6.0 RESTORATION STRATEGIES AND PROJECTS

As described in Chapter 3 of this ERP, the current land use configuration of the Pleasant Grove/Curry Creek watershed comprises roughly one quarter urbanized areas in the Roseville and Rocklin city limits and the balance in rural areas of Placer and Sutter counties. The watershed's rural areas are characterized by a matrix of scattered residential properties on large parcels, situated among agriculture lands in various stages of use ranging from active rice farming to fallow grasslands and pasture. Available habitat is largely associated with either the preserved open space corridors in the urban areas or the undeveloped rural areas. Since the likely future build-out of the watershed will see a doubling of the urban area with a corresponding reduction in the rural areas, the most significant impacts to habitat conditions will be development driven. For this reason, this ERP focuses recommendations on reducing the impacts of build-out on the sensitive resources within the watershed through the protection and enhancement of habitat and water quality.

Recommendations are provided in five categories. The first three categories address ecosystem restoration across the three spatial scales of Watershed/Region, Community, and Site. These scales may be thought of as "nested" with the broad vision of the Watershed/Region recommendations gaining in specificity as the focus moves down to the Community scale, and then down to the scale of specific Sites. The Community scale refers to areas that are typically in the range of many hundred of acres and are planned as discrete development projects, such as a specific plan area or community plan area. Sites are understood to be individual locations on the scale of dozens of acres or smaller. Strategies at all scales should support and reinforce each other. For example, individual preserves (sites) in urban areas should be located in places that are designated as open space by the Community plan. In turn, the Community plan open space areas should be consistent with the watershed/regional vision for habitat preservation. Preserve areas that are not in urban boundaries should refer directly to the watershed/regional vision. The remaining two categories are Mapping/Monitoring and Stakeholder Education. Recommendations in these categories are potentially relevant at all three scales of restoration activity (Figure 6-1).

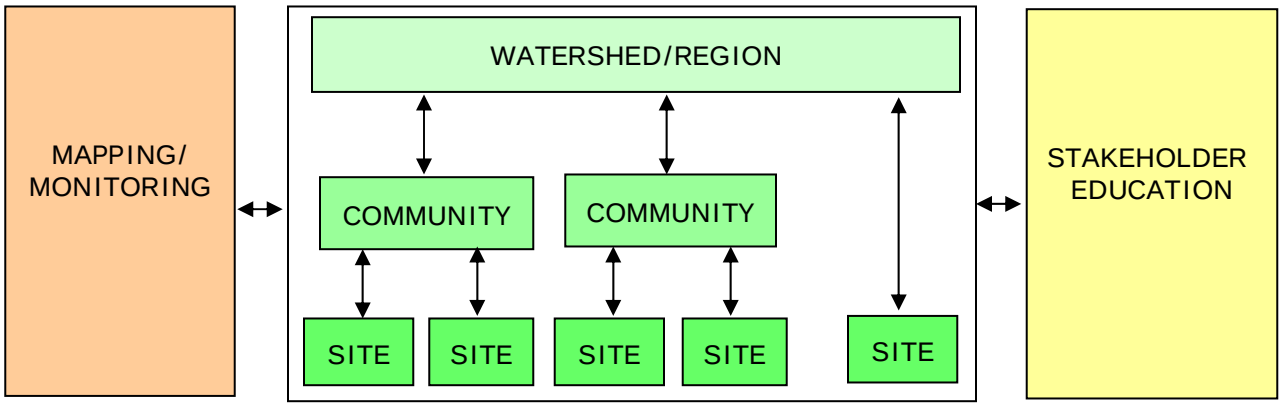


Figure 6-1 Organization of ERP Strategies

This chapter also provides an analysis of the potential benefits associated with implementation of the recommended Community scale strategies for Low Impact Development in several portions of the watershed for which development plans are still at a very conceptual stage. This exercise modifies the likely build-out condition described in Chapter 4 to create a future scenario that is more sensitive to natural resources and may also providing a higher quality of life to area residents.

6.1 WATERSHED/REGIONAL STRATEGIES

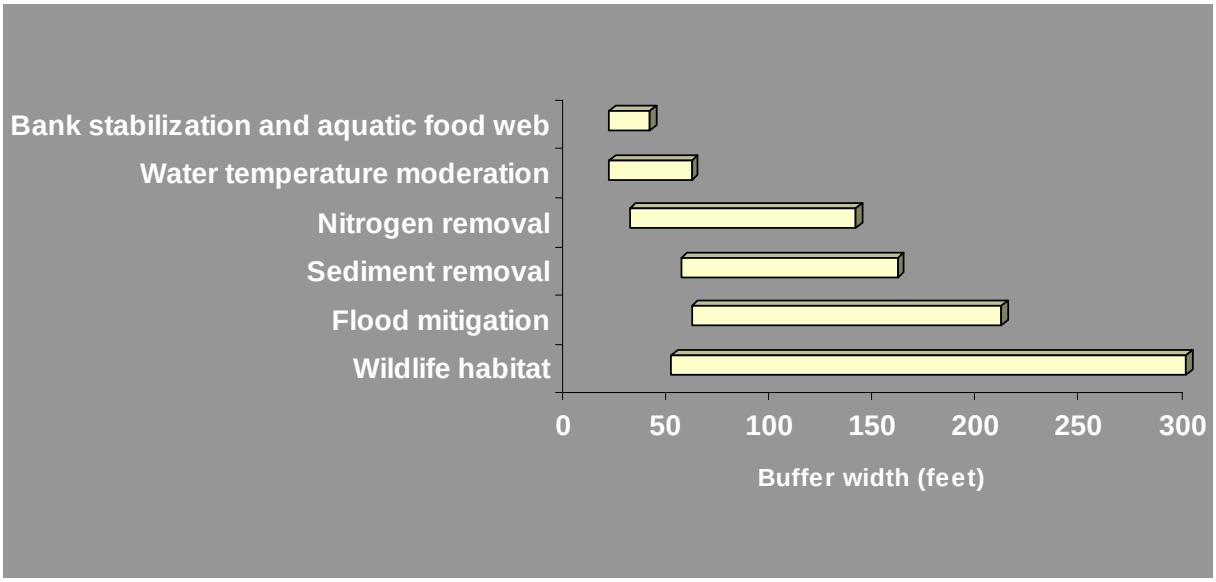
The following section presents strategies that support ecosystem restoration at the scale of the entire watershed and, to some extent, the surrounding region. These recommendations typically describe either a change or enhancement to land use policy or a large scale planning effort that will set the strategic framework within which restoration efforts at the Community and/or Site scale may be implemented. It is important to recognize that because multiple jurisdictions have regulatory authority within the watershed, pursuit of these strategies will require coordination and cooperation among these stakeholders.

6.1.1 Riparian Buffers Preservation and Enhancement

Current Placer County regulations restrict development within 100 feet of perennial and 50 feet of intermittent streams. Within this watershed, Pleasant Grove Creek, South Branch Pleasant Grove Creek, Kaseberg Creek and Curry Creek and the major tributaries noted in the study should be considered perennial streams. 100-foot buffers are commonly used for

protection of water quality and habitat; however, for improved sediment removal, flood mitigation and wildlife habitat, buffers as wide as 300 feet could be beneficial as depicted in Figure 6-2.[74]

Figure 6-2 Minimum Riparian Buffer Widths

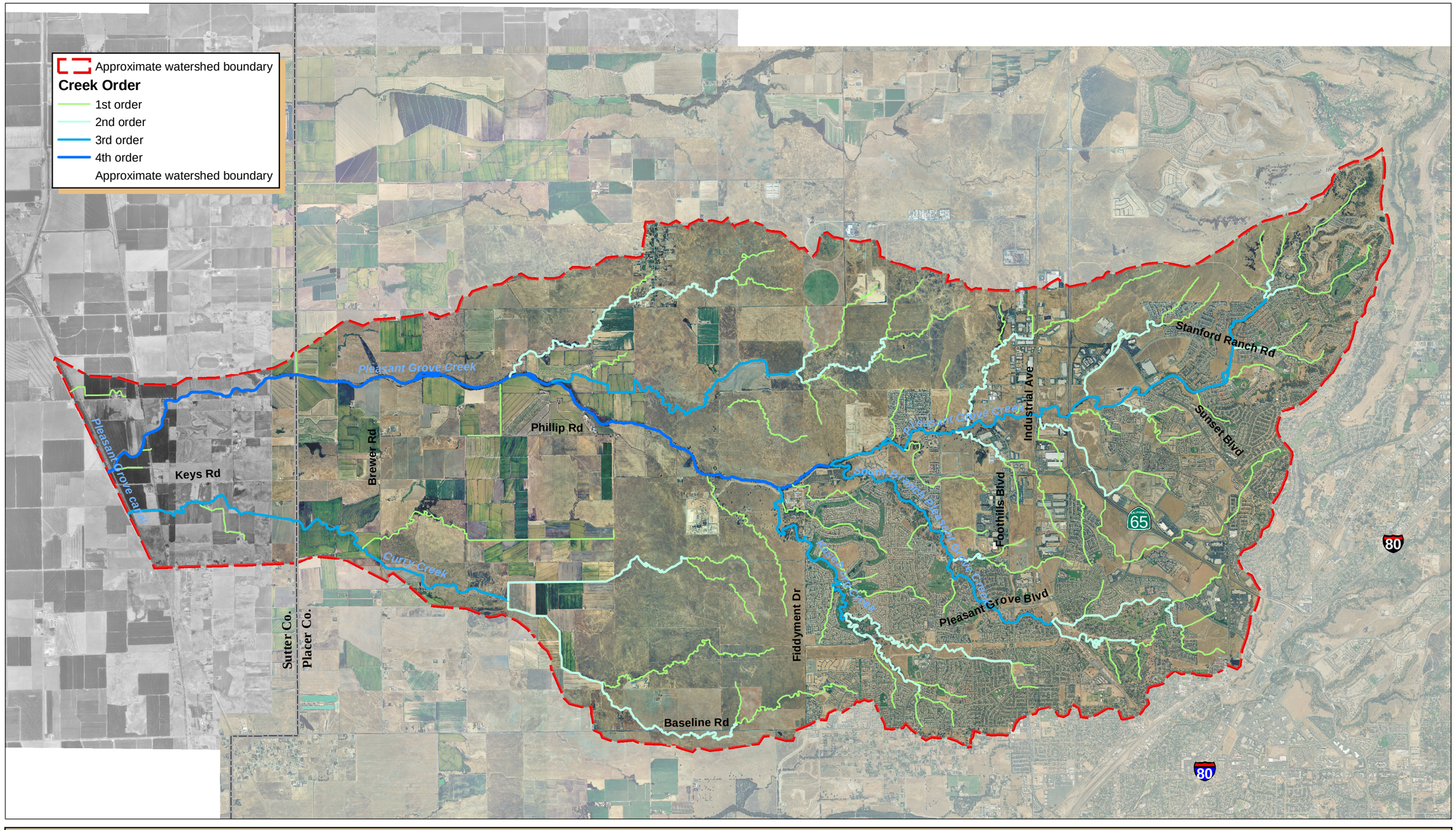


A recent report by Jones and Stokes (2005) recommends riparian setbacks in western Placer County ranging from 30m (98 ft) along 1st and 2nd order streams and 100m (328 ft) to 150m (492 ft) around 3rd and higher order streams and selected lower order stream sites, such as those adjacent to conservation lands. Stream order for the Pleasant Grove/Curry Creek watershed is shown in Figure 6-3. Additionally, the report recommends buffers of 30m (98 ft) beyond the edge of the active (2-10 year) floodplain to preserve hydrologic and geomorphic functions of the creek.

The topography and vegetative cover, however, is an important factor in evaluating the effectiveness of the buffer, and not incorporated into Placer County's creek set back requirements. Gradual slopes covered with dense grassy vegetation are optimal for the removal of sediment and pollutants from sheet flow. As the slope increases and the vegetative cover decreases, additional buffer widths will be needed to provide the same level of water quality benefit.

Additionally, it is important not to allow adjacent land uses to concentrate flow before it enters the buffer area. Vegetative buffers are not nearly as effective at removing pollutants in deep, fast moving flow as they are in shallow, dispersed sheet flow situations.

[74] U.S. Dept of Agriculture and U.S. EPA, 1997.



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LANDSCAPE ARCHITECTURE

STREAM ORDER MAP

PLEASANT GROVE/CURRY CREEK ECOSYSTEM RESTORATION PLAN

N

0 2,300 4,600
SCALE IN FEET

FIGURE 6-3

Springfield:\Pleasant_Grove_and_Curry_Creek\GIS_Projects\WDGT_Report_Figures\Fig 6-3_stream_order

Buffers also provide the potential benefit of preserving sufficient open space surrounding valley streams to allow them to meander without impacting adjacent land uses[75]. Existing development patterns tend to lock a creek into its existing meander pattern by building close around both sides of the stream. Creek maintenance entities then struggle against the creek's natural tendency to move through the process of erosion and deposition, often resulting in application of rip-rap or gabions on the outside meander bends. Riparian buffers sized to the width of the meander amplitude would allow the creek to continue to adjust its form within the floodplain, perhaps only requiring minor adjustments if it wandered too far towards the edge of the buffer. Buffers with a width equal to the meander amplitude would be sufficient to allow the creek to meander linearly along the floodplain. It may be better to size buffers to 1.5 to 2 times the natural meander amplitude of the subject creeks, which would allow lateral, as well as linear migration[76] (Figure 6-4).

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

[75] Mitch Swanson, Stream Erosion Management Workshop, 2004.

[76] Leopold, Trush & McBain, River Channels 2004, Teton Science School.

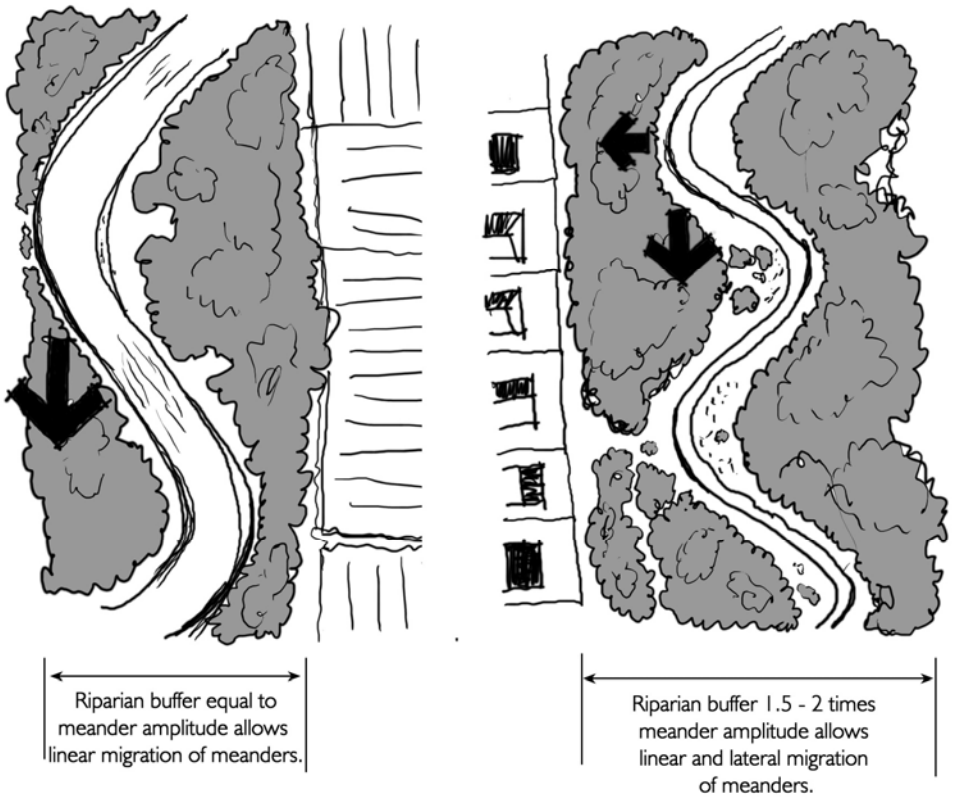

Figure 6-4 Riparian Buffer Widths as a Function of Meander Amplitude

6.1.2 Open Space Corridors / Network

The City of Roseville has established an extensive network of open space corridors that includes the major creek channels of the Pleasant Grove/Curry Creek watershed that are in the City limits. These open space areas also provide a variety of passive recreation opportunities. Placer County has developed a plan for the Dry Creek Greenway to provide similar preservation of creek habitat within the upper portion of the Dry Creek watershed. These types of coordinated approaches to corridor preservation should be implemented prior to further development in the remainder of the Pleasant Grove/Curry Creek watershed. Open space corridors should include riparian buffers and should form an interconnected network to facilitate wildlife migration and accommodate passive recreation at levels that do not compromise the habitat function of the corridor. Where feasible, this open space network should be integrated with the bicycle plans of the local jurisdictions to provide routes for both recreational trail users and commuters.

Open space corridors should occur at a range of scales including neighborhood connections to local parks and schools; city connections to

downtowns or central business districts, high schools, and shopping venues; and regional connections such as regional parks, creeks and rivers, and major transportation corridors. Open space corridors that include recreational trails and function as connections for wildlife migration will need to be sufficiently wide to accommodate the species of concern with any additional width as needed to allow for anticipated trail use. Jones and Stokes[77] suggests that most wildlife habitat functions in Western Placer County could be preserved by extensive riparian areas greater than 100m (328 ft) wide connected by narrower corridors of 30m (98 ft) width.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.1.3 Coordinated Habitat Conservation

Valuable habitats in the Pleasant Grove/Curry Creek watershed include vernal pools and other wetlands, grasslands, oak woodland savannas, riparian and other woodlands as documented in the existing conditions discussion in Chapter 3. It is important to coordinate habitat conservation objectives at the watershed scale and within the context of the surrounding region to achieve adequate acreage, biological diversity, and connectivity to support habitat viability.

Phase One of the Placer County Conservation Plan (PCCP) is positioned to provide a very significant degree of this coordination since all of the sensitive species covered by the Pleasant Grove/Curry Creek ERP are discussed in the PCCP. The PCCP covers western Placer County, and addresses conservation of sensitive resources by identifying both the types and general locations of habitat to be preserved or enhanced. The PCCP does not include the portion of the watershed in Sutter County, but discussions among the counties have focused on joint county efforts to improve fish passage and water fowl and Swainsons hawk conservation.

Placer County is working to coordinated habitat conservation within the Pleasant Grove/Curry Creek watershed by supplementing and refining the information in the PCCP with more detailed information about the watershed habitat including the Sutter County areas. This resultant conservation vision could then be used as a framework to guide implementation of a variety of habitat conservation measures ranging from the designation of preserve areas, planning for open space at the Community scale, establishing mitigation standards, and acquisition of

[77] Jones and Stokes, 2005.

conservation easements. Some of the factors that should be addressed by the coordinated habitat conservation vision include:

- Quality and types of existing habitat;
- Amount of existing habitat (of same type) remaining in the watershed;
- Sensitivity of the various species with the potential to use those habitats;
- Potential for enhancement of degraded habitat;
- Impact to surrounding habitat if land in question were developed; and
- Connectivity of existing habitat (of same type) remaining in the watershed, and whether this piece plays a significant role in that connectivity.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.1.4 Erosion Management Strategy

Erosion in the Pleasant Grove/Curry Creek watershed is of concern for several reasons. Within the watershed, erosion is occurring as a response to increased flows in both wet and dry seasons. The observed erosion is mainly related to bank failures in the creek channel and sheet flow across adjacent uplands. Erosion of bank channels is an issue where loss of riparian habitat is occurring at a rate that exceeds natural processes and/or there is insufficient buffer area for the riparian habitat to migrate. In these situations, mature oak woodlands are being lost with no corresponding opportunity for regeneration. Erosion related to sheet flow across adjacent uplands carries sediments that transport pollutants such as excess nutrients, pesticides, and herbicides into the creek. These in turn potentially damage aquatic habitat and water quality. The third issue related to sediment concerns potential downstream impacts. Erosion generated sediment originating in the watershed does eventually discharge into the Sacramento River where it can contribute to aquatic habitat degradation, turbidity, and siltation in the Delta.

A watershed erosion management strategy should include identification of erosion hotspots sources through a comprehensive study of the watershed, with ongoing updates by local municipality maintenance crews, volunteers, or public monitors. An erosion control specialist should classify the extent and severity of the erosion and determine appropriate control strategies. At the same time, the cause of the erosion needs to be

identified and then a solution developed and implemented to prevent future erosion. Damage to the creek and banks should be repaired or stabilized preferably using bioengineering techniques. A range of such techniques are included in Appendix A.

Priority: Medium

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.1.5 Beaver Management

Beaver populations in the Pleasant Grove/Curry Creek watershed need to be managed to prevent habitat degradation and adverse impacts on water quality. While beaver do provide certain ecosystem benefits, such as creating open water habitat for waterfowl, these animals can be excessively destructive to both existing and restored habitat. Some of the beaver impacts on watershed habitat include direct impacts to trees though culling, indirect impacts to trees through inundating species intolerant of prolonged submersion, such as valley oaks, blue oaks and interior live oaks, increased water temperatures and bacteria. The beaver management issue is especially problematic in the developed areas of the watershed where urban streams must carry storm water. Beaver dams impound water and increase the level of flooding upstream. If the floodplain is not wide enough to support this, damage to private property could occur.

The question is not whether beaver are good or bad, but rather how many beaver can the watershed support in balance with other ecosystem values. Jurisdictions within the watershed are currently working to determine appropriate beaver population levels, and taking actions to limit populations when these levels are exceeded. The City of Roseville has recently adopted a Beaver Management Policy that provides direction for areas within the City's boundaries. Roseville's approach establishes criteria for beaver management and provides a progressive approach to control, using the least harmful methods when feasible. The approach should be considered for adoption by other watershed jurisdictions, with coordination on criteria and implementation. It will be essential for all watershed jurisdictions to coordinate on this effort since beaver impacts are clearly not constrained by jurisdictional boundaries. Public education should also be a part of the beaver management strategy so that residents understand the impacts, criteria and range of management options.

Priority: Medium

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.1.6 Invasive Species Management

Invasive non-native plant and animal species contribute to habitat degradation by aggressively competing with and supplanting native species. There are a variety of non-native invasive species in the Pleasant Grove/Curry Creek watershed including arundo, water hyacinth, tree of heaven, and vinca. A multi-jurisdictional management strategy is needed to control their spread. The first step in developing this strategy is to conduct a comprehensive inventory of the species assessing their prevalence and impact on native flora and fauna. The priorities for non-native species eradication/management should correspond to the threat level. Coordination is also needed with agencies and organizations undertaking eradication efforts and/or active in invasive species management in other local watersheds such as the Sacramento Weed Warriors, SAFCA, and the Sacramento Weed Management Association. At a minimum, the management strategy should specify best management techniques for each species to be managed, establish thresholds for management action, designate responsibility for management, and identify funding and other resources in cooperation with the Pleasant Grove/Curry Creek Watershed Group and other agencies involved in weed management or watershed management activities.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.2 COMMUNITY STRATEGIES

The likely build-out condition is not highly desirable with respect to habitat and water quality preservation. While significant amounts of open space are preserved along local creeks, equally significant losses occur to open grasslands, riparian woodlands and vernal pools. The large-scale conversion of grassland to urbanized land uses cannot be significantly reduced based upon planning goals for the middle watershed, but some modifications to the likely build-out scenario to incorporate Low Impact Development concepts would help to improve quality of life within the urban areas and reduce some of the impacts of urbanization on the watershed.

6.2.1 Low Impact Development

Low Impact Development concepts such as on-site storm water collection and filtration, use of narrower streets and reduction in paved surfaces, and incorporation of mixed-use town centers, show potential for reducing the

impacts of urbanization on habitat, water quality and the hydrologic regime.[78]

These concepts were used successfully in Village Homes in Davis to create a medium density neighborhood with reduced impact on the land as compared to traditional development methods. Low Impact Development concepts are also used in several Placer County projects including the United Auburn Indian Community Center and the Eaglewood-Timilick community in the Martis Valley. The following are Low Impact Development concepts recommended for incorporation in future Pleasant Grove/Curry Creek watershed developments.

On-site Storm Water Management

New residential and commercial developments should be encouraged to capture storm water and other runoff on-site and convey it above ground in vegetated swales and detention wetlands to maintain pre-development surface-flow runoff conditions for water exiting the site. On-site detention basins have been required by Placer County, the cities, and PCFCWCD for new developments within the Pleasant Grove watershed for the past 10 years. Impervious surfaces, especially roads and parking lots, should be designed to drain into landscape areas before entering storm drain system. Storm water and other runoff can still be safely and efficiently drained, while capitalizing on the benefits of more naturalistic drainage pathways.

Routing storm water to local waterways via above-ground vegetated swales delays the time that water falling on impervious or saturated surfaces reaches local creeks, which broadens the floodwater curve and reduces peak flows. Additionally, passing storm water through swales in which herbaceous plants are growing filters and settles some of the contaminants that may be carried by that storm water. If theses swales can be routed to small detention wetlands, additional filtering and settlement will occur. Wetlands of 60 to 120 feet in length are sufficient for effective removal of most contaminants, except for some aqueous chemicals and bacteria[79]. Large regional detention basins are not as preferable because they mitigate for impacts farther away from the source. While regional facilities are not always avoidable, it is important to recognize that they do not mitigate for or prevent impacts upstream of the basin.

Detention mechanisms include basins, wetlands, infiltration areas, and other means to slow runoff and provide infiltration into the soil. Detention

[78] US Department of Housing and Urban Development, 2003 and Maryland Department of Environmental Resources, 1999.

[79] France, 2003.

facilities should be designed to not only reduce peak storm water flow, but to manage summertime nuisance flow from sources such as irrigation. This is especially important in the Pleasant Grove system where increases in dry season flows in recent years have resulted in damage to oak habitat within the riparian zone. If detention, retention and infiltration are used at a variety of scales, from dry wells on downspouts of individual homes to neighborhood scale wetlands, the impacts to the hydrologic regime of local creeks may be significantly reduced. Development of multi-purpose detention facilities should be encouraged. Basins can be combined with filtration wetlands, recreation facilities, overflow parking lots, or other uses that are not degraded by occasional inundation.

Detention wetlands can also be a resource for the residential or commercial development of which they are a part, attracting birds and other wildlife and forming an attractive amenity for the residents or visitors.

Detention wetlands may also prove beneficial to water quality during site construction. If designed to handle storm water runoff from a construction site, they could help to filter and remove fine sediment downstream of a conventional settling basin. This may allow reduction in the size of the settling basin needed as well as help to avoid SWPPP violations in larger storm events if the basin overflows. Following construction, the facility could be converted to a storm water detention basin and a filtration wetland.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

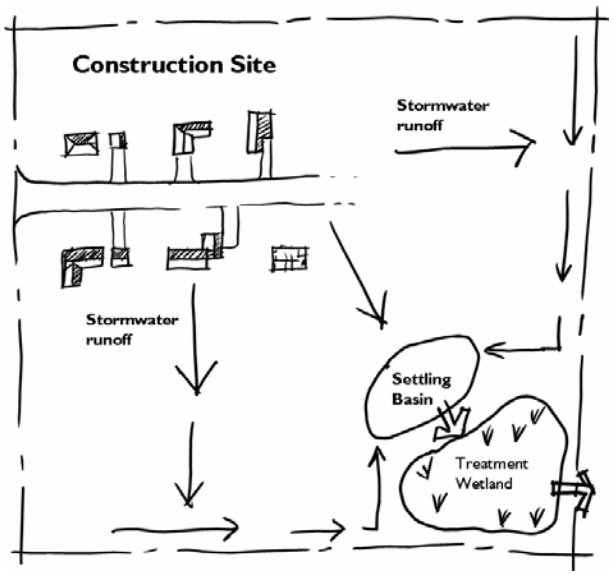

Figure 6-5 Detention Wetland Used to Filter Sediment on Construction Site

Road Design

The design of roads and crossings impact creek systems in a number of ways, including creating barriers to water flow, wildlife migration and fish passage, disturbance of the streambed while under construction, and introduction of contaminants from road materials and automotive travel. Additionally, road networks contain large amounts of impervious surfacing, which, without detention, increases peak flood flows in creeks and significantly changes hydrologic regimes, creating incision, increased erosion, impacts to riparian vegetation, and other negative effects. It is often difficult to incorporate detention into roadway projects because of the amount of land necessary to accommodate storm water detention and the linear nature of roadways.

The following measures can help to reduce impacts of roads and associated infrastructure on habitat, water quality and stream stability:

- Vegetated swales with detention wetlands should be utilized in road rights-of-way to intercept, filter and detain runoff on local, collector and arterial roadway. Swales might be combined with
  - Flush-curb streets on local roads to keep runoff above-ground.
  - Medians with flush-curbs and vegetated swales on arterial streets to collect, filter and detain runoff.

- Creek crossings should be minimized. In one location in the City of Roseville, 4 bridges cross the creek within approximately ¼ mile. Road design which minimizes creek crossings will help to limit impacts and preserve wildlife migration corridors.
- Where creek crossings are necessary, bridges are the preferred alternative. Free-span bridges impact creek channels and flood plains less than bridges supported by columns embedded in the creek bed and floodplain.
- Open-bottom culverts can be used for crossings where bridges are not warranted. Bridges are more beneficial than culverts because they generally have a lower impact on the creek and provide more room for wildlife to pass beneath, but on local roads, the cost of a bridge may not be warranted. In such a case, wide, open bottom culverts such as low-span arches are preferred to closed culverts. Open bottom culverts allow the creek to maintain a natural streambed, which facilitates fish passage and provides more beneficial aquatic habitat.
- Hard armoring of banks at bridge abutments using rip-rap or gabions should be avoided if at all possible. Instream structures such as V-weirs, W-weirs and J-hooks are preferred methods of keeping flows in the middle of the channel and avoiding bank erosion[80].
- Culverts and bridges should be wider than the bankfull channel to accommodate wildlife passage. Where possible, the natural channel bottom should be retained. There preferred width will vary depending on the specific types of wildlife that might utilize the passage and the hydrology of the creek. Road engineers should include consultation with a qualified wildlife biologist to establish appropriate culvert/bridge widths.
- Permeable or porous paving should be used for interior alleys, courts and parking lots.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Mixed-Use Town Centers

Another new Low Impact Development concept that seems promising is the creation of town centers with higher density housing, commercial

[80] Rosgen, D.L., The Cross-Vane, W-Weir and J-Hook Vane Structures…Their Description, Design and Application for Stream Stabilization and River Restoration. ASCE conference, Reno, NV, August, 2001.

services, schools and parks. These town centers serve as nodes for mass transit as well as provide local services to the surrounding community.

By containing both residential housing and destinations such as schools, parks and shopping, multi-use town centers reduce traffic on the local street network. The average American residential single-family household makes between 9 and 10 car trips per day[81]. By locating multiple uses in close proximity to one another, car trips can be combined or replaced by walking or biking. Additionally, mixed-use town centers provide residential homes at higher densities than typical suburban development, reducing the overall conversion of land to urban/suburban land use to accommodate a growing population. Finally, the higher densities and multiple uses of a town center support mass transit better than lower density suburban communities, which are often too dispersed for successful operation of bus and light rail service.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Schools and Parks Adjacent to Open Space

Schools and parks can benefit from proximity to open space and creeks through shared use of trail facilities and environmental education. Often, schools in proximity to creeks, such as Mira Loma High School on Arcade Creek, develop educational programs around the creek. Mira Loma's students study general environmental functions of the creek and riparian system, conduct water quality chemical analysis and bioassay, and do habitat mapping and assessment. Students who go through such a program receive a general introduction to the environmental benefits of healthy creeks and may be instilled with a greater appreciation of the local creek and sense of stewardship. These values may get passed on to their parents and may translate into more environmentally sound decision-making as the students become adults.

Trail systems that are shared between creek corridors and school/park sites not only provide alternative transportation routes to these locations, but also facilitate environmental education through interpretive signage located along the trail. Interpretive signage can help to educate the public on the impact of personal actions on creek systems, such as the affect of household and landscape chemicals on water quality, and as with school environmental programs, interpretive signage can help instill a greater sense of stewardship to local creeks and waterways.

[81] Institute of Traffic Engineers Trip Generation Manual, and others.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Recreation Facility Design

Parks and other passive recreation facilities are preferred over active recreation adjacent to open space corridors, but in the event that active recreation is developed adjacent to riparian areas, the following concepts are encouraged to lower the impacts of such facilities on the creek and habitat:

- Use native plantings in between areas of turf (i.e. golf course fairways).
- Use open vegetated swales and drainages to filter irrigation and storm water runoff prior to discharge into the creek.
- Minimize turf areas.
- Utilize reclaimed water.
- Minimize use of fertilizers, pesticides and herbicides.
- Utilize Integrated Pest Management (IPM).
- Increase stream setbacks.
- Delineate natural areas with post and cable fence and include signage requesting that site users such as golfers stay within the course or other active recreation areas.

Two examples of more environmentally sensitive golf courses that employ one or more of these techniques are the Ridge Golf Course in Placer County and the Sea Ranch Golf Course in Sonoma County (Figure 6-6).

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Figure 6-6 Sea Ranch Golf Course, Sonoma County

Industrial Zone Buffers

Industrial land uses can have a larger impact on creeks and riparian habitat than other less intensive land uses due to increased impervious surfacing, use of chemicals in industrial processes, waste products of manufacturing, and excess noise. Riparian buffers and storm water filtration mechanisms may need tailoring for specific industrial uses, with wider buffers and additional filtration required for facilities with a higher potential to pollute creeks or impact habitat. Alternately, the maximum riparian buffer could be required (300 feet or greater[82]) for any industrial use, with an additional setback for a detention/filtration wetland, and variances could be granted to those uses deemed to have a low-impact on the creek system.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Landscape Transition Zones

Jurisdictions should encourage the designation of a landscaped transition zone around valuable habitats such as riparian corridors. Development within this zone should be restricted to provide an additional buffer between riparian or other sensitive species and human use. Land uses appropriate within the transition zone include passive recreation (walking,

[82] USDA & US EPA, 1997.

roller blading, biking, horseback riding, picnicking), low impact active recreation such as Frisbee golf that does not require managed turf or a hard court, community and residential gardens, landscape buffers and other uses deemed to be compatible with the adjacent habitat.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Parking Lot Storm Drain Filters

Often referred to as a post-construction Best Management Practice (BMP) storm drain filters in parking lots are built into the project underground so they are protected and do not detract from the functionality of the project. Different filter systems can be installed which will remove any combination of sediments, oil and grease, soluble metals, nutrients, organics and debris. Typically, these systems are not designed to treat all storm water, but rather the initial storm runoff and irrigation water which contains the highest concentrations of pollutants. Parking lots are a constant source of automotive fluid pollutants such as oil, transmission fluid and radiator coolant from older and poorly maintained vehicles.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

Incentive Programs

The use of Low Impact Development concepts can be encouraged by establishing incentive programs for local jurisdictions and developers. Such programs have been implemented by a number of regional transportation and development planning agencies and local jurisdictions, including the Atlanta Regional Commission, the San Francisco Bay Area Metropolitan Transportation Commission, the City/County Association of Governments of San Mateo County, the Sacramento Area Council of Governments (SACOG), the San Diego Area Council of Governments, and the City of Austin.[83] These programs typically provide funding for planning research and implementation of specific projects that include low impact development principles. Implementation assistance may include fee reductions or waivers or public investment in infrastructure to reduce capital costs.

SACOG's incentive program provides $500 million in federal funds over a 23-year period for Community Design grants. These grants are for

[83] Capital, 2000.

projects in Sacramento area cities and counties that reduce congestion and air pollution and improve livability. Public projects within the Pleasant Grove/Curry Creek watershed would be eligible to compete for these funds.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.2.2 Preferred Future Land Use - Potential Benefits Analysis

While the simple model run in this study does not have the ability to extensively analyze the effect of implementation of these concepts on the future build-out condition, the build-out scenario can be modified to include some of these elements, and then executed to observe the outcomes. To this end, the likely future build-out scenario was modified as follows:

- Three town centers were added in the Curry Creek Community Plan area and the WRSP Remainder area.
- A new housing type was defined to represent a new urbanist type of community similar to Village Homes in Davis, CA. Compared to typical low-density residential development, this land use type utilizes flush-curb, narrow streets; more permeable paving; above-ground storm water conveyance and detention/filtration systems; higher density cluster development; increased open space; and lesser dependence on landscape chemicals (or greater awareness of the impacts of these chemicals on local water bodies). These key concepts were simulated in the impact models by adjusting values in the hydrologic model representing decreases in impervious surfacing and nutrient loading, with an increase in surface flow friction coefficient to compensate for the above-ground storm water conveyance and detention/filtration systems.
- Additional open space was preserved, particularly in critical corridor areas and around vernal pools.
- Land use within urban open space corridors along creeks was converted from agriculture to riparian habitat to reflect a management approach of those open space buffers to promote health of riparian vegetation.

Because of the coarseness of the impact models, it was not expected that these changes to the likely build-out condition would result in large reductions in modeled habitat and water quality/hydrology impacts;

however, the concepts used to define the desired build-out condition are expected to provide benefits other than those quantified by the impact models. For example, the new urbanist type of development preserves additional open space that is not reflected in the GIS data, because the specific open space configuration within the new urbanist land use types are dependant upon design of the individual neighborhoods, which was not undertaken as a part of this study. Additionally creation of town centers containing high density residential, retail shops, schools and parks will likely lead to a reduction in resident automobile usage by localizing some common destinations.

Table 6-1 shows the acreages for each land use in the desired build-out condition. While most of these numbers are similar to that for the likely build-out condition, there are some key differences. An additional 500 acres of grassland is preserved from development in the desired condition, and, perhaps more significantly, riparian vegetation communities have increased from 179 acres to 554 acres, or over 100 acres more than in the existing conditions. This reflects the conversion of land use from agriculture to riparian within the urban open space corridors in the desired build-out scenario.

Table 6-1 Desired Build-out Condition Land Use Acreages

DESCRIPTION	ACREAGE
Agriculture	7,975
Business professional	1,158
Commercial	1,527
Grassland	6,022
Industrial	3,553
Infrastructure	1,453
Orchards	21
Open space	2,177
Public/Quasi-public	2,166
Parks and Recreation	1,041
Residential	12,221
Riparian	554
Special Study Area	63
Urban forest	0
Unclassified	104

DESCRIPTION	ACREAGE
Vacant	343
Water	24
Wetland	396
Woodland	335

Impacts to Hydrology

Using the same methodology that was applied for the future build-out scenario hydrology and water quality modeling, a preferred build-out analysis was conducted. Output from the SWAT model was used to compare changes in the hydrology and water quality parameters from the future and desired build-out conditions, as was done in the previous build-out analysis. For the desired build-out analysis, Equations 4-1 and 4-2 are replaced by Equation 6-1 and Equation 6-2.

Equation 6-1 Percent change of a parameter from modeled existing conditions to modeled build-out conditions

$$\%\Delta_A = \frac{D_A - B_A}{B_A} \times 100$$

Equation 6-2 Monthly Percentage of Annual Change

$$\%\Delta^1_A = \frac{D_M - B_M}{D_A - B_A} \times 100$$

Where $\%\Delta_A$ is the percent annual change, B_A is the annual build-out, D_A is the annual desired build-out, $\%\Delta^1_A$ is the percentage of the annual change, B_M is the monthly build-out, D_M is the monthly desired build-out, B_A is the annual build-out and D_A is the annual desired build-out.

Modeling Results

Hydrologic results from the model output analysis are presented in Table 6-2. The analysis shows an average monthly discharge decrease from the likely build-out condition of 0.1% and an average annual volume decrease of 0.1%. The maximum monthly average discharge showed no significant change.

Table 6-2 Discharge Percent Change Estimates for the Pleasant Grove & Curry Creeks Watershed between Likely Build-out and Desired Build-out

	AVERAGE MONTHLY DISCHARGE	MAX MONTHLY AVERAGE DISCHARGE	AVERAGE ANNUAL VOLUME
CHANGE	-0.1%	0.0%	-0.1%

Water quality analysis results are presented in Table 6-3. Total nitrogen (TN) shows a 5% decrease over likely build-out conditions, with 93% of the increase occurring during the rainy season (December-March). Total phosphorous (TP) had the same 5% decrease with 91% occurring during the rainy season. A 6% decrease in sediment loading was calculated with 95% of the decrease occurring during the rainy season. Carbonaceous Biological Oxygen Demand (CBOD) also showed 9% decrease, with the wet season contributing 94% of the change. A slight increase in Dissolved Oxygen (DO) of 2% was calculated for October through April.

Table 6-3 Water Quality Percent Change Estimates for the Pleasant Grove & Curry Creeks Watershed between Likely Build-out and Desired Build-out

		TOTAL NITROGEN	TOTAL PHOSPHOROUS	SEDIMENT	CBOD	DO
ANNUAL CHANGE		**-5%**	**-5%**	**-6%**	**-9%**	**2%**
Percentage of Annual Change	October	2%	2%	2%	2%	3%
	November	9%	9%	9%	9%	21%
	December	20%	20%	23%	22%	36%
	January	33%	33%	35%	31%	20%
	February	19%	18%	19%	20%	12%
	March	12%	11%	9%	12%	5%
	April	6%	5%	4%	5%	3%
	May	0%	0%	0%	0%	0%
	June	0%	0%	0%	0%	0%
	July	0%	0%	0%	0%	0%
	August	0%	0%	0%	0%	0%
	September	0%	0%	0%	0%	0%

Discussion

The results indicate a reverse trend from what was observed in the likely build-out analysis. The average monthly discharge rate and the average annual volume both showed a 0.1% decrease from the 0.3% likely build-out increase. This suggests that the preferred build-out scenario would increase discharge by only two-thirds as much as the likely build-out scenario. The maximum monthly average discharge showed no change, although, as discussed during the previous analysis discussion, the methodology used with this particular study resulted in inconclusive and speculative flow results. It would be expected, however, that peak storm flows will decrease to some extent because of the proposed changes in the desired build-out land use.

Changes in the desired build-out land use resulted in a decrease of nutrients, TN (5%) and TP (5%), and sediment (6%) as was anticipated, based upon other studies. The nutrient and sediment decreases resulted in an associated decrease in the CBOD (9%), a measurement of the water's Organic Matter (OM). This decrease in CBOD is caused by both a decrease in algae growth associated with fewer nutrients and a decrease in soil organic carbon that moves with sediment associated with erosion of the upper organic layer. Due to the interactions within an aquatic ecological system, decreases in CBOD typically lead to increases in DO because less aerobic decomposition occurs within the water column. As anticipated, the model results support this ecological interaction with a 2% annual increase in DO.

Summary

Based upon the model results, the increased areas of open space and the new urbanism land use type utilized in the desired build-out show a positive benefit to creek water quality. The magnitude of this benefit is highly dependent upon on the ground implementation of the new urbanism concept and the amount of open space area that can be obtained. Mitigating for all hydrology and water quality impacts associated with urbanization within the watershed is infeasible. However, the modeling results do show that these types of land use changes benefit water quality and its associated ecology.

Impacts to Habitat and Key Resources

Table 6-4 presents habitat statistics for the selected sensitive species for the preferred build-out condition and Table 6-5 shows the differences between the likely and preferred build-out conditions, with positive

numbers indicated higher values in the preferred and negative numbers denoting lower values.

Table 6-4 Preferred Build-out Condition Habitat Statistics

	POTENTIAL HABITAT	MAXIMUM PATCH SIZE	AVERAGE PATCH SIZE	NUMBER OF PATCHES	AVERAGE PERIMETER (FT)	AVE. PERIMETER COMPLEXITY
Bogg's Lake Hedge-hyssop	356	147	9.9	36	2,567	1.80
Vernal pool fairy shrimp	356	147	9.9	36	2,567	1.80
Vernal pool tadpole shrimp	356	147	9.9	36	4,516	1.80
Swainson's hawk	14,497	2,946	32.4	448	3,967	1.07
California burrowing owl	10,852	2,946	28.7	379	2,418	1.00
Dwarf downingia	370	147	8.8	42	2,089	1.10
Legenere	377	147	7.0	54	2,401	1.07
Red Bluff dwarf rush	375	147	8.5	44	2,401	1.11
California linderiella	356	147	9.9	36	2,567	1.10
Loggerhead shrike	9,185	2,946	30.3	303	4,132	1.01
Tiger salamander	6,308	1,590	21.9	288	3,829	1.11
Elderberry longhorn beetle	824	167	9.4	88	4,012	1.77
Calif. red-legged frog	287	133	5.1	56	2,931	1.75
Western spadefoot toad	538	147	6.3	85	2,435	1.31
Giant garter snake	3,179	666	66.2	48	7,486	1.24
Yellow-breasted chat	199	133	6.6	30	3,596	1.89

Note: all sizes are in acres, unless otherwise noted.

Table 6-5 Differences between Preferred and Likely Build-out Conditions

	POTENTIAL HABITAT	MAXIMUM PATCH SIZE	AVERAGE PATCH SIZE	NUMBER OF PATCHES	AVERAGE PERIMETER (FT)	PERIMETER COMPLEXITY
Bogg's Lake Hedge-hyssop	0.6%	0.0%	-13.3%	16.1%	-14.9%	-8.6%
Vernal pool fairy shrimp	0.6%	0.0%	-13.3%	16.1%	-14.9%	-8.6%
Vernal pool tadpole shrimp	0.6%	0.0%	-13.3%	16.1%	-14.9%	-8.6%
Swainson's hawk	5.0%	-0.5%	-30.2%	50.3%	-23.3%	-8.2%
California burrowing owl	5.9%	-0.5%	-28.7%	48.6%	-23.2%	-9.1%
Dwarf downingia	0.6%	0.0%	-11.4%	13.5%	-13.2%	-7.8%
Legenere	2.2%	0.0%	-20.5%	28.6%	-17.4%	-7.4%
Red Bluff dwarf rush	0.5%	0.0%	-6.4%	7.3%	-8.9%	-5.9%
California linderiella	0.6%	0.0%	-13.3%	16.1%	-14.9%	-8.6%
Loggerhead shrike	6.8%	-0.5%	-32.3%	57.8%	-26.1%	-10.2%
Tiger salamander	10.0%	-1.8%	-28.9%	54.8%	-27.0%	-13.4%
Elderberry longhorn beetle	86.4%	26.1%	-17.4%	125.6%	-31.4%	-24.6%
Calif. red-legged frog	30.5%	0.1%	-11.5%	47.4%	-12.6%	-7.1%
Western spadefoot toad	2.4%	0.0%	-36.1%	60.4%	-34.2%	-17.6%
Giant garter snake	-8.7%	-.06%	-2.9%	-5.9%	-7.0%	-5.6%
Yellow-breasted chat	0.2%	0.1%	-19.9%	25.0%	-21.5%	-12.3%

For all species except one (giant garter snake), total habitat increased, particularly for those species utilizing grasslands, open fields and riparian: Swainson’s hawk, California burrowing owl, loggerhead shrike, and tiger salamander. The slight decrease in giant garter snake habitat can be attributed to the conversion of more rice field acreage to open space supporting grassland and urban riparian habitat.

Average patch size has decreased for all species, particularly those using vernal pools and wetlands. For the vernal pool and wetland species, the reduction in average patch size and increase in number of patches is due to two differences between desired and likely build-out: 1) a small cluster of vernal pools along Pleasant Grove Creek in the upper watershed was preserved in the desired build-out that was lost in the likely build-out. 2) A linear vernal swale along Blue Oaks Boulevard west of Foothills Boulevard was present in the likely build-out but not the desired scenario. Detailed examination of the map shows that both of these vernal pool polygon clusters are narrow, wedge-shaped polygons immediately adjacent to roads. It is likely that these polygons were a result of the GIS data aggregation process, which tends to create small wedge-shaped polygons at the edges of larger units when multiple GIS data layers are combined. These wedge-shaped polygons are often cleaned by hand, and the vernal pool polygons under question were likely handled differently between the likely and preferred condition. This means that the reported differences in average patch size and number of patches between the likely and preferred build-out conditions likely do not indicate real-world phenomenon.

An additional cause for the average patch size decrease could be attributed to the increase in the number of patches for all species except giant garter snake. If the desired build-out condition preserves more small patches, then one would expect the average patch size to go down and the number of patches to go up, which is consistent with the data. The data also show a decrease in the average perimeter and perimeter complexity. This could be a result of preserving a greater number of smaller patches that are simpler shapes or a reduction in fragmentation of larger patches.

6.3 SITE STRATEGIES (RESTORATION PROJECTS)

This section discusses potential restoration projects that meet multiple goals of this plan. Some of these projects were discussed briefly in the section on Potential Restoration Sites in the Existing Conditions chapter. They are expanded upon in this section to present issues found during site assessments and discuss restoration techniques applicable to specific reaches. Additional information on specific restoration techniques proposed in this section can be found in Appendix A, RCRMRP Restoration Strategies and Conceptual Improvement Techniques. Restoration projects are subject to permitting and regulatory compliance through the various resource agencies and local jurisdictions. Any channel realignment, revegetation, and/or reconstruction project should be

submitted to the PCFCWCD for review of flooding impacts per the District's Coordination Agreement with Placer County and its cities.

6.3.1 Pleasant Grove Creek

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. In the build out condition, the majority of the upper reaches of Pleasant Grove Creek will be urbanized. Runoff should be treated to reduce peak flow and summertime flow, the latter of which was absent historically on this creek. Urban and suburban runoff should also be managed to reduce pollutant loading from automobiles, landscape and household chemicals and other common urban and suburban contaminants.

The lower creek reaches are generally agricultural and should be managed as a valley oak riparian mix. Strategies for restoration 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 storm water outfalls associated with the existing and future development or agriculture are excessive. Cooperative agreements with agricultural land owners adjacent to the creek should be established with the following long-term goals:

- Improve management of agricultural runoff to reduce sediment and chemical loading;
- Expand riparian buffers to allow migration of creek meanders, improve habitat and filter storm water and irrigation runoff;
- Restore creek reaches that have been straightened.

The following sections expand on restoration opportunities for specific reaches of Pleasant Grove Creek that were briefly discussed in the existing conditions chapter.

PG6

- Revegetation
- Riprap replacement
- Bank stabilization

Upstream and downstream of Pleasant Grove Road, Pleasant Grove Creek flows in a wide channel with high (approximately six foot) banks. Little

riparian vegetation is growing in this area; willows and cottonwoods were growing on the banks, but large woody vegetation was sparse. Many swallows were flying around the bridge. The southern bank of the channel upstream of the bridge had been riprapped with broken concrete and asphalt. Banks were bare in several places with evidence of erosion. A fisherman, who was actively fishing from the bank during the field survey, said that he had caught a bluegill that day and had recently caught a steelhead in the creek in the location of the bridge.

Revegetation, replacement of riprap with an environmentally beneficial bank stabilization method, and bank stabilization of the eroding cut banks would be appropriate in this reach. Bank recontouring to reconnect the creek to its floodplain would also be beneficial, but would likely be expensive, given the size of the creek and the scale of the grading work that would be needed to have a significant impact.

Priority: High

Lead Stakeholder: Sutter Co.

PG32, 33

- Channel Realignment
- Revegetation

This reach, approximately 0.25 miles long, is downstream of Industrial Avenue west of the Union Pacific rail line and is located in Placer County. The reach contains the water quality monitoring site PG1 which was used to represent the upper watershed and inputs from the City of Rocklin. There is a long, straight channelized section starting at the Industrial Avenue and extending west. This channelized section has a wide and deep trapezoidal channel structure which then transitions back into a natural channel formation. Downstream of the channelized section scattered mature oaks and willows are present, but the altered section has a distinctly absent riparian area. This reach would benefit significantly from the planting of riparian vegetation such as willows and cottonwoods and realignment of the channel to introduce meanders. If flooding of the adjacent lands is a concern then widening of the trapezoidal channel could allow for meandering of the active channel and formation of a floodplain while maintaining flood control benefits.

Priority: Medium

Lead Stakeholder: Roseville

PG39

- Bank recontouring
- Revegetation
- Park runoff management

As discussed earlier, the channel in this reach has been modified at some point in the past. The floodplain appears to have been narrowed, and the creek is constrained between the adjacent bike path and park to the north and residential development to the south. Relatively slow-moving water in this reach has allowed cattails to thrive. Some riparian vegetation, mostly willows, has begun to establish on the creek banks. Restoration activities on this reach that are likely to be effective include planting additional riparian vegetation, including willows, valley oaks and interior live oaks; managing the cattails so that they don't displace other native vegetation; and widening the flood channel. Laying back the banks of the channel to create lower terraces on either side of the creek will allow the creek greater access to its floodplain. Additionally, earth removed in flood channel widening can be deposited within the existing bankfull channel to narrow the bankfull width. This narrowing would help increase structural diversity within the low-flow channel and accelerate the water in this reach, which may help to control the cattails (see Figure 6-7).

Prior to modifying the flood channel banks, a hydrologic/geomorphic study should be conducted to determine the optimal bankfull width, and channel modifications should recreate this width.

Where the trail is adjacent to the park site, care should be taken to avoid contaminating the creek with herbicides, pesticides and fertilizers used in park maintenance. If storm water runoff from the park flows directly into the stream, a vegetated swale could be built on the north side of the bike path to intercept and filter the runoff prior to the storm water entering the creek. If irrigation runoff flows into the creek, irrigation schedules should be modified to eliminate this source of supplemental water.

Interpretive signs along the trail in this area could inform trail users of the multiple values of healthy creeks and the efforts of the local jurisdictions in maintaining connected open space corridors.

Priority: High

Lead Stakeholder: Placer Co.

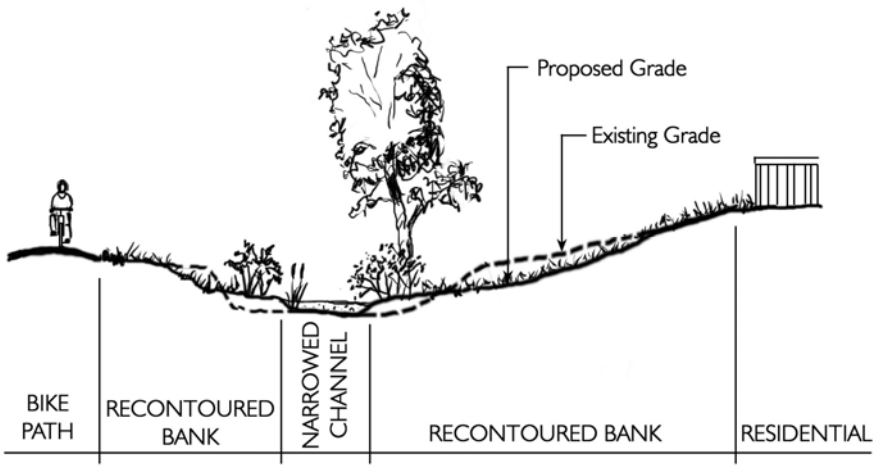

Figure 6-7 Restoration Activities on PG39

PG41

- Beaver management
- Revegetation

Reach 41 on Pleasant Grove Creek is dominated by downstream beaver activity. The reach downstream of Farrier Road is inundated from a large beaver dam approximately ¼ mile below the Farrier Road culverts. Some willows, valley oaks, and live oaks are growing on the banks on both sides of the channel. Although beaver have removed some trees, those that remain are protected by wire mesh skirts around the base of their trunks. Rushes and sedges are growing in the channel. The level of impact of the beaver dam on flood capacity within the channel will determine the restoration strategies that will be most effective in this location. The creek is bordered on both sides by single-family homes in this reach, and it is likely that the residents enjoy the beaver, beaver pond and wildlife that the pond has attracted (primarily birds). It is also likely that predation of beavers to eliminate the pond would raise objections from the neighborhood. If it is deemed necessary to remove the pond in its entirety to protect the adjacent residences from flood damage, an extensive public education campaign should be conducted to inform the residents of the potential negative impacts of beavers on creek

systems and the reasons for the culling of the beavers. If it is not necessary to completely remove the dam, a beaver pond leveling device could be installed to maintain the dam and pond at an acceptable level. Beaver pond leveling devices, such as the one shown in Figure 6-8, maintain the pond at a designed level by draining water from the pond without the accompanying sound of water trickling through the dam or current flow that cause the beavers to repair breaches[84] (Figure 6-8).

Priority: Medium

Lead Stakeholder: Placer Co.

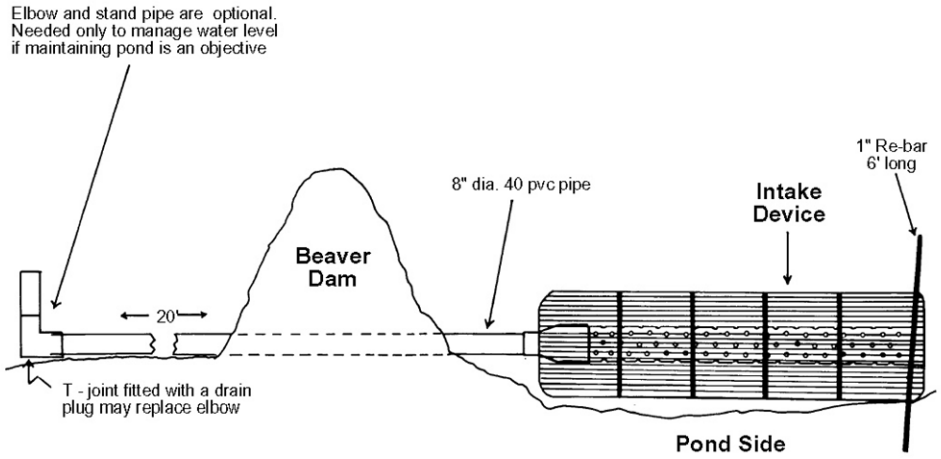

Figure 6-8 Clemson Beaver Pond Leveler

The intake device on the Clemson leveler should be installed below seasonal low water level in the pond, and for the highest probability of success, the outlet should also be located below water level on the downstream side, although tests have found it effective even when the outlet flows out in "fountain-like fashion.85" Other methods of beaver control include live trapping and relocation of the beaver, but many of the streams in the Sacramento Valley are undergoing similar beaver problems making relocation to an innocuous spot difficult. This method can also be labor intensive and therefore expensive without a crew of volunteers.

Upstream of the beaver pond, the creek has a well defined channel. Riparian vegetation is still sparse, and planting of riparian trees and

[84] Clemson University, 2004.

[85] Ibid.

shrubs would improve habitat and stream shading. Appropriate fencing for beaver protection should be installed when planting woody vegetation along this stretch of creek.

PG44-45

- Bank recontouring
- Revegetation
- Channel realignment

The designated open space in this reach is wide, over 1400 feet at Stanford Ranch Road and narrowing to 180 feet at the northern end. The channel banks are steep, with slopes approximately 1.5:1, and it appears that the channel may have been straightened in the past, possibly due to agricultural land use. Vegetation is sparse, with a few willows growing on the lower banks. Reeds and sedges are growing in the channel. The Stanford Ranch Road crossing is wide, with the stream flowing through a number of concrete-bottom box culverts. The low-flow/bankfull channel is not well defined within the bottom of the large flood channel.

Restoration of the channel in this section should incorporate a number of techniques discussed earlier, including laying back the banks to create a terraced floodplain, creation of a well defined bankfull channel within the larger floodplain, and revegetation of riparian trees and shrubs. Recontouring of the creek banks to 8:1 or 10:1 slopes would help reconnect the stream to its floodplain, as well as support a healthier riparian vegetation community (Figure 6-9).

The benefits of floodplain restoration through channel widening include:

- More diverse riparian vegetation due to more diversity in moisture levels in the soil, which in turn leads to
- Improve shading of the creek.
- Improved habitat for riparian species.
- Reduce flood energy levels due to increased roughness and dispersion of floodwater.
- Reduced erosion of creek banks and reduced siltation in the stream channel.
- Increase floodwater capacity of the channel, which in turn allows for additional woody vegetation in the floodplain and large woody debris within the channel without increasing the risk of private property damage from flooding.

The benefits of narrowing of the bankfull channel include:

- Increased diversity in the creek channel and riffle-pool structure.
- Increased stream flow to reduce presence of cattails.
- Better defined low-flow channel.
- Cooler water temperatures due to increased water depths.

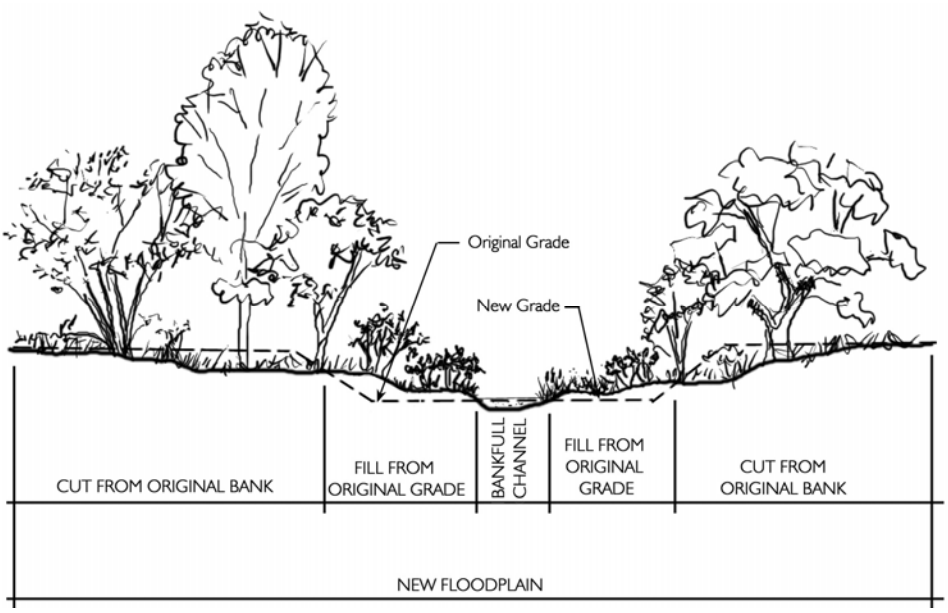

Figure 6-9 Floodplain Restoration on Pleasant Grove Creek

Prior to this project being undertaken, a hydrologic and geomorphic study should be performed for this section of the creek to determine the desirable width/depth ratio for the bankfull channel; stable configuration for the bankfull channel, including meander amplitude and period; and the desired bank slopes and contours.

Priority: Medium

Lead Stakeholder: Placer Co.

PG-A4

- 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 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.

Priority: Medium

Lead Stakeholder: Roseville

Pleasant Grove Canal

The Pleasant Grove Canal is very wide, 300 feet from east levee to west levee. The creek channel is braided in this area; the low-flow channel is not well defined. Some willows are growing between the levees, but larger vegetation is absent, probably due to flood control maintenance of the canal. Flooding in this canal occurs regularly, with water contributions from Pleasant Grove Creek, Curry Creek, several minor drainages, and the Sacramento River. It is likely that any restoration of a low-flow channel in this canal would silt up in several years time from sediment washed up through the cross-canal and deposited by Sacramento River floodwater. Placer and Sutter Counties should work with RD1000 to determine if the maintenance regime of the canal can be modified to allow additional riparian woody vegetation without compromising flood capacity of the canal.

Priority: Medium

Lead Stakeholder: Sutter Co.

6.3.2 South Branch Pleasant Grove Creek

As of 2005, the South Branch Pleasant Grove Creek watershed is mostly urbanized, and while a number of vacant parcels will undergo infill development between now and build out, the overall land use in the watershed will remain largely unchanged. Environmental management to preserve habitat and stream health in the watershed should focus on preservation of quality riparian in the lower creek reaches where it is

present, revegetation in reaches without healthy woody vegetation, management of runoff in Diamond Oaks Golf Course and Woodcreek Oaks Golf Club, beaver management, and homeowner education programs targeted at reducing household and landscape chemical runoff and the spread of invasive plants.

The following sections address restoration actions on specific reaches on South Branch Pleasant Grove Creek.

SP-7

- Runoff Controls

Downstream of Woodcreek Oaks Boulevard, 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.

Priority: Medium

Lead Stakeholder: Roseville

SP-12

- Runoff Controls

The reach downstream of Pleasant Grove Boulevard 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 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.

Priority: High

Lead Stakeholder: Roseville

SP-15,16

- Revegetation

Degraded reaches along South Pleasant Grove Creek occur primarily in the upper watershed. In the reach from the Union Pacific railroad tracks to Diamond Oaks Road, 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.

Priority: Medium

Lead Stakeholder: Roseville

SP-19

- In-stream Structure
- Revegetation

Where South Branch Pleasant Grove Creek flows through Diamond Oaks Golf Course, 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.

Priority: Low

Lead Stakeholder: Roseville

SP-20

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

Between Heritage Drive and Chipshot Way, 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.

Priority: High

Lead Stakeholder: Roseville

SP-22

- Revegetation

Revegetation of limited riparian vegetation in the reach between Roseville Parkway and the headwaters, 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". 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.

Priority: Medium

Lead Stakeholder: Roseville

6.3.3 Kaseberg Creek

As with South Branch Pleasant Grove Creek, the Kaseberg Creek watershed has largely been developed by 2005. Other than infill parcels, a small portion of the lower watershed remains undeveloped within the West Roseville Specific Plan (WRSP); however, the WRSP preserves this area as open space. Similar to the environmental management goals for South Branch Pleasant Grove Creek, programs on Kaseberg Creek should seek to preserve and enhance existing riparian areas, manage runoff from Sierra Pines Golf Course, proper management of the beaver population and homeowner education to reduce the impacts of residential runoff on the creek system. As in Curry Creek, assessment of soil and water regime in the upper watershed streams will be necessary to determine the appropriate riparian vegetation for the buffer areas. Since significant amounts of open space have been preserved around both Kaseberg and South Branch Pleasant Grove Creeks, riparian buffers up to 300 feet or more wide are possible, and already present in some areas, providing habitat for sensitive species utilizing riparian woodlands.

The following sections address restoration of specific degraded reaches as well as those providing good opportunities for improvement.

KA3,4

- Revegetation
- In-stream Structure

The segment of Kaseberg between Timeberrose Way and Fiddyment Road 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.

Priority: High

Lead Stakeholder: Roseville

KA5, KA9, KA12, KA-A5

- Revegetation
- Beaver Management (KA9)

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 (KA5), the south branch just downstream of Pleasant Grove Boulevard (KA9), the middle branch between Woodcreek Oaks Boulevard and Country Club Drive (KA-A5), and the south branch between Pleasant Grove Boulevard and Woodcreek Oaks Boulevard (KA12). In addition, KA9 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.

Priority: High – KA9; Medium -- KA5, KA-A5; Low – KA12

Lead Stakeholder: Roseville

KA-A4

- Revegetation
- Channel Realignment
- In-stream Structures

On the middle branch of Kaseberg Creek, the reach near Mahany Park 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.

Priority: High

Lead Stakeholder: Roseville

KA-A6-8

- Revegetation
- Runoff Controls

Upstream of County Club Drive, the middle fork of Kaseberg Creek has been channelized. 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.

Priority: Medium

Lead Stakeholder: Roseville

KA-B4

- Revegetation
- Channel Realignment
- In-stream Structure

The headwaters of the north branch of Kaseberg Creek, at the east end of Sierra Pines 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.

Priority: Medium

Lead Stakeholder: Roseville

6.3.4 Curry Creek

Curry Creek is in a condition that is similar to lower Pleasant Grove Creek. The uppermost reaches of Curry Creek will be urbanized at build out, by the Placer Vineyards Community Plan and the yet to be developed Curry Creek Community Plan. These upper reaches should be managed as willow and cottonwood riparian habitat, where soils and water regime permit, and as herbaceous seasonal riverine drainages where soils are too shallow or the water flow insufficient to support woody riparian vegetation. Runoff in these areas should be managed to reduce pesticides, fertilizers and other household chemicals; reduce peak and summertime flows, prevent ORV and other motorized vehicle access, and limit bank erosion. The lower reaches of Curry Creek will remain agricultural in the build out condition. As with Pleasant Grove Creek, these reaches should be managed in cooperation with agricultural land owners to reduce contaminants in agricultural runoff, manage peak flows, improve riparian buffers, and restore straightened sections.

CC15-18

This reach is in moderate condition. The channel in this reach is open with little large woody vegetation. Water movement is very slow, and many cattails are growing within the bankfull channel. Some road-runoff enters the channel through vegetated swales. Banks are approximately one to two feet high at the upstream crossing of Baseline Road, and three to four feet high in the downstream crossing. The banks appear to be stable with little active erosion. The adjacent land in this area does not appear to be in active agricultural production, although it could be in use as pasture land or hay production.

Probably the most beneficial restoration action on this reach would be riparian restoration; however, additional research is required to determine the appropriate riparian vegetation for specific sites on Curry Creek. Many of these headwater streams are on soils classified as Xerofluvents with hard pan substrate in the Placer County Soil

Survey[86]. These soils have a hardpan at 20 to 36" depth. The survey also notes that the water table on these soils rises to within 10" of the surface during the winter, but dries up in the spring. Either of these factors, or likely a combination of them, could contribute to the absence of significant riparian vegetation. Additionally, grazing could be preventing growth of new riparian trees and shrubs. This site and other reaches in the lower watershed should be further studied by qualified botanists to determine the appropriate trees and shrubs for riparian buffers.

Priority: Low

Lead Stakeholder(s): Placer Co.

CC10

Curry Creek has been channelized downstream of Brewer Road. Banks are steep and the channel is wide. A berm has been constructed on the north bank between the creek and the adjacent rice field. Agricultural fields are also on the south bank. Both banks are very steep and approximately four to five feet high, evidence of some incision of the creek in the past. While some large woody vegetation occurs upstream of Brewer Road, riparian vegetation is absent on the downstream reach (Figure 6-10).

Figure 6-10 Curry Creek Upstream and Downstream of Brewer Road

Restoration of this reach will require working cooperatively with the agricultural land owners to establish setbacks from the creek and riparian buffer widths. For this to happen, farmers must be willing to return some of their land to riparian function, and this will likely require incentives, such as property tax reductions. Provided cooperative agreements can be reached with adjacent agricultural users, restoration activities appropriate in this reach include laying

[86] USDA SCS, 1980.

back of the overly steepened banks to improve the connection between the creek and the floodplain, reconstruction of the bankfull channel, improve management of agricultural runoff, and relocation of the rice field berms further from the creek. As an alternative to a set back plan, it may be possible to utilize a cooperative seasonal approach to operating check dams to provide stormwater retention and improved wetlands. PCFCWCD is currently coordinating this type of approach with the Central Valley Joint Venture through flood and conservation easements on existing agricultural lands.

Priority: High

Lead Stakeholder(s): Placer Co.

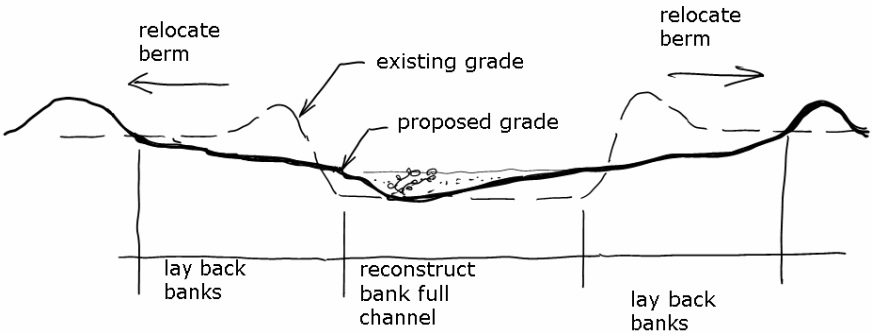

Figure 6-11 Restoration Options on Lower Curry Creek

Curry Creek & Pleasant Grove, Various

Various reaches on both Pleasant Grove Creek and Curry Creek have been heavily modified in the western watershed agricultural lowlands (CC1, CC4-8, CC13, CC-B1, CC-C1, CC-C3, PG-D2, PG-D7). Most of these reaches have been straightened and the majority of large woody vegetation removed. As with reach CC10, restoration of these reaches will involve working with local agricultural land owners to implement restoration measures. Financial or other incentives could help to facilitate this process, particularly since restoration will require some lands being taken out of production. Placer County could also work cooperatively with land owners to identify funding opportunities and seek grant money to realign and replant these highly modified stream sections.

Priority: Varies

Lead Stakeholders: Placer Co., Sutter Co.

6.3.5 Site Specific Restoration Priorities

Site specific restoration priorities for the Pleasant Grove/Curry Creek watershed are summarized in Table 6-6 below. If a project was recommended in the Roseville Creek Riparian Management and Restoration Plan (RCRMRP), its RCRMRP site ID is also given.

Table 6-6 Restoration Priorities

CREEK	REACH ID	RCRMRP SITE ID	REACH LOCATION	RESTORATION STRATEGIES	PRIORITY
Pleasant Grove Creek	PG6	N/A	Pleasant Grove Rd bridge	Revegetation, riprap replacement, bank stabilization	High
Pleasant Grove Creek	PG32,33	PG-2	D/S of UPRR crossing	Revegetation, channel realignment	Medium
Pleasant Grove Creek	PG39	N/A	1500 ft D/S of Sunset Blvd bridge	Bank recontouring, revegetation, park runoff management	High
Pleasant Grove Creek	PG41	N/A	Farrier Rd. Bridge	Beaver management, revegetation	Medium
Pleasant Grove Creek	PG44-45	N/A	U/S of Stanford Ranch Rd	Bank recontouring, revegetation, channel realignment	Medium
Pleasant Grove Creek	PG-A4	PG-1	SR65 to Blue Oaks Blvd	Revegetation, channel realignment, ORV management	Medium
Pleasant Grove Creek	PG-D2, PG-D7	N/A	Agricultural lowlands	Cooperative agreements with agricultural land owners, channel realignment, revegetation, bank recontouring	Low
Pleasant Grove Creek	All	N/A	All	Revegetation, runoff controls, sediment management, monitoring	High
Pleasant Grove Canal	N/A	N/A	Pleasant Grove Canal	Cooperation with local flood control agencies to identify most environmentally beneficial channel configuration and restore to that condition	Medium
South Pleasant Grove Creek	SP7	SP-5	D/S of Woodcreek Oaks	Sediment management	Medium

CREEK	REACH ID	RCRMRP SITE ID	REACH LOCATION	RESTORATION STRATEGIES	PRIORITY
South Pleasant Grove Creek	SP12	SP-4	D/S of Pleasant Grove Blvd	Runoff controls, homeowner education	Medium
South Pleasant Grove Creek	SP15,16	SP-1	UPRR to Diamond Oaks	Revegetation	Medium
South Pleasant Grove Creek	SP19	SP-2	Diamond Oaks Golf Course	In-stream structures, revegetation	Low
South Pleasant Grove Creek	SP20	SP-6	Chipshot Way to Heritage Dr	Revegetation, in-stream structures, grade control	High
South Pleasant Grove Creek	SP22	SP-3	Roseville Parkway to Headwaters	Revegetation	Medium
Kaseberg Creek	KA-5	KC-4	Timberrose Way to Del Web Blvd	Revegetation	Medium
Kaseberg Creek, S. branch	KA-9	KC-5	D/S of Pleasant Grove Blvd	Revegetation	High
Kaseberg Creek, S. branch	KA-12	KC-7	Pleasant Grove Blvd to Woodcreek Oaks	Revegetation	Low
Kaseberg Creek	KA3,4	KC-3	Timberrose Way to Fiddyment Rd	In-stream structures, revegetation	High
Kaseberg Creek, middle branch	KA-A4	KC-8	Near Mahany Park	Revegetation, in-stream structure	High
Kaseberg Creek, middle branch	KA-A5	KC-6	Woodcreek Oaks to County Club Dr	Revegetation	Medium
Kaseberg Creek	KA-A6-8	KC-1	U/S of Country Club Dr	Homeowner education	Medium

CREEK	REACH ID	RCRMRP SITE ID	REACH LOCATION	RESTORATION STRATEGIES	PRIORITY
Kaseberg Creek, N. branch	KA-B4	KC-2	U/S of Sierra Pines GC	Channel realignment, in-stream structures, revegetation	Medium
Curry Creek	CC10	N/A	D/S of Brewer Rd.	Bank recontouring, revegetation, cooperative agreements with agricultural land users	High
Curry Creek	CC15-18	N/A	Baseline Rd crossings	Revegetation	Low
Curry Creek	CC1, CC4-8, CC13, CC-B1, CC-C1, CC-C3	N/A	Agricultural lowlands	Cooperative agreements with agricultural land owners, channel realignment, revegetation, bank recontouring	Varies

6.4 MAPPING AND MONITORING

Several of the watershed/regional strategies already discussed above in Section 6.1 will require significant mapping and monitoring efforts as part of their implementation. The Coordinated Habitat Conservation strategy will require refinement of the PCCP data as well as periodic inventories of known occurrences of sensitive species and high quality sensitive species habitat. Mapping and monitoring will also be associated with the strategies for management of invasive species, beaver, and erosion as well as planning for the open space network. Since these strategies have already been described, they will not be further addressed in this section. However, there are additional mapping and monitoring strategies that are recommended for the watershed.

6.4.1 Water Quality Monitoring

Preparation of this ERP included development of a water quality sampling strategy for the watershed and a year's worth of monitoring as described in Chapter 3. This monitoring consisted of both surface water grab samples and BMI samples. Water quality monitoring should be continued according to this strategy, and potentially expanded if warranted by results and resources. This water quality monitoring should be coordinated with the City of Roseville's limited monitoring activities associated with the

WWTP on Pleasant Grove Creek in order to develop a comprehensive understanding of how watershed activities and development are impacting water quality.

Priority: High

Lead Stakeholders: Placer Co., Roseville, Dry Creek Conservancy

6.4.2 Hydrologic Mapping/Monitoring

More information is needed about both wet and dry season flows in the watershed. FEMA is in the process of updating floodplain mapping. The lack of gauging stations in the watershed, however, means that data for the adjacent Dry Creek and Auburn Ravine/Coon Creek watershed will need to be used by FEMA in this exercise. Since the hydrology of these systems is quite different than the Pleasant Grove/Curry Creek system it remains to be seen how accurately the FEMA mapping will reflect actual conditions. No monitoring of dry season flows is occurring at this time. To enhance understanding of both wet and dry season flows, gauging stations should be installed in the watershed.

The two common types of stations are the variety used by the USGS and pressure transducer models. USGS stations can range in cost from $20,000 to $80,000 and use sophisticated telemetry to continuously record and transmit readings. Pressure transducer stations are much less expensive ($5,000 - $10,000) but require significant manual effort to read and collect data. Regardless of the type of station used, periodic manual effort will be required to resurvey the channel cross section at the station location. Current estimated costs for this work are $17,500 annually.[87]

Stations should be located in several places in the watershed. The City of Roseville currently has two gauging stations in the upper watershed but they are designed only to log flood flows. Hydrology in the lower watershed is significantly influenced by agricultural diversions and discharges of irrigation water extracted from wells. The type and location of the stations will need to be determined through a more detailed analysis than is within the scope of this ERP.

Priority: High

Lead Stakeholders: Placer Co., Sutter Co., Placer County Flood Control and Water Conservation District (PCFCWCD)

[87] Robert Mason, Assistant Chief for the USGS Office of Surface Water, Reston VA, personal conversation

6.4.3 Restoration Project Mapping/Monitoring

As restoration projects are implemented in the watershed, it will be important to document pre-project conditions and monitor post-project habitat conditions on a regular basis. This information should be used to evaluate the success of projects and inform the design and implementation of subsequent projects.

Priority: Medium

Lead Stakeholders: All stakeholders implementing restoration projects

6.4.4 Mapping/Monitoring Database

A publicly accessible watershed mapping/monitoring database should be established to compile GIS mapping and monitoring efforts of all stakeholder groups. This effort will require the establishment of protocols for common mapping and monitoring activities, standards for metadata, a mechanism for access and distribution, security restrictions for sensitive data, and designation of a data steward to maintain and manage the database.

Priority: Medium

Lead Stakeholders: TBD by Watershed Group

6.4.5 Stakeholder Monitors

A broad range of stakeholders should be involved in watershed mapping and monitoring to leverage limited human and financial resources, and to foster a sense of stewardship. Whenever feasible, partnerships should be encouraged with local schools, watershed groups and conservation organizations to assist in mapping and monitoring activities. Agency and government stakeholders should also contribute by providing their information to the common watershed database.

Priority: Medium

Lead Stakeholders: TBD by Watershed Group

6.5 PUBLIC EDUCATION AND STEWARDSHIP

The diverse opportunities for public education and stewardship associated with all of restoration strategies described in this ERP are as numerous and varied as the community of watershed stakeholders. Implementing a

variety of public education strategies is critical to fostering a sense of responsibility among stakeholders for ecosystem stewardship since they cannot effectively care for something they don't understand. Some specific strategies that should be pursued are described below; however, individual and organizational stakeholders should be encouraged to propose additional strategies based on their own interests and resources.

6.5.1 Stewardship Coordination

The City of Roseville's Creek and Riparian Management Plan includes a number of education strategies that would be appropriate for extension to other areas of the watershed. These include more media awareness of stewardship opportunities, public stewardship events and celebrations, and stewardship recognition awards. The efficiency of some of these strategies and potential for funding could be enhanced if they were pursued in collaboration with other watershed jurisdictions and organizations. A review of these strategies with other interested parties should be conducted to identify opportunities for collaboration.

Priority: Medium

Lead Stakeholders: TBD by Watershed Group

6.5.2 Stewardship Directory

There are already many public education and stewardship strategies being pursued by local jurisdictions and organizations within the watershed. To more broadly publicize and increase participation in these efforts, a public directory or web site should be created that organizations can use to post their programs and notify watershed residents of events and programs.

Priority: Low

Lead Stakeholders: TBD by Watershed Group

6.5.3 Private Property Preservation Incentives

Since much of the watershed is, and will continue to be, owned by private individuals, many valuable habitats exist on private land. Preservation or enhancement of these habitats will require educating landowners on the value of these landscape patches and providing programs to encourage landowners to undertake restoration or preservation projects. Property owners are likely to need both assistance with obtaining funding and guidance on how to restore or preserve specific habitats. Incentives may

take many forms, including conservation easements, technical assistance, financial assistance, and the use of equipment.

Priority: Medium

Lead Stakeholders: Placer Co., Sutter Co., Placer Land Trust

6.5.4 Water Quality Stewardship Training for Homeowners

An educational program should be developed to inform homeowners how to minimize their impacts to storm water and the creeks. This would include discouraging homeowners from car washing in locations where byproducts can easily enter local water bodies, while promoting the use of biodegradable soaps and car care products. The understanding of proper application rates and methods for fertilizers, pesticides and herbicides is also a very important concept that needs to be understood and practiced by many. The NPDES Phase II program requires an educational and outreach component which should provide the same public and ecological services. Being able to relate individual actions to negative impacts within the local creeks can help foster stakeholder participation and local pride in an important neighborhood resource.

Priority: Medium

Lead Stakeholders: Roseville, Rocklin, Placer Co. Dept. of Public Works

6.5.5 Landscape Guidelines for Homeowners

Through a series of approaches (classes, print media, etc.), public agencies should encourage the use of landscaping methods that will support ecosystem health (Figure 6-12). These include the use of drought tolerant plants to limit irrigation, proper irrigation schedules, buffering of natural areas from herbicide, pesticide and fertilizer impacts, and limiting the use of invasive plant species in the ornamental landscape.

Priority: Low

Lead Stakeholders: Roseville, Rocklin, PCFCWCD

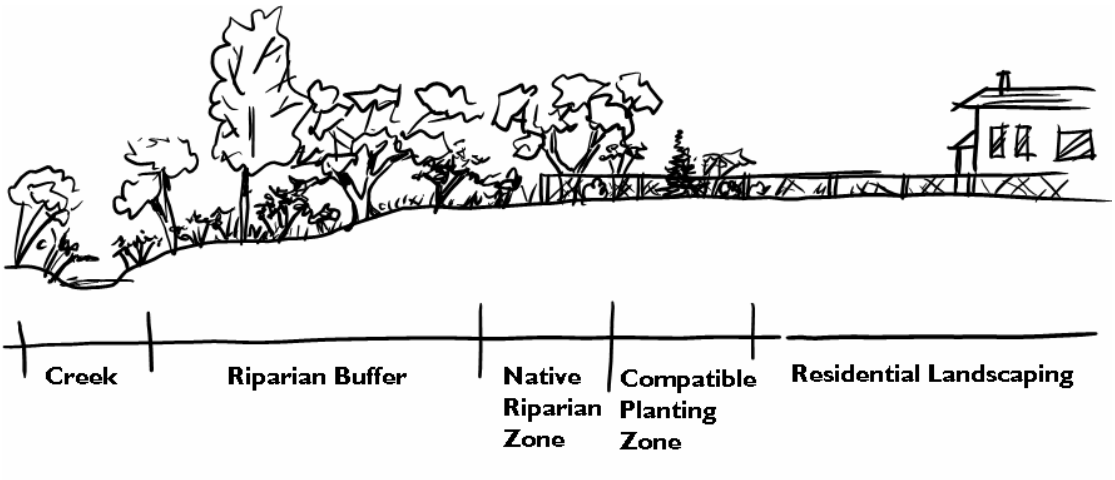

Figure 6-12 Recommended Residential Plantings Adjacent to Riparian Buffer

6.5.6 Homeowner Storm Water Retention Program

Homeowners should be encouraged to store 1 inch of storm water from their impervious surfaces on their property. This practice is currently being required in the Tahoe Basin to help address the impacts of impervious surface drainage on the natural waters. The use of dry wells filled with rock or gravel, or as a prefabricated structure, rock filled infiltration systems, and infiltration trenches are all ways of accomplishing this goal[88].

Priority: Low

Lead Stakeholders: Roseville, Rocklin, PCFCWCD

6.5.7 Impervious Surface Retrofit Program

Encourage replacement of large residential impervious surfaces such as concrete driveways and patios. While roofs obviously must remain as impervious surfaces, many of the other impervious surfaces commonly found at individual residences are not required by function to be impervious. Things such as driveways, patios and walkways do not need to be made of impervious concrete. Cumulatively, all of the driveways and concrete patios within a single residential neighborhood add up to a large portion of the area, and they typically drain directly to the street gutters and storm drain systems. Concrete driveways can be replaced with gravel, decomposed granite or porous pavers. Similarly, concrete patios can be replaced by wood or synthetic wood decking with spaces between

[88] The Partners in Conservation, April 2004

the planking, or a permeable paver system. Participation in this program could be increased through incentives such as rebates on materials and labor costs, waived fees for the disposal of the old material, or free technical assistance.

Priority: Low

Lead Stakeholders: Roseville, Rocklin, Placer Co. Dept. of Public Works

6.5.8 Interpretive Programs

Interpretive programs including signage along trails and in parks adjacent to open space, classes, curricula in local schools, nature themed festivals, and other similar special events should be encouraged throughout the watershed to increase stakeholders understanding of ecosystem function. Successful habitat preservation and enhancement will depend in part upon the public's enthusiasm and appreciation for valuable habitat.

Priority: Medium

Lead Stakeholders: TBD by Watershed Group

6.5.9 Storm Drain Labels

Expand existing efforts in the watershed to label storm drains indicating the local water body the drain connects to. This type of signage informs people where the drain leads, eliminating the "black hole" mystique that storm drains often have with the public. It also helps make people feel like they are connected to the creeks and lets them know exactly where their impacts, or lack of impacts, will affect their surroundings.

Priority: Low

Lead Stakeholders: Placer Co., Sutter Co., Roseville, Rocklin

6.5.10 Agricultural Lands Management

Currently, there is very little participation by agricultural land owners in the Pleasant Grove/Curry Creek Watershed Group. This situation might be improved by designing and implementing a voluntary outreach and education strategy for local farmers to assist them with implementing environmentally beneficial projects and land management practices. This strategy should be multifaceted and driven by the farming stakeholder

community. It should identify incentive programs as well as sources for technical assistance, grants, and permitting support.

Priority: Medium

Lead Stakeholders: Placer Co., Sutter Co., Placer County Agricultural Commission, Farm Bureau, NRCS