SCOTT RIVER RIPARIAN RESTORATION PROJECT II

FUNDED BY

UNITED STATES FISH AND WILDLIFE SERVICE -

Jobs in the Woods

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ID # 98 HR-02

Contracted by:
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[illegible] 2001

Abstract: The goal of the Scott River Riparian Restoration II Project is to improve and expand riparian and cold water habitat throughout a 5.0 river mile section of the Scott River by planting 35 acres of riparian area. The project was funded by the USFWS - Jobs in the woods program, USFWS - Klamath Restoration Act, and the National Fish and Wildlife Foundation. The project reach of the Scott River is important to the watershed's fisheries due to cool summer flows and prime spawning habitat. Although the reach has some positive aspects, there are also problems present as well. Much of the project reach has an overly wide and unstable active channel due to excessive bed load created by millions of yards of mining tailings located up stream from the project.

The overly wide active channel is due to the instability of the banks and rapid channel changes which occur due to the migrating gravel deposits (tailings). The migrating gravel bars and unstable banks prevent contiguous riparian woodland establishment. In turn, the lack of riparian woodland establishment and natural vegetation propagation prevents the channel from becoming a stable single thread channel. Over the past several years, previous instream projects have provided bank stability in locations which should keep the channel relatively stable and in equilibrium with the bed load volumes. This project encompasses the next phase which is to establish a contiguous vegetated riparian area which will trap bed load, provide in stream habitat improvement, and help to stabilize the channel.

The Siskiyou Resource Conservation District (RCD) focused on planting riparian cuttings and using a back-hoe to bury willow and cottonwood cuttings as deep as possible in order to keep developing roots incontanct with moist soil. The RCD has used this planting style over the past four years and has received better results then planting rooted stock accompanied by drip irrigation lines. The RCD has also planted Ponderosa Pine trees throughout the project area where pine establishment is likely. Approximately 36 acres of riparian trees has been planted under the Riparian Restoration Planting II project. Funding for the SRRRII project has come from three sources: USFWS- Jobs in the Woods, USFWS - Klamath Restoration Act, and the National Fish and Wildlife Foundation.

INTRODUCTION

RCD & Watershed Group Background:

The Siskiyou Resource Conservation District (RCD) is a special district which has been operating since 1949. The focus of the RCD has changed over time, but the trust vested in the RCD by the agricultural community has not varied. In the late 1980's the RCD Board (composed of conservation minded property owners in the watershed) shifted their attention to fishery restoration and water quality concerns in the watershed. The establishment of the Klamath Restoration Act by Congress initiated the movement for communities to improve their watershed. The RCD began to implement a basic plan of riparian protection and bank stabilization in 1993.

The RCD also sought funding to develop a community based group in the watershed to address the declining anadromous fishery issues. The group formed was a consensus group called the Scott River Coordinated Resource Management (CRMP) Council. The CRMP developed working plans which focused on agricultural issues, water quality concerns, fishery needs and upland issues which may improve the condition of our watershed. The CRMP has recently evolved to a super-majority community group now called the Scott River Watershed Council. The mission and focus of the group remains the same, but may now have a more concerned ear about the community as a whole rather then a single species or issue.

Project Area Background:

In the 1920's through the 1940's, a large yuba dredge mined 6.5 miles of the scott River located upstream from the project scope. The tailings piles from the dredge eliminated the flood plain. Since then the river has tried to regain the flood plain by eroding the tailing opposing bank and moving the material downstream. The material is moved as bed load then depositied below where the floodplain is entact. As the excessive volumes of bed load deposit and shift in the affected reach, excessive erosion has occured. Reduced riparian woodland areas aided in the demise of stream function.

Due to the excessive bed load and rduced ripairan areas, the landowners located up to 11 miles below the mine tailings on the main stem of the Scott River were in direct conflict with the Scott River. The Scott River was carrying excessive bed load generated from placer mine tailings located upstream of the project reach. During high water, the tailings piles are eroded and taken downstream to agricultural land. The flood plain is still intact in the agricultural area and the high flows spread out and deposit the tailings as highly unstable, unconsolidated gravel bars. The gravel bars have replaced mid-level terraces which were composed of loam and were prime areas for natural propagation. The shifting gravel bars have been so active that natural riparian establishment has been severely limited. The channel changes created by the increased bed load deposits braid the channel and force it flow to the outside of the bars causing lateral erosion of farm land. Agriculture worsened the situation by weakening the riparian areas through excessive

grazing and limiting the width of the riparian area. Government programs designed to improve drainage and reduce flooding have also damaged riparian condition in the area.

Historically, the active channel through the reach below the tailings used to be about 100' wide. Today the active channel width now ranges from 250'-1,000+' with an estimated average width of 350 feet wide. A layered mix of gravel, loam and silt has been replaced with deposits of gravel and sand which possess little to no fines. The washed gravel is more difficult to establish riparian species on, because it is too porous to hold moisture during the arid summer months.

Landowners within the 11 mile agricultural reach noticably affected by the tailings (from the tailings down to about the Etna Creek confluence) tried to protect their farm land from being eroded by pushing the gravel from the bottom of the channel to the eroding banks in order to provide bank protection and increase channel capacity using bull dozers. Others were able to afford bank armoring or received assistance from the then Soil Conservation Service (SCS). While the use of dozers may have temporarily protected the affected area, it usually caused unexpected damage downstream. The constant use of dozers also prevented riparian establishment.

Scott River Riparian Restoration I Project Development

During 1994 and 1995, the RCD had been contacted by several landowners located in the upper portion of the reach affected by the tailings. They were looking for assistance to the chronic problem and were tired of treating their problem while the upstream neighbor created another.

In January of 1996, the Wildlife Conservation Board (WCB) contacted the RCD in search of a large on-the-ground riparian restoration project in the Scott River. The upper 4.5 miles of the reach affected by the tailings was selected for project development due to the long term potential benefit. The CRMP and RCD worked with the Wildlife Conservation Board to develop and submit a proposal to the Cantara Trustee Council in hopes of obtaining an equal match. The Cantara Trustee Council was developed through a legal settlement focused on improving and enhancing riparian and cold water species similar to those found in the upper Sacramento River. The Cantara Trustee Council equally matched the Wildlife Conservation Boards' funding ($200,000 each) and the Scott River Riparian Restoration Project (SRRRI -$400,000.00) was contracted by the RCD. The scope of the project included design, bank stabilization, in-stream structures, riparian planting, riparian fencing, fish screens and stock watering systems. The RCD and CRMP wanted to develop a plan which would provide long term benefits to the 4.5 mile long project site. We needed professional help in developing a workable design. Using fisheries biologists, engineers, hydrologists, geologists, geomorphologists, riparian experts, and local knowledge, we were able to develop a plan which addressed the basic problems facing the reach.

Identifying the limiting factors of the project reach led us to project objectives. At this point we knew the channel was unstable due to excessive bed load. We knew the rapid

channel changes and poor riparian condition which were preventing a properly functioning system. On the other hand, we had cool water and a shallow water table which was good for riparian establishment and fishery production. We also knew we had helpful, willing property owners who were looking for a long term solution to their love/hate relationship with the river.

It was determined by the specialists that continued erosion of the banks would only lead to a wider active channel choked by tailings. The first step was to stabilize the rapidly eroding banks identified through the 4.5 mile project scope. Our attempt was not to "pickle" the channel in one designated location but to provide limits to current erosion occurring on the outer banks of the active channel. It was determined that the existing active channel width was more then sufficient to allow a natural meander pattern. We wanted the channel to find its own pattern and then encourage riparian vegetation encroachment to constrict the width of the active channel.

Once erosion was limited and existing channel pattern barriers (levees within active channel and misplaced bank armoring) were removed, riparian protection and planting occurred. Areas planted were behind the stabilized banks, on the higher elevation areas of gravel bars and nearby flood plain areas throughout the project reach. Approximately 68 acres of riparian areas were planted within the project reach of SRRRI. Riparian protection included riparian fencing with sufficient width for riparian function, and installation of two water efficient stock watering systems which eliminated the need for livestock to enter the riparian area for water.

Scott River Riparian Restoration II Project Development :
Much of the same background and restoration approach utilized in Scott River Riparian Restoration I Project has occurred on the stream reach considered within the Scott River Riparian Restoration II (SRRRII) Project. The SRRRII Project scope is located just down stream from the project scope of the SRRRI. Although the tailings influence is reduced and the diameter of material has decreased, the effects are still the same. Bank stabilization and instream structures were installed through various RCD sponsored projects (Fowle Maintenance, Scott River Restoration II - Cantara funded) as well as government programs through the SCS.

Fencing and stock watering systems were also installed to protect the riparian area through the SRRRII reach through other funding sources implemented by the RCD (319h IV and V). The Scott Riparian Restoration II Project was solely developed to improve riparian condition throughout the five mile reach. Three funding sources were combined to fund the riparian planting phase (USFWS - Jobs in the woods, USFWS Klamath Restoration Act, and the National fish and Wildlife Foundation (NFWF). The areas to be planted totaled about 35 acres. The RCD planted approximately 37 acres with varying degrees of success.

Materials and Methods:

The major focus of the Scott River Riparian Restoration Project is establishing a riparian area. The benefits of a riparian corridor are many. Riparian areas trap fine sediment and bed load, provides instream cover, and the root structure provides added strength to the stream banks and increases the water holding capacity. Our goal with the riparian area was to occupy areas within the active channel with riparian species and increase the width of the riparian area. Once the active channel width is reduced, the ability of the channel to move bed load will increase, and the riparian area will absorb high flows, which will limit the conflict between agriculture and the proper river function.

The planting style of using large cuttings of willow species and cottonwood was determined to be the best alternative for the project reach. The RCD began planting large cuttings or pole stock during the spring of 1996. Since then we have planted over 80 acres of pole stock throughout the watershed. The method is rather severe initially, but the results have been favorable in many locations and conditions. Within this project we found that the planting style does have its limits and it is not the "cure all" to riparian restoration.

The planting of the cuttings is done while material is dormant (Late February to Mid April). Planting is done only when winter flows are low, in order to better determine the depth of the summer moisture layer. During higher flows in the winter the water table increases and the holes cannot be dug as deep because the holes collapse. The RCD cuts large rooted stock from willow species (Pacific Willow, Arroyo Willow and Red Willow) and from Black Cottonwood. The cuttings are usually no more then 3.0" in diameter yet may be as long as 12-14 feet. The cuttings are transported to the site and buried using a back hoe. The RCD uses a back-hoe in order to place the cuttings at an elevation deep enough to be in contact with the estimated summer water table or at least the moisture layer. An 8-12 foot long (4' wide) trench is dug down to the depth which is estimated to be the summer water table. 2-3 cuttings are placed upright in the trench and the trench is back filled. The maximum depth cuttings were placed was about 12 feet. On average the cuttings were placed in a trench 6-8' deep. Most of the sites were locations which were too harsh for small rooted stock or too far away from a source for irrigation (ground water well). The density of the plantings using the pole stock method averaged around 150-210 trees per acre, depending on the site conditions and the intent of the planting.

Once the cuttings are buried, the tips are cut off so they don't over transpire when they come out of dormancy. We have found that about 1 foot of stem above ground is optimum for equal development of root and stem development. If we leave two feet above ground the stream will die back later in the summer. If no annual grasses or ground cover is available, we place mulch around the cutting to reduce the refractive heat off the soil and gravel. We have found that the heat on the gravel bars gets so hot it can burn the cambium layer. We also place shade cards and deer browse protection where necessary. Irrigation was used in some locations but was avoided because of the unhealthy dependency the tree gets on the water system.

The decision to use large rooted stock as our primary planting style was based on several factors learned in previous planting locations. Planting survival and vigor rates were much higher using this style in the SRRRI planting sites. The alternative style of using medium sized (14"-18" tall) and small (8-10" tall) rooted stock only performed well in locations which had stable and relatively low water table conditions as well as decent soil conditions. A test area was developed to determine the survival and vigor rates using various plating styles used in the SRRRI project area. The site was a high elevation gravel bar (high elevation was determined to be anything which was over six feet from soil surface to the estimated low flow water table levels) which was similar to much of the sites within the SRRRII project area. The test plot showed that large cuttings placed deep in the soil performed much better then the drip irrigated rooted stock on high elevation gravel bars. Deep planted large cuttings with drip line irrigation survived slightly better then deep planted cuttings without drip irrigation.

Review of all higher elevation planting using rooted stock and drip lines showed drastic declines in survival after the drip lines were removed (two years). Survival on the third year plunged, because the rooted stock depended on the drip lines rather then training its roots to follow the moisture level down as flows dropped in the summer. Several irrigation methods were used to reduce the dependency on the drip irrigation, but none was very successful.

The cost of developing rooted stock and maintaining the planting for two years is more expensive then using cuttings and less successful in much of the area types to be planted under the SRRRII project. The drawback to using the deep planting method is the limitation of varieties that can be used as cuttings. We are limited to several varieties of willow and cottonwood. Alder and sand bar willow are two species within the project reach which cannot be used, because they do not sprout from cuttings. Fortunately, alder is currently in place from natural propagation in many locations through the project reach and would not establish in many of the locations we have selected for planting.

Sand bar willow commonly spreads by tubers or root sprouts and will not take from cuttings. Sand Bar and Narrow Leaf Willow are desirable trees for some of the sites we were trying to establish, because they are pioneer species which can survive and spread in inhospitable locations. Such locations are wide active channel areas which are inundated with water during high flow and are extremely hot during the summer. We spent a significant amount of time and effort trying to use sand bar willow cuttings and using root balls for transplanting. We set up a trial to determine which method, if any, would work for establishing Sand bar Willow. The trial area had plots where we used sand bar willow cuttings mostly buried, cuttings fully buried, cuttings with a portion of root fully buried and, root balls fully buried. We found the best survival (4 out of 15) occurred when a root ball and small piece of stem was fully buried. Four surviving plants out of 15 is not a success or even worth pursuing.

Pole stock within the project reach has been planted over three seasons. Survival varies from poor results to very good. Below is a description of each planting location as well as

the survival and vigor ratings. As you can see the sites vary greatly in performance and some correlation occurs among like sites.

Example:

Planting site as identified on map

Location: Site description Year Planted: Spring planting occurred
Site size: # of acres planted Fall 2000 survival rate: % alive in fall 2000
Vigor Rating: Vigor determined by attached description
Planting Intent: Purpose or intent of planting
Conditions: Review of factors which affect tree condition.

#1

Location: West side of river- upper terrace Year Planted: 1998
Site size: 2.0 acres Fall 2000 survival rate: 81%
Vigor Rating: 5+ - rating high because trees are three years old
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, some annual grass ground cover, stable water table at about 8-10 feet deep, no browse concerns.

#2

Location: East side of river- upper terrace Year Planted: 2000
Site size: 2.5 acres Fall 2000 survival rate: 92%
Vigor Rating: 3.8
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, heavy perennial grass ground cover, stable water table at about 5-7 feet deep, no browse concerns.

#3

Location: West side of river- upper terrace Year Planted: 1998
Site size: 3.0 acres Fall 2000 survival rate: 72%
Vigor Rating: 5+ - rating high because trees are three years old
Planting Intent: Expand riparian area, trap sediment & debris during floods
Planting Conditions: Good soil (some gravel), some annual grass ground cover, stable water table at about 8 feet deep, no browse concerns.

#4

Location: East side of river- upper terrace Year Planted: 1999
Site size: 4.5 acres Fall 2000 survival rate: 75%
Vigor Rating: 2.9
Planting Intent: Expand riparian area on terrace to gain a contiguous reach

Planting Conditions: Good soil, heavy perennial grass ground cover, stable water table at about 4-7 feet deep, no browse concerns. Survival and vigor lower then expected probably because tree root and perennial grass are forced to share the same soil profile due to shallow water table caused by SVID Dam.

#5

Location: West side of river- upper terrace and high gravel bars at bank full level. Year Planted: 1998
Site size: 3.5 acres Fall 2000 survival Rate: 38%
Vigor Rating: 3.3
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Poor soil, little annual grass ground cover, water table fluctuates but bottoms out at estimated 10-14 feet deep, some browse concerns but not considerable. Trees were dug up to determine condition of dead and live trees. We decided that roots couldn't follow moisture level down as swiftly as it fell in many cases.

#6

Location: East side of river- high gravel bars Year Planted: 1999
Site size: 4.0 acres Fall 2000 survival rate: 46%
Vigor Rating: 2.9
Planting Intent: Expand and establish riparian area on bars to hold and trap sediment and bed load.
Planting Conditions: Poor soil, unconsolidated gravel, little to no annual grass ground cover, Fluctuating water table at about 8-10 feet deep, heavy browse concerns (cages were installed)

#7

Location: East side of river- Edges of overflow channels, low elevation gravel bars. Year Planted: 1999
Site size: 2.5 acres Fall 2000 survival rate: 56%
Vigor Rating: 3.1
Planting Intent: Heavily plant overflow channel so they cannot enlarge and become main channel, trap bed load.
Planting Conditions: gravel layers, no plant competition, mulch was added to reduce refractive heat caused from gravel, some browse in open areas, good stable water table.

#8

Location: East side of River- Mid terrace along river, northern site.
Year Planted: 2002 -not planted yet
Site size: 2 acres Survival Rate: ?%

Vigor Rating: N/A
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, some annual grass ground cover, stable water table at about 8-10 feet deep.

#9

Location: West side of river- Mid-terrace along river -90' average width
Year Planted: 1999
Site size: 2 acres Fall 2000 survival rate: 47%
Vigor Rating: 2.2
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Poor soil-sand, no ground cover, stable water table at about 7-8 feet deep, heavy browse concerns - cages added in 2000.

#10

Location: West side of river- upper terrace along river - 120' average width
Year planted: 1999 & 2000
Site size: 3.5 acres Fall 2000 survival Rate: 84%
Vigor Rating: 3.4
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, some annual grass ground cover, stable water table at about 8-10 feet deep, browse cages installed in 2000. No cages were installed in 1999 and survival in this area was less then 50%. Cages have greatly improved growth and vigor.

#11

Location: West side of river & along Etna Ck. Year Planted: 1999 & 2000
Site size: 2 acres Fall 2000 survival Rate: 60%
Vigor Rating: 2.7
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, some gravel layers, annual and perennial grass ground cover, stable water table at about 10-12 feet deep, deer browse cages added in 2000. 1999 planting survival was poor due to lack of browse cages. 2000 survival was good.

#12

Location: North side of Etna Creek & west side of river. Year planted: 2000
Site size: 1.5 acres Fall 2000 survival Rate: 52%
Vigor Rating:
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, some annual grass ground cover, stable water table at about 8-10 feet deep, no browse concerns.

#13

Location: East side of river- high elevation gravel bars. Year planted: 2000
Site size: 2.5 acres Fall 2000 survival rate: 54%
Vigor Rating: 1.85
Planting Intent: Expand riparian area to encroach on active channel
Planting Conditions: Poor - sand and gravel, no ground cover, water table stable at 6-8 feet some annual grass ground cover, stable water table at about 8-10 feet deep, deer browse cages installed.

#14

Location: East side of river- upper terrace along river - 60' average width
Year planted: 2000
Site size: 3.5 acres Fall 2000 survival rate: 76%
Vigor Rating: 3.4
Planting Intent: Expand riparian area on terrace to gain a contiguous reach
Planting Conditions: Good soil, annual and perennial grass ground cover, stable water table at about 10-12 feet deep, deer browse concerns cages installed.

Summary and Conclusions: The project scope has been difficult for two main reasons: 1.) Based on channel evidence and anecdotal information much of the mid-level terraces which were composed of fine sediment and loam have been replaced with large gravel bars and sand, presumably originating from the mine tailing upstream. The increased bed load has caused the mid-level terraces to be replaced with gravel bars. This makes riparian establishment difficult, but even more important. We feel that riparian establishment is the only way to improve the mid elevation terrace conditions by trapping finer material in transport and improving the properties of the soil for further establishment. At present, the cuttings are vulnerable to excessive heat, poor moisture holding content of the soil and water table fluctuations 2.) Deer concentrations in the northern reach of the project pose serious threat to establishment. Wire cages were constructed after initial planting attempts (1999) were repressed by the high density of resident deer.

Even though the mid and northern sites are difficult, any establishment is a move toward historical conditions. Property owners realize the benefits of a functioning, contiguous riparian area and will protect the planting sites. We believe that replanting the reach will be necessary in 6-8 years. At that point we could expand on the established areas as establishment conditions will be improved through fine sediment trapping, and shading of previously established trees. Once significant establishment occurs and soil conditions on the gravel bars transition to a loam, natural propagation is likely and the reach will again be self supporting.

SISKIYOU RESOURCE CONSERVATION DISTRICT

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April 10, 2001

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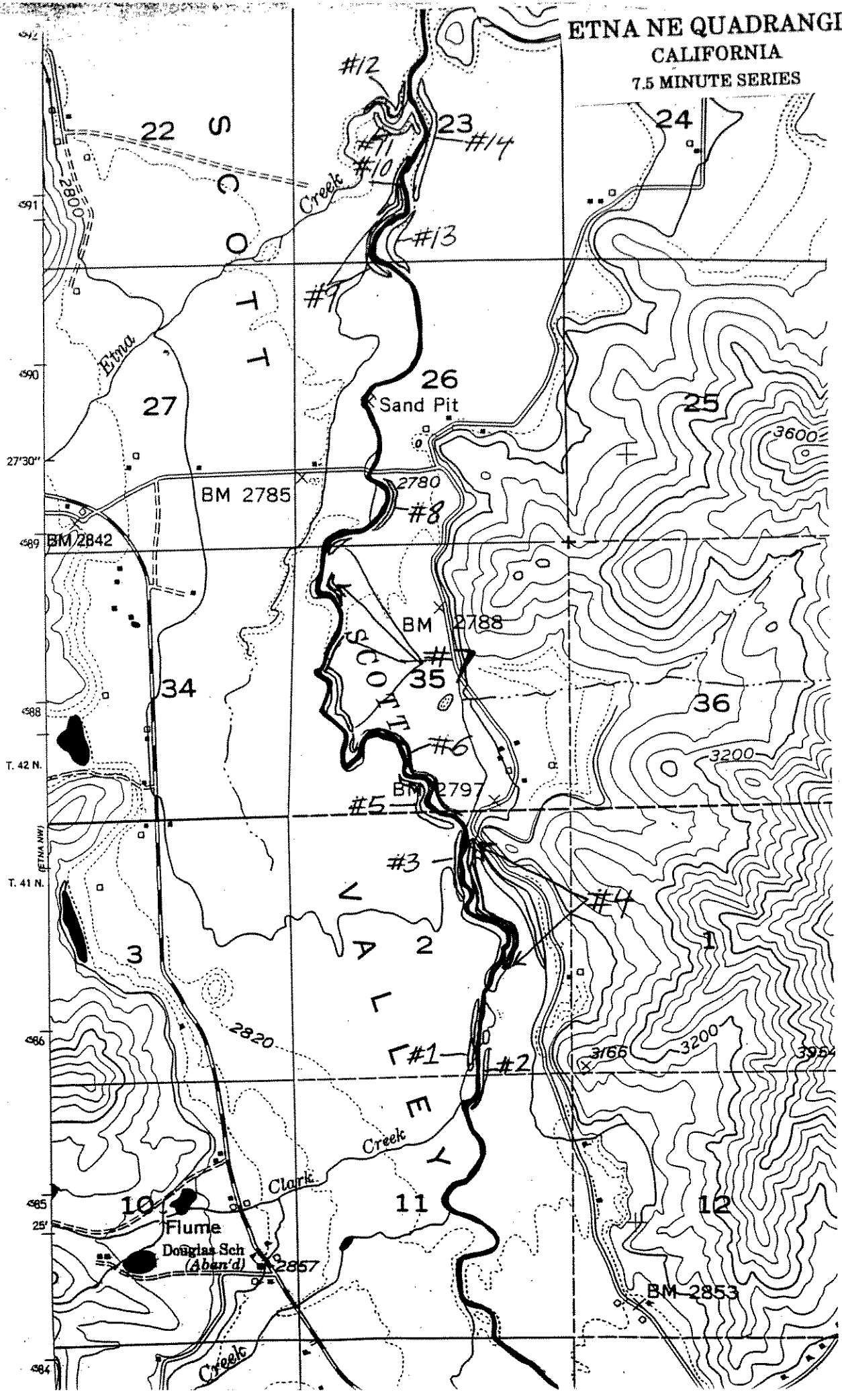
Scott River Riparian Restoration Project
Agreement # 14-48-11333-97-JI75
Project # 97-JITW-02
(RCD ref. # 81 J)

	Budget	Budget Readjustment	Final Budget	Amount Remaining
Salaries	8,887.00	3,735.04	12,622.04	-
Travel	4,899.00	(4,325.15)	573.85	-
Expend. Equip. & Supplies	11,112.00	(2,466.22)	8,645.78	-
Operations & Maintenance	954.00	3,056.33	4,010.33	-
Sub Total	25,852.00	-	25,852.00	-
Administration @ 18 %	4,653.00		4,653.00	-
Total	30,505.00		30,505.00	-


ETNA NE QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES
SCOTT VALLEY
Etna Creek
Clark Creek
Sand Pit
Flume
Douglas Sch (Aban'd)
BM 2785
BM 2842
BM 2788
BM 2797
BM 2853
2780
2820
2800
3600
3200
3166
2857
T. 42 N.
T. 41 N.
(ETNA NW)
27'30"
25'
22
23
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12
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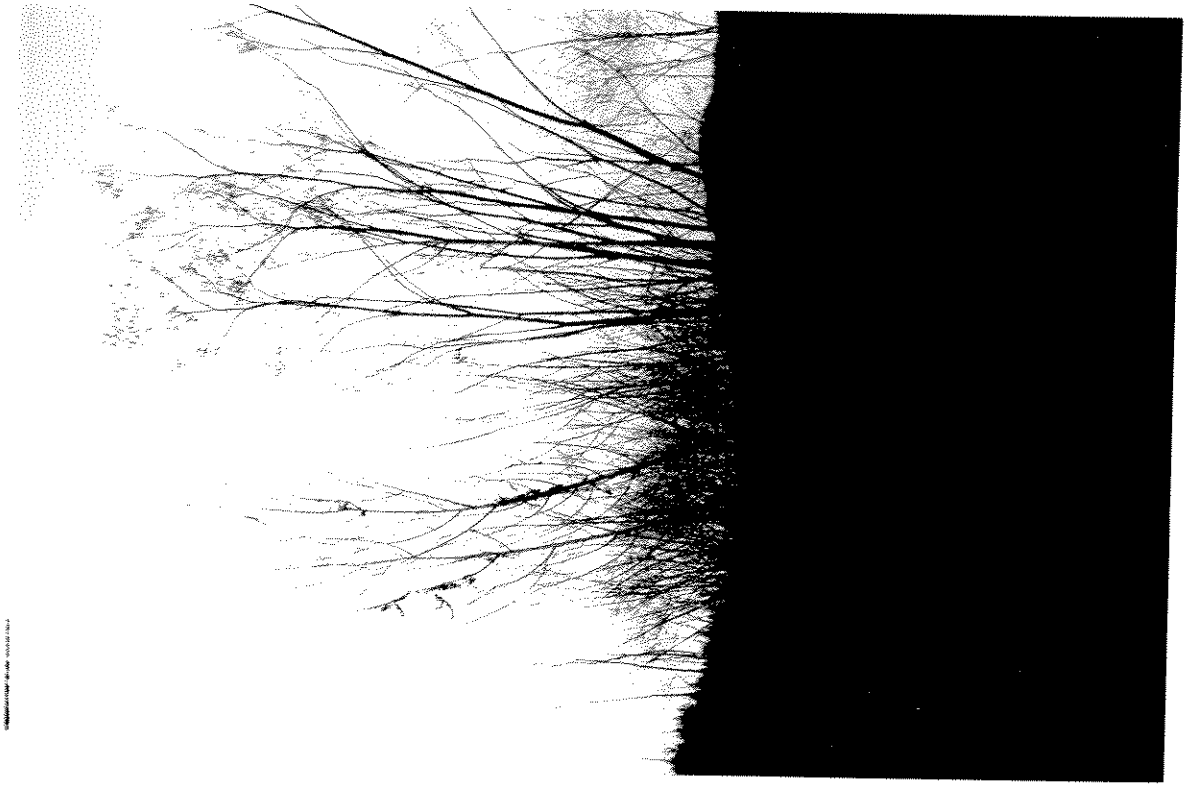
#13
#14

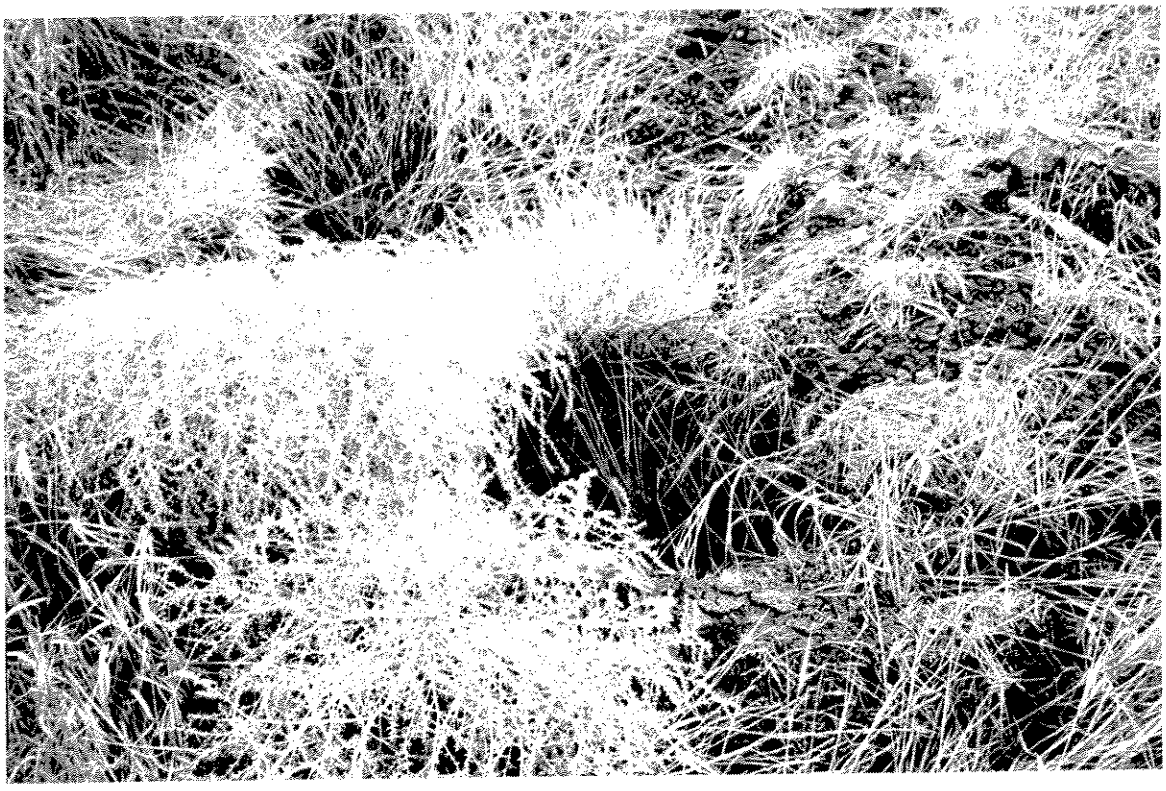
Sample of willow cuttings without browse protection. No livestock have entered this area in fifteen years. Browse is by deer only and is limiting natural revegetation to Sand Bar Willow and Narrow Leaf Willow only (not palatable for deer). Photo 11/01/00 Site #11

Willow growth when page wire cages are used (one season growth). 14 acres of trees were planted in the project area (1.3 river miles) at a density ranging from 140-220 trees per acre. Site #11

Cottonwood and willow cuttings getting above the browse and competition levels (Site #6).



A two year old willow which has established on Site # 11.



Cutting with one year of growth located in a difficult area. The RCD has used tumble weed to cover the cuttings to protect them from direct sun and browse. (Site #7)

Cutting making a move to get above the competition and browse. One years growth in an excellent site (Site #2).

2000 Riparian Inventory

Directions: When a tree is dead, make a "X" on the dead line. When a tree is alive, make a rating from 1-5.

Tree Rating:
1 = Tree is less then 8" tall and has less then less then 3 main stems.
2 = Tree is less then 8" tall and has more then 3 main stems.
3 = Tree is over 8" tall with several stems. Tree is up to knee height with several main stems
4= Tree is over knee height with several main stems,
5 = Tree is hip height or over with several main stems.

: Location_____

Alive-_____

_____

_____

_____

_____

_____

Dead-_____

_____

_____

_____