

**SCOTT RIVER RIPARIAN WOODLAND
RESTORATION PROJECT**

Final Report FY 1996

*"Scott River Riparian Woodland Revegetation III"
Project 96-HR-06*

by

Cal Forest Nursery, Project Subcontractor

for the

SISKIYOU RESOURCE CONSERVATION DISTRICT

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KLAMATH FISHERY RESTORATION PROGRAM

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SCOTT RIVER RIPARIAN WOODLAND REVEGETATION PROJECTS

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Abstract

The Scott River Riparian Revegetation III, funded by the Klamath Restoration Program, continued riparian rehabilitation along the Scott River for the third year. Planting occurred on the Eiler, Black / Davidson and Hansen ranches. A total of ~18 acres were planted and watered with drip irrigation. Estimated depth to water table is 10 feet to 15 feet at levee sites. Sites consisted of a mix of native and imported soils used in levee construction with heavy vegetative (weed) competition from a variety of species including: starthistle, russian thistle, hemlock and quack grass. Deer presence was noted on all sites with heavy browse in certain areas. In 1997, the fourth largest flood on record (34,400 cfs), topped levees at Blacks/Davidsons, removed a portion of levee at the Hansen Ranch and created a large cut bank at the confluence of Moffet Creek and the Scott River on the Eiler Ranch. The 1997 "New Years Flood" decreased rodent populations, provided new deposits of soil, and temporary knocked back weed stands providing a window of opportunity for replanting.

Success varied across the sites. The Eiler Ranch shows the least success with < 5% survival (estimate A.Eller, Cal Forest 1998) with the remaining trees heavily browsed. Portions of the Hansen plantings show higher densities despite heavy weed competition while other locations, typically grassy, show lower survival and considerable browse. At the Black / Davidson ranches, the majority of remaining trees are Ponderosa pine which apparently handle grass competition the best. The observed factors that most effect outcome include: soil type, competing vegetation, rodents, deer browse and watering frequency and volume.

A minimum commitment of two years (weeding and watering) is needed on sites located a long distance form the summer/low water table if planting with irrigated plug stock. During the first year, site selection and preparation is crucial for sites with heavy vegetative competition and considerable distance to the water table. The site may need :

1) Weed control - Site design (rows) should include access by a tractor mower or disc to control competing weeds. In addition to mowing or discing, a localized, as needed treatment with herbicides may provide the needed release for the young trees. 2) Rodent Control - In areas of especially thick vegetation, instead of using tree protectors, mowing or discing on either side of the tree may limit rodents access to the trees. 3) Browse - Relief from deer browse may entail protecting trees on a individual basis which will increase maintenance and operating costs. Options include planting at high density with no browse protection, plant protection on fewer trees, or not planting areas of heavy deer traffic or allowing surrounding weeds to protect the trees. 4) Success - a desired goal (percent remaining trees after one year, expected density per acre) would provide a measure of the success of the planting sites.

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INTRODUCTION

The goal of this project is to continue the riparian woodland restoration efforts along fenced portions the Scott River by planting ponderosa pine, willow, cottonwood and alder seedlings. Historically, extensive stands of cottonwood were found in the Scott Valley, and the river most observers would agree was much narrower. Presently the channel (fifth order stream size) varies in width from approximately 80 to 800 ft. and existing riparian vegetation is sparse.

The Siskiyou RCD (sponsor) and Scott River Watershed Coordinated Resource Management Planning (CRMP) projects have focused on integrated riparian restoration which includes fencing (controlled livestock access), bank stabilization and planting of riparian species along the Scott River (Scott River Watershed CRMP, Fish Population and Habitat Plan, 1997). From 1994 to 1996, approximately 41.5 acres have been planted along the Scott River mainstem. Riparian vegetation is planted to: offer shade, create roughness, increase habitat diversity, help in bank building, provide a role in channel narrowing, filter groundwater, raise groundwater levels, provide forage for beavers and collect sediment during high flows.

The overall objectives include: Re-establishing a riparian woodland, developing cost effective methods for large scale riparian revegetation, applying the siltation baffle concept to help narrow the channel, and improving habitat (food source and large woody debris) for salmon and steelhead .

DESCRIPTION OF STUDY AREA

The Eiler Ranch - The ~ 5.8 acre site is located at T43 N., R9 W., Section 3. NE 1/4 (Fort Jones Quadrangle). The site includes a narrow strip located just downstream of the confluence of Moffet Creek and the Scott River, and a large sandy site, ~ 400' by 600', surrounded by a stand of old sand bar willow. This reach has no levees. The 1997 "New Years Flood" deposited fines and dramatically cut into the river right bank of Moffett Creek at the confluence. This portion (south end) of the planting was abandoned since equipment was accessing the bank to install rock protection.

The Hansen Ranch - The 11.5 acre site is located at T43 N., R9 W., Section 35 (Fort Jones Quadrangle). The site is a 1.1 mile strip along the river varying in width from 50' to 600'. The plantings on the south portion were located on the river side of the levee, while the north end plantings were situated on the field side and top of the levee. During the 1997 "New Years Flood" a portion of levee was washed out (~ 70' hole) on the north end of the property and overwash of sand occurred into the adjacent pasture in the middle of the site.

The Black / Davidson Ranch - The 3.5 acre site is located at T 42 N., R 9W., Section 2 (Fort Jones Quadrangle). The site is a ~.5 mile narrow strip varying in width from 40' to 300'. The planting were located on the top and field sides of the levees. A sand and gravel bar was planted on the river side of the levee.

METHODS AND MATERIALS

Plant material

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

Pacific or Yellow Tree willow	<i>Salix lucida ssp. lasiandra</i>
Arroyo willow	<i>Salix lasilolepis</i>
White Alder	<i>Alnus rombifolia</i>
Black Cottonwood	<i>Populus trichocarpa</i>
Ponderosa Pine	<i>Pinus ponderosa</i>
Bigleaf Maple	<i>Acer macrophyllum</i>

Trees were started at Cal Forest Nursery. Dormant cuttings of cottonwood and willow were collected within an elevation range of 500' of the planting site and then started in containers (Styro 8's) in late January 1996 and 1997. Big Leaf maple and alder were sown as seed into containers (Styro 8's) at the same time. Ponderosa Pine seedlings were started April 1995 and 1996 (Styro 5's) and kept in cold storage until planting time. Containers were placed in a greenhouse and kept warm (~70 degrees F) until adequate roots formed a "plug". Plants were moved outside to acclimate (hardened off) for 1 week before planting. Large rooted plugs (4" x 14" containers, with sticks ~ 5' tall), started in January 1998, initiated experiments using nursery stock independent of drip irrigation.

Planting sites and preparation

Planting sites were located where willing landowners who had livestock exclusion and available wells or water sources allowed a source of water for the project. No site preparation was necessary on gravel, sand and cobble substrate due to its unconsolidated nature and lack of competing vegetation, especially after flood events. Site preparation, on soil sites, included forming rows with a trenching (ditch)

attachment to a tractor which created a weed free furrow about 2' wide or a 3' to 4' scalp created with a tilt blade on a bulldozer (D6 Cat). Rows, 10' to 15' apart, were cut perpendicular to the river with a slight downstream angle to create "siltation baffles" (Salmonid Restoration Field School, 1995). The baffles provide a fence of vegetation to capture sediment.

Planting and replanting

Trees were installed by Cal Forest personnel with hoedads. Planting occurred in late spring after threat of heavy frost, and when the irrigation system was functioning. Large plugs, 4"x 14", were installed in 1998 by auguring 4' to 6' holes with a tractor auger, placing the plug and back filling the hole. The large plugs were not irrigated.

Irrigation system and watering

Water was supplied to the site by nearby pumps and pressurized stock watering systems. Water was delivered to the site in surface 1" PVC pipe (schedule 200) and then reduced to ½" poly pipe (.60 drip tube). The drip tubes have inline emitters every 5 feet with ½ Gallon Per Hour (GPH) delivery rate. In 1997, watering was recorded on a irrigation tracking sheet that listed watering times and irrigation system maintenance (see Appendix)

Monitoring and evaluation

In 1997 survival information was collected in the fall at each of the sites. Information was collected

using a hand held data logger (Transterm TT7c08). Information was transferred, sorted and queried into a database, Paradox for Windows. Every fifth line of the drip system was inventoried (approximately 20% of the plants) using the following: *Site, Line #, Plant #, Tree Type and Condition.*

The condition is a subjective qualitative measure that lists the condition of the plant as:

Good - plant alive; shows signs of vigor and is healthy; likely to survive.

Poor - plant unlikely to survive; signs of stress, insect or rodent predation; little to no growth,

Dead - tree dead (dry, brittle, no leaves).

Missing - plant gone; due to animals, excessive weed competition, other.

The Black Ranch site was re-inventoried in the fall of 1998. Instead of using a rating of good, poor, dead or missing a rating of 0 through 5 was given. A vigor rating of 0 = dead, 3 = average and 5 = excellent vigor. To compare to 1997 inventories: good = vigor rating of 3,4,5; poor = vigor rating of 1,2; and dead = vigor rating of 0.

RESULTS AND DISCUSSION

Tasks 1- 8 including: growing cuttings, site preparation, planting, tree protector installation, irrigation, maintenance and survival information collection, were completed in 1996 and again in 1997. Several sites were replanted because of flooding and high tree mortality (due to vegetative competition, deer browse and rodent damage). Survival and replanting information is shown below.

Eiler Ranch

In 1996, 19,000 feet of drip tube was installed at average of 12 foot spacing. Approximately 3800 trees were planted. No condition information was collected in 1996. Replanting occurred on ~ 4 acres (estimate, A. Eller) of the 5.8 acre site. On April 23 and 24, 1997, ~ 1800 plugs were replanted along the drip irrigation system after it was installed. No site preparation was needed, other than hand scalping some grassy areas, because of new deposition of fine materials and gravel on the site. In the fall of 1997, ~13% of the trees were inventoried. The inventory (see Table 1)in the fall of 1997 showed a "good" condition of 65% with a corresponding density/acre of 425 trees/acre (.65 "good" x 3800 trees./ 5.8 acres) .

TABLE 1. Eiler Ranch Results of Condition Inventory- by Tree Species - Fall 1997

	Good	Good %	Poor	Poor %	Dead	Dead %	Missing	Missing %
Alder	16	76%	0	0	1	5%	-----	-----
Cottonwood	71	76%	7	8%	6	6%	-----	-----
Maple	0	0	11	58%	4	21%	-----	-----
Pine	101	73%	4	3%	5	4%	-----	-----
Willow	137	59%	20	9%	38	18%	-----	-----
Total #'s	325		42		54		82	
Overall %		65%		8%		11%		16%
Density	1997 = 425 trees/ acre				1998 = 15 to 30 trees/acre 1998 = 15 to 30			

With the completion of the two year contract in 1997, the site was revisited three times in 1998. On April 6 all the surviving plants (from 1996 and 1997) were mulched with straw donated by the Eiler Ranch. Each plant received approximately 3 flakes of straw for moisture retention and weed control. On May 20th, twenty large rooted plug Cottonwoods were planted using a tractor mounted auger (Kubota LA480). In late August the condition of the site was estimated to be <5% alive, or ~ 15 to 30 trees/acre (estimate, A. Eller, Cal-Forest). Death was contributed to soil inability to hold moisture in summer months and heat stress. The large rooted plugs also died (observations, A. Eller, Cal-Forest)

Hansen Ranch

In 1996, 26,675 feet of drip tube was installed at 15' centers, and 8,800 feet of tube at 10' centers. Approximately 7100 trees were planted. No condition information was collected for 1996. In the spring of 1997, after flooding, replanting occurred on ~ 5 acres of the 11.5 acre site. On May 1 - 9, ~ 2300 plugs were replanted throughout the site. Second year treatments included:

1. Areas that were established and surviving in spite of grass and weed competition, received no treatment except irrigation for the second year (the south end and the north end in-non grassy areas).
2. Replanted sites were scalped (D6 Cat) or hand grubbed and irrigated.
3. Several locations were abandoned due to thick grass competition and difficulty removing competition away effectively (levied sections on the south end).
4. Downstream of the levee break (the north site), no irrigation was supplied since repairs to the washout were to occur. This portion (< 1 acre) was considered a "test" to observe if trees, with one year of growth and watering, could survive the following year without irrigation.

In fall 1997, the condition inventory (see Table 2) showed an overall "good" condition of 44% and a overall "missing" condition of 41% (resulting from rapid overgrowth of competing vegetation). The density of trees varied according to site conditions. The basic site division included: 1) *The sites that worked* - good soil, consistent watering, no grass competition, weeds (starthistle) protected trees from browse. These sites, the southern most and middle of the north end, had densities of 548 trees/acre and 392 trees/acre respectively. 2) *The sites that did not work* - sandy soil, heavy grass and weed growth, farthest away from the pumps, heavy browse. In the fall of 1997, these sites had densities of 175 to 250 trees per acre (estimates from 1997 inventory information, A.Eller, Cal Forest).

TABLE 2. Hansen Ranch Results of Condition Inventory- by Tree Species - Fall 1997

	Good	Good %	Poor	Poor %	Dead	Dead %	Missing	Missing %
Alder	3	20%	0	0	7	47%	-----	-----
Cottonwood	99	41%	287	12%	17	7%	-----	-----
Maple	7	29%	2	8%	2	8%	-----	-----
Pine	73	26%	31	11%	24	8%	-----	-----
Willow	584	50%	91	7%	76	7%	-----	-----
Total #'s	766		152		126		691	
Overall %	44%		8%		7%		41%	
Density	(see the above text)							

With the completion of the two year contract in 1997, the site was revisited twice in 1998. On May 21, 1998 ~ 40 large rooted plugs 4"x14" were planted using a tractor mounted auger (Kubota LA480). A majority of the large rooted stock were difficult to locate and had been browsed. In late August the site was revisited to observe survival, although no condition measurements were made. Densities remained high in sites that had high densities in the fall 1997 inventory (high good condition). Density dropped in sites that grasses were established. Sites that were predominately starthistle in 1997, are presently dominated by hemlock, russian thistle or grasses. The switch in weed species is contributed to the wetter than normal winter and spring in 1998.

The north "test" site (site with only one year of irrigation) showed a "good" condition of 36%, or ~208 trees/acre in 1997. The trees had received only one year of irrigation in 1996 and grown among a heavy stand of starthistle for two years. In 1998, the remaining trees were half as tall as trees on adjacent lines that had been irrigated, but appeared healthy and growing.

Black / Davidson Ranches

In 1996, 13,300 feet of drip tube was installed servicing ~ 2,660 trees on the 3.5 acre site. No record of condition information was found for the first year, 1996. Replanting occurred on ~ 3 acres of the 3.5 acre site after flooding. On April 25-30th, ~ 1500 plugs were replanted throughout the site. A large number of pines had survived the weed competition (predominant weeds on the site: annual rye and starthistle) and flooding from 1996, limiting site preparation to hand grubbing to avoid burying trees with tractor scalping. In fall 1997, the condition inventory (see Table 3) showed an overall "good" condition of 64% and a overall "missing" condition of 30% (resulting from rapid overgrowth of competing grasses). The pines showed the best ability to compete with the grass competition. A majority of plugs planted on the sand and gravel bar were burned at the base due to heat transfer through the sand.

TABLE 3. Black / Davidson Ranch Results of Condition Inventory- By Tree Species - Fall 1997

	Good	Good %	Poor	Poor %	Dead	Dead %	Missing	Missing %
Alder	1	17%	0	0	1	17%	-----	-----
Cottonwood	61	64%	2	2%	4	4%	-----	-----
Maple	13	48%	8	30%	0	0	-----	-----
Pine	155	73%	20	9%	6	3%	-----	-----
Willow	144	58%	20	8%	10	4%	-----	-----
Total #'s	374		50		21		143	
Overall %	64%		8%		4%		24%	
Density	1997 = ~ 428/ acre							

The Black/Davidson ranch was revisited four times in 1998. The first visit on March 21, 1998 included 3 AmeriCorps members and Cal Forest staff. Approximately .5 of an acre was hand grubbed and the drip system reinstalled. On May 21, 40 large rooted cottonwood plugs were planted using a tractor mounted auger. On August 28th, the drip system was checked and the site was walked through. Deer were

observed bedding on the site, no survival was seen on the gravel bars, the majority of the large plugs found were either dead or had not grown, and few cottonwood or willow were found. The last site visit on September 9th, the row inventory was re-measured (see Table 4) since the drip system was still intact and rows could be found. The results show:

Table 4. **Black / Davidson Ranch Results of Condition Inventory- By Tree Species - Fall 1998**

Species	Good		Poor		Dead		Missing		Total
	*(3,4,5)	%	(1,2)	%	(0)	%			
Cottonwood	3	18%	8	50%	5	32%			16
Pine	82	62%	41	31%	9	7%			132
Willow	42	40%	32	32%	29	28%			103
Total #'s	127		81		43				
Overall % '97		64%		8%		4%	24%		
Overall % '98		25%		18%		9%	48%		

* = vigor rating system established in fall 1998, based on 0 = dead to 5 = excellent vigor

SUMMARY AND CONCLUSIONS

The spectrum of success and failures at the three ranches has supplied ideas and techniques for planting other locations along the Scott River. Conclusions include:

Site assessment - Information that would increase the beforehand knowledge of the site (and success) is usually available from the landowner regarding: historic conditions, areas of poor soil/ good soil, the average depth to the water table, flooding frequency, river movement, weed control methods, cattle use and crossings, deer presence and population, and good locations to plant. Other indicators of appropriate sites can be seen in the existing vegetation. For example, areas that have annual grasses have very well drained sandy soils, and low survival. Areas with perennial grasses tend to be found on good soil, and are indicative of heavy competition and rodent presence which need to be addressed before planting. A better assessment of soil quality and layering may save frustration of failure. A day digging holes with a backhoe and a soils person is recommended. The collection and use of this information can provide strategies for planting particular sites.

Site preparation and planting strategies - The planting of small rooted plugs on a extensive drip irrigation system is a labor and cost intensive method. Plugs are placed directly in the zone of competition of the surrounding vegetation and require weed control measures for two years minimum. Some sites at the Hansen's showed success despite heavy weed competition. It appears the overgrowth of weeds provided shade and protection from deer browse. Areas located at the beginning of the drip system had higher success, leading to the conclusion that zoned watering system were needed to evenly distribute flows over long distances. Replanting efforts after the 1997 flood were ineffective, because the same treatment (site scalped with D6 Cat, plugs planted, irrigation system installed, occasional hand grubbing of weeds) was used with weeds dominating the site before and after scalping.

Getting away without watering - The method of planting dormant pole stock (G.Black, Siskiyou R.C.D) with a backhoe, (although not widely used on these levee sites to date) may provide a alternative planting method because irrigation systems and weed control may not be required. Pole planting is limited to cottonwood and willow. Planting larger plugs of pine in the winter may provide the method for establishment of these species without watering.

Good weeds versus bad weeds - If planting with drip irrigation is to occur on sites with heavy weed competition, heavy weed control is needed for the first year and the next spring. If deer are present, thick starthistle stands appear to protect seedlings from browse, while hemlock and grasses choke out seedlings. Effective weed control such as discing or mowing (somewhat impractical on levee sites) opens pathways for deer browse. Thus the weed control dilemma. Future planting of areas of heavy grass and weed competition may include, planting dormant poles of cottonwood and willow by backhoe (holes dug to estimated summer low water level) and large rooted plugs (4"x14") of pine. Weeds would be scalped back by backhoe before planting the pines. Since fewer trees would be planted additional effort could be spent on protectors, and if needed, applying herbicides the following spring to release trees from weeds. Planting would occur on sites that from experience or soil analysis are adequate for tree establishment.

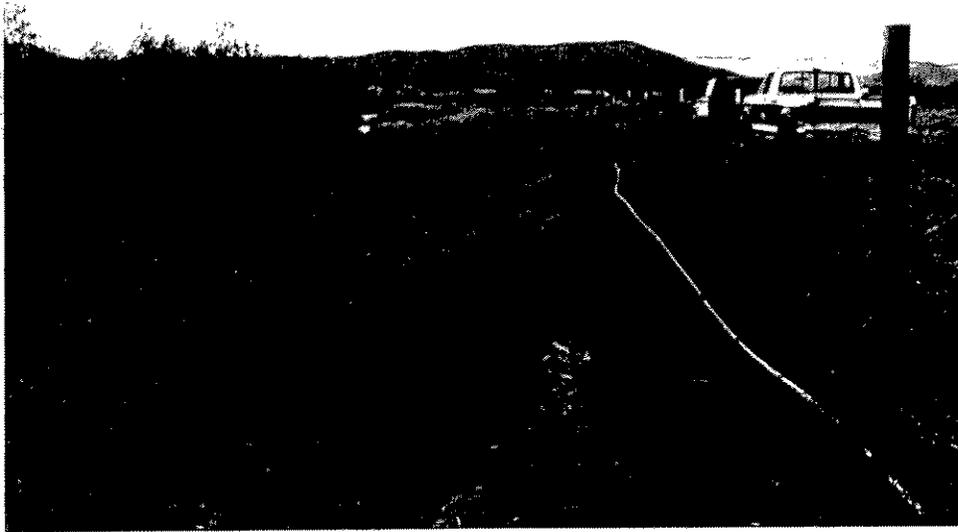
Goals and Objectives - Initial established goals of plant density and expected survival would provide a target for the site and some measure of success. Another helpful monitoring tool would be to establish photo-points before the implementation of the project. The objectives of narrowing the channel along the levee reach is impractical since the levees already provide this function.



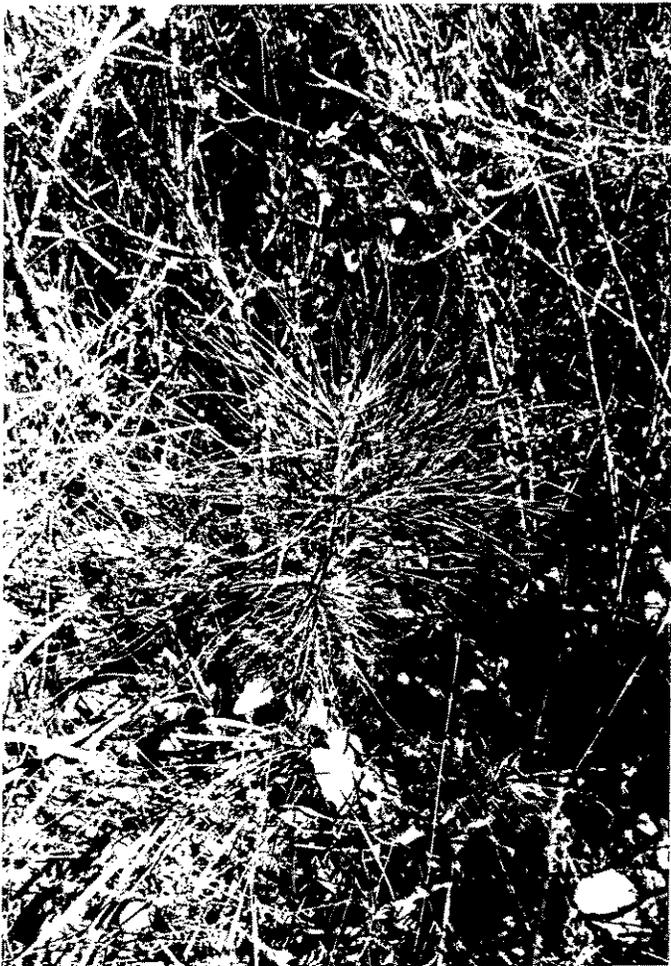
North end of the Hansen Ranch, Spring of 1997 after flooding. This site was not irrigated in the second year of planting, and trees survived (good soils, wet years, browse protection from weeds.)



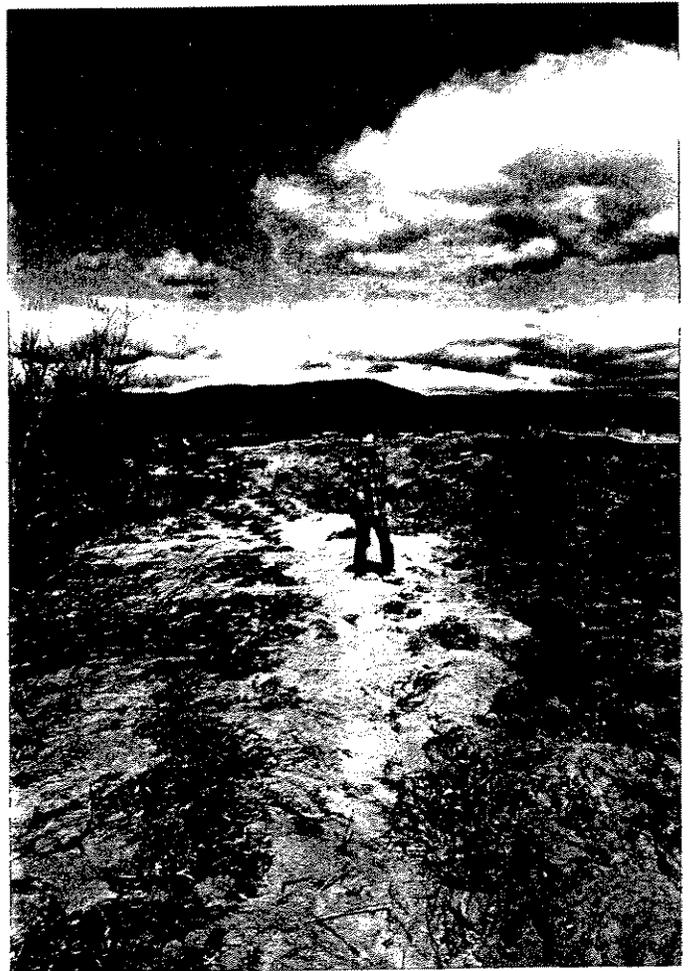
Cottonwoods and Willow (tree on right) above the hemlock and starthistle at Hansen's levee site.



South portion of Hansen's in May of 1996 (looking west along fence line)



Pine tree surviving in the starthistle



Shot taken at approximately the same location as the above picture. 1997 flood deposited fines along this row. This site has good soil, consistent watering - and good success

PHOTOS AT EILER RANCH



Site conditions on the North portion of the Eiler's Ranch, this area was replanted in 1997 after the "New Years Eve Flood" had covered the site and deposited silt and sand.



Cottonwood youngster protected from deer browse by starthistle



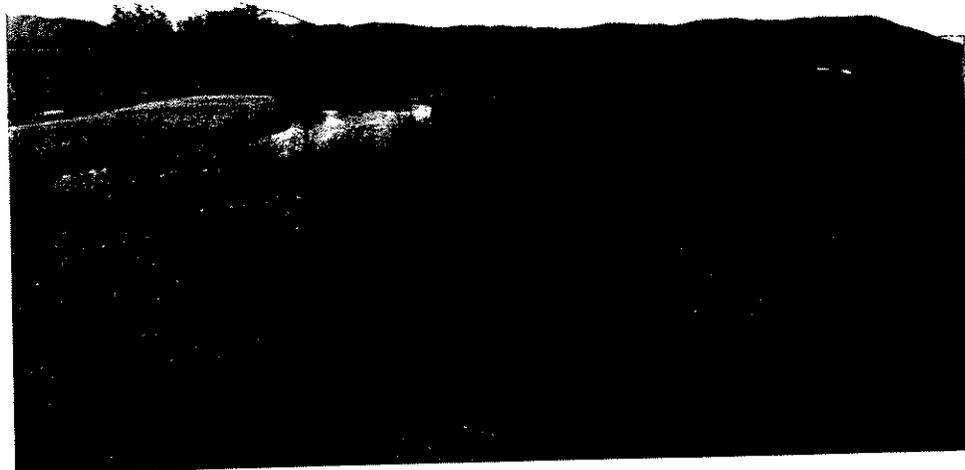
Cottonwood up and above surrounding weed
This is a year and a half old tree



Levee shot at the Davidson Ranch looking north towards Blacks. Starthistle, plant protectors, and scalped rows visible (Scott River on right)



Example of Rye Grass growth on the Black's. Tree protector on bamboo stake in fore ground



Row after scalping and planting at the Hansen Ranch