TMDL FOR PHOSPHORUS IN OSAGE CREEK NEAR BERRYVILLE, AR

(Reach 11010001-045L)

FINAL
January 10, 2006

TMDL FOR PHOSPHORUS IN OSAGE CREEK NEAR BERRYVILLE, AR (Reach 11010001-045L)

Prepared for

EPA Region VI
Water Quality Protection Division
Permits, Oversight, and TMDL Team
Dallas, TX 75202

Contract No. 68-C-02-108
Task Order #108

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FINAL
December 22, 2005

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be allocated to point sources and nonpoint sources discharging to the waterbody.

This report presents a TMDL for phosphorus for Osage Creek downstream of Berryville (Reach 11010001-045L) in the Kings River basin in northwest Arkansas. The upper end of the Osage Creek watershed is in the Boston Mountains ecoregion, but most of the watershed (including the impaired reach) is in the Ozark Highlands ecoregion. The Osage Creek watershed is approximately 98% forest and pasture. Osage Creek flows into the Kings River, which flows into Table Rock Lake in Missouri. The Osage Creek watershed has a drainage area of 164 square miles at its mouth.

The Environmental Protection Agency (EPA) Region 6 added this stream reach to the final 2002 Arkansas 303(d) list for not supporting its aquatic life designated use. Based on information in the Arkansas Department of Environmental Quality (ADEQ) 2002 Integrated Assessment Report and the EPA Decision Document for the final 2002 Arkansas 303(d) list, the primary cause of impairment is total phosphorus and the primary source of elevated phosphorus concentrations is the City of Berryville wastewater treatment plant (WWTP).

Arkansas has no numeric water quality criterion for phosphorus. Previous versions of Arkansas Regulation No. 2 included a guideline of 0.1 mg/L for total phosphorus in streams. Although this guideline was never a numeric criterion, it was still considered to be a reasonable benchmark for evaluating phosphorus levels in streams for the protection of aquatic life. The guideline of 0.1 mg/L was used as the target concentration, or endpoint, for this TMDL.

Historical monitoring data for phosphorus have been collected by ADEQ in Osage Creek upstream of Berryville (WHI0068) and downstream of Berryville (WHI0069). These data were

summarized and plotted. In general, concentrations of total phosphorus tended to be higher at the downstream station.

The TMDL in this report was developed for average annual conditions because aquatic life impairments typically occur as a result of long term exposure to elevated nutrient concentrations rather than short term increases in nutrient concentrations. The TMDL was developed using a simple mass balance approach assuming conservative mixing. Ten percent of the allowable loading was set aside as an explicit margin of safety.

A wasteload allocation (WLA) was developed for total phosphorus discharged from two point sources (City of Berryville and Bedford Falls Mobile Home Park). The allowable load for the City of Berryville was based on an effluent concentration of 1 mg/L as required in Arkansas Regulation No. 6. This will require the City of Berryville WWTP to reduce its current phosphorus load by approximately 85%. Because the discharge from the Bedford Falls Mobile Home Park is very small, its allowable loading was based on its estimated current loading. Two other point sources in the segment (Carroll County Stone, and Carroll Electric Cooperative) were excluded from the WLA because they do not have a source of phosphorus in their discharges.

The load allocation (LA) for nonpoint sources was calculated as the TMDL minus the MOS and WLA. This allowable nonpoint source load was compared to the existing nonpoint source load, which was calculated as the mean phosphorus concentration upstream of Berryville multiplied by the average annual ambient flow from the watershed. Comparing these allowable and existing loads showed that no reductions of nonpoint source loads of phosphorus are needed.

The components of this TMDL are summarized in Table ES.1.

Table ES.1. Osage Creek total phosphorus TMDL.

Allocation	Load (lbs/day)
WLA for point sources	22.44
LA for nonpoint sources	64.54
MOS	9.66
TMDL	96.64

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1.0 INTRODUCTION

This report presents the total maximum daily load (TMDL) for phosphorus for Osage Creek downstream of Berryville (stream segment 11010001-045L), which is located in the Kings River basin in northwest Arkansas. This stream segment was included on the Arkansas final 2002 Section 303(d) list (Environmental Protection Agency (EPA) 2003) for not supporting its aquatic life designated use (Table 1.1). Phosphorus is listed as the suspected cause of this impairment in the 303(d) list. According to the Arkansas Department of Environmental Quality (ADEQ) 2002 integrated assessment report (ADEQ 2002), the suspected primary source of elevated phosphorus concentrations in Osage Creek is the Berryville municipal wastewater treatment plant (WWTP).

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standards for that pollutant and to establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL is the sum of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern and the LA is the load allocated to nonpoint sources and natural background. The MOS is a percentage of the TMDL that takes into account any lack of knowledge concerning the relationship between pollutant loadings and water quality.

Table 1.1. 303(d) listing for the stream reach in this task order (EPA 2003, ADEQ 2002).

Reach No.	Stream Name	Impaired Use	Source	Cause	Priority
11010001-045L	Osage Creek	Aquatic Life	Municipal Point Source	Total Phosphorus	High

2.0 BACKGROUND INFORMATION

2.1 General Information

The study area for the TMDL in this report is the Osage Creek watershed located in Carroll County in northwest Arkansas (see Figure A.1 located in Appendix A). Osage Creek drains in a generally northwesterly direction before joining the Kings River east of Berryville. The Kings River then flows into Table Rock Lake in Missouri. The impaired portion of Osage Creek is from Berryville (where the municipal WWTP effluent enters Osage Creek) to the mouth.

The upper end of the Osage Creek watershed is in the Boston Mountains ecoregion, but most of the watershed (including the impaired reach) is in the Ozark Highlands ecoregion. The Osage Creek watershed is also part of ADEQ Planning Segment 4K and US Geological Survey (USGS) Hydrologic Unit 11010001. The drainage area for Osage Creek at its mouth is 164 square miles.

Additional background information for the Osage Creek watershed (topography, soils, geology, etc.) is documented in a watershed assessment report that was prepared for the Kings River Watershed Partnership (KRWP) (FTN Associates, Ltd. (FTN) 2005).

2.2 Land Use

Land use/land cover data for the Osage Creek watershed were obtained from the University of Arkansas Center for Advanced Spatial Technologies (CAST) (2001). These data were based on satellite imagery from 1999, but they were compared with aerial photography in certain areas because of known growth in development during the last few years, particularly around Berryville. For example, in Berryville during 1 year (2004), construction permits were issued for 27 single family dwellings, 2 duplexes, 6 four-plexes, 9 commercial buildings, and 86 miscellaneous structures (primarily storage buildings and fences) (Carroll County News 2005). Because of this development, the most recent aerial photography (2002) was obtained and used to identify areas of new construction or other development that occurred after the published land

use/land cover data were developed. As a result of this review, the land use/land cover data were changed to urban for a number of small areas in the Berryville area.

These updates of the urban area did not significantly affect the overall land use statistics for the Osage Creek watershed. A map of land uses for the watershed is included as Figure A.2 (located in Appendix A) and land use statistics for the watershed are presented in Table 2.1.

Table 2.1. Land use/land cover percentages for the Osage Creek watershed.

Land use category	Percentage of watershed
Urban	1.3%
Water	0.3%
Forest	67.1%
Pasture/hay/grass	31.3%
TOTAL	100.0%

2.3 Description of Hydrology

Average annual precipitation ranges from 48 inches in the southern part of the watershed to 44 inches in the northern part of the watershed (USGS 1985). Approximately 35% of this precipitation becomes streamflow (USGS 1985). There is no USGS flow gage in the Osage Creek watershed, but the USGS maintains a continuous flow gage on the Kings River near Berryville (Gage # 07050500), about 5.6 miles downstream of the mouth of Osage Creek. Published daily flow data for this gage are currently available from April 1939 to September 1975 and from October 1992 to September 2004 (USGS 2005). The long term average flow for this gage is 576 cfs and its drainage area is 527 square miles (USGS 2005).

2.4 Water Quality Standards

The water quality standards for Osage Creek are given in Arkansas Regulation No. 2 (Arkansas Pollution Control and Ecology Commission (APCEC) 2004a). The designated uses for Osage Creek are primary contact recreation; secondary contact recreation; domestic, industrial and agricultural water supply; and perennial fishery (where the drainage area is at least 10 square miles).

For nutrients, the Arkansas water quality standards have narrative criteria but not a numeric criterion. The narrative criteria for nutrients in Arkansas are as follows:

> "Materials stimulating algal growth shall not be present in concentrations sufficient to cause objectionable algal densities or other nuisance aquatic vegetation or otherwise impair any designated use of the waterbody. Impairment of a waterbody from excess nutrients are dependent on the natural waterbody characteristics such as stream flow, residence time, stream slope, substrate type, canopy, riparian vegetation, primary use of waterbody, season of the year and ecoregion water chemistry. Because nutrient water column concentrations do not always correlate directly with stream impairments, impairments will be assessed by a combination of factors such as water clarity, periphyton or phytoplankton production, dissolved oxygen values, dissolved oxygen saturation, diurnal dissolved oxygen fluctuations, pH values, aquatic-life community structure and possibly others. However, when excess nutrients result in an impairment, based upon Department assessment methodology, by any established, numeric water quality standard, the waterbody will be determined to be impaired by nutrients."

The upper White River basin (including the Osage Creek watershed) has also been designated as a nutrient surplus area by the Arkansas Natural Resources Commission (ANRC 2005) due to concerns about excessive nutrient loads to streams and lakes. ANRC's regulations require poultry operations with 2,500 or more birds in nutrient surplus areas to register each year with ANRC. For point source dischargers in nutrient surplus areas, Regulation No. 2 also specifies the following requirements:

> "All point source discharges into the watershed of waters officially listed on Arkansas' impaired waterbody list (303d) with phosphorus as the major cause shall have monthly average discharge permit limits no greater than those listed below. Additionally, waters in nutrient surplus watersheds as determined by Act 1061 of 2003 Regular Session of the Arkansas 84th General Assembly and subsequently designated nutrient surplus watersheds may be included under this Reg. if point source discharges are shown to provide a significant phosphorus contribution to waters within the listed nutrient surplus watersheds.

Facility Design Flow	Total Phosphorus discharge limit
15 MGD or more	Case by case
3 to <15 MGD	1.0 mg/L
1 to <3 MGD	2.0 mg/L
0.5 to <1.0 MGD	5.0 mg/L
<0.5 MGD	Case by case

> "For discharges from point sources which are greater than 15 MGD, reduction of phosphorus below 1 mg/L may be required based on the magnitude of the phosphorus load (mass) and the type of downstream waterbodies (e.g., reservoirs, Extraordinary Resource Waters). Additionally, any discharge limits listed above may be further reduced if it is determined that these values are causing impairments to special waters such as domestic water supplies, lakes or reservoirs or Extraordinary Resource Waters."

In Arkansas Regulation No. 6, Chapter 4, it is stated that "No permit for discharge of domestic wastewater to Osage Creek or its tributaries, by the City of Berryville, shall authorize more than 1.0 mg/L Total Phosphorus based on a monthly average." Compliance with this requirement "shall be attained as soon as feasible, but no later than January 1, 2012" (APCEC 2004b).

Because Osage Creek flows into the Kings River, which flows into Missouri, water quality standards for the Kings River in Missouri are relevant to this TMDL. Currently the Missouri water quality standards do not have a numeric instream criterion for phosphorus for the Kings River in Missouri.

As specified in EPA's regulations at 40 CFR 130.7(b)(2), applicable water quality standards include antidegradation requirements. Arkansas' antidegradation policy is listed in Sections 2.201 through 2.204 of Regulation No. 2. These sections impose the following requirements:

- Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
- Water quality that exceeds standards shall be maintained and protected unless allowing lower water quality is necessary to accommodate important economic or social development, although water quality must still be adequate to fully protect existing uses.
- For outstanding state or national resource waters, those uses and water quality for which the outstanding waterbody was designated shall be protected.
- For potential water quality impairments associated with a thermal discharge, the antidegradation policy and implementing method shall be consistent with Section 316 of the Clean Water Act.

2.5 Nonpoint Sources

A recent study of the Kings River watershed (FTN 2005) included a detailed investigation of phosphorus loading by subwatershed. Nonpoint sources of phosphorus load that were identified in the Osage Creek subwatershed included livestock (beef and dairy cattle), application of poultry litter to pasture, on-site wastewater systems (i.e. septic tanks), and streambank erosion. Beef and poultry production is fairly common in the Osage Creek watershed, and runoff from pasture was estimated to be the greatest potential nonpoint source of phosphorus in the watershed (FTN 2005).

2.6 Point Sources

Point source discharges in the Osage Creek watershed were identified using EPA's Permit Compliance System (PCS) web site (EPA 2005). According to PCS, there are a total of four facilities in the watershed with point source discharges that are permitted through the National Pollutant Discharge Elimination System (NDPES). Information for these facilities is summarized in Table 2.2 and locations of these facilities are shown on Figure A.3. None of the facilities currently has a permit limit for phosphorus, although, as noted in Section 2.4 above, the City of Berryville is required under Regulation 6 to reduce phosphorus discharge to a 1 mg/L monthly average by no later than 2012.

The largest point source discharge in the Osage Creek watershed is the City of Berryville wastewater treatment plant (WWTP), which has a treatment system that includes two oxidation ditches, two final clarifiers, and ultraviolet disinfection with land application of sludge on permitted farms near the WWTP. The City of Berryville is planning changes to the treatment system that could reduce effluent concentrations of phosphorus and sludge volume. The Berryville WWTP receives wastewater from a Tyson poultry processing facility in addition to domestic wastewater from residences. Although the Tyson facility uses pretreatment to decrease pollutant concentrations in their wastewater, personnel at the City of Berryville WWTP have estimated that approximately 70% to 80% of their incoming load of biochemical oxygen demand (BOD) and ammonia comes from the Tyson facility (FTN 2005).

Table 2.2. Point source discharges in the Osage Creek watershed.

NPDES Number	Facility Name	Design Flow (MGD)	Parameter	Monthly Average Permit Limits (mg/L)
AR0021792	City Of Berryville WWTP	2.4	BOD5	15 (summer), 20 (winter)
			TSS	20 (summer), 30 (winter)
			NH3-N	2 (summer), 10 (winter)
			Total Phos	not in permit
AR0044059	Carroll Electric Cooperative	0.0020	CBOD5	25
			TSS	90
			NH3-N	5
			Total Phos	not in permit
AR0047619	Carroll County Stone	0.0364	CBOD5	not in permit
			TSS	35
			NH3-N	not in permit
			Total Phos	not in permit
AR0049867	Bedford Falls Mobile Home Park	0.0387	CBOD5	15
			TSS	20
			NH3-N	5 (summer), 10 (winter)
			Total Phos	not in permit

The City of Berryville WWTP and the Bedford Falls Mobile Home Park were the only two point sources discharges included in the TMDL calculations because it was assumed that the other two discharges did not have any source of phosphorus in their discharges.

2.7 Previous Studies

2.7.1 Parsons/UA Study

During 2003 and 2004, Parsons and the University of Arkansas at Fayetteville (UA) conducted a comprehensive survey of the Kings River and Illinois River watersheds, which included looking at water quality, fish and benthic communities, and habitat and streambed characteristics at two sites on Osage Creek (shown on Figure A.4) (Parsons/UA 2004). The water quality sampling showed increases of nitrite + nitrate, total nitrogen, orthophosphorus, and total phosphorus in Osage Creek downstream of the discharge from the City of Berryville WWTP. The stream habitats at the sampling sites were characterized as unimpacted. The biological data collection showed some evidence of impacts during at least one sampling event at each of the sampling sites. The water chemistry data, physical habitat data, and biological data were

combined to classify each sampling site concerning the level of impacts to aquatic life. As shown in Table 2.3, the site on Osage Creek downstream of Berryville was classified as severely impacted and the site on Osage Creek upstream of Berryville was classified as unimpacted.

2.7.2 ADEQ Water Quality Survey of White River

During 1992 and 1993, ADEQ conducted a water quality survey of the upper White River that included five sampling sites on Osage Creek. Four of these sampling sites were located upstream of Berryville, and the fifth was the ADEQ routine ambient water quality sampling site located downstream of Berryville (WHI0069). Seven sampling events were conducted and included water quality and macroinvertebrate sampling on Osage Creek. Nutrient analysis of the water quality samples indicated that the Berryville WWTP was contributing significant nutrient loads to Osage Creek (ADEQ 1995). A dairy farm upstream of Berryville was also identified as a possible cause of elevated phosphorus concentrations observed in Osage Creek (station OSG03) (ADEQ 1995). Macroinvertebrates were sampled at two of the Osage Creek sampling sites, both upstream of Berryville. One of these sites indicated slight impairment due to habitat.

Table 2.3. Conclusions for Osage Creek sampling stations from Parsons/UA study.

Station ID	Sampling event	Water Chemistry					Habitat		Biological				Total number of indicators impacted	Conclusion (based on all events)
		DO minimum	DO fluctuation	DO saturation	Total phos.	TDS	Riffle	Pool	Periphyton	Filamentous	Benthics	Fish		
OSG045UP (Osage Creek upstream of Berryville)	1	○	○	○	○	○	○	○	○	**x**	○	**x**	3	Unimpacted
	2	○	○	○	○	○	○	○	-	-	-	○		
	3	**x**	○	○	○	○	-	-	-	-	-	-		
OSG045DN (Osage Creek downstream of Berryville)	1	**x**	**x**	○	**x**	**x**	○	○	○	**x**	**x**	○	16	Severely impacted
	2	○	**x**	**x**	**x**	**x**	○	○	-	-	**x**	**x**		
	3	○	**x**	**x**	**x**	**x**	-	-	-	-	-	-		

x = impacted, o = not impacted

2.7.3 ADEQ Water Quality Survey Freeman Branch and Osage Creek

In 1991 ADEQ conducted an investigation of water quality effects of the Berryville WWTP effluent on Freeman Branch (the receiving waterbody for City of Berryville WWTP) and Osage Creek (ADEQ 1992). One sampling station was located on Freeman Branch and four sampling stations were located on Osage Creek, one upstream of Freeman Branch and three downstream. Fish and macroinvertebrates were sampled on Freeman Branch and at two sites on Osage Creek, one upstream and one just downstream of Freeman Branch. Water quality samples were analyzed for nitrogen but not phosphorus. The nitrogen and dissolved oxygen results indicated nutrient related impacts in Freeman Branch and Osage Creek downstream of Freeman Branch. The Freeman Branch macroinvertebrates samples indicated impairment, as did the fish community samples. Osage Creek Macroinvertebrate and fish samples did not indicate impairment.

2.7.4 Kings River Watershed Assessment

In 2005, FTN compiled an assessment of the Kings River Watershed for the Kings River Watershed Partnership (FTN 2005). This assessment evaluated the effects of streambank erosion, road and ditch erosion, pasture and forest management, septic tanks, urban runoff, construction site erosion, and point source discharges on the total phosphorus load in the Kings River. Poultry litter and erosion of phosphorus-bound sediment were determined to be the major nonpoint sources of phosphorus loads while the City of Berryville sewage treatment plant was identified as the major point source of phosphorus loads.

3.0 EXISTING WATER QUALITY

3.1 General Description of Data

Historical water quality data have been collected by ADEQ at approximately monthly intervals for two locations in Osage Creek. The locations of these sampling stations are shown on Figure A.4. Table 3.1 summarizes the ADEQ total phosphorus data collected at these two sites.

Table 3.1. Summary of ADEQ total phosphorus data for Osage Creek.

Station	Begin	End	Count	Min	Avg	Median	Max
Osage Creek above Berryville (WHI0068)	11/21/83	10/19/04	229	0.003	0.050	0.036	0.92
Osage Creek below Berryville (WHI0069)	11/21/83	10/19/04	197	0.010	1.049	0.410	24.62

3.2 Long Term Trends

Time series plots of ADEQ measurements of total phosphorus over the period of record are included in Appendix B. For the most part, these data do not show noticeable trends in water quality. This is not unexpected, since there has been relatively little change in land use in the watershed over the sampling period of record. For Osage Creek below Berryville (Station WHI0069), total phosphorus concentrations appear to have been higher during the period from about 1994 through 2002 than they had been in the 1980's; however the 2003 and 2004 concentrations appear similar to the 1980's levels (Figures B.1 and B.2).

3.3 Seasonal Patterns

Seasonal plots of ADEQ measurements of total phosphorus over the period of record are shown in Figures B.3 and B.4 (in Appendix B). Time series plots of KRWP measurements of phosphorus are shown in Figures B.5 and B.6. Since just one year of KRWP data are plotted, these plots are similar to the seasonal plots. For the most part, these data do not show noticeable seasonal patterns in water quality. Patterns that are apparent are discussed below:

- For Osage Creek below Berryville (Station WHI0069), total phosphorus concentrations tend to be lower in January through April than during the rest of the year (Figure B.4). This pattern may be the result of one or two years of data with higher concentrations during this period.
- For Lower Osage Creek at CR 306 (KRWP station #2), phosphorus concentrations are higher in the late summer – fall than during the rest of the year (Figure B.6). This pattern is similar to the pattern of the phosphorus data from station WHI0069, which is just upstream (see above).

3.4 Relationship to Flow

Figures B.7 and B.8 (in Appendix B) show plots of ADEQ data for total phosphorus versus flows estimated from measured data for the Kings River near Berryville (USGS Gage 07050500). The data upstream of Berryville do not show a noticeable correlation between flow and water quality. For Osage Creek below Berryville (station WHI0069), the highest total phosphorus concentrations occur during the lowest flows (Figure B.8). This type of correlation between concentration and flow suggests that the highest phosphorus concentrations are coming from a point source. The higher phosphorus concentrations at this station are occurring when there is the least amount of dilution water in Osage Creek.

4.0 TMDL DEVELOPMENT

4.1 Seasonality and Critical Conditions

EPA's regulations at 40 CFR 130.7 require the determination of TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. Also, both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to consider seasonal variations for meeting water quality standards. Aquatic life impairments typically occur as a result of long term exposure to elevated nutrient concentrations rather than short term fluctuations in nutrient concentrations. This phosphorus TMDL was developed for average annual conditions. These nutrient TMDLs were developed for average annual conditions. The most obvious result of nutrients is algal blooms. When the algae die, the resultant biological oxygen demand consumes oxygen, which adversely affects aquatic life. The effect occurs in a short time but the build-up of nutrients and the conditions to start the algal bloom may occur over an extended time.

4.2 Water Quality Targets

As mentioned in Section 2.4, the Arkansas water quality standards do not include a numeric criterion for phosphorus. At the time when this reach of Osage Creek was first added to the 303(d) list for phosphorus, Arkansas Regulation No. 2 contained a numeric guideline for total phosphorus of 0.1 mg/L for streams. Although the current version of Regulation No. 2 no longer includes that guideline, it is still considered a reasonable benchmark for evaluating phosphorus levels in streams for the protection of aquatic life. The total phosphorus concentration of 0.1 mg/L was used as the target concentration, or numeric endpoint, for this phosphorus TMDL.

4.3 TMDL

The first step in developing the components of the phosphorus TMDL was to calculate the assimilative capacity for the segment. The assimilative capacity for the segment was calculated by simply multiplying the target phosphorus concentration (0.1 mg/L) by the total flow in the stream for the segment and the appropriate conversion factor. The total flow in the

segment was calculated as the average annual ambient flow from the watershed plus the design flows of both point sources that have phosphorus in their discharge (City of Berryville WWTP and Bedford Falls Mobile Home Park). The average annual ambient flow for the segment was estimated as the average annual flow per unit area for the USGS gage on the Kings River (1.09 cfs per square mile) times the drainage area of the segment (164 square miles) minus the historical average contribution of the point source discharge to the USGS measured flows (2.12 MGD). This resulted in average annual ambient flow rate of 175.5 cfs, or 113.4 MGD. Including the combined design flows from the point source discharges (2.4387 MGD), the total average annual flow for the segment is 115.9 MGD. When this total flow was multiplied by the target concentration, the resulting value for assimilative capacity was 96.64 lbs/day of total phosphorus. The TMDL was set equal to the assimilative capacity.

4.4 Margin of Safety

The next step was to account for the MOS. Both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to include a MOS to account for lack of knowledge concerning the relationship between pollutant loadings and water quality. The MOS may be expressed explicitly as unallocated assimilative capacity or implicitly through conservative assumptions used in establishing the TMDL. For this phosphorus TMDL, 10% of the assimilative capacity (i.e., 9.66 lbs/day) was set aside as an explicit MOS. In addition to the explicit MOS, this TMDL also includes an unquantified implicit MOS due to the calculation of loads assuming that both point sources are simultaneously discharging at design capacity.

4.5 Wasteload Allocation

After subtracting the MOS from the TMDL, allowable point source loads were calculated. An effluent phosphorus concentration of 1 mg/L was used for the City of Berryville based on requirements in Arkansas Regulation No. 6. For the Bedford Falls Mobile Home Park, an effluent phosphorus concentration of 7.5 mg/L was used because its effluent phosphorus concentration was assumed to be similar to the current effluent concentration that was back-calculated for the City of Berryville (FTN 2005). Because the Bedford Falls Mobile Home

Park is very small, its allowable load was based on its estimated current load with no reductions. Each point source load was calculated as the design flow multiplied by the effluent concentration and the appropriate conversion factor. The resulting allowable loads of total phosphorus were 20.02 lbs/day for the City of Berryville and 2.42 lbs/day for the Bedford Falls Mobile Home Park. The allowable effluent concentrations and loads are shown in Table 4.1.

Table 4.1. Summary of allowable point source concentrations and loads.

	Total Phosphorus Loads	
	(mg/L)	(lbs/day)
City of Berryville WWTP (AR0021792)	1.0	20.02
Bedford Falls Mobile Home Park (AR0049867)	7.5	2.42
Carroll County Stone (AR0047619)	NA	NA
Carroll Electric Cooperative (AR0044059)	NA	NA

Based on recent effluent phosphorus loads that were back-calculated for the City of Berryville WWTP (134 lbs/day; FTN 2005), the City of Berryville WWTP will need to reduce its phosphorus load by approximately 85% to comply with this TMDL.

4.6 Load Allocation

The LA for nonpoint source loading from the watershed was calculated as the remaining available load after the MOS and WLA were subtracted from the TMDL. The LA was calculated to be 64.54 lbs/day.

In order to calculate a percent reduction that would be needed for nonpoint source loads, the existing nonpoint source load was calculated as the mean concentration of total phosphorus at ADEQ Station WHI0068 (0.050 mg/L; see Table 3.1) times the average annual ambient flow for the segment (113.4 MGD) and the appropriate conversion factor. This yielded an existing load of 47.3 lbs/day. Because this existing nonpoint source load is smaller than the allowable nonpoint source load (64.54 lbs/day), no nonpoint source reductions are required.

The LA and other components of the TMDL are summarized in Table 4.2.

Table 4.2. Osage Creek total phosphorus TMDL.

Allocation	Load (lbs/day)
WLA for point sources	22.44
LA for nonpoint sources	64.54
MOS	9.66
TMDL	96.64

4.7 Future Growth

Compliance with this TMDL for total phosphorus is based on keeping concentrations in the stream below the target concentrations rather than keeping the loads in the stream below a certain amount. The assimilative capacity of the stream will increase as the amount of flow in the stream increases. Increases in flow will allow for increased loadings of phosphorus to Osage Creek. Future growth for existing or new point sources discharging to Osage Creek is not limited by this TMDL as long as the point source(s) do not cause instream concentrations of total phosphorus to exceed the target concentration of 0.1 mg/L. At this time the instream criterion is the water quality target established in Section 4.2. In the future, the instream criterion may be set by an addition of a numeric criterion to the standard or other values set by a nutrient criteria setting procedure by ADEQ.

5.0 OTHER RELEVANT INFORMATION

In accordance with Section 106 of the Federal Clean Water Act and under its own authority, ADEQ has established a comprehensive program for monitoring the quality of the State's surface waters. ADEQ collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for long term trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters which is published as the 2002 Arkansas Integrated Water Quality Monitoring and Assessment Report (ADEQ 2002).

Point source reductions for this TMDL will be implemented through the NPDES program, which is administered by ADEQ in Arkansas.

6.0 PUBLIC PARTICIPATION

When EPA establishes a TMDL, federal regulations require EPA to publicly notice and seek comment concerning the TMDL. Pursuant to a May 2000 consent decree, this TMDL was prepared under contract to EPA. After development of the draft version of this TMDL, EPA prepared a notice seeking comments, information, and data from the general public and affected public. Comments were submitted during the public comment period and this TMDL has been revised accordingly. Responses to these comments are included in Appendix C. EPA has transmitted the revised TMDL to ADEQ for implementation and for incorporation into ADEQ's current water quality management plan.

7.0 REFERENCES

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APPENDIX A

Maps

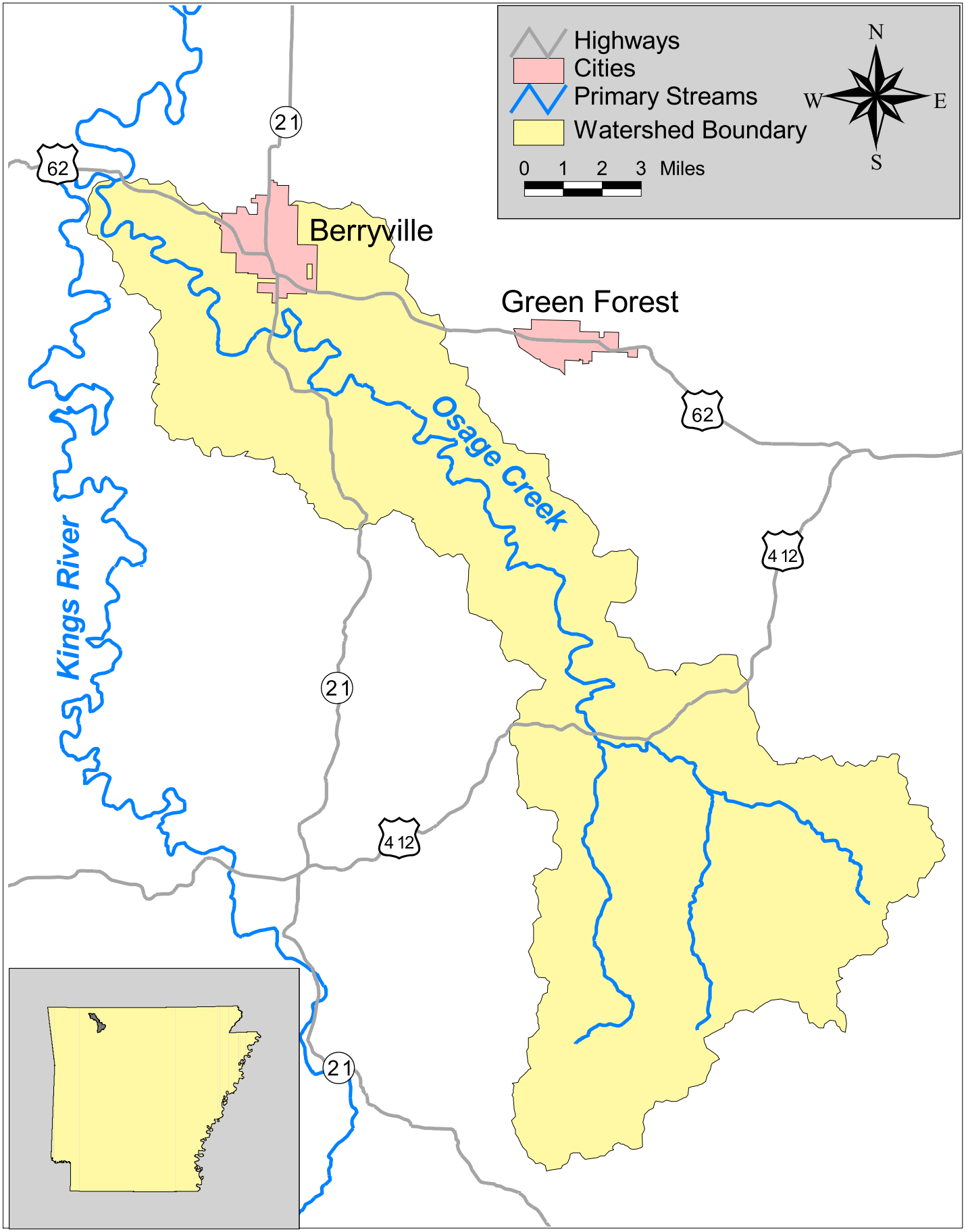


Figure A.1. Map of study area.

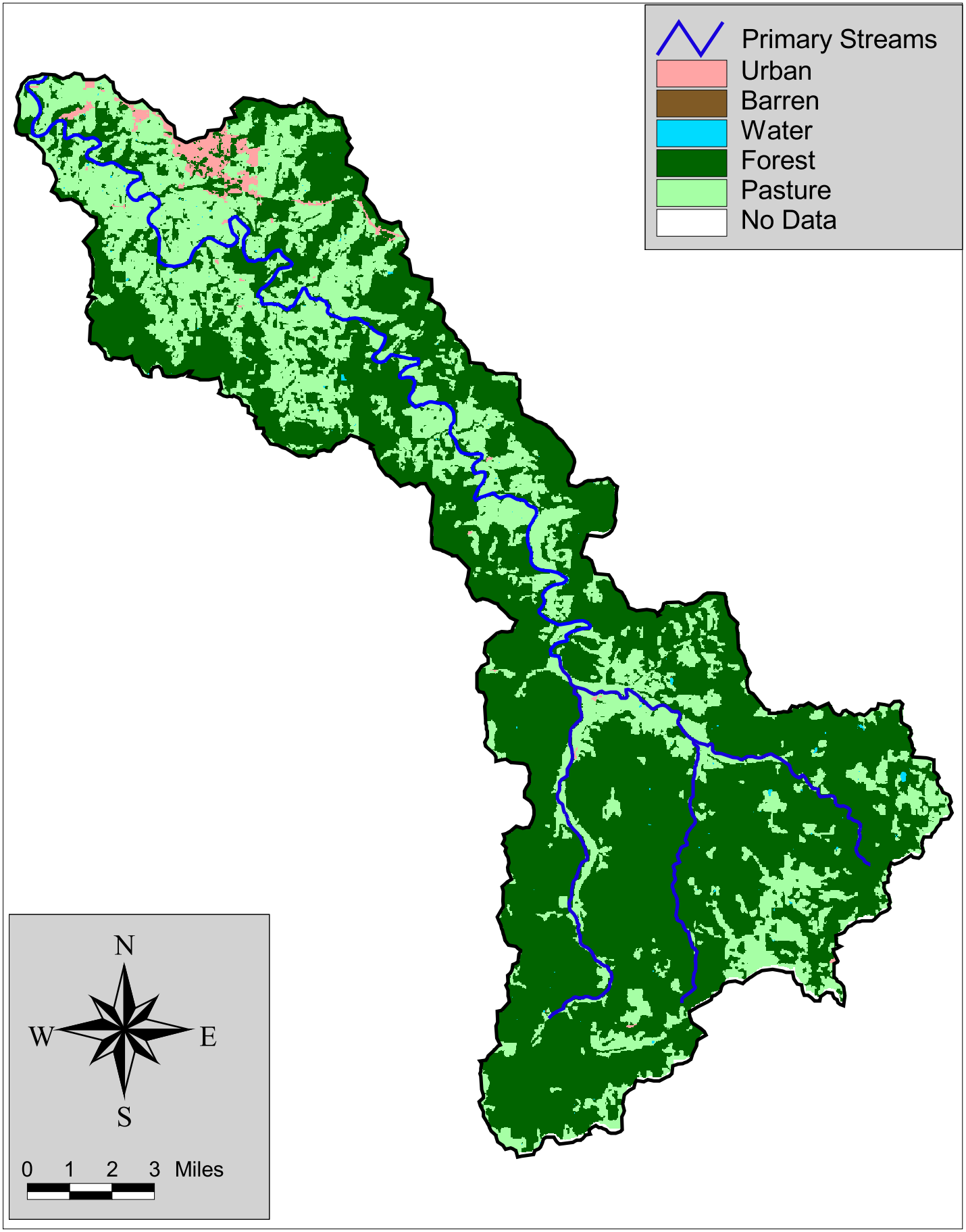


Figure A.2. Land use/land cover for study area.

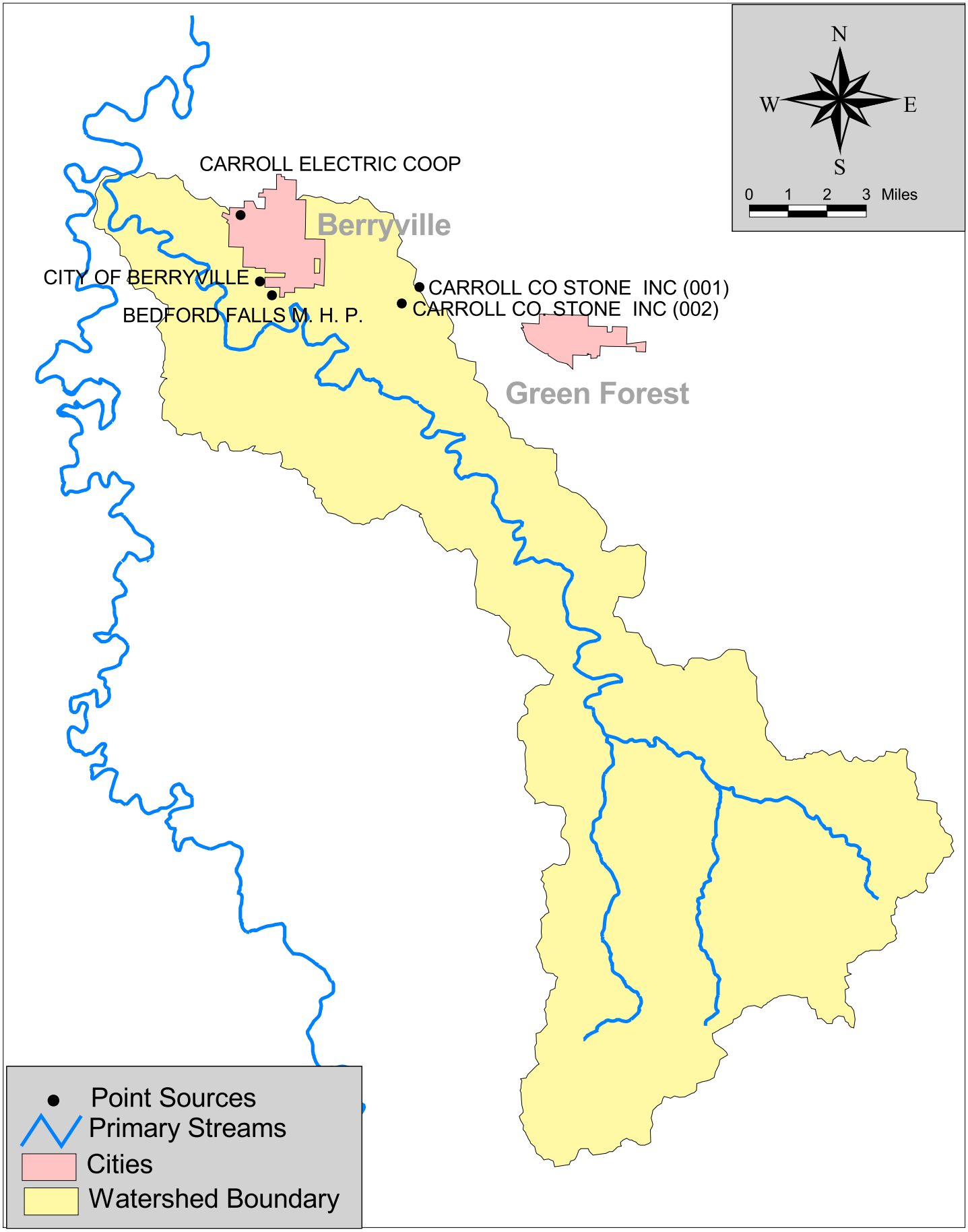


Figure A.3. Point sources in study area.

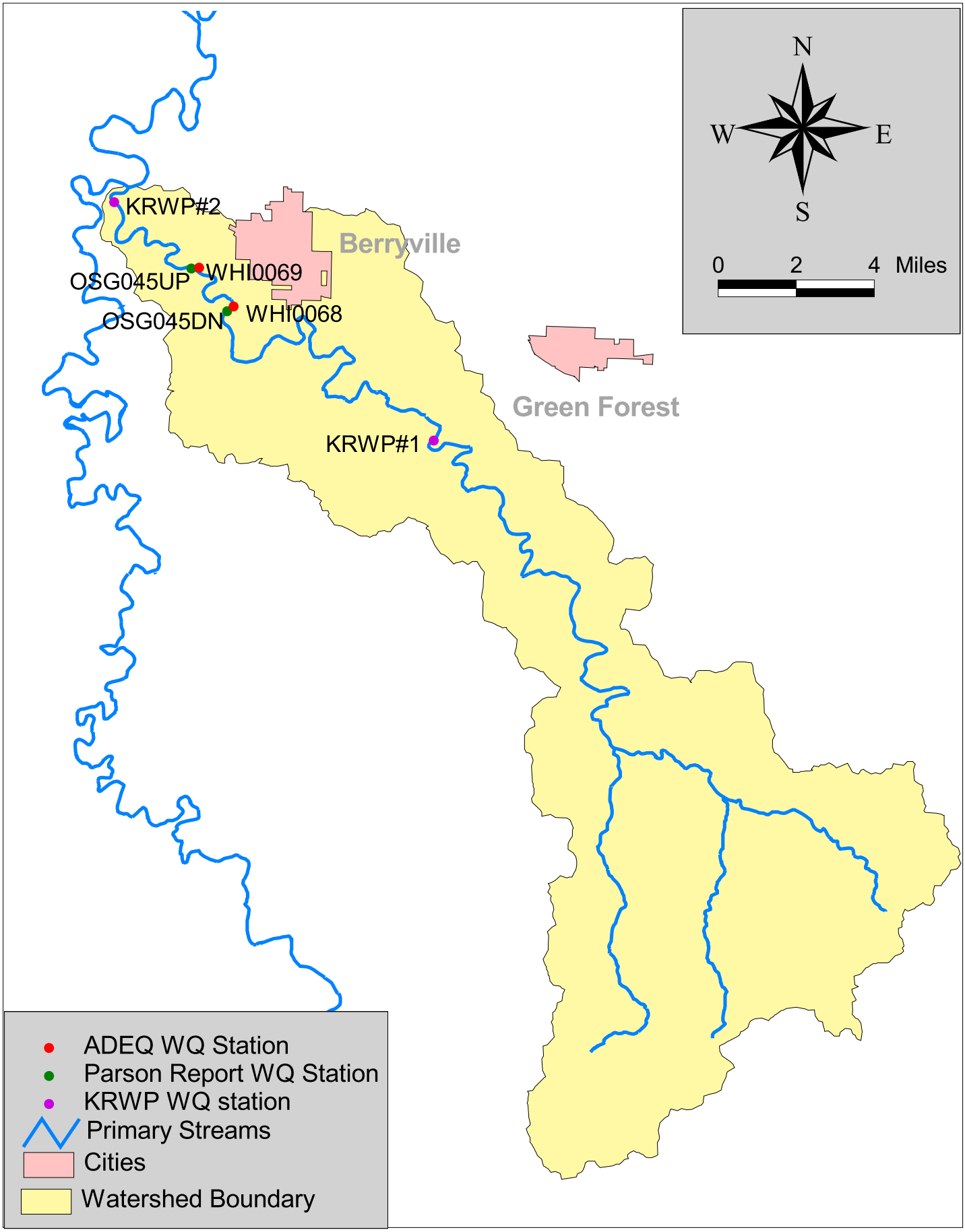


Figure A.4. Map of water quality stations in study area.

APPENDIX B

Total Phosphorus Plots

Figure B.1. Long Term Total P for Osage Creek above Berryville (WHI0068)

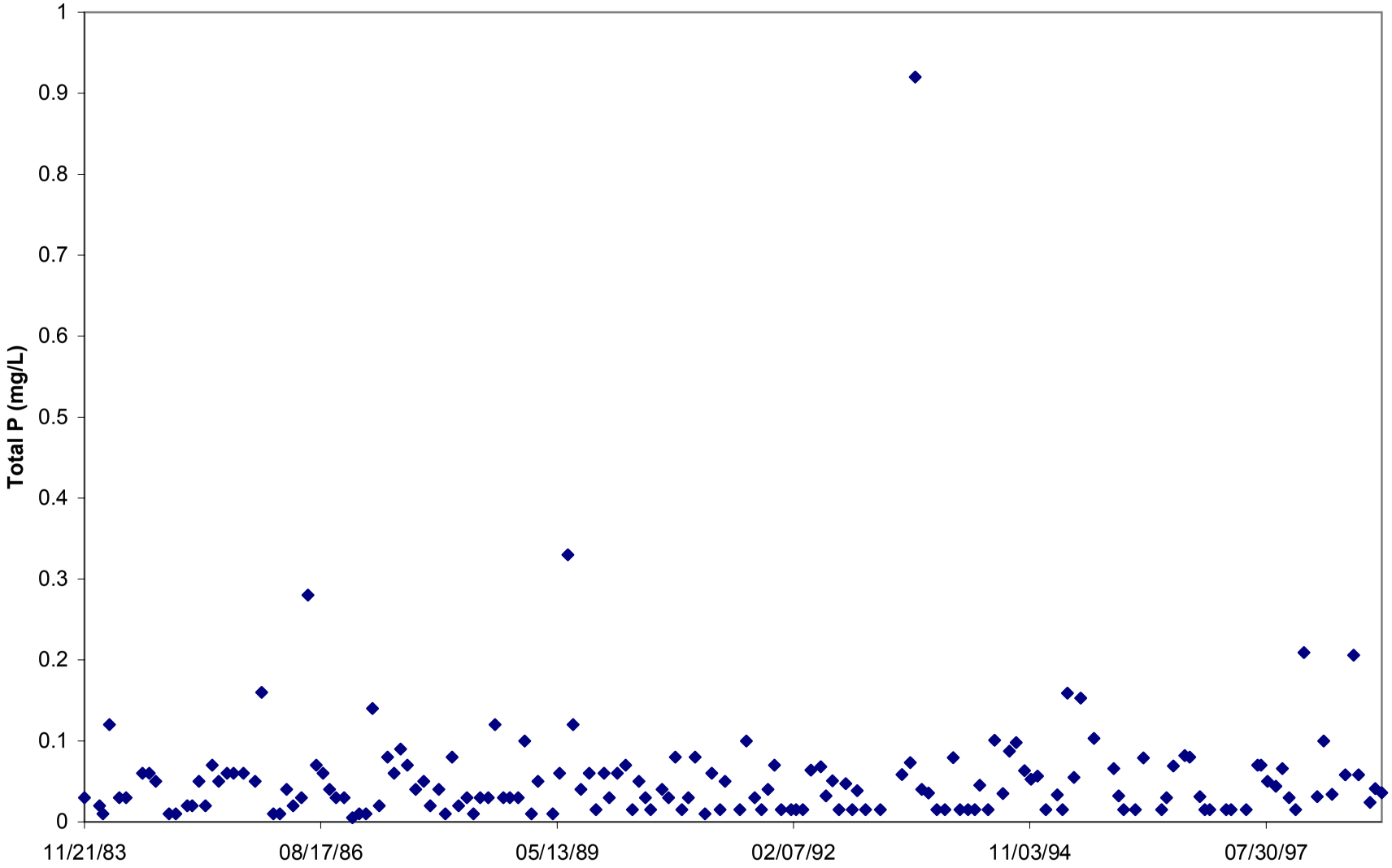


Figure B.2. Long Term Total P for Osage Creek below Berryville (WHI0069)

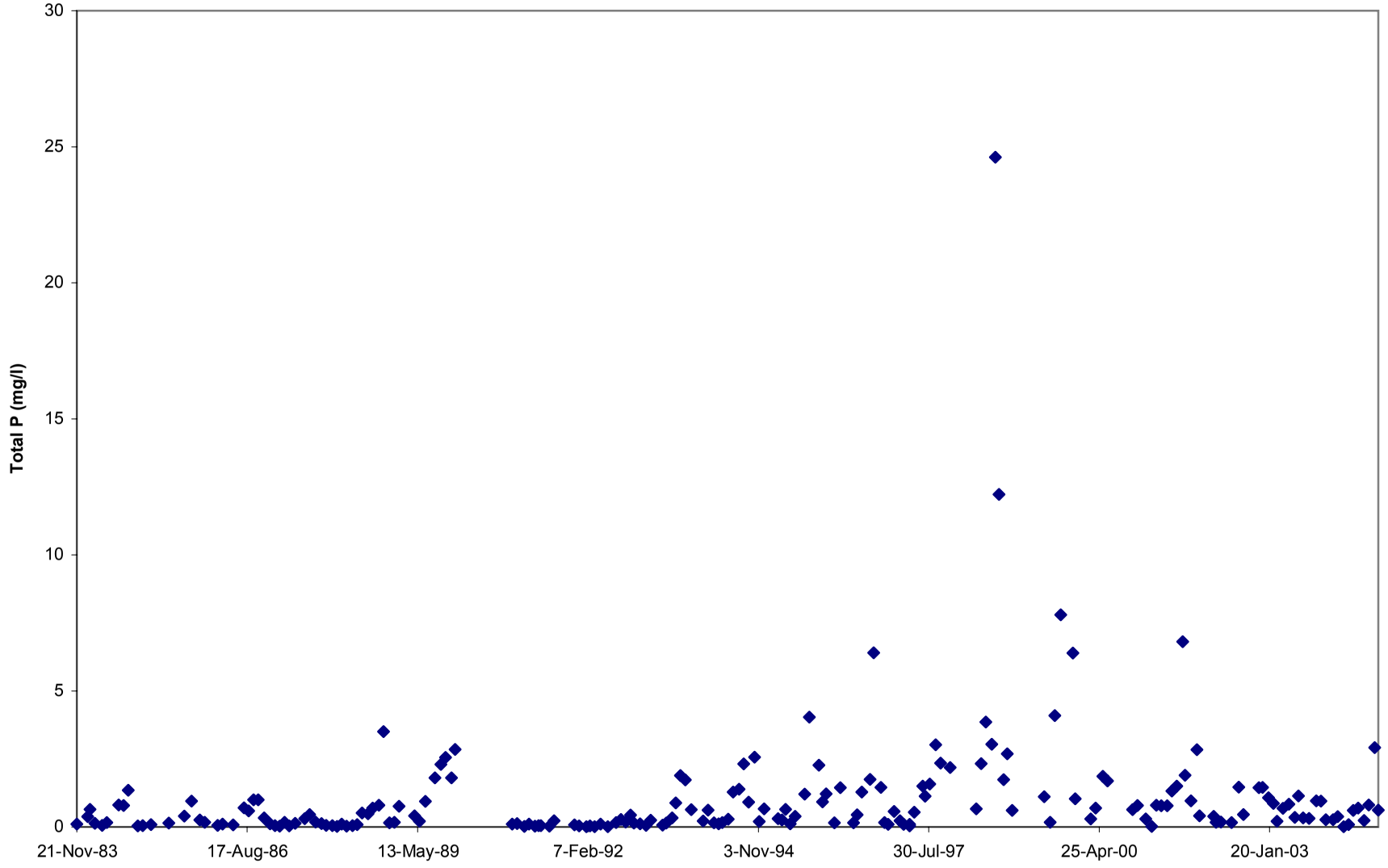


Figure B.3. Seasonal Total P for Osage Creek Above Berryville (WHI0068)

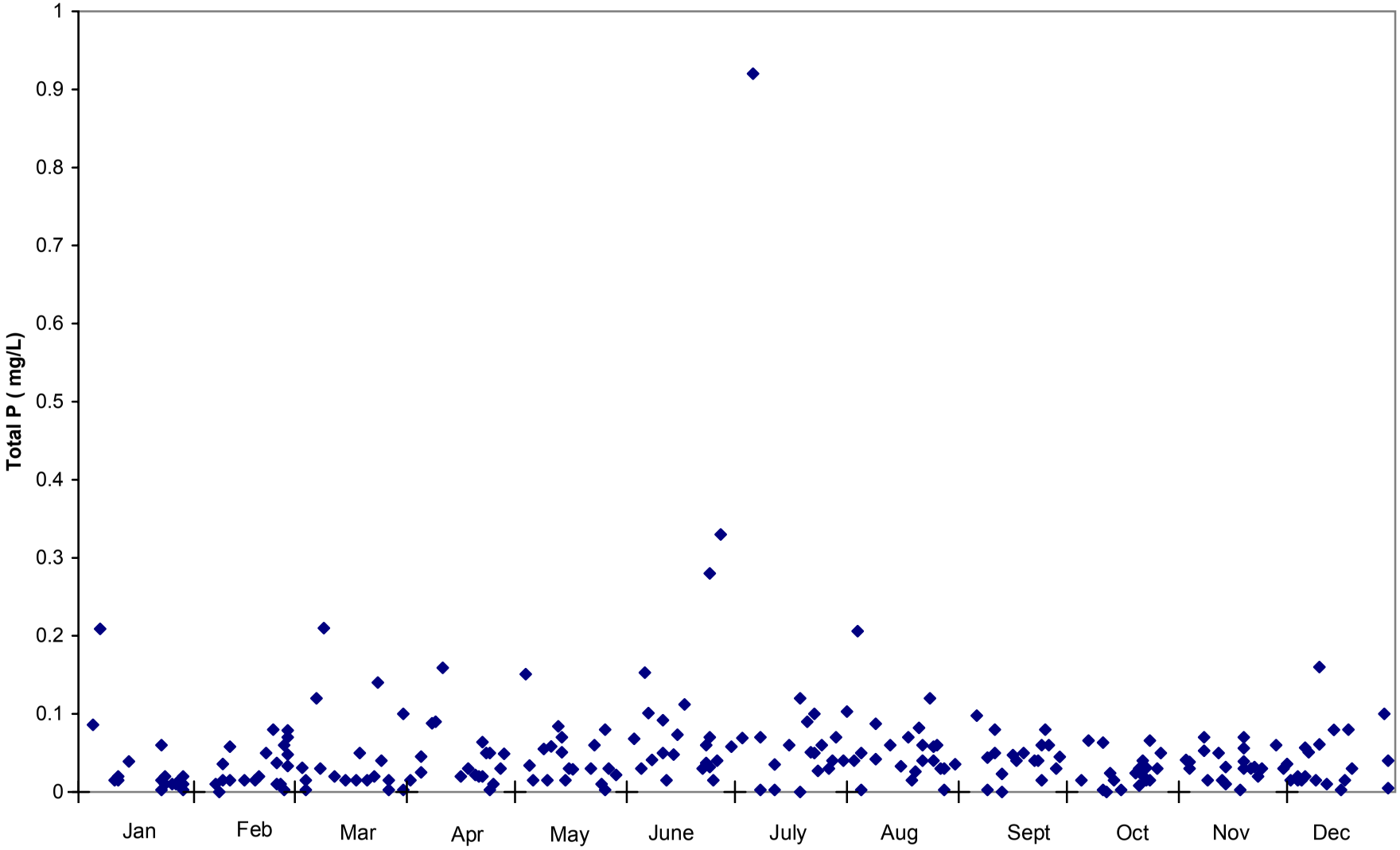


Figure B.4. Seasonal Total P for Osage Creek below Berryville (WHI0069)

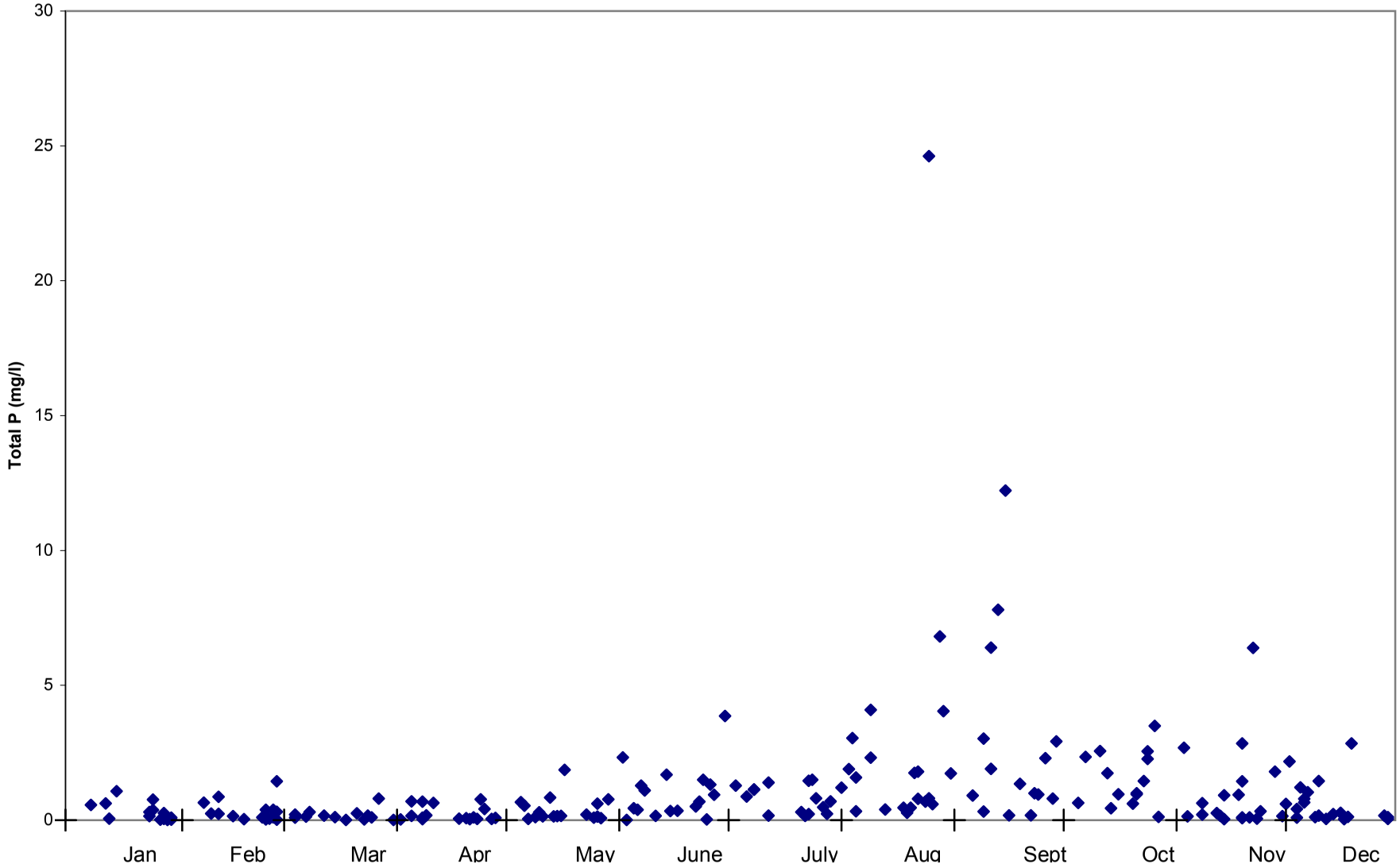


Figure B.5. Observed Phosphorus at KRWP Site 1: Upper Osage Creek at CR 702 above Berryville

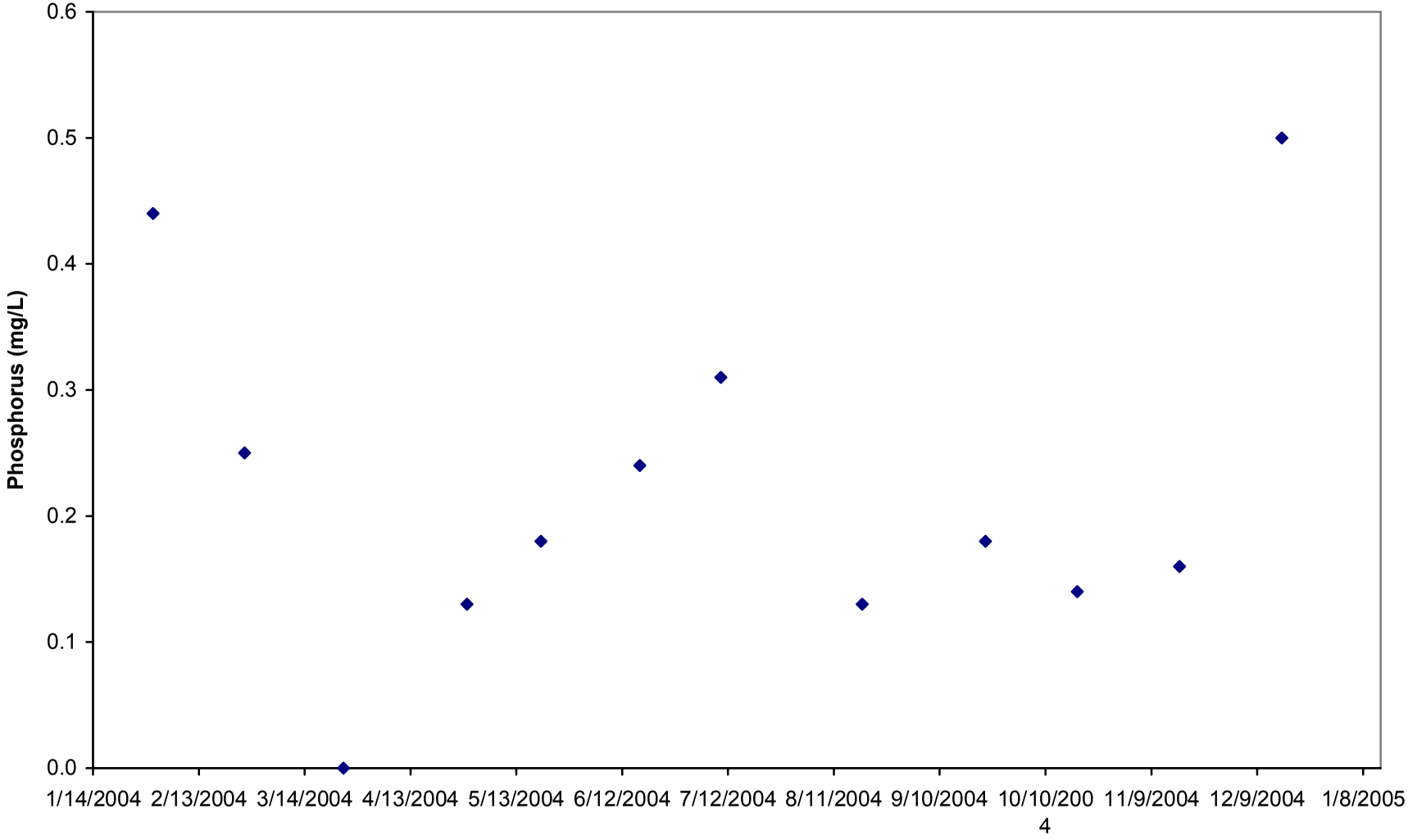


Figure B.6. Observed Phosphorus at KRWP Site 2: Lower Osage Creek at CR 306 below Berryville

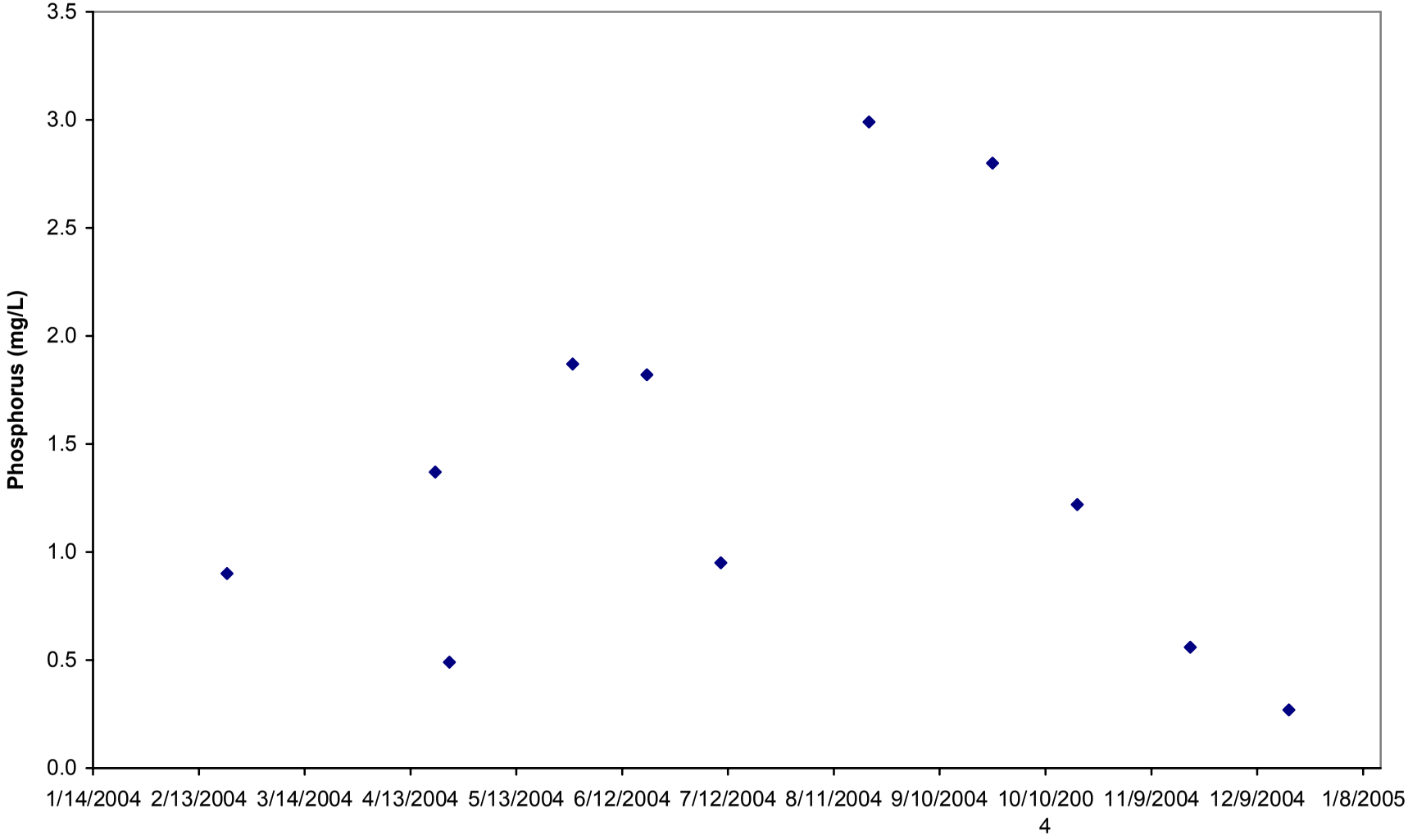


Figure B.7. Flow vs Total Phosphorus on Osage Creek above Berryville, AR (WHI0068)

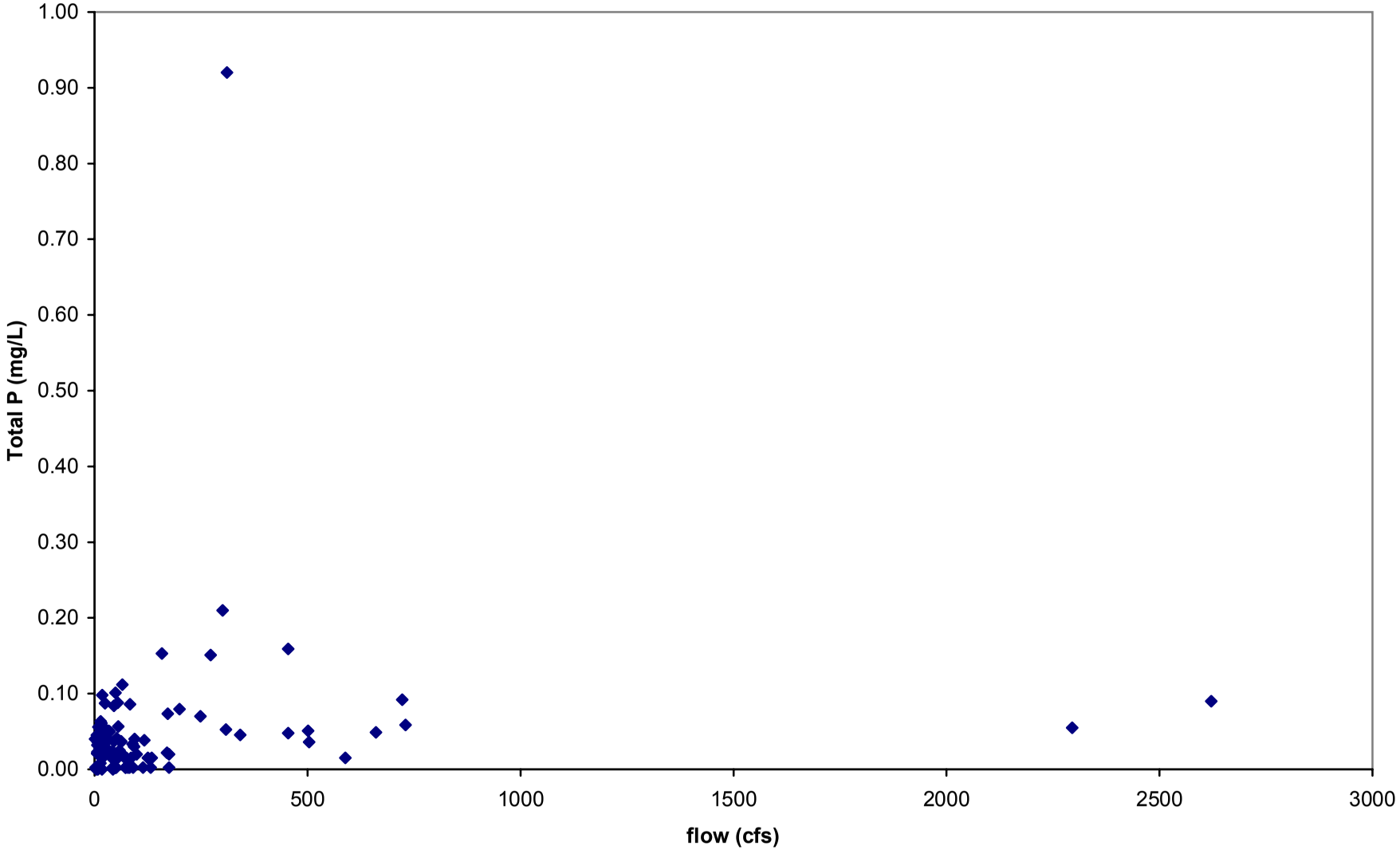
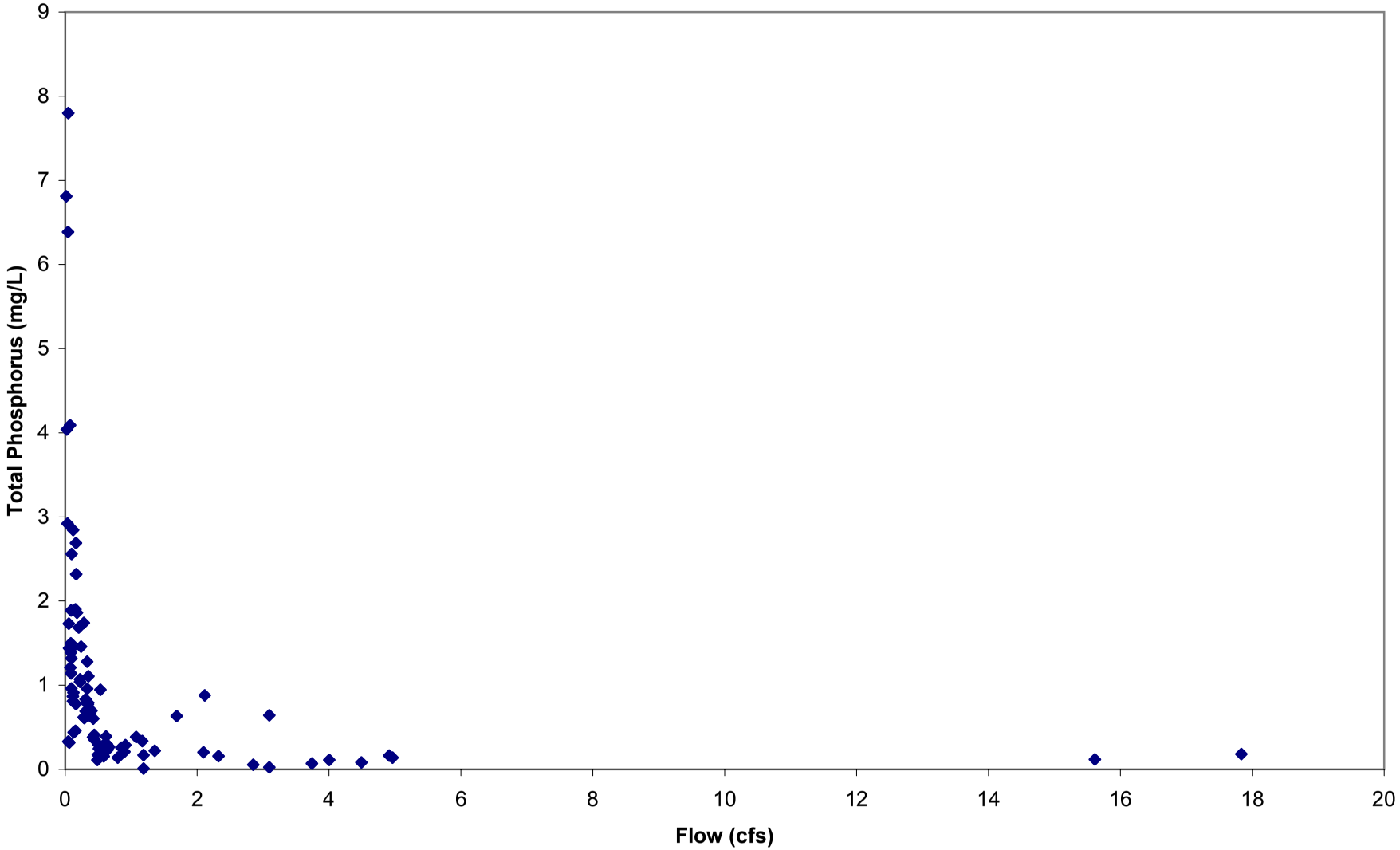


Figure B.8. Total Phosphorus vs Flow for Osage Creek Below Berryville, AR (WHI0069)



APPENDIX C

Public Comments and Responses

PUBLIC COMMENTS AND RESPONSES
TMDL FOR PHOSPHORUS IN OSAGE CREEK NEAR BERRYVILLE, AR
January 10, 2006

Comments that were received by EPA during the public comment period are shown below with EPA responses inserted in a different font.

COMMENTS FROM TYSON FOODS, INC.:

The Arkansas Department of Environmental Quality (ADEQ) recently published proposed changes to the Impaired Waterbodies List (303d list) on February 20, 2005. Since that time, the Arkansas information has been forwarded to EPA. Currently, EPA Region 6 has prepared 43 TMDLs and the calculations for these TMDLs for waters listed in the state of Arkansas under section 303(d) of the Clean Water Act (CWA). EPA is allowing comments on the 43 proposed TMDLs until December 12, 2005.

Tyson Foods (Tyson) is respectfully submitting this letter to offer comments regarding one of the streams included on the proposed 303(d) list. This stream is the Osage Creek which is located near a Tyson processing facility in Berryville, AR.

Tyson provides comments concerning Phosphorus as follows:

The basis for the phosphorus target for the TMDL is not a valid numerical water quality standard and is not a scientifically derived implementation of a narrative water quality standard. The 0.1 mg/L phosphorus target is not supported in the Arkansas standards. As acknowledged in the TMDL the 0.1 mg/L total phosphorus value was removed from the water quality standards. The value has never been a water quality standard but rather was used as a "guideline" for certain waters of the state. The 0.1 mg/L phosphorus target is not technically defensible. EPA supports the idea that the 0.1 mg/L target is not appropriate in all Ecoregions in Arkansas (EPA Rationale for making Listing Decisions, Region 6). In their Rationale for Listing Decisions, EPA states that "EPA did not believe that application of the guideline values (i.e., the 0.1 mg/L phosphorus guideline for streams) was an appropriate approach."

The TMDL acknowledges that the 0.1 mg/L phosphorus guideline does not currently exist, but states that "it is still a reasonable benchmark for evaluating phosphorus levels in streams for the protection of aquatic life." This assumption is incorrect as there is no documented relationship between 0.1 mg/L phosphorus and protection of aquatic life that could be applied in Osage Creek. This point is further illustrated by the ADEQ in their public response to comments made in the April 9, 2004 Responsiveness Summary to Comments received from the Public Concerning proposed Changes to Regulation No. 2. In this document the ADEQ states that "Based on years of water division field data, the relationship between nutrient concentration and impairment is not necessarily directly correlated for streams. Therefore, at this time we believe numeric criteria are not

appropriate." Furthermore, in their amendments to Regulation No. 2 the ADEQ has added language for determining impairments due to nutrients that considers factors such as "water clarity, periphyton or phytoplankton production, dissolved oxygen values, dissolved oxygen saturation, diurnal dissolved oxygen fluctuations, pH values, aquatic life community structure and possibly others." None of the listed determining factors were considered in the development of the TMDL target. Therefore, based on the latest regulations of the ADEQ with input from EPA, the target for this TMDL is outdated and technically inappropriate. Without a valid phosphorus target as the basis for the TMDL, the resulting TMDL must also be invalid.

There has been no substantiated scientific link made between phosphorus levels and aquatic life impairment. In addition, there are several examples of streams in Arkansas that have phosphorus levels above 0.1 mg/L and still maintain all aquatic life uses (good fish and macroinvertebrate communities). For example, collections completed in the Illinois River near the Oklahoma State Line and on Osage Creek downstream from phosphorus discharges all were found to have good communities of macroinvertebrates with total phosphorus concentrations exceeding 0.2 mg/L on average (ADPC&E, 1997). Two stations on Osage Creek (OSG03 and OSG04) even exhibited total phosphorus levels averaging 0.4 mg/L or higher during the study period, yet still contained good macroinvertebrate communities (ADPC&E, 1997). The Parsons/EPA study (EPA, 2004) cites several indicators of aquatic life impairment (diurnal dissolved oxygen fluctuation, supersaturated oxygen levels, minimum dissolved oxygen levels, etc.). These "indicators" could be signs of increased algal productivity (though not demonstrated in the studies, as no downstream impact to periphyton community was found) resulting from nutrient enrichment, but they are not direct indicators of aquatic life impairment, and no linkage is made.

Response: The TMDL in this report is being established to maintain Arkansas' narrative criteria for nutrients. Establishing a TMDL to comply with narrative criteria requires the development of a numeric endpoint. The endpoint for this TMDL is an estimate of the phosphorus that the stream can have and still maintain the aquatic life designated use. The 0.1 mg/L endpoint used in this TMDL was considered by EPA to be a reasonable goal that is not overly stringent. If a more appropriate numeric endpoint is developed in the future, this TMDL can be revised at that time.

EPA agrees with the statements above that aquatic life impairments are usually due to a number of other factors in addition to phosphorus concentrations. The list of factors quoted above is presented in Regulation 2 for the purpose of determining impairment rather than developing TMDLs. The determination of impairment for this stream did rely on several different factors as documented in EPA's Decision Document for the Final 2002 Section 303(d) List for Arkansas (EPA 2003). The TMDL in this report is

focused on phosphorus concentration as the endpoint rather than on other indicators of aquatic life impairment (e.g., large diurnal fluctuations of DO and pH, etc.) because the 303(d) listing for this stream cited phosphorus as the major cause of impairment. Other indicators of aquatic life impairment are often the result of elevated phosphorus concentrations.

The comments above state that aquatic life is not impaired in some streams that have phosphorus concentrations above 0.1 mg/L, such as Osage Creek in the Illinois River basin. EPA disagrees with this specific example. EPA considers aquatic life to be impaired in Osage Creek in the Illinois River basin, as indicated by EPA's addition of that stream to the Arkansas 2002 Section 303(d) List. The Parsons/EPA study mentioned in the comments above (cited as Parsons/UA 2004 in this report) characterized several sampling stations along Spring Creek and Osage Creek in the Illinois River basin as "severely impacted" and "impacted". The results of that study showed that the sampling stations with the greatest level of impact were the same stations that had the highest phosphorus concentrations. The results of that study, along with other research and data for streams in this area, demonstrate that elevated phosphorus concentrations definitely contribute to aquatic life impairments.

The wasteload allocation for the City of Berryville for phosphorus presented in the TMDL is in conflict with the current Arkansas Water Quality Standards, and should be changed. The wasteload allocation cites the total phosphorus discharge limit of 2 mg/L for facilities with design flows of 1 to 3 mgd (APCEC Reg. 2.509). However, the wasteload allocation developed in this TMDL is the product of the facility flow multiplied by the 1.0 mg/L concentration that is not required until 2012 according to ADPCE rules. (APCEC, Reg. 6.) The effluent limitations and narrative standards at Reg. 2.509 are the Water Quality Standards for the state, not the 0.1 mg/L instream guideline that was removed during a previous revision; or the 1 mg/L limit outlined for attainment in 2012. The TMDL should be completed using the current 2 mg/L limit for the City of Berryville. At a minimum, implementation of the TMDL results into the permit should be phased, with a 2 mg/L based waste load allocation in the interim period and 1 mg/L based wasteload allocation effective in 2012.

Response: There are several important parts of Regulations 2 and Regulation 6 that are not considered in the comments above. APCEC Regulation 2.509 states that facilities with design flows of 1 to 3 MGD discharging into streams on the 303(d) list for phosphorus can have monthly average limits for total phosphorus **no greater than** 2 mg/L. This regulation does not prohibit a more stringent limit for phosphorus, which in this case is

required by Regulation 6.401. Regulation 6.401 states that compliance with the 1 mg/L limit for the City of Berryville "shall be attained **as soon as feasible**, but no later than January 1, 2012" (bold added here). The last sentence in the next to last paragraph of Section 2.4 of this report has been modified to clarify the time frame for compliance with the 1 mg/L limit for the City of Berryville. It should be noted that the endpoint used in this TMDL (0.1 mg/L total phosphorus in the stream) resulted in the same permit limit as specified in Regulation 6.401. This provides additional evidence that the endpoint used in this TMDL is reasonable.

The load allocation (LA) found in the TMDL is not consistent with the background load of phosphorus calculated in the report. In Section 4.6, background loading is calculated as the average annual flow (113.4 mgd) times average total phosphorus values from ambient monitoring station WHI0068 (Osage Creek upstream of the City discharge). The resulting background load for total phosphorus is 47.3 lbs/day.

In the TMDL report this background level is then simply compared to the load allocation, which was derived as the load remaining after the MOS and the wasteload allocation (WLA) was removed from the TMDL, to determine if non-point source (NPS) load reductions were necessary. If the TMDL process had been carried through to proper completion, the background load should have been subtracted from the TMDL along with the MOS and the remaining loading (17.24 lbs/day of total phosphorus) should have been allocated among point and non-point sources.

In this TMDL the background load is assumed to be the existing NPS load, and given that no NPS reductions are necessary, the remaining load should be available to the only existing discharger asked to make load reductions; the City of Berryville. Therefore, if the instream targets were assumed to be set correctly (see previous comments) the LA should be, at a minimum, set to the background loading and the WLA should be 37.26 lbs/day of total phosphorus.

Response: For clarification, it appears that "background" loading in the comments above refers to the total nonpoint source loading, which includes both natural background loading as well as nonpoint source loading caused by human impacts. The comments above appear to suggest that the load allocation for nonpoint sources should have been set equal to the existing nonpoint source load (47.3 lbs/day instead of 64.54 lbs/day) so that more loading could be allocated to point sources (i.e., so that the City of Berryville could get monthly average discharge limits higher than 1 mg/L). This suggestion is not feasible because the City of Berryville's allocated loading must be based on a

concentration no greater than 1 mg/L due to requirements in Regulation 6.

The determination of aquatic life impairment in Osage Creek, below the City of Berryville point source discharge (as described in the TMDL report), was made using data from three assessment reports. The first and second were completed by the Arkansas Department of Pollution Control and Ecology (ADPC&E) in 1992 and 1995, respectively, and the third was completed by EPA and Parsons in 2004. No aquatic life use impairments were detected downstream of the discharge in Osage Creek by the ADPC&E studies. Only the 2004 EPA/Parsons report cited impairments to the aquatic life use (several water quality indicators and macroinvertebrate and fish communities) downstream of the city discharge. Upon closer review of the EPA/Parsons report it was discovered that two sampling events for aquatic biota were completed. No impacts consistent with non-attainment of the aquatic life use were found to periphyton, macroinvertebrate, or fish communities during the first sampling event, but impacts to the fish and macroinvertebrate community were measured during the second sampling event. Note that an impact was noted to the macroinvertebrate community in Osage Creek downstream of the discharge, but use of a rapid bioassessment scoring system such as developed by Plafkin et al. (EPA, 1989), and used in the EPA/Parsons study typically allows a “slight impairment” while indicating full attainment of the aquatic life use.

The second sampling event occurred during a period when the stream was experiencing high flow such that macroinvertebrate samples could not be collected at the two reference sites (Osage Creek upstream of the discharge and the Kings River upstream of Osage Creek). Data was collected at the downstream sites both in Osage Creek and in the Kings River and then compared back to the reference data collected during the first sampling event over two months previous. Conclusions drawn from use of this data should be invalidated for two reasons. First, the sampling should never have been completed for fish or macroinvertebrates during this high flow event. High flows create dispersion in the aquatic communities making the sampling results much more spatially variable and limited in scope. Second, the macroinvertebrate community sampled during the second event cannot be legitimately directly compared to a sample from a different season for an impairment determination. The variable life cycles and seasonal distribution of macroinvertebrates is well documented in aquatic ecology. Any macroinvertebrate samples collected with this level of temporal variance will be assured to be different than the previous collection based on life cycles and season alone. A meaningful impairment determination could not be made using the data collected during the second sampling event.

Additional impairments are cited in the TMDL report and the EPA/Parsons report for diurnal fluctuation, low dissolved oxygen and oxygen saturation. Many of the results of concern presented in the report are not atypical of those of least disturbed reference streams in the Ozark Highlands Ecoregion (ADPC&E, 1987). In addition, no linkage is made in the study to these indicators and algal productivity or aquatic life impairment. Therefore, based on the analysis of the three studies cited in the TMDL report, it appears that Osage Creek below the City of Berryville discharge is maintaining the aquatic life use.

Response: The determination of impairment for this stream is not being based solely on the three reports identified in the comment. EPA's rationale for considering this stream to be impaired is given in the Decision Document for the Final 2002 Section 303(d) List for Arkansas (EPA 2003). Data from the Parsons/UA study were not used to determine impairments in Osage Creek below Berryville because data collection for that study did not begin until the late summer of 2003, which is after EPA finalized the Arkansas 2002 Section 303(d) list in June 2003. The Decision Document describes how EPA's determination of impairment for this stream included a review of various reports and other data such as DO and pH profiles.

Tyson is requesting to work with ADEQ and EPA on assessing the water quality impacts associated with indirect discharges from its Berryville Processing Plant via the City of Berryville POTW. In the event ADEQ and EPA determine the Berryville Processing Plant is contributing to water quality impairments, Tyson would prefer to develop additional voluntary procedures in lieu of developing a TMDL. If you have any questions related to these comments please contact me at (479) 290-7541 or John Couch at (479) 986-1276.

Tyson Foods would like to request a meeting with EPA to further discuss and clarify the points made above. Tyson requests that such a meeting be scheduled prior to the potential adoption of a TMDL for the Osage Creek. My contact information is listed below.

Response: After these comments were received, EPA discussed these comments with the author of the letter by telephone on December 14, 2005. EPA will gladly discuss the TMDL with Tyson Foods further and answer any questions concerning the TMDL.

COMMENTS FROM ARKANSAS DEPARTMENT OF ENVIRONMENT QUALITY:

The Water Division staff has completed its review of the following draft TMDLs: Nitrate and Phosphorus in Rolling Fork; Phosphorus in Osage Creek near Berryville, Ar.; Phosphorus, Copper and Zinc for the Poteau River near Waldron, Ar.

Our comments are as follows:

In each of these studies, the value utilized as the phosphorus removal target is not a numerical water quality standard. In previous versions of Regulation #2, phosphorus was mentioned as a guideline, but was not--and is not--technically defensible due to varied (by ecoregion and individual watershed) responses by aquatic communities to instream

nutrient concentrations. As a result, this guideline has since been removed in Arkansas' current water quality standards. TMDL validity must be based on addressing documented violations of existing Arkansas water quality standards and impaired use.

Response: The TMDL in this report is being established to maintain Arkansas' narrative criteria for nutrients. Establishing a TMDL to comply with narrative criteria requires the development of a numeric endpoint. The endpoint for this TMDL is an estimate of the phosphorus that the stream can have and still maintain the aquatic life designated use. The 0.1 mg/L endpoint used in this TMDL was considered by EPA to be a reasonable goal that is not overly stringent. If a more appropriate numeric endpoint developed in the future, this TMDL can be revised at that time.

EPA agrees with the statements above that aquatic life impairments are usually due to a number of other factors in addition to phosphorus concentrations. The list of factors quoted above is presented in Regulation 2 for the purpose of determining impairment rather than developing TMDLs. The determination of impairment for this stream did rely on several different factors as documented in EPA's Decision Document for the Final 2002 Section 303(d) List for Arkansas (EPA 2003). The TMDL in this report is focused on phosphorus concentration as the endpoint rather than on other indicators of aquatic life impairment (e.g., large diurnal fluctuations of DO and pH, etc.) because the 303(d) listing for this stream cited phosphorus as the major cause of impairment. Other indicators of aquatic life impairment are often the result of elevated phosphorus concentrations.

The comments above state that aquatic life is not impaired in some streams that have phosphorus concentrations above 0.1 mg/L, such as Osage Creek in the Illinois River basin. EPA disagrees with this specific example. EPA considers aquatic life to be impaired in Osage Creek in the Illinois River basin, as indicated by EPA's addition of that stream to the Arkansas 2002 Section 303(d) List. The Parsons/EPA study mentioned in the comments above (cited as Parsons/UA 2004 in this report) characterized several sampling stations along Spring Creek and Osage Creek in the Illinois River basin as "severely impacted" and "impacted". The results of that study showed that the sampling stations with the greatest level of impact were the same stations that had the highest phosphorus concentrations. The results of that study, along with other research and data for streams in this area,

demonstrate that elevated phosphorus concentrations definitely contribute to aquatic life impairments.

Specific comments include (1) the stream segment below the Tyson discharge to Rolling Fork has had the domestic water supply source designation removed, thereby invalidating the instream TMDL target for nitrate-nitrogen, (2) the current 303d listing for metals in the Poteau River at Waldron is in the 5c category, which indicates questionable data due to QA/QC procedures, and may be resolved due to refinement of sampling techniques, and (3) the Osage Creek TMDL (Berryville) contains numerous errors, erroneous data and inaccurate loading calculations.

Response: The comment concerning this report does not list any specific errors to be addressed nor does it provide any substantiated evidence of errors in the report. EPA and the contractor have reviewed this report and have not found errors. Comment 1 above is addressed in the separate document, "TMDLs for Nitrate and Phosphorus in Rolling Fork." Comment 2 above is addressed in the separate document, "TMDLs for Phosphorus, Copper, and Zinc for the Poteau River near Waldron, AR."

All three of these point source dischargers have voluntarily agreed to develop/utilize technologies that effectively reduce nutrient loads to the receiving streams. ADEQ commends their willingness to initiate these procedures that will serve to enhance the protection of the instream aquatic communities, and prefers this approach to potential requirements dictated by technically invalid TMDLs.

The Water Division looks forward to continuing our long-standing working relationship with EPA. If you have any questions regarding the above comments, please feel free to contact me.

Response: EPA also commends the City of Berryville for voluntary efforts to reduce nutrient loading to Osage Creek. This TMDL imposes the same limits as Regulation 6 on the City of Berryville.

COMMENTS FROM UPPER WHITE RIVER BASIN FOUNDATION:

I write on behalf of the Upper White River Basin Foundation to express concerns over the proposed TMDL for Osage Creek near Berryville, Arkansas. Specifically, I have concerns about the quality of information the EPA has relied upon as part of the assesment of this basin.

The Upper White River Basin Foundation was founded for the sole purpose of making the lakes along the Upper White River the cleanest lakes in North America. As part of

that mission, the Foundation secured a Watershed Initiative Grant from the EPA during the innaugural year of that program. A portion of those funds were used to contract FTN Associates to conduct the "Kings River Watershed Assesment" which is cited in the draft FTN submitted to the EPA.

The work done by FTN Associates on the "Kings River Watershed Assesment" can only be described as extremely poor in quality and content. That report was rife with errors, of extremely low quality, and so inadequate that it really cannot and should not be relied upon by anyone. To the extent that FTN Associates' work on the assesment was used as any kind of basis for the draft TMDL is to call into question the validity of the TMDL draft itself.

While we are certainly supportive of improving the Kings River watershed, and recognize the need for improvements in the wastewater treatment abilities within that watershed, I would be remiss if I did not bring our serious concerns about the FTN report to the attention of the EPA.

The Foundation has worked closely with the EPA to direct a significant amount of grant dollars into the Kings River watershed, and we look forward to a continued partnership as we work together to improve that watershed. However, decisions on how to best make a difference in the water quality of the Kings River must be made on sound science. Our experience with FTN Associates on the Kings River calls into question the vailidity of the science on which they have based their report.

As a result, I urge the EPA to seek more information and verifiable data in order to have a draft TMDL based upon sound science. Until such time as the information relied upon is accurate and meets professional standards, the EPA should not approve the current draft TMDL for Osage Creek near Berryville, Arkansas.

Response: These comments do not list any specific errors to be addressed nor do they provide any substantiated evidence of errors in the information from the Kings River Watershed Assessment. EPA and the contractor have reviewed the information that was taken from the Kings River Watershed Assessment and have not found errors. The Upper White River Basin Foundation has not communicated any findings of error to FTN Associates for the final version of the Kings River Watershed Assessment report submitted in August 2005.

This TMDL simply confirms the requirements for the City of Berryville that were already in Regulation 6, providing further evidence that this TMDL is reasonable and is based on sound science.