

# **WATERSHED RESTORATION ACTION STRATEGY (WRAS)**

for the

## **EUCHA/SPAVINAW WATERSHED**

prepared by:

City of Tulsa  
INCOG

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### **INTRODUCTION:**

In 1997, on the 25<sup>th</sup> anniversary of the 1972 Federal Clean Water Act, Vice President Al Gore initiated development of a nationwide strategy to protect water quality. This initiative resulted in the development of the *Clean Water Action Plan* (CWAP), which established goals and implementation schedules for numerous strategies dealing with point and nonpoint sources. Oklahoma's Office of Secretary of Environment (OSE) was designated as the state lead agency to implement the provisions of the CWAP in Oklahoma.

Under OSE's leadership, Oklahoma has successfully met the CWAP requirement to establish a *Unified Watershed Assessment* (UWA) strategy. Oklahoma's UWA is a written document whose development and implementation relied upon input from the state's UWA Work Group. Through the UWA process, the Work Group identified three "Category I" watersheds in Oklahoma that were recognized as significantly impaired and in need of immediate federal and state funding to target restoration activities. Lake Eucha was one of these high priority watersheds (see Figure 1 location map).

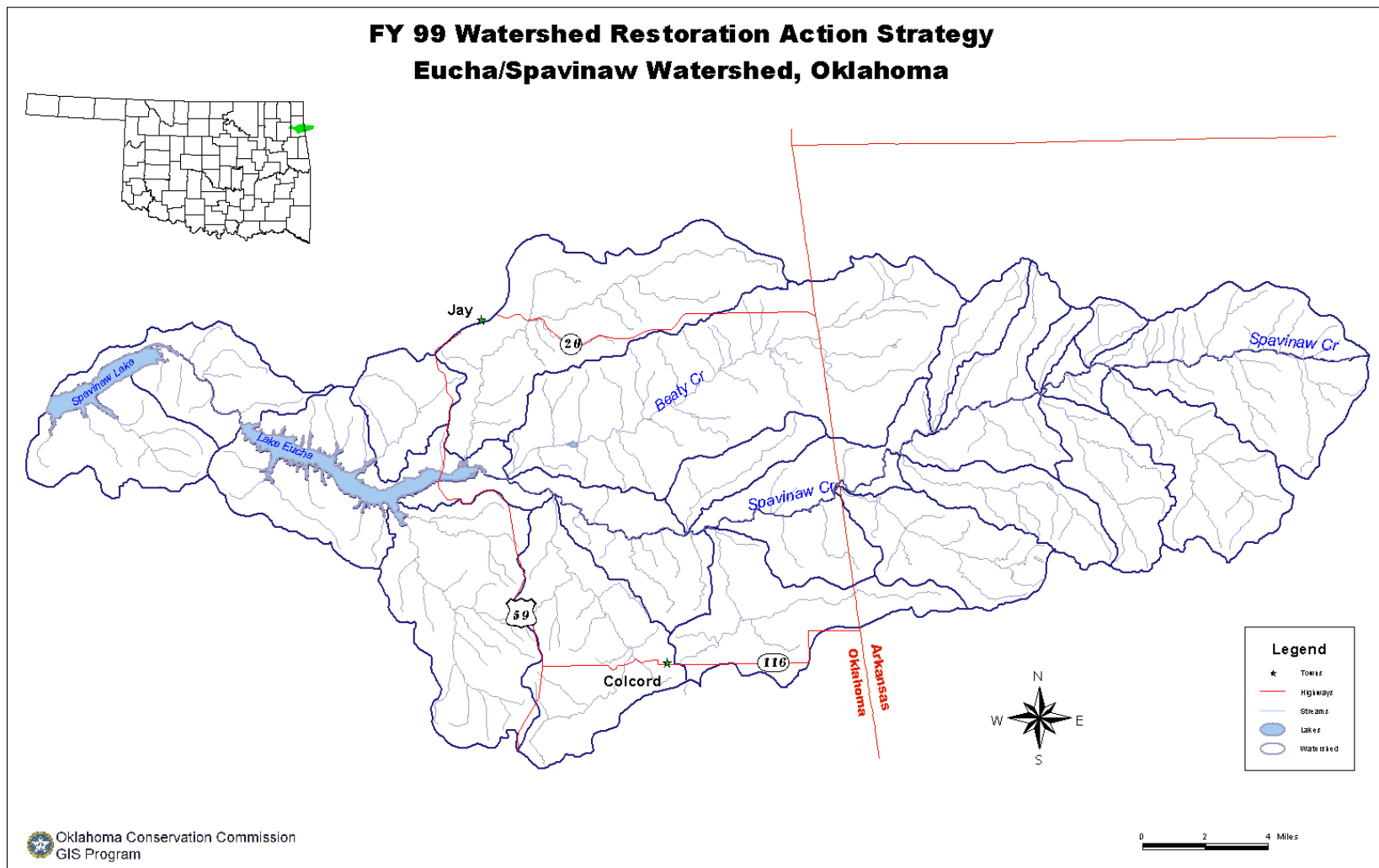


Figure 1. Location of Eucha/Spavinaw Watershed

The next step in meeting the requirements of the CWAP has been to develop a *Watershed Restoration Action Strategy* (WRAS) for each of the priority watersheds. This *Watershed Restoration Action Strategy for Eucha/Spavinaw Watershed* has been developed to meet one of the goals established in the federal CWAP.

After completion of the 1997 Phase I Clean Lakes study by the Oklahoma Conservation Commission, the City of Tulsa learned that the Lake Eucha watershed was experiencing unprecedented growth of poultry production, and that the dramatic increase in application of poultry litter to pastures in the watershed was the most likely source of excess nutrients feeding into Lake Eucha. The resultant increase in nuisance algal growth caused by increased lake eutrophication was the most likely source of the taste and odor problems being experienced by consumers of Tulsa's drinking water from the Mohawk Treatment Plant.

Immediately after release of the OCC Clean Lakes study in early 1997, the City of Tulsa initiated a number of studies and organized a Watershed Management Team and three Work Groups (see Figure 2) to begin addressing these water quality problems. The *Watershed Restoration Action Strategy for Eucha/Spavinaw Watershed* has incorporated these planning activities and current water quality projects into the framework of the WRAS.

It is anticipated that the WRAS for the Eucha/Spavinaw watershed will become a dynamic document that will be revised, when necessary, to incorporate the latest information and address new strategies not yet conceived during the initial WRAS development stage. Also, it is understood that the water quality goals set forth in this WRAS, as well as the WRAS technical approach to address the goals, are not all-inclusive and may be revised or expanded in the future.

New approaches to addressing water quality problems, as well as litter and nutrient management strategies in the watershed, will be periodically updated, expanded and revised. New water quality issues will be identified as existing programs generate more data and information. New partnerships between private, commercial and governmental organizations will lead to new strategies which may shift priorities.

Federal and state funding allocations for future water quality projects designed to address Eucha/Spavinaw watershed problems should not be based solely upon their being included in the *Watershed Restoration Action Strategy for Eucha/Spavinaw Watershed*. The WRAS for the Eucha/Spavinaw watershed should be considered a "focal point" tool for initial planning and strategy development.

In order for this WRAS to become an integral part of the entire watershed restoration program, it must be amenable to revision and update. It is anticipated that at least annual revisions may be necessary, and that the responsibility for such revisions will rest primarily with the City of Tulsa / TMUA with support from the OSE and the UWA Work Group.

The following six items are based upon EPA Guidance and have been designated by OSE as the essential components of each WRAS.

## I. PUBLIC OUTREACH:

This section identifies those agencies and organizations that are responsible for the development of the WRAS and implementation of the Public Outreach components. There have been several important Public Outreach programs recently implemented statewide that address animal waste nonpoint issues. There have also been several Public Outreach programs initiated within the Eucha/Spavinaw watershed by the City of Tulsa and other agencies.

Because Tulsa owns both source water lakes and is directly responsible for the quality of the treated drinking water, Tulsa will play a central role in developing, coordinating and implementing watershed protection activities, including Public Outreach programs, within the Eucha/Spavinaw watershed. The three Work Groups established by Tulsa / TMUA will provide the principal means to establish and implement these activities in the watershed. Tulsa will work closely with statewide programs and other focused education and Public Outreach programs initiated by other agencies.

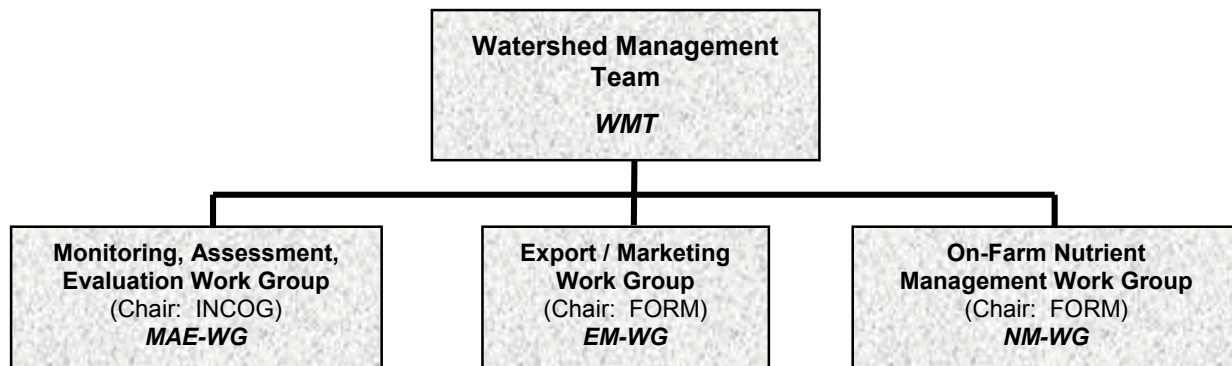


Figure 2. Organization of Work Groups for Eucha/Spavinaw Watershed

<b>TEAM PARTICIPANTS</b>	<b>WMT</b>	<b>MAE-WG</b>	<b>NM-WG</b>	<b>EM-WG</b>
Indian Nations Council of Governments	●	●	●	●
Foundation for Organic Resources Management	●	●	●	●
City of Tulsa/ Tulsa Metropolitan Utility Authority	●	●	●	●
Gardere and Wynne	●	●	●	●
Tyson Foods, Inc.	●	●	●	●
Peterson Farms	●	●	●	●
Simmons Industries, Inc.	●	●	●	●
Poultry Federation	●	●	●	●
Private Litter Processing Enterprises			●	●
Livestock Producers, Farmers, Landowners	●	●	●	●
Contract Haulers	●	●	●	●
Oklahoma Department of Agriculture	●	●	●	●
Oklahoma Conservation Commission	●	●	●	●
Oklahoma Water Resources Board	●	●		
Oklahoma Department of Environmental Quality	●	●		
Oklahoma Department of Wildlife Conservation	●	●		
Natural Resources Conservation Service – OK, AR	●	●	●	●
Arkansas Soil & Water Conservation Commission	●	●	●	●
Arkansas Department of Pollution Control & Ecology		●	●	●
Cherokee Nation	●	●		
Oklahoma State University	●	●	●	●
University of Tulsa	●	●		
University of Arkansas	●	●	●	●
USDA / Agricultural Research Service	●	●	●	●
U.S. Environmental Protection Agency	●	●		
U.S. Geological Survey	●	●	●	
U.S. Fish & Wildlife Service	●	●		
U.S. Army Corps of Engineers	●	●		
State Conservation Districts ( Oklahoma & Arkansas)	●	●	●	●
Cooperative Extension Service (Oklahoma & Arkansas)	●	●	●	●

A. WRAS DEVELOPMENT:

Several organizations have been actively involved in development of the WRAS for the Eucha/Spavinaw watershed protection program. The role of each is described below:

1. Unified Watershed Assessment Work Group (UWA-WG)

This state-wide Work Group was established by the Oklahoma Office of Secretary of Environment (OSE) to facilitate implementation of the EPA Clean Water Action Plan and other state water quality programs, particularly with respect to non-point sources and TMDLs. The UWA-WG is providing technical support and leadership in development of all WRAS programs in the state. The UWA-WG and OSE conduct meetings, set WRAS development schedules, and assist with WRAS development guidance.

2. City of Tulsa technical staff

The City of Tulsa water quality and technical support staff were primarily responsible for preparation of the WRAS document and development of the content of the WRAS. The draft WRAS document was circulated for review and comments to other Tulsa staff, officials of the Operations Committee of the Tulsa Metropolitan Utility Authority (TMUA) and members of several TMUA Work Groups. Also, the draft WRAS document was submitted by Tulsa to the Oklahoma Conservation Commission for circulation to Oklahoma's UWA-WG members.

3. Indian Nations Council of Governments (INCOG)

Water quality staff of INCOG have provided technical guidance and assisted Tulsa with preparation of the draft WRAS. INCOG helped with distribution of draft documents and preparation of the final WRAS document.

4. Oklahoma Conservation Commission (OCC)

The OCC staff is coordinating the development of all WRAS documents for Oklahoma and will insure that all document formats are consistent and that all items are adequately addressed.

B. WRAS IMPLEMENTATION:

The success of much of the water quality assessment and enhancement programs in the Eucha/Spavinaw watershed depends upon wide-spread public support and buy-in of stakeholders. The coalition of various local, state and federal agencies and organizations established through Tulsa's three Work Groups will provide the most efficient means to coordinate all activities identified in the Eucha/Spavinaw WRAS including Public Outreach. There are many state-wide programs that are providing public involvement and education that will complement Tulsa's efforts. Tulsa also is an important participant in current public education programs within the Beaty Creek sub-watershed.

Through numerous meetings of the three Work Groups, as well as special meetings between industry and grower stakeholders and Tulsa staff, an unprecedented spirit of cooperation has been established between parties that have divergent interests in poultry production and animal waste disposal. These early Public Outreach efforts have resulted in agreements from the principal Integrators to supply technical data on animal production and generation and disposal of poultry waste. The Integrators are now actively pursuing alternative animal waste control measures such as: detailed questionnaires to all growers about animal production and waste generation; use of alum in bedding to reduce phosphorus runoff; intensified research on phytase as a means to reduce phosphorus in feed; assisting growers with development of Animal Waste and Nutrient Management Plans; postponing spring clean-outs of poultry houses to reduce nutrient runoff; and direct funding of statewide education of growers and haulers as required by recent Oklahoma legislation.

These early successes cannot be attributed to any one agency or Work Group; rather they are the result of many months of careful planning and implementation of Public Outreach initiatives by Tulsa and its three Work Groups. The focus to date has been on development of reliable data and reaching agreements on control of animal waste in the watershed. New Public Outreach initiatives are being developed to address stakeholder participation in implementation of BMPs for animal waste controls and other structural and non-structural practices to reduce nutrient loadings into the watershed. Also, Tulsa will take the lead in presenting watershed successes and protection strategies to state and Federal agencies, including regional and national EPA officials and state and federal elected representatives and their technical staff.

The City of Tulsa's three Work Groups, as well as many state and federal agencies and other organizations, are collectively contributing to the Public Outreach efforts in the Eucha/Spavinaw watershed. The roles of these groups and programs are summarized below:

1. Monitoring, Assessment and Evaluation Work Group (MAE-WG)

This is one of three Work Groups established by Tulsa / TMUA to provide technical support to water quality programs for Eucha/Spavinaw. In addition to representation from many state and Federal technical agencies, the MAE-WG has representatives from local poultry growers, poultry industries (Integrators), Indian tribes, and other organizations that routinely work with the public (e.g. OSU and NRCS). The MAE-WG provides a forum for discussion of and makes decisions concerning the technical data being collected from the various water quality studies. The Work Group also provides a forum to address watershed protection strategies (e.g. the development of nutrient TMDLs). The MAE-WG also encourages public input and involvement with all water quality projects and programs in which the Work Group is involved.

2. Nutrient Management Work Group (NM-WG)

This second Work Group established by Tulsa / TMUA focuses on management of nutrients in the watershed. The NM-WG has more local representation (growers, haulers, integrators, private citizens), and issues are focused on solving local watershed problems. Consequently, the NM-WG has more direct public outreach with Integrators, growers, land owners, haulers, and commercial users of animal waste. The NM-WG provides a valuable opportunity for all sectors of the poultry production industry to meet and discuss related issues and develop animal waste strategies that benefit all stakeholders.

3. Export / Marketing Work Group (EM-WG)

The EM-WG is the third Work Group established by Tulsa / TMUA. The EM-WG shares a common membership with the NM-WG, but focuses principally on issues dealing with export and marketing of poultry litter. This Work Group has more immediate interest to and involvement with local growers than any other group. This Work Group has played an important role in establishing the ODA litter Hotline as well as elevating the education and understanding of the issues related to export of litter.

4. Oklahoma Department of Agriculture (ODA) Hotline

The ODA established a toll-free poultry litter hotline in 1998 to match buyers and sellers of poultry litter. The hotline was established to develop mechanisms for marketing excess animal waste in the impaired watersheds (e.g. Eucha/Spavinaw) to areas that can benefit from land application of litter. The ODA Litter Hotline is 1-800-583-7131. The ODA hotline is also available on Oklahoma State University's Cooperative Extension Service web site at [www.dasnr.okstate.edu/poultry/haul.htm](http://www.dasnr.okstate.edu/poultry/haul.htm). Poultry growers in the Arkansas portion of the Eucha/Spavinaw Watershed are encouraged to contact the ODA hotline regarding export assistance. ODA maintains information concerning



Arkansas sources of litter through the voluntary assistance of private individuals, since the ODA cannot directly target Arkansas growers who may have litter to sell.

5. Beaty Creek Watershed Advisory Group (WAG)

The Beaty Creek Watershed Advisory Group (WAG) is an advisory group established by the Oklahoma Conservation Commission (OCC) to meet one of the requirements of the OCC's 319 Water Quality Program in Beaty Creek, an important nonpoint source tributary in the Eucha/Spavinaw watershed. The purpose of the WAG is to give guidance on the 319 program that the OCC will be implementing in the Beaty Creek Watershed. The OCC 319 program is a demonstration and implementation project which will give land owners the opportunity to implement best management practices (BMPs) that will enhance water quality in Lake Eucha. The WAG is also putting into place an educational program which will take the "show and tell" approach to the public in the entire Lake Eucha Watershed. The WAG is made up of fourteen members from Oklahoma and Arkansas and includes the Mayor of Tulsa and a Tulsa staff person.

6. Oklahoma State University (OSU) Cooperative Extension Service

OSU has a website on Animal Waste Nutrient Management which provides all the background information needed for developing Nutrient Management Plans and Animal Waste Management Plans. OSU organized the High Plains Animal Waste Management Conference in March, 1999. Also to date, OSU has provided training to approximately 1200 growers as required by recent Oklahoma legislation on poultry production. The training includes general background on water quality and nonpoint source impacts as well as descriptions of BMP options and implementation resources.

7. OSU Web Page for Litter Marketing

In 1998, OSU's Department of Agricultural Economics established the Oklahoma Poultry Litter Line web page. Its purpose is "... to promote better understanding of the movement and application of poultry litter in Oklahoma." This market web site is designed for agricultural producers wanting bulk amounts of poultry litter as a soil fertilizer and/or soil amendment. The web address is [www.dasnr.okstate.edu/poultry/haul.htm](http://www.dasnr.okstate.edu/poultry/haul.htm). This list includes a list of contract haulers.

8. OSU Publications and Fact Sheets

OSU has developed several fact sheets including: (1) "Using Poultry Litter as Fertilizer", (2) "Soil Quality and Animal Manure", and (3) "Manure and Raising Soil pH". Other publications include a water quality driven soil handbook,

"Oklahoma Soil Fertility Handbook". Also, OSU will produce a promotional video on poultry litter management and utilization that will support the marketing and export of poultry litter. Specific instances of loading, trucking, and spreading of poultry litter will be covered.

9. NRCS Local Offices - Oklahoma and Arkansas

The United States Department of Agriculture Natural Resource Conservation Service (USDA/NRCS) in Arkansas and Oklahoma have been involved with the Eucha/Spavinaw Creek Priority Area for the Environmental Quality Incentives Program (EQIP). This is a joint venture for Oklahoma and Arkansas. The NRCS designated the Eucha watershed as an EQIP Priority Area for FY 1998. Funds are available through the NRCS to implement practices intended to reduce phosphorus loading to Lake Eucha. The Eucha watershed also may be designated a priority area in FY 1999. An Education Plan will be developed under EQIP, and will include: 1) development of Animal Waste Management Handbooks. (2,000 are planned); 2) purchase of a Table Top Display unit for use in educational workshops to highlight water quality and conservation practices; 3) organization of an annual tour for producers to visually see the results of best management practices and effects of proper waste application; and 4) development of a Grassland/Wildlife Handbook for use in watershed protection.

10. Local Conservation District Offices - Oklahoma and Arkansas

The OCC has obtained 319 funds to develop a Beaty Creek Watershed Implementation Project. This is a demonstration project in the Eucha Watershed (Beaty Creek Sub-basin) that will demonstrate the effectiveness of BMPs. The intent of this project is to demonstrate the benefits of proper animal waste application on the water resources of the Lake Eucha watershed. The Public Outreach Objectives of the project are to: 1) promote consistency in animal waste plans written in Oklahoma and Arkansas; 2) promote protection and re-establishment of buffer zones and riparian areas; 3) provide technical assistance to producers in the development of total resource conservation plans; 4) provide educational assistance to producers through producer meetings, workshops, and individual contacts; and 5) demonstrate management practices in the Beaty Creek watershed to achieve the nutrient control needed to protect Lakes Eucha and Spavinaw. Additional Arkansas 319 funds will be used to hire a grassland specialist. The duties of this specialist will include preparation of Animal Waste Management Plans in Arkansas and presentation of public awareness programs in Arkansas (see below).

11. Arkansas Soil and Water Conservation Commission (ASWCC)

The ASWCC has obtained 319 funds for a cooperative effort with the OCC to implement animal waste and grassland management practices throughout the

Lake Eucha watershed in Arkansas and Oklahoma. A portion of the funds will be used to hire a grassland specialist. The duties of this specialist will include preparation of Animal Waste Management Plans in the Lake Eucha watershed in Arkansas and presentation of public awareness programs in Arkansas.

12. Integrators

Presently, the poultry industry is actively represented by officials from Peterson Foods, Tyson Foods and Simmons Foods. These three integrators represent the vast majority of all poultry production in the Eucha/Spavinaw watershed. All three are actively pursuing public outreach and public education initiatives through their relationships with their contract growers. All three Integrators have established dialogue with their contract growers concerning Oklahoma legislative and regulatory requirements on animal production and poultry waste issues. The Integrators have agreed to fund education programs for growers as required by Oklahoma legislation. The Integrators are active participants in the three Work Groups established by Tulsa, and they host meetings of the Work Groups and other organizations.

13. Poultry Federation

The Poultry Federation, representing Missouri, Oklahoma and Arkansas, is currently involved with education of integrators and growers about legislative and water quality issues dealing with poultry production. This organization has become an important voice for the poultry industry. The Poultry Federation relies upon an effective education program for its members, and it is an important partner in the Eucha/Spavinaw watershed program. The Poultry Federation will increase its involvement with the rural stakeholders in the watershed.

14. Quad-State Poultry Dialogue

This organization has representatives of poultry integrators and contract growers, as well as state and federal agencies that represent Oklahoma, Arkansas, Missouri and Kansas. Like the Poultry Federation, the primary focus of this group is education of the public, and in particular those in the poultry industry, about issues that may affect their operations and businesses. This organization conducts regional meetings and shares data with the three Work Groups.

15. Town Hall meetings

Since the release of the OCC Clean Lakes Report, the City of Tulsa has held Town Hall meetings at the Community Center in Jay, Oklahoma, and purchased full-page local newspaper ads. The newspaper ads were prompted by questions raised at a Town Hall meeting attended by approximately 300 area residents. The City of Tulsa provides drinking water treatment for local communities and provides many services to the area, including: a National Weather Service Station in Delaware County to collect and report local weather data to assist

boaters and others during emergencies; making a contribution of \$75,000 to launch a Green Box trash collection program in Delaware County; providing a free recreation area with shelters around the lakes; providing a weekly fishing report to local newspapers and radio stations; providing educational materials for local students; and donating a fire truck to the City of Spavinaw.

## II. MONITORING / EVALUATION ACTIVITIES:

This section describes the water quality goals and expected outcomes for the Eucha/Spavinaw watershed. All monitoring and data collection will be done according to formal quality assurance planning. All Tulsa / TMUA data collection contracts will be required to develop Quality Assurance Project Plans that will be reviewed and approved by the MAE-WG and submitted to EPA Region 6 for approval. All watershed activities will have detailed budget information provided to Tulsa, and all project outputs and milestones will be submitted to Tulsa / TMUA. Tulsa will maintain a Project Management Database (PMD) that will be used to track the progress of all watershed activities, including fund allocations and sources, milestones, and accomplishments. Tulsa will prepare periodic summaries for management and make project information available to the public, to all Work Groups, and to government agencies and private companies, as requested.

### A. GOALS AND OUTCOMES:

The following Goals have been established for the Eucha/Spavinaw Watershed Program. Many of these Goals have already been met or are presently being addressed.

1. Establish a ***Watershed Management Team*** and technical ***Work Groups*** to support all water quality and nutrient management activities.
2. Establish ***Quality Assurance Goals*** for all Tulsa funded research, and require that all Tulsa funded data collection projects develop a peer reviewed and approved QAPP for all project activities.
3. Establish a ***Project Management Database*** to be used by Tulsa for project management, scheduling, planning, funding and reporting of all watershed activities.
4. Improve ***raw water treatment methods*** to control Taste and Odor problems at Mohawk TP by researching and establishing state of the art treatment and control practices.
5. Reduce ***non-point source nutrient loadings*** to Eucha/Spavinaw watershed and lakes by supporting and implementing appropriate nutrient management strategies and Public Outreach initiatives.

6. Coordinate with the appropriate authorities in Arkansas to develop a **preliminary TMDL** for nutrients for the Eucha/Spavinaw watershed based upon results from current water quality studies, and recommend future TMDL strategies after completion of the preliminary TMDL.
7. Work with the appropriate authorities in Arkansas to encourage the modification of **municipal NPDES permit allocations**, as necessary, for nutrients.
8. Conduct **intensive studies** of Spavinaw Creek and its tributaries and Lakes Eucha, Spavinaw and Yahola to address nutrient related water quality problems. Focus efforts to identify and quantify different sources of nutrients and sub-basins as potential nutrient sources, quantify nutrient loadings to the lakes, assess impacts on lake water quality and algae production, and set lake nutrient target values for proper watershed management to improve lake water quality.
9. Support collection of **soils and land use data** for use with water quality assessments and development of Animal Waste and Nutrient Management Plans.
10. Create a **common database** for all water quality data and other information, provide backup to all databases, and link all data geospatially into a GIS system.
11. Establish a water quality **Trend Monitoring Program** after completion of intensive studies.
12. Develop a **Comprehensive Watershed Management Plan** or other similar watershed planning tool (e.g. WRAS) to establish water quality improvement goals, schedules, activities, milestones, outputs, funding and resource options, participants, and education goals.
13. Implement **Best Management Practices** (BMPs) and other Point Source and Non-Point Source control strategies to control nutrients in the lakes and watershed.
14. Support **litter export** and **nutrient management** activities in the watershed, including development of market-based litter uses as a value-added product, creation of effective litter availability hotlines and other communication venues, cultivate commercial enterprises that use litter as a raw material, support delays in poultry house clean-outs to protect water quality, support development of water quality based Animal Waste Management Plans, investigate options for controlling nutrient levels in litter (e.g. by increasing use of phytase and alum and reductions in phosphorus in feed), support incentive payments through EQIP programs, and support other programs as they become viable.

15. Develop and support **Public Outreach** and **Education** programs in the watershed to promote implementation of nutrient management strategies and awareness of water quality issues.

## **B. ASSESSING PROGRESS:**

Effective communication is one of the most difficult problems of managing multiple projects being conducted concurrently by different organizations. Tulsa has established and supports a number of methods to facilitate the transfer of basic project information (status), resources (funding, equipment and manpower), and sharing of data.

1. Frequent meetings of the Tulsa / TMUA Work Groups and the WAG.
2. Frequent update of the Tulsa / TMUA Project Management Database (PMD).
3. Frequent written reports and technical presentations to the TMUA Board, the TMUA Operations Committee and Tulsa management and staff meetings.
4. City of Tulsa internal Monthly Status Reports by staff.
5. Periodic and special request project summary reports generated from the PMD.
6. Requirement for all Tulsa / TMUA contractors to provide periodic reports to Tulsa and TMUA on the status of all contracted activities.
7. Creation of Internet Web Sites (presently at INCOG and FORM) having information about watershed programs and other water quality issues and important internet links.

## **III. CLEARLY DEFINE WATER QUALITY PROBLEMS:**

### **A. PROBLEMS:**

Lake Spavinaw was constructed on Spavinaw Creek by the City of Tulsa in 1924, along with a 60 mile long raw water flowline, to provide excellent quality drinking water to a growing Tulsa urban area fueled by the oil boom. In the 1950s, Lake Eucha was constructed four river miles upstream of Lake Spavinaw to provide sufficient water quantity for Spavinaw withdrawals to Tulsa. In the past 10 years, Tulsa has experienced a steady decline in taste and odor quality of its drinking water from the Eucha/Spavinaw system. As the problems became symptomatic in the early 1990s, Tulsa began to actively pursue solutions to these concerns.

A 1997 Phase 1 Clean Lakes Study performed by the Oklahoma Conservation Commission (OCC) on behalf of Tulsa confirmed that Lakes Eucha and Spavinaw are

impacted by non-point sources of nutrients. The OCC report identified increased poultry production as the most likely source of excess nutrients. The report also identified sub-basins having the greatest potential to cause phosphorus loadings to Lake Eucha.

The following are the principal water quality problems that must be addressed by the WRAS:

1. Taste and Odor problems in drinking water from the Mohawk TP.
2. Taste and Odor problems in drinking water in other E/S raw water users (Jay and Spavinaw).
3. Eutrophication in Eucha/Spavinaw / Yahola.
4. Excess nutrient loadings from watershed (principally nitrogen and phosphorus).
5. Continued decline in water quality (e.g. dissolved oxygen problems, aesthetics, productivity, eutrophication) in Lakes Eucha and Spavinaw as well as Spavinaw Creek and its tributaries.

## **B. SOURCES AND THEIR CONTRIBUTIONS:**

Based upon the 1997 OCC findings, Tulsa has initiated a comprehensive investigation of these problems. Other state agencies and organizations have also begun water quality and land use assessments within the Eucha/Spavinaw watershed. Using data from the OCC report as well as other sources, Tulsa has identified the following potential sources of excess nutrients entering the lakes that require further investigation:

1. Poultry litter and poultry production.
2. Production of other livestock (cattle, hogs).
3. Poorly functioning private septic systems.
4. Municipal permitted point source dischargers.
5. Background nutrient sources.
6. Commercial fertilizer use in both urban and rural settings.
7. Nutrient loadings from soil erosion.

#### **IV. SPECIFY ACTION PLAN AND WATER QUALITY GOALS:**

To address the water quality problems discussed above, a number of studies and programs are being pursued by local, state and federal organizations. Tulsa / TMUA contracts have been executed with the Oklahoma Water Resources Board (OWRB) and Oklahoma State University (OSU), and other water quality studies are being proposed for possible Tulsa / TMUA funding in the near future. In addition, the OCC and NRCS have begun studies under federal funding to address nutrient management in the watershed. These studies are described in Item VI and address the following action items:

- A. Characterize NPS contributions from poultry, other livestock, septic systems and background contributions.
- B. Evaluate nutrient impacts and nutrient dynamics in Spavinaw Creek and tributaries.
- C. Evaluate nutrient impacts and nutrient dynamics in Lakes Eucha, Spavinaw and Yahola.
- D. Evaluate point source discharger contributions.
- E. Conduct comparative studies on soil sampling options to determine the best relationship between phosphorus in soils and runoff.
- F. Develop public education and outreach programs, including internet sites.
- G. Develop Phosphorus Target Values for Lakes Eucha and Spavinaw for lake management decisions.
- H. Develop litter reduction and litter export programs (e.g. AWMPs and litter marketing and transport).
- I. Implement riparian management programs and other Best Management Practices.
- J. Develop City of Tulsa Lake Management Plan to control erosion.
- K. Partner nationally with Federal agencies in Washington to develop model strategies for source water protection.
- L. Improve treatment of Taste and Odor at Mohawk TP (upgrade aging facilities, increased biological and chemical testing of precursors, bench testing, GAC / PAC options, etc.).
- M. Support and emphasize voluntary approaches to watershed protection.



- N. When necessary, support development of state and federal legislation to protect the watershed.
- O. Implement a Comprehensive Watershed Management Plan or WRAS to manage the watershed.
- P. Establish long-term water quality Trend Monitoring programs.

## V. IMPLEMENTATION SCHEDULE

The following table provides a summary of all projects that have been either recently completed, are currently underway or are being considered for funding and start-up in the near future. Several projects have no time limit and will be ongoing throughout the entire watershed restoration program.

<b>Lead Agency</b>	<b>Project(s)</b>	<b>Duration</b>	<b>Status</b>
Arkansas Soil and Water Commission (ASWCC)	Lake Eucha; NP 97 Section 319(h) Project	1998 -	Ongoing
City of Tulsa (COT)	Sampling and testing water for water quality studies	1995 -	Ongoing
Foundation for Organic Resources Management (FORM)	Coordinate Nutrient Management and Transport Activities in the Lake Eucha Watershed	1/98 - 11/98	Completed
Foundation for Organic Resources Management (FORM)	Coordinate Nutrient Management and Transport Activities in the Lake Eucha Watershed	1/99 - 12/99	Ongoing
Indian Nations Council of Governments (INCOG)	Provide quality assurance and technical support relating to water quality; Monitoring, Assessment, and Evaluation Work Group Coordinator	1997 -	Ongoing

Oklahoma Conservation Commission (OCC)	Phase I Clean Lakes Diagnostic Study and Confined Animal Inventory	8/92 - 1/97	Completed
Oklahoma Conservation Commission (OCC)	Lake Eucha Watershed Implementation Project	1998 - 2003	Ongoing
Oklahoma Department of Agriculture (ODA)	Poultry Litter Hotline, public education, rules development and enforcement	1997 -	Ongoing
Applied Environmental Data Services (AEDS)	GIS and Data Management Support for Tulsa / TMUA	1997 -	Ongoing
Oklahoma Department of Environmental Quality (ODEQ)	Holistic source survey to determine point source locations of septic tanks. Conduct Preliminary TMDL.	1998 -	Ongoing
Cooperative Extension Service (OSU - CES)	Publications (fact-sheets, handbooks, videos, web-sites); Organize 1999 Waste Management Conference; Provide waste management training for growers; Provide demonstration projects on the benefits of poultry litter	1998 -	Ongoing
OSU Biosystems & Agricultural Engineering Department	Modeling Phosphorus Loading for the Lake Eucha Basin	4/98 - 9/01	Ongoing
OSU Biosystems and Agricultural Engineering Department	Instream Nutrient Dynamics Within the Lake Eucha Basin	9/98 - 9/01	Ongoing

Oklahoma Water Resource Board	Nutrient Algae Relationship and Target Nutrient Concentration for Eucha/ Spavinaw/Yahola Lake Complex	8/97 - 8/00	Ongoing
Tulsa Metropolitan Utility Authority (TMUA)	Develop GIS data base of point and nonpoint pollution sources for the Eucha/ Spavinaw Watershed. Provide quality assurance and technical support relating to water quality for Eucha/ Spavinaw Watershed.	1997 -	Ongoing
USDA/ARS (Area Research Service)	Using the Phosphorus Index to Reduce P Runoff from Soils in the Eucha/Spavinaw Watershed		Proposed
USDA/NRCS - WSI (Watershed Science Institute)	Oklahoma - Lake Eucha/Spavinaw Basin Watershed Phosphorus Management Study	3/99 - 1/02	Ongoing
USDA/NRCS -AR & OK	Environmental Quality Incentives Program (EQIP): Eucha/Spavinaw Priority Area	Spr 1998 -	Ongoing
United States Geological Survey	Historical and real time water quality data	1998 -	Ongoing
WINROCK	Coordinate Nutrient Management and Transport Activities in the Lake Eucha Watershed	5/97 - 12/97	Completed

**VI. FUNDING NEEDS:**

The information presented below pertains to recently completed, existing and proposed contracts for water quality projects in the Eucha/Spavinaw watershed that support the WRAS goals. Many of the contracts are financed by Tulsa / TMUA, while others are funded by state and federal grant funds. A brief outline of each contract’s purpose is presented in Section V above. The order of each fund summary below follows the order of each project presented in Section V.

- 1. Arkansas Soil and Water Conservation Commission (ASWCC)  
(Ongoing Program)

Federal	State	Other	Total
\$31,309	\$69,371		\$100,680

- 2. City of Tulsa

Federal	State	Other (annual cost)	Total
		City of Tulsa	\$765,000
		\$300,000 (lab)	
		\$165,000 (personnel)	
		TMUA	
		\$302,000 (pro bono)	

- 3. Foundation for Organic Resources Management (FORM)- Coordinate Nutrient Management and Nutrient Export/Marketing Activities  
(Current Contract)

Federal	State	Other (TMUA)	Total
		\$70,436	\$70,436

- 4. Indian Nations Council of Governments (INCOG) - Technical and QA support; coordinate Monitoring/Assessment/Evaluation (MAE) Work Group  
(Ongoing Program)

Federal	State	Other	Total
\$31,804		\$50,000 (est.)	\$81,804 (est.)

- 5. Oklahoma Conservation Commission (OCC) - Phase I Clean Lakes Diagnostic Study and Confined Animal Inventory  
(Completed Project)

Federal	State	Other (TMUA)	Total
\$100,000		\$42,857	\$142,857

6. OCC - Lake Eucha Watershed Implementation Project - FY98 & FY99  
(Ongoing Project)

Federal	State	Other	Total
\$619,598	4413,065		\$1,032,663

7. ODA - Hotline. public education, rules development and enforcement.  
(Ongoing Program)

Federal	State	Other	Total
	\$10,000 (est.)		\$10,000 (est.)

8. Oklahoma Department of Environmental Quality (ODEQ) - Holistic source survey to determine point source locations of septic tanks. Preliminary TMDL.  
(Ongoing Project)

Federal	State	Other	Total
\$20,000 (est.)			\$20,000 (est.)

9. OSU - Education programs  
(Ongoing Program)

Federal	State	Other	Total
		\$10,000 (est.)	\$10,000 (est.)

10. OSU-1 - Modeling Phosphorus Loading for the Lake Eucha Basin  
(Current Contract)

Federal	State	Other (TMUA)	Total
		\$112,687	\$112,687

11. OSU-2 - Assessment of In-Stream Nutrient Dynamics Within the Lake Eucha Basin  
(Current Contract)

Federal	State	Other (TMUA)	Total
		\$121,333	\$121,333

12. OSU - Targeted Research Initiative Program (TRIP)  
(Proposed Program FY99)

Federal	State	Other	Total
			\$64,000

13. OWRB - Establishing a Nutrient-Algae Relationship and Target Nutrient Concentration for the Spavinaw-Eucha Complex  
(Current Contract)

Federal (USGS)	State(OWRB)	Other (TMUA)	Total
\$16,000	\$163,532	\$185,604	\$365,136

14. AEDS - Consultant for GIS And Data Management  
(Current Contract)

Federal	State	Other (TMUA)	Total
		\$25,000	\$25,000

15. USDA/ARS - Future contract or research on P-Index  
(Proposed)

Federal	State	Other	Total
		\$75,972 (TMUA)	\$151,944
		\$75,972 (Poultry Federation)	

16. USDA / NRCS -AR - Environmental Quality Incentive Program (EQIP)  
(Ongoing Program)

Federal (USDA)	State	Other	Total
\$150,000			\$150,000

17. USDA/NRCS -OK - Environmental Quality Incentive Program (EQIP)  
(Ongoing Program)

Federal	State	Other	Total
\$67,900 (USDA)			\$67,900

18. USDA-NRCS - Watershed Science Institute (WSI) Water Quality Modeling of the Eucha/Spavinaw  
(Ongoing Program)

Federal (USDA)	State	Other	Total
\$250,000 (estimate)			\$250,000 (estimate)

19. USGS - Collect water quality data at stream gages in the watershed  
 (Current Contract / Ongoing Project)

Federal (USGS)	State	Other (TMUA)	Total
50% of monitoring		\$54,950 (install monitoring stations - Spav Cr)	\$54,950
		\$47,000 (install monitoring stations - Beaty Cr & BI Hollow Cr)	\$47,000
		\$24,000 (maintain Beaty Cr & BI Hollow Cr)	\$24,000

20. WINROCK International- Coordinate Nutrient Management and Nutrient Export/Marketing Activities  
 (Completed Contract)

Federal	State	Other (TMUA)	Total
		\$71,086	\$71,086