CHAPTER 13. ECONOMIC ANALYSIS

Key Points

- The proposed Shasta River TMDL Action Plan will provide significant economical benefits at a reasonable cost.

- Economic benefits relate to:
  - Improving fishing, including commercial, subsistence, and cultural fishing;
  - Improving recreation;
  - Establishing properly functioning ecosystems;
  - Improving fish and wildlife habitat;
  - Improving land values; and
  - Improving water conveyance and storage facilities.

- Costs may be related to the following implementation measures:
  - Temperature and vegetation implementation actions;
  - Tailwater return flow control;
  - Water use implementation actions;
  - Agricultural implementation actions, such as those for grazing; and
  - Dwinnell Dam and Lake Shastina pollutant control study(ies).

- This economic analysis is limited in scope to new requirements imposed by this proposal. Landowners and dischargers are already bound by various existing regulatory requirements that involve water quality and natural resource protection, and the economic impacts associated with existing obligations are not included in this analysis.

- The costs and benefits will not be uniformly distributed throughout the watershed, or even across properties with similar land uses.

- Potential sources of financing for implementation measures include private financing as well as public monies available through grants and other public funding programs.

- Regional Water Board staff conclude the estimated costs of the proposed Shasta River TMDL Action Plan are reasonable considering economic benefits and legal obligations to protect water quality and beneficial uses.

This chapter includes an analysis of the potential economic benefits and costs that may result from the adoption and implementation of the proposed Shasta River TMDL Action Plan. Benefits relate to both economic and non-economic values that will be improved by recovery of the watershed, high water quality, and supported beneficial uses. The

costs relate primarily to implementation of preventative and remediation measures necessary to achieve the TMDLs.

Regional Water Board staff conclude that the estimated costs of the proposed Shasta River TMDL Action Plan are justified, not only because of the economic benefits that would be achieved, but also because of the legal obligations under which the Regional Water Board must act to protect water quality, beneficial uses, and the general public interest in fulfilling these obligations.

13.1 Legal Framework

In amending the Basin Plan, the Regional Water Board must analyze the reasonably foreseeable methods of compliance with proposed performance standards and treatment requirements (Pub. Resources Code §21000 et seq.). This analysis must include economic factors, but does not require a cost-benefit analysis.

Additionally, in accordance with the Porter-Cologne Water Quality Control Act, it is the policy of the state to protect the quality of all waters of the state. Waters of the state include "any surface water or groundwater, including saline waters, within the boundaries of the state (CWC §13050)." When adopting the Porter-Cologne Act, the Legislature declared that all values of the water should be considered, but then went on to provide only broad, non-specific direction for considering economics in the regulation of water quality.

> The Legislature further finds and declares that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible (CWC §13000).

The Porter-Cologne Act directed regulatory agencies to pursue the highest water quality that is reasonable, and *one* of the factors used to determine what is reasonable is economics. It is clear, though, that economic factors cannot be used to justify a result that would be inconsistent with the federal Clean Water Act or the Porter-Cologne Act. The Regional Water Board is obligated to restore and protect water quality and beneficial uses.

13.2 Scope of the Economic Analysis

13.2.1 Existing Requirements

Landowners and dischargers are bound by various existing regulatory requirements that involve water quality and natural resource protection. The cost of complying with existing obligations and/or requirements should not be attributed to the proposed Shasta River TMDL Action Plan. Therefore, the scope of the economic analysis is limited to the implementation of the Shasta River TMDL Action Plan as proposed.

Applicable existing requirements include:

- Existing Basin Plan requirements (such as the federal and state antidegradation policies, prohibitions, and the existing water quality objectives for temperature, dissolved oxygen, sediment, settleable material, suspended material, and turbidity).
- State nonpoint source program requirements.
- Porter-Cologne Act requirements (such as the requirement of Section 13260 for every person who discharges a waste that impacts water quality to file a report of waste discharge with the Regional Water Board, and the cleanup and abatement requirements of Section 13304).
- The California Department of Forestry and Fire Protection or USFS requirements for timber harvest activities.
- The federal and state endangered and threatened species requirements.
- Obligations imposed by other local, state and federal natural resource agencies.

Every segment of riparian control fencing and surface drainage and reuse systems, for example, cannot be attributed to the proposed Shasta River TMDL Action Plan; some are necessary for compliance with other regulatory programs. Some costs to control total thermal, nutrient and oxygen-consuming loads, and related factors such as flow that reduce assimilative capacity are related to actions necessary to avoid a violation of the prohibitions in the Basin Plan and to avoid a taking under federal and state Endangered Species Acts or to fully mitigate impacts of authorized takes. Other costs may be incurred as a result of compliance with the Clean Water Act, other related statutes and regulations, or local land use ordinances. Conversely, compliance with the proposed Shasta River TMDL Action Plan will help dischargers comply with the other regulatory requirements.

13.2.2 Geographic Scope

The costs and benefits will not be uniformly distributed throughout the Shasta River watershed. The implementation actions proposed by the Shasta River TMDL Action Plan (see Chapter 8 of this Staff Report) are not uniformly required across the Shasta River watershed or even across properties with similar land uses. Instead, many of the implementation actions will be required of landowners on an as-needed, site-specific basis or are activities that are ongoing and are encouraged by the Regional Water Board. While this flexibility adds greatly to the effectiveness of the Shasta River TMDL Action Plan, it is one factor preventing this economic analysis from totaling benefits and cost on a watershed scale.

Additionally, more intensive land use activities will face greater costs than less intensive land use activities. Activities in proximity to surface water bodies will require greater care and assume higher costs than activities on lands that do not deliver to a surface water body.

13.2.3 Sediment Linkage to Dissolved Oxygen Impairment

As discussed in Chapters 4, the Shasta River watershed is not listed for sediment on the USEPA 303(d) list. However, Regional Water Board staff believes that fine sediment and organic material inputs to the Shasta River and tributaries promote the establishment and productivity of aquatic macrophytes. Aquatic macrophytes and periphyton contribute significantly to depressed dissolved oxygen concentrations. Fine sediment and organic material in the Shasta River promote the anchorage, growth, and production of aquatic plants. By reducing fine sediment sources to the river system, the production of aquatic plants may also be reduced. The luxuriant growth of the submerged macrophytes may also be stimulated, in part, by the oxygen consuming fine sediment and organic materials discharged in enriched tailwater return flows in addition to organic material from their own senescence and death. Runoff from livestock wastes and fertilizer may be other sources of oxygen consuming fine sediment and organic material to the Shasta River. Warm water temperatures, high nutrient concentrations, and ample light availability also contribute to aquatic plant productivity.

13.3 Benefits

This section presents the estimated benefits of the proposed Action Plan. These benefits relate to both economic and non-economic values that will be achieved by recovery of the watershed, high water quality, and supported beneficial uses. Benefits also include avoiding costs associated with the impacts of current and expected fine sediment waste discharges and elevated temperatures and low dissolved oxygen levels if they are not prevented and controlled. Existing temperature and dissolved oxygen impairments of beneficial uses negatively impact the cold water salmonid fishery (including the essential habitat of these fish), the fishing industry, water supplies, parks and the recreation industry, and others. The loss of topsoil from stream bank erosion and topsoil runoff from farming, grazing, and horticulture is another economic impact to agricultural industries.

The United Nations Environmental Programme, Division of Technology, Industry and Economics (UNEP 1999), summarized the results of many studies related to economic impacts of eutrophication of water bodies in the United States. The report stated that most of the studies focused on the benefits of improved water quality. The document pointed to a common theme among the studies, that improvements in water quality resulted in a range of benefits from improved recreation benefits and higher property values, to improved fish populations and lowered health risks.

Ribaudo (1989), an economist with the U.S. Department of Agriculture, studied water quality benefits related to prevention of soil erosion under the U.S.D.A. Conservation Reserve Program. He concluded that if sediment could be prevented from entering streams, the benefits to downstream landowners and water users would include actual benefits and avoided costs, such as lowered water treatment costs, reduced sediment removal costs, reduced flood damage, less damage to equipment that uses water, and increased recreational fishing.

Although many of the economic benefits of the proposed Shasta River TMDL Action Plan are foreseeable and describable, there is inadequate information to fully quantify some of these benefits. What information is available on benefits related to fishing, recreation, properly functioning ecosystems, , remediation activities, residential land prices, and water conveyance and storage facilities are described in the following sections. These sections are organized alphabetically, and are not listed in order of importance or size of economic benefit.

13.3.1 Fishing – Commercial, Subsistence, & Cultural

Commercial commodity fishing has been adversely affected by the decline in fisheries stocks in recent years. Salmon, especially, have economic value to commercial, recreational, and cultural fishing activities. The financial losses of commercial fisheries are due to many factors beyond habitat impaired by the impact of elevated water temperature and low dissolved oxygen (including ocean harvest, water diversions, and other habitat impairments), so the amount of the loss attributed to low dissolved oxygen and high water temperatures in the Shasta River watershed has not been determined. However, the Coho Recovery Strategy extrapolates coho recovery benefits and concludes that the economic benefits of recovery would be greater than the costs:

> Benefits associated with non-use values include intrinsic, or existence values which are derived from the knowledge that coho salmon populations exist, and bequest values which confer value to the resource for the benefit of future generations. Based on studies that examined streams in Colorado and salmon restoration in the Columbia River Basin, the San Joaquin River, and the Elwha River, the extrapolated value of California coho salmon recovery could be significantly larger than the fiscal or socioeconomic costs of recovery (CDFG 2004c).

In addition to the impact on the commercial fishery, fishing plays an important role in Native American cultures in the Klamath River to which the Shasta River is tributary. Improved habitat resulting from increased dissolved oxygen and lowered water temperatures will result in improved opportunities for cultural and subsistence fishing. Although these benefits are not quantified, the economic and cultural impact on the tribes of the Klamath Basin due to loss of salmonids fisheries is significant. The economic costs due to changes in traditional diets were explored in a recent study:

> Whereas historic fish consumption for the Karuk Tribe is estimated at 450 pounds per person per year, fish consumption for the Tribe based on the tribal fish catch in 2003 is estimated at less than 5 pounds per person per year. . . .The central thesis of this report is that Karuk people face significant and costly health consequences as a result of denied access to many of their traditional foods. Not only does a traditional diet prevent the onset of conditions such as obesity, diabetes, heart disease, kidney trouble and hypertension, a traditional

> diet of salmon and other foods is one of the best treatments for such conditions (Norgaard 2004).

The Coho Recovery Strategy also discussed this issue, but could not quantify it:

> Coho salmon recovery will have significant costs, but will also provide economic benefits. Benefits associated with Yurok and Hoopa Valley tribes' Federally reserved fishing rights, increased commercial land and water use activities, multiple species benefits, and improved water quality and watershed health will be realized, but they are not quantified. Coho salmon recovery will also result in benefits to recreational and commercial fishing and related industries, which are also not quantified in this document (CDFG 2004c).

13.3.2 Properly Functioning Ecosystems

Another large, but intangible, benefit can be ascribed to properly functioning ecosystems at various scales – local planning watershed, watershed, regional, etc. The National Academy of Sciences (NAS) states, "We now think of the natural environment, and the ecosystems of which it consists, as natural capital – a form of capital asset that, along with physical, human, social, and intellectual capital, is one of society's important assets (NAS 2004)." Some functions are most beneficial if they remain part of an integrated ecosystem rather than as individual components. Some of the valuable functions of intact ecosystems are nutrient recycling, regulation of climate and atmospheric gases, maintenance of biodiversity, water supply, flood risk reduction, etc. Not all of these services, of course, are impacted by high water temperature or low dissolved oxygen levels. The National Academy of Sciences has recently reviewed the studies associated with valuation of ecosystem services. They discuss several non-market valuation methods for both use and nonuse benefits. These analyses are beyond the scope of what is required for this economic analysis, but the concept of ecosystem services, apart from direct measurable goods and services, is among the intangible benefits of controlling low dissolved oxygen levels, and high water temperatures.

13.3.3 Recreation

Recreation does more than just supply leisure activity – recreation can have a significant economic impact. "Recreation and tourism are California's largest industries. California's rivers draw more of these users than any other location, except for its beaches (California State Lands Commission 1993)." "The demand for water-based recreation has been increasing as our population expands and the desire for outdoor recreation grows, particularly near urban areas and in national parks and other unique sites (Koteen et al. 2002)." Recreation and leisure activities provide economic value to those offering travel services. Services and amenities proximate to the recreation locations, such as equipment rental, hotels, campgrounds, restaurants, sale of supplies, park fees, etc.

The impact of water quality on recreation varies depending on the type of recreational activity. Some activities are more sensitive to nutrient and temperature related water quality impairments than others. A study by Koteen et al. (2002) showed that rafters, for example, are more interested in water quantity than sediment loads and are less willing to pay for improved water quality than are other recreational users such as swimmers, shoreline campers, fishermen, and sightseers. Koteen et al. (2002) summarized the value of water for particular recreational activities. They compared the mean increase in benefit to households in 1998 dollars for a specific change in water uses – such as from non-boatable to boatable; boatable to fishable; fishable to swimmable, etc. – in various geographic areas and nationwide. For example, a nationwide study showed a mean increase in benefit to households in 1998 dollars for a water quality change that allowed a change in recreation activity from boatable to fishable to be $79.60 for a change from fishable to swimmable to be $88.68. The report also summarized a 1982 study in 119 counties in Idaho, Oregon, and Washington that calculated the mean annual recreation benefits of swimming ($54,630), camping ($48,957), fishing ($98,303), and boating ($66,515). The 1982 values are based on the travel costs per number of visits to each recreational site in a year by nearby populations. They also summarized the marginal values of increasing water flow by type of activity, with fishing offering the highest marginal values per acre-foot for higher flows.

Recreational salmonid fishing will increase if fish stocks recover. Recreational fishing also creates jobs. As more fish are available, recreational fishing will be more attractive. Stedman and Hanson (2005) reported: "During 1991 it was estimated that 2.7 million people spent more than $1.5 billion fishing in California. The state's recreational fishery generated more than $900 million in earnings by supporting 40,000 jobs and contributed more than $90 million in state sales tax." Some studies suggest that recreational fishing rivals or exceeds commercial fishing in its economic value. Recreational fishing also supports direct and indirect economic value. "Dollars pumped into California's economy from river recreation include not only the direct value of licenses for fishing, registration of boats, equipment purchased, and hiring of guides or rafts, but also the value of lodging or campsites, money generated by travel to and from the rivers, and the maintenance and repair of river-related equipment (California State Lands Commission 1993)."

The impact of reducing nutrient loads and improving water temperatures, flow, and dissolved oxygen levels on recreational uses (and the associated economic benefit) will vary, depending on the activity and location. Recreational fishing appears to be highly sensitive to water quality improvements – not only because of the nature of the recreational water contact (i.e., it is more desirable to fish in clean water), but also because of the impact of poor water quality on fish stocks.

13.3.4 Remediation - Habitat Restoration

Remediation costs can be expected to decrease if the total thermal, nutrient and oxygen-consuming loads, and related factors such as flow that reduce assimilative capacity, are prevented. Remediation of fish habitat after impairment occurs can be expensive. The

need for expensive restoration and remediation will be reduced, if not eliminated, if adverse impacts to temperature and dissolved oxygen levels can be reduced.

Prevention is far less expensive than remediation after degradation occurs. An enforcement case, which took place in 2003 - 2004 in the North Coast Region, illustrates the costs associated with remediation and enforcement. In this case, a local flood control agency removed all riparian canopy in two creeks while performing maintenance activities. The County District Attorney's office charged the Agency with two misdemeanors under a violation of Water Code Section 13387(a)(2) for conducting vegetation removal projects in the two creeks in a manner contrary to a permit issued by the Regional Water Quality Control Board.

The incidents at the two creeks raised concerns from the public, Regional Water Board staff, and other local environmental officials after extensive vegetation was removed from the creek beds and banks during the agency's flood control operations. The flood control agency responded with plans to revegetate the impacted area and other corrective actions. The County Superior Court authorized a conditional dismissal requiring the Agency to take corrective actions resulting from alleged unlawful streambed clearing operations. The settlement required the Agency to complete revegetation work at the impacted creeks and to enhance the creeks in areas not directly impacted by the vegetation clearing activities. The Agency was also required to enact interim guidelines for flood control activities and to work with state and federal agencies on a long-term maintenance program to provide effective flood control while minimizing environmental impacts. Additionally, the Agency must now solicit input from local cities and post notices near work sites to advise neighbors of impending creek clearing activity. The settlement also requires the Agency to develop watershed education programs for local high schools and provide technical assistance to the local high schools' creek habitat enhancement projects. The criminal case provides for a final dismissal of the criminal charges in three years if the Agency complies with conditions geared towards restoring the affected creeks and improving environmental education programs.

13.3.5 Residential Land Prices

Improvement of water quality has a positive economic impact on property values, even if property owners do not consume the water. Koteen et al. (2002) and others have summarized studies concerning the change in residential property prices near water bodies as related to changes in water clarity. "The studies examined the change in property price for each foot of lake frontage given a 1-foot improvement in water clarity." The studies found price increases ranging from $2.34 per foot of lakefront property in Minnesota to $16-28 in Maine. Conversely, the authors include a study showing a decrease in property value related to a decrease in water clarity in Florida. The precise property value changes discussed in the report cannot, of course, be applied directly or quantitatively to the Shasta River watershed; the authors caution, "The value is unique for each situation, such as location and current clarity." The tendency, though, for property values to increase when water quality is increased is borne out by other studies.

13.3.6 Water Conveyance and Storage Facilities

Excess water-borne sediment and other pollutants are deposited in slow moving areas, such as reservoirs and irrigation canals. This will reduce the life of these facilities. Higher sediment loads and nutrients increase maintenance costs of irrigation canals and reservoirs. The capacity of reservoirs is reduced. The costs avoided by reducing sediment and improving dissolved oxygen levels are difficult to quantify, but dams are expensive and this economic benefit is likely large overall.

13.4 Costs

This section presents the estimated costs of the proposed Action Plan. These costs relate to the economic impacts of compliance and remediation. See Section 13.2 for a discussion of the costs that can be ascribed to this proposal compared to the costs that are imposed by existing regulatory requirements.

The costs of the proposed Shasta River TMDL Action Plan will not be uniformly distributed throughout the Shasta River watershed. The proposed implementation actions (see Chapter 8 of this Staff Report) are not uniformly required across the Shasta River watershed or even across properties with similar land uses. Instead, the extent of the implementation action necessary is not known and may change based on the success of implementation. Additionally, there are various ways to address a given impairment and not all the management measures listed may be needed. Also, some of the actions called for in the Shasta River TMDL Action Plan (such as control fencing) are already in place or completed. Finally, many of the implementation actions will be required of landowners on an as-needed, site-specific basis or are activities that are on going and are simply encouraged by the Regional Water Board. While this flexibility should greatly improve the effectiveness of the Shasta River TMDL Action Plan, it is a factor that prevents this economic analysis from totaling benefits and cost on a watershed scale. Therefore, estimated costs are expressed on a unit scale (e.g., per acre, per linear foot of fence).

13.4.1 Methodology

The cost analysis was conducted to provide approximate estimates of the cost to implement the proposed Shasta River TMDL Action Plan. An economist on staff with the State Water Board assisted in developing this analysis (see Horner 2005 for more information). Costs of management measures that are likely to be required to achieve the actions specified in the TMDL were estimated using the Natural Resource Conservation Service (NRCS) Program Costs derived from the ProTracts cost dataset. ProTracts is a national dataset maintained by NRCS to assist local NRCS Districts in setting cost shares for implementing conservation practices. Cost estimates are provided at the county level and the data used for this analysis are specific to Siskiyou County. These cost estimates may not represent the total cost of implementing a management practice, but they do provide a reasonable approximation of costs that can be adjusted if necessary. The NRCS Program Costs database is updated on a monthly basis.

Management measures that are likely to achieve proposed implementation actions are varied and numerous. An early step in this analysis was to select the management measures from the NRCS Program Costs database that are the most appropriate and the most likely to be used to control total thermal, nutrient, and oxygen- consuming loads.

Table 13.1 lists the NRCS Program Costs best management practice categories. The management measures that were selected are in bold text.

Table 13.1: NRCS Program Costs

BEST MANAGEMENT PRACTICES			
CODE	**NAME**	**CODE**	**NAME**
322	**Channel Vegetation**	548	Grazing Land Mechanical Treatment
327	Conservation Cover	**550**	**Range Planting**
328	**Conservation Crop Rotation**	**554**	**Drainage Water Management**
329	**Residue Management, No-Till/Strip Till**	555	Rock Barrier
330	**Contour Farming**	**560**	**Access Roads**
332	**Contour Buffer Strips**	561	Heavy Use Area Protection
340	**Cover Crop**	562	Recreation Area Improvement
342	**Critical Area Planting**	566	Recreation Land Grading and Shaping
344	**Residue Management, Seasonal**	568	Recreation Trail and Walkway
350	**Sediment Basin**	**570**	**Runoff Management System**
382	**Fence**	572	Spoil Spreading
386	**Field Border**	**574**	**Spring Development**
390	Riparian Herbaceous Cover	575	Animal Trails and Walkways
391	**Riparian Forest Buffer**	**580**	**Streambank and Shoreline Protection**
393	**Filter Strip**	582	Open Channel
410	Grade Stabilization Structure	584	Channel Stabilization
412	**Grassed Waterway**	585	Stripcropping
422	Hedgerow Planting	600	Terrace
423	Hillside Ditch	601	Vegetative Barriers
450	**Anionic Polyacrylamide (PAM) Erosion Control**	**607**	**Surface Drainage, Field Ditch**
468	**Lined Waterway or Outlet**	**612**	**Tree/Shrub Establishment**
484	Mulching	**614**	**Watering Facility**
490	Forest Site Preparation	**638**	**Water and Sediment Control Basin**
511	Forage Harvest Management	655	Forest Trails and Landings
512	Pasture and Hay Planting	666	Forest Stand Improvement

13.4.2 Estimated Costs for Shasta River TMDL Action Plan

Estimates of the costs of the Shasta River TMDL Action Plan, should it be adopted and implemented as proposed, are listed in Table 13.2. The table is organized in the same order as the proposed implementation actions in Chapter 8. This information is based on the economic analysis conducted by an economist on staff with the State Water Board (Horner 2005).

As discussed above, a single management measure will likely not be implemented over the entire extent of a given land use or across the entire Shasta River watershed. It is up to the landowner/discharger to decide which implementation actions and management measures are most appropriate to control sediment and water temperature on his or her

property. Also, some of the management measures have already been implemented or are required by other regulatory programs.

Table 13.2: Estimated Costs for the Implementation of the Shasta River TMDL Action Plan

Estimated Costs for Livestock Access Limitation Practices		
Fencing	$3.25 per running foot of fence	Per NRCS Program Cost database.
Installation of Remote Water Supply (Tanks)	$1.75 per gallon of tank capacity	Per NRCS Program Cost database.
Estimated Costs for Temperature and Vegetation Implementation Actions		
Planting Trees	$180 per acre.	Per NRCS Program Cost database.
Maintaining Trees	$800 per acre.	Per NRCS Program Cost database.
Estimated Costs for Water Use Implementation Actions		
Contain Facility Wastewater and Runoff	$20 per acre foot	Per NRCS Program Cost database.
Lining Water Delivery Ditches	$206.25 per irrigated acre	Per NRCS Program Cost database.
Install Surface Drainage and Reuse Systems	$41.25 per irrigated acre	Per NRCS Program Cost database.
Install Cropland Filter Strips	$1.11 per irrigated acre	Per NRCS Program Cost database.
Install Stock water Conveyances	$2.00 to $5 per linear foot	Per NRCS Program Cost database.
Well Construction	$35 per linear foot	Per NRCS Program Cost database.
Install Remote Water Supply	$1.00 per gallon of trough capacity	Per NRCS Program Cost database.
Estimated Costs for Flood Control and Bank Stabilization Implementation Actions		
Planting Trees	$180 per acre.	Per NRCS Program Cost database.
Maintaining Trees	$800 per acre* (*includes installation and a one time maintenance)	Per NRCS Program Cost database.
Estimated Costs for Grazing Implementation Actions		
Fencing	$3.25 per running foot of fence	Per NRCS Program Cost database.
Development of a Ranch Management Plan	Level Ground: $8.50 to $12.50 per acre Steep Ground: $12.50 to $18.50 per acre	Based on the estimated cost for a consultant to prepare the plan at a rate of $200 to $300 per day. A plan for 100 acres of flat ground would take about 4 days to prepare and a plan for 100 acres of steep ground would take about 6 days to prepare. Miscellaneous expenses (e.g., gas) are also included (Fitzgerald, 2005)[1].
Estimated Costs for Dwinnell Dam and Lake Shastina Studies		
Study design, and implementation, including monitoring,	$150,000 to $200,000	Per personnel communication with Dr. Deas

[1] Note: Costs for developing this type of plan are highly variable. Therefore, these costs should be considered rough estimates based on costs for developing a similar type of plan in the Scott River watershed.

13.5 Sources of Funding

Potential sources of funding for implementing required management measures or actions include monies from private and public sources. Public financing includes, but is not limited to grant funds, as described below, single-purpose appropriations from federal, state, and/or local legislative bodies, and bond indebtedness and loans from government institutions.

Every year there are different sources of public financing through grant and funding programs administered, at least in part, by the Regional Water Board and the State Water Board. These programs vary over time depending upon federal and state budgets and ballot propositions approved by voters. An up-to-date list and description of funding programs can be viewed at the State Water Board's website at: <http://www.waterboards.ca.gov/funding/index.html>. At the time of this writing there are several Regional and State Water Board grant funding programs pertinent to the proposed Action Plan for the Shasta River Temperature and Dissolved Oxygen TMDLs. The programs currently available are listed below.

- The Federal 319(h) Clean Water Act Program.

This is an annual federally funded nonpoint source pollution control program that is focused on controlling activities that impair beneficial uses and on limiting pollutant effects caused by those activities. Project proposals that address TMDL implementation and those that address problems in impaired waters are favored in the selection process. There is also a focus on implementing management activities that lead to reduction and/or prevention of pollutants that threaten or impair surface and groundwaters. Eligible applicants include nonprofit organizations, local government agencies including special districts, tribes, and educational institutions. State or federal agencies may qualify if they are collaborating with local entities and are involved in watershed management or proposing a statewide project. Approximately $4.5 - 5.5 million are available per year. For 2005-2006, the 319(h) Program has been added to the Consolidated Programs; however, it is available on an annual basis where the other programs in the consolidated list (below) are funded by bonds and are not necessarily going to be eligible in the future. Eligible 319(h) project types include:

- Implementation of measures and practices that reduce or prevent nonpoint source pollution to ground and surface waters.

- Projects consistent with Total Maximum Daily Loads, local watershed-based plans, and the California Nonpoint Source Program Plan.

At the time of this writing, the State Board in coordination with the nine Regional Water Boards, US Environmental Protection Agency (EPA), as well as other agencies, are working to implement the 2005-06 Consolidated Grants Program. The current Consolidated Grants Program integrates and coordinates related grant programs for Watershed Protection, Water Management, Agricultural Water Quality, Drinking Water,

Urban Storm Water, and Non-Point Source Pollution Control. Approximately $143 million will be made available from six interrelated grant programs administered by the State Water Board's Division of Financial Assistance. Consolidation of these grants reduces application efforts and better integrates program goals with partner agencies, which include the US EPA, CALFED, Coastal Commission, Coastal Conservancy, Department of Water Resources, Department of Fish and Game, Resources Agency, and other related agencies. The 2005-06 Consolidated Grants are funded utilizing Proposition 40, Proposition 50, and federal appropriations. The six consolidated programs are as follows:

1. Proposition 40 – Non-Point Source Pollution Control Program
2. Proposition 50 - Coastal Nonpoint Source Pollution Control Program
3. Federal Clean Water Act Section 319 (h) – Non-point Source Implementation Program
4. Propositions 40 and 50 – Agricultural Water Quality Grant Program
5. Proposition 40 – Urban Storm Water Program
6. Proposition 40 – Integrated Watershed Management Program