SHASTA VALLEY RESOURCE CONSERVATION DISTICT

MASTER INCIDENTAL TAKE PERMIT APPLICATION

For

Coho Salmon (*Oncorhynchus kisutch*)

I. GENERAL INFORMATION

A. Application date: March 29, 2005

B. Applicant: Shasta Valley Resource Conservation District (SVRCD)
215 Executive Court, Suite A
Yreka, California 96097

Phone: (530) 842-6121 ext. 106
Fax: (530) 842-1027

C. Contact Person: Blair Hart
Chairman of the Board of Directors

Address and Phone: same as above

D. Project Description: The proposed project includes ongoing legal agricultural water diversions and other agricultural activities occurring within the Shasta River watershed.

E. Project Location:
The project area addressed in this application includes the entire 507,000-acres of the Shasta River watershed, located in Siskiyou County, Northern California (**Figure 1**).

F. Permit Duration: A term of 5 years is being sought by the SVRCD for this Incidental Take Permit. At the end of this Permit the SVRCD may seek renewal of the permit and update and modify any additional changes to avoidance, minimization, and/or mitigation measures required upon renewal.

G. Other Permits Required: The SVRCD is submitting a 1600-Lake and Streambed Alteration Agreement notification to the Department of Fish and Game concurrently with this Permit. In addition, NOAA Fisheries will issue take authorization pursuant to Section 10 of the Federal Endangered Species Act.

H. CEQA Lead Agency: California Department of Fish and Game (CDFG)
Northern California-North Coast Region
601 Locust Street
Redding, CA 96001

Contact Person: Caitlin Bean
Phone: (530) 225-2273
Fax: (530) 225-2345

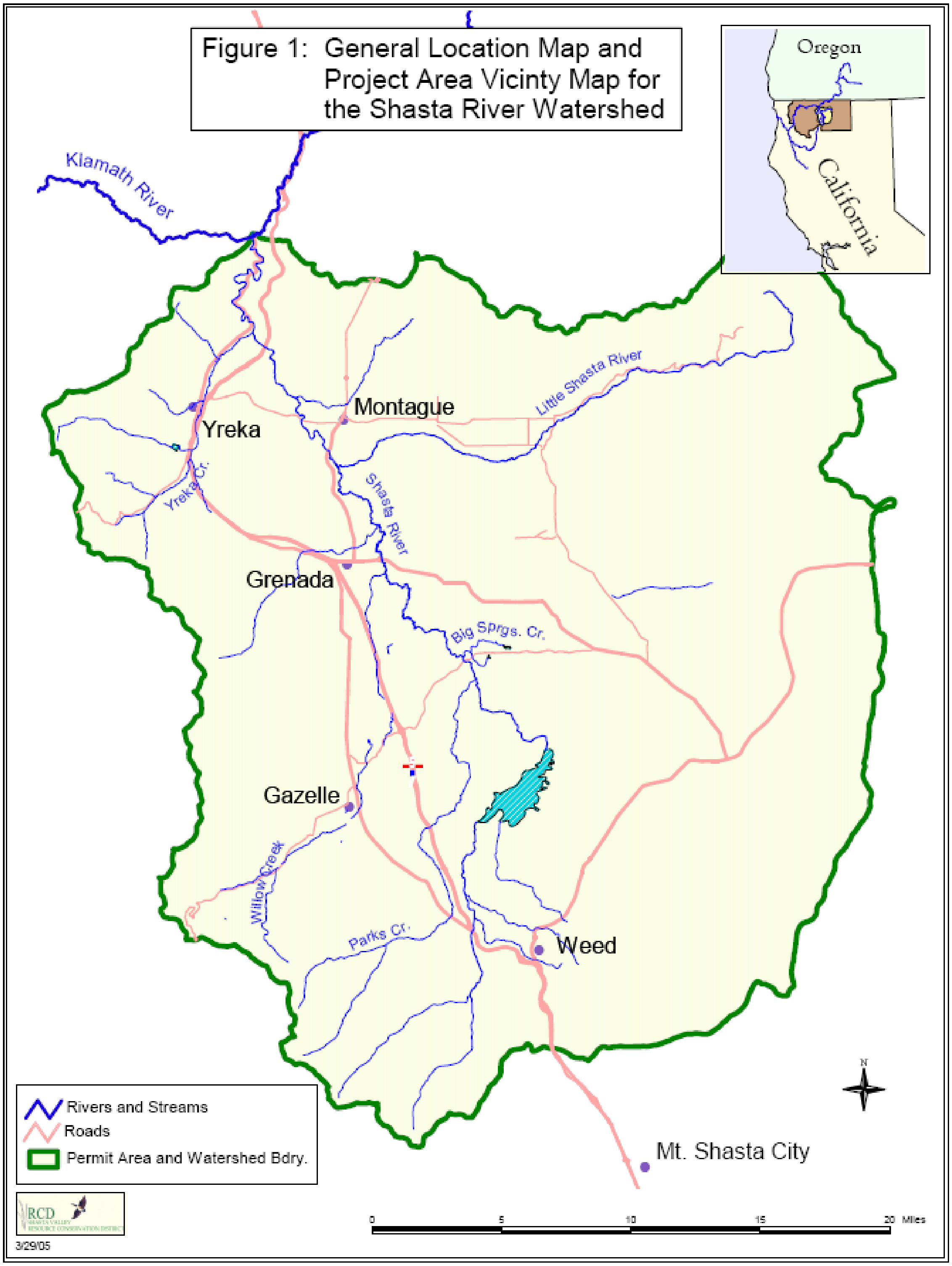
Figure 1: General Location Map and Project Area Vicinty Map for the Shasta River Watershed
Oregon
California
Klamath River
Yreka
Montague
Little Shasta River
Yreka Cr.
Shasta River
Grenada
Big Sprgs. Cr.
Gazelle
Willow Creek
Parks Cr.
Weed
Mt. Shasta City
Rivers and Streams
Roads
Permit Area and Watershed Bdry.
RCD
0
5
10
15
20 Miles
3/29/05

II. Biological Analysis

A. Species to be Covered: This Permit covers the following species:

Name	Status[1]	Subject to DFG Code 2112 and 2114
Coho salmon (*Oncorhynchus kisutch)*	Threatened	Yes

B. Project Description:

The project includes ongoing legal water diversion and other irrigation activities, livestock management, vehicular impacts, and ongoing fishery restoration activities[2]. For a complete list of activities for which take authority pursuant to Fish and Game Code Section 2081 is sought refer to Table 1-1 (**Attachment 1**). The RCD is applying for take authority that would be extended to existing legal agricultural water diverters, should they choose to participate in this general permit. A description of the sub-permittee contract structure is provided in **Attachment 7**.

C. Extent of project activity that may result in the incidental taking of coho:

Impacts to coho salmon as a result of the activities for which this permit is sought are identified in **Table 1-1** (**Attachment 1**). The table also provides information regarding the likelihood of coho occurrence during the time of activity and the consequence the activity may have on the species. A list of activities for which this permit is sought is outlined in **Attachment 2**.

D. Impacts to coho and their habitat:

Data collection on coho populations in the Shasta River watershed is not extensive and has only occurred in the past 5 years. Due to the lack of inadequate information and numerical data collected on current populations of coho within the Shasta River watershed, it is difficult to accurately assess the viability of the species and quantify the estimated incidental take that may result from implementation the activities identified in Table 1-1 **(Attachment 1)**.

The SVRCD along with the CDFG has analyzed actual data and literature values in the efforts of estimating take of coho in the Shasta River watershed. Discussions of the existing data and three different methodologies for estimating take are included in **Attachment 3*: Extent of take***.

E. Jeopardy Analysis:

Coho salmon populations in the Shasta River watershed have been subject to an ongoing level of take associated with water diversions and other agricultural activities for an extended period of time. The avoidance, minimization and mitigation measures presented in this application will minimize and fully mitigate for impacts related to these activities ***(*Attachment 4)**. Authorization of this project will therefore result in improved conditions for coho. Based on the best available

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[1] Refers to the CESA status. Under CESA, a species may be on the list of endangered species, the list of threatened species, or the list of candidate species. All other species are "unlisted".
[2]Activities not to be covered by this permit include municipal, industrial or mining water uses, along with power production for commercial purposes, and pesticide use in water delivery channels.

information, this project is unlikely to result in jeopardy to coho salmon in the Shasta River. A detailed Jeopardy Analysis is provided in **Attachment 5**.

F. Mitigation Measures:

In order to avoid, minimize and fully mitigate for incidental take of the coho salmon within the Shasta River watershed the SVRCD has prepared an *Avoidance, Minimization and Mitigation Measure Plan* (**Attachment 4).** As described in the plan, each individual water diverter would have primary responsibility for avoidance and minimization measures taken on their property. The SVRCD shall take responsibility for mitigation measures required to offset the potential for take.

G. Plan to Monitor Compliance and Effectiveness:

The Shasta Valley RCD is committing to numerous steps and measures to minimize and fully mitigate for take of coho in the Shasta Valley. In order to insure that the avoidance, minimization and mitigation measures outlined in Table 1-1 (**Attachment 1**) are implemented and successful at meeting their objectives, the SVRCD has prepared a *Monitoring Plan* (**Attachment 6).**

H. Sub-permittee Permit Structure and Contract Agreements with the RCD:
The RCD will enter into an individual sub-agreement(s) covering these matters with any water user who wishes to participate (sub-permittee) in this Master Incidental Take Permit. The avoidance, minimization and mitigation measures required of the RCD and individual sub-permittees should be roughly proportionate to the potential take by the sub-permittees and consistent with the specific operations of the sub-permittees. Sub-permittees may not be required to secure individual incidental take permits or Streambed Alteration Agreements other than the aforementioned sub-agreement(s). **Attachment 7** outlines responsibilities of the SVRCD and the sub-permittees. The sub-permittee agreement may be reviewed and approved by CDFG prior to SRCD entering into any sub-agreement with any sub-permittee.

I. Financial Assurances:
The Shasta Valley RCD has a twenty year history of applying for and receiving monies to implement the projects it has accomplished (See **Attachment 8** for additional information on grants received and projects accomplished). The measures contained in this application will be implemented with projects for property owners and districts under formalized contracts with those entities. Funding for these projects under the programmatic master permit will be accomplished in the same manner as in the past. In addition, those entities entering into contracts to receive the benefits of being covered by the programmatic master permit will be required to pay a fair and proportionate share of the permitting program costs of the Shasta Valley RCD to implement the legally required measures and actions and to administer the master permit. Those contracts and fees will be developed between the Shasta Valley RCD and the individual entity as described in Attachment 7.

The Shasta Valley RCD, as master permit holder, in its role as advisory body to the Natural Resources Conservation Service, shall also devise funding allocation guidelines that will assure that Federal Klamath EQIP funds (est. $750,000/year for three years) shall be dedicated to ITP specific measures.

The County of Siskiyou will seek funds through various sources such as appropriate granting agencies and the public utility re-licensing process, by seeking to have the utility, where appropriate, fund the appropriate PM&Es,. The County of Siskiyou will also attempt to pursue or consider other funding options that may be legally appropriate to help provide the legally required financial assistance/assurances.

Certification

I certify that the information submitted in this application is complete and accurate to the best of my knowledge and belief. I understand that any false statement herein may subject me to suspension or revocation of this permit and to civil and criminal penalties under the laws of the State of California.

Print Name Blair Hart **Date** March 29, 2005

Signature ____________________

Title Chairman of the Board of the Shasta Valley RCD

List of Attachments:

Attachment 1: *Table 1- Potential Impacts on SONCC Coho Salmon Due to Covered Activities as Described by the Shasta Valley RCD Incidental Take Permit and Proposed Minimization and Mitigation Measures*
Attachment 2: *List of activities for which take authority it sought.*
Attachment 3: *Extent of take*
Attachment 4: *Avoidance, Minimization and Mitigation Measure Plan*
Attachment 5: *Jeopardy Analysis*
Attachment 6: *Monitor plan*
Attachment 7: *Sub-Permittee agreement.*
Attachment 8: *Financial assurances*
Attachment 9: *SVRCD History and Accomplishments*

Attachment 1
Table 1-1
Potential Impacts on Coho Salmon Due to the Covered Activities as Described by the Shasta Valley RCD's Incidental Take Permit and Proposed Minimization and Mitigation Measures.

Covered Activity	Mechanisms of Take	Potential of occurrence *	Consequence **	Avoidance and Minimization	Mitigation Measures
Water diversion for legal irrigation purposes and water management and monitoring activities including watermastering activities.	• Individual fish may become trapped or crushed in diversion structures and/or pumps. • Entrapment and stranding of fish down diversion ditches/pipes with no return access to stream channels. • Stranding of fish due to rapid fluctuations in feeder stream water levels. • Decreases water levels may cause the loss of edge habitat suitable for foraging and protective cover. • Increased stream temperatures lethal to fish due to return tailwater. • Reduction of dissolved oxygen lethal to fish. • Limited access to upstream fish rearing habitat or to downstream migration corridors. • Behavior altering harassment of fish. • Temporary disturbance by pedestrians monitoring water flows, or fish populations from the stream bank. • Potential of turning off water due to illegal activities that are in of water rights and adjudicated law.	High	High	• Installation and maintenance of NOAA/CDFG compliant fish screens. • Support for watermastering services to assure proper allocation of water. • Install and maintenance of proper headgates, valve and gauges where necessary. • Installations of tailwater capture mechanisms on-site to insure collection of the minimum requirement. • DWR staff and/or private entities involving watermastering activities will minimize disturbance to riparian habitat while carrying out watermastering activities.	• Ramped irrigation capture in the spring to reduce rapid fluctuation of water depth and flow during the start of irrigation season. • Capture of additional tailwater from on –site or from neighboring fields. • Addition and/or enhancement of habitat for SONC coho such as construction of gravel redds, planting of emergent vegetation, placement of woody debris in channel will be coordinated with SVRCD, the landowners and CDFG staff.
Installation, operation and removal of water diversion structures (flashboard dams, gravel push-up dams, boulder weirs and/or	• Behavior-altering harassment of fish. Death by crushing or suffocation of fish nearby. • Temporary disturbance and loss of fish access to stream bank vegetation cover and substrate. • Poisoning of fish from machinery fuel and/or fluid discharge into streams or stream-connected channels.	Low	Moderate	• Fish passage mechanisms will be installed at all diversions and will meet NOAA/CDFG criteria for both adult and juvenile	

headgates and measuring devices).	• Adult and juvenile passage may be compromised depending on how long the diversion is in place and when it is placed in the stream.			salmonids. • Passages will be in place within 2 seasons of when the sub-permittee signs up for coverage under this permit. • Activities within the bed and bank of the stream will not occur starting October 15 until April 15th. • Fueling of equipment will occur away from the stream bank at designated re-fueling sites. Spillage of fuel will be minimized to the fullest extent.	
Installation of fish screens at water diversion and pumping locations	• Behavior-altering harassment of fish. Death by crushing or suffocation of fish nearby. • Temporary disturbance and loss of fish access to stream bank vegetation cover and substrate. • Poisoning of fish from machinery fuel and/or fluid discharge into streams or stream-connected channels.	Low	Low	• Initial construction activities within bed and bank of stream will be timed to coincide with conditions when fish are least likely to be present (July through September). • NOAA/CDFG-compliant fish screens will be maintained at all times while water is being diverted from the stream. • Operating conditions of the fish screens will be verified by random spot checks by the SVRCD or CDFG. • Fueling of equipment will occur away from	

				the stream bank at designated re-fueling sites. Spillage of fuel will be minimized to the fullest extent. • Construction machinery will be kept above bed and away from the bank of stream when ever possible. • If machinery needs to cross a stream or work within the bed an bank the activity must be overseen by either SVRCD or CDFG staff.	
Movement of livestock and vehicles across stream channel	• Behavior-altering harassment of fish. Death by crushing or suffocation of fish. Crushing and/or suffocation of fish eggs, located in redds. • Temporary disturbance and loss of fish access to stream bank vegetation cover and substrate. • Increased turbidity/suspended sediment associated with crossing streams makes fish prey and predator detection difficult, • Reduction of feeding opportunities, and possibly inducing behavioral modifications. • Suspended sediments may cause clogging and abrasion of gills and other respiratory surfaces, providing conditions conducive to entry and persistence of disease-related organisms. • Elevated turbidity levels can also affect the entire foodweb in streams by reducing stream photosynthesis and primary production which may result in the hindrance of benthic macro-invertebrate production. • Poisoning of fish from vehicle fuel and/or fluid discharge into streams or stream-connected channels.	Low	High	• Fencing will be installed to limit livestock access to stream bank. Fencing design and construction will be coordinated with SVRCD, the landowners and CDFG staff. • Crossing lane locations will be determined based on will be coordination with SVRCD, the landowners and CDFG staff. • Vehicles, equipment and livestock will not be allowed to cross flowing streams starting October 15 until April 15th, unless	

	• Increased nutrient input into stream by livestock waste which may alter the chemical make-up of the water.			specified otherwise pending CDFG approval. • Non-spawning gravel will be placed at appropriate locations in the stream channel when fish are least likely to be present – July through Sept, to reduce possible increased sedimentation at crossings and will be coordinated with SVRCD, the landowners and CDFG staff. • Fueling of equipment will occur away from the stream bank at designated re-fueling sites. Spillage of fuel will be minimized to the fullest extent.	
Grazing adjacent to streams	• Temporary disturbance and loss of fish access to stream bank vegetation cover. • Increased turbidity/suspended sediment associated with crossing streams makes fish prey and predator detection difficult, • Reduction of feeding opportunities, and possibly inducing behavioral modifications. • Suspended sediments may cause clogging and abrasion of gills and other respiratory surfaces, providing conditions conducive to entry and persistence of disease-related organisms. • Elevated turbidity levels can also affect the entire foodweb in streams by reducing stream photosynthesis and primary production which	Site specific	High	• Fences will be placed at a minimum 35-foot set-back to limit livestock access to stream banks and streams and will be coordinated with SVRCD, the landowners and CDFG staff. • Construction of fences will occur when the fish are least likely to occur	• Planting of native vegetation along stream banks and in stream channels will be coordinated with SVRCD, the landowners and CDFG staff.

	may result in the hindrance of benthic macro-invertebrate production. • Increased nutrient input into stream by livestock waste which may alter the chemical make-up of the water.			in adjacent streams (July through September). • Planting of riparian vegetation along stream banks will be coordinated with SVRCD, the landowners and CDFG staff. • Grazing along the stream corridor may occur as a mechanism of riparian management and will be coordinated with SVRCD, the landowners and CDFG staff.	
Installation and maintenance of livestock exclusion fencing and stockwatering lanes.	• Behavior-altering harassment of fish. • Temporary disturbance and loss of fish access to stream bank vegetation cover. • Increased turbidity/suspended sediment associated with crossing streams makes fish prey and predator detection difficult, • Reduction of feeding opportunities, and possibly inducing behavioral modifications. • Suspended sediments may cause clogging and abrasion of gills and other respiratory surfaces, providing conditions conducive to entry and persistence of disease-related organisms. • Elevated turbidity levels can also affect the entire foodweb in streams by reducing stream photosynthesis and primary production which may result in the hindrance of benthic macro-invertebrate production.	Low	Low	• Fencing will be constructed to control livestock access to stream banks and streams will be coordinated with SVRCD, the landowners and CDFG staff. • If fencing is needed across flowing stream channels, construction of the fencing will not occur starting October 15 until April 15th. • New fences installed upon initiation of this permit will be installed a minimum of 35-feet from the	• Planting of emergent vegetation and construction of redds in order to enhance or add to stream habitat will be coordinated with SVRCD, the landowners and CDFG staff.

				stream channel. • Existing set back on already installed fences will be maintained. • Fences will be maintained by the individual landowner. • The SVRCD will perform random monitoring on the status of fencing.	
Riparian restoration and revegetation activities	• Behavior-altering harassment of fish. • Temporary disturbance and loss of fish access to extant stream bank vegetation cover.	Low	Low	• Timed activities within bed and bank of stream will not occur starting October 15 until April 15. • Activities may include planting of native vegetation on the stream bank and will be coordinated with SVRCD, the landowners and CDFG staff.	• All riparian restoration or revegetation activities will be consistent with CDFG's Salmonid Stream Habitat Restoration Manual or otherwise approved by CDFG/NOAA personnel on a site-specific basis. • Installation of stream bank stabilization activities will be coordinated with SVRCD, the landowners and CDFG staff. • Planting of emergent vegetation and construction of redds in order to enhance or add to stream habitat will be coordinated with SVRCD, the landowners and CDFG staff.
Activities that will restore or enhance instream habitat conditions.	• Behavior-altering harassment of fish. • Temporary disturbance and loss of fish access to extant stream bank vegetation cover. • If installation work is required within streams, see five boxes above in this column for potential effects from suspended sediment, bed load, and toxic poisoning.	Low	Low	• Construction of instream habitat structures will be conducted when fish are least likely to occur – July through September. • Fish stream habitat	• Planting of emergent vegetation and construction of redds in order to enhance or add to stream habitat will be coordinated with SVRCD, the landowners and CDFG staff.

				structures will meet CDFG criteria for both adult and juvenile Coho salmon in place at the time the project is initiated. • Mechanical equipment fueling will be kept away from the bed and bank of the stream channel.	
Other activities associated with the implementation of minimization and mitigation measures such as tailwater capture basins, spawning gravel placement, woody debris, large and small, boulder clusters, weirs, and other habitat structures as well as fish rescue efforts.	• Behavior-altering harassment of fish. • Temporary disturbance and loss of fish access to extant stream bank vegetation cover.	Low	Low	• Construction of structures adjacent to stream channels will be conducted when fish are least likely to occur – July through September • Mechanical equipment fueling and servicing will be kept away from the bed and bank of the stream channel. • Revegetation will occur as needed to stabilize areas damaged from installation activities.	• Planting of emergent vegetation and construction of redds in order to enhance or add to stream habitat will be coordinated with SVRCD, the landowners and CDFG staff.
Activities associated with monitoring studies and effectiveness of this ITP permit.	• Behavior-altering harassment of fish. • Temporary disturbance and loss of fish access to extant stream bank vegetation cover and substrate.	Low	Low	• Research staff will minimize impacts to fish and their habitat, via timing of work, number of individuals affected, and intensity of impacts.	• Monitoring of implemented minimization and mitigation practices by the SVRC on a yearly and random basis.
Those activities as				• Installation and removal of barriers for	• Placement of riprap to stabilize bank will be

defined by the 1600 permit that are in issuance with the CESA criteria and are not arbitrated.				instream work • Installation and removal of silt barriers.	coordinated with SVRCD, the landowners and CDFG staff.
* The potential that the coho are within the vicinity of the stream at the time of covered activity. ** The potential negative consequence of the covered activity on coho.					

Attachment 2
Activities for which Take Authority is sought

The Shasta Valley RCD requests take authority for the following activities:

1. Diversion of water from streams, channels or sloughs within the Shasta River watershed for irrigation or domestic uses in accordance with a legal water right.

2. Installation, operation, and removal of structures used to control or divert water described in item 1 above, including:

   a. Flashboard dams
   b. Gravel push-up dams
   c. Boulder Weirs
   d. Headgates and measuring devices
   e. Other temporary structures

3. Installation, operation and maintenance of fish screens meeting CDFG/NOAA Fisheries criteria (at the time of construction) employed at stream diversions or pumping locations. These include:

   a. Self-cleaning screens, including flat plate self-cleaning screens, and other self-cleaning designs including rotary drum screens, cone screens, etc. with a variety of cleaning mechanisms.
   b. Non-self cleaning screens, including tubular, box and other designs consistent with CDFG/NOAA fisheries screening criteria.

4. Movement of livestock and vehicles across flowing streams at designated locations where incubating eggs or fry can be determined by the DFG not to be present in the substrate either due to the nature of the substrate or time of year.

5. Grazing of livestock adjacent to the channel of the rivers and streams when done in accordance with guidelines set forth by the SVRCD and approved by the CDFG which addresses the timing, duration and intensity of livestock grazing within the riparian zone so as to minimize negative impacts to riparian plants necessary for shading the stream or bank stability, and which includes a suitable monitoring and adaptive management plan to assure streambank recovery and health.

6. Installation and maintenance of livestock exclusion fencing and associated stockwatering lanes to protect the riparian zone of the rivers and streams in the Shasta Valley.

7. Water management, water monitoring and watermastering activities in accordance with the Shasta River Adjudication Decree and/or state water law.

8. Riparian restoration or revegetation activities that are consistent with the CDFG's Salmonid Stream Habitat Restoration Manual (3rd and subsequent editions) or are otherwise specifically approved in writing by DFG or NOAA Fisheries personnel (Flosi et al. 1998 as revised 2003).

9. Installation of instream habitat structures and habitat improvement measures consistent with the methods specified in the CDFG's Salmonid Stream Habitat Restoration Manual (3rd and subsequent editions) (Flosi et al. 1998 as revised 2003) or otherwise specifically approved in writing by DFG or NOAA Fisheries personnel.

10. Activities associated with the implementation of minimization and mitigation measures identified in the ITP, including irrigation tailwater reduction and capture projects, spawning gravel cleaning and supplementation, placement of large and small woody debris, construction of riparian fencing and controlled stockwatering access lanes, installation of pipelines to improve efficiency of use of diverted water or to provide for water substitution, instream work associated with the installation of new fish screens, instream work involved in providing for additional rearing habitat, and planting of riparian and emergent plants.

11. Activities associated with the implementation of compliance and effectiveness monitoring required by the ITP.

12. Studies to improve understanding of salmonid dynamics in the Shasta.

13. Any additional protective or mitigation activities specified in the master 1600 agreement.

References:

Flosi, G., S. Downie, M. Bird, R. Coey and B. Collins. 1998. California salmonid stream habitat restoration manual. 3rd edition as revised in 2003. California Department of Fish and Game, Native Anadromous Fish and Watershed Branch.

ATTACHMENT 3
Extent of Take

Introduction:

In order to estimate the extent of take occurring to coho in the Shasta River watershed three different methods were analyzed, then the best method was selected to be used. The following discusses where we were able to use actual Shasta River data as well as where literature review values had to be used in the analysis of extent of take in the Shasta watershed.

Method 1- 0+ coho outmigrant approach

Working Hypothesis:

Take is presumed to be occurring throughout the Shasta watershed where coho are present, but evidence of that take is lacking due to past inability to aggressively gather data. At the same time, large numbers of 0+ coho are leaving the Shasta and attempting to rear elsewhere in the Klamath Basin. Survival in the Klamath is presumed to be very poor due to inhospitable conditions during much of the summer. Some of those 0+ outmigrants are probably part of a natural process (and therefore are not "take"), and some of them are being forced out of the Shasta as flows decline and water quality deteriorates during the summer but would be able to stay if agriculture did not have impacts on their habitat (and therefore are "take").

This approach proposes to use the total number of 0+ outmigrants (i.e. both those that would leave naturally and those being forced out) as a surrogate for the real but unknown number of coho being taken both as 0+ outmigrants forced into the Klamath and not surviving, and those dying elsewhere within the Shasta watershed as a result of agricultural activities but whose bodies are never found.

Data Analysis:

Beginning in 2000, CDFG and the RCD have annually operated a rotary screw trap on the Shasta River to sample out-migrant juvenile salmonids, including coho and chinook salmon and steelhead trout. For each year, the trap has been located 0.25 miles upstream from the confluence with the Klamath River and was operated from February to June or early July.

Table 3-1 below shows the data collected between 2000 and 2004. The table shows counts data of actual trapped 0+ coho as well as estimated totals of all 0+ coho that are moving downstream into the Klamath based on estimated trap efficiency.

Table 3-1
Estimated 0+ coho In the Shasta River, California [3]

Year	Total Trapped	Expanded 0+ Outmigrant t Totals
2001	179	558
2002	381	2,447
2003	334	603
2004	230	727
Mean		**1,084**

[3] Chesney. 2004

As shown in **Table 3-1**, the total number of outmigrating 0+ coho was estimated using trap efficiency data. Trap efficiency is determined by marking a known number of downstream migrants, releasing them some distance above the trap and determining how many are recaptured. The percent recaptured is then expanded to develop a number representing the total expected number moving past the trap.

Because of the low number of 0+ coho captured in most weeks, it was not possible to estimate a trap efficiency for 0+ coho. Instead, an estimate of trap efficiency for 0+ chinook was used to estimate the total number of 0+ coho moving downstream past the trap. For weeks when it was not possible to estimate 0+ chinook salmon trap efficiencies, the trap efficiencies from the closest available period were used. If trap efficiencies were not available for a number of weeks, an average efficiency for the entire sample period was used.

Discussion:
Based on estimated trap efficiencies, a total number of 0+ coho juveniles moving downstream past the trap was projected for each year between 2001 and 2004 with a low of 558 in 2001 and a high of 2,447 in 2002 (**Table 3-1**). CDFG believes the majority of these fish are leaving the system prematurely in response to declining availability of rearing habitat as flows recede and temperatures increase following the start of irrigation season (Miller, 2004).

The number of 0+ fish leaving the Shasta River is also influenced by a variety of other factors such as the number of spawning adults in the prior year, water year type, and high flow events that may scour redds or result in decreased survival from egg-to-fry stages. The four years of available data encompasses at least some of this variability:

- 2002 was an extremely dry water year,
- 2003 was a relatively good water year.
- The large number of 0+ coho observed leaving the system in 2002 were the product of a large brood year
- The 2003 and 4 outmigrants were the products of relatively small brood years

Assumptions:
Several assumptions were made when analyzing the data above to calculate take of coho 0+ salmon in the Shasta River watershed.

Assumption 1: It is known that upon hatching from the redds, coho salmon usually stay for a little over 1 year in fresh water before migrating downriver and out to the ocean. However, the data shows that there is some downstream migration of 0+ coho out of the watershed. Due to the low water quality and increasing disease mortality rates (up to 85% for coho in some years) in the Klamath River (Williamson, 2005) it has been assumed that 0+ coho out-migrating from the Shasta River will not be able to find cold water refugia and therefore will die
Assumption 2 and 3: Building off of the above assumption, if the out-migration of 0+ salmonids is not a natural migration and is due to alteration of natural conditions then it suggests that 0+ coho would have moved naturally into colder waters upstream in the Shasta River watershed (most likely to cold water refugia in the main stem and colder tributaries) in order to rear prior to 1+ smolt out migration. This theory also suggests that under natural conditions the lower Shasta River region (RM-27 to the mouth) gets too warm during the summer months which would require those juveniles rearing in the lower sections of the river to travel upstream to colder areas of the Shasta or possibly would have been able to move into the Klamath if conditions there were suitable in the past.

Assumption 4: Agricultural related activities are the only cause of take to coho in the Shasta River and therefore no take is due to other human related activities such as non-point source runoff, urban development, and/or forest management practices. This method also assumes that no mortality is due to natural causes such as weather patterns, or predators, and that all 0+ outmigration is not natural.

Assumption 5: There is no immigration of pre-smolts (0+ coho) during the spring months into the Shasta River watershed and therefore all 0+ coho out-migrating from the Shasta River are a product of the watershed.

Conclusion:
If the 0+ coho salmon are prematurely leaving the Shasta River due to degraded habitat and water quality within the watershed and it is assumed that all 0+ coho die as a result of their premature departure then a take value could be determined based on the average total of 0+ coho out migrants. However, in the middle of this permit process the CDFG, who had originally proposed this method as an appropriate way to estimate take of coho in the Shasta River watershed, has since backed away from this approach of estimating take. Problems with this approach include:

1. It appears as though a substantial numbers of 0+ fry probably moved from Shasta to Klamath naturally and therefore should not be counted as take due to agricultural activities upstream and therefore negates Assumption 2 and 3.
2. Evidence exists that an unknown number of ~1 year old juveniles move from the Klamath into to Shasta River watershed in the fall for rearing prior to leaving for the ocean, and are occasionally observed in the course of counting fall chinook spawners entering the Shasta. (Bill Chesney, pers comm. ~2004). Some of those may have originated in the Shasta, left as 0+, then returned. If so, not all 0+ entering the Klamath die.
3. The rearing habitat in the Shasta River canyon is limited due to a variety of factors and agricultural activities up river are not the only cause to coho take in the watershed. Historic mining activities in Yreka Creek and the Shasta River canyon during the mid 1800's and 1900's have substantially altered the biotic conditions of the Shasta River (Siskiyou Pioneer, 2003).
4. This method appears to provide an overestimation of take while there is not an accurate method to provide a minimum take value.
5. This method creates a disincentive to increase coho numbers, as any increase in coho spawners is likely to yield an increase in 0+ outmigrants because rearing habitat in the Shasa Canyon is so limited.

Method 2- Density estimates based on habitat conditions:

Working Hypothesis:
This approach presumes that coho densities reported for several Oregon streams represent baseline conditions in the Shasta, and any deviation from those densities is "take" that can be attributed to agricultural activities.

Data Analysis and Discussion:
The second method for estimating take of coho salmon in the Shasta River watershed builds on coho population density data found in a report titled: *The Oregon Plan for Salmon and Watershed (*Solazzi, 2003*)*. According to studies on 7 creeks in Oregon the mean density of smolts per meter is approximately 0.39 (approximately 627 coho/mile) under natural conditions. Other studies

conducted by CDFG on Mill Creek, a tributary to the Smith River in Northern California, calculated an average density of 1,100 coho per linear mile (CDFG, unpublished).

Currently the Shasta Valley RCD and California Department of Fish and Game have been working toward modeling flows and temperatures in the mainstem Shasta River in order to gain a better idea of the extent of cold water refugia without irrigation water usage vs. their extent with irrigation water usage.. Once the study is completed, the data will be used to calculate the change in coho numbers based on literature density values with and without water usage.

Once completed a take value could be estimated based on the change of coho populations between pre and post agricultural activities. The CDFG has stated that this Incidental Take Permit needs to address as take changes in coho numbers currently found as compared to expected numbers if all activities covered by this permit were to stop as of the date this application is submitted (pers.comm. Martz et.al, 2005). See Method 3's discussion below on definition of "base-line" and "existing" conditions.

Assumptions:
Several assumptions were made when analyzing the data above to calculate take of coho 0+ salmon in the Shasta River watershed.

Assumption 1: Coho density project areas in Oregon and Mill Creek are comparable to the Shasta River watershed and it's tributaries under the full range of natural conditions that exist in the watershed.

Assumption 2: Using the model runs to predict the amount of cold water refugia habitat lost due to agricultural related activities suggests that cold water is the only habitat condition that controls mortality for the coho salmon in the Shasta River watershed. If cold water conditions is the only habitat condition that affect coho then it is assumed in this method that the cold water tolerances of the coho salmon in the Shasta River is comparable with the cold water tolerances of coho in the 7 streams in Oregon and Mill Creek and that food availability in all project area is also similar. Also, if cold water is not the only habitat condition that affects coho, then additional modeling will have to occur taking into consideration other habitat conditions such as woody debris in channel, bank condition, and riparian vegetation and gravel redds under both baseline and existing conditions.

Assumption 3: The model runs being used to calculate habitat ae able to accurately reflect what baseline conditions would actually be like in the Shasta River.

Assumption 4: That no other human induced activities are causing mortality of coho except for changes in water temperature and flow and that all mortality takes place only where human induced temperature changes in the main stem of the Shasta River can be modeled (downstream of Dwinnell Dam).

Conclusion:
Although the data to assess the extent of take based on habitat condition and coho density has still not been completed several reasons as to why this method may not be entirely appropriate in this estimation of take for the purposes of this ITP include:

1. The streams with published density values used in this assessment do not resemble the Shasta or the climate of the Shasta Valley, so probably do not accurately reflect coho densities within the Shasta River watershed.

2. Current habitat condition models are based on changes in water temperature and do not take into consideration other coho limiting habitat conditions.
3. It is assumed that all take calculated in this method is due solely to agricultural related activities.

Method 3 – Take by life stage using existing data, and literature values.

Working Hypothesis:
Values exist in the literature for ranges of survival normally encountered for coho salmon at each step in their life history. Sufficient data exists in the Shasta to select appropriate survival values from published ranges in many cases. By combining real Shasta River data with literature estimates a reasonable approximation of take can be arrived at, and an appropriate mitigation approach developed that will compensate for that take, all based on the same peer reviewed foundation.

Appropriate literature values and Shasta River data were assembled through the combined efforts of the CDFG and SVRCD. Shasta River data includes rotary screw trap data collected by CDFG and the SVRCD approximately 0.25 miles upstream from the mouth of the Shasta River (also used in Method 1). Counts of adult coho were obtained from the adult video weir station operated by DFG, located at the same site as the rotary screw trap Gravel quality data was reported by Ricker.

Based on the above, representative survival values can be estimated for each life history stage.

Data Analysis:
Table 3-2 below represents an analysis of existing data and literature reviewed values collected by CDFG and SVRCD staff. The table compares "baseline" and "existing" conditions by life stage in order to estimate the extent of take in the Shasta watershed.

Baseline conditions have been defined by the CDFG as those conditions that would exist if all of the covered activities defined in this permit were to stop instantly as of March 29, 2005 (the approximate date this application will be submitted). Existing conditions then are defined by the Department as those conditions that exist today assuming that covered activities continue and no avoidance, minimization and mitigation measures have been implemented (pers. comm. Martz, et.al. 2005).

The definition of what defines baseline and existing conditions is crucial in determining to what extent of impact the present day agricultural users of the Shasta Valley have on coho salmon in the Shasta River. As an example, historically speaking, the Shasta River has undergone drastic changes due to the severity of mining in Yreka Creek and the Shasta River canyon from the mid 1800's to the mid 1900's (Siskiyou Pioneer, 2003). Due to the nature of the mining activities the natural biotic communities in the Shasta River have been severely altered. The Department and the Shasta Valley RCD recognize that comparing historic to existing populations of coho puts an unfair burden on the agricultural producers in the Shasta Valley.

By establishing baseline conditions for this permit as those conditions that would exist if today's agricultural covered activities were stopped is a necessary step in developing an appropriate method of allocating take to the agricultural community. This approach means that impacts from any source (agricultural or otherwise) that do not fully correct themselves when covered activities cease necessarily become part of baseline conditions, including lack of large trees, sedimented gravels, etc.

In order to calculate estimated take using Method 3, existing data from rotary screw trap and video weir studies were analyzed (the rotary screw trap data is discussed in further detail in Method 1). Literature values were also extracted from a range of sources in order to calculate estimated populations of coho by life stage in the Shasta River. Sources for the data values inputted into **Table 3-2** are documented in the "Notes" column of the table. Where literature values produced a broad range of numbers, or Shasta River data did not exist, professional judgment was used as to the appropriate values. Assumptions in this analysis were made on the percent survival of egg to fry (for base-line conditions only) and percent fry to smolt survival (for base-line and existing conditions). As noted in the table, percent egg to fry survival under existing conditions was calculated using data referenced in a report that focused on gravel sediment in the Shasta River.

As shown in **Table 3-2**, the percent of egg to fry survival, based on actual field data from several locations in the Shasta River and literature values, is very low and spotlights the life stage where a majority of take of coho occurs in the Shasta River (data extracted from Cloern 1975 in Ricker 1997).

The biggest gap in this analysis of take is estimating the percent survival of fry to smolt in the Shasta River. The literature reviewed values are inconsistent and range from 0.7% to 65% (Sanderock, 1997; Chapman, 1965). Obviously this range is quite large and does not assist in determining an adequate survival rate of fry to smolt for the Shasta River. However, David Wah Kwai Au stated in his study of coho salmon dynamics in coastal streams that anything more than 20% fry to smolt survival was excessive (Au, 1972). Therefore the 20% value was used for the analysis of base-line conditions and an assumed value of 15% was used to represent existing conditions.

Discussion:
Perhaps one of the biggest problems with estimating take based on this method is that actual data indicates that the watershed is producing far more coho smolts then what the literature values state as the productive potential for the Shasta River (**Table 3-2**). This quandary is quantified in **Table 3-2** by comparing actual smolt data, collected by the Department of Fish and Game's rotary screw trap, with calculated numbers based on literature calculated values. Actual smolt data for the 2003 and 2004 years were used because they represent the offspring from the 2001 and 2002 adult spawners that entered the Shasta River and were recorded at the video weir respectively. However as the table shows, actual smolt production ranges from 2,314 in 2004 to 11,217 in 2003. These actual smolt counts are very different from the literature calculated values that range from 144 to 232 smolts under both baseline and existing conditions (**Table 3-2**). Two hypotheses are set forth below that attempt to describe why literature values and actual values are so different from one another.

Hypothesis One: Fry from other tributaries in the Klamath Basin immigrate undocumented into the Shasta River for over wintering rearing habitat.
Rotary screw trap activities commence in the early spring. Due to the timing of the rotary screw trap activities, fry from other tributaries along the Klamath River may immigrate into the Shasta River for winter rearing habitat and are not documented by the traps. Furthermore, if fry are immigrating into the Shasta River it is likely they reared in cold water tributaries such Bogus, Cottonwood, Beaver, Horse, Seiad and McKinney Creeks tributaries to the Mid-Klamath (see **Figure 4-6**).

Table 3-2
Calculated Estimates of Coho Populations in the Shasta River based on 2001 and 2002 Adult Counts and Existing Literature Values.

	Baseline Conditions		Existing Conditions		Notes
Actual adult count (2001)	291	291	291	291	Video weir data collected on the Shasta River (Hampton, 2005a)
Estimated % weir efficiency	50%	80%	50%	80%	Pers.comm. Hampton 2005b
Expanded spawner count	437	349	437	349	Calculated value
Pre-Spawner Survival	74%	74%	74%	74%	Values from literature review (Jong and Mills, No Date)
# of Females	61%	61%	61%	61%	Sex ratio extracted from radio tagging data on the Shasta River (Chesney, 2005b) and literature values range from 40 to 60%.
Redds/Female	1	1	1	1	
Fecundity	2583	2583	2583	2583	Iron Gate Hatchery 4 year average (pers.com. Rushton, 2005).
Total female spawners	**197**	**158**	**197**	**158**	Calculated spawners.
Fertilization rate	85%	85%	85%	85%	Literature values range from 70-100% (Croot and Marcolis, 1991)
Total fertilized eggs	**432,603**	**346,082**	**432,603**	**346,082**	Calculated eggs.
Eggs to Fry Survival	1.50%	1.50%	1.00%	1.00%	Existing condition values are based on Cloern (1976) research as noted in Ricker (1997) using existing Shasta River data (CDFG, 2005d). Base-line condition values are based on reduced risk of trampling and minor reductions in sediment in gravel.
Total fry	**6,489**	**5,191**	**4,326**	**3,461**	Calculated fry populations.
Fry to Smolt Survival	20.00%	20.00%	15.00%	15.00%	Assumptions based on literature values stating that anything greater than 20% is excessive (Au, 1972).
Total smolt	**1,298**	**1,038**	**649**	**260**	Calculated smolt populations.
Actual smolt (2003)	11,217	11,217	11,217	11,217	1+ Rotary Screw Trap data for the Shasta River in 2003 (Chesney, 2005c).
Number of smolts in excess of values predicted by the literature and field conditions.	9,919	10,179	10,568	10,957	May be due to immigration into the Shasta River from the Klamath or other tributaries (Actual smolt - Total smolt).

Table 3-2 continued with 2002 Adult Data					
	Baseline Conditions		**Existing Conditions**		**Notes**
Actual adult count (2002)	86	86	86	86	Video weir data collected on the Shasta River (Hampton, 2005a)
Estimated % weir efficiency	50%	80%	50%	80%	Pers.comm. Hampton 2005b
Expanded spawner count	129	103	129	103	Calculated value
Pre-Spawner Survival	74%	74%	74%	74%	Values from literature review (Jong and Mills, No Date)
# of Females	61%	61%	61%	61%	Sex ratio extracted from radio tagging data on the Shasta River (Chesney, 2005a) and literature values range from 40 to 60%.
Redds/Female	1	1	1	1	
Fecundity	2583	2583	2583	2583	Iron Gate Hatchery 4 year average (pers.com. Rushton, 2005).
Total female spawners	**58**	**47**	**58**	**47**	Calculated spawners.
Fertilization rate	85%	85%	85%	85%	Literature values range from 70-100% (Croot and Marcolis, 1991)
Total fertilized eggs	**127,848**	**102,279**	**127,848**	**102,279**	Calculated eggs.
Eggs to Fry Survival	1.50%	1.50%	1.00%	1.00%	Existing condition values are based on Cloern (1976) research as noted in Ricker (1997) using existing Shasta River data (pers.comm. Chesney, 2005d). Base-line condition values are based on reduced risk of trampling and sediment input into the stream.
Total fry	**1,918**	**1,534**	**1,278**	**1,023**	Calculated fry populations.
Fry to Smolt Survival	20.00%	20.00%	15.00%	15.00%	Assumptions based on literature values stating that anything greater than 20% is excessive (Au, 1972).
Total smolt	**384**	**307**	**192**	**77**	Calculated smolt populations.
Actual smolt (2003)	2,314	2,314	2,314	2,314	1+ Rotary Screw Trap data for the Shasta River in 2003 (Chesney, 2005c).
Number of smolts in excess of values predicted by the literature and field conditions.	1,930	2,007	2,122	2,237	May be due to immigration into the Shasta River from the Klamath or other tributaries (Actual smolt - Total smolt).

Several factors that may discredit this hypothesis include: 1) Are fry capable of swimming upstream from cold water tributaries into reaches of the Shasta River? and 2) How do the fry survive the deteriorating water quality conditions in the Klamath River prior to arrival at the Shasta?

However if this hypothesis is correct and that it is physically impossible for fry to migrate into the Shasta River from downstream tributaries, it may be possible that fry are immigrating from Bogus Creek, or Cottonwood Creek (cold water tributaries upstream from the mouth of the Shasta) (see **Figure 4-6**). Further studies are needed to determine whether fry are moving between these systems.

Hypothesis Two: The large numbers of undocumented fry may actually have originated from the Shasta watershed, out migrated as 0+ fry to other tributaries in the Klamath, and returned in the winter for further rearing t. This theory would therefore suggest that survival of eggs to fry in the gravel far exceeds the known literature values for the Shasta River watershed (as noted in Ricker, 1997).

If this hypothesis is correct, then the same questions arise as to where the out migrating fry rear in or around the Klamath River before they return the Shasta? This hypothesis also assumes that the young fry are somehow capable of surviving the low water quality conditions in the Klamath when returning to the Shasta in the fall or winter. This assumption does not support existing data that shows increasing disease mortality rates (up to 85% for coho) and poor water quality conditions in the Klamath River (Williamson, 2005).

Assumptions:
Assumption 1: the literature accurately reflects conditions in the Shasta River.
Literature values cited in **Table 3-2** are extracted from studies that were conducted outside of the Shasta River watershed and therefore may not necessarily represent similar conditions within the watershed.

Assumption 2: all take occurring in the Shasta River is due to agricultural activities.
By using the change in population of coho between "baseline" and "existing" conditions, it is being assumed that all take has occurred due to agricultural related activities and therefore omits any incidental take that may be due to other human induced activities such as municipalities, roads, forestry and/or mining practices and natural morality due to weather, beaver etc. Because many other factors also play a role in the declining populations of coho in the Shasta River, the take determined by this analysis is an overestimation and actual take that occurs due to agricultural activities.

Assumption 3: the video weir data accurately represents the true numbers of adult coho.
In addition, while the above video weir data confirms the continued presence of coho migrating into the Shasta River system; annual differences in timing of the video weir operation and weather may not accurately represent the true numbers of adult coho migrating into the Shasta River watershed. Weir efficiency estimates were not based on data.

Assumption 4: *if baseline conditions exist then suitable rearing habitat is available in what are now lethally hot reaches of the river during the summer months.*
It is known that upon hatching from the redds, coho salmon usually stay for 12 to 18 months in the fresh water before migrating downriver and out to the ocean. However, data collected from the rotary screw traps indicates that there is some downstream migration of 0+ coho. Therefore CDFG biologist have suggested that the 0+ coho out-migrating from the Shasta River to the

Klamath River will most likely die due to low water quality and a lack of suitable habitat in the Klamath with an assumption that the 0+ salmonids are unable to seek refuge in other cold water refugia, such as nearby tributaries, where they can rear for the remaining year before migrating to the ocean (pers.comm. Chesney 2005b).

Assumption 5: if baseline conditions exist, no 0+ out migrants should be observed.
Building off of the above assumption, if baseline conditions existed, meaning that all activities covered in the permit were stopped which in turn would result in the return of full natural flow to the system, potentially suitable rearing habitat would exist all summer long or at least for longer periods of time in the lower reaches of the Shasta River region (RM-27 to the mouth) (Bennett, 2004). Therefore, if baseline conditions exist and outmigration of 0+ coho is not natural there would be no observed out-migration of 0+ salmonids and that instead the 0+ would remain in the system, either in the lower stretches of the river or move into cold water streams located higher in the watershed. This assumption will be examined in planned habitat modeling discussed in Method 2.

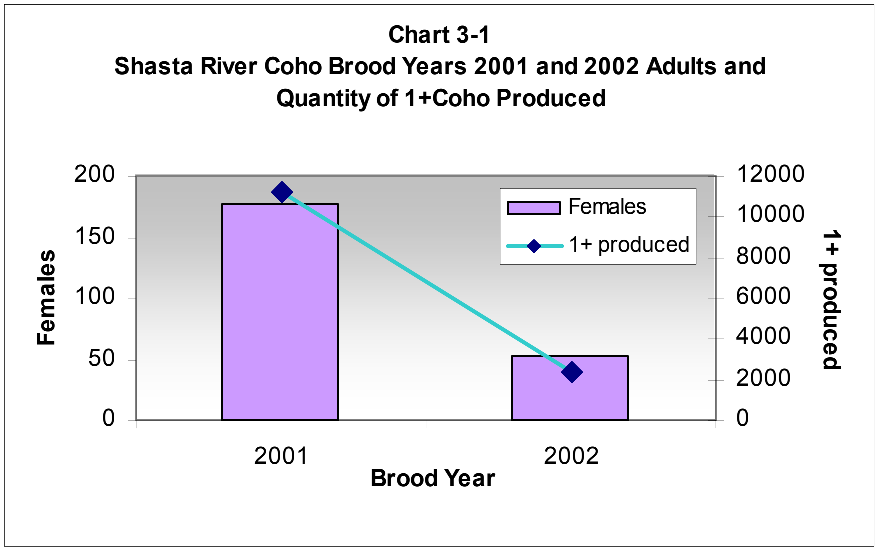
Method 3 Extent of Take Conclusion:
Conclusion 1: it is still very early to accurately determine extent of take of coho in the Shasta watershed.
This method of estimating extent of take draws heavily on literature values available on the life cycle of a coho. These literature values were extracted from studies that occurred outside of the Shasta River and therefore do not necessarily accurately reflect conditions within the watershed. Due to the lack of actual data, it is still very early to accurately determine the extent of take of coho in the Shasta River watershed. Further studies need to be conducted in order to gather additional information as to coho use and survival in the Shasta River watershed.

Conclusion 2: as population trends began to increase, the amount of take will also increase.
As this ITP permit is implemented changes to agricultural activities and their influence on coho habitat will occur. Therefore it must be clear that in order to be able to grow fish in the Shasta River the take values will also grow due to the increased populations. In addition, changes to existing activities may benefit one portion of the life cycle of the coho while altering, either for the better or worse, other parts of the cycle. This Incidental Take Permit is designed to allow percent survival to shift between life stages as long as the SVRCD is able to equal or exceed the pre-activity net of coho salmon in the Shasta River. For that purpose we will focus on smolt production. As the measures outlined in this permit serve their appropriate role and are successful, we will begin to see an increase in coho populations in the Shasta River. For additional information on proposed avoidance, minimization and mitigation activities see **Attachment 4** while **Attachment 6** describes the compliance and effectiveness monitoring plan.

Chosen Method to Estimate Extent of Take:

Of the data available and the various methods discussed above, Method 3 seems to be the most suitable method in estimating coho populations in the Shasta River watershed based on the best literature values available and actual data collected. This method also attempts to analyze conditions within the Shasta watershed based on the various life stages of the coho and therefore provides a much more in-depth perspective as to what life stages in the Shasta River are most vulnerable due to activities covered by this permit.

As shown in **Table 3-2** estimated mortality values were calculated based on literature and actual data for coho egg and fry. The mortality calculation for these two life stages was possible because direct mortality occurs within the Shasta watershed, whether it is due to natural or human induced activities. However, mortality of smolt and adult coho is more difficult to estimate because coho that originate in the Shasta watershed are exposed to conditions outside the control of the Shasta Valley community during their migration and rearing downriver and in the ocean. Therefore take and the success of the avoidance, minimization, and mitigation measures proposed with this permit will be analyzed based on the actual ratio of out migrant smolts to the immigration of adults that spawned them (**Chart 3-1**).



According to DFG data, shown in **Chart 3-1** above, there appears to be a strong correlation between actual out migrating smolt populations and immigrating female adults of the same brood year. Under existing conditions, by using 2001 and 2002 brood year data, one adult coho produces between 44.1 and 63.1 out migrating smolts*. According to a study entitled *Reference points for coho salmon (Oncorhynchus kisutch) harvest rates and escapement goals based on freshwater production* (Bradford, Myers and Irvine, 2000), an estimated 85 smolts per female were produced in 14 coastal streams in North America.

The 85 smolt per female index can serve two purposes in that it provides a recovery goal for coho in Shasta River watershed as well as a qualitative method to show success of the ITP measures. Success and therefore a qualitative method to prove that the impacts from covered activities are being minimized and fully mitigate for will be evident over time as the smolt to female ratio begins to trend toward the 85 recovery goal. If we are to use the above mentioned index as a goal for voluntarily recovery actions in the Shasta River watershed and as a way to measure the effectiveness of the minimization/mitigation activities we must make the following assumptions: 1) the current data may or may not count those smolts that rear in the Shasta River canyon and leave the watershed before being counted by rotary screw traps, 2) the index values for the 14 coastal streams accurately reflect conditions in the Shasta River although the system is further removed from the marine environment and exhibits harsher conditions than the coastal streams.

After thorough investigation of the literature and actual data, the Shasta Valley RCD believes that Method 3 is currently the best way to estimating the extent of take in the Shasta River watershed based on the best available data. Furthermore, monitoring adults and smolt numbers relative to the literature based smolt to adult index will provide a way to assure that the impacts of covered

* This ratio assumes that 61% of the recorded migrating adult coho are female (Chesney, 2005a).

activities are being fully mitigated. For more information on the monitoring of activities please refer to **Attachment 6: Monitoring Plan**.

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Attachment 4:
Outline (See main text below)

Attachment 4
Avoidance, minimization and mitigation measure plan.

I. Goals and Objectives:

The goals and objectives of the following avoidance, minimization and mitigation plan is to increase the viability of the coho in the Shasta River watershed, increase water quality and riparian habitat, minimize the effects of agricultural activities and restore coho habitat.

II. Introduction and overview:

The fundamental activity (i.e. the "project") needing coverage via this permit is irrigated agriculture, an activity entirely dependent on the ability to divert water from both surface and sub-surface sources for application to the land for the purposes of growing crops. Other adjunct activities also to be covered relate to livestock management, vehicular impacts, other water uses, recovery and restoration activities, and alterations to the stream, its bed or banks directly associated with the above activities.

The continued viability of coho salmon runs in the Shasta River is of great concern to all of us. Lack of instream flows necessary to meet the critical needs of coho during their spawning, incubation, and rearing cycles have been identified by some as a primary factor limiting coho survivability in the Shasta River. While it may not be possible to divert water for agricultural use and presume to avoid all potential take of coho salmon, efforts shall first be made to avoid and minimize take under the proposed permit and then fully mitigate the estimated impacts of any incidental take resulting from the covered activities of the participating individuals. Water diversion is the primary activity for which this permit is being sought. In order to fully mitigate for any possible take resulting, we recognize that we must cause the remaining habitat to increase in productivity to compensate for potential changes in survival resulting from the consequent and unavoidable change in water volume as a result of stream diversion and other covered activities.

Fortunately, because the best cold water habitat in the Shasta watershed is upstream of many large stream diversions, and because the majority of summer flows in those parts of the Shasta River accessible to coho as refugia originate from springs fed by glacial melt on Mt Shasta, considerable buffering exists in terms of the maintenance of reliable and relatively cold instream flows in key refugia areas through both normal periods and protracted dry cycles. This is a situation not found in many other streams. In developing our mitigation strategy, considerable reliance has been placed in part on these unique conditions in order to meet the ongoing legal requirements of the CESA.

Beyond the easily focused-on issue of flows, other water quality and habitat-related limitations are also extremely significant and will help form the foundation of mitigations proposed. Reduction in fine sediment, increased shade, enhanced instream habitat complexity, improved water quality, and other measures to assure improved survival all address identified limiting factors in the Shasta River, and will result in significant increases in coho survival over that found at the time of listing.

It needs to be noted that the landowners in the Shasta Valley have been actively and aggressively pursuing the recovery and restoration of their river and its anadromous fish since 1991. During that time, many of the fundamental remedial measures needed for coho recovery were begun, and have now been incorporated into the baseline condition of the river at the time of listing. The Shasta Valley RCD has been working with landowners in the watershed since 1953 on improving farming and ranching practices, upgrading water delivery technologies and other conservation and restoration activities. This Incidental Take Permit and its associated measures will be an extension of that long history of proactive efforts on resource related issues. For a more complete description of the Shasta Valley RCD's activities and the on going efforts by the community to reduce impacts to coho please refer to ***Attachment 9****: SVRCD History and Accomplishments*.

This ITP application contains all the necessary steps required to meet the legal requirements of an ITP. Other additional steps, not required by law but essential to the RCD's goal of coho recovery within its sphere of influence will continue to be pursued and implemented by the RCD as quickly and extensively as funds and opportunity allow.

Consistent with all of the above, it is the proposal of the RCD that each individual water diverter will have primary responsibility for minimization and avoidance measures, while the RCD shall take responsibility for any mitigation measures required. In addition to the proposed avoidance, minimization and mitigation activities contained in this document, **Table 6-1** (Attachment 6) outlines what monitoring requirements will be involved with each activity.

III. Avoidance measures:

In order to obtain coverage under this permit, the sub-permittees will have primary responsibilities for the following avoidance measures.

A. – Water management improvements to assure maintenance of instream flows.

Recognizing that water is the fundamental need of fish, new emphasis and additional oversight and reporting shall be put in place assuring that a) all water usage in the Shasta watershed is consistent with the terms of the court order and state laws regulating such activities, and b) that no participating individual will knowingly exceed his or her legal water right, and that c) additional mechanisms shall be put into place to assure that accidental excessive declines in flow shall not occur.

In addition, the existing Memorandum Of Understanding (MOU) between the California Department of Water Resources (DWR) and California Department of Fish and Game (DFG) will provide complete assurance that no diversion of water will result in take of coho (See MOU-Appendix 1 below).

Steps to accomplish these assurances include:

i. Watermaster Services

All persons covered by this permit and diverting water from within the Shasta River Watershed will be expected support ongoing watermastering services (either by DWR or by some other entity should DWR cease to provide that service), and pay their proportionate cost of that service to provide summer watermaster service in the Shasta Valley between April 1 and October 1 when instream flows are likely to be most critical to coho. Individual proportional costs for this activity are expected to continue to be collected by the County of Siskiyou via annual property taxes.

Those participants exercising riparian rights and not subject to watermaster control will cooperate with the watermaster in assuring they are within their legal water rights and will inform the watermaster of any changes in the quantities of water they will be diverting.

ii. Ramped diversion starts at initiation of irrigation season:

The onset of the irrigation season in the Shasta River watershed can cause dramatic reductions in stream flow if large numbers of irrigators begin taking water simultaneously, especially in dry years. This rapid decrease in flow may result in stranding of fish in shallow pools and side channels in the lower six miles of the Shasta River. In consultation with DFG and DWR, the Shasta Valley RCD shall develop and implement a management plan to coordinate and monitor irrigation season start-up so as to minimize rapid reductions in instream flows and the subsequent possible stranding of coho salmon at the beginning of irrigation season. A draft Ramped Diversion Plan will be submitted to DFG by January 1, 2007 with a finalized Plan submitted by January 1, 2008.

iii. Maintenance of instream flows:

Maintenance of instream flows in the mainstem Shasta River are of critical concern to the SVRCD, and essential to the successful completion of key life history stages of coho salmon, the prey species they rely on, and the riparian vegetation that protects water quality. All persons covered by this ITP shall endorse continuation of efforts by DWR or other private watermaster organizations, to assure that flows year around shall not be allowed to fall below 20 cfs minimum at the Shasta River near Montague (SRM) gage, a quantity that has been historically the watermaster's minimum target for flow at this location, nor that flows at A-12 shall fall below 45 cfs at any time during the summer, a quantity that will assure that substantial cold water refugia areas are retained upstream of that point. **Figure 4-1** shows DWR gage locations in the Shasta River watershed.

B. - Fish screening:

i. Summer and winter diversions:

Each diversion covered under this permit, including diversions for stock water, shall be fitted with fish screens meeting DFG or National Oceanic and Atmospheric Administration (NOAA) criteria in existence at their time of construction. Fish screens shall be in place and maintained at all times water is being diverted, and usage and proper operating condition shall be verified by random spot checking by the Shasta Valley RCD in consultation with CDFG. **Figure 4-2** shows those known diversions that need to be installed with fish screens. Where fish screens on winter diversions have not been installed due to icing, debris accumulation or other factors, the RCD shall develop and submit plans for conversion to an alternative system that does not require unprotected diversion of surface water from streams that are accessible to coho salmon. The RCD shall tentatively identify these diversions at the time individual sub-contracts are developed, and the user of those diversions shall convert to an alternative system within 2 years of coverage by an ITP subcontract should winter operation of fish screening prove problematic.

ii. Dwinnell releases into the mainstem Shasta River:

Since 1928 Dwinnell Reservoir has stored water for several downstream water users which the Montague Water Conservation District (MWCD) releases on demand for irrigation purposes. Because Dwinnell Reservoir contains large populations of non-native fish, these releases serve to exacerbate existing problems of predation. Should ITP coverage be provided to the MWCD their summer discharge into the river shall be screened.

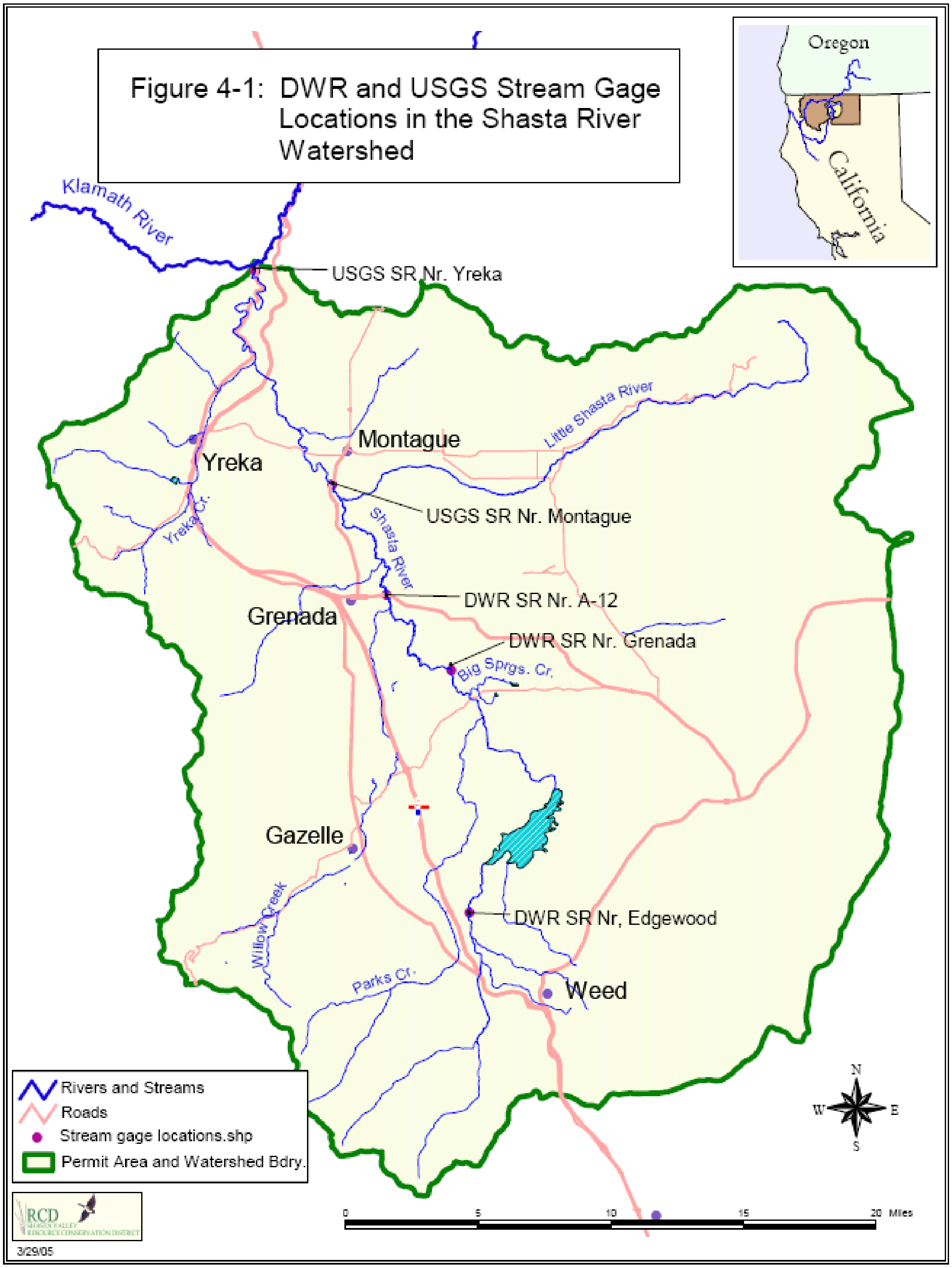


Figure 4-1: DWR and USGS Stream Gage Locations in the Shasta River Watershed

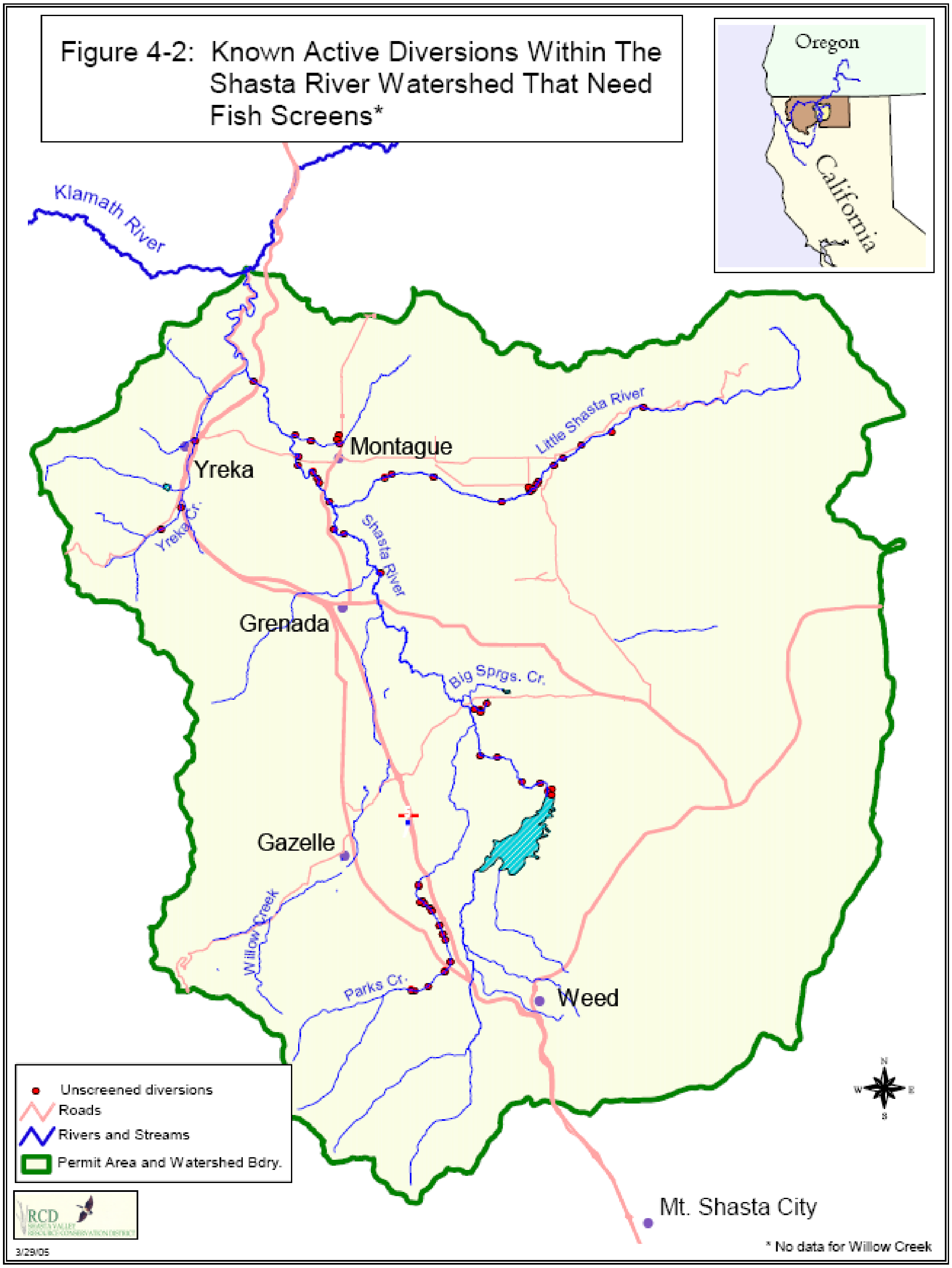


Figure 4-2: Known Active Diversions Within The Shasta River Watershed That Need Fish Screens*
Oregon
California
Klamath River
Yreka
Montague
Little Shasta River
Yreka Cr.
Shasta River
Grenada
Big Sprgs. Cr.
Gazelle
Willow Creek
Parks Cr.
Weed
Mt. Shasta City
Unscreened diversions
Roads
Rivers and Streams
Permit Area and Watershed Bdry.
RCD
3/29/05
* No data for Willow Creek

C. – Maintenance of Fish Passage

Each diverter covered by this permit shall provide fish passage meeting DFG criteria for both adult and juvenile coho salmon, both upstream and downstream, at each diversion structure. Where passage appears to be inadequate, plans for providing fish passage shall be developed no later than two summers after initial ITP coverage for any diversion. Annual reports shall be made by the owners of such barriers showing a substantial and on-going good faith effort to provide fish passage with an expected operational date on or before April 1, 2010.

If a sub-permittee under the RCD's ITP is found not to be adequately maintaining his or her fish passage device the sub-permittee will be given two days to fix the problem by the RCD, unless the violation is due to substantial damage beyond the control of the landowner and the sub-permittee is actively working to fix the problem, in which case the Shasta Valley RCD will extend coverage to the landowner for up to 3 months. If after the designated time period the sub-permittee is not able to assure passage the Shasta Valley RCD will remove coverage under the District's ITP permit. **Figure 4-3** shows where partial and/or complete fish barriers exist in the Shasta River watershed.

D. – Season of use/details of crossing areas:

The potential exists for disturbance of coho redds as a result of livestock, and vehicular traffic while eggs are in the gravel. Livestock operators shall not allow livestock and/or vehicles to cross the river or flowing streams between October 15 and April 15 to avoid any possible damage to coho redds, except on designated lanes where measures to prevent spawning have been taken or where spawning is deemed unlikely, as documented in writing by a local DFG biologist. Time of construction will occur when coho are least likely to be present and/or when water temperatures exceed coho tolerance levels, generally July through August. The RCD will verify with DFG when construction activities can begin.

Due to the uniqueness of landscape and conditions throughout the Shasta River watershed Shasta Valley RCD will work with landowners and the DFG on the appropriate placement for crossing areas. Sites will be selected based on the least amount of resulting impacts. The DFG will have final approval of the location and design of the crossing area.

E. – Timing of instream restoration projects:

Time of instream work on structural restoration projects will occur when coho are least likely to be present and/or when water temperatures exceed coho tolerance levels, generally July through September. Planting activities may require work at the stream edge, and therefore may need to be done outside the above mentioned window to assure survival of the plant species. If stream edge planting does need to occur while coho are present the RCD will verify with the Department and will minimize any direct and/or indirect impacts to species and habitat that may be present.

F. – Development of a dry year plan:

The SVRCD will develop a dry and critically dry year plan to assure that stranding, or elimination of needed cold water in refugia areas does not occur during extremely dry years. The Dry Year Plan will be developed by the SVRCD and will insure that previously described flows at 50 cfs at A-12 and 20 cfs and Montague-Grenada road are achieved. A draft Dry Year Plan will be completed by the SVRCD one year from the issuance of this permit.

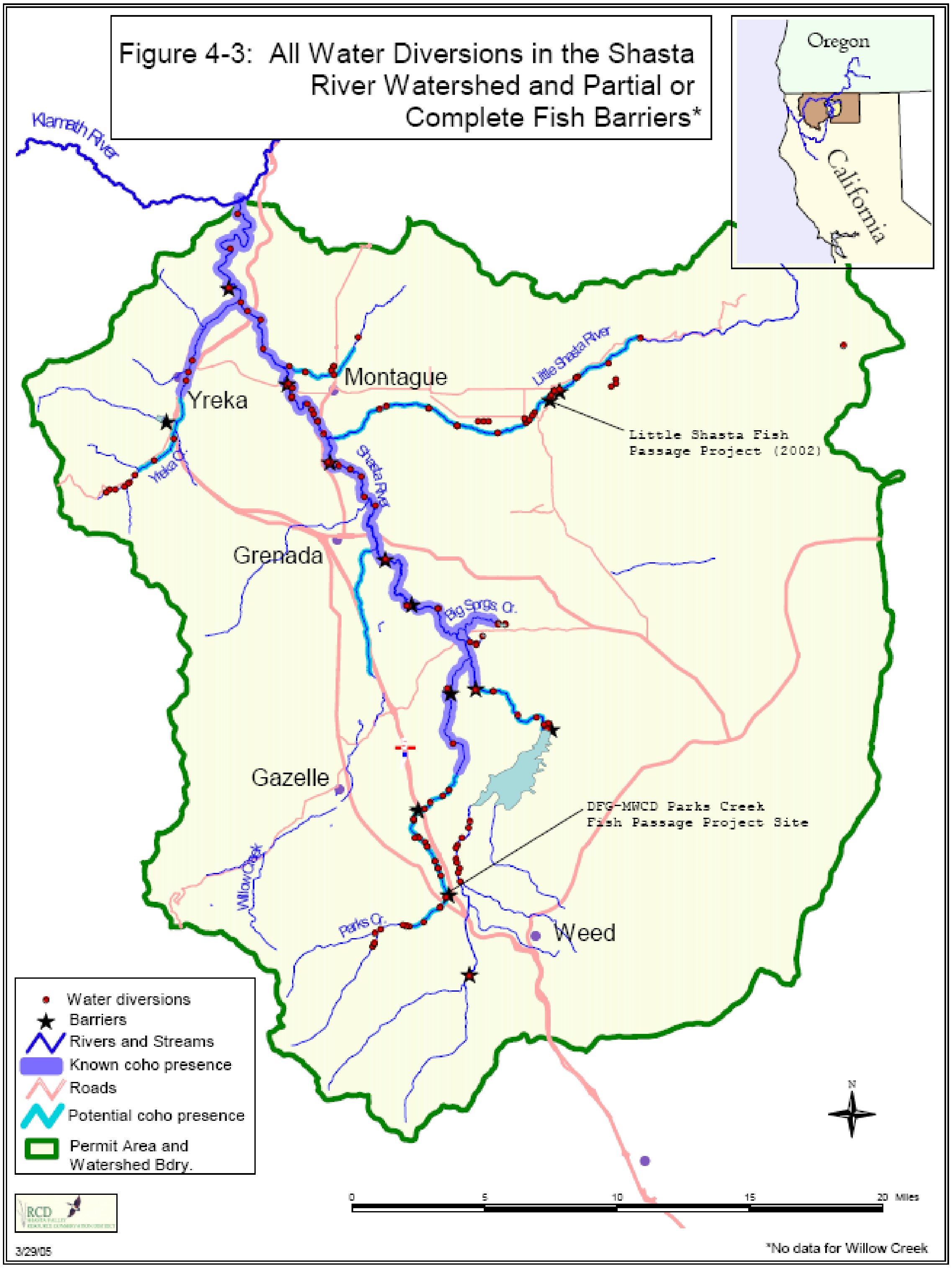


Figure 4-3: All Water Diversions in the Shasta River Watershed and Partial or Complete Fish Barriers*
Oregon
California
Klamath River
Yreka
Montague
Little Shasta River
Little Shasta Fish Passage Project (2002)
Yreka Cr.
Shasta River
Grenada
Big Sprgs Cr.
Gazelle
DFG-MWCD Parks Creek Fish Passage Project Site
Willow Creek
Parks Cr.
Weed
Water diversions
Barriers
Rivers and Streams
Known coho presence
Roads
Potential coho presence
Permit Area and Watershed Bdry.
N
0
5
10
15
20 Miles
RCD
3/29/05
*No data for Willow Creek

G. – Limiting equipment operations in or near streams:

Time of instream equipment operations will occur when coho are least likely to be present and/or when water temperatures exceed coho tolerance levels, generally July through September. The RCD will verify with DFG when operations can begin. To the extent possible all work shall be done from outside the channel and all refueling of machinery shall be done no less than 150 feet away from the edge of the stream.

IV. Minimization Measures:

Similar to the above avoidance measures, implementation of the following minimization measures will be the primary responsibility for those individual seeking coverage under this permit. All the following that apply to an individual sub-permittee shall be a requirement of ITP coverage for that individual (or organization).

A. - Gravel Push-up Dams

The historic practice for some irrigators is to utilize gravel from the bed and banks of the stream of create a diversion dam each irrigation season. In consultation with CDFG, the Shasta Valley RCD shall prepare and adopt a set of Best Management Practices (BMPs) governing the construction, operation and/or removal of gravel push-up dams if any users of these dams seek coverage under this ITP. BMPs for gravel push-up dams shall specify the conditions under which these structures may be used, including work windows for instream construction and removal, provisions for allowing passage of both adult and juvenile coho salmon, and measures to minimize downstream sedimentation and water quality impacts, appropriate equipment to be used and placement. By January 1, 2009, no one utilizing a gravel push up dam in the Shasta Valley shall be eligible for coverage under this or future ITPs issued to the RCD for use in the Shasta Valley unless those gravel dams are determined by DFG to be the best alternative, and for which BMPs approved by DFG are in place to minimize impacts.

B. – Improvements in riparian condition resulting from livestock exclusion:

Historically livestock grazing has caused considerable reduction in instream habitat via removal of riparian and emergent vegetation, trampling of stream banks, and contributed to degraded water quality through reduction in shading and increased sedimentation. Therefore, on properties owned by participants in this ITP, livestock exclusion fencing shall be in place on at least 90% of that person’s owned stream bank length where there is the potential to affect coho habitat, or fencing shall be in active progress towards implementation along those streams with installation by January 1, 2008, and/or shall have other CDFG approved livestock management measures in place that will provide similar protections to the streambanks and riparian zone. Livestock riparian exclusion fencing built after 3-30-05 needing to comply with this permit must be approved by the SVRCD, will be expected to have a setback of at least 35 feet from the normal high water line, and shall be maintained in good working order as long as this permit is in place and livestock are present.

Shasta Valley RCD will work with landowners and the DFG on the appropriate placement of fences. Potential results of fencing in combination with riparian plantings and or growth include:

i. Improvement in shading leading to lower water temperatures;

ii. Reduction in fine sediment delivery due to limiting livestock hoof impacts to stream, banks, and the encouragement of streambank vegetation *iii. Reduction of nutrient inputs will occur by limiting livestock access to stream channel.. Riparian vegetation will also act to filter any surface flows from pastures adjacent to streams.*

C. – Additional riparian habitat improvements by planting:

By limiting livestock access riparian vegetation will be encouraged to grow along the stream channel. In those cases where riparian vegetation is not able to re-establish itself naturally in a timely fashion, additional plantings of riparian vegetation may be necessary. Shasta Valley RCD will work with landowners and the DFG on the appropriate methodology and species selection on a site by site basis. Potential results of riparian planting in combination with fencing include those items *i -iii* discussed above.

D. – Bioengineered Bank Stabilization:

In areas where the streambank slopes have become unstable, bioengineered bank stabilization techniques may need to be implemented in order to prevent additional erosion into the stream channel. Bank stabilization techniques will be determined on a site-by-site basis. The Shasta Valley RCD will work with landowners and the DFG on the appropriate bioengineered bank stabilization techniques.

E. – Self -created tailwater Capture:

Those persons seeking coverage under the Shasta Valley RCD's Incidental Take Permit will be guided by the standards put forth in the RCD's *Draft* Tailwater Capture Policy (currently under development). The RCD considers tailwater impacts a matter of urgency if tailwater reaches a waterway inhabited by coho and will withhold coverage from persons creating tailwater who are not actively pursuing appropriate solutions in a timely fashion.

V. Mitigation Measures:

In order to assist the landowners with the burden and expense involved with coverage under this permit, the SVRCD will take responsibility and implementing the following proposed mitigation measures

A. – Prioritization of Mitigation Activities:

For all participants, whenever possible avoidance, minimization and mitigation will be first targeted on properties that individual owns that border streams potentially important to coho. Where that is not possible or where additional effort is required, the following will be utilized to target efforts:

As discussed in ***Attachment 3: Extent of Take*** and shown in ***Table 3-1, and also as discussed in Attachment 1, Table 1***, based on the best available data most of the mortality to coho in the Shasta River occurs during the egg to fry life stage as a result of egg suffocation (additional mortality during this life stage may be taking place as a result of trampling by livestock)--See **Chart 4-1** below. Data used to produce Chart 4-1 is from a combination of actual Shasta River data where available, or literature values. Description of data used is presented in greater detail in **Table 3-1** of Attachment 3.

As depicted in **Table 4-1** and **Chart 4-1** below, avoidance, minimization and mitigation activities that increase the survivability of eggs to fry provide the greatest opportunity for overall increases in coho smolt production in the Shasta River. Data used to produce the table and chart are based on literature values and actual data shown in Table 3-2. In Chart 4-1 and Table 3-3, smolts are used as a way to monitor the index of success for coho under CESA in the Shasta River because the egg, fry and smolt stages are those lifecycles that most likely are directly and/or indirectly influenced by activities in the Shasta Valley. Therefore during the life of this ITP permit (5 years) the SVRCD will prioritized its mitigation activities based on where the maximum potential increase in numbers of coho smolts currently exists in the Shasta River: spawning gravel quality protection, improvement and supplementation At the same time, the SVRCD also recognizes that additional rearing habitat improvement activities are appropriate in order to insure that the increased numbers of coho that will be the result of increased survival to emergence are capable of successfully rearing in the Shasta watershed as well. Therefore habitat improvement projects will also be included during this first 5-year ITP permit in order to assure satisfactory fry to smolt survival rates. Upon renewal of this permit, the SVRCD will reevaluate the prioritization of mitigation activities and determine what next steps are needed in order to continue to avoid, minimize, and fully mitigate for any take of coho in the Shasta River.

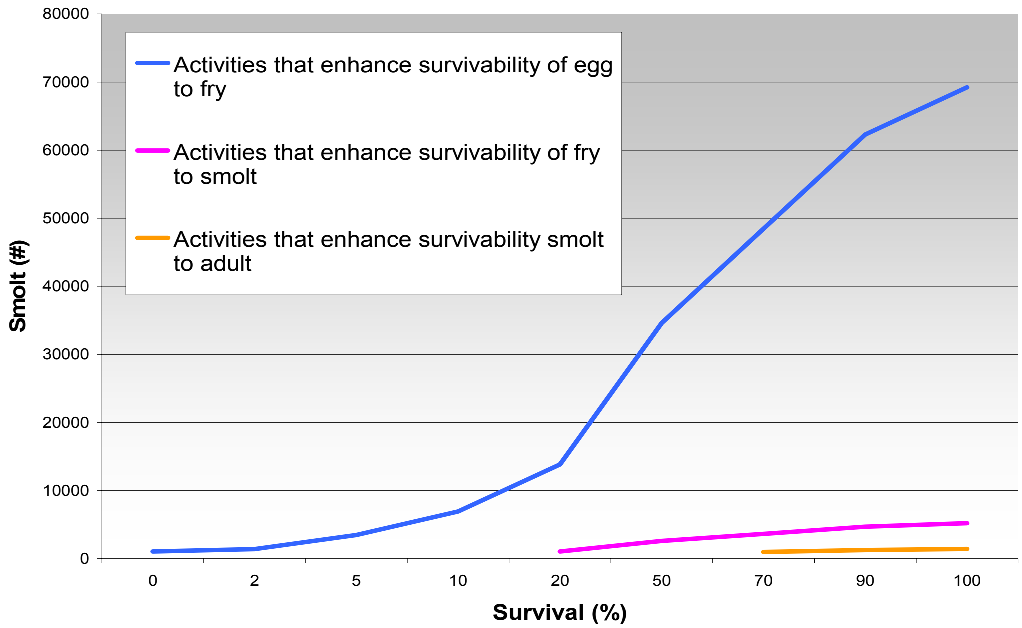
i. Activities that enhance egg to fry survival:

Spawning gravel additions and improvements
The type, quantity, distribution and size of substrate within a river channel have essential direct and indirect functions at several life stages for the coho salmon. Adult salmonids require gravel of an appropriate size and shape for successfully, building redds, and laying eggs. Eggs develop and hatch within the gravel substrate and alevins remain in the gravel for some time. The alevins use the gravel for protection and shelter from predators. Rearing salmonid juveniles also utilize the gravels located in faster flowing waters for protection from predators. Excess of fine sediment can significantly threaten eggs and fry because it reduces interstitial flow that regulates water temperature and dissolved oxygen (DO) levels, and reduces the removal of excreted waste. Fine sediments in gravel effectively reduce available spawning habitat as adults look elsewhere, and can suffocate existing eggs and emerging fry.

Table 4-1
Calculated survival of Coho in the Shasta River watershed based on activities that enhance individual life stages.

Survival	0%	2%	5%	10%	20%	50%	70%	90%	100%
Smolt populations with respect to activities that enhance egg to fry survival.	1038	1384	3461	6922	13843	34608	48451	62295	69216
Smolt populations with respect to activities that enhance fry to smolt survival.					1038	2596	3634	4672	5191
Smolt populations with respect to activities that enhance smolt to adult survival.							982	1263	1403

Chart 4-1
Potential to increase Shasta River outmigrant smolt numbers by increasing percent survival at any one of three life stages



This mitigation measure will act to restore exiting gravel via gravel cleaning projects and/or add additional new gravel at appropriate locations within the watershed. The SVRCD has identified priority areas in the Shasta River system, based on coho radio tag data provided by CDFG, and summer, temperature data from various sources. in order to enhance survival of egg to fry coho. Some of the characteristics used to define the location of potentially suitable areas for redds include: cold water sources (i.e. groundwater and/or spring inflow areas), adequate water flow through the summer, and adequate dissolved oxygen content (Croot and Marcolis, 1991). **Figure 4-4** shows the general region in the Shasta River and adjacent tributaries where existing gravels or potentially suitable gravel areas co-exist with suitable year around rearing habitat.

Gravel enhancement and replacement activities will be implemented by the SVRCD will work with landowners and the DFG on project specifics. The SVRCD will monitor implemented gravel enhancement and or replacement activities to see if the project was successful and determine the necessary frequency for renewal of the effort to maintain its effectiveness. Effectiveness monitoring is discussed further in ***Attachment 6- Monitoring Plan.***

i. Activities that enhance fry to smolt survival:
After emergence, fry may continue to hide in gravel and under stones during daylight in the vicinity of their birth place. Eventually as the fry grow they progress to the streambanks and take advantage of any cover that may be available. Fry tend to congregate in quiet backwaters, side channels and or small creeks where there is shade and overhanging branches (Croot and Marcolis, 1991). As shown in **Figure 4-4,** primary sites for habitat enhancement activities are located in the vicinity of coho redds. Eventually depending on the density of fry utilizing habitat near there place of birth, fry will move upstream or downstream to other areas with suitable habitat.

As a mitigation component for coverage under this ITP permit, the sub-permitee must insure that adequate riparian vegetation becomes established and appropriate woody debris is provided along the landowner's section of stream channel. The goal of the Riparian Revegetation mitigation measure is to provide sufficient habitat of appropriate water velocity and habitat complexity so that young juvenile fish will be able remain for longer periods of time closer to where they hatched, so that they will be better able to move upstream to areas with better habitat conditions as water temperatures warm, and so that juveniles of all sizes will have sufficient escape cover to reduce existing losses to predation by birds, mammals, other salmonids, and non-native fish.

Habitat restoration activities will be selected for individual implementation with the objective of enhancing rearing habitat for fry and smolt in the Shasta River watershed. Habitat enhancement activities include:

Improve baseline instream flows via water efficiency improvements:
Because water flow is crucial to coho survival rates of fry to smolts in the Shasta River, efforts will be made to improve baseline instream flows to the watershed via water efficiency improvement projects. The SVRCD will work with those entities seeking coverage under the ITP to assist them in their efforts to upgrade their overall irrigation efficiency. Potential projects that may be implemented to improve instream flows include upgrade of water delivery systems to reduce waste, upgrade of water application systems, monitoring of crop water requirements vs. soil moisture, etc.

Additional tailwater capture from off-site sources:
As discussed in the minimization section of this document, capture of on-site tailwater will be an important element in order to seek coverage under the SVRCD's ITP. The SVRCD recognizes however that not everyone will seek coverage and some may not have on-site tailwater capture systems installed. Therefore, the SVRCD will assist those landowners seeking mitigation for take allocated under the RCD's permit in the designing and implementation of tailwater capture systems that captures and reuses runoff from properties that are not their own (neighboring fields and/or farms). The capture and reuse of both on-site and off-site tailwater runoff will reduce the amount of river water needed for irrigation as well as reduce the amount of warm and/or nutrient rich water returning to the streams via run-off or underground seepage. Tailwater capture will assist in maintaining adequate cold water flows for fry to smolt survival as well as reduce the amount of nutrients water input into the system. Any tailwater capture system implemented under the SVRCD's Master ITP permit will be in accordance to standards outlined by the Natural Resources Conservation Services guidelines.

Addition of Woody debris in stream channel:
Woody debris provides substrate for the production of invertebrates fed on by coho. In addition it provides overhead cover to reduce predation, may be capable of directing hydraulic forces to create deep pond areas, and can provide sheltered backwater areas. Placement of woody debris along appropriate locations in the Shasta River watershed will be considered a mitigation activity under the SVRCD's Master ITP. Placement of woody debris will be in coordination with the Shasta Valley RCD, the DFG and the permit participant.

Planting of emergent and riparian vegetation:
Emergent and overhanging vegetation within a stream corridor provides many essential benefits to stream conditions and habitat. Vegetation serves to capture sediment and filter surface runoff, provides for stream-bank stability, and influences stream flow and micro-habitat formation. Riparian and emergent vegetation also help to moderate water temperatures, and provide suitable cover for rearing. Taller vegetation provides a cool microclimate and assists with the lowering of

the ambient air temperature near the stream. Riparian vegetation also serves as a cover from predators and supplies both insect prey and slow released organic nutrients to the streams.

Although in many situations stream bank vegetation will grow when livestock are excluded there are many situations where both emergent and especially woody riparian plants are not able to re-seed and establish themselves rapidly. Supplemental planting is often needed in those instances, and will be included as mitigations as appropriate. Compliance and effectiveness monitoring of this mitigation activity is discussed in ***Attachment 6: Monitoring Plan***.

B- Mitigation Activity Locations:

Because of the complexity and diversity of water temperature and habitat conditions throughout the Shasta River watershed the impact to coho due to water diversion in one part of the watershed may be greater or less than water diversion elsewhere on coho. In order to assure the greatest potential of success for each of the proposed mitigation measures discussed above the watershed was divided into sub-watersheds. By dividing the watershed into sub-regions, the SVRCD can further assess which mitigation measures are most appropriate for the region (**Figure 4-5).** The sub-watersheds shown in **Figure 4-5** were identified based on their unique locations and features and include tributaries such as: Parks Creek, Little Shasta River, and Yreka Creek. Furthermore the mainstem of the Shasta River was divided based on significant changes to habitat conditions and include river reaches such as: the Shasta River above Dwinnell Dam (RM-40), Dwinnell Dam to RM- 26, RM-26 to RM-7.75, RM-7.75 to the mouth of the river. Detailed descriptions of each sub-watershed are included in **Appendix 2** and summarized in **Table 4-2.**

C – Off-site mitigation:

As indicated by **Figure 4-4**, there is a very limited area under existing conditions where enhancement of spawning and/or rearing habitat can occur with maximal effectiveness in the Shasta River. In addition, it is difficult for the SVRCD to predict exactly how many individuals will seek coverage under this permit and more importantly where the individual properties are located within the watershed. Several irrigation districts are expected to seek coverage, and they do not border the streams at all. Therefore it is the SVRCD's responsibility to insure that there are enough places throughout the district where an individual seeking ITP coverage can fully mitigate for their allocated take of coho.

Existing data discussed in **Attachment 3-Extent of Take** documents that significant numbers of coho leave the Shasta as 0+ fry, which must rear elsewhere if they are to survive. Occasional observations of juvenile salmonids entering the Shasta in the fall suggests that some portion of the coho smolts counted leaving the Shasta may have entered the Shasta as approximately 1 year old fry during their first fall/winter, which would also require that they were able to rear elsewhere before moving into the Shasta.. These observations suggest that the Shasta coho population is part of a larger metapopulation that circulates within the Klamath and its tributaries near the Shasta

Beyond fry related considerations, smolts exiting the Shasta need to successfully traverse the Klamath on their way to the ocean. Water quality and habitat conditions outside the Shasta ultimately affect overall success at sustaining coho populations in the Shasta.

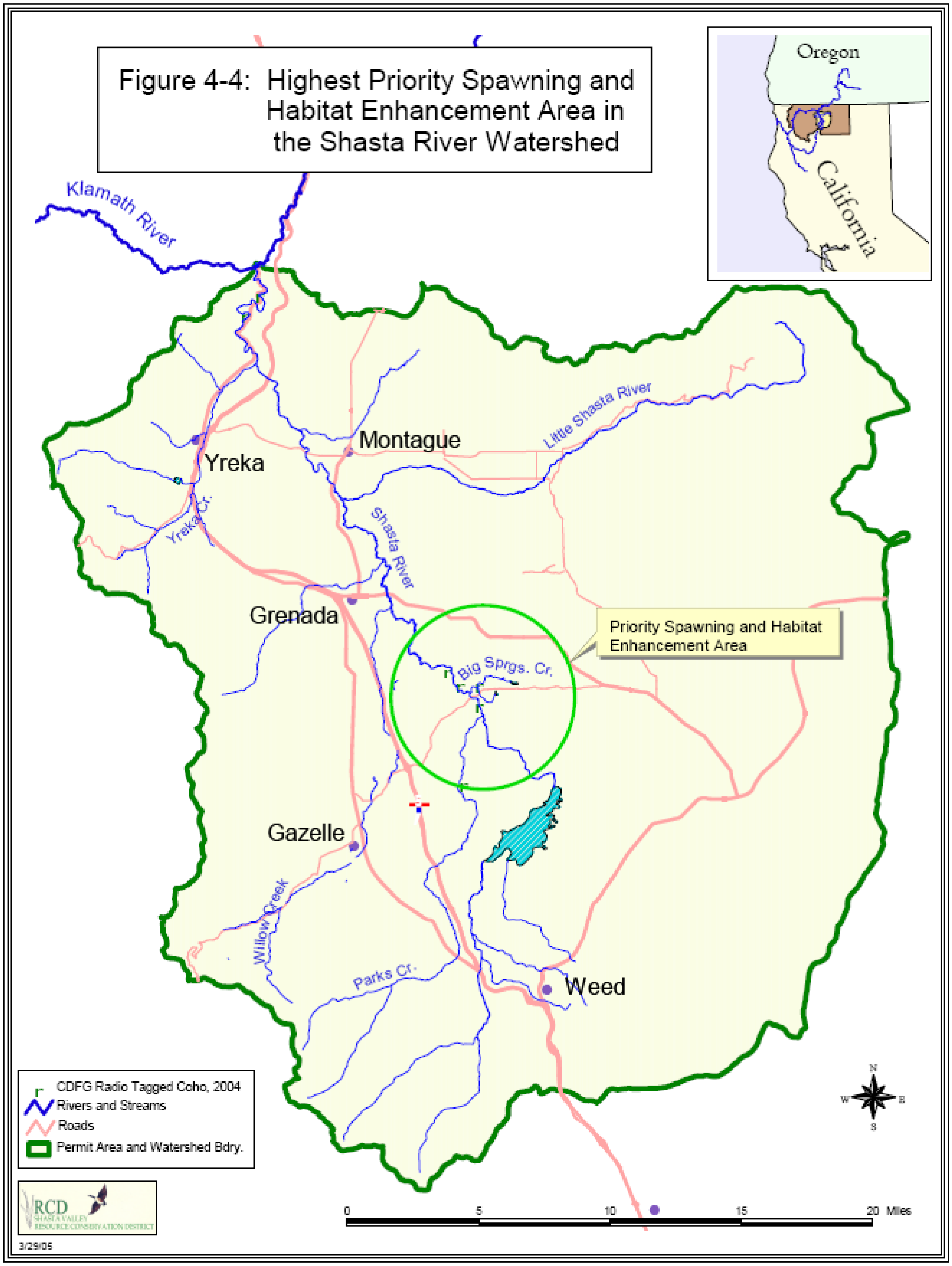


Figure 4-4: Highest Priority Spawning and Habitat Enhancement Area in the Shasta River Watershed
Oregon
California
Klamath River
Yreka
Montague
Little Shasta River
Yreka Cr.
Shasta River
Grenada
Priority Spawning and Habitat Enhancement Area
Big Sprgs. Cr.
Gazelle
Willow Creek
Parks Cr.
Weed
CDFG Radio Tagged Coho, 2004
Rivers and Streams
Roads
Permit Area and Watershed Bdry.
RCD
N
W
E
S
0
5
10
15
20 Miles
3/29/05

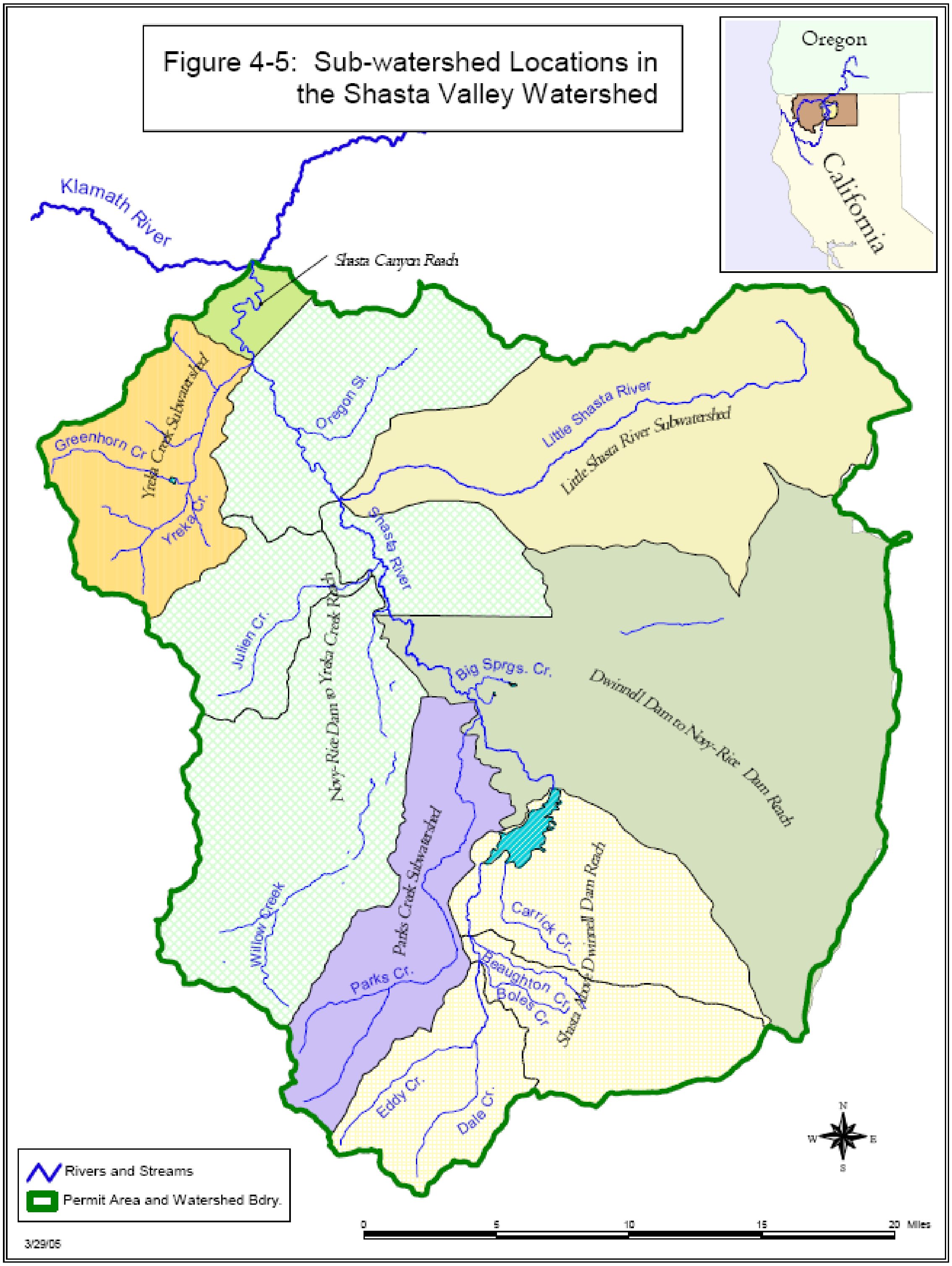


Figure 4-5: Sub-watershed Locations in the Shasta Valley Watershed
Oregon
California
Klamath River
Shasta Canyon Reach
Greenhorn Cr
Yreka Creek Subwatershed
Yreka Cr.
Oregon Sl.
Little Shasta River
Little Shasta River Subwatershed
Shasta River
Julien Cr.
Novy-Rice Dam to Yreka Creek Reach
Big Sprgs. Cr.
Dwinnell Dam to Novy-Rice Dam Reach
Parks Creek Subwatershed
Willow Creek
Carrick Cr.
Shasta Above Dwinnell Dam Reach
Parks Cr.
Beaughton Cr.
Boles Cr
Eddy Cr.
Dale Cr.
N
W
E
S
Rivers and Streams
Permit Area and Watershed Bdry.
0
5
10
15
20 Miles
3/29/05

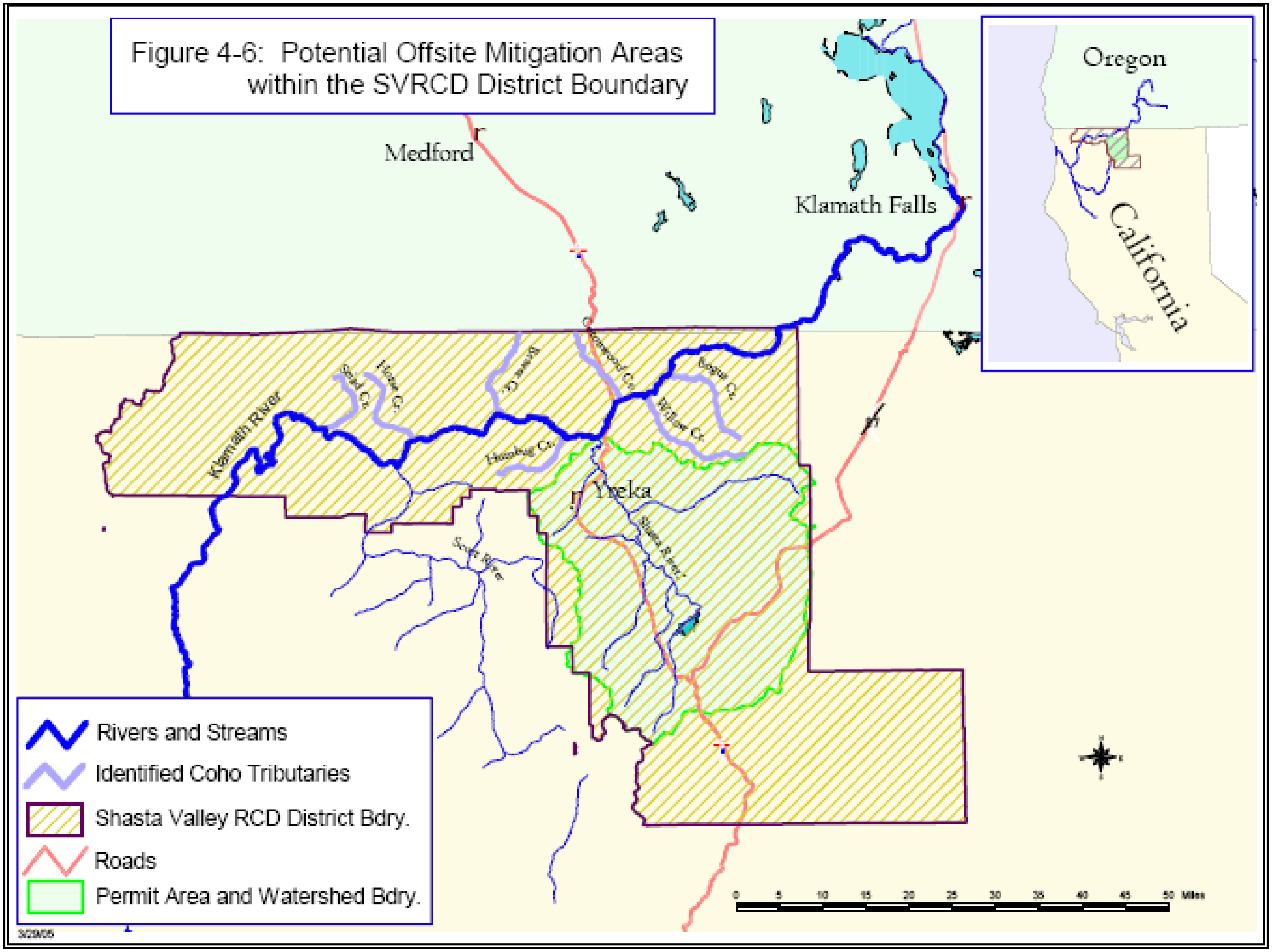


Figure 4-6: Potential Offsite Mitigation Areas within the SVRCD District Boundary

Because of the above considerations, and the need of the RCD to assure that persons within the covered area of the ITP have suitable locations within the RCD's jurisdiction in which to perform mitigations needed, if suitable high priority areas are not available within the Shasta watershed, as a last resort offsite mitigations may be implemented in cold water tributaries to the Klamath within the RCD boundary including Bogus Creek, Horse Creek, Beaver Creek McKinney Creek and Seiad Creek (see **Figure 4-6**)   These are known spawning and/or rearing cold-water tributaries of the Klamath River (pers. comm. Soto, 2005).

An additional benefit of any off site work done will the accumulation of data on these important tributaries that are essential refugia areas for any coho originating or finding themselves in the mainstem Klamath. Future RCD ITPs envision expanding coverage to individuals residing in these watersheds. Expanding that coverage will require a substantially improved knowledge base over what is now known.

D. – Timing and deadlines for mitigation activities

Timing and deadlines for completion of the mitigation activities will begin immediately, and will extend over three years from when a sub-permit is issued. The three year time period will assist the landowners and RCD in planning, in allocating funds to implement the required work, and to assure that projects are designed appropriately to serve the appropriate function.

VI. References:

Chesney, Bill. 2005. Pers.com. No date. Bill Chesney (Fish biologist, CDFG) and Dave Webb (SVRCD) on radio tagging data.

Croot, C. and L. Marcolis. 1991. *Pacific Salmon Life Histories.* UBC Press, Vancouver, B.C. Canada. Pp. 411.

Soto, Toz. 2005. Pers. comm. with Toz Soto (fishery biologist for the Karuk Tribe) and Amy Hansen (SVRCD) on March 21, 2005.

Table 4-2					
Mitigation areas	**Anadromous species present**	**Attributes to the watershed**	**Significant Activities**	**Limitations to Coho**	**Prioritized Avoid, Minimize, Mitigation Activities**
Parks Creek	Coho Chinook Steelhead Lamprey	Approximately 7% of the Shasta River watershed. Only tributary that is connected to headwaters that contribute to frequent flooding events. One of three cold water tributaries remaining in the Shasta River watershed. Currently utilized by coho for spawning	Summer irrigation Winter stock watering, & storage	Limited access to spawning habitat and cold water due low water flows and partial fish barriers. Sediment laden gravels limit survival of eggs Limited cold water near current spawning areas limits utility of creek for rearing. Possible trampling of redds by livestock.	Avoidance and Minimization: 1. Protection of streambank/sediment reduction by fencing 2. Fish passage improved at partial barriers 3. Combination of possible road closures, rocking, culvert replacement, and outsloping in headwaters to reduce sediment input. 4. Fish screens on unscreened diversions Mitigation: 1. Gravel cleaning and addition of supplemental spawning gravel. 2. Reduction of warm water input. 3. Riparian planting. 4. Insure enough water flow during crucial periods so that spawning salmon can access higher reaches of the creek. 5. Seek ways to capture additional cold water for instream flows
Little Shasta	Fall Chinook Steelhead Re:Coho no data exists identifying	Approximately 10% of the entire Shasta River watershed Cold water sources in upper reaches of the sub-watershed	Summer irrigation Winter stock watering Winter recreational and	Limited access to suitable spawning habitat. Limited areas of suitable spawning gravel. Lack of access to	Avoidance and Minimization: 1. Provide fish passage at partial barriers 2. Protection of streambank/sediment reduction by fencing 3. Screen unscreened diversions Mitigation:

	coho populations in the Little Shasta however suitable habitat exists.	Healthy habitat for coho in upper reaches.	agricultural storage.	suitable rearing habitat Loss of functioning aquatic community due to dewatering in some of stream	1. Gravel cleaning off-site 2. Addition of supplemental spawning gravel off-site 3. Riparian plantings 4. Improved water management activities 5. Recapture cold water if possible for dedicated instream flows
Mainstem Shasta-Above Dwinnell Dam	None.	Includes ~16% of the total watershed. Access blocked by Dwinnell Dam Water quality in Lake Shastina often very poor	Recreation. Timber harvesting. Urban and sub-urban developments. Agriculture.	Dwinnell Dam prevents fish access to 16% of the watershed. The dam periodically releases water of low quality into the Shasta River (Can be warm, nutrient enriched, low in dissolved oxygen, and/or containing non-native predatory fish)	Avoidance and Minimization: 1. Verify compliance with water rights for all users above Dwinnell Dam. 2. If the Shasta River channel is going to continue to be used to transport irrigation water, the discharge from Lake Shastina should be screened to minimize the transport of non-native predatory warm water fish into the Shasta. Mitigation: 1. Irrigation water now released into the stream channel below Dwinnell should be piped or otherwise contained to minimize commingling of lower quality Dwinnell water with spring waters entering the Shasta River further downstream. 2. Reduce net irrigation demand from higher priority water rights holders should be investigated to allow transfer of saved water to instream flows or traded fro higher quality water from elsewhere downstream. 3. Purchase of water rights for instream flows or water exchange should be pursued if feasible or if likely to become feasible in the future.
	Fall Chinook Steelhead	Approximately 26% of the entire watershed.	Summer irrigation	Irrigation tailwater return increases water temperatures.	Avoidance and Minimization: 1. Improve fish passage at partial barriers. 2. Protection of stream bank/sediment

Mainstem-RM 40.5 (Dwinnell Dam) to RM 20.6	Coho	Forms one of the primary cold water refugia areas for coho due to cold water spring water in-flows Believed to be primary area for salmonid production in the Shasta River watershed.	Winter stock watering	Livestock access to stream channel causes increased sedimentation. Diversions of cold water. Lack of shading. Fish passage issues with regards to early returning adult salmon.and juveniles Sediment laden gravels limit instream survival of eggs. Poor water quality and high water temperatures from summer releases of Dwinnell Dam. Possible trampling of redds by livestock.	reduction by fencing. 3. Tailwater capture. 4. Installation and maintenance of fish screens. Mitigation: 1. Protecting and increasing inflows of cold water (both summer and winter). 2. Riparian planting to increase shading to lower temperatures and reduce fine sediment inputs. 3. Gravel cleaning and addition of supplemental spawning gravel 4. Minimize co-mingling of low quality water from Dwinnell Dam.
Mainstem Shasta- RM 26 to RM 7.5 and converging tributaries	Coho Chinook Steelhead	Overwinter survival is high in the reach due to low gradient, moderate stream flows and abundance of edge of channel habitat. Anadromous fish use this section primarily	Summer irrigation. Winter stockwatering.	Presumed build up of fine sediments reduces in-gravel surviva in this reach and downstream. Substantial erosion of streambanks increases sedimentation in gravels.	Avoidance and Minimization: 1. Support for watermastering activities. 2. Livestock exclusionary fencing. 3. Fish screens. 4. Improved fish passage. 5. Tailwater capture. 6. Improved efficiency of irrigation water use

		for rearing and traveling to and from upper reaches in the Shasta River watershed Limited areas with gravels used for spawning.		Very limited cold water refugia areas Lethal summer water temperatures. Reduction in flows at start of irrigation season probably eliminate edge habitat needed by juveniles. Possible trampling of redds by livestock.	Mitigation: 1. Spawning gravel cleaning both within this reach and downstream 2. Gravel addition within the reach only near identifiable refugia areas if at all. 3. Offsite gravel enhancement. 4. . Riparian and emergent plantings
Mainstem Shasta- Below Yreka Creek to Mouth	Coho Chinook Steelhead	Provides an essential transit corridor to upstream habitat. Provides substantial spawning and rearing habitat.	Historic mining activities. Recreation – fishing. Electricity production. Very limited small scale agriculture.	Lethal summer water temperatures. Lack of habitat complexity and shade in channel. Limited rearing habitat due to high water velocities and reduced instream habitat. Those fish that do rear may be stranded due to rapid reduction in water flows after commencement of irrigation season. Poor conditions of spawning gravels due to upstream fine sediment	Avoidance and Minimization: 1. Improve passage at former hydroelectric flashboard dams. 2. Provide large woody debris and other habitat forming structures along the stream edge to provide for initial rearing. 3. Encourage recruitment of trees and/or plant to provide shade extend rearing season and eventually contribute woody debris. Mitigation: 1. Investigate and if possible enhance possible refugia associated with Yreka Creek underflow. 2. Habitat improvements downstream of the mouth of the Shasta either in the Klamath or its tributaries where summer-long conditions are suitable to provide refugia for coho displaced from the lower Shasta. 3. Perform gravel cleaning an supplementation only if unlikely to reduce coho utilization of upper portions of Shasta.

				producing activities. Low to no input of gravel now occurs due to modifications in Yreka Creek. Likely loss of coho redds at start of irrigation season	
Yreka Creek	Coho Chinook Steelhead	Comprises approximately 6.6% of the entire watershed. Possible cold water source from underflow that may provide cold water refugia in the mainstem of the Shasta River. Currently utilized by coho juveniles for rearing in few small refugia areas.	Agricultural activities, especially in the upper half of the drainage. Urban. Recreational. Historic mining activities. Timber management activities	Poor condition of stream bank due to grazing upstream from Yreka. Limited adult access due to low flows some years. Permanent dam in only major tributary blocks fish and affects flows. Presumed degraded spawning gravels due to sedimentation. Possible trampling of redds by livestock. Urban and mining related channelization impacts. Urban storm-water runoff transports contaminants from roads.	Avoidance and Minimization: 1. Fencing of streambank to limit livestock access to channel. 2. Riparian plantings. 3. Maintenance and/or enhancement of instream flows Mitigation: 1. Enhancement or addition of spawning gravels. 2. Capture of non-point source pollution from runoff of urban roads and developments. 3. Recreate historic gravel input into Shasta River. 4. Maintenance and/or enhancement of instream flows during the summer and fall.

Appendix 1

The following is the Memorandum of Understanding (MOU) between the California Department of Fish and Game and the California Department of Water Resources on watermastering activities.

Memorandum of Understanding Between the Department of Water Resources and the Department of Fish and Game on Procedures for Watermasters on the Scott and Shasta River Systems to Coordinate Actions to Avoid the Take of Coho Salmon

Recitals

1. Pursuant to Water Code Section 4000 et seq., the California Department of Water Resources provides watermaster service to water users on the Scott River and the Shasta River in Siskiyou County. These services involve the diversion and serving of water to water right holders pursuant to judicial decrees. In carrying out its watermaster services, DWR will conform with the existing judicial decrees including to hold diversions to the limits specified in those decrees. This task is complicated, however, by the fact that diversion facilities on these rivers vary from modern, screened and measured to unscreened, unmeasured diversions and turnouts. DWR watermasters will use their best efforts to carry out their duties in compliance with the decrees.

2. Pursuant to Fish and Game Code Section 2050 et seq., the California Department of Fish and Game is responsible for the administration of the California Endangered Species Act. DFG is also the trustee agency for the State of California with jurisdiction over the conservation, protection and management of fish, wildlife, native plants and habitat necessary for the biologically sustainable population of those species.

3. The Scott and Shasta rivers are spawning and rearing areas for Coho salmon (Oncorhynchus Kisutch), which is a candidate for listing under CESA.

4. Between the period of 1990-2000, nearly $6 million from State and federal funding has been spent on anadromous fish restoration efforts within the Scott River and Shasta River watersheds. In the year 2001, nearly $3 million has been spent or funding obligated for additional restoration. DFG expects this funding level to continue or increase for the next 10 years as an integral part of a much larger focused Klamath River Basin Restoration Program. The kinds of restoration projects being implemented include fish screening, improved efficiency in water delivery systems, dedication of water to the stream for fish, erosion control through road decommissioning and stream crossing removal or repair, conservation easements to protect streamside buffers, riparian fencing, riparian plantings, construction of fish friendly seasonal diversion facilities, and improved fish passage over permanent diversion dams.

5. DWR and DFG would like DWR to continue to provide watermaster service to the decreed right-holders, to assist water users in a manner that avoids the take of Coho salmon.

6. The purpose of this MOU is to coordinate actions between DFG and DWR on the Scott and Shasta rivers.

Agreement

1. The Department of Water Resources provides watermaster service on the Shasta River and on five creeks in the Scott River watershed. DWR will provide the Department of Fish and Game information on streamflow, diversions, and stream conditions, obtained and summarized from the watermasters' daily field logs, as described in Attachment A. This information will be conveyed by DWR to the person designated below by 9 a.m. of the day following.

2. DWR will otherwise cooperate with DFG in providing hydrologic and hydraulic information on the Scott and Shasta relevant to the needs of Coho salmon.

3. DWR's Northern District Chief, its Branch Chief over watermaster services, its Supervising Watermaster, and DFG's Regional Manager, its Fisheries Program Manager, and its Senior Fisheries Biologist will meet either in person or via weekly conference call to assure appropriate communication under this MOU.

4. DFG will timely inform DWR watermasters, by FAX, of any and all imminent or foreseeable take occurrences resulting from diversions under the control of the watermasters. The DFG Senior Fisheries Biologist below is responsible for informing DWR watermasters for this purpose.

5. DFG will advise DWR on the needs of the fishery in order to assist DWR to identify actions to implement reductions or cessation in diversions or changes in the timing or manner of the diversions as necessary to avoid the take of Coho Salmon.

6. DWR will implement the reductions or cessation in diversions or changes in the timing or manner of diversions subject to DWR Watermaster Service under the decrees as necessary to avoid the take of Coho Salmon.

7. As soon as possible, but no later than 24 hours after the fact, DWR will notify DFG of all reductions it has implemented to avoid take of Coho Salmon.

8. DWR reserves its unconditional right to terminate watermaster service on any and all creeks or streams subject to this MOU. DWR will give DFG 24 hours notice of its intention to do so.

9. DFG's designee for the purposes of this Agreement is: Senior Fisheries Biologist (530) 225-2866 or (530) 225-2381 fax. In the event the Senior Fisheries Biologist is unreachable, DFG's after hours dispatch is (916) 445-0045.

10. DWR's designee for the purposes of this Agreement is: Supervising Watermaster (530) 529-7369 or (530) 529-7322 fax. In the event the Supervising Watermaster is unreachable, DWR's after hours page should be used (916) 592-7332.

(sgd) Thomas M. Hannigan	Original Signed by Robert C. Hight
Thomas M. Hannigan, Director	Robert Hight, Director
Department of Water Resources	Department of Fish and Game
Date: JUN 0 6 2002	Date:

Appendix 2
Sub-watershed summaries

Outline

1. **Main Stem Shasta River Sub-watershed summaries:**
   a. ***Shasta Above Dwinnell Dam Reach*** (Mainstem Shasta River from Headwaters to RM 40.5)
   b. ***Dwinnell Dam to Novy-Rice Dam Reach*** (Mainstem Shasta River from RM 40.5 to RM 27)
   c. ***Novy-Rice Dam to Yreka Creek Reach*** (Mainstem Shasta River from RM 27 to RM 7.75)
   d. ***Shasta Canyon Reach*** (Mainstem Shasta River from RM 7.75 to the Mouth)

2. **Key Tributaries to the Shasta River Sub-watershed summaries:**
   a. **Parks Creek**
   b. **Yreka Creek**
   c. **Little Shasta River**

Sub-watershed Summaries

1a. *Shasta Above Dwinnell Dam Reach*
(Mainstem Shasta River from Headwaters to RM 40.5)

Area Description
This Portion of the watershed is comprised of about 81,501 acres (32,983 hectares), and comprises approximately 16% of the total watershed. General landform includes Mount Shasta (elev. 14,162 ft.), an active volcano to the south and east and the Eddy Mountains (max elevation 9025 ft.) containing high peaks and glaciated valleys to the west. Going north, it then transitions to the lowland Shasta Valley where the Pleistocene debris flow dominates the landscape (minimum elevation in this reach is 2750 ft.) . The high elevation terrain captures significant amounts of rain and snow, with precipitation ranging from 70 inches at the highest elevations to less than 10 inches at the lower end of the reach. The large amount of rain and snow at high elevation creates both surface flows forming Dale Creek and Eddy Creek, and also large amounts of spring flow, especially from the flanks of Mt. Shasta. Those springs form the numerous creeks that coalesce into the Shasta River, including Boles Creek, Beaughton Creek, and Carrick Creek. Overall, there are approximately 51.7 stream miles, broken down as follows:

Stream Name	Length, miles	Length, Kilometers
Dale Creek	6.6	10.6
Eddy Creek	7.5	12.1
Boles Creek	5.5	8.8
Beaughton Creek	6.3	10.1
Carrick Creek	8	13
Shasta River	17.8	28.7

Flows in Dale Creek, Eddy Creek and the Shasta River can be flashy, while flows in the spring creeks tends to be stable, and provides reliable base flow in both wet and dry years. Approximately 4.5 miles of the Shasta River, and 2 miles of Carrick Creek are beneath the surface of Dwinnell Reservoir at maximum lake elevations. Also included in this reach are wilderness areas on Mt Shasta above 8,000 ft., timber harvest related activities in the public and private lands generally above 4000 feet, urban and suburban activities in pockets below about 4000 ft, and agriculture also below about 4,000 ft.

Anadromous Species Use
Anadromous fish no longer are able to access this portion of the watershed due to the presence of Dwinnell Dam (built 1928) and Lake Shastina.

Agricultural Activity
Agriculture is waning, but still focused on cow-calf operations and associated irrigated pasture and hay fields.

Other Land uses
Urban and suburban uses include the city of Weed, part of the urban corridor between Weed and Mt. Shasta, and the community of Lake Shastina. Timber management is also a significant though declining activity.

Key Features
While the Pleistocene Debris flow underlies all or nearly all of this portion of the Shasta Watershed, it has been overlain by more recent materials including granitic and metamorphic materials from the Eddys, along with more recent volcanic materials eroded from Mt. Shasta, with the result that unlike the rest of the Shasta Watershed, gravels are readily transported downstream until they reach the large flat area now occupied by Lake Shastina where the apparent end of natural gravel transport was reached long before the reservoir was created.

Urbanization is rapidly overtaking this portion of the Shasta Valley at the lower elevations along the Interstate 5 corridor, and around Lake Shastina. Areas formerly agricultural are being subsumed into rural residential land uses. One out of 3 houses built in Siskiyou County in 2004 was built near Lake Shastina

Dwinnell Dam and Lake Shastina form the downstream end of this reach, prevent salmon access to this portion of the channel, capturing all or nearly all the runoff reaching Lake Shastina in most years, and provide no flow release other than to meet specified irrigation demand immediately downstream.

Water Quality Conditions
Not applicable to coho

Riparian Condition
Not applicable to coho

Limitations on Coho
While most of the low elevation stream reaches found in this area were formerly apparently accessible to salmon of all species, have abundant supplies of spawning gravel continuously supplied from upland areas, and have large and reliable sources of cold and clean water, lack of access prevents its current utilization in any way, either for spawning rearing, transit, or contribution to instream flows downstream.

Avoidance, Minimization, Mitigation and Enhancement targets

Watermastering abilities should be enhanced to allow quantification of amounts of water stored in Lake Shastina, with any in excess either released for instream flows, or traded for better quality water downstream.

Unused irrigation water rights should be identified and the water captured for instream flows or trade for higher quality water further downstream.

Releases from Lake Shastina for irrigation purposes using the stream channel should be piped or otherwise contained to minimize commingling of lower quality Dwinnell water with spring waters entering the Shasta River downstream.

If the Shasta River channel is going to continue to be used to transport irrigation water, the discharge from Lake Shastina should be screened to minimize the transport of non-native predatory warm water fish into the Shasta.

Measures to reduce net irrigation demand from higher priority water rights holders should be investigated to allow transfer of saved water to instream flows.

Purchase of water rights for instream flows or water exchange should be engaged in if feasible, or investigated if likely to become feasible in the future.

1b. *Dwinnell Dam to Novy-Rice Dam Reach*
(Mainstem Shasta River from RM 40.5 to RM 27)

Area Description
Because Dwinnell dam includes no provision for passage of fish, has no fisheries related instream flow release requirement, seldom exceeds its storage capacity and so seldom needs to release water, the base of the dam becomes in many ways the defacto point of beginning of the mainstem Shasta. The elevation of the river at that point is 2750 feet. At the lower end of the reach RM 26 it is 2526 feet. The mainstem Shasta River length is approximately 15.24 but this reach also includes Big Springs Creek (2.25 miles), Little Springs Creek (1.1 miles), and Hole in the Ground Spring Creek (2.25 miles). Overall channel length is 20.84 miles. At the downstream end of the reach is a small summer flashboard irrigation dam that for convenience is used as a sub-watershed breakpoint for this reach.

This reach of the stream represents approximately 26% of the watershed (based on size of entire watershed, including that above Dwinnell), or about 130,656 acres, nearly all of it to the east of the Shasta River. General landform is made up of old cascade volcanics on the eastern portions of the watershed; lower down, recent lava flows of the Pluto's Cave Basalt communicates with Mt Shasta and directs substantial amounts of water from the melting glaciers to the valley floor as springs, and also as abundant groundwater, while the bulk of the valley bottom on both sides of the river is entirely comprised of remnants of the Pleistocene age volcanic debris flow which completely filled the ancient Shasta Valley. Numerous hills were carried intact in the flow, and now dot this portion of the Shasta Valley. The river is a low slope, near-surface (i.e. not incised) stream with its flows generated largely from the above mentioned springs which surface in and near the stream channel. In addition, Parks Creek joins the mainstem Shasta at approximately RM 35. Maximum elevation is at Herd Peak at 7071 ft. Precipitation ranges from 30 inches annually in the highest elevations, to as little as 5 inches near the middle of the stream reach. Land use is primarily timber harvest related in the public and private lands of the upper ¼ of the watershed to the east, grading into dry land grazing, then irrigated pastures and hayfields nearer the river.

Anadromous Species Use
Fall chinook, coho and steelhead use this portion of the Shasta for both spawning and rearing. Lamprey have been observed in Parks Creek, and presumably are widespread in this section of the river, although they apparently are not numerous.

Because of the abundant inflows of spring water, cool water conditions are more reliable here than elsewhere in the mainstem Shasta, but temperatures still reach near maximum tolerance levels for cold water fish at least in part due to agricultural impacts on water quality. This area is believed to form the primary refugia area for coho juveniles rearing in the Shasta through their first summer, although it appears to be underutilized at present. Spawning gravels are found in patches in the mainstem Shasta over much of the length of this reach, and also in the lower portions of Big Springs Creek. All gravels in this area are relict materials of volcanic origin which tend to move very little, making them extremely susceptible to fine sediment buildup. Unlike other streams where fresh gravel is continuously supplied from upslope areas, these are not being replaced (landform is too flat to allow tributary streams to transport of coarse sediment due to Pleistocene debris flow) and so should be seen as essentially non-renewable under natural conditions.

Spring water constituting most of the base flows in this reach enters the Shasta at temperature ranging from 49-52 degrees F providing relatively warm conditions in the winter leading to rapid egg maturation, and cool conditions in the summer, along with reliable flows regardless of annual weather variations due to the buffering effect of the glaciers on Mt. Shasta which feed most of the springs. Some springs are fed by seepage from Dwinnell, and can be distinguished at least at times by degraded water quality in terms of low levels of dissolved oxygen It is unknown at present what the net effect of this supplemental inflow is.

It is believed that this portion of the Shasta is one of the core areas of salmonid production (for all species) for the entire Shasta watershed. Approximately half of the radio tagged coho in 2005 spawned in this reach and the lower end of the Parks Creek sub-watershed. Juveniles produced here have potential access to many miles of low gradient habitat for extended rearing, and high food abundance and cover assures rapid growth and good survival.

Agricultural Activity
Primary agricultural activities in this portion of the watershed are focused on cow-calf production, and revolve around maintaining a working balance of irrigated pasture for summer grazing, irrigated hayfields for growing livestock feed for the winter, and dry upland areas usable for spring grazing and as sites for winter supplemental feeding. Additional agricultural activities include the growing of strawberry bedding plants for export.

Livestock exclusion fencing is currently in place along approximately 4 miles (one bank only) of this critically important area. Irrigation tailwater return to the river is known to occur in this reach, and is believed to be contributing to temperature gains. Past participation in fisheries related work in this area has been limited.

Other Land uses
Limited agricultural options on this very dry portion of the Shasta Valley led to the subdivision of parts of it in the mid-1960's, followed by building of mostly retirement homes since them. Development continues slowly, encouraged by television advertisement in the San Francisco Bay Area, and possibly elsewhere, coupled with the growing numbers of persons nearing retirement age desiring to exit large urban areas. Relatively low land and housing costs also encourage

immigration into the area. Rural residential development brings with it loss of open space and increased demand on groundwater resources that were economically unavailable for agricultural use, but very feasible for domestic use, lawns, gardens and pasturage for horses etc. Status of groundwater resources and possible impacts on groundwater development on flows of springs currently bringing cold water to the Shasta River are unknown, but direct impacts of the use of some wells on spring flow have already resulted in court cases in this area of the valley.

Key Features

This area represents the best and most important area of the Shasta River for anadromous fish and also for wildlife. This and Parks Creek are the areas where greatest improvements for coho can be made in the near term. Springs forming the majority of base flows in this reach also provide cold water needed to create refugia areas for coho in summer, but that cold water is vulnerable to being lost due to irrigation tailwater return, lack of shading, surface diversion for irrigation, heating behind impoundments, increased solar gain due to channel widening, or (less visibly) diversion via groundwater pumping.

Gravels found in this reach provide for spawning opportunities for approximately half of the salmonids spawning in the Shasta, but are extremely vulnerable to sedimentation or complete burial due to fine sediment being generated within this reach, or transported to it by Parks Creek. Higher flows that might flush out fines are seldom available due to Dwinnell Dam capturing all winter runoff from the upper portions of the watershed. Riparian conditions are variable, but long stretches are in relatively good shape and provide shade, woody debris, overhung banks, etc.

Three summer flashboard dams are found in this reach. Passage at the dam forming the downstream boundary of the reach may be limited in summer, but good in winter. Diversion at this point is approximately 6 cfs. For planning purposes this dam is treated as the downstream end of cold water refugia in the mainstem Shasta (only small islands of refugia are believed to exist further downstream associated with coldwater inflows, as confirmed by the July 2003 RWQCB thermal infrared survey of the river). A similar dam with similar passage conditions exists near the center of this section of the river (RM 31, diversion quantity 52 cfs, and a third one is located about 4 miles from the upstream end of the reach (RM 36.5, diversion quantity about 20 cfs. All are normally installed for the summer irrigation season only and removed in the fall; all have the potential to increase transit time for the river, diminishing the length of cold water areas, promote heating, promote settling of fine sediments and organic material, provide slow water areas that may be attractive to non-native predatory fish, and may prevent juvenile fish responding to changing conditions by moving freely up and downstream.

Periodically during the irrigation season, water is released on demand from behind Dwinnell Dam into the Shasta River channel to supply irrigation water for any one of three downstream users whose water rights were affected when the dam was built. That water is released near the bottom of Lake Shastina, and is therefore highly variable in quality, is particularly poor in mid to late summer, and also contains non-native fish planted and reproducing in Lake Shastina.

Development pressures coupled with difficult agricultural economics greatly increase the vulnerability of this portion of the river.

Water usage

Demands for water in this section of the river are substantial. Even in mid-summer, flows in this area ramp up rapidly from near zero at the base of the dam, to over 100 cfs in the middle of the reach, and then decline as water is diverted for agricultural uses. Maintenance of substantial instream flows are dependent on the active efforts of the watermaster directing water downstream in periods of short supply to meet demands of higher priority water users further downstream. A fortunate but unintended consequence of those efforts has been the maintenance of substantial instream flows well beyond the downstream boundary of this reach.

Approximately 15 diversions are found within the reach with a maximum diversion quantity of 120 cfs, 7 are in areas inaccessible to coho (24.3 cfs). Of the remainder, 3 are screened for a maximum volume of 64.2 cfs, and the remaining volume that may be accessible to coho (31.55 cfs) is unscreened. Not all of these diversions receive water for the entire summer in all years. Shortages that would otherwise occur downstream are met by restricting major diverters in this reach, something that occurs most summers.

Approximately 8,905 acres (3,604 hectares) are irrigated in this portion of the watershed, some of them with water stored from behind Dwinnell Dam. Surface water is used on 4,086 ac (1,654 hectares), ground water on 4629ac. (1,873 hectares), and reclaimed treated sewage on 190 ac. 77 hectares).

Riparian Condition

Riparian conditions within this reach vary from among the best in the entire watershed, to areas significantly impacted by livestock usage. Areas in the upper portion of the reach appear to be in a declining trend due to increased livestock pressure. So far large ranches still border nearly the entirety of the river in this reach and so buffer it from potential impacts of residential development that is slowly reaching north from near Dwinnell Dam.

Limitations on Coho

Adult/Spawning

Passage at the uppermost dam in the system may be a problem for adult coho returning to spawn.

In-gravel

Available data indicates that severe sedimentation has degraded spawning gravels in this reach. Causes are believed to be a combination of reduced winter flows and livestock impacts on stream banks increasing sediment load. In-gravel survival appears to be severely compromised.

Rearing

Rearing conditions are variable through the reach. Water releases from Dwinnell may raise stream temperatures to above tolerable levels in the upper areas of the river, and also add to nutrient loading that may contribute to water quality problems downstream. Tailwater entering the upper portions of this reach, along with Big Springs Creek and presumably Little Springs Creek contribute to elevated temperatures there. Flow reductions in Big Springs itself from diversion and groundwater pumping appears to be reducing total supply of cold water in the system, threatening this key area. Inflows from Parks Creek can also contribute to degraded water quality in the upper portions of this reach.

As one moves downstream, additional inflows provide sufficient dilution to maintain tolerable temperatures but with little margin for error.

Overwinter survival is assumed to be very high due to low gradient, moderated stream flows due to presence of Dwinnell Dam, and abundant edge of channel vegetation, along with assumed ready availability of food and relatively warm water temperatures.

Avoidance, Minimization, Mitigation and Enhancement targets

Highest priority in this area should be given to protecting and increasing inflows of cold water. Secondary effort should be given to minimizing temperature gain by increasing shading, reducing irrigation tailwater return, and minimizing commingling of water from Dwinnell Dam with spring-water inflows. Water quality problems in Parks Creek should be addressed.

Additional efforts should be expended on combating the impacts of reduced winter flows and consequent sedimentation problems, including livestock exclusion from stream banks, and mechanical gravel cleaning and/or supplementation.

Remaining unscreened diversions should be evaluated for likelihood of entraining coho, and screened if needed.

Woody debris would be beneficial over several miles in the area below Parks Creek where few trees remain, the channel is wide, and rearing habitat could be created in close proximity to spawning areas.

Potential fish passage problems should be addressed.

Studies should be undertaken to reduce the level of uncertainty currently necessary on measures to meet coho needs there.

Efforts need to be made to create infrastructure to allow trading water from other sources for high quality spring water and river water now used for irrigation in this reach.

Efforts should be pursued to buy out and retire, or move downstream existing water rights and points of diversion to minimize demand for cold water from refugia section of Shasta River.

Any new or unperfected water rights from this reach should be denied, both for summer or winter use.

Groundwater usage affecting surface flows should be incorporated into water management activities.

1c. *Novy-Rice Dam to Yreka Creek Reach*
(Mainstem Shasta River from RM 27 to RM 7.75)

Area Description
This reach of the mainstem Shasta covers the majority of the agricultural portions of the Shasta Valley. The river in this reach varies between elevation 2526’ at the upper end and 2387’ at the confluence with Yreka Creek. The highest elevation in this reach is 8158 at the divide between Parks Creek to the south and Willow Creek to the north. The mainstem covers a distance of 18.25 miles. This reach also includes Willow Creek (approximately 20 miles long), Julian Creek (approximately 8 miles long), the Oregon Slough (approximately 8 miles long), and a few other very minor drainages. Much of the length of these miscellaneous tributaries is essentially dry by mid-summer.

This portion of the Shasta forms a convoluted meandering stream as it travels through the very flat (volcanic debris flow) central portion of the Shasta Valley. Significant tributaries include Willow Creek, Julian Creek and the Little Shasta River. The reach ends with the confluence with Yreka Creek.

Within the reach are only minor cold water inputs associated with springs, and numerous irrigation tailwater return areas. Temperatures rise above tolerances for cold water fish every year over most of the reach and over the entire reach many years, a condition heightened and accelerated by the amount of tailwater, lack of shade and increased transit time due to reduced river volume. Stream banks in this area tend to be fine textured, highly erodible and vertical (height ranging from 3-6 feet) and hence very susceptible to livestock hoof and grazing impacts. The condition of the stream bank encourages streambank failures and significantly increases fine sediment load. Soil alkalinity over parts of the reach tend to be very restrictive of tree growth, although other areas within the reach still sustain good canopy and shade. Tules are the most common emergent plant in this reach, and they provide for channel roughness, channel narrowing, shade, bank stabilization and fine sediment capture.

This portion of the Shasta Valley covers 139,499 acres, (56,434 hectares), and represents approximately 28% of the watershed. The bulk of this reach is to the west of the Shasta River. Geologically the higher elevations are uplifted metamorphics that form the eastern edge of the Klamath-Siskiyou mountains. The low elevations are overlain by material from the same Pleistocene volcanic debris flow that fills much of the rest of the Shasta Valley. Julian Creek is unique in being the only tributary to the Shasta which flows across the volcanic debris flow and yet is able to deliver coarse sediment to the Shasta. Most years, however, its overland flow is very small, and significant amounts of coarse materials are only delivered during very substantial flood events, none of which appear to have occurred in the last 100 years. Significant amounts of somewhat coarse material is stored in the vicinity of the confluence with the Shasta River and is slowly being routed downstream.

Precipitation in this reach ranges from approximately 50 inches in the higher elevations, to as little as 10 inches on the valley floor. Land uses predominantly revolve around livestock raising and hay production, but also include small orchards, small truck gardens and timber production.

Anadromous Species Use

While there are limited areas in the mainstem Shasta in this reach where spawning gravels can be found, the majority of this reach is used for travel to or from more important spawning areas upstream, and more importantly for extended rearing by juveniles in the relatively slow moving water. Salmonid use of tributaries is currently extremely limited, if it occurs at all. In the mainstem, naturally high nutrient levels produce abundant invertebrate populations which in turn insure rapid growth and also help coldwater fish to withstand water temperatures that produce metabolic demands likely be unsustainable in less productive waters. While tree cover is limited or nonexistent over large areas of the reach, rooted aquatic plants, tules, cattails and overhanging streambank vegetation provides habitat complexity not common in other coldwater streams.

Agricultural Activity

Primary agricultural activities in this portion of the watershed are focused on cow-calf production, and revolve around maintaining a working balance of irrigated pasture for summer grazing, irrigated hayfields for growing livestock feed for the winter, and dry upland areas usable for spring grazing and as sites for winter supplemental feeding. Many of the agricultural operations found here are very small. Additional agricultural activities include the growing of conventional and organic fruits and vegetables on a small scale, and production of alfalfa for sale outside the area.

Irrigation tailwater return to the river is common in this reach, and is contributing to temperature gains and excessively high nutrient levels and yet at the same time is a component of instream flows. Several irrigation tailwater capture projects have been put into place in this reach; additional ones are needed.

Past participation in fisheries related work in this portion of the river has been considerable, although substantial additional work remains. Approximately 9.1 miles of mainstem Shasta (both banks) is protected from livestock impacts in this reach; an approximately equal amount needs protection. Approximately 1 mile of livestock protection is known to be in place on the tributaries in this reach. Planting of trees and emergent plants has been undertaken on much of the area protected along the mainstem. One flashboard dam originally built in 1889 has been permanently retired from this mainstem reach.

Other Land uses
The city of Montague is located within this reach (pop. est. 2500). In the headwaters of Willow Creek is the remains of the Dewey mine. Associated with it is a log crib dam roughly 12 feet high and completely filled with depositional material and below it the remains of a small cyanide gold extraction operation. Potential impacts of the failure of the dam are uncertain.

Key Features
Key features of this reach include pockets of spawning gravel, likely very small refugia areas associated with springs or irrigation return water entering in the bed of the river, soil conditions resistant to tree recruitment, and many miles of rearing habitat. Water temperatures that are generally lethal at the lower end to marginal in some years at the upper end at the peak of the summer. Significant water withdrawal occurs within the reach, along with significant tailwater return. Two summer-use flashboard dams are located in this reach (RM 12.6 and RM 17.8), both of which are partial passage barriers and both impound water which contributes to both heating and dissolved oxygen problems. A diversion structure and also a ditch appear to present partial obstructions to fish passage on the Oregon Slough. A dam blocks about ½ of the length of Willow Creek.

The watermasters weir, used for managing upstream and downstream water users is located in this reach at RM 15.5. It may be a partial barrier to fish passage at lower flows. The Shasta River is so tightly managed because demand for water is so high. One aspect of this management is that the watermaster must assure that sufficient water is in the stream to meet the water rights of the highest priority water users. Fortunately for salmon, some of those high priority rights are fairly far downstream, and as a result far more water remains in the river to the holders of those rights points of diversion than would otherwise be expected. From a water management standpoint, the watermaster must be sure that he has at least 62 cfs at RM 17.9, and at least 20 cfs at RM 15.5 to successfully provide water in conformance with the adjudication. Since little inflow occurs below RM 31, there is a very long stretch beginning at about RM 33.5 and ending at RM 17.9 where flows must be kept high over the entire distance in order to meet high priority water demands, whether it is a dry year or a wet year. In dry years junior water rights holders are sequentially told to cease to divert in order to protect those flows. Because that stretch brackets the prime refugia area, fish benefit from the protection it provides in all years also.

Water usage
Two irrigation districts are within this reach; one takes 42 cfs from approximately RM 17.9, while the other has its point of diversion (40 cfs) in the next reach upstream at RM 31, as does an association of water users (11.9 cfs). About 16 smaller diversions are also found within the reach, with a combined maximum diversion quantity of approximately 27 cfs. Four diversions totaling approximately 6.75 cfs are known not to be screened in areas potentially accessible to coho. Approximately 4.6 cfs is taken in winter for stockwater. Note: the above numbers do not

refer to any diversions or diversion quantities on Willow Creek--reliable data not currently available.

In this reach, there are 4,822 acres irrigated with ground water, 20,833 acres irrigated with surface water, and 1,042 acres irrigated with a combination of surface and ground water.

Included in the above numbers is the majority of the Montague Irrigation District which provides irrigation water from behind Dwinnell Dam (RM 40.5) for approximately 10,000 acres in the northwest portions of the Shasta Valley, the Shasta Water Association which diverts at RM 17.8 and provides water for approximately 3600 acres east of the Shasta River near the center of the valley, and the Grenada Irrigation District which diverts at RM 31 for delivery to approximately 1600 acres several miles to the east of the Shasta River..

Riparian Condition
Riparian conditions in this reach are variable, ranging from good condition and on an improving trend, to heavily impacted by livestock.

Limitations on Coho
Adult/Spawning

Access to the tributaries in this reach is frequently limited by lack of flows, but it is unclear to what extent coho may have used these minor tributaries historically. No known coho spawning occurs within this reach, but little effort has been made to survey for usage during spawning season due to turbidity, cost and access issues.

In-gravel

In-gravel survival in this reach is assumed to be poor to very poor due to build-up of fine sediments noted both upstream and downstream of this reach, and substantial erosion from streambanks occurring within this reach. Gravel within this reach is naturally limited, and has been further reduced by historic mining.

Rearing (over-summering, over-wintering & out-migration)

Over-summer survival of coho either originating within this reach or finding their way into it is assumed to be low due to limited cold water refugia areas, difficulty of passage upstream to reliably cold areas, and high temperatures nearly always encountered at some time each summer within all or nearly all of the reach.

Overwinter survival is assumed to be very high due to low gradient, moderated stream flows due to presence of Dwinnell Dam, and abundant edge of channel vegetation, along with assumed ready availability of food and relatively warm water temperatures.

Avoidance, Minimization, Mitigation and Enhancement targets

Watermastering activities must be continued to maintain the current levels of instream flows.

Beyond continuation of watermastering, highest near term priority within this reach should be given to efforts to minimize generation of fine sediments and to increase the amount of stream shading, both of which can and should happen concurrently. While spawning opportunities are limited in this reach, fine sediment is a severe problem further downstream and substantial quantities are being generated in this reach. Shading will delay the timing of onset of lethal temperature conditions, and ultimately add to habitat complexity in this reach and downstream.

Additional fish screens need to be installed and fish passage needs to be improved at several diversion dams/weirs.

Longer term it is important to avoid further depletions of instream flows in this section to assist in riparian growth within the section, maintain available habitat volume, avoid decreasing river mass and velocity to slow warming, aid in mechanical oxygenation, and dilute nutrients entering from agricultural activities, and further regeneration of riparian cover and aquatic organisms in the lowest portions of the Shasta where habitat complexity is extremely limited, as is shade, both of which could assist in improving survival of coho hatching there, or passing through (in or out) over the course of the year.

Irrigation demand should be managed at the start of the irrigation season to minimize rapid drawdown of the river to minimize the risk of stranding fish.

Irrigation tailwater return needs to be managed in this stretch to minimize introduction of heat and nutrients to the river without taking steps that further reduce instream flows.

Spawning gravel supplementation/cleaning in this reach should probably wait until juvenile fish passage, dissolved oxygen levels and water temperatures are improved.

1d. *Shasta Canyon Reach*
(Mainstem Shasta River from RM 7.75 to the Mouth)

Area Description
This stretch of the river is locally known as the Shasta River Canyon. It tends to be steep, bedrock constrained, hot and dry. Essentially no commercial agricultural activities occur here, but the impacts of all activities upstream have profound effects, particularly reductions in flow, earlier than natural increases in water temperature and the transport of fine sediment into this reach.

Elevation within the reach ranges from 2036 feet at the confluence with the Klamath, to 4974 ft. at Badger Peak. Maximum river elevation is 2387 feet. The stream has no significant tributaries or springs in this reach and measures 7.75 miles long. The watershed draining into this short reach covers 5867 acres (2375 hectares). Rainfall varies between 18 and 30 inches.

Past mining beginning in the late 1800's stripped most of the soil and vegetation from the bedrock adjacent to the stream in this reach; subsequent livestock usage until 1991 largely prevented recovery from those activities. Since 1991 significant herbaceous and woody vegetation growth has occurred in the canyon, sediment is being trapped, and the channel is gaining shade and bank complexity. Nevertheless, proximity of bedrock near the surface limits water availability to plants. The river runs through about 3 miles of public lands in this reach.

Anadromous Species Use
All three species of anadromous fish use this reach for transit, spawning and rearing. Approximately 50% of the coho spawning in the Shasta are presumed to spawn here (based on 2004 radio tagging data—9 of 19 tagged coho spawned in the canyon), and if able to find suitable edge habitat are able to rear here until water temperatures and/or dropping river levels force them to seek suitable habitat in the Klamath River. Significant numbers exit the Shasta as young of the year out migrants.

Agricultural Activity

Minor agricultural activities in this reach are limited to 3 very small ranchettes at the upper end of the reach, and homestead style gardening further downstream. Livestock are currently excluded from essentially all of this reach. All identified diversions in the reach are screened.

Other Land uses
Both Placer and hardrock mining took place in the Shasta. Currently no mining activities are allowed in the stream. Occasional boaters float the Shasta Canyon. This reach contains one active hydroelectric powerplant for personal use, one formerly FERC licensed hydro plant currently not operating, and a dam from a third hydro plant that was removed in 1948. No other significant activities are known to occur.

Key Features
Significant features include extremely hot conditions in summer, near absence of woody debris due to shortage of large trees in this reach or upstream, significant pockets of spawning gravel in poor condition due to sedimentation from upstream sources, three enhanced spawning areas constructed in the mid-1980's but little maintained since then, the adult and juvenile counting facilities for salmon entering and exiting the Shasta River, and the USGS gage site (since 1934). Some stranding occurs in some years in this reach. Historically gravel was supplied to this reach from the Yreka Creek drainage, but channelization, capture of winter flows and stream incision have substantially reduced this source. Little or no gravel reaches the channel from within this reach.

Yreka Creek underflow may be entering the Shasta near the mouth of Yreka Creek, and could possibly provide a lower Shasta refugia area suitable for coho.

Water usage
Consumptive use identified in this reach = <.5 cfs. Non-consumptive use reaches a maximum of 50 cfs in winter.

Riparian Condition
Riparian condition is on a strongly improving trend, but was very severely degraded by mining and will continue to be slow to recruit trees until stream banks accrue sufficient soil to hold adequate moisture. Because instream flows drop significantly and rapidly trees may not be able to re-colonize many areas where bedrock prevents access to water. Herbaceous vegetation is vigorous and effective in capturing fine sediment and providing some channel and bank complexity.

Limitations on Coho
In-gravel

Gravel in this reach is depleted from long periods of reduced supply formerly from Yreka Creek. What gravel remains is heavily infiltrated with fine sediment, substantially reducing egg survival although chinook production indicates that egg survival may not be as bad as Jong and Rickers work indicates.

Rearing (over-summering, over-wintering & out-migration)

Relatively high water velocities, coupled with reduced instream habitat complexity limit rearing opportunities for the smallest coho as they emerge. Those which are able to find suitable edge habitat may be stranded or displaced as water levels drop upon the beginning of the main irrigation season upstream on April 1, and be forced into the Klamath where they will need to find alternate suitable habitat in the mainstem Klamath or its tributaries.

Those remaining or passing through will be faced with lethal temperatures as the summer progresses.

Avoidance, Minimization, Mitigation and Enhancement targets
Improve passage at former hydroelectric flashboard dams.

Provide improvements to habitat downstream of the mouth of the Shasta either in the Klamath or its tributaries where summer-long conditions are suitable to provide refugia for coho displaced from the lower Shasta.

Avoid additional demands on water upstream that will either reduce base flows in the canyon, advance the timing of onset of irrigation season, or advance timing of arrival of minimum flows in canyon. Protect existing instream flows to encourage continuing riparian recovery and provide for food chain elements.

Minimize temperature gains upstream in order to extend potential rearing period in lower Shasta; increase instream flows if longer rearing period can be produced in Shasta Canyon.

Provide large woody debris and other habitat forming structures along the stream edge to provide for initial rearing. Manage water diversions upstream to minimize rapid or repeated draw downs leading to stranding.

Transplant young of year coho captured in outmigrant trap and rescued stranded coho to upstream areas with suitable conditions for survival which are not already fully seeded.

Encourage recruitment of trees and/or plant to provide shade and extend rearing season.

Possible refugia associated with Yreka Creek underflow may exist and could be enhanced if water temperatures allow.

1d. Mainstem Shasta River Between River Miles 7.75 and the mouth of the Shasta River (RM 0)

Area Description
This stretch of the river is locally known as the Shasta River Canyon. It tends to be steep, bedrock constrained, hot and dry. Essentially no commercial agricultural activities occur here, but the impacts of all activities upstream have profound effects, particularly reductions in flow, earlier than natural increases in water temperature and the transport of fine sediment into this reach.

Elevation within the reach ranges from 2036 feet at the confluence with the Klamath, to 4974 ft. at Badger Peak. Maximum river elevation is 2387 feet. The stream has no significant tributaries or springs in this reach and measures 7.75 miles long. The watershed draining into this short reach covers 5867 acres (2375 hectares). Rainfall varies between 18 and 30 inches.

Past mining beginning in the late 1800's stripped most of the soil and vegetation from the bedrock adjacent to the stream in this reach; subsequent livestock usage until 1991 largely prevented recovery from those activities. Since 1991 significant herbaceous and woody vegetation growth has occurred in the canyon, sediment is being trapped, and the channel is gaining shade and bank complexity. Nevertheless, proximity of bedrock near the surface limits water availability to plants.

The river runs through about 3 miles of public lands in this reach.

Anadromous Species Use

All three species of anadromous fish use this reach for transit, spawning and rearing. Approximately 50% of the coho spawning in the Shasta spawn here, (9 of the 19 radio tagged coho were recovered in the canyon and if able to find suitable edge habitat are able to rear here until water temperatures and/or dropping river levels force them to seek suitable habitat in the Klamath River. Significant numbers exit the Shasta as young of the year outmigrants.

Agricultural Activity

Minor agricultural activities in this reach are limited to 3 very small ranchettes at the upper end of the reach, and homestead style gardening further downstream. Livestock are currently excluded from essentially all of this reach. All identified diversions in the reach are screened.

Other Land uses
Both Placer and hardrock mining took place in the Shasta. Currently no mining activities are allowed in the stream. Occasional boaters float the Shasta Canyon. This reach contains one active hydroelectric powerplant for personal use, one formerly FERC licensed hydro plant currently not operating, and a dam from a third hydro plant that was removed in 1948.

No other significant activities are known to occur.

Key Features
Significant features include extremely hot conditions in summer, near absence of woody debris due to shortage of large trees in this reach or upstream, significant pockets of spawning gravel in poor condition due to sedimentation from upstream sources, three enhanced spawning areas constructed in the mid-1980's but little maintained since then, the adult and juvenile counting facilities for salmon entering and exiting the Shasta River, and the USGS gage site (since 1934). Some stranding occurs in some years in this reach. Historically gravel was supplied to this reach from the Yreka Creek drainage, but channelization, capture of winter flows and stream incision have substantially reduced this source. Little or no gravel reaches the channel from within this reach.

Water usage
Consumptive use identified in this reach = <.5 cfs. Non-consumptive use reaches a maximum of 50 cfs in winter.

Riparian Condition
Riparian condition is on a strongly improving trend, but was very severely degraded by mining and will continue to be slow to recruit trees until stream banks accrue sufficient soil to hold adequate moisture. Because instream flows drop significantly and rapidly trees may not be able to re-colonize many areas where bedrock prevents access to water. Herbaceous vegetation is vigorous and effective in capturing fine sediment and providing some channel and bank complexity.

Limitations on Coho

In-gravel

Gravel in this reach is depleted from long periods of reduced supply formerly from Yreka Creek. What gravel remains is heavily infiltrated with fine sediment, substantially reducing egg survival. Chinook production indicates that egg survival may not be as bad as Jong and Rickers work indicates

Rearing (over-summering, over-wintering & out-migration)
Relatively high water velocities, coupled with reduced instream habitat complexity limit rearing opportunities for the smallest coho as they emerge. Those which are able to find suitable edge habitat may be stranded or displaced as water levels drop upon the beginning of the main irrigation season upstream on April 1, and be forced into the Klamath where they will need to find alternate suitable habitat in the mainstem Klamath or its tributaries.

Those remaining or passing through will be faced with lethal temperatures as the summer progresses.

Avoidance, Minimization, Mitigation and Enhancement targets

Improve passage at former hydroelectric flashboard dams.

Provide improvements to habitat downstream of the mouth of the Shasta either in the Klamath or its tributaries where summer-long conditions are suitable to provide refugia for coho displaced from the lower Shasta.

Avoid additional demands on water upstream that will either reduce base flows in the canyon, advance the timing of onset of irrigation season, or advance timing of arrival of minimum flows in canyon. Protect existing instream flows to encourage continuing riparian recovery and provide for food chain elements.

Minimize temperature gains upstream in order to extend potential rearing period in lower Shasta; increase instream flows if longer rearing period can be produced in Shasta Canyon.

Provide large woody debris and other habitat forming structures along the stream edge to provide for initial rearing.

Manage water diversions upstream to minimize rapid or repeated drawdowns leading to stranding.

Transplant young of year coho captured in outmigrant trap and rescued stranded coho to upstream areas with suitable conditions for survival which are not already fully seeded.

Encourage recruitment of trees and/or plant to provide shade and extend rearing season.

2a. Parks Creek

Area Description:
The Parks Creek sub-watershed is approximately 35,152 acres and includes approximately 23.3 miles of both the West Fork and mainstem of Parks Creek. The West Fork of Parks Creek is the only significant tributary in the sub-watershed. As one travels downstream in the watershed from the headwaters to the mouth, the glaciated valleys of the headwaters transitions slowly to flat and broad alluvial fans which have formed wetlands in the lower 3-4 miles of the stream. For

its lowest 10 miles, Parks Creek passes over and through a volcanic debris flow that originated from Mount Shasta during the Pleistocene age.

Parks Creek varies from deeply incised channels in its upper reaches to a meandering near-surface stream in its lower reaches. Water flow in the creek is flashy in the winter and spring due to rain on snow events upslope. Substantial summer base flow is provided by numerous springs scattered along its length. Elevation ranges from a high of 8,542 feet at China Mountain to 2,590 feet at the confluence with the Shasta River. Precipitation ranges from 55 inches annually in the headwaters, to as little as 5 inches near its mouth. Land use in the upper quarter of the watershed is primarily timber harvest related in the public and private lands there. Limited rural residential developments are located at the base of this hills with agricultural land use (irrigated and dryland pasture) predominating along the lower 15 miles of Parks Creek.

Anadromous species use:
Currently both fall chinook and coho are known to spawn in the lower 4 miles of Parks Creek where limited gravelly areas exist in association with tributary springs. In the 1950's, fall chinook were spawning at least as far as RM 12 (Mark Healey, pers. comm.). Presumably steelhead are able to proceed further upstream than either coho or chinook. While summer utilization studies have not been conducted, water temperatures in the numerous springs feeding Parks Creek are well within the range of coho tolerance as are waters in the higher elevations where slope and velocity may or may not allow coho usage. Middle portions of Parks Creek are presumed to exceed tolerances for coho during most summers. Lamprey are also found in Parks Creek, but little is known about their usage of the basin.

Agricultural Activities
Agricultural activity is focused primarily on pasture for cattle. Approximately 4,875 acres are irrigated with surface water derived from Parks Creek or the Shasta River. No riparian fencing or other streambank protection is known to exist in the watershed associated with agricultural operations. Irrigation tailwater return to the river is known to occur in this sub-watershed, and is believed to be contributing to elevated water temperatures in Parks Creek.

Other Land Uses
Historically, the headwaters region of the Parks Creek sub-watershed has been heavily roaded for timber harvest, mostly during the 1960's. Active harvest activities still occur currently. Fine sediment transport into Parks Creek due to such activities are well above natural levels for the system (Resource Management, 2002).

Key features:

- *Frequent flood events and high flows:*
  Parks Creek is the only stream still connected to a headwaters area capable of generating frequent flood events. Other similar tributaries are either disconnected from the Shasta by Dwinnell Dam, or receive too little rain and/or snow to generate significant flows. While these high flows, coupled with significant coarse and fine sediment yield in the headwaters mean that Parks Creek moves substantial amounts of sediment, the very flat gradient of the lower seven miles causes coarse sediment to gradually drop out of the water column and as a result there is no evidence of coarse sediment transport to the mainstem Shasta.

- *Cold water source:*
  Much of the water that flows down Parks Creek is captured high in the mountains and originates from snow melt. This attribute, along with input of springs along Parks Creek suggests that it once may have contributed valuable cold water to the Shasta River during the

warmer summer months. Recent investigations (RWQCB 2004 data) suggest that water is withdrawn returned and reused so often that cold areas in the lower portions of the creek are now found only in proximity to source springs, and the water delivered to the Shasta can be quite warm.

- *Lack of coarse sediment transport:*
  The lack of coarse sediment transport is a consequence of the landform generated by the Pleistocene debris flow which filled the ancient Shasta Valley including the lower 10 miles of Parks Creek. Over millennia this will change, but at present Parks Creek is only able to deliver fine sediment to the Shasta itself, and any gravels in its lower reaches are found only where large springs have winnowed out gravels from the materials comprising their immediate bed and banks, leaving them vulnerable to activities that increase sedimentation or decrease fine sediment transport. Investigations by DFG indicated excessively high levels of fines in spawning gravels (28-41% fines, n=2) in Parks Creek which would be expected to result in extremely poor egg survival (Ricker 1997). Fine sediments also make emergence from gravels difficult which will most likely also result increase mortality rates.

- *Fish passage barriers:*
  Two partial barriers potentially affecting coho exist in the stream, one associated with a summer diversion, one with the construction of Interstate 5. Remedial work is currently underway on the barrier associated with I-5. A third barrier in the headwaters is believed to be beyond areas usable for coho. Periodic channel cleaning and minor channelization is occasionally done where Hy 99 crosses Parks Creek via a low bridge.

Water usage
The only significant water usage in Parks Creek is for irrigation. Diversion occurs both during the summer for immediate use, in winter for stockwatering purposes, and in winter/spring for storage for subsequent summer use. Current records indicate that 27 diversions extant the length of the stream and coho are known or possible at 24 of those. Seven are known to be screened to current criteria as of 3/05 for summer irrigation season usage. Summer irrigation season runs from March 1 to November 1. Summer irrigation maximum diversion quantity is 46.2 cfs, although full diversion quantity is unlikely to be available all summer. Winter diversion quantity for stockwater is 16.3 cfs, and for storage is 14,000 acre feet.

Water Quality Information
Limited data available indicates summer temperatures in lower Parks Creek to be variable, presumably from the combined effects of irrigation tailwater return, ponding associated with some diversions, loss of shade, and increased transit time related to reduction in volume tending to exacerbate heating, and the inflows of numerous large and small springs depressing stream temperatures. Salmonid utilization of the lower 15 miles of Parks Creek in summer is almost certainly restricted to large and small refugia areas formed by springs. Temperatures in the upper portions of the watershed are believed to be below maximum temperature tolerances for coho.

Riparian Condition
The lower 15 miles of Parks Creek have areas of significant and longstanding livestock impacts resulting in increased sedimentation and decreased shade.

Limitations on Coho
Spawning

Flows in Parks Creek normally allow fall chinook to enter the stream and spawn in its lower reaches, so are believed to be adequate for the later arriving and smaller coho. Reduced flows and restrictions on passage probably restrict spawner access to the lower ~5 miles of the system currently

In-gravel survival

Available data indicates that egg survival should be very poor to non-existent due to high levels of fine and small sediments in gravels sampled in Parks Creek. Eggs in gravel are also at risk of trampling should livestock be present due to unrestricted livestock access and propensity of cattle to cross streams in areas with firm footing such as gravelly areas.

Rearing

Suitable water temperatures are believed to restrict coho to refugia areas formed by springs feeding Parks Creek. Many of those springs are also used for irrigation, and some are apparently captured and held in ponds for periodic use. Coho rearing in the outflows of those springs and spring-fed ponds may be at risk from fluctuations in flow and temperature resulting from water management activities.

Avoidance, Minimization, Mitigation and Enhancement targets

Highest priority in the near term appears to be to reduce the bottleneck on overall production resulting from the build-up of fine sediment in the already limited spawning gravels. Measures should include protection of stream banks adjacent to and upstream of all potential spawning areas. Upslope fine sediment production should be curtailed. A combination of natural (i.e. high flow) and/or mechanical gravel cleaning should be considered for the lower portions of the creek, especially for the brood years at greatest risk. Impacts of fine sediment delivered to the mainstem Shasta should also not be overlooked.

Water management should be examined to seek opportunities to minimize warming of water flowing down streams by isolating ponds that are fed by springs from the stream and by preventing overflowing of stored and consequently warmed water. Where possible, alternate irrigation sources should be developed, and at the very least, no additional demands placed on existing cold water sources. Instream ponding should be reduced or eliminated via changes in diversion methods. Impacts of water temperatures in Parks Creek on the mainstem Shasta at their confluence should be minimized by lowering Parks Creek temperatures.

Streambanks in the lower 5 miles of stream need to be assessed for suitability for tree growth, and where appropriate, riparian trees should be re-planted. Other areas should be stabilized as quickly as possible with herbaceous plants either through natural recruitment or supplemental plantings. Because of the size and nature of the stream, overhanging banks and vegetation appear to be the best source of instream cover in this section.

Streambanks further upstream appear to be generally suitable for riparian trees. Upstream banks should be protected from livestock impacts and growth of shade-producing plants allowed/supplemented to minimize increases in stream temperatures, provide overhead cover, supply woody debris, provide roughness in winter, and add leaf and insect drop.

Instream flows should be monitored to assure that bypass requirements are met and coho are able to ascend as far upstream as they wish. Spawning gravel quantity and quality improves dramatically as one moves upstream. Additional water for instream flows, especially in the fall, would provide a margin of error regarding access.

Past stream channel maintenance associated with the HY 99 road crossing should be evaluated and ways found to minimize large-scale disruption of the channel while still keeping the road open. The channel should be allowed to heal from past gravel mining/management, and ill effects of excessive coarse sediment resulting from upstream disturbances.

While known spawning currently occurs below unscreened diversions, all diversions potentially accessible to coho should be screened.

Supplemental spawning gravel could be placed in areas found to have cold water where such gravels are not already present and conditions are such that gravels are likely to stay or can be maintained in a usable condition for a reasonable length of time.

Passage at the partial barriers should be improved.

Road improvements and closures in the headwaters should be undertaken as quickly as possible to prevent both catastrophic damage in flood years and the ongoing introduction of greater amounts of fine sediment than the system can absorb in normal years.

Studies should be undertaken in Parks Creek to reduce the level of uncertainty currently necessary on measures to meet coho needs there.

References:

Mark Healey, pers. comm. with Dave Webb.

Resource Management. 2002. *Parks Creek Sediment Source Assessment*. Under contract with Great Northern Corporation, pages 5-6.

Ricker, Seth J. 1997. Evaluation of salmon and steelhead spawning habitat quality in the Shasta River Basin, 1997. California Department of Fish and Game- Inland Fisheries Administrative Report 97-9.

2b. Yreka Creek

Area Description

This tributary stream is comprised of about 12 miles in Yreka Creek, and six miles in Greenhorn Creek, its only significant tributary. Total watershed acreage is approximately 33,443 acres (13,534 hectares). General landform is the result of the tectonic uplift of the metamorphic Klamath-Siskiyou Mountains on the west side of the watershed, and lower, rounded sandstone marine sediments forming the edge of the valley to the east. The creek varies from steep and deeply incised in its upper reaches to a near-surface stream in its alluvial lower reaches. The portion of the creek flowing through Yreka has been channelized (but not straightened completely or lined) to a significant degree by progressive filling of properties bordering it, and downstream from Yreka its floodplain was completely overturned by dredge mining prior to WW II. In the 1950's the dredge tailings were leveled, and a channel created for the stream at the base of the hills bordering the east side of the historic flood plain. Elevation ranges from a high of 5,810 feet on the ridge shared by Yreka and Greenhorn Creeks with the Scott Valley, down to 2,387 feet at the confluence with the Shasta River. Precipitation ranges from 40 inches annually in the headwaters of Greenhorn Creek, to 18 inches near the confluence with the Shasta. Summer thunderstorms can result in very flashy flows in mid-summer, and on rare occasions rain on snow can produce high water in winter. Land use is primarily timber harvest related in the public and private lands of the upper ¼ of the watershed, grading into rural residential near the base of the hills, and with agricultural land use (irrigated and dryland pasture) and urban areas in the bottomlands. The city of Yreka, population 7,000, is in the center of the watershed. Yreka owns Greenhorn Reservoir built near the mouth of Greenhorn Creek that now serves as the focal point of a large city park.

Anadromous Species Use
Chinook salmon can be found spawning in the lower 4 miles of Yreka Creek in years when creek flows are high enough in the fall to allow their entry, and run size is large enough to encourage colonization of new habitat. Steelhead can be found spawning in Yreka Creek nearly all years when numbers are high enough to be visible. No recent records of coho spawning exist for coho in Yreka Creek, but no real effort has been mounted to document this activity. Juvenile coho and steelhead are found over summering in Yreka Creek where pockets of cold water persist through the summer. Cold water sources include some small springs in the city limits of Yreka, and seepage from the Yreka sewage treatment plant.

Agricultural Activity
Agriculture in the watershed is limited, and consists of irrigated and partially irrigated fields in the bottomlands bordering Yreka Creek (but not Greenhorn Creek) both upstream and downstream of Yreka. Those fields are grazed while forage and water is available, then livestock are moved elsewhere.

Approximately 12.6 miles of Greenhorn and Yreka Creek are protected from livestock impacts in this watershed.

Other Land uses
Mining was historically the predominant activity in the watershed, especially in the Greenhorn drainage, and Yreka Creek below Greenhorn Creek. Gold mining largely ceased with the advent of WW II, and never returned. Timber harvest is ongoing on small tracts in the higher elevations to the west of the watershed. The primary activity now occurring in the watershed is the slow expansion of the urban and suburban area centered around Yreka, where increasing numbers of people are moving to retire.

Key Features
Grazing of pastures bordering the creek has had a significant impact on bank stability and shading, and much of Yreka creek upstream of Yreka is in poor condition, with resultant increases in fine sediment yields. Grazing downstream of Yreka is reducing the maximal amount of stream cover, although large trees in this portion of the creek continue to provide adequate shade. Trampling of redds may be an issue.

Urban impacts are large and growing, but unquantified, especially in terms of urban runoff and contaminants likely to be contained in them. Past channelization has left the creek substantially different from its historic character as a near-surface meandering stream. Much of the floodplain is now occupied by fill and buildings and streets.

Coho utilization of the watershed is dependent on the persistence of very small refugia areas that could easily be lost if shade or coldwater inputs were disrupted, if large amounts of warm water were added, or if transient slugs of urban runoff associated with thunderstorms or first rains of winter brought significant toxic loads.

Water usage

Irrigation diversions capture the available water in the headwaters of Yreka Creek, although runoff there appears to be largely seasonal. Runoff in Greenhorn Creek is captured by Greenhorn Reservoir, where there is no fish passage, although neither is there any consumptive use. Persons living outside of town do capture underflow of both Yreka Creek and Greenhorn Creek for domestic and/or irrigation uses. The city of Yreka imports up to 6 cfs from Fall Creek off the Klamath for domestic use, but supplements that water with water from the underflow of Yreka Creek during times of peak demand in mid-summer.
Peak potential diversion quantities equal 9.88 cfs, not including any water captured by Greenhorn Reservoir should it not be full, or in Greenhorn Creek upstream of the reservoir.
There appear to be at least 510 acres irrigated in the watershed, although records are not thought to be complete or up to date due to the marginal nature of most of the agricultural activities, the short season in which water is available to divert, and the fact that Yreka Creek is not watermastered. Approximately 100 acres are irrigated with groundwater, and the remainder uses surface water or stream underflow.

Some water usage is believed to be still occurring from Humbug Creek, a small and usually disconnected tributary which might otherwise reach Yreka Creek and provide for surface or subsurface flows.

Riparian Condition

Riparian condition in the upper 5 miles of Yreka Creek is generally poor as a result of ongoing grazing impacts, and loss of most of what little water would be in the stream in mid to late-summer to support riparian growth. The lower seven miles of Yreka Creek is in generally good condition in terms of vegetation, but the stream is overly constrained to a fixed channel with limited opportunities for habitat variability.

Limitations on Coho

Adult/Spawning

> Access may be problematic in fall due to low flows. This may be a natural condition in whole or in part.

In-gravel

> Survival may be compromised by sediment delivered from upstream in the watershed. No data is available, although sediment delivery appears to be diminishing from the middle reaches of the stream. Survival may also be compromised by delivery of urban contaminants to the stream.

Rearing (over-summering, over-wintering & out-migration)

> Opportunities to rear are restricted to very few cold water refugia that are utilized by coho and steelhead. The coho may have migrated into Yreka Creek from the main Shasta, or may be the progeny of coho that spawned there.

Avoidance, Minimization, Mitigation and Enhancement targets

Maintenance and enhancement of instream flows in the fall are necessary in dry years to assure access.

Summer augmentation of flows are needed, but should be approached cautiously to be sure that existing refugia aren't subsumed in the transition process. Any reductions in flow at any time of year should be avoided strenuously.

Watermaster Service or other method of verification that water usage is within legal rights might provide incremental additional water to upper Yreka Creek, assisting riparian revegetation and recovery, additional shade, the potential of additional habitat in the future, and reductions in fine sediment yield in the near term.

Urban runoff from roads and yards should be filtered or otherwise treated to remove antifreeze, detergents, pesticides, herbicides and other petroleum products before they reach the stream.

Changes/improvements to the Yreka Sewage treatment plant should be approached with an eye towards introducing water as cold as possible to the stream, as far upstream as possible.

Drafting of the underflow of Yreka Creek should be avoided.

Streambank livestock protection needs to be put into place in both the lower reaches and upper reaches of Yreka Creek.

Fish passage opportunities and possible benefits should be investigated for Greenhorn Reservoir

Historic gravel transport to the Shasta River should be recreated.

Additional signage and public outreach related to coho should be focused around the urban section of the creek to bolster understanding and awareness of sensitivity of Yreka Creek.

Opportunities to include verbiage in the Yreka General Plan now under revision should be pursued, possibly including measures to discourage removal of riparian vegetation, measures to discourage placement of any additional pumps into the creek for urban irrigation, and measures intended to restore floodplain function and the ability of the stream to change over time.

Nutrient inputs to the creek should be reduced.

Instream cover elements might be added in refugia areas.

Additional demands for water within the drainage should be avoided year around; abandoned water rights should be recaptured if possible to provide to provide additional instream flows.

<u>2c. Little Shasta River</u>

Area Description
The Little Shasta River is approximately 26 miles long with a watershed of approximately 51,943 acres (33,160 hectares). Numerous intermittent tributaries enter the Little Shasta from the north. The Little Shasta sub-watershed is comprised of cascade volcanics in the headwaters areas transitioning through a steep constrained canyon reach, and then flowing across dry flatlands in the lower 11 miles where the influence of a Pleistocene volcanic debris flow predominates. Land along the creek varies from high mountain wet meadows in its upper reaches, through long stretches of steep ground covered with sandy volcanic ash and lava flows where timber harvest was actively engaged in, and in its lower reaches it is the flat, dry Shasta Valley debris flow where agricultural activities predominate Flow can be flashy in winter and spring although the very porous soils tend to minimize runoff from much of the drainage, the relatively low elevation limits snow captured, and total precipitation ranges from only 10 to 40” annually. Substantial summer base flow is provided by numerous springs in the headwaters along with others

concentrated near RM 13. Elevation ranges from a high of 8,241 feet at Goose Nest down to 2,471 feet at the confluence with the Shasta River. Land use is primarily timber harvest related in the public and private lands of the upper 1/2 of the watershed, with agricultural land use (irrigated and dryland pasture, and hay production) predominating in the lower half of the watershed.

In addition to public lands managed by the Forest Service in the higher elevations, the Department of Fish and Game operates a wildlife area centered near RM 4, where several man-made winter storage reservoirs provide hunting, fishing and bird watching opportunities to the public.

Anadromous Species Use
The Little Shasta is currently known to be used intermittently by fall chinook salmon and also by steelhead. No evidence is available documenting coho utilization now or in the past, although natural streamflow and gradient suggest that it would have been used by them prior to water development, especially that used for winter storage when adult access is now restricted.

Agricultural Activity
Agricultural activities in the Little Shasta focus on cow-calf operations, with land used for dryland and irrigated pasture, production of grass and alfalfa hay, and production of small grains for livestock feed locally. Substantial farmable acreages exist that are largely left fallow for lack of sufficient water either from rain or irrigation to make them productive, assuring that water will always be in short supply.

Approximately 19% of the stream frontage on private land used by livestock is currently fenced to protect stream banks. Of portions of the stream on US Forest Service lands, approximately 2/3 are fenced to exclude livestock, with the remainder deemed too rough to attract them and therefore not needing protection. Irrigation tailwater return to the river is known to occur in this sub-watershed, and is believed to be contributing to temperature gains.

Other Land uses
Historically timber harvest activities were conducted in the upper elevations of the watershed where sufficient natural moisture was available to foster conifer growth. Currently little harvest is underway. The Fish and Game Wildlife Area draws hunters from urban areas to the south who are seeking ducks and geese, along with local residents. Other land uses in the wildlife area are similar to operations on surrounding ranches, with irrigated areas, grain fields, etc. being grown for the benefit of waterfowl. Limited grazing is utilized for vegetation management to improve palatability of grass for geese and improve predator-avoidance visibility for sandhill cranes.

Key Features
- *Reduced water flows and access to suitable habitat:*

While the Little Shasta flows through an intact watershed, heavy demand for water both summer and winter has substantially altered the character of the stream. Flows in mid-summer tend to largely end near RM 12. Above that point is substantial cold water and a healthy stream. Below there the channel tends to loose its aquatic values and characteristics. In fall and early winter, major storage diversions place heavy demands on nearly all of the available water through most of the winter. The combination effectively precludes most or all anadromous fish usage of the sub-basin most years.

While logging activities have been extensive in the headwaters of the drainage, high soil permeability has largely prevented surface runoff and associated fine sediment from reaching the stream.

- *Fine Sediment Source:*

Similar to Parks Creek the Little Shasta transports substantial amounts of coarse sediment from its headwaters, but once it reaches the ancient volcanic debris flow in the middle of the Shasta Valley the water velocity drops, and the stream is ultimately unable to transport anything but fine sediments to the Shasta itself. Appropriate spawning gravel substrate exists from the headwaters to approximately RM 10.

Water usage

Significant water usage in the Little Shasta is for irrigation, stockwatering, municipal and recreation uses. Diversion occurs both during the summer for immediate use, in winter for stockwatering and municipal purposes, and also in winter for storage for recreation and/or subsequent summer use. Current records indicate that approximately 29 diversions (some are combined) are extant in or near the stream and coho are possibly present at 26 of those. 14 are known to be screened to current criteria as of 3/05 for summer and winter season usage. Summer irrigation maximum diversion quantity is 85.6 cfs, although full diversion quantity is unlikely to be available most of any summer. By summers end most years all water users are severely restricted. Winter diversion quantity for stockwater is 6.8 cfs, and for storage is 8,528 acre feet with no restrictions on instantaneous quantity.

In addition to areas irrigated with water derived from the Little Shasta, other substantial amounts of land are irrigated with water transported via canal from behind Dwinnell Dam by the Montague Water Conservation District. Total irrigated areas in this sub-watershed are 10.610 ac. (4293 hectares) with surface water from all sources, and 375 acres (152 hectares) with groundwater.

Riparian Condition

Riparian conditions above about RM 11 are generally quite good with dense over story, tall trees and appropriately stable banks. Between RM 11 and RM 8.75, recently installed protection is yielding rapid improvement in an area that had been in only fair condition. Below RM 8.75 riparian conditions tend to be unprotected and poor.

Limitations on Coho

Adult/Spawning

Severe access limitations, all related to lack of instream flows, effectively prevent adults from entering the Little Shasta in nearly all years. Absence of coho mean that no take is occurring directly in the Little Shasta, but also means that recovery (colonization of additional streams in the watershed) cannot happen.

In-gravel survival

To the extent that destabilized stream banks increase sediment loading transported downstream to the mainstem Shasta, offsite impacts on eggs in gravel may be occurring.

Rearing

No documented rearing is occurring in the Little Shasta. However, to the extent that diminution of instream flows is resulting in degraded water quality or reduced habitat in the mainstem Shasta, or encouraging excessive early migration to the Klamath, offsite impacts may be occurring.

Avoidance, Minimization, Mitigation and Enhancement targets

Highest priority for the Little Shasta is to re-build instream flows to initiate the process of rebuilding channel health and aquatic and riparian communities, and to allow for consistent re-colonization of the stream by anadromous fish.

Secondary goals include protecting stream banks from livestock impacts to minimize generation of fine sediment to be transported downstream, or other grazing related impacts that might exacerbate the current poor condition of the lower portions of the watershed or slow its recovery.

One man-made barrier or partial barrier is thought to occur near RM 6 and should be investigated and remediated if needed. Another man made barrier exists near RM 13 where a diversion structure lacks adequate passage provision. This too should be remediated.

Studies should be undertaken to reduce the level of uncertainty currently necessary on measures to meet coho needs there.

Attachment 5
Jeopardy Analysis

Overview:

Coho are a widespread species of Pacific salmon, occurring in most major river basins around the Pacific Rim from central California to Korea and northern Hokkaido, Japan (Laufle et al. 1986). Klamath River coho, including those which spawn and rear in the Shasta River, are part of the Southern Oregon-Northern California Coasts (SONCC) Evolutionarily Significant Unit (ESU) which includes all coho salmon stocks between Cape Blanco in southern Oregon and Punta Gorda in northern California. The Central California Coast (CCC) ESU includes coho salmon from Punta Gorda to the southern boundary of their range at the San Lorenzo River near Monterey.

In response to three petitions seeking protection of coho salmon under the Federal ESA during the early 1990s, NOAA Fisheries conducted a status review of coho salmon in Washington, Oregon, and California. The Biological Review Team (BRT) assembled for this review concluded that all coho salmon stocks in the SONCC ESU were depressed relative to past abundance but that limited data was available to assess population numbers or trends (Weitkamp et al. 1995). The BRT also found that main stocks in the ESU (Rogue River, Klamath River and Trinity River) were heavily influenced by hatcheries and, apparently, had little natural production in mainstem rivers. There was unanimous agreement among the BRT that coho salmon in the SONCC ESU were not in danger of extinction but were likely to become endangered in the foreseeable future if present declines continued. No specific conclusions regarding the status of coho salmon spawning or rearing in the Shasta River were made. The SONCC coho salmon ESU was listed as threatened pursuant to the ESA on May 6, 1997.

An ESU is a population (or group of populations) considered distinct for purposes of the Federal Endangered Species Act (ESA). A population must meet two criteria in order to be considered an ESU: (1) it must be reproductively isolated from other co-specific population units; and (2) it must represent an important component of the evolutionary legacy of the species (Waples 1991). ESUs reflect the best and most current understanding of the likely geographic boundaries of reproductively isolated salmon populations. Understanding these boundaries is especially important to NOAA Fisheries, which is charged with evaluating and protecting salmon species with broad ranges extending across state borders. Similar populations are thus grouped for efficient protection of biological and genetic diversity. CDFG, in contrast, has responsibility for evaluation and protection of California stocks only and typically evaluates and manages salmon on a watershed basis, regardless of the biological affinities of California stocks to stocks across our borders (CDFG 2002, 2003). CDFG therefore recognizes the importance of genetic structure and biodiversity among California stocks in evaluating and protecting coho salmon.

The SONCC coho salmon ESU was listed as threatened pursuant to the Federal ESA due to numerous factors including several long-standing, human-induced factors (e.g., habitat degradation, harvest, water diversions, and artificial propagation) that exacerbate the adverse effects of natural environmental variability (e.g., floods, drought, poor ocean conditions). Habitat factors that may contribute to the decline of SONCC coho salmon include changes in channel morphology, substrate changes, loss of instream roughness and complexity, loss of estuarine habitat, loss of wetlands, loss and/or degradation of riparian areas, declines in water quality, altered stream flows, impediments to fish passage, and elimination of habitat. The major activities identified as responsible for the decline of coho salmon in Oregon and California included logging, road building, grazing, mining, urbanization, stream channelization, dams, wetland loss, beaver trapping, water withdrawals, and unscreened diversions for irrigation (May 6, 1997; 62 FR 24588).

In 2001, NOAA Fisheries updated the status review of coho salmon in California including the California portion of the SONCC ESU from Punta Gorda to the Oregon border. This review was based on presence-absence data collected between 1989 and 2000 and population trend data from a wide variety of sampling methods including juvenile surveys, downstream migrant trapping, upstream migrant trapping and spawning and redd surveys (NOAA Fisheries 2001a). This updated status review agreed with the previous BRT conclusions that the California portion of the SONCC coho salmon ESU was threatened but likely to become endangered in the foreseeable future. Again, no specific conclusions were made regarding the status of coho salmon spawning or rearing in the Shasta River.

The coho salmon status review recently completed by CDFG included a thorough analysis of the factors affecting the capability of coho salmon to survive and reproduce (CDFG 2002). These factors included drought, flooding, changes in ocean condition, disease, predation, hatcheries, genetic diversity, forest activities, water temperature, sedimentation, altered stream flow, lack of large woody debris, lack of streamside vegetation and canopy cover, physical barriers, low dissolved oxygen by life stage, effects on estuaries, water diversions and fish screens, artificial barriers, gravel extraction, suction dredging, streambed alteration, reduced water quality, agricultural impacts, urbanization, and illegal harvest.

Based on its review of the status of coho salmon north of San Francisco, CDFG concluded that California coho salmon have experienced a significant decline in the past 40 or 50 years. CDFG also concluded that coho populations have been individually and cumulatively depleted or extirpated and that the natural linkages between individual populations have been fragmented or severed. For the California portion of the SONCC coho salmon ESU, the analysis of presence-by-brood-year data indicated that coho salmon now occupy about 61% of the streams that were previously identified as historical coho salmon streams (CDFG 2002). However, these declines appeared to have occurred prior to the late 1980s and existing data does not support a significant decline in distribution between the late 1980s and 2002. The analysis also indicated that some streams in the ESU may have lost one or more brood year lineages. Based on this information, CDFG concluded that coho salmon populations in the California portion of the SONCC ESU are threatened and will likely become endangered in the foreseeable future in the absence of special protection and management efforts required by the California Endangered Species Act. No specific coho population trend data was provided in this status review for the Shasta River.

NOAA Fisheries is currently updating the listing status of 27 salmon and steelhead ESUs in California, Oregon, Washington and Idaho including the SONCC coho salmon ESU. Preliminary conclusions were circulated in February 2003 for review by tribal, state, and federal agencies for technical review (NOAA Fisheries 2003). None of the data currently under review contradicts conclusions reached previously by the BRT or CDFG. Although coho salmon stocks within the entire SONCC ESU have experienced significant declines in distribution over the past 50 to 60 years, there do not appear to have been any substantial changes in the distribution of the species ESU-wide since the late 1980s.

Klamath River:
Additional information relating to juvenile coho rearing in Klamath River tributaries indicates that while many cold-water tributaries do not currently support coho spawning based on field surveys conducted in winter, they do provide rearing habitat for significant numbers of juvenile coho through the summer, indirectly documenting the ability of coho to locate and utilize available habitat apparently some distance removed from where they hatched. Available data of Shasta coho spawning derived from radio tagging in 2004 indicates that approximately half (9 out

of 19 tags recovered were found in the Shasta Canyon. Bill Chesney CDFG, pers. comm.) the coho spawn in the lower 6 miles of the Shasta River, an area known to reach temperatures lethal to coho juveniles. Many 0+ juveniles are counted leaving the Shasta each year, presumably including most or all the progeny of those spawning in the lower 6 miles of the Shasta River. It seems reasonable to assume that some of them may be taking up residence in those cold water Klamath tributaries for their first summer, then re-distributing themselves over the next winter as juveniles, or later as returning adults. Such a life history would be conducive to re-colonizing streams, and is consistent with the workings of a larger meta-population. Klamath coho tendency to spawn at places other than their natal streams is further supported by data collected at Iron Gate Hatchery, in which unmarked (wild) coho make up a significant fraction (9.4% to 46.2% between 1997 and 2004; mean=23.8%. Source of data: Kim Rushton DFG, pers. comm.) of each return class, and those that are returned unspawned to the Klamath from the hatchery can move widely before spawning (Mark Hampton CDFG, pers. comm.)

Shasta River Recovery Unit

While the above large scale reviews by CDFG and NOAA were unable to reach down to the individual tributary level, there is information available for the Shasta River specifically that provides some of the best long-term trend numbers for any individual stream. The information presented in **Table 5-1** and **Chart 5-1** below clearly shows a population that was highly variable in its numbers over a 70 year period of record, even given the inconsistencies in dates of observation each year. By sorting for only those years in which counts continued until at least mid-December, multi-year comparisons can be reasonably made on numbers fairly comparable and representative of all or nearly all of entire year classes. It should also be noted that in 2004, field conditions forced counts to be ended while coho were still known to be entering the Shasta (Hampton, pers. comm. 2005).

Table 5-1. Shasta River Adult Coho Counts

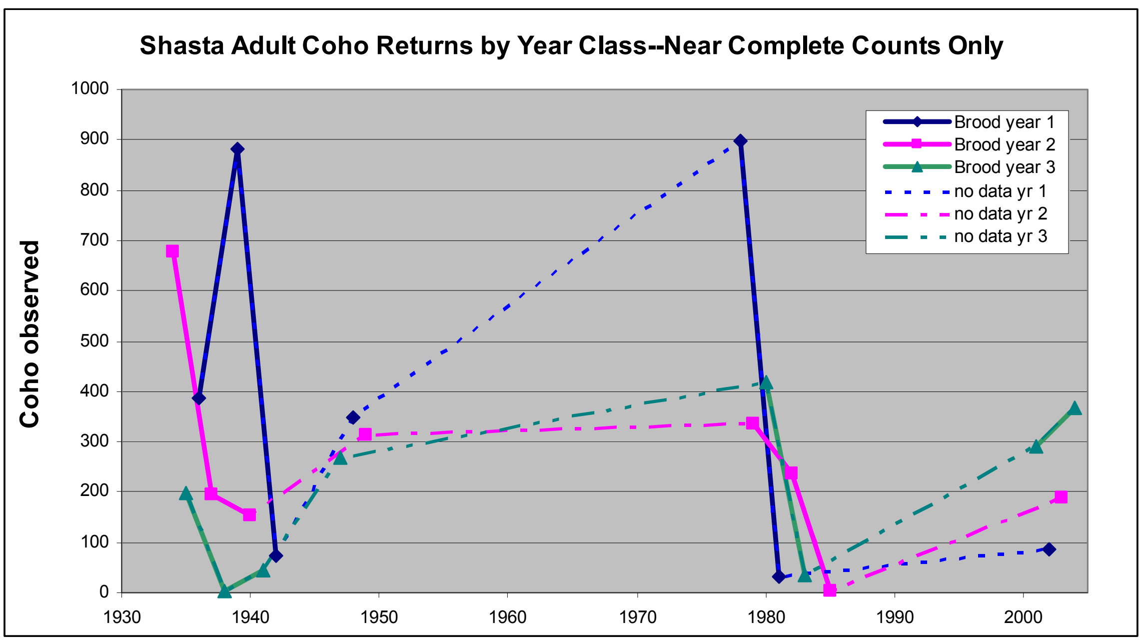
Note—historic data differentiated between adults and grilse. Recent data does not, making precise age class comparisons not possible. Nevertheless, the trends can be compared.

Brood year-class 1 return	Dates of weir operation	Adults	Juveniles	Total
1936	8/1-1/31/37	387	0	387
1939	8/19-4/12/40	730	152	882
1942	8/29-2/9/43	74	0	74
1948	8/30-4/14/49	285	63	348
1978	9/11-4/11/79	748	151	899
1981	9/23-1/7/82	32	1	33
2002	9/19 to 12/17	ND	ND	86
Brood year-class 2 return				
1934	8/30-12/13	677	N/D	677
1937	8/25-12/2	195	ND	195
1940	8/19-3/31/41	70	82	152

1949	9/12-1/21/50	312	ND	312
1979	9/1-3/30/80	194	141	335
1982	9/6-2/24/83	150	86	236
1985	9/6 to 12/2	3	0	3
2003	9/6 to 12/28	ND	ND	187
Brood year-class 3 return				
1935	9/1-1/4/36	186	13	199
1938	8/16-4/18	2	0	2
1941	8/29-3/31/42	36	8	44
1947	9/14-1/7/48	226	43	269
1980	9/7-5/9/81	321	97	418
1983	9/10 to 1/13	29	7	36
2001	9/6 to 12/14	ND	ND	291
2004	9/10 to 12/8	ND	ND	369

Perhaps of more importance is the apparent drop in numbers in all three return years occurring in the early 1980's, and the improvement in numbers apparently paralleling the time the RCD began fishery and water quality improvement work in the Shasta Watershed.

Chart 5-1. Brood Year-Class Returns to Shasta River



In the Shasta River and Klamath Rivers, apparent re-distribution of both adult and juvenile coho occurring naturally throughout this portion of the basin suggests strongly that Shasta coho are part of a larger metapopulation, and that consequently it is unlikely to become extinct given the current focus on coho protection throughout the entire Klamath Basin. However, this jeopardy analysis is focusing specifically on the Shasta River recovery unit. Coho adult count data presented above suggests that adult numbers are already improving in the Shasta. This localized upturn suggests that efforts within the watershed are already yielding results above and beyond the ‘maintain the status quo’ target necessary to meet incidental take permit requirements, and further suggest that the watershed is in fact already moving towards the higher goal of recovery.

Ongoing Restoration Activities

Many actions recently initiated in the Shasta River Watershed or nearby in areas not directly related to this ITP will improve the likelihood of coho survival. In 1991, before coho listing was envisioned, the Shasta Valley RCD and the Shasta River CRMP initiated a watershed wide salmonid restoration program which is ongoing, and involves a substantial number of voluntary projects to benefit anadromous salmonids (including coho) within the watershed. As described below, that ongoing program, in conjunction with the take minimization and mitigation measures proposed in this application will improve coho salmon populations inhabiting the watershed. Beyond that, it will provide a critically important avenue to assure additional recovery actions identified in the *Recovery Strategy for California Coho Salmon* are undertaken.

Voluntary salmonid habitat restoration projects and studies implemented or currently funded for implementation in the agricultural areas of the Shasta River watershed include over 130 individual restoration projects or actions on the Shasta River since 1986, nearly all on private land, including:

1. Design and installation of six irrigation tailwater capture and re-use systems to prevent return of hot irrigation water to the river.

2. Developed and installed an alternate water diversion system allowing the permanent removal of a diversion dam in 1994 that had been a fish barrier since 1889. Actively working to remove 2 additional dams within the next 5 years.

3. Designed and installed innovative fish screens on five diversion structures where standard CDFG screen designs where not applicable.

4. Fenced or otherwise protected approximately 24 miles of Shasta River or its tributaries to eliminate livestock damage to stream banks. Approximately 5 additional miles of fencing funded for construction in 2005-6. Provided alternate stockwatering systems on all areas fenced to assure livestock have water without degrading stream water quality or stream bank condition.

5. Planted local native riparian trees and emergent plants in approximately half of the riparian areas fenced to exclude livestock.

6. Developed bioengineered bank stabilization techniques and successfully implemented same on thousands of feet of eroding stream banks.

7. Organized and implemented numerous baseline and trend monitoring efforts including monitoring of water temperature, water quality and dissolved oxygen, and secured funding to continue juvenile outmigrant counting in the Shasta and Scott Rivers in partnership with DFG after state funds for that effort were eliminated .

8. Developed numerous baseline study and planning efforts including the first Shasta watershed restoration plan in 1992 with a major revision in 1997, developed a river flow

and temperature model, performed a sediment source assessment work, and initiated groundwater studies.

9. Numerous ongoing outreach and educational activities.

The *Shasta and Scott River Pilot Program for Coho Recovery* (SSRT 2003), in combination with implementation of the *Recovery Strategy for California Coho Salmon* (CDFG 2003), represent both ongoing and planned recovery efforts that are having positive impact on coho populations in the Shasta River, Klamath watershed and other tributaries within the range of coho salmon in California. Ongoing salmon juvenile outmigrant monitoring, currently staffed by the SVRCD and supervised by the CDFG is expected to document those changes as annual data accrues.

These locally led efforts will be complimented by ongoing efforts to fulfill certain Reasonable and Prudent Measures (RPMs) pertaining to the Shasta River, as contained in the NOAA Fisheries 2002 Biological Opinion on coho salmon associated with operation of the Klamath Reclamation Project (NOAA Fisheries 2001b). Discussions between the SVRCD and the U.S. Bureau of Reclamation and NOAA Fisheries on implementation specifics have been initiated and direct actions are now begun on initial implementation of those RPMs.

Impacts to coho outside the scope of this ITP Application:
Records of well drilling in the Shasta Valley indicate the continued installation of new wells, both agricultural and domestic in the Shasta Valley, potentially impacting surface flows originating from springs. This ongoing activity, outside the scope of this ITP has potential consequences for coho salmon with regards to maintaining instream flows and maintaining water temperatures within the zone of tolerance for coho salmon. The SVRCD in 2004 initiated groundwater investigations within the Shasta Watershed in partnership with the Calif. Department of Water Resources in order to be better able to predict the cumulative effects of such changes over time. At present work is underway, with a final report expected in late 2005. Future actions will be determined by the findings in that report.

In the near term, limitations on the availability of ground water under or near agricultural land in quantities sufficient to support agriculture are limiting further agricultural well drilling, as is the ultimate cost of delivered groundwater from wells relative to the value of possible crops. At the same time, relatively low land values, coupled with rising demand are resulting in continued drilling of wells for single family homes. While of considerably lower yield, collectively residential wells are a significant and growing demand on ground water, and one where in many ways price of delivered water is of little consequence. An effort embodied in this ITP to retain land ownership in large agricultural blocks is the best available measure to limit residential well development, while economics and water availability is effectively limiting agricultural irrigation well development in most areas. Should efforts to sustain large blocks of agricultural land use fail (as a result of ESA, economic or other factors); rapid increases in residential groundwater use can be expected in addition to a continuation of existing surface diversion activities. Likewise, if agricultural operators find themselves unable to meet their crop water needs with their customary surface diversions as a result of ESA or DFG 1600 limitations or other restraints, they should be expected to shift to use of (unregulated) groundwater if able. Such an outcome would likely undermine gains in surface flows that night otherwise be expected to result from such restrictions, and the surface water that was present would be likely to be warmer due to loss of cold spring-water inflows.

Future regional climate change due to global warming may also affect the hydrologic cycle in the Klamath watershed (NRC 2003). A detailed model of the Klamath Basin has been developed by

Snyder et al. (2002). The model demonstrates potential changes in the hydrology of the Klamath watershed that could occur over the next century with possible negative effects for salmonids including altered timing of snowmelt, lower base flows and additional warming of water in summer (NRC 2003).

However, while global climate change is likely to have negative impacts elsewhere in the Klamath Basin, at present it seems to be having beneficial effects in the Shasta Watershed. Mt. Shasta, the source of most of the spring water feeding the Shasta through the summer is the only mountain in the entire Western US on which glaciers have been expanding since the 1950's as a result of increased precipitation.

These glaciers feed the springs which in turn provide for summer baseline flows depended on by coho. Because these glaciers persist through extended periods of time while continuing to melt off and feed springs, because they are capable of spanning multiple wet and dry cycles, and because of the current trend in glacial expansion, the evidence so far suggests that Shasta Valley water supply in general, and critical summer cold water specifically, may at present be improving as a result of climatic changes.

Conclusions of Jeopardy Analysis

The capability of coho salmon to survive and reproduce is dependent on many environmental factors associated with their complex life history. In the Shasta River watershed, this includes adequate conditions to ensure that critical life stage activities and requirements are met including:

- upstream migration and spawning of adults
- adequate instream flows to sustain eggs and alevins in the gravel
- adequate summer rearing habitat
- adequate over wintering habitat
- outmigration of juveniles

Over the last 10 to 15 years many positive water-use conservation measures and salmonid habitat restoration activities have been implemented on the Shasta River, or have been funded and are pending implementation by the Shasta Valley RCD and the Shasta River Coordinated Resources Management and Planning (CRMP) (See Attachment 9 for further details on the SVRCD History and Past Accomplishments). The measures proposed in this permit application to manage agricultural water use and other agricultural activities, in conjunction with habitat improvement measures will minimize and fully mitigate all authorized incidental take associated with these activities. Together with the ongoing voluntary efforts of the RCD and landowners, these measures will help set the stage for recovery of coho and other salmonids in the Shasta River watershed.

In the Shasta Watershed, despite the long-standing nature of the agricultural activities impacting habitat, the coho have been able to persist within the watershed, and are currently present in numbers within a range similar to what has been seen over the last 70 years. This long-term persistence in the face of longstanding changes gives us some assurances that focused restoration and enhancement efforts will reliably move the coho in the Shasta Valley towards recovery.

Since considerable fishery and water quality improvement work is currently in place and working to improve coho survival, and since additional work is planned or underway and which will continue beyond the term of this proposed ITP, and since the agricultural activities covered are all of a longstanding nature and hence do not pose any new threats to the species than those it is already withstanding, issuance of this ITP will not further jeopardize the existence of coho in the Shasta River Recovery Unit, nor in the ESU as a whole.

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Attachment 6
Monitoring Plan

I. Introduction and purpose:

This chapter describes the ITP monitoring and adaptive management plan. Monitoring includes the observation, detection, and recording of environmental conditions, resources, and effects of covered activities and ITP conservation measures. The evaluation of monitoring and research data will provide the basis for assessing the compliance with the terms and conditions of ITP permit and for assessing the success of the ITP in attaining biological goals and objectives. The adaptive management plan will guide the manner in which information collected by the RCD through monitoring and directed research, as well as new information collected by others, will be used to continually evaluate and modify ITP implementation and long-term management of preserve lands. Collecting and analyzing data through monitoring and research are essential components of adaptive management. Much of the guidance in this Monitoring Plan was extracted from the *Draft California Coastal Restoration, Monitoring, and Evaluation* Plan currently being prepared by the California Department of Fish and Game (CDFG, 2003). As this monitoring handbook is updated and finalized by the DFG, the Shasta Valley Resource Conservation District (SVRCD) will continue to be consistent with guidelines in the document.

II. Goals and Objectives of Monitoring Components:

The goals of this monitoring plan are to evaluate the compliance and effectives of Avoidance, Minimization and Mitigation Measures (as outlined in **Attachment 4**) required upon issuance of this Incidental Take Permit ("Permit"). To meet the goals, this monitoring plan will provide sufficient and reliable guidance so that the SVRCD and CDFG can assess the effectiveness of the activities and assure that the projects are meeting the required objectives of the Permit.

III. Scope of Area to be Monitored:

Because of the nature of this Master Permit and the uncertainty of who will seek coverage under the SVRCD's Incidental Take Permit, the scope of monitoring will only occur on those properties of individuals who seek coverage under the permit.

IV. Monitoring Components:

Strictly defined, "monitoring" is the systematic and usually repetitive collection of information, typically used to track the status of a variable or system (Atkinson, 2004). This monitoring plan includes three components: compliance (implementation) monitoring, effectiveness monitoring, and adaptive management monitoring. Definitions of each component are provided below:

Compliance (implementation) monitoring tracks the statuses of plan implementation, ensuring that planned actions are executed (Atkinson, 2004). Compliance monitoring tasks may include:

- Verification of compliance within legal water rights;
- Installation, proper operation and maintenance of avoidance, minimization and mitigation activities;
- Data gathering to document compliance.

Effectiveness monitoring evaluates the success of the plan in meeting its stated biological objectives (Atkinson, 2004). Typical effectiveness monitoring measures:

- Monitoring of habitat for coho utilization;
- Data gathering to document compliance.

Adaptive management is the process whereby management is initiated, evaluated, and refined.

- It recognizes and prepares for the uncertainty that underlies resource management decisions
- Continually evaluates and modifies management practices.
- Uses information gained from past management experiences to evaluate both success and failure, and explore new management options.

V. Monitoring Plan and Protocols:

In order to assess whether the avoidance, minimization and mitigation activities outlined in **Attachment 4** have been implemented and maintained under the guidelines specified in this document and are effectively meeting the specified goals of the activity the following compliance and effectiveness monitoring techniques will be implemented:

A. Photographic Monitoring:

Description:
One aspect of compliance and effectiveness monitoring includes photo monitoring documentation. Photo monitoring will be done to document installation, operation, maintenance and effectiveness of the activities specified in the *Avoidance, Minimization and Mitigation Activities Plan* (**Attachment 4**). The following photographic monitoring plan was adapted from the *California Coastal Salmonid Restoration Monitoring and Evaluation Program; Interim Restoration Effectiveness and Validation Monitoring Protocols* (March 2003). Although the above mentioned document is still in *Draft* form the SVRCD will continually track changes and modify its monitoring plans to keep in compliance with DFG monitoring guidelines.

Goals of Photo Monitoring:
Photo monitoring will be used to document compliance by:

- Documenting pre and post site conditions,
- Identify key steps taken during and after the completing of a project,
- Determine whether a project was correctly implemented and is in compliance with SVRCD and DFG guidelines.

Photo monitoring will document effectiveness by:

- Assisting observers qualitatively judge the effectiveness of the project at meeting its objectives.
- facilitating the evaluation of how well the project met effectiveness criteria,
- documenting unanticipated problems or negative outcomes to an activity,
- Documenting the success of an activity.

Appendix 1 characterizes each of the activities specified in the *Avoidance, Minimization and Mitigation Plan* with respect to the requirements for the Photo Monitoring Plan. The tables represented in **Appendix 1** list the effectiveness and implementation criteria for each project type. Location and types of photos to be taken are listed for each criterion. The photo sequence should include pre- project photos taken of the project area before the project is implemented, post-project photos taken directly after project implementation, and post-project photos taken during subsequent effectiveness monitoring, all from the same photo point.

Table 6-1
Compliance and Effectiveness Monitoring for Avoidance, Minimization and Mitigation Activities Outlined in the Shasta Valley RCD Incidental Take Permit

Activity	Avoidance	Minimization	Mitigation	Goals of Activity	Issues to be Addressed by Compliance/Implementation Monitoring	Issues to be Addressed by Effectiveness Monitoring (includes qualitative analysis and photo monitoring)
Watermaster services	√			• Assure water usage limited to legal amounts; possibly free up water inappropriately diverted in past to give better understanding of Qty. available	• Field observations, flow measurements, staff gage readings, etc by watermaster. Spot checks. Monthly reports by watermaster submitted verbally to RCD as to status of watermaster services and compliance issues as well as overall legal compliance and list of sites visited. • Annual summary to RCD and DFT that includes the monthly details found in the RCD minutes, appendix showing water distribution through summer and what, if any problems that were encountered. • Incident reports will be issued within 4 weeks of non-compliance discovery and will include a notice of termination of coverage under the permit if the landowner remains out of compliance.	• Are proportionate costs being paid by water users? • Documentation from watermaster of number of diversions visited since the previous months report. • Analysis and reporting of any persistent problems of compliance encountered that could not be resolved? • Maintain ongoing records of date of last visit of all diversions to present to RCD at monthly report.
Ramped diversions	√	√		• Reduction of the number of fish that get stranded during rapid decrease of flows due to the start of irrigation season.	• Has a Draft Ramped Flow management plan been submitted to CDFG by January 1st, 2006? And a final report by January 1st,	• Is there reduction in stranding of coho? Evaluation may include field crews, direct observations of what habitat is being used immediately prior to irrigation

					2007? If not, why?	season. • Is the Ramped Flow plan effective in reducing the amount of fish stranded?
Maintenance of instream flows	√			• Assure completion of key life history stages of the coho, the insects they feed on and riparian vegetation.	• Have flows been maintained to a minimum of 20 cfs at the SRM gage? • Have flows been maintained at a minimum of 50 cfs at any time during the summer at A-12? • 1. call in on net and look at realtime data at SRNM daily. Confer with watemaster if trend looks likely to dip below target.	• Link to flows at mouth from USGS data. • Photo monitoring. • Periodic aquatic insect sampling as future goal.
Fish screening (summer, winter and flows from Dwinnell Dam)	√			• To prevent the passage of fish into fields and irrigation ditches during water diversion activities.	• Have all known summer and winter diversions been screened? If not, why? • How many known diversions are left to be screened? • Are the screens properly installed and do they meet CDFG and/or NOAA regulations? • Are the existing screens being properly maintained on a regular basis by the landowner? • Have summer discharges from Dwinnell Dam been screened? If not, why not? • Random Spotchecks of installation and maintenance status over course of summer of both screen and any required bypass. • Planned visits to inspect compliance of all requirements.	• Are there any indications that the fish screens have not been properly maintained? If so, what? • Is there any evidence of dead fish in downstream ditches and/or fields that are screened? • Visual observations at times of inspection/site visit of discharge and ditch for fish bypassed around screen. • Visual inspection of bypass and bypass passageway for effectiveness and proper maintenance. • Reliance on DFG/NOAA screen standards to assure effectiveness.
Maintenance of Fish Passage	√			• To provide adequate fish passage for both adult and juvenile coho salmon upstream and downstream at all times of year	• Annual intake check to assure the fish passage mechanism appropriately installed and does it meet CDFG/NOAA requirements? • Inspect passage areas during planned and random visits to assure proper installation, absence of	• Visual observations during site visits of either adult or juvenile fish jumping, held-up, or dead on banks. • Overall rely on DFG design standards to assure effectiveness.

					damage, and proper removal of any debris, etc that would impair its effectiveness.	
Livestock and vehicular crossing areas	√			• To minimize impact to coho or eggs in the stream by limiting crossing lanes to areas of the stream where the least impacts would occur or during time periods when coho are least likely to be present. • Reduction of sediment input, potential trampling of redds and impact to streambank vegetation.	• At intake, identify need for any crossing lanes, desired timing, etc. If need exists during critical periods, visit site with DFG rep to develop details of appropriate approach for site, then implement within timeline allowed by master permit. • Are the crossing lanes being properly maintained throughout the period of use?	• During random and planned visits, confirm that no evidence of crossing activity is found except in crossing lanes, and that crossing lanes are adequately maintained to be functional. Photo monitoring document lane. • Confer with landowner periodically to verify workability of provisions in place.
Timing of instream restoration activities	√	√		• Timing of activities will occur when coho of all life stages are least likely to be present in the project area.	• Work periods to be defined for each activity and location in contracts associated with those projects. RCD project inspector to do field monitoring to assure compliance with timelines established.	• Screw trap and adult weir observations to be utilized to update/revise work windows. • Temperature monitoring to be utilized as appropriate to confirm or define work window—need to set numeric criteria, maybe absolute temperature reached (~79F) or MWAT. •
Dry Year Plan	√			• To develop a plan during dry and critically dry years to assure that stranding or elimination of cold water does not occur.	• Has a dry year plan been developed by within 12 months upon issuance of this permit?	• Are the elements discussed in the Dry Year plan adequately preventing stranding and or elimination of cold water?— • Temperature monitoring in refugia areas. • Flow monitoring at key points as described above.
Limiting equipment operations in or near streams.	√			• To reduce impacts to coho of equipment used in or near the stream	• Work periods to be defined for each activity and location in contracts associated with those projects. RCD project inspector to do field monitoring to assure compliance with timelines established. • At times of random or planned visits, document if there any evidence that equipment use in or near the stream impacts coho and/or habitat in a fashion otherwise not considered? If so, describe.	• Screw trap and adult weir observations to be utilized to update/revise work windows. • Temperature monitoring to be utilized as appropriate to confirm or define work window.

Gravel push-up dam removal and/or installation		✓		• Minimize tendency of Gravel push-up dams to create partial to complete barriers to fish passage, and/or mobilize fine sediment	• Have BMP's been prepared and adopted by the SVRCD? • If a gravel push-dam remains, due to approval by CDFG, is it being properly maintained?	• How many gravel push-up dams have been removed? • How many remain to be removed?
Livestock exclusion		✓		• To minimize livestock impacts in order to stabilize stream banks and reduce sediment inputs, revive streambank vegetation and avoid potential trampling of redds.	• Identify fence status at time of intake. Establish window for installation that is consistent with master permit conditions. And relay to landowner if fence not already in place. • 2x/year site visit to verify fence in place, adequately maintained, no evidence of livestock usage of river side of fence unless part of approved grazing plan. • Include incidental fence condition observations in site visit forms associated with all other site visits.	• Use photo points to document riparian conditions, fence condition.
Riparian and emergent vegetation planting.		✓	✓	• Stabilization of stream banks to reduce sediment input. • Increase shading and protective covering for coho in the stream bank. • Increased shading keeps stream water from heating up rapidly.	• If required, has the riparian and/or emergent planting occurred? If not, why? • Does the planting follow guidelines specified in the SVRCD's policy for streambank planting techniques? If not, why? • Is the vegetation receiving adequate amount of water, whether it be mechanically or naturally?* If not, why?	• What is the overall status and quality of the vegetation along the streambank or in the channel? • Is the vegetation providing enough protective cover and shading in the creek? If not, why? • Does the streambank appear to be more stable? If not, why? • What other measures need to occur to insure success of this activity?
Bioengineered bank stabilization		✓	✓	• To reduce input of sediment into stream channel.	• Has the bank stabilization activity been implemented using the standards specified in the SVRCD streambank stabilization policy?* If not, why? • Is the bank stabilization project being properly maintained to insure maximum success? If not, why?	• What is the overall status of the activity? Is it effective? • Is there observed reduction in sediment transport to downstream gravel and stream channel? • Is there vegetation starting to grow in the stream bank? • Do any changes need to occur to increase the effectiveness of the project?

On-site tailwater capture		√		• To reduce the input of warm, nutrient rich water runoff from the land into adjacent streams. • To reduce the amount of diverted water needed.	• Has the agreed upon tailwater capture systems been correctly installed utilizing the guidelines specified in the SVRCD's tailwater capture policy?* If not, why? • If the systems has not been implemented why not and when will it be installed? • Is the tailwater system being used and properly maintained?	• Has the amount of diverted water been reduced due to the capture and reuse of on-site created tailwater? If not, why? • Is there a reduction in warm water runoff into stream channels? If not, why? • Is the landowner satisfied with the tailwater capture system? If not, why? • How much tailwater is being captured? Is there potential to capture additional tailwater? • Do any changes need to occur to increase the effectiveness of the project?
Gravel enhancement and/or additions.			√	• To enhance existing spawning habitat and/or add habitat for spawning. • Enhancement projects include physical cleaning of gravel projects on a regular basis.	• Has the gravel addition activity been properly installed using guidelines specified by SVRCD policy?* If not, why? • Are gravel enhancement projects occurring when needed? If not, why? • Was the gravel added to a location that is appropriate for suitable spawning habitat? If not, why?	• Are gravel enhancement projects being effective in the goal of maintaining clean gravels? If not, why? • Are there fish observed utilizing the redds? • If no fish observed, is there evidence that the redds are being used? • If no evidence of used is observed why? • Do any changes need to occur to increase the effectiveness of the project?
Water efficiency projects.			√	• To reduce the amount of water (cold and/or warm) needed for irrigation purposes.	• Have the agreed upon water efficiency projects been implemented? If not, why? • What projects remain to be implemented? • Are the projects properly utilized and maintained? • Do the projects meet the standards and guidelines specified in SVRCD policy?* If not, why?	• Are the water efficiency projects effectively doing what they were designed to do? If not, why? • Is there a reduction in water use? If not, why? • Is the landowner satisfied with the projects? If not, why? • Do any changes need to occur to increase effectiveness of the project?
Off-site tailwater capture		√	√	• To reduce the input of warm, nutrient rich water runoff from off-site sources into adjacent streams. • To reduce the amount of diverted water needed.	• Has the agreed upon tailwater capture systems been correctly installed utilizing the guidelines specified in the SVRCD's tailwater capture policy?* If not, why? • If the systems has not been implemented why not and when will it be installed? • Is the tailwater system being used	• How much tailwater is the landowner capturing from off-site sources? Is there potential to capture additional tailwater? • Is the landowner satisfied with the tailwater capture system? If not, why? • Do any changes need to occur to increase effectiveness of the project?

					and properly maintained?	
Habitat enhancement projects: woody debris and riparian/emergent vegetation plantings.			√	• To provide and/or enhance rearing habitat for coho. • To enhance protective covering for coho. • To increase shading in the stream.	• If required, has the riparian/emergent planting and or woody debris placement been implemented? If not, why? • Does the planting follow guidelines specified in the SVRCD's policy?* If not, why? • Are the plantings and or woody debris received adequate maintenance (watering, stabilizing etc.)? If not, why?	• Are there any fish observed using the riparian/emergent plantings or woody debris for coverage? • Is the vegetation providing shading and/or coverage to fish? If not, why? • Is the woody debris effectively creating deep pools and/or providing protection for coho? If not, why? • Do additional plantings or input of woody debris need to occur to insure success of the project?
* Specific guidelines and policies as to the requirements of proper implementation of this mitigation activity will be completed shortly after submission of this permit.						

Photo Monitoring Timing
Sequential photographs must be taken over time in order to show changes in site conditions. The timing and number of photos needed for an effective photo sequence depends on the project type. At minimum, photos should be taken at three different times, before project implementation, directly after project implementation, and again at a later date appropriate to the particular project. This later date for photographing effects depend on the project type and goals.

B. Qualitative Monitoring:
Description:
This protocol is intended to allow compilation of implementation and effectiveness information for all projects implemented under the guidance of the *Avoidance, Minimization and Mitigation Plan* (**Attachment 4)**. A detailed monitoring plan is concurrently being developed with the submission of this permit and will include checklists used in the field to evaluate compliance and effectiveness of the activities described in Attachment 4. A summary of what each checklist will include is attached in Appendix 1. Photographic monitoring will also be an important aspect to the Monitoring Plan.

Project evaluators conducting the monitoring will provide the specific objectives and effectiveness measures for each individual project assessed. The measures should be developed based on project documentation and guidelines provided by the SVRCD (concurrently being developed with submission of this Permit). For each project type, a checklist will be completed with an overall summary judgment of the project (excellent, good, fair, or poor). Reports will require recommendations for remedial actions or improvement and suggestions for timing of return monitoring visits. Forms are being designed to be completed within a few hours on one or several visits to the project. The following criteria are involved with the Qualitative Monitoring Protocol:

- Implementation and qualitative effectiveness monitoring will be done on every activity used as an avoidance, minimization and/or mitigation measure to receive coverage under the Shasta Valley RCD Master ITP.
- Monitoring will be performed by and funded through the SVRCD.
- Compliance monitoring will be done immediately after project implementation using photographs and checklists for documentation.
- Effectiveness monitoring will be conducted at a later time depending on project activity
- Each project feature installed will have at least one specific objective documented in project files in order to allow evaluation of effectiveness.
- Project evaluators will have access to photographs and project files to take with them on site visits.

Repeated photographs and field evaluations provide the basis for before and after comparisons and for detecting effectiveness of the project over time. The data collected will be used in annual reports to the CDFG on individual and overall program accomplishments and for reports to the SVRCD in order to assess the need for remedial action. To summarize what questions the SVRCD will address specifically for each mitigation activity see attached **Table 6-1.**

Timing:
Some information will be collected before project implementation in order to allow comparison to post project conditions and effectiveness. This information will include pre-project photos (See Photo Monitoring Plan) and pre-treatment checklists (see web-site above). The pre-treatment

checklist would be used during later monitoring to help judge effectiveness of the project. Compliance monitoring will be done immediately after project implementation. Timing of effectiveness monitoring visits will depend on the specific project objectives. Since projects often have many features that are expected to show impacts at different times, not all questions included in the checklist may be answered during the same visit. The primary objective of each project should dictate timing.

VI. Adaptive Management:

Based on the best scientific information currently available, the RCD believes that the measures outlines in this permit (**Attachment 4**) will effectively achieve the biological goals and objectives of this Incidental Take Permit. However, conditions within the permit area such as existing habitat conditions, and the status of covered species and natural communities will likely change during the ITP implementation. Furthermore, it is possible that additional and different conservation measures, not identified in the ITP, will be suggested and proven to be more effective in achieving the biological goals and objectives of the ITP than those currently identified for implementation. Results of the implementation and effectiveness monitoring may also indicate that some ITP conservation measures are less effective in achieving ITP biological goals and objectives than anticipated. To address these uncertainties, the ITP includes implementation of an adaptive management process to:

- gauge, in cooperation with NMFS and CDFG, the effectiveness of ITP conservation measures and techniques to implement them;
- propose alternative or modified conservation measures as the need arises; and
- address changed and unforeseen circumstances.

The cornerstone of the ITP adaptive management process is the ITP Monitoring Plan. Information collected through the monitoring will be used to manage watershed lands and provide information to direct the coho salmon habitat and natural community protection/enhancement/creation/restoration elements of the ITP. During the early phases of ITP implementation and monitoring will provide the SVRCD with the data necessary to improve the efficacy of techniques that are employed to better manage preserve lands and to successfully enhance/create/restore coho salmon habitats and natural communities. As habitats and communities are enhanced/created/restored, the adaptive management process will allow for the experience gained through early projects to shape and refine future habitat and natural community enhancement/creation/restoration projects.

The adaptive management process will be administered by the SVRCD. Responsibilities of the SVRCD for implementing the adaptive management plan include:

- gathering monitoring data, including relevant information developed by others, and maintaining databases;
- disseminating ITP–generated monitoring and research data, including monitoring reports and research papers, to others;
- assessing the effectiveness of conservation measures;
- identifying the need to modify existing or to adopt additional conservation measures;
- identifying the need to modify the monitoring program;
- identifying the need for and implementing experimental pilot and demonstration projects;
- identifying and prioritizing research needs and conducting limited directed research, as funding allows;
- developing the adaptive management elements of preserve management plans;

- incorporating monitoring, research, and other adaptive management–related activities into annual work plans; and contacting Science Advisors, as needed, to solicit input regarding new scientific information relevant to implementation, important data gaps, monitoring and management methods, and data interpretation.

The ITP adaptive management process will also provide for scientific reviews to evaluate the effectiveness of existing or proposed avoidance, minimization, and mitigation measures. The RCD will incorporate recommendations offered through these reviews, where appropriate, into implementation of the ITP. It is also intended that the adaptive management process will provide the basis for budget and funding decisions throughout the term of the Plan. Adaptive management, in conjunction with monitoring and research, will provide the RCD with a process to effectively address uncertainties associated with successful implementation of the ITP.

VI: Reporting and Analysis:

The SVRCD will develop and maintain a comprehensive GIS-linked database to track implementation of all aspects of the ITP. Completed summaries and checklists will be entered into a monitoring database by SVRCD staff. The database will be structured to be "user friendly" and to allow for future expansion and integration with external databases (e.g., linkage to agency or other GIS map libraries). The database should be structured to facilitate the following requirements:

- data documentation such that future users can determine why, how, and where data were collected;
- quality assurance and quality control of the data;
- access and use of the most current information in assessment and decision making
- evaluation of data by all database users, as appropriate, and incorporation of corrections and improvements into the data.

Reports generated as a result from this database will allow evaluation of the activities specified in the *Avoidance, Minimization and Mitigation Activity Plan.*

Each year the Shasta Valley RCD will submit an annual report to CDFG for each of the activities. The project activities will be monitored at least annually if not more depending on objectives of project and their complexity. At the completion of the monitoring season, the SVRCD will provide data to CDFG in a report including updates as to the projects progress, recommendations on bringing projects into compliance (if needed), and the effectiveness of each project. If an activity is not deemed as effective based on the projects goals and objectives the SVRCD will work with DFG to resolve the problem.

The RCD will prepare annual monitoring reports over the term of the HCP/ITP. The annual reports will summarize the previous calendar year's monitoring results and be completed by March 1 following the reporting year. Reports will be submitted to the CDFG and/or NMFS. The RCD may also distribute monitoring reports to other entities engaged in various aspects of ecosystem management/research that could benefit from sharing monitoring data. Monitoring reports, as warranted by the ITP activities undertaken during the reporting period, will include:

- a description of all covered activities implemented during the reporting period;
- a description of all ITP natural community protection/enhancement/creation/ restoration conservation measures implemented during the reporting period;
- a year-to-date summary of the extent of protected/enhanced/created/restored natural communities;

- a summary of impacts on covered natural community types and species associated with implementation of covered activities and conservation measures;
- a description of avoidance, minimization, and mitigation conservation measures implemented to address impacts of covered activities and conservation measures;
- a description of effectiveness monitoring undertaken during the reporting period and an analysis of monitoring results;
- a description of compliance monitoring undertaken during the reporting period, an analysis of monitoring results, and a description of remedial actions, if undertaken during the reporting period;
- a description of status and trends monitoring undertaken during the reporting period and an analysis of monitoring results;
- an assessment of the efficacy of the monitoring and research program and recommended changes to the program based on interpretation of monitoring results and research findings;
- an assessment of the efficacy of habitat enhancement/creation/restoration methods in achieving performance objectives and recommended changes to improve the efficacy of the methods; and

VII. Measurement of Success of Overall Activities:

This Master Incidental Take Permit developed by the Shasta Valley RCD is to be renewed by the DFG 5 years from the issuance of the Permit. This 5 year time period was selected so that the SVRCD has enough time to evaluate the overall structure of the permit and short enough so that necessary changes and updates could occur to the Permit in 5 years as seen fit by DFG and/or the RCD.

As discussed in ***Attachment 3- Extent of Take***, estimated take of coho in the Shasta River watershed will be based on a ratio of smolt out migrating from the Shasta River watershed to adults of the same brood year. This ratio will then be compared to an 85 smolt to female adult literature ratio discussed in a report titled *Reference points for coho salmon (Oncorhynchus kisutch) harvest rates and escapement goals based on freshwater production* (Bradford, Myers and Irvine, 2000). The 85 smolt per female index can serve two purposes in that it provides a recovery goal for coho in Shasta River watershed as well as a qualitative method to show success of the ITP measures. Success and therefore a qualitative method to prove that the impacts from covered activities are being fully minimized and fully mitigate for will be evident over time as the smolt to female ratio begins to trend toward the 85 recovery goal.

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Appendix 1

The following Tables and guidelines for photo monitoring are taken directly from the *California Coastal Salmonid Restoration Monitoring and Evaluation Program; Interim Restoration Effectiveness and Validation Monitoring Protocols* (March 2003). The Shasta Valley RCD will keep current on updates to the CDFG manual and will make changes to the monitoring plan when necessary.

Table 1: Fish Passage
Projects: Fish ladders, channel modification, barrier removal, barrier modification

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Area of habitat made accessible	Photo of conditions causing fish barrier. Photo of habitat above barrier.	Photo of location of previous barrier. Photo of habitat above previous barrier.
No unforeseen adverse effects on habitat such as incision, instability or sedimentation.	Photos of channel conditions taken from mid-channel upstream of barrier, downstream, and at barrier.	Photos taken from mid-channel of channel upstream of barrier, downstream, and at previous barrier.
Increased attraction flows during migration periods (for barrier modifications).	Photo of attraction flow at barrier during migration	Photo of attraction flow at previous barrier during migration

Table 2: Instream Structures. *Projects:* Install structures, install gravel.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Properly installed structures; structures in good condition; structure integrity preserved; no undesirable channel changes or bank erosion.	Photos taken from mid-channel looking upstream and downstream from each future structure location and photo taken from either right or left bank looking down upon future structure location.	Photos taken from mid-channel looking upstream and downstream from each structure location and photo taken from either right or left bank looking down upon structure.
Habitat enhancement and addition.	Habitat at future location of each Activity.	Habitat formed by each activity (pool, shelter, undercut banks, gravels, side channels, etc.) .

Table 2b: Instream Structures. *Projects:* Remove structures.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Properly removed structures; no undesirable changes or bank	Photos taken from mid-channel looking upstream and downstream from structure	Photos taken from mid-channel looking upstream and downstream from previous

erosion; Increased riparian vegetation; Increased channel/floodplain connectivity.	and photo taken from either right or left bank looking down upon structure and the adjacent habitat.	structure location and photo taken from either right or left bank looking down upon previous structure location.
Habitat enhancement and addition.	Habitat at location of each structure	Habitat formed by structure removal (pool, shelter, undercut banks, gravels, side channels, etc.)

Table 3: Streambank stabilization. *Projects:* Deflect stream flow, bioengineering, armoring.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Properly installed structures; Structures in good condition; Structure integrity preserved.	Photos taken from opposite bank and mid-channel looking across channel to where structure is to be placed.	Photo taken from opposite bank and mid-channel looking across channel at the structure. Photo taken from the bank with the structure looking down upon the structure.
Reduced bank erosion; Improved channel geometry; Increased riparian vegetation.	Photos of channel upstream and downstream of future structure location. Photo of channel at future structure location from opposite bank.	Photos of channel upstream and downstream of structure. Photo of channel at structure location from opposite bank.

Table 4: Land use. *Projects:* Exclude grazing, install watering sites, manage grazing, conservation easements.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Properly installed structures *(fences, troughs);* Structures in good condition; Integrity preserved.	Photos taken of future structure locations.	Photos taken of structures.
Livestock/wildlife effectively excluded.	Photo of animal impacts on riparian zone/channel.	Photos at same locations Photo of fence line showing vegetation use/trampling on each side.
Increased riparian vegetation, riparian connectivity; Increased bank stability; Improved channel geometry.	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel upstream, channel downstream, and overhead [upstream of project reach, throughout project reach, and	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel upstream, channel downstream, and Overhead [upstream of project reach, throughout project reach, and downstream of

	downstream of project reach].	project reach].
Improved water quality	Photo of water clarity (including algal blooms and other indications of nutrient loading) within future project reach (from above channel at low flow).	Photo of water clarity within project reach (from above channel at low flow).

Table 5: Vegetation Control. *Projects:* Remove exotic plants, plant vegetation, reduce vegetation encroachment into channel.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Project properly installed, planting survival, reduced exotic plants, increased native plants, species richness.	Photos where plantings/removals will occur.	Photos at same location after treatment.
Reduced barren ground.	Photo of areas of bare ground.	Photo at same location after treatment.
Increased riparian canopy cover, reduced vegetation within bankfull, increased availability of spawning gravels (if clearing encroachment involved).	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel upstream, channel downstream, and overhead [upstream of project reach, throughout project reach, and downstream of project reach].	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel, channel upstream, channel downstream, and overhead [upstream of project reach, throughout project reach, and downstream of project reach].

Table 6: Riparian Planting or Management. *Projects:* Plant vegetation, alter vegetation composition.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Project properly installed; Planting survival; Advancement in riparian successional stage from grass-shrub to forest.	Photos where plantings/removals will occur (from opposite bank).	Photos of project plantings/removals at same location (from opposite bank).
Increased riparian canopy cover, increased riparian corridor continuity and patch size.	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel upstream, channel downstream, and overhead [upstream of project reach, throughout project reach, and	Photos taken from mid-channel of riparian vegetation on left bank, right bank, channel upstream, channel downstream, and overhead [upstream of project reach, throughout project reach, and downstream of project reach.

	downstream of project reach].	

Table 7: Restore Streamflow. *Projects:* Obtain/monitor water rights, manage flows.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Project properly installed .	Photo of location where structure/practice to restore water will be implemented.	Photo of structure/practice where water flow restoration is occurring.
Increased low flows, flows achieve natural peak flow regime.	Photo of streamflow/channel throughout future project reach (from mid-channel) during low flows and high flows.	Photo of streamflow/channel throughout project reach (from mid-channel) during low flows and high flows.
No adverse changes in downstream flows.	Photo of streamflow/channel downstream of future project reach (from midchannel) during high and low flows.	Photo of streamflow/channel downstream of future project reach (from mid-channel) during high and low flows.

Table 8: Slope Stabilization. *Projects:* Soil engineering, bioengineering.

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Project structures or treatments are properly installed, implemented or applied.	Photos of locations of future project structures or treatments, if any.	Photos of project structures or treatments, if any.
Decreased soil erosion and sediment delivery from site.	Photos of areas with soil erosion and sediment delivery occurring.	Photos of same areas after treatment.
Decreased sediment load near site during peak flow events; No significant increase in mass wasting and sediment delivery from treated area.	Photos of areas where sediment from project area delivers to channel (ditch, culverts, channel)/ Photos of channel immediately downstream from potential sites of sediment delivery.	Photos of same areas after treatment. If planting involved, reduced bare ground and increase in deep rooted vegetation. Photos of bare ground/Photos of future planting locations. Photos of plantings/ground cover.

Table 9: Gully Repair. *Projects:* Gully modification, bioengineering, armoring

Compliance/ Effectiveness Criteria	***Pre-project photos***	***Post project photos***
Project structures properly installed.	Photos of location where structures will be installed.	Photos of project structures if any.
Cause or source of gullying is removed.	Photos of conditions causing gully formation, or of flows in gully.	Photos of same areas after treatment.
Improved channel geometry; No offsite adverse effects on	Photos taken of channel (from mid channel) upstream of	Photos taken of channel (from mid channel) upstream of

downstream channels; Reduced erosion and sediment yield; Increased vegetation cover.	project reach, throughout future project reach, and downstream of project reach).	project reach, throughout project reach, and downstream of project reach)
Planting survival and effectiveness.	Photos where plantings will occur.	Photos of same areas after treatment.

Appendix 2
Qualitative Monitoring Instructions and Guidelines

The following summary sheet and subsequent check lists are taken directly from the *California Coastal Salmonid Restoration Monitoring and Evaluation Program; Interim Restoration Effectiveness and Validation Monitoring Protocols* (March 2003). The Shasta Valley RCD will keep current on updates to the CDFG manual and will make changes to the monitoring plan when necessary.

IN THE OFFICE

SUMMARY SHEET

1) **Project ID # -** Enter project identification number assigned to this contract by the Shasta Valley RCD.
2) **Project Feature # -** Enter project feature number assigned during the project planning and implementation phase.
3) **Date of visit-** Enter the day's date: mm/dd/yy
4) **Project Feature Description** (Pre-treatment) – Describe briefly the project feature that will be installed at this location.
5) **Watershed Name-** Enter the name of the watershed.
6) **Stream Name-** Enter in the name of the stream If unnamed, use named stream to which it is tributary.
7) **Evaluator Name/Title/Agency -** Enter the names of the person(s) conducting the monitoring visit.
8) **Problem Statement** (Effectiveness) **-** Identify the original problem (s) the Avoidance, Minimization and/or Mitigation Activity was designed to correct in this section.
9) **Project Type** (Compliance) – Chose the appropriate Avoidance, Minimization and/or Mitigation Activity to which this project is affiliated.
10) **Project Description** (Compliance) – Write a brief description of the overall project, project features, and goals.
11) **Project Objective** (Effectiveness) – Was it the objective of the activity.
12) **Specific Objectives** (Effectiveness) - Write in any specific objectives of the activity found in the sub-permittee's Avoidance, Minimization and Mitigation Plan.
13) **Effectiveness Criteria** (Effectiveness) - Identify the criteria by which the project will be considered effective and check all appropriate boxes. Additional effectiveness criteria should be tailored to the project and its objectives. Write these in the "Other" section. For example, if a project is intended to increase the number of pools in a reach, increased pool number would be the effectiveness criterion. If a project is intended to reduce stream temperature by increasing riparian shade, then reduced stream temperature and increased riparian shading would be the appropriate criteria.

IN THE FIELD

14) **Checklist completion** (Pre-treatment)- Answer all the checklist questions it is possible to answer using a combination of observations, project plans, and rudimentary measurements.
15) **Checklist completion** (Compliance and Effectiveness) - Answer all the checklist questions it is possible to answer using a combination of observations, photos, and pre-project and implementation information. Possible answers are:

- **Yes** When a project has completely met an implementation or effectiveness criterion, circle the answer YES.
- **Partially** When a project has substantially met an implementation or effectiveness criterion, but has not completely met it, circle the answer PARTIALLY.

- **No** When a project has not even partially met an implementation or effectiveness criterion, circle the answer no.
- **DK = Don't Know** When questions cannot be answered with the available information, please circle DK for Don't Know. Questions might be relevant to project objectives, but not answerable with available information. For each question answered DK, please make a recommendation on the cover sheet about how to get the needed information or when to revisit the project in order to answer the question.
- **NA = Not Applicable** When questions are not relevant to a particular project or feature, please circle NA for Not Applicable. Questions which address effects which are apparent at a site even though they were not an objective of the project should be answered with a Yes, Partially, or No, rather than NA. This will allow unintended effects to be documented. Please refer to project objectives listed in the summary before answering NA.
- **Comments** A number of implementation or effectiveness questions require further information to be provided. Please provide it in the comment section.

16) **Overall Implementation** After completing the implementation checklist, provide an overall judgment on project implementation.
17) **Overall Effectiveness** After completing the effectiveness checklist, provide an overall judgment on project effectiveness at this point in time.
18) **Recommendations** If maintenance or improvements to this project are needed to help it meet its objectives, please write your recommendations here.
19) **Objective for next visit/ Date for next visit** If some important information was not available due to timing of this monitoring visit, please make a recommendation of when a return visit would be necessary to gather this information (e.g., high flows for fish passage projects, two-three years from now for planting projects)

Attachment 7
Sub-permittee Agreements and Contract Conditions

It is the intention of the Shasta Valley RCD that anyone voluntarily seeking coverage under this Master Incidental Take Permit will enter into a contract agreement with the RCD and therefore should agree to comply with the terms and conditions listed in the individual sub-permittee contract. Individual contracts may focus on the specific operations of the landowner as well as describe what avoidance, minimization and mitigation activities need to be implemented in order to comply with a proportionate potential of take as determined by the RCD. Once the sub-permittee enters into an agreement with the RCD the sub-permittee will not be required to secure individual incidental take permits or Streambed Alteration Agreements other than the aforementioned sub-agreement(s).

The relationship between the RCD and the sub-permittees should be that of private contracting parties. The RCD has no police powers that permit or require it to enforce any statutory and/or regulatory matters. For example, the RCD has no authority to enforce the State of California Water Code or the adjudicated water decrees issued by the Superior Court. Likewise it has no authority to enforce the California Endangered Species Act or regulations of the California Department of Fish and Game. Enforcement responsibility and authority for these items remain with the appropriate Federal, State of California or County of Siskiyou authorities and agencies.

It is the intention that if an individual landowner or water district enters into a contract agreement with the Shasta Valley RCD the sub-permittee should meet and comply with the following requirements:

1. The sub-permittee should agree to implement the avoidance and minimization measures specified in the individual contract and described in *Avoidance, Minimization and Mitigation Measures Plan* (*Attachment 4*). Implementation of the activities should comply with policies established by the Shasta Valley RCD.

2. The sub-permittee should agree to maintain all of the avoidance and minimization measures specified in the *Avoidance, Minimization and Mitigation Measures Plan* (*Attachment 4*).

3. Upon receiving coverage under the Shasta Valley RCD's Master ITP permit the sub-permittee may be required to pay a fee based on the sub-permittee's water diversion allocation quantity.

4. The above mentioned fees collected from the sub-permittee may be used by the Shasta Valley RCD for monitoring and random spot checks to insure that the avoidance and minimization measures have been properly installed and are maintained.

5. If the Shasta Valley RCD finds that the sub-permittee is not in compliance under the guidelines set forth with this permit the Shasta Valley RCD may initiate communication with the sub-permittee and work with the individual to become in compliance.

6. If the sub-permittee remains not in compliance the RCD may give the sub-permitee a specified amount of time (depending on the activity or compliance issue) to become in compliance. If the sub-permittee is unable to come under compliance, the Shasta Valley RCD may remove the sub-permittee's coverage under this Master permit.

7. In addition, a diverter who obtains incidental take coverage as a sub-permittee should agree in writing to provide reasonable access to the CDFG and RCD for coho-related monitoring and research purposes associated with the ITP.

In turn, it its agreed upon by the sub-permittee that the Shasta Valley RCD should work with individual landowners or water districts to procure finances and implement appropriate mitigation measures defined under the *Avoidance, Minimization and Mitigation Measure Plan* (Attachment 4). In order for the Shasta Valley RCD to fulfill the mitigation measures established by a sub-permittees individual contract the sub-permittee may:

1. Agree to allow the Shasta Valley RCD access to the sub-permittee's land for implementation and monitoring of mitigation projects;

2. Agree to allow random spot checks on the sub-permittee's land without prior notification from the Shasta Valley RCD as to when the check will occur;

3. Be responsible for maintaining the mitigation measures agreed upon with the Shasta Valley RCD and set forth with this permit.

Attachment 8
Funding Assurances

Fish Screen Assurances:

- 6 tube screens for up to 1.6 cfs each and 6 tube screens 3.3 cfs screens constructed and available for installation as needed (estimated $50,000 total).
- The Permit proposes that prior to coverage the diverters shall have fish screens.
- SVRCD has a long history for securing grant funding (approximately $4 million since 1992) for activities such as fish screening and anticipates that providing money for fish screening in the future will continue to be a high priority for grant funding agencies.
- NRCS EQIP program has funded fish screens in past, future EQIP funds are expected to continue ($360,000/year for all of Siskiyou County). In addition, special Klamath EQIP funds, approximately $300,000/year (Shasta Valley) is available for each of the next 2 years and can be utilized for fish screening projects if needed.
- Department of Fish and Game continues to operate a screen shop in the Shasta Valley and will continue to make and install screens.

Water Management:

- *Watermaster Service:*
    - Local cost collected by property tax assessment by Siskiyou County. The failure to pay eventually results in the loss of property virtually assuring that assessments are met.(approximately $50,000/year).
    - Other non-local costs are being provided by the Bureau of Reclamation (~ $170,000 this year).
    - Local water users are investigating private watermaster service as a way to keep costs within reasonable limits.
    - Funding for the installation of headgates, gauges and valves has been provided for the coho accessible portions of the Shasta Valley by grants from the State of California, and matching funds from NRCS.
- *Ramped Irrigation Season Start-up:*
    - Funding for this minimization activity is included in the watermaster service budget. Major water users met on March 22, 2005 to discuss the needs of 2005 in this regard.
- *Tailwater capture:*
    - This minimization activity is fundable through both Klamath EQIP and regular EQIP as described above. It has also been funded by USFWS and DFG in the past, and can be expected to be viewed favorable in the future.
    - The Shasta Valley has received approximately $433,793 for tailwater capture projects in the last 10 years by funders focused on fishery benefits. The NRCS has also funded numerous tailwater capture activities in the Shasta Valley over the last 20-30 years, and can be expected to continue to do so.
- *Water use efficiency measures:*
    - This is explicitly targeted by Klamath EQIP and regular EQIP funding through the NRCS as noted elsewhere.
    - The Bureau of Reclamation may provide funding as part of their off-site coho mitigation.
    - Water use efficiency projects have been historically funded by NRCS for over 30 years.

- SVRCD has initiated multi-year outreach efforts using soil moisture monitoring to help water users fine turn their irrigation and reduce overwatering and consequent tailwater creation and reduced river flows. This program is ongoing and will be expanded.

Habitat Improvements:

- *Fish Passage:*
  - The SVRCD is currently targeting $300,000 in 2005 Klamath EQIP funding to improve fish passage at two flashboard dams on the Shasta River. NRCS has allocated $80,000 in engineering assistance to this effort, and the US Fish and Wildlife Service has allocated $24,000. Requests for additional needed funds for these two projects are being sought and are currently being viewed favorably. Additional barrier remediation is underway on Parks Creek, and scheduled for implementation on the Little Shasta River in 2005. In the future, all repairable barriers in the river are targeted for remediation.
- *Fencing:*
  - Funding has been acquired to fence approximately 24 miles of the Shasta or its tributaries below Dwinnell Dam since 1991. New sources of funding seem to be readily found. Approximately $60,000 was provided from the Siskiyou Resource Advisory Committee (RAC) for the first time in 2004. An additional $43,500 was allocated for another fence by them in 2005.
  - Funding has been recently acquired to fence approximately 4.5 miles of stream in the best cold water refugia area along the mainstem Shasta. Approximately $50,600 was provided by USFWS, and $116,700 was received from the State of California. Notice of additional fence funding has already been received in 2005 for $140,000.
  - NRCS has essentially unlimited money available for riparian fencing projects for all interested participants through their Conservation Reserve Program (CRP). Numerous projects in the Shasta Watershed are covered by this program, with substantial additional participation expected if this ITP is issued and fencing becomes a requirement for coverage.
- *Stream crossings:*
  - Land owners requiring livestock crossing shall pay costs associated with the construction if grant funding is not available.
- *Riparian and emergent planting:*
  - Some funding is available with association with NRCS CRP fencing project funding for riparian zone protection.
  - Grant funding has been successfully captured in the past from the State of California, US Fish and Wildlife Service, Cantara Trustee Council, and others for past riparian planting efforts. The SVRCD anticipates future grants from these or similar sources.
- *Spawning gravel:*
  - Spawning gravel cleaning and placement projects will be funded by participants not otherwise able to meet their share of on-site improvements. Several irrigation districts will most likely participate in the ITP and own essentially no land bordering the stream and will therefore need off-site mitigation projects.
- Woody debris:
  - Costs associated with this measure will covered by a combination of grant funding and assessments on persons not bordering the stream but using water

(irrigation districts).

- Monitoring costs:
  - Screw trap monitoring of juvenile out-migrants is funded for 2005 year by the Cantara Trust (~$165,000 for Shasta and Scott) to the Shasta Valley RCD. Additional funding has been sought for two additional years from the State of California. Historically the State of California provided all funding for screw trap operations until 2004 through the DFG budget. Currently funding for 2006 appears to be likely.
  - Adult monitoring of coho is an on going project funded by the DFG at the mouth of the Shasta River and is expected to continue indefinitely at their expense.
  - DWR watermaster services does both spot checking and enforcement of State water law (funding described above).
  - NRCS provides initial monitoring of NRCS funded projects for consistency with plans and completion.
  - The North Coast Regional Water Quality Control Board will continue to implement its Surface Water Ambient Monitoring Program (SWAMP).
  - The SVRCD will be monitoring water temperature at key locations in the Shasta River watershed with internal funding.
  - The US Geological Survey is planning to initiate coho early life history studies in the Shasta River watershed starting summer 2005 and following.
  - Funding for coho early life history studies through the U.C. Extension were initiated in 2003, have continued through 2004, and will be expanded in 2005. Most funding is internally generated by the principal investigator.
  - The SVRCD will charge participants to cover cost of compliance monitoring. Effectiveness will be gauged by comparing the adult returns to smolts produced 1+ year later.
  - Funding in hand for use by the SVRCD for staffing needs, a major portion of which will be used to further protection and restoration of coho and other salmon. Funds include $25,000 from the USFWS for salmon restoration-related planning outreach, project development and monitoring, and $~180,000 from the DFG also for salmon restoration-related planning outreach, project development and monitoring over the next 3 years. Similar levels of funding are anticipated in the out years.
  - Additional staff funding in hand from the NOAA (~$10,000) will be used for outreach and project development.
  - The SVRCD has been funded by the State of California to assess the effectiveness of past restoration activities for $61,375. Past projects rely on methods, techniques and approaches utilized to avoid, minimize, and fully mitigate under this permit. This study will help develop baseline data during 2005 also.

In addition to the financial contribution of the property owners and districts who will benefit from a programmatic master incidental take permit, which will be formalized in a contract between the programmatic master permit holder and the property owner/district so as to assure that the property owner/district pays a fair and proportionate share of the costs of the legally required mitigation measures and monitoring. The master permit holder (the Shasta Valley RCD), in its role as advisory body to the Natural Resources Conservation Service, shall also devise funding allocation guidelines that will assure that Federal Klamath EQIP funds (est. $300,000/year for 2005, 2006 and 2007) shall be dedicated to ITP specific measures.

The County of Siskiyou is organizing efforts to seek funds through various sources such as granting agencies, the public utility re-licensing process by seeking to have the utility, where appropriate, fund the appropriate PM&Es, and will also attempt to pursue or consider other funding options that may be legally appropriate to help provide the legally required financial assistance/assurances. Currently efforts are targeting Calif. Prop 50, focused on water quantity and quality, and study and planning needs. Funding under review for the Shasta totals $3,272,663 in direct funding requested for projects totaling $5,796,887 for agricultural impacts related projects. With additional funds targeted for urban water quality problems. Notification of success is expected in late summer 2005.

Efforts to locate and secure additional funding will be ongoing from all available sources.

RCD
SHASTA VALLEY
RESOURCE CONSERVATION DISTRICT

Attachment 9
Shasta Valley Resource Conservation District
History and Accomplishments

History and Background
The Shasta Valley Resource Conservation District was formed in July of 1953 and reached its present boundaries in 1957. The RCD has historically worked to directly benefit agricultural operators. Since 1991, it has expanded its scope to focus on fisheries and water quality, and actively sought board members representing a broader perspective of resource issues (see Appendix 2). The SVRCD is managed by volunteer directors who all live within their district and who have an understanding of local concerns. In addition, the SVRCD hires staff members to oversee district operations and coordinate projects.

The Shasta Valley Resource Conservation District lies entirely within Siskiyou County, CA. The District is comprised of approximately 1,765,000 acres, 54% of which is private agricultural and timber land. The district includes portions of the Middle Klamath Sub-Basin, McCloud River Sub-Basin, Upper Sacramento Sub-Basin, and the entirety of the Shasta River Sub-Basin (see **Figure 1**). There are a number of small urban areas within SVRVD, ranging from several hundred, to approximately 7,000 residents. Land in the vicinity of these areas is used in a fashion similar to that found throughout the west--small city lots in the towns, grading into progressively larger acreages as one moves farther from the urban center. While increased urbanization, especially of marginal agricultural lands is ongoing, . the population of Siskiyou County was 44,596 on 1/1/96, and 44,391 on 1/1/97, and 44,350 on 1/1/00 (source: Calif. Dept. of Finance). What the numbers do not show is a corresponding decrease in family size as young people move out of the area and are replaced by retirees, a shift that brings with it increased demand for additional housing and larger rural residential demands.

Although past RCD activities have focused on agricultural issues, the SVRCD continues to serve all residents of the district and has implemented projects that benefit fish, wildlife, plants, and other valuable resources found within its boundaries. Highest priority for district activities outside the Shasta Valley is placed on those portions of the Middle Klamath Sub-Basin which are within the boundaries of the SVRCD. People in this area are affected by endangered species issues and currently lack an effective watershed council or partnership able to meet their needs. The SVRCD puts high priority on projects in this area.

Agriculture is still an area the RCD continues to take a strong interest in. In Siskiyou County, agriculture contributes over 116 million dollars annually to the rural economy. Primary products are cattle and calves, alfalfa hay, nursery products, pasture and range, potatoes and potato seed. Within the SVRCD boundaries, the Shasta Valley holds most of the agricultural lands, including irrigated permanent pasture/hay fields near the river, dryland grazing on the sloping land, the growing of alfalfa in areas without high water tables, and dry land grain where irrigation is not possible. In addition, there are also limited acreages of row crops including potatoes, strawberries, garlic, and small commercial orchards.

Heavy recreation use also occurs in the mountain regions due in part to the abundance of and accessibility of water. White water rafting is popular on the Klamath, Sacramento, and McCloud rivers. Lake Siskiyou, formed by Box Canyon Dam, attracts fishermen, swimmers and boaters, as do the many other lakes in the area. The ski park at Mount Shasta attracts tourists as well. Activities throughout the district include fishing, hunting, bicycling, hiking, boating, skiing, 4-wheel driving, and swimming.

Shasta River CRMP

Because of its historic importance for salmon production, considerable effort has been expended since the late 1980's to restore the salmon productivity of the districts rivers and streams. The clear-eyed vision of the Shasta Valley RCD in the late 1980's in recognizing the need to protect the shared resources of fish and water led to the formation of the Shasta River Coordinated Resources Management and Planning (CRMP) group in 1991. Foremost in supporting this first watershed restoration group in the Klamath Basin has been the Klamath River Basin Fishery Task Force (KRBFTF) with its ongoing support for both essential public outreach efforts and on-the-ground projects. More recently, the people of California, through a variety of bond measures, have stepped up their support for fishery restoration work, and restoration funding allocated by the Department of Fish and Game now exceeds that from all other sources.

Restoration Projects

hrough 200March 2005, over 7.7 million dollars in money and in-kind effort have been dedicated to fisheries restoration in the Shasta Watershed, nearly all of it on private land. Those funds allowed over 168 individual projects to be completed, in progress or funded and ready to start. Projects have ranged from livestock exclusion fences, stockwatering arrangements to minimize livestock impacts to streams, tree and emergent vegetation planting, dam removal, fish screen fabrication and installation, irrigation efficiency improvements, irrigation tailwater capture and reuse or treatment and return to the river, local outreach and assistance, along with cooperative efforts with younger Klamath River watershed groups, operation of screw traps on the Shasta and Scott Rivers to count juvenile out migrants, and focused field work with grade school and high school students,

While considerable effort has been expended in the Shasta Watershed over the last 15 years, much work remains to be done. Water quality issues, especially high temperatures and low levels of dissolved oxygen continue to the major impediments to improved salmon survival. Other factors include reduced stream flow, both in the mainstem and tributaries, excessive levels of fine sediment, fish passage barriers, degraded riparian condition, loss of spawning gravel, and alterations to the natural hydrograph. While these problems are significant, experience over the recent past has shown that they can improve rapidly once given the opportunity.

Over the last 15 years, restoration in the Shasta Watershed has seen many firsts—

- First watershed-wide restoration group formed in the Klamath Basin
- First private lands outreach program
- First real-time, publicly accessible river flow and temperature monitoring station
- First Klamath basin riparian zone livestock exclusion fencing projects
- First video counting of salmon spawners in Klamath Basin

- First basin-wide production estimates of both fall chinook and coho juveniles using screw trap data

Dam Removal Projects:
Of the many projects initiated in the Shasta Watershed, by far the most significant and most difficult has been the removal of a summer flashboard dam that had been both a barrier to adult and juvenile salmon, and a source of lethal water quality since 1889. This project is now serving as the prototype of work targeting the rest of the flashboard dams in the Shasta system.

This cooperative effort, involving the active participation of the USFWS/KRBFTF, US NMFS, US BOR, US NRCS, Shasta Valley RCD, Shasta Valley CRMP, Great Northern Corp, along with the members of the Fiock Family who owned the dam, allowed the permanent removal of a dam that had been written about with despair in DFG documents dating to before the 1950's, articles where biologists would describe the truckloads of fish annually found dead below the dam, unable to pass it.

Through the combined efforts of funding agencies, the enlightened patience and persistence of the landowners, and a lot of hard work, there is no longer a fish barrier in the lower end of the Shasta River. Salmon are spawning in the gravel now appearing in the area which was formerly mud bottomed summer impoundment, something that hadn't occurred in living memory. Levels of dissolved oxygen have risen at this site by 1 mg/l, improving it from periodically lethal to only difficult for salmon, a vast improvement. The river channel itself is beginning to narrow as it responds to more natural conditions, and salmon are able to continue upstream much earlier than they had been able to in the past, improving their ability to utilize spawning areas up to 25 miles further upstream.

This project highlights the opportunities and promise of the Shasta River and the people of the Shasta Valley—working together, we can and have overcome problems long in the making, and once given a chance, the Shasta River springs back to full, vibrant life.

Water Conservation Projects:
Since 1991 the Shasta River CRMP has installed pipelines to replace leaky ditches, stock watering systems to minimize livestock impacts on water quality, and irrigated field moisture sensors to eliminate over irrigation.

The Shasta Valley RCD/CRMP has installed numerous tailwater capture systems at key locations along the Shasta River. In fact, through the efforts of the SVRCD and CRMP the Meamber Ranch was honored by the Klamath River Basin Fisheries Task Force in 2002 for their efforts toward innovative tailwater captures systems and restoration projects (see Appendix 1 for additional information). And the Beck Ranch Tailwater capture system was selected as the most significant restoration project in the Klamath Basin by the Klamath River Basin Fishery Task Force in 2004.

Water Quality and Soil Erosion Projects
In partnership with the SVRCD/CRMP the Shasta Valley ranching and farming community has made huge efforts toward enhancing the water quality of the mainstem Shasta River and its tributaries. Since 1991 local landowners in partnership with the RCD/CRMP have installed livestock exclusion fencing 24 miles of the mainstem of the Shasta and its tributaries. Widespread efforts have also been made to work with the local community on management of riparian zone including stream bank riparian and emergent plantings.

Fishery and Wildlife Habitat Improvement Projects:
The Shasta Valley RCD and the local agricultural community of the Shasta Valley recognize the value of our local natural resources including local fishery and wildlife habitats. Since 1997 the RCD/CRMP has been working on collecting water temperature data throughout the valley. Local efforts have also been focused on making sure that properly designed and installed fish screens, water diversion structures and control devices were in place. Fish passage improvements are ongoing in the Shasta, Parks Creek and the Little Shasta.

The Shasta Valley RCD/CRMP recognizes that ongoing data collection is essential toward monitoring existing fish populations in the Shasta River watershed. As a result, the SVRCD has funded and will continue to fund O+ out-migrant juvenile coho surveys.

***Education and Outreach*:**
The Shasta Valley RCD recognizes that the best tool toward conservation and restoration efforts in the Shasta River watershed is through education and outreach. As a result, the SVRCD/CRMP speaks to public service groups and organizations about the various projects and issues of local concern. Along with public speaking engagements the SVRCD attends local agricultural awareness days and has several informational brochures to assist with the education of the community. In 2002 the SVRCD started a website located at **www.svrcd.org**. While the website is still in its early stages it is the SVRCD's intention to expand the website to include fact sheets on conservation practices, keep the public informed about local projects and opportunities.

The Shasta Valley RCD has also been recognized as an organization that can assist other non-profit organizations in conservation and restoration projects. One such partnership the SVRCD has made is with the Yreka Creek Greenway Committee. The RCD is currently working closely with the Greenway Committee and the City of Yreka on procuring funds to restore and enhance the Yreka Creek corridor which runs through the City of Yreka. This project will not only enhance the existing Yreka Creek channel but will act to restore vital floodplains. Once established, the greenway will also serve as a valuable educational tool for local schools and organization that want to learn more about stream-riparian habitat. It is also the only tributary to the Shasta still supporting coho salmon through the hot summers, making it doubly important.

Into the Future
The Shasta Valley RCD is continuing to support landowner activities (both private and public) in order to enhance the conservation and economic stability of the County's natural resources. In January 2005 the RCD hired a new full-time Executive Director to manage the district. The RCD is already working with several landowners on the removal of two additional flashboard dams and is always looking for other ways to assist people throughout the basin on their conservation needs.

Appendix 1

Mr. Don Meamber, a local Shasta Valley rancher was awarded in 2002 with the *Nathaniel S. Bingham Memorial Award* for his restoration efforts. Since 1994 the Meamber Ranch has lead the way in the Shasta Valley with livestock exclusionary fencing, riparian plantings, tailwater capture, and as a study site for local school children.

DAILY NEWS

Thursday, March 20, 1997

Montague rancher honored for restoration efforts

MONTAGUE — Don Meamber Jr., of Montague, planted native trees along the Shasta River, installed fencing to keep his cattle off the riverbanks, put fish screens and water intakes along the river, and implemented "innovative" irrigation and water conservation methods.

For those efforts, he was honored recently by the Klamath River Basin Fisheries Task Force, which also named the French Creek Watershed Advisory Group as an outstanding contributor to the river system's fish habitat restoration program.

The award plaques were presented by the U.S. Fish & Wildlife Service (FWS) at a task force meeting in Yreka in February.

Meamber is a member of an early Siskiyou County family that has ranched along the Shasta since pioneer days.

The French Creek group includes several state and federal agencies as well as the French Creek Drainage Property Owners Association, Roseburg Resources Company, Sierra Pacific Industries, Fruit Growers Supply and the Marble Mountain Audubon Society.

In expending a total of $600,000 in road improvements, the advisory group's effort succeeded in "significantly" reducing sediment washing into French Creek, a tributary of the Scott River which in turns flows into the Klamath.

The 32 percent decrease in sediment came by upgrading road surfaces, clearing culverts, replanting cut banks and retiring obsolete logging roads.

The task force is represented by federal, state, local and private interests in California and Oregon cooperating in an effort to reduce Klamath River environmental problems and improve fish habitat.

Appendix 2
Shasta Valley RCD
Board of Directors Biographies.

Blair Hart – President. Blair Hart is the current President of the Board for the Shasta Valley Resource Conservation District. He has played an active role in the RCD since 1988. He is a 5th generation Siskiyou County rancher and is also the current president of the Siskiyou County Planning Commission. Blair has worked for the past 20 years on assuring that ranching in his community continues to be economically and environmentally viable.

Kerry Mauro – Board Member. Kerry Mauro has been involved with the Shasta Valley RCD since the fall of 2003. His background is in electronic design and development and has lived is Siskiyou County sine 1973. He is the current president of the Mount Shasta Area Audubon Society and is a member of the Siskiyou County Resource Advisory Committee (RAC). He is also on the board of directors for the Shasta Ranch Road Association. Kerry became involved with the SVRCD because of interest in conservation issues in Siskiyou County and the belief that the RCD has the potential to be one of the primary leaders in conservation for Siskiyou County through promotion of stewardship and resource conservation.

Don Meamber – Board Member. Don has been involved with the Coordinated Resource Management and Planning group (CRMP) since 1993 and became a board member for the Shasta Valley RCD in March of 2004. He is an 4th generation Siskiyou County cattle rancher. Don first became interested in conservation when he was approached by the CRMP coordinator to conduct conservation projects on his land such as livestock exclusionary fencing and the installation of tailwater capture systems that not only captures his on-site tailwater but also tailwater from neighboring parcels. Don has also played an active role in the community as a soccer, baseball, and basketball youth coach. He also assists with local fundraisers.

Bill Hirt - Board Member. William H. Hirt is the newest member to the Shasta Valley RCD board of directors (since March 2005) after having been involved with the organization for a little over a year. He has lived in Siskiyou County since August 1991, when he joined the faculty at College of the Siskiyous as the geology instructor. As a member of the community, his principle motivation for serving on the SVRCD board is to help facilitate projects and relationships that will enable residents to manage resources in the Shasta Valley and surrounding areas wisely and sustainably. He learned about the RCD's work through conversations with another of its board members, and hopes to be able to draw upon his professional background to assist the district in addressing some of the geological and hydrological questions it deals with.