

5.0 MANAGEMENT RECOMMENDATIONS

5.1 Upper Watershed Erosion Management

A "start at the source" approach is recommended by the State Water Quality Control Board for dealing with runoff-related problems. This approach recognizes that it is often far more effective to manage water quality by preventing the inflow of pollutants in a water body rather than attempting to treat them once they are in the water body. This approach is applied here in dealing with sedimentation and nutrient problems in Lagoon Valley Lake.

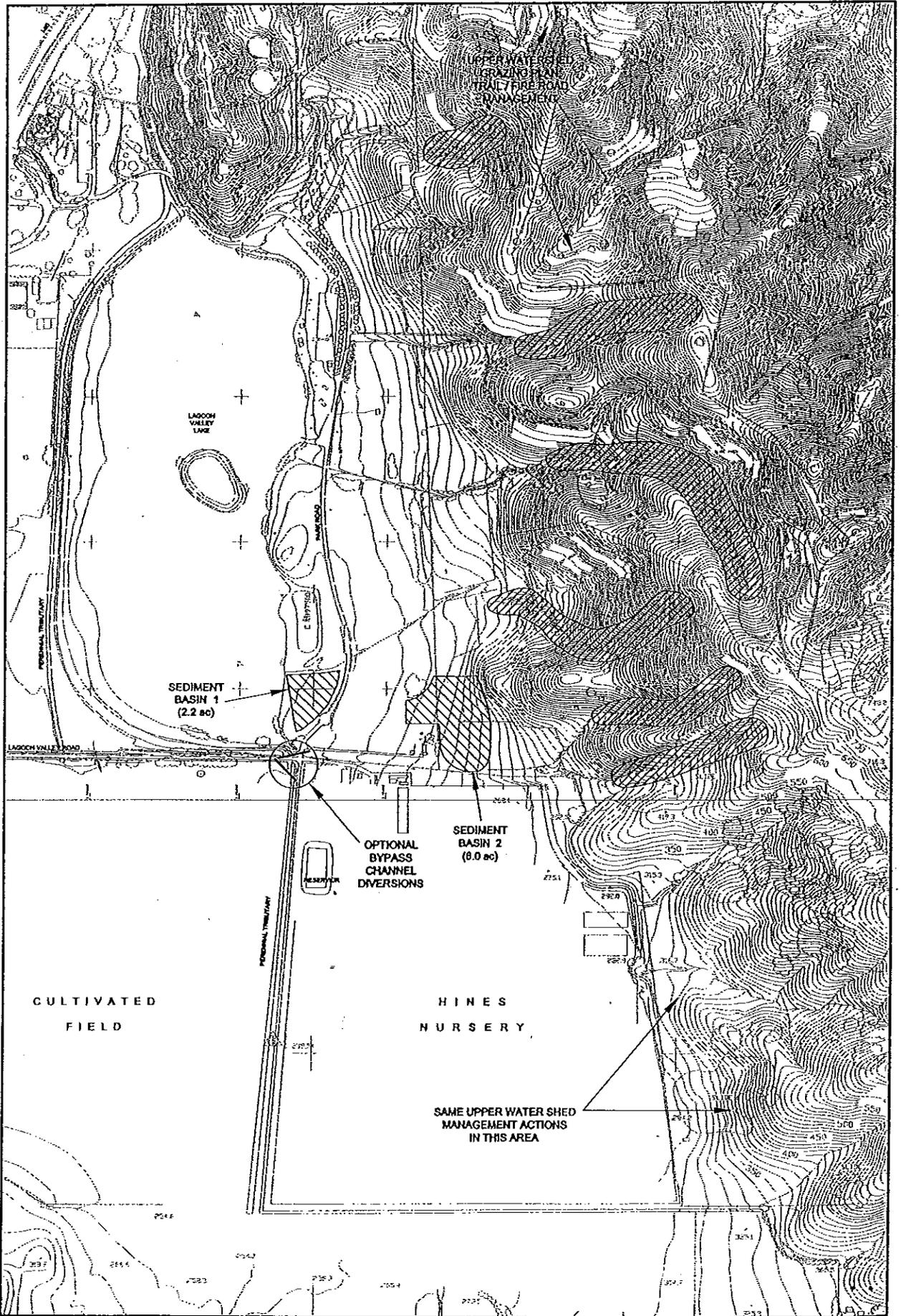
The most significant source of sedimentation to the lake is runoff from Drainage Basin DB-1. Fortunately, the inflow from DB-1 is concentrated through two conveyance and discharge systems to the lake, allowing for the installation of storm water detention and management systems that could effectively reduce sediment volumes. Options for achieving such reductions are provided below. The order that they are provided is not intended to imply any particular order of priority.

Management Action 1: Sediment Basins - Under this action, one or two sediment basins would be installed on existing public lands to intercept and retain sediments generated largely from the upper watershed, as follows:

- **Sediment Basin 1** would be a 6-acre basin constructed along the north side of Hines Nursery in the location shown in Figure 17. This location is far enough from the lake so that seepage from the lake will not affect the basin. The design of the sediment basin would need to allow storm water of up to one foot in depth to be conveyed in the channel and pass directly into the lake without diversion, as such low flow would not carry a significant amount of sediment. Prevention of low flows from entering the sediment basin will also make maintenance easier to accomplish. When flow in the channel exceeds one foot, excess water will be diverted into the sediment basin via a weir section. As the flow in the channel decreases, water from the basin would flow back into the channel. This temporary diversion of the high flows will give much of the sediment an opportunity to settle out in the sediment basin and reduce the sediment concentration that ultimately enters the lake as per the conceptual design shown in Figure 18.

Sediment Basin 2 would be a 3-acre basin constructed in the location shown in Figure 17. The basin would have roughly the same design parameters of Sediment Basin 1, except it could also intercept water diverted from the Hines storm water system prior to discharge into the lake. Because of the basin's proximity to the lake, it would need to be lined with dense clay and/or other impermeable material to minimize potential seepage from the lake.

Figure 17 – Upper watershed sediment management actions



05-21-99(COV831)UpperWtrshdEro

Figure 17

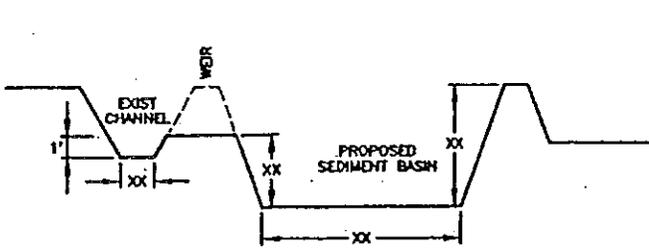
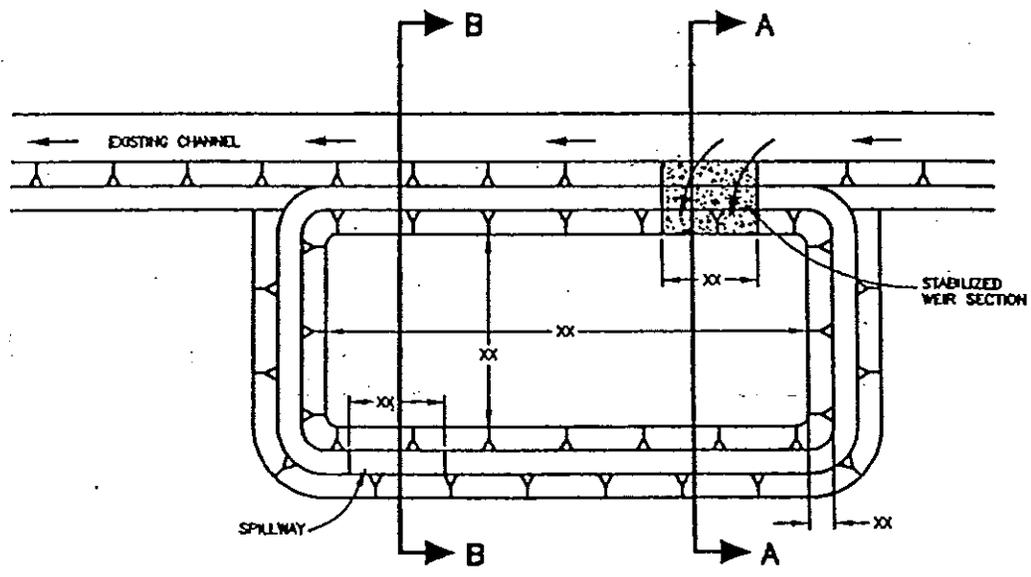


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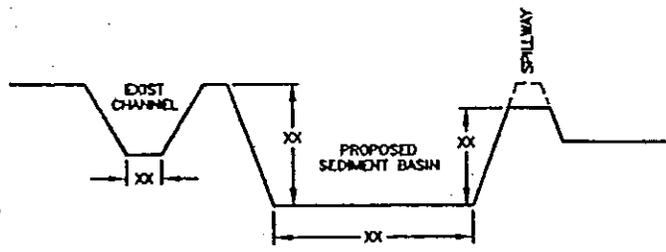
Upper Watershed Drainage Stabilization and Revegetation

Upper Watershed Erosion and Sediment Management Actions

Figure 18 – sediment basin conceptual design



SECTION A-A



SECTION B-B

Source: Cella Barr Associates

05-20-99(COV831Sediment Basin)

Figure 18



Not to Scale

Sediment Basin
Conceptual Design

Management Action 2: Diversion to Bypass Channel -The perennial tributary that borders Lagoon Valley Road currently discharges directly into Lagoon Valley Lake via a set of three 48-inch pipes at the lake's southeastern corner (Figure 6). Another 48-inch pipe discharges runoff collected from the hills above Hines Nursery that is conveyed in a buried culvert from a collection point at the northeast corner of Hines Nursery (Figure 6). Diversion structures could be constructed at or above both culvert discharge locations to divert high flows, laden with sediments, away from the lake and into the bypass channel. Similar to Management Action 1, when flow in either the perennial tributary or the underground culvert exceeds a minimum design level, excess water would be diverted into the bypass channel via a weir section or adjustable gate. This temporary diversion of the high flows would cause much of the sediments to bypass the lake.

The advantage to this system is that it would not require the City to acquire or obtain easement over any private lands since both diversion structures could be constructed on existing parkland and public right-of-way. The disadvantages would be that a sediment basin, similar in design to Sediment Basin 1, would probably need to be constructed somewhere downstream along the bypass channel (on City-owned lands) to deal with the excess sediment load. Further, the capacity of the bypass channel to handle the additional flows would need to be evaluated, and both RWQCB and State Department of Water Resources would need to approve this new flow diversion.

Management Action 3: Upper Watershed Management - The upper watershed area, particularly in DB-1, is characterized by eroded drainages, often with somewhat incised channels and headcut problems. Grass cover and vegetative cover along drainages appear to be minimal due to cattle grazing impacts. The following upper watershed management program is proposed to mitigate these problems. The program is intended to comprise an *integrated* set of actions. Although implementation of any of the below-listed actions would probably be helpful, the probability of achieving success would be greatest if all the actions were carried out.

- **Grazing Management Plan** - A grazing management expert should be retained to assess the current grazing regime and to develop an overall plan designed to achieve the following goals:
 1. Determine optimal grazing densities based on desirable levels of residual dry matter in the grasslands at the beginning of the rainy season during an average rainfall year. The overall need for grazing as a management tool for fuel reduction should also be evaluated.
 2. Assess and modify livestock rotations to ensure that all portions of the watershed retain sufficient grass cover to minimize erosion. This may require additional division of the watershed into several sections. A grazing regime that allows one or more sections to be grazed while other sections are "rested" for an adequate period of time would allow the grassland vegetation to recover in the non-grazed sections.
 3. Assess which drainage and riparian corridors have been badly degraded due to cattle grazing impacts and develop cattle exclusion plans to allow corridors to re-vegetate. Fencing could be constructed to exclude cattle from the corridors

to allow natural and/or artificial regeneration of riparian vegetation. Exclusion of cattle is expected to promote regeneration of native trees and shrubs and herbaceous species and therefore stabilize drainage corridors (in concert with the physical stabilization actions proposed below). Oaks, in particular will regenerate successfully in areas excluded from cattle.

4. Assess the option of replacing cattle with less damaging grazers such as sheep within some areas. This may be particularly desirable option for allowing occasional weed reduction in the fenced riparian areas.
- **Drainage Stabilization** - Several drainages in the upper watershed would benefit from stabilization actions. This would involve a physical assessment of all significant drainage channels in the watershed, and development of stabilization prescriptions for each. Stabilization options could include earthmoving work to establish more stable channel cross sections and/or to stabilize headcuts, placement of rock riprap into headcuts and along channel slopes, construction of rock riprap drop structures at critical grade breaks along channels, and placement of riprap or geotextile retaining materials along key segments of erosion.
 - **Re-vegetation of Drainages** - In addition to the fencing of drainages and riparian areas, native woody and herbaceous species could be planted or seeded into stabilized drainage corridors. Oak, bay, coyote brush, cottonwood, buckeye, coffeeberry and willow as well as other native trees and shrubs could be planted in those locations where slope and moisture conditions are determined to be adequate to sustain these species. This planting program could be implemented through a volunteer stewardship program that works the local school system and civic groups (see Management Action 42). Where conditions are probably not suitable to sustain woody vegetation, an erosion control seed mix could be applied to stabilization areas. A suggested seed mix for channel slopes is provided in Table 11.
 - **Trail/Fire Road Assessment and Maintenance** - The entire trail and dirt road system in the watershed should be inspected for areas of existing or incipient erosion. Repairs and preventative measures could be implemented such as retaining structures, drainage diversion and routing structures, physical blockage and revegetation of unauthorized trails. Additionally, an assessment should be made as to whether some trails should be limited to hiking use only, based on whether the trails are too erosion-prone for mountain bikes and horses. Use of motorized vehicles (including motorcycles) must be limited to paved surfaces only.

Implementation of a program of erosion management in the upper watershed, in accordance with the above management actions, will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
4. *Wildlife Habitat*
5. *Storm Water Management*

Management Plan Goal:

- F. *Reduce Sedimentation*
- C. *Enhance Stabilized Drainage Corridors*
- A. *Maintain lake Storage Capacity*

Table 11
Suggested Native Erosion Control Seed Mix

Seed and Other Components	Function/Type	Application Amount (per acre)
California brome (<i>Bromus carinatus</i>) native variety	perennial	15 lbs. PLS*
California poppy (<i>Eschscholzia californica</i>)	annual	1 lb. PLS
Blue wildrye (<i>Elymus glaucus</i>)	perennial	2 lbs. PLS
Lupine** (<i>Lupinus succulentus</i>)	nitrogen fixing	3 lbs. PLS
Meadow barley (<i>Hordeum brachyantherum</i>)	perennial	5 lbs. PLS
Blando brome (<i>Bromus hordeaceus</i>)	cover crop	10 lbs. PLS
Zorro fescue (<i>Vulpia myuros</i>)	cover crop	10 lbs. PLS
Mulch	erosion control	2000 lbs.
Fertilizer	Plant establishment	200 lbs.
Tackifier***	erosion control	100 lbs.

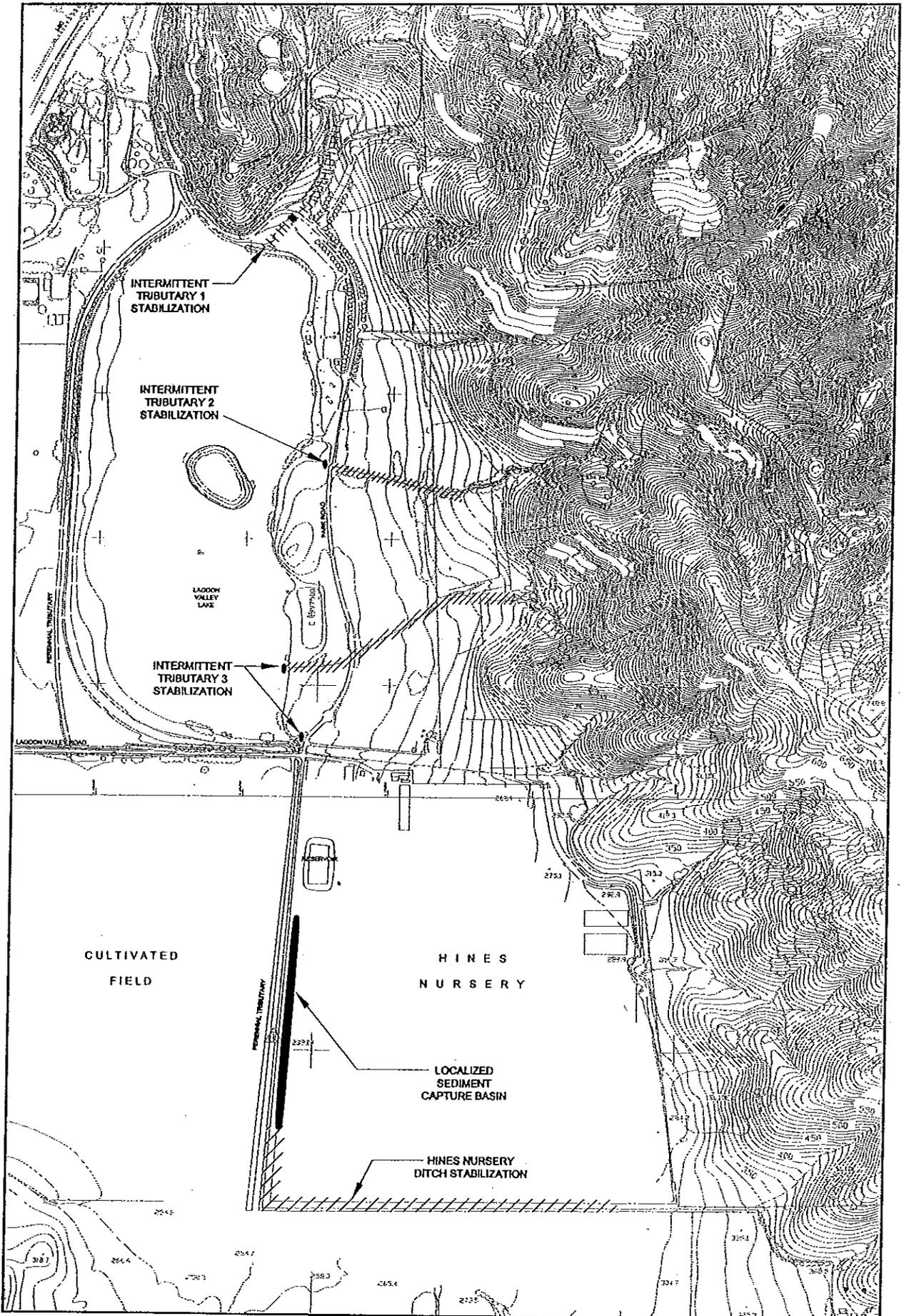
Note: This is a preliminary erosion control seed mix recommendation that has been successfully applied elsewhere in the region. A more suitable site-specific mix may be appropriate.

5.2 Lower Watershed Erosion Management

Sediment volumes derived from the lower watershed are less significant than from the upper watershed. Nevertheless, there are certain management options for the lower watershed that should be considered under a system-wide approach to protecting Lagoon Valley Lake. Implementation of one or more of these management actions could have minor benefits for reducing sediment load to the lake.

Management Action 4: Hines Nursery Ditch Stabilization - The runoff collection ditch that borders the Hines Nursery has bank erosion problems that probably contribute to sediment inflow to the lake during major storm events (Figure 19). This problem could be alleviated by stabilizing the entire channel bank adjacent to Hines Nursery with vegetation and/or geotextiles. This would need to be done with the permission and cooperation of Hines Nursery since the ditch belongs to them. Moreover, under California Department of Agriculture regulations, Hines Nursery needs to maintain a vegetation-free zone between the ditch and its nursery stock in order to avoid infestations of snails. An alternative to full ditch stabilization would be to provide bank protection (concrete, gunite, rock riprap or geotextile) only along the 90 degree bend in the existing channel south of Lagoon Valley Road. The bank protection would

Figure 19 – Lower watershed sediment management recommendations



05-21-99(COV831LowerWtrshdEro)

Figure 19



Scale in feet
0 600

● Cutoff Walls and Plunge Pools

Lower Watershed Erosion and Sediment Management Actions

start at the bend and extend at least 100 feet both upstream and downstream directions.

Management Action 5: Localized Sediment Capture - Under this option, a long narrow sediment basin would be constructed along the west property line of Hines Nursery adjacent to the existing ditch (Figure 19). The basin would need to be 3 to 5 feet wide and 2 to 3 feet deep (a buffer zone), and would intercept the soil being eroded by the impact of sprinkler irrigation splashing against the soil. Alternatively, a series of smaller basins could be created behind small check dams in the ditch. Either of these options would also need to be done with the permission and cooperation of Hines Nursery.

Management Action 6: Intermittent Drainage Channel Stabilization – Three of the intermittent drainages that enter Lagoon Valley Lake are incised and with steep cut banks and poor vegetative cover (Figure 14). Tributary No 1 and Tributary No. 3 (along a spur tributary that flows to the perennial tributary outlet) have zones of deep incision between the lake and the park drive. Tributary No. 2, at the north end of the lake, has a severely eroded upstream plunge pool, 10-12 feet deep, and deeply incised banks where it enters the lower watershed. Sediments carried along this tributary have created a small delta at the lake outlet (Figure 14).

To mitigate drainage channel erosion, cutoff walls and rock riprap plunge basins could be constructed at the outlet of the pipe crossings along the park roadway east and north of the lake. The cutoff walls would prevent channel headcut that exist along some of these low flow channels from migrating further upstream and the plunge basins would slow down flow velocities exiting the pipes. For the severe headcuts near the southeast and northeast corners of the lake, rock riprap should be placed from the plunge basin downstream to the edge of the lake to protect the channel from further erosion. Upstream severely eroded plunge pools and headcuts could be stabilized with rock riprap or re-grading. A conceptual design of a cutoff wall and a rock riprap plunge basin is shown on Figure 20.

Implementation of a program of erosion management in the lower watershed, in accordance with the above Management Actions, will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
3. *Scenic Amenity*
4. *Wildlife Habitat*
5. *Storm Water Management*

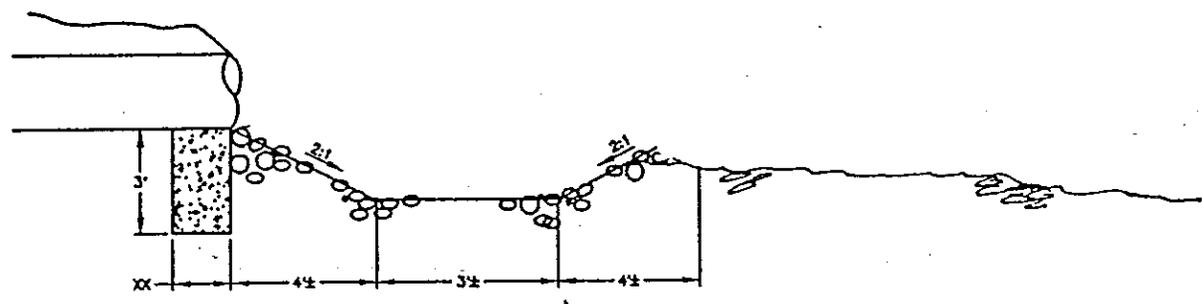
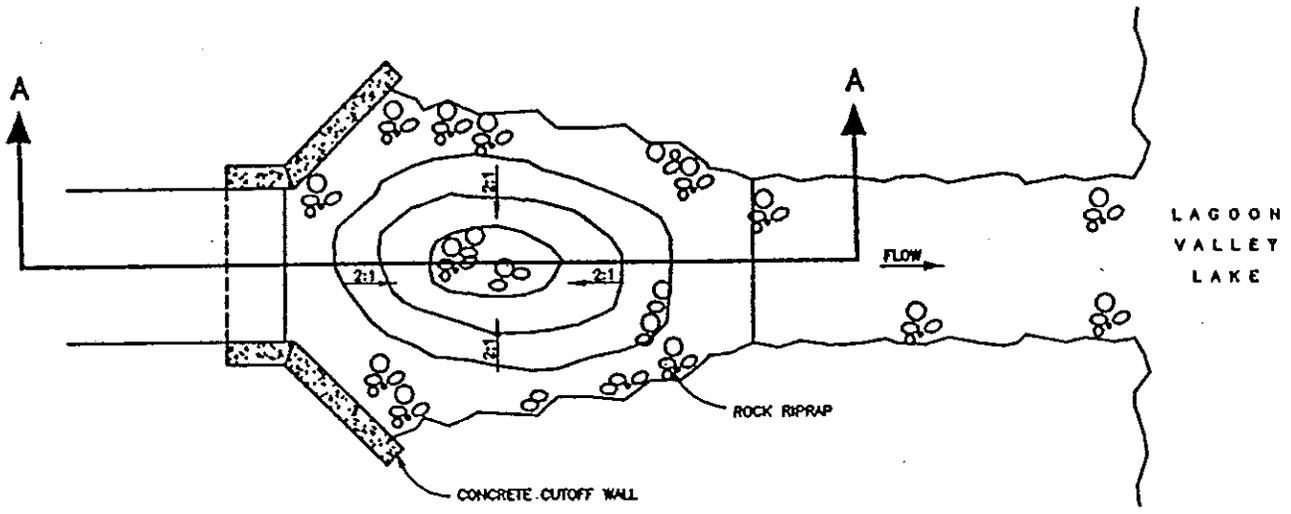
Management Plan Goal:

- F. *Reduce Sedimentation*
- B. *Enhance Visual Quality of Shoreline Usage Areas*
- C. *Enhance Stabilized Drainage Corridors*
- A. *Maintain Lake Storage Capacity*

5.3 Lower Watershed Nutrient Management

As discussed in Section 4.3.1, a major source of nutrient inflow to the lake is likely to be storm water bypass flows from the Hines Nursery, as indicated by the excessively

Figure 20 – Conceptual design for plunge basin



Source: Cella Barr Associates

05-20-99(COV831 Wall&BasinA)

Figure 20



Not to Scale

Conceptual Design for
Plunge Basin

high levels of orthophosphate entering the lake from the perennial tributary downstream of the nursery bypass pipe (Figure 14). Further water quality sampling upstream and downstream of the bypass pipe may verify the extent of the nursery's nutrient contribution, however there is no other known source upstream for such high levels of orthophosphate. The perennial tributary's input of dissolved orthophosphate is a key source of nutrients responsible for algae blooms and excessive aquatic plant growth.

This bypass of storm water runoff by the nursery is necessary in order to avoid the potential for tremendous flood damage to nursery facilities and plant stock. Under the current storm water management system, the nursery has no choice but to continue this discharge. High levels of nitrate entering the lake from the lower watershed appear to be from two primary sources: Hines Nursery bypass runoff and waterfowl waste concentrations along the shoreline.

Cooperative Nutrient Reduction Planning with Hines Nursery

To reduce nutrient inflows from the lower watershed, a cooperative planning program with Hines Nursery is proposed. Under this program, the City and Hines Nursery would work together to design changes to the storm water management system in order to greatly reduce nutrient inflows from the perennial tributary, while ensuring that the nursery maintains its existing level of flood protection. A civil engineer would need to conceptually design and assess the feasibility of the various options, before final detailed designs are prepared. A cost-sharing program would also need to be investigated. The intent of this approach would be to develop a plan fully acceptable to the nursery that would not burden nursery operations or budget. Management actions that may be considered include the following:

Management Action 7: Increase Hines Nursery Reservoir Storage Capacity - An obvious option would be to increase the storage capacity of the nursery's reservoir so that the need for bypass flows to the perennial tributary could be greatly reduced or entirely eliminated. This could entail deepening and/or expanding the reservoir. However the feasibility of this option from a nursery operations standpoint needs to be evaluated.

Management Action 8: Off-Stream Water Quality Treatment Ponds - Another option would be to create one or more water quality treatment ponds downstream of the nursery bypass discharge in the private land to the west of Lagoon Valley Road (Figure 21). The City would need to obtain ownership or easement over a portion of this land in order to construct such ponds. The water quality pond(s) would be designed to treat the "first-flush" of storm water runoff, often defined as the first half-inch of runoff of the winter season, or the first half-inch of runoff following a dry period of several weeks or longer. Concentrations of pollutants in these flows are typically much higher than in subsequent storm events because the initial rainfall mobilizes pollutants that have built up over the preceding dry period.

Water-quality ponds are currently thought to be the most effective BMP for treating the wide range of pollutants typically found in runoff, including nutrients. The pond(s) would have an active treatment volume equivalent to the anticipated first flush volume of runoff from the nursery. Flows during the latter portion of the storm runoff

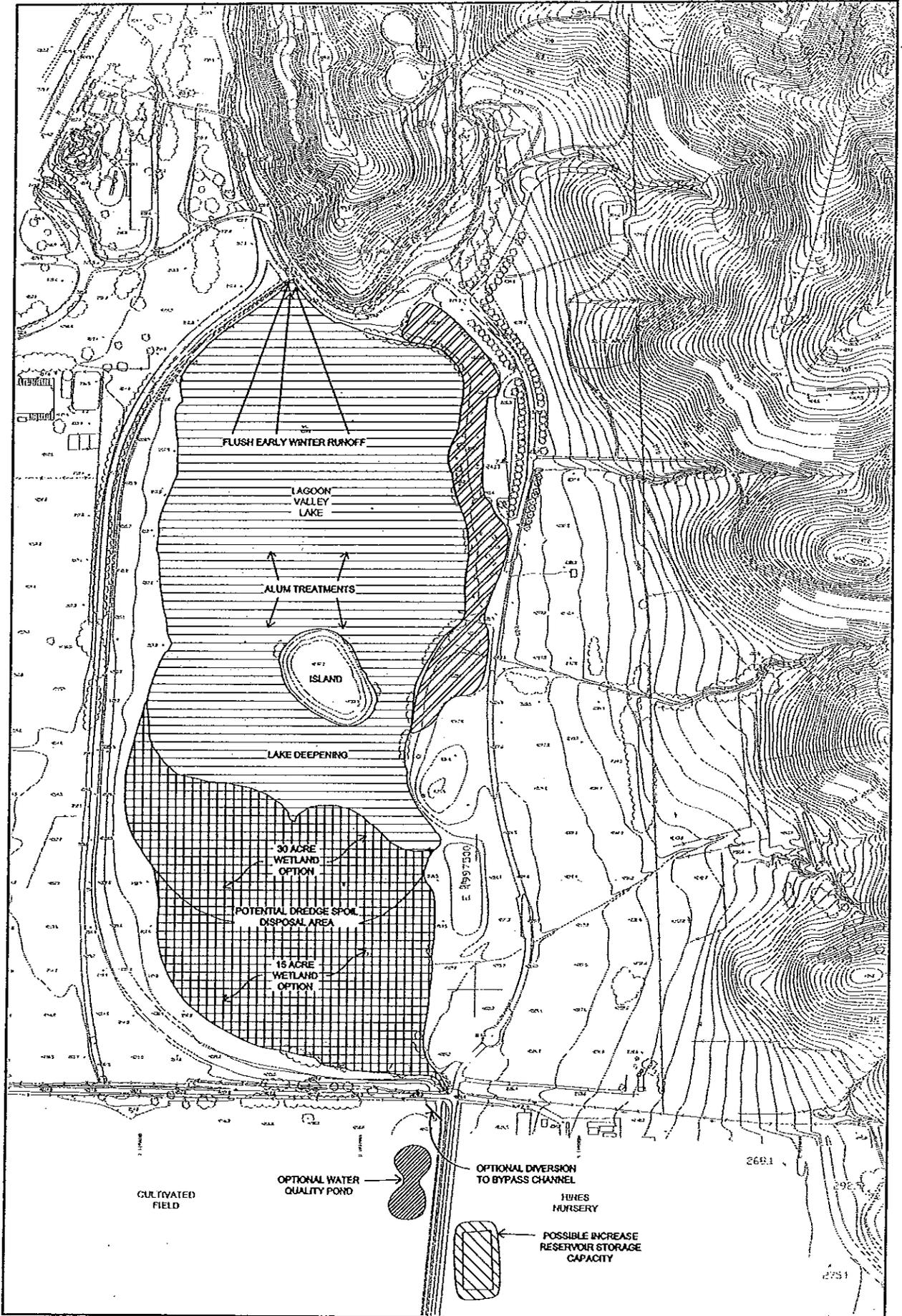
hydrograph, which typically contain low concentrations of pollutants, will be bypassed around the wet ponds. The active pond volume would drain through a low flow outlet over a period of 2 weeks, more or less. This will provide adequate time for uptake of nutrients as well as extended retention for biological degradation of oils, greases and pesticides, and other pollutants. It would also provide time for fine organic and inorganic sediments to settle out. The effectiveness of the pond(s) would be further enhanced by including an 18-inch deep minimum pool below the level of the riser. Longer retention of runoff in the minimum pool will provide additional time for pollutant degradation, and would promote the growth of vegetation to take up nutrients and filter runoff. The riser drainpipe will have a slightly raised outlet invert to trap floatable contaminants in the pond.

Management Action 9: Diversion to Bypass Channel - This would be approximately the same management action as discussed in Section 5.1 for sedimentation routing (Figure 19). However, the diversion structure would need to be designed so that first flush flows, as well as high flows (laden with sediments), are sent to the bypass channel, probably requiring manual manipulation of an outlet valve or gate.

Management Action 10: Waterfowl and Turf Fertilizer Waste Management - This is not intended to be an option or alternative to Cooperative Nutrient Reduction Planning with Hines Nursery, but rather a supplemental management recommendation that could have modest additional nutrient (and bacterial) reduction benefits. To reduce nutrient and bacterial input from waterfowl waste, a program could be initiated to discourage waterfowl from their primary foraging and resting area on the mowed picnic area along the eastern shore, west of the paved park road (Figure 21). This program would entail a combination of runoff management and treatment, educating the public, enforcement and the trapping and removal of domestic waterfowl, as follows:

- **Landscaping and Runoff Treatment** - The eastern shoreline area, north of the boat ramp could be re-graded in a manner to provide a vegetative buffer to divert and detain sheet runoff into the lower tributaries and lake. This would entail the grading of a small, gently-sloped berm (1 foot high), parallel to the shoreline, approximately 10 feet from the shoreline edge. The berm would divert runoff into one or more shallow retention basins that would allow for nutrient treatment prior to discharge into the lake. The basin could be vegetated with herbaceous wetland vegetation that could further detain runoff and allow nutrient uptake. A biofilter could also be used. These basin areas could be periodically cleaned, as needed.
- **Educating the Public and Enforcement** - Large and clearly visible signs should be posted in English and Spanish advising that the feeding of waterfowl causes lake pollution, is harmful to the waterfowl and is illegal. Park rangers should periodically issue warning notices, in both languages, to persons who violate this rule, and the possibility of issuing violation notices with associated monetary fines should be considered.
- **Trapping and Removal Program** - Domesticated waterfowl should be trapped and removed from the eastern shoreline area on a twice-annual basis. The goal of the program should be greatly reduce or eliminate resident waterfowl in this area.

Figure 21 – Lower watershed and lake nutrient management actions



05-21-99(COV831Wtrhd&lake)



Scale in feet
0 400

 Lake Deepening

 Area Where Waterfowl Waste Management Program Would be Concentrated

Figure 21

Lower Watershed & Lake Nutrient and Bacterial Management Actions

Implementation of a program of nutrient management and reduction in the lower watershed, in accordance with the above management actions, will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
2. *Motorless Craft Use of Lake*
6. *Swimming & Shoreline Recreation*

Management Plan Goal:

- G. *Reduce Summer Aquatic Weed Infestations*
- A. *Facilitate Windsurfing Use of Lake*
- A. *Establish a Controlled Wading Beach*

5.4 Lake Nutrient & Bacterial Management

In addition to watershed management actions that deal with the source of nutrients, there are a range of within-lake management actions that may reduce nutrient levels and thereby reduce annual aquatic weed growth. These are discussed below:

Management Action 11: Treatment with Alum - Applying alum (aluminum hydroxide) to the lake would precipitate suspended sediments and nutrients from the water column and seal the nutrients into the lake bottom sediments under the precipitate. This technique is a temporary fix that would at best, have to be repeated annually, and at worst, would be ineffective because high winds and shallow depths may re-suspend the sediments by disturbing the precipitate crust on the bottom.

Management Action 12: Flushing the Early Winter Runoff - The first rains of the rainy season typically carry the greatest load of watershed derived nutrients to the lake. It may be possible to annually flush a portion of these nutrient laden waters out of the lake by partially draining the lake following the first significant storm events of the rainy season. The subsequent runoff waters later in the rainy season would carry fewer nutrients to the lake. However, for this approach to be effective, it will be necessary to ensure that the perennial tributary is not contributing significant levels of nutrients during later storm events or during periods without storm runoff.

Management Action 13A: Deepening the Lake; Off-site Disposal - Part of the reason that Lagoon Valley Lake is so vulnerable to excessive growths of aquatic plants and algae is that most of the lake is about 6 feet deep. Sunlight needed to sustain rooted aquatic plants can penetrate through a maximum water depth of about 6 feet. The actual depth of light penetration through water varies with the clarity of the water. Although the lake's relatively high turbidity reduces light penetration, it is apparently sufficient to allow rooted aquatic plant growth in those portions of the lake that are 6 feet or less deep. Duane Davis (*pers. com.*), Solano County Park Ranger Supervisor, reports that when viewing the lake from the adjacent hillside during the summer, one can see those portions of the lake over 6 feet in depth because they are the only places not exhibiting sago pondweed.

Deepening most of the lake to 10 feet in depth or greater would prohibit rooted aquatic plants from all but the shoreline perimeter of the lake (the slope transition into deeper water) and would remove nutrients accumulated in the lake sediments. However, disposal of excavated material can be costly due to trucking costs. Excavated material

would first need to be deposited in a de-watering location where it would need to become sufficiently dry for efficient truck hauling. A water quality treatment plan would need to be implemented for the de-watering process to ensure that turbid runoff does not return to the lake or its tributaries. A suitable disposal site, as close as possible to the lake would be desirable to minimize trucking costs. One possible option would be to investigate the suitability of the excavated material for nursery uses. If the material is high in nutrients, does not contain unacceptable levels of boron, it may be suitable for use by the Hines Nursery as a supplemental or direct potting medium. Under these circumstances, it might be possible to hydraulically transport the material to a bermed de-watering location on City-owned property immediately to the north of the nursery, thereby avoiding the need for trucking altogether.

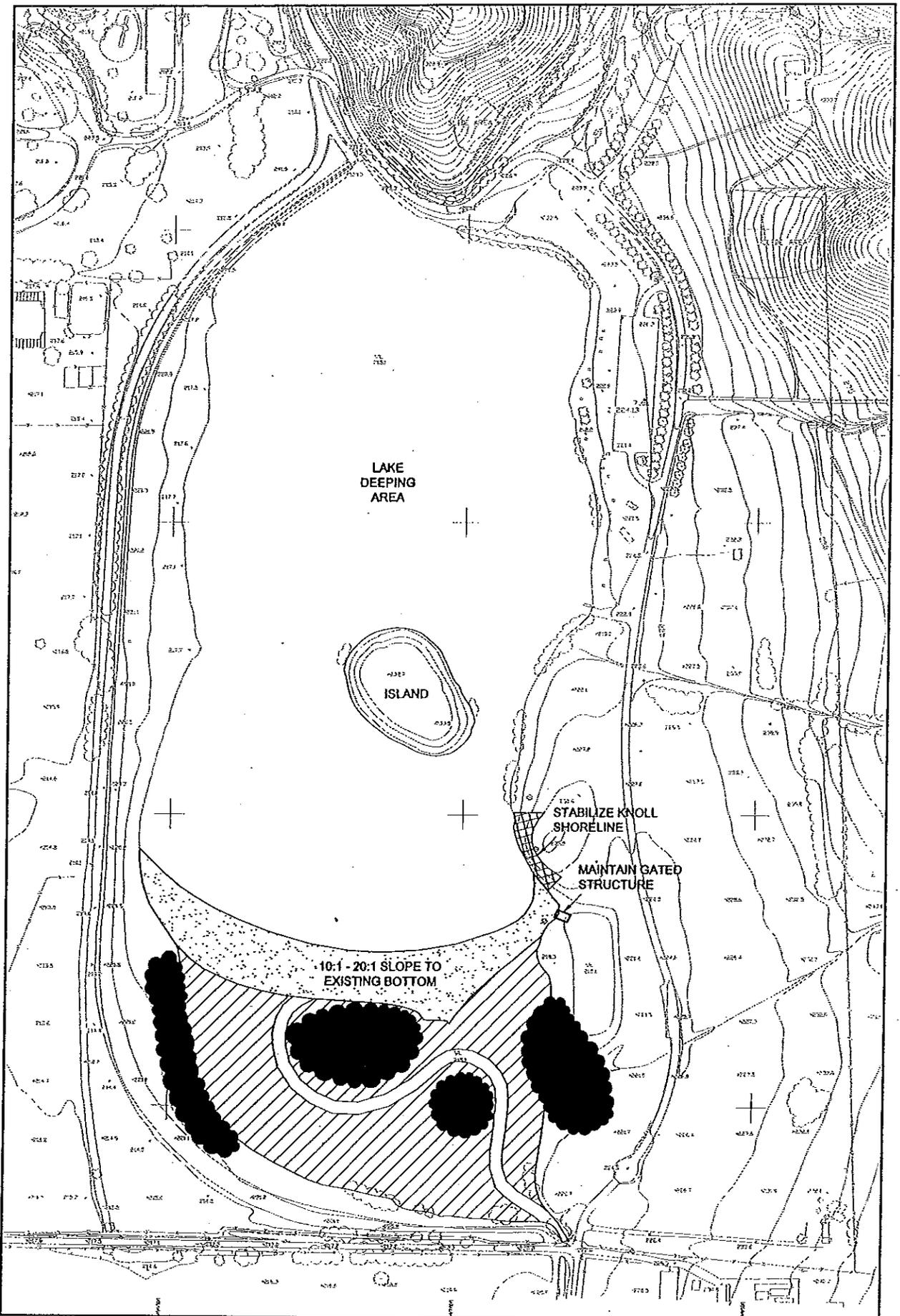
Management Action 13B: Deepening the Lake; Create New Wetland Area -

Another possibility is to deepen 60-80 percent of the lake and deposit the excavated materials in the south end of the lake to create an emergent marsh in the vicinity shown in Figures 21 and 22a and b. The created wetland would greatly enhance the biological quality of the lake by providing a significant littoral area with seasonal, emergent, and submergent vegetation zones that would provide benefits to fish, aquatic fauna, and waterbirds. Establishment of shoreline wetland habitat would best be achieved by creating a complex of shallow marsh habitat, dominated by emergent vegetation such as cattail or bulrush, interspersed with low willow islands. Fremont cottonwood could be planted along the created marsh along the south and southwestern shoreline, and at the waters edge of the island, to provide additional nesting and roosting habitat for upland birds and shelter for waterbirds and other wildlife species, including white-tailed kite and loggerhead shrike. If it proves difficult to sufficiently reduce the nutrient loading in the perennial tributary, meandering the tributary channel through the created emergent marsh may help strip nutrients from the in-flowing water before it gets to the lake.

Because visitor activities are concentrated in the northeastern portion of the lake, the southeastern portion of the lake would be suitable as the lake's primary wildlife area (Figure 22a and b). This would encompass an area of approximately 15-35 acres (depending on the extent of deepening and lake disposal chosen) that would include not only the created marsh complex but also most of the lake's other best habitat features, which include the following:

- the island, which offers potential nesting and roosting habitat and has a water barrier that provides at least partial protection from predators;
- the old swim lagoon which provides good feeding habitat for diving and dabbling ducks;
- good upland cover from stands of coyote brush and dense herbaceous vegetation in the area northwest of the knoll and the shoreline;
- the lake's most mature and dense woody riparian habitat at the mouth of the perennial tributary outlet; and
- a stand of emergent marsh vegetation at the perennial tributary mouth with dense stands of willows and tule.

Figure 22 – Excavated spoil wetland creation area



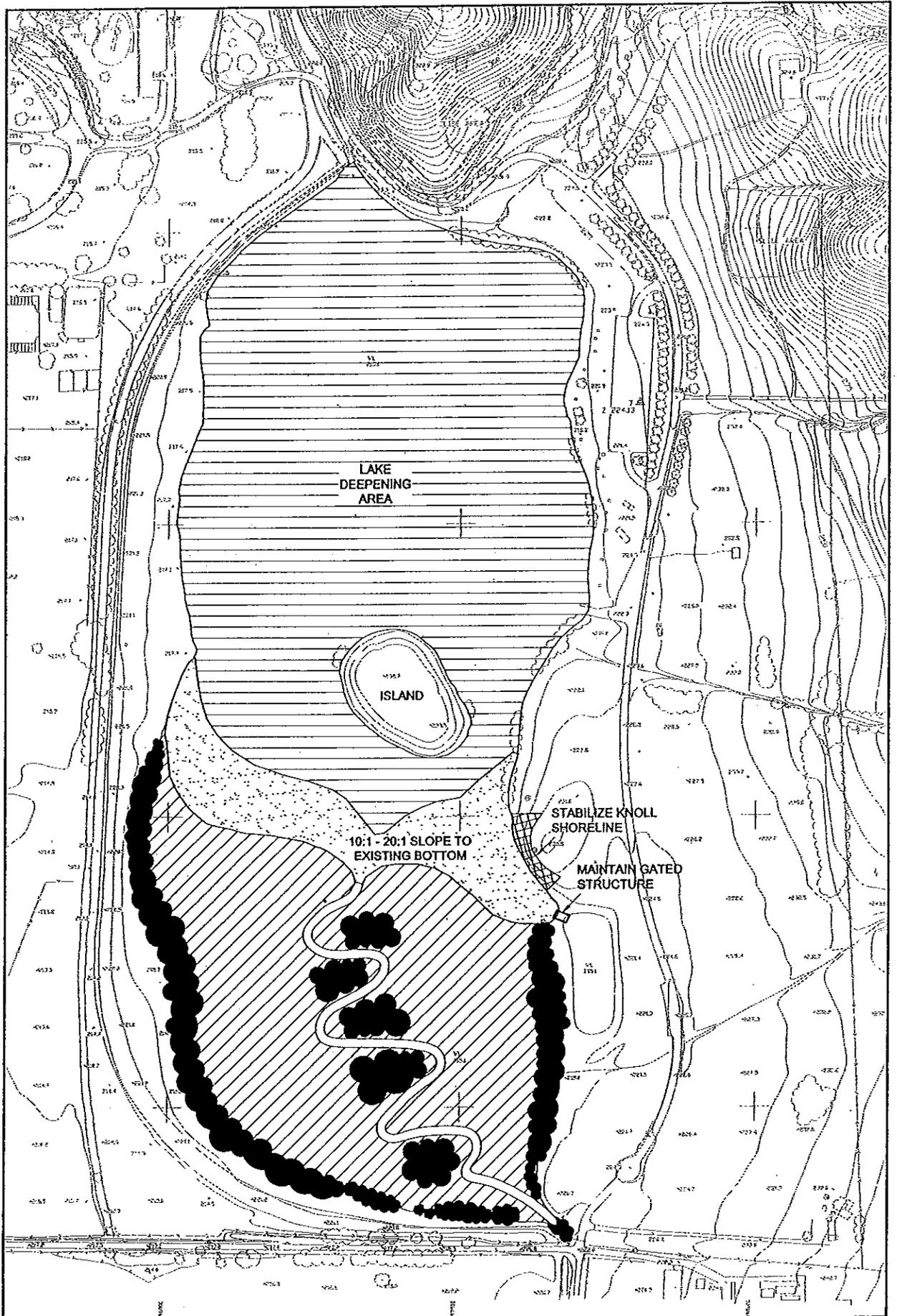
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Scale in feet
0 300

-  Meandering Low Flow Channel
-  Low Spoil Disposal Area (created marsh)
-  Elevated Spoil Disposal Areas Planted With Woody Riparian and Upland Vegetation

Figure 22
Proposed Dredged Spoil Wetland
Creation - Conceptual Plan
(15 Acre Wetland Alternative)



05-21-99(COV831WetlandCreationA)



Scale in feet
0 300

-  Meandering Low Flow Channel
-  Spoil Disposal Area (created emergent marsh)
-  Planted Willows and Cottonwoods

Figure 22A
Proposed Dredged Spoil Wetland
Creation - Conceptual Plan
(30 Acre Wetland Alternative)

Sediment Sampling Results: In order to assess the potential nutrient reduction benefits of the proposed lake deepening, the project team conducted sampling and testing of sediments on May 25, 1999. Sampling results suggest that lake deepening (in combination with reduction in nutrient inflows) could have a significant beneficial effect in reducing the potential for annual weed growth.

Results showed that the upper layer of sediments (*i.e.*, the layer between 6 and 8 feet that has become deposited since the time of lake excavation) contains as much as 100 times the concentration of total phosphorus than is normal for soils in the valley. Total phosphorus concentrations from three random locations in the lake bottom ranged from 410 ppm to 750 ppm. (Normal total phosphorus concentrations in valley soils is in the range of 5-35 ppm). Total Kjeldhal nitrogen (TKN) was similarly high in the sediment layer (range 410-780 ppm) while nitrate as N and nitrite as N were very low (<3 ppm). This is consistent with the fact that nitrate and nitrite are unstable forms that are readily uptaken by each year's growth of aquatic plants. TKN, on the other hand, includes nitrogen in the decomposing plant materials in the sediments. These decomposing plant materials would be expected to be high due to the large biomass of aquatic weeds that annually die-off.

Additional Studies Needed: A detailed engineering and hydrology study of the lake and surrounding valley lands will also be needed in order to prepare plans and specifications for lake deepening. This should include more exacting bottom surveys to determine the total volume of material that would need to be excavated and whether or not a balanced excavation/dredging and disposal plan could be designed. The study should also include an assessment of the effects of lake deepening and/or increasing the lake level (see Management Action 35) on surrounding groundwater levels and on original lake and dam design requirements such as residual freeboard. The study should also predict the period of time that depths can be sustained at the approximate original design depth based on expected sediment load reductions achieved under Management Actions 1 through 6.

Management Action 14: Waterfowl Waste and Turf Fertilizer Management - This is the same recommendation as in Management Action 10 above.

Management Action 15: Water Quality Monitoring Program - This recommendation is not intended to be an alternative to the listed above, but rather a necessary component of whatever set of water quality enhancement options are ultimately chosen by the City. In order to document water quality changes, to modify management actions as needed, and to implement additional improvements if needed, a monthly water quality monitoring program should be conducted in the lake from May through October. Parameter should include dissolved oxygen, temperature, transparency (Secchi disk), and nutrients. The program should include the perennial tributary as part the nutrient monitoring.

The dry season monitoring program (May - October) should consist of sampling water quality at three locations in the lake: 1) upper lake (300 feet out from the mouth of the perennial tributary), 2) mid-lake (100 feet offshore of the picnic area north of the boat ramp), and 3) lower lake (200 feet south of the spillway). Monthly sampling at each of these three stations would involve: recording field measurements of dissolved oxygen

and temperature near bottom, mid-depth, and 1 foot below the water surface; recording water transparency as indicated by a Secchi disk; and collecting a water sample at mid-depth, and analyzing for nitrate nitrogen and dissolved orthophosphate.

To track the summer nutrient contribution of the perennial tributary, the dry season water quality monitoring program should also include monthly sampling of water from this tributary at a point approximately 20 feet below the culvert (below all nursery drainage inflow). Sampled on the same day as the lake, a water sample should be collected from the tributary station, and analyzed for nitrate nitrogen and dissolved orthophosphate.

A wet season water quality monitoring program (November - April), consisting of three sampling periods, should be conducted to track winter storm inflow of nutrients from the perennial and ephemeral tributaries. Although the perennial tributary appears to be the primary source of nutrient inflow to the lake, inclusion of the ephemeral tributaries in this monitoring program will establish baseline data against which the success of management efforts can be compared. The schedule for winter sampling must coincide with storm events, and would generally occur in November, January, and March. The most important sampling is the first substantial storm of the wet season. Runoff from this first storm event causes the ephemeral tributaries to flow to the lake, and that flow would be carrying the previous dry season's accumulation of animal waste and excess fertilizer.

The location of the winter storm event sampling stations should be: two stations on the perennial tributary, one above the nursery influence zone, and one below its most downstream discharge to the tributary (this would correspond to about 20 feet below the culvert). Two additional stations should be located on each of the ephemeral tributaries, above the paved access road and near the mouths of the tributaries. Wherever appropriate, stations on the ephemeral tributaries should be located at the same place as those sampled in 1998-99 for this investigation. At each tributary station, a water sample should be collected and analyzed for nitrate nitrogen and dissolved orthophosphate.

Implementation of a program of nutrient management and reduction in the lake, in accordance with the above management actions, will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
2. *Motorless Craft Use of Lake*
4. *Wildlife Habitat*

6. *Swimming & Shoreline Recreation*

Management Plan Goal:

- G. *Reduce Summer Aquatic Weed Infestations*
- A. *Facilitate Windsurfing Use of Lake*
- A. *Establish Shoreline Wetland Mitigation Zones*
- B. *Establish Woody Riparian Vegetation Zones along the Shoreline*
- A. *Establish a Controlled Wading Beach*

5.5 Weed Management

Management Action 16: Aquatic Weed Control - The nutrient reduction management actions discussed in Sections 5.3 and 5.4 will help achieve conditions that should discourage the growth of aquatic weeds. In the absence of these proposed measures, direct weed management approaches would be required. Many shallow lakes and lagoons require periodic mechanical harvesting and removal of rooted aquatic plants in combination with the chemical treatment of planktonic and attached algae. This is a relatively expensive operation that must be conducted two or more times a year.

Mechanical harvesting is very effective with aquatic weeds such as the sago pondweed that chokes Lagoon Valley Lake each summer. A harvester boat would travel back and forth across the lake, cutting the pondweed about 4 feet below the surface and removing the cut pieces to a temporary storage bin. Disposal of the cut material can be expensive, particularly if it is trucked offsite while still wet. It is less expensive to dry it near the lake, then either truck it to a landfill or use it for compost (perhaps the Hines Nursery could use it). Harvester boats can not operate effectively in the shallow perimeter of the lake and cannot physically harvest the filamentous algae common to the shallows. Chemical treatment of the lake shallows, and treatment of the tiny planktonic algae when blooms occur, would still be needed to in addition to the mechanical harvesting. The approved chemical products used to manage the lake's algae would likely be REWARD, SONAR, or EARTH-TEC. The mechanical removal of rooted aquatic plants has the advantage of removing from the lake the nutrients assimilated by the harvested plant material.

Management Action 17: Terrestrial Invasive Exotic Plant Control - Both the upper and lower watersheds have significant growths of yellow and purple star thistle, invasive exotic plant species that tends to exacerbate drainage problems and displace more desirable native and naturalized plant species. Other invasive exotic pest species known or likely to occur in the watershed include perennial pepperweed, pampas grass, eucalyptus, tamarisk and giant reed. In order to improve habitat quality and to protect watershed drainage corridors, a park-wide exotic vegetation program should be developed and implemented. This would entail mapping of infestation areas and developing management prescriptions for each exotic species. Implementation of this program could be through a through a volunteer stewardship program that works the local school system and civic groups (see Management Action 42).

Implementation of a program of a aquatic and terrestrial weed management will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
2. *Motorless Craft Use of Lake*
4. *Wildlife Habitat*
6. *Swimming & Shoreline Recreation*

Management Plan Goal:

- G. *Reduce Summer Aquatic Weed Infestations*
- A. *Facilitate Windsurfing Use of Lake*
- B. *Enhance Stabilized Drainage Corridors*
- B. *Enhance Shoreline Passive Recreational Opportunities*

5.6 Lake Shoreline – Stabilization and Planting

In order to mitigate the effects of erosion along the shoreline, at the mouths of intermittent tributaries, and on the island, several treatment options are proposed. These are discussed below.

Management Action 18: Regrading - Where steep vertical cuts have developed, regrading to a more stable configuration is achievable. In most instances such regrading would entail minor re-sloping (7:1 grade or gentler) and compacting of banks shoreward from existing gradual slopes that are below the OHWL. In other instances, such as along the island's south and west shoreline, more intensive stabilization grading work will be required. In all instances, re-grading should be followed by seeding, planting and/or use of geotextiles as described below.

Management Action 19: Geotextiles - There are a large variety of geotextile fabrics on the market that are designed to hold seeds and soil in place until vegetation is established. Geotextiles are relatively inexpensive and offer a good solution for areas that have experienced recent slumping. The natural looking mesh fabric protects the soil surface from water and wind erosion while offering partial shade and heat storage to accelerate vegetative development. Geotextile fabrics are most effective when used in conjunction with erosion control planting and can be fully biodegradable. Examples of suitable geotextile material include *Bionet*, *Curlex* and *Greenfix* Erosion Control Blankets, and *Straw Wattles*.

Management Action 20: Rock Riprap - Rock riprap offers a permanent structural solution for areas that are experiencing severe erosion problems. The disadvantages are that construction costs are higher than installation of geotextile fabric and the end result is not as aesthetically pleasing.

Management Action 21: Tri-Lock Articulated Erosion Control System - *Tri-Lock* is a flexible, permeable erosion control system that has the capacity to allow revegetation. It employs a specially engineered woven filter fabric in combination with an interlocking articulated concrete block armor. The voids in the *Tri-Lock* system are filled with top soil and seeded with grass or other vegetation to visually restore the embankment to its natural state. This solution may be utilized as an option that would be of similar function to geotextiles.

Management Action 22: Island/Breakwater Device - Erosion of the lake island shores can probably be attributed to the unstable nature of the material from which the island was constructed combined with wind and wave action against the water's edge. Geotextile fabrics could be used to stabilize the island's banks, although this in itself may not be enough. In order to be more effective, it may be necessary to regrade the eroded slopes to more stable configurations.

Another solution could be to place a breakwater device (or levee) off the island's shore to protect it from the full impact of wave action. Since erosion on the island is most severe on the north side, this would be the logical location to place such a device. As the lake will ultimately also be used by boaters, and wind-surfers the location of this device must be clearly marked above the surface.

Management Action 23: Shoreline Planting - Planting of shorelines can be conducted in conjunction with or, in some cases, as an alternative to other shoreline erosion control treatments. In particular planting of trees along the lake's western shoreline (*i.e.* the sediment deposit zone waterward of the dam berm) could be of significant value in serving as a windbreak to reduce erosion along the island shoreline and on portions of the lake's northern shoreline. In addition to the planting of eroded shoreline segments, planting of stabilized intermittent tributary outlets would also be desirable. With good stands of riparian and emergent marsh vegetation, these outlet areas can become productive zones of wetlands that would also serve to better retain sediments.

For the upper portions of re-graded shorelines, where inundation would not occur under normal rainfall years, the upland erosion control seed mix provided above in Table 11 is proposed. For the lower shoreline zones, slightly above to or below the OHWL, the seasonal wetland seed mix in Table 12 is proposed.

Proposed woody replanting species are provided in Table 13. Figure 4 in Section 13 shows the major areas of the lake that are experiencing shoreline erosion problems. For each problem area (identified on the map by a letter) the range of most appropriate erosion control measures have been identified in Table 14.

Implementation of a program of a shoreline and tributary outlet erosion will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*
3. *Scenic Amenity*
4. *Wildlife Habitat*
6. *Swimming & Shoreline Recreation*

Management Plan Goal:

- F. *Reduce Sedimentation*
- B. *Enhance Visual Quality of Shoreline*
- A. *Establish Woody Riparian Vegetation Along the Lake Shoreline*
- B. *Enhance Shoreline Passive Recreational Opportunities*

Table 12. Seasonal Wetland Seed Mix	
Seed Species	Application Amount (lbs./acre)
Meadow barley (<i>Hordeum brachyantherum</i>)	4
Baltic rush (<i>Juncus balticus</i>)	2
False nutsedge (<i>Cyperus strigosus</i>)	2
Iris-leaf rush (<i>Juncus xiphioides</i>)	4
Monkey flower (<i>Mimulus guttatus</i>)	2
Slender rush (<i>Juncus tenuis</i>)	2
Spike rush (<i>Eleocharis</i> spp.)	2
TOTAL	18
If the above species are difficult to obtain, increase the amount of meadow barley or substitute with the following.	
California oatgrass (<i>Danthonia californica</i>)	2
Slender rush (<i>Juncus tenuis</i>)	2
Spreading rush (<i>Juncus patens</i>)	2
Soft rush (<i>Juncus effusus</i> var. <i>brunneus</i>)	2
Soft rush (<i>Juncus effusus</i> var. <i>pacificus</i>)	2

Note: This is a preliminary wetland seed mix recommendation that has been successfully applied elsewhere in the region. A more suitable site-specific mix may be appropriate.

Table 13. Summary of Proposed Shoreline Plantings				
Planting Zone	Common Name	Scientific Name	Spacing	Minimum Plant Size
Along lower shoreline zone – subject to regular inundation				
Willows		<i>Salix goodingii</i> ; <i>laevigata</i> ; or <i>lasianдра</i>	5 feet	wattles and pole cuttings
Along upper shoreline – subject to infrequent inundation				
Cottonwood		<i>Populus fremontii</i>	5 feet	pole cuttings, leach tubes
Box elder		<i>Acer negundo</i>	15-20 feet	leach tubes; deep pot
Western sycamore		<i>Platanus racemosa</i>	15-20 feet	leach tubes; deep pot
Valley oak		<i>Quercus lobata</i>	20-30 feet	bare root; leach tubes; deep pot
Big leaf maple		<i>Acer macrophyllum</i>	20 feet	liners or rooted cuttings
Shrubs				
Blue elderberry		<i>Sambucus mexicana</i>	10 feet	leach tubes; deep pot
Coyote brush		<i>Baccharis pilularis</i>	5-10 feet	leach tubes
Buttonbush		<i>Cephalanthus occidentalis</i>	5 feet	Cuttings, leach tubes
California coffeeberry		<i>Rhamnus californicus</i>	10 feet	Deep pot
Toyon		<i>Heteromeles arbutifolia</i>	10 feet	Liners
Mule fat		<i>Baccharis salicifolia</i>	10 feet	Liners

Table 14
Summary of Proposed Shoreline
Erosion Control Treatments

Treatment	Shoreline Segment (see Figure 4)						
	A	B	C	D	E	F	G
Re-grading	●		●			●	●
Rock RipRap,			●				●
Geotextiles or Tri-Lock			●			●	●
Planting	●	●	●	●	●	●	●
Breakwater Device							●

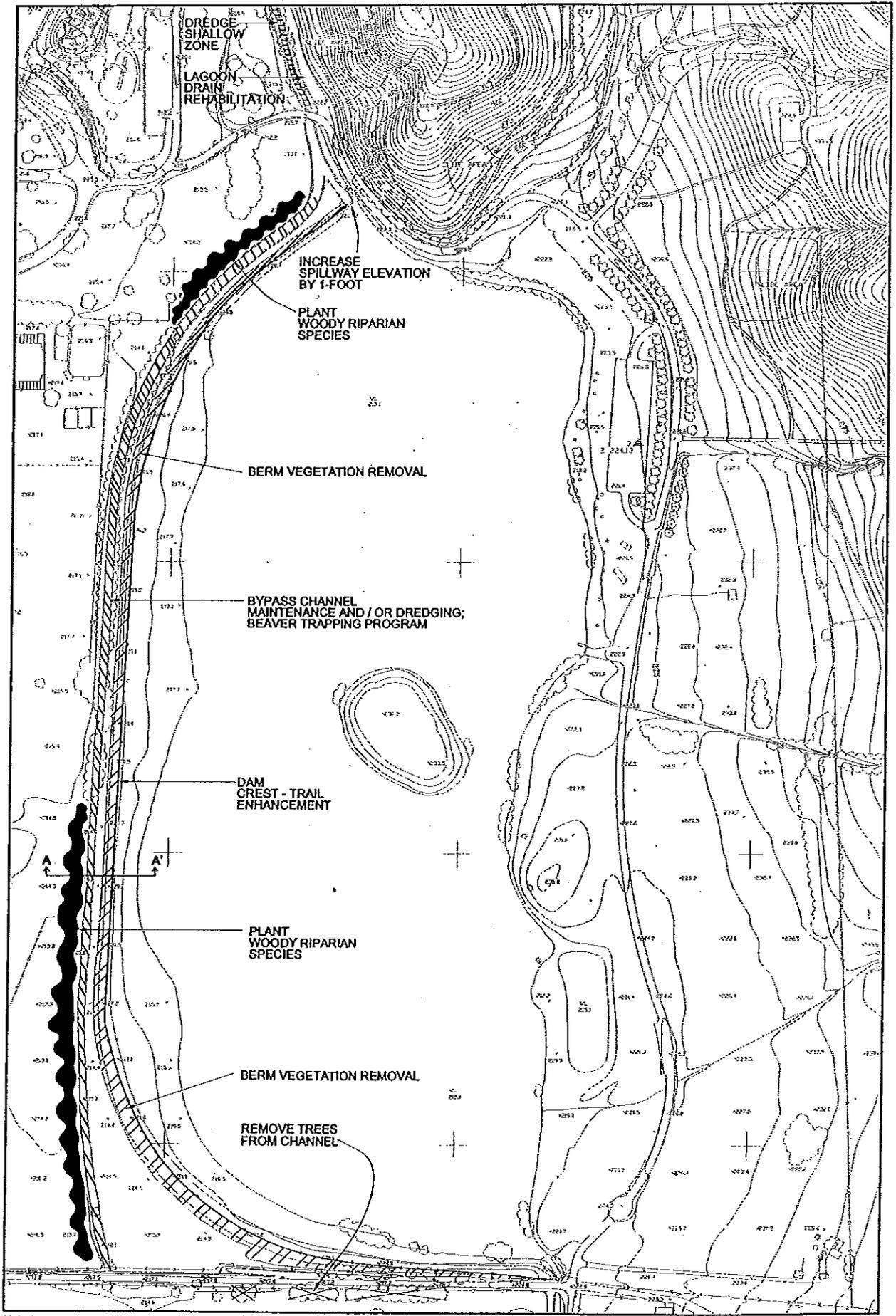
5.7 Bypass Channel Enhancement and Management

The bypass channel on the west side of the lake (Figure 23) already provides well-established riparian habitat with mature cottonwood and willow trees, stands of emergent marsh and a good deal of cover for waterfowl and aquatic fauna. At east 25 western pond turtles, a state-listed Species of Special Concern, have been observed within the channel as well as muskrats and various wading birds and waterfowl. The bypass channel also provides some of the best fishing in the Lower Lagoon Valley due to the presence of an apparently healthy population of largemouth bass. However, the woody riparian vegetation along the channel suffers from extensive beaver cutting damage. Along some segments, nearly 50 percent of the willows and cottonwoods have been toppled by beavers. In the absence of a beaver trapping and relocation program, the quality of the bypass channel habitat will decline. Moreover, the felling of trees into the channel can conflict with its flood flow capacity.

Management Action 24: Beaver Trapping Program - A state-licensed trapper should be retained by the City to remove beavers from the bypass channel and relocate them to suitable habitat outside Lagoon Valley. Given the propensity of beavers to re-colonize areas, this trapping program would probably need to continue on an annual basis for the foreseeable future.

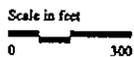
Management Action 25: Riparian Planting Program - The southern and northernmost segments of the bypass channel has relatively few riparian trees and could benefit from a planting program similar to the one contained in Table 13. Trees could also be planted in locations where beaver damage has been significant. The following additional trees are proposed for planting along the bypass channel: white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), and California Black

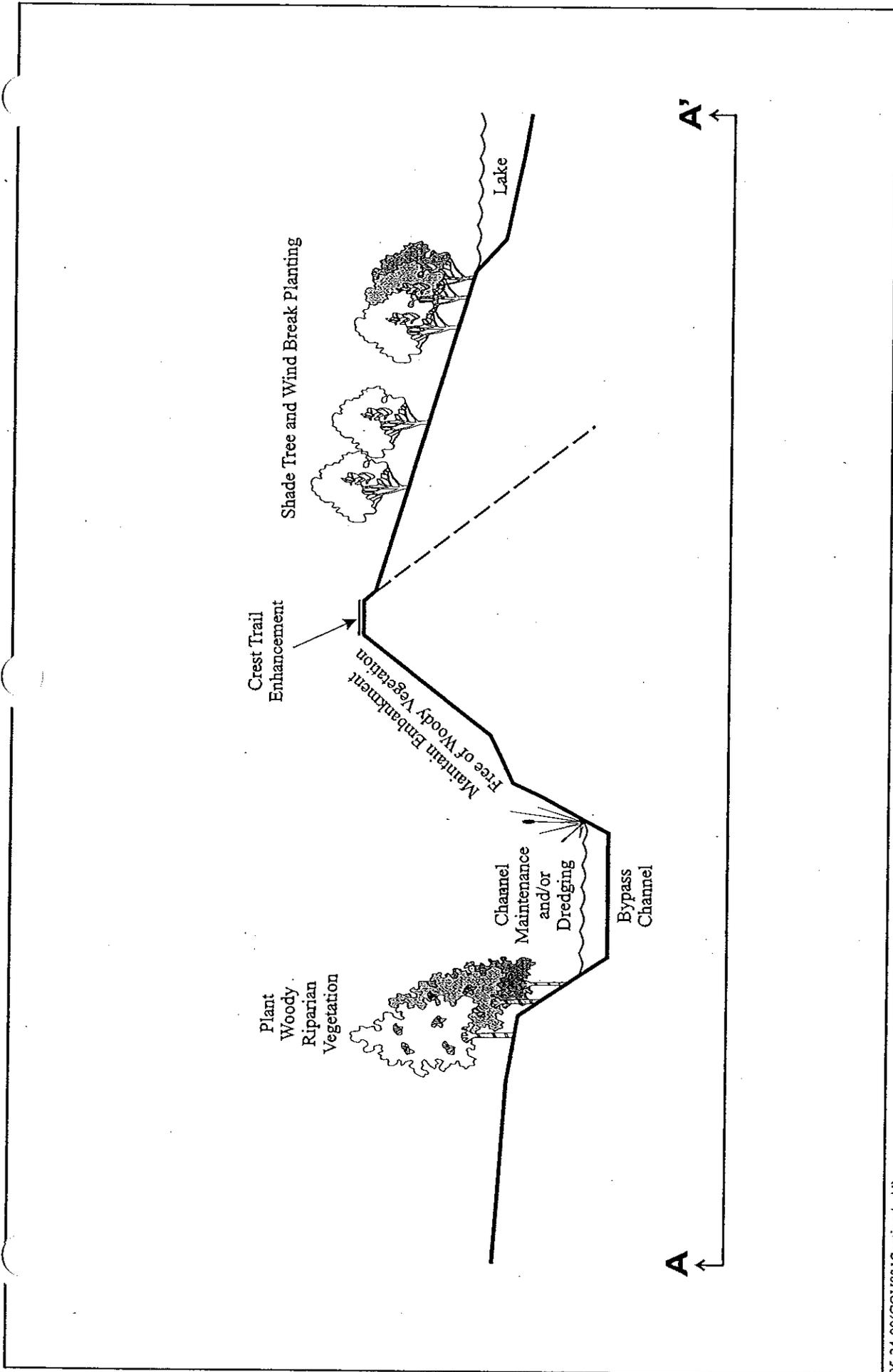
Figure 23 – Bypass channel, dam and embankment management actions



05-21-99(COV831BypassChannel)

Figure 23





05-24-99(COV83 | Section A-A')

Figure 23A

Conceptual Section A-A'
 Bypass Channel, Dam and
 Embankment Management Actions

Walnut (*Juglans hindsii*). Additionally, the bypass channel is an excellent location for planting stands of elderberry, in an attempt to provide habitat for the federally-listed valley elderberry longhorn beetle.³

Management Action 26: Bypass Channel Maintenance - In order to ensure the maintenance of the bypass channel's function as a conduit for storm flow, riparian vegetation should be periodically trimmed back (once every 2-3 years) and dense stands of cattails that may have taken hold in the middle of the channel should be treated with an herbicide, approved by the EPA for use in aquatic systems, and then harvested.

Management Action 27: Bypass Channel Dredging - To ensure that the bypass channel's function as a conduit for storm flow is maintained for the long term, bottom depths should be surveyed and a channel profile and storm flow capacity ascertained. If design capacity has been significantly reduced by the accumulation of sediments and organic matter, limited dredging of the central (deepest) portion should be considered. This would need to be carefully done in such a manner as to avoid serious damage to riparian trees and to avoid turbidity impact downstream.

Management Action 28: Tree Removal from Bypass Channel along Lagoon Valley Road - This arm of the bypass channel, which parallels Lagoon Valley Road, is very narrow and shallow. Several mature cottonwood and willow trees have become established in the middle of the channel and need to be removed to maintain flood flow capacity.

Implementation of a program of a bypass channel maintenance and enhancement will help address the following beneficial uses and related management goals:

Beneficial Use:

4. *Wildlife Habitat*
5. *Storm Water Management*

Management Plan Goal:

- D. *Enhancement of Bypass Channel*
- B. *Spillway and Dam Maintenance*

5.8 Dam Berm Maintenance and Lagoon Drain Rehabilitation

The earthen dam berm is in generally in good condition with no evidence of significant erosion or destabilization. However the DSD has identified management actions that will help maintain the integrity of the dam (Figure 23). The DSD has also identified problems with the Lagoon Drain channel that flows from the dam spillway to Laguna Creek.

Management Action 29: Berm Vegetation Removal - Woody vegetation such as coyote brush needs to be removed from the dam berm's western side where it has

³ Elderberry planting should be done with a prior written agreement from the USFWS that channel maintenance work will need to continue indefinitely and that such maintenance may require elderberry trimming or removal from time to time.

become established. This vegetation has the potential to undermine the dam berm through the growth of roots and by creating locations for rodent burrows.

Management Action 30: Crest Trail Enhancement - The dam may be over-topped during storm events in excess of the 100-year storm. The ability to withstand such events without extensive erosion could be enhanced by construction of an impervious all-weather (asphalt) bike/hiking trail along the dam's crest. This would also serve to enhance the recreational utility of the dam.

Management Action 31: Lagoon Drain Rehabilitation - In order to restore the design capacity of the Lagoon Drain, growths of cattails and tule need to be removed. Concentrations of wood debris in the drain also need to be removed. A continued annual maintenance program for this purpose should be implemented. The DSD also identified a constricted zone in the drain, near the Pena Adobe footbridge, that impedes design flow. This constricted zone has a bedrock impediment that needs to be dredged or blasted out to improve flow.

Implementation of a program of a dam berm and drain maintenance and rehabilitation will help address the following beneficial uses and related management goals:

Beneficial Use:

- 5. Storm Water Management
- 6. Swimming & Shoreline Recreation

Management Plan Goal:

- B. Spillway and Dam Maintenance
- C. Enhance Shoreline Recreational Opportunities

5.9 Fisheries Management and Enhancement

Many of the management actions proposed above will have indirect benefits to the lake fishery. The management actions proposed below are designed to directly improve and maintain the lake fishery over the long-term, in association with or instead of the other actions discussed above.

Management Action 32: Chemical Treatment to Eliminate Blackfish - Under favorable circumstances, the California Department of Fish and Game could be requested to chemically treat the lake with rotenone to kill all fish in the lake, then re-stock it with desirable species. This is unlikely to occur because, until the potential for backflows from the lake drain into the lake is eliminated, blackfish would likely re-establish themselves in the lake during the first wet water year.

Management Action 33: Draining the Lake to Eliminate Blackfish - The lake could be drained and pumped dry to eliminate blackfish from the lake and re-stock it with desirable species. This would be a temporary solution unless the potential for blackfish re-introduction is also eliminated by correcting the downstream problem.

Management Action 34: Controlling Blackfish Numbers through Seining: The commercial fishermen who presently seining the lake use nets with a large mesh size (3.5 inch stretch mesh) to avoid capturing the smaller blackfish and perch. The commercial

fishermen could be contracted by the City to annually seine the entire lake and remove all blackfish captured, as well as carp and goldfish. This approach would not eliminate blackfish from the lake, but it would reduce their numbers sufficiently to eliminate their impact to the fishery. Desirable sport fish captured during the seining operation could be released, and a subsample of their numbers would allow the lake manager to track the success of the sport fishery. Additionally, any bass habitat structures added to the lake should be a type that can be easily removed during the seining, then replaced. The contracted scope of work would preferably include a requirement that they subsample their catch to provide an index of the species and size composition of the sport fish population, as a means of tracking the success of the fisheries management program.

Management Action 35: Add Riser to Dam Spillway: The DSD has stated that they would have no objection to increasing the spillway elevation by about 1 foot to allow the lake to store more water and increase lake depth. This would also have the possible advantage of preventing blackfish re-introductions during period of downstream flooding problems. It might also be advisable to add an appropriate-meshed screen above the riser to add an additional 1-2 feet of protection. The screen would allow backflow into the lake during extreme flood situation while excluding blackfish.

Management Action 36: Lake Drainage in Conjunction with Lake Deepening - Should the lake be deepened by first fully draining it before using excavation equipment, the blackfish will be eliminated from the lake. This action should coincide with a correction to the downstream flooding problem, otherwise the blackfish will reappear in the lake following a wet year.

Management Action 37: Fish Stocking Program - Assuming that the blackfish population can be adequately controlled by one or more of the methods described above, stocking the following fish species is suggested to create a sport fishery in the lake: redear sunfish, largemouth bass, and channel catfish. To facilitate successful angling for these species, it is important that the growths of sago pondweed be controlled so that only a relatively small portion of the lake supports this aquatic plant and that algae blooms be controlled sufficiently to prevent fish kills when the algae dies and decomposes. The fisheries program described above could also be supplemented by a winter stocking of catchable size rainbow trout with the intent that they will all be caught prior to the lake waters warming to 21 degrees C (< 55 degrees F) in the spring. Catfish, largemouth bass and other warm water species would be stocked under warmer water temperatures.

One option for fish stocking would be to work with the CDFG *Reciprocal Stocking Program* under which a hatchery agreement would be arranged between the City and CDFG. In exchange for funding from the city, the CDFG will arrange for specific annual stockings into the lake. For example, the EBRPD has Lafayette Reservoir is stocked annually by requiring annual fishing access fees that are shared with the CDFG. The City could also solicit funds from local or regional commercial sponsors in association in exchange for their advertising at scheduled public events or fishing derbies. A lake fishery may also be established, or supplemented, through the *California Sport Fish Restoration Act*, (at potentially at no cost to the City).

The small pond adjacent to the lake's southeastern shore could be stocked with bluegill and redear sunfish and managed as a children's fishery. This lagoon would need to be deepened slightly to a maximum depth of 4 feet with a gradual slope from shore for safety. The lagoon bottom would be lined with an impermeable liner to prevent the growth of aquatic weeds. However, it would likely still require periodic treatment with an algicide to maintain control the proliferation of both filamentous and planktonic algae. The number and frequency of 4 to 6-inch bluegill and redear sunfish stocked in the lagoon would depend on the fishing pressure it receives; however, it is estimated that 100 fish of each species could be stocked monthly during the period of June through August.

Implementation of a fisheries management program, in accordance with the management actions listed above, will help address the following beneficial uses and related management goals:

Beneficial Use:

1. *Recreational Fishing*

Management Plan Goal:

A. *Manage and control blackfish populations*

B. *Expand largemouth bass and redear sunfish populations*

C. *Maintain Sacramento perch nursery benefits*

D. *Improve recreational fishing accessibility*

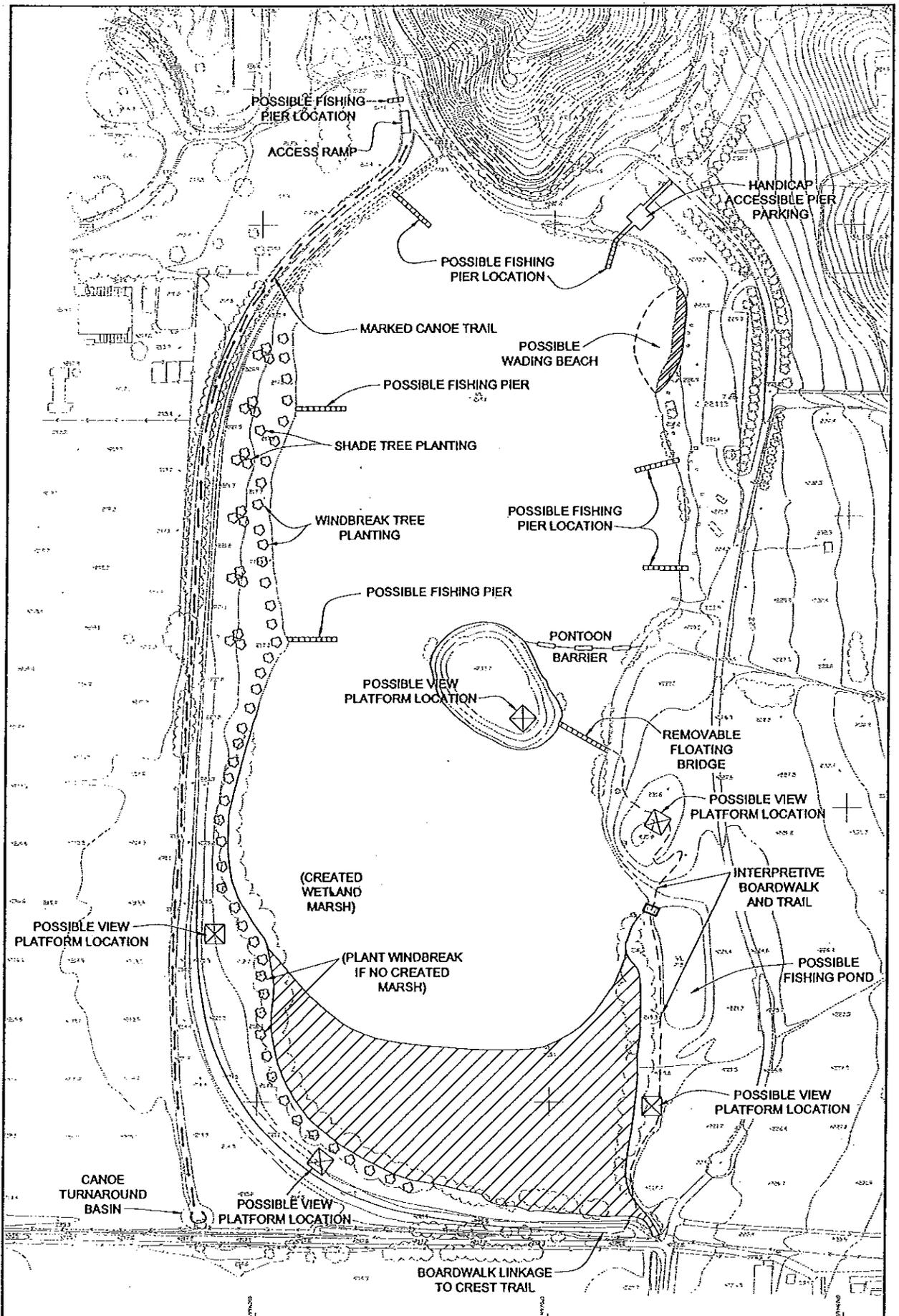
5.10 Interpretive Enhancements

There are an array of options for enhancing the public's understanding and appreciation of Lagoon Valley Lake's natural ecosystems (Figure 24). These are discussed below:

Management Action 38: Establishment of a Protected Habitat Area in the Southeastern Portion of the Lake - As discussed in Section 5.4 (Management Action 13B), the southeast portion of the lake offers the best wildlife habitat due to the diversity of habitats, and the separation from areas of intensive human use. If a new wetland complex is created in this area as a result of dredged spoil disposal, the natural value will increase further. However, whether or not the dredged spoil disposal option is implemented, the southeastern portion of the lake could be protected and managed as the lake's prime habitat area. This would require protecting the area with a well-marked floating barrier in the approximate location shown in Figure 24 to prevent windsurfing and other boating activities from disturbing ducks and other waterbirds that would use the lake for resting and foraging. In addition, if birds nest on the island, windsurfing activities could disrupt the nesting activities of the birds. (The floating barrier could be removed and windsurfing activities allowed seasonally in this area, if few birds are present.)

Management Action 39: Trail and Boardwalk - A trail and boardwalk could be constructed through the protected habitat area (Figure 24), crossing the perennial tributary delta area and linking with the trail atop the dam berm. Interpretive signage could be designed to illustrate the significance of the lake to migratory and resident

Figure 24 – Interpretive and shoreline recreation enhancements



05-21-99(COV831InterpSbria)



Scale in feet
 0 300

Figure 24

Interpretive and Shoreline
 Recreation Enhancements

waterfowl and other wildlife, including raptors such as white-tailed kite. The kinds of information provided could include maps showing migration routes and nesting range of the migrant waterfowl that occur in the park. If the dredged spoil disposal/wetland creation option is selected, then interpretive signs could also discuss the wetland creation process and the benefits and long-term habitat goals of the operation.

Management Action 40: Wildlife Viewing Platforms - Wildlife viewing platforms could be constructed on the knoll south of the boat ramp, to provide views of the island and much of the lake (Figure 24). If a marsh complex is created at the south end of the reservoir, a platform could be constructed at the southeast or southwest portion of the shoreline to provide a view into the marsh.

A viewing platform could also be constructed on the island with some form of limited access provided by a removable pontoon bridge. However, if not designed very carefully, such access to the island could disrupt breeding activities of birds and could disturb wintering and migrant waterfowl and waterbirds that rest and forage in the lake near the island. This access should only be considered after adequate surveys have been conducted to determine the year-round use of the island area by waterbirds and other wildlife species. Access to the island could be appropriate during periods when bird numbers are low and/or birds are not nesting on the island, or if designed in a non-intrusive manner so that birds become accustomed to a low level of human presence.

Management Action 41: Interpretive Signs and Pamphlets - Interpretive signs and pamphlets could also be placed along the berm crest trail and in the picnic areas. In addition to the sign information suggested in Management Action 39, these signs and pamphlets should also emphasize the importance of not feeding waterfowl and other wildlife; and the potential harmful effects of releasing domesticated ducks and geese, and other animals such as exotic turtles, in the park.

Management Action 42: Development of Public Stewardships - The City Parks Department could develop a program of stewardship in cooperation with local schools and civic organizations. Under this program, a classroom or organization would "adopt" a particular unit of the lake and surrounding watershed to help implement some of the management actions described herein. For example, a classroom could assume responsibility for planting and maintaining a segment of shoreline with willows. This would entail properly supervised collection of willow cuttings, assembly of willow wattles and pole cuttings, planting, and regular visits to check on the health of the plantings and re-plant as needed. Another example could be a high school class that regularly collects data from viewing platforms on the numbers and species of bird usage as well as the types of usage observed (nesting, feeding, resting).

Management Action 43: Marked Canoe Trail - The bypass channel provides an excellent opportunity for a short interpretive canoe trail that could be opened for limited periods by the Parks Department (Figure 24). This would require a small access ramp in the vicinity of the dam spillway and possibly dredging a small turn-around basin at the trail's southern end. Interpretive signs could be placed along the shoreline describing the riparian and aquatic habitat of the channel.

Implementation of an interpretive program, in accordance with the management actions listed above, will help address the following beneficial uses and related management goals:

Beneficial Use:

6. *Swimming & Shoreline Recreation*

Management Plan Goal:

B. *Enhance Interpretive Values*

D. *Enhance Shoreline Passive Recreation Opportunities*

5.11 Recreational Enhancements

Many of the management actions described above will increase the utility of the lake for activities such as recreational fishing, sail boarding and nature study. The following additional recreational options may also be considered:

Management Action 44: Public Wading Beach - Unless management actions in Sections 5.3 and 5.4 (bacterial and nutrient management) are successfully designed and implemented, there is no realistic possibility of establishing a safe public wading area. It should also be noted that goal of creating a wetland and protected habitat area in the southeast portion of the lake will likely encourage waterfowl usage and therefore may be counter to the goal creating a wading beach. However, notwithstanding that contradiction, and assuming that the management goals are realized, a wading beach could potentially be established in the area of the eastern shoreline picnic grounds (Figure 24), provided that the following measures were taken:

- **Bacterial Monitoring** - A minimum weekly bacterial monitoring program by the Solano County Health Department would need to be initiated. During periods of high waterfowl usage and/or during the warm summer months, more frequent testing may be needed. Under current public health standards, waters designated for contact recreation shall not have fecal coliform concentrations that exceed a geometric mean of 200 MPN/100 ml., nor can more than 10 percent of the samples exceed 400 MPN/100 ml., based on a minimum of not less than five samples for a 30-day period (California RWQCB 1998). No individual samples should exceed 1000 mpp/100ml., and a minimum 3 foot visibility should be maintained. Furthermore, requirements for water contact recreation may undergo revisions on a state-wide level in the future. Revisions under consideration may require monitoring of the ratio of fecal coliform to fecal streptococcus bacteria, which can vary depending on the source of contamination, and may be very difficult to attain with even moderate duck usage.
- **Create Shallow Wading Area** - The existing drop-off to waters in excess of 4-feet may be too abrupt in the potential wading beach area. A detailed bottom depth profile will need to be surveyed to ascertain the needed modifications of the bottom contour. An overall gently-sloped beach and wading zone will need to be created through the deposition of clean sand.

- **Public Safety** - The entire wading beach proposal should be reviewed by the County Risk Manager. Based on the experience of the EBRPD (Frances Heath *pers. com.*) wading beaches often turn into swimming beaches. In order to prevent this, frequent patrols would be necessary by park rangers unless lifeguards are utilized. In the absence of lifeguards, signs would need to be posted warning that the beach is unprotected. A well-anchored clearly-marked pontoon would be required at the approximate 3-4-foot water depth edge with signs advising waders that the pontoon may not be passed. Regular sifting/raking of beach sand will be needed to protect against injuries from glass and sharp metal and to remove contaminants.

Management Action 45: Fishing Piers - There are many potential locations for fishing piers around the lake. Potential locations would be any shoreline other than the proposed protected habitat area in the southeastern portion of the lake (if implemented). Optimal locations for fishing piers are shown in Figure 24 and are described below:

- 1) near the dam spillway, anchored to the rip-rapped portion of the dam embankment;
- 2) on the lake's north shore near the Tributary No. 1 outlet, carefully positioned between a break in the willows and cottonwoods;
- 3) on the lake's eastern shoreline, toward the southern of the picnic area; and
- 4) at the northern end of the bypass channel near the park entrance (this would require a pathway or elevated boardwalk for access).

The DSD has verified that it would have no objection to the installation of such piers along the earthen dam embankment or the fill/sediment zone that occurs waterward of the embankment on the west side of the lake. If the lake is deepened, fishing piers should be extended close enough to allow casting by children into the deeper water. General guidelines for fishing piers are the following:

- **Pier Materials** – The optimal material for pier pilings is reinforced concrete. This material is durable, long lasting and will not cause environmental problems. Tropical hardwood pilings such as "greenheart" wood are durable, but should be avoided to set a public example of discouraging rainforest deforestation. Domestic wood pilings usually need to be pressure-treated with copper chromates that allow them to last 10 or years or more. However there is evidence that these piles leach heavy metals that get bound into sediments near pilings (Craig Grossenbacher, *pers. com.*).

The ideal material for decking and stringers is recycled wood products. These can be very durable because they contain an ultra-violet stabilizer that allow for long term exposure to the sun, and provide a good public example of wood re-use. However recycled wood products are more expensive in comparison to other wood products such as standard marine decking material. For floating piers, such material can be used in combination with plastic flotations covered with polyethylene. However the use of plastic materials for decking should be avoided because they present a potential fire hazard, they crack under long-term sun exposure, and can be slippery when wet. Metal decking can be very durable but is noisy and visually unattractive.

- **Handicapped Accessible Piers** - The American Disability Act (ADA) has a set of standards for handicapped accessible piers and docks. The best option for the City would be to work with an expert on such piers, such as the Pioneer National Grants Service which has grant funds available for installing piers in accordance with ADA standards. Under such a grant, this service will plan and arrange entire pier construction process from planning to installation. Funds for planning and grant processing do not affect project grant funds.

A key component of handicapped fishing piers is that they must be located near to handicapped parking areas and fully accessible from the parking area. This means that handicapped piers at Lagoon Valley Lake would need to be placed near the eastern shore picnic grounds or that new handicapped parking would need to be established in other locations. An asphalt-paved and smooth pathway and ramp to the pier would need to be provided from the parking areas.

Management Action 46: Fishing Derbies - City and or corporate sponsored fishing derbies can be an excellent means to enhance public awareness of Lagoon Valley Lake as a recreational resource, raise revenue for fishing management and stocking programs and to introduce children to fishing. The small pond near the southeast corner of the lake could also be a suitable location for fishing derbies. Many cities and resource management agencies have used this approach for their lake and creek resources. For example the EBRPD has used "ticket splitter" corporate sponsors to help fund such event and to help pay for fish stocking programs in lakes such as Lafayette Reservoir ad (Don Mecchi, *pers. com.*). The City of Novato Parks and Recreation Department in cooperation with the Kiwanis Club holds an annual fishing rodeo in Novato Creek, as well as the Scottsdale Marsh Lake. The CDFG sponsors a "Fishing in the City" program, in which it works with local sponsors, such as cities, to get city kids involved in fishing. Fishing derbies can be a part of this program.

Management Action 47: Shade Tree and Windbreak Planting

As discussed in Management Action 23, planting of the lake's western shoreline could help reduce island and northern shoreline erosion by creating a windbreak. Planting of the western shoreline area with shade trees could also serve to enhance this area's recreational value by creating shaded spots for picnicking and relaxing. During preliminary discussions on April 7, 1999, DSD indicated that planting of most of this area would not be a problem. However, the DSD will need to determine the landward extend of this shoreline that can be safely planted without the potential for undermining the dam berm (Figure 24). Shade trees should be native species such as those contained in Table 13.

5.12 Summary of Possible Management Actions

Table 15 summarizes all 47 proposed management actions and indicates the particular management goals toward which each action is directed. This table is intended to provide a guide for decision making by the City and for public and agency recommendations to the City

Management actions can be categorized into three groups that the City should take under consideration when deciding how to proceed. These groups are the following:

Mandatory (indicated by an **M** in Table 15) - These are management actions which must be implemented in order to attain the particular management goal. In some instances, two or more management actions are mandatory to achieve a goal.

Optional (indicated by an **O** in Table 15) - These represent alternative actions toward attaining the same goal. Implementation of any one of the options may be sufficient to attain the goal. However, implementation of two or more options may be advisable in some instances.

Contributive (indicated by a **C** in Table 15) – These are management actions that will help attain a goal in combination with mandatory or optional actions, or may make a mandatory or optional action more effective. Contributive actions cannot realistically attain a management goal, either by themselves or in combination with other contributive actions.

Table 15

**Table 15
Relationship of Possible Management Actions to Management Goals**

Management Goal	Upper Watershed Erosion Management			Lower Watershed Erosion Management			Lower Watershed Nutrient Management				Lake Nutrient & Bacterial Management				Weed Management		Lake Shoreline Stabilization and Planting								
	1. Sediment Basins	2. Diversion to Bypass Channel	3. Upper Watershed Management Program	4. Hines Nursery Ditch Stabilization	5. Localized Sediment Capture	6. Intermittent Drainage Channel Stabilization	7. Increase Hines Nursery Reservoir Storage Capacity	8. Off-Stream Water Quality Treatment Ponds	9. Diversion to Bypass Channel	10. Watertown Waste Management	11. Treatment with Alum	12. Flushing the Early Winter Runoff	13A. Deepening the Lake; Off-site Disposal	13B. Deepening the Lake; Create New Wetland Area	14. Watertown Waste Management	15. Water Quality Monitoring Program	16. Direct Aquatic Weed Control	17. Terrestrial Invasive Exotic Plant Control	18. Regrading	19. Geotextiles	20. Rock RipRap	21. Tri-Lock Articulated Erosion Control System	22. Island/Breakwater Device	23. Shoreline Planting	
1. Recreational Fishing Goals:																									
1F. Reduce sedimentation	O	O	C	C	C	C		O	C	C															
1G. Reduce summer aquatic weed infestations																									
2. Small Motorless Craft Goals:																									
2A. Facilitate windsurfing usage of lake																									
3. Scenic Amenity Goals:																									
3B. Enhance visual quality of shoreline usage areas																									
4. Wildlife Habitat Goals:																									
4A. Establish shoreline wetland zones																									
4B. Establish woody riparian vegetation zones along lake shoreline																									

Table 15
Relationship of Possible Management Actions to Management Goals

Management Goal	Upper Watershed Erosion Management			Lower Watershed Erosion Management			Lower Watershed Nutrient Management				Lake Nutrient & Bacterial Management				Weed Management		Lake Shoreline Stabilization and Planting								
	1. Sediment Basins	2. Diversion to Bypass Channel	3. Upper Watershed Management Program	4. Hines Nursery Ditch Stabilization	5. Localized Sediment Capture	6. Intermittent Drainage Channel Stabilization	7. Increase Hines Nursery Reservoir Storage Capacity	8. Off-Stream Water Quality Treatment Ponds	9. Diversion to Bypass Channel	10. Watertown Waste Management	11. Treatment with Alum	12. Flushing the Early Winter Runoff	13A. Deepening the Lake; Off-site Disposal	13B. Deepening the Lake; Create New Wetland Area	14. Watertown Waste Management	15. Water Quality Monitoring Program	16. Direct Aquatic Weed Control	17. Terrestrial Invasive Exotic Plant Control	18. Regrading	19. Geotextiles	20. Rock RipRap	21. Tri-Lock Articulated Erosion Control System	22. Island/Breakwater Device	23. Shoreline Planting	
4C. Enhance stabilized drainage corridors			C			M											C								
4D. Enhancement of by-pass channel		C																							
5. Storm Water Management Goals:																									
5A. Maintain lake storage capacity	O	O	C	C	C	C																			
6. Swimming & Shoreline Recreation Goals:																									
6A. Establish a controlled wading beach							C	C	C	C	C	O	O	O	M	M	C								
6B. Enhance interpretive values																		C	C						C
6C. Enhance shoreline passive recreational opportunities													C	C			C	C	C						C

6.0 COST ANALYSES AND FUNDING SOURCES

6.1 Cost Estimates

"Order of magnitude" cost estimates for the various capital improvements and management actions were being prepared in consultation with City staff. These estimates allowed decision-making by the City based on which management actions are within the realm of feasibility given known and potential sources of revenue.

6.2 Potential Funding Sources

Given the need to find supplemental and cost-sharing funding for plan implementation, a range of potential sources for state and federal grants were researched and evaluated. These are described in Table 16.

Table 16

Table 16 Potential Sources of Funding for Capital Improvements				
Agency/ Program	Eligibility	Contact	Funding Available	Application Period
CAL-FED Local Watershed Stewardship Grant**	<p>Proposals to fund the development and implementation of watershed plans by new or existing watershed groups for key tributaries of the Central Valley and Bay-Delta watershed. Types of projects include, but are not limited to, plan development watershed assessments, implementation of practices to protect and enhance water quality, riparian and habitat restoration, monitoring, technical assistance, and others.</p> <p>Proposals are encouraged to address CALFED priority species (i.e., winter-run Chinook salmon, spring-run salmon, San Joaquin and eastside Delta tributary fall-run chinook salmon, steelhead trout, delta smelt, green sturgeon, and Sacramento late fall-run chinook salmon), and habitats (i.e., tidal perennial aquatic habitat (freshwater); seasonal wetland and aquatic habitat; instream aquatic habitat; shaded riverine aquatic habitat; saline emergent wetlands habitat (tidal); mid-channel islands and shoal habitat; north Delta agricultural wetlands and perennial grasslands.</p> <p>Proposals which meet minimum requirements are evaluated using the following criteria:</p> <ol style="list-style-type: none"> Community-based Significant environmental results Consistent with CALFED and related efforts Multiple ecosystem issues Provide for ongoing implementation Monitoring Applicant's ability 	<p>CALFED Bay Delta Program 1416 Ninth Street, Room 1155 Sacramento, CA 95814 publica@water. ca.gov 800-900-3587 916-657-2666</p>	<p>Up to \$2,300,000 in federal funding</p>	<p>Date for next round of RFPs not yet set.</p>

*** funding source most compatible with Lagoon Valley project

** funding source possibly compatible with project

* funding source probably not compatible with project

**Table 16
Potential Sources of Funding for Capital Improvements**

Agency/ Program	Eligibility	Contact	Funding Available	Application Period
<p>State Parks and Recreation Department Federal Land & Water Conservation Funds***</p>	<p>Funds for acquisition or development of neighborhood, community or regional parks or facilities supporting outdoor recreation activities. Project grants for acquisition, development, and planning assistance. Eligible applicants include counties, cities, recreation and park districts, special districts with public park and recreation areas, California Departments of Parks and Recreation, Boating and Waterways and Water Resources, and the Wildlife Conservation Board.</p>	<p>Odel King, California Department of Parks and Recreation Local Assistance Section 1416 Ninth Street, Room 1449-1 P.O. Box 942896 Sacramento, CA 94296-0001 916-653-8758</p>	<p>50/50 matching program, wherein applicant is expected to finance entire project and will be reimbursed 50% of the costs up to the amount of the grant. NO FUNDING CURRENTLY AVAILABLE</p>	<p>Announcements made each spring to identify funding available.</p>

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Table 16 Potential Sources of Funding for Capital Improvements				
Agency/ Program	Eligibility	Contact	Funding Available	Application Period
State Parks and Recreation Department Habitat Conservation Fund Program***	<p>Types of projects eligible for funds are acquisition project, enhancement and restoration projects (i.e. wetlands, aquatic habitat for spawning and rearing of anadromous salmonids and trout resources, and riparian habitat), and programs that:</p> <p>a) Provide for the interpretation of the State's park and wildlife resources, and</p> <p>b) bring urban residents into park and wildlife areas; include proposals designed to provide opportunities for urban residents to use park and wildlife areas; include nature interpretation programs that are designed to increase awareness and appreciation for park and wildlife resources. Examples of project types include the following: deer and lion habitat, including oak woodlands; habitat for rare and endangered, threatened and fully protected species; wildlife corridors and urban trails; wetlands; aquatic habitat for spawning and rearing of anadromous salmonoids and trout species; and riparian habitat.</p> <p>This is a matching program - 50% State/50% Local (match must come from non-State source); Grants for development may be matched by non-State monetary or non-monetary contributions (i.e., in-kind contributions- goods and/or volunteer services; force account labor - applicant's employees; value of real property donated for project)</p>	<p>Odel King, California Department of Parks and Recreation Local Assistance Section 1416 Ninth Street, Room 1449-1 P.O Box 942896 Sacramento, CA 94296-0001 916-653-8758</p>	<p>\$2 million available annually beginning in FY 90/91 thru 2020</p>	<p>Application deadline- October 1 (may be changed to accommo- date applicants)</p>

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* funding source probably not compatible with project

**Table 16
Potential Sources of Funding for Capital Improvements**

Agency/ Program	Eligibility	Contact	Funding Available	Application Period
<p>National Park Service Urban Park and Recreation Recovery (UPARR) Program**</p>	<p>Provides federal grants to local governments for the rehabilitation of critically needed recreation areas and facilities; demonstration of innovative approaches to improve park system management and recreation opportunities, and development of improved recreation planning. To be eligible, jurisdiction must have a current Recovery Action Program that demonstrates commitment to revitalizing its park and recreation system. RAPs emphasize action priorities for overall recreation system recovery for the most urgent implementation actions.</p>	<p>Headquarters: Recreation Grants Division (202) 343-3700 Sam Hall, Chief</p>	<p>Rehabilitation and Innovation grants are matching capital grants 70% federal/30% local; Planning grants are matching 50% federal/50% local</p>	<p>None</p>

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Table 16 Potential Sources of Funding for Capital Improvements				
Agency/ Program	Eligibility	Contact	Funding Available	Application Period
<p>Natural Resource Conservation Service</p> <p>Watershed Protection and Flood Prevention Program**</p>	<p>Provides technical and financial assistance to state agencies and units of local government in planning and carrying out works of improvement and to protect, develop, and utilize the land and water resources in small watersheds not exceeding 250,000 acres. This includes total resource management and planning to improve water quality and solve problems caused by flooding, erosion, and sediment damage, conservation, development, utilization, and disposal of water. This program emphasizes planning through interdisciplinary teams which include the sponsors, other agencies, and environmental groups in all stages of plan development. Projects must address one or more of the purposes authorized by P. L. 83-5566 to solve problems and needs that are beyond the capability of individual landowners.</p> <p>Criteria for selecting proposals are as follows:</p> <ol style="list-style-type: none"> 1) the watershed must meet the requirements of the law; 2) the governor or his or her representative must recommend the watershed for planning assistance; 3) it should be evident that problems can be solved by project action under authority of P. L. 83-566; 4) the local sponsors should have authority under state statutes to carry out their responsibility for installation and operation and maintain of project measures; 5) the local sponsors should indicate willingness to carry out watershed project; 6) the project should have good prospects for a favorable benefit-cost ratio; 7) no critical environmental issues; and 8) available capabilities and resources to develop a watershed plan. 	<p>Chief of Natural Resources Conservation Service 202-720-4525 contact: Paul W. Johnson</p>	<p>Cost-sharing requirements are variable; share requirement = 50% for public recreation and fish and wildlife purposes; no matching requirements for flood prevention; interest for loans are near Treasury rates and may be repaid up to 30 years.</p>	<p>No deadline</p>

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**Table 16
Potential Sources of Funding for Capital Improvements**

Agency/ Program	Eligibility	Contact	Funding Available	Application Period
<p>EPA State Wetlands Protection Grants*</p>	<p>Funds for State and tribal agencies, local governments, conservation districts, nonprofits, and others to be used to develop new wetlands protection programs, refine existing protection programs, and support local efforts that better protect wetlands resources. Priority projects include: wetland/watershed protection demonstration; river corridor and wetland restoration projects; wetland conservation plans; regulatory programs; assessment and monitoring; wetland assessment models; and American Wetlands Month activities. Projects must clearly demonstrate a direct link to improving a state, tribe, or local government's ability to protect, restore, and/or manage its wetlands resources. Because of the conditions in Section 104(b)(3) of the Clean Water Act, these grants can only be used for the development of, and not for operational support of, wetland programs.</p>	<p>Mary Butterwick/Cheryl McGovern Water Division 415-744-1985 butterwick.mary@epamail.epa.gov</p>	<p>Approximately \$1.7 million available in past year; expected to be similar this year</p>	<p>12/99; RFP will come out in September, 1999</p>
<p>EPA Sustainable Development Challenge Grants (SDCG)*</p>	<p>Funds for incorporated non-profits, local governments, educational institutions, states, territories, and possessions for projects that use proactive, innovative, approaches to protect the environment while providing economic benefits; are supported by and involve diverse interests in the community; have measurable environmental and economic results; and/or foster long-term investments in local sustainability efforts. EPA strongly emphasizes the need for a project to have clearly defined economic/community benefit and grassroots involvement; strictly restoration projects unlikely to be funded.</p>	<p>Nova Blaje Cross Media Division 415-744-2089 blaje.nova@epamail.epa.gov website - www.epa.gov/ecocommunity</p>	<p>\$500,000 nationally in FY96; 20% matching share required in FY96</p>	<p>RFP will come out in May/June of 1999</p>

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**Table 16
Potential Sources of Funding for Capital Improvements**

Agency/ Program	Eligibility	Contact	Funding Available	Application Period
EPA Water Quality Assessment & Planning**	Funds will support water quality assessment and planning projects which will lead to implementable actions that promote healthy aquatic ecosystems; important goal of program is to support projects which foster local watershed management efforts that protect and enhance environmental conditions.	Cheryl McGovern Water Division 415-744-2013 mcgovem.cheryl @ epa.mail.epa.gov	\$460,000 Regionally in FY97; \$10,000- \$150,000; matching share varies by State	Varies
State Water Resources Control Board NPS Grant 319***	Federally funded nonpoint source pollution control program that funds watershed management and implementation projects to reduce eliminate, or prevent water pollution and enhance water quality. Program focuses on control of activities that impair beneficial uses, and limit pollutant effects, as well as management activities that lead to reduction and/or prevention of pollutants such as sediments, nutrients, toxic and rare metals, pesticides, industrial and commercial toxicants, and urban runoff. Projects must have defined water quality beneficial use protection or enhancement goal. Projects must target specific watershed identified by RWQCBs and support watershed management, and be consistent with SWRCB Initiative on NPS Management and enhance States' efforts to satisfy Section 6217 of the Federal Coastal Zone Act.	Ken Colter SWRCB, Division of Water Quality 901 P Street, Sacramento, CA 95814 916-657-0682	\$25,000- \$250,000 per project; 40% matching share required	RFP Available in January; Proposal submittals due early April

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Table 16 Potential Sources of Funding for Capital Improvements				
Agency/ Program	Eligibility	Contact	Funding Available	Application Period
State Water Quality Control Board (SWQRCB) Water Quality Planning Grants (205)**	Federally funded water quality planning support program for local public agency projects to reduce, eliminate, or prevent water pollution and to enhance water quality; recipient agencies may subcontract for planning work, subject to federal contracting regulations, and report quarterly and at the end of the project to SWRCB.	Paul Lillebo Division of Water Quality, SWRCB 901 P Street, Sacramento, CA 95814 916-657- 1031 CALNET 8- 437-1031 lilip@dwq.swrcb. ca. gov	Maximum funds for any one project will be \$120,000; total federal funds available for projects in CA in 1998 = approx. \$700,000. Grants typically run for a two- year period; will fund up to 75% of project costs, 25% must be non-federal funds.	RFPs out in annually in January. Proposals due in April.
California Department of Fish and Game - Wildlife Conservation Board Inland Fisheries Division Grant Program**	Proposition 99 provides money for fish habitat restoration, with a priority on coho salmon in specific drainages. Wildlife Conservation Board (WCB) is a separately funded part of Fish and Game, and has funding for restoration of fish and wildlife resources in California. Funds may be granted to public agencies or non-profit groups for projects which enhance, develop or restore flowing waterways for the management of fish outside the coastal zone.	Peter Perrine Department of Fish and Game, Wildlife Conservation Board 1416 9th Street Sacramento, CA 95814 916-445-1109		None

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**Table 16
Potential Sources of Funding for Capital Improvements**

Agency/ Program	Eligibility	Contact	Funding Available	Application Period
California Department of Fish and Game - Wildlife Conservation Board	<p>Acquisition/Restoration and Enhancement Project which meet one or more of the following Program goals:</p> <ul style="list-style-type: none"> X Protect 80,000 acres of existing wetlands through acquisitions of fee title or perpetual conservation easements. X Secure an incremental, firm 402,450 acre-foot quality water supply for use by National Wildlife Refuges (NWRs), State Wildlife Areas (SWAs), and the Grassland Resource Conservation District (GRCD). X Secure Central Valley Project power for NWRs, WAS, GRCDs, and other public and private land dedicated to wetland management. X Increase wetland acres by 120,000 acres and protect these wetlands in perpetuity by acquisition of fee-title or conservation easements. X Enhance wetland habitat on 291,000 acres of public and private lands. X Enhance waterfowl habitat on 443,000 acres of agricultural lands. 	<p>Peter Perrine, Field Agent Department of Fish and Game Wildlife Conservation Board 801 K Street, Suite 806 Sacramento, CA 95814 (916) 445-1109</p>	<p>Wildlife Restoration Fund - continuous annual appropriation of \$750,000 since 1955 from horse racing revenues; State Bond Acts also provide funding; California Wildlife Protection Act of 1990 provides up to \$21 million a year until 2020.</p>	<p>None.</p>
Inland Wetlands Conservation Program*	<p>Grantee (i.e., non-profit organization, local government agency, or state department) must provide matching contribution - cash or in-kind services; promise to manage and maintain wetlands; obtain all required environmental permits; and encourage partnerships to complete, operate and maintain projects.</p>			

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 ** funding source possibly compatible with project
 * funding source probably not compatible with project