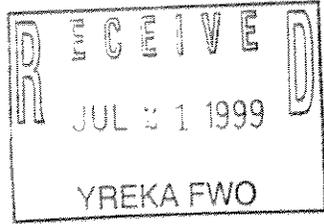


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U. S. Fish and Wildlife Service  
P.O. Box 1006  
Yreka, CA 96097

January 20, 1999

Attn: Ms. Della Smith

Final Report for Project ID#96-HR-05, Improve Habitat Conditions in and Along the Shasta River Through Restoration of the Riparian Zone , Cooperative Agreement # 14-48-0001-96

Three Shasta River Coordinated Resource Management and Planning (CRMP) livestock exclusion fencing sites along the Shasta River and one Dept. of Fish and Game wildlife enhancement site on the Little Shasta River were planted with native riparian trees to stabilize eroding streambanks and reduce the amount of sunlight hitting the water. The fishery habitat benefits expected to accrue from an established riparian zone include: a reduction in the sediment yield from unstable streambanks and a capacity to filter sediment from up slope areas, enhanced fishery microhabitat complexity and cover, and reduced solar heating of the water column. Terrestrial wildlife, including threatened and endangered avian species will also benefit from the diversity and continuity of habitats provided by a restored riparian zone

The trees planted included: white alder (Alnus rhombifolia ), water birch (Betula occidentalis), black cottonwood (Populus trichocarpa), and three species of willows, sandbar (Salix hindsiana), pacific (Salix lasiandra), and arroyo (Salix lasiolepis). The project employed a mix of cuttings, rooted cuttings, and seedlings cultured by the Siskiyou County School's Learn to Earn program. Planting took place during the winter/spring dormant period of 1996, 1997, and 1998 to minimize the risk of desiccation . The trees were planted in four inch augured holes and covered with vexar seedling tubes (mouse protection), inside a one ft. diameter by three ft. high wire cage (deer and beaver protection). The cages were also clipped to a steel fence post to guard against damage during high flows. Three of sites included drip irrigation systems, the fourth site relied upon the irrigation regimen of the adjacent pastureland and proximity to the river for moisture.

The labor force employed for the project included: Great Northern Corporation, California Conservation Corps, Siskiyou Training and Education Program, personnel and students from Siskiyou County Schools, and the Dept. of Fish and Game.

A brief description of the four sites planted and status report follows.

## Fiock Brothers Ranch

This Shasta River CRMP livestock exclusion site encompasses both river banks and extends approximately ½ mile upstream of the Shasta River bridge on Ager road to the railroad bridge (river mile 10.5). The initial planting of 490 rooted cuttings took place in December 1995. The trees were not provided with irrigation until August 1996 due to funding delays. The irrigation system at this site utilizes a 3 hp gasoline powered pump situated in the middle of the project to pull water from the river through a tube screen under the landowner's riparian water right. Drip irrigation was chosen as the most efficient and least conspicuous method to deliver the water to the individual trees. The system provides each tree with 2 gallons/hour delivered via spaghetti tubes connected to drip emitters punched into the main line. Filtration for the drip system is provided by a 3/4" disc filter on each of the four discharge circuits (each circuit serves approximately 125 trees). The irrigation system has functioned reasonably well except for damage to the lines during flood events and the effort required to ensure that the spaghetti tube feeder lines are in place and actually delivering water to the individual trees.

The mortality from the first year was approximately 50%. Possible sources of the observed mortality include: the small size and reduced vigor of the planting stock, preplanting handling that allowed the roots to desiccate, and the delay in providing irrigation during the summer. Replanting the 249 failed trees with rooted cuttings took place in spring 1997; the fall census in 1998 showed 326 trees surviving.

<u>initial planting</u>	<u>replanted</u>	<u>survivors</u>	<u>total planted</u>	<u>survival rate</u>
490	249	326	739	44%

The site has diverse planting conditions that vary from dry star thistle covered banks to low wet point bars. The bank stabilization goal of the project which sought to vegetate the eroding bluff banks has met with limited success due to erosion during high water events. This a pervasive problem at the all of the planting sites whereby trees are unable to become established because of continued erosion and cut bank decay. Established trees have endured continuing damaged by rodents that have defeated the vexar tubes. The dense grass that grows along the river within the livestock exclusion area provides a favorable habitat for mice and voles; perches for raptors are needed to help control the rodent population and allow the trees to become established.

## Kuck Brothers Ranch

The planting site covered ½ mile on the east side of the river and is approximately one mile (river mile 16.5) upstream from the confluence of the Little Shasta River. This site is enclosed by a Shasta River CRMP project livestock exclusion fence and was initially planted with 467 trees in January 1996. Irrigation was not provided at this site; it was believed that the proximity to the river and the water management scenario expected for the adjacent pasture should provide sufficient moisture. The site experienced approximately 30% survival during the first summer. Probable causes of mortality include the following factors: the reduced vigor of the small planting stock used, desiccation at the time of planting, bank erosion, competition from the established turf, and the lack of specific irrigation for each individual tree. The river has eroded into the east bank of the river during the last two winters. Livestock exclusion fencing that at the time of

installation was a minimum of twenty feet from the river is now in jeopardy of falling into the water. The proximity of the fence to the river and the flood plain topography have caused this fence to require yearly cleaning and repair. A total of 320 trees were replanted in spring 1997, but were subject to the previously mentioned constraints upon survival. The livestock exclusion fence will need to be reconfigured in those areas where the river has encroached into the fence line and replanted with riparian vegetation.

#### Kuck Ranch Fall 1998 Census

<u>initial planting</u>	<u>replanted</u>	<u>survivors</u>	<u>total planted</u>	<u>survival rate</u>
467	320	82	787	10%

#### Freeman Ranch

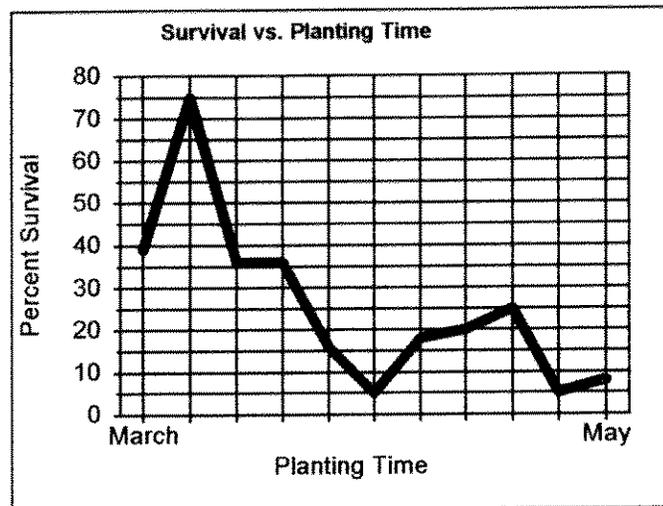
The Freeman Ranch project encompasses approximately 3/4 of mile on both sides of the river at river mile 19.25. The entire riparian area, a total of nearly 36 acres, has been fenced to exclude livestock from the project area by the Shasta River CRMP. The generous set aside at this site greatly increases the likelihood of success for the restoration project by allowing the livestock exclusion fencing to be situated above the majority of high water events thus reducing the chances of flood damage. A total of 1705 trees were planted in the spring of 1997 and supplied with a drip irrigation. The system delivers one gallon/hour to each tree via spaghetti tube connected to emitters punched into the main line. The water supply is based upon the landowner's riparian right and utilizes a 4 hp gasoline powered pump to charge one of two circuits on alternate days.

The problems encountered with the irrigation system were similar to the other drip systems where high water disrupted the spaghetti tubes to the individual trees necessitating a large expenditure of time each season to ensure that water was being accurately delivered. The filtration capacity provided by the two 1 1/2 inch filters proved to be insufficient during periods of high turbidity; the output under turbid conditions was reduced to five gallons of water for each irrigation set which was less than optimum for training root growth. The project was inventoried in September 1997, March 1998, and September 1998 to assess survival and guide replanting efforts. During the spring of 1998 a total of 896 trees were replanted, primarily cuttings. The mortality exhibited from the previous winter in low lying areas has prompted a shift to more water tolerant species in areas subject to prolonged inundation.

Fall 1997 Census	<u>initial planting</u> 1,740 (1,553 surveyed)	<u>survivors</u> 1,352	<u>survival rate (surveyed)</u> 87%
Spring 1998 Census	<u>initial planting</u> 1,740	<u>survivors</u> 1,104	<u>survival rate</u> 63%
Fall 1998 Census	<u>initial planting</u> 1,740	<u>survivors</u> 743	<u>survival rate</u> 43%
	<u>replanted 3/98</u> 896 (643 surveyed)	<u>survivors</u> 422	<u>survival rate (surveyed)</u> 66%

Bank stabilization at a high risk site utilizing willow matting was undertaken during the summer of 1997 and has been effective in arresting the erosion to date. Tule clumps planted during 1998 have grown but it remains to be determined if they will remain in place during high winter flows.

The initial planting took longer than was anticipated and ran later into the season than was desired. A break down of survival plotted against planting date shows that the later plantings did not fare as well as those planted earlier in the season. The data does however have some factors that confuse the issue; the largest trees were used first leaving the smaller stock for the later plantings, but generally it would appear that planting prior to the end of dormancy is preferable.



An attempt was made to use the project to contrast the effectiveness of planting rooted cutting vs. unrooted whips. The results of the comparison were unfortunately inconclusive due to the lack of a reliable and durable marking protocol.

### Shasta Valley Wildlife Area, Little Shasta River

The project encompasses approximately ½ mile on both banks of the Little Shasta River at river mile 4.0 on the California Dept. of Fish and Game Shasta Valley Wildlife Area. Restoration efforts entailed planting native riparian trees and protecting existing mature willow trees from further beaver damage. The area is managed for fish and wildlife habitat; livestock are excluded from the project site. A total of 660 trees were planted, protected with wire cages and supplied with drip irrigation during the spring of 1998. The irrigation system utilizes a 4hp gasoline pump connected to 2" pvc distribution mainline. The water is delivered to the individual trees via 3/4" lines equipped with a maximum of 20 variable volume emitters. The soil chemistry is highly variable at this site; some areas proved to be highly alkaline and thus unsuitable for trees. The wet spring and abundant flow throughout the summer were propitious for establishing riparian vegetation and it is fortunate that the project could take advantage of the unusually benign weather. A survey on 9/98 counted 429 survivors.

<u>initial planting</u>	<u>replanted</u>	<u>survivors</u>	<u>total planted</u>	<u>survival rate</u>
660	0	429	660	65%

## Project Summary

<u>initial planting</u>	<u>replanted</u>	<u>survivors</u>	<u>total planted</u>	<u>survival rate</u>
3,321	1,465	1,901	4,786	30%

It is anticipated that maintenance of the trees using irrigation pumps supplied by the project will continue by Dept. of Fish and Game staff and the Shasta River CRMP. The project has not used all the supplies purchased, approximately 1,000 steel fence post and 450 wire cages remain; with the consent of the project manager and the U.S. Fish and Wildlife Service these materials will be used to plant trees on a recently fenced section of the Shasta River immediately downstream and contiguous to the Fiock Brothers project at Ager Road.

We wish to thank the Fish and Wildlife Service for their generous support of the riparian restoration efforts along the Shasta River.

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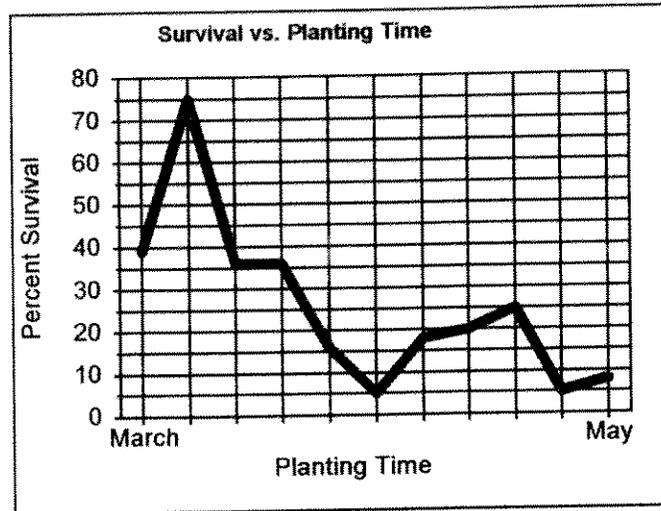
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Please direct any questions you may have to Juanita Quijada or Dave Hill of my staff.

A handwritten signature in cursive script that reads "R. A. Iverson". The signature is written in black ink and includes a long horizontal flourish at the end.

Ronald A. Iverson  
Project Leader

Enclosure