# Cantara Trustee Council

## Final Report on the Recovery of the Upper Sacramento River – subsequent to the 1991 Cantara Spill

2007

*The upper Sacramento River, near the Cantara Loop.*

*Kid's Fishing Day participants.*

## THE CANTARA TRUSTEE COUNCIL PRESENTS ITS FINAL REPORT



The Cantara Trustee Council (CTC), and the Cantara Program, operated for a period of 12 years, from 1995-2007. During that time, the CTC funded numerous projects which included restoration activities, land acquisition and protection, research, and public education.

The purpose of this document is to leave a summary record of events that occurred due to the 1991 Cantara spill. It is our intent to provide a condensed presentation of the spill event, the legal processes following the spill, including the formation of the CTC, the formation of the Cantara Program, and the development of guiding plans and documents used by the CTC in the disbursement of settlement funds.

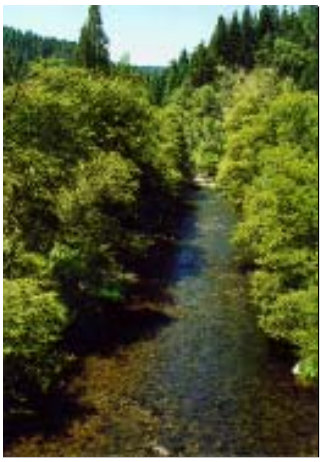
Included with this report is a CD containing comprehensive summaries of the CTC grants, and lists of documents associated with the Cantara spill. These lists include references cited in this report – published papers and grey literature. Plans developed by the CTC, as guidelines for the operation of the Cantara Program, are included as well. Also contained on the CD, is the 'Evaluation Tool' developed by the Cantara Program staff for use in evaluating funding proposals.

We are proud of what we have accomplished during our tenure, and view our program as having been highly successful. A great many people helped us succeed in our mission: public interest groups, agency representatives, landowners, researchers, teachers, and members of the general public. Our sincere thanks to everyone involved with our program over the years. We hope you find our report to be informative, and our program to be useful as a model, in the event of a future inland spill.

Sincerely,

Donald B. Koch
Chair, Cantara Trustee Council

# The Upper Sacramento River



The upper Sacramento River ecosystem is the 37.3-mile segment of the river upstream of Shasta Lake, and downstream of Box Canyon Dam at Lake Siskiyou, in northern California. It is a highly productive, cold-water mountain stream for most of its length. Its varied habitats include pools, runs, riffles, cascades, and pocket-water. The river ecosystem can best be simplified into two interrelated sets of communities: aquatic and terrestrial. The river flows south, through Siskiyou and Shasta counties into the northern end of Shasta Lake, a large, fluctuating storage reservoir. Occurring approximately 2.3 miles below Box Canyon Dam, the Cantara spill affected nearly the entire river ecosystem.

A biologically diverse and complex system, the river supports a wide array of aquatic plants and animals, from algae and phytoplankton to aquatic insects, mollusks, crayfish, amphibians, and several species of fish. However, the most prominent aquatic resource is the area's internationally renowned wild rainbow trout fishery.

The river directly, and indirectly, supports a wide variety of terrestrial resources as well. Vegetation most closely fits the White Alder Riparian Forest natural community type (Holland 1986), but is variable and includes riparian forest, riparian scrub, and gravel bar. Terrestrial wildlife species interact in a complex web of interdependence with each other and their habitat, including the aquatic environment. The California Department of Fish and Game's (DFG) California Wildlife Habitats Relationship Program (WHR), which lists all native and introduced wildlife species known in California, indicates that the watershed supports up to 247 species of terrestrial wildlife, including 76 mammals, 17 reptiles, 14 amphibians, and 140 birds. Of these, 29 are identified by WHR as "river dependent" upon the aquatic habitat elements that were virtually eliminated by the spill.

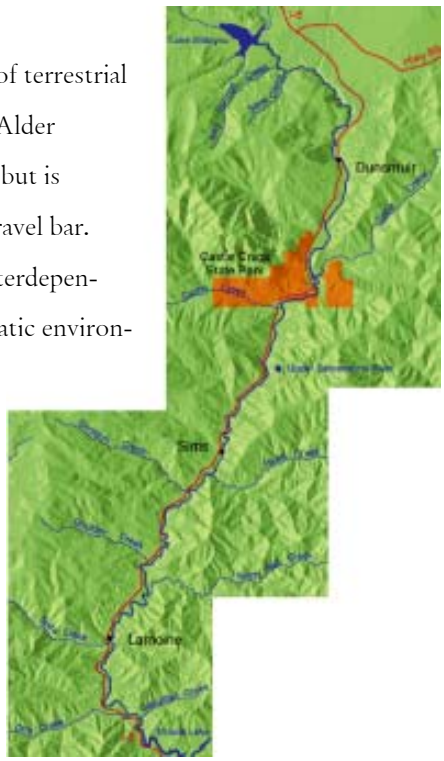
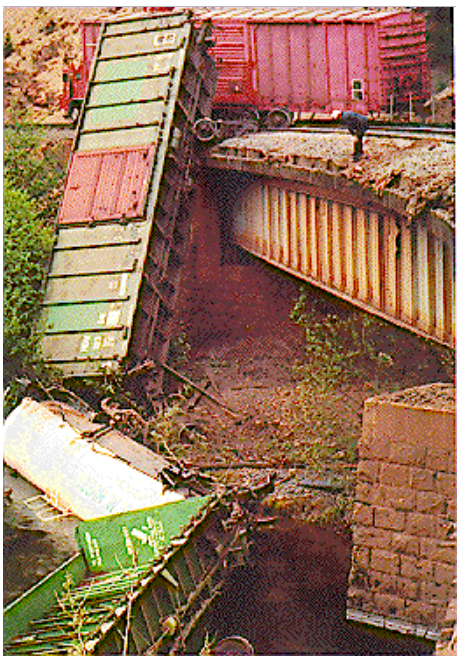



***Figure 1.*** *Upper Sacramento River watershed.*

# The Cantara Spill

On the night of 14 July 1991, a Southern Pacific train derailed into the upper Sacramento River at a sharp bend of track known as the Cantara Loop, upstream from Dunsmuir, California, in Siskiyou County. Several cars made contact with the water, including a tank car that initially appeared to be undamaged, however a small rupture below the water line allowed its contents to be released. DFG wardens arrived at the spill site approximately two hours after the derailment occurred. Early in the morning of 15 July, it became apparent that the tank car had ruptured and spilled its entire contents into the river - approximately 19,000 gallons of a soil fumigant - metam sodium.

As the metam sodium came into contact with oxygen in the water, the toxins began killing all aquatic life (Howd 1992). Metam sodium is a potent herbicide and pesticide used principally to sterilize soil for agricultural purposes. When mixed with water, metam sodium breaks down into several highly toxic compounds. These chemical compounds have varying toxicities and half-lives in the aquatic environment. Though some are highly toxic, all dissipate in a matter of hours or weeks and do not linger long-term (del Rosario et al. 1994). Some of the compounds volatilized into the air, creating a toxic cloud above the river as the chemical plume moved downstream (Fetzell and Lew 1992). Efforts to determine the extent of damage to aquatic life from the metam sodium spill were delayed 12-48 hours due to the hazard of fume exposure [a complete chronology of the spill was prepared by DiBartolomeis (1992)].



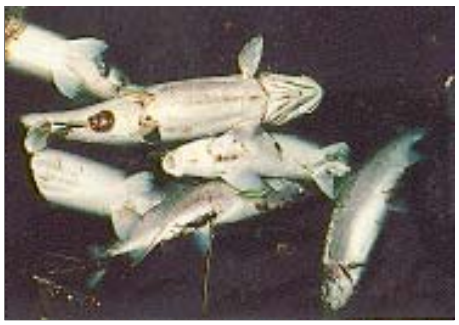
*The train derailment at the Cantara Loop, July 14, 1991.*

In the upper Sacramento River, every living creature in the water, downstream from the spill, died. Initial responders to the scene found numerous dead and dying fish, salamanders, crayfish, and other aquatic organisms. Within a few days, dead algae and damaged aquatic plants were observed.

Traveling at just under one mile per hour on average, the plume entered Shasta Lake on the morning of 17 July 1991. At the lake, U.S. Environmental Protection Agency (EPA), California

Department of Water Resources (DWR), and Southern Pacific (SP) representatives aerated the chemical plume. Dilution and evaporation of the metam sodium, combined with continued aeration, reduced the chemical to undetectable levels in the lake by 29 July 1991.

Vegetative damage from the spill resulted in a sudden and catastrophic reduction in canopy cover and foliage along the river, with a corresponding dramatic loss of many wildlife species dependent on the river's riparian vegetation. Wildlife such as birds, bats, otters, and mink either starved or were forced to move because their food sources were no longer available.



Ultimately, over a million fish, and tens of thousands of amphibians and crayfish were killed. Millions of aquatic invertebrates, including insects and mollusks, which form the basis of the river's ecosystem, were destroyed. Hundreds of thousands of willows, alders, and cottonwoods eventually died. Many more were severely injured. The chemical plume left a 41-mile wake of destruction, from the spill site to the entry point of the river into Shasta Lake.

The Department of Fish and Game, as lead Trustee for a contingent of state and federal Trustee Agencies, initiated a Natural Resource Damage Assessment (NRDA) process under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and state law. Studies conducted under the NRDA identified the injured resources, and estimated the type and extent of injuries. DFG released a draft of the NRDA plan in October 1991. The final NRDA report was released in October 1993 (CDFG 1993).

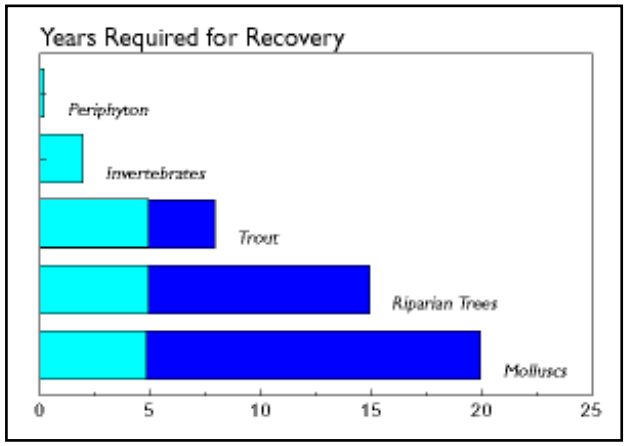



***Figure 2.*** *Estimated recovery time for various organismal groups.*

In July 1992, a lawsuit was filed by the State of California and the federal

government on behalf of the resources, against Southern Pacific Railroad and other parties considered responsible for the Cantara spill. The basis of the lawsuit was to recover damages for injured resources. By 1994, an out-of-court agreement was reached; by August 1995, the entire settlement process was complete. Following the settlement, the Cantara Trustee Council (CTC) was established. At this point, restoration of the ecosystem could begin.

## Administration

During the NRDA process, the California Department of Fish and Game established a Cantara Program staff to handle the many tasks that needed to be accomplished. These staff members were later assigned as support to the CTC. Biologists and administrative staff worked to keep the CTC's program on track and progressing forward. Dedicated staff support was vital to the success of the Cantara Program.

### Settlement & Memorandum of Agreement (MOA)

In 1994, all parties to the suit reached a settlement agreement. A consent decree and Memorandum of Agreement (MOA) were written, outlining the distribution of settlement funds. The plaintiffs received $38 million in damages, reimbursements, and restoration funds. Of this amount, $13 million was awarded to the trustee agencies as reimbursement for their costs in responding to the spill and documenting spill damages, $3 million was awarded to establish a fund to be used for responding to future resource-damaging incidents, $2 million was awarded for damages, $1 million was assessed in penalties, and $5 million was awarded for direct restoration of damaged resources.

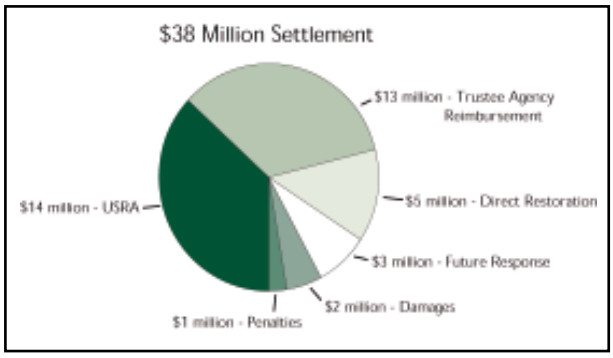



***Figure 3.*** *Settlement dollars distribution.*

The remaining $14 million was deposited in an interest-bearing special account, the Upper Sacramento River Account (USRA), held by the Department of Fish and Game. Beginning in 1995, five yearly deposits were made, as follows:

| |
|---|
| 1st installment - $1,800,000 |
| 2nd installment - $1,800,000 |
| 3rd installment - $3,300,000 |
| 4th installment - $3,550,000 |
| 5th installment - $3,550,000 |

***Figure 4.*** *Settlement installments, as paid into the USRA.*

According to the MOA, expenditures from the USRA could be used for the following purposes: Resource Protection; Restoration, Rehabilitation, and Enhancement; Acquisition; Study and/or Research; and Program and Administrative Support. The MOA stipulated that a "Cantara Trustee Council" would administer "any and all funds" in the USRA. Further, the MOA called for the Council to release a plan for the expenditure of funds "…no later than the first anniversary of the date of the first meeting of the Trustee Council…"

## Formation of the Cantara Trustee Council

In 1995, the CTC was established to administer the $14 million in the USRA. The MOA gave the CTC authority to act as the sole administrator of the funds and to make all decisions regarding their expenditure. The CTC consisted of five voting members: three representatives from the California Department of Fish and Game (DFG), one representative from the Central Valley Regional Water Quality Control Board (RWQCB), and one representative from the United States Fish and Wildlife Service (USFWS). Each voting member had equal authority in all decision making and all funding decisions had to be unanimous. Additionally, the CTC included two nonvoting members: one representative each from an environmental group and a resource-user group.

## Cantara Program

As previously mentioned, Cantara Program staff were assigned as support to the CTC. Staff biologists evaluated grant proposals and prepared/administered grant agreements. These personnel also continued to conduct field work to monitor recovery, or restore lost resources. Clerical staff were employed to handle correspondence, track program expenditures, and prepare all documents, meeting minutes, and grant application packages. Contract employees were hired to assist with field work, perform technical writing assignments, and create annual reports, brochures, and other

graphics-oriented tasks. While minimizing expenditures for administrative and support staff costs, it was estimated that approximately 10-12% of the total expenditures would be spent on staff.

## Guiding Documents — Cantara Trustee Council Plans

Cantara Program staff developed several plans to guide the CTC in implementing their restoration program. A brief summary of each plan is below. For full text of each plan, please see www.cantaratrustees.org.

### Expenditure Plan

In 1996, an Expenditure Plan was prepared for the CTC, by Cantara Program staff, pursuant to the Cantara settlement MOA. The objective of the plan was to adopt a balanced, cost-effective restoration program that maximized benefits to the natural resources injured by the Cantara spill. A variety of methods available to the CTC to implement its restoration program were outlined:

- **Grant Program** — a means to solicit project proposals from both the public and private sectors
- **Mini-grant Program** — a means to increase public involvement in restoration and resource stewardship at the local level
- **Direct CTC Action (Initiative Process)** — a means for the CTC to pursue its own initiatives independent of either grant program

The plan provided an estimate of expenditures over the life of the CTC's restoration program. Because restoration, rehabilitation, and enhancement of natural resource types injured by the spill were a high priority, estimated expenditures on those project types were projected at approximately $4,897,500 over the life of the program. For habitat acquisition and resource protection projects, it was estimated that approximately $5,718,500 would be spent. This amount was higher than the estimate for restoration projects because

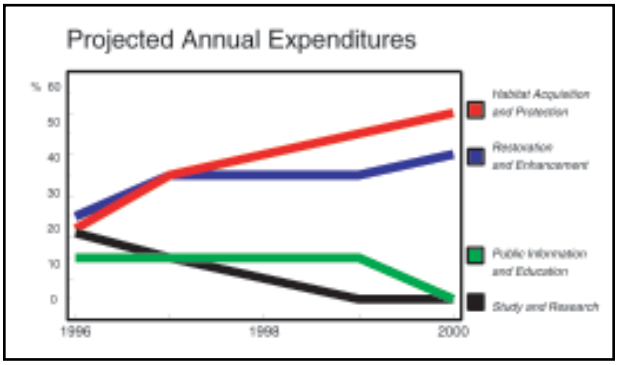



***Figure 5.*** *Projected annual Cantara Trustee Council expenditures.*

acquiring land to protect resources is costly. As recovery progressed on the upper Sacramento River, expenditures for study and research projects were projected to decrease. Following that theory, it was estimated that $1,333,000 would be expended on study and research projects. For public information and education projects, it was estimated that approximately $1,745,000 would be spent.

## Strategic Plan

In March 1997, the CTC released its Strategic Plan. This plan was written as the CTC recognized the need for an overall plan to guide its decision-making over the life of the program. The Strategic Plan focused on goals identified by the CTC and identified strategies to achieve its overall mission. CTC goals were grouped into four key areas, or themes. Three themes focused on restoration and long-term protection of natural resources, while the fourth dealt with project evaluation and the CTC's decision making process. The four themes were as follows:

*The upper Sacramento River, Dunsmuir.*

- Restoration and replacement of resource types injured by the spill
- Planning for the long-term health of the river ecosystem
- Public outreach and promotion of resource stewardship
- Effective use of settlement funds

Implementing the Strategic Plan was an ongoing effort over the life of the CTC's restoration program.

## Aquatic and Fishery Management Operational Study Plan

At the beginning of the restoration program, the CTC recognized the need for continued studies and monitoring of aquatic resources that were affected by the Cantara spill. The CTC believed that the studies were necessary to:

- Provide important information for adaptive management as part of the CTC's recovery and restoration programs
- Document recovery of resources
- Identify resources needing further restoration
- Develop easily repeatable techniques in the event of future spills, on the river as well as other systems
- Establish baseline populations of aquatic resources on the river

*California Department of Fish and Game employees collect data by utilizing electrofishing techniques.*

As a result, the Aquatic and Fishery Management Operational Study Plan was released in March 1997. The purpose of the plan was to identify and prioritize aquatic and fishery studies to be funded from the USRA. Goals and objectives of the Fishery Management Operational Study Plan were as follows:

- Meet the requirements of the MOA by focusing the expenditure of study and research dollars on high priority projects
- Support recovery, restoration, management, and enhancement activities for the natural resources affected by the Cantara spill through the collection of important information
- Provide guidance for future natural resource damage assessments by establishing baseline data and developing repeatable techniques for resource evaluation
- Document the effectiveness of restoration projects through performance monitoring

### Upper Sacramento River Water Quality Management Operational Plan

In September 1996, funding was granted to the Central Valley Regional Water Quality Control Board to conduct water quality monitoring and develop an enhanced regulatory program on the upper Sacramento River. The five-year program was approved to fulfill

*Water quality and temperature monitoring on the upper Sacramento River.*

the objectives of a Water Quality Management Plan and to be incorporated into the CTC's overall planning process. The Upper Sacramento River Water Quality Plan was released in March 1997. The purpose of the plan was to identify elements of the monitoring program, and describe the regulatory and management activities that would be taken to protect and enhance water quality and aquatic resources in the upper Sacramento River watershed. Goals and objectives of the plan were as follows:

- Develop and implement a baseline water quality monitoring program to determine existing water quality in the watershed and to identify water quality parameters that are not in compliance
- Identify and prioritize water quality problems in the watershed that exceed water quality objectives or restrict the full recovery of aquatic life
- Implement corrective actions to eliminate or minimize discharges or activities that are affecting water quality or impairing full recovery of aquatic life
- Identify potential CTC projects that would provide enhanced protection of water quality or enhance recovery of aquatic life

## Resource Protection Plan

*Above: A GIS technician collects data with a GPS device.*

As outlined in the MOA, funds from the USRA could be used for resource protection and acquisition projects. Within the Expenditure Plan, habitat acquisition was identified as an increasingly important element of the CTC's resource protection efforts. To evaluate acquisition projects, and ensure that settlement dollars were spent to maximize resource protection and recovery, the Resource Protection Plan was released in March 1999. The Resource Protection Plan outlined the methods, criteria, and Geographic Information System (GIS) techniques that would be used to identify, prioritize, and select parcels for potential acquisition within the upper Sacramento River watershed. The plan enabled the CTC to evaluate resource distribution within the watershed, identify key areas for resource protection, and prioritize and select appropriate conservation actions on a site-specific basis. Goals of the plan were as follows:

- Protect and replace resources damaged by the spill, including cold-water lotic aquatic habitats, montane riparian terrestrial habitats, and the species they support
- Enhance opportunities for stream-oriented recreation - the spill also caused a reduction in human use values associated with stream-oriented recreation
- Protect and improve water quality - identifying and correcting water quality problems through monitoring, enforcement, and remediation within the watershed
- Establish a forum for long-term watershed planning that would involve all interested parties and extend beyond the CTC's limited tenure

### Public Relations and Education Operational Plan

The CTC thought it important to continue the flow of information to the public at large, the resource user groups, and the decision makers regarding recovery of the upper Sacramento River ecosystem and the activities of the CTC. Consequently, a Public Relations and Education Operational Plan was released in 1998. The plan identified potential target audiences, potential media outlets, potential messages, potential implementation mechanisms, and costs for specific public relations and education projects for the CTC. The goals and objectives of the plan were as follows:

*Initially funded by the CTC, the Upper Sacramento River Exchange provides watershed stewardship information and education about the river.*

- Meet the requirements of the MOA by producing annual reports
- Promote recovery, restoration, enhancement, public support, and public stewardship of natural resources injured by the Cantara spill through public relations and education
- Provide history and guidance for future use of the Comprehensive Environmental Restoration Compensation and Liability Act (CERCLA) to other natural resource Trustee Agencies about what works and does not work, with regard to the Natural Resource Damage Assessment (NRDA) process and restoration under CERCLA
- Develop state and federal support for the CERCLA process which has come under political scrutiny, by educating legislators and environmental groups on the positive outcome of the Cantara settlement

## Disbursement of Settlement Funds

Through the CTC's Expenditure Plan, the following funding categories were established:

Acquisition and Resource Protection

This category included property acquisitions or easements to promote recovery and provide protection for resource types affected by the Cantara spill, or provide public access and landscape linkages.

*Sulphur Creek restoration project.*

Restoration, Rehabilitation, and Enhancement

These types of projects could complement or expand the direct restoration projects being carried out by DFG under its direct restoration and monitoring programs. They could also be used to fund restoration projects outside the area directly affected by the spill.

Study and/or Research

These types of projects could improve the understanding of feasibility for future restoration efforts, and provide recovery monitoring to support the restoration program. They could also include feasibility studies, resource surveys and assessments, long-term recovery monitoring activities, or studies to establish baselines for at-risk systems.

Public Information and Education

These projects were eligible for funding if they clearly supported and facilitated the resource restoration, resource protection, and research goals stated above. Public information and education projects also included those that would inform or educate the public about the spill, the resources that were injured, and their recovery. Projects in this category needed to promote and encourage the development of a stewardship ethic for these resources.

*A Dunsmuir Schools student learns about aquatic insects on the upper Sacramento River, Dunsmuir.*

Program and Administrative Support

At the time of the formation of the CTC, Cantara Program staff consisted of three biologists, three administrative

personnel, and several contract field personnel, all being paid directly by DFG. These employees were assigned to act as staff for the CTC. DFG continued to pay for CTC staff for the first two years of the program, eventually being reimbursed for these expenditures through the settlement.

The CTC began funding program staff in 1998, undertaking three initiatives to do so. The program was extended twice beyond its original projected termination because of the large number of long-term grant awards that needed to be administered, and because a significant portion of the CTC's funds remained to be awarded. With each extension, the size of the staff was reduced.

As staff reductions and replacements occurred over time, staff members learned new skills in dealing with ecosystems unfamiliar to them, as well as in grant management, general administration, and report writing. Staff experience in ecosystem function and species biology was important throughout the program's duration, not just during its early stages. This experience enabled staff to recognize potential problems in the implementation of grantee plans and to help overcome them. The adaptability of staff as the program emphasis changed from response and monitoring, to grant management, was critical to the success of the program throughout its life.

### Priority for the Expenditure of Funds

Following the implementation of the Expenditure Plan, spending priorities were established. Consistent with the MOA, these priorities were based on project locations and habitat types; a separate ranking addressed study and research projects. Expenditures were made either through the grant process, or by direct CTC action.

As outlined in the MOA, the priority of expenditures by the CTC was as follows (from highest to lowest priority):

- on-site, in-kind
- off-site, in-kind
- on-site, out-of-kind
- off-site, out-of-kind
- study/research projects

"On-site" was defined as the Sacramento River from the mouth of Campbell Creek upstream to Box Canyon Dam; the tributaries which have their confluence within the reach; and watersheds of the tributaries that have their confluence within the reach.

"Off-site" was defined as locations which do not lie within the watershed described under the "on-site" definition. "In-kind" was defined as montane riparian terrestrial habitats, coldwater lotic habitats, and the species closely associated with those resource types. "Out-of-kind" was defined as any ecosystem other than montane riparian terrestrial and coldwater lotic habitats.

These priorities controlled how grant proposals were scored. By the year 2000, it became difficult to fund on-site restoration grants, as opportunities for completing such projects in the upper Sacramento River Canyon were limited. Consequently, most funded projects in this category were off-site, but in-kind. The CTC funded a few out-of-kind projects, but only to the extent that they involved valley-foothill riparian, instead of montane riparian habitats.

During the life of the grant program, the CTC closely followed the Expenditure Plan percentages when funding projects in the various grant categories. From 1996 to 2003, the CTC approved $9.8 million in projects through the formal grant process. Of these projects, 51% were Restoration, Rehabilitation, and Enhancement grants; 26% were Acquisition and Resource Protection grants; 8% were Study and Research grants; and 14% were Public Information and Education grants.

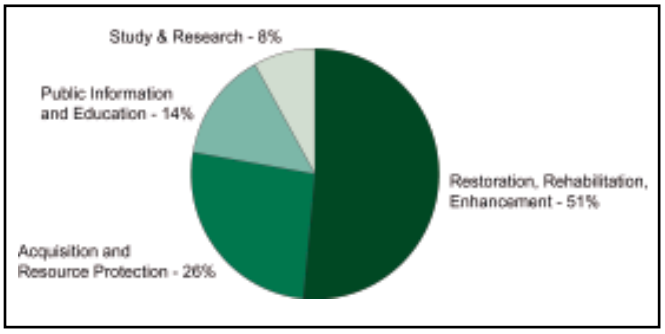



***Figure 6*** *Percentages spent in Expenditure Plan categories.*

Expenditures for acquisitions were lower than expected. This was due to the lack of available properties with willing sellers within the Sacramento River watershed. The CTC chose to spend additional monies on restoration, as that was considered the next most valuable use of the funds. Outside the formal grant process, the CTC expended its funds on the mingrant program and CTC initiatives.

## Vehicles for Expenditures

*The Dunsmuir City Park Addition.*

### CTC Grant Program and Initiative Process
(Direct CTC Action)

The CTC initiated a grant program in 1996, as a way to expend the settlement dollars and implement a restoration program. Through Cantara Program staff, the CTC requested project proposals once per year for funding decisions. Proposals were evaluated, scored, and ranked by a Technical Review Committee (TRC), and selected for funding by the CTC, incorporating the priorities outlined above.

Some aspects of the grant program (e.g., habitat acquisition) were more effectively accomplished through an initiative process, or direct action, initiated by the CTC. The CTC had three options for implementing its own projects — work could be performed in-house by CTC staff, competitive bids could be obtained via the state contracting process, or interagency agreements between state or federal agencies could be negotiated.

An "Evaluation Tool" was developed to help rank competitive grant proposals. While ranking grant proposals was the tool's main purpose, it was also applied in the evaluation of CTC Initiatives. Funding for Program and Administrative Support was not subjected to this process. The Evaluation Tool is discussed in more detail, below.

Beginning in 1998 and continuing through 2002, Study and Research projects were not eligible for funding through the grant program. The CTC chose to address individual research needs through direct actions. Restoration, Rehabilitation and Enhancement projects, Acquisition and Resource Protection projects, and Public Information and Education projects were all eligible for funding throughout the entire life of the CTC's grant program.

*Willow trees were planted as part of the lower Clear Creek acquisition and restoration project.*

The CTC's restoration program was initially scheduled to run for only five years; however, with a substantial amount of interest received by the USRA and funds returned from projects that were completed under budget or canceled, the annual grant program was extended to seven years. After 2002, project proposals were not actively solicited through the grant program as proposal submissions were declining. From 2003 through 2006, the CTC reviewed and funded projects, outside of the annual grant cycle, that they thought would effectively restore natural resources and replace resource values lost as a result of the spill. During an eleven year period, the Council met approximately 30 times to review project proposals and the status of ongoing projects. Over 120 projects were funded by the CTC either through their grant program or direct actions.

## Evaluation Tool

Once the CTC was established to award restoration grants from the $14 million in settlement funds, a Cantara Program Team was established to develop a mechanism for evaluating grant proposals. This team consisted of the DFG's Cantara Program staff, a representative from DFG's Legal Office, and a consulting firm, Industrial Economics, Inc. The document the team developed was called "A Decision Support System for Selecting Restoration Projects" and given the short title of "Evaluation Tool." The stated purpose of the Evaluation Tool document was to develop an effective, rational, and appropriate method of evaluation, in order to ensure that those proposals selected for funding were:

- Consistent with the Trustee values expressed in the MOA, as well as general guidance provided in CERCLA and the NRDA regulations of the Department of the Interior (DOI)
- Appropriate, given the current restoration requirements
- Fair and flexible to allow requirements to be adjusted over time, as program requirements evolved, or CTC priorities changed

*Above: A comprehensive project on the Scott River, part of which involved bank stabilization.*

The overall objectives of the Evaluation Tool were to:

- Provide the greatest practicable restoration benefit to the injured resources, communities, and habitats of concern
- Ensure that restoration activities were focused on the resources injured as a result of the Cantara spill
- Achieve the above objectives in the most cost-effective and balanced manner

The document addressed the range of potential projects outlined in the MOA by classifying all proposals into the four project categories described in the previous section. The authors developed a project evaluation flow chart for each of the categories. Each chart had three common primary objectives (Expected Benefit, Relationship to Injury, and Program Cost) applied across all categories of projects. However, the set of criteria and feasibility factor measures for the primary objectives differed as appropriate for each category.

The score for each objective was determined by these various criteria. For most categories, the Expected Benefit score depended on the potential benefit, plus overall feasibility of the project. These criteria were influenced by such factors as technical feasibility of the project, qualifications of the staff, and study design. As an example of how some of the measures differed among categories, restoration projects needed to demonstrate high resource benefit and low collateral damage, acquisitions had to benefit public access and landscape linkages, study and research projects needed to document recovery or develop baseline data, and public information projects had to address the audience composition and persistence of benefits to receive a high Expected Benefit score.

Relationship to Injury objective scores were applied across all categories. Projects which were on-site and in-kind scored better than those which weren't. The Program Cost objective scores were influenced by project costs and cost share factors in all cases, but some categories looked at more types of costs than others.

*Cal Trout property acquisition, at the Cantara Loop.*

Each evaluation criterion was scored, using a rating system of zero to five, or poor to excellent. Each grade was well defined so that evaluators could easily assign the proper score to each factor. The CTC established a Technical Review Committee (TRC) to review and score projects. All projects received during the years when a formal grant cycle was in place were evaluated by the TRC, using the Evaluation Tool. All grant application packages sent out to prospective project submitters contained a complete explanation of how the tool was used to score their projects, allowing them to prepare the best applications possible.

Even after the CTC no longer used a formal grant cycle and the TRC was no longer functioning, Cantara Program staff evaluated every project using the Evaluation Tool. Thus, project scores could be compared to those from past grant cycles to weigh the relative benefits of each project.

### Minigrant Program

After the initiation of the CTC's grant program, many public requests were received to develop a less complicated minigrant program. In response, the CTC initiated such a program in 1997. This program allowed local clubs, schools, and organizations to request money for small scale restoration and public information projects. Established for three years, the program was limited to Siskiyou and Shasta counties, the two counties directly affected by the Cantara spill. Each year, the CTC allocated a total of $27,500 for minigrants. Funds were split between each county, based upon the percentage of river miles affected by the spill. The Siskiyou County Administrator's office was responsible for overseeing $11,000 in minigrant dollars each year. Minigrant recipients were selected by the Siskiyou County Fish and Game Commission. Since no similar agency existed in Shasta County, Cantara Program staff administered the $16,500 allocated to Shasta County each year. Over the three years of the minigrant program, 32 projects were funded.

*A demonstration pond was constructed at Junction School.*

## In Hindsight....

After a 12 year run, the CTC feels that its program experience is valuable to pass along, in the event of another catastrophic environmental incident which may involve a large settlement. A number of factors arose which were unforeseeable at the beginning of the program. Some of these were positive, while others were not. Ultimately, these challenges helped the program evolve into a unit that developed and implemented efficient processes.

The grant program was originally intended to run for five years; however, this plan did not allow for the fact that a number of grants were not completed, due to a variety of causes. In these cases, funds were returned to the CTC. Also, during this time period, interest rates were high and periodic interest payments continually augmented the USRA. Further, some projects did not progress as rapidly as planned; funds were not fully paid out to grantees as soon as expected. This had the effect of further increasing the account balance, due to accruing interest. Because of these factors the grant program lasted for 11 years, more than twice the projected life of the program.

### Challenges

There were a number of challenges that recurred with grantees and projects funded by the CTC. These occurred despite careful review criteria established by the Technical Review Committee and evaluation by the CTC.

A number of grantees were unfamiliar with grant management; this significantly increased the staff time needed to guide grantees through the process of implementing their project and fulfilling the obligations of the grant agreement. In particular, there were frequent delays and problems with

submission of deliverables (such as progress reports, drafts of documents, or copies of permitting documents). Much follow-up was required to ensure grantees complied with the full terms of the agreement.

Some grants were funded to develop restoration design plans for needed restoration activities in a given area or watershed. Design plans helped determine which restoration projects were needed, in what priority they should be accomplished, and what the associated costs of each project would be. These plans, intended to be comprehensive documents to guide restoration work, were effective in determining projects and priorities. However, there were a number of problems associated with some of them. A few plans failed in project cost estimation, did a poor job of evaluating habitats and restoration potential that could be brought about via implementation of the project, and did a poor job of proposing and evaluating alternatives.

*A series of images shows the progressive improvements during the Bear Creek Meadow Restoration Project.*

In the area of restoration and rehabilitation, projects involving substantial engineering and heavy equipment operations were often significantly underestimated in the following areas: (i) costs for engineering work; (ii) time needed for the engineering plans, documents, and permits to be completed; (iii) time for environmental documents and permits to be completed; and (iv) a lack of understanding about the full range of permits and documents needed for the project. It became apparent that many projects suffered from a lack of consultation with, and involvement by, engineers.

Several projects failed because the grantees did not ensure landowner acceptance of the project prior to submitting a grant proposal. One project failed when costs escalated to more than double

the original estimates, due to changes in county construction regulations and increased construction costs. Another project was cancelled after expenditure of one-half of the allocated funds, and was only partially completed. This was due to the loss of key personnel who had written and submitted the grant. Once these interested personnel left, there was no further interest in completing the work.

Work on another project could not be initiated, nor was the construction plan brought to completion. This occurred for two main reasons: (1) steel costs rose dramatically, nearly doubling estimated costs for the necessary materials, and, (2) costs for the earth work were severely underestimated in the grant proposal, as submitted to the CTC for funding.

*Fishing access at Pollard Flat was improved.*

## Accomplishments

As mentioned in the introduction, many accomplishments were made over the life of the Cantara program. Overall, the Council feels that settlement dollars were spent in an efficient and effective manner. The following paragraphs touch on some of the program's successes.

*Department of Fish and Game biologists at work.*

Several properties were acquired for the purposes of habitat preservation, to increase public access, and to improve riparian habitat. Fishing access to the upper Sacramento River was improved. Riparian restoration projects offered new life to multiple watersheds, including the upper Sacramento River canyon.

Research projects enabled biologists to acquire invaluable information about the upper Sacramento River's natural resources. For the first time, baseline data was developed for many river dependent species on the upper Sacramento River. Recovery periods for all species affected by the Cantara spill were documented. An improved understanding of the river ecosystem, from the point of sterilization to recovery, was attained.

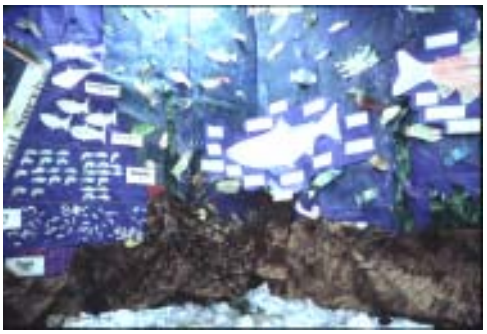
As part of the CTC's program, a ten-year fisheries monitoring program was conducted. A separate study discovered genetic differences between the wild upper Sacramento River trout and stocked hatchery trout, leading to an understanding of wild trout resiliency. Information acquired from these two studies helped DFG with the development of stocking practices and fishing regulations on the upper Sacramento. Ultimately, these processes assisted the recovery of the upper Sacramento River fishery.

*Dunsmuir School students collect aquatic invertebrates in the upper Sacramento River.*

Further accomplishments of the CTC are many, and varied. Watershed education programs were funded which benefited hundreds of school children. A series of aerial photos of the upper Sacramento River canyon were taken, documenting changes in the river and showing vegetation recovery. A number of river access points were improved to better provide opportunities for public access. Nesting platforms were constructed within the canyon to assist with osprey recovery — a pair of bald eagles used one of these to successfully raise a number of eaglets.

The ability to work effectively with a wide variety of groups was critical to the success of the Cantara program. Government agencies, schools, members of the public, angler groups, and many others were involved with the recovery of the watershed. Increased stewardship of the river and its watershed has resulted from these efforts.

Providing grant funding for projects was a central focus of the CTC's program. Overall, the grant program worked well and inspired various groups within the watershed to develop restoration projects. Grants for work in the affected area of the upper Sacramento River watershed were ranked highest by the evaluation tool. During the first four years of the grant program, projects were focused in this area. After this period, the number of applicants with projects in the upper Sacramento River watershed dwindled. The CTC expanded the scope of the grant program to



*A mural created by Dunsmuir Elementary students is displayed at the annual River Festival in Dunsmuir.*

increase the ranking for projects in the following counties: Lassen, Modoc, Shasta, Siskiyou, and Tehama. Expansion into these areas brought in many proposals, which were located within the extended Sacramento River watershed. The CTC's initiative process was also an effective tool that allowed a number of projects to be carried out that, for various reasons, would not have been brought before the CTC through the grant process.

## A Brief Summary of Grants, by Category

Habitat Acquisition and Resource Protection Projects

The Cantara Trustee Council (CTC) purchased five properties, encompassing 152 acres and two linear miles of riparian habitat. The properties are located on the Sacramento River, Clear Creek, and Battle Creek (*Figure 7*). Additional grants were funded in this category to protect and enhance trails, vegetation, and fishing access sites. A DFG warden was hired through a grant, to provide additional protection of the upper Sacramento River's resources during the early period of recovery.

*Battle Creek Wildlife Area acquisition.*

Public Information and Education Projects

This project category included grants for school watershed education programs, support for a local watershed stewardship program, radio public service announcements, videos, field guides, environmental education interpreters, and special events, such as Kid's Fishing Days. These projects were an important component of the CTC's program and reached thousands of people.

Study and Research Projects

Grants within this category were funded to investigate the recovery status of fish, mollusks, aquatic macroinvertebrates, birds, and vegetation that were affected by the spill. The goal of many of these studies was to determine injury and recovery under the terms of the NRDA.


*Figure 7.*

*Cantara Loop, Dunsmuir City Park addition, and Rhinesmith properties - approximately 76 acres along the upper Sacramento River, Siskiyou County.*


*Clear Creek acquisition - 20 acres located along Clear Creek in the city of Redding, Shasta County.*


*Battle Creek Wildlife Area acquisition - 80 acres along Battle Creek, Battle Creek Wildlife Area, Tehama County.*

Restoration, Rehabilitation, and Enhancement Projects

This was a broad funding category, which covered a variety of project types. Enhancement and rehabilitation projects commonly were carried out on public property to improve recreation or fishing access. Restoration projects sometimes included Geographic Information System (GIS) projects and plans for the on-the-ground work. A total of 291 acres and 76 linear miles of riparian habitat were restored. Five on-the-ground restoration projects were funded in the upper Sacramento River Watershed. These projects restored approximately 104 acres and 37 linear miles of riparian habitat.

## Wrap-Up of the Cantara Program

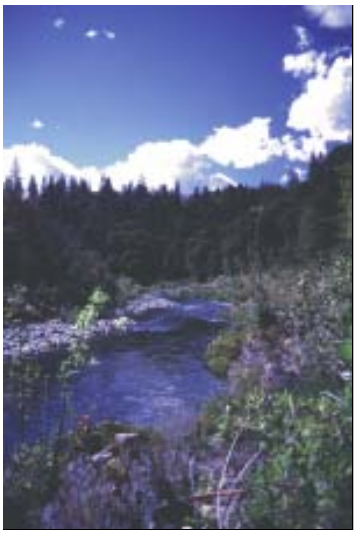
In the process of drawing our program to a close many small, and some large, tasks had to be accomplished. Records including administrative files, CTC meeting minutes, and grant files had to be organized and archived. A few grants remained open beyond the end of our program, which necessitated the assignment of DFG personnel for continued oversight. Many papers and reports were collected over the course of the Cantara program, as well as a large slide collection; these had to be organized and archived. The CTC's public website was assigned to a DFG server. Equipment and vehicles were dispersed as needed throughout the DFG's Northern Region headquarters. Some remaining specimen samples collected during the Cantara spill, that were preserved in formalin, had to be disposed of — it took some time to determine how best to handle these. In addition to these tasks, one more issue remained; there were still unallocated funds in the USRA. Many options were considered by the CTC about how to best utilize the remaining funds.

### How remaining funds were disposed of

Determining the exact amount remaining in the USRA, prior to the end of the Cantara Program, was difficult. Final closing statements and invoices were not available for processing until after the close of the program in June 2007. Remaining funds were directed to several existing endowment accounts and the Wildlife Conservation Board (WCB). Endowment funds were assigned specific dollar amounts by the CTC; all remaining dollars were directed to the WCB, with the stipulation that these be expended on riparian resources.

### Where reference materials and documents are deposited / available

References were deposited, and are held, at the California Department of Fish and Game's Northern Region facility located in Redding. Records are organized into the following categories: fiscal / grant related, scientific / administrative reports, and the Cantara slide collection, containing images from the spill.



## Status of the River — a brief update

It is not possible to make a definitive determination about natural resource recovery of the upper Sacramento River watershed. The lack of pre-spill data prevents the comparison of prior population numbers with latest survey results. Additionally, the upper Sacramento River is a dynamic system in which resource populations regularly wax and wane based on natural events, such as drought or flood. Though it is difficult to quantify results, it is clear that tremendous progress has been made towards recovery since the spill and the ensuing sterilization of the upper Sacramento River. A majority of post-spill surveys indicate that most of the natural resources are well on the way towards recovery.

### Aquatic Resources

Aquatic resources were the most pervasively affected by the spill. Data indicate that the upper Sacramento River's internationally renowned wild trout fishery has recovered and habitat appears healthy. However, not all aquatic species have recovered. Mollusks and giant salamanders suffered significant and potentially permanent population losses.

Fish

*Upper Sacramento River Angling Regulations, pre- and post-spill*

Prior to the spill, the upper Sacramento River below Lake Siskiyou and above Shasta Lake was divided into two fishing zones. The river below Shotgun Creek was a catch-and-release zone with a two fish limit, no gear restrictions, and no stocking. Above Shotgun Creek was a put-and-take zone, an area where hatchery fish are "put" in and anglers permitted to "take" caught fish home.

*Above: A view of the upper Sacramento River, at Pollard Flat.*

After the spill, the upper Sacramento River remained closed to all fishing and stocking for the remainder of 1991, and all of the 1992 and 1993 seasons. The California Fish and Game Commission (Commission) reopened the upper Sacramento River to fishing in 1994, and allowed limited stocking of hatchery trout in the Dunsmuir area. A six-mile stretch of river centered near Dunsmuir was designated as a put-and-take zone, with a five-fish limit, and stocking of hatchery fish. Barbless hooks were required until 1998, after which this river section was opened to unrestricted gear usage. The remainder of the river was open to catch-and-release fishing only, with artificial lures and barbless hooks (CDFG 2000). In 2002, the Commission adopted a regulation change which allowed a two-fish bag limit with continued artificial lure restrictions downstream of the Sweetbriar Bridge. The put-and-take zone around Dunsmuir was expanded to ten miles, from

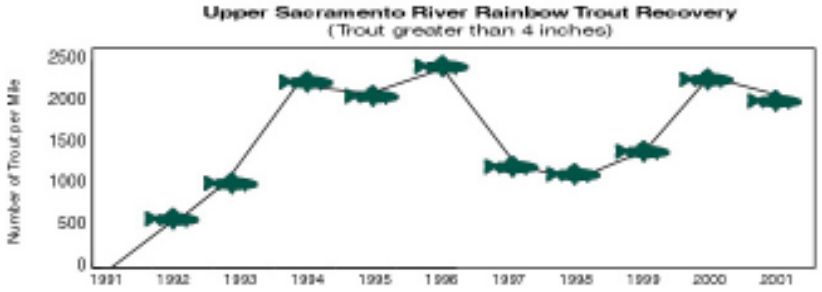



*Figure 8.*

Scarlett Way downstream to the Sweetbriar Bridge, with no gear restrictions. The reach upstream of Scarlett Way in Dunsmuir remained a zero-limit zone, restricted to artificial lures with barbless hooks, and catch-and-release (CDFG 2000).

In 2002, DFG implemented a creel survey to evaluate the effects of the 2002 regulation changes on the recovering trout population. Results from the survey showed that the annual wild trout harvest in the two-fish-limit zone was within acceptable limits as the rate of 1,500 fish was well below the annual natural mortality of 5,000-10,000 fish (Dean and Moore 2003).

With continued recovery of fish populations in the spill zone, DFG recommended one further regulation change in 2004, which the Commission adopted. The entire upper Sacramento River upstream of Shasta Lake and downstream of Box Canyon Dam was opened to winter fishing,

*A young fisherman provides information during a Department of Fish and Game angler survey.*

restricted to artificial lures with barbless hooks, and a zero fish limit (Dean 2005). The goal of this winter season was to maximize angler opportunity while minimizing effects on the wild trout population. Results of an angler survey conducted during this season indicated this goal was accomplished (Dean 2005).

*Fish Populations*

Based on Thomas R. Payne and Associates (TRPA) 1992 - 2001 annual dive count data, and DFG electrofishing and creel survey data, TRPA concluded that the rainbow trout population in the upper Sacramento River has likely recovered from the effects of the spill (TRPA 2005). TRPA observed that populations were fluctuating within the range of natural variation, and not likely to expand much beyond the density of 1,000 to 3,000 juvenile and adult trout per mile.

*TRPA divers survey fish populations.*

In addition to monitoring the wild rainbow trout (*Oncorhynchus mykiss*) population, TRPA surveyed spotted bass (*Micropterus punctulatus*) and nongame fish such as riffle sculpin (*Cottus gulosus*), pikeminnow (*Ptychocheilus grandis*), and Sacramento sucker (*Catostomus occidentalis*). Their surveys concluded that the riffle sculpin population continued to grow, and populations still had not peaked as of 2001. Pikeminnows approached peak densities by 1995, and subsequently fluctuated in abundance, but without statistical significance. Sacramento sucker abundance indices did not peak until 1998, and subsequently declined. Surveys found relatively low densities overall of pikeminnows and suckers, along with more limited post-spill distribution. These findings, coupled with the fact that these species are known to be relatively slow reproducers, suggested it may take additional years for nongame fish to reach full recovery. On the contrary, spotted bass densities were highest in 1995, when population growth ended, which may indicate a recovered equilibrium has been reached.

Crayfish

Signal crayfish (*Pacifastacus leniusculus)* are a non-native species in the upper Sacramento River that occupy an important niche in the ecosystem. Field work on crayfish concluded with a 1993 study by Ecological Research Associates (Brett and Goldman 1993). Subsequent research conducting quadrat sampling for riffle sculpin also recorded crayfish findings. The data from these studies suggested that it was likely that crayfish abundance was increasing (TRPA 2005). DFG concluded that the crayfish population would recover over time as individuals migrated from tributaries into the mainstem, and upstream from Shasta Lake (N. Manji, California Dept. of Fish and Game, personal communication).

*A Signal crayfish,* Pacifastacus leniusculus

Mollusks

Prior to the spill there was very little information on the fresh water mollusks of the upper Sacramento River watershed. DFG contracted with Deixis Consultants to conduct comprehensive mollusk surveys to attempt to determine species diversity and distribution in the watershed. Survey results showed that mollusk densities were low at all upper Sacramento River sample locations affected by the spill, as compared to the control sites. However, there were some indications that recovery was proceeding slowly. Two sites in previous post-spill surveys had either no mollusks or were uncharacteristically dominated by generalists, e.g. *Physella.* A 2003 survey showed that the populations at these sites had changed to contain species of more characteristic cold-water genera such as *Fluminicola* and *Vorticifex.* This reestablishment of a more typical species assemblage suggests continuing improvements in recovery and ecosystem stability.

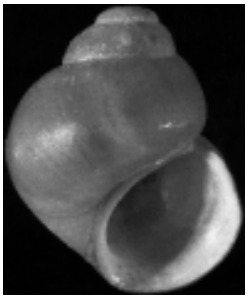


***Figure 10.*** *A new species - Fluminicola multifarius - the Shasta Pebblesnail.*

Aquatic Macroinvertebrates and Aquatic Vegetation

All members of the aquatic macroinvertebrate and aquatic vegetation communities were essentially eliminated by the spill. Macroinvertebrate surveys conducted by California Department of Water Resources in 2001 (Boullion 2006), showed higher densities of an Ephemeroptera-Plecoptera-Trichoptera (mayfly-stonefly-caddisfly) assemblage compared to chironomids (midges) and other

dipterans (flies) in two out of six sample stations. Chironomids and other dipterans represent species groups that are more successful under conditions of poor water quality or stress. The Ephemeroptera-Plecoptera-Trichoptera assemblage represents species groups that indicate high quality aquatic conditions. The conclusion of the 2001 study, however, showed that recovery of these insect assemblages was probably complete within a year and a half. Fluctuations in populations recorded since that time could not be assigned to recovery or lack of recovery, as they could not be distinguished from natural fluctuations brought on by storm events (Boullion 2006). In contrast, the aquatic vegetation dominated by periphyton (algae, fungi, and other assorted sessile organisms) appeared to be near recovery, by December 1991, although no pre-spill data existed (Reuter and Goldman 1993).

*Nymphs of a variety of aquatic invertebrates.*

## Terrestrial Resources

The Cantara spill had a wide variety of effects on terrestrial resources. Vegetation was significantly affected, while the most mobile forms of wildlife fled the spill's toxins, or attempted to relocate when food sources disappeared.

### Birds

Point Reyes Bird Observatory (PRBO) conducted post-spill surveys for riparian birds and ospreys. PRBO estimated that, as of 1996, the recovery of riparian birds was essentially complete, and osprey productivity would recover to baseline numbers by 1999. By 1994, DFG believed that osprey numbers in the upper Sacramento River canyon were possibly being limited by lack of nest sites due to anthropogenic disturbances. Eight artificial platform nests were constructed in 1994 and 1995 to enhance recovery (CDFG 1997). These nest platforms prevented a population loss from occurring after the spill

*An osprey surveys its surroundings in the upper Sacramento River canyon.*

by allowing immigration of adults from outside populations. In 2000, an additional platform was constructed. All platform nests were monitored from 1995-2005. Production on the artificial nest platforms reached its highest (14 chicks from 7 platforms) in 2004, proving the nests to be successful in boosting productivity. The first documented sighting of bald eagles nesting in the Sacramento River drainage, upstream of Shasta Lake, was in 1998. The pair of bald eagles used one of the platforms from 1998-2002; in 2005 they were found nesting in a live, natural tree just downstream. The pair has successfully produced a total of eight eaglets.

Mammals

River dependent and small mammal populations were minimally affected by the spill and quickly recovered to pre-spill conditions (Morrison 1993). Bats, on the other hand, had quite the opposite response. Bat populations were significantly impacted, and studies conducted in 1994 (Rainey and Pierson 1996) showed that recovery from the spill was slow. An additional study in 1996 (Rainey and Pierson 1997) suggested that the river was not sustaining bat populations as well as it had in 1992 or 1994. These results indicated the demography and density of the bat population was unstable. It was unknown whether it was due to long-term ongoing spill effects, or natural year-to-year variation.

*An otter along the bank of the Sacramento River.*

Amphibians and Reptiles

Amphibian and reptile surveys were conducted by Biosystems Analysis, Inc. (BSA), during 1991-1994. Foothill yellow-leg frogs (*Rana boylei*) were estimated to recover in 20 years; 22 years were estimated for garter snakes (*Thamnophis* spp.) (Luke and Sterner 1995). BSA estimated the recovery time for Pacific giant salamanders to be 27-35 years (Luke and Sterner 1995). In a preliminary relocation project conducted in 1994, surrounding Pacific giant salamander populations were surveyed in upper Sacramento River tributaries. These surveys found Pacific giant salamanders in 26 out of 28 tributaries, but densities were low. Due to the low abundance, Pacific giant salamanders found in other tributaries were never relocated and the project ended. This

species still may not have recovered from the spill. The impact on amphibian populations was quite different compared to terrestrial reptiles, which were insignificantly affected by the spill and populations remained unchanged (Morrison 1993; Luke and Sterner 2000a, 2000b).

*A butterfly feeds on milkweed in the upper Sacramento River Canyon.*

Terrestrial Insects

At this time, the recovery status of terrestrial insects is unknown though many species of insects have been recently observed. In post-spill surveys, it was found that insect abundance and diversity correlated with spill vegetation damage. Recovery of terrestrial insects may depend on the recovery of vegetation which is discussed below.

Riparian Vegetation

Riparian vegetation was surveyed by analyzing aerial photos taken along the upper Sacramento River in 1991 and 2001. Vegetation was mapped for six community types and three habitat types. Two community types were associated with riparian forests: mixed hardwoods, and canyon live oak. Three community types were associated with riparian scrub: foothill, montane, and mixed willow. One community type, herbaceous riparian, was associated with gravel bars, as were two of the habitat types: disturbed/transition, and gravel/sand bars. The remaining habitat type was open water (Lis 2005a).

*Observations of vegetation along the upper Sacramento River.*

Image analysis for the nine associations showed that, from 1991 to 2001, acreage for five community types declined, while it increased for the other four. Both types of riparian forest communities and two of the three types of riparian

scrub communities, decreased in acreage. In contrast, gravel bar and open water acreage increased. Montane riparian scrub was the only community of high riparian species diversity that increased.

Total acreage in the riparian forest communities decreased by 20 acres from 1991 to 2001, showing that recovery of these forests had not yet reached pre-spill levels. Because these communities reflect mature trees, their recovery is expected to be the slowest (Lis 2005a, b). It is probable that the riparian forest may take a minimum of 30-40 years to return to 1991 levels.

In the riparian scrub communities, foothill riparian scrub and mixed willow communities decreased by 25 acres subsequent to the 1991 analysis. High flood flows in 1997 and 1998 likely hindered recovery of these communities. An exception was an 82-acre increase of montane riparian scrub.

The communities and habitats associated with gravel bars increased by a total of 14 acres from 1991 to 2001. The greater value of disturbed/transition acreage in 1991, compared to 2001, suggested that the 1986-1992 drought negatively affected the upper Sacramento River's riparian vegetation.

## In Conclusion....

Throughout the long, slow process of monitoring and recovery of the upper Sacramento River, the Cantara Trustee Council has worked towards the goal of healing the river. Projects funded in the upper Sacramento River watershed included species monitoring and recovery studies, water quality studies, and preservation of lands. Through its efforts in working with members of the public, watershed groups, and agency representatives, the CTC succeeded in its goal. Today the upper Sacramento River once again supports the world-class fishery that it did prior to the spill.

## Financial Summary

### Assets

| | | |
|---|---|---|
| Income from Settlement | | |
| First Installment | $ | 1,800,000 |
| Second Installment | | 1,800,000 |
| Third Installment | | 3,300,000 |
| Fourth Installment | | 3,550,000 |
| Fifth Installment | | 3,550,000 |
| **Subtotal** | | 14,000,000 |
| Additional Income | | |
| Accumulated Interest | | 3,226,084 |
| **Total Income** | | **17,226,084** |

### Expenses

| | |
|---|---|
| Recovery Obligation | 695,905 |
| Grants and Contracts 1996-2006 | 10,975,734 |
| Land Acquisitions | 1,190,704 |
| Land Endowments | 441,999 |
| Operations Expenses - (includes rent, utilities, equipment and vehicle maintenance, office supplies, salaries, and overhead) | 3,564,949 |
| **Total Expenses** | **16,869,291** |
| ***Balance as of December 31, 2006** | ***356,793** |

*Estimated dollar amount - final invoices and interest income are pending. Upon final payments, all remaining funds will be transferred to the Wildlife Conservation Board.

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**APPENDIX C – Aditional Gray Literature Associated with the Cantara Spill** (a select list)


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## APPENDIX D - Grant projects funded by the CTC

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Avian Monitoring | Point Reyes Bird Observatory | 1995 | 45,000 | 44,999 |
| Riffle Sculpin Population Study | Thomas R. Payne & Assoc. | 1995 | 75,531 | 52,825 |
| Aquatic Macro-Invertebrate Recovery Assessment | Dept. of Water Resources | 1995 | 40,000 | 38,198 |
| Fall River Aquatic Monitoring & Assessment | Dept. of Water Resources | 1995 | 75,000 | 74,749 |
| Dunsmuir Schools Watershed Education | Siskiyou Co. Superintendent of Schools | 1995 | 50,000 | 49,957 |
| Battle Creek Wildlife Area Acquisition | Wildlife Conservation Board | 1995 | 165,000 | 165,000 |
| South Fork Sacramento River Fish Habitat | USFS — Shasta-Trinity Nat'l. Forest, Mt. Shasta Ranger District | 1995 | 40,899 | 40,899 |
| South Fork Sacramento River Cooperative Education Proposal | USFS — Shasta-Trinity Nat'l. Forest, Mt. Shasta Ranger District | 1995 | 8,644 | 6,253 |
| Rainbow Trout Genetics | USDA — Pacific Southwest Research Station | 1995 | 59,996 | 59,996 |
| Upper Sacramento Fishery Monitoring | Thomas R. Payne & Assoc. | 1995 | 162,950 | 162,950 |
| Cantara/Ney Springs Enhancement Project | Alan Pardee, Landscape Arch. | 1995 | 39,500 | 39,500 |
| Scott River Riparian Restoration | Wildlife Conservation Board | 1995 | 200,000 | 190,775 |
| Gap Analysis of the Upper Sacramento River Watershed | Enplan Environmental Scientists and Planners | 1995 | 32,490 | 32,490 |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Mollusk Recovery Monitoring | Deixis | 1995 | 36,820 | 36,012 |
| Freeman Ranch Cattle Exclusion Fencing | Great Northern Corp. / Shasta River Coordinated Resources Mgmt. & Planning Committee | 1995 | 61,531 | 58,123 |
| ID and Control of Pollution Sources in The Upper Sacramento River | Central Valley Regional Water Quality Control Board | 1996 | 610,017 | 474,001 |
| Upper Sacramento River Exchange | City of Dunsmuir | 1996 | 200,000 | 200,000 |
| California Welcome Center | Shasta Cascade Ed. Foundation | 1996 | 75,000 | 75,000 |
| Siskiyou Co. Minigrant Program | Siskiyou County | 1996 | 11,000 | 11,000 |
| 1997/98 CTC Staff Funding | Cantara Trustee Council | 1996 | 202,649 | 181,054 |
| Scott River Riparian Restoration II | Siskiyou Resource Cons. District / Scott River Wtrshed. Coordinated Resource Mgmt. Planning Group | 1996 | 47,692 | 47,692 |
| Plant Community Characterization of the upper Sacramento River Watershed | KEA Environmental, Inc. | 1996 | 170,905 | 170,889 |
| Willow Creek Riparian Restoration Project | Ducks Unlimited, Inc. | 1996 | 10,500 | 10,500 |
| Lassen Creek Restoration Design | Goose Lake Resource Conservation District | 1996 | 15,000 | 14,754 |
| Sulphur Creek Watershed Assessment & Action Plan | Sacramento River Watershed Action Group | 1996 | 27,000 | 26,959 |
| Pollard Gulch River Access Project | USFS — Shasta-Trinity Nat'l. Forest | 1996 | 175,000 | 170,411 |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Upper Sacramento River Exchange II | City of Dunsmuir | 1996 | 120,000 | 120,000 |
| Dunsmuir Schools Watershed Ed. Project | Dunsmuir Elementary School District | 1996 | 30,000 | 30,000 |
| Plant Community Mapping within the Upper Sacramento River Watershed | Univ. Foundation, Calif. State University, Chico | 1996 | 106,355 | 106,355 |
| Warden Staff Funding | Department of Fish and Game | 1997 | 278,583 | 227,253 |
| Conceptual Acquisition Plan — GIS | Department of Fish and Game | 1997 | 20,100 | 18,370 |
| GIS II | CSU, Chico — University Foundation | 1997 | 39,000 | 33,500 |
| Special Events Projects | Department of Fish and Game | 1997 | 26,000 | 25,296 |
| Angler & Recreation Surveys | Department of Fish and Game | 1996 | 120,000 | 105,935 |
| River Exchange Vision 2002 | Upper Sacramento River Exchange | 1997 | 520,404 | 520,404 |
| Special Events II | CSU, Chico Research Foundation | 1997 | 58,963 | 58,962 |
| GIS III | CSU, Chico Research Foundation | 1997 | 30,426 | 30,426 |
| Cantara Staffing | Department of Fish & Game | 1998 | 1,843,702 | 733,049 |
| 1998 Minigrants | Siskiyou County Fish & Game Commission | 1998 | 11,000 | 11,000 |
| Spring Creek Culvert Rehabilitation and Signal Crayfish Eradication | Maria J. Ellis | 1998 | 130,000 | 130,000 |
| Lassen Creek Restoration — Bishop Ranch | Goose Lake RCD | 1998 | 116,570 | 606 |
| Fall River Restoration | Fall River RCD | 1998 | 7,500 | 7,500 |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Watershed Education | Dunsmuir Elementary School District | 1998 | 55,932 | 55,932 |
| Castle Crags Interpreter | Department of Parks & Recreation | 1998 | 27,595 | 27,595 |
| Resource Radio | Ms. Helen Chambers-Aria | 1998 | 73,735 | 71,029 |
| Invasive Plant Control | Department of Parks & Recreation | 1998 | 33,000 | 29,925 |
| Cantara website Foundation | CSU, Chico Research | 1998 | 29,071 | 29,029 |
| Trailside, Make Your Own Adventure (video) | Teaching Learning Network | 1998 | 25,000 | 25,000 |
| Fishery Baseline Study | Thomas R. Payne & Assoc. | 1998 | 117,516 | 85,441 |
| Minigrant Program | Siskiyou County | 1999 | 11,000 | 11,000 |
| Special Events III | CSU, Chico Research Foundation | 1999 | 54,964 | 54,962 |
| Bear Creek Meadow Restoration | CalTrout | 1999 | 43,600 | 43,591 |
| Tauhindauli Park & Trail Foundation | Dunsmuir Garden Club | 1999 | 741,834 | 578,864* |
| Shasta Crayfish Habitat Enhancement | Ms. Maria Ellis | 1999 | 32,190 | 32,190 |
| Lower Clear Creek Land Acquisition | Bureau of Land Management | 1999 | 225,000 | 225,000 |
| Dunsmuir City Park Addition | City of Dunsmuir | 1999 | 315,000 | 315,000 |
| Sacramento River Acquisition Project | Wildlife Conservation Board | 1999 | 1,319,130 | 1,019,106 |
| Land Agent Funding | Wildlife Conservation Board | 1999 | 20,000 | 1,704 |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Lake Siskiyou Watershed Conservation Plan | Siskiyou County | 2000 | 98,200 | 47,724 |
| Restoration of Western Tributaries | Northern California Resource Center | 2000 | 204,640 | 197,029* |
| Special Events and Education Project IV | CSU, Chico Research Foundation | 2000 | 69,026 | 68,911 |
| Spawning Gravel and Erosion Inventory | Western Shasta RCD | 2000 | 165,434 | 164,875* |
| Big Bear Restoration | Fall River RCD | 2000 | 34,863 | 34,841 |
| Sucker Springs Restoration | Spring Rivers Ecological Restoration Sciences | 2000 | 45,000 | 45,000 |
| Lower Sulphur Creek Action Group | Sacramento Watershed | 2000 | 188,825 | 188,769* |
| Parker Crk. Fish Passage | USFWS | 2000 | 355,000 | 15,758 |
| Sacramento Mollusk Field Guide | Deixis Consultants | 2000 | 231,805 | 149,592* |
| Dunsmuir Schools Watershed Education | Dunsmuir School District | 2000 | 450,000 | 450,000 |
| Rapid Bioassessment Project | Department of Fish & Game | 2000 | 12,452 | 6,072* |
| Cantara Program Staffing & Project Mgmnt. III | Department of Fish & Game | 2001 | 1,302,610 | 627,019 |
| River Exchange Public Outreach Project | Upper Sacramento River Exch. | 2001 | 81,500 | 81,500 |
| Aquatic Macroinvertebrate Baseline Study | Dept. of Water Resources | 2001 | 26,512 | 25,148 |
| Special Events & Education Project V | CSU, Chico Research Foundation | 2001 | 75,653 | 75,379 |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Fishery Baseline Study II | Thomas R. Payne and Assoc. | 2001 | 140,897 | 140,887 |
| Vegetation Baseline Project | CSU, Chico Research | 2001 | 186,755 | 152,018* |
| Control of Himalayan Blackberry & Scotch Broom, Phase 2 | Dept. Parks & Recreation | 2001 | 88,913 | 88,913 |
| Riparian Riprap Restoration | River Exchange | 2001 | 45,200 | 40,725 |
| Barrier Modifications on Salt Creek and Olney Creek | Western Shasta RCD | 2001 | 90,000 | 53,983 |
| Creel Survey | Department of Fish & Game | 2001 | 56,734 | 51,360 |
| Mollusk ID & Recovery Monitoring | Deixis Consultants | 2001 | 168,240 | 82,511* |
| Tate Creek Restoration | USFS | 2001 | 155,500 | 120,401* |
| Wagon Creek Fish Passage | CalTrout | 2001 | 78,480 | 18,159 |
| Cantara Video | Cantara Productions | 2001 | 53,008 | 53,003 |
| Pollard Flat | USFS | 2002 | 18,940 | 18,109* |
| Shasta River Restoration & Habitat Improvement Project | Resource Mgmt. Company | 2002 | 109,962 | 109,962 |
| Special Events VI | CSU, Research Foundation | 2002 | 78,167 | 77,340* |
| Upper Pit River Watershed Enhancement & Protection Project | Central Modoc RCD | 2002 | 240,665 | 240,665 |
| Scott River Water Quality Improvement Project | Siskiyou RCD | 2002 | 315,489 | 270,754* |
| Upper Big Bear Restoration Project | Fall River RCD | 2002 | 695,545 | 693,580* |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Hedge Creek Falls Trail Project | River Exchange | 2002 | 225,000 | 183,349* |
| Riparian Restoration on Butler Slough | CSU, Chico Research Foundation | 2002 | 353,617 | 225,771* |
| Shasta River Fish Passage | Great Northern Corp. | 2002 | 76,000 | 76,000 |
| Cantara Program Staffing & Project Mgmt. III | Department of Fish & Game | 2003 | 1,111,436 | 1,024,777 |
| Special Events VII | CSU, Chico Research Foundation | 2003 | 81,954 | 81,954 |
| Hat Creek Bank Stabilization | CalTrout | 2003 | 27,770 | 27,723 |
| Redband Trout Genetics | UC Davis | 2003 | 102,500 | 102,500 |
| Rhinesmith Development Plan | River Exchange | 2003 | 35,810 | 35,810 |
| Scott and Shasta River Rotary Screw Trap Operations | Shasta Valley RCD | 2003 | 164,363 | 164,363 |
| Oregon Gulch Access Barrier | Western Shasta RCD | 2003 | 36,414 | 36,258 |
| Sacramento River Web Guide | CSU, Chico Research Foundation, GIC | 2004 | 32,000 | 25,384* |
| Upper Sacramento Winter Angler Survey | River Exchange | 2004 | 11,818 | 11,818 |
| Scott and Shasta River Rotary Screw Trap Operations, 2005 | Shasta Valley RCD | 2004 | 164,363 | 164,363 |
| Cantara Staffing & Program Mgmt. IV | Department of Fish and Game | 2005 | 520,396 | 134,940* |
| Cantara Staffing & CTC Support V | CSU, Chico Research Foundation | 2005 | 510,451 | 337,700* |

| Grant | Grantee | Year | Grant Amount | Amount Spent |
|---|---|---|---|---|
| Tauhindauli Park and Trail Maintenance | Dunsmuir Garden Club | 2006 | 14,500 | 7,250* |
| Lassen Creek | Goose Lake RCD | 2006 | 62,400 | 29,392* |
| Dunsmuir Schools Watershed Education Project | Dunsmuir Elementary School District | 2006 | 25,000 | 12,124 |
| Cantara Ney Springs Improvements and Endowment | Department of Fish & Game | 2007 | 167,000* | |
| Riparian Aerial Photo Interpretation | California State University, Chico Geographical Info. Ctr. | 2007 | 30,000* | |
| Tauhindauli Park Endowment Addition & Maintenance | Dunsmuir Garden Club | 2007 | 69,325* | |
| Upper Shasta River Fish Passage Project Addition | Shasta Valley Resource Conservation District | 2007 | 25,000* | |
| Kid's Fishing Day | Department of Fish & Game | 2007 | 6,000* | |

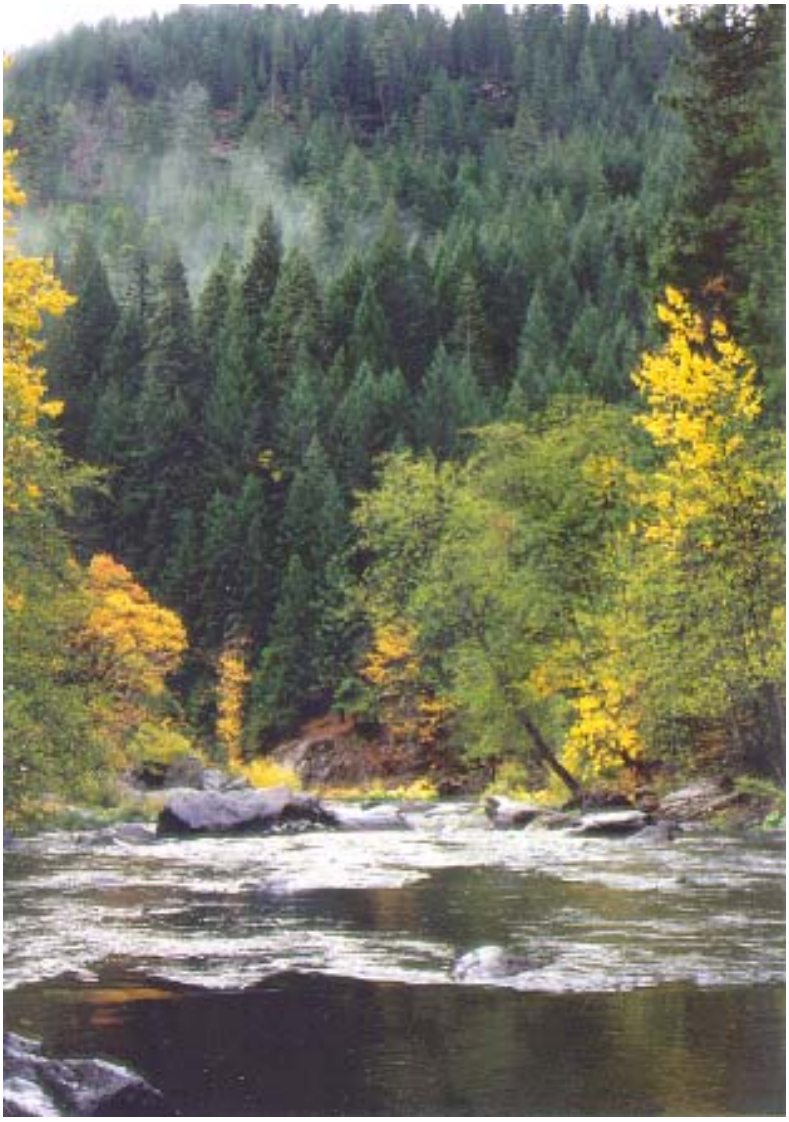
*Grants open as of March 2007

## APPENDIX E – CD CONTENTS

A. Summaries of Grant Projects

B. List of all grants funded by the CTC

C. List of published papers & gray literature associated with the Cantara spill



The upper Sacramento River.

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