Demonstration *of* Best Management Practices *in the* Salt Fork Watershed

Final Report

CWA Section 319(h) FY 1997

Nonpoint Source Pollution Program Task 1100

Oklahoma Conservation Commission Task #96

OSU Project Account AC-5-90300

Project Manager:

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December 2002

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Foreword

The workplan for the Salt Fork project set forth a series of seven specific tasks to be completed in order to attain the goal of increased BMP implementation in the watershed. The underlying premise for these tasks was that 10 cooperating producers would be convinced to implement a BMP or several BMPs on their holdings for the duration of the project period. Project personnel would monitor fertilizer, nutrient, and pesticide applications on each of these cooperating farms. Amounts of these materials used after BMP implementation could then be compared to pre-BMP usage. To accurately document these changes, cooperators with detailed records of pre-BMP usage would have to be identified, convinced to implement the practice or practices, and commit to maintain accurate records during the project period. In addition, to obtain enough data to make comparisons at least visible, if not valid, such operations would have to be initiated early on and continue uninterrupted throughout the project period.

For the Salt Fork project, the person charged with this vast undertaking was OSU IPM Coordinator, Gerritt Cuperus. Dr. Cuperus has an impressive history of accomplishing similar feats of organization and cooperation with other projects. However, just as the project was getting underway, a vehicle struck him while he was jogging. Fortunate to be alive, he was unable to resume any kind of project management duties until his return in late 2000. At that time, he did return to work until his retirement with disability in early 2002.

In the interim, various project personnel attempted to fill in the gaps created by Dr. Cuperus' absence. Sadly, much of his original vision and much precious time were lost, never to be recovered. The end result was that some of the goals and tasks became unattainable in the form originally set forth in the workplan. Much project effort was spent developing alternative methods to attain results similar to those expected under the previous goals.

Although perhaps the original *letter* of the workplan was not strictly adhered to, the original *intent* of the workplan was followed in all project activities. Great strides were made in evaluating the attitudes and practices of producers in this watershed, especially with regard to BMP adoption and implementation. The use of current computer modeling technology resulted in the production of a valuable simulation of the watershed's hydrology. Most importantly, the project opened up a line of communication with producers, raising awareness of water quality, tillage, and chemical use, and paving the way for future promotion, discussion and implementation of BMPs in the Salt Fork watershed.

Acknowledgements

The authors would like to express appreciation to the following people whose efforts and cooperation helped make the project a success.

Cooperating Producers

Gerritt Cuperus – OSU IPM Coordinator (retired)

Robert Dotson – NRCS District Conservationist, Cherokee

Kenneth Failes – Burlington Coop Agronomist

Roger Gribble – OCES Area Extension Agronomy Specialist

Gene Krenzer – OCES State Extension Small Grains Specialist

Bob LeValley – former Woods County Extension Educator, Agriculture & CED and (currently OCES Area Extension Livestock Specialist)

Phil Mulder – OCES State Extension Entomology Specialist

Scott Price – Grant County Extension Educator, Agriculture/4-H Youth Development & CED

Tommy Puffinbarger – Alfalfa County Extension Educator, Agriculture/4-H Youth Development

Jim Rhodes - Woods County Extension Educator, Agriculture/4-H Youth Development

Tom Royer – Asst. Professor, Field Crops, OSU Entomology & Plant Pathology

Dan Storm – Professor, OSU Biosystems & Agricultural Engineering

Mike White – Graduate Research Assistant, OSU Biosystems & Agricultural Engineering

Hailin Zhang – Director, OCES Soil, Water, & Forage Analytical Laboratory

Salt Fork Advisory Committee

Salt Fork Steering Committee

List of Commonly Used Abbreviations

BAE – Biosystems and Agricultural Engineering Department
BMP – Best Management Practice
CorpComm – Oklahoma Corporation Commission
DEQ – Department of Environmental Quality
EPP – Entomology and Plant Pathology Department
EQIP – Environmental Quality Incentives Program
FSA – Farm Service Agency
IRB – Institutional Review Board
NPS – Non-Point Source
NRCS – Natural Resource Conservation Service
OCC – Oklahoma Conservation Commission
OCES – Oklahoma Cooperative Extension Service
ODA – Oklahoma Department of Agriculture
ODA-FD – Oklahoma Department of Agriculture-Forestry Division
ODWC – Oklahoma Department of Wildlife Conservation
ONLA – Oklahoma Nursery and Landscape Association
OSE – Office of the Secretary of the Environment
OSNA – Oklahoma State Nursery Association (now known as ONLA)
OSU – Oklahoma State University
OWRB – Oklahoma Water Resources Board
PPP – Pollution Prevention Plan
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
USFS – United States Forestry Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
WHIP – Wildlife Habitat Improvement Program

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Measures of Success

1. *Producer implementation of tillage, nutrient, and pest management BMPs. Target is 20% adoption of BMPs after year 5.*

   Comparisons of the results from the pre- and post-project surveys are listed below. (These results are discussed in detail under Tasks 2 and 6 in this report.)

   - Different management for different fields (i.e., fertilizer application rate based on soil test results) rose 29%, from 38% in 1999 to 67% in 2002.
   - Conservation tillage use rose 21%, from 67% in 1999 to 88% in 2002.
   - Willingness to consider a vegetated buffer rose 19% among producers with stream banks, from 59% in 1999 to 78% in 2002.
   - Willingness to consider no-till rose 13%, from 35% in 1999 to 48% in 2002.
   - Willingness to consider planting trees in a vegetated buffer remained unchanged at 31% from 1999 to 2002 among producers with stream banks.

2. *Reduction in sediment loss estimated from cropland in the watershed based on modeling the impact of BMP implementation. Target is 50% reduction.*

   The SWAT model results indicated that conservation tillage practices yield 25% (stubble mulch) to 50% (low till) less sediment than moldboard plowing. Producers reported a total of 111,100 acres of land in production in 1999 (97500 acres of wheat, 8800 acres of alfalfa, and 4800 acres of sorghum). Pre-project survey results indicated that producers moldboard plowed approximately 46,200 acres of this total area. This means that at the start of the project, conservation tillage was already being used on the remaining acres, equal to approximately 58% of the cropland in the watershed. This results in a 15-29% reduction (0.58*25-50%) in sediment yield compared to the worst-case scenario (all cropland moldboard plowed). The post-project survey indicated an increase of 21% in the number of watershed producers utilizing conservation tillage. Although the exact acreage affected was not recorded, this translates to an additional reduction of sediment yield in the Salt Fork watershed.

3. *Reduction in excess fertilizer applied by cooperating farmers when management is based on soil testing and IPM principles. Target is 50% reduction on demonstration farms compared to typical practices.*

   In a study conducted in cooperation with Burlington Coop Agronomist Kenneth Failes, three years of soil test results and two years of fertilization and yield data were collected from eight sites in Alfalfa County. This exercise demonstrated how nitrogen in the soil profile can be “mined” for utilization by the wheat crop. Nitrogen levels in the soil, as indicated by soil test results, were used to calculate a fertilizer application rate. In the 1996-97 crop year, 38,502 pounds of N were applied to these eight sites at an average application rate of 36.7 lbs N/acre. Compared to 136,370 pounds of N at the typical application rate of 130 lbs N/acre, this is a 71.8% reduction in fertilizer usage.

   The following year, fertilizer application rates were again based on soil test results. The amount of nitrogen actually applied was 95,765 pounds at an average rate of 91.3 lbs N/acre for the 1997-98 crop year. This was a 33.0% reduction from typical fertilizer usage. In summary, utilizing these nutrient management BMPs resulted in a 49.2% reduction in the amount of fertilizer applied to these fields over a two-year period. Yields during this period were satisfactory. In fact, an increase in the yield

goal for these fields (from 50 bu/acre to 60 bu/acre) was planned for the 1998-99 crop year.

4. *Reduction in nitrogen and phosphorus loss estimated by modeling. Target is model prediction of 50% reduction.*

   The modeling results indicated that splitting the application of nitrogen fertilizer into a pre-plant application in the fall and a top-dress application in the spring reduced several nutrient-related factors. In both the 1999 pre-project and 2002 post-project surveys, approximately 75% of the respondents indicated that they utilize both a pre-plant and a top-dress application. Multiplying the percentage of producers that split fertilizer application by the percent reduction this practice accomplishes provides an estimate of the total reduction for each parameter within the entire watershed. Below is a listing of the results obtained by combining the modeling and survey results in this manner.

Nutrient Parameter	Reduction due to split application (%)	Producers that split application (%)	Reduction in watershed (%)
Nitrate leached	almost 90	75	almost 67.5
Nitrate in lateral flow	approx. 80	75	approx. 60
Nitrate in runoff	greater than 50	75	greater than 37.5
Soluble P	approx. 50	75	approx. 37.5
Sediment-bound P	20	75	15
Organic N	15-20	75	11.25-15

5. *Reduction in pesticide use on cooperating farms employing IPM (improvements in pest management through improved cultural practices, pesticide use only based on scouting and thresholds, and implementation of non-pesticide practices). Target is 50% reduction on demonstration farms compared with typical practices.*

   The results of the interviews with cooperating producers indicated that several improvements in pest management techniques are being utilized in the Salt Fork watershed. Scouting to determine insect population levels before spraying is a common practice. A few producers graze their alfalfa stands, which may have benefit as a pesticide alternative. Still others among the group dislike the use of pesticides for a variety of reasons; cost, environmental threat, safety concerns and do not use the pesticides unless it is absolutely necessary to save the crop. The reduction in the amount of pesticide utilized by these individuals in comparison to “typical” levels is dependent upon the crop, weather, and insect population.

Conclusions

The pre-project survey indicated widespread usage of many BMPs and generally favorable attitudes toward BMP implementation. Still, comparison of pre-project and post-project survey results showed improvement in both these areas over a three-year period. No-till practices in the project area are a good example of this trend. At the project outset, few producers used this method and it was viewed with open skepticism. However, by project end, several producers were testing it on at least a portion of their cropland. The project team also noted producers were more receptive to discussion of the practice than previously. Overall, little change in individual acreage holdings was noted, but some very great changes were recorded for a few individuals, with gains or losses of more than 2,000 acres. The impact of a community-wide education program can be very great when management of such large parcels can change hands within a relatively brief period of time.

The impact of individual efforts can also be quite far-reaching. Burlington Coop Agronomist Kenneth Failes aids many producers in northern Alfalfa County, the heart of the project area. Widespread acceptance of regular soil-testing and nutrient management in the watershed is due, in no small part, to the trust he has earned from his clientele over the years. Another individual, Tommy Puffinbarger (Alfalfa County Extension Educator, Ag/4-H Youth Dev), has been instrumental in promoting another BMP in the watershed. His efforts to actively assist producers in collecting and releasing musk thistle weevils as a biological control for musk thistle has helped reduce pesticide use in the area. As part of the project, a sign was developed for producers to indicate when fields had been treated with the weevils. When the OSU Integrated Pest Management program adopted this promotional tool for use statewide, the impact of these efforts reached beyond the Salt Fork to include watersheds all across Oklahoma.

Determining just how much BMPs impact a watershed was the goal of the project's modeling task. Results indicated that significant reductions in nutrient and soil loss could be made with implementation of select BMPs. In addition, the results showed that in low slope zones, such as much of the project area, upland range management could greatly impact water quality. Poor upland management in the past may account for much of the sediment deposition problem currently observed in the watershed.

One of the greatest impacts of the project was the widening of communications in the sensitive area of environment and water quality within Extension at state, area, and county levels and between Extension and other agencies. Improved relationships have been forged that will provide for continued promotion and adoption of BMPs within the watershed. New environmental content for extension programs and improved presentation technology will increase the effectiveness of and encourage further attention to environmental programs by county educators (e.g., Output 1105.2: musk thistle weevil presentation). The stage has been set for continued effort beyond the original scope and duration of the project.

The project provided unique insight into BMP promotion and implementation. Multi-faceted relationships exist between the agricultural community, various technical resource personnel, and governmental agencies. The project survey was a good, strong step forward in elucidating these relationships. Additional funding for a follow-up survey would allow the OCES Water Quality office to evaluate the long-term impact of the project. Continued cooperation and support would not only serve the Salt Fork watershed, but the lessons learned could be used to enhance BMP implementation and improve water quality for a much wider audience.

This report details OCES activities from 1997–2002 in support of the FY1997 CWA 319(h) NPS Pollution Program grant, "Task 1100: Demonstration of Best Management Practices in the Salt Fork Watershed," (OCC Task #96, OSU Account No. 3-5-90300, Contract No. AG-97-EX-002). The grant was administered by OCC. Key personnel at OSU included Project Director Michael D. Smolen (OCES Water Quality Programs Coordinator), Gerritt Cuperus (former OSU IPM Coordinator), and Project Manager Timothy L. Propst (OCES Engineer/Environmental Scientist).

Project Description

The Salt Fork of the Arkansas River watershed encompasses 1400 square miles in southern Kansas and northern Oklahoma. It drains to the 8890-acre Great Salt Plains Reservoir, a recreational center. Agriculture, mainly cattle, wheat, and alfalfa, is the primary industry, with only three population centers at Alva, OK (pop. 5500), Medicine Lodge, KS (pop. 2300) and Cherokee, OK (pop. 1800). Also in the watershed, the 32,000-acre Salt Plains National Wildlife Refuge is considered critical habitat for the whooping crane and supports a variety of other birds and wildlife including interior least terns, bald eagles, and American avocets.

The juxtaposition of conservation and agriculture highlights water quality issues in this area. The 1989 assessment indicated fish kills, high levels of suspended solids (Cause Code 11) and nutrients (Cause Code 9), as well as documented levels of pesticides (Cause Code 2). Pesticide residues have not been found in bird or fish tissue, but concern for contamination exists due to the level of protection desired and the extent of agricultural activity.

Although only a medium priority on the 303(d) list, the combination of wildlife, recreation, and agriculture gives this area far greater importance. This project promoted agricultural Best Management Practices (BMPs) to help reduce nutrients, sediment, and pesticides entering the watershed. [Petroleum industry activities are also potential causes, but were beyond the project scope.] Technology transfer was the key to BMP implementation.

Task 1 - Establish Advisory/Steering Committee

Two separate project committees were formed. The goal-oriented Steering Committee included several technical resource professionals from OCES and NRCS. They were to confirm that all project aspects were accounted for and workplan tasks completed. Members of the Salt Fork agricultural community composed the task-oriented Advisory Committee. Their charge was to ensure practicality of the tasks undertaken and the promotion of BMPs.

Outputs: 1101.1: Report on structure of advisory committees and membership
1101.2: Minutes and accomplishments of Advisory Committee

Task 2 - Assess Pre-Project Management Practices and Attitudes

A pre-project telephone survey was conducted in September 1999. In addition to general information (crops grown, size of operation, etc.), producers were questioned about planting, fertilizing, and erosion control practices, as well as their sources for managerial support.

Results indicated that producers already utilized many BMPs. Frequent soil testing of fields and widespread use of conservation tillage were reported. Pesticide usage was also lower than expected, although this may have been a financial, rather than a conservation, decision. (Poor wheat prices during the project period may have made producers unwilling to add spraying to their list of capital expenses.) A few areas showed room for improvement. Although 70% of wheat producers indicated annual soil testing, only 36%

reported using different yield goals for different fields. Attitudes toward no-till and vegetated buffers were less than enthusiastic.

Outputs: *1102.1: Survey instrument*
1102.2: Reports of assessment of producer attitudes and practices regarding tillage, nutrient, and pest management BMPs

Task 3 - Establish Communications

A website containing general project information and downloadable watershed maps was established at http://bioen.okstate.edu/home/mjwhite/saltfork/. Articles on landscape maintenance and workshops of interest were published in the Alfalfa and Woods County Extension newsletters. Maps indicating areas to avoid spraying herbicide in order to protect water quality were provided to the Alfalfa Electric Cooperative. Signs were developed to promote musk thistle weevils as a pesticide alternative in the watershed and were also adopted by the OSU IPM program for statewide distribution.

Outputs: *1103.1: Newsletter contributions at time of mailing*
1103.2: Description and URL of WWW Home Page

Task 4 - Establish Ongoing Demonstrations on Nutrient Management, IPM, and Tillage in Each County

Several demonstration sites were utilized to compare BMPs and typical practices side-by-side. These covered a variety of topics, including:

- Alfalfa Variety Trials – new multiple pest resistance varieties
- Alfalfa Weevil – scouting, threshold vs. calendar based pesticide spraying
- Legume Forage – simultaneous forage and nitrogen level build-up in the soil profile
- Nutrient Management – fertilizer application rates based on soil test results
- Roadside Bindweed Control – non-arsenical chemicals
- Musk Thistle Weevil – pesticide alternative and biological control of musk thistle
- Subsoil Nitrogen – including subsoil nitrogen in fertilizer application rate calculations
- Wheat Aphid – economic value of various IPM methods for control
- Wheat Variety Trial –new multiple pest resistant varieties

In addition, seven cooperating producers were interviewed regarding overall management planning and how BMPs are incorporated into operations. Results indicated the same environmental goal could be reached by different BMPs, dependent on personal attitudes and management goals. For example, several producers use no-till as erosion control. However, one producer dislikes no-till's dependence on chemicals for weed control. He uses disk and chisel plowing to manage crop residue and combat erosion. Flexible and adaptable BMPs can be custom-fit to various management schemes and operations.

Outputs: *1104.1: Description of demonstration plots and self-guided tours*
1104.2: QAPP for demonstration sites, including locations and plans for 10 demonstration plots
1104.3: Identify cooperators for 10-IPM case studies; Report initial description of operations
1104.4: Report fertilizer use, pesticide use, and crop history on 10 cooperating farms (changes from previous years to be summarized and explained)

Task 5 – Agricultural Production BMP Presentations

Two presentations were developed. The first was a general overview of BMPs, with an emphasis on wheat production. The second discussed musk thistle weevils as a pesticide

alternative. OCES personnel presented or sponsored numerous agricultural production workshops. A rainfall simulator field day compared the effects of different tillage methods on runoff. Technological equipment supplied to the Alfalfa County Extension office will greatly impact future educational programming in the watershed.

Outputs: 1105.1: Water quality-related educational materials for agricultural production management presentations
1105.2: Report on agricultural production management workshops, tours, and field days

Task 6 - Model the Environmental Impact, and Assess Changes in Knowledge Level and Practices with a Post-project Survey

The Soil & Water Assessment Tool (SWAT) was used to combine information from Geographic Information Systems (GIS) maps and actual weather data to create a model of the watershed. The model was calibrated against actual flow data from three gage stations on the Salt Fork. Conclusions drawn from simulation runs of the watershed included:

- Sediment and nutrient yields varied dramatically across the basin.
- Wheat cropland is the largest source of sediment.
- Each land cover has unique temporal nutrient and sediment distributions.
- Wheat accounts for 92% of surface nonpoint source nitrate contributions to groundwater.

The model was used to compare the effects of implementation of various BMPs on water quality in the watershed. Primary conclusions were:

- Split fertilizer applications showed less nitrogen loss than a single pre-plant one.
- Switching from moldboard to low till reduced sediment yield by half.
- Harvest type had a greater influence than tillage on soluble nutrients.
- Harvest type and tillage had statistically significant effects on sediment and sediment-bound nutrients.
- Higher fertilization rates increased nitrogen and phosphorous yields.
- Insecticide yield spiked a few times over the model period, likely due to short residence time of the chemical and the timing of rainfall events relative to application.
- Yields of the wheat herbicide studied (Maverick™) show far less year-to-year variability than insecticide, presumably due to longer lasting residuals.

A post-project telephone survey interviewed fifty wheat farmers in August 2002. Results showed little difference in total and average acreage farmed. Conservation tillage, different management for different fields, and the number of producers willing to consider no-till methods and vegetated buffers all increased.

Outputs: 1106.1: QAPP for BMP impact evaluation model
1106.2: Evaluation report on modeling of environmental impact of BMPs relative to conventional practices; poster session for use with producers at field site

Task 7 - Final Report

This report, including the appendices, tables, figures, and photos, is the final report.

Outputs: 1107.1: Final Report

Measures of Success

1. *Producer implementation of tillage, nutrient, and pest management BMPs. Target is 20% adoption of BMPs after year 5.*

- Different management for different fields (i.e., fertilizer application rate based on soil test results) rose 29%, from 38% in 1999 to 67% in 2002.
- Conservation tillage use rose 21%, from 67% in 1999 to 88% in 2002.
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- Willingness to consider no-till rose 13%, from 35% in 1999 to 48% in 2002.
- Willingness to consider planting trees in a vegetated buffer remained unchanged at 31% from 1999 to 2002among producers with stream banks.

2. *Reduction in sediment loss estimated from cropland in the watershed based on modeling the impact of BMP implementation. Target is 50% reduction.*

   Modeling showed conservation tillage yields 25% (stubble mulch) to 50% (low till) less sediment than moldboard plowing. Conservation tillage use was reported on 58% of watershed cropland in the pre-project survey, a 15-29% reduction (25-50% of 58%) in sediment yield compared to the worst-case scenario (all cropland moldboard plowed).

3. *Reduction in excess fertilizer applied by cooperating farmers when management is based on soil testing and IPM principles. Target is 50% reduction on demonstration farms compared to typical practices.*

   Nutrient management was demonstrated at eight sites where typical practice applies 130 lbs N/ac. Using soil nitrogen levels to calculate fertilizer application rates reduced the average application rate to 36.7 lbs N/ac in 1996-97 and 91.3 lbs N/ac in 1997-98. This equaled a 49.2% reduction in fertilizer use over a two-year period.

4. *Reduction in nitrogen and phosphorus loss estimated by modeling. Target is model prediction of 50% reduction.*

   Modeling showed split nitrogen fertilizer applications (fall preplant and spring topdress) reduced several nutrient-related factors, including (1) leached nitrate - 90%, (2) nitrate in lateral flow - 80%, (3) nitrate in runoff - 50%, (4) soluble phosphorus - 50%, (5) sediment-bound phosphorus - 20%, and (6) organic N - 15-20%.

5. *Reduction in pesticide use on cooperating farms employing IPM (improvements in pest management through improved cultural practices, pesticide use only based on scouting and thresholds, and implementation of non-pesticide practices). Target is 50% reduction on demonstration farms compared with typical practices.*

   Cooperating producers indicated use of several IPM techniques, including scouting fields before spraying and grazing of alfalfa stands. Some dislike the cost, environmental threat, and safety concerns of pesticides, so they do not use them unless absolutely necessary. Reduction in pesticide use under these practices is dependent upon the crop, weather, and insect populations.

Conclusions

Survey results showed satisfactory acceptance of BMPs prior to the project start, with improved support by project end. Modeling showed reductions of nutrient and soil loss with BMP usage and stressed the importance of good upland management. Project and individual educational efforts of Kenneth Failes and Tommy Puffinbarger have helped improve water quality in the watershed and beyond. Additional funding and continued efforts would provide valuable support for future educational programming to increase BMP implementation and further improve water quality in the Salt Fork and other watersheds.

Final Project Report

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Introduction

The watershed of the Salt Fork of the Arkansas River and two small tributaries encompasses about 1400 square miles in south-central Kansas and north central Oklahoma that drain to the Great Salt Plains Reservoir. The reservoir is a recreational center for the area, but agriculture is the primary industry in the watershed, with cattle, wheat, and alfalfa the major products. There are three population centers at Alva, OK (pop. 5500), Medicine Lodge, KS (pop. 2300) and Cherokee, OK (pop. 1800). The 32,000-acre Salt Plains National Wildlife Refuge encircles the reservoir and lies entirely within the watershed. The refuge is utilized by several rare or endangered birds including whooping cranes, interior least terns, bald eagles, and American avocets. It is considered critical habitat for the whooping crane and supports a wide variety of other birds and wildlife.

The extreme juxtaposition of wildlife conservation and agricultural production highlights water quality issues in this area. Within the watershed, excessive siltation has eliminated spawning habitat, initiated excessive algae blooms, and promoted fish kills during hot summers. Based on OWRB monitoring data, the reservoir was considered eutrophic and partially supporting for warm-water fishery and recreation in the 1987 assessment. The 1989 assessment indicated numerous fish kills, high levels of suspended solids (Cause Code 11) and nutrients (Cause Code 9), as well as documented levels of pesticides (Cause Code 2). Pesticide residues have not been found in bird or fish tissue, but concern for episodic pesticide contamination exists due to the high level of protection desired and the extensive agricultural activity in the watershed.

Although designated only a medium priority on the 303(d) list, the unique combination of wildlife, recreational, and agricultural values give this area far greater importance. This project promoted the use of agricultural Best Management Practices (BMPs) to help reduce nutrients, sediment, and pesticides entering the watershed. [Petroleum industry activities are also potential causes, but were beyond the scope of this project.] Technology transfer of sediment, nutrient, and pest management techniques was the key to implementation of BMPs within the watershed. Agricultural support industries in the watershed, such as consultants, Certified Crop Advisors, and others, offered a tremendous opportunity for educational programming. These industries contact producers on a daily basis and indicated interest and support for an in-depth educational effort.

Project Area

The project focused on the Great Salt Plains Reservoir watershed (Hydrologic Unit Code: OK621010), which covers approximately 1400-square miles of north-central Oklahoma and south-central Kansas with 113 miles of stream. This area includes the 8890-acre reservoir and the Salt Plains National Wildlife Refuge. Project activity was concentrated on the southern tip of the watershed in Woods and Alfalfa Counties in Oklahoma.

Project Goals

The project was an education and demonstration project, with goals to improve the nutrient management and tillage management skills of 20% of producers directly through intense educational and demonstration activities, and to show 50% reduction of erosion, fertilizer use, and pesticide use on 10 demonstration sites. A target of directly influencing 20% of producers was selected because it has been demonstrated as the initial critical level to stimulate wider diffusion through the target community (Cuperus & Berberet, 1994). If achieved, a rapid transfer from farmer to farmer is likely to occur through producer meetings, the State Association of wheat growers, and the daily interactions of producers and agricultural businesses. The approved project workplan is included as Appendix 1.

Multiple educational avenues, including educational meetings, demonstrations, field days, a watershed website, and newsletter contributions were used to present BMP information to producers. Activities were targeted to agribusiness and wheat producers, encouraging them to maintain up-to-date information on crops, fertilizers, and pesticides. Demonstrated BMPs included conservation tillage, nutrient management, and pest management. The project emphasized how these practices reduce erosion and runoff of nutrients and pesticides to surface and ground waters. Educational programs stressed the dual roles that record-keeping plays in both production efficiency and pollution prevention. The project emphasized integrated crop management components of BMPs and the balance between environmental and economic goals. Key environmental components that the project focused on were:

- Minimizing sediment loss.
- Improving nutrient management and reducing the use of nitrogen and phosphorous fertilizer by mining excesses already in the soil profile.
- Minimizing impact of pesticides through use of integrated pest management.

Program evaluation was to be done by assessing producer knowledge and behavior before and after the educational program. Ten producer/cooperator operations were to be utilized as case study sites on the effects of implementation of specific BMPs. A computer modeling activity was planned to project the impact of BMP implementation on erosion, nutrient, and pesticide levels within the watershed.

Project Management

The Office of Secretary of Environment and OCC oversaw the project and acted as liaison between project personnel and EPA. OCC provided administrative oversight. OCC developed a cooperative agreement with OSU Cooperative Extension to conduct education and demonstration tasks. Contact person for OSU Cooperative Extension was Michael Smolen (405-744-8414). Smolen provided overall guidance and coordination to the project.

A project subgroup was established to implement demonstrations on cooperating farms. Led by Gerritt Cuperus, IPM Coordinator (405-744-9419), it included:

Roger Gribble, OCES Area Agronomist	(405) 237-7677
James Stiegler, OCES Soil Specialist	(405) 744-9620
Gordon Johnson, OCES Fertility Specialist	(405) 744-6420
Gene Krenzer, OCES Wheat Specialist	(405) 744-9617
Robert LeValley, Woods County OCES Director and Educator, Agriculture	(405) 237-2786
Tommy Puffinbarger, Alfalfa County OCES Educator, Agriculture	(405) 395-2134
Hailin Zhang, OCES Soil Analysis Lab Director	(405) 744-9566

Cuperus was also to serve as the Project Manager, in charge of the day-to-day operations of the project. After his unfortunate accident early in the project period, Area Extension Agronomist Roger Gribble accepted this responsibility. In 2000, the project funded a Northwest District Extension Water Quality Specialist position to fill the Project Manager role, as well as to promote other aspects of the project. Kevin Shelton took the position but left in September 2000, after approximately 8 months on the job. In early 2001, Extension Engineer/Environmental Scientist Tim Propst was named Project Manager and remained in this capacity during the remainder of the project period. As such, he provided support through project development and implementation including educational materials development, demonstration implementation, and project evaluation. Various OCES personnel provided technical assistance for implementation of Integrated Pest Management practices, project coordination, newsletter development, homepage development and updating, and development of IPM, nutrient, and tillage demonstrations. A graduate student was employed to develop the hydrologic model of the watershed in order to simulate the effects of BMP implementation, to analyze the effectiveness of IPM employed with farm cooperators, and to evaluate the environmental impact of the project. The Oklahoma Conservation Commission, Natural Resource Conservation Commission, Department of Wildlife Conservation, Oklahoma Department of Agriculture, and the local conservation districts partnered with OCES in public education programs.

Project Tasks

The goals of the project were accomplished through seven different tasks. A listing of the seven tasks with a discussion of the activities undertaken follows.

Task 1 - Establish Advisory/Steering Committee

"Establish Advisory/Steering Committee as described in above to assure agency coordination and cooperation in implementation efforts. Producers-Agribusiness representatives will be included. This group will meet approximately annually to share program progress and develop support among agencies and producers."

Outputs: *1101.1: Report on structure of advisory committees and membership*

1101.2: Minutes and accomplishments of Advisory Committee

In developing a management structure for the Salt Fork Project, it became apparent that both goal-oriented and task-oriented supervision would be necessary. In order to meet these two different needs, the Advisory Committee referred to in the approved workplan was developed into two separate committees.

The Salt Fork Project Steering Committee was made up of individuals representing the various agencies and groups with demonstrated interest in the project. As indicated in Table 1, this group included OCES personnel from several university departments at OSU in Stillwater, as well as area technical resource professionals from OCES and NRCS. The Steering Committee was charged with ensuring that the overall goals of the project were accomplished. They were to make sure that each of the tasks from the project workplan were completed and that the different aspects of the project were accounted for in project activities. The Steering Committee helped formalize plans and working relationships to ensure cooperation among the agencies and commonality of objectives. This committee also helped design technically sound and relevant demonstrations and made sure the objectives were clear and organized before being presented to the Advisory Committee.

Table 1. Salt Fork Watershed Project Steering Committee

Name	Affiliation	Location
Gerrit Cuperus	OCES	OSU, Entom & Plant Path
Robert Dotson	NRCS	Cherokee
Roger Gribble	OCES	Enid, Plant & Soil Sciences
Gordon Johnson	OCES	OSU, Plant & Soil Sciences
Scott Price	OCES	Grant County
Tommy Puffinbarger	OCES	Alfalfa County
Tom Royer	OCES	OSU, Entom & Plant Path
Kevin Shelton	OCES	NW District Office, Enid
Mike Smolen	OCES	OSU, Biosys & Ag Eng
Jim Stiegler	OCES	OSU, Plant & Soil Sciences
Dan Storm	OCES	OSU, Biosys & Ag Eng
Hailin Zhang	OCES	OSU, Plant & Soil Sciences

The second management group retained the title of "Advisory Committee" and was composed of professional members of the agricultural community in and around the Salt Fork watershed. The principal roles of the Advisory Committee were to assure relevance and credibility of the program as well as project ownership by agribusiness and producers. They were to help design demonstrations and field days, discuss project activities and make recommendations. Their charge was to ensure the practicality of the tasks and the suitability of the project approach and activities, help identify target audiences, assist in publicizing events, and garner support from their neighbors and clients. The names and locations of the members of this group are listed below in Table 2.

Table 2. Salt Fork Watershed Project Grower's Advisory Committee

Name	Location
Greg Baker	Alva, Woods County
A.B. Cochran	Cherokee, Alfalfa County
Kenneth Failes	Cherokee, Alfalfa County
Mickey Ferrel	Burlington, Alfalfa County
Joe Hadwiger	Cherokee, Alfalfa County
Keith Kisling	Burlington, Alfalfa County
Ronald McMurtrey	Cherokee, Alfalfa County

Task 2 - Assess Pre-Project Management Practices and Attitudes

"Assess pre-project management practices and attitudes of a statistically valid sample of producer population. Producers in the watershed will be surveyed for their present attitudes and behaviors with respect to: utilization of tillage, nutrient, and pest management BMPs. Preliminary analysis suggested there are approximately 120 producers in the watershed. At project completion, a subset of the same producers will be assessed to document changes."

Outputs: *1102.1: Survey instrument*

1102.2: Reports of assessment of producer attitudes and practices regarding tillage, nutrient, and pest management BMPs

In September 1999, the OSU Bureau for Social Research was contracted to conduct a telephone survey of agricultural producers in the Salt Fork Watershed. The purpose of the survey was to determine producers' planting, fertilizing, and erosion control practices and

their sources for management support information. Operational aspects such as crops grown (wheat, alfalfa, or sorghum), and size of operation were also included. The survey instrument is included as Appendix 2. All interviewing staff underwent training in interviewing techniques, including the subject of confidentiality. Each interviewer signed a confidentiality agreement. In the survey database, each producer was assigned a randomly generated respondent number so that no identifying information was linked to the survey responses. The survey was reviewed and approved by the OSU Institutional Review Board.

OCES provided the Bureau with a list of all producers and their phone numbers in the watershed from Alfalfa, Grant, and Woods counties. This created a potential respondent pool of 126 producers. Of these, 1 number was disconnected and 10 individuals were no longer farming (5 retired, and 5 sold farms for economic reasons). This reduced the respondent pool to 115 producers. From this list, 10 contacts requested the interviewer call back at a different time, 7 refused to complete the survey, and 5 did not answer. In addition, 3 calls were picked up by an answering machine, and 2 received busy responses. A total of 88 respondents completed the survey, a 77% response rate.

Individuals were asked only those questions pertaining to their crop operations, based on a minimum production acreage (50 acres for wheat, 10 acres for alfalfa, and 50 acres for sorghum). One completed survey did not meet any of these three requirements and was dropped from the results. Of the other 87 respondents, 82 produced wheat, 58 alfalfa, and 23 sorghum. A brief analysis of the survey results is included below as fulfillment of Output 1102.2. Results are discussed on a per crop basis. For a complete listing of survey results, see Appendix 3.

Wheat Producers

The 82 wheat producers reported managing approximately 97,500 acres of wheat. Of these, 52,500 acres were managed for grain only; 36,500 acres were managed for grain and grazing; and 8500 acres were managed for grazing only. The average number of wheat acres per producer was 1188, with a median and mode of 900 and 400 acres, respectively.

Respondents generally sowed more than a single variety on their land. By far, Kansas State University's (KSU) "Jagger" was the most frequently planted wheat variety, being utilized by 80% of the respondents. Approximately 43% planted "2137" another KSU variety, 22% planted OSU's "Custer" and 16% planted "2174" another OSU variety. A number of other varieties were also grown, but each was used by less than 8% of the respondents.

Almost 80% of the producers that graze cattle on wheat reported a typical stocking rate of 1 head/acre. Former Woods County Extension Director (CED) & Agricultural Educator Bob LeValley (currently OCES Area Extension Livestock Specialist) indicated that there might have been some confusion on the units expressed in the survey. He felt that a stocking rate of 2 acres/head, or 0.5 head/acre, was more typically used in the area. In discussion with OSU Bureau of Social Research Director Dr. Christine Johnson, it was discovered that the survey software accepts only whole numbers. If a producer had responded with an answer of "0.5," the software would have recorded this as "1". Therefore, the results must be interpreted as saying that approximately 80% of the producers who graze wheat have a typical stocking rate of 1 head/acre *or less*.

Approximately 70% of the wheat producers in the survey indicated that they test their soils annually. Only 2 of the 87 said they never soil test. In addition, about half of the respondents said they also test the subsoil of their wheat fields. Producers can use these soil test results to help them determine appropriate yield goals and nutrient management planning for their fields.

Despite the high frequency of soil testing, only 36% of the respondents said they have different yield goals for different fields. The average reported yield goal for wheat was 46 bushels/acre. Current OCES recommendations call for a fertilizer application rate of 2 lbs N/acre for every bushel/acre of the yield goal. This would mean an average application rate of 92 lbs N/acre, based on the average reported yield goal. Sixty-seven (67) of the 82 wheat producers surveyed said they apply an average of 43 lbs N/acre as pre-plant, while 72 producers reported an average topdress application of 38 lbs N/acre. This results in a combined average fertilizer application rate of 82 lbs N/acre, almost 10 lbs N/acre less than typically recommended by OSU. A producer interviewed as part of Task 4 indicated that he applies a little less than what is recommended by the soil test because he feels that those making the recommendations are also selling the fertilizer. If other producers share this attitude of avoiding a "padded" recommendation, it may account for the difference from the recommended rate observed in the survey results. In any case, the average reported actual yield was 39 bushels/acre, only 7 bushels/acre less than the average yield goal.

The survey also queried the wheat producers regarding application of phosphate fertilizer. Fifty-nine (59) of the 82 producers indicated they apply phosphate to their wheat fields at an average of 29 lbs P_2O_5/acre.

Wheat producers reported a wide range of tillage methods used on their fields. Approximately half of the respondents reported moldboard, chisel, and/or disk plowing as their primary tillage method. Various other methods, including no-till and other conservation tillage practices, were each reported at less than 4%. Approximately 33% said they have used deep ripping in some of their wheat fields. About 60% of the respondents said they would not consider using no-till methods and gave a wide variety of reasons. Most producers were not convinced no-till methods work (i.e., that they would be profitable) for this area. Of the 40% that said they would consider using no-till, about half said they would use it if it was shown to reduce costs.

Finally, chemical usage among the wheat growers was lower than anticipated. Very few (4 of 82) listed any fungicide use to combat disease. Only 20 of the 82 producers surveyed indicated they used any sort of insecticide. Eleven of these 20 used ground application, 4 used aerial application, and 5 used both types. Herbicide use was more frequent, with 67 of the 82 respondents indicating they used these chemicals. "Finesse" (51%), "Glean" (37%), and "2,4-D" (31%) were the most commonly used herbicides.

In deciding whether or not to apply pesticide, the producer must weigh several different options; crop health, potential for damage, market conditions, and cost of application, to name a few. Pesticide application is quite expensive and during the project period the wheat market was not very good. The interviewers reported that these were major factors in the response to this survey. Respondents were suffering severely.

Alfalfa Producers

Of the 87 respondents, 58 indicated they raised 10 or more acres of alfalfa, for a total of 8800 acres. The average reported alfalfa acreage was 152 acres, with a median and mode of 95 and 200 acres, respectively. "OK49" (40%), "Cimarron 3i" (21%), "Cimarron VR" (19%), and "Oklahoma Common" (12%) were the most frequently mentioned varieties. None of the other varieties were mentioned by more than 7% of the respondents.

Producers were asked to give their average yield in units of tons per acre. The reported average yields ranged from 1 to 80 tons/acre. The majority of the results (61%) were listed as 4-6 tons/acre, which is considered a valid response. Responses, however, could have been misinterpreted, because the question did not clearly specify the length of time under

consideration. A response of 1-3 tons/acre could be accurate on a per cutting basis. Answers on an annual basis would probably be in the 4-6 tons/acre range, but a response of 9 or 10 would also be possible. The larger reported yields may have been based upon the life of the stand. Since there was no means to determine the period referenced by each producer, there was difficulty interpreting the results of this question.

Most of those surveyed (62%) used their alfalfa fields for grazing. Almost half of these (16 of 36, 44%) put their cattle on the fields on October 15, and another 17% started the cattle on October 1. Several other start dates were listed, but only by 3 or fewer respondents. The vast majority (27 of 36, 75%) of the producers who grazed alfalfa left the cattle on for only one (42%) or two (33%) months. This is consistent with OSU recommendations.

Respondents indicated insecticide use more frequently on alfalfa (47 of 58, 81%) than on wheat (20 of 82, 24%). Use of "Lorsban" was reported by 32% of the producers. Several other chemicals were used by 10-20% of those responding. Interestingly, 10 of those surveyed (21%) indicated that they did not know what chemical was sprayed on their alfalfa. Of the alfalfa producers who used insecticides, almost half of them (22 of 47, 47%) used ground application, while 28% used aerial application and 26% used both.

Herbicides were used by a smaller group of alfalfa producers (27 of 58, 47%). "Pursuit DG" (26%), "Sinbar" (26%), and "Sencor" (22%) were the most commonly listed chemicals. The number of producers answering "Don't Know" to this question (7 of 27, 26%) was the same as for the top two chemicals. As was seen in the wheat producer survey results, very few producers (5 of 58, 9%) used fungicides on their alfalfa crop. Again, the most frequent response was "Don't Know" (4 of 5).

Based on these results, it was suggested that a pesticide education program be developed for these producers. However, some members of the Steering Committee felt this would not be a good use of time and resources. They said the majority of these producers schedule the co-op to come out and spray their fields, so the fact that they don't know the particular chemical used does not indicate a lapse in management. Secondly, they felt that in some cases, the producer might have feigned ignorance because they feared government intervention in their operations.

Optimal nutrient management was less frequently reported for alfalfa than it was for wheat. Annual soil testing was reported by only 17 of 58 (29%) alfalfa producers (compared to 70% reported for wheat). In addition, 15 producers (26%) said they never soil test their alfalfa fields. On the other hand, 20 of the 58 alfalfa producers (35%) said they apply phosphate fertilizer every year to their alfalfa fields, while almost as many (19 of 58, 33%) indicated they apply phosphate every 3-4 years. Smaller percentages said they apply phosphate every other year (17%) or never (16%).

Closer analysis of these results reveals some interesting trends. First of all, the average reported alfalfa acreage was 150 acres. Of all the producers that said they never soil test, only one had holdings of more than 155 acres. Thus, larger operators are doing more soil testing. Secondly, there seems to be a strong correlation between the frequency of soil testing and the application of phosphate fertilizer. Of the twenty producers that said they apply phosphate every year, 11 of them were among the annual soil testers. Conversely, of the 9 producers that said they never apply phosphate, 7 of them were among those that never soil test.

Sorghum Producers

Of the three main crops that the survey focused on, sorghum producers comprised the smallest group. Only 23 of the 87 respondents (26%) said they raised 50 or more acres of

sorghum. Total reported acreage for sorghum was 4800 acres, with an average of 209 acres, a median of 150, and a mode of 100. Although several different sorghum varieties were reported, no particular variety was grown by more than two producers. In fact, the most frequently listed response to the question of variety grown was “Don’t Know”.

Producers were asked to list their yield goal as well as their average actual yield. Answers ranged from under 5 to 100 bushels per acre for both questions. The interpretation problems listed above in regard to alfalfa yields may be applicable here.

Half of the sorghum producers (12 of 23, 52%) indicated they soil test every year, with only 2 of them saying they never soil test. Only two producers said they use insecticides. Both said they use ground application. A single sorghum producer used fungicide to control disease. Herbicides were used by 14 of the 23 sorghum producers (61%). “Atrazine”, “Dual” and “2,4-D” were the most commonly used herbicides, each of them being listed by three producers.

Additional Crops, Erosion Control, and Sources for Management Support

Thirteen of the 87 respondents (15%) said they grow soybeans. Nine grow them full-season (single-crop), while four double-crop them. Producers were asked if they grew any other crops besides wheat, alfalfa, sorghum, or soybeans. Nineteen of the 87 (22%) said they also had hay, feed, or pasture. Three (3.4%) raised cotton, one raised corn, and one raised Austrian winter peas. The other 63 producers (72%) said they raised no other crops.

Sixty producers (69%) indicated they used a moldboard plow to till a total of approximately 46,200 acres in the watershed. Based on reported values, each producer moldboard plows an average of 770 acres, with a median and mode of 700 and 1000, respectively.

Forty-four producers also reported a total of 5800 acres of cropland with salt problems. The average number of affected acres reported per producer was 132, with a median and mode of 25 and 10, respectively. Eighteen of the 44 producers (41%) that reported salt accumulation indicated this occurred in their range, only 11% said it was in their pastureland, and 48% said it was in both. Interviewers did not give respondents a definition for each of these cropland types, so these results should be interpreted with care.

About 37% of the respondents said they had stream bank erosion problems. Almost 60% said they would consider leaving a vegetated buffer between their crop and the stream. Only 30% would consider planting trees in such a buffer, however. About 60% said they have field gullies that occur most years, and 77% said they would consider installing a grass waterway or terrace to prevent gulleying.

For advice on insect, weed, and crop disease management, 71% indicated communication with the local co-op and 33% indicated Extension. Other sources included local communication, commercial sources, and publications. The local co-op was also listed by 56% of the producers as a source for advice on fertilizer and lime needs. Nine percent (9%) said they communicated with Extension, while another 9% indicated they used the soil tests for advice. Approximately 20% more listed some combination of these three for their nutrient management support.

In discussion with Tommy Puffinbarger (Alfalfa County Extension Educator, Agriculture) it was learned that in at least one instance, the co-op takes the soil tests and sends them to the OCES Soil, Water, and Forage Laboratory for analysis. The co-op then passes along these reported recommendations to their customers. Similar cases may exist with other commercial testing laboratories in the area. This is to say that although the face-to-face communication with co-op personnel indicated by the survey results is obviously of great

importance, there may also exist a “behind the scenes” influence of other agencies, institutions, and/or personnel.

Finally, producers were asked their age. About 15% were 26-40 years old, 67% were 41-60, and 18% were over the age of 60. Sixty-seven (77%) of the producers said they would like to receive a copy of the survey results so a preliminary report was sent to them. The Alfalfa and Woods County Extension Offices also received copies of this report.

Task 3 - Establish Communications

Contributions will be made to Alfalfa and Woods County agricultural newsletters. A WWW Home Page will be established to keep all parties informed about project activities with timely information. At this time we have no criteria for evaluating effectiveness of the web page other than number of visits. The home page will offer an opportunity for participants to ask questions of those involved, however.

Self-guided tours will be established at demonstration sites. Self-guided tours will consist of a kiosk, or shelter, with signage describing the project and requesting feedback from viewers. Most self-guided tours will be set up in conjunction with an attractive item like a variety trial. A guest registry will be included so we can know how many people chose to tell us they visited. These tours are intended to be non-threatening private activities that do not lend themselves to evaluation.

The newsletter articles will be targeted to wheat, cattle and alfalfa producers in the watershed. The focus will be on key environmental components including:

A. *Minimizing sediment loss*
B. *Improving nutrient management and reducing nitrogen and phosphorous application based on soil testing for excess nutrient already in the soil profile.*
C. *Minimizing impact of pesticides through utilization of integrated pest management practices and approaches.*

There will be an additional focus on the interface of wheat and alfalfa with cattle and a focus on riparian protection during the grazing period.

Outputs: *1103.1: Newsletter contributions at time of mailing*

1103.2: Description and URL of WWW Home Page

Newsletters

The most consistent mode of published communication used during the project period was the Alfalfa County Extension Newsletter. During the final year and a half of the project, Tommy Puffinbarger (Alfalfa County Educator, Agriculture) inserted timely landscape maintenance articles in every issue of the agricultural newsletter. This publication was sent to all agricultural producers in the county. At various times during the project, additional articles highlighted BMPs and promoted educational workshops in the watershed.

Bob LeValley (former Woods County CED & Educator, Agriculture: currently Area Extension Livestock Specialist) also printed articles of interest to the project in that county’s newsletter. Copies of articles from both these sources are included in Appendix 4, submitted in fulfillment of Task 1103.1.

Website

Research Assistant Mike White developed a project website at http://bioen.okstate.edu/home/mjwhite/saltfork/. The site contained general project

information as well as downloadable maps of the watershed created during the modeling portion of the project (Task 6).

Self-guided Tours –Extension Demonstrations & Variety Trials

As discussed below (Task 4) Extension personnel set up several BMP demonstrations and variety trials during the project period. The Extension Service commonly uses such sites as educational tools. In general, these areas are established and promoted so producers can gain first-hand knowledge of new technology or methods. Usually a field day is held that includes a formal tour of the site with one or more area technical professionals. Once thus publicized, producers are encouraged to return to the sites on their own to monitor progress at the site and/or re-familiarize themselves with the demonstration's claims or purpose. Although formal kiosks were not established at these demonstration sites in the watershed, the project team felt that the educational value represented by these locations met the criteria of a "self-guided tour".

Self-guided Tours –Musk Thistle Weevil Release

The musk thistle is an invasive non-native plant that can quickly overwhelm native vegetation and take over a field or pasture. Usually by the time a producer realizes there is a problem, the species has established seed stock in the soil, where they may remain viable for up to five years. Therefore, although chemical and physical control methods may immediately rid the affected land of visible plants, the same cost and effort must be expended every year for the next five years to control the problem.

In the 1970s, the USDA began searching for alternative methods. As a result, the plant's natural predators were imported as biological control measures. Two main species, the musk thistle head weevil and the musk thistle rosette weevil, are used. Proper use of these insects can control the musk thistle population within 5-7 years. This practice reduces the amount of chemical herbicide that is released to the environment, as well as the cost of operation for producers. Although the weevils can be ordered from various biological controls supply stores, the OSU IPM program sponsors a spring musk thistle weevil roundup at sites with established populations at various locations in the state. Producers collect weevils from these sites for transfer to their property. (Although some studies have indicated that the weevils may threaten unique populations of thistles closely related to musk thistle, no such populations are known to exist in Oklahoma).

Tommy Puffinbarger (Alfalfa County Extension Educator, Agriculture) has actively promoted this BMP and taken part in the weevil roundup for a number of years. In 1998, the Oklahoma State Legislature passed the Noxious Weed Law, requiring landowners to utilize control measures for certain plants, including musk thistle, or face hefty fines. Typically this entails spraying pesticides to kill the thistle. As a result of being placed in charge of enforcing this law, ODA developed a mechanism for Oklahomans to report affected areas. In the summer of 2001, over 50 Alfalfa County residents were turned in to ODA for musk thistle on their property. Some of these individuals had released musk thistle weevils on these areas. However, since it was early in the treatment phase (i.e., the weevil population was not large enough to reduce the thistle population) the thistles were still visible. Once ODA inspectors learned that musk thistle weevils had been released in an affected field, they considered it treated and the landowner in compliance. Although all parties were satisfied in the end, much effort and resources were wasted.

During project discussion, Puffinbarger and the Salt Fork Watershed Project Manager, Tim Propst, had the idea for a sign that producers could use to indicate a musk thistle-affected field had received treatment in the form of musk thistle weevil release. Even if passers-by

saw the invasive plant, the sign would let them know the problem was being treated and the landowner was in compliance with state law. The idea received the support of NRCS and ODA as well as the Extension Service. In addition to its impact on the project area, Pat Bolin, OSU Interim IPM Coordinator, had approximately two hundred of them printed for use by producers statewide. A copy of the sign is included in Appendix 5.

Other Communications – Alfalfa Electric Cooperative

The Alfalfa Electric Cooperative (AEC) maintains a program of routine pesticide spraying to suppress vegetation growth underneath their power lines. In the summer of 2002, AEC employee Dusty Shepherd noted that precautionary measures were necessary for the Tordon herbicide being used. Tommy Puffinbarger (Alfalfa County Extension Educator, Agriculture) was contacted with a request for maps highlighting pesticide-sensitive areas where spraying should be avoided in order to protect water quality.

Puffinbarger apprised Salt Fork Watershed Project Manager, Tim Propst, of the request. After discussions with Dr. Case Medlin of the OSU Plant & Soil Sciences Department and Doug Montgomery with the OSU Turfgrass Research Station, it was determined that the areas of major concern were the bottomlands near creekbeds and other areas with extremely sandy soils. Research Assistant Mike White created a map of the watershed highlighting these areas using project data generated from the previously completed modeling task. The map was printed in color and sent to Mr. Shepherd at AEC with a brief description and contact information for further assistance, if needed. A copy of the map and letter is included in Appendix 6.

Task 4 - Establish Ongoing Demonstrations on Nutrient Management, IPM, and Tillage in Each County

Demonstration plots will be established at 10 locations. Project personnel (Mulder, Krenzer, Gribble, and County agents) will work with 10 farmers to establish case histories of reduced pesticide use, considering herbicide use, fungicide use, and insecticide use. The IPM approach will promote prescription-based applications, based on scouting and weather information rather than preventive treatment. Demonstrations will focus primarily on wheat and alfalfa production, the principal crops in the area.

The plots are installed to demonstrate to producers that water quality BMPs can be utilized without production losses and without excessive expense to the producer. Demonstrating such practices is essential to acceptance by producers. Standard Extension demonstration plots will be installed.

There will not be sufficient funding to demonstrate riparian protection. However, cattle management practices with respect to water quality will be included in public meetings and educational programs associated with this project.

Outputs: *1104.1: Description of demonstration plots and self-guided tours*

1104.2: QAPP for demonstration sites, including locations and plans for 10 demonstration plots

1104.3: Identify cooperators for 10-IPM case studies; Report initial description of operations

1104.4: Report fertilizer use, pesticide use, and crop history on 10 cooperating farms (changes from previous years to be summarized and explained)

No other task was so directly affected by the circumstances described in the foreword than this one. The workplan called for BMPs to be implemented on 10 cooperating farms at the outset of the project. Fertilizer use, pesticide use, and other management variables were to be compared pre- and post-BMP implementation. Unfortunately, the lost time and resources prevented this from happening. Instead the project team attacked the goals of this task using a two-pronged approach of demonstration plots and cooperator interviews.

DEMONSTRATION PLOTS

OCES personnel have long made use of demonstration plots to educate their constituents on new techniques and/or technologies (see discussion in Task 3 section). These sites are intended to provide evidence of the effectiveness of BMP implementation. Overall, several demonstrations were promoted within the watershed. A brief history of each is listed below. This section is submitted in fulfillment of Output 1104.1.

Alfalfa Variety Demonstration – Daryl Schwerdtfeger Farm near Capron, OK

This trial promoted the use of high-yielding alfalfa varieties with multiple-pest resistance. ICI 630, ICI 645, Good As Gold, Ok 49, Cimarron VR, and Archer were the varieties recommended for this area. Ok 49, ICI 645 and Cimarron VR were the top performers in the 1998 harvest results.

On March 12, 1999, Bob LeValley (former Woods County CED and Educator, Agriculture; currently OCES Area Extension Livestock Specialist) hosted an educational meeting discussing the findings of the demonstration. Insect management practices, including alfalfa weevil egg counts, as well as degree-day information and nutrient management for alfalfa, were discussed with an audience of approximately 20.

In addition to producer education, the demonstration also provided hands-on learning opportunities for community youth. The Burlington High School FFA Chapter helped harvest the plots and gained a great deal of information about research and data collection in general, as well as alfalfa pests in particular. The importance of variety testing was also emphasized. Students were shown how an informed decision on variety selection can be used to improve yields and reduce pesticide use, resulting in higher net farm returns and better water quality in the community.

Alfalfa Variety Demonstration – Chris Buck Farm near Cherokee, OK

A second alfalfa variety trial was established in the fall of 1998 at a location just 2 miles from the Great Salt Plains Reservoir. It also was designed to provide producers a chance to compare pest resistance levels and corresponding yields of new varieties with recommended varieties. The improved varieties DK 142, DK 143, Reward and Magnum V were expected to show higher production.

At harvest, data were collected and analyzed. Results were reported in the Oklahoma Central Alfalfa Improvement Conference report for 1999. First year data indicated no yield differences between the multiple pest resistant and common varieties. This is not unusual for a seedling demonstration receiving large amounts of rainfall in the first year.

Alfalfa Weevil Demonstration – Alfalfa & Woods Counties

In early 2001, two sites were established to demonstrate how timely insecticide applications (rather than calendar-based prophylactic applications) combat alfalfa weevil infestations effectively. *Timely insecticide application* means using threshold spraying levels to reduce costs associated with controlling this pest. The associated potential reduction in pesticide

use can protect water quality in nearby streams and ponds, as well as in the local aquifer. Four objectives were set forth:

- Demonstrate the utility of the *alfalfa weevil degree-based model* as a predictive tool to enhance *timely insecticide applications* for larval populations of this insect.
- Demonstrate how misapplications, based on *calendar-based timing*, can result in inadequate control of alfalfa weevil and increase the need for pesticide.
- Demonstrate how *late applications* (after threshold) can result in loss of production and quality in alfalfa hay.
- Quantify the economic losses (yield, quality, pesticide costs, etc.) obtained from a replicated trial that demonstrates the aforementioned treatments.

Plots were established at two separate sites, one in each of Alfalfa and Woods counties. *Application thresholds*, or simply *thresholds*, were derived from OSU Current Report No. 7177 in conjunction with the alfalfa weevil degree-day model available through the Oklahoma Mesonet. Thresholds correlate insect counts obtained by regular field scouting with critical levels in the weevil population where insecticide application is the most efficient. The demonstration showed the effects of three different application timings: early (before weevil populations reached threshold levels), timely (at threshold), and late (after threshold levels had been reached).

All treatments consisted of an application of the insecticide Lorsban 4E. Sampling was conducted on 3 or 4 days, 7 or 8 days, and 14 or 15 days after each application. Yields were estimated for first harvest by sampling two quadrats from each of the respective plots and were calculated on a dry weight per acre basis.

Unfortunately for this evaluation, alfalfa weevil populations were relatively low during the demonstration. During the study, weevil larvae numbers approached the lower level of the threshold only once. Every timing of application treatment for alfalfa weevil resulted in excellent (75%) control of insect populations and no repeat applications were justified. Late applications were made on a declining population. By 14 days after the threshold application, no significant differences in alfalfa weevil numbers were observed between untreated and treated alfalfa.

Alfalfa treated early (calendar-based treatment) in Alfalfa County yielded significantly more forage than untreated alfalfa but not more than the other treatments. Conversely, alfalfa that was treated late in Woods County yielded significantly more forage than plants receiving an early treatment, but not better than the untreated or threshold-treated (timely) plants. Knowing this occurs in years when alfalfa weevil populations are low can help preserve the quality of the environment (water and wildlife) and save growers considerable costs associated with application. Based on a sale price of $80.00 per ton of alfalfa, the values of the various treatments ranged from $112.31 to $141.58 per acre. Interestingly, the greatest returns in Woods County were obtained from untreated alfalfa ($131.24/acre).

The higher yields from early treatments in Alfalfa County and later or no treatment in Woods County are most likely due to rainfall amounts and timing rather than to control of alfalfa weevil populations. Woods County had over two inches of rain in the month of May before harvest, while Alfalfa County only experienced 0.5 inches during that same period of time.

During the test period, many alfalfa producers besides the cooperator observed the test plots regularly. It was reassuring to know that growers are quite accurate in making treatment decisions in a year when alfalfa weevil populations are relatively low. In addition, their choices of insecticide when making that treatment are based on good knowledge of

OSU evaluations and careful considerations of costs and infestation levels. This further contributes to the protection of water quality and the environment in the area. Had the populations of weevils peaked earlier and/or been more intense, then treatment decisions would have been more challenging to make.

See Appendix 7 for more details regarding this demonstration.

Legume Forage Demonstration – Kent Kissling Farm near Burlington, OK

An attempt was made to establish a legume forage trial in the fall of 1998 using Texas Sprout Cowpeas, Chinese Red Cowpeas, Berken Mungbeans, and 3 varieties of soybeans. A legume crop could provide forage in either a grazing program or a hay operation, while also building nitrogen levels in the soil profile. This could reduce the amount of nitrogen needed for a small grains grazing and wheat production program, resulting in a reduction in fertilizer application. Unfortunately, the 1998 summer drought severely limited legume growth and the demonstration was consequently abandoned.

Nutrient Management in the Watershed - Burlington Cooperative Ass'n

In a study conducted in cooperation with Burlington Coop Agronomist Kenneth Failes, three years of soil test results and two years of fertilization and yield data were collected from eight sites in Alfalfa County. The 1996 and 1997 yield goals for these fields were 50 bu wheat /acre, and 100 lbs beef/acre. Based on OCES recommendations of 2 lbs N/bu wheat/acre and 30 lbs N/100 lbs beef/acre, this translates to a total fertilizer application rate of 130 lbs N/acre.

"Typical" practice would be to apply 100 lbs N/ac as a single application in the fall to all fields, with another 30 lbs N/ac applied as topdress in the spring for grazing. In this demonstration, nitrogen in the soil profile was "mined" for utilization by the wheat crop. Nitrogen levels in the soil, as indicated by soil test results, were used to calculate a new fertilizer application rate. A complete listing of soil test results, as well as fertilizer application rates and yield data is provided in Appendix 8.

In 1996, surface and sub-soil test results averaged approximately 140 lbs NO_3-N/acre for all eight fields, indicating an abundance of available nitrogen. No nitrogen applications for grain production were recommended for fall 1996. In the actual application data, on each of two farms, 100 lbs/ac of 18-46-0 (N-P-K) fertilizer was applied to meet an observed phosphorus deficiency. No other nitrogen was applied in fall 1996. A topdress application of 30 lbs N/ac was made on all farms except one (40 lbs N/ac applied) in spring 1997 for grazing.

Total pounds of nitrogen actually applied was obtained by multiplying the acreage of each field by the application rate. Total pounds of nitrogen typically applied was obtained by multiplying the acreage by 130. For all eight fields in the 1996-97 crop year, 38,502 pounds of nitrogen were actually applied, compared to 136,370 pounds of nitrogen typically applied. This shows a drop from 130 lbs N/ac typically applied to the average actual application rate in 1996-97 of 36.7 lbs N/acre, a 71.8% reduction.

This decrease was immediately noticed in the 1997 soil test results, where the eight-farm average dropped to 31.5 lbs NO_3-N/acre. For the 1997-98 crop year, fertilizer application rates were again based on soil test results. Since much of the excess nitrogen had been utilized in the previous year, recommended fertilizer application rates for grain production rose from 0 to an average of approximately 70 lbs N/acre for the eight fields. All farms applied 30 lbs N/acre in the spring. The total pounds of nitrogen actually applied was 95,765 pounds in the 1997-98 crop year, for an average application rate of 91.3 lbs N/acre.

This is a 29.8% reduction from typical fertilizer usage. Using fertilizer on an as-needed basis reduced nitrogen buildup in the soil, as shown by the 1998 average soil test reading of 26.6 lbs NO_3-N /acre for the eight farms.

Yield results from this time period indicated an average of 59.8 bu/acre in 1996-97 and 63.1 bu/acre in 1997-98. These yields were well above the 50 bu/acre goal. In fact, an increased yield goal of 60 bu/acre for the 1998-99 crop year was planned. Unfortunately, fertilizer application and yield data for that year were not obtained.

To summarize, this study showed that at these eight sites (1) both surface and sub-surface soil nitrogen levels could be used to calculate a fertilizer application rate for wheat, (2) use of nutrient management BMPs reduced fertilizer usage by 49.2% over two years, and (3) use of these BMPs resulted in satisfactory production yields.

Roadside Bindweed Control

High levels of arsenic have been detected in sediment and water samples from the project area, including some from the Great Salt Plains Reservoir. Pesticide use within the watershed was identified as a likely contributor to this problem. A review of the pesticides utilized in the watershed indicated that the only arsenical (arsenic-containing) products in common use were those sprayed along roadsides for weed control, not those used in fields for crop production.

Some new herbicides offer a promising alternative to the use of these arsenical products. These new herbicide products are not as water-soluble and have different modes of action from the arsenical compounds traditionally used. Imazapic (tradename: *Plateau*) and imazapyr (tradename: *Arsenal*), both from the imidazolinone herbicide family, control some pre- and post-emergent annual and perennial grasses, as well as some broadleaf weeds. They inhibit production of branched-chain amino acids, prohibiting protein synthesis and cell growth, thus killing the plant (Tu et al., 2001). From the phenoxy herbicide family, diglycolomine (tradename: *Vanquish*), is a growth regulator herbicide used for post-emergence control of broadleaf weeds and woody brush. It mimics indole-3-acetic acid (IAA), a natural plant hormone responsible for numerous aspects of plant growth. Growth regulator herbicides interfere with natural plant growth resulting in malformed leaves, epinastic bending and swelling of stems, deformed roots, and tissue decay (Gerst, 1999).

A field trial was set up with the Woods County Commissioners to investigate the use of these new chemicals. The demonstration focused on efforts to reduce bindweed invasion into producer's fields. *Plateau* and *Vanquish* products were both evaluated. At the site on the south side of Alva, OK, 8 ounces of *Plateau* per acre provided 88% control of bindweed. *Vanquish* provided only 45% control at twice this rate (1 pound per acre).

In a similar demonstration at a farm near Alva, OK, *Plateau* was again the better herbicide treatment for bindweed with more than 90% control. *Vanquish* bindweed control was near 70%, while *Arsenal* showed 50–70% control. *Plateau* and *Arsenal* controlled the annual broadleaf weeds that express themselves along the roadsides, but exhibited poor control of annual grasses (crabgrass and foxtail) and perennial grasses (Johnsongrass). With *Arsenal*, perennial broadleaf weeds such as ragweed were also released. *Vanquish* controlled the broadleaf weeds, but also released grasses. Although bindweed control was accomplished, the grass release exhibited by these chemicals could become a problem for producers.

Self-guided Tours – Musk Thistle Weevil Release Sites, Alfalfa County

The signs developed under Task 3 provided impetus for further educational opportunities as kiosks promoting musk thistle weevil release were established at two Alfalfa County locations in October 2002. At each of these weevil release sites, one of the signs and a mailbox were set up. Inside the mailbox, several copies of OSU Extension factsheet F-7318, *Integrated Control of Musk Thistle in Oklahoma*, were included as handouts for visitors. Pictures of the kiosks and copies of the factsheet are included in Appendix 9.

Subsoil Nitrogen Demonstration – Jim Buck Farm near Cherokee, OK

Nitrogen (N) fertilizer management for wheat forage and grain production is important to farmers' profit and to water quality. Nitrate-nitrogen (NO_3-N) is water-soluble, so it may move downward in the soil profile when conditions are favorable. A significant amount of NO_3-N was found in the subsoil (6-24") by a recent statewide soil test program. Wheat roots can penetrate this zone and utilize this nitrate during growth. Utilizing NO_3-N from the subsoil would significantly reduce farmers' fertilizer expenses. However, very few producers who collect soil samples for estimating residual N submit subsoil samples. Two of the main reasons for subsoil sampling not being more commonly used are the lack of understanding of its importance and the lack of access to a proper sampling device.

In August 2000, OCES personnel developed a demonstration site with a cooperating producer in fields located just southeast of Cherokee, OK. There were two main objectives:

- To fine-tune N recommendation based on residual N at four soil sampling depths;
- To promote soil sampling by demonstrating the contribution of residual nitrogen in the subsoil to winter wheat forage and grain yields.

One site had high residual soil nitrate N and the other had relatively low soil residual N. At each location, soil samples were taken from four depths and tested for plant available nutrients. Nitrogen application rates were set for a yield goal of 50 bu/acre (100 lbs N /acre), less the available N in 0-6", 0-12", 0-18" and 0-24" depth soil. Two additional treatments with N rates based on 0-6" depth residual N and a 50 bu/acre yield goal plus 30 and 60 lb/acre N (equivalent to 100 and 200 lbs beef gain for grazing, respectively) were also included.

As expected, more residual nitrogen was found when subsoil samples were taken. The June 2001 harvest results indicated that the differing rates of nitrogen application did not significantly affect wheat grain yields in the first year of this study. However, grain protein was increased with higher N rates. Complete 2001 results are listed in Appendix 10. Data is only available for this one year, since the drought in summer 2001 forced the trial to be abandoned.

Wheat Aphid Demonstration

Two replicated experiments were set up with grower/cooperators in Alva and Burlington, OK, focusing on the economic value of a sustainable pest management strategy for wheat production, including field monitoring/scouting. Locations were established in the fall of 1997 and were harvested in the spring of 1998. Each site demonstrated Integrated Crop Management practices on wheat, with the main objectives being to evaluate the economic return of:

- including dimethoate with a topdress nitrogen treatment for aphid control.
- using a scouting based pest management program in wheat.
- using Gaucho seed treatment.

At each location, six treatments were demonstrated, including an untreated check, insecticide at nitrogen topdress time, insecticide when needed, and various rates of a seed treatment insecticide. Aphid populations at both locations remained low throughout the experiment, averaging less than 100 per ft of row in the untreated check. Slight differences were seen among treatments, but were not meaningful. For example, at the demonstration near Alva, OK, the highest yielding treatment was a 3-ounce rate of Gaucho Seed Treatment. However, this treatment has an unrealistic cost of $25 per acre. In general, yield response reflected the low overall aphid numbers. No recommendations could be formulated using these data. A complete report is included in Appendix 11.

Wheat Variety Demonstrations – Kenneth Failes Farm near Cherokee, OK, and Wes Mallory Farm near Alva, OK

The wheat variety trials in Cherokee and Alva were set up by OCES personnel to compare harvest success of high yielding varieties adaptable to the Salt Fork Watershed. These locations also served as test sites for candidate releases from Oklahoma State University. Various seed companies and universities are constantly in the process of improving stock to help increase yields. One of the key factors that they attempt to include in these improvements is resistance to multiple pests and/or diseases.

From an economic standpoint, the "hardier" a variety is (i.e., the more resistant to various insults) the greater its yield potential. In theory then, an improved variety would require less pesticide to reach the same yield as an unimproved one. The intent of the project team was to piggyback this message of reduced pesticide use onto the variety trial results. Unfortunately, since the trials were set up from a production standpoint, the experimental manipulations necessary to support the environmental benefits argument (i.e., different pesticide application rates) were not part of the demonstration protocol. However, there are still some important lessons that can be learned from these variety trials.

The main goal of variety trials is to have side-by-side comparisons of different varieties available for observation. The length of the wheat growing season (Sept to June) and the myriad factors with potential to impact the crop during that time make it very difficult to isolate a single causal factor for one particular variety's success or failure. Furthermore, the inability to predict the exact combination of factors that will be at work during a single growing season makes variety recommendation difficult as well. The variety trial scenario enables producers to monitor variety success over time and through different conditions.

With that in mind, the following tables list the five varieties that performed best at each location, based on yield and test weight results from two or more growing seasons. Several varieties grown for a single year achieved better results, but since the consistency of their performance remains unknown, they are not included in this discussion. They are included, however, in the complete yield and test weight results and site maps from these demonstrations, included as Appendix 12 (Cherokee) and Appendix 13 (Alva).

The top 5 performers were determined based on an average of the percentile rank they achieved in each of the years they were grown. The use of a relative value instead of actual yield or test weight allowed for a more balanced comparison. For instance, the 2001-02 crop-year was very poor, with a reduction of almost 30 bushels/acre in the average yield. Consequently, the overall average yield of varieties grown during that season also decreased. Other varieties not grown in this year were unaffected. This is why some varieties with a higher average yield have a lower overall ranking.

Table 3. The top yielding wheat varieties from the Alva and Cherokee trials.

	Source	Variety	Yrs in Study	Avg Yield (bu/ac)	Avg %Rank
Cherokee	KAES	Jagger	5	49.5	0.88
	AgriPro	Cutter	2	31.8	0.84
	KAES	2137	5	46.5	0.75
	OAES	Custer	5	45.1	0.63
	OAES	OK101	4	43.1	0.61
Alva	AgriPro	Cutter	2	43.9	0.96
	KAES	Jagger	5	57.4	0.94
	Cargill	Kalvesta	2	39.1	0.77
	AgriPro	Thunderbolt	3	47.2	0.76
	Agseco	7853	3	64.5	0.69

Table 4. The top test weight wheat varieties from the Alva and Cherokee trials.

	Source	Variety	Yrs in Study	Avg Test Wt (lb/bu)	Avg %Rank
Cherokee	OAES	Tonkawa	4	59.5	0.87
	OAES	Intrada	3	57.4	0.83
	Agseco	7853	3	59.1	0.77
	Agseco	Onaga	2	55.8	0.75
	AgriPro	Cutter	2	56.4	0.74
Alva	Cargill	G1878	2	60.1	0.93
	Agseco	7853	3	60.5	0.92
	OAES	Intrada	3	59.9	0.91
	AgriPro	Thunderbolt	3	59.8	0.87
	OAES	Tonkawa	4	60.3	0.82

In the 1999 pre-project survey, 80% of the Salt Fork wheat producers reported growing Jagger. The yield results from these trials support their confidence in this variety. KAES 2137 (43%), Custer (22%), and AGSECO 7853 (7.3%) were also mentioned in the survey, but none of the other "top 5" from the trial were reported by more than one producer. As far as results directly applicable to the project, the bottom line is that these variety trial results will not immediately impact chemical usage in the watershed.

First of all, 67 of the 82 producers surveyed in 1999 reported spraying insecticide. The primary insect of concern for the project area is the greenbug (*Schizaphis graminum* Rondani). None of the varieties currently in or being considered for production in the watershed possesses resistance to this pest. (Krenzer, 2002). Therefore, variety selection is not a factor in the decision-making process for insecticide use.

Secondly, only 4 of the 82 producers surveyed in 1999 reported use of chemicals to combat disease. This is probably due to the exceedingly poor wheat market for the last number of years. In all likelihood, the yield increase that fungicide use might bring about would not be great enough to pay for itself. Producers simply cannot afford another financial input to the

wheat crop. Until the wheat market improves, variety selection is also not a factor in the decision-making process for fungicide use.

However, if, and hopefully when, the market does improve, the performance of disease resistant varieties in trials could be used as an argument to continue operation without additional chemical usage. For example, in the complete results provided in Appendices 14 and 15, "AgriPro's "Jagalene (a Jagger descendant) had the highest overall ranking for both yield and test weight at both variety trial locations. Although it was grown only during the 2001-02 season, this relatively new variety appears to combine the high-yielding attributes of its ancestor with an improved resistance to leaf rust, a frequent nuisance in the watershed. Further trials with this variety are planned.

COOPERATOR INTERVIEWS

The delays and circumstances surrounding this project, mentioned above and in the foreword, impacted the manner in which the project utilized cooperating producers. The original workplan called for the establishment and consequent monitoring of BMPs implemented by these individuals. The project team would have then made pre- and post-BMP comparisons with regard to fertilizer application, pesticide usage, and soil loss. When these activities were not initiated at the project outset, a large amount of time, critical to the success of such an operation, was lost. With an inadequate period in which to successfully and convincingly complete ten of these demonstrations, the project management team decided to accomplish the goals of this task through different means.

The project team felt that the purpose of this task was twofold; (1) use "real-world" data to illustrate the efficiency and profitability of BMPs, and (2) utilize the influence and standing of respected producers in the area to promote BMP implementation. As evidenced in the results of the survey, several BMPs were already in place in the watershed. The new approach adopted by the project team was to capture the necessary BMP information in a series of interviews conducted with producers utilizing these methods.

The first step was to identify the cooperators to be interviewed. OCES staff in Alfalfa and Woods Counties provided names of individuals that utilized BMPs in their day-to-day operations. Interviews were to be conducted in a two-step process. An initial survey would gather information from each cooperator about the size, type, and functioning of their operation, as well as a general overview of their attitudes and knowledge of various nutrient, pesticide, and erosion control BMPs. Based on the results of these initial interviews, each cooperator would then be asked for more detailed information concerning particular BMPs.

One goal of the interviews was to give each producer an opportunity to share their overall management plans and techniques. Therefore, the project team designed an open-ended survey instrument. Rather than multiple-choice questions, producers were asked to describe how they approached or dealt with each topic of interest. In summer 2001, the survey instrument was completed and approved by the OSU Internal Review Board (Appendix 14). Also at this time, the project hired an intern to complete the interview task.

The project intern, Ryan Jenlink, had just finished his first year at OSU, where he was named as one of the top ten male freshmen campus-wide. He grew up on his parents' farm in Alfalfa County near Jet, OK, just south of the Salt Fork watershed. During high school, he was actively involved in the local 4-H program and was the State 4-H Vice President during his senior year. These activities made him a familiar face among the agricultural community in the project area. Jenlink completed seven initial interviews with cooperators during his time with the project. His findings were summarized and are provided in Appendix 15.

These interviews were performed under a confidentiality agreement. Jenlink apprised each cooperator of these conditions at the time of the interview. Some cooperators refused to sign the confidentiality form, but still agreed to the interview. This revision in method was submitted to and approved by OSU-IRB. The confidentiality agreement listed Jenlink by name, as it was expected that he would complete both parts of the interview process during the summer 2001. Unfortunately, that was not the case. Furthermore, in spring 2002, the project team found that Jenlink had obtained another internship elsewhere and would be unavailable to the project. An appeal was made to OSU-IRB, and permission granted to hire a second intern to complete the interview process during summer 2002. Although an individual was appointed, he requested several delays for personal reasons before starting work, and effectively declined the position.

Since the project was near to ending by this time in the fall 2002, project manager Tim Propst, project director Mike Smolen, and Tommy Puffinbarger (Alfalfa County Educator, Agriculture), reviewed the completed initial surveys and developed a set of questions, specific to each producer, that would help clarify and/or quantify their responses. Using these sets of questions, Propst then conducted telephone interviews with the seven cooperators. The results of these interviews are included below and are submitted in fulfillment of Output 1104.4.

Producer 2

Producer 2 manages 2700 acres, with 1000 acres wheat, 700 acres alfalfa, and 1000 acres grass. He rotates between alfalfa and wheat, putting in the alfalfa until the stand declines and then putting this back into wheat. This helps to replenish soil nitrogen, requiring less capital investment than fertilizers and also has fewer hazards. He recognizes the erosion problem with moldboard plowing, so uses it only sparingly, i.e. to control a significant cheat problem. Although he could use pesticide to help control the cheat, he dislikes pesticide usage because of its potential hazards to the environment, particularly groundwater, and because it requires a large investment of capital. He also uses grazing as an alternative to pesticide use. Cattle are put into alfalfa after first frost (to avoid bloat) and left in for a month to all winter, depending on forage availability. Sometimes he lets them onto adjacent wheat pasture as well, rather than putting up a fence. As for an overall management philosophy, he said that a professor once told him that if you can raise a crop in the lower half of the price, then you can stay. In other words, if you can raise a crop for less than the average cost to do so, you will make money. He feels that using the cattle to graze the alfalfa might save him a little money on pesticide, depending on the year.

Producer 3

Producer 3 manages 750 acres, with 550 acres wheat, 150 acres grass, and 50 acres alfalfa. He also does some crop rotation between alfalfa and wheat. He tries to go 4-5 years with each crop, but sometimes the alfalfa stand, particularly hay fields, doesn't last that long, so the rotation is shortened. Producer 3 has a very well monitored nutrient management program. He tests subsoil regularly. In his words, the subsoil has twice the nitrogen as the surface, so he might as well use it instead of paying to put more on. If a large nitrogen application is recommended by the soil test, he splits his application. He puts some on in late summer and then topdresses in February. If only a small amount is required, he puts it all on as topdress. He uses soil test information to set yield goals on a per field basis, fertilizing accordingly. Although he moldboard plows about half his acreage annually, he uses other tillage methods on sandy soils to help control erosion. He does spray pesticide, but not until dictated by scouting results.

Producer 4

Producer 4 has 4000 ac of wheat. A family operation, both he and his wife were questioned for the interview. He is opposed to moldboard plowing because he feels it causes too much erosion. He said he has never used a moldboard plow in 50 years of farming and doesn't plan on doing it anytime soon. Their approach is one of residue management. They try to keep as much residue on the top as they possibly can. The type of equipment they use for the first plowing is dependent on the residue they have. If it is heavy, they disk (Chisel, 12in space on shanks). If they need more depth they'll use duckfeet (chisel sweep). The next pass is dependent on the weather. They might go over it again with a FlexKing 5 ft sweep (every 5 ft, 18in sweep on chisels) for a low crown sweep. Then he likes to go in with a Baker field cultivator. If he can't get in with that, he uses a 4000 Krause (35 ft sweep, with 18 inch sweeps 12in apart.). He keeps most records on a field-by-field basis. He feels that this allows them to use different management based on each field's conditions (e.g., soil test results).

Producer 4 is unique to the extent that he chooses not to use pesticides with any frequency, both because it requires a large investment and because of potential environmental hazards. They do use some herbicide, mixing Finesse in with liquid fertilizer when they topdress in the spring and using Tordon 22K for spot treatment. (He mentioned that he was checked this year for his applicator license, something that had never happened before). However, they try to avoid insecticides altogether. She feels like the dangers to area wildlife are too great. She commented that 25 yrs ago they saw a dieoff in robins at a neighbor's place that had sprayed intensely for cutworms. Whether or not to spray is determined by field conditions. Last year their stands were not good and they had no rain, so spraying pesticide would have been a waste. Basically they took the fields as a loss. Some fields they killed with Roundup and then plowed them under. Others were so poor there wasn't enough to kill. He said that the only real concern is greenbugs. If they feel like the population is bad enough that they are going to destroy the stand, then he will spray. However, he has only sprayed for them about 3-4 times in his farming career (50 years). Otherwise, he just lets the field go and allows the natural greenbug predators to balance out the situation.

They also do not use anhydrous fertilizer. Their main concern is safety. They are a family operation and their children and grandchildren are running the machinery, so they don't like the risks posed by using anhydrous. Although using dry, granular fertilizer is a little more expensive, he feels the reduced risk is worth it. He did say that for cattlemen, there probably is an advantage to using the anhydrous, but in his purely wheat operation these factors don't apply. In addition, he feels the anhydrous is harmful to earthworms and other beneficial organisms in the soil. With his avoidance of chemicals, it is no surprise that Producer 4 is adamantly opposed to no-till farming, primarily because of its reliance on chemicals.

Producer 5

Producer 5 has one of the most diverse operations of anyone interviewed. He operates approximately 4300 acres, with 3800 acres of that in wheat and the rest split up among alfalfa, corn, sorghum, and grass. He rotates alfalfa and wheat in one field, maintaining the alfalfa until the stand declines and then goes back to wheat for one year. He also rotates between corn and wheat in another field. He raises the corn for silage and puts in wheat to graze it out. One interesting practice is his use of disk ripping on the tighter soils that are grazed, about a third of his operation. He says it opens up the subsoil, allows roots to go down better, improves absorption, and therefore decreases runoff. He soil tests about one third of his fields each year and manages them accordingly. He grazes the last cutting of

alfalfa to get the cattle started. When asked if he thought of this as a pesticide alternative, he said there might be some pest control advantages to this practice, since removal of the forage leaves nothing for the bugs to feed on, and the disturbance of the soil caused by the cattle disrupts insect development.

Producer 5 is one of the few interviewed that uses any kind of filter strip. He has some 100-head cattle pens that drain to a creek. As he said, everybody's pens are on sloped ground (i.e., near waterway) because they want to take advantage of the drainage. When EPA began to talk of tightening up CAFO restrictions, he was afraid that he would be harassed about the locations of these pens, so he decided to put in some filter strips. He did receive some government assistance on putting in the Bermuda grass and instructions on fertilization, etc. He thinks it probably helps some to filter out nitrates before they make it to the creek, but heavily stressed that this should not be a mandated practice. If it is handy for someone to do, as in his case, then yes it is a good practice, but some folks don't have the room to put in these sorts of strips. He felt that requiring a fence 100 ft away from a creekbank to keep the cows out was ridiculous. When asked about the use of alternative, freeze-proof waterers and/or re-location of salt blocks, feeding stations, etc., away from the riparian areas, he thought those were good ideas. One interesting side note is that he has sprigged Bermuda into some of the growing pens. He feels this has also helped cut down on runoff and given the cattle another food source.

Producer 6

Producer 6 operates 2000 acres of wheat, cane feed (to supplement his cattle), and bluestem grass. He moldboard plows if stubble is heavy, otherwise uses a disk or chisel. He scouts before spraying pesticide. He uses slightly less fertilizer than recommended by the soil test. He says, "The people doing the recommending are also selling the fertilizer. So, if they say 60, I buy 50." Most of the time he does a single application of fertilizer as a topdress in the spring. If phosphate is called for, then he puts it down in the fall. If he is planning to graze a field, he accounts for the extra nutrient requirements by putting an additional 10 lbs N/ac on as topdress in the spring. This is a significant reduction from the 30 lbs N/ac most of the others use.

Producer 7

Producer 7 farms 4000 acres, with 3000 acres wheat, 800 acres milo, and 200 acres alfalfa. He does do some crop rotation, but the specifics of the rotation vary. After he cuts wheat, he lets the field lay one winter, then plants early milo the following spring, hoping it comes off in time to plant wheat. This year it did not. He may do some soybeans when the milo comes off. He may also do beans on failed wheat. Producer 7 has done no-till for the last two years on milo and has started no-till on some wheat. He has not had very good harvests so far using the no-till, but last year was extremely dry. In addition, an independent contractor sprayed the wrong formulation of pesticide, which also decreased his yields. Current wisdom is that it takes 3-5 years to get a good picture of no-till, so he will probably give it a few more years.

Producer 7 works with several landlords and has extensive records for each field, allowing him to custom manage each field. These records include regular soil testing, including subsoil test results. If the soil test recommendations call for more than 70 lbs N/ac, he splits the application. He has also taken ground categorized as "highly erodible" by NRCS standards and no-tills alfalfa or grass on it, which is then grazed out. This has worked fairly well for him. Another practice that has worked well for him is to have cows bred to fall calve and then turning the cow-calf pairs out into wheat pasture. As a side note, he filled out

paperwork to put in some filter strips, but the CRP folks never got back with him. He still needs to water from the wheat pastures, so no strips are currently in place.

Producer 8

Producer 8 farms 1700 acres of wheat, alfalfa, sorghum, and cotton. He uses a cotton-milo rotation on no-till ground. Also, he will rotate in alfalfa if the ground is right. The rotation period depends upon harvest yields, field condition, and weed pressure. It is a two-year maximum rotation, but he rotates sooner if grass appears in the milo before that. Also, since it requires more tillage, he only uses cotton for 1 year in the lighter soils to avoid erosion. He uses conventional, minimum, and no-till tillage methods. He has used no-till on about 360 ac for 3 years. It has not been extremely successful, but he will give it a couple more years. Although he does not keep very extensive records ("I'm terrible at writing things down," he says.) he keeps track of things in his head. For example, he knows that he has sprayed his fields four times this year at roughly $7 per acre. "That means it's going to take quite a crop to make a profit on those fields," he said. Pesticide spraying is dependent on scouting. He scouts wheat and alfalfa himself, and hires scouting for the other crops. He does have some filter strips that were installed under EQIP. He doesn't think that many terraces work as designed. He is not sure if that is a problem in design, of if they were not built correctly to specs. He thinks many of the waterways are misused in that they are farmed clean and not preserved as intended.

Task 5 – Agricultural Production BMP Presentations

In each of the two counties, agricultural production workshops are held. These workshops are well attended by project-targeted agribusiness and producers. The Project will develop informative talks for these workshops, emphasizing BMPs specific to the production area(s) of interest. These will be state-of-the-art presentations focused on economically and environmentally sound crop production. Presentations will draw on expertise of OCC, ODA, NRCS, agribusinesses, and cooperating producers.

Presentations will cover the following topics:

- *A. BMPs*
  - *1) Improved nutrient management*
  - *2) Nitrogen*
  - *3) Phosphorus*
- *B. Reduced/modified tillage to minimize sediment loss to the environment*
- *C. Buffer-strip Initiative of the NRCS and riparian management*
- *D. Integrated pest management*
  - *1) Pests*
  - *2) Weeds*
  - *3) Insects*
  - *4) Diseases*
  - *5) Scouting*
  - *6) Thresholds*
  - *7) Pesticides and the environment*
- *E. Risk reduction through improved management*

Evaluation will be conducted indirectly through the post-project survey.

Outputs: *1105.1: Water quality-related educational materials for agricultural production management presentations*

1105.2: Report on agricultural production management workshops, tours, and field days

The project team developed two presentations for use at agricultural production meetings. Project Director Mike Smolen presented the first, "BMPs in the Salt Fork Fork Watershed," (Appendix 16), at a field day in Alfalfa County. The second is a discussion of IPM methods, focusing on musk thistle weevil release. It is to be used at another meeting in Alfalfa County in Spring 2003 and is included as Appendix 17. These were completed in fulfillment of Output 1105.1.

The following is submitted as fulfillment of Output 1105.2:

Tommy Puffinbarger (Alfalfa County Extension Educator, Agriculture), Bob LeValley (former Woods County CED and Educator, Agriculture; currently OCES Area Extension Livestock Specialist), and Roger Gribble (OCES Area Extension Agronomist) were listed as a match for this project. Their activities in the watershed included a large number of educational meetings with agriculture producers, covering a wide variety of crops and BMPs. Appendix 18 contains flyers and agendas from a sampling of these meetings.

The project directly sponsored a field day in August 2002. The BIOEN rainfall simulator was set up to illustrate the effects of residue on runoff and soil erosion. As it turned out, the simulator was not necessary since a much-needed rain saturated the area the night before and day of the tour. Fortunately, the cooperator in whose field the simulator was set up visited the site previous to the meeting and filmed the runoff that was occurring. The video offered good evidence of how residue reduces the impact of the raindrops and helps reduce soil erosion. Current plans are to publish the video on the OCES Water Quality website at http://waterquality.okstate.edu.

In addition, the project greatly enhanced the technology available to the Alfalfa County Extension office for their educational programming. Project funding purchased a laptop computer, digital camera, scanner, lighted display board, and LCD projector. These items would have been virtually impossible for this capital-poor area to obtain. Obviously they will serve to increase the effectiveness of their educational presentations, as well as their connectedness with the University.

Task 6 - Model the Environmental Impact, and Assess Changes in Knowledge Level and Practices with a Post-project Survey

Profitability and cost of BMPs and alternative management systems will be determined and used in the education program. A computer modeling activity will consolidate findings from the demonstration sites and project their impact on reduction of erosion and reduced pesticide and fertilizer applications across the watershed. Computer modeling (Universal Soil Loss Equation and delivery coefficients) will be used to determine erosion, sediment yield, nutrient yield, and pesticide losses. Using various levels of BMP implementation, computer modeling will project reductions in sediment, nutrient, and pesticide loading to the Great Salt Plains Reservoir. All models will be accepted technology with well-established procedures to project the impact of program on a watershed basis. This effort will use the GIS database at OSU with research and graduate student support. [This task differs from Task 2. Task 2 addresses attitudes and practices, whereas this task addresses economics and environmental impact.] Modeling will be used to

project the impact across the watershed, based on land use, topography and soils information in conjunction with findings of Task 2.

Outputs: *1106.1: QAPP for BMP impact evaluation model*

1106.2: Evaluation report on modeling of environmental impact of BMPs relative to conventional practices; poster session for use with producers at field site

OSU BIOEN Professor Dan Storm and Graduate Research Assistant Mike White performed the modeling task of the project. All outputs were previously completed and submitted. A brief summary of activities and findings of this task, taken from the modeling report (White, et al., 2001) is included below. For more detailed information regarding the model and simulation results, please see that document, available online at http://biosystems.okstate.edu/waterquality/Publications/Saltfork_modeling.pdf.

MODELING

Introduction

The Soil and Water Assessment Tool, or SWAT, a distributed hydrologic basin-scale model, was used to simulate and compare the effects of implementation of various agricultural BMPs on water quality in the Salt Fork Watershed. An ArcView GIS interface was used to convert the most current GIS (Geographic Information System) data for topography, soils, land cover, and streams to a form usable by the model. Actual weather data in the form of precipitation and temperature readings observed from 28 stations in and around the basin were also utilized.

SWAT used these data to create a digital copy of the Salt Fork watershed basin. The twenty-year period from 1980 to 2000 was selected as the time frame during which the simulation of BMP implementation would be performed. To more accurately accomplish this task, the SWAT model was calibrated against observed streamflow from three USGS gages in the watershed. Two of these gages had records covering the entire period of interest. At these two gages, the model was calibrated separately against both observed surface flow and observed baseflow. Baseflow (from groundwater) was separated from daily stream flow using a method adapted from the USGS HYdrograph SEParation (HYSEP) program (Sloto and Crouse, 1996). The third gage only covered the period from 1980 to 1992. Since it is located downstream of the Great Salt Plains Reservoir, baseflow separation was impossible. Thus, the model was calibrated for total flow only at this site.

Model Limitations

A model by definition is a simplification of the real world. Hydrologic models will always have limitations, because the science behind the model is neither perfect nor complete. Additional model limitations may be the result of data used in the model, inadequacies in the model, or using the model to simulate situations for which it was not designed. Important limitations of the SWAT model that should be considered include:

- Weather data from a few stations may not be representative of the entire area.
- All hydraulic response units (HRU) in a sub-basin are assumed to have the same topographical characteristics.
- Management varies by field, not by HRU as was assumed.
- Very small land covers are not represented in the GIS data.
- Land cover area fractions from the original GIS data cannot be preserved.

Results

The basin that feeds the Great Salt Plains Reservoir covers more than 8,000 square kilometers in both Oklahoma and Kansas. The majority of this area is rangeland, but a quarter of the basin is covered in wheat. Much of this is contained in Oklahoma.

SWAT is a distributed model and operates on a daily time step, so it was possible to view model outputs as they varied both spatially and temporally. Model outputs were grouped by land cover and examined. Conclusions drawn from the calibrated model:

- Sediment and nutrient yields varied dramatically across the basin.
- Wheat cropland is the largest source of sediment.
- Each land cover has unique temporal nutrient and sediment distributions.
- Wheat cropland accounts for 92% of all surface nonpoint source nitrate contributions to ground water.

BMP Results

Several tillage, harvest type, fertilization, and pesticide BMPs were compared. All comparisons were made strictly on a relative basis since the model was not calibrated for the majority of the outputs examined. Tillage (moldboard plow, stubble mulch, or low till) and harvest type (grazing only, grain only, or grazing and grain) combinations were simulated and compared. Several fertilization scenarios and application rates were simulated. Herbicide applications on wheat and insecticide usage on alfalfa were also examined. The primary conclusions from SWAT model BMP simulations included:

- Split fertilizer applications showed less nitrogen loss than a single pre-plant one.
- Switching from moldboard to low till reduced sediment yield by half.
- Harvest type had a greater influence than tillage on soluble nutrients.
- Harvest type and tillage had statistically significant effects on sediment and sediment-bound nutrients.
- Higher fertilization rates increased nitrogen and phosphorous yields.
- Insecticide yield spiked a few times over the model period, likely due to short residence time of the chemical and the timing of rainfall events relative to application.
- Yields of the wheat herbicide studied (Maverick™) show far less year-to-year variability than insecticide, presumably due to longer lasting residuals.

POST-PROJECT SURVEY

In 2002, the OSU Bureau for Social Research was again contracted to conduct a telephone survey of agricultural producers in the Salt Fork watershed. The purpose of the second survey was to determine if any changes in agricultural practices had occurred during the project period. Due to both budget and time constraints, this post-project survey was more narrowly focused than the previous one. The survey instrument is included as Appendix 19. The survey was reviewed and approved by the OSU Institutional Review Board.

As reported in the results of the pre-project survey, wheat accounts for approximately 90% of the cropland in the watershed. Eighty-two of the 87 pre-project survey respondents were identified as wheat producers. The project team set a goal of surveying at least 50 of these individuals concerning their wheat production techniques and attitudes. Results from this second survey could then be compared to the earlier one in order to document any changes in producers' attitudes or practices during the project period.

In August 2002, the Bureau of Social Research initiated the work and completed 50 surveys. Three producers refused, 10 callbacks were requested, 8 answering machines picked up, one producer was deceased, one was physically or mentally unable to complete the survey, no one answered at one location, and six producers were no longer farming. Overall, a 67% response rate was reported. A higher rate would have been possible with more work, but the intended goal of 50 respondents had been reached. In addition, the observed rate was very close to the target of 70%, so extra effort was deemed unnecessary. Of the 50 respondents, two of them reported managing less than 50 acres wheat, so they were removed from further analysis. The complete survey results are included as Appendix 20. Table 5 contains a summary of these results, as well as a comparison to 1999 results.

Table 5. Comparison of 1999 (pre-project) and 2002 (post-project) survey results of 50 wheat producers in the Salt Fork watershed.

	1999	2002
Wheat acres	61102	62820
Yield Goal (bu/a)	45	43
Pre-plant N (lbs/a)	40	43
Topdress N (lbs/a)	39	36
Total N (lbs/a)	78	77
P_2O_5 (lbs/a)	31	30
Dffrnt mngt, dffrnt fields(%)	38	67
Conservation tillage use (%)	67	88
Consider No-till (%)	35	48
Avg Yield (bu/a)	39	35
Consider Vegetated Buffer (%)	54(59)*	52(78)
Consider Trees in Buffer (%)	25(31)	21(31)

*Percentages in parentheses were calculated after producers that responded “Not applicable” to the question were removed from the respondent pool.

The results indicated a 1,700-acre increase in total wheat production area. The average wheat acreage reported per producer was basically unchanged, with 1300 acres reported in both surveys. Since the survey utilized a subset of those who responded to the first survey, individual responses could be compared between the surveys. The difference in individual reported acreage between the two surveys showed that on average, each producer gained 36 acres of wheat. However, drastic changes did occur for some individuals. These changes ranged from a net loss of almost 2300 acres for one individual to a net gain of 2600 for another.

Producers were asked to list yield goals, pounds of nitrogen applied as both pre-plant and topdress fertilizer, pounds of phosphate applied, and average yields. As seen in Table 5, these numbers were virtually unchanged between the two surveys.

On the surface, two other questions showed only a slight change in response from 1999 to 2002. In both surveys, about half of the producers said they would consider putting in a vegetated buffer between their crop and the creek. Review of the data reveals 9 producers that said they would not consider a buffer in 1999 indicated they would consider a buffer in 2002. Only 2 producers that said they would consider a buffer in 1999 said they would not in 2002. Producers were also asked if they would plant trees in a vegetated buffer. Review of individual responses showed that although 5 producers changed their response from

"yes" in 1999 to "no" in 2002, another 5 made the exact opposite switch, resulting in no difference in percentages for each of those responses.

Although the syntax for these questions was identical in both surveys, an additional possible response was added in 2002 that was not available previously. In 1999, producers were only given the option of answering "Yes" or "No" to these questions. In the 2002 survey, however, "Not applicable-no creek banks" was also listed as a potential response. In the 2002 survey, sixteen producers said the *vegetated buffer* question did not apply to them and fifteen of these also said the *trees in buffer* question did not apply (one producer that indicated "not applicable" to the *vegetated buffer* question said he would not consider planting trees in a buffer). In 1999, seven of these had said they would consider a buffer and nine had said they would not. Two of them had said they would consider planting trees in a vegetated buffer in 1999, the other 13 had indicated they would not.

Removal of the 16 producers that listed "not applicable" to the vegetated buffer question from the 2002 analysis left a sample size of 32. In 1999, 59% of these producers indicated that they would consider installing such a buffer. This increased to 78% in 2002. The percentage of these producers willing to plant trees in a buffer remained unchanged at 31% for both surveys, despite the flip-flopping responses of the 10 producers already mentioned.

Increases in the use of other BMPs were also reported. Producers with differing management for different fields almost doubled from 38% in 1999 to 67% in 2002. Only 35% of the producers said they would consider no-till in 1999, while almost half (48%) said they would do so in 2002. The use of other conservation tillage methods also increased.

In 1999, producers were asked to list the primary tillage methods for their wheat fields. They were given five possibilities: (1) chisel plow, (2) disk, (3) moldboard plow, (4) no-till, and (5) other. Many of the producers listed multiple tillage methods in response to this 1999 question. In 2002, producers were asked simply if they used conservation tillage on any of their wheat fields. In order to compare the two surveys, responses from 1999 were reviewed and producers were re-grouped. "Non-conservation tillers" from 1999 were those producers listing only "moldboard plow" as the primary tillage method. All other responses categorized a producer as a user of conservation tillage. Under these stipulations, use of conservation tillage increased from 67% in 1999 to 88% in 2002.

CONCLUSIONS

Comparison of the 1999 and 2002 survey results indicated that the use of BMPs in the Salt Fork watershed has increased during the project period. A number of factors may have contributed to this increase. First are the educational efforts of technical resource personnel in the watershed, including those associated with the project. Another factor that plays into this is the fact that BMPs are "best" by definition. For example, if a producer can be shown that by following the soil test recommendations on a per field basis he can reduce fertilizer use, and the cost associated with it, he has little problem using different management for different fields.

Results indicated that producers in this watershed were already employing most of the BMPs recommended, but that some areas could use further work, such as individual management of separate wheat fields and soil testing in alfalfa fields. Attitudes toward conservation tillage, and no-till in particular, seem to be improving, and producers are becoming more receptive to riparian management and filter strip installation.

Task 7 - Final Report

Final report will be developed, printed and submitted.

Outputs: 1107.1: Final Report

This report, including the appendices, tables, figures, and photos, is the final report.

Measures of Success

1. *Producer implementation of tillage, nutrient, and pest management BMPs. Target is 20% adoption of BMPs after year 5.*

   Comparisons of the results from the pre- and post-project surveys are listed below. (These results are discussed in detail under Tasks 2 and 6 in this report.)

   - Different management for different fields (i.e., fertilizer application rate based on soil test results) rose 29%, from 38% in 1999 to 67% in 2002.
   - Conservation tillage use rose 21%, from 67% in 1999 to 88% in 2002.
   - Willingness to consider a vegetated buffer rose 19% among producers with stream banks, from 59% in 1999 to 78% in 2002.
   - Willingness to consider no-till rose 13%, from 35% in 1999 to 48% in 2002.
   - Willingness to consider planting trees in a vegetated buffer remained unchanged at 31% from 1999 to 2002 among producers with stream banks.

2. *Reduction in sediment loss estimated from cropland in the watershed based on modeling the impact of BMP implementation. Target is 50% reduction.*

   The SWAT model results indicated that conservation tillage practices yield 25% (stubble mulch) to 50% (low till) less sediment than moldboard plowing. Producers reported a total of 111,100 acres of land in production in 1999 (97500 acres of wheat, 8800 acres of alfalfa, and 4800 acres of sorghum). Pre-project survey results indicated that producers moldboard plowed approximately 46,200 acres of this total area. This means that at the start of the project, conservation tillage was already being used on the remaining acres, equal to approximately 58% of the cropland in the watershed. This results in a 15-29% reduction (0.58*25-50%) in sediment yield compared to the worst-case scenario (all cropland moldboard plowed). The post-project survey indicated an increase of 21% in the number of watershed producers utilizing conservation tillage. Although the exact acreage affected was not recorded, this translates to an additional reduction of sediment yield in the Salt Fork watershed.

3. *Reduction in excess fertilizer applied by cooperating farmers when management is based on soil testing and IPM principles. Target is 50% reduction on demonstration farms compared to typical practices.*

   In a study conducted in cooperation with Burlington Coop Agronomist Kenneth Failes, three years of soil test results and two years of fertilization and yield data were collected from eight sites in Alfalfa County. This exercise demonstrated how nitrogen in the soil profile can be “mined” for utilization by the wheat crop. Nitrogen levels in the soil, as indicated by soil test results, were used to calculate a fertilizer application rate. In the 1996-97 crop year, 38,502 pounds of N were applied to these eight sites at an average application rate of 36.7 lbs N/acre. Compared to 136,370 pounds of N at the typical application rate of 130 lbs N/acre, this is a 71.8% reduction in fertilizer usage.

   The following year, fertilizer application rates were again based on soil test results. The amount of nitrogen actually applied was 95,765 pounds at an average rate of 91.3 lbs N/acre for the 1997-98 crop year. This was a 33.0% reduction from typical

fertilizer usage. In summary, utilizing these nutrient management BMPs resulted in a 49.2% reduction in the amount of fertilizer applied to these fields over a two-year period. Yields during this period were satisfactory. In fact, an increase in the yield goal for these fields (from 50 bu/acre to 60 bu/acre) was planned for the 1998-99 crop year.

4. *Reduction in nitrogen and phosphorus loss estimated by modeling. Target is model prediction of 50% reduction.*

   The modeling results indicated that splitting the application of nitrogen fertilizer into a pre-plant application in the fall and a top-dress application in the spring reduced several nutrient-related factors. In both the 1999 pre-project and 2002 post-project surveys, approximately 75% of the respondents indicated that they utilize both a pre-plant and a top-dress application. Multiplying the percentage of producers that split fertilizer application by the percent reduction this practice accomplishes provides an estimate of the total reduction for each parameter within the entire watershed. Table 6 shows the results obtained by combining the modeling and survey results in this manner.

Table 6. Estimated reduction of nutrient loss in the Salt Fork watershed due to split fertilizer application, calculated by combining the modeling and survey results.

Nutrient Parameter	Reduction due to split application (%)	Producers that split application (%)	Reduction in watershed (%)
Nitrate leached	almost 90	75	almost 67.5
Nitrate in lateral flow	approx. 80	75	approx. 60
Nitrate in runoff	greater than 50	75	greater than 37.5
Soluble P	approx. 50	75	approx. 37.5
Sediment-bound P	20	75	15
Organic N	15-20	75	11.25-15

5. *Reduction in pesticide use on cooperating farms employing IPM (improvements in pest management through improved cultural practices, pesticide use only based on scouting and thresholds, and implementation of non-pesticide practices). Target is 50% reduction on demonstration farms compared with typical practices.*

   The results of the interviews with cooperating producers indicated that several improvements in pest management techniques are being utilized in the Salt Fork watershed. Scouting to determine insect population levels before spraying is a common practice. A few producers graze their alfalfa stands, which may have benefit as a pesticide alternative. Still others among the group dislike the use of pesticides for a variety of reasons; cost, environmental threat, safety concerns, and do not use the pesticides unless it is absolutely necessary to save the crop. The reduction in the amount of pesticide utilized by these individuals in comparison to "typical" levels is dependent upon the crop, weather, and insect population.

Conclusions

The pre-project survey indicated widespread usage of many BMPs and generally favorable attitudes toward BMP implementation. Still, comparison of pre-project and post-project survey results showed improvement in both these areas over a three-year period. No-till practices in the project area are a good example of this trend. At the project outset, few producers used this method and it was viewed with open skepticism. However, by project

end, several producers were testing it on at least a portion of their cropland. The project team also noted producers were more receptive to discussion of the practice than previously. Overall, little change in individual acreage holdings was noted, but some very great changes were recorded for a few individuals, with gains or losses of more than 2,000 acres. The impact of a community-wide education program can be very great when management of such large parcels can change hands within a relatively brief period of time.

The impact of individual efforts can also be quite far-reaching. Burlington Coop Agronomist Kenneth Failes aids many producers in northern Alfalfa County, the heart of the project area. Widespread acceptance of regular soil-testing and nutrient management in the watershed is due, in no small part, to the trust he has earned from his clientele over the years. Another individual, Tommy Puffinbarger (Alfalfa County Extension Educator, Ag/4-H Youth Dev), has been instrumental in promoting another BMP in the watershed. His efforts to actively assist producers in collecting and releasing musk thistle weevils as a biological control for musk thistle has helped reduce pesticide use in the area. As part of the project, a sign was developed for producers to indicate when fields had been treated with the weevils. When the OSU Integrated Pest Management program adopted this promotional tool for use statewide, the impact of these efforts reached beyond the Salt Fork to include watersheds all across Oklahoma.

Determining just how much BMPs impact a watershed was the goal of the project's modeling task. Results indicated that significant reductions in nutrient and soil loss could be made with implementation of select BMPs. In addition, the results showed that in low slope zones, such as much of the project area, upland range management could greatly impact water quality. Poor upland management in the past may account for much of the sediment deposition problem currently observed in the watershed.

One of the greatest impacts of the project was the widening of communications in the sensitive area of environment and water quality within Extension at state, area, and county levels and between Extension and other agencies. Improved relationships have been forged that will provide for continued promotion and adoption of BMPs within the watershed. New environmental content for extension programs and improved presentation technology will increase the effectiveness of and encourage further attention to environmental programs by county educators (e.g., Output 1105.2: musk thistle weevil presentation). The stage has been set for continued effort beyond the original scope and duration of the project.

The project provided unique insight into BMP promotion and implementation. Multi-faceted relationships exist between the agricultural community, various technical resource personnel, and governmental agencies. The project survey was a good, strong step forward in elucidating these relationships. Additional funding for a follow-up survey would allow the OCES Water Quality office to evaluate the long-term impact of the project. Continued cooperation and support would not only serve the Salt Fork watershed, but the lessons learned could be used to enhance BMP implementation and improve water quality for a much wider audience.

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NONPOINT SOURCE PROJECT SUMMARY PAGE

FY 1997 319(h)

1. TITLE OF PROJECT:

Demonstration of Best Management Practices in the Salt Fork Watershed

2. PROJECT GOALS/OBJECTIVES:

The project is an education and demonstration project. Project goals are to improve knowledge and nutrient and tillage management skills of 20% of producers through an intense educational and demonstration program, and to show 50% reductions of erosion, fertilizer use, and pesticide use through modeling.

The program will work through multiple educational avenues including educational meetings with producers, focused meetings and training sessions with consultants and Certified Crop Advisors (CCAs), the Watershed Home page, and demonstrations and field days. Activities will be targeted at agribusiness and wheat producers, encouraging them to maintain up to date information on crops, fertilizers, and pesticides. Demonstrations will compare BMPs and conventional management to identify economic and environmental aspects of each system.

3. PROJECT TASKS:

Task 1. Establish Advisory/Steering Committee.

Task 2. Assess pre-project management practices and attitudes of a statistically valid sample of the producer population.

Task 3. Establish communications. Contributions will be made to the Alfalfa and Woods County Extension newsletters. A WWW Home Page will be established to keep all parties informed about project activities with timely information. Self-guided tours will be established at each demonstration site.

Task 4. Establish ongoing demonstrations on nutrient management, IPM, and tillage in each county. The IPM approach will promote prescription-based applications, based on scouting and weather information rather than preventive treatment.

Task 5. Develop environmental presentations for use at agricultural production management meetings and workshops.

Task 6. Model the environmental impact, and assess changes in knowledge level and practices with a post-project survey.

Task 7. Prepare and submit final report.

4. MEASURES OF SUCCESS:

1. Producer implementation of tillage, nutrient, and pest management BMPs. Target

is 20% adoption of BMPs after 5 years.

2. Reduction in sediment losses estimated from cropland in the watershed based on modeling the impact of BMP implementation. Target is 50% reduction.
3. Reduction in excess fertilizer applied by cooperating farmers when management is based on soil testing and IPM principles. Target is 50% reduction on demonstration farms compared to typical practices.
4. Reduction in nitrogen and phosphorus loss estimated by modeling. Target is model prediction of 50% reduction in the watershed.
5. Reduction in pesticide use on cooperating farms employing IPM (improvements in pest management through improved cultural practices, pesticide use only based on scouting and thresholds, and implementation of non-pesticide practices). Target is 50% reduction on demonstration farms compared to typical practices.

5. PROJECT TYPE:

Statewide ( ) **Watershed (x)** **Demonstration (x)**

6. WATER BODY TYPE:

River (x) **Lake (x)** **Wetland (x)**
Ground Water (x) **Other ( )**

7. PROJECT LOCATION:

Basin ( ) **Segment ( )**

This project is focused on the Great Salt Plains Reservoir watershed (OK621010), a 1400 sq. Mile watershed in Woods and Alfalfa counties. The watershed includes approximately 113 miles of stream and a 8890 ac reservoir. It includes the Salt Plains National Wildlife Refuge

8. NPS MANAGEMENT PROGRAM REFERENCE:

Agricultural NPS Management Program: III-7, Pesticide and fertilizer use problem evaluation; III-9 OSDA/ODA Coordination activities for the development of research projects on nutrient management

9. NPS ASSESSMENT REPORT STATUS:

Impaired (x) **Impacted ( )** **Threatened ( )**

The Reservoir and its tributaries have excessive siltation that has eliminated spawning habitat, led to fish kills during hot summers, and initiated excessive algae blooms. The area was considered partially supporting for warm water fishery (based on monitored data), eutrophic and partially supporting for recreation (based on monitored by OWRB) in the 1987 assessment. High sediment arsenic is thought to originate from pesticide use in the basin.

10. NPS ASSESSMENT REPORT REFERENCE:

The 1989 assessment shows numerous fish kills, high levels of suspended solids (Cause Code 11) and nutrients (Cause Code 9), and documented levels of pesticides (Cause Code 2).

11. KEY PROJECT ACTIVITIES:

Hire Staff	**( )**	**Monitoring**	**( )**	**Education**	**(x)**
Technical Assistance	**( )**	**Regulatory Assistance**	**( )**	**BMP Implementation**	**(x)**
Demonstration Project	**(x)**	**Other**	**( )**		

12. NPS CATEGORY(IES):

Agricultural: Non-irrigated crop production (11);

13. PROJECT COSTS:

Federal: $90,000 **State:** $60,000 **Total:** $150,000

14. PROJECT MANAGEMENT:

Oklahoma Conservation Commission will provide administrative and liaison for this project. OCC will subcontract with OSU Cooperative Extension to conduct education and demonstration tasks. Contact person for OSU Cooperative Extension is Michael Smolen (405-744-8414). Smolen will provide overall guidance and coordination to the project.

15. PROJECT PERIOD:

July 1, 1997 through September 30, 2000

Agency:

Oklahoma Cooperative Extension Service

Title:

Demonstration of Best Management Practices in the Salt Fork Watershed

Task Number:

1100

Project Location:

This project is focused on the Great Salt Plains Reservoir watershed (OK621010), a 1400 sq. Mile watershed in Woods and Alfalfa counties. The watershed includes approximately 113 miles of stream and a 8890 ac reservoir. It includes the Salt Plains National Wildlife Refuge

Problem Statement:

The Salt Fork of the Arkansas River and two small tributaries flow into the Great Salt Plains Wildlife Refuge and the Great Salt Plains Reservoir. The Reservoir and its tributaries have excessive siltation that has eliminated spawning habitat and promoted fish kills during hot summers. The lake also has excessive algae blooms. The area was considered partially supporting for warm-water fishery (based on monitored data), eutrophic and partially supporting for recreation (based on monitored by OWRB) in the 1987 assessment. High sediment arsenic is thought to originate from pesticide use in the basin. The 1989 assessment shows numerous fish kills, high levels of suspended solids (Cause Code 11), high levels of nutrients (Cause Code 9), and documented levels of pesticides (Cause Code 2). Although this area is designated medium priority in the 303(d) list, its importance is far greater due to the wildlife and habitat values.

The Great Salt Plain National Wildlife Refuge includes 32,000 acres entirely within the watershed. It is utilized by several rare or endangered birds including whooping cranes, interior least terns, bald eagles, and American avocets. It is considered critical habitat for the whooping crane, and supports a wide variety of other birds and wildlife. Although pesticide residues have not been found in bird or fish tissue, concern for episodic pesticide contamination exists due to the high level of protection desired and the extensive agricultural activity in the watershed.

Salt Fork watershed above the Reservoir includes about 1400 square miles, in the middle of the breadbasket of Oklahoma agriculture. The causes are primarily associated with non-irrigated agricultural production. (Petroleum activities will not be addressed.) Addressing the agricultural issues will reduce nutrients, sediment, and pesticides entering this watershed primarily in wheat and pasture.

Technology transfer of BMPs for sediment, nutrients, and pest management is the key to implementation. A tremendous opportunity is the development of support industries in this area including consultants, Certified Crop Advisors, and other support industries. These industries have shown interest and support for an in-depth educational effort. These industries contact producers on a daily basis and area key to reaching producers.

Description/Objective:

The project is an education and demonstration project, with goals to improve the nutrient management and tillage management skills of 20% of producers directly through intense educational and demonstration activities, and to show 50% reduction of erosion, fertilizer use, and pesticide use on 10 demonstration sites. A target of directly influencing 20% of producers was selected because 20% has been demonstrated as the initial critical level to stimulate wider diffusion through the target community (Cuperus & Berberet 1995). If we achieve the 20% goal, a rapid diffusion from farmer to farmer is likely to occur through producer meetings, through the State Association of wheat growers, and through daily interactions of producers and agricultural businesses.

Activities include installing 10 demonstration sites at suitable locations throughout the watershed, conducting educational programs to teach the use of BMPs, and promoting continued support for BMP-implementation through Agribusiness cooperators, Certified Crop Consultants, Cooperative Extension Service agents, and other important actors.

The project will have an Advisory/Steering Committee. The Committee will consist of representatives of agencies such as the Conservation Districts, OCC, Cooperative Extension Service, Oklahoma Department of Agriculture, Natural Resource Conservation Service, along with producers and representatives from agribusiness. The Committee will meet annually or more frequently if necessary.

The Committee will help formalize working relationships and plans in a way that is acceptable to all the agencies. This committee will assure cooperation among the agencies and commonality of objectives. This committee will also make sure the objectives are clear and organized. This committee will also help design demonstrations and make sure they are technically sound and relevant.

The Committee will help design demonstrations and field days, identify target audiences, and assist in publicizing events. The Committee will help design the recordkeeping systems that will be presented along with BMPs. Their principal role will be to assure relevance and credibility of the program. Their role will be to help target this program and make sure there is ownership by agribusiness and producers, and support from their neighbors and clients.

OCES State Specialists with assistance from Area and County agents will install demonstration plots on producer fields at 10 locations within the project area. Each site will be set up for self-guided tours and formal tours. The formal tours will occur in conjunction with field days where other topics such as variety selection and profitability always draw a crowd. Producer involvement in the demonstration plots will help spread the information throughout the farming community. BMPs will include: conservation tillage, nutrient management, and pest management to reduce erosion, sediment production, and loss of nutrients and pesticides to surface and ground waters. Educational programs will stress the importance of recordkeeping in production systems and in pollution prevention.

There will be at least 10 demonstrations for this project. Tours will focus on demonstration of BMPs with emphasis on environmental protection. There will be discussions of integrated crop management components of BMPs and the balance between environmental and economic goals. Key environmental components that the tours will focus on are:

A. Minimizing sediment loss.

B. Improving nutrient management and reducing the use of nitrogen and phosphorous fertilizer by mining excesses already in the soil profile.

C. Minimizing impact of pesticides through use of integrated pest management.

The program will work through multiple educational avenues including educational meetings with producers, focused meetings and training sessions with consultants and Certified Crop Advisors (CCAs), the Watershed Home page, and demonstrations and field tours. Activities will be targeted to agribusiness and wheat producers, encouraging them to maintain up to date information on crops, fertilizers, and pesticides. Demonstrations will compare BMPs, conventional management, high input management, and no inputs and identify economic aspects as well as environmental concerns for each system.

Program evaluation will consist of assessing producer knowledge and behavior before and after the educational program, and applying case-study information to similar areas across the watershed. Producers in the watershed will be surveyed on their management practices before and after the educational program. Ten producer-cooperator operations will be utilized as case study sites for whole farm assessment. These whole farm assessments will take considerable time to achieve complete evaluation. Although this does not give a general evaluation of practices in the area, it gives in-depth evaluation that will be valuable in sharing project results.

A computer modeling activity will consolidate findings from the demonstration sites and project their impact on reduction of erosion and reduced pesticide and fertilizer applications across the watershed.

Project Tasks:

Task 1 - Establish Advisory/Steering Committee

Establish Advisory/Steering Committee as described in above to assure agency coordination and cooperation in implementation efforts. Producers-Agribusiness representatives will be included. This group will meet approximately annually to share program progress and develop support among agencies and producers.

Cost: $5,000

Cost is based on the Steering Committee meeting in two-hour sessions six times a year for one year and four times per year for two years. The Advisory Committee will meet annually for half-day sessions. $3000 is the salary match of Extension Specialists participating in these meetings. The balance will cover travel costs of participants and any printing required to support the meetings.

Task 2 - Assess Pre-Project Management Practices and Attitudes

Assess pre-project management practices and attitudes of a statistically valid sample of producer population. Producers in the watershed will be surveyed for their present attitudes and behaviors with respect to: utilization of tillage, nutrient, and pest management BMPs. Preliminary analysis suggested there are approximately 120 producers in the watershed. At project completion, a subset of the same producers will be assessed to document changes.

Cost: $20,000

Cost is based on 400 producers surveyed twice at cost of about $25 per interview. Actual budget will be used to pay graduate student assistants to develop instrument and analyze results, hourly wage and telephone charges. Match will come from faculty advisor.

Task 3 - Establish Communications

Contributions will be made to Alfalfa and Woods County agricultural newsletters. A WWW Home Page will be established to keep all parties informed about project activities with timely information. At this time we have no criteria for evaluating effectiveness of the web page other than number of visits. The home page will offer an opportunity for participants to ask questions of those involved, however.

Self-guided tours will be established at demonstration sites. Self-guided tours will consist of a kiosk, or shelter, with signage describing the project and requesting feedback from viewers. Most self-guided tours will be set up in conjunction with an attractive item like a variety trial. A guest registry will be included so we can know how many people chose to tell us they visited. These tours are intended to be non-threatening private activities that do not lend themselves to evaluation.

The newsletter articles will be targeted to wheat, cattle and alfalfa producers in the watershed. The focus will be on key environmental components including:

A. Minimizing sediment loss

B. Improving nutrient management and reducing nitrogen and phosphorous application based on soil testing for excess nutrient already in the soil profile.

C. Minimizing impact of pesticides through utilization of integrated pest management practices and approaches.

There will be an additional focus on the interface of wheat and alfalfa with cattle and a focus on riparian protection during the grazing period.

Cost: $15,000

Cost includes contribution of Smolen (one week $1800), Cuperus (one week $1600), Gribble (one week $1300), 10% of Water Quality/IPM Specialist ($2800), and travel ($1000). Also costs for newsletter printing and mailing, 500 per quarter, ($3500) and signs, kiosks, and materials for self-guided tours ($3000).

Task 4 - Establish Ongoing Demonstrations on Nutrient Management, IPM, and Tillage in Each County

Demonstration plots will be established at 10 locations. Project personnel (Mulder, Krenzer, Gribble, and County agents) will work with 10 farmers to establish case histories of reduced pesticide use, considering herbicide use, fungicide use, and insecticide use. The IPM approach will promote prescription-based applications, based on scouting and weather information rather than preventive treatment. Demonstrations will focus primarily on wheat and alfalfa production, the principal crops in the area.

The plots are installed to demonstrate to producers that water quality BMPs can be utilized without production losses and without excessive expense to the producer. Demonstrating

such practices is essential to acceptance by producers. Standard Extension demonstration plots will be installed.

There will not be sufficient funding to demonstrate riparian protection. However, cattle management practices with respect to water quality will be included in public meetings and educational programs associated with this project.

Cost: $40,000

Cost: includes travel ($4500), plot materials (signage $5000, fertilizer, pesticide, and seed $3000), equipment rental and landowner expenses ($2000), soil sampling ($2500), and salary for technicians to install plots. Professional contribution will be obtained from Krenzer, Gribble, Stiegler, Johnson, Zhang, and all county agents ($17,800). Water Quality/IPM Specialist will commit 10% time ($2800).

Task 5 – Agricultural Production BMP Presentations

In each of the two counties, agricultural production workshops are held. These workshops are well attended by project-targeted agribusiness and producers. The Project will develop informative talks for these workshops, emphasizing BMPs specific to the production area(s) of interest. These will be state-of-the-art presentations focused on economically and environmentally sound crop production. Presentations will draw on expertise of OCC, ODA, NRCS, agribusinesses, and cooperating producers.

Presentations will cover the following topics:

A. BMPs
    1) Improved nutrient management
    2) Nitrogen
    3) Phosphorus
B. Reduced/modified tillage to minimize sediment loss to the environment
C. Buffer-strip Initiative of the NRCS and riparian management
D. Integrated pest management
    1) Pests
    2) Weeds
    3) Insects
    4) Diseases
    5) Scouting
    6) Thresholds
    7) Pesticides and the environment
E. Risk reduction through improved management

Evaluation will be conducted indirectly through the post-project survey.

Cost: $30,000

Cost includes Water Quality/IPM Specialist 10%, Johnson, Cuperus, Zhang, Gribble, and County agents. Time committed by Specialists and County Agents, one-day per meeting and one-day preparation per meeting (18 days) far exceeds the matching requirement of $30,000.

Task 6 - Model the environmental impact, and assess changes in knowledge level and practices with a post-project survey

Profitability and cost of BMPs and alternative management systems will be determined and used in the education program. A computer modeling activity will consolidate findings from the demonstration sites and project their impact on reduction of erosion and reduced pesticide and fertilizer applications across the watershed. Computer modeling (Universal Soil Loss Equation and delivery coefficients) will be used to determine erosion, sediment yield, nutrient yield, and pesticide losses. Using various levels of BMP implementation, computer modeling will project reductions in sediment, nutrient, and pesticide loading to the Great Salt Plains Reservoir. All models will be accepted technology with well-established procedures to project the impact of program on a watershed basis. This effort will use the GIS database at OSU with research and graduate student support. [This task differs from Task 2. Task 2 addresses attitudes and practices, whereas this task addresses economics and environmental impact.] Modeling will be used to project the impact across the watershed, based on land use, topography and soils information in conjunction with findings of Task 2.

Cost: $30,000

Cost based on graduate assistantship 50% time for three years ($22,000), computer for modeling ($2500) and matching salary from a faculty advisor and senior project personnel ($5,000), travel ($500).

Task 7 - Final Report

Final report will be developed, printed and submitted.

Cost: $10,000

Cost is based on three months professional time to draw together the multifaceted components of this project.

Outputs (by Task):

Task No.	Output	Due Date
1101.1	Report on structure of Advisory committees and membership	October 1997
1101.2	Minutes of advisory committee meetings and committee accomplishments, following each meeting	Semiannually
1102.1	Survey instrument	September 1997
1102.2	Reports of assessment of producer attitudes and practices regarding tillage, nutrient, and pest management BMPs	June 30, 2001
1103.1	Newsletter contributions at time of mailing	As published
1103.2	Description and URL of WWW Home Page	January 1998
1104.1	Description of demonstration plots and self-guided tours	July 2001
1104.2	QAPP for demonstration sites, including locations and plans for 10 demonstration plots	November 1997
1104.3	Identify cooperators for 10-IPM case studies; Report initial description of operations	July 2001
1104.4	Report fertilizer use, pesticide use, and crop history on 10	In final report

	cooperating farms (changes from previous years to be summarized and explained)	
1105.1	Water quality-related educational materials for agricultural production management presentations	August 2001
1105.2	Report on agricultural production management workshops, tours, and field days	June 30, 2002
1106.1	QAPP for BMP impact evaluation model	January 1999
1106.2	Evaluation report on modeling of environmental impact of BMPs relative to conventional practices; poster session for use with producers at field site	September 2002
1107.1	Final Report	September 2002

Project Management:

Office of Secretary of Environment and OCC will oversee project and act as liaison between project and EPA. Individuals from OSE may be called on to interface with other agencies and to contribute to educational programs from time to time. Oklahoma Conservation Commission will provide administrative oversight to this project. OCC will develop a cooperative agreement with OSU Cooperative Extension to conduct education and demonstration tasks. Contact person for OSU Cooperative Extension is Michael Smolen (405-744-8414). Smolen will provide overall guidance and coordination to the project.

An Extension Water Quality/IPM Specialist position will be established at the Extension District Office in Enid. This person will devote 25% time to water quality education in the watershed area and interfacing with cooperating agencies and organizations.

A project subgroup will be established to implement demonstrations on cooperating farms. This subgroup will be lead by Gerrit Cuperus, IPM Coordinator (405-744-9419) and will include the following people:

Roger Gribble, Area Agronomist	(405) 237-7677
James Stiegler, Soil Specialist	(405) 744-9620
Gordon Johnson, Fertility Specialist	(405) 744-6420
Gene Krenzer, Wheat Specialist	(405) 744-9617
Robert LeValley, Ag Agent Woods County	(405) 237-2786
Tommy Puffinbarger, Ag Agent Alfalfa County	(405) 395-2134
Hailin Zhang, Soil Fertility Specialist	(405) 744-9566
Phil Mulder, Entomologist, Alfalfa	(405 744-9416
Tom Royer, Entomologist, Wheat	(405) 744-9406

The Oklahoma Conservation Commission, Natural Resource Conservation Commission, Department of Wildlife Conservation, Oklahoma Department of Agriculture, and the local conservation district will be partners in public education programs.

A graduate student will be employed to determine the actual cost/benefit of BMPs that are demonstrated, to analyze the effectiveness of IPM employed with farm cooperators, and to

evaluate the environmental impact of the project.

An Extension professional will provide educational support throughout project development and implementation including educational materials development, demonstration implementation, and project evaluation. Cuperus and Smolen will be project coordinators from OCES. OCES will provide support for the technical aspects of Integrated Pest Management, assist in project coordination, assist in newsletter development, develop and update Home page, develop IPM and nutrient demonstrations, and assist in tillage demonstrations.

Measures of Success:

1. Producer implementation of tillage, nutrient, and pest management BMPs. Target is 20% adoption of BMPs after year 5.
2. Reduction in sediment loss estimated from cropland in the watershed based on modeling the impact of BMP implementation. Target is 50% reduction.
3. Reduction in excess fertilizer applied by cooperating farmers when management is based on soil testing and IPM principles. Target is 50% reduction on demonstration farms compared to typical practices.
4. Reduction in nitrogen and phosphorus loss estimated by modeling. Target is model prediction of 50% reduction.
5. Reduction in pesticide use on cooperating farms employing IPM (improvements in pest management through improved cultural practices, pesticide use only based on scouting and thresholds, and implementation of non-pesticide practices). Target is 50% reduction on demonstration farms compared with typical practices.

Project Budget:

July 1, 1997 through December 31, 2000

	FTE	EPA	OSU	Total
Personnel	3.3	50200	46000	96200
Fringe Benefits		15000	14000	29000
Travel		6000		6000
Supplies				
Field plots (signage)		5000		5000
Postage		2000		2000
Printing		2800		2800
Contractual Services				
Soil tests		2500		2500
Telephone (surveys)		2000		2000
Equipment rental		2000		2000
Equipment (computers for project)		2,500		2,500
Total		$90,000	$60,000	$150,000
Percentage of Total		60%	40%	

Project Staffing:

	FTE	Yrs		FED	OSU
Smolen	0.02	3	0.06		4500
Cuperus	0.02	3	0.06		3600
Gribble	0.05	3	0.15		6700
Krenzer	0.02	3	0.06		3600
Johnson	0.02	3	0.06		4200
Stiegler	0.02	3	0.06		3900
LeValley	0.1	3	0.3		10500
Puffinbarger	0.1	3	0.3		9000
WQ Specialist	0.25	3	0.75	28200	
Student	0.5	2	1.5	22000	
TOTAL			3.3	$50,200	$46,000

I'D LIKE TO BEGIN BY ASKING YOU SOME QUESTIONS ABOUT THE CROPS YOU PLANT.

1. How many acres of wheat do you have?
   NUM (if less than 100, skip wheat)
2. How many acres of alfalfa do you have?
   NUM (f less than 10 skip alfalfa)
3. How many acres of sorghum do you have?
   NUM (if less than 50 skip sorghum)
4. Do your have soybeans? YES/NO
5. Are your soybeans a *single crop* or *double crop*?
6. What other crops do you have (besides wheat, alfalfa, sorghum, and soybeans)?

CROP-SPECIFIC QUESTIONS -- WHEAT
Now I would like to ask you some questions about your wheat production practices.

7. What varieties of wheat do you grow?
   OPEN see list
   Jagger
   Custer
   2137
   2174
   Tomahawk
   AGSECO 7853
   Longhorn
   Ogallala
   2163
   Karl (Karl 92)
   2180
   Chisholm
   Tonkawa
   Cimaron
   Coronado
   Big Dawg
   Ike
8. Of the _____ acres of wheat, how many do you harvest for grain?
   NUM
9. Of the _____ acres of wheat, how many do you graze?
   NUM
10. What is your typical stocking rate for grazing wheat?

11. How often do you soil test for wheat?
    Every year
    Every 2-3 years
    Every 3-4 years
    Never

12. Do you soil test the subsoil (6" to 24" depth)
    YES/NO

13. What is your yield goal for wheat? How many bushels per acre?
How many pounds of Nitrogen per acre do you typically apply to wheat?

    14. Pre-plant NUM

    15. Top Dress NUM

16. Together then, that is _____ pounds of nitrogen per acre applied to your wheat.

17. How many pounds of Phosphate per acre do you typically apply to wheat?

18. Do you have different yield goals for some fields?
    YES/NO

19. What is your primary tillage method for wheat? (read list. They may say more than one.)
    Mold board plow
    Chisel plow
    Disk
    No-till
    Other –describe

20. Do you use deep ripping in any of your fields?
    YES/NO

21. What chemical products do you use for *Insect Control* on wheat?
    21B. For each product ask "is it applied by *ground* or *aerial* applicator?"

22. What chemical products do you use for *Weed Control* on wheat?

23. What chemical products do you use for *Disease Control* on wheat?

24. Would you consider using No-till for wheat?
    YES/NO

25. Why would you consider using No-till for wheat?
    OPEN

26. Why would you NOT consider using No-till for wheat?
    OPEN

27. What is you're average yield for wheat? (bushels per acre)

CROP-SPECIFIC QUESTIONS -- ALFALFA
Now I would like to ask you some questions about your alfalfa production practices.

28. What varieties of alfalfa do you plant?
    OPEN or give list

29. Do you graze your alfalfa?
    YES/NO

30. What date do you start to graze alfalfa? APPROXIMATE DATE

31. How long do you graze (number of months)?

32. What chemical products do you use for *Insect Control* on Alfalfa?
    32B. For each product mentioned ask, "is it *ground applied* or *aerial applied*?"

33. What chemical products do you use for *Weed Control* on Alfalfa?

34. What chemical products do you use for *Disease Control* on Alfalfa?

35. What is your average yield for alfalfa? How many tons per acre.

36. How often do you soil test your alfalfa fields?
    Every year? Every 3 years? Every time I plant_____.

37. How often do you apply phosphate fertilizer?
    Every year? Every 3 years? Every time I plant_____.

CROP-SPECIFIC QUESTIONS -- SORGHUM
Now I would like to ask you some questions about your sorghum production practices.

38. What varieties of sorghum do you produce?
    OPEN or give list

39. What is your production yield goal for sorghum? How many bushels per acre?
    NUM

40. How often do you soil test for sorghum production?
    Every year
    Every 2-3 years
    Every 3-4 years
    Never

41. What chemical products do you use for *Insect Control* on Sorghum?
    41B. For each product mentioned ask, "is it *ground applied* or *aerial applied*?"

42. What chemical products do you use for *Weed Control* on Sorghum?

43. What chemical products do you use for *Disease Control* on Sorghum

44. What is your average yield of sorghum? (bushels per acre).

WE ARE ALMOST FINISHED. NOW I'D LIKE TO ASK SOME GENERAL QUESTIONS.

45. How many acres do you moldboard plow?
    NUM

46. Do you have areas of salt accumulation in your cropland?
    YES/NO

47. Is that in your range or pastureland or both?
    YES/NO

48. How many acres are affected by salt accumulation?

49. Do you have stream-bank erosion problems?
    YES/NO

50. Would you consider leaving a vegetated buffer between your crop and the stream?
    YES/NO

51. Would you consider planting trees in the buffer?
    YES/NO

52. Do you have any field gulleys that occur most years?
    YES/NO

53. Would you consider installing a grassed waterway or terraces to prevent gulleying?
    YES/NO

54. Where do you get advice for management of insect, weeds, and disease?
    OPEN

55. Where do you get advice for fertilizer and lime needs?
    OPEN

56. Finally, may I ask which of the following age groups you are in?
    AGE: 18 TO 25; 26-40; 41-60; OVER 60

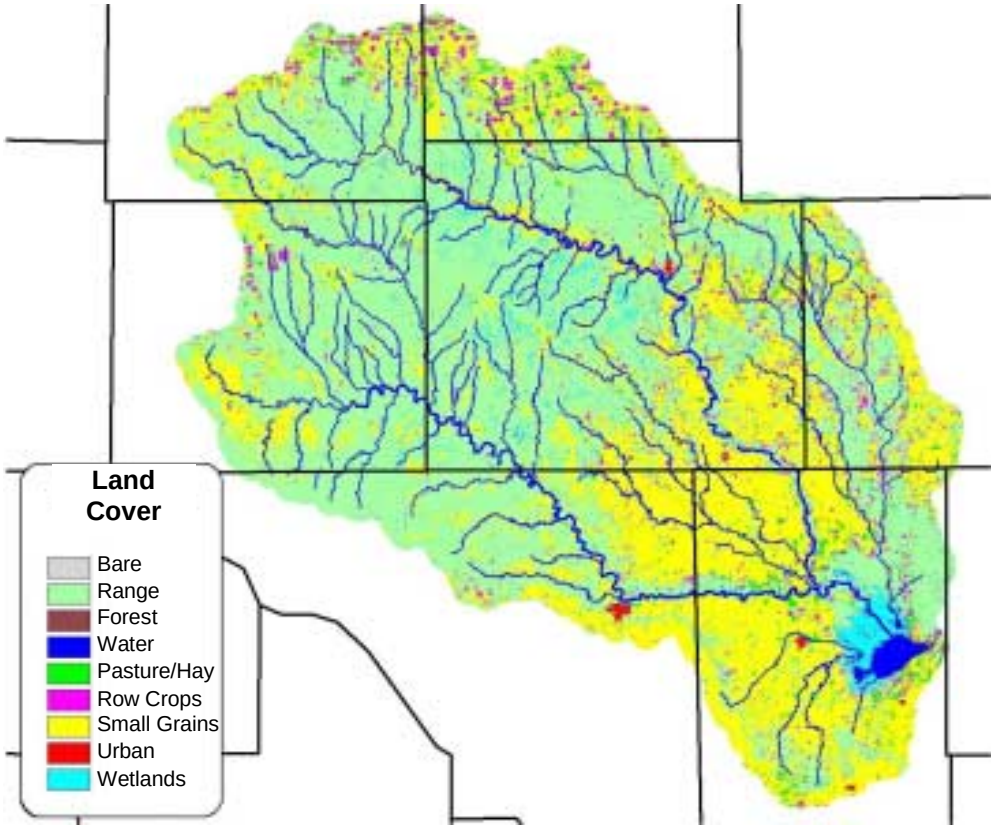
THOSE ARE ALL OF MY QUESTIONS. THANK YOU FOR YOUR TIME. HAVE A GOOD DAY/EVENING.

57. Would you be interested in a copy of the report from this suvey?
    IF YES, GIVE NAME AND ADDRESS (CONFIDENTIALLY)

OKLAHOMA COOPERATIVE EXTENSION SERVICE
WATER QUALITY PROGRAMS

Salt Fork Watershed

Agricultural Producer Survey Results



This project is funded in part by US EPA and the Oklahoma Conservation Commission under Cooperative Agreement AG-97-EX002, "Demonstration of Best Management Practices in the Salt Fork Watershed," (FY 97 319(h) Task 1100).

In September 1999, Dr. Mike Smolen and Dr. Gerrit Cuperus of the OSU Cooperative Extension Service contracted the OSU Bureau for Social Research to conduct a survey of agricultural producers in the Salt Fork Watershed. The Extension Service provided the Bureau with a list of producers in the watershed from Woods and Alfalfa counties. A telephone interview was conducted to determine producers' planting and fertilizing practices, field size and yield for each crop grown (wheat, alfalfa, or sorghum), and sources of information for crop management and erosion control.

All interviewing staff underwent training in interviewing techniques, including the subject of confidentiality. Each interviewer signed a confidentiality agreement. In the survey database a randomly generated respondent number identifies each producer so that no identifying information is linked to the survey responses.

A total of 87 producers responded to the survey and met the minimum production acreage requirements. Of these, 82 produced wheat, 58 alfalfa, and 23 sorghum. Individuals were asked only those questions pertaining to their crop operations.

The survey results are presented here in table form. For each question, the number of producers and percentage of respondents for each different response are listed. Responses that were mentioned by a single producer are listed under each table. Some producers gave more than one response to a single question, so the total number of responses may be greater than the number of respondents.

For further information, please contact the Extension Water Quality Office at 405/744-5653 or write:

OCES Water Quality Programs
218 Ag Hall
Oklahoma State University
Stillwater, OK 74078

Q1: How many acres of wheat do you have?

Acres of Wheat	*Number*	*(%)*
0 - 49	5	5.7
50 - 500	25	28.7
501 - 1000	23	26.4
1001 - 1500	12	13.8
1501 - 2000	6	6.9
2001 - 2500	8	9.2
Over 2501	8	9.2

Answers from 87 of 87 producers

Q7: What varieties of wheat do you grow?

Variety	*Number*	*(%)*
Tonkawa*	66	80.5
Jagger	35	42.7
2163	18	22.0
2137	13	15.9
2174	6	7.3
Tomahawk	6	7.3
Big Dawg	6	7.3
AGESCO 7853	4	4.9
Coronado	4	4.9
Ogallala	3	3.7
Cimarron	3	3.7

Answers from 82 of 82 producers w/more than 50 acres wheat
Mentioned once*: 47, 2136, 2180, Karl 92, Custer, Ike, Longhorn, Red Dawg, Pioneer, Different every year*

*The Oklahoma Agricultural Statistics Service has reported that Tonkawa totaled less than 2% of seeded acres for each of the last 5 years.

Q8: Of the _____acres of wheat, how many do you harvest for grain?

Acres for grain	*Number*	*(%)*
0	3	3.7
1 - 500	25	30.5
501 - 1000	24	29.3
1001 - 1500	8	9.8
1501 - 2000	8	9.8
2001 - 2500	9	11.0
Over 2501	5	6.1

Answers from 82 of 82 producers w/more than 50 acres wheat

Q9: Of the _____acres of wheat, how many do you graze?

Acres grazed	*Number*	*(%)*
0	24	29.3
1 – 500	33	40.2
501 - 1000	11	13.4
1001 – 1500	3	3.7
1501 – 2000	5	6.1
2001 – 2500	3	3.7
Over 2501	3	3.7

Answers from 82 of 82 producers w/more than 50 acres wheat

Q10: What is your typical stocking rate for grazing wheat (cattle/acre)?

Cattle/acre	*Number*	*(%)*
1	45	78.9
2	8	14.0
3	3	5.26
5	1	1.75

Answers from 57 of 58 producers that graze cattle on wheat

Q11: How often do you soil test for wheat?

Soil test	*Number*	*(%)*
Every year	57	69.5
Every other year	12	14.6
Every 3-4 years	11	13.4
Never	2	2.4

Answers from 82 of 82 producers w/more than 50 acres wheat

Q12: Do you soil test the subsoil for wheat?

Subsoil test	*Number*	*(%)*
Yes	38	46.9
No	43	53.1

Answers from 81 of 82 producers w/more than 50 acres wheat

Q13: What is your yield goal for wheat? How many bushels per acre?

Yield Goal (bu/a)	*Number*	*(%)*
0	2	2.5
30 - 35	2	2.5
40	21	26.6
45 - 47	16	20.3
50	31	39.2
55 - 60	5	6.3
80 - 100	2	2.5

Answers from 79 of 82 producers w/more than 50 acres wheat

Q27: What is your average yield for wheat? How many bushels per acre?

Avg yield (bu/a)	*Number*	*(%)*
20	3	3.7
25 - 32	16	19.5
35 - 42	37	45.1
45 - 50	21	25.6
55-60	4	4.9
65	1	1.2

Answers from 82 of 82 producers w/more than 50 acres wheat

Q14: How many pounds of N/ac do you typically apply to wheat as pre-plant?

N (Lbs/a)	*Number*	*(%)*
0	12	15.2
1 - 25	9	11.4
26 - 50	29	36.7
51 - 75	21	26.6
76 - 100	8	10.1

Answers from 79 of 82 producers w/more than 50 acres wheat

Q15: How many pounds of N/ac do you typically apply to wheat as top dress?

N (Lbs/a)	*Number*	*(%)*
0	8	10.0
20 - 25	9	11.3
30 - 35	23	28.8
40 - 45	15	18.8
50 - 55	11	13.8
60 - 65	9	11.3
70 - 80	5	6.3

Answers from 80 of 82 producers w/more than 50 acres wheat

16: Together then, that is ____ lbs. N/ac applied to your wheat.

N (Lbs/a)	*Number*	*(%)*
20 - 27	2	2.5
30 - 38	3	3.8
40 - 48	3	3.8
50 - 56	7	8.8
60 - 65	9	11.3
70 - 78	7	8.8
80 - 85	16	20.0
90 - 95	11	13.8
100 - 105	14	17.5
110 - 150	8	10.0

Answers from 80 of 82 producers w/more than 50 acres wheat

Q17: How many pounds of phosphate per acre do you typically apply to wheat?

P (Lbs/acre)	*Number*	*(%)*
0	23	28.0
1 - 25	25	30.5
26 - 50	24	29.3
51 - 75	2	2.4
76 - 100	7	8.5
Over 100	1	1.2

Answers from 82 of 82 producers w/more than 50 acres wheat

Q18: Do you have different yield goals for some wheat fields?

Response	***Number***	***(%)***
Yes	29	35.8
No	52	64.2

Answers from 81 of 82 producers w/more than 50 acres wheat

Q19: What is your primary tillage method for wheat?

Tillage method	***Number***
Mold board	43
Chisel Plow	42
Disk	39
Min. plow, min. till, low-till	3
No-till	2
Conventional	2
Sweep-plow	2
Stubble farming	2
Spring tooth	2
Crust busting	1

Answers from 79 of 82 producers w/more than 50 acres wheat

Q20: Do you use deep ripping in any of your wheat fields?

Response	***Number***	***(%)***
Yes	27	32.9
No	55	67.1

Answers from 82 of 82 producers w/more than 50 acres wheat

Q21: What chemical products do you use for insect control on wheat?

Insecticides	***Number***	***(%)***
Chlorpyrifos (Lorsban 4E-SG)	6	30.0
Dimethoate (Cygon)	4	20.0
Malathion	4	20.0
Parathion	4	20.0

Answers from 20 of 82 producers w/more than 50 acres wheat
Mentioned once: *Ally, Can't Remember, Don't Know, Grazon, Methyl parathion (Pencap M), What Coop is Using*

Q21B: Do you typically apply insecticide on wheat by ground or aerial application or both?

Application method	***Number***	***(%)***
Ground	11	55.0
Aerial	4	20.0
Both	5	25.0

Answers from 20 of 20 producers who answered Q21

Q22: What chemical products do you use for weed control on wheat?

Herbicide	***Number***	***(%)***
Finesse	34	50.7
Glean	25	37.3
2,4-D	21	31.3
Amber	9	13.4
Ally	5	7.5
Maverick	4	6.0
Don’t Know	3	4.5
Banvel	2	3.0

Answers from 67 of 82 producers w/more than 50 acres wheat
Mentioned once: *None, Banvel + 2,4-D, Rhonox, Torodon 22K, Roundup Ultra, Weed Out*

Q23: What chemical products do you use for disease control on wheat?

Fungicides	***Number***	***(%)***
Vitavax 200	1	25.0
Don’t Know	2	50.0
None	1	25.0

Answers from 4 of 82 producers w/more than 50 acres wheat

Q24: Would you consider using No-till for wheat?

No till	***Number***	***(%)***
Yes	31	37.8
No	51	62.2

Answers from 82 of 82 producers w/more than 50 acres wheat

Q25: Why would you consider using No-till for wheat?

Reason	***Number***	***(%)***
To reduce costs (machinery, fuel, etc.)	11	35.5
To reduce costs and conserve resources	4	12.9
To conserve resources	3	9.7
To follow recommendations	2	6.5
To reduce costs and save time	2	6.5
To simplify crop rotation	2	6.5
Doesn't work	2	6.5
Already had success with it	2	6.5
To save time	2	6.5
To reduce costs, conserve resources, and simplify crop rotation	1	3.2

Answers from 31 of 31 producers who said yes to Q24

Q26: Why would you NOT consider using No-till for wheat?

Reason	***Number***	***(%)***
Not profitable, doesn't work	10	19.6
Weed control problems	7	13.7
Method needs improved	5	9.8
New equipment expensive	5	9.8
Don’t want to change	3	5.9
Not compatible with area (climate, soil,etc)	3	5.9
Not compatible with current crop scheme	3	5.9
Don't like it	2	3.9
Don't know enough about it	2	3.9
Combinations of above and other	11	21.6

Answers from 51 of 51 producers who said no to Q24

Q2: How many acres of alfalfa do you have?

Acres of Alfalfa	***Number***	***(%)***
0 – 9	29	33.3
10 - 100	32	36.8
101 - 200	14	16.1
201 - 300	6	6.9
301 - 400	2	2.3
401 - 500	2	2.3
Over 501	2	2.3

Answers from 87 of 87 producers

Q28: What varieties of alfalfa do you plant?

Varieties	***Number***	***(%)***
OK49	23	39.7
Cimarron 3i	12	20.7
Cimarron VR	11	19.0
Oklahoma Common	7	12.1
630	4	6.9
Don’t Know	4	6.9
WL 320	2	3.5
Pioneer	2	3.5

Answers from 58 of 58 producers w/more than 10 acres alfalfa
Mentioned once: *Advantage, Cimarron, Good As Gold, Kansas Common, Kanza, Key, Liberty, New Buffalo, VNS-Variety Not Stated, WL 323, WL 325, WL 414*

Q29: Do you graze your alfalfa?

Graze	***Number***	***(%)***
Yes	36	62.1
No	22	37.9

Answers from 58 of 58 producers w/more than 10 acres alfalfa

Q30: What date do you start to graze alfalfa?

Grazing start date	***Number***	***(%)***
Oct 15	16	44.4
Oct 1	6	16.7
Nov 1	3	8.3
Sept 1	2	5.6
Dec 1	2	5.6

Answers from 36 of 36 producers that graze cattle on alfalfa
Mentioned once: *Feb 15, May 1, Aug 1, Sep 15, Nov 15, Dec 15, Year round*

Q31: How long do you graze (# of months)?

# Months grazed	*Number*	*(%)*
1	15	41.7
2	12	33.3
3	1	2.8
4	3	8.3
5	3	8.3
6	1	2.8
12	1	2.8

Answers from 36 of 36 producers that graze cattle on alfalfa

Q32: What chemical products do you use for insect control on alfalfa?

Insecticide	*Number*	*(%)*
Lorsban	15	31.9
Don't Know	10	21.3
Baythroid (Vaytrol, Batryl)	9	19.1
Furadan	7	14.9
Parathion	6	12.8
Dimethoate	5	10.6
Permethrin (Pounce)	3	6.4
Warrior - T (Karate)	3	6.4
Javelin	2	4.3
What the Co-op uses	1	2.1

Answers from 47 of 58 producers w/more than 10 acres alfalfa

Q32B: Do you typically apply insecticide on alfalfa by ground or aerial application or both?

Application method	*Number*	*(%)*
Ground	22	46.8
Aerial	13	27.7
Both	12	25.5

Answers from 47of 47 producers who answered Q32

Q33: What chemical products do you use for weed control on alfalfa?

Herbicides	*Number*	*(%)*
Don't Know	7	25.9
Pursuit DG	7	25.9
Sinbar	7	25.9
Sencor	6	22.2
Poast Plus	4	14.8

Answers from 27 of 58 producers w/more than 10 acres alfalfa
Mentioned once: *Kerb 50-W, Select 2EC, Treflan E.C., Treflan HFP, Treflan TR-10, 2,4,5-T, Lorsban, Hay machine*

Q34: What chemical products do you use for disease control on alfalfa?

Fungicides	*Number*	*(%)*
Don't Know	4	80.0
Nu-Gro	1	20.0

Answers from 5 of 58 producers w/more than 10 acres alfalfa

Q35: What is your average yield for alfalfa? How many tons per acre?

Hay (tons/a)	*Number*	*(%)*
1	6	11.1
2	7	13.0
3	4	7.4
4	8	14.8
5	18	33.3
6	7	13.0

Answers from 54 of 58 producers w/more than 10 acres alfalfa
Mentioned once: 9, 10, 50, 80

Q36: How often do you soil test your alfalfa fields?

Soil test	*Number*	*(%)*
Every year	17	29.3
Every other year	8	13.8
Every 3-4 years	18	31.0
Never	15	25.9

Answers from 58 of 58 producers w/more than 10 acres alfalfa

Q37: How often do you apply phosphate fertilizer to your alfalfa fields?

Apply phosphate	***Number***	***(%)***
Every year	20	34.5
Every other year	10	17.2
Every 3-4 years	19	32.8
Never	9	15.5

Answers from 58 of 58 producers w/more than 10 acres alfalfa

Q3: How many acres of sorghum do you have?

Acres of Sorghum	***Number***	***(%)***
0 – 49	64	73.6
50 - 100	9	10.3
101 - 200	7	8.0
201 - 300	2	2.3
301 - 400	2	2.3
401 - 500	1	1.1
Over 501	2	2.3

Answers from 87 of 87 producers

Q38: What varieties of sorghum do you produce?

Varieties	***Number***	***(%)***
AgriPro AP2838	2	8.7
Asgrow A570	2	8.7
DeKalb DK-53	2	8.7
Pioneer 85G55	2	8.7
Mycogen 3838	2	8.7
Don't Know	4	17.4

Answers from 23 of 23 producers w/more than 50 acres sorghum
Mentioned once: *1506, Agri-9850, Cargill-627, DeKalb, DK-36, DK-54, DK-65, Evergreen, Haygrazer, Milo, Mycogen, Mycogen-M3556, NC+7R83, NC+NC+6R95, NK-2030, NK-3020, Pioneer-699, Pioneer-84G62, Pioneer-8500, Rocks Cain, Vita-cane*

Q39: What is your production yield goal for sorghum (bu/acre)?

Bushels/acre	***Number***	***(%)***
Under 5	3	16.7
20	1	5.6
40	1	5.6
60	2	11.1
75 - 80	5	5.6
85 - 90	3	16.7
100	3	16.7

Answers from 18 of 23 producers w/more than 50 acres sorghum

Q44: What is your average yield for sorghum? How many bushels per acre?

Bu/a	***Number***	***(%)***
Under 5	3	17.6
10	1	5.9
20	1	5.9
40	2	11.8
54	1	5.9
75 – 80	7	41.2
90	1	5.9
99	1	5.9

Answers from 17 of 23 producers w/more than 50 acres sorghum

Q40: How often do you soil test for sorghum production?

Soil test	***Number***	***(%)***
Every year	12	52.2
Every other year	5	21.7
Every 3-4 years	4	17.4
Never	2	8.7

Answers from 23 of 23 producers w/more than 50 acres sorghum

Q41: What chemical products do you use for insect control on sorghum?

Insecticides	***Number***	***(%)***
Gaucho	1	50.0
Don’t Know	1	50.0

Answers from 2 of 23 producers w/more than 50 acres sorghum

Q41B: Do you typically apply insecticide on sorghum by ground or aerial application or both?

Application type	*Number*	*(%)*
Ground	2	100
Answers from 2 of 2 producers who answered Q41		
Total Answers	***2***	

Q42: What chemical products do you use for weed control on sorghum?

Herbicide	*Number*	*(%)*
Atrazine	3	21.4
Dual	3	21.4
2,4-D	3	21.4
Bicep 6E	2	14.3

Answers from 14 of 23 producers w/more than 50 acres sorghum
Mentioned once: *Banvel,, Butracil 2E, Roundup, Peak, Amber, Bicep Lite II, Leadoff, Don't Know*

Q43: What chemical products do you use for disease control on sorghum?

Fungicides	*Number*	*(%)*
Don’t Know	1	100

Answers from 1 of 23 producers w/more than 50 acres sorghum

Q4: Do you have soybeans?

Soybeans	*Number*	*(%)*
Yes	13	14.9
No	74	85.1

Answers from 87 of 87 producers

Q5: Are your soybeans a single or double crop?

Soybeans	*Number*	*(%)*
Single	9	69.2
Double	4	30.8

Answers from 13 of 13 producers who said yes to Q4

Q6: What other crops do you have (besides wheat, alfalfa, sorghum, and soybeans)?

Crops	*Number*	*(%)*
None	63	72.4
Hay, feed, pasture	19	21.8
Cotton	3	3.4
Corn	1	1.1
Austrian winter peas	1	1.1

Answers from 87 of 87 producers

Q45: How many acres do you moldboard plow?

Acres plowed	*Number*	*(%)*
0	27	31.0
1 - 50	7	8.1
100 - 500	19	21.8
600 - 1000	19	21.8
1200 - 1800	11	12.6
2200 - 2625	4	4.6

Answers from 87 of 87 producers

Q46: Do you have areas of salt accumulation in your cropland?

Salt accumulation	*Number*	*(%)*
Yes	44	50.1
No	43	49.9

Answers from 87 of 87 producers

Q47: Is that in your range or pastureland or both?

Salt accumulation	*Number*	*(%)*
Range	18	40.9
Pastureland	5	11.4
Both	21	47.7

Answers from 44 of 44 producers who said yes to Q46

Q48: How many acres are affected by salt accumulation?

Acres affected	*Number*	*(%)*
1 - 25	23	52.3
30 - 52	9	20.5
60 - 100	6	13.6
200 - 250	3	6.8
450	1	2.3
1200	1	2.3
2500	1	2.3

Answers from 44 of 44 producers who said yes to Q46

Q49: Do you have stream-bank erosion problems?

Stream-bank erosion	*Number*	*(%)*
Yes	31	35.6
No	56	64.4

Answers from 87 of 87 producers

Q50: Would you consider leaving a vegetated buffer between your crop and the stream?

Vegetated buffer	*Number*	*(%)*
Yes	50	57.5
No	37	42.5

Answers from 87 of 87 producers

Q51: Would you consider planting trees in the buffer?

Plant trees	*Number*	*(%)*
Yes	26	29.9
No	61	70.1

Answers from 87 of 87 producers

Q52: Do you have any field gullies that occur most years?

Gullies	*Number*	*(%)*
Yes	51	58.6
No	36	41.4

Answers from 87 of 87 producers

Q53: Would you consider installing a grass waterway or terraces to prevent gulleying?

Grass waterways	*Number*	*(%)*
Yes	67	77.0
No	20	23.0

Answers from 87 of 87 producers

Q54: Where do you get advice for management of insects, weeds, and disease?

Information source	*Number*	*(%)*
Co-op	41	47.1
Co-op & Extension	15	17.2
Extension	10	11.5
Local communication	7	8.1
Co-op & commercial	4	4.6
Extension & commercial	2	2.3
Co-op, Extension, & publications	2	2.3
Commercial	1	1.2
Publications	1	1.2
Other	4	4.6

Answers from 87 of 87 producers

Q55: Where do you get advice for fertilizer and lime needs?

Information source	*Number*	*(%)*
Co-op	49	57.0
Extension	8	9.3
Soil tests	8	9.3
Combination of above	16	18.6
Local (inc. self)	4	4.7
Private consultant	1	1.2

Answers from 86 of 87 producers

Q56: Finally, may I ask which of the following age groups you are in?

Age	*Number*	*(%)*
18 - 25	0	0
26 - 40	13	14.9
41 - 60	58	66.7
Over 60	16	18.4

Answers from 87 of 87 producers

Q57: Would you be interested in a copy of the report from this survey?

Receive copy	*Number*	*(%)*
Yes	67	77.0
No	20	23.0

Answers from 87 of 87 producers

March 2001

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
Cherokee, Oklahoma 73728
580-596-3131

Landscape Maintenance Schedule

1. March is a major planting season. Many trees and shrubs such as magnolia, pine, holly, pecan, sweetgum and strawberries are best planted this month.
2. Cultivate annual flowerbeds to destroy winter weeds, but do not cultivate around shrubs, especially azaleas. Pull those weeds.
3. Locate a source of mulch material. Mulching will control most weeds in beds and make nitrogen last longer. Two inches of fine materials such as wood chips or sawdust are equal to six inches of loose material such as straw.
4. Remove the thatch (old growth and clippings). Dethatching, if necessary should precede crabgrass control methods.
5. Apply preemergant crabgrass control to cool and warm season grasses when soil temperatures reach 50 degrees Fahrenheit or when forsythia flowers.
6. Broadleaf weeds can easily be controlled in cool-season lawns at this time with post-emergent broadleaf herbicides.
7. Cool season lawns such as bluegrass, fescue, and ryegrass may be adequately fertilized with two pounds of actual nitrogen per 1000 square feet per season. One half pound is applied in March, April, October and November. Water in nitrate fertilizers to avoid burning the grass. Mow cool season grasses at 2 to 3 ½ inches high.
8. Begin diplodia pine tip blight control on pines at bud swell.
9. Prune spring flowering shrubs after they bloom, (azaleas, lilac, and forsythia).
10. Prune roses before growth starts. Begin a disease spray program when leaves appear. Prune crape myrtles.
11. Divide and replant summer and fall blooming perennials such as chrysanthemums.

Commercial Receiving Lot Conference

March 12, 2001 – 9:30 a.m. – 6:30 p.m.
Cherokee Strip Conference Center, Enid, OK

Nutrition Seminar

- Nutritional Management of Receiving Cattle
- Growing Programs in Drylot
- Stocker Research Update

Stocker Health

- Receiving Health Programs
- Treatment Programs
- 1999 Mycoplasma
- Environmental & Regulatory Issues for Receiving Yards
- HACCP: Monitoring Check Points to Improve Job Quality
- Future Role & Impact of the Stocker Cattle Sector

The cost is $25.00 per person. Pre-registration is required and is **due by March 8th in the NW District Area Office, 316 E. Oxford, Enid, OK 73701-1335. Make checks payable to OSU Extension Center and indicate it is for "Receiving Lot Conference"**. If you have any questions contact the OSU Extension Office at 580-596-3131.

OSU OKLAHOMA COOPERATIVE EXTENSION SERVICE

APRIL 2001

ALFALFA COUNTY

AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
Cherokee, Oklahoma 73728
580-596-3131

Landscape maintenance Schedule

1. Powdery Mildew disease looks like a white coating on leaves. It may occur during wet seasons on crapemyrtle, lilac, roses, and many other plants. One treatment will not control a plant disease. Early detection and regular treatment are necessary to remedy the problem. Space or prune plants for increased air circulation. Many new plant cultivars are resistant. See "Powdery Mildews of Ornamental and Shade Trees," Fact Sheet 7617.
2. Most bedding plants and summer flowering bulbs, such as gladiolus and dahlias, can be planted after danger of frost. This is about mid-April in most of Oklahoma. Annual flower seeds can be planted at this time also.
3. Let spring flowering bulb foliage remain as long as possible before removing it. The foliage is necessary to produce next year's flowers. Leaf spot diseases can cause premature death of foliage and reduce plant vigor. See "Diseases of Iris, Gladiolus, Dahlia, Daffodil, narcissus and Tulip Plants," Fact Sheet 7608.
4. Warm season lawn planting begins now. Hybrid Bermuda Zoysia must be started vegetatively. Spring, plugs, or squares of sod laid solid can be used. Buffalograss and Oklawn Centipede grass can be seeded
5. Warm season grasses may be fertilized four times per season using 1 pound of actual nitrogen per 1000 square feet. Apply 1 pound in April, May, June and September. Water-in nitrate fertilizers. Cutting height for Bermuda, Buffalo and Zoysia should be 1 to 1½ inches high. All others should be 2 to 3 ½ inches high.
6. Be alert for both insect pests and predators. Some pests can be hand picked without using a pesticide. Do not spray if predators such as Lady Beetles are present. Spay only when there are too few predators to be effective.
7. Remove any winter-damaged branches or plants that have not begun to grow. Waxleaf Privet and Euonymus are frequently damaged by cold.
8. Plant warm season flowers after April 15th. Sunny areas - Marigolds, periwinkles, petunias, geraniums, portulaca, zinnias. Shady areas – begonias, impatiens, coleus, lobelia.

Future – Options
May 1, 2001 10A.M.
Alfalfa County Exhibit Building

Dr Kim Anderson, OSU Extension Grain Mkt. Spec and J.C. Hobbs, OSU Area Ag Econ Spec. will conduct a futures, options, marketing and strategies meeting.

They will also evaluate marketing alternatives to wheat and summer stockers. This will be an excellent and informative meeting for all individuals.

Tractor & Machinery Operators Certification Program

Youth who are 14 and 15-years-old who are planning to drive a tractor this summer are required by Federal Law to become certified through a tractor and machinery operators certification program.

Alfalfa County OSU Extension will offer this 24-hour course in April. Cost of the training is $25 and pre-registration is required in order that enough materials are available. This class can also be taken by individuals older than 15 years or younger than 14.

Dates will be:
April 5, 4:00 - 8:00 p.m.
April 12, 4:00 - 8:00 p.m.
April 19, 4:00 - 8:00 p.m.
April 26, 4:00 - 8:00 p.m.

All classes will be held at the Alfalfa County Fairgrounds in Cherokee, OK. For more information or to pre-register contact the Extension Office at 596-3131.

Musk Thistle Control

Musk thistle is an aggressive biennial weed that has spread throughout this area in the past few years. In most years the seedling emerge in September and October, staying in the rosette stage of growth for the first year. In the spring of the second year of growth, the plants usually start bolting (sending up a seed head) by mid-April, then die after seed is produced. The flower head will be a somewhat purple color.

Like other thistles, musk thistle is covered with sharp spines, but it has no hairs on its leaves. All other thistles in Oklahoma have hairs on the leaves. Musk thistle can sometimes act as a cool-season annual, blooming in the first spring after fall emergence. This has been noted in early fall-planted wheat and alfalfa and closely grazed pastures.

Herbicides can be very effective for control, but timing is important. The best time for control is to apply the proper herbicide in the fall (October or November). Once the plants start to bolt in April they can be very difficult to control. Recent work has shown 90-100% control of both rosette stage and bolted plants is possible by applying two pint/acre of Grazon P=D or Weedmaster in late April to early May. This means that a timely application of one of these herbicides at this rate should control musk thistle as well as many other summer weeds.

With all herbicides it is important that weeds be actively growing at the time of application. For musk thistle, this means spraying when there is adequate soil moisture and daytime air temperature is above 60 degrees.

A little Soybean History

In 2000, more than 73 million acres of soybeans were planted in the U.S. with virtually every acre intended for grain production. Eventually, all of the nearly 3 billion bushels of grain produced will be converted into an amazing array of human foods, animal foods and industrial products. About half of the production will be sent overseas.

Before the soybeans ascended to its lofty position as a food and industrial staple, it served in another very valuable role. Soybeans actually began as a forage crop in America.

Between 1900 and 1920, the USDA introduced about 800 varieties and strains of soybeans from all areas of the Orient. As late as 1920, only about 20% of the 750,000 acres planted were grown for grain production. However, as the soybean industry developed, value of soybeans for grain production exceeded value for forage production. Today, few soybeans are planted exclusively for forage. Some Oklahoma growers may reconsider soybeans as a forage crop in 2001.

Early Season Soybean Productions

Conventional soybean production systems in Oklahoma involve planting maturity group V and VI varieties in May and June and harvest in October. Prolonged hot, dry weather in July and August usually coincides with the soybean blooming and seed-filling periods. Yields of full-season soybeans grown under non-irrigated conditions may be very low due to the adverse summer weather condition.

An alternative system is to plant maturity group III or IV in April and harvest in August or September. This system reduces (but doesn't eliminate) the probability that the crop will be flowering or maturing during hot, dry conditions. In some cases, the results have been better than planting longer season varieties in May or June. Based on Oklahoma tests, maturity group III varieties mature in late August and group IV varieties mature in early to mid-September.

Drought avoidance is the primary purpose of the early season soybean production concept. Full season soybeans have the highest demand for moisture in July and August when rains are in infrequent. Full season soybeans may be nearly ready for a premature harvest when the rains begin again in September. The early season soybean production system enhances pod filling in June when rain probability is high and harvest in August/early September before the fall rains begin.

Early season soybeans should be planted after April 5. If possible, planting should be before April 20. May plantings are not usually satisfactory for early season production. With this early planting, a longer period (10 days to two weeks) will be required for emergence than with conventional planting times.

Planting Soybeans For Forage

Wheat and / or alfalfa growers who didn't get some fields planted or have poor stands in planted fields are looking or spring or summer crop options for these acres. Corn, grain sorghum, and other grass crops that might be planted on these fields will require nitrogen fertilizer. Nitrogen is expected to be expensive and in tight supply. Soybeans planted for hay can be an option for some of these growers.

Soybeans have long served as versatile emergency hay crop. For example, during the drought of 1998, tens of thousands of acres of soybeans that had made good vegetative growth but were not setting pods were harvested for hay. Soybean hay harvested at the optimum time can produce quality that is similar to alfalfa. Samples submitted to the OSU Forage Testing Lab in 1998 had crude protein averaging 15%.

Following are a few tips for planting soybeans for forage productions in 2001.

- Seed of true forage varieties will be difficult (or impossible) to locate. Plan to plant a variety that would ordinarily be planted for grain production.
- Plant a bushy-type variety in maturity group 5 or 6. Earlier maturity groups (3 and 4) should be avoided as they typically produce less forage. Hutcheson would be a good variety to plant for forage production.
- Use a grain drill (7-10" rows) to plant around 50 pounds of pure live seed per acre. Much of the seed produced in 2000 has low quality. Determine the germination % before planting.
- Inoculate the seed with rhizobium bacteria specific for soybeans. A peat based inoculant applied directly to the seed in the drill box is adequate. Seed may be dampened with water or sugar water to improve sticking ability. Mix inoculant thoroughly with seed.
- Soybean perform best on soils with pH between 5.8 and 7.5.
- Soybean for forage can be planted from early April through June. July planted soybeans will produce limited forage.
- Keep soil preparation to a minimum. A stand can be obtained with little or no soil disturbance. If there is significant weed cover or wheat stand, a burndown heribicide will be needed and should be applied 2 weeks prior to planting.
- Soybeans are excellent foragers for nutrients. If the soil tests medium to high in phosphorous and potassium or if the wheat crop was fertilized, skip the fertilizer application to the soybeans. Soybeans respond poorly to fertilizer in the year of application.
- Soybean hay can be difficult to cure and is subject to loss of leaves and to spoilage. Crimping the stems will hasten curing and reduce vulnerability to wet weather the crops should be cut for hay during good drying condition.
- Forage quality will vary depending on stage of growth when the crop is harvested. A general recommendation is to harvest when the seed is beginning to develop (R3-R5). Crude protein at this stage should e around 15%. Harvesting earlier will produce higher quality forage but total yield will be lower. **Harvest before lower leaves begin to turn brown and fall off.**
- Weeds, mainly crabgrass and pigweed, may be present. Crabgrass will not be a threat to forage quality but will compete with soybeans and reduce early season growth. Pigweed will compete with the soybeans for nutrients and moisture and will be a problem in the harvested forage. If these weeds are expected to be a problem an application of pre-plant incorporated herbicide (Prowl or Treflan) is advisable. Both herbicides require a 4 month delay before wheat can be planted.
- It is possible to produce 3 tons+ of dry soybean forage per acre.

Vegetable Gardens

Cool season vegetables should be in the ground by mid-March while most of the warm season vegetables should not be planted until the ground temperature reaches at least 50 degrees F at the depth where the seeds will be planted. In

Oklahoma, this means that most warm-season crops should not be planted until about the second week of April. Sweet corn, however, should be planted between the middle of February and middle of March. See fact sheet F-6004 for more information on vegetable gardening. The chart below is from F-6004

Crop	Time to Plant
Bean, lima	April 15-30
Beans, Green or wax	April 10-30
Beans, Pole	April 10-30
Cantaloupe	May 1-20
Cucumber	April 10-30 or later
Eggplant	April10-30
Okra	April 10-30 or later
Pepper	April 10-30 or later
Pumpkin	April 10-3- or later
Southern Pea	May 1-June 10
Squash, Summer	April 10-30 or later
Squash, Winter	May 15-June 15
Sweet Corn	March 15-April 15
Sweet Potato	May 1-June 10
Tomato	April 10-30
Watermelon	May 1-20

What is the Land EKG of Your Native Pastures?

Plan to attend the rangeland monitoring workshop on Land EKG. The land EKG Technique depicts the relative health of the soil system and plant community by assessing four basic ecological process: Water and Nutrient Cycling, Energy Flow, and Biotic Community. Understanding these processes and their importance in the health and productivity of the land is critical. This method was developed for landowners and resource managers to provide a tool that is easy to understand and apply on the land. And Land EKG has another improtant advantage: it becomes the tool that leads to more profitable and sustainable land management decisions. Monitoring provides you the opportunity to assess your rangeland health and gives you the ability to:

- Optimize profit: Ranchers are capitalizing on monitoring information with improved plant vigor, forage production, and more profitable grazing practices.
- Promote land stewardship: Monitoring educates and promotes your business image and the livestock industry.
- Prescribe best management practices: Land monitoring leads you to and through the "what to do now for this pasture" question.
- Capitalize on opportunities: Land monitoring provides management opportunities that are often non-existent for those without monitoring data.

Charley Orchard, a fourth generation Wyoming rancher, created the land EKG technique out of a need to document ecological and economic effects of management practices on his family's private and public lands. Charley recognized the benefits resulting from monitoring land resources, and continued further development of this assessment method that brings all land factors and ecological processes into one easy to understand data picture.

Rangeland monitoring gives you the ability to enhance productivity or your ecosystem by improving: land and resource health, riparian and wildlife habitat, forage production and grazing efficiency, and economic profit. This workshop will provide participants the opportunity to better understand basic ecological processes occurring on their land and the benefits of monitoring and management of rangeland resources.

This workshop will be conducted by Charley Orchard, creator of Land EKG, Inc. The workshop will be held April 26 through April 28, at the Kelly Ranch located near Vinita, Oklahoma. The cost per person is $175.00 and includes monitoring kit, supplies and notebook. Space is available on a first-pay basis. The workshop is limited to 20 participants. The deadline is Friday, April 6, 2001. To obtain a registration form for the workshop, contact the Cherokee NRCS office at 596-3402 Ext. 3.

This workshop is sponsored by the Oklahoma Grazing Lands Conservation Association, with funding provided by OGLCA and EQIP Educational Funds.

June / July 2001

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
Cherokee, Oklahoma 73728
580-596-3131

Traveling Overseas This Summer? What You Should Know About Foot and Mouth Disease

In response to the increasing number of foot-and-mouth disease (FMD) outbreaks worldwide, travelers to the United States from infected regions need to take steps to help prevent the accidental introduction of the disease into this country.

FMD is not considered a human health risk but humans can carry the virus on their clothing, shoes, body (particularly the throat and nasal passages) and personal items. The disease is extremely contagious and spreads easily among cloven-hoofed animals such as cattle, sheep, pigs, goats and deer.

Introduction of FMD into this country would be disastrous to the American livestock industry and wildlife community. For this reason all visits to farms or other livestock facilities in FMD infected areas and all food items and other materials of plant or animal origin in the traveler's possession must be reported on the U.S. Customs Declaration Form upon entering the country.

The following preventive measures should be taken by travelers to the United States from FMD infected countries.

1. Avoid farms, sale barns, stockyards, animal laboratories, packinghouses, zoos, fairs or other animal facilities for 5 days prior to travel.
2. Before travel to the United States, launder or dry-clean all clothing and outerwear. All dirt and soil should be removed from shoes by thoroughly cleaning. Luggage and personal items (including watches, cameras, laptops, CD players and cell phones), if soiled, should be wiped clean.
3. Avoid contact with livestock or wildlife for 5 days after travel in the United States. **Extra**, precautionary measures should be taken by people traveling from farms in infected locales to visit or work on farms in the United States. It is advisable that employers or sponsors provide arriving travelers with a clean set of clothing that can be worn after the visitor showers and shampoos thoroughly. Visitor's traveling clothes should be laundered or dry-cleaned immediately. Off-farm activities should be scheduled for the visitor's first 5 days in country and contact with livestock or wildlife should be strictly avoided.

Johne's Disease Emerging as Herd Health Concern

A slow developing disease is emerging in Oklahoma and cow/calf producers should watch for symptoms to prevent if from becoming widespread in their cattle herd. Johne's Disease (pronounced yo-nee's) is a chronic, incurable, and infectious disease of the intestinal tract of ruminants. It is present in cattle throughout Oklahoma, and the

incidence appears to be increasing. Tests from OSU Animal Disease Diagnostic laboratory indicate an annual reactor rate incidence from 4.1% to 16.8% of all cattle tested during a nine-year period.

The bacteria *Mycobacterium paratuberculosis* causes Johne's Disease. The organism is passed through the feces of infected animals. It will remain infectious in contaminated feed, water, pasture and equipment for extended times. Infections is usually acquired early in life (less than 6 months of age) as disease resistance increases with age. Calves nursing udder contaminated with feces from infected dams are at high risk. However, 20% to 40% of calves born from infected and symptomatic dams become infected during gestation. The organism grows within the lining cells of the intestine and is shed in the feces of infected cattle with or without clinical signs. Clinical signs occur primarily in 2 to 6 years old animals as a chronic diarrhea (inability to absorb nutrients) and weight loss, with leads to emaciation, dehydration, and debilitation. Affected cattle maintain a good appetite and do not have elevated body temperatures. Mortality rate (those that die) is 100%. Morbidity rates (those that have clinical signs) will vary but is usually low. However, it is estimated that for each animal in the herd that are in some stage of the disease process. Due to the long incubation and small number of animals with clinical disease, early diagnosis is very difficult.

Johne's disease is not a treatable disease and all cows showing clinical signs will eventually die from the disease. Introduction of the disease into a clean herd is usually by a subclinically infected carrier. A positive laboratory diagnosis is reported to Oklahoma Department of Agriculture, but no federal or state regulation exists. The information is just used for monitoring purposes. Infected cattle cannot be moved in interstate commerce due to their ineligibility to be certified as healthy. Infected animals should be humanely euthanized and disposed of by incineration or burial. The carcasses of infected animals are condemned as unsuitable for human consumption.

More information is available in OSU Fact Sheet # 9126 from the Alfalfa County OSU Extension Center.

Southern Conservation Tillage Conference

The 24th Annual Southern Conservation Tillage Conference for Sustainable Agriculture will be held in Oklahoma City, at the Embassy Suites July 9-11, 2001. The conference speakers consist of university researchers, extension specialist, ARS, and NRCS personnel, from the 13 southern state. The purpose of the conference is to, meet, report and exchange ideas about conservation tillage. It is also a great opportunity for local agency and university personnel, consultants and farmers, to interact with these scientists and increase their knowledge about conservation tillage.

We are looking forward to an outstanding conference. There will be 14 oral and approximately 20 poster presentation on Tuesday, July 10th. On Monday, July 9th registration and an evening reception is planned. A

conservation field tour is scheduled for Wednesday, July 11th.

The registration fee is $75. The form and other information about the conference can be found "on-line" at the conference website, www.agr.okstate.edu/SCTC. CEU's for CCA members will be given for the conference. 8 CEU's on Tuesday and 4 CEU's on Wednesday are anticipated

Should I Fertilize My Pond?

By: Marley Beem, Area Ext. Aquacultre Spec.

People usually ask about fertilizing their ponds for one of two reasons; either to make fish grow faster or as a pond weed control method. Fertilizing can make your fish grow faster by increasing the base of the food pyramid. There are disadvantages to fertilizing, however. If the pond is loaded with stunted forage fish, bass will not benefit – see fact sheet # 9206. Too much can lead to excessive algae growth and a fish kill as the algae dies and uses up all the oxygen. For further information go to http://dasnr.okstate.edu/oces/sedistrict/ click on "Aquaculture" then Oklahoma Pond Roundup" then the title of this article.

In the deep South, Spring application of fertilizers to ponds is sometimes recommended to promote the growth of unicellular algae so as to shade out and prevent the early growth of rooted pond weeds. It has been my observation that in Oklahoma nutrients are already high – the algae will grow well as soon as the pond warms up and gets enough light each day. Fertilizing in an already nutrient-rich pond can be like throwing gas on the fire – the result may be even worse weed growth.

Filamentous Algae On Pond Edges

By: Marley Beem, Area Ext. Aquacultre Spec.

Probably the most common aquatic weed complaint in the spring is filamentous algae. Often the algae is just growing along the shore and pond and the owner wants a quick spot treatment recommendation. Remember that a total alkalinity test is recommended before using copper sulfate. If you do not want to do one, then the following rates can be tried: 1 heaping Tablespoon per 100 feet of shoreline if water in the area general runs in the low to moderate range for total alkalinity (50-150 mg/l). Use 2 heaping Tablespoons if total alkalinities are moderate to high (150-300 mg/l).

Dissolve the cooper sulfate and screen it to remove grit before pouring into to a sprayer. Apply only when wind is calm to avoid wave action dilution. Clean the sprayer immediately after use. These rates are for shoreline situations only. Do not use these rates in very small ponds. Do not use if bass are nesting in the treatment area. Copper sulfate should not be used if sheep and goats cannot be excluded.

Total alkalinity testing and accurate volume measurements are needed when treating major portions of ponds.

In addition to copper sulfate there are other methods to consider: Cutrine is very similar to plain copper sulfate but offers the benefit of having a label. Aquashade or similar dye products work slowly by reducing light penetration. Reward (Diquat) is relatively costly but may be justified if there is also a problem with najas, milfoil, pondweeds or coontail.

Landscape Maintenance Schedule

1. Vigorous unwanted limbs should be removed or shortened on new trees. Watch for forks in the main trunk and remove the least desirable trunk as soon as it is noticed. See "Training Young Shade and Ornamental Trees", Fact Sheet 6415
2. Remain alert for insect damage. Add spider mites to the list. They are particularly fond of junipers.
3. Cultivate and Mulch. Be sure to mulch young plantings. Mulching will reduce about 70% of the summer yard maintenance.
4. Fertilize warm season grasses. Irrigate to wash fertilizer off the grass and into the soil. Buffalo and centipede lawns need not be fertilized again this year.
5. Continue to water deeply as needed. Apply at least one inch of water each time, but don't waste it by run off. Water after light shower for better water usage.

Water Management

Proper watering is the main factor in healthy landscape plants. Improper watering can increase pest problems. Water plants deeply and less often.

Generally, most plants, including bermudagrass, need 1" of water each week. Fescue lawns require 2" of water weekly. Water young trees weekly the first three years if needed and apply mulch.

Water in the morning. This allows leaves to dry quickly and prevent disease problems. Use soaker hoses in flowerbeds to prevent wet leaves and evaporation loss.

How much water does a sprinkler apply? Place containers (butter dishes, pie plates, etc.) around sprinklers to collect water. Record the time it takes to fill an inch of water in the container. This is the amount of time needed for 1" of water.

Commercial Soap Products May be Best

A study led by scientists at Colorado State University indicated that homemade detergent sprays are slightly toxic to many plants and therefore can cause visible leaf damage, delayed maturity, and yield reductions when sprayed repeatedly on crops such as tomatoes. Tomato yields when sprayed with commercial soap spray yielded 26 pounds on contrast to tomatoes treated with homemade soap spray, which yielded 14 pounds. Tomatoes treated with water, which was the control, yielded 22 pounds. Commercial insecticidal soap products are specifically formulated for insect control and go easier on the treated plants.

August 2001

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Landscape Maintenance Schedule

August

1. Water all plantings thoroughly
2. Cicada killers are large wasps that kill Cicada. Avoid killing these wasps if possible. Their nests (holes) are found in bare soil or areas with little vegetation.
3. The fall vegetable garden is planted now. See "Fall Gardening", Fact Sheet 6009.
4. Dig, divide and replant spring blooming perennials (iris, peonies, and daylilies)
5. Plant chrysanthemums for fall color
6. Treat for white grubs
7. Fertilize warm season grasses if water is present for growth. Apply 1lb. of nitrogen fertiiizer to 1,000 square feet.
8. Hedges & shrubs can be pruned if necessary about mid-August. Prune up for vision and safety before school starts.

How Often Does Your Lawn Need Watering?

Although it is often difficult to determine when a garden should be watered, gardeners will get the best results if they water two to four inches deep when the ground is dry. Applying slow running water for a long period of I time, rather than watering with the faucet turned all the, way up, allows the soil to moisten thoroughly four to six inches down. This allows plants to grow longer, stronger roots rather than shallow weak root systems.

Although having the top one-inch of soil dry won't harm plants and, actually is desirable for older plants. Vegetables should get the equivalent of one inch of water each week during dry conditions, using the deep soak method. A heavy mulch will keep the moisture in the soil longer.

Gardeners should avoid watering in the middle of the day. Although it doesn't hurt the plants, it's wasteful because so much of the water evaporates in the heat of the sun. Early morning water is best, although evening watering is acceptable. However, gardeners must provide enough time for leaves to dry before nightfall if they choose to water in the evening, otherwise foliage diseases may develop.

Early in the season one inch of rain or applied water should sustain a lawn in good growing condition for about two weeks. A one-inch soaking won't last as long in the hotter weather of July and August. A lawn needs about one inch of water per week then.

One inch of water in clay soil will fill a depth of six to eight inches to field capacity, or 25 percent water, 25 percent air and 50 percent solids. One inch of water will penetrate ~bout the top 18 inches in sandy loam soil. However, approximately 90 percent of the roots of grass plant are in the top six to eight inches of soil. So one inch of water applied weekly to sandy loam soil should be split into two half-inch applications to keep more of the water in the root zone.

Musk Thistle

The Noxious Weed Law was amended as of June 6, 2000 by the Oklahoma Legislature. A summary of the law is as follows.

Musk, Scotch, and Canada thistles are designated as noxious weeds in all counties of Oklahoma.

It shall be the duty of every landowner in each county to treat, control or eradicate all Canada, musk, or Scotch thistles growing on the landowner's land every year as shall be sufficient to prevent these thistles from going to seed.

Failure of the land owner to treat, eradicate, or control all musk, Canada, or Scotch thistle may result in a fine not to exceed One Thousand Dollars ($1,000) for each violation per day.

Upon written complaint, the State Department of Agriculture shall inspect the type of thistle infestation, assess the nature and extent of this thistle infestation on the property of the landowner and determine the most appropriate thistle treatment, control, or eradication method available for the type of thistle and location of the property.

Cherokee Wheat Variety Trial 2000-2001

Cooperator: Kenneth Failes, Soil Type: Dale silt loam, pH = 6.1

SOURCE	ENTRY	HEIGHT INCHES	TEST WEIGHT (LB/BU) 2000-2001	TEST WEIGHT (LB/BU) 2-YEAR	TEST WEIGHT (LB/BU) 3-YEAR	YIELD (BU/A) 2000-2001	YIELD (BU/A) 2-YEAR	YIELD (BU/A) 3-YEAR
KAES	JAGGER	29	58.0(10)[1]	57.4(11)	57.1(8)	49.8(1)	50.6(1)	58.9
OAES	CUSTER	29	57.9(11)	57.5(10)	57.7(6)	48.4(2)	48.1(3)	55.2
KAES	2137	31	57.8(12)	57.6(7)	57.5(7)	44.2(8)	49.6(2)	55.0
OAES	INTRADA (W)	29	59.0(5)	58.9(2)	59.1(1)	41.3(14)	46.0(7)	54.7
OAES	Ok101	30	55.5(18)	56.4(13)	56.8(10)	37.5(19)	45.3(8)	54.6
OAES	CHISHOLM	29	57.8(12)	57.6(7)	57.8(5)	44.3(6)	47.4(5)	54.3
AGRIPRO	OGALLALA	30	57.0(17)	57.6(7)	58.0(4)	37.0(20)	44.2(10)	54.2
OAES	2174	29	59.1(4)	58.7(3)	58.7(3)	45.9(3)	47.6(4)	51.8
OAES	TONKAWA	31	60.1(1)	59.1(1)	59.0(2)	44.2(8)	43.1(11)	50.1
TAES	TAM 302	31	54.4(20)	54.8(16)	54.6(13)	38.5(17)	43.0(12)	48.4
AGRIPRO	TOMAHAWK	30	57.1(16)	56.4(13)	55.8(11)	43.4(10)	42.7(13)	47.3
TAES	LOCKETT	32	54.9(19)	54.9(15)	55.4(12)	37.6(18)	40.9(16)	47.3
AGRIPRO	CORONADO	27	58.2(9)	57.3(12)	57.0(9)	42.3(11)	41.8(15)	46.6
OAES	2174+GAUCHO	31	59.4(2)	58.7(3)	-	44.3(6)	46.4(6)	-
AGRIPRO	THUNDERBOLT	37	59.0(5)	58.4(6)	-	41.8(12)	44.4(9)	-
KAES	TREGO (W)	30	57.7(14)	58.5(5)	-	40.4(15)	42.4(14)	-
OAES	OK97508	29	58.4(8)	-	-	45.1(4)	-	-
AGRIPRO	CUTTER	32	58.7(7)	-	-	44.7(5)	-	-
AGSECO	ONAGA	29	59.2(3)	-	-	41.8(12)	-	-
OAES	OK98680	29	57.3(15)	-	-	40.2(16)	-	-
MEAN		30	57.8	57.5	57.3	42.6	45.2	52.2
LSD (0.05)		2	0.8	1.8	1.4	3.9	N.S.	7.5

[1] Number in () is rank within column.

KAES, OAES, TAES = Kansas, Oklahoma, Texas Agricultural Experiment Stations, respectively.

Planted October 11, 2000 at 60 lb/a.

Partial Financial Support by the Oklahoma Wheat Commission

OKLAHOMA COOPERATIVE EXTENSION SERVICE

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

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Landscape Maintenance Schedule for September

1. Annual spring grassy – weed control begins about Labor Day. Pre-emergent grass-weed control chemicals must be on the ground by September 15th.
2. Fertilize warm season lawns if adequate irrigation is available.
3. Young trees and shrubs may be fertilized again. If you are only fertilizing your trees once a year, wait till after a killing frost. Scatter the fertilizer evenly on the surface under mature trees beginning 3 feet from the trunk and extending 10 to 20 feet beyond the ends of the branches. Do not place fertilizers against the stems of shrubs of trees because it may burn them. For more information on fertilizing trees and shrubs contact the extension office and ask for fact sheet #6412
4. Plan to reseed Bluegrass, Fescue or Rye grasses as needed in shady area.
5. Choose spring flowering bulbs as soon as available.
6. Apply Grub control in early September.
7. Adult Elm Leaf Beetles may be active. They look for over wintering places such as inside homes.
8. Lacewing eggs can be seen now. They are often found on the underside of sycamore trees, especially those with lace bugs. Lacewing larvae are predators of insect pest like lacebugs and aphids.
9. Plant cool-season annuals (pansies, ornamental cabbage and kale).
10. Check plants for aphids as temperatures cool.

NITRATE TOXICITY AFTER A DROUGHT-ENDING RAIN

Oklahoma summers often bring "high pressure domes" that cause 100+ degree-days and no rain. The resulting heat stress can cause nitrate accumulation in summer annual forage crops. Producers are very cautious about cutting or grazing the drought-stressed forages and for good reason. However, when the first drought-ending thunderstorm comes along, cattlemen are anxious to cut the forage or turn in the cattle on the field that has just received rain.

This practice can lead to a potentially dangerous situation. As the plant starts to grow and turn green once again, the nitrate uptake is accelerated. Plant enzymes (such as nitrate reductase) are still not present in great enough quantities or active enough to convert the nitrate to plant proteins. Therefore the plant nitrate concentrations become even greater in the first few days after the first rain.

Producers should exercise caution and test forages before cutting or grazing shortly after a drought-ending shower. Some of the greatest concentrations of nitrate in forages will be recorded at this time. Usually by 7 to 10 days after the rain, plant metabolism returns to normal and nitrate accumulations begin to decrease. Be sure to test the forage before cutting and storing a large quantity of potentially poisonous hay. Drop tests can be done in the extension office at no cost. Samples sent to OSU for Nitrate tests are $6.00 each.

October / November 2001

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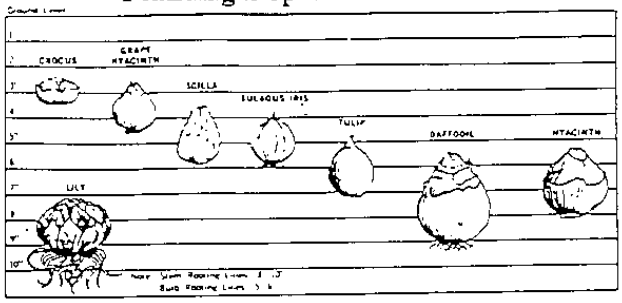
October 2001

Landscape Maintenance Schedule

Planting Depth for Bulbs



Most bulbs must be planted at the proper depth to grow and flower well. The rule of thumb for planting is 2 times the bulb diameter

1. Plant most spring flowering bulbs such as daffodils and crocus now. Tulips may be planted through November. Be sure to use proper planting depths. Bulbs require well-drained soils in good sunlight.
2. Dig and store tender perennials such as dahlias and tuberoses in a cool, dry place.
3. Container grown shade tress and pines are most successfully planted in the fall. Broadleaf evergreens like holly and magnolia or bare root plants are best planted in spring. Be sure to check drainage before planting. See "Planting Trees and Shrubs," Fact Sheet 6414.
4. In mid-month, fertilize cool season lawns.
5. Mow and edge neatly before killing frost.
6. Start pruning the bleeders, birch, elm, maple, and willow.
7. Check the form of young trees. Eliminate any forks that developed during the summer. See "Training Young Shade and Ornamental Trees and Shrubs", Fact Sheet 6415.
8. Fall is a good time to soil test for the home landscape plants, lawns, and food gardens. Refer to Fact Sheet 6406, "Winter Protection for landscape Plants."

Master Gardener Classes Alfalfa / Woods Counties

At the present time we are soliciting an interest in the Master Gardener program. If you like to garden, have a desire to learn more and share your knowledge with others in your community, this program is for you. The program will be scheduled for approximately 60 hours of instruction by OSU Extension specialists covering: Botany, Plant Physiology, Soils and Plant Nutrition, Pant Pathology, Woody Ornamentals-Trees and Shrubs Herbaceous Ornamentals, Pesticide Safety, Entomology, Vegetable Gardening, Fruits and Nut Trees, Turf Selection and Maintenance.

Cost of the class is $75, which includes materials for class including a Master Gardener Notebook, Agents Handbook of Insect, Pant Disease, and Weed Control and other materials necessary for class.

A requirement of the Master Gardener program is for participants to share their knowledge gained in the program with

others through volunteering in their local communities. These hours of volunteering can be in a variety of activities, events or projects. Examples are community service projects, presentations to groups, a master gardener project, youth horticulture projects, garden, organizing a farmers market.

At this time we are asking people to call in and express their interest in participating in this program. You may contact Tommy Puffinbarger at the Alfalfa County Extension Office 580-596-3131 or Jim Rhodes at the Woods County Extension Office 580-327-2786 before December 15, 2001.

Beef Research Field Day

The OSU Animal Science Department will host the 3rd annual Beef Research Field Day on Saturday, November 3rd. The Field Day will begin at 10:00 a.m. at the OSU Cross Timbers Research Range. A sponsored lunch and the conclusion of the field day will be at the OSU Willard Sparks Beef Research Center. The program will end at approximately 3 p.m.

Numerous animal science faculty and graduate students will be presenting updates on various research projects that have been or are being conducted.

Topics will include:

1. The ruminant animal's digestive system. Participants will actually see and hear how the rumen converts roughage to beef.
2. See and try different methods to determine the amount of forage available in a pasture or hay field.
3. Determining optimal stocking rates.
4. Uses for prescribed burning and fire control methods.
5. New USDA feeder cattle grades. A hands on demonstration with live cattle.
6. Factors affecting the success of a timed artificial insemination programs for beef cows.
7. Fall calving beef production systems. Participants will see feedlot cattle from fall calving cows managed in different ways.
8. Detecting sick calves during the weaning/receiving period.
9. Treating sick calves.
10. See an experiment in progress evaluating the performance, health and profitability of cattle purchased from preconditioned calf sales, direct from the ranch, or from auction markets

The Beef Research Field Day is free and open to the public. **To register call Katina Chance at 405-744-6060. Please RSVP no later than Wednesday, October 31st at 5 p.m.**

Direction to the OSU Cross Timber Research Range: From highway 51, turn south on Coyle Road 2 miles to 44th Street. Turn east and drive 2.5 miles. The headquarters are located on the north side of 44th Street.

Directions to Willard Sparks Beef Research Center: If you are traveling east from I-35 on Highway 51-Turn north on Country Club road (between convenience store & Ron and Shirley), go 1 mile and turn east on McElroy road, turn north at Willard Spark's sign, approximately a quarter a mile.

If you are traveling west from Stillwater on Highway 51 – Turn north on Snagre Road, go 1 mile turn west on McElroy road, go approximately 1/3 mile to the Willard Spark's sign on the north side of the road.

November 2001

Landscape Maintenance Schedule

1. Apply a 2-inch layer of well-rotted manure under pines & magnolia trees if available. Di-Syston will control the next June brood of pine tip borers if applied now. 15% Di-Syston can be applied only by a professional.
2. Just after frost before freezing weather begins is the most important time to fertilize trees, shrubs and vines.
3. November 15 to March 15 constitutes our major pruning season. Dehorning is not pruning but butchery!
4. November and December is the best time to control chickweed, dandelion, and henbit. Most trees and shrubs are less susceptible at this time. Caution is the watchword whenever herbicides are applied.

Time to Plant Trees

Fall and winter are times many trees are planted in Oklahoma. The following are the **most desirable for homeowner use**:

- Lacebark Elm
- Fruitless Mulberry
- Kentucky Coffetree (male)
- Bur Oak
- Caddo Sugar Maple
- Western Soapberry
- Bald Cypress
- Littleaf Linden .
- Shumard Oak
- Japanese Zelkove
-

Undesirable trees are:

- Silver maple (weak wood, shallow roots)
- Lombardy Poplar (disease-prone)
- American Elm (disease-prone)
- Mimosa (insect problems, short-lived, prolific seedlings)
- Green Ash (insect problems)
- Honeylocust (thorns, insect problem seedlings)
- Purple Leaf Plum (short-lived, pest problems)
- Tree of Heaven (weak wood, prolific seedlings)
- Bradford Pear (disease-prone, weak wood)

Diverse tree plantings are important in your yard and neighborhood. See OSU Extension Circulars E-897, E-878 and Fact Sheet #5036 for additional information.

Establishing Cool-Season Grasses in Lawns

Following some guidelines in preparing and seeding lawn areas with cool-season grasses should provide a thicker, more vigorous cover, according to OSU Turf Grass Specialists. However, time is going to start running short this fall to plant seeds and get good establishment.

First, the soil should be roto-tilled uniformly to a depth of six to eight inches. Then, rake and level the ground. Rolling the soil to provide a firmer seedbed is also suggested. Only top ¼ to ½ inch of soil should remain loose in a proper seedbed.

Make sure soil pH and phosphorus and potassium levels are adequate for good lawn establishment. Then, at planting time, apply one pound of actual nitrogen per 1,000 square feet. Use proper spreader and calibration to ensure uniform coverage.

After seeding, lightly rake the seed and fertilizer into the top 1/8 inch of soil. Rolling the ground again will make good seed-to-soil contact. Some type of mulch may be needed to keep the soil moist between watering. Weed free wheat straw, finely ground tree bark, wood-cellulose fiber or other material scattered lightly provides useful mulch.

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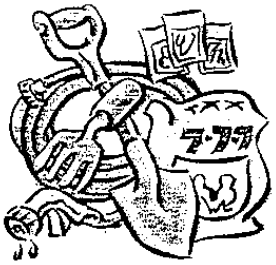
Landscape Maintenance Schedule

1. Soak all plantings before hard freezing weather. Do not forget mature evergreens or plants under broad eaves of houses.

2. Light pruning of evergreens can be used for Christmas decorations. Continue pruning the bleeders: birch, elm, maple, and willow.

3. Review the year's schedule and make plans for next year's improvements.

Master Gardener Classes Alfalfa / Woods Counties



At the present time we are soliciting an interest in the Master Gardener program.

If you like to garden, have a desire to learn more and share your knowledge with others in your community, this program is for you. The program will be scheduled for approximately 60 hours of instruction by OSU Extension specialists covering: Botany, Plant Physiology, Soils and Plant Nutrition, Pant Pathology, Woody Ornamentals-Trees and Shrubs Herbaceous Ornamentals, Pesticide Safety, Entomology, Vegetable Gardening, Fruits and Nut Trees, Turf Selection and Maintenance.

Cost of the class is $75, which includes materials for class including a Master Gardener Notebook, Agents Handbook of Insect, Pant Disease, and Weed Control and other materials necessary for class.

A requirement of the Master Gardener program is for participants to share their knowledge gained in the program with others through volunteering in their local communities. These hours of volunteering can be in a variety of activities, events or projects. Examples are community service projects, presentations to groups, a master gardener project, youth horticulture projects, garden, organizing a farmers market.

At this time we are asking people to call in and express their interest in participating in this program. You may contact Tommy Puffinbarger at the Alfalfa County Extension Office 580-596-3131 or Jim Rhodes at the Woods County Extension Office 580-327-2786 before December 15, 2001.

January 2002

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
Cherokee, Oklahoma 73728
580-596-3131

Landscape Maintenance Schedule

- Remember to water plants during prolonged dry periods. Pay special attention to evergreen trees and shrubs, plants growing in protected areas (under roof overhangs), and plants growing in raised planters.
- Finish pruning deciduous trees and shrubs, but remember to wait and prune spring flowering plants after flowering in spring.
- Fertilize trees, including fruit and nut trees and shrubs in February.
- Continue to control over wintering insects on deciduous shrubs and trees with a dormant oil when temperatures are above 40 degrees F. Do not spray evergreen plants with dormant oil.
- Continue to control winter weeds in "dormant" bermudagrass with a product containing glyphosate. Temperatures should be above 50 degrees F. A broadleaf herbicide may be mixed with the glyphosate for better control. Remember, DO NOT use glyphosate on bermuda that is thin and weak or still showing green leaves or stems!
- Treat young pines for tip borers if you did not spray for them in November.
- Spray peaches and nectarines with a fungicide to control peach leaf curl before bud swell (February).

Your Trees and Shrubs

Keep on planting deciduous trees and shrubs. Once most of their leaves have fallen, deciduous trees and shrubs can be safely transplanted to a new location.

Fertilize trees and shrubs 10 days after the first good freeze. Use 1 pound of actual nitrogen per 1,000 square feet of root area. Tree and shrub roots extend out twice the distance or more from the trunk to the branch tips. Use this larger area to estimate the root area to fertilize. Soil test to determine pH, nitrogen, phosphorus, and potassium.

Mulch trees and shrubs with 2-3 inches of compost, wood chips, or bark. Keep mulch 2-3 inches away from the trunk to avoid rot. Pines respond especially well to a layer of compost or aged manure. Aging manure helps to destroy weed seeds and reduces ammonia that can damage plant roots.

Quicken 2001 Workshop

A beginning level "hands on" class will be held on the Quicken computer program. Quicken is a popular commercial record-keeping package that is:

- Very user friendly,
- Inexpensive and readily available.
- Flexible, allowing record keeping for a wide variety of agricultural and non-ag business enterprises.

During the workshops participants will set up a file, open accounts, import a farm income and expense category list, modify the category list, use classes with categories, enter transaction data, create reports, view graphs and back up data. No previous experience with Quicken is needed.

Two workshops are scheduled for Tuesday, **January 31st one at 1:30 p.m. and one at 6:00p.m.** Classes are at the Alfalfa County Exhibit Building in Cherokee, Oklahoma. The workshops will be 3 hours long. Each participant will have the use of a laptop computer for the workshop. **Space is limited and you must pre-enroll by contacting the extension office before**

January 28th. Cost of the workshop is **$25,** which includes a notebook with instructions of the tasks performed during the workshop, and a disk containing sample files. Couples, business partners, or friends may share a computer thus sharing the registration fee.

Spring Calving Season Approaching

Greg Highfill,
OCES Area Ext. Livestock Spec.

Over 75% of death loss in calves occurs at birth or in the first two weeks. Planning ahead and managing to reduce illness can increase the number of calves you wean next year.

Adequate Cow Nutrition. Survival of the neonatal calf is 20% higher in cowherds fed to meet their nutritional requirements during the last 60 days of gestation. Thin cows are weak during labor and have weaker, non-vigorous calves.

Nighttime Feeding. To observe females during delivery it is beneficial for them to calve in daytime. Begin nighttime feeding (5pm or later) when calving starts and 75 to 85 percent of the head should calve in the daylight hours (6am to 6pm). Their not sure why, but it works.

Labor. Calving is divided into three stages. 1. Uneasiness, seeking quiet place and elevated tailhead. 2. Dilation of cervix, starts with serious straining, lying down and delivery of calf. 3. Delivery of placenta. Stage 2 is normally 60-90 minutes for heifers and 30-60 minutes for cows. When should cattlemen help? Rule of thumb, if reasonable progress stops after the feet or water bag appear, assistance may be indicated. Examination for malpresentation is not detrimental if done in a quite, sanitary manner. If you cannot safely deliver the calf yourself, it is time to call the veterinarian.

Colostrum. Nursing normally begins within 1 hour of birth. Colostrum (first milk) contains antibodies necessary to protect from infection like scours and pneumonia. Maximum absorption of antibodies occurs between 2-6 hours of age and ends after 24 hours. Early nursing is vital. A lot of new data is demonstrating the long-term health status of beef cattle is related to proper colostrum intake.

Master Gardener Classes Alfalfa / Woods Counties

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3131 or Jim Rhodes at the Woods County Extension Office 580-327-2786 before January 15, 2002.

Oklahoma Agriculture Mediation Program

State and federal laws provide for a fast, fair, and effective process of resolving conflicts other than going to court or using administrative hearings. This "user-friendly" process is called mediation. The Oklahoma Agriculture Mediation Program (OAMP) provides this process in agriculture-related issues as a public service of the Oklahoma Department of Agriculture, the Oklahoma Supreme Court, and the USDA. In mediation, participants settle their issues with the help of a trained, court-certified expert called a mediator. By law, the mediator has no stake in the decisions made by the participants and is there solely to facilitate their decision making. The only charge for mediation services is a one-time fee of $5.00 paid by each participant.

Oklahoma Agriculture Mediation Program (OAMP) services are provided to people, businesses, or agencies that have a dispute. Mediation allows for the disputing parties to meet face-to-face in a neutral environment. A neutral third party mediator is involved to create a civil environment where information is exchanged. The disputing parties develop their own working agreement.

OAMP has worked with problems that are credit and financial in nature, but they continue to take on more cases that involve environmental, employment, land rights, divorce, and family issues. OAMP cases in 1999-2000 were resolved by disputing parities in 85% of the cases. For cases that are not resolved in mediation, the parities have not surrendered their rights to follow due process or the court system.

The mediator doesn't judge the cases or give legal advice or counseling, but rather establishes clear communication and promotes stability between the participants.

OAMP cases are, by law confidential, private, and not a part of any public record.

Interested parties may call OAMP toll free at 1-800-248-5465. Or write: Weldon Schieffer, Mediation Coordinator, OAMP, 2302 West 7th, Stillwater, OK 74074.

Alfalfa Weed-it-tips

January & February is the time to apply herbicides like Sinbar and Velpar L for control of cool-season weeds in established stands. If the first cutting of hay last year had more than 3% weeds, then you need to spray those fields in January or February. Once alfalfa stands thin to less than 30 stems/sq. ft., then weeds are able to grow in areas not occupied by alfalfa. When weeds are able to have growing room, they start competing with alfalfa, and each year the percentage of weeds in the hay will increase.

It's Time to Think About... For Spring Calving Cow/Calf Produces

Cowherd Management

- Finish culling cows in order of priority. "Three O rule" Open. Old. Onry.
- Get rid of problems/structure, feet and legs, eyes teeth.
- Poor producers.
- Continue feeding/grazing programs started in October and November.
- Supplement to achieve ideal body condition scores at calving.
- Be sure the herd has an adequate water supply. Depending on body size and stage of production, cattle need 5 to 11 gallons per head per day, even in the coldest weather.
- Provide some protection, such as a windbreak, during severe winter weather to reduce energy requirements.

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

June / July 2002

Alfalfa County OSU Extension Center, 300 S. Grand, Cherokee, OK 580-596-3131

OSU Released New Wheat Variety

Ok102 is the name of a new hard red winter wheat variety releases by he Oklahoma Agriculture Experiment Station and USDA-ARS. Its targetcd production area extends throughout Oklahoma, with greatest potential in the central corridor and for irrigated areas of the High Plains.

Experimentally tested as OK97508, Ok102 has exceeded the mean yield of 2174, Custer, 2137 and Jagger (the four most widely grown varieties in Oklahoma) by 2.4 bushels per acre. It has moderately large kernels with excellent test weight, averaging 60.0 pounds per bushel compared to 60.3 lb/bu for 2174 in 48 comparisons since 1997. Ok102 has excellent standability with plants 2 to 4 inches shorter than most varieties. Its heading date is a couple days later than OK101, Custer and Jagger, but equal to 2174. Acid soil tolerance is intermediate.

Ok102 is suitable for both grain-only and dual-purpose management systems. Germination is highly temperature-sensitive; therefore, it is not recommended for very early seeding in hot soils. Two characteristics that lend Ok102 to a dual-purpose system include above-average coleoptile length and a relatively late dormancy release to circumvent early spring freezes and allow extended winter grazing. Fall forage potential of Ok102 is about average.

Ok102 is resistant to wheat soilborne mosaic virus. Seedlings are susceptible to wheat leaf rust, but Ok102 has a high level of adult plant resistance to leaf rust. Ok102 has at least an intermediate reaction to barley yellow dwarf virus, similar to its parent 2174, and an intermediate susceptibility to greenbug, and to Russian wheat aphid, and a heterogeneous response to Hessian fly.

Ok102 has performed very well for milling and baking. Wheat protein of Ok102 is similar to 2174 and Jagger, which are among the best varieties grown in Oklahoma. The Wheat Quality Council rated Ok102 as above-average for overall baking quality and complimented it for strong mixing tolerance an internal loaf characteristics. Bake absorption and loaf volume were deemed acceptable. In summary, Ok102 combines good protein levels and good protein strength.

Landscape Maintenance Schedule

June:

1. Vigorous unwanted limbs should be removed or shortened on new trees. Watch for forks in the main trunk and remove the least desirable trunk as soon as it is noticed. See "Training Young Shade and Ornamental Trees", Fact Sheet 6415
2. Remain alert for insect damage. Add spider mites to the list. They are particularly fond of junipers.
3. Cultivate and Mulch. Be sure to mulch young plantings. Mulching will reduce about 70% of the summer yard maintenance.
4. Fertilize warm season grasses. Irrigate to wash fertilizer off the grass and into the soil. Buffalo and centipede lawns need not be fertilized again this year.
5. Continue to water deeply as needed. Apply at least one inch of water each time, but don't waste it by run off. Water after light shower for better water usage.

Supporting Tomato Plants

Providing support for tomato plants is one of the ways gardeners can express their creativity. Many different methods have been tried.

In research conducted at Oklahoma State University, the highest yielding support system was a round cage. In tests over a seven-year period, the tomatoes in round cages yielded 30% more fruit than staked tomatoes. During a 3-year part of the study, caged tomatoes yielded 56% more fruit than tomatoes grown on the ground with no support. Caged tomatoes also produced a much higher quality tomato with less sunscald. What does all this research mean? You're wasting a lot of time and tomatoes, if you don't provide a support system for your tomatoes.

Tomato cages are easily constructed from 6 inch by 6-inch concrete wire. Cut the wire 4 feet long for a 14-inch wide circular cage or 5 feet long for a larger 19-inch diameter cage. Bind the two ends of the cage with light wire. Remove the lowest circular wire to expose 6 inches of wire that standout like prongs. The wire prongs will anchor the cage when they are pushed into the soil. If the wind is strong, you may also need to insert a single stake or fence post into the soil to keep the cage from blowing over.

Landscape Maintenance Schedule
July

1. Expect some leaf fall. Clear yellow leaves are a normal reaction to drought. Water young plantings well, especially first season container-grown plants. As heat intensifies, young plants may need water every two to three days. Make arrangements for watering when vacationing. It does little good to water sensitive pants in the fall if you do not water during summer drought.
2. Now is the time to control unwanted bermuda grass with one of the new grass-only killing herbicides. Iris can be oversprayed without damage.
3. Many disease control measures can be discontinued during hot dry weather.
4. Obscure scale insect crawlers become active in July and August. They can easily be controlled in the crawler stage on oaks. See "Ornamental and Lawn Insect Control," Fact Sheet 7306.
5. Place potted plants together for easy watering.
6. Trim back chrysanthemums by mid July for bushier plants. Fertilize to promote new growth and heavier fall blooms.
7. Divide and replant crowded bearded iris after flowering until August.

Musk Thistle Weevil Roundup

Roundups are nothing new to our great state. However, on May 8 and 9, a different kind of roundup took place in several Oklahoma counties. No horses or branding irons were involved, although widespread evidence of cows was underfoot at a couple of locations. During those two days, approximately 120 producers from 18 counties descended on pastures and vacant lots intent on rounding up, not four-legged critters, but six-legged ones.

The object of the roundup was the musk thistle weevil. Oklahoma State Law declared the musk thistle, which the weevil is named after, a noxious weed in 1998. Landowners with musk thistle on their property must treat the problem or face some hefty fines. The release of these small insects into infested areas is approved by the Oklahoma Department of Agriculture as treatment for the problem. The roundup participants were taking part in the first phase of this process, sponsored by the OSU Integrated Pest Management program, OSU Extension Water Quality Program, and several county OSU Extension offices, including Alfalfa County.

Both weed and weevil are native to the areas surrounding the Mediterrancan Sea. When the musk thistle's unwelcome visit to our shores turned into an invasion, agricultural scientists began to seek for control measures. In the early 1970s, they imported the weevils, a natural predator of the thistle, as a biological control. Two species, head and rosette weevils, (each named for the portion of the plant on which they feed) can be used. The weevils have a natural affinity for musk thistle plants and will not attack crop plants. (Recent reports indicate the weevils will feed on native thistles, so if a state has rare or endangered thistles, weevil release may be banned. This scenario does not currently exist in Oklahoma.)

The plant's bright purple blooms are a vivid reminder of the musk thistle problem. Seeds released by these blooms can remain viable in the soil for up to five years. It takes some time, 5-10 years, for the tiny predators to catch up with this seed bank, but when they do, results are dramatic. Although mowing or spraying makes those purple blooms go away immediately, if seed has been laid down, the problem remains. Musk thistle weevil release offers a less costly and non-chemical alternative to annual mowing and/or spraying.

By reducing pesticide use, weevil release helps protect water quality and is, therefore, considered a Best Management Practice. As such, the musk thistle weevil release program dovetails nicely with the goals and objectives of the Salt Fork Watershed project, a demonstration and education program of the OSU Extension Water Quality office. As part of this project, Alfalfa County Agricultural Educator Tommy Puffinbarger and Salt Fork Watershed Project Manager Tim Propst developed a sign for producers to display on fields that have been treated with the weevils. This summer, each producer that releases weevils will receive a sign, compliments of the OSU IPM and OSU Water Quality programs. The signs help producers show their compliance with the law and help them protect water quality in the Salt Fork watershed.

The musk thistle weevil roundup has become an annual spring event for OSU Extension; so if you missed this year, plan on coming out next year. You don't need your horse, but your chaps might come in handy...those thistles are sharp!

(Contact Tommy Puffinbarger for more information on the musk thistle weevil release program.)

By: ***TL Propst***

August 2002

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
Cherokee, Oklahoma 73728
580-596-3131

Landscape Maintenance Schedule

August

1. Water all plantings thoroughly
2. Cicada killers are large wasps that kill Cicada. Avoid killing these wasps if possible. Their nests (holes) are found in bare soil or areas with little vegetation.
3. The fall vegetable garden is planted now. See "Fall Gardening", Fact Sheet 6009.
4. Dig, divide and replant spring blooming perennials (iris, peonies, and daylilies)
5. Plant chrysanthemums for fall color
6. Treat for white grubs
7. Fertilize warm season grasses if water is present for growth. Apply 1lb. of nitrogen fertilizer to 1,000 square feet.
8. Hedges & shrubs can be pruned if necessary about mid-August. Prune up for vision and safety before school starts.

Oklahoma Quality Beef Network

Alfalfa, Major and Woods County Extension Offices are holding an informal OQBN meeting on August 29th, 2002 at 7pm in the Carmen High School located in Carmen, Okla. For more information contact the Extension Office at 580-596-3131

OK Steer Feedout

If you are a small, medium or large cow operator and would like to have a chance to evaluate some of your steer calves in the feedyard, the OK STEER FEEDOUT may be the answer for you. The OK STEER FEEDOUT is designed to allow a producer to enter lots of 5 steers into a feedyard setting. The steers are fed just like they would be in a large feed yard and Feeding Data along with Carcass Data is collected on each individual calf.

This could be the opportunity for you to evaluate your breeding program and see just how well your calves perform in the feedyard. There are several guidelines that must be followed in order to enter a pen in the OK STEER FEEDOUT.

The date to have claves entered in OK STEER FEEDOUT for 2002-2003 Fall Born Calves is August 14, 2002. Nominations and entry fee money must be received by August 14, 2002. Calves will be delivered to the feedyard (Oklahoma Feeders, Inc. Guthrie, OK) on August 22, 2002. To be considered a fall born calf, calves must have been born before January 1, 2002. The birth date of calves or month of birth is required and they must weigh at least 500 lbs. when weighed at the feedyard.

The date to have calves entered in the OK STEER FEEDOUT for 2002-2003 Spring Born Calves is October 30, 2002. Nominations and entry fee money must received by October 30, 2002. Calves will be delivered to the feedyard (Okla. Feeder, Inc. Guthrie, OK) on November 6, 2002. To be considered a spring born calf, calves must have been born after January 1, 2002. The birth date of claves or month of birth is required and they must weigh at least 500 lbs. when weighed at the feedyard.

What Makes a God Soil Sample?

With wheat harvest over and field work in progress, it's time to sample the soil before the next crop is planted.

A soil sample will only provide results of the sample that is mailed in, therefore, a representative sample from 15-20 core samples representing the entire field will provide an average of the soil in the field.

If the area sample is extremely variable in the soil properties which are going to be tested, then it may be better to separate the field into smaller areas., and get a representative (15-20 cores) sample from each of these area of the field is. In this way it may be possible to treat some areas of the field differently form others and remove the variability so the field can be sampled and treated as a unit in the future.

Variability in a field can often be noted by differences in surface soil color and crop growth and yield.

Appropriate sampling depth is important for accurate interpretations and recommendations. Fertilizer recommendations from OSU Soil, Water and Forage Analytical Laboratory are calculated based on a 6-inch furrow slice (0-6 inches) for surface samples, and 18 inches furrow slice (6-24 inches) for subsurface soil samples. Soil that is to be sampled for both surface and subsurface should be separated and put in different containers while being collected.

About two weeks are needed to allow for mailing the sample to the lab, testing, and receiving results back from the lab.

Soil testing probes and sample bags are available from the extension office.

Cost of the routine surface soil sample is $10, which will provide readings for pH and buffer index, Nitrate-Nitrogen, Available Phosphorus Index and Available Potassium Index. Subsurface sample submitted with a surface sample cost $2 and provides Nitrate-Nitrogen.

Collecting a Good Soil Sample

- ✓ Soil properties vary form place to place. The sample should be representative of the lawn, garden or field as a whole.
- ✓ Do not sample unusual or nonrepresentative areas.
- ✓ Scrape plant debris from soil surface before sampling.
- ✓ Samples lawn to a depth of 3-4". Sample gardens to a 6" depth.
- ✓ Using a clean bucket and a soil probe or spade, combine cores or slices of soil form at least 10 locations scattered throughout the lawn or garden (see diagram).
- ✓ Mix soil thoroughly and fill the sample bag with a pint of the mixture.
- ✓ Submit samples to extension office.

Rain Fall Simulator No-Till / Direct Seeding Meeting

Sponsored by Alfalfa County OSU Extension

Alfalfa County Fairgrounds
Cherokee, Oklahoma
August 13, 2002 10:00a.m.
Noon Lunch

Rain Fall Simulator	Dr. Jim Stiegler, Dept. Head Plant & Soil Sciences
Soil Fertility	Dr. Gordon Johnson, Ext. Soils Spec.
Weed Control	Dr. Case Medlin, Ext. Weed Science Spec.
Water Quality	Dr. Mike Smolen, Ext. Water Quality Spec.
Farm Program Update	J.C. Hobbs, Area Ext. Economic Spec.
No-Till Programs	Robert Dotson, Dir. Alfalfa Co. NRCS

RSVP for lunch contact the Alfalfa County OSU Cooperative Extension Office at 580-596-3131

OSU OKLAHOMA COOPERATIVE EXTENSION SERVICE

September 2002

ALFALFA COUNTY AGRICULTURAL NEWSLETTER

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

Alfalfa County Courthouse
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Landscape Maintenance Schedule for September

1 Annual spring grassy – weed control begins about Labor Day. Pre-emergent grass-weed control chemicals must be on the ground by September 15th.
2 Fertilize warm season lawns if adequate irrigation is available.
3 Young trees and shrubs may be fertilized again. If you are only fertilizing your trees once a year, wait till after a killing frost. Scatter the fertilizer evenly on the surface under mature trees beginning 3 feet from the trunk and extending 10 to 20 feet beyond the ends of the branches. Do not place fertilizers against the stems of shrubs of trees because it may burn them. For more information on fertilizing trees and shrubs contact the extension office and ask for fact sheet #6412
4 Plan to reseed Bluegrass, Fescue or Rye grasses as needed in shady area.
5 Choose spring flowering bulbs as soon as available.
6 Apply Grub control in early September.
7 Adult Elm Leaf Beetles may be active. They look for over wintering places such as inside homes.
8 Lacewing eggs can be seen now. They are often found on the underside of sycamore trees, especially those with lace bugs. Lacewing larvae are predators of insect pest like lacebugs and aphids.
9 Plant cool-season annuals (pansies, ornamental cabbage and kale).
10 Check plants for aphids as temperatures cool.

NITRATE TOXICITY AFTER A DROUGHT-ENDING RAIN

Oklahoma summers often bring "high pressure domes" that cause 100+ degree-days and no rain. The resulting heat stress can cause nitrate accumulation in summer annual forage crops. Producers are very cautious about cutting or grazing the drought-stressed forages and for good reason. However, when the first drought-ending thunderstorm comes along, cattlemen are anxious to cut the forage or turn in the cattle on the field that has just received rain.

This practice can lead to a potentially dangerous situation. As the plant starts to grow and turn green once again, the nitrate uptake is accelerated. Plant enzymes (such as nitrate reductase) are still not present in great enough quantities or active enough to convert the nitrate to plant proteins. Therefore the plant nitrate concentrations become even greater in the first few days after the first rain.

Producers should exercise caution and test forages before cutting or grazing shortly after a drought-ending shower. Some of the greatest concentrations of nitrate in forages will be recorded at this time. Usually by 7 to 10 days after the rain, plant metabolism returns to normal and nitrate accumulations begin to decrease. Be sure to test the forage before cutting and storing a large quantity of potentially poisonous hay. Drop tests can be done in the extension office at no cost. Samples sent to OSU for Nitrate tests are $6.00 each.

Protecting Wheat from Early-Season Pests.

Tom A. Royer, Extension Entomologist

False Wireworms and Wireworms

Both false wireworms and wireworms live in the soil as beetle larvae. Their behavior and appearance are quite similar. False wireworms are the larval stage of darkling beetles and wireworms are the larval stage of click beetles. They feed on the seed and germinating seedling, causing stand loss that seems to occur in patches and seem to occur more commonly in the drier more western areas of the wheat belt.

While the larvae are not easily distinguished from each other, the adult beetles are quite different. False wireworm beetles are generally dark brown to black in color and measure about 1 inch in length. Their wing covers may be smooth or ridged but are usually fused together, which makes them unable to fly. These beetles walk rapidly, and can often be seen crossing roads as they move from place to place. They walk with their abdomen raised, giving them the appearance that they are trying to stand on their heads. If adult beetle activity is very noticeable during the summer, it may be an early warning that there could be damaging infestations in winter wheat. False wireworms have a one-year lifecycle, but may live for up to 3 years as an adult beetle.

Click beetles have an elongated, flattened body and a freely-moving prothorax that they can use to flip upright with a distinct clicking sound if they are overturned. Click beetles vary in length, measuring from one tenth to nearly two inches long, depending on the species. Adult activity levels are rarely useful for predicting potential for damaging infestations in wheat. Wireworm larvae may live in the soil for 2-3 years before pupating, so if an area has a history of problems, controls may be needed.

It is very difficult to predict if these pests will be a problem in a given field. One suggestion is to take one-square-foot samples of soil at a depth of four inches and sift them through a piece of hardware cloth with one-quarter inch mesh. Sample in about 10 locations in the field. If you detect more than one wireworm/false wireworm per 3 square feet, treatment may be justified, especially if conditions are dry.

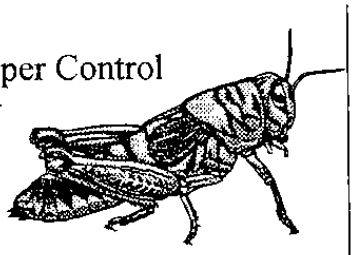
Both false wireworms and wireworms can be managed with a seed treatment of lindane at the labeled rate. In addition, Gaucho seed treatment is labeled for control of wireworms, but will not control false wireworms. Seed can be treated with lindane on-farm, but Gaucho can only be applied to seed by a commercial seed treater.

2002 OSU EXTENSION VARIETY TESTS

Yields in bushels per acre

Variety	North Central						
	Alva	Cherokee	Lahoma	Lamont	Marshall	Perkins	Tonkawa
2137	19	10	**67**	**39**	47	**54**	**37**
2145	18	11	56	35	**59**	**54**	28
2174	13	4	52	33	54	46	30
Above (Clearfield)	**28**	**19**	**63**	30	32	42	**40**
Chisholm	13	5	55	25	47	41	30
Coronado (AgriPro)	19	4	55	32	45	49	31
Cossack (Goertzen)	16	—	—	—	—	46	—
Custer	14	3	**63**	24	47	**50**	32
Cutter (AgriPro)	**25**	**19**	60	**37**	**58**	49	36
Enhancer (Goertzen)	13	—	—	—	—	46	—
G1878 (Goertzen)	12	—	—	—	—	44	—
Intrada (white)	14	6	58	31	48	46	32
Jagalene (AgriPro)	**29**	**20**	**73**	**40**	**62**	49	**38**
Jagger	**20**	**18**	**66**	**40**	44	44	**43**
Kalvesta (Goertzen)	18	—	—	—	—	44	—
Lockett	16	4	51	26	36	46	24
Ok101	15	8	62	36	51	**53**	30
Ok102	12	4	56	34	**56**	49	26
Onaga (Agseco)	**11**	4	53	34	52	44	33
Thunderbolt (AgriPro)	**22**	12	60	26	39	**50**	29
Trego (white)	15	5	**63**	36	48	44	31
Venango (Goertzen)	15	—	—	—	—	49	—
STATION AVG.	17	9	57	33	48	47	32

Grasshopper Control in Winter Wheat



Tom A. Royer
Extension Entomologist

Late summer rainfalls in certain parts of Oklahoma will signal the early planting of wheat for pasture and hay. Grasshoppers were numerous this summer, and like an unruly gang of teenagers, are still hanging around in many locations. Wheat seedlings could be vulnerable to attack by grasshoppers, especially as their other food sources begin to dry up. Because early-planted wheat is usually intended for forage or hay, control options are even more limited than they would be for wheat that is intended for grain production.

A non-chemical management option is to plant a thicker (double) seeding rate in a strip around the margin of the field, or plant some faster growing forage sorghum in a strip around the field. Grasshoppers tend to invade the margins of fields where wheat is just emerging, especially as their other food sources become depleted and they begin to search for egg-laying sites. Either of these strategies will produce a thick plant stand around the margins of the field and may hold the foraging grasshoppers long enough to allow the seedlings in the rest of the field to grow large enough to establish so they can withstand additional feeding. It should also reduce final plant stand loss in the margins of the field.

Another option is to apply an insecticide along the margins of the wheat field as the wheat seedlings begin to emerge. It may require up to a 150-foot wide band to get effective control, and a second application may be needed after 2 weeks or so. Several insecticides that are registered for control of grasshoppers in wheat are not useful for wheat that is intended for grazing. Di-Syston and Thimet have very long (70 days) grazing restrictions and require specialized application equipment. Wheat treated with Furadan cannot be grazed at all.

Dimethoate, Lorsban 4E SG, methyl parathion, Mustang and Warrior can all be used in wheat intended for grazing. Dimethoate has some systemic activity when plants are actively growing. It can be applied with a ground or aerial application. Mustang, Warrior and Lorsban are also effective, and both can be applied with a ground or aerial application. Methyl parathion can be applied only by air. Mustang, dimethoate and Lorsban have a 14-day waiting period for grazing; methyl parathion has a 15-day grazing interval, and Warrior has a 30-day waiting period for grazing.

A producer should think long and hard about treating wheat pasture for grasshopper control. As more acres of wheat get planted, grasshoppers will spread out and probably not cause nearly as much damage. Numbers should exceed 3-6 grasshoppers per square yard in a field to even justify any type of control. Remember that when temperatures are as hot as they are now (90's to 100's), residual activity of the insecticide is reduced, so a repeat application may be necessary, Finally, if grasshopper populations are extremely high, complete control will be very difficult.

CHEROKEE Wheat Variety Trial

Cooperator: Kenneth Failes

Soil Type: Dale silt loam, pH = 6.1

		TEST WEIGHT (LB/BU)		YIELD (BU/A)	
SOURCE	ENTRY	2001-2002	2-YEAR[1]	2001-2002	2-YEAR[1]
KAES	JAGGER	52.8(8)[2]	57.4(9)	13.2(4)	50.6
KAES	2137	50.8(12)	57.6(6)	9.9(8)	49.6
OAES	CUSTER	50.8(12)	57.5(8)	3.3(20)	48.1
OAES	2174	50.9(11)	58.7(2)	3.8(17)	47.6
OAES	CHISHOLM	51.7(10)	57.6(6)	5.3(12)	47.4
OAES	2174+GAUCHO	50.8(12)	58.7(2)	4.8(13)	46.4
OAES	INTRADA (W)	54.4(3)	58.9(1)	6.1(10)	46.0
OAES	Ok101	50.5(16)	56.4(11)	8.4(9)	45.3
AGRIPRO	THUNDERBOLT	53.5(6)	58.4(5)	12.2(6)	44.4
KAES	TREGO (W)	50.5(16)	58.6(4)	5.4(11)	42.4
AGRIPRO	CORONADO	48.7(19)	57.3(10)	4.1(16)	41.8
TAES	LOCKETT	47.0(21)	54.9(12)	3.7(18)	40.9
AGSECO	ONAGA	52.4(9)	-	4.3(15)	-
AGRIPRO	CUTTER	54.0(5)	-	18.9(3)	-
OAES	Ok102	49.3(18)	-	3.5(19)	-
AGRIPRO	JAGALENE	55.6(1)	-	19.7(1)	-
CAES	ABOVE	54.3(4)	-	19.3(2)	-
OAES	OK96705-99-6738	54.9(2)	-	12.5(5)	-
KAES	2145	52.9(7)	-	10.7(7)	-
OAES	OK95548-98-6654	48.6(20)	-	4.5(14)	-
OAES	OK96717-99-6756	50.7(15)	-	2.9(21)	-
	MEAN	51.7	57.5	8.7	45.2
	LSD (0.05)	1.2	2.5	2.8	N.S.

[1] 2-Year average is 1999-2000 and 2000-01.

[2] Number in () is rank within column.

CAES, KAES, OAES, TAES = Colorado, Kansas, Oklahoma, Texas Agricultural Experiment Stations, respectively.

(W) Hard white wheat variety. Planted September 24, 2001 at 60 lb/a.

Partial financial support by the Oklahoma Wheat Commission

JUN-26-2000 11:00 FROM WOODS CO. OSU EXT. CENTER TO 15802371242 P.06

The Ag Page

from the
Woods County OSU Extension Center

Wheat Update and Stocker Cattle Nutrition
August 23, 7:00 PM

Mark your calendars for a wheat production update informational program on Monday, August 23, 7:00 PM at the Woods County Fairgrounds. We will bring you the latest information from OSU on varieties, cheat control, wheat for forage, fertility etc. Area Extension Agronomist, Roger Gribble will be on hand to lead the discussion on wheat production topics.

Often, if we can get our wheat pasture cattle bought early, we can purchase them at a significantly lower price. Relatively low cost feeds make this an option to take a close look at this year. With a good supply of hay available and low grain and by-product feed prices, there are several safe, nutritionally sound, feeds to consider. Among the by-product feeds would be soybean hulls or wheat midds. Other options would be a corn/alfalfa ration. OSU Area Extension Livestock Specialist, Greg Highfill, will discuss several different feeding programs that appear to be low-input and cost effective.

Hope to see you there!

Summer Crop Tour
Thursday, August 26,
8:00 AM

Cotton, Grain Sorghum and Soybeans will be the topics of discussion for a summer crop tour, Thursday, August 26. Gather at the Alva Co-op Fertilizer Plant for coffee and doughnuts at 8:00 AM. We will leave to look at several sites at 8:30. The stops will be primarily north and east of Alva. Of interest will be the varied planting dates, tillage methods and management inputs.

Another item we will take a look at is the initiation of a project involving the use of grid soil sampling and GPS type equipment. We hope to have some results available from the sampling to be able to review the variability in a 30 acre site. It should be very interesting to see!

Field tours are a great way to view and get detailed information on ideas producers are putting to practice. Plan to attend and see if there are ways to adapt some of these types of enterprises to fit your operation.

Wheat Disease Notes

Wheat Streak Mosaic Virus (WSMV): WSMV occurs primarily in the panhandle and northwestern Oklahoma, and is transmitted by the wheat curl mite (WCM). WCMs survive on crops such as corn, grassy weeds, and volunteer wheat. Seedling wheat infected with WSMV in the fall is either killed by the next spring or severely damaged. Planting late in the fall (in general, after October 1) and controlling volunteer wheat are two practices that provide some control of WSMV. It is imperative to destroy volunteer wheat that is in close proximity to seedling wheat for at least two weeks prior to emergence of seedling wheat. WCMs have a life span of 10-14 days. Thus, destroying volunteer wheat at least two weeks prior to emergence of seedling wheat helps to limit the number of WCMs carrying WSMV that feed on seedling wheat in the fall.

Root and Foot Rots: The root and foot rots most commonly observed in Oklahoma are dryland root rot, Rhizoctonia root rot/sharp eyespot, common root rot, take-all, and foot rot (strawbreaker). This last disease (foot rot) was confirmed this past year in Oklahoma for the first time, although it has been known to occur in Kansas for many years. In 1999, take-all and sharp eyespot were the most prevalent root rots in Oklahoma, and caused significant losses to many producers. The most typical symptom of all these root and foot rots is the appearance of white heads in the spring when plants are subjected to water stress. Tillers also frequently lodge, and yield little and shriveled grain. Losses can vary from slight to severe depending on the severity of the rot and the degree of drought stress to which the wheat is subjected.

Controlling root rots is difficult. Currently, there are no resistant cultivars or fungicide treatments that consistently control these diseases. Early planting favors development of the root and foot rots, and although later planting (after October 1 in northern Oklahoma) helps limit the incidence and severity of these diseases, it will not entirely eliminate their presence or effects. If you have a field that has a history of root rot, plant that field as late as possible or plan to use it as a graze-out field if that fits into your plan of operation. In addition to planting date, take-all is greatly favored by a high soil pH (>6.5). Thus, when liming fields to correct for acid soils, be sure not to raise the pH above this level.

JUN-26-2000 10:59 FROM WOODS CO. OSU EXT. CENTER TO 15802371242 P.05

AGRICULTURAL NEWSLETTER

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

407 Government Street, Room 11 • Alva, OK 73717 • (580) 327-2786

August 5, 1999

WHEAT UPDATE AND STOCKER CATTLE NUTRITION
Monday, August 23, 7:00 PM

Mark your calendars for a wheat production update informational program on Monday, August 23, 7:00 PM at the Woods County Fairgrounds. We will bring you the latest information from OSU on varieties, cheat control, wheat for forage, fertility etc. Area Extension Agronomist, Roger Gribble will be on hand to lead the discussion on wheat production topics.

Often, if we can get our wheat pasture cattle bought early, we can purchase them at a significantly lower price. Relatively low cost feeds make this an option to take a close look at this year. With a good supply of hay available and low grain and by-product feed prices, there are several safe, nutritionally sound, feeds to consider. Among the by-product feeds would be soybean hulls or wheat midds. Other options would be a corn/alfalfa ration. OSU Area Extension Livestock Specialist, Greg Highfill, will discuss several different feeding programs that appear to be low-input and cost effective.

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Field tours are a great way to view and get detailed information on ideas producers are putting to practice. Plan to attend and see if there are ways to adapt some of these types of enterprises to fit your operation.

Please contact me at the OSU Extension Center if we can be of service.

Sincerely,

Bob LeValley
Extension Educ. Agric & CED
E-Mail: blevalley@alvaext.alva.ok.us (580) 327-2786

The Ag Page

from the
Woods County OSU Extension Center

OKLAHOMA COOPERATIVE EXTENSION SERVICE

Calving Managing School
January 16, 1:00 PM

The OSU Extension Center will hold a "Calving Management School" on January 16 at the Woods County Fairgrounds, in Alva. The program will begin at 1:00.

The topics include:

- Working with the cow or heifer at calving time
- Time of feeding in relation to calving time
- Cow condition as related to calving difficulties
- Three stages of parturition
- When should you intervene and examine to see if there is a problem
- How to assist
- Baby calf health
- Effect of difficult birth on re-breeding performance of the cow

Speaker for the Calving Management School is Glenn Selk, OSU Extension Livestock Reproduction Specialist.

Please pre-register by calling the OSU Extension Office at 327-2786.

Alfalfa Weed and Insect Control Update
Thursday, January 18
12 Noon
J&B's Family Restaurant, Alva

You are invited to attend an informational program from the OSU Cooperative Extension Service, designed to bring you the latest research information on alfalfa insect and weed control. Insecticides and weed control products change over time, but your need to control alfalfa pests in the most efficient and economical manner does not change or go away! OSU Extension Specialists Dr. Phil Mulder, from the Entomology and Plant Pathology Department, and Dr. Jim Stritzke, from the Plant and Soil Science Department, will bring you an update of the most current research based recommendations.

We will start with the buffet lunch, and then at approx. 12:30 the presentation will begin. We hope to conclude by about 1:30 so you can be back to your normal business. All participants will pay for their own lunch. We do this at noon to try to work around your busy schedule!

Contact us if you have questions!

Musk Thistle Control

Musk thistle is an aggressive biennial weed that has spread throughout this area in the past few years. In most years the seedlings emerge in September and October, staying in the rosette stage of growth for the first year. In the spring of the second year of growth, the plants usually start bolting (sending up a seed head) by mid-April, producing flower heads from May-June, then die after seed is produced. The flower head will be a somewhat purple color. Like other thistles, musk thistle is covered with sharp spines, but it has no hairs on its leaves. All other thistles in Oklahoma have hairs on the leaves. Musk thistle can sometimes act as a cool-season annual, blooming in the first spring after fall emergence. This has been noted in early fall-planted wheat and alfalfa and closely grazed pastures.

Herbicides can be very effective for control, but timing is important. The best time for control is to apply the proper herbicide in the fall (October or November). Once the plants start to bolt in April they can be very difficult to control. Recent work has shown 90-100 percent control of both rosette stage and bolted plants is possible by applying two pints/acre of Grazon P+D or Weedmaster in late April to early May. This means that a timely application of one of these herbicides at this rate should control musk thistle as well as many other summer weeds.

With all herbicides it is important that weeds be actively growing at the time of application. For musk thistle, this means spraying when there is adequate soil moisture and daytime air temperature is above 60 degrees.

Extension Agriculture Advisory Committee

I will soon be meeting with our OSU Extension Agriculture Advisory Committee to set priorities for programs and activities for the coming year. Your input is always welcome at any time of the year, but is especially timely now as we plan activities to try to meet the needs as identified by advisory committees. Please feel free to call or come by if you have comments or suggestions.

Grazing Alfalfa for Weevil Control

If you have alfalfa stands that you have not had to graze yet, and have cattle to do so, this is the time to consider winter grazing for reduction of alfalfa weevil populations.

- The alfalfa weevil lays eggs throughout the winter in plant stems remaining from fall growth after the final harvest of the previous year.
- Grazing with cattle at high stocking density (flash grazing) to remove the remains of fall growth quickly and cleanly will reduce weevil egg numbers by 50-75%.
- This means that the first insecticide may be delayed this spring. Overall, fewer sprays or lower rates of insecticide can be applied than on non-grazed fields.

It is recommended that grazing be conducted when soils are dry or frozen to reduce damage to alfalfa plants.

Ag Page for Newsgram January 10, 2001

JUN-26-2000 10:58 FROM WOODS CO. OSU EXT. CENTER TO 19802371242 P.03

The Ag Page

from the
Woods County OSU Extension Center

Soybeans, Sunflowers, and Grain Sorghum Thursday, March 9, noon

If you have any interest in trying an alternative crop such as soybeans, sunflowers or grain sorghum, plan to attend an informational program on Thursday, March 9, at noon at the VIP. We will review the production practices of each of these and if they will fit into some type of rotation system.

Each of these crops have unique cultural practices, insect or weed problem, etc. that producers should be aware of before taking the production risk of the particular crop. Herbicides become very important in these summer crops, as moisture is most often the most limiting factor. In grain sorghum, for instance there are many pre-emerge herbicides that can be used, but most require the use of treated or safened seed, or the herbicide will damage the seedling sorghum plants.

Another consideration is to plan ahead to what crop you expect to plant next. Check the re-crop interval to see how long you have to wait to plant another crop after applying the herbicide.

Wheat Forage Production

We just received the fall forage production results from OSU plots. The top five fall forage producers (3-year av.) are as follows:

1. 2174
2. Custer
3. Lockett
4. Chisholm
5. Tonkawa

Fall forage production is measured since in most cases, this is what determines the stocking rate for the entire season. Full season forage production through graze-out would probably show a different ranking of varieties.

One more comment on forage production. It is important to screen varieties for differences in forage production potential, but we can give variety differences too much credit! When we are targeting forage, date of planting and seeding rate will make a much larger impact than variety selection.

We continue to stress monitoring the wheat plant for hollow stem as a guide to determine when to pull cattle off wheat that will be harvested for grain. Even with the current wheat/cattle price relationship, grazing past the first hollow stem stage will probably not provide an economic advantage. The reduction in grain yield can be so dramatic, it is hard to recover the lost income through a few extra days of grazing.

If you need additional information on the first hollow stem grazing termination concept, give me a call at the OSU Extension Service.

Alfalfa Notes

As we drive by alfalfa fields this time of year they seem to be almost dead. The cold snaps in January brown off nearly all the top growth. So is there anything going on in alfalfa fields this time of year?

We might be surprised by the number of things going on in those fields that look so dead from the road. A couple of things that are happening will affect the production through the rest of the year and maybe life of the stand. Plants are accumulating carbohydrate and protein in their roots and crowns for a quick start when warm weather comes to stay. Plants cannot accumulate the needed carbohydrate or protein if they are stressed by inadequate soil fertility.

Insects and weeds are also getting ready for spring in dormant alfalfa fields. It is always surprising to find that tiny weeds, weevils and aphids survive temperatures approaching zero, but they do.

A list of important things alfalfa producers should do the next few weeks to get ready for the upcoming hay season include the following.

- Check for cool-season weeds
- Soil test and fertilize
- Check for insects, especially weevils and aphids
- Graze off old growth
- Evaluate stand density

MUSK THISTLE CONTROL

MUSK THISTLE WEEVILS HAVE BEEN RELEASED IN THIS FIELD AS AN INTEGRATED PEST MANAGEMENT PRACTICE

- Biological Control Reduces Pesticide Use
- Reduced Pesticide Use Protects Water Quality
- Accepted by the Oklahoma Department of Agriculture as Treatment for Musk Thistle

FOR MORE INFORMATION CONTACT OSU COUNTY EXTENSION OR THE LOCAL CONSERVATION DISTRICT OFFICE

OSU OKLAHOMA COOPERATIVE EXTENSION SERVICE

NRCS Natural Resources Conservation Service

OKLAHOMA DEPARTMENT OF AGRICULTURE

 Developed under FY1997 USEPA 319(h) Task 1100 in cooperation with USDA EQIP Education Program and USDA-CSREES IPM Program. Concept and Design: TE Puffinbarger, TL Propst. Photos: JF Stritzke, LM Cargill.

Biosystems & Agricultural Engineering • 218 Agriculture Hall • Oklahoma State University
Stillwater, Oklahoma • 74078-6021 • Telephone: 405/744-6519 • FAX: 405/744-6059 • Email: propst@okstate.edu

July 18, 2002

Dusty Shepherd
Alfalfa Electric Cooperative
P.O. Box 39
Cherokee, OK 73728

Dusty,

Thank you for your call last week regarding pesticide application in Alfalfa County. I have talked with some of our Extension specialists about the topic. They were quite impressed with your recognition of the sensitivity of the issue. Your caution is much appreciated.

I have enclosed copies of maps developed by Mike White, one of our Research Engineers, for the Salt Fork Watershed Project. The red coloring on the maps denotes those areas with highly permeable soils. These areas are highly susceptible to leaching, so the use of Tordon within these areas is discouraged. If you could let me know the species of brush you wish to control, Dr. Case Medlin in the Plant & Soil Sciences Department said he might be able to suggest an alternative herbicide for use in those sandy areas.

I sent maps at two different resolution levels. Let me know which level, or something in between, would be most helpful for you, and we can print off a larger version for you to utilize in mapping out your work areas.

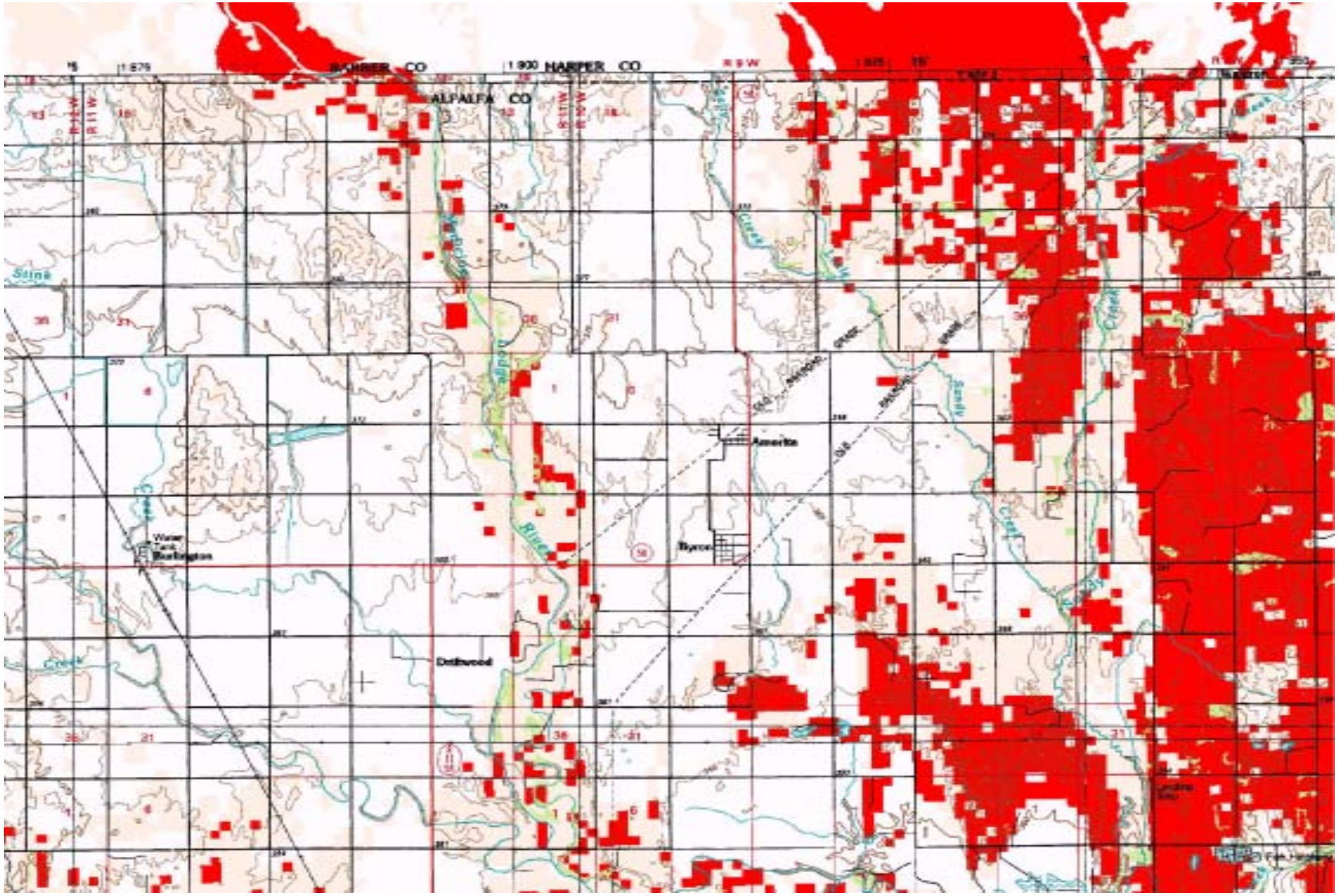
As I mentioned, these maps were originally developed for the Salt Fork watershed, so we do not have complete coverage of the county, but a large portion (~80%) is included. For those areas we do not have coverage, Doug Montgomery with the OSU Turfgrass Research Station suggested using soil survey maps from the NRCS to determine areas to avoid. He thought you only needed to avoid the extremely sandy soils, provided your application rate was below 1 quart Tordon per acre. He also suggested that on-site evaluations would be useful. For example, crews should avoid spraying Tordon in river bottoms and areas where peanuts, melons, or cantaloupes (sandy soil crops) are being grown.

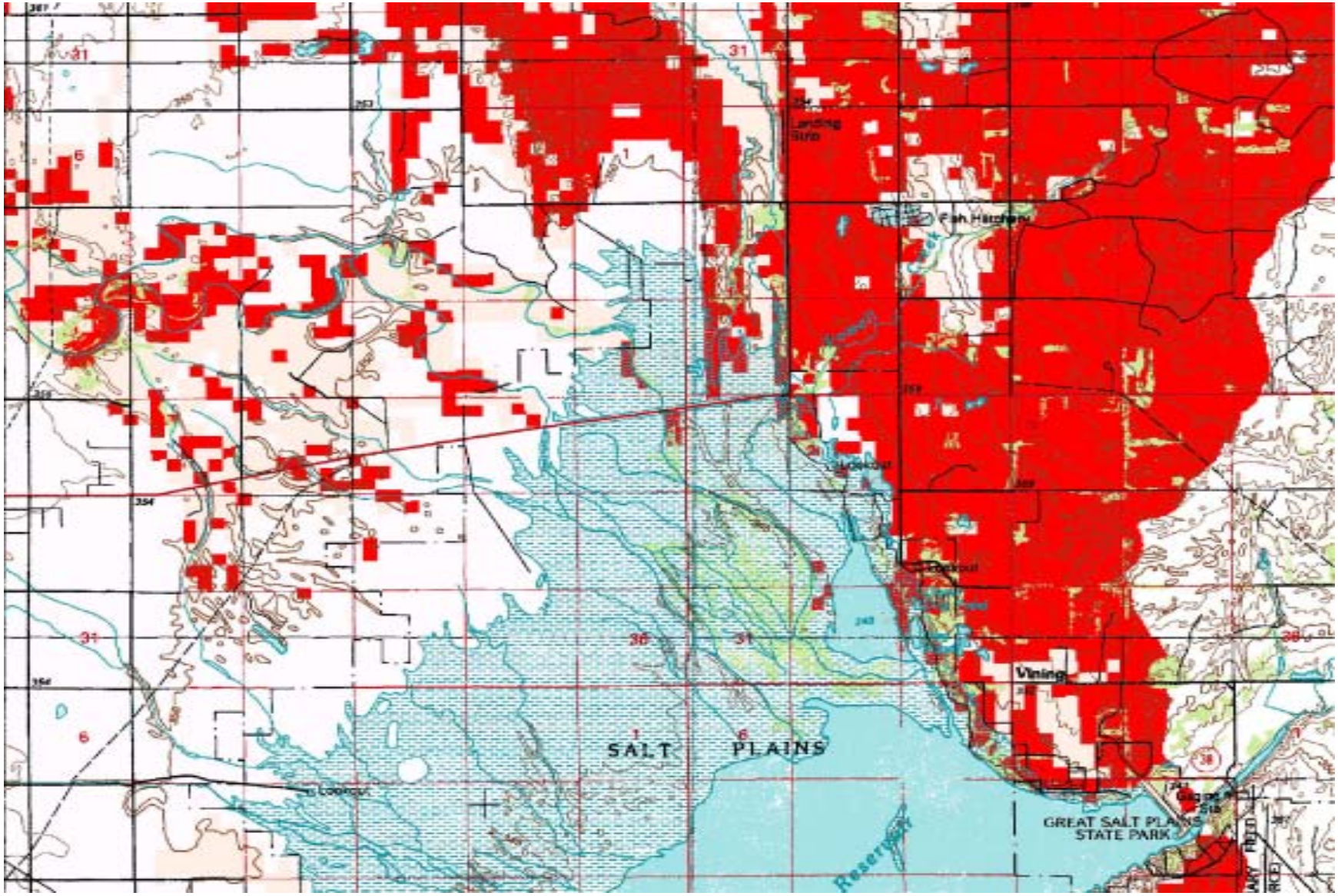
Again, thank you for your interest and please let me know how we can help you.

Sincerely,

Tim Propst
Extension Environmental Scientist

Enclosures: 4
cc: Medlin, Montgomery, Smolen, White


HARPER CO
ALFALFA CO
Amorita
Byron
Burlington
Driftwood


SALT
PLAINS
Vining
GREAT SALT PLAINS
STATE PARK

Demonstration of Timely Control of Alfalfa Weevil and its Potential Impact on Water Quality (Project Demonstration Report - Salt Fork Water Quality Project)

Phillip Mulder – Extension Entomologist
Kelly Seuhs – Extension Assistant
Robert LeValley – Area Extension Livestock Specialist
Thomas Puffinbarger – Extension Educator, Agriculture and 4-H

Introduction

Timely insecticide applications to combat alfalfa weevil infestations are an integral aspect of reducing costs associated with controlling this pest. Furthermore, during years when high infestation numbers occur early in the season, the use of thresholds to effectively find the best treatment time can reduce the number of applications and in turn, the amount of insecticide released into the environment. Ultimately, reducing the number of applications and/or the application rate can have a profound effect on protecting water quality in nearby streams and ponds, as well as in the local aquifer. In early 2001, two sites were established to demonstrate the following concepts to alfalfa producers:

Objective 1: To demonstrate the utility of the alfalfa weevil degree-based model as a predictive tool to enhance timely insecticide applications for larval populations of this insect.

Objective 2: To demonstrate how misapplications, based on timing, can result in inadequate control of alfalfa weevil and increased need for pesticide application.

Objective 3: To demonstrate how late applications (after threshold) can result in loss of production and quality in alfalfa hay.

Objective 4: To quantify the economic losses (yield, quality, pesticide costs, etc.) obtained from a replicated trial that demonstrates the aforementioned treatments.

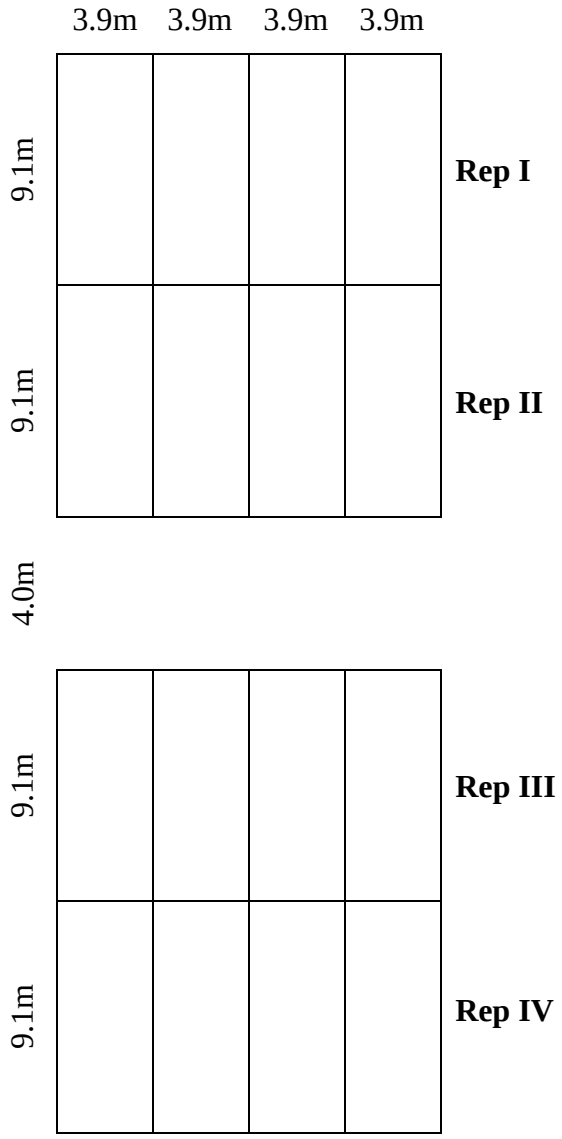
Materials and Methods

Before the alfalfa weevil season began, 16 individual plots were established and flagged at two separate sites, one in each of Alfalfa and Woods counties in northwest Oklahoma (See Figure 1). The two OSU Extension county agriculture educators made arrangements for the specific locations, selecting established alfalfa stands that were at least two years old and near potential overwintering sites for adult weevils.

Application thresholds, or simply *thresholds*, were derived from OSU Current Report No. 7177 in conjunction with the alfalfa weevil degree-day model available through the Oklahoma Mesonet. These numbers correlate insect counts obtained by regular field scouting with critical levels in the weevil population where insecticide application is the most efficient. At these sites, the threshold was determined to be approximately 1½ to 2 larvae per stem. The demonstration showed the effects of three different application timings: early (before weevil populations reached threshold levels), timely (at threshold), and late (after threshold levels had been reached). At each site, alfalfa weevil larval activity was monitored immediately following establishment of the plot areas. When larval activity first became

evident, but before populations reached threshold levels, the early application was made. This occurred on 12 April 2001. Threshold and late applications were made on 18 and 25 April 2001, respectively.

Figure 1. Alfalfa Weevil Demonstration Plot Design



For each application, the insecticide Lorsban 4E was applied at 0.5 lb. a.i./A using a CO_2-pressurized bicycle sprayer calibrated to deliver 20 gpa at 21 psi through seven, 11004 flat fan nozzles when traveling 3 mph. Treatments were arranged in a randomized complete block design using plots 3.9 x 9.1m in size, replicated four times. To avoid contamination of plot areas, a buffer zone outside the plots was also flagged and sprayed by the team on the last treatment day to insure that the influences from insecticide drift were minimized. Treatment timing was determined based on alfalfa weevil populations obtained from adjacent untreated plants (buffer area). Sampling was conducted on 3 or 4 days, 7 or 8 days, and 14 or 15 days after each application, by pulling 25 stems per plot and placing them in a plastic

bucket for shaking and subsequent counting. Initially (after the early application), only alfalfa that had been treated or the untreated plants were sampled. After each subsequent treatment date, recently-treated and early-treated plots were sampled along with the untreated plants. This procedure allowable for a minimum of two weeks of sampling after the last application and up to three weeks on alfalfa that was treated either early or at threshold.

Dry matter yields were estimated for first harvest on 9 May, 2001 by sampling two, $1m^2$ guadrats from each of the respective plots. The two quadrats were taken from each diagonal corner to avoid the center area where samples for larvae were made. The quadrat area had to represent the plant growth in the remainder of the plot or it was relocated. Alfalfa yield samples were carefully measured using rectangular metal quadrats and plants were clipped at the soils surface. Each harvest sample was placed in a large paper bag and sealed with tape. Samples were returned to Stillwater for weighing and then dried for determination of moisture content. Yields were calculated on a dry weight per acre basis.

Weather conditions for the first 14 days after the initial treatment were good for activity of insecticides with no rainfall in the Alfalfa County location and only 0.11 inches of rain in the Woods County area. Mean daily high temperature for the same period of time for Alfalfa and Woods Counties was 71.5° F and 72.6°F, respectively. For the month of April, Alfalfa and Woods Counties received only the aforementioned amounts of rainfall. During the month of May, but prior to harvest (9 May), Alfalfa and Woods Counties received 0.5 inches and 2.01 inches of rainfall, respectively.

Results and Discussion

Unfortunately, in this evaluation, alfalfa weevil populations were relatively low and while they reached threshold levels they never exceeded them ().

Mean alfalfa weevil infestations are depicted in Tables 1 and 2. Table 1 presents the results from each sampling date, for each treatment, in comparison with an average of the three sampling dates for the untreated alfalfa. As an example, 33.5 weevils per 25 stems (Table 1) taken from the untreated control, represents the average number of weevils sampled 3-4 days after each treatment timing (Table 2). During the entire study, weevil larvae only approached the lower level of the threshold once (late application date in Alfalfa County). At that time, the mean number of weevils obtained from untreated alfalfa was exactly 1.5 weevils per stem. Weevil populations in Woods County never reached threshold levels (Table 2). Every timing of application for alfalfa weevil resulted in excellent control of insect populations and no repeat applications were justified. In addition, as suggested in Table 2, every treatment provided at least 75% control. When populations of alfalfa weevil are as low as experienced in this test, 75% control is certainly adequate. In fact, in Cherokee County the grower cooperator made no applications for insects on the first cutting and harvested slightly before our test was cut. In Woods County, the grower made one application of Lorsban 4E (0.5 lb a.i./A), which was made the same time as our early application.

Overall, numbers of alfalfa weevil larvae were low in both counties and consequently, late applications were made on a declining population. At both locations, by 14 days after the threshold application, no significant differences were observed between alfalfa weevil numbers in untreated and treated alfalfa (Table 2). Interestingly, at both locations, populations of alfalfa weevil larvae peaked on the same date (4-25-01), which represented the last application date.

Results of yield data are presented in Table 3. Based on these results, alfalfa treated early in Alfalfa County, yielded significantly more forage than untreated alfalfa but not more than the other treatments. Conversely, alfalfa that was treated late in Woods County, yielded significantly more forage than plants receiving an early treatment. The late treatment; however, did not yield better than the alfalfa treated at threshold or the untreated plants (Table 3). Knowing this occurs in years when alfalfa weevil populations are low, can save growers considerable costs associated with application and can also help preserve the quality of the environment (water and wildlife). Based on a sale price of $80.00 per ton of alfalfa the values of the various treatments ranged from $112.31 to $141.58 per acre (Table 3). Interestingly, the greatest returns in Woods County were obtained from untreated alfalfa ($131.24/acre).

The higher yields from early treatments in Alfalfa County and later or no treatment in Woods County are most likely due to rainfall amounts and timing than they are to control of alfalfa weevil populations. As stated previously, Woods County had over two inches of rain in the month of May before harvest, while Alfalfa County only experienced 0.5 inches during that same period of time.

During the test period, grower observation of test plots was regular and observed by many alfalfa producers besides the cooperator. It was reassuring to know that growers are quite accurate in making treatment decisions in a year when populations of alfalfa weevil are relatively low. In addition, their choices of insecticide when making that treatment are based on good knowledge of OSU evaluations and careful considerations of costs and infestation levels. This further contributes to the protection of water quality and the environment in the area. Had the populations of weevils been earlier and/or more intense, then treatment decisions would have been more challenging to make.

Table 1. Mean alfalfa weevil infestation (per 25 stems) obtained from alfalfa treated before (early), at (threshold), and after (late) threshold levels compared to untreated (UTC) alfalfa; OK 2001.

Location	Treatment[1]	3 or 4 DAT*	7 or 8 DAT	14 or 15 DAT
Alfalfa County	Early	0.3 a	0.3 a	1.8 a
	Threshold	1.8 a	1.3 a	2.0 a
	Late	0.0 a	2.0 a	0.5 a
	UTC[2]	33.5 b	26.3 b	17.3 b
Woods County	Early	2.3 a	0.5 a	1.3 a
	Threshold	1.0 a	1.3 a	8.0 b
	Late	0.5 a	0.8 a	2.0 a
	UTC	22.5 b	20.5 b	15.8 c

Means, within columns, for each county, followed by the same letter are not significantly different (LSD;P=0.05).
*DAT = Number of days after treatment
[1] Treatment consisted of Lorsban 4E applied by ground at 0.5lb a.i./A using 20 gallons per acre of liquid.
[2] UTC; Untreated control means derived from average of samples taken xDAT from each application timing. See table 2 for individual means.

Table 2. Mean alfalfa weevil infestation (per 25 stems) obtained from alfalfa treated before (early), at (threshold), and after (late) threshold levels compared to untreated (UTC) alfalfa; OK 2001.

Location	Treatment[1]	3-4 DAT*	7 DAT	14 DAT	Mean % Control
Alfalfa County	Early	0.3 a	0.3 a	1.8 a	97.7
	UTC	31.8 b	29.8 b	37.5 b	
	Threshold	1.8 a	1.3 a	2.0 a	93.1
	UTC	34.3 b	37.5 b	16.8 a	
	Late	0.0 a	2.0 a	0.5 a	89.0
	UTC	34.8 a	11.3 b	3.3 a	
Woods County	Early	2.3 a	0.5 a	1.3 a	93.7
	UTC	19.8 b	17.8 b	30.3 b	
	Threshold	1.0 a	1.3 a	8.0 a	75.7
	UTC	21.5 b	31.8 b	12.5 a	
	Late	0.5 a	0.8 a	2.0 a	83.3
	UTC	25.8 b	12.5 b	4.8 a	

Means, within each sample day, comparing treated to untreated alfalfa. Followed by the same letter are not significantly different (LSD; P=0.05).
*DAT = Days after treatment
[1] Treatment consisted of Lorsban 4E applied by ground at 0.5lb a.i./A using 20 gallons per acre of liquid.

Table 3. Mean alfalfa yields, values and returns associated with plants treated before (early) at (threshold) and after (late) threshold levels compared to untreated (UTC) alfalfa; OK 2001.

Location	Treatment	Yield (lb/A)[1]	Value ($/A)[2]	Cost ($/A)[3]	Return ($/A)[4]
Alfalfa County	Early	3539.5 a	141.58	8.17	133.41
	Threshold	3152.8 ab	126.11	8.17	117.94
	Late	3079.0 ab	123.16	8.17	114.99
	UTC	2915.3 b	116.61	0	116.61
Woods County	Early	2807.8 b	112.31	8.17	104.14
	Threshold	3112.8 ab	124.51	8.17	116.34
	Late	3369.8 a	134.79	8.17	126.62
	UTC	3281.0 ab	131.24	0	131.24

Yield Means, within columns for each county, followed by the same letter are not significantly different (LSD; P=0.05).

[1] Yields obtained from 2, $1m^2$ quadrats per plot.

[2] Value derived from $80.00/Ton alfalfa

[3] Cost per acre based on $5.17 per of Lorsban $L=$3.00 application cost.

[4] Return = Value – Cost

Nutrient Management Demonstration

In a study conducted in cooperation with Burlington Coop Agronomist Kenneth Failes, three years of soil test results and two years of fertilization and yield data were collected from eight sites in Alfalfa County. The 1996 and 1997 yield goals for these fields were 50 bu wheat /acre, and 100 lbs beef/acre. Based on OCES recommendations of 2 lbs N/bu wheat/acre and 30 lbs N/100 lbs beef/acre, this translates to a total fertilizer application rate of 130 lbs N/acre.

"Typical" practice would be to apply 100 lbs N/ac as a single application in the fall to all fields, with another 30 lbs N/ac applied as topdress in the spring for grazing. This exercise, however, demonstrated how nitrogen in the soil profile can be "mined" for utilization by the wheat crop. Nitrogen levels in the soil, as indicated by soil test results, were used to calculate a new fertilizer application rate.

In 1996, surface and sub-soil test results averaged approximately 140 lbs NO_3-N/acre for all eight fields, indicating an abundance of available nitrogen. No nitrogen applications for grain production were recommended for fall 1996. In the actual application data, on each of two farms, 100 lbs/ac of 18-46-0 (N-P-K) fertilizer was applied to meet an observed phosphorus deficiency. No other nitrogen was applied in fall 1996. A topdress application of 30 lbs N/ac was made on all farms except one (40 lbs N/ac applied) in spring 1997 for grazing.

Total pounds of nitrogen actually applied was obtained by multiplying the acreage of each field by the application rate. Total pounds of nitrogen typically applied was obtained by multiplying the acreage by 130. For all eight fields in the 1996-97 crop year, 38,502 pounds of nitrogen were actually applied, compared to 136,370 pounds of nitrogen typically applied. This shows a drop from 130 lbs N/ac typically applied to the average actual application rate in 1996-97 of 36.7 lbs N/acre, a 71.8% reduction.

This decrease was immediately noticed in the 1997 soil test results, where the eight-farm average dropped to 31.5 lbs NO_3-N/acre. For the 1997-98 crop year, fertilizer application rates were again based on soil test results. Since much of the excess nitrogen had been utilized in the previous year, recommended fertilizer application rates for grain production rose from 0 to an average of approximately 70 lbs N/acre for the eight fields. All farms applied 30 lbs N/acre in the spring. The total pounds of nitrogen actually applied was 95,765 pounds in the 1997-98 crop year, for an average application rate of 91.3 lbs N/acre. This is a 29.8% reduction from typical fertilizer usage. Using fertilizer on an as-needed basis reduced nitrogen buildup in the soil, as shown by the 1998 average soil test reading of 26.6 lbs NO_3-N /acre for the eight farms.

Yield results from this time period indicated an average of 59.8 bu/acre in 1996-97 and 63.1 bu/acre in 1997-98. These yields were well above the 50 bu/acre goal. In fact, an increased yield goal of 60 bu/acre for the 1998-99 crop year was planned. Unfortunately, fertilizer application and yield data for that year were not obtained.

To summarize, this study showed that at these eight sites (1) both surface and sub-surface soil nitrogen levels could be used to calculate a fertilizer application rate for wheat, (2) use of nutrient management BMPs reduced fertilizer usage by 50.8% over two years, and (3) use of these BMPs resulted in satisfactory production yields.

Table 10-1. Summary of field conditions and nutrient application recommendations for Burlington nutrient management demonstration.

		Soil Test Results							*Recommendations*						
Date	**Location Name**	**pH**	**Buffer Index**	**NO_3-N (#/ac)**			**P (#/ac)**	**K (#/ac)**	**Lime Rec**		**N Grn Rec (#/ac)**	**N Bf Rec (#/100#)**	**P Rec (#/ac)**	**K Rec (#/ac)**	**Suggestions**
				Srf N	**Sub N**	**Ttl N**			**Grain(T/ac)**	**pH(T/ac)**					
06/20/96	A	5.1	6.7	61	92	153	50	567	0.5	1.4	0	30	12	0	1T Lime/a
07/28/97	A	5.8	7.0	14	24	38	49	697	0	0	62	30	13	0	
06/22/98	A	5.5	6.9	9	19	28	72	686	0	0	97	30	0	0	
07/01/96	B*	5.5	7	48	116	164	45	478	0	0	0	30	16	0	
07/11/97	B	5.8	7.1	6	8	14	67	446	0	0	86	30	0	0	
06/22/98	B	5.5	6.9	8	19	27	38	403	0	0	98	30	22	0	
07/01/96	C	5.3	6.9	32	59	91	39	521	0.5	1	9	30	21	0	1T Lime/a
07/22/97	C	5.8	6.9	12	14	26	42	604	0	0	75	30	18	0	
06/22/98	C	5.6	7	7	14	21	42	538	0	0	105	30	18	0	
06/20/96	D	5.7	7	39	132	171	49	479	0	0	0	30	13	0	
07/11/97	D	5.4	6.9	11	14	25	72	670	0.5	1	76	30	0	0	limed 1997
06/22/98	D	7.4	-	7	32	39	27	272	0	0	86	30	33	0	100#18-46-0/ac+N
06/20/96	E	5.2	6.9	47	189	236	61	585	0.5	1	0	30	3	0	1T Lime/a
07/28/97	E	5.5	6.9	21	41	62	80	664	0	0	39	30	0	0	
06/22/98	E	5.6	7	6	14	20	47	499	0	0	106	30	14	0	
06/20/96	F	5.8	7.1	33	76	109	60	707	0	0	0	30	4	0	
07/11/97	F	5.9	6.9	6	11	17	95	753	0	0	83	30	0	0	
06/22/98	F	5.8	7	10	22	32	66	658	0	0	93	30	0	0	
07/01/96	G	5.9	7.1	28	27	55	28	462	0	0	45	30	32	0	100# 18-46-0/ac
07/22/97	G	6	7.1	13	22	35	37	553	0	0	65	30	23	0	
06/22/98	G	5.7	7	8	16	24	32	453	0	0	101	30	28	0	phosphate
06/20/96	H	5.5	7	34	116	150	35	466	0	0	0	30	25	0	100 #/ac 18-46-0
07/22/97	H	6.4	7.2	5	30	35	20	489	0	0	65	30	40	0	100 #/ac 18-46-0
06/22/98	H	5.6	7	6	16	22	33	435	0	0	103	30	27	0	phosphate
1996 Avg		**5.5**	**7.0**	**40.3**	**100.9**	**141.1**	**45.9**	**533.1**	**0.2**	**0.4**	**7.7**	**30.0**	**15.8**	**0.0**	
1997 Avg		**5.8**	**7.0**	**11.0**	**20.5**	**31.5**	**57.8**	**609.5**	**0.1**	**0.1**	**68.9**	**30.0**	**11.8**	**0.0**	
1998 Avg		**5.8**	**7.0**	**7.6**	**19.0**	**26.6**	**44.6**	**493.0**	**0.0**	**0.0**	**98.6**	**30.0**	**17.8**	**0.0**	
1996 Ttl									**1.5**	**3.4**	**54**	**240**	**126**	**0**	
1997 Ttl									**0.5**	**1**	**551**	**240**	**94**	**0**	
1998 Ttl									**0**	**0**	**789**	**240**	**142**	**0**	

Table 10-2. Summary of actual fertilizer application and yield data from Burlington nutrient management demonstration.

		Application & Yield Data										
Date	**Location Name**	**Acres**	**Fall Fert (# N/ac)**	**Spr Fert (# N/ac)**	**Lime (#/ac)**	**18-46-0 (#/ac)**	**Actl N (#/ac)**	**Typcl N (#/ac)**	**Beef (#)**	**Beef/ac (#/ac)**	**Yield (bu/ac)**	**Wht Vrty**
06/20/96	A	80	0	30	100	0	2400	10400	6877	86.0	71	Custer
07/28/97	A	77	60	30	0	0	6930	10010	6900	89.6	66	Custer
07/01/96	B[1]	74	0	30	0	0	2220	9620	6279	84.9	69	Jagger
07/11/97	B	77	70	30	0	0	7700	10010	6000	77.9	68	Jagger
07/01/96	C	153	0	30	100	0	4590	19890	15249	99.7	57	Jagger
07/22/97	C	153	65	30	0	0	14535	19890	15300	100.0	65	2137
06/20/96	D	130	0	30	0	0	3900	16900	10166	78.2	59	2163
07/11/97	D[2]	130	70	30	0	0	13000	16900	16800	129.2	58	65ac-Custer 65ac-Jagger
06/20/96	E	152	0	30	100	0	4560	19760	13754	90.5	61	Jagger
07/28/97	E	152	40	30	0	0	10640	19760	13800	90.8	69	2137
06/20/96	F	156	0	40	0	0	6240	20280	14352	92.0	50	2163
07/11/97	F	156	70	30	0	0	15600	20280	14400	92.3	51	Jagger-to wet
07/01/96	G	148	0	30	0	100	7104	19240	10166	68.7	60	2163
07/22/97	G	148	60	30	0	0	13320	19240	13200	89.2	61	Custer
06/20/96	H	156	0	30	0	100	7488	20280	13156	84.3	51	Jagger
07/22/97	H	156	60	30	0	0	14040	20280	13200	84.6	67	2137
1996 Avg		**131.1**	**0.0**	**31.4**	**28.6**	**28.6**	**4813**	**17046**	**11874.6**	**85.5**	**60**	
1997 Avg		**131.1**	**61.9**	**30.0**	**0.0**	**0.0**	**11971**	**17046**	**12450.0**	**94.2**	**63**	
1996 Ttl		**1049**	**0**	**220**	**200**	**200**	**38502**	**136370**	**83122**	**684.2**	**478**	
1997 Ttl		**1049**	**495**	**240**	**0**	**0**	**95765**	**136370**	**99600**	**753.7**	**505**	

[1]Data incorrectly shows 6279 lbs beef obtained on 50 acres for 84 lbs/ac (6279/50=125). 125 lbs/ac seemed improbable so acreage was adjusted to 74 to reflect the recorded yield.

[2]Data sheet shows "65ac" next to the "Lime" column, but no application rate was recorded. Also, data states cattle were allowed access to 150ac alfalfa field in 1997, so beef yields are not directly comparable between years at this location.


MUSK THISTLE
WEEVIL
INFORMATION
MUSK THISTLE CONTROL
MUSK THISTLE WEEVILS HAVE BEEN RELEASED IN THIS FIELD
AS AN INTEGRATED PEST MANAGEMENT PRACTICE
Biological Control Reduces Pesticide Use
Reduced Pesticide Use Protects Water Quality
Accepted by the Oklahoma Department of
Agriculture as Treatment for Musk Thistle
FOR MORE INFORMATION CONTACT OSU COUNTY EXTENSION OR
THE LOCAL CONSERVATION DISTRICT OFFICE
PROTECTING THE SALT FORK WATERSHED
OSU
NRCS


MUSK THISTLE
WEEVIL
INFORMATION
MUSK THISTLE CONTROL

Oklahoma Cooperative Extension Service
OSU Extension Facts F-7318

Integrated Control of Musk Thistle in Oklahoma

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Musk thistle, *Carduus nutans* L., was accidentally introduced into the United States and was first recorded in 1853. It originated from Europe and has spread from the eastern seaboard throughout most of North America. It has become a weed of considerable economic importance, especially in range and pasture lands.

Musk thistle was first identified in Oklahoma (Payne County) in 1944. During the 1950s, additional plants from several eastern counties were identified. By the 1960s, musk thistle was common in many northeastern counties, particularly around abandoned mine sites. It has spread over much of Oklahoma and is currently a serious weed problem in many central and northeastern counties (Figure 1). In addition, some isolated problems exist in north central and western counties.

Figure 1. A severe infestation of musk thistle.

In 1994, musk thistle was declared a noxious weed in four northeast counties (Craig, Delaware, Ottawa, and Mayes). The 1994 law has been amended twice. Roger Mills County was added to the law in 1995, and in 1998, musk thistle was designated a noxious weed in all counties of Oklahoma. In addition, County Commissioners in eight counties (Craig, Delaware, Ottawa, Mayes, Roger Mills, McCurtain, Rogers, and Leflore) were given the authority to cut, mow, spray, or otherwise eradicate musk thistle and then charge the landowner.

Spread and proliferation of musk thistle are caused by movement of seed-contaminated hay to uninfested areas and dissemination of airborne seed from mature plants along waterways.

Recognizing the Problem

Musk thistle is generally classified as an aggressive biennial (two growing seasons needed to mature and produce seed). Seedlings can emerge anytime during the growing season when moisture conditions are favorable. In most years, primary emergence of seedlings occurs in September and October. During the first season, plants normally stay in the rosette stage of growth (Figure 2). In the spring of the second season, plants usually start bolting by mid-April, produce flower heads from May through June, then die after seed is produced. Musk thistle solitary flower heads are borne on long bending stems, and the colorful flowers are usually deep rose to violet or purple. Like other thistles, musk thistle is covered with sharp spines but has no hairs on its leaves, while all other thistles in Oklahoma have hairs on their leaves.

Figure 2. In the rosette stage of growth the leaves are in a basal-cluster with no visible stem.

Musk thistle can also act like a cool-season annual in Oklahoma when it emerges in late summer or early fall and growing conditions are favorable. Evidently, these plants are able to store enough root reserves in the fall to enable them to bloom the following spring. This has been noted in early fall planted wheat and alfalfa and in over-grazed pastures.

Musk thistles reproduce entirely by seed. Each plant is capable of producing 10,000 seeds. Some seeds may germinate the first year while others may remain viable in the soil for as long as five years. Newly established rosettes are inconspicuous and often go unnoticed until they bolt.

Moderate infestations of musk thistle reduce pasture yields approximately 20 percent. Livestock do not graze infested areas, but will feed occasionally on flowerheads. Musk thistle is not a serious problem in most crops since tillage operations usually destroy plants before they produce seed. However, musk thistle can be a problem in early planted wheat, alfalfa, and clover fields.

Integrated Management

Prevention

Prevention is the first-line defense against musk thistles. This includes:

1. **Do not bring** feed or hay infested with musk thistle seed into uninfested areas.
2. **Do not allow** any musk thistles to produce seed on or near your area.
3. **Prevent the spread** of small infestations by spot-treating and/or mechanical removal of small infestations of isolated plants. Remember, one plant can produce up to 10,000 seeds with some seeds remaining viable for five years.

Mechanical Control

Mechanical control involves tilling and mowing. For example, using a hoe or spade to cut thistle plants off below the crown area is an effective way to kill individual plants. Tillage also destroys emerged plants. Mowing is best to prevent seed production. To minimize sprouting from lower leaf axils, mowing should be as close to the ground as possible and done when terminal heads start blooming. Mowing after plants start blooming will result in some production of viable seeds by mowed plants.

Chemical Control

Herbicides are very effective for controlling established plants. The table at the right lists recommended herbicides for musk thistle control.

For best results, apply herbicides to musk thistles in October and November. Some resprouting from the base of plants has been observed with applications of Ally. If applications of 2,4-D are made in the spring, then spraying needs to be done in March and early April before plants start bolting.

Once musk thistle plants start bolting in April, they are more difficult to control. However, 90 to 100 % control of both rosette and bolted plants has been possible with Transline and 2 pints/acre of Grazon P

+ D or Weedmaster applied in late April or early May. This means that a timely application of Grazon P + D or Weedmaster at 2 pints /acre applied to pastures in late April or early May to control summer weeds like ragweeds, bitter sneezeweed, or other summer weeds would also control musk thistle.

With all herbicides, it is important that plants be actively growing at the time of application. This means spraying when there is adequate soil moisture and daytime air temperature is above 60° F.

Ammonium nitrate fertilizer (33-0-0) has also been effective for controlling small musk thistle plants. Place up to one teaspoon of ammonium nitrate in the center of each rosette (< 8 inch across). This is a good option for control of individual plants in alfalfa.

Biological Control

Biological control is the use of natural enemies to reduce musk thistle populations once an area is infested. Good results with weevils have been reported from several states. Missouri has demonstrated a 50 to 95 percent reduction in thistle populations with releases of the thistle head weevil, Rhinocyllus conicus Froelich. A natural enemy of musk thistle, thistle weevil larvae feed in the receptacle of developing flowers, disrupting seed development. Another weevil, the rosette weevil, *Trichosirocalus horridus* (Panzer), was imported from Italy in 1970 to 1972. It became established in Virginia by 1977, and was found to complement the head weevil. The rosette weevil can actually kill small rosettes. On larger plants it causes disruption of apical dominance resulting in shorter, multiple-stemmed plants that are less competitive than other plants.

Advantages of biological control include: 1) low cost, 2) non-target organisms are unaffected, 3) adjoining infested areas will attract weevils, 4) requires little effort once established, and 5) can be used with other methods.

Weevil Release Program in Oklahoma

Beginning in 1991, the Oklahoma Cooperative Extension Service and cooperating landowners began a head weevil release program in 18 northeast counties in Oklahoma. More than 60,000 thistle head weevils have been collected in Missouri and released in Oklahoma. This effort appears to be successful, since head weevil establishment has been confirmed at most release sites. Weevil populations at most of these sites are high enough for use as collection sites and redistribution at this time.

Herbicides Labeled*	Rate	Estimated Herbicide Cost
2,4-D	2 to 4 pt/A (2 oz/gal. for spot spraying)	$4 to $8/A
Weedmaster	11/2 to 2 pt/A (1 oz/gal. for spot spraying)	$5 to $11/A
Grazon P+D	2 to 3 pt/A (1 oz/gal. for spot spraying)	$6 to $10/A
Ally	2/10 to 3/10 ounce product /A (3 cc/gal. for spot spraying)	$5 to $7/A
Transline	1/3 to 2/3 pt/A (1/3 oz/gal. for spot spraying)	$12 to $24/A

*2,4-D, Weedmaster, Grazon P + D, and Ally labeled for pastures and rangelands. Transline is only labeled for non-cropland, Grazon P + D is a restricted use pesticide. Read labels for specific information and guidelines.

Biology of the Musk Thistle Head Weevil

The head weevil overwinters as an adult (Figure 3). In early spring, they feed on rosettes, mate, and females lay eggs on the emerging seed heads. The eggs are laid on the bracts of developing flowers (Figure 4). Each female lays approximately 100 eggs.

Figure 3. Head weevil in the adult stage.

Figure 4. Head weevil eggs.

Eggs hatch in 6 to 8 days and larvae (Figure 5) feed on flower heads for 25 to 30 days. They stop feeding and enter a resting stage (pupation) that lasts another 8 to 14 days. In July, adults emerge to seek an overwintering site. A second generation, however, has been observed in some locations.

Figure 5. Head weevil larvae.

Collecting and Releasing Weevils

A good time to collect weevils is after plants have bolted 1 to 2 feet (about mid-May). Collect on sunny days when weevils are active on the upper portions of the plant.

Weevils are collected by beating the upper portion of the plant with a dowel rod while holding a sweep-net or some other device beneath the plant. Leather gloves are required for holding plants. Weevils play dead and drop into the sweep-net. Move from one plant to another repeating this process. Occasionally tap on the net to keep weevils from escaping.

After collecting weevils, sort through the debris and separate weevils from other insects and spiders. Place 500 adult weevils in cardboard containers with tight fitting lids. Do not use plastic cartons because of moisture accumulation and resulting weevil mortality.

Weevils can be stored for a week in a refrigerator or ice chest. However, they should be released as soon as possible to ensure that eggs are not deposited in storage containers. At least 500 weevils should be released at each site. Simply sprinkle weevils over the plants at a rate of about ten per plant.

Studies have shown that releases are most successful if the area is not mowed or sprayed during critical times in the life cycle of the weevil, such as head development. When possible, release in areas free from livestock. Remember, it takes five to seven years for weevil populations to reach a point where thistle control occurs.

Interested parties should contact their county Extension office for additional information concerning weevil roundups in the spring.

Integrated Control

Once an area has a heavy infestation of musk thistles, the most economical approach is an integration of various control options. A good integrated management approach would be:

Release thistle head weevils on thick stands of musk thistle on non-pasture areas (500/site). There is a better chance of weevil survival if area is undisturbed for a couple of months after release. It is also important to protect these areas for several years to insure maximum opportunity of a successful weevil population. After several years, herbicide spraying and mowing can be integrated into these areas.

Stop seed production on infested pastures and on adjacent areas. There is a significant number of musk thistle seeds in the soil on these pastures and they will be there for up to five years. Seed production can be stopped by selective mowing and spot treatment with herbicides.

Integrate control methods. Researchers in Missouri found that the best approach was to spray rosettes in the fall and from mid-March to mid-April. Let the head weevils disrupt seed development in May and June and then mow in mid-July (Figure 6).

Figure 3,4 & 5 Photos contributed by Don Arnold, Oklahoma State University.
Figure 6 contributed by Dr. Benjamin Pulter, University of Missouri.

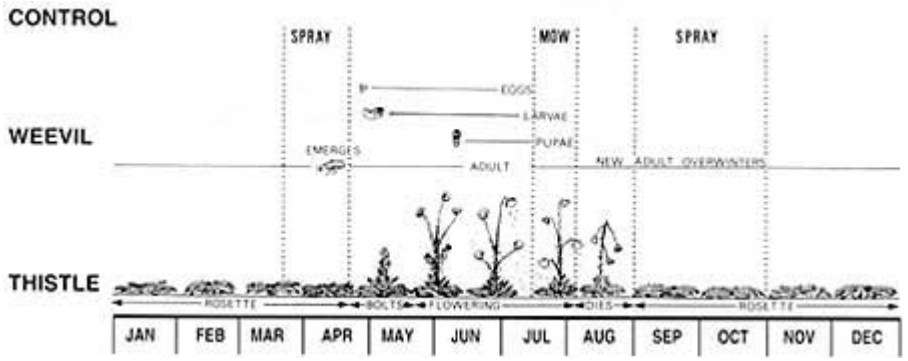

Figure 6. Integrated control scheme for musk thistle.

F-7318, Integrated Control of Musk Thistle in Oklahoma *(pdf file)*

P*E*A*R*L (Publications Database)

Oklahoma Cooperative Extension Service

Division of Agricultural Sciences and Natural Resources

Oklahoma State University

This publication was originally published 2-00. This page was created 5-00.

Fine Tuning Nitrogen Recommendation for Wheat Forage and Grain Production

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Department of Plant and Soil Sciences

- More residual nitrogen was found when subsoil samples were taken
- Nitrogen rates did not significantly affect wheat grain yields in the first year of this study
- Grain protein was increased by increasing N rates

Nitrogen (N) fertilizer management for wheat forage and grain production is important to farmers' profit and to water quality. Nearly six million acres of wheat are planted in Oklahoma annually, which indicates a tremendous amount of nitrogen fertilizers is used for wheat production each year. Most producers fertilize their fields regularly, but do not test their soils before planting. Only 4% of Oklahoma producers tested soils at OSU Soils Lab although some may send soil samples to other labs. Fertilizing without soil test is neither economically sound nor environmentally safe. A significant amount of nitrate-nitrogen (NO_3-N) was found in the subsoil (6-24") by a recent statewide soil test program. This is the zone wheat roots can penetrate and utilize the nitrate from during growth. Utilizing NO_3-N from the subsoil would significantly reduce farmers' fertilizer expenses. Because nitrate is water soluble, movement of the nitrates downward in the profile may occur when conditions are favorable. Thus, soil samples to deeper than tillage depth are necessary for a reliable measurement of available N. However, producers who collect soil samples for estimating residual N submit few subsoil samples. One of the main reasons for subsoil sampling not being commonly used is the lack of understanding of the importance and lack of proper sampling device.

Research Objectives:

1. To fine-tune N recommendation based on residual N at four soil sampling depths;
2. To promote soil sampling by demonstrating the contribution of residual nitrogen in the subsoil to winter wheat forage and grain yields.

Procedures:

Two N treatment plots were established on a producer's fields located a few miles southeast of Cherokee. Both sites are on a Grant Silt Loam soil, but one site had a high residual soil nitrate nitrogen (South Location), and the other had relatively low soil residual N (North Location). At each location, soil samples were taken from four depths and tested for plant available nutrients. Nitrogen application rates were targeted for a yield goal of 50 bu/acre (100 lb/A N) less the available N in 0-6", 0-12", 0-18" and 0-24" depth soil. Two additional treatments with N rates based on 0-6" depth residual N and 50 bu/acre yield goal plus 30 and 60 lb/acre N (equivalent to 100 and 200 lbs beef gain for grazing, respectively) were also included.

Preliminary Results:

Wheat test weights, yields and protein contents under different nitrogen rates from two locations are shown in Table 1 and 2. No significant differences in yields were found among treatments, but grain protein was increased with higher N rates. This study is continuing for the second year although the funding was for one year.

Table 1. Nitrogen fertilizer treatment, residual nitrogen in the soil at the end of growing season and wheat yields: South Location (Soil type: Grant silt loam)

	NITROGEN (LB/A)			TEST WEIGHT	YIELD	PROTEIN
	August 2000		June 2001			
TREATMENT	IN SOIL[1]	ADDED	IN SOIL[2]	LB/BU	BU/A	(%)
NONE APPLIED	55	0	41	61.5	47.2	11.6
0-24" RECOMMENDED	55	45	38	61.5	42.0	12.4
0-18" RECOMMENDED	43	57	49	61.5	48.1	12.5
0-12" RECOMMENDED	29	71	59	61.6	54.1	12.9
0-6" RECOMMENDED	14	86	53	61.0	52.4	12.7
0-6" RECOMMENDED + 30	14	116	51	61.1	49.8	12.8
0-6" RECOMMENDED + 60	14	146	77	60.5	53.5	12.9
MEAN				61.2	49.6	12.5
LSD (0.05)				0.7	N.S.	0.8

[1]N in the soil is nitrate N based on soil sample Aug. 2000 to the depth indicated.

[2]Nitrogen in the soil is nitrate N based on soil sample June 2001 from 0-24".

Table 2. Nitrogen fertilizer treatment, residual nitrogen in the soil at the end of growing season and wheat yields: North Location (Soil type: Grant silt loam)

	NITROGEN (LB/A)			TEST WEIGHT	YIELD	PROTEIN
	August 2000		June 2001			
TREATMENT	IN SOIL[1]	ADDED	IN SOIL[2]	LB/BU	BU/A	(%)
NONE APPLIED	27	0	23	59.8	28.4	9.4
0-24" RECOMMENDED	27	73	30	61.1	40.0	11.0
0-18" RECOMMENDED	23	77	28	60.5	33.6	10.6
0-12" RECOMMENDED	17	83	36	60.8	33.1	10.7
0-6" RECOMMENDED	9	91	34	61.0	36.8	11.2
0-6" RECOMMENDED + 30	9	121	44	60.5	40.3	11.8
0-6" RECOMMENDED + 60	9	151	53	60.5	39.8	12.1
MEAN				60.6	36.0	11.0
LSD (0.05)				0.6	N.S.	0.6

[1]N in the soil is nitrate N based on soil sample Aug. 2000 to the depth indicated.

[2]N in the soil is nitrate N based on soil sample June 2001 from 0-24".

Results of Wheat Aphid Demonstrations in the Salt Fork Watershed

Tom Royer, Assistant Professor, OSU Entomology & Plant Pathology

Objectives

Two replicated experiments were set up, one each in both Alfalfa and Woods counties, to demonstrate Integrated Crop Management practices on wheat. The demonstrations focused on the economic value of a sustainable pest management strategy for wheat production, including field monitoring/scouting, with the following objectives:

- Evaluate the economic return of including dimethoate with a topdress nitrogen treatment for aphid control.
- Evaluate the economic return of using a scouting based pest management program in wheat.
- Evaluate the economic return of using Gaucho seed treatment.

Location

Plots for demonstrations were established inside the Salt Fork Watershed with grower/cooperators in Alva and Burlington, OK.

Treatments

The following six treatments were demonstrated at both locations:

1. Topdress N only
2. Topdress N + Gaucho 3.00 oz/acre
3. Topdress N + Gaucho 1.5 oz/acre
4. Topdress N + Gaucho 0.75 oz/acre
5. Topdress N + Dimethoate 0.25-0.375 lb ai/A (applied on 2/19/02)
6. Topdress N + IPM approach (Lorsban 0.25-0.50 lb ai/A when threshold is reached)

Design

The demonstration utilized a randomized complete block with 4 replications, conducted over 2 years. (See Figures 1 and 2 below).

3	1	2	6	4	5
2	1	5	3	6	4
6	2	4	3	5	1
6	2	4	3	1	5

Figure 1. Demonstration plot layout for Alfalfa County.

6	5	1	4	3	2
2	4	3	5	1	6
6	3	5	4	2	1
4	5	6	1	3	2

Figure 2. Demonstration plot layout for Woods County.

Results & Conclusions

Aphid populations at both locations remained low throughout the experiment, averaging less than 100 per ft of row in the untreated check. Slight differences were seen among treatments, but were not meaningful. Yield response reflected the low overall aphid numbers. There were no significant differences in yield at either site. No recommendations were able to be formulated using these data.

Table 1. Results of Alva wheat aphid demonstration.

		Aphids/ft of row						Yield (bu/A)
Treatment	**Rate***	**11/20/97**	**2/19/98**	**3/26/98**	**4/08/98**	**4/18/98**	**5/01/98**	
Gaucho	0.75	0	0	0.125	8.25	25.88	22.25	75.5
Gaucho	1.5	0	0.125	0.625	6.125	211.5	22.25	73.05
Gaucho	3.0	0.25	0	0.125	1.75	9.75	11.25	77.0
Dimethoate (topdress)	0.375	0	0.25	0.125	2.0	16.6	19.4	76.6
Untreated		0.5	1.125	1.0	6.88	75.38	27.38	70.84

* Gaucho application rate reported as oz/cwt seed. Diemethoate application rate is in lb of active ingredient/acre.

Table 2. Results of Burlington wheat aphid demonstration.

		Aphids/ft of row						Yield (bu/A)
Treatment	**Rate***	**11/20/97**	**2/19/98**	**3/26/98**	**4/08/98**	**4/18/98**	**5/01/98**	
Gaucho	0.75	0.125	0	0.125	1.125	7.0	4.63	72.7
Gaucho	1.5	0.125	0	0	0.625	7.88	1.25	70.20
Gaucho	3.0	0	0	0	0.625	3.88	1.25	67.27
Dimethoate (topdress)	0.375	0.375	0	0	0.63	6.75	1.88	76.52
Untreated		0.5	0	0	0.5	12.25	11.5	72.25

* Gaucho application rate reported as oz/cwt seed. Diemethoate application rate is in lb of active ingredient/acre.

Table 12-1. Summary of yield results from Cherokee wheat variety trial.

Source	Variety	Yrs in Study	1997-98	%Rank	1998-99	%Rank	1999-00	%Rank	2000-01	%Rank	2001-02	%Rank	Avg Yield	Avg %Rank	Ovrll Rank
AgriPro	Jagalene	1									19.7	100	19.7	100	1
OAES	OK94P549-2C	1					57.5	100					57.5	100	1
CAES	Above	1									19.3	95	19.3	95	3
OAES	OK95616-14C	1			73.3	91							73.3	91	4
KAES	Jagger	5	52.5	71	75.6	100	51.4	86	49.8	100	18.2	85	49.5	88	5
AgriPro	Cutter	2							44.7	79	18.9	90	31.8	84	6
OAES	OK95G7012	1			72	82							72.0	82	7
OAES	OK96705-99-6738	1									12.5	80	12.5	80	8
OAES	Cimarron	1	52.9	76									52.9	76	9
KAES	2137	5	57.6	100	65.8	59	55.1	95	44.2	58	9.9	65	46.5	75	10
KAES	2145	1									10.7	70	10.7	70	11
OAES	OK96717	1					49.4	64					49.4	64	12
OAES	Custer	5	56.3	94	69.5	73	47.8	50	48.4	95	3.3	5	45.1	63	13
OAES	Ok101	4			73.2	86	53.2	91	37.5	5	8.4	60	43.1	61	14
OAES	Chisholm	5	51.1	53	68.1	68	50.5	68	44.3	68	5.3	45	43.9	61	15
AgriPro	Ogallala	4	52	65	74.2	95	51.3	82	37	0			53.6	60	16
KAES	2163	2	53.3	82	62.5	36							57.9	59	17
-	Dominator	3	50.9	47	63.8	45	51.1	77					55.3	57	18
OAES	2174	5	53.5	88	60.2	18	49.1	59	45.9	89	3.8	20	42.5	55	19
OAES	2174+Gaucho	3					48.6	55	44.3	68	4.8	40	32.6	54	20
OAES	Intrada	3					50.7	73	41.3	32	6.1	55	32.7	53	21
KAES	Karl 92	2	50.6	41	66.1	64							58.4	52	22
AgriPro	Thunderbolt	3					46.9	41	41.8	37	12.2	75	33.6	51	23
OAES	Tonkawa	4	51.3	59	64.2	55	42	23	44.2	58			50.4	48	24
OAES	Ok102	2							45.1	84	3.5	10	24.3	47	25
KAES	Betty	1			63.7	41							63.7	41	26
OAES	OK95G703	1					45.3	36					45.3	36	27
KAES	Trego	3					44.4	32	40.4	26	5.4	50	30.1	36	28
AGSECO	7853	3	45.6	24	69.8	77	39.3	5					51.6	35	29
OAES	OK95548-98-6654	1									4.5	35	4.5	35	30
STAR	Champ	2	44.9	18	63.9	50							54.4	34	31
AGSECO	Onaga	2							41.8	37	4.3	30	23.1	33	32
AgriPro	Big Dawg	1			61.8	32							61.8	32	33
AgriPro	Tomahawk	4	46.4	29	56.7	0	41.9	18	43.4	53			47.1	25	34
TAES	TAM 302	3			59.1	14	47.6	45	38.5	16			48.4	25	35
AgriPro	Coronado	5	49	35	57.6	5	39.9	9	42.3	47	4.1	25	38.6	24	36
OAES	OK98680	1							40.2	21			40.2	21	37
TAES	Lockett	4			60.2	18	44.2	27	37.6	11	3.7	15	36.4	18	38
AgriPro	Oro-Blanco	3	41.9	6	61.5	27	41.7	14					48.4	16	39
KAES	Ike	1	43.4	12									43.4	12	40
KAES	Heyne	2			58.2	9	38.9	0					48.6	5	41
AgriPro	Longhorn	1	41.3	0									41.3	0	42
OAES	OK96717-99-6756	1									2.9	0	2.9	0	42

Table 12-2. Summary of test weight results from Cherokee wheat variety trial.

Source	Variety	Yrs in Study	1997-98	%Rank	1998-99	%Rank	1999-00	%Rank	2000-01	%Rank	2001-02	%Rank	Avg Test Wt	Avg %Rank	Ovrll Rank
AgriPro	Jagalene	1									55.6	100	55.6	100	1
OAES	OK95G7012	1			59.6	100							59.6	100	1
OAES	OK96717	1					59	95					59.0	95	3
OAES	OK96705-99-6738	1									54.9	95	54.9	95	4
OAES	Cimarron	1	61.3	94									61.3	94	5
AgriPro	Big Dawg	1			59.2	90							59.2	90	6
OAES	Tonkawa	4	60.9	88	58.8	85.7	58.1	72.7	60.1	100			59.5	87	7
CAES	Above	1									54.3	85	54.3	85	8
OAES	Intrada	3					58.8	86	59	74	54.4	90	57.4	83	9
AGSECO	7853	3	60.3	82	59.2	90	57.8	59					59.1	77	10
AGSECO	Onaga	2							59.2	89	52.4	60	55.8	75	11
AgriPro	Cutter	2							58.7	68	54	80	56.4	74	12
OAES	2174	5	60.2	71	58.7	71.4	58.2	81.8	59.1	84.2	50.9	50	57.4	72	13
KAES	2145	1									52.9	70	52.9	70	14
AgriPro	Thunderbolt	3					57.8	59	59	74	53.5	75	56.8	69	15
-	Dominator	3	59.5	41	58.7	71	58.8	86					59.0	66	16
OAES	2174+Gaucho	3					58	68	59.4	95	50.8	35	56.1	66	17
AgriPro	Ogallala	4	61.3	94	58.7	71.4	58.1	72.7	57	15.7			58.8	63	18
KAES	Karl 92	2	60	65	58.1	57							59.1	61	19
KAES	Betty	1			58	52							58.0	52	20
KAES	Trego	3					59.4	100	57.7	32	50.5	20	55.9	51	21
OAES	Custer	5	60.2	71	58.2	66.6	57	27.2	57.9	47.3	50.8	35	56.8	49	22
OAES	Chisholm	5	59.6	47	58.1	57.1	57.4	45.4	57.8	36.8	51.7	55	56.9	48	23
AgriPro	Longhorn	1	59.6	47									59.6	47	24
OAES	OK94P549-2C	1					57.4	45					57.4	45	25
KAES	Jagger	4	58.4	18			56.8	22.7	58	52.6	52.8	65	56.5	39	26
OAES	OK102	2							58.4	63	49.3	15	53.9	39	27
AgriPro	Oro-Blanco	3	59.8	59	56.2	19	57.2	36					57.7	38	28
OAES	OK95616-14C	1			56.8	38							56.8	38	29
KAES	2137	5	58.8	24	57.3	42.8	57.4	45.4	57.8	36.8	50.8	35	56.4	37	30
OAES	OK96717-99-6756	1									50.7	30	50.7	30	31
OAES	OK101	4			57.5	48	57.3	41	55.5	11	50.5	20	55.2	30	32
KAES	Ike	1	59	29									59.0	29	33
AgriPro	Coronado	5	59.2	35	56.4	23.8	56.4	18.1	58.2	57.8	48.7	10	55.8	29	34
OAES	OK95G703	1					57	27					57.0	27	35
OAES	OK98680	1							57.3	26			57.3	26	36
KAES	Heyne	2			56.5	33	56.1	14					56.3	23	37
STAR	Champ	2	58.3	12	54.8	10							56.6	11	38
AgriPro	Tomahawk	4	57.8	6	54.6	5	55.6	9	57.1	21			56.3	10	39
TAES	Lockett	4			56.4	24	54.8	0	54.9	5	47	0	53.3	7	40
KAES	2163	2	57.3	0	54.9	14							56.1	7	41
OAES	OK95548-98-6654	1									48.6	5	48.6	5	42
TAES	TAM 302	3			54.2	0	55.2	5	54.4	0			54.6	2	43

DEC 05 2002

CHEROKEE HARD RED WINTER WHEAT VARIETY TRIAL 2001-2002
COOPERATOR: KENNETH FAILES

1	6	12	11	21	19	2	15	4	8	7	16	20	10	18	13	17	14	22	9	5	3
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422
3	13	4	18	1	8	9	21	14	16	19	20	11	15	12	5	6	22	17	7	2	10
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322
22	12	19	15	8	18	7	10	20	11	2	4	21	13	6	9	16	3	14	1	17	5
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222
21	22	13	3	11	1	16	8	12	19	14	7	17	18	2	10	15	9	20	5	6	4
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122

W
S ✧ N
E

PLANTED: 9-24-01
FERTILIZATION: 500#/A 18-46-0, In seed furrow.
Soil test information: pH = 6.1, Total N = 164, P = 60, K =550.
60 # seeding rate.

1 = ABOVE	7 = AGSECO ONAGA	13 = Ok101	19 = OK96717
2 = AGRIPRO CORONADO	8 = CHISHOLM	14 = TREGO	20 = OK97508
3 = AGRIPRO CUTTER	9 = CUSTER	15 = 2137	21 = OK96705
4 = AGRIPRO JAGALENE	10 = INTRADA	16 = 2145	22 = OK995548
5 = AGRIPRO OGALLALA	11 = JAGGER	17 = 2174	
6 = AGRIPRO THUNDERBOLT	12 = LOCKETT	18 = 2174+GAUCHO	

Figure 12-1. Site map of Cherokee wheat variety trial.

Table 13-1. Summary of yield results from Cherokee wheat variety trial.

Source	Variety	Yrs in Study	1997-98	%Rank	1998-99	%Rank	1999-00	%Rank	2000-01	%Rank	2001-02	%Rank	Avg Yield	Avg %Rank	Ovrll Rank
AgriPro	Jagalene	1									28.9	100	28.9	100	1
OAES	OK95G7012	1			72.1	100							72.1	100	1
AgriPro	Cutter	2							62.9	100	24.8	91	43.9	96	3
CAES	Above	1									28.1	96	28.1	96	4
KAES	Jagger	5	67	94	72	95	65.9	100	62.8	96	19.5	83	57.4	94	5
Cargill	Kalvesta	2							59.8	84	18.3	70	39.1	77	6
AgriPro	Thunderbolt	3					59.9	62	59.5	80	22.3	87	47.2	76	7
AGSECO	7853	3	65.5	88	68.6	70	59.4	48					64.5	69	8
OAES	Custer	5	68.8	100	66.7	60	65.3	95	56.3	48	14.2	39	54.3	68	9
OAES	OK94P549-2C	1					60	67					60.0	67	10
KAES	2163	2	62.3	76	66.3	55							64.3	66	11
AgriPro	Ogallala	4	63.7	82	70.6	90	63	86	51.5	4			62.2	66	12
KAES	2145	1									17.6	65	17.6	65	13
Cargill	Cossack	1									16.4	61	16.4	61	14
KAES	Trego	3					65.2	90	56.3	48	15.2	43	45.6	61	15
OAES	Intrada	3					62.6	81	56.9	60	14	35	44.5	59	16
Cargill	Venango	2							57.9	68	15.3	48	36.6	58	17
OAES	2174	5	59.6	53	69.3	80	60.4	71	57.7	64	12.6	17	51.9	57	18
Cargill	Enhancer	2							61	92	12.8	22	36.9	57	19
OAES	Chisholm	5	59.2	47	69.7	85	58.5	38	60.1	88	13	26	52.1	57	20
OAES	OK101	3					61	76	56	40	15.3	48	44.1	55	21
OAES	2174+GAUCHO	3					59.5	52	58.9	76	13.4	30	43.9	53	22
-	Dominator	3	59.7	59	68	65	58.4	33					62.0	52	23
KAES	Heyne	2			68.7	75	58.3	29					63.5	52	24
KAES	2137	5	57.6	29	65.9	45	59.7	57	54.2	24	19	74	51.3	46	25
AgriPro	Tomahawk	4	61.1	71	61	20	57.4	19	58.6	72			59.5	45	26
OAES	OK96717	1					58.7	43					58.7	43	27
TAES	Lockett	4			65.9	45	50.1	0	56.7	56	15.9	57	47.2	39	28
OAES	OK98680	1							55.7	36			55.7	36	29
OAES	Cimarron	1	59	35									59.0	35	30
AgriPro	Coronado	5	57.1	24	59.7	15	57	10	56.2	44	19.2	78	49.8	34	31
TAES	TAM 302	3			61.2	25	57.7	24	55.3	32			58.1	27	32
AgriPro	Oro Blanco	3	59	35	62.7	35	52.3	5					58.0	25	33
OAES	Tonkawa	4	60.5	65	57.6	0	57.2	14	53.5	12			57.2	23	34
Star	Champ	2	54.2	0	63.5	40							58.9	20	35
OAES	OK96705-99R	1							54.1	20			54.1	20	35
Cargill	G1878	2							54.8	28	11.7	9	33.3	18	37
KAES	Karl 92	2	54.8	6	62.1	30							58.5	18	38
AgriPro	Longhorn	1	57	18									57.0	18	39
OAES	OK102	2							53.5	12	11.8	13	32.7	13	40
KAES	Ike	1	56.8	12									56.8	12	41
KAES	Betty	1			59.1	10							59.1	10	42
AgriPro	Big Dawg	1			58.2	5							58.2	5	43
OAES	OK96717-99-6756	1									10.8	4	10.8	4	44
AGSECO	Onaga	2							52.5	8	10.6	0	31.6	4	45
OAES	OK93P656-H	1							47.9	0			47.9	0	46

Table 13-2. Summary of test weight results from Cherokee wheat variety trial.

Source	Variety	Yrs in Study	1997-98	%Rank	1998-99	%Rank	1999-00	%Rank	2000-01	%Rank	2001-02	%Rank	Avg Test Wt	Avg %Rank	Ovrll Rank
AgriPro	Jagalene	1									58.7	96	58.7	96	1
OAES	OK95G7012	1			60.4	95							60.4	95	2
Cargill	G1878	2							61.7	100	58.4	87	60.1	93	3
AGSECO	7853	3	61.8	100	60.4	95	59.4	81					60.5	92	4
OAES	Intrada	3					59.8	95	61.6	96	58.2	83	59.9	91	5
AgriPro	Thunderbolt	3					59.7	90	61.1	76	58.7	96	59.8	87	6
OAES	Cimarron	1	60.6	82									60.6	82	7
OAES	Tonkawa	4	61.2	94	60	75	58.7	71	61.3	88			60.3	82	8
AgriPro	Longhorn	1	60.3	76									60.3	76	9
OAES	OK96717	1					59	76					59.0	76	10
KAES	Trego	3					60	100	60.3	36	58.6	91	59.6	76	11
AgriPro	Cutter	2							61.2	84	57.1	65	59.2	75	12
CAES	Above	1									57.5	74	57.5	74	13
OAES	OK96717-99-6756	1									57.5	74	57.5	74	13
AgriPro	Ogallala	4	60.7	88	59.3	60	59.5	86	60.6	48			60.0	70	15
OAES	OK96705-99R	1							60.9	68			60.9	68	16
OAES	Chisholm	5	59.3	53	60.2	90	58.2	62	61.1	76	57	48	59.2	66	17
AgriPro	Big Dawg	1			59.4	65							59.4	65	18
OAES	2174	5	59.8	65	60	75	57.7	52	60.9	68	56.5	30	59.0	58	19
KAES	Karl 92	2	60	71	58.6	40							59.3	55	20
OAES	2174+GAUCHO	3					57.6	48	61.4	92	56.4	26	58.5	55	21
-	Dominator	3	58.3	24	60	75	58.6	67					59.0	55	22
OAES	Custer	5	59.7	59	59.9	70	58	57	60.8	60	56	17	58.9	53	23
AGSECO	Onaga	2							60.8	60	56.9	43	58.9	52	24
OAES	OK98680	1							60.6	48			60.6	48	25
KAES	2145	1									57	48	57.0	48	26
KAES	Ike	1	58.7	47									58.7	47	27
KAES	Heyne	2			58.8	55	56.9	33					57.9	44	28
Cargill	Venango	2							60.6	48	56.8	39	58.7	44	29
OAES	OK94P549-2C	1					57.4	38					57.4	38	30
AgriPro	Coronado	5	58.3	24	58.6	40	57.4	38	60.3	36	57	48	58.3	37	31
Cargill	Kalvesta	2							60.3	36	56.6	35	58.5	35	32
AgriPro	Oro Blanco	3	58.4	35	58.6	40	56.5	24					57.8	33	33
KAES	2137	5	58.6	41	58.5	35	56.3	14	59.5	20	57	48	58.0	32	34
KAES	Jagger	5	57.7	12	57.4	20	56.6	29	59.5	20	57.3	70	57.7	30	35
KAES	Betty	1			57.7	25							57.7	25	36
OAES	OK102	2							59.9	32	55.9	13	57.9	23	37
OAES	OK101	3					56.4	19	58.9	16	56.3	22	57.2	19	38
AgriPro	Tomahawk	4	57.9	18	56.9	15	55.3	10	59.7	28			57.5	18	39
TAES	Lockett	4			57.7	25	54.3	5	58.8	12	54.9	4	56.4	12	40
Cargill	Cossack	1									55.2	9	55.2	9	41
KAES	2163	2	56.4	6	55.8	10							56.1	8	42
Cargill	Enhancer	2							58.7	8	54.1	0	56.4	4	43
OAES	OK93P656-H	1							58.4	4			58.4	4	43
TAES	TAM 302	3			55.6	0	54	0	58.1	0			55.9	0	45
Star	Champ	2	55.9	0	55.6	0							55.8	0	45

ALVA HARD RED WINTER WHEAT VARIETY TRIAL 2001-2002
COOPERATOR: WES MALLORY

17	12	15	20	7	18	6	10	14	11	36	2	5	13	8	9	16	3	37	1	4	19	38	39	40
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425

19	39	40	3	36	13	16	12	18	4	14	10	17	38	7	2	37	9	20	8	1	6	5	11	15
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325

5	6	1	11	16	19	40	15	39	8	7	38	20	17	18	10	13	14	2	9	36	37	12	3	4
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225

2	13	18	6	4	40	36	7	1	16	19	20	38	3	12	5	11	37	17	15	8	39	9	10	14
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125

N
W ✧ E
S

PLANTED: 9-24-01
FERTILIZATION: 50#/A 18-46-0, In seed furrow.
Soil test information: pH = 5.3, Total N =110, P = 95, K =634.
60 # seeding rate.

1 = ABOVE
2 = AGRIPRO CORONADO
3 = AGRIPRO CUTTER
4 = AGRIPRO JAGALENE
5 = AGRIPRO OGALLALA
6 = AGRIPRO THUNDERBOLT
7 = AGSECO ONAGA
8 = CHISHOLM
9 = CUSTER
10 = INTRADA
11 = JAGGER
12 = LOCKETT
13 = Ok101
14 = TREGO
15 = 2137
16 = 2145
17 = 2174
18 = 2174+GAUCHO
19 = OK96717
20 = OK97508
36 = ENHANCER
37 = KALVESTA
38 = VENANGO
39 = G1878
40 = COSSACK

Figure 13-1. Site map of Alva wheat variety trial.

Salt Fork Cooperator Management Interview

How would you describe your operation?

- Acres
- Crops
- Number of separate fields
- Crop rotation
- Tillage methods used
- Percent of income from farming

What kind of recordkeeping do you do?

- Field by field history
- Crop
- Weather
- Herbicides/insecticides
- Fertilizers
- Soil tests
- Yield goals and averages
- Costs

How do you deal with weeds, insects, and disease in your crop?

- Pesticide use
- Choice of pesticide
- Who applies pesticide?
- How is it determined when to apply?
- IPM methods
    - Scouting
    - Grazing management
    - Resistant varieties
    - Biological control

What is your approach to nutrient management?

- Fertilizer application rate for each crop
- Split application of fertilizer
- Importance of soil tests
- Sub-soil testing for nitrogen
- Grazing considerations

What is your view of erosion control practices?

- Filter strips
- Terraces
- Grassed waterways
- Reduced tillage/No-till
- Riparian area management
- Usefulness
- Cost

What do you do differently from your neighbors and why?

- Advantage(s)
- Why don’t they follow these methods

		Operation					Records						
Prdcr	**Age**	**Acres**	**Crops**	**Fields**	**Rotate**	**Tillage**	**Field**	**Wthr**	**Pstcde**	**Frtlzr**	**Sl tst**	**Yld**	**Csts**
2	50	2700	Wheat, alfalfa, grass	~20	Wheat & alfalfa	Conv., disc, chisel, sweep, very little plowing	N	N	N	N	N	N	N
3	60	750	Wheat, alfalfa, grass	6	Wheat & alfalfa	Conv	Y	N	Y	Y	Y	Y	Y
4	65	4000 (2000)	Wheat	~20	None	Cnsrvtn, disc, chisel, sweep, springtooth	Most	N	Y	Y	Y	Y	Y
5	60	4300	Wheat, alfalfa, corn, sorghum, grass	19 FSA Units	Wheat & alfalfa, corn & wheat for grazeout	Conv, (due to soil types), disc rip every 3rd yr	Y	N	Y	Y	Test ½ fields/yr	Y	Y
6	50	2000	Wheat, sowed feed, grass	~20	N	Conv	N	N	N	N	N	N	N
7	65	4000	Wheat, milo, alfalfa	A lot	Milo & wheat	Conv, notill on milo (2 yrs), just started on some wht acres	N	N	Y	Y	Y	N	N
8	40	1700	Wht, alf, sorg, cotton	Varies	All four crops	Conv	N	N	Y	N	N	N	Profit/loss ratio

	Pest Management					Nutrient Management				
Prdcr	**Chmicl**	**Choice**	**Apply**	**When**	**IPM**	**Rate**	**Split**	**Soiltest**	**Subsoil**	**Grazing**
2	N	NA	NA	NA	Grazing	< test or area avg	When applicable	Yes	No	Add 25 lbs/ac
3	Y	CCA	Comm	Scout	Scout	= test	Sometimes	Y	Y	Acc to # of animals
4	Weeds only	Applicator	Comm	Usually early spring, or as needed	N	≤ test, no anhydrous	Usually not	Test ½ fields/yr	N	Rarely
5	Y	CCA, CropQuest	Depends on chmcl	CCA, convenience	Rare grzg	= tests	Usually	Test ½ fields/yr	When possible	Add 30 lbs/ac
6	Y	Applicator, most common	Comm	Scout	Scout	< test	Usually not	Y	Recently, no results yet	Usually none
7	CCA	CCA	Self	CCA	Area agron scouts, grazing used when possible or as a last resort to failed crops	= test	Spr&Fall	Annual	Annual(CCA)	If planned. Apply fert during Spr
8	Y	Comm	Comm, self in future	Crop dependent	none	History	When possible	Y	Important for notill	Not usually

	Erosion Control					
Prdcr	**Filter strips**	**Terraces**	**Waterways**	**Riparian**	**Usefulness**	**Costs**
2	None	Work	Usually work	None in use	Terraces and Wways help	Terraces worth $$
3	None	Very practical & useful	Very practical & useful	None needed	Very important on many farms	Benefits > $$
4	Future possibility	Y, ~75% of land	Y	NA	Very important when properly used and maintained	Terraces and waterways worth $$
5	Y, esp. near livestock areas	Definitely useful when necessary	Useful when necessary	Erosion not a major problem	NA	NA
6	None	Work well	Work well	None	Usefulness > cost	
7	Along crks, rivers, &CRP	Used commonly	In conjunction with terraces	Notills highly erodible ground	Conv tillage requires erosion control	Usefulness > cost
8	Good for problem areas	Overused or misused	Overused or misused	N	Great importance	Profit/Loss key evaluation of crop

		How would you describe your operation?				
Producer	**Age**	**Acres**	**Crops-acres**	**Fields (#)**	**Crop Rotation**	**Tillage methods used**
2	50	2700	Wheat-1000 Alfalfa-700 Grass-1000	~20	Wheat & alfalfa	Conventional Disc, chisel, sweep, very little plowing
3	60	750	Wheat-550 Grass-150 Alfalfa-50	6	Wheat & alfalfa	Conventional
4	65	4000	Wheat-4000 (2000 in SF wtrshd)	~20	None in use	Conservation tillage Disk, chisel, sweep, springtooth
5	60	4300	Wheat-3800 Alfalfa-125 (50 irrig) Corn-70 (70 irrig) Sorghum-200 Grass-100	19 FSA Units	Wheat & alfalfa Corn & wheat for grazeout	Conventional Plow (due to soil types) Disk rip every 3rd yr
6	50	2000	Wheat Soda feed Bluestem grass	~20	None in use	Usually conventional
7	65	4000	Wheat-3000 (1500 in SF wtrshd) Milo-800 Alfalfa-200	No idea! A lot	Milo & wheat	Conventional Notill on milo (2 yrs) Just started notill on some wheat acres
8	40	1700	Wheat Alfalfa Sorghum Cotton	Dependent on crops used and in what acreages	All four crops	Conventional tillage Minimum tillage Just starting some notill methods

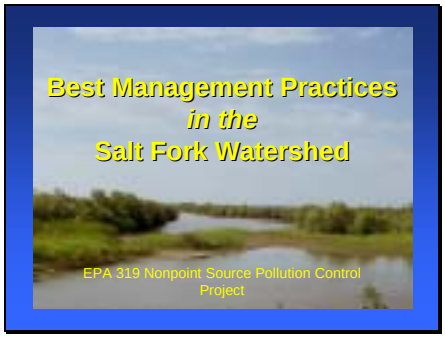
		What kind of recordkeeping do you do?						
Producer	**Comments**	**Field by field**	**Weather**	**Herbicide/ Insecticide**	**Fertilizer**	**Soil Test**	**Yield Goals & Avgs**	**Costs**
2	No particular records are kept.							
3		Y	N	Y	Y	Y	Y	Y
4		Most	N	Y, when used	Y	Y	Y	Costs in relation to profit is a primary concern in all aspects.
5	All records kept on PC.	Y	N	Y	Y	Test ½ farms/yr	Y	Y
6	No specific records are kept.							
7	All records kept on PC. Designed program to track field operations, crops produced, & soil test results.	N	N	Y	Y	Y	N	N
8		N	N	Y	N	N	No specific goals or averages are set, however, productivity is evaluated from a profit/loss standpoint.	More specifically, profit/loss ratio and how it seems to be affected by fertilizers, pesticides, and tillage methods.

		How do you deal with weeds, insects, and disease in your crop(s)?				
Producer	**Comments**	**Pesticide Use**	**Choice of Pesticide**	**Self or Commercial Application**	**How is application timing determined?**	**IPM Methods Used**
2	Dislikes environ. hazards (esp. groundwater), and cost of pesticides	NA	NA	NA	NA	Grazing used as pesticide alternative
3		Y	CCA	Commercial	Scouting	Scouting
4	Dislikes environ. hazards and cost of pesticides	Weeds sometimes, almost never for insects or disease	Applicator	Comm	Usually early spring; necessity & opportunity also considered	Nonr
5	CropQuest online scouting service used when advisor unavailable	Y	CCA; CropQuest	Depends on chemical	CCA, convenience	Grazing is rarely used in place of chemical pest control.
6		Y	Applicator; One most commonly used	Comm	Scouting	Usually scouts personally
7		CCA	CCA	Usually applied themselves	CCA	Area agronomist scouts; Grazing used when opportunity is present or as a last resort to failed crops
8		Y	Comm	Comm Self in future	Crop dependent	None

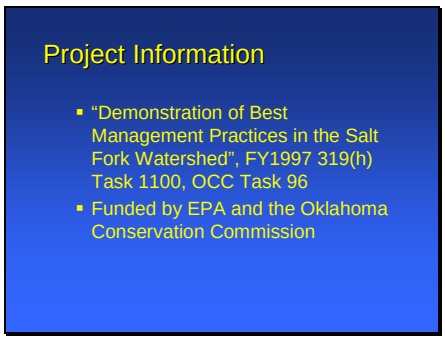
		What is your approach to nutrient management?				
Producer	**Comments**	**Fertilizer Application Rate**	**Split Fertilizer Application**	**Importance of Soil Tests**	**Sub-soil Tests**	**Grazing Considerations**
2	Rotates wht & alf to replenish soil N and avoid fertilizer cost and hazards	Slightly < soil test recs or avg of what others are applying	When applicable	Play role in app. rate determination	None in use	Add ~25 lbs N/ac
3		Soil tests determine appropriate rates as they relate to yield goals	Sometimes	Play role in app. rate determination	Also play role in app. rate determination	Increase rate according to # of animals
4		As per soil test or slightly less, no anhydrous	Usually not	Test ½ fields/yr	None in use	Crops grown for grain, grazing rarely a consideration
5		Determined by soil tests	Usually	Test ½ fields/yr	Taken by area agronomist when possible (too dry last summer)	Add 30 lbs N/ac
6		Slightly less than soil test recommendations	Usually not	Help determine app. rates	Recently started, no results yet	Usually none
7		Determined by soil tests	For wheat, fertilizer applied in spring & fall	Determine fertilizer usage; done annually	Performed annually by CCA in combination with soil tests	Not a primary consideration. When cropland is grazed, allowances are made during spring fertilizer application.
8		Determined by history of how	When possible	Used and recommendations are usually followed	Not used much in past, but more important with the addition of notill methods	Not usually

	What is your view of erosion control practices?					
Producer	**Filter strips**	**Terraces**	**Waterways**	**Riparian Area Management**	**Usefulness**	**Costs**
2	None in place	Work	Usually work	None in use	Terraces and waterways a great deal of help	Farming terraces increase costs, but well worth the alternative
3	None in use	Very practical & useful	Very practical & useful	None needed	Very important on many farms	Costs offset by the alternative of not having them
4	None at present, they are a future consideration	Yes, used on ~75% of land	Y	NA	Very important when properly used and maintained	Terraces and waterways worth costs involved
5	Yes, esp, near areas used by livestock	Useful when necessary	Useful when necessary	Erosion not a major problem	NA	NA
6	None	Work well	Work well	None	Usefulness definitely outweighs cost	
7	Used along creeks, rivers, & as CRP ground	Used commonly	Used in conjunction with terraces	Highly erodible ground placed into notill operations	When using conven-tional tillage, erosion control is a necessity	Additional cost associations outweigh non-use
8	Appropriate for problem areas	Overused or misused	Overused or misused	NA	Of great importance	Costs (profit/loss) key evaluation of crops

Slide 1

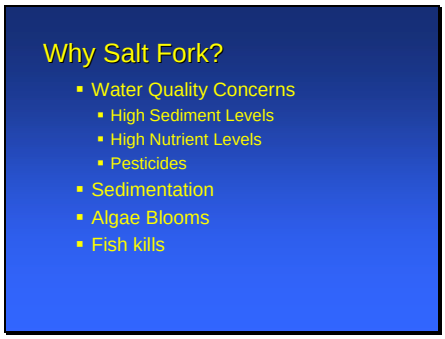


Slide 2



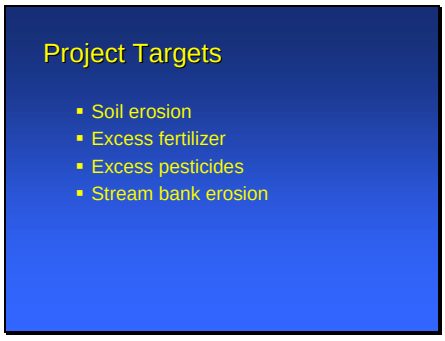
This presentation was produced as part of The Salt Fork Watershed Project, an Oklahoma Cooperative Extension education and demonstration project. It is funded through Section 319 of the Clean Water Act, which targets nonpoint source pollution. "Nonpoint source" means the water contaminant cannot be traced to a specific site.

Slide 3



A 1995 assessment of the Salt Fork of the Arkansas River and the Great Salt Plains Lake indicated that NPS pollutants impaired the quality of these two water bodies. Specific problems identified included toxicity associated with pesticides and metals, high nutrient levels, and high suspended solids. Potential sources for these problems include agricultural activities, the petroleum industry, channelization, removal of riparian vegetation or other stream bank modification, and/or highway maintenance and runoff.

Slide 4

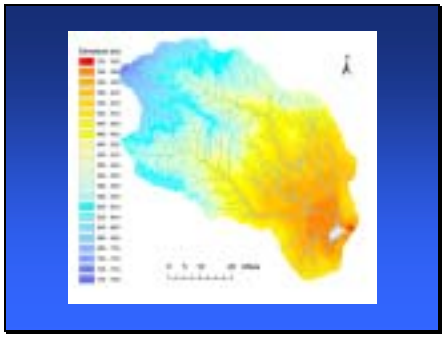


With regard to wheat management, the project is targeted at three main concerns within the Salt Fork watershed; (1) excess fertilizer, (2) excess pesticides, and (3) loss of sediment.

Slide 5

Slide 6

Slide 7



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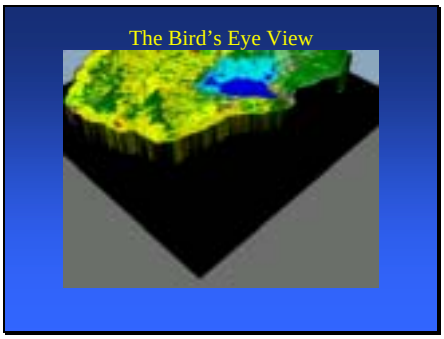

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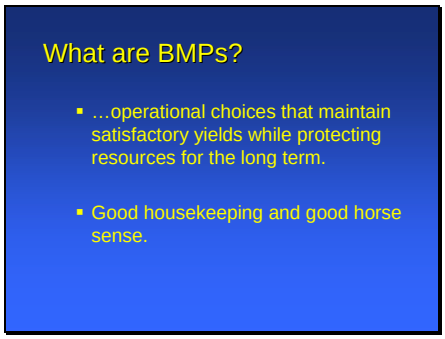
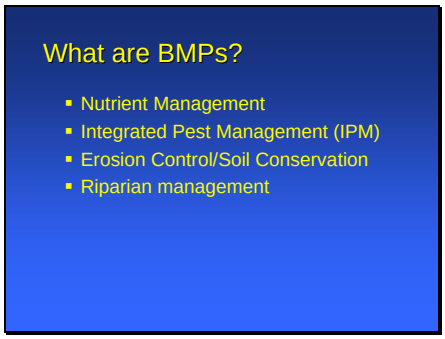


This definition is meant to cover all the bases for explaining why Best Management Practices are promoted by natural resource agencies. The bottom line is that it makes sense to utilize operations that produce good results and protect the air, water, and land resources we've been blessed with.

Slide 10



The project is focused on BMPs in three target areas that follow directly from the results of the 1995 water quality assessment. First of all, in order to reduce the nutrient load in the watershed, proper nutrient management is key. Second, Integrated Pest Management, or IPM, methods help reduce the amount of pesticides used in agriculture production operations. Finally, decreasing sediment loss in runoff is the primary goal of erosion control practices.

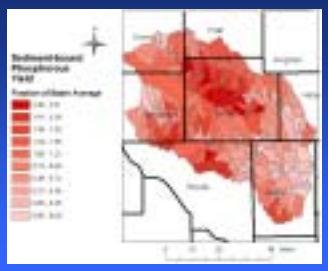
Slide 11

Modeling the sources of pollution

- Sediment sources:
  - grazing land in poor condition
  - Cropland
  - Stream banks
- Phosphorus: sediment-bound and soluble
- Nitrogen: leaching and runoff

Slide 12

Slide 13



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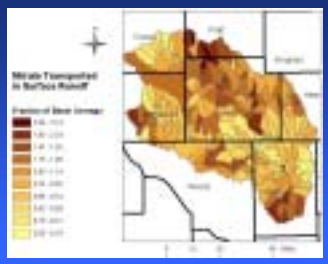

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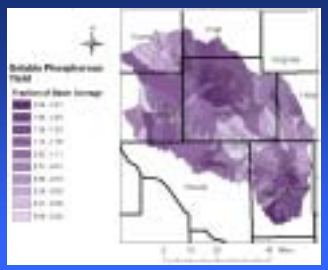


Slide 16

Riparian Management

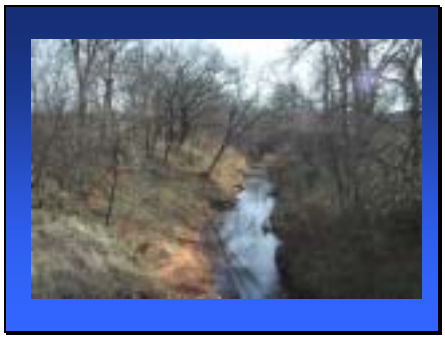
- Protects stream banks
- Provides wildlife habitat
- Protects water quality

Slide 17

Slide 18

Slide 19

Slide 20



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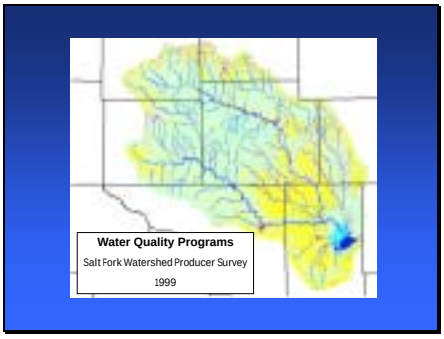


Slide 22

Erosion Control

- Sediment is the number one pollutant.
- Chemicals/nutrients are transported with soil particles.
- Sediment blocks waterways and destroys habitat.

The third and final project focus is the reduction of erosion in the watershed. Sediment is the number one pollutant of waters in the US, and Oklahoma is no exception. An added benefit of reductions in sediment levels is that the chemicals and nutrients bound to soil particles are also controlled, reducing the levels of these pollutants in the water as well.

Slide 23

Erosion Control BMPs

- Terraces
- Grassed waterways
- Conservation tillage
- Filter strips
- Riparian area management

Some erosion control BMPs, such as terracing, grassed waterways, and conservation tillage, are already commonly used in the watershed. The project also hopes to demonstrated the usefulness of filter strips and riparian area management.

Slide 24

Nutrient Management BMPs

- Realistic Yield Goals
- Soil sampling (including subsoil N)
- Manage fields for their unique capabilities.
- Split Nitrogen application on sandy soils.

Nutrient management does not end with knowing how much of what to apply.

Slide 25

Integrated Pest Management: BMPs

- Identify the pests: Weeds, Insects and Mites, Diseases
- Select resistant varieties
- Use biological controls and cultural practices.
- Use pesticides at economic threshold – based on scouting.

The handbook chapter on pest management considers three basic threats to the wheat crop: weeds, insects and mites, and diseases. Full-color photographs in the print version and videoclips in the electronic version aid in the identification of these pests. Brief descriptions of the damage potential and timing, as well as possible control methods, are also given for each pest.

Slide 26

BMP: Integrated Pest Management (IPM)

- A system of insect, weed, and disease management that considers all available control methods
- Economic and environmentally sound

The handbook and the project promote the IPM concept in determining pest control methods to be used. A well-designed wheat IPM program involves planning ahead to create the best possible conditions for growing a healthy wheat crop while limiting pests that may infest the crop. Consistent field monitoring and good record keeping provide a solid information base to aid the decision-making process. The best decisions simultaneously optimize profit and environmental stewardship.

Slide 27

Slide 28

Slide 29

The handbook lists several areas in which the wheat producer can implement IPM methods. Although the overall goal is to reduce the use of chemical pesticides, this is sometimes the most logical course of action. Even when chemicals are used, IPM methods help reduce the amount utilized and make what is used more effective.

Slide 30

Of 87 producers interviewed for a preliminary survey of the area by this project, 82 indicated they raise wheat. The recently released Wheat Management Handbook, developed by the OSU Extension Wheat Management team, provides timely support to the project. It covers all aspects of wheat production in Oklahoma. This handbook is available in print or electronic form by contacting your local Extension office.

Slide 31

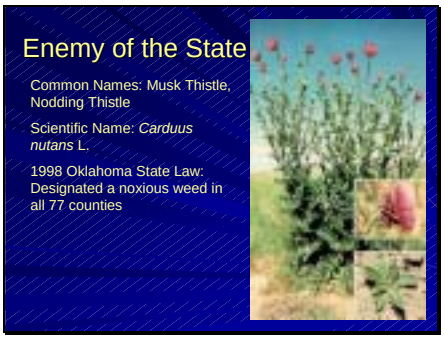
The goal of this project is to demonstrate practices that maintain both agricultural production and natural resources. Best Management Practices are designed to do just that. By using these, the productivity of the land will be greater in the long run.

Slide 32

The timing of this project and the unique aspects of the Salt Fork watershed provide a great opportunity to demonstrate the stewardship of natural resources that can be accomplished with agricultural production.

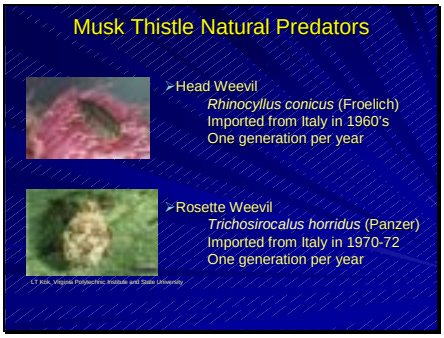
Slide 1

Slide 2

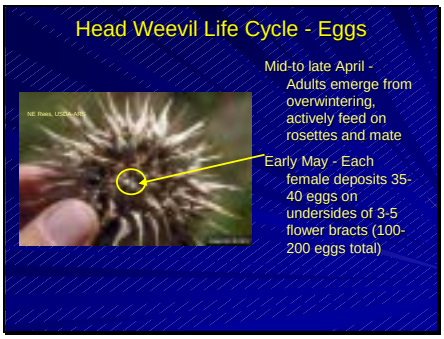


Musk thistle was brought from Europe to the US by accident in the 1860's. Plants are biennials or winter annuals, have one main stem and large purplish blooms. Propagation is by seed alone. A single plant may produce 10,000 seeds. Seeds may remain viable in the soil for as long as five years.
Moderate infestations of musk thistle reduce pasture yields by about 20%. Tillage operations usually destroy plants in crop fields, but thistles may become a problem in early planted wheat, alfalfa, and clover. Because of its negative impact, musk thistle was declared a noxious weed by the State of Oklahoma in 1998. Landowners are required to address infestations on their property.
In addition to mechanical and chemical methods, biological control of this weed is also available. Beginning in the 1960's, US researchers traveled to the original home range of these plants in search of its natural enemies. Musk thistle head & rosette weevils were recovered from areas near Rome, Italy. These species are best matched to our climate and coordinate their life cycle with plant growth in the US.

Slide 3

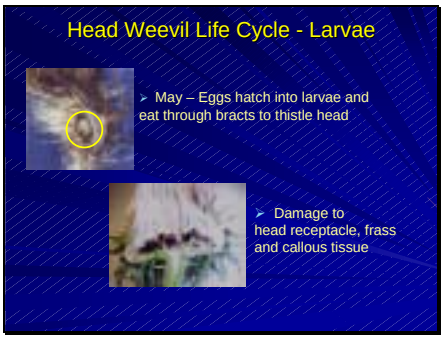


Slide 4



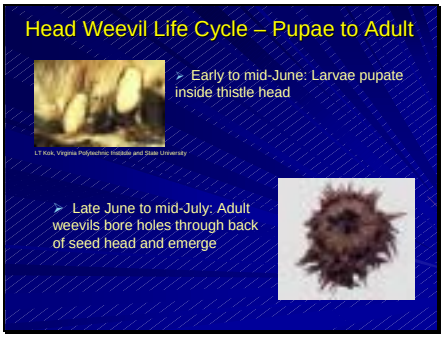
When the eggs hatch the larvae immediately tunnel through the bracts and into the flower head.

Slide 5



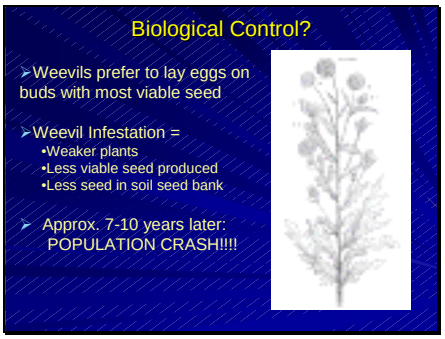
Larvae consume the receptacle tissue of the flower head. This breaks the connectives in the vascular system preventing nutrients from reaching the developing seeds. The plant responds by producing a buildup of callous tissue that further restricts nutrient movement.

Slide 6



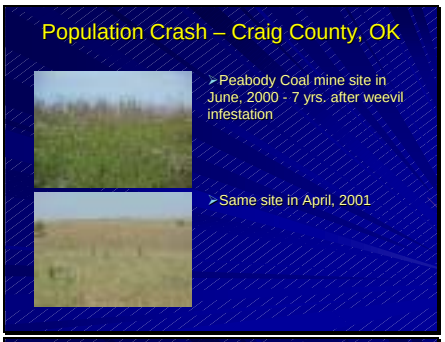
Overall, the eggs take 6-8 days to hatch, larvae feed on the seed heads for 25-30 days, and pupation lasts 8-14 days. Once they emerge in July, most of the new adult weevils seek an overwintering site. In some locations however, a second generation in one season has been observed.

Slide 7



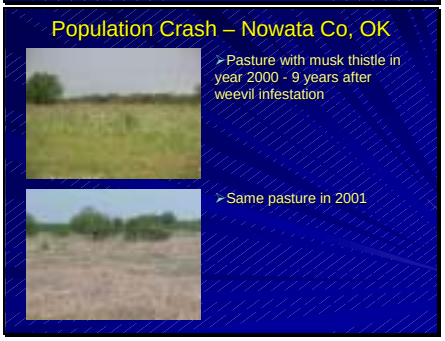
Viable seed positions: The healthiest most viable seed is located on the top four heads (T, A, B, C) Weevils prefer to lay their eggs on these blooms. When all these seeds are destroyed only seed from lower and inner blooms are left. These seeds are less viable and produce weaker, smaller plants. This puts lower quality seed in the seed bank. It becomes a cat chasing it's tail scenario. Each year the most viable seed is consumed and plants become weaker and eventually they will be very thin and have only 3-4 blooms. In about 7-10 years there is little seed left in the soil seed bank and the thistle population crashes.

Slide 8



This location and the next both had very spindly plants with 2-4 blooms each in 2000. None of the plants was healthy and there were very few rosettes present for 2001 plants.

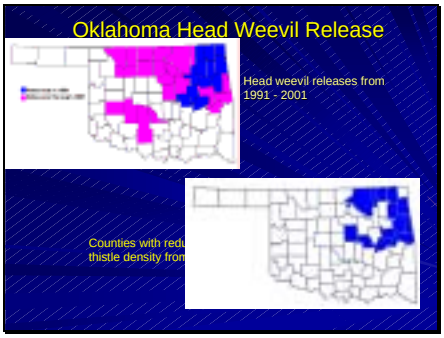
Slide 9



Slide 10

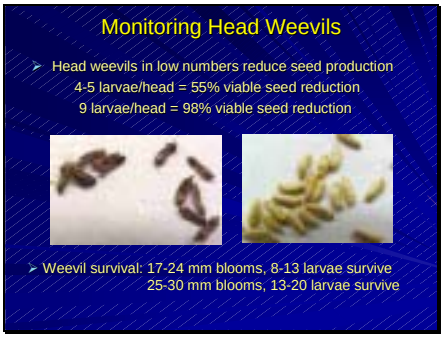
Proper collection technique. In Oklahoma, collections are generally done in the first weeks of May. The weevils are active for approximately 5 week. Best collection is done when the plants are almost ready to bloom (buds in the pink stage or just opening). Weevils are most active on sunny warm days. If it is cold, damp, or rainy they stay near the ground for shelter.

Slide 11



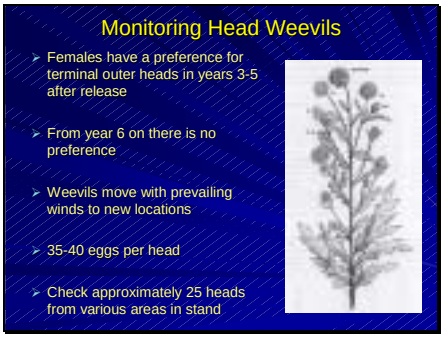
These counties were the ones checked by Mary Roduner during 2000-2001. Other counties have had reductions in the past but were not verified during these two years.

Slide 12



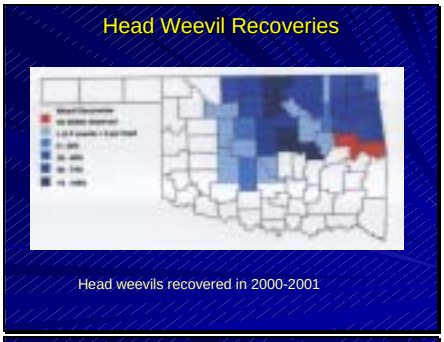
Even one or two larvae in a head reduces seed production.
Seeds on the left did not mature, shriveled and dry
Seeds on the right are mature viable seed
Seeds are heavy for their size
The weevil survival numbers are the numbers of larvae that do 100% damage (no seeds produced) and still survive to adult. If larger numbers of larvae are present, there will be a larval die back until only the number the flower head can support are left. Fewer larvae in each head will still reduce seed production.
Plant structure: first head to develop is the terminal (T), each lateral branch has a terminal (outer heads: A, B, C, etc.), the next blooms (inner heads: A1, A2, etc.)
Weevils can travel as far as eight miles in one year looking for more plants to lay eggs on.
To check for levels of weevil infestation in a thistle infestation: Look at the backs of the four top heads (T, A, B, C). If there are 35-40 eggs per head enough larvae will be present to prevent seed development. Check about 25 heads from various locations (edge, middle, thick areas, thin areas) in a particular stand
Four or more larvae per flower head meant the head was well infested.

Slide 13



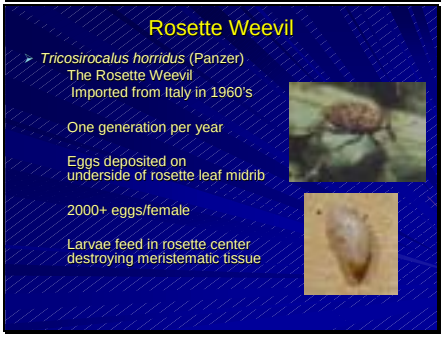
30% of heads with four or more larvae per head meant the site was well infested.

Slide 14



The chart shows the percentage of well infested sites per county.

Slide 15

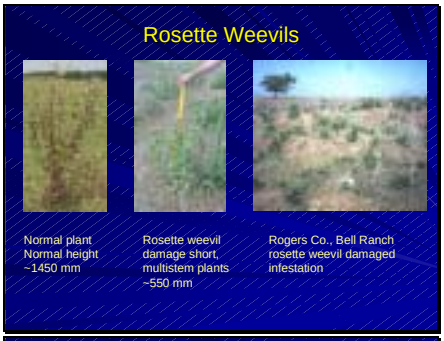


Meristematic tissue is the growing point of the plant. If this is destroyed the plant must produce new growth points. Production of new shoots is very expensive for the plant and reduces it's ability to produce viable seed. Rosette weevils lay eggs starting in the fall on overwintering rosettes. The weevils overwinter as adults, eggs, or larvae. In early spring adults emerge from the soil, lay new eggs for several weeks and die. The overwintering & new eggs hatch and the larvae resume feeding. They pupate in April/May and new adults emerge about the same time as head weevil adults. They feed for a few weeks and then rest through the summer, emerging in the fall to mate & lay eggs.

Slide 16

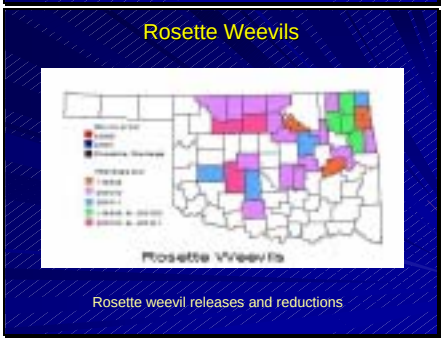
(top left) fall germinated seedling (winter annual), almost no growth tissue left. This plant would not have survived
(top right) spring germinated seedling (biennial), serious tissue damage. This plant will survive but at a reduced efficiency rate.
(bottom left) cross section of a biennial, growth center destroyed and plant will only produce side shoots. Note the amount of dead tissue
(bottom right) cross section of a biennial, tissue regrowth so distorted that much is growing downward into the natural cavity of the roots.

Slide 17



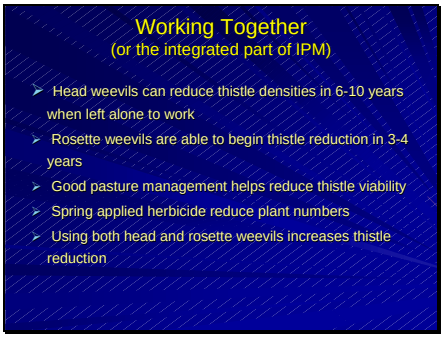
(left) normal plant; one main stem and multiple blooms
(middle) rosette weevil damage, multiple stems, short, will not produce as many viable seeds, the plant spends much of its reserves trying to survive and repair damage
(right) head weevils were released in 1991 and rosette weevils in 1998. This field in 2000 had approximate density of 1 plant per square foot. Almost 80% of weevils collected in 2001 were rosette weevils. The original thistle infestation was 2000+ acres. In 2001 less than 40 acres were still infested.

Slide 18



Rosette weevils released in 1998, 2000, & 2001. Adair Co. had head weevils released in 1991 from MO. A few rosette weevils contaminated some of the containers per Bill Stacy. In 2000 (near Chewey), adult rosette weevils were collected 3 weeks before, and miles away from the first official release site in that county. By 2001 the rosette weevils from this site had moved a mile away and were infesting fields. It took longer with only a few to start, but there is now an established population in the northwest corner of the county.
Rosette weevils recovered from Delaware and Rogers counties in 2001. Records from several of the 1998 release site were lost; no data from those counties.

Slide 19



Summer Crop Tour

August 25, 1999
Alva Area

A Henderson 14

Stop No. 1
Soybeans – Bob Wright

Stop No. 2
Cotton – Lee Brandt, Norman Shafer

Stop No. 3
Soybeans – Martin Kletke
60 lbs. of topdress nitrogen applied to grazeout wheat/tritacale in spring
Disked 2 times, springtoothed, then drilled, with every other hole covered (12 inch rows)
Drilled June 7&8
Maturity Group 5, Round-Up Ready
Herbicide applied on July 5

Stop No. 5
Grain Sorghum – Rick Tyree

Stop No. 6
Grain Sorghum – Kelly Theising
Planted May 10, replanted approx. 10 days later due to hard rain.
Initial planting rate 4 ½ lbs/ac (variety: DK 52). Replanting rate of 2 lbs/ac (variety. DK 54)
Herbicide: ¾ oz. Peak, plus ¾ lb of Atrazine 4L plus 1 qt. crop oil. Applied when majority of milo was aprox. 18" tall

A Hardaway 42

Cotton Production In Northern Oklahoma

OSU Cooperative Extension Informational Meeting

Thursday, February 3
Noon, VIP Supper Club

OSU Cotton Specialist J. C. Banks will cover the basics of cotton production in northern Oklahoma. J.C. is stationed in Altus, in the heart of the traditional cotton producing area of Oklahoma. He has traveled to this area many times over the past few years to work with beginning cotton producers. He is a recognized expert in the industry and will be a great resource. If you have any interest in growing cotton, this is the place to be on Thursday, February 3, at noon. Those attending may go through the buffet for lunch (lunch is on your own.) See you there!

Contact Bob LeValley at the OSU Extension Center if more information is needed. No reservation is necessary.

Attendance => 130

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

North Central Crop Production Conference

February 23, 2000
Blackwell, Oklahoma
Kay Electric Community Building

Registration and Trade Show at **8:30 am**
Presentations at **9:00 am**
Lunch Provided by Sponsors

Production and Outlook Information Dealing With:

Cotton
Corn
Soybeans
Weather

Speakers List:

Brady Brus, KWTV News9 Weatherman
Dr. J.C. Banks, OCES Cotton Specialist
Dr. Ron Sholar, OCES Soybean Specialist
Dr. Gordon Johnson, OCES Soils Specialist
Rick Kockenower, OCES Area Agronomist
J C. Hobbs, OCES Area Ag Econ. Specialist
Dr. Tom Royer, OCES Entomology Specialist
Dr. Miles Karner, OCES Cotton Entomologist

Trade Show including seeds, ginning facilities, fertility, herbicide, and insecticide representatives.

JUN-26-2000 10:59 FROM WOODS CO. OSU EXT. CENTER TO 15982371242 P.04

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

Woods County Extension Center • 407 Government Street, Rm. 22
Alva, Oklahoma 73717-2246 • (580) 327-2786 • Fax (580) 327-2791

Soybeans, Sunflowers, Grain Sorghum

* Attendance 27

OKLAHOMA COOPERATIVE EXTENSION SERVICE

Informational Meeting

Thursday, March 9
Noon, VIP Supper Club

If you have any interest in trying an alternative crop such as soybeans, sunflowers or grain sorghum, plan to attend an informational program on Thursday, March 9, at noon at the VIP. OSU Area Extension Agronomist, Roger Gribble, will review production practices for each of these crops and how they may fit into some type of rotation system.

Contact Bob LeValley at the OSU Extension Center if more information is needed. No reservation is necessary.

Sincerely,

Bob LeValley
Extension Educator Agriculture/
4-H & Youth Development & CED

Attendence => 25

Cotton Production Educational Meeting

Thursday March 30

10 a.m.

Coffee & Doughnuts at 9:45am

Civic Center, Medford, Oklahoma

J.C. Banks

OSU Extension Cotton Specialist

Miles Karner

OSU Area Extension Entomologist

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

Sponsored by the Grant County
OSU Extension Office

Oklahoma State University, U.S. Department of Agriculture, State and local Governments cooperating. Oklahoma Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, sex, age or disability and is an Equal Opportunity Employer

Attendence = 57

No-Till Seminar

April 5, 2000

Wheatland Civic Center

AGENDA

10:00 – 10:10	WELCOME	Dan Wilson
10:10 – 10:40	Advantages/Disadvantages	Dr. Jim Stigler
10:40 – 11:10	Soybean Production	Roger Gribble
11:10 – 11:15	*BREAK*	
11:15 – 11:45	Grain Sorghum Production	Dr. Dale Fjell
11:45 – 12:30	*LUNCH*	(Provided)
12:30 - 3:00	*TOUR*	(Bus Provided)

SPONSORS

Grant County Conservation District

Wheatland RC&D

Novartis Crop Production, Inc.
Gerald Lea (Meal)

DuPont Agriculture Products
Francis Beling (Meal)

Grant County OSU Extension

SPEAKER INFORMATION

Dr. Dale Fjell, Extension Specialist
Crop Production, KSU

Dr. Jim Stigler, State Soil
Management Specialist, OSU

Roger Gribble, Area
Agronomist, OSU

Dan Wilson, Grant County
Conservation District

X Attendance = 82

Wheat Variety Plot Tour

OKLAHOMA COOPERATIVE EXTENSION SERVICE
WOODS COUNTY

Tuesday, May 9, 5:00PM
Wes Mallory Farm, west of Alva on Highway 64

- Discussion of wheat varieties in plot by Roger Gribble, OSU Area Extension Agronomist
- Insecticide Trial Report – Tom Royer, OSU Extension Entomologist

Free dinner at the Woods County Fairgrounds following the plot tour (approx. 6:00) catered by Sterlings

The after dinner program will feature comments by:

- Terry Detrick, President, National Association of Wheat Growers

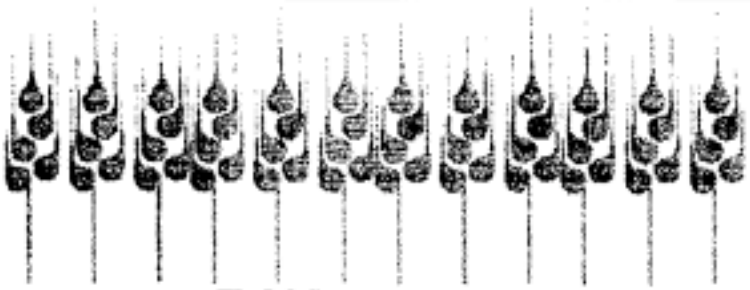
and

- Update on Value Added Products frozen dough co-operative

Special thanks to the following sponsors:

Alva Farmer's Co-op	Alva State Bank
Central National Bank	Community National Bank
Dacoma Farmer's Co-op	Devery Implement
DuPont	Freedom State Bank
Hopeton State Bank	Mark Ream Motor
R&R Systems	Roth Aerial Spraying
Tri-K Equipment	Washburn Motor
Wheeler Bros. Grain	Caldwell Equipment Co. Inc.

Attendence => 40



GRANT COUNTY

Wheat Variety Plot Tours

May 15, 2000

10:00am

Don Kirby Farm

6 miles west of Lamont
on Highway 60
or
8 miles east of Pond Creek
on Highway 60

OSU

Roger Gribble, OSU Area Extension Agronomist
will be leading the discussion on the varieties

Support for the wheat variety trials is provided by
The Oklahoma Wheat Commission

FEB-27-2001 11:33 FROM WOODS CO. OSU EXT. CENTER TO 14057446059 P.02

Agriculture Educational Programs
Woods County
2000-01
Bob LeValley

Nov. 20	Breeding Strategies for Value Based Marketing – Implications for Cow-calf Producers
Nov. 29	Calving Management Shortcourse – Session #1
Dec. 6	Calving Management Shortcourse – Session #2
January 18	Alfalfa Weed & Insect Control, Seasonal Pricing Patterns **Producers meeting**
January 18	Alfalfa Weed & Insect Control – **Applicators only meeting**
Feb. 20	Program Advisory Committee meetings
March 26	Cotton Production Update
March 15	Spring Crop Clinic – Soybeans, Grain Sorghum, Sunflowers
April 12	Pasture & Range Weed Control Summer Supplementation of Stockers
May 8	Wheat Plot Tour

FEB-27-2001 11:34 FROM WOODS CO. OSU EXT. CENTER TO 14957446859 P.03

Alfalfa Weed and Insect Control Update
Thursday, January 18
12 Noon
J&B's Family Restaurant, Alva

You are invited to attend an informational program from the OSU Cooperative Extension Service, designed to bring you the latest research information on alfalfa insect and weed control. Insecticides and weed control products change over time, but your need to control alfalfa pests in the most efficient and economical manner does not change or go away! OSU Extension Specialists Dr. Phil Mulder, from the Entomology and Plant Pathology Department, and Dr. Jim Stritzke, from the Plant and Soil Science Department, will bring you an update of the most current research based recommendations.

We will start with the buffet lunch, then at approx. 12:30 the presentation will begin. We hope to conclude by about 1:30 so you can be back to your normal business. All participants will pay for their own lunch. We do this at noon to try to work around your busy schedule!

Contact us if you have questions!

Producer meeting

FEB-27-2001 11:34 FROM WOODS CO. OSU EXT. CENTER TO 14857443059 P.04

Applicator only meeting

January 3, 2001

Alfalfa Insect and Weed Control Update
Thursday, January 18
10:00 AM –12 Noon
J&B's Family Restaurant, Alva

**********Applicators Only**********

Mark your calendar for an update on the latest research information concerning alfalfa weed and insect control.

Speakers:

Dr. Phil Mulder, OSU Extension Entomologist, will discuss research results concerning aphid and weevil control.
Dr. Jim Stritzke, OSU Extension Weed and Brush control Specialist, will discuss control options for grassy and broadleaf weed problems in alfalfa.

This program is directed to applicators only. A program with similar topics for producers is scheduled at noon. We hope you will invite and encourage your alfalfa producers customers to attend the producer session. (You are welcome to attend the producer session if you wish.) We have applied for CCA and Pesticide Applicator CEU's.

The restaurant will have their usual buffet at noon. Lunch is on your own. We hope you will stay to eat lunch at the restaurant and visit with the OSU personnel or producers who come for the producer session.

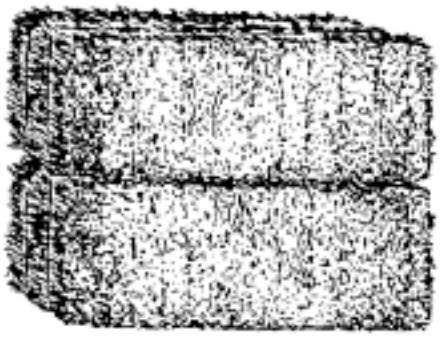
Sincerely,

Bob LeValley,
Extension Educator Agriculture/4-H & CED
rlevall@okstate.edu

02/22/01 THU 14:00 FAX 580 596 3172 ALFALFA CO OSU EXT 003

Alfalfa Production Clinic

February 27th, 2001
9:30 A.M.
Alfalfa County Exhibit Building
Alfalfa County Fairgrounds
Cherokee, Oklahoma



9:15 A.M.	Registration
9:30 A.M.	Dr. Gordon Johnson, Ext. Soil Specialist Alfalfa Soil Fertility
10:30 A.M.	Dr. Jim Stritzke, Ext. Weed & Brush Specialist Weed Control in Alfalfa
11:00 A.M.	Dr. John Caddel, Ext. Alfalfa Breeding Alfalfa Varieties & Market Attitudes
11:30 A.M.	Questions & Comments

For more information contact Tommy Puffinbarger at the Alfalfa County OSU Extension Office, 580-596-3131.

Q: Hello **********
T: 2 1
Hello, my name is _____ and I'm calling from Oklahoma State University on behalf of Drs. Mike Smolen and Gerrit Cuperus from the Oklahoma Cooperative Extension Service. In 1999 you participated in a survey with us concerning nutrient and pest management practices. We would like to ask you 12 questions to determine how your practices may have changed since then. Before we start, I want to assure you that your answers are strictly confidential and this will only take about 10 minutes of your time.

I'D LIKE TO BEGIN BY ASKING YOU SOME QUESTIONS ABOUT THE CROPS YOU PLANT.

1. How many acres of wheat do you farm?
   NUM (if less than 50, skip to Question 10)
2. What is your yield goal for wheat? How many bushels per acre?
   NUM
3. How many pounds of Nitrogen per acre do you typically apply to wheat as pre-plant?
   NUM
4. How many pounds of Nitrogen per acre do you typically apply to wheat as top dress?
   NUM
5. How many pounds of Phosphate per acre do you typically apply to wheat?
   NUM
6. Do you have the same yield goals for all fields or do you treat some differently?
   (a) all are the same
   (b) some are different
   ANSWER A OR B
7. Do you utilize conservation tillage practices in any of your wheat fields? (READ DEFINITION: "Conservation tillage is any system that keeps crop residue on the surface to prevent erosion. This would include chisel plowing, sweep plowing, or disking, but not mold board plowing or disk plowing that buries crop residue.")
   YES/NO
8. Would you consider using No-till for wheat?
   YES/NO
9. What is your average yield for wheat? Bushels per acre.
   NUM
10. Would you consider installing a vegetated buffer between your crop fields and the creek?
    YES/NO
11. Would you consider planting trees to hold creek banks?
    YES/NO
12. How do you control musk thistle on your land?
    (RECORD ALL RESPONSES. ANSWERS ARE CONFIDENTIAL)

THOSE ARE ALL OF MY QUESTIONS. THANK YOU FOR YOUR TIME. WOULD YOU BE INTERESTED IN A COPY OF THE REPORT ON THIS SURVEY? IF YES, GIVE NAME AND ADDRESS (CONFIDENTIALLY) HAVE A GOOD DAY/EVENING.

Agricultural Producers in the Salt Fork Watershed Area of Oklahoma State University
Follow-up Telephone Survey
August 2002
Tables

Q1 How many acres of wheat do you farm?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
30	1	5.9	0	0.0	0	0.0	1	2.0
40	0	0.0	0	0.0	1	4.3	1	2.0
100	1	5.9	0	0.0	0	0.0	1	2.0
160	2	11.8	0	0.0	0	0.0	2	4.0
200	1	5.9	0	0.0	0	0.0	1	2.0
240	0	0.0	0	0.0	1	4.3	1	2.0
275	0	0.0	1	10.0	0	0.0	1	2.0
300	1	5.9	0	0.0	1	4.3	2	4.0
400	1	5.9	0	0.0	0	0.0	1	2.0
450	0	0.0	0	0.0	1	4.3	1	2.0
500	0	0.0	2	20.0	1	4.3	3	6.0
600	1	5.9	0	0.0	2	8.7	3	6.0
640	1	5.9	0	0.0	0	0.0	1	2.0
750	1	5.9	1	10.0	0	0.0	2	4.0
800	1	5.9	2	20.0	2	8.7	5	10.0
900	0	0.0	0	0.0	1	4.3	1	2.0
950	0	0.0	0	0.0	2	8.7	2	4.0
1000	0	0.0	1	10.0	1	4.3	2	4.0
1010	1	5.9	0	0.0	0	0.0	1	2.0
1200	0	0.0	0	0.0	1	4.3	1	2.0
1500	0	0.0	1	10.0	1	4.3	2	4.0
1585	0	0.0	1	10.0	0	0.0	1	2.0
1800	0	0.0	1	10.0	1	4.3	2	4.0
2000	1	5.9	0	0.0	1	4.3	2	4.0
2500	2	11.8	0	0.0	3	13.0	5	10.0
3500	0	0.0	0	0.0	1	4.3	1	2.0
3600	0	0.0	0	0.0	1	4.3	1	2.0
4000	2	11.8	0	0.0	1	4.3	3	6.0
Total	17	100.0	10	100.0	23	100.0	50	100.0

Q2 What is your yield GOAL for wheat? How many bushels per acre?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
20	0	0.0	0	0.0	1	4.5	1	2.1
30	2	12.5	2	20.0	0	0.0	4	8.3
33	1	6.3	0	0.0	0	0.0	1	2.1
35	1	6.3	1	10.0	2	9.1	4	8.3
40	1	6.3	2	20.0	12	54.5	15	31.3
45	2	12.5	2	20.0	1	4.5	5	10.4
50	8	50.0	2	20.0	6	27.3	16	33.3
55	1	6.3	1	10.0	0	0.0	2	4.2
Total	16	100.0	10	100.0	22	100.0	48	100.0

Q3 How many pounds of Nitrogen per acre do you typically apply to wheat as PRE-PLANT?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
0	3	18.8	0	0.0	4	19.0	7	14.9
10	0	0.0	1	10.0	0	0.0	1	2.1
15	1	6.3	1	10.0	0	0.0	2	4.3
19	0	0.0	0	0.0	1	4.8	1	2.1
30	1	6.3	1	10.0	2	9.5	4	8.5
35	0	0.0	0	0.0	1	4.8	1	2.1
36	0	0.0	1	10.0	0	0.0	1	2.1
40	2	12.5	1	10.0	2	9.5	5	10.6
50	3	18.8	0	0.0	7	33.3	10	21.3
60	3	18.8	0	0.0	0	0.0	3	6.4
62	0	0.0	1	10.0	0	0.0	1	2.1
65	0	0.0	1	10.0	0	0.0	1	2.1
70	3	18.8	1	10.0	3	14.3	7	14.9
80	0	0.0	2	20.0	0	0.0	2	4.3
100	0	0.0	0	0.0	1	4.8	1	2.1
Total	16	100.0	10	100.0	21	100.0	47	100.0

Q4 How many pounds of Nitrogen per acre do you typically apply to wheat as TOP DRESS?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
0	1	6.3	2	20.0	4	19.0	7	14.9
20	1	6.3	0	0.0	0	0.0	1	2.1
25	1	6.3	0	0.0	1	4.8	2	4.3
28	0	0.0	1	10.0	0	0.0	1	2.1
30	8	50.0	3	30.0	3	14.3	14	29.8
32	0	0.0	1	10.0	0	0.0	1	2.1
33	0	0.0	0	0.0	1	4.8	1	2.1
40	1	6.3	2	20.0	3	14.3	6	12.8
50	1	6.3	0	0.0	5	23.8	6	12.8
55	1	6.3	0	0.0	1	4.8	2	4.3
56	1	6.3	0	0.0	0	0.0	1	2.1
60	0	0.0	0	0.0	1	4.8	1	2.1
80	1	6.3	0	0.0	1	4.8	2	4.3
90	0	0.0	1	10.0	0	0.0	1	2.1
100	0	0.0	0	0.0	1	4.8	1	2.1
Total	16	100.0	10	100.0	21	100.0	47	100.0

Q5 How many pounds of Phosphate per acre do you typically apply to wheat?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
0	5	33.3	0	0.0	6	30.0	11	25.6
10	1	6.7	0	0.0	0	0.0	1	2.3
11	0	0.0	0	0.0	1	5.0	1	2.3
20	1	6.7	1	12.5	0	0.0	2	4.7
23	0	0.0	1	12.5	0	0.0	1	2.3
25	0	0.0	0	0.0	1	5.0	1	2.3
28	2	13.3	0	0.0	0	0.0	2	4.7
30	1	6.7	0	0.0	4	20.0	5	11.6
34	0	0.0	1	12.5	0	0.0	1	2.3
35	0	0.0	1	12.5	1	5.0	2	4.7
45	0	0.0	0	0.0	1	5.0	1	2.3
46	4	26.7	0	0.0	5	25.0	9	20.9
50	0	0.0	1	12.5	1	5.0	2	4.7
65	0	0.0	1	12.5	0	0.0	1	2.3
70	0	0.0	1	12.5	0	0.0	1	2.3
92	0	0.0	1	12.5	0	0.0	1	2.3
100	1	6.7	0	0.0	0	0.0	1	2.3
Total	15	100.0	8	100.0	20	100.0	43	100.0

Q6 Do you have the same management yield goal for all your fields, or do you treat some fields differently?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	All are the same	12	75.0	6	60.0	14	63.6	32	66.7
2	Some are different	4	25.0	4	40.0	8	36.4	16	33.3
	Total	16	100.0	10	100.0	22	100.0	48	100.0

Q7 Conservation tillage is any system that keeps crop residue on the surface to prevent erosion. This would include chisel plowing, sweep plowing, or disking, but NOT mold board plowing or disk plowing that buries crop residue. Do you utilize conservation tillage practices in any of your wheat fields?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Yes	15	93.8	7	70.0	20	90.9	42	87.5
2	No	1	6.3	3	30.0	2	9.1	6	12.5
	Total	16	100.0	10	100.0	22	100.0	48	100.0

Q8 Would you consider using No-till for wheat?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Yes	9	56.3	4	40.0	10	45.5	23	47.9
2	No	7	43.8	6	60.0	12	54.5	25	52.1
	Total	16	100.0	10	100.0	22	100.0	48	100.0

Q9 What is your average YIELD for wheat? How many bushels per acre?

	Alfalfa County		Grant County		Woods County		All Respondents	
	n	%	n	%	n	%	n	%
0	1	6.3	0	0.0	0	0.0	1	2.1
10	1	6.3	0	0.0	0	0.0	1	2.1
12	0	0.0	0	0.0	1	4.8	1	2.1
20	0	0.0	1	10.0	0	0.0	1	2.1
23	0	0.0	1	10.0	1	4.8	2	4.3
25	0	0.0	0	0.0	1	4.8	1	2.1
28	0	0.0	1	10.0	0	0.0	1	2.1
29	0	0.0	1	10.0	0	0.0	1	2.1
30	1	6.3	1	10.0	2	9.5	4	8.5
32	0	0.0	1	10.0	3	14.3	4	8.5
33	0	0.0	0	0.0	1	4.8	1	2.1
35	3	18.8	2	20.0	3	14.3	8	17.0
36	0	0.0	0	0.0	1	4.8	1	2.1
38	1	6.3	2	20.0	1	4.8	4	8.5
40	2	12.5	0	0.0	3	14.3	5	10.6
42	3	18.8	0	0.0	0	0.0	3	6.4
43	1	6.3	0	0.0	1	4.8	2	4.3
45	1	6.3	0	0.0	1	4.8	2	4.3
48	1	6.3	0	0.0	0	0.0	1	2.1
50	1	6.3	0	0.0	1	4.8	2	4.3
55	0	0.0	0	0.0	1	4.8	1	2.1
Total	16	100.0	10	100.0	21	100.0	47	100.0

Q10 Would you consider installing a vegetated buffer between your crop fields and the creek?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Yes	12	70.6	8	80.0	7	30.4	27	54.0
2	No	2	11.8	1	10.0	4	17.4	7	14.0
3	Not applicable – no creek banks	3	17.6	1	10.0	12	52.2	16	32.0
	Total	17	100.0	10	100.0	23	100.0	50	100.0

Q11 Would you consider planting trees to hold creek banks?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Yes	5	29.4	3	30.0	4	17.4	12	24.0
2	No	9	52.9	6	60.0	8	34.8	23	46.0
3	Not applicable – no creek banks	3	17.6	1	10.0	11	47.8	15	30.0
	Total	17	100.0	10	100.0	23	100.0	50	100.0

Q12 How do you control musk thistle on your land? Please tell me all the ways.

Responses
We haven't got any yet.
I turned out weevils, and have sprayed with a mix of round-up, and something else, I don't remember what it was for sure.
I don't have a problem with it.
I've been spot spraying with round up.
I haven't had a problem with it yet and if we do we just pull it out.
I just plow it up; I haven't really done anything about it, even though I know I should.
I plow them up and under. I have used the Finesse also.

Q12 (cont'd). How do you control musk thistle on your land? Please tell me all the ways.
I spray with Brash.
Really we haven't been bothered by that.
We used tilling and sprayed with round-up.
We have all of our pastures sprayed every year but I do spot spray or dig some of it out.
I have used 24D and another chemical; I don't remember the other chemical I have used.
We spray and I get out there and dig it by hand if we need to.
I don't have any.
We don't have a problem with that yet but if we have it we dig it up or spot spray it.
I try to cut it out or spray it.
I treat them with Gleen.
I fight a little bit of that but I just use a herbicide.
I went and got bugs. I just did it this spring. I used to spray and that just didn't work.
I spray with Grazon, or pull it up.
I end up spraying it, I suppose.
I use chemicals; I don't remember for sure what they are.
Usually I just spray it.
I spray with 24D mixed with Hyvar.
Currently I am spraying it.
I hand pick them and use some spray.
I chop it out early.
This year I sprayed. I just go out and dig it up.
Grazon spraying.
I chop it off or spray with Grazon p+d
I don't have any
I haven't got any.
I usually spray.
We really don't have that problem on our cropland.
We treat it very carefully. Up until this year we've been spot spraying and we have put out some weevils.
We do it by hand and spray.
I spray all my pastures but I usually don't spray all my land.
Well we do it with weevil. I sprayed them to start with.
We use Cimarron Max. But we only have the problem in our grass pasture, not the crop field.
I don't have a problem in my crop fields.
I dig it up.
We do it mostly by hand.
We used to spray, but haven't in a few years.
We spray with Round-up and hand chop.
I've had it sprayed with an airplane or use a shovel.
I try and spray it. If there's not very many I take a hoe to it.
I don't have any.
So far we've been lucky enough not to have any.
This year we started a program of spraying. I personally walk all of my land with a hand sprayer.
We do it by hand cutting and spraying with Grazon, or a 240 product.

Q13 Those are all of my questions. Would you be interested in a copy of the report on this survey?

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Yes	11	64.7	7	70.0	19	82.6	37	74.0
2	No	6	35.3	3	30.0	4	17.4	13	26.0
	Total	17	100.0	10	100.0	23	100.0	50	100.0

county County code

		Alfalfa County		Grant County		Woods County		All Respondents	
		n	%	n	%	n	%	n	%
1	Alfalfa county	17	100.0	0	0.0	0	0.0	17	34.0
2	Grant county	0	0.0	10	100.0	0	0.0	10	20.0
3	Woods county	0	0.0	0	0.0	23	100.0	23	46.0
	Total	17	100.0	10	100.0	23	100.0	50	100.0