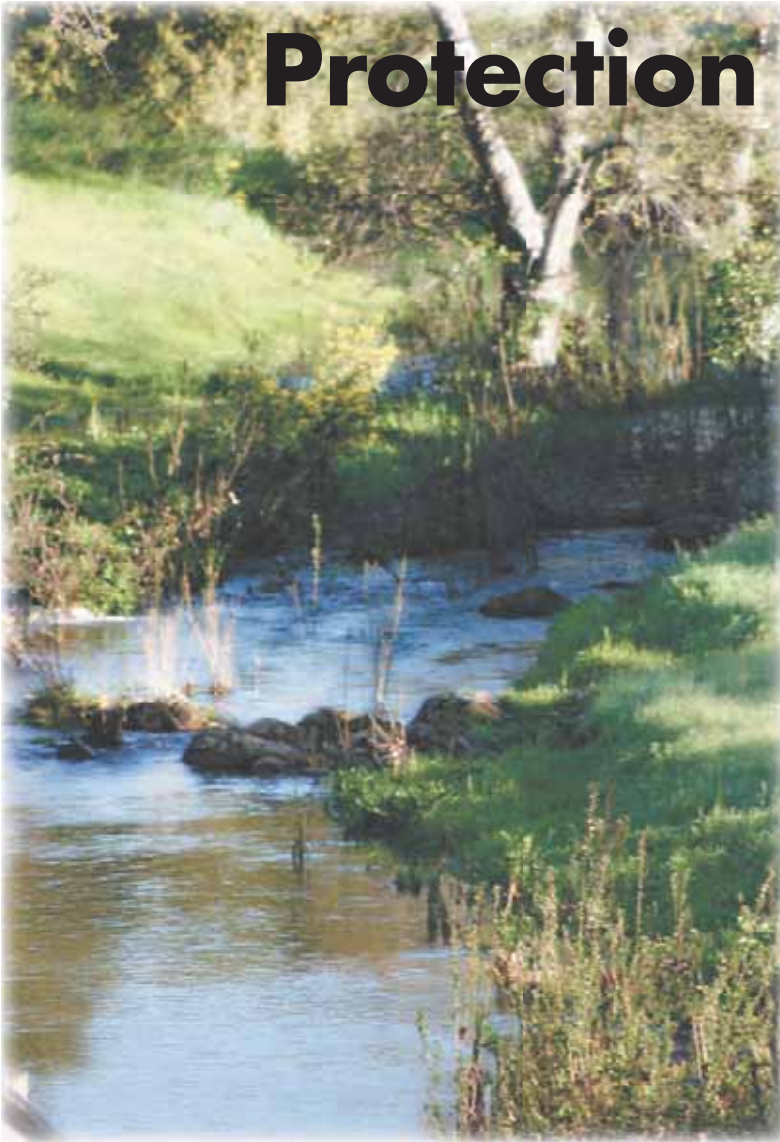


Water Resources Protection Manual



August 22, 2006

RESOLUTION NO. 2006- 75
A RESOLUTION OF THE SANTA.CLARA VALLEY WATER DISTRICT ADOPTING A
WATER RESOURCES PROTECTION MANUAL CONCERNING EVALUATION OF
ENCROACHMENT PERMIT APPLICATIONS AND ESTABLISHMENT OF CONDITIONS
FOR SUCH PERMITS

WHEREAS, the Santa Clara Valley Water District (District) desires to implement standards to accomplish District purposes described in the District Act and in Ordinance and to facilitate the implementation of District policies of providing a reliable supply of healthy and clean water; reducing the potential for flood damages; protecting and when appropriate enhancing and restoring natural resources of streams and watersheds; and providing additional open spaces, trails, and parks along creeks and in the watersheds when reasonable and appropriate.

WHEREAS, District staff, along with staff representatives of the County of Santa Clara, the Cities in Santa Clara County, the Guadalupe-Coyote Resource Conservation District, the San Francisco Bay Regional Water Quality Control Board (RWQCB), various business and development interests, environmental, agricultural, community, and property owners' interests have formed and are members of the Santa Clara Valley Water Resources Protection Collaborative (Collaborative).

WHEREAS, the Collaborative developed a set of model guidelines, standards, procedures, and recommendations to apply to land use activities near streams and on streamside properties, and to protect streams and streamside resources.

WHEREAS, the District desires to adopt a Water Resource Protection Manual containing standards and illustrative guidelines, drawing from the Collaborative's model guidelines and standards, which-will be used for the evaluation of permit applications and establishment of permit conditions under Ordinance 06- 01

WHEREAS, the Water Resource Protection Manual contains streamside and facility protection requirements and recommendations (Chapter 1) , and a Design Guide (Chapter 3) intended to provide further detail, illustrations, and clarification on the application of the requirements and recommendations.

WHEREAS, in addition to the requirements contained in the Water Resource Protection Manual, there may be additional applicable requirements for District encroachment permits which are hereby incorporated by reference (Chapter 2).

WHEREAS, the guidance in the Water Resource Protection Manual is intended to compliment existing local, state, and federal regulations.

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WHEREAS, additional requirements beyond what is contained in the Water Resource Protection Manual may be needed to comply with the California Environmental Quality Act or any regulatory permits in which case those requirements shall control.

NOW, THEREFORE BE IT RESOLVED that the attached Water Resources Protection Manual dated August 22, 2006, to be used in the evaluation of encroachment permit applications, and establishment of permit conditions is hereby adopted.

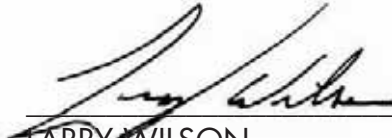
PASSED AND ADOPTED BY THE BOARD OF DIRECTORS OF THE SANTA CLARA VALLEY WATER DISTRICT ON October 24, 2006, by the following vote:

AYES: Directors R. Kamei, T. Estermera, S. Sanchez, R. Santos, G. Zlotnick, L. Wilson

NOES: Directors None


ABSENT: Directors J. Judge

SANTA CLARA VALLEY WATER DISTRICT



LARRY WILSON
Board of Directors/Chairperson

ATTEST:



Lauren Keller
Clerk of the Board

APPROVED AS TO FORM AND LEGALITY



Debra L. Cauble
District Counsel

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Water resources Protection Manual

Requirements and Recommendations

The following requirements will be used to determine compliance with Section 2.3.3 (6) of the Water resources Protection Ordinance (Ordinance 06-1). Recommended practices are outlined at the end of each section as appropriate. Illustrative detail and clarification on the specific application of the requirements and recommendations can be found in the Design Guide contained in Chapter 3.

I. Riparian Corridor Protection

- A. Existing native riparian vegetation is retained unless it presents a threat to public health and safety, including an imminent danger of induced flooding, and/or a biologist/arborist confirms that removal will improve the stream ecology or habitat or it is deemed that removal is unavoidable.
- B. When riparian vegetation is removed, required mitigation is provided.
- C. Non-native species are not planted between the top of banks of a stream or within an existing riparian corridor.
- D. Planting of non-native invasive species is not taking place adjacent to an existing riparian corridor.
- E. Invasive species are not planted.

Recommendations:

- 1. Preserve in and near-stream existing riparian vegetation whose canopies provide shade and nutrients to aquatic life.
- 2. Protect stream characteristics suitable for fish habitat when a modification is proposed to influence these characteristics including riffles, pools, gravel beds, stable undercut banks, overhanging vegetation and in-stream woody debris.
- 3. Use watershed specific native species for major development restoration landscaping.
- 4. Locate loading docks, trash enclosures, chemical storage areas, and stationary noise producing mechanical equipment away from streams and riparian corridors.
- 5. Locate new paved areas, active recreational areas, agricultural growing areas, and grazing activities outside riparian corridors.
- 6. Avoid nighttime lighting in riparian corridors.
- 7. Locate trash bins away from streams.
- 8. Avoid bright colors and glossy or glare producing building finishes on structures facing the stream or riparian areas.
- 9. Direct nighttime lighting away from the riparian corridor.
- 10. Maximize the distance between nighttime lighting and the riparian corridor.

II. Levee and Pipeline Protection

- A. A slope stability analysis shows the integrity of the levee is maintained related to any modification to a levee.
- B. Replacement of fill in levees is designed according to District specifications.
- C. Trees are not planted on levees unless additional fill is placed against the levee.
- D. Bubbler or drip-system irrigation is used within the outboard levee slope, and only for plant establishment purposes.
- E. Main irrigation lines are not installed on levees.
- F. Any structure providing support to levees is designed for a 50 to 100-year life span.
- G. Water pipelines are outside District levees.
- H. Trees are not planted within easements or right-of-way of District water supply pipelines.

Recommendations:

- 1. Provide a building setback for levee sections of 18 to 25 feet from the toe of the levee.
- 2. Place fill adjacent to the dry side of the levee to minimize the levee height unless it causes drainage problems, disturbs wetlands, creates safety concerns, or impacts aesthetics of properties.

III. General Landscaping

- A. Irrigation systems are designed such that runoff will not cause erosion.
- B. Use of pesticides on District property or easements is conducted according to District's pesticide policy.

Recommendations:

- 1. Follow efficient water use landscape ordinance requirements for drought tolerant plants and water conservation.

IV. Streambank Stability and Streambed Conditions

- A. Projects are located outside the slope stability area, defined as the greater of 1 or 2, below:
 - 1. Two to one (2:1) slope stability requirement. Please note that distance may need to be increased depending on whether the stream is deeply incised or have highly erodible banks.
 - 2. Twenty (20) feet from top of bank.
- B. Projects which are within the slope stability area have a geotechnical analysis demonstrating that:
 - 1. The development would not require introduction of hardscape in order to maintain active floodplain or active channel slope.
 - 2. Maintenance or repair of the stream can be provided.
 - 3. The location of the proposed structure will not threaten bank stability.
 - 4. Bank instability will not threaten existing structures and/or potentially cause a health and safety hazard.

V. Encroachments between the Top of Bank

- A. Decks, pathways, and buildings or any other structures do not overhang or encroach beyond or within the top of bank.
- B. New and replacement bridges are constructed as clear span structures unless length of the span makes clear span infeasible, then
 1. Footings and pile caps are designed based on channel scour to prevent erosion.
 2. Foundation depth is a minimum of three (3) feet below the active channel invert.
 3. The clearance under the bridge is a minimum of 12 feet unless access to the stream is to be provided from the road.
- C. Structures proposed between the top of bank do not reduce the active channel or active floodplains' conveyance area or re-direct flow to the detriment of another bank or the river bed unless a hydraulic analysis indicate no increase in erosive velocity or flood elevations will result.
- D. Any required hydraulic analysis:
 1. Is prepared using HECII or HEC-RAS format (small rural streams may utilize simpler hydraulic analysis methods).
 2. Models debris loading on piers (3 times the pier width).
 3. Includes a scour analysis.
- E. Structures proposed between the top of bank along jurisdictional creeks comply with District freeboard requirements.
- F. Proposed encroachments in the active channel and active floodplains provide for fish passage and do not impact aquatic life.
- G. Proposals to place structures in the active channel due to structural requirements, feasibility, or otherwise, include the appropriate accepted feasibility, geomorphic, biological, and/or hydraulic analyses.

Recommendations:

1. Mitigation for loss of riparian habitat or aquatic habitat impacts related to construction of new structures is located as close to the new structure as possible.

VI. Erosion Prevention and Repair

- A. Remediation of onsite existing erosion is provided.
- B. Erosion repair projects have an evaluation of the project on potential impacts and no negative impacts are found relating to
 1. Upstream and downstream banks.
 2. Post-construction erosion potential.
 3. Flood elevations.
 4. Or, mitigation is identified and provided as part of the project.
- C. Construction on slopes greater than 5 percent include plans for implementation of erosion and sediment control measures.
- D. Hardscape or retaining wall proposals have an analysis demonstrating that
 1. All softer methods have been evaluated
 2. The proposed method will reduce erosion
 3. The proposed method will not cause erosion or negatively impact proper stream function in other areas
 4. Or, mitigation is identified and provided as part of the project.
- E. Channel repairs match the contours of the upstream and downstream banks.

- F. Treatment of bare earthen slopes to minimize erosion and sedimentation resulting from work is provided.
- G. Design cutoff walls or keys anticipate scour depth and have a minimum depth of three (3) feet.
- H. Design of erosion protection utilizes the softest possible method.

Recommendations:

- 1. Include guidance provided in the Bank Protection and Erosion Design Guide for any erosion prevention and repair design work.
- 2. Appropriate vegetation is planted between the top of banks as an alternative to hardscape bank protection while maintaining design channel capacity.
- 3. Encourage drainage designs that avoid the need for outfalls or reduce the size and/or number of outfalls.
- 4. Lay back over-steepened banks to a more stable configuration whenever possible.

VII. Grading

- A. Grading adjacent to streams provides for buffer areas and vegetated swales between the stream and graded areas.
- B. Erosion and sediment control measures are taken to prevent sediment contribution from any construction area into Calero, Anderson, Lexington, Coyote, and Almaden reservoirs.

Recommendation:

- 1. Consider protective measures in source water protection zones and sensitive areas of reservoir watersheds.

VIII. Outfalls, Pump Stations and Site Drainage

- A. Runoff is directed to the same watershed where the project is located.
- B. Site drainage is directed through vegetated areas or stilling basins prior to discharge or collection in storm drain systems.
- C. Concentrated drainage (i.e. roof overhangs or downspouts) is directed away from the stream or overbank drainage is directed to vegetative buffer strips or landscape areas prior to reaching the stream.
- D. The minimum number of outfalls is used.
- E. New channel outfalls conform to the municipality's drainage master plan.
- F. Slope protection for outfalls meet District minimum engineering standards.
- G. Outfalls do not overhang the stream bank or bed.
- H. The minimum outfall diameter is 12 inches.
- I. Outfall discharge is oriented downstream and pipe invert is at least 2 feet above the stream bottom in areas where sediment deposition is anticipated.
- J. Flap gates are installed whenever 100-year surface water elevation is above adjacent ground at inlet.
- K. Dormers in outfalls are provided with flap gates to isolate the flap gates and keep them out of flow area.

- L. In conjunction with new or redevelopment, abandoned outfall pipes and slope protection are removed and the stream bank restored to similar condition existing upstream and downstream of site.
- M. Outfall discharge does not pollute receiving water or cause channel erosion.
- N. A discharge management plan is developed to manage pump operations during high water (flood) events for development projects requiring a pump station that discharges to a stream.

Recommendations:

- 1. Limit pump discharges to the extent feasible during peak flows to minimize potential impacts from flooding.
- 2. Prefer that there are no new outfalls

IX. Channelization

- A. On-site surface streams are not buried.
- B. On-site surface streams are not in culverts except for road crossings in which case the crossing is clear span and:
 - 1. Carries the bank full flow.
 - 2. Accommodates a modified floodplain drainage.
 - 3. Accommodates the 100-year flow, if feasible.
- C. Regional debris or sediment basins that will be owned or maintained by the District are designed for 50-year sediment capacity.
- D. Modifications to open channels have an accepted hydraulic analysis including stream dynamics and induced flooding.
- E. Stream conveyance area is designed for 100-year design flow with freeboard, unless the active channel and floodplain will not contain the designed 100-year flow.
- F. Creeks are not filled to accommodate grading and construction until impact avoidance and minimization efforts are maximized.
- G. Impacts to habitat are demonstrated to be avoided.

Recommendation:

- 1. Dedicate an 18 to 22-foot wide maintenance area to the District for stream modification projects.
- 2. Recommend restoration of natural stream processes if possible.
- 3. Use multi-stage culverts with cross-sections designed to carry different flows for meeting IX.B.1,2 and 3.

X. Utility Encroachments

- A. Proposals do not include longitudinal (parallel) encroachments within District right of way.
- B. Utility pipes or conduits are under the stream or placed inside of, or attached to, the downstream face of a bridge, and go under any levee (no cuts in levees). If it is unfeasible to go under or attach to the downstream face of bridge, the utility crossing is located on the upstream face of bridge and the design provides the following features:
 - 1. Would not catch debris,
 - 2. Would be capable of surviving impacts from floating debris in high flow,
 - 3. Would not hinder emergency debris removal or maintenance operations.
- C. New or replacement bridges provide locations for future utility crossings.

- D. Utilities proposed under the stream are concrete encased or placed in a sleeve.
- E. Borings are five (5) feet below lined channels and eight (8) feet below unlined channels.
- F. The minimum clearance for cut and cover is three (3) feet and is based on scour depth.
- G. A fracout prevention and response plan (describing how water quality will be protected in the event of fracout) is prepared for directional drilling projects using bentonite or other lubricants to go beneath or near streams and aquatic habitats.

Recommendations:

1. Utilize directional bore to install under-channel utilities.

XI. Trail Construction

- A. Trails are located so as to avoid impacts to stream and riparian areas unless unfeasible.
- B. Deep excavation for trail construction takes place outside tree root zones unless unfeasible.
- C. Trails on District right of way have an agreement defining maintenance, management, and liability responsibilities of facilities.

Recommendations:

1. Encourage joint use of pedestrian/bicycle paths along creeks.
2. Place paved multi-use trails so as to maximize the distance between the stream and the riparian areas.

XII. Septic Systems

Recommendations:

1. Consult with District to determine whether land feature is an active floodplain or swale and assist in determining high water marks at reservoirs.

XIII. Groundwater Protection

- A. Groundwater resource assessments acceptable to the District are prepared when there is potential for significant groundwater supply or groundwater quality impacts.
- B. Wells are shown on plans and are registered with the District and either be maintained or destroyed in accordance with District standards.

Recommendations:

1. Manage (limit, monitor and implement best management practices) existing high risk activities in recharge areas of basin.

XIV. Flood Protection

- A. In special flood hazard zone A (areas where base flood elevations have not been determined) hydraulic analyses are prepared to determine the base flood elevation for subdivisions greater than 5 acres or 50 lots whichever is lesser.
- B. For major developments near streams subject to California Environmental Quality Act (CEQA) review that are compatible with the General Plan utilized for developing District hydrology

and the Federal Emergency Management Agency (FEMA) floodmaps, development does not increase site runoff so as to increase depth (0.1 foot increase in water surface) or lateral extent of flooding or increase discharge in local streams.

- C. A hydraulic analysis, prepared by registered civil engineer, is prepared to demonstrate that there will not be flood impacts created in relation to XIV.B.

Recommendations:

1. Recommend increased levels of protection as described in the Department of Water Resources Model Floodplain Ordinance, recommendations of California Floodplain Management Task Force (Dec 2002), and FEMA's Community Rating System Program.
2. Utilize any other available base flood elevation data as criteria for meeting National Flood Insurance Program requirements for construction and substantial improvements for subdivisions other than those covered under XIV.A.

Additional Standards for District Encroachment Permits

Additional standards to evaluate District encroachment permits and to establish related permit conditions may be found in the following documents. The standards may be found at the Clerk of the Board of the Santa Clara Valley Water District; 5750 Almaden Expressway, San Jose, CA 95118-3686.

1. District's administration policies.
2. District's design guide.
3. Best Management Practices Handbook, ISO Document WW75109, for construction activities near streams.
4. United States Corps of Engineers guidelines for levee stability and safety.

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INTRODUCTION TO THE DESIGN GUIDE

THE PURPOSE OF THE DESIGN GUIDE IS TO PROVIDE FURTHER ILLUSTRATIVE DETAIL AND CLARIFICATION ON THE SPECIFIC APPLICATION OF THE REQUIREMENTS AND RECOMMENDATIONS OUTLINED IN CHAPTER 1, AND TO DETERMINE COMPLIANCE WITH SECTION 2.3.3(6) OF THE WATER RESOURCES PROTECTION ORDINANCE (ORDINANCE 06-1).

WHERE THERE IS A VARIETY OF OPTIONS, THE PREFERRED OPTION IS INDICATED. IT IS NOTED, HOWEVER, THAT THE PREFERRED OPTION MAY NOT ALWAYS BE FEASIBLE OR PREFERRED DEPENDING ON THE CIRCUMSTANCES, OTHER OPTIONS, WHICH ARE ALLOWABLE NOT TYPICALLY RECOMMENDED HAVE BEEN INCLUDED AS WELL.

IF THERE IS A CONFLICT BETWEEN INFORMATION IN THE DESIGN GUIDE AND THE REQUIREMENTS AND RECOMMENDATIONS IN CHAPTER 1, PLEASE DEFER TO CHAPTER 1.

ALSO, SOME JUDGEMENT WILL NEED TO BE MADE BASED ON SITE-SPECIFIC CONDITIONS AND THE DYNAMIC NATURE OF THE STREAM SYSTEMS.

PROTECTION OF EXISTING RIPARIAN VEGETATION

INTRODUCTION

This Design Guide was assembled in order to provide more detail on protection of native riparian plants. The sections that follow provide more detail on how to best implement these requirements. They also serve as helpful guidelines for single family home owners involved in landscaping and revegetation projects.

THE IMPORTANCE OF RIPARIAN VEGETATION

Riparian vegetation plays a vital role in maintaining stream stability, providing valuable wildlife habitat, and moderating downstream flooding. In addition, the presence and/or absence of riparian areas is directly correlated to water quality as the riparian vegetation serves to filter pollutants from stormwater, such as oil and grease from roadways, fertilizer runoff from lawns, and excess sediments from upstream.

Due to the importance and relative lack of riparian vegetation in Santa Clara County, particularly in urban areas, one goal of any planning project is **to avoid removal of any native riparian vegetation and to prevent the types of conditions that would threaten or degrade existing riparian habitat and/or contribute to soil loss** critical to the continued health and regeneration of riparian trees. To this end, all development activities need to be outside this riparian corridor where at all possible. Any exceptions to this rule need to be justified and mitigated.

VALUE OF ESTABLISHING RIPARIAN BUFFERS

The amount and condition of the riparian habitat has been significantly reduced in Santa Clara County over time, primarily due to channel encroachment and modification. This has led to incised channels, as well as a lowering of the water table, loss of riparian vegetation, decline in water quality and most beneficial uses, as well as increased risk of erosion, bank failure and flooding. To stop and reverse this trend, an additional buffer area should be established between the edge of the existing riparian zone and any development, where feasible. This buffer should be planted with native vegetation in order to better protect the riparian corridor and the watercourse. The goal is to eventually establish and increase the riparian buffer area all along the riparian corridor. The value of riparian buffers areas has been well documented, in addition to reducing flash runoff and improving water quality, they provide supplemental foraging resources and corridors for wildlife to access the streams and even increase streamside property values.

This Design Guide describes standard criteria for determining how far from existing riparian habitat to locate construction and development activities in order to help ensure its protection. The Design Guides that follow provide more detail on the types of plants to use in landscaping and revegetation of areas, in or adjacent, to riparian areas. For more information on design of trails in specific, see Design Guide number 16.

CALCULATING RECOMMENDED TREE PROTECTION ZONES

Calculation of the recommended distance between an existing riparian tree and closest construction, staff need to consider the following variables:

1. Evaluate the species tolerance of the tree: good, moderate, or poor.
2. Identify tree age: young, mature or overmature.
3. Using the table below, "GUIDELINES FOR OPTIMAL TREE PRESERVATION ZONES", find the distance from the trunk that should be protected per inch of trunk diameter.
4. Multiply the distance by the trunk diameter to calculate the optimum radius (in feet) for the tree protection zone.

If excavation occurs inside the identified "Tree Protection Zone", roots will be severed, the tree's health will decline, the incidence of insect and diseases will increase and people may be endangered by eventual failure of the destabilized tree. Where there are other site constraints, anticipated encroachment within the recommended tree protection zone, an arborist should be consulted to determine the appropriate protection measures or alternative setbacks.

GUIDELINES FOR OPTIMAL TREE PRESERVATION ZONES

Species Tolerance	Tree Age	Distance from trunk feet (per inch trunk diameter)
Good	Young*	.05'
	Mature*	.75'
	Overmature*	1.0'
Moderate	Young	.75'
	Mature	1.0'
	Overmature	1.25'
Poor	Young	1.0'
	Mature	1.25'
	Overmature	1.5'

*Young (<20% life expectancy)

*Mature (20-80% life expectancy)

*Overmature (>80% Life expectancy)

EXAMPLE TREE PROTECTION ZONES

Western Cottonwood (*Populus fremontii*): Poor Tolerance

The Western Cottonwood has a poor tolerance to root disturbance. The tree protection zone for an overmature tree is 1.5' per inch of tree diameter or a 45 foot radius for a 30 inch diameter tree. Other trees with a poor tolerance include the black cottonwood and bigleaf maple.

Western Sycamore (*Platanus racemosa*): Moderate Tolerance

A Western Sycamore has a moderate sensitivity to impacts around its roots. The tree protection zone for an overmature tree measured from its trunk is 1.25 feet per inch of trunk diameter. A 30" diameter mature Western Sycamore needs a tree protection zone with a 37.5' radius. Other species with a moderate tolerance include the valley oak, California bay and willows.

Coast Live Oak (*Quercus agrifolia*): Good Tolerance

The Coast Live Oak has a good tolerance to disturbance. The species is sensitive to the addition of fill around its trunk and does not tolerate frequent summer watering. The tree protection zone for a mature tree is one foot per inch of trunk diameter. A 30 inch diameter tree needs a protection zone with a 30 foot radius. Other trees with a good tolerance include alders, box elders, and California buckeye.

USE OF LOCAL NATIVE SPECIES

INTRODUCTION

The use of locally native plants for all landscaping and revegetation projects adjacent to streams and riparian areas is required for new and major redevelopment. It should also be the preferred choice for homeowners involved in any landscaping and revegetation projects within the riparian corridor since native plants are ecologically best suited to a particular creek environment and will provide the most habitat and slope protection with the least amount of maintenance over time.

HOW TO FIND AND SELECT NATIVES IN THE WATERSHED

When vegetating the creek, choose species growing nearby and make sure the plants used were propagated from seeds, cuttings or divisions collected from the same local creek or watershed. Try local home-grown native plants via direct installation of seeds, divisions and cuttings on the creek bank. Oaks, buckeye and bay trees are easy to grow from seed planted directly into moist creek bank soil. Cottonwood and willow are easy to grow from cuttings stuck directly into moist sandbars. California rose, California blackberry, snowberry, mugwort, beardless wildrye and others can be propagated readily from vegetative offsets and division.

GUIDELINES FOR PLANTING NATIVE SPECIES

- Geared toward establishing or enhancing the native habitat.
- **Ensure that the initial planting density is high**, averaging 6 to 12 feet on center, to create canopy coverage and closure quickly. Include a range of species in the plant palette to fill in the understory, mid-story and overstory.
- **Avoid hardscape** such as patios, walkways and decks within these areas to minimize human impacts and maximize habitat value.
- **Maintain and monitor plantings** for a 3 to 5 year period to ensure healthy establishment. Performance and success criteria include percentage of allowable mortality and goals for an annual percentage of vegetative cover.
- Slowly eliminate the need for human intervention, including irrigation, weed control, replanting, pruning, etc. The final goal is to discontinue maintenance activities when habitat is self sustainable.

California Native Plant Society's Web site:
www.cnps.org

LIST OF NATIVE PLANT SPECIES

The following list is a conglomerate of riparian plant species that exist within the boundaries of Santa Clara County. The distribution of one plant may or may not overlap with the next one on the list. Some of them would never be seen together in the wild due to preferences for different

microclimates, soil substrates and hydrologic regimes. If you are unfamiliar with local native plant ecology, consult local experts for help selecting the best plant palette for your particular creek or follow Nature's example and copy what you see in a wild area located close to your project site.

TREES:

Big Leaf Maple

Acer macrophyllum

California Box Elder

Acer negundo var. californicum

California Buckeye

Aesculus californica

White Alder

Alnus rhombifolia

Western Sycamore

Platanus racemosa

Fremont Cottonwood

Populus fremontii ssp. fremontii

Black Cottonwood

Populus trichocarpa

Coast Live Oak

Quercus agrifolia

Valley Oak

Quercus lobata

Narrow-leaved Willow

Salix exigua

Red Willow

Salix laevigata

Yellow Willow

Salix lucida ssp. lasiandra

Arroyo Willow

Salix lasiolepis

Blue Elderberry

Sambucus mexicana

California Bay Laurel

Umbellularia californica

SHRUBS AND VINES:

California Sagebrush

Artemisia californica

Mule Fat

Baccharis salicifolia

Virgin's Bower

Clematis ligusticifolia

Toyon

Heteromeles arbutifolia

Coffeeberry

Rhamnus californica

California Wild Grape

Vitis californica

Brown Dogwood

Cornus glabrata

California Rose

Rosa californica

California Blackberry

Rubus ursinus

Snowberry

Symphoricarpos albus var. laevigatus

GROUND COVERS AND HERBACEOUS PERENNIALS:

Mugwort

Artemisia douglasiana

Western Aster

Aster chilensis

Douglas' Baccharis

Baccharis douglasii

Western Goldenrod

Euthamia occidentalis

Beardless Wildrye

Leymus triticoides

Sticky Monkey Flower

Mimulus aurantiacus

California Figwort

Scrophularia californica

California Native Plant Society's Web site:
www.cnps.org

USE OF ORNAMENTAL OR NON-NATIVE LANDSCAPING

INTRODUCTION

If the use of local native plants propagated from local stock does not fit your landscaping goals, choose:

- **Non invasive drought-tolerant, non native ornamental plants** having no potential to cross pollinate native riparian species. For example, if native valley and coast live oaks, willows, sycamores or cottonwoods exist in the riparian corridor, don't plant ornamental oaks, willows, sycamores or poplars.
- **Non invasive, drought tolerant, non-local California natives** (aka ornamental natives), with no potential to cross-pollinate local native species; for example- Fremontodendron or Romneya.

When selecting plants and choosing their location in an ornamental landscape, the project design goals are generally geared to human aesthetics. In choosing ornamental landscaping, hardscape features, such as patios, decks, and walkways, are design components. **These features should be avoided within the riparian habitat area at all locations.**

PLANT SELECTION GUIDE

The choices of plants that meet the criteria described above for ornamental landscaping is vast. Selection of a plant species for a particular site will depend on goals of the landscape plan, site constraints, the owner's desires and budget. There are a variety of resources available from which selections can be made. Cities generally have plant lists available that were assembled for water conservation purposes. The East Bay Municipal Utility District has prepared a book, entitled "Plants and Landscapes for Summer Dry Climates" and the Sunset Western Garden Book, commonly available at most nurseries, has plant selections identified that are suitable for dry places. **Select plants from these sources as long as you avoid invasive plants and take the caution provided above for selecting native species that have not been propagated from your local watershed.**

REFERENCES

The California Native Plant Society's 'Guidelines for Protecting Native Plants from Genetic Degradation' is a helpful reference on the subject.

Find it at: <http://www.cnps.org/archives/archives.htm>

Scroll down to:

- 1) Policies and Guidelines
- 2) Conservation Policies
- 3) Guidelines for Landscaping to Protect Native Vegetation from Genetic Degradation.

NON – LOCAL CALIFORNIA NATIVE PLANTS

The following California native plants have a very low potential of hybridizing with our Santa Clara County natives since they do not naturally occur in northern California

TREES

Chilopsis linearis, (Desert Willow), Lyonothamnus floribundus, (Catalina Ironwood), Prosopis glandulosa var. torreyana, (Mesquite)

SHRUBS

Fremontodendron californicum or Fremontodendron mexicanum, (Flannel Bush), Galvesia speciosa, (Island Bush Snapdragon) Rhus integrifolia, (Lemonade Berry), Rhus ovata, (Sugar Bush), Romneya coulteri, Matilija Poppy, Simmondsia chinensis, (Jojoba)

California Invasive Plant Council Web site:
www.cal-ipc.org

COMMONLY FOUND INVASIVE SPECIES TO BE AVOIDED

Acacia*Acacia spp.***Almond***Prunus dulcis***Ash, evergreen***Fraxinus uhdei***Bamboo, running types***Arundinaria, chimonobambusa, phyllostachys, etc.***Black locust***Robinia pseudoacacia***Broom, french***Genista monspessulana, previously cytisus monspessulanus***Broom, scotch***Cytisus scoparius***Broom, spanish***Spartium junceum***Cape weed***Arctotheca calendula***Cotoneaster***Cotoneaster spp.***Elm***Ulmus spp.***Eucalyptus***Eucalyptus spp.***Fig***Ficus carica***Flowering plum, fruitful varieties***Prunus spp.***Fountain grass***Pennisetum setaceum*; purple variety "cupreum" is sterile and acceptable**Foxglove***Digitalis purpurea***Giant reed***Arundo donax***Glossy privet***Ligustrum lucidum***Gorse***Ulex europaea***Himalayan blackberry***Rubus discolor***Holly oak***Quercus ilex***Iceplants***Carpobrotus edulis, c. Chilensis, mesembryanthemum spp.***Ivy, algerian***Hedera canariensis***Ivy, cape***Delairea odorata, previously senecio mikanioides***Ivy, english***Hedera helix***Kikuyu grass***Pennisetum clandestinum***Lemon balm***Melissa officinalis***Lombardy poplar***Populus nigra 'italica'***London plane tree***Platanus acerifolia***Mint, any kind including pennyroyal, peppermint, spearmint***Mentha spp.***Monterey pine***Pinus radiata***Myoporum***Myoporum laetum***Olive***Olea europaea***Pampas grass, jubata grass***Cortaderia selloana, C. Jubata***Pepper trees***Schinus spp.***Periwinkle***Vinca major***Pyracantha***Pyracantha spp.***Tamarisk, salt cedar***Tamarix spp.***Tree of heaven***Ailanthus altissima***Walnut, english or black***Juglans regia, juglans californica var. Hindsii*

California Invasive Plant Council Web site:
www.cal-ipc.org

DESIGN GUIDE 4

RIPARIAN REVEGETATION OR MITIGATION PROJECTS

INTRODUCTION

This Design Guide is most applicable for larger scale revegetation or mitigation projects but also provides helpful information for anyone planning a revegetation project. Because of the complexity of revegetation design and the variety of ecosystems that exist within the county, it is nearly impossible to create succinct detailed Design Guidelines. Instead, a list of general, broad brush design planning guidelines is included below for riparian revegetation projects in Santa Clara County. Each individual project should be mentored through all stages of project planning and design by experienced biological staff on a case by case basis.

WATERSHED FIDELITY

- **To preserve genetic integrity in county watersheds, propagation material (seeds, cuttings, divisions) must originate from local native stock, i.e. individuals found as close as possible to the project site and within the same watershed.**
- If propagation material cannot be obtained from within the watershed, material may be collected from an immediately adjacent watershed that shares common ecological characteristics (climate, elevation, soil type, headwaters in the same mountain range, etc.).
- An ecological justification is required before any species may be planted using container stock grown from propagules that originate outside Santa Clara County.

SEED AND CONTAINER PLANTS

- Direct seeding should be used when possible. *Quercus* sp. and *Aesculus californica* have high success rates when installed in this manner.
- Direct stuck cuttings of willows, cottonwoods and mule fat is encouraged.
- Containerized native plants for revegetation or landscape plantings should be grown and installed in the smaller, deeper container sizes typically offered by revegetation nurseries rather than commercial nurseries to ensure they are healthy. For that reason, quality native plants will normally be smaller and younger than conventional nursery container stock, usually 1-gallon equivalent or smaller size. **Contract nursery production takes one-year minimum lead time before installation. Designers should take these factors into account when commitments are made to project stakeholders.**

SPECIES SELECTION

- Select plant species that are historically and ecologically appropriate to the project area unless site conditions have been radically modified. The plant palette should be well-suited to these conditions and blend with the existing native vegetation types.
- Non-local, showy, native **“landscape” species should not be intermingled with native revegetation species on projects where habitat restoration is the goal.**
- Do not plant invasive, non-native species near streams.

DESIGN CRITERIA

- Revegetation design should be predicated upon thorough analysis of groundwater and surface water hydrology, soil profiles, and other physical information obtained from direct site investigations. Existing site conditions should be preserved and modification into an artificially sustained condition should be discouraged.
- Revegetation projects should be designed to quickly attain sustainability rather than to require long-term human intervention.
- Irrigation, weed and pest control, soil manipulation, etc., should become unnecessary within one to three years.
- Land use on adjacent sites that could disrupt or damage the project goals should be factored into design decisions for revegetation projects.
- Experienced biological staff should be active participants during the entire design process for revegetation, native landscape, mixed (native & non-native) landscape, erosion control, etc. plans and specifications.

California Native Plant Society Web site:
www.cnps.org

TEMPORARY EROSION CONTROL OPTIONS

INTRODUCTION

This design guide provides more detail on G&S I.C.3 and GS IV.B.7 by explaining what steps can be taken during post construction to provide erosion control in short order on stream banks through temporary vegetative measures. These measures are typically employed:

- when the grading and/or construction is being done in phases,
- when it does not make sense to plant more permanent vegetation or
- if grading and/or construction has not been completed by the rainy season.

These temporary techniques are also sometimes used in conjunction with final more permanent revegetation. The following guidelines can be used to determine if and how erosion control seed mixes should be used.

SEED MIXES TO BE AVOIDED

Some commercially available seed mixes contain species, which are invasive weeds, aggressive competitors with native plants and/or future fire hazards. **These seed mixes should be excluded from streamside areas.** Examples are Blando brome, rose or red clover and annual rye.

EROSION CONTROL OPTIONS FOR WORK SITES WITH EXISTING NATIVE PLANTS

These erosion control options should be followed in most areas along natural creeks, where native trees, shrubs and herbs reside on or near the work site. A site visit or referral of a good series of photos to a landscape professional familiar with native plants or a revegetation specialist may be needed to determine the best approach.

If no irrigation is available, if the slope is very steep, or if it's late in the season

- Use a non-biological method, such as straw, straw with tackifier, erosion control blankets (jute netting with straw or coir filling), etc. instead of seeding.

Benefits:

- The blankets are functional immediately after installation.
- The adjacent native plants will fill in at their own pace.

Use if there is absolutely no time to investigate site conditions.

- Use a Failsafe mix with 50 lb/ac 'Regreen' sterile wheat (Triticum X Elymus 'Regreen'), with 95% minimum purity, and minimum germination of 85%.

Benefits:

- This plant mix makes few if any seeds, so it cannot become a weed, and it usually lives only one year.
- The adjacent native plants can seed in thereafter.

EROSION CONTROL OPTIONS FOR WORK SITES WITHOUT EXISTING NATIVE PLANTS

These erosion control options should be followed in areas where there is no remaining native vegetation for miles around. An example of such a site is the back slope of a levee in an urbanized area.

For Sunny Slopes 3:1 or Flatter

- **California Native Grass**

Use a mix of:

Prostrate *Hordeum californicum* (Prostrate California Barley) @ 16 lb/ac, minimum purity 90%, minimum germination 80%.

Elymus glaucus 'Berkeley' ('Berkeley' Blue Wildrye) @12 lb/ac, minimum purity 95%, minimum germination 85%

Bromus carinatus 'S.F. Bay Area' ('S. F. Bay Area' California Brome) @ 10 lb/ac, minimum purity 95%, minimum germination 85%

- **Failsafe mix**

50 lb/ac 'Regreen' sterile wheat (*Triticum* X *Elymus* 'Regreen'), minimum purity 95%, minimum germination 85%

- **Non-biological method** as outlined above

For Slopes 2:1 or Steeper

- **California Native Grasses PLUS Mix**

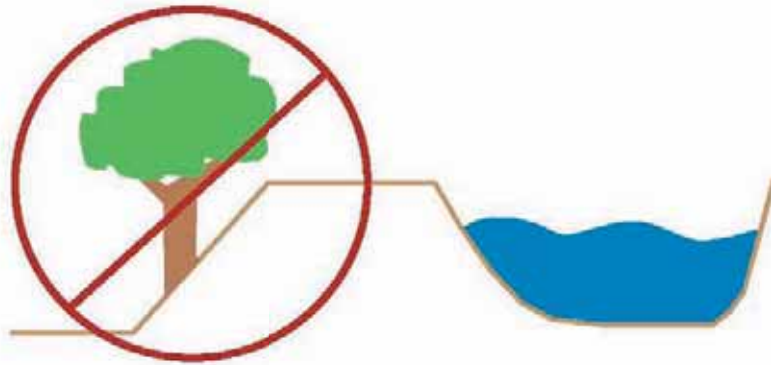
Use the mix for Slopes 3:1 or Flatter PLUS *Vulpia microstachys* (Three Weeks Fescue) @ 5 lb/ac, minimum purity 95%, minimum germination 70%

- **Failsafe mix**

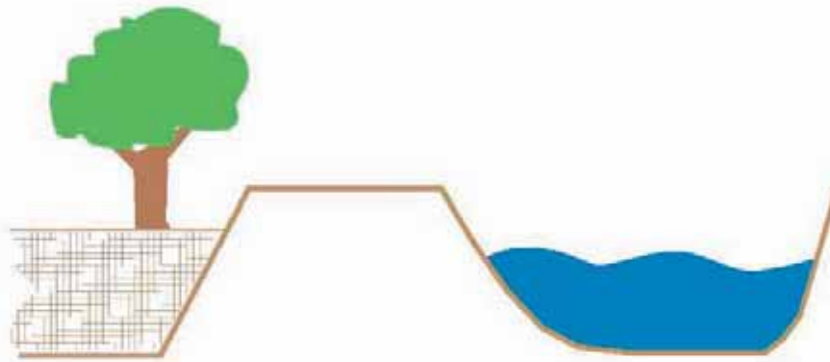
50 lb/ac 'Regreen' sterile wheat (*Triticum* X *Elymus* 'Regreen'), minimum purity 95%, minimum germination 85%.

- **Non-biological method** as outlined above

PLACEMENT OF FILL AND PLANTING OF TREES BY LEVEES



Plants with large root systems (trees and large shrubs) should not be placed on existing levees.

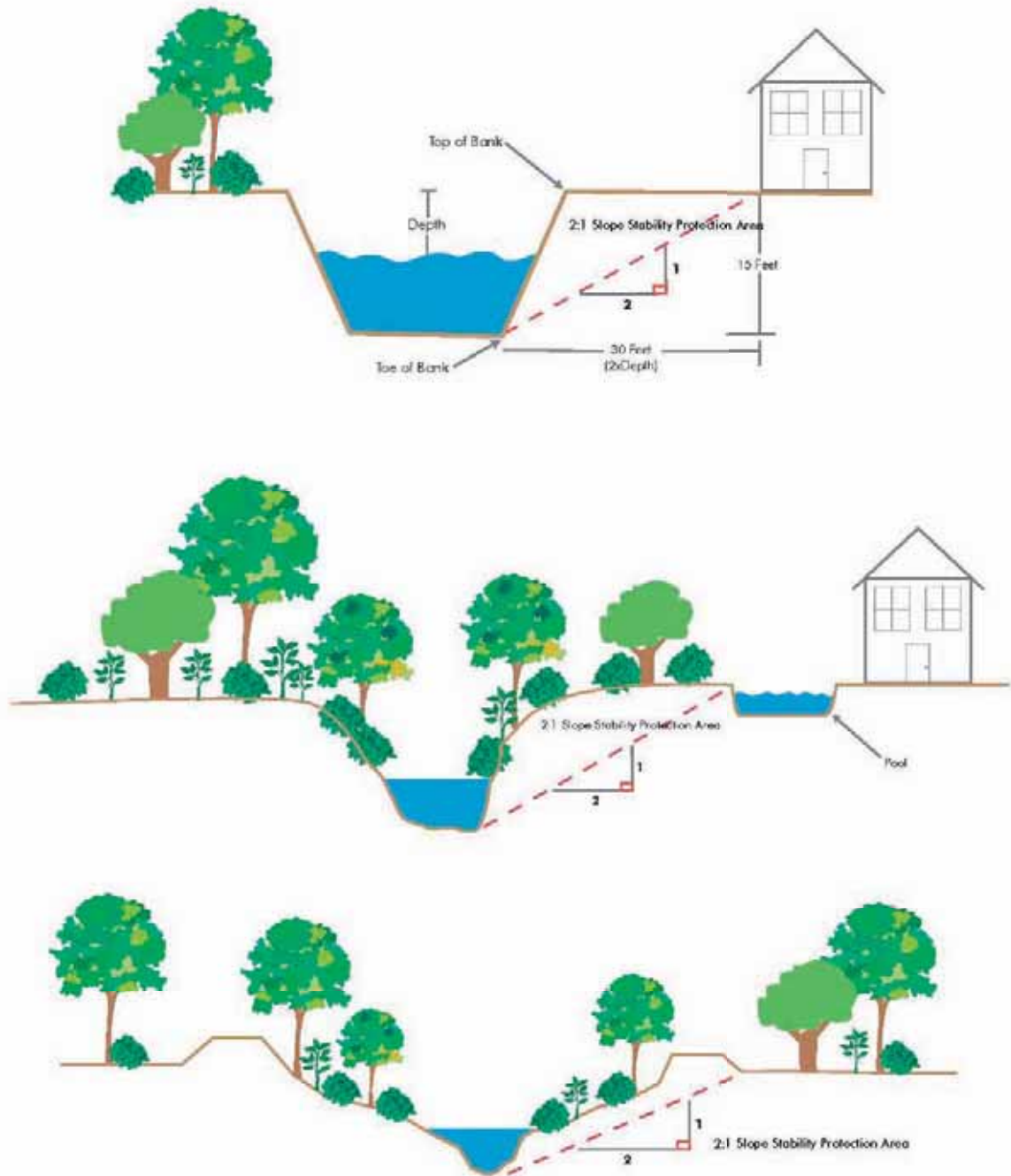


Trees may be planted on a levee if additional fill is placed on the levee.



The placement of fill on/next to the out board slope of the levee will reduce the height of the levee for aesthetics and improves the safety of the levee system. The height of the fill may vary. Geotechnical analyses may be needed to determine the impacts of the fill to the levee slope.

SLOPE STABILITY PROTECTION AREA



Note: While accessory structures are typically exempt, it is still recommended to locate them outside the 2:1 Slope Stability Protection Area in order to protect the structures, creek bank, and habitat.

GUIDELINES FOR ESTABLISHING FREEBOARD FOR BRIDGE CROSSINGS AND FLOOD PROTECTION PROJECTS

BACKGROUND

Freeboard is the additional capacity in a stream above the calculated capacity required for the 1 percent flow. Freeboard provides a safety factor for such things as normal wave action, inaccuracies in determination of friction factors, and minor silt and debris deposits. **The freeboard guidelines should also be followed when streams are modified as part of major land development proposals.** The Federal Emergency Management Agency (FEMA) has set guidelines for the determination of freeboard. In order for an area to be removed from a flood zone designated by FEMA following completion of a flood control project, the project must meet the FEMA guidelines. These freeboard guidelines are followed by the SCVWD in the design of flood protection projects **and should be followed for the design of bridges and other street crossings.**

A. Where the design water surface¹ is above natural ground, the following criteria shall be considered a minimum:

1. Federal Emergency Management Agency (FEMA) guidelines. FEMA currently specifies that levees shall have a minimum of 3 feet of freeboard with an additional foot of freeboard required 100 feet on either side of structures that are within the leveed section of creek or where the flow is constricted such as at bridges. FEMA also requires an additional $\frac{1}{2}$ foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee. To comply with these requirements, use as a minimum $3\frac{1}{2}$ feet of freeboard within leveed sections and 4 feet within 100 feet of bridges or other constrictions.

2. For floodwalls, use the same freeboard criteria as for levees. (Basis—SCVWD guideline)
3. If two-tenths of the total energy (depth of flow + $[\frac{v^2}{2g}]$) is greater than the freeboard requirement of A-1 or A-2 above, then the computed value shall be used for freeboard. (Basis—Natural Resource Conservation Service [NRCS] guideline)

B. Where the design water surface is below natural ground, the following criteria shall be considered a minimum:

1. One foot of freeboard shall be used for constructed, nonnatural channels where large amounts of vegetation are not anticipated in the channel. (Basis—Corps of Engineers guideline)
2. For all channels, if two-tenths of the total energy is greater than the freeboard requirement of B-1 above, then the computed value shall be used for freeboard. (Basis—NRCS guideline)

C. For bridges, the following criteria shall be considered minimum:

1. At new bridges, freeboard shall be the same as in the existing or proposed channel either upstream or downstream, whichever is greater. When the bridge structure encroaches into the freeboard area, there shall not be an increase in water surface for bank full flow. The intent is to define a system (bridge and channel) with a uniform level of protection. (Basis—SCVWD guideline)

¹ Defined by recent flood protection projects or determined according to local topography and site conditions. For more information, contact SCVWD.

2. Where an existing bridge or culvert can convey the design flow under pressure, it must be structurally sound and must be able to resist the resultant lateral and uplift forces.
(Basis—SCVWD guideline)

D. Other Considerations:

1. Evaluate all bridges with debris loads on the piers. (suggest Corps practice of three times pier diameter as blockage)
2. Freeboard should also contain the flow defined by the 80 percent confidence

limit statistical parameter where practical to do so.

3. All channels with super-critical flow will use sequent depth plus freeboard.
4. All channels will include freeboard for super-elevation of water surface at curves in addition to requirements specified in Sections A, B, and C above.
5. In areas of the County where there is the possibility of continued land surface subsidence, additional freeboard allowances should be considered.

GRADING OPTIONS NEXT TO STREAMS

INTRODUCTION

The details in this Design Guide are intended to provide clarification to G&S V.A, which calls for all grading next to streams to address drainage and avoid the concentration of flow over the stream bank. For all major redevelopment and new development, grading should be addressed in stormwater permit provisions. The applicants will have to observe urban runoff pollution prevention regulations during grading operations. In addition, the following grading guidelines would also be useful to single family homeowners interested in minimizing erosion and saturation of the streambank and maintaining slope stability and riparian habitat.

ADDITIONAL INFORMATION REQUIRED

In addition to the urban runoff pollution prevention regulations, permit applicants should also be asked to provide the following information:

- Existing trees that are to remain and those proposed to be removed
- The species of tree and its diameter at 4 feet from the ground
- Source of fill and hazmat certification

This will help in assess if the proposed grading method is the most appropriate for the site so as to avoid other impacts.

OPTIONS FOR GRADING

This Design Guide provides 5 options of how to design grading. Any other proposal which satisfactorily meets the goals of preventing over-bank drainage and the placement of fill along the riparian protection area by future lot owners may be considered. The selection of a particular option will be influenced by a site's finished grades needed to provide for streets, building pads and positive drainage to the storm sewer system.

Option #1 is the preferred option because it avoids disturbance to the riparian corridor and does not direct drainage over bank.

In other cases, applicants might need to use one of the Options 2- 5, because of the need to raise the site elevation. Option 2 avoids disturbance to the riparian corridor and minimizes the drainage directed over bank. Options 3 and 4 are similar but more costly. Option 5 would only be suitable if there is no riparian vegetation and it conforms to adjacent property upstream and downstream. **Fill placed within the riparian area should be suitable for planting.**

GRADING OPTIONS NEXT TO STREAMS

DEVELOPMENT ← ○ → SCVWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

4:1 OR FLATTER

VARIABLES

Exist. Ground

14/1 **DETAIL**
OPTION 1
PREFERRED

DEVELOPMENT ← ○ → SCVWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

2' (MAX)

4:1 OR FLATTER

Exist. Ground

14/2 **DETAIL**
OPTION 2

DEVELOPMENT ← ○ → SCVWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

REINF. CONCRETE OR BLOCK RETAINING WALL WITH ARCHITECTURAL TREATMENT ON FACE

Exist. Ground

14/3 **DETAIL**
OPTION 3

Santa Clara Valley Water District
5750 Almaden Expressway, San Jose 95118
Phone (408)265-2600

SCALE: N.T.S.

6/13/2005
REVISED

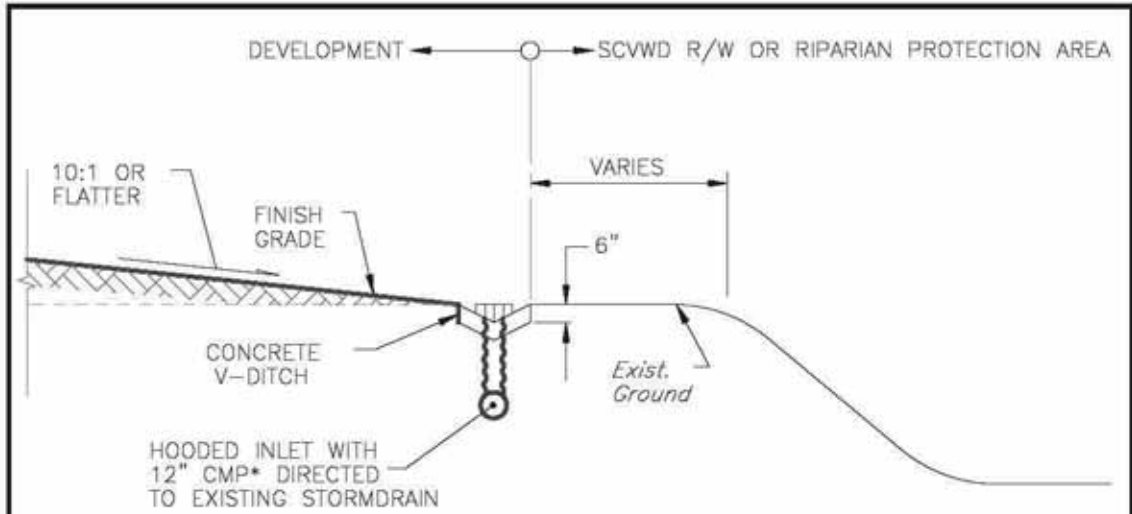
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**GRADING ADJACENT
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GRADING OPTIONS NEXT TO STREAMS

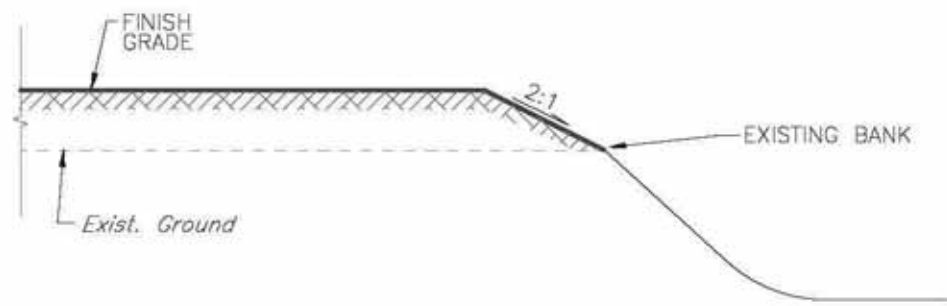
Option 5 is not the preferred option because placement of fill in riparian areas can damage stream side resources. If fill must be used in riparian areas, the type of fill used must support riparian vegetation and the area should be revegetated.



14/5 DETAIL OPTION 4

* CORRUGATED ALUMINUM OR STEEL PIPE

USE ONLY WHERE THERE IS NO RIPARIAN CORRIDOR



14/4 DETAIL OPTION 5

Santa Clara Valley Water District
 5750 Almaden Expressway, San Jose 95118
 Phone (408)265-2600
 SCALE: N.T.S.
 6/13/2005
 REVISED

GRADING ADJACENT TO STREAMS

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GRADING AND DRAINAGE

Use of Vegetated Swales or Buffer Strips

INTRODUCTION

The Guidelines and Standards Section V on Grading and Section VI on Outfalls and Site Drainage refer to the use of vegetated swales or buffer strips. A vegetated swale (a.k.a. grassed channel, dry swale, wet swale or biofilter) is a broad, shallow channel with a dense stand of vegetation designed to trap particulate pollutants (suspended solids and trace metals). Vegetated swales are fairly straight forward to design and can be easily incorporated into a project's site drainage plan. For all major redevelopment and new development, vegetated swales may be included in the stormwater permit; however, they are also a good practice for single family homeowners to consider incorporating in landscaping and design plans.

The benefits of using vegetated swales or buffer strips next to streams are that they:

1. Improve the quality of stormwater runoff and reduce or slow the velocity of runoff from hardened or paved areas
2. Allow for infiltration
3. Provide an opportunity for sediment and pollutants to be filtered and removed from the runoff.

The swales can be located within landscaped or turf areas and can collect runoff from patios, driveways, roof drains, parking lots. Discharge from the swale should be to a storm drain system, which will ultimately discharge to a stream.

DESIGN ELEMENTS

- Gentle side slopes: 3 horizontal to 1 vertical slope maximum
- Minimal longitudinal slope: 1% to 2% recommended. If greater, install check dams to reduce velocity. Do not use swales on slopes greater than 6%
- Flowpath length: Minimum of 10 feet
- Bottom width: 2 to 8 feet. Consider access with mowing equipment if turf grasses are used.

RECOMMENDED TYPES OF VEGETATION TO USE

There is a variety of vegetation, including trees, shrubs, groundcover and grasses that are suitable for periodic inundation. One goal is to select plants that will thrive at the site. Near streams, native plants and wetland vegetation are preferred to turf grasses as swale liners because they offer higher resistance to flow and provide a better environment for filtering and trapping pollutants from stormwater. However, turf grass, allowed to remain slightly high, can provide some benefits as well.

MAINTENANCE

Turf maintenance consists of mowing and removal of grass clippings. Swales should be cleaned of any sediment accumulation and monitored for erosion with subsequent reseeding or replanting as necessary. Fertilizers should be applied before the rainy season to minimize conveyance of pollutants to the stream.

PLANT SPECIES FOR VEGETATED BUFFERS AND SWALES

The following trees and shrubs tolerate wet soil and periodic inundation, and may be suitable for planting in basins and biofilters depending on regional hardiness and other factors. This list is not all-inclusive, and draws from both native and exotic species.

TREES

- Box Elder (N)**
Acer negundo
- Red Maple (H)**
Acer rubrum
- Silver Maple (H)**
Acer saccharinum
- Alder (N)**
Alnus spp.
- Birch**
Betula spp.
- Pecan**
Carya illinoensis
- Buttonbush**
Carya ovata
- She-Oak**
Casuarina spp.
- Lily of the Valley**
Clethra arborea
- Redtwig Dogwood (N)**
Cornus stolonifera
- Persimmon**
Diospyros virginiana
- Oregon Ash (N)**
Fraxinus latifolia
- Honey Locust**
Gleditsia triacanthos
- Liquidambar**
Liquidambar styraciflua
- Tulip Tree**
Liriodendron tulipifera
- Southern Magnolia**
Magnolia grandiflora
- Sweet Bay**
M. virginiana
- Cajeput Tree**
Melaleuca quinquenervia

- Tupelo**
Nyssa sylvatica
- Sitka Spruce**
Picea sitchensis
- Sycamore (H)**
Platanus occidentalis
- California Sycamore (N)**
P. racemosa

- Fremont Cottonwood (N)**
Populus fremontii
- Wingnut**
Pterocarya stenocarpus
- Bur Oak (H)**
Quercus macrocarpa
- Pin Oak (H)**
Q. palustris

- Willow (N)**
Salix spp.
- Bald Cypress**
Taxodium distichum
- Arborvitae**
Thuja occidentalis

SHRUBS

- Salal (N)**
Gaultheria shallon
- Horsetail (N)**
Equisetum hyemale
- Fern (N)**
Ferns (many spp.)
- Iris (N)**
Iris (many spp.)
- Myoporum**
Myoporum parvifolium 'putan creek'
- Pacific Wax Flower (N)**
Myrica

- Willow (N)**
Salix spp.
- Huckleberry (N)**
Vaccinium

GROUND COVER

- Acorus**
Acorus gramineus
- Sedge (N)**
Carex spp.
- Tufted Hairgrass (N)**
Deschampsia caespitosa
- Sierra Laurel**
Leucothoe davisiae
- Bulrush**
Scirpus spp.
- Rush (N)**
Juncus spp.

- Spiderwort**
Tradescantia Virginiana
- Common Cattail (N)**
Typha latifolia

SUITABLE TURF GRASS

- Bentgrass (N)**
Agrostis exarata
- California Brome (N)**
Bromus carinatus
- Creeping wildrye (N)**
Elymus triticoides
- Idaho Fescue, (N) Blue Bunchgrass**
Festuca idahoensis
- Molate/Red Fescue (N)**
Festuca rubra

- Meadow Barley (N)**
Hordeum brachyantherum
- Meadow Barley salt (N)**
Hordeum brachyantherum salt
- Rushes (N)**
Juncus spp.

N = Use plants grown from propagules collected locally

H = This species has a potential to hybridize with natives. Delete if native plants of the same genus exist nearby.

Table excerpted from BASMAA's *Start at the Source Guide* (2003) and adapted from Harris (1992), *Sunset Western Garden Book* (1998) and *ABAG* (1995b).

"Start at the Source" is available at http://www.scvurppp-w2k.com/basmaa_satism.htm. Other design guidance for pollution prevention is available at www.scvurppp.org