Garcia River Watershed
Water Quality Attainment Action Plan for Sediment

The Garcia River watershed comprises approximately 73,223 acres in southwestern Mendocino County and discharges to the Pacific Ocean. In 1996, the state of California identified the Garcia River as a high-priority waterbody according to the requirements in Section 303(d) of the federal Clean Water Act (CWA). Section 303(d)(1)(A) of the CWA requires that states list those waters within its boundaries for which existing management practices are not sufficient to achieve water quality standards. The Garcia River was identified as a high-priority waterbody due to excessive sedimentation. Accelerated erosion from land use practices and other causes was identified as affecting the migration, spawning, reproduction, and early development of cold-water fish such as coho salmon and steelhead trout. When the Garcia River was designated a high-priority waterbody under the requirements of the CWA, the development of a Total Maximum Daily Load (TMDL) for the river became necessary.

As a result of the designation of the Garcia River as a high-priority waterbody under the guidelines of the CWA, landowners, land managers, resource protection agencies, and interested members of the public provided input in the preparation of the *Garcia River Watershed Water Quality Attainment Strategy for Sediment* (1997) (Strategy). The Strategy is a staff-level tool for landowners; land managers; interested public; and state, local and federal resource protection agency personnel to use as an aid for developing and implementing plans to reduce sediment delivery to the Garcia River and its tributaries. It also is useful as a reference document for providing additional detail about the concepts that follow. It is a planning document that should be revised or updated over time as factors affecting sediment conditions are better understood. The following Action Plan describes the approach of the Regional Water Board to achieve sedimentation reduction and attain beneficial uses in the Garcia River watershed and serves as a phased TMDL, implementation plan, and monitoring plan for the Garcia River watershed. As a phased TMDL, it will be updated and revised, through Basin Plan amendments, based on new information gathered by Regional Water Board staff and/or submitted by landowners, other agencies, academic institutions and the public that provides an improved assessment of conditions in the Garcia River watershed.

I. Problem Statement

The Garcia River and its tributaries have experienced a reduction in the quality and amount of instream habitat that is capable of fully supporting the beneficial use of a cold-water fishery, due to increased sedimentation. This has resulted in a reduction in the stocks of coho salmon and steelhead trout. The acceleration of sediment delivery in the Garcia River watershed due to land management activities has resulted in the loss or reduction of pools necessary for salmonid rearing and the loss or degradation of potential spawning gravel. In addition, the loss or reduction of instream channel structure in the Garcia River watershed due to land management activities has contributed to this habitat loss or reduction.

II. Numeric Targets

The Numeric Targets, as derived from the scientific literature, focus on the elimination of sediment as a pollutant of concern, and provide instream water quality goals for restoring the cold-water fishery habitat. The Numeric Targets represent the desired future condition of the watershed, and are intended to be consistent with existing water quality objectives and beneficial uses, but are not themselves enforceable. The Numeric Targets will be revised through Basin Plan amendments if additional site-specific data for the watershed or additional research support the need for revision. They are expected to be attained throughout the watershed by the year 2049. Table 1 provides the Numeric Targets for the Garcia River watershed.

Table 1. Numeric Targets for the Garcia River Watershed

Parameter	**Numeric Target**
Migration barriers on Class I watercourses[1]	Zero human-caused barriers
Embeddedness on Class I watercourses	Improving trend[2]
Percent fines < 0.85 mm on Class I watercourses	<14 percent
Percent fines <6.5 mm on Class I watercourses	<30 percent
Primary pool frequency in Class I watercourses [3]	Primary pools covering 40 percent of the length of the watercourse
V* in 3rd order streams with slopes between 1 percent and 4 percent[4]	<0.21 (mean) <0.45 (max)
Median particle size diameter (d_{50}) in 3rd order stream with slopes between 1 percent and 4 percent	>69 mm (mean) >37 mm (min)
Large woody debris in Class I , II, and III watercourses	Improving trend[5]
Width-to-depth ratio in Class I, II, and III watercourses	Improving trend[6]
Thalweg profile in Class I, II, and III watercourses	Increasing variability around the mean
Inman, Signal and Hathaway (Planning Watersheds 113.70014, 113.70020 and 113.70026 except mainstem)	0 percent open stream channel[7]
Pardaloe, Larmour, Whitlow, and Blue Waterhole and North Fork (Planning Watersheds 113.70010 – 113.70013 and 113.70025)	<1 percent open stream channel
Rolling Brook (Planning Watershed 113.70024)	<3 percent open stream channel
Graphite, Beebe (Planning Watersheds 113.70021 – 113.70022)	<6 percent open stream channel
South Fork (Planning Watershed 113.70023)	<20 percent open stream channel

[1] Class I watercourses are watercourses that contain domestic water supplies, including springs, on site and/or within 100 feet downstream, or have fish always or seasonally present onsite, or contain habitat to sustain fish migration and spawning. Class I watercourses include historically fish-bearing watercourses.
Class II watercourses are watercourses that have fish always or seasonally present offsite within 1000 feet downstream, or contain aquatic habitat for non-fish aquatic species. Class II watercourses do not include Class III watercourses that are directly tributary to Class I watercourses.
Class III watercourses are watercourses that do not have aquatic life present, but show evidence of being capable of sediment transport to Class I and II watercourses under normal high flow conditions during and after completion of land management activities.

[2] Embeddedness measures the degree to which the larger particles (boulders, rubble, or gravel) of watercourse channels are surrounded or covered by fine sediment, impeding the ability of fish to dig an adequate redd, or nest. Measurements are generally recorded as 0-25 percent, 25-50 percent, 50-75 percent, or 75-100 percent embedded. An improving trend would be represented by a decrease in embeddedness as measured over a rolling 10 year period.

[3] Primary pools have a depth greater than three feet at the pool's deepest point, a width greater than one-half the width of the low flow channel at the pool's widest point (measured by a transect perpendicular to flow), and a length greater than the width of the low-flow channel at the pool's longest point (measured by a transect parallel to flow). Primary pool frequency will be measured by surveying segments of the watercourse that provide a statistically significant representation of the watercourse as a whole and are located based on field conditions.

[4] V* is a numerical value that represents the proportion of fine sediment that occupies the scoured residual volume of a pool. Stream order is the designation of the relative position of stream segments in the drainage basin network. For example, a first order stream is the smallest, unbranched, tributary that terminates at the upper point. A second order stream is formed when two first order streams join.
[5] An improving trend in large woody debris would be represented by an increase in the volume of large woody debris measured within a given stream segment over a rolling 10 year period. Large woody debris is defined as a piece of woody material having a diameter greater than 30 cm (12 inches) and a length greater than 2 m (6 feet) that is located in a position where it is in the watercourse channel or may enter the watercourse channel.
[6] An improving trend in the width-to-depth ratio would be represented by a change over a rolling 10 year period in the existing width-to-depth ratio towards the width-to-depth ratio appropriate for the stream channel type in question, as determined using the Rosgen stream classification system described in *Applied River Morphology* (1996) by Dave Rosgen.
[7] Open stream channels are those segments of channel, as viewed in aerial photographs with a 1:24,000 resolution or better, that are not covered by canopy and thus are visible.

III. Source Analysis

The analysis of sediment sources is divided into three components: mass wasting (primarily landslides), fluvial erosion (primarily from gullies), and surface erosion (primarily from rills and sheetwash). For each of these categories, data was reviewed to estimate the sediment delivery rate associated with natural background, roads (including but not limited to private, public, rural residential and skid trails), timber harvest units, and agricultural operations. Aerial photograph interpretation and road density data analysis were used to estimate the existing rates of sediment delivery from the above sources and from natural background, where the data was sufficient to do so. The estimates are contained in Table 2. Based on the existing data, at a minimum, the Garcia River watershed produced an average of 1,380 tons of sediment per square mile per year as measured from 1956 to 1996.

Table 2. Average annual sediment load (Derived from*: Garcia River Sediment Total Maximum Daily Load, Table 16*, promulgated by USEPA, Region IX on March 16, 1998)

SOURCE	ESTIMATED AVERAGE ANNUAL SEDIMENT LOAD (tons/mi^2/yr)
Natural Background	
⇒ Mass wasting	162
⇒ Fluvial erosion	Insufficient data
⇒ Surface erosion	Insufficient data
Roads (including skid trails)	
⇒ Mass wasting	486
⇒ Fluvial erosion	532
⇒ Surface erosion	38
Timber Harvest Units	
⇒ Mass wasting	162
⇒ Fluvial erosion	Insufficient data
⇒ Surface erosion	Insufficient data
Agricultural Operations	
⇒ Mass wasting	Insufficient data
⇒ Fluvial erosion	Insufficient data
⇒ Surface erosion	Insufficient data
TOTAL	1,380

IV. Loading Capacity Calculation

Data from the Garcia River watershed were compared to that from other north coast watersheds with similar physical, climatic, and geologic characteristics to the Garcia River watershed. In particular, data from the North and South Forks of Caspar Creek, also located in western Mendocino County, were used to estimate the reduction in sediment loading needed to achieve the desired future condition in the Garcia River. South Fork Caspar Creek was heavily logged by

ground-based equipment (tractors) up until the 1970s and is reported by Pacific Watershed Associates (1997) to produce 1,420 tons/mi^2/yr of sediment. North Fork Caspar Creek, on the other hand, received very little tractor logging up through the 1970s and is reported by Pacific Watershed Associates (1997) to produce 680 tons/mi^2/yr of sediment. The U.S. Environmental Protection Agency Region IX (USEPA) promulgated a TMDL for the Garcia River on March 16, 1998. In it, USEPA assumes that the condition of South Fork Caspar Creek is comparable to the existing condition of the Garcia River watershed and that North Fork Caspar Creek represents a reference for the desired future condition of the Garcia River watershed, a condition similar to that which existed prior to the steep decline in salmonid populations. As a result, a reduction in sediment delivery of 52 percent is identified as appropriate to achieve the desired future conditions in the Garcia River watershed [(1420-680)/1420=0.52]. Applying a margin of safety of 8 percent to account for uncertainties in the data and differences between the Garcia River watershed and the Caspar Creek watershed, an overall reduction in sediment loading of 60 percent is established. (*Garcia River Sediment Total Maximum Daily Load*, USEPA, Region IX, March 16, 1998).

A 60 percent reduction of the average annual sediment load to the Garcia River watershed (1,380 tons/mi^2) results in a Loading Capacity of 552 tons/mi^2/yr [a)1,380 X 0.60=828; b) 1,380-828=552]. The loading capacity of 552 tons/mi^2/yr is a conservative estimate based on the best available data, and will be measured over a 40-year period. This loading capacity is the TMDL for the purposes of 40 CFR 130.2 and 130.7. As a phased TMDL, the loading capacity can be modified through a Basin Plan amendment if new information is made available that supports such modification. Neither the order of magnitude of the overall sediment budget nor that of the loading capacity is expected to change significantly as a result of new information.

V. Load Allocations

The existing data are insufficient to allocate specific components of the TMDL to individual landowners or to individual land management activities. That is, it does not include estimates of sediment delivery from individual properties, all landuse, or the amount of sediment delivery that can be reasonably controlled. These three elements are necessary to form rational individual load allocations.

To address the limitations in the existing data, a general load allocation is developed as follows. It is phased, as contemplated in a phased TMDL. First, landowners are required to inventory the Sediment Delivery Sites on their property. Sediment Delivery Sites are controllable, human-caused erosion sites that are currently eroding or have the potential to erode in such a manner as to deliver sediment to a watercourse. Landowners are then directed to reduce the controllable volume of sediment at the inventoried Sediment Delivery Sites. Correction or control of these sites is required according to a schedule contained in the Implementation Schedule section. Landowners are also directed to assess their property for Unstable Areas. Unstable Areas are areas with a naturally high risk of erosion and areas or sites that will not reasonably respond to efforts to prevent or mitigate sediment discharges. Finally, landowners are directed to implement protective land management measures designed to control future sediment delivery from land management activities on the identified unstable areas and on riparian areas, and from activities related to roads, skid trails, landings, agricultural facilities, and gravel mining. These practices are to be implemented in accordance with the schedules contained in the Implementation Section.

In short, as the first phase, landowners are directed to identify and control all existing and future controllable discharges of sediment. Controllable discharges are those discharges resulting from human activities that can influence the quality of waters of the State and that can be reasonably controlled by prevention or mitigation. For the purposes of the TMDL equation, the load allocation is expressed as zero controllable discharges. For the purpose of implementation and as noted in Table 3, it is recognized that measures to control discharges are not 100 percent effective. In the absence of additional data, the Regional Water Board judges that this program of source identification and source control will result, over time, in a reduction in the rate of sediment delivered to watercourses in the Garcia River watershed that is comparable to the rate that existed prior to the steep decline in salmonid populations and attainment of the desired future conditions. As per the Loading Capacity Calculation, that level of sediment delivery is estimated to be 552 tons/mi^2/yr. Should additional data be made available to the Regional Water Board that supports a revision to the Load Allocation, the Regional Water Board will consider such revisions in a Basin Plan Amendment.

VI. Implementation Plan

The Implementation Plan is intended to control existing and future sources of sediment delivery resulting from human activity to the Garcia River and its tributaries. To control these sources, three options are offered to landowners. These options are:

Option 1. Comply with the waste discharge prohibitions that apply within the Garcia River watershed.

Option 2. Comply with an approved Erosion Control Plan and an approved Site-Specific Management Plan, or

Option 3. Comply with an approved Erosion Control Plan and the Garcia River Management Plan.

Waste Discharge Prohibitions that Apply within the Garcia River Watershed

The following waste discharge prohibitions apply within the Garcia River watershed:

1. The controllable discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, gravel mining, agricultural, grazing, or other activity of whatever nature into waters of the State within the Garcia River watershed is prohibited.

2. The controllable discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, gravel mining, agricultural, grazing, or other activity of whatever nature to a location where such material could pass into waters of the state within the Garcia River watershed is prohibited.

Controllable discharges are those discharges resulting from human activities that can influence the quality of the water of the State and that can be reasonably controlled through prevention,

mitigation or restoration. The above two waste discharge prohibitions replace the region-wide waste discharge prohibitions contained in the action plan for logging, construction, and associated activities. The region-wide waste discharge prohibitions no longer apply to activities in the Garcia River watershed. The above two prohibitions do not apply to landowners who are conducting their land management activities in accordance with an approved Erosion Control Plan *and* either an approved Site-Specific Management Plan or the Garcia River Management Plan (Options 2 and 3, respectively). If the Regional Water Board finds that significant discharges or threatened discharges of sediment occur despite the implementation of an approved Erosion Control Plan and either an approved Site-Specific Management Plan or the Garcia River Management Plan, it will consider the need to revise the plans and will consider the issuance of a Cleanup and Abatement Order to address the discharge, but it will not impose administrative civil liabilities for violations of the prohibitions.

All landowners choosing either Option 2 or 3 as described above must submit an Erosion Control Plan. The general purpose of the Erosion Control Plan is to outline the program by which a landowner or landowners will identify areas of sediment delivery, identify areas at risk of sediment delivery, and control all sediment delivery associated with past and present land management activities. The necessary components of an Erosion Control Plan are enumerated below.

In addition, landowners choosing Option 2 must submit a Site-Specific Management Plan. Those choosing Option 3 must comply with the Garcia River Management Plan, as outlined below. (The Site-Specific Management Plan and Garcia River Management Plan are collectively referred to as Management Plans.) The general purpose of the Management Plans is to outline the program by which a landowner or landowners will manage their property or properties to reduce the future risk of initiating new sediment delivery problems and to increase the ability of the Riparian Management Zone to properly function with regard to sediment filtering, large woody debris recruitment and stream bank stabilization.

A Site-Specific Management Plan differs from the Garcia River Management Plan. With the Site-Specific Management Plan, the landowner is able to select land management measures for controlling sediment that are suitable for the specific activities and conditions on his or her land. In the Garcia River Management Plan, more general land management measures are specified for unstable areas and riparian areas, and for activities related to roads, skid trails, landings, near stream facilities, and gravel mining. The Regional Water Board strongly encourages all landowners to prepare Site-Specific Management Plans and to use the Garcia River Management Plan only until they can develop their own plans to control discharges of sediment from their properties. The Regional Water Board also encourages groups of dischargers with similar land management activities to develop collective watershed-based Erosion Control Plans and Site-Specific Management Plans, where appropriate.

Erosion Control Plans, Site-Specific Management Plans, and the Garcia River Management Plan are not independently enforceable. The submission of an Erosion Control Plan and Site-Specific Management Plan by a landowner does not create an obligation by the landowner to implement the plans. In addition, none of the land management measures contained in a Management Plan shall be construed as a gift or dedication of private lands to the general public. A landowner may submit to the Executive Officer a request for an interim extension of time to develop or implement

either the Erosion Control Plan or the Management Plan. If the Executive Officer determines that the landowner is making a good faith effort to develop or implement the plans in accordance with the final timelines described in the Implementation Schedule, the extension will be granted. A landowner who is not making a good faith effort to develop or implement an Erosion Control Plan and a Management Plan is subject to the above prohibitions (Option 1).

The elements of an approvable Erosion Control Plan and Site-Specific Management Plan are described below. In addition, the Garcia River Management Plan is outlined in detail. Erosion Control Plans must be submitted no later than [insert date that is 3 years after the date of OAL approval or after 6/1/99, whichever is later]. Site-Specific Management Plans can be submitted at any time. The Garcia River Management Plan must be implemented by [insert date of OAL approval or 6/1/99, whichever is later] or substituted by an approved Site-Specific Management Plan.

Elements of an Erosion Control Plan

1. Baseline Data Inventory

   A Baseline Data Inventory includes an ownership-wide inventory of Sediment Delivery Sites. Sediment Delivery Sites are controllable, human-caused erosion sites that are currently eroding or have the potential to erode in such a manner as to deliver at least 10 cubic yards of sediment to a watercourse over the life of the TMDL. They include such features as undersized culverts, culverts with diversion potential, eroding sidecast or fill, downcutting inside ditches, etc.

   The Baseline Data Inventory shall include a description of all active and potential sediment sources resulting from roads, landings, skid trails, timber operations and agricultural operations, and other significant human-caused earth movement activities that have or might have the ability to enter waters of the state.

   The Baseline Data Inventory shall include, at a minimum:

   - A description of the inventory method used;
   - A map showing the ownership boundary and the location of all inventoried sites; and,
   - For each site, an estimate of the volume of sediment and the relative potential for sediment delivery.

   The Baseline Data Inventory must be comprehensive and may follow as examples, completely or in part, the inventory methods described in the *Assessment and Implementation Techniques for Road-Related Sediment Inventories and Storm-Proofing* and contained in the draft *Sustained Yield Plan/Habitat Conservation Plan* for the Pacific Lumber Company (August 25, 1997, Appendix 20, prepared by William Weaver, of Pacific Watershed Associates, Inc.); the *STAR* Worksheet system of the *Watershed and Aquatic Habitat Assessment* (September 29, 1997, Appendix 6:1 prepared by Coastal Forestlands, Ltd.); or the *Sediment TMDL Inventory and Monitoring Worksheet* developed by U.C. Davis (1998).

2. Sediment Reduction Schedule

The Sediment Reduction Schedule shall describe how and in what order of priority the sediment discharges from the Sediment Delivery Sites identified in the Baseline Data Inventory will be reduced in accordance with the schedule set forth in Table 3 of the Implementation Schedule section. The Baseline Data Inventory described in 1. above shall be used when prioritizing and conducting sediment delivery reduction activities, and the highest priority for sediment delivery reduction shall be assigned to those sites with the greatest potential to discharge sediment to a watercourse that supports fish**.**

3. Assessment of Unstable Areas

The Assessment of Unstable Areas shall identify through modeling, data analysis and/or a field inventory, areas of instability across the property. Unstable Areas are areas with a naturally high risk of erosion and areas or sites that will not reasonably respond to efforts to prevent, restore or mitigate sediment discharges. Unstable Areas are characterized by slide areas, gullies, eroding stream banks, or unstable soils that are capable of delivering sediment to a watercourse. Slide areas include shallow and deep seated landslides, debris flows, debris slides, debris torrents, earthflows, headwall swales, inner gorges and hummocky ground. Unstable soils include unconsolidated, non-cohesive soils and colluvial debris.

The Assessment of Unstable Areas shall include, at a minimum:

- All known active and potential shallow and deep-seated landslides, debris flows, debris slides, debris torrents, earthflows, headwall swales, inner gorges, and unstable soils.
- All known active or potentially active gullies and streambank erosion sites, as appropriate, but should not include the sites identified in 1. above.

Preparers of the Assessment of Unstable Areas may but are not required to use existing California Department of Conservation maps such as the series entitled "Geology and Geomorphic Features Related to Landsliding" or a digital terrain-type model like the one developed by Louisiana Pacific Corporation in its draft *Sustained Yield Plan for Coastal Mendocino County* (1997) in combination with field-based maps of Unstable Areas.

4. Monitoring Plan

The Monitoring Plan shall describe the method for monitoring the effectiveness of the sediment control efforts the landowner has implemented for the Sediment Delivery Sites identified in the Baseline Data Inventory. The monitoring method must be consistent with the submitted Baseline Data Inventory method so that results are comparable from year to year. The results of the sediment control efforts and any other erosion control related activities, including the implementation of land management measures, shall be submitted to the Regional Water Board in an annual report, due January 30. Any changes in ownership or primary land management activities shall also be included in the annual report. In addition, individual landowners are encouraged to establish instream monitoring points above and

below any significant land management activity on their properties and in potential anadromous fish refugia. (See Monitoring section, below).

Elements of a Site-Specific Management Plan

1. Description of Land Management Measures to Control Sediment Delivery

   A Site-Specific Management Plan shall include a description of, and schedule for, the Land Management Measures the landowner proposes to implement to control the future delivery of sediment from the following land management activities:

   - Roads, landings, skid trails, watercourse crossing construction, reconstruction, maintenance, use, and obliteration;
   - Operations on unstable slopes;
   - Use of skid trails and landings;
   - Use of near stream facilities, including agricultural activities; and
   - Gravel mining.

   In addition, the description must include:

   - A Long-term Road System Plan (Road Plan) similar to that described below in the Garcia River Management Plan, and
   - Supporting information that demonstrates that the proposed Land Management Measures will provide a level of water quality protection that is roughly equivalent to that expected from the corresponding measures of the Garcia River Management Plan.

2. Description of Land Management Measures to Improve the Condition of the Riparian Management Zone

   The Site-Specific Management Plan shall include a description of, and schedule for, the Land Management Measures and any restoration activities the landowner proposes to improve or maintain the condition of the Riparian Management Zone such that it provides:

   - Stream bank protection,
   - Filtering of eroded material prior to its entering the watercourse channel, and
   - Recruitment of large woody debris to the watercourse channel and flood plain.

   In addition, the description shall include supporting information that demonstrates that the proposed Land Management Measures will provide a level of water quality protection that is roughly equivalent to that expected from the corresponding riparian measures of the Garcia River Management Plan.

Relation of Other Planning Efforts to Erosion Control Plans and Management Plans

The Regional Water Board does not intend for landowners to engage in duplicative or overly complex planning efforts if they are already involved in planning efforts that will satisfy the requirements of

this Basin Plan Amendment. For example, the Regional Water Board will consider all of the following to be approvable as an Erosion Control Plan and Management Plan, as long as three conditions are met. First, the document(s) must include, or be modified to include, the elements described above. Second, the document(s) must demonstrate water quality protection and restoration for the area of ownership that is roughly equivalent to the Garcia River Management Plan. Third, the document(s) must provide an assurance that the Implementation Schedule will be met.

- Non-Industrial Timber Management Plans
- Sustained Yield Plans
- Habitat Conservation Plans
- Letters of Intent followed by Ranch Plans as described in the *California Rangeland Water Quality Management Plan* (July 1995)
- Timber Harvest Plans that cover entire ownerships

The Garcia River Management Plan

The term "roads" as used in the Garcia River Management Plan include private roads, public roads, rural residential roads, skid trails, and landings. The term "near stream facility" includes any building, equipment, corral, pen, pasture, field, trail, livestock crossing or other feature or structure which is associated with commercial land use operations and is close enough to any watercourse to have the potential to cause the discharge of sediment to the watercourse. The term "feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technical factors.

<u>Land Management Measures That Apply To Roads, Watercourse Crossings, and Near Stream Facilities Throughout the Garcia River Watershed</u>

1. By [insert date that is 3 years after the date of OAL approval or after 6/1/99, whichever is later], a Long-term Road System Plan (Road Plan) shall be developed and submitted which describes the long-term road system, and identifies all roads and watercourse crossings. The road system described in the Road Plan shall be designed and constructed to provide surfacing, drainage, and watercourse crossings to match the intended road use and maintenance abilities. Roads (including road prism and watercourse crossing drainage structures) that are constructed or reconstructed after [insert date of OAL adoption or 6/1/99, whichever is later] shall comply with the standards below. Existing usable roads will be scheduled for upgrading as necessary as Sediment Delivery Sites under the Erosion Control Plan. Roads that are not needed as part of the long-term road system and that discharge or threaten to discharge earthen material to waters of the state shall be scheduled as necessary for abandonment or obliteration as Sediment Delivery Sites under the Erosion Control Plan. The road plan shall include, at a minimum:
    - The location of all roads and watercourse crossings within the ownership,
    - The current status of each road, including road surface material, road and watercourse design, and use restrictions, and
    - The future plan and schedule for each road.

A. Roads used year round shall be designed, constructed, reconstructed or upgraded to permanent road status with the application of an adequate layer of competent rock for surface material and the installation of permanent watercourse crossings and road prism drainage structures. These roads shall receive regular and storm period inspection and maintenance.

B. Roads used primarily during the dry season but to a limited extent during wet weather shall be designed, constructed, reconstructed or upgraded to seasonal road status with the application of spot rocking where needed to provide a stable running surface during the period of use. These roads shall be designed, constructed, reconstructed, and upgraded to provide permanent watercourse crossings and road surface drainage structures. These roads shall receive inspection at least once during the wet weather period and shall receive at least annual maintenance.

C. Roads that are not used or maintained during wet weather shall be constructed or reconstructed to a temporary road status. Spot rocking of the road surface shall be used, where needed, to provide a stable running surface during the period of use. Road surface drainage structures shall be designed and constructed to prevent erosion so that regular and storm period maintenance is not needed to prevent sediment discharge to watercourses. All roads that will not receive at least annual maintenance shall have watercourse crossings, except rock fords, removed prior to October 15 of each year of installation.

2. All watercourse road crossings shall, at a minimum, utilize the standards described on pages 64 - 79 of the *Handbook for Forest and Ranch Roads* (prepared by Weaver and Hagans, 1994). These standards include but are not limited to the design and installation of permanent crossings using a culvert with a minimum diameter designed to pass at least a 50-year flood frequency event. Larger diameter culverts shall be used if debris that might result in blockage of the culvert inlet is present in the channel. All crossings shall be designed and installed to prevent the diversion of stream flow down or through the road prism in the event of culvert failure, and to provide free passage to fish at all flow regimes. All watercourse road crossings that do not meet these minimum standards as of [insert date of OAL approval or 6/1/99, whichever is later] must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan. All watercourse road crossings installed after [insert date of OAL approval or 6/1/99, whichever is later] must be installed according to these minimum standards.

3. All road design, construction, and reconstruction shall use, at a minimum, the standards described on pages 39 - 54 and 81 - 120 of the *Handbook for Forest and Ranch Roads* (prepared by Weaver and Hagans, 1994). These standards include but are not limited to the outsloping of the road prism (whenever feasible and safe) and the installation of rolling dips (rather than water bars) for additional road drainage. If insloped roads are necessary, ditch relief culverts shall be installed, at a minimum, at the distances described in Table 20 of the *Handbook for Forest and Ranch Roads*, and located to prevent discharge of road drainage directly onto erodible soils. All roads that do not meet the minimum standards as of [insert date of OAL approval or 6/1/99, whichever is later] must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan. All roads constructed or

reconstructed after [insert date of OAL approval or 6/1/99, whichever is later] must be constructed or reconstructed to these minimum standards.

4. Straw bale check dams or silt fences shall be installed at the outlet of all road drainage structures prior to use of the road for all roads used after [insert date of OAL approval or 6/1/99, whichever is later] if less than one hundred feet of 90 percent vegetative buffer exists between the outlet and a watercourse. Road drainage structures with less than one hundred feet of 90 percent vegetative buffer that are associated with roads not in use after [insert date of OAL approval or 6/1/99, whichever is later] must be scheduled as necessary for upgrade as Sediment Delivery Sites.

5. After [insert date of OAL approval or 6/1/99, whichever is later], there shall be no construction, reconstruction, or use of roads within the channel of any watercourse. This measure does not apply to watercourse crossings.

6. After [insert date of OAL approval or 6/1/99, whichever is later], there shall be no construction, reconstruction, or use of skid trails on slopes greater than 40 percent within 200 feet of a watercourse, as measured from the channel or bankfull stage, whichever is wider.

7. After [insert date of OAL approval or 6/1/99, whichever is later], there shall be no use of roads or near stream facilities, when the activity contributes to the discharge of visibly turbid water from the road or near stream facility surface or is flowing in an inside ditch in amounts that cause a visible increase in the turbidity of a watercourse. As an exception, short-term, temporary use of near stream facilities may occur if there is no feasible alternative.

8. After [insert date of OAL approval or 6/1/99, whichever is later], the use of heavy equipment (defined as 1.5 tons) between October 15 and May 1 shall be limited to roads that have permanent drainage and are surfaced with an adequate layer of rock to maintain a stable road surface throughout the period of use. A stable road surface is defined as a surface that does not allow the concentration of road runoff to the extent that depressions or rills that are capable of channeling water are formed on the road surface. On near stream facilities, use of heavy equipment in this time period shall be limited to facilities with drainage collection and storage capabilities and/or facilities with a stable soil surface throughout the period of use. As an exception, short-term, temporary use of heavy equipment on near stream facilities may occur if there is no feasible alternative.

9. After [insert date of OAL approval or 6/1/99, whichever is later], all roads and other near stream facilities that are actively used shall have drainage and/or drainage collection and storage facilities installed before the start of any rain that causes overland flow across or along the disturbed surface and could result in the delivery of sediment to a watercourse. Roads and near stream facilities that are no longer actively used and have the potential to discharge sediment to a water of the state shall be addressed as necessary as Sediment Delivery Sites.

10. After [insert date of OAL approval or 6/1/99, whichever is later], there shall be no road construction, reconstruction, or upgrading from October 15 to May 1, except for emergency road maintenance.

11. After [insert date of OAL approval or 6/1/99, whichever is later], all new crossings installed as temporary watercourse crossings and designed to carry less water and debris than predicted for a 50 year flood discharge shall be removed and stabilized by October 15 of each year of installation. For all watercourses, the approaches to all temporary watercourses crossings shall be pulled back to create side slopes of less than 50 percent, and stabilized with rock, grass seed, mulch, or slash from the lowest (closest) drainage structure to the watercourse transition line. Existing temporary watercourse crossings not removed and stabilized by [insert date of OAL approval or 6/1/99, whichever is later] shall be addressed as necessary as Sediment Delivery Sites.

12. After [insert date of OAL approval or 6/1/99, whichever is later], off-channel water drafting and livestock watering locations shall be developed to the extent feasible.

Land Management Measures That Apply in Unstable Areas-- effective date [insert date of OAL approval or 6/1/99, whichever is later]

13. No road construction shall occur across unstable areas without the field review and development of site specific mitigation measures by a Certified Engineering Geologist registered in the State of California. A report prepared by the Certified Engineering Geologist shall be submitted to the Regional Water Board before construction/ reconstruction activities begin.

14. No more than 50 percent of the existing basal area formed by tree species shall be removed from unstable areas that have the potential to deliver sediment into a watercourse.

15. No concentrated flow shall be directed across the head, toe, or lateral margin of any unstable area.

16. Agricultural activities on unstable slopes that have the potential to deliver sediment to a water of the state shall be minimized to the extent practical.

Land Management Measures That Apply in the Riparian Management Zone

A Riparian Management Zone width shall be assigned to each watercourse based on the class of the watercourse. For Class I and II watercourses, the Riparian Management Zone is a 100-foot strip of land on each side of, and adjacent to, the watercourse. For Class III watercourses, the Riparian Management Zone is a 50-foot strip of land on each side of, and adjacent to, the watercourse. The Riparian Management Zone shall be measured from the active channel or bankfull stage, whichever is wider.

17. All roads within the Riparian Management Zone used after [insert date of OAL approval or 6/1/99, whichever is later] shall be surfaced with competent rock to a sufficient depth prior to use of the road to prevent road fines from discharging into watercourses.

18. After [insert date of OAL approval or 6/1/99, whichever is later], any new soil exposure within the Riparian Management Zone caused by land management activities shall be stabilized with the application of grass seed, mulch, slash or rock before October

15 of the year of disturbance. Stabilization measures shall achieve at least 90 percent coverage of all soil within the Riparian Management Zone exposed by land management activities. Existing exposed soil caused by land management activities that is not stabilized prior to [insert date of OAL approval or 6/1/99, whichever is later] shall be addressed as Sediment Delivery Sites.

19. After [insert date of OAL approval or 6/1/99, whichever is later], to promote stream bank stability, each landowner shall ensure that there are no commercial land management activities, including commercial or salvage timber harvest, grazing or crop agriculture, within the first 25 feet of the Riparian Management Zone for Class I or II watercourses. This measure does not apply to watercourse crossings. Commercial land management activities existing prior to [insert date of OAL approval or 6/1/99, whichever is later] must be phased out by [insert date that is 5 years after the date of OAL approval or after 6/1/99, whichever is later].

20. After [insert date of OAL approval or 6/1/99, whichever is later], in order to maintain present levels and promote future instream large woody debris, each landowner shall restrict commercial land use activities within the Riparian Management Zone to ensure that:

    A. There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard.

    B. On Class I and II watercourses, at least five standing conifer trees greater than 32 inches in diameter at breast height (DBH) are permanently retained at any given time per 100 linear feet of watercourse. Where sites lack enough trees to meet this goal, there shall be no commercial harvest of the five largest diameter trees per 100 linear feet of watercourse.

    C. There is no removal of trees from unstable areas within a Riparian Management Zone that have the potential to deliver sediment to a water of the State unless the tree is causing a safety hazard.

<u>Land Management Measures that Apply to Gravel Mining in the Garcia River Watershed--effective date [insert date of OAL approval or 6/1/99, whichever is later]</u>

21. In-channel gravel mining shall follow the following recommendations from the *Garcia River Gravel Management Plan,* prepared for the Mendocino County Water Agency, August 1996.

22. Floodplain (Off-Channel) gravel mining shall follow the following recommendations from the *Garcia River Gravel Management Plan,* prepared for the Mendocino County Water Agency, August 1996.

Extracted from the
Garcia River Gravel Management Plan*
Mendocino County, adopted 12/9/96

7.1.1 In-channel Mining Recommendations

Establish an Absolute Elevation below Which No Extraction May Occur

The absolute elevation below which no mining could occur would be surveyed on a site specific basis. A "redline" elevation tied to NGVD or NAVD should be established below which mining may not take place, in order to avoid impacts to structures such as bridges and to avoid vegetation impacts associated with downcutting due to excess removal of sediment. A redline elevation should be 2 feet above the low flow water surface elevation (at the edge of the bar closest to the low flow channel) during the first year following adoption of the gravel management plan (assuming that this will occur in 1996) [note: The Mendocino County adopted the Gravel Management Plan on December 9, 1996]. A 2-foot minimum elevation as a buffer with a 2% grade toward the bank is consistent with that required by the National Marine Fisheries Service (NMFS).

Limit In-channel Extraction Methods To "Bar Skimming" or an Alternative Method Recommended by the Mendocino County Data Evaluation Team

If mining is limited to the downstream end of the bar as described above with a riparian buffer on both the channel and hillslope (or floodplain) side, bar skimming would minimize impacts. Other methods such as excavation of trenches or pools in the low flow channel lower the local base level, and maximize upstream (headcutting and incision) and downstream (widening and braiding) impacts. In addition, direct disturbance of the substrate in the low flow channel should be avoided. Trenching on bars (described in the Eel River EIR; EIP, 1992) may be beneficial in the future for the Garcia if it becomes severely aggraded, flat, shallow, and braided and has few invertebrates. The Department of Fish and Game should be consulted in order to determine if the Garcia River meets these conditions in the future. In the future, the Mendocino County Data Evaluation Team should have flexibility to decide on the most appropriate method to enhance habitat on a site specific basis.

- ~~excavated pools are a short-term morphologic feature that will fill in during subsequent floods (as did the trenching adjacent to the Buckridge Bar in 1990). Thus, in order to create a permanent pool, long-term maintenance would be required. Natural pools in the Garcia River are maintained without excavation in association with large woody debris or as a result of geomorphic processes that create pools spaced approximately 5-7 channel widths apart in alluvial channels. However, artificially constructed pools not associated with these hydraulic factors would not be permanent features;~~
- an excavated pool (or larger in-stream pit) acts as a local base level, and can cause upstream and downstream incision as the channel re-establishes its gradient. Incision is a negative effect of trenching that may result in increased bank erosion and loss of

habitat;

- in-channel excavation of pools would take place in summer after June 15 – after the need for spawning habitat has passed. Subsequent winter flows may re-fill the pool before it can be used by fish in the following season.

Grade Slope of Excavated Bar to Prevent Fish Entrapment

Excavation on bars by gravel skimming would have a 2% slope toward the bank. After extraction, gravel bars must be left void of isolated pockets or holes.

Extract Gravel from the Downstream Portion of the Bar

Retaining the upstream one to two thirds of the bar and riparian vegetation while excavating from the downstream third of the bar is accepted as a method to promote channel stability and protect the narrow width of the low flow channel necessary for fish. Gravel would be redeposited in the excavated downstream one to two thirds of the bar (or downstream of the widest point of the bar) where an eddy would form during sediment transporting flows. In contrast, if excavation occurs on the entire bar after removing existing riparian vegetation, there is a greater potential for widening and braiding of the low flow channel.

Concentrate Activities to Minimize Disturbance

In-channel extraction activities should be concentrated or localized to a few bars rather than spread out over many bars. This localization of extraction will minimize the area of disturbance of upstream and downstream effects. Skimming decreases habitat and species diversity—these effects should not be expanded over a large portion of the study area.

Maintain Flood Capacity

Flood capacity in the Garcia River should be maintained in areas where there are significant flood hazards to existing structures or infrastructure.

Minimize Activities That Release Fine Sediment to the River

No washing, crushing, screening, stockpiling, or plant operations should occur at or below the streams "average high water elevation," or the dominant discharge (Macedo, 1995). In the Garcia River the elevation of the dominant discharge is near the top of bank. These and similar activities have the potential to release fine sediments into the stream, providing habitat conditions deleterious to salmonids. The Regional Water Quality Control Board (RWQCB) regulates fine sediment releases to the river from gravel processing through its waste discharge requirements. Gravel mining and processing applicants should notify the RWQCB if waste discharge requirements are applicable to their operation.

Avoid Dry Road Crossings

Dry road crossings disrupt the substrate and can result in direct mortality or increased predation opportunity on fry. The crossing of choice and the one utilized in recent years in the lower Garcia is the free-span seasonal bridge. This type of crossing protects the upstream habitat as well as improving river conditions for recreation**. If dry crossings are unavoidable, they should not be placed in the channel prior to June 15, and should be removed by October 15 so that they do not interfere with incubating or migrating salmonids. The number of crossings should be kept to a minimum. Placement of crossings should also take into account the damage which might occur to riparian vegetation. Roads should lead directly to the crossings and not long distances through the riparian corridor. Placement of any road crossing should be done with the approval of the Data Evaluation Team. Any structure placed across a river or recreationally navigable stream should be designed and installed so as to provide sufficient overhead clearance to allow unobstructed and safe passage for small recreational craft.

Limit In-channel Operations to the Period Between June 15 and October 15

Gravel extraction for outside this window may interfere with salmonid incubation and migration. The hatching period for late steelhead spawners may extend for 40-50 days. Therefore, the June 15 start date is necessary to protect eggs laid from late April to May. Spawning salmonids have been observed in the Garcia River system as late as June 2.

Avoid Expansion of Instream Mining Activities Upstream of River Mile 3.7

The reach of channel upstream of River Mile 3.7 is important to steelhead spawning. Gravel mining increases the probability of additional fine sediments in spawning gravels. In order to maintain suitable spawning gravels of riffles in this reach, it is strongly recommended that gravel mining within this reach be restricted to the site of present operations.

7.1.2 Floodplain (Off-Channel) Extraction Recommendations

Floodplain Gravel Extraction Should Be Set Back from the Main Channel

In a dynamic alluvial system, it is not uncommon for meanders to migrate across a floodplain. In areas where gravel extraction occurs on floodplains or terraces, there is a potential for the river channel to migrate toward the pit. If the river erodes through the area left between the excavated pit and the river, there is a potential for "river capture," a situation where the low flow channel is diverted through the pit. In the Garcia River, a setback of at least 400 feet is recommended to minimize the potential for river capture. In order to avoid river capture, excavation pits should set back from the river to provide a buffer and should be designed to withstand the 100-year flood. Adequate buffer widths and reduced pit slope** gradients are preferred over engineered structures which require maintenance in perpetuity. Hydraulic, geomorphic, and geotechnical studies should be conducted prior to design and construction of the pit and levee.

In addition to river capture, extraction pits create the possibility of stranding fish. To avoid this

impact, CDFG requires that all off-channel mining be conducted above the 25-year floodplain.

The Maximum Depth of Floodplain Gravel Extraction Should Remain above the Channel Thalweg

Floodplain gravel pits should not be excavated below the elevation of the thalweg in the adjacent channel. This will minimize the impacts of potential river capture by limiting the potential for headcutting and the potential of the pit to trap sediment. A shallow excavation (above the water table) would provide a depression that would fill with water part of the year, and develop seasonal wetland habitat. An excavation below the water table would provide deep water habitat.

Side Slopes of Floodplain Excavation Should Range from 3:1 to 10:1

Side slopes of a floodplain pit should be graded to a slope that ranges from 3:1 to10:1. This will allow for a range of vegetation from wetland to upland. Steep side slopes excavated in floodplain pits on other systems have not been successfully reclaimed, since it is difficult for vegetation to become established. Terrace pits should be designed with a large percentage of edge habitat with a low gradient which will naturally sustain vegetation at a variety of water levels. Pit margins should be reclaimed with riparian buffer zones of fifty feet surrounding them. Islands should be incorporated into the reclaimed pits as waterfowl refugia. Pits should be designed with input from the Mosquito Abatement District.

Place Stockpiled Topsoil above the 25-year Floodplain

Stockpiled topsoil can introduce a large supply of fines to the river during a flood event and degrade salmonid habitat. The CDFG considers storage above the 25-year flood inundation level sufficient to minimize this risk.

Floodplain Pits Should Be Restored to Wetland Habitat or Reclaimed for Agriculture

There are very few examples of successfully restored or reclaimed gravel extraction pits on other river systems with gravel extraction. The key to over coming barriers to successful restoration or reclamation is to conserve or import adequate material to re-fill the pit, while ensuring that pit margins are graded to allow for development of significant wetland and emergent vegetation.

* Internal citations omited

** Changed from 'reaction' and 'slop', respectively, to correct typographical errors per telephone conversation with Dennis Slota, Director, Mendocino County Water Agency, August 3, 2000.

Review of Individual Land Management Projects

Proposed land management projects that require Regional Water Board review for possible issuance of waste discharge requirements pursuant to Section 13260 of the California Porter-Cologne Water Quality Control Act, Clean Water Act Section 404 permits, and/or Clean Water Act Section 401 certification shall comply with this Action Plan, including TMDL, Implementation Plan and Monitoring Plan, as appropriate.

Restoration Projects

Landowners, agencies, and interested groups are encouraged to continue their interest, participation, and cooperation with restoration activities in the Garcia River watershed. Restoration is a tool useful for both stabilizing eroding stream banks throughout the watershed and improving instream habitat conditions. To ensure that stream restoration projects are planned and implemented in a manner that allows compliance with the provisions of the Action Plan, each landowner conducting restoration projects on his/her ownership shall notify the Regional Water Board in writing of any stream restoration activity, its location, the time frame of the project, and a summary of the work proposed. Landowners may propose to conduct restoration work in lieu of controlling a Sediment Delivery Site. The Executive Officer may consider allowing such a substitute in those cases where a greater environmental benefit would result.

Implementation Schedule

This Action Plan, including TMDL, Implementation Plan, and Monitoring Plan will take effect on [insert either date of OAL approval or 6/1/99, whichever is later] in order to give landowners in the watershed the opportunity to implement voluntary actions.

Regional Water Board staff will send a letter to each landowner in the Garcia River watershed requesting a Statement of Intent regarding this Action Plan. The Regional Water Board letter will describe the options available to the landowner, which are as follows:

Option 1 Comply with the waste discharge prohibitions that apply to the Garcia River watershed.

Option 2 Comply with an approved Erosion Control Plan and a Site-Specific Management Plan

Option 3 Comply with an approved Erosion Control Plan and the Garcia River Management Plan.

Landowners must comply with this Action Plan, including TMDL, Implementation Plan and Monitoring Plan through one of these three options or face potential permitting and/or enforcement action in the event of discharges of sediment. Landowners who do not submit a Statement of Intent are subject to the waste discharge prohibitions (Option 1).

Regional Water Board staff will review and respond to each Statement of Intent. The Board will then prioritize efforts in the Garcia River watershed, based on its general estimates of relative threat to water quality. Highest priority will be assigned on an ownership by ownership basis to

those sites identified as having the highest existing discharge or potential discharge of sediment to a watercourse that supports fisheries.

Landowners who intend to follow either Option 2 or Option 3 are encouraged to do so as soon as possible and to submit their plans to the Regional Water Board. Regional Water Board staff will acknowledge receipt of each plan submitted and will review each plan for completeness. The Executive Officer will approve the plans if the review indicates that the plans meet the requirements specified above and complies with the schedule contained in Table 3, below. The Executive Officer will notify the landowner of his/her approval in a letter. Prior to approving an Erosion Control Plan or Site-Specific Management Plan, the Executive Officer will provide notice and an opportunity to comment to those who have requested it. At the Executive Officer's discretion, a Regional Board workshop may be scheduled to receive comments. Time extensions and minor revisions to approved Erosion Control Plans and Site-Specific Management Plans may be approved by the Executive Officer without notice.

Table 3, Schedule for Reducing Sediment Delivery from Land Management Activities in the Garcia River Watershed

Source and Land Use	**Final Compliance Date**	**Activity and Interim Schedule[8]**
Roads, landings, skid trails, timber harvest operations, agricultural operations, gravel mining, and other significant human-caused earth movement	[insert date that is 3 years after the date of OAL approval or after 6/1/99, whichever is later] and every 10 years thereafter, as necessary if new Sediment Delivery Sites are identified	Prepare an ownership-wide Baseline Data Inventory of controllable Sediment Delivery Sites and a Sediment Reduction Schedule for the reduction of sediment from the inventoried sites. No interim schedule.
Unstable Areas	[insert date that is 3 years after the date of OAL approval or after 6/1/99, whichever is later] and every 10 years thereafter, as necessary if new Unstable Areas are identified	Prepare an ownership-wide Assessment of Unstable Areas. No interim schedule.
Sediment Delivery Sites associated with Roads	[insert date that is 13 years after the date of OAL approval or after 6/1/99, whichever is later]	Following the completion of the Baseline Data Inventory, control, in order of priority, all controllable Sediment Delivery Sites identified in the Baseline Data Inventory in such a manner as to reduce the sediment from sites representing 10 percent of the overall volume of inventoried sediment every year, or until 100 percent of the sites are controlled, whichever occurs first. Control measures are predicted to be 90 percent effective at reducing sediment delivery.
Sediment Delivery Sites associated with Timber Harvest Operations, including skid trails and landings	[insert date that is 13 years of OAL approval or 6/1/99, whichever is later]	Following the completion of the Baseline Data Inventory, control, in order of priority, all controllable Sediment Delivery Sites identified in the Baseline Data Inventory in such a manner as to reduce the sediment from sites representing 10 percent of the overall volume of inventoried sediment every year, or until 100 percent of the sites are controlled, whichever occurs first. Control measures are predicted to be 90 percent effective at reducing sediment delivery.

Sediment Delivery Sites associated with agricultural operations in the Riparian Management Zone	[insert date that is 23 years after the date of OAL approval or after 6/1/99, whichever is later]	Following the completion of the Baseline Data Inventory, control, in order of priority, all controllable Sediment Delivery Sites in the Riparian Management Zone in such a manner as to reduce the sediment from sites representing 20 percent of the overall volume of inventoried sediment every four years, or until 100 percent of the sites have been controlled, whichever occurs first. Control measures in the Riparian Management Zone are predicted to be 90 percent effective at reducing sediment delivery.
Sediment Delivery Sites associated with agricultural operations on the hillslopes	[insert date that is 23 years after the date of OAL approval or after 6/1/99, whichever is later]	Following the completion of the Baseline Data Inventory, control, in order of priority, all controllable Sediment Delivery Sites on hillslopes in such a manner as to reduce the overall volume of inventoried sediment by 20 percent every four years, or until a 100 percent of the sites have been controlled, whichever occurs first. Control measures on the hillslopes are predicted to be 50 percent effective at reducing sediment delivery.
Activities on Unstable Areas and in Riparian Management Zones, and activities related to roads, watercourse crossings, near stream facilities, and gravel mining	See the Garcia River Management Plan or the approved Site-Specific Management Plan	Implement Land Management Measures contained in an approved Site-Specific Management Plan or the Garcia River Management Plan in accordance with the schedule contained therein.
Annual Report	[insert 1/30 date that is second January after either OAL approval or 6/1/99, whichever is later] and each January 30th thereafter	Report to the Regional Water Board all erosion control-related activities and sedimentation reduction results of the previous year.

[8] Compliance with the interim schedules for the control of Sediment Delivery Sites will be calculated by dividing the volume of sediment controlled during each one year or four year period by the overall volume of inventoried sediment associated with that category of source or land use.

VII. Monitoring Plan

Monitoring is intended to provide information regarding the effectiveness of sediment control efforts in attaining the Numeric Targets over time. Instream and hillslope monitoring parameters, monitoring protocols, and frequency of monitoring are described in Table 4. Instream and hillslope monitoring by landowners (except for the Sediment Delivery Site monitoring described in the Erosion Control Plan, above) is on a voluntary basis. Regional Water Board staff will coordinate instream monitoring efforts of the landowners, other regulatory agencies, academic institutions, and members of the public and shall set a goal of establishing at least one instream monitoring point in each of the twelve Planning watersheds in the Garcia River watershed. In addition, Regional Water Board staff will work together with the University of California Cooperative Extension to assist landowners in developing voluntary monitoring plans.

Landowners choosing Option 2 or Option 3 should assess the landscape associated with their property to determine which of the listed instream and hillslope monitoring parameters are most appropriately measured and are encouraged to submit their plans for voluntary monitoring to the Regional Water Board for comment prior to implementing them. Landowners are strongly encouraged to conduct voluntary instream and hillslope monitoring as a means of improving the scientific understanding of the Garcia River watershed and to provide a site specific basis for revising the Action Plan over time. Landowners are particularly encouraged to establish instream monitoring points above and below any significant land management activity on their properties and in potential anadromous fish refugia.

Landowners are required to submit by January 30 of each year an annual report describing the erosion control-related activities of the previous year and the sediment delivery reduction results of those activities, including source reduction volumes. In addition, landowners are encouraged to disclose in the annual reports the results of any voluntary instream and hillslope monitoring. At least annually, Regional Water Board staff will compile and evaluate the results of the annual reports provided by landowners for review by the Regional Water Board to assess the progress of the Action Plan. In the event that sufficient information to assess the progress of the Action Plan is not gained through the voluntary monitoring efforts of landowners and others as augmented by the Regional Water Board, revisions to the monitoring provisions of the Action Plan, through a Basin Plan amendment, will be contemplated.

VIII. Estimated Total Cost and Potential Sources of Funding

An estimated cost to implement the sedimentation reduction efforts described in the Action Plan is $5 million plus unquantified costs which include inventory costs and the opportunity cost of the volume of unharvested timber, up to an additional $2 million. Potential training and financing resources available to landowners include but are not limited to the Wildlife Habitat Incentive Program (WHIP), the Environmental Quality Incentives Program (EQUIP), the Conservation Reserve Program (CRP), the Salmon and Steelhead Restoration Program (SSRP), the Forestry Incentive Program (FIP), the Salmon and Steelhead Restoration Account (SSRA), and Clean Water Act Section 205(j) and Section 319(h) funding.

IX. Plan for Future Review of the Strategy

Public participation was a key element in the development of the Strategy and will continue to be an essential component in its implementation. Interested persons will have the opportunity to comment on the progress of the Action Plan at watershed meetings, and to the Regional Water Board at least once every 3 years, at which time the Regional Water Board shall determine if there is sufficient progress toward implementation of erosion control and management activities, as well as movement towards attainment of the Numeric Targets described in the Action Plan. If sufficient progress as described above is not documented, the
Regional Water Board will consider revising the Action Plan through a Basin Plan amendment. If the Regional Water Board concludes that the Numeric Targets are being attained throughout a Planning watershed, it may consider suspending or terminating some or all of the Action Plan for landowners within that Planning watershed.

~~**Figure 38**~~**Table 4:** Summary of Monitoring Parameters and Protocols

Parameter	**Protocol**	**Brief Description** (Protocol should be consulted for detailed methodology)	**Frequency**
INSTREAM MONITORING			
Sediment-related barriers	Any defensible method	Stream survey; identification of sediment deltas, underground stream sections, shotgun culverts, reaches with water depths less than 0.18 meters, etc.; measurement or estimate of extent of barrier and mapping of location.	Annual
Embeddedness	Flosi and Reynolds (1994), Burns (1984)	Identify at least 5 riffle habitat units in Class I streams. Randomly select at least 50 cobbles from each habitat unit and measure or estimate the percent of each cobble which is covered or surrounded by fines. This will be obvious from a dark ring around the cobble indicating its exposure to stream flow. Rate each cobble 1, 2, 3, or 4 as follows: score of 1=cobbles 0-25% surrounded or covered by fines; 2=26-50%; 3=51-75%; 4=76-100%.	Annual
% fines, gravel composition	McNeil protocol, Valentine (1995)	Identify at least 5 riffle habitat units in Class I streams. Collect at least 2 bulk core samples of sediment in each habitat unit in the first at the pool/riffle break immediately downstream of pool crests. Measure the of volume of sediment associated with each size class in the field. Bag at least 5 samples to be weighed in the laboratory to establish a correlation between weight and volume.	Annual
Pool characteristics	Flosi and Reynolds (1994)	Identify at least 10 pool habitat units within a reach that is 20-30 bankfull widths long in Class I streams. Measure habitat unit length, characterize habitat types in each unit, and measure mean width of low flow channel. Measure maximum length, width and depth of all pools in each unit. Measure depth of each pool tail crest.	Annual
Frequency of primary pools	Flosi and Reynolds (1994)	Within each reach (as described above), identify the maximum length of all pools which are >3 feet deep, > in width thaen 1/2 width of low flow channel, and > in length thaen width of low flow channel.	Annual
V*	Lisle and Hilton (1992), Knopp (1993)	Identify at least 10 survey units within a reach of 20-30 bankfull widths in length in 3rd order streams with slopes 1-4%. Measure the residual volume of each pool within the unit with a graduated rod along transects, as described by Lisle and Hilton.	Annual
D50	Wolman (1954), Knopp (1993), Rosgen (1996)	Identify at least 5 survey units within a reach of at least 20-30 bankfull channel widths long in 3rd order streams with slopes 1-4%. Lay out transects, as described by Rosgen, and collect at least 100 particles in each reach. Measure the particle, as described, and tally for later graphing.	Annual
Volume of large woody debris	Shuett-Hames (1994) for Timber, Fish and Wildlife Watershed Assessment Manual (Level 2 analysis)	Identify at least 10 survey units of at least 500 feet long within Class I, II and III streams. Identify and measure all pieces of large woody debris, including logs at least 4 inches in diameter and 72 inches long, and root wads. Note the location of the LWD in the channel, the channel length, wood type, stabilizing factors, pool formation function and orientation and decay class.	At least once every three years

Parameter	**Protocol**	**Brief Description** (Protocol should be consulted for detailed methodology)	**Frequency**
Cross-section	Rosgen (1996)	Identify at least 1 survey unit within a reach of 20-30 bankfull widths long in each Class I and II streams. Establish at least 3 transects across the bankfull channel in each survey unit and collect evenly spaced measurements of the depth to channel along each transect. The transect should be marked for return at subsequent samplings.	At least once every three years
Thalweg profile	Trush (1997), Dunne and Leopold (1976)	Identify at least 1 survey unit within a reach of at least 20-30 bankfull widths long in each Class I and II streams. Survey units must be no less than 30 times the bankfull channel width with 3-4 meanders within the survey unit.	At least once every three years
Miles of open stream channel	Grant (1988)	Modified RAPID analysis measuring linear distance of open stream channels from aerial photographs.	At least once every ten years
Flow and/or stage height	Gordon, et. al. (1992)	Measurements or estimates determined during instream sampling. Continuous measurements are desirable but require sophisticated equipment that is vulnerable to damage. Point measurements of stage height during storm event and routinely through the year are more manageable.	Ongoing
Rainfall		Daily measurement using a gage with a sensitivity of 0.1 inch.	Ongoing
HILLSLOPE MONITORING			
Landslides, fluvial, and surface erosion associated with roads, landings and skid trails	Pacific Watershed Associates or similar method	Road inventory; identification of existing and potential sediment delivery sites; measurement or estimation of volume of sediment associated with each site.	Annual
Landslides associated with harvest units	Timber, Fish and Wildlife (Washington State)	Aerial photographs; identification of landslide features associated with timber harvest units; measurement of the area of the landslide feature; estimate of the volume of sediment delivered to the stream from each feature.	Annual
Landslides, fluvial, and surface erosion associated with agricultural activities	Any defensible method	Property survey; identification of existing and potential erosion problems; measurement or estimation of volume of sediment associated with each site or situation.	Annual
Stream crossing failures	Pacific Watershed Associates or similar method	Road survey after storms with a 20 year recurrence interval or greater; identify location of failed or partially failed crossings; measurement or estimation of volume of sediment associated with failure.	Once in summer of years having storms with a 20 year recurrence interval, or greater
Density of unpaved roads	Any defensible method	GIS and/or THP data review; cumulative tally of miles of road per tributary or Planning Watershed, the average width of the road system, and the density of unpaved roads.	At least once every ten years