Technical Assistance for the Establishment and Maintenance of Riparian Corridors

Final Project Report

CWA Section 319(h) FY 1993
Nonpoint Source Pollution Program Task 300
Contract AG-99-EX-011
OSU Project Account 3-5-90340

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Several individuals and organizations contributed to the success of this project in numerous ways. All efforts were greatly appreciated, especially the following:

Initial Project Manager Anna Fallon’s dedication ensured the printing and distribution of the Riparian Management Handbook, a vital resource to the project.

The second Project Manager, Dr. Scott Stoodley, played a major role in developing the content and format of the workshops and also organized the first four of them. His continued assistance to the project after taking a new position was very helpful.

The staffs of the Extension offices in Cherokee, Carter, LeFlore, Payne, Woods, Roger Mills, Jackson, Caddo, and Tulsa counties were instrumental in organizing the workshops within their areas. The support of the four District Directors was also much appreciated. Of special note was the help given by the three Area Water Quality Specialists in the state, Mitch Fram in the Northeast, Marley Beem in the Southeast, and Wes Lee in the Southwest.

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Of course, much appreciation is given to each of the speakers who gave of their time and insight during the workshops.

List of Commonly Used Abbreviations

BMP – Best Management Practice
CorpComm – Oklahoma Corporation Commission
DEQ – Department of Environmental Quality
EQIP – Environmental Quality Incentives Program
FSA – Farm Service Agency
NPS – Non-Point Source
NRCS – Natural Resource Conservation Service
OCC – Oklahoma Conservation Commission
OCES – Oklahoma Cooperative Extension Service
ODA – Oklahoma Department of Agriculture
ODA-FS – Oklahoma Department of Agriculture-Forestry Division
ODWC – Oklahoma Department of Wildlife Conservation
OSE – Office of the Secretary of the Environment
OSU – Oklahoma State University
OWRB – Oklahoma Water Resources Board
PPP – Pollution Prevention Plan
TMDL – Total Maximum Daily Load
USFS – United States Forestry Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
WHIP – Wildlife Habitat Improvement Program

Table of Contents

Recommendations

The focus of this project was a series of educational workshops throughout the state of Oklahoma designed to educate the land management personnel of various state, federal, and tribal agencies on the importance of riparian area protection and maintenance. A pre-workshop survey of cooperating producers around the state, pre- and post-tests conducted as part of the workshops, and participant evaluations of the workshops provided a measure of the knowledge and attitudes concerning riparian area protection within the state. Based on these results, consideration of the following recommendations should improve the effectiveness of further educational efforts on this subject.

- Develop a riparian education program to introduce the general public, including both adult and youth audiences, to the importance of riparian areas.
- Develop a riparian education program to provide technical training to land managers. In particular, the following areas need to be addressed:
    - Utilization of riparian vegetation species appropriate to the ecoregion
    - Channel stability evaluation
    - Channel restoration options
    - Establishment of grazing management plans that include riparian protection
    - Optimization of riparian wildlife habitat
- Encourage audiences to explore local, state, and federal incentive programs for financial support of measures to protect riparian values.

In addition, there is a definite shortage of good riparian management demonstration sites. Resource personnel and producers desire to see working solutions to the problems at hand. It is one thing to share and discuss the possibilities with them and quite another to take them to a site where riparian management is in full operation.

Executive Summary

This report details the activities of the OCES from 1993 – 1999 in support of the FY 1993 CWA 319(h) Nonpoint Source Pollution Program, Task 300 grant entitled "Technical Assistance for the Establishment and Maintenance of Riparian Corridors". The OSU Project Account Number was 3-5-90340, the Contract Number, AG-99-EX-011, and OCC Project Number, 47. OCC administered the grant. Project Director was Michael D. Smolen, OCES Water Quality Programs Coordinator. Project Managers included Timothy L. Propst, OCES Engineer/Environmental Scientist, Scott Stoodley, OSU Environmental Sciences doctoral student (currently State EQIP Coordinator for Oklahoma with OCES/NRCS), and Anna Fallon, OCES Extension Engineer/Environmental Scientist (currently with EPA Region 4). Troy Pierce, currently with EPA Region 4, was retained as Project Consultant.

Accomplishments

- Printed three thousand copies of the Riparian Area Management Handbook (the Handbook), an output from a 104(b)(3) Wetlands Program grant. The Handbook is a comprehensive practical reference.
- Distributed approximately one thousand copies of the Handbook to county Extension offices, Conservation Districts and other state, federal, and tribal land management agencies statewide.
- Made the Handbook available online at www.okstate.edu/OSU_Ag/e-952.pdf.
- Conducted a pre-project survey in ten Conservation Districts around the state. In general, most cooperators were open to riparian management education and were willing to change practices or invest income in order to protect water quality. The need for further education on the benefits from and threats to riparian areas was also demonstrated.
- Developed a curriculum for use in the planned workshop series. Topics included the benefits and functions of riparian areas, attitudes and knowledge of cooperating producers, organization of the Handbook, stream stability, riparian vegetation and wildlife, forestry and grazing management options, and relevant incentive programs.
- Presented the workshop curriculum at McAlester and Woodward as part of the OCES Sustainable Agriculture training.
- Held nine workshops with 182 attendees at pre-selected locations throughout the state. Each workshop consisted of a classroom presentation of the curriculum and a field trip to local riparian sites.
- Administered identical pre- and post-tests to workshop participants. Results indicated both the levels and areas of knowledge and learning. Areas for further education were also identified.
- Collected written evaluations of the workshops by participants. Results indicated overall satisfaction with the workshops. The most common suggested improvement was to provide concrete examples of solutions to specific problems.

Final Project Report

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Introduction

The effects of land use practices on the quality of surface and ground water resources are well documented and an extensive knowledge base exists concerning techniques to protect these resources. Unfortunately the information is typically concentrated in centralized state offices and is not effectively transferred to the landowners where it is needed. In some cases this information can be highly technical and difficult to explain; however, in most cases it is relatively simple and can easily be transmitted in an effective manner to landowners and conservation district personnel. A good example of the latter case is information concerning the importance of riparian corridors as well as techniques for their establishment and maintenance.

Siltation and nutrient loading are the two most widespread water quality problems in Oklahoma, especially in the western two-thirds of the state. In Oklahoma's Section 319 Assessment Report, NPS loading of nutrients and sediment was reported in a number of streams. These pollutants have a number of sources, such as rural roads and abandoned oilfield sites; however, the vast majority is associated with agricultural practices. In some cases pollutant loading is a result of poor land management practices, such as the farming of highly erosive soils and/or lack of conservation practices. In many cases however, land use practices that appear adequate to control runoff still contribute pollutants to surface waters. In these cases it is often found that riparian vegetation, wetlands, and floodplains are severely degraded. This results in the lack of a buffer zone between farm or grazing land and watercourses. In many areas, stream courses are also significantly degraded through the action of livestock that trample banks, increasing streambank erosion.

There is an abundance of data that demonstrates riparian areas are very important in protecting water quality and maintaining aquatic habitat. Beneficial effects are seen through the filtering effect of streamside vegetation on suspended sediments and associated nutrients in runoff water. The uptake of nutrients from shallow ground water moving towards the stream enhances the filtering effect and protects the water body from influxes of excess nutrient loads. Shading by riparian vegetation at the water's edge helps regulate water temperature. The cooler water created by the shading holds more oxygen, benefiting aquatic organisms. Unfortunate insects that lose their grip on the edge vegetation provide additional food inputs to the aquatic ecosystem. Leaves

and dead branches also serve this function. Larger vegetation that enters the water body (i.e., storm-blown trees) provides important structure for the aquatic habitat. The root systems of larger trees at the water's edge are also important contributors to habitat structure. In addition, the root systems of all riparian vegetation help stabilize streambanks and prevent erosion. Finally, riparian vegetation helps decrease the effects of moving water during high flow events. Grassy vegetation lies down under the force of the water and protects the soil, much like shingles cover a roof. Woody vegetation dissipates the energy of the water, reducing flood magnitude.

Project Area

Statewide

Project Objectives

The overall water quality objective of these activities was the improvement of surface and ground water quality through educational efforts, behavioral changes, and the implementation of BMPs directed towards water quality protection and improvement. The primary focus was on demonstrating the water quality benefits of proper riparian corridor areas and instructing attendees on the techniques for establishing and maintaining these areas.

Objectives for the Demonstration/Education Component

Under this project, technical assistance was provided to conservation district, OCES, tribal, state, and federal natural resource personnel concerning riparian management. Technical assistance was provided in the form of workshops with presentations concerning the effects of different land use practices on riparian areas and the benefits of modifying these practices to conserve riparian benefits. Materials concerning proper land use techniques for establishment and maintenance of riparian corridors were distributed.

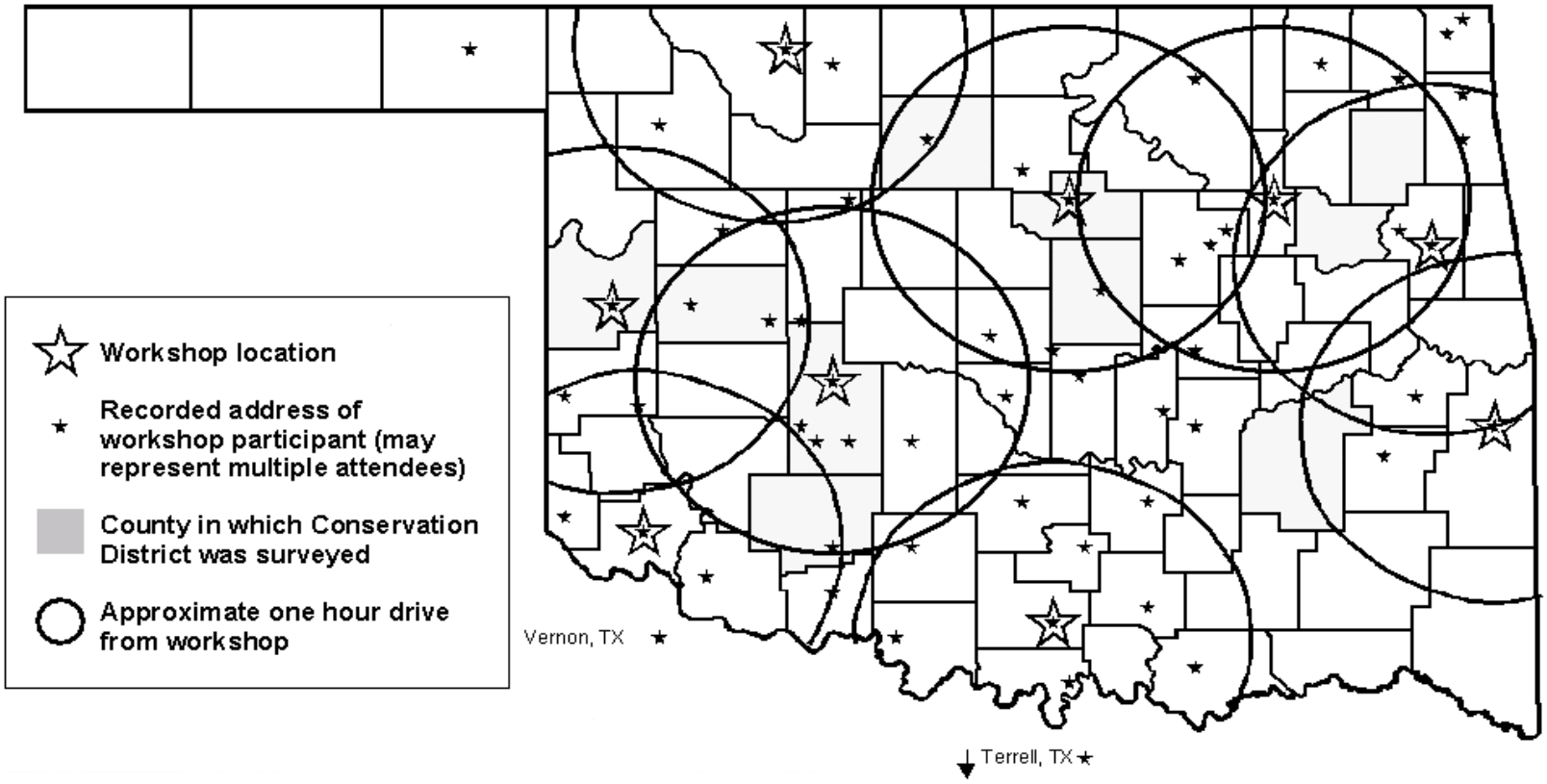
The project involved a series of nine full day workshops, two in each of the five conservation district areas. Selections by the Riparian Technical Review Committee were made so that no location in the state would be more than an hour drive away from a workshop site (See Fig. 1). The workshops dealt with methods of establishing and maintaining riparian corridors as well as alternatives for managing livestock to minimize riparian area degradation. Attendees at five of the nine workshops were given a pre-workshop survey, and were asked to complete a post-work shop survey as well.

Project Management

The workshops were coordinated by OCES and sponsored by the OCC and Rural Conservation and Development Coordinators. Local Conservation Districts provided personnel to the meetings The ODA provided technical assistance concerning the establishment of riparian zones, tree planting, and livestock ma

nagement. The NRCS provided additional technical assistance. The operation of the workshops, including the materials to be presented, was reviewed by USEPA prior to their use.

Figure 1. Distribution map of workshop activities.



Project Tasks

The goals of the project were divided into five different tasks. A copy of the workplan delineating the tasks is provided as Appendix A. A listing of the five tasks with a discussion of the education/demonstration activities undertaken to accomplish them follows.

Task 1. Print Riparian Area Management handbook. This handbook was developed as part of the grant "Management Program for Riparian Wetlands to Protect Water Quality," through 104(b)(3) Wetlands Program funds.

At the very outset of this project, it was determined that no suitable Oklahoma-based reference material existed to provide technical assistance to landowners and resource personnel. The Riparian Area Management Handbook, developed through the 104(b)(3) Wetlands project, is such a tool. Printing of the handbook (OSU Extension publication E-952) was the first task undertaken as part of this 319(b) project.

The Riparian Area Management Handbook utilized the expertise of experts from Oklahoma-based agencies to address the many issues related to management of riparian areas. Each group of experts was responsible for a chapter of the handbook devoted to their area of expertise. Vegetation tables and specific figures in the handbook were created solely for that purpose.

The handbook was designed to educate the reader in three areas; (1) the benefits of riparian areas, (2) the functions of riparian areas, and (3) the manner in which riparian protection can be made a part of various land management plans. After technical difficulties with the printer were resolved in mid-September 1998, three thousand copies of the handbook were printed. Copies were sent to all county Extension, conservation district, and Oklahoma-based State, federal, and tribal natural resource offices. Copies were also distributed to all workshop participants. All told, there are approximately 1000 copies of this reference now distributed statewide. The full text of the handbook can be viewed in final format at www.okstate.edu/OSU_Ag/e-952.pdf, or it may be ordered from OSU Extension by calling 405-744-5653. A ". pdf" file of the handbook is provided with the digital version of this report.

Task 2. Select districts, arrange workshops and conduct pre-workshop survey to establish information baseline. Receive and tabulate response.

The OCC's State Water Quality Specialist and its Interim Director assisted independent consultant Troy Pierce in developing and administering a survey instrument for monitoring knowledge and attitudes of Conservation District cooperating producers concerning streambank management. A copy of the survey instrument is provided in Appendix B. A Conservation District within the same general area as each planned workshop was selected for survey. The ten Districts were; Comanche County, Deer Creek, Garfield County, Lincoln County, Mayes County, Payne County, Pittsburg County, Upper Washita, Wagoner County and West Caddo. Figure 1 indicates the location of each of the selected districts. A sample size of 30 was determined to be the appropriate number to survey based on available resources and statistical validity. A random number generator was used to select survey candidates from lists of

cooperating producers from each of the 10 targeted conservation districts. District staffs who were asked to conduct the survey with the pre-selected cooperators.

Responses were received from 9 of the 10 districts. The non-responding District was dropped for the purposes of analysis. In the remaining nine Districts, percent response ranged from 10-100% within each District. Preliminary results were presented at the workshops to illustrate the level of knowledge and attitude of cooperating producers concerning riparian areas and riparian protection. A summary of the final survey results is presented below in Table 1.

Table 1. Summary of results of the 1998 Creek/Riverbank Management survey of cooperating producers in 10 Oklahoma conservation districts.

Question	Yes	Maybe	No	Don't Know
Do creeks and riverbanks need special attention to protect water quality?	101		14	29
Would you invest some of your farm/ranch income to protect creeks and rivers in your area?	39	74	29	
If needed, would you be willing to change your agricultural practices to improve water quality?	74	48	20	
Have you heard about any state or federal programs to help farmers protect water quality?	26		117	
Can trees help protect the banks of creeks and rivers?	116		7	21
Can cattle in or near a creek cause water quality problems?	69		68	
Does straightening a creek decrease flooding?	42		48	53
Can landowners make money from leasing their land along creeks and rivers for hunting?	59	56	19	
Do you think farmers will protect water quality without regulations?	69	44	21	

The survey elucidated two main points. First of all, cooperators are receptive to education on riparian management. Most of them indicated a willingness to modify practices or invest income in order to help protect water quality. Secondly, it demonstrated a definite need for education on several riparian management issues. Most cooperators already knew that riparian areas help protect water quality and that trees help protect creekbanks, but respondents were divided on other basic ideas such as whether cattle cause water quality problems and whether recreational leasing of land can be profitable. For most of the questions on the survey, it was not so much that cooperators were misinformed, but rather uninformed. This was no more apparent than in the vast majority of respondents who did not know of any available government programs to aid producers in protecting water quality. Detailed findings and recommendations are contained in the complete report covering the results of the survey, also included in Appendix B.

Task 3. Establishment of workshop program including slide shows, demonstrations, materials, etc. Workshop program subject to EPA review and approval before use.

The workshop format was divided into two parts. A morning lecture session paralleled the approach of the handbook, introducing the audience to the benefits and functions of riparian areas and then discussing management options available to help preserve them. As the sample programs provided in Appendix C attest, the first order of business for the workshops was to discuss the preliminary results of the cooperating producer survey. This was done to illustrate to the technical resource personnel in attendance that opportunities exist for both education and further cooperation with these individuals. Next in the morning session was a presentation on the general benefits and functions of riparian areas, followed by an introduction to the utility of the handbook. A discussion of stream morphology and channel stability was the final introductory topic of the day. The remainder of the presentations focused on including riparian protection in the management plans of various land uses in Oklahoma.

Since most Oklahoma land resource technical personnel deal primarily with agricultural landowners, the content of the workshops was directed toward this industry. Grazing accounts for much of the land use in Oklahoma, so options for management of livestock were presented statewide. On the other hand, the poultry industry is mainly limited to the eastern portion of the state, so concerns specific to this industry were only addressed at workshops in Tahlequah and Poteau. Other examples of region-specific adjustment to workshop content were the presentations on riparian vegetation and forestry. The eastern portion of the state contains some areas that are able to utilize their heavily forested land as a cash crop. Therefore, timber management options were included in the eastern workshops. However, the western portion of the state, though containing some forested stands, has only limited timber industry. In that region, the vegetation presentation concentrated more on the importance of maintaining a vegetative buffer area between upland practices and the water body. The only major departure from the agricultural theme was at the final workshop in Tulsa, presented to the Tulsa Blue Thumb volunteers, where effort was made to address urban riparian management issues.

The speakers recruited for morning sessions included many of the individuals that helped author the handbook. A complete list of speakers and their affiliation is provided in Appendix C. When possible, local experts were utilized at each location. It was hoped that this would help increase rapport during the workshops, and help facilitate local networking afterward. The use of different speakers at the different workshops resulted in different presentations on some of the topics. Copies of the programs and representative presentations from the workshops are provided in Appendix D.

The second half of each workshop was a field trip to local sites of riparian interest. These areas were chosen to illustrate and reinforce some of the concepts introduced during the morning lecture session. The goal of the field trip was to provide visible examples of both healthy and damaged riparian areas to the workshop participants. On-site discussions allowed for interaction between attendees and speakers relating to area specific problems and possible solutions. Table 2 below gives general

descriptions of the features viewed and discussed at each site. Appendix E contains maps and more detailed descriptions of some of the sites.

Table 2. Listing of field sites visited during the workshop field trips.

Site	Owner	Main features
Tahlequah	Private landowner	Riparian exclusion, wildlife management, poorly managed grazing
Ardmore	Private landowner	Restoration of natural prairie ecosystem
Poteau	Kerr Center for Sustainable Agriculture	2-, 5-, and 10-year riparian corridor protection
Stillwater	Private landowner	WHIP program, fenced pond w/ freeze-proof waterer . cross-fencing and rotational grazing
Alva	Private landowner	Rested grazing land, effects of channelization, high quality aquatic community
Cheyenne	USFS Black Kettle National Grassland	Extensive grazing management, alternate water sources, effects of channelization
Binger	Private landowner	Riparian planting project, effects of altering stream course
Altus	Private landowner	Effects of siltation, importance of vegetation as debris filter , waste tire erosion control structure
Tulsa	Private neighborhood; Oral Roberts University	Effects of water level control structures, bank reinforcement and channelization in urban area

Task 4. Prepare and conduct workshops at selected sites (10 workshops).

The workplan called for 10 workshops total, with two in each of the five Conservation District areas. Prior to the actual start of the workshop tour, the OCES WQ team presented an abbreviated workshop as part of OCES Sustainable Agriculture training at Weatherford in the western part of the state, and McAlester in the eastern portion. In discussion with OCC it was decided that each of these would count as a “half-credit”, leaving nine workshops to be completed.

The locations for each of the remaining workshops were determined by the Riparian Technical Review Committee (initiated under the 104(b) Wetlands Project, “Management Program for Riparian Wetlands to Protect Water Quality”). They were selected to offer the most coverage of the state. In total, all areas of the state were within approximately a one-hour drive of a workshop location. The only area of the state that did not have a workshop offered within its immediate vicinity was the Panhandle. Figure 1 highlights the workshop locations statewide, as well as participant locations.

The workshops were advertised through three main avenues. First of all, the District Extension office was provided an information flyer to distribute to each of their county offices, along with a letter from the District Director, endorsing the workshop. Contact

information for the Extension office for the county in which the workshop was being held was listed on the flyer and registrants made reservations with those personnel. Second, the flyers were provided to the state NRCS office. The Assistant State Conservationist sent these to personnel in the area and also enclosed an endorsement letter. The third and most effective method was local conservation district personnel who distributed the flyer to surrounding districts. Tribal environmental personnel were also notified by flyers sent through the EPA Region 6 Regional Native American Office (RNAO) in the Office of External Affairs, the Oklahoma Inter-Tribal Environmental Council, and/or the Southwestern Oklahoma Tribal Environmental Council.

The workshop curriculum was approved for seven hours of credit in Soil and Water Management by the Certified Crop Adviser program. This was also advertised on publicity materials and provided additional impetus for participation.

Most of the workshops were held at the local Extension office. For each location, local Extension and NRCS personnel reserved venues, setup facilities, and helped garner additional support. They also conferred together to locate sites in the area suitable for the afternoon field trips. In addition to the local staff, Extension Area Water Quality specialists and NRCS Area specialists provided much support for workshops in their regions. Although the same basic mechanisms were used for the final workshop in Tulsa, another group, the Blue Thumb volunteers, contributed extensively to its success.

The nine workshops drew 182 attendees from around the state, averaging just over 20 at each location. Including speakers, there was an average of 27 participants at each workshop. The following table lists attendance at each location.

Table 3. Workshop attendance by location.

Location	***Attendees***	***Speakers***	***Total Participants***
Tahlequah	21	6	27
Ardmore	30	7	37
Poteau	18	5	23
Stillwater	29	6	35
Alva	18	4	22
Cheyenne	10	7	17
Binger	18	7	25
Altus	19	7	26
Tulsa	19	8	27
Total	**182**	**NA**	**NA**
Average	**20**	**7**	**27**

Task 5. Prepare final report.

This document, including appendices, is the final report.

Measures of Success

Number of landowners that receive technical assistance.

Number of landowners that participate through establishment, development, and/or protection of riparian areas on their land.

These measures of success are currently not discernible. When sufficient time has elapsed, perhaps five years from now, the OCC should be able to utilize their District network to obtain this information.

The "train-the-trainer" attitude adopted for this initial step in the Oklahoma riparian education program focused on the state technical resource personnel. It was feared that approaching landowners first might have produced a situation where an "educated" landowner would contact an "uneducated" resource person and find that they were unfamiliar with the subject. The landowner might then become discouraged and probably unreceptive to any future education. This project was designed to replace that situation with one in which further educational outreach to the general public is combined with support from local technical personnel.

Results and Conclusions

Pre-and Post-testing

During the course of the project, a pre-and post-test was developed to evaluate the quality of informational exchange that took place during the workshops. During the final five workshops, participants were given a pre-test to gauge their level of knowledge prior to the program. Immediately following the field trip, an identical test was administered. Testing was anonymous, but the overall scores give some indication of the areas where learning took place. Copies of the tests and final results are provided in Appendix F. A summary of the results is provided below.

Table 4. Summary of results from pre- and post-testing of workshop participants.

Question ***Correct answer is italicized, bold and underlined*** Incorrect answer	Pre-test Incorrect (%)	Post-test Incorrect (%)
1. Which is better for holding the soil in riparian areas: Grasses and forbs or ***Woody plants (trees, shrubs, or brush)***	39.0	7.5
2. Straightening a creek reduces flooding. T or ***F***	9.1	7.3
3. Hunting/fishing/recreational leasing can be more profitable than traditional agricultural use of riparian areas. ***T*** or F	21.3	0.0
4. Trees are needed for good riparian habitat. T or ***F***	64.9	65.5
5. Protecting a riparian area requires livestock exclusion. T or ***F***	37.7	21.8

6. Dormant season grazing is not recommended in riparian areas. T or ***F***	45.8	25.0
7. The most efficient channel is: Wide and deep Straight and narrow ***Curved like an "S"*** Straight and wide	19.5	1.8
8. Bridges cause stream bank erosion. ***T*** or F	27.3	10.9
9. Riparian vegetation helps regulate dissolved oxygen in the water. ***T*** or F	6.5	1.8
10. Invasive species increase biodiversity. T or ***F***	24.7	12.7

The results of the testing indicated that many participants already knew some riparian management information before the workshop. Over 90% of them already knew that straightening a creek does not reduce flooding (question 2) and that riparian vegetation helps regulate stream temperature (question 9). Approximately 80% of participants already knew that leasing of land for recreational use could be more profitable than traditional agricultural use (question 3) and that the most efficient stream channel is "S" shaped (question 7). Happily, improved scores were demonstrated even for these questions that had a high percentage of correct answers initially. In fact, only two incorrect answers were marked on these questions during the post-testing.

The greatest difference from pre-test to post-test was seen in the answers to question 1. Almost 40% of the participants incorrectly assumed that grasses and forbs hold soil better than woody plants. After the workshop, less than 10% of them made that same mistake. Question 8 regarding bridges as a cause of erosion and question 10 concerning the effects of invasive species on biodiversity also showed improvement from approximately 30% incorrect on the pre-test to approximately 10% on the post-test.

Approximately 40-45% of the participants answered questions 5 and 6 concerning grazing management incorrectly on the pre-test. Improvement was observed on the post-test, but 20-25% of participants still answered these two questions incorrectly. It should be noted that these questions were the only ones from the test in which a management option was evaluated. Differing opinions concerning these options have been proffered in discussions with grazing experts since the test was developed. Therefore, the low level of improvement on these questions may have been due to the participants not agreeing with the recommendations rather than not learning them.

Only one question did not show improvement between the pre- and post-testing. Question 4 asked whether trees were necessary for good riparian habitat. Approximately 65% of participants answered this question incorrectly on both the pre- and post-tests. One of the aims of the workshop was to impress upon the participants that in some areas, especially in the western portion of Oklahoma, native riparian species do not necessarily include trees. In those areas it is quite acceptable to maintain a grassy riparian area. However, another workshop goal was to dispel the false notion that grasses hold soil better than woody vegetation. As evidenced in the results to question 1, this point was learned by many workshop participants. So much so, as a matter of fact, that it appears that the message addressed in question 4 was

drowned out. Any further educational efforts should be careful to delineate the parameters of both these concepts.

Workshop Evaluations

The other feedback received from participants was an evaluation performed following the workshop activities. In general, participants rated the overall quality of the workshop and the workshop instructors' presentation and knowledge as very good to excellent. They also overwhelmingly agreed that they had a better understanding of the role of riparian areas in the environment and the management of these areas to protect water quality. In addition, participants were satisfied with the structure of the workshop. Summarized results are provided in Appendix G.

When participants were asked to list the workshop topic for which they felt they needed more information, the greatest number of requests involved specific methodologies for riparian management. The second most frequently requested general topic was riparian vegetation. For both of these areas, the wording used by the participants reflected a desire for specific answers to specific problems, (i.e., how to select the correct practice for riparian restoration, what species to plant at different locations on a streambank.)

For the most valuable workshop topic, "All" was the most frequent response, with each separate topic receiving approximately equal individual mention. The final evaluation question asked participants for suggestions to improve the workshop. Many responses focused on format and presentation style, while others included additional topics to cover. The desire for specific examples was also brought out in the responses to this question as participants were critical of a lack of discussion, particularly on the field trip, and requested more specific examples of riparian problem solving. However, overall satisfaction with the workshop was indicated by participants' most frequently suggested change, "None". Actual responses to the three free-response questions were organized by general topic and are included in Appendix G.

Measures of Success

The workplan lists several factors and/or conditions by which the ultimate success of this could be determined. These items, such as number of conservation plans written that include a riparian management aspect, number of trees planted to restore a riparian area, acreage designated as buffer area, etc., can and will most definitely be used to evaluate improved riparian management in Oklahoma. However, most of these types of indices require a definite period of incubation before they can be properly applied. In an effort to gauge the effectiveness of this program prior to the availability of these other endpoints, a survey instrument was designed and mailed to the individuals that took part in the educational meetings. The instrument questioned these natural resource professionals on the impact the training and materials had on their activities and asked them to comment on the number and types of opportunities they have had to share this information. Of the 172 individuals surveyed, 53 (approx. 30%) replies were received. A copy of the survey instrument and the tabulated results are included in Appendix H. A quick overview of these findings show a total of 142 conservation plans were written or revised to include riparian management, riparian management information was

presented at 82 public meetings, and 349 individuals received one-on-one education concerning riparian management. Also, the riparian management practices most frequently recommended by the survey group were riparian forest buffers and filter strips.

Conclusions

The project was successful in meeting all of its tasks. The Riparian Area Management Handbook was printed and distributed, making available a practical resource to land management agencies statewide. A baseline of information was obtained from the producer survey on the knowledge and attitudes of cooperators concerning riparian area management. This will not only be invaluable in the future to evaluate the effectiveness of this and future projects, but even served in this project to alert resource professionals to the interests and attitudes of their clientele. A riparian program covering a wide spectrum of topics and management options was developed and reviewed by EPA. This curriculum will be very useful for future endeavors. In addition, the workshops at various locations throughout the state brought resource personnel from within the same region into dialogue on how to bring about a solution to the problem of improper riparian area management.

The ultimate success of this project will be determined by the degree to which riparian management becomes standard practice in the project area. At present, such a comprehensive evaluation is impossible due to the inadequate time for such practices to have been implemented. However, a “sneak peek,’ provided by the results of the meeting attendees survey indicates that we are well on our way. The number of producers receiving information was very encouraging, showing the effectiveness of the train-the-trainer approach adopted in the project. Just as encouraging was the area of influence, encompassing virtually all of Oklahoma, and a large portion of Texas.

The recommended next step in improving riparian management for this region is development and demonstration of technical solutions to common problems. The basic information promoting the benefits of riparian areas has been provided and is in the process of being accepted. For the most part, the technical personnel and their constituents agree with the goal of preserving and/or restoring these areas. The reason it is being done at such a slow pace, or not at all in some cases, is that the appropriate solution for specific problems has not been identified. Perhaps the most significant finding from our tours of riparian areas around Oklahoma was that each and every location has a unique set of problems; geologically, biologically, hydrologically, and legally. Addressing these issues head on at several areas would demonstrate a variety of solutions, developing a mixed bag of potential methods from which resource personnel could draw. The dual advantage to such areas would be their availability to serve as sites to witness firsthand the improvement in land and water quality provided by proper riparian area management.

Appendix A - Workplan

Attachment A-1. Project workplan

FY 1993 SECTION 319 PROJECT PLAN

SUBMITTED BY
OKLAHOMA CONSERVATION COMMISSION

TITLE: TECHNICAL ASSISTANCE FOR THE ESTABLISHMENT AND MAINTENANCE OF RIPARIAN CORRIDORS

BASE PROGRAM - TOTAL COST $95,649.59

FEDERAL SHARE $57,389.75
STATE SHARE $38,259.84

(REVISED May 8, 1998)

Agency: Oklahoma Conservation Commission

Title: Technical Assistance for the Establishment and Maintenance of Riparian Corridors

Task: 300

Cooperators: Oklahoma Conservation Commission
Oklahoma State University Cooperative Extension Service
Oklahoma State Department of Agriculture
Oklahoma State Department of Agriculture -Forestry Division
Conservation Districts
Soil Conservation Service
Rural Conservation and Development Areas

Introduction:

The effects of land use practices on the quality of surface and ground water resources are well documented and an extensive knowledge base exists concerning techniques which will protect these resources. Unfortunately the information is typically concentrated in centralized state offices and is not effectively transferred to the landowners where it is needed. In some cases this information can be highly technical and difficult to explain; however, in most cases it is relatively simple and can easily be transmitted in an effective manner to landowners and conservation district personnel. A good example of the latter case is information concerning the importance of riparian corridors as well as techniques for their establishment and maintenance health.

Siltation and nutrient loading are the two of the most widespread water quality problems in Oklahoma, especially in the western two-thirds of the state. In Oklahoma's Section 319 Assessment Report, NPS loading of nutrients and sediment was reported in a number of streams. These pollutants have a number of sources, such as rural roads and abandoned oilfield sites; however, the vast majority are associated with agricultural practices. In some cases pollutant loading is occurring as a result of poor land management practices, such as the farming of highly erosive soils and/or lack of proper terracing, but in many cases land use practices which would appear to be adequate to control runoff still contribute pollutants to surface waters. In these cases it is often found that riparian areas are either severely limited or non-existent; therefore, no buffering zone exists between farm or grazing land and water courses. In many areas, stream courses are significantly degraded through the action of livestock which trample down banks, thereby increasing the potential for streambank erosion.

There is an abundance of data which demonstrates that riparian areas are very important in protecting the quality of stream water. Beneficial effects are seen through the filtering effect of streamside vegetation on suspended sediments, and associated nutrients, in runoff water and through the uptake of nutrients from shallow ground water moving towards the stream. An additional benefit is seen through the stabilization of streambanks.

Project Area: Statewide

Project Objectives:

The overall water quality objective of these activities is the improvement of surface and ground water quality through educational efforts, behavioral changes, and the implementation of BMPs directed towards water quality protection and improvement. The primary focus will be on demonstrating the water quality benefits of proper riparian corridor areas and instructing attendees on the techniques for establishing and maintaining these areas.

Activity Descriptions:

Under this project it is proposed that technical assistance be provided to conservation district personnel and landowners concerning this issue. Technical assistance will be provided in the form of workshops where presentations will be made concerning the effects of different land use practices and the benefits of improving those practices. Materials concerning proper land use techniques for establishment and maintenance of riparian corridors will be distributed.

The project will involve a series of district level workshops with two being conducted in each of the five conservation district areas. The workshops will deal with methods of establishing and maintaining riparian corridors as well as alternatives for managing livestock to minimize riparian area degradation. All attendees will be given a pre-workshop survey, and will be asked to complete a post-work shop survey as well.

Measures of Success:

Success will be measured by the number of landowners who receive technical assistance and participate through establishment, development, and/or protection of riparian areas on their land. This can be quantified in several ways and will include number of trees (or other vegetation) planted, stream bank stabilization efforts, fencing of livestock from sensitive areas, length of stream protected, and the inclusion of riparian area protection in conservation plans.

Each participating conservation district will provide information quantifying the levels of these activities on a yearly basis to the Conservation Commission. The Commission will report these results on a yearly and cumulative basis to USEPA for a period of four years.

Project Management:

The workshops will be coordinated by OSU Cooperative Extension Service and sponsored by the Oklahoma Conservation Commission and Rural Conservation and Development Coordinators. Local Conservation Districts will provide personnel to the meetings and will establish landowner contacts to encourage their attendance. The Oklahoma State Department of Agriculture will provide technical assistance concerning the establishment of riparian zones, tree planting, and livestock management. Additional technical assistance will be provided by the Natural Resources

Conservation Service. The operation of the workshops including the materials to be presented will be subject to USEPA approval prior to their use.

Project Milestones:

Semi-annual reports to EPA concerning project activities - Due twice annually.
Annual Report of activities submitted with overall Section 319 activities. - Due July 1 of each year that the grant is in effect.

Task I. Print Riparian Area Management Handbook. This handbook was developed as part of the grant "Management Program for Riparian Wetlands to Protect Water Quality," through 104 (b)(3) Wetlands Program funds. Due Date: June 30, 1998

Resource Allocation:	$ 33,300
Printing:	$ 20,000
Editing and layout:	$ 13,300

Task II. Select districts, arrange workshops and conduct pre-workshop survey to establish information baseline. Receive and tabulate response. Due Date: September 30, 1998.

Resource Allocation:	$ 8,000
Consultant for survey:	$ 4,800

Task III. Establishment of workshop program including slide shows, demonstrations, materials, etc. Workshop program subject to EPA review and approval before use. Due Date: September 30, 1998

Resource Allocation:	$ 20,000
Project staff salary:	$ 15,000
Travel	$ 500

Task IV. Prepare and conduct workshops at selected sites (10 workshops), and ask participants to complete a post-work shop survey. Due Date: June 30, 1999.

Resource Allocation:	$ 30,000
Travel:	$ 1,500

Task V. Final Report Due Date: October 31, 1999

Resource Allocation:	$ 4349.59

Duration: May 1, 1998 to October 31, 1999

Resource Support:	Federal	$57,389.75
	State	$38,259.84
	Total	$95,649.59

Appendix B – Producer Survey

Attachment B-1. Survey instrument

District Cooperators' Creek/Riverbank Survey 1998

For each of the following 11 questions, please mark what your best answer.

1. Do creek and/or river banks need special attention to protect water quality?
   Yes _____No _____Don't know

2. Would you invest some of your farm and/or ranch income to protect creeks and rivers in your area?
   Yes _____Maybe _____No

3. If needed, would you be willing to change your agricultural practices to improve water quality?
   Yes _____Maybe _____No

4. Have you heard about any state or federal programs that help farmers and ranchers protect water quality?
   No _____Yes If yes, which ones_____

5. Can trees help protect the banks of creeks and rivers?
   Yes _____No _____Don't know

6. Does straightening of a creek decrease flooding?
   Yes _____No _____Don't know

7. Could you make money from leasing land along creeks and rivers for hunting?
   Yes _____Maybe _____No

8. Do you think farmers and ranchers will protect water quality without regulations or financial incentives?
   Yes _____Maybe _____No

9. What would you recommend to protect water quality?

10. Do cattle in or near a creek cause water quality problems?
    Yes _____No If Yes, what problems do they cause?

11. Are there any streambank problems on or near your property? Please describe.

Attachment B-2. Survey report

RIPARIAN MANAGEMENT EDUCATIONAL NEEDS SURVEY OF SELECTED CONSERVATION DISTRICT COOPERATORS

FINAL REPORT

JUNE 1998 – MAY 1999

BY

Troy A. Pierce, Ph.D.

STATE OF OKLAHOMA REPORT
OKLAHOMA STATE UNIVERSITY
OKLAHOMA CONSERVATON COMMISSION

INTRODUCTION

This study was initiated as a result of a recognized need for training of adult education personnel concerning riparian management. Oklahoma State University (OSU) in conjunction with the Oklahoma Conservation Commission requested that a survey be conducted to determine educational needs and knowledge of Conservation District cooperators on the subject of riparian management. The results of this study were used by OSU educators and experts to prepare for riparian management seminars given in specific Conservation Districts. An independent contractor specializing in water quality evaluation was hired to aid with the design, implementation and analysis of the survey. This study was funded by the Oklahoma State University Cooperative Extension Service, Oklahoma Conservation Commission and the Environmental Protection Agency 319(h).

METHODOLOGY

An instrument was developed to assess the knowledge and attitudes concerning streambank management among Conservation District cooperators. The survey instrument was designed by an independent contractor specializing in water quality survey design, the Oklahoma State Water Quality Specialist, and the Interim Director of the Oklahoma Conservation Commission.

Ten Conservation Districts were purposely targeted to receive the survey because educational programs for Extension Educators and District personnel were to be implemented in those Districts. The ten Conservation Districts chosen supplied a list of cooperators for each District. It was determined that 30 randomly chosen cooperators per District would be used as a sample to represent the population of cooperators in each District. This determination was based on the money and time available to conduct the study as well as the statistical sampling of at least 30 random samples to approximate a normal distribution. A random number table was used to identify the cooperators to be used for this study. The lists of 30 cooperators from each District was supplied back to the Conservation District representative who was identified by the Oklahoma Conservation Commission. The representative from each District contacted by phone the random list of 30 cooperators provided and asked the respondents to answer the survey. In some cases where phone calling did not result in completed surveys, the District representative mailed the surveys out to the list of 30 cooperators for that District. Surveying began in September 1998 and ended in May 1999.

The Conservation Districts chosen for the survey were Comanche County, Deer Creek, Garfield County, Lincoln County, Mayes County, Payne County, Pittsburg County, Upper Washita, Wagoner County and West Caddo. Of these Districts, nine had respondents who completed the survey. In many cases respondents would not respond to the survey. There were also many cooperators whose information was not current on the cooperator lists maintained by the Districts. Further, in instances where no surveys were completed in a District or cooperators had died, replacement cooperators were chosen by random selection from the cooperator lists. Even with replacement, one District had no respondents for the survey by the time it was decided surveying should end.

The population of cooperators for each district was based on the cooperator lists provided by the Conservation Districts. Population numbers were probably lower for each district than the numbers represented because of death and other attrition among cooperators. Nevertheless, the number of cooperators from each list is given as the best number for establishing the population number for each Conservation District. The population number and number of respondents for each District are as follows:

District	**Population**	**# Respondents**
Comanche County	1,371	3
Deer Creek	1,211	23
Garfield County	1,754	14
Lincoln County	1,996	10
Mayes County	1,074	0
Payne County	396	18
Pittsburg County	1,507	8
Upper Washita	693	30
Wagoner County	1,645	30
West Caddo	360	9
TOTAL	**10,933(Mayes not included)**	**145**

There were a total of 145 respondents from the nine Districts which had respondents. Upper Washita and Wagoner County Conservation Districts had complete samples of respondents who completed the survey. Since there were no respondents from the Mayes County Conservation District, this District will not be considered for this study.

RESULTS

The results are based on simple descriptive measures as the majority of Conservation Districts did not have complete samples of respondents. In Table I, the results of the survey questions based on individual Conservation District are represented. Of those who responded to

the survey, the large majority (70.1 percent) thought creeks and riverbanks needed special attention to protect water quality. Also, a large majority (80.0 percent) of respondents would at least "maybe" be willing to invest some of their farm and/or ranch income to protect creeks and rivers in their area.

Well over three quarters (85.9 percent) of respondents indicated that, if needed, they would at least be willing to "maybe" change their agricultural practices to improve water quality. However, the decided majority (81.8 percent) of respondents said that they had not heard about any state or federal programs that help farmers and ranchers protect water quality. In addition, respondents agreed, by a large margin (80.6 percent), that trees can help protect the banks of creeks and rivers.

Respondents were split almost exactly down the middle on whether or not cattle in or near a creek can cause water quality problems. Of those who thought that cattle in or near a stream could cause water quality problems, the most common problems sited included erosion and animal waste issues.

When asked if straightening a creek decreases flooding, respondents were fairly evenly split between all three responses. A little less than a third (29.4 percent) believed that straightening a creek would decrease flooding while right at one-third of respondents did not think the practice would decrease flooding. The remainder of the respondents (37.1 percent) said that they didn't know if straightening a creek would decrease flooding.

A large majority (85.8 percent) of respondents thought that at least "maybe" landowners could make money by leasing their land along creeks and rivers for hunting. Of this majority, close to half (44.0 percent) of the respondents said "yes" they did believe that landowners could make money by leasing their land along creeks and rivers for hunting.

There was a slight majority (51.5 percent) of respondents indicating that they thought farmers and ranchers would protect water quality on their own without regulations. However, about one-third (32.8 percent) of those responding said that farmers and ranchers would not protect water quality without regulations. Several (15.7 percent) said they did not know if farmers and ranchers would protect water quality without regulations.

At least two themes seemed to exist in respondents' recommendations to protect water quality. The first theme was pollution prevention and it took the form of a desire for prevention of things like erosion and illegal dumping. Secondly, the theme of controlling the movement of water dominated many of the recommendations and the use of practices such as filter strips made up the majority of these recommendations.

Problems encountered by respondents when considering creek and riverbank problems in their area included "erosion" as a main concern. Flooding also was a main concern for respondents with a few respondents expressing concern about trees in and along creeks and rivers in conjunction with the subject of flooding. Some respondents encountered problems with how roads affected creek and riverbanks in their area. As with respondents recommendations to

protect water quality many also felt that trash dumping was a problem associated with creek and riverbanks.

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT

1. Do creek and riverbanks need special attention to protect water quality?

District	Yes	Maybe	No	Don't Know
Comanche	2			1
Deer Creek	20			3
Garfield	9		2	2
Lincoln	9		1	
Payne	9		3	6
Pittsburg	6			2
Upper Washita	19		5	6
Wagoner	21		2	7
West Caddo	6		1	2
TOTAL	**101**		**14**	**29**

2. Would you invest some of your farm and/or ranch income to protect creeks and rivers in your area?

District	Yes	Maybe	No	Don't Know
Comanche	1		2	
Deer Creek	5		15	3
Garfield	3		8	2
Lincoln	8		2	
Payne	2		13	2
Pittsburg	4		4	
Upper Washita	8		13	9
Wagoner	6		12	11
West Caddo	2		7	
TOTAL	**39**		**74**	**29**

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT (*CONTINUED*)

3. If needed, would you be willing to change your agricultural practices to improve water quality?

District	Yes	Maybe	No	Don't Know
Comanche		3		
Deer Creek	13	6	4	
Garfield	6	6	1	
Lincoln	5	2	3	
Payne	8	5	4	
Pittsburg	5	3		
Upper Washita	14	15	1	
Wagoner	18	5	6	
West Caddo	5	3	1	
TOTAL	**74**	**48**	**20**	

4. Have you heard about any state or federal programs that help farmers and ranchers protect water quality?

District	Yes	Maybe	No	Don't Know
Comanche	1		2	
Deer Creek	5		17	
Garfield	2		12	
Lincoln	2		8	
Payne	3		14	
Pittsburg	6		2	
Upper Washita	5		25	
Wagoner	2		28	
West Caddo			9	
TOTAL	**26**		**117**	

If yes to question number four, which ones (# of respondents in parentheses):

Comanche	flood control (1)
Deer Creek	319 program (1)
Lincoln	pesticide management (1)
Payne	cost share (1); buffer zones (1); EQUIP (1)
Pittsburg	pond programs (3); creek program (1); flood control structures (1)
Upper Washita	CRP (1); erosion control (1)
Wagoner	drainage FSA (1); grassways (1)

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT (*CONTINUED*)

5. Can trees help protect the banks of creeks and rivers?

District	Yes	Maybe	No	Don't Know
Comanche	2			1
Deer Creek	19			4
Garfield	11		2	1
Lincoln	10			
Payne	14			3
Pittsburg	7			1
Upper Washita	20		2	8
Wagoner	25		3	2
West Caddo	8			1
TOTAL	**116**		**7**	**21**

6. Can cattle in or near a creek cause water quality problems?

District	Yes	Maybe	No	Don't Know
Comanche	1		2	
Deer Creek	15		7	
Garfield	5		8	
Lincoln	8		2	
Payne	8		7	
Pittsburg	7			
Upper Washita	3		25	
Wagoner	16		14	
West Caddo	6		3	
TOTAL	**69**		**68**	

If yes to question number six, what problems (# of respondents in parentheses):

Deer Creek erosion (5); waste (1); suspended solids (1); fecal coliform (1); pollution (1)
Garfield feedlots (1)
Lincoln erosion (4); waste (6); trails (1); downstream pollution (1)
Payne erosion (5); contamination (1); E. coli (1); waste (1); eutrophication (1)
Pittsburg erosion (4); waste (2); spray (1)
Upper Washita proximity (1)
Wagoner erosion (4); contamination (2); waste (5); sediment (1); fly spray (1); dead animals (1); disease (1); pollution (2)
West Caddo erosion (2); waste (2)

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT (*CONTINUED*)

7. Does straightening of a creek decrease flooding?

District	Yes	Maybe	No	Don't Know
Comanche	1			2
Deer Creek	3		9	11
Garfield	8		3	2
Lincoln	3		5	2
Payne	5		8	4
Pittsburg	4		3	1
Upper Washita	3		9	18
Wagoner	10		8	12
West Caddo	5		3	1
TOTAL	**42**		**48**	**53**

8. Can landowners make money from leasing their land along creeks and rivers for hunting?

District	Yes	Maybe	No	Don't Know
Comanche	1	1	1	
Deer Creek	6	12	5	
Garfield	6	7		
Lincoln	7	2	1	
Payne	8	7	2	
Pittsburg	6	1	1	
Upper Washita	13	14	3	
Wagoner	9	8	4	
West Caddo	3	4	2	
TOTAL	**59**	**56**	**19**	

9. Do you think farmers and ranchers will protect water quality without regulations?

District	Yes	Maybe	No	Don't Know
Comanche	3			
Deer Creek	7	12	4	
Garfield	7	1	5	
Lincoln	5	3	2	
Payne	7	5	5	
Pittsburg	5	3		
Upper Washita	23	7		
Wagoner	10	6	5	
West Caddo	2	7		
TOTAL	**69**	**44**	**21**	

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT (*CONTINUED*)

10. What recommendations would you make to protect water quality? (if more than one respondent, the # of respondents is in parentheses)

Comanche	prevent dumping (3)
Deer Creek	grass buffer (2); plant trees
Garfield	dam creeks; grass spillway; monitor nitrate & livestock quantity near creeks; prevent city & corporate pollution; remove trees; stop pig farms; terrace;
Lincoln	biodegradable research; clean out creeks; control pollution; control runoff; cut trees; don't graze on streambank; erosion; eliminate harmful chemicals; good regulations; monitor illegal dumping; prevent trash dumping; research; vegetation filter strips
Payne	education (2); clean-up city effluent; cost share; county government erosion control; filter strips; keep channels clear; low-till/no-till; manage golf courses; prevent illegal dumping; prevent oil company pollution; road/ditch maintenance; slow down runoff; terrace; tree planting; urban chemical management;
Pittsburg	conservation & flood control structures; management & regulations; more pasture; more ponds; plant trees; prevent dumping
Upper Washita	chemical industry regulation; prevent dumping; regulate oil field waste; septic tank education; stop environmentalists; stop open oil pits
Wagoner	prevent dumping (5); plant vegetation (3); business waste prevention; decrease cultivation; erosion prevention; improve drainage; fewer feedlots; limit pesticide use near creeks; prevent septic overflow; residential fertilizer/pesticide prevention
West Caddo	decrease animal waste near wells; fertilizer study on streambanks; grass waterways; oil field chemicals need to be nonharmful; prevent dumping; remove drift wood; riparian forest buffers; road maintenance; use less fertilizer

TABLE I. RESULTS BASED ON INDIVIDUAL DISTRICT (*CONTINUED*)

11. Could you please describe any creek or riverbank problems in your area? (if more than one respondent, the # of respondents is in parentheses)

Comanche	flooding; maintenance; straighten creek
Deer Creek	agricultural runoff; beavers; erosion; flooding; highway; steep banks; trees were removed
Garfield	beavers; clean & straighten creeks; flooding; silt; trees slowing water down
Lincoln	erosion (2); broken dikes; cropland washing; flooding; more flood control lakes; full ditches; illegal dumping; trees growing in creek; upstream debris;
Payne	erosion (3); flooding (2); litter; proper highway project management; road crossing creeks
Pittsburg	erosion (2); flooding (2); creek bends; dead trees clog creek
Upper Washita	erosion (7); shallow creeks; silt; stagnation
Wagoner	flooding (4); erosion (3); creeks should be straightened (2); beavers/muskrats; lack of vegetation; trash dumping
West Caddo	creeks are wider and more shallow than before; drainage ditch problems; driving through creek; erosion caused by reservoir surges; need bridge; rain erosion

CONCLUSIONS & RECOMMENDATIONS

The District cooperators who responded to this survey are willing to consider changing their practices to protect water quality. They also are willing to consider investing some of their own money in this effort.

State and Federal programs which help farmers and ranchers protect water quality are not known to the cooperators completing this survey. It seems that the cooperators know individual practices which protect water quality, but do not associate these practices with government programs.

While responding cooperators largely felt that trees could help protect creek and riverbanks, there is a minority of cooperators which see trees as a problem with flooding and erosion.

There is a definite need for education and demonstration projects concerning livestock impacts to creek/riverbanks and water quality. Education on the benefits of natural meandering streams also needs to be addressed.

When implementing and/or discussing the benefits of riparian area management, some economic benefit related to hunting leases should be included.

Since only around half of the responding cooperators thought farmers and ranchers would protect water quality without regulations, long term economic benefit should be included in discussions with farmers/ranchers concerning protecting their water. These discussions should also include the serious facts associated with land loss to erosion and decrease in quality of life. Additionally, the cost of being regulated versus the cost of voluntary adoption of practices should be presented to farmers/ranchers.

District Cooperators who responded to this survey desire aid in preventing problems that directly affect them such as illegal dumping and flooding along with the traditional aid available such as cost share and erosion control.

Responding Cooperators were familiar with contemporary best management practices especially concerning riparian area management.

Finally, Conservation District cooperator lists need to be updated.

Appendix C – Workshop Agenda

Table C-1. Listing of workshop speakers.

NAME	GROUP	TITLE	LOCATION
Rod Wanger	FSA		Stillwater
Grant Huggins	Noble Foundation		Ardmore
Denise Turner	NRCS	Grazing Land Specialist	Alva
John Mustain	NRCS	Resource Specialist (Agronomy)	Alva, Cheyenne
Mark Conkling	NRCS		Binger, Altus
Phil Moershel	OCC		Ardmore
Jennifer Myers	OCC	Wetlands	Ardmore, Tulsa
Dan Butler	OCC		Tahlequah, Poteau
Jim Leach	OCC		Stillwater
Chris Hise	OCC		Alva, Cheyenne, Binger, Altus, Tulsa
Mike Smolen	OCES	Assoc. Prof., Water Quality Program Coordinator	All
Bob Woods	OCES	Area Agronomist	Tahlequah, Tulsa
Jim Britton	OCES	State Poultry Specialist	Tahlequah, Poteau
Terry Bidwell	OCES	Assoc. Prof., Rangeland Management Specialist	Ardmore, Stillwater
Joe Bullard	OCES	Extension Water Quality Educator	Poteau
Tim Propst	OCES	Extension Engineer-Environmental Scientist	Alva, Cheyenne, Binger, Altus, Tulsa
Mark Gregory	OCES		Binger, Altus
Sue Gray	OCES		Tulsa
Scott Stoodley	OCES/NRCS	State EQIP Education Coordinator	Tahlequah, Ardmore, Poteau, Stillwater, Binger, Altus
Steve Mattax	ODA-FS	District Forester	Tahlequah, Ardmore Poteau
Dan Stidham	ODA-FS	District Forester	Stillwater
Tom Murray	ODA-FS		Binger
John Norris	ODA-FS		Tulsa
Tom Smeltzer	ODWC		Cheyenne
Rod Smith	ODWC		Altus
Ed Fite	Oklahoma Scenic Rivers Commission	President	Tahlequah
Reggie Blackwell	USFS		Cheyenne
Ken Frazier	USFWS		Tulsa

Attachment C-1. Workshop agendas

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: October 28, 1998

Location: Scenic Rivers Commission, Tahlequah, Oklahoma

RSVP: We are limiting this workshop to 25 people. Please make reservations with: Otis Bennett – (918) 456-1919

Schedule of Events:

9:00 - 9:15 – Introduction on the role of Riparian Areas in Water Quality-
- Otis Bennett, Oklahoma Conservation Commission

9:15 – 9:45 - Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design
- Scott Stoodley, OSU Riparian Management Technical Staff

9:45 - 10:15 – Stream Stability and Riparian Buffers
- Ed Fite, Oklahoma Scenic Rivers Commission

10:15 – 10:30 – Break

10:30 - 11:00 – Grazing Management to Protect Riparian Areas
- Bob Woods, Area Agronomist, OSU Cooperative Extension

11:00 – 11:30 - Wildlife Management in Riparian Areas
- Scott Stoodley, OSU Riparian Management Technical Staff

11:30 – 12:00 – Poultry Litter Management and Riparian Areas
- Jim Britton, Poultry Specialist, OSU Cooperative Extension

12:00 – 12:30 – Lunch - Free

12:30 – 1:00 – Tree Species for Riparian Areas
- Steve Mattax, District Forester, State Dept. of Agriculture Forestry Services, Forestry Division

1:00 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up and Final Q&A

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: November 18, 1998

Location: Carter County Cooperative Extension Office, 107 1st Avenue SW, Courthouse Annex, Ardmore, Oklahoma.

RSVP: Please make reservations with: Denise Menke (580) 223-6570

Schedule of Events: Moderator: Leland McDaniel, OSU Cooperative Extension

9:00 - 9:15 – Introduction on the Knowledge and Attitudes of Cooperators
- Mike Smolen, OSU Cooperative Extension

9:15 – 9:40 - Introduction on the role of Riparian Areas in Water Quality-
- Phil Moershel, Oklahoma Conservation Commission

9:40 – 10:05 - Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design
- Scott Stoodley, OSU Riparian Management Technical Staff

10:05 - 10:25 – Stream Stability and Riparian Buffers
- Mike Smolen, OSU Cooperative Extension

10:25 – 10:40 – Break

10:40 - 11:10 – Grazing Management to Protect Riparian Areas
- Terry Bidwell, OSU Cooperative Extension

11:10 – 11:40 - Wildlife Management in Riparian Areas
- Grant Huggins, Noble Foundation

11:40 – 12:00 – Wetland Management and Incentive Programs
- Jennifer Myers, Oklahoma Conservation Commission

12:00 – 12:30 – Lunch - Provided

12:30 – 1:00 – Tree Species for Riparian Areas
- Kevin Keyes, District Forester, State Dept. of Agriculture Forestry Services, Forestry Division

1:00 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up and Final Q&A

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: December 2, 1998

Location: Kerr Center, Poteau, Oklahoma

RSVP: We are limiting this workshop to 25 people. Please make reservations with: Lisa McRay, OSU Cooperative Extension, (918) 647-8231

Schedule of Events: Moderator: Joe Bullard, OSU Cooperative Extension

8:30 – 9:00 – Registration

9:00 - 9:15 - Introduction on the Knowledge and Attitudes of Cooperators
- Mike Smolen, OSU Cooperative Extension

9:15 - 9:40 - Introduction to the role of Riparian Areas in Water Quality-
- Dan Butler, Oklahoma Conservation Commission

9:40 - 10:05- Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design
- Scott Stoodley, OSU Riparian Management Technical Staff

10:05- 10:25 - Stream Stability and Riparian Buffers
- Mike Smolen, OSU Cooperative Extension

10:25 - 10:40 - Break

10:40 - 11:10 - Grazing Management to Protect Riparian Areas
- Joe Bullard, OSU Cooperative Extension

11:10 - 11:40 - Wildlife Management in Riparian Areas
- Scott Stoodley, OSU Riparian Management Technical Staff

11:40 - 12:00 - Poultry Litter Management and Riparian Areas
- Jim Britton, Poultry Specialist, OSU Cooperative Extension

12:00 - 12:30 - Lunch - Provided

12:30 - 1:00 - Tree Species and planting considerations for Riparian Areas
- Steve Mattax, District Forester, State Dept. of Agriculture Forestry Services, Forestry Division

1:00 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up and Final Q&A

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: December 9, 1998

Location: Payne County Expo Center, Community Building, Stillwater, Oklahoma

RSVP: Please make reservations with anyone at: (405) 747-8320

Schedule of Events: Moderator: Nathan Anderson, OSU Cooperative Extension

8:30 - 9:00 - Registration

9:00 - 9:15 - Introduction on the Knowledge and Attitudes of Cooperators
- Mike Smolen, OSU Cooperative Extension

9:15 - 9:40 - Introduction on the role of Riparian Areas in Water Quality-
- Jim Leach, Oklahoma Conservation Commission

9:40 - 10:05 - Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design
- Scott Stoodley, OSU Riparian Management Technical Staff

10:05 - 10:25 – Stream Stability and Riparian Buffers
- Mike Smolen, OSU Cooperative Extension

10:25 – 10:40 – Break

10:40 - 11:10 – Grazing Management to Protect Riparian Areas
- Terry Bidwell, OSU Cooperative Extension

11:10 – 11:40 - Wildlife Management in Riparian Areas
- Scott Stoodley, OSU Riparian Management Technical Staff

11:40 – 12:00 – Incentive Programs
- Rod Wanger, Farm Service Agency

12:00 – 12:30 – Lunch - Provided

12:30 – 1:00 – Tree Species for Riparian Areas
- Dan Stidham, (580) 237-4810 - District Forester, State Dept. of Agriculture Forestry Services, Forestry Division

1:00 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up and Final Q&A

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: March 9, 1999

Location: Greenleaf Community Center, Alva, Oklahoma

RSVP: Please make reservations with Barbara Case at: (580) 327-2786

Schedule of Events: Moderator: Bob LeValley, OSU Cooperative Extension

8:30 - 9:00 - Registration

9:00 - 9:15 - Introduction on the Knowledge and Attitudes of Cooperators –
Mike Smolen, OSU Cooperative Extension

9:15 - 10:40 -- Introduction on the Role of Riparian Areas in Water Quality—
Jim Leach, Oklahoma Conservation Commission

9:40 - 10:05 -- Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design—
Scott Stoodley, OCES-NRCS

10:05 - 10:25 – Stream Stability and Riparian Buffers—
Mike Smolen, OSU Cooperative Extension

10:25 – 10:40 – Break

10:40 - 11:05 – Wildlife Management in Riparian Areas—
Ron Masters, OCES

11:05 – 11:30 - Grazing Management to Protect Riparian Areas—
Denise Turner, NRCS

11:30 – 12:15 – Lunch

12:15 – 12:40 – Vegetation in Riparian Areas—
John Mustain, NRCS

12:40 – 12:55 – Incentives for Riparian Area Management
Scott Stoodley, OCES/NRCS

1:00 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up and Final Q&A

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: March 15, 1999 **Location:** Roger Mills County Ag Pavilion, Cheyenne, Oklahoma

RSVP: Please make reservations with Joan Taylor at: (580) 497-3339

Schedule of Events:

8:30 - 9:00 – Registration

9:00 - 9:05 – Welcome and Introductions
Moderator: Dixie Ferrel, OSU Cooperative Extension

9:05 - 9:20 – Introduction on the Knowledge and Attitudes of Cooperators
Mike Smolen, OSU Cooperative Extension

9:20 - 9:45 – Introduction on the Role of Riparian Areas in Water Quality
Chris Hise, Oklahoma Conservation Commission

9:45 - 10:05 – Riparian Management and the Sergeant Major Watershed Dam Rehabilitation Pilot Project – Dwain Phillips, NRCS

10:05 - 10:30 – Riparian Area Management Handbook – Ecoregions, Vegetation, and Riparian Buffer Design – Tim Propst, OCES

10:30 – 10:45 – Break

10:45 - 11:10 – Stream Stability
Mike Smolen, OSU Cooperative Extension

11:10 - 11:35 – Vegetation in Riparian Areas
John Mustain, NRCS

11:35 – 12:15 – Lunch - Provided

12:15 – 12:40 – Wildlife Management in Riparian Areas
Tom Smeltzer, ODWC

12:40 – 1:05 – Grazing Management to Protect Riparian Areas
Reggie Blackwell, USFS Black Kettle National Grasslands

1:05 - 4:00 – Field Trips to Various Riparian Areas

4:00 – Wrap-up

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: May 5, 1999 **Location:** Caddo Electric Cooperative, Binger, OK
(3 miles west of Binger on Hwy. 152.)

Schedule of Events:

8:30 - 9:00 – Registration

9:00 - 9:05 – Welcome and Introductions: David Nowlin, OCES

9:05 - 9:20 – Introduction on the Knowledge and Attitudes of Cooperators:
Mike Smolen, OCES

9:20 - 9:40 – Introduction on the Role of Riparian Areas in Water Quality:
Chris Hise, Oklahoma Conservation Commission

9:40 - 10:00 – Riparian Area Management Handbook Overview, Ecoregions, and
Riparian Buffer Design: Tim Propst, OCES

10:00 - 10:15 – Break

10:15 – 10:35 – Stream Stability: Mike Smolen, OCES

10:35 - 11:05 – Vegetation in Riparian Areas: Mark Conkling, NRCS

11:05 - 11:35 – Grazing Management to Protect Riparian Areas: Mark Gregory, OCES

11:35 – 12:00 – Wildlife Management in Riparian Areas: Scott Stoodley, OCES

12:00 – 12:30 – Lunch

12:30 – 12:50 – Riparian Forest Management: Tom Murray, ODA – Forestry Services

12:50 – 1:05 – Incentive Programs for Riparian Area Management:
Scott Stoodley, OCES/NRCS

1:05 - 4:00 – Field Trips to Various Riparian Areas

4:00 – 4:30 – Wrap-up

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

Date: May 19, 1999 **Location:** OCES Irrigation Research Station, Altus, OK
(2 miles south of Altus on Hwy. 283.)

RSVP: Please make reservations with the Jackson County Extension Office at: (580) 482-0823.

CCA Credit: This workshop has been approved for 7 hours credit in Soil and Water Management with the Oklahoma Certified Crop Adviser program.

Preliminary Schedule of Events:

8:30 - 9:00 – Registration

9:00 - 9:05 – Welcome and Introductions: Marty Montague, OCES

9:05 - 9:20 – Introduction on the Knowledge and Attitudes of Cooperators: Mike Smolen, OCES

9:20 - 9:40 – Introduction on the Role of Riparian Areas in Water Quality: Chris Hise, Oklahoma Conservation Commission

9:40 - 10:00 – Riparian Area Management Handbook Overview, Ecoregions, and Riparian Buffer Design: Tim Propst, OCES

10:00 - 10:20 – Stream Stability: Mike Smolen, OCES

10:20 – 10:35 – Break

10:35 - 11:05 – Vegetation in Riparian Areas: Mark Conkling, NRCS

11:05 - 11:35 – Grazing Management to Protect Riparian Areas: Mark Gregory, OCES

11:35 - 12:00 – Wildlife Management in Riparian Areas: Rod Smith, ODWC

12:00 - 12:30 – Lunch

12:30 - 12:50 – Incentive Programs for Riparian Area Management: Scott Stoodley, OCES/NRCS

1:05 - 4:00 – Field Trips to Various Riparian Areas

4:00 - 4:30 – Wrap-up

Riparian Area Management Workshop
Co-sponsored by:
OSU Cooperative Extension and Tulsa County Blue Thumb

Date: June 3, 1999 **Location:** OCES Ag Building
4116 E. 15th, Tulsa, OK

CCA Credit: This workshop has been approved for 7 hours credit in Soil and Water Management with the Oklahoma Certified Crop Adviser program.

Agenda:

8:30	-	9:00	–	Registration
9:00	-	9:05	–	Welcome and Introductions *Sue Gray, OCES*
9:05	-	9:20	–	Introduction on the Knowledge and Attitudes of Cooperators: *Mike Smolen, OCES*
9:20	-	9:40	–	Introduction on the Role of Riparian Areas in Water Quality *Chris Hise, Oklahoma Conservation Commission*
9:40	-	10:00	–	Riparian Area Management Handbook Overview *Tim Propst, OCES*
10:00	-	10:20	–	Stream Stability *Mike Smolen, OCES*
10:20	-	10:35	–	Break
10:35	-	11:05	–	Vegetation in Riparian Areas *Sue Gray, OCES*
11:05	-	11:35	–	Grazing Management to Protect Riparian Areas *Bob Woods, OCES*
11:35	-	12:05	–	Wildlife Management in Riparian Areas *Ken Frazier, US Fish and Wildlife Service*
12:00	-	12:30	–	Lunch
12:30	-	12:50	–	Forestry Management in Riparian Areas *John Norris, ODA-Forestry Services*
12:50	-	1:05	–	Incentive Programs for Riparian Area Management *Jennifer Myers, Oklahoma Conservation Commission*
1:05	-	4:00	–	Field Trips to Various Riparian Areas
4:00	-	4:30	–	Wrap-up

Appendix D – Workshop Curriculum

Attachment D-1. Riparian area management incentives curriculum

Incentives for Riparian Area Management

Scott Stoodley, Ph.D.
Dept. of Plant & Soil Sciences
Oklahoma State University
NRCS/OCES

Incentive and Cost-Share Programs - Riparian Areas

- 2 types available - Federal and State
- Programs vary as to eligibility, types of payments, types of cost-share, and management requirements

Federal Programs

- Environmental Quality Incentives Program (EQIP) – USDA
- Partners For Wildlife (PFW) – USFWS
- Wildlife Habitat Incentives Program (WHIP) – USDA
- Conservation Reserve Program (CRP) - USDA
- Wetlands Reserve Program - (WRP) - USDA

Environmental Quality Incentives Program (EQIP) – USDA

- Locally-led conservationists submit proposed priority areas
- If funded, specific environmental concerns are targeted
- Competitive bidding process
- Contracts that have the greatest benefit with the least amount of cost are more likely to be funded

Environmental Quality Incentives Program (EQIP) – USDA

- Participants must be farming or ranching
- Provides technical, educational, and financial assistance
- Provides up to 75% cost-share

Environmental Quality Incentives Program (EQIP) – USDA

- Incentive payments up to 3 years for implementing various management practices
- Contracts run 5-10 years
- Incentive payments limited to $10,000/person and $50,000 for life of contract

Partners For Wildlife (PFW) – USFWS

- Provide grants to States to benefit fish and wildlife species and to provide non-consumptive fish and wildlife recreation opportunities
- Program emphasizes habitat restoration (i.e., hydrology and vegetation), and to a lesser extent habitat improvement and creation

Partners For Wildlife (PFW) – USFWS

- Projects with private landowners must secure a minimum 10-year habitat development agreement
- The maximum amount of Service funds that may be expended on a person's property during any single fiscal year is $10,000

Wildlife Habitat Incentives Program (WHIP) – USDA

- Provides technical and cost-share assistance to landowners to develop improved wildlife habitat
- Cost-share assistance may pay for up to 75 percent of the cost of installing wildlife habitat development practices on the land

Wildlife Habitat Incentives Program (WHIP) – USDA

- WHIP offers 10-year contracts
- The total cost-share amount cannot exceed $10,000 per contract
- USDA will work with state and local partners to establish wildlife habitat priorities in each state. Competitive bidding

Conservation Reserve Program (CRP) - USDA

- The 1996 Farm Bill allows for CRP non-competitive, continuous sign-up for environmentally conscious conservation practices, such as riparian buffers and grass waterways (CP-22)
- Contracts run 10-15 years

Conservation Reserve Program (CRP) - USDA

- CRP offers:
  - annual rental payment
  - incentive payment
  - cost-share assistance
  - maintenance payments

Wetlands Reserve Program - (WRP) - USDA

- Voluntary program to restore and protect wetlands on private property
- It is an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land

Wetlands Reserve Program - (WRP) - USDA

- The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration
- Permanent Easement - payment will be the lesser of: the agricultural value of the land, an established payment cap, or an amount offered by the landowner

Wetlands Reserve Program - (WRP) - USDA

- In addition to paying for the easement, USDA pays 100 percent of the costs of restoring the wetland
- 30-Year Easement - Easement payments are 75 percent of what would be paid for a permanent easement. USDA also pays 75 percent of restoration costs

Wetlands Reserve Program - (WRP) - USDA

- Restoration Cost-Share Agreement. This is an agreement (generally for a minimum of 10 years in duration) to re-establish degraded or lost wetland habitat
- USDA pays 75 percent of the cost of the restoration activity. This does not place an easement on the property

State Incentive Programs

- Stewardship Incentive Program (SIP) - State Department of Agriculture-Forestry Services
- Eligibility: Farmers, ranchers and landowners who have streamside forests or would like to establish a forested riparian buffer

Stewardship Incentive Program (SIP)

- Commercial forestry operators are not eligible
- Provides technical and financial assistance. This program can assist with planting trees, establishing wildlife habitat, and installing fences to protect streamside forests

State Programs

- New State legislation has made available $15,000 per conservation district as supplemental cost-share assistance
- Riparian buffers qualify for this assistance

Questions???

Attachment D-2. Stream stability curriculum

Riparian Area Management Channel Considerations

M. D. Smolen
Biosystems and Agricultural Engineering
Oklahoma State University

Overview

- Sources of instability in Oklahoma streams channels.
- Assessment of channel stability and stability problems.
- The decision of whether to address a stream bank problem.

Definition of Stable Channel

- A stable channel carries all the water and sediment it receives without changing shape or pattern.
- This means:
  Neither erosion nor deposition

Historical problem

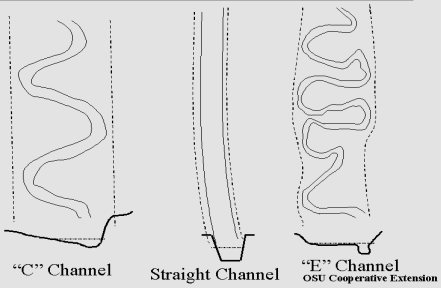
- Many channels are already clogged (from previous generations).
- Erosion control has reduced sediment loads to channels.
- Channels have been straightened.
- Riparian areas have been cleared.
- Roads and bridges constrain channels.

Current problem

- Many of Oklahoma's channels are not stable.
- They are finding a new equilibrium.
- Some will get worse before they get better.

Channel must carry all the sediment and water completely through the reach.

Which channel is more efficient?



The "C" Channel is most efficient

- "C" channel has the right shape and slope for a wide range of flows.
- Straight channel is:
  - too steep for high flow (erosion occurs)
  - too wide for low flow (deposition occurs)
- "E" channel:
  - Curves are too tight.
  - Not enough slope.

Why do channels meander?

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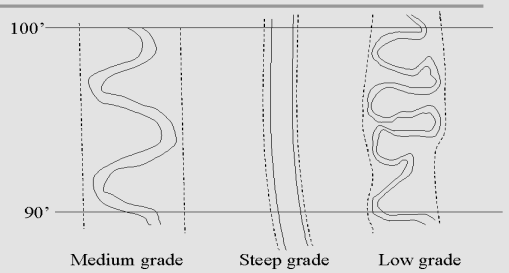
Meandering (sinuosity) reduces grade.



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Stream needs a flood plain

- Flood plain is a relief area to store water and prevent downstream flooding.
- Vegetation in the flood plain absorbs energy from flood water.

A straightened creek does not use its flood plain

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Curves don't cause flooding

- The curves cause the creek to "use" its flood plain.
  - If you are on the flood plain, this looks like flooding.
  - If you are downstream, you might appreciate it.
- Straightening may protect one reach, but it does not control the flood water.

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Do trees cause flooding?

- Generally, No.
  - Trees on the flood plain reduce flow velocity and increase water depth.
  - This will reduce flooding somewhere else.
- But, Yes. They may cause local flooding.
  - If a tree falls into the channel, it may obstruct the flow.

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Which is better trees or grass?

- Depends on the ecoregion
- Where trees are suited, they will hold soil better than grass.
- Where trees are not suited, shrubs and grasses are preferred.

Trees do not cause erosion.

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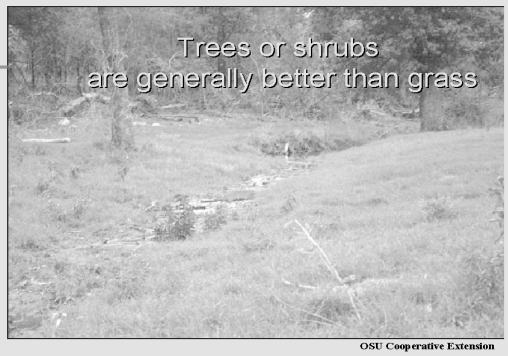

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Channel Assessment

- Office assessment
- Field assessment

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Aerial Photos and Topo Maps

- watershed land use (past and present)
- basic channel morphology
- meander pattern- has it been straightened?
- location of bridges, dams, and road crossings
- general topography and grade

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Examine soil survey

- for erodible soils
- rock formations
- water features

OSU Cooperative Extension

Assessment in the Field

- Watershed -- land use
- Riparian area -- condition and type of vegetation
- Wildlife potential

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Assessment of Channel

- Channel grade, profile, and pattern
- Evidence of straightening
- mid-channel bars (or trash)
- Habitat and structures (Riffles, Runs, Pools)

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Assessment of Banks

- Look for steep or undercut banks
  - Extremely steep or "blown out" banks
  - Sloughing, head cutting
  - Seepage from the banks
  - junk cars

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Reasons for channel instability

- Peak flows too high (urbanization)
- Sediment load too high (watershed sources)
- Removal of riparian vegetation
- Change of grade
- Straightening of channels
- Widening of channels
- Obstruction of channels

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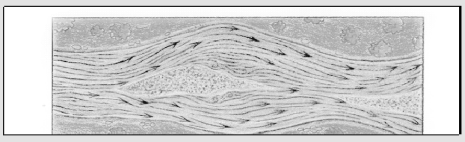
Bars, Islands, and other obstructions



Obstruction of the channel causes erosion of the banks.

Stream Bank Stabilization-armoring

- Rip-rap and other structures are very expensive.
- Armoring one place causes another to blow out.
- Armoring gives poor aesthetics.
- Armoring gives poor aquatic (and terrestrial) habitat.

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Bio-Engineering (use of vegetation)

- Preferred if it will work
  - may not stand the highest flows
  - but may be self-healing
- May need some structural support
- Less expensive than all structures

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Stream Restoration

- Re-establish the meander pattern
- Re-establish the stream profile
- Re-establish a riffle and pool structure
- Slope back high banks
- Establish bank vegetation
- Establish riparian vegetation

Not Cheap

OSU Cooperative Extension

How much is worth doing?

- Before investing large budget, determine if the stream is stable.
  - If not stable, will it recover by itself? or
  - Is restoration needed?
- Riparian area value may be its own justification.

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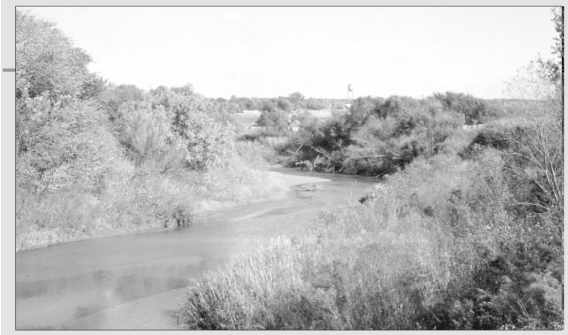

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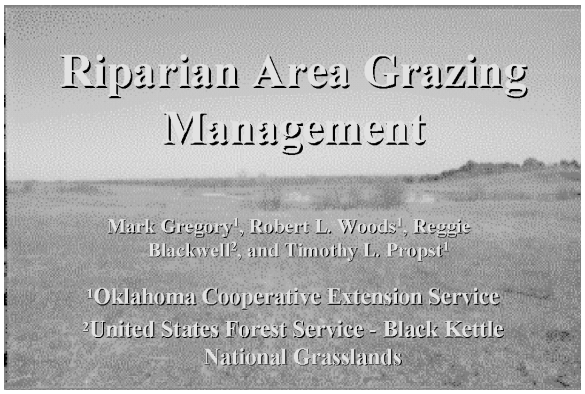
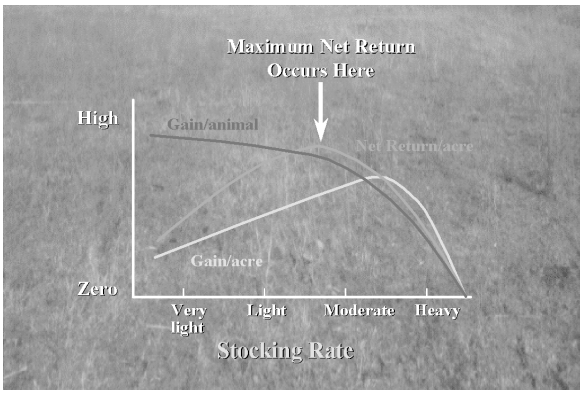
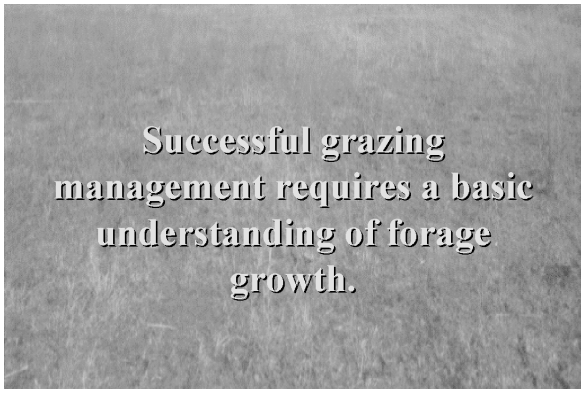
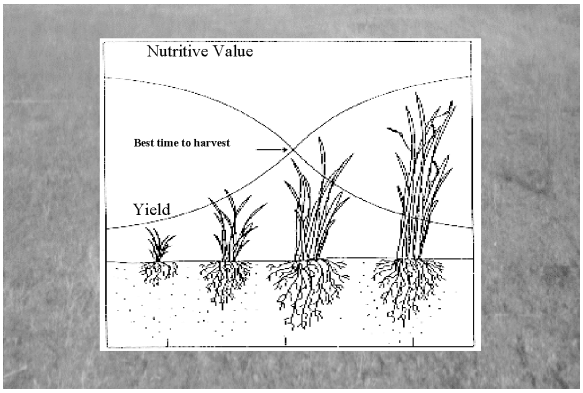
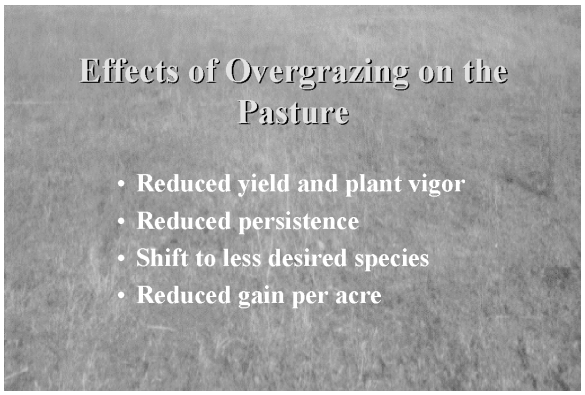
Attachment D-3. Riparian grazing management curriculum

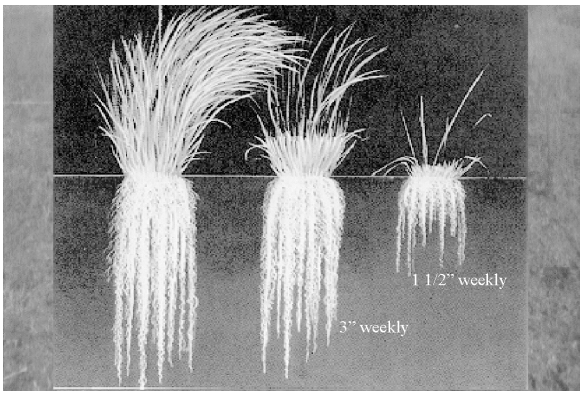


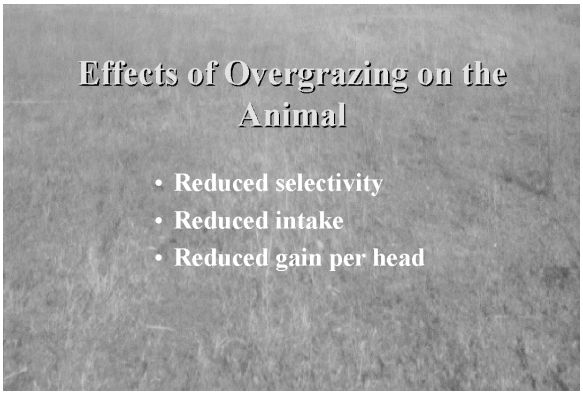












Grazing Systems

- Continuous
- Rotational
- Short Duration
- Strip
- Creep
- Management Intensive
- Intensive Early Stocking

Continuous Stocking

- Traditional
- Best individual animal performance
- No allowance for deferment
- Could increase cost on large area
- Only way to alter is with stocking rate

Rotational Stocking

- Increased flexibility
- Improved control of forage resource
- Improved harvest efficiency
- Increased management inputs
- Decreased selectivity
- Decreased individual performance

Grazing Management Based on Forage Type

Native Range

- Adjust stocking rate
- Slow growth = Long rest

Introduced Forages

- Fertilize to increase carrying capacity
- Fast growth = Short rest

Which Grazing System?

System should fit the forage and accomplish a predetermined goal(s).

Grazing System Objectives

- Save labor equipment
- Improve cattle management
- Improve harvest efficiency
- Control residue height
- Control where excess accumulates
- Reduce nutrient runoff

Grazing System Objectives

- Improve plant vigor
- Control forage maturity
- Improve grazing distribution
- Avoid overgrazing
- Monitor forage supply
- Riparian protection

Riparian Protection

- Properly managed uplands
  - Maximum filter strips
  - Stabilization of soil loss
  - Prescribed fire

Riparian Protection

- Properly managed uplands
- Reduced traffic in riparian area
  - No salt blocks
  - No feeding areas
  - No pesticides
  - No pens

Riparian Protection

- Properly managed uplands
- Reduced traffic in riparian area
- Water source management
  - Restricted use of riparian area
  - Alternative upland sources

Riparian Protection

- Properly managed uplands
- Reduced traffic in riparian area
- Water source management
- Rotational use of riparian pastures

Riparian Protection

- Properly managed uplands
- Reduced traffic in riparian area
- Water source management
- Rotational use of riparian pastures
- Total exclusion, if needed
  - wildlife, water quality, recreation

Riparian Pasture Rotation

- No continuous grazing

Riparian Pasture Rotation

- No continuous grazing
- Adequate pasture size
  - Filtration
  - Meet designed use

Riparian Pasture Rotation

- No continuous grazing
- Adequate pasture size
- Maintain proper rest period

For native, mixed grass prairie in western Oklahoma

- Usage of 30 days or less is most ecologically sound
- Minimum rest from grazing to allow full recovery is 75-90 days
- Moderate grazing use (≤ 50%) during growing season

Pasture Number Comparison

Pastures (#)	Use (<30d)	Rest (75-90d)	Grazed (d)	Rest (d)	Rest (%)
1	No	No	365	0	0
2	No	No	183	182	50
3	Yes	No	122	243	67
4	Yes	Yes	91	274	75
5	Yes	Yes	73	292	80
6	Yes	Yes	61	304	83
8	Yes	Yes	46	319	88
10	Yes	Yes	37	328	90

Riparian Pasture Rotation

- No continuous grazing
- Adequate pasture size
- Maintain proper rest period
- Timing and duration of use

Riparian Pasture Rotation: Timing and Duration

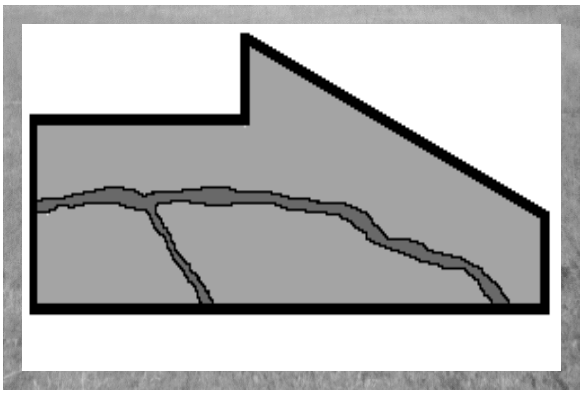
- Winter: Best for longer grazing period
  - forage dormant
- Early or late growing season: next best
  - dependent on forage inspection
  - cheat grass control
- Growing season: least desirable
  - shorter use period than “regular” pasture

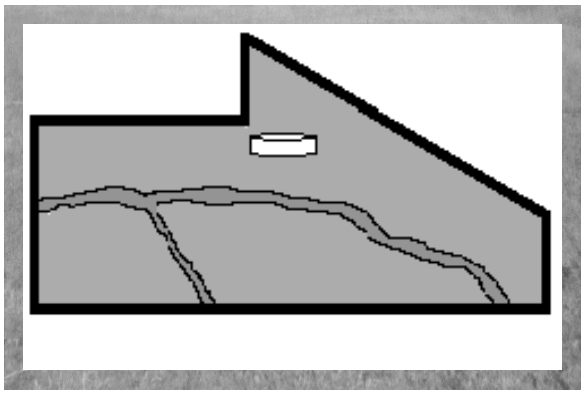
Design Suggestions

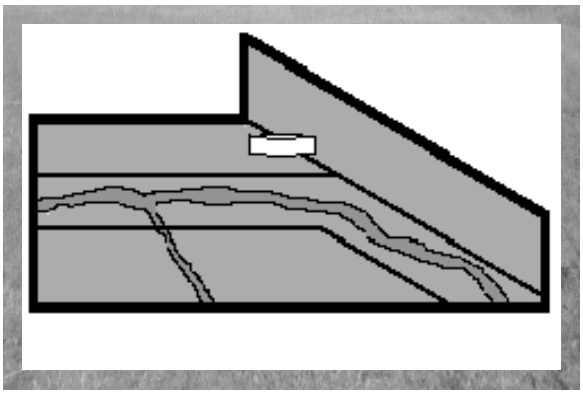
- Management considerations
  - More pastures require more timely moves
    - Days not weeks
  - Better to start small and work up
- Pastures do not have to be equal sized or square.
- Pie design is not recommended.
- Lanes and water access small enough to prevent livestock from congregating.

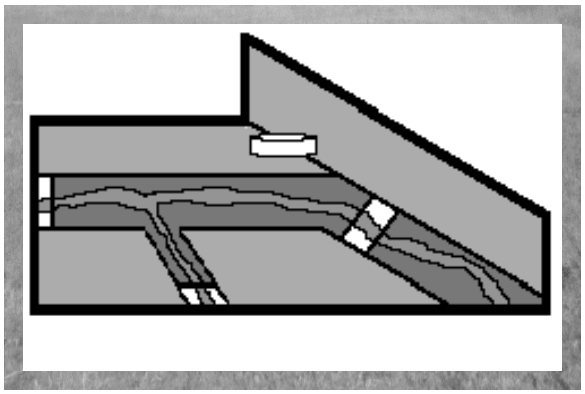
Fencing Considerations

- Livestock Behavior
- Terrain
- Soils
- Water
- Forage Type
- Fence Type









Attachment D-4. Riparian Area Management Handbook introduction curriculum

Riparian Area Management Handbook

Timothy L. Propst and Scott Stoodley
Oklahoma Cooperative Extension Service
Oklahoma State University

Riparian Area Decline

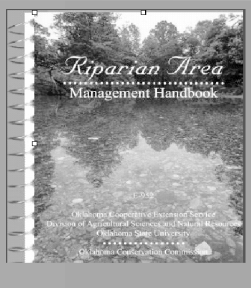
- Compared to pre-settlement area
  - Estimated 75% decrease in riparian habitat in western Oklahoma - Stinnett and Smith, 1987
  - Estimated 85% decrease of riparian habitat in eastern Oklahoma - Brabander, Masters, and Short, 1985
- Riparian area degradation continues - urbanization, channelization, agricultural practices

Project Genesis

- 1993 - NPS - Technical Assistance for the Establishment and Maintenance of Riparian Corridors
  - needed starting point
- 1994 - Wetlands - Management Program for Riparian Wetlands to Protect Water Quality
  - developed the Riparian Area Management Handbook

Riparian Area Management Handbook

- Product of OCC Task #75, FY1994 104 (b)(3) Task #200
  - *Management Program for Riparian Wetlands to Protect Water Quality*
- 110 page, full-color
- Extension Publication - E-952



Riparian Area Management Handbook: Contributors

- OCES
- OSU
- OCC
- NRCS
- ODWC

ODA - Forestry Division
Oklahoma Biological Survey
OU
US Forest Service
US Fish and Wildlife

Riparian Area Management Handbook: Chapters

- Benefits and Functions of Riparian Areas
- Ecoregions
- Vegetation
- Forest Management in Riparian Areas
- Assessing Stream Stability and Sensitivity
- Grazing and Riparian Area Management
- Managing Riparian Areas for Wildlife
- Riparian Buffer Recommendations

Riparian Area Management Handbook: Utility

- Gives user background information and specifics about riparian management including buffer design, grazing, wildlife, and vegetation management, and stream stability
- Provides additional resource information for further detail about specific issues
  - Who to Contact, p. 86

Benefits and Functions of Riparian Areas

- Help mitigate the effects of non-point source pollution
- Reduce flood magnitude
- Improve water quality
- Critical to the health of terrestrial and aquatic ecosystems
- Repositories of biological diversity

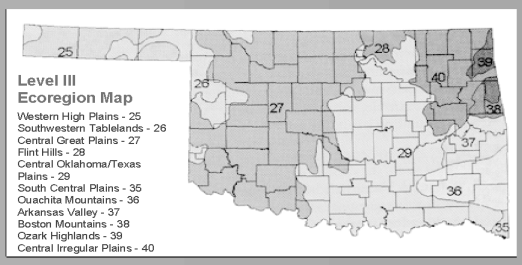
Benefits and Functions of Riparian Areas

- Store and absorb water
- Dissipate energy from high flows
- Stabilize stream banks
- Trap sediment and nutrients
- Shade streams and help maintain temperature for fish habitat
- Provide shelter and food for birds and other animals

Ecoregions

- Provide a large-scale framework to group similar areas based on soil, land-use, and potential natural vegetation
- Guide managers' riparian management recommendations
  - species choices for vegetation plantings
  - wildlife habitat potential

Oklahoma Ecoregions, p. 5



Handbook and Ecoregions

- Geology
- Soils
- Indigenous plant and animal communities
- Unique biotic and abiotic features

Vegetation

- Key to the quality and effectiveness of any riparian area
- Appropriate riparian vegetation is ecoregion dependent
- Chapter contains a guide for developing riparian plantings with native species in mind

Vegetation Tables

- 1 - ecoregional riparian vegetation associations, p. 22-31
  - Forest and woodland, shrubland, herbaceous
- 2 - ecoregional native woody species, p. 32-33
- 4 - high wildlife value riparian trees and shubs, p. 80
- 5 - common woody species, p. 81-85
  - Availability, wildlife value, root type, and growth rate

Forest Management in Riparian Areas

- Identifies special precautions to use when landowner objectives include the production and harvesting of trees in riparian areas
- Includes BMPs, management objectives and goals, and additional resources for further information

Assessing Stream Stability and Sensitivity

- Provides methodology for assessing streams and external factors prior to large investment in riparian restoration, protection, and management systems
- Information from assessment will help determine if riparian management alone will solve problem or if more aggressive measures are necessary

Grazing Management

- Grazing is not always bad! Fencing is not always necessary!
- Proper management can help maintain riparian areas in a healthy and productive condition
- Alternative management options are available

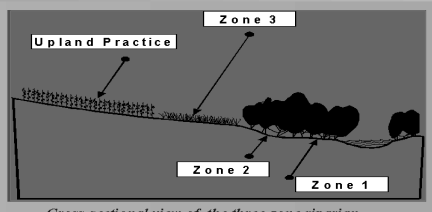
Wildlife Management

- Both game and non-game species thrive in riparian areas
- Management criteria is provided for in this chapter
- Leasing land for hunting is economic option in many places

Riparian Buffer Recommendations

- Riparian buffer should be considered where:
  - Water quality is impaired
  - Wildlife habitat enhancement is desired
  - Protection from future water quality impairment is desired
  - Stream temperature and aquatic habitat are considerations
  - Streambank erosion is a concern

3-Zone Riparian Buffer System



Cross-sectional view of the three-zone riparian buffer system; (modified from NRCS, Riparian Forest Buffer Standard)

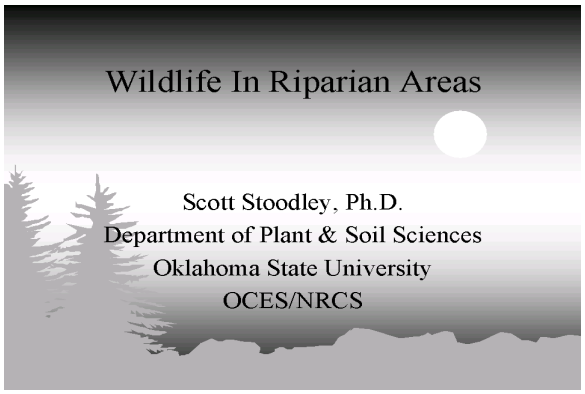
Riparian Buffer System Recommendations

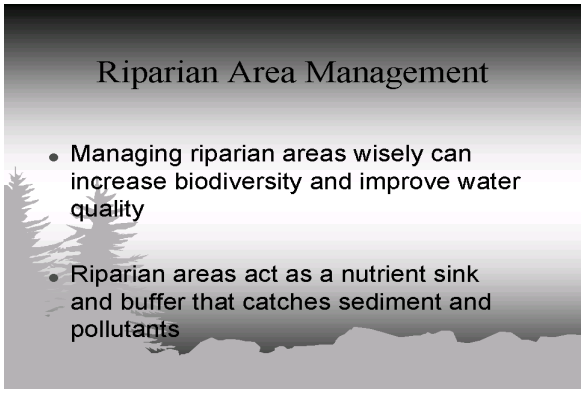
- Zone 1 - 15 ft wide - undisturbed area of native trees or shrubs (little management activity)
- Zone 2 - 60 ft wide - managed zone of native trees, shrubs, forbs, or grasses
- Zone 3 - 20 ft wide - designed as a runoff control zone of dense, perennial grasses and forbs

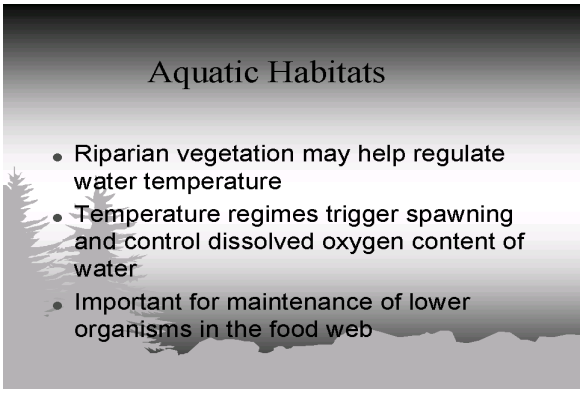
Riparian Area Management Handbook: Purpose

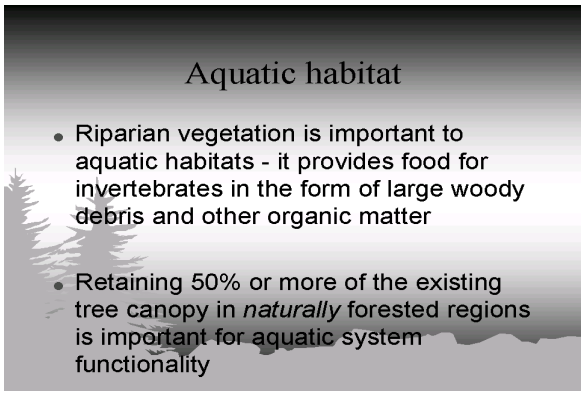
To provide a resource of riparian-related information to the general public and technical staffs

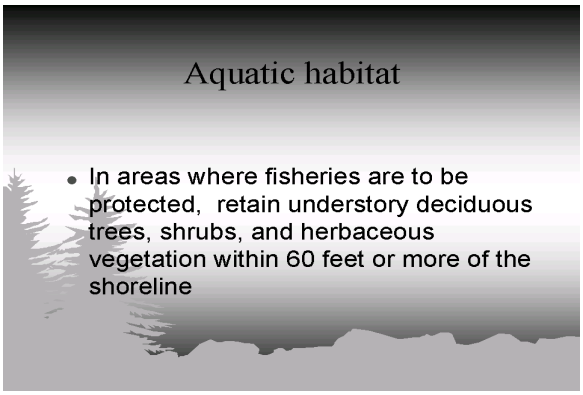
Attachment D-5. Riparian area wildlife management curriculum

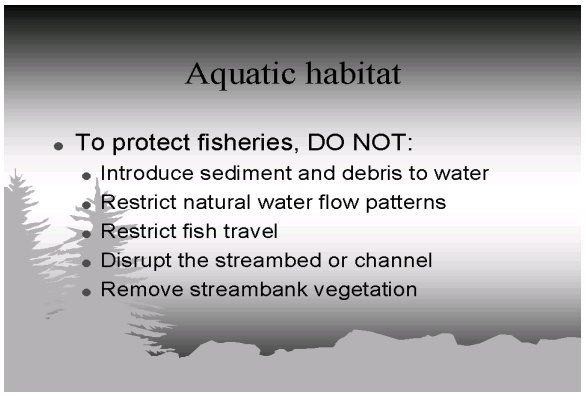


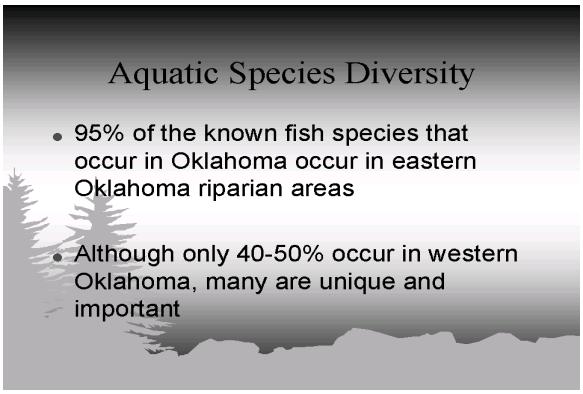












Terrestrial habitat

- Riparian areas are important because they:
  - Provide a water source
  - Provide structural diversity of habitat through diverse vegetation
  - Maximize wildlife diversity through interspersion of riparian and upland communities

Terrestrial habitat

- Provide a variety of wildlife nesting and feeding sites
- Provide important travel corridors that promote movement and dispersal of wildlife species

Terrestrial habitat

- Riparian woodlands offer a larger and more structurally complex habitat than windbreaks or shelterbelts
- Structural and species composition variation in riparian vegetation increases animal species richness, diversity, and abundance

Terrestrial habitat

- The greatest wildlife diversity in western riparian areas can be found in areas with a variety of habitats - grasslands and shrublands interspersed with occasional trees

Terrestrial habitat

- Wildlife and plant diversity is not always the best indicator of riparian area health!
- Native species are the key

Wildlife and Grazing

- Grazing by livestock will alter riparian vegetation
- Grazing inhibits establishment of some plants, limits growth of others, and changes the character of the community

Wildlife and Grazing

- Limit grazing from late fall until late spring
- Grazing at these periods dramatically changes habitat structure and may seriously impact shrub and herbaceous layers that provide food and cover

Wildlife and Grazing/Haying

- Peak nesting/brooding is in April to mid-May
- Peak fawning is late April to early June

Wildlife and Grazing

- To optimize wildlife benefits, riparian areas should be grazed only during the growing season and periodically rested
- Periodic late spring and early summer grazing by cattle, at low stocking rates, can stimulate new plant growth without damaging vegetation structure

Riparian Buffer Size - Birds

- Riparian area size affects species mix of migratory and resident breeding birds
- Riparian woodlands of 12 to 15 ac are necessary to support high bird diversity
- 135 bird species associated with western Oklahoma riparian areas

Wildlife and Trees

- High quality wildlife trees are often present in riparian areas and are used by many species. They should be retained whenever possible.
- When cutting timber or thinning trees, fruit and mast producing trees should be left standing.

Wildlife and Trees

- If you plan to cut trees for firewood or other wood products, choose a method appropriate for the tree species you want to regenerate
- Use selective methods for shade tolerant trees and patch cuts for shade intolerant trees

Riparian Buffer Size - Mammals

- Few mammals are exclusively riparian dependent
- Riparian corridors are important to mammals because they provide food, shelter, cover, and water in greater abundance than uplands

Riparian Buffers - Mammals

- 30+ mammal species occur in riparian habitats of western Oklahoma
- Riparian zones often form the core area of home ranges
- Deer prefer the cover of riparian areas and use them for security and as travel corridors
- Racoons, squirrels, rabbits and coyotes are common in riparian areas

Wildlife Tables

- Tables 1 & 2 in the Appendix list tree species found in Oklahoma riparian areas and suggest minimum widths for riparian buffers related to wildlife concerns
- Table 3 lists shrubland/thicket-dependent wildlife species that may be attracted to a riparian buffer

Wildlife Tables

- Table 4 in the Appendix lists Riparian tree and shrub species with relatively high value to wildlife

Wildlife Considerations

- When designed with upland wildlife habitat considerations in mind, riparian buffers incorporate the following factors:
  - Wildlife species native to the area
  - Species targeted for management
  - Structure and size of the habitat required for targeted species

Wildlife and Economics

- Wise management of wildlife can put $$ in your pocketbook
- Consider recreational leasing as management option

Wildlife and Economics

- Types of Recreational Leases
  - Hunting
  - Fishing
  - Camping
  - Birding/Bed & Breakfast

Wildlife Considerations

- Terrestrial wildlife diversity increases dramatically when habitat size increases from 10-20 acres
- Above 20-acres, terrestrial wildlife diversity rises significantly with each 10-15 acre increase

Wildlife Considerations

- Size, composition and structure of the habitat determines what will live there
- Species diversity tends to increase with riparian zone size

Wildlife Considerations

- Depending on site conditions, a riparian forest buffer as little as 50 feet wide may provide wildlife habitat
- Habitat needs vary from species to species. Individual species needs must be considered when planning for wildlife

Wildlife Considerations

- Not all riparian areas should have trees planted on them
  - review Soil Survey to determine naturally existing condition

Wildlife Considerations

- Introduction of exotic species is one of the major problems facing riparian area management in western Oklahoma

Wildlife Considerations

- Salt cedar encroachment has a major negative influence on wet and dry sandbar dynamics and associated wildlife species
- Juniper encroachment changes riparian habitat structure - makes it unsuitable to many species

Wildlife Considerations

- Autumn and Russian olive are extremely invasive and change habitat structure important for riparian associated wildlife species
- Use native species for any plantings

Questions?

Attachment D-6. Riparian vegetation curriculum

Oklahoma Riparian Area Vegetation

Mark D. Conkling[1], John W. Mustain[1] and Timothy L. Propst[2]

[1]Natural Resource Conservation Service
[2]Oklahoma Cooperative Extension Service

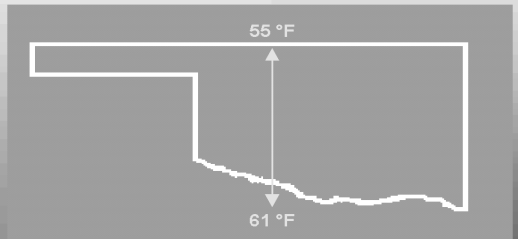
Definition

- *Riparian* - from the Latin "riparius," meaning of or relating to the bank of a stream, river, lake, or other body of water
- *Riparian area* - the geographically delineated areas with distinct resource values that occur adjacent to streams, lakes, ponds, wetlands, and other water bodies.
- *Riparian species* - native species adapted to live near water

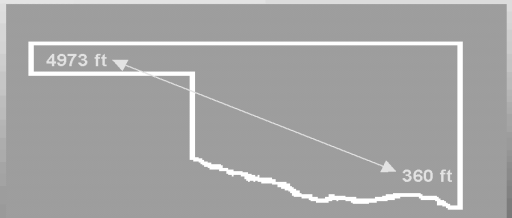
Riparian Area Vegetation Types

- Trees
- Shrubs
- Grasses
- Sedges
- Various forbs

Oklahoma Temperature Extremes

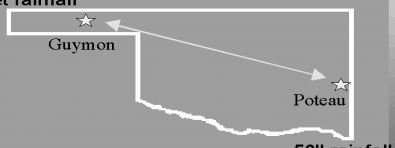


Oklahoma Elevation Extremes



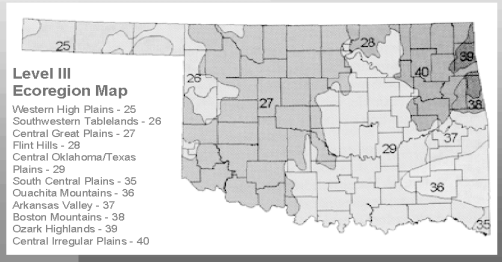
Oklahoma Rainfall Extremes

18" rainfall
68" lake evap.
-50" net rainfall



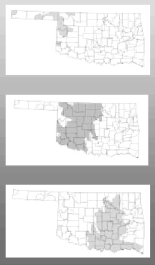
56" rainfall
48" lake evap.
8" net rainfall

Oklahoma Ecoregions



Riparian Vegetation by Ecoregion

- Southwestern Tablelands
  - 17 vegetation associations
  - 7 woody species
- Central Great Plains
  - 24 vegetation associations
  - 26 woody species
- Central Oklahoma/Texas Plains
  - 42 vegetation associations
  - 42 woody species



Native Vegetation

- Adapted to the Site
  - Drought
  - Fire
  - Competition
  - Grazing
  - Insects
  - Disease
  - Man

Filter Strips/Riparian Buffers:

- An area of vegetation for removing sediment, organic matter, and other pollutants from runoff and waste water
  - Filters runoff water by trapping sediment, nutrients, pathogens, pesticides, etc.

Filter Strips/Riparian Buffers: Purpose

- Primary
  - protect or improve water quality
- Secondary
  - erosion control
  - wildlife habitat
  - forage production
  - aesthetics
  - etc.

Filter Strips/Riparian Buffers: Characteristics

- Located on the lower edge of cropland fields, areas of animal waste production, or areas where animal wastes are applied and adjacent to bodies of water
- Width depends on slope and the type of pollutant to be managed
- Vegetation depends on site characteristics, pollutants, and management upslope

Trees vs. Grass

- Trees provide more benefits
  - *If suited to location*
- Establish historical species

Invasive Exotic Species

- Upset the balance of riparian areas
  - Affect stream flow dynamics
  - Change biological diversity
  - Degrade wildlife habitat
  - Compete with preferred species
  - No natural controls
  - Long-term pest

Invasive Exotic Species

- Salt cedar
- Russian olive
- Eastern red cedar*

Riparian Tree Species

Annual rainfall >20"

- Primary
  - Willow
  - Cottonwood
  - American elm
  - Hackberry
- Secondary
  - Black walnut
  - Green ash
  - Persimmon
  - Western soapberry
  - Eastern red cedar
  - Tamarisk

Riparian Vegetation Choices

- Match riparian management with landowner's objective:
  - Timber harvest
  - Wildlife management
  - Stream shading for fish habitat
  - Erosion prevention
  - Etc.

Riparian Vegetation Choices (cont.)

- Utilize plants with multiple values
  - timber
  - erosion control
  - biomass
  - fruit
  - nuts
  - browse
  - nesting
  - pesticide tolerance
  - aesthetics

Riparian Vegetation Choices (cont.)

- Site characteristics to consider
  - Bottomland or upland?
  - What species are present?
  - What species grow on adjacent sites?
  - What species grow on similar sites?
  - Check species against handbook list
  - Experience
  - Availability

Using the Handbook

- Determine relevant ecoregion (p. 5)
- Determine possible vegetation associations (p. 22)
- Select specific tree species (p. 32)
- Research tree selections (p. 81)
  - availability, wildlife value, root type, growth rate, etc.

Appendix E – Workshop Field Sites

Attachment E-1. Photos of Reeds Ranch near Ardmore, OK.

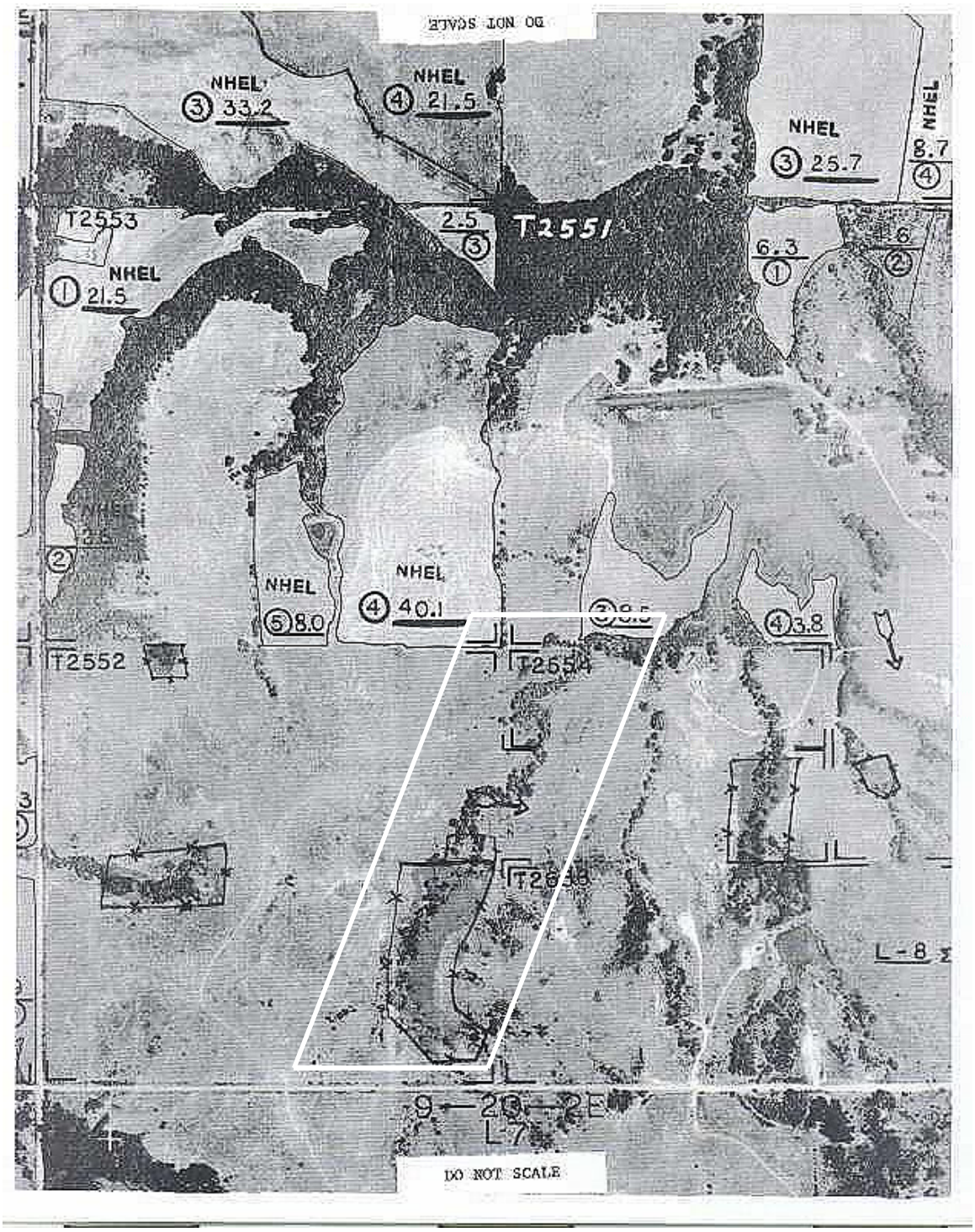
Attachment E-2. Photos of field site near Tahlequah, OK.




Attachment E-3. Photos of Kerr Center for Sustainable Agriculture land near Poteau, OK.

Attachment E-4. Photos of Bidwell Ranch near Stillwater, OK.

Figure E-1. Aerial photograph of field trip site near Stillwater.



White lines encompass general field trip area. Black X-lines (--X--) represent existing and/or potential riparian fencing.

Attachment E-5. Stillwater field trip questionairre

Riparian Area Management Workshop Agenda
OSU Cooperative Extension

FIELD TRIP – TERRY BIDWELL'S PROPERTY

1) Is current stocking rate appropriate for the land?

2) What stocking rate would you suggest for this property?

3) Is the Riparian Zone on this property overgrazed?

4) What fencing design would you propose for the property? Please draw on map provided.

5) Would you recommend permanent or electric fencing?

Attachment E-6. Photos of Faulkner Ranch near Alva, OK.




Figure E-2. Aerial map of field trip site near Alva.

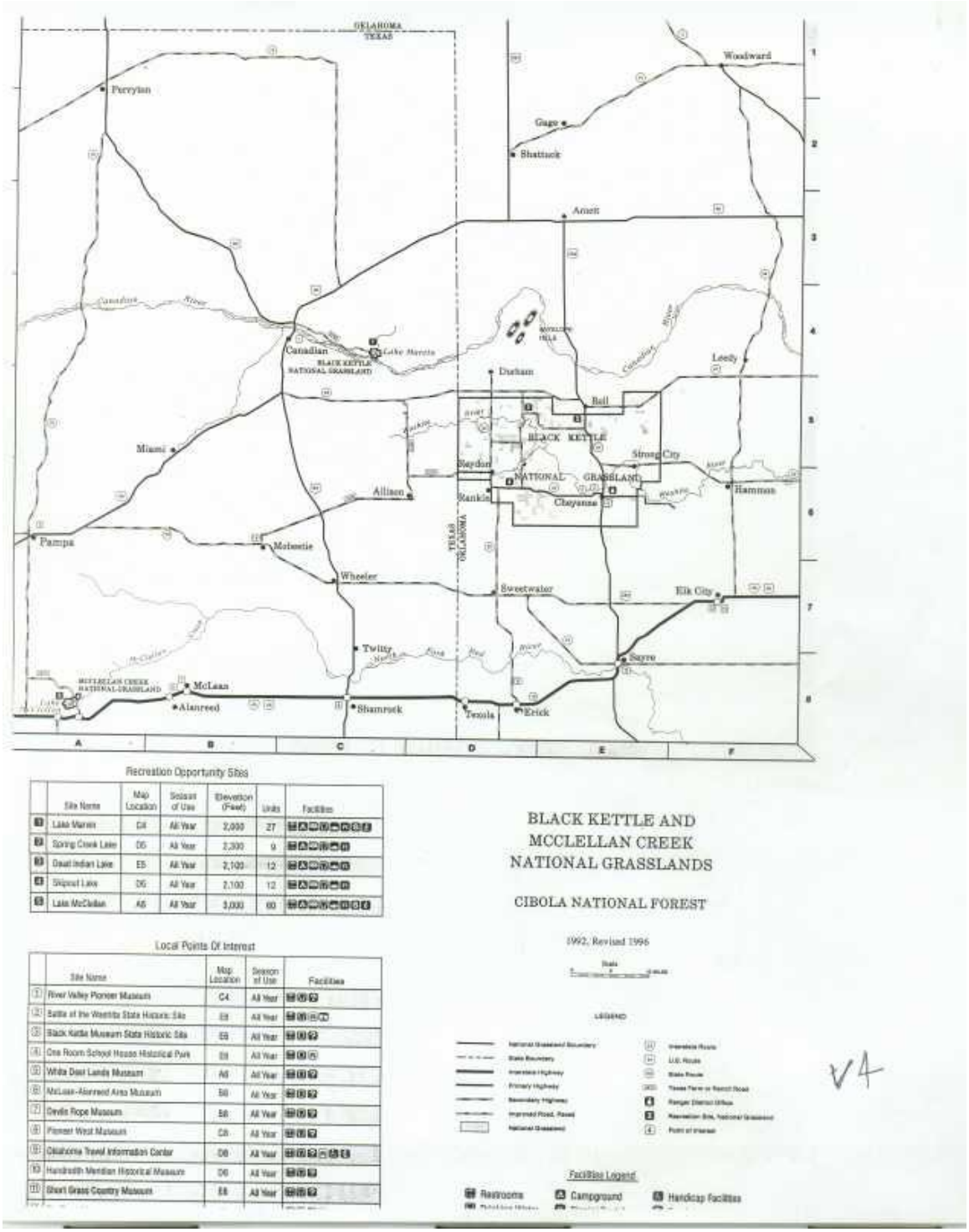
White lines encompass general field trip area.

Figure E-3. Aerial map of field trip site near Alva.

White lines encompass general field trip area.

Attachment E-7. Photos of Black Kettle National Grassland and other areas near Cheyenne, OK.

Figure E-4. U.S. Forest Service map of Black Kettle National Grassland, the Cheyenne field trip site.



Recreation Opportunity Sites

	Site Name	Map Location	Season of Use	Elevation (Feet)	Units	Facilities
1	Lake Marvin	C4	All Year	2,000	27	
2	Spring Creek Lake	D5	All Year	2,300	9	
3	Quail Indian Lake	E5	All Year	2,100	12	
4	Skipout Lake	D6	All Year	2,100	12	
5	Lake McClellan	A5	All Year	3,000	60	

Local Points Of Interest

	Site Name	Map Location	Season of Use	Facilities
1	River Valley Pioneer Museum	C4	All Year	
2	Battle of the Washita State Historic Site	E8	All Year	
3	Black Kettle Museum State Historic Site	E8	All Year	
4	One Room School House Historical Park	E8	All Year	
5	White Deer Lands Museum	A8	All Year	
6	McLean-Alanreed Area Museum	B8	All Year	
7	Devils Rope Museum	B8	All Year	
8	Pioneer West Museum	C8	All Year	
9	Oklahoma Travel Information Center	D8	All Year	
10	Hundredth Meridian Historical Museum	D6	All Year	
11	Short Grass Country Museum	E8	All Year	

BLACK KETTLE AND
MCCLELLAN CREEK
NATIONAL GRASSLANDS

CIBOLA NATIONAL FOREST

1992, Revised 1996

Facilities Legend

Restrooms Campground Handicap Facilities

Attachment E-8. Photos of riparian restoration demonstration site near Binger, OK.



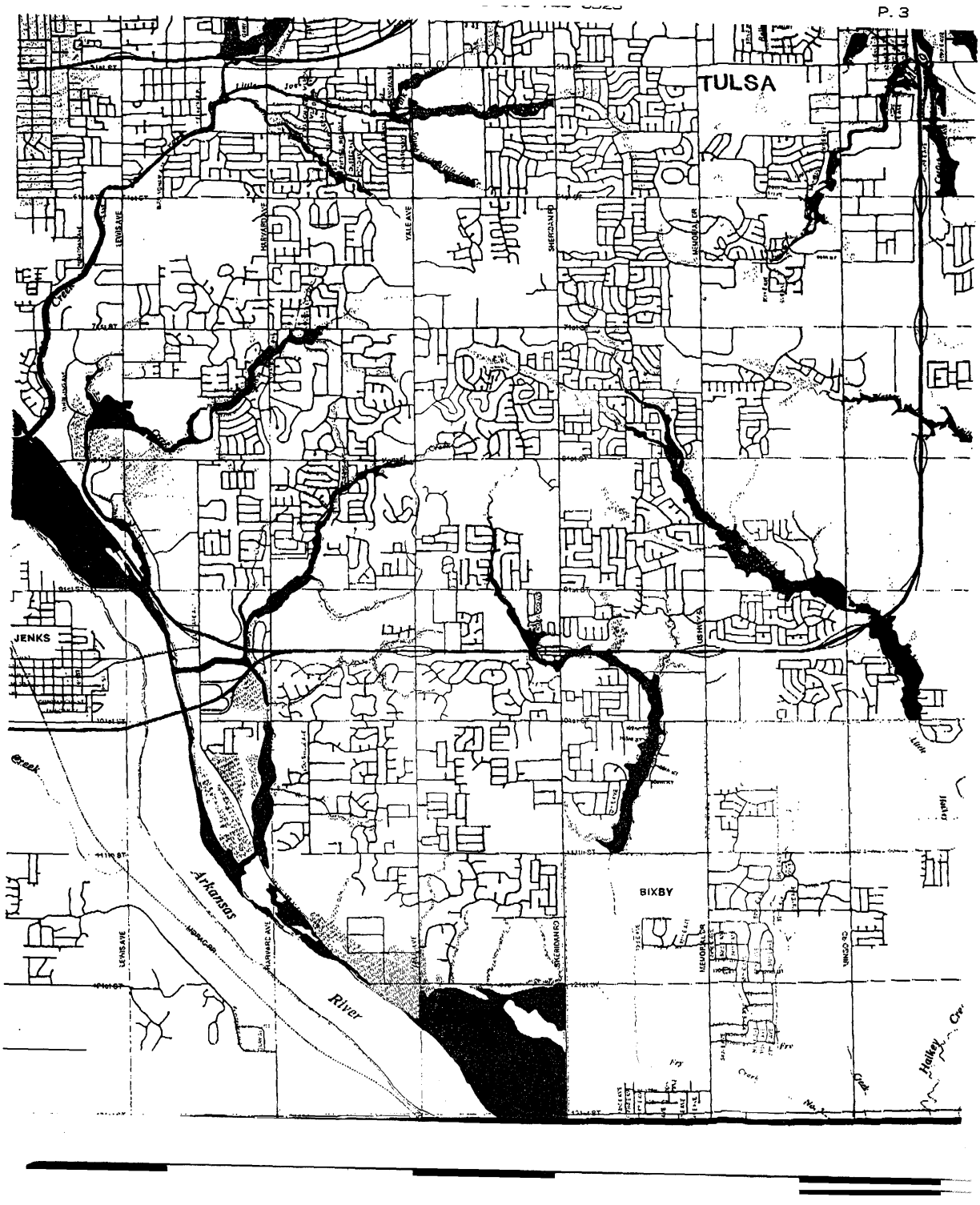



Attachment E-9. Photos of waste tire erosion control structure near Altus, OK.




Attachment E-10. Photos of field sites in Tulsa, OK.

Figure E-5. General map encompassing Tulsa area field trip sites.



Attachment E-11. NRCS narrative description of Tulsa field trip sites.

SUBJECT: Fred Creek Sites for Tour

I cruised around Fred Creek to find sites of interest for the riparian workshop slated for Thursday, June 3. The following are my $UggeStiODS: 1) Fred Creek just south of 7 1" Street at Jamestown (area called Pebble Creek) In this area, Fred is manicured to the banks and some of the bank erosion is almost vertical. 2) Fred Creek at 70 and Guy This area is behind nice homes, and it demonstrates measures taken to control erosion and live in harmony with the modified creek. Some areas of the bank are concrete, but it is not an artificial channel. 3) Fred Creek at 76' and College Pull to the dead end and look south down Fred Creek, and the stream contains a natural riparian area. This riparian area is narrow, but this is not evident just looking downstream. There are plenty of trees and shrubs along the bank. 4) Fred Creek at Evanston Blue Thumb monitoring site. This area has a narrow riparian zone. People who live in this neighborhood say that once Fred Creek was so narrow they could jump over it. 5) Fred Creek in the ORU Campus This area of Fred Creek has been very manicured, and no riparian areas are visible. Recent attemps by ORU staff to slow down erosion is apparent on the banks.

Appendix F – Workshop Pre- and Post-testing

Table F-1. Participant test scores at the final five workshops (#IC = number of incorrect answers, # = number in sample)

	ALVA				CHEYENNE				BINGER				ALTUS				TULSA				TOTALS					
	Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre	Post
	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	# IC	#	%-IC	%-IC
1	11	18	6	15																	11	18	6	15	61.1	40.0
2	1	18	1	15	1	12	1	12	4	19	0	14	0	14	1	8	1	14	1	6	7	77	4	55	9.1	7.3
3	2	18	0	15	7	12	1	12													9	30	1	27	30.0	3.7
4	9	18	10	15	7	12	6	12	16	19	13	14	7	14	3	8	11	14	4	6	50	77	36	55	64.9	65.5
5	5	18	3	15	2	12	0	12	10	19	6	14	3	14	0	8	9	14	3	6	29	77	12	55	37.7	21.8
6	7	18	8	15																	7	18	8	15	38.9	53.3
7	2	18	0	15	3	12	0	12	4	19	0	14	3	14	0	8	3	14	1	6	15	77	1	55	19.5	1.8
8	4	18	2	15	4	12	0	12	7	19	2	14	4	14	0	8	2	14	2	6	21	77	6	55	27.3	10.9
9	1	18	0	15	0	12	0	12	3	19	0	14	1	14	1	8	0	14	0	6	5	77	1	55	6.5	1.8
10	2	18	0	15	3	12	1	12	7	19	3	14	6	14	2	8	1	14	1	6	19	77	7	55	24.7	12.7
11					11	12	1	12	7	19	1	14	2	14	1	8	3	14	0	6	23	59	3	40	39.0	7.5
12					8	12	0	12	5	19	5	14	4	14	1	8	10	14	4	6	27	59	10	40	45.8	25.0
13									3	19	0	14	3	14	0	8	4	14	0	6	10	47	0	28	21.3	0.0

1. Which is better for holding soil? Grass ***Trees*** (*Question changed to # 11*)
2. Straightening a creek reduce flooding. True ***False***
3. A riparian buffer of 50 ft (on both sides) of a creek will get some wildlife benefit. ***True*** False (*Question dropped*)
4. Trees are needed for good riparian habitat. True ***False***
5. Livestock exclusion is necessary for riparian protection. True ***False***
6. Late spring grazing and early summer grazing is not recommended for wildlife management. True ***False*** (*Question dropped*)
7. The most efficient channel is: Wide and deep Straight and narrow ***Curved like an "S"*** Straight and wide
8. Bridges cause erosion. ***True*** False
9. Riparian vegetation helps regulate stream temperature. ***True*** False
10. Invasive species increase biodiversity. True ***False***
11. Which is better for holding soil in riparian areas? Grasses and forbs ***Woody plants (trees, shrubs, or brush***
12. Dormant season grazing is not recommended in riparian areas. True ***False***
13. Hunting/fishing/recreational leasing can be more profitable than traditional agricultural use of riparian areas. ***True*** False

Attachment F-1. Final version of workshop pre- and post-test.

Riparian Management Workshop

June 3, 1999 Pre-test

1) Which is better for holding the soil in riparian areas:

   Grasses and forbs or Woody Plants (trees, shrubs, or brush)

2) Straightening a creek reduces flooding. True False

3) Hunting/fishing/recreational leasing can be more profitable than traditional agricultural use of riparian areas. True False

4) Trees are needed for good riparian habitat. True False

5) Protecting a riparian area requires livestock exclusion. True False

6) Dormant season grazing is not recommended in riparian areas. True False

7) The most efficient channel is:

   Wide and deep Straight and narrow Curved like an "S" Straight and wide

8) Bridges cause stream bank erosion. True False

9) Riparian vegetation helps regulate dissolved oxygen in the water. True False

10) Invasive species increase biodiversity. True False

Riparian Management Workshop

June 3, 1999 Pre-test

1) Which is better for holding the soil in riparian areas:

   Grasses and forbs or Woody Plants (trees, shrubs, or brush)

2) Straightening a creek reduces flooding. True False

3) Hunting/fishing/recreational leasing can be more profitable than traditional agricultural use of riparian areas. True False

4) Trees are needed for good riparian habitat. True False

5) Protecting a riparian area requires livestock exclusion. True False

6) Dormant season grazing is not recommended in riparian areas. True False

7) The most efficient channel is:

   Wide and deep Straight and narrow Curved like an "S" Straight and wide

8) Bridges cause stream bank erosion. True False

9) Riparian vegetation helps regulate dissolved oxygen in the water. True False

10) Invasive species increase biodiversity. True False

Appendix G – Workshop Evaluations

Table G-1. Workshop participant responses to short answer questions.

Location	Responses	Question 1					Question 2		Question 3		Question 4		Question 6				
		E*	VG	Avg	Fair	Poor	Yes	No	Yes	No	Yes	No	E	VG	Avg	Fair	Poor
Altus	10	4	4	2			10		10		10		4	6			
Binger	14	2	9	1	1		14		14		14		3	7	3		
Cheyenne	12		9	3			11	1	10	1	11	1		9	3		
Alva	15	4	9	2			15		15		15		3	10	2	1	
Stillwater	12	4	8				10	1	11		11		6	5			
Poteau	13	2	8	3			13		13		13			11	2		
Ardmore	13	2	7	4			12	1	11	2	13		1	9	2		
Tahlequah	19	4	10	4			19		17	1	18		5	13	1		
Totals	**108**	**22**	**64**	**19**	**1**	**0**	**104**	**3**	**101**	**4**	**105**	**1**	**22**	**70**	**13**	**1**	**0**

**E = Excellent, VG = Very Good, Avg = Average*

1) My overall rating of this workshop would be:
2) Do you have a better understanding of Riparian Areas and the role they play in the environment?
3) Do you have a better understanding of managing riparian areas to protect water quality?
4) Were you satisfied with the structure of the workshop?
5) On what topics do you feel you need more information? *(See Table G-2)*
6) Please rate the workshop instructors on their presentation and knowledge:
7) What were the most valuable workshop topics? *(See Table G-3)*
8) What changes would you suggest to improve the workshop? *(See Table G-4)*

Table G-2. Workshop participant responses to evaluation question 5, 'On what topics do you feel you need more information?', grouped by category.

Methodology (16)
Restoring riparian areas in Alfalfa County
Designs
More ideas or examples of stream management success
Management practices for different situations
Actual riparian area planning
Management
Ways to profitably establish riparian strips next to farmer's land
Show actual methods of establishment of riparian areas
Even more problem/solution scenarios
Erosion problems helped by treating riparian areas
Demonstrations of actual practices of riparian protection
How to treat different problems landowners may have
More on How To in different situations
How to select different practices
How to handle erosion problems in urban areas-more specific suggestions
Riparian Management
Vegetation (14)
Arid area vegetation
Species of plant
Species of plants to use and planting info, i.e., in western OK on vertical banks do you plant right next to the bank or back off anticipating erosion before vegetation is established
Emphasis on natural species
Table of grasses to use in RAs in the manual
Types of vegetation/trees to plant
More on species of locality
Trees
Invasive vegetation management
Vegetation
Planting techniques
Shrub, forbs species suited to area
Which species to plant for which problems
Forestry
Financial (6)
Governmental programs
Incentives-selling the program
Cost sharing
Economics
Programs such as WHIP, EQIP
Costs of various riparian management strategies
Miscellaneous (6)
Plant, riparian insect, and water wildlife identification

Riparian areas
All – greater detail
Field trip sites not adequate
Water quality
Cooperator survey data
Promotion (6)
Landowner recommendations
RAM-What do you tell landowners?
Info for landowners
How to get the word out. Workshops? I have used newspaper
Ways to educate the public
Stewardship, urban land management, promoting conservation in urban area
Stream Morphology (6)
Reforming channels into "S" channels
Erosion on banks that need immediate attention
Stream assessment (2)
Stream morphology
Stream stability, reworking banks to achieve a more natural meander
Grazing (5)
Controlling livestock/grazing practices
Grazing management
Range management
Bob Woods
How to lay out fences and develop alternative water sources
None (5)
None (5)
Wildlife (4)
How to lease out hunting profitably
Wildlife management
Riparian for cropland areas-species choice to minimize crop damage by wildlife
Wildlife versus Agriculture
Poultry (3)
Nutrient runoff data on riparian areas with poultry litter applied
Jim Britton
Poultry
Size (2)
Width of RA
How small an area justifies protection?

Table G-3. Workshop participant responses to evaluation question 7, 'What were the most valuable workshop topics?', grouped by category.

All (10)
Everything
All; Urban and rural topics are important for all types of people
All Good (6)
Good blend of coverage
General and good
Grazing (9)
Grazing(3)
Discussion of grazing and wildlife aspects in relation to riparian management
Bob Woods
Grazing management (3)
Prescribed grazing
Wildlife (9)
Wildlife(5)
Discussion of grazing and wildlife aspects in relation to riparian management
Wildlife management
Wildlife in riparian habitat (2)
Handbook (8)
Booklet-something to use later
Use of the handbook.
Handbook: very good info
How to use riparian manual
Handbook
Tables in Handbook
Handbook
The book
Vegetation (8)
Riparian vegetation
Learning the different vegetation in a riparian area
Types of vegetation coverage
Vegetation
Types of vegetation
Grass discussions
Vegetation vs. rainfall in state
Grass in Panhandle riparian area vs. trees in Woods County riparian area
Field Trip (6)
Field trip-good to see the streams in action
Field discussion on different management practices
Tour and landowner involvement
Tour
Ranch tour
Field application of principles

Riparian Benefits (6)
Purpose for protection
Butler's presentation
Different roles of riparian areas
Explaining what constitutes a stable riparian area
Explaining benefits of riparian area
Benefits of riparian area
Miscellaneous (4)
Wetland criteria
Riparian relationship with agriculture
Alternatives to land use around riparian areas such as hunting, etc.
Each site will be different
Outlook (3)
Riparian values and stressing long term economic and environmental values
Managing the system for benefiting the whole
New perspectives to old issues
Stability (3)
Structure and stability
Stability
Best type of structure needed for stable stream
Cooperator Survey (2)
Survey
Cooperator responses
Poultry (2)
Jim Britton
Britton's presentation
Riparian Zones (2)
Riparian zones
Definition of zones in riparian area

Table G-4. Workshop participant responses to evaluation question 8, 'What changes would you suggest to improve the workshop ?', grouped by category.

None (16)
None (13)
None, good job, get message to the public
Can't think of anything, very good facilities, food, and workshop
Super Workshop
Workshop Format (10)
Less time on field trips
More breaks in the morning
Not as long in classroom
Too many speakers
Something to drink on tour.
Less redundancy
2 or 3 day workshop
Larger lecture hall
Field visits on ALL topic covered
MORE FOOD!
Improvements to Presentation (8)
More slides
More info
More pictures from some of the presenters of their subject matter
Either leave out looking at tables in handbook or do a little better explanation of what their application is
Handouts to supplement notes-hard to write down all interesting information as it is processed
Perhaps go a bit more in depth on each topic
Make sure all items on pre-test are covered completely and people caome away with those answers
Handouts tied to some of the presentations to deep up with the material
Additional Discussion (7)
More discussion in the field (2)
Structured topics in field
More feedback and discussion
In the field have specified discussion of application of concepts discussed in classroom.
Travel to sights that have problems and then allow more group discussion
Have a wrap-up discussion and group contribution of where do we go from here and what more do you need in the way of training, support materials, etc
Specific Problem-Solution Examples (7)
Go to a river that some RA work has been done on – A demonstration plot
Show us how to fix problems in RAs. I do not feel that the workshop addressed how to handle producers that want these problems fixed
Assess riparian areas on site
Travel to sights that have problems and then allow more group discussion
Need more photos of actual situations, examples of what does and does not work,

recommendations are site-specific so less theoretical and more real-life examples
Demonstrations of actual practices of riparian protection
A site that good riparian filterstrip protection and economic success
Additional Topics (5)
More on aquatic biology
More information on field trip
Include information on plant, riparian insect and water wildlife identification
More field trip type activities (2)
More info on establishment of riparian areas as part of the stabilization of eroding waterways
Miscellaneous (3)
Missed the morning session so unsure
Landowner presence makes objective discussion difficult
Some instructors didn't seem to be fully aware of data portrayed in tables
Regional Specificity (2)
Develop program for the part of the state where you are at. Do not us eastern OK program for SW part of state.
Better understanding of local ecology

Appendix H – Workshop Participant Survey

Attachment H-1. Riparian workshop participant follow-up survey instrument.

Biosystems & Agricultural Engineering --- 218 Agricultural Hall --- Stillwater, Oklahoma 74078-6021
Phone: 405-744-8414 Fax: 405-744-6059 --- Email smolen@okstate.edu

July 20, 2000

Dear Bud Adams:

You are on our list as having attended one of the nine riparian management workshops we conducted between September 1998 and June 1999. We are, therefore, asking your help to document impacts that may have resulted from this training. We are particularly interested in learning how many times you have included riparian management in conservation plans or in landowner education since attending the workshop.

Please take a few minutes and estimate the following information.

1. _____ Number of conservation plans written or revised to include riparian management.

   Please describe what practices you most commonly recommend.
   _____
   _____
   _____

2. _____ Number of public meetings where you presented information about riparian management financing of riparian management practices.

3. _____ Number of farmers who received one-on-one (or small group) education from you addressing riparian management practices or programs to finance riparian management.

4. Anything else that might be an indicator of impact of the riparian management training.
   _____
   _____
   _____

Please fax this form to Jennifer Lawson at 405-744-6059 or mail it to the address above.

Thank you for your help.

Sincerely,

Table H-1. Responses of riparian area management educational meeting participants to follow-up survey.

Last Name	First Name	# Plans	Practices recommended	Public mtgs	One-on-one	Other/Comments
Anderson	Nathan	0		2	12	
Babek	Kenneth	0	Grass planting either native or bermuda	0	5	
Barnes	Kent	0		5	18	
Barrick	Mike	0	Our NRCS staff in the field offices write the plans. I just provide training and write the standards.	5	0	Increase in the numbers on acres reported in the PRMS system that NRCS uses to show areas of riparian work done by farmers.
Bigger	Walter	0		2	3	
Black	Steve	0	We are a national park and we were concerned about our riparian area. We don't plan on talking with anybody, just managing our own area.	0	0	The class was very helpful and showed us what to do and what not to do.
Boerngen	Laurie	0		0	0	Beaver field office has been tied down with CRP conservation and CRP maintenance. When we get back to planning I will recommend riparian management in my plans.
Bullard	Gerald	0		0	0	Presented riparian information to 300+ poultry farmers.
Chambers	Billie	0		0	0	Used material gained from workshop as background for developing 4-H project fact sheets
Cheadle	Cheryl	0		5	0	Continued education. DEQ might benefit from riparian education, also urban folks need it too.
Clark	Paul	4	Filter strips	0	3	Incentive payment under CRP is a plus for selling buffers.
Cline	Bobby	2	Filter strips, field borders, riparian forest buffers.	0	10	My awareness and training has helped me to better explain the benefits, etc. There seems to be more interest.

Collier	Suzanne					My job is state office support of planning and programs, so my participation was for my own information and background.
Conkling	Mark	1	Riparian forest buffers.	4	2	Next week I will conduct the first of 3 two day training sessions for NRCS employees in SW Oklahoma on CORE4 Buffers which include riparian management.
Davis	Dana	20	Riparian forest buffers.	0	12	
Dotson	Robert	5	Filter strips.	1	15	
Ferrell	Dixie	0		0	0	*SEE ATTACHMENT H-2
Fitzler	Harry	0		0	0	I am an area resource specialist and do not specifically write conservation plans. Contacts with farmers is usually through the local field office who in turn writes the plans. There have been 3 or 4 in-house training sessions where riparian area management and buffer practices have been addressed.
Fjeseth	Wayne	5	Riparian forest buffers, Filter strips.	2	4	RWP Water Quality activities - stream & drainage systems after clean up activities related to the May 3/99 tornados
Fram	Mitch	0		4	7	Several extension clients who are not farmers (suburban, and/or rural land owners) received one-on-one or small group education.
Goedecke	Ron	4	Tree planting, fencing and livestock exclusion.	1	10	
Gray	Sue	0	Riparian buffers and proper vegetation management.	0	35	Greater awareness, more educational materials available.
Green	Marty	0		10	25	I use the riparian management information for the poultry training workshops and it comes up on most farm visits.
Gregory	Mark	0		0	0	
Hanna	Bobby	0	Zone agronomist for 52 TX counties	0	0	Have provided training to 130 NRCS employees on all of the buffer practices.
Hollenback	Jason	1		3	5	

Horton	Clay	15	Fencing, watering points, prescribed grazing.	0	3	I discuss riparian management with many people. I could use some fencing training. Selling the downstream benefits can be difficult.
Johnson	Tony	0		3	9	
Justice	Ron	0		2	6	Have suggested to some producers to look at the riparian site in the ?Altus? (illegible) area.
Lee	Wes	0		2	10	I use the book occasionally in assisting landowners with erosion problems.
LeValley	Robert	0		0	0	
Lynch	Robin	0	Maintaining buffers of trees along creeks and fencing out areas so that cattle cannot freely move along streambanks, and have creek crossings fenced to limit access	0	3	It has increased my awareness of the importance of trees and grassed buffer areas to improve the water quality. Most landowners are agreeable to fencing out the creeks because it reduces the need for water gaps in the fence and is easier to keep track of the livestock when they are not walking down the creek getting out.
Marquardt	Craig	10	Leave SML's undisturbed. Leave draws feeding into streams untreated during site prep.	0	0	
Moseley	Mark	0		3	4	As a state-level specialist, I do not regularly contact many producers one on one.
Nowlin	David	0		0	10	Working with Wichita Housing Authority (Wichita Tribe) on erosion management.
Odom	Larry	0		0	2	
Oliphant	Shelly	2	Grassed waterways, and wind strips.		10	
Poindexter	Larry	1	CRP contract along Cimarron River.	2	3	
Risenhoover	Kenneth	5	Riparian forest buffers, filter strips.	2	12	
Rose	Michael	0		1	2	
Sanders	Warren	25	Fencing to exclude livestock, tree & shrub establishment. Both zone 1 & 2 and critical area planting streambank protection. Prescribe grazing - grazing plan for grazing riparian area.	2	45	

Schneider	Joe G.	7	Riparian forest buffers.	1	10	Handbook is very good.
Shearhart	Jim	1	Filter strip	0	1	
Shockley	Wes	0	Writing of conservation Plan has not been part of my duties.	1	6	
Slocum	Ron	0		0	0	I am an engineer with the NRCS and I have worked with our field offices and they have started including riparian management in their conservation plan.
Smith	Rod	0		0	0	I attended the meeting to give a presentation and have not been involved directly with programs resulting from the training.
Smith	Wayne	0		0	0	My job position limits my involvement in these activities.
Stephens	Karla	25	Grade stabilization, residue management, terracing, waterways, and grass planting.	1	10	Employee awareness/importance of riparian areas drastically increased. Discussions with producers increased.
Taylor	Brooke	0		0	0	NRCS has just finished giving us a two day training on conservation buffers which includes riparian management. NRCS has a new national goal promoting buffers, so we should be doing more planning in this area next year.
Turner	Denise	0		0	1	
Vick	Ron	0		0	8	Riparian information was presented at the conservation day camp and the 4-H water day camp.
Williams	Jim	9	Forest riparian buffers.	0	20	
Wilson	Thomas	0	Grass buffer areas and waterways.	0	4	Tree planting is a very low priority with farm price low. Grass vegetation is possible.
Woods	Bob	0	Forage/grazing systems	18	4	
	Totals	**142**		**82**	**349**	

Attachment H-2. Details of riparian workshop impact on Roger Mills County youth education.

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

Oklahoma Cooperative Extension Service
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

Roger Mills County • P.O. Box 9 • Cheyenne, OK 73628 • (580) 497-3339 • Fax (580) 497-3552
Dixie Ferrell email: rmcext1@logixnet.net • Justin Barr email: rmcext@logixnet.net

July 20, 2000

Dr. Smolen,

The data that I have to share doesn't really fit in the spaces that are provided on the form. However, I thought you might be able to use it in some way so I'm sending it to you.

This spring, I planned the Cooperative Extension learning center for our Outdoor Classroom with riparian areas in mind. We let the students build soil models using vegetation and plant residue to demonstrate how rain water is filtered by these items before it enters our streams, rivers or ponds. They also constructed a model using only soil. We asked them to use the watering cans to sprinkle premeasured rain water on their models. They collected, measured and visually acessed the water that ran off their soil model and their model with vegetation/plant residue. They were asked to note how much silt accumulated at the lower end of the models and how cloudy or clear the water samples were.

They were very amazed at the difference between the two experiments. We thought this was an excellent demonstration to show how important it is to maintain plant growth along waterways and ponds or lakes.

Maybe this doesn't sound too impressive so far, but here is a little more information on the people who participated in these workshops. All 205 of them were third grade students from schools in Dewey, Roger Mills and Beckham County. 182 were Caucasian, 17 were Native American and 6 were Hispanic. There were 90 males and 115 females. We taught 14 workshops, spread out over 2 days in the Blackkettle Recreation area located 10 miles north of Cheyenne. The kids had a blast designing their models and comparing the outcomes of their experiments.

If you need more information or further explanation of this adventure in youth development and education, please give me a call.

Sincerely,

Dixie L. Ferrell

Dixie L. Ferrell
Extension Educator,
Family Consumer Science, 4-H Youth Development & CED
Roger Mills County