Farm and Ranch Wellhead and Ground Water Assessment Pilot Project

Final Report

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The OSU Oklahom*A*Syst Team gratefully acknowledges the support of the USDA Water Quality Initiative Program for its financial support for the Oklahom*A*Syst county mini-grant program.

Executive Summary

A wellhead and ground water assessment pilot project was conducted in several Oklahoma counties. With input from several state and federal regulatory and educational agencies, educational materials and assessment forms developed by the national Farm*A*Syst program were adapted to suit Oklahoma conditions and regulations.

Two counties were selected for a pilot study of the program. In one county the program was delivered through Family Community Education (FCE) clubs. In the other county the program was delivered largely through meetings arranged through traditional agricultural producer groups. The county model that directed its efforts through the FCE groups, targeting the adult female member of households produced a greater response from the public.

Participants in the program were promised free water screenings for attending the educational meetings. Equipment that permitted testing of water samples for total dissolved solids (TDS), pH and nitrate during the meetings was purchased, and a testing procedure that assured reliable results was established. Participants were additionally given the opportunity to have a free bacteria test on their water. Arrangements were made with the Oklahoma Department of Environmental Quality Environmental Laboratory for this testing.

Participants in the pilot project were surveyed to determine what effect participation in the program had on their on-farm activities that could alter the risk to ground water contamination on their property. The survey found that 38% of those responding reported tested their water for bacteria for the first time ever, 32% changed how hazardous products were handled, and 15% changed their handling practices for fertilizers and pesticides.

An additional finding from the pilot project was that significant numbers of participants in the program were not involved in primary agricultural production. They were rural and suburban dwellers, who worked in the metropolitan area, but preferred living on a small acreage outside of the city. This reflected the findings in other states implementing Farm*A*Syst. As a result, the Home*A*Syst program was developed. Draft materials from the national Farm*A*Syst/ Home*A*Syst office was adapted for use in Oklahoma. These new materials were printed and a second printing of Farm & Ranch*A*Syst materials was made.

To determine the effectiveness of the integrated Oklahom*A*Syst program in bringing about changes ground water protection practices around the home a survey of participants was made. A total of 335 surveys were mailed to participants in six counties that had programs in 1996/97. 38% of the surveys were returned. 34% completed the assessment planner and map for their property. 26% of the respondents completed at least one other work sheet. 45% of respondents reported making at least one change on their property as a result of the program, with the cost of changes ranging from $0 to $3422. 23% of respondents reported they had not made changes, but planned to as a result of the program.

Since implementation of the pilot project began water tests have been provided at public meetings as an incentive for public participation. 886 samples were tested for nitrate, TDS and pH. 7% of the samples exceeded the Safe Drinking Water Act (SDWA) standard of 10 mg/l for nitrate. 42% exceeded the SDWA guideline for of 500 mg/l for TDS. 204 participants also had their water tested

for coliform bacteria. 46% of the tests were positive for the presence of coliform bacteria. (Note: These results also include data from in-service training for CES personnel, and results of from Home*A*Syst meetings that were part of the Oklahoma City Blue Thumb Project.)

Oklahom*A*Syst has been made available to citizens in eleven counties as a direct result of this pilot project. The expansion of Oklahom*A*Syst throughout the state is proceeding as rapidly as possible with the personnel and financial resources that are available at this time. It is currently available to residents of all counties through OSU Cooperative Extension Service (through mini-grants supported the USDA Water Quality Initiative program). OCES anticipates that with current levels of support that expansion into 4 to 6 new counties each year is possible. Expansion into more counties is ongoing through support from county Conservation Districts, and in some cases as a service supported by externally funded grants.

Farm and Ranch Wellhead and Ground Water Assessment Pilot Project

Background

The majority of Oklahoma's rural residents rely on ground water for their drinking water supply. Ground water in Oklahoma is often highly mineralized from natural sources, with aesthetic

problems of hardness and high total dissolved solids (TDS) being the most frequent complaints. The most common water quality problems that are primary health concerns are bacterial contamination and high nitrates. Routine testing of public water supplies during 1993 and 1994 indicate approximately 170 public supplies using ground water in the state exceed the Safe Drinking Water Act standard of 10 mg/L for nitrate nitrogen. (Personal communication with DEQ Environmental Laboratory, 1996) A significant number of private water wells were expected to have excess nitrate-nitrogen levels as well.

Accurate information regarding the number of private water wells in the state with biological contamination problems is not available. At the outset of this program anecdotal information from extension personnel about requests for treatment options in contaminated wells led to the conclusion that bacterial contamination of private water wells would be a major concern.

Caddo County, in southwest Oklahoma, was selected as one of the original pilot project sites. The county is characterized by sandy soils with fractured sandstone bedrock. The county supports intense agriculture, producing peanuts, cotton, wheat, alfalfa, livestock and a number of minor crops. About one-third of the population is served by private wells. The Rush Springs aquifer, the main ground water supply for two-thirds of the county, has nitrate-nitrogen levels above IO mg/I.

Lincoln County, in northeast Oklahoma, was the second of the original pilot project sites. The' county has heavier soils and rolling topography. Agricultural production is less intensive, but risks to ground water from inadequate household waste systems, household hazardous wastes, and petroleum products are believed to be significant risks. Nearly half of the residents are served by private wells. Ground water sources include shallow alluvial formations near streams, and the Vamoosa and the Garber-Wellington aquifers. Nitrate-nitrogen contamination is not common, but saline contamination associated with petroleum production and microbiological contamination are.

A number of reasons are suspected for poor water quality in private wells. Many areas of Oklahoma have naturally high TDS levels, but oil production has resulted in salt brine contamination in numerous locations. High nitrate levels may stem from crop production activity, animal production, or human sewage. Coliform contamination likely comes from surface water entering poorly constructed wells, carrying bacteria from human or animal wastes. It is believed that by educating the public about the risks of certain activities in the area around water wells and the problems of poor well construction, they will be motivated to improve conditions in their private wellhead area.

Project Location

The project was set-up with two pilot counties, Lincoln and Caddo counties. During the initial project phase when materials and procedures were being developed, activities were limited to

these two counties. After the initial phase, the project area expanded to encompass several more counties, including Okfuskee and Pottawatomie in 1996 and Adair, Carter, Cleveland, Delaware, Grady, LeFlore, and Haskell in 1997. (Home*A*Syst assessments were also incorporated as part of the Oklahoma City Blue Thumb Project in 1996-1997. Consequently, 7 additional public meetings were held in Oklahoma County, but the results of those meetings are not covered in this report.)

Steering Committees
Each of the pilot counties had a steering committee established to help develop public interest and support for the program. In Lincoln County the committee consisted largely of the leaders of the Family Community Education clubs (formerly Extension Homemaker clubs) in the major communities of the county. In Caddo County the committee was made up of selected people generally recognized as community leaders in the agricultural sector. The Lincoln County model seemed to function quite effectively, with the subsequent public meetings being well publicized and well attended. The committee in Caddo County functioned much less effectively.

County Staff Training
The field staff of each pilot county was trained by working through a case study assessment. The assessment planner was completed, potential sources of contamination identified, and the assessment work sheet for each identified risk completed. Training slide-sets were obtained from the Farrn*A*Syst/Home*A*Syst national office to help identify various structures and systems that might be encountered in a typical assessment.

Community Group Activation
The leadership of county FCE groups in Lincoln County were given training in the scope and aims of the Farm & Ranch*A*Syst program. The county home economist developed a small, hand-held flip chart for use by club leaders in making presentations to their club members. The club members were encouraged to complete the assessments for their own household, and to then assist one other neighbor or family member to do an assessment on their property.

In Caddo County the agricultural focus groups functioned less well. Additional contacts were attempted through the Vocational Agriculture classes at three high schools. Educational sessions were held as part of the regular class programming. Return visits to the schools resulted in fewer than five assessments being completed.

Printed Materials Development
Draft copies of the original Farm*A*Syst fact sheets and work sheets were obtained from Wisconsin. Review of these materials revealed that a number of regulations cited in them differed substantially from Oklahoma regulations. These differences, plus the differences in agricultural enterprises convinced the project personnel at Oklahoma State University Cooperative Extension Service (OCES) that modifications had to be made before local use. A team of representatives from a number of state and federal agencies having educational and regulatory responsibilities related to ground water was assembled to modify the draft materials. The agencies represented included OCES, Oklahoma Secretary of Environment (OSE), Oklahoma Department of Agriculture (ODA), Oklahoma Department of Health (ODH), Oklahoma Conservation Commission (OCONSC),

Oklahoma Corporation Commission (OCORPC), and USDA Natural Resource Conservation Service (NRCS).

After several months of rewriting, review by interested agencies, and revision, the Oklahoma Farm & Ranch*A*Syst Fact Sheets and Work Sheets were completed and 750 copies of each were printed. The topic areas for the fact sheets and companion work sheets are:

1. Site Assessment Planner and Glossary

2. Water Well Condition
3. Pesticide Storage and Handling
4. Fertilizer Storage and Handling
5. Petroleum Product Storage and Handling
6. Hazardous Waste Management
7. Household Wastewater Treatment
8. Swine, Dairy and Beef Waste Management
9. Poultry Waste Management

At the same time the fact sheets and work sheets were printed a tri-fold color brochure explaining the features and purposes of Farm & Ranch*A*Syst was printed. These brochures were used to advertise and promote the program in the pilot counties, and to promote the program with agency personnel in other counties in the state. (See Farm & Ranch*A*Syst Publications, Appendix K.)

The pilot project was originally aimed at agricultural producers. However, it was soon discovered that a significant number of participants at meetings were not involved in agriculture. Many of the people attending the meetings to get information about protecting their water wells were people who lived on a small acreage in the countryside and worked in the city. Others live in small, unincorporated communities without city water or sewers. Various discussions took place among project personnel about how to best serve these participants for whom the Farm & Ranch*A*Syst literature was not designed.

In 1996 the National Farm*A*Syst office announced the development of a set of draft fact sheets and work sheets called Home*A*Syst. These materials were aimed at educating rural and suburban, non-agricultural homeowners about water well protection. OCES personnel obtained a copy of these draft materials. These drafts were modified in a manner similar to the original Farm*A*Syst drafts. Printing of 1000 copies each of the newly modified Home*A*Syst materials were completed in March 1997. At the same time an additional I 000 copies of the original Oklahoma Farm & Ranch*A*Syst materials were printed after minor editorial corrections from the first printing were made. (See Home*A*Syst publications, Appendix A.)

With the addition of the Home*A*Syst materials a new name for the program was required to reflect its broader nature. Oklahom*A*Syst was chosen for the name of the program. Participants in the program receive either the Farm & Ranch*A*Syst information packet or the Home*A*Syst packet, depending on the nature of activity on their property. With the changes in the program, it was necessary to reprint the advertising brochure with the changes incorporated. The new brochure was completed and printed in June 1997.

Water Testing

As an incentive for public participation in the Farm & Ranch* A* Syst program it was decided to offer an evaluation of drinking water condition for citizens who attended educational meetings. After reviewing the options for professional laboratory analysis and the costs of laboratory equipment it was decided that the most cost-effective approach was to purchase analytical equipment and perform the tests with project personnel. An Orion ion selective electrode and meter were purchased to perform nitrate measurements, and a Cole-Parmer conductivity/pH meter to evaluate total dissolved solids (TDS) and pH.

Because of the number of public meetings scheduled during the course of this project, it was necessary for a number of different persons to be able to prepare and operate the testing equipment. It was recognized that it would be difficult to operate efficiently and to achieve consistent, accurate results with a variety of instrument operators unless some standardized procedures were established. Consequently, a laboratory procedure manual was developed with a standard preparation and test procedure to be followed by all project personnel performing water tests. This included meter maintenance, calibration and operation; standards preparation; sample identification, preparation and handling. A standard laboratory notebook is maintained whenever water samples are tested to record meter accuracy and to identify any problems to be corrected. (See Laboratory Notebook, Appendix B.)

In order to insure that the findings of any water tests and any resulting recommendations made to the land owners are valid is was necessary to develop quality control practices for the testing of water samples at Oklahom*A*Syst meetings. The manufacturers of the meters have established testing procedures that assure the quality of their test results. These procedures include testing practices, checks for meter calibration through use of spiked and duplicate samples, and protocols for meter recalibration and sample retesting based on the error analysis of spiked and duplicate sample tests. Following these procedures the projected level of accuracy for the nitrate testing equipment is ±10%. The accuracy for conductivity measurements is projected to be ±1% ±1 digit, while pH accuracy is ±0.1% ±1 digit. (See QAPP, Appendix C.)

In the course of the project, from 1995 through 1997, 886 samples of drinking water were evaluated for nitrate, TDS, and pH. The results show that 7% of the samples tested exceed the federal standard of 10 mg/l nitrate-nitrogen for public water supplies. Further, 42% of the water tests exceeded the federal guideline of 500 mg/l for TDS. A portion of the meeting participants took home sterile sample bottles to have their water evaluated for biological quality by the Oklahoma DEQ Environmental Laboratory. The DEQ Laboratory provided the project with a summary of results showing that 204 participants obtained bacterial tests with 46% of the tests being positive for total coliform bacteria. (See Water Test Results, Appendix D.)

Public Meetings

The process for promoting the Oklahom* A* Syst program was to hold a number of public meetings in several communities in each county where the program was targeted. The meetings were advertised through OCES circulars and newsletters, and in local media. (See Public Meeting Notices, Appendix E.) In the advertising for these meetings the public was encouraged to bring a sample of

their drinking water for nitrate, TDS, and pH screening. At these meetings the project staff would explain the aims of the program and the agencies involved. Appropriate project literature would be distributed to the attendees, based on the type of activity on their property. A member of the project staff would then work through a case study, completing the site assessment and one of the work sheets (usually for Water Well Condition). During the case study visual aids of proper well construction, backflow prevention devices, sanitary well seals and other important water well safety information would be shown to the audience.

While the presentation was taking place, additional project staff tested the water samples. Results were recorded on report forms for return to the landowners at the end of the meeting. A summary of

the results was also recorded in the laboratory notebook. After the case study was complete and any questions answered, test results were distributed. An explanation of the results was given to the group and the risks associated with high nitrate water explained.

The importance of bacteria testing for a more complete picture of drinking water quality would be given next. Directions for collection and handling of a proper water sample for bacterial analysis would be made, and sterile sample bottles from the Department of Environmental Quality (DEQ) would be distributed. Whenever possible, the local DEQ representative would be invited to present this portion of the meeting. If a DEQ representative could not attend, one of the project staff would hand this portion of the meeting, encouraging all present to mail their water samples to the DEQ laboratory for a bacteria test.

At this point about 1 to 1 ½ hours would have elapsed since the meeting began. The group would be dismissed, and usually the next 15 to 30 minutes would be spent addressing individual water quality related questions.

Between the initiation of the project in early 1995 and the termination in late 1997, 41 presentations were made in public meetings or school classrooms in 11 counties across Oklahoma. (See Public Meeting Schedule, Appendix F.) Over 900 people attended these educational meetings, receiving packets of educational materials and working through the case studies.

Field Staff In-Service Training

In April 1996 three in-service training sessions were held with OSU Cooperative Extension field staff. The locations were Enid, Oklahoma City and McAlester. At these sessions the staff were introduced to the Farm & Ranch*A*Syst program by explaining the background and history of the national program. The future expansion and renaming of the program to Oklahom*A*Syst through the planned addition of Home*A*Syst materials was explained as well. All participants were given complete packets containing Farm & Ranch*A*Syst fact sheets and work sheets and draft copies of the Home*A*Syst materials then being developed.

T'he staff had been encouraged to bring samples of their own household water to the sessions, and while their water was tested a sample assessment was completed, just like a regular Farm & Ranch*A*Syst public meeting. The results of their tests and the significance of the results were explained, as they would be for citizens at regular public meetings.

Additionally, the field staff from the pilot project counties spoke about how the program had been promoted in their home counties and the benefits to their county-wide program of having participated in Farm & Ranch*A*Syst. To conclude the session the mini-grant process for counties wishing to participate in the expanded program was explained. The mini-grants, funded from OSU Division of Agriculture water quality funds, were intended to help counties participating in the expansion of the Oklahom*A*Syst program cover expenses for the extra travel, office expenses, advertising and follow-up survey.

Mini-Grant Proposals

Once the funding from this EPA 319 grant was exhausted, there was not a ready source of funds for statewide implementation of Oklahom*A*Syst. Neither were there sufficient human resources to support implementation if all 77 counties in the state wanted to start a county-level program. The

OSU campus steering group determined that with existing personnel that it was possible to support initial expansion with public meetings into 5 or 6 new counties each year. The OSU Division of Agriculture Water Quality Coordinator pledged a portion of his USDA Water Quality Initiative budget to support travel and purchase of consumable supplies for 2 to 3 public meetings in up to 6 new counties each year.

In order to identify which counties were most interested in implementing the Oklahom*A*Syst program, a proposal process was developed. Counties successfully proposing a project would also receive a $500 mini-grant from USDA Water Quality Initiative funnds. The mini-grants were intended to help counties participating in the expansion of the Oklahom*A*Syst program cover expenses for the extra travel, office expenses, advertising and follow-up survey. The criteria for the proposal are listed in request for county-level proposals in Appendix G. The initial year of the expansion program, 1996/97, six counties submitted proposals. All were funded. Five of the counties were able to complete all of the programs proposed and participate in a follow-up survey.

Evaluations

During the initial year of the project, the Farm & Ranch*A*Syst program was piloted in two counties, Lincoln and Caddo counties. A follow-up survey was done in Lincoln County to determine what impact the program had on the attitudes and activities of the landowners. The survey was sent to 120 families who participated in the program, with 34 responding. A sample of the survey questionnaire is shown in Appendix H. The following summarizes the responses:

- 15% of the respondents completed the Planner, 35% did not, 50% did not respond
- 32% of the respondents completed the water well assessment
- 26% of the respondents completed the wastewater assessment
- 38% had their water tested as a result of the program
- 2 families drilled new wells, 2 families did repairs to their wells
- 11 changed how they handled and disposed of hazardous products
- 5 altered their handling and storage of pesticides and fertilizers

To evaluate the change in the attitudes and practices by participants in the Oklahom*A*Syst program during 1996/1997 follow-up surveys were sent to people who attended meetings in six counties. Surveys were sent to all attendees from Pottawatomie, Adair, LeFlore and Okfuskee counties. In Grady and Delaware counties, where attendance was 125 and 135 persons, Respectively, surveys were sent to 60% of attendees. This survey pattern was recommended by a statistician, and resulted in 335 surveys being sent out. The total response to the survey, including the initial response and responses after a reminder card was mailed, was 127 replies (38 % response rate). Not all surveys returned were filled completely, so not all questions received 127 total responses. A tally of the survey responses is included in Appendix H. A summary of the responses follows:

- 72% of respondents learned to identify sources of pollution on their property
- 84% found the results of the water tests at the meeting useful

- 54% of respondents took Farm & Ranch*A*Syst packets
- 20% of respondents took Home* A* Syst packets
- 25% did not specify which packet they received
- 34% completed the assessment planner and map
- 50% of the respondents completing the planner were male
- 100% of the respondents completing the planner were adults
- 26% of the respondents completed at least one other work sheet
- for F&R*A*S respondents, water well condition, pesticides, fertilizer, waste water, petroleum, and hazardous waste, in order, were the most frequently completed work sheets
- for H*A*S respondents, water well, waste water, hazardous products and liquid fuels, in order, were the most frequently completed work sheets
- 45% of respondents reported making at least one change on their property as a result of the program
- 23% of respondents reported the had plans to make changes as a result of the program
- the cost of changes made ranged from "$0: personal labor only" to $3422

APPENDICES

APPENDIX A

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Progress Report
Farm and Ranch Wellhead and Ground Water Assessment Pilot Project
October 27, 1994

Project Participants: Oklahoma Cooperative Extension Service, Oklahoma Conservation Commission, Caddo and Lincoln County Extension Services, Caddo and Lincoln County Conservation Districts, Office of Secretary of Environment, Department of Environmental Quality, Oklahoma Department of Agriculture, Oklahoma Corporation Commission

Project Coordinators: Barbara Brown and Michael Kizer

Accomplishments:

1 Members of the county steering committees have been recruited from citizen leaders, conservation district members and agency personnel in both counties. (Milestone 1)

2. Steering committee members, county extension and conservation district staff members and selected state agency personnel attended a National Farm*A*Syst satellite training conference which was downlinked at the Oklahoma County Extension Center. The conference included case studies of successes and problems in adapting and implementing Farm*A*Syst in other states. (Part of Milestone 2)

3. The project coordinators have finished editing and adaptation of the glossary, the assessment planner, six of eight work sheets, and six of eight fact sheets that will make up the Oklahoma Farm and Ranch*A*Syst package. (Part of Milestone 3)

4. The glossary, assessment planner, Work sheet #1 and Fact sheet #1 have been sent to the OSU Agricultural Communications Department for artwork, layout and paste-up. They will be printed within one month. (Part of Milestone 3)

5. An information display was set up in the Extension booth at the Lincoln County Fair in September, explaining the Farm and Ranch*A*Syst program to county residents. Tentative dates for various activities, work sheet and fact sheet subjects, water tests and the overall aim of the project were addressed. (Part of Milestone 4)

6. A discussion of the Farm and Ranch * A * Syst program was included in a drinking water in-service training program for Extension Human Environmental Science agents in all four districts of Oklahoma in early October. Draft copies of the assessment planner, glossary, Work sheet # 1 and Fact sheet # 1 were shown to the agents in attendance. (Part of Milestone 2)

AGENCY: OSU/OCC

QUARTERLY REPORT: January, February, March: FY95.

TITLE: *Farm and Ranch Wellhead and Ground Water Assessment Pilot Program*

OBJECTIVE:

*Educate homeowners and well users about well and ground water protection in two selected counties and to test and perfect the use of Farm*A*Syst..*

Steering committees for each county were established during the first quarter of FY95. The steering committees for each county have met collectively and with state staff to determine the best approach for introducing this project into their county.

Fact sheets, and work sheets have been reviewed, completed, published and are ready for distribution.

On March 14, 1995, a public meeting was held in Lincoln county in the city of Prague, Thirty people including the county extension director, were in attendance. State specialists covered a wide range of topics, including what Farm & Ranch*A*Syst is attempting to accomplish, how to fill out the work sheets, possible health problems, confidentiality of information and other topics. Of the 20 water samples analyzed, the pH ranged from 5.85 to 8.95, nitrates ranged from 1.94 ppm to 10.8 ppm, alkalinity ranged from 40 ppm to 460 ppm, electrical conductivity ranged from 55 mS/cm to 1970 mS/cm, and total soluble salts ranged from 36 ppm to 1300 ppm. Various visual observations were made on the samples, including color, odor, and clarity.

On February 2, 1995, an advisory board meeting of the Caddo County Water Quality Committee was held at the Vocational center in Ft Cobb. Three board members were present along with the county agent. State specialists covered a wide range of topics, including what Farm & Ranch*A*Syst is attempting to accomplish, how to fill out the work sheets, possible health problems, and confidentiality of information. The board agreed that this was something they would like to be involved with, and voted to set a later date for a larger public meeting.

OSU specialists were on hand to discuss results of the water tests, with the homeowners at the end of the meeting.

Bacteria test kits were distributed to those individuals who requested them, along with instructions on how to take a proper sample.

AGENCY: OSU/OCC

QUARTERLY REPORT: April, May, June: FY95.

TTTLE: *Farm and Ranch Wellhead and Ground Water Assessment Pilot Program*

OBJECTIVE:

Educate homeowners and well users about well and ground water protection in two selected counties, and to test and perfect the use of Farm-A-Syst.

Lincoln County:

On May 15, 1995, a public meeting was held in Lincoln county in the city of Chandler. Twenty-five well owners, the county extension director, and OSU State Specialists were in attendance. State

specialists covered a wide range of topics, including what Farm & Ranch A*Syst is attempting to accomplish, how to fill out the work sheets, possible health problems, confidentiality of information and other topics. Of the 18 water samples analyzed, the pH ranged from 6.53 to 8.46, nitrates ranged from 0.34 ppm to 9.70 ppm, electrical conductivity ranged from 416 mS/cm to 1453 mS/cm, and total soluble salts ranged from 274 ppm to 958 ppm. Various visual observations were made on the samples, including color, odor, and clarity.

Stroud was also the host to the second meeting in this county. Forty people were in attendance. Of the 38 water samples analyzed, the pH ranged from 6.12 to 9.02, nitrates ranged from 0.30 ppm to 64.4 ppm, electrical conductivity ranged from 238 mS/cm to 2400 mS/cm, and total soluble salts ranged from 157 ppm to 1584 ppm.

Caddo County:

On May 9, 1995 Hydro hosted a FAS meeting. Seven people were in attendance and 7 water samples were analyzed. Of the 7 water samples analyzed, the pH ranged from 7.14 to 7.8 1, nitrates ranged from 3.27 ppm to 28.2 ppm, electrical conductivity ranged from 336 mS/cm to 1969 mS/cm, and total soluble salts ranged from 222 ppm to 1300 ppm.

OSU, as a service to participants, offered the above water tests at each meeting.
Specialists were on hand to discuss results of the water tests, with the homeowners at the end of the meeting.

Bacteria test kits were distributed to those individuals who requested them, along with instructions on how to take a proper sample.

AGENCY: OSU/OCC

QUARTERILY REPORT: July, August, September- FY95.

TITLE: *Farm and Ranch Wellhead and Ground Water Assessment Pilot Program*

OBJECTIVE:

*Educate homeowners and well users about well and ground water protection in two selected counties, and to test and perfect the use of Farm *A *Syst.*

Lincoln County:

On July 18, August 22, September 8, 1995, public meetings was held in Lincoln county in Captain Creek, Carney, and at the county fair. Over a hundred well owners, the county extension staff, and OSU State Specialists were in attendance. State specialists covered a wide range of topics, including what

Farm & Ranch*A*Syst is attempting to accomplish, how to fill out the work sheets, possible health problems, confidentiality of information and other topics.

OSU, as a service to participants, offered water tests at each meeting. Of the 98 water samples analyzed, the pH ranged from 5.89 to 8.92, nitrates ranged from 0. 1 2 ppm to 37.3 ppm, electrical conductivity ranged from 196 mS/cm to 6520 mS/cm, and total dissolved solids ranged from 129 ppm to 4173 ppm. Various visual observations were made on the samples, including color, odor, and clarity. State specialists were on hand to discuss results of the water tests with homeowners at each meetings conclusion.

Bacteria test kits were distributed to those individuals who requested them, along with instructions on how to take a proper sample.

All participants were encouraged to take packets explaining the Farm & Ranch*A*Syst program, and were encouraged to read and follow through with the assessment if improvements needed to be made on their wellhead. Participants were informed that someone would be contacting them either by phone or personal contact to see if any changes were implemented on their farm. Contacts have not been made at this time, but should start next quarter.

Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

QUARTERLY REPORT
January 1, 1996

1) **Grant Activities and Major Accomplishments:**

· Public presentations were made to Vocational Agriculture classes and Earth Science classes in Cement on Oct. 12, Cyril on Oct. 26, Anadarko on Nov. 14, and Ft. Cobb on Nov. 21. A Farm*A*Syst seminar was conducted at the EPA Regional NonPoint Source workshop in Tulsa on Oct. 16. A presentation was made to the public at the Tulsa Farm Show on December 13.

· A written survey was mailed to 120 meeting participants in Lincoln County. Response has been received from 32% of the surveys.

2) Progress in Meeting Milestones and Output Commitments:

Task	Due Date	Status
1- Project coordinator hired; county steering committees assembled	Jan. 1995	Completed
2- Farm & Ranch*A*Syst packets printed	Feb. 1995	Completed
3- Media/community education campaign conducted; community meetings held	Oct. 1995	Completed
4- Public workshops held; water screenings provided (See 3)	Nov. 1995	-Overdue
5- Follow-up visits made at a limited number of sites	Dec. 1995	In Progress
6- Survey complete in one county; final report pending (See 3)	Dec. 1995	Overdue

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

· Public response in the adult community in Caddo County has been sparse due to scheduling and other problems. Plans are in progress to use the contacts of the County Home Economist and the Family Community Education groups in planning further public meetings.

· Response to the survey mailing was moderately successful in Lincoln County. Because of the poor response in the adult community in Caddo County no survey has been undertaken. If future meetings bring a better response, a survey of the participants will be undertaken at that time. A followup mailing for the Lincoln County survey is producing additional responses. The Lincoln Co. results will be compiled and interpreted when the response rate slows.

4) Contributions by key personnel:

·Lee and Nowlin conducted the presentations and screened the samples in 4 Caddo County schools.

·Kizer made the public presentation at the Tulsa Farm Show.

·Douglas developed and distributed the Lincoln County survey.

·Brown, Douglas, Kizer and Shelton led Farrn*A*Syst seminar at EPA Region VI NPS workshop in Tulsa.

·Brown and Shelton represented Oklahoma at EPA Region VI Farrn*A*Syst workshop in Dallas.

5) Changes in key personnel:

· Kevin Shelton's term of project service was completed on Dec. 3 1.

· Nicole Gurski will join the project team on Jan 1, 1996.

6) Work planned for next quarter:

· Extend the project through December, 1996 at no cost, utilizing unused grant funds from OCC.

· Expand project into Oklahom*A*Syst by beginning development of Home*A*Syst materials.

- Identify counties with interest in Oklahom*A*Syst for future expansion.
- Identify field staff for training in use of Oklahom*A*Syst.
- Begin drafting handbook of standards and procedures for water screenings.

Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

QUARTERLY REPORT
April 1, 1996

1) Grant Activities and Major Accomplishments:

- No public meetings or activities were held during this quarter.
- Planning sessions were held in conjunction with the Residential Environmental Management group within the Human Environmental Sciences Extension group to organize concurrent in-service training sessions with Cooperative Extension field staff. These sessions will help identify counties in which to first expand the pilot project.

2) Progress in Meeting Milestones and Output Commitments:

Task	Due Date	Status
1- Project coordinator hired; county steering committees assembled	Jan. 1995	-Completed

2- Farm & Ranch*A*Syst packets printed	Feb. 1995	-Completed
3- Media/community education campaign conducted; community meetings held	Oct. 1995	-Completed
4- Public workshops held; water screenings provided (See 3)	Nov. 1995	-Overdue
5- Follow-up visits made at a limited number of sites	Dec. 1995	-Completed
6- Survey complete in one county; final report pending (See 3)	Dec. 1995	In Progress

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

· Public response in the adult community in Caddo County has been sparse due to scheduling and other problems. Plans are in progress to use the contacts of the County Home Economist and the Family Community Education groups in planning further public meetings.

· Response to the follow-up survey mailing produced an additional 6 responses within 10 days of mailing. No further responses were received in the next 2 weeks. Total response is now 38 out of approximately 120 households identified at public meetings. Results of the survey are being compiled and interpreted.

4) Contributions by key personnel:

· Kizer and Douglas made follow-up visits with two households which had drilled new water well as a result of OF&R*A*S contacts.

5) Changes in key personnel:

·None

6) Work planned for next quarter:

· In-service training workshops set for Cooperative Extension personnel at three sites: Fairview- April 4; OKC- April 17; McAlester- April 18.
· Begin adapting national Home*A*Syst materials for use in Oklahoma.
· Identify counties with interest in Oklahom*A*Syst for priority expansion of pilot project.
· Complete handbook of standards and procedures for water screenings.

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Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

QUARTERLY REPORT
July 1, 1996

1) Grant Activities and Major Accomplishments:

- In-service training workshops were held for Cooperative Extension personnel at three sites: Fairview- April 4; OKC- April 17; McAlester- April 18.
- Proposals were received from Adair, Cleveland, Delaware, Dewey/Major, Grady, LeFlore, Okfuskee, and Pottawatomie county extension offices to develop county-level Farm & Ranch*A*Syst /Home*A*Syst programs.
- Six new titles of draft Home*A*Syst materials were received from the national office. Planning sessions were held to select the titles appropriate for use in Oklahoma, identify basic changes to be made, and identify possible reviewers for Oklahoma draft documents. A graphic artist was retained to develop artwork for use in the new materials.
- Handbook of standards and procedures for testing water samples at public meetings was completed.

2) Progress in Meeting Milestones and Output Commitments:

Task	Due Date	Status
1- Project coordinator hired; county steering committees assembled	Jan. 1995	-Completed
2- Farm & Ranch*A*Syst packets printed	Feb. 1995	-Completed
3- Media/community education campaign conducted; community meetings held	Oct. 1995	-Completed
4- Public workshops held; water screenings provided (See 3)	Nov. 1995	-Overdue
5- Follow-up visits made at a limited number of sites	Dec. 1995	-Completed
6- Survey complete in one county; final report pending (See 3)	Dec. 1995	In Progress

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

Public response in the adult community in Caddo County has been sparse due to scheduling and other problems. Plans are in progress to use the contacts of the County Home Economist and the Family Community Education groups in planning further public meetings.

Response to the follow-up survey mailing produced an additional 6 responses within IO days of mailing. No further responses were received in the next 2 weeks. Total response is now 38 out of approximately 120 households identified at public meetings. Results of the survey are being compiled and interpreted.

4) Contributions by key personnel:

Kizer, Brown, Smolen, Gurski and Douglas led three in-service training sessions attended by 39 Cooperative Extension personnel and 2 Conservation Commission/Conservation District personnel.

5) Changes in key personnel:

None

6) Work planned for next quarter:

Continue adapting national Home*A*Syst materials for use in Oklahoma.

Finalize meeting sites and dates for county-level Oklahom*A*Syst projects.

Hold public meetings in Oklahoma, Okfuskee and Pottawatomie counties.

Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

QUARTERLY REPORT
October, 1996

1) Grant Activities and Major Accomplishments:

Public meetings were held in Okfuskee, Oklahoma and Pottawatomie counties. Home*A*Syst was highlighted in the Oklahoma Co. meetings at Lake Hiwassee on August 24 and Choctaw on September 21. Farm & Ranch*A*Syst was featured at Wannette on September 24 in Pottawatomie Co., and again at Mason on September 24 in Okfuskee Co.

Work continues on the revision of the draft Home*A*Syst materials received from the national office. A commercial artist has drawn several figures for inclusion in the Oklahoma Home*A*Syst materials. Three H*A*S modules have been sent to Agricultural Communications to be setup for printing. Two additional modules have been rewritten and reviewed once in preparation for submittal for printing.

2) Progress in Meeting Milestones and Output Commitments:

Task	**Due**	**Date**	**Status**
1 - Project coordinator hired; county steering committees assembled	Jan.	1995	-Completed
2- Train county staff in use of Farm*A*Syst	March,	1995	-Completed
3- Farm*A*Syst packets printed	Feb.	1995	-Completed
5- Activate community groups (FCE, FFA, 4-H, etc.)	Sept., 1996		-In progress
6- Public workshops held; water screenings provided	April, 1996		-In Progress

7- Conduct on-site visits at request of participants	Nov., 1996	-In Progress
8- Contact participants to determine response to program and any changes made	Oct., 1996	-In progress
9- Prepare final report and guide for Farm*A*Syst implementation	Dec., 1996	-Pending
10- Conduct in-service training for field staff	April, 1996	-Completed
11- Develop QAPP for water screening	May, 1996	-Completed
12- Develop handbook for water screening process	May, 1996	-Completed
13- Adapt and print Home*A*Syst materials for Oklahoma	Nov. 1996	-In Progress
14- Develop & test proposal process for added Oklahom*A*Syst county programs	Dec. 1996	-Pending

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

Public workshops for Farm & Ranch*A*Syst were held in the two original counties in 1995. During the one year extension the project has been expanded to include Home*A*Syst and more meetings are being held in additional counties not originally in the project plan. Milestones and project tasks have been revised to reflect the additional goals of the project and the extended time frame.

4) Contributions by key personnel:

Kizer, Brown, Smolen, Gurski, Marley Beem (Extension SE District Water Quality Specialist) and Mitch Fram (Extension NE District Water Quality Specialist) have made presentations and conducted water screenings at county meetings with the assistance of county extension and conservation district field staff.

Gurski has made revisions to the national Home*A*Syst materials for Oklahoma use. Brown, Kizer and Smolen have reviewed various materials after the revisions.

5) **Changes in key personnel:**

None

6) Work planned for next quarter:

Continue adapting national Home*A*Syst materials for use in Oklahoma.

Complete the printing of the revised Home*A*Syst materials.

Hold additional public meetings in Oklahoma, Okfuskee and Pottawatomie counties.

Schedule public meetings for Adair, Dewey, Cleveland, Grady and LeFlore counties to begin after

January 1, 1997.

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Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

SEMIANNUAL REPORT
April, 1997

1) Grant Activities and Major Accomplishments:

Public meetings were held in Adair, Delaware, Grady, Le Fiore, Okfuskee, Oklahoma and Pottawatomie counties. Home*A*Syst was highlighted in the Oklahoma Co. meeting at Edmond on October 19, Feb. 1, and March 22. Fan-n & Ranch*A*Syst was featured in Pottawatomie Co. communities of McCloud on Oct. 8, Tecumseh on Oct. 22 and Shawnee on Nov. 12, and in the Okfuskee Co. communities of Paden on Oct. 10, and Okemah on Nov. 7. Both Farm & Ranch*A*Syst and Home*A*Syst were featured at meetings in Grady county at Chickasha on Feb. 4, and in both Tuttle and Rush Springs on Feb. 25; in Delaware county at Kansas on Feb. 6, Kenwood on Feb. 13, Jay on Feb. 20, and Grove on Feb. 27; in LeFlore county at Hodgen on Feb. 17, and at Bokoshe on Feb. 18; and in Adair county at Stillwell on March 19

Revision work was completed on the draft Home*A*Syst materials received from the national office. All of the revised materials have been sent to OSU Agricultural Communications for layout in preparation for printing. The last of the five revised Oklahoma Home*A*Syst modules was received from the printer on March 24.

2) Progress in Meeting Milestones and Output Commitments:

Task	Due Date	Status
1- Project coordinator hired; county steering committees assembled	Jan. 1995	-Completed
2- Train county staff in use of Farm*A*Syst	March, 1995	-Completed
3- Farm*A*Syst packets printed	Feb. 1995	-Completed
5- Activate community groups (FCE, FFA, 4-H, etc.)	Sept., 1996	-In progress
6- Public workshops held; water screenings provided	April, 1996	-In Progress
7- Conduct on-site visits at request of participants	Nov., 1996	-In Progress
8- Contact participants to determine response to program and any changes		

made	Oct., 1996	-In progress
9- Prepare final report and guide for Farm*A*Syst implementation	Dec., 1996	-Pending
10- Conduct in-service training for field staff	April, 1996	-Completed
11- Develop QAPP for water screening	May, 1996	-Completed
12- Develop handbook for water screening process	May, 1996	-Completed
13- Adapt and print Home*A*Syst materials for Oklahoma	Nov. 1996	-Completed
14- Develop & test proposal process for added Oklahom*A*Syst county programs	Dec., 1996	-Completed

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

One public meeting scheduled in Okfuskee County had no attendance because of local scheduling conflicts and lack of advertising in the community prior to the meeting. At another meeting there were difficulties with people bringing in water samples for nitrate screening near the end of the meeting time, after all of the other samples had been analyzed and the testing equipment had been cleaned and dismantled. To avoid future problems in these areas a list of guidelines for advertising Oklahom*A*Syst meetings, specific requirements on the size and delivery of samples to be screened, local agency personnel to be notified and other important basic information will be developed. This infor7nation will be delivered to the local agents responsible for organizing the meetings at the time of scheduling so that maximum likelihood of success for all scheduled meetings is possible.

At one meeting the technicians were not able to perform nitrate screenings on-site because of instrument failure. Consultation with the manufacturer's literature led to the discovery that the expected working life of an instrument component had been exceeded. The failed component was replaced and the number of samples tested before failure occurred was noted. In the future the component will be replaced before that quantity of samples has been processed, with a factor of safety to insure that a failure during a public meeting will not be repeated.

At one meeting the meter used to operate the nitrate probe could not be powered up. Another pH meter with a millivolt output was acquired that can be used as a backup meter for both pH and nitrate measurements.

4) Contributions by key personnel:

Kizer, Brown, Smolen, Gurski, Marley Beem (Extension SE District Water Quality Specialist), Mitch Fram (Extension NIE District Water Quality Specialist) and Sue Williams (HES Extension Family Policy and Energy Specialist) have made presentations and conducted water screenings at county meetings with the assistance of county extension and conservation district field staff.

Gurski has completed all revisions to the national Home*A*Syst materials for Oklahoma use. Brown, Kizer and Smolen have reviewed various materials after the revisions. Printing of materials was completed in March.

Kizer completed minor corrections to Farm & Ranch*A*Syst materials. Reprints for use in the expansion of the original project to additional counties were ordered and received in February.

5) Changes in key personnel:

None

6) Work planned for next quarter:

Gurski and Williams will develop a revised survey to determine the extent of worksheet usage and change in activity by citizen participants in the Oklahom*A*Syst program.

Kizer will develop a brief survey to determine the views of the county and area extension staff that have participated in the Oklahom*A*Syst program regarding its benefit to their local programs, and any improvements needed.

Kizer and Gurski will present an Oklahom*A*Syst workshop for youth at the Annual State 4-H Roundup in Stillwater on May 28.

Hold public meetings for Adair and Cleveland counties as listed:

Date	County	Location	Time
Apr. 28	Cleveland	Norman	1:30 pm
May 13	Cleveland	Little Axe	7 pm
TBA	Adair	Westville	TBA

Task 400

Farm and Ranch Wellhead and Ground Water Assessment--Pilot Program

SEMIANNUAL REPORT
October, 1997

1) Grant Activities and Major Accomplishments:

Public meetings were held in Cleveland, Carter and Pawnee counties. On April 28 a meeting was held at Norman in Cleveland Co. Meetings were held in Carter Co. on July 7 in Ardmore, and on August 14 in Healdton. On July 11 a meeting was held at the Pawnee Tribal Complex in Pawnee Co.

The draft Quality Assurance Plan that has been used for water sample analysis on the project was completed and sent to the Oklahoma Conservation Commission.

A survey of project participants was sent to all counties which completed scheduled programming in 1996/1997. The survey was a telephone survey to be conducted by county extension and conservation district staff. Results have been received from 4 of 7 counties, to date.

2) Progress in **Meeting Milestones and Output Commitments:**

Task	Due Date	Status
1- Project coordinator hired; county steering committees assembled	Jan. 1995	-Completed
2- Train county staff in use of Farm*A*Syst	March, 1995	-Completed
3- Farm*A*Syst packets printed	Feb. 1995	-Completed
5- Activate community groups (FCE, FFA, 4-H, etc.)	Sept., 1996	-In progress
6- Public workshops held; water screenings provided	April, 1996	-In Progress
7- Conduct on-site visits at request of participants	Nov., 1996	-In Progress
8- Contact participants to determine response to program and any changes made	Oct., 1996	-In progress

9- Prepare final report and guide for Farm*A*Syst implementation	Dec., 1996	-Pending
10- Conduct in-service training for field staff	April, 1996	-Completed
11- Develop QAPP for water screening	May, 1996	-Completed
12- Develop handbook for water screening process	May, 1996	-Completed
13- Adapt and print Home*A*Syst materials for Oklahoma	Nov. 1996	-Completed
14- Develop &test proposal process for added Oklahom*A*Syst county programs	Dec. 1996	-Completed

3) Problems or obstacles encountered and remedial action taken, including delays and revised schedule:

Results from the telephone survey have been slow coming in. The survey forms and pre-survey notification cards were mailed to the counties in late June. As of the end of September, three counties still had not completed their survey calls. These counties have been contacted and urged to complete their calling before the end of October.

4) Contributions by key personnel:

Kizer, Brown, Smolen, Gurski, and Marley Beem (Extension SE District Water Quality Specialist) have made presentations and conducted water screenings at county meetings with the assistance of county extension and conservation district field staff.

Kizer attended the Home*A*Syst Kickoff meeting in Denver, May 21-22. He gave a progress report on Oklahom*A*Syst to other participants, and shared project experiences with people from other states which are just starting their programs.

Gurski and Williams developed and mailed the survey forms for counties to use when contacting participants for their views on the effectiveness of the program and to determine the degree of change in their activities as a result of the program.

Kizer and Gurski gave a seminar on Oklahom*A*Syst and water quality to 9 participants at 4-H Roundup in Stillwater on May 28.

Smolen, Kizer and Gurski advised and assisted an undergraduate intern, Lisa Fields, who worked on a special problem assignment to do Oklahom*A*Syst assessments on 11 individual wells for members of the Pawnee Tribe in Pawnee Co. She presented her findings at a student symposium held on the OSU campus in July.

Brown gave a poster presentation on Oklahom*A*Syst at the National Watershed Water Quality Projects Symposium in Washington, DC., September 22-25.

5) Changes in key personnel:

None

6) Work planned for next quarter:

Gurski and Williams will compile and analyze the results of the completed county surveys.

Hold public meetings for Oklahoma and Haskell counties as listed:

Date	**County**	**Location**	**Time**
Oct. 11	Oklahoma Co.	Forest Park Comm. Ctr.	10 am
Oct. 20	Haskell Co.	Stigler	7 pm
Oct. 21	Haskell Co.	McCurtain	10 am
Oct. 21	Haskell Co.	Enterprise	7 pm

APPENDIX B

Laboratory Instructions

Instruction Guide for Oklahom*A*Syst Water Sample Testing

prepared by

Nicole Gurski
April 30, 1996

Introduction

These instructions are for use with the JENCO Model 1671 Dual Display Benchtop pH and Conductivity meter and the ORION Model 290A Portable pH/ISE meter. The instructions are designed for testing performed as part of the Oklahom*A*Syst project. All guidelines may not apply if the meters are used for other testing purposes.

Calibration of JENCO Model 1671 pH Meter

1. Prepare buffers.

Buffers of pH 4 and 7* are included with the meter. Pour each into a clean 150 ml beaker.

2. Turn on the pH meter

3. Press CLEAR. Wait for STAND to start flashing.

4. Rinse electrode in distilled water, blot off excess water with a lint-free tissue and immerse in buffer 7.

5. Press STAND. STAND will stop flashing and WAIT will start flashing. pH will be displayed, WAIT will stop flashing and SLOPE will start flashing.

6. Remove electrode from buffer 7 and rinse will distilled water. Use a lint-free tissue to blot away excess water and immerse in buffer 4.

7. Press SLOPE. SLOPE will stop flashing and WAIT will start flashing. pH will be displayed, WAIT will stop flashing.
At this point, STAND, SLOPE, pH and AUTOLOCK should all be on.
The pH meter is now calibrated. Remove electrode from buffer IO and rinse with distilled water.

To measure the pH of a sample, place the electrode in the sample and press measure. After a few seconds, the pH will be displayed.

* Note: If pH readings are above 8, recalibrate the meter using buffers of pH 7 and 10. For best accuracy, the instrument should always be calibrated to reflect the range of samples tested.

Calibration of JENCO Model 1671 Conductivity Meter

1. After the meter is plugged in, check the display and choose display range "C." This is the most probable range for drinking water samples. If the scale is changed, perform the calibration procedure again, using the appropriate calibration solution.

2. Rinse the conductivity cell in distilled water.

3. Measure 100 ml of O.O IN KCI into a clean beaker.

4. Immerse the conductivity cell into the O.OIN KCI solution.

5. Using the CELL ADJ control on the rear panel of the instrument, rotate the knob until the display reads 1413. This knob is very sensitive. Small movements can make big changes in the conductivity reading.

6. To measure the conductivity of a sample, rinse the cell in distilled water and immerse in sample.

pH and Conductivity Electrode Storage

When performing a series of samples, store the pH and conductivity electrodes in a beaker of tap water between measurements. Rinse the electrodes with distilled water and blot off excess water with a lint-free tissue.

Preparation of Conductivity Meter Calibration Solution

A 1N solution of KCl can be prepared using laboratory grade KCl reagent crystals. Measure 74.555 gm of KCl crystals using a calibrated electronic balance. Carefully pour the crystals into a clean 1-liter volumetric flask. Add sufficient distilled water to make 1-liter of solution (until the solution level reaches the etched line in the flask). Cover the flask and swirl gently until the crystals are completely dissolved. Pour this solution into a storage container labeled "1 N KCl".

Using a volumetric pipette, measure 10 ml of the 1 N KCl solution into a clean 1-liter volumetric flask. Add sufficient distilled water to make 1-liter of solution. Pour this solution into a storage container labeled "0.01 N KCl". Repeat this process using the stored 1N solution whenever the supply of 0.01 N KCl calibration solution is exhausted.

Preparation for Nitrate Meter Calibration

ORION Model 93-07 Nitrate Electrode

1. Gently screw the sensing module onto the electrode body.

2. Soak the electrode in distilled water for at least 30 minutes.

3. Prepare a 100 ppm nitrate standard and soak electrode for at least 4-6 hours. (see instructions
on page 7 on how to prepare the 100 ppm standard). Increasing the soaking times is strongly recommended.

ORION Model 90-02 Reference Electrode

1. Unscrew the electrode cap and slide the cap and spring up the cable.

2. Push down on the inner chamber of the electrode until the cone at the bottom of the electrode can be grasped with a lint-free tissue. Never touch the bottom of the electrode with fingertips. Oils from the skin may impede electrode performance.

3. Using a lint-free tissue, grasp the cone and pull the inner chamber free of the outer sleeve.

4. Slide the white rubber sleeve at the top of the inner chamber down until the filling hole is visible. Using the flip top spout, fill the inner chamber with the "Inner Chamber Filling Solution". This is the green solution. Fill the chamber up to the fill hole. If chamber is difficult to fill and there are visible air bubbles in the chamber, shake the inner chamber like a clinical thermometer to release the air bubbles.

5. Slide the rubber sleeve back up over the hole.

6. Wipe outer surface of the chamber clean of any filling solution.

7. Slide the outer chamber back over the inner chamber. Place the spring back on the inner chamber and screw cap back on. Be careful not to touch the inner chamber with fingertips. Always use a tissue.

8. Using the "Outer Chamber Filling Solution" (diluted Ionic Strength Adjuster - clear solution), add a small amount through the hole in the outer chamber. Moisten the 0-ring inside the chamber (this is slightly above the filling hole). Holding the electrode upright, gently push the outer sleeve up into the cap. This allows the cone at the bottom of the electrode to be moistened with the filling solution. Release the sleeve and make sure that the bottom of the

outer sleeve is flush with the cone of the inner sleeve. If the outer sleeve does not return to the correct position, gently push it down into place.

9. Fill the outer chamber up to the filling hole.

Outer Filling Solution Preparation

Pipette 2 ml of ISA (ionic strength adjuster: 2M $(NH_4)_2S0_4$ - Orion Catalog # 930711) into a 100 ml volumetric flask. Fill the flask to the etched line on the flask.

Ionic Strength Adjuster Preparation

The ionic strength adjuster is a 2M solution of $(NH_4)_2S0_4$. This may be purchased ready-made or prepared using $(NH_4)_2S0_4$ reagent crystals. To mix a 2M solution, measure out 264.27752 gm of $(NH_4)_2S0_4$ crystals on a calibrated electronic balance. Carefully pour the crystals into a 1-liter volumetric flask. Add distilled water to the flask until the solution volume is 1 liter (the solution reaches the etched line in the neck of the flask). Cover the flask and swirl gently until the crystals dissolve completely.

Standard Preparation

1. 100 ppm Nitrate Standard: Pipette 10 ml of 1000 ppm nitrate standard (KNO_3 - Orion Catalog # 920707) into a 100-ml volumetric flask. Fill the flask with distilled water to the etched
line on the flask.

2. 10 ppm Nitrate Standard: Pipette 1 ml of 1000 ppm nitrate standard into a 100-ml volumetric flask. Fill the flask with distilled water to the etched line.

3. 1 ppm Nitrate standard: Pipette 1 ml of the 100 ppm nitrate standard (made in step 1 above) into a 100-ml volumetric flask. Fill the flask with distilled water to the etched line.

Tips for Using Volumetric Glassware

Pipettes:

When using volumetric pipettes be sure to fill the pipette exactly to the etched line on the glass. The top of the liquid surface will be curved due to surface tension at the glass. The bottom of this curve (i.e., the bottom of the meniscus) should be exactly on the etched line. See Figure 1 below.

When the correct amount of liquid has been drawn into the pipette, touch the tip of the pipette to the inside of the beaker to remove the drop at the tip. This will ensure that only the liquid measured in the pipette is transferred to the final solution. Likewise, when draining the pipette, allow the pipette to drain for at least 30 seconds. This will make sure that all of the measured solution has been drained from the pipette. To drain a pipette properly, touch the tip to the inside of the flask or beaker. This is done to allow the final drop of liquid on the tip of the pipette to drain into the flask or beaker.

A small amount of liquid will be left inside the tip of the pipette. Do not add this small amount to the standard. The pipette is designed to deliver the specified amount of solution. The liquid left in the tip is in excess of the specified amount. This is why it is important to let the pipette drain on its own and not force the liquid out.

Volumetric flasks:

Fill the flasks to the etched line on the glass in the same manner as the volumetric pipette. The bottom of the meniscus should be exactly on the etched line. It is a good idea when filling a volumetric flask to use a squeeze bottle or an eyedropper to fill the top portion of the flask. This helps prevent overfilling of the flask because a squeeze bottle or eyedropper is easier to control.

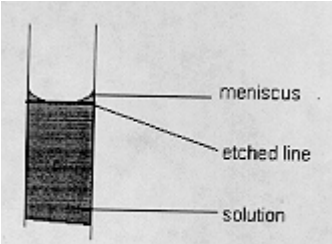


Figure 1.

Calibration of ORION Model 290A Nitrate Meter

(The following instructions are for a 3-point calibration. If a 4- or 5-point calibration is desired, refer to the ORION Model 290A Instruction Manual).

1. Prepare the necessary standards and pour each into a clearly labeled 150 ml beaker.

2. Add 2 ml of ionic strength adjuster (ISA) to each of the standards. Add a magnetic stirring bar, place the beaker on the stirring plate. Turn stirrer ON.

3. Connect the electrodes to the meter. Press the MODE key until the CONC mode is indicated. This should appear in the bottom right hand comer of the display.

4. Place the electrodes into the least concentrated standard (1.0 ppm).

5. Press 2ND CAL. followed by CALIBRATE. The time and date of the last calibration will be displayed. After a few seconds, PI will be displayed. The meter is now ready to read the first standard.

6. When ready, the meter will beep and the word "ready" will be displayed in the bottom right of the display. To change the value on the display, press the up or down arrows on the key pad. (They are in blue.) The value will begin to flash. Press the arrow again and the decimal will begin to flash. Position the decimal using the arrow keys. Press YES. The first digit will begin to flash. Using the arrow keys scroll to the desired digit and then press YES. Continue for each digit on the display. The display will freeze for three seconds and then P2 will be displayed. (Set all values to one decimal place - 1.0, 10.0, 100.0)

7. Rinse the electrodes in distilled water and place into the second standard (10 ppm). When the meter indicates "ready", enter the value of the standard using the same procedure as above. The reading will freeze and P3 will be displayed.

8. Rinse the electrodes in distilled water and immerse in the third standard (100 ppm). When the meter indicates "ready", enter the value of the standard. The reading will freeze and P4 will be displayed.

9. Press MEASURE. The electrode slope will be displayed for a few seconds and then the meter will advance to the MEASURE mode.

10. The meter is now calibrated.

Measurement of Nitrate Sample

1. Measure 100 ml of the sample using a 100 ml graduated cylinder and pour into a clean 150 ml beaker.

2. Add 2 ml of Ionic Strength Adjuster (ISA) to the sample using a volumetric or microliter pipette.

3. Add a stirring bar and place on the magnetic stirrer and turn it on.

4. Rinse the electrodes with distilled water, blot off excess water with a lint-free tissue and place in the sample. Be careful that the electrodes do not hit the stirring bar. Press MEASURE.

5. Wait for a stable reading (the meter will indicate READY). Record concentration.

Performing a Series of Samples

1. Rinse a 100 ml graduated cylinder and a 150 ml beaker with a small amount of the sample water.

2. Measure 100 ml of the sample using the graduated cylinder.

3. Carefully pour the water into the 150 ml beaker.

3. Take measurements for pH and conductivity.
These measurements can be taken simultaneously. Remove the electrodes from their storage solution and rinse with distilled water. Blot electrodes with a lint-free tissue to remove excess distilled water. Place the electrodes into the sample. The conductivity will be read automatically. Press MEASURE to obtain the pH reading.

4. Record pH and conductivity readings. Place electrodes back into storage beaker (tap water.)

5. Add 2 ml of ISA to sample, a stirring bar and place on magnetic stiffer.

6. Place nitrate electrodes into sample. Press MEASURE to obtain nitrate reading. After recording the nitrate reading, leave electrodes in sample until the next water sample is ready to be tested.

Quality Assurance Checks for Testing Multiple Samples

1. If equipment has been transported, allow it to come to room temperature before calibrating. This is more of a concern during winter months when the equipment may be cold. In the summer allow time for the equipment to adjust to the temperature of the room.

2. Calibrate meter before testing any samples.

3. For every 20 samples tested follow this procedure:

Randomly choose a sample to spike and one to duplicate. (Consider the amount of water sample that is available when choosing a sample. Choose a sample with more than 200 ml of water available for testing.) Run a spiked sample in samples 1-10. Run a duplicate sample in samples 11-20.

Spike Preparation

1. Label the second aliquot of the sample with the sample number and the letter S for "spike." Place the spike in the sample sequence so that it is not tested before or immediately after the "un-spiked" sample.

2. Add 1 ml of 1000 ppm nitrate solution to the sample. This will increase the amount of nitrate in the sample by 10 ppm.

3. After the spiked sample measurements are recorded, compare the spiked and un-spiked samples. The nitrate reading of the spike should be 10 ppm higher than the un-spiked sample. If the nitrate reading is not within 10% of the measured value of the un-spiked sample + 10, re-calibrate the meters. If the readings are not within 20%, re-calibrate meter and measure all samples again.

Example:

A sample is measured and the nitrate content is recorded as 1.2. A spike of the sample is made by adding 1 ml of 1000 ppm nitrate solution. The **expected** nitrate value is 11.2. The **actual measured** value is 9.3. The difference between the **actual** and **expected** nitrate values is 17%. In this, case, the meter should be re-calibrated.

To determine the %difference use the following formula:

$$\%\text{difference} = \left| \frac{\text{actual - expected}}{\text{expected}} \right| \times 100$$ Formula 1: %difference

Duplicate Sample Preparation

1. Measure a second aliquot of the chosen water sample and label it with sample number and the letter D for "duplicate."

2. Place the duplicate in the measuring sequence so that it is not before or immediately after the sample being duplicated.

4. Compare the results for the two samples. Readings for pH, conductivity and nitrate should be within 10% of each other. If the readings are not within 10%, re-calibrate meters. Use formula 1 to calculate % differences.

4. After the 20th sample, check the calibration of the equipment by measuring standards.

pH

Place pH electrode in buffer of pH 7 and 4. If electrode does not accurately read the pH of the buffers, re-calibrate meter.

Conductivity

Place conductivity electrode in 0.01N KCl solution. If meter does not read 1413 recalibrate meter by adjusting reading.

Nitrate

Place electrode in each of the three nitrate standard solutions. If reading are off by more than 10%, re-calibrate meter. Make sure that readings are taken while solution is stirred on the magnetic stirring plate.

Keeping the Lab Notebook

1. Record all data in a lab notebook.

2. Make an entry with date, and place where samples are collected. Also, identify where samples will come from. Identify who will be operating the meters.

Sample entry:

6/l/96 3:00pm Payne Co. homeowner samples collected at township meeting in Town Hall, Stillwater OK.

3. Record data. A chart form is easiest to use.

Sample entry:

Sample Number	pH	Conductivity	Nitrate	Comment
001	7.1	900	1.2	
002	7.5	682	4.5	
001D	7.1	902	1.3	duplicate

Denote spikes and duplicates with an S or D after the sample number. Sample numbers should be unique for each sample. Use the "comment" column to write down spikes or duplicates. Also, mark where equipment was re-calibrated, or note any unique occurrences that take place while sampling. For example, if a portion of a sample was spilled during testing, make sure to note it in the comment column.

4. Always write in pen. If an error is made in the notebook, cross it out with a single line and initial the error. Do not use white-out or attempt to erase an error.

5. Do not skip pages in the notebook.

6. Sign the bottom of every page and the end of every entry.

APPENDIX C

Quality Assurance Project Plan

A1.0 TITLE AND SIGNATURE PAGE

OKLAHOMA COOPERATIVE EXTENSION SERVICE
OKLAHOM *A* SYST WELLHEAD PROTECTION PROGRAM FY 1994 SECTION 319 QUALITY ASSURANCE PROJECT PLAN

APPROVING OFFICERS:

Oklahoma Cooperative Extension Service

Michael D. Smolen, Water Quality Coordinator

_____Date: _____

Barbara J. Brown, Project Coordinator

_____Date:_____

Michael A. Kizer, Project Coordinator

_____Date:_____

Oklahoma Office of the Secretery of the Environment

Sylvia Ritzky - Environmental Program Administrator

_____Date:_____

United States Environmental Protection Agency

USEPA Region VI Project Officer

_____Date: _____

USEPA Region VI Office of Water Quality

_____Date:_____

A2.0 TABLE OF CONTENTS

A3.0 DISTRIBUTION LIST

The following list of persons and their respective agencies will received finalized, signed and USEPA Region IV approved copies of this project plan:

John Hassell	Oklahoma Conservation Commission.
Sylvia Ritzky	Office of the Secretary of the Environment.
Scott Smith	USEPA Region IV.

Copies of the approved plan will be provided to the following:

Kendra Eddleman	Oklahoma Conservation Commission
Phil Moershel	Oklahoma Conservation Commission
Dan Butler	Oklahoma Conservation Commission
Michael Kizer	Oklahoma State University, Department of Biosystems and Agricultural Engineering
Barbara Brown	Oklahoma State University, Department of Nutritional Sciences
Mike Smolen	Oklahoma State University, Department of Biosystems and Agricultural Engineering

A4.0 PROJECT ORGANIZATION

The following is a list of key personnel and their corresponding responsibilities involved in this project.

1 . Oklahoma Cooperative Extension Service Director-

Samuel E. Curl, Dean and Director - Responsible for all operations of OCES, including water quality programs.

2. Water Quality Programs Coordinator

Michael Smolen - Responsible for all water quality programs.

3. Oklahom*A*Syst Project Manager

Kendra Eddleman - Responsible for project oversight.

3. Oklahom*A*Syst Coordinators -

Barbara J. Brown and Michael A. Kizer - Responsible for project operation including project activities, tasks, milestones, and outputs planning, sample collection, field analysis, sample delivery, and report progress for quarterly submission through GRTS.

4. Oklahom*A*Syst technical staff-

Nicole Gurski - Graduate Assistant, Responsible for laboratory equipment, sample analysis, development and revision of program materials.

Sue Williams - State Extension Housing Specialist, Responsible for program delivery.

Mitch Fram - NE District Water Quality Extension Specialist, Responsible for program delivery.

Marley Beem - SE District Water Quality Extension Specialist, Responsible for program delivery.

Wes Lee - SW District Water Quality Extension Specialist, Responsible for program delivery.

5. OCC Oklahom*A*Syst Program QA officer

Phillip Moershel - Responsible for all aspects of project QA.

The OSU Cooperative Extension Service Water Quality offices are located at:

218 Agriculture Hall
Stillwater, OK 74078-6021

The telephone number for the Water Quality offices is: (405) 744-5653.
The Fax number for the Water Quality offices is: (405) 744-6059.

All correspondence regarding the project should be directed to Michael D. Smolen, Coordinator, Water Quality Programs, at the address above.

A5.0 PROBLEM DEFINITION

Outside of the major metropolitan areas, the majority of Oklahoma residents rely on groundwater for their drinking water supplies. Numerous activities in rural areas have the potential to affect the quality of water produced by water supply wells. A review of water tests performed by the Department of Environmental Quality between 1977 and 1981 revealed that of the 3,176 public and private water supply wells tested, 9.1 % of them exceeded the safe drinking water standard of 10 mg/L for nitrate nitrogen.

Christensen and Rea (1993) identified volatile organic compounds (VOCs) and/or pesticides in over 40% of well samples from the Garber-Wellington formation, which underlies the central part of the state. Oklahoma City and a number of other major cities in the state have recently failed EPA water quality tests due to the presence of toxins like Diazinon insecticide in their municipal wastewater treatment plant effluent.

Oklahoma's 319 NPS Assessment (1991) also found serious degradation in virtually all the major streams in the state. The Assessment identified numerous problems, including pesticides, plant nutrients, bacteria, and unknown toxins in the major river and their tributaries.

A6.0 PROJECT DESCRIPTION

The Oklahom*A*Syst project will bring educational efforts to rural and suburban residents on the sources of drinking water and how to prevent drinking water contamination, especially in regards to private drinking water sources. Well owner education will be accomplished through seminars and workshops. The Oklahom*A*Syst program has two environmental self-assessment components. Home*A*Syst addresses the concerns of rural and suburban non-agricultural households. The Farm & Ranch*A*Syst program will emphasize risk assessment for the kinds of activities that take place on production agriculture farms and ranches.

As a participation incentive, the Oklahom*A*Syst program will offer water quality testing. Program advertising will invite people to bring a water sample to the educational meetings. During the meeting the water samples will be analyzed for: pH, conductivity, and nitrates and the results will be discussed. Any results that indicate possible pollutants will trigger a suggestion for further tests as detailed in Section A7.4. The attendees will also receive sample bottles so they can send a sample directly to the DEQ Environmental Laboratory for coliform bacteria analysis. The Oklahom*A*Syst project will not be directly involved in the collection, handling or testing of samples for bacterial analysis. Attendees will be advised that for a more complete picture of their drinking water quality. Those in attendance who desire one will be given a sterile sample bottle from the DEQ Environmental Laboratory and detailed instructions on how to collect a sample for submission to the laboratory.

A7.0 DATA QUALITY OBJECTIVES

Personnel involved in establishing the DQO for this project include with varying extent:

Mike Smolen
Mike Kizer
Barbara Brown
Nicole Gurski
Jennifer Meyers
Kendra Eddleman
Phillip Moershel

PROJECT DESCRIPTION

A variety of activities take place on rural and suburban property which can put the quality of drinking water produced by domestic wells in those locations at risk. Farms and ranches handle large quantities of animal waste, plant nutrients and pesticides. Non-farm residents may dispose of hazardous products such as pesticides, waste oil and antifreeze in an improper fashion. However, residents are unaware that their activities are high risk and they do not know what actions they should take to protect their water source; nor do they know the current quality of their drinking water. The Oklahom*A*Syst program provides residents with worksheets, supporting literature, and a seminar to help answer these and other questions. At the seminars we will also provide water quality tests to estimate the quality of a homeowner's water. The water quality tests will be used as incentives for homeowners to attend the well-owner seminars. Variables which will be tested include: pH, conductivity, and nitrates. The homeowner will also be provided materials for a bacteria test from DEQ Environmental Laboratory. The results from the sampling, especially results from the seminar sampling, will be used strictly for an educational tool. From the water evaluated at the Oklahom*A*Syst meeting, bacterial test, and recommendations from Extension specialists, a homeowner can determine if the quality of their water meets EPA drinking water standards.

ACTIONS or OUTCOMIES

If the testing results are near or above the drinking water standards in any manner the homeowner will be encouraged to have the water re-sampled and retested using a certified laboratory. If the results from the testing at the Oklahom*A*Syst meeting are above 80% of the EPA drinking water standards, Oklahom*A*Syst will highly recommend, as the test is not completed under controlled conditions nor at a certified laboratory, the sample be retaken and retested by a certified laboratory. If the results are between 50% and 80% of the EPA drinking water standards Oklahom*A*Syst recommends, as the test is not completed under controlled conditions nor at a certified laboratory, the sample should be retaken and retested by a certified laboratory. If the results are below 50% of the drinking water standard Oklahom*A*Syst believes the water to be of good quality, however, for conclusive results have the sample taken and tested by a certified laboratory. If total coliforms are present in a 100 ml sample of well water DEQ Environmental Laboratory will strongly recommend the water be retested for the presence of total coliforrn.

Oklahom*A*Syst will also recommend ways to maintain or improve the quality of a homeowners drinking water through detecting potential risks to groundwater. This will be completed by assisting the homeowner in surveying their property to determine the proximity of pollution sources such as septic systems, petroleum storage systems, and fertilizer storage.

METHODS

The results of this project will be used as educational tools rather than for regulatory purposes. The results from this project are not achieved under controlled circumstances, not based on expert sampling techniques, nor are they tested by a certified laboratory.

At the Oklahom*A*Syst meetings, homeowners drinking well water will be tested for pH, nitrates, and conductivity. Testing for pH and conductivity will be performed using a Jenco Model 1671 Conductivity/pH meter according to standard method 2510B and standard method 4500H-B respectively. Nitrate testing will be accomplished using an ATI ORION Model 93-07 pH and pH/ION Meter according to 56 RF 318888 (July 17, 1992) and 56 FR 50758 (October 8, 1992).

PROJECT SCOPE

The initial pilot project area will encompass Lincoln and Caddo counties. Educational activities will address household hazardous waste, surface water, ground water, maintaining private wells, household septic systems, fertilizer and pesticide storage and handling, and animal waste management. Presenters may include personnel from OSU Cooperative Extension Service, Conservation Districts, NRCS districts, and the Department of Environmental Quality. The program will provide homeowners with an idea of the current status of their drinking water and worksheets which allow them to assess the potential environmental risk to their wells. Subsequent to completion of the pilot portion of the project, the Oklahom*A*Syst program will expand into any of the 77 counties of the State where Cooperative Extension Service, Conservation District, NRCS, or DEQ personnel identify a programming need and an interest on the part of local citizens and support from private and civic organizations.

DECISION RULES

Analysis during Education Program
No recommendations will be made for pH or Electrical Conductivity.

Decision Rule for Nitrates

Nitrate Testing	Decision	Recommended Action
>8ppm	Impaired Sample	Re-sampling and Retesting of the well by certified laboratory technician from the DEQ Environmental Laboratory is highly recommended. Have your well tested in subsequent years.
5-8ppm	Adequate Sample	Re-sampling and retesting of the well water by the DEQ Environmental Laboratory is recommended. Have your well tested in subsequent years.
<5ppm	Nonimpared Sample	Water appears to be of good quality. We suggest for conclusive results to have well water tested by the DEQ Environmental Laboratory. To maintain this quality have your well tested in the years to come

Result	**Classification**	**Consequence False Positive**	**Consequence False Negative**	**Recommendation**
<5 mg/l	Nonimpared		If true concentrations are high then may cause Methemoglobinemia.	Suggest for conclusive results retesting by certified laboratory
5-8 mg/l	Satisfactory		If true concentrations are higher could cause Methemoglobinemia	Recommend re-sampling and testing by certified laboratory
>8 mg/l	Impaired	Caused homeowners unnecessary duress.		Strongly recommend re-sampling and testing by certified laboratory

Detection limits for nutrients will allow defining high quality drinking waters as well as levels of impairment. Precision and accuracy of all data must of course, be as true as possible. As a general rule precision and accuracy must be within ± 10 % except for parameters approaching detection limits, where practical considerations require a wider range of acceptable precision and accuracy. The precision and accuracy criteria presented in the City County Health Department of Oklahoma County laboratory Quality Assurance Plan are suitable for this study. OCCHD insures data quality through the use of analysis control charts for precision and accuracy following section 1020 of Standard Methods 1992. With these charts warning limits of ± 2 standard deviations are established and Control limits of ± 3 standard deviations. General acceptance limits for field duplicates and spikes are based on table 1020:1 of Standard Methods 1992. Method detection limits and acceptable limits for duplicates and spikes for the water quality parameters to be analyzed are shown in the following table.

Parameter/Method	Meter/ laboratory	Acceptable limits for precision of low level duplicates	Acceptable limits for precision of high level duplicates	Acceptable limits for accuracy	Method Detection level
Nitrates 56 FR 50758	ATI ORION Model 93-07 pH/ION Meter	10%	10%	10%*	.1mg/l
pH 4500 H-B	Jenco Model 1671 Conductivity/pH Meter	N/A	±1%±1digit	±.1%±1digit	-2.0su
Conductivity 2510 B	Jenco Model 1671 Conductivity/pH Meter	N/A	±1%FS±digit	±1%FS±digit	0.0ms

* Acceptable limits for recovery of known additions

MEASURES OF SUCCESS

The primary measure of success are based on educational objectives these will be determined by pre and post surveys presented to the homeowners attending the Oklahom*A*Syst program(s). The pre survey will be given at the program presentation. The post survey will be given, by phone, 6 to 8 months after the presentation to determine if behavior and attitudes towards ground water pollution prevention has changed.

A8.0 SPECIAL TRAINING REQUIREMENTS

Principle investigators for this project require degrees in biological sciences.

A9.0 DOCUMENTATION AND RECORDS

Data acquired with this project will be following formats according to the type of data and intended use.

Data type	Primary reporting format	Computer format format	Final reporting
Water quality laboratory analysis	Laboratory rep ort sheets, computer diskette	MicroSoft Excel	Tables, graphs, etc.
Water quality laboratory analysis - Field blanks duplicates and spike samples	Laboratory report sheets, computer diskette	MicroSoft Excel	QA summary tables

DATA ACQUISITION

B1.0 SAMPLING PROCESS DESIGN

SAMPLING DESIGN

The purpose of this program is strictly well owner education. The Oklahom*A*Syst program will demonstrate to homeowners the importance of proper well care and construction. As an incentive to attend the seminar Oklahom*A*Syst will either conduct water quality testing. Variables which will be tested include pH, conductivity, and nitrates. Each homeowner who attends the seminar will be allowed one sample of water tested.

BI.1 PROJECT ACTIVITIES AND TIME TABLE

The Farm & Ranch *A* Syst portion of the project was piloted in two counties (Lincoln and Caddo) in 1995. The Home*A*Syst portion of the program was developed in 1996. Eight counties were added in 1996, with two or more meetings in each county. In 1997, five additional counties were added. An additional five or six counties will be added to the program per year, funding permitting.

B 1.2 PROGRAM SITE SELECTION

Oklahom*A*Syst meetings may be scheduled in counties where local county Extension staff, Conservation District staff, or other agency personnel have identified a critical population of private well owners. Priority for well owner educational programs will be given to locations where local personnel can arrange suitable meeting locations, advertising, and linkages with interested citizen or private sector groups to ensure reasonable success of the program.

B2.0 SAMPLING METHODS REQUIREMENTS

The following sampling method will allow homeowners to become familiar with the quality of their source of groundwater. It will also provide recommendations, which will be helpful in deciding if the water coming from their tap is drinkable. The well sampling for this project will be completed by the homeowners themselves. Consequently, the accuracy of our results are dependent upon the techniques the homeowners utilize to complete their well water collections.

Homeowner Well Water Sample Procedure: Homeowners will bring a clean quart jar or larger sarnple of well water to the seminar to be tested by project personnel for nitrates, pH, and conductivity.

Seminar Testing: Conductivity and pH testing will be completed using a Jenco Model 1671 Conductivity/pH Meter following methods set forth in 2510B and 450OH-B. Nitrates will be completed using an ATI ORION Model 93-07 pH/ION Meter following EPA approved alternative methods set forth in 56 FR 50758.

B4.0 ANALYTICAL METHODS REQUIREMENTS

Analysis of well owner samples at the Oklabom*A*Syst workshops will be the responsibility the Oklahom*A*Syst Program and/or OSU Cooperative Extension. Conductivity and pH testing will be completed using a Jenco Model 1671 Conductivity/pH Meter following methods set forth in 2510B and 4500H-B. Nitrates will be completed using an ATI ORION Model 93-07 pH/ION Meter following EPA approved alternative methods set forth in 56 FR 50758.

B5.0 QUALITY CONTROL REQUIREMENTS

Nitrate spikes and duplicates will be analyzed for every 10 samples assessed during the workshop water quality analysis.

B7.0 INSTRUMENT CALIBRATION AND FREQUENCY

Calibration of field equipment used during the Oklahom*A*Syst program is the responsibility of Oklahom*A*Syst and/or OSU Cooperative Extension. Variables assessed during the well owner education seminar include conductivity, pH, and nitrates. Calibration of laboratory equipment used at the seminar will be completed by the Oklahom*A*Syst laboratory technician and will follow manufacturer instructions. The nitrate, pH and conductivity meters will be calibrated before each meeting where samples are tested. Any recalibration during the course of testing will be as required in accordance with the manufacturer's recommendations based on the results of spiked and duplicate sample testing.

B8.0 INSPECTION /ACCEPTANCE REQUIREMENTS FOR SUPPLIES

All supplies upon receipt are inspected for completeness and integrity. All reagents are checked for expiration dates and shelf life. Damaged, incomplete and expired supplies will not be used and will be returned to the supplier.

B9.0 DATA ACQUISITION REQUIREMENTS

Data acquired for use in this project from other projects or from outside sources will be reviewed for completeness, quality and how it meets with the data quality objectives. All data from outside sources will be cited appropriately.

B10.0 DATA QUALITY MANAGEMENT

The information resulting from the water analyses at Oklahom*A*Syst public meeting are for educational purposes only. The results are the property of the well owner and will be reported to the owners at the end of the meeting. No individual data will be retained by the Oklahom*A*Syst project. In order to assure proper laboratory procedures are followed, and to document the extent of the educational program a standard laboratory notebook will be maintained. The results of analyses at each meeting will be recorded by sample number, with no ownership attributed.

ASSESSMENT/OVERSIGHT

C2.0 REPORTS TO MANAGEMENT

Quality assurances reports will be sent to the EPA Region VI project officer through the Office of the Oklahoma Secretary of the Environment. The quarterly reports will include: status of the project, results of performance and system audits, results of data quality assessments and significant quality assurance problems and solutions.

DATA VALIDATION AND USABILITY

D1.0 DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS

Acceptance criteria for water quality data resulting from spiked and duplicate samples will follow Table 1020:I of Standard Methods (APHA,AWWA,WPCF. 1992.). All data for a specific parameter for a given set of samples will be considered suspect if spike recovery or duplicate analysis result in figures exceeding the criteria in table 1020:I.

D2.0 VALIDATION AND VERIFICATION METHODS

Through the data management process as described in Section B10 data are reviewed several times. Data validation is an integral part of this process. The mechanism of this process is already described in B10. For spiked samples the percent recovery of a known addition to a sample will be calculated, and for duplicates the difference as the percentage of the mean will be calculated (Table 1020:I of Standard Methods (APHA,AWWA,WPCF. 1992.)). All data will be routinely reviewed for abnormalities, inconsistencies, or unusual results. If any of these occur, the data will be traced back to look for possible causes of the error. In the event that no error is found, the data will be assumed to be normal and appropriate for use in project reports and in decision-making. If an error is found and no resolution can be arrived at concerning its source or cause, the data will be discarded.

D3.0 RECONCILIATION WITH DATA QUALITY OBJECTIVES

The objective of this Quality Assurance Project Plan is to provide data consistent with the work plan that is as complete as possible with the precision and accuracy necessary for meaningful interpretation. The data must also be representative of the activity performed. These data will primarily be utilized for educating homeowners. The samples are not collected or tested under controlled laboratory conditions.

The primary measure of success will be changes in the attitudes and behavior within homeowners who attend Oklahom*A*Syst programs.

These factors will be documented as part of the project and will also serve to document or qualify success of the project.

D4.0 BIBLIOGRAPHY.0

APHA,AWWA,WPCF. 1992. Standard Methods for Examination of water and Waste Water 18th edition, American Public Health Association, Washington DC.

Christensen, Scott, and A. Rea. 1993. Ground water quality in the Oklahoma City Urban area. In Regional GroundWater Quality. Van Nostrand Reinhold. NY, NY.

Cuperus, G.W., J. Pruitt, and K. Pinkston. 1992. Extension Entomology at a Crossroads. Amer. Entomol. 38:78.

D5.0 APPENDIX A

APPENDIX D

Water Test Results

Oklahom*A*Syst Water Testing
(04/96 - 01/98)

Nitrate (NO_3-N) Testing

County	Total Tests	Tests w/NO_3 > 10 ppm	Percent > 10 ppm
Training: Enid, OKC, McAlester 24	5	21	
Oklahoma Co.	186	6	3
Okfuskee Co.	54	3	6
Carter Co.	29	1	3
Delaware Co.	126	5	4
Adair Co.	20	1	5
LeFlore Co.	13	0	0
Grady Co.	114	22	19
Haskell Co.	41	0	0
Pottowatomie Co.	65	7	11

Lincoln Co.	174	11	6
Cleveland Co.	40	1	3
TOTAL	886	62	7

Total Dissolved Solids (TDS) Testing

County	Total Tests	Tests with TDS > 10 ppm	Percent Tests w/ TDS > 500 ppm
Training: Enid, OKC, McAlester	24	7	29
Oklahoma Co.	186	118	63
Okfuskee Co.	54	18	33
Carter Co.	29	23	79
Delaware Co.	126	10	8
Adair Co.	20	0	0
LeFlore Co.	13	9	69
Grady Co.	114	60	53
Haskell Co.	41	23	56
Pottowatomie Co	65	31	48
Lincoln Co.	174	59	34
Cleveland Co.	40	17	43
TOTAL	886	375	42

Oklahom*A*Syst Bacteria Testing

County	Total Tests	Positive	Negative	Percent Positive
Delaware	32 (6)	21 (6)	11	66
Grady	5	3	2	60
Lincoln	18	7	11	39
Major	2	0	2	0
Okfuskee	9 (1)	7 (1)*	2	78
Oklahoma	100	38	62	38
Pottawatomie	38 (1)	18	20 (1)*	47
TOTAL	204 (8)	94 (7)*	110 (1)*	46

* Numbers in parentheses are retests

APPENDIX E

Public Meeting Notices and Advertising

Do you have a clear picture of the potential sources of contamination on your property?

If not, the Oklahom*A*Syst program can...

* Protect you from liability.
* Maintain or improve your ground water quality and your family's health.
* Create awareness of possible sources of drinking water contaminants on your property.
* Promote understanding of ground water protection and clean-up actions.
* Identify sources for technical, educational, and financial assistance.
* Aid in developing a personal, voluntary action plan.

*Farm & Ranch*A*Syst Assessment Topics*

* Drinking Water Well Condition
* Pesticide Storage and Handling
* Fertilizer Storage and Handling
* Petroleum Product Storage and Handling
* Hazardous Waste Management
* Household Waste Water Management
* Swine, Dairy, and Beef Cattle Waste Management
* Poultry Waste Management

*Home*A*Syst Assessment Topics*

* Drinking Water Well Condition
* Household Waste Water
* Household Hazardous Products
* Liquid Fuels

*About the Oklahoma Farm & Ranch*A*Syst Program*

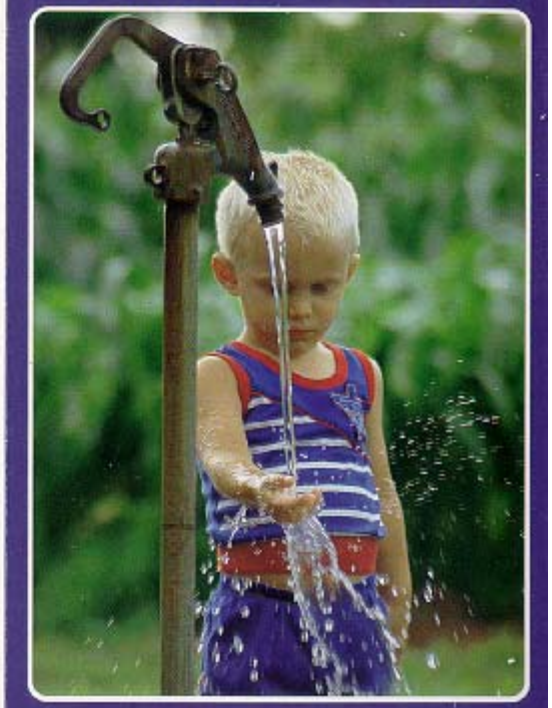
This program is designed to help you protect, maintain, and improve the quality of ground water—your source of drinking water. Participation in the program is strictly voluntary.

For further information about the Oklahom*A*Syst program, contact your county Extension office, listed under county government in your phone directory, or your conservation district representative.

*Partial funding for the cost of printing the Oklahom*A*Syst publications was provided by a grant from the Environmental Protection Agency, Region 6, Office of Secretary of Environment.*

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Samuel E. Curl, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Dean of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of $1,010.45 for 5,000 copies. #8860 0697 MSC.

OKLAHOM*A*SYST



Farm & Ranch*A*Syst and Home*A*Syst

Self-Assessments Designed to Help Protect Your Family's Drinking Water

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

Oklahom*A*Syst

Farm & Ranch*A*Syst and Home*A*Syst

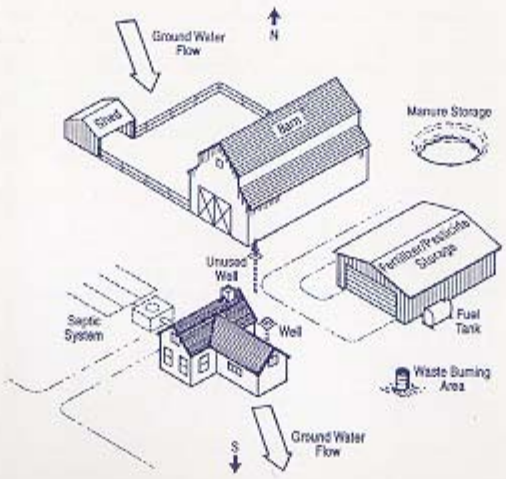
Self-Assessment Programs for Clean Water

If you're like most suburban and rural Oklahoma residents, you are concerned about protecting your drinking water. You may know that well construction, well location, and facilities near your well can cause ground water contamination. The activities that take place on your property and how you manage them can put the health of your family and neighbors and the value of your property at risk.

Knowing these facts may provide the motivation for action. But many people don't know what activities create a high risk for ground water contamination and they aren't sure where to go for help. Oklahom*A*Syst is an assessment tool designed to give you the answers you need to protect your ground water.

The Oklahom*A*Syst program has two components. Farm & Ranch*A*Syst is designed for farmers and ranchers and addresses activities common in production agriculture. Home*A*Syst is designed for people who live on small acreages in suburban or rural areas, but are not engaged in commercial agriculture. It is aimed at the sort of environmental issues encountered in and around the home. Both Farm & Ranch*A*Syst and Home*A*Syst have several worksheets that take you through a step-by-step assessment of your property. This allows you to rank the risk for ground water contamination point-by-point. Using these rankings and information from companion fact sheets, you can develop an overall action plan for protecting your drinking water.

Oklahom*A*Syst is a confidential assessment that you can use on your own or in consultation with local experts. You decide what to do with the results of your assessment and you keep your action plan in your private records. It's like having a detailed environmental assessment of your property at little or no cost...and you remain in control.



Oklahom*A*Syst is based on a program developed and tested in a joint project between the University of Wisconsin Extension Service, Minnesota Extension Service, and the Environmental Protection Agency, Region 5. The state staff of the Natural Resources Conservation Service of Wisconsin and Minnesota assisted in material and project review.

Oklahoma is one of many states which have adapted the original Farm*A*Syst/Home*A*Syst materials to reflect local conditions and regulations. Using the expertise of agricultural, water quality, and environmental experts, the Oklahom*A*Syst program provides a comprehensive, practical approach to protecting the state's ground water and your drinking water.

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*Ground water pollution can affect land values, because lenders deduct the cost of corrective actions or cleanup from sales prices. Legal action is also a possibility from both owned and leased property. Oklahom*A*Syst can help you keep your property clean and avoid these costly problems. More importantly, it can help keep your family's drinking water pure and safe.*

THE PRAGUE TIMES-HERALD, Prague, Oklahoma , March 2, 1995

Safe Water Program Presented By Extension Service

A farm program will be presented in Prague on March 14 by the Lincoln County Oklahoma Cooperative Extension. The 7:00 p.m. program is entitled "How Safe Is Your Water?" and is offered through Prague Community Education. It will be held at the High School Library.

Oklahoma Farm & Ranch 'A' Syst is a pilot project offered in Lincoln and Caddo Counties to educate private well head owners on how to reduce the risk of pollution to private water wells.

Participants in the program should bring a water sample (1 pint to 1 quart in a clean container) which will be tested for nitrates, total dissolved salts and pH. Those participating in the eight fact sheet worksheet education series will also receive a free bacteria test.

Interested well owners should contact JoAnn Howell, Prague Community Education, 567-2281, ext. 250 to register for the free program. Deadline for registration is March 9.

Thursday, May 11, 1995 THE LINCOLN COUNTY NEWS

County Briefs

Farm and Ranch meeting scheduled

Lincoln County is participating in a pilot project for the protection of our ground water through protection of private water wells. This project is currently being done in two counties, Caddo and Lincoln.

One meeting has been held in the Prague area. Community meetings have been scheduled in the following communities: Chandler on May 16, from 7-9 p.m. in the courthouse lobby, Stroud on June 27 from 7-9 p.m. and Captain Creek on July 18, from 7-9 p.m.

Interested persons with a private well water supply are asked to bring a clean (does not need to be sterile) water sample in a clean fruit jar or soda bottle. This will be tested free at the meeting.

Those interested in completing the pertinent worksheets for their operation will be given a sterile bottle for another free test to be sent to Oklahoma City.

MEEKER NEWS, Thursday, May 11, 1995

Water protection meeting planned

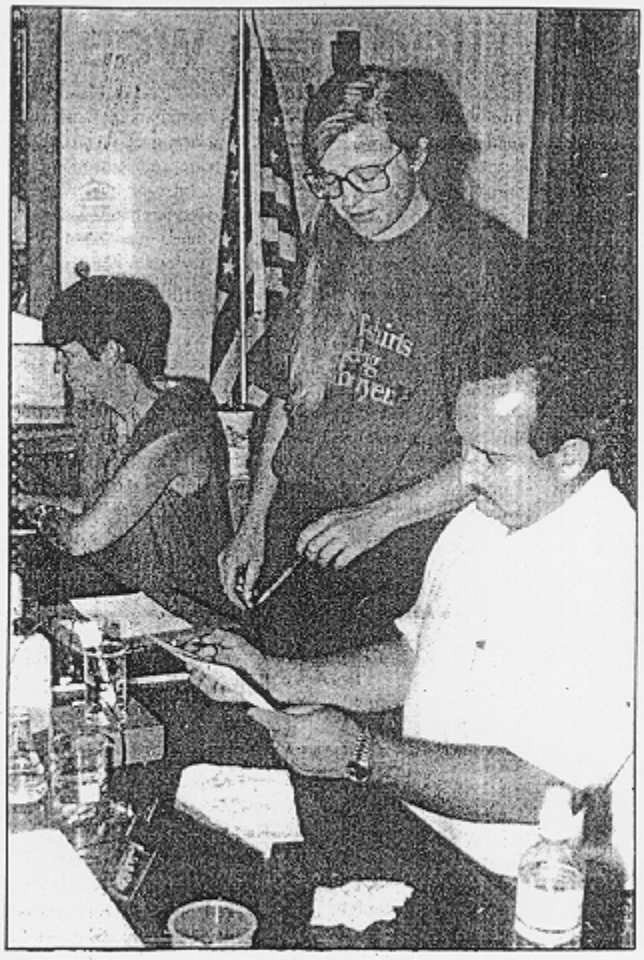
Lincoln County is participating in a pilot project for the protection of our ground water through protection of private water wells. This project is currently being done in two counties, Caddo and Lincoln.

One meeting has been held in the Prague area. Community meetings have been scheduled in the following communities: Chandler, May 16 from 7-9 p.m. in the courthouse lobby; Stroud, June 27, from 7-9 p.m. and at Captain Creek, July 18 from 7-9 p.m.

Interested persons with a private well water supply are asked to bring a clean (does not need to be sterile) water sample in a clean fruit jar or soda bottle. This will be tested free at the meeting.

Those interested in completing the pertinent worksheets for their operation will be given a sterile bottle for another free test to be sent to Oklahoma City.

Thursday, Aug. 31, 1995 The Lincoln County News



GOOD WATER or bad? Testing for quality of water from county wells will be an added feature at the Lincoln County Free Fair this year. Sponsored by Oklahoma State University Extension Service, water will be accepted on Friday, September 8, from 9 a.m. to 7 p.m. and will be tested beginning at 4 p.m. The program has been offered in several communities in the past month. Letrisa Miller from northwest of Carney has Kevin Shelton, extension association for OSU, test for nitrates and Barbara Brown, a food specialist at OSU, test for PH and electrical conductivity. Those interested in testing should bring a sample of well water in a clean jar or bottle.

COMING SOON
TO

LINCOLN COUNTY-

OKLAHOMA FARM AND RANCH ASSIST

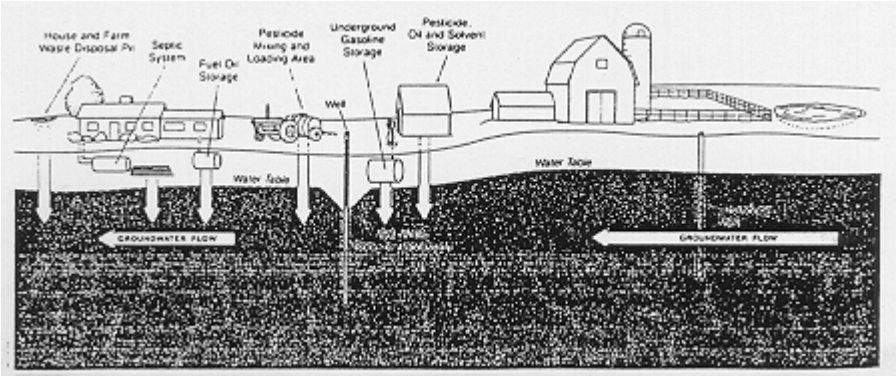
A SELF -ASSESSMENT TOOL FOR EVALUATING THE SAFETY OF YOUR GROUND WATER

THE PROGRAM INCLUDES FACT SHEETS AND ASSESSMENT SHEETS ON AREAS OF RISK TO YOUR GROUNDWATER SUPPLY, INCLUDING:

- WELL CONDITION
- HOUSEHOLD WATER TREATMENT
- PESTICIDE MANAGEMENT
- FERTILIZER MANAGEMENT
- HAZARDOUS WASTE
- ANIMAL WASTE MANAGEMENT

YOU FILL OUT THE ASSESSMENT SHEETS - WE CAN HELP YOU. THE SCORING GIVES YOU AN INDICATION OF RISKS TO YOUR FAMILY'S GROUNDWATER.
ASSESSMENTS DO NOT GO TO ANY GOVERNMENT AGENCY. THEY ARE YOU YOUR INFORMATION ONLY.

SIGN UP ON OUR MAILING LIST IF YOU'RE INTERESTED IN OKLAHOMA FARM AND RANCH ASSIST



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

Oklahoma Farm & Ranch*A*Syst
is a pilot education project for the protection
of private wellhead water supplies.

FREE

Water test for private well owners

LAST SCHEDULED OPPORTUNITY

Captain Creek - July 18
7:00 - 9: 00 p.m.
Captain Creek School

Come to the meeting of your choice.
More meetings may be scheduled at a later date.

Bring a clean (not necessarily sterile) water sample in a clean fruit jar or liter soda bottle. This will be tested free of charge at the meeting. Those interested in continuing by doing fact sheets and work sheets pertinent to their farmstead will have another free water test provided.

Call Lincoln County OCES-405-258-0560 for further information.

See Inside Pages For C

STIGLER

Haskell County News--Volume 91--Number42

STIGLER, OKLAHOMA, OCTOBER 16, 1997

Water Quality Program To Offer Free Testing For Well Users

The Haskell County Water Quality Program will get underway next week with the offering of free water testing and educational seminars for area residents.

Haskell County OSU Extension Agent Marty Green invites the public to attend one of three meetings scheduled Oct. 20 and 21. Those attending will receive a free analysis of their water and learn more about ensuring the safety of water sources on property.

These meetings will be held Oct. 20 at 6:30 p.m. in the Keota School auditorium; Oct. 21 at 10 a.m. in the McCurtain School auditorium; and Oct. 21 at 6:30 p.m. at Stigler Fairgrounds Showbarn.

Persons interested in having their water tested should bring a sample in a clean, one pint container. This water will be analyzed for nitrates, total dissolved solids and acidity. There will also be an opportunity to obtain a free bacteria test for the water.

Green says although the program is designed for persons with private water wells, those with rural water may have water tested as well.

Green said the testing takes approximately an hour and a half, and while persons are waiting, they will be able to listen to expert advice provided by Michael Kizer and Barbara Brown. Kizer is an Associate Professor and Extension Ag Engineer in soil and water while Brown is an Assistant Professor and Extension Food Specialist.

They will be pointing out the importance of proper well house construction, storage of products in or near water sources, potential sources of contamination, and proper placement of septic systems in correlation with a water system.

Green pointed out that results of testing are kept confidential.

This water quality program is being sponsored by the local extension service, the Oklahoma Department of Environmental Quality, the Haskell County Conservation District and the Haskell County Commissioners.

This testing will be conducted only once a year, Green noted.

Oklahom*A*Syst Drinking, Water Quality Program

Is My Well Water Safe?

How Can I Protect My Water Well?

Find out the answers to these, and other questions about your private water well.

Who Should Attend:	Owners of private drinking water wells	
Where and When:	Keota School Auditorium	Oct. 20 @ 6:30 PM
	McCurtain School Auditorium	Oct. 21 @ 10:00 AM
	Stigler Fairbarn	Oct. 21 @ 6:30 PM

What will Happen: You will find out how to do a confidential self-evaluation of your property to determine if your drinking water well is properly constructed, and if you are managing your property to reduce the risk of your water supply being contaminated. *Bring a water sample* in *a clean, 1-pint container to have your water analyzed for nitrate, total dissolved solids and acidity*. You will also have the opportunity to obtain a free bacteria test for your water. Meetings are Open to the Public. You may attend any or all of the meetings. Locations are for your convenience.

Oklahom*A*Syst is brought to you by:

OSU Cooperative Extension Service
Oklahoma Department of Environmental Quality
Haskell County Conservation District
Haskell County Commissioners

APPENDIX F

Public Meeting Schedule

FARM & RANCH*A*SYST
1995 Meeting Calendar

Date	County	Location	Time	Meeting Team Members
Feb. 2	Caddo	Ft. Cobb	2 PM	MK, BB, KS
Mar. 14	Lincoln	Prague	7 PM	MK, BB, MS, KS
May 9	Caddo	Hydro	7 PM	MK, BB, KS
May 16	Lincoln	Chandler	7 PM	MK, BB, MS, KS
June 27	Lincoln	Stroud	7 PM	MK, BB, KS
July 18	Lincoln	Captain Creek	7 PM	MK, BB, KS
Aug. 22	Lincoln	Carney	7 PM	MK, BB, KS
Sept. 8	Lincoln	County Fair (Chandler)	1PM	MK, KS

MK - Mike Kizer BB - Barbara Brown MS - Mike Smolen
KS - Kevin Shelton WL - Wes Lee

OKLAHOM*A*SYST
1996 Meeting Calendar

Date	County	Location	Time	Meeting Team Members

Apr. 4	OCES	Fairview	10 am	MK, MS, NG
Apr. 17	OCES	Oklahoma City	10 am	MK, MS, NG
Apr. 18	OCES	McAlester	10 am	MK, BB, MS, NG
Aug. 24	Oklahoma	Lake Hiawasee Fire Hall	10 am	MK, JM, NG
Sept. 21	Oklahoma	Choctaw City Hall	10 am	MS, JM, NG
Sept. 24	Pottowatomie	Wannette School	7 pm	MK, SW, MB, NG
Sept. 26	Okfuskee	Mason	7 pm	MS, BB, MF, NG
Oct. 8	Pottowatomie	McCloud Board of Educ.	7 pm	BB, MB, NG
Oct. I 0	Okfuskee	Paden/Boley	7 pm	MS, BB, MF, NG
Oct. 19	Oklahoma	Edmond Arrowhead Hills	10 am	MS, JM, NG
Oct. 22	Pottowatomie	Tecumseh City Council Ch.	7pm	MK, MB, NG
Oct. 24	Okfuskee	Weleetka	7 pm	SW, MF, NG
Nov. 7	Okfuskee	Okemah	7 pm	SW, MF, NG
Nov. 12	Pottowatomie	Shawnee OCES Center	7 pm	MK, MB, NG

NG - Nicole Gurski
BB- Barbara Browne
MF - Mitch Fram
MK - Mike Kizer
SW - Sue Williams
JM - Jennifer Meyers (OK Co. Cons. Dist.)
MS – Mike Smolen
MB – Marley Beem

OKLAHOM*A*SYST
1997 Meeting Calendar

Date	County	Location	Time	Meeting Team Members
Jan. 16	Oklahoma	Edmond Public Libr.	6:30 pm	MK, NG, CK, JM

Feb. 1	Oklahoma	Edmond Dntwn. Com. Ctr.	10 am	MS, NG, JM
Feb. 4	Grady	Chickasha	11 am	WL, BB, MK
Feb. 6	Delaware	Kansas Vo-Tech. School	7 pm	MF, BB, MS, NG
Feb. 13	Delaware	Kenwood Sr. Citizen's Ctr.	7 pm	MF, MK, NG
Feb. 17	LeFlore	Hodgen School Cafeteria	6:30 pm	MS, MK, MF, MB
Feb. 18	LeFlore	Bokoshe	6:30 pm	MS, MK, MF, MB
Feb. 20	Delaware	Jay Community Ctr./Libr.	7 pm	MF, MK, SW, NG
Feb. 25	Grady	Rush Springs Lions club	11 am	BB, WL, MK, NG
Feb. 25	Grady	Tuttle Bank	7 pm	WL, BB, MK, NG
Feb. 27	Delaware	Grove Civic Ctr.	5:30 pm	BB, MK, MS, NG
Mar. 19	Adair	Stillwell	10:30 am	MK, SW, NG
Mar. 22	Oklahoma	Edmond	10 am	MS, JM, NG
Apr. 28	Cleveland	Norman Fairgrnds. Audit.	1:30 pm	MK, WL, NG
July 7	Carter	Ardmore Extension Center	7 pm	MK, MB, NG
Aug. 14	Carter	Healdton Cham. of Comm.	7 pm	MK, MB, NG
Oct. 11	Oklahoma	Forest Park Town Hall	10 am	MK, NG, KS
Oct.20	Haskell	Keota School Auditorium	7 pm	MK, BB, NG
Oct. 21	Haskell	McCurtain School Audit.	10 am	MK, BB, NG
Oct. 21	Haskell	Stigler Fairgrnd. Showbarn	7 pm	MK, BB, NG

NG - Nicole Gurski
BB- Barbara Browne
MF - Mitch Fram
JM - Jennifer Meyers (OK Co. C.D.)
MK - Mike Kizer
SW - Sue Williams
CK - Cathy Koelsch
KS - Karen Scanlon (OK Co. C. D.)
MS - Mike Smolen
MB - Marley Beem
WL - Wes Lee

APPENDIX G
Request for County-Level Proposals

Request for Proposals
Oklabom*A*Syst County Programs
Farm & Ranch*A*Syst/Home*A*Syst

Oklahom*A*Syst is a confidential environmental self-assessment that land owners can use to identify any high-risk practices on their property which might threaten the quality of drinking water in their domestic well. Use of the assessment package can help them to better protect the health and well-being of their family, the value of their property and ground water supply that serves them and their neighbors.

T'he Oklahom*A*Syst team at OSU is requesting proposals for local programs from OSU county or unit extension teams. Since we have limited financial and personnel resources, we ask that you submit a brief (2 pages, maximum) proposal outlining your county/unit plan for implementing Oklahom*A*Syst. Successful proposals will receive $500 to assist with travel, advertising, and other expenses (refreshments cannot be purchased with these funds-- this is state rule), plus the technical support of the campus and area Oklahom*A*Syst team in program delivery.

The following are suggested topics to be addressed in your proposal:

Introduction: What are your concerns? Who is interested or who should be interested? What known problems are there in your county?

Objective: What are your goals? Which people will you seek to reach? What should they learn? What do you want them to do as a result of the program?

Approach: How will you conduct your program?

Who will help? Priority will be given to proposals in which two or more members of the field staff (Ag., Home Ec., 4-H, RD, Hort. agents) are actively involved in the county or unit program. Do you have interest and support from other state agency personnel or local entities? (Conservation District, NRCS, DEQ, Water Resources Board, Fertilizer Dealers, Electric Coops, Rural Water Districts)

How will you reach the public? Open meetings? FCE clubs? Producer Groups? Young Farmers? 4-H club projects? FFA Chapter activities?

Follow-up/Technical Assistance? Public meetings work well to raise awareness and develop interest, but individual attention may be needed to help participants complete their assessments. Can your staff do this? (With support from state and area specialists)

Evaluation: How will you evaluate your program? A follow-up evaluation of the participants (mail or telephone survey, etc.) to determine any changes implemented because of the program is a must.

Resources Available: What resources do you have?

Interested groups, Concerned well-owners, Newspaper column, Good partners?

Potential Support (Banks, Civic Groups, Farm Organizations, Realtors). Proposals with financial support from local groups or businesses will be given higher priority than those without local financial support.

Resources Required: What resources do you need?
Specialist help in public meetings? Where and how many?
Water testing (nitrate, pH and TDS) during meetings?
Lab tests for coliform bacteria?
Technical assistance to follow-up on requests?
Fact sheets/publications/other resources?

If you have further questions contact:

Mike Kizer	405-744-8421
Barbara Brown	405-744-6824
Mike Smolen	405-744-5653
Wes Lee (SW Dist. WQ Specialist)	405-255-0601
Marley Beem (SE Dist WQ Specialist)	405-332-4100
Mitch Fram (NE Dist. WQ Specialist)	918-687-2466

APPENDIX H

Surveys and Results

Lincoln County Farm & Ranch*A*Syst Survey

We did/did not do the assessment map and planner. (circle one)

If you did the planner please answer the following sections as they pertain to your individual farm/homestead.

If you have taken no action please indicate the reason.

_____Problem is not serious_____Too expensive_____Haven't had time
Need technical assistance Other-List

Who completed the assessment/survey for your property?
_____Male Adult_____Female Adult_____Male Youth _____Female Youth

Suggestions for future implementation of this program. _____

_____

_____

_____

Worksheet #1

Assessing the Risk of Ground Water Contamination from Drinking Water Well Condition

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
New well drilled	_____	_____	_____	_____	_____
Changed condition of well	_____	_____	_____	_____	_____
Anti-backflow devices	_____	_____	_____	_____	_____
Abandoned wells plugged	_____	_____	_____	_____	_____
Drinking water tested	_____	_____	_____	_____	_____

Worksheet #2

Assessing the Risk of Ground Water Contamination from Pesticide Storage and Handling

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Safe storage of pesticides	_____	_____	_____	_____	_____
Change amount stored	_____	_____	_____	_____	_____
Change pesticide containers	_____	_____	_____	_____	_____
Fence or lock up pesticides	_____	_____	_____	_____	_____
Sprayer separate from tank	_____	_____	_____	_____	_____
Backflow preventer	_____	_____	_____	_____	_____
Supervised sprayer filling	_____	_____	_____	_____	_____
Rinse & recycle containers	_____	_____	_____	_____	_____

Worksheet #3

Reducing the Risk of Ground Water Contamination by Improving Fertilizer Storage and Handling

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Fertilizer safely stored	_____	_____	_____	_____	_____
Mixed away from well	_____	_____	_____	_____	_____
Safe applicator disposal	_____	_____	_____	_____	_____

Worksheet #4

Reducing the Risk of Ground Water Contamination by Improving Petroleum Product Storage

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Fuel tank located downslope	_____	_____	_____	_____	_____
Tank installed w/protection	_____	_____	_____	_____	_____
Tank & piping protected	_____	_____	_____	_____	_____
Non-combustible tank area	_____	_____	_____	_____	_____
Regular leak monitoring	_____	_____	_____	_____	_____
Unused tanks removed	_____	_____	_____	_____	_____

Worksheet #5

Reducing the Risk of Ground Water Contamination by Improving Hazardous waste Management

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Storage and disposal area	_____	_____	_____	_____	_____
Safe disposal of Building/ Metal/Adhesives/Cleaners,etc.	_____	_____	_____	_____	_____
Lead acid batteries	_____	_____	_____	_____	_____
Vehicle Lubricant or Fuel	_____	_____	_____	_____	_____
Used Antifreeze	_____	_____	_____	_____	_____
Used Solvents & Cleaners	_____	_____	_____	_____	_____
Household Pesticides	_____	_____	_____	_____	_____
Safe disposal of containers	_____	_____	_____	_____	_____

Worksheet #6

Reducing the Risk of Ground Water Contamination by Improving Household Wastewater Management

This work sheet does/does not apply to my farm/homestead. (Circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Septic drainfield 75-100'	_____	_____	_____	_____	_____
Approved waste system	_____	_____	_____	_____	_____
Lateral lines functioning	_____	_____	_____	_____	_____
Septic checked each year	_____	_____	_____	_____	_____
Traffic away from drainfield	_____	_____	_____	_____	_____
Use of water saving fixtures	_____	_____	_____	_____	_____

Worksheet #7

Reducing the Risk of Ground Water Contamination by Improving Swine, Dairy, and Beef Cattle Waste Management

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	Did as result	Plan to do	Don't plan to do	$ Cost of changes
Animal facilities downslope	_____	_____	_____	_____	_____
Confinement area paved with downslope	_____	_____	_____	_____	_____
100-3001 downslope disposal	_____	_____	_____	_____	_____
Record waste application	_____	_____	_____	_____	_____

Worksheet #8

Reducing the Risk of Ground Water Contamination by Improving <u>Poultry Waste Management</u>

This work sheet does/does not apply to my farm/homestead. (circle one)

	Did before FAS	**Did as result**	**Plan to do**	**Don't plan to do**	**$ Cost of changes**
Animal facilities downslope	_____	_____	_____	_____	_____
Waste protected from weather	_____	_____	_____	_____	_____
Disposal pit, pond or lagoon	_____	_____	_____	_____	_____
Application areas include buffer strips	_____	_____	_____	_____	_____
Records waste application	_____	_____	_____	_____	_____

We will be calling a random sampling of participants for a telephone interview for in-depth case study information.

Thank you for your participation. Please return the completed survey in the enclosed SASE by December 15, 1995 to:

Edwina Douglas
Extension Home Economist
Lincoln County
Courthouse
Chandler, Oklahoma 74834

Attempt: #1 Time:_____ Date:_____ County_____
#2 Time:_____ Date:_____ Meeting Location_____
#3 Time:_____ Date:_____ Respondent #_____

Survey complete? YES ___ NO___ SURVEYOR_____

Survey Questions:

Identify yourself: Name, OK Cooperative Extension Service.
Ask for person on the list. If not available, ask if someone else in household attended the meeting.

"I understand that you attended an Oklahom*A*Syst meeting where you learned about protecting your well water and had your water tested. I'd like to take a few minutes to ask you some questions about the program. Is this a convenient time, or shall I call you back?" **[schedule a convenient time to call back]** "This information will be used to help the Cooperative Extension improve the Oklahom*A*Syst program. Any information you share will be completely confidential."

(Circle the answer that applies)

1. As a result of the meeting, did you learn to identify sources of pollution on your property?
YES SOMEWHAT NO

2. Did you find the results of the water tests taken at the meeting useful?
YES SOMEWHAT NO

3. Which information packet did you receive at the meeting?
Farm & Ranch*A*Syst Home*A*Syst

4. Did you complete the Assessment Map and Planner?
YES NO

If NO, why was no action taken?_____

If NO, GO TO #8

If YES, who completed the survey? (circle one)
MALE or FEMALE

YOUTH (18 and under) or ADULT(above 18)

5. Did you complete any other worksheets?
YES NO
If YES, which ones?

Farm and Ranch*A*Syst	✓	Home*A*Syst	✓
Drinking Water Well Condition		Drinking Water Well Condition	
Pesticide Storage and Handling		Household Waste Water	
Fertilizer Storage and Handling		Household Hazardous Products	
Petroleum Storage and Handling		Liquid Fuels	
Hazardous Waste Management			
Household Waste Water Management			

6. Have you made any changes to reduce risk as a result of completing the Site Assessment and Worksheets? YES NO

If YES, what?_____

If YES, GO TO #8.
If NO, GO TO #7.

7. Have you planned or thought about making any changes to reduce risk?
YES NO

If YES, what changes have you thought about?_____

If NO, GO TO #9.

8. Please estimate the cost of the changes you made:_____

9. "Thank you for taking the time to answer these questions. This information will be used to improve future Oklahom*A*Syst programs."

Do you have any questions or comments?_____

-END OF SURVEY-

Survey results from meetings in 1996/1997

(Adair, Delaware, Grady, LeFlore, Okfuskee and Pottawatomie counties)

1. Did you learn to identify sources of pollution on your property?

Yes	92
Somewhat	19
No	11
No Response	5

2. Did you find the results of the water test useful?

Yes	107
Somewhat	9
No	11

3. Which information packet did you receive at the meeting?

F&R*A*S	69
H*A*S	26
No Response	32

4. Did you complete the Assessment Planner and Map?

Yes	43
No	66
No Response	18

If Yes, who completed the assessment?

Male	27
Female	27
No Response	73

Youth	0
Adult	8
No Response	119

Some reasons for not completing:
- Water not used for drinking
- Tests showed water was safe
- Forgot to follow-up
- Made some changes, but didn't fill out the forms
- Didn't think it would help
- No time to do it

- Can't afford any changes

5. Did you complete any other work sheets?

Yes	33
No	45
No Response	49

If Yes, which ones?

Farm & Ranch*A Syst		Home*A*Syst	
Water Well	23	Water Well	13
Pesticides	15	Waste Water	6
Fertilizer	12	Hazardous Products	6
Waste Water	12	Liquid Fuels	2
Petroleum	11		
Hazardous Waste	10		

6. Have you made changes on your property as a result of completing the Site Assessment and Work Sheets?

Yes	57
No	40
No Response	30

If Yes, what changes?
- Shock chlorination and screened vent
- Moved fuel tanks away from well
- Diverted surface runoff away from well
- Changed cleaners used in house
- Don't use pesticides in yard (multiple responses)
- Reduced fertilizer and pesticide use around house (multiple responses)
- Moved watering location for cattle
- Changed location of livestock pasture
- Hooked up to rural water district
- Poured slab and built well house
- Got water tested
- Drilled new well

7. Have you planned or thought about making changes to reduce risks?

Yes	29
No	60
No Response	38

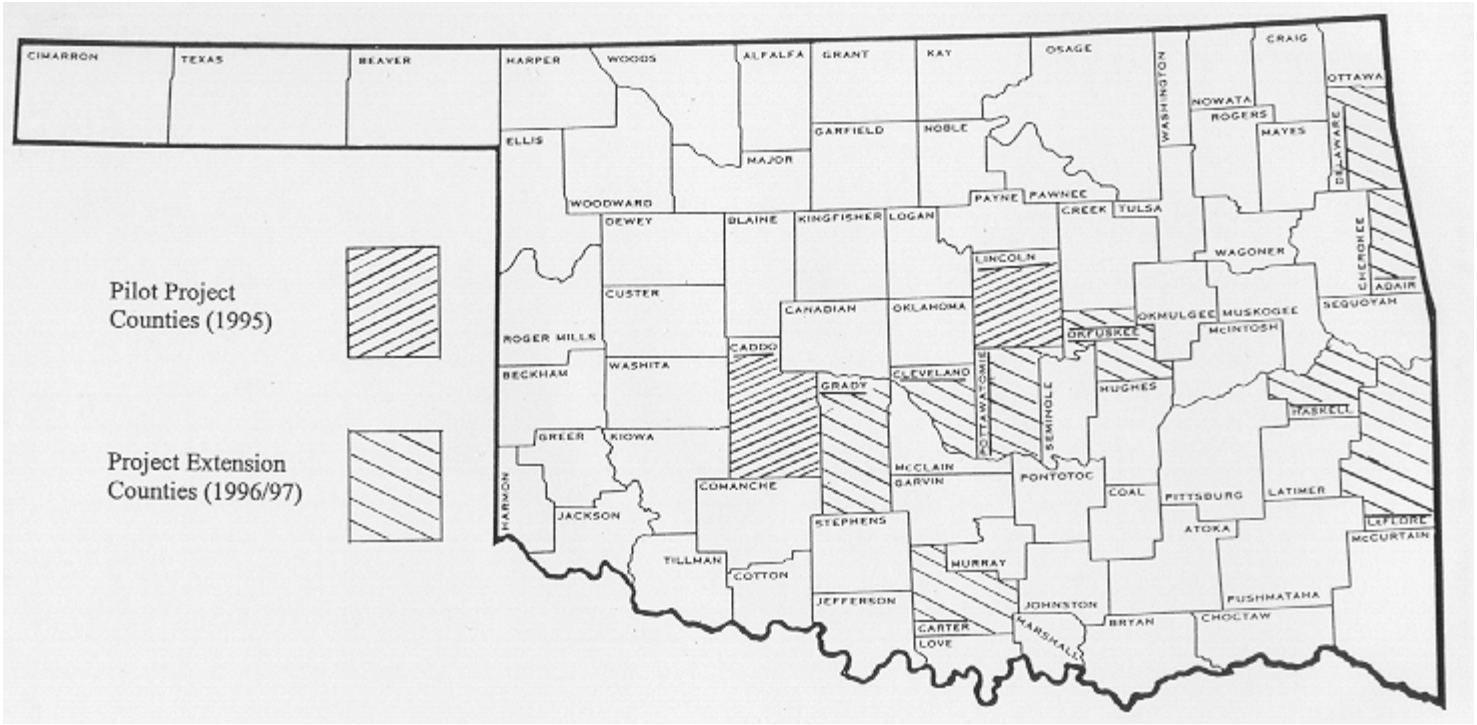
If Yes, what changes?
- Regular water testing schedule
- Pick up trash and discontinue dumping on property

- Increase height of well casing
- Chlorinate well
- Cut down on pesticide use (multiple responses)
- Improve chemical storage on property
- Will drill new well
- Will check well maintenance
- Proper disposal of used oil and antifreeze

8. Estimate the cost of changes you made.
Personal labor only, $10, $12, $24, $100, $375, $750, $980, $2000, $3422
Not sure or Unknown 5
No response 112

APPENDIX J

Map of Project Area


Pilot Project Counties (1995)
Project Extension Counties (1996/97)
CIMARRON
TEXAS
BEAVER
HARPER
WOODS
ALFALFA
GRANT
KAY
OSAGE
WASHINGTON
NOWATA
CRAIG
OTTAWA
ROGERS
MAYES
DELAWARE
ELLIS
GARFIELD
NOBLE
MAJOR
WOODWARD
PAYNE
PAWNEE
CREEK
TULSA
DEWEY
BLAINE
KINGFISHER
LOGAN
LINCOLN
WAGONER
CHEROKEE
ADAIR
CUSTER
CANADIAN
OKLAHOMA
OKMULGEE
MUSKOGEE
SEQUOYAH
OKFUSKEE
McINTOSH
ROGER MILLS
CADDO
BECKHAM
WASHITA
CLEVELAND
GRADY
POTTAWATOMIE
SEMINOLE
HUGHES
HASKELL
GREER
KIOWA
McCLAIN
GARVIN
PONTOTOC
COAL
PITTSBURG
LATIMER
HARMON
JACKSON
COMANCHE
STEPHENS
ATOKA
LeFLORE
McCURTAIN
TILLMAN
COTTON
MURRAY
JOHNSTON
PUSHMATAHA
JEFFERSON
CARTER
LOVE
MARSHALL
BRYAN
CHOCTAW