected that the Roseville Creek and Riparian Management and Restoration Plan (RCRMRP) will be implemented through the collaborative efforts of the City, community organizations, individual residents, the regulatory agencies, and other regional partners. The resources needed for Plan implementation will also be derived from a wide variety of sources ranging from volunteer labor to specific project grants, and general fund revenues. The rate of Plan implementation will correspond to the ability of the City and its partners to attract the needed funding and non-financial resources. It is not practical at this time to estimate total Plan implementation costs since so many elements of the plan are described at a conceptual level. Further refinement of costs will occur as elements are selected for implementation.

11.1 City Resources

The City has access to several types of resources for implementation of this Plan. General Fund revenues from property taxes are best suited for funding recurring costs, such as routine creek maintenance, plan management, processing fess from permit reviews, permanent stewardship programs, and ongoing monitoring. These types of activities are very difficult to fund with grants since granting agencies have limited funding and therefore focus on projects that have a finite scope, duration, and clear deliverables. Some of the recurring expenses associated with implementation of the RCRMRP are already part of the City's operational budget, such as staff and materials required for routine creek maintenance and permitting. However, new resources will be needed to implement other aspects of the Plan, such as expanded stewardship programs, additional data collection, and monitoring.

Access to recurring funds is likely to be a limiting factor for the aspects of the Plan implementation that rely on City staff and new program development, and it is important that existing City resources be used efficiently. As suggested in Chapter 6 of this Plan, it may be possible to incorporate certain habitat enhancement, invasives monitoring, or water quality actions into the routine creek maintenance work done by City crews. Another way to partially address the issue of limited recurring funding would be to consider increasing the General Fund allocation for creek maintenance and restoration. The economic justification for this action is based on the asset value of the City's creeks for flood conveyance and as an amenity that enhances the quality of life and property values in Roseville. As the City develops its stormwater ordinance, there may also be opportunities to identify funding for creek maintenance and restoration because many of these activities also provide stormwater management benefits.

Since General Fund revenues are the primary source for many of the essential safety and public services (e.g., police and fire) provided by the City, they cannot be used exclusively for RCRMRP implementation. New property assessments may offer some potential funding, but approval of any new assessment requires appropriate nexus studies and a favorable vote by the affected property owners. Given the uncertainty of this outcome, new assessments should not be regarded as a likely funding source. However, new assessments and/or establishment of a special district for creek maintenance and restoration should be considered at the appropriate time in the development review process (i.e., at the Specific Plan/ Development Approval stage when the City has the ability to leverage long term funding from landowners seeking land use entitlement from the City).

The City has had excellent success in the past attracting grant funds for various creek enhancement projects. The skill of City staff in preparing grant proposals, grant administration, and completing project deliverables positions the City favorably for future efforts to attract additional funds.

11.2 Grants

The approach to management of Roseville's creeks promoted by the RCRMRP supports a variety of beneficial uses including flood control, recreation, habitat, and water quality. This diversity of uses will allow the City to pursue grants under many federal, state, and private programs. A selection of these programs is described in Appendix D. While some grants provide one-time funding for a specified project or activity, others may allow additional awards in subsequent years for phased projects if performance is satisfactory. The City may also be able to improve its success with securing grant funds by seeking grants for projects that extend or complement activities that are already funded by City revenues. In such situations, the City's investment may qualify as a "match" against grantor funds.

Another positive factor in the City's ability to attract grant funds is the regional value of the City's creeks. The City of Roseville is situated in the heart of the multi-jurisdictional Dry Creek Greenway. The trails along the Roseville creek corridors and the corridors themselves provide essential recreation and habitat connections between the upper and lower portions of the watershed, as well as alternative transportation opportunities. A major segment of the east-west alignment required to complete the 70-mile regional loop trail serving south Placer and north Sacramento counties is located in Roseville along Dry Creek and Linda Creek. Roseville also encompasses major portions of the headwaters of the Pleasant Grove Creek system, and effective management of these reaches will result in beneficial flood control, water quality, and habitat impacts beyond the City limits. As the City pursues grant funding, it will be important to solicit the support of the various regional partners who will benefit from implementation of the RCRMRP.

The City will also need to work with local special interest groups and community organizations to pursue grant funding and to develop proposals. While many of these entities have the vision and technical expertise required to prepare proposals, they may not have the structure required of the grantor for grant administration and accountability.

The Dry Creek Watershed Council and the Pleasant Grove/Curry Creek CRMP provide a forum for the City to collaborate with other jurisdictions, agencies, and organizations in the mutually beneficial pursuit of grant resources.

11.3 Volunteerism

One of the most important resources that will be needed for implementation of the RCRMRP is the involvement of individual residents, organizations, and the local business community. Volunteers can participate in many important creek management activities including restoration, maintenance, monitoring, and public education. The labor and other resources that these volunteers provide will help to reduce the need for paid City staff to undertake these tasks, while building a greater sense of stewardship in the community.

Volunteerism is also a key source of in-kind matching contributions that can be used to enhance the City's ability to attract grants or other donations. This allows the City to reserve financial resources for the types of expenses that perhaps cannot be funded through grants. The City should share coordination of volunteers with community organizations in order to involve a wide variety of people in creek stewardship.

11.4 Cooperative Maintenance and Restoration Opportunities

Maintenance and restoration projects that involve multiple stakeholders from local, state, and federal agencies as well as private entities provide greater opportunities for leveraging limited financial resources and for attracting outside funding in the form of state and federal grants. Examples of funding sources include the CALFED Bay-Delta Program, DWR Urban Streams Program and Fish Passage Improvement Program, California Department of Fish and Game, Natural Resource Conservation Service (NRCS), U.S. Fish and Wildlife Service, National Parks Service, and the California Environmental Trust. The City could identify specific maintenance activities or restoration projects which have regional benefits, such as the removal of invasive non-native plants, and develop cooperative agreements with other local jurisdictions, agencies, and organizations for implementation and maintenance.

11.5 Other Potential Funding Sources

Donations and sponsorships may also be a viable way of funding certain elements of the RCRMRP. Such methods provide a benefit to the community and can also offer public visibility for the contributing business or individual. Donations for implementation of specific events or projects could be gathered by an existing non-profit group to support a plan activity that is especially meaningful to the group's mission. Community events or restoration projects could be sponsored by local businesses, in much the same way that Creek Week is sponsored each year. The Adopt-A-Creek program is another form of sponsorship that allows local groups to associate their organization with a publicly visible service.

The establishment of a foundation could be another mechanism to facilitate donations. Endowments from local business or individuals, or estate bequests, could be made through the foundation to support a particular educational program, event, or restoration project. Such a foundation would also be an effective way to increase awareness of the City's creeks and to provide further opportunities for stewardship.

12.0 REFERENCES

Ayres, E. Knapp, E. Liebermann, S. Love J. Vodopals. 2003. *Assessment of Stressors on Fall-Run Chinook Salmon in Secret Ravine* (Placer County, CA). Prepared for Office of Environmental Health Hazard Assessment (OEHHA) at California EPA and the Placer County Planning Department. 122 pp plus appendices.

Brown, K. B. *Urban Stream Restoration Practices: An Initial Assessment*. The Center for Watershed Protection. 2001.

CDFG. Arundo, Streamside Invader. www.ceres.ca.gov/tadn

City of Palo Alto. *San Francisquito Creek Bank Stabilization and Revegetation Master Plan*. 2000.

City of Roseville, *Bicycle Master Plan*, 2002.

City of Roseville, *Del Webb Specific Plan*, 1993.

City of Roseville, *Dry Creek Urban Streams Restoration Program Initial Study/Mitigated Negative Declaration*, October 2002.

City of Roseville, *General Plan*, 1992.

City of Roseville, *Stormwater Management Plan*, Kennedy-Jenks, 2003.

City of Roseville, *Highland Reserve Specific Plan*, 1996.

City of Roseville, North *Central Roseville Specific Plan*, 1990.

City of Roseville, *North Roseville Specific Plan*,1997

City of Roseville, *Northeast Roseville Specific Plan*, 1987.

City of Roseville, *Northwest Roseville Specific Plan*, 1988.

City of Roseville, *Southeast Roseville Specific Plan*, 1988.

City of Roseville, *Stoneridge Specific Plan*, 1998.

Cowardin, Lewis M., et. al. *Classification of Wetlands and Deepwater Habitats of the Untied States*, U.S. Department of the Interior. December 1979.

Dry Creek Conservancy, (2001). Secret Ravine Adaptive Management Plan.

ECORP, *Dry Creek Watershed Coordinated Resource Management Plan, Public Review Draft*, 2003.

Federal Interagency Stream Restoration Working Group. *Stream Corridor Restoration Principles, Processes, and Practices.*

Fisheries and Oceans, Canada. Fish and Pollution *(http://www-heb.pac.dfo-mpo.gc.ca/water_quality/fish_and_pollution/index_e .htm)*.

Foothill Associates, et. al. *Existing Conditions Assessment Report, Roseville Creek and Riparian Management Plan,* Prepared for the City of Roseville, 2003.

GANDA. 1998. Cirby-Linda-Dry Creek Flood Control Project. Biological Assessment for Chinook Salmon and Steelhead Trout. Prepared for the City of Roseville, Community Development Department and Dames & Moore. 37 pp., plus appendices.

GANDA. 1999b. 1998-1999 Adult and Juvenile Salmonid Surveys, Water Temperature and Flow Monitoring in Cirby and Linda Creeks, Placer County, California. Prepared for the City of Roseville, Community Development Department and Dames & Moore. 29 pp., plus appendices.

GANDA. 2000. 1999-2000 Adult and Juvenile Salmonid Surveys, Water Temperature Monitoring, Flow Measurements and Fish Trapping in Cirby and Linda Creeks, Placer County, California. Prepared for the City of Roseville, Community Development Department. 25 pp., plus appendices.

GANDA. 2001a 2000-2001 Adult and Juvenile Salmonid Surveys, Water Temperature Monitoring, and Flow Measurements in Cirby and Linda Creeks, Placer County, California. Prepared for the City of Roseville, Community Development Department. 26 pp., plus appendices.

GANDA. 2001b Creek Maintenance Guidelines Document. Prepared for the City of Roseville, Community Development Department. 33 pp., plus appendices.

GANDA. 2002. 2001-2002 Adult and Juvenile Salmonid Surveys, Water Temperature.

GANDA. *Cirby-Linda-Dry Creek Flood Control Project. Biological Assessment for Chinook Salmon and Steelhead Trout.* Prepared for the City of Roseville, Community Development Department and Dames & Moore. 1998.

Georgia Soil and Water Conservation Commission. *Guidelines for Streambank Restoration*. 2000

HDR and Foothill Associates, 2003. *Secret Ravine Floodplain Restoration Feasibility Study*. Prepared for Placer County Flood Control and Water Conservation District.

Langis, R. and Guo, S. *Lower Silver Creek Watershed Project Maintenance Plan*. Santa Clara Valley Water District. 2001.

Montgomery, J. M. *Final Report: Dry Creek Watershed Flood Control Plan*. Prepared for the Placer County Flood Control District and Water Conservation District and Sacramento County Water Agency, April 1992.

Moyle. P. Inland Fishes of California, Revised and Expanded. 4-406. University of California Press. London, U.K. 2002.

Placer County Stream Management Task Force. *Goal, Policy, and Strategy Recommendations for Stream Management in Placer County*. Placer County Flood Control and Water Control and Water Conservation District, 1991.

Poff, L. Allan, D. Functional Organization of Stream Fish Assemblages in Relation to Hydrological Variability. Ecology. 76 (2), pp. 606-627. 1995.

Riley, Ann, L. *Restoring Streams in Cities, A Guide for Planners, Policymakers, and Citizens*, Island Press, 1998.

Santa Clara Valley Water District. Stream Maintenance Program. 2002.

Schiff, K. and Sutula, M. *Organophosphorous Pesticides in Stormwater Runoff from Southern California*, Southern California Coastal Water Research Project, 2001.

State Water Resources Control Board. *Macroinvertebrate Assemblages in Agriculture- and Effluent-dominated Waterbodies of the Lower Sacramento River Watershed*, 2002.

Stormwater Managers Resource Center. *Aquatic Buffers Fact Sheet: Buffer Zones.* http://www.stormwatercenter.net/

Swanson Hydrology and Geomorphology. *Dry Creek Bank Erosion Management Plan*. 2003.

Tappel, P.D., and T.C. Bjornn. A new method of relating size and spawning gravel to salmonid embryo survival. North Am. J. Fish. Manage. 3(2): 123-135. 1983.

US Fish and Wildlife Service. *Project Design Standards for Fish Passage Activities.* http://pacific.fws.gov/jobs/orojitw/standard/fish-std.htm

Winkler, M. F. *Defining Angle and Spacing of Bendway Weirs*. USACE, 2003.

Appendix A: Sample Visual Assessment Forms

PHYSICAL HABITAT QUALITY
(California Stream Bioassessment Procedure)

WATERSHED/ STREAM: ____________________________ DATE/ TIME: __________________________

COMPANY/ AGENCY: ____________________________ SAMPLE ID NUMBER: __________________________

SITE DESCRIPTION: ____________________________

Circle the appropriate score for all 20 habitat parameters. Record the total score on the front page of the CBW.

Parameters to be evaluated within the sampling reach

HABITAT PARAMETER	CONDITION CATEGORY			
	OPTIMAL	**SUBOPTIMAL**	**MARGINAL**	**POOR**
1. Epifaunal Substrate/ Available Cover	Greater than 70% (50% for low gradient streams) of substrate favorable for epifaunal colonization and fish cover; most favorable is a mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% (30-50% for low gradient streams) mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% (10-30% for low gradient streams) mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% (10% for low gradient streams) stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/ Depth Regimes *(deep<0.5 m, slow<0.3 m/s)*	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in an area longer than the sampling reach

HABITAT PARAMETER	CONDITION CATEGORY			
	OPTIMAL	**SUBOPTIMAL**	**MARGINAL**	**POOR**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left of right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zones covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities haveimpacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

City Of Roseville Creek and Riparian Management and Restoration Plan
Modified Stream Visual Assessment Protocol (Data Sheet)
(source: USDA-National Water and Climate Center Technical Note 99-1)

11. Hydrologic alteration		**Responsibility (HDR)**	
Flooding every 1.5 to 2 years. No dams, no water withdrawals, no dikes or other structures limiting the stream's access to the flood plain. Channel is not incised.	Flooding occurs only once every 3 to 5 years; limited channel incision. or Withdrawals, although present, do not affect available habitat for biota.	Flooding occurs only once every 6 to 10 years; channel deeply incised. or Withdrawals significantly affect available low flow habitat for biota.	No flooding; channel deeply incised or structures prevent access to flood plain or dam operations prevent flood flows. or Withdrawals have caused severe loss of low flow habitat. or Flooding occurs on a 1-year rain event or less.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

12. Water appearance			**Responsibility (Foothill)**
Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks.	Occasionally cloudy, especially after storm event, but clears rapidly; objects visible at depth 1.5 to 3 ft; may have slightly green color; no oil sheen on water surface.	Considerable cloudiness most of the time; objects visible to depth 0.5 to 1.5 ft; slow sections may appear pea-green; bottom rocks or submerged objects covered with heavy green or olive-green film. or Moderate odor of ammonia or rotten eggs.	Very turbid or muddy appearance most of the time; objects visible to depth < 0.5 ft; slow moving water may be brightgreen; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface. or Strong odor of chemicals, oil, sewage, other pollutants.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

13. Nutrient enrichment		Responsibility (Foothill)	
Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present.	Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates.	Greenish water along entire reach; overabundance of lush green macrophytes; abundant algal growth, especially during warmer months.	Pea green, gray, or brown water along entire reach;dense stands of macrophytes clog stream; severe algal blooms create thick algal mats in stream.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

14. Barriers to fish movement			Responsibility (GANDA)	
No barriers.	Seasonal water withdrawals inhibit movement within the reach.	Drop structures, culverts, dams, or diversions (< 1 foot drop) within the reach.	Drop structures, culverts, dams, or diversions (> 1 foot drop) within 3 miles of the reach.	Drop structures, culverts, dams, or diversions (> 1 foot drop) within the reach.
20 19 18 17	**16 15 14 13**	**12 11 10 9**	**8 7 6 5**	**4 3 2 1 0**

15. Instream fish cover			Responsibility (GANDA)	
>7 cover types available	6 to 7 cover types available	4 to 5 cover types available	2 to 3 cover types available	None to 1 cover type available
20 19 18 17	**16 15 14 13**	**12 11 10 9**	**8 7 6 5**	**4 3 2 1 0**

Cover types: Logs/large woody debris, deep pools, overhanging vegetation, boulders/cobble, riffles, undercut banks, thick root mats, dense macrophyte beds, isolated/backwater pools,
other: ___________________________________.

16. Pools		Responsibility (HDR and GANDA)	
Deep and shallow pools abundant; greater than 30% of the pool bottom is obscure due to depth, or the pools are at least 5 feet deep.	Pools present, but not abundant; from 10 to 30% of the pool bottom is obscure due to depth, or the pools are at least 3 feet deep.	Pools present, but shallow; from 5 to 10% of the pool bottom is obscure due to depth, or the pools are less than 3 feet deep.	Pools absent, or the entire bottom is discernible.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

Canopy cover (if applicable)

17. Coldwater fishery			Responsibility (GANDA)
> 75% of water surface shaded and upstream 2 to 3 miles generally well shaded.	>50% shaded in reach. or >75% in reach, but upstream 2 to 3 miles poorly shaded.	20 to 50% shaded.	< 20% of water surface in reach shaded.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

18. Warmwater fishery		Responsibility (GANDA)	
25 to 90% of water surface shaded; mixture of conditions.	> 90% shaded; full canopy; same shading condition throughout the reach.	(intentionally blank)	< 25% water surface shaded in reach.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

19. Riffle embeddedness (if applicable)		Responsibility (HDR and GANDA)		
Gravel or cobble particles are < 20% embedded.	Gravel or cobble particles are 20 to 30% embedded.	Gravel or cobble particles are 30 to 40% embedded.	Gravel or cobble particles are >40% embedded.	Riffle is completely embedded.
20 19 18 17	**16 15 14 13**	**12 11 10 9**	**8 7 6 5**	**4 3 2 1 0**

20. Local Erosion		Responsibility (HDR and GANDA)	
No erosion adjacent within flood prone area, floodplain, and terraces. Little to no evidence of overland disturbance or denudation due to sheet erosion, concentrated flows, or mass wasting.	10 to 50% of area within flood prone area showing evidence of overland disturbance and denudation due to sheet erosion, concentrated flows, or mass wasting. Limited levels of damage to overland areas evident.	50 to 80% of area within flood prone area showing evidence of overland disturbance and denudation due to sheet erosion, concentrated flows, or mass wasting. Moderate levels of damage to overland areas evident.	Significant levels of erosion adjacent to sample reach. 80 to 100% of area within flood prone area showing evidence of overland disturbance and denudation due to sheet erosion, concentrated flows, or mass wasting. High levels of damage evident.
20 19 18 17 16	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**

Appendix B: Roseville Permit Review Process and Checklists

Step 6 – Once all Departments have reviewed the revised project plans, Planning Department staff prepares final Conditions of Approval. These Conditions of Approval are included within the Planning Department's staff report that is forwarded to the approving authority for their review and consideration. At this step, the Planning Department also prepares the necessary environmental documentation for the project.

Step 7 – The Planning Department will prepare a Public Hearing notice for the project (this notice will include the environmental determination). The Public Hearing notice is sent to property owners within a 300 radius of the project. At the same time, the Planning Department staff is preparing and finalizing your project's staff report. Please note, your staff report may include recommendations relating to any outstanding design and/or site issues not fully addressed on the project plans. This staff report is then forwarded to the approving authority for their review and consideration (i.e. Design Committee, Planning Commission).

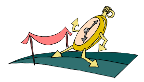
Step 8 – At the Public Hearing, testimony is heard on the project and the approving authority takes final action on the project. The final Conditions of Approval are provided in the Planning Department's "Notice To Applicant" which is mailed out to the Project Coordinator the day following the hearing.

Note: Permits for new development that include land use and/or zoning issues such as: General Plan Amendments, Rezones and/or Development Agreement Amendments, require two public hearings (Planning Commission and City Council). In these cases the City Council is the final approving authority.

Appeals

Please note that following the approval of all Planning Department projects, the action on a project, including the Conditions of Approval, may be appealed. For more information, contact the Planning Department at (916) 774-5276.

Timing



In each case, the processing time of the project is dependant upon the size and the scale of the project. Typically most public Hearing Projects require approximately three (3) to four (4) months for Planning approval. For most Administratively Processed projects, the processing time is 6-8 weeks.

Departments & Review Responsibilities

Identified below is a brief summary of the Development Departments who review your project and provide general comments on your project during the Permit Review process. Many of these departments will provide project specific comments on your project during the Plan Check stage of the Development Review process.

* **Electric**—Performs technical review of electrical load calculations;
* **Environmental Utilities Department**—Ensures water, sewer and recycled water (if applicable) infrastructure improvements are design per City Standards.
* **Planning Department** — Ensures compliance with applicable General and Specific Plan Policies, Ordinances and Roseville Municipal Code (RMC) requirements and makes recommendations based upon adopted Design Guidelines.
* **Public Works Department**

  Building Division—Ensures compliance with applicable State and Federally Mandated building code requirements.

  Engineering Division—Ensures that the design and construction of all improvements (incl. grading and drainage improvements) is performed to City Improvement Standards.
* **Fire Department** – Ensure compliance with applicable fire codes and department policies.
* **Economic and Community Services Department (ECS)** – ECS provides information regarding any potential affordable housing obligations required of projects.

NEED ASSISTANCE

For additional information or specific questions regarding the City's of Roseville Development "Permit" Review Process, please contact the City's Planning Department at (916) 774-5276. For general questions and/or inquiries regarding the City's overall Development Review Process, please contact the City's Project Processing Manager, Aaron Busch at (916) 774-5334.

Additional brochures are available from the Community Development Department regarding the following processes:

* New Business
* Tenant Improvement
* Plan Check Process

For copies contact (916) 774-5334 or visit our web site at communitydevelopment@roseville.ca.us.

(revised 10/02)

CITY OF ROSEVILLE
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City of Roseville
Community Development Department
311 Vernon Street
Roseville, CA 95678

ENTITLEMENT "PERMIT" REVIEW PROCESS

Contact:	**Planning Department**
Telephone:	**(916) 774-5276**
City Web Site:	**www.roseville.ca.us**
Email:	**planningdept@roseville.ca.us**

ENTITLEMENT "PERMIT" REVIEW PROCESS

UNDERSTANDING THE PERMIT REVIEW PROCESS

If you are planning to develop a new "project" in the City of Roseville, chances are, that your project must receive Planning Department approval before it is submitted for a building permit. This process is referred to as the Entitlement or "Permit" Review Process. It is performed for the purpose of ensuring that "projects" comply with all of the City's Ordinances and design standards, as well as for allowing opportunities for public review and comment.

An example of "projects" that are subject to this review process include:

* New non-residential, apartment complexes and major project expansions;
* Modifications to existing non-residential projects and apartment complexes;
* Tentative subdivision maps;
* Proposed rezones of property;
* Accessory structures;
* Second dwelling units;
* Temporary sales events;
* Antennae's and communication facilities;
* Open air vending carts;
* Food Service facilities;
* Conversions of residences to commercial uses; and
* Parking relocations.

Where to Start ? The Permit Center

To begin the Permit Review Process for the preliminary approval of your project, you start with the City's Planning Department which is located at the ***Permit Center***. The Planning Department is responsible for determining what types of applications your project requires, and then processing those applications.

If you are uncertain that your proposed project requires Planning Department approval, or you don't know what application is needed for your project, then you may contact the Planning Department at (916) 774-5276 for assistance or visit the City's ***Permit Center*** where a trained Permit Technician will be able to assist you with your inquiries.

The "Permit" Review Process

In general, there are two Permit Review Processes, as set forth by the City's Zoning Ordinance: 1) the Administrative Process which is used for smaller projects that can be approved by the Planning Director (or designee); and 2) the Public Hearing process which is used for handling projects that are to be reviewed and approved by either the City's *Design Committee* or *Planning Commission.*

Administrative Permit Process

The Administrative Permit Review Process is used for those types of Permits that are more routine in nature and smaller in scale. These Administratively processed projects are handled in a similar manner as Steps 1 through 7 of the Public Hearing Process (see below). Due to the smaller scale of these projects, the project plans are generally routed to fewer Departments and agencies for their review and comment and they have a shorter review time period. A notice is sent out called a "Notice of Intent to Approve" that allows adjacent property owners the opportunity to request a public hearing. If no public hearing is requested then your project is approved by the Planning Director or authorized designee. If a public hearing is requested, then your project is forwarded to and reviewed by the appropriate approving authority.

Public Hearing Process

Provided below is a summary of the eight (8) steps involved with the Public Hearing Process:

Step 1 - The applicant (Project Coordinator) submits a completed Planning Department "Universal" application along with the necessary plans and materials and application fee (e.g. radius list, application fee, etc.) as identified on the submittal checklist, to the staff at the ***Permit Center***.

Note: Copies of the "Universal" application, as well as the different application submittal checklists are available at the Permit Center and on the City's website (www.roseville.ca.us) under the Planning Department's homepage.

Step 2 - Upon receipt of a complete application, the Planning Department routes the project plans and materials to multiple City Development Departments (identified on back side of this brochure) for their review and comment. In some cases due to environmental regulations, the project may also be routed to State and Federal agencies such as the Army Corps of Engineers, U. S. Fish & Wildlife, and California Department of Transportation for review and comment.

Step 3 — Within 30 days of submitting your application, the Planning Department holds a Project Evaluation Meeting (PEM) to discuss the project's site/design issues. Generally, the project coordinator, engineer and architect attend this meeting. At the PEM, City staff provides written comments from each development department (engineering, building, electric etc.) on the project as well as a draft set of recommended Conditions of Approval. In some cases, the written comments require modifications to the project plans.

Note: Administratively processed permits generally do not require a PEM.

Step 4 - If following the PEM the project is modified, the Project Coordinator is responsible for responding to each Development Department's comments and making sure that each department's comments are adequately addressed before submitting revised plans.

Step 5 — The Project Coordinator submits revised plans to the ***Permit Center*** for redistribution to the applicable Department's for their review and finalization of the project Conditions of Approval.

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APPLICATION CHECKLIST FOR FLOOD ENCROACHMENT PERMIT (FEP)

Requests for Flood Encroachment Permit require one (1) public hearing before the Planning Commission. Processing time is normally eight (8) to twelve (12) weeks, however it is dependent upon the number of similar requests before the City. The applicant or the applicant's representative must be present at all public hearings to answer questions.

Applications shall be reviewed for compliance with the Application Submittal Requirements. *Applications submitted without the required information are not required to be accepted for processing.*

Application Submittal Requirements:

A) One (1) copy of the completed application form, with an approved address and all required original signatures.

B) The required processing fee (see fee schedule).

C) One (1) copy each of the property owner's radius list (as shown on the latest equalized Assessment Roll), property owner's map, signed affidavit, and typed address labels (see attached instructions).

D) One (1) copy of a detailed description of the proposed use.

E) Twenty-five (25) copies of a site plan drawn to scale (must be engineer's scale - no smaller than 1" = 40') indicating:

- ___ 100 year hydraulic grade line - zoned floodway, flood fringe boundary
- ___ Zoned Floodway/Floodway Fringe boundary
- ___ Existing and proposed grades
- ___ Property lines
- ___ Building setback lines
- ___ Existing and proposed buildings and other structures on site
- ___ Driveways and parking spaces
- ___ All planted areas and areas to be planted (include location of existing trees)
- ___ Entrances, exits, and walkways
- ___ Trash enclosures and other site improvements
- ___ Existing and proposed fencing
- ___ Existing easements and type
- ___ Street names
- ___ Project name
- ___ A vicinity map
- ___ North arrow and scale
- ___ Summary of project statistics including zoning, square footage by use and parking required and provided
- ___ One (1) 11" x 17" reproducible copy

F) Hydraulic analysis (check with Engineering to verify precise analysis requirements)

G) Additional information as deemed necessary by the Planning Department.

NOTE: ALL MAPS LARGER THAN 8 ½" X 11" MUST BE FOLDED PRIOR TO SUBMITTAL.

If you have questions, call the Planning Department at (916) 774-5276 (California Relay Service 1-800-735-2929). Staff is available at 311 Vernon Street, Roseville, CA 95678.

CITY OF ROSEVILLE
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APPLICATION CHECKLIST

TREE PERMIT APPLICATION (TP)

A request for a Tree Permit, requires one (1) public hearing before the City's Planning Commission or Design Committee if the Tree Permit is associated with a Design Review Permit. Processing time is normally eight (8) to twelve (12) weeks, however, it is dependent upon the number of similar requests before the City. **(The applicant or the applicant's representative must be present at all public hearings to answer questions.)**

Applications shall be reviewed for compliance with the Application Submittal requirements. Applications submitted without the required information are not required to be accepted for processing.

Application Submittal Requirements:

A) One (1) copy of the completed application form, **(with an address approved by the Engineering Division)** and all required signatures.

B) The required processing fee (see fee schedule).

C) One (1) copy each of the property owner's radius list (current within a year), property owner's map, signed affidavit, and typed address labels (see attached instructions).

D) Twenty-five (25) copies of a fully dimensional site/grading plan drawn to scale indicating:
- ___ Property lines and building setback lines
- ___ Existing and proposed buildings and structures on-site and on adjacent properties
- ___ Driveways, parking spaces, entrances, exits, walkways and chimneys
- ___ Existing and proposed fencing detail
- ___ Existing and proposed planting areas and areas to be planted
- ___ Protected zone and dripline of all oak trees on the property or overhanging the site
- ___ Percent encroachment into the protected zone
- ___ Number of trees to be removed and total diameter inches to be removed
- ___ All existing trees with elevations and numbered corresponding to an arborist report
- ___ All true elevations including: contours, spot, existing and post project elevations
- ___ All cut/fill slopes and retaining walls
- ___ Method of drainage
- ___ Location of all existing and proposed utilities
- ___ Project name
- ___ A vicinity map
- ___ North arrow and scale (must be engineer's scale - no smaller than 1" = 40')
- ___ One (1) 8 1/2" x 11" reproducible copy

E) Fifteen (15) copies of an elevation plan required when a building or structure encroaches into the protected zone. The plan shall be drawn to scale indicating:
- ___ Building elevations from all sides (indicating direction)
- ___ Project name
- ___ Scale (no smaller than 1/8" = 1')
- ___ One (1) 8 1/2" x 11" reproducible copy

F) Fifteen (15) copies of an Arborist report, prepared by a Certified Arborist, indicating:
- ___ Botanical and common name of tree(s) by tree number
- ___ Diameter at Breast Height (DBH, 4.5' above grade) by tree number
- ___ Dripline radius (measure longest radius) by tree number
- ___ Condition by tree number, i.e. health, vigor and structure (see attached tree ordinance)
- ___ Recommendations by tree number, i.e. fertilizing, cabling, pruning, watering etc...
- ___ Specific and general preservation measures, by tree number, for trees not removed

G) Tree mitigation plan (required for tree removal, see attached tree ordinance).

H) Additional information as deemed necessary by the Planning Department.

NOTE: All exhibits larger than 8 1/2" x 11" must be FOLDED prior to submittal. Full size color exhibits are not required to be folded.

If you have questions, call the Planning Department at (916) 774-5276 (California Relay Service 1-800-735-2929) or, staff is available at 311 Vernon Street, Roseville, CA 95678

CITY OF ROSEVILLE
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APPLICATION CHECKLIST

ADMINISTRATIVE TREE PERMIT (ATP)

A request for an Administrative Tree Permit requires approval by the City's Planning Director. Administrative Tree Permits only apply to encroachments into the protected zone of native oak trees of 20 percent or less on projects not associated with any discretionary approval.

Applications shall be reviewed for compliance with the application submittal requirements. Applications submitted without the required information cannot be processed.

APPLICATION SUBMITTAL REQUIREMENTS:

A) One (1) copy of the completed Universal Application form (available on Planning Department website at *www.roseville.ca.us*), **(with an address approved by the Engineering Division)** and all required signatures.

B) The required processing fee (see fee schedule)

C) Administrative Tree Permit Summary Table with completed information.

D) Three (3) copies of a fully dimensional site/grading plan drawn to scale indicating:
- ___ Property lines and building setback lines
- ___ Existing and proposed buildings and structures on-site and on adjacent properties
- ___ Driveways, parking spaces, entrances, exits, walkways, decks and chimneys
- ___ Existing and proposed fencing detail
- ___ Existing and proposed planting areas and areas to be planted
- ___ Protected zone and dripline of all oak trees on the property or overhanging the site
- ___ Location of required protective fencing (dripline plus one foot).
- ___ Percent encroachment into the protected zone
- ___ All existing trees with elevations and numbered corresponding to an arborist report
- ___ All true elevations including: contours, spot, existing and post project elevations
- ___ All cut/fill slopes and retaining walls
- ___ Method of drainage
- ___ Location of all existing and proposed utilities and pathways
- ___ Project name
- ___ A vicinity map
- ___ North arrow and scale (must be engineer's scale - no smaller than 1" = 40')

E) Three (3) copies of an elevation plan, required when a building or structure encroaches into the protected zone. The plan shall be drawn to scale indicating:
- ___ Building elevations from all sides (indicating direction)
- ___ Project name
- ___ Scale (no smaller than 1/8" = 1')

F) Three (3) copies of an Arborist report, prepared by a Certified Arborist, indicating:
- ___ Botanical and common name of tree(s) by tree number
- ___ Diameter at Breast Height (DBH, 4.5' above grade) by tree number
- ___ Dripline radius (measure longest radius) by tree number
- ___ Condition by tree number, ie. health, vigor and structure (see attached tree ordinance)
- ___ Recommendations by tree number, ie. Fertilizing, cabling, pruning, watering etc.
- ___ Specific and general preservation measures, by tree number based on the impacts from encroachment

G) Additional information as deemed necessary by the Planning Department.

NOTE: All exhibits larger than 8 1/2" x 11" must be FOLDED prior to submittal.

If you have questions, call the Planning Department at (916) 774-5276 (California Relay Service 1-800-735-2929)
Or, staff is available at 311 Vernon Street, Roseville, CA 95678

CITY OF ROSEVILLE
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PLANNING DEPARTMENT

311 VERNON STREET• ROSEVILLE, CA 95678 PHONE: (916) 774-5276

Administrative Tree Permit Summary Table

Please complete the following table prior to Administrative Tree Permit Application submittal.

Tree Number	Tree Species	Percent Encroachment	Type of Encroachment	Arborist's Recommendation
	❑ Blue Oak ❑ Live Oak ❑ Interior Oak ❑ Valley Oak		❑ Cut Slope ❑ Fill Slope ❑ Foundation ❑ Stem Wall ❑ Utility Trench ❑ Driveway ❑ Sidewalk ❑ Raised Foundation ❑ Retaining Wall ❑ Other ____	❑ Deep Root Fertilizing ❑ Aeration ❑ Special Foundation ❑ Watering ❑ Limb Support ❑ Hand Tools ❑ Clearance Pruning ❑ Hand Trenching ❑ Deadwood Pruning ❑ Other ____
	❑ Blue Oak ❑ Live Oak ❑ Interior Oak ❑ Valley Oak		❑ Cut Slope ❑ Fill Slope ❑ Foundation ❑ Stem Wall ❑ Utility Trench ❑ Driveway ❑ Sidewalk ❑ Raised Foundation ❑ Retaining Wall ❑ Other ____	❑ Deep Root Fertilizing ❑ Aeration ❑ Special Foundation ❑ Watering ❑ Limb Support ❑ Hand Tools ❑ Clearance Pruning ❑ Hand Trenching ❑ Deadwood Pruning ❑ Other ____
	❑ Blue Oak ❑ Live Oak ❑ Interior Oak ❑ Valley Oak		❑ Cut Slope ❑ Fill Slope ❑ Foundation ❑ Stem Wall ❑ Utility Trench ❑ Driveway ❑ Sidewalk ❑ Raised Foundation ❑ Retaining Wall ❑ Other ____	❑ Deep Root Fertilizing ❑ Aeration ❑ Special Foundation ❑ Watering ❑ Limb Support ❑ Hand Tools ❑ Clearance Pruning ❑ Hand Trenching ❑ Deadwood Pruning ❑ Other ____
	❑ Blue Oak ❑ Live Oak ❑ Interior Oak ❑ Valley Oak		❑ Cut Slope ❑ Fill Slope ❑ Foundation ❑ Stem Wall ❑ Utility Trench ❑ Driveway ❑ Sidewalk ❑ Raised Foundation ❑ Retaining Wall ❑ Other ____	❑ Deep Root Fertilizing ❑ Aeration ❑ Special Foundation ❑ Watering ❑ Limb Support ❑ Hand Tools ❑ Clearance Pruning ❑ Hand Trenching ❑ Deadwood Pruning ❑ Other ____

If the subject parcel is located in the **Ashley Woods Subdivision, Reuter Ranch, or other Subdivisions with Tree Permits authorizing Administrative Approval**, please provide the following additional information:

Subdivision Name & Unit Number: ____________________
Lot Number: ____________________
Tree Permit Number: ____________________

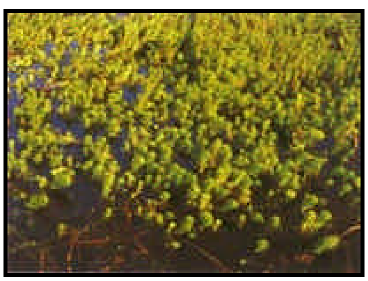
Trees Approved for Removal (By Number):	Removed	Remaining	Mitigation Amount	Mitigation Paid (Yes/No)

Amount paid as part of this request: $____________________

Appendix C: Roseville Creek Invasive Plant Species and Controls

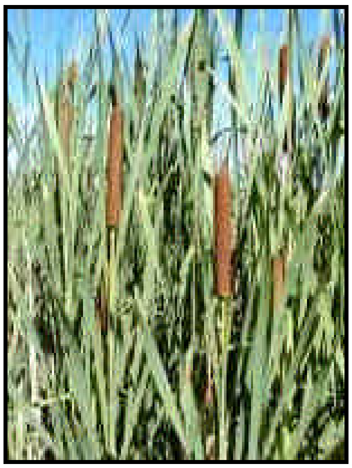
Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone** **Standing Water and Wetlands**	**Zone** **Upper Terraces**	**Zone** **Stream Banks**
Mosquito Fern *Azolla sp.* 	Appropriate herbicide • *Impedes water flow* • *Clogs pumps*	■		
Black Locust *Robinia pseudoacacia* 	Mechanical removal, cutting root shoots repeatedly, herbicides • *Displaces native vegetation* • *Seeds, leaves and bark toxic to humans*		■	■

Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone**		
		Standing Water and Wetlands	**Upper Terraces**	**Stream Banks**
Eichhornia crassipes *Water Hyacinth* 	Mechanical removal and approved foliar spray • *Dominates waterways* • *Degrades open water habitat* • *Can clog pumps* • *Breeding habitat for mosquitoes* • *Displaces native species*	■		
Giant Reed *Arundo donax* 	Manual removal and approved herbicide • *Displaces native plants and associated wildlife* • *Reduces habitat* • *Fuel load fire hazard* • *Reduces basin capacity*		■	■
Himalayan Blackberry *Rubus discolor* 	Manual removal of canes and roots and appropriate herbicide • *Competes with native species* • *Can limit access to water for wildlife* • *Limits access for maintenance* • *Limits recreation uses*		■	■

Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone** **Standing Water and Wetlands**	**Upper Terraces**	**Stream Banks**
Water Primrose *Ludwigia peploides.* 	Mechanical removal and appropriate herbicide • *Displaces native species* • *Clogs waterways and pumps*	■		
Parrot's Feather *Myriophyllum aquatica* 	Mechanical removal preferred • Competes with native aquatic plants • Forms dense mats that can entirely cover open water • Can block pumps and water intakes • Provides optimal habitat for mosquitoes	■		

Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone** **Standing Water and Wetlands**	**Zone** **Upper Terraces**	**Zone** **Stream Banks**
Bristly Ox-tongue *Picris echinoids* 	Manual removal and repeated mowing before seed sets • *Displaces native species*		■	■
Water Lettuce *Pistia stratiotes* 	Manual removal or appropriate herbicide • *Displaces native species* • *Damages habitat value of open water*	■		

Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone** **Standing Water and Wetlands**	**Upper Terraces**	**Stream Banks**
Scotch Broom *Cystus scoparius* 	Manual removal and appropriate foliar spray • *Displaces native vegetation* • *Fuel load fire hazard*		■	■
Red Sesbania *Sesbania punicea* 	Manual removal at any time, but especially before seed sets • *Rapidly displaces native species*		■	■

Common Name ***Latin Name***	**Management Approach** ***Nuisance Issues***	**Zone** **Standing Water and Wetlands**	**Upper Terraces**	**Stream Banks**
Cattails *Typha latifolia* 	Manual removal to limit spread and allow other natives to become established • *Competes with other natives* • *Decomposition of plants can reduce pond capacity*	■		
Yellow Star Thistle *Centaurea solstitialis* 	Mechanical removal with post-emergent herbicide. Important control times are late winter/early spring and mid-summer before seed sets. • *displaces native plants and animals* • *limits recreation use*		■	

Appendix D: Grant Funding Sources

FEDERAL

1. **Department of Transportation Intermodal Surface Transportation Efficiency Act (ISTEA)**
   The Act allows a portion of the transportation funds to be used to build bicycle paths along federal-aid highways, roads, trails or parkways.

2. **Watershed Assistance Grants Program (WAG)**
   The Clean Water Action Plan calls for the creation of a dedicated source of funding to build the capacity of existing or new watershed partnerships to protect and restore their watershed. These partnerships would serve as national demonstrations or models of how to bring together diverse interests to achieve watershed protection and restoration and of how to ensure diversity in watershed partnerships. The WAG program will make grants to local watershed partnerships to support their organizational development and long-term effectiveness. Grants area awarded for amounts between $1,500 to $30,000.

3. **Cooperative Endangered Species Conservation Fund**
   Granted by the U.S. Fish and Wildlife Service to a State agency with a cooperative agreement with the Secretary of the Interior to assist in the development of programs for the conservation of endangered and threatened species – including habitat protection, restoration, management and acquisition; and public education. Up to 75% of program costs may be received.

4. **Wildlife Conservation and Appreciate (Partnership For Wildlife)**
   Granted by the U.S. Fish and Wildlife Service. Available for actions to conserve fish and wildlife species and their habitats; and to provide opportunities for the public to use and enjoy fish and wildlife through nonconsumptive activities. Eligible for any fish and wildlife agency in partnership with State agencies and private organizations and individuals. Up to 33% of program costs may be received and private funding match required.

5. **Water Banks Program**
   Granted by the Department of Agriculture's Natural Resources Conservation Service, landowners are eligible for funds to conserve surface waters; preserve and improve wetlands and preserve important nesting, breeding and feeding areas of migratory waterfowl. Annual payments for 10 years will be made for $7 to $75 per acre.

6. **Wetlands Grants**
   Granted by the EPA's Office of Water, funds are available to States, local government and not-for-profit organizations to develop the capacity to protect, manage and restore wetlands and riparian resources. Minimum match of 25% of total project cost is required.

7. **North American Wetlands Conservation Fund**
   Granted by the U.S. Fish and Wildlife Service, funds are available for wetlands conservation projects to be matched one on one by U.S. non-federal dollars. Special consideration is given for migratory bird habitat and other key wildlife habitat. Beneficiary eligibility is available to any organization or individual.

8. **Urban Park and Recreation Recovery Program**
   Funded by the National Park Service, funds are available for the rehabilitation of recreation areas and facilities, demonstration of innovative approaches to improving recreation opportunities, and development of improved recreation planning. These grants are matching grants (50% Federal – 50% local).

9. **Recreational Trails Program**
   Granted by the Department of Transportation's Federal Highway Administration, this grant is available to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. A State agency must be designated by the Governor to receive the funds.

10. **Outdoor Recreation Acquisition, Development and Planning (Land and Water Conservation Fund Grants)**
    Grants provided by the National Park Service to acquire and develop outdoor recreation areas and facilities for the general public, to meet current and future needs. Not more than 50% of the project cost may be federally financed.

11. **Environmental Education Grants (EEG)**
    For grants provided by the EPA's Office of Environmental Education, funds are available to support projects to design, demonstrate, or disseminate practices, methods, or techniques related to environmental education and training. Federal funds will not exceed 75% of the project cost.

STATE

1. **California's Department of Conservation Resource Conservation District (RCD) Assistance Program/Grants**
   This grant annually provides $120,000 to support conservation education and on-the-ground projects promoting conservation with landowners and communities within watersheds. Land restoration, fish and wildlife habitat enhancement, water quality conservation, and public outreach and education are all eligible actions supported with this grant. A 25% local match is required.

2. **State Lands Commission**
   Can acquire land through Land Bank funds and/or exchange.

3. **Department of Transportation**
   Proposition 116 - Bicycle trails funding.

4. **Resources Agency**
   State Environmental License Plate Funds - Grants are offered to state agencies, city or county agencies, or private non-profit organizations to support a variety of projects that help to preserve or protect environment. Eligible projects include acquisition, restoration or enhancement of resource lands and endangered species, and development of interpretive facilities. Projects are funded in one-year increments and each must be a separate, distinct project with a clearly defined benefit.

   Environmental Enhancement and Mitigation Program (EEMP)-Grants offered to local, state or federal agencies or non-profit entities to provide enhancement or additional mitigation related to eligible transportation facilities. Eligible projects include highway landscaping and urban forestry, acquisition restoration or enhancement of resource lands, and acquisition and/or development of roadside recreation opportunities. The program, established in 1989 (Section 164.56 of the Streets and Highways Code) provides funding from fuel taxes and weight fees.

5. **Department of Fish and Game**
   Inland Fisheries Division Grant Project provides funds for fishery restoration work. Funds for this program come from a variety of sources.

   The Cigarette and Tobacco Tax Benefit Fund (Proposition 99) provides funds to restore fish habitat. The Commercial Salmon Stamp account provides funds for projects directed at restoring salmon populations through habitat enhancement or fish rearing, and for projects designed to educate the public on the importance and the ecology of salmon. Anyone may apply. Action projects are preferred to studies, evaluations or monitoring. Funding levels are recommended by the Commercial Salmon Trollers Advisory Committee or the California Advisory Committee on Salmon and Steelhead Trout.

6. **Wildlife Conservation Board (Generally administers the Federal Land and Water Conservation Fund)**
   Proposition 19 (1984 Fish and Wildlife Enhancement Bond Act) provides funds to correct the more severe deficiencies in fish and wildlife habitat. Funds may be used only by public agencies to enhance, develop or restore flowing waterways for the management of fish outside the coastal zone. Proposition 70 funds are available for endangered species and for native trout habitat restoration.

7. **Department of Water Resources**
   Urban Streams Restoration Program offers grants for local street restoration projects for prevention of property damage by floods and bank erosion and to restore the natural value of streams. Under the Proposition 13 - Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act, the grants can fund simple projects such as organizing volunteer help to monitor and clean up streams or can fund complex stream restoration work. Cities, counties, districts and nonprofit organizations may apply for grants. Small unincorporated community organizations or consulting firms may apply but must find a non-profit organization or a local government to sponsor this proposal. This grant program stresses community participation. Therefore, any proposal submitted by a government agency must be cosponsored by a logical local group with an interest in the problems or streams to be addressed by the proposal. Likewise, projects submitted by nonprofit organizations must be co-sponsored by an appropriate local agency.

8. **Department of Forestry and Fire Protection**
   The Urban Forestry Grant Program (Proposition 12 Tree Planting Grant) was created by the Watershed, Wildlife, and Parks Improvement Bond Act. Cities, counties, districts and nonprofit organizations may apply for grants. Eligible projects include planting trees along streets, in dedicated open space areas, and in public parking lots and school yards.

Forest Stewardship Program - Funded by Federal dollars and administered by the State for private land owners only. Grants provided to protect, restore and improve wetlands and riparian areas to maintain water quality and enhance habitat. Eligibility is for private landowners as well as public jurisdictions. Small acreage from 20 to 299 acres of land.

9. State Water Resources Control Board

The Nonpoint Source Pollution Control Program - Non-point sources (NPS) are the major cause of water pollution in California. As the state agency charged with protecting water quality in the State of California, the State Water Resources Control Board (State Board) is committed to promoting implementation projects that reduce NPS pollution in waterbodies of the State. The February 1987 amendments to the federal Clean Water Act (CWA) include Section 319, which establishes the framework for non-point sources (NPS) activities on the State level. The CWA provides funding for the states' NPS programs, including grants for NPS implementation projects. Implementation projects to reduce NPS loading from various sources are eligible for grant funding. NPS implementation activities include demonstration projects, technology transfer, training, public education technical assistance, ordinance development, and other similar activities associated with control of NPS pollution. The amount of funds available is dependent upon Congressional appropriations.

Water Quality Planning - The State Water Resources Control Board provides water quality management planning grants to state, local, and regional agencies to address a wide variety of surface and ground water quality problems. These funds are provided by the federal government under Sections 205 and 604(b) of the Clean Water Act. These grants require a 25% non-federal match. The funding emphasis is on projects that focus directly on corrective or preventive actions for water bodies identified as "impacted" in the State's Water Quality Assessment. However, projects that focus on other water quality problems will also be considered. Projects which are primarily research-oriented will not normally be funded.

EPA's State Wetland Program Development

Under the Clean Water Act (CWA) Section 104 (b)(3), grants are given to various wetland projects include "multi-objective river corridor management" projects that address multiple use of rivers and adjacent areas, such as recreation habitat protection, water quality and open space. Funds available to assist states, and local government in implementing new programs relating to wetlands preservation and enhancement. Range of financial assistance for these project grants is generally $25,000 to $500,000.

10. Department of Parks and Recreation

Land and Water Conservation Fund - This program has funds available for the acquisition or development of neighborhood, community or regional parks or facilities supporting outdoor recreation activities. Eligible applicants include counties, cities, recreation and park districts, special districts with public park and recreation areas. This is a 50/50 matching program. The applicant is expected to finance the entire project and will be reimbursed 50% of the costs, up to the amount of the grant. The amount of funds available varies from year to year.

Riparian and Riverine Habitat Grant Program To provide funds on a competitive basis to increase public recreational access, awareness, understanding, enjoyment, protection, and restoration of California's irreplaceable rivers and streams. Includes the acquisition, development, or improvement of recreation areas, open space, parks, and trails in close proximity to rivers and streams. All projects must include a Riparian or Riverine habitat enhancement element and also provide for public access. The minimum is $20,000, and the maximum is $400,000.

Habitat Conservation Fund- This program provides funds for a variety of habitat conservation projects. Eligible applicants include counties, cities, cities and counties, or districts as defined in Subdivision(b) of the Public Resources Code. Eligible projects include: deer and lion habitat, including oak woodlands; habitat for rare and endangered, threatened and fully protected species; wildlife corridors and urban trails; wetlands; aquatic habitat for spawning and rearing of anadromous salmonids and trout species; and riparian habitat. This is a 50/50 matching program. The match must come from a non-State source.

Non-Motorized Trails Grant Program Eligible applicants include cities, counties, eligible districts, and eligible local agencies formed for park purposes, and federally recognized California Indian tribes. This competitive grant program funds the development, improvement, rehabilitation, restoration, and enhancement of non-motorized trails and associated interpretive facilities for the purpose of increasing public access to, and enjoyment of, public areas for increased recreational opportunities.

PRIVATE

1. **The Conservation Fund - American Greenways Grant Program**
   Provides grants in recognition of accomplishments in successful and creative approaches to developing California Greenways, particularly through overcoming obstacles and creative problem-solving. ($500 - $2,500)
2. **National Fish and Wildlife Foundation's Grants**
   A private non-profit established by Congress in 1984, the foundation fosters cooperative partnerships to conserve fish, wildlife, plants, and the habitats on which they depend. The Foundation works with its grantees and conservation partners to stimulate private, state, and local funding for conservation through challenge grants. Through a challenge grant, each dollar awarded by the Foundation must be matched with one non-federal dollar. Projects that benefit multiple species, achieve a variety of resource management objectives, and/or lead to revised management practices that reduce the causes of habitat degradation. A special emphasis is placed on larger projects that demonstrate a landscape-level approach and produce lasting, broad-based results on the ground. Numerous grants would apply to the Dry Creek Parkway including "Bring Back the Natives", "Native Plant Conservation Initiative", and habitat conservation plans focusing on migratory bird populations.

LOW COST SERVICES/MATERIALS

1. **U. S. Department of Agriculture, Soil Conservation Service, Resource Conservation District**
   Interest is in preserving site-specific plants. Will collect and propagate seeds if project approved by local Resource Conservation District.
2. **California Conservation Corps**
   Provides low cost services for brush clearance and trail building. Sponsor must provide materials, but Corps provides supervision and some tools, and crews often work alongside volunteers. Provides plant materials to any public agency at cost.

Prefer 1 to 1-1/2 year lead time for preparation of plant materials. Planting projects do not have to have Corps workers.

3. **National Parks Service**
   Rivers and Trails Conservation Assistance Program - Under the National Center for Recreation and Conservation. The program provides technical assistance for corridor conservation plans, statewide assessments, conservation workshops, consultation, and information exchange. Rivers & Trails staff work on the grassroots level with local citizens groups and state and local governments to revitalize nearby rivers, preserve valuable open space, and develop trail and greenway networks. All Rivers & Trails projects are locally led and managed, and begin with an invitation from local agencies and/or organizations to help.

4. **California Department of Forestry**
   Sells low-cost native trees. Must be purchased in quantities of 10, habitat and erosion control, but not for landscaping. Can also provide discounts if jurisdiction provides own seed. Ordering requires advance planning for availability during proper season.

Appendix E: Proposed Fish Passage Improvement Projects

CIRBY CREEK CONFLUENCE
FISH PASSAGE IMPROVEMENT PROJECT
10% SUBMITTAL

SHEET INDEX

C1 COVER SHEET
C2 SITE PLAN
C3 PROFILES

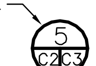
PROJECT DESCRIPTION

THESE PLANS CONSTITUTE A 10%–SUBMITTAL OF DESIGNS FOR THE IMPROVEMENT OF FISH PASSAGE CONDITIONS AT AN EXISTING SEWER LINE CROSSING LOCATED ON DRY CREEK. THE PROJECT IS LOCATED JUST UPSTREAM OF THE CONFLUENCE OF CIRBY CREEK TO DRY CREEK, DOWNSTREAM OF DARLING WAY.

GENERAL NOTES

1) PREPARED AT THE REQUEST OF:
ECORP CONSULTING, INC.
2260 DOUGLAS BLVD., SUITE 160
ROSEVILLE, CA 95661
2) TOPOGRAPHIC MAPPING PERFORMED BY SH+G ENGINEERING, NOVEMBER, 2003.
3) ELEVATION DATUM: ASSUMED ELEVATION OF 126.95 AT CP#2, SPIKE SET ON RIGHT BANK 135' UPSTREAM OF CONCRETE SEWER CROSSING.
4) CONTOUR INTERVAL IS 1 FOOT, ELEVATIONS ARE IN DECIMAL FEET.

SECTION AND DETAIL CONVENTION



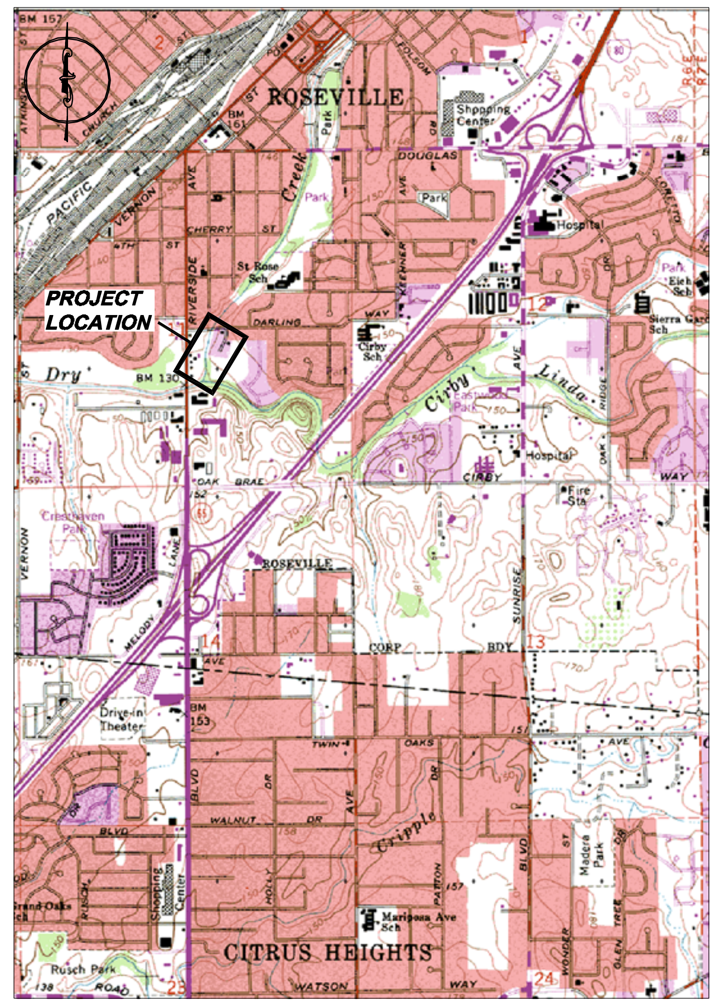
SECTION OR DETAIL IDENTIFICATION

REFERENCE SHEET FROM WHICH DETAIL OR SECTION IS TAKEN.

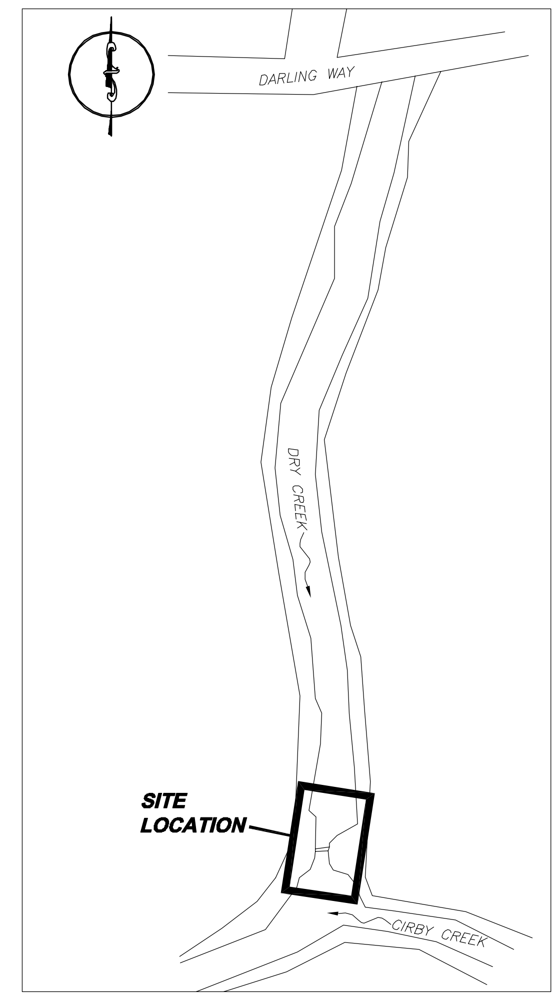
REFERENCE SHEET No. ON WHICH SECTION OR DETAIL IS SHOWN.

ABBREVIATIONS

(E) = EXISTING
(N) = NEW



VICINITY MAP
NTS



SITE OVERVIEW
SCALE: 1"=100'

Rev	Date		By

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Swanson Hydrology + Geomorphology

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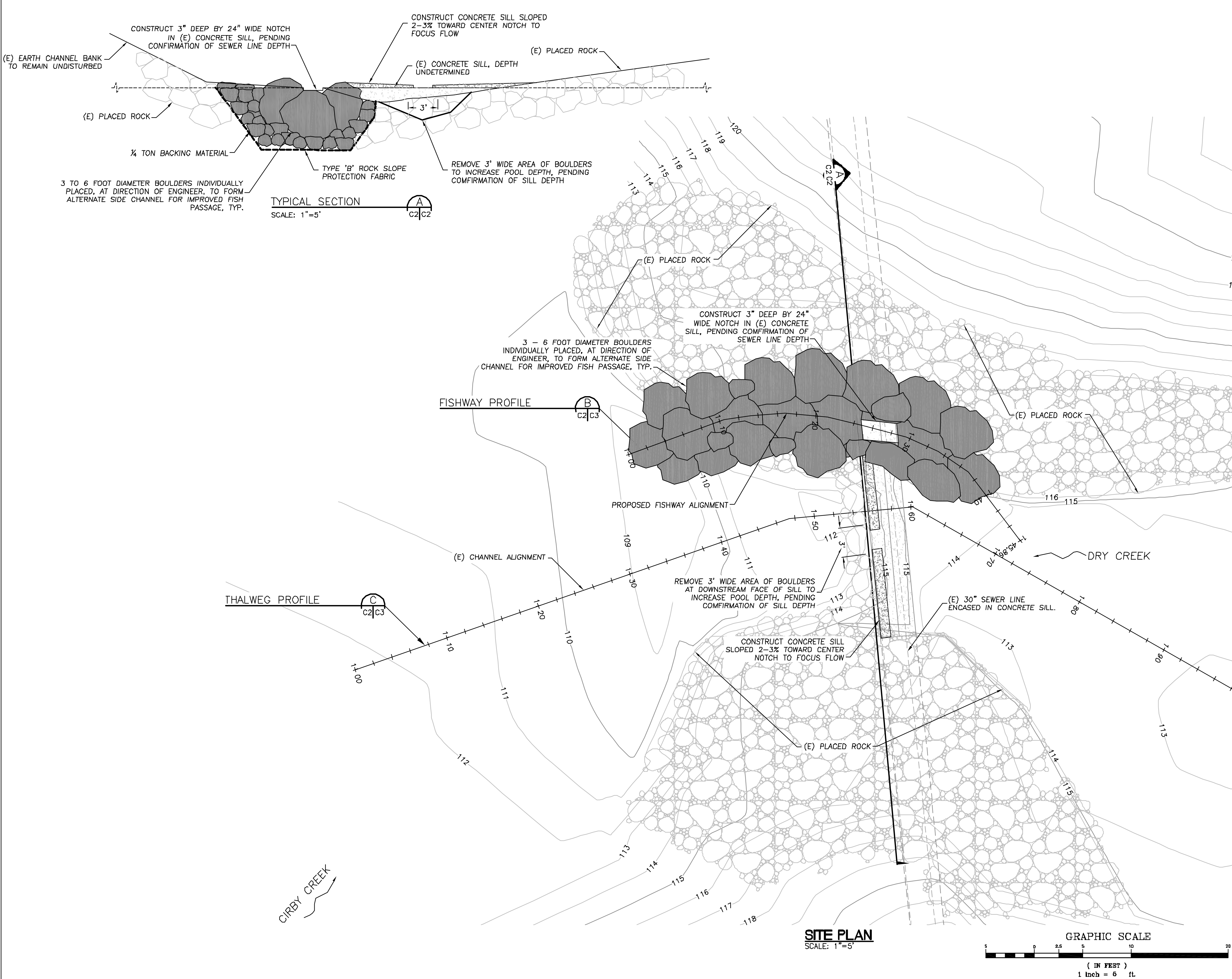
ROSEVILLE, CA 95661

COVER SHEET

CIRBY CREEK CONFLUENCE
FISH PASSAGE IMPROVEMENT PROJECT
10% SUBMITTAL

Date 12/03
Scale AS SHOWN
Project 99-131

C1 1 OF 3



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SITE PLAN

CIRBY CREEK CONFLUENCE FISH PASSAGE IMPROVEMENT PROJECT 10% SUBMITTAL

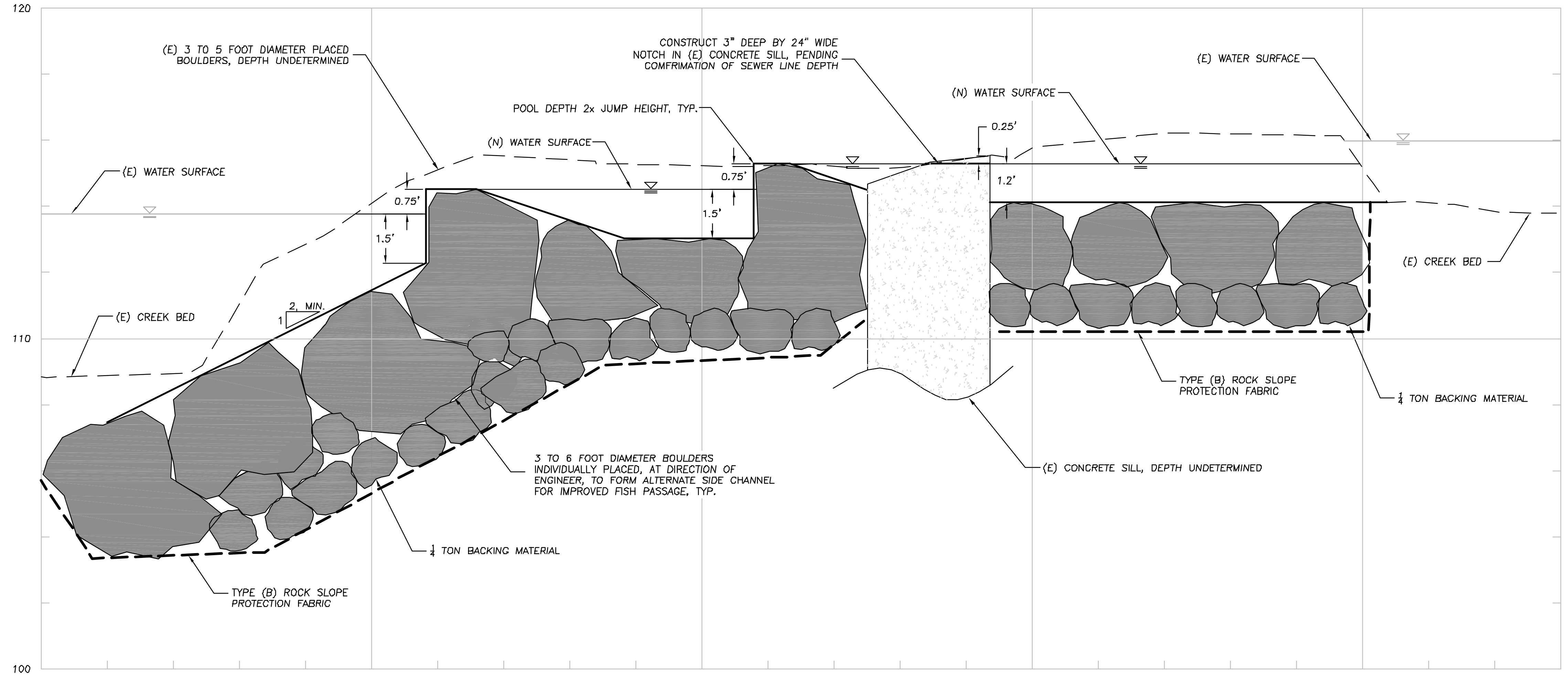
Date 12/03
Scale AS SHOWN
Project 99-131

C2 2 OF 3

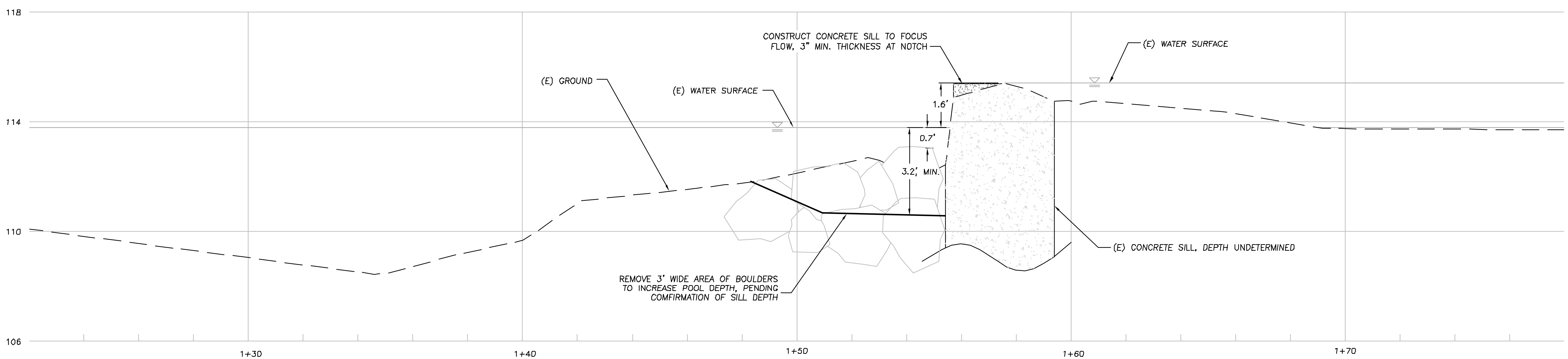
NOTES:

DESCRIPTION: THE PROPOSED FISHWAY WILL OFFER AN ALTERNATE ROUTE FOR FISH PASSAGE DURING PERIODS OF LOW FLOW. THE FISHWAY SHALL BE CONSTRUCTED OF 3 TO 6 FOOT BOULDERS PLACED TO PROVIDE ADEQUATE POOL DEPTHS AND JUMP HEIGHTS (POOL DEPTH = 1.5 x JUMP HEIGHT, PER CALIFORNIA DEPARTMENT OF FISH AND GAME STANDARDS FOR FISH PASSAGE). THE EXISTING SILL SHALL BE NOTCHED WITHIN TO ENSURE THE FISHWAY RECIEVES FLOW DURING LOW FLOW PERIODS. SEWER LINE DEPTH SHALL BE CONFIRMED PRIOR TO NOTCHING. CONCRETE SILLS SHALL BE CONSTRUCTED ON THE EXISTING SILL TO FOCUS FLOW. THESE SILLS SHALL HAVE A MAXIMUM HEIGHT OF 6" AT EITHER END AND SLOPE 2-3% TOWARD THE CENTER TO A MINUMIM HEIGHT OF 3". EXISTING BOULDERS AT THE DOWNSTREAM FACE OF THE EXISTING SILL SHALL BE REMOVED WITHIN A 3' WIDTH TO INCREASE POOL DEPTH.

ALL WORK SHALL BE DONE UNDER THE SUPERVISION OF ENGINEER.



FISHWAY PROFILE B C2|C3
SCALE: 1"=2' H; 1"=2' V



THALWEG PROFILE C C2|C3
SCALE: 1"=2' H; 1"=2' V

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PROFILES

CIRBY CREEK CONFLUENCE
FISH PASSAGE IMPROVEMENT
PROJECT
10% SUBMITTAL

Date 12/03
Scale AS SHOWN
Project 99-131

C3 3 OF 3

SECRET RAVINE
FISH PASSAGE IMPROVEMENT PLAN
10% SUBMITTAL

PREPARED FOR

ECORP CONSULTING, INC.

SHEET INDEX

C1 COVER SHEET
C2 SITE PLAN – ALTERNATIVE #1 (ROCK WEIRS)
C3 PROFILES – ALTERNATIVE #1 (ROCK WEIRS)
C4 SITE PLAN, SECTION & PROFILE – ALTERNATIVE #2 (BRIDGE REMOVAL)

PROJECT DESCRIPTION

THESE PLANS CONSTITUTE A 10%–SUBMITTAL OF DESIGN ALTERNATIVES FOR THE IMPROVEMENT OF FISH PASSAGE CONDITIONS AT TWO ADJACENT SITES ON SECRET RAVINE. THE PROJECT IS LOCATED APPROXIMATEY 500 FEET UPSTREAM OF THE CONFLUENCE OF MINERS AND SECRET RAVINES.

GENERAL NOTES

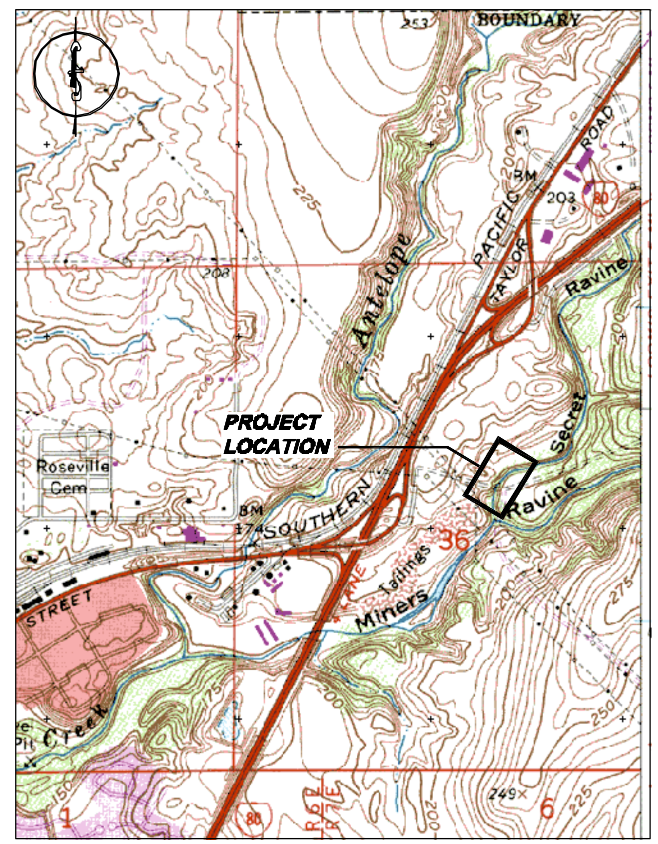
1) PREPARED AT THE REQUEST OF:
ECORP CONSULTING INC.
2260 DOUGLAS BLVD., SUITE 160
ROSEVILLE, CA 95661
2) SURVEY DATA PROVIDED BY THE DEPARTMENT OF WATER RESOURCES
3) CONTOUR INTERVAL IS 1 FOOT, ELEVATIONS AND DISTANCES ARE IN DECIMAL FEET.

SECTION AND DETAIL CONVENTION

SECTION OR DETAIL IDENTIFICATION
5
C2 C3
REFERENCE SHEET FROM WHICH DETAIL OR SECTION IS TAKEN.
REFERENCE SHEET No. ON WHICH SECTION OR DETAIL IS SHOWN.

ABBREVIATIONS

(E) = EXISTING
(N) = NEW



VICINITY MAP
N.T.S.

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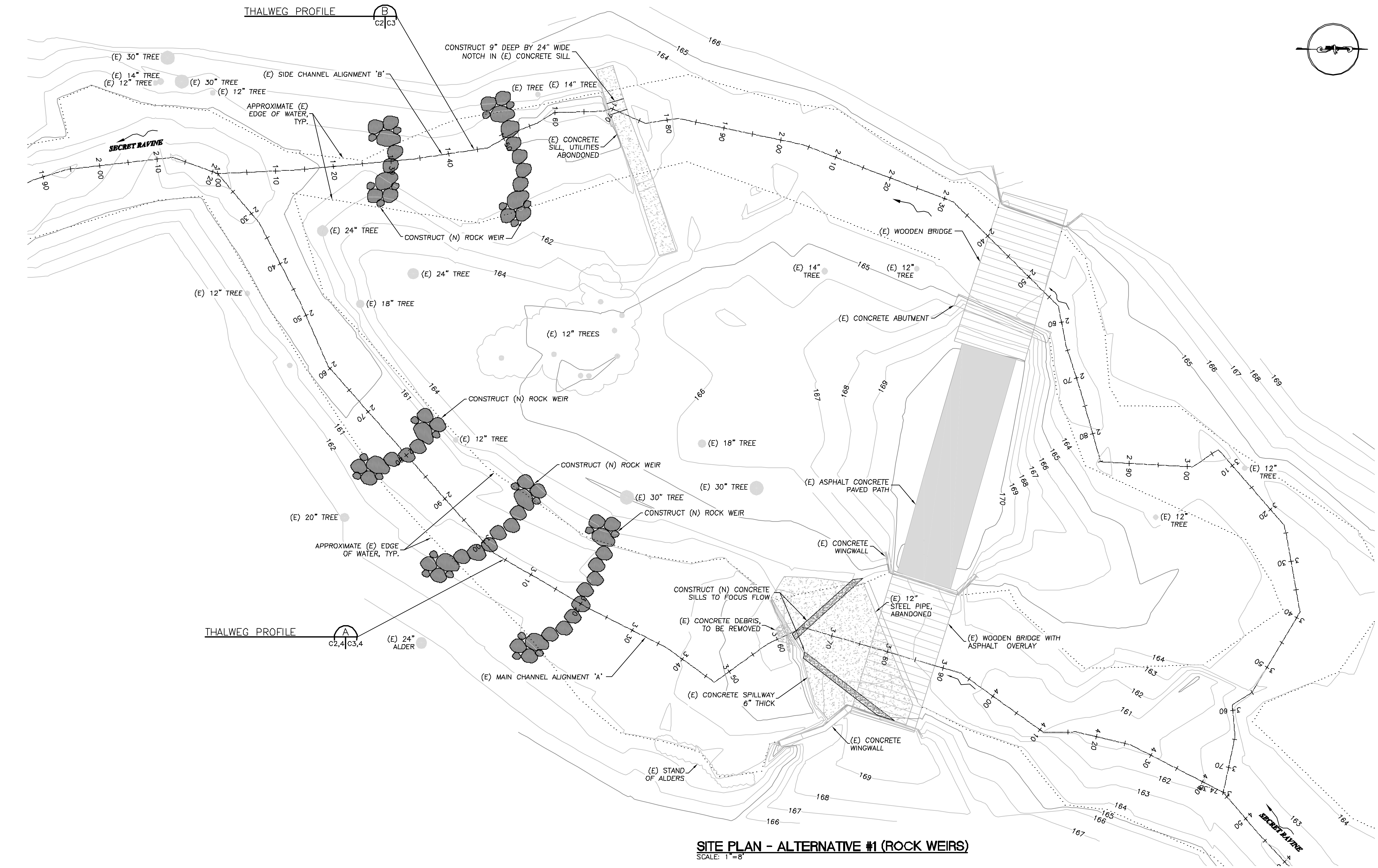
COVER SHEET

SECRET RAVINE FISH PASSAGE IMPROVEMENT PROJECT
10% SUBMITTAL

Rev	Date		By

Date 12/03
Scale AS SHOWN
Project 99–131

C1 1 OF 4



SITE PLAN - ALTERNATIVE #1 (ROCK WEIRS)
SCALE: 1"=8'

GRAPHIC SCALE
(IN FEET)
1 inch = 8 ft.

Rev	Date		By

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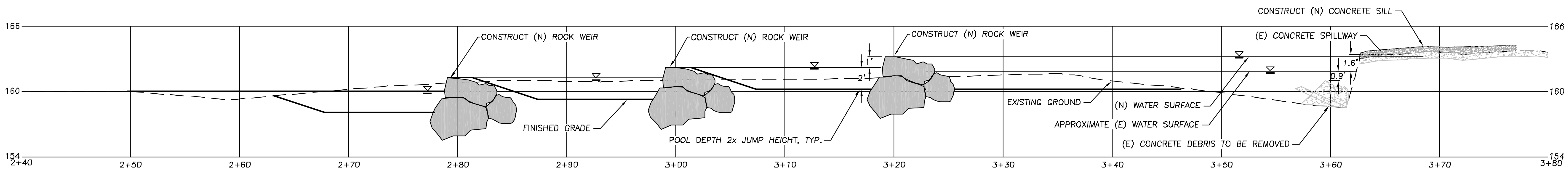
SITE PLAN
ALTERNATIVE #1
ROCK WEIRS

SECRET RAVINE FISH PASSAGE
IMPROVEMENT PROJECT
10% SUBMITTAL

Date 12/03
Scale AS SHOWN
Project 99-131

C2

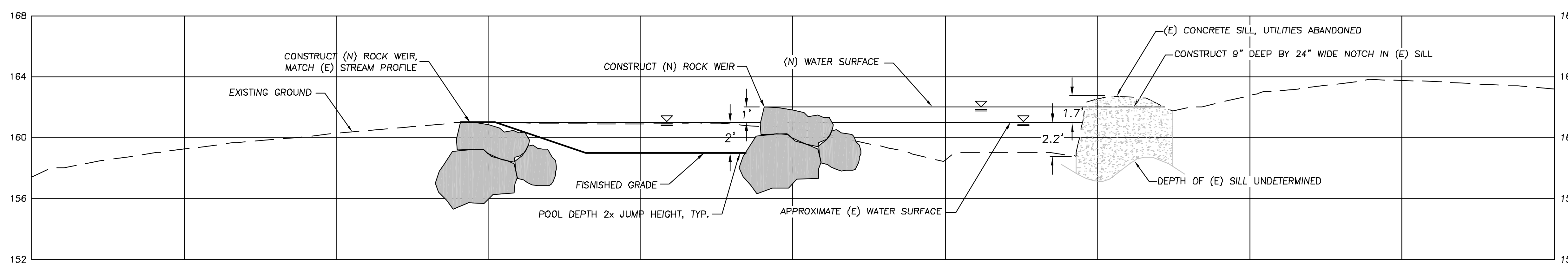
2 OF 4



THALWEG PROFILE A C2|C3
SCALE: 1"=5' H; 1"=5' V

NOTE

ALTERNATIVE #1: EXISTING CONDITIONS CREATE SHALLOW SHEET FLOW OVER A LARGE AREA OF A CONCRETE SPILLWAY. THE SHEET FLOW AND CONCRETE DEBRIS BELOW THE SPILLWAY PRESENT A FISH PASSAGE IMPEDIMENT. THE PROPOSED DESIGN FOR ALTERNATIVE #1 WILL RAISE WATER SURFACE ELEVATION THROUGH A SERIES OF ROCK WEIRS PLACED DOWNSTREAM. TWO CONCRETE SILLS WILL BE CONSTRUCTED TO FOCUS FLOW AND INCREASE DEPTH OVER THE EXISTING SPILLWAY. EXISTING CONCRETE DEBRIS WILL BE REMOVED BELOW A CENTRAL PORTION OF THE SPILLWAY TO INCREASE POOL DEPTH.



THALWEG PROFILE B C2|C3
SCALE: 1"=4' H; 1"=4' V

NOTE

ALTERNATIVE #1: EXISTING CONDITIONS AT THE CONCRETE SILL PROVIDE INSUFFICIENT POOL DEPTH FOR THE REQUIRED JUMP HEIGHT (POOL DEPTH = 1.5 x JUMP HEIGHT, PER CALIFORNIA DEPARTMENT OF FISH AND GAME STANDARDS FOR FISH PASSAGE). THE PROPOSED DESIGN FOR ALTERNATIVE #1 WILL RAISE THE EXISTING WATER SURFACE ELEVATION THROUGH A SERIES OF ROCK WEIRS PLACED DOWNSTREAM, AND INCREASE WATER DEPTH OVER THE EXISTING SILL BY MAKING A 9" DEEP BY 24" WIDE NOTCH.

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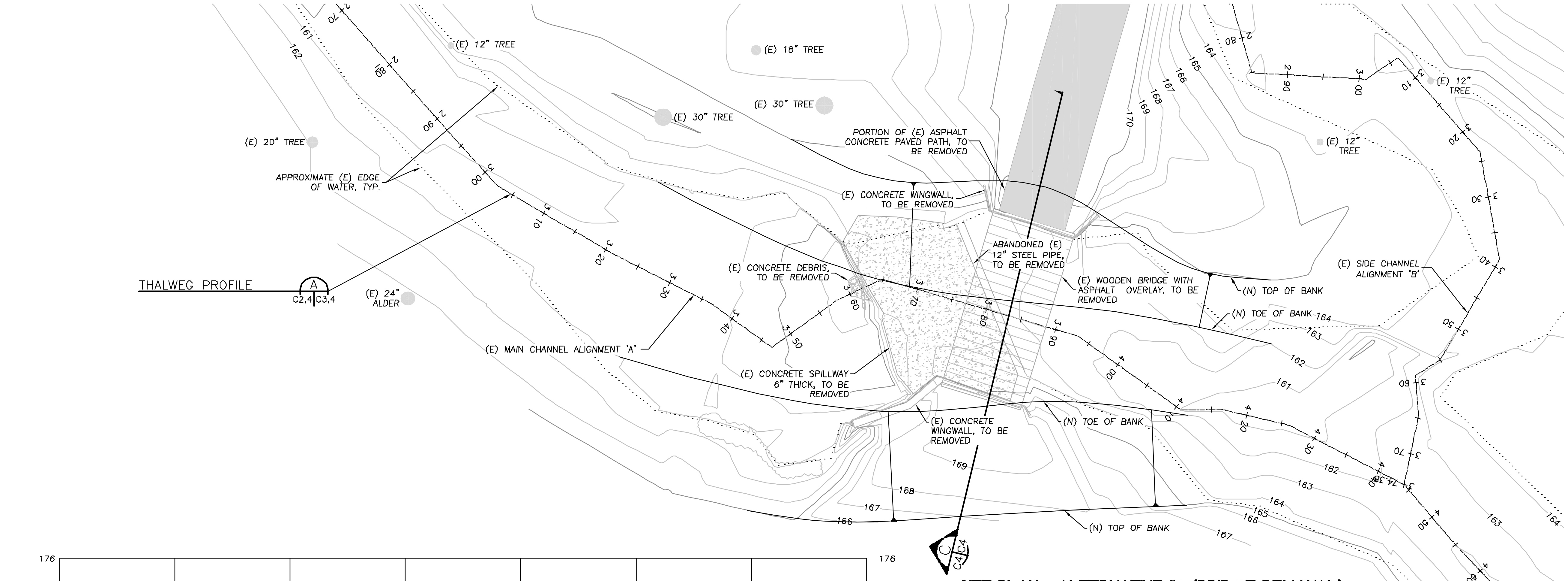
PROFILES
ALTERNATIVE #1
ROCK WEIRS

SECRET RAVINE FISH PASSAGE
IMPROVEMENT PROJECT
10% SUBMITTAL

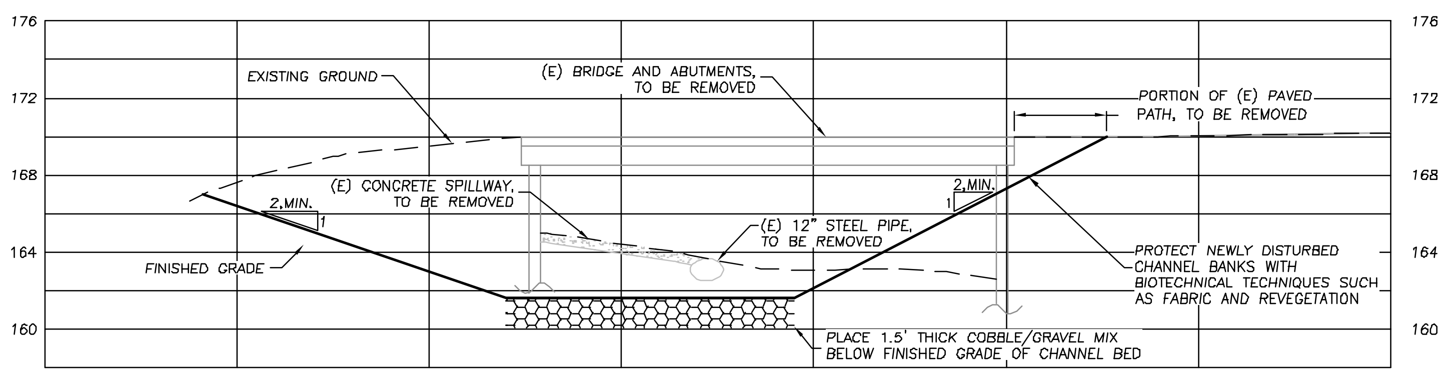
Date 12/03
Scale AS SHOWN
Project 99-131

C3 | 3 OF 4



SITE PLAN - ALTERNATIVE #2 (BRIDGE REMOVAL)

SCALE: 1"=8'

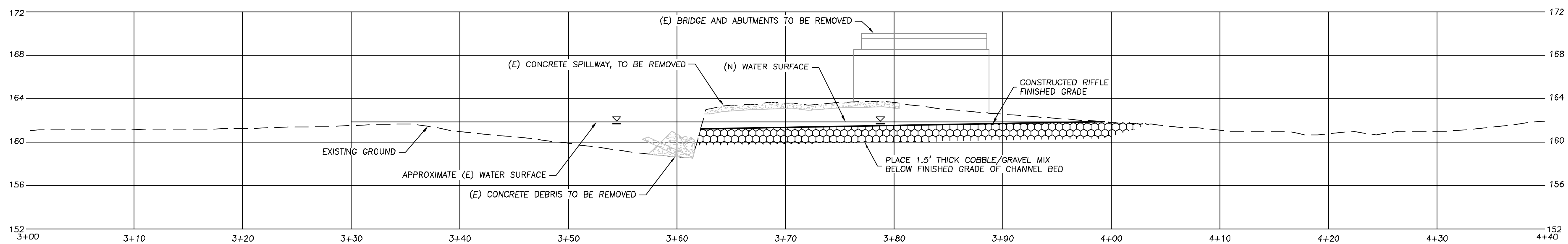


BRIDGE SECTION

SCALE: 1"=5' H; 1"=5' V

NOTE

ALTERNATIVE #2: EXISTING CONDITIONS CREATE SHALLOW SHEET FLOW OVER A CONCRETE SPILLWAY. THE SHEET FLOW AND CONCRETE DEBRIS BELOW THE SPILLWAY PRESENT A FISH PASSAGE IMPEDIMENT. THE PROPOSED DESIGN FOR ALTERNATIVE #2 WILL REMOVE THE EXISTING SPILLWAY AND BRIDGE STRUCTURE, AND REGRADE THE CHANNEL TO CONFORM TO EXISTING CHANNEL GEOMETRY. THE NEW CHANNEL SHALL BE LINED WITH A GRAVEL/COBBLE MIX, AND NEWLY DISTRUBED BANKS SHALL BE PROTECTED WITH BIOTECHNICAL TECHNIQUES. THE EXISTING SIDE CHANNEL (ALIGNMENT 'B') WILL RECEIVE SIGNIFICANTLY LESS FLOW AFTER THE REMOVAL OF THE SPILLWAY, WHICH IS CURRENTLY BACKWATERING THE STREAM. THEREFORE, NO TREATMENT IS PROPOSED FOR THE SIDE CHANNEL UNDER THIS ALTERNATIVE.



THALWEG PROFILE

SCALE: 1"=5' H; 1"=5' V

GRAPHIC SCALE

(IN FEET)

1 inch = 8 ft.

Rev	Date		By

SH+G ENGINEERING

115 LIMEKILN STREET
SANTA CRUZ, CA 95060
(831)-427-0288
A Division of Swanson Hydrology + Geomorphology

ECORP CONSULTING INC.
2260 DOUGLAS BLVD.
SUITE 160
ROSEVILLE, CA 95661

SITE PLAN, SECTION & PROFILE
ALTERNATIVE #2
BRIDGE REMOVAL

SECRET RAVINE FISH PASSAGE IMPROVEMENT PROJECT
10% SUBMITTAL

Date 12/03
Scale AS SHOWN
Project 99-131

C4

4 OF 4

Appendix F: City of Roseville Beaver Management Policy

RESOLUTION NO. 04-518

ADOPTING THE BEAVER MANAGEMENT POLICY

WHEREAS, City coordinates beaver management with the California Department of Fish and Game (CDFG), and operates in accordance with the Memorandum of Understanding for Stream Channel Maintenance between the City and CDFG; and

WHEREAS, the proposed Beaver Management policy's intended to ensure consistent and efficient management of beaver dams, and where necessary the beaver population, for the protection of public health, safety, property and natural resources; and

WHEREAS, the City Council has reviewed the proposed Beaver Management Policy, a copy of which is on file with the City Clerk,

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Roseville that the City of Roseville Beaver Management Policy is hereby approved.

PASSED AND ADOPTED by the Council of the City of Roseville this 17th day of November, 2004, by the following vote on roll call:

AYES COUNCILMEMBERS: Richard Roccucci, Jim Gray, Gina Garbolino

NOES COUNCILMEMBERS: None

ABSENT COUNCILMEMBERS: John Allard, F.C. "Rocky" Rockholm

MAYOR PRO TEMPORE

ATTEST:

City Clerk

EXHIBIT 1

City of Roseville
Beaver Management Policy

1.0 Purpose

Beaver dams become problematic when they create the potential for health and safety issues, interfere with utility operations, cause property damage, or impact certain natural resources subject to permit regulation. The purpose of this policy is to establish a City policy and procedure for addressing beaver management issues in a consistent and cost effective manner.

2.0 Definitions

The following definitions shall apply to implementation of this policy.

Backwater. The area of added ponding behind a beaver dam above the creek's ordinary hydraulic grade line where no ponding would occur absent a beaver dam.

Beaver Impacts. Beaver impacts occur when any of the criteria for beaver dam or population management are triggered as described in sections 3 and 5 respectively.

"Breach" or "Breaching" of a beaver dam. To remove a portion of a beaver dam to sufficiently relieve backwater ponding behind the dam so as to alleviate the initial issue of concern (per criteria listed in Section 3).

Depredation Permit. A required permit issued by the California Department of Fish and Game for beaver extermination.

Lead Department. The City department responsible for the utility, facility, or resource area affected by beaver activities as described in Section 3. For example, the Environmental Utilities Department would serve as Lead Department for implementation of this policy should backwater caused by a beaver dam inundate a sewer manhole.

Mitigation Monitoring Program or Plan. The approved method by which CEQA required mitigation measures will be monitored for implementation in accordance with an adopted or certified CEQA document. Such plans or programs may address habitat restoration success criteria or other performance standards.

Progressive Management. A management methodology that gradually progresses by first exhausting all known reasonable alternatives to remedy the problem before concluding that permanent take (extermination) of the beaver is the most prudent action.

Preserve and Mitigation Area. An area established by state or federal permit, or mitigation area required pursuant to CEQA. Preserve areas are managed, maintained and monitored in accordance with approved Operation and Management Plans.

"Removal" of a beaver dam. The complete removal of a beaver dam, including all related woody and vegetative debris.

3.0 Criteria for Beaver Dam Management

Beaver impacts may be mitigated by City action when they present a potential threat to public health, safety or property; City utility or facility damage; impacts to preserve and mitigation areas, or riparian and oak woodland resources; or, where dams increase city maintenance or operational costs. Progressive Management actions are warranted under any of the following circumstances.

3.1 Health and Safety/City Utilities and Facilities

The City has a responsibility for maintaining creeks and assuring drainage flow capacity to protect public health and safety. The City is also responsible for maintaining many public utilities and facilities (e.g. water and sewer lines, bike trails, fire access roads) that run through or are adjacent to areas that may become inundated or damaged as a result of beaver dams. Breaching and/or removal of a beaver dam, as the first step in Progressive Management, is warranted under any of the following circumstances.

3.1.1 The dam creates potential for flood damage of City utilities and facilities, including: structures, roadways, bike trails, utility manholes, or other city infrastructure where it is determined by the director of the Lead Department for the infrastructure in question, that damage or increased maintenance and/or operational costs could result from backwater caused by a beaver dam.

3.1.2 Backwater from a beaver dam reduces the City standard of 2 feet above the 100-year flood plain (to the foundation of buildings) as determined by the Public Works Director.

3.1.3 The dam location reduces the effectiveness of a flood control facility's operational design, potentially causing an increase in downstream flood threat as determined by the Public Works Director.

3.1.4 Water levels in channels must be reduced to facilitate maintenance activities, or project construction as determined by the Director of the Lead Department.

3.1.5 If washed out, the debris from a beaver dam could block downstream drainage facilities or flood control structures, resulting in a potential flood threat as determined by the Public Works Director.

3.2 Preserve and Mitigation Areas and Natural Resources

To protect preserve and mitigation areas, breaching and/or removal of a beaver dam, as the first step in Progressive Management, may be warranted under any of the following circumstances.

3.2.1 Related flooding conflicts with a Preserve Area Operation and Management Plan objective, as determined by the Community Development Director.

3.2.2 Beaver dam backwater negatively impacts mitigation sites (including trees planted pursuant to the City Tree Preservation Ordinance) and/or restoration plantings that may be required by permit and for which the City or a private applicant is obligated to meet certain pre-determined vegetative success criteria.

3.2.3 Beaver dam backwater negatively impacts riparian or oak woodland vegetation, results in conflict with riparian management recommendations, or negatively impacts restoration projects consistent with the City's adopted Creek and Riparian Management and Restoration Plan.

4.0 Progressive Management Methodology

4.1 Determining Lead Department and Cost Allocation for Services

Generally, the determination regarding a threat to infrastructure, and the costs associated with assessing and addressing beaver dam impacts, will be borne by the Lead Department. There may be instances when department interests overlap, for example when beaver dam backwater inundates both a bike trail and a manhole. In those situations, a Lead Department will be designated by the Community Development Director, and the affected City departments will coordinate fieldwork and cost-share expenses incurred to implement beaver management policy.

4.2 Beaver Dam Breaching or Removal Protocol

If backwater caused by a beaver dam results in any of the conditions listed in Section 3, the Lead Department shall take steps to breach or remove the dam sufficiently to relieve backwater ponding behind the dam and alleviate the initial concern. The Parks Maintenance, and Public Works (Streets Division) Departments typically conduct work of this nature, and have the appropriate equipment; therefore the lead departments (if not Parks or Public Works) will coordinate with these divisions for dam removal, and reimburse the expense. Vegetation and woody materials removed from the dam shall be properly disposed of so as not to allow materials to be easily reused by beavers to rebuild the dam and to ensure that these materials don't cause down stream constrictions.

Frequently, dams are quickly re-constructed following breaching or removal. In such instances, should circumstances and site conditions allow, the methods listed below to deter dam rebuilding should be implemented in combination with breaching and/or dam removal activities. The Lead Department should document all Progressive Management actions in the event a depredation permit is ultimately necessary.

4.2.1 Repeat breaching and/or removing the dam and related building materials.

4.2.2 Install a pond-leveler device (pvc pipe) if conditions are appropriate. This method has been largely ineffective in Roseville. It is most effective if the bottom of the pond is hardpan or gravel, which is generally not the case locally.

4.2.3 Wrap or paint trees in the vicinity to limit and discourage available dam building materials.

4.2.4 Employ other practicable deterrent methods (e.g., use eucalyptus [or other] scent deterrent on at-risk trees; screen culverts [during low-water season] to prevent direct access for beaver).

The sequence of progressive management actions (i.e., breaching and other dam building deterrent methods) leading to beaver dam removal may be bypassed and the beaver dam removed if circumstances warrant (including but not limited to a threat to safety or property) as determined by the Director of the Lead Department.

5.0 Beaver Population Management Protocol

5.1 Determining the Need for Beaver Population Management

If a dam has been repeatedly removed and/or breached in accordance with the management criteria and deterrent methods described in Section 4.2, and dam re-construction persists and continues to trigger criteria for dam removal as described in Section 3, then beaver extermination may be warranted and the following protocol shall be followed.

5.1.1 Trapping and Removal. To trap and exterminate beaver(s), the Lead Department shall obtain a Beaver Depredation Permit from the California Department of Fish and Game (CDFG). The CDFG only issues Depredation Permits if all reasonable efforts have been made to otherwise remedy the problem. Consequently, CDFG may ask that the Lead Department demonstrate that all reasonable efforts to remedy the situation have been attempted prior to issuing a permit. After receiving the permit, the Lead Department would then contact the Placer County Department of Agriculture to request dispatch of a professional trapper to eliminate the beaver(s). The method of trapping and extermination would be determined by the trapper based on site conditions and surrounding uses.

5.1.2 Coordination and Outreach. Prior to implementing a Depredation Permit, the Lead Department shall inform the Public Information Officer (PIO) of the steps taken to discourage beaver damming, or why immediate action is warranted, in accordance with this beaver management policy. The PIO will consult with the Director of the Lead Department to determine the need for and appropriate degree and methods of public outreach. The Community Development Department Environmental Coordinator, and Parks Department, shall also be notified of the need for a Beaver Depredation Permit prior to application to CDFG and after permit issuance but prior to implementation.

The sequence of progressive management actions (i.e., dam breaching, dam removal and/or other dam building deterrent methods) leading to the need for beaver population management may be bypassed and a beaver Depredation Permit may be obtained and implemented if circumstances warrant as determined by the Director of the Lead Department.

Appendix G: Glossary

GLOSSARY

A

ADAPTIVE MANAGEMENT: The process of modifying management practices based on periodic monitoring of field conditions so that management practices are responsive to unanticipated conditions and responses.

AQUATIC MACROPHYTES: The macroscopic (large enough to be observed by the naked eye) forms of aquatic plants found in water bodies.

AQUIFER: A permeable geologic formation capable of storing and yielding groundwater to wells and springs.

AS-BUILT: Drawing or certification of conditions as they were actually constructed.

B

BAFFLES: Guides, grids, grating or similar devices placed in a pond to deflect or regulate flow and create a longer flow path.

BANK RECONTOURING: The practice of modifying the profile a creek bank to accomplish a wide range of ecosystem benefits such as increasing riparian vegetative diversity, stabilizing the channel, and/or increasing channel capacity.

BANKFULL FLOW: The condition where stream flow just fills a stream channel up to the top of the bank and at a point where the water begins to overflow onto a floodplain.

BASE FLOW: The stream discharge from ground water.

BASIN: The largest single watershed management unit for water planning, which combines the drainage of a series of subbasins. Often have a total area more than a thousand square miles.

BENCH: A 10 to 15 foot wide bench which is located around the inside perimeter of a permanent pool and is normally vegetated with aquatic plants; the goal is to provide pollutant removal and enhance safety in areas using stormwater pond stormwater practices.

BENTHIC MACROINVERTEBRATE: Aquatic organisms such as insects, crustaceans, mollusks, and worms that inhabit the bottom of a creek, lake or ocean.

BENTHOS: Refers to the bottom of a creek or lake bed.

BERM: A shelf that breaks the continuity of a slope; a linear embankment or dike.

BEST MANAGEMENT PRACTICE (BMP): A structural or non-structural device designed to temporarily store or treat urban stormwater runoff in order to mitigate flooding, reduce pollution and provide other amenities.

BIOFILTERS: Grass depression areas such as engineered channels or swales that are used to collect and filter urban stormwater.

BIORETENTION: A water quality practice that utilizes landscaping and soils to treat urban stormwater runoff by collecting it in shallow depressions, before filtering through a fabricated planting soil media.

BUFFER: An area adjacent to a shoreline, wetland or stream where development is restricted or prohibited.

C

CANOPY: The overhead shade and layers of foliage provided by trees and shrubs in forests and woodlands. A canopy may have many layers or may only be a single layer.

CATCHMENT: The smallest watershed management unit, defined as the area of a development site to its first intersection with a stream, usually as a pipe or open channel outfall.

CHANNEL: A natural stream that conveys water; a ditch or channel excavated for the flow of water.

CHANNEL STABILIZATION: Erosion prevention and stabilization of velocity distribution in a channel using jetties, drops, revetments, structural linings, vegetation and other measures.

CHECK DAM: A small dam construction in a gully or other small watercourse to decrease the stream flow velocity (by reducing the channel gradient), minimize channel scour, and promote deposition of sediment.

COMPACTION (SOILS): Any process by which the soil grains are rearranged to decrease void space and bring them in closer contact with one another, thereby increasing the weight of solid material per unit of volume, increasing the shear and bearing strength and reducing permeability.

CONDUIT: Any channel intended for the conveyance of water, whether open or closed.

CONSERVATION EASEMENT: Voluntary agreements that allow an individual to set aside private property to limit the type or amount of development on their property. Easements relieve property owners of the burden of managing these areas by shifting responsibility to a private organization or government agency better equipped to handle maintenance and monitoring issues.

CONTOUR: 1. An imaginary line on the surface of the earth connecting points of the same elevation. 2. A line drawn on a map connecting points of the same elevation.

CRITICAL ROOT ZONE (CRZ) - The area around a tree required for the tree's survival.

CUT: Portion of land surface or area from which earth has been removed or will be removed by excavation; the depth below original ground surface to excavated surface.

CUT-AND-FILL: Process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

D

DAM: A barrier to confine or raise water for storage or diversion, to create a hydraulic head, to prevent gully erosion, or for retention of soil, sediment or other debris.

DETENTION: The temporary storage of storm runoff in a stormwater practice with the goals of controlling peak discharge rates and providing gravity settling of pollutants.

DETENTION STRUCTURE: A structure constructed for the purpose of temporary storage of stream flow or surface runoff and gradual release of stored water at controlled rates.

DISTURBED AREA: An area in which the natural vegetative soil cover has been removed or altered and, therefore, is susceptible to erosion.

DIVERSION: A channel with a supporting ridge on the lower side constructed across the slope to divert water from areas where it is in excess to sites where it can be used or disposed of safely. Diversions differ from terraces in that they are individually designed.

DRAINAGE: 1.The removal of excess surface water or ground water from land by means of surface or subsurface drains. 2. Soils characteristics that affect natural drainage.

DRAINAGE AREA (WATERSHED): All land and water area from which runoff may run to a common (design) point.

DROP STRUCTURE: A structure for dropping water to a lower level and dissipating surplus energy; a fall. The drop may be vertical or inclined.

DRY POND: A stormwater pond design with no permanent pool. Stormwater is detained in the practice temporarily to settle pollutants, protect downstream channels, and prevent flooding. These practices typically provide poor pollutant removal.

DRY SWALE : An open drainage channel explicitly designed to detain and promote the filtration of stormwater runoff through an underlying fabricated soil media.

DRY WELL: An infiltration practice designed to treat rooftop runoff. Runoff is directed to the trench via a downspout. It is temporarily stored in the voids of the trench, and then percolated into the ground.

E

EMERGENCY SPILLWAY: A dam spillway designed and constructed to discharge flow in excess of the principal spillway design discharge.

ENERGY DISSIPATOR: A designed device such as an apron of rip-rap or a concrete structure placed at the end of a water transmitting apparatus such as pipe, paved ditch or paved chute for the purpose of reducing the velocity, energy and turbulence of the discharged water.

EPIFAUNAL: Used to describe organisms living on the surface of the creek substrate, or rocks and gravels on the creek bed.

EROSION: 1. The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. 2. Detachment and movement of soil or rock fragments by water, wind, ice or gravity. The following terms are used to describe different types of water erosion:

Accelerated erosion: Erosion much more rapid than normal, natural or geologic erosion, primarily as a result of the influence of the activities of man or, in some cases, of other animals or natural catastrophes that expose base surfaces, for example, fires.

Gully erosion: The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 or 2 feet to as much as 75 to 100 feet.

Rill erosion: An erosion process in which numerous small channels only several inches deep are formed. See rill.

Sheet erosion: The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not subsequently be removed by surface runoff.

EROSIVE VELOCITIES: Velocities of water that are high enough to wear away the land surface. Exposed soil will generally erode faster than stabilized soils. Erosive velocities will vary according to the soil type, slope, structural, or vegetative stabilization used to protect the soil.

EUTROPHICATION: The process of over-enrichment of water bodies by nutrients often typified by the presence of algal blooms.

F

FILTER FENCE: A geotextile fabric designed to trap sediment and filter runoff.

FILTER MEDIA: The sand, soil, or other organic material in a filtration device used to provide a permeable surface for pollutant and sediment removal.

FILTER STRIPS: A vegetated area that treats sheetflow and/or interflow by removing sediment and other pollutants. The area may be grass-covered, forested or of mixed vegetative cover (e.g. wildflower meadow).

FINES (SOIL): Generally refers to the silt and clay size particles in soil.

FLOODPLAIN: Areas adjacent to a stream or river that are subject to flooding or inundation during severe storm events (often called a 100 year floodplain, it would include the area or flooding that occurs, on average, once every 100 years).

FLOODPLAIN MANAGEMENT: A process to limit flood damage by prohibiting new development within the boundaries of the 100-year floodplain. In existing developments within the floodplain, management includes maintaining and increasing open space areas along waterways.

FOREBAY: Additional storage space located near a stormwater practice inlet that serves to trap incoming coarse sediments before they accumulate in the main treatment area.

G

GABION: A flexible woven-wire basket composed of two to six rectangular cells filled with small stones. Gabions may be assembled into many types of structures such as revetments, retaining walls, channel liners, drop structures and groins.

GABION MATTRESS: A thin gabion, usually six or nine inches thick, used to line channels for erosion control.

GEOTEXTILE FABRIC: A synthetic textile of relatively small mesh or pore size that is used to (a) allow water to pass through while keeping sediment out (permeable), or (b) prevent both runoff and sediment from passing through (impermeable). Also known as filter fabric.

GRADE: 1. The slope of a road, channel or natural ground. 2. The finished surface of a canal bed, roadbed, top of embankment, or bottom of excavation; any surface prepared for the support of construction, like paving or laying a conduit. 3. To finish the surface of a canal bed, roadbed, top of embankment or bottom of excavation.

GRASS CHANNEL: An open vegetated channel used to convey runoff and to provide treatment by filtering out pollutants and sediments.

GRAVEL TRENCH: A shallow excavated channel backfilled with gravel and designed to provide temporary storage and permit percolation of runoff into the soil substrate.

GRAVEL: 1. Aggregate consisting of mixed sizes of 1/4 inch to three inch particles which normally occur in or near old streambeds and have been worn smooth by the action of water. 2. A soil having particle sizes, according to the Unified Soil Classification System, ranging from the No. 4 sieve size angular in shape as produced by mechanical crushing.

GRAVEL FILTER: Washed and graded sand and gravel aggregate placed around a drain or well screen to prevent the movement of fine materials from the aquifer into the drain or well.

GROUND COVER: Plants which are low-growing and provide a thick growth which protects the soil as well as providing some beautification of the area occupied.

GULLY: A channel or miniature valley cut by concentrated runoff through which water commonly flows only during and immediately after heavy rains or during the melting of snow. The distinction between gully and rill is one of depth. A gully is sufficiently deep that it would not be obliterated by normal tillage operations, whereas a rill is of lessor depth and would be smoothed by ordinary farm tillage.

H

HEAD (HYDRAULICS): 1. The height of water above any plane of reference. 2. The energy, either kinetic or potential, possessed by each unit weight of a liquid expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed. Used in various terms such as pressure head, velocity head, and head loss.

HEAD CUT: An area where erosive forces within a creek channel are causing the creek bed to be progressively lowered.

HEAVY METALS: Metals with high molecular weights that are generally toxic to animal life and human health if naturally occurring concentrations are exceeded. Examples include, arsenic, chromium, lead and mercury.

HERBACEOUS PERENNIAL (PLANTS): A plant whose stems die back to the ground each year.

HERBICIDES: Chemicals developed to control or eradicate plants.

HYDRAULIC GRADIENT: The slope of the hydraulic grade line. The slope of the free surface of water flowing in an open channel.

HYDROGEOMORPHIC: Related to the transformative energy of moving water as it passes over and shapes earth and rock, such as when flood flows carve out creek channels.

HYDROGRAPH: A graph showing variation in stage (depth) or discharge of a stream of water over a period of time.

HYDROSEED: Seed or other material applied to areas in order to revegetate after a disturbance.

I

IMPERVIOUS: The characteristic of a material which prevents the infiltration or passage of liquid through it. This may apply to roads, streets, parking lots, rooftops and sidewalks.

IMPERVIOUS COVER: Any surface in the urban landscape that cannot effectively absorb or infiltrate rainfall.

IMPERVIOUSNESS: The percentage of impervious cover within a development site or watershed.

INFILTRATION BASIN: An infiltration practice that stores stormwater runoff in a shallow depression, and allows this runoff to percolate into the ground.

INFILTRATION TRENCH: A stormwater quality treatment practice that consists of a stone-filled reservoir that allows runoff and accompanying pollutants to settle into the soil where further filtering can take place.

INFILTRATION RATE: The rate at which stormwater percolates into the subsoil measured in inches per hour.

INFLOW PROTECTION: A water handling device used to protect the transition area between any water conveyance (dike, swale, or swale dike) and a sediment trapping device.

INSECTICIDES: Chemicals developed to control or eradicate insects.

J

JURISDICTIONAL WETLAND: A wetland which is regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.

L

LARGE WOODY DEBRIS (LWD): Large pieces of wood, such as trunks and stumps, situated in a creek corridor to provide additional habitat structure.

M

MEMORANDUMS OF UNDERSTANDING (MOUs): Agreements by local government agencies and other local stakeholders to work together in exploring solutions/alternatives to water quality issues and the creation of a watershed planning strategy.

MICRO-ENVIRONMENT: This term refers to the conditions created under which a separate, smaller environment exists distinct from the dominant one, which can affect and be affected by the immediate surroundings.

MICROPOOL: A smaller permanent pool which is incorporated into the design of larger stormwater ponds to avoid resuspension or settling of particles and minimize impacts to adjacent natural features.

MORPHOLOGICAL: Pertaining to geologic structure.

MULCH: Covering on surface of soil to protect and enhance certain characteristics, such as water retention qualities.

N

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES): Established by Section 402 of the Clean Water Act, this federally mandated system is used for regulating point source and stormwater discharges.

NICK POINT: The position in a head cut where the erosion is actively occurring.

NUTRIENT: A substance that provides food or nourishment, such as usable proteins, vitamins, minerals or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to eutrophication.

O

OIL/GRIT SEPARATOR: A stormwater treatment practice that briefly detains stormwater in three underground concrete chambers. Stormwater first passes through the sedimentation chamber, which is designed to capture coarse sediment particles. It then passes through a second chamber designed to capture oil and grease, and finally into an overflow chamber and back to the storm drain system.

ONE YEAR STORM: A stormwater event that occurs on average once every year, or statistically has a 100% chance on average of occurring in a given year.

ONE HUNDRED YEAR STORM: A extreme flood event which occurs on average once every 100 years or statistically has a 1% chance on average of occurring in a given year.

OPEN CHANNELS: Also known as swales, grass channels, and biofilters. These systems are used for the conveyance, retention, infiltration and filtration of stormwater runoff.

OPEN SPACE: A portion of a development site which is permanently set aside for public or private use and will not be developed with homes. The space may be used for passive or active recreation, or may be reserved to protect or buffer natural areas.

OPEN SPACE MANAGEMENT: The legal and financial arrangements needed to manage open space according to its prescribed use (i.e., natural areas, recreation).

OPEN VEGETATED CHANNELS: Also known as swales, grass channels, and biofilters. These systems are used for the conveyance, retention, infiltration and filtration of stormwater runoff.

ORDINANCE: A law, a statute, a decree enacted by a municipal body, such as a city council or county commission. Ordinances often govern matters not already covered by state or federal laws (such as local zoning, safety and building regulations), but may also be used to require stricter standards in local communities than those imposed by state or federal law.

OUTFALL/OUTLET: The point where water flows from a conduit, stream, or drain.

P

PEAK DISCHARGE (FLOW RATE):The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.

PERENNIAL STREAM: A stream channel that has running water throughout the year.

PERMEABILITY: The rate of water movement through the soil column under saturated conditions.

PERMISSIBLE VELOCITY (HYDRAULICS): The highest average velocity at which water may be carried safely in a channel or other conduit. The highest velocity that can exist through a substantial length of a conduit and not cause scour of the channel. A safe, non-eroding or allowable velocity.

PERVIOUS: Any material that allows for the passage of liquid through it.

PLANFORM: Describes the alignment of a creek channel when viewed from above.

PLUGS: Pieces of turf or sod, usually cut with a round tube, which can be used to propagate the turf or sod by vegetative means.

POLLUTION PREVENTION PLAN: A requirement for some land uses or activities (e.g., industrial sites) that outlines techniques to prevent pollutants from being washed off in stormwater runoff (e.g., spill response, material handling, employee training, etc.)

POROSITY: Ratio of pore volume to total solids volume.

POROUS PAVEMENT: Permeable pavement surface with an underlying stone reservoir to temporarily store surface runoff before it infiltrates into the subsoil.

PRETREATMENT: Techniques employed in stormwater practices to provide storage or filtering to help trap coarse materials before they enter the system.

PROPAGULE: Seeds, spores, and any part of the vegetative portion of a plant capable of independent growth if detached from the parent.

R

RAPID STREAM ASSESSMENT TECHNIQUE (RSAT): A set of protocols developed to provide a simple, quick field-level assessment of stream quality conditions.

RATE-BASED DESIGN: Stormwater practice design which uses the discharge in volume per unit of time as a basis for sizing the practice.

RECHARGE RATE: Annual amount of rainfall which contributes to groundwater as a function of hydrologic soil group.

REDD: The hollowed out nest in a streambed where a fish deposits its eggs, a behavior typical to most salmonids.

REFERENCE CONDITION/REFERENCE REACH: An area in a watershed that is least impacted in comparison to other areas. This area can be used as a baseline to judge the success of future watershed management efforts.

RETENTION: The amount of precipitation on a drainage area that does not escape as runoff. It is the difference between total precipitation and total runoff.

RETROFIT: The installation of a new stormwater practice or the improvement of an existing one in a previously developed area.

RIP-RAP: Broken rock, cobbles, or boulders placed on earth surfaces, such as the face of a dam or the bank of a stream, for protection against the action of water (waves); also applies to brush or pole mattresses, or brush and stone, or similar materials used for soil erosion control.

RIPARIAN: The land area which borders a stream or river and which directly affects and is affected by the water quality. This land area often coincides with the maximum water surface elevation of the 100 year storm.

RIPARIAN CORRIDOR: Areas of land and water that are important to the integrity and quality of a stream, river, or other body of water. An aquatic corridor usually consists of the actual stream or river, the aquatic buffer, and other areas that are a part of the stream's right-of-way.

ROUGHNESS COEFFICIENT (HYDRAULICS): A factor in velocity and discharge formulas representing the effect of channel roughness on energy losses in flowing water. Manning's "n" is a commonly used roughness coefficient.

RUNOFF: That portion of the precipitation on a drainage area that is discharged from the area in the stream channels. Types include surface runoff, ground water runoff or seepage.

RUNOFF PRETREATMENT: Technique employed in a stormwater practice to retain storage volumes or prevent clogging by trapping coarse materials before they enter the system.

S

SALMONID: Of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.

SCOUR: The result of the forces of moving water acting to erode the creek bottom, and/or displace gravels or other materials on the channel bed.

SEDIMENT: Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

SEDIMENT POLISHING: The process of removing sediments suspended in water before it discharges to a creek.

SEDIMENTATION: The process by which soil particles suspended in stormwater or runoff settle in stream beds.

SETBACKS: The minimum distance requirements for location of a structural stormwater practice in relation to roads, wells, septic fields, other structures.

SHEET FLOW: Water, usually storm runoff, flowing in a thin layer over the ground surface.

SIDE SLOPES: The slope of the sides of a channel, dam or embankment. It is customary to name the horizontal distance first, as 1.5 to 1, or frequently, 1 ½: 1, meaning a horizontal distance of 1.5 feet to 1 foot vertical.

SILT: 1. (Agronomy) A soil separate consisting of particles between 0.05 and 0.002 millimeter in equivalent diameter. 2. A soil textural class. 3. (Engineering) According to the Unified Soil Classification System a fine grained soil (more than 50 percent passing the No. 200 sieve) that has a low plasticity index in relation to the liquid limit.

SINUOSITY: The extent to which a creek channel meanders across the floodplain and generally expressed as a ratio of the channel length to the valley length.

SOIL TEST: Chemical analysis of soil to determine needs for fertilizers or amendments for species of plant being grown.

SPECIES DIVERSITY:

SPILLWAY: An open or closed channel, or both, used to convey excess water from a reservoir. It may contain gates, either manually or automatically controlled to regulate the discharge of excess water.

STABILIZATION: Providing adequate measures, vegetative and/or structural that will prevent erosion from occurring.

STAKEHOLDER: Any agency, organization, or individual that is involved in or affected by the decisions made in the development of a watershed plan.

STORMWATER FILTERING: Stormwater treatment methods which utilize an artificial media to filter out pollutants entrained in urban runoff.

STORMWATER MANAGEMENT: The programs to maintain quality and quantity of stormwater runoff to pre-development levels.

STORMWATER OUTFALL: A discharge point for stormwater runoff which has been collected in a conveyance system.

STORMWATER PONDS: A land depression created for the detention or retention of stormwater runoff.

STORMWATER QUALITY CONTROL: The removal of pollutants from stormwater runoff through the use of stormwater management practices.

STORMWATER WETLAND: A shallow, constructed pool that captures stormwater and allows for the growth of characteristic wetland vegetation.

STREAM BUFFERS: Zones of variable width which are located along both sides of a stream and are designed to provided a protective natural area along a stream corridor.

STRUCTURAL STORMWATER PRACTICES: Devices that are constructed to provide temporary storage and treatment of stormwater runoff.

SWALE: An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff.

T

TEN YEAR STORM (QP 10): The peak discharge rate associated with a 24 hour storm event which exceeds bankfull capacity and occurs on average once every ten years (or has a likelihood of occurrance of 1/10 in a given year).

THALWEG: The line along the bottom of a creek channel that follows the lowest part of the channel.

TIME OF CONCENTRATION: Time required for water to flow from the most remote point of a watershed, in a hydraulic sense, to the outlet.

TOE (OF SLOPE): Where the slope stops or levels out. Bottom of the slope.

TOPSOIL: Fertile or desirable soil material used to top dress roadbanks, subsoils, parent material, etc.

TWO-YEAR STORM: The peak discharge rate associated with a 24 hour storm event which exceeds bankfull capacity and occurs on average once every two years (or has a likelihood of occurrence of 1/2 in a given year).

V

VEGETATED OPEN CHANNELS: Also known as swales, grass channels, and biofilters. These systems are used for the conveyance, retention, infiltration and filtration of stormwater runoff.

VEGETATIVE BUFFER: A vegetative buffer is a band of vegetation (trees, shrubs and herbaceous plants) between a waterway and an adjacent land use.

VORTEX: A mass of fluid moving in a circular motion.

W

WATER SURFACE PROFILE: The longitudinal profile assumed by the surface of a stream flowing in an open channel; the hydraulic grade line.

WATERSHED: All the land area that contributes runoff to a particular point along a waterway.

WATERSHED MANAGEMENT UNIT: Refers to one of five categories based on typical drainage area. The five categories from smallest to largest are catchment, subwatershed, watershed, subbasin, and basin. Impervious cover influences each unit in varying degrees and corresponding management measures usually differ as well.

WING WALL: Side wall extensions of a structure used to prevent sloughing of banks or channels and to direct and confine overfall.

Z

ZONING: A set of regulations and requirements that govern the use, placement, spacing and size of buildings and lots within a specific area or in a common class (zone).

Appendix H: Consolidated Permitting Approach

Consolidated Permitting Strategy

For Roseville Creek and Riparian Management
and Restoration Projects

Prepared for:
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311 Vernon Street
Roseville, California

May, 2005

Submitted by:
FOOTHILL ASSOCIATES

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Consolidated Permitting Strategy ("Strategy") is to provide an approach for consolidating various regulatory processes to facilitate activities addressed in the Roseville Creek and Riparian Management and Restoration Plan ("Creek Plan": Foothill Associates, 2005).

1.2 Background

The Creek Plan addresses over 35 miles of creeks in the City of Roseville, within portions of the Dry Creek and Pleasant Grove/Curry Creek watersheds (Figures 1 and 2). Preparation of the Creek Plan was funded by the California Bay-Delta Authority's CALFED Watershed Program. The Creek Plan incorporates the objectives of the CALFED Watershed Program, and also includes specific measures that are consistent with implementation actions outlined for the CALFED Watershed Program.

As described in the Creek Plan, stream systems within the City have experienced extensive degradation, primarily from historic land use such as mining and urbanization that occurred prior to the establishment of current land use regulations protecting creeks and floodplains. These historic land use practices have contributed to excessive sedimentation, elevated water temperatures, altered stream flow conditions, abundance of non-native invasive plant species, barriers to fish passage, poor water quality, degraded riparian vegetation, and channel and floodplain alteration. These factors have in turn affected habitat and populations of special status salmonids (steelhead trout, Chinook salmon). The Creek Plan identifies measures for restoring habitat conditions and for protecting streams against adverse effects of past mining activities and current urbanization. The Creek Plan also describes creek maintenance practices the City uses for flood control and public health and safety purposes.

One of the Creek Plan's goals is to address regulatory considerations related to implementation of maintenance and restoration activities identified in the plan. The Creek Plan recommends seeking consolidated permitting to facilitate agency review and regulatory compliance for these activities. Consolidated permitting is expected to expedite regulatory approval for maintenance and restoration activities, reduce permitting costs, and reduce workload for agency and City personnel. The consolidated permitting approach also gives the City and regulatory agencies an opportunity to work in partnership and assess multiple small maintenance and restoration activities from a regional perspective, in the context of the Creek Plan. This way, conservation measures can be designed and carried out to provide benefits at a more meaningful scale than would be possible through individual project-by-project review.

A Consolidated Permitting Proposal (Foothill Associates, 2004b) was reviewed by each of the agencies with regulatory authority over restoration and maintenance activities described in the Creek Plan. These included the US Army Corps of Engineers (Corps), the US Fish and Wildlife Service (Service), National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), California Department of Fish and Game (CDFG), and the Regional Water Quality Control Board (RWQCB). The purpose of the review was to initiate a process of coordination between the various regulatory agencies and the City of Roseville ("City"), to introduce the agencies to the concept of consolidated permitting for implementing the Creek Plan, and to receive feedback from the agencies in response to the proposal. Representatives from each agency provided verbal comments during meetings and telephone conversations, and the proposal was revised consistent with these comments to prepare this Strategy.

2.0 ACTIVITIES TO BE COVERED

Activities to be covered under the Consolidated Permitting Strategy are described in detail in the Creek Plan. These activities are briefly outlined below.

2.1 Restoration

Chapter 4 of the Creek Plan describes the types of restoration that would be employed, the benefits of each type of restoration, and standard practices and techniques to be used for each type of restoration. Restoration strategies and techniques are included in the Creek Plan for each of the following:

- Revegetation
- Bank recontouring
- Bank stabilization
- Channel realignment
- In-stream structures
- Grade control
- Removal of fish barriers
- Beaver management
- Invasive plant species management
- Runoff controls
- Access management

2.2 Maintenance Practices

In addition to restoration strategies described above, creek maintenance activities would be covered under the consolidated permitting approach. Maintenance activities to be covered are described in Chapter 6 of the Creek Plan. These activities would be implemented by the City Park Maintenance and Street Maintenance Divisions.

- Floodplain debris and obstruction removal
- Flow obstruction removal
- Vegetation control

- Repair of previous erosion control work
- Minor erosion control work

The activities listed above are already covered under California Fish and Game Code Section 1602 through a Memorandum of Understanding with CDFG. The MOU includes specific restrictions to each type of activity, and measures to avoid, minimize and offset impacts to the creek channel.

The Creek Plan (Section 6.3) also includes recommendations for optional maintenance practices that are not covered under the current CDFG MOU, but may be added in the future. These include activities that would provide habitat enhancement benefits as well as creek maintenance, and could be potentially be accomplished on a routine basis by the Parks and Streets Maintenance staff as part of their normal maintenance practices. Covered activities to fall under this category may include:

- Vegetation management for habitat value
- Invasive plant management
- Boulder placement
- Removal or placement of gravels
- Placement of gravels
- Fish barrier removals
- Domestic animal control

Specific techniques for accomplishing these measures are described in Chapter 6 of the Creek Plan.

3.0 CALIFORNIA DEPARTMENT OF FISH AND GAME

The following describes laws and regulations under the authority of CDFG as they relate to the proposed restoration and maintenance activities.

3.1 Existing Laws, Regulations, and Agreements

3.1.1 Streambed Alteration Agreement

The primary CDFG regulatory issue pertinent to creek restoration and maintenance in the plan area is California Fish and Game Code Section 1602. Section 1602 requires CDFG notification for any activity that will do one or more of the following: (1) substantially obstruct or divert the natural flow of a river, stream, or lake; (2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake. A Streambed Alteration Agreement (Agreement) from CDFG is necessary for any such activity that may substantially adversely affect existing fish and wildlife resources.

a. Typical Permitting Procedures: Fish and Game Code outlines the specific procedures and information to be included in a formal notification for an applicant intended to carry activities regulated under Section 1602. Once CDFG deems the notification complete, they must determine whether the proposed action will substantially adversely affect an existing fish or wildlife resource. If CDFG determines that the action will not adversely affect existing fish or wildlife resources, then CDFG informs the entity in writing as such and the action may proceed, including implementation of any measures described in the notification to protect fish and wildlife resources.

   If CDFG determines that the activity may substantially adversely affect existing fish and wildlife resources, they issue an Agreement which includes reasonable measures necessary to protect the resource, and the entity may conduct the activity in accordance with this agreement. A draft Agreement must be submitted within 60 days after the notification is deemed complete. If this draft Agreement is not submitted within 60 days, the applicant may proceed with the project as described in the Notification. The applicant has 30 days to respond to the draft Agreement if the conditions are unacceptable. Once CDFG has completed a final Agreement, the proposed activity may proceed with conditions stipulated in the final Agreement.

b. Existing Agreement with CDFG: An existing Memorandum of Understanding (MOU) between the City and CDFG addresses routine maintenance activities in unimproved and improved channels throughout the City. This MOU constitutes a Streambed Alteration Agreement consistent with Fish and Game Code, and maintenance activities carried out consistent with the MOU do not require further notice and agreement in compliance with streambed alteration requirements under Fish and Game Code.

3.1.2 CEQA Compliance

CDFG must comply with the California Environmental Quality Act (CEQA) before issuance of a final Agreement. The State or local governmental agency with the principal responsibility for carrying out or approving the activity is the "Lead Agency" under CEQA. If the activity is not exempt under CEQA, the Lead Agency must prepare an environmental document (a Negative Declaration, a Mitigated Negative Declaration, or an Environmental Impact Report). Acting as a Responsible Agency, CDFG may wait until the Lead Agency has fully complied with CEQA before issuing a final Agreement.

3.1.3 Fish and Game Code: Protection of Nesting Birds and Raptors

California Fish and Game Code Section 3503 prohibits the taking, possessing, or needless destroying bird nests or eggs. Section 3503.5 prohibits the taking, possessing, or destroying of birds-of-prey, or destroying the nests or eggs of birds-of-prey.

3.1.4 Fish and Game Code: Protection of Fur-Bearing Mammals (Beaver Control)

Beavers and other fur-bearing mammals are protected under California Fish and Game Code Section 4000 through 4012. A person must be licensed in order to trap beavers in the State of California. Sections 4152 and 4180, however, allow for non-licensed landowners to trap fur-bearing animals that are injuring crops or other property. These laws are pertinent to the Creek Plan in that the plan recommends control of beaver where populations cause health and safety concerns or degrade stream quality.

3.1.5 California Endangered Species Act

The California Endangered Species Act (CESA) can be found in Division 3, Chapter 1.5 (Sections 2050 to 2116) of California Fish and Game Code. Section 2080 prohibits the importing, taking, exporting, possessing, purchasing, or selling, any species, or any part or product thereof that is endangered or threatened. State lead agencies are required to consult with DFG to ensure that any action it undertakes is not likely to jeopardize the continued existence of any State listed species or result in destruction or adverse modification of essential habitat. Take can be authorized through section 2081, or, if the species is also federally listed and the project has gone through a federal consultation process, take can be authorized through section 2080.1 (consistency determination).

3.2 Strategy for Meeting CDFG Regulatory Requirements under the Creek Plan

3.2.1 Streambed Alteration Agreement

The strategy for complying with California Fish and Game Code Section 1602 for creek maintenance and restoration activities is to prepare a *Programmatic Streambed Alteration Agreement* which will outline specific parameters for individual restoration projects to be covered under the agreement. There will likely still need to be project by project CDFG review, but the review will be much less extensive than what would be needed for individual Streambed Alteration Agreements.

3.2.2 CEQA

The City of Roseville will likely be the Lead Agency for CEQA compliance in the context of finalizing and approving the Creek Plan. The City will likely prepare an Initial Study/Negative Declaration to meet CEQA requirements. Therefore, CDFG would serve only as a Responsible Agency to review and comment on the City's CEQA document.

3.2.3 Protection of Nesting Birds and Raptors

The existing MOU with CDFG states that no trees shall be disturbed that contain active bird nests until all eggs have hatched and young birds have fledged without prior consultation and approval of a CDFG representative. These restrictions would also be applied to restoration activities covered under the Creek Plan. This is expected to fulfill regulatory requirements under Fish and Game Code sections 3503 and 3503.5.

3.2.4 Beaver Management

Beaver trapping for habitat restoration purposes be conducted by licensed individuals, unless CDFG determines that these animals are injuring property as outlined in Fish and Game Code Sections 4152 and 4180. A beaver management program will be developed in coordination with CDFG during preparation of the Programmatic Streambed Alteration Agreement.

3.2.5 California Endangered Species Act

Compliance with CESA will be achieved through avoiding take of any state listed species. The only state listed species potentially affected by creek maintenance and restoration activities in the plan area is Swainson's hawk. Standard CDFG take avoidance measures will be incorporated into the Programmatic Streambed Alteration Agreement; therefore, there will be no permitting requirements under CESA.

4.0 U.S. ARMY CORPS OF ENGINEERS

4.1 Existing Laws and Permitting Process

4.1.1 Clean Water Act Section 404

The primary regulatory authority of the Corps over creek restoration and maintenance projects is through Section 404 of the Clean Water Act. Section 404 requires Corps authorization for projects involving placement of fill or discharge of dredged materials into any "waters of the United States".

Projects can be authorized under Section 404 through either an Individual or a General permit. Individual Permits (IPs) are Corps authorizations issued following a case-by-case evaluation, and they require more lengthy case-by-case review and documentation than General Permits (GPs).

a. Individual Permits: An individual permit may be issued as a Standard Permit, or as a Letter of Permission (LOP). The Standard Permit process involves submittal of a formal application to the Corps. Once the Corps has received a complete application package, a public notice is issued within 15 days, followed by a 15 to 30-day public comment period. The Corps is required to consider all comments received during the public comment period, and to consult with other Federal agencies as appropriate. The Corps issues an Individual Permit after considering public comments and making the necessary regulatory findings. One of the findings the Corps must make is that the proposed activity is the Least Environmentally Damaging Practicable Alternative (LEDPA). An alternatives analysis must be prepared for the proposed activity in order for the Corps to make a LEDPA determination.

   If the proposed activity is minor or routine with minimum impacts, then it may qualify for an LOP. An LOP is a type of IP issued through an abbreviated processing procedure. Processing time is normally 45 days or less.

   LOPs can be used in conjunction with programs approved by the Corps for streamlining the 404 permitting process. For example, the City of Eugene entered into an agreement with the Corps recognizing the West Eugene Wetland Plan, which provides the framework for an abbreviated permitting procedure. Through the abbreviated processing procedure, the Corps has recognized the inventory and acknowledged the regional mitigation strategy, and individual permit decisions are based on the regional strategy. Under this abbreviated procedure, project applicants receive certification for wetland mitigation projects through the City of Eugene. If the City makes a determination that a project is consistent with the Wetland Plan, the City certifies the project and forwards the certification and other pertinent information to the Corps. The Corps evaluates a narrower range of issues than under the standard individual permit procedure, and public and agencies will have to comment within a shortened timeframe (a total of 45 days for the Corps decision unless unusual evidence or changing circumstances dictate otherwise).

b. General Permits: There are two types of General Permits: Nationwide Permits (NWPs) and Regional General Permits (RGPs).

NWPs are issued by the Corps on a nation-wide basis for specific types of similar activities that have minimal impacts. NWPs are designed to regulate these types of activities with little, if any, delay or paperwork. NWPs currently in effect are described in the Corps implementing regulations (Code of Federal Regulations, Part 330, Appendix A). Some of the creek maintenance and restoration activities addressed in the Creek Plan could fall under existing NWPs.

Coverage of projects under some existing NWPs require written notification to the Corps prior to commencing the authorized activity. The Corps has 30 days from receipt of notification to determine whether the project qualifies for authorization under a NWP. If the Corps determines that the notification is incomplete, a new 30-day period will commence upon receipt by the Corps of a revised notification. The permittee cannot move forward with the proposed activity until the 30 days have passed or until the Corps has issued authorization to proceed. If the Corps does not act within this 30-day period, the permittee may go forward with the activity, but the Corps has the authority to modify, suspend, or revoke authorization through a process outlined in the Corps' regulations (33 CFR 330.5).

RGPs are issued by the Corps for a general category of activities when (1) the activities are similar in nature and cause minimal environmental impact (both individually and cumulatively), and (2) the RGP reduces duplication of regulatory control by State and Federal agencies. RGPs have been issued by the Corps for particular programs and geographic areas to cover wetland restoration and maintenance activities. For example, an RGP for stream restoration was issued by the Portland District of the Corps for stream restoration and fish habitat enhancement throughout the State of Oregon (Permit #2000-0011). An RGP has also been issued by the Los Angeles District of the Corps for removal of exotic, invasive plants, for the purpose of habitat recovery, within ten counties in within this district in California (RGP #41). Another RGP has been issued by the Sacramento District of the Corps for maintenance activities within wetlands in the Lake Tahoe Basin (RGP #16). RGPs generally require a notification procedure that involves an abbreviated review process by the Corps so that they may ensure that activities are being carried out consistent with the terms of the RGP.

Another type of General Permit is a Programmatic General Permit (PGP). A PGP is administered by the permittee rather than the Corps. For example, a local jurisdiction might hold a PGP and process individual projects to be permitted under the PGP.

4.1.2 National Environmental Policy Act

The Corps is also required to comply with the National Environmental Policy Act (NEPA) when issuing a 404 permit, to address the environmental effects of the project being permitted. For IPs, this generally entails preparation of an Environmental Assessment (EA) but can involve preparation of an Environmental Impact Statement (EIS) if the project would result in significant environmental impacts. NWPs currently in effect have already been addressed through NEPA, therefore, no additional NEPA compliance is necessary for NWPs. The Corps needs to comply with NEPA through preparation of an EA or EIS when issuing a PGP or an RGP.

4.1.3 Clean Water Act Section 401

In accordance with Section 401 of the Clean Water Act, any applicant requiring a Section 404 permit must also seek certification from the State that the proposed activity will not violate State and Federal water quality standards. This Water Quality Certification (WQC) process is described further in Section 6.0. Any requirements of Section 401 WQC or wavier of certification will be a condition of the Corps authorization.

4.1.4 National Historic Preservation Act

The Corps is required to comply with the National Historic Preservation Act (NHPA) when issuing a 404 permit for a project, through consultation with the State Historic Preservation Officer (SHPO) for any project with potential to cause adverse effects on a historic property that qualifies for inclusion in the National Register.

4.1.5 Federal Endangered Species Act

To comply with the Federal Endangered Species Act (FESA), the Corps must formally consult with the U.S. Fish and Wildlife Service (Service) and/or NOAA Fisheries regarding effects to any federally listed species under their jurisdiction that are likely to be adversely affected by the proposed activity, as described in Section 5.0 below. The Corps must ensure that the federal action (permit issuance) does not jeopardize the continued existence of any federally listed species or adversely modify formally designated critical habitat.

4.2 Strategy for Meeting Corps Compliance under Creek Plan

4.2.1 Programmatic General Permit

The proposed approach for Section 404 compliance is establishment of a Programmatic General Permit (PGP) as described in section 4.2.1, above. Measures would be incorporated into the PGP to ensure that environmental impacts are minimized and mitigated, and that the program provides a net benefit to aquatic habitats and the fish and wildlife species dependent upon them. It is anticipated that some projects to be covered under the PGP would require Corps notification with an abbreviated review process. This notification would allow the Corps to track projects and to confirm that projects are appropriate for inclusion under the PGP. Other activities resulting in negligible or minor impacts would not require notification, or might be included in annual reports to the Corps. The types and size of projects that would require notification would be specified in the PGP.

The Corps would likely need to prepare an EA to comply with NEPA prior to issuance of the PGP. To facilitate this process, the City could prepare a draft EA for the Corps to adopt and/or modify as needed. To comply with Clean Water Act Section 401, a WQC approach would be issued for all activities covered under the RGP as described in Section 6.0, below.

To comply with Section 106 of the NHPA, a programmatic agreement would be developed between the Corps and SHPO. A record search for historic resources would be conducted, and a programmatic-level analysis would be conducted to assess the potential for historic resources within the plan area that may be eligible for the National Historic Register. An approach would be developed for ensuring that restoration and maintenance activities avoid impacts to historic resources that are potentially National Historic Register eligible, and for consulting with SHPO for activities that are unable to avoid such resources. The programmatic 106 agreement would need to be adopted by the Corps and SHPO.

The Corps' responsibility for compliance with FESA would be met through section 7 consultation with the Service and NOAA Fisheries, as described in section 5.0, below.

4.2.2 Alternative Strategy: Nationwide Permits

The Corps is currently very understaffed due to budget constraints and the large volume of applications being received. While the PGP described above would reduce agency workload over the long-term, it would require a considerable amount of up-front work on the part of the Corps to process the permit. Therefore, as an alternative, projects could be processed through the NWP process described above. Many of the maintenance and restoration activities would likely fall under the following NWPs:

NWP 3. Maintenance. The repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area including those due to changes in materials, construction techniques, or current construction codes or safety standards which are necessary to make repair, rehabilitation, or replacement are permitted, provided the environmental impacts resulting from such repair, rehabilitation, or replacement are minimal. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction. This nationwide permit authorizes the repair, rehabilitation, or replacement of those structures destroyed by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced or under contract to commence within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornados, this two-year limit may be waived by the District Engineer, provided the permittee can demonstrate funding, contract, or other similar delays. Maintenance dredging and beach restoration are not authorized by this nationwide permit. (Sections 10 and 404)

NWP 7. Outfall Structures. Activities related to construction of outfall structures and associated intake structures where the effluent from the outfall is authorized, conditionally authorized, or specifically exempted, or are otherwise in compliance with regulations issued under the National Pollutant Discharge Elimination System program (Section 402 of the Clean Water Act), provided that the nationwide permittee ***notifies*** the district engineer in accordance with the "Notification" general condition. (Also see 33 CFR 330.1(e)). Intake structures *perse* are not included - only those directly associated with an outfall structure. (Sections 10 and 404).

NWP 13. Bank Stabilization. Bank stabilization activities necessary for erosion prevention provided:

a. No material is placed in excess of the minimum needed for erosion protection;

b. The bank stabilization activity is less than 500 feet in length;

c. The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line;

d. No material is placed in any special aquatic site, including wetlands;

e. No material is of the type or is placed in any location or in any manner so as to impair surface water flow into or out of any wetland area;

f. No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and,

g. The activity is part of a single and complete project.

Bank stabilization activities in excess of 500 feet in length or greater than an average of one cubic yard per running foot may be authorized if the permittee ***notifies*** the district engineer in accordance with the "Notification" general condition and the district engineer determines the activity complies with the other terms and conditions of the nationwide permit and the adverse environmental impacts are minimal both individually and cumulatively. (Sections 10 and 404)

NWP 18. Minor Discharges. Minor discharges of dredged or fill material into all waters of the United States provided:

a. The discharge does not exceed 25 cubic yards;

b. The discharge will not cause the loss of more than 1/10 acre of a special aquatic site, including wetlands. For the purposes of this nationwide permit, the acreage limitation includes the filled area plus special aquatic sites that are adversely affected by flooding and special aquatic sites that are drained so that they would no longer be a water of the United States as a result of the project;

c. If the discharge exceeds 10 cubic yards or the discharge is in a special aquatic site, including wetlands, the permittee ***notifies*** the district engineer in accordance with the "Notification" general condition. For discharges in special aquatic sites, including wetlands, the notification must also include a delineation of affected special aquatic sites, including wetlands. (Also see 33 CFR 330.1(e)); and

d. The discharge, including all attendant features, both temporary and permanent, is part of a single and complete project and is not placed for the purpose of stream diversion. (Sections 10 and 404)

NWP 19. Minor Dredging. Dredging of *no more than 25 cubic yards* below the plane of the ordinary high water mark or the mean high water mark from navigable waters of the United States as part of a single and complete project. This nationwide permit does not authorize the dredging or degradation through siltation of coral reefs, submerged aquatic vegetation, anadromous fish spawning areas, or wetlands or, the connection of canals or other artificial waterways to navigable waters of the United States (see Section 33 CFR 322.5(g)). (Section 10)

NWP 27. Wetland and Riparian Restoration and Creation Activities. Activities in waters of the United States associated with the restoration of altered and degraded non-tidal wetlands and creation of wetlands on private lands in accordance with the terms and conditions of a binding wetland restoration or creation agreement between the landowner and the U.S. Fish and Wildlife Service (USFWS) or the Soil Conservation Service (SCS); or activities associated with the restoration of altered and degraded non-tidal wetlands, riparian areas and creation of wetlands and riparian areas on U.S. Forest Service and Bureau of Land Management lands, Federal surplus lands (e.g., military lands proposed for disposal), Farmers Home Administration inventory properties, and Resolution Trust Corporation inventory properties that are under Federal control prior to being transferred to the private sector. Such activities include, but are not limited to: Installation and maintenance of small water control structures, dikes, and berms; backfilling of existing drainage ditches; removal of existing drainage structures; construction of small nesting islands; and other related activities. This nationwide permit applies to restoration projects that serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and "natural" functions of riparian areas. For agreement restoration and creation projects only, this nationwide permit also authorizes any future discharge of dredged or fill material associated with the reversion of the area to its prior condition and use (i.e., prior to restoration under the agreement) within five years after expiration of the limited term wetland restoration or creation agreement, even if the discharge occurs after this nationwide permit expires. The prior condition will be documented in the original agreement, and the determination of return to prior conditions will be made by the Federal agency executing the agreement. Once an area is reverted back to its prior physical condition, it will be subject to whatever the Corps regulatory requirements will be at that future date. This nationwide permit does not authorize the conversion of natural wetlands to another aquatic use, such as creation of waterfowl impoundments where a forested wetland previously existed. (Sections 10 and 404)

5.0 FISH AND WILDLIFE SERVICE/NOAA FISHERIES

5.1 Existing Laws and Regulatory Process

5.1.1 Federal Endangered Species Act

FESA is administered by NOAA Fisheries for anadramous fish, and by the Service for other listed fish and wildlife species. Listed species that could be affected by restoration and maintenance activities within the plan area are described below.

a. Listed Species in the Plan Area: The Central Valley steelhead (*Oncorhynchus mykiss*) is a federally listed threatened species that occurs in the uppermost portions of the Dry Creek watershed (e.g., Miner's Ravine and Secret Ravine). The fall/late fall-run Chinook salmon (*Oncorhynchus tshawytshca*), a candidate for federal listing, is also present in the Dry Creek watershed within the City.

NOAA Fisheries is currently in the process of formally designating critical habitat for 20 evolutionarily significant units (ESUs) of salmon and steelhead, including the Central Valley ESU for steelhead (Fed. Reg. 68-188 (55926-55932). However, there is currently no formally designated critical habitat within the City.

Federally listed anadramous fish species and their critical habitat are protected under the regulatory authority of NOAA Fisheries. Creek maintenance and restoration activities could affect these species and trigger regulatory requirements under FESA, although restoration activities under the plan are expected to provide a net benefit to salmonids.

The valley elderberry longhorn beetle (VELB) is a federally threatened species protected under the regulatory authority of the Service. This species occurs in elderberry shrubs in the Central Valley and foothills. The Service generally treats shrubs with stem size of 1 inch or greater in diameter as suitable habitat for VELB, and typically assumes presence of VELB in any shrubs with these characteristics. Take of VELB could occur when maintenance or restoration activities in the City result in removal or disturbance of elderberry shrubs occupied by VELB.

b. Regulatory Requirements: Section 9 of FESA prohibits the taking of any federally listed species. Take can be authorized in two ways: (1) through Section 7 of FESA for activities with Federal involvement; and (2) through Section 10 of FESA for activities with no Federal involvement.

Section 7 of FESA requires a Federal agency to consult with the Service or NOAA Fisheries for any action which may affect federally listed species. Through the informal consultation process, the agencies determine whether the proposed activity is likely to adversely affect the species. If the agencies determine through informal consultation that the action "is not likely to adversely affect" federally listed species, this finalizes the informal consultation process and formal consultation is not necessary. If the action "is likely to adversely affect" federally listed species, the agencies are required to go through a formal consultation process pursuant to Section 7, to determine whether the action would jeopardize the species' survival and recovery. NOAA Fisheries or the Service issue a Biological Opinion with a determination as to whether the action could jeopardize the continued existence of the species or result in adverse modification of critical habitat. If the activity could jeopardize a listed species or result in adverse critical habitat modification, the Service or NOAA Fisheries provides reasonable and prudent alternatives to avoid jeopardy or adverse modification. Take of listed species is authorized through an Incidental Take Statement issued in conjunction with the Biological Opinion.

Section 10 of FESA allows for take of federally listed species for entities who have prepared a Habitat Conservation Plan that includes (1) an assessment of impacts likely to result from the proposed taking; (2) measures to be implemented to monitor, minimize, and mitigate these impacts; (3) alternatives to the proposed taking, and why these alternatives will not be implemented; and (4) other measures as required by the Service or NOAA Fisheries. An Implementation Agreement is prepared as a legal instrument to bind the parties to the terms of the HCP. When the agency approves the HCP, an Incidental Take Permit (ITP) is issued which authorizes take of covered species for activities implemented consistent with the terms of the HCP

5.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits taking of migratory birds. Birds protected under the MBTA include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows and others, including their body parts (feathers, plumes, etc.), nests, and eggs. Take is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities." Take does not include habitat destruction or alteration, as long as there is not a direct taking of birds, nests, eggs, or parts thereof.

5.1.3 NEPA and National Historic Preservation Act

NOAA Fisheries and the Service are also required to comply with NEPA and the NHPA for actions they undertake, including permitting. However, the Corps typically takes the lead on NEPA and NHPA compliance for actions requiring a 404 permit, and therefore the NOAA Fisheries and the Service have no further requirements under these acts. In the absence of another Federal agency to take on these regulatory responsibilities, NOAA Fisheries and the Service must comply with these regulations.

5.2 Strategy for NMFS and USFWS Compliance Under the Creek Plan

5.2.1 Formal Consultation through Programmatic General Permit

The proposed approach for FESA compliance is section 7 consultation between the Corps and wildlife agencies through a PGP issued by the Corps. This would include consultation between the Corps and the Service for valley elderberry longhorn beetle, and between NOAA Fisheries and the Corps for anadramous fish, specifically Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon.

The consultation with NOAA Fisheries for Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon would likely be informal. That is, a Biological Assessment would be prepared for anadramous fish, including a project description that outlines measures to ensure that the restoration and stream maintenance activities would avoid adverse effects on anadramous fish. The City would coordinate with the Corps and NOAA Fisheries to develop a program that avoids adverse effects on these species. The Corps would then make a "not likely to adversely affect" determination, and seek concurrence from NOAA Fisheries. The consultation process would be completed with this "not likely to adversely affect" determination.

For valley elderberry longhorn beetle, the City would prepare a Biological Assessment clearly detailing (1) all the types of activities that may affect the species; (2) conservation measures to be implemented to avoid, minimize, and offset these impacts; (3) total additive impact threshold for all projects to be addressed under the biological opinion; and (4) an assessment of the effects to listed species that would result from the proposed activities along with the proposed conservation measures. The Biological Assessment would be prepared using a format that facilitates incorporation into the Biological Opinion, to expedite the Service's preparation of the Biological Opinion and reduce agency workload.

Measures would be incorporated into the programmatic agreements with the Service to avoid take of migratory birds. This would likely involve seasonal restrictions to avoid disturbance of nesting birds. In cases where activities must occur during the nesting season, activities would be designed to avoid disturbance in the immediate vicinity of active nests that could result in take as defined under the MBTA.

The Corps will be the NEPA lead, as described in section 4.1.2, in the context of approving the PGP.

5.2.2 Alternative Strategy: "Not Likely to Adversely Affect"

The Service is currently very understaffed due to budget constraints and the large volume of applications being received. While the Biological Opinion described above would reduce agency workload over the long-term, it would require up-front work on the part of the Service to prepare the Biological Opinion. Therefore, as an alternative, clear design measures and parameters could be defined for projects to follow in order to achieve a "not likely to adversely affect" determination for VELB. If a PGP is issued by the Corps, then the "not likely to adversely affect" determination for VELB would follow the same procedure as that described above for NOAA Fisheries addressing anadramous fish. If the alternative 404 strategy is instead implemented (NWPs), then the City could seek a letter agreement with both NMFS and FWS outlining specific parameters under which "not likely to adversely affect" determinations could be made for maintenance and restoration projects. Any project unable to follow these procedures would need to go through the section 7 consultation process. However, projects that require a Corps permit and impact less than 25 elderberry plants, with less than 200 stems measuring one inch or more in diameter, along a length of less than 250 feet of undeveloped watercourse, could utilize the Service's relatively streamlined Programmatic Consultation process for VELB.

6.0 REGIONAL WATER QUALITY CONTROL BOARD

6.1 Existing Laws and Regulations

6.1.1 Water Quality Certification

In accordance with Section 401 of the Clean Water Act, any applicant requiring a Corps permit to fill into waters of the United States must receive State Water Quality Certification (WQC) to ensure that the proposed activity will not violate State and Federal water quality standards. The WQC is based on a finding by the Regional Water Quality Control Board (RWQCB) that the proposed Section 404 discharge will comply with all pertinent water quality standards.

In order to receive a WQC, a project must demonstrate that it meets state water quality standards. These standards include the following (1) beneficial uses (uses of water for drinking, agriculture, navigation, recreation, and fish and wildlife habitat); (2) objectives (numeric and narrative limits on water characteristics, or bans on substances which affect water quality); and the anti-degradation Policy (requires that existing high quality waters be protected and maintained). The RWQCBs maintain Water Quality Control Plans (Basin Plans) for each major hydrologic basin in California, describing the applicable water quality standards for each basin.

6.1.2 Other Regulatory Requirements

The RWQCB is a state agency required to comply with CEQA. RWQCB is generally not the Lead Agency, and must simply ensure that CEQA requirements have been fulfilled by the Lead Agency before issuing a WQC.

6.2 Strategy for Creek Plan Water Quality Certification

The strategy for Section 401 compliance for creek maintenance and restoration activities is to receive certification in conjunction with the PGP issued by the Corps. Examples of this approach include 401 certification issued in conjunction with the Corps RGP for removal of invasive plants in the Los Angeles District (RGP 41) and 401 certification in conjunction with emergency repair and protection activities in the San Francisco District (RGP 5). Individual projects covered under the PGP which require Corps notification will also require RWQCB notification, to allow RWQCB to track projects and ensure compliance with standard conditions.

7.0 JOINT NOTIFICATION/APPLICATION PROCESS FOR RESTORATION PROJECTS

It is anticipated that the City will be a partner in each of the restoration projects implemented under the Creek Plan, and will assist landowners or other entities choosing to implement a creek restoration project in completing the requirements for regulatory compliance. Individual projects being implemented under the plan and covered under the various programmatic regulatory programs would typically require some level of notification or simplified application process. As part of the consolidated permitting program, a system will be developed to facilitate the application/notification process for each restoration project by providing a single application/notification form to be used for review by all the appropriate agencies.

Applicants will be able to fill out a single form to fulfill all the environmental regulatory requirements for a restoration project. Joint Aquatic Resources Applications (JARPAs) are successfully being used by the Department of Ecology in Washington, and by the Association of Bay Area Governments in California. Applicants complete a single JARPA form and submit a copy to each State, Federal, and local agency with jurisdiction over their project.

Additionally, a checklist will be developed for entities moving forward with restoration projects to determine whether or not various authorizations are needed. The checklist will also outline measures to avoid impacts and thereby avoid the need for further authorization, as would be specified in the programmatic agreements with each agency.

8.0 SUMMARY

In summary, the following strategy will be used to meet regulatory requirements for each agency, to facilitate review and approval of creek maintenance and restoration activities in the City:

- CDFG: Prepare a Programmatic Streambed Alteration Agreement to cover restoration and maintenance activities not covered under the current MOU. CDFG will be a Responsible Agency and the City will be the Lead Agency to comply with CEQA requirements..

- Corps: Process a PGP to comply with Section 404 of the Clean Water Act. Corps will be the lead agency for NEPA compliance (probably an EA), although the City or the City's consultant may prepare this document for adoption by the Corps. The Corps will consult with the federal wildlife agencies pursuant to section 7 of FESA regarding federally listed species, and will coordinate with SHPO in preparation of a programmatic agreement for compliance with Section 106 of the National Historic Preservation Act.

  Although the PGP would be expected to reduce agency workload over the long term, current staffing constraints may prevent the Corps from carrying out the upfront work necessary to process a PGP. If the Corps is unable to devote staff time to this process, an alternative strategy is to process NWPs as described in section 4.2.2, above. This process could be facilitated and streamlined through the joint notification/application process described in Section 7.0.

- Service/NOAA Fisheries: The covered activities will be designed in coordination with NOAA Fisheries to avoid impacts to anadramous fish. The goals is to reach a "not likely to adversely affect" determination from the Corps, with concurrence from NOAA Fisheries, for anadramous fish. The Corps will formally consult with the Service to address effects to valley elderberry longhorn beetle, and take of this species associated with implementation of the Creek Plan will be authorized through this consultation process. Measures to avoid impacts to nesting migratory birds will be incorporated into the plan for compliance with MBTA.

  Although section 7 consultation through the PGP process would be expected to reduce agency workload over the long term, current staffing constraints may prevent the Corps and the Service from carrying out the upfront work necessary to process a section 7 biological opinion with a PGP. If the agencies are unable to devote staff time to this process, an alternative strategy is to outline specific measures for avoiding impacts to VELB in a letter agreement to be signed by the Service. Another alternative is to use NWPs and the Programmatic Consultation between the Corps and Service for VELB, as described in Section 5.2.2.

- RWQCB: A programmatic WQC will be sought in conjunction with issuance of the Corps' PGP. If the PGP is not sought, and the City alternatively chooses to utilize NWPs, then WQCs will need to be sought for each project rather than a single WQC for implementation of the entire Creek Plan. In this case, the WQC application process will be folded into the joint notification/application process described in Section 7.0, along with the PGP process, to streamline permitting and avoid duplication of effort.

To satisfy and facilitate the notification/application process for each individual restoration project to be implemented under the Creek Plan, a standard application/ notification form will be developed. This single form will be used for all regulatory authorizations, and will include all the information necessary for each agency to make its required findings for project authorization.

9.0 LITERATURE CITED

Foothill Associates, 2004a. Roseville Creek and Riparian Management and Restoration Plan. Prepared for City of Roseville. July.

Foothill Associates. 2004b. Consolidated Permitting Proposal for Roseville Creek and Riparian Management and Restoration Projects. Prepared for City of Roseville. March.

Foothill Associates, HDR, Ganda Associates. 2001. Administrative Draft Roseville Creek Riparian Management and Restoration Plan, Existing Conditions Report. September.

Gordon, S.C. Land, Air and Water: Innovative Approaches to Conserving Wetlands. University of Oregon, Environmental Law Conference. Eugene, Oregon. March 3

Sawyer, J. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. CNPS Press. 412. pp.

Appendix I: Santa Rosa Creek Revitalization Project

Santa Rosa Transforms an Eyesore Into a Lush Greenway

During the 1960s, the City of Santa Rosa channeled the Santa Rosa Creek for flood control using large chunks of concrete tossed together in loose piles known as riprap. While this strategy prevented flooding, it destroyed the natural beauty of the creek and the native steelhead habitat in this Northern California city. The creek area also became a haven for homeless encampments, drug use and vandalism.

In the late 1980s, a handful of interested citizens gathered together and generated enough enthusiasm to engage local, state and federal elected officials in discussing solutions to resolve these issues. The Committee for Restoring Santa Rosa Creek was subsequently formed in 1989.

Santa Rosa Creek has become a model of urban creek restoration that addresses social as well as environmental and educational goals.

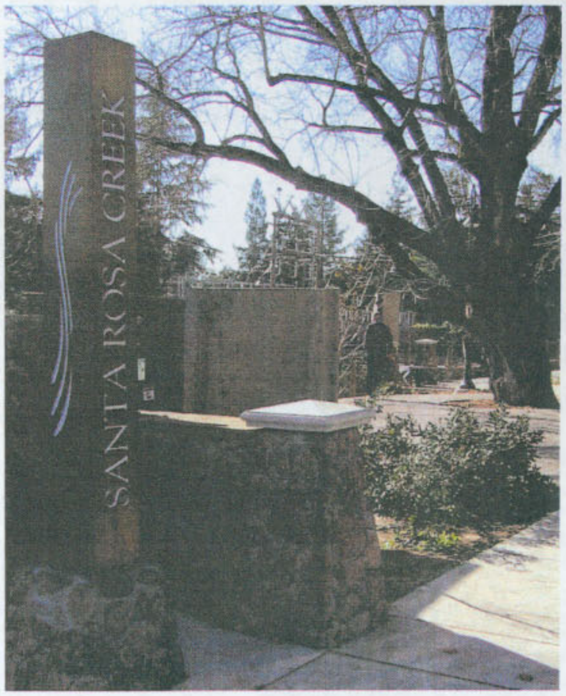
The committee launched a grassroots effort to develop community awareness of the creek's presence and initiate a community-based master planning process for its restoration. The committee held several workshops that brought together hundreds of citizens to share their vision and ideas for the Santa Rosa Creek Master Plan, which was adopted by the City of Santa Rosa, the County of Sonoma and the Sonoma County Water Agency in 1993.

The primary task was to revamp the creek for public use and benefit. The project goals included:

- Creating a more natural creek environment;
- Maintaining flood control;
- Removing toxic materials along the creek;
- Restoring creek habitat to save endangered and threatened species of fish and wildlife;
- Creating a bicycle and pedestrian path to link downtown and Railroad Square;
- Creating environmental education opportunities; and
- Increasing tourism and revitalizing downtown and Railroad Square.

Securing Funding and Partners

Recognizing that these goals would require significant resources, the Santa Rosa Creek Committee sought partners for funding and expertise in numerous ways. With a lead gift from the Prince Family Trust, the project was "christened" the Prince Memorial Greenway. In addition to the Prince donation, major funding was provided by the Sonoma County Open Space District, the Natural Resource Conservation Service, the California Resources Agency, the Sonoma County Water



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The City of Santa Rosa won an Award for Excellence in the Public Works, Infrastructure and Transportation category of the 2004 California Cities Helen Putnam Award for Excellence. For more information about the award program, visit www.cacities.org.

Using historic building materials, including stone, black cast iron, steel and wood, the creek has been transformed into a series of terraces with lush landscaping, trails, plazas and public art.

This mural is just one of many public art installations enhancing the creek.

Agency, the Santa Rosa Redevelopment Agency, California State Parks and Recreation and the California Department of Water Resources. Together these public agencies and nonprofit organizations contributed $19 million to fund the project.

Other state and federal agencies involved in the restoration project included the California Department of Fish and Game and the Army Corps of Engineers.

Demolition Reveals Surprises

Demolition of the existing channels was not an easy task. The concrete sides were removed with giant jackhammers and cranes to create a deeper, narrower channel within the larger channel for the fish to swim in. As work progressed, the city found that the banks had been used in the past as a dumping ground for everything from underground diesel tanks to rubble from the 1906 earthquake. Cleanup of toxic waste increased the cost of the project and complicated construction activities in the creek bed, which required additional funding from local and state agencies.

To maintain the channel's hydraulics, large boulders and rocks were interspersed with native riparian plantings and root wads for the fish. Native riparian vegetation was planted along the banks offering shade for the stream and habitat for wildlife. Deep pools were created along with gravel bars and riffles to provide steelhead habitat for juvenile rearing and adult migration.

The 0.6-mile creek restoration portion of the project stretches from Santa Rosa City Hall to Railroad Square. Late 19th- and early 20th-century vintage commercial and industrial buildings characterize the area. Using historic building materials, including stone, black cast iron, steel and wood, the creek has been transformed into a series of terraces with lush landscaping, trails, plazas and public art. The Prince Memorial Greenway features stone-lined retaining walls, curved stairs and ramps that lead to the water's edge, and benches, murals and sculptures. ArtStart, a local nonprofit that provides summer jobs for high school artists, created the murals and art benches.

Revitalizing Downtown, Increasing Tourism

Approximately $2 million of redevelopment funds were contributed to the Prince Memorial Greenway as part of the Santa Rosa Redevelopment Agency's Downtown Linkage Program to enhance connections between the east and west sides of downtown. The greenway is adjacent to another redevelopment project that was in the planning phase, the Hyatt Hotel and Conference Center.

The upscale 156-room hotel and spa, McCormick and Schmick Brasserie Restaurant, and approximately 21,000 square feet of executive meeting space opened for business in June 2002 at an estimated value of $30 million. The design and layout of the hotel and conference center was carefully planned to integrate with the Prince Memorial Greenway for the highest return on the agency's investment in both projects. A fine arts program valued at 1 percent of the construction cost was required by the redevelopment

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A hotel, conference center and restaurant complex help achieve the creek project's goal to improve tourism.

agency as a part of the hotel and conference center project. The installation of five sculptures, crafted by local artists, helps visually tie together the interface between the hotel and creek frontages.

Numerous Benefits for Residents And the Environment

This project on the five-mile stretch of Santa Rosa Creek, which runs through the downtown west to the Laguna de Santa Rosa, has increased the public's awareness of the entire creek system in Santa Rosa. Walkers, joggers and bicyclists of all ages are all enjoying the pleasant and peace-ful walkway.

In spring 2004, biologists observed increased numbers of juvenile steelhead trout in the creek and adult steelhead spawning upstream along with increases in the river otter and other wildlife populations. The project draws public attention to the dependence of wildlife, plants and fish on clean water in Santa Rosa Creek through the Creek Stewardship Program. The program offers citizens who live, travel and recreate along Santa Rosa's creeks the opportunity to protect and enhance the creeks they enjoy. Working with City of Santa Rosa staff, volunteer creek stewards are involved with trash removal, water quality, natural habitat, recreational opportunities, trail maintenance and neighborhood safety efforts.

Santa Rosa Creek has become a model of urban creek restoration that addresses social as well as environmental and educational goals.

Santa Rosa Transforms an Eyesore Into a Lush Greenway, continued from page 22

Bill Cox, fishery biologist with the California Department of Fish and Game says, "This project will have major benefits in the years ahead as people become more aware of and tuned into the stream. They've taken the stream out of the back alley and put it in the front yard."

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