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FOR SUSTAINABLE AGRICULTURE

COMPETITIVE GRANT
REPORT
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Native willow stream-bank plantings: a local resource to control erosion and provide an acceptable alternative riparian planting technique

Abstract: *Over three years, small willow cuttings ("posts") cut from local sites were planted into the stream bank on six sites along the Middle Raccoon River. These posts stabilize the bank, reducing erosion and protecting water quality. In addition, unlike most riparian buffer planting techniques, they do not take land out of agricultural row-crop production. They also provide shading and enhance wildlife habitat. Plantings are most successful if cut while dormant, planted on rivers or streams that have less than 50,000 acres drainage, and inspected regularly for insect and beaver damage (so that preventive measures may be taken where indicated). This technique was demonstrated to the public via field days and media coverage, and results of a survey assessing attitudes about adoption of the technique are being analyzed.*

Principal Investigator:
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M & M Divide Resource Conservation and Development Board
Dedham, Iowa

Budget
$4,000 for year one
$5,730 for year two
$6,730 for year three

Background

Due in part to tiling, overland runoff, and channelization, large volumes of water in streams during rainfall events have increased erosion on many of Iowa's stream banks. A loss of stream-side vegetation, due in part to the conversion of riparian zones to crop fields, has left many of these stream banks susceptible to heavy soil loss. The streams have cut deep and wide into the land, and landowners sustain economic losses as valuable soil is rapidly lost. In addition, the ecological integrity of the stream deteriorates as it becomes overloaded with sediment.

Other Iowa research has shown that water quality can be improved by re-establishment or improvement of riparian zones. Deeply planted poplars were found to be an effective tool to reduce nitrate-nitrogen for near-surface groundwater. The effect of mixed woody and herbaceous buffer strips on water quality is currently under study at Bear Creek in Story County, Iowa. In fact, planting techniques along riparian zones typically involve establishment of herbaceous and/or woody vegetation as strips between the stream bank and adjacent agricultural field. Many times, farm land must be removed from production to establish these buffers. In many cases, devoting existing agricultural land to a non-row crop use is unacceptable to landowners. Therefore, other, more agriculturally acceptable riparian zone management tools must be promoted in order to improve water quality.

The objectives of this demonstration/education project were to

(1) establish willow-post stream-bank plantings along areas of the Middle Raccoon River in Guthrie and Carroll Counties in Iowa where stream-bank erosion is severe;
(2) increase public awareness of the positive aspects of willow riparian plantings;
(3) promote the use of willows as a local, perennial resource;
(4) promote the use of willow plantings on the cut of the bank as a tool in cases where other riparian planting techniques are unacceptable to landowners;
(5) measure the change in awareness of landowners along the river, along with their willingness to implement riparian plantings after promotion of the project;
(6) slow the loss of soil from farm land adjacent to the river; and
(7) improve the aquatic and upland ecological integrity of the river system.

Approach and methods

An initial survey during the fall of 1992 was sent to approximately 140 landowners and

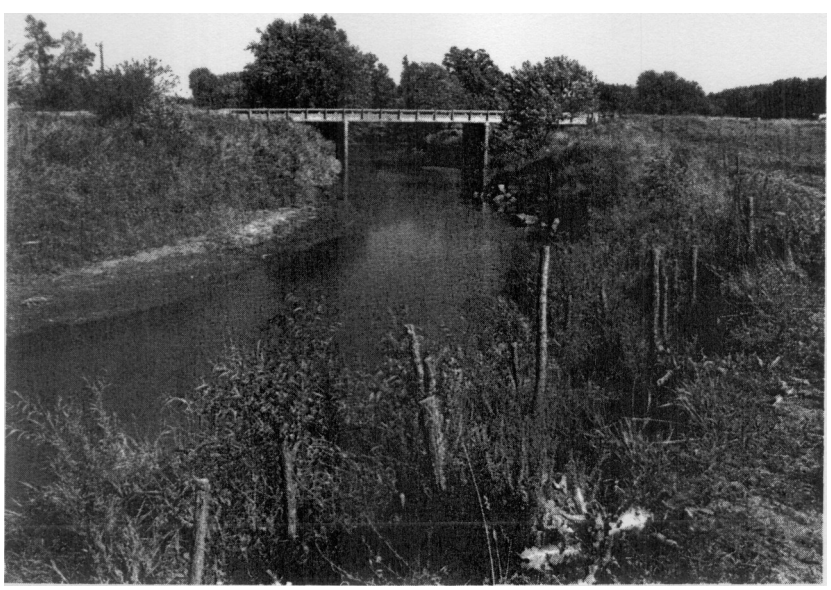
operators of land adjacent to the Middle Raccoon River in Carroll and Guthrie Counties. The function of this first survey was to measure these individuals' awareness and willingness to adopt stream-bank protection techniques. This survey was sent prior to field work time and before the willow post planting project had been publicized. During 1993, 1994, and 1995, the willow project was highly publicized through news releases, news articles, and public field days. (In the late fall of 1995, a second survey was sent to the same landowners to measure the change in awareness and willingness to implement stream-bank stabilization plantings.)

From the initial survey, landowners who indicated interest in sponsoring a demonstration site were then contacted. All sites were visited, and several judged suitable were selected for future plantings. Selection of sites was based on the greatest need for stream-bank stabilization as well as on accessibility by the public for viewing. Through the three years of the project, six sites were planted to willows. Of the six, four were adjacent to county or state highways, which afforded ease of viewing.

The planting technique, used successfully by the Illinois State Water Survey, involved harvesting dormant willow cuttings during late winter or early spring. The 3- to 4-inch diameter trees were cut and trimmed to make 12-foot-long posts. In spring, after the ground was frost-free, a backhoe was used to grade the vertical banks to a 1:1 slope. The backhoe was then implemented with an eight-foot-long, eight-in.-diameter hydraulic auger. Holes were drilled eight feet deep into the stream bank, willow posts were immediately inserted, and the holes were refilled with soil. The first of four rows was planted at the water line, and the remaining rows were planted at increments of four feet up the bank. Trees were also planted four feet apart within rows, giving the entire riverbank a four- by four-foot grid design.

Six eroding bends, totaling 2,400 feet, were planted to willow posts this way during the three years of the project: one in 1993, two in 1994, and three in 1995. All six sites were sponsored by five different private landowners. In addition to general media coverage and field days, local government groups were invited to learn about the willow-post planting technique.

In this technique, willow posts are drilled eight feet deep into the stream bank. Four rows are planted from the water line up the bank in four-foot increments.



Findings

Total cost for the willow post planting technique ranged from $7 to $10 per linear foot of bank planted. The range reflected the difference in the cost of grading different sites to the 1:1 ratio. Depending on contractors' rates, the cost can be expected to increase in proportion to (1) how far the contractor must move equipment and (2) the distance over which the willow cuttings must be transported to the planting site.

Survival of the willow cuttings appears to be limited to four main factors: dormant, healthy cuttings; size of the watershed; insects; and beaver. All sites were planted with healthy, dormant cuttings shortly after the ground was frost-free, except for the 1993 planting, which was not installed until early May due to wet spring weather. The continued wet weather that year appeared ideal for the willow trees until flooding occurred.

All plantings appear to have reduced the soil loss by almost completely revegetating the

area. One exception was an area of the 1993 planting, where the river cut through during the early July flood. This site was under water for more than a week, significantly reducing survival of the remaining planting. The 90,000-acre watershed likely allowed too much water to enter the site for too long a period. A watershed size closer to 50,000 acres would be more suitable for this technique by itself; streams fed by larger watersheds need additional erosion control measures (such as rip-rap). However, in 1995, a small amount of erosion also occurred at the tow of the bank at one planting with a more suitable watershed size, though the area now appears to be stable.

Spider mites infested the two 1994 plantings, which reduced survival of the newly establishing trees. In early spring of 1995, small cuttings were placed adjacent to willow posts that had not survived. These cuttings did well and helped to revegetate the sites. A more rigorous inspection in the 1995 plantings revealed a spider mite problem at one site that was controlled by thorough spraying with soapy water.

Beaver also caused some problems at three of the sites. At two sites, the beaver stripped the bark from some trees in the lower row, causing mortality of those trees. In cases where beavers cut trees but left bark, plantings survived well. Where beaver were beginning to affect survival of a significant number of trees, the beaver were controlled by trapping (with permission of the local Iowa Department of Natural Resources Conservation officer). It appeared that the beaver problem was only present during the planting year; no problems were observed on sites during their second season.

In summary, to maximize potential for success, the cuttings used should be healthy and dormant; the practice should be limited to streams with a watershed size of fewer than 50,000 acres unless rip-rap or other conventional materials are used in combination; and inspection for insect and beaver damage should be conducted regularly through the first year and addressed immediately.

The results of a final survey of area landowners (under analysis as this publication went to press) will show the impact of this demonstration/education project on improving the awareness and willingness of landowners to implement stream-bank stabilization projects.

Implications

This willow-post bank stabilization technique offers opportunities to reduce stream bank erosion. It allows landowners to keep valuable farm land in production. It can reduce sediment loading in streams, thus improving water quality and enhancing habitat for fish and wildlife. It can also help to protect public facilities such as roads and bridges.

Improving water quality by reducing sediment loading depends largely on reducing the amount of soil delivered to streams, including soil from stream banks. Reducing stream-bank erosion will have a direct and immediate impact on the amount of sediment entering the stream. Keeping the soil in place also maintains productive land area and ultimately maintains ecological integrity of the stream.

This willow-post planting technique is only one soil bioengineering technique. Others—brush mattress, brush layer, live facine, or branchpacking—may be warranted depending on stream size and watershed size, bank stability, and soil structure. These bioengineering techniques may also be used in conjunction with conventional stabilization practices such as cribwalls, joint plantings, vegetated rock gabions, and vegetated rock walls.

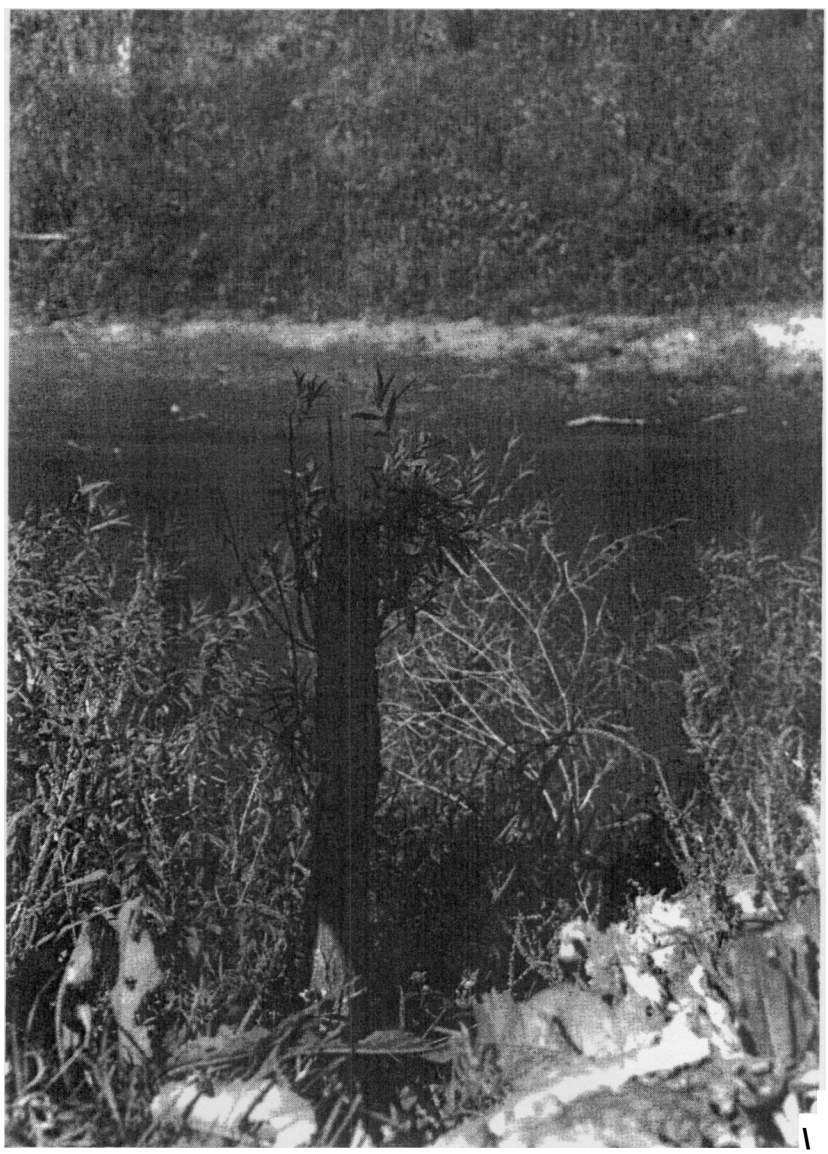
To make landowners more aware of such techniques, such practices must be demonstrated locally. This project has generated considerable local interest. The Carroll Soil and Water Conservation District has applied for grants to extend the willow work to include other bioengineering practices. Crawford County has also undertaken a willow planting along a small stream near a county road. Department of Natural Resources fisheries biologists are installing willow posts adjacent to trout streams in northeastern Iowa, and the project director is working with forestry professors at Iowa State University to integrate this technique with other riparian area management strate-

gies in other demonstration and research projects and publications.

This project has also demonstrated that landowners have a sincere desire to protect their stream-side land. Natural resource specialists are now aware that the technique is valuable and that financial assistance is an important factor in expanding the use of this practice. To help ensure long-term success, trained personnel should provide consultation to individuals interested in adopting the technique.

For more information contact J. Judson, Dedham, Iowa; (712) 683-5555.

Cooperative efforts: The Lake Panorama Association (LPA) provided $4,065 for costs associated with grading the stream bank planting sites. It also contributed one-half of the project director's salary and expenses. The Consolidated Farm Services Agencies in Guthrie and Carroll Counties provided a list of owners and operators for use in conducting the survey, and Natural Resources Conservation Service personnel in Carroll County and the Illinois State Water Survey also provided important support to the project.



By midsummer, heavy vegetative growth can be seen on willow posts, even in the first year.