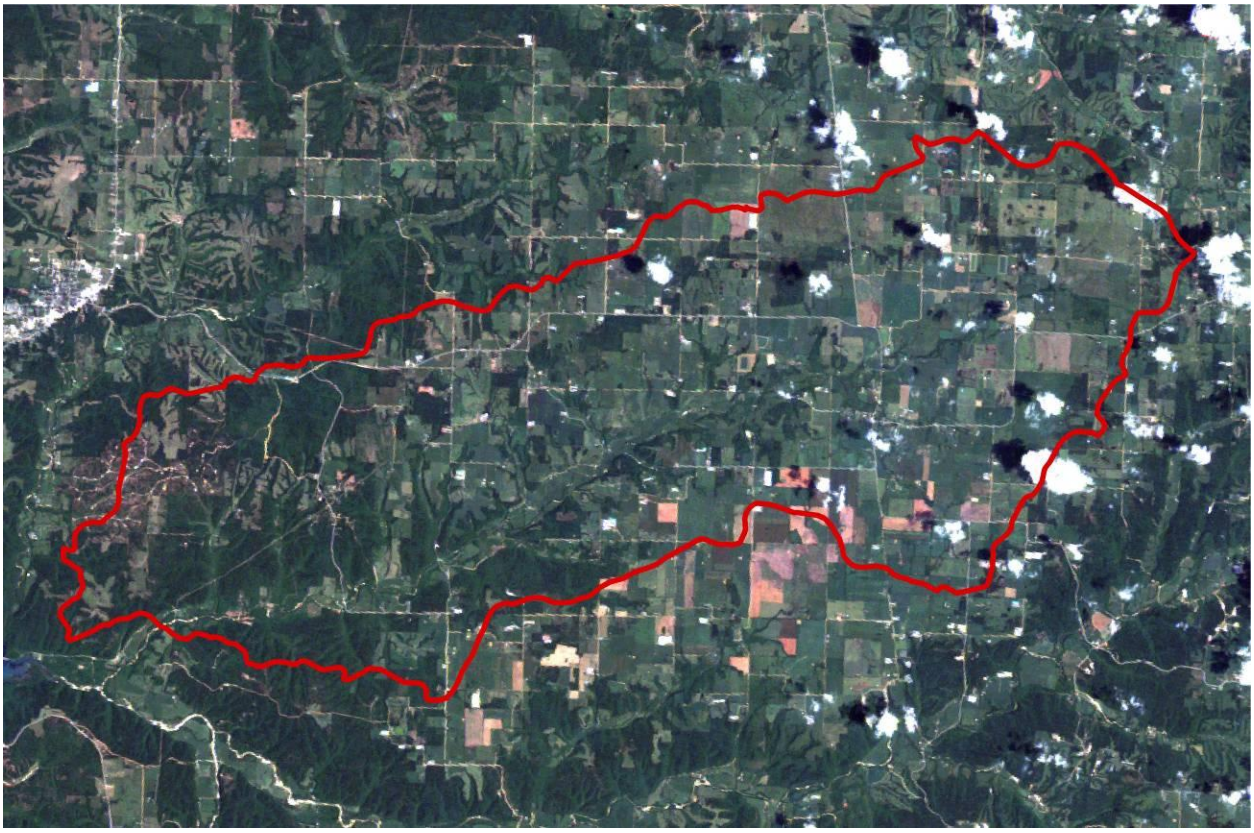
Lake Eucha Watershed Implementation Project: Beaty Creek Watershed



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Submitted by:

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FINAL REPORT
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Introduction

Oklahoma's 2000 Nonpoint Source (NPS) Management Program sets a goal that the State will implement at least one large-scale implementation/demonstration project each year. These projects use assessment, planning, education, and demonstration / implementation of best management practices to address NPS-derived causes and sources of impairment.

These projects have been chosen based on the 1998 Unified Watershed Assessment list of priority watersheds, further prioritized by Oklahoma's NPS Working Group. The Lake Eucha Watershed: Beaty Creek Project was the first large-scale priority watershed project to be undertaken following the goals outlined in the 2000 NPS Management Program.

Project Location

Lake Eucha Watershed

Lake Eucha is a water supply reservoir located in Delaware County of Northeastern Oklahoma. The lake's tributaries include Spavinaw Creek, Beaty Creek, Brush Creek,

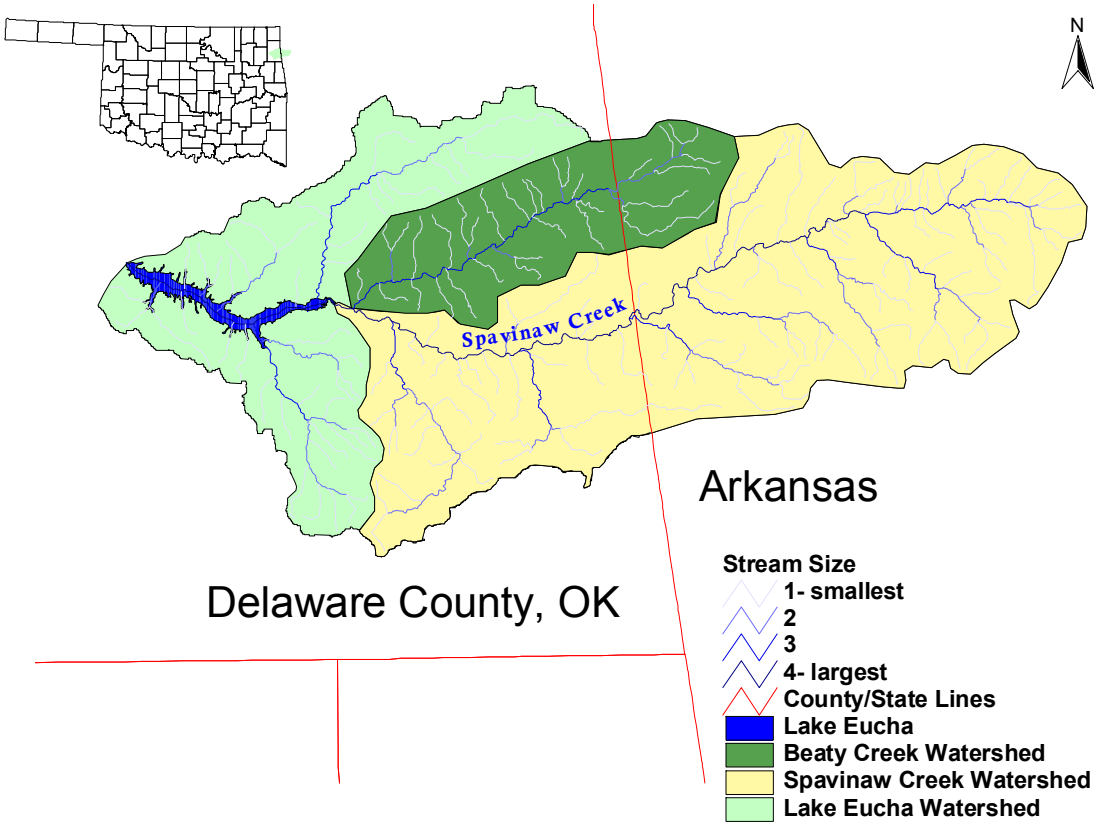


Figure 1. Watershed Location.

Dry Creek and Rattlesnake Creek. The Lake Eucha watershed encompasses roughly 230,000 acres, with 60% located in Delaware County, Oklahoma and the remainder located in Benton County, Arkansas. Lake Eucha, Brush Creek, Dry Creek, Rattlesnake Creek, and the lower Beaty and Spavinaw Creek watersheds are located in Oklahoma. The upper Spavinaw and Beaty Creek watersheds are located in Arkansas (Figure 1).

A 1997 Clean Water Act Section 314 Diagnostic and Feasibility Study on Lake Eucha by the Oklahoma Conservation Commission (OCC) indicated excessive nutrient loading and eutrophication threaten its beneficial uses of Sensitive Water Supply (SWS), public and private water supply, cool water aquatic community, agriculture, primary recreation and aesthetics. Lake Eucha and downstream Lake Spavinaw are currently listed on the 2002 303(d) list as impaired by phosphorus. The City of Tulsa reports a growing number of taste and odor complaints and treatment costs as much as double what they once were (Fimple 2000). Studies have related these problems primarily to the production of geosmin and methyl isoborneols (MIB) (OWRB 2001). At one time, the City of Tulsa had reported the largest ever recorded concentration of geosmin with levels as high as 600 parts per trillion (ppt) (Associated Press 2000). Taste and odor problems can be detected by humans at levels as low as 5-10 ppt.. Lake Eucha is the water supply for the cities of Jay and Tulsa, providing approximately 500,000 people with drinking water.

Problem Statement

Numerous threats and impairments to Lake Eucha have been documented through monitoring by the City of Tulsa, OCC, Oklahoma Department of Environmental Quality, U. S. Geological Survey, and Oklahoma Water Resources Board. Water quality problems in the watershed are primarily related to excess phosphorus loading, but also include excessive sediment in the tributaries and upper end of Lake Eucha, excessive nitrogen loading, taste and odor problems, and excessive levels of fecal bacteria in tributary streams. The sources of pollutants have been attributed to non-irrigated crop production, specialty crops, pasture land,

range land, feedlots (all types), animal holding / management, silviculture, on-site waste water treatment systems, removal of riparian vegetation, stream bank modification / destabilization, and recreation. Conversion of forestland to pasture, especially on steep slopes, has been observed as contributing to the problem. Additional localized sources may include gravel mining, road maintenance, and urban development.

Considerable resources have already been devoted to monitoring and preserving the water quality in the Lake Eucha watershed. Education, cost share, and demonstration directed at the poultry and recreation industries have been successful only at slowing the degradation of water quality. Priority in the watershed must now be given to reducing the overall load of nutrients reaching Lake Eucha to address water quality problems in the watershed. Riparian reestablishment and stream bank protection to maintain the stream habitat quality are of equal importance.

Based on previous monitoring and watershed modeling, eutrophication is being caused by elevated nutrient loading from Beaty Creek and Spavinaw Creek to Lake Eucha. It is estimated that Beaty Creek and Spavinaw Creek supply approximately 85% of the phosphorous entering the lake. Because Lake Eucha is phosphorous limited, increased phosphorous loads have resulted in eutrophication of the lake. The phosphorous in Beaty Creek likely originates from nonpoint source pollution resulting from agricultural practices associated with the poultry industry. The phosphorous in Spavinaw Creek likely originates from a combination of both point source pollution (Decatur WWTP) and nonpoint source pollution (agricultural practices associated with the poultry industry). Another indication of possible nonpoint source contamination and impacts from animal waste is suggested by the elevated levels of bacteria found in the tributaries to Lake Eucha.

The Eucha Lake Watershed and downstream Lake Spavinaw Watershed support a poultry industry with the capacity to produce over 84 million birds annually (Everett 2004). Along with these birds, more than 80,000 tons of litter are produced annually, containing over 1500 tons of waste phosphorus. Additional sources of nonpoint source pollution include cattle grazing, sewage treatment, septic systems, land development, commercial fertilizer application, row crops, and natural background loading.

This project focused on a subwatershed in the Eucha Watershed to most effectively concentrate available funds and more quickly document success. The Beaty Creek watershed, approximately 59 square miles, was chosen as the demonstration subwatershed because its sources of pollution were entirely nonpoint source in nature, and because water quality monitoring indicated it contributed significantly to phosphorus loading in the lake.

The intent of the project was to demonstrate the benefits of proper animal waste application on the water resources of the Lake Eucha watershed. Objectives were to:

- promote consistency in the way Oklahoma and Arkansas write animal waste plans,

- determine if producers are following the recommendations of the animal waste plans,
- determine if the animal waste plans should recommend lower P application rates,
- promote protection and re-establishment of buffer zones and riparian areas,
- provide technical assistance to producers in the development of total resource conservation plans,
- provide educational assistance to producers through producer meetings, workshops, and individual contact,
- demonstrate practices on a sub watershed necessary to achieve the nutrient control needed to protect Lake Eucha,
- coordinate the activities of the various agencies and groups working within the watershed and,
- monitor the effectiveness of the project.

Program Partners

This program would not have been as effective without the cooperation of the local conservation districts in Delaware County, Oklahoma and Benton County, Arkansas. In addition to housing the project coordinator and project technician, the districts recommended potential members for the Watershed Advisory Groups, participated in those groups, and worked with the cooperators to insure that they received their cost-share reimbursements and incentive payments. The districts played a critical role in promoting the program and cooperation with complementary programs such as NRCS EQIP and Cooperative Extension Education programs.

Other partners critical to the success of the project and a short summary of the roles they played include:

- The Environmental Protection Agency (EPA) for guidance and funding of the project
- The Oklahoma State Legislature for matching funds to increase the amount of best management practices that could be installed;
- The Oklahoma Secretary of the Environment who coordinated program activities and outputs between the EPA and OCC;
- City of Tulsa and U.S. Geological Survey (USGS) who collected water quality data in the watershed that can be used (now and in the future) to evaluate the water quality impacts of the program;
- The Oklahoma Department of Agriculture, Food and Forestry who regulate compliance with the State's poultry regulations and in doing so, monitor litter application, soil phosphorus and litter phosphorus content in the watershed, in addition to promoting implementation of sound best management practices associated with the industry;
- The Oklahoma Department of Environmental Quality who has been working to develop the TMDL that this program will help work towards and who also has

been encouraging through permitting, the upgrade of point source dischargers in the watershed to reduce the impacts from those sources;
- OSU Cooperative Extension Service whose long-standing education programs in the watershed have helped increase awareness of the water quality problems, knowledge about potential solutions to those problems, and receptiveness towards implementing solutions to those problems through changing behaviors;
- Natural Resource Conservation Service (NRCS) and Farm Services Agency whose programs provide funding and technical support to implement best management practices that expand the effects of this project both during and beyond the project period;
- Poultry Integrators who are working with the States of Oklahoma and Arkansas and their contract growers to reduce the impacts of the industry by requiring BMPs, training, and certification of growers, providing funding that is used to match federal funds to address the problems, and providing technical assistance to address the problems; **and most importantly**
- Landowners and local producers in the watershed who were receptive to information provided to them and willing to invest their time, finances, and risk potential short-term impacts to their bottom-line that would lead to improved water quality, conserve the additional natural resources in the area, and ultimately improve their productivity.

Assessment

Water Quality Monitoring is critical to the project for purposes of:
- determining the causes and sources of NPS-derived pollution in the watershed
- ascertaining whether or not project efforts have had an effect on water quality, or whether or not the project has been a success.

The City of Tulsa / Tulsa Metropolitan Utilities Authority, USGS, OWRB, OCC, and other groups have completed significant water quality monitoring in the watershed. These programs have been summarized in many reports including Clean Lakes Study (OCC 1997), the OWRB study (OWRB 2001), and many reports. However, in order to evaluate water quality changes related to the implementation of this project, it was necessary to implement a project-specific water quality monitoring plan.

The Beaty Creek Project was undertaken per EPA guidelines utilizing a paired watershed approach (EPA 841-F-93-009, 1993). The basic method requires a minimum of two watersheds, a control and a treatment, and two definable periods of study, calibration and treatment. The control watershed is chosen to account for environmental variability over the periods of study throughout the relatively short project duration. This environmental variability may otherwise mask the overall effect of BMPs on NPS pollutant loads in the treatment watershed. The control watershed must experience the same weather and seasonally induced changes as the treatment watershed. For this study, the Little Saline Creek watershed was chosen as the control as it is proximal to Beaty Creek and would be expected to experience the same climatic and other environmental impacts (Figure 2). Because its purpose is to account for

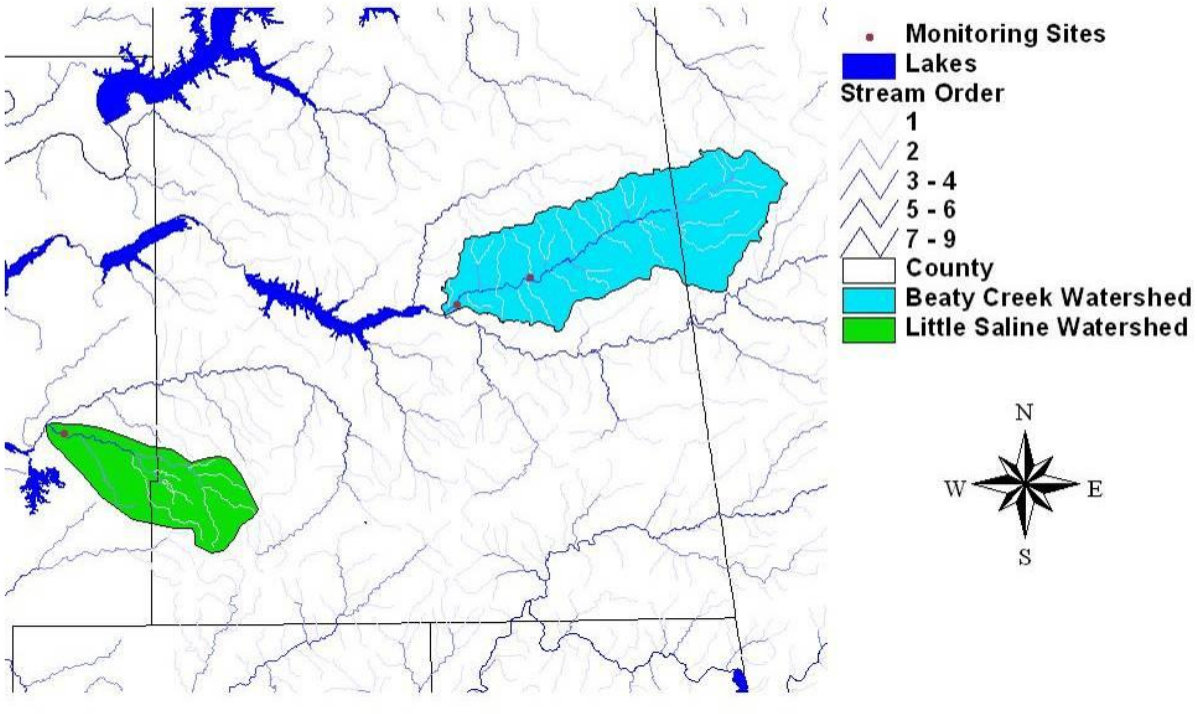


Figure 2. Location of Water Quality Monitoring Sites in Control (Little Saline) and Treatment (Beaty Creek) Watersheds.

natural variability, the control watershed must not incur any major landuse changes during the course of the study period.

The foundation of the paired watershed approach is that there is a quantifiable relationship between the watersheds for a parameter of interest, and that this relationship remains valid until major changes (i.e., BMPs) occur in one or the other (EPA 841-F-93-009, 1993). Following these changes, a new relationship will exist and have to be determined. It is the comparison of these "before" and "after" relationships that allows the determination of land management effects, slight though they may be due to short project duration, on NPS pollutant loads. It is necessary to note that the difference in quality of runoff between the control and treatment watersheds is not the issue, but rather that the relationship between paired observations between the two remain the same through time, except for the effects of the BMPs (EPA 841-F-93-009, 1993). Thus, if litter is spread in one watershed contributing to higher levels of phosphorus than in the other, it has no bearing on the paired watershed approach. Differences in water quality between the two watersheds are expected, but it is the predictable response of the two watersheds together that is the foundation of the paired watershed method.

To monitor pollutant loads through the systems, automated samplers were placed in both watersheds to allow continuous, flow weighted sampling. Specifically, samplers

were programmed to pull samples based upon rate of water passage (e.g., sample pulled for every 10,000 cubic feet of water). Thus, during periods of runoff, sampling frequency was heavier than during seasonal base flows. The integration of such sampling over a period of time results in more accurate estimates of pollutant loads (i.e., simply how much of a certain item of interest is being transported via the system) than single weekly or monthly grab samples. Weekly composited samples collected from these autosamplers were analyzed for Total Phosphorus, ortho-Phosphorus, Ammonia, Nitrate, Total Kjedahl Nitrogen and Instantaneous Discharge.

In addition to the autosampler data, weekly measurements were collected for dissolved oxygen, conductivity, pH, Temperature, Instantaneous Discharge, Alkalinity, Turbidity, Ammonia-Nitrogen, Total Kjeldahl Nitrogen, Nitrate, Ortho-Phosphorus and Total Phosphorus. Grab Samples were analyzed monthly for Total Suspended Solids, Sulfate, Chloride, and Hardness. Grab samples were analyzed for Fecal Coliform, *E. coli*, and *Enterococcus spp*. weekly from May – September. Benthic Macroinvertebrates were collected twice yearly and fish collections were completed annually during years 1, 3, and 5 of the project.

Upon completed installation of the BMPs, data were compiled, collated into calibration and treatment periods, and analyzed per EPA Paired Watershed Study protocol (EPA 841-F-93-009, 1993). Because there was at least some implementation throughout the study period, the first year and last two years of the project were chosen for calibration and treatment periods, respectively. Data collected between August 1999 and August 2005 were summarized for this report. Although 2 autosamplers were deployed along Beaty Creek, the autosampler at the lower station on the creek was not functional during the calibration period. Therefore the comparison between the treatment and calibration watersheds is based on analysis at the upper Beaty Creek Station. Although this station does not represent the entire watershed, it represents a subwatershed more similar in size to the Little Saline Watershed.

Preliminary Analysis Results- Comparison of August 1999-August 2000 Calibration Period to August 2003-August 2004 Treatment Period

A preliminary comparison of total phosphorus loading during the project period was compiled in March of 2005 comparing total phosphorus loading between the first year of the program (1999-2000) and the second to last year of the program (2003-2004). Weekly total phosphorus (T-P) loads were determined by multiplying T-P concentrations from weekly, integrated samples by the total flow for the sampling period. The first step in the analysis was to determine the relationship, if any, between the watersheds for both the calibration and treatment phases. To meet assumptions necessary to implement certain statistical methods, weekly T-P loads were converted to log base ten values before analysis. These log T-P load values were paired between the watersheds by date of collection and analyzed by linear regression to determine relationship. Figure 3 indicates strong, statistically significant ($P<0.001$) linear relationships between the two watersheds for both the calibration and treatment periods. Dotted bands are the upper and lower bounds of the interval within which the regression would be expected to occur

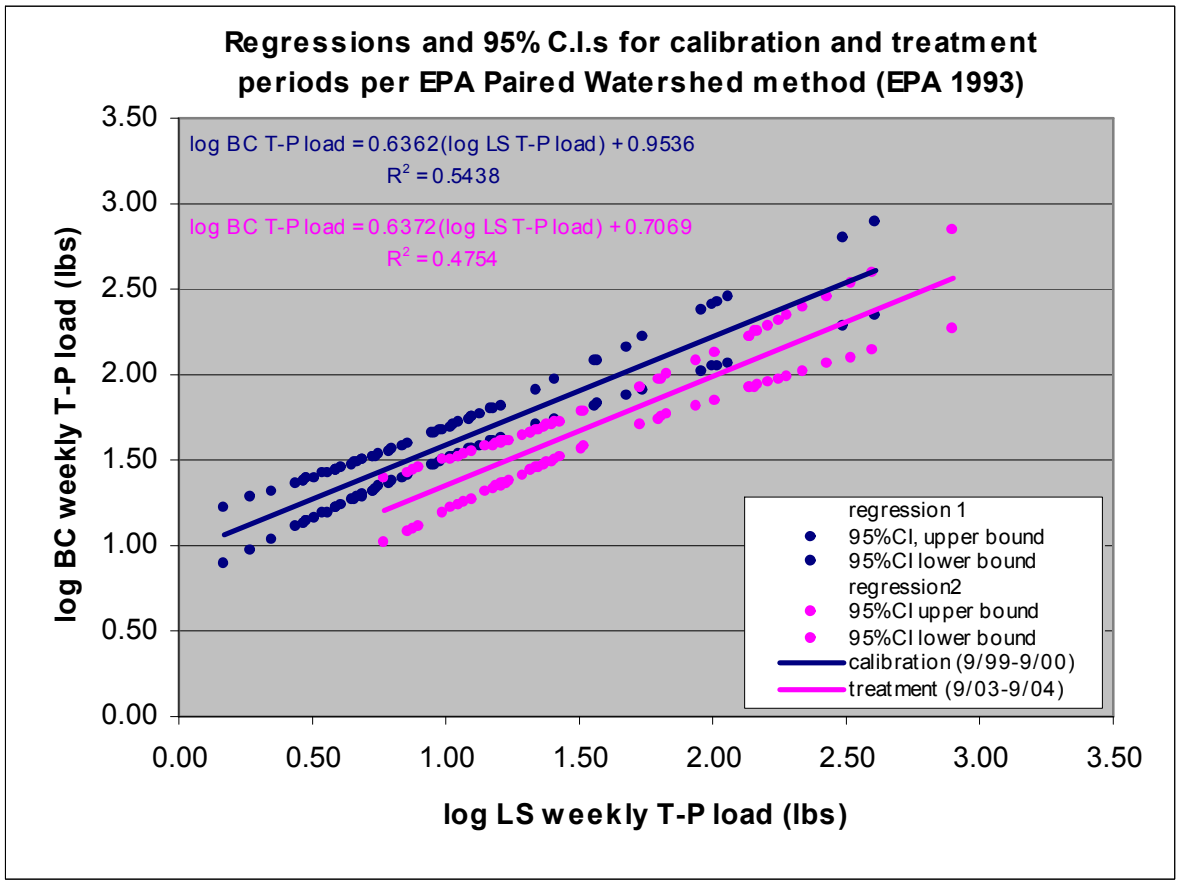


Figure 3. Relationships of log transformed Beaty T-P load to Little Saline T-P load for calibration and treatment periods. Both regressions are significant at the P<0.001 level.

95 times if the project were repeated 100 times. Since both regression lines fall outside the 95% CI bounds (i.e., the dotted bands) of each other, the relationships are said to be significantly different.

After determining that the relationship between the watersheds is significant for both periods, it is necessary to determine what level of change in T-P load between the calibration and treatment periods the sampling effort is sufficient to detect. Discussion of the exact procedure is too involved to include in this summary, but the method involves computing the ratio of the residual variance for the treatment regression to the percent difference expected (e.g., 20% reduction in T-P load between calibration and treatment periods). The results of this analysis show that sampling effort during the calibration period is sufficient enough to allow detection of at least a 12.75 percent change in weekly T-P load between the periods. Thus, to detect a lesser change like 10%, it would have been necessary to increase sampling effort to 88 samples for both creeks.

To determine the effect of the BMPs on weekly T-P load in Beaty Ck, it was necessary to employ a statistical tool called analysis of covariance (ANCOVA). This powerful tool

allows the determination of difference between the calibration and treatment periods despite whatever difference might have occurred because of environmental variability (e.g., wet year vs. dry year) or other factors as accounted for by the Little Saline data. The statistical software package Minitab, V. 14 was employed to conduct the analysis. The results of the ANCOVA analysis are included in Table 1 (below).

Table 1. Minitab results of the ANCOVA for the combined calibration and treatment T-P data (log transformed) for Beaty and Little Saline Creeks.

Factor	Type	Levels	Values			
Period	Fixed	2	Calibration, Treatment			
Analysis of Variance for log BC T-P load, using Adjusted SS for Tests						
Source	DF	Seq. SS	Adj SS	Adj MS	F	P
Log LS T-P Load	1	11.2189	12.1397	12.1397	103.83	0.000
Period	1	1.2258	1.2258	1.2258	10.48	0.002
Error	100	11.6916	11.6916	0.1169		
Total	102	24.1364				

The ANCOVA results show that both log Little Saline T-P load and calibration/treatment period are strongly related to Beaty T-P. The items in the table of most significance are the P-values, 0.000 and 0.002, which convey the statistical significance of the relationships to log Beaty T-P load of Little Saline T-P and study period, respectively. Specifically, the P-value of 0.002 indicates that there is strong evidence of a difference between the calibration and treatment periods, even after adjusting for difference due to other things as accounted for in the Little Saline data. The P-value associated with “log LS T-P load” shows that the Little Saline T-P data is related to the Beaty T-P data quite significantly for both periods combined. A test of difference in slopes and intercepts per EPA method (EPA 841-F-93-009, 1993) show no difference in slopes between the calibration and treatment regressions but a highly significant difference in intercepts ($P<0.005$), corroborating the overall parallel shift in regression as seen in Figure 3.

To aid in visualizing any change in log weekly T-P load between the calibration and treatment periods, a plot of the difference between weekly Beaty T-P loads observed during the treatment period and those predicted by the calibration equation was constructed (Figure 4). Since the calibration period regression represents the relationship between the two watersheds before any significant BMP implementation, input of treatment period log weekly Little Saline T-P loads into the equation will result in log weekly T-P loads for Beaty Creek that would be expected under the same circumstances. Thus, subtraction of these “predicted” loads from the actual loads seen during the treatment period would result in determination of a change, if any, from what would be expected given no BMPs. Theoretically, if the relationship is adequate, most of the differences should be slight to none if BMPs have had no effect on T-P loads (i.e., T-P loads during the treatment shouldn’t be that different from those during the calibration). In this case, it is obvious by the shift in the regression line (Figure 4) that log weekly T-P loads on average are lower during the treatment period when adjusted for differences due to environmental variability and other factors accounted for in the

Little Saline data. Thus, most of the observed weekly loads for Beaty Ck. during the treatment period are less than those predicted by the calibration relationship and contribute to the many negative differences seen in Figure 4.

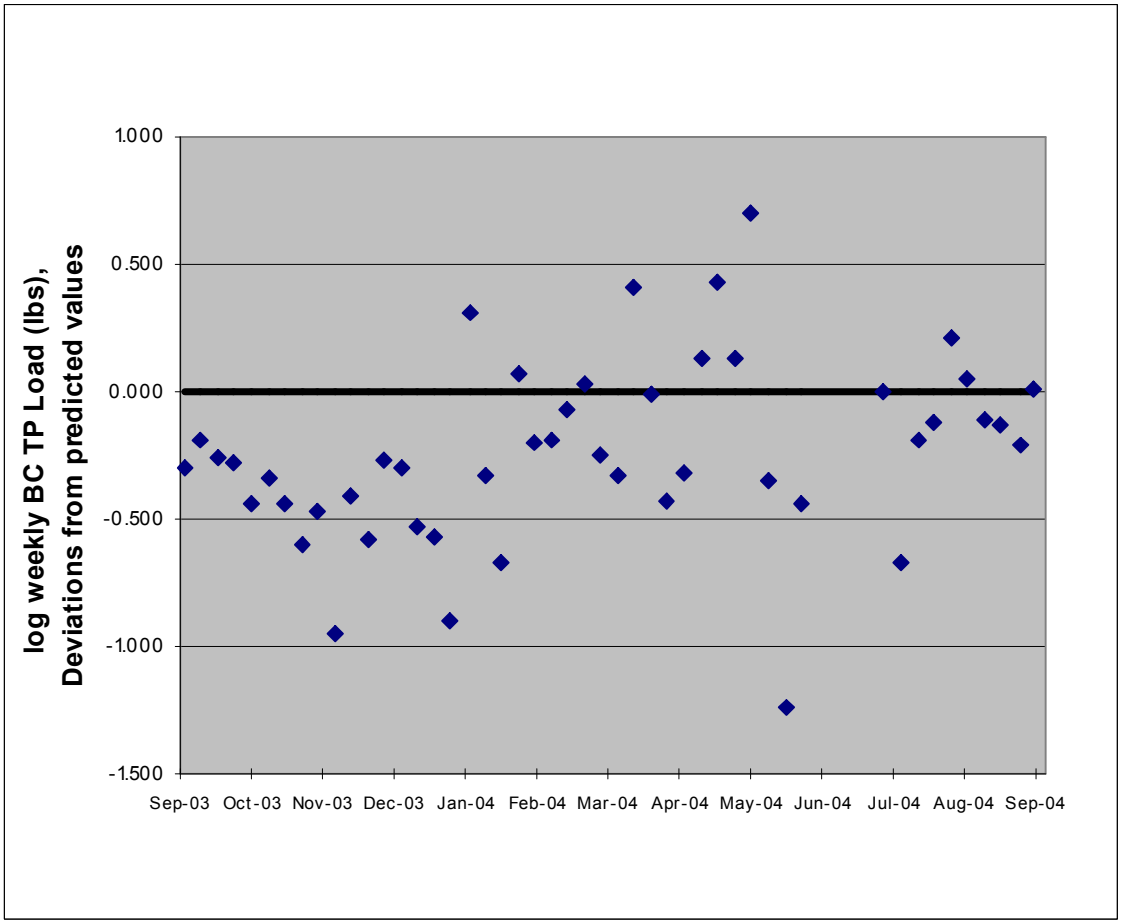


Figure 4. Plot of deviations of predicted weekly log BC T-P from observed values during the treatment period.

Again, to arrive at an estimate of BMP influence on the weekly T-P load in Beaty Ck., it is necessary to consider the difference between the observed and expected loads for the treatment period as opposed to the difference in calibration and treatment period means, which are not corrected for environmental variability (Table 2). Although the treatment mean weekly T-P load for Beaty Ck is a little higher than the calibration period mean, it is actually 14% lower than what would be predicted before BMPs were implemented, and this is the value of interest in paired watershed studies. Even if the difference in observed and predicted loads had not been statistically significant, a presumed benefit of BMPs is still realized in the difference in observed loads between the periods when compared to Little Saline Creek. Despite no adjustment in watershed management practices, Little Saline exhibited a 176 percent increase in observed weekly T-P load between the periods as opposed to an 18 percent increase in Beaty Creek, which is assumed to have experienced a similar magnitude of difference in load driving runoff between calibration and treatment periods.

Table 2. Mean observed weekly T-P loads (lbs) for study periods and predicted load for Beaty Ck. during treatment period. Change in Beaty T-P load is calculated using the weekly loads observed and predicted during the treatment period.

	Mean weekly T-P load (lbs)	
Calibration		
Little Saline	30.29	
Beaty	90.66	
Treatment		
Little Saline	83.56	
Beaty (observed)	106.81	
Beaty (predicted)	123.60	
Change in T-P load*	*(observed-predicted/observed)*	-14%

*adjusted for environmental variability as accounted for in Little Saline

Another way to relay the difference between study periods in the Beaty Creek T-P data is to present the adjusted means of the log transformed data from the ANCOVA analysis previously discussed. Using all the data combined, an overall project mean of log weekly Little Saline T-P load (1.268) was computed and used in both regression equations in Figure 3 to generate corrected log weekly Beaty Creek T-P load means for the calibration and treatment periods. The Minitab results outlined in Table 3 exhibit clearly the drop in adjusted means of log weekly Beaty Creek T-P load between the periods (0.2458), along with a 95 % confidence interval around the difference and the associated statistical confidence (P=.0016). Again, the percent difference from calibration is approximately 14 percent.

To observe the change in climate adjusted log weekly T-P loads in Beaty Creek, ANCOVAs were performed for each succeeding pair of years for the project using the same procedure outlined in the preceding discussion. By subtracting the first year from the second for each pair, a difference in climate adjusted means was determined and plotted along with the 95% confidence interval to track the effect of BMPs. The results of this analysis show not only a decrease in climate adjusted means from year to year but also a significant increase in the difference between them over the project duration (Figure 5). The statistical confidence in the difference estimates between the first and last years of the project is evident in the non-overlap of the 95% C.I.s.

Table 3. Minitab output detailing adjusted means analysis.

Tukey 95% Simultaneous Confidence Intervals
Response variable log BC T-P load
All Pairwise Comparisons among Levels of Period
Period = calibration subtracted from

Period	Lower	Center	Upper	---+---------+---------+---------+---
treatment	-0.3964	-0.2458	-0.09520	(----------*----------)

```
---+---------+---------+---------+---
-0.36    -0.24    -0.12     0.00
```

Tukey Simultaneous Tests
Response Variable log BC T-P load
All Pairwise Comparisons among Levels of Period
Period = calibration subtracted from:

Period	Difference of Means	SE of Difference	T-Value	Adjusted P-Value
Treatment	-0.2458	0.07592	-3.238	0.0016

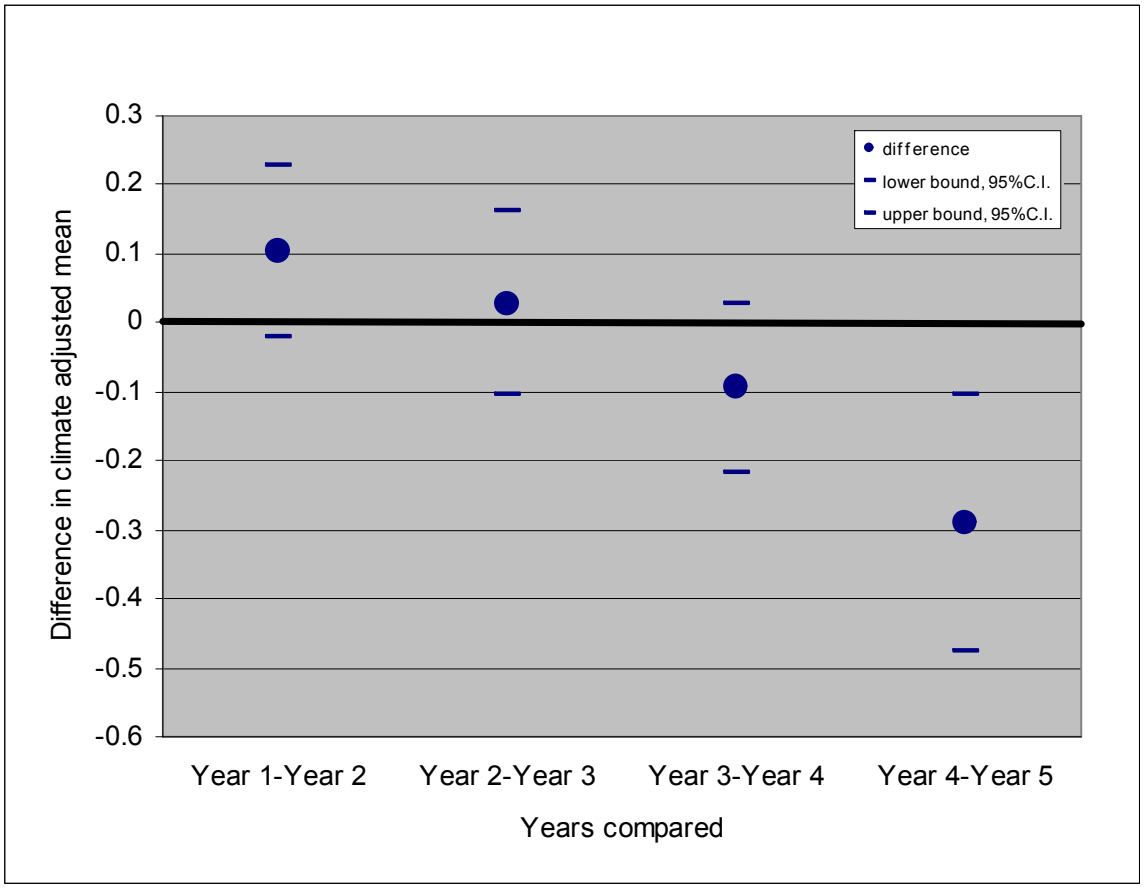


Figure 5. Difference in year-to-year climate adjusted means of log weekly T-P load for Beaty Creek. Hash marks depict the 95% confidence interval around the estimate.

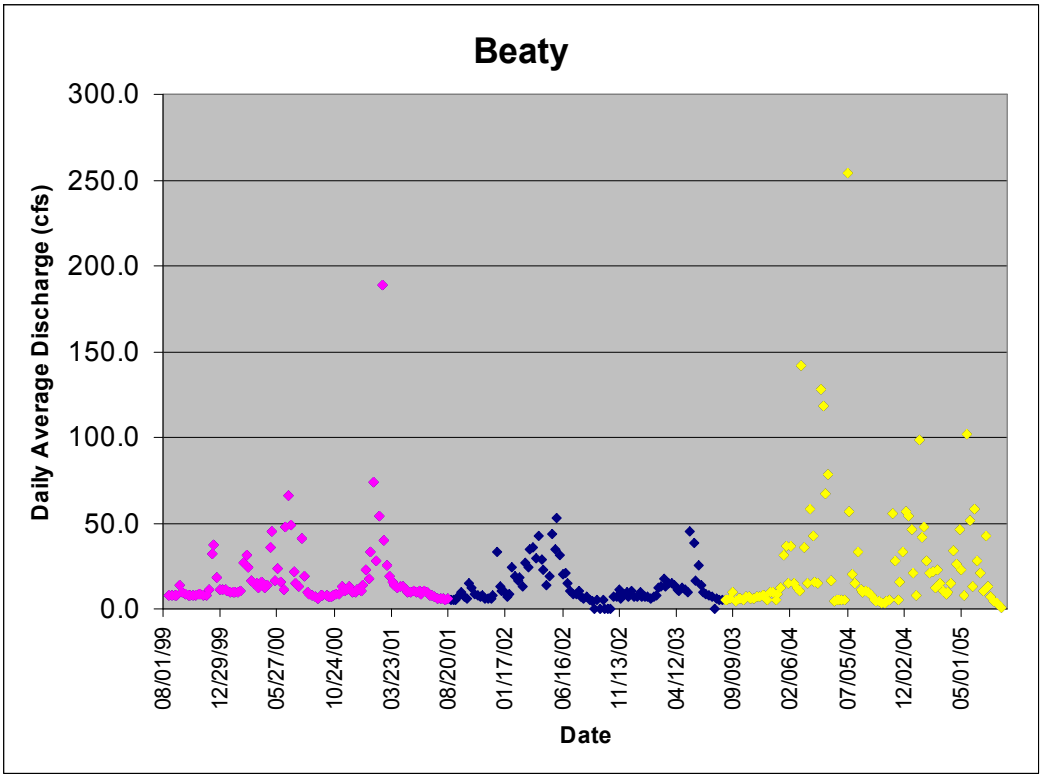
Documentation of the 14% reduction in loading was encouraging, especially given that a comparison of calibration period to treatment period flows revealed that treatment period flows were 20% higher than during the calibration period (Figure 6). Indeed, storm events during 2003-2004 resulted in some of the highest discharges on record for the area, while 1999-2001 was a relatively drier period.

Final Analysis Results- Comparison of August 1999-August 2001 Calibration Period to August 2003-August 2005 Treatment Period

Given that the BMPs implemented as part of the project were designed to reduce the impacts of stormwater runoff, they might be expected to be more documentable during wetter years than dry years. Addition of the second year of post-implementation monitoring (2004-2005) into the comparison seems to support this theory. 2005 was a dryer year, more in line with the calibration period (now 1999 – 2001); while roughly 1/3 (30%) of the accumulated elevated average (on a weekly basis) daily flows of the period of record occurred during year 1 of the treatment period, only 25% occurred during the second year of treatment, and 30% during the entire 2 year calibration period (Figure 6). In addition, the magnitude of elevated flows during the first year of the treatment period were greater than the second year.

Nonetheless, comparison of the Calibration Period (1999-2001- Figure 6 pink) to the entire Treatment Period (2003-2005- Figure 6 yellow) did not indicate the statistically significant reduction in phosphorus loading that was evident in the preliminary analysis (Table 4). And although total Kjeldahl Nitrogen (TKN) loading was significantly lower than predicted amounts by 32% (Table 4), Total Nitrogen in the system is dominated by Nitrates, which appeared to increase (although not significantly). Temperature was significantly lower during treatment than pre-implementation by a factor of 5.4%. Although ANCOVA results were significant at the $\alpha = 0.05$ for nitrate loading and concentration, TKN loading, and E. coli weekly counts, an insufficient number of samples was collected to overcome sample variability to document a significant change.

Figure 7 displays the comparison of phosphorus loading during the calibration period to loading during the entire treatment period. Although the treatment line was generally lower than the calibration line, the difference was not statistically significant. The slopes of the treatment line and calibration line are slightly different, although not significantly different. The shift in slope suggests, however, that for higher loads, the difference between calibration period and treatment periods is greater than for lower loads.



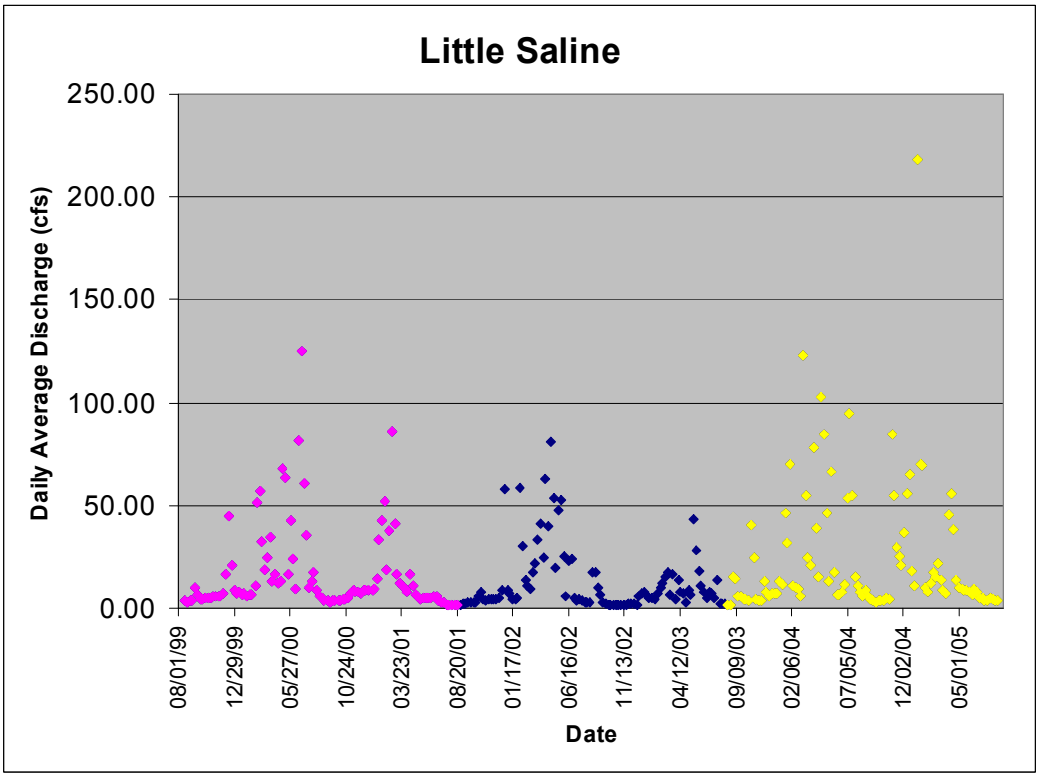
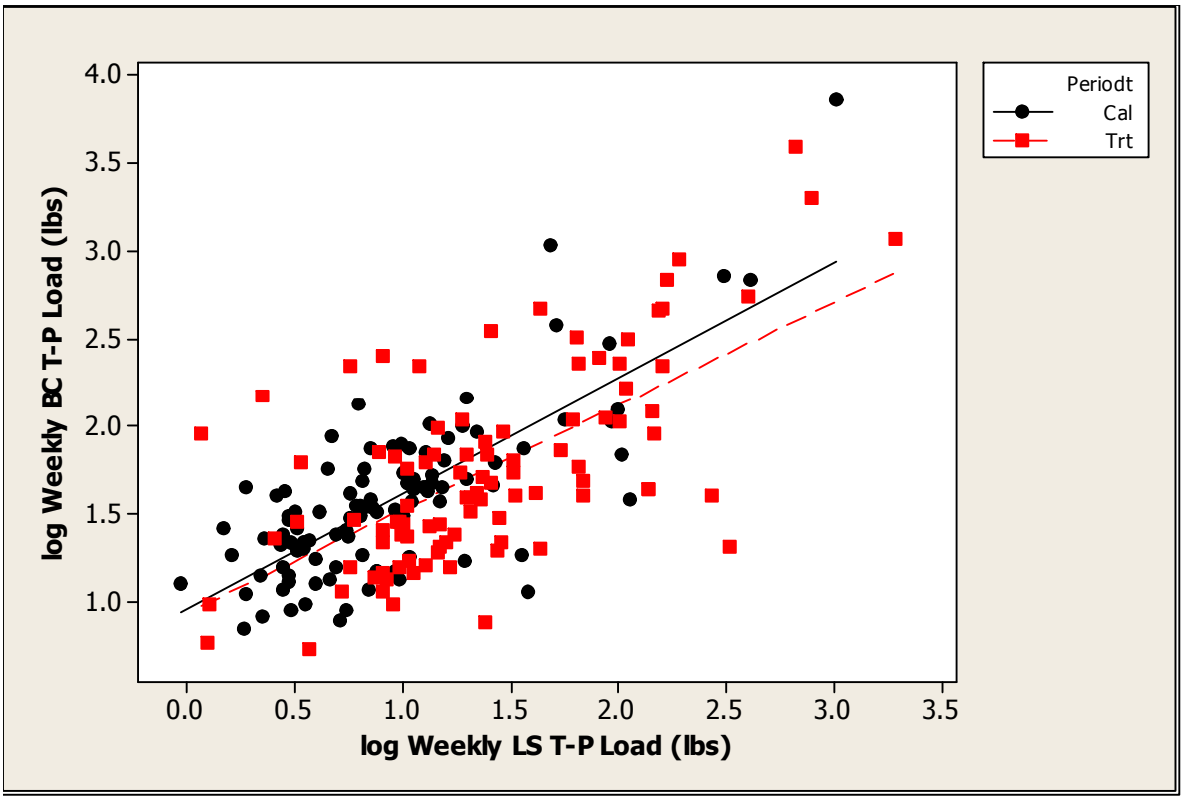


Figure 6. Average Daily Discharge at Beaty and Little Saline Autosamplers for Period of Record.

Table 4. ANCOVA results for comparison of pre- and post-implementation data.

Analyte	ANCOVA P-Value	Sufficient n to see the change?	Change from Predicted Amount
Ortho-P Weekly Load	0.78	na	Na
Total P Weekly Load	0.08	na	Na
Nitrate-N Weekly Load	0.01	no	**30%**
TKN-N Weekly Load	0.00	yes	-32%
Ammonia-N Weekly Load	0.25	na	Na
Ortho-P Weekly Concentration	0.12	na	Na
Total P Weekly Concentration	0.47	na	Na
Nitrate-N Weekly Concentration	0.00	no	**37%**
TKN-N Weekly Concentration	0.00	no	-44%
Ammonia-N Weekly Concentration	0.44	na	Na
E. coli Weekly Count	0.00	no	-19%
Enterococcus Weekly Count	0.12	na	Na
Temperature	0.00	yes	-5.4
Turbidity	0.06	na	Na
Alkalinity	0.46	na	Na
pH	0.36	na	Na

By contrast, the lower graph in Figure 7 displays the significant reduction in TKN Loading and Figure 8 displays the significant reduction in temperature. Although, the program successfully increased protected riparian area in the watershed, shading over the creek did not significantly increase during the project period to be responsible for this decrease in temperature. More likely, this decrease relative to the control watershed was a due to increased infiltration of runoff. Improved vegetative cover in the watershed intercepted and directed more runoff to groundwater, resulting in cooler overall in-stream temperatures.



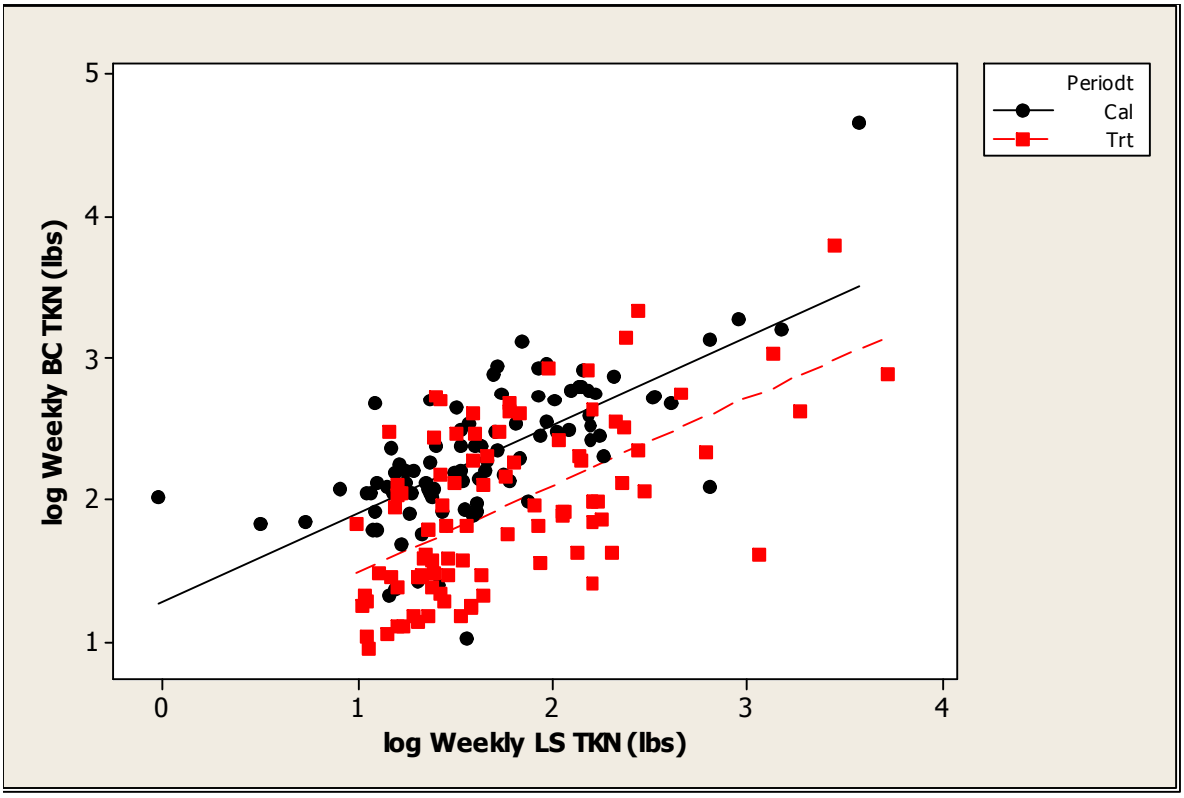


Figure 7. Calibration Versus Treatment TP and TKN Loading.

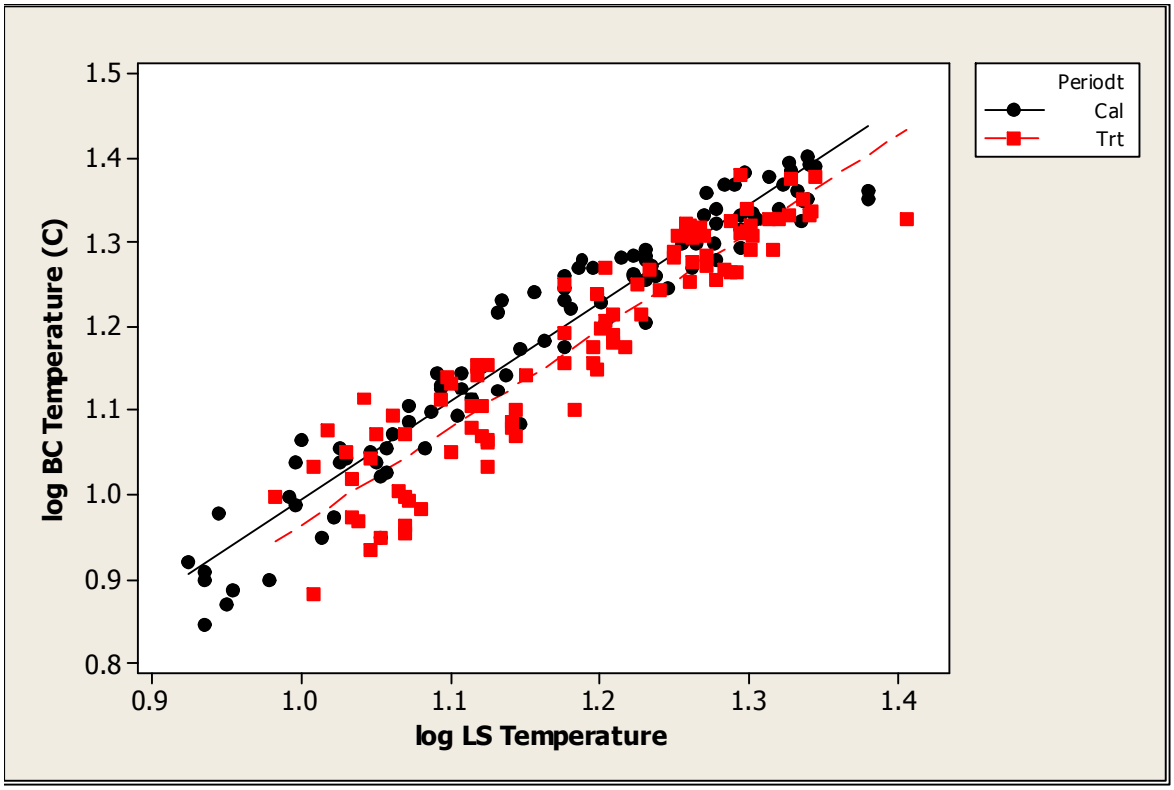


Figure 8. Decreases in Temperature Between Calibration and Treatment Period.

Beaty Creek is listed on the 2002 303(d) list for pathogens, and on the Draft 2004 303(d) list for *Enterococcus spp.* and *E. coli*. Although the ANCOVA results for *E.coli*. suggested a 19% reduction from the calibration period, an insufficient number of samples was collected to document the change (Figure 9). This suggests that the treatment period has not yet continued for a period of time sufficient to verify a decrease in weekly E. Coli counts.

In addition, evaluation of the *E.coli* data following procedures outlined in the State's Use Support Assessment Protocols (USAP), according to Oklahoma's Water Quality Standards suggests that the stream is no long violating is Primary Body Contact Recreation Use for *E.coli,* although it still violates that use based on *Enterococcus* data (Table 3). Therefore, although the decrease in *E.coli.* between calibration and treatment is not statistically significant, even with higher magnitude storm events during the treatment period, *E. coli* counts are reduced.

Additional parameters for which ANCOVA p-values were significant, yet an insufficient number of samples were collected during the treatment phase were Nitrate-N loading and concentration, both of which appeared to increase between calibration and treatment.

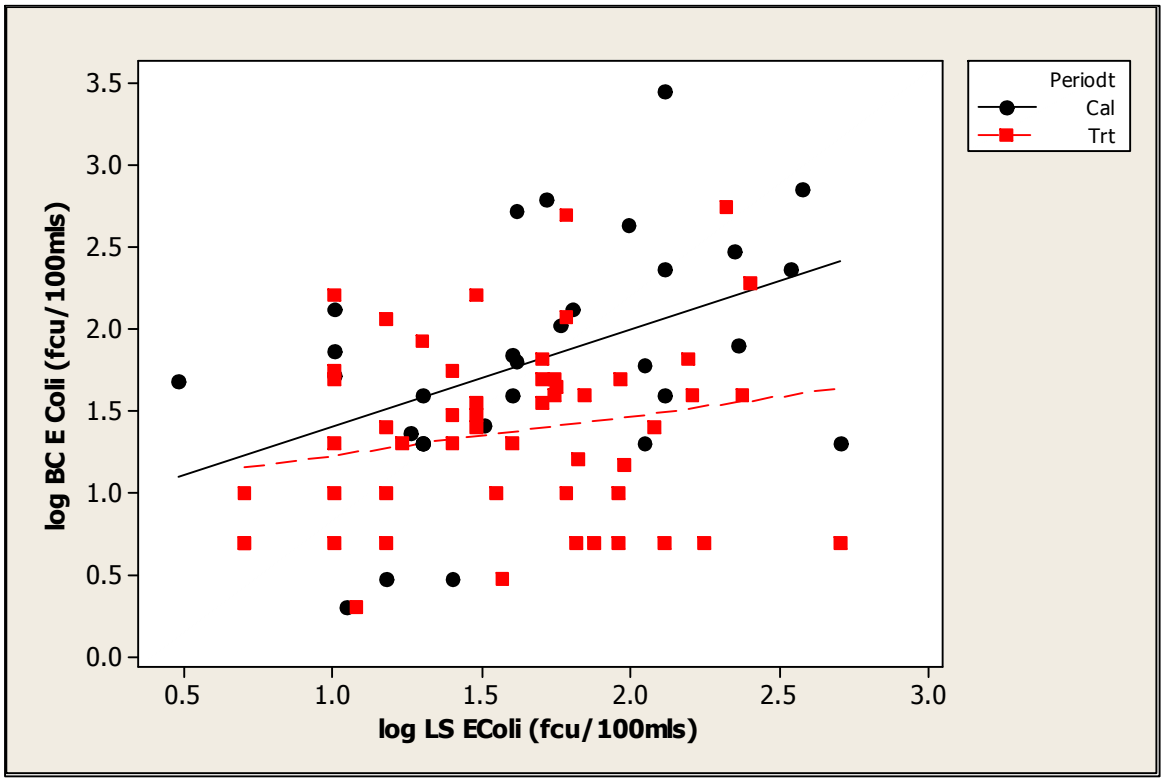


Figure 9. Comparison of Calibration and Treatment Weekly E. coli Counts.

Further graphic depictions of the comparisons between calibration and treatment periods are available in Appendix A.

Table 4. Primary Body Contact Support Status.

Parameter	*E.coli*	*Enterococcus*
Geometric Mean	29	85
# Samples > 406	4	4
Geometric mean > criterion	No	yes
PBCR Support	**Supporting**	**Not supporting**

In addition to the paired watershed analysis, significant habitat information was collected throughout the watershed to aid in conservation planning and prioritization of implementation efforts. For purposes of this exercise, OCC staff surveyed the entire length of the stream network in the watershed and completed abbreviated habitat assessments every 400 meters. The purpose of these habitat assessments were to pinpoint areas of the near stream area most likely contributing to the water quality problems in Lake Eucha. This information was then digitized and mapped out to provide planners with the tools necessary to select and prioritize best management practices. These images, and how they were used, is detailed later in the report.

The extensive set of water quality data collected through the project has been submitted to statisticians and water quality modelers at Oklahoma State University to investigate

methods of separating out whether differences suggested by the analysis in the BMPs effectiveness between base and high flow loadings can be further separated statistically. These experts are considering slightly a slightly different statistical application of the paired watershed concept to identify potential impacts of the program. Initial projections from their comparison of the data suggests a statistically significant reduction in phosphorus loading over the entire project period; however, this process is not yet completed. Following completion of this analysis, an addendum to the final report will be sent to EPA.

Planning

The intent of this project was to demonstrate the benefits of proper animal waste management on the water resources of the Lake Eucha watershed. Objectives of the project were to:

- promote consistency in the way the two states write animal waste plans,
- determine if producers are following the recommendations of the animal waste plans,
- determine if the animal waste plans should recommend lower P application rates,
- promote protection and re-establishment of buffer zones and riparian areas,
- provide technical assistance to producers in the development of total resource conservation plans,
- provide educational assistance to producers through producer meetings, workshops, and individual contact,
- demonstrate practices on a sub watershed necessary to achieve the nutrient control needed to protect Lake Eucha,
- coordinate the activities of the various agencies and groups working within the watershed and,
- monitor the effectiveness of the project

To achieve those objectives required the participation of many different groups including OCC, Delaware and Benton County Conservation Districts, Oklahoma Department of Agriculture, Oklahoma Department of Environmental Quality, Oklahoma Water Resources Board, Oklahoma State University Cooperative Extension Service, NRCS, City of Tulsa, local producers, poultry integrators, and animal waste marketers. Most importantly, success of the program relied heavily upon interaction with and buy-in from the local watershed residents, the people who would have to change their behaviors in order for the program to make a difference.

The project sought local buy-in in several ways. The first was to partner with the local Conservation Districts. Conservation Districts and their boards consist largely of local agricultural producers or persons with a strong tie to the local agricultural industry. The districts are well known to the local producers and have worked with many of them in the past and will into the future. Districts also have a well-established partnership with local NRCS offices and are the most effective means to involve and coordinate with NRCS at a local level.

Secondly, the project hired a local project coordinator and local conservation technician, rather than someone from outside the area. These people were familiar with the landowners and the issues in the watershed. They live in the area so landowners would see them at local restaurants and church, etc, rather than just at meetings about the project. In this manner, the local landowners would be more likely to place their trust in these people than in strangers from outside the watershed.

This local coordinator was responsible for:

- identify and schedule producers in need of conservation planning,
- assist with local producer and other meetings held in the watershed,
- work with local clean-out groups to determine availability of excess litter,
- review plans for consistent application of NRCS specifications and standards between Arkansas and Oklahoma,
- coordinate tracking conservation plans and practices recommended with OCC GIS,
- Work with NRCS to ensure that water quality concerns are addressed,
- hold periodic meetings with the various groups working in the watersheds,
- identify potential animal waste market groups,
- participate in watershed educational activities,
- coordinate demonstration watershed implementation activities as outlined in subsequent tasks of this workplan, and
- coordinate demonstration watershed steering committee (Watershed Advisory Group).

The conservation technician assisted the project coordinator with these duties and maintained electronic records of project activities.

The project staff worked out of the Delaware County Conservation District, which is housed in the Delaware County NRCS office.

Finally, the project assembled a local Watershed Advisory Group (WAG) to recommend practices to be offered through the program and the cost-share rates at which to fund the practices. This group of individuals, recommended by the Delaware and Benton County Conservation District (CD) Boards, was selected to represent the NPS interests in the watershed. Ideally, this would mean that the WAG would include a poultry producer, poultry integrator, swine producer, resident homeowner, cattle beef/dairy producer, Conservation District Board Members from Delaware and Benton counties, minority representative(s), resident homeowner, the City Of Tulsa, Trust for Public Land, and a minority representative. WAG meeting minutes are available in Appendix B.

The Beaty Creek WAG consisted of 14 members to represent the conservation district boards, dairy producers, beef producers, swine producers, minorities, and cities and towns. Members included:

- Dave Chamberlain- Oklahoma poultry producer
- Jim Hollenback- Oklahoma swine producer

- Woody Wilson- Oklahoma minority representative
- David Holcombe- Delaware County CD Board Member
- Dean Austin- Arkansas poultry producer
- Leon Whiteside- Arkansas beef producer
- Mel Reynolds, Arkansas swine producer
- Ronnie McGhee- Benton County CD Board Member
- Jack Cowgur- Simmons Industries
- Avery Hoke- Arkansas resident homeowner
- Ray Duncan- Oklahoma beef producer
- Herb Beattie- Trust for Public Land
- Mickie Stockton- Oklahoma resident landowner, and
- Susan Savage- Mayor of Tulsa

Figure 10. WAG members at the signing of the first cooperative agreement.

The purpose of the WAG was to represent local interests in the watershed as they recommended practices and cost-share rates to be applied through the program to reduce NPS pollution in the watershed.

Because 319 programs are demonstration programs and because the money available was inadequate to meet all the NPS needs in the watershed, it was necessary to focus implementation funds in areas that needed it most and where BMPs would result in the greatest load reductions. This focus was accomplished in two stages. First of all, the

WAG considered the concentration of, types and sources of problems in the watershed to determine the types of practices they would offer, and tried to focus implementation into those areas by offering the highest cost-share rates for practices that would most significantly benefit water quality but that producers might be most hesitant to implement. Secondly, OCC personnel used their knowledge of the location of the most likely significant sources to try to target implementation towards those areas through evaluation of eligibility and conservation plan development and later, by door-to-door solicitation of landowners in targeted areas to participate. Further detail on how this was accomplished is discussed below.

In order to choose which practices would be offered, the WAG asked OCC Water Quality staff to provide information on the known water quality problems in the watershed, the known and likely sources of those problems, and the practices that could be used to control those problems. Therefore, OCC gave the WAG information on the water quality problems and sources, largely in the form of maps, along with descriptions of practices that could be used to reduce pollution from those sources. The WAG's recommendations on BMPs and cost-share rates were approved by the OCC Commissioners and incorporated into a following summary document.

Potentially, a number of GIS layers existed or could be developed for the watershed to guide the targeting. Many of these were listed in the workplan, including soils, digital elevation maps, conservation plan inventory, CAFO survey, landuse, riparian area, and detailed digital hydrology. In addition, a number of potential analyses were identified (in the workplan) that could be used to help direct or target the implementation. These included: 1) Conservation plan survey- identify areas not under a plan and the status of other plans- correlate to LandSAT landuse.; 2) Stream Habitat and Riparian Assessment. A detailed digital hydrology file could be developed from 5 meter satellite data to spatially relate the habitat assessment parameters. This would allow a multitude of analyses. Riparian areas would also be digitized from 5 meter satellite data, in addition older aerial photos can be scanned and riparian areas digitized to show changes; then we could try to correlate the reduction of riparian areas to stream bank erosion, Landuse assessment from LANDSAT Thematic mapper images- these images are being purchased by OCC for the entire Eucha watershed. LANDSAT images in 5 year increments could be used to show landuse trends (riparian area reduction) and land clearing; 3) CAFO (layer) will be updated to detail individual house locations; 4) The locations of all land deemed to be suitable for animal waste application could be determined; and 5) Use GIS to track BMP implementation and estimate nutrient reduction (modeling).

Problems existed with the use of some of these layers, either with the quality of data or in using the data for this particular application such that not all of the data layers originally planned could be incorporated into the targeting, either initially, or later as targeting became more focused. For instance, land use data available at that time in the watershed was over ten years old. Information was available on soil type, but not widely available on soil nutrient content. Satellite images and aerial photos that could be used to determine riparian coverages were also dated and likely to be inaccurate. Therefore,

these types of layers were of limited use in targeting initially. This information had to be developed as the program progressed and incorporated when appropriate.

Therefore, in order to develop and summarize information on sources of water quality problems and the areas that were most likely significant sources, data collected in accordance with the approved Quality Assurance Project Plan by the Oklahoma Conservation Commission, Water Quality Division was converted by the Oklahoma Conservation Commission, Geographic Information Systems (GIS) Program into six maps of the Beaty Creek Watershed. The map coverages included (Figures 11 – 17):

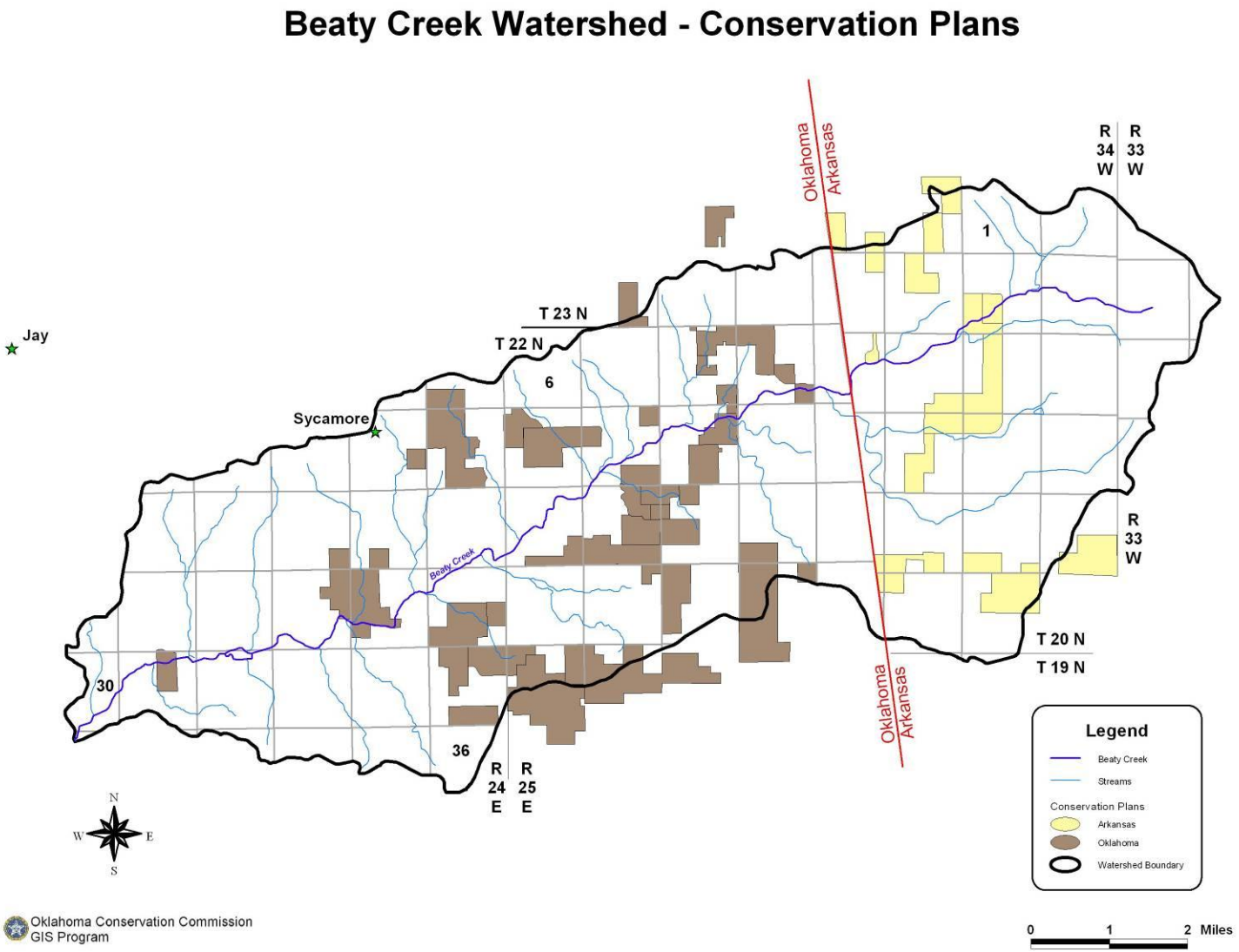


Figure 11. Conservation Plans Drafted in the First Year of the Project (1999).

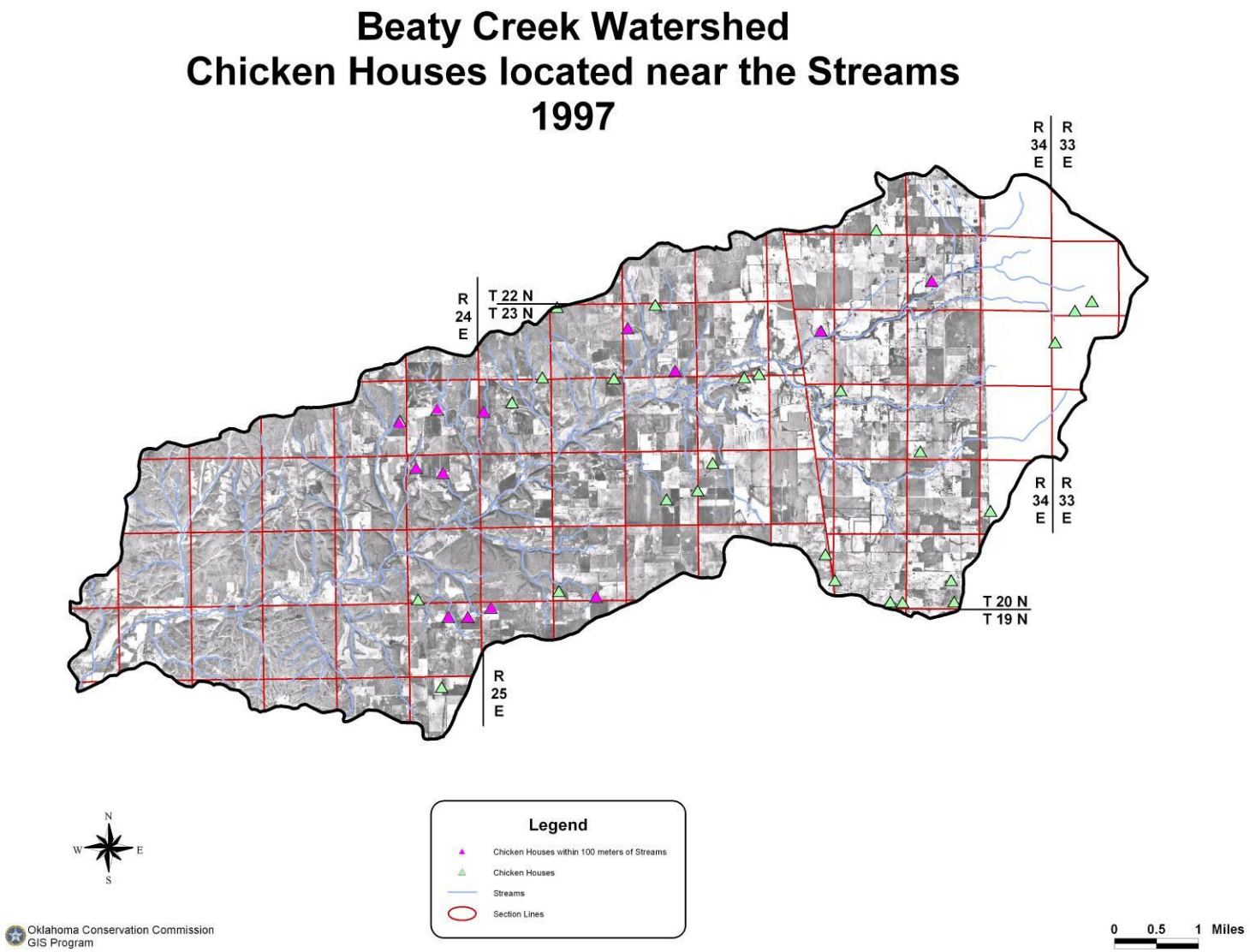


Figure 12. Location of Poultry Houses Near Streams.

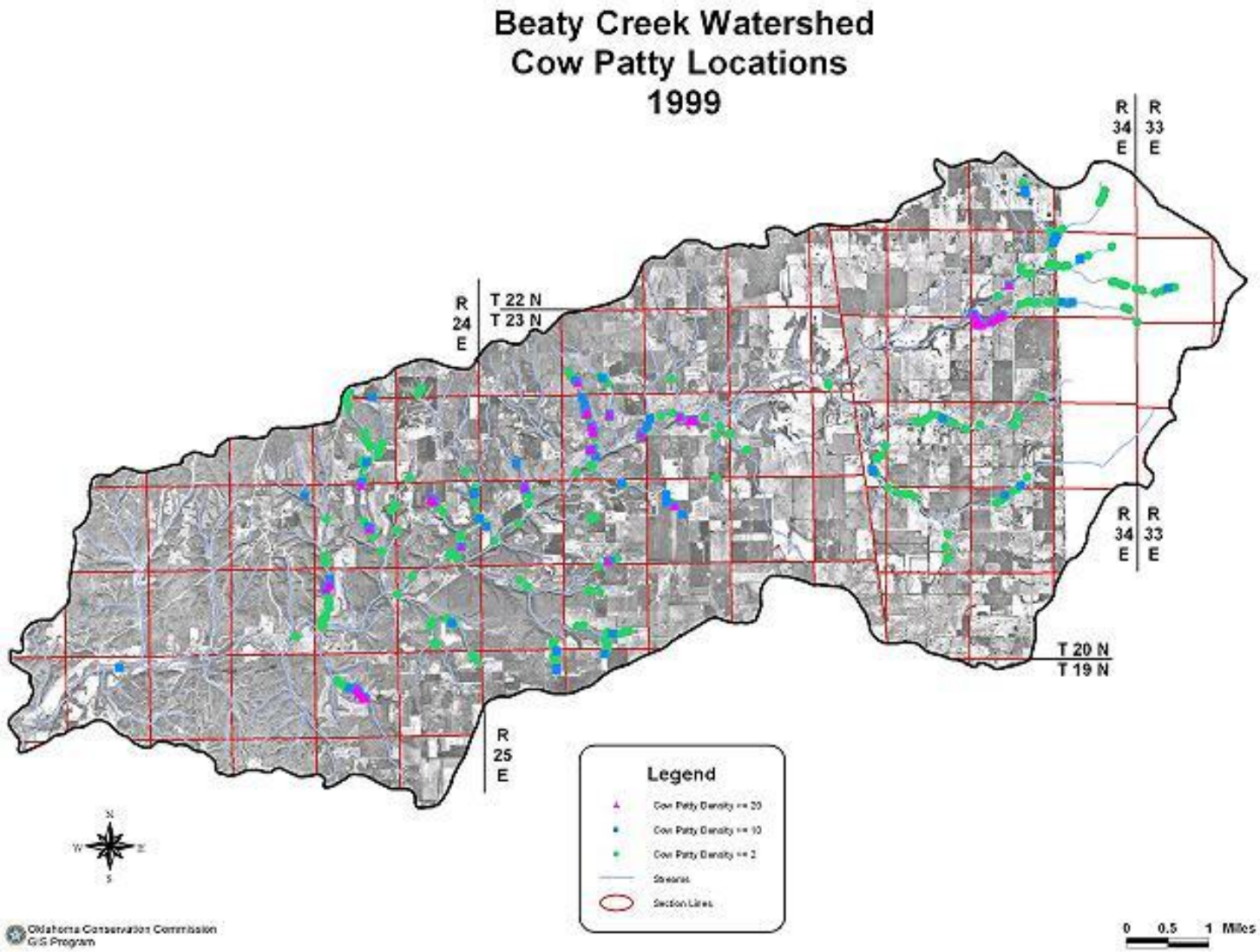


Figure 13. Location of Cow Patties within Bank-Full Width.

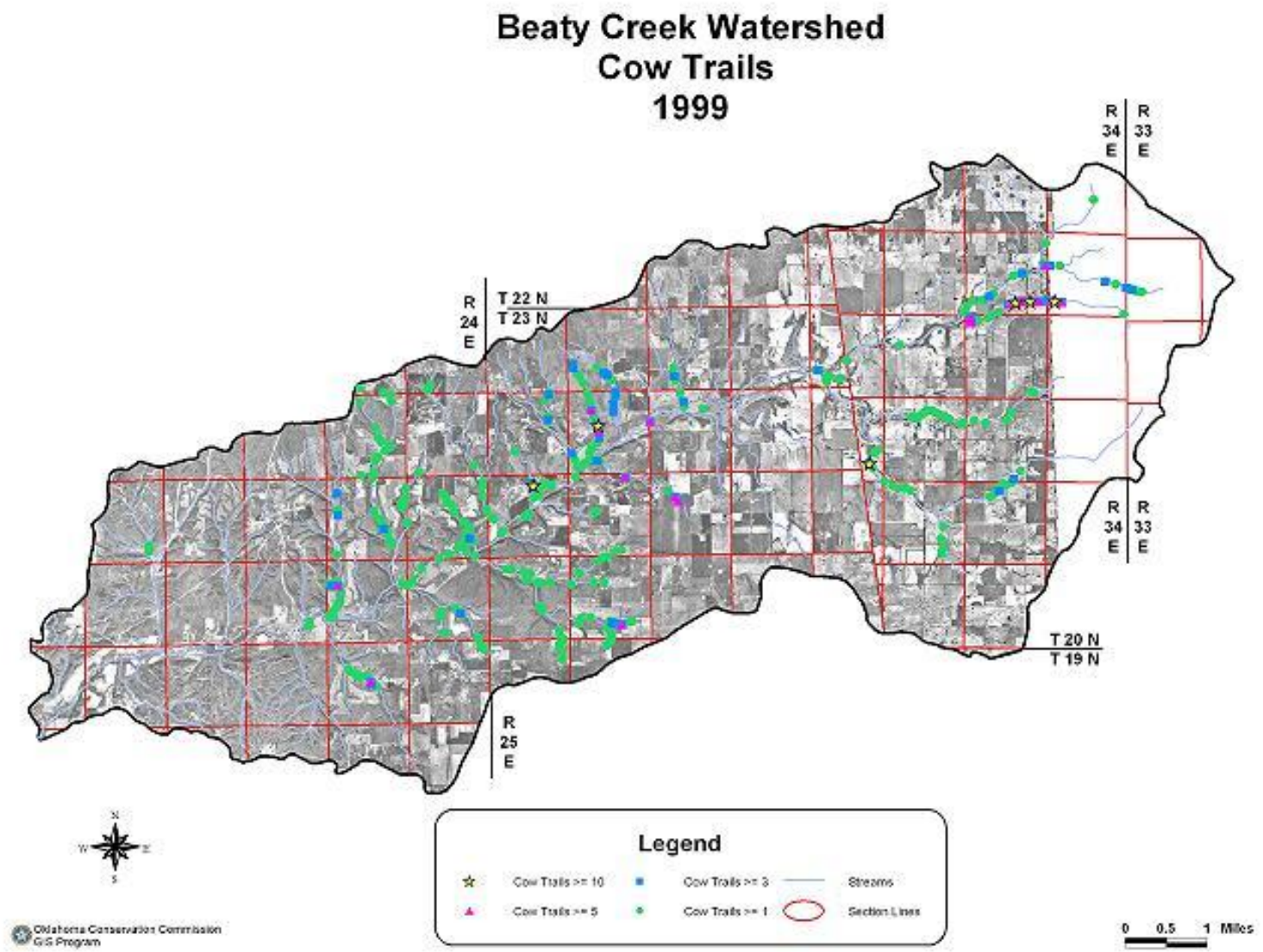


Figure 14. Location of Cattle Trails within Bankfull Width.

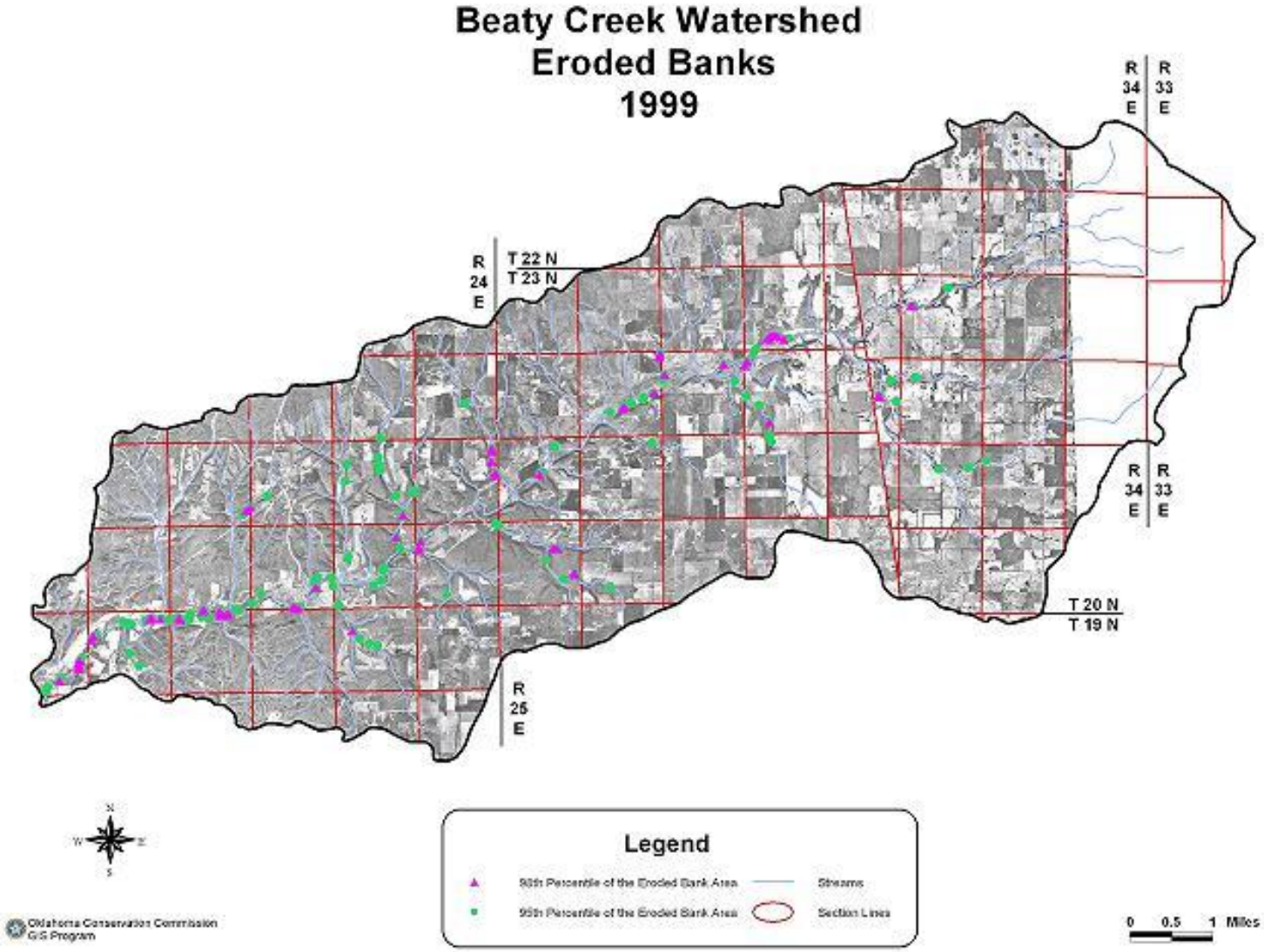


Figure 15. Location of Streambanks with Significantly Eroded Banks.

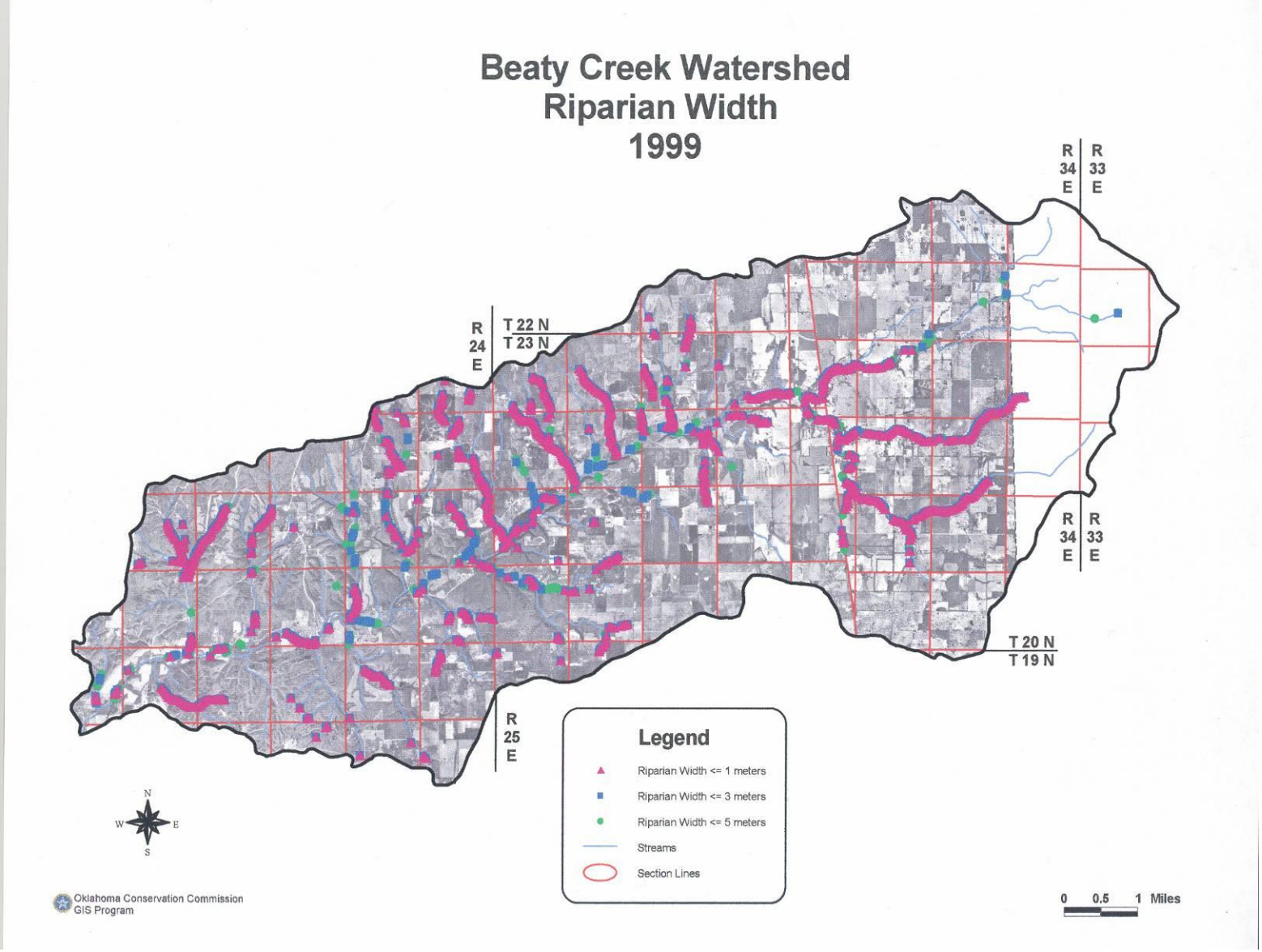


Figure 16. Areas of Degraded or Non-existent Riparian Area Protection.

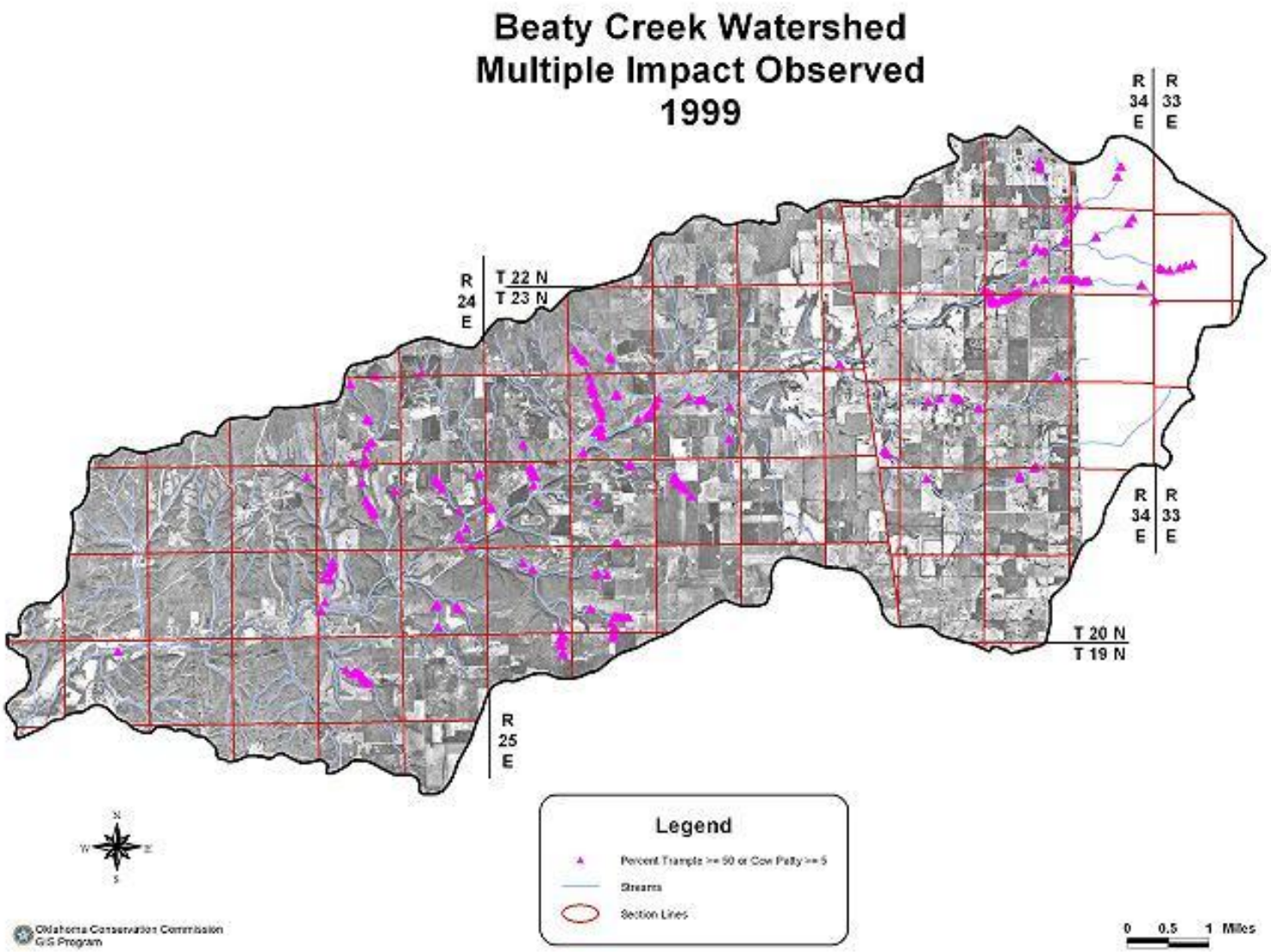


Figure 17. Locations where Two or More Impacts Likely to Contributed to NPS Pollution were Observed.

1. Chicken Houses and Pipes Located near the Streams 1997
2. Cow Patty Locations 1999
3. Cow Trails 1999
4. Riparian Width 1999
5. Eroded Banks 1999
6. Multiple Impacts Observed 1999
7. Conservation Plans 1999

With the exception of the background information for the maps (stream location, roads, watershed size and location, digital elevation, etc.) the remaining layers were derived from stream habitat evaluations and watershed surveys. For instance, rather than using satellite images or old aerial photos which were, at that time, likely to be significantly dated and inaccurate, information on riparian area "health" was measured throughout the watershed by walking the stream. The location of chicken houses was originally developed in 1996 based on watershed reconnaissance to locate houses. That layer was updated in 1998 and paired with the location of pipes (lateral or other septic lines) through watershed reconnaissance. The remaining maps were developed based on extensive watershed (primarily within the riparian area) reconnaissance, referred to in the workplan as riparian and watershed assessment. Habitat evaluations were conducted at 100m intervals throughout the entire network of streams in the Beaty Creek Watershed (normally habitat assessments are completed at 20m intervals for a 400m segment). These habitat assessments provided extensive information related to the types and extent of impacts to the streams, notable in the riparian zone. Examples of these impacts included eroding banks, cattle trails, cattle patty densities, etc. Initially, the WAG was presented with maps of poultry house location, stream location, exposed pipe (likely to be related to septic systems), to support OCC's explanation of the types of practices that were needed.

Included in this Appendix C is the *Lake Eucha Water Quality Project Cost Share Program,* which details cost share practices and rates. The only pieces of data used for targeting that are not presented in these maps includes information on soil phosphorus concentrations. That information, although not available in digital form, was used by the OCC Water Quality Staff to determine where litter could be spread in the watershed, and coupled with litter nutrient analyses, at what rates litter could be spread. Cooperating landowners whose soil phosphorus values were too high, had to find locations either within or outside of the watershed where litter could be spread. If spread inside the watershed, they had to document that the location to spread the litter was within allowable limits based on soil phosphorus values at the site.

To target funds into the riparian area, the WAG chose practices that promote riparian area development and protection. They offered the highest cost-share rates for riparian area practices. The WAG also recognized that improper application of poultry litter as fertilizer and pasture management were key issues in the watershed. Therefore they also recommended practices that worked to correct these issues and offered relatively

high cost share rates for the practices that would be the most beneficial to water quality. A complete list of practices and rates selected follows later in the document.

Finally, the WAG considered how NRCS programs like EQIP and CRP could work together with the 319 program to maximize implementation in the watershed. The Lake Eucha Watershed was designated a “Special Emphasis Area” by NRCS, meaning that approximately $320,000 EQIP funding was available to the entire watershed between 1997 and 2000. Although only approximately $53,000 of these funds were implemented in the Beaty Creek watershed, WAG members, upon consultation with NRCS, realized that the 319 program could focus on practices with the greatest benefits for water quality such as riparian areas or practices EQIP did not fund, such as septic systems. At the same time, EQIP could fund other important practices such as litter storage sheds. Throughout the program, NRCS and project personnel cooperated as possible to maximize the implementation of practices in the watershed.

Once the WAG had developed the list of practices and rates, a public meeting was held to introduce landowners in the watershed to the program and to sign up interested individuals for an evaluation of eligibility. Landowners who were interested in the program either signed up that night, or called the district later, and were then visited by OCC staff to determine their eligibility and update their farm plan. Eligibility was related to need of landowners relative to the sources of the problem; animal waste and riparian area degradation. Therefore, eligible parties included landowners who were poultry producers, spread poultry litter on their pastures, had absent or improperly managed riparian area, had inadequate septic systems, or had pastures that were poorly managed. More than one of these problems was evident at most eligible sites.

Eligibility and Conservation Plan development also involved factors such as soil tests and litter tests. Landowners interested in spreading litter had to have a soil test (and have the litter tested) before a plan could be drawn up to designate whether litter could be spread. Soil test values dictated which practices a landowner could qualify for. For instance, if Soil P values were too high, he qualified for a practice that transported the litter to an alternate site with low soil P values.

Therefore, initial targeting in the watershed was aimed at the most significant types of sources, rather than at geographic areas in the watershed believed to be contributing the most loadings. However, in FY 2000, additional funds were allocated to the project with the specific requirement that they be applied in a more targeted manner. EPA and OCC recognized that more extensive “targeting” of the implementation might be necessary to be more effective in the watershed. By that time, the data from the extensive habitat assessments had been digitized such that it could be used in the targeting. Once again, the OCC and Conservation Districts used GIS to help determine how to target the areas of the watershed most likely to be contributing significant loads. They considered the location of current conservation plans, riparian areas, poultry houses, sewer pipes, cattle activity, riparian width, and eroded banks to come up with a map of most impacted areas. Landowners in these areas who were not currently cooperators in the project were contacted by the OCC through phone and at home visits

to inform them about the program and encourage them to participate. Only landowners within those areas qualified to receive the "targeted" funds.

Education Program

One of the most important components of the project revolves around the related education program. 319 projects are designed as demonstration projects; money is not available to holistically solve the water quality problems, rather it is used to demonstrate effective methods of solving the problem. The intent is that once people become educated about what the problem is and what they can do to fix it, that they will begin to adopt those strategies on their own or through similar programs such as NRCS EQIP or CRP. The intent is to get people to change their behaviors by educating them about the problems and solutions.

The goals set for this project are to affect long term behavioral changes of watershed residents and users that will assure continued protection of water quality in the Eucha watershed. A Watershed Advisory Group Education Committee (the "EdWAG") was formed with representatives from Benton County, Arkansas and Delaware County, Oklahoma[1]. The program coordinator invited representatives from the Cooperative Extension Services, FFA and Vo-Ag programs, the public school system, chicken producers, poultry integrators, land owners, OCC, Department of Environmental Quality, Oklahoma Department of Agriculture, EPA Region 6, City of Tulsa, and local environmental groups to participate on the EdWAG.

An initial EdWAG meeting was held April 1, 1998, with representatives from the OCC, a poultry integrator and landowner, a high school teacher, Benton and Delaware County Conservation Districts, and the Project's coordinator and staff. The EdWAG membership fluctuated during the five years it operated. An additional teacher and Watershed Advisory Group member joined the group, as well as a representative from the OSU Extension Service.

The EdWAG drafted a plan to implement the Education Program associated with the project. This plan included activities including a newsletter, fact sheets, educational meetings, Blue Thumb, and other efforts, detailed in the Education Final Report.

The following section highlights a few of the activities of the Education Program, while a more complete summary is available in the Education Final Report.

Volume 1, Issue 1 of *The Tri-County Conservation District Newsletter* was published in July 1999 by the Delaware County Conservation District (OK), the Benton County Conservation District (AR), the Washington County Conservation District (AR), and the Lake Eucha Water Quality Project Office. Funds were donated by Tyson Foods, Simmons Industries and Peterson Farms to purchase computer equipment and

[1] EdWAG members were: Cheryl Cheadle (Chair), Fred Reed, Mike Bryan, Billie Spencer, Marti Mefford, Joe Schneider, Otis Bennett, Jason Hollenback, Mickie Stockton, David Holcombe, Marc Cooper, Mitch Fram.

programs for publication of the newsletter. The Delaware County CD agreed to edit and publish the newsletter. Each of the four publishing entities accepted responsibility for sending in articles and for paying printing and mailing costs for each person on their mailing lists. The variety of articles from the four entities has given area cooperators an opportunity to learn more about the problems and solutions being addressed by their neighbors. Since its inception, T*he Tri-County Conservation District Newsletter* has been published on a bi-monthly basis.

Through the Tri-County Newsletter, landowners received practical information on practices to improve land management methods. Additionally, they receive information from and about the governmental entities offering programs, educational forums, and technical assistance. They are more familiar with the names of the employees of those government entities and are more confident about whom to contact when they have questions or need assistance. The benefits of this dissemination of information will continue well past the five-year life of this project.

The newsletter, with a circulation of 2,250, offered educational items in an effort to effect behavioral changes by watershed residents. The majority of the land users in the Oklahoma portion of the Beaty Creek watershed will continue to receive *The Delaware County Conservation District Newsletter* after the end of the 319 project.

The Project assisted the Delaware County Conservation District by developing, promoting and participating in educational activities for schools, 4-H clubs, community events, and, for three consecutive years, booths at the Delaware County Fair. Project staff initiated an outdoor classroom event for fifth grade students. All county schools were contacted and urged to participate.

The Cherokee Nation purchased an EnviroScape® model for use by the project and district staff. This model was used for outdoor classrooms, training Blue Thumb volunteers and demonstrations at schools and campgrounds.
A Project Kick-off meeting was held September 8 – 9, 1999, called the Lake Eucha Tent Meeting. Local poultry integrators sponsored and cooked meals served at the event. The OSU Extension Service offered up to 4 continuing credit hours to poultry producers for attendance at the tour and educational sessions. The educational sessions offered at the morning portion of the meeting included the following topics:

- What is the Lake Eucha Project?
- EPA – the 319 NPS Project
- City of Tulsa's Water
- How Nutrients Affect Eucha Water
- Poultry Litter – An Asset
- Best Management Practices for Water Quality

Figure 18. Lake Eucha Tent Meeting.

On October 14, 2000, the project hosted a Best Management Practices Bus Tour to Protect Water Quality. Again, local poultry integrators supplied and cooked a meal for this event. This tour consisted of three stops demonstrating BMPs put in place by either the Beaty Creek 319 Project or an NRCS EQIP project:

- Farm One – Benton County Cooperator Jim Singleton: Conversion of cropland to permanent cover; pipelines/tanks/cross fencing with rotational grazing.
- Farm Two – Benton County Cooperator Tim Crawley and Valley View Farms: Utilizing poultry and dairy waste.
- Farm Three – Delaware County Cooperator David Holcombe (WAG chairman, Delaware County Conservation District Board member, Oklahoma Department of Agriculture board member, 2001 Oklahoma Been Environmental Stewardship Award recipient): Use of geo-cells in heavy use area; livestock shade; litter storage sheds.

Educational Seminar Discussing Pasture Management.

The common thread of the educational meetings was touring the Beaty Creek watershed and furnishing information about the work being done in the watershed to conserve and protect the natural resources in the area.

Numerous tours were given to legislators, agency personnel, and other interested parties to educate those individuals concerning the water quality problems in the watershed and the efforts being made to address those problems.

By unanimous vote on July 9, 1999, the Delaware County Conservation District became a Blue Thumb sponsor. Blue Thumb is a water pollution education program principally sponsored by conservation districts and the OCC. The District's staff and the Lake Eucha Water Quality Project's staff worked since that time to promote the Blue Thumb program in Delaware County. To kick off the program, the Delaware County Conservation District hosted a Blue Thumb Earth Day Celebration. The event was publicized in local newspaper and on KGVE radio station in Grove, OK. Flyers were placed in area businesses and in the OSU Cooperative Extension Office, and were mailed to each school, the Watershed Advisory Group members and the EdWAG members. Door prizes were obtained from area merchants, an oversize "Earth Cake" was especially made for the event, and exhibitors were invited to participate. The celebration took place in the Community Center at Jay, OK, on Thursday, April 27, 2000.

The Earth Day program topics included an overview of the Lake Eucha/Beaty Creek Project, an overview of the stream monitoring project being conducted by the Jay High School Stream Team, information about becoming a Blue Thumb volunteer, information about water monitoring, information about 4-H clubs, and hands-on demonstrations by Mitch Fram, OCES Area Water Quality Specialist, and by the Jay High School Stream Team. Project and District staff were available to answer questions on Best Management Practices, riparian areas and buffer zones, pest management, nutrient application rates, watershed management, and other topics of interest.

Two training sessions were conducted in Delaware County to teach water monitoring. Sites monitored included Cave Springs, Brush Creek, Wolf Creek, two sites on Honey Creek, and Beaty Creek.

Three teachers were trained as volunteer monitors and included their students in their monitoring activities. Mark Cooper, the first teacher who began a monitoring program, was selected by OACD as their secondary Teacher of the Year in 2000. Jay High School was chosen as the "Keep Oklahoma Beautiful" Educational Institution for the year 2000 in the education and promotion category. Mr. Cooper entered the contest for the school due to the efforts of several of his students who participated as members of his Blue Thumb "Stream Team". Other volunteers included a husband and wife, a grandfather/grandson team and a father and three of his daughters. Two sites in Brush Creek were monitored, one in Spring Creek, one in Wolf Creek, one in Beaty Creek and two in Honey Creek.

In addition to the Blue Thumb monitoring, project staff monitored a site on Beaty Creek and one on Little Saline Creek for the length of the project. Staff attended a training session for instruction on air monitoring for a National Air Deposition Sampler. A monitoring station was set up at Lake Eucha in January of 2000.

Another group, from Kansas (OK) Middle School, monitored a site at Lake Eucha as part of the Oklahoma Water Watch program. Their efforts were recognized and awarded by the Oklahoma Water Resources Board and the Oklahoma State Legislature.

The watershed education program supported the project objectives by:

- *Providing educational assistance to producers through producer meetings, workshops and individual contact.* In addition to scheduled educational activities, the project coordinators were available when checking installation progress of BMPs, in informal gatherings, and in their offices. Help was provided to producers to conduct assessments of factors affecting water quality on their farms.
- *Demonstrating practices on a sub watershed necessary to achieve the nutrient control needed to protect Lake Eucha.* This project covered the entire Beaty Creek Watershed, a sub watershed of the Spavinaw Creek/Lake Eucha Watershed. BMPs were demonstrated on tours and newsletter articles notified area residents of improvements made under the project.
- *Coordinating activities of the various agencies and groups working within the watershed.* The project coordinator and staff were participants in various workgroups in the region. Additionally, they attended the majority of poultry meetings over the five-year span of the project and served as a source of information for poultry growers. Staff assisted with programs presented by Delaware County Conservation District, Ottawa County Conservation District, OSU Extension Service, and NRCS, and also worked with the Oklahoma Department of Agriculture and the Benton County (Arkansas) Conservation District.
- *Providing youth education.* The educational activities provided to schools, 4-H clubs, community groups, and fair attendees are lessons which will remain with students well beyond this project. Through interaction with parents, teachers and others those students then become the “educators”.
- *Monitoring the effectiveness of the program.* As mentioned previously, cooperators proudly displayed signs proclaiming their participation in “Clean Water – We do our part”. During the final six months of the program, cooperators were not actively sought. However, eight additional cooperators were added during that time. Those new cooperators had been told of the project by their neighbors and were encouraged to participate. Several existing cooperators installed additional best management practices during the last six months of the project.

Demonstration of Best Management Practices

The primary goal of this project was to demonstrate methods of land management that would reduce NPS pollution. Although the education program included all causes and sources of NPS pollution, the demonstration portion of the program focused on agricultural sources, primarily those associated with animal waste. The most significant landuse in the watershed relative to nonpoint source pollution is related to the poultry, beef, and dairy production in the watershed. Although the number of dairies has decreased over time, there are still quite a few in the watershed and most are fairly small and may not have the same pollution control structures and procedures as the larger dairies. Dairy cattle often spend significant concentrations of time in dry lots rather than open pasture and these areas can accumulate a great deal of waste that is susceptible to being washed off during rainfall events.

The poultry industry is well established in the Eucha Watershed and there has never been a cost-effective mechanism for disposing of the nutrient-rich poultry litter other than to spread it on pastureland in the watershed. The litter is an excellent fertilizer and allows the pastureland in the watershed to support a much higher cattle-stocking rate than it otherwise would without the fertilization. However, the litter nutrient ratio is much higher in phosphorus (approximately 4X greater than plant requirements, when applied based on plant nitrogen requirements) than the plants require and as such, soils have become saturated with phosphorus and a significant quantity runs off in rainfall events.

Therefore, the primary focus of the program was to demonstrate practices that landowners could use that would reduce the impacts of these industries on receiving waters and hopefully at the same time, not be an unreasonable financial burden for the landowners. Many practices are even designed to improve productivity and reduce operating costs in the long run.

All agriculture producers and individual rural residents in the Beaty Creek Watershed in the Delaware and Benton Counties were eligible for cost-share assistance regardless of size of land ownership. There was no minimum cost-share payment to any applicant. The maximum cost-share assistance to any one participant was $50,000.00. If the total value of the practices (cost-share assistance plus landowner's share) to be installed exceeded this cap, practices were installed and cost shared in the following order of priority: 1. Riparian area establishment/management; 2. Stream bank protection; 3. Stream crossing; 4. Pasture management; and 5. Waste management structures. Thus riparian areas were the top priority for installation.

Because funding available for implementation was not sufficient to blanket the watershed with all needed practices, the Watershed Advisory Group was instructed that their task was to recommend practices and cost-share rates that would maximize the amount of implementation that could occur with the project, focusing on practices with the greatest potential to improve water quality. At the time the program was initiated, a watershed-wide model detailing areas of the watershed contributing most significantly to total loading was not universally agreed upon among State agencies (or the two States).

Therefore, it was determined that implementation would be targeted towards types of practices that were suspected to contribute most significantly to water quality problems, rather than a program focused towards specific subwatersheds. In addition, landowners along blue line (on USGS 1:24,000) maps ephemeral or perennial streams would be targeted first, followed by upland landowners.

Interested landowners visited the Delaware and Benton County Conservation District offices to learn about the program and sign up to have a conservation plan either drafted or updated for their land. The Project Coordinator or Benton County District Conservationist (DC) then visited the Oklahoma or Arkansas farms, interviewed the landowner about their operation, detailing current, and as possible, future management and discussing conservation needs with the landowner. The Coordinator or DC and landowner would then discuss implementation options to meet conservation needs and agree upon the recommended practices to address those needs.

A total of $1,338,401 was available to support installation of practices associated with this project. These included $632,467.31 federal dollars, $528,133.66 state dollars, and a required $177,800.34 match from landowners. This amount was far short of the amount needed to address all sources of NPS pollution in the watershed and therefore, monies were targeted towards what appeared to be the significant sources and implemented in such a way to encourage nonparticipating landowners to later implement them on their own or as part of another program such as EQIP, CRP, or similar programs.

Prioritization of practices was implemented by offering the highest cost-share rates on practices that were the highest priority, riparian area protection and animal waste management. Lower cost-share rates were offered for lower priority practices, such as poultry waste composters and storage sheds (Table 5).

As the first of the OCC's large Priority Watershed Projects, the Beaty Creek Program served as a learning exercise for the OCC as much as it served as a tool to address NPS pollution problems in the Lake Eucha Watershed. It was also a program where OCC and Conservation Districts explored a number of "new" BMPs that had been utilized successfully in other states to address similar problems, but had not been used in our State through NRCS or similar conservation cost-share programs.

Table 5. Practices, Cost-Share Rates, and Incentive Payments Offered through the Beaty Creek Project.

Practice Description	Incentive	Costshare Percentage
Riparian Area- fencing, offsite water, vegetative establishment, windbreaks		90%
Total Exclusion	$50/acre	
Total Exclusion w/ hay production	$45/acre	
Limited Grazing	$40/acre	
Buffer-Filter Strip Establishment- fencing, vegetative establishment	$45/acre	80%
Streambank Stabilization- fencing, vegetative plantings		80%
Composters/Animal Waste Storage Facilities		50%
Pasture Establishment- vegetative establishment		75%
Pasture Management- fencing, watering facilities, windbreak	$5/acre	75%
Proper Waste Utilization for Poultry Producers*		
Litter moved out of watershed & applied to non-nutrient threatened watershed based on soil and litter tests & state guidelines	$0.15/lb of P	
Litter moved off farm to another farm in watershed and applied based on soil & litter tests according to State guidelines	$0.08/lb of P	
Litter used on farm based on soil and litter tests according to State guidelines	$0.06/lb of P	
Heavy Use Areas- concrete pads for round bale feeding, gravel for heavy traffic areas, terracell for erosive areas		80%
Rural Waste Systems- tank replacement, installation, and percolation test and certification		80%
Winter Feeding Facility- structure, gravel, geotextile,		75%

*Proper waste utilization was only funded during the first two years of the project.

Brochures, copies of magazine articles, and fact sheets from suppliers were compiled to educate the Conservation Districts and landowners on these practices. Several of these practices were then adopted by Oklahoma NRCS upon seeing their successful implementation through the project, and gauging the landowners' satisfaction with the practices. These practices included:

- The use of geotextiles in heavy use areas in livestock operations to reduce nutrient and sediment loading in the Eucha watershed
- The use of TerraCell® for high traffic areas, especially around freeze-proof tanks.
- Waste storage and cattle feeding facilities to give cattle a consistent feeding area without the resultant trampling and erosion of the soil.
- Windbreak/Cattle shade panels to replace shelter provided by riparian areas.

- Project staff was instrumental in the approval by the Oklahoma NRCS of 200 gallon freeze proof water tanks for cattle. Information provided to cooperators included a recommended installation guide by Smith Cattleguard Company, Mirafount Livestock Waterers specifications and price list, Anti-Siphon C.W. 200 Livestock Waterer from Steward Concrete Products, NRCS OK-ENG-17A data sheet on energy free watering fountain, and NRCS OK-OWG schematics for watering facility freeze proof concrete tank for earth dams.
- Project staff spearheaded the use of Wrangler® Bermudagrass. Successful stands were obtained from drilling and from ground and aerial broadcasting.

The implementation of these practices is documented in conservation plans developed for each of the 100 cooperators (Figure 20). An additional 14 new or updated conservation plans were developed for cooperators who dropped out of the program, primarily for financial reasons. 82 of these cooperators were in Oklahoma and 23 in Arkansas. This translates to 71% of the landowners in Oklahoma and 28% of the landowners in Arkansas participating in this project. Although some of the land holdings owned by cooperators were not in the Beaty Creek Watershed, these lands were in the Eucha watershed. Conservation plans were updated for these land holdings, but practices were not funding on these lands.

The number one priority practice for the program was riparian area establishment and protection. With relatively low capital investments required (mainly fencing and alternative water supply costs) and an extremely high efficiency for phosphorus removal (as high as 75 – 80%), this is the most cost-effective method to reduce nonpoint source pollution in watersheds like Beaty Creek. In addition to filtering nutrients, sediment, bacteria, and other pollutants from runoff, riparian zones also help stabilize streambanks and can, over time improve channel stability and instream habitat. Aside from environmental benefits, restricting cattle access to streams and allowing riparian vegetation to develop can also improve herd health, reduce the amount of near-stream land lost to erosion, and help retain nutrients onsite that can eventually be exported from the farm as a product such as hay, milk, or beef. Unfortunately, these benefits directly to the producer are not as obvious as those from a practice such as pasture planting or as well known as those from a practice such as terracing. As such farmers are more reluctant to implement riparian protection than more traditional practices.

However, this is not the first NPS-directed demonstration/implementation effort in northeastern Oklahoma and northwestern Arkansas and these producers have been listening to water quality educators, OCC, Conservation District and NRCS personnel explain the virtues of riparian zones for a over a decade. In addition, in order to encourage landowners to implement this practice, a cost-share rate of 90% was offered, requiring only a 10% match from the landowner. The program was also flexible with regard to the allowable width for a riparian area, ranging from 12 feet up to 180 feet from bankfull width (Figure 21). Research has shown that riparian buffers from 12.5 to 20 feet were adequate to allow filtering of nutrients and bacteria, depending on environmental factors (Mosley et. al. 1998). Landowners were also offered flexible management choices, including limited haying and limited grazing of the

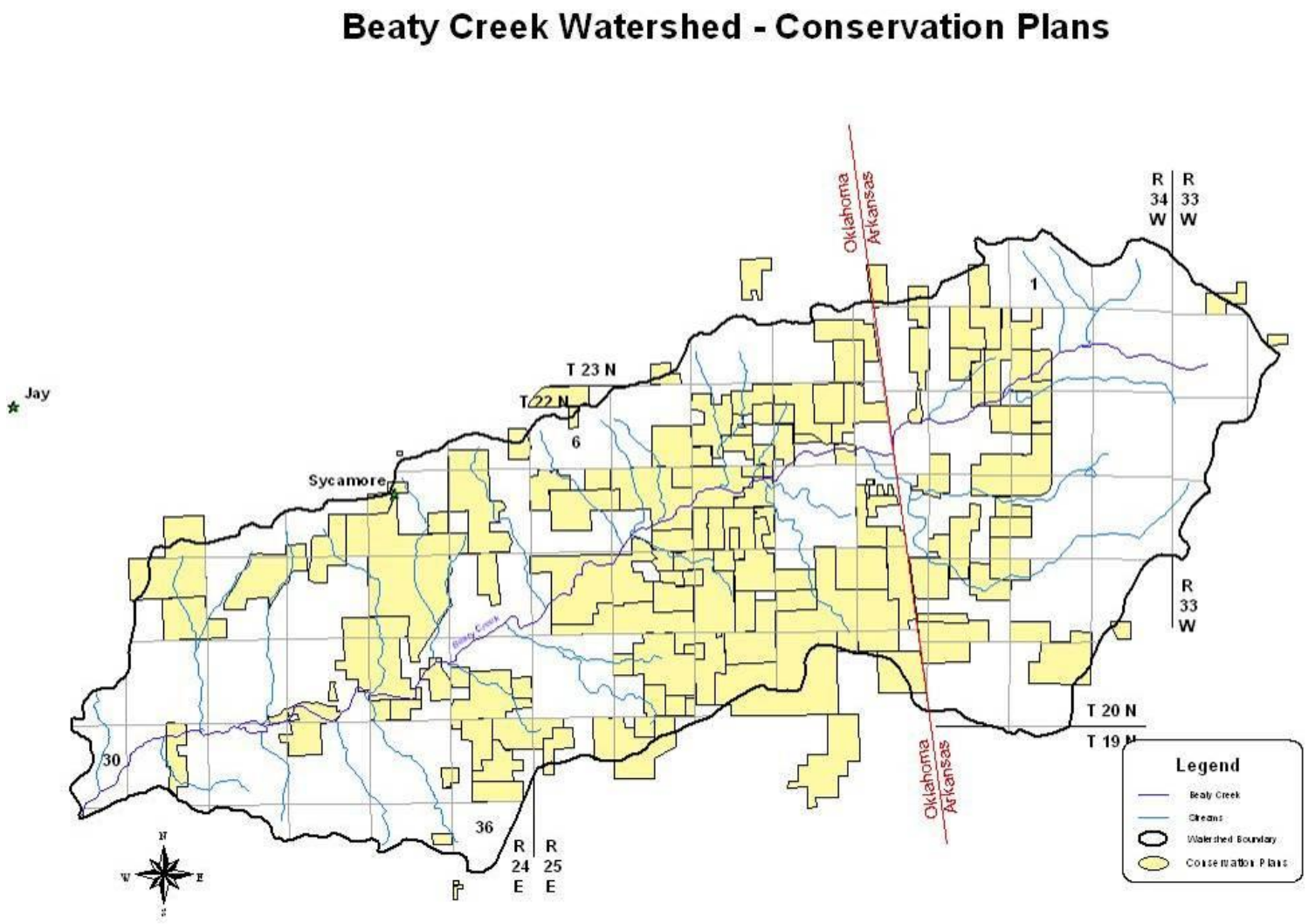


Figure 19. Cooperator Land Holdings in (and around) the Beaty Creek Watershed.

Figure 20. Riparian Areas Installed Through the Beaty Creek Project.

buffer, for lower incentive rates. As a result, landowners were more receptive to riparian practices than in the past. The program installed 331.5 acres of protected riparian area in the watershed and provided alternative water supplies when this eliminated a drinking water source for livestock (Table 6). This installation is the equivalent to over fifteen miles of protected riparian zone on either side of the Illinois River. An estimated 47.43 miles of stream are in direct contact with pastureland in the watershed. This suggests that approximately 32% of potentially degraded riparian area was protected through implementation of this project.

The second priority practices were funded at a rate of 80% and included field buffer strips, heavy use areas, and rural waste systems. Five acres of field buffer strips were established through the program. Forty-four landowners installed 78 heavy use areas such as concrete pads for round bale feeding, or geo-cell, gravel, and grading around heavily used areas such as freeze-proof tanks.

Figure 21. Installation of Heavy Use Area Protection in the Beaty Creek Watershed to Reduce Runoff of Nutrients, Sediment, and Bacteria.

Nineteen landowners installed 22 septic tanks and 25 landowners had 27 percolation tests run and lateral lines installed. One landowner had their septic tank pumped out. Working with landowners through the course of the project revealed that many landowners were not knowledgeable about how their septic tank functioned or even where it was, much less were practicing routine maintenance. Landowners seemed unaware that lateral fields should not be noticeably saturated or bar ditches noticeably green. Through the course of the project, however, landowners became more aware that these situations constituted a problem and more sought assistance to correct the problem. Based on the rural nature of the watershed and the relatively few people living there, septic tank loading is not expected to be a major contributor to nutrient loading in the watershed; however, WAG members felt septic upgrades and maintenance were an important part of a holistic program to address NPS-related nutrient problems in the watershed. Therefore, rural waste system upgrades were allowed as part of the program. The program did not cost-share septic systems for new construction or

Table 6. Riparian and Buffer Practices Implemented by the Program.

Practice	# Participants	Units	Cost		
			landowner	State/Fed	Total
Riparian Area Total Exclusion	12	93 acres	$0	$18,720.00	$18,720.00
Riparian Area Total Exclusion with Hay	2	18 acres	$0	$3.825.00	$3.825.00
Riparian Area Limited Grazing	9	220.5 acres	$0	$22,385.08	$22,385.08
Riparian Area Offsite Watering- Pond	3	3 ponds	$2,411.75	$3,728.25	$6,140.00
Riparian Area Offsite Water- Pipeline	20	19,602 ft	$4,590.66	$21,887.43	$26,478.09
Riparian Area Offsite Watering- Well	14	15 wells	$23,859.43	$49,567.81	$73,427.24
Riparian Area Offsite Watering- Freeze-proof tank	16	32 tanks	$3,664.69	$19,642.68	$23,307.37
Riparian Area Permanent Vegetative Establishment- Winter Hardy Bermuda	1	5 acres	$122.28	$144.00	$266.28
Riparian Area Fencing	19	8.8 miles	$25,641.68	$41,911.12	$67,552.80
Totals			$60,290.49	$177,990.20	$238,280.69
Percent of Total			25%	75%	
Approved Cost-Share Rate			10%	90%	

Table 7. Second Priority Practices (80% Cost-Share Rate).

Practice	# Participants	Units	Cost		
			landowner	State/federal	total
Buffer-Filter Strip Establishment	1	5 acres	$0	$450.00	$450.00
Buffer-Filter Strip Fencing	1	585 ft	$201.64	$468.01	$669.65
Heavy Use Areas/Concrete Pads for Round Bale Feeding	44	78 areas	$55,020.22	$113,235.66	$168,255.88
Septic Tank	19	22 tanks	$2,408.00	$6,282.00	$8,690.00
Tank Installation	19	22 tanks	$1,372.50	$872.50	$2,245.00
Lateral Line Installation	25	27 sets	$12,281.94	$31,753.40	$44,035.34
Percolation Test & certification	24	27	$872.25	$3,352.75	$4,225.00
Percolation Test & Cleanout	1	1	$99.00	$396.00	$495.00
Totals			$72,255.55	$156,810.32	$229,065.87
Percent of Total			32%	68%	
Approved Cost-Share Rate			25%	75%	

temporary structures such as trailer homes. The program upgraded approximately 13% of the septic systems in the watershed.

The third priority group of practices offered through the program focused on pasture establishment, prescribed grazing, and further reducing the impacts of beef/dairy cattle in the watershed through winter feeding facilities. These practices were funded at a 75% cost-share rate. These included practices such as pasture sprigging to establish vegetation with a better chance of filtering NPS pollution, rotational grazing and watering facilities to encourage better use of available pasture, and winter feeding facilities to reduce the use of near-stream areas for winter feeding and sheltering of cattle.

Pasture management practices were the most commonly adopted practice, even at the lower cost-share rate because cattlemen can easily understand the economic benefits of pasture management. It improves their bottom line by improving forage quality and therefore beef production. They see higher weight gain with lower inputs of supplemental feed or they can stock higher densities of cattle. However, that increased forage quality also improves the filtering capacity of the pastureland and allows more pollutants to remain onsite, rather than being washed off. Alternative water supplies and winter feeding facilities/waste storage structures encourage cattle to spend more time away from stream channels and capture a significant portion of their waste and therefore reduce pollutant load reaching those areas.

The program installed over 30 miles of fencing, improving vegetative cover and pollutant retention on approximately 8,960 acres of pastureland (Table 8). The program installed twenty-eight ponds and 122 freeze-proof tanks with pasture management. In addition, over eight miles of PVC pipe were installed associated with the ponds and tanks. These efforts addressed approximately thirty-five percent of the pastureland in the watershed.

In addition to these pasture management/establishment practices, 16 winter feeding facilities/waste storage buildings were constructed in the watershed. Feeding facilities are a BMP used to winter-feed beef cattle or feed dairy cattle year round. The facility is divided between a waste storage area and a feeding area and designed to fit the number of cattle fed at the site (41 sq. ft per cow). Sixty-three percent of the facility is used for feeding and 37% for waste storage. That waste capacity is equivalent to three-months worth of waste that can then be properly (timing and rate) land applied as fertilizer. The facility is sited in the uplands on a relatively flat area. The covered area sits over a concrete floor with an 8 inch lip around the feeding area to contain wastes. The entire structure is surrounded by a graveled area to eliminate trampling and allow waste collection from the area surrounding the facility.

The purpose of the winter feeding facility is to reduce the impacts of supplemental feeding of cattle in the winter time. Producers often use the same pastures each winter to feed cattle, and these are often the sheltered, bottomland pastures. The creeks generally flow so ice doesn't have to be chopped and the areas are relatively sheltered from winter winds. The feeding facilities help landowners reduce reliance on the creeks by providing shelter and are often associated with a freeze-proof tank. Collection of waste to be spread

Table 8. Priority III and IV Practices Installed in Beaty Creek.

Practice	# Participants	Units	Cost		
			landowner	State/federal	total
Winter Feeding/Waste Storage Facility	15	16 facilities	$70,376.20	$149,355.00	$219,731.20
Pasture Establishment-Vegetative Planting, seedbed preparation, seed, liming, fertilizer	38	1821.8 acres	$97,957.37	$120,234.90	$218,192.27
Pasture Management Cross Fencing	46	30.87 miles	$57,640.69	$119,403.45	$177,044.04
Pasture Management/Nutrient Management Incentive	46	7,135.1 acres	$0.00	$132,729.50	$132,729.50
Pasture Management Pond	21	28 ponds	$18,352.16	$32,235.68	$50,587.84
Pasture Management Fencing Freeze-proof Tank	43	122 Tanks	$25,251.56	$74,162.35	$99,413.91
Pasture Management PVC Pipeline	51	8.6 miles	$18,378.98	$46,068.87	$64,447.85
Windbreaks/Shade Belts	2	126 feet	$3,250.80	$7,560.00	$10,810.80
Proper Waste Utilization of Poultry Litter					
Litter moved out of watershed	5	82,004.73 lbs P	$0.00	$8,745.42	$8,745.42
Litter applied on another farm in watershed	14	319,319.5 lbs P	$0.00	$35,213.15	$35,213.15
Litter applied on farm based	6	70,470.8 lbs P	$0.00	$4,654.32	$4,654.32
Composter/Litter Storage Shed	4		$36,574.88	$33,544.32	$70,119.10
Totals			$192,441.43	$355,414.73	$606,332.56

Figure 22. Winter Feeding/Waste Storage Facility.

on an upland area, rather than trampled into an over-grazed ravine or floodplain, reduces the sediment, nutrients, and bacteria in runoff.

The final group of practices installed in the program were poultry waste storage structures. These structures were offered at a 50% cost-share rate to the landowners. The program installed 4 of these structures in the watershed. However, EQIP offered these structures at a 75% cost-share rate, so additional structures were funded by NRCS. Exact figures on EQIP implementation in the watershed through the entire project period are not available at this time, however, approximately $53,000 was devoted to the Beaty Creek watershed between 1997 and 2000.

The Beaty Creek 319 project was by no means the sole source of BMP implementation in the watershed. In addition to implementation through a 319 project in the Arkansas portion of the watershed, the State passed poultry litter regulations in 1998 that limited the amount of litter that could be spread in the watershed based on soil and litter nutrient testing. In addition, the City of Tulsa lawsuit settlement resulted in significantly lower litter application during at least a portion of the project. In addition, following the settlement, the integrator-owned houses in the watershed committed to haul litter produced in their complexes out of the watershed, rather than finding suitable land for application in the watershed. Finally, the NRCS and FSA devoted substantial technical support and financial resources towards soil and water conservation in the watershed. Unfortunately, it is not possible to separate out the benefits of these programs from the benefits of the Beaty Creek project; however, combined, they are all working towards protecting water resources of the watershed.

Predicting Loading Reductions Associated with Project

Many of the practices implemented during the project were not put in place until the final years of the project. This was due to many factors, although the most commonly supplied reason was related to the economy. Only during the later years of the project, when beef prices were up, did many of the producers have the financial resources to provide their portion of the required match.

Regardless of the reason for delaying the implementation, the result is that load reductions associated with implementation are less likely to be seen during the project period, and indeed, water quality data collected concurrent with the project does not indicate decreased loading. However, it is still possible to estimate the load reduction that should eventually be measurable based on the practices that were implemented.

Using EPA's Spreadsheet Tool for Estimating Pollutant Load (STEPL) model, it is possible to estimate the load reduction that should result from the project implementation. Using EPA's STEPL Input Data Server and selecting the portions of the Eucha Watershed where implementation occurred (Lower Neosho River HUC 11070209, 20% of subwatershed 12938 and 20% of watershed 12958), we estimated the landuse, livestock numbers, and

septic tank information for the watershed. STEPL uses this information to calculate the pre-implementation loading of sediment, nitrogen, phosphorus, and BOD_5.

Although not exact, these loading numbers were roughly comparable to estimates developed in Storm et. al (2001 and 2002), for watershed loading from cropland and pastureland in the watershed. These estimates would constitute the pre-implementation loading input into the model because they were derived from data collected from 1994 to 2000. This rough comparability suggests that the STEPL model could give a comparable estimate about potential load reductions from the implemented practices.

Table 9. Input parameters from STEPL Input Data Server.

	Urban	Cropland	Pastureland	Forest	Feedlots			
Acres	0	400	25001	14559	0			
	Beef cattle	Dairy Cattle	Hogs	Sheep	Horse	Chickens	Turkey	Duck
animals	5648	391	200	149	385	112,085	46579	4
	# Septic Systems		Population Per Septic System		Septic Failure Rate			
	450		2.43		2%			

Accurate reflection of all the BMPs installed in the watershed required the addition of four new BMPs to the Pastureland BMP list. Those BMPs were feeding facilities/heavy use areas, streambank stabilization and fencing, cross fencing, and composters/lagoons. Estimates of removal efficiencies were based on literature review.

Table 10. Removal Efficiencies used for the STEP L model.

Removal Efficiency	Nitrogen	Phosphorus	BOD	Sediment
Feeding Facilities / Heavy Use Areas	0.65[1]	0.60[1]	ND[1]	ND[1]
Composters/Lagoons	0.65[1]	0.6[1]	ND[1]	ND[1]
Cross Fencing	0.30[2]	0.35[2]	ND[2]	0.30[2]
Streambank Stabilization	0.60[3]	0.65[3]	ND[3]	0.65[3]

[1]- based on removal efficiencies in similar or identical feedlot BMP section
[2]- Bottcher, A. and H. Harper. 2003
[3]- Durham, S. 2003

The BMP calculator was used to estimate the combined effect of these BMPs on loading from pastureland. The pre-BMP loads associated with each section were calculated from the pastureland or animal units affected by the BMP and by the total load estimated to be coming from pastureland. For the BMP calculator exercise, phosphorus loads, rather than acreage, was used as the preimplementation measure and therefore, nitrogen and sediment load reduction predictions are not considered valid.

Table 11. STEPL Estimated Total Load by Land Uses (Pre-Implementation.

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)	acres
Septic	279.8	109.6	1142.5	0	
Cropland	8225.9	1735.5	13501.0	339.4	400
Pastureland*	149934.0	15454.0	470314.2	4242.9	25001
Forest	3423	1643.3	8261.0	185.3	14559
Feedlots	0.0	0.0	0.0	0.0	0
User Defined	0.0	0.0	0.0	0.0	0

*Storm et. al. estimated loading from Pasture land to be approximately 10,500 lbs/yr P and 1641 tons sediment/yr.

Table 12. Load information used to estimate pre-implementation loads related to each BMP.

	Acreage Affected	# Animals Affected	Associated N Load (pre-imp.) lbs/yr	Associated P Load (pre-imp. lbs/yr
Pasture Management/Pasture Establishment	8,960		53,732.81	5,537.94
Streambank Stabilization	331.5		1,987.99	204.89
Feeding Stations / Heavy Use Areas	300+	300+	1,799.09	185.42
Composters		800,000 birds	100,000	30,700
Proper Waste Utilization				

The resulting phosphorus load reductions predicted by STEPL suggest that implementation could result in phosphorus load reductions on the order of 30-40%. This estimate is a conservative estimate in that it does not take into account the effects that the demonstration will have on watershed landowner behavior. Landowners who did not sign up for the program have seen the practices on their neighbor's land or heard their neighbor talk about it and are beginning to request information on the practice. Some are asking for NRCS assistance with the cost of implementation, some are funding the implementation on their own. Districts are reporting increased requests for technical assistance. Cooperators who completed some, but not all of their recommended practices may choose to implement the remaining practices once they are satisfied with what they've done, or what they've seen on their neighbor's place. Following completion of this project, we have between 5-10 landowners in the Beaty Creek Watershed who would like to participate in a cost-share program, if funding becomes available.

This load reduction estimate may also under-predict the load reduction that can be achieved through this project in that the load reduction efficiencies selected for most of the practices were conservative and may actually result in greater load reductions. For instance, the 65% phosphorus removal efficiency for riparian zone protection was conservative in that many studies show as high as an 80 – 90% phosphorus removal capacity.

This 30% estimate also does not take into account the load reduction expected from septic tank replacement. Phosphorus loading from 27 improperly functioning septic tanks would be approximately (assumes P load of 1.946 lbs/cap/yr; Wilson, G. and T. Anderson. 2004) 141.75 lbs per year. Therefore, septic tank upgrades resulted in less than 1% load reduction. However, many landowners with failing septic systems are completely unaware of the failure. One result of the demonstration is that many more landowners are aware that their septic tanks are failing. Some of them will likely upgrade their systems at their own expense.

Table 13. Total Load and Reductions as Estimated From STEPL.

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
W1	161862.7	18942.3	493218.7	4767.6	31482.05	5866.71	678	568.61	130380.7	13075.59	492540.7	4198.99	20.6	37.3	0.1	13.1
Total	161862.7	18942.3	493218.7	4767.6	31482.05	46295.2	678	1639.6	130380.7	13075.59	492540.7	4198.99	20.6	37.3	0.1	13.1

Table 14. Total Load by Land Use (With BMPs Implemented).

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban and Septic	279.8	109.6	1142.5	0
Cropland	0	0	0	0
Pastureland	118452	9587.29	469636.2	3674.291
Forest	3423	1643.3	8261.0	185.3
Feedlots	0.0	0.0	0.0	0.0
User Defined	0.0	0.0	0.0	0.0

Finally, this prediction does not take into account the effects of proper waste utilization in the watershed. We know that through the program, at least 82,000 lbs of P was moved out of the watershed. An additional 389,789 lbs of P was applied in the watershed according to State rules, likely at considerably lower rates than it was applied prior to the project. However, unless these transactions resulted in a continued relationship between buyer and seller that extended beyond the life of the subsidies, these actions might not have continued beyond the life of the subsidy, and therefore were not included in a projection of potential overall load reduction.

Conclusion

The Lake Eucha Watershed Demonstration Project: Beaty Creek Project was intended to demonstrate and implement practices necessary to reduce nutrient loading to Lake Eucha. The program promoted the protection and re-establishment of buffer zones and riparian areas and provided technical and educational assistance to producers to aid them in the implementation of these practices. The program was targeted at the most significant sources of the problem, animal waste, riparian degradation, and pasture management. The program used assessment, planning, education, and demonstration / implementation to address these goals and sources.

On July 29, 2004, WAG members and cooperators were invited to the Jay Community Center for a Cooperator Recognition Meeting to summarize the successes of the program. The initial loading reduction projections were presented, and WAG members were recognized by the Governor for their service to the program and the State. The program was attended by more than 100 people and it also served as a mechanism to introduce area residents to the continuation of Beaty Creek efforts through a similar project in the Spavinaw Creek Watershed. Speaking to the success of the Beaty Creek effort, approximately 50 people signed up to cooperate in the Spavinaw project during the meeting and in the days that followed.

Figure 23. Public Meeting Recognizing WAG Members and Summarizing Project Successes.

Significant project resources were devoted toward water quality monitoring in order to document success of the overall program. Although initial analysis suggested phosphorus load reductions as high as 14% related to implementation of the BMPs, final analysis suggested that although post-implementation phosphorus loading appeared to be reduced over pre-implementation loading, the reduction was not significant. **However, analysis of *E. coli* data according to the State's USAP indicate that Beaty Creek no longer violates water quality standards for *E. coli*,** although it still violates for *Enterococcus*. Although comparison between pre- and post-implementation data does not reveal a significant decrease in *E. coli* weekly counts, the decrease was sufficient for removal of the cause code/waterbody segment pair from the State's 303(d) list. Further analysis of water quality data collected during the project is ongoing through consultation with Oklahoma State University Statisticians and Waters Quality Modelers. Initial analysis of these data suggest a statistically significant phosphorus load reduction; however, final analysis results are not available at project reporting time. An addendum to the final report will be drafted when this analysis is complete.

Although implementation of practices was significant, additional growth was ongoing in the watershed that could have negative impacts on water quality during the project period. This included expansion of the poultry industry in the

watershed. The 1996 watershed inventory projected approximately 714 active poultry houses in operation within the Lake Eucha Watershed producing approximately 13,302,000 broilers per cycle. There were 5 turkey houses producing 100,000 turkeys per cycle and 57 hog houses. 1995 estimates of phosphorus input to the watershed from combined animals (hogs, broilers, and turkeys) was 2,585,540 lbs. 2002 projections by Everett suggested that current watershed capacity is more than 6 times larger at 84,000,000 birds and that broilers alone produce more than 3,000,000 lbs of excess phosphorus. This increase is largely the result of replacement of older houses with newer, larger capacity houses. However, a significant number of producers relocated from Ottawa County, Oklahoma in response to a lawsuit to just over the State Line in Benton County, Arkansas.

In addition to the growth in the poultry industry, the economic growth and development in northwest Arkansas (growing at a rate of approximately 20%) is spilling over into northeastern Oklahoma. Landowners are selling out in Arkansas and buying land for development in Oklahoma. Significant tracts of land are being cleared for pasture development, litter spreading, and/or future development.

Figure 24. Recently cleared land in the Eucha Watershed to be developed as pasture land and/or future residential development site.

Also during the project period, WAG members discovered that liquid processing waste from a poultry processing plant was being stored in tanks and injected at a depth of 18 inches into the soil in three fields in the watershed. The purpose of the injection is to filter out nutrients, pathogens, and other pollutants and allow uptake of nutrients into the soil. The injection works fine when the soil moisture is relatively normal, but during dry periods, the injection is not as deep, potentially allowing the liquid to surface. Due to the efforts of the WAG and Conservation District to educate the company about the possible negative impacts to the Beaty Creek Project, the company responsible for the waste committed to begin soil testing and would not apply the waste to any fields with a soil-test P over 300 lbs. Currently, according to local NRCS, injections are not occurring, although dry matter is being spread in the watershed. However, the long-term impacts of this process are not known.

Planning the project involved efforts at the statewide and local level. State-level efforts included selection of the watershed as a priority watershed project, coordination of monitoring activities, and determination that the project would include elements of assessment, planning, education, and implementation. Planning at the local level involved hiring a local project coordinator conservation technician to oversee the project and development of the Watershed Advisory Group. The project coordinator assessed each potential demonstration site based on need for BMPs according to the project's priorities and developed, along with the landowner, a conservation plan to reduce NPS pollution. The project coordinator also kept the local conservation district boards and the WAG current on different issues related to the project. The WAG was another mechanism to insure that local citizens were part of the planning process in that the WAG recommended the practices and cost share rates that should be offered through the program, along with selecting priorities for the source-directed suites of practices. Finally, local involvement in the planning process was ensured through the EdWAG's development of the education plan for the project. The EdWAG, like the WAG, was composed of local citizens with expertise related to the sources of pollution in the watershed, and played an important role in guiding the progress of the project.

The Beaty Creek education program partnered with other agencies in the area to make this program a success including OSU Extension and Arkansas Cooperative Extension, Conservation Districts, Oklahoma Department of Agriculture, Food, and Forestry, the City of Tulsa, as well as other state and local agencies. The Beaty Creek Project has been completed; however, education efforts continue with local residents, stakeholders, and communities planning to continue the volunteer monitoring, school program long after the life of the project. In addition, the willingness of the local stakeholders to participate in a program to address the water quality problems, as demonstrated through the heavy participation in the program, the continued contact of landowners with the Conservation Districts, inquiring about additional implementation of BMPs, and

the participation of the City of Tulsa in the program will ensure that the Eucha Watershed will continue to be a high priority for the State and its Nonpoint Source Program.

Demonstration or Implementation of Best Management Practices was the primary focus of the program and the most direct means of reducing phosphorus, sediment, and fecal bacterial loading to Beaty Creek and downstream Lake Eucha. Although water quality monitoring concurrent with implementation did not suggest significant decreases in phosphorus loading, a significant number of practices were implemented that should ultimately result in demonstrable reduced loading to the watershed. The program included 100 cooperators in two States. As a result, approximately 15 miles of riparian area were protected, twenty-seven inadequate septic systems were replaced, and waste from cattle and poultry in the watershed was more appropriately dealt with. Also as a result, approximately 8,900 acres, approximately 35%, of pastureland in the watershed could be better maintained and over 200 alternative water supplies were established that would encourage better pasture utilization and significantly reduce the amount of time cattle spent in or near streams. In addition, only 32% of the landowners cooperator landholdings did not include blue line stream channels, meaning that the majority of implementation occurred within the most critical areas of the watershed related to potential for pollutant delivery to a stream. Given the topography of the area and the fact that most blue line drainages have countless intermittent drainages that feed into them, the majority of installed practices are likely to directly affect runoff in the watershed As a result, it is estimated that theses practices could ultimately reduce phosphorus loading by as much as 30-40%.

Measures of Success

The overall measure of success for activities in the Eucha Watershed is reversal of the eutrophication of Lake Eucha. However, this is beyond the scope of this project. More attainable measures of success specific to the activities in this project are:

- Reduction of phosphorus loading from Beaty Creek watershed to levels comparable with the loading from the greater Eucha Watershed (based upon OCC data from the clean lakes project would require a 75% reduction). When a TMDL is established for the Eucha watershed by the OWRB and DEQ, the specific loading reduction goals will be used as a specific measure for phosphorus reductions from Beaty Creek watershed. As an interim measure we will seek to achieve an over all mean in-stream phosphorus concentration of 0.05 mg/l total phosphorus.
- Based upon pre-implementation reconnaissance of the watershed, an estimated 70% of the total length of waterways in the Beaty Creek watershed have inadequate riparian conditions. Funding is inadequate to achieve

universally good riparian condition in the Beaty Creek watershed. Our goal is to at least achieve this in the upper portion of the watershed above a monitoring point that can measure the benefits in water quality improvement. An estimate of this goal in quantifiable terms is 80% of the waterways in the upper ¼ of the watershed will have good riparian conditions. We will seek to have good riparian conditions for at least 50% of the watershed as a whole.

- Because the intent of a demonstration project is to transfer the technology, we will look for an indication that the practices demonstrated are repeated in other segments within the Eucha watershed. The activities of this project will be deemed successful if based upon implementation of conservation plans there is a 5% increase of the stream miles in the greater Eucha watershed with good riparian conditions.
- A substantial part of the project funding is going toward personnel to work in the watershed to establish and or update conservation plans. The goal for this effort is to have 95% of all landowners in the Eucha watershed to have current conservation plans. We will expect that 60% of those will actively implement the practices recommended in the plans.
- Because much of the controversy within the Eucha watershed has focused upon animal waste, this project needs to meet a goal of 90% compliance with animal waste plans in the Beaty Creek watershed and 75% within the greater Eucha watershed.
- A goal of this project is to promote consistency in the way the two states write animal waste plans; therefore, a measure of success is to verify that a random selection of 25 animal waste plans from each state from the Eucha watershed will show consistent application of decision criteria for determining animal waste handling in each plan.

Relative to meeting these specific MOS, the following results were achieved:

- Reduction of phosphorus loading from Beaty Creek to Lake Eucha;
  - Although water quality data did not indicate a statistically significant decrease between pre- and post-implementation loading in Beaty Creek, loading does appear to be slightly lower, following the project. However, mean Total Phosphorus concentrations in Beaty Creek were 0.118 mg/L (median 0.092 mg/L) during the post-implementation period, so the program was not successful at reducing mean loading to 0.05 mg/L.

- Increase in Protected Riparian Area in the Watershed;
  - The program increased protected riparian area in the watershed by approximately 32%. These increases were not necessarily in the upper ¼ of the watershed, but the estimated protected riparian area in the watershed is now approximately 62%, above the overall goal of 50% of overall riparian area. One indicator of increased riparian protection, along with overall increased vegetative cover in the watershed may be the statistically significant decrease in temperature compared to pre-implementation conditions. This decrease is most likely due to

increased interception and infiltration of runoff, rather than increased canopy cover. However, further decreases may be evident as the riparian areas mature.

- Implementation of demonstrated BMPs in other parts of the Lake Eucha Watershed.
  - The Beaty Creek project demonstrated that producers in the Eucha/Spavinaw Watershed would voluntarily participate in programs to protect the water quality of a downstream reservoir, even though most of them did not rely on that reservoir to meet their own water supply needs. Their participation and the State's overall continued focus in the watershed insured that numerous programs were put in place to implement the demonstrated BMPs in the remainder of the Eucha watershed, These programs included:
    - The City of Tulsa sued the Poultry Integrators of the watershed, resulting in a settlement agreement that further limited the rates at which poultry litter could be spread in the watershed (effective January 2004), required nutrient management plans for all poultry producers, appointed a Special Master and Watershed Management Team to implement the details of the settlement, required development of a joint Oklahoma/Arkansas soil phosphorus index to set application rates for poultry litter, created a nonprofit organization to identify potential assistance and solutions to water quality problems in the watershed, and set limitations and compliance schedule for the City of Decatur Waste Water Treatment Plant. The settlement has resulted in decreased litter application (at times by as much as 1/3 the pre-settlement rate) in the watershed, and significantly reduced litter application in areas of the watershed with high soil phosphorus concentrations. In addition, the Management Team has collected an extensive database of soil phosphorus concentrations that can be useful in guiding further implementation in the watershed;
    - The Oklahoma NRCS recognizes the Eucha/Spavinaw Watershed as a Local Emphasis Area, meaning that additional EQIP resources are devoted specifically to that area of Delaware County. Between 1997 and 2000, approximately $265,898 worth of practices were implemented in the remainder of the watershed. Through this program, between 2004 and 2007, approximately $250,000 EQIP dollars will be devoted to practices that protect water quality in the watershed. These dollars will be matched by approximately $75,000 of non-federal funds to total $325,000 worth of practices, many of which were also funded through the Beaty Creek Project;
    - Eucha Spavinaw was included as a priority watershed for NRCS's 2005 Conservation Security Program where landowners receive incentive payments for best management practices they've previously implemented;
    - The Arkansas Soil and Water Conservation Commission, Arkansas

NRCS, and Benton County Conservation District funded a 319 project in the Lake Eucha Watershed that used EQIP and 319 funds to install pasture planting, heavy use areas, watering facilities, wells, ponds, fencing, and a dairy waste storage facility;

- ❖ The willingness of Beaty Creek landowners to participate in the 319 project encouraged the OCC to implement a similar program, utilizing the same BMPs under an FY 2003 319 project in the remainder of the Lake Eucha Watershed; and
- ❖ The City of Tulsa will devote at least $1,250,000 towards the establishment of permanent riparian easements in the Eucha/Spavinaw Watershed.

- Development of current conservation plans for producers in the watershed and implementation of those plans
  - The project drafted 114 new or updated conservation plans in Oklahoma and Arkansas. This constitutes plans for 59% of the landowners in the watershed. Arkansas, through a complimentary EQIP/319 effort on the Arkansas side, drafted an additional 6 conservation plans for the watershed, bring the total to 61% of landowners in the watershed. A conservative estimate of Oklahoma and Arkansas NRCS new or updated plans in the watershed would be 10 per project year for a total of 60, bring the total number of updated plans in the watershed to 90%.
- Compliance with animal waste management plan requirements, and
  - The lawsuit settlement required that every poultry producer in the entire Eucha/Spavinaw Watershed have an updated nutrient management plan (which would include an animal waste management plan). The Eucha/Spavinaw Watershed Management Team members were certified by Oklahoma Department of Agriculture, Food, and Forestry to draft animal waste management plans as part of the settlement-required nutrient management plans. The team met the State's requirement for animal waste management plans for 100% of the poultry producers in the watershed.
- Consistency in conservation planning between the two states.
  - The lawsuit settlement resulted in consistent nutrient management plans between the two states, although a formal agreement between the two states on a soil P index has not been reached.

Additional measures of success became evident as the project progressed that may be useful in the development of future projects. These included measures ranging from the satisfaction of the landowners with the practices implemented to the types of practices that they were willing to implement. For instance, although landowners appreciated the benefits of riparian areas, most fences washed out in places on an annual basis. This suggested that fences need to be placed farther from the stream to be maintained. Many, if not all, of the landowners who implemented the heavy use areas and winter feeding facilities were so thrilled with the practices that they told their neighbors about how much it was helping

them and encouraged them to implement the same practice. As a result, more requests were made for these practices than the available funds would support.

The program was also successful in demonstrating cooperation between States. Practices were implemented in both Oklahoma and Arkansas. In addition, more landowners were willing to participate than there were funds available, suggesting that they observed the benefits of the practices and will seek other sources of funding such as EQIP or even implement some without cost-share assistance.

One of the most impressive measures of success of this combined with previous education efforts in the watershed was the willingness of landowners to implement riparian protection. Previous projects in the area met with little or no success with respect to implementation of riparian protection. However, year-by-year, with a few, prominent landowners implementing and praising riparian protection and with continued emphasis on riparian benefits from NRCS, OSU Extension, Conservation District, and OCC education programs, this project found landowners more receptive to riparian protection than ever before.

The City of Tulsa has taken an active role in protecting the watershed of their one of their major water supply systems. Hands-on involvement of the Mayor with the other local stakeholders through the WAG helped her understand that local landowners were committed to working towards a solution, but the main impediment to progress was funding for installation of BMPs. Recognizing this need, the City is committing city resources towards permanent easements.

Future activities in the watershed will include continued monitoring efforts to determine whether or not these, and related activities will eventually result in decreased loading to Lake Eucha. In considering these future improvements, in addition to continued water quality monitoring, it will be necessary to track BMP implementation in the watershed. BMP tracking will also be beneficial for TMDL development and other modeling exercises in the watershed to determine areas where future BMPs could be concentrated. The BMP tracking associated with this project is the first major step towards an electronic, geo-referenced database that can be used in these two efforts.

Oklahoma and Arkansas will continue to work together to address the water quality concerns in the Eucha/Spavinaw Watershed. The lawsuit settlement will eventually lead to a joint soil phosphorus index that both States will apply. Eventually, the States will also cooperate in development of a joint Watershed Based Plan for the watershed.

The data and information gathered associated with this project will be incorporated into ongoing and future efforts to address problems in the watershed. Ongoing projects include litter transfer efforts in both Arkansas and Oklahoma as well as projects or programs to find alternative uses of the litter

such as production of heat energy or electricity or production of concentrated liquid fertilizer or compost that can be available for retail sale. The location of BMPs and contacts developed during this project will be useful in a planned Conservation Reserve Enhancement Program (CREP) to protect riparian areas throughout the Oklahoma portion of the watershed, and neighboring watersheds to the south. The CREP, a partnership between the City of Tulsa, OCC, Farm Services Agency, the Delaware County Conservation District, and the State of Oklahoma will seek to protect approximately 65% of the degraded riparian area in the watershed. In addition, the City of Tulsa will use $1.25 million to establish permanent riparian easements in the watershed.

The Eucha/Spavinaw Watershed represents one of the most successful cooperative programs in the State to address water quality problems. The combined efforts of the local, state, and federal stakeholders in the watershed will expand and continue in the future. The 319 program was instrumental in assisting this effort, but the commitment of the local stakeholders towards water quality improvement is critical to its long-term success.

Literature Cited

Associated Press. 2000. Tulsa looks at ways to solve bad-tasting water. The Daily Ardmoreite. [online] Available http://ardmoreite.com/stories/110600/new_tulsa.shtml

Bottcher, A. and H. Harper. 2003. Estimation of Best Management Practices and Technologies Phosphorus Reduction Performance and Implementation Costs in the Northern Watershed of Lake Okeechobee. Letter report to SFWMD.

Durham. S. 2003. Designing the Best Possible Conservation Buffers. Agricultural Research Magazine. 51: 4-7.

Everett, J. 2004. Eucha/Spavinaw Watershed Management Team. Presented at the Secretary of Agriculture's Poultry Waste Task Force Meeting April 29, 2004 in Jay, Oklahoma.

Fimple, L. 2000. The Environmental Impact of Poultry Litter Fertilizer on Watersheds. Oklahoma Junior Academy of Science. [Online] Available http://ojas.ucok.edu/00/Papers/fimpleL.htm

Haggard, B.E, M.D. Matlock, R.S. Avery, and S.M. Williamson. 2005. Algal nutrient limitation at Lake Eucha, Oklahoma, 2003-2005. Presented at Oklahoma Water Resources Research Institute 2005, September 27-28 at OSU-Tulsa Conference Center, Tulsa, OK. [Online] Abstract Available http://environ.okstate.edu/OKWATER/index.htm

Mosley, J.C., P.S. Cook, A.J. Griffis, and J. O'Laughlin. 1998. Guidelines for Managing Cattle Grazing in Riparian Areas to Protect Water Quality: Review of Research and Best Management Practices Policy. [Online] http://www.uidaho.edu/cfwr/pag/pag15es.html

Oklahoma Conservation Commission. 1997. Phase I Clean Lakes Project: Diagnostic and Feasibility Study of Lake Eucha. Oklahoma City, OK

Oklahoma Water Resources Board. 2001. Water Quality Evaluation of the Eucha/Spavinaw Lake System. Oklahoma City, OK

Prosser, I. & L. Karssies. 2001. Designing filter strips to trap sediment and attached nutrients. Riparian Land Management Technical Guideline Update, Land & Water, Australia, Canberra.

Storm, D.E., M.J. White, and M.D. Smolen. 2002. Modeling the Lake Eucha Basin Using SWAT 2000. Oklahoma State University Biosystems and Agricultural Engineering Department. [Online] http://biosystems/okstate.edu/home/dstorm/index.html

Storm, D.E., M.J. White, M.D. Smolen, and H. Zhang. 2001. Modeling Phosphorus Loading for the Lake Eucha Basin. Oklahoma State University Biosystems and Agricultural Engineering Department. [Online] http://biosystems/okstate.edu/home/dstorm/index.html

Wilson, G. and T. Anderson. 2004. Final – Detailed Assessment of Phosphorus Sources to Minnesota Watersheds – Individual Sewage Treatment Systems/Unsewered Communities. Technical Memorandum, Minnesota Pollution Control Agency. 23/62-853 ISTS 009.

APPENDIX A:

Water Quality Data

BCSAMPLEID	LSSAMPLEID	BCDateActivityStart	LSDateActivityStart	BCAmmonia (mg/l)	LSAmmonia (mg/l)	BCNitrate (mg/l)	LSNitrate (mg/l)	BCTKN (mg/l)	LSTKN (mg/l)	BCTotOrthoPhos (mg/l)	LSTotOrthoPhos (mg/)	BCTotPhosphorus (mg/l)	LSTotPhosphorus (mg/l)	BCAccumulated flow (cf)	LSAccumulated flow (cf)	BCAutosampler mean daily flow for sampling period (cfs)	LSAutosampler mean daily flow for sampling period (cfs)	BCo-P Load (lbs)	LSo-P Load (lbs)	BCT-P Load (lbs)	LST-P Load (lbs)	BCNitrate (lbs)	LSNitrate (lbs)	BCTKN (lbs)
18479	18481	08/17/99	08/17/99	0.310	0.015	2.770	0.410	0.440	0.250	0.035	0.014	0.067	0.019	4953167	2249856	8.2	3.72	10.80	1.96	20.68	2.66	854.83	57.47	135.78
18482	18480	08/24/99	08/24/99	**0.007**	**0.011**	2.730	0.380	0.390	0.100	0.007	0.015	0.077	0.026	4596190	1868832	7.6	3.09	2.00	1.75	22.05	3.03	781.77	44.25	111.68
16972	16945	08/31/99	08/31/99	**0.035**	**0.035**	1.910	0.330	0.490	0.330	**0.001**	0.008	0.076	0.027	4529256	2050272	7.5	3.39	0.20	1.02	21.45	3.45	538.98	42.15	138.27
18488	18491	09/07/99	09/07/99	**0.035**	**0.035**	1.840	0.310	0.370	**0.007**	**0.001**	0.006	0.078	0.026	4551568	2171232	7.5	3.59	0.40	0.81	22.12	3.52	521.79	41.94	104.92
16974	16947	09/14/99	09/14/99	**0.011**	**0.001**	2.500	0.480	0.290	0.080	**0.001**	**0.004**	0.062	0.023	8567561	6326208	14.2	10.46	0.75	1.39	33.10	9.07	1334.48	189.19	154.80
16975	16971	09/22/99	09/22/99	**0.002**	**0.035**	2.540	0.500	0.260	**0.071**	0.051	**0.006**	0.070	0.021	6859185	4347648	9.9	6.29	21.80	1.72	29.91	5.69	1085.48	135.44	111.11
16977	16950	09/28/99	09/28/99	**0.005**	**0.008**	2.560	0.360	0.180	0.130	0.038	**0.004**	0.063	0.030	4379438	2104704	8.4	4.06	10.37	0.46	17.19	3.93	698.51	47.21	49.11
16948	16949	10/05/99	10/05/99	**0.035**	**0.010**	2.470	0.400	0.340	0.140	0.041	0.006	0.052	0.028	4863923	2776032	8.0	4.59	12.42	1.04	15.76	4.84	748.51	69.18	103.03
16967	16951	10/12/99	10/12/99	0.035	0.02	2.200	0.29	0.400	0.12	0.043	0.0044	0.083	0.026	4663123	3096576	7.7	5.12	12.35	0.85	24.11	4.92	639.17	56.53	116.21
18489	18490	10/19/99	10/19/99	**0.035**	**0.035**	1.930	0.186	0.460	0.100	0.044	**0.003**	0.114	0.023	4529256	2866752	7.5	4.74	12.42	0.51	32.17	4.11	544.63	33.22	129.81
23573	23574	10/26/99	10/26/99	**0.035**	**0.035**	1.940	0.280	0.450	**0.071**	0.035	**0.003**	0.040	0.210	4596190	2848608	7.6	4.71	10.02	0.50	11.45	37.27	555.54	49.69	128.86
23576	23575	11/02/99	11/02/99	**0.006**	**0.012**	1.870	0.220	0.260	0.130	0.033	**0.003**	0.039	0.018	5131655	3435264	8.5	5.68	10.55	0.61	12.47	3.85	597.88	47.09	83.13
16984	23577	11/09/99	11/09/99	**0.028**	**0.023**	1.820	0.220	**0.071**	**0.071**	0.029	**0.002**	0.042	0.013	5354766	3622752	8.9	5.99	9.68	0.48	14.01	2.93	607.19	49.66	23.59
16986	16960	11/16/99	11/16/99	**0.024**	**0.018**	1.750	0.310	**0.071**	**0.071**	0.030	0.007	0.036	0.009	4886234	3314304	8.1	5.48	9.13	1.45	10.96	1.86	532.76	64.01	21.53
23578	23579	11/22/99	11/22/99	**0.020**	**0.017**	1.690	0.250	**0.042**	0.190	0.026	0.006	0.035	0.028	4073458	3094848	7.9	5.97	6.60	1.16	8.88	5.40	428.91	48.21	10.77
23580	23581	11/30/99	11/30/99	**0.013**	**0.009**	1.890	0.340	0.400	0.210	0.028	**0.003**	0.040	0.010	7853622	5204736	11.4	7.53	13.70	0.92	19.57	3.24	924.80	110.25	195.72
23582	23583	12/07/99	12/07/99	**0.033**	**0.018**	2.780	0.500	0.490	0.200	0.099	0.006	0.111	0.010	19366119	9876384	32.0	16.33	119.45	3.69	133.93	6.15	3354.31	307.67	591.23
23585	23584	12/14/99	12/14/99	**0.033**	**0.021**	3.690	0.930	0.380	0.200	0.055	0.007	0.067	0.013	22467358	27252288	37.1	45.06	76.99	11.89	93.79	22.07	5165.29	1579.07	531.93
23587	23586	12/21/99	12/21/99	**0.013**	**0.011**	3.820	0.930	0.390	0.200	0.051	0.006	0.067	0.016	10820979	12773376	17.9	21.12	34.38	4.77	45.17	12.73	2575.41	740.12	262.93
23588	23589	12/29/99	12/29/99	**0.020**	**0.011**	3.470	0.780	1.260	0.380	**0.004**	0.006	0.172	0.013	8108605	5778432	11.7	8.36	1.79	2.16	86.89	4.68	1753.04	280.82	636.55
18870	18871	01/04/00	01/04/00	**0.007**	**0.006**	3.050	0.680	**0.071**	0.110	0.007	0.007	0.056	0.015	5756350	3748032	11.1	7.23	2.51	1.63	20.08	3.50	1093.86	158.79	25.36
18872	18873	01/11/00	01/11/00	**0.015**	**0.013**	3.060	0.640	0.130	**0.071**	**0.004**	0.005	0.080	0.021	7050408	4838400	11.7	8.00	1.55	1.51	35.14	6.33	1344.16	192.93	57.10
18874	18875	01/18/00	01/18/00	**0.028**	**0.023**	2.720	0.550	0.400	**0.071**	0.034	**0.002**	0.063	0.021	6358764	4076352	10.5	6.74	13.47	0.54	24.96	5.33	1077.60	139.69	158.47
18522	18521	01/25/00	01/25/00	0.074	0.088	2.720	0.545	**0.071**	**0.071**	0.027	0.008	0.035	0.016	6046409	4584384	10.0	7.58	10.17	2.29	13.19	4.57	1024.67	155.67	26.64
18523	18524	02/01/00	02/01/00	0.073	0.070	2.710	0.509	0.300	0.110	0.024	**0.003**	0.035	0.014	5845610	3417120	9.7	5.65	8.74	0.60	12.75	2.98	987.00	108.37	109.26
18880	18881	02/07/00	02/07/00	0.071	0.078	2.280	0.500	0.400	**0.071**	0.012	0.005	0.026	0.011	4991399	3234816	9.6	6.24	3.73	1.01	8.09	2.22	709.04	100.77	124.39
18882	18883	02/14/00	02/14/00	0.053	0.06	2.025	0.46	0.535	0.18536	0.018	0.007	0.025	0.012	5756365	4082400	9.5	6.75	6.46	1.78	8.97	3.05	726.26	117.00	191.87
18884	18885	02/23/00	02/23/00	**0.035**	**0.035**	1.770	0.420	0.670	0.300	0.024	0.009	0.024	0.013	7946069	8553600	10.2	11.00	11.88	4.80	11.88	6.93	876.28	223.83	331.70
18886	18887	03/01/00	03/01/00	**0.021**	**0.035**	2.260	0.720	0.630	**0.071**	0.009	0.007	0.052	0.007	16264880	30838752	26.9	50.99	9.12	13.45	52.70	13.45	2290.21	1383.39	638.42
18888	18889	03/06/00	03/06/00	**0.007**	**0.035**	2.690	0.850	0.460	0.100	0.011	**0.002**	0.031	**0.002**	13673578	24727680	31.7	57.24	9.37	3.27	26.41	3.27	2291.66	1309.54	391.88
18891	18892	03/13/00	03/13/00	**0.035**	**0.028**	2.450	0.700	0.590	**0.071**	0.005	**0.002**	0.044	**0.002**	14569239	19462464	24.1	32.18	4.54	2.57	39.94	2.57	2223.92	848.81	535.56

18893	18894	03/20/00	03/20/00	**0.008**	**0.006**	1.660	0.620	1.250	**0.071**	0.038	0.005	0.129	0.014	9906225	11273472	16.4	18.64	23.45	3.51	79.62	9.83	1024.55	435.48	771.50
18895	18896	03/27/00	03/27/00	**0.005**	**0.006**	1.720	0.540	0.620	**0.071**	**0.002**	**0.003**	0.067	0.016	8835293	14757120	14.6	24.40	1.17	2.60	36.88	14.71	946.82	496.49	341.29
18897	18898	04/03/00	04/03/00	**0.001**	**0.004**	1.720	0.560	1.030	0.120	**0.001**	0.005	0.080	0.020	9103026	20829312	15.1	34.44	0.40	6.49	45.37	25.95	975.51	726.74	584.17
18899	18900	04/10/00	04/10/00	**0.017**	**0.002**	1.450	0.480	1.850	0.290	**0.004**	**0.002**	0.166	0.018	7273518	8001504	12.0	13.23	1.60	1.06	75.23	8.97	657.10	239.29	838.36
18901	18902	04/17/00	04/17/00	**0.035**	**0.035**	2.360	0.400	0.970	0.270	0.038	**0.001**	0.080	0.018	9214582	10033632	15.2	16.59	21.82	0.88	45.93	11.25	1354.89	250.05	556.88
18903	18904	04/24/00	04/24/00	**0.035**	**0.035**	1.240	0.380	0.960	**0.071**	**0.001**	**0.001**	0.032	0.020	7496629	7281792	12.4	12.04	0.33	0.64	14.95	9.07	579.17	172.40	448.39
18824	18825	05/01/00	05/01/00	**0.007**	**0.007**	1.200	0.340	0.300	**0.071**	**0.004**	**0.004**	0.025	0.020	8567561	7735392	14.2	12.79	1.89	1.70	13.34	9.64	640.55	163.86	160.14
18838	18837	05/08/00	05/08/00	**0.007**	**0.007**	1.650	0.440	0.360	0.160	0.009	0.008	0.052	0.041	21507982	41132448	35.6	68.01	12.06	20.50	69.68	105.07	2211.05	1127.60	482.41
21311	21310	05/15/00	05/15/00	**0.007**	**0.007**	1.910	0.550	0.960	0.630	0.017	0.008	0.072	0.042	27152683	38453184	44.9	63.58	28.76	19.17	121.80	100.62	3231.19	1317.68	1624.05
18828	18829	05/22/00	05/22/00	**0.035**	**0.035**	1.130	0.550	0.820	0.160	0.048	0.010	0.113	0.020	10017780	10215072	16.6	16.89	29.96	6.36	70.53	12.73	705.29	350.04	511.80
19280	19281	05/30/00	05/30/00	**0.05**	**0.035**	0.460	1.420	0.120	0.350	0.012	0.024	0.037	0.062	16370077	29569536	23.7	42.78	12.24	44.22	37.74	114.22	469.16	2616.07	122.39
19282	19283	06/05/00	06/05/00	0.064	**0.030**	0.810	0.380	1.080	**0.071**	**0.001**	0.007	0.207	0.072	8338060	12369024	16.1	23.86	0.37	5.39	107.54	55.49	420.79	292.84	561.05
19284	19285	06/12/00	06/12/00	0.119	**0.014**	0.970	0.450	0.570	**0.071**	0.016	0.008	0.108	0.042	6626497	5757696	11.0	9.52	6.61	2.87	44.59	15.07	400.47	161.43	235.33
21338	21337	06/19/00	06/19/00	**0.020**	**0.004**	1.420	0.390	0.760	0.210	0.130	0.010	0.400	0.100	29138369	49557312	48.2	81.94	236.01	30.88	726.17	308.76	2577.92	1204.17	1379.73
19286	19287	06/27/00	06/27/00	0.120	0.080	2.440	0.630	0.670	0.170	0.115	0.039	0.242	0.075	45744197	86600448	66.2	125.29	327.76	210.43	689.71	404.67	6954.11	3399.20	1909.53
23356	23355	07/05/00	07/05/00	0.170	**0.035**	1.690	0.400	0.450	**0.035**	0.072	0.0213	0.146	0.035	33504980	42142464	48.5	60.97	150.30	55.84	304.77	91.90	3527.87	1050.26	939.37
21343	21344	07/10/00	07/10/00	**0.035**	**0.035**	**0.035**	0.370	0.410	**0.035**	0.029	**0.004**	0.124	0.038	9498220	15303600	22.0	35.43	17.16	3.37	73.38	36.23	20.92	352.79	242.63
23361	23357	07/17/00	07/17/00	**0.035**	**0.035**	2.640	0.380	0.550	0.280	0.069	0.011	0.135	0.029	8857604	5975424	14.6	9.88	38.08	4.10	74.50	10.80	1456.92	141.47	303.53
23363	23362	07/24/00	07/24/00	**0.035**	**0.035**	2.750	0.480	0.320	0.090	0.046	0.010	0.094	0.021	8009784	8019648	13.2	13.26	22.96	5.00	46.91	10.49	1372.36	239.83	159.69
23365	23364	07/31/00	07/31/00	0.120	**0.035**	1.580	0.420	0.550	0.130	0.680	0.042	0.718	0.073	24609221	10475136	40.7	17.32	1042.61	27.41	1100.88	47.64	2422.54	274.11	843.29
23367	23366	08/07/00	08/07/00	0.090	0.080	2.130	0.380	0.480	0.290	0.021	0.009	0.116	0.051	11691111	5122656	19.3	8.47	15.30	2.87	84.49	16.28	1551.50	121.28	349.63
23368	23369	08/14/00	08/14/00	0.120	0.060	1.550	0.380	0.640	0.200	0.030	**0.004**	0.120	0.058	6001787	3386880	9.9	5.60	11.22	0.75	44.87	12.24	579.60	80.19	239.32
21339	21340	08/21/00	08/21/00	**0.035**	**0.035**	2.470	0.400	0.510	0.110	0.072	0.012	0.109	0.041	5042411	2866752	8.3	4.74	22.62	2.14	34.24	7.32	775.98	71.44	160.22
23371	23370	08/28/00	08/28/00	**0.035**	**0.035**	1.380	0.360	0.420	0.180	0.010	0.001	0.083	0.040	4551568	2201472	7.5	3.64	2.84	0.14	23.54	5.49	391.34	49.38	119.10
23373	23372	09/06/00	09/06/00	0.160	**0.035**	0.400	0.290	1.590	0.140	0.013	0.010	0.176	0.027	5220931	2671056	6.7	3.44	4.23	1.66	57.25	4.49	130.11	48.26	517.20
23375	23374	09/11/00	09/11/00	**0.035**	**0.035**	0.900	0.330	0.480	0.140	0.016	0.002	0.068	0.032	2804898	1395360	6.5	3.23	2.80	0.17	11.88	2.78	157.28	28.69	83.88
23377	23376	09/18/00	09/18/00	0.060	**0.050**	1.670	0.330	0.390	0.120	0.070	0.011	0.079	0.028	4596190	2077488	7.6	3.44	20.05	1.42	22.62	3.62	478.22	42.71	111.68
23379	23378	09/25/00	09/25/00	**0.05**	**0.050**	1.540	0.350	0.510	0.120	0.016	0.005	0.087	0.011	4908545	2139480	8.1	3.54	4.89	0.67	26.61	1.47	470.97	46.65	155.97
23381	23380	10/04/00	10/04/00	**0.035**	**0.035**	1.290	0.380	1.200	0.070	0.018	0.007	0.187	0.040	6368357	2830464	8.2	3.64	7.14	1.23	74.20	7.05	511.84	67.01	476.13
23383	23382	10/09/00	10/09/00	0.190	**0.035**	1.170	0.300	0.350	**0.035**	0.015	0.016	0.082	0.030	3091755	1477440	7.2	3.42	2.89	1.47	15.80	2.76	225.38	27.62	67.42
23385	23384	10/16/00	10/16/00	**0.035**	**0.035**	1.310	0.280	0.250	**0.035**	0.005	0.005	0.045	0.006	4440012	2485728	7.3	4.11	1.38	0.77	12.45	0.93	362.39	43.36	69.16
23387	23386	10/23/00	10/23/00	0.120	**0.050**	1.770	0.320	0.280	**0.110**	0.003	0.001	0.050	0.013	4573879	2700432	7.6	4.47	0.85	0.17	14.25	2.19	504.40	53.84	79.79
23389	23388	10/30/00	10/30/00	0.090	**0.035**	1.230	0.240	0.190	0.070	0.011	0.005	0.022	0.010	5176278	2915136	8.6	4.82	3.55	0.91	7.10	1.82	396.68	43.59	61.28
23391	23390	11/06/00	11/06/00	0.240	**0.035**	1.060	0.280	0.900	0.130	0.028	0.005	0.132	0.007	5466322	4221504	9.0	6.98	9.54	1.32	44.96	1.84	361.01	73.64	306.52
23393	23392	11/13/00	11/13/00	0.080	**0.035**	2.520	0.520	0.220	**0.035**	0.054	0.009	0.070	0.019	7987473	5140800	13.2	8.50	26.87	2.88	34.84	6.09	1254.08	166.55	109.48
23395	23394	11/20/00	11/20/00	0.060	0.050	2.600	0.490	0.720	0.600	0.012	**0.004**	0.122	0.046	6202587	4717440	10.3	7.80	4.64	1.04	47.15	13.52	1004.76	144.02	278.24
23397	23396	11/27/00	11/27/00	**0.035**	0.050	2.300	0.440	2.060	0.180	**0.004**	**0.004**	0.239	0.046	6894230	4650912	11.4	7.69	1.52	1.02	102.66	13.33	987.94	127.50	884.85
23399	23398	12/04/00	12/04/00	**0.035**	**0.035**	0.500	3.040	0.200	0.260	0.002	0.026	0.035	0.067	7853606	4578336	13.0	7.57	0.98	7.42	17.13	19.11	244.66	867.16	97.86
23401	23400	12/11/00	12/11/00	**0.035**	**0.035**	3.040	0.480	0.210	0.120	0.033	0.002	0.049	0.033	5890232	5189184	9.7	8.58	12.11	0.65	17.98	10.67	1115.63	155.19	77.07

23403	23402	12/18/00	12/18/00	0.035	0.04	3.275	0.71	0.220	0.125	0.027	0.004	0.040	0.024	5979476	5189184	9.9	8.58	9.87	1.29	14.90	7.60	1220.09	229.55	81.96
		12/25/00	12/25/00	0.035	0.04	3.393	0.71	0.225	0.125	0.023	0.004	0.036	0.024	6715742	5189184	11.1	8.58	9.73	1.29	14.85	7.60	1419.48	229.55	94.14
23405	23404	01/04/01	01/04/01	**0.035**	**0.035**	3.510	0.940	0.230	0.130	0.020	0.006	0.031	0.014	9370806	7413120	10.8	8.58	11.68	2.77	18.10	6.47	2049.27	434.16	134.28
23407	23406	01/08/01	01/08/01	**0.035**	**0.007**	3.370	0.730	0.290	0.170	0.029	**0.004**	0.033	0.017	4691762	3317760	13.6	9.60	8.48	0.73	9.65	3.51	985.10	150.90	84.77
23409	23408	01/16/01	01/16/01	**0.035**	**0.035**	3.580	0.820	0.130	**0.035**	0.029	0.005	0.054	0.016	15834611	10056960	22.9	14.55	28.61	3.13	53.27	10.03	3531.88	513.80	128.25
23411		01/22/01	01/23/01	**0.035**	**0.035**	4.100	0.89	0.360	0.15	0.011	0.011	0.033	0.028	8892649	20145888	17.2	33.31	6.09	13.81	18.28	35.14	2271.60	1117.10	199.46
	23413	01/29/01	01/29/01	0.035	**0.035**	4.865	1.740	0.420	0.240	0.059	0.053	0.086	0.067	19879274	22130496	32.9	42.69	73.07	73.08	105.90	92.38	6025.59	2399.14	520.19
23415	23414	02/05/01	02/05/01	**0.035**	**0.035**	5.630	1.780	0.480	**0.035**	0.107	0.011	0.138	0.026	44488386	31491936	73.6	52.07	296.58	21.58	382.51	51.01	15605.26	3492.49	1330.47
23417	23416	02/12/01	02/12/01	**0.035**	**0.035**	5.540	1.630	0.300	0.170	0.041	0.013	0.060	0.037	16599546	11454912	27.4	18.94	42.40	9.28	62.05	26.41	5729.57	1163.31	310.27
23419	23418	02/20/01	02/20/01	**0.035**	**0.035**	4.450	1.250	0.330	0.130	0.039	0.008	0.062	0.012	37202243	25850880	53.8	37.40	90.40	12.88	143.71	19.33	10314.43	2013.27	764.89
23422	23420	02/28/01	02/28/01	0.79	0.090	3.28	1.400	6.71	0.990	0.645	0.133	1.1	0.276	65122894	59602176	188.4	86.23	4316.29	493.89	7322.86	1024.91	25786.57	5198.84	45499.15
23425	23424	03/05/01	03/05/01	**0.035**	**0.035**	5.410	1.480	0.260	0.080	0.071	0.012	0.093	0.017	17131794	17651520	39.7	40.86	75.78	13.20	99.27	18.70	5774.52	1627.65	277.52
23427	23426	03/12/01	03/12/01	**0.035**	**0.035**	5.190	1.290	0.360	0.060	0.061	0.021	0.067	0.025	15238571	9997344	25.2	16.53	57.91	13.08	63.61	15.57	4927.51	803.51	341.79
23429	23428	03/19/01	03/19/01	**0.035**	**0.035**	4.700	1.390	0.240	**0.035**	0.055	0.015	0.060	0.024	11646488	7457184	19.3	12.33	39.91	6.97	43.54	11.15	3410.43	645.81	174.15
23431	23430	03/26/01	03/26/01	**0.035**	**0.035**	4.040	0.980	0.250	0.140	0.036	0.019	0.051	0.025	9660803	6462288	16.0	10.69	21.67	7.65	30.70	10.07	2431.70	394.57	150.48
23433	23432	04/02/01	04/02/01	0.070	**0.035**	3.550	0.810	0.120	**0.035**	0.014	0.010	0.015	0.015	8277517	5467392	13.7	9.04	7.22	3.41	7.74	5.11	1830.81	275.92	61.89
23435	23434	04/09/01	04/09/01	**0.035**	0.04	**0.035**	0.72	***	***	0.037	0.0115	0.121	0.023	7518940	4590432	12.4	7.59	17.33	3.29	56.68	6.58	16.56	204.49	
23437	23436	04/16/01	04/16/01	**0.035**	**0.035**	2.500	0.620	***	***	0.035	0.013	0.105	0.031	7675118	10088064	12.7	16.68	16.74	8.17	50.21	19.48	1195.48	389.69	
23441	23438	04/23/01	04/23/01	**0.035**	**0.035**	2.460	0.550	***	***	0.024	0.011	0.062	0.015	8009784	6707232	13.2	11.09	11.98	4.60	30.94	6.27	1227.64	229.84	
23443	23442	05/01/01	05/01/01	0.050	**0.035**	2.200	0.520	***	***	0.033	0.015	0.081	0.026	7573140	4409856	11.0	6.38	15.57	4.12	38.22	7.14	1038.04	142.87	
23445	23444	05/07/01	05/07/01	**0.035**	**0.035**	2.160	0.480	***	***	0.058	0.020	0.132	0.031	5010523	2913408	9.7	5.62	18.11	3.63	41.21	5.63	674.30	87.13	
23447	23446	05/14/01	05/14/01	0.220	**0.035**	1.830	0.440	***	***	0.064	0.035	0.137	0.038	5667121	2715552	9.4	4.49	22.60	5.92	48.37	6.43	646.14	74.44	
23451	23449	05/22/01	05/22/01	0.200	**0.035**	1.990	0.500	***	***	0.035	0.012	0.065	0.014	7063172	3366144	10.2	4.87	15.40	2.52	28.60	2.94	875.73	104.86	
23722		05/29/01	05/29/01	**0.035**	**0.035**	1.900	0.49	***	***	0.034	0.01	0.064	0.012	5711743	3084480	9.4	5.10	12.10	1.92	22.78	2.31	676.14	94.17	
23456		06/04/01	06/05/01	0.290	0.04	1.550	0.45	***	***	0.047	0.011	0.125	0.015	5469493	3084480	10.6	5.10	16.02	2.11	42.60	2.79	528.20	86.48	
23458	23457	06/11/01	06/11/01	0.05	**0.035**	1.500	0.410	***	***	0.037	0.012	0.094	0.017	5220900	2757888	8.6	5.32	12.04	2.06	30.58	2.92	487.92	70.45	
23462	23460	06/18/01	06/18/01	0.09	**0.035**	1.840	0.470	***	***	0.036	0.009	0.081	0.015	6403387	3405024	10.6	5.63	14.36	1.91	32.32	3.18	734.08	99.71	
23464	23463	06/25/01	06/25/01	0.150	**0.035**	1.450	0.400	***	***	0.058	0.019	0.094	0.028	5689432	3592512	9.4	5.94	20.56	4.25	33.32	6.27	513.99	89.53	
23465	23466	07/02/01	07/02/01	0.049	**0.011**	1.150	0.510	0.800	0.270	0.018	0.014	0.145	0.087	4774678	2376864	7.9	3.93	5.35	2.07	43.13	12.88	342.10	75.52	237.99
23468	23467	07/09/01	07/09/01	0.023	**0.011**	1.120	0.420	1.060	0.500	0.050	0.018	0.085	0.027	4484634	1632960	7.4	2.70	13.97	1.83	23.75	2.75	312.94	42.73	296.18
23470	23469	07/16/01	07/16/01	**0.026**	**0.024**	1.180	0.650	0.720	0.240	0.031	**0.004**	0.199	0.116	4038413	1554336	6.7	2.57	7.80	0.34	50.07	11.23	296.90	62.95	181.16
23473	23471	07/23/01	07/23/01	**0.011**	**0.011**	1.790	0.730	0.970	0.220	0.080	0.012	0.158	0.165	3815302	1076544	6.3	1.78	19.02	0.80	37.56	11.07	425.50	48.96	230.58
23476	23475	07/30/01	07/30/01	0.091	0.091	**0.141**	**0.141**	1.010	1.010	0.046	0.046	0.147	0.147	3569880	828576	5.9	1.37	10.23	2.37	32.70	7.59	31.45	7.30	224.64
23479	23478	08/06/01	08/06/01	0.048	**0.011**	**0.141**	**0.141**	0.560	0.170	0.025	0.015	0.084	0.034	3480636	768096	5.8	1.27	5.42	0.72	18.22	1.63	30.67	6.77	121.44
23486	23485	08/27/01	08/27/01	0.097	0.075	1.460	**0.007**	0.325	0.256	0.056	0.005	0.057	0.018	3302148	889056	5.5	1.47	11.52	0.28	11.73	1.00	300.38	0.39	66.86
23490	23488	09/04/01	09/04/01	**0.011**	0.022	1.660	0.240	0.110	0.139	0.054	0.009	0.075	0.037	3799381	1596672	5.5	2.31	12.78	0.90	17.75	3.68	392.95	23.87	26.04
23493	23491	09/10/01	09/10/01	0.266	0.135	1.440	0.780	3.577	0.305	0.059	**0.004**	0.222	0.027	2792165	1026432	5.4	1.98	10.26	0.23	38.62	1.73	250.51	49.88	622.27
23496	23494	09/17/01	09/17/01	0.113	0.048	1.540	0.700	0.571	0.214	0.021	**0.004**	0.091	0.036	4038413	1572480	6.7	2.60	5.28	0.35	22.90	3.53	387.48	68.58	143.67
23499	23497	09/24/01	09/24/01	0.184	0.122	1.860	0.780	0.428	0.280	0.027	**0.004**	0.040	0.005	5555566	1572480	9.2	2.60	9.35	0.35	13.85	0.49	643.81	76.42	148.15

23502	23500	10/02/01	10/02/01	0.122	**0.011**	2.490	1.120	0.554	**0.078**	**0.004**	**0.004**	0.067	**0.008**	4589831	2218752	6.6	3.21	1.01	0.49	19.16	1.17	712.05	154.83	158.42
23503	23505	10/08/01	10/08/01	**0.011**	**0.011**	2.080	0.760	0.144	**0.078**	0.021	**0.004**	0.053	0.009	3251135	1487808	6.3	2.87	4.25	0.33	10.74	0.83	421.32	70.45	29.17
23506	23508	10/15/01	10/15/01	**0.011**	**0.011**	3.080	1.280	0.204	0.140	0.032	**0.004**	0.060	0.014	8902227	3706651	14.7	6.13	17.75	0.82	33.28	3.23	1708.30	295.60	113.15
23513	23517	10/22/01	10/22/01	0.118	**0.011**	2.940	0.790	0.648	**0.078**	0.043	**0.004**	0.079	**0.004**	7318140	4620672	12.1	7.64	19.61	1.02	36.02	1.02	1340.49	227.43	295.46
23522	23524	10/29/01	10/29/01	0.199	0.114	7.820	0.750	0.334	0.137	0.015	0.009	0.053	0.009	5087033	2600640	8.4	4.30	4.75	1.46	16.80	1.46	2478.49	121.52	105.86
23530	23526	11/05/01	11/05/01	0.079	0.027	2.440	0.700	0.355	**0.078**	0.008	**0.004**	0.017	**0.004**	4863923	1970149	8.0	3.26	2.42	0.43	5.15	0.43	739.42	85.92	107.58
23536	23532	11/13/01	11/13/01	0.029	**0.011**	2.160	0.740	0.173	**0.078**	0.021	**0.004**	0.022	**0.004**	4870313	2897963	7.0	4.19	6.37	0.64	6.68	0.64	655.43	133.61	52.50
23540	23542	11/19/01	11/19/01	0.049	0.020	2.300	0.920	0.227	0.261	0.023	**0.004**	0.052	**0.004**	3288853	2081758	7.8	4.02	4.71	0.46	10.66	0.46	471.29	119.33	46.51
23546	23544	11/26/01	11/26/01	0.029	**0.011**	1.960	0.750	0.211	**0.078**	0.014	**0.004**	0.020	0.020	3955632	2658821	6.5	4.40	3.45	0.59	4.93	3.31	483.05	124.24	51.88
23552	23554	12/04/01	12/04/01	0.020	**0.011**	1.980	0.720	0.194	0.110	0.017	**0.004**	0.034	**0.004**	4114646	2978112	6.0	4.31	4.36	0.66	8.72	0.66	507.59	133.59	49.73
23560	23556	12/10/01	12/10/01	0.021	**0.011**	1.930	0.740	0.291	**0.078**	0.026	0.006	0.047	0.013	3261655	2698502	6.3	5.21	5.28	1.01	9.55	2.19	392.20	124.41	59.14
23566	23562	12/17/01	12/17/01	0.062	**0.011**	2.570	1.160	0.264	0.122	0.044	0.007	0.082	0.008	4469654	5226704	7.5	8.64	12.25	2.28	22.84	2.61	715.69	377.75	73.52
23572	23568	12/26/01	12/26/01	0.083	0.082	4.700	3.760	0.530	0.110	0.039	**0.004**	0.080	0.022	25903295	44928974	33.3	57.78	62.94	9.90	129.11	61.58	7585.23	10525.20	855.36
23774	23776	01/02/02	01/02/02	0.051	0.047	3.980	0.770	**0.078**	**0.078**	0.033	**0.004**	0.056	0.018	7764362	5292000	12.8	8.75	15.96	1.17	27.09	5.93	1925.33	253.88	37.63
23778	23782	01/07/02	01/07/02	0.040	0.037	3.730	0.740	0.111	0.135	0.035	**0.004**	0.056	0.020	4398546	3252960	10.2	7.53	9.59	0.72	15.35	4.05	1022.20	149.98	30.42
23784	23788	01/14/02	01/14/02	0.028	0.064	3.440	0.550	0.373	0.407	0.041	**0.004**	0.044	0.021	5600188	2835398	9.3	4.69	14.31	0.62	15.35	3.71	1200.26	97.16	130.14
23792	23790	01/22/02	01/22/02	0.067	0.353	2.910	0.960	0.349	0.867	0.031	**0.004**	0.053	0.006	4742097	2872297	7.0	4.16	9.16	0.63	15.66	1.07	859.76	171.80	103.11
23800	23796	01/28/02	01/28/02	0.122	0.079	2.950	0.480	0.283	2.780	0.036	**0.004**	0.067	0.029	4608923	2529261	8.9	4.88	10.34	0.56	19.24	4.57	847.11	75.64	81.26
23806	23802	02/04/02	02/04/02	**0.011**	**0.011**	3.890	0.840	0.218	0.199	0.051	0.009	0.058	0.024	14591550	35239933	24.1	58.27	46.36	19.76	52.73	52.69	3536.45	1844.29	198.19
23812	23808	02/11/02	02/11/02	**0.011**	0.054	3.960	0.880	0.254	0.286	0.042	**0.004**	0.051	0.029	11691111	18330588	19.3	30.31	30.59	4.04	37.15	33.12	2884.48	1005.02	185.01
23818	23814	02/19/02	02/19/02	0.131	0.040	3.330	1.060	0.641	0.257	0.043	0.016	0.078	0.019	11198870	9697037	16.3	14.03	30.00	9.67	54.42	11.48	2323.46	640.41	447.25
23824	23820	02/25/02	02/25/02	0.017	0.033	3.330	0.600	0.217	0.341	0.029	0.011	0.052	0.020	9455321	5802161	18.3	11.19	17.08	3.98	30.63	7.23	1961.72	216.90	127.84
24919	24915	03/05/02	03/05/02	**0.011**	0.051	6.090	1.100	1.020	**0.078**	0.053	0.012	0.137	0.067	8720566	6243200	12.6	9.03	28.80	4.67	74.44	26.06	3308.86	427.87	554.19
24925	24921	03/11/02	03/11/02	0.036	**0.011**	3.030	0.540	0.140	**0.078**	0.022	0.011	0.044	0.019	14022004	8984098	26.7	17.33	19.22	6.16	38.44	10.64	2647.09	302.26	122.31
24932	24928	03/18/02	03/18/02	**0.011**	**0.011**	3.040	0.790	0.113	**0.078**	**0.004**	**0.004**	0.026	**0.004**	12362827	13178693	24.4	21.79	2.72	2.90	20.03	2.90	2341.57	648.66	87.04
24974	24970	03/25/02	03/25/02	0.066	**0.011**	2.890	0.85	0.681	**0.078**	0.029	0.0035	0.032	0.004	21059676	19969521	35.1	33.02	38.05	4.40	41.99	4.40	3791.97	1051.33	893.54
25077	25073	04/01/02	04/01/02	0.165	**0.011**	3.140	0.900	0.343	**0.078**	**0.004**	**0.004**	**0.004**	**0.004**	21503197	25102890	35.7	41.51	4.74	5.53	4.74	5.53	4206.77	1407.61	459.53
25084	25079	04/08/02	04/08/02	0.085	**0.011**	2.930	0.840	0.621	0.124	0.033	**0.004**	0.052	**0.004**	17629920	14916819	29.4	24.66	36.25	3.29	57.12	3.29	3218.35	780.68	682.12
25092	25088	04/15/02	04/15/02	0.094	**0.011**	2.720	0.880	0.913	**0.078**	0.032	**0.004**	0.074	**0.004**	25723383	38167088	42.6	63.11	51.29	8.41	118.60	8.41	4359.26	2092.61	1463.24
25122	25118	04/22/02	04/22/02	**0.011**	**0.011**	3.250	0.870	2.730	0.167	**0.004**	**0.004**	0.020	0.012	17324532	23977088	28.6	39.64	3.82	5.28	21.59	17.93	3508.01	1299.67	2946.73
25129	25125	04/29/02	04/29/02	0.387	0.032	2.560	0.680	1.636	0.150	0.030	0.018	0.184	0.022	13528315	48884578	22.4	80.83	25.29	54.82	155.09	67.01	2157.74	2071.08	1378.93
25195	25191	05/06/02	05/06/02	0.548	0.015	2.160	1.000	1.231	0.101	0.034	**0.004**	0.117	0.012	8393891	32150169	14.1	53.16	17.78	7.08	61.19	24.04	1129.62	2003.08	643.78
25201	25197	05/13/02	05/13/02	0.280	0.106	2.130	0.950	1.713	0.460	0.051	0.010	0.242	0.048	11486512	11783482	19.0	19.48	36.50	7.34	173.19	35.24	1524.35	697.45	1225.92
25210	25206	05/20/02	05/20/02	0.481	**0.011**	3.510	0.890	3.972	0.124	0.174	0.006	0.235	0.025	26170996	28871507	43.3	47.74	283.72	10.79	383.18	44.97	5723.26	1600.94	6476.58
25216	25212	05/28/02	05/28/02	0.073	**0.011**	3.390	0.600	0.482	0.260	0.065	0.009	0.104	0.040	24121581	36574618	34.9	52.91	97.69	20.51	156.30	91.15	5094.73	1367.25	724.38
25255	25251	06/03/02	06/03/02	0.445	0.018	2.350	0.690	1.563	0.203	0.159	0.015	0.276	0.031	27095558	13071104	52.9	25.21	268.42	12.22	465.93	25.25	3967.18	561.92	2638.60
	25257	06/10/02	06/10/02	0.264	**0.011**	2.540	0.840	0.917	0.163	0.101	0.014	0.182	0.028	19038111	3459456	31.5	5.72	119.21	3.02	215.29	6.04	3012.82	181.05	1087.70
25271	25267	06/17/02	06/17/02	0.082	**0.011**	2.730	0.900	0.271	0.170	0.042	0.019	0.087	0.044	12115021	13868064	20.0	22.93	31.70	16.42	65.67	38.02	2060.64	777.63	204.55
25281	25277	06/24/02	06/24/02	0.236	**0.011**	2.420	0.770	1.241	0.173	0.047	0.011	0.172	0.023	12530859	14250418	20.8	23.56	36.69	9.77	134.28	20.42	1889.35	683.65	968.88

25296	25292	07/01/02	07/01/02	0.375	0.076	1.940	0.770	1.679	0.593	0.046	0.007	0.258	0.035	7625369	3147299	14.5	5.20	21.85	1.37	122.57	6.86	921.68	150.99	797.68
25304	25300	07/08/02	07/08/02	0.246	0.141	1.800	0.790	1.671	0.495	0.043	0.006	0.250	0.028	6322202	2302858	10.4	3.81	16.94	0.86	98.47	4.02	709.02	113.35	658.20
25350	25346	07/15/02	07/15/02	0.238	0.028	1.720	0.780	3.167	0.353	0.039	0.006	0.140	0.026	5155474	2523801	8.6	4.17	12.53	0.94	44.97	4.09	552.48	122.65	1017.26
25391	25387	07/22/02	07/22/02	0.275	0.047	1.570	1.030	2.489	0.270	0.064	0.017	0.187	0.029	5048535	2092455	8.4	3.46	20.13	2.22	58.82	3.78	493.83	134.28	782.90
25532	25528	07/29/02	07/29/02	0.304	0.085	1.670	0.790	0.911	0.286	0.033	**0.004**	0.052	0.014	6339042	1808674	10.5	2.99	13.03	0.40	20.54	1.58	659.56	89.02	359.80
25602	25598	08/05/02	08/05/02	0.356	0.117	1.420	0.770	1.506	0.302	0.037	0.012	0.142	0.014	4340670	1731298	7.2	2.86	10.01	1.29	38.40	1.51	384.03	83.06	407.28
		08/12/02	08/12/02	0.339	0.02	1.390	0.8	1.981	0.148	0.070	0.022	0.144	0.05	3792991	1713600	6.3	2.83	16.54	2.35	34.03	5.34	328.48	85.41	468.15
25694		08/19/02	08/19/02	0.331	**0.011**	1.360	0.96	2.219	**0.078**	0.156	0.03	0.230	0.019	4214215	10523520	7.0	17.40	40.96	19.67	60.39	12.46	357.08	629.43	582.49
25700		08/26/02	08/26/02	0.322	**0.011**	1.360	0.9	2.456	0.10489	0.103	0.029	0.146	0.026	3129936	10523520	5.2	17.40	20.09	19.01	28.47	17.05	265.21	590.09	478.94
25749		09/03/02	09/02/02	0.285	**0.011**	1.160	0.8	1.572	0.132	0.068	0.028	0.119	0.033	3118075	6175008	4.5	10.21	13.21	10.77	23.12	12.70	225.35	307.78	305.39
26020	26016	10/28/02	10/28/02	0.024	**0.011**	1.520	0.730	**0.078**	0.158	0.031	0.011	0.059	0.016	4069615	909958	6.7	1.50	7.86	0.62	14.96	0.91	385.40	41.39	19.72
26026	26022	11/04/02	11/04/02	0.105	**0.011**	1.790	0.760	0.484	**0.078**	0.047	0.008	0.072	0.016	4239213	1063089	7.0	1.76	12.41	0.53	19.02	1.06	472.77	50.34	127.83
26032	26028	11/12/02	11/12/02	0.054	**0.011**	1.620	0.730	0.264	0.119	0.028	0.010	0.062	0.018	6783478	1237915	11.2	1.79	11.83	0.77	26.20	1.39	684.67	56.30	111.58
26038	26034	11/18/02	11/18/02	0.029	**0.011**	1.710	0.62	0.333	0.209	0.032	0.008	0.085	0.013	3193764	812156	6.2	1.57	6.37	0.40	16.91	0.66	340.26	31.12	66.26
26044	26040	11/25/02	11/25/02	**0.011**	**0.011**	1.800	0.500	**0.078**	**0.078**	0.037	0.010	0.044	0.013	5048545	1116262	8.4	1.85	11.64	0.70	13.84	0.90	566.18	34.77	24.47
26159	26155	12/02/02	12/02/02	0.022	**0.011**	1.780	0.56	0.141	0.271	0.032	0.007	0.039	0.009	4840373	1104770	9.4	1.83	9.65	0.48	11.76	0.62	536.80	38.55	42.52
26165	26161	12/09/02	12/09/02	0.020	**0.011**	1.770	0.59	0.285	**0.078**	0.036	0.008	0.043	0.018	4283835	1180988	7.1	1.95	9.61	0.59	11.48	1.32	472.41	43.41	76.07
26169	26167	12/16/02	12/16/02	**0.011**	**0.011**	1.760	0.620	**0.078**	**0.078**	0.035	0.007	0.046	0.030	6448946	1021581	10.7	1.69	14.06	0.45	18.48	1.91	707.16	39.46	31.25
		12/23/02	12/23/02	0.021	0.01	2.365	0.67	0.078	0.07778	0.036	0.0075	0.047	0.025	4306146	3589488	7.1	5.94	9.66	1.68	12.48	5.48	634.51	148.72	20.87
26183	26179	12/30/02	12/30/02	0.031	**0.011**	2.970	0.710	**0.078**	**0.078**	0.037	0.008	0.047	0.019	4395390	4360608	7.3	7.21	10.13	2.17	12.87	5.16	813.34	192.90	21.30
26560	26556	01/06/03	01/06/03	0.041	**0.011**	1.730	0.660	**0.078**	**0.078**	0.032	**0.004**	0.057	0.052	5622499	4790016	9.3	7.92	11.21	1.06	19.97	15.52	606.03	196.97	27.25
26566	26562	01/13/03	01/13/03	**0.011**	**0.011**	2.200	1.190	0.090	0.023	0.035	**0.004**	0.051	0.026	4462323	3683232	7.4	6.09	9.73	0.81	14.18	5.97	611.65	273.08	25.02
	26568	01/20/03	01/21/03	0.011	**0.011**	2.195	0.680	0.084	**0.078**	0.022	**0.004**	0.044	**0.004**	4083035	3490560	6.8	5.05	5.60	0.77	11.19	0.77	558.38	147.88	21.34
		01/27/03	01/27/03	0.011	**0.011**	2.193	0.59	0.081	**0.078**	0.016	**0.004**	0.041	**0.004**	3993791	2449440	6.6	4.73	3.86	0.54	10.08	0.54	545.56	90.04	20.11
26727	26723	02/03/03	02/03/03	**0.011**	**0.011**	2.190	0.550	**0.078**	**0.078**	0.009	**0.004**	0.037	**0.004**	3808855	2661120	6.4	4.40	2.14	0.59	8.78	0.59	519.70	91.19	18.46
		02/11/03	02/10/03	0.011	0.01	2.090	0.53	0.078	0.07778	0.006	0.0035	0.020	0.004	4564332	4375728	6.6	7.24	1.78	0.96	5.76	0.96	594.35	144.49	22.12
26742	26738	02/18/03	02/18/03	**0.011**	**0.011**	1.990	0.510	**0.078**	**0.078**	**0.004**	**0.004**	**0.004**	**0.004**	5606027	6960384	8.1	10.07	1.23	1.53	1.23	1.53	695.06	221.17	27.17
		02/25/03	02/24/03	0.011	0.01	2.350	0.66	0.078	0.07778	0.006	0.0035	0.015	0.004	7429696	6508512	12.3	12.56	2.67	1.43	7.07	1.43	1087.81	265.61	36.01
27185	27181	03/03/03	03/03/03	**0.011**	**0.011**	2.710	0.800	**0.078**	**0.078**	0.008	**0.004**	0.027	**0.004**	6655167	9096192	12.8	15.04	3.32	2.00	11.20	2.00	1123.68	453.38	32.25
27242	27238	03/10/03	03/10/03	**0.011**	**0.011**	3.840	0.990	**0.078**	**0.078**	**0.004**	**0.004**	0.016	**0.004**	10754046	10287648	17.8	17.01	2.37	2.27	10.72	2.27	2572.88	634.55	52.12
27272	27268	03/17/03	03/17/03	**0.011**	**0.011**	4.120	0.850	**0.078**	**0.078**	**0.004**	**0.004**	**0.004**	**0.004**	7764362	4112640	12.8	6.80	1.71	0.91	1.71	0.91	1993.05	217.80	37.63
27276	27274	03/24/03	03/24/03	**0.011**	**0.011**	2.210	0.710	**0.078**	**0.078**	**0.004**	**0.004**	0.037	**0.004**	8991471	9870336	14.9	16.32	1.98	2.17	20.73	2.17	1238.05	436.62	43.57
	27280	03/31/03	03/31/03	0.013	**0.011**	2.595	0.880	0.078	**0.078**	0.011	**0.004**	0.044	0.006	9192271	2711889	15.2	4.48	6.45	0.60	25.20	1.01	1486.20	148.69	44.55
27369	27373	04/07/03	04/07/03	0.016	**0.011**	2.980	0.800	**0.078**	**0.078**	0.019	**0.004**	0.051	0.017	8456005	8346240	14.0	13.80	10.01	1.84	26.87	8.84	1569.99	416.00	40.98
27377	27379	04/14/03	04/14/03	**0.011**	**0.011**	2.790	0.710	**0.078**	**0.078**	0.018	**0.004**	0.091	0.065	6938852	4844448	11.5	8.01	7.78	1.07	39.34	19.62	1206.17	214.30	33.63
27382	27384	04/21/03	04/21/03	**0.011**	**0.011**	2.110	0.660	0.130	0.228	0.009	**0.004**	0.067	0.049	6425698	4221504	10.6	6.98	3.60	0.93	26.82	12.89	844.73	173.59	52.05
27488	27484	04/28/03	04/28/03	**0.011**	**0.011**	2.140	0.480	**0.078**	0.115	**0.004**	**0.004**	0.071	0.052	7518940	1536861	12.4	2.54	1.66	0.34	33.26	4.98	1002.50	45.96	36.44
27494	27490	05/05/03	05/05/03	0.041	0.027	1.790	0.530	0.121	**0.078**	0.014	**0.004**	0.049	0.006	6648808	5098464	11.0	8.43	5.91	1.12	20.30	1.91	741.50	168.36	50.12
27500	27496	05/12/03	05/12/03	0.034	0.048	1.710	0.520	0.307	0.202	0.025	0.0113	0.027	0.02	5711743	3752028	9.4	6.20	8.90	2.63	9.61	4.68	608.53	121.56	109.25

27506	27502	05/19/03	05/19/03	0.041	0.029	2.820	0.715	0.262	0.201	0.104	0.019	0.104	0.034	27331172	26351136	45.2	43.57	177.10	31.19	177.10	55.82	4802.01	1173.87	446.14
27512	27508	05/27/03	05/27/03	0.044	0.029	3.580	0.81	0.223	0.192	0.080	0.0135	0.068	0.048	26237945	19602432	38.0	28.36	130.78	16.49	111.16	58.01	5852.33	992.31	364.54
27585	27581	06/02/03	06/02/03	0.035	0.039	2.350	0.910	0.375	0.128	**0.004**	0.008	0.225	0.061	8682288	9274176	16.7	17.89	1.91	4.62	121.71	35.25	1271.21	525.81	202.58
27591	27587	06/09/03	06/09/03	0.025	0.020	2.900	0.720	0.526	0.251	0.043	0.006	0.111	0.153	15461682	6386688	25.6	10.56	41.42	2.39	106.93	60.88	2793.64	286.50	506.71
27597	27593	06/16/03	06/16/03	**0.011**	0.015	2.360	0.630	0.312	0.199	0.026	0.007	0.108	0.054	8165961	4614624	13.5	7.63	13.23	2.01	54.95	15.53	1200.70	181.13	158.74
27603	27599	06/23/03	06/23/03	**0.011**	0.019	0.090	0.580	0.505	0.186	0.014	**0.004**	0.118	0.051	5979476	3223584	9.9	5.33	5.22	0.71	43.96	10.24	33.53	116.49	188.14
27608	27605	06/30/03	06/30/03	**0.011**	**0.011**	1.760	0.450	1.034	0.483	**0.004**	**0.004**	0.164	0.075	5421699	4741632	9.0	7.84	1.19	1.04	55.40	22.16	594.52	132.94	349.28
27768	27765	07/07/03	07/07/03	0.055	**0.011**	1.390	0.470	0.918	0.170	0.028	0.009	0.136	0.069	4618501	4403424	7.6	7.28	8.06	2.47	39.13	18.93	399.97	128.94	264.16
27820	27817	07/14/03	07/14/03	0.039	0.019	1.230	0.450	0.431	**0.078**	0.024	0.011	0.156	0.054	4350768	3193344	7.2	5.28	6.51	2.19	42.29	10.74	333.42	89.53	116.83
		09/08/03	09/08/03	0.017	0.02	1.94	0.62	**0.0778**	**0.078**	0.038	0.015	0.11	0.075	6024098	8704282	10.0	14.39	14.26	8.13	41.29	40.67	728.13	336.23	29.19
28211		09/15/03	09/15/03	0.047	**0.011**	1.260	0.48	0.158	**0.078**	0.019	0.01	0.112	0.052	2448632	3343334	4.1	5.53	2.90	2.08	17.09	10.83	192.23	99.99	24.10
	28350	10/13/03	10/13/03	0.016	**0.011**	1.41	0.360	**0.0778**	0.215	0.035	**0.004**	0.1	0.060	3971480	2126536	6.6	3.52	8.66	0.47	25.49	7.95	348.89	47.70	19.25
	28495	11/10/03	11/10/03	**0.02**	**0.011**	1.34	0.290	**0.08**	**0.078**	0.033	0.061	0.05	0.052	4328457	2286144	7.2	3.78	8.90	8.69	13.75	7.41	361.37	41.31	21.57
	28501	11/17/03	11/17/03	0.032	0.097	1.82	0.460	**0.08**	0.297	0.026	**0.004**	0.08	0.054	4172279	2346624	6.9	3.88	6.76	0.52	21.84	7.90	473.11	67.25	20.80
	28511	11/24/03	11/24/03	**0.02**	**0.011**	1.9	0.480	**0.08**	**0.078**	0.022	0.008	0.04	0.049	3469054	7868448	8.1	13.01	4.75	3.92	7.56	24.02	410.66	235.31	17.29
	28513	12/01/03	12/01/03	**0.02**	**0.011**	2.05	0.500	**0.08**	**0.078**	0.029	0.013	0.08	0.055	4796989	4947264	7.9	8.18	8.67	4.01	23.91	16.95	612.69	154.12	23.91
28561	28558	12/08/03	12/08/03	**0.011**	**0.011**	2.130	0.330	**0.078**	**0.078**	0.023	**0.004**	0.086	0.053	2671200	3380832	5.6	5.59	3.83	0.74	14.31	11.16	354.49	69.51	12.94
		12/15/03	12/15/03	**0.02**	**0.011**	2.65	0.45	**0.08**	**0.078**	0.031	0.007	0.08	0.056	5756365	4203965	9.5	6.95	11.12	1.83	27.26	14.67	950.41	117.87	28.69
		12/22/03	12/22/03	**0.02**	**0.011**	3.91	0.46	**0.08**	**0.078**	0.02	**0.004**	0.07	0.048	5979476	4457376	9.9	7.37	7.45	0.98	26.82	13.33	1456.65	127.75	29.80
28645	28641	12/29/03	12/29/03	**0.011**	**0.011**	3.040	0.330	**0.078**	**0.078**	0.007	**0.004**	0.089	0.062	2858437	4257792	5.6	7.04	1.25	0.94	15.85	16.45	541.40	87.54	13.85
29369	29371	01/05/04	01/05/04	0.019	0.019	3.350	0.580	**0.078**	**0.078**	0.015	**0.004**	0.083	0.055	3780000	7827920	8.9	12.94	3.53	1.72	19.55	26.82	788.96	282.87	18.32
	29412	01/12/04	01/12/04	**0.02**	**0.011**	3.72	0.650	**0.08**	**0.078**	0.03	0.012	0.09	0.610	7407385	7081420	12.2	11.71	13.85	5.29	40.15	269.13	1716.82	286.78	36.92
29451	29449	01/20/04	01/20/04	0.039	0.027	3.550	0.900	0.611	**0.078**	0.167	0.016	0.234	0.057	21852226	31760640	31.6	45.95	227.37	31.66	318.59	112.79	4833.26	1780.93	831.86
29489	29490	01/26/04	01/26/04	**0.011**	**0.011**	5.110	0.970	**0.078**	**0.078**	0.043	0.007	0.096	0.085	18733782	16500672	36.9	31.83	50.19	7.20	112.05	87.38	5964.34	997.22	90.79
29534	29535	02/02/04	02/02/04	**0.011**	**0.011**	4.610	0.870	**0.078**	**0.078**	0.025	**0.004**	0.080	0.052	8723738	42287420	14.4	69.92	13.59	9.31	43.48	137.00	2505.64	2292.17	42.28
29553	29554	02/09/04	02/09/04	**0.011**	**0.011**	4.620	0.880	0.301	**0.078**	0.023	**0.004**	0.072	0.047	15531896	6663921	36.7	11.02	22.26	1.47	69.67	19.51	4470.77	365.37	291.28
29607		02/17/04	02/16/04	0.048	0.05	4.450	0.74	**0.078**	**0.078**	0.019	**0.004**	0.078	0.054	8093172	6048000	14.4	10.00	9.58	1.33	39.33	20.35	2243.85	278.84	39.22
	29657	02/24/04	02/23/04	0.029	0.019	4.145	0.700	0.198	**0.078**	0.014	0.048	0.089	0.062	7474318	5691343	12.4	9.41	6.52	17.02	41.45	21.98	1930.24	248.22	92.15
29705	29703	03/01/04	03/01/04	**0.011**	0.019	3.840	0.640	0.318	**0.078**	0.009	**0.004**	0.100	0.050	5565112	3392834	10.7	5.61	3.12	0.75	34.67	10.57	1331.44	135.29	110.26
	29728	03/08/04	03/08/04	0.116	0.026	2.57	1.120	-0.11	0.400	0.248	0.038	0.37	0.173	85808492	74108989	141.9	122.53	1325.86	175.46	1994.14	798.79	13739.77	5171.36	415.84
	29731	03/15/04	03/15/04	0.036	0.042	5.24	1.040	0.163	0.135	0.047	0.016	0.09	0.070	21507982	33414365	35.6	55.25	62.98	33.31	120.60	145.73	7021.77	2165.12	218.43
	29775	03/22/04	03/22/04	**0.02**	0.163	4.51	0.930	0.148	0.120	0.038	0.049	0.11	0.069	9080715	14931847	15.0	24.69	21.50	45.59	59.41	64.19	2551.60	865.19	83.73
	29813	03/29/04	03/29/04	**0.02**	**0.011**	3.41	0.680	0.397	0.121	0.092	0.043	0.15	0.081	35363158	12603295	58.5	20.84	202.70	33.77	326.08	63.60	7513.14	533.96	874.70
	30043	04/05/04	04/05/04	0.017	0.025	4.18	0.720	**0.08**	**0.078**	0.033	0.034	0.14	0.055	25836330	47045601	42.7	77.79	53.12	99.66	225.36	161.21	6728.57	2110.41	128.78
	30046	04/12/04	04/12/04	0.023	0.027	3.82	0.860	0.139	**0.078**	0.059	0.023	0.08	0.046	9348448	23791810	15.5	39.34	34.36	34.09	48.93	68.19	2224.94	1274.80	80.96
	30049	04/19/04	04/19/04	**0.02**	**0.011**	3.33	0.080	0.134	0.321	0.027	0.061	0.07	0.058	8746049	9191489	14.5	15.20	14.71	34.93	39.78	33.21	1814.56	45.81	73.02
	30130	04/26/04	04/27/04	**0.02**	**0.011**	4.36	0.560	0.224	0.313	0.008	0.035	0.11	0.090	77397218	71016978	128.0	102.74	38.58	154.86	549.73	398.22	21024.60	2477.80	1080.16
	30174	05/03/04	05/03/04	**0.02**	**0.011**	4.39	0.490	**0.08**	**0.078**	0.038	**0.004**	0.15	0.062	71417850	43659648	118.1	84.22	169.09	9.62	685.24	168.65	19533.82	1332.88	355.97
	30203	05/10/04	05/10/04	0.017	0.042	4.16	0.470	**0.08**	**0.078**	0.027	0.007	0.09	0.058	40583949	28070282	67.1	46.41	68.27	12.24	230.10	101.44	10518.74	821.98	202.28

30221	30219	05/17/04	05/17/04	0.069	0.058	3.550	0.530	0.231	**0.078**	0.123	**0.004**	0.203	0.050	27781463	8076597	78.4	13.35	212.90	1.78	351.37	25.16	6144.68	266.70	399.84
	30231	05/24/04	05/24/04	0.076	0.055	***	***	0.186	0.120	0.053	0.032	0.145	0.060	9881755	40016842	16.6	66.17	32.63	79.78	89.27	149.59			114.52
30315	30313	06/01/04	06/01/04	0.023	0.027	***	***	0.221	1.563	0.048	0.028	0.110	0.452	2999338	11763735	4.4	17.02	8.97	20.52	20.56	331.28			41.30
30373	30371	06/07/04	06/07/04	0.020	0.020	***	***	**0.078**	**0.078**	0.053	0.007	0.098	0.057	2681692	3556817	5.2	6.86	8.86	1.55	16.37	12.63			13.00
30397	30395	06/14/04	06/14/04	0.026	0.020	***	***	**0.078**	**0.078**	0.024	**0.004**	0.110	0.063	3225357	4001820	5.4	6.62	4.82	0.88	22.10	15.71			15.63
30432	30433	06/21/04	06/21/04	0.069	0.046	***	***	**0.078**	**0.078**	**0.004**	0.014	0.098	0.049	3138480	4712271	5.2	7.79	0.69	4.11	19.16	14.39			15.21
30438	30436	06/28/04	06/28/04	0.054	0.044	***	***	**0.078**	**0.078**	0.054	0.038	0.109	0.065	3172479	6916280	5.4	11.44	10.67	16.37	21.54	28.01			15.37
30553	30551	07/06/04	07/06/04	0.131	0.104	***	***	0.78	1.220	0.196	0.072	0.5	0.286	65862331	37190584	254.1	53.81	1558.59	166.83	3960.09	662.70			6202.56
30552	30558	07/12/04	07/12/04	0.131	0.036	***	***	0.780	**0.078**	0.196	0.051	0.498	0.062	29106480	49077139	56.1	94.67	355.44	155.94	903.10	189.58			1414.49
30588	30589	07/19/04	07/19/04	**0.011**	0.088	3.200	0.440	**0.078**	**0.078**	0.048	0.033	0.134	0.067	5268776	33239678	20.1	54.96	15.76	68.34	43.99	138.75	1050.45	911.22	25.53
30611	30612	07/26/04	07/26/04	0.022	0.057	3.190	0.460	0.370	1.080	0.063	0.039	0.126	0.093	9169959	9201826	15.2	15.21	35.99	22.36	71.99	53.32	1822.53	263.72	211.39
30775	30776	08/02/04	08/02/04	0.034	**0.011**	2.490	0.330	0.270	0.340	0.027	**0.004**	0.091	0.080	11143034	6529208	33.0	10.80	18.74	1.44	63.18	32.54	1728.70	134.24	187.45
30784		08/09/04	08/09/04	**0.011**	0.01	***	***	0.950	0.20889	0.047	0.0228	0.247	0.065	7028097	4602528	11.6	7.61	20.58	6.53	108.16	18.64			415.98
30787		08/16/04	08/16/04	**0.011**	**0.011**	2.110	0.42	0.331	**0.078**	0.056	0.042	0.154	0.05	6046409	3325152	10.0	5.50	21.10	8.70	58.01	10.36	794.87	87.01	124.69
	30818	08/23/04	08/23/04	**0.011**	**0.011**	2.730	0.310	**0.08**	**0.078**	0.049	0.028	0.100	0.073	6123487	5052499	10.2	8.35	18.69	8.81	38.15	22.98	1041.54	97.59	30.52
	30873	08/30/04	08/30/04	**0.011**	**0.011**	2.730	0.660	**0.08**	0.130	**0.004**	**0.004**	0.105	0.086	5934854	3628800	9.8	6.00	1.31	0.80	38.83	19.44	1009.46	149.22	29.58
	30974	09/06/04	09/07/04	**0.011**	**0.011**	2.540	0.290	0.190	0.320	**0.004**	**0.004**	0.079	0.054	4841611	2937371	8.0	4.25	1.07	0.65	23.83	9.88	766.20	53.07	57.31
30992	30990	09/13/04	09/13/04	**0.011**	**0.011**	1.750	0.320	0.810	0.350	0.032	**0.004**	0.183	0.048	2512084	1984781	4.9	3.83	5.01	0.44	28.64	5.94	273.90	39.57	126.78
31007	31008	09/20/04	09/20/04	0.031	0.380	1.700	0.310	0.370	0.720	0.026	0.042	0.117	0.127	2786194	1890000	4.7	3.13	4.51	4.95	20.31	14.95	295.10	36.50	64.23
31046	31044	09/27/04	09/27/04	0.049	0.074	1.730	0.260	0.260	0.170	0.031	0.021	0.090	0.065	2363684	2073450	3.9	3.43	4.57	2.71	13.25	8.40	254.77	33.59	38.29
31158	31159	10/04/04	10/04/04	0.031	0.033	1.590	0.320	**0.078**	**0.078**	0.018	0.014	0.082	0.061	1873090	2370000	3.1	3.92	2.10	2.07	9.57	9.01	185.55	47.25	9.08
31198	31199	10/11/04	10/11/04	0.039	**0.011**	1.500	0.340	**0.078**	**0.078**	0.022	0.010	0.080	0.055	2253762	2339616	3.8	3.87	3.09	1.46	11.23	8.02	210.63	49.56	10.92
31210	31211	10/18/04	10/18/04	**0.011**	**0.011**	1.480	0.340	0.180	**0.078**	0.025	0.012	0.095	0.050	2592518	3078719	4.3	5.09	4.04	2.30	15.34	9.59	239.06	65.22	29.07
31221	31222	10/25/04	10/25/04	**0.011**	**0.011**	1.620	0.310	0.160	**0.078**	0.024	**0.004**	0.075	0.048	3079888	2655072	5.2	4.39	4.61	0.58	14.39	7.94	310.86	51.28	30.70
31290	31288	11/02/04	11/02/04	0.036	**0.011**	1.59	0.560	1.24	**0.078**	0.091	0.014	0.27	0.045	27584854	58387081	55.3	84.47	156.40	50.93	464.03	163.70	2732.65	2037.14	2131.12
31300		11/08/04	11/09/04	**0.011**	**0.011**	3.970	0.78	**0.078**	**0.078**	0.066	0.024	0.122	0.029	14114098	33213197	27.6	54.92	58.04	49.66	107.28	60.01	3491.08	1614.07	68.40
31304		11/15/04	11/16/04	**0.011**	**0.011**	3.690	0.64	0.170	**0.078**	0.041	0.011	0.096	0.038	3333832	18025459	5.6	29.80	8.52	12.35	19.94	42.68	766.45	718.76	35.31
31328	31329	11/22/04	11/22/04	**0.011**	**0.011**	3.530	0.520	0.160	0.200	0.340	**0.004**	0.790	0.053	9519176	13030820	15.6	25.14	201.65	2.87	468.54	43.03	2093.58	422.17	94.89
31333	31334	11/29/04	11/29/04	**0.011**	**0.011**	3.580	0.520	0.380	**0.078**	0.029	**0.004**	0.075	0.037	19960695	12568413	33.2	20.78	36.07	2.77	93.27	28.97	4452.20	407.19	472.58
31391	31392	12/06/04	12/06/04	0.120	0.018	4.010	0.640	0.170	**0.078**	0.070	0.010	0.148	0.046	24559767	22284962	56.8	36.85	107.11	13.88	226.47	63.87	6135.99	888.60	260.13
31436	31435	12/13/04	12/13/04	0.024	0.052	3.950	0.730	0.210	**0.078**	0.075	0.010	0.120	0.039	32596585	33671226	53.9	55.67	152.32	20.98	243.71	81.82	8022.05	1531.43	426.49
31466	31467	12/20/04	12/20/04	0.055	0.024	4.480	0.670	0.330	0.190	0.048	**0.004**	0.098	0.045	27384152	39126826	45.8	64.69	81.89	8.62	167.20	109.70	7643.52	1633.30	563.03
	31475	12/27/04	12/27/04	0.054	0.038	4.065	0.620	0.390	**0.078**	0.039	0.008	0.107	0.035	12298976	11051163	20.6	18.27	29.88	5.51	81.61	24.10	3114.91	426.89	298.85
31698		01/03/05	01/03/05	0.052	0.05	3.650	0.55	0.450	**0.078**	0.030	0.008	0.115	0.05	4546457	6531840	7.6	10.80	8.50	3.26	32.58	20.35	1033.91	223.83	127.47
31727	31728	01/10/05	01/10/05	0.073	0.070	2.19	0.800	0.23	0.640	0.183	0.147	0.35	0.233	54410018	131829425	97.9	217.97	620.36	1207.38	1169.54	1913.75	7424.02	6570.80	779.69
31814	31815	01/18/05	01/18/05	**0.011**	**0.011**	3.820	0.870	0.180	**0.078**	0.132	0.009	0.260	0.052	28515350	48299450	41.6	69.88	234.51	27.08	461.92	156.48	6786.69	2618.05	319.79
31817	31818	01/24/05	01/24/05	**0.011**	**0.011**	4.930	0.730	**0.078**	**0.078**	0.045	0.010	0.085	0.046	19555141	36092903	47.5	69.62	54.83	22.49	103.56	103.44	6006.53	1641.57	94.77
31820	31821	01/31/05	01/31/05	**0.011**	**0.011**	4.310	0.730	0.380	0.170	0.031	0.015	0.093	0.037	16866932	6313780	28.0	10.44	32.58	5.90	97.73	14.55	4529.28	287.16	399.33
31925	31923	02/07/05	02/07/05	**0.011**	**0.011**	4.080	0.610	**0.078**	**0.078**	0.027	0.015	0.089	0.047	12546052	4729375	20.8	7.82	21.11	4.42	69.57	13.85	3189.21	179.74	60.80

	31954	02/14/05	02/14/05	**0.02**	**0.011**	3.46	0.640	**0.08**	**0.078**	0.019	0.005	0.06	0.070	13342130	7412151	22.1	12.26	15.79	2.31	53.20	32.33	2876.19	295.56	66.50
31989	31990	02/22/05	02/22/05	**0.011**	0.261	3.440	0.560	0.270	**0.078**	0.033	0.006	0.053	0.013	8576489	11793946	12.4	17.06	17.63	4.41	28.32	9.55	1838.16	411.49	144.27
32026	32024	02/28/05	02/28/05	**0.011**	**0.011**	3.300	0.500	0.260	**0.078**	0.030	0.210	0.063	0.050	11863495	8006675	22.7	15.44	22.17	104.76	46.57	24.94	2439.17	249.42	192.18
32063	32064	03/07/05	03/07/05	0.214	**0.011**	3.280	0.530	0.330	**0.078**	0.056	0.007	0.093	0.029	8926362	13026120	14.8	21.54	31.14	5.68	51.72	23.54	1824.17	430.14	183.53
32076		03/14/05	03/15/05	**0.011**	**0.011**	3.030	0.51	0.490	**0.078**	0.027	**0.004**	0.131	0.03	6511367	9676800	10.9	14.00	10.95	2.13	53.14	18.09	1229.22	307.48	198.79
32112	32113	03/21/05	03/21/05	**0.011**	**0.011**	5.070	0.670	0.130	**0.078**	0.022	**0.004**	0.075	0.037	5046561	4580475	8.4	8.84	6.92	1.01	23.58	10.56	1594.11	191.21	40.87
32152	32153	03/28/05	03/28/05	0.020	**0.011**	3.320	0.540	**0.078**	**0.078**	0.026	0.006	0.076	0.034	5887496	4415747	9.8	7.30	9.54	1.65	27.88	9.35	1217.82	148.56	28.53
32242		04/04/05	04/04/05	**0.011**	**0.011**	2.580	0.5	**0.078**	**0.078**	0.027	0.009	0.056	0.016	8710490	27457920	14.5	45.40	14.65	15.40	30.39	27.37	1400.16	855.37	42.21
32246	32244	04/11/05	04/11/05	**0.011**	**0.011**	2.740	0.540	**0.078**	**0.078**	0.031	0.006	0.049	0.006	20133826	33847438	33.5	55.96	38.89	12.65	61.47	12.65	3437.11	1138.77	97.57
32248	32249	04/18/05	04/18/05	0.029	**0.011**	4.090	0.630	**0.078**	**0.078**	0.026	0.005	0.071	0.017	15777174	22949956	26.1	37.95	25.56	7.15	69.79	24.31	4020.39	900.82	76.46
32281	32279	04/25/05	04/25/05	0.032	**0.011**	3.020	0.430	0.170	**0.078**	0.030	0.005	0.131	0.023	27384152	8248262	45.8	13.64	51.18	2.57	223.50	11.82	5152.55	220.98	290.04
32372	32370	05/02/05	05/02/05	0.029	**0.011**	2.880	0.480	**0.078**	**0.078**	0.028	0.006	0.083	0.021	13614375	5937926	22.8	9.82	23.75	2.22	70.40	7.77	2442.90	177.58	65.98
32374	32375	05/09/05	05/09/05	0.054	**0.011**	2.760	0.450	**0.078**	**0.078**	0.030	0.006	0.097	0.029	4546457	5537549	7.6	9.16	8.50	2.07	27.48	10.01	781.80	155.26	22.03
32469	32470	05/16/05	05/16/05	0.110	**0.011**	2.470	0.380	**0.078**	**0.078**	0.032	0.010	0.074	0.025	55488275	5108141	101.8	8.45	110.63	3.18	255.83	7.96	8539.14	120.94	268.90
32472	32473	05/23/05	05/23/05	0.105	**0.011**	2.250	0.380	0.250	**0.078**	0.027	**0.004**	0.041	**0.004**	34922141	5241197	50.9	8.67	58.75	1.15	89.21	1.15	4895.53	124.09	543.95
	32665	05/30/05	05/31/05	**0.02**	**0.011**	2.91	0.470	0.3	**0.078**	0.041	0.007	0.12	0.010	7987473	5416243	13.2	7.84	20.40	2.36	61.71	3.37	1448.17	158.60	149.30
32513	32511	06/06/05	06/06/05	0.056	**0.011**	2.200	0.370	**0.078**	**0.078**	0.047	**0.004**	0.155	0.026	23041312	3509568	58.3	6.77	67.47	0.77	222.51	5.69	3158.25	80.90	111.66
32550		06/13/05	06/13/05	**0.011**	**0.011**	2.100	0.49	0.490	**0.078**	0.027	0.009	0.063	0.026	16866932	5606496	28.0	9.27	28.37	3.14	66.21	9.08	2206.84	171.16	514.93
32560	32558	06/20/05	06/20/05	0.150	**0.011**	2.120	0.510	**0.078**	**0.078**	0.027	**0.004**	0.036	0.011	12546052	4775501	20.8	7.90	21.11	1.05	28.14	3.27	1657.14	151.74	60.80
32696	32694	06/27/05	06/27/05	0.227	0.023	1.280	0.370	0.650	**0.078**	0.073	0.120	0.086	0.364	7504428	2949610	10.9	4.88	34.13	22.05	40.21	66.89	598.47	68.00	303.91
32710	32711	07/05/05	07/05/05	0.201	**0.011**	1.750	0.350	**0.078**	**0.078**	**0.004**	**0.004**	0.109	**0.011**	22248357	3366144	42.8	4.87	4.90	0.74	151.09	2.22	2425.78	73.40	107.82
32748	32746	07/11/05	07/11/05	0.027	**0.011**	1.620	1.030	**0.078**	0.200	**0.004**	**0.004**	0.048	0.021	7651167	1935706	12.7	3.73	1.69	0.43	22.88	2.53	772.25	124.22	37.08
32750	32751	07/18/05	07/18/05	0.145	**0.011**	1.480	0.350	**0.078**	**0.078**	0.006	**0.004**	0.063	0.039	3949169	2313965	6.5	3.83	1.48	0.51	15.50	5.62	364.15	50.46	19.14
32753	32754	07/25/05	07/25/05	0.074	**0.011**	1.350	0.380	**0.078**	**0.078**	0.014	**0.004**	0.066	0.007	2368906	2883476	4.0	4.77	2.07	0.64	9.74	1.26	199.25	68.27	11.48
33115	33113	08/02/05	08/02/05	0.138	**0.011**	0.890	0.360	0.610	**0.078**	0.034	0.005	0.079	0.026	2290409	3234055	3.3	4.68	4.85	1.01	11.27	5.24	127.00	72.54	87.05
33125	33123	08/08/05	08/08/05	0.125	**0.011**	1.170	0.310	0.860	**0.078**	0.025	0.005	0.068	0.028	1263764	2059233	2.4	3.97	1.97	0.64	5.35	3.59	92.12	39.77	67.71
33172	33170	08/15/05	08/15/05	0.313	**0.011**	1.010	0.320	0.380	**0.078**	0.058	0.009	0.123	0.009	752575	2189210	1.3	3.62	2.72	1.23	5.77	1.23	47.36	43.65	17.82

BCSAMPLEID	LSSAMPLEID	BCDateActivityStart	LSDateActivityStart	LSTKN (lbs)	BCAmmonia (lbs)	LSAmmonia (lbs)	logBCo-P Load (lbs)	logLSo-P Load (lbs)	logBCT-P Load (lbs)	logLST-P Load (lbs)	logBCAmmonia (lbs)	logLSAmmonia (lbs)	logBCNitrate (lbs)	logLSNitrate (lbs)	logBCTKN (lbs)	logLSTKN (lbs)	Period
18479	18481	08/17/99	08/17/99	35.04	95.67	2.10	1.03	0.29	1.32	0.43	1.98	0.32	2.93	1.76	2.13	1.54	Cal
18482	18480	08/24/99	08/24/99	11.64	2.02	1.32	0.30	0.24	1.34	0.48	0.31	0.12	2.89	1.65	2.05	1.07	Cal
16972	16945	08/31/99	08/31/99	42.15	9.98	4.52	-0.70	0.01	1.33	0.54	1.00	0.65	2.73	1.62	2.14	1.62	Cal
18488	18491	09/07/99	09/07/99	0.96	10.03	4.78	-0.40	-0.09	1.34	0.55	1.00	0.68	2.72	1.62	2.02	-0.02	Cal

16974	16947	09/14/99	09/14/99	31.53	5.66	0.56	-0.12	0.14	1.52	0.96	0.75	-0.25	3.13	2.28	2.19	1.50	Cal
16975	16971	09/22/99	09/22/99	19.15	0.91	9.58	1.34	0.24	1.48	0.75	-0.04	0.98	3.04	2.13	2.05	1.28	Cal
16977	16950	09/28/99	09/28/99	17.05	1.35	1.02	1.02	-0.33	1.24	0.59	0.13	0.01	2.84	1.67	1.69	1.23	Cal
16948	16949	10/05/99	10/05/99	24.21	10.71	1.71	1.09	0.02	1.20	0.69	1.03	0.23	2.87	1.84	2.01	1.38	Cal
16967	16951	10/12/99	10/12/99	23.15	10.27	4.37	1.09	-0.07	1.38	0.69	1.01	0.64	2.81	1.75	2.07	1.36	Cal
18489	18490	10/19/99	10/19/99	17.86	9.98	6.31	1.09	-0.30	1.51	0.61	1.00	0.80	2.74	1.52	2.11	1.25	Cal
23573	23574	10/26/99	10/26/99	12.55	10.12	6.27	1.00	-0.30	1.06	1.57	1.01	0.80	2.74	1.70	2.11	1.10	Cal
23576	23575	11/02/99	11/02/99	27.82	2.03	2.57	1.02	-0.22	1.10	0.59	0.31	0.41	2.78	1.67	1.92	1.44	Cal
16984	23577	11/09/99	11/09/99	15.96	9.20	5.11	0.99	-0.32	1.15	0.47	0.96	0.71	2.78	1.70	1.37	1.20	Cal
16986	16960	11/16/99	11/16/99	14.60	7.32	3.65	0.96	0.16	1.04	0.27	0.86	0.56	2.73	1.81	1.33	1.16	Cal
23578	23579	11/22/99	11/22/99	36.64	5.02	3.27	0.82	0.06	0.95	0.73	0.70	0.51	2.63	1.68	1.03	1.56	Cal
23580	23581	11/30/99	11/30/99	68.10	6.23	2.98	1.14	-0.04	1.29	0.51	0.79	0.47	2.97	2.04	2.29	1.83	Cal
23582	23583	12/07/99	12/07/99	123.07	39.25	11.31	2.08	0.57	2.13	0.79	1.59	1.05	3.53	2.49	2.77	2.09	Cal
23585	23584	12/14/99	12/14/99	339.59	45.53	34.82	1.89	1.08	1.97	1.34	1.66	1.54	3.71	3.20	2.73	2.53	Cal
23587	23586	12/21/99	12/21/99	159.17	8.58	9.00	1.54	0.68	1.65	1.10	0.93	0.95	3.41	2.87	2.42	2.20	Cal
23588	23589	12/29/99	12/29/99	136.81	10.00	4.07	0.25	0.33	1.94	0.67	1.00	0.61	3.24	2.45	2.80	2.14	Cal
18870	18871	01/04/00	01/04/00	25.69	2.54	1.32	0.40	0.21	1.30	0.54	0.40	0.12	3.04	2.20	1.40	1.41	Cal
18872	18873	01/11/00	01/11/00	21.32	6.52	3.84	0.19	0.18	1.55	0.80	0.81	0.58	3.13	2.29	1.76	1.33	Cal
18874	18875	01/18/00	01/18/00	17.96	11.21	5.75	1.13	-0.27	1.40	0.73	1.05	0.76	3.03	2.15	2.20	1.25	Cal
18522	18521	01/25/00	01/25/00	20.20	27.88	25.14	1.01	0.36	1.12	0.66	1.45	1.40	3.01	2.19	1.43	1.31	Cal
18523	18524	02/01/00	02/01/00	23.42	26.59	14.90	0.94	-0.22	1.11	0.47	1.42	1.17	2.99	2.03	2.04	1.37	Cal
18880	18881	02/07/00	02/07/00	14.25	22.08	15.72	0.57	0.00	0.91	0.35	1.34	1.20	2.85	2.00	2.09	1.15	Cal
18882	18883	02/14/00	02/14/00	47.15	19.07	14.42	0.81	0.25	0.95	0.48	1.28	1.16	2.86	2.07	2.28	1.67	Cal
18884	18885	02/23/00	02/23/00	159.88	17.50	18.84	1.07	0.68	1.07	0.84	1.24	1.28	2.94	2.35	2.52	2.20	Cal
18886	18887	03/01/00	03/01/00	135.86	21.50	67.93	0.96	1.13	1.72	1.13	1.33	1.83	3.36	3.14	2.81	2.13	Cal
18888	18889	03/06/00	03/06/00	154.06	6.02	54.47	0.97	0.51	1.42	0.51	0.78	1.74	3.36	3.12	2.59	2.19	Cal
18891	18892	03/13/00	03/13/00	85.74	32.09	34.30	0.66	0.41	1.60	0.41	1.51	1.54	3.35	2.93	2.73	1.93	Cal
18893	18894	03/20/00	03/20/00	49.67	5.24	3.97	1.37	0.55	1.90	0.99	0.72	0.60	3.01	2.64	2.89	1.70	Cal
18895	18896	03/27/00	03/27/00	65.01	2.72	5.20	0.07	0.42	1.57	1.17	0.44	0.72	2.98	2.70	2.53	1.81	Cal
18897	18898	04/03/00	04/03/00	155.73	0.80	5.51	-0.40	0.81	1.66	1.41	-0.10	0.74	2.99	2.86	2.77	2.19	Cal
18899	18900	04/10/00	04/10/00	144.57	7.69	1.06	0.20	0.02	1.88	0.95	0.89	0.02	2.82	2.38	2.92	2.16	Cal
18901	18902	04/17/00	04/17/00	168.79	20.30	22.10	1.34	-0.05	1.66	1.05	1.31	1.34	3.13	2.40	2.75	2.23	Cal
18903	18904	04/24/00	04/24/00	32.08	16.51	16.04	-0.48	-0.19	1.17	0.96	1.22	1.21	2.76	2.24	2.65	1.51	Cal
18824	18825	05/01/00	05/01/00	34.08	3.77	3.41	0.28	0.23	1.13	0.98	0.58	0.53	2.81	2.21	2.20	1.53	Cal
18838	18837	05/08/00	05/08/00	410.03	9.48	18.12	1.08	1.31	1.84	2.02	0.98	1.26	3.34	3.05	2.68	2.61	Cal
21311	21310	05/15/00	05/15/00	1509.35	11.96	16.94	1.46	1.28	2.09	2.00	1.08	1.23	3.51	3.12	3.21	3.18	Cal
18828	18829	05/22/00	05/22/00	101.83	22.07	22.50	1.48	0.80	1.85	1.10	1.34	1.35	2.85	2.54	2.71	2.01	Cal
19280	19281	05/30/00	05/30/00	644.81	51.00	65.14	1.09	1.65	1.58	2.06	1.71	1.81	2.67	3.42	2.09	2.81	Cal
19282	19283	06/05/00	06/05/00	54.49	33.25	23.43	-0.43	0.73	2.03	1.74	1.52	1.37	2.62	2.47	2.75	1.74	Cal

19284	19285	06/12/00	06/12/00	25.37	49.13	5.07	0.82	0.46	1.65	1.18	1.69	0.71	2.60	2.21	2.37	1.40	Cal
21338	21337	06/19/00	06/19/00	648.40	35.94	13.10	2.37	1.49	2.86	2.49	1.56	1.12	3.41	3.08	3.14	2.81	Cal
19286	19287	06/27/00	06/27/00	917.24	342.01	431.64	2.52	2.32	2.84	2.61	2.53	2.64	3.84	3.53	3.28	2.96	Cal
23356	23355	07/05/00	07/05/00	92.83	354.87	92.83	2.18	1.75	2.48	1.96	2.55	1.97	3.55	3.02	2.97	1.97	Cal
21343	21344	07/10/00	07/10/00	33.71	20.92	33.71	1.23	0.53	1.87	1.56	1.32	1.53	1.32	2.55	2.38	1.53	Cal
23361	23357	07/17/00	07/17/00	104.24	19.51	13.16	1.58	0.61	1.87	1.03	1.29	1.12	3.16	2.15	2.48	2.02	Cal
23363	23362	07/24/00	07/24/00	44.97	17.64	17.67	1.36	0.70	1.67	1.02	1.25	1.25	3.14	2.38	2.20	1.65	Cal
23365	23364	07/31/00	07/31/00	84.84	183.99	23.07	3.02	1.44	3.04	1.68	2.26	1.36	3.38	2.44	2.93	1.93	Cal
23367	23366	08/07/00	08/07/00	92.56	65.56	25.53	1.18	0.46	1.93	1.21	1.82	1.41	3.19	2.08	2.54	1.97	Cal
23368	23369	08/14/00	08/14/00	42.20	44.87	12.66	1.05	-0.13	1.65	1.09	1.65	1.10	2.76	1.90	2.38	1.63	Cal
21339	21340	08/21/00	08/21/00	19.65	11.11	6.31	1.35	0.33	1.53	0.86	1.05	0.80	2.89	1.85	2.20	1.29	Cal
23371	23370	08/28/00	08/28/00	24.69	10.03	4.85	0.45	-0.86	1.37	0.74	1.00	0.69	2.59	1.69	2.08	1.39	Cal
23373	23372	09/06/00	09/06/00	23.30	52.05	5.88	0.63	0.22	1.76	0.65	1.72	0.77	2.11	1.68	2.71	1.37	Cal
23375	23374	09/11/00	09/11/00	12.17	6.18	3.07	0.45	-0.76	1.07	0.44	0.79	0.49	2.20	1.46	1.92	1.09	Cal
23377	23376	09/18/00	09/18/00	15.53	17.18	6.47	1.30	0.15	1.35	0.56	1.24	0.81	2.68	1.63	2.05	1.19	Cal
23379	23378	09/25/00	09/25/00	16.00	15.29	6.66	0.69	-0.18	1.42	0.17	1.18	0.82	2.67	1.67	2.19	1.20	Cal
23381	23380	10/04/00	10/04/00	12.34	14.03	6.23	0.85	0.09	1.87	0.85	1.15	0.79	2.71	1.83	2.68	1.09	Cal
23383	23382	10/09/00	10/09/00	3.25	36.60	3.25	0.46	0.17	1.20	0.44	1.56	0.51	2.35	1.44	1.83	0.51	Cal
23385	23384	10/16/00	10/16/00	5.48	9.78	5.48	0.14	-0.11	1.10	-0.03	0.99	0.74	2.56	1.64	1.84	0.74	Cal
23387	23386	10/23/00	10/23/00	18.51	34.20	8.41	-0.07	-0.77	1.15	0.34	1.53	0.92	2.70	1.73	1.90	1.27	Cal
23389	23388	10/30/00	10/30/00	12.71	29.03	6.42	0.55	-0.04	0.85	0.26	1.46	0.81	2.60	1.64	1.79	1.10	Cal
23391	23390	11/06/00	11/06/00	34.19	81.74	9.30	0.98	0.12	1.65	0.27	1.91	0.97	2.56	1.87	2.49	1.53	Cal
23393	23392	11/13/00	11/13/00	11.32	39.81	11.32	1.43	0.46	1.54	0.78	1.60	1.05	3.10	2.22	2.04	1.05	Cal
23395	23394	11/20/00	11/20/00	176.35	23.19	14.70	0.67	0.02	1.67	1.13	1.37	1.17	3.00	2.16	2.44	2.25	Cal
23397	23396	11/27/00	11/27/00	52.16	15.19	14.49	0.18	0.01	2.01	1.12	1.18	1.16	2.99	2.11	2.95	1.72	Cal
23399	23398	12/04/00	12/04/00	74.16	17.30	10.09	-0.01	0.87	1.23	1.28	1.24	1.00	2.39	2.94	1.99	1.87	Cal
23401	23400	12/11/00	12/11/00	38.80	12.97	11.43	1.08	-0.19	1.25	1.03	1.11	1.06	3.05	2.19	1.89	1.59	Cal
23403	23402	12/18/00	12/18/00	40.41	13.17	11.43	0.99	0.11	1.17	0.88	1.12	1.06	3.09	2.36	1.91	1.61	Cal
		12/25/00	12/25/00	40.41	14.79	11.43	0.99	0.11	1.17	0.88	1.17	1.06	3.15	2.36	1.97	1.61	Cal
23405	23404	01/04/01	01/04/01	60.04	20.64	16.33	1.07	0.44	1.26	0.81	1.31	1.21	3.31	2.64	2.13	1.78	Cal
23407	23406	01/08/01	01/08/01	35.14	10.33	1.46	0.93	-0.14	0.98	0.55	1.01	0.16	2.99	2.18	1.93	1.55	Cal
23409	23408	01/16/01	01/16/01	22.15	34.88	22.15	1.46	0.50	1.73	1.00	1.54	1.35	3.55	2.71	2.11	1.35	Cal
23411		01/22/01	01/23/01	188.28	19.59	44.38	0.78	1.14	1.26	1.55	1.29	1.65	3.36	3.05	2.30	2.27	Cal
	23413	01/29/01	01/29/01	330.92	43.79	48.75	1.86	1.86	2.02	1.97	1.64	1.69	3.78	3.38	2.72	2.52	Cal
23415	23414	02/05/01	02/05/01	69.37	98.00	69.37	2.47	1.33	2.58	1.71	1.99	1.84	4.19	3.54	3.12	1.84	Cal
23417	23416	02/12/01	02/12/01	121.33	36.57	25.23	1.63	0.97	1.79	1.42	1.56	1.40	3.76	3.07	2.49	2.08	Cal
23419	23418	02/20/01	02/20/01	209.38	81.95	56.94	1.96	1.11	2.16	1.29	1.91	1.76	4.01	3.30	2.88	2.32	Cal
23422	23420	02/28/01	02/28/01	3676.32	5260.79	334.21	3.64	2.69	3.86	3.01	3.72	2.52	4.41	3.72	4.66	3.57	Cal
23425	23424	03/05/01	03/05/01	87.98	37.74	38.88	1.88	1.12	2.00	1.27	1.58	1.59	3.76	3.21	2.44	1.94	Cal

23427	23426	03/12/01	03/12/01	37.37	33.57	22.02	1.76	1.12	1.80	1.19	1.53	1.34	3.69	2.90	2.53	1.57	Cal
23429	23428	03/19/01	03/19/01	16.43	25.65	16.43	1.60	0.84	1.64	1.05	1.41	1.22	3.53	2.81	2.24	1.22	Cal
23431	23430	03/26/01	03/26/01	56.37	21.28	14.23	1.34	0.88	1.49	1.00	1.33	1.15	3.39	2.60	2.18	1.75	Cal
23433	23432	04/02/01	04/02/01	12.04	36.10	12.04	0.86	0.53	0.89	0.71	1.56	1.08	3.26	2.44	1.79	1.08	Cal
23435	23434	04/09/01	04/09/01		16.56	10.11	1.24	0.52	1.75	0.82	1.22	1.00	1.22	2.31			Cal
23437	23436	04/16/01	04/16/01		16.91	22.22	1.22	0.91	1.70	1.29	1.23	1.35	3.08	2.59			Cal
23441	23438	04/23/01	04/23/01		17.64	14.77	1.08	0.66	1.49	0.80	1.25	1.17	3.09	2.36			Cal
23443	23442	05/01/01	05/01/01		23.59	9.71	1.19	0.62	1.58	0.85	1.37	0.99	3.02	2.15			Cal
23445	23444	05/07/01	05/07/01		11.04	6.42	1.26	0.56	1.61	0.75	1.04	0.81	2.83	1.94			Cal
23447	23446	05/14/01	05/14/01		77.68	5.98	1.35	0.77	1.68	0.81	1.89	0.78	2.81	1.87			Cal
23451	23449	05/22/01	05/22/01		88.01	7.41	1.19	0.40	1.46	0.47	1.94	0.87	2.94	2.02			Cal
23722		05/29/01	05/29/01		12.58	6.79	1.08	0.28	1.36	0.36	1.10	0.83	2.83	1.97			Cal
23456		06/04/01	06/05/01		98.82	6.79	1.20	0.33	1.63	0.45	1.99	0.83	2.72	1.94			Cal
23458	23457	06/11/01	06/11/01		16.26	6.08	1.08	0.31	1.49	0.47	1.21	0.78	2.69	1.85			Cal
23462	23460	06/18/01	06/18/01		35.91	7.50	1.16	0.28	1.51	0.50	1.56	0.88	2.87	2.00			Cal
23464	23463	06/25/01	06/25/01		53.17	7.91	1.31	0.63	1.52	0.80	1.73	0.90	2.71	1.95			Cal
23465	23466	07/02/01	07/02/01	39.98	14.58	1.57	0.73	0.32	1.63	1.11	1.16	0.20	2.53	1.88	2.38	1.60	Cal
23468	23467	07/09/01	07/09/01	50.87	6.43	1.08	1.15	0.26	1.38	0.44	0.81	0.03	2.50	1.63	2.47	1.71	Cal
23470	23469	07/16/01	07/16/01	23.24	6.58	2.33	0.89	-0.47	1.70	1.05	0.82	0.37	2.47	1.80	2.26	1.37	Cal
23473	23471	07/23/01	07/23/01	14.76	2.52	0.71	1.28	-0.09	1.57	1.04	0.40	-0.15	2.63	1.69	2.36	1.17	Cal
23476	23475	07/30/01	07/30/01	52.14	20.24	4.70	1.01	0.38	1.51	0.88	1.31	0.67	1.50	0.86	2.35	1.72	Cal
23479	23478	08/06/01	08/06/01	8.14	10.41	0.51	0.73	-0.14	1.26	0.21	1.02	-0.29	1.49	0.83	2.08	0.91	Cal
23486	23485	08/27/01	08/27/01	14.18	19.96	4.15	1.06	-0.56	1.07	0.00	1.30	0.62	2.48	-0.41	1.83	1.15	
23490	23488	09/04/01	09/04/01	13.83	2.51	2.19	1.11	-0.05	1.25	0.57	0.40	0.34	2.59	1.38	1.42	1.14	
23493	23491	09/10/01	09/10/01	19.50	46.27	8.63	1.01	-0.65	1.59	0.24	1.67	0.94	2.40	1.70	2.79	1.29	
23496	23494	09/17/01	09/17/01	20.97	28.43	4.70	0.72	-0.46	1.36	0.55	1.45	0.67	2.59	1.84	2.16	1.32	
23499	23497	09/24/01	09/24/01	27.43	63.69	11.95	0.97	-0.46	1.14	-0.31	1.80	1.08	2.81	1.88	2.17	1.44	
23502	23500	10/02/01	10/02/01	10.75	34.89	1.47	0.00	-0.31	1.28	0.07	1.54	0.17	2.85	2.19	2.20	1.03	
23503	23505	10/08/01	10/08/01	7.21	2.15	0.98	0.63	-0.48	1.03	-0.08	0.33	-0.01	2.62	1.85	1.46	0.86	
23506	23508	10/15/01	10/15/01	32.33	5.88	2.45	1.25	-0.09	1.52	0.51	0.77	0.39	3.23	2.47	2.05	1.51	
23513	23517	10/22/01	10/22/01	22.39	53.80	3.05	1.29	0.01	1.56	0.01	1.73	0.48	3.13	2.36	2.47	1.35	
23522	23524	10/29/01	10/29/01	22.20	63.07	18.47	0.68	0.16	1.23	0.16	1.80	1.27	3.39	2.08	2.02	1.35	
23530	23526	11/05/01	11/05/01	9.55	23.94	3.31	0.38	-0.36	0.71	-0.36	1.38	0.52	2.87	1.93	2.03	0.98	
23536	23532	11/13/01	11/13/01	14.04	8.80	1.92	0.80	-0.19	0.82	-0.19	0.94	0.28	2.82	2.13	1.72	1.15	
23540	23542	11/19/01	11/19/01	33.85	10.04	2.59	0.67	-0.34	1.03	-0.34	1.00	0.41	2.67	2.08	1.67	1.53	
23546	23544	11/26/01	11/26/01	12.88	7.15	1.76	0.54	-0.23	0.69	0.52	0.85	0.24	2.68	2.09	1.71	1.11	
23552	23554	12/04/01	12/04/01	20.41	5.13	1.97	0.64	-0.18	0.94	-0.18	0.71	0.29	2.71	2.13	1.70	1.31	
23560	23556	12/10/01	12/10/01	13.08	4.27	1.78	0.72	0.00	0.98	0.34	0.63	0.25	2.59	2.09	1.77	1.12	
23566	23562	12/17/01	12/17/01	39.73	17.27	3.45	1.09	0.36	1.36	0.42	1.24	0.54	2.85	2.58	1.87	1.60	

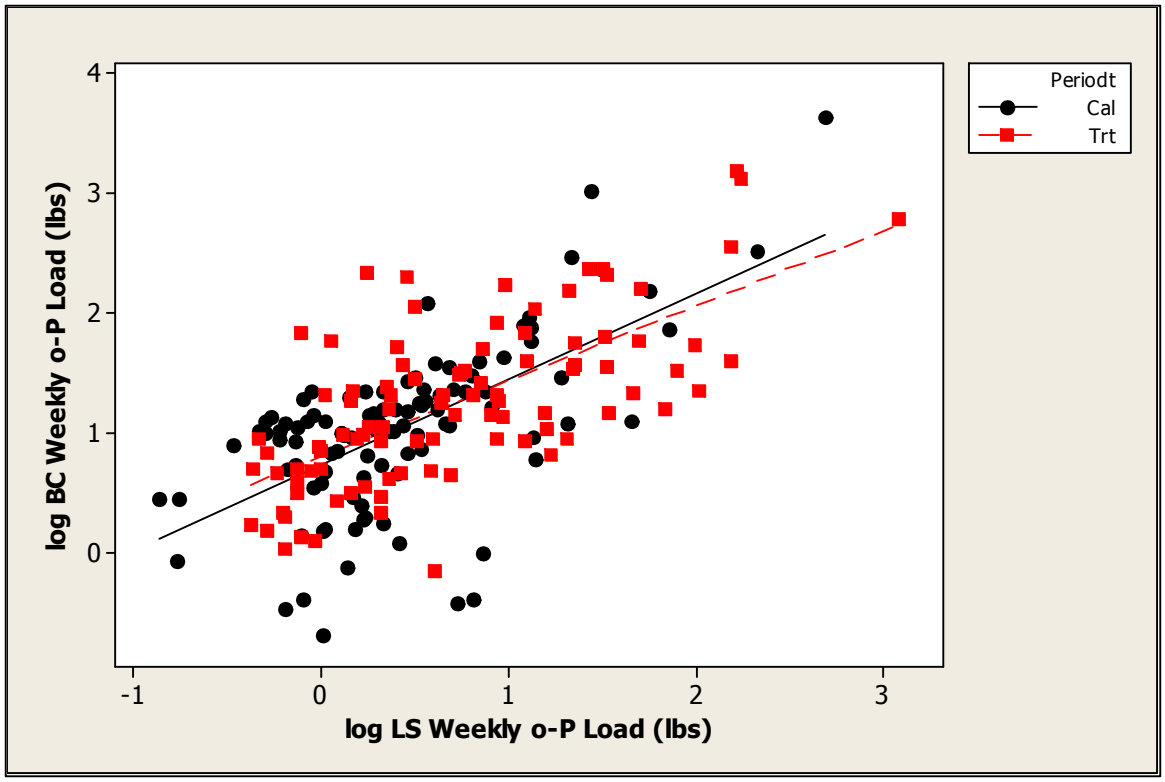
23572	23568	12/26/01	12/26/01	307.92	133.95	229.54	1.80	1.00	2.11	1.79	2.13	2.36	3.88	4.02	2.93	2.49
23774	23776	01/02/02	01/02/02	25.65	24.67	15.50	1.20	0.07	1.43	0.77	1.39	1.19	3.28	2.40	1.58	1.41
23778	23782	01/07/02	01/07/02	27.36	10.96	7.50	0.98	-0.14	1.19	0.61	1.04	0.87	3.01	2.18	1.48	1.44
23784	23788	01/14/02	01/14/02	71.90	9.77	11.31	1.16	-0.20	1.19	0.57	0.99	1.05	3.08	1.99	2.11	1.86
23792	23790	01/22/02	01/22/02	155.15	19.80	63.17	0.96	-0.20	1.19	0.03	1.30	1.80	2.93	2.24	2.01	2.19
23800	23796	01/28/02	01/28/02	438.08	35.03	12.45	1.01	-0.25	1.28	0.66	1.54	1.10	2.93	1.88	1.91	2.64
23806	23802	02/04/02	02/04/02	436.92	9.64	23.29	1.67	1.30	1.72	1.72	0.98	1.37	3.55	3.27	2.30	2.64
23812	23808	02/11/02	02/11/02	326.63	7.73	61.67	1.49	0.61	1.57	1.52	0.89	1.79	3.46	3.00	2.27	2.51
23818	23814	02/19/02	02/19/02	155.27	91.40	24.17	1.48	0.99	1.74	1.06	1.96	1.38	3.37	2.81	2.65	2.19
23824	23820	02/25/02	02/25/02	123.27	10.01	11.93	1.23	0.60	1.49	0.86	1.00	1.08	3.29	2.34	2.11	2.09
24919	24915	03/05/02	03/05/02	30.26	5.76	19.84	1.46	0.67	1.87	1.42	0.76	1.30	3.52	2.63	2.74	1.48
24925	24921	03/11/02	03/11/02	43.54	31.45	5.94	1.28	0.79	1.58	1.03	1.50	0.77	3.42	2.48	2.09	1.64
24932	24928	03/18/02	03/18/02	63.87	8.17	8.71	0.44	0.46	1.30	0.46	0.91	0.94	3.37	2.81	1.94	1.81
24974	24970	03/25/02	03/25/02	96.77	86.60	13.20	1.58	0.64	1.62	0.64	1.94	1.12	3.58	3.02	2.95	1.99
25077	25073	04/01/02	04/01/02	121.65	221.06	16.59	0.68	0.74	0.68	0.74	2.34	1.22	3.62	3.15	2.66	2.09
25084	25079	04/08/02	04/08/02	115.24	93.37	9.86	1.56	0.52	1.76	0.52	1.97	0.99	3.51	2.89	2.83	2.06
25092	25088	04/15/02	04/15/02	184.96	150.65	25.22	1.71	0.92	2.07	0.92	2.18	1.40	3.64	3.32	3.17	2.27
25122	25118	04/22/02	04/22/02	249.48	11.45	15.84	0.58	0.72	1.33	1.25	1.06	1.20	3.55	3.11	3.47	2.40
25129	25125	04/29/02	04/29/02	456.86	326.19	97.46	1.40	1.74	2.19	1.83	2.51	1.99	3.33	3.32	3.14	2.66
25195	25191	05/06/02	05/06/02	202.31	286.59	30.05	1.25	0.85	1.79	1.38	2.46	1.48	3.05	3.30	2.81	2.31
25201	25197	05/13/02	05/13/02	337.71	200.38	77.82	1.56	0.87	2.24	1.55	2.30	1.89	3.18	2.84	3.09	2.53
25210	25206	05/20/02	05/20/02	223.05	784.30	19.08	2.45	1.03	2.58	1.65	2.89	1.28	3.76	3.20	3.81	2.35
25216	25212	05/28/02	05/28/02	592.47	109.71	24.17	1.99	1.31	2.19	1.96	2.04	1.38	3.71	3.14	2.86	2.77
25255	25251	06/03/02	06/03/02	165.32	751.23	14.66	2.43	1.09	2.67	1.40	2.88	1.17	3.60	2.75	3.42	2.22
	25257	06/10/02	06/10/02	35.13	312.55	2.29	2.08	0.48	2.33	0.78	2.49	0.36	3.48	2.26	3.04	1.55
25271	25267	06/17/02	06/17/02	146.89	61.89	9.16	1.50	1.22	1.82	1.58	1.79	0.96	3.31	2.89	2.31	2.17
25281	25277	06/24/02	06/24/02	153.60	184.25	9.42	1.56	0.99	2.13	1.31	2.27	0.97	3.28	2.83	2.99	2.19
25296	25292	07/01/02	07/01/02	116.28	178.16	14.90	1.34	0.14	2.09	0.84	2.25	1.17	2.96	2.18	2.90	2.07
25304	25300	07/08/02	07/08/02	71.02	96.90	20.23	1.23	-0.07	1.99	0.60	1.99	1.31	2.85	2.05	2.82	1.85
25350	25346	07/15/02	07/15/02	55.51	76.45	4.40	1.10	-0.03	1.65	0.61	1.88	0.64	2.74	2.09	3.01	1.74
25391	25387	07/22/02	07/22/02	35.20	86.50	6.13	1.30	0.35	1.77	0.58	1.94	0.79	2.69	2.13	2.89	1.55
25532	25528	07/29/02	07/29/02	32.23	120.06	9.58	1.12	-0.40	1.31	0.20	2.08	0.98	2.82	1.95	2.56	1.51
25602	25598	08/05/02	08/05/02	32.58	96.28	12.62	1.00	0.11	1.58	0.18	1.98	1.10	2.58	1.92	2.61	1.51
		08/12/02	08/12/02	15.80	80.11	1.92	1.22	0.37	1.53	0.73	1.90	0.28	2.52	1.93	2.67	1.20
25694		08/19/02	08/19/02	51.00	86.78	6.95	1.61	1.29	1.78	1.10	1.94	0.84	2.55	2.80	2.77	1.71
25700		08/26/02	08/26/02	68.77	62.79	6.95	1.30	1.28	1.45	1.23	1.80	0.84	2.42	2.77	2.68	1.84
25749		09/03/02	09/02/02	50.78	55.37	4.08	1.12	1.03	1.36	1.10	1.74	0.61	2.35	2.49	2.48	1.71
26020	26016	10/28/02	10/28/02	8.96	6.09	0.60	0.90	-0.21	1.17	-0.04	0.78	-0.22	2.59	1.62	1.29	0.95
26026	26022	11/04/02	11/04/02	5.15	27.73	0.70	1.09	-0.28	1.28	0.03	1.44	-0.15	2.67	1.70	2.11	0.71

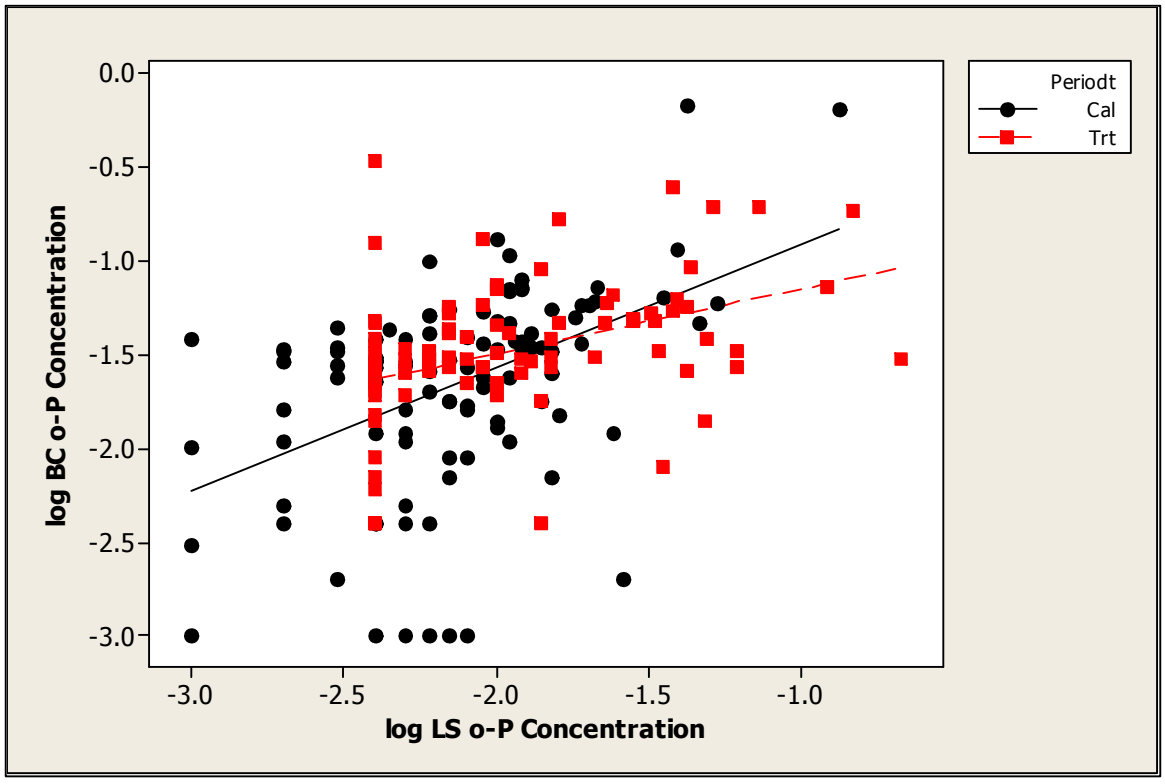
26032	26028	11/12/02	11/12/02	9.18	22.82	0.82	1.07	-0.11	1.42	0.14	1.36	-0.09	2.84	1.75	2.05	0.96	
26038	26034	11/18/02	11/18/02	10.58	5.77	0.54	0.80	-0.39	1.23	-0.18	0.76	-0.27	2.53	1.49	1.82	1.02	
26044	26040	11/25/02	11/25/02	5.41	3.34	0.74	1.07	-0.16	1.14	-0.04	0.52	-0.13	2.75	1.54	1.39	0.73	
26159	26155	12/02/02	12/02/02	18.65	6.63	0.73	0.98	-0.32	1.07	-0.21	0.82	-0.14	2.73	1.59	1.63	1.27	
26165	26161	12/09/02	12/09/02	5.72	5.34	0.78	0.98	-0.23	1.06	0.12	0.73	-0.11	2.67	1.64	1.88	0.76	
26169	26167	12/16/02	12/16/02	4.95	4.26	0.68	1.15	-0.35	1.27	0.28	0.63	-0.17	2.85	1.60	1.49	0.69	
		12/23/02	12/23/02	17.40	5.58	2.37	0.98	0.22	1.10	0.74	0.75	0.38	2.80	2.17	1.32	1.24	
26183	26179	12/30/02	12/30/02	21.13	8.49	2.88	1.01	0.34	1.11	0.71	0.93	0.46	2.91	2.29	1.33	1.32	
26560	26556	01/06/03	01/06/03	23.21	14.36	3.17	1.05	0.02	1.30	1.19	1.16	0.50	2.78	2.29	1.44	1.37	
26566	26562	01/13/03	01/13/03	5.28	2.95	2.43	0.99	-0.09	1.15	0.78	0.47	0.39	2.79	2.44	1.40	0.72	
	26568	01/20/03	01/21/03	16.92	2.70	2.31	0.75	-0.11	1.05	-0.11	0.43	0.36	2.75	2.17	1.33	1.23	
		01/27/03	01/27/03	11.87	2.64	1.62	0.59	-0.27	1.00	-0.27	0.42	0.21	2.74	1.95	1.30	1.07	
26727	26723	02/03/03	02/03/03	12.90	2.52	1.76	0.33	-0.23	0.94	-0.23	0.40	0.25	2.72	1.96	1.27	1.11	
		02/11/03	02/10/03	21.21	3.02	2.89	0.25	-0.02	0.76	-0.02	0.48	0.46	2.77	2.16	1.34	1.33	
26742	26738	02/18/03	02/18/03	33.73	3.70	4.60	0.09	0.19	0.09	0.19	0.57	0.66	2.84	2.34	1.43	1.53	
		02/25/03	02/24/03	31.54	4.91	4.30	0.43	0.16	0.85	0.16	0.69	0.63	3.04	2.42	1.56	1.50	
27185	27181	03/03/03	03/03/03	44.08	4.40	6.01	0.52	0.30	1.05	0.30	0.64	0.78	3.05	2.66	1.51	1.64	
27242	27238	03/10/03	03/10/03	49.86	7.11	6.80	0.37	0.36	1.03	0.36	0.85	0.83	3.41	2.80	1.72	1.70	
27272	27268	03/17/03	03/17/03	19.93	5.13	2.72	0.23	-0.04	0.23	-0.04	0.71	0.43	3.30	2.34	1.58	1.30	
27276	27274	03/24/03	03/24/03	47.83	5.94	6.52	0.30	0.34	1.32	0.34	0.77	0.81	3.09	2.64	1.64	1.68	
	27280	03/31/03	03/31/03	13.14	7.62	1.79	0.81	-0.22	1.40	0.01	0.88	0.25	3.17	2.17	1.65	1.12	
27369	27373	04/07/03	04/07/03	40.45	8.43	5.52	1.00	0.26	1.43	0.95	0.93	0.74	3.20	2.62	1.61	1.61	
27377	27379	04/14/03	04/14/03	23.48	4.59	3.20	0.89	0.03	1.59	1.29	0.66	0.51	3.08	2.33	1.53	1.37	
27382	27384	04/21/03	04/21/03	59.97	4.25	2.79	0.56	-0.03	1.43	1.11	0.63	0.45	2.93	2.24	1.72	1.78	
27488	27484	04/28/03	04/28/03	11.01	4.97	1.02	0.22	-0.47	1.52	0.70	0.70	0.01	3.00	1.66	1.56	1.04	
27494	27490	05/05/03	05/05/03	24.71	16.98	8.58	0.77	0.05	1.31	0.28	1.23	0.93	2.87	2.23	1.70	1.39	
27500	27496	05/12/03	05/12/03	47.22	12.10	11.22	0.95	0.42	0.98	0.67	1.08	1.05	2.78	2.08	2.04	1.67	
27506	27502	05/19/03	05/19/03	330.00	69.82	47.61	2.25	1.49	2.25	1.75	1.84	1.68	3.68	3.07	2.65	2.52	
27512	27508	05/27/03	05/27/03	234.49	71.93	35.42	2.12	1.22	2.05	1.76	1.86	1.55	3.77	3.00	2.56	2.37	
27585	27581	06/02/03	06/02/03	73.96	18.66	22.53	0.28	0.66	2.09	1.55	1.27	1.35	3.10	2.72	2.31	1.87	
27591	27587	06/09/03	06/09/03	99.88	24.08	7.96	1.62	0.38	2.03	1.78	1.38	0.90	3.45	2.46	2.70	2.00	
27597	27593	06/16/03	06/16/03	57.21	5.40	4.31	1.12	0.30	1.74	1.19	0.73	0.63	3.08	2.26	2.20	1.76	
27603	27599	06/23/03	06/23/03	37.36	3.95	3.82	0.72	-0.15	1.64	1.01	0.60	0.58	1.53	2.07	2.27	1.57	
27608	27605	06/30/03	06/30/03	142.69	3.58	3.13	0.08	0.02	1.74	1.35	0.55	0.50	2.77	2.12	2.54	2.15	
27768	27765	07/07/03	07/07/03	46.64	15.83	2.91	0.91	0.39	1.59	1.28	1.20	0.46	2.60	2.11	2.42	1.67	
27820	27817	07/14/03	07/14/03	15.48	10.57	3.78	0.81	0.34	1.63	1.03	1.02	0.58	2.52	1.95	2.07	1.19	
		09/08/03	09/08/03	42.18	6.38	9.22	1.15	0.91	1.62	1.61	0.80	0.96	2.86	2.53	1.47	1.63	Trt
28211		09/15/03	09/15/03	16.20	7.17	2.21	0.46	0.32	1.23	1.03	0.86	0.34	2.28	2.00	1.38	1.21	Trt
	28350	10/13/03	10/13/03	28.49	3.96	1.41	0.94	-0.33	1.41	0.90	0.60	0.15	2.54	1.68	1.28	1.45	Trt

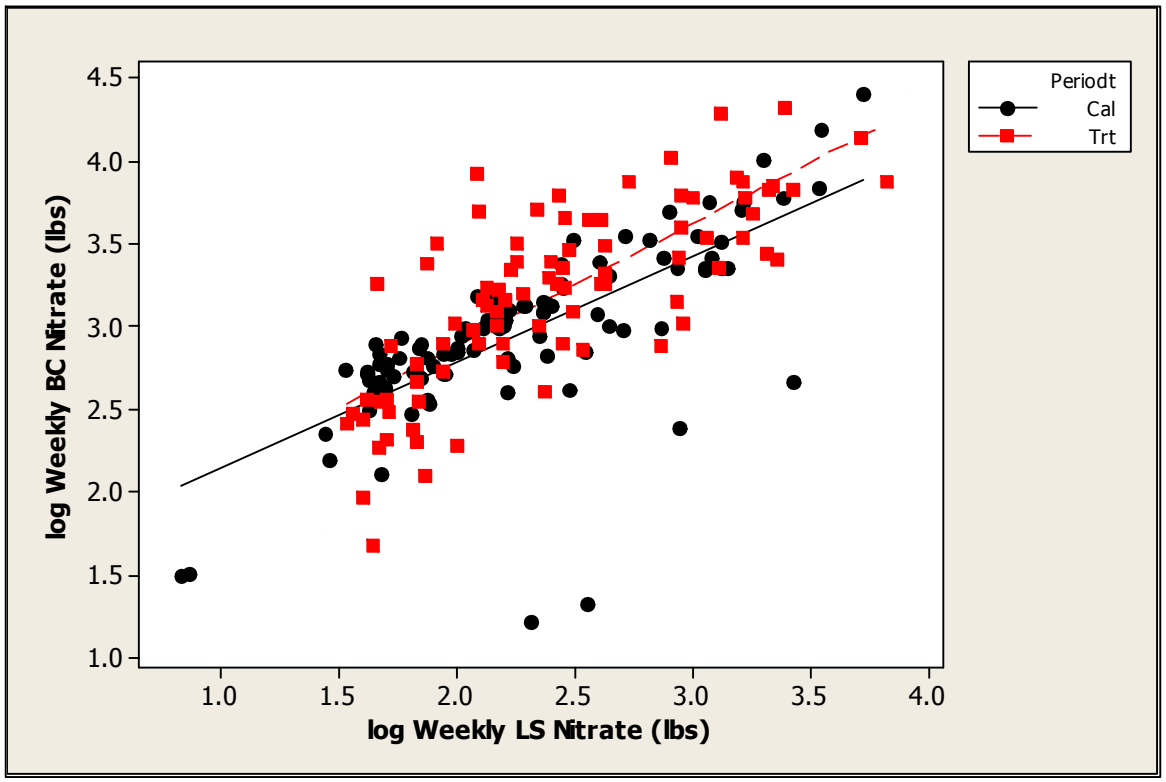
	28495	11/10/03	11/10/03	11.08	5.39	1.51	0.95	0.94	1.14	0.87	0.73	0.18	2.56	1.62	1.33	1.04	Trt
	28501	11/17/03	11/17/03	43.42	8.32	14.18	0.83	-0.29	1.34	0.90	0.92	1.15	2.67	1.83	1.32	1.64	Trt
	28511	11/24/03	11/24/03	38.13	4.32	5.20	0.68	0.59	0.88	1.38	0.64	0.72	2.61	2.37	1.24	1.58	Trt
	28513	12/01/03	12/01/03	23.98	5.98	3.27	0.94	0.60	1.38	1.23	0.78	0.51	2.79	2.19	1.38	1.38	Trt
28561	28558	12/08/03	12/08/03	16.38	1.77	2.23	0.58	-0.13	1.16	1.05	0.25	0.35	2.55	1.84	1.11	1.21	Trt
		12/15/03	12/15/03	20.37	7.17	2.78	1.05	0.26	1.44	1.17	0.86	0.44	2.98	2.07	1.46	1.31	Trt
		12/22/03	12/22/03	21.60	7.45	2.95	0.87	-0.01	1.43	1.12	0.87	0.47	3.16	2.11	1.47	1.33	Trt
28645	28641	12/29/03	12/29/03	20.63	1.89	2.81	0.10	-0.03	1.20	1.22	0.28	0.45	2.73	1.94	1.14	1.31	Trt
29369	29371	01/05/04	01/05/04	37.93	4.47	9.27	0.55	0.24	1.29	1.43	0.65	0.97	2.90	2.45	1.26	1.58	Trt
	29412	01/12/04	01/12/04	34.32	9.23	4.68	1.14	0.72	1.60	2.43	0.97	0.67	3.23	2.46	1.57	1.54	Trt
29451	29449	01/20/04	01/20/04	153.92	53.10	53.43	2.36	1.50	2.50	2.05	1.73	1.73	3.68	3.25	2.92	2.19	Trt
29489	29490	01/26/04	01/26/04	79.96	12.38	10.90	1.70	0.86	2.05	1.94	1.09	1.04	3.78	3.00	1.96	1.90	Trt
29534	29535	02/02/04	02/02/04	204.93	5.76	27.94	1.13	0.97	1.64	2.14	0.76	1.45	3.40	3.36	1.63	2.31	Trt
29553	29554	02/09/04	02/09/04	32.29	10.26	4.40	1.35	0.17	1.84	1.29	1.01	0.64	3.65	2.56	2.46	1.51	Trt
29607		02/17/04	02/16/04	29.31	24.20	18.46	0.98	0.12	1.59	1.31	1.38	1.27	3.35	2.45	1.59	1.47	Trt
	29657	02/24/04	02/23/04	27.58	13.65	6.74	0.81	1.23	1.62	1.34	1.14	0.83	3.29	2.39	1.96	1.44	Trt
29705	29703	03/01/04	03/01/04	16.44	3.68	4.02	0.49	-0.13	1.54	1.02	0.57	0.60	3.12	2.13	2.04	1.22	Trt
	29728	03/08/04	03/08/04	1846.91	620.16	120.05	3.12	2.24	3.30	2.90	2.79	2.08	4.14	3.71	2.62	3.27	Trt
	29731	03/15/04	03/15/04	281.05	48.24	87.44	1.80	1.52	2.08	2.16	1.68	1.94	3.85	3.34	2.34	2.45	Trt
	29775	03/22/04	03/22/04	111.64	11.32	151.64	1.33	1.66	1.77	1.81	1.05	2.18	3.41	2.94	1.92	2.05	Trt
	29813	03/29/04	03/29/04	95.01	44.07	8.33	2.31	1.53	2.51	1.80	1.64	0.92	3.88	2.73	2.94	1.98	Trt
	30043	04/05/04	04/05/04	227.99	27.37	73.28	1.73	2.00	2.35	2.21	1.44	1.86	3.83	3.32	2.11	2.36	Trt
	30046	04/12/04	04/12/04	115.30	13.40	40.02	1.54	1.53	1.69	1.83	1.13	1.60	3.35	3.11	1.91	2.06	Trt
	30049	04/19/04	04/19/04	183.83	10.90	6.07	1.17	1.54	1.60	1.52	1.04	0.78	3.26	1.66	1.86	2.26	Trt
	30130	04/26/04	04/27/04	1384.91	96.44	46.93	1.59	2.19	2.74	2.60	1.98	1.67	4.32	3.39	3.03	3.14	Trt
	30174	05/03/04	05/03/04	211.58	88.99	28.85	2.23	0.98	2.84	2.23	1.95	1.46	4.29	3.12	2.55	2.33	Trt
	30203	05/10/04	05/10/04	136.03	42.99	73.45	1.83	1.09	2.36	2.01	1.63	1.87	4.02	2.91	2.31	2.13	Trt
30221	30219	05/17/04	05/17/04	39.14	119.43	29.19	2.33	0.25	2.55	1.40	2.08	1.47	3.79	2.43	2.60	1.59	Trt
	30231	05/24/04	05/24/04	299.19	46.48	137.13	1.51	1.90	1.95	2.17	1.67	2.14			2.06	2.48	Trt
30315	30313	06/01/04	06/01/04	1145.57	4.30	19.79	0.95	1.31	1.31	2.52	0.63	1.30			1.62	3.06	Trt
30373	30371	06/07/04	06/07/04	17.24	3.34	4.43	0.95	0.19	1.21	1.10	0.52	0.65			1.11	1.24	Trt
30397	30395	06/14/04	06/14/04	19.39	5.22	4.99	0.68	-0.05	1.34	1.20	0.72	0.70			1.19	1.29	Trt
30432	30433	06/21/04	06/21/04	22.84	13.49	13.51	-0.16	0.61	1.28	1.16	1.13	1.13			1.18	1.36	Trt
30438	30436	06/28/04	06/28/04	33.52	10.67	18.96	1.03	1.21	1.33	1.45	1.03	1.28			1.19	1.53	Trt
30553	30551	07/06/04	07/06/04	2826.89	1041.71	240.98	3.19	2.22	3.60	2.82	3.02	2.38			3.79	3.45	Trt
30552	30558	07/12/04	07/12/04	237.83	237.56	110.08	2.55	2.19	2.96	2.28	2.38	2.04			3.15	2.38	Trt
30588	30589	07/19/04	07/19/04	161.08	3.48	182.24	1.20	1.83	1.64	2.14	0.54	2.26	3.02	2.96	1.41	2.21	Trt
30611	30612	07/26/04	07/26/04	619.18	12.57	32.68	1.56	1.35	1.86	1.73	1.10	1.51	3.26	2.42	2.33	2.79	Trt
30775	30776	08/02/04	08/02/04	138.31	23.60	4.31	1.27	0.16	1.80	1.51	1.37	0.63	3.24	2.13	2.27	2.14	Trt

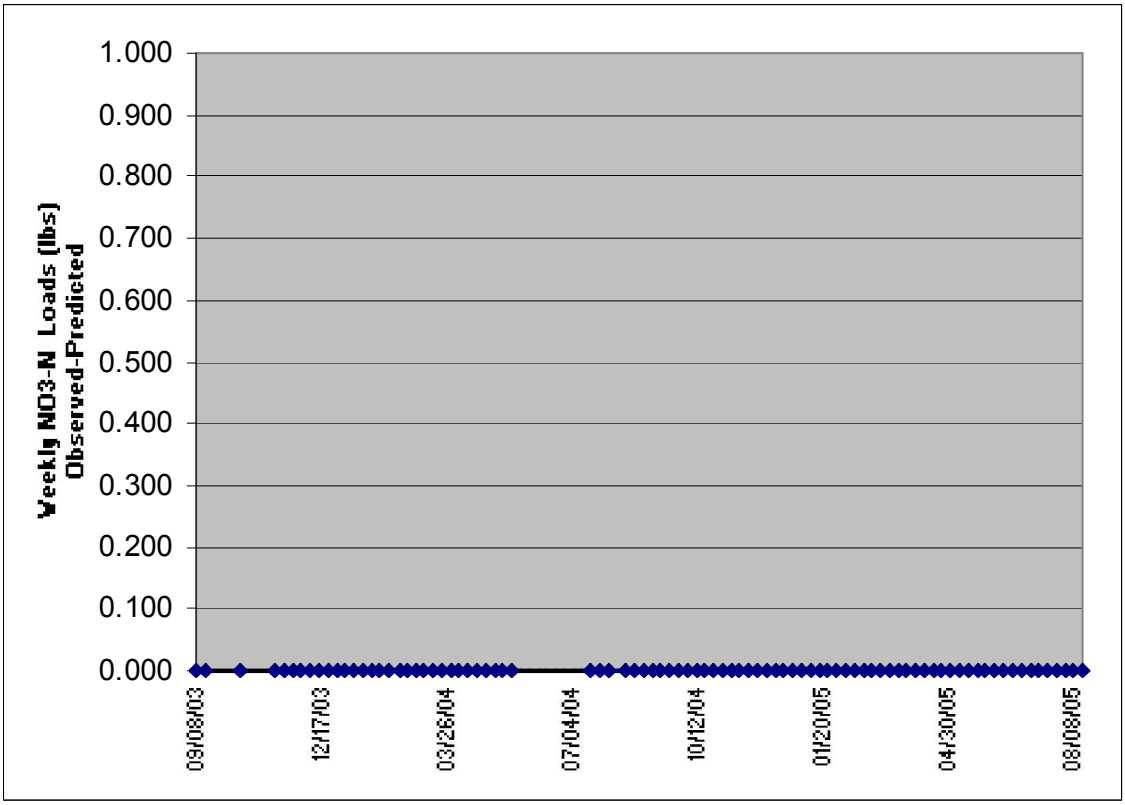
30784		08/09/04	08/09/04	59.90	4.64	3.04	1.31	0.81	2.03	1.27	0.67	0.48			2.62	1.78	Trt
30787		08/16/04	08/16/04	16.11	4.00	2.20	1.32	0.94	1.76	1.02	0.60	0.34	2.90	1.94	2.10	1.21	Trt
	30818	08/23/04	08/23/04	24.48	4.05	3.34	1.27	0.95	1.58	1.36	0.61	0.52	3.02	1.99	1.48	1.39	Trt
	30873	08/30/04	08/30/04	29.39	3.92	2.40	0.12	-0.10	1.59	1.29	0.59	0.38	3.00	2.17	1.47	1.47	Trt
	30974	09/06/04	09/07/04	58.56	3.20	1.94	0.03	-0.19	1.38	0.99	0.51	0.29	2.88	1.72	1.76	1.77	Trt
30992	30990	09/13/04	09/13/04	43.28	1.66	1.31	0.70	-0.36	1.46	0.77	0.22	0.12	2.44	1.60	2.10	1.64	Trt
31007	31008	09/20/04	09/20/04	84.78	5.38	44.75	0.65	0.69	1.31	1.17	0.73	1.65	2.47	1.56	1.81	1.93	Trt
31046	31044	09/27/04	09/27/04	21.96	7.22	9.56	0.66	0.43	1.12	0.92	0.86	0.98	2.41	1.53	1.58	1.34	Trt
31158	31159	10/04/04	10/04/04	11.49	3.62	4.87	0.32	0.32	0.98	0.95	0.56	0.69	2.27	1.67	0.96	1.06	Trt
31198	31199	10/11/04	10/11/04	11.34	5.48	1.55	0.49	0.16	1.05	0.90	0.74	0.19	2.32	1.70	1.04	1.05	Trt
31210	31211	10/18/04	10/18/04	14.92	1.71	2.03	0.61	0.36	1.19	0.98	0.23	0.31	2.38	1.81	1.46	1.17	Trt
31221	31222	10/25/04	10/25/04	12.87	2.04	1.75	0.66	-0.23	1.16	0.90	0.31	0.24	2.49	1.71	1.49	1.11	Trt
31290	31288	11/02/04	11/02/04	282.95	61.87	38.58	2.19	1.71	2.67	2.21	1.79	1.59	3.44	3.31	3.33	2.45	Trt
31300		11/08/04	11/09/04	160.95	9.33	21.95	1.76	1.70	2.03	1.78	0.97	1.34	3.54	3.21	1.84	2.21	Trt
31304		11/15/04	11/16/04	87.35	2.20	11.91	0.93	1.09	1.30	1.63	0.34	1.08	2.88	2.86	1.55	1.94	Trt
31328	31329	11/22/04	11/22/04	162.37	6.29	8.61	2.30	0.46	2.67	1.63	0.80	0.94	3.32	2.63	1.98	2.21	Trt
31333	31334	11/29/04	11/29/04	60.91	13.19	8.31	1.56	0.44	1.97	1.46	1.12	0.92	3.65	2.61	2.67	1.78	Trt
31391	31392	12/06/04	12/06/04	108.00	183.62	24.99	2.03	1.14	2.36	1.81	2.26	1.40	3.79	2.95	2.42	2.03	Trt
31436	31435	12/13/04	12/13/04	163.17	48.74	109.09	2.18	1.32	2.39	1.91	1.69	2.04	3.90	3.19	2.63	2.21	Trt
31466	31467	12/20/04	12/20/04	463.17	93.84	58.51	1.91	0.94	2.22	2.04	1.97	1.77	3.88	3.21	2.75	2.67	Trt
	31475	12/27/04	12/27/04	53.56	41.00	26.16	1.48	0.74	1.91	1.38	1.61	1.42	3.49	2.63	2.48	1.73	Trt
31698		01/03/05	01/03/05	31.65	14.73	21.98	0.93	0.51	1.51	1.31	1.17	1.34	3.01	2.35	2.11	1.50	Trt
31727	31728	01/10/05	01/10/05	5256.64	247.47	574.95	2.79	3.08	3.07	3.28	2.39	2.76	3.87	3.82	2.89	3.72	Trt
31814	31815	01/18/05	01/18/05	234.06	18.84	31.92	2.37	1.43	2.66	2.19	1.28	1.50	3.83	3.42	2.50	2.37	Trt
31817	31818	01/24/05	01/24/05	174.91	12.92	23.85	1.74	1.35	2.02	2.01	1.11	1.38	3.78	3.22	1.98	2.24	Trt
31820	31821	01/31/05	01/31/05	66.87	11.15	4.17	1.51	0.77	1.99	1.16	1.05	0.62	3.66	2.46	2.60	1.83	Trt
31925	31923	02/07/05	02/07/05	22.92	8.29	3.13	1.32	0.65	1.84	1.14	0.92	0.49	3.50	2.25	1.78	1.36	Trt
	31954	02/14/05	02/14/05	35.92	16.63	4.90	1.20	0.36	1.73	1.51	1.22	0.69	3.46	2.47	1.82	1.56	Trt
31989	31990	02/22/05	02/22/05	57.15	5.67	191.79	1.25	0.64	1.45	0.98	0.75	2.28	3.26	2.61	2.16	1.76	Trt
32026	32024	02/28/05	02/28/05	38.80	7.84	5.29	1.35	2.02	1.67	1.40	0.89	0.72	3.39	2.40	2.28	1.59	Trt
32063	32064	03/07/05	03/07/05	63.13	119.02	8.61	1.49	0.75	1.71	1.37	2.08	0.93	3.26	2.63	2.26	1.80	Trt
32076		03/14/05	03/15/05	46.89	4.30	6.39	1.04	0.33	1.73	1.26	0.63	0.81	3.09	2.49	2.30	1.67	Trt
32112	32113	03/21/05	03/21/05	22.20	3.33	3.03	0.84	0.00	1.37	1.02	0.52	0.48	3.20	2.28	1.61	1.35	Trt
32152	32153	03/28/05	03/28/05	21.40	7.34	2.92	0.98	0.22	1.45	0.97	0.87	0.47	3.09	2.17	1.46	1.33	Trt
32242		04/04/05	04/04/05	133.06	5.76	18.15	1.17	1.19	1.48	1.44	0.76	1.26	3.15	2.93	1.63	2.12	Trt
32246	32244	04/11/05	04/11/05	164.03	13.31	22.37	1.59	1.10	1.79	1.10	1.12	1.35	3.54	3.06	1.99	2.21	Trt
32248	32249	04/18/05	04/18/05	111.22	28.51	15.17	1.41	0.85	1.84	1.39	1.45	1.18	3.60	2.95	1.88	2.05	Trt
32281	32279	04/25/05	04/25/05	39.97	54.60	5.45	1.71	0.41	2.35	1.07	1.74	0.74	3.71	2.34	2.46	1.60	Trt
32372	32370	05/02/05	05/02/05	28.78	24.60	3.92	1.38	0.35	1.85	0.89	1.39	0.59	3.39	2.25	1.82	1.46	Trt

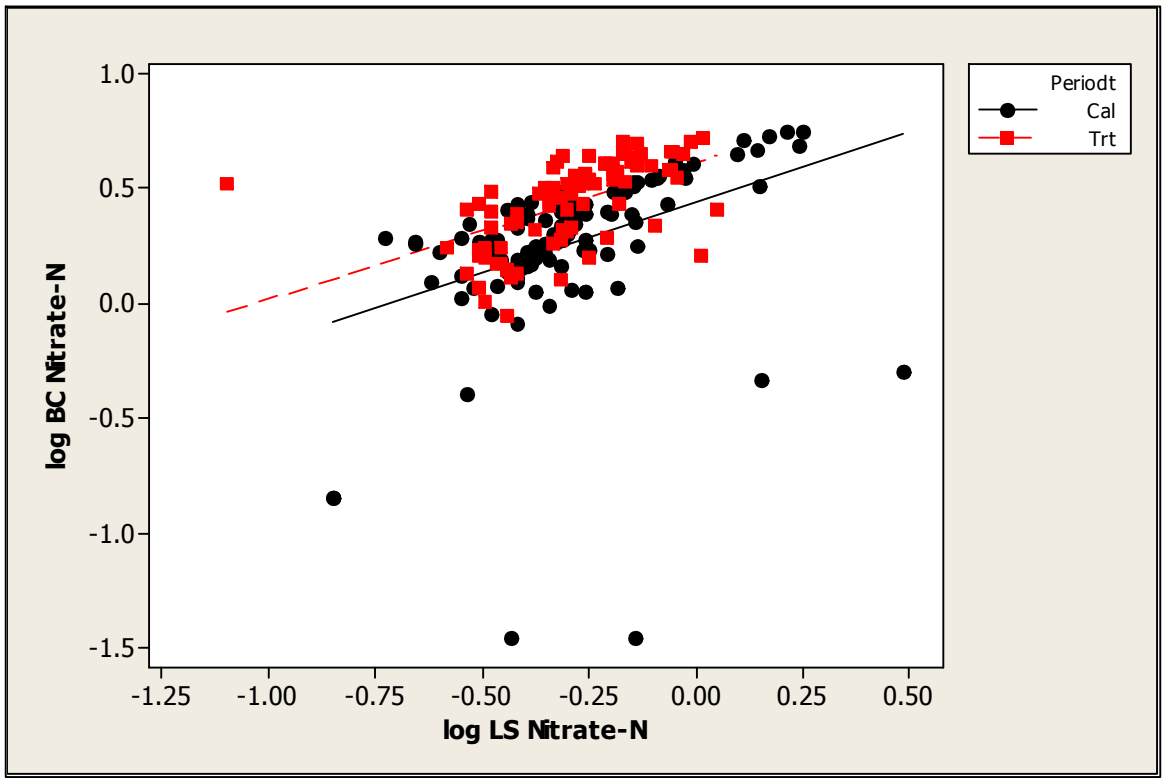
32374	32375	05/09/05	05/09/05	26.84	15.30	3.66	0.93	0.32	1.44	1.00	1.18	0.56	2.89	2.19	1.34	1.43	Trt
32469	32470	05/16/05	05/16/05	24.75	380.29	3.38	2.04	0.50	2.41	0.90	2.58	0.53	3.93	2.08	2.43	1.39	Trt
32472	32473	05/23/05	05/23/05	25.40	228.46	3.46	1.77	0.06	1.95	0.06	2.36	0.54	3.69	2.09	2.74	1.40	Trt
	32665	05/30/05	05/31/05	26.25	9.95	3.58	1.31	0.37	1.79	0.53	1.00	0.55	3.16	2.20	2.17	1.42	Trt
32513	32511	06/06/05	06/06/05	17.01	80.39	2.32	1.83	-0.11	2.35	0.75	1.91	0.37	3.50	1.91	2.05	1.23	Trt
32550		06/13/05	06/13/05	27.17	11.15	3.70	1.45	0.50	1.82	0.96	1.05	0.57	3.34	2.23	2.71	1.43	Trt
32560	32558	06/20/05	06/20/05	23.14	117.25	3.16	1.32	0.02	1.45	0.51	2.07	0.50	3.22	2.18	1.78	1.36	Trt
32696	32694	06/27/05	06/27/05	14.29	106.14	4.23	1.53	1.34	1.60	1.83	2.03	0.63	2.78	1.83	2.48	1.16	Trt
32710	32711	07/05/05	07/05/05	16.31	278.62	2.22	0.69	-0.13	2.18	0.35	2.45	0.35	3.38	1.87	2.03	1.21	Trt
32748	32746	07/11/05	07/11/05	24.12	12.87	1.28	0.23	-0.37	1.36	0.40	1.11	0.11	2.89	2.09	1.57	1.38	Trt
32750	32751	07/18/05	07/18/05	11.21	35.68	1.53	0.17	-0.29	1.19	0.75	1.55	0.18	2.56	1.70	1.28	1.05	Trt
32753	32754	07/25/05	07/25/05	13.97	10.92	1.91	0.32	-0.20	0.99	0.10	1.04	0.28	2.30	1.83	1.06	1.15	Trt
33115	33113	08/02/05	08/02/05	15.67	19.69	2.14	0.69	0.00	1.05	0.72	1.29	0.33	2.10	1.86	1.94	1.20	Trt
33125	33123	08/08/05	08/08/05	9.98	9.84	1.36	0.29	-0.19	0.73	0.56	0.99	0.13	1.96	1.60	1.83	1.00	Trt
33172	33170	08/15/05	08/15/05	10.61	14.68	1.45	0.43	0.09	0.76	0.09	1.17	0.16	1.68	1.64	1.25	1.03	Trt

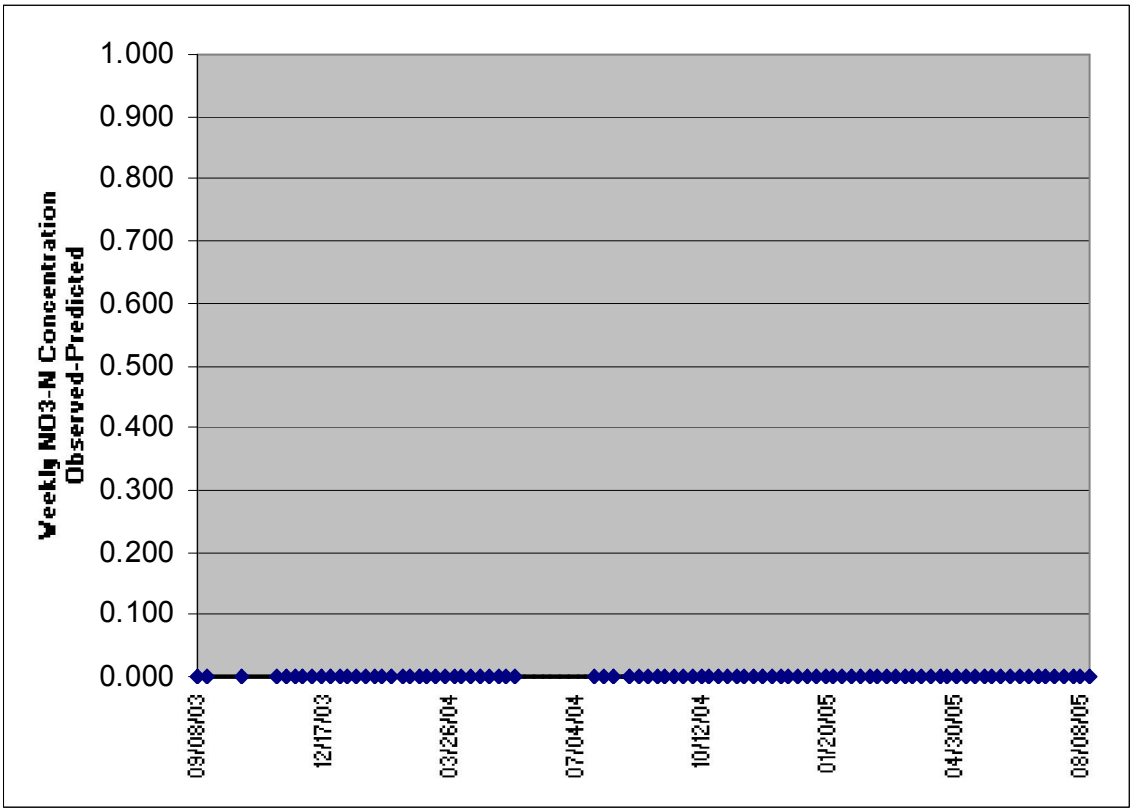

log BC Weekly o-P Load (lbs)
log LS Weekly o-P Load (lbs)
Periodt
Cal
Trt
4
3
2
1
0
-1
0
1
2
3

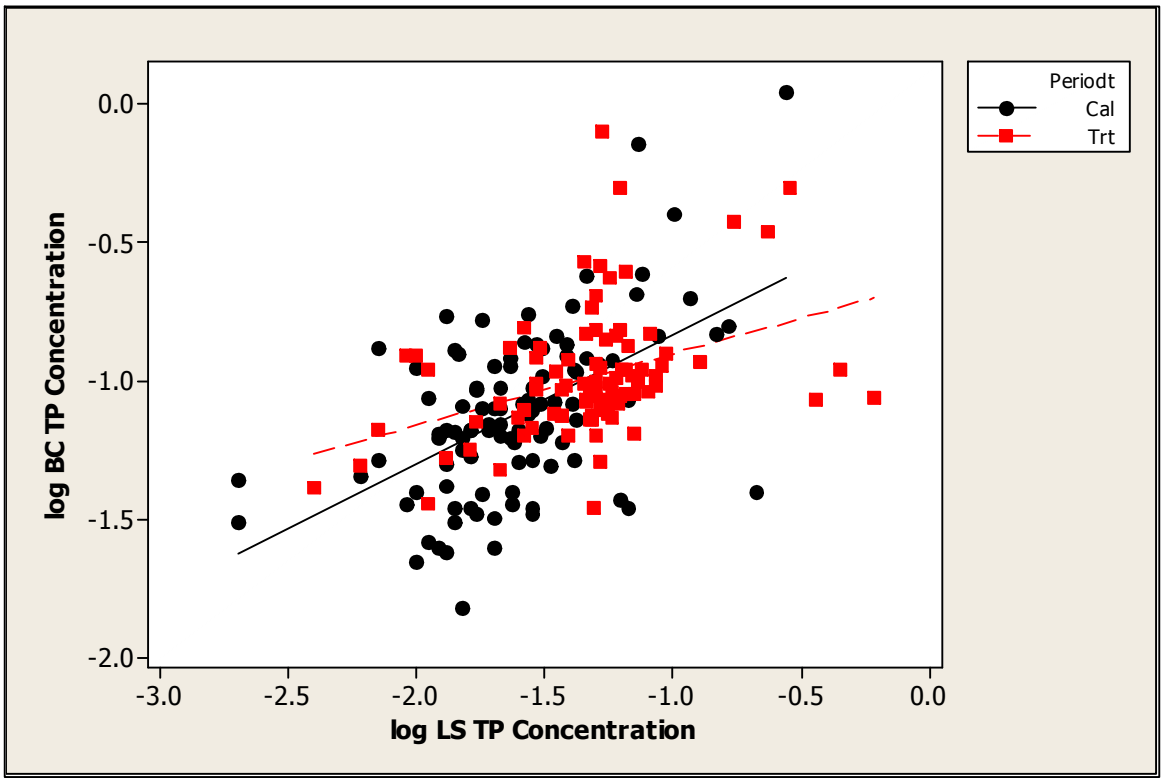

log BC o-P Concentration
log LS o-P Concentration
Periodt
Cal
Trt
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.0
-2.5
-2.0
-1.5
-1.0

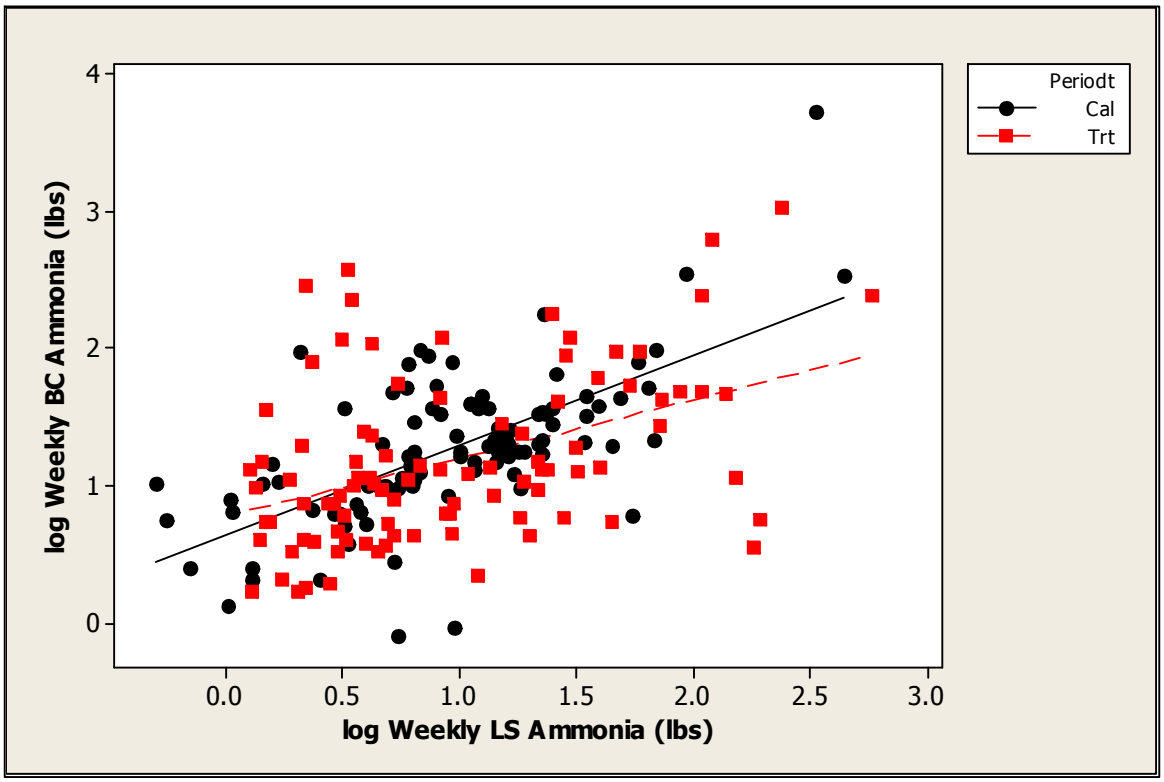

log Weekly BC Nitrate (lbs)
log Weekly LS Nitrate (lbs)
Periodt
Cal
Trt
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0

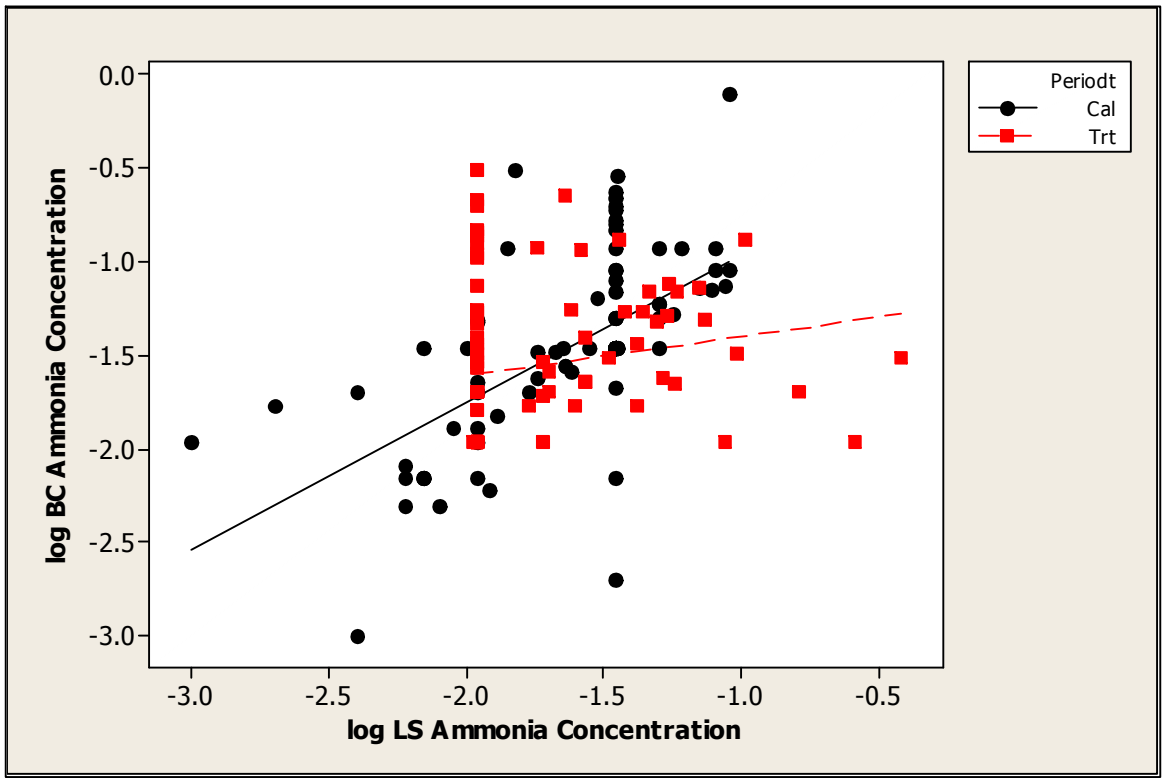

Weekly NO3-N Loads (lbs)
Observed-Predicted
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
09/08/03
12/17/03
03/26/04
07/04/04
10/12/04
01/20/05
04/30/05
08/08/05

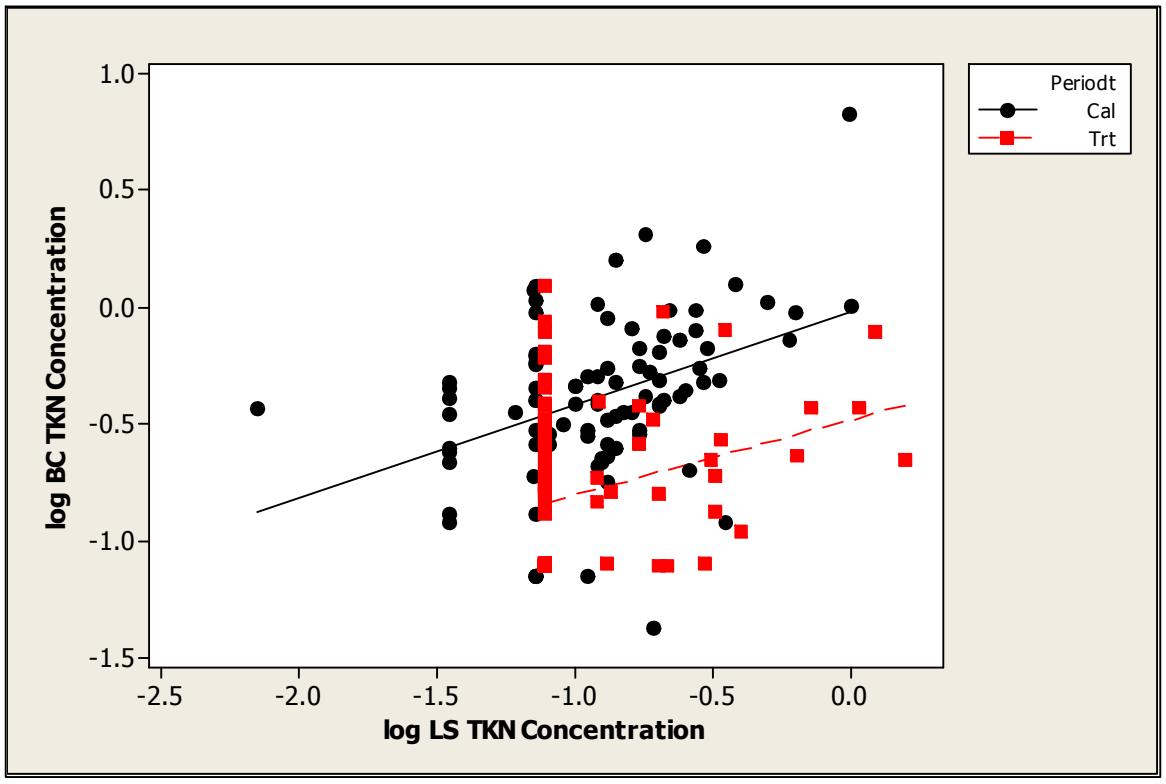

log BC Nitrate-N
log LS Nitrate-N
1.0
0.5
0.0
-0.5
-1.0
-1.5
-1.25
-1.00
-0.75
-0.50
-0.25
0.00
0.25
0.50
Periodt
Cal
Trt

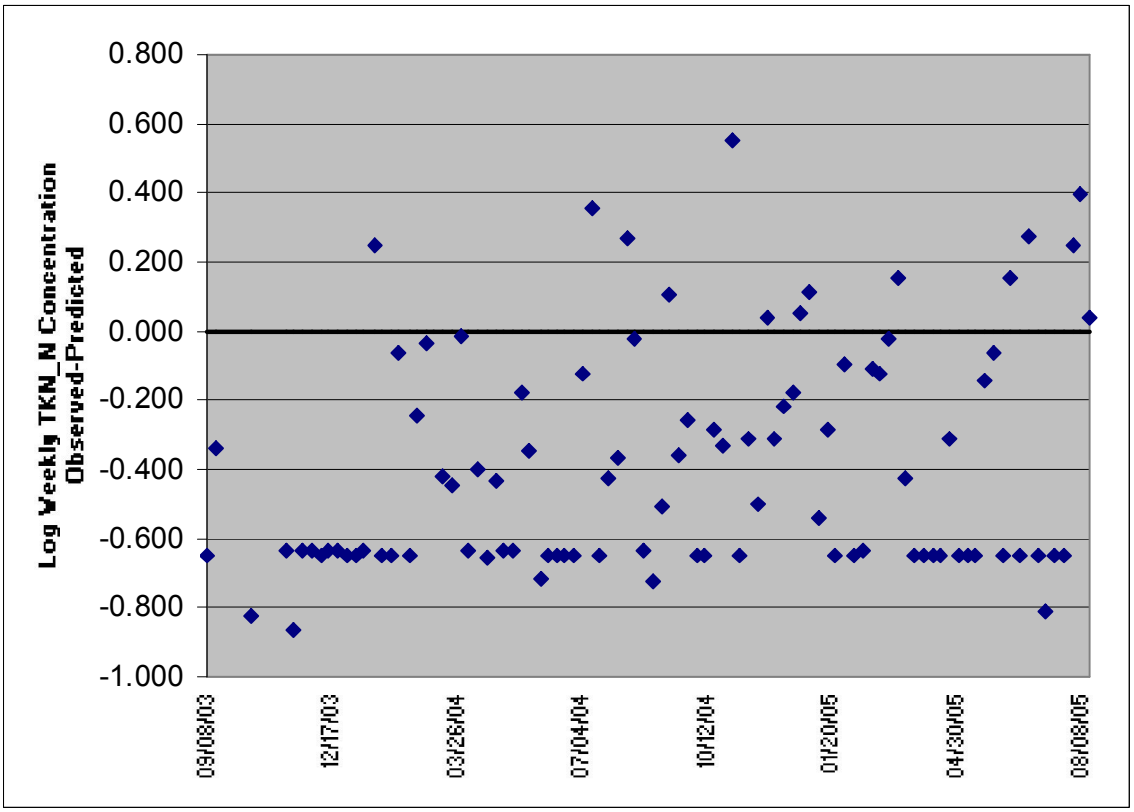

Weekly NO3-N Concentration
Observed-Predicted
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
09/08/03
12/17/03
03/26/04
07/04/04
10/12/04
01/20/05
04/30/05
08/08/05

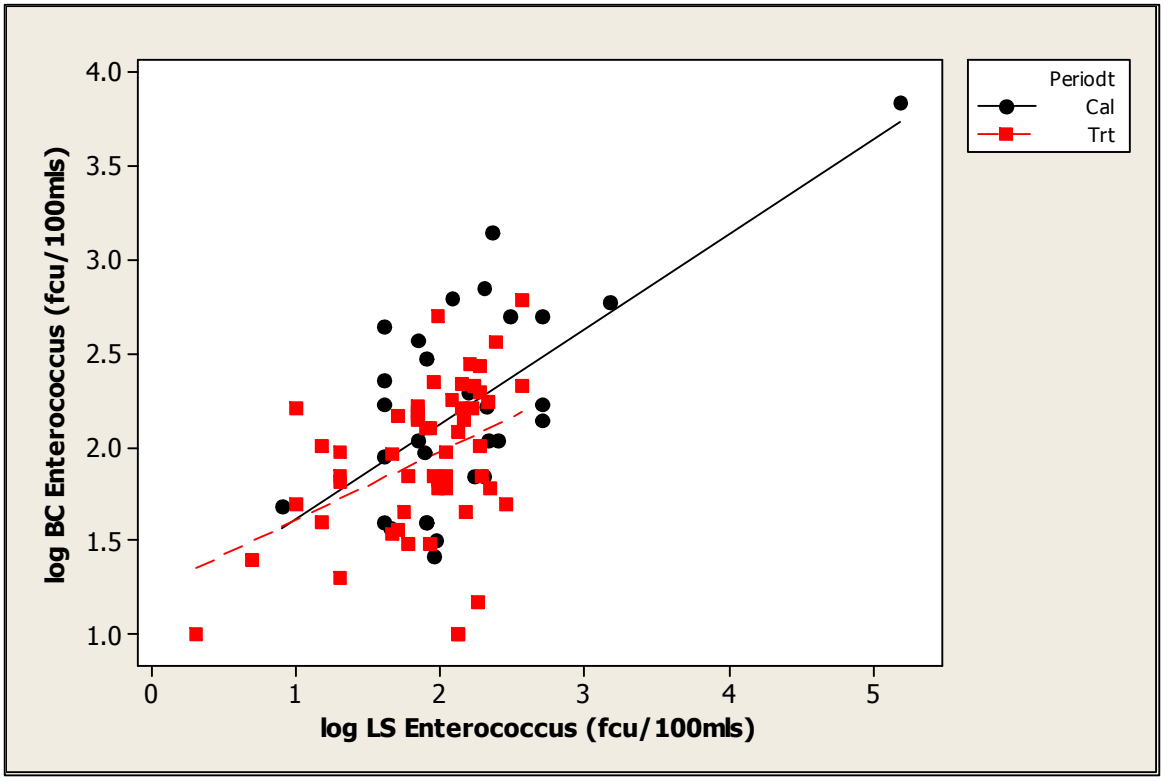

Periodt
Cal
Trt
log BC TP Concentration
0.0
-0.5
-1.0
-1.5
-2.0
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
log LS TP Concentration

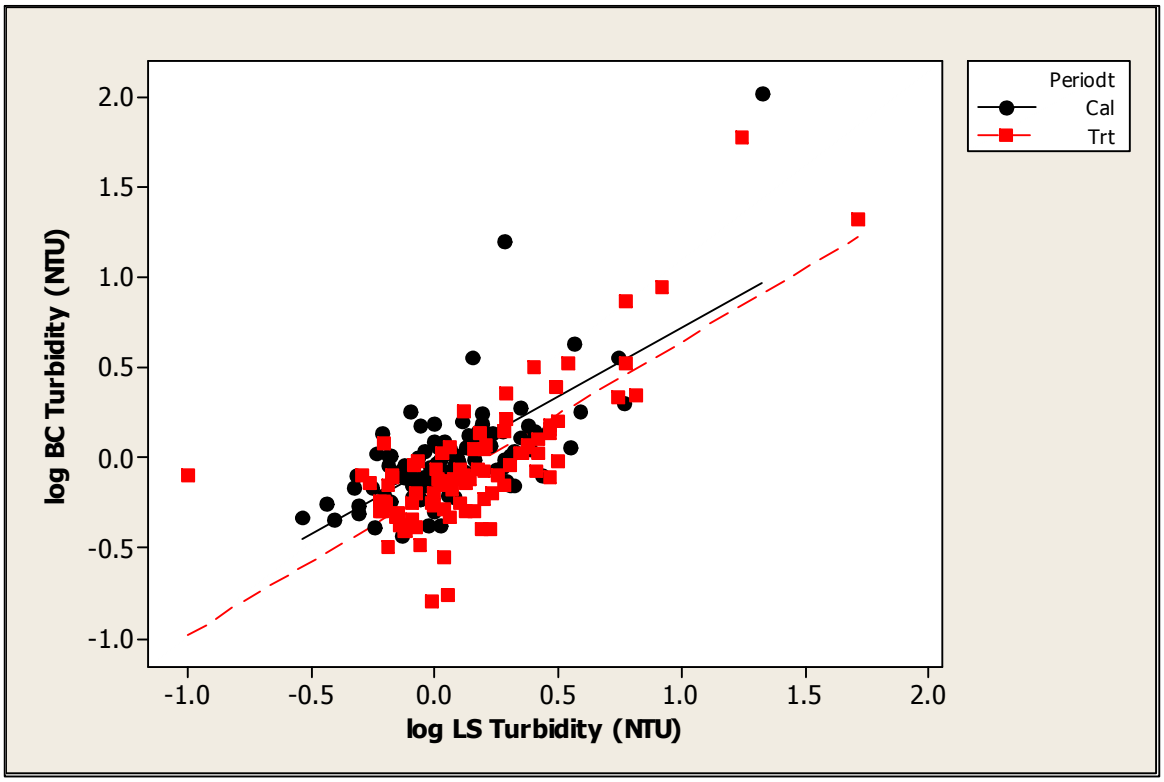

Periodt
Cal
Trt
log Weekly BC Ammonia (lbs)
4
3
2
1
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
log Weekly LS Ammonia (lbs)

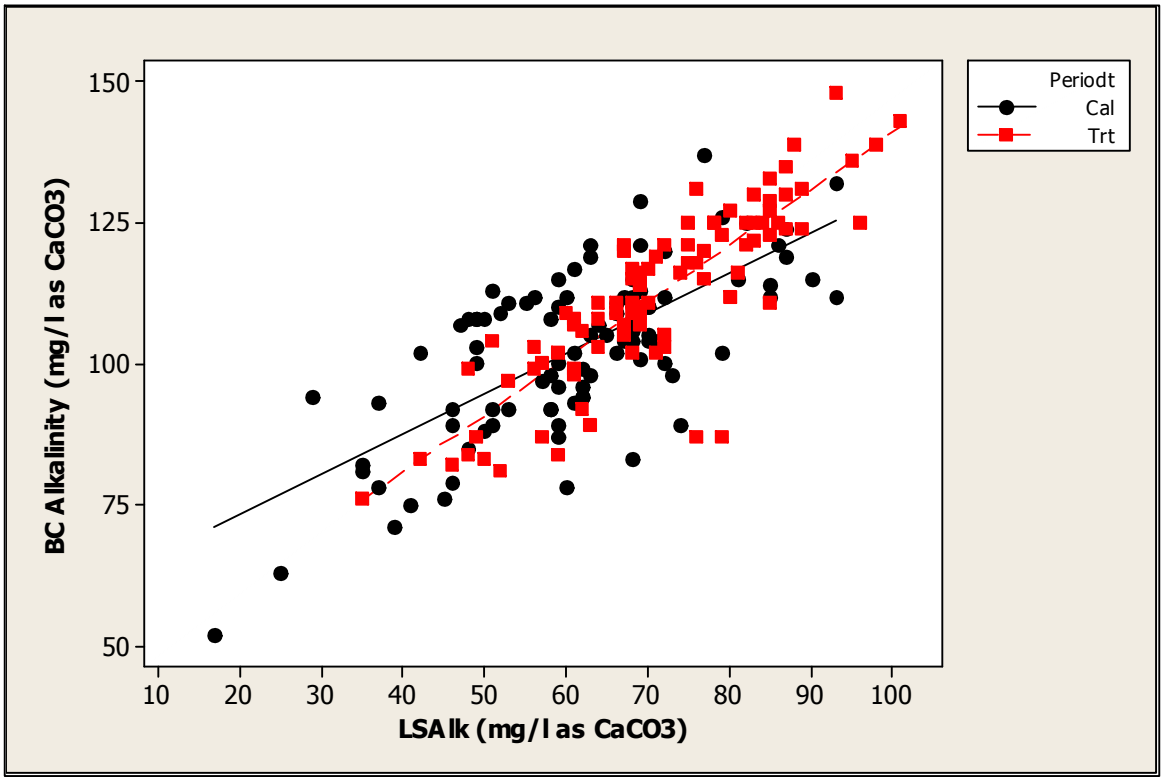

Periodt
Cal
Trt
log BC Ammonia Concentration
log LS Ammonia Concentration
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5

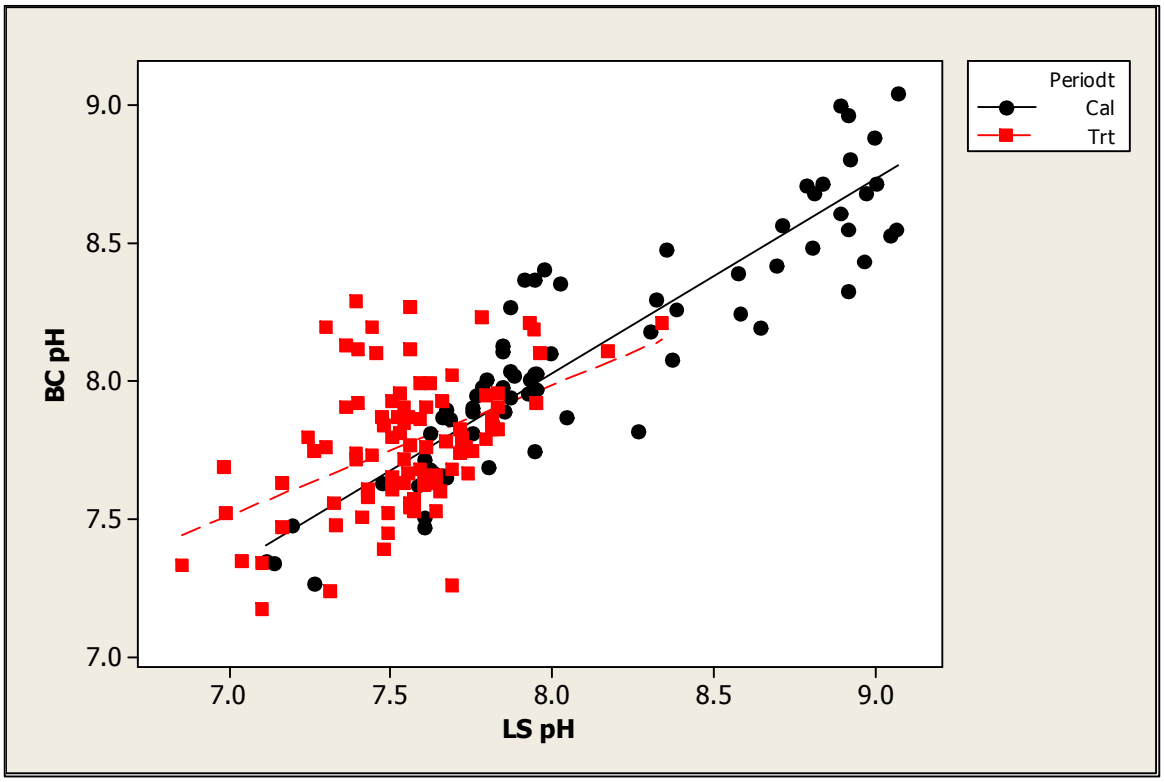

Periodt
Cal
Trt
log BC TKN Concentration
log LS TKN Concentration
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.5
-2.0
-1.5
-1.0
-0.5
0.0


Log Weekly TKN_N Concentration
Observed-Predicted
0.800
0.600
0.400
0.200
0.000
-0.200
-0.400
-0.600
-0.800
-1.000
09/08/03
12/17/03
03/26/04
07/04/04
10/12/04
01/20/05
04/30/05
08/08/05


log BC Enterococcus (fcu/100mls)
log LS Enterococcus (fcu/100mls)
Periodt
Cal
Trt
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
1
2
3
4
5


Periodt
Cal
Trt
log BC Turbidity (NTU)
log LS Turbidity (NTU)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0


Periodt
Cal
Trt
BC Alkalinity (mg/l as CaCO3)
LSAlk (mg/l as CaCO3)
150
125
100
75
50
10
20
30
40
50
60
70
80
90
100


Periodt
Cal
Trt
BC pH
LS pH
9.0
8.5
8.0
7.5
7.0
7.0
7.5
8.0
8.5
9.0

	BCSAMPLEID	BCDateActivityStart	BCEColi	BCEnteroCoccus
23730		07/02/01	231	196
23732		07/09/01	48	37
23734		07/16/01	105	166
23474		07/23/01	**3**	32
23736		07/30/01	26	63
23738		08/06/01	**3**	26
23740		08/13/01	23	94
23743		08/20/01	**2**	48
23746		08/27/01	95	140
23755		09/17/01	3	21
23758		09/24/01	5	30
25194		05/06/02	180	45
25209		05/20/02	84	122
25215		05/28/02	**400**	530
25254		06/03/02	43	83
25260		06/10/02	56	20
25270		06/17/02	30	17
25280		06/24/02	18	28
25295		07/01/02	65	165
25303		07/08/02	95	130
25349		07/15/02	30	210
25390		07/22/02	38	80
25531		07/29/02	151	157
25601		08/05/02	15	45
25687		08/12/02	560	43
25693		08/19/02	45	25
25699		08/26/02	65	40
25748		09/03/02	**10**	10
25754		09/09/02	**2**	10
25758		09/16/02	10	150
25766		09/23/02	**20**	40
27493		05/05/03	30	100
27499		05/12/03	20	40
27505		05/19/03	30	120
27511		05/27/03	35	113
27584		06/02/03	**2000**	795
27590		06/09/03	10	70
27596		06/16/03	30	90
27602		06/23/03	50	130
27607		06/30/03	190	220
27767		07/07/03	100	100
27821		07/14/03	20	80
27856		07/21/03	50	125

27887	07/28/03	20	120
28048	08/04/03	15	45
28063	08/11/03	**10**	70
28107	08/18/03	20	50
28157	08/25/03	**10**	**10**
28199	09/02/03	190	360
28212	09/15/03	55	165
30176	05/03/04	5	155
30205	05/10/04	10	60
30221	05/17/04	65	140
30315	06/01/04	5	60
30373	06/07/04	50	60
30397	06/14/04	25	160
30432	06/21/04	3	210
30438	06/28/04	120	180
30560	07/12/04	40	195
30588	07/19/04	35	70
30611	07/26/04	15	70
30775	08/02/04	10	30
30787	08/16/04	**5**	45
30817	08/23/04	5	160
30872	08/30/04	**5**	100
30972	09/07/04	5	95
30992	09/13/04	10	70
31007	09/20/04	**5**	160
31046	09/27/04	**5**	100
32372	05/02/05	10	25
32374	05/09/05	20	95
32469	05/16/05	**5**	50
32472	05/23/05	**500**	**500**
32664	05/31/05	25	70
32513	06/06/05	30	65
32550	06/13/05	65	210
32560	06/20/05	25	70
32696	06/27/05	50	125
32710	07/05/05	85	125
32748	07/11/05	160	140
32750	07/18/05	40	30
32753	07/25/05	115	220
33115	08/02/05	30	145
33125	08/08/05	50	92
33172	08/15/05	555	615
33200	08/22/05	160	270
33214	08/29/05	20	60
33241	09/06/05	5	145
33270	09/12/05	160	190
33310	09/19/05	15	95
geomean		29	85

# smpls > 406	**4**	**4**
geomean>criterion?	**no**	**yes**
PBCR support	supporting	not supporting

APPENDIX B:

Watershed Advisory Group Meeting Minutes and Agendas

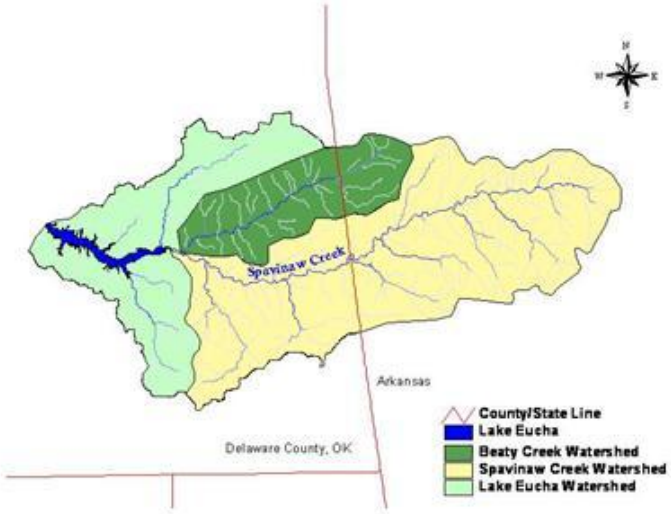
Oklahoma Conservation Commission's Water Quality Office will host a joint Cooperator Recognition for Participants in the Beaty Creek 319 Water Quality Cost-Share Program and Kick-Off for the Upper Spavinaw 319 Water Quality Cost-Share Program

Date of Event: July 29, 2004

Dinner: 5:00 pm
Program: 6:00 to 8:30

Jay Community Center

Jay, OK



AGENDA

5:00 to 6:00 Dinner

6:00 pm Welcome/Introduction of Participants in the Beaty Creek Project

6:15: Review of Beaty Creek Project and Best Management Practices

6:40: Upper Spavinaw Project Information

7:00 USDA/NRCS Programs

Break

7: 20 Status of Waste Management Plans in the Eucha/Spavinaw Watershed

7:45 Department of Ag Regulations

8:00 OSU Extension Updates

8:20: Question and Answer Period

1.5 education creditors available for poultry growers

LAKE EUCHA WATER QUALITY PROJECT OFFICE

210 S. Fifth Street
PO Box 467
Jay, OK 74346

Phone: 918-253-8550
Fax: 918-253-4160
E-mail: martim@okcc.state.ok.us

APPENDIX C:

Lake Eucha Water Quality Program
Cost Share Program

FY 1998 319(h) Task 500
Oklahoma Conservation Commission Task #105
C9-996100-06-0

Lake Eucha Watershed Implementation Project

Output 3 Pre-Implementation Report

In the 1989 Nonpoint Source Assessment Report, Part A (2): *Surface Waterbodies Showing No Apparent Concerns,* Page 8 lists Spavinaw Creek including Spavinaw Lake and Eucha Lake and Watersheds as water bodies with no apparent water quality concerns. This section of the Nonpoint Source Assessment Report identifies water bodies that need to be considered for future protection activities. The completion of the Conservation Commission's Clean Lake Study on Lake Eucha confirms that protection efforts need to be directed at this outstanding lake resource of northeast Oklahoma. A 2001 Oklahoma Water Resources Board report stated that "Both Lake Eucha and Spavinaw Lake are nutrient-enriched and display high or excessive levels of algal production. Phosphorus was the limiting nutrient during most of the project period. Average water quality values showed Lake Eucha and Spavinaw Lake to be eutrophic... During the two-year study period, there were significant taste and odor events. There was a relationship between particular phytoplankton species present and taste and odor events in both years. The presence of specific diatoms and blue-green algae species know to produce undesirable taste and odors were associated with the taste and odor events."

Based on these water quality problems that appear to be increasing in magnitude, the Oklahoma Conservation Commission (OCC) began a project in 1998 to take steps to reduce the problem through demonstration and education. The OCC chose to focus this effort in the Beaty Creek Watershed. Beaty Creek and Spavinaw Creek contribute most significantly to the water quality problems in Lake Eucha; however, the load in Beaty Creek is entirely NPS-derived. This report will describe the practices and strategies that were used to implement the program in the Beaty Creek Watershed.

One of the first steps taken in the project was to establish a local steering committee. This committee, called the Watershed Advisory Group (WAG), was made up of residents in the Lake Eucha Watershed, with the exception of two members that represent Conservation District Boards in Delaware County, OK and Benton County, Arkansas. The membership was chosen to represent the local interests of the watershed. Members included:

- Dave Chamberlain, Oklahoma poultry producer
- Jim Hollenback, Oklahoma swine producer

- Mickie Stockton, Oklahoma resident homeowner
- Ray Duncan, Oklahoma beef producer
- Woody Wilson, Oklahoma minority representative
- David Holcombe, Delaware Co. Conservation District board member
- Herb Beattie, Oklahoma Trust for Public Lands
- Dean Austin, Arkansas poultry producer
- Avery Hoke, Arkansas resident homeowner
- Leon Whiteside, Arkansas beef producer
- Ronnie McGhee, Benton Co. Conservation District board member
- Mel Reynolds, Arkansas swine producer
- Jack Cowgur, Simmons Industries.

The purpose of the WAG was to represent local interests in the watershed as they recommended practices and cost-share rates to be applied through the program to reduce NPS pollution in the watershed.

Because 319 programs are demonstration programs and because the money available was inadequate to meet all the NPS needs in the watershed, it was necessary to focus implementation funds in areas that needed it most and where BMPs would result in the greatest load reductions. This focus was accomplished in two stages. First of all, the WAG considered the concentration of, types and sources of problems in the watershed to determine the types of practices they would offer, and tried to focus implementation into those areas by offering the highest cost-share rates for practices that would most significantly benefit water quality but that producers might be most hesitant to implement. Secondly, OCC personnel used their knowledge of the location of the most likely significant sources to try to target implementation towards those areas through evaluation of eligibility and conservation plan development and later, by door-to-door solicitation of landowners in targeted areas to participate. Further detail on how this was accomplished is discussed below.

In order to choose which practices would be offered, the WAG asked OCC Water Quality staff to provide information on the known water quality problems in the watershed, the known and likely sources of those problems, and the practices that could be used to control those problems. Therefore, OCC gave the WAG information on the water quality problems and sources, largely in the form of maps, along with descriptions of practices that could be used to reduce pollution from those sources. The WAG's recommendations on BMPs and cost-share rates were approved by the OCC Commissioners and incorporated into a following summary document.

Potentially, a number of GIS layers existed or could be developed for the watershed to guide the targeting. Many of these were listed in the workplan, including soils, digital elevation maps, conservation plan inventory, CAFO survey, landuse, riparian area, and detailed digital hydrology. In addition, a number of potential analyses were identified (in the workplan) that could be used to help

direct or target the implementation. These included: 1) Conservation plan survey- identify areas not under a plan and the status of other plans- correlate to LandSAT landuse.; 2) Stream Habitat and Riparian Assessment. A detailed digital hydrology file could be developed from 5 meter satellite data to spatially relate the habitat assessment parameters. This would allow a multitude of analyses. Riparian areas would also be digitized from 5 meter satellite data, in addition older aerial photos can be scanned and riparian areas digitized to show changes; then we could try to correlate the reduction of riparian areas to stream bank erosion, Landuse assessment from LANDSAT Thematic mapper images- these images are being purchased by OCC for the entire Eucha watershed. LANDSAT images in 5 year increments could be used to show landuse trends (riparian area reduction) and land clearing; 3) CAFO (layer) will be updated to detail individual house locations; 4) The locations of all land deemed to be suitable for animal waste application could be determined; and 5) Use GIS to track BMP implementation and estimate nutrient reduction (modeling).

Problems existed with the use of some of these layers, either with the quality of data or in using the data for this particular application such that not all of the data layers originally planned could be incorporated into the targeting, either initially, or later as targeting became more focused. For instance, land use data available at that time in the watershed was over ten years old. Information was available on soil type, but not widely available on soil nutrient content. Satellite images and aerial photos that could be used to determine riparian coverages were also dated and likely to be inaccurate. Therefore, these types of layers were of limited use in targeting initially. This information had to be developed as the program progressed and incorporated when appropriate.

Therefore, in order to develop and summarize information on sources of water quality problems and the areas that were most likely significant sources, data collected in accordance with the approved Quality Assurance Project Plan by the Oklahoma Conservation Commission, Water Quality Division was converted by the Oklahoma Conservation Commission, Geographic Information Systems (GIS) Program into six maps of the Beaty Creek Watershed. The map coverages included:

1. Chicken Houses and Pipes Located near the Streams 1997
2. Cow Patty Locations 1999
3. Cow Trails 1999
4. Riparian Width 1999
5. Eroded Banks 1999
6. Multiple Impacts Observed 1999
7. Conservation Plans 1999

With the exception of the background information for the maps (stream location, roads, watershed size and location, digital elevation, etc.) the remaining layers were derived from stream habitat evaluations and watershed surveys. For

instance, rather than using satellite images or old aerial photos which were, at that time, likely to be significantly dated and inaccurate, information on riparian area “health” was measured throughout the watershed by walking the stream. The location of chicken houses was originally developed in 1996 based on watershed reconnaissance to locate houses. That layer was updated in 1998 and paired with the location of pipes (lateral or other septic lines) through watershed reconnaissance. The remaining maps were developed based on extensive watershed (primarily within the riparian area) reconnaissance, referred to in the workplan as riparian and watershed assessment. Habitat evaluations were conducted at 100m intervals throughout the entire network of streams in the Beaty Creek Watershed (normally habitat assessments are completed at 20m intervals for a 400m segment). These habitat assessments provided extensive information related to the types and extent of impacts to the streams, notable in the riparian zone. Examples of these impacts included eroding banks, cattle trails, cattle patty densities, etc.

Initially, the WAG was presented with maps of poultry house location, stream location, exposed pipe (likely to be related to septic systems), to support OCC’s explanation of the types of practices that were needed.
To target funds into the riparian area, the WAG chose practices that promote riparian area development and protection. They offered the highest cost-share rates for riparian area practices. The WAG also recognized that improper application of poultry litter as fertilizer and pasture management were key issues in the watershed. Therefore they also recommended practices that worked to correct these issues and offered relatively high cost share rates for the practices that would be the most beneficial to water quality. A complete list of practices and rates selected follows later in the document.

Once the WAG had developed the list of practices and rates, a public meeting was held to introduce landowners in the watershed to the program and to sign up interested individuals for an evaluation of eligibility. Landowners who were interested in the program either signed up that night, or called the district later, and were then visited by OCC staff to determine their eligibility and update their farm plan. Eligibility was related to need of landowners relative to the sources of the problem; animal waste and riparian area degradation. Therefore, eligible parties included landowners who were poultry producers, spread poultry litter on their pastures, had absent or improperly managed riparian area, had inadequate septic systems, or had pastures that were poorly managed. More than one of these problems was evident at most eligible sites.

Eligibility and Conservation Plan development also involved factors such as soil tests and litter tests. Landowners interested in spreading litter had to have a soil test (and have the litter tested) before a plan could be drawn up to designate whether litter could be spread. Soil test values dictated which practices a landowner could qualify for. For instance, if Soil P values were too high, he

qualified for a practice that transported the litter to an alternate site with low soil P values.

Therefore, Initial targeting in the watershed was aimed at the most significant types of sources, rather than at geographic areas in the watershed believed to be contributing the most loadings. However, in FY 2000, additional funds were allocated to the project with the specific requirement that they be applied in a more targeted manner. EPA and OCC recognized that more extensive "targeting" of the implementation might be necessary to be more effective in the watershed. By that time, the data from the extensive habitat assessments had been digitized such that it could be used in the targeting. Once again, the OCC and Conservation Districts used GIS to help determine how to target the areas of the watershed most likely to be contributing significant loads. They considered the location of current conservation plans, riparian areas, poultry houses, sewer pipes, cattle activity, riparian width, and eroded banks to come up with a map of most impacted areas. Landowners in these areas who were not currently cooperators in the project were contacted by the OCC through phone and at home visits to inform them about the program and encourage them to participate. Only landowners within those areas qualified to receive the "targeted" funds.

Included in this submittal for fulfillment of output 3 is the *Lake Eucha Water Quality Project Cost Share Program,* which details cost share practices and rates, and the Beaty Creek Watershed GIS data coverages. The data collected for the development of the GIS coverages will be further reported on in the final report, but these maps represent the format used for targeting. The only pieces of data used for targeting that are not presented in these maps includes information on soil phosphorus concentrations. That information, although not available in digital form, was used by the OCC Water Quality Staff to determine where litter could be spread in the watershed, and coupled with litter nutrient analyses, at what rates litter could be spread. Cooperating landowners whose soil phosphorus values were too high, had to find locations either within or outside of the watershed where litter could be spread. If spread inside the watershed, they had to document that the location to spread the litter was within allowable limits based on soil phosphorus values at the site.

LAKE EUCHA WATER QUALITY PROJECT COST SHARE PROGRAM

Developed by: Oklahoma Conservation Commission

Sponsors:
Delaware County Conservation District - Oklahoma
Benton County Conservation District - Arkansas
Oklahoma Conservation Commission
Lake Eucha Watershed Advisory Group

Lake Eucha Water Quality Cost Share Program

INTRODUCTION

This cost share program has been developed by the Oklahoma Conservation Commission Water Quality staff for the sponsors of the Lake Eucha 319 Water Quality Nonpoint Source Project. It will be used to administer the cost share funds made available by the Environmental Protection Agency 319( ) Nonpoint Program to the State of Oklahoma. The initial funds will be used in the Beaty Creek Demonstration Area.

The OCC water quality staff developed this program with recommendations from the Lake Eucha Watershed Advisory Group (WAG). The WAG approved the Best Management Practices (BMP) at their December meeting on Thursday, December 17, 1998. The Delaware County Conservation District approved the BMP list at their regularly scheduled board meeting on January 14, 1999 and the Oklahoma Conservation Commission gave their approval at their meeting on February 8, 1999.

PLAN DEVELOPMENT

The cost share program was developed to meet specific needs of the Lake Eucha/Beaty Creek Watershed. For that reason, local people (WAG members and Conservation Districts) were involved in choosing the BMPs and cost-share rates that would be offered with the program. However, because funding was not adequate nor was the 319 program intended to be the ultimate panacea for water quality problems, the program had to demonstrate solutions that anyone can apply in their watershed. It also had to be targeted to use the money most efficiently and therefore achieve the most significant results with the funds available. Therefore, BMPs needed to be implemented where they could achieve the largest loading reductions (or in places where NPS pollution affects the creeks most significantly).

A series of data collection exercises were completed and translated into a Geographic Information System (GIS) format for use in targeting the funding towards the most significant sources. This data, in GIS format, was evaluated by both the WAG in determining which practices would be funded and at what cost-share rates (to potentially encourage the most water quality-beneficial of the practices) and by the OCC and Conservation Districts in determining which landowners qualified for the program.

PROGRAM OBJECTIVE

The cost share program will be offered on a voluntary basis to residents in the Beaty Creek Watershed in Delaware County, Oklahoma and Benton County, Arkansas. The cost share funds can only be used to implement Best Management Practices as approved by the WAG, Delaware County Conservation District and the Oklahoma Conservation Commission.

The objective of the demonstration project is to demonstrate best management practices that can correct water quality problems in Lake Eucha, with emphasis on phosphorus reduction. Eligibility guidelines for cost share are: (1) be a land user in Beaty Creek; (2) have a water quality related problem and/or be willing to install BMP's that will protect the water in Beaty Creek; (3) be a cooperator with the respective conservation district in Oklahoma or Arkansas; (4) have developed a conservation plan addressing the total farm concept; (5) if applicable, have developed an animal waste plan and be in compliance with the AWP as to proper utilization and/or storage of animal waste according to soil and litter test; (6) sign an agreement to maintain the BMP for the life of the practice; (7) and install BMP's in a timely manner as prescribed in the conservation plan.

PRIORITY PROBLEMS

The program will address water quality problems within Beaty Creek. The Best Management Practice of highest priority will be riparian area establishment. The BMP list is as follows: (1) riparian area establishment, (2) buffer zone establishment, (3) bank stabilization, (4) animal waste storage/composters, (5) pasture establishment/ management, (6) proper waste utilization, (7) heavy use area. These BMP's are designed to address the high phosphorus levels in the water that affect the quality of the water in Lake Eucha, a City of Tulsa water supply.

PROGRAM GOALS

The program goals for Beaty/Spavinaw Watershed is as follows: (1) develop conservation/animal waste plans on all farms in the watershed. The total farm plan concept will be used in writing the plans. Develop plans that address all needed BMP's that will meet water quality standards; (2) install BMP's that are needed to meet the water quality issues; (3) cost share with landowners on the BMP that address the needs; (4) if funds are available with the completion of Beaty Creek, move the concentration of funds to the entire Spavinaw Creek Watershed.

COST SHARE RATES

The cost share percentages have been set by the Eucha Watershed Advisory Group (WAG) and concurred with by the Delaware County

Conservation District and Oklahoma Conservation Commission. The percentage rates are from 50% to 90% (see attached list of BMP's with % rates).

PROGRAM ADMINISTRATION

The Eucha Project Coordinator, of the OCC Water Quality Staff, has the responsibility for program administration. He will write or coordinate with NRCS in Oklahoma and Arkansas, all plan development. Also, planning efforts will be coordinated with Delaware County Conservation District and Benton County Conservation District.

The Lake Eucha Coordinator will develop the project agreement for each participating individual. A six-part folder will be developed to include: (1) conservation district agreement, (2) correspondence and status review, (3) conservation/animal waste plans, (4) schedule of operations, (5) project agreement, (6) funds disbursement form. One copy will be maintained in the Lake Eucha Project office and one copy sent to OCC Water Quality office.

The conservation plan and the project agreements will be approve or concurred by, and signatures of the following: (1) the cooperator, (2) the Lake Eucha Watershed Advisory Group chairperson, (3) the Delaware County Conservation District board chairman (the Delaware County Conservation District will sign off on participants for both Delaware and Benton County), (4) and the Lake Eucha Project Coordinator for the Oklahoma Conservation Commission.

CERTIFICATION OF COMPLETION

When the Best Management Practices have been completed, the cooperating participant will furnish all needed receipts of materials and labor to the Lake Eucha Project Coordinator. The project coordinator or NRCS representative will certify completion of the BMP on the 319 funds disbursement form.

Best Management Practices (BMPs)

Lake Eucha 319 Project

Incentive Percentage

1. Riparian Area Management — 90%

Components:

1a. Incentive Payments:

1a-1. Total exclusion	**$50.00/ac.**
1a-2. Total exclusion with haying production	**$45.00/ac.**
1a-3. Limited grazing	**$40.00/ac.**

1b. Off-site Watering Facilities

- **1b-1. Pond**
- **1b-2. Well**
- **1b-3. Freeze-proof tank and pipeline**
- **1b-4. Watering lane to creek**

1c. Vegetative Establishment

- **1c-1. Pasture (grass planting)**
- **1c-2. Seedbed preparation**
- **1c-3. Forestry plantings**

1d. Fencing

- **1d-1. 4 wire fence**
- **1d-2. Woven wire fence**

1e. Livestock Shelters

- **1e-1. Construction of shade/wind break when cattle are fenced out of natural areas.**

1. PURPOSE

To establish riparian areas along the creeks and all tributaries draining into Lake Eucha. To control and filter runoff water from pastures and fields and to stabilize the creek banks to stop erosion.

2. APPLICABILITY

To target areas where the stream banks are eroded, over grazed, and over used by cattle having access to the water. These targeted areas have deteriorated because of the lack of vegetation or lack of the proper vegetation to hold them in place.

3. POLICIES

A. Cost-sharing is authorized for:

(1) Incentive payment for:
- **a. Total exclusion**
- **b. Total exclusion with haying production**
- **c. Limited grazing**

(2) Off-site watering

(3) Vegetative establishment

(4) Fencing

(5) Livestock shelters

(6) To receive cost-share assistance, the following criteria must be met:
- **a. The livestock producer must be willing to fence the riparian area as established by the Natural Resource Conservation Service/Oklahoma Conservation Commission Water Quality staff technicians**
- **b. The livestock producer will be required to maintain the riparian area and all component parts for the life of the practice**
- **c. To receive Incentive Payments, the cooperator must enter into an agreement with the Conservation District in their respective county and obtain a conservation plan or animal waste plan as applicable**

B. Cost share is not authorized for:

(1) Individuals receiving cost-share funds from any other state or federal agencies on the same Best Management Practices

(2) Producers who do not enter into a total farm or water quality plan with the Conservation District in their respective county

C. Design, layout and inspection:

(1) Technical assistance will be accomplished by the Oklahoma Conservation Commission Water Quality staff representative or Natural Resources Conservation Service personnel

(2) Natural Resources Conservation Service technical guides will be used in all designs.

D. Best Management practices approval

(1) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan

(2) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practice Cost Share Rates
BMP No. 1: Riparian Management/Establishment

A: Cost Share Rate: Incentive Payment 100%
Component Parts 90%

Code	Conservation Practices	Components	Unit	Cost Share	Cost
1:	Riparian Area Management and Establishment				
391A		1a: Incentive Payments			
		1a-1: Total Exclusion	acre	100%	$50.00
		1a-2: Total Exclusion with hay production	acre	100%	$45.00
528		1a-3: Limited Grazing	Acre	100%	$40.00
		1b: Off-site Watering Facilities			
378		1b-1: Pond	cu yd	90%	$1.00
		1b-2: Trickle Pipe PVC	DIFT	90%	$0.68
642		1b-3: Well Drilling to 600 ft	ft	90%	$5.50
		1b-4: Casing	ft	90%	$6.00
		1b-5: Cement	lump sum	90%	$100.00
		1b-6: Sub Pump	Each	90%	$850.00
		1b-7: Pressure Tank	Each	90%	$250.00
		1b-8: Values; Switch Controls	lump sum	90%	$100.00

614		**1b-9: Freeze Proof Tank Installed**	**Each**	**90%**	**$800.00**
516		**1b-10: Pipe Line PVC**	**DIFT**	**90%**	**$0.36**
		1b-11: Trenching & Cover	**L ft**	**90%**	**$1.00**
		Access Lane to Stream			
		1b-12: Grading & Shaping	**cu yd**	**90%**	**$1.00**
		1b-13: Filter Fabric	**sq yd**	**90%**	**$1.50**
		1b-14: Gravel Fill	**ton**	**90%**	**$9.00**
		1b-15: Rock	**cu yd**	**90%**	**$20.00**
512		**1c: Permanent Vegetative Establishment**			
		1c-51: Bermuda Grass Sprig	**ac**	**90%**	**$45.00**
		1c-2: Winter Hardy Bermuda Grass Seed	**#PLS**	**90%**	**$8.00**
		1c-3: Tall Fescue	**#PLS**	**90%**	**$1.65**
		1c-4: Native Mixtures	**#PLS**	**90%**	**$15.30**
		1c-5: Other Grasses Cost From OK & AR State Cost List		**90%**	
		1c-6: Liming (Soil Test)	**ton**	**90%**	**$21.00**
		1c-7: Fertilizer (Soil Test)	**ac**	**90%**	**$23.00**
		1c-8: Seedbed Preparation	**ac**	**90%**	**$15.00**
		1c-9: No-till Drill	**ac**	**90%**	**$12.00**
391		**Riparian Forest Buffer**			

		1c-10: Barerooted	**each**	**90%**	**$0.50**
		1c-11: Potted	**each**	**90%**	**$1.05**
382		**1d: Fencing**			
		1d-1: 4-wire permanent standard	**lf**	**90%**	**$1.00**
		1d-2: Woven wire	**lf**	**90%**	**$1.20**
380		**1c: Livestock Wind Break Shelters**	**575**	**90%**	
		1e-1: Construction of Shade/Wind Break	**lf**	**90%**	**$75.00**

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

2. Buffer-Filter Strip Establishment 80%
Components:
2a. Incentive Payments: $45.00/ac.
2b. Vegetative Establishment (same as 1c.)
2c. Fencing
1d-1. 4 wire fence
1d-2. Woven wire fence

1. PURPOSE

To establish buffer/filter strip around cultivated fields and/or farmsteads where the runoff water has the potential to contain large amounts of nutrients that pollute the waters of Lake Eucha.

2. APPLICABILITY

To target high use areas away from creeks and tributaries going into the creeks of the watershed.

3. POLICIES

B. Cost-sharing is authorized for:

(1) Incentive payment for:
(2) Vegetative establishment
(3) Fencing, if necessary
(4) To receive cost-share assistance, the following criteria must be met:
a. Have a whole farm conservation plan to include Animal Waste Plan, if applicable
b. Must agree to maintain all components of the Best Management Practices for their entire life

B. Cost share is not authorized for:

(1) Individuals receiving cost-share funds from any other state or federal agencies on the same Best Management Practices

C. Design, layout and inspection:

(1) The Lake Eucha Oklahoma Conservation Commission Water Quality staff representatives and/or Natural

Resources Conservation Services personnel in their respective county will have the responsibility

(2) Natural Resources Conservation Service standard and or specifications will be used when available.

D. Best Management practices approval

(3) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan

(4) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

Best Management Practice Cost-Share Rates

BMP No.2: Buffer/Filter Strip Establishment

A: Cost Share Rate: Incentive Payment 100%
Components 80%

B: Component Parts:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
2:393:	Buffer-Filter Strip Establishment				
		2a: Incentive Payments	ac	100%	$45.00
		2b: Vegetative Establishment			
		2b-1: Bermuda Grass Sprig	ac	80%	$45.00
642		2b-2: Winter Hardy Bermuda Grass Seed	PLS	80%	$8.00
		2b-3: Tall Fescue	PLS	80%	$1.65
		2b-4: Native Mixtures		80%	$15.30
		2b-5: Other Grasses Cost From OK & AR State Cost List		80%	
		2b-6: Liming (Soil Test)	ton	80%	$21.00

		2b-7: Fertilizer (Soil Test	**ac**	**80%**	**$23.00**
		2b-8: Seedbed Preparation	**ac**	**80%**	**$15.00**
		2b-9: No-till Drill	**ac**	**80%**	**$12.00**
382		**2c: Fencing**			
		2c-1: 4-wire permanent standard	**lf**	**80%**	**$1.00**
		2c-2: Woven wire	**lf**	**80%**	**$1.20**

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

3. Streambank Stabilization 80%
Components:

3a. Fencing
3a-1. 4 wire fence
3a-2. Woven wire fence

3b. Vegetative Plantings:
3b-1. Grass establishment
3b-2. Forestry plantings

3c. Special best management practices
Note: this only used when a BMP is needed that is not covered under the list of approved BMPs.

1. PURPOSE

This Best Management Practice (BMP) is designed to correct/protect stream banks in the Eucha Watershed. Stopping erosion will stop sediment build up in the waters of Lake Eucha.

2. APPLICABILITY

To target high use areas where the riparian area is depleted.

3. POLICIES

C. Cost-sharing is authorized for:
(1) Areas determined in need of erosion control:
(2) Areas where vegetative cover is lacking
(3) To receive cost-share assistance, the following criteria must be met:
a. Have a whole farm conservation plan to include Animal Waste Plan, if applicable
b. Must be willing to maintain BMP for the established life

B. Cost share assistance is not authorized for:
(1) Individuals who are receiving cost-share funds from any other state or federal agencies on the same Best Management Practices

(2) Projects that will require large amounts of work, materials, and labor to complete. (The objective for this BMP is to correct small on-the-farm stream bank erosion.)

C. Design, layout and inspection:
(3) The Lake Eucha Oklahoma Conservation Commission Water Quality staff representatives and/or Natural Resources Conservation Services personnel in their respective county will have the responsibility
(4) Natural Resources Conservation Service standard and or specifications will be used when available.

D. Best Management practices approval
(5) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan
(6) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

Best Management Practice Cost-Share Rates

BMP No.3: Streambank Stabilization

A: Cost Share Rate: Incentive Payment 100%
Components 80%

B: Component Parts:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
3:580	Streambank Protection				
382		3.a: Fencing			
		3a-1: 4-wire permanent standard	lf	80%	$1.00
		3a-2: Woven wire	lf	80%	$1.20
512		3b: Vegetative Planting			
		3b: Vegetative Establishment			
		3b-1: Bermuda Grass Sprig	ac	80%	$45.00

		3b-2: Winter Hardy Bermuda Grass Seed	**PLS**	**80%**	**$8.00**
		3b-3: Tall Fescue	**PLS**	**80%**	**$1.65**
		3b-4: Native Mixtures		**80%**	**$15.30**
		3b-5: Other Grasses Cost From OK & AR State Cost List		**80%**	
		3b-6: Liming (Soil Test)	**ton**	**80%**	**$21.00**
		3b-7: Fertilizer (Soil Test	**ac**	**80%**	**$23.00**
		3b-8: Seedbed Preparation	**ac**	**80%**	**$15.00**
		3b-9: No-till Drill	**ac**	**80%**	**$12.00**
391		**Riparian Forest Buffer**			
		3b-10: Barerooted	**each**	**80%**	**$0.50**
		3b-11: Potted	**each**	**80%**	**$1.05**
		3c: Special Best Management Practices **Note: this only used when a BMP is needed that is not covered under approved list of BMPs**		**80%**	

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

4. Composters (dead bird) Animal Waste Storage Facilities: 50%
Components:
- **4a. Composters**
- **4b. Cake out house**
- **4c. Cake out house with composter**
- **4d. Full clean out house**
- **4e. Full clean out house with composter**

Note: 4d and 4e will be a cost share on houses that only rotate their flocks once or twice a year.

1. PURPOSE

This Best Management Practice (BMP) has been developed to address the proper disposal of dead animals and proper storage of litter.

2. APPLICABILITY

To target producers who do not have available proper disposal of dead birds and those producers who are required to dispose of animal waste when weather conditions are not acceptable.

3. POLICIES

A. Cost-sharing is authorized for:
- **(1) Producers who rotate their flocks one or two times annually**
- **(2) Producers who have no other way to dispose of their dead birds**

B. Cost share assistance is not authorized for:
- **(1) Producers who have adequate means for proper disposal of dead birds**
- **(2) Broiler producers who rotate their flocks every 6 to 8 weeks**

C. Design, layout and inspection:
- **(1) The Lake Eucha Oklahoma Conservation Commission Water Quality staff representatives and/or Natural Resources Conservation Services personnel in their respective county will have the responsibility**

(2) Natural Resources Conservation Service standard and or specifications will be used when available.

D. Best Management practices approval

(1) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan

(2) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

Best Management Practice Cost-Share Rates

BMP No.4: Composters (Dead Birds) Animal Waste Storage Facilities

A: Cost Share Rate: 50%

B: Component Parts:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
4	Composters-Animal Waste Storage Facilities				
317		4.a: Composters	sq ft	50%	$9.25
313		4b: Cake Out Storage w/ Concrete Floor	sq ft	50%	$7.50
		4b-: Cake Out Storage w/ Earthen Floor	sq ft	50%	$6.25
		4c: Full Cleanout Storage Note: 4c will be cost shared on houses that only rotate their flock once or twice a year			
		4c-1: Concrete Floor	sq ft	50%	$7.50
		4c-2: Earthen Floor	sq ft	50%	$6.25

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

5. Pasture Establishment/Management 75%

5a. Pasture Establishment
Components:
5a-1. Sprigging
5a-2 – 5a.5. Seeding
5a-7. Fertilizer (soil test)
5a-8. Seedbed preparation

5b. Pasture Management
Components:
5b-1. Incentive for proper use $5.00 per acre (proper management, fertilizer/litter use)
5b-2. Fencing (for rotational grazing systems)
Watering Facilities
5b-3. Pond
5b-4. Freeze-proof tank
5b-5. Pipeline (PVC)
5b-6. Trenching and cover

5c. Livestock shelters
5c-1. Construction of shade/wind break when cattle are utilizing rotational grazing system

1. PURPOSE

This Best Management Practice (BMP) is to be used to correct erosion problems that contribute to the movement of nutrients from pastures into the waters of Lake Eucha.

2. APPLICABILITY

To encourage producers to manage pastures so as not to overgraze, causing erosion problems. Also, to establish vegetative cover on areas where inadequate cover is causing nutrients to move from pastures into the waterways of Lake Eucha.

3. POLICIES

D. Cost-sharing is authorized for:
(1) Pasture establishment:
(2) Pasture management with components:

a. Incentive payments
b. Fencing
c. Watering Facilities

B. Cost share assistance is not authorized for:
(1) Pasture establishment where an adequate cover is present
(2) Where a producer wants to change species of vegetation. Example: From fescue to Bermuda
(3) Producers who do not want to develop a total pasture rotational program
(3) Producers who are receiving cost-share practice money to include Incentive Payments from other programs from state or federal agencies

C. Design, layout and inspection:
(1) The Lake Eucha Oklahoma Conservation Commission Water Quality staff representatives and/or Natural Resources Conservation Services personnel in their respective county will have the responsibility
(2) Natural Resources Conservation Service standard and or specifications will be used when available.

D. Best Management practices approval
(1) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan
(2) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

Best Management Practice Cost-Share Rates

BMP No.5: Pasture Establishment/Management

A: Cost Share Rates:
(1) Pasture Establishment 75%
(2) Pasture Management 80%

B: Components:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
5:	Pasture Establishment/ Management				

512		5a: Permanent Vegetative Establishment			
		5a-1: Bermuda Grass Sprig	ac	75%	$45.00
		5a-2: Winter Hardy Bermuda Grass Seed	#PLS	75%	$8.00
		5a-3: Tall Fescue	#PLS	75%	$1.65
		5a-4: Native Mixtures	#PLS	75%	$15.30
		5a-5: Other Grasses Cost From OK & AR State Cost List	PIP #PLS	75%	
		5a-6: Liming (Soil Test)	ton	75%	$21.00
		5a-7: Fertilizer (Soil Test	ac	75%	$23.00
		5a-8: Seedbed Preparation	ac	75%	$15.00
		5a-9: No-till Drill	ac	75%	$12.00
528A		5b: Prescribed Grazing/Management			
528A		5b-1: Incentive Proper Use and Nutrient Management	ac	100%	$5.00
382		Fencing			
		5b-2: 4-wire permanent Woven Wire Fencing	lf lf	80% 80%	$1.00 $1.20
378		5b-3: Pond Excavating	cu yd	80%	$1.00
614		5b-4: Freeze-Proof Tank	each	80%	$800.00
516		5b-5: PVC Pipe Line	DIFT	80%	$0.36
		5b-6: Trenching & Cover	lf	80%	$1.00

380	**Approved by OCC 8/2/99**	**5c-1: Construction of Shade/Wind Break for Livestock**	**If**	**80%**	**$75.00**

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

6. Proper Waste Utilization (For Poultry Waste Producers)
(This BMP will require a Waste Management Plan)

6a. ***6¢ per lb. of phosphorus produced and properly utilized on producer's farm. Must have soil/litter test.***

6b. ****8¢ per lb. of phosphorus moved from producer's farm and applied according to Oklahoma State guidelines and USDA-NRCS waste utilization standard 633. Must have soil/litter test.***

6c. *****15¢ per lb. of phosphorus moved from producer's farm out of Lake Eucha watershed into a non-phosphorus threatened watershed, except Illinois, Lake Eucha, Wister, and Grand Lake. Must have soil/litter test.*****

*** Cannot be used if receiving cost share on BMP 5b-1**
**** Must show movement location.**

1. <u>PURPOSE</u>

To insure proper application of animal waste and not to exceed the phosphorus level as established by the Natural Resources Conservation Service.

2. <u>APPLICABILITY</u>

To target producers who have excess litter and give an incentive for movement to areas within the Eucha Watershed that can utilize it and also to encourage movement of litter out of the Eucha Watershed.

3. <u>POLICIES</u>

A. Cost-sharing is authorized for:
- **(1) Proper use of litter**
- **(2) Movement of litter**

B. Cost share assistance is not authorized for:
- **(1) If cost-share is being received for BMP 5b-1- Pasture Management Incentive Program**

(2) When like funds are being received from any other state or federal agency
(3) Where producer cannot or will not show proof of movement and provide a soil test at receiving location

C. Best Management Practice Structure:
(1) Producer/Cooperator must have Animal Waste Plan and Conservation Plan
(2) The structure of the movement will be by the producer and concurred by the Oklahoma Conservation Commission Water Quality staff representatives.

D. Best Management practices approval
(1) The Oklahoma Conservation Commission Water Quality staff representative will be responsible for the initial approval of this Best Management Plan
(2) The Watershed Advisory Group (WAG) and Delaware County Conservation District will be the official approving authority

Best Management Practice Cost-Share Rates

BMP No.6: Proper Waste Utilization

A: Cost Share Rate: Incentive Payment 100%

B: Components:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
6:633	Proper Waste Utilization (For Poultry Waste Producers) Note: This BMP will require a Waste Management Plan				
		6a: Phosphorus produced and properly utilized on producer's farm.* Must have soil/litter test	lb		6¢

		6b: Phosphorus moved from producer's farm and applied according to Oklahoma State guidelines and USDA-NRCS waste utilization standard 633. Must have soil/litter test**	**lb**		**8¢**
		6c: Phosphorus moved from producer's farm out of Lake Eucha watershed into a non-phosphorus threatened watershed, except Illinois, Lake Eucha, Wister, and Grand Lake. Must have soil/litter test	**lb**		**15¢**
		***Cannot be used if receiving cost share on BMP 5b-1 ** Must show movement location**			

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

7. Heavy Use Areas 80%

7a. ***Establish permanent feeding areas away from water sources (creeks, drainage ways, etc.)***

Components:

7a-1. Concrete pads for round bale feeding
7a-2. Gravel for heavy traffic areas (cattle)
7a-3. Concrete or gravel pads around watering facilities
7a-4. 4" Terracell- erosive areas
7a-5. 6" Terracell- erosive areas

1. PURPOSE

To reduce pollution entering stream from pasture feeding of hay to livestock.

2. APPLICABILITY

To target livestock producers who feed hay in areas too close to streams.

3. POLICIES

E. Cost-sharing is authorized for:

(1) To construct feeding areas away from creeks
(2) Divert winter runoff from feeding areas to proper disposal areas

B. Cost share assistance is not authorized for:

(1) Producers that do not have a full farm conservation plan to include an Animal Waste Plan
(2) Producers who are not involved with Best Management Practice #5 (Pasture Management)

C. Design, layout and inspection:

(1) The Lake Eucha Oklahoma Conservation Commission Water Quality staff representatives will be responsible for layout and inspection

D. Best Management practices approval

(1) This Best Management Practice will be written into the whole farm plan developed and approved by the Oklahoma Conservation Commission Water Quality staff representatives, the Watershed Advisory Group (WAG), and the Delaware County Conservation District

Best Management Practice Cost-Share Rates

BMP No.7: Heavy Use Areas

A: Cost Share Rate: 80%

B: Components:

Code	Conservation Practices	Components	Unit	Cost Share	Cost
561	Heavy Use Areas				
		7a: Establish permanent feeding areas away from water sources (creeks, drainage ways, etc.)			
		7a-1: Concrete Pads for Round Bale Feeding	sq ft	80%	$1.23
	Approved by OCC 8/2/99	7a-2: Gravel for Heavy Livestock Use Areas .22 ton/sq yd – 6: depth Geotextile fabric	ton sq yd	80% 80%	$9.00 $1.25
		7a-3: Grading and Shaping	cu yd	80%	$1.00
		7a-4: 4" terracell 7a-5: 6" terracell For livestock heavy use and erosive areas	sq ft sq ft	80% 80%	$1.25 $2.00

STATE OF OKLAHOMA
LAKE EUCHA CONSERVATION COST SHARE PROGRAM

Best Management Practices (BMPs)

Incentive Percentage

8. Rural Waste Systems **80%**
Install residential septic system in the rural area of Lake Eucha Watershed.

8a. ***Septic Tanks***
8a-1. 1000 gallon tank
8a-2. Installation of tank
8a-3. Percolation test and certification (one allowed)

8b. ***Installation of Lateral Lines***
To include: materials, machinery, cost and labor.

1. PURPOSE

To reduce residential sewer pollution entering the waters of Lake Eucha.

2. APPLICABILITY

To target problems within the watershed where septic systems are not in place, or systems which are not adequate to function as needed to prevent water pollution in Lake Eucha.

3. POLICIES

F. Cost-sharing is authorized for:

(1) Installation of septic systems to include:
a. Septic tank
b. Lateral lines
c. Labor for installation
d. Percolation test and certification

(2) To receive cost-share assistance, the following criteria must be met:
a. If the applicant is an agriculture livestock producer (poultry, dairy, swine, beef), a water quality conservation plan must be developed with the Conservation District in their respective county.
b. If the Water Quality Conservation Plan addresses other best management practice needs, the applicant will be required to correct them along with the septic system. These other BMP needs may also receive cost share assistance, if they are in the program.

c. If the applicant is a non-agriculture producer and lives within 1/8 mile (660ft) of a tributary, cost-share assistance is available. They must meet all criteria of the program and have no other water quality problems on the property.

B. Cost share assistance is not authorized for:
- **(1) Trailer type homes not permanently attached to the ground**
- **(2) Recreational trailer**
- **(3) Seasonal homes**
- **(4) New home construction**

C. Design, layout and inspection:
- **(1) A local representative of the Department of Environmental Quality for the State of Oklahoma or a certified percolation tester and septic system installer will design and make final approval of the installation.**
- **(2) The septic system will be designed within the guidelines of Oklahoma Departmental Quality Bulletin No. 640.**

D. Best Management practices approval
- **(1) The Lake Eucha Watershed Water Quality office will take applications and refer them to the local representative of the Department of Environmental Quality**
- **(2) When and if, in doubt of applicant meeting all criteria for cost share, the final decision will be made by Oklahoma Conservation Commission Water Quality representative.**

Best Management Practice Cost-Share Rates

BMP No.8: Rural Waste System

A: Cost Share Rate: 80%

B: Cost Share Components:
- **(1) Septic Tank (flat c/s rate) $0.36 per gallon**
- **(2) PVC perforated pipe 4" diameter, junction boxes, gravel for laterals in absorption field, includes installation (flat c/s rate) $4.00/lin. ft.**

C. The septic system will be designed, checked out, and approved within the guidelines of Oklahoma State Department of Environmental Quality Bulletin No. 640.

Code	Conservation Practices	Components	Unit	Cost Share	Cost
	Rural Waste System				
		8a: Septic Tank			
		8a-1: 1000 gallon	**each**	**80%**	**$360.00**
		8a-2: Installation of tank	**each**	**80%**	**$50.00**
	Approved by OCC 8/2/99	**8a-3: Percolation test and certification (one allowed)**	**unit**	**80%**	**invoice**
		8B: Installation of Lateral Lines (material, machinery, and labor)	**L/ft**	**80%**	**$4.00**

Lake Eucha 319 Project Best Management Practices approved by:

Watershed Advisory Group:

December 17, 1998 _____
Chairman

Delaware County Conservation District:

January 14, 1999 _____
Chairman

Oklahoma Conservation Commission:

February 8, 1999 _____
Chairman