

Final Report
Fiock Bioengineered Bank Protection

Great Northern Corp.

Cooperative Agreement: 14-48-11333-00-J002

Project Number: 2000-HR-05

June 28, 2002

Abstract

The Klamath River Task Force has an ongoing history of funding projects along the Shasta River that improve water quality and habitat. Previous projects in this stretch of the Shasta River include riparian exclusion fencing of cattle, fish screen installation, installation of pumps to facilitate removal of diversion dams, and construction of rock groins for bank stabilization. This bioengineered bank stabilization project protects and begins restoration of 310 feet of eroding riverbank. The placement of willow wattles protects against erosion for 5-10 years, allowing time for the tules and willow whips, planted as part of this project, to establish themselves. This will continue the recovery being achieved by livestock exclusion fencing and continues the commitment by the Task Force to improving water quality and habitat.

Introduction

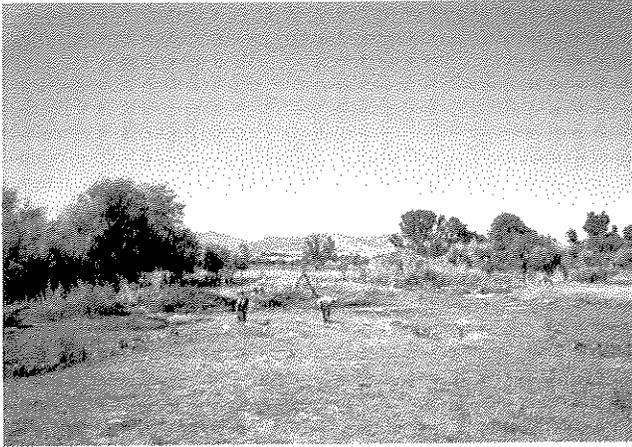
The Shasta River CRMP has utilized bioengineered bank protection measures periodically since 1991. Klamath River Task Force funding has been utilized in this instance to provide protection to a stretch of the Shasta River on the Fiock Ranch. This grant enables the Shasta River CRMP to continue the bank protection program.

This project will re-establish the stabilizing presence of local native riparian plants, and create a self-sustaining riverbank able to adjust to changing future conditions. Willow matting, planting tules, and planting willows will help repair damage done by erosion to the bank of the Shasta River. Planting willows will help stabilize the bank and provide shade for habitat improvement and lowering of water temperatures. Planting tules will stabilize the bank with their root systems and reduce the water flow velocity along the edge of the Shasta River. The willow matting will reduce water flow velocity and catch debris and silt during the first 5-10 years until the tules and willows get established. The willow mats will also serve as habitat for small fish (steelhead, coho, and fall Chinook).

Description of Project Area

This project is located approximately one-quarter mile downstream from the Yreka Ager Road Bridge over the Shasta River on the Bruce and Boyd Fiock Ranch. The land is irrigated pasture with some willows growing along the Shasta River as shown in picture one. The eroding bank is shown in picture two. In pictures 1 and 2 the recently completed riparian stock exclusion fence (also funded by the Klamath River Task Force) can be seen. This will keep the cattle away from this project.

Riparian stock exclusion fencing has been done upstream of the site and upstream of the Yreka-Ager road for a distance of $\frac{3}{4}$ mile. These excluded areas have been planted with riparian vegetation and are in very good condition.



Picture 1



Picture 2

Methods and Materials

Feet of Matting: 310 feet.

Willow Whips Planted: Approx. 900.

Number of Willow Wattles: Approx. 1200.

Wattle Diameter: Average 8".

Wattle Length: 14' to 20'.

Number of T-Posts: Approx. 110.

Length of Wire: **Approx.** 7 feet of wire per wattle (wound three strand .045 stainless lashing wire).

Amount of Tules Planted: **Approx.** 10 cubic yards (planted usually every 2 square feet of bank).

Key to beginning this project was the exclusion fencing of cattle from the riparian area. This was completed prior to the beginning of this project. This is shown in Pictures 1 & 2.

Construction Details:

Tim Louie Construction brought tules for bank planting. The tules were planted along the bank as shown in picture 3 on the next page. Resources Management Co. of Fort Jones did the planting.

Willows for matting were donated by the City of Yreka from a site scheduled to be stripped of all vegetation for expansion of sewage treatment operations. They were cut and hauled by the Resources Management crew from city property to the project site. The cut willows are shown in picture 5 staged at the site and ready to be made into wattles. The Resources Management crew made wattles by tying clumps of willows together with wire. The wattles were then placed in the river angling down into the river as shown in pictures 6 & 7. As the wattles were put in they were tied to the T-Posts as shown in pictures 6 & 7. As this process took place the wattles formed into a mat. The wattles were attached to the T-Posts that were driven into the bank in 2 staggered rows spaced at 6

feet. The willow whips used range from 10 to 15 feet long, and are approximately 3/4 to 1 inch in diameter. The individual whips are wired into bundles approximately 6 to 9 inches in diameter

On the bank to be matted, 6-ft. steel "T" posts are driven deeply into the ground on a 2 -3 foot grid. This is shown in pictures 2 & 4. The bundles of whips are then set in place and temporarily wired together. The bundles of whips are installed between 30 and 45 degrees to the horizontal, with 45 degrees the target angle. Curvature of the bank below the water line and the stiffness of the bundles may dictate that the angle be reduced to as little as 30 degrees. This change may be necessary to assure that the finished mat will conform closely to the existing bank without leaving voids, yet still reach out over the stream bottom to prevent undermining. Matting proceeds shingle fashion, working from downstream to upstream.

Once the bank is covered with bundles, willow cross bars are installed the length of the matting, and permanently tied to the "T" posts.

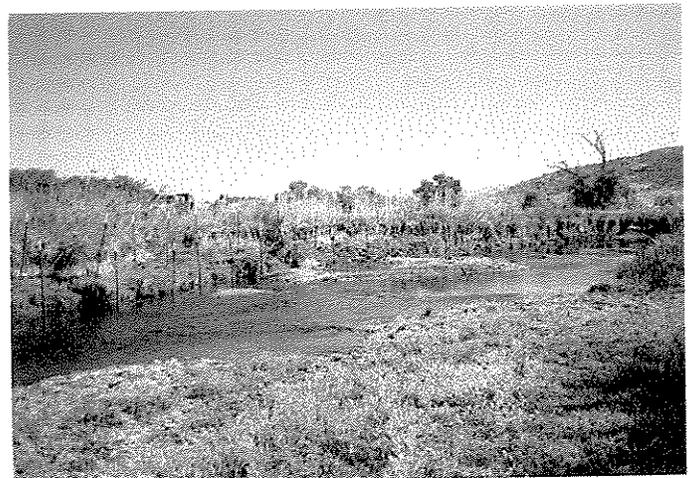
With the matting in place, steel bars are used to pry open areas in which to insert tule root masses near the water line. If the soil is damp, additional tule root balls are jammed into the ground adjacent to the upper end of the bundles. The tule roots then re-sprout and grow for the remainder of the summer, and in following years. Tule roots are gathered from irrigation ditches or reservoirs using an excavator, and transported to the site in 10 yard dump trucks.

Once all that is done, all the "T" posts are then progressively driven further into the bank, pulling the entire assembly tightly into the substrate. Finally, the T posts are bent over pointing downstream to minimize potential hazards to boaters as shown in pictures 6 and 7.

In late winter or early spring following installation of the willow matting, willow whips (primarily sandbar willow, a species that spreads readily from root sprouts) are brought to the site and forced into the bank near the water line by hand, where they can root and then spread.



Picture 3



Picture 4



Picture 5



Picture 6



Picture 7

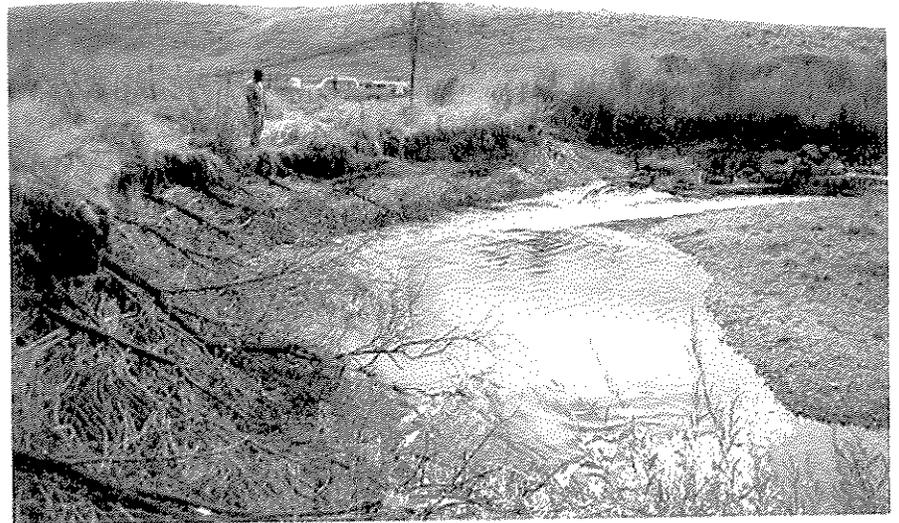
Approximately 900 willow whips were planted along the bank above the matting in early spring 2002.

Results and Discussion of Accomplishments

The result of this project is 310 feet of Shasta River bank that is matted with willows and planted with tules. The finished product (minus the willow whips) is shown in pictures 8 & 9. The matting can be seen pointing toward midstream and angling down from the bank. This matting will protect the bank from erosion for 5-10 years, giving the tules and willow whips time to get established so that they can stabilize the bank and prevent erosion in a natural and sustainable manner. You can see that the T-Posts the wattles are wired to are bent over in a downstream direction.



Picture 8



Picture 9

Summary and Conclusions

Before this project the bank was eroding and dumping silt into the Shasta River. It was obvious that something needed to be done to stabilize the bank and prevent silt from being eroded and deposited in salmon and steelhead spawning gravel. The use of willow matting to protect the planted tules and willow whips will allow the Shasta River to return to a natural state and thus provide it own protection. During the first few years the willow mats will provide the protection and offer habitat for juvenile salmon and steelhead. As time goes on the willow mats will deteriorate and the tules and willows will establish themselves and offer natural bank protection and habitat.

Summary of Expenditures

U.S. Fish & Wildlife - 1829 So. Oregon St. - Yreka,
CA 96097

3069

Flock Bioengineered Bank Protection 2000-HR-05/14-48-11333-
00-J002

Contract (01/01/00 - 8/1/02)

REPORT MONTH: Final Summary of Contract Expenses

CURRENT DATE: 31 May 2002

	Contract Budget	Monthly Expenses	Cumulative Expenses	Contract Balance
Personnel Costs	\$996.00	\$0.00	\$996.00	\$0.00
Construction	\$9,050.00	\$0.00	\$9,050.00	\$0.00
General Administration	\$1,000.00	\$0.00	\$1,000.00	\$0.00
(In-Kind = \$2,626.00)				
Annual Totals	\$11,046.00	\$0.00	\$11,046.00	\$0.00
Contract Totals	\$11,046.00		\$11,046.00	\$0.00
 Billing Amount		 \$0.00		

Paul F. Wagner, Ex. Director
(I certify that above expenses were incurred for program.)