SCOTT RIVER RIPARIAN WOODLAND REVEGETATION PROJECTS

Final Report FY 1995

"Riparian Woodland Revegetation Phase II" Project 95-HR-15

Partial Completion Report

"Jobs-in-the-Woods" Project 95-JITW-02

by

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for the

SISKIYOU RESOURCE CONSERVATION DISTRICT

Funding provided by the

KLAMATH FISHERY RESTORATION PROGRAM
Klamath River Basin Fisheries Task Force
U.S. Fish & Wildlife Service Cooperative Agreement No. 14-48-0001-94522

May 1996

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ABSTRACT

This year's projects were the first application of the experience gained from the "Scott River Riparian Woodland Revegetation Demonstration Project", funded by the Klamath Fisheries Restoration in 1994. The years 1994 and 1995 displayed a strong contrast in conditions favorable to revegetation: 1994 was the third driest on record in Scott Valley, while 1995 was one of the wettest in recent decades.

The 1995 plantings were considerably more successful that the Demonstration Project, due primarily to more reliable water sources for the planting areas. A total of approximately 27.5 acres were planted along the Scott River between Etna Creek and French Creek, as well as along Kidder Creek. The overall success rate was about 80%, as compared to 40% for the 1994 plantings. By site, survival ranged from 61% to 90%.

New information from the 1995 planting year should lead to better results in 1996 and 1997. Conclusions include: 1) May is the ideal planting month in most years; 2) Small (12-18") rooted cuttings, as opposed to plug seedlings, do not perform well and should be avoided; 3) deer browse can seriously reduce survival of plantings, despite seedling protectors; 4) a reliable water supply is essential to ensure survival of plantings; 5) line spacing should be 15 feet for wider river planting sites, but remain at 10 feet for narrow (<60 feet width) sites.

SCOTT RIVER RIPARIAN WOODLAND REVEGETATION PROJECTS

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INTRODUCTION

This year's projects were the first application of the experience gained from the "Scott River Riparian Woodland Revegetation Demonstration Project", funded by the Klamath Fisheries Restoration Program in 1994 (Jopson, 1995). The 1995 riparian projects were funded by the California Dept. of Fish and Game, the Kiewit Pacific Corporation (via SHN Engineering Inc. to CalForest Nursery), the federal Jobs-in-the Woods (JITW) program, and the Klamath Fisheries Restoration Program (KFRP) / U.S. Fish & Wildlife Service (USFWS). By funding source, the total acreages planted were: JITW - 7.5 acres; KFRP - 10.0 acres; CDFG - 2.5 acres; and Kiewit - 7.5 acres.

Significant changes have occurred over the past century to the riparian woodland community along the Scott River and its tributaries. What was once a riparian woodland, based on historic photographs and oral accounts, is now largely barren or sparsely vegetated by scattered willows, alders and native and non-native woody plants and grasses. Without the large trees, fish habitat has deteriorated since there is no canopy cover providing shade and no large woody debris (LWD) contributing to instream structure, such as scour pools.

Purpose

The intent of this project is to continue the restoration of riparian woodland along the Scott River in the Scott Valley. Material and methods are based on the revegetation recommendations of the Scott River Riparian Woodland Revegetation Demonstration Project, funded by the Restoration Program for FY 1994.

Since the formulation of the original Demonstration Project, which emphasized the importance of tall riparian tree species for shade and habitat diversity, another important concept has emerged to share the spotlight: the stream bank building and channel-narrowing role of riparian vegetation. The Salmonid Stream Habitat Restoration Field School's workshop on streambank restoration, held by the Salmonid Restoration Foundation (SRF) in the fall of 1994 at Quincy, presented both the conceptual basis and the practical means of achieving streambank reconstruction through the use of vegetation. This new area of emphasis has led to changes in the proposed species composition and in the design of the plantings.

Project Objectives

1. Re-establish a riparian (cottonwood, willow and ponderosa pine) woodland community within the fenced, riparian zone of the Scott River in Scott Valley, based on the recommendations of the 1994 Riparian Woodland Revegetation I demonstration project.

2. Continue to develop cost-effective methods for large-scale riparian revegetation.

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3. Apply the "siltation baffle" concepts in its design and implementation to help narrow the channel.

4. Improve salmon and steelhead habitat through cooler stream temperatures in the summer, a source of food (insects and detritus), increased bank stability, and additional sources of large woody debris (LWD) to create more pools, riffles, and cover from predators.

Background

Black cottonwood (*Populus trichocarpa*) was once found in extensive stands along the Scott River and in some areas of Scott Valley in stands more than 2 miles across (Griffin & Critchfield, 1972). They were removed over the years for firewood, fence posts, tractor fuel, and channelization, according to local oral history. Disease, most notably oystershell scale, also helped decimate the native cottonwood population, possibly exacerbated by water stress. Ponderosa pine was also prevalent throughout the Scott Valley before being cleared for crop cultivation. A circa 1908 panoramic photograph of the river in central Scott Valley, found in the Siskiyou County Museum, shows a wide riparian woodland which looks like a mix of pine and cottonwood trees. Black cottonwood can grow to 120-180 feet tall (Faber & Holland, 1988).

The willows chosen for use will represent the three forms of willow which occurs naturally along the river: a tall tree-type willow, a small tree/large bush type willow, and an even smaller bush type ("sand bar") willow. The latter two forms will be used primarily for their role in bank reconstruction.

The Scott River channel (a fifth order size stream) presently varies in width in the valley from 80 to 800 feet, with an average width of about 200 feet. Most observers agree that the channel was much narrower historically, perhaps an average of 50-100 feet. A narrow channel provides cooler water temperatures both by more effective shading and by increasing the development of scour pools in the low-water channel. The moderately high flows in winter of 1995 showed that riparian vegetation within the flood plain does trap significant amounts of sediment, and therefore serves to rebuild channel banks and narrow the low water channel (Lisle, 1989).

The plantings will be designed to provide vegetative "baffles" through which the high water flows over the gravel bars. The vegetation slows the flow and thus causes the deposition of suspended sediment. Unrooted cuttings of the bush-type willow will be placed between the drip lines in some areas to take advantage of the moisture spread from the drip line and to test whether additional vegetation can be established at minimal additional cost.

The Task Force has also funded a RCD study, the Scott River Riparian Zone Inventory and Evaluation, which identified riparian landowner interest and fenced properties. Counting both the right and left banks, at least 25.5 miles (135,000 feet) of the Scott River within Scott Valley are now fenced and owned by people expressing either high or moderate interest in riparian planting. While some of these sites may already have some riparian shrubs and small trees established, they are still in need of the woodland phase of riparian restoration to mimic the natural condition and improve fish habitat.

STUDY AREA

Planting Sites

Plantings were located on sites with willing landowners who also had livestock exclusion and available nearby wells or other reliable water sources. The river sites for planting ranged from Scott River mile 42 to 48, or from the confluence of Etna Creek to French Creek. In addition, a site on Kidder Creek near Greenview was also planted.

Five areas were planted in 1995 (Figure 1). These sites, the acreage, and the specific funding sources are indicated below:

Site	Acres	Funding Source
Spencer / Platt Ranches	2.5	CDFG
Spencer Ranch	1.0	JITW / USFWS
Fowle Ranch	4.0	JITW / USFWS
Whipple Ranch - east	10.0	KFRP / USFWS
Whipple Ranch - west	2.5	JITW / USFWS
Kiewit Gravel / Kidder	7.5	Kiewit
Total:	27.5 acres	

Spencer-Platt Ranches: This site includes approximately 1/2 mile of riparian ground extending north from the mouth of French Creek along the west bank of the Scott River. The average width of the planted area is about 100 feet. Until fenced as part of this CDFG project, the streambanks and gravel bars had been heavily grazed by cattle and only old, decadent sandbar willows and a few old cottonwood were present on the site.

Fowle-Spencer Ranches: Extending for about 1 mile along the east bank of the Scott River, the southern end of the site is across the river from the northern end of the Spencer-Platt Ranches site. The average width of the planted area is about 60 feet.

Whipple Ranch - East & West Sites: The east bank site is about 12 acres in size, extending for about 1/2 mile along the river. This area was also one of the demonstration sites in 1994. It was overwashed in the winter/spring of 1995 during high water and experienced scour in some areas and silt deposition in other areas. The average width is 300 feet. This site has had very little livestock grazing in a decade or more, but little natural revegetation other than sandbar willow was occurring.

The Whipple west bank site extends for about 2/3 mile along the Scott River, upstream from the mouth of Etna Creek. The southern end of this site overlaps with the northern end of the Whipple Ranch east bank site across the river. The average width is about 80 feet.

Kiewit / Kidder Site: The Kidder Creek site was a commercial gravel extraction site restoration project on both sides of Kidder Creek about 1/2 mile upstream from the State Highway 3 bridge in Greenview. It was primarily gravel and cobbles, with essentially no soil or competing vegetation.

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METHODS (See photos on pages 14-17)

Plant Material and Appropriate Sites

Riparian plant materials included the following species of native shrubs and trees:

Pacific or Yellow Tree Willow	*Salix lucida ssp. lasiandra*
Yellow Willow	*S. lutea*
Arroyo Willow	*S. lasiolepsis*
Black Cottonwood	*Populus trichocarpa*
Ponderosa Pine	*Pinus ponderosa*

All plant materials were grown locally at CalForest Nursery in Scott Valley. Pine seed and willow and cottonwood cuttings were collected locally and grown in styroblock containers (#5 size for pine and #8 (lower density) for others, all with 6 inch depth) in greenhouses. Pine were sowed in April 1994 and willow and cottonwood cuttings were taken and stuck in the containers in January 1995. "Plug" seedlings, with roots than form a compact plug, are the result.

These species were planted in mixed stands, with emphasis on the most appropriate species for the site. For example, the high dry banks received mostly ponderosa pine, while the sites near the river's edge received mostly willow and cottonwood. Plants were space 10 feet apart and at an approximate density of 1,000 plants per acre.

Irrigation System and Watering

A water source was developed at each site. Types of sources included sumps (Spencer & Fowle), pressurized irrigation mainlines and well (Whipple - east & west), and a sump and a well (Kidder). Main distribution pipes were run along the riparian fences to feed drip tubing in rows toward the river. The 16 mm drip tubes, with built-in 1/2 gallon per hour emitters, were placed on 10-foot centers, and spanned the entire space from the fence to the river's edge. A total of 108,000 feet of drip tubing was used for all of the sites.

Following planting, the site was continuously watered for several days to thoroughly saturate the ground. The trees were watered 4 hours each day for the entire summer. Water was turned off after the onset of the rains in the fall.

Planting and Weeding

Competing vegetation was scalped away where necessary, and a tree was planted directly adjacent to each dripper. Planting was done manually with a hoedad or a dibble, depending on the soil type. In Kidder Creek, the rocky substrate required the use of a jackhammer to penetrate for planting to an adequate depth.

particularly at the Spencer-Platt site.

Weeding was done periodically to keep competition down with the plantings.

RESULTS AND DISCUSSION

Survival Evaluation

In November 1996, survival at the sites was evaluated through a sampling strategy. On the average, 1 out 4 rows of plants (25% sample) were observed for individual plant condition: alive, dead due to weed competition, dead due to other causes, or missing.

Tree survival by site is presented in Table 2. Survival varied from 61% on the Whipple east bank to 90% at Kidder Creek. The variation in survival was controlled by the extent of competing vegetation, the intensity of browsing by deer, and variation in the size of the planted cuttings. The site with essentially no competing vegetation, Kidder Creek, had the highest survival even though they received only minimal watering until very late in the summer.

The site with the lowest survival, Whipple east bank, suffered from all three negative factors and had the lowest overall survival despite nearly constant watering for the entire summer. The poorest survival on this site was in the area that received rooted cuttings instead of plugs. Rooted cuttings were used because a problem with cold storage at the nursery resulted in a shortage of ponderosa pine seedlings.

Maximum growth (up to 7 feet) was achieved with willows at the Spencer/Platt ranch site, probably the result of a combination of early planting and good soil. The Fowle & Spencer sites had good survival and moderate growth (up to 4 feet). This site was the last to be planted (late June) and hence had less time to grow than the trees across the river. The Whipple Ranch west bank site had good survival but poor growth because of heavy deer browse.

Table 2. Survival of Plants by Site, November 1995

Planting Site	Alive %	Dead %
Spencer / Platts	86%	14%
Spencer - North	82%	18%
Fowles - East	77%	23%
Whipple - East	61%	39%
Whipple - West	77%	23%
Kidder - Kiewit	90%	10%
TOTAL	79%	21%

Description of Problems by Site

Spencer / Platt Site: The sump water proved to be a problem when used in the drip tube (the algae plugged up the drippers), even though the source was filtered. A well has been drilled on the site, and will be used as a water source in 1996. Weed growth and density were particularly high as the result of relatively good soil and the continuous spring rains in 1995.

Fowle / Spencer Site: The algae content of the water in this sump was much less than in the Spencer sump and caused fewer problems in the drip tube. Located above Young's Dam, this site appears to be affected by the aggradation behind the dam, causing smaller streambanks and less depth to ground water.

Whipple Site - East & West: The water source on the east side was the main water system on the Whipple Ranch while that for the west bank was an adjacent well. Severe deer browse was experienced on both of these sites. While the deer do not seem to directly kill the plants, they severely restrict the growth of the plants which then leads to mortality from other causes. Ironically, this site is already partially covered with sand-bar willow, golden willow, and a few alder and cottonwood, providing cover and attracting the deer to the site during the hot summer months.

SUMMARY AND CONCLUSIONS

The ideal planting time appears to be in the month of May. The May planted stock had the most growth of any of the plantings. However, in certain years, as demonstrated by June 1994, trees will probably be damaged by frost when planted in May. Based on the results of the Kidder Creek site, trees can be established on sites with little or no competing vegetation, such as bare cobbles or sand, with only a minimal water supply. It is possible that such sites could be planted early in the spring, such as April, and achieve success with no additional water supply.

Small (12-18") rooted cuttings without an intact root ball do not perform well, even with an adequate water supply, under conditions of heavy browse from deer. The cuttings never can achieve enough growth to get established. Small rooted cuttings can be used where heavy browse is not a problem, but they will put on less growth than plug seedlings planted at the same time.

Deer browse can seriously reduce the establishment and growth of trees in riparian plantings. An attempt to use protective tubes was not very successful, because the deer browse down into the tubes through the open top and eliminate every branch and leaf that comes out of the tube. A more satisfactory solution appears to be to plant 5 foot whips on site where deer are present. The added cost of the larger plants could be compensated for by reducing the density of the planting.

The 10 foot line spacing used in 1995 appears to be closer than is needed to achieve the desireable benefits of the plantings in the wider sites. In 1996, the line spacing on sites where there is more than 60 feet between the fence and the river will be 15 feet, while narrower sites will remain at 10 feet. Another 2.5 acres is to be planted for Project 95-JITW-03 in FY 96.

In addition to the fisheries and streambank benefits from riparian planting, farmers and ranchers need to become aware of other values of direct benefit to them (Oregon Dept. of Forestry, 1996). Rodent populations, a pest to most farmer's fields, can be reduced by the presence of raptors who prefer to perch in tall cottonwood trees. A study in eastern Oregon showed that a pair of barn owls and their offspring nesting in a cottonwood tree consumed at least 1,200 rodents. The tall cottonwoods and other riparian deciduous trees provide thermal cover for cows during calving season, and shade in the hot summer months. If landowners can realize the mutual benefits of cottonwoods on their property, the success of this riparian woodland revegetation effort on the Scott River will be more enduring.

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SUMMARY OF EXPENDITURES - SCOTT RIVER RIPARIAN WOODLAND REVEGETATION II - Project 95-HR-15

Volunteer Contributions: Landowners assisted in site selection and preparation, monitoring of survival, and water cost (electricity for pumping). They also donated the use of their land: 10 acres @ $ 1,000/ac = $10,000 for permanent commitment to riparian use.

Matching Funds or In-kind Contributions: Drip system from 1994 was re-used: 5,000 ft @ $85.53/M = $428. Willow cuttings (not plugs) will be donated by CalForest: 5,000 cuttings @ $.20 ea = $1,000. Donated water pipe ($ 150 per acre x 1 acre = $150.00); Landowner assistance (site prep., tractor time 30 hrs. @ $35/hr = $1050; monitoring 80 hrs. @ $10/hr = $800; Electric costs for pumping water= $1,000).

BUDGET: Laborers were used for site preparation, tree planting, drip tube installation, irrigation, seedling protector installation, and summer maintenance. Staff benefits at 31% reflect the higher Worker's Compensation rate for tree planters. Project Coordinator supervised and coordinated the entire project.

PERSONNEL COSTS

Level of Staff	# Hours	Rate	Requested
Project Coordinator	300 hrs	$ 15.00	$ 4,500.00
Laborers	312.5 hrs	$ 8.00	$ 2,500.00
SubTotal			$ 7,000.00
Staff Benefits at 31%			$ 2,170.00
TOTAL PERSONNEL COSTS			$ 9,170.00
MATERIALS AND SUPPLIES			
Plants: 5,000 cottonwood @ $.50 ea; 5,000 pine & willow @ $.35 ea			$ 4,250.00
Irrigation: pumps & drip tubing			$11,320.00
Electric fencing: (@ Spencer)			$ 1,564.00
TOTAL MATERIALS AND SUPPLIES			$17,134.00
OPERATING EXPENSES			
Fuel & Oil for pump			$ 120.00
Transportation costs (2,000 mi. @ $.25/mi)			$ 500.00
Miscellaneous (Phone, photographs)			$ 66.00
TOTAL OPERATING EXPENSES			$ 686.00
SUBTOTAL			$26,990.00
Administrative overhead at 15%			$ 4,048.50
TOTAL EXPENSES			**$31,038.50**

SUMMARY OF EXPENDITURES TO DATE
Project 95-JITW-02

SALARIES	$ 22.40
TRAVEL & TRANSPORTATION	$ 0
NONEXPENDABLE EQUIPMENT	$ 0
EXPENDABLE EQUIPMENT, ETC.	$ 0
OPERATIONS & MAINTENANCE	
Subcontractor $3,500 / acre @ 7.5 acres	$26,250.00
SUB-TOTAL	$26,272.40
GENERAL & ADMIN. EXPENSES Overhead @ 10%	$ 2,627.24
TOTAL TO DATE	$28,899.64
TOTAL PROJECT COST TO USFWS	$39,257.00
BALANCE REMAINING FOR FY 1996	$10,357.36

NOTE: Balance to be spent in FY 1996 to complete the planting of 2.5 acres of riparian sites, for a total of 10.0 acres for the project.

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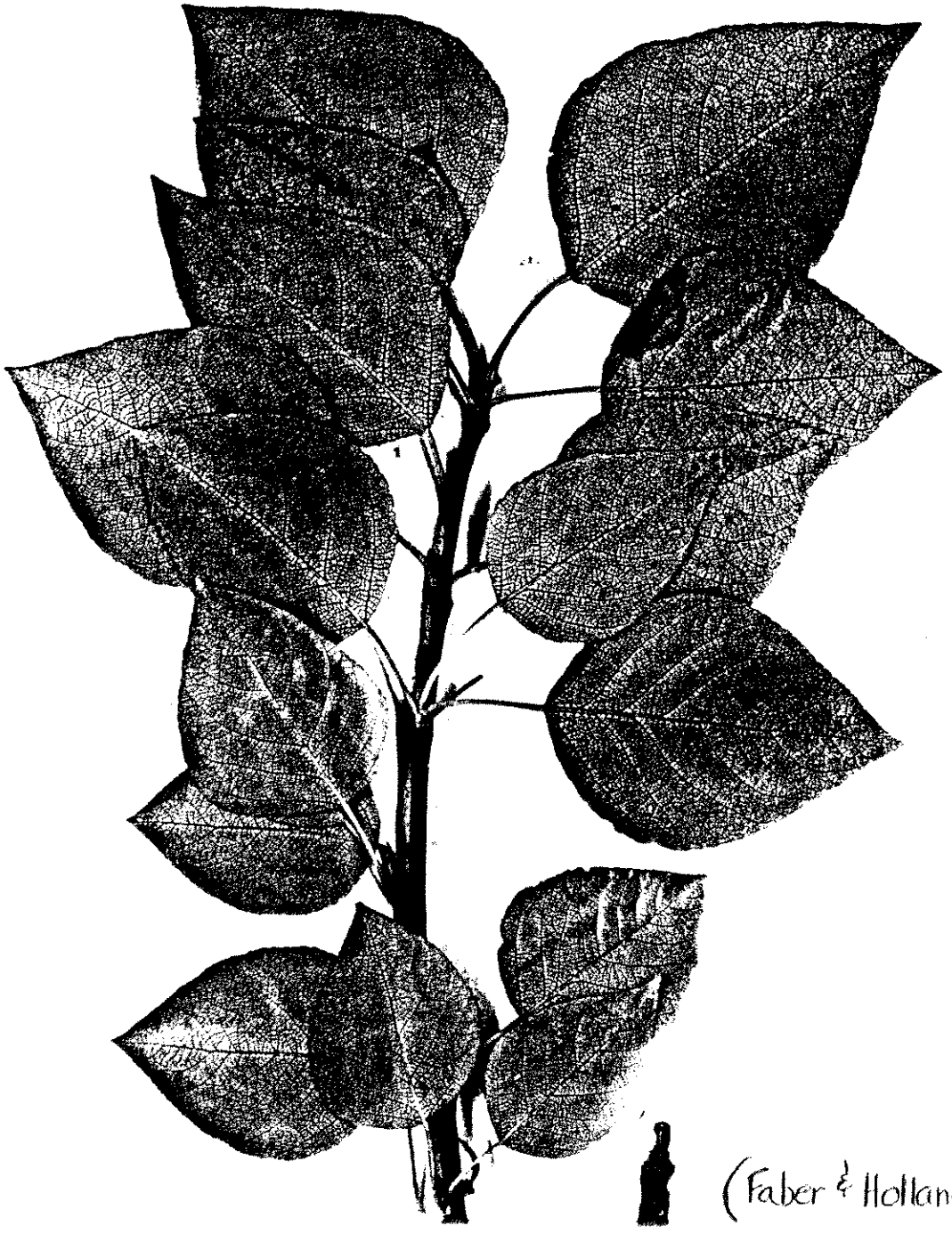
WILLOW FAMILY *Salicaceae*

Black Cottonwood

Populus trichocarpa

- Common along streams below 9000 feet; many plant communities throughout California west of the Sierra Nevada.
- Tall, open-crowned, deciduous tree with greyish bark becoming furrowed in age, separate male and female trees; 120 to 180 feet tall. .
- Finely toothed ovate leaves on long stems, dark green above and pale beneath.
- Inconspicuous flowers in male or female catkins, 1.5 to 3 inches, on separate trees, fruit a dry capsule with many minute seeds bearing a tuft of hairs; blooms February through April.

Black cottonwood, our tallest cottonwood and common in much of California outside the Great Valley, is more shallow rooted and grows in shallower soils than *P. fremontii*.



(Faber & Holland, 1988)

Figure 1. Containerized cottonwood & willow plugs at CalForest Nursery

Figure 4. Whipple - West Site: Broad, dry gravel bar;
Willow (l.) and cottonwood (r.) growth, the latter browsed by deer.

Feb. 96

Aug. 95

Figure 2. Spencer / Platts Site near French Creek: Widened channel; and Planting site on west side gravel/sand bar, during watering cycle.

Figure 3. Scalping; Sump pump; and vigorous willow (l.) & cottonwood (r.) growth.