2006 Report of the Oklahoma

BENEFICIAL USE MONITORING PROGRAM

Streams Report

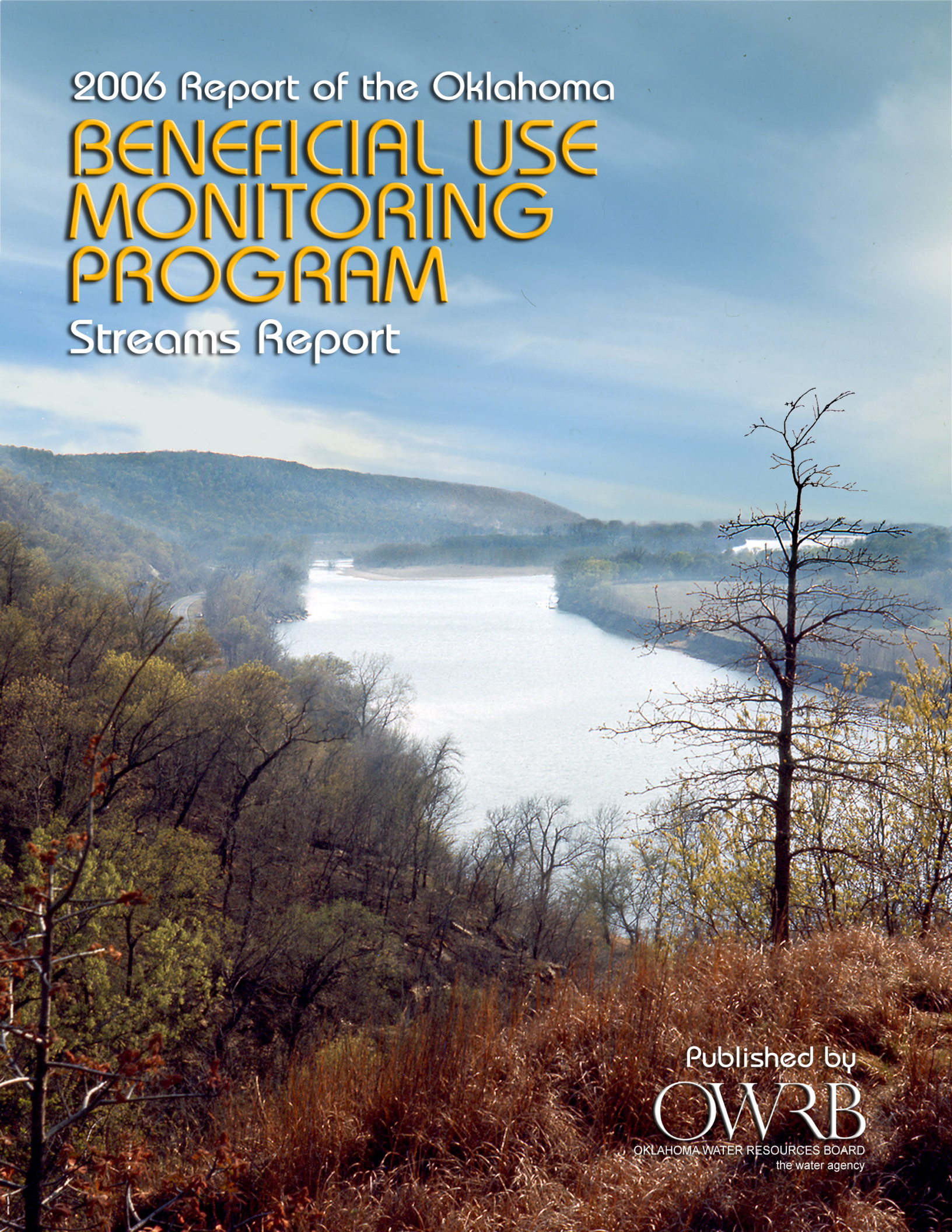

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TABLE OF CONTENTS

Figure 1. USGS 8-digit Hydrologic Unit Codes for Oklahoma. **3**

Figure 2. Beneficial Use Monitoring Program permanent ambient trend monitoring sites. **9**

Figure 3. USGS 4-digit HUC basins. **21**

Figure 4 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Mocane (AT157000), 2001-2006. ..... **30**

Figure 5a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d & e), Minerals (f & g), and Nutrients (h) for the Cimarron River at Ames (AT158115), 2003-2006. ..... **38**

Figure 6a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Buffalo (AT157950), 2001-2006. ..... **41**

Figure 7a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Dover (AT159100), 2001-2006. ..... **44**

Figure 8a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Guthrie (AT160000), 2001-2006. ..... **47**

Figure 9a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Oilton (AT161500), 2001-2006. ..... **50**

Figure 10a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Ripley (AT161450), 2001-2006. ..... **53**

Figure 11 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Waynoka (AT158000), 2003-2006. ..... **56**

Figure 12 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Skeleton Creek at Lovell (AT160500), 2001-2006. ..... **59**

Figure 13 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Ralston (AT152500), 2001-2006. ..... **67**

Figure 14 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Black Bear Creek at Pawnee (AT153000), 2001-2006 ..... **70**

Figure 15 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Chickaskia River at Blackwell (AT152000), 2001-2006 ..... **73**

Figure 16 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Salt Fork of the Arkansas River at Ingersoll (AT148450), 2001-2006 . **76**

Figure 17 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Salt Fork of the Arkansas River near Tonkawa (AT151000), 2001-2006 ..... **79**

Figure 18 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Big Cabin Creek at Big Cabin (AT191000), 2001-2006 ..... **87**

Figure 19 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and

Nutrients (f) for Bird Creek at Catoosa (AT178050), 2001-2006 ..... **90**

Figure 20 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Caney River at Ramona (AT175500), 2001-2006 ..... **93**

Figure 21 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Elk River at Tiff City (MO) (AT189000), 2001-2006 ..... **96**

Figure 22 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Honey Creek at Grove (AT189090), 2001-2006. ..... **99**

Figure 23 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Chouteau (AT191530), 2001-2006. ..... **102**

Figure 24 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Commerce (AT185000), 2001-2006. ..... **105**

Figure 25 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Connor Bridge (AT185010), 2001-2006. ..... **108**

Figure 26 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Langley (AT190500), 2001-2006. ..... **111**

Figure 27 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Spring Creek at Murphy (AT191558), 2001-2006. ..... **114**

Figure 28 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Spring River at Quapaw (AT188000), 2001-2006. ..... **117**

Figure 29 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Verdigris River at Inola (AT178600), 2001-2006. ..... **120**

Figure 30 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Keetonville (AT176000), 2001-2006. ..... **123**

Figure 31 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Lenepah (AT171000), 2001-2006. ..... **126**

Figure 32 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Wagoner (AT178900), 2001-2006. ..... **129**

Figure 33 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Brushy Creek at Haileyville (AT231600), 2001-2006. ..... **136**

Figure 34 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Bridgeport (AT228500), 2001-2006. ..... **139**

Figure 35 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Calvin (AT231500), 2001-2006. ..... **142**

Figure 36 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Konawa (AT229400), 2001-2006. ..... **145**

Figure 37 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Purcell (AT229200), 2001-2006. ..... **148**

Figure 38 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Taloga (AT228250), 2001-2006.....151

Figure 39 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Whitefield (AT245000), 2001-2006. .....**154**

Figure 40 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Sasakwa (AT231000), 2001-2006. .....**157**

Figure 41 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Beaver (AT234000), 2001-2006.....**168**

Figure 42 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Fort Supply (AT234450), 2001-2006. .....**171**

Figure 43 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Gate (AT234200), 2001-2006. .....**174**

Figure 44 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Guymon (AT232500), 2001-2006. .....**177**

Figure 45 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Laverne (AT234400), 2003-2006. .....**180**

Figure 46 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Turpin (AT233900), 2001-2006. .....**183**

Figure 47 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Deep Fork River at Beggs (AT243500), 2001-2006. .....**186**

Figure 48 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Deep Fork River at Stroud (AT242500), 2001-2006. .....**189**

Figure 49 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Dustin (AT242200), 2001-2006. .....**192**

Figure 50 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at El Reno (AT239500), 2001-2006. .....**195**

Figure 51 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Harrah (AT241550), 2000-2005. .....**198**

Figure 52 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Seiling (AT238000), 2001-2006. .....**201**

Figure 53 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Shawnee (AT241700), 2001-2006. .....**204**

Figure 54 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Watonga (AT2393000), 2003-2006.....**207**

Figure 55 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Wetumka (AT242000), 2001-2006. .....**210**

Figure 56 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and

Nutrients (f) on the North Canadian River at Woodward (AT237500), 2001-2006. ..... **213**

Figure 57 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Wolf Creek at Fort Supply (AT237050), 2001-2006. ..... **216**

Figure 58 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Bixby (AT165520), 2001-2006. ..... **225**

Figure 59 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Haskell (AT165570), 2001-2006. ..... **228**

Figure 60 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Arkansas River at Moffett (AT249453), 2001-2006. ..... **231**

Figure 61 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Arkansas River at Muskogee (AT194500), 2001-2006. ..... **234**

Figure 62 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Sand Springs (AT164400), 2001-2006. ..... **237**

Figure 63 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Barren Fork River at Eldon (AT197000), 2001-2006. ..... **240**

Figure 64 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Caney Creek at Barber (AT197360), 2001-2006. ..... **243**

Figure 65 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Flint Creek at Flint (AT196000), 2001-2006. ..... **246**

Figure 66 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Fourche-Maline Creek at Red Oak (AT247550), 2001-2006. ..... **249**

Figure 67 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Illinois River at Tahlequah (AT196500), 2001-2006. ..... **252**

Figure 68 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Illinois River at Watts (AT195500), 2001-2006. ..... **255**

Figure 69 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Lee Creek at Short (AT249800), 2003-2006. ..... **258**

Figure 70 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Poteau River at Heavener (AT247350), 2001-2006. ..... **261**

Figure 71 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Poteau River at Pocola (AT249435), 2001-2006. ..... **264**

Figure 72 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Sager Creek at West Siloam Springs (AT195865), 2001-2006. ..... **267**

Figure 73 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Elk Creek at Roosevelt (AT304500), 2001-2006. ..... **275**

Figure 74 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Elm Fork River at Granite (AT303500), 2001-2006. ..... **278**

Figure 75 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Fork of the Red River at Carter (AT301500), 2001-2006. **281**

Figure 76 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Fork of the Red River at Headrick (AT305000), 2001-2006. **284**

Figure 77 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Salt Fork of the Red River at Elmer (AT301110), 2001-2006. **287**

Figure 78 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Salt Fork of the Red River at Mangum (AT300500), 2001-2006. **290**

Figure 79 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on East Cache Creek at Walters (AT311000), 2001-2006. **299**

Figure 80 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Mud Creek at Courtney (AT315700), 2001-2006. **302**

Figure 81 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Davidson (AT308000), 2001-2006. **305**

Figure 82 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Terral (AT315500), 2001-2006. **308**

Figure 83 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Sandy Creek at Eldorado (AT299710), 2001-2006. **311**

Figure 84 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Alex (AT328100), 2003-2006. **314**

Figure 85 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Anadarko (AT326500), 2001-2006. **317**

Figure 86 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Cordell (AT325300), 2001-2006. **320**

Figure 87 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Durwood (AT331000), 2001-2006. **323**

Figure 88 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at McClure (AT324200), 2001-2006. **326**

Figure 89 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Paul's Valley (AT328500), 2001-2006. **329**

Figure 90 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on West Cache Creek at Taylor (AT315050), 2001-2006. **332**

Figure 91 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Blue River at Durant (AT332500), 2001-2006. **342**

Figure 92 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Clear Boggy Creek at Caney (AT335000), 2001-2006. **345**

Figure 93 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and

Nutrients (f) on the Glover River at Glover (AT337900), 2001-2006. ..... **348**

Figure 94 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Antlers (AT336200), 2001-2006. ..... **351**

Figure 95 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Big Cedar (AT335700), 2001-2006. ..... **354**

Figure 96 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Fort Townson (AT336710), 2002-2006. ..... **357**

Figure 97 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Tuskahoma (AT335780), 2001-2006. ..... **360**

Figure 98 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Cloudy (AT337100), 2001-2006. ..... **363**

Figure 99 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Holly Creek (AT338000), 2003-2006. ..... **366**

Figure 100 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Mountain Fork River at Eagletown (AT339000), 2001-2006. ..... **369**

(Figure 101 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Mountain Fork River at Smithville (AT338840), 2001-2006. ..... **372**

Figure 102 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Muddy Boggy Creek at Atoka (AT332950), 2001-2006. ..... **375**

Figure 103 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Muddy Boggy Creek at Unger (AT335300), 2001-2006. ..... **378**

Figure 104 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Harris (AT336820), 2001-2006. ..... **381**

Figure 105 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Hugo (AT335500), 2001-2006. ..... **384**

LIST OF PLATES

Plate 57. HUC 1104 - UPPER CIMARRON SUB-BASIN **26**

Plate 58. HUC 1105 - LOWER CIMARRON SUB-BASIN **32**

Plate 59. HUC 1106 - UPPER ARKANSAS SUB-BASIN **61**

Plate 60. HUC 1107 - NEOSHO/GRAND SUB-BASIN **81**

Plate 61. HUC 1109 - CANADIAN SUB-BASIN **131**

Plate 62. HUC 1110a & 1110b - BEAVER/NORTH CANADIAN SUB-BASIN **160-161**

Plate 63. HUC 1111 - LOWER ARKANSAS SUB-BASIN **218**

Plate 64. HUC 1112 - NORTH FORK OF THE RED SUB-BASIN **269**

Plate 65. HUC 1113 - UPPER RED SUB-BASIN **292**

Plate 66. HUC 1114 – LOWER RED SUB-BASIN **334**

LIST OF TABLES

Table 1. Permanent Ambient Trend Monitoring Stations and their Beneficial Use Support Status. ..... **xiv**

Table 2. Eight Digit United States Geological Survey HUC Watersheds. **2**

Table 3. Permanent Ambient Trend Monitoring Stations. **5**

Table 4. Variables Monitored by the BUMP Stream Sampling Program. **10**

Table 5. Permanent Ambient Trend Monitoring Stations and their Beneficial Use Support Status. **22**

Table 6. Permanent Ambient Trend Monitoring Stations Located in HUC 1104. ..... **27**

Table 7. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1104. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **27**

Table 8. Permanent Ambient Trend Monitoring Stations Located in HUC 1105. ..... **34**

Table 9. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1105. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **34**

Table 10. Permanent Ambient Trend Monitoring Stations Located in HUC 1106. ..... **63**

Table 11. Toxicant exceedances in HUC 1106. ..... **63**

Table 12. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1106. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **64**

Table 13. Permanent Ambient Trend Monitoring Stations Located in HUC 1107. ..... **83**

Table 14. Toxicant exceedances in HUC 1107. ..... **83**

Table 15. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1107. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **84**

Table 16. Permanent Ambient Trend Monitoring Stations Located in HUC 1109. ..... **133**

Table 17. Toxicant exceedances in HUC 1109. ..... **133**

Table 18. Exceedances of fecal coliform, enterococci, and E. coli screening limits in HUC 1109. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **134**

Table 19. Permanent Ambient Trend Monitoring Stations Located in HUC 1110. ..... **162**

Table 20. Toxicant exceedances in HUC 1110. ..... **162**

Table 21. Exceedances of fecal coliform, enterococci, and E. coli screening limits in HUC 1110. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **163**

Table 22. Permanent Ambient Trend Monitoring Stations Located in HUC 1111. **220**

Table 23. Toxicant exceedances in HUC 1111. **220**

Table 24. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1111. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **221**

Table 25. Permanent Ambient Trend Monitoring Stations Located in HUC 1112. **271**

Table 26. Toxicant exceedances in HUC 1112. **271**

Table 27. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1112. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **272**

Table 28. Permanent Ambient Trend Monitoring Stations Located in HUC 1113. **294**

Table 29. Toxicant exceedances in HUC 1113. Underlined values were measured at the minimum quantification limit (MQL) and are reported at one-half of the MQL per 785:46-15-3(e)(2). **294**

Table 30. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1113. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **295**

Table 31. Permanent Ambient Trend Monitoring Stations Located in HUC 1114. **336**

Table 32. Toxicant exceedances in HUC 1114. **336**

Table 33. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1114. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included. **338**

EXECUTIVE SUMMARY

Beneficial Use Monitoring Program Goal

The goal of the Beneficial Use Monitoring Program is to document beneficial use impairments, identify impairment sources (if possible), detect water quality trends, provide needed information for the OWQS and facilitate the prioritization of pollution control activities.

The Beneficial Use Monitoring Program exists as a result of the vital economic and social importance of Oklahoma's lakes, streams, wetlands, and aquifers and the associated need for their protection and management. The data contained in this report is scientifically defensible and has been collected and analyzed following procedures outlined in Use Support Assessment Protocols (USAP), developed by Oklahoma's environmental agencies. Specifically, USAPs establish a consistent method to determine if beneficial uses assigned for individual waters through Oklahoma Water Quality Standards (OWQS) are being supported. (Legitimacy of data analyzed following protocols other than those outlined in the USAP must be defended.) If the BUMP report indicates that a designated beneficial use is impaired, threatened, or otherwise compromised, measures must be taken to mitigate or restore the water quality.

Traditionally, the State of Oklahoma has utilized numerous water monitoring programs conducted by individual state and federal agencies. In general, each environmental agency designs and implements its own program with only limited participation from with other state, municipal, or federal entities. These programs collect information for a specific purpose or project (e.g., development of Total Maximum Daily Loads, OWQS process, lake trophic status determination, water quality impact assessments from nonpoint and point source pollution, stream flow measurement, assessment of best management practices, etc.). Therefore, the information is specific to each project's data quality objectives (DQOs) and is often limited to a very small geographic area.

To synchronize Oklahoma's monitoring efforts related to water quality, the State Legislature appropriated funds in 1998 to create the Beneficial Use Monitoring Program under the direction of the Oklahoma Water Resources Board, who maintains Oklahoma's Water Quality Standards. The BUMP brings the OWRB's overall water quality management program full circle. From the promulgation of OWQS, to permitting and enforcement of permits stemming from OWQS-established criteria, to non-point source controls—all agency water quality management activities are intended to work in concert to restore, protect, and maintain designated beneficial uses.

The specific objectives of the BUMP are to detect and quantify water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a pollution crisis. This report interprets current Oklahoma lake and stream data collected as part of the comprehensive, long-term program, but also includes an assessment of data collected through the Water Board's volunteer water quality monitoring program, Oklahoma Water Watch (OWW). As the program matures, the BUMP report is sure to become one of the most important documents published annually in Oklahoma.

BENEFICIAL USE MONITORING PROGRAM COMPONENTS

- **Monitoring Rivers & Streams** - The OWRB is currently monitoring approximately one hundred thirty (130) stations on a monthly basis. These sites are segregated into two discrete types of monitoring activities. The first monitoring activity is focusing on fixed station monitoring on rivers and streams and the second monitoring activity focuses on a number of sample stations whose location rotate on an annual basis. The two monitoring components are explained below.

    - **Fixed Station Monitoring on Rivers & Streams** - Fixed station monitoring is based largely upon the sixty-seven (67) United States Geological Survey 8-digit hydrologic unit code (HUC) basins present in Oklahoma. In general, at least one (1) sample station was located in all of the HUC watersheds with the exception of some of the smaller HUC watersheds adjacent to the state line or in a HUC that does not contain a free flowing stream at some point during the year. After consultation with the other state environmental agencies and over time the OWRB has identified one hundred nineteen (119) fixed stations of which one hundred and two (102) are currently being monitored.

    - **Rotating Station Monitoring on Rivers & Streams** - Over the life of the BUMP, rotational sampling has occurred on over two hundred twenty (220) stream segments. Sample stations and variables monitored are based upon Oklahoma's 303(d) list and input from other state environmental agencies on their monitoring needs. Variables monitored as part of this program component are specific for each stream segment monitored

- **Fixed Station Load Monitoring** – The OWRB is currently working with several partners including the the USGS, US Army Corp of Engineers, Grand River Dam Authority, and National Weather Service to conduct flow monitoring on all of our fixed station sites that are not part of the Oklahoma/USGS Cooperative Gaging Network. This cooperative effort will allow for loadings to be calculated, trends to be assessed statewide, and provide much needed data for the Use Support Assessment process.

- **Fixed Station Lakes Monitoring** - Quarterly sampling (approximately once every 90 days) of approximately 55-60 lakes annually is currently occurring. This represents approximately a 40% increase in effort over historical BUMP Lake sampling efforts. In general, a minimum of three stations per reservoir, representing the lacustrine zone, transitional zone, and riverine zone are designated for sampling at each lake, with additional sites sampled as needed. Additional water quality parameters and lake sites were added to the lake sampling program beginning in 2001 to aid in making use support determinations.

- **Fixed Station Groundwater Monitoring** - Limited monitoring as part of this task has occurred in the program. Results of monitoring are presented in this report. OWRB staff has made recommendations in this report related to the scope and magnitude of groundwater monitoring activities that the state should pursue in the future. Any proposed groundwater monitoring efforts will be coordinated with the Oklahoma Department of Environmental Quality (ODEQ) program.

- **Intensive Investigation Sampling** - Although no funding was made available for this element of the program, it is important that waters identified as impaired be restored. If routine monitoring identifies impairment, then an intensive study will be undertaken to document the source of the impairment and recommend restorative actions if possible. This task will not be conducted in year one or year two of the program, but thereafter, intensive investigations will be conducted as warranted. If water bodies are not identified for intensive study as part of this task, then monies will be reallocated to Tasks **1** and **3**. Other entities (i.e. tribal or governmental units outside of Oklahoma) are involved as circumstances dictate or allow.

PROGRAM HISTORY/OVERVIEW

Sampling of the numerous lakes, streams, and rivers across this state was initiated in the summer and fall of 1998. Lake sampling in connection with the Beneficial Use Monitoring Program began in July of 1998. Sampling on numerous streams and rivers began in earnest in November of the same year. The two sampling programs, one for lakes and one for streams had separate starting dates for a number of reasons. First, the OWRB has been conducting a lake-sampling program during the warmer summer months since 1990 as part of the Federal Clean Lakes Program. This historical lake sampling program was funded through federal dollars with the express purpose of determining lake trophic status. The trophic status of a reservoir can range from oligotrophic (low biological productivity) to hyper-eutrophic (excessive biological productivity). In general, the more productive a reservoir, the more water quality problems it is likely to experience. Federal dollars to fund this trophic state assessment of our state's lakes were discontinued in 1994. At that time, the OWRB searched for other funding sources, and through working with the Secretary of the Environment and the Oklahoma Conservation Commission, the Water Board was able to obtain a one time federal 319 nonpoint source grant to continue the lake trophic state assessment program. The OWRB subsequently initiated a quarterly lake sampling program in the spring of 1998 and was able to roll the existing lake program into the BUMP.

For streams, no such comprehensive, statewide sampling effort was ongoing at the time the BUMP was funded. Because of this, the OWRB required a number of months to re-allocate staff and implement a monitoring regime on streams. In addition, OWRB staff greatly desired input from the other environmental agencies on the placement of stream monitoring stations. The existence of a previous statewide stream-monitoring network greatly aided in sample site selection. This historical ambient trend stream-monitoring network existed from 1975 until 1993 and was implemented by the Oklahoma State Health Department. Although this program did not evaluate sample results through comparison with the OWQS criteria or determine use support, it did provide a framework upon which to build. The historical sampling network sampled streams on a monthly basis from 1975-1986 and on a semi-annual basis from 1987-1993. Based upon the historical program and input from other agencies, the OWRB has established an ambient monitoring network of 100 active permanent stations with numerous rotational sites. Both the permanent and rotational networks are evaluated annually to determine if any stations should be dropped and others added. The Water Resources Board relies heavily on the other state and federal agencies for input into this process. With continued funding it is the desire of BUMP staff to increase the number of permanent sites to 120 to more effectively monitor our stream resources. In addition, monitoring personnel with the OWRB work closely with the other state environmental agencies to avoid duplication of sampling effort (i.e. the Oklahoma Conservation Commission rotating and data gaps sampling initiatives), except on a very limited basis for

quality assurance purposes. A very small number of sites that are duplicative in nature do allow for the comparison of results between sampling programs to ensure that sampling protocols and the Use Support Assessment Protocols (USAP - described below) are working effectively and that decisions on support status are being made in a consistent manner.

The OWRB has developed Use Support Assessment Protocols (USAP) for lakes and streams, which are essential if the state is to be consistent in identifying waters that are not meeting their assigned beneficial uses or are threatened. The Water Resources Board has incorporated the USAP into Oklahoma Administrative Code (OAC) 785:46 to ensure that consistent determinations for impairments are made by the all of the monitoring agencies.

The state must follow consistent procedures for listing waters as impaired. Using the OWRB Use Support Assessment Protocols, it was possible for OWRB staff to assess whether threats or impairments are present in our waterways. With continued funding, identification of impaired waters will be accomplished on additional waters.

Results of Stream Sampling Efforts

It is essential that Oklahoma quantify impacts in a comprehensive and scientific manner and look for trends in water quality to identify waters that are not meeting their assigned beneficial uses. As a state, we must manage our water resources effectively and direct money to areas in most need of protection or remediation to ensure that we continue to have good quality and sufficient quantity of water to meet our needs well into the 21st century. Comprehensive statewide data sets on rivers and streams for accurately assessing beneficial use impairments has not existed since 1993. With the implementation of monitoring on a large scale in October of 1998, this is no longer the case. With the availability of data, it is the desire of the Oklahoma Water Resources Board to provide the legislature and professional water managers with a comprehensive and up-to-date document for their review and approval. Administrative and Technical staff at the OWRB look forward to conducting the Beneficial Use Monitoring Program far into the future and providing the state of Oklahoma with the information it needs to make informed decisions that allow us to effectively manage our precious water resources.

The BUMP permanent ambient trend stream monitoring sites and their associated beneficial uses are listed in Table 1. Beneficial uses that are not being met are shown in **RED**. Listed next to the support code indicating that the beneficial use was not being met is the variable code which indicates which water quality variable violated the OWQS criteria. A large number of water bodies are deemed impaired due to their exceedance of the turbidity standard of 10 or 50 nephelometric turbidity units (NTU). The OWQS states that turbidity standards only apply during seasonal base flow conditions. In other words, the criteria should not be applied where normal in-stream conditions exceed the OWQS due to natural processes from a high-flow event. Several “quick” methods are available to assist in the determination of seasonal base flow including the existence of a periphyton line and visual estimation of the degree of flow. However, to reliably determine base flow, a measurement of stream discharge at the time of sampling is needed. This measurement when used in concert with the “quick” methods described above will give a reliable indication of whether the stream is at, below, or above seasonal base flow conditions. Because the BUMP network encompasses the state’s large rivers and streams, discharge is often obtained by comparing stream stage to a continuously updated rating curve. Due to the intense nature of establishing a reliable rating curve, rated discharges are often provisional for a number of months. Therefore, the determination of the previous year’s base flow and consequently eligible turbidity values are also **provisional** at the

publication of this report. As of the beginning of 2002, the OWRB was gaging all but 4 permanent station locations. Where permanent water-quality monitoring stations were located near a United States Geological Survey (USGS) stream-flow monitoring station, the information collected by USGS is used to determine if a high-flow event exceeding seasonal base flow had occurred at the time of sampling.

Table 1. Permanent Ambient Trend Monitoring Stations and their Beneficial Use Support Status.

STATION NAME	FWP	PBCR	PPWS	AG	AES
ARKANSAS RIVER, US 64, MOFFETT	S	NS (8)	S	S	NT
ARKANSAS RIVER, SH 104, HASKELL	S	S	N/A	NS (10)	NT
ARKANSAS RIVER, SH 18, RALSTON	NS (5)	NS (8)	S	S	NT
ARKANSAS RIVER, SH 97, SAND SPRINGS	S	S	N/A	S	NT
ARKANSAS RIVER, US 62, MUSKOGEE	NS (3)	NS (8)	N/A	NS (10)	T (17)
ARKANSAS RIVER, US 64, BIXBY	S	NS (6, 7, 8)	N/A	S	NT
BARREN FORK, SH 51, ELDON	S	NS (8)	S	S	NS (14)
BEAVER RIVER, OFF US 64, GUYMON	NS (1)	NS (6, 7, 8)	S	S	NT
BEAVER RIVER, US 83, TURPIN	S	NS (6, 7, 8)	N/A	NS (10, 11)	NT
BEAVER RIVER, SH 23, BEAVER	S	NS (6, 8)	N/A	NS (10, 11, 12)	NT
BEAVER RIVER, US 283, LAVERNE	S	NS (8)	N/A	S	NT
BEAVER RIVER, CR N1650, GATE	S	NS (6, 8)	N/A	NS (10, 11)	NT
BEAVER RIVER, US 183, FORT SUPPLY	S	NS (8)	N/A	S	NT
BIG CABIN CREEK, OFF US 69, BIG CABIN	S	NS (7, 8)	S	PS (12)	NT
BIRD CREEK, SH 266, PORT OF CATOOSA	PS (5)	NS (6, 8)	S	S	NT
BLACK BEAR CREEK, SH 18, PAWNEE	NS (5)	NS (6, 8)	S	S	NT
BLUE RIVER, US 70, DURANT	S	NS (8)	S	S	NT
BRUSHY CREEK, OFF US 270, HAILEYVILLE	NS (1, 3, 5)	NS (8)	S	NS (12)	NT
CANADIAN RIVER, SH 2, WHITEFIELD	S	S	S	S	NT
CANADIAN RIVER, US 183, TALOGA	S	NS (8)	N/A	NS (10, 11,12)	NT
CANADIAN RIVER, US 270, CALVIN	PS (5)	NS (8)	S	PS (12)	T (17)
CANADIAN RIVER, US 377, KONAWA	PS (3,5)	NS (8)	S	NS (10)	T (17)
CANADIAN RIVER, US 66, BRIDGEPORT	NS (5)	NS (8)	N/A	S	NT
CANADIAN RIVER, US 77, PURCELL	PS (5)	N/A	N/A	S	T (13, 17)
CANEY CREEK, OFF SH 100, BARBER	S	S	S	S	NT
CANEY RIVER, OFF US 75, RAMONA	NS (3, 5)	NS (8)	S	S	NT
CHICKASKIA RIVER, US 177, BLACKWELL	NS (3, 5)	NS (6, 8)	S	NS (10)	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
CIMARRON RIVER, OFF SH 8, NEAR AMES	S	NS (6, 7, 8)	N/A	NS (10, 11, 12)	NT
CIMARRON RIVER, SH 34, BUFFALO	S	NS (6, 7, 8)	N/A	NS (10,11)	NT
CIMARRON RIVER, SH 99, OILTON	NS (5)	NS (6, 8)	N/A	S	NT
CIMARRON RIVER, US 77, GUTHRIE	S	NS (6, 8)	N/A	S	T (17)
CIMARRON RIVER, US 81, DOVER	S	NS (7, 8)	N/A	NS (10, 11)	NT
CIMARRON RIVER, OFF US 64, MOCANE	S	NS (6, 8)	S	NS (10, 11)	NT
CIMARRON RIVER, SH 33, RIPLEY	NS (5)	NS (8)	N/A	S	NT
CIMARRON RIVER, US 281, NEAR WAYNOKA	NS (16)	No Info	N/A	NS (10, 11)	NT
CLEAR BOGGY CREEK, OFF US 69, CANEY	NS (3, 5)	NS (6, 8)	S	S	NT
DEEP FORK RIVER, OFF SH 16, BEGGS	NS (3, 5)	NS (8)	S	S	NT
DEEP FORK RIVER, US 377, STROUD	NS (3, 5)	NS (8)	PS (9)	S	T (13)
EAST CACHE CREEK, SH 53, WALTERS	NS (5)	NS (6, 7, 8)	S	S	NT
ELK CREEK, OFF US 183, ROOSEVELT	NS (5)	NS (6, 8)	S	S	NT
ELK RIVER, SH 43, TIFF CITY (MO)	S	NS (8)	S	S	NT
ELM FORK RIVER, SH 9, GRANITE	NS (5)	NS (6, 7, 8)	S	S	NT
FLINT CREEK, US 412, FLINT	S	NS (8)	S	S	NS (14)
FOURCHE-MALINE CREEK, OFF US 270, RED OAK	NS (1, 3)	NS (8)	S	S	NT
GLOVER RIVER, SH 3, GLOVER	NS (3, 5)	NS (8)	S	S	NT
HONEY CREEK, OFF SH 25, GROVE	S	NS (8)	S	S	NT
ILLINOIS RIVER, US 59, WATTS	PS (5)	NS (8)	S	S	NS (14)
ILLINOIS RIVER, US 62, TAHLEQUAH	S	NS (8)	S	S	NS (14)
KIAMICHI RIVER, OFF US 271, TUSKAHOMA	NS (2, 3)	S	S	S	NT
KIAMICHI RIVER, SH 63, BIG CEDAR	NS (3, 4)	NS (8)	S	S	NT
KIAMICHI RIVER, US 271, ANTLERS	NS (2, 3)	NS (8)	S	S	NT
KIAMICHI RIVER, SH 109, FORT TOWSON	S	NS (8)	S	S	NT
LEE CREEK, SH 101, SHORT	S	NS (8)	S	S	S
LITTLE RIVER, OFF SH 3, CLOUDY	NS (3, 5)	NS (8)	S	S	NT
LITTLE RIVER, OFF US 70, NEAR HOLLY CREEK	NS (1, 5)	No Info	S	S	NT
LITTLE RIVER, SH 56, SASAKWA	NS (3)	NS (8)	S	S	NT
MOUNTAIN FORK, SH 4, SMITHVILLE	NS (2, 3, 5)	NS (8)	S	S	NS (14)
MOUNTAIN FORK, US 70, EAGLETOWN	NS (2, 3)	NS (8)	S	S	NT
MUD CREEK, SH 32, COURTNEY	NS (5)	NS (8)	S	S	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
MUDDY BOGGY CREEK, US 70, UNGER	NS (3, 5)	NS (6, 8)	S	S	NT
MUDDY BOGGY CREEK, US 69, ATOKA	NS (1, 3, 5)	NS (6, 8)	S	S	NT
NEOSHO RIVER, OFF US 66, COMMERCE	NS (3, 5)	S	S	S	NT
NEOSHO RIVER, OFF SH 137, CONNOR BRIDGE	PS (5)	S	S	S	NT
NEOSHO RIVER, SH 82, LANGLEY	S	S	S	S	NT
NEOSHO RIVER, US 412, CHOUTEAU	S	S	S	S	NS (13)
NORTH CANADIAN RIVER, IND. NAT. TPK., DUSTIN	NS (3, 5)	NS (6, 8)	S	S	T (13)
NORTH CANADIAN RIVER, SH 3E, SHAWNEE	NS (3, 4, 5)	NS (8)	N/A	S	T (13, 17)
NORTH CANADIAN RIVER, OFF US 62, HARRAH	PS (5)	NS (6, 8)	N/A	S	T (13, 17)
NORTH CANADIAN RIVER, US 270, WATONGA	S	NS (6, 7, 8)	S	S	NT
NORTH CANADIAN RIVER, US 281, SEILING	S	NS (8)	S	S	NT
NORTH CANADIAN RIVER, US 75, WETUMKA	NS (3, 5)	NS (6, 8)	S	S	T (13, 17)
NORTH CANADIAN RIVER, US 412, WOODWARD	S	NS (8)	N/A	S	NT
NORTH CANADIAN RIVER, US 81, EL RENO	S	NS (8)	S	S	NT
NORTH FORK OF THE RED RIVER, US 62, HEADRICK	NS (5)	NS (8)	S	NS (10, 11)	T (17)
NORTH FORK OF THE RED RIVER, SH 34, CARTER	S	NS (8)	S	S	NT
POTEAU RIVER, OFF SH 112, POCOLA	NS (3, 5)	NS (8)	S	S	NT
POTEAU RIVER, US 59, HEAVENER	S	S	S	S	NT
RED RIVER, US 183, DAVIDSON	NS (3, 5)	NS (6, 8)	N/A	NS (10, 11, 12)	T (17)
RED RIVER, US 259, HARRIS	PS (5)	S	S	S	NT
RED RIVER, US 271, HUGO	PS (5)	NS (8)	S	S	NT
RED RIVER, US 81, TERRAL	NS (5)	NS (8)	S	NS (11, 12)	NT
SAGER CREEK, OFF US 412, WEST SILOAM SPRINGS	S	NS (8)	PS (nitrates)	S	T (13, 15)
SALT FORK OF THE ARKANSAS, SH 58, INGERSOLL	NS (5)	NS (6, 7, 8)	S	S	NT
SALT FORK OF THE ARKANSAS, US 77, TONKAWA	NS (5)	NS (8)	S	S	NT
SALT FORK OF THE RED RIVER, SH 34, MANGUM	S	NS (8)	S	S	NT
SALT FORK OF THE RED RIVER, OFF US 283, ELMER	NS (3)	NS (6, 8)	S	PS (11)	NT
SANDY CREEK, SH 6, ELDORADO	NS (2, 3, 5)	N/A	N/A	NS (10, 11, 12)	NT
SKELETON CREEK, SH 74, LOVELL	NS (5)	NS (6, 8)	S	S	NT
SPRING CREEK, OFF US 412, MURPHY	S	S	S	S	NT
SPRING RIVER, OFF SH 137, QUAPAW	NS (2. 3, 5)	NS (8)	S	S	NT
VERDIGRIS RIVER, US 412, INOLA	NS (3, 5)	NS (8)	S	S	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
VERDIGRIS RIVER, SH 10, LENEPAH	NS (3, 5)	NS (8)	S	S	NT
VERDIGRIS RIVER, SH 20, KEETONVILLE	S	NS (8)	S	S	NT
VERDIGRIS RIVER, SH 51, WAGONER	NS (2, 3, 5)	NS (8)	S	S	NT
WASHITA RIVER, OFF SH 19, ALEX	NS (5)	NS (6, 8)	S	S	T (17)
WASHITA RIVER, SH 152, CORDELL	NS (5)	NS (6, 7, 8)	S	S	T (17)
WASHITA RIVER, SH 19, PAULS VALLEY	NS (5)	NS (8)	S	S	NT
WASHITA RIVER, SH 33, MCCLURE	PS (5)	NS (6, 7, 8)	S	S	NT
WASHITA RIVER, US 177, DURWOOD	NS (5)	NS (6, 8)	S	S	NT
WASHITA RIVER, US 281, ANADARKO	NS (5, 16)	NS (6, 8)	S	S	T (17)
WEST CACHE CREEK, SH 5B, TAYLOR	NS (5)	NS (6, 7, 8)	S	PS (10,11)	NT
WOLF CREEK, OFF US 270, FORT SUPPLY	S	NS (8)	S	S	NT

ASSIGNED OWQS BENEFICIAL USES

FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
PPWS = PUBLIC AND PRIVATE WATER SUPPLY	AG = AGRICULTURE
AES = AESTHETICS	

SUPPORT CODES

S—FULLY SUPPORTING	PS—PARTIALLY SUPPORTING	NS—NOT SUPPORTING
N/A—NOT APPLICABLE	NT-NOT THREATENED (NUTRIENTS)	T-THREATENED (NUTRIENTS)

WATER QUALITY VARIABLES

1—DISSOLVED OXYGEN	2—METALS (ACUTE)	3—METALS (CHRONIC)
4—pH	5—TURBIDITY	6—FECAL COLIFORM
7— *ESCHERICHIA COLI*	8— ENTEROCOCCI	9—METALS
10— TOTAL DISSOLVED SOLIDS	11— CHLORIDES	12— SULFATES
13— TOTAL PHOSPHORUS (TP)	14—TP OK SCENIC RIVER CRITERION	15— NITRITE + NITRATE
16—BIOCRITERIA	17—SESTONIC CHLOROPHYLLL-A (TSI)	

INTRODUCTION

Protecting Oklahoma's valuable water resources is essential to maintaining the quality of life for all Oklahomans. Used for a myriad of purposes—such as irrigation, hydropower, public/private water supply, navigation, and a variety of recreational activities—the state's surface and groundwaters provide enormous benefits to Oklahoma from both an economic and recreational standpoint.

The National Recreation Lakes Study Commission (NRLSC) estimates that 32,100 people in Oklahoma are employed in support of activities related to our numerous man-made lakes. Also according to the NRLSC, 18,718,000 visitor days are spent on Oklahoma lakes each year and recreation in and around these lakes contributes approximately $2.2 billion each year to Oklahoma's economy. Of additional value are the recreational benefits associated with our smaller municipal/watershed projects, Oklahoma Department of Wildlife lakes, and rivers and streams throughout the state, which infuse millions into state coffers through fishing, hunting, camping and related activities. (In 1987, the Oklahoma Comprehensive Outdoor Recreation Plan estimated that approximately $10.7 million was realized through camping and $15.2 million through hunting/fishing.[1]) According to a 2001 federal study, fishing activities alone contribute $476,019 dollars to Oklahoma's economy, not including the substantial ancillary costs associated with that extremely popular sport.[2]

In addition to surface waters, abundant groundwaters also fuel the state's economy serving as supply for thousands municipalities, rural water districts, industrial facilities, and agricultural operations. According to the 1995 update of the *Oklahoma Comprehensive Water Plan*, groundwater represents the primary water supply for approximately 300 cities and towns and comprises 60 percent of the total water used in the state each year.[3] Groundwater resources also supply approximately 90 percent of the state's irrigation needs.

Oklahoma works to protect and manage its water resources through a number of initiatives, with the Oklahoma Water Quality Standards (OWQS) serving as the cornerstone of the state's water quality management programs. The Oklahoma Water Resources Board (OWRB) is designated by state statute as the agency responsible for promulgating water quality standards and developing or assisting the other environmental agencies with implementation framework. State agencies are responsible for implementing the OWQS as outlined by the OWRB through development of Implementation plans. Protecting our waters is a cooperative effort between many state agencies and because the OWQS are utilized by all agencies and represent a melding of both science and policy, they are an ideal mechanism to assess the effectiveness of our diverse water quality management activities.

The OWQS are housed in OAC 785:45 and consist of three main components: beneficial uses,criteria to protect beneficial uses, and anantidegradation policy. An additional component, which is not directly part of the OWQS but necessary to water resource protection, is a monitoring program. A monitoring program is required in order to ensure that beneficial uses

[1] Oklahoma Statewide Comprehensive Outdoor Recreation Plan (SCORP), 1987.
[2] U.S. Department of Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.*
[3] Oklahoma Water Resources Board, *Update of the Oklahoma Comprehensive Water Plan, 1995*.

are maintained and protected. If uses are not being maintained, the cause of that impairment must be identified and restoration activities should be implemented to improve water quality such that it can meet it's assigned beneficial uses.

All state agencies are currently required to implement Oklahoma's Water Quality Standards within the scope of their jurisdiction through the development of an Implementation Plan specific for their agency. This process, called OWQS Implementation, allows the OWQS to be utilized by other state agencies in the performance of their regulatory (statutory) responsibilities to manage water quality or to facilitate best management practice initiatives.

In the late 1990's, the need for a protocol to determine beneficial use impairment was identified, which would facilitate state agencies in directing their time and money to the areas in most need of protection or remediation. The OWRB working in close concert with other state environmental agencies and other concerned parties developed Use Support Assessment Protocols (USAP) to be used by all parties for assessing if a water was meeting it's assigned beneficial uses. In addition, protocols were developed which could be coupled with a trend monitoring system to detect threatened waters before they become seriously impaired. Data collection efforts connected with protocol development and/or implementation also serves a vital purpose in refining numerical criteria currently included in the OWQS and in developing appropriate numerical and narrative criteria for future OWQS documents. It is essential that our waters meet their assigned uses and that OWQS implementation protocols are appropriate. Please see APPENDIX A for the applicable Oklahoma Administrative Code OAC 785:46 related to the USAP. Final approval of the USAP occurred in 2000 and the OWRB has constantly worked to refine the existing protocols and pursue the addition or modification of USAP protocols to further enhance its utility and effectiveness.

Work to be performed towards development and implementation of the critical fourth component of the OWQS program, monitoring, is the subject of this report. All sampling activities described and conducted as part of this program were consistent with the Oklahoma USAP. It is also important to note that they are consistent with Environmental Protection Agency (EPA) reporting requirements for the "*Integrated Water Quality Monitoring and Assessment Report*", §319 Nonpoint Source (NPS) Assessment, and the §314 Lake Water Quality Assessment (LWQA).

BACKGROUND & PROBLEM DEFINITION

The State of Oklahoma has historically had numerous monitoring programs conducted by several state and federal agencies. In general, each environmental agency conducts their monitoring programs with some degree of integration and coordination with other state, municipal, or federal programs. Most water quality monitoring programs in Oklahoma are designed and implemented by each agency to collect information for one specific purpose or project (i.e. development of Total Maximum Daily Loads, OWQS process, lake trophic status determination, water quality impacts from point source dischargers, stream flow measurements, document success of best management practices, etc.). Information of this type is very specific to each individual project's data quality objectives (DQOs) and is often limited to a very small geographic area. This document describes sampling activities the OWRB has historically conducted on lakes and efforts that are currently on going on lakes and streams across Oklahoma as part of a comprehensive, long-term, statewide Beneficial Use Monitoring Program (BUMP). The goal of the BUMP is to detect and quantify water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a pollution crisis.

The state is taking a major step towards coordinating sampling activities with the creation of a "Water Quality Monitoring Council" comprised of representatives from state, local, and federal agencies as well as universities, industries, volunteer groups, Indian tribes, and environmental organizations. This Council as envisioned would serve a useful purpose in providing an avenue for communication between the various groups and will allow the state to coordinate water quality monitoring in a more effective manner. The Council will focus on coordinating agency activities and help the state avoid duplication of effort. Coordination between all concerned parties is obviously essential, but a comprehensive basic monitoring initiative to support the OWQS implementation process must be pursued to identify waters which are not meeting their assigned beneficial uses and thus ensure that Oklahoma's water resources are protected from water quality degradation. The Council will also be pivotal in ensuring consistency between data collection efforts. The Monitoring Council will function in a coordinating capacity, which will maximize monitoring efforts.

BENEFICIAL USE MONITORING PROGRAM (BUMP) OVERVIEW

The overall goal of the Beneficial Use Monitoring Program is to document beneficial use impairments, identify impairment sources (if possible), detect water quality trends, provide needed information for the OWQS, and facilitate the prioritization of pollution control activities.

BENEFICIAL USE MONITORING PROGRAM COMPONENTS

- **Monitoring Rivers & Streams** - The OWRB is currently monitoring approximately one hundred thirty (130) stations on a monthly basis. These sites are segregated into two discrete types of monitoring activities. The first monitoring activity is focusing on fixed station monitoring on rivers and streams and the second monitoring activity focuses on a number of sample stations whose locations rotate on an annual basis. The two monitoring components are explained below.

    - **Fixed Station Monitoring on Rivers & Streams** - Fixed station monitoring is based largely upon the sixty-seven (67) United States Geological Survey 8-digit hydrologic unit code (HUC) basins present in Oklahoma. In general, at least one (1) sample station was located in all of the HUC watersheds with the exception of some of the smaller HUC watersheds adjacent to the state line or in a HUC that does not contain a free flowing stream at some point during the year. After consultation with the other state environmental agencies and over time the OWRB has identified one hundred nineteen (119) fixed stations of which one hundred and two (102) are currently being monitored.

    - **Rotating Station Monitoring on Rivers & Streams** - Over the life of the BUMP, rotational sampling has occurred on two hundred twenty (220) stream segments. Sample stations and variables monitored are based upon Oklahoma's 303(d) list and input from other state environmental agencies on their monitoring needs. Variables monitored as part of this program component are specific for each stream segment monitored

- **Fixed Station Load Monitoring** - The OWRB is currently working with several partners including the the USGS, US Army Corp of Engineers, Grand River Dam Authority, and National Weather Service to conduct flow monitoring on all of our fixed station sites that are not part of the Oklahoma/USGS Cooperative Gaging Network. This cooperative effort will allow for loadings to be calculated, trends to be assessed statewide, and provide much needed data for the Use Support Assessment process. Along with the USGS cost share program, Oklahoma's 319 program, Oklahoma's 314 program and the 303(d)-process will drive sample site locations associated with this task.

- **Fixed Station Lakes Monitoring** - Fixed station lakes monitoring goal is designed to facilitate sampling on the 130 largest lakes in Oklahoma every other year. To accomplish this task, the OWRB is sampling approximately 55 to 60 lakes currently, on a quarterly basis. Under this scenario repeat sampling on a lake will occur approximately every other year, with the inclusion of lakes data collected by other sources, like the Corps of Engineers, to meet the goal of 130 lakes every two years. Data collected consists primarily of water chemistry, nutrients, and chlorophyll-a information. In general, sampling of three stations per reservoir, representing the lacustrine zone, transitional zone, and riverine zone occurs. On many reservoirs, additional sites are monitored, including major arms of the reservoir as appropriate. Water quality parameters have been added to the lakes sampling effort over the years to enhance our ability to make use support determinations.

- **Fixed Station Groundwater Monitoring** - Limited monitoring as part of this task has occurred in the program. Results of monitoring are presented in this report. OWRB staff has made recommendations in this report related to the scope and magnitude of groundwater monitoring activities that the state should pursue in the future. Any proposed groundwater monitoring efforts will be coordinated with the Oklahoma Department of Environmental Quality (ODEQ) program.
- **Intensive Investigations** - If beneficial use impairment is identified or suspected, then all appropriate state agencies will be alerted and an investigation will be initiated to confirm if beneficial use impairment is occurring. If routine monitoring cannot definitively identify impairments, then an intensive study will be undertaken and if impairment is present, the source of the impairment will be identified if possible. One potential use for the intensive studies envisioned was identified during the data analysis phase of this reporting process. For example, monies could be spent to identify if high turbidity readings in rivers and streams are due to natural processes or do to human activities in the watershed of concern. Some potential causes of beneficial use impairment are; improper beneficial use or criteria (Oklahoma Water Resources Board jurisdiction), point source problems (Oklahoma Department of Environmental Quality or Oklahoma Department of Agriculture), non-point source problems (Oklahoma Conservation Commission, Oklahoma Department of Agriculture, Oklahoma Corporation Commission, or Oklahoma Department of Environmental Quality), oil and gas contamination (Oklahoma Corporation Commission), agricultural activities (Oklahoma Department of Agriculture), or mining activities (Oklahoma Department of Mines). All monitoring activities will be cooperative in nature with the agency with statutory authority assuming the lead role for intensive monitoring. If water bodies are not identified for intensive study as part of this task, then monies will be reallocated for routine monitoring of beneficial use attainment. Other entities (i.e. tribal or governmental units outside of Oklahoma) will be involved as appropriate. All intensive-monitoring activities will be consistent with the OWQS and the USAP. If no protocols exist, then best professional judgment or State/Environmental Protection Agency guidance is used as appropriate.

STREAM MONITORING PROGRAM

The Stream Beneficial Use Monitoring Program was initiated in November of 1998. Implementation of the program was delayed due to the relocation of the ODEQ State Environmental Laboratory to a new building and the fact that the OWRB required a few months to assemble the necessary infrastructure to implement stream sampling (purchase of equipment, database development, assignment of personnel, etc.). The BUMP streams staff began collecting monthly data in November of 1998 and changed to visiting stations on a 5-week schedule in 2003. A summary of the data results for the period of record from October 2000 through September 2005 is presented in this section. Results of stream sampling efforts are organized by their 4-digit USGS hydrologic unit code (HUC). Stream results are discussed in alphabetical order for each HUC. Each stream station is described individually with a brief narrative outlining the site location and other pertinent information followed by a brief synopsis of data results. Additional graphical representations of the data are included for each station. Toxicant or bacteria data used to determine a status of non-support are located in tables near the beginning of each section. All of the permanent monitoring sites are listed and discussed very briefly.

RIVER AND STREAM MONITORING OVERVIEW

Historically, data on rivers and streams across the state has been very sketchy. Over the years, various local, tribal, state, and federal agencies have managed a number of sampling programs. These programs have varied in nature ranging from short-term, site-specific sampling to the former Oklahoma State Department of Health (OSDH) statewide sampling program. However, a comprehensive, statewide ambient trend-monitoring program had not existed since 1989, the last year that the OSDH conducted monthly sampling. Furthermore, a program with the specific intent of documenting statewide beneficial use impairments on a long-term basis had never existed until the Beneficial Use Monitoring Program (BUMP) was started in September of 1998 with subsequent sampling begun in November of the same year. By establishing a monitoring network that evaluates general water quality through the use of an existing framework like the Oklahoma Water Quality Standards, the state of Oklahoma initiated a progressive phase in the long-term assessment of the overall health of our state's streams and rivers.

MATERIALS & METHODS

The Monitoring Network. The BUMP rivers and streams network consists of two major station classifications — permanent ambient trend sites and rotating sites. Permanent ambient trend monitoring stations are relatively static within the program. In general, they do not change from year to year and have been chosen to allow for long-term assessment of beneficial uses and water quality trends. Since program inception a small number of sites have been dropped from the program and new sites added to more effectively assess the water quality of our major stream basins. Rotating stations are only actively monitored for a predetermined period of time and for a specific purpose.

With the creation of the permanent monitoring network in September of 1998, OWRB staff established three overarching objectives for the program. First, the network must encompass the entire state. To accomplish this, a commitment was made to locate at least one site in each of the 8-digit USGS hydrologic units (HUC) (Table 2).

Table 2. Eight Digit United States Geological Survey HUC Watersheds.

8 Digit HUC Number	Description	8 Digit HUC Number	Description
11040001	Cimarron Headwaters	**11100301**	Middle North Canadian
11040002	Upper Cimarron	**11100302**	Lower North Canadian
11040006	Upper Cimarron – Liberal	**11100303**	Deep Fork
11040007	Crooked	**11110101**	Polecat – Snake
11040008	Upper Cimarron – Bluff	**11110102**	Dirty – Greenleaf
11050001	Lower Cimarron – Eagle Chief	**11110103**	Illinois
11050002	Lower Cimarron – Skeleton	**11110104**	Robert S. Kerr Reservoir
11050003	Lower Cimarron	**11110105**	Poteau
11060001	Kaw Lake	**11120105**	Lower Prairie Dog Town Fk., Red
11060002	Upper Salt Fork – Arkansas	**11120202**	Lower Salt Fork – Red
11060003	Medicine Lodge	**11120302**	Middle North Fork – Red
11060004	Lower Salt Fork – Arkansas	**11120303**	Lower North Fork – Red
11060005	Chickaskia	**11120304**	Elm Fork – Red
11060006	Black Bear – Red Rock	**11130101**	Groesbeck – Sandy
11070103	Middle Verdigris	**11130102**	Blue – China
11070105	Lower Verdigris	**11130201**	Farmers – Mud
11070106	Caney	**11130202**	Cache
11070107	Bird	**11130203**	West Cache
11070205	Middle Neosho	**11130208**	Northern Beaver
11070206	Grand Lake	**11130210**	Lake Texoma
11070207	Spring	**11130301**	Washita Headwaters
11070208	Elk	**11130302**	Upper Washita
11070209	Lower Neosho	**11130303**	Middle Washita
11090103	Rita Blanca	**11130304**	Lower Washita
11090201	Lower Canadian – Deer	**11140101**	Bois D'Arc – Island
11090202	Lower Canadian – Walnut	**11140102**	Blue
11090203	Little	**11140103**	Muddy Boggy
11090204	Lower Canadian	**11140104**	Clear Boggy
11100101	Upper Beaver	**11140105**	Kiamichi
11100102	Middle Beaver	**11140106**	Pecan – Waterhole
11100103	Coldwater	**11140107**	Upper Little
11100104	Palo Duro	**11140108**	Mountain Fork
11100201	Lower Beaver	**11140109**	Lower Little
11100203	Lower Wolf		

Currently, all but four of these 8-digit HUCs have at least one sampling station. A map of the 8-digit USGS HUCs is included as Figure 1. The second objective was that the foundation of the monitoring network should be principally the state's largest rivers, the Arkansas River and the Red River, and their major tributaries, such as the Canadian River and the Washita River. Currently, fifty-nine (59) of the 102 stations currently being monitored (58%) meet this criterion. These sites are dispersed over 20 different rivers and streams with the majority located on the Arkansas River and several tributaries including the Cimarron River, the Canadian River, the Verdigris River, and Neosho River as well as the Red River and several tributaries including the Washita River, the Kiamichi River, and the Little River. Secondary consideration was given to the major tributaries of rivers such as Canadian River and the Little River. Currently, thirty-six (36) of the 102 sites (35%) meet this criterion. Further consideration was given to areas of the state (e.g., the Panhandle) that were underrepresented as well as rivers and streams (e.g., The Deep Fork River) that were conspicuously missing from the network. Currently, seven (7) of the 102 monitoring stations (7%) meet one of these criteria. The third and last objective was to seek the advice and input of other state environmental agencies and professionals before making a final determination of permanent monitoring station locations. In particular, the ODEQ and OCC continue to be very helpful in assisting with locating permanent stations.

Operating within these overarching objectives, the staff of the OWRB has selected and performed monitoring on one hundred nineteen (119) permanent ambient trend-monitoring sites since September of 1998 and is currently monitoring 102 permanent stations (Table 3). The placement of a site location necessitates several considerations. Above all, a site must be accessible by vehicle and be safe for sampling personnel and other motorists. It is also essential that a site be located in an area where representative data can be acquired. The OWQS Use Support Assessment Protocols (USAP) set spatial limitations on the data that is collected. In summary, a site can only represent twenty-five stream miles for non-wadable streams and ten stream miles for wadable streams (with some exceptions). Furthermore, a site can only be representative of the waterbody identification number (12 digit HUC number) in which it is located and the site cannot be located within a regulatory mixing zone. This requires that monitoring sites be selected so that they represent as long a stream reach as possible while maintaining the spatial integrity outlined in USAP. Thirdly, it is important that historical data be considered. Many of the current BUMP permanent monitoring sites were selected from a set of historical monitoring stations that were a part of the OSDH (the environmental Division that conducted the Ambient Program later became part of the ODEQ) Ambient Trend Monitoring Program. Before initial sampling began in 1998, OWRB staff worked closely with the ODEQ to integrate many of the historical sites into the BUMP. Although the historical data from these sites can not be used to assess beneficial uses (USAP sets a temporal limitation of five years), the historical data set benefits the state in assessing long-term water quality trends. Lastly, it is imperative that rivers and streams which have been designated in the OWQS as Outstanding Resource Waters (ORW), High Quality Waters (HQW), or Sensitive Water Supplies (SWS) be given unique consideration even if they do not meet the objectives as outlined. For example, Sager Creek is not a tributary of a major tributary of a major river. However, it is listed as an ORW and therefore is sampled as part of the BUMP. The water quality status of each site is discussed in more detail in the individual HUC narrative sections that follow this section of the report.

Figure 1. USGS 8-digit Hydrologic Unit Codes for Oklahoma.

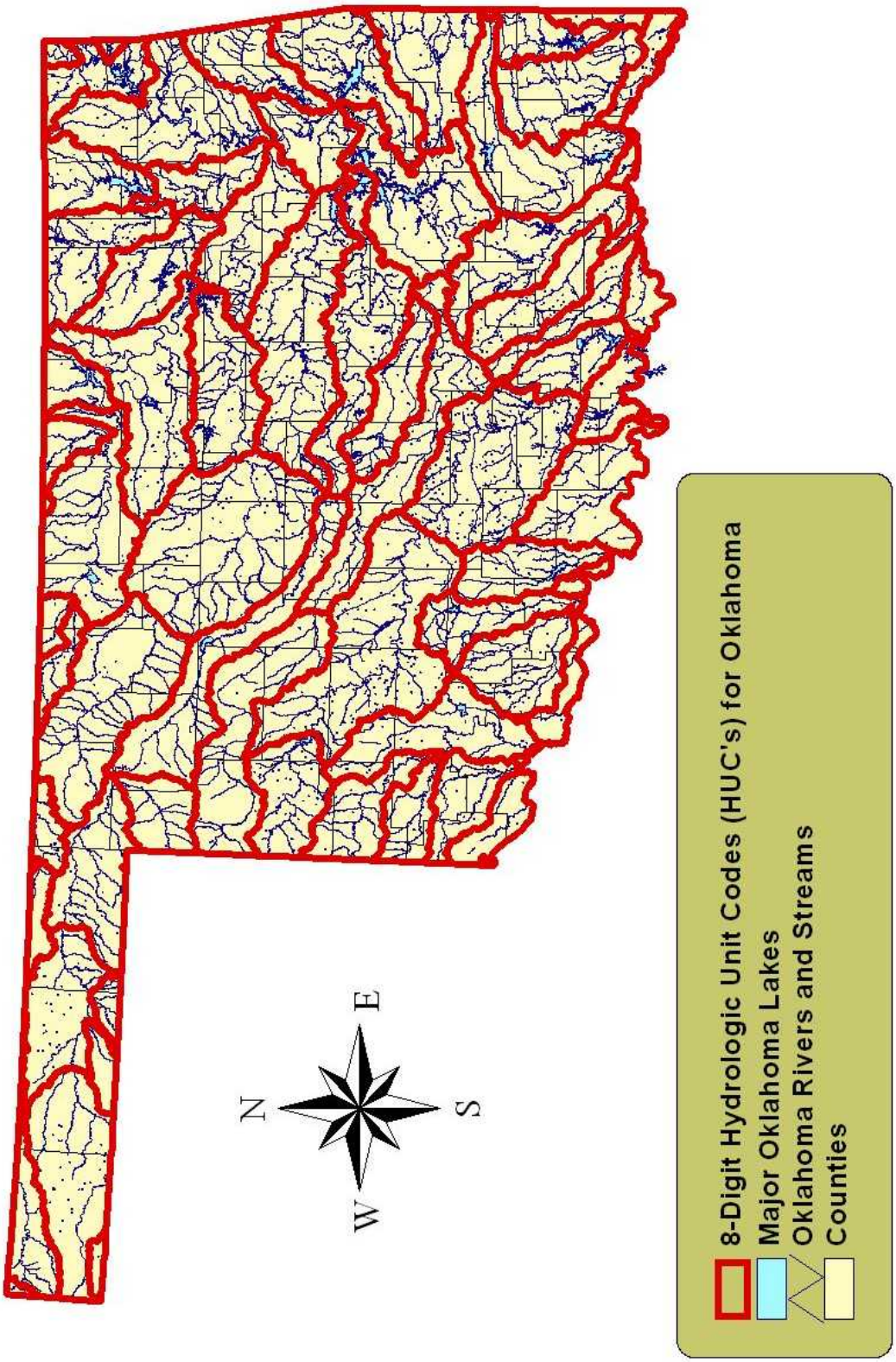

United States Geological Survey
8-Digit Hydrologic Unit Codes for Oklahoma
N
E
S
W
8-Digit Hydrologic Unit Codes (HUC's) for Oklahoma
Major Oklahoma Lakes
Oklahoma Rivers and Streams
Counties

Table 3. Permanent Ambient Trend Monitoring Stations.

	4-DIGIT USGS #	WBID #	STATION NAME	COUNTY	STATUS
1	1111	220200010010	Arkansas River, US 64, Moffett	Sequoyah	Active 11/98-P
2	1106	621210000030	Arkansas River, off US 77, Newkirk	Kay	Inactive 09/99-10/02
3	1111	120410010080	Arkansas River, SH 104, Haskell	Muskogee	Active 11/98-P
4	1106	621200010200	Arkansas River, SH 18, Ralston	Osage	Active 11/98-P
5	1111	120420010130	Arkansas River, SH 97, Sand Springs	Tulsa	Active 09/99-P
6	1111	121400010260	Arkansas River, US 62, Muskogee	Muskogee	Active 09/99-P
7	1111	120420010010	Arkansas River, US 64, Bixby	Tulsa	Active 11/98-P
8	1111	120400010260	Arkansas River, US 69, Muskogee	Muskogee	Inactive 11/98-12/99
9	1111	121700050010	Barren Fork, SH 51, Eldon	Cherokee	Active 11/98-P
10	1110	720500020010	Beaver River, US 183, Fort Supply	Harper	Active 10/00-P
11	1110	720500020140	Beaver River, CR N1650, Gate	Beaver	Active 10/00-P
12	1110	720510000150	Beaver River, off US 64, Guymon	Texas	Active 11/98-P
13	1110	720500020290	Beaver River, SH 23, Beaver	Beaver	Active 11/98-P
14	1110	720500020010	Beaver River, US 283, Laverne	Harper	Active 01/03-P
15	1110	720500020450	Beaver River, US 83, Turpin	Texas	Active 10/00-P
16	1107	121600060060	Big Cabin Creek, off US 69, Big Cabin	Craig	Active 09/99-P
17	1107	121600060010	Big Cabin Creek, SH 28, Pensacola	Mayes	Inactive 11/98-08/99
18	1107	121300010010	Bird Creek, SH 266, Port of Catoosa	Tulsa	Active 11/98-P
19	1106	621200030010	Black Bear Creek, SH 18, Pawnee	Pawnee	Active 11/98-P
20	1114	410600010010	Blue River, US 70, Durant	Bryan	Active 11/98-P
21	1109	220600030020	Brushy Creek, off US 270, Haileyville	Pittsburg	Active 11/98-P
22	1109	220600010120	Canadian River, Ind. Nat. Tpk., Hanna	McIntosh	Inactive 11/98-09/99
23	1109	220300000010	Canadian River, SH 2, Whitefield	Haskell	Active 09/99-P
24	1109	520620020120	Canadian River, US 183, Taloga	Dewey	Active 11/98-P
25	1109	220600010119	Canadian River, US 270, Calvin	Hughes	Active 11/98-P
26	1109	520600010010	Canadian River, US 377, Konawa	Seminole	Active 11/98-P
27	1109	520620010050	Canadian River, US 66, Bridgeport	Blain	Active 11/98-P
28	1109	520610010010	Canadian River, US 77, Purcell	McClain	Active 11/98-P
29	1111	121700040010	Caney Creek, off SH 100, Barber	Cherokee	Active 09/99-P
30	1107	121400010010	Caney River, off US 75, Ramona	Washington	Active 11/98-P
31	1106	621100000010	Chickaskia River, US 177, Blackwell	Kay	Active 11/98-P
32	1104	620930000010	Cimarron River, off US 64, Mocane	Beaver	Active 10/99-P
33	1105	620910020010	Cimarron River, SH 34, Buffalo	Woods	Active 11/98-P
34	1105	620900010170	Cimarron River, SH 99, Oilton	Creek	Active 11/98-P
35	1105	620920010010	Cimarron River, US 412, Ames/Orienta	Major	Active 11/98-P
36	1105	620910030010	Cimarron River, US 77, Guthrie	Logan	Active 11/98-P
37	1105	620910010010	Cimarron River, US 81, Dover	Kingfisher	Active 11/98-P

	4-DIGIT USGS #	WBID #	STATION NAME	COUNTY	STATUS
38	1105	620900030010	Cimarron River, SH 33, Ripley	Payne	Active 10/00-P
39	1105	620920020010	Cimarron River, US 281, Waynoka	Woods	Active 03/03-P
40	1114	410400030020	Clear Boggy Creek, off US 69, Caney	Atoka	Active 11/98-P
41	1110	720500020070	Clear Creek, US 283, May	Ellis	Inactive 11/98-09/00
42	1113	311200000030	Cow Creek, SH 5, Waurika	Jefferson	Inactive 11/98-09/02
43	1110	520700020010	Deep Fork River, off SH 16, Beggs	Okmulgee	Active 11/98-P
44	1110	520700040180	Deep Fork River, US 377, Stroud	Lincoln	Active 11/98-P
45	1113	311300010020	East Cache Creek, SH 53, Walters	Cotton	Active 11/98-P
46	1112	311500030010	Elk Creek, off US 183, Hobart	Kiowa	Active 11/98-8/06
47	1112	311500030010	Elk Creek, off SH 19, Roosevelt	Kiowa	Active 5/06-P
48	1107	121600030440	Elk River, SH 43, Tiff City (MO)	McDonald	Active 05/99-P
49	1112	311800000010	Elm Fork River, SH 9, Mangum	Greer	Active 11/98-8/06
50	1112	311800000010	Elm Fork River, SH 6, Granite	Greer	Active 5/06-P
51	1111	121700060010	Flint Creek, US 412, Kansas	Delaware	Active 11/98-P
52	1111	220100040020	Fourche-Maline Creek, off US 270, Red Oak	Latimer	Active 11/98-P
53	1114	410210080010	Glover River, SH 3, Glover	McCurtain	Active 11/98-P
54	1113	311100020010	Hickory Creek, off SH 32, Marietta	Love	Inactive 11/98-09/00
55	1107	121600030440	Honey Creek, off SH 25, Grove	Delaware	Active 11/98-P
56	1111	121700030350	Illinois River, US 59, Watts	Adair	Active 11/98-P
57	1111	121700030010	Illinois River, US 62, Tahlequah	Cherokee	Active 11/98-P
58	1114	410310010010	Kiamichi River, off US 271, Tuskahoma	Pushmataha	Active 11/98-P
59	1114	410310020010	Kiamichi River, SH 63, Big Cedar	LeFlore	Active 11/98-P
60	1114	410300030010	Kiamichi River, US 271, Antlers	Pushmataha	Active 11/98-P
61	1114	410300010010	Kiamichi River, SH 109, Fort Towson	Bryan	Active 10/02-P
62	1110	720500020130	Kiowa Creek, off US 283, Laverne	Harper	Inactive 11/98-09/00
63	1111	220200050010	Lee Creek, SH 101, near Short	Sequoyah	Active 01/03-P
64	1114	410210020140	Little River, off SH 3, Cloudy	Pushmataha	Active 11/98-P
65	1109	520800010010	Little River, SH 56, Sasakwa	Seminole	Active 11/98-P
66	1114	410200010200	Little River, off US 70, near Holly Creek	McCurtain	Active 10/02-P
67	1114	410200010200	Little River, US 70, Idabel	McCurtain	Inactive 11/98-09/02
68	1114	410210060020	Mountain Fork, SH 4, Smithville	McCurtain	Active 11/98-P
69	1114	410210040010	Mountain Fork, US 70, Eagletown	McCurtain	Active 11/98-P
70	1113	311100040010	Mud Creek, SH 32, Courtney	Love	Active 11/98-P
71	1114	410400050270	Muddy Boggy Creek, SH 3, Farris	Atoka	Inactive 11/98-06/99
72	1114	410400050270	Muddy Boggy Creek, US 69, Atoka	Atoka	Active 09/99-P
73	1114	410400010070	Muddy Boggy Creek, US 70, Unger	Choctaw	Active 07/99-P
74	1107	121600040220	Neosho River, off US 66 , Commerce	Ottawa	Active 10/00-P
75	1107	121600040010	Neosho River, off SH 137, Connor Bridge	Ottawa	Active 11/98-P

	4-DIGIT USGS #	WBID #	STATION NAME	COUNTY	STATUS
76	1107	121600020170	Neosho River, SH 82, Langley	Mayes	Active 11/98-P
77	1107	121600010280	Neosho River, US 412, Chouteau	Mayes	Active 11/98-P
78	1110	520510000110	North Canadian River, US 377, Centerview	Pottawatomie	Active 10/00-P
79	1110	520500010110	North Canadian River, Ind. Nat. Tpk., Dustin	McIntosh	Active 11/98-P
80	1110	520510000110	North Canadian River, off US 62, Harrah	Oklahoma	Active 11/98-P
81	1110	720500010010	North Canadian River, US 281, Seiling	Dewey	Active 11/98-P
82	1110	520510000010	North Canadian River, US 75, Wetumka	Hughes	Active 09/99-P
83	1110	520530000010	North Canadian River, US 81, El Reno	Canadian	Active 11/98-P
84	1110	720500010140	North Canadian River, US 412, Woodward	Woodward	Active 10/00-P
85	1112	311510010010	North Fork of the Red River, SH 34, Carter	Beckham	Active 11/98-P
86	1112	311500010020	North Fork of the Red River, US 62, Headrick	Tillman	Active 11/98-P
86	1110	720500020500	Palo Duro Creek, SH 3, Bryan's Corner	Texas	Inactive 11/98-09/00
87	1111	220100010010	Poteau River, off SH 112, Pocola	LeFlore	Active 11/98-P
88	1111	220100020010	Poteau River, US 59, Heavener	LeFlore	Active 11/98-P
89	1107	121610000010	Pryor Creek, US 69A, Sportsman Acres	Mayes	Inactive 09/99-09/00
90	1113	311100010190	Red River, I-35, Gainsville	Love	Inactive 11/98-08/99
91	1113	311200000010	Red River, SH 79, Waurika	Jefferson	Inactive 11/98-10/03
92	1113	311310010010	Red River, US 183, Davidson	Tillman	Active 11/98-P
93	1114	410100010010	Red River, US 259, Harris	McCurtain	Active 11/98-P
94	1114	410400010010	Red River, US 271, Hugo	Choctaw	Active 11/98-P
95	1113	311100010190	Red River, US 81, Terral	Jefferson	Active 11/98-P
96	1111	121700060080	Sager Creek, off US 412, West Siloam Springs	Delaware	Active 11/98-P
97	1106	621010010160	Salt Fork of the Arkansas, SH 58, Ingersoll	Alfalfa	Active 11/98-P
98	1106	621000010010	Salt Fork of the Arkansas, US 77, Tonkawa	Kay	Active 10/00-P
99	1106	621000010010	Salt Fork of the Arkansas, US 177, White Eagle	Noble	Inactive 11/98-09/00
100	1112	311600020010	Salt Fork of the Red River, off US 283, Elmer	Jackson	Active 11/98-P
101	1112	311600020010	Salt Fork of the Red River, off SH 34, Mangum	Greer	Active 10/00-P
102	1113	311600010040	Sandy Creek, SH 6, Eldorado	Jackson	Active 11/98-P
103	1105	620910030010	Skeleton Creek, SH 74, Lovell	Logan	Active 11/98-P
104	1107	121600010290	Spring Creek, off US 412, Murphy	Mayes	Active 11/98-P
105	1107	121600070010	Spring River, off SH 137, Quapaw	Ottawa	Active 11/98-P
106	1107	121500020260	Verdigris River, US 412, Inola	Rogers	Active 10/00-P
107	1107	121510010010	Verdigris River, US 60, Nowata	Nowata	Inactive 02/99-09/99
108	1107	121510020010	Verdigris River, SH 10, Lenepah	Nowata	Active 11/98-P
109	1107	121500030010	Verdigris River, SH 20, Keetonville	Rogers	Active 11/98-P
110	1107	121500010200	Verdigris River, SH 51, Wagoner	Wagoner	Active 09/99-P
111	1113	311100030010	Walnut Bayou, SH 32, Burneyville	Love	Inactive 09/99-09/00
112	1113	310810020010	Washita River, off SH 19, near Alex	Grady	Active 01/03-P

	4-DIGIT USGS #	WBID #	STATION NAME	COUNTY	STATUS
113	1113	310830030060	WASHITA RIVER, SH 152, CORDELL	WASHITA	Active 11/98-P
114	1113	310810010010	WASHITA RIVER, SH 19, PAULS VALLEY	GARVIN	Active 11/98-P
115	1113	310840010010	WASHITA RIVER, SH 33, HAMMON	CUSTER	Active 11/98-P
116	1113	310800020010	WASHITA RIVER, US 177, DURWOOD	CARTER	Active 11/98-P
117	1113	310830010010	WASHITA RIVER, US 281, ANADARKO	CADDO	Active 11/98-P
118	1113	311310020010	WEST CACHE CREEK, SH 5B, TAYLOR	COTTON	Active 11/98-P
119	1110	720500030040	WOLF CREEK, OFF US 270, FORT SUPPLY	WOODWARD	Active 11/98-P

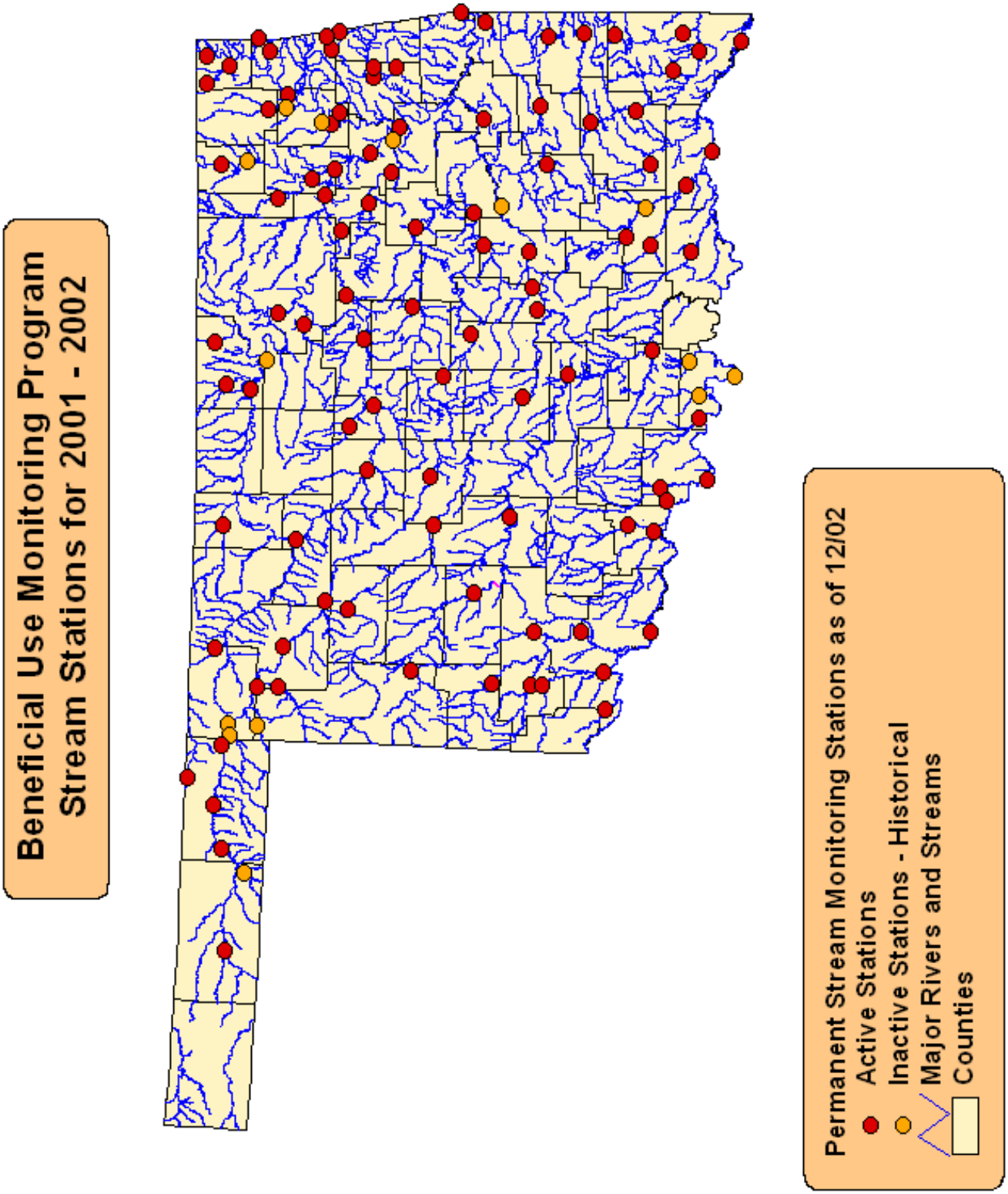


Figure 2. Beneficial Use Monitoring Program permanent ambient trend monitoring sites.

Rotating site selection is not as simple of a process. The goal of the rotating portion of the program is to provide short-term assessments on priority waters as identified by a state agency or other party. Two over-arching objectives were identified to aid in the determination of what would qualify as a rotating site. First of all, it was determined that data collection at a particular site should be short-term in nature and not extend past one sampling year, although some stations do remain in the network for up to two years. Data collected within that year should allow water quality managers to make the appropriate decisions regarding the segment being monitored. For instance, if a stream reach is listed as impaired due to pH on the 303(d) list, measuring pH throughout one year should allow the requesting agency or entity to either de-list the segment or determine what other monitoring efforts are necessary. Secondly, the monitoring should fall within the framework of the USAP. Since the inception of the program, the staff of the OWRB has met individually with representatives of other state agencies to identify their priority short-term monitoring needs. Once the OWRB receives a list of waters for monitoring from the interested agencies, staff evaluates the nominations and notifies the nominating agency of which waters would be monitored (all of the waters requested for monitoring have been accommodated since program inception). In all, over two hundred twenty (220) monitoring stations have been or are currently being monitored. In most instances, the segments were listed for one or more variables on the state's 303d list. For a comprehensive list of historic and/or current rotational monitoring stations, **please contact the Oklahoma Water Resources Board/Water Quality Programs Division at (405) 530-8800.**

Stream Monitoring Variables. The variables that are monitored were chosen to reflect both objectives of the programs — assessment of beneficial uses within the framework of USAP as well as the assessment of general water quality. Even though a variable may not be listed in the OWQS with a specific criterion (e.g., hardness), the variable is an important constituent in analyzing and understanding the general water quality of a particular segment. See Table 4 for a list of monitoring variables.

Table 4. Variables Monitored by the BUMP Stream Sampling Program.

SAMPLE VARIABLES		
General Water Quality Variables – Sampled 10 times annually		
Dissolved Oxygen (D. O.)	pH	Specific Conductance
Temperature	Oxidation/Reduction Potential	% D. O. Saturation
Salinity	Total Alkalinity	Total Hardness
Chloride	Nephelometric Turbidity	Sulfate
Total Dissolved Solids		
Nutrients – Sampled 10 times annually		
*Kjeldahl Nitrogen	Ortho-Phosphorus	Total Phosphorus
*Nitrate Nitrogen	*Nitrite Nitrogen	Ammonia Nitrogen
Metals – Sampled as needed		
Arsenic	Cadmium	Chromium
Copper	Lead	Mercury
Nickel	Selenium	Silver
Zinc	Thallium	

SAMPLE VARIABLES		
Organics – Site specific sampling as needed		
Analysis of Pesticides, Herbicides, Fungicides, and other organics		
Bacteriological Communities – Sampled 5-10 times annually (during recreational season)		
Fecal Coliform	*Escherichia coli*	Enterococci
Biological Communities – Sampled as described below		
Sestonic Chlorophyll-a (10 times annually	Benthic Chlorophyll-a (as needed during summer)	Fish (once every 4-5 years)
Benthic Macroinvertebrates (2 summer/2 winter 2 out of every 5 years	Habitat (sampled with fish and macroinvertebrate sampling)	

*Total nitrogen is calculated by OWRB staff, based upon concentrations for these compounds.

Data for general water quality, nutrient, metals, organics, chlorophyll, and bacteriological variables are collected in one of two ways. Some variables are monitored in-situ utilizing a Hydrolab® Minisonde or YSI multi-probe instrument. The measurement is taken at the deepest point of the channel at a depth of at least 0.1 meters and no greater than one-half of the total depth. The data are uploaded from the instrument to a data recorder, transferred manually to a field log sheet, and downloaded to the OWRB monitoring database. These variables include dissolved oxygen (D. O.), %D. O. saturation, water temperature, pH, salinity, oxidation-reduction potential, total dissolved solids, and specific conductance. Data for all other variables are gathered from water quality samples collected at the station. Samples are collected either by suspending a depth-integrating sampler (DH-95 with polyethylene collection bottle) from a bridge, by wading the stream with a DH-81 wadable depth-integrating sampler (polyethylene collection bottle), or in rare cases as a composite or point grab sample. If sampling occurs from a bridge, the sampling is done on the down-stream side of the bridge spanning the stream of interest. Samples are collected using a combination of the depth-integration method and the equal-width increment method. The depth-integration method involves collection of samples from the surface of the water to the bottom of the water column with water collected at a consistent rate on both the descent and the ascent. The equal-width-increments-method allows for collection of a composite sample by sampling with depth-integration at 5 to 10 equal widths across the stream. As each increment is sampled, the water is added to a polyethylene churn splitter. From this composite water sample, water quality variables are monitored in several ways. For laboratory analysis of general water quality variables and nutrients, water is aliquotted from the churn splitter to two (2) 1-liter bottles (one for sulfuric acid/ice preservation and one for ice preservation). If a sample is needed for metals analysis, water is aliquotted into a 1-liter acid washed bottle, preserved with nitric acid, and placed on ice. Sample water for the determination of nephelometric turbidity, total hardness, and total alkalinity is also aliquotted from the splitter churn. Nephelometric turbidity is determined through use of a HACH Portable turbidimeter. Total hardness and alkalinity are determined using HACH test kits. All instruments and test kits are calibrated and used according to manufacturer's instructions. Sestonic chlorophyll-a samples are also gathered from the churn and are filtered to a glass fiber filter with subsequent chemical/physical extraction. Samples for organics analysis are collected separately using Teflon and glass containers as opposed to polypropylene. Because organics have an increased affinity for polypropylene, allowing a sample to contact polypropylene sample bottles or churn splitters may cause concentrations to be significantly underestimated. Therefore, a composite sample for organics analysis is collected using a 1-liter Teflon collection

bottle. At each increment, water is added to a 2-gallon glass bottle. The laboratory sample is aliquotted by inverting the glass bottle 10 times and dispensing to one-quart or one-pint clear or amber glass jars depending on the type of organic analysis. The samples are placed on ice for preservation. Bacteriological samples are collected using a composite grab sample method and are aliquoted to 2 100-mL bacteria bottles for laboratory analysis.

Biological data are collected using a variety of methods. In short, fish are typically collected using siene in all waters, and where water conductivity allows, electrofishing methods are used. Benthic macroinvertebrates are collected by targeting the richest habitats in the waterbody including riffles, streamside vegetation, and woody debris. Collections are then sorted and a subsample taken for taxonomic analysis. Various habitat measures are also included during each biological sampling event. The long form habitat classification is used during fish collections, and staff gather data various instream and riparian characteristics using both quantitative and qualitative methods. A short form habitat classification is used during macroinvertebrate collections that focus on target habitat substrate composition. Benthic chlorophyll-a samples are gathered from the characteristic substrates of the stream.

For a more detailed discussion of water quality sampling procedures, please contact the OWRB for copy of the BUMP Standard Operating Procedures (SOP). The SOP document can be obtained by contacting the Oklahoma Water Resources Board/Water Quality Programs Division at (405) 530-8800 or by accessing and downloading the document via the web at the link below. http://www.state.ok.us/~owrb/reports/publications.html

OWRB stream sampling personnel collect water quality data for all variables on permanent ambient trend monitoring stations (Table 3). In all cases, the rotating stations have been derived from stream segments listed on Oklahoma's 303(d) list and on streams submitted for monitoring by other state agencies. Therefore, the water quality variables analyzed are determined from the 303(d) listed cause code or by the requesting agency, with concurrence by OWRB staff. The stations monitored for the OCC are located on stream segments designated for salinity on the 303(d) list. Each station is sampled monthly for a variety of cations and anions. Methods used at rotating sites are identical to methods described for the permanent sites.

Quality Assurance/Quality Control (QA/QC). QA/QC will not be discussed in detail in this report. However, for a comprehensive description of field QA/QC methods, please contact the Oklahoma Water Resources Board/Water Quality Programs Division at (405) 530-8800. For laboratory QA/QC methods please contact the Oklahoma Department of Environmental Quality/Customer Services Division at (405) 702-6100. Comprehensive QA/QC has been performed on all data collected and utilized for this report.

STREAM DATA ANALYSIS PROTOCOLS

BUMP data collection on streams began in November of 1998. In order to provide a structural framework for data analysis and interpretation within the confines of the OWQS, the program uses the Use Support Assessment Protocols (USAP) promulgated into rule in Oklahoma Administrative Code (OAC) 785:46-15. A detailed explanation of the relationship between the USAP and the data collected on streams and rivers as part of the BUMP is presented below. This explanation is broken down into 8 subsections: Data Requirements, Default Protocols, Assessment of Fish and Wildlife Propagation Support, Assessment of Primary Body Contact Recreation Support, Assessment of Public and Private Water Supply Support, Assessment of Agriculture Support, Assessment of Aesthetics Support, and Assessment of Human Health

Support (fish consumption). The latest USAP is included with this document as Appendix A and should provide greater insight into exactly how use support determinations were made for this report. In addition, OAC 785:45 (Oklahoma Water Quality Standards) and the justification document for the USAP can be obtained by contacting the OWRB/Water Quality Programs Division at (405) 530-8800 or through accessing the documents on the OWRB web page at: http://www.state.ok.us/~owrb/rules/Rules.html.

Data Requirements. USAP divides the number of stream miles that can be represented by a single site/station (or spatial coverage) into two categories—non-wadable and wadable streams. Sites/stations can be representative of no more than 25 stream miles on non-wadable streams and 10 stream miles on wadable streams. These limitations can be adjusted based upon existing data, distance between monitoring sites, sources of pollution, and the influence of major hydrological features, such as major tributaries and dams (delineated by 12-digit waterbody identification segments). A definition of what constitutes a wadable and non-wadable stream is not outlined in the USAP, so OWRB staff use federal guidance as well as best professional judgment. Federal 305 (b) guidelines say that no monitoring site/station can be representative of more than 25 stream miles on large streams and rivers. Furthermore, in areas where topography and land use are relatively homogeneous and there are no other significant influences, a single monitoring station can be representative up to 50 to 75 stream miles. Therefore, only two firm guidelines are currently available for determining the spatial coverage of a monitoring site/station:

1) The spatial coverage can not extend outside the 12-digit segment in which the monitoring site/station is located except in those instances where it is determined that it is reasonable to do so (e.g., the segment break is not caused by a major hydrological influence).
2) No monitoring site/station can be representative of more than 25 stream miles (in some instances, monitoring sites/stations may be representative of up to 50 stream miles with a scientifically defensible justification).

Accordingly, spatial coverage for the 2004 - 2005 BUMP report on streams will be limited to these two guidelines. The spatial coverage is subject to change dependent upon the language of the latest version of USAP.

USAP sets two limitations on temporal coverage. First, data used in assessments must be collected such that decisions are not biased towards either critical-flow, base-flow, or high-flow conditions. This report uses data collected during all seasons. Secondly, stream data that is more than five years old cannot be used to assess support unless no other data exists or a scientifically defensible reason can be brought forth justifying the use of older data. This report uses no data collected before November of 1998.

USAP also sets data requirements on the number of samples needed and the magnitude of criteria exceedance for toxicants and dissolved oxygen before a use support determination can be made. The minimum number of samples required to assess use support for all general water quality variables is ten (10). This minimum number of samples is not applicable if data from samples already collected ensures that the use will not be supported. In other words, if a 25% percent exceedance is required to designate a use as not supporting and three (3) of the first five (5) samples collected were in exceedance of the criteria, then sampling can discontinue because you are assured of having >25% of the minimum number of samples exceeding the criteria. The BUMP program collects at least ten samples per year on all general water quality parameters with the exception of bacteria, organics and metals. Toxicants (metals and

organics) require a minimum of five (5) samples to determine use support, however, less than 5 samples can be used to determine if a use is partially supported or not supported. Furthermore, if at least 2 sample concentrations of a toxicant exceed the criteria prescribed in the OWQS by two or more orders of magnitude, then the use is determined to be "not supporting".

Finally, USAP gives guidance on the treatment of practical quantification limits (PQL), or detection limits. A PQL is the minimum value that a particular test or instrument can "read-to" with an acceptable level of confidence. If a value is determined to be less than the PQL, then it is generally reported as a "less than value" (e.g., variable data point "x" = <2.0 mg/L). In other words, the test or the instrument cannot deliver a value less than the PQL without introducing statistically significant uncertainty to the data. Moreover, when analyzing the data, data point "x" cannot be assigned a value of 2.0 mg/L or 0.0 mg/L because staff would be making an arbitrary determination that would assuredly be either an under estimation or an over estimation of the "true" value. Consequently, the OWRB staff assigns a value that is fifty percent of the PQL ("x" would equal 1.0 mg/L).

Default Protocols. USAP outlines the procedures for determining whether a set of data points for a particular variable **support**, **partially support**, or **do not support** a particular beneficial use. These protocols are constructed around two distinct types of numerical variables — short term averages and long term averages. In each case, samples collected for the range of water quality parameters are analyzed and aggregated in different ways.

Short-term average numerical variables measure variables with exposure periods of less than seven days (e.g., turbidity or a sample standard for chlorides). In other words, the set of samples that is being analyzed considers each sample as a separate entity. For example, **each** turbidity sample collected monthly from January through December is considered a unique sample, and consequently, every sample is not aggregated into a single sample for analysis but is considered a fraction of the whole. Use support determination for short-term numerical variables requires a three-step process:

1. Each sample exceeding the prescribed criterion or screening level for a particular variable is identified,
2. The number of samples exceeding the prescribed criterion or screening level is divided by the total number of samples collected to obtain a percent exceedance, and
3. The percent exceedance is compared to a range of prescribed percent exceedances to determine use support. The prescribed percent exceedances are:
    - i) Supporting — less than or equal to ten percent (10%),
    - ii) Partially supporting — greater than 10% but less than twenty-five percent (25%),
    - iii) Not supporting — greater than or equal to 25%.

Long-term average numerical variables measure variables with exposure periods of greater than or equal to seven days (e.g., yearly mean standard for chlorides). In other words, the **entire** set of samples that is being analyzed is considered a unique entity. For example, chloride samples collected monthly from January through December are aggregated through the calculation of a geometric mean. Use support determination for long-term numerical variables requires a three-step process:

1) Samples for a particular variable are aggregated into a geometric mean
2) The geometric mean is compared to the prescribed criterion or screening level

3) Use support is determined to be supporting if the mean is less than the prescribed criterion or screening level or not supporting if the mean is greater than the prescribed criterion or screening level.

Because the long-term average compares only one value (the geometric mean) to the prescribed criterion or screening level, it cannot be considered partially supporting. In most instances, at least ten samples are required to calculate a geometric mean. Furthermore, geometric means are calculated on a two-year rolling average using the most recent data available.

A particular change to this year's report is the addition of the lanquage "but is impaired per the CPP" when a beneficial use is determined to be partially supporting. The data produced by the BUMP is used to help develop Oklahoma's Integrated Report, which is a USEPA required report classifying all water bodies based on impairment status. Althought the USAP is the guiding document for use support attainment decisions; the State also uses the Continuing Planning Process (CPP) document as required by the USEPA. Its methodology section is mostly a reiteration of the USAP, however it does address areas where the USAP is silent or does not fully meet reporting requirements. Once such area is the use of "partial support" which is not a valid reporting endpoint for use attainment. The CPP classifies water bodies as "impaired" or "not impaired". Subsequently, for reporting purposes, those waters classified as "supporting" by the USAP are classified as "not impaired", and those waters classified as "partial supporting" or "not supporting" by the USAP are classified as "impaired".

So that the reader will fully understand how use support was determined for our rivers and streams for the various beneficial uses assigned to them a short discussion of the OWQS beneficial uses and the Use Support Assessment Protocols (USAP) is included below.

Assessment of Fish and Wildlife Propagation (FWP) Support. The FWP beneficial use utilizes five different water quality variables to assess use support: dissolved oxygen (D.O.) concentration, toxicants, hydrogen ion activity (pH), turbidity, and biological criteria. Only one variable needs to exceed the assessment protocol for the beneficial use to be partially supported or not supported.

The OWQS 785:45-5-12(g)(1) in a table entitled "Dissolved Oxygen Criteria" prescribes three screening levels for D.O. in streams. Streams are categorized in Appendix C of the OWQS as habitat limited aquatic communities (HLAC), warm water aquatic communities (WWAC), cool water aquatic communities (CWAC), and trout fisheries (TF). The prescribed screening level for each of the categories is: HLAC—4.0mg/l (April 1—June 15) and 3.0 mg/L (June 16—May 31); WWAC—4.0mg/l (June 16—October 15) and 5.0 mg/L (October 16—June 15); and CWAC and TF—5.0mg/l (June 1—October 15) and 6.0 mg/L (October 16—May 31). The protocol for short-term average numerical parameters is used to assess the level of support.

Numerical criteria is prescribed for toxicants in OWQS 785:45-5-12(g)(6)(G) in a table entitled "Numerical Criteria for Toxic Substances". To determine use support, the protocol for short-term average numerical parameters is used. Sample values must be compared to both acute and chronic criterion. Both criterions need not be exceeded for the variable to be partially supported or not supported.

A numerical range for pH of 6.5 to 9.0 units is prescribed in 785:45-5-12(g)(3) for all aquatic classifications. The protocol for short-term average numerical parameters is used to assess the level of support.

Screening limits are established for turbidity in OWQS 785:45-5-12(g)(7)(A)(i) and (iii). CWAC are assigned a criterion of 10 Nephelometric Turbidity Units (NTU), and all other stream communities are assigned a criterion of 50 NTU. The protocol for short-term average numerical parameters is used to assess the level of support. In OWQS 785:45-5-12(g)(7)(C), it is stated that numerical criteria for turbidity "apply only to seasonal base flow conditions". Therefore, those measurements that are taken above seasonal base flow are not included in determining support. To determine seasonal base flow, the average discharge for the sampling day is compared to the median flow of the three months surrounding the sampling day. If the station is not part of the USGS stream-flow monitoring program but has an upstream or downstream stream-flow station in close proximity, that station is used to determine whether the station in question is at seasonal base flow. If no proximal stream-flow station exists, stream-flow monitoring stations on other waterbodies that are in close geographical proximity were used to determine whether the station in question is at seasonal base flow. Because discharge data is not yet available from October of 2001 through September of 2002, use support determinations based on turbidity data are provisional and assessments related to turbidity may be subject to change. Therefore, all turbidity assessments are provisional. Changes will be reported in an addendum to this report. Furthermore, to assist staff in the determination of seasonal base flow at stations that do not have continuous discharge measurements, the OWRB is now collecting discharge measurements at all but four of the permanent monitoring stations. To supplement base flow determination staff uses several anecdotal methods. These methods are only used in concert with another method when determining if base flow conditions existed when the sample was taken. In one method, staff determines flow condition visually by noting whether the flow is minimal, light, moderate, high, or stormwater. Also, beginning in 2002, staff began noting the presence or absence of a periphyton line as well as the color and texture of the periphyton. In most instances, if a periphyton line has been established, flow has not exceeded that level in at least seven days.

Additionally, biological criteria have been promulgated into rule for all but four ecoregions. As fish data are collected on streams throughout the state, an assessment of biological health will be presented in this report. The application of biological criteria requires a three-step process. First, various metrics (e.g., # of sunfish species) are determined on the raw collection data (i.e., species and numbers of each species). From these metrics, an index of biological integrity (IBI) is calculated. Finally, the IBI score is compared to regionally developed scoring ranges, and the site is placed into 1 of 3 biocriteria categories—fully supporting, undetermined, or not supporting. For those regions where biological criteria have yet to be developed, the data are presented in this report, but the site evaluation is left as undetermined.

Assessment of Primary Body Contact Recreation (PBCR) Support. The PBCR beneficial use utilizes 2 different bacteriological classes and one bacteriological species to assess use support: fecal coliform (FC), *Escherichia coli* (*E. coli*), and enterococci (Ent.). The assessment is performed by using the long-term average numerical protocol to compare to a prescribed geometric mean and by using a modified version of the short-term average numerical protocol to compare each sample to a prescribed screening level. The prescribed geometric means (GM) and screening levels (SL) are: FC—GM of 400 colony forming units/mL (cfu/mL) and SL of 400 cfu/mL; *E. coli*—GM of 126 cfu/mL and SL of 235 cfu/mL in scenic rivers and 406 cfu/mL in all other waters; and Ent.—GM of 33 cfu/mL and SL of 61 cfu/mL in scenic rivers and 406 cfu/mL in all other waters. For *E. coli* and Ent., both the SL (only one sample exceedance is necessary) and the GM must be exceeded for the use to not be supported. If all of the samples meet the SL or the GM is met, the use is supported. In the case of FC, the use may only be supported if the GM is met and no greater than 25% of the sample concentrations exceed the

SL. If either the GM is exceeded or greater than 25% of the sample concentrations exceed the SL, the use is not supported for FC. In no instance is the PBCR beneficial use partially supported. Furthermore, PBCR support is only determined from samples collected during the recreational season from May 1 through September 30 of each year. Only one variable needs to violate the assessment protocol for the beneficial use to be not supported.

Assessment of Public and Private Water Supply (PPWS) Support. The PPWS beneficial use utilizes toxicant concentrations to assess use support. For purposes of this report, only metals are considered in the toxicant category. Only one variable needs to violate the assessment protocol for the beneficial use to be partially supported or not supported. Organics are currently being collected at some stations and will be used in the 2003 assessment. In previous reporting years, total coliform bacteria were used to determine use support. This was done in error. The criterion of 5,000 cfu/mL in the OWQS is only applied at the water supply intake point and is not to be applied throughout the waterbody.

Numerical criteria for metals is established in OWQS 785:45-5-10(1) and (6). The short-term numerical average protocol is used to determine use support for both sets of criterion. If a substance has different numerical criteria listed in both tables, the most stringent criterion takes precedence. Furthermore, criteria in both tables need not be exceeded for the use to be partially supported or not supported.

Assessment of Agriculture (AG) Support. The AG beneficial use utilizes three variables to assess use support: total dissolved solids, chlorides, and sulfates. Numerical criteria for both yearly mean standards and sample standards are located in Appendix F of OAC 785:45. The yearly mean standard for each variable is compared to the geometric mean of the samples using a long-term average numerical protocol. The sample standard for each variable is compared to the each sample using a short-term average numerical protocol. Use support assessment for each variable requires a three-step process:

1) The sample standard and yearly mean standard for the six digit management segment which encompasses the monitoring must be located in Appendix F of OAC 785:45;
2) The geometric mean of the samples is compared to the yearly mean standard (if the geometric mean exceeds the yearly mean standard, the use is not supported and no further analysis is necessary);
3) If the geometric mean meets the yearly mean standard, the sample standard is compared to each sample and percent exceedance is calculated (depending on the percent exceedance, the variable is supporting, partially supporting, or not supporting). Regardless of the criteria in Appendix F of OAC 785:45, if all TDS samples are less than 750 mg/L and all chloride and sulfate samples are less than 250 mg/L, the AG beneficial use is supported. Only one variable needs to violate the assessment protocol for the beneficial use to be partially supported or not supported.

Assessment of Aesthetics Support. With the exception of the numerical criterion of 0.037 mg/L of total phosphorus for Oklahoma scenic rivers and 70 Platinum-cobalt units for true color, the OWQS includes only narrative criteria for the aesthetics beneficial use. Furthermore, the USAP only addresses the effect of nutrients and true color. However, narrative criteria in OAC 785:45-3-2(c) requires that nutrients related water quality degradation cannot interfere with the maintenance of any beneficial use protected under OAC 785:46-13-3(a)(1). Because numerical nutrient criteria exists only for scenic rivers, assessments of nutrients on all other rivers and

streams do not determine beneficial use support but whether a particular stretch of stream is nutrient-threatened. Therefore, these assessments of nutrients do not utilize any of the default protocols, but revolve around the use of a dichotomous key. The use of the key is a rather involved process and will not be verbally outlined in this report. Please refer to OAC 785:46-15-10 for a detailed discussion of the dichotomous key and how it is apllied for use support determination.

The impact of nutrients on streams is related to the growth of phytoplankton. Phytoplankton are autotrophic which means that when light and consumables such as nutrients are available they can convert energy and grow. The available nutrients are total phosphorus and nitrite and nitrate (utilized as a combined nitrogen concentration). Several factors determine if the level of these compounds pose a threat to the health of the stream. Foremost, the size of the stream must be considered. Smaller streams (3rd order or less) tend to be more susceptible to nutrient impacts and, therefore, smaller concentrations have similar effects as larger concentrations in larger streams (greater than 3rd order). Depending on stream order, USAP has established preset threshold values for total phosphorus and nitrate/nitrite. If the two-year rolling median of the sample values exceeds the threshold, the following confounding factors are considered to determine if the excessive nutrients are threatening the health of the stream. The amount of time the nutrient is resident in the stream is proportional to the impact. Therefore, the slope of the topography around the station must be considered. Furthermore, phytoplankton is light dependent for growth. Consequently, light must be able to able to penetrate the surface of the water. For this reason, water clarity must be measured by using a nephelometric turbidity meter or a Secchi disk. Only turbidity readings taken at seasonal base flow are included when calculating the geometric mean. Logic states that low clarity will limit the impact of phytoplankton on the stream and that high clarity will increase the impact of phytoplankton. On smaller streams, available light is also measured by percent canopy shading. An option to the dichotomous key is the use of Carlson's Trophic State Index (TSI) value (Carlson, 1977) on non-wadeable streams. The mean of sestonic chlorophyll-a data is used to calculate the TSI using the equation: **TSI = 9.81 x ln(chlorophyll-a) + 30.6**. A TSI value of 62 or greater indicates that a nonwadeable waterbody is nutrient threatened.

In 2002, A numerical criterion of 0.037 mg/L of total phosphorus was set for all waterbodies designated as Oklahoma Scenic Rivers. These rivers include the Barren Fork River, Flint Creek, the Illinois River, Lee Creek, Little Lee Creek, and the Mountain Fork River above Broken Bow Reservoir. The current USAP requires that a multi-step process for support determination. First of all, three-month rolling geometrics are calculated for the most immediate 5 years of data available. This data, when possible, should include high flow monitoring events. Once the geometric means are calculated a short-term protocol is used for final assessment. If less than 10% of the three-month geometic means are below 0.037, the station is supporting, but if more than 10% are above the criterion, the station is not supporting.

Assessment of Human Health Support. A new beneficial use was created in 1999 dealing with fish consumption and is housed under the Human Health criteria. The new use deals with fish consumption bans and states that waters that the DEQ has issued a fish consumption ban on will be considered as not supporting it's fish consumption use. Currently the BUMP has sampled several waters to determine fish consumption use support but will not report results until the 2003 report.

PERMANENT STREAM MONITORING STATION RESULTS & DISCUSSION

The results for the permanent monitoring stations are grouped alphabetically within their home 4-digit USGS sub-basin (Table 3). A map of the state with all of the 4-digit HUC basins is included as to aid the reader in finding a particular water body (Figure 3). Each of these sections has a similar arrangement. Immediately following the tab for a particular sub-basin, there is a 1 or 2-page synopsis of the physical, geographical, and hydrological attributes of the HUC. Included in this description will be a tabular listing of the stations located within the sub-basin.

Following the HUC description will be a detailed 1-4-page analysis of each station. The analysis includes a physical, geographical, and hydrological description of the site. Directly following the descriptive information, a short narrative is included that verifies that monitoring at the site complied with the data requirements outlined in USAP, or, in some instances, an explanation is offered as to why certain data requirements were not followed. For example, several stations in western Oklahoma go dry during the late spring or early summer. Therefore, the assessments for these stations may not be seasonally representative. Next, a comprehensive assessment of each of the prescribed beneficial uses will be done both in a narrative format and graphically. An all-inclusive assessment of the stations can be found in Table 5. Under certain circumstances, a beneficial use may not be assessed for a variety of reasons. The station may be new or inactivated before adequate data was collected for assessment, data may not be available due to laboratory, field, or equipment error, or sometimes data may not be collected due to monetary or personnel constraints.

Table 5 lists the BUMP permanent ambient trend stream monitoring sites and their associated beneficial uses. Beneficial uses that are not being met are shown in **RED**. Listed next to the support code indicating that the beneficial use was not being met is the variable code which indicates which water quality variable violated the OWQS criteria. When reviewing Table 5 it is apparent that an inordinate number of water bodies are deemed impaired due to turbidity and bacteria.

Many waterbodies exceed the turbidity standard of 10 or 50 nephelometric turbidity units. The OWQS states that turbidity standards only apply during seasonal base flow conditions. In other words, the criteria should not be applied where normal in-stream conditions exceed the OWQS due to natural processes from a high-flow rain event. Several “quick” methods are available to assist in the determination of seasonal base flow including the existence of a periphyton line and visual estimation of the degree of flow. However, to reliably determine base flow, a measurement of stream discharge at the time of sampling is needed. This measurement when used in concert with the “quick” methods described above will give a reliable indication of whether the stream is at, below, or above seasonal base flow conditions. Because the BUMP network encompasses the state’s large rivers and streams, discharge is often obtained by comparing stream stage to a continuously updated rating curve. Due to the intense nature of establishing a reliable rating curve, rated discharges are often provisional for a number of months. Therefore, the determination of the previous year’s base flow and consequently turbidity values available for use support analysis are **provisional** at the publication of this report. As of the beginning of 2002, the OWRB is now gaging all but 4 permanent station locations. Where permanent water-quality monitoring stations were located near a United States Geological Survey (USGS) stream-flow monitoring station, the information collected by USGS is used to determine if a high-flow event exceeding seasonal base flow had occurred at the time of sampling. All other stations are being rated through a cooperative effort between the OWRB

Monitoring Section and the USGS. To supplement base flow determination staff use several anecdotal methods. These methods are only used in concert with another method when determining if base flow conditions existed when the sample was taken. In one method, staff determines flow condition visually by noting whether the flow is minimal, light, moderate, high, or stormwater. Also, beginning in 2002, staff began noting the presence or absence of a periphyton line as well as the color and texture of the periphyton. In most instances, if a periphyton line has been established, flow has not exceeded that level in at least seven days.

Of the ninety-eight (98) stations assessed for Primary Body Contact Recreation (PBCR) in this report, eighty-six (86) stations (or 88%) are listed as not supporting due to the exceedance of one or more variable. Several explanations may address this inordinate number of non-supporting stations. Primarily, a valid assumption may be that the assessment of data is reflective of reality in many listings. Of the 86 non-supporting stations, thirty-five (37), or 41%, have multi-variable exceedances. Furthermore, a pattern of consistency can be seen for certain variables at some stations. In other words, exceedances of the applicable screening limits are present in each recreational season during the period of record. Secondly, the high percentage of non-supporting stations may be an artifact of either the OWQS criteria and/or the USAP decision-making process. The criteria used to assess PBCR are protective of human health, and rightfully so. However, are all waterbodies assigned PBCR recreated to the same extent? In other words, should the same amount of protection apply to all waterbodies? Currently, Oklahoma has a two-tiered system—lakes/scenic rivers and all others—with more stringent criteria applied to lakes and scenic rivers. Additionally, the decision-making process in USAP may be producing some type I errors—assigning non-support status incorrectly. While maintaining the need for protection of human health, the process for assignment and assessment of the PBCR beneficial use needs to be looked over carefully so that water quality management will be become more precise and accurate.

It is also imperative that the state continues to refine the minerals criteria found in OAC 45: Appendix F. The process was begun in earnest in 2005 with a major revision to Appendix F criteria, and the assessments in this report reflect these new criteria. However, some management segment values are still extrapolated from minimum data and from stations not necessarily representative of the entire management segment. By using the OWRB's methodology for the development of site-specific minerals criteria, BUMP data as well as other other water quality monitoring program data may be used to refine inconsistent criteria.

It is essential that Oklahoma quantify impacts in a comprehensive and scientific manner and look for trends in water quality to identify waters that are not meeting their assigned beneficial uses. As a state, we must manage our water resources effectively and direct money to areas in most need of protection or remediation to ensure that we continue to have good quality and sufficient quantity of water to meet our needs well into the 21st century. It is the desire of the Oklahoma Water Resources Board to provide the legislature, the general public and professional water managers with a comprehensive and up-to-date document for their review and approval. Administrative and Technical staff at the OWRB look forward to conducting the Beneficial Use Monitoring Program far into the future and providing the state of Oklahoma with the information it needs to make informed decisions related to the effective management of it's precious water resources.

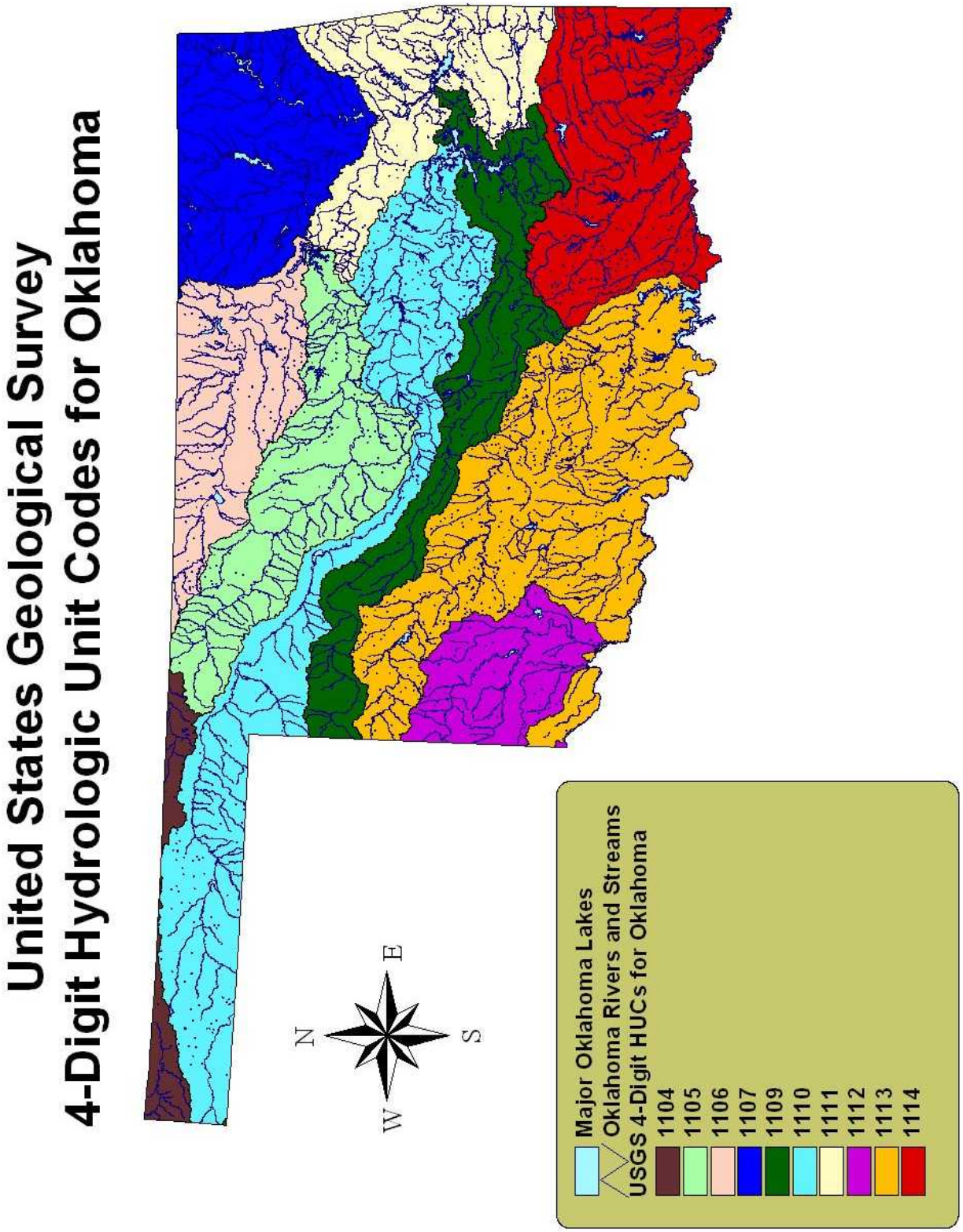


Figure 3. USGS 4-digit HUC basins.

Table 5. Permanent Ambient Trend Monitoring Stations and their Beneficial Use Support Status.

STATION NAME	FWP	PBCR	PPWS	AG	AES
Arkansas River, US 64, Moffett	S	S	S	S	NT
Arkansas River, SH 104, Haskell	S	S	N/A	NS (10)	NT
Arkansas River, SH 18, Ralston	NS (5)	NS (8)	S	S	NT
Arkansas River, SH 97, Sand Springs	S	S	N/A	S	NT
Arkansas River, US 62, Muskogee	NS (3)	NS (8)	N/A	NS (10)	T (17)
Arkansas River, US 64, Bixby	S	NS (6, 7, 8)	N/A	S	NT
Barren Fork, SH 51, Eldon	S	NS (8)	S	S	NS (14)
Beaver River, off US 64, Guymon	NS (1)	NS (6, 7, 8)	S	S	NT
Beaver River, US 83, Turpin	S	NS (6, 7, 8)	N/A	NS (10, 11)	NT
Beaver River, SH 23, Beaver	S	NS (6, 8)	N/A	NS (10, 11, 12)	NT
Beaver River, US 283, Laverne	S	NS (8)	N/A	S	NT
Beaver River, CR N1650, Gate	S	NS (6, 8)	N/A	NS (10, 11)	NT
Beaver River, US 183, Fort Supply	S	NS (8)	N/A	S	NT
Big Cabin Creek, off US 69, Big Cabin	S	NS (7, 8)	S	PS (12)	NT
Bird Creek, SH 266, Port of Catoosa	PS (5)	NS (6, 8)	S	S	NT
Black Bear Creek, SH 18, Pawnee	NS (5)	NS (6, 8)	S	S	NT
Blue River, US 70, Durant	S	NS (8)	S	S	NT
Brushy Creek, off US 270, Haileyville	NS (1, 3, 5)	NS (8)	S	NS (12)	NT
Canadian River, SH 2, Whitefield	S	S	S	S	NT
Canadian River, US 183, Taloga	S	NS (8)	N/A	NS (10, 11,12)	NT
Canadian River, US 270, Calvin	PS (5)	NS (8)	S	PS (12)	T (17)
Canadian River, US 377, Konawa	PS (3,5)	NS (8)	S	NS (10)	T (17)
Canadian River, US 66, Bridgeport	NS (5)	NS (8)	N/A	S	NT
Canadian River, US 77, Purcell	PS (5)	N/A	N/A	S	T (13, 17)
Caney Creek, off SH 100, Barber	S	S	S	S	NT
Caney River, off US 75, Ramona	NS (3, 5)	NS (8)	S	S	NT
Chickaskia River, US 177, Blackwell	NS (3, 5)	NS (6, 8)	S	NS (10)	NT
Cimarron River, off SH 8, near Ames	S	NS (6, 7, 8)	N/A	NS (10, 11, 12)	NT
Cimarron River, SH 34, Buffalo	S	NS (6, 7, 8)	N/A	NS (10,11)	NT
Cimarron River, SH 99, Oilton	NS (5)	NS (6, 8)	N/A	S	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
Cimarron River, US 77, Guthrie	S	NS (6, 8)	N/A	S	T (17)
Cimarron River, US 81, Dover	S	NS (7, 8)	N/A	NS (10, 11)	NT
Cimarron River, off US 64, Mocane	S	NS (6, 8)	S	NS (10, 11)	NT
Cimarron River, SH 33, Ripley	NS (5)	NS (8)	N/A	S	NT
Cimarron River, US 281, near Waynoka	NS (16)	No Info	N/A	NS (10, 11)	NT
Clear Boggy Creek, off US 69, Caney	NS (3, 5)	NS (6, 8)	S	S	NT
Deep Fork River, off SH 16, Beggs	NS (3, 5)	NS (8)	S	S	NT
Deep Fork River, US 377, Stroud	NS (3, 5)	NS (8)	PS (9)	S	T (13)
East Cache Creek, SH 53, Walters	NS (5)	NS (6, 7, 8)	S	S	NT
Elk Creek, off US 183, Roosevelt	NS (5)	NS (6, 8)	S	S	NT
Elk River, SH 43, Tiff City (MO)	S	NS (8)	S	S	NT
Elm Fork River, SH 9, Granite	NS (5)	NS (6, 7, 8)	S	S	NT
Flint Creek, US 412, Flint	S	NS (8)	S	S	NS (14)
Fourche-Maline Creek, off US 270, Red Oak	NS (1, 3)	NS (8)	S	S	NT
Glover River, SH 3, Glover	NS (3, 5)	NS (8)	S	S	NT
Honey Creek, off SH 25, Grove	S	NS (8)	S	S	NT
Illinois River, US 59, Watts	PS (5)	NS (8)	S	S	NS (14)
Illinois River, US 62, Tahlequah	S	NS (8)	S	S	NS (14)
Kiamichi River, off US 271, Tuskahoma	NS (2, 3)	S	S	S	NT
Kiamichi River, SH 63, Big Cedar	NS (3, 4)	NS (8)	S	S	NT
Kiamichi River, US 271, Antlers	NS (2, 3)	NS (8)	S	S	NT
Kiamichi River, SH 109, Fort Towson	S	NS (8)	S	S	NT
Lee Creek, SH 101, Short	S	NS (8)	S	S	S
Little River, off SH 3, Cloudy	NS (3, 5)	NS (8)	S	S	NT
Little River, off US 70, near Holly Creek	NS (1, 5)	No Info	S	S	NT
Little River, SH 56, Sasakwa	NS (3)	NS (8)	S	S	NT
Mountain Fork, SH 4, Smithville	NS (2, 3, 5)	NS (8)	S	S	NS (14)
Mountain Fork, US 70, Eagletown	NS (2, 3)	NS (8)	S	S	NT
Mud Creek, SH 32, Courtney	NS (5)	NS (8)	S	S	NT
Muddy Boggy Creek, US 70, Unger	NS (3, 5)	NS (6, 8)	S	S	NT
Muddy Boggy Creek, US 69, Atoka	NS (1, 3, 5)	NS (6, 8)	S	S	NT
Neosho River, off US 66, Commerce	NS (3, 5)	S	S	S	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
Neosho River, off SH 137, Connor Bridge	PS (5)	S	S	S	NT
Neosho River, SH 82, Langley	S	S	S	S	NT
Neosho River, US 412, Chouteau	S	S	S	S	NS (13)
North Canadian River, Ind. Nat. Tpk., Dustin	NS (3, 5)	NS (6, 8)	S	S	T (13)
North Canadian River, SH 3E, Shawnee	NS (3, 4, 5)	NS (8)	N/A	S	T (13, 17)
North Canadian River, off US 62, Harrah	PS (5)	NS (6, 8)	N/A	S	T (13, 17)
North Canadian River, US 270, Watonga	S	NS (6, 7, 8)	S	S	NT
North Canadian River, US 281, Seiling	S	NS (8)	S	S	NT
North Canadian River, US 75, Wetumka	NS (3, 5)	NS (6, 8)	S	S	T (13, 17)
North Canadian River, US 412, Woodward	S	NS (8)	N/A	S	NT
North Canadian River, US 81, El Reno	S	NS (8)	S	S	NT
North Fork of the Red River, US 62, Headrick	NS (5)	NS (8)	S	NS (10, 11)	T (17)
North Fork of the Red River, SH 34, Carter	S	NS (8)	S	S	NT
Poteau River, off SH 112, Pocola	NS (3, 5)	NS (8)	S	S	NT
Poteau River, US 59, Heavener	S	S	S	S	NT
Red River, US 183, Davidson	NS (3, 5)	NS (6, 8)	N/A	NS (10, 11, 12)	T (17)
Red River, US 259, Harris	PS (5)	S	S	S	NT
Red River, US 271, Hugo	PS (5)	NS (8)	S	S	NT
Red River, US 81, Terral	NS (5)	NS (8)	S	NS (11, 12)	NT
Sager Creek, off US 412, West Siloam Springs	S	NS (8)	PS (nitrates)	S	T (13, 15)
Salt Fork of the Arkansas, SH 58, Ingersoll	NS (5)	NS (6, 7, 8)	S	S	NT
Salt Fork of the Arkansas, US 77, Tonkawa	NS (5)	NS (8)	S	S	NT
Salt Fork of the Red River, SH 34, Mangum	S	NS (8)	S	S	NT
Salt Fork of the Red River, off US 283, Elmer	NS (3)	NS (6, 8)	S	PS (11)	NT
Sandy Creek, SH 6, Eldorado	NS (2, 3, 5)	N/A	N/A	NS (10, 11, 12)	NT
Skeleton Creek, SH 74, Lovell	NS (5)	NS (6, 8)	S	S	NT
Spring Creek, off US 412, Murphy	S	S	S	S	NT
Spring River, off SH 137, Quapaw	NS (2. 3, 5)	NS (8)	S	S	NT
Verdigris River, US 412, Inola	NS (3, 5)	NS (8)	S	S	NT
Verdigris River, SH 10, Lenepah	NS (3, 5)	NS (8)	S	S	NT
Verdigris River, SH 20, Keetonville	S	NS (8)	S	S	NT
Verdigris River, SH 51, Wagoner	NS (2, 3, 5)	NS (8)	S	S	NT

STATION NAME	FWP	PBCR	PPWS	AG	AES
Washita River, off SH 19, Alex	NS (5)	NS (6, 8)	S	S	T (17)
Washita River, SH 152, Cordell	NS (5)	NS (6, 7, 8)	S	S	T (17)
Washita River, SH 19, Pauls Valley	NS (5)	NS (8)	S	S	NT
Washita River, SH 33, mcclure	PS (5)	NS (6, 7, 8)	S	S	NT
Washita River, US 177, Durwood	NS (5)	NS (6, 8)	S	S	NT
Washita River, US 281, Anadarko	NS (5, 16)	NS (6, 8)	S	S	T (17)
West Cache Creek, SH 5B, Taylor	NS (5)	NS (6, 7, 8)	S	PS (10,11)	NT
Wolf Creek, off US 270, Fort Supply	S	NS (8)	S	S	NT

ASSIGNED OWQS BENEFICIAL USES

FWP = Fish & Wildlife Propagation
PBCR = Primary Body Contact Recreation
PPWS = Public and Private Water Supply
AG = Agriculture
AES = Aesthetics

SUPPORT CODES

S—Fully Supporting	PS—Partially Supporting	NS—Not Supporting
N/A—Not Applicable	NT-Not Threatened (Nutrients)	T-Threatened (Nutrients)

WATER QUALITY VARIABLES

1—Dissolved Oxygen	2—Metals (Acute)	3—Metals (Chronic)
4—pH	5—Turbidity	6—Fecal Coliform
7— *Escherichia coli*	8— Enterococci	9—Metals
10— Total Dissolved Solids	11— Chlorides	12— Sulfates
13— Total Phosphorus (TP)	14—TP Ok Scenic River Criterion	15— Nitrite + Nitrate
16—Biocriteria	17—Sestonic Chlorophylll-a (TSI)	

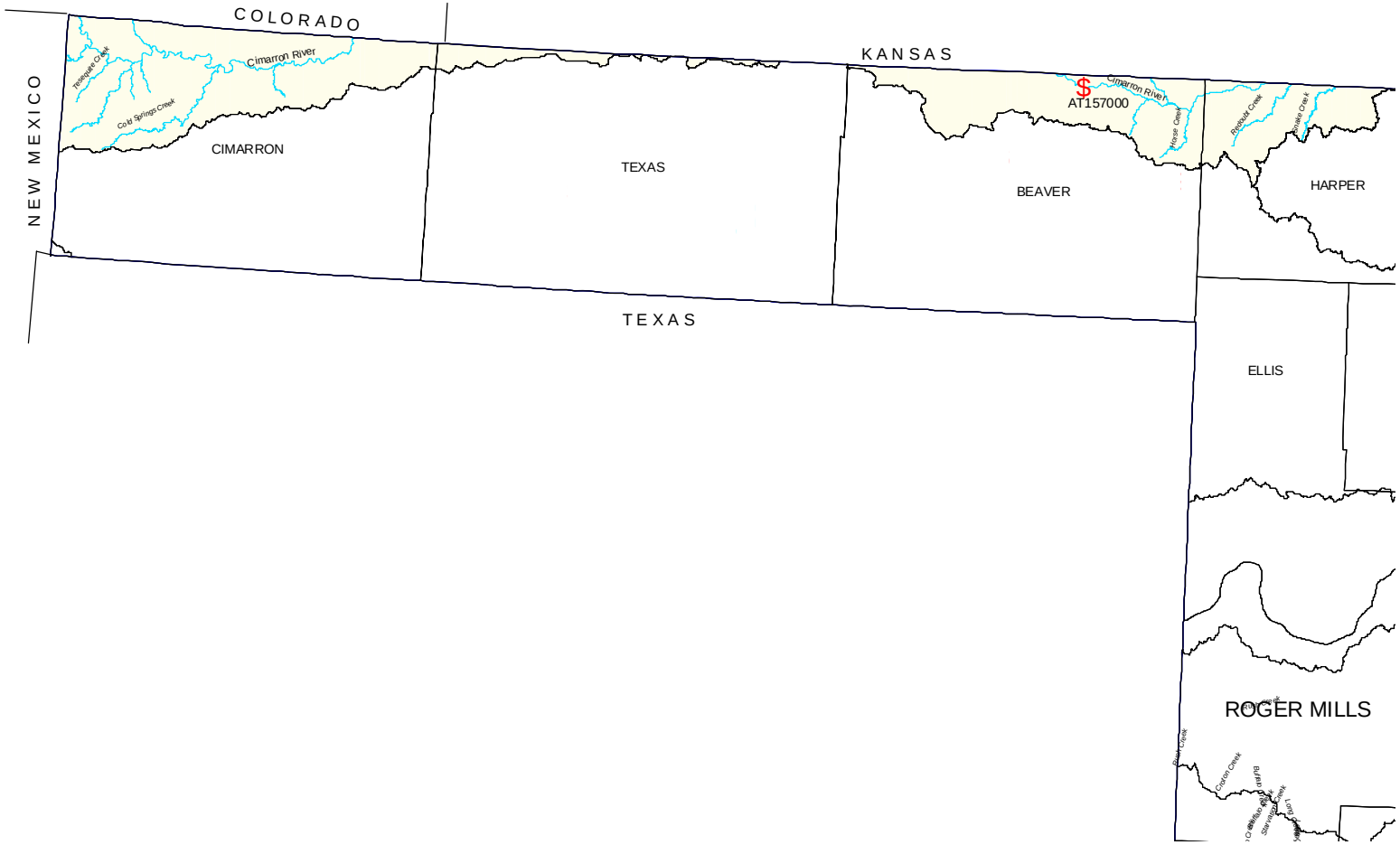


Plate 57
UPPER CIMARRON SUBBASIN (HUC 1104)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1104

UPPER CIMARRON SUB-BASIN

The Upper Cimarron sub-basin (4-digit hydrologic unit 1104) is situated in the far northwest portion of the state. It originates in the northwestern portion of Cimarron County and continues along the northern third of the county until exiting at the northwest corner of Texas County. The sub-basin reenters Oklahoma in the upper reaches of Beaver County and terminates in the northwest section of Harper County. No major cities or County seats are located within the sub-basin. Minor cities of note include Kenton and Knowles.

The sub-basin is subdivided into four 8-digit hydrologic units (HUC) within the state. These HUC's are the Cimarron Headwaters (11040001), the Upper Cimarron (11040002), the Upper Cimarron-Liberal (11040006), and the Upper Cimarron-Bluff (11040008). The Cimarron River dominates the sub-basin. Near the headwaters of the Cimarron River, Lake Carl Etling is formed by South Carrizo Creek. The only water quality monitoring station in the sub-basin is AT157000 (Table 6).

The sub-basin is dominated by two major ecoregions. The Southwestern Tablelands are prominent in the far west and appear in portions of Beaver County while the Western High Plains are foremost in the near west, central and eastern portions of the sub-basin. The Central Great Plains touches the sub-basin in the far eastern reaches of Harper County. The primary land usage in the sub-basin is rangeland with open grasslands to the west and east and sand sagebrush in portions of Beaver County. Irrigated croplands are scattered throughout the sub-basin. Other land uses of note include pastureland, woodlands, large farmsteads, and bare exposed rock.

Table 6. Permanent Ambient Trend Monitoring Stations Located in HUC 1104.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
620930000010	AT157000	CIMARRON RIVER, OFF US 64, MOCANE	ACTIVE 10/99- P	PPWS, FWP, AES	NONE	AG, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES	
PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 7. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1104. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT157000	CIMARRON RIVER, OFF US 64, MOCANE	06/07/2000		440	
		07/12/2000	3100	6100	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		08/09/2000	1800	1300	
		09/07/2000	3900	500	
		06/05/2001	800	500	
		07/10/2001	2000	4000	
		08/07/2001	700		
		07/16/2002	600		
		08/13/2002	11000	9000	
		06/01/2004	1300	500	
		06/22/2004		500	
		07/06/2004		1000	
		07/27/2004		500	

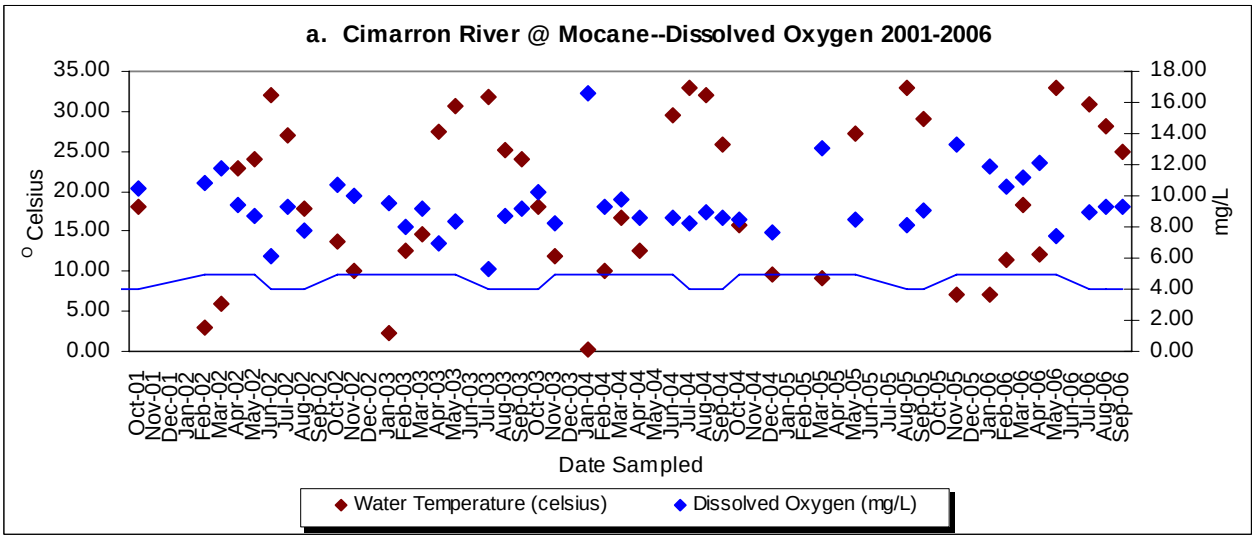
Cimarron River near Mocane

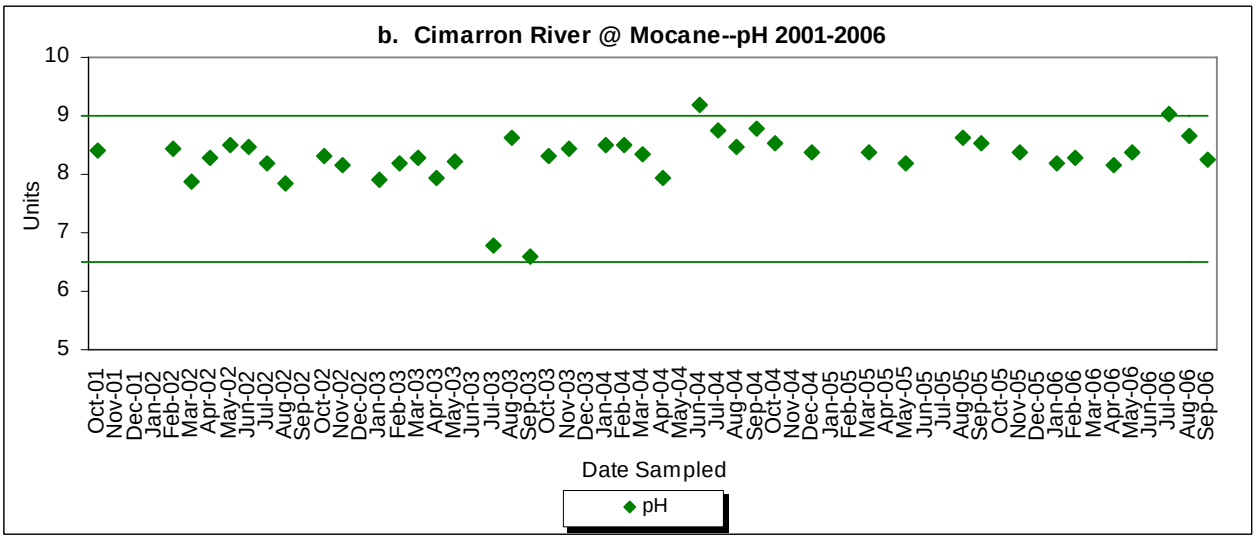
Station AT157000 (620930000010-001AT) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the northeastern portion of Beaver County, the site was established northeast of the town of Mocane off of US Highway 64 on County Road 1510. The station is positioned near the upper end of stream segment 620930000010 and is classified within the Upper Cimarron River – Liberal 8 digit HUC watershed (11040006). Water enters the stream system from Kansas and from several tributaries including Cottonwood Creek, Crooked Creek, and Horse Creek, among others.

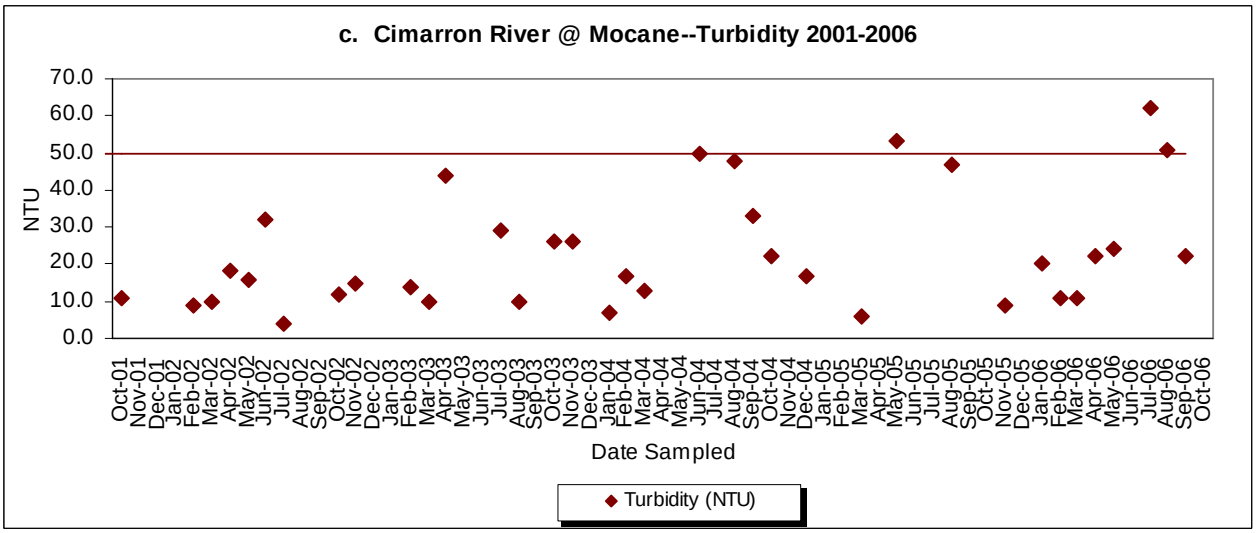
This station on the Cimarron River has been active for all water quality variables since October of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Cimarron River from its entrance into Oklahoma near Mocane, Oklahoma (97.3276, 36.9679) downstream to its exit from Oklahoma near Englewood, Kansas (97.1739, 36.6243). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 4a), pH (Figure 4b), turbidity (Figure 4c), and toxicants data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2005. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 10 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 21. However, because biocriteria have not been developed for the Southwest Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is not supported (Figure 4d and Figure 4e). Of the forty-three (43) total dissolved solids concentrations, forty-two (42) samples (or 98%) exceeded the prescribed sample standard of 700 mg/L, and the geometric mean (2821.9 mg/L) exceeded the yearly mean standard (700 mg/L). Of the forty-one (41) chloride concentrations, forty (40) samples (or 98%) exceeded the prescribed sample standard of 250 mg/L, and the geometric mean (1196.3 mg/L) exceeded the yearly mean standard (250 mg/L). Sulfate concentrations met the prescribed segment-specific criterion. The PBCR beneficial use is not supported (Table 7). Of the 13 fecal coliform concentrations, five (5) samples (or 38%) exceeded the prescribed screening level of 400 cfu/mL. Of the fifteen (15) enterococci concentrations, 5 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (206.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 4f).

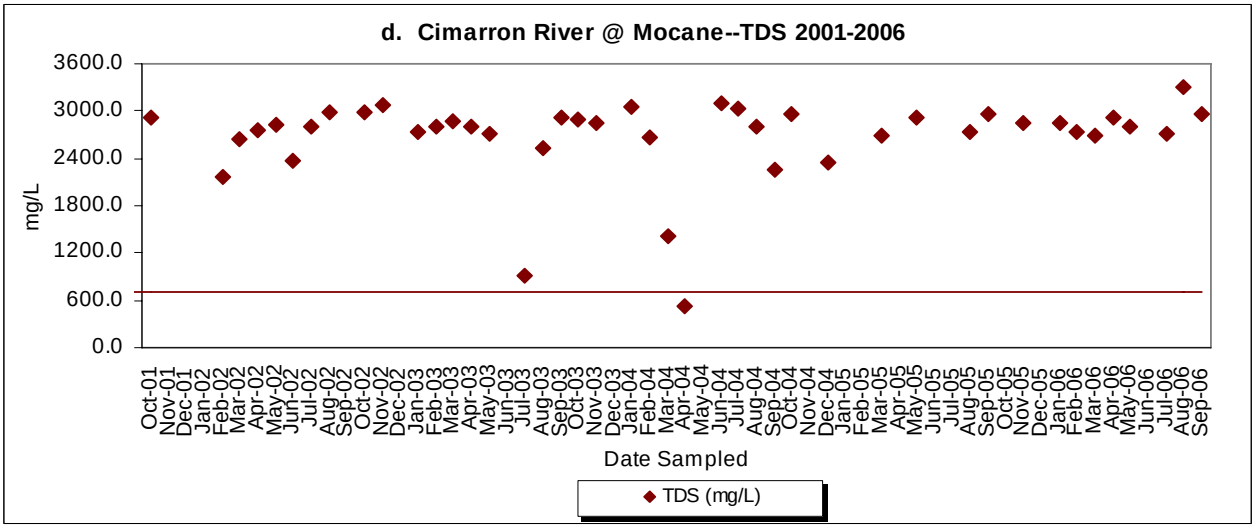
Figure 4 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Mocane (AT157000), 2001-2006.

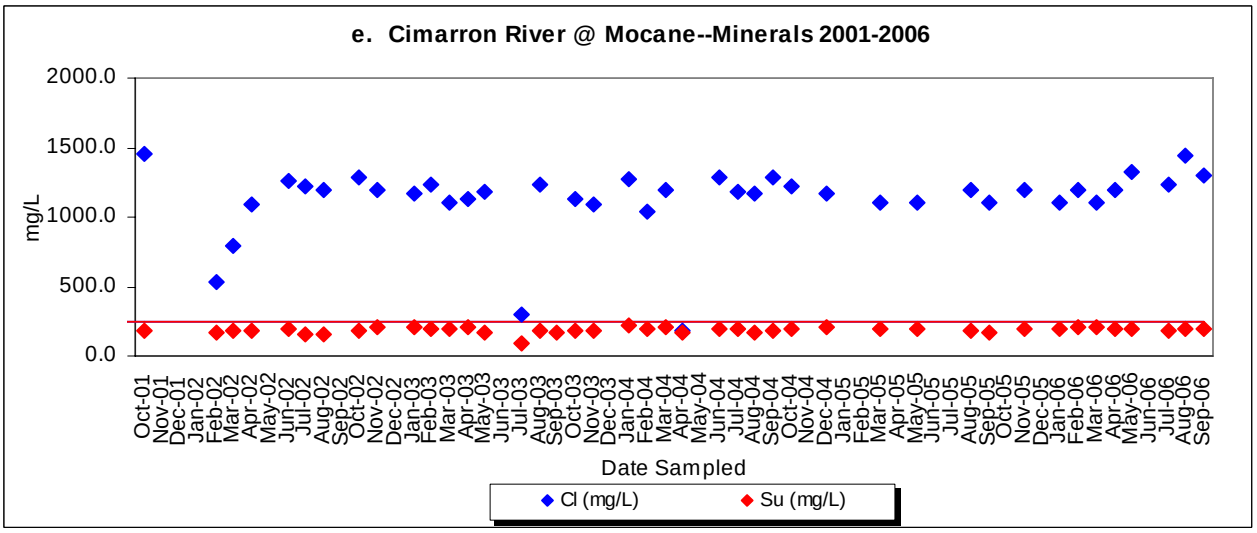


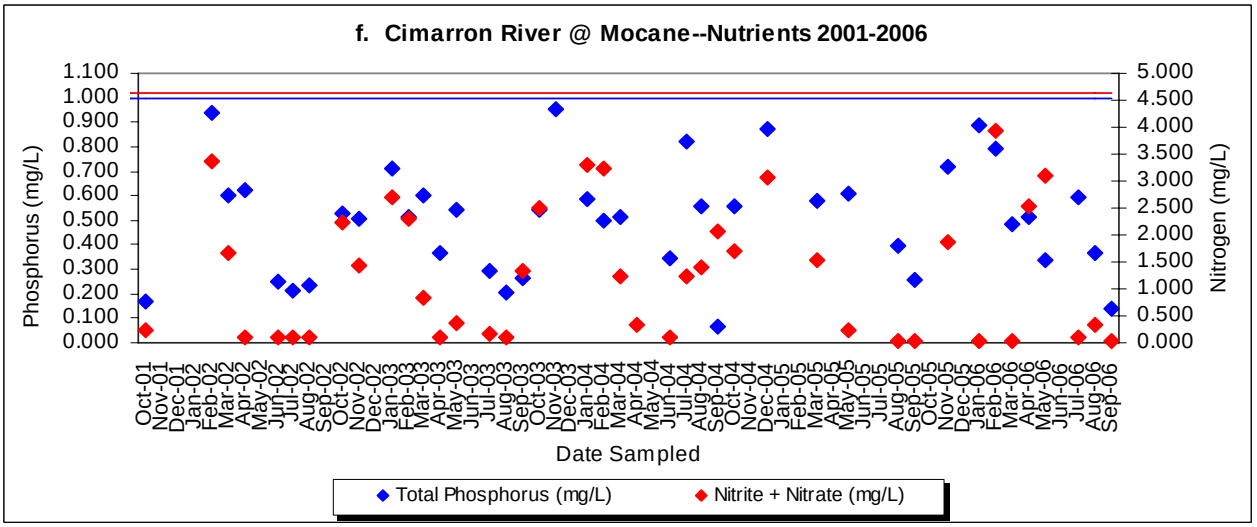




HUC 1104


d. Cimarron River @ Mocane--TDS 2001-2006
mg/L
3600.0
3000.0
2400.0
1800.0
1200.0
600.0
0.0
Date Sampled
TDS (mg/L)


e. Cimarron River @ Mocane--Minerals 2001-2006
mg/L
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Mocane--Nutrients 2001-2006
Phosphorus (mg/L)
1.100
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

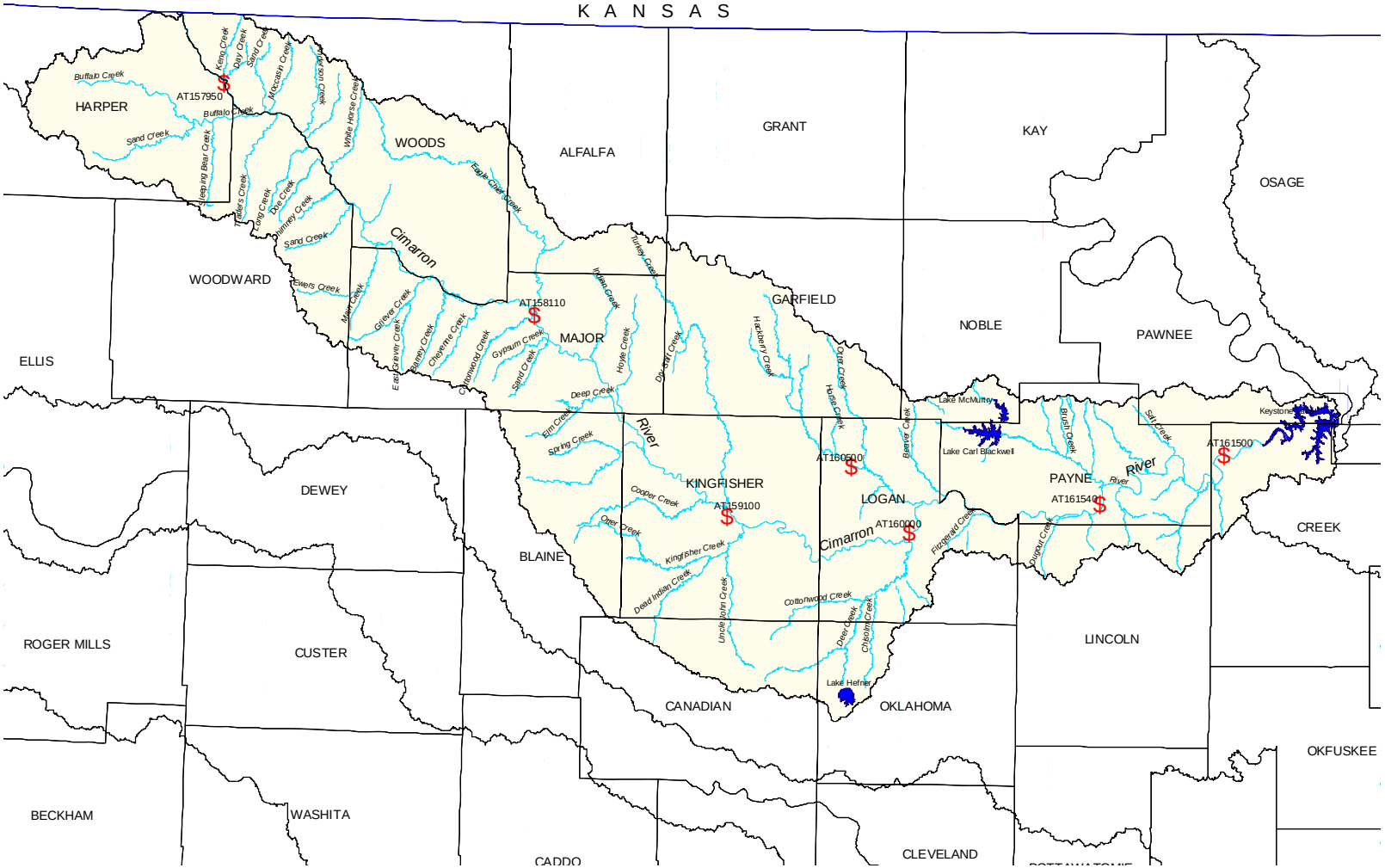


Plate 58
LOWER CIMARRON SUBBASIN (HUC 1105)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1105

LOWER CIMARRON SUB-BASIN

The Lower Cimarron sub-basin (4-digit hydrologic unit 1105) is situated in the near northwest and north central portions of the state. It originates in the eastern portion of Harper County, continues eastward through portions of Woodward, Woods, Alfalfa, Major, Garfield, Blaine, Kingfisher, Logan, Noble, Payne, Lincoln, and Pawnee Counties and terminates in the northern part of Creek County. Major cities and county seats located within the sub-basin include Enid, Kingfisher, Guthrie, Stillwater, and north Edmond. Minor cities of note include Buffalo, Fairview, Hennessey, Langston, Cushing, and Drumright.

The sub-basin is subdivided into three 8-digit hydrologic units (HUC) within the state. These HUC's are the Lower Cimarron – Eagle Chief (11050001), the Lower Cimarron – Skeleton (11050002), and the Lower Cimarron (11050003). The major surface water in the sub-basin is the lower Cimarron River. Major tributaries include Buffalo Creek, Eagle Chief Creek, Turkey Creek, Kingfisher Creek, Cottonwood Creek, Skeleton Creek, and Stillwater Creek. Three major lakes are located in the sub-basin—Lake Carl Blackwell formed by Stillwater Creek, Lake McMurtry formed by a tributary of Stillwater Creek, and the Cimarron River Arm of Lake Keystone. Eight permanent water quality-monitoring stations (Table 8) are located in the sub-basin—AT157950, AT158000, AT158115, AT159100, AT160500, AT160000, AT161450, and AT161500. station AT158115 was deactivated in 2004.

The sub-basin is characterized by three ecoregions. The Central Great Plains is the primary ecoregion beginning in the far eastern portion and continuing through the central part of the sub-basin. The Central Oklahoma/Texas Plains represent the eastern quarter (¼) of the sub-basin. The Southwestern Tablelands typify portions of Woodward and Woods Counties. The primary land usage in the sub-basin is rangeland (open grasslands). It dominates the southern portion of the sub-basin from the far western portions through Kingfisher County and is further interspersed throughout the northern portion and in parts of Payne, Creek, and Noble Counties to the east. The secondary land use is cropland, which dominates the north central portion of the sub-basin and is further interspersed in areas to the western, central, and eastern portions. The tertiary land use is pastureland (brushy or mixed) that covers much of Creek Logan, Lincoln and Payne Counties and is further interspersed throughout each of the remaining counties in the sub-basin. Other land uses of note are forestland, rangeland, farmsteads, major urban areas, wetlands, and bare sand channels.

Table 8. Permanent Ambient Trend Monitoring Stations Located in HUC 1105.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
620910020010	AT158115	Cimarron River, off SH 8, Ames	Active 03/03-P	AES, FWP	NONE	AG, PBCR	NONE
620920030010	AT157950	Cimarron River, SH 34, Buffalo	Active 11/98-P	AES, FWP	NONE	AG, PBCR	NONE
620910020010	AT159100	Cimarron River, US 81, Dover	Active 11/98-P	AES, FWP	NONE	AG, PBCR	NONE
620920010010	AT160000	Cimarron River, US 77, Guthrie	Active 11/98-P	AG, FWP	NONE	PBCR, AES	NONE
620900010170	AT161500	Cimarron River, SH 99, Oilton	Active 11/98-P	AG, AES	NONE	FWP, PBCR	NONE
620900030010	AT161450	Cimarron River, SH 33, Ripley	Active 10/00-P	AG, AES	NONE	FWP, PBCR	NONE
620920020010	AT158000	Cimarron River, US 281, Waynoka	Active 03/03-P	AES	NONE	FWP, AG	PBCR
620910030010	AT160500	Skeleton Creek, SH 74, Lovell	Active 11/98-P	PPWS, AG, AES	NONE	FWP, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 9. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1105. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT157950	Cimarron River, SH 34, Buffalo	05/17/2000		620	
		08/23/2000			2187
		09/15/2000	970	480	4880
		05/08/2001	1500		
		06/05/2001	6000	11000	617
		07/10/2001			426
		08/07/2001			24199
		09/25/2001			2143
		05/14/2002	1800	2000	
		06/11/2002		700	4611
		07/16/2002	500	1500	6131
		08/13/2002	1000	800	4884
		09/17/2002	7000		3873
AT159100	Cimarron River, US 81, Dover	07/26/2000		900	
		05/08/2001		5000	
		06/05/2001		1200	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		08/07/2001		1600	
		09/24/2001		1000	
		08/27/2002		7000	
		09/24/2002		500	
		06/11/2003		87000	9208
		07/01/2003			703
		08/12/2003		1100	
		09/09/2003			1989
		09/30/2003		600	1274
AT160000	CIMARRON RIVER, US 77, GUTHRIE	6/20/2000	630	1000	
		07/26/2000	1500		
		05/08/2001		6000	
		06/05/2001		9000	
		07/11/2001		3000	
		09/24/2001	1000	11000	
		06/05/2002	1800	1700	
		08/27/2002	2000		
		09/24/2002	4000	2000	
		09/30/2003	1300		
AT161500	CIMARRON RIVER, SH 99, OILTON	06/21/2000	19000	57000	
		07/26/2000	530		
		05/07/2001		700	
		06/04/2001	600		
		05/22/2002	4000		
		08/26/2002	600	500	
		09/23/2002	27000	6000	
		06/02/2004		1100	
		06/22/2004	2100	3700	
		07/07/2004	600	1700	
AT158110	CIMARRON RIVER, US 412, ORIENTA	05/08/2001		500	
		06/05/2001		630	
		08/07/2001		900	
		09/24/2001			408
		06/05/2002		2500	933
		07/10/2002			512
		08/27/2002		4000	475
		06/10/2003			1112
		09/09/2003		600	
		09/16/2003		900	
AT161450	CIMARRON RIVER, SH 33, RIPLEY	05/07/2001		1000	
		06/04/2001		3000	
		08/26/2002		600	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		09/23/2002		3000	
		06/09/2003		4000	
AT160500	SKELETON CREEK, SH 74, LOVELL	06/21/2000	410	122000	
		07/26/2000	1600	1400	
		05/08/2001		800	
		06/05/2001	600	5000	
		07/10/2001			
		08/07/2001		27000	
		09/24/2001	900	7000	
		06/05/2002	3000	41000	
		09/25/2002	700	2000	
		06/01/2004	600		
		06/15/2004		900	
		06/21/2004	12300	13200	
		07/06/2004	3200	2800	
		08/24/2004	5620		

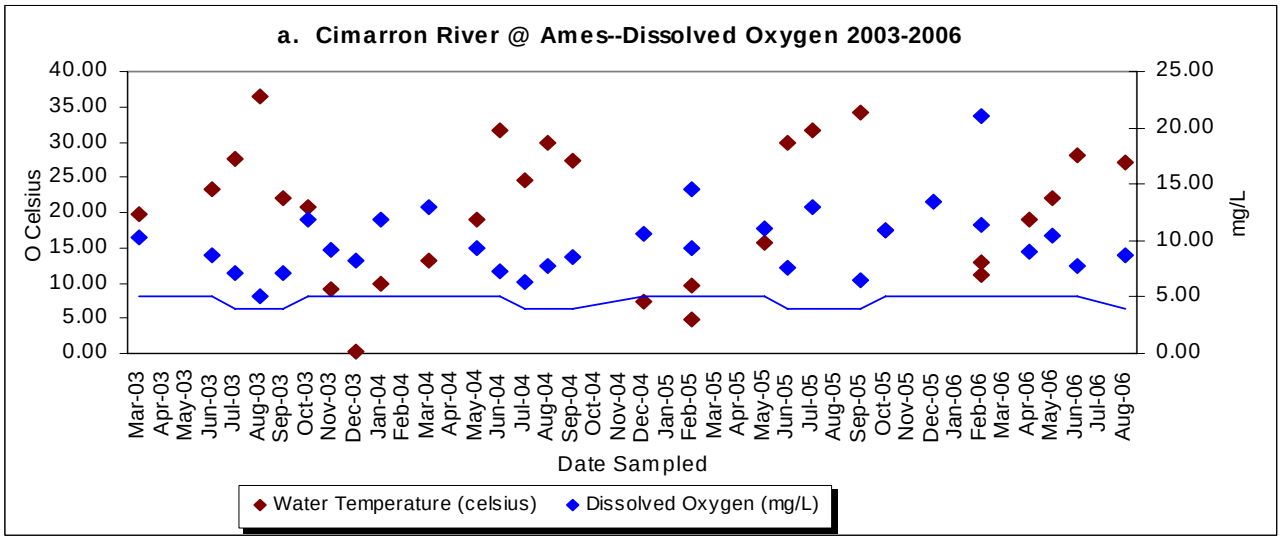
Cimarron River near Ames

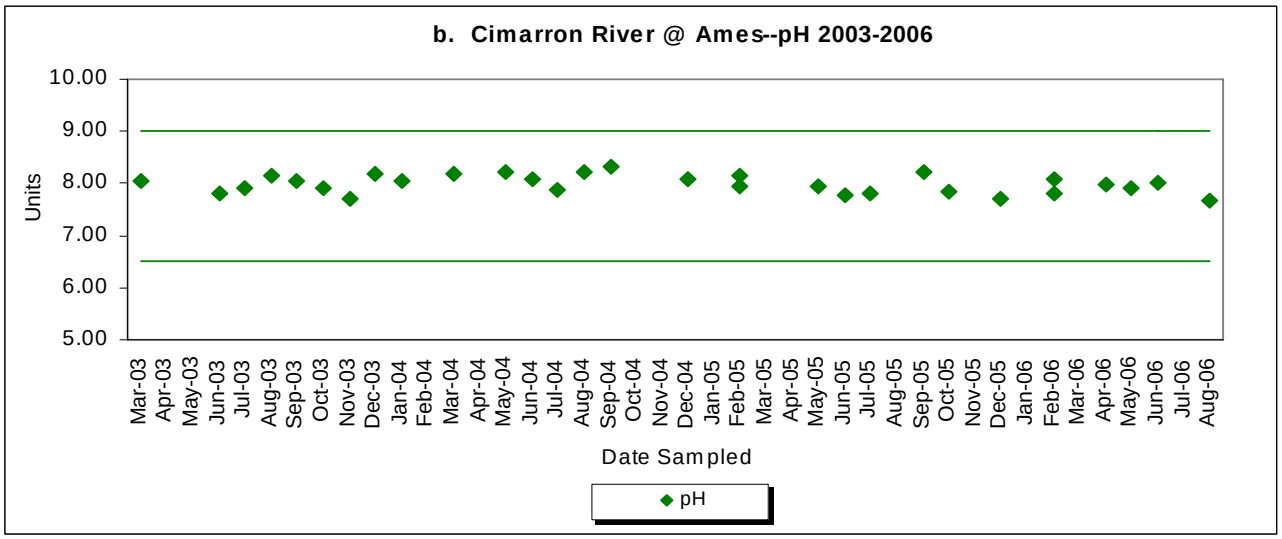
Station AT158115 (620910020010-004RS) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. This station temporarily replaces the Cimarron River near Orienta (AT158110), which was discontinued for safety reasons. The assessment for this segment will continue to include data from the Orienta station. The Ames station is situated in the southeastern portion of Major county and was established southwest of the city of Ames on a County Road E0550 off of State Highway 8. The station is positioned near the lower end of stream segment 620910020010 and is classified within the Lower Cimarron River - Eagle Chief Creek 8 digit HUC watershed (11050001). Water enters the stream system from several tributaries including Main Creek, Griever Creek, Cheyenne Creek, Eagle Chief Creek, Sand Creek, and Indian Creek, among others.

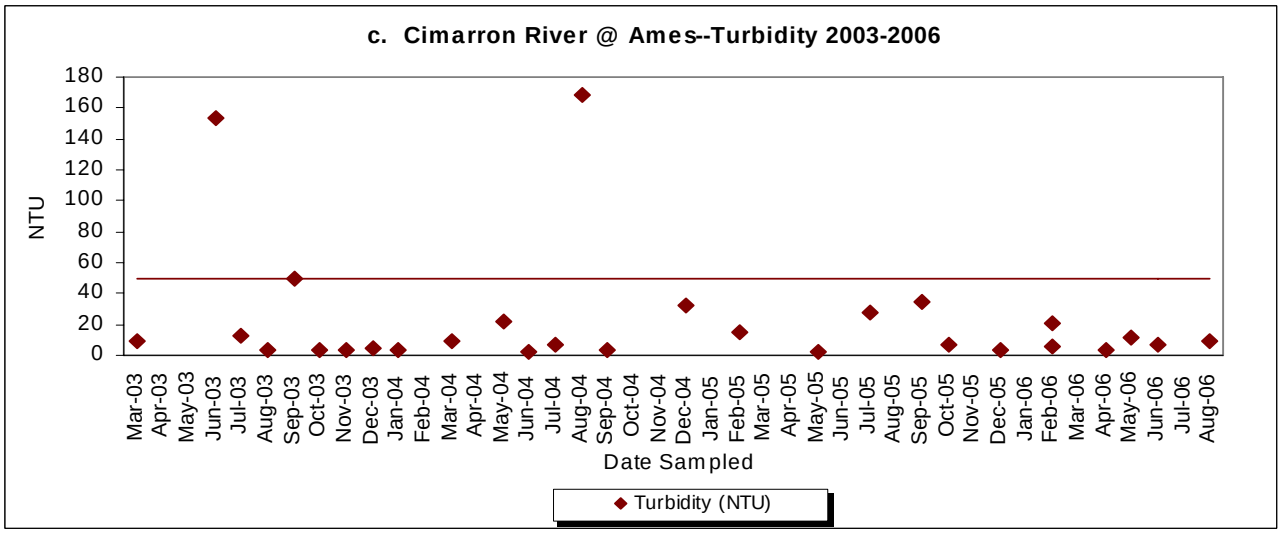
This station on the Cimarron River has been active for all water quality variables since March of 2003. The following assessment of beneficial uses is based on data collected from March of 2003 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of Main Creek (98.8753, 36.5154) downstream to confluence of the Cimarron River with Deep Creek one mile south of the sampling location. As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 5a), pH (Figure 5b), turbidity (Figure 5c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2004 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the segment had a sample composition score of 8 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 19. This is between the assigned non-supporting and supporting thresholds of 19-21 for Central Great Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is not supported (Figure 5d and e). Of the thirty-one (31) total dissolved solids concentrations, sixteen (16) samples (or 52%) exceeded the prescribed sample standards of 10028.0 mg/L, and the geometric mean (11325.8 mg/L) exceeded the yearly mean standard (7437.0 mg/L). Of the 31 chloride concentrations, thirteen (13) samples (or 42%) exceeded the sample standard of 5902.0 mg/L, and the geometric mean (5072.0 mg/L) exceeded the yearly mean standard (4218.0 mg/L). Of the 31 sulfate concentrations, nine (9) samples (or 29%) exceeded the sample standard of 873.0 mg/L, and the geometric mean (852.7 mg/L) exceeded the yearly mean standard (680.0 mg/L). The PBCR beneficial use is not supported (Table 9). Of the twenty-nine (29) fecal coliform concentrations, 8 samples (or 28%) exceeded the prescribed screening level of 406 cfu/mL. Of the twenty-eight (28) *E. coli* concentrations, 7 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (166.0 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. Of the 28 enterococci concentrations, eight (8) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (74.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 5f).

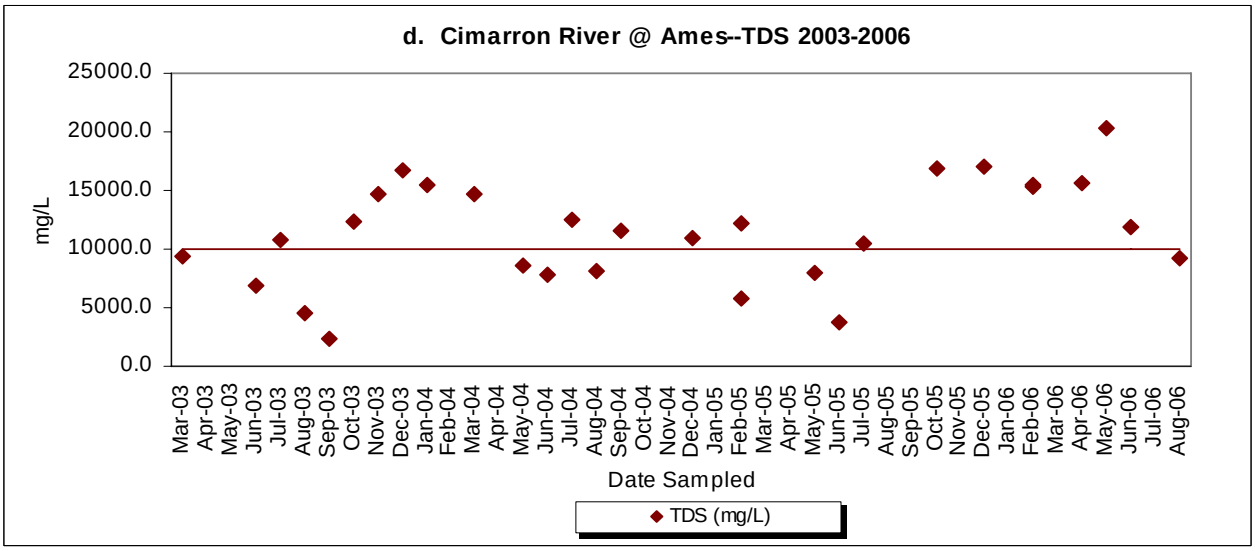
Figure 5a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d & e), Minerals (f & g), and Nutrients (h) for the Cimarron River at Ames (AT158115), 2003-2006.

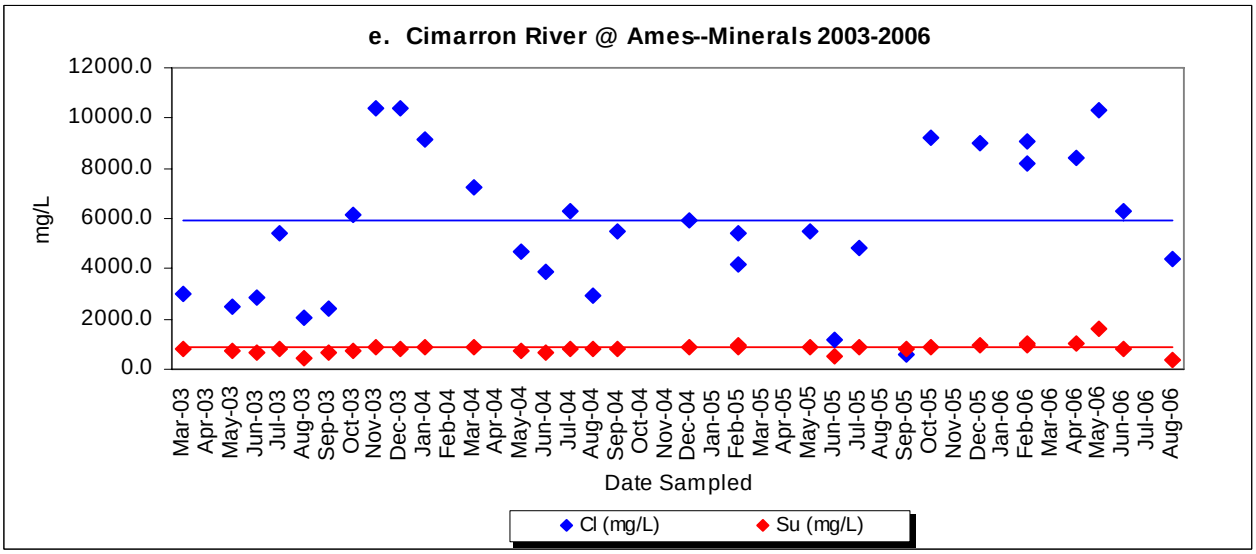


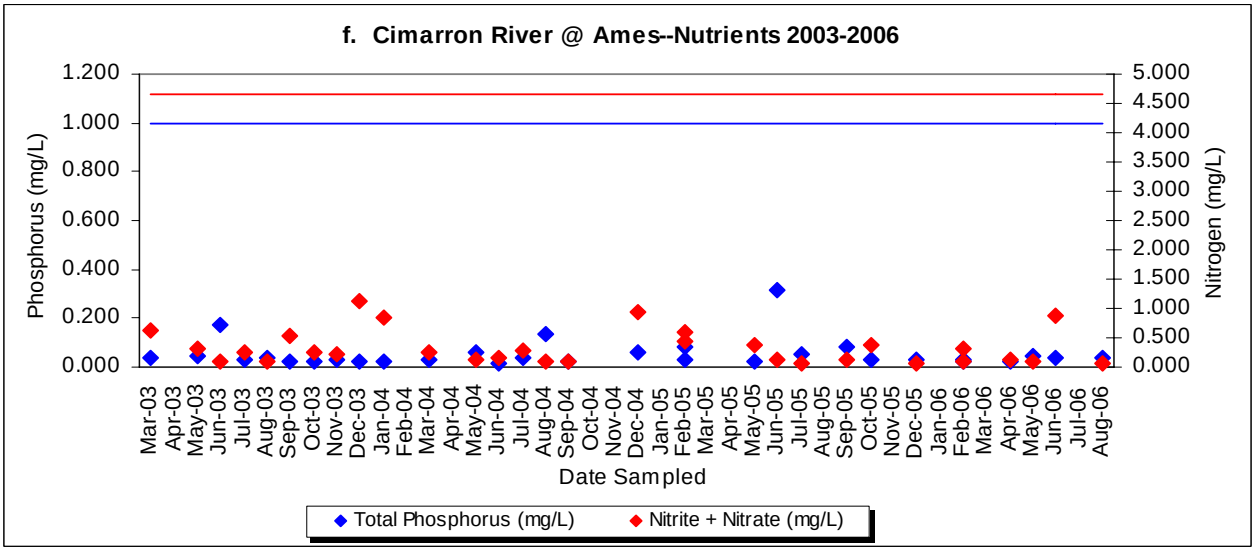




HUC 1105


d. Cimarron River @ Ames--TDS 2003-2006
mg/L
25000.0
20000.0
15000.0
10000.0
5000.0
0.0
Date Sampled
TDS (mg/L)


e. Cimarron River @ Ames--Minerals 2003-2006
mg/L
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Ames--Nutrients 2003-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

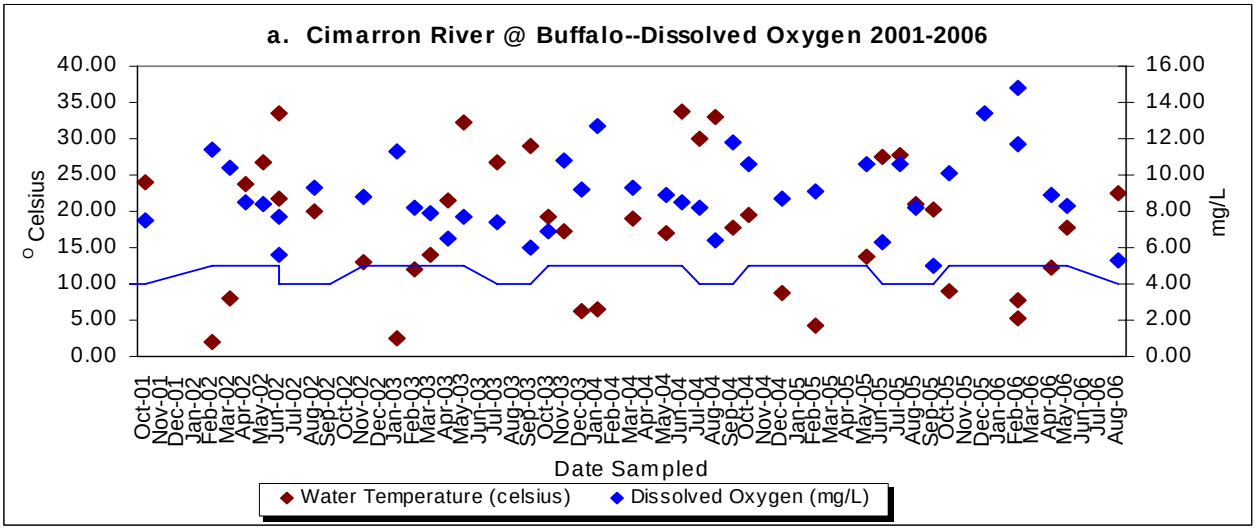
Cimarron River Near Buffalo

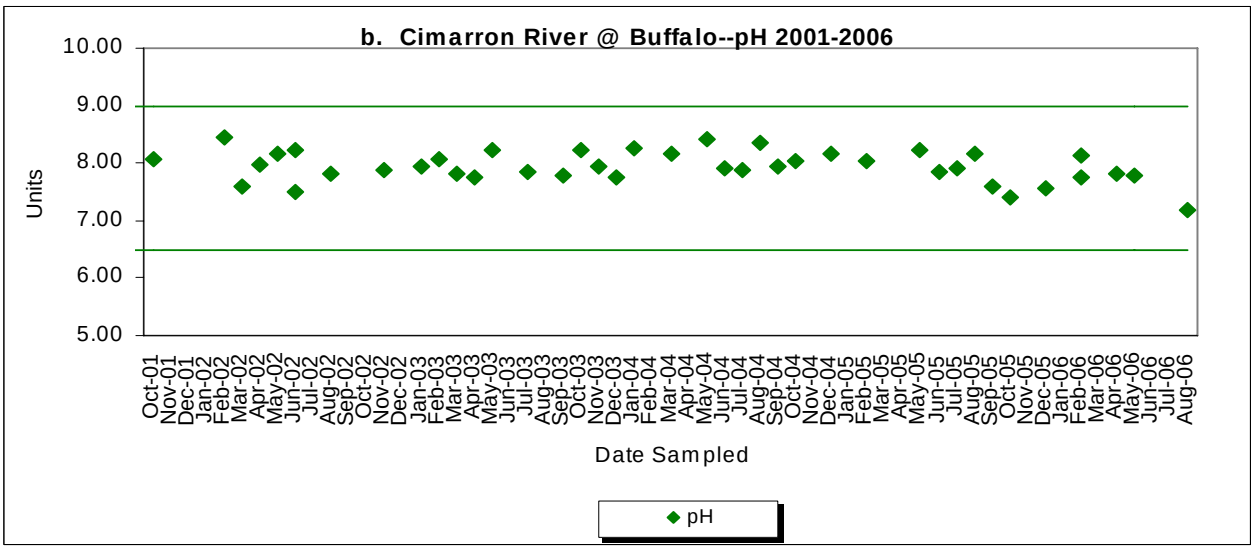
Station AT157950 (620920030010-001AT) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the northwestern portion of Woods County, the site was established east of the town of Buffalo on State Highway 34. The station is positioned near the midpoint of stream segment 620920030010 and is classified within the Lower Cimarron River - Eagle Chief Creek 8 digit HUC watershed (11050001). Water enters the stream system from Kansas and from several tributaries including Keno Creek, Day Creek, Buffalo Creek, and Sand Creek, among others.

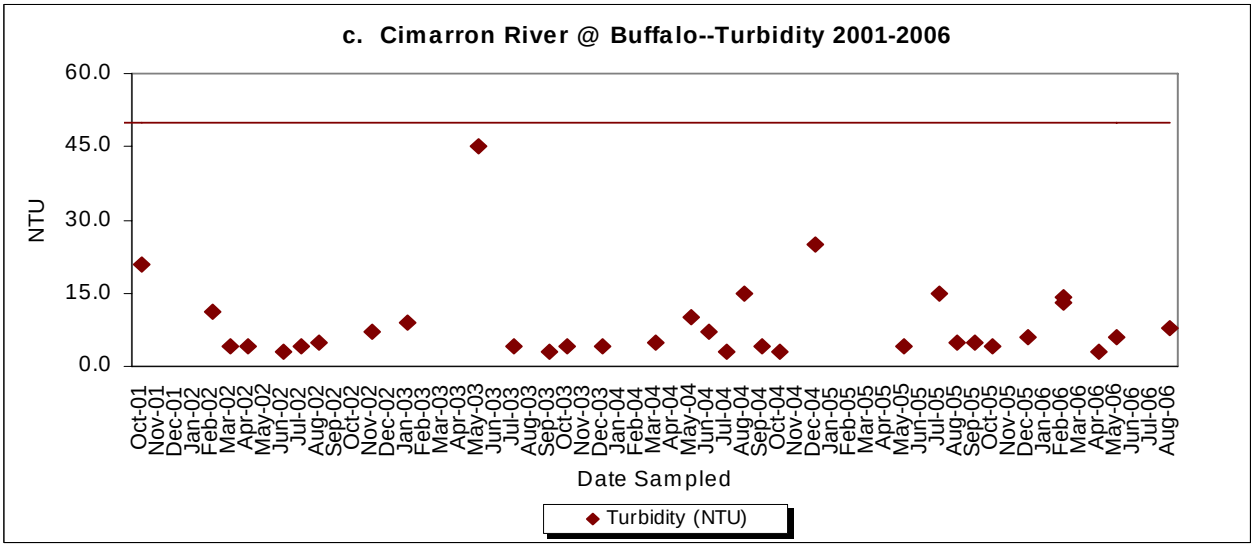
This station on the Cimarron River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from entrance into Oklahoma near Buffalo, Oklahoma (99.4562, 36.9996 downstream to confluence of the Cimarron River with Buffalo Creek (99.2166, 36.7869). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 6a), pH (Figure 6b), turbidity (Figure 6c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 6d and e). Of the forty-one (41) total dissolved solids concentrations, ten (10) samples (or 24%) exceeded the sample standard of 14955.0 mg/L, and the geometric mean (10363 mg/L) exceeded the yearly mean standard (10353 mg/L). Of the forty (40) chloride concentrations, eight (8) samples (or 20%) exceeded the sample standard of 6556.0 mg/L. Sulfate concentrations met the prescribed segment-specific criterion. The PBCR beneficial use is not supported (Table 9). Of the eleven (11) fecal coliform concentrations, 6 samples (or 55%) exceeded the prescribed screening level of 400 cfu/mL, however, the geometric mean (310.3 cfu/mL) did not exceed the prescribed mean standard of 400 cfu/mL. Of the 11 enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (221.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 11 *E. coli* concentrations, eight (8) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (970.0 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 6f).

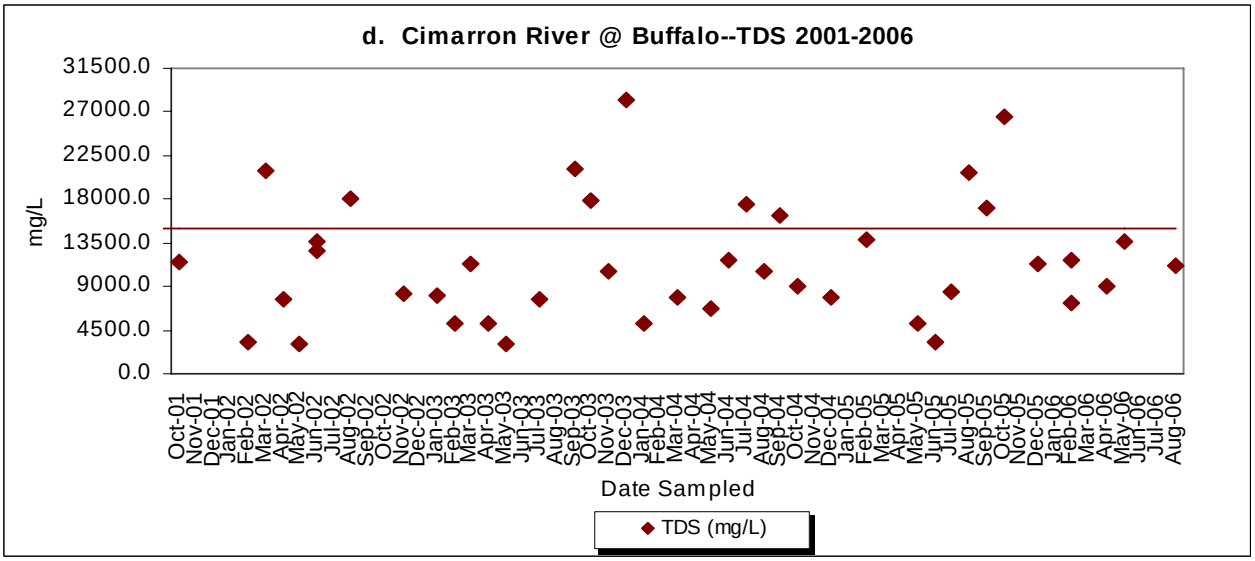
Figure 6a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Buffalo (AT157950), 2001-2006.

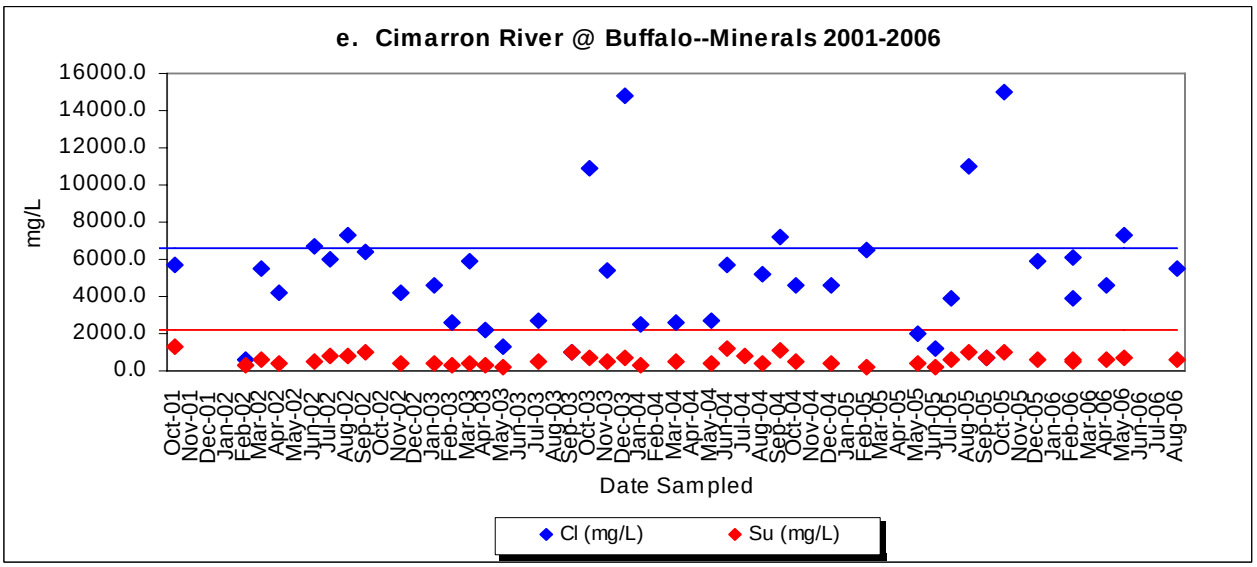


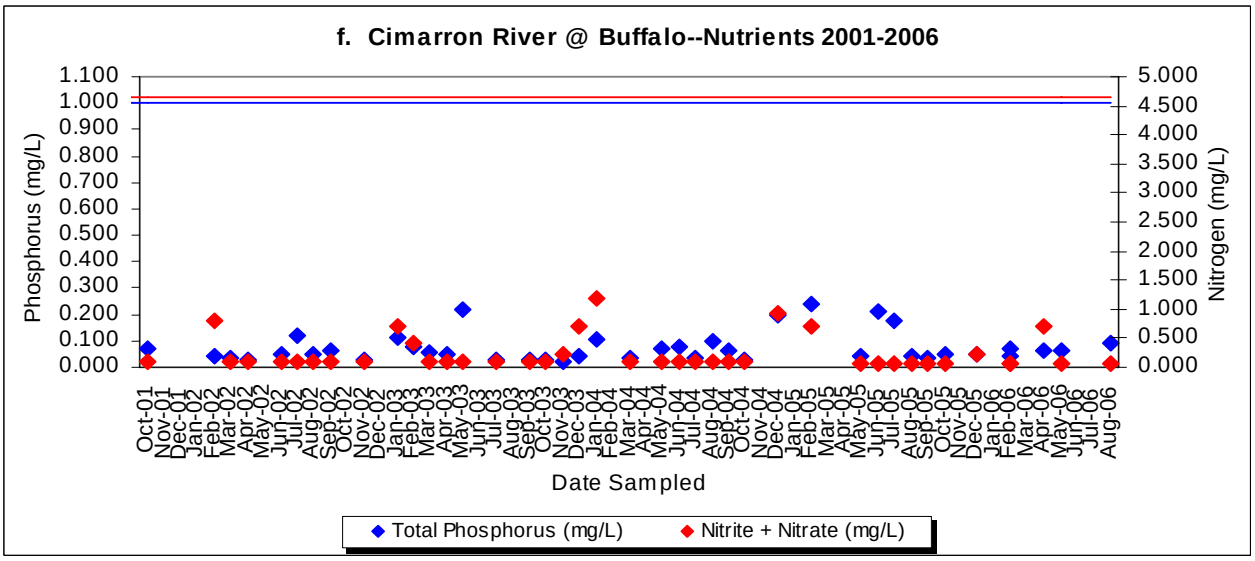




HUC 1105


d. Cimarron River @ Buffalo--TDS 2001-2006
mg/L
31500.0
27000.0
22500.0
18000.0
13500.0
9000.0
4500.0
0.0
Date Sampled
TDS (mg/L)


e. Cimarron River @ Buffalo--Minerals 2001-2006
mg/L
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Buffalo--Nutrients 2001-2006
Phosphorus (mg/L)
1.100
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

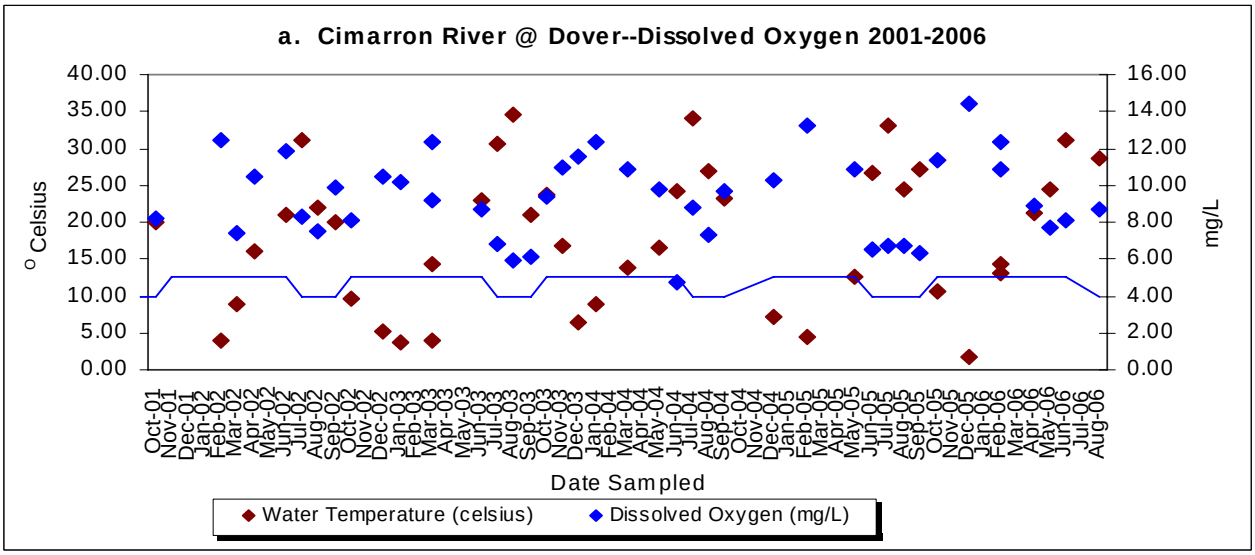
Cimarron River near Dover

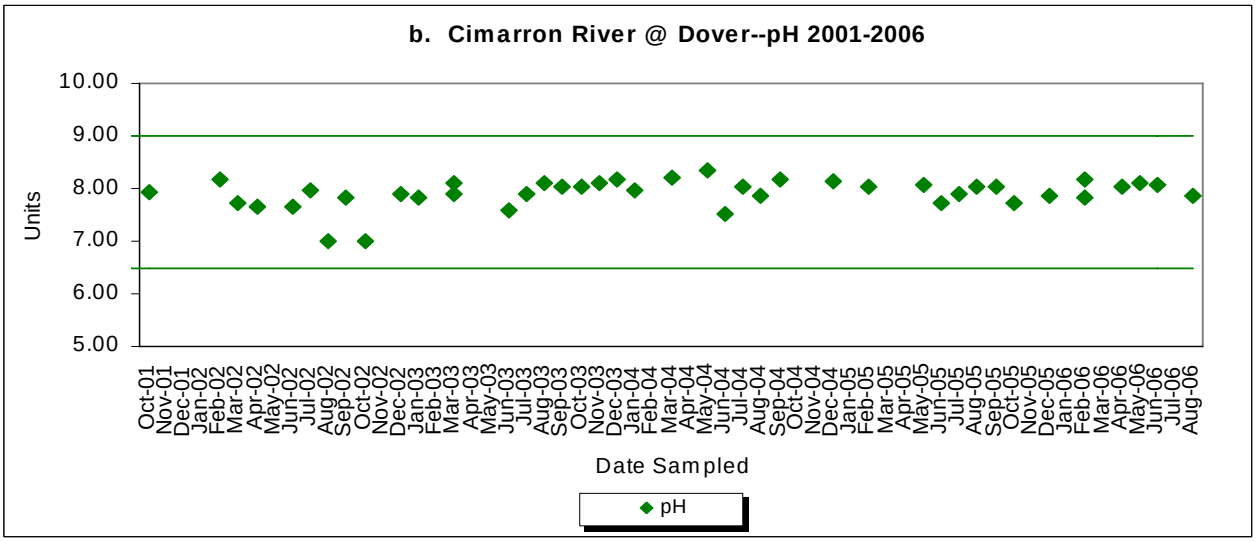
Station AT159100 (620910020010-001AT) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the central portion of Kingfisher County, the site was established south of the town of Dover on US Highway 81. The station is positioned near the midpoint of stream segment 620910020010 and is classified within the Lower Cimarron River - Skeleton Creek 8 digit HUC watershed (11050002). Water enters the stream system from several tributaries including Indian Creek, Deep Creek, Hoyle Creek, Salt Creek, Cooper Creek, Turkey Creek, and Kingfisher Creek, among others.

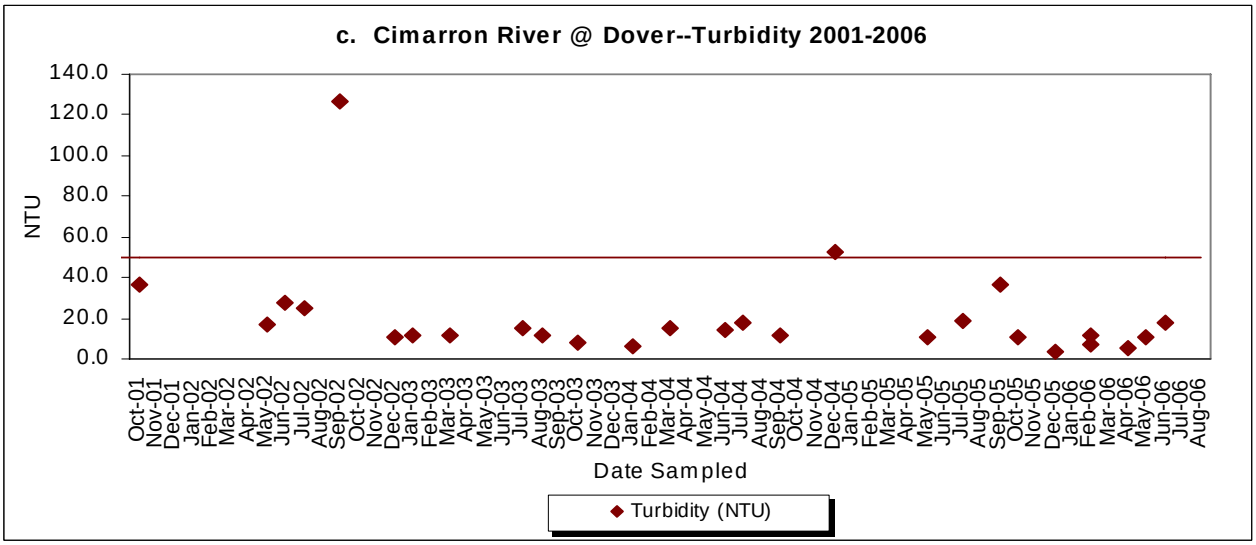
This station on the Cimarron River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of Indian Creek (98.2968, 36.2762) downstream to confluence of the Cimarron River with Kingfisher Creek (97.8787, 35.9308). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 7a), pH (Figure 7b), turbidity (Figure 7c) and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 7d and e). Of the forty-two (42) total dissolved solids concentrations, thirteen (13) samples (or 31%) exceeded the prescribed sample standard of 10028 mg/L, and the geometric mean (8498.3 mg/L) exceeded the yearly mean standard (7437 mg/L). Of the forty-four (44) chloride concentrations, eight (8) samples (or 18%) exceeded the prescribed sample standard of 10028 mg/L. Sulfate concentrations met the prescribed segment-specific criteria. The PBCR beneficial use is not supported (Table 9). Of the nineteen (19) *E. coli* concentrations, 4 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (338.6 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. Of the 19 enterococci concentrations, nine (9) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (178.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 7f).

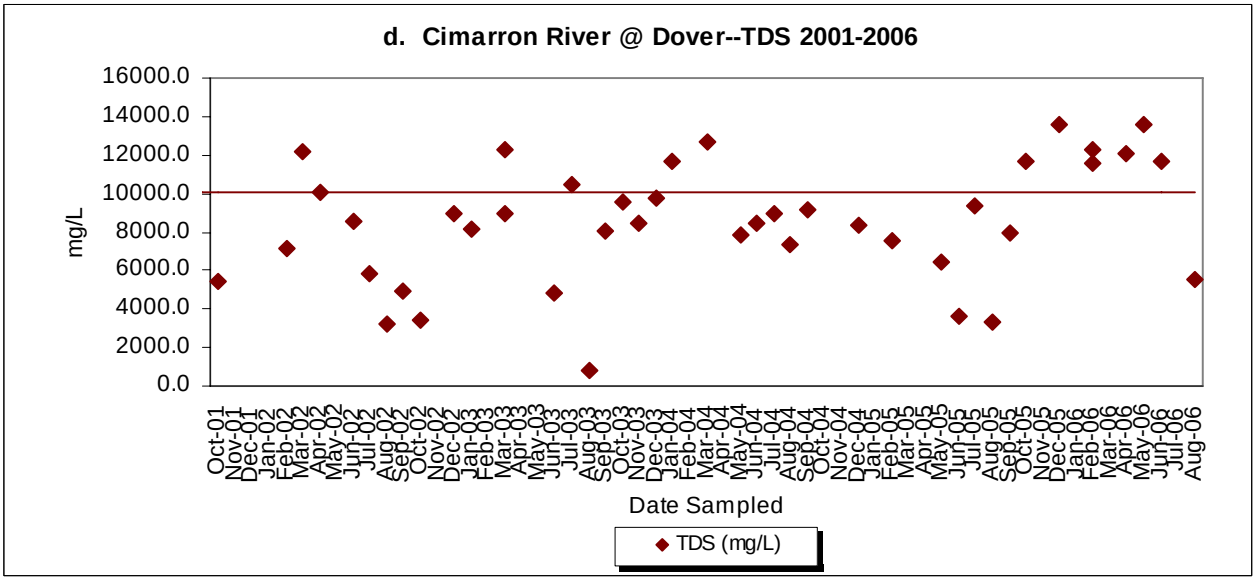
Figure 7a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Dover (AT159100), 2001-2006.

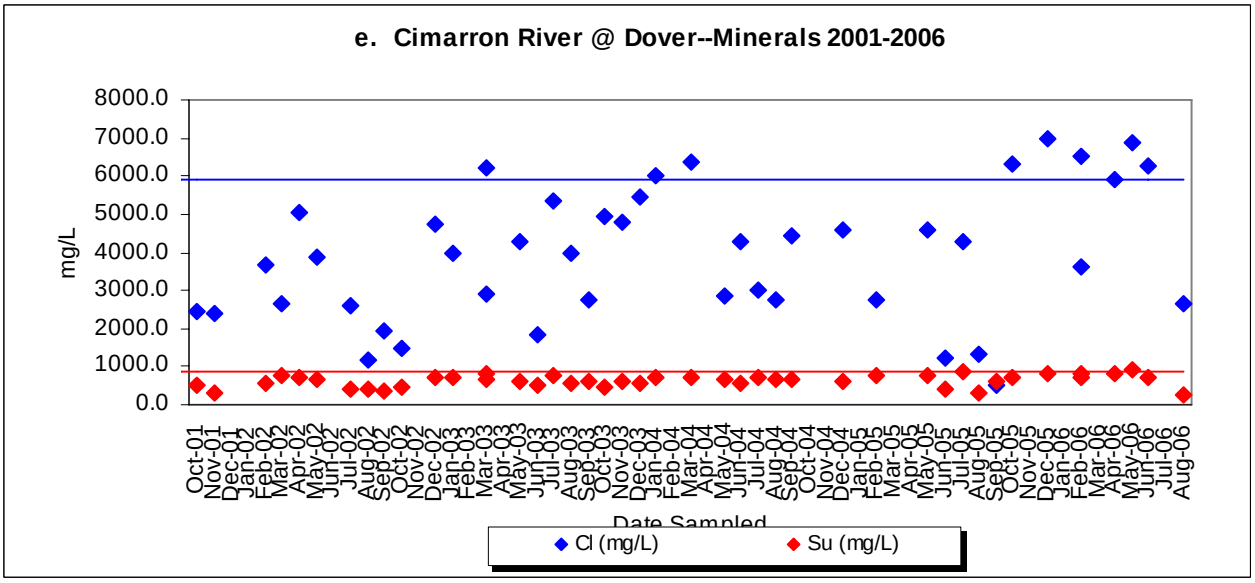


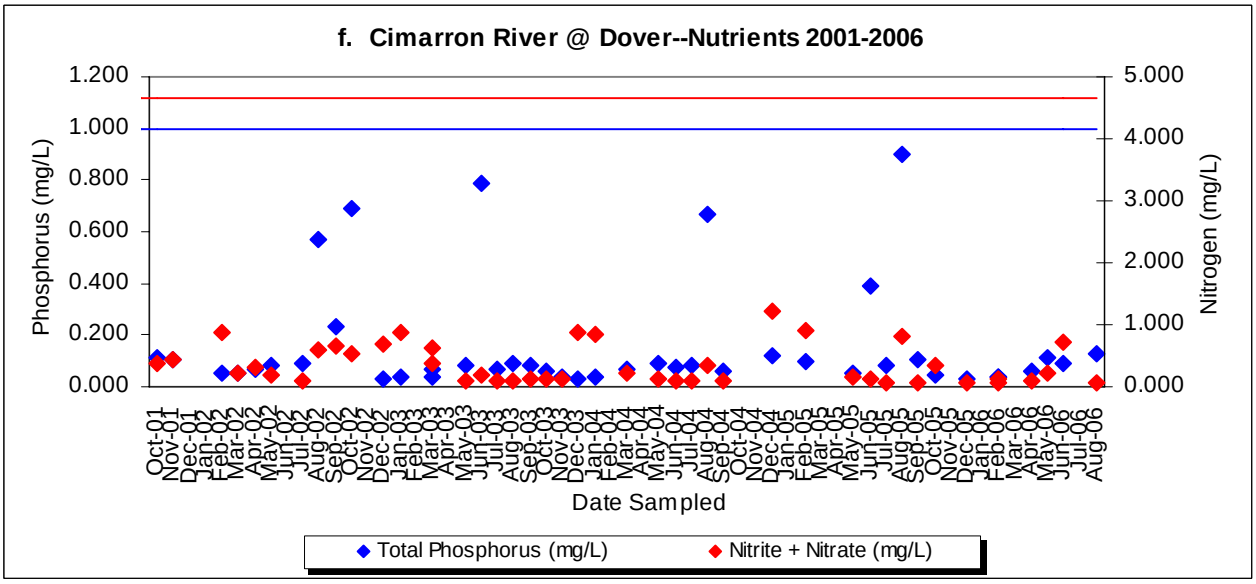




HUC 1105


d. Cimarron River @ Dover--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Cimarron River @ Dover--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Dover--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

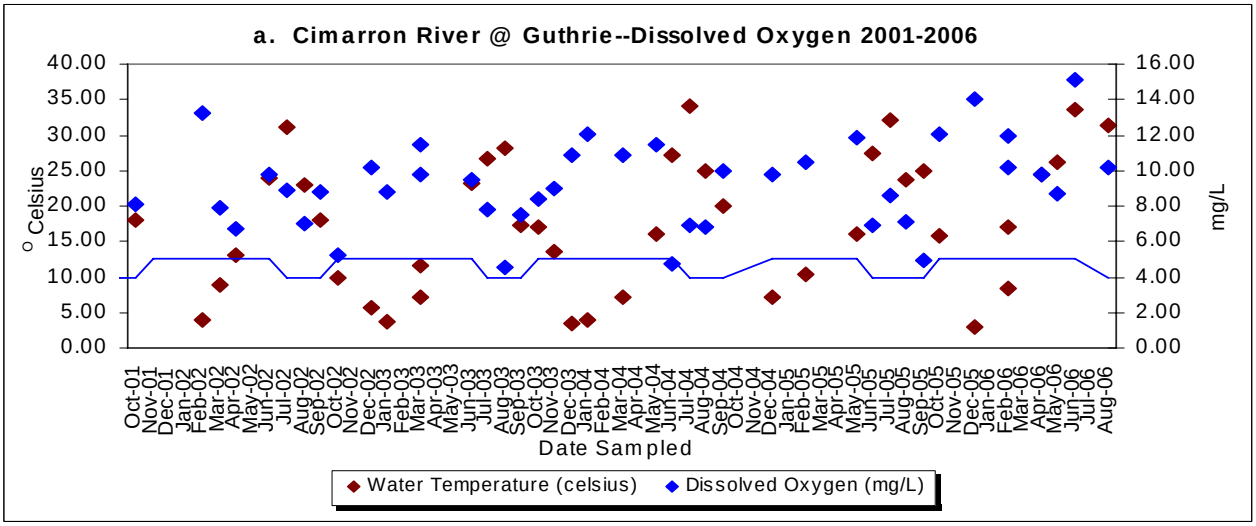
Cimarron River near Guthrie

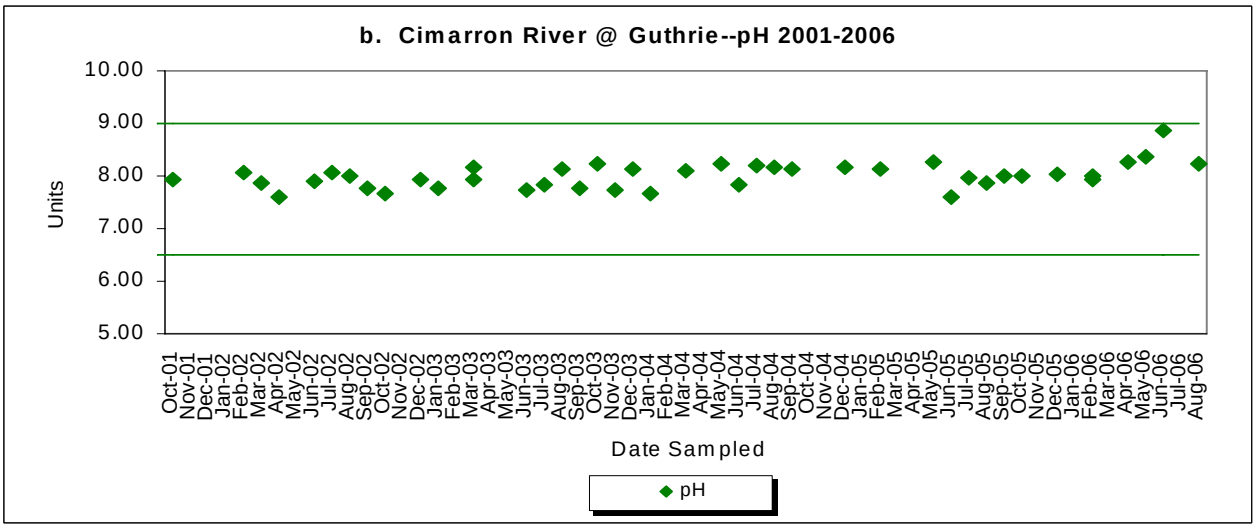
Station AT160000 (620910010010-001AT) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the central portion of Logan county, the site was established north of the city of Guthrie on US Highway 77. The station is positioned near the upper end of stream segment 620910010010 and is classified within the Lower Cimarron River - Skeleton Creek 8 digit HUC watershed (11050002). Water enters the stream system from several tributaries including Kingfisher Creek, Cottonwood Creek, and Skeleton Creek, among others.

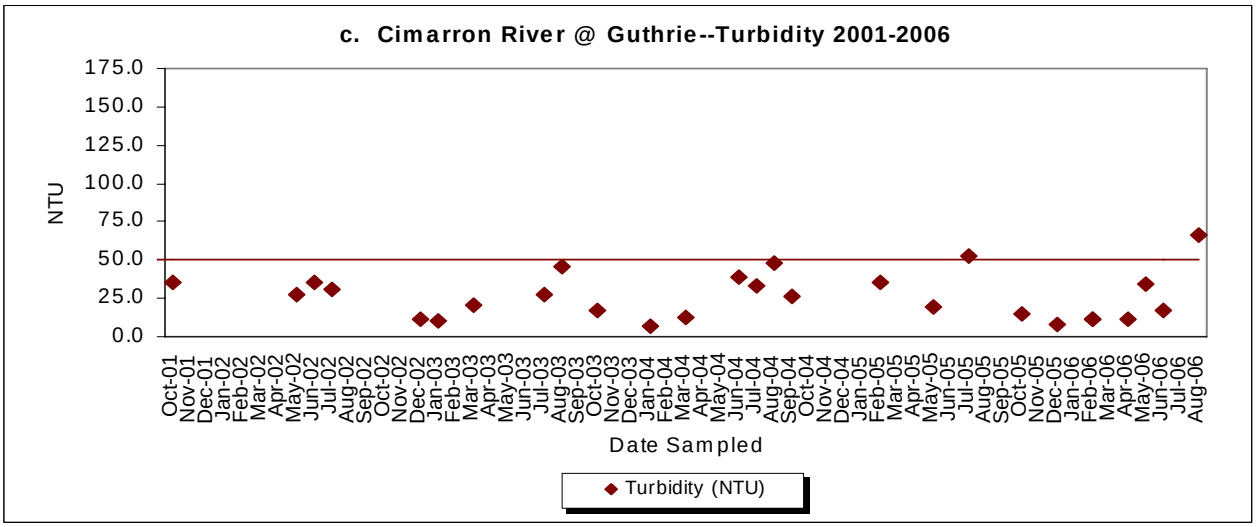
This station on the Cimarron River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of Kingfisher Creek (97.8787, 35.9308) downstream to confluence of the Cimarron River with Skeleton Creek (97.3975, 35.9875). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 8a), pH (Figure 8b), turbidity (Figure 8c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 8d and e). The PBCR beneficial use is not supported (Table 9). Of the seventeen (17) fecal coliform concentrations, 5 samples (or 29%) exceeded the prescribed screening level of 400 cfu/mL. Of the eighteen (18) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (55.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (24.9 mg/M^3) produced a TSI of 62, which is at or above the threshold TSI of 62. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 8f).

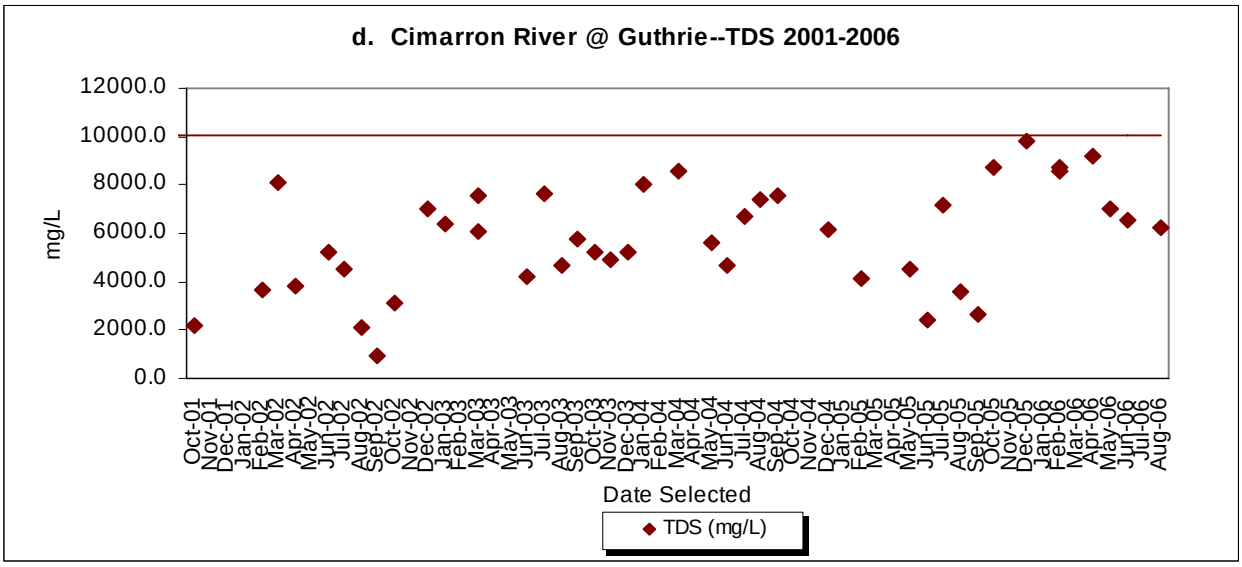
Figure 8a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Guthrie (AT160000), 2001-2006.

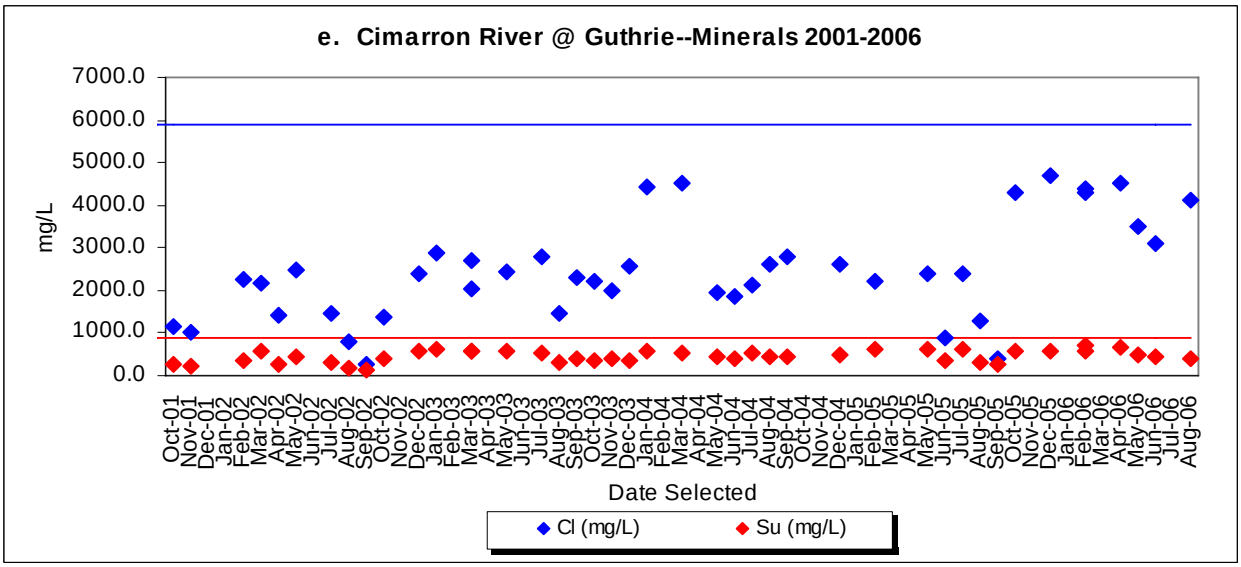


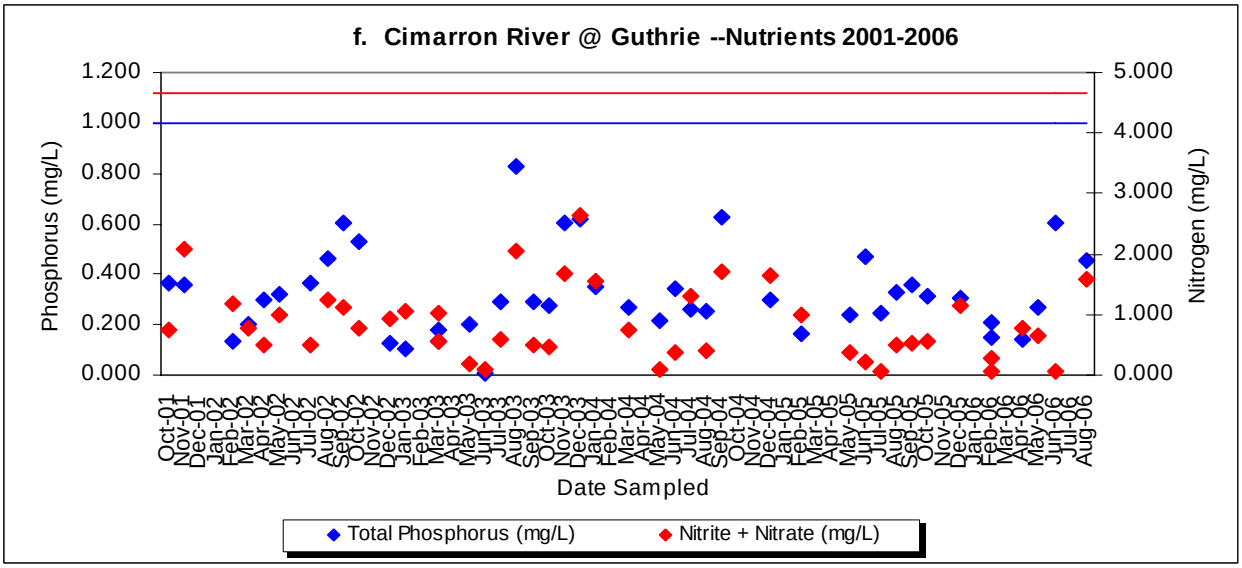




HUC 1105


d. Cimarron River @ Guthrie--TDS 2001-2006
mg/L
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Selected
TDS (mg/L)


e. Cimarron River @ Guthrie--Minerals 2001-2006
mg/L
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
Date Selected
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Guthrie --Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

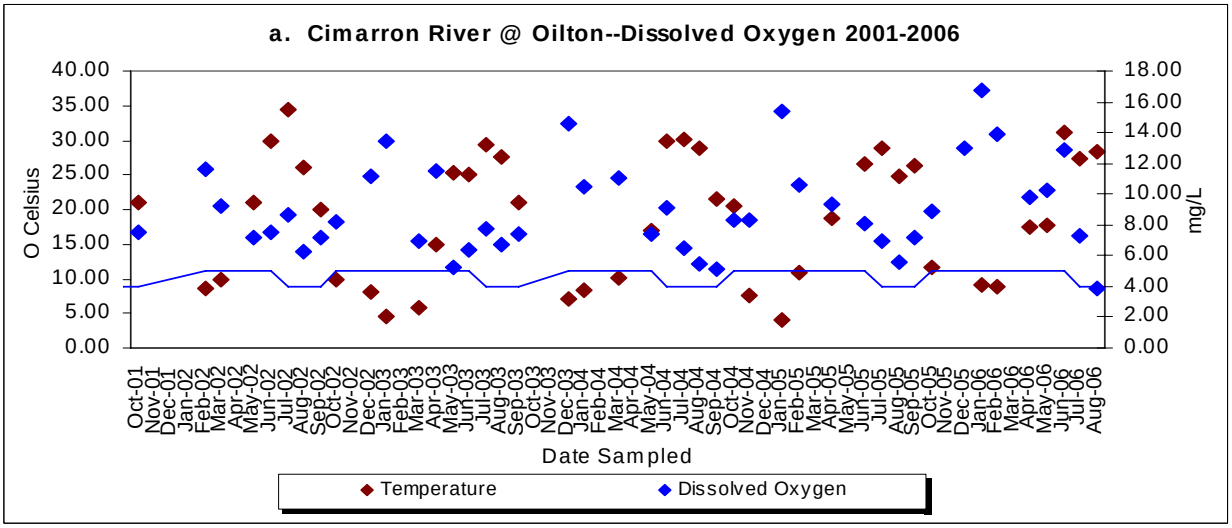
Cimarron River near Oilton

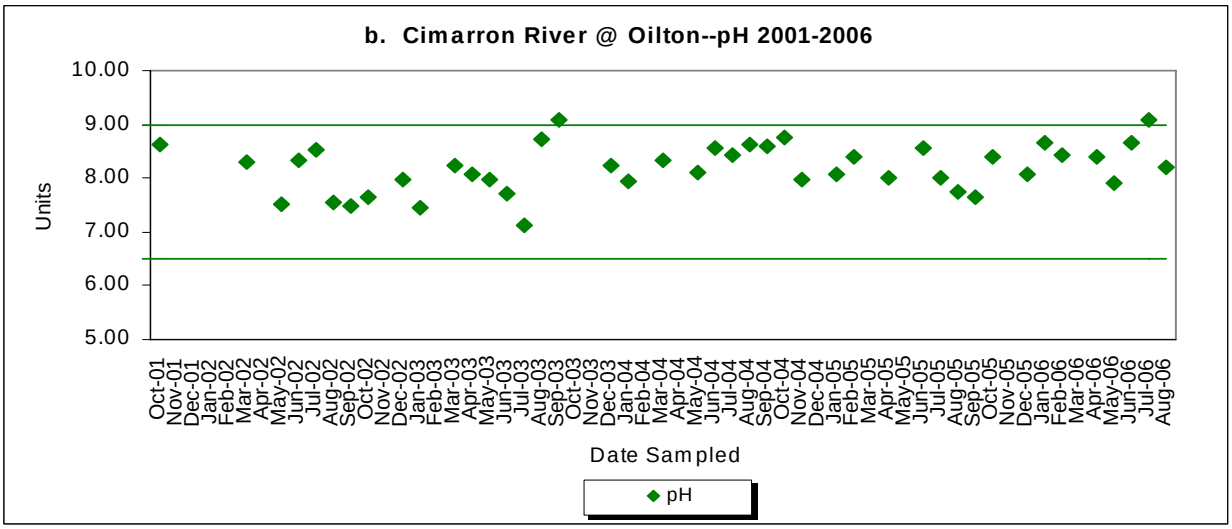
Station AT161500 (620900010170-001AT) is a permanent ambient trend monitoring station near the terminal end of the Cimarron River in Oklahoma. Situated in the northwestern portion of Creek County, the site was established north of the town of Oilton on State Highway 99. The station is positioned near the midpoint of stream segment 620900010170 and is classified within the Lower Cimarron River 8-digit HUC watershed (11050003). Water enters the stream system from several tributaries including Salt Creek, Skull Creek, Euchee Creek, and Tiger Creek, among others.

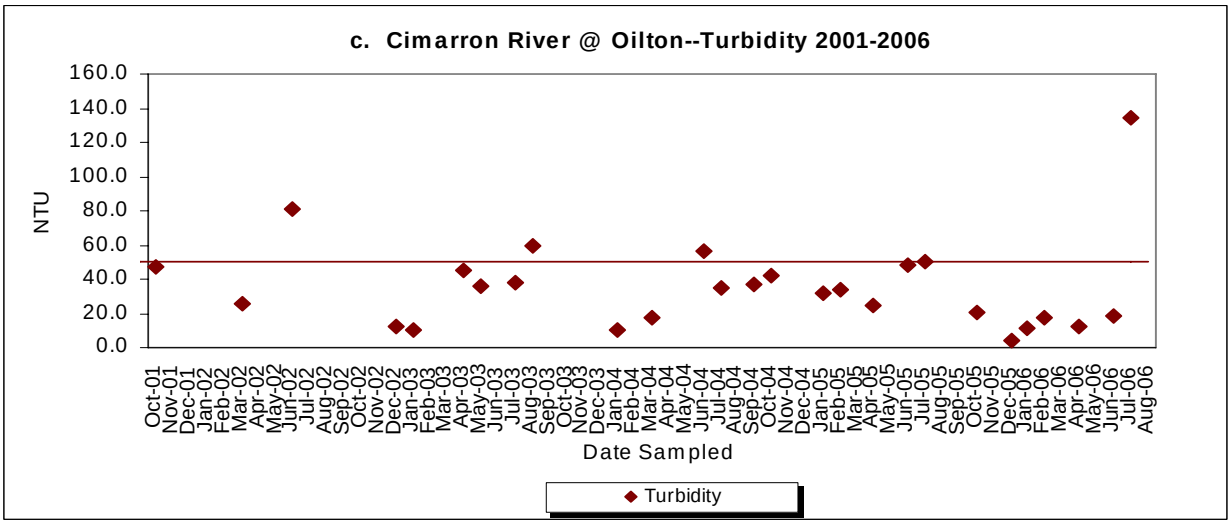
This station on the Cimarron River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of Salt Creek (96.7212, 36.0928) downstream to confluence of the Cimarron River with Keystone Reservoir (96.4829, 36.1160). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported Of the twenty-eight (28) turbidity samples (Figure 9c), four (4) samples (or 14%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 9a), pH (Figure 9b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (d and e). The PBCR beneficial use is not supported (Table 9). Of the twenty (20) fecal coliform concentrations, 7 samples (or 35%) exceeded the prescribed screening level of 400 cfu/mL. Of the nineteen (19) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (127.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 9f).

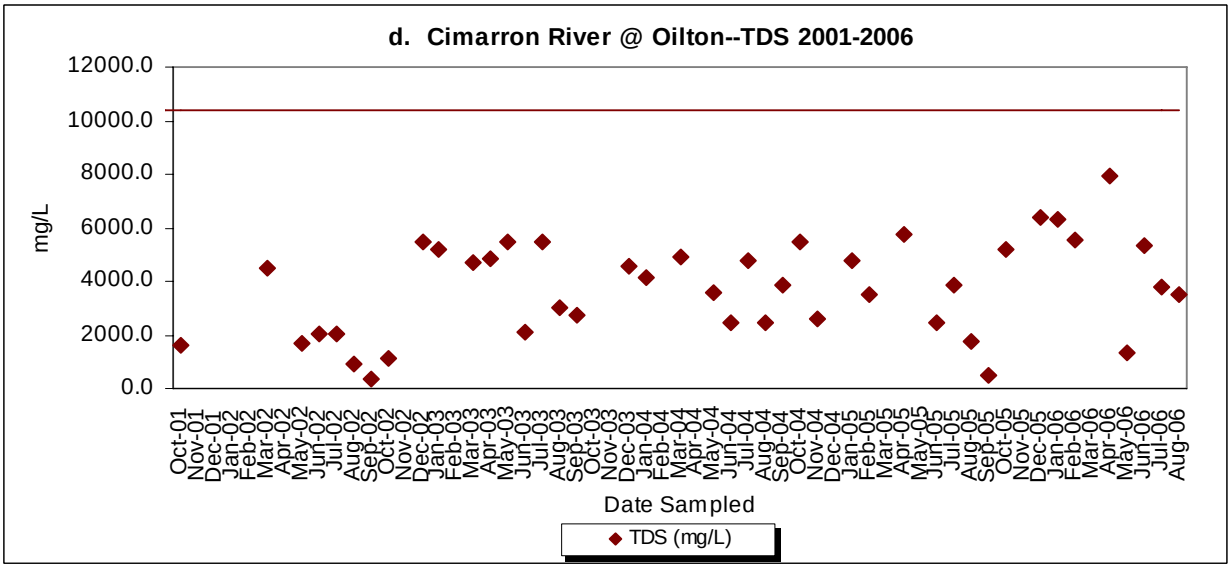
Figure 9a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Oilton (AT161500), 2001-2006.

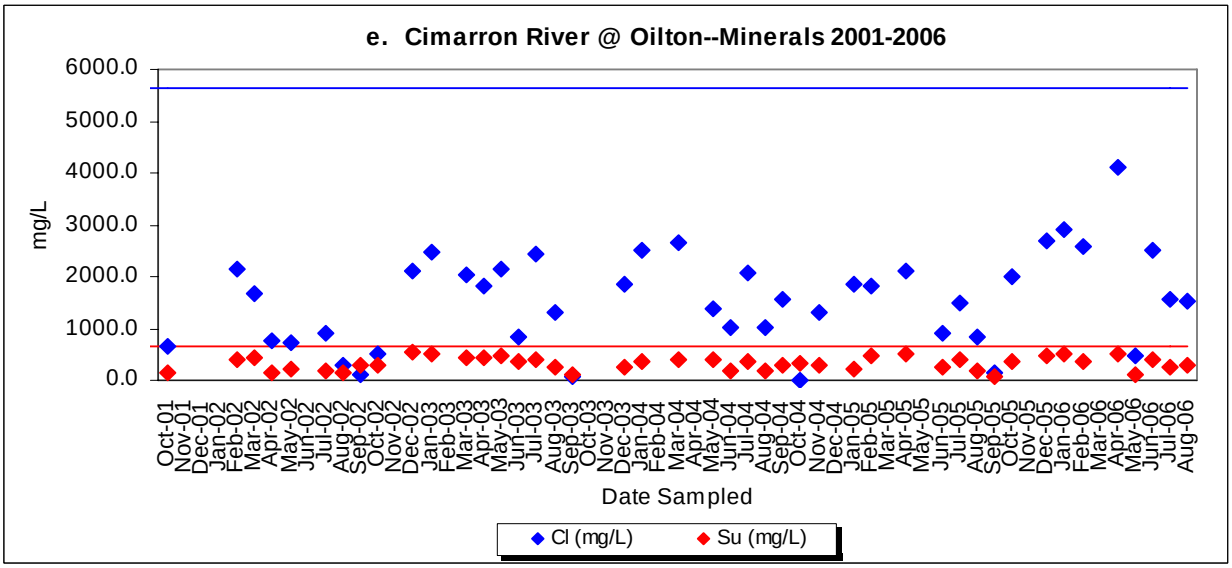


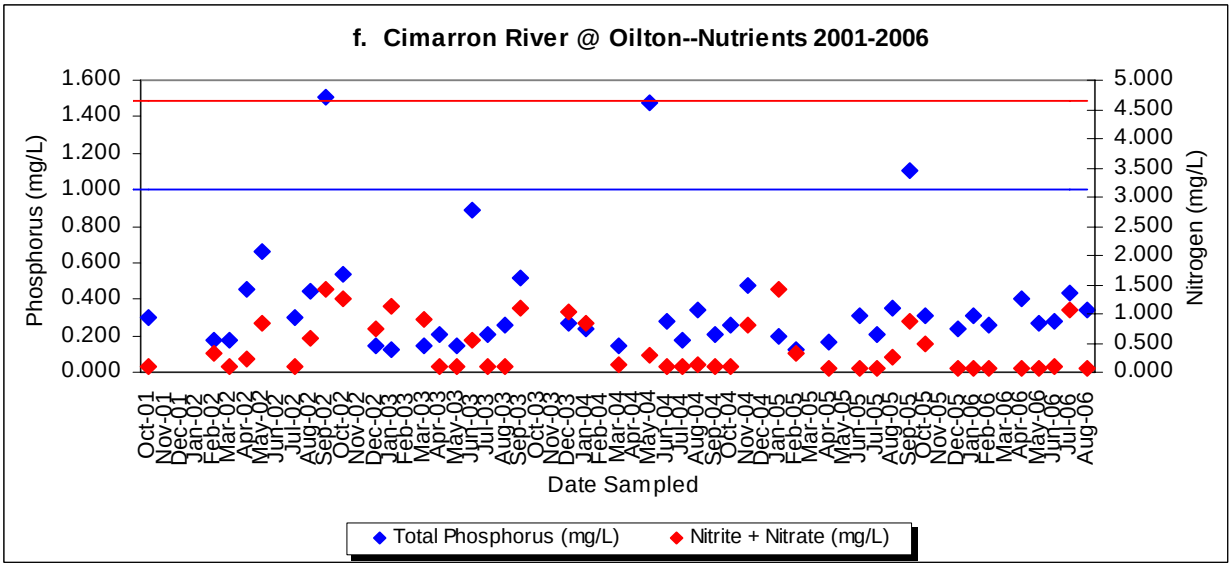




HUC 1105


d. Cimarron River @ Oilton--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Cimarron River @ Oilton--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Oilton--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

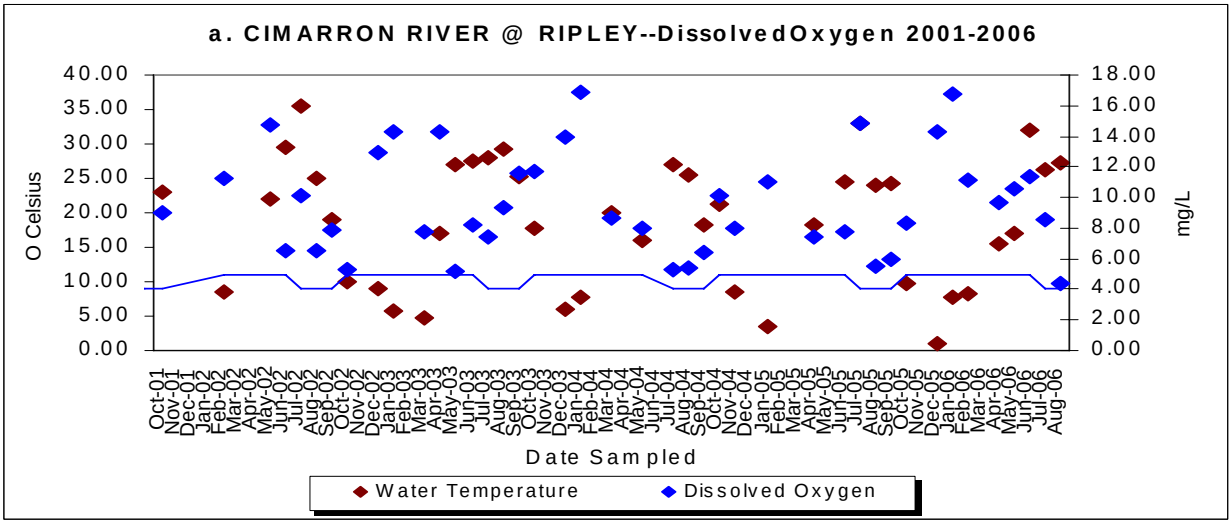
Cimarron River near Ripley

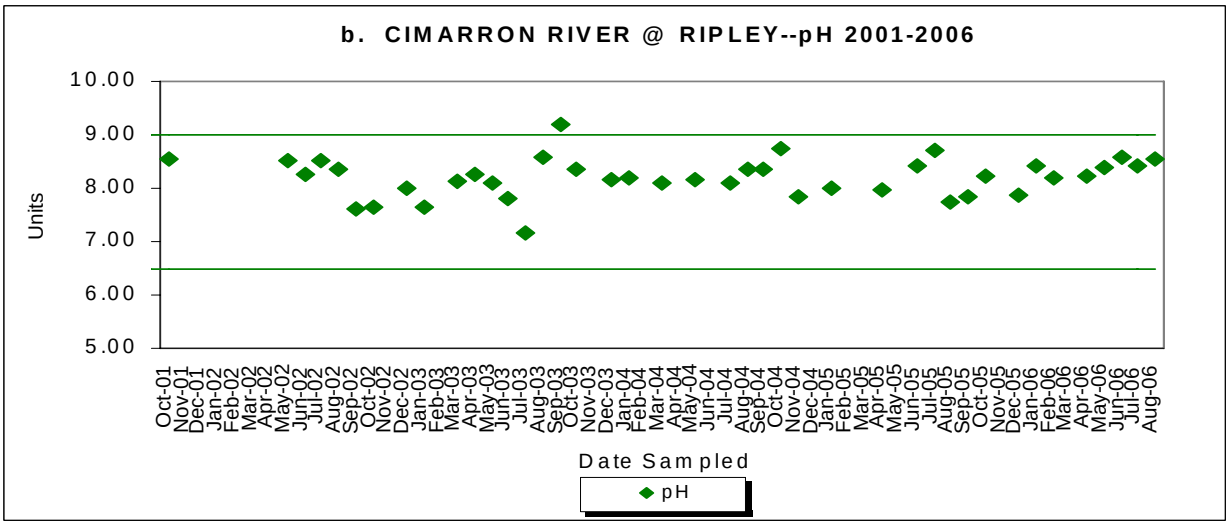
Station AT161450 (620900030010-001AT) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the south central portion of Payne County, the site was established south of the town of Ripley on State Highway 33. The station is positioned near the terminal end of stream segment 620900030010 and is classified within the Lower Cimarron River 8 digit HUC watershed (11050003). Water enters the stream system from Skeleton Creek, Beaver Creek, Fitzgerald Creek (Langston Lake), Dugout Creek, and Sand Creek, among others.

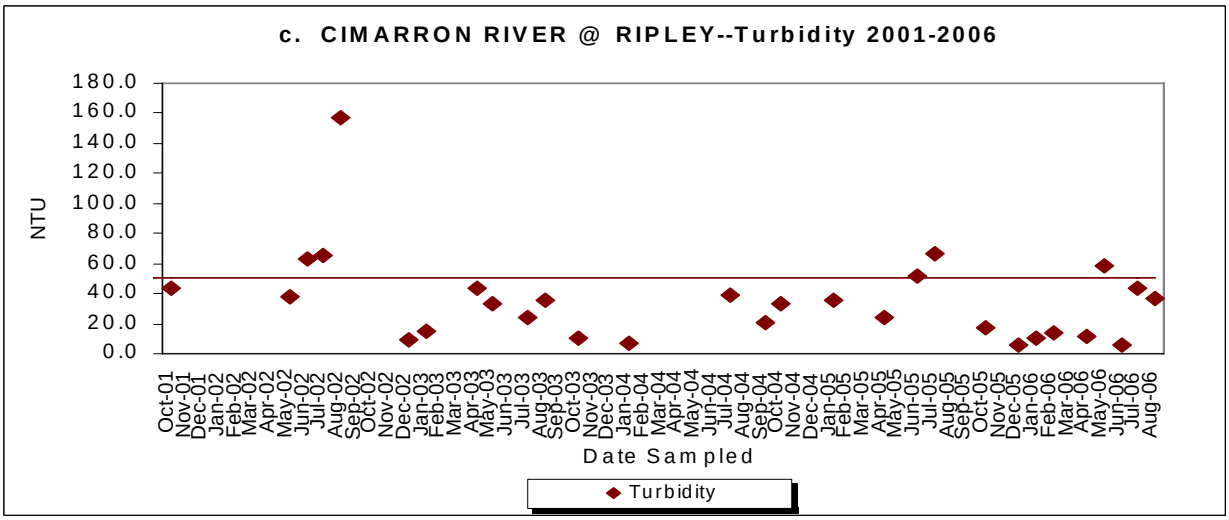
This station on the Cimarron River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of Skeleton Creek (97.3975, 35.9875) downstream to the confluence of the Cimarron River with Stillwater Creek (-96.9149, 36.0230). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported. Of the twenty-nine (29) turbidity samples (Figure 10c), six (6) samples (or 21%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 10a), pH (Figure 10b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 10d and e). The PBCR beneficial use is not supported (Table 9). Of the twenty (20) enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (67.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 10f).

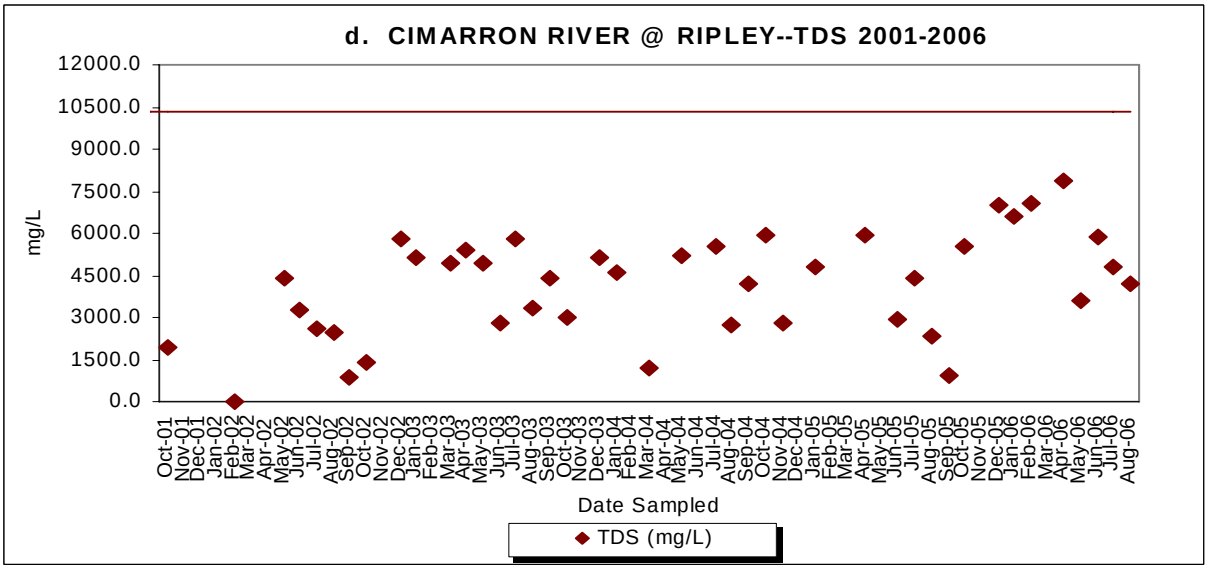
Figure 10a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Ripley (AT161450), 2001-2006.

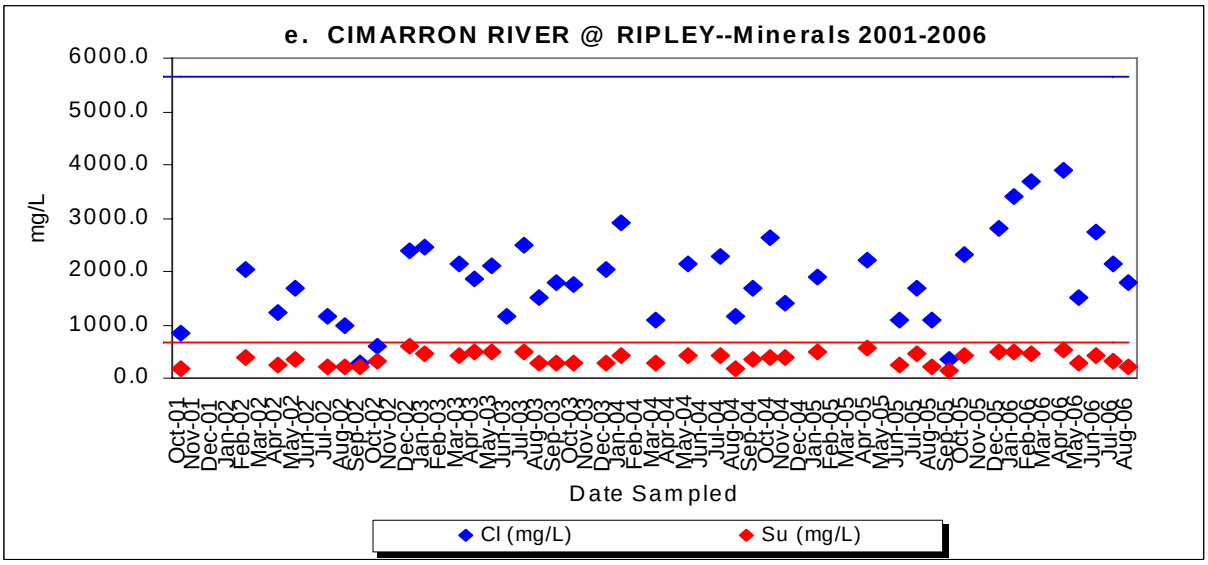


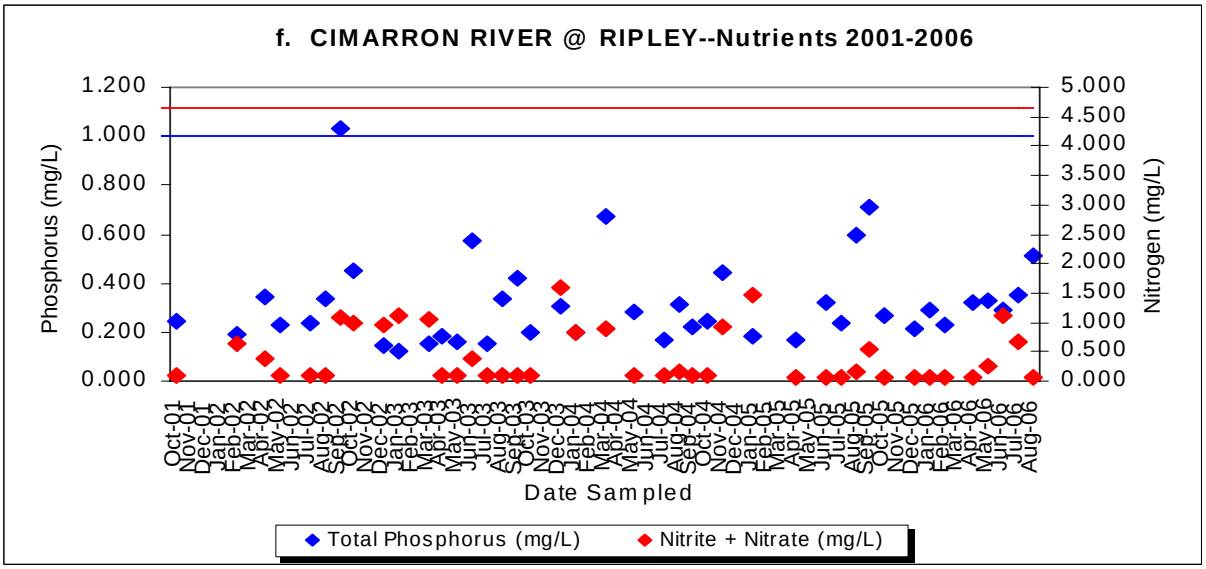




HUC 1105


d. CIMARRON RIVER @ RIPLEY--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. CIMARRON RIVER @ RIPLEY--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. CIMARRON RIVER @ RIPLEY--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

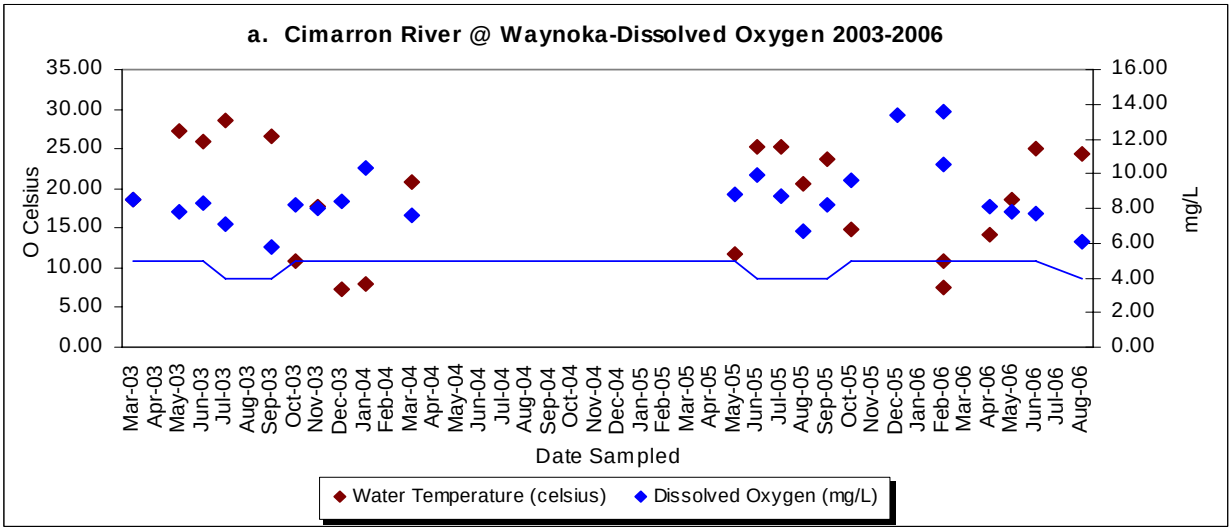
Cimarron River near Waynoka

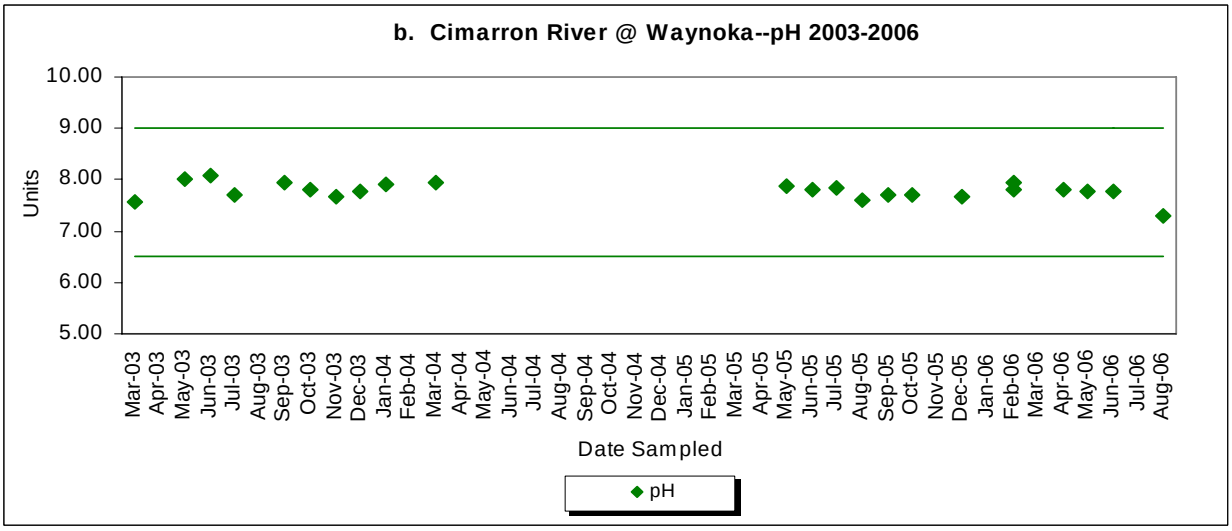
Station AT158000 (620920020010-001RS) is a permanent ambient trend monitoring station located on the Cimarron River in Oklahoma. Situated in the south central portion of Woods County, the site was established south of the town of Waynoka on US Highway 281. The station is positioned near the end of stream segment 620920020010 and is classified within the Lower Cimarron River - Eagle Chief Creek 8 digit HUC watershed (11050001). Water enters the stream system from several tributaries including Traders Creek, Long Creek, Doe Creek, Whitehorse Creek, and Chimney Creek, among others.

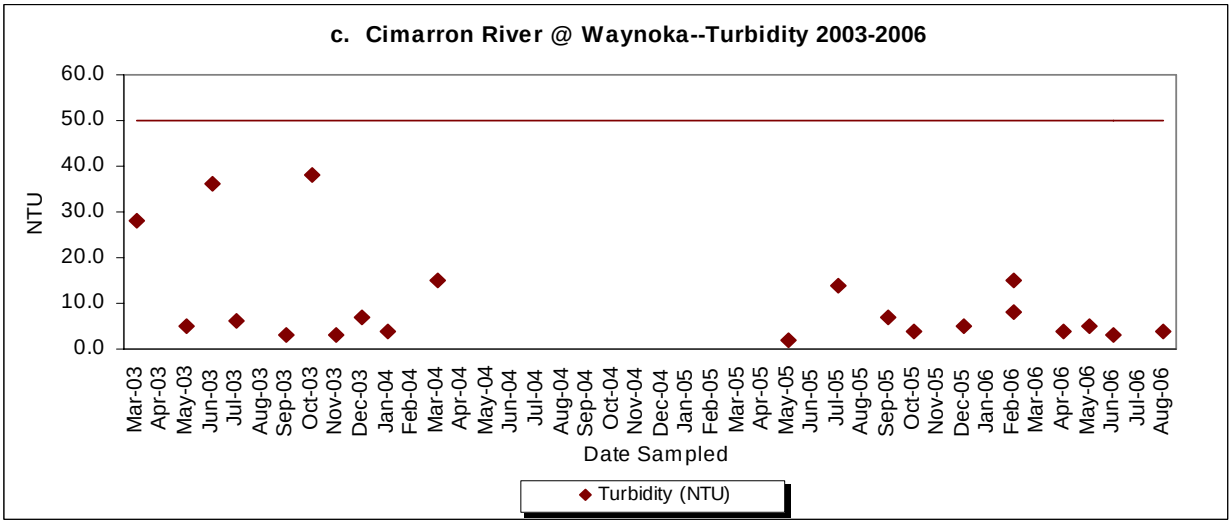
This station on the Cimarron River has been active for all water quality variables since March of 2003. The following assessment of beneficial uses is based on data collected from March of 2003 through August of 2006. For purposes of reporting, this station is representative of the Cimarron River from the confluence of the Cimarron River with Buffalo Creek (99.2166, 36.7869) downstream to confluence of the Cimarron River with Main Creek (98.8753, 36.5154). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported. Fish collected during the summer of 2004 indicate that the segment is not supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, samples from the Waynoka station had a sample composition score of 6 (maximum 30) and a fish condition score of 11 (maximum 15) for a total score of 17. This is below the non-supporting threshold of 19 for Central Great Plains warm water aquatic communities [OAC 46:15-5(l)]. Dissolved oxygen (Figure 11a), pH (Figure 11b), and turbidity (Figure 11c) samples met the criteria prescribed in the WWAC beneficial use. Toxicant data are not available for this station. The AG beneficial use is not supported (d and e). Of the twenty-four (24) total dissolved solids concentrations, eighteen (18) samples (or 74%) exceeded the sample standard of 14955.0 mg/L, and the geometric mean (16577.0 mg/L) exceeded the yearly mean standard (10353 mg/L). Of the 24 chloride concentrations, nineteen (19) samples (or 79%) exceeded the sample standard of 6556.0 mg/L, and the geometric mean (8079.8 mg/L) exceeded the yearly mean standard (4430.0 mg/L). Sulfate concentrations met the prescribed segment-specific criterion. The PBCR beneficial use status cannot be determined at this time due to insufficient data. This segment of the Cimarron River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 11f).

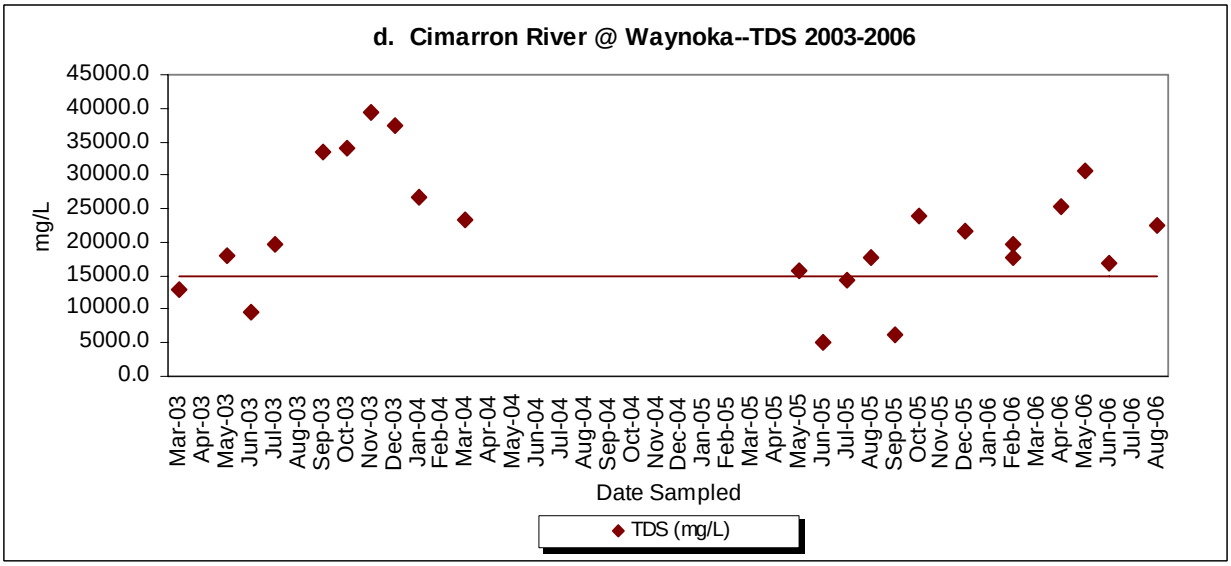
Figure 11 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Cimarron River at Waynoka (AT158000), 2003-2006.

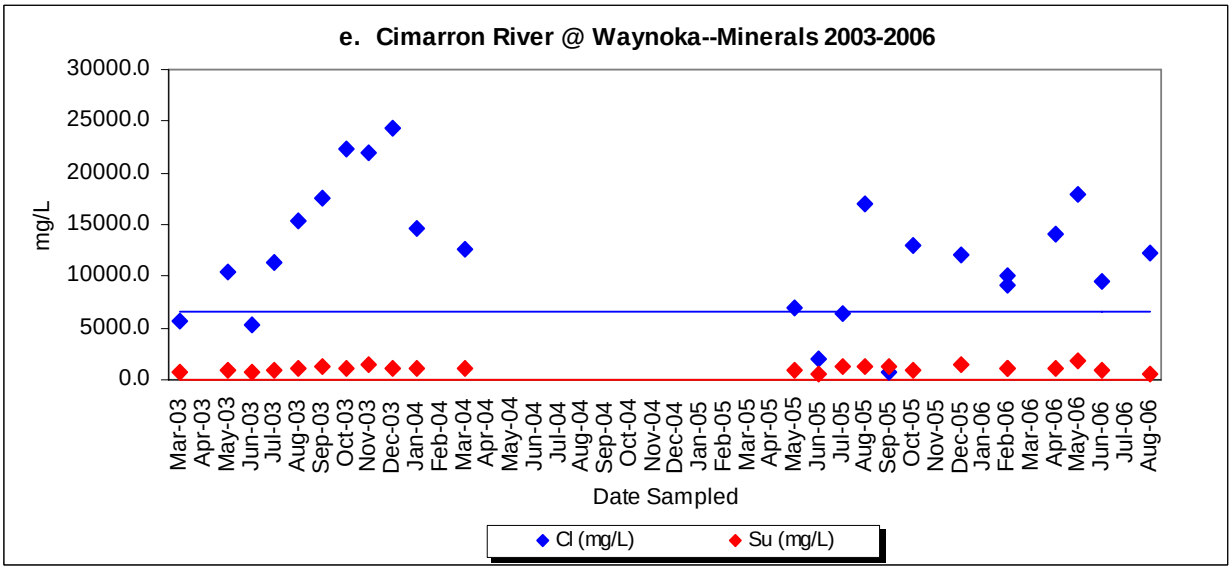


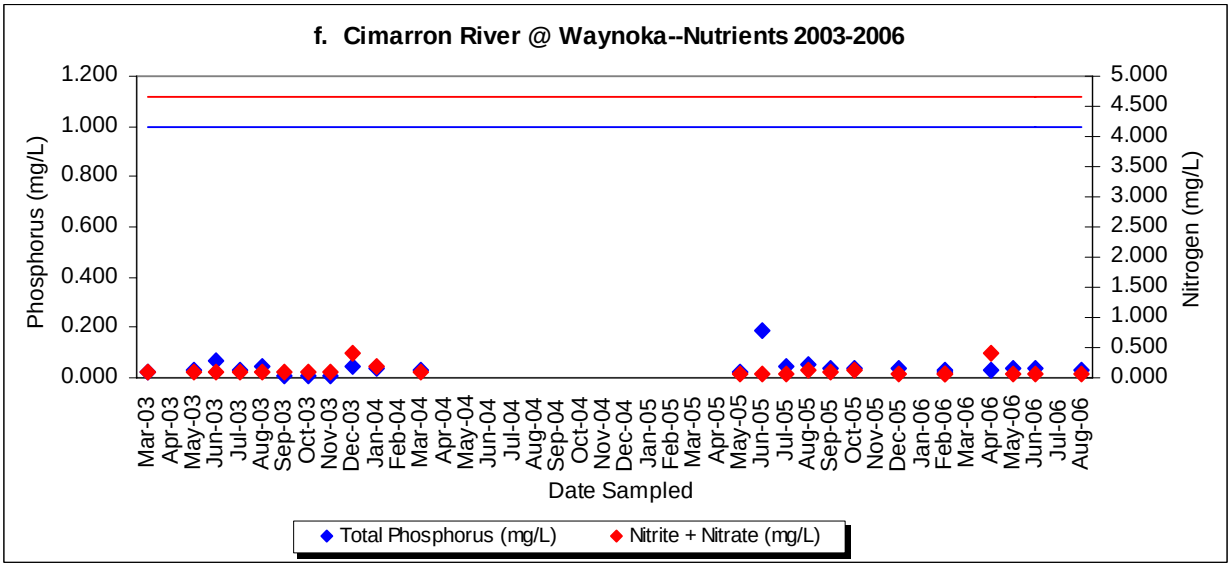




HUC 1105


d. Cimarron River @ Waynoka--TDS 2003-2006
mg/L
45000.0
40000.0
35000.0
30000.0
25000.0
20000.0
15000.0
10000.0
5000.0
0.0
Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06
Date Sampled
TDS (mg/L)


e. Cimarron River @ Waynoka--Minerals 2003-2006
mg/L
30000.0
25000.0
20000.0
15000.0
10000.0
5000.0
0.0
Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Cimarron River @ Waynoka--Nutrients 2003-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

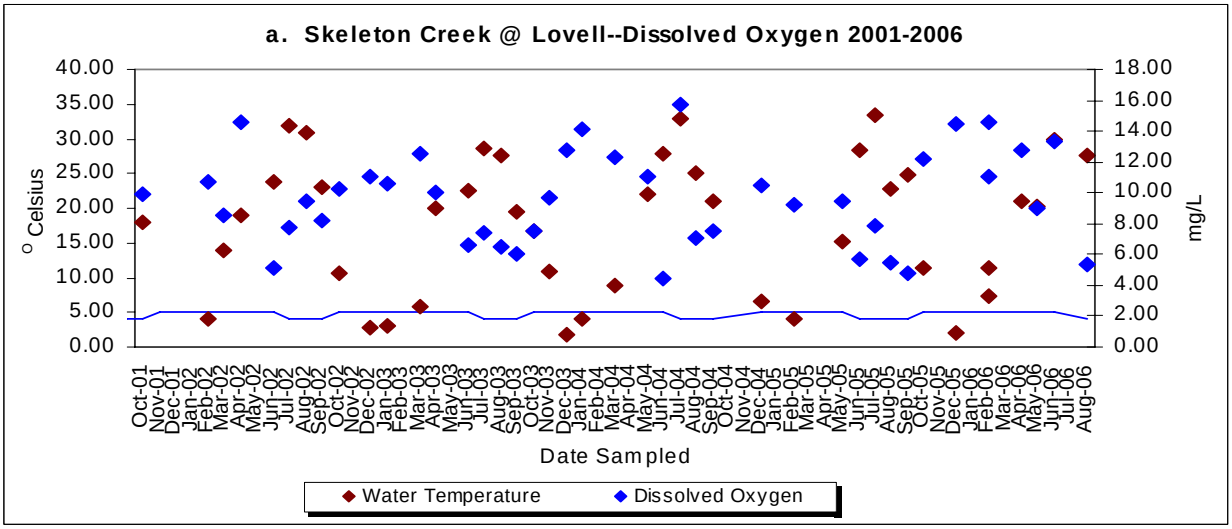
Skeleton Creek near Lovell

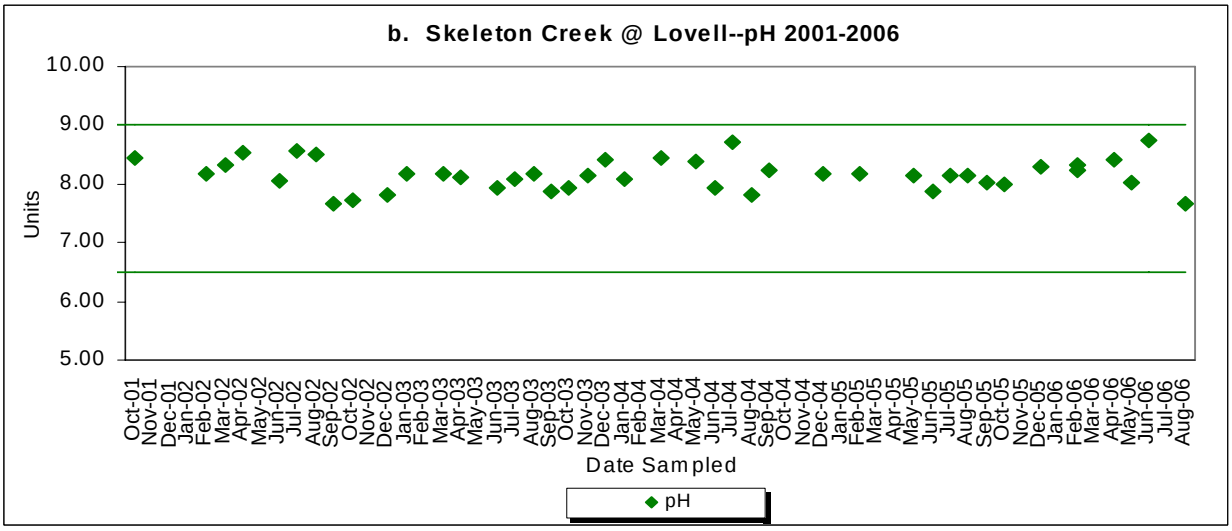
Station AT160500 (620910030010-001AT) is a permanent ambient trend monitoring station located on Skeleton Creek. Situated in the northwestern portion of Logan County, the site was established east northeast of the city of Lovell on State Highway 74. The station is positioned near the upper end of stream segment 620910030010 and is classified within the Lower Cimarron River - Skeleton Creek 8 digit HUC watershed (11050002). Water enters the stream system from several tributaries including Horse Creek, Otter Creek, and Wolf Creek, among others.

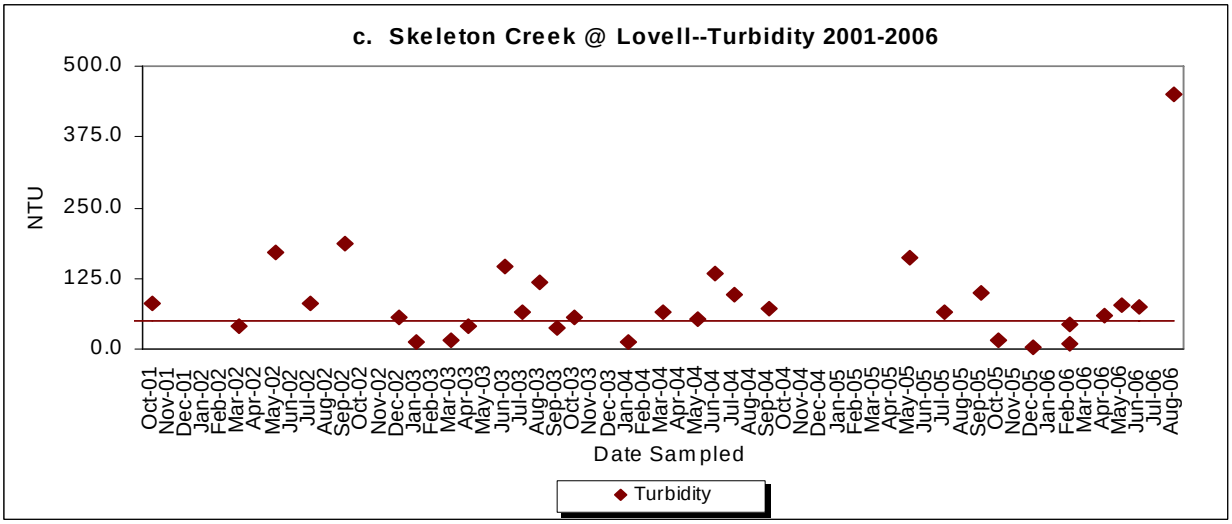
This station on Skeleton Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October 2001 through August of 2006. For purposes of reporting, this station is representative of Skeleton Creek from the confluence of Spring Creek (-97.7067, 36.1194) downstream to confluence of Skeleton Creek with the Cimarron River (97.3975, 35.9875). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-one (31) turbidity samples (Figure 12c), twenty-one (21) samples (or 68%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 12a), pH (Figure 12b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 12d and e). The PBCR beneficial use is not supported (Table 9). Of the twenty (20) fecal coliform concentrations, eight (8) samples (or 40%) exceeded the prescribed screening level of 400 cfu/mL. Of the 20 enterococci concentrations, nine (9) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (234.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Skeleton Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 12f).

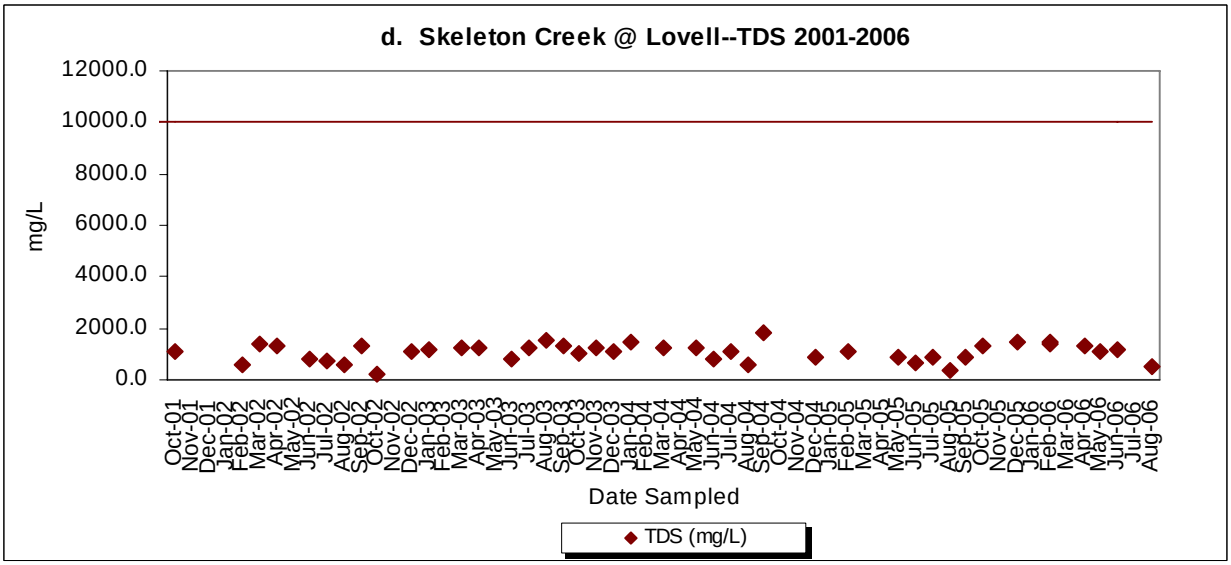
Figure 12 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Skeleton Creek at Lovell (AT160500), 2001-2006.

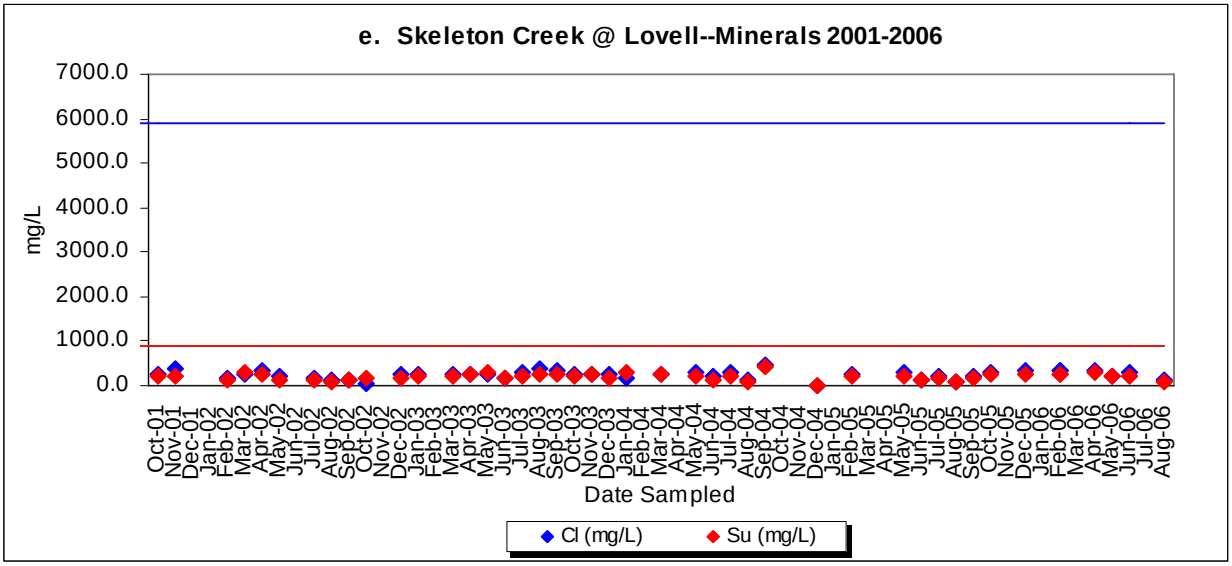


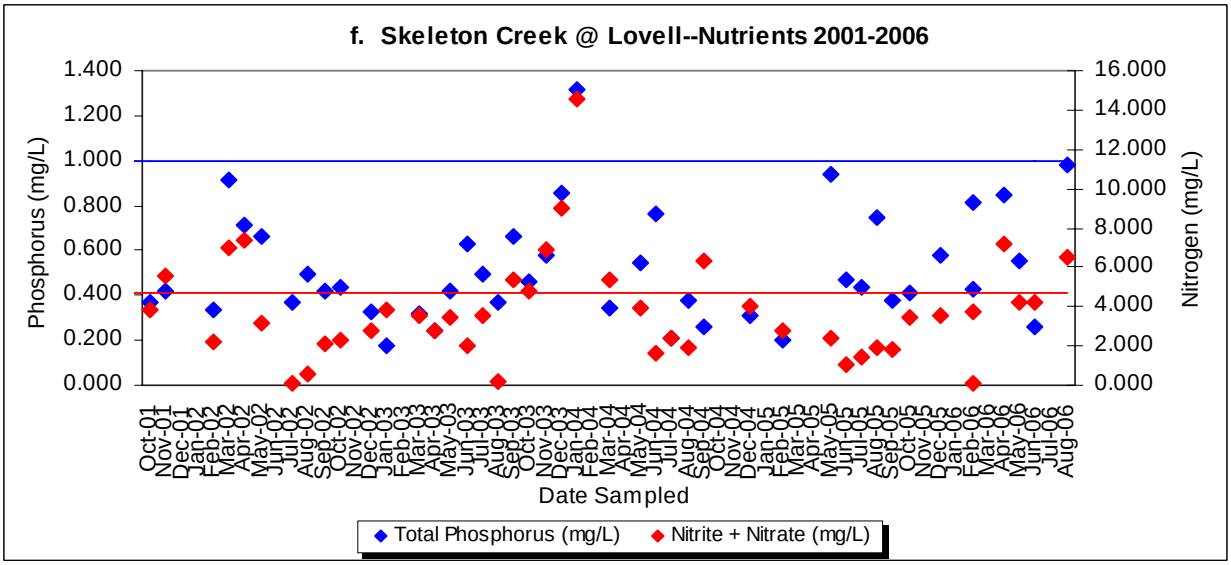




HUC 1105


d. Skeleton Creek @ Lovell--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Skeleton Creek @ Lovell--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Skeleton Creek @ Lovell--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1105

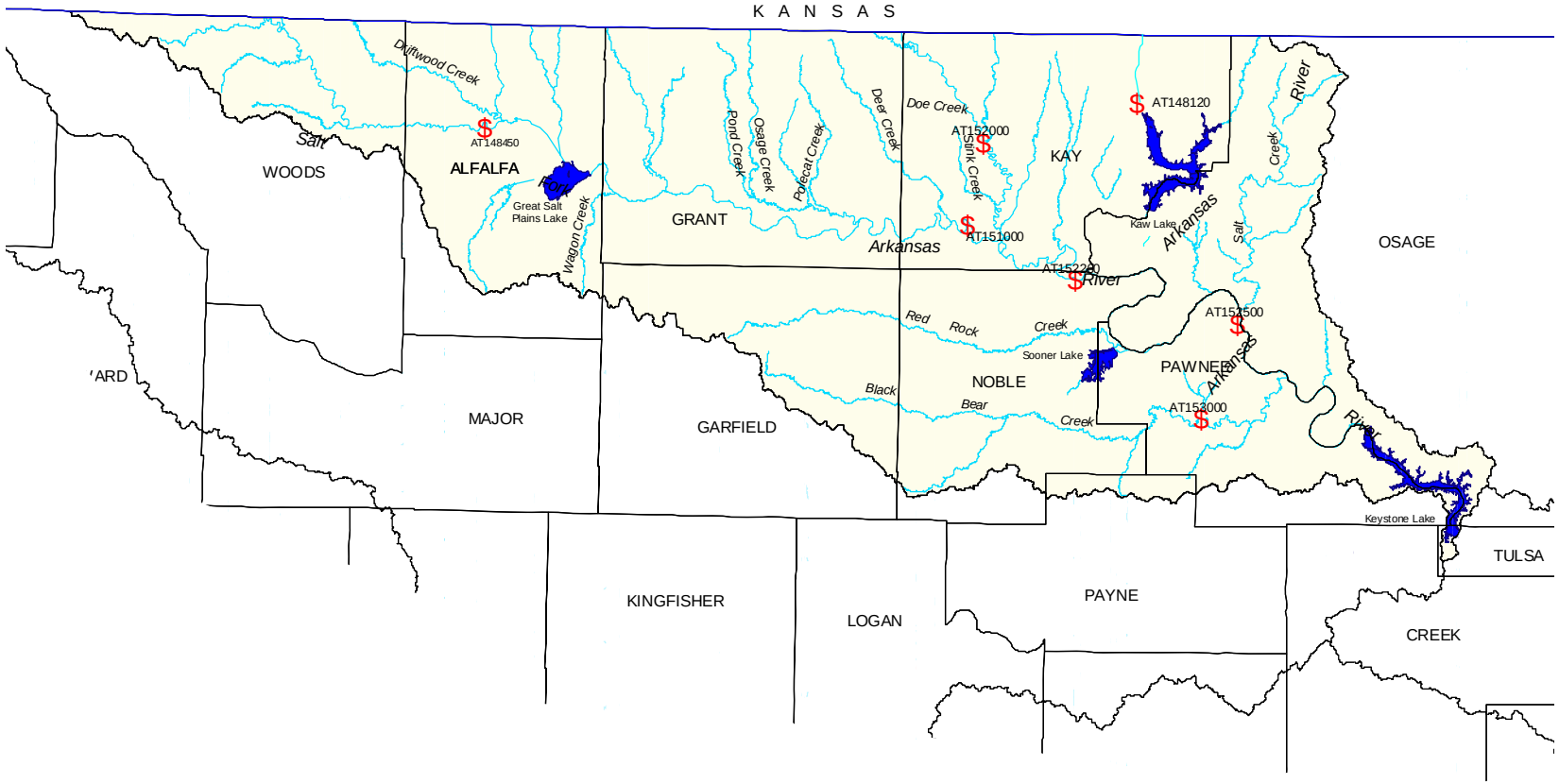


Plate 59
UPPER ARKANSAS SUBBASIN (HUC 1106)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1106

UPPER ARKANSAS SUB-BASIN

The Upper Arkansas sub-basin (4-digit hydrologic unit 1106) is situated in the north central portion of the state. It originates in the northeast portion of Woods County, continues eastward through portions of Alfalfa, Grant, Garfield, Kay, Noble, and Payne Counties and terminates in the western part of Osage County and northern one-half (½) of Pawnee County. Major cities and County seats located within the sub-basin include Alva, Ponca City, Perry, Pawnee, Tonkawa, Blackwell, and Cleveland. Minor cities of note include Cherokee, Medford, and Ralston.

The sub-basin is subdivided into six 8-digit hydrologic units (HUC) within the state. These HUC's are the Kaw Lake (11060001), the Upper Salt Fork of the Arkansas (11060002), the Medicine Lodge (11060003), the Lower Salt Fork of the Arkansas (11060004), the Chickaskia (11060005), and the Black Bear–Red Rock (11060006). The major surface water in the sub-basin is the upper Arkansas River. Major tributaries include the Salt Fork of the Arkansas River, the Chickaskia River, Black Bear Creek, Beaver Creek, Salt Creek, Sand Creek, Pond Creek, Deer Creek, Bois d'Arc Creek, and Red Rock Creek. Three major lakes are located in the sub-basin— the Great Salt Plains Lake formed by the Salt Fork of the Arkansas River, Kaw Lake formed by the Arkansas River and Beaver Creek, Sooner Lake formed by Greasy Creek, and the Arkansas River arm of Keystone Lake. Five active permanent water quality-monitoring stations (Table 10) are located in the sub-basin—AT148450, AT152000, AT151000, AT152500, and AT153000. Two inactive water quality-monitoring stations (AT152260 and AT148120) are located in the sub-basin. These stations were last assessed in the 2001 and 2003 BUMP reports, respectively.

The sub-basin is characterized by four ecoregions. The Central Great Plains is the primary ecoregion beginning in the far western portion and continuing through the east part of the sub-basin. The Central Oklahoma/Texas Plains represent the eastern quarter (¼) of the sub-basin. The Flint Hills characterize the northeast portion of Kay County and part of Osage County. The Southwestern Tablelands typify portions of Woods County. The primary land usage in the sub-basin is cropland. It dominates the central part of the sub-basin from eastern Woods County to the east central parts of Kay and Noble Counties. Cropland is further interspersed through the far western and eastern portions. The secondary land use is rangeland (open grasslands, sand sagebrush, upland shrubs, eastern red cedar, and post oak–blackjack oak). Rangeland dominates the far western and eastern portions of the sub-basin as well the northeastern portion of Alfalfa County and the southern portion of Payne and Pawnee Counties. It is further interspersed throughout the sub-basin. The tertiary land use is forestland (bottomland hardwoods and post oak–blackjack oak) that dominates the eastern portion of Payne County and the north and eastern portions of Pawnee County. Forestland is also present in portions of Kay and Osage Counties. Other land uses of note are pastureland, woodlands, farmsteads, major urban areas, wetlands, and confined animal feeding operations.

Table 10. Permanent Ambient Trend Monitoring Stations Located in HUC 1106.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
621200010200	AT152500	Arkansas River, SH 18, Ralston	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
621200030010	AT153000	Black Bear Creek, SH 18, Pawnee	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
621100000010	AT152000	Chickaskia River, US 177, Blackwell	Active 11/98-P	AES, PPWS	NONE	FWP,PBCR, AG	NONE
621010010160	AT148450	Salt Fork of Arkansas River, SH 58, Ingersoll	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
621000010010	AT151000	Salt Fork of Arkansas River, US 77, Tonkawa	Active 10/00-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES	
PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 11. Toxicant exceedances in HUC 1106.

STATION #	STATION NAME	DATE	Lead (ug/L)
AT152000	Chickaskia River, US 177, Blackwell	11/14/2000	15.00
		04/04/2001	27.00
		01/22/2003	14.00

Table 12. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1106. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT152500	ARKANSAS RIVER, SH 18, RALSTON	07/26/2000		2200	
		05/08/2002		500	
		08/26/2002		1300	
		07/06/2004		2900	
AT153000	BLACK BEAR CREEK, SH 18, PAWNEE	06/21/2000		3000	
		05/09/2001		500	
		06/06/2001		1100	
		09/24/2001	2000		
		08/26/2002	9000	19000	
		09/23/2002	1000	2000	
		05/04/2004	1000		
		06/15/2004		1500	
		06/21/2004	1500	4100	
		07/06/2004	1700	2300	
		07/20/2004		600	
		08/09/2004		430	
		09/28/2004	4530		
AT152000	CHICKASKIA RIVER, US 177, BLACKWELL	06/21/2000	1030	2300	
		07/26/2000	2700	3800	
		06/06/2001	500	7000	
		09/24/2001	5100	11000	
		05/15/2002	1000	800	
		08/28/2002		1100	
		09/25/2002		1600	
		05/03/2004	2000	2000	
		06/21/2004	1200	3900	
		07/06/2004	8100	6700	
		07/19/2004		500	
		08/09/2004	1400	2100	
AT148450	SALT FORK OF ARKANSAS RIVER, SH 58, INGERSOLL	07/26/2000	2600		
		08/23/2000	730	480	
		09/20/2000	1600	9000	865
		05/08/2001	1700	4000	
		06/05/2001	700	1500	
		08/07/2001	700		
		09/24/2001	2000	3000	
		05/14/2002	15000	18000	4884
		06/05/2002	1800	8000	1222

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		07/10/2002	1400	15000	823
		08/27/2002	2000	13000	
		09/24/2002	4000	5000	581
		05/26/2003	500	5000	
		06/10/2003	800	11000	
		07/01/2003	900	600	422
		08/05/2003	3000	17000	1497
		08/12/2003	1100	1500	520
		09/02/2003	500	1900	
		09/16/2003	600	1000	
		10/01/2003		600	
AT151000	SALT FORK OF ARKANSAS RIVER, US 77, TONKAWA	05/09/2001		3000	
		06/04/2001		2000	
		07/09/2001		600	
		08/06/2001		1000	
		09/10/2001		700	
		05/15/2002		1500	
		07/10/2002		1900	
		09/25/2002		500	
		05/03/2004		700	
		06/21/2004		7700	
		07/06/2004		3900	
		07/19/2004		1400	
		08/09/2004		1200	

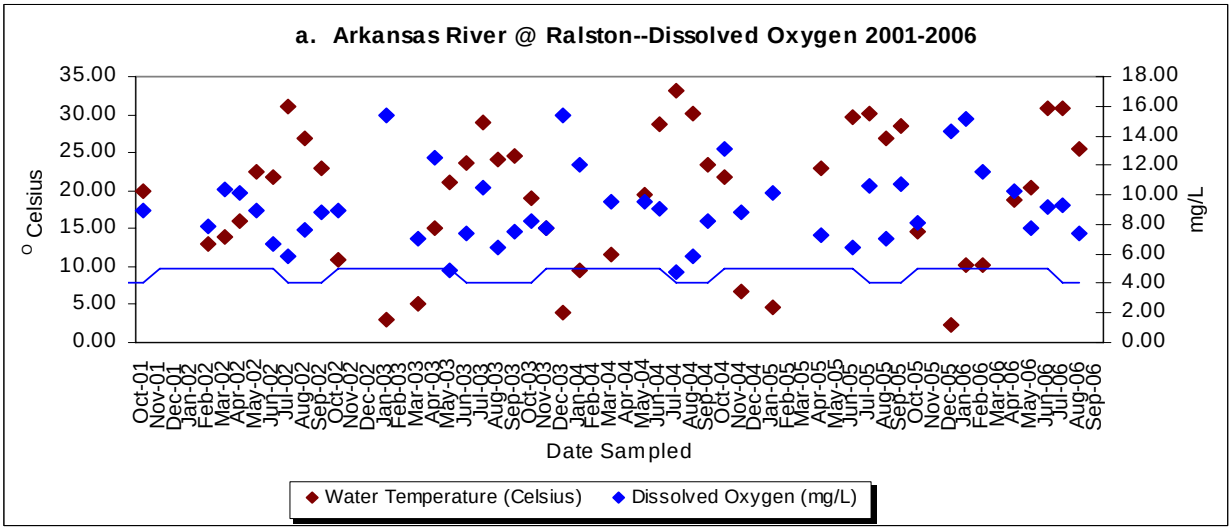
Arkansas River near Ralston

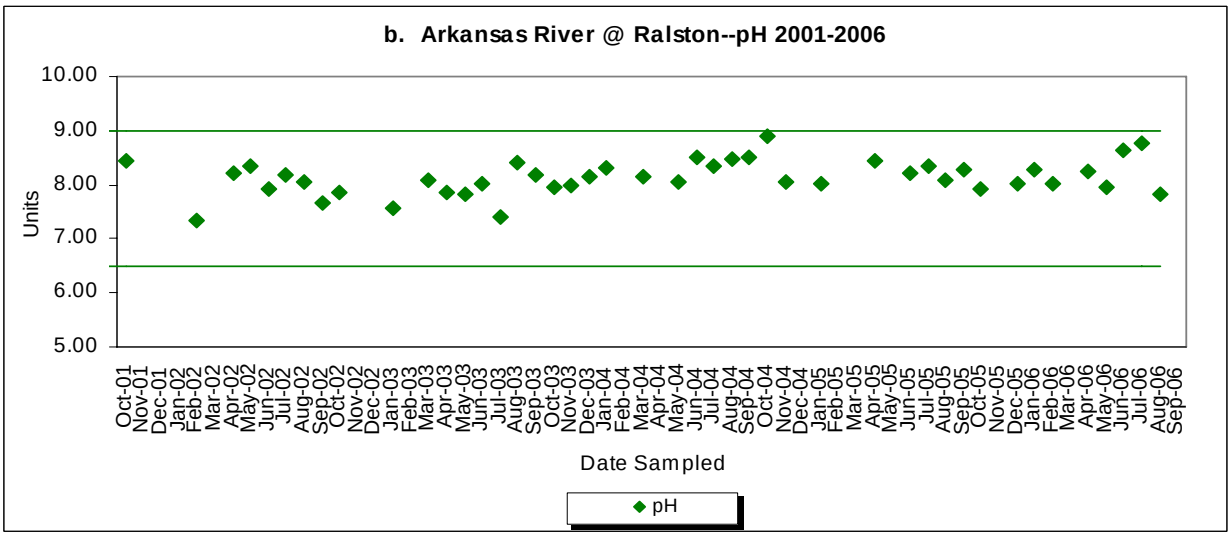
Station AT152500 (621200010200-001AT) is a permanent ambient trend monitoring station located on the Arkansas River in Oklahoma. Situated in the west central portion of Osage County, the site was established east of the town of Ralston on State Highway 18. The station is positioned near the upper end of stream segment 621200010200 and is classified within the Black Bear - Red Rock Creek 8 digit HUC watershed (11060006). Water enters the stream system from several tributaries including Salt Creek (Fairfax Lake), Black Bear Creek (Pawnee Lake), and Bug Creek, among others.

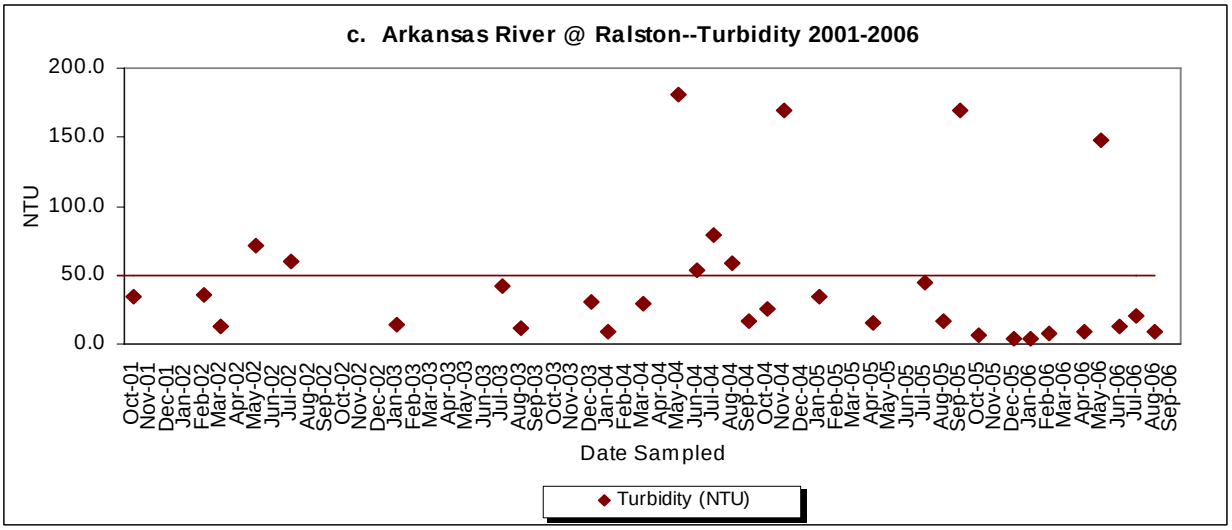
This station on the Arkansas River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Arkansas River from the confluence of Salt Creek (97.3276, 36.9679) downstream to confluence of the Arkansas River with Keystone Reservoir (97.1739, 36.6243). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-three (33) turbidity samples (Figure 13c), nine (9) samples (or 27%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 13a), pH (Figure 13b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 13d and e). The PBCR beneficial use is not supported (Table 12). Of the fifteen (15) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (90.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Arkansas River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 13f).

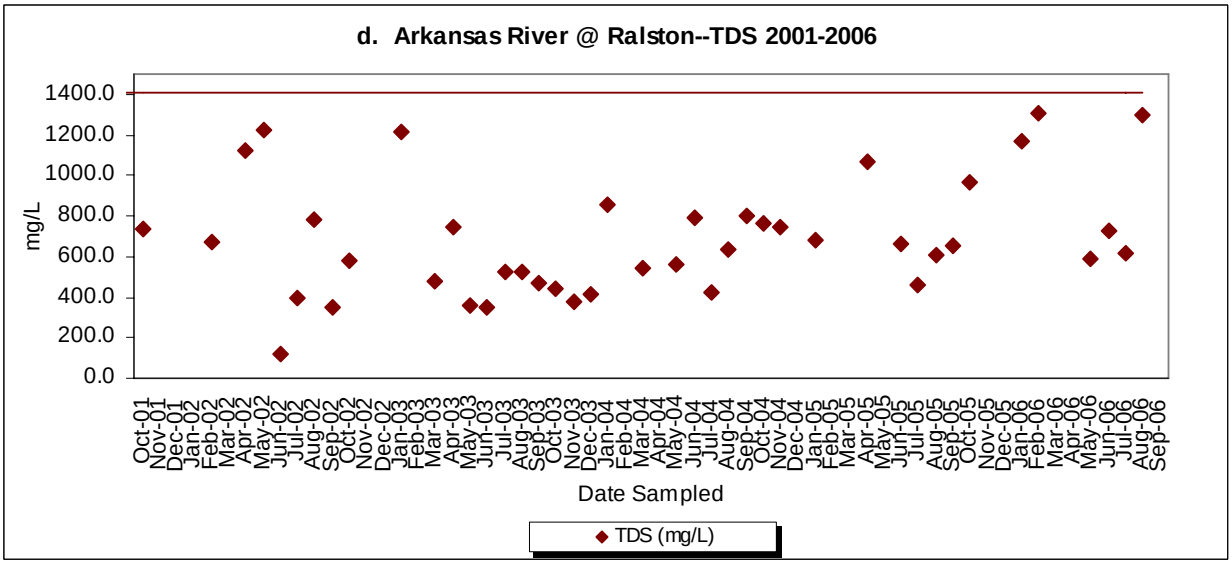
Figure 13 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Ralston (AT152500), 2001-2006.

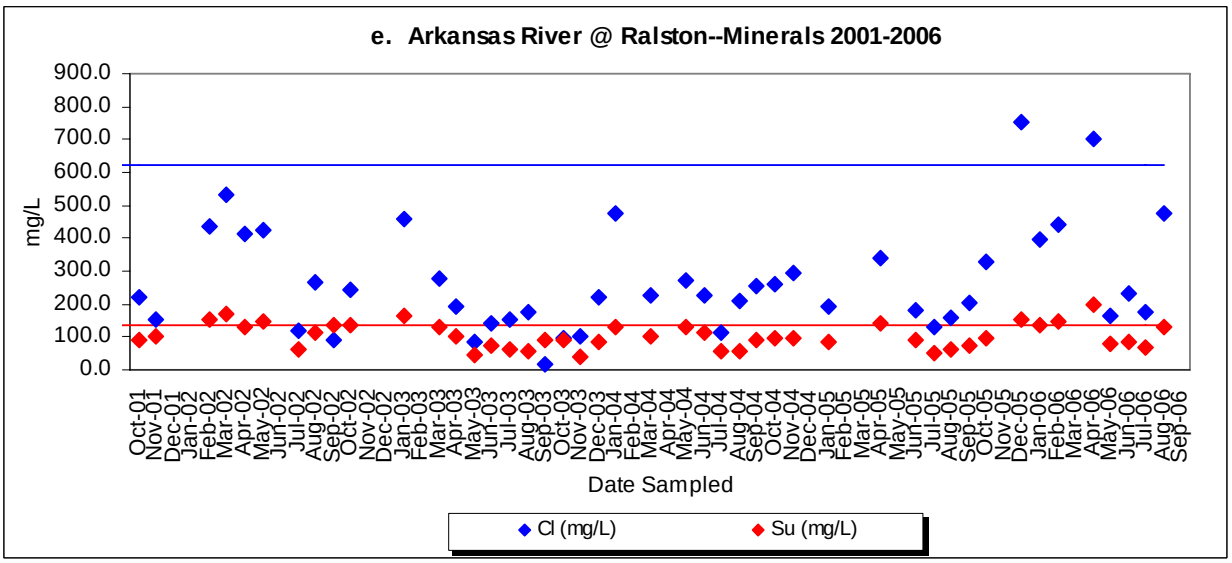


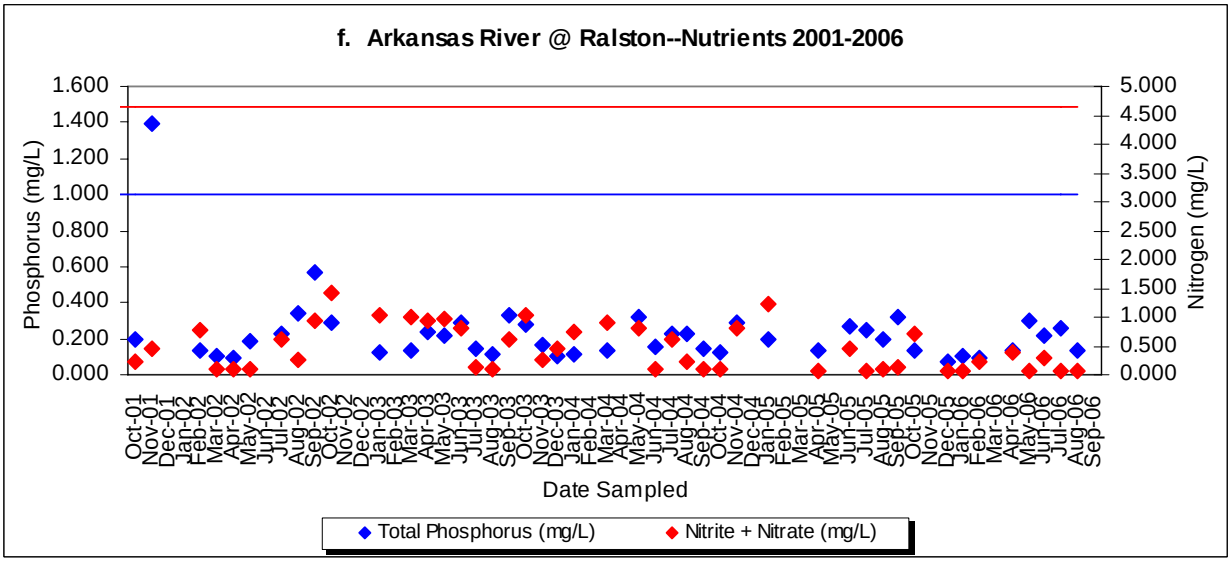




HUC 1106


d. Arkansas River @ Ralston--TDS 2001-2006
mg/L
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


e. Arkansas River @ Ralston--Minerals 2001-2006
mg/L
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Ralston--Nutrients 2001-2006
Phosphorus (mg/L)
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1106

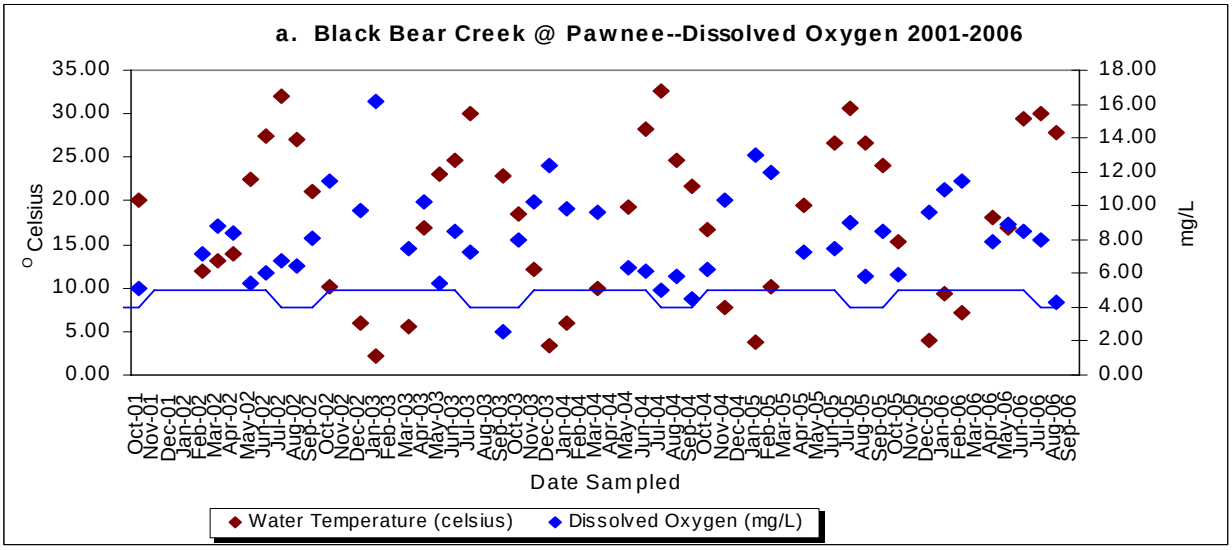
Black Bear Creek at Pawnee

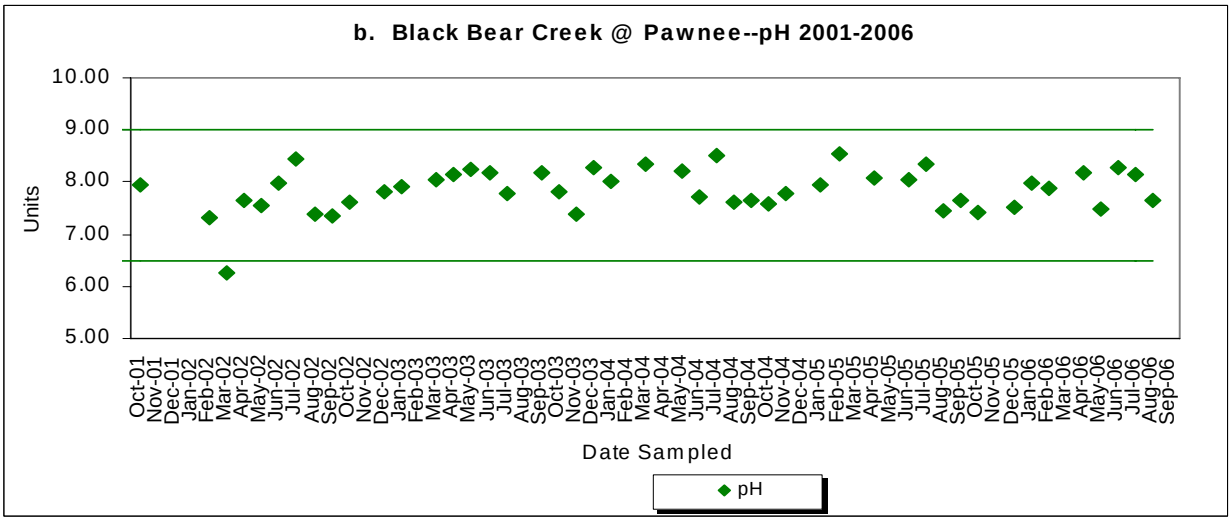
Station AT153000 (621200030010-001AT) is a permanent ambient trend monitoring station located on Black Bear Creek. Situated in the west central portion of Pawnee County, the site was established north of the city of Pawnee on State Highway 18. The station is positioned near the terminal end of stream segment 621200030010 and is classified within the Black Bear - Red Rock Creek 8 digit HUC watershed (11060006). Water enters the stream system from Pawnee Lake and from several tributaries including Cow Creek, Oak Creek, and Camp Creek (Lone Chimney Lake), among others.

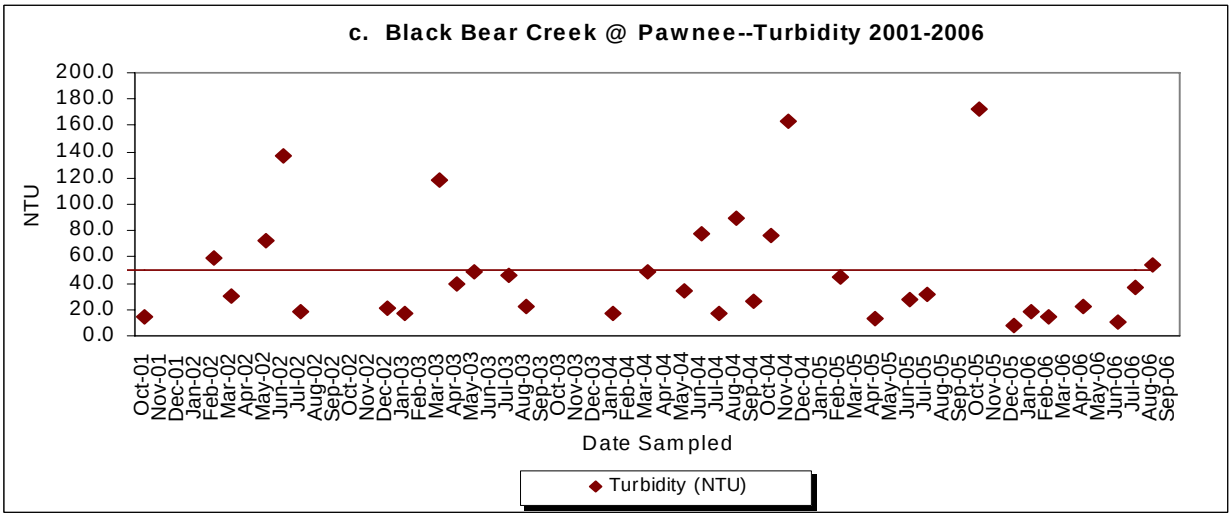
This station on Black Bear Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of Black Bear Creek from the confluence of Cow Creek (97.3276, 36.9679) downstream to confluence of Black Bear Creek with the Arkansas River (97.1739, 36.6243). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-five (35) turbidity samples (Figure 14c), ten (10) samples (or 29%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 14a), pH (Figure 14b), and toxicant data met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 14d and e). The PBCR beneficial use is not supported (Table 12). Of the seventeen (17) fecal coliform concentrations, six (6) samples (or 35%) exceeded the prescribed screening level of 400 cfu/mL. Of the nineteen (19) enterococci concentrations, nine (9) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (225.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Black Bear Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 14f).

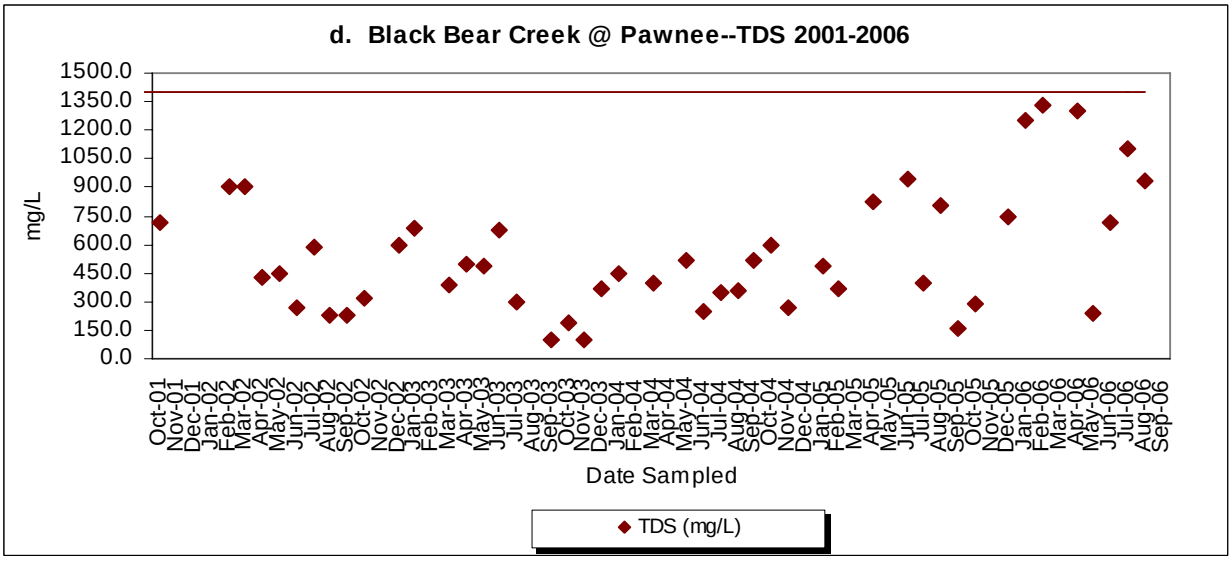
Figure 14 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Black Bear Creek at Pawnee (AT153000), 2001-2006

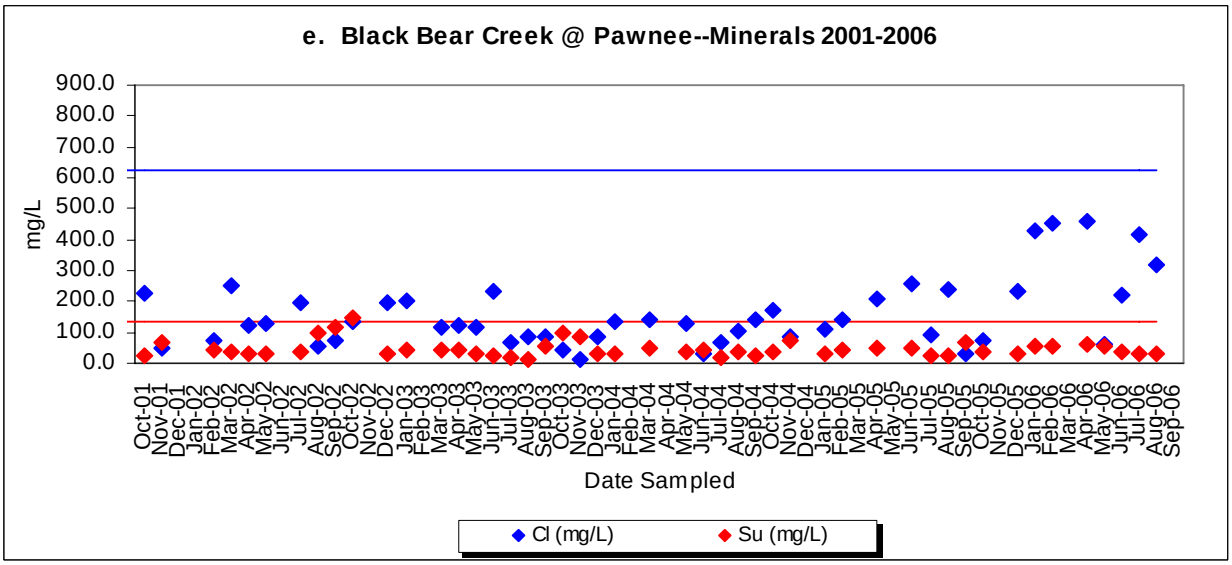


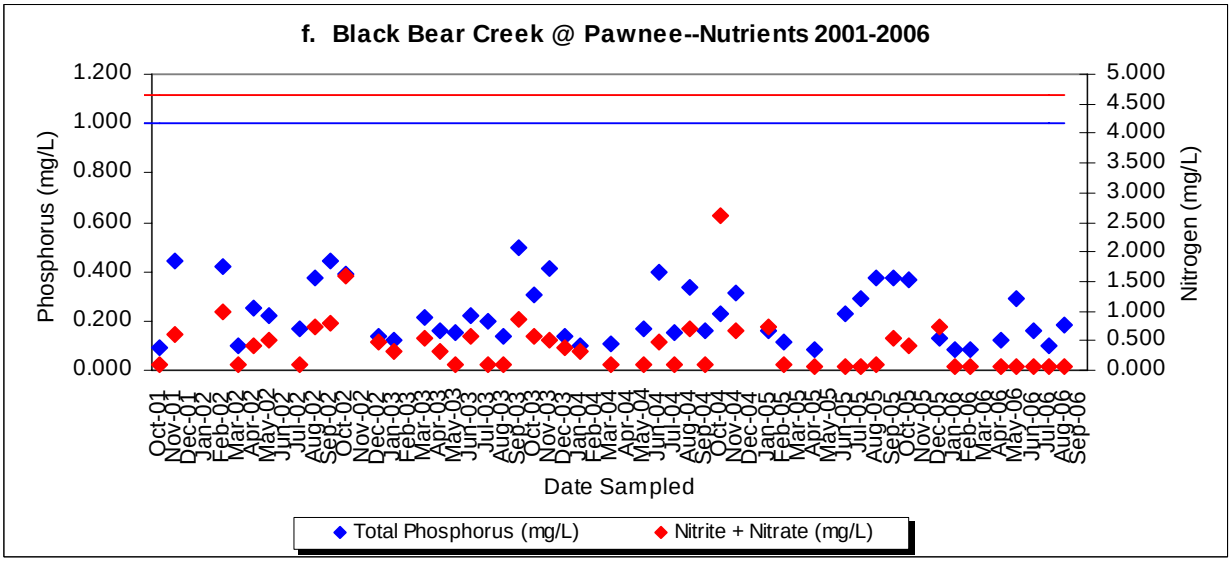




HUC 1106


d. Black Bear Creek @ Pawnee--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Black Bear Creek @ Pawnee--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Black Bear Creek @ Pawnee--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1106

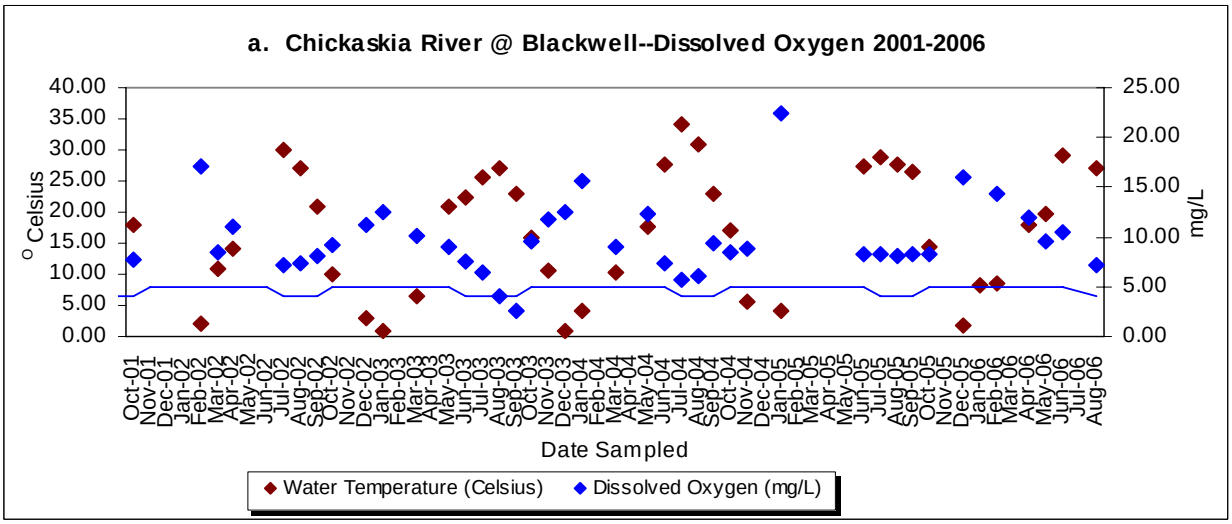
Chickaskia River near Blackwell

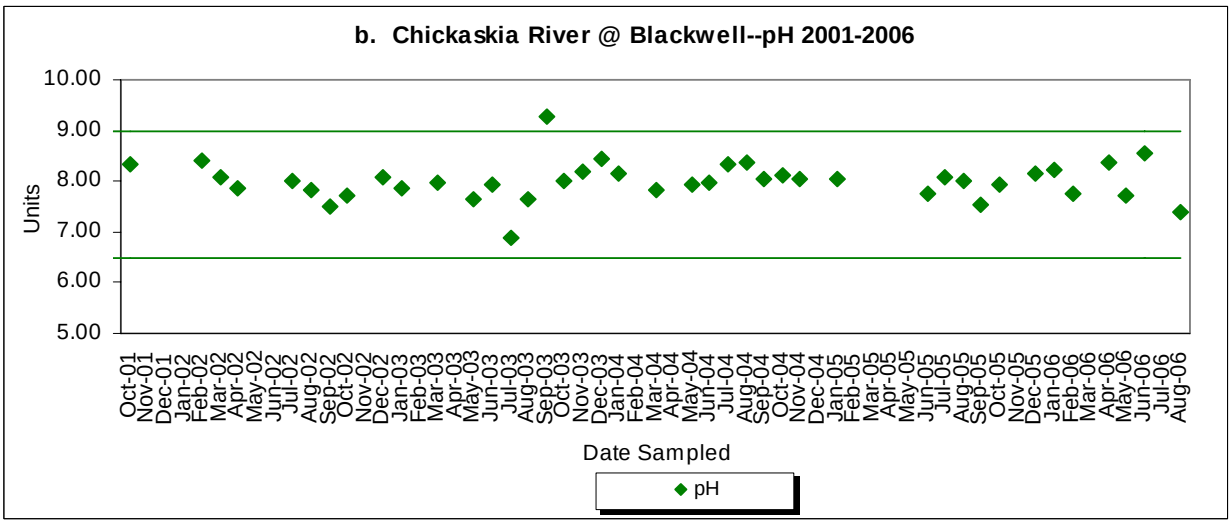
Station AT152000 (621100000010-001AT) is a permanent ambient trend monitoring station located on the Chickaskia River in Oklahoma. Situated in the west central portion of Kay County, the site was established north of the city of Blackwell on US Highway 177. The station is positioned near the midpoint of stream segment 621100000010 and is classified within the Chickaskia River 8 digit HUC watershed (11060005). Water enters the stream system from Lake Blackwell and from several tributaries including Bluff Creek, Shoo Fly Creek, Doe Creek, Bitter Creek, Stink Creek, and Duck Creek, among others.

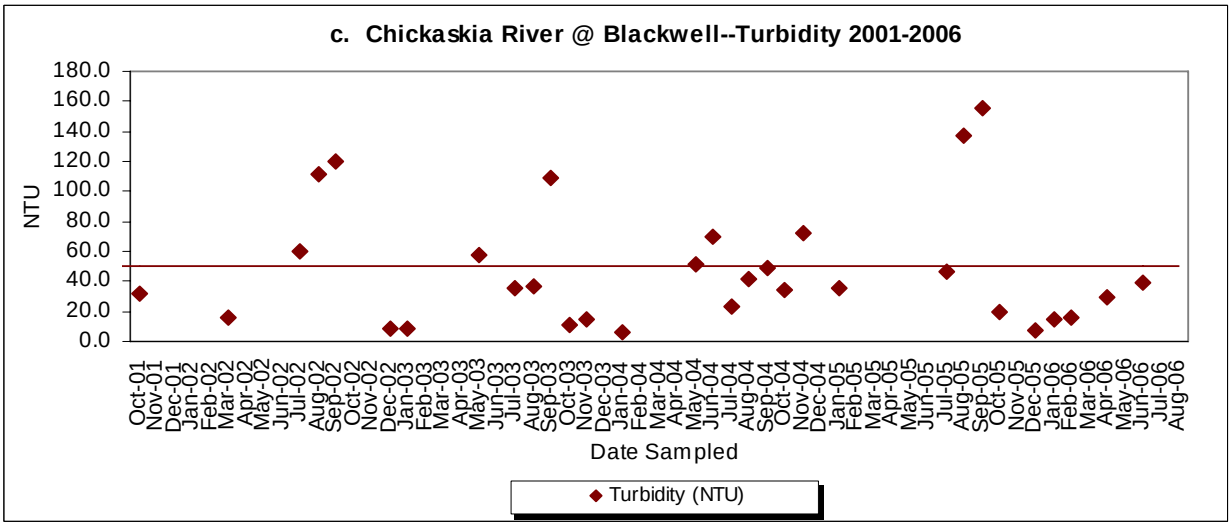
This station on the Chickaskia River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Chickaskia River from the confluence of Bluff Creek (97.3276, 36.9679) downstream to confluence of the Chickaskia River with the Salt Fork of the Arkansas River (97.2442, 36.6233). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-one (31) turbidity samples (Figure 15c), ten (10) samples (or 32%) exceeded the numerical criterion of 50 NTU. Of the nineteen (19) toxicant samples collected, three (3) of the lead concentrations (or 16%) exceeded the prescribed, hardness-dependent chronic criteria of 11.91 ug/L (Table 11). Dissolved oxygen (Figure 15a) and pH (Figure 15b) data met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 15d and e). Of the forty-two (42) total dissolved solids concentrations, 10 samples (or 23%) exceeded the minimum sample standard of 700.0 mg/L. Chloride and sulfate values met the prescribed segment-specific criteria. The PBCR beneficial use is not supported (Table 12). Of the nineteen (19) fecal coliform concentrations, seven (7) samples (or 37%) exceeded the prescribed screening level of 400 cfu/mL. Of the 19 enterococci concentrations, ten (10) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (295.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Chickaskia River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 15f). Furthermore, the mean sestonic chlorophyll-a concentration (19.6 mg/M^3) produced a TSI of 60, which is below the threshold TSI of 62.

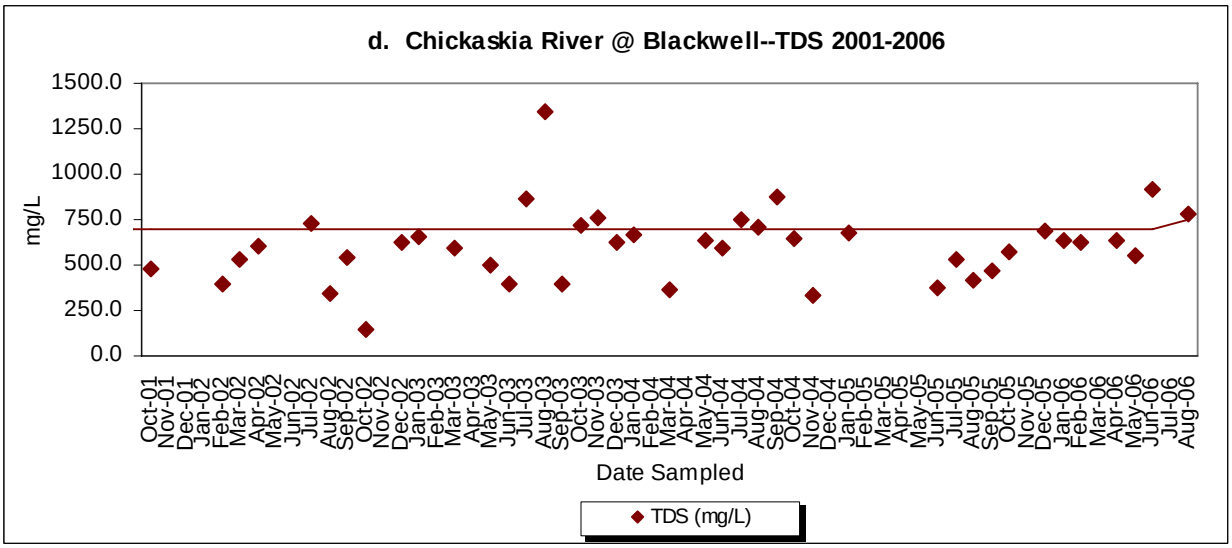
Figure 15 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Chickaskia River at Blackwell (AT152000), 2001-2006

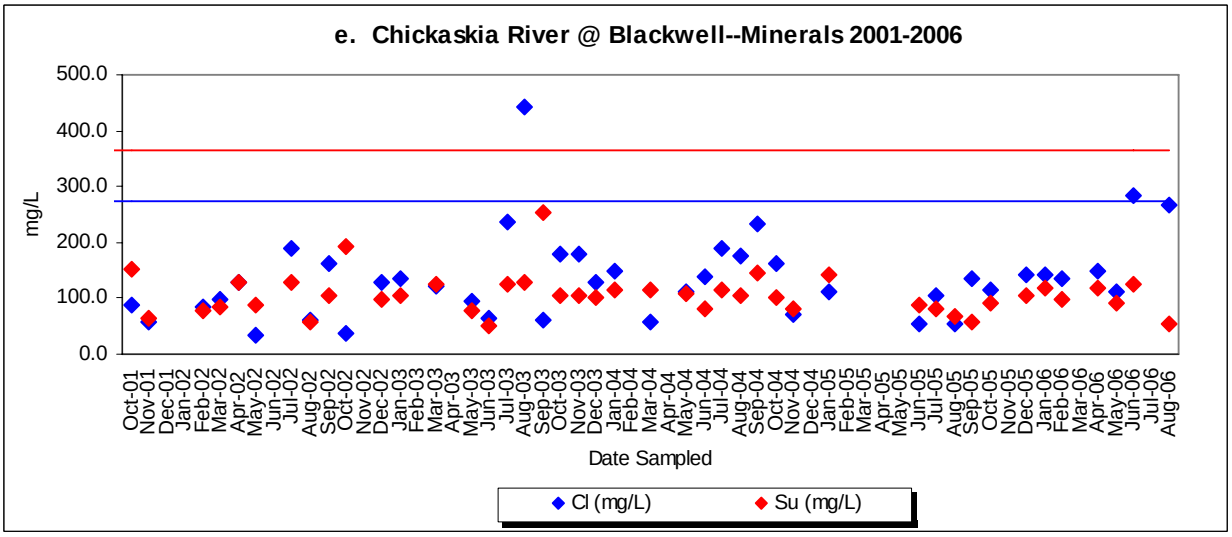


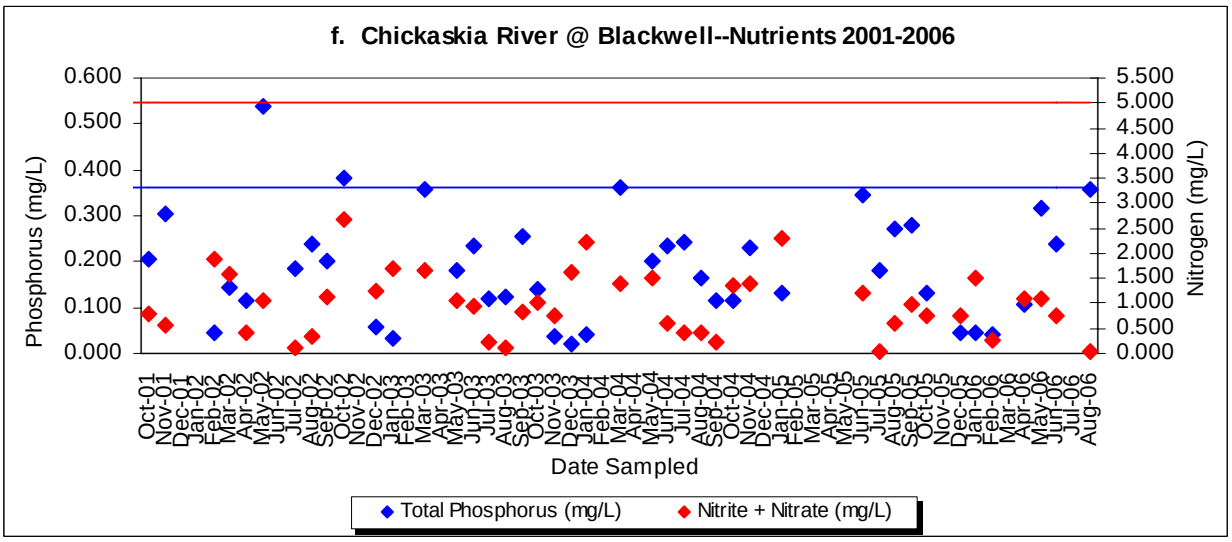




HUC 1106


d. Chickaskia River @ Blackwell--TDS 2001-2006
mg/L
1500.0
1250.0
1000.0
750.0
500.0
250.0
0.0
Date Sampled
TDS (mg/L)


e. Chickaskia River @ Blackwell--Minerals 2001-2006
mg/L
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Chickaskia River @ Blackwell--Nutrients 2001-2006
Phosphorus (mg/L)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
5.500
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1106

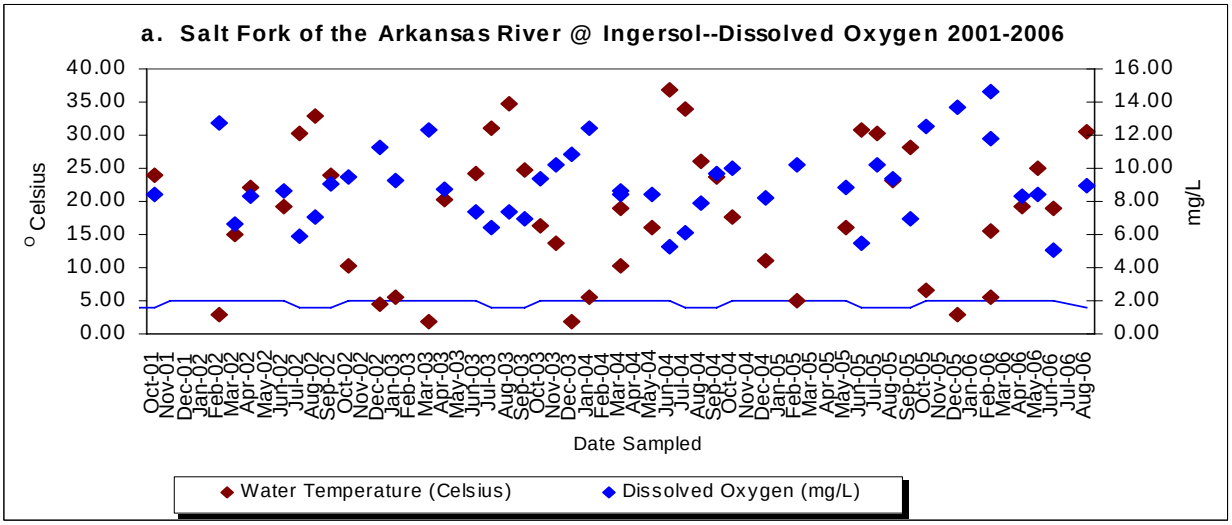
Salt Fork of the Arkansas near Ingersoll

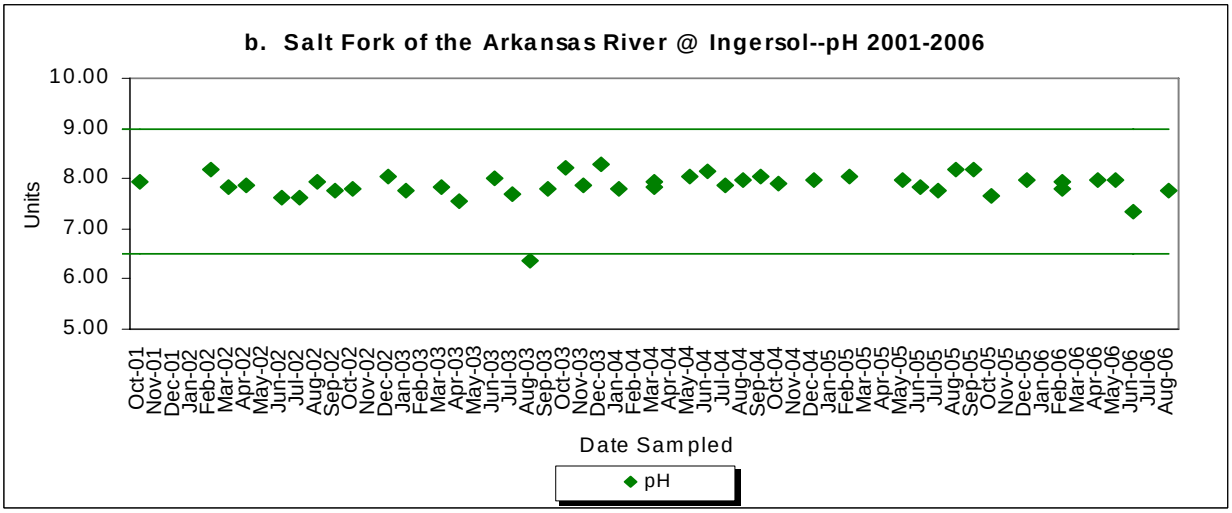
Station AT148450 (621010010160-001AT) is a permanent ambient trend monitoring station located on the Salt Fork of the Arkansas River in Oklahoma. Situated in the north central portion of Alfalfa County, the site was established north of the town of Ingersoll on State Highway 58. The station is positioned near the midpoint of stream segment 621010010160 and is classified within the Upper Salt Fork of the Arkansas River 8 digit HUC watershed (11120302). Water enters the stream system from Kansas and from several tributaries including Yellowstone Creek, Greenleaf Creek, and Turkey Creek, among others.

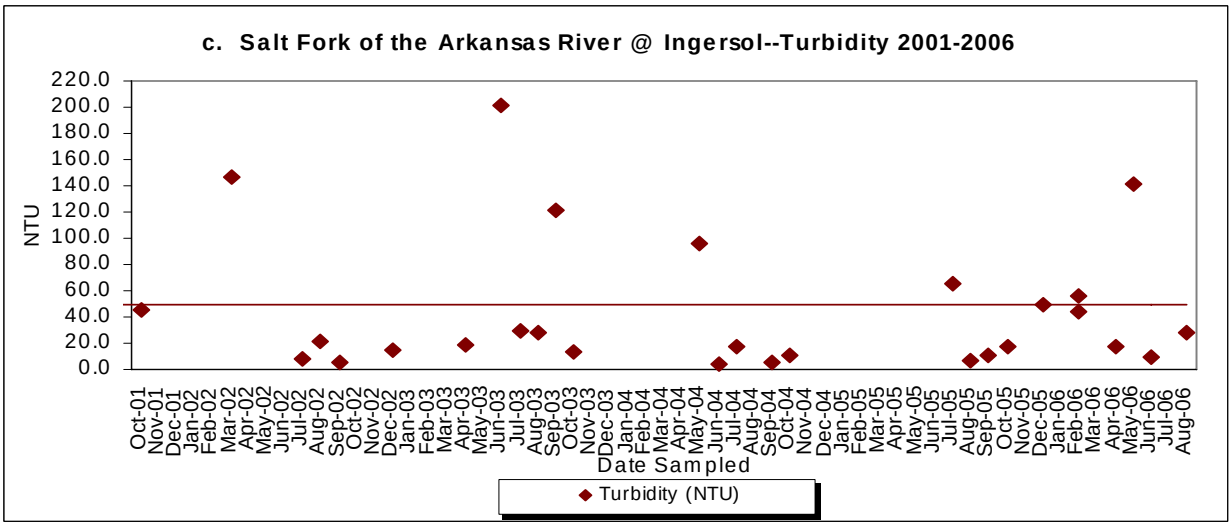
This station on the Salt Fork of the Arkansas River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Salt Fork River from the confluence of Turkey Creek (98.6673, 36.8149) downstream to confluence of the Salt Fork River with the Medicine Lodge River (98.3265, 36.8333). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-eight (28) turbidity samples (Figure 16c), seven (7) samples (or 25%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 16a), pH (Figure 16b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2004 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 10 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 21. This is between the assigned non-supporting and supporting thresholds of 19-21 for Central Great Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 16d and e). The PBCR beneficial use is not supported (Table 12). Of the twenty (20) fecal coliform concentrations, sixteen (16) samples (or 80%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (484.5 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the 20 enterococci concentrations, 16 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (1440.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 20 *E. coli* concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (155.5 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Salt Fork River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 16f).

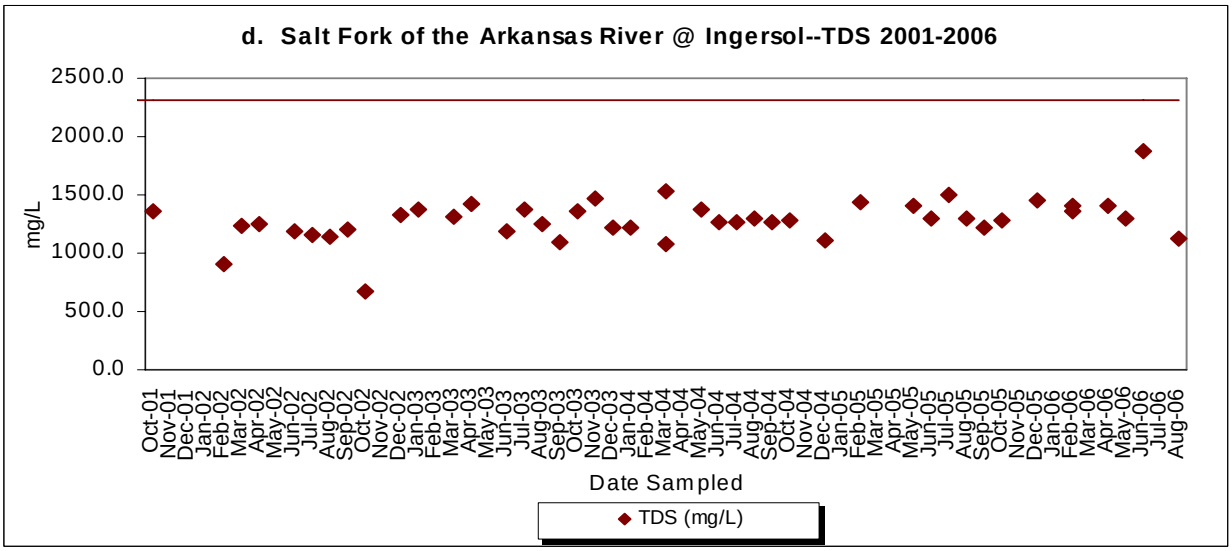
Figure 16 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Salt Fork of the Arkansas River at Ingersoll (AT148450), 2001-2006

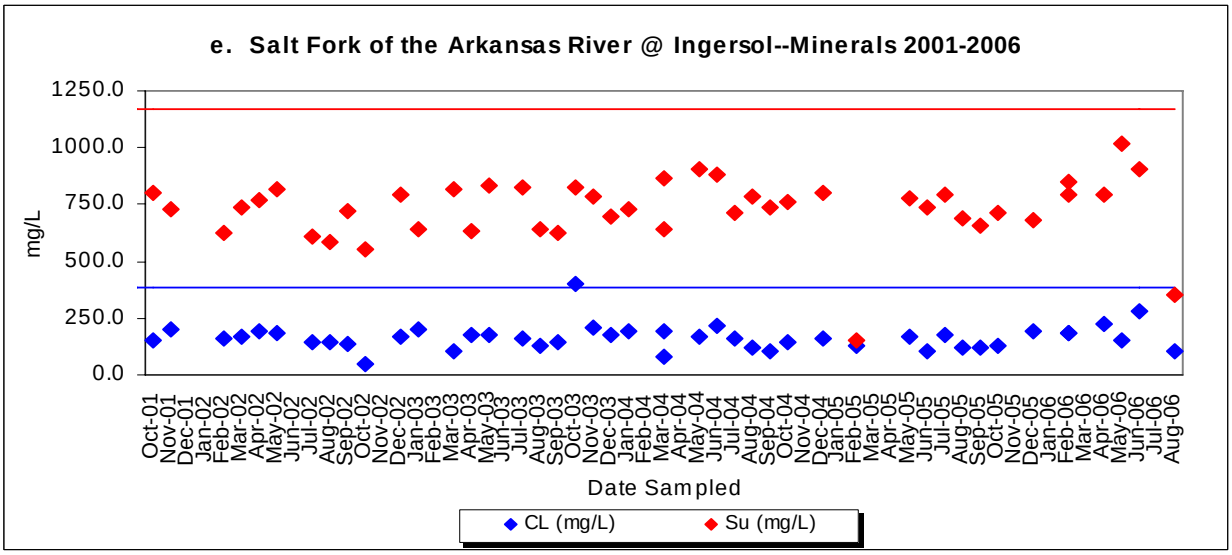


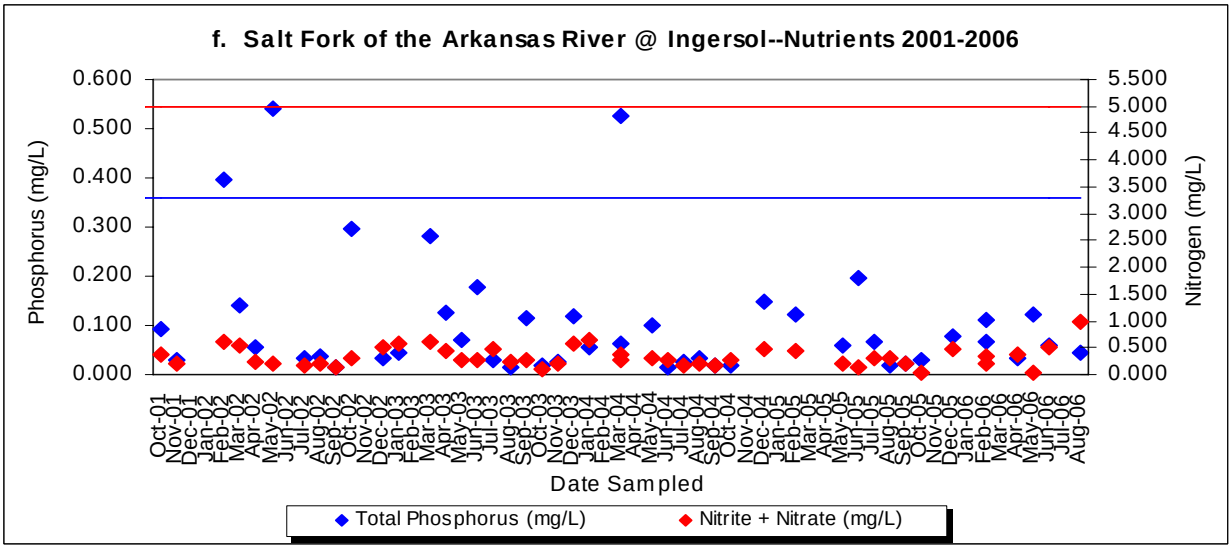




HUC 1106


d. Salt Fork of the Arkansas River @ Ingersol--TDS 2001-2006
mg/L
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
TDS (mg/L)


e. Salt Fork of the Arkansas River @ Ingersol--Minerals 2001-2006
mg/L
1250.0
1000.0
750.0
500.0
250.0
0.0
Date Sampled
CL (mg/L)
Su (mg/L)


f. Salt Fork of the Arkansas River @ Ingersol--Nutrients 2001-2006
Phosphorus (mg/L)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
5.500
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1106

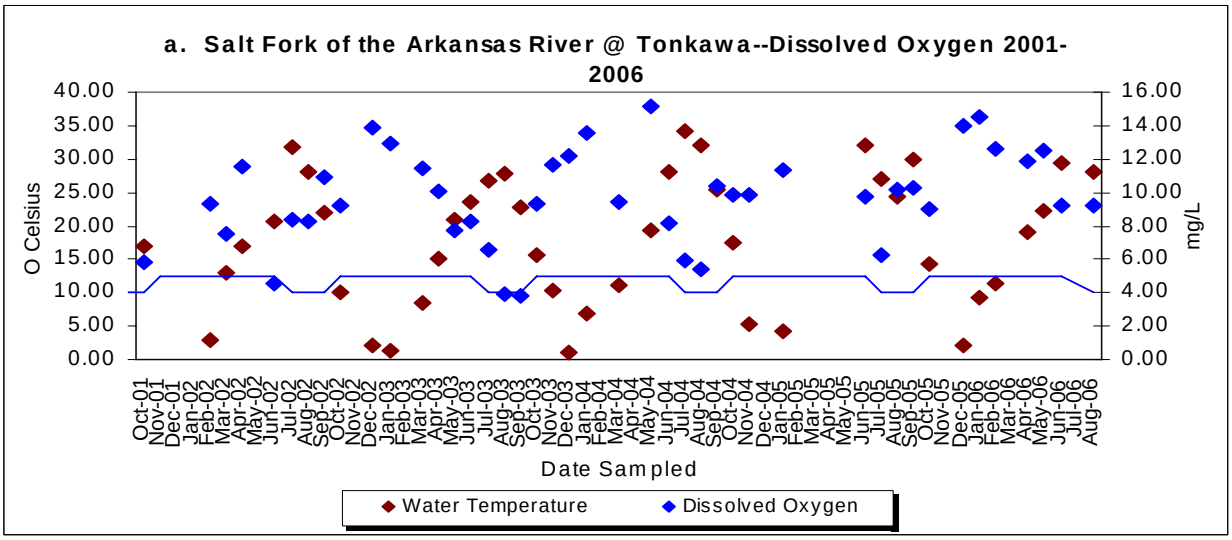
Salt Fork of the Arkansas River near Tonkawa

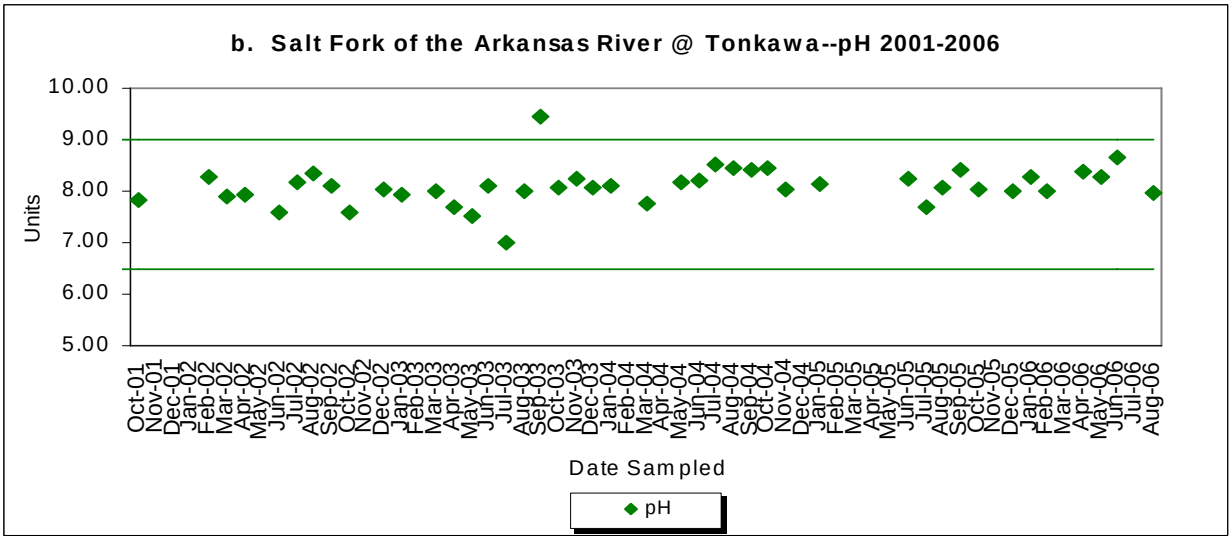
Station AT151000 (621000010010-001AT) is a permanent ambient trend monitoring station located on the Salt Fork of the Arkansas River in Oklahoma. Situated in the southwest portion of Kay County, the site was established south of the town of Tonkawa on US Highway 77. The station is positioned near the midpoint of stream segment 621000010010 and is classified within the Lower Salt Fork – Arkansas River 8 digit HUC watershed (11060004). Water enters the stream system from Sand Creek, Pond Creek, and Deer Creek, among others.

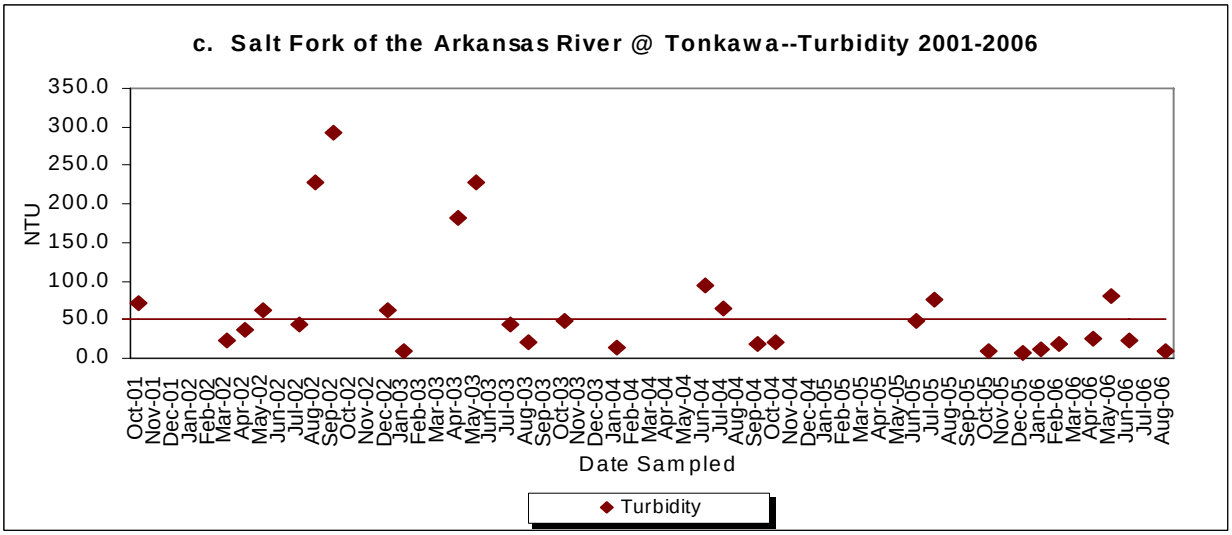
This station on the Salt Fork of the Arkansas River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Salt Fork of the Arkansas River from the confluence of Sand Creek (97.9700, 36.7194) downstream to the confluence of the Salt Fork of the Arkansas River with the Chickaskia River (97.2442, 36.6233). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-nine (29) turbidity samples (Figure 17c), eleven (11) samples (or 38%) exceeded the numerical criterion of 50 NTU. The dissolved oxygen (Figure 17a), pH (Figure 17b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2004 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 16 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 27. This is above the assigned supporting threshold of 22 for Central Great Plains warm water aquatic communities [OAC 46:15-5(m)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 17d and e). The PBCR beneficial use is not supported (Table 12). Of the nineteen (19) enterococci concentrations, thirteen (13) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (563.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Salt Fork River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 17f).

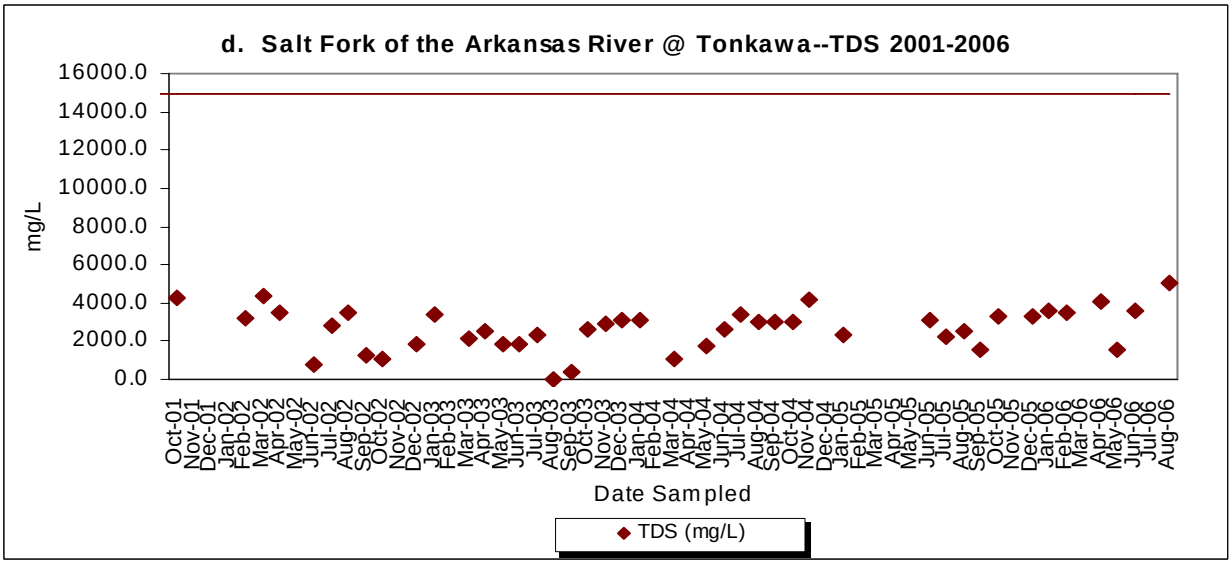
Figure 17 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Salt Fork of the Arkansas River near Tonkawa (AT151000), 2001-2006

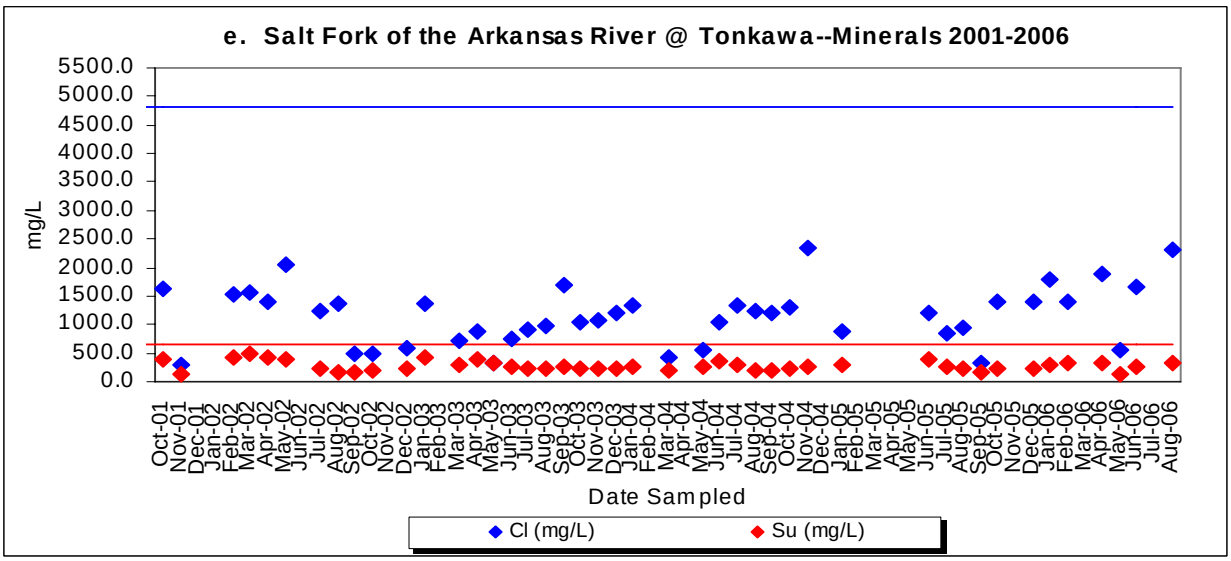


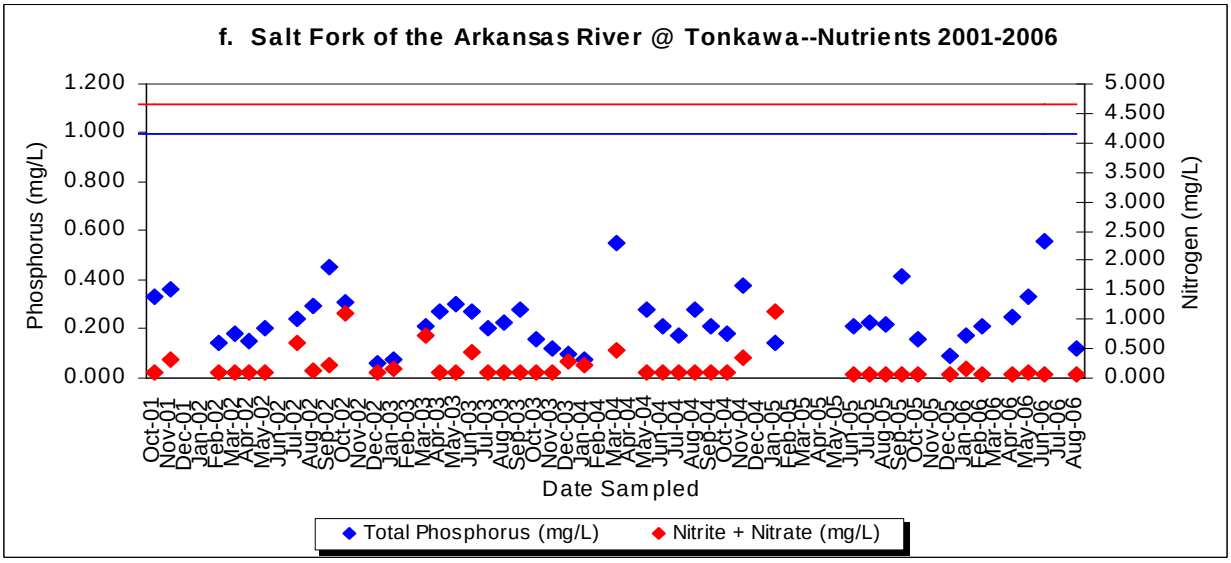




HUC 1106


d. Salt Fork of the Arkansas River @ Tonkawa--TDS 2001-2006
mg/L
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Sampled
TDS (mg/L)


e. Salt Fork of the Arkansas River @ Tonkawa--Minerals 2001-2006
mg/L
5500.0
5000.0
4500.0
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Salt Fork of the Arkansas River @ Tonkawa--Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1106

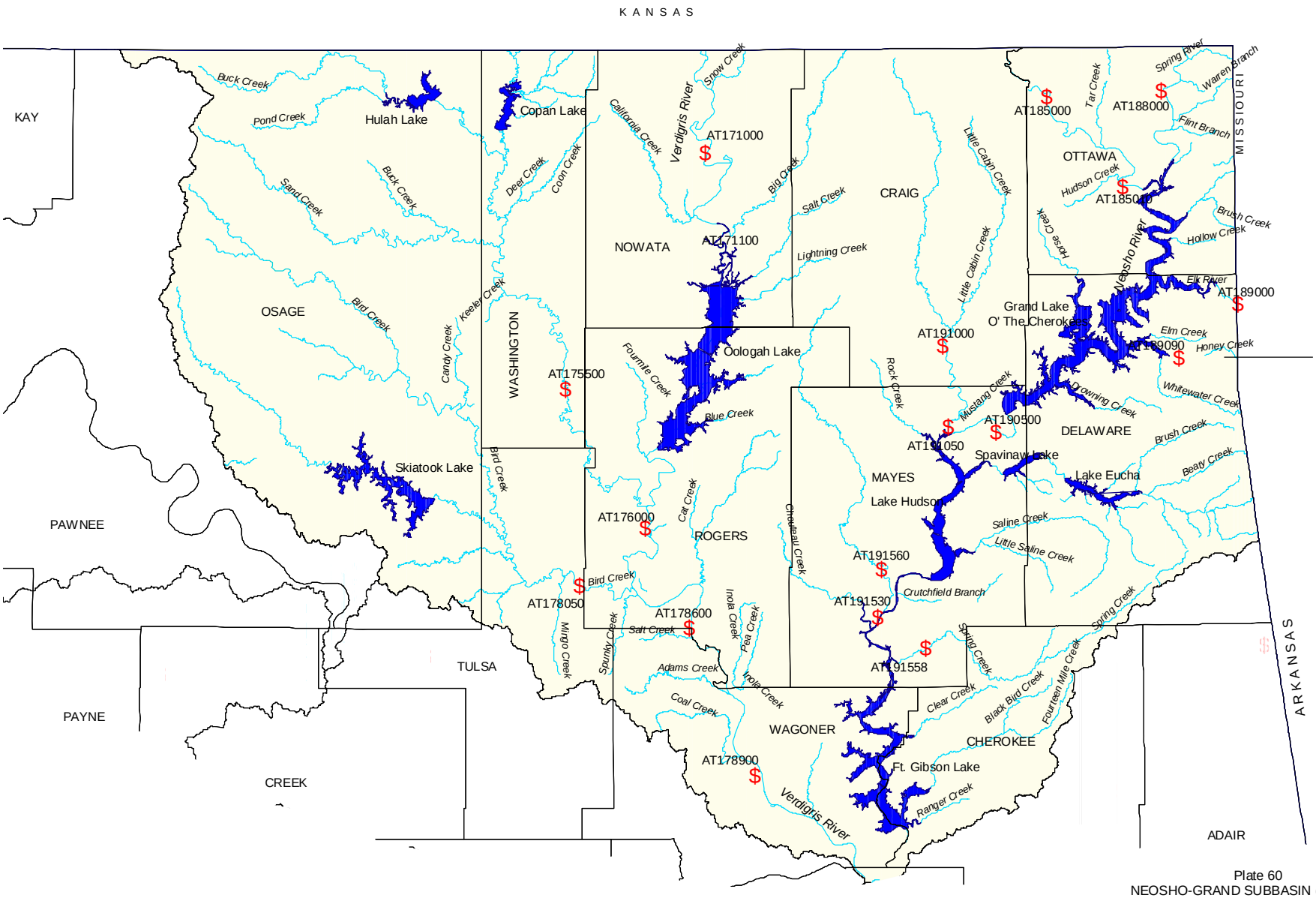


Plate 60
NEOSHO-GRAND SUBBASIN (HUC 1107)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1107

NEOSHO/GRAND SUB-BASIN

The Neosho/Grand sub-basin (4-digit hydrologic unit 1107) is situated in the northeast portion of the state. It originates in the west central portion of Osage County, continues eastward through portions of Washington, Tulsa, Nowata, Rogers, Wagoner, Muskogee, Craig, Mayes, and Cherokee Counties and terminates in Ottawa and Delaware Counties. Major cities and County seats located within the basin include Pawhuska, Dewey, Bartlesville, Skiatook, Collinsville, Sperry, Owasso, Tulsa, Nowata, Oologah, Port of Catoosa, Claremore, Pryor, Chouteau, Locust Grove, Wagoner, Fort Gibson, Vinita, Langley, Miami, Grove, and Jay. Minor cities of note include South Coffeyville, Adair, Quapaw, Afton, and Ketchum.

The sub-basin is subdivided into nine 8-digit hydrologic units (HUC) within the state. These HUC's are the Middle Verdigris (11070103), the Lower Verdigris (11070103), the Caney (11070106), the Bird (11070107), the Middle Neosho (11070205), the Grand Lake (11070206), the Spring (11070207), the Elk (11070208), and the Lower Neosho (11070209). The major surface waters in the basin are the Verdigris and Grand/Neosho Rivers. Major tributaries include Caney River, Little Caney River, Spring River, Elk River, Sand Creek, Bird Creek, Big Creek, Dog Creek, Tar Creek, Honey Creek, Big Cabin Creek, Spavinaw Creek, Pryor Creek, and Spring Creek. Nine major lakes are located in the basin—Hulah Lake formed by the Caney River, Copan Lake formed the Little Caney River, Bluestem Lake formed by the headwaters of Bird Creek, Skiatook Lake formed by Hominy Creek, Oologah Lake formed by the Verdigris River, Grand Lake formed by the Neosho, Spring, and Elk Rivers (among other creeks), Lake Eucha formed by Spavinaw Creek, Spavinaw Lake formed by Spavinaw Creek, Lake Hudson formed by the Neosho River and Spavinaw, Rock, and Saline Creek, and Fort Gibson Lake formed by the Neosho River and Clear and Fourteen Mile Creek. Fifteen active permanent water quality-monitoring stations (Table 13) are located in the basin— AT171000, AT175500, AT176000, AT178050, AT178600, AT178900, AT185000, AT185010, AT188000, AT189000, AT189090, AT190500, AT191000, AT191530, and AT191558. Three inactive water quality-monitoring stations (AT171100, AT191050, AT191560) are located in the sub-basin. Stations 171100 and 191050 were last assessed in the 1999 BUMP report while station 191560 was last assessed in the 2000 BUMP report.

The sub-basin is characterized by four ecoregions. The Central Irregular Plains is the primary ecoregion covering the central portion of the sub-basin, the majority of Ottawa and Cherokee Counties, and part of Delaware County. The Central Oklahoma/Texas Plains covers the majority of Osage County and parts of Tulsa and Washington Counties. The Ozark Highlands typify the majority of Delaware County, one-quarter (¼) of Ottawa County, and a small part of western Mayes County. The Boston Mountains ecoregion is represented in a small part of eastern Cherokee County. The primary land usage in the sub-basin is rangeland (open grasslands and woody areas). It dominates the western and north central portions of the sub-basin and is further interspersed throughout the southern, central and east central portions of the sub-basin. The secondary land uses are pastureland and forestland. Pastureland is interspersed throughout the eastern, central, and southern portions of the sub-basin with concentrations in Ottawa, Cherokee, Delaware, Craig, Rogers, Tulsa, and Washington Counties. Forestland (post oak–blackjack oak, hickory, and bottomland hardwoods) is interspersed throughout the entire sub-basin with heavy concentrations in Cherokee and

Delaware Counties. The tertiary land use is cropland with heaviest concentrations in the central and east central portions of the sub-basing. Other land uses of note include farmsteads, major urban areas, wetlands, and confined animal feeding operations.

Table 13. Permanent Ambient Trend Monitoring Stations Located in HUC 1107.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
121600060060	AT191000	Big Cabin Creek, off US 69, Big Cabin	Active 9/99-P	FWP, AES, PPWS	AG	PBCR	NONE
121300010010	AT178050	Bird Creek, SH 266, Port of Catoosa	Active 11/98-P	AG, AES, PPWS	FWP	PBCR	NONE
121400010010	AT175500	Caney River, off US 75, Ramona	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121600030440	AT189000	Elk River, SH 43, Tiff City (MO)	Active 5/99-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
121600030445	AT189090	Honey Creek, off SH 25, Grove	Active 11/98-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
121600010280	AT191530	Neosho River, US 412, Chouteau	Active 11/98-P	AG, FWP, PBCR, PPWS	NONE	AES	NONE
121600040220	AT185000	Neosho River, off US 66, Commerce	Active 10/00-P	AG, AES, PBCR, PPWS	NONE	FWP	NONE
121600040010	AT185010	Neosho River, off SH 137, Connor Bridge	Active 11/98-P	AG, AES, PBCR, PPWS	FWP	NONE	NONE
121600020170	AT190500	Neosho River, SH 82, Langley	Active 11/98-P	AG, FWP, AES, PBCR, PPWS	NONE	NONE	NONE
121600010290	AT191558	Spring Creek, off US 412, Murphy	Active 11/98-P	AG, FWP, AES, PBCR, PPWS	NONE	NONE	NONE
121600070010	AT188000	Spring River, off SH 137, Quapaw	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121500020260	AT178600	Verdigris River, US 412, Inola	Active 10/00-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121500030010	AT176000	Verdigris River, SH 20, Keetonville	Active 11/98-P	AG, AES, PPWS, FWP	NONE	PBCR	NONE
121510020010	AT171000	Verdigris River, SH 10, Lenepah	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121500010200	AT178900	Verdigris River, SH 51, Wagoner	Active 9/99-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

HUC 1107

Table 14. Toxicant exceedances in HUC 1107.

STATION #	STATION NAME	DATE	Copper (ug/L)	Lead (ug/L)	Zinc (ug/L)
AT175500	Caney River, off US 75, Ramona	05/07/2001		8.04	
		04/07/2003		19.77	
		09/27/2004		72.00	
AT185000	Neosho River, off US 66, near Commerce	06/06/2001		13.00	
		10/04/2004		12.00	
AT188000	Spring River, off SH 137, Quapaw	10/24/2000			157.00

STATION #	STATION NAME	DATE	Copper (ug/L)	Lead (ug/L)	Zinc (ug/L)
		1/29/2003			168.00
		04/07/2003			221.00
AT178600	VERDIGRIS RIVER, US 412, INOLA	05/30/2001		47.00	
		06/26/2001		12.14	
		09/17/2001		10.37	
		11/27/2001		8.57	
		04/01/2003		6.20	
AT171000	VERDIGRIS RIVER, SH 10, LENEPAH	06/04/2001		21.60	
		04/09/2002		9.78	
AT178900	VERDIGRIS RIVER, SH 51, WAGONER	05/02/2001		5.85	
		05/30/2001	40.90	108.00	
		06/26/2001		23.21	
		09/17/2001	24.50	13.08	
		10/29/2001	27.60	43.36	
		11/27/2001	24.50	16.56	
		03/31/2003		5.62	

Table 15. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1107. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT191000	BIG CABIN CREEK, OFF US 69, NEAR BIG CABIN	06/28/2000			471
		06/04/2002		500	
		05/18/2004		4000	2723
		06/22/2004		42100	
		07/27/2004		3100	
AT178050	BIRD CREEK, SH 266, PORT OF CATOOSA	06/28/2000	690		
		08/02/2000	1200		
		09/27/2000	2100	900	
		05/07/2001		31000	
		06/04/2001		800	
		05/07/2002	3700	38000	
		07/09/2002	1800	1200	
		06/02/2003		73000	
		08/11/2003	5700	700	
		09/15/2003	500	700	
AT175500	CANEY RIVER, OFF US 75, RAMONA	05/08/2002		2000	
		06/02/2003		700	
		10/01/2003		500	
AT189000	ELK RIVER, SH 43, TIFF CITY (MO)	05/24/2000		440	
		06/28/2000		1100	
		06/05/2001		1300	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT189090	HONEY CREEK, OFF SH 25, GROVE	06/28/2000		1090	
		08/07/2001		600	
		07/09/2002		800	
		09/04/2002		7000	
		10/01/2002		900	
		07/22/2003		9000	
		08/26/2003		700	
		09/30/2003		700	
AT188000	SPRING RIVER, OFF SH 137, QUAPAW	06/28/2000		430	
		05/12/2003		33000	
AT176000	VERDIGRIS RIVER, US 412, INOLA	06/02/2004		30100	
		06/22/2004		23900	
		07/07/2004		1100	
AT176000	VERDIGRIS RIVER, SH 20, KEETONVILLE	06/28/2000		2000	
		06/04/2001		430	
		09/04/2002		2000	
AT171000	VERDIGRIS RIVER, SH 10, LENEPAH	05/07/2001		7000	
		09/26/2001		500	
AT178900	VERDIGRIS RIVER, SH 51, WAGONER	07/31/2000	500		
		09/28/2000	7000		
		05/30/2001	700		
		05/28/2002		500	
		06/02/2004	700	1500	
		06/22/2004	1700	2800	
		07/06/2004	1300	4100	

HUC 1107

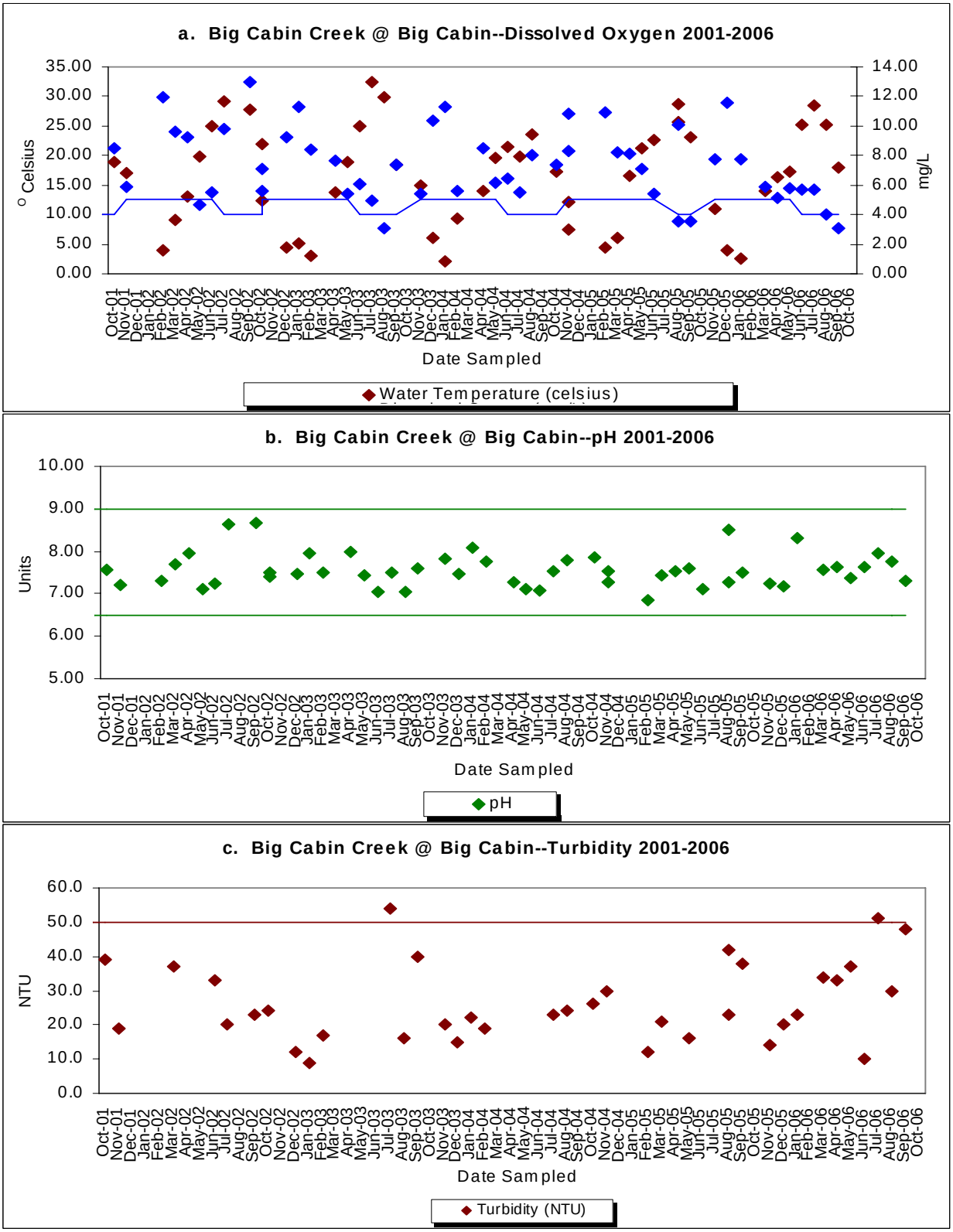
Big Cabin Creek near Big Cabin

Station AT191000 (121600060060-001AT) is a permanent ambient trend monitoring station located on Big Cabin Creek. Situated in the south central portion of Craig county, the site was established northeast of the town of Big Cabin off of US Highway 69 on County Road 310. The station is positioned near the upper end of stream segment 121600060060 and is classified within the Lower Neosho River 8 digit HUC watershed (11070209). Water enters the stream system from several tributaries including Bull Creek, Little Cabin Creek, and White Oak Creek, among others.

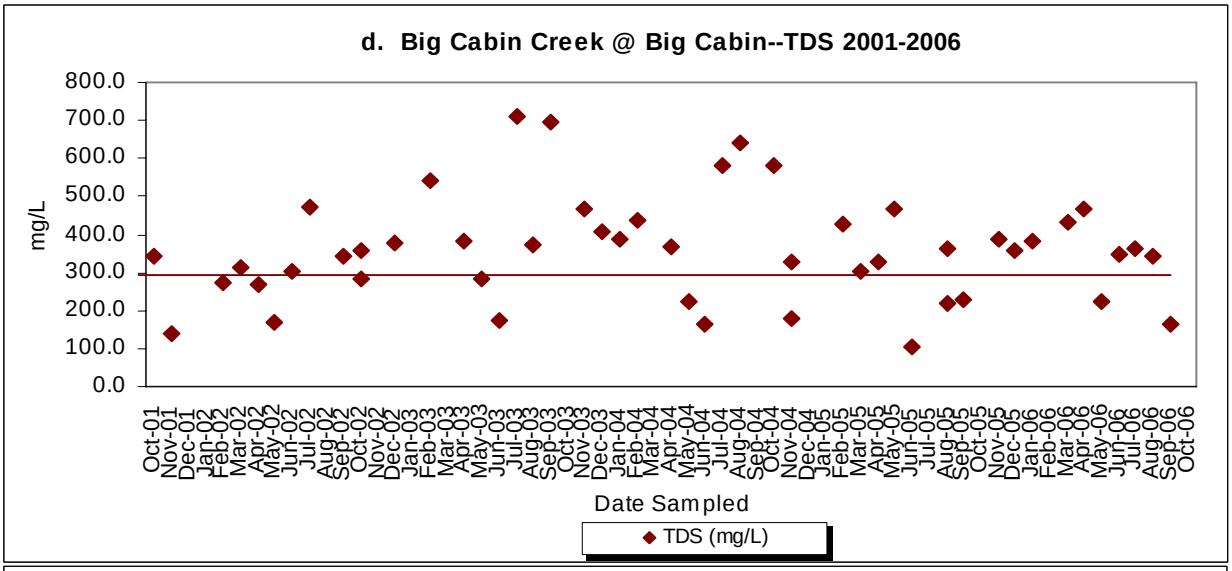
This station on Big Cabin Creek has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Big Cabin Creek from the confluence of Bull Creek (95.1416, 36.5875) downstream to the confluence of an unnamed tributary at the Mayes County line (95.143, 36.5094). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

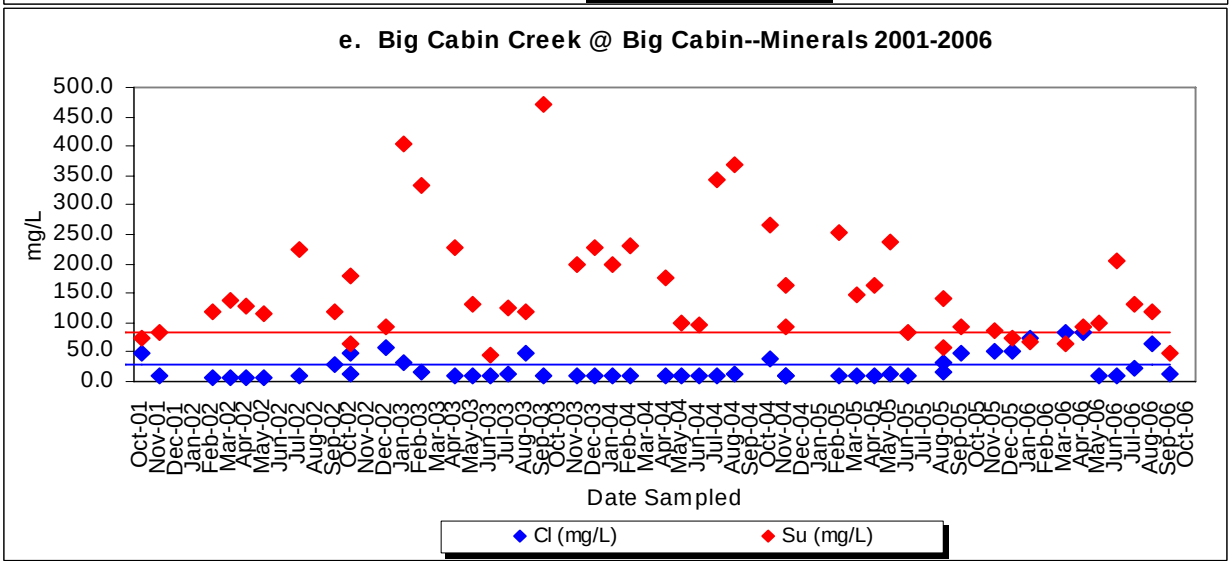
The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 18a), pH (Figure 18b), turbidity (Figure 18c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is partially supported (Figure 18d and e) but impaired per the CPP. Of the forty-nine (49) sulfate concentrations, seven (7) of the samples (or 14.3%) exceeded the minimum sample standard of 250 mg/L. Total dissolved solids and chlorides are within the prescribed sample standards and yearly means. Although 68% of the TDS concentrations exceeded the sample standard of 294.0 mg/L and the geometric mean (327.8 mg/L) exceeded the yearly mean standard of 253.0 mg/L, these values are below the prescribed minimum values of 750 mg/L and 700 mg/L, respectively. Although 20% of the chloride concentrations exceeded the sample standard of 30.0 mg/L, the geometric mean (12.9 mg/L) did not exceed the yearly mean standard of 21.0 mg/L and the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 15). Of the fifteen (15) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (347.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the seventeen (17) *E. coli* concentrations, two (2) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (264.2 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of Big Cabin Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 18f). Furthermore, the mean sestonic chlorophyll-a concentration (21.1 mg/M^3) produced a TSI of 61, which is below the threshold TSI of 62.

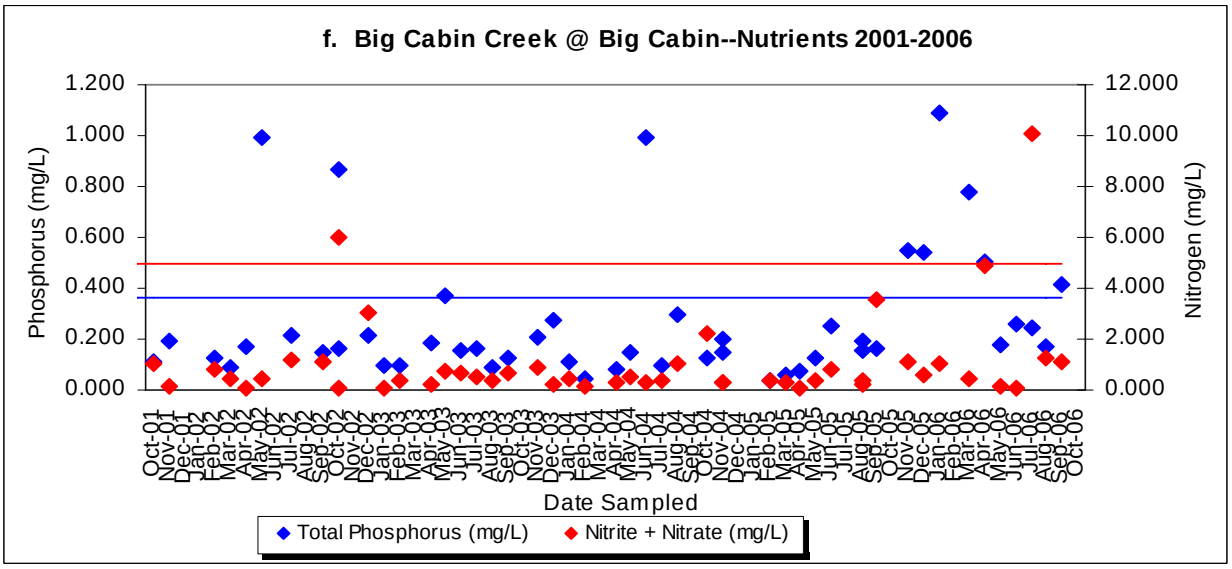
Figure 18 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Big Cabin Creek at Big Cabin (AT191000), 2001-2006



HUC 1107


d. Big Cabin Creek @ Big Cabin--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Big Cabin Creek @ Big Cabin--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Big Cabin Creek @ Big Cabin--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

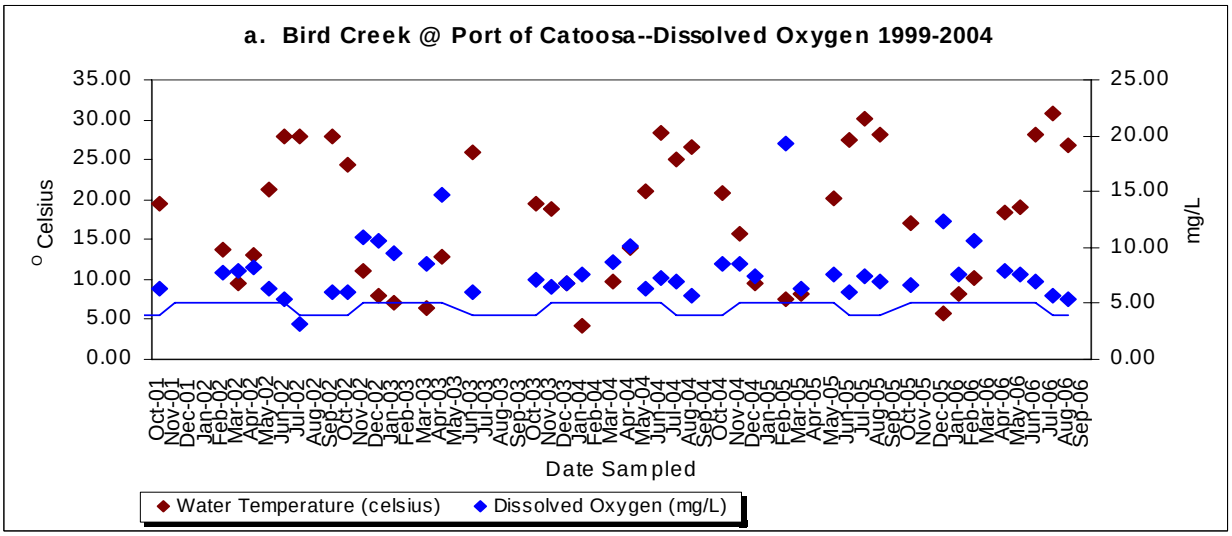
Bird Creek near Catoosa

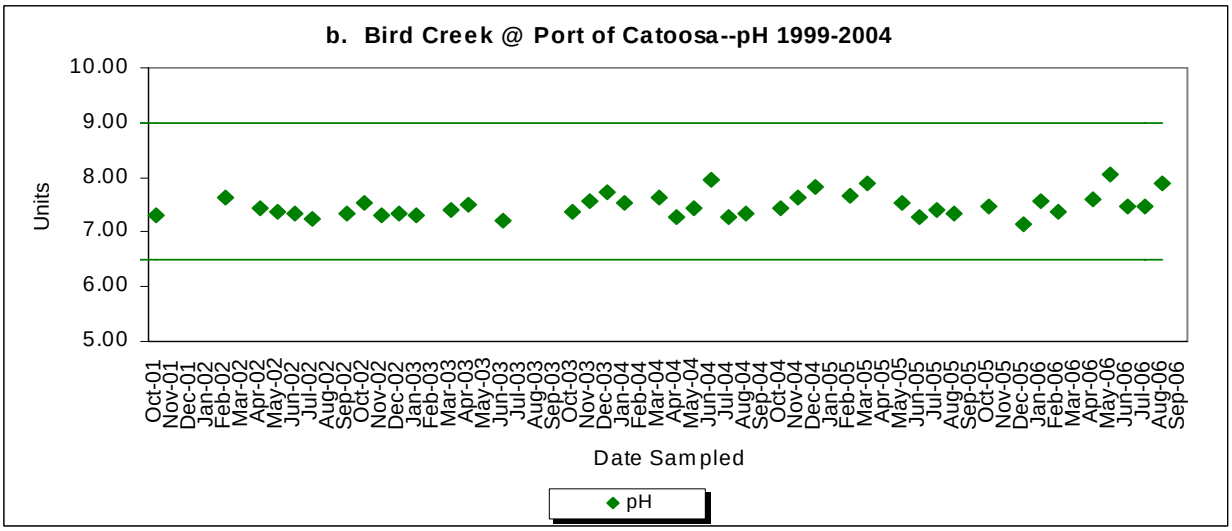
Station AT178050 (121300010010-001AT) is a permanent ambient trend monitoring station located on Bird Creek. Situated in the northeastern portion of Tulsa County, the site was established west of the Port of Catoosa on State Highway 266. The station is positioned near the terminal end of stream segment 121300010010 and is classified within the Bird Creek 8 digit HUC watershed (11070107). Water enters the stream system from Lake Yahola, Delaware Creek, Flat Rock Creek, Owasso Creek, and Mingo Creek, among others.

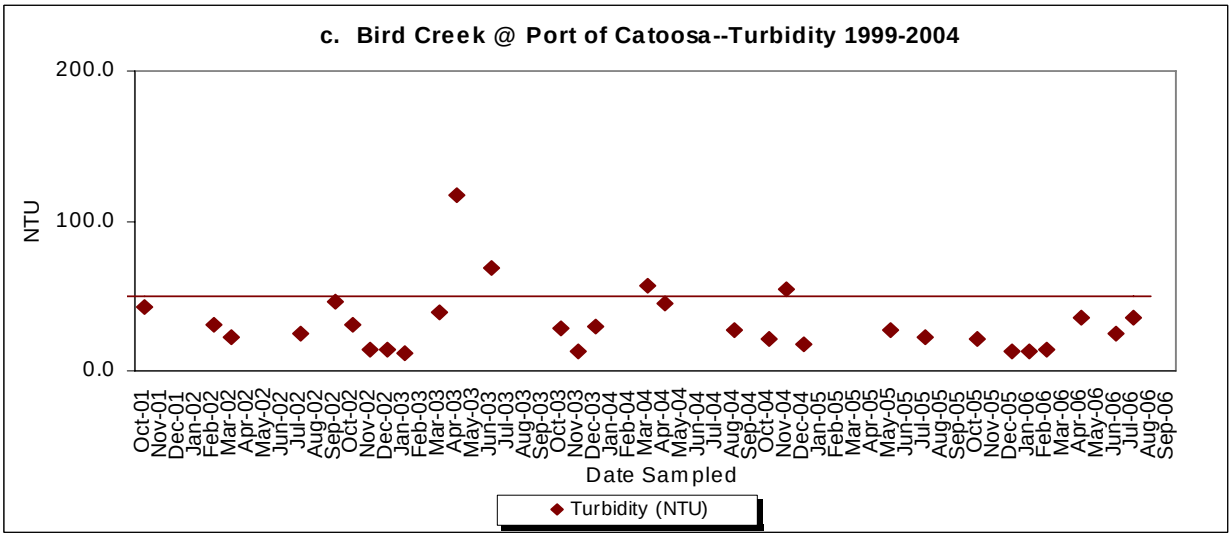
This station on Bird Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of Bird Creek from the confluence of Delaware Creek (95.9453, 36.2639) downstream to confluence of Bird Creek with the Verdigris River (95.7261, 36.2210). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the thirty-four (34) turbidity samples (Figure 19c), four (4) samples (or 12%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 19a), pH (Figure 19b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 19d and e). Although 14% of the sulfate concentrations exceeded the sample standard of 65.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 15). Of the fifteen (15) fecal coliform concentrations, 4 samples (or 27%) exceeded the prescribed screening level of 400 cfu/mL. Of the sixteen (16) enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (234.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Bird Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 19f). Furthermore, the mean sestonic chlorophyll-a concentration (6.1 mg/M^3) produced a TSI of 48, which is below the threshold TSI of 62.

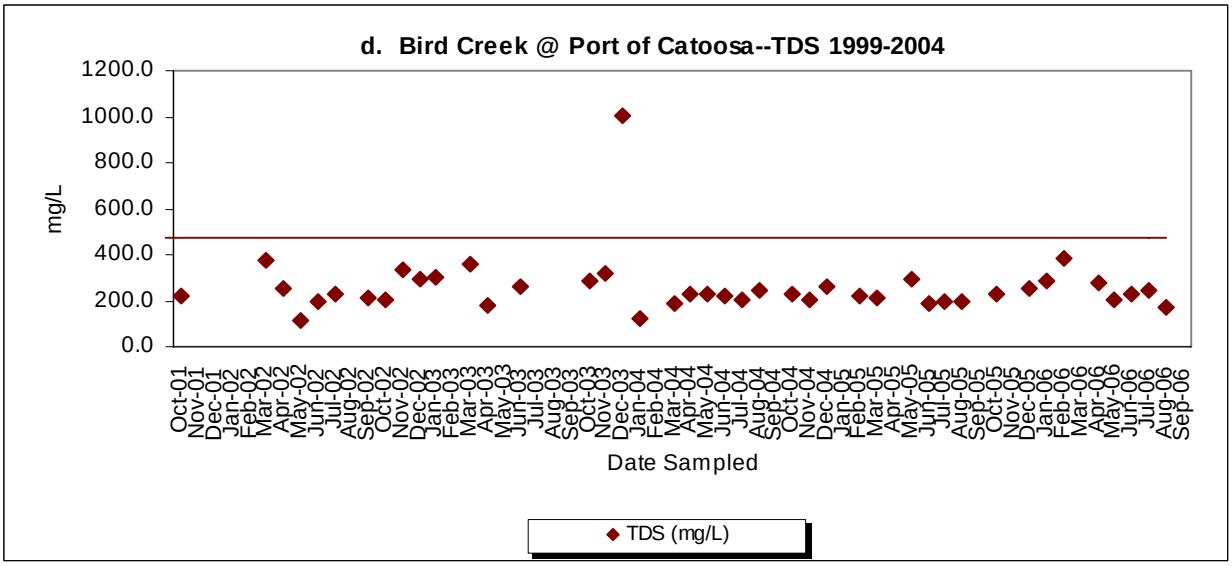
Figure 19 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Bird Creek at Catoosa (AT178050), 2001-2006

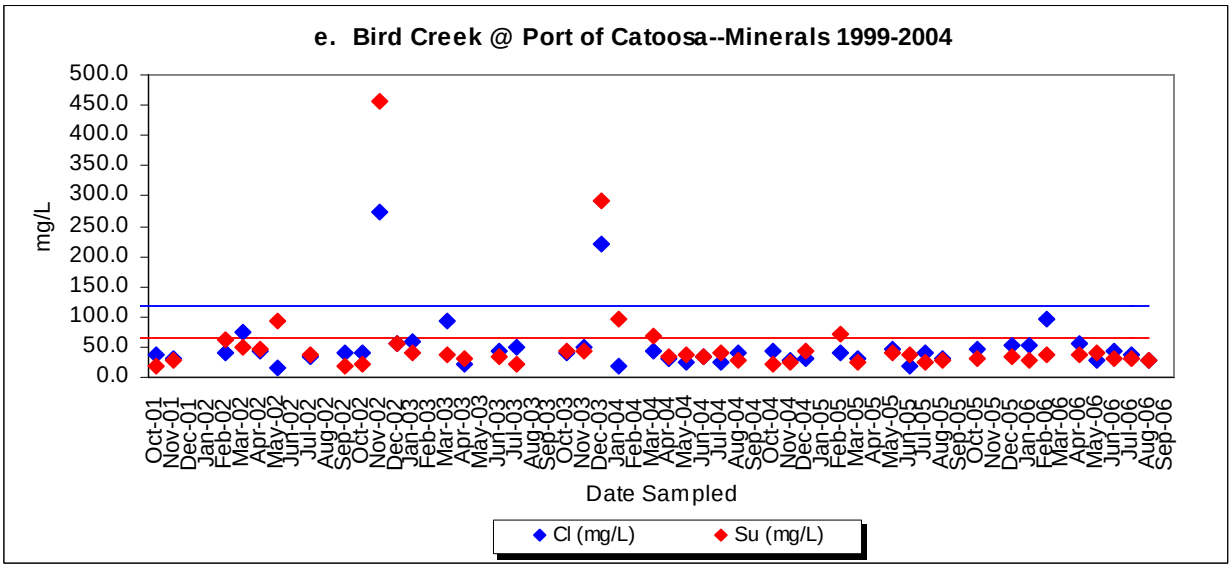


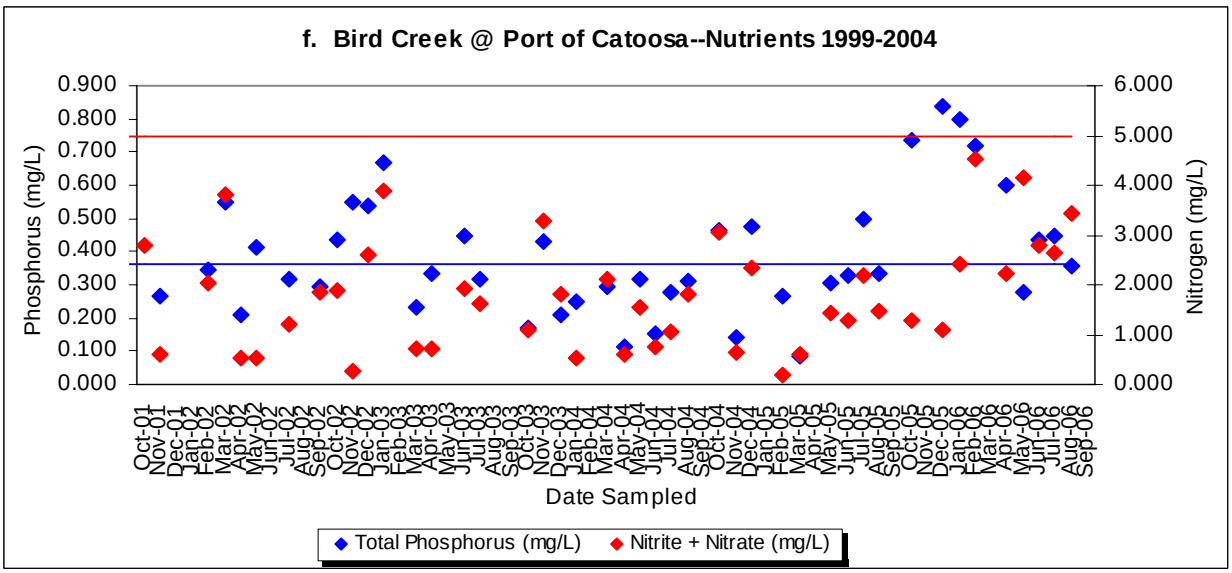




HUC 1107


d. Bird Creek @ Port of Catoosa--TDS 1999-2004
mg/L
Date Sampled
TDS (mg/L)


e. Bird Creek @ Port of Catoosa--Minerals 1999-2004
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Bird Creek @ Port of Catoosa--Nutrients 1999-2004
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

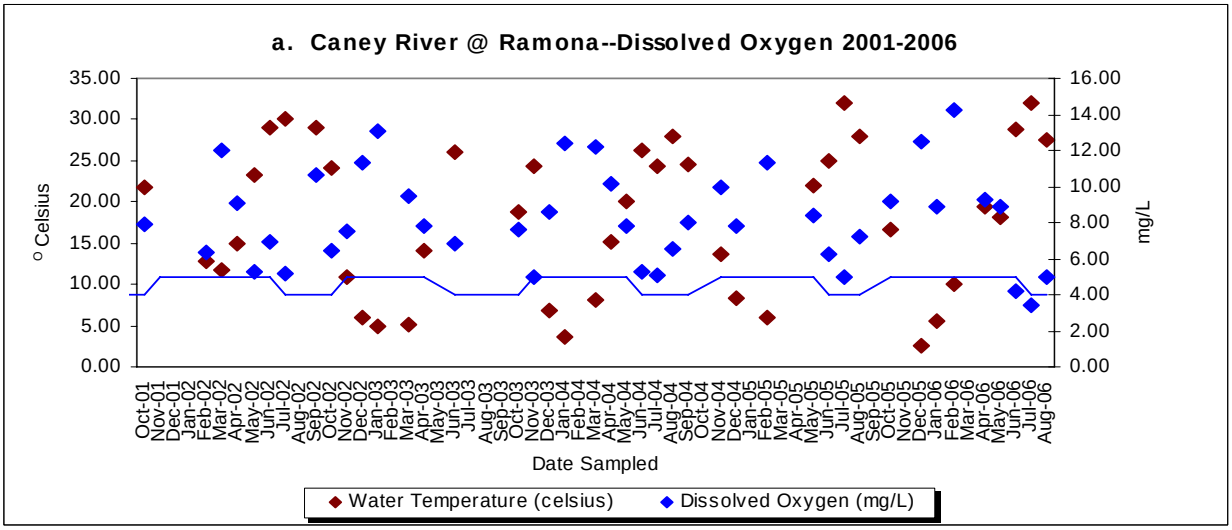
Caney River near Ramona

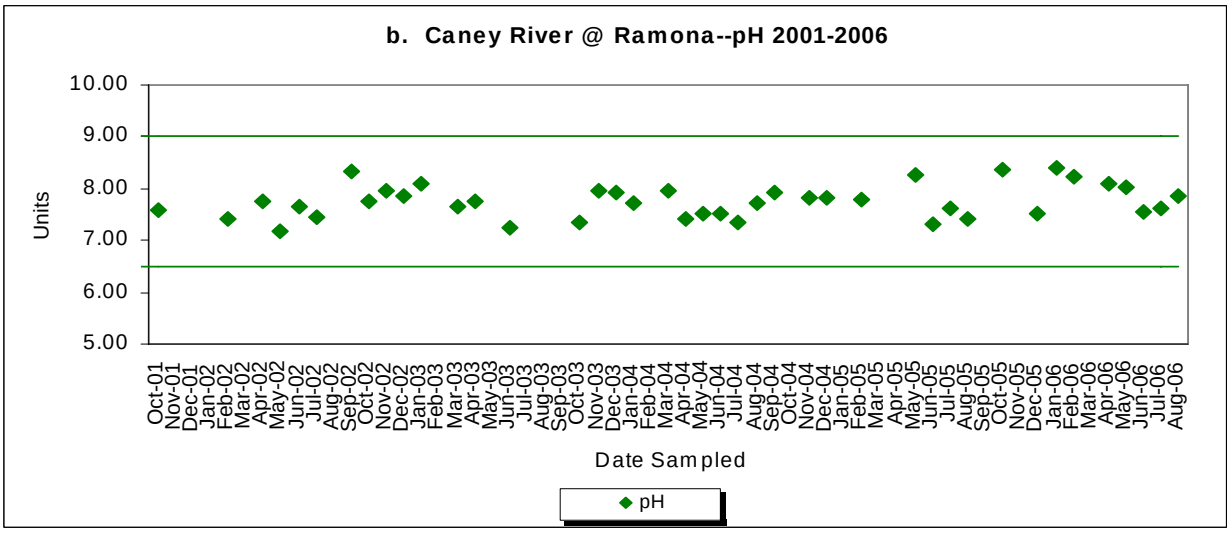
Station AT175500 (121400010010-001AT) is a permanent ambient trend monitoring station located on the Caney River in Oklahoma. Situated in the southeastern portion of Washington County, the site was established southeast of the town of Ramona off US Highway 75 on county road 390. The station is positioned between the midpoint and the terminal end of stream segment 121400010010 and is classified within the Caney River 8 digit HUC watershed (11070106). Water enters the stream system from Sand Creek, Keeler Creek, and Rabb Creek, among others.

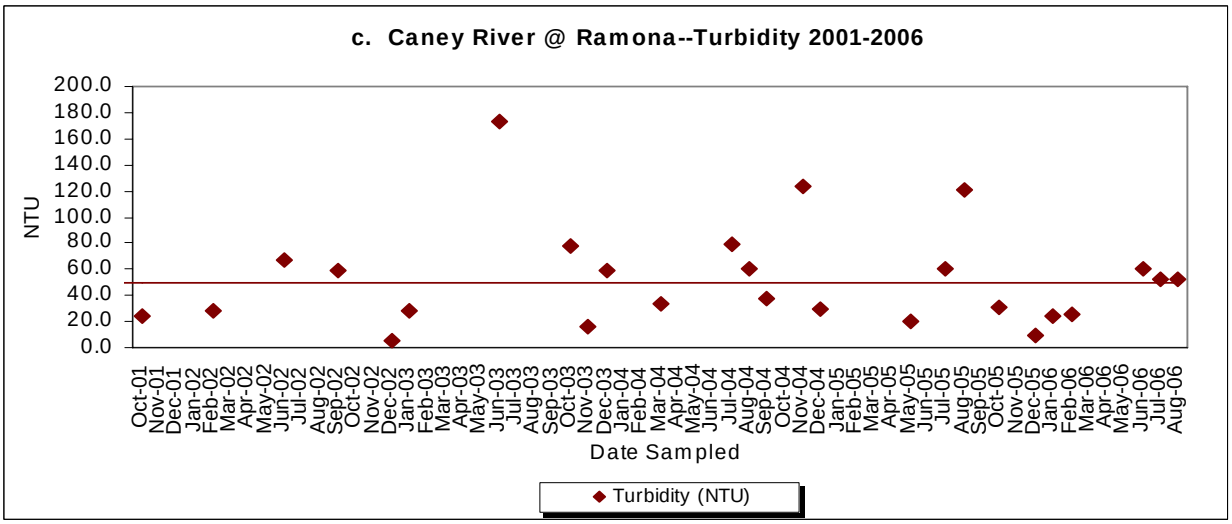
This station on the Caney River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Caney River from the confluence of Sand Creek (95.9684, 36.7167) downstream to confluence of the Caney River with Rabb Creek (95.8101, 36.4338). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-six (26) turbidity samples (Figure 20c), thirteen (13) samples (or 50%) exceeded the numerical criteria of 50 NTU. Of the ten (10) toxicant samples collected, three (3) of the lead concentrations (or 30%) exceeded the prescribed hardness-dependant chronic criteria of 5.66 ug/L (Table 14). Dissolved oxygen (Figure 20a) and pH (Figure 20b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 20d and e). Although 14% of the sulfate concentrations exceeded the sample standard of 45.0 mg/L, the values are below the prescribed minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 15). Of the eighteen (18) enterococci concentrations, 3 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (93.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Caney River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (31.7 mg/M^3) produced a TSI of 65, which is above the threshold TSI of 62. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 20f).

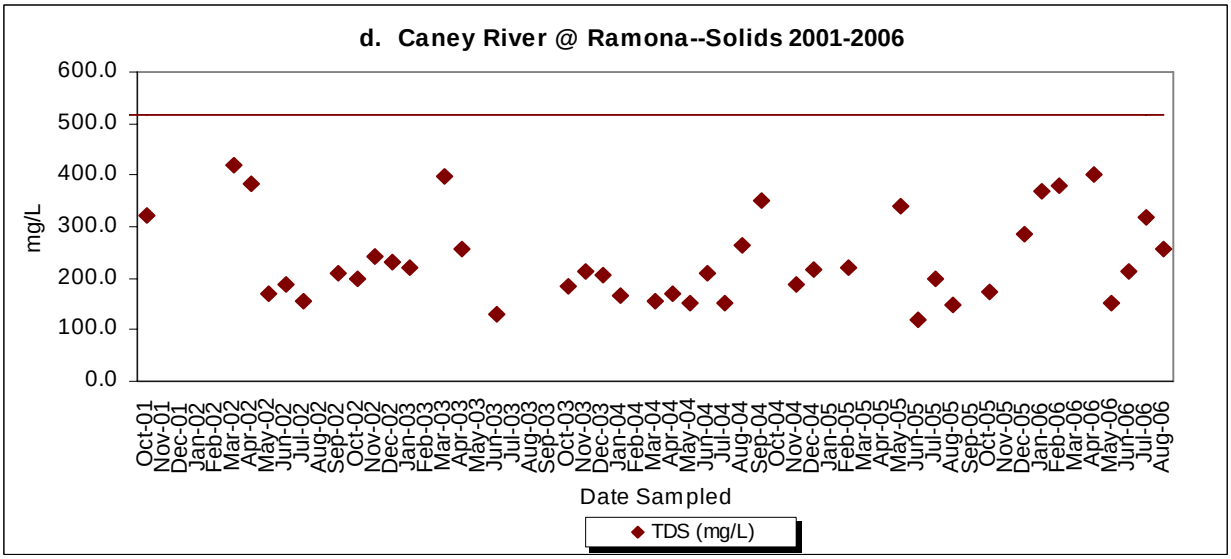
Figure 20 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Caney River at Ramona (AT175500), 2001-2006

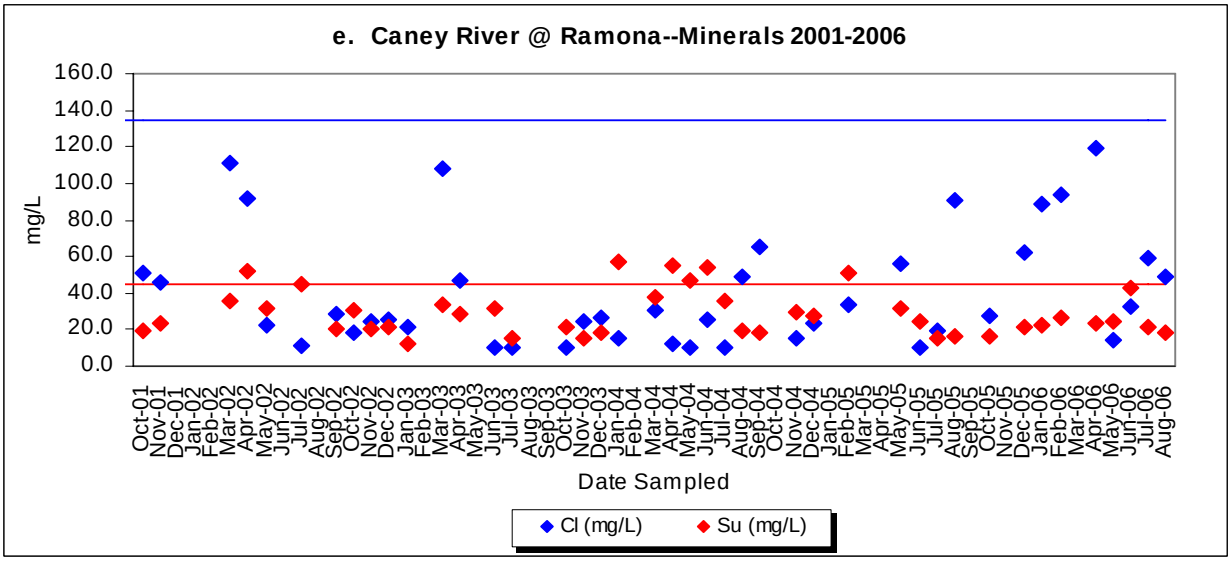


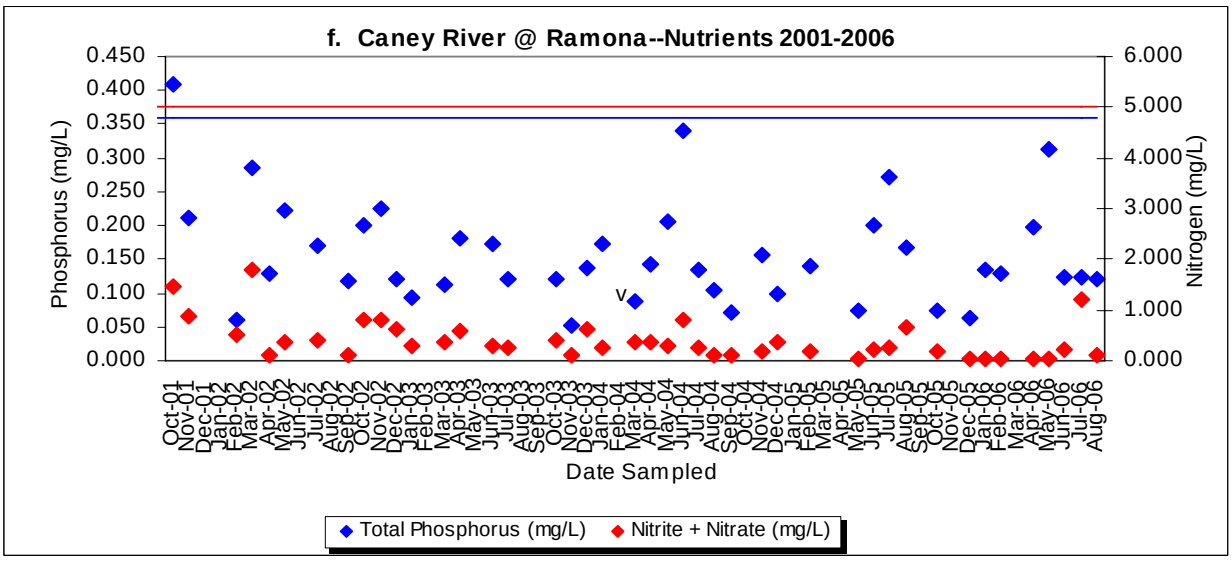




HUC 1107


d. Caney River @ Ramona--Solids 2001-2006
mg/L
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Caney River @ Ramona--Minerals 2001-2006
mg/L
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Caney River @ Ramona--Nutrients 2001-2006
Phosphorus (mg/L)
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

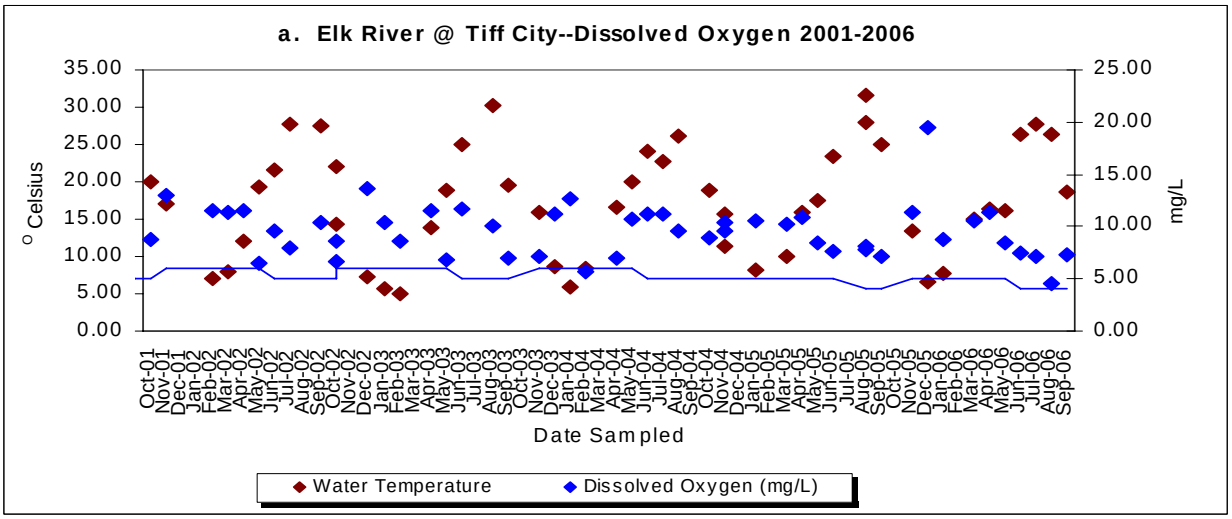
Elk River near Tiff City, Missouri

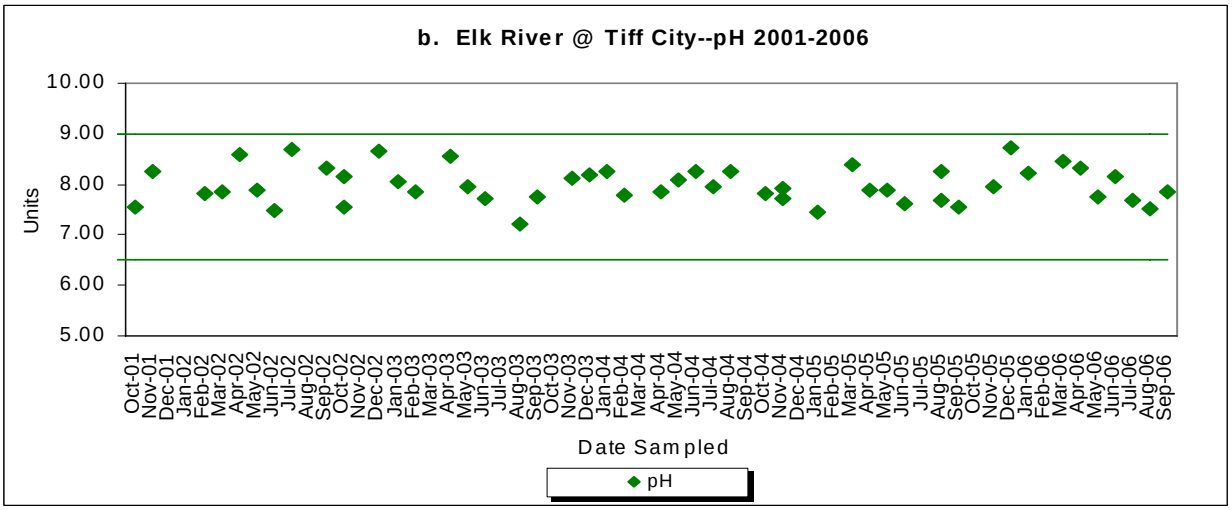
Station AT189000 (121600030440-001AT) is a permanent ambient trend monitoring station located on the Elk River in Missouri. Situated in the west central portion of McDonald county, the site was established south-southeast of the town of Tiff City on Missouri SH 43. The station is positioned near the midpoint of stream segment 121600030440 and is classified within the Elk River 8 digit HUC watershed (11070208). Water enters the stream system from several tributaries including the Buffalo Creek, among others.

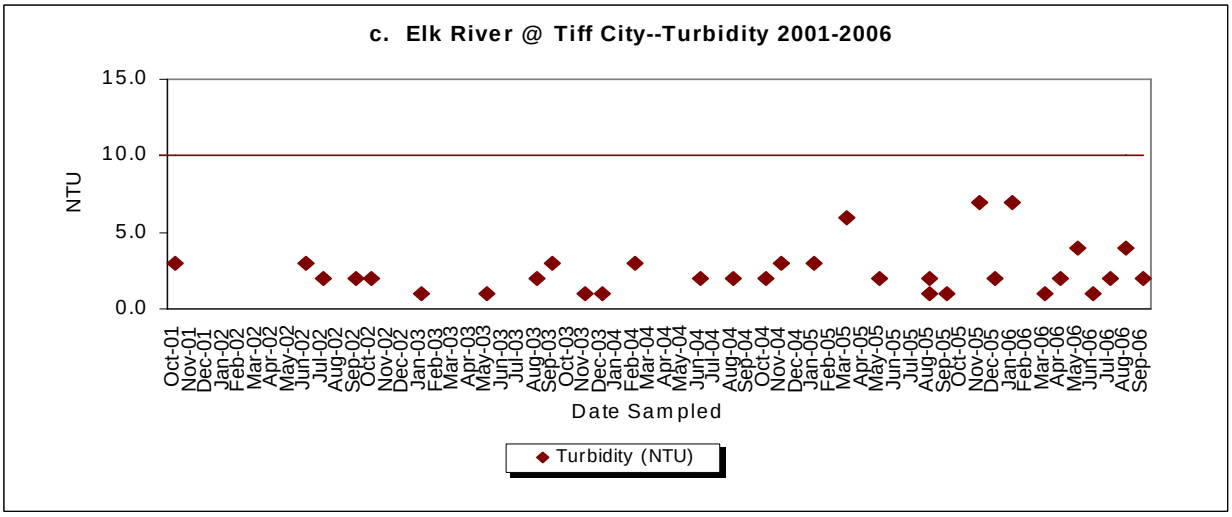
This station on the Elk River has been active for all water quality variables since May of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Elk River from its entrance into Oklahoma near Tiff City, Missouri (94.2950, 36.5510) downstream to confluence of the Elk River with Grand Lake (94.6177, 36.6250). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 21a), pH (Figure 21b), turbidity (Figure 21c), and toxicants met the criteria prescribed in the CWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 21d and e). The PBCR beneficial use is not supported (Table 15). Of the nineteen (19) enterococci concentrations, one (1) sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (50.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Elk River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 21f). Furthermore, the mean sestonic chlorophyll-a concentration (3.4 mg/M^3) produced a TSI of 43, which is below the threshold TSI of 62.

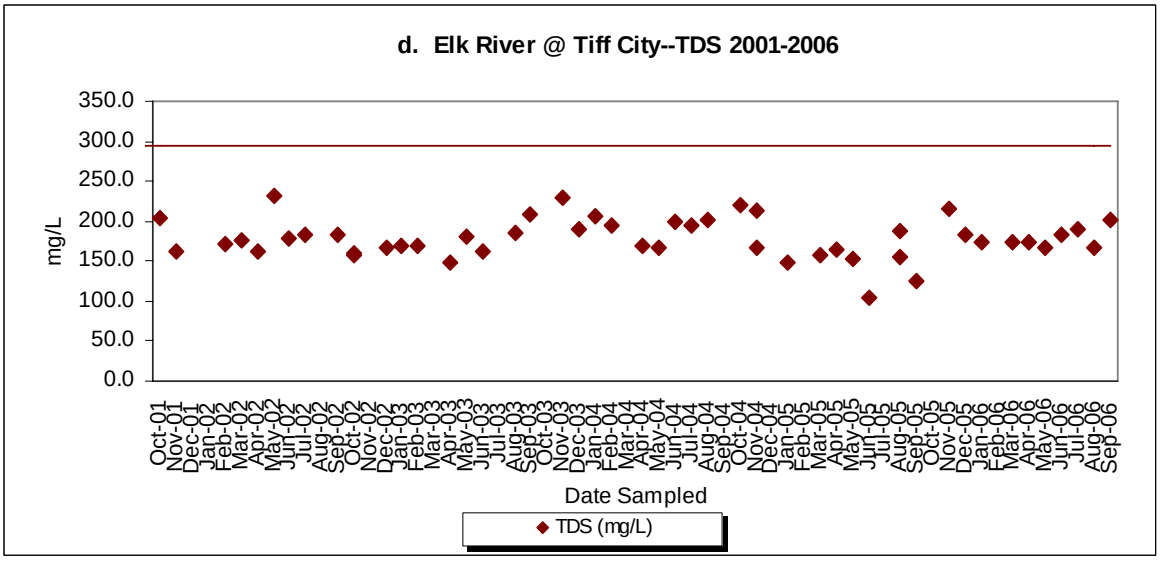
Figure 21 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Elk River at Tiff City (MO) (AT189000), 2001-2006

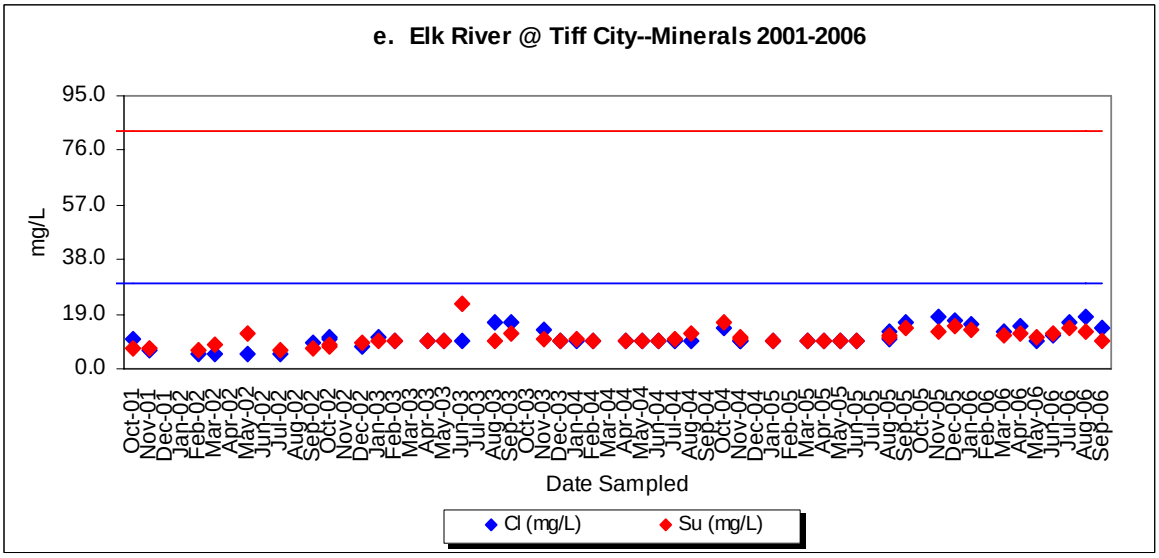


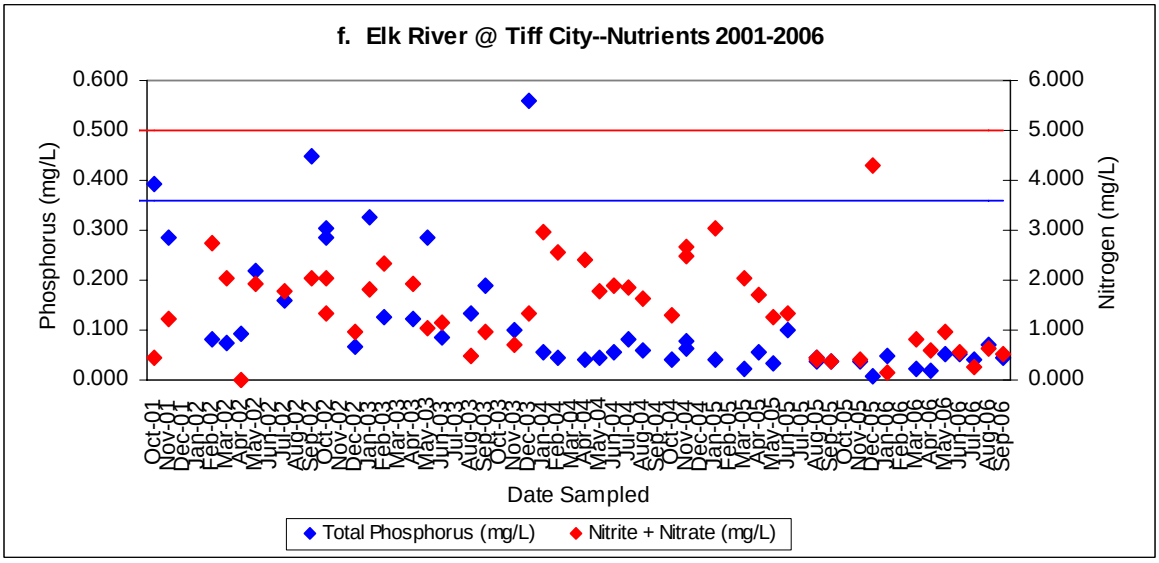




HUC 1107


d. Elk River @ Tiff City--TDS 2001-2006
mg/L
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Elk River @ Tiff City--Minerals 2001-2006
mg/L
95.0
76.0
57.0
38.0
19.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Elk River @ Tiff City--Nutrients 2001-2006
Phosphorus (mg/L)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

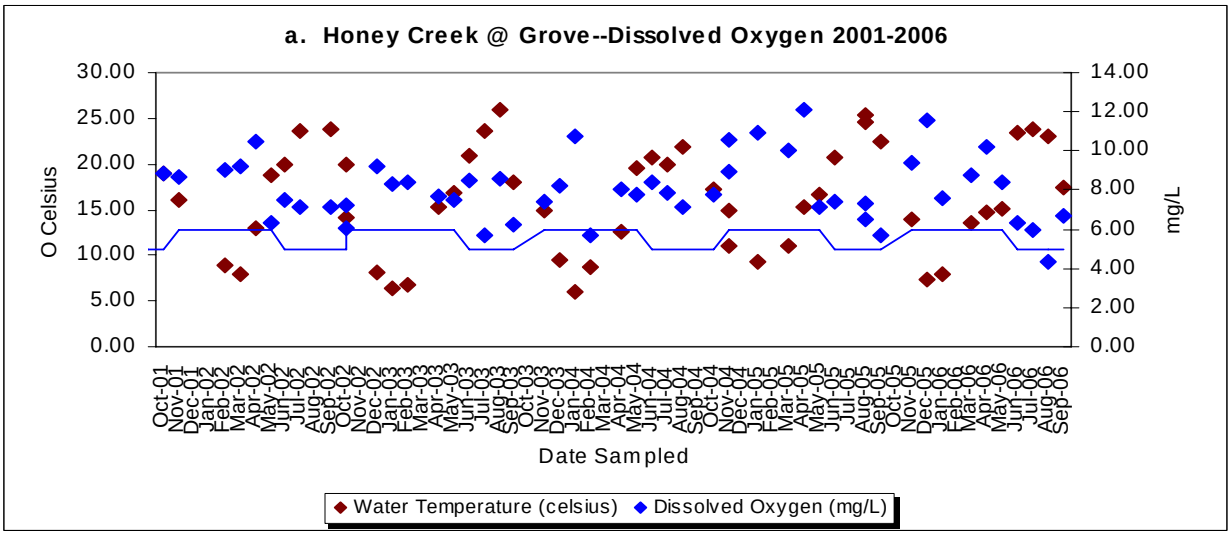
Honey Creek near Grove

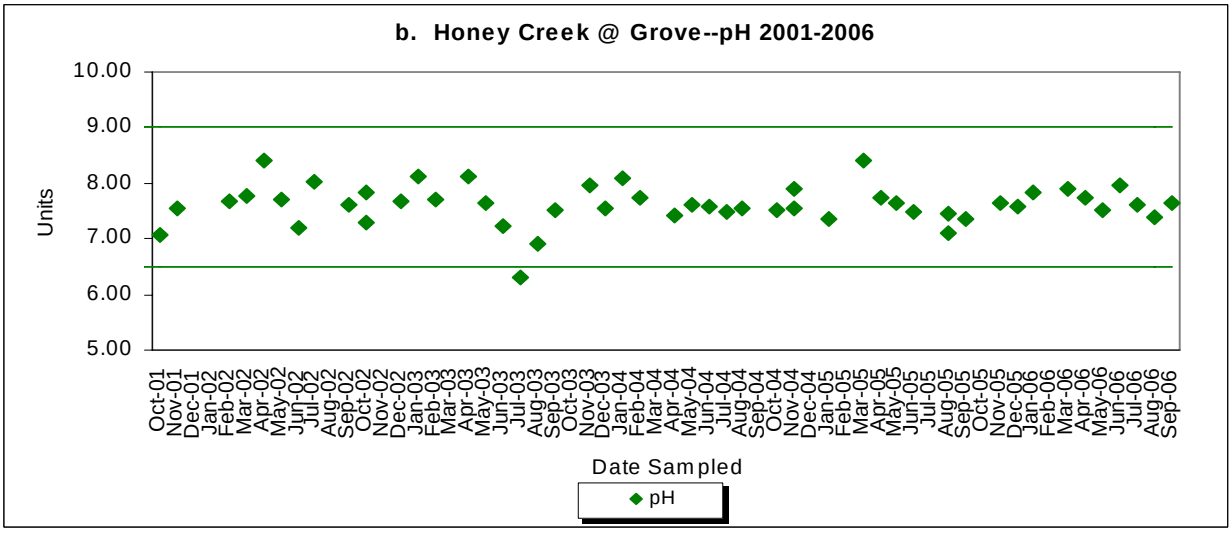
Station AT189090 (121600030290-001AT) is a permanent ambient trend monitoring station located on Honey Creek in Oklahoma. Situated in the northeastern portion of Delaware county, the site was established southeast of the city of Grove off of SH 25 on County Road N4650. The station is positioned near the terminal end of stream segment 121600030445 and is classified within the Grand Lake 8 digit HUC watershed (11070206). Water enters the stream system from Missouri and from several tributaries including the Cave Springs Branch, among others.

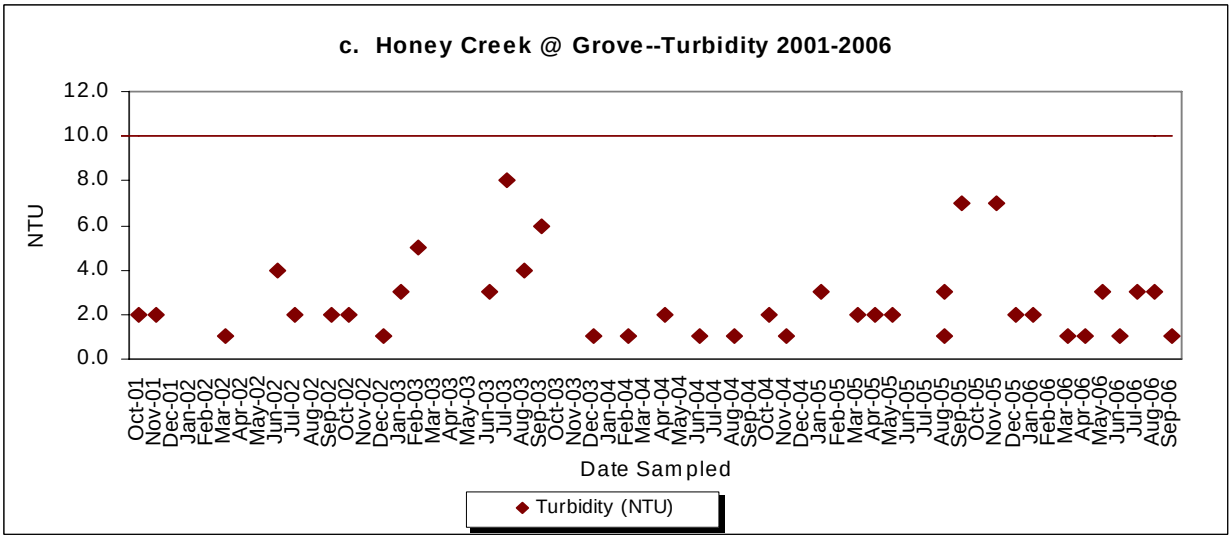
This station on Honey Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Honey Creek from its entrance into Oklahoma near Southwest City, Missouri (94.6178, 36.5243) downstream to confluence of Honey Creek with Grand Lake (94.7427, 36.5505). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 22a), pH (Figure 22b), turbidity (Figure 22c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2006 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 37 for Ozark Highland cool water aquatic communities [OAC 46:15-5(j)]. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 22d and e). Although 58% of the TDS concentrations exceeded the sample standard of 294.0 mg/L and the geometric mean (333.5 mg/L) exceeded the yearly mean standard of 187.0 mg/L, the values are below the minimum standard of 700 mg/L. Although 85% of the chloride concentrations exceeded the sample standard of 30.0 mg/L, and the geometric mean (63.1 mg/L) exceeded the yearly mean standard of 21.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 15). Of the nineteen (19) enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (362.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Honey Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.15 mg/L and 2.4 mg/L, respectively (Figure 22f).

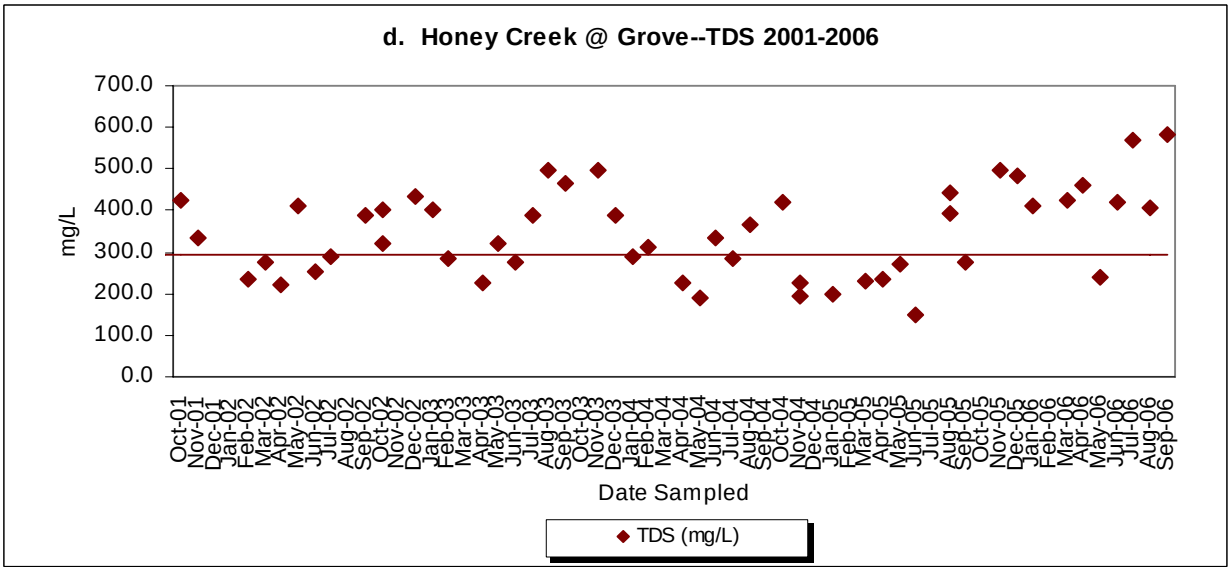
Figure 22 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Honey Creek at Grove (AT189090), 2001-2006.

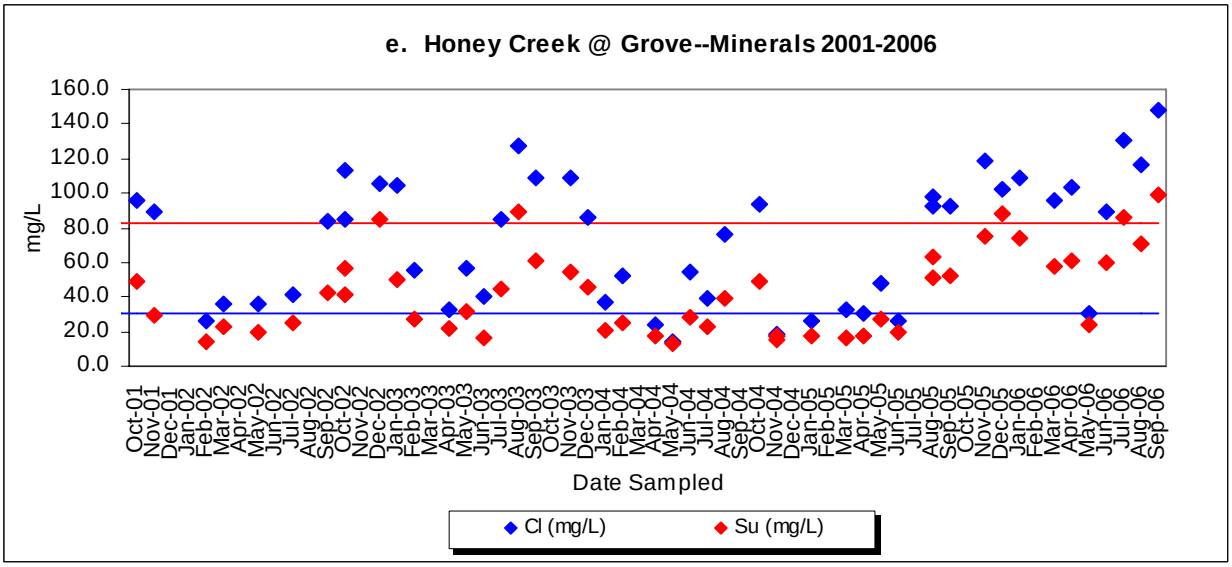


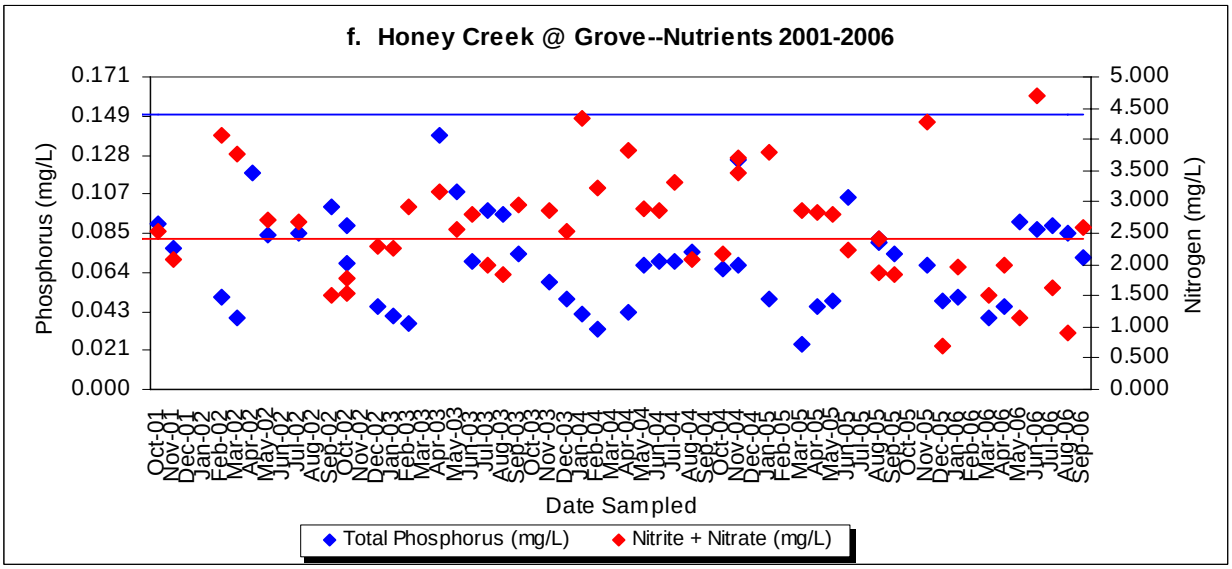




HUC 1107


d. Honey Creek @ Grove--TDS 2001-2006
mg/L
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Honey Creek @ Grove--Minerals 2001-2006
mg/L
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Honey Creek @ Grove--Nutrients 2001-2006
Phosphorus (mg/L)
0.171
0.149
0.128
0.107
0.085
0.064
0.043
0.021
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

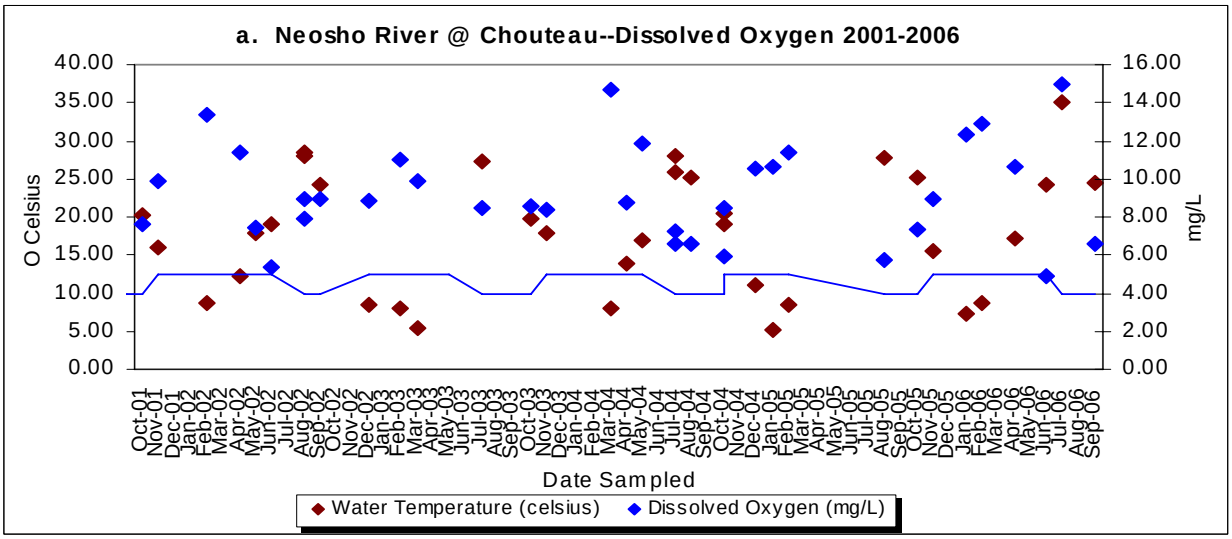
Neosho River near Chouteau

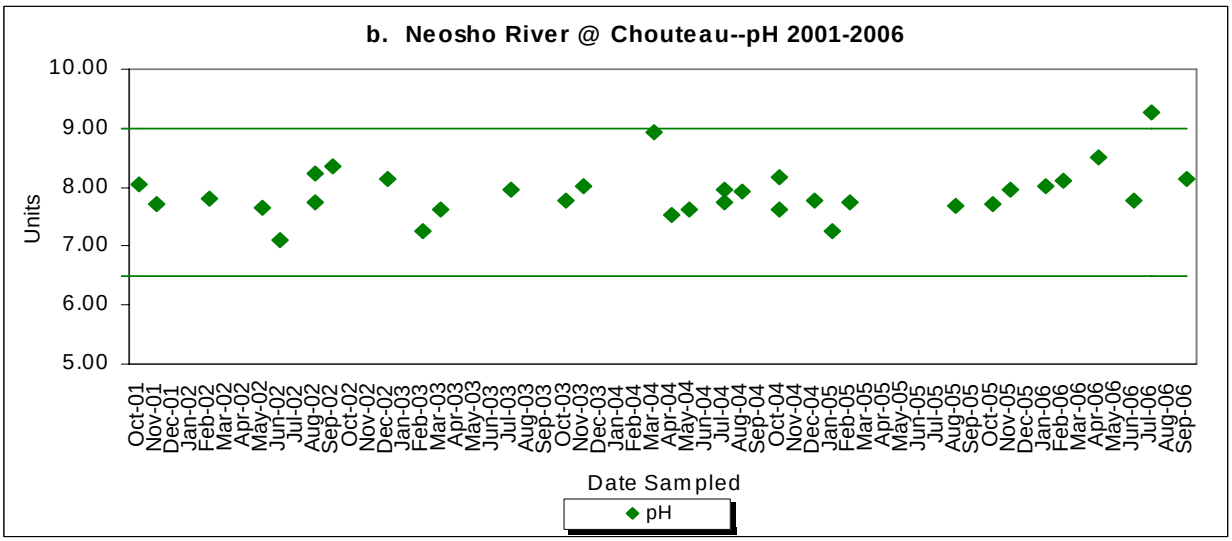
Station AT191530 (121600010280-001AT) is a permanent ambient trend monitoring station on the Neosho River in Oklahoma. Situated in the south central portion of Mayes County, the site was established east of the city of Chouteau on US Highway 412. The station is positioned near the terminal end of stream segment 121600010280 and is classified within the Lower Neosho River 8-digit HUC watershed (11070209). Water enters the stream system from Lake Hudson and from several tributaries including Crutchfield Branch Creek, Pryor Creek, and Chouteau Creek, among others.

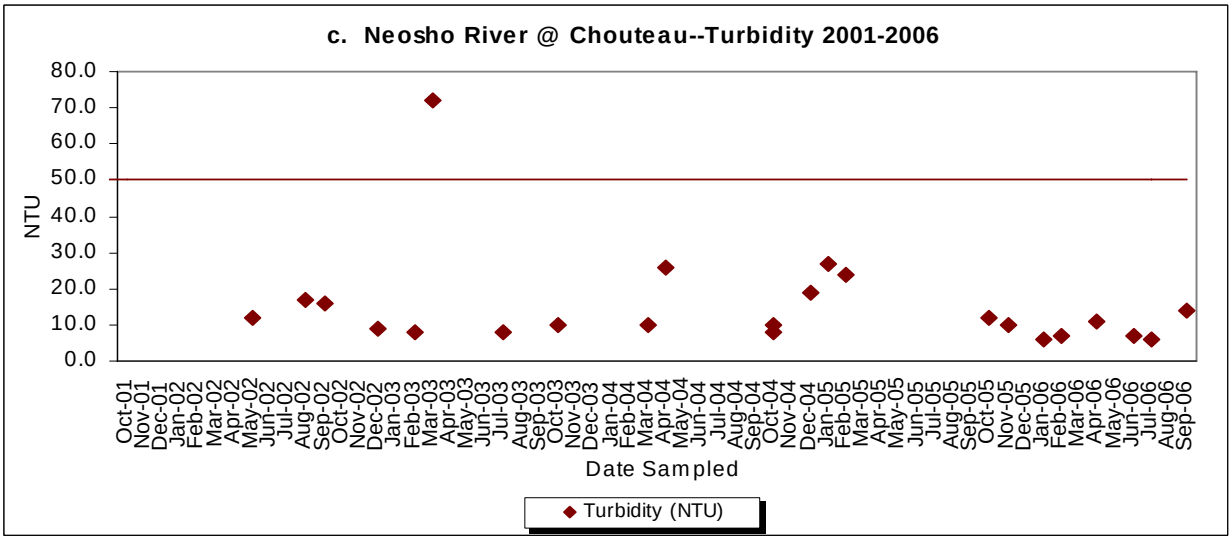
This station on the Neosho River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Neosho River from the confluence of Lake Hudson (95.1815, 36.2307) downstream to confluence of the Neosho River with Fort Gibson Lake (95.3005, 36.1540). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported for dissolved oxygen (Figure 23a), pH (Figure 23b) turbidity (Figure 23c), and toxicants. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 23d and e). The PBCR beneficial use is supporting for fecal coliform, *E. coli* and enterococci. This segment of the Neosho River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 23f). Furthermore, the mean sestonic chlorophyll-a concentration (17.4 mg/M^3) produced a TSI of 59, which is below the threshold TSI of 62.

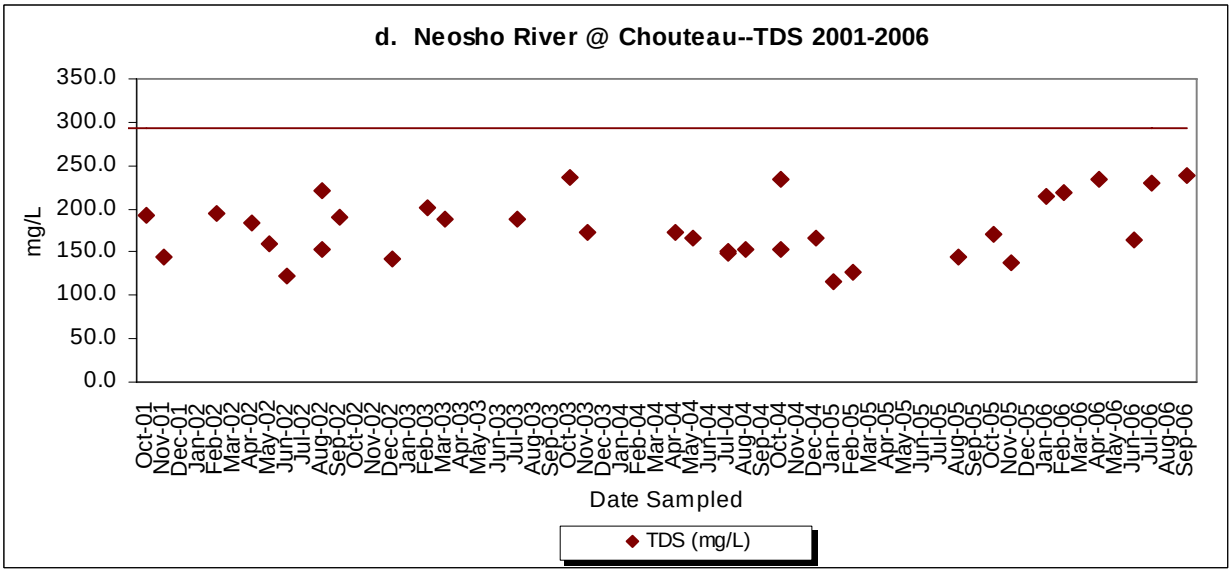
Figure 23 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Chouteau (AT191530), 2001-2006.

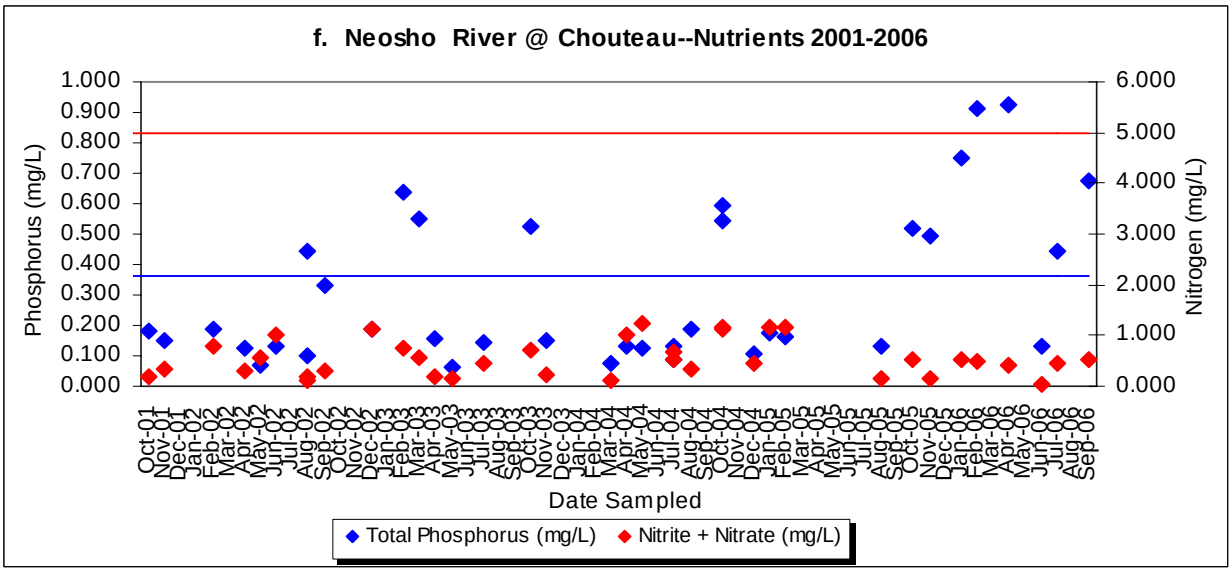


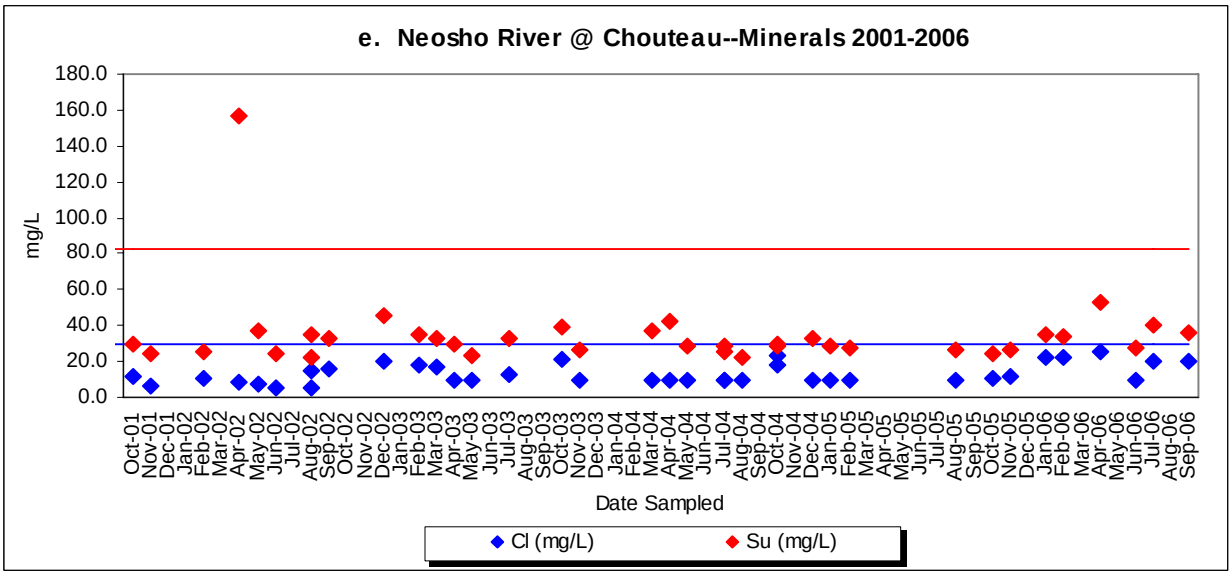




HUC 1107


d. Neosho River @ Chouteau--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


f. Neosho River @ Chouteau--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)


e. Neosho River @ Chouteau--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)

HUC 1107

Neosho River near Commerce

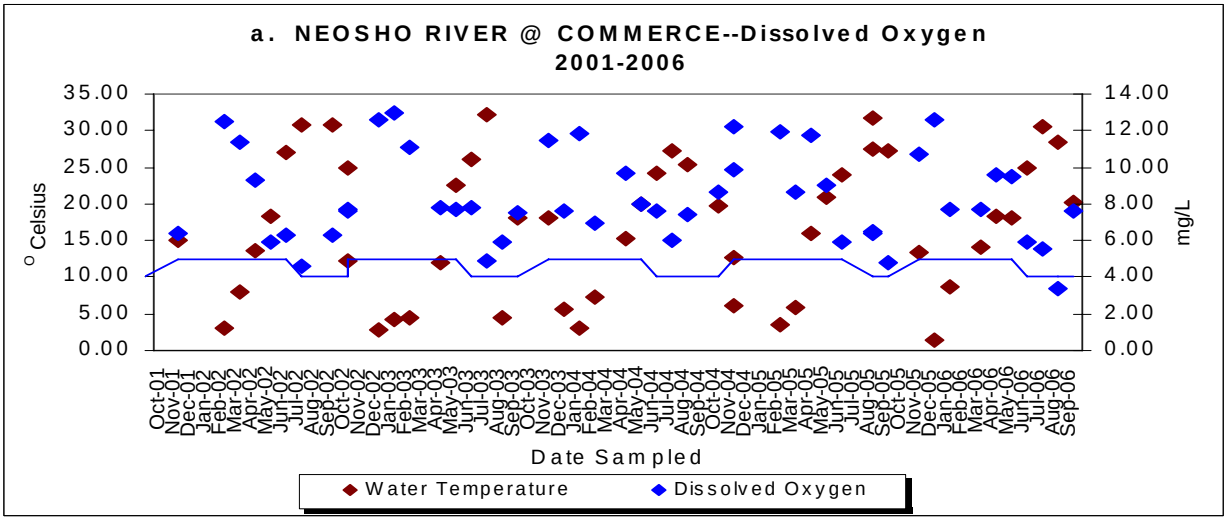
Station AT185000 (121600040220-001AT) is a permanent ambient trend monitoring station located on the Neosho River in Oklahoma. Situated in the northwest portion of Ottawa County, the site was established west of the town of Commerce off of US Highway 66 on County Road . The station is positioned near the midpoint of stream segment 121600040220 and is classified within the Lower Verdigris River 8 digit HUC watershed (11070206). Water enters the stream system from Bird Creek, Spunky Creek, Chambers Creek, Dog Creek (Claremore Lake), and Salt Creek, among others.

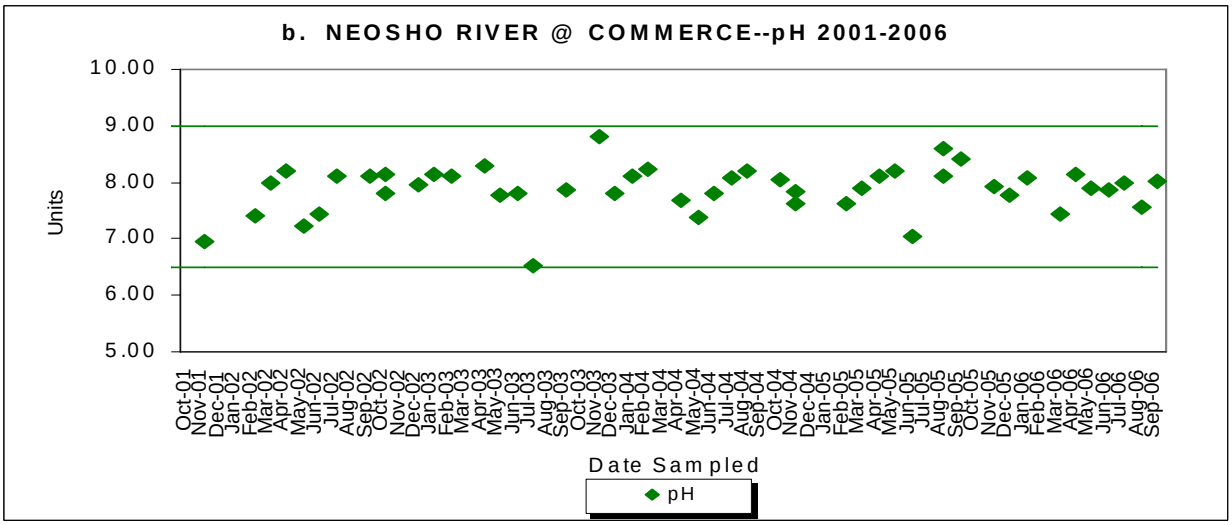
This station on the Neosho River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Neosho River from its entrance into the state of Oklahoma (95.0352, 36.9995) downstream to the confluence of the Neosho River with Elm Creek (94.9286, 36.8907). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

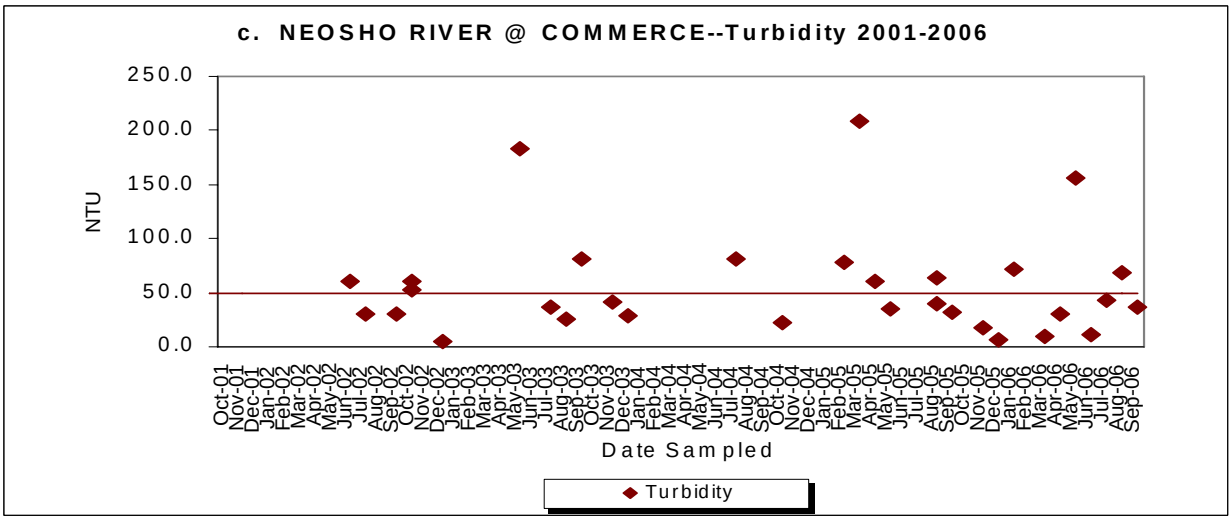
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-one (31) turbidity samples (Figure 24c), thirteen (13) samples (or 84%) exceeded the numerical criterion of 50 NTU. Of the ten (10) toxicant samples collected, two (2) of the lead concentrations (or 20%) exceeded the prescribed hardness-dependant chronic criteria of 6.58 ug/L (Table 14). Dissolved oxygen (Figure 24a) and pH (Figure 24b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 24d and e). Although 45% of the TDS concentrations exceeded the sample standard of 294.0 mg/L, the values are below the minimum standard of 700 mg/L. Although 30% of the sulfate concentrations exceeded the sample standard of 83.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci. This segment of the Neosho River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 24f). Furthermore, the mean sestonic chlorophyll-a concentration (18.6 mg/M^3) produced a TSI of 59, which is below the threshold TSI of 62.

HUC 1107

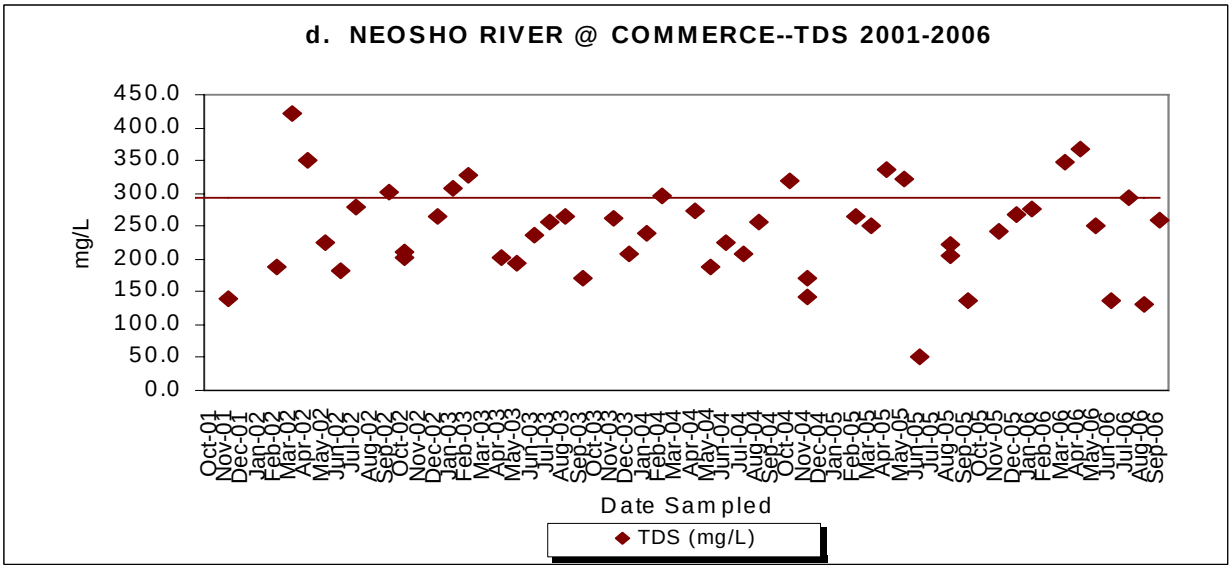
Figure 24 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Commerce (AT185000), 2001-2006.

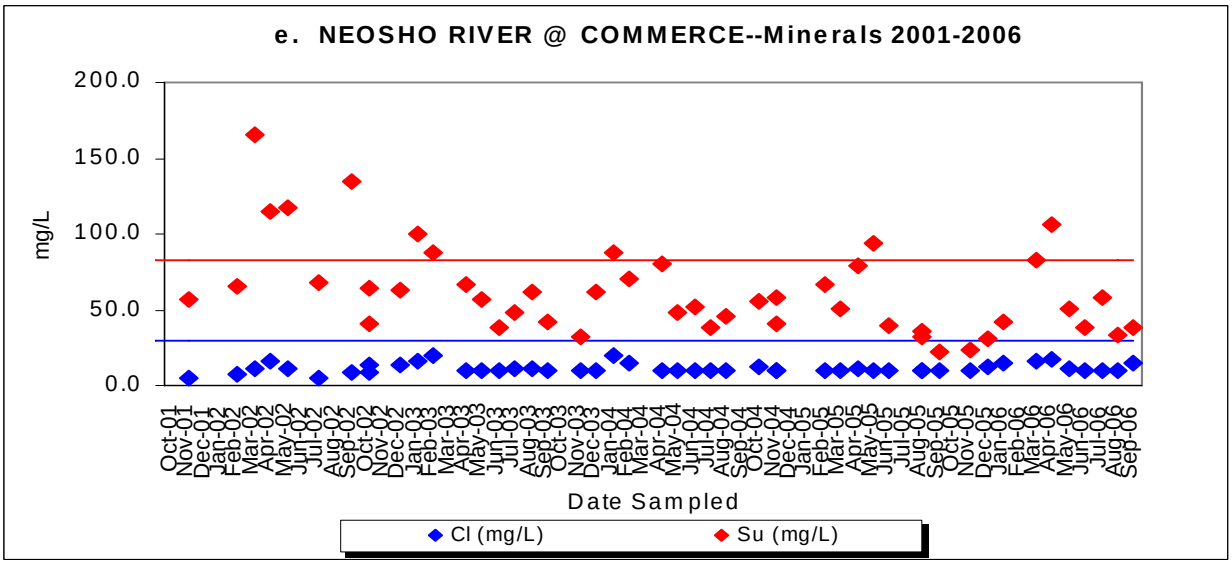


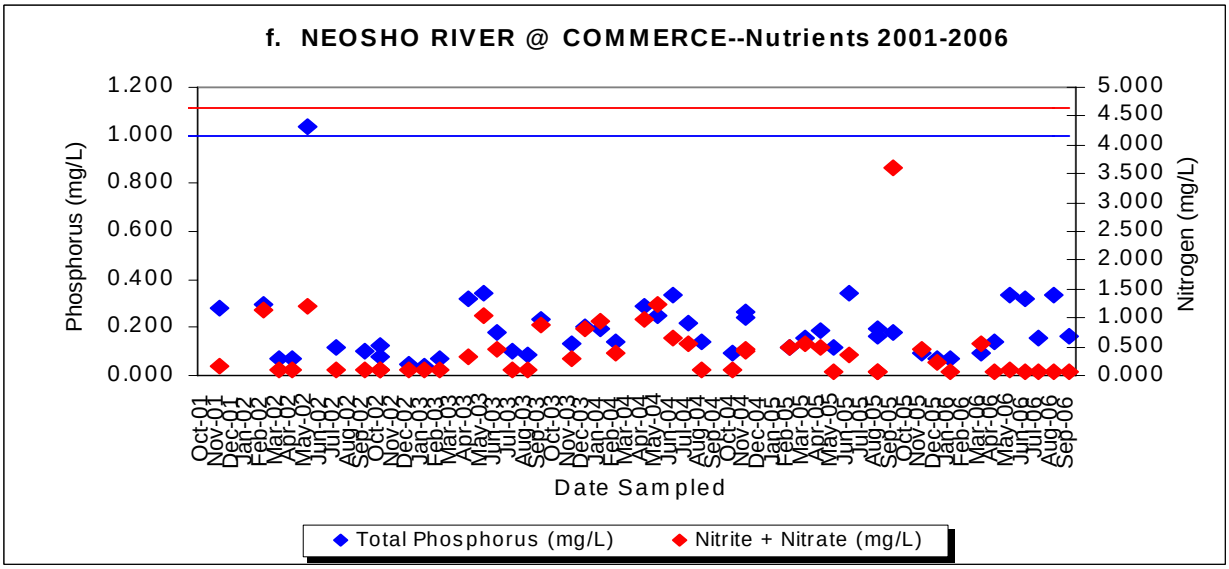




HUC 1107


d. NEOSHO RIVER @ COMMERCE--TDS 2001-2006
mg/L
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. NEOSHO RIVER @ COMMERCE--Minerals 2001-2006
mg/L
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. NEOSHO RIVER @ COMMERCE--Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

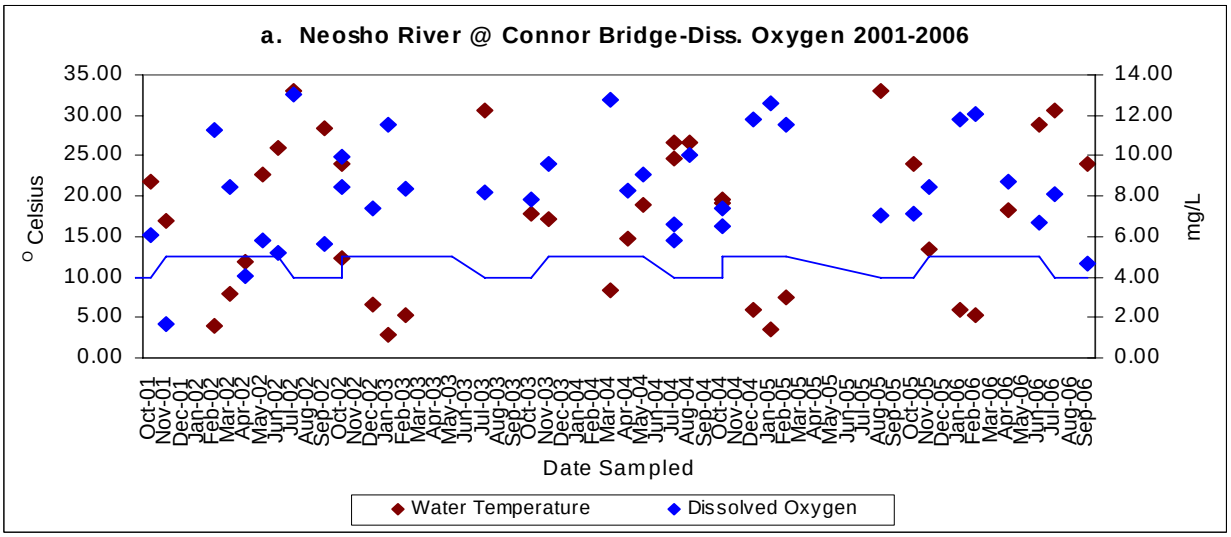
Neosho River near Connor Bridge

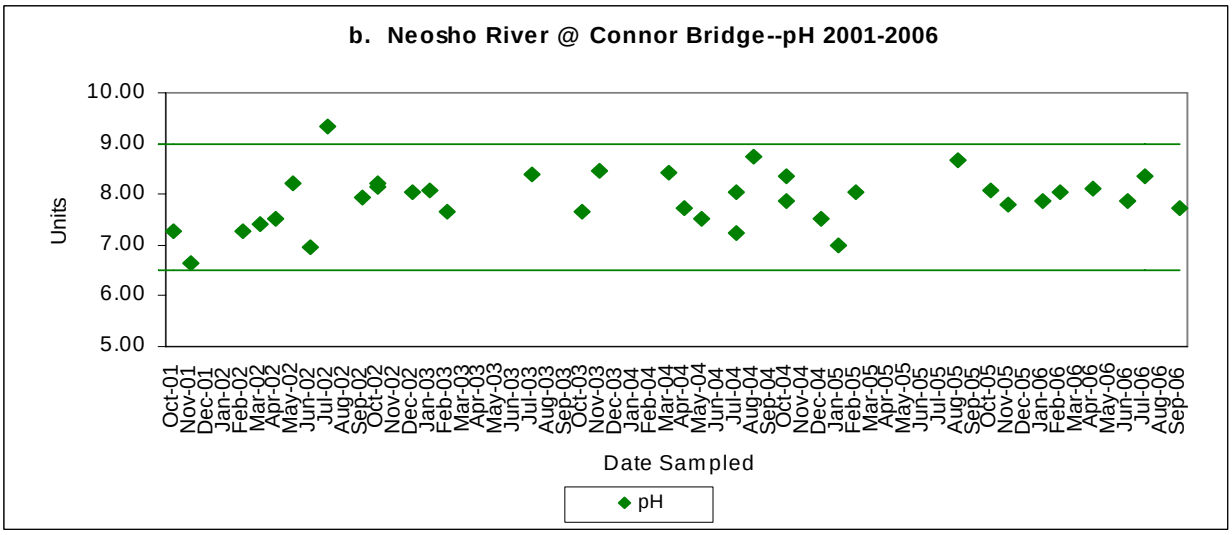
Station AT185010 (121600040010-001AT) is a permanent ambient trend monitoring station located on the Neosho River in Oklahoma. Situated in the central portion of Ottawa County, the site was established south southeast of the city of Miami off of State Highway 137 on County Road E0145 at Connor Bridge. The station is positioned near the terminal end of stream segment 121600040010 and is classified within the Grand Lake 8 digit HUC watershed (11070206). Water enters the stream system from several tributaries including Tar Creek and Hudson Creek, among others.

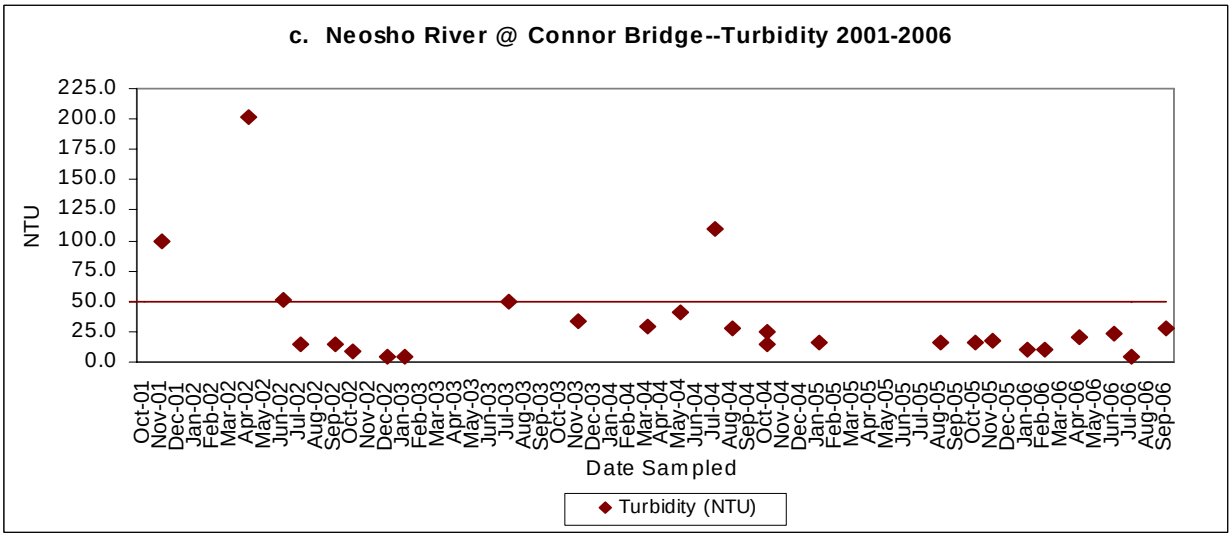
This station on the Neosho River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Neosho River from the confluence of an unnamed tributary above the city of Miami, Oklahoma (94.9116, 36.8757) downstream to confluence of the Neosho River with Grand Lake (-94.7866, 36.7919). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the twenty-six (26) turbidity samples (Figure 25c), four (4) samples (or 15%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 25a), pH (Figure 25b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 25d and e). Although 19% of the TDS concentrations exceeded the sample standard of 294.0 mg/L, the values are below the minimum standard of 700 mg/L. Although 32% of the sulfate concentrations exceeded the sample standard of 83.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci. This segment of the Neosho River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 25f). Furthermore, the mean sestonic chlorophyll-a concentration (11.7 mg/M^3) produced a TSI of 55, which is below the threshold TSI of 62.

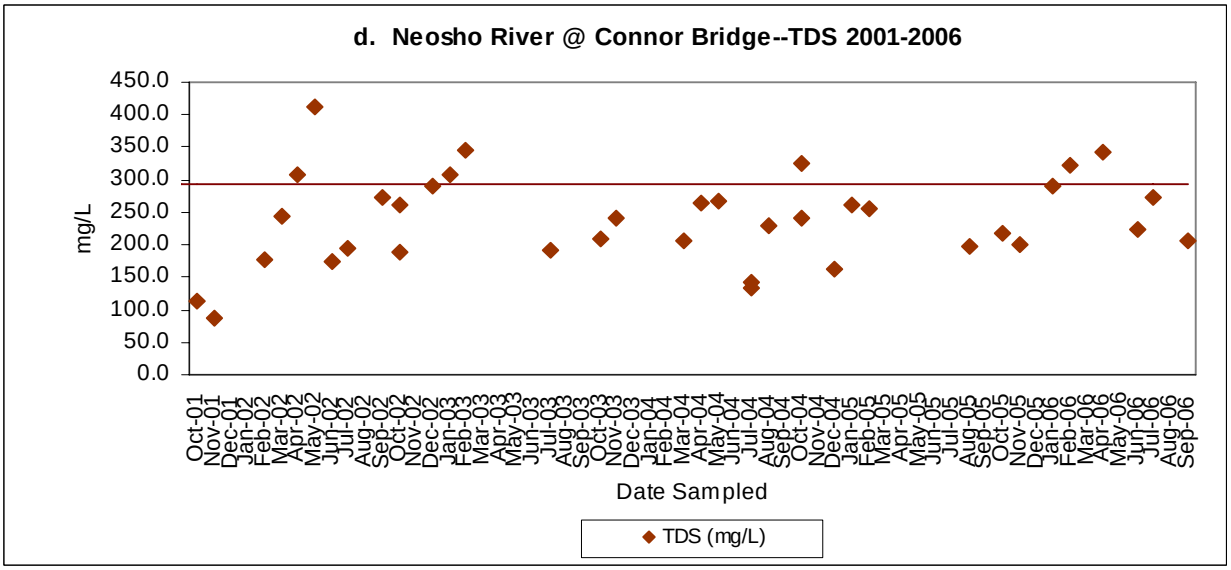
Figure 25 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Connor Bridge (AT185010), 2001-2006.

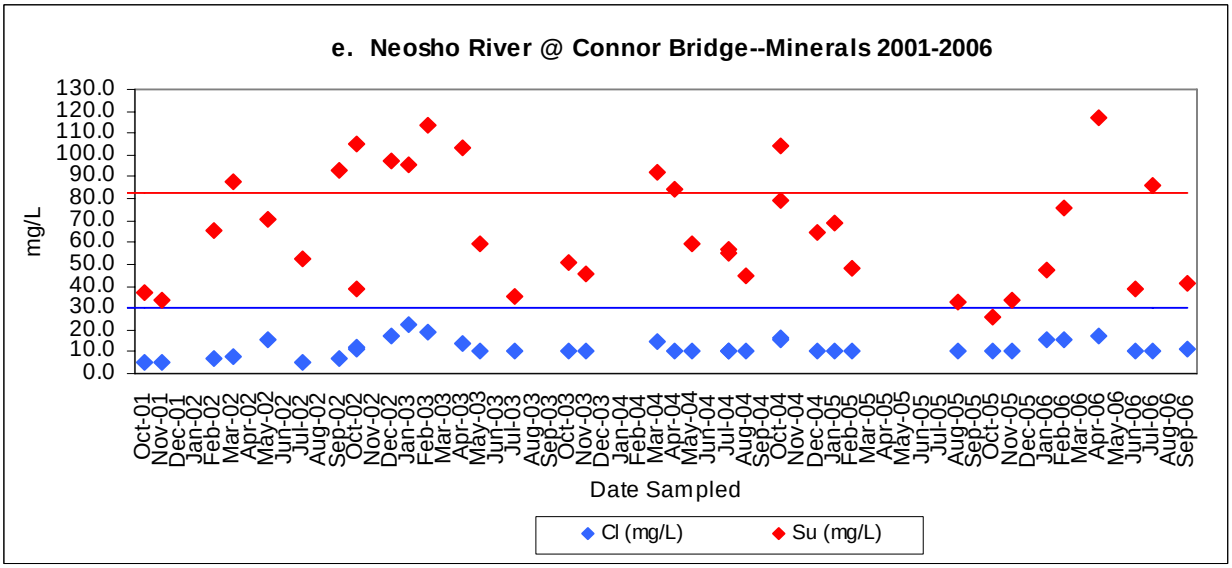


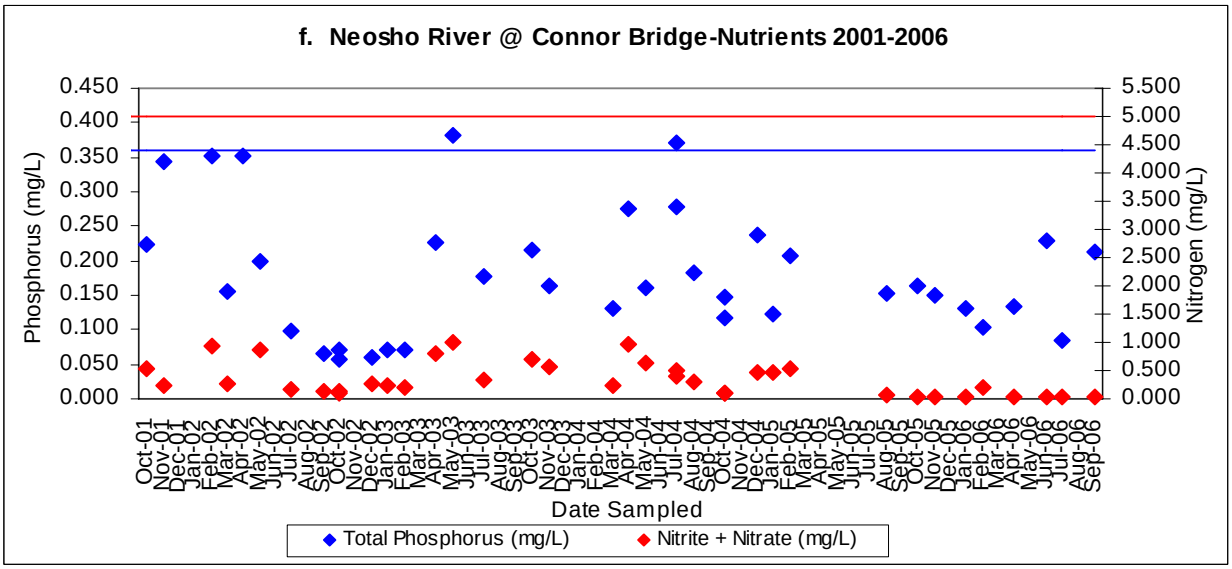




HUC 1107


d. Neosho River @ Connor Bridge--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Neosho River @ Connor Bridge--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Neosho River @ Connor Bridge-Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

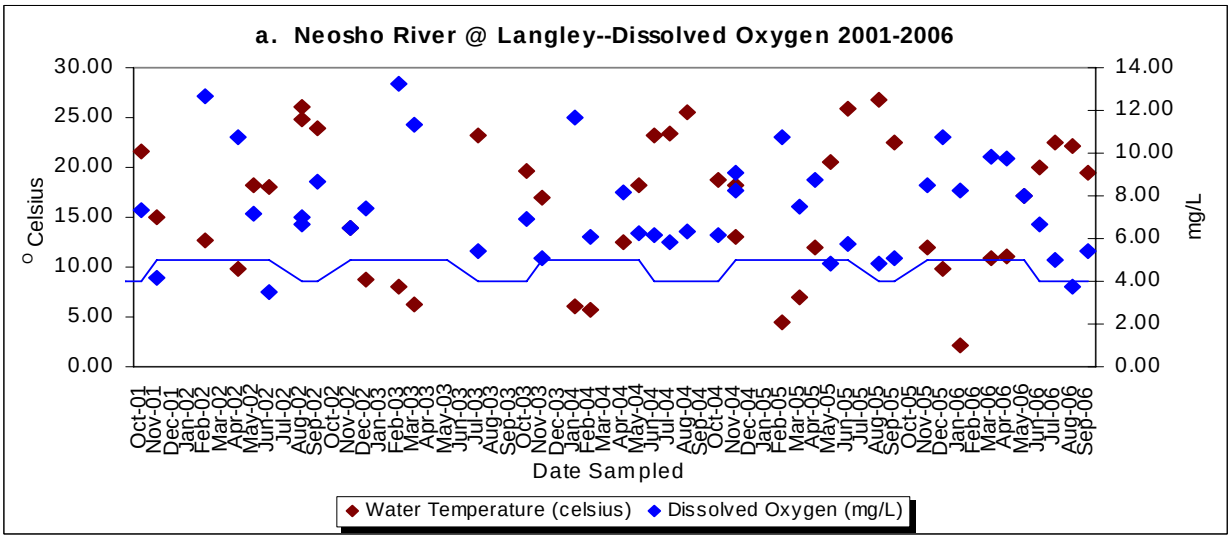
Neosho River near Langley

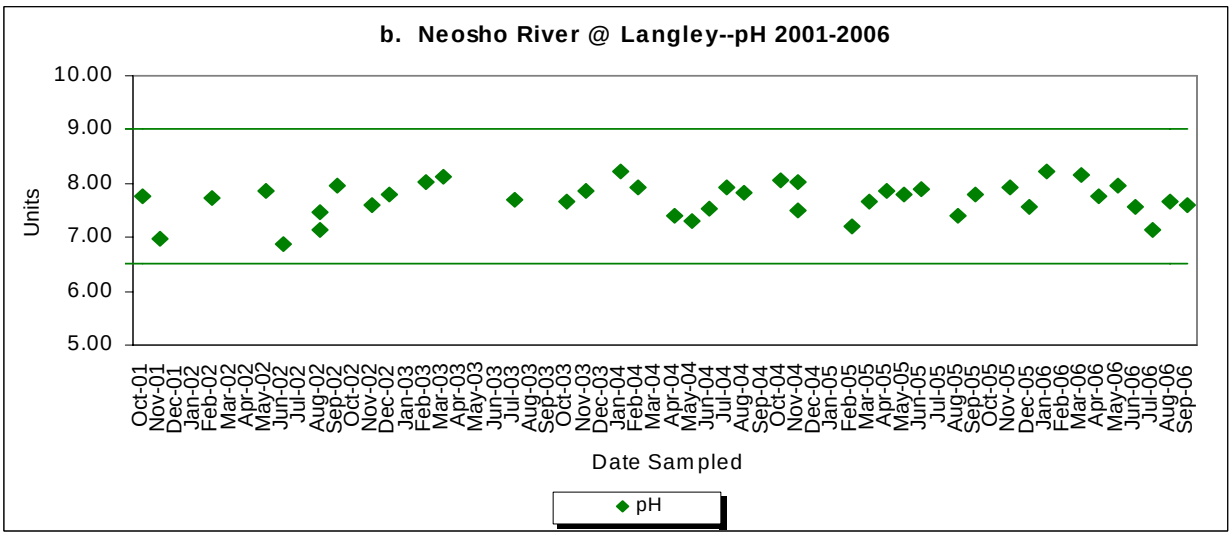
Station AT190500 (121600020170-001AT) is a permanent ambient trend monitoring station on the Neosho River below Grand Lake and above Lake Hudson. Situated in the northeastern portion of Mayes County, the site was established south of the town of Langley on State Highway 82. The station is positioned near the midpoint of stream segment 121600020170 and is classified within the Lower Neosho River 8-digit HUC watershed (11070209). Water enters the stream system from Grand Lake and several tributaries including Big Cabin Creek, among others.

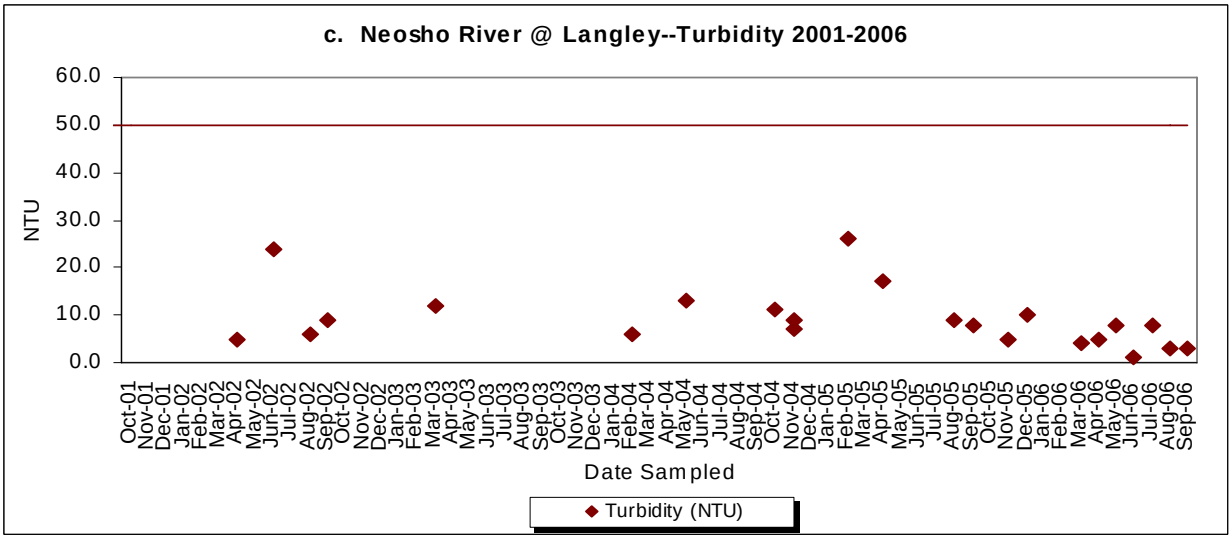
This station on the Neosho River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Neosho River from the confluence of Grand Lake (95.1426, 36.4415) downstream to confluence of the Neosho River with Lake Hudson (95.0408, 36.4690). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. The dissolved oxygen (Figure 26a), pH (Figure 26b), turbidity (Figure 26c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 26d and e). The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci samples. This segment of the Neosho River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 26f). Furthermore, the mean sestonic chlorophyll-a concentration (5.2 mg/M^3) produced a TSI of 47, which is below the threshold TSI of 62.

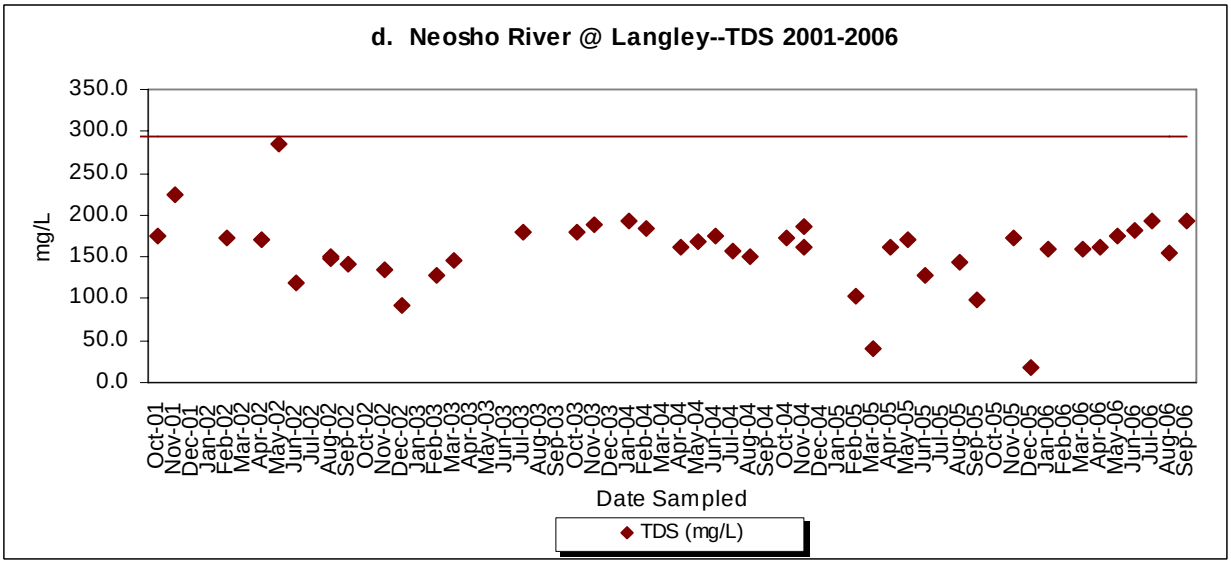
Figure 26 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Neosho River at Langley (AT190500), 2001-2006.

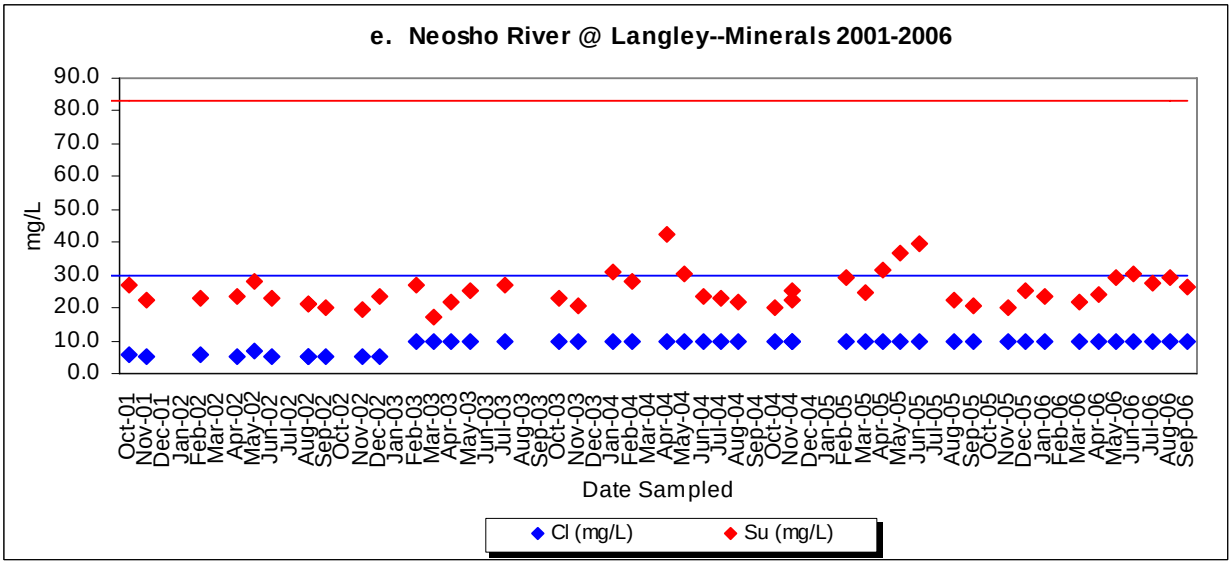


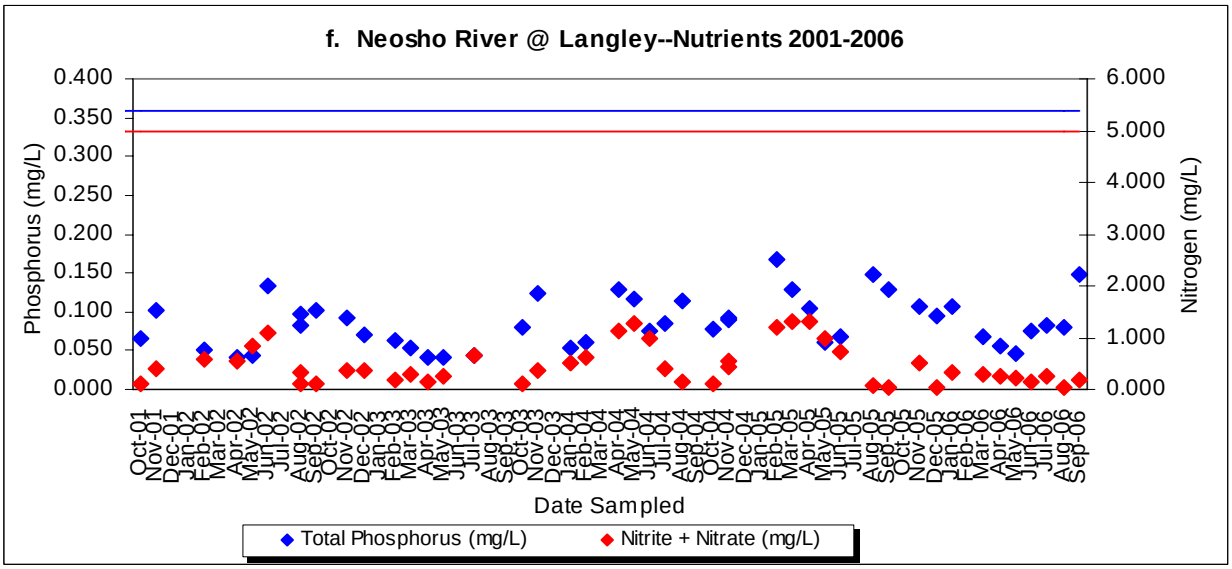




HUC 1107


d. Neosho River @ Langley--TDS 2001-2006
mg/L
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Neosho River @ Langley--Minerals 2001-2006
mg/L
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Neosho River @ Langley--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

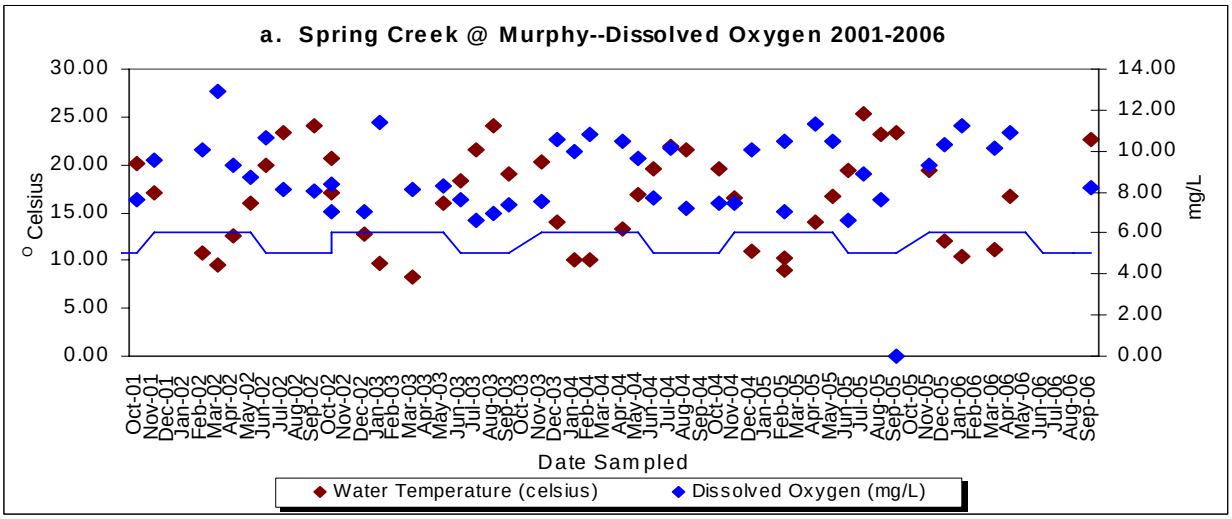
Spring Creek near Murphy

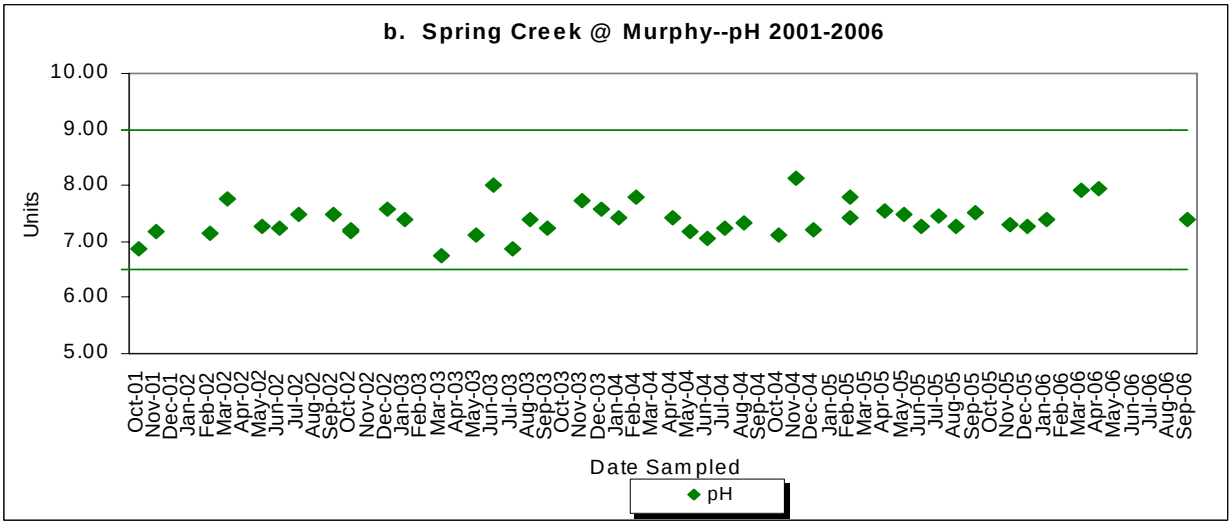
Station AT191558 (121600010290-001AT) is a permanent ambient trend monitoring station located on Spring Creek. Situated in the south central portion of Mayes County, the site was established east-southeast of the town of Murphy off US Highway 412 near County Road E0610. The station is positioned near the terminal end of stream segment 121600010290 and is classified within the Lower Neosho River 8-digit HUC watershed (11070209). Water enters the stream system from several tributaries including Double Spring Creek and Snake Creek, among others.

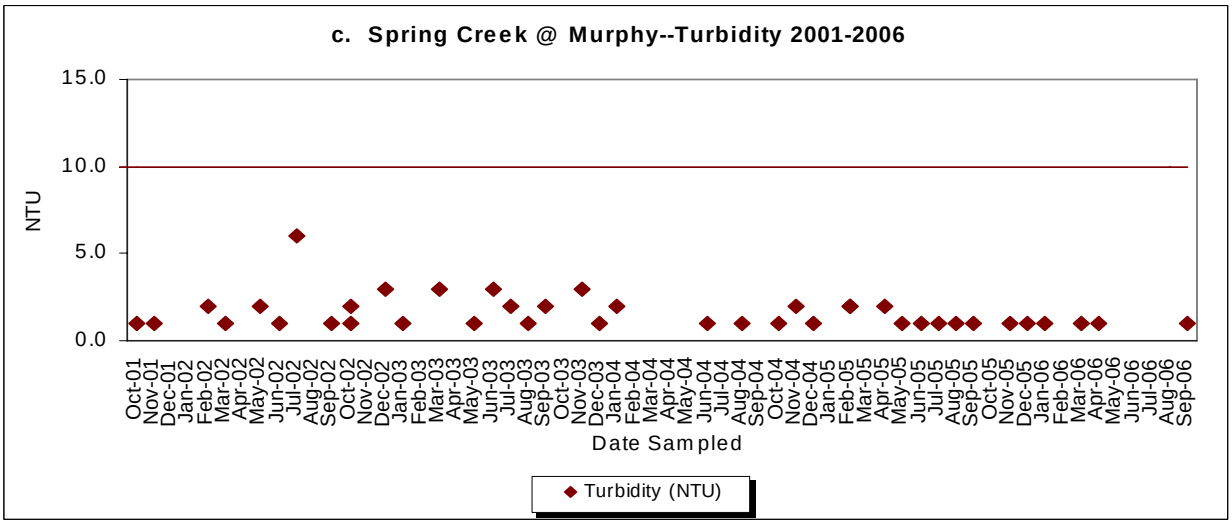
This station on Spring Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Spring Creek from the confluence of Double Spring Creek (94.9929, 36.1043) downstream to confluence of Spring Creek River with Cedar Crest Lake (95.2250, 36.1181). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 27a), pH (Figure 27b), turbidity (Figure 27c), and toxicant data collected during the same period met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2006 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 35 for Central Irregular Plains cool water aquatic communities [OAC 46:15-5(k)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 27d and e). The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci samples. This segment of Spring Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 27f).

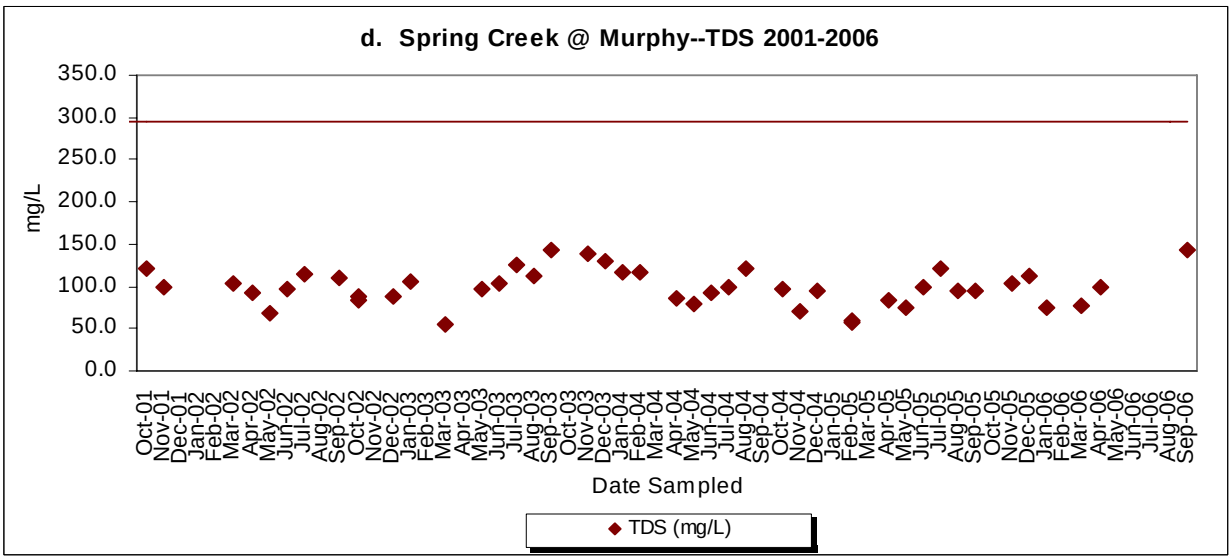
Figure 27 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Spring Creek at Murphy (AT191558), 2001-2006.

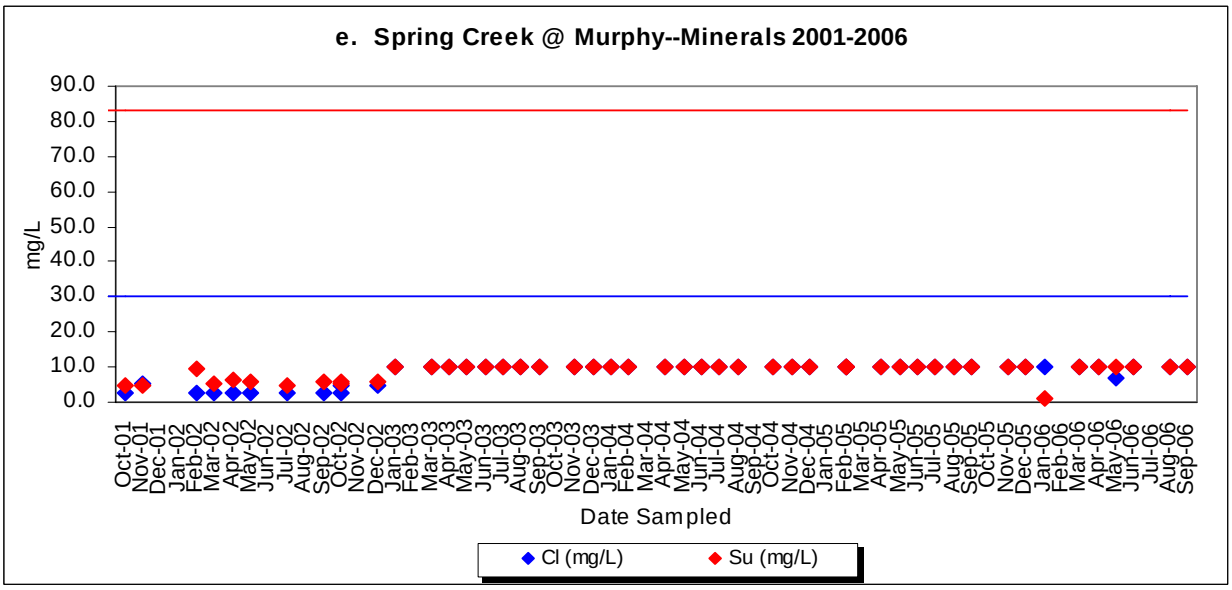


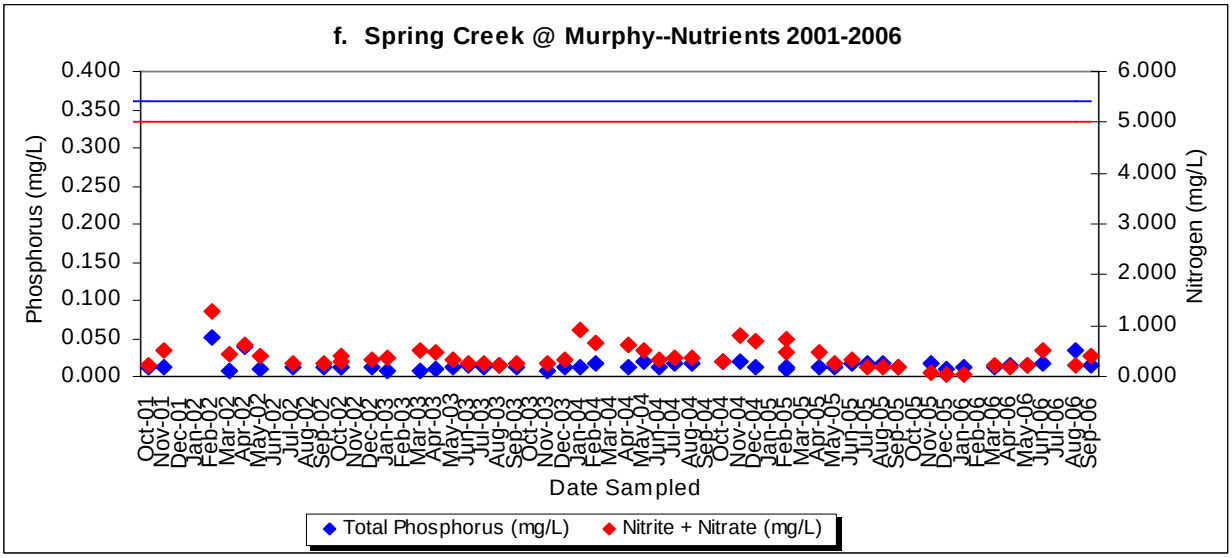




HUC 1107


d. Spring Creek @ Murphy--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Spring Creek @ Murphy--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Spring Creek @ Murphy--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

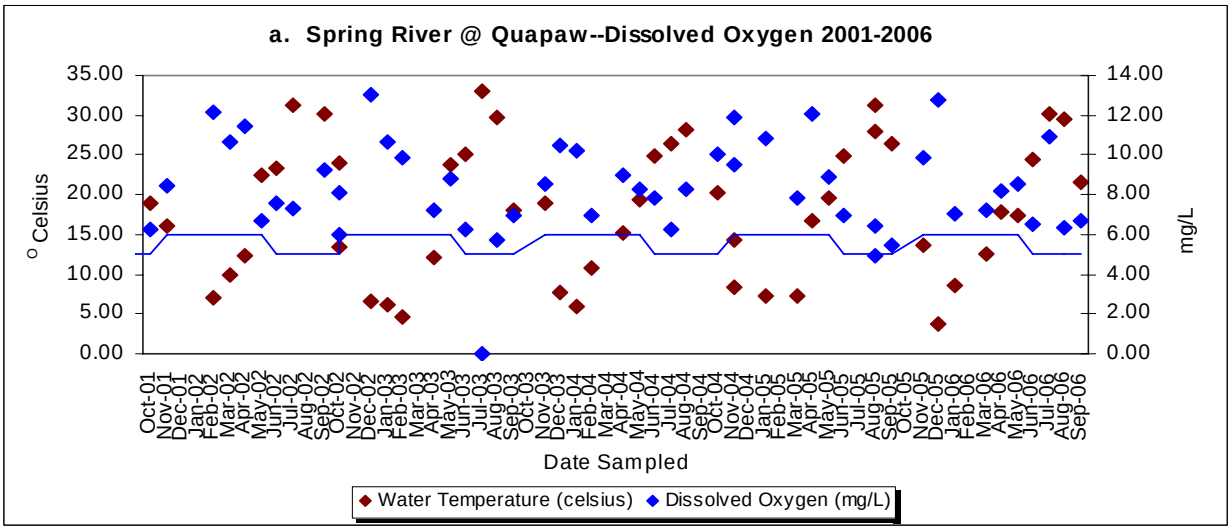
Spring River near Quapaw

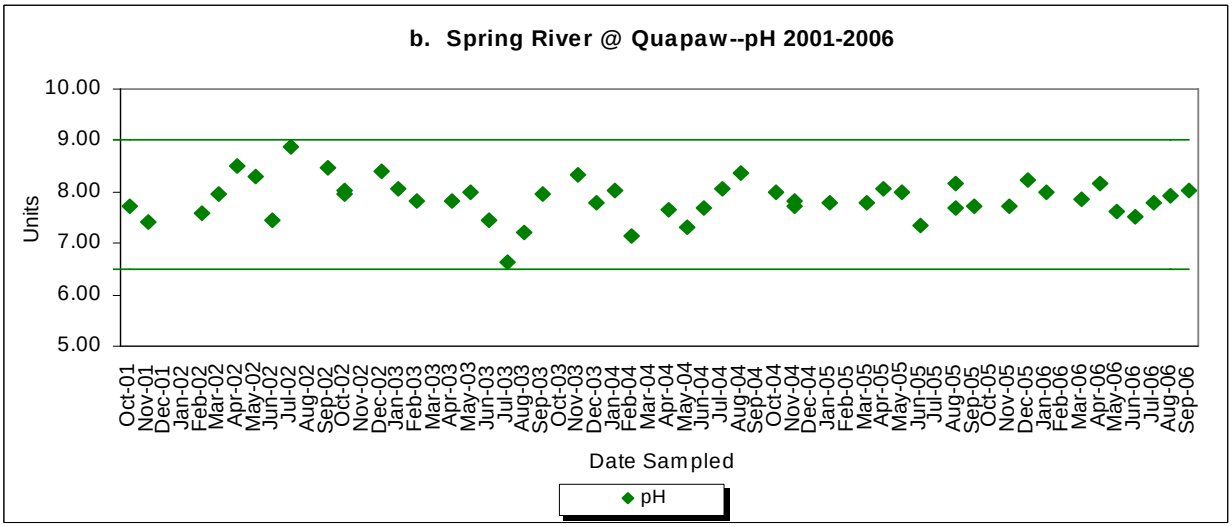
Station AT188000 (121600070010-001AT) is a permanent ambient trend monitoring station located on Spring River in Oklahoma. Situated in the north central portion of Ottawa County, the site was established east-southeast of the city of Quapaw off of State Highway 137 on County Road E0050. The station is positioned near the midpoint of stream segment 121600070010 and is classified within the Spring River 8 digit HUC watershed (11070207). Water enters the stream system from Kansas and from several tributaries including Five Mile Creek, Devil's Hollow Creek, Warren Branch Creek, and Flint Branch Creek, among others.

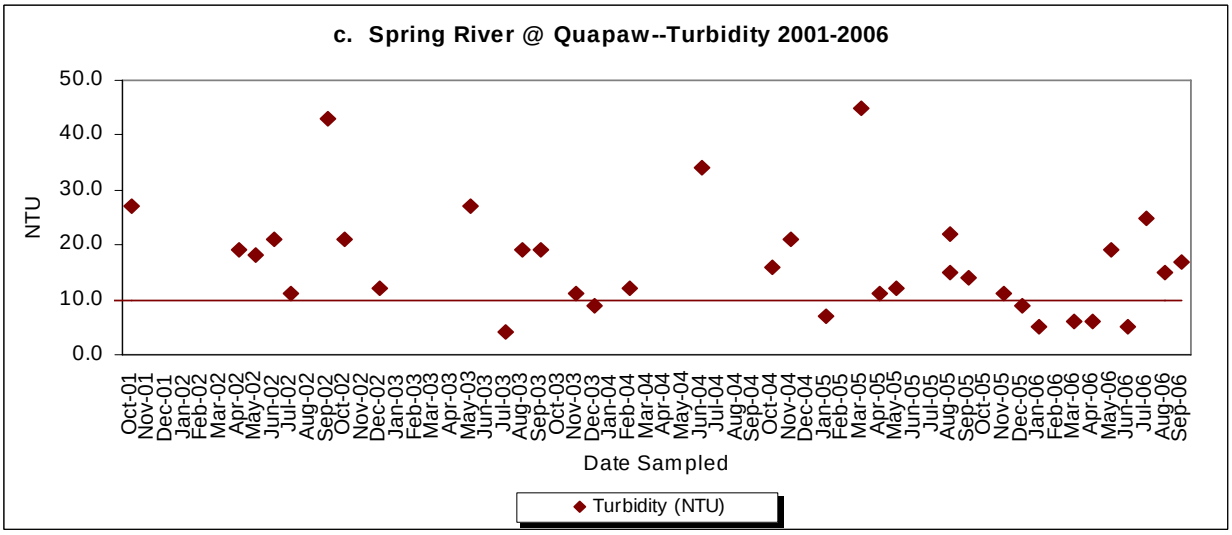
This station on the Spring River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Spring River from its entrance into Oklahoma (94.7118, 36.9988) downstream to confluence of the Spring River with Grand Lake (94.7342, 36.8322). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the thirty-five (35) turbidity samples (Figure 28c), twenty-seven (27) samples (or 77%) exceeded the numerical criteria of 10. Of the eleven (11) zinc samples, three (3) of the concentrations (or 27%) exceeded the prescribed hardness-dependant chronic criteria of 149.23 ug/L, and two (2) of the concentrations (or 18%) exceeded the prescribed hardness-dependant acute criterion of 164.74 ug/L (Table 14). Dissolved oxygen (Figure 28a) and pH (Figure 28b) samples met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2006 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 20 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 31. This is between the assigned non-supporting and supporting thresholds of 29 to 34 for Central Irregular Plains cool water aquatic communities [OAC 46:15-5(k)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 28d and e). The PBCR beneficial use is not supported (Table 15). Of the seventeen (17) enterococci concentrations, one (1) sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (44.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Spring River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 28f).

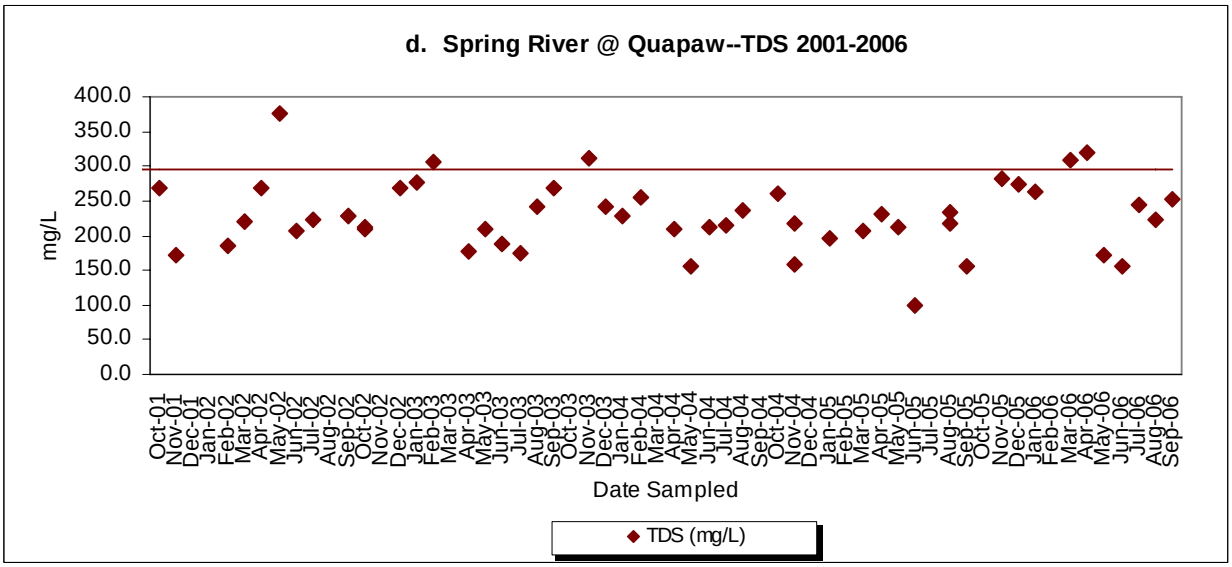
Figure 28 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Spring River at Quapaw (AT188000), 2001-2006.

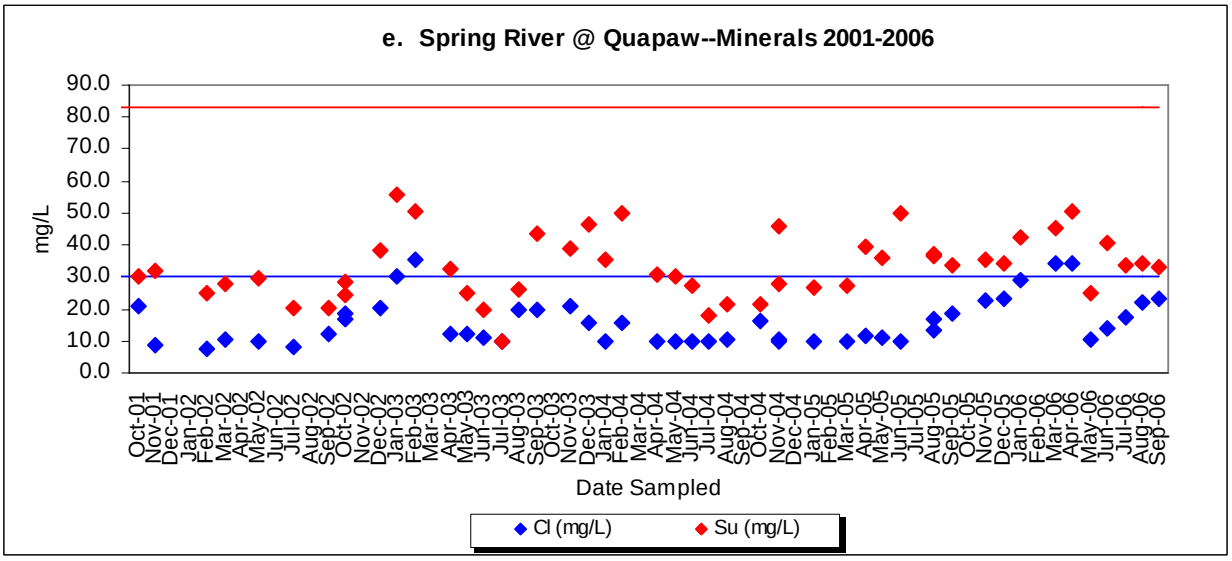


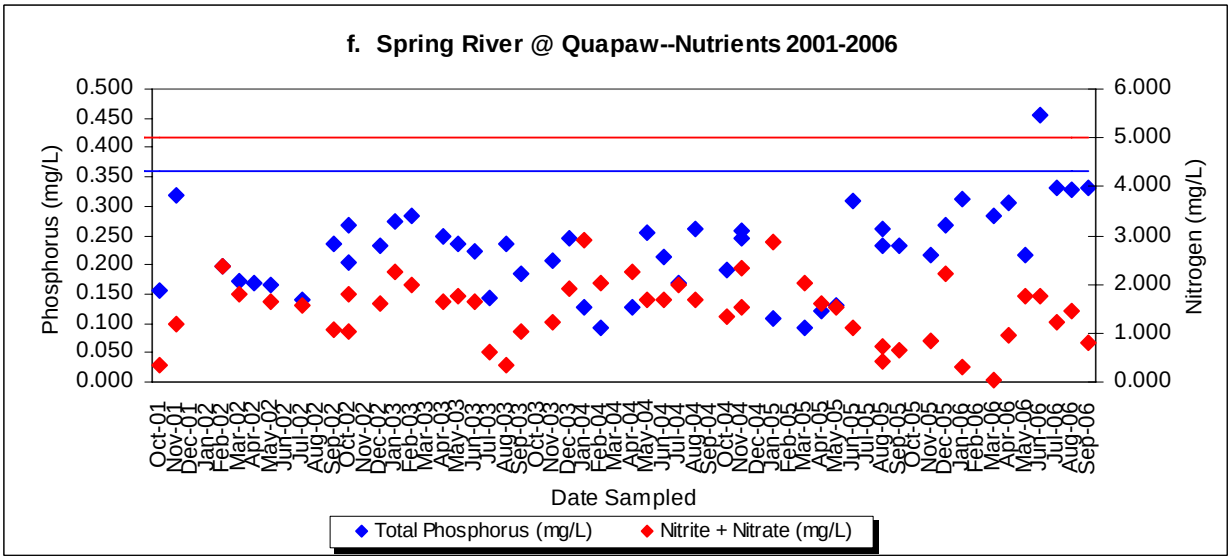




HUC 1107


d. Spring River @ Quapaw--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Spring River @ Quapaw--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Spring River @ Quapaw--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

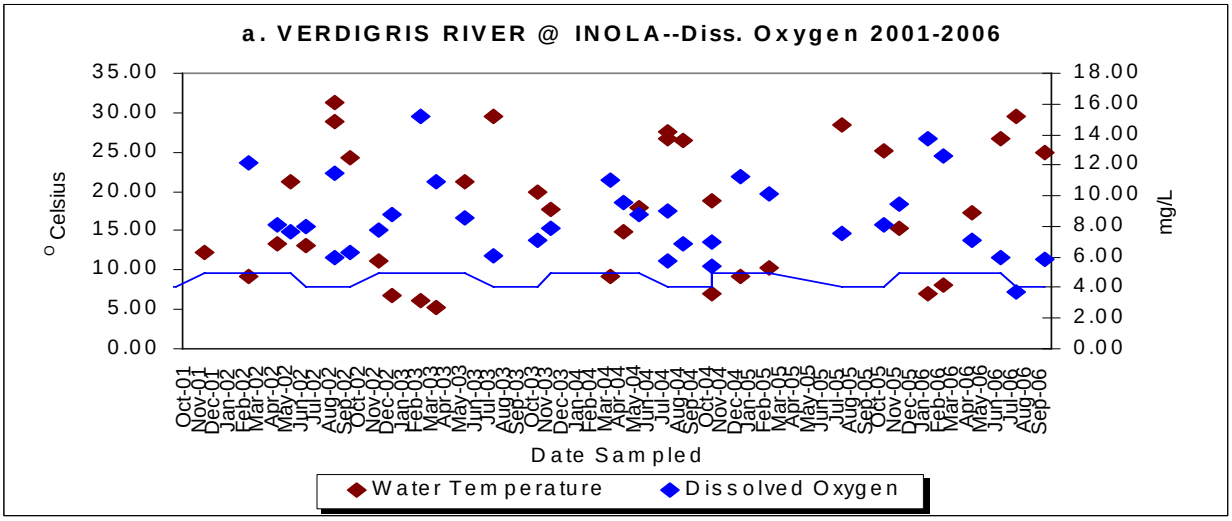
Verdigris River near Inola

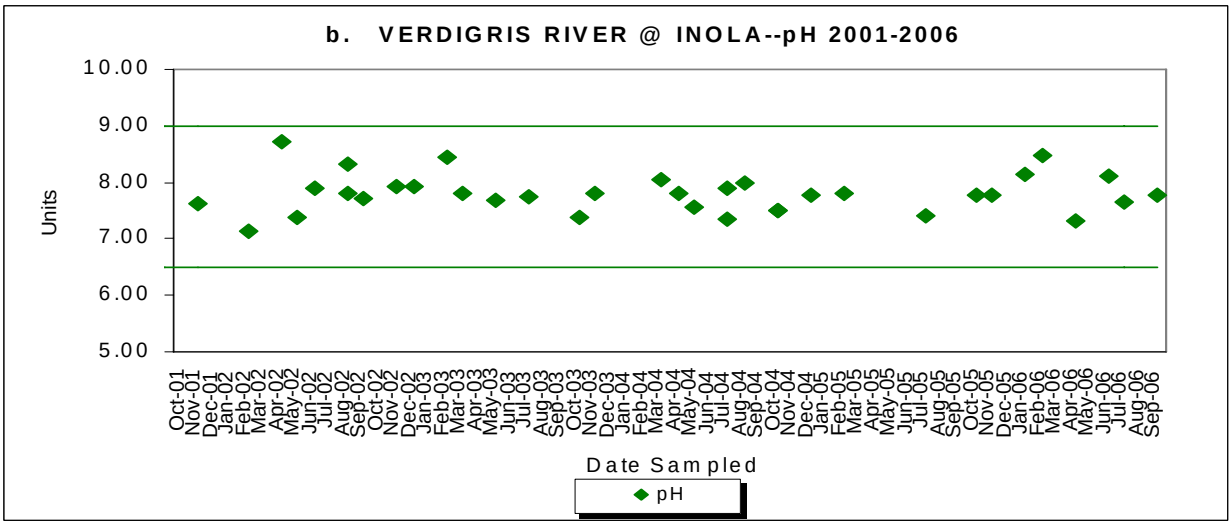
Station AT178600 (121500020260-001AT) is a permanent ambient trend monitoring station located on the Verdigris River (McClellan-Kerr Navigational System) in Oklahoma. Situated in the extreme south central portion of Rogers County, the site was established west of the town of Inola on US Highway 412. The station is positioned near the midpoint of stream segment 121500020260 and is classified within the Lower Verdigris River 8 digit HUC watershed (11070105). Water enters the stream system from Bird Creek, Spunky Creek, Chambers Creek, Dog Creek (Claremore Lake), and Salt Creek, among others.

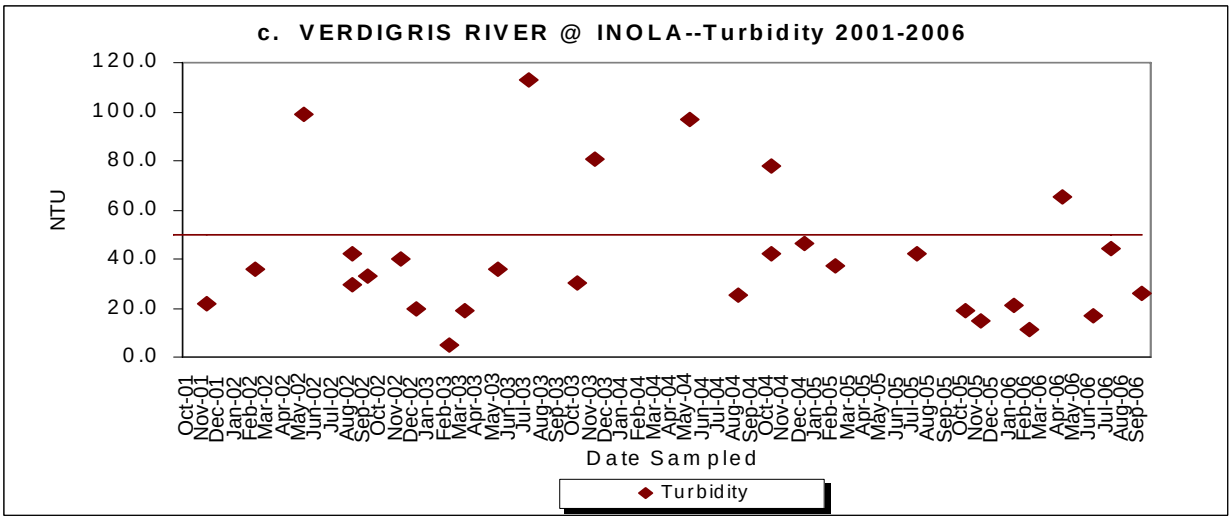
This station on the Verdigris River has been active for all water quality variables since November of 2000. The following assessment of beneficial uses is based on data collected from November of 2001 through September of 2006. For purposes of reporting, this station is representative of the Verdigris River from the confluence of Bird Creek (95.7261, 36.2210) downstream to the confluence of the Verdigris River with Adams Creek (95.5510, 36.0673). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the nine (9) toxicant samples collected, five (5) of the lead concentrations (or 56%) exceeded the prescribed hardness-dependant chronic criteria of 5.42 ug/L (Table 14). Of the twenty-nine (29) turbidity samples (Figure 29c), six (6) samples (or 21%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 29a) and pH (Figure 29b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 29d and e). The PBCR beneficial use is not supported (Table 15). Of the sixteen (16) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (346.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Verdigris River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.00 mg/L and 4.65 mg/L, respectively (Figure 29f). Furthermore, the mean sestonic chlorophyll-a concentration (8.0 mg/M^3) produced a TSI of 51, which is below the threshold TSI of 62.

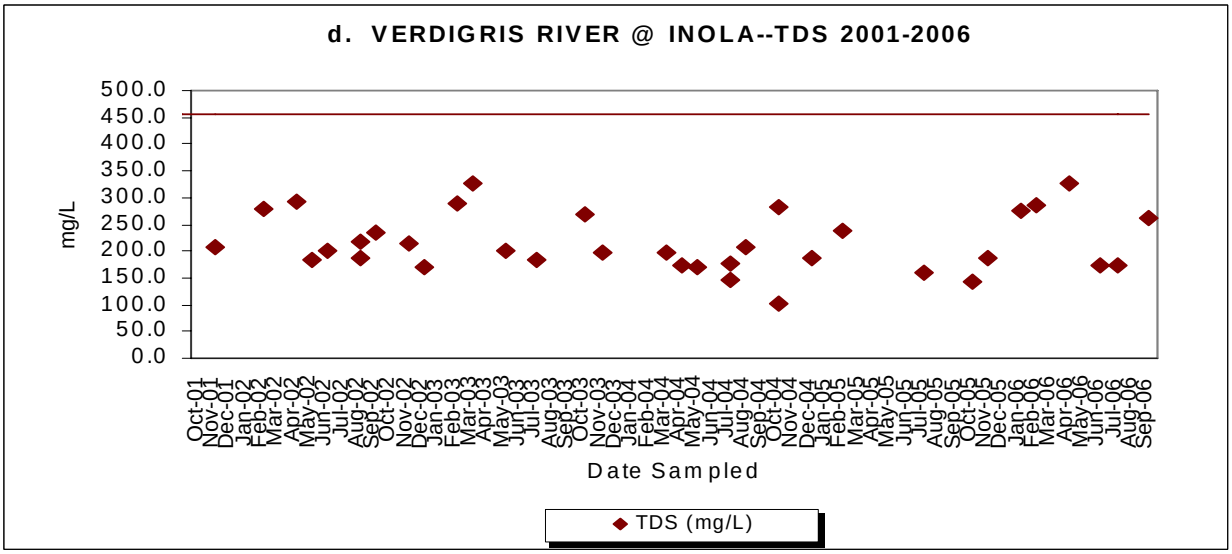
Figure 29 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for Verdigris River at Inola (AT178600), 2001-2006.

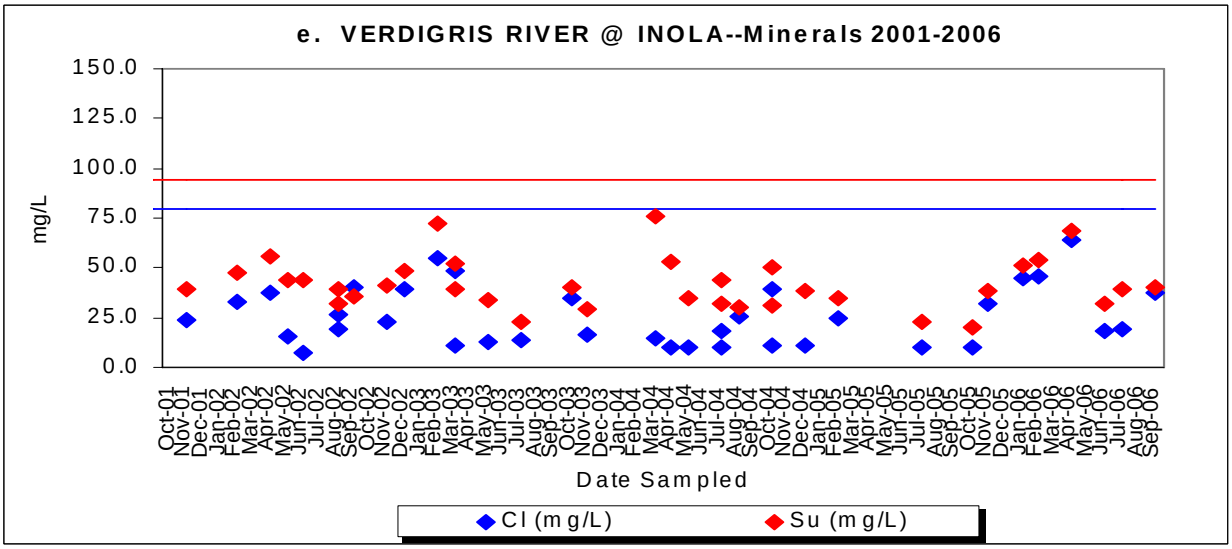


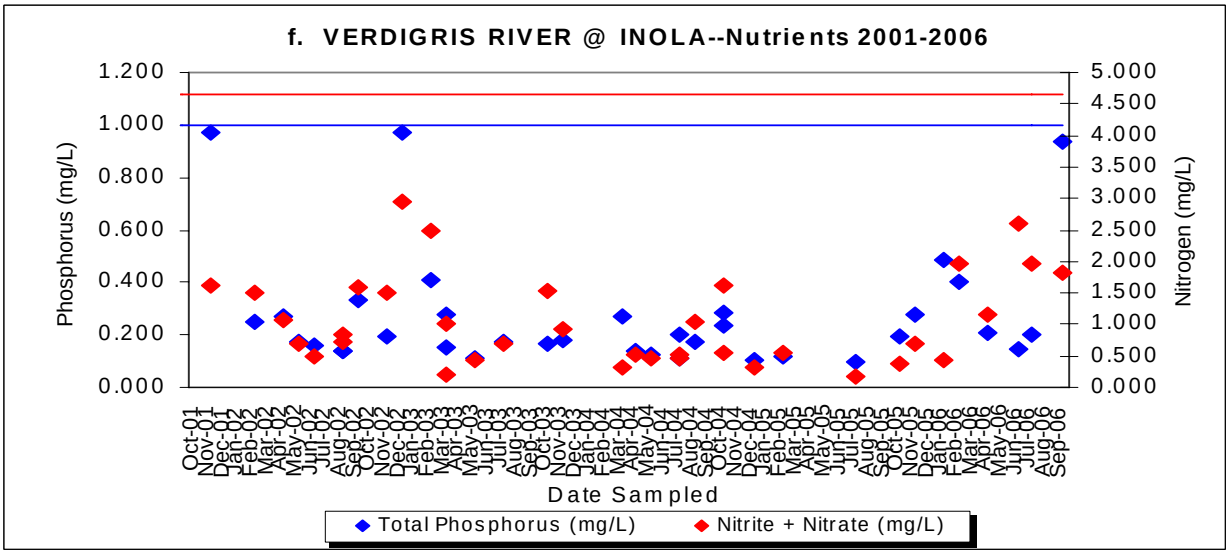




HUC 1107


d. VERDIGRIS RIVER @ INOLA--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. VERDIGRIS RIVER @ INOLA--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. VERDIGRIS RIVER @ INOLA--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

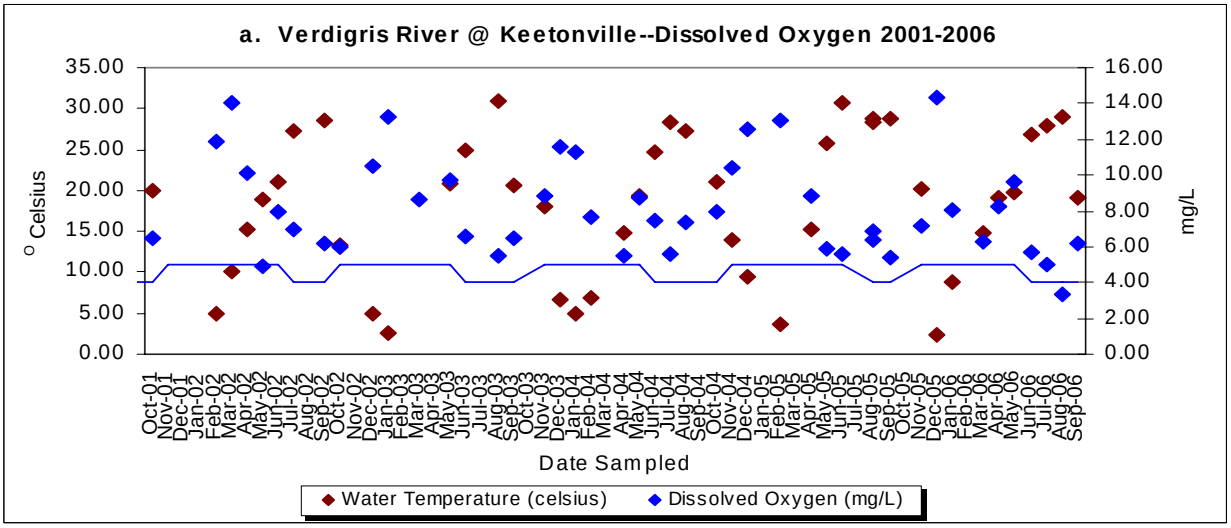
Verdigris River near Keetonville

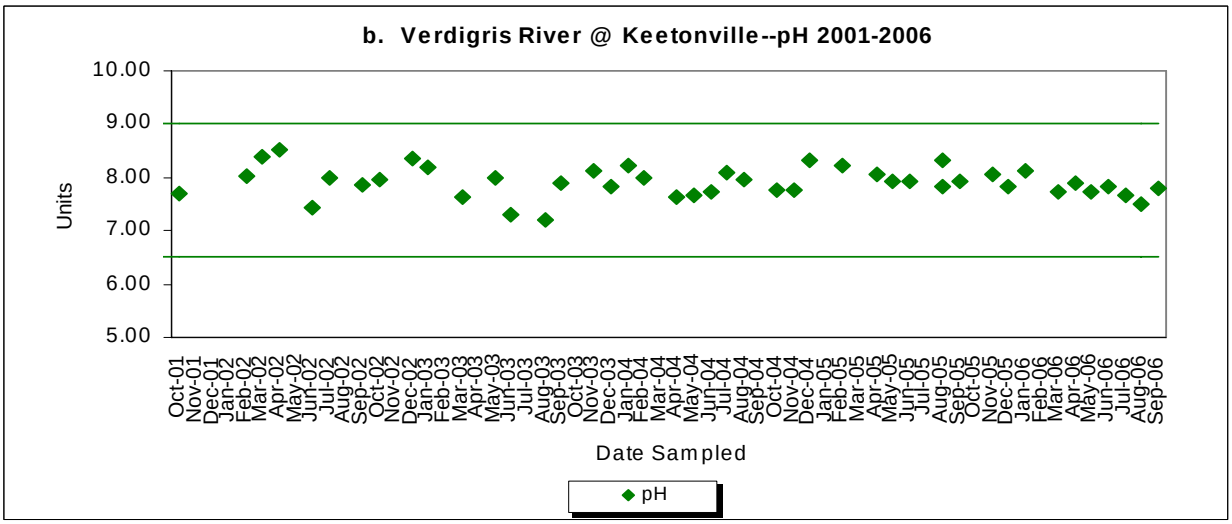
Station AT176000 (121500030010-001AT) is a permanent ambient trend monitoring station located on the Verdigris River in Oklahoma. Situated in the east central portion of Rogers County, the site was established east of the city of Keetonville on State Highway 20. The station is positioned near the midpoint of stream segment 121500030010 and is classified within the Lower Verdigris River 8-digit HUC watershed (11070105). Water enters the stream system from Oologah Lake and from several tributaries including Fourmile Creek, Caney River, and Bird Creek, among others.

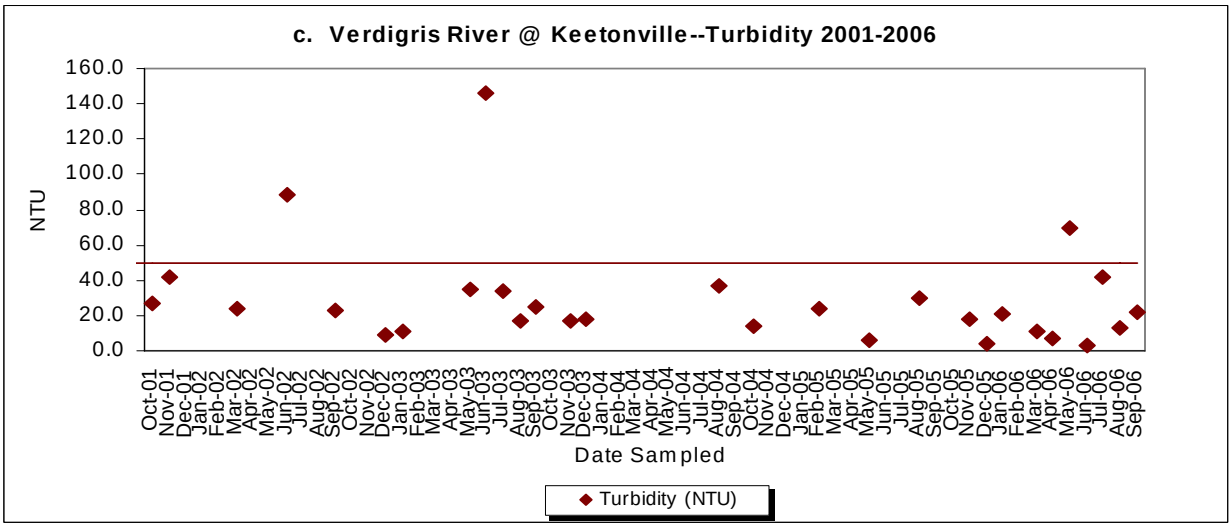
This station on the Verdigris River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Verdigris River from the confluence of Oologah Lake (95.4226, 36.6794) downstream to confluence of the Verdigris River with Bird Creek (95.7261, 36.2210). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 30a), pH (Figure 30b), turbidity (Figure 30c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 30d and e). The PBCR beneficial use is not supported (Table 15). Of the seven (2) enterococci concentrations, two (2) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (108.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Verdigris River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 30f). Furthermore, the mean sestonic chlorophyll-a concentration (7.8 mg/M^3) produced a TSI of 51, which is below the threshold TSI of 62.

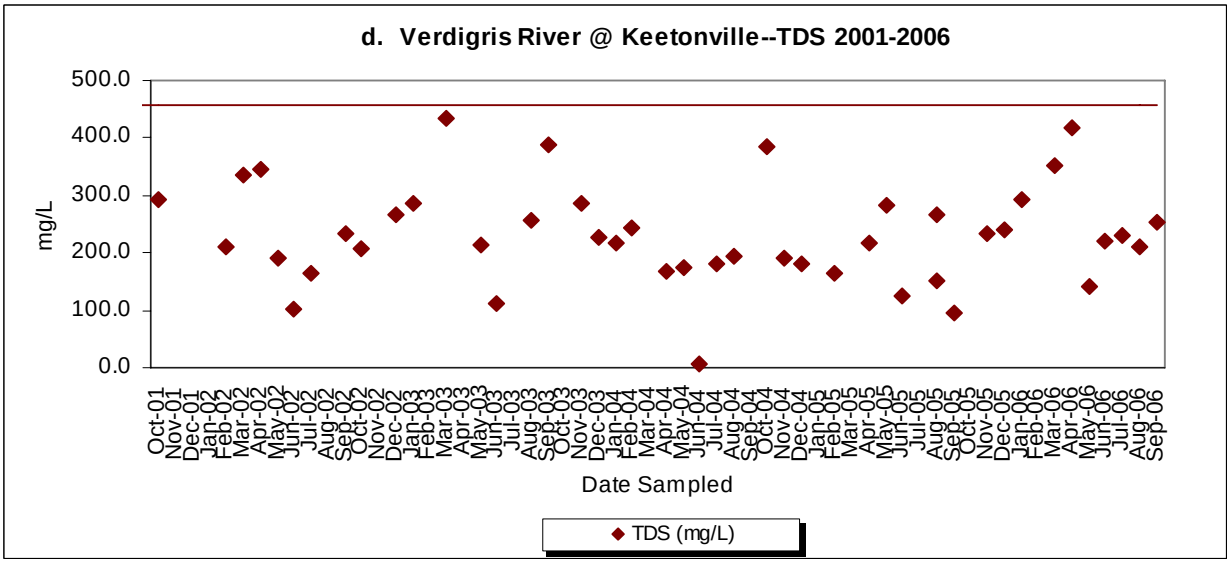
Figure 30 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Keetonville (AT176000), 2001-2006.

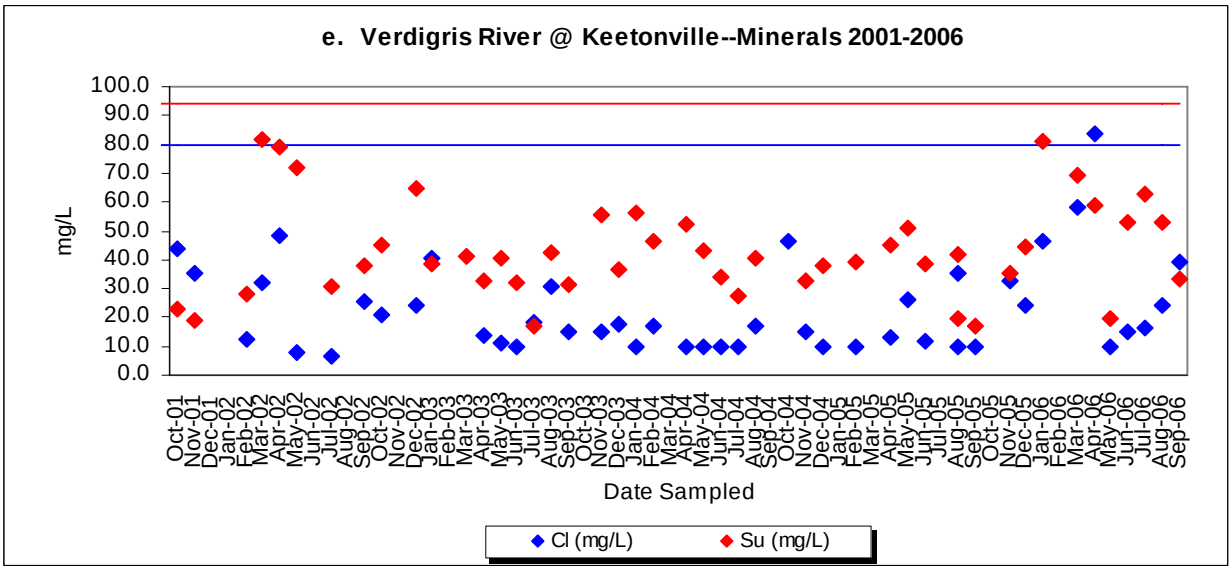


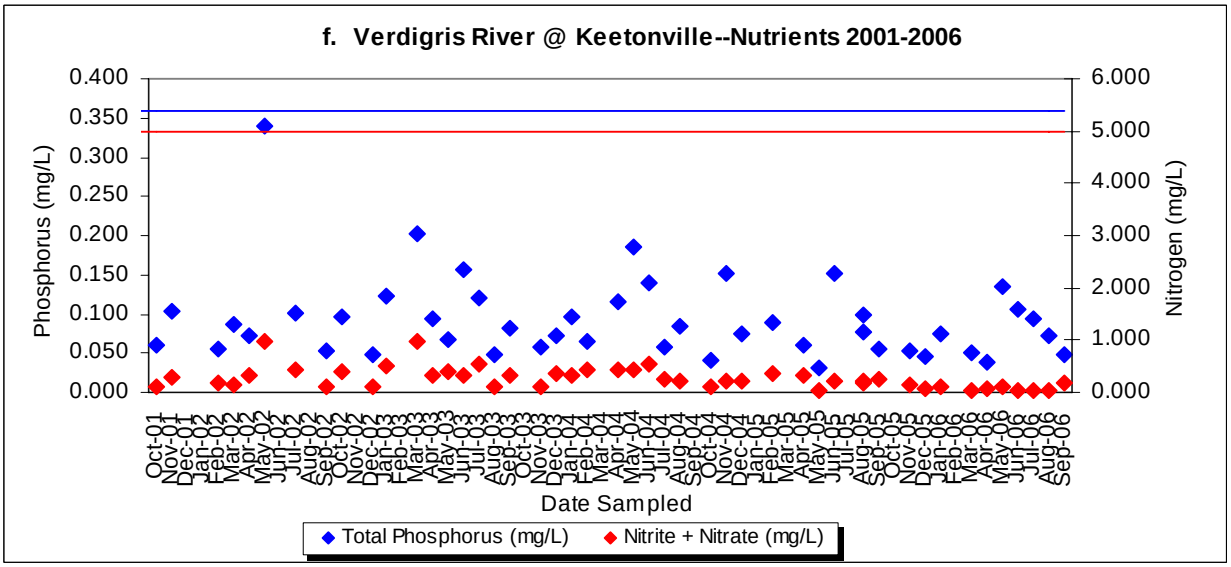




HUC 1107


d. Verdigris River @ Keetonville--TDS 2001-2006
mg/L
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Verdigris River @ Keetonville--Minerals 2001-2006
mg/L
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Verdigris River @ Keetonville--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

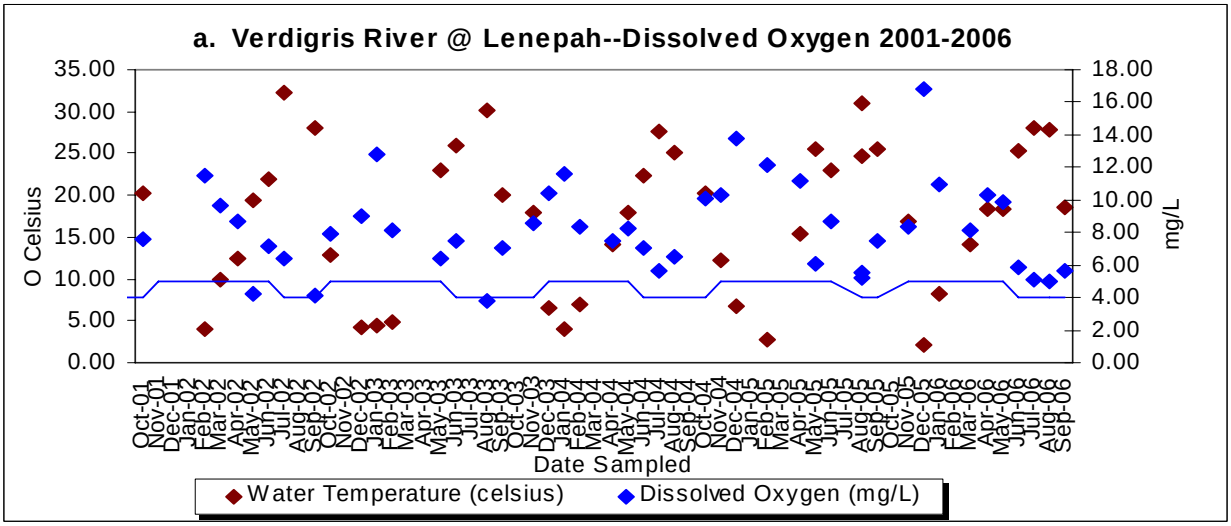
Verdigris River near Lenapah

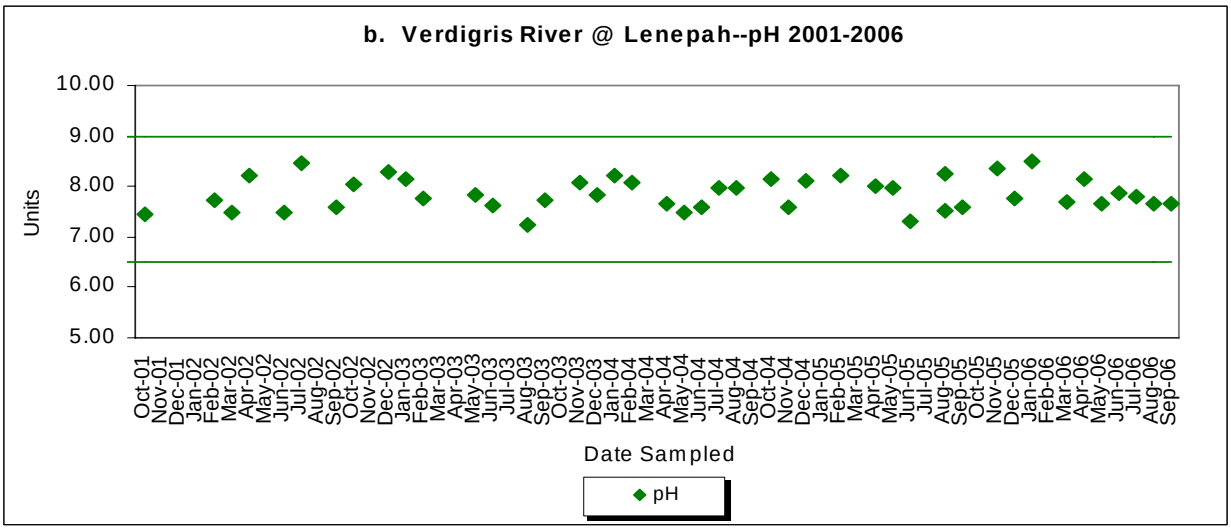
Station AT171000 (121510020010-001AT) is a permanent ambient trend monitoring station near the upper end of the Verdigris River in Oklahoma. Situated in the north central portion of Nowata County, the site was established east of the town of Lenapah on State Highway 10. The station is positioned near the terminal end of stream segment 121510020010 and is classified within the Middle Verdigris River 8 digit HUC watershed (11070103). Water enters the stream system from Kansas and from several tributaries including Onion Creek, Snow Creek, and California Creek, among others.

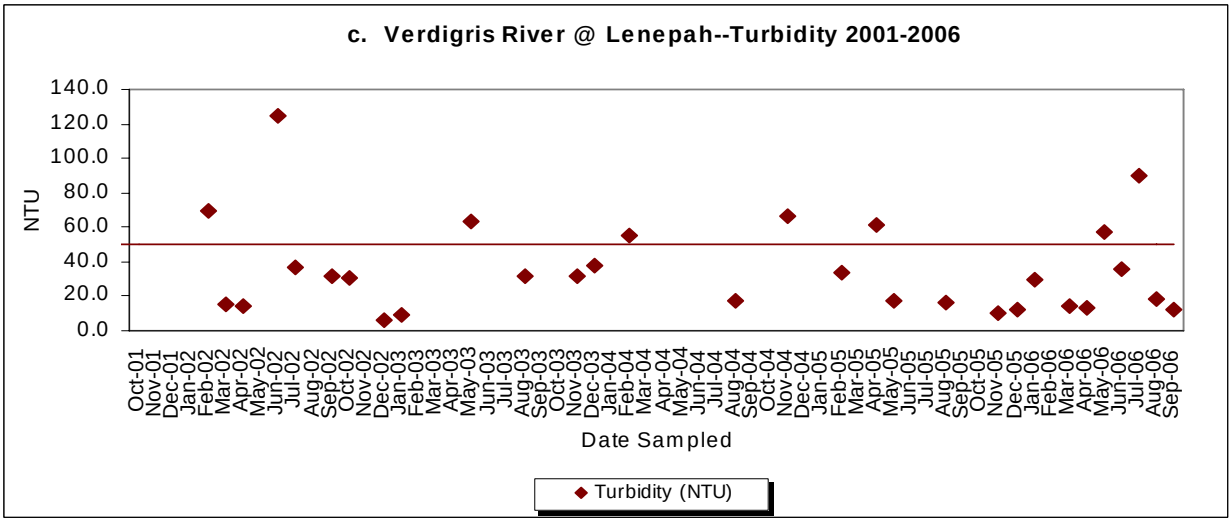
This station on the Verdigris River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Verdigris River from entrance into Oklahoma near Coffeyville, Kansas (95.5890, 36.9993) downstream to confluence of the Verdigris River with California Creek (95.6142, 36.7567). As per Appendix A, Table1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the eleven (11) toxicant samples collected, two (2) of the lead concentrations (or 18%) exceeded the prescribed hardness-dependant chronic criteria of 5.89 ug/L (Table 14). Of the twenty-nine (29) turbidity samples (Figure 31c), eight (8) samples (or 28%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 31a) and pH (Figure 31b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 31d and e). The PBCR beneficial use is not supported (Table 15). Of the 7 enterococci concentrations, two (2) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (395.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Verdigris River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 31f). Furthermore, the mean sestonic chlorophyll-a concentration (11.5 mg/M^3) produced a TSI of 55, which is below the threshold TSI of 62.

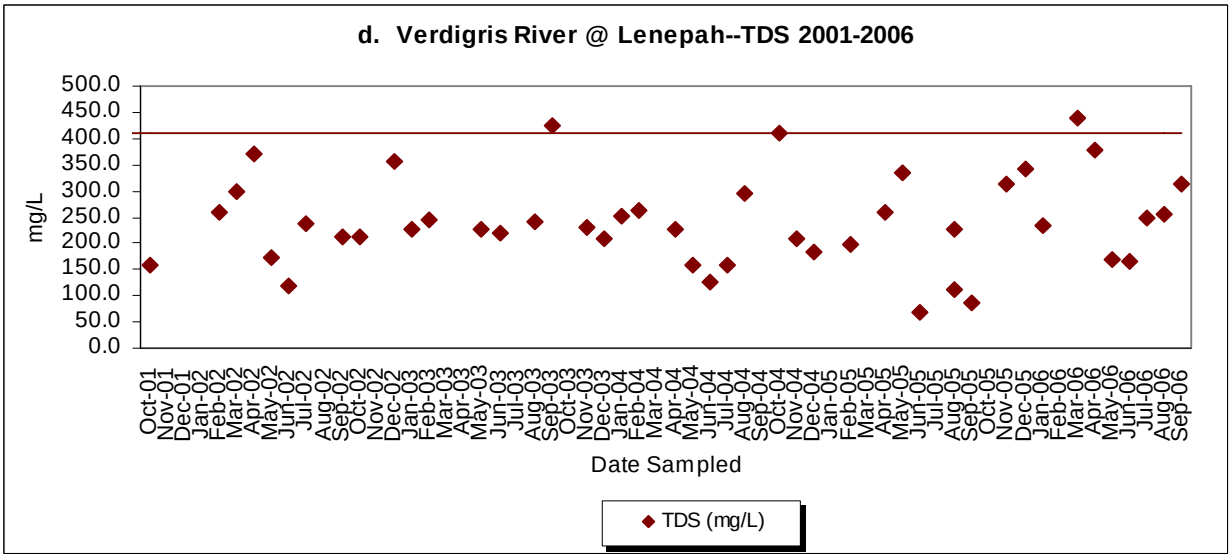
Figure 31 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Lenepah (AT171000), 2001-2006.

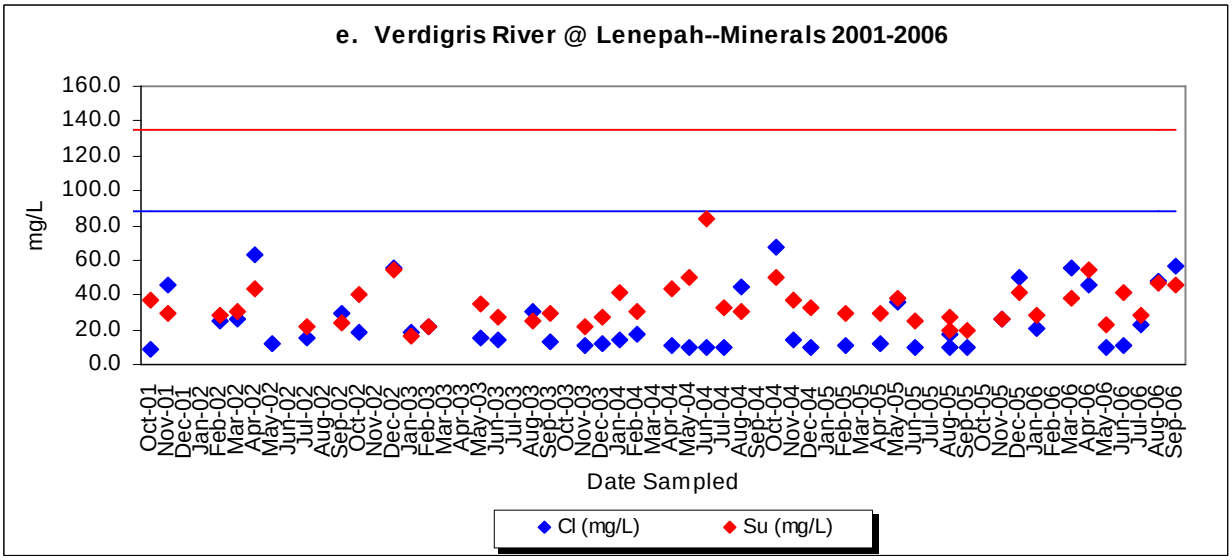


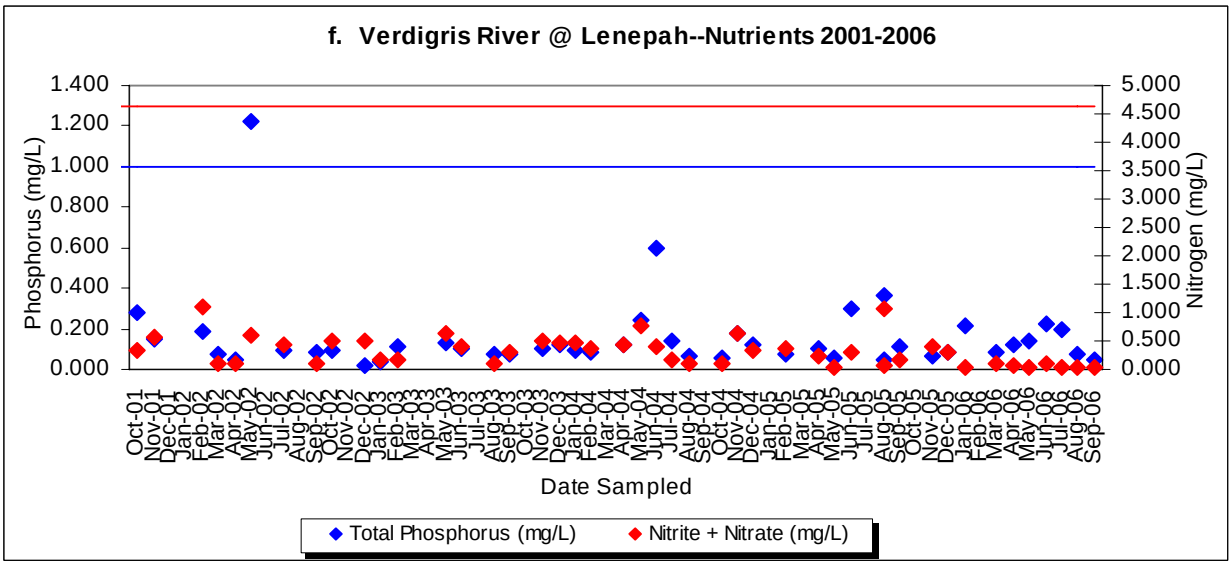




HUC 1107


d. Verdigris River @ Lenepah--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Verdigris River @ Lenepah--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Verdigris River @ Lenepah--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

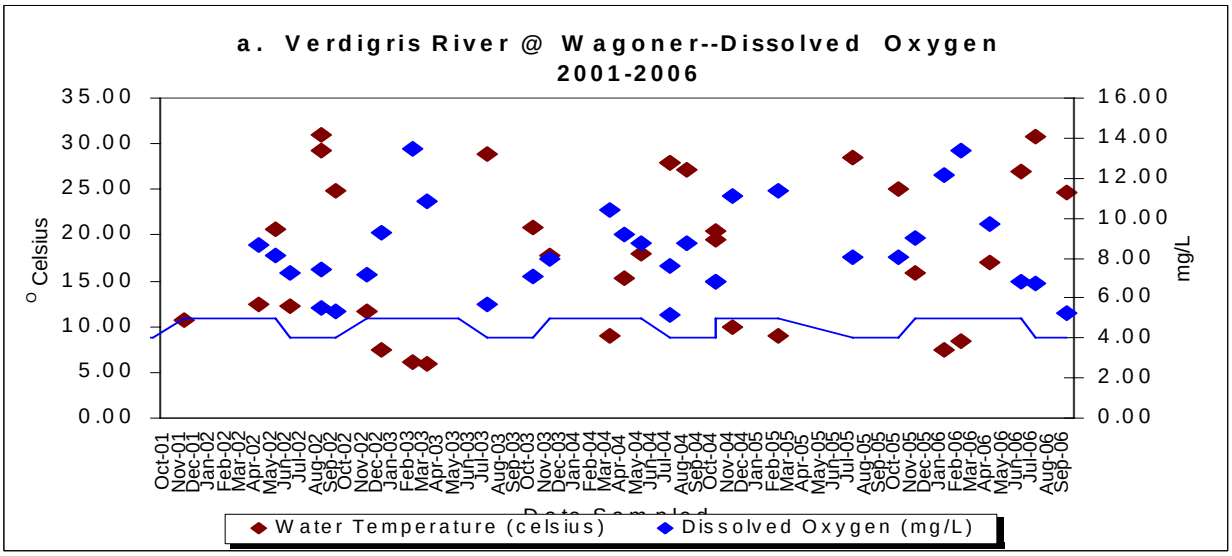
Verdigris River near Wagoner

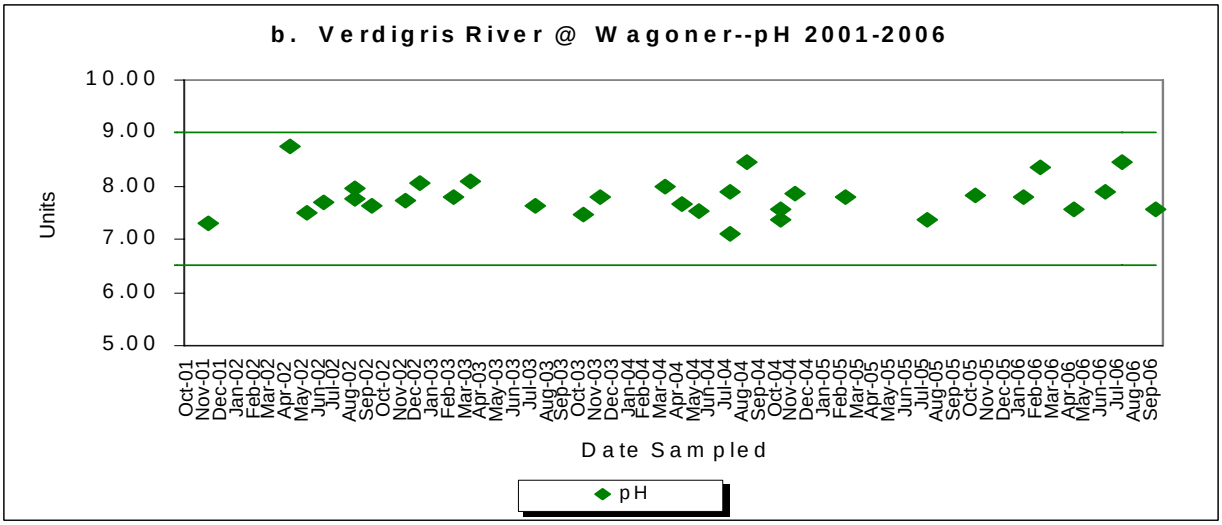
Station AT178900 (121500010200-001AT) is a permanent ambient trend monitoring station near the lower end of the Verdigris River (McClellan-Kerr Navigational System) in Oklahoma. Situated in the central portion of Wagoner County, the site was established west of the city of Wagoner on State Highway 51. The station is positioned near the midpoint of stream segment 121500010200 and is classified within the Lower Verdigris River 8 digit HUC watershed (11070105). Water enters the stream system from several tributaries including Adams Creek (Newt Graham Lake), Inola Creek, Pea Creek, Coal Creek, and Coal Creek near Wagoner, among others.

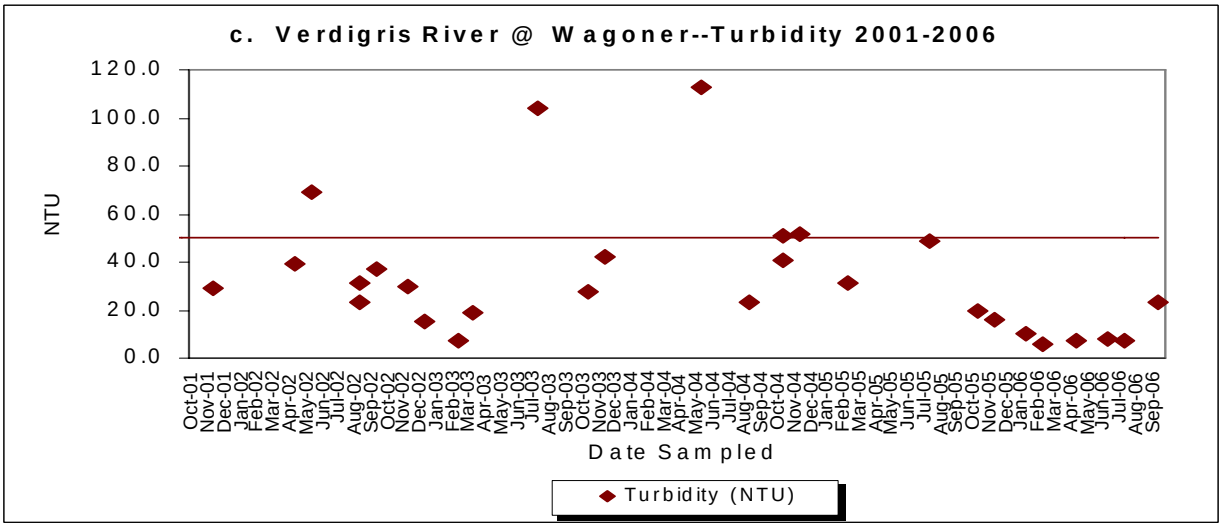
This station on the Verdigris River has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from November of 2001 through September of 2006. For purposes of reporting, this station is representative of the Verdigris River the confluence of Adams Creek (95.5510, 36.0673) downstream to its confluence with the Arkansas River (95.3073, 35.7983). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the seven (7) lead samples collected, 7 of the concentrations (or 70% of the required 10) exceeded the prescribed hardness-dependant chronic criteria of 4.55 ug/L (Table 14). Of the 7 copper samples, four (4) of the concentrations (or 40% of the required 10) exceeded the prescribed hardness-dependant chronic criteria of 16.26 ug/L, and two (2) of the concentrations (or 20% of the required 10) exceeded the prescribed hardness-dependant acute criterion of 25.00 ug/L (Table 14). Of the twenty-eight (28) turbidity samples (Figure 32c), five (5) samples (or 18%) exceeded the numerical criterion 50 NTU. Dissolved oxygen (Figure 32a) and pH (Figure 32b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 32d and e). The PBCR beneficial use is not supported (Table 15). Of the fifteen (15) enterococci concentrations, 4 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (194.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Verdigris River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 32f). Furthermore, the mean sestonic chlorophyll-a concentration (5.4 mg/M^3) produced a TSI of 47, which is below the threshold TSI of 62.

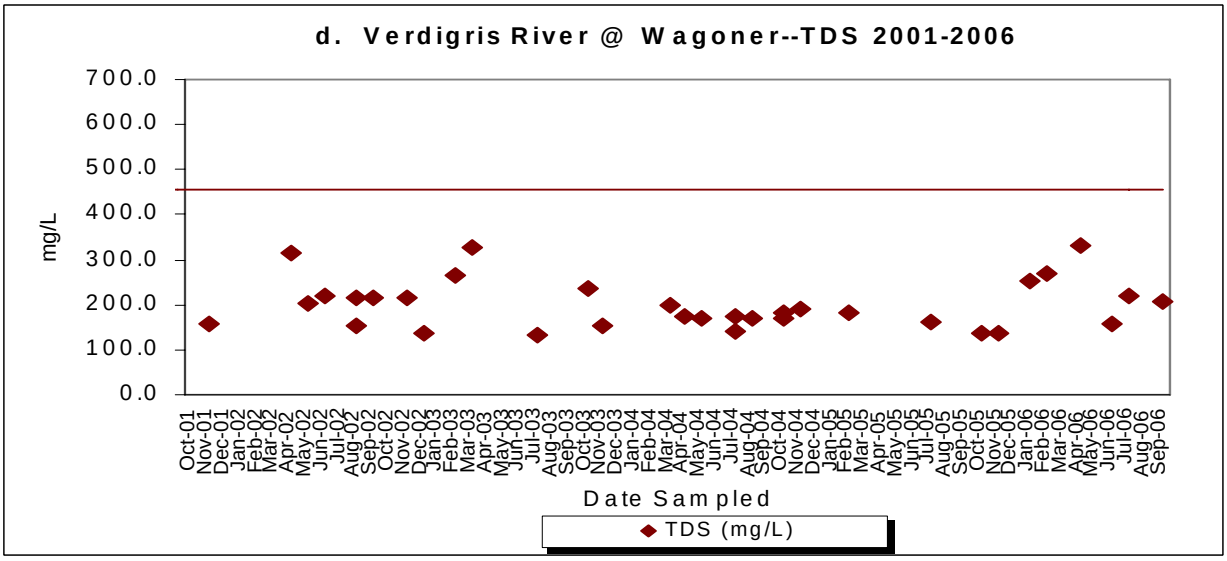
Figure 32 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Verdigris River at Wagoner (AT178900), 2001-2006.

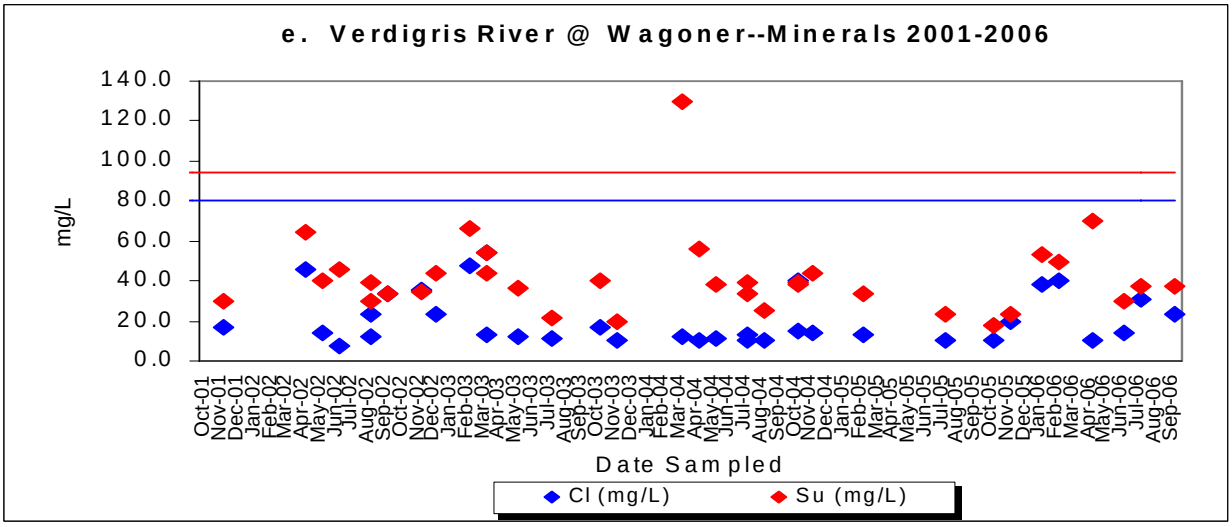


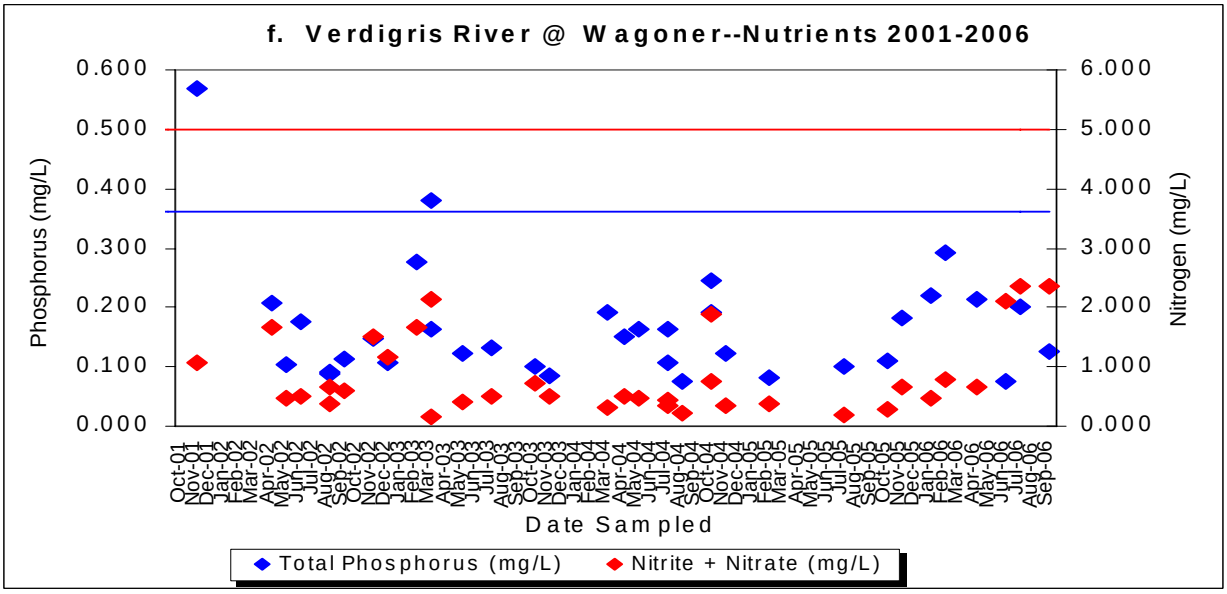




HUC 1107


d. Verdigris River @ Wagoner--TDS 2001-2006
mg/L
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Verdigris River @ Wagoner--Minerals 2001-2006
mg/L
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Verdigris River @ Wagoner--Nutrients 2001-2006
Phosphorus (mg/L)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1107

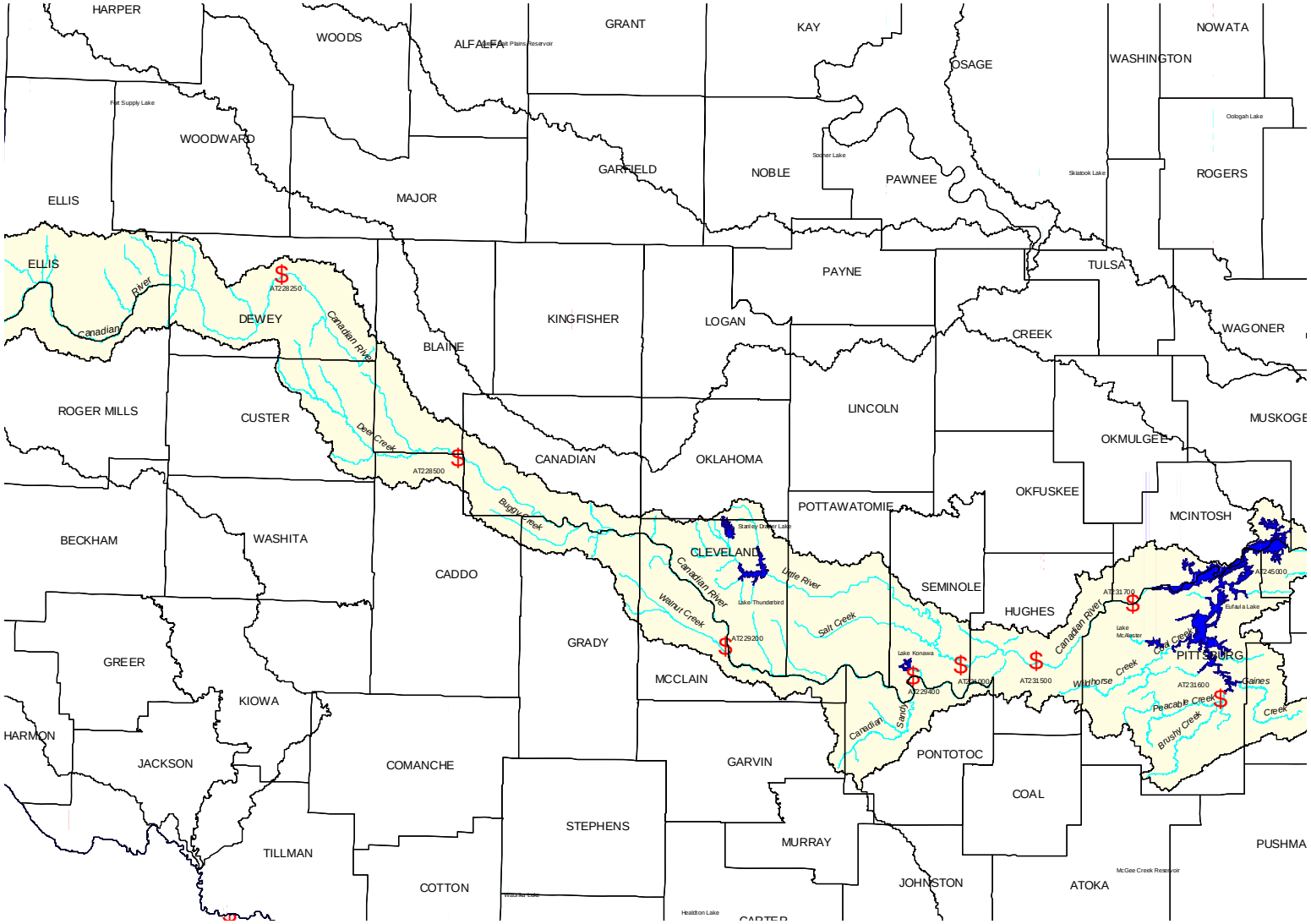


Plate 61
CANADIAN SUBBASIN (HUC 1109)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1109

CANADIAN SUB-BASIN

The Canadian sub-basin (4-digit hydrologic unit 1109) begins in the central west and runs to the east central portion of the state. It originates in the southern portion of Ellis and the northern portion of Roger-Mills Counties, continues eastward through portions of Ellis, Roger Mills, Dewey, Custer, Blaine, Caddo, Canadian, Grady, Cleveland, McClain, Pottawatomie, Pontotoc, Seminole, Hughes, McIntosh, and Muskogee Counties and terminates in Pittsburg, Haskell, and Latimer Counties. Major cities and County seats located within the basin include Arnett, Taloga, Weatherford, Mustang, Moore, Norman, Noble, Oklahoma City, Purcell, Ada, Tecumseh, Holdenville, McAlester, and Stigler. Minor cities of note include Newcastle, Lexington, Konawa, and Hartshorne.

The basin is subdivided into five 8-digit hydrologic units (HUC) within the state. These HUC's are the Rita Blanca (11090103), the Lower Canadian–Deer (11090201), the Lower Canadian–Walnut (11090202), the Little (11090203), and the Lower Canadian (11090204). The major surface water in the basin is the Canadian River. Major tributaries include Little River, Deer Creek, Walnut Creek, Canadian Sandy Creek, Salt Creek, Coal Creek, Gaines Creek, and Brushy Creek. Five major lakes are located in the basin—Lake Stanley Draper formed by East Elm Creek, Lake Thunderbird formed by the Little River, Lake Konawa formed by Jumper Creek, Lake McAlester formed by a tributary of Coal Creek, and the lower half of Lake Eufaula formed by the Canadian River and Coal, Brushy, and Gaines Creeks (among others). Eight permanent water quality-monitoring stations (Table 16) are located in the basin—AT228250, AT228500, AT229200, AT229400, AT231000, AT231500, AT231600, and AT245000. One inactive water quality-monitoring station (AT231700) is located in the sub-basin. This station was last assessed in the 2000 BUMP report.

The basin is characterized by five ecoregions. The Central Great Plains is one of two primary ecoregions beginning in western Dewey County and continuing to eastern Cleveland and McClain Counties. The other primary ecoregion is the Central Oklahoma/Texas Plains beginning where the Central Great Plains ends and continues through the majority of Pittsburg and McIntosh counties. The Southwestern Tablelands cover an area beginning in the west and ending in the western part of Dewey County. The Arkansas Valley covers the rest of McIntosh, the eastern portions of Pittsburg County, and parts of Haskell and Latimer Counties. The Ouachita Mountains extend over the bottom part of Pittsburg and Latimer Counties. The primary land usage in the sub-basin is rangeland (open grasslands and woody areas). It dominates the western portion of the sub-basin, is prevalent in the central and east central portions, and is further interspersed throughout the remainder of the sub-basin. The secondary land use is pastureland, which is prevalent in the central and eastern portions. The tertiary land uses are cropland and forestland (post oak–blackjack oak and bottomland hardwoods). Cropland is prevalent in the west central portion of the sub-basin and is interspersed throughout the remainder of the sub-basin. Forestland is prevalent in the east central and eastern portions of the sub-basin. Other land uses of note are woodlands, bottom woodlands, farmsteads, major urban areas, and confined animal feeding operations.

Table 16. Permanent Ambient Trend Monitoring Stations Located in HUC 1109.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
220600030010	AT231600	Brushy Creek, off US 270, Haileyville	Active 11/98-P	AES, PPWS	NONE	AG, FWP, PBCR	NONE
520610010050	AT228500	Canadian River, US 66, Bridgeport	Active 11/98-P	AES, AG	NONE	FWP, PBCR	NONE
220600010119	AT231500	Canadian River, US 270, Calvin	Active 11/98-P	PPWS	AG, FWP	AES, PBCR	NONE
520600010010	AT229400	Canadian River, US 377, Konawa	Active 11/98-P	PPWS	FWP	AG, AES, PBCR	NONE
520610010010	AT229200	Canadian River, US 77, Purcell	Active 11/98-P	AG	FWP	AES	NONE
520620020010	AT228250	Canadian River, US 183, Taloga	Active 11/98-P	AES, FWP	NONE	AG, PBCR	NONE
220300000010	AT245000	Canadian River, SH 2, Whitefield	Active 9/99-P	AG, FWP, AES, PPWS, PBCR	NONE	NONE	NONE
520800010010	AT231000	Little River, SH 56, Sasakwa	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 17. Toxicant exceedances in HUC 1109.

STATION #	STATION NAME	DATE	Lead (ug/L)
AT231600	Brushy Creek, off US 270, Haileyville	08/20/2001	2.62
		4/24/2002	4.03
		09/03/2003	6.62
AT229400	Canadian River, US 377, Konawa	11/07/2000	18.00
		04/15/2002	16.00
AT231000	Little River, SH 56, Sasakwa	04/11/2001	17.00
		03/19/2003	46.00

Table 18. Exceedances of fecal coliform, enterococci, and E. coli screening limits in HUC 1109. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Enterococci (cfu/mL)
AT231600	BRUSHY CREEK, OFF US 270, HAILEYVILLE	05/10/2000	40000
		06/13/2000	610
		05/22/2001	73000
		06/10/2002	900
		05/05/2003	4000
		09/03/2003	1300
AT228500	CANADIAN RIVER, US 66, BRIDGEPORT	05/09/2000	900
		05/22/2001	7000
		09/17/2001	900
		06/16/2003	3000
		08/25/2003	500
AT231500	CANADIAN RIVER, US 270, CALVIN	08/13/2002	700
		05/17/2004	900
		06/21/2004	1500
		07/06/2004	1700
AT229400	CANADIAN RIVER, US 377, KONAWA	08/15/2001	700
		06/21/2004	9100
		07/07/2004	3300
		07/26/2004	900
AT228250	CANADIAN RIVER, US 183, TALOGA	05/02/2001	1000
		08/14/2002	500
		06/16/2003	3000
		07/21/2003	600
		09/08/2003	600
AT231000	LITTLE RIVER, SH 56, SASAKWA	05/08/2000	500
		07/24/2000	1000
		09/05/2001	700
		05/17/2004	1000
		06/21/2004	6700

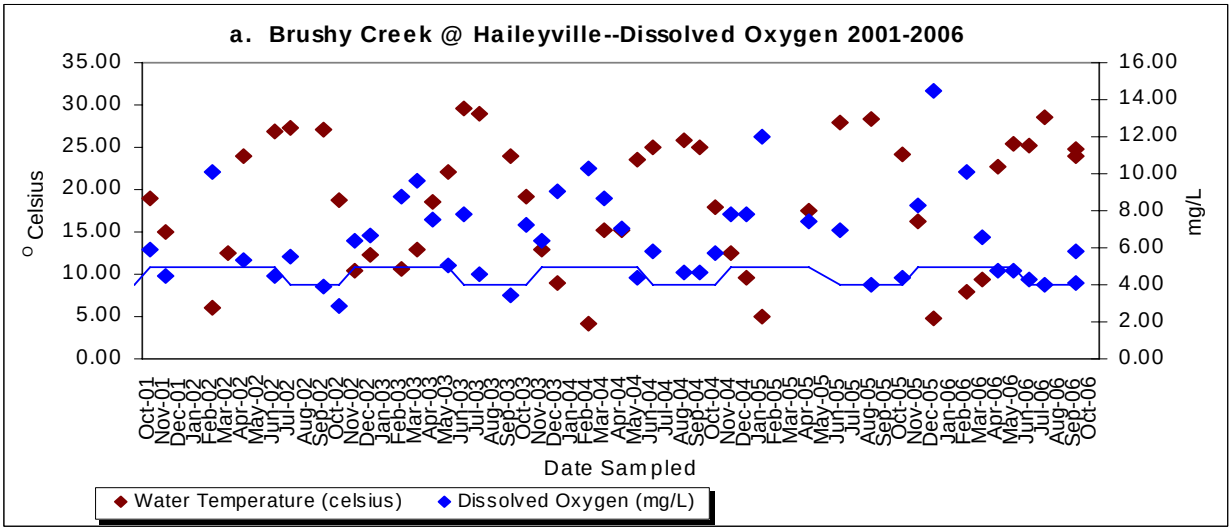
Brushy Creek near Haileyville

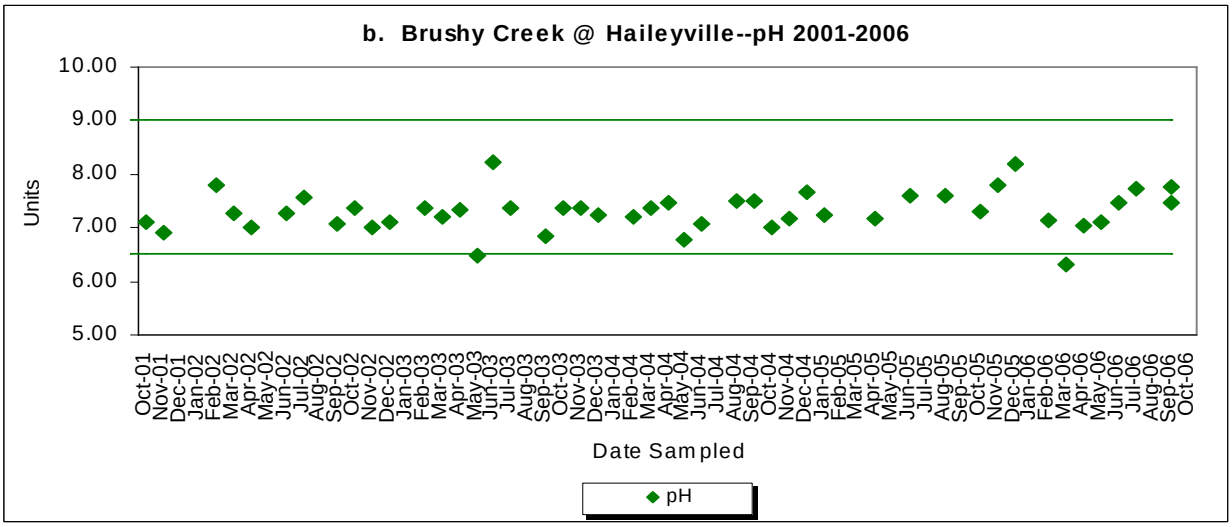
Station AT231600 (220600030010-001AT) is a permanent ambient trend monitoring station located on Brushy Creek. Situated in the east central portion of Pittsburg County, the site was established north of the town of Haileyville off of US Highway 270 on County Road 1480. The station is positioned near the terminal end of stream segment 220600030010 and is classified within the Lower Canadian River 8 digit HUC watershed (11090204). Water enters the stream system from several tributaries including Elm Creek, Peaceable Creek (Brown Lake Watershed) and Blue Creek (Hartshorne Lake), among others.

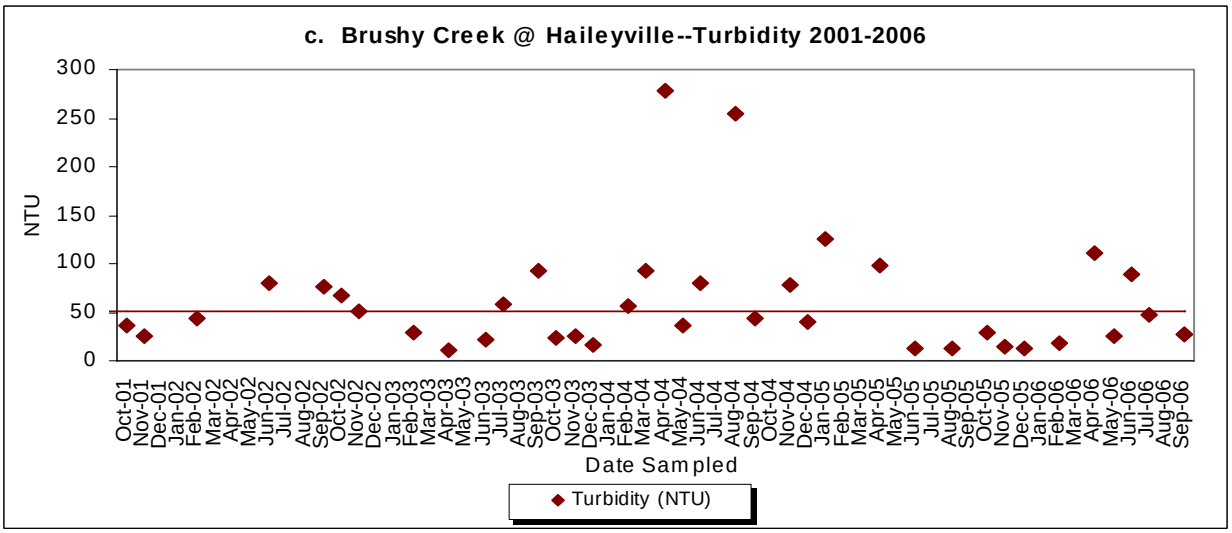
This station on Brushy Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Brushy Creek from the confluence of Elm Creek (95.7520, 34.6870) downstream to confluence of Brushy Creek with Lake Eufaula (95.5844, 34.8904). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-nine (39) turbidity samples (Figure 33c), sixteen (16) samples (or 41%) exceeded the numerical criteria of 50 NTU. Of the nine (9) toxicant samples collected, three (3) of the lead concentrations (or 33%) exceeded the prescribed, hardness-dependent chronic criteria of 2.39 ug/L (Table 17). Of the forty-five (45) dissolved oxygen samples (Figure 33a), nine (9) samples (or 20%) were below the prescribed screening level. The pH (Figure 33b) samples met the criterion prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 33d and e). Of the forty-six (46) sulfate concentrations, seven (7) samples (or 15%) exceeded the sample standard of 255.0 mg/L. The TDS and chloride values met the segment-specific criterion. The PBCR beneficial use is not supported (Table 18). Of the seventeen (17) enterococci concentrations, 4 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (89.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Brushy Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 33f).

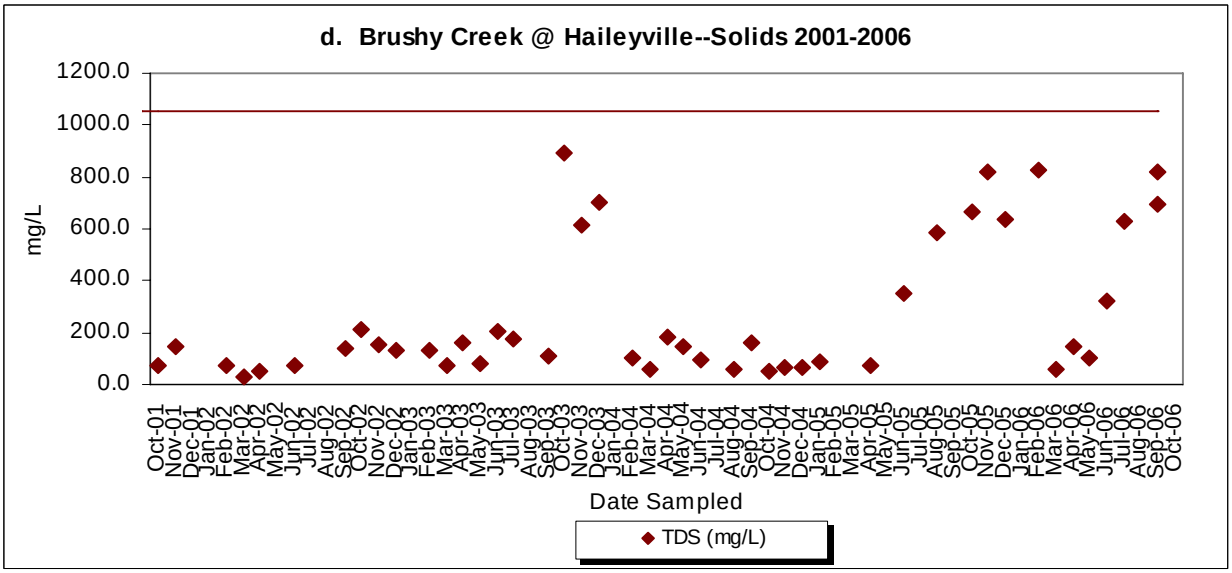
Figure 33 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Brushy Creek at Haileyville (AT231600), 2001-2006.

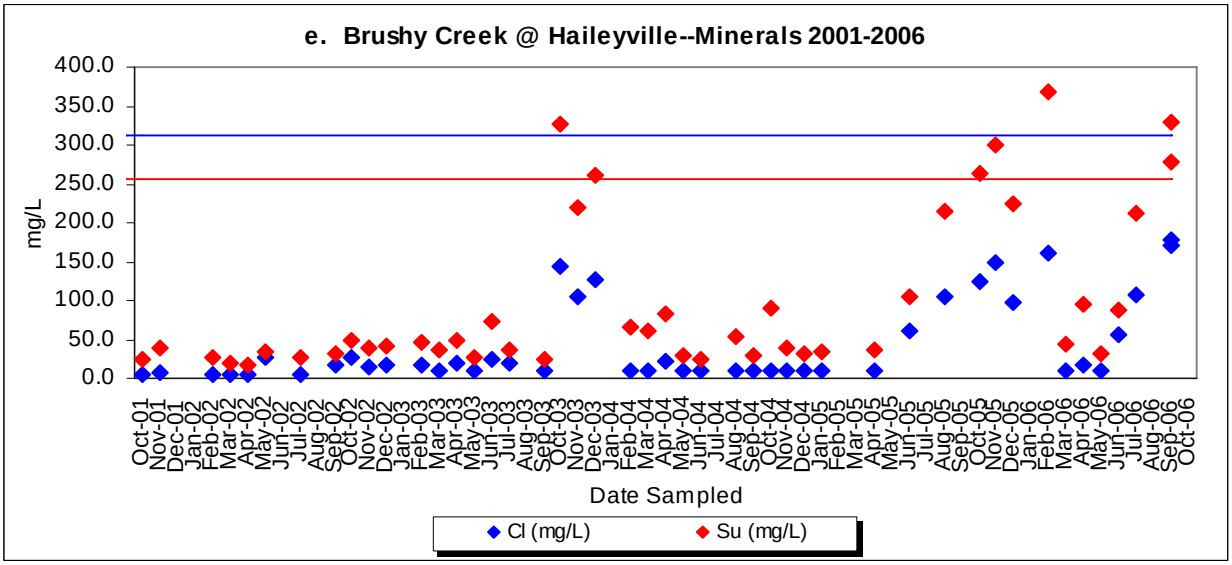


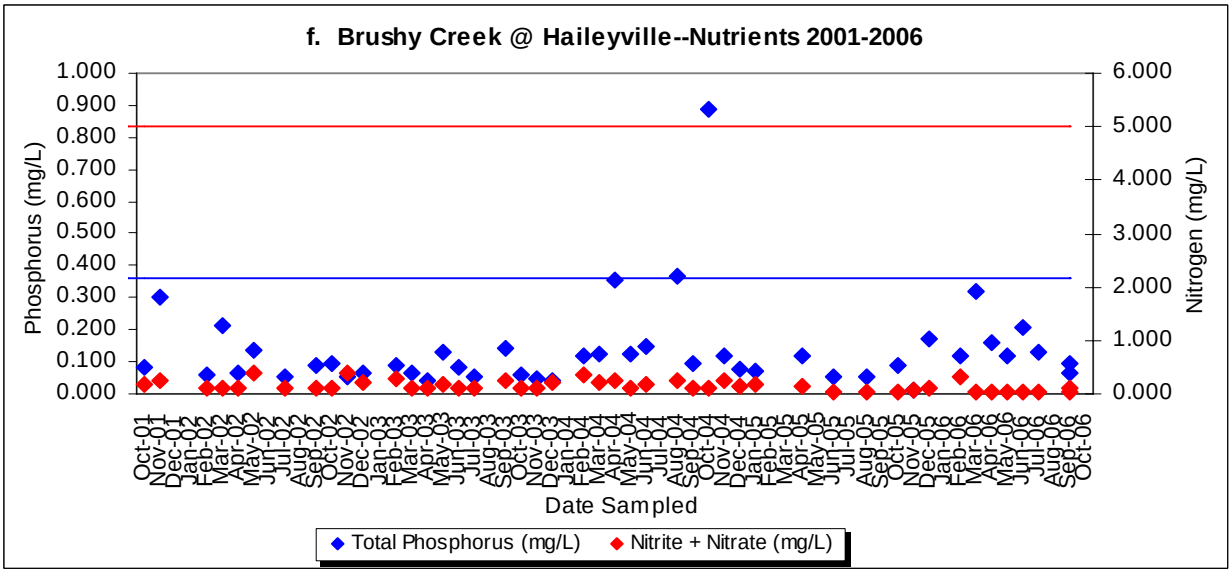




HUC 1109


d. Brushy Creek @ Haileyville--Solids 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Brushy Creek @ Haileyville--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Brushy Creek @ Haileyville--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

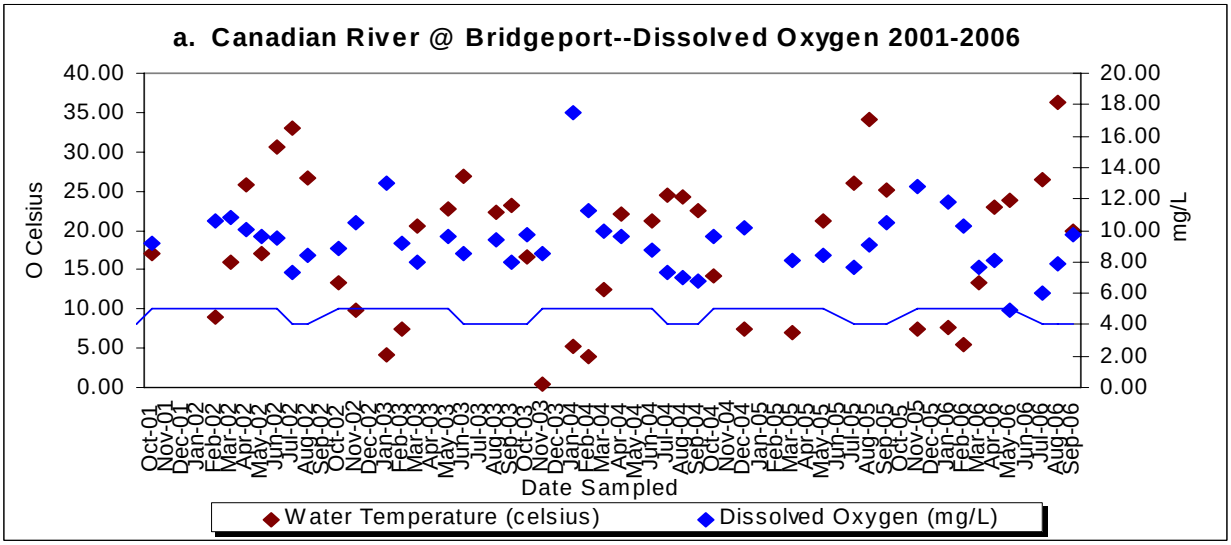
Canadian River near Bridgeport

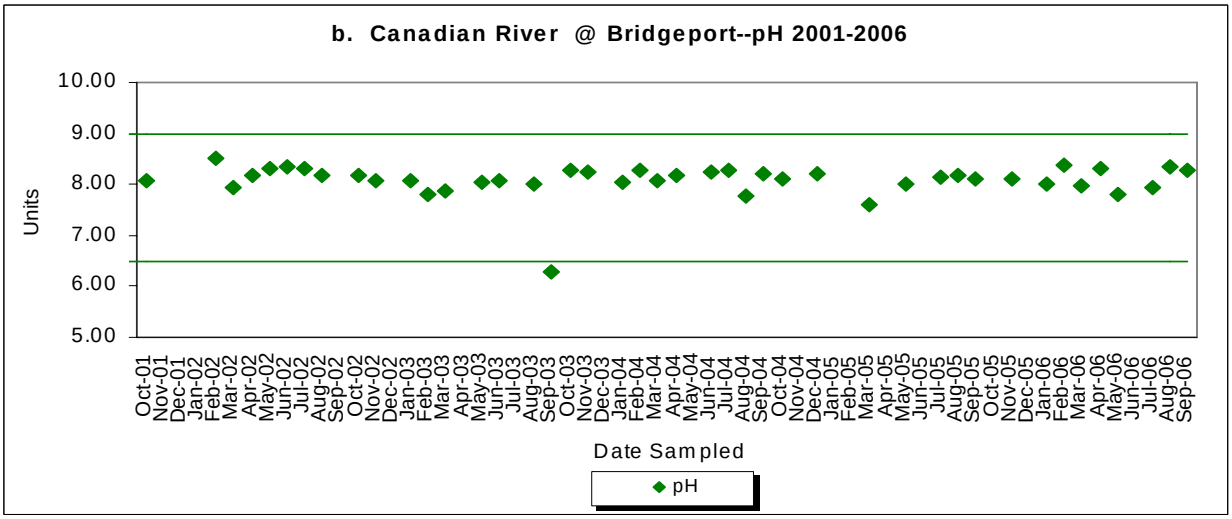
Station AT228500 (520610020150-001AT) is a permanent ambient trend monitoring station located on the Canadian River in Oklahoma. Situated in the northeastern portion of Caddo County, the site was established east of the town of Bridgeport on US Highway 66. The station is positioned near the upper end of stream segment 520610020150 and is classified within the Lower Canadian River - Walnut Creek 8 digit HUC watershed (11090202). Water enters the stream system from several tributaries including Lariat Creek, Canyon View Creek, Powder Face Creek, and Buggy Creek, among others.

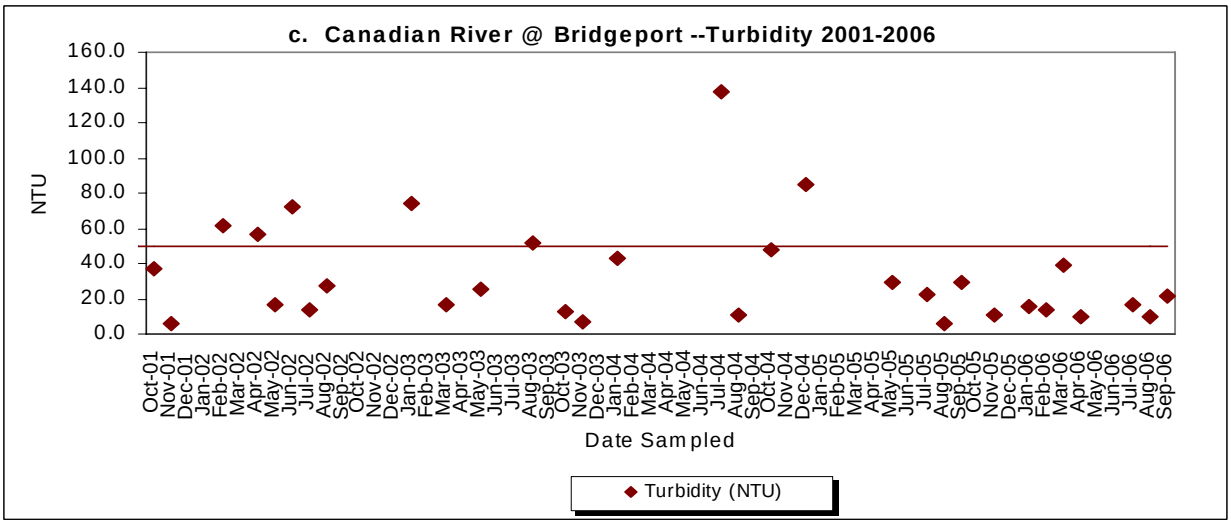
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Canadian River from the confluence of Deer Creek (98.4737, 35.5580) downstream to confluence of the Canadian River with Buggy Creek (97.8950, 35.3450). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported. Of the thirty-one (31) turbidity samples (Figure 34c), seven (7) samples (or 23%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 34a), pH (Figure 34b), and toxicants samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 34d and e). The PBCR beneficial use is not supported (Table 18). Of the seventeen (17) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (172.9 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 34f).

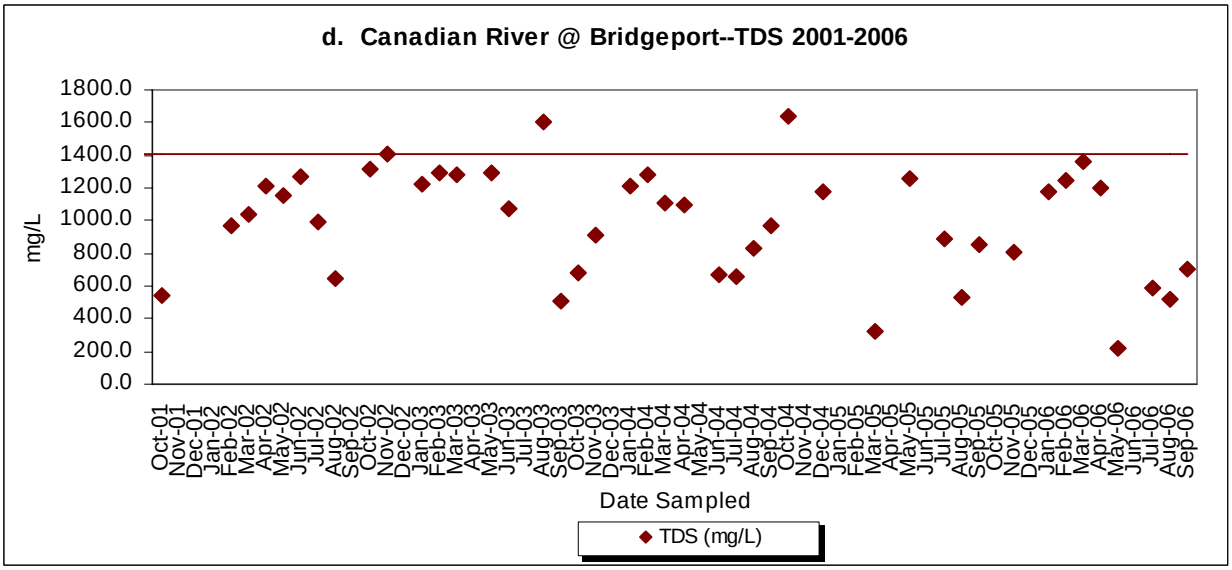
Figure 34 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Bridgeport (AT228500), 2001-2006.

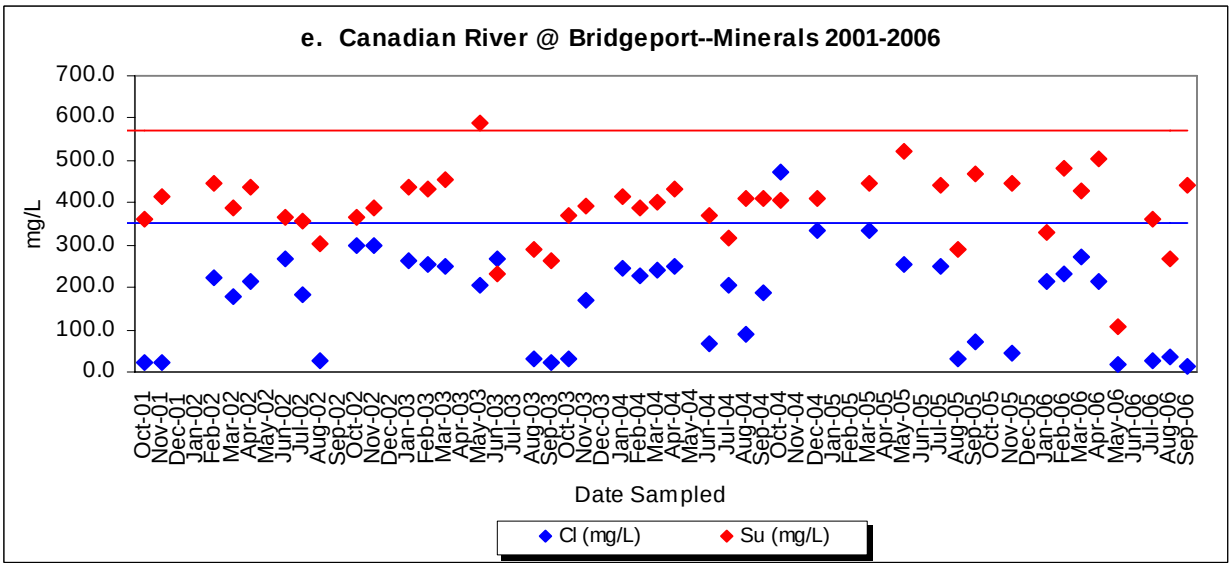


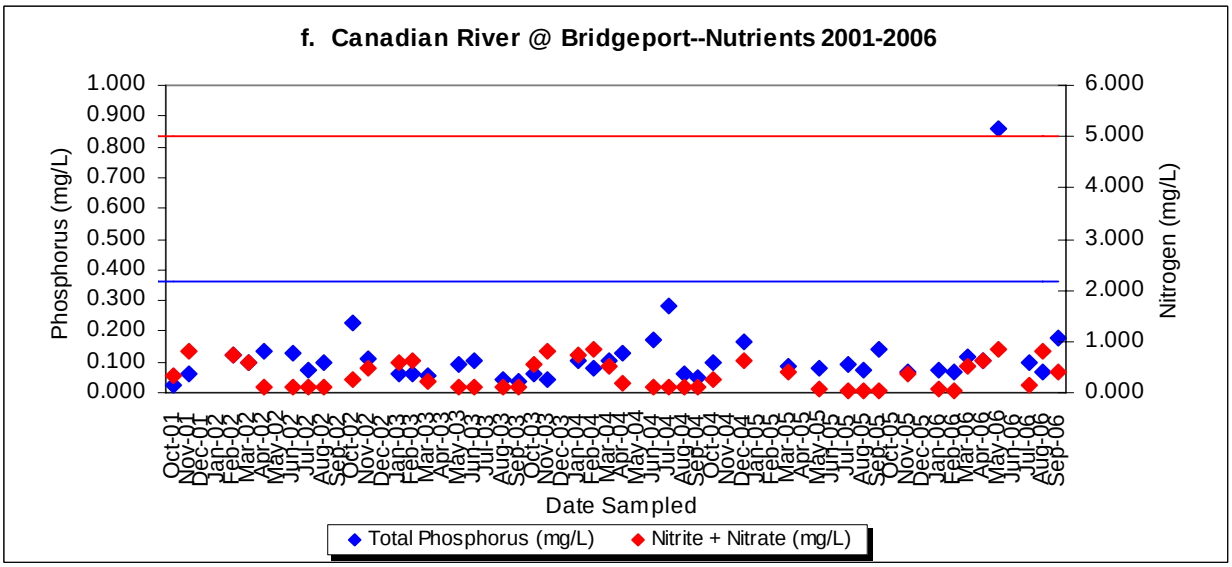




HUC 1109


d. Canadian River @ Bridgeport--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Canadian River @ Bridgeport--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian River @ Bridgeport--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

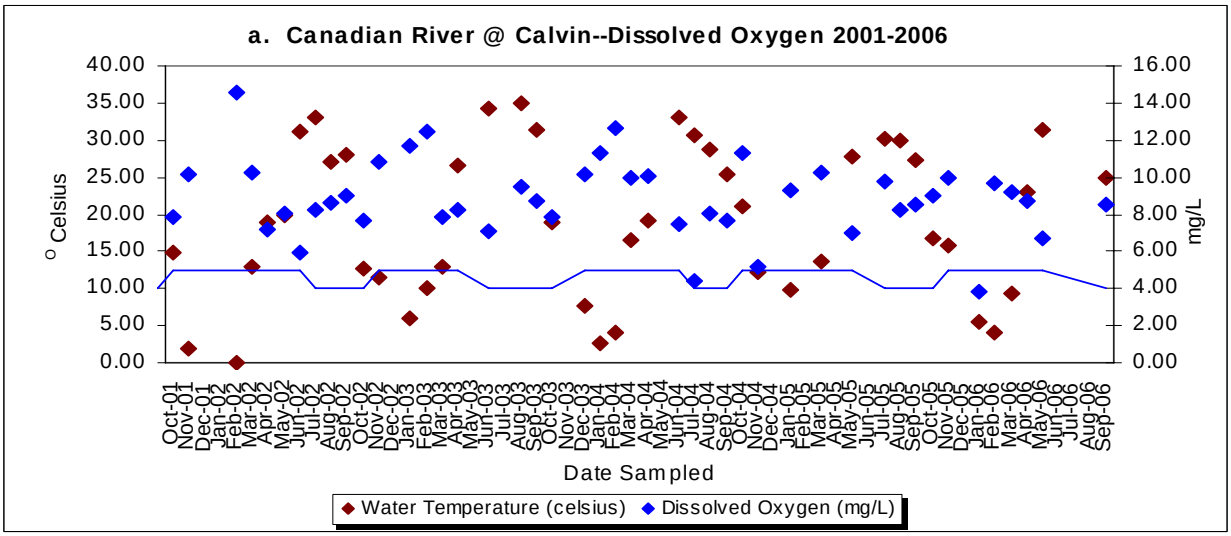
Canadian River near Calvin

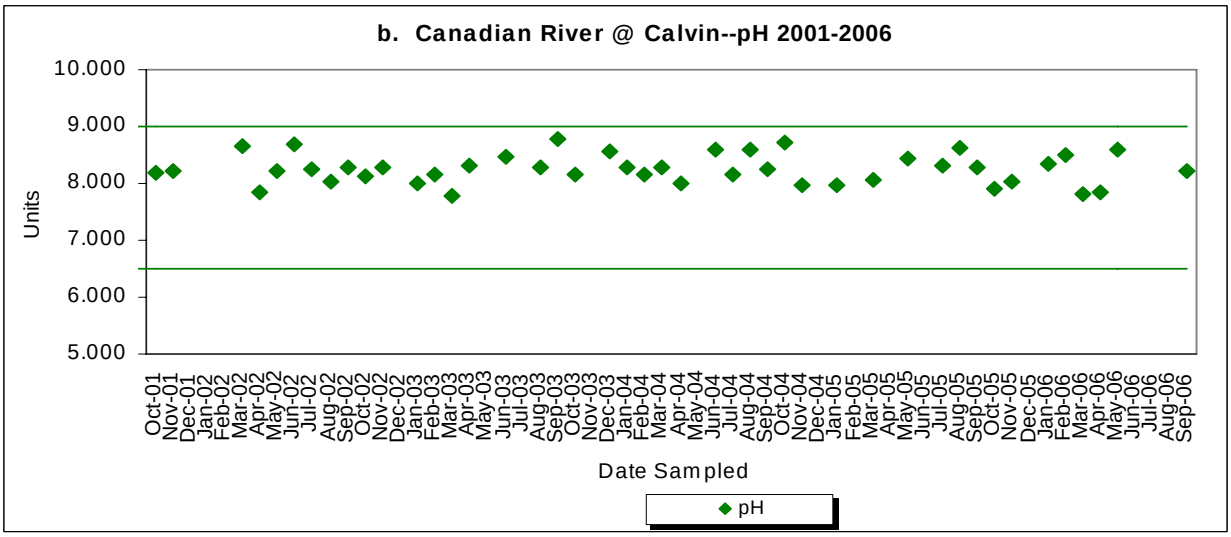
Station AT231500 (220600010119-001AT) is a permanent ambient trend monitoring station between the midpoint and the lower end of the Canadian River in Oklahoma. Situated in the central portion of Hughes County, the site was established north of the town of Calvin on US Highway 270. The station is positioned near the upper end of stream segment 220600010119 and is classified within the Lower Canadian River - Walnut Creek 8 digit HUC watershed (11090202). Water enters the stream system from several tributaries including Big Creek, Salt Creek, Spring Creek, Coal Creek, and Gobbler Creek, among others.

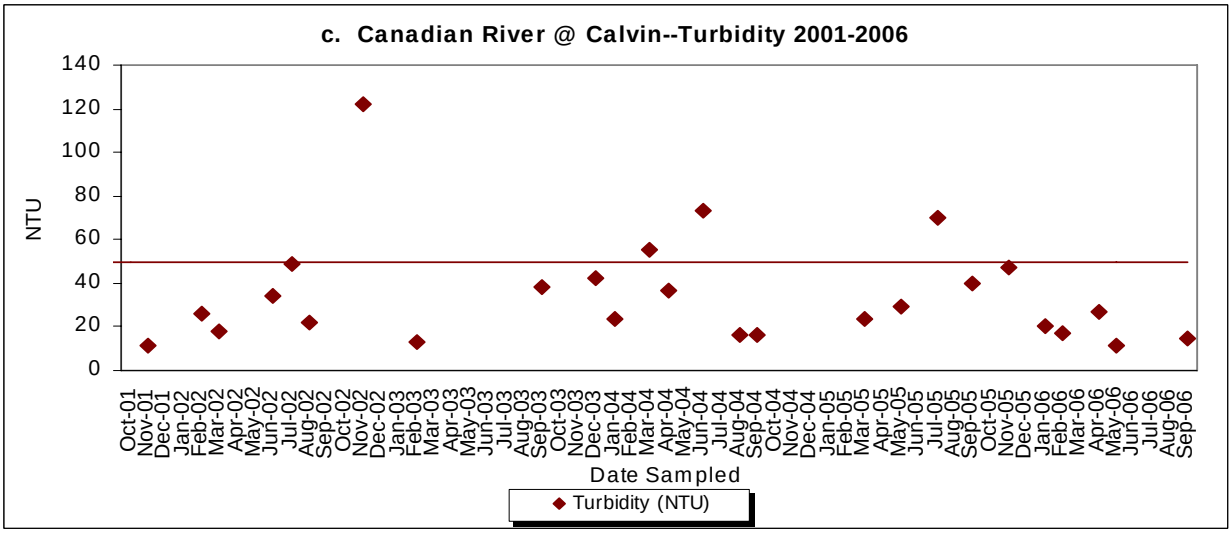
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Canadian River from below the confluence of the Little River (96.3637, 34.9962) downstream to confluence of the Canadian River with Eufaula Lake (95.8391, 35.1899). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the twenty-six (26) turbidity samples (Figure 35c), four (4) samples (or 15%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 35a), pH (Figure 35b) and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is partially supporting (Figure 35d and e) but impaired per the CPP. Of the forty-three (43) sulfate concentrations, eight (8) samples (or 19%) exceeded the prescribed sample standard of 255.0 mg/L. Total dissolved solids and chloride values met the prescribed segment-specific criteria. The PBCR beneficial use is not supported (Table 18). Of the twenty (20) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (108.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Canadian River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (33.2 mg/M^3) produced a TSI of 65, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 35f).

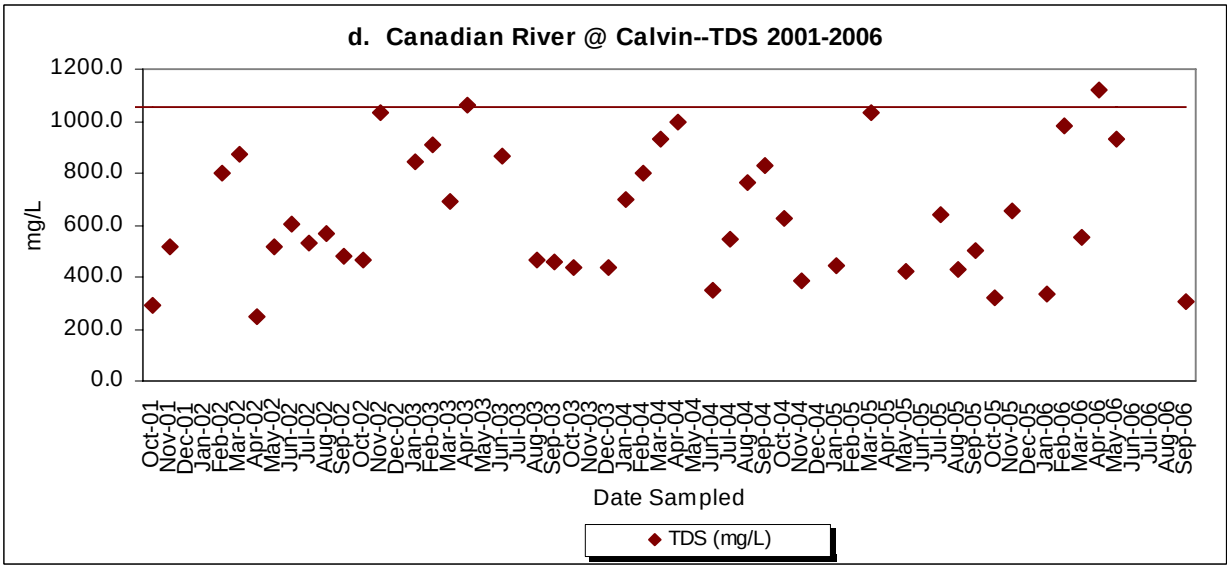
Figure 35 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Calvin (AT231500), 2001-2006.

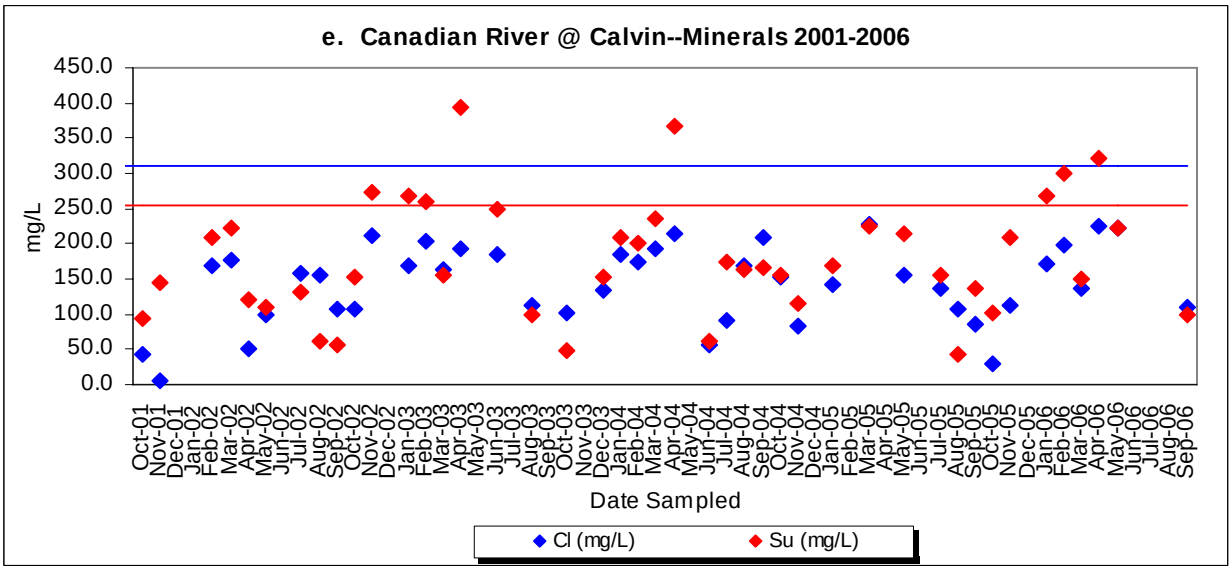


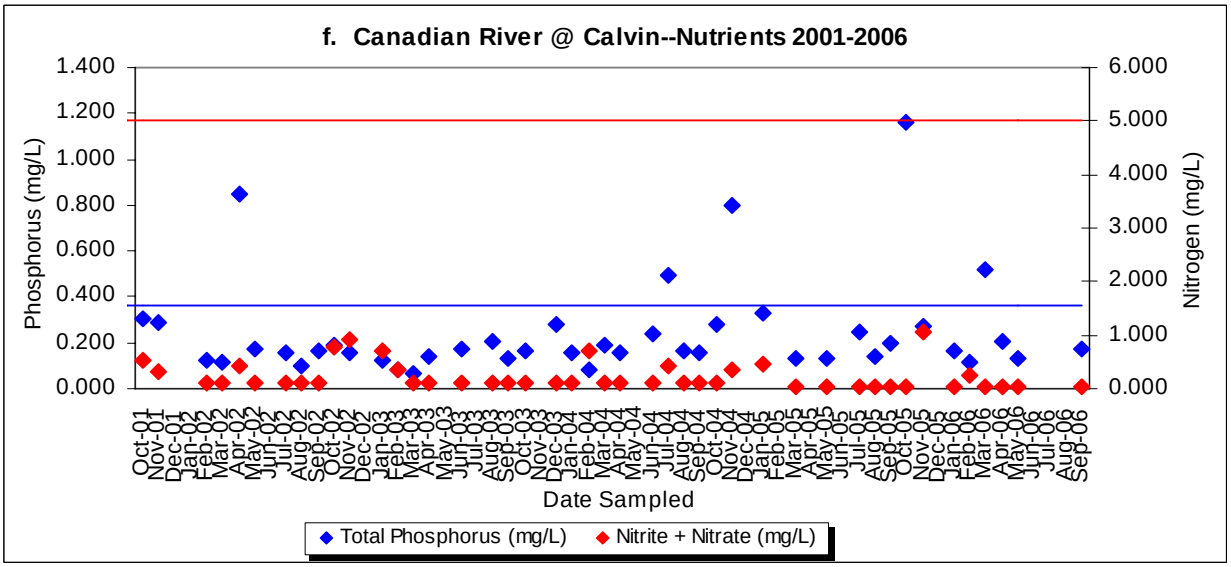




HUC 1109


d. Canadian River @ Calvin--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Canadian River @ Calvin--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian River @ Calvin--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

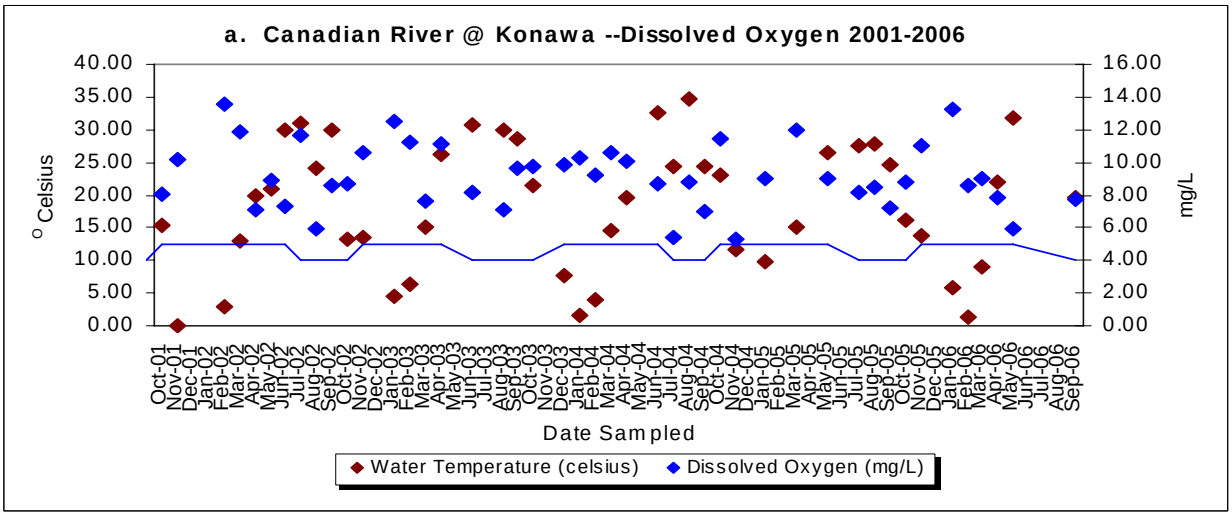
Canadian River near Konawa

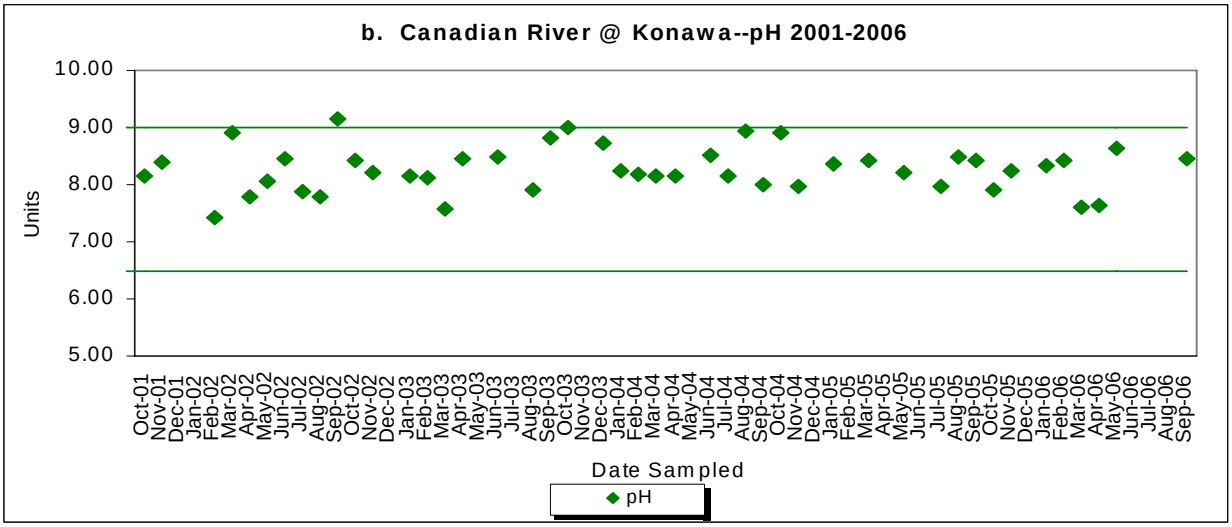
Station AT229400 (520600010010-001AT) is a permanent ambient trend monitoring station located on the Canadian River in Oklahoma. Situated in the southeastern portion of Seminole County, the site was established east of the town of Konawa on US Highway 377. The station is positioned near the upper end of stream segment 520600010010 and is classified within the Lower Canadian River - Walnut Creek 8 digit HUC watershed (11090202). Water enters the stream system from and from several tributaries including Canadian Sandy Creek, Jumper Creek, and the Little River, among others.

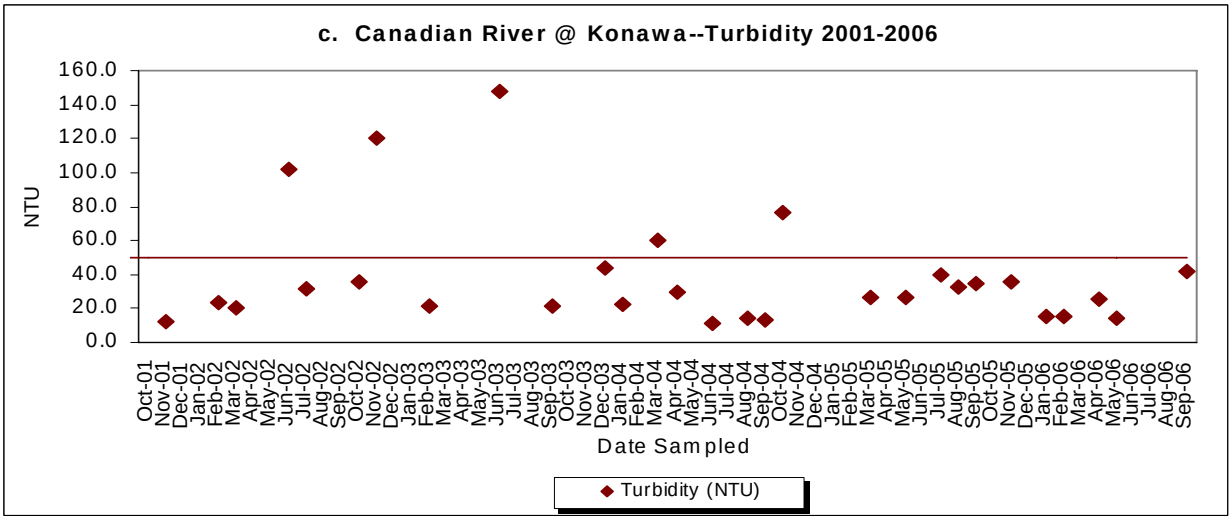
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Canadian River from the confluence of Canadian Sandy Creek (96.7007, 34.8651) downstream to confluence of the Little River with the Canadian River (96.3637, 34.9962). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the twenty-nine (29) turbidity samples (Figure 36c), five (5) samples (or 17%) exceeded the numerical criterion of 50 NTU. Of the nine (9) toxicant samples collected, two (2) of the lead concentrations (or 22%) exceeded the prescribed, hardness-dependent chronic criteria of 15.78 ug/L (Table 17). Dissolved oxygen (Figure 36a) and pH (Figure 36b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 36d and e). Of the forty-five (45) total dissolved solids concentrations, twenty-one (21) samples (or 47%) exceeded the minimum sample standard of 700.0 mg/L. Chloride and sulfate values met the prescribed segment-specific criteria. The PBCR beneficial use is not supported (Table 18). Of the seventeen (17) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (133.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Canadian River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (31.7 mg/M^3) produced a TSI of 64, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 36f).

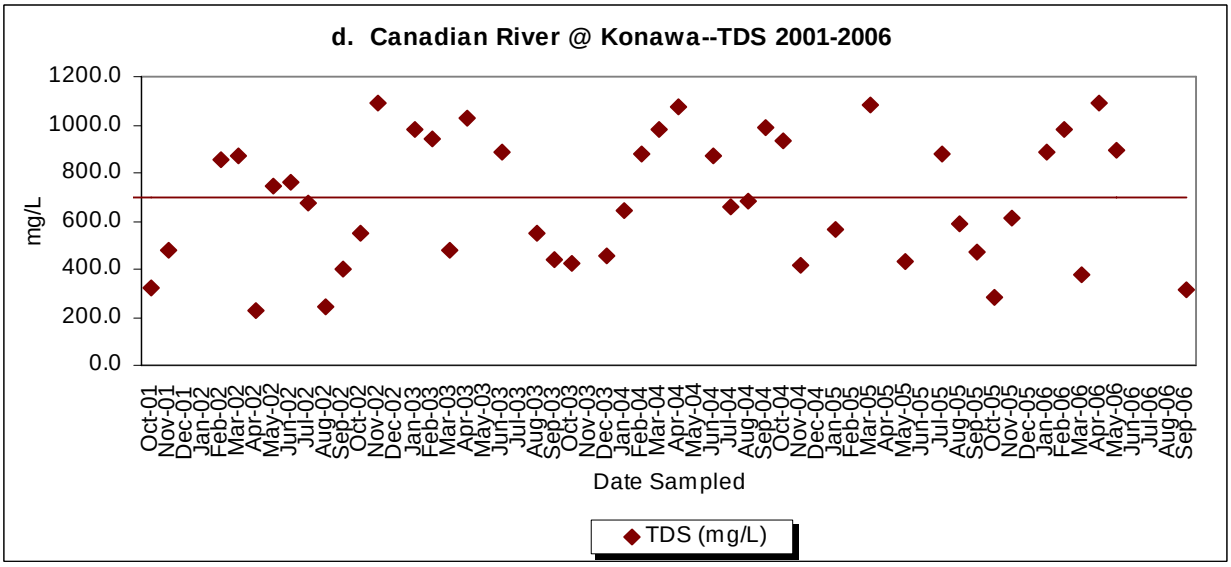
Figure 36 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Konawa (AT229400), 2001-2006.

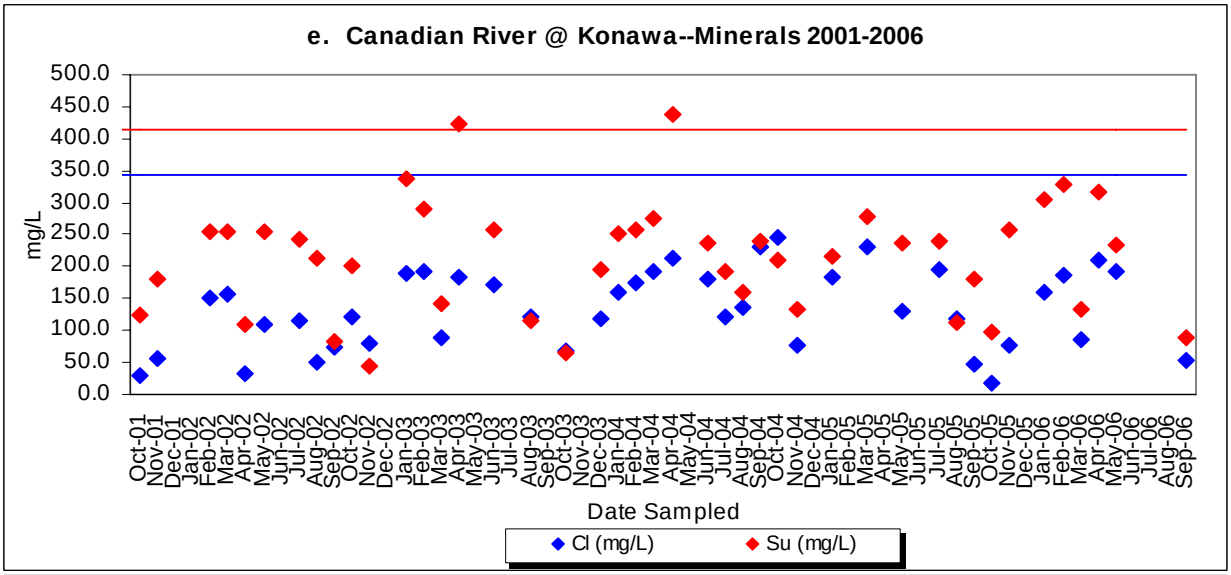


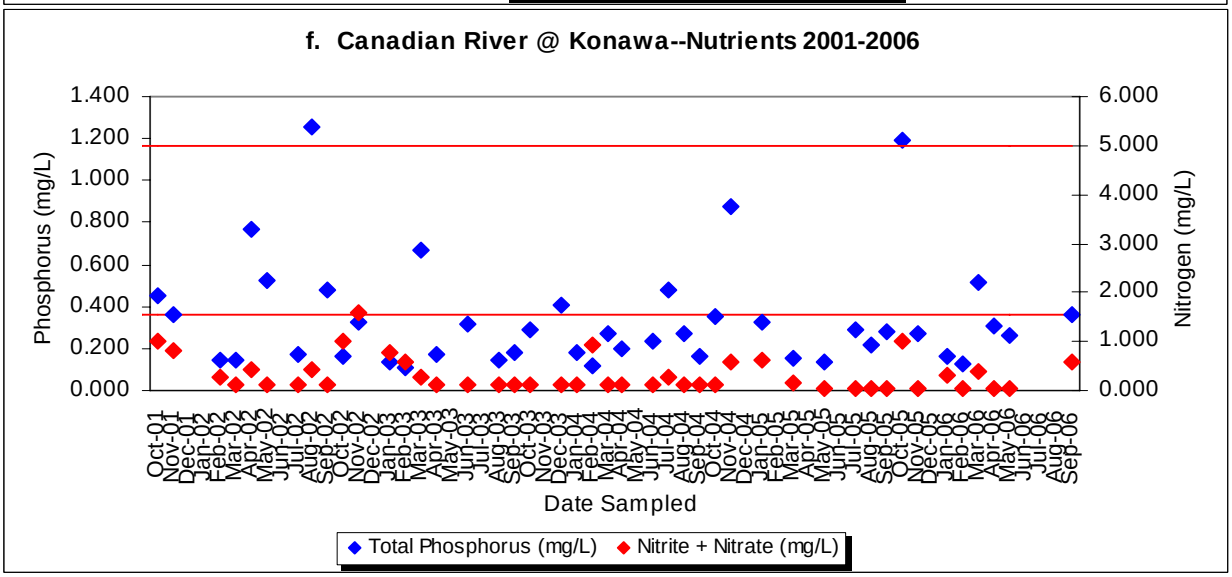




HUC 1109


d. Canadian River @ Konawa--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Canadian River @ Konawa--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian River @ Konawa--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

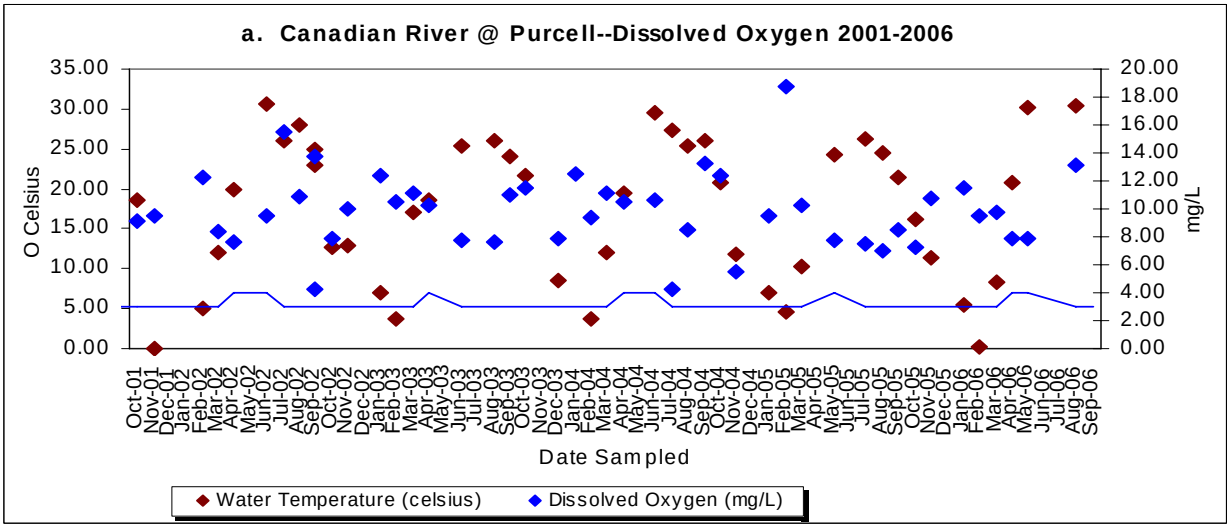
Canadian River near Purcell

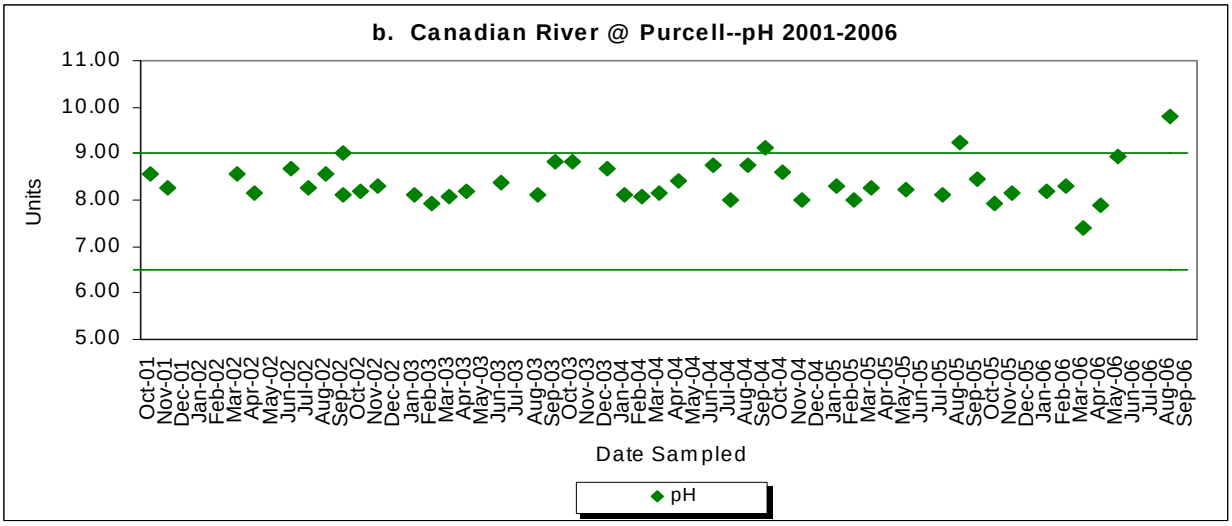
Station AT229200 (520610010010-001AT) is a permanent ambient trend monitoring station located on the Canadian River in Oklahoma. Situated in the east central portion of McClain County, the site was established east of the city of Purcell on US Highway 77. The station is positioned near the midpoint of stream segment 520610010010 and is classified within the Lower Canadian River - Walnut Creek 8 digit HUC watershed (11090202). Water enters the stream system from several tributaries including Cow Creek, Pond Creek, and Walnut Creek, among others.

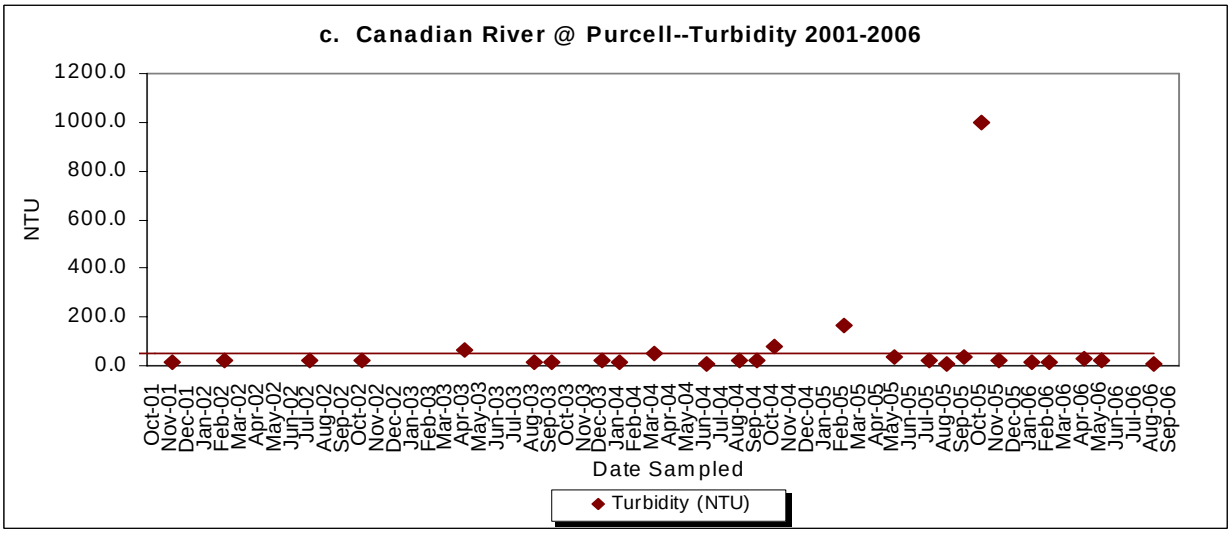
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Canadian River from the confluence of Cow Creek (-97.6291, 35.3154) downstream to confluence of Walnut Creek with the Canadian River (-97.8950, 35.3450). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Habitat Limited Aquatic Community—Fish and Wildlife Propagation (HLAC), 2) Agriculture—Class II Irrigation (AG), and 3) Secondary Body Contact—Recreation (SBCR).

The HLAC beneficial use is partially supported but impaired per the CPP. Of the twenty-seven (27) turbidity samples (Figure 37c), four (4) samples (or 15%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 37a), pH (Figure 37b), and toxicant samples met the criteria prescribed in the HLAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 37d and e). This segment of the Canadian River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (40.1 mg/M^3) produced a TSI of 67, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 37f).

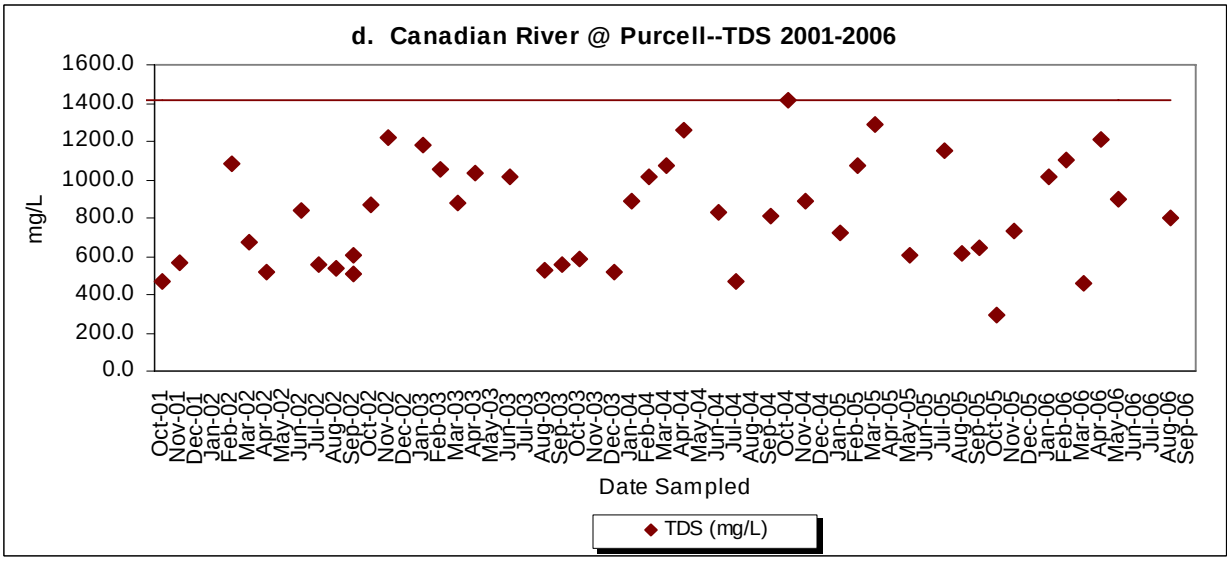
Figure 37 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Purcell (AT229200), 2001-2006.

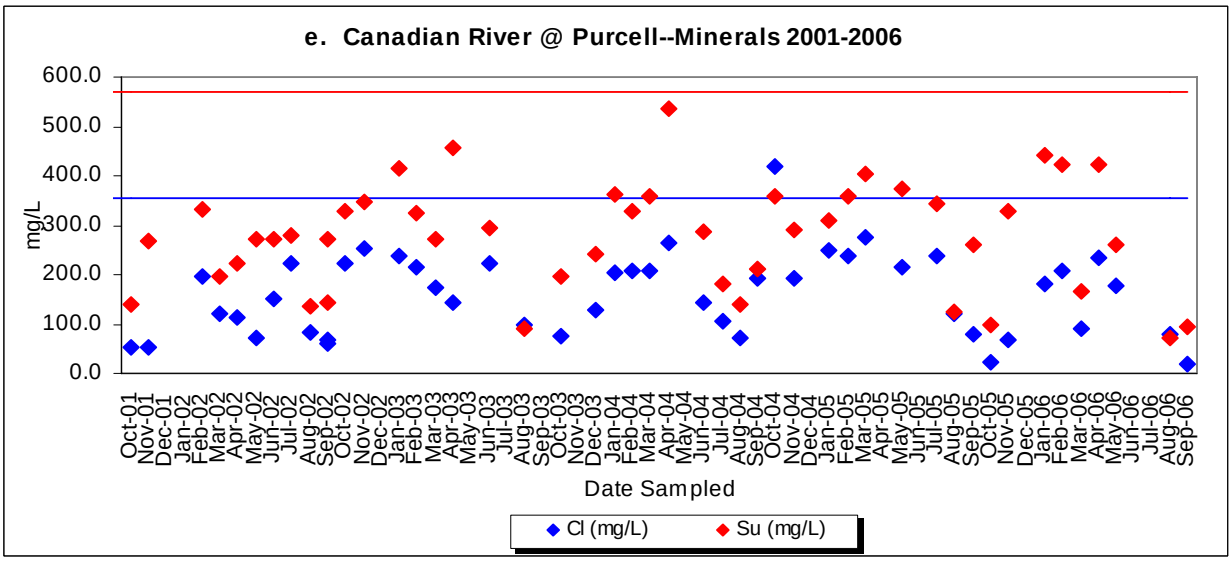


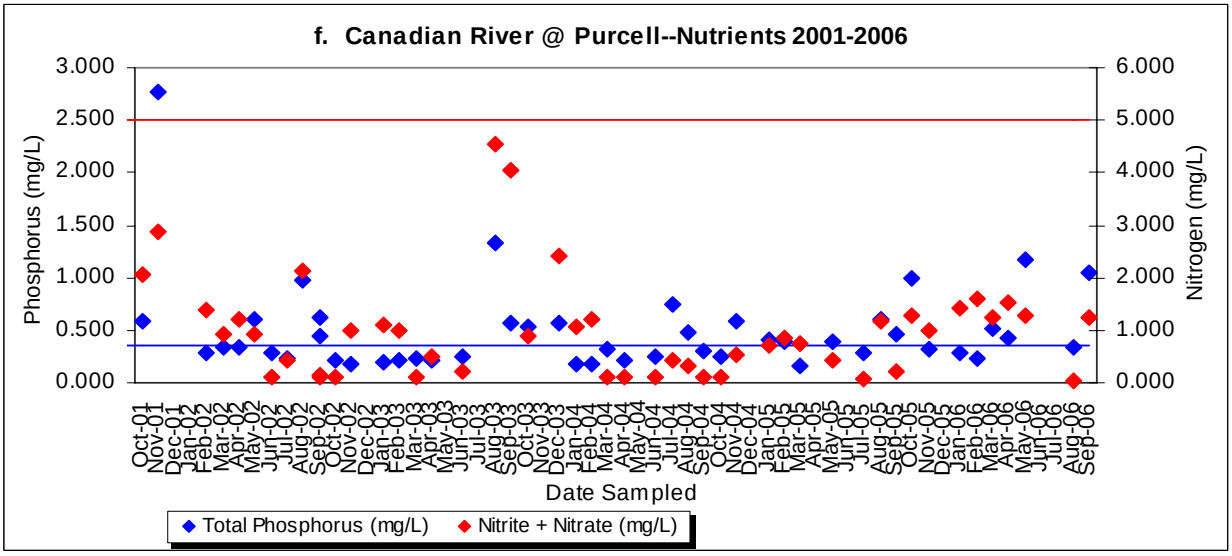




HUC 1109


d. Canadian River @ Purcell--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Canadian River @ Purcell--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian River @ Purcell--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

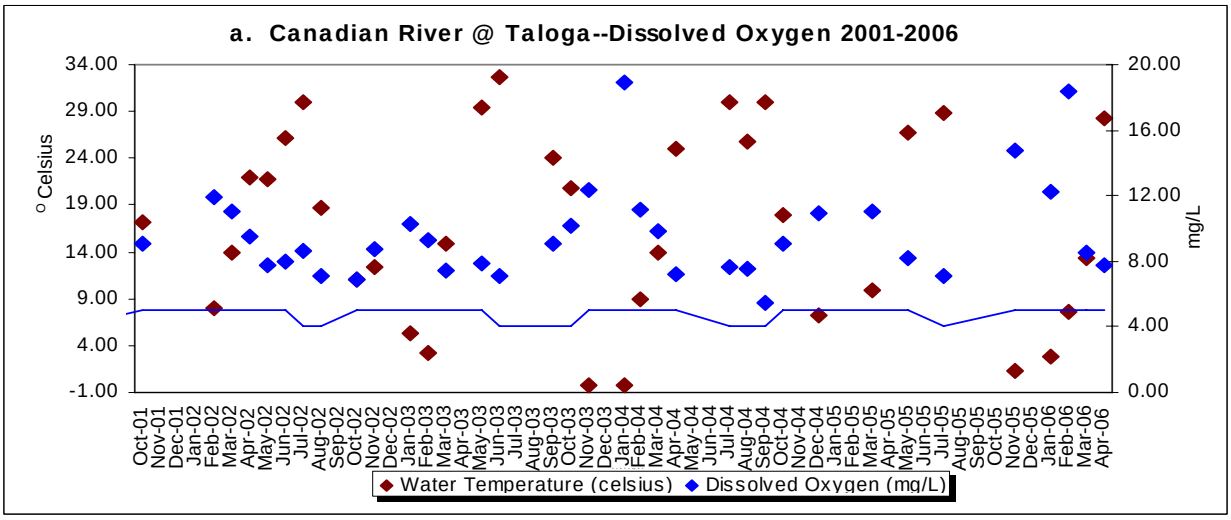
Canadian River near Taloga

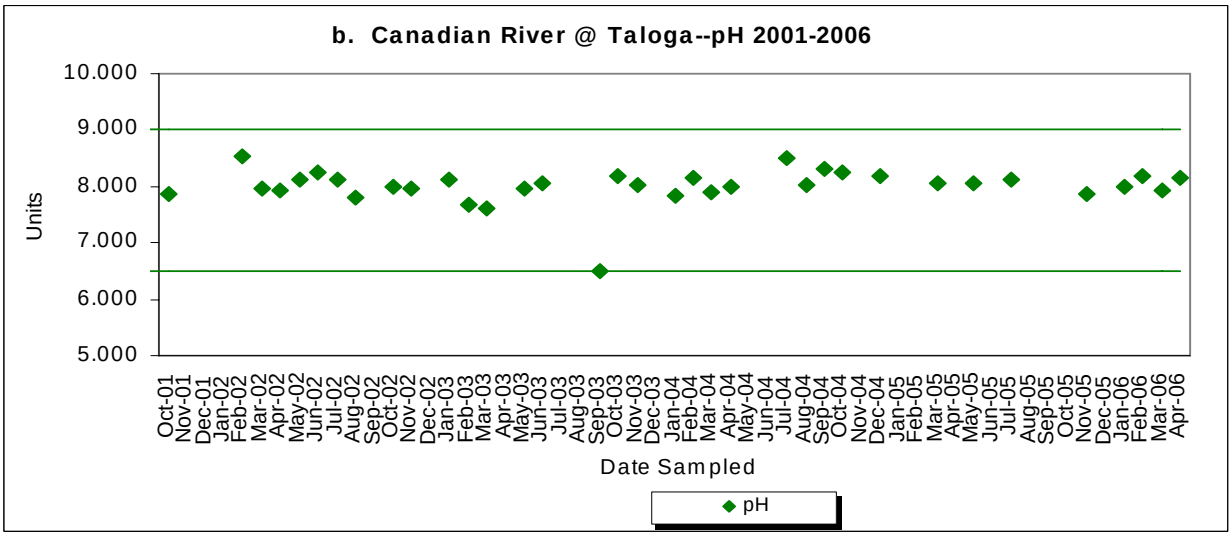
Station AT228250 (520620020010-001AT) is a permanent ambient trend monitoring station located on the Canadian River in Oklahoma. Situated i n the north central portion of Dewey County, the site was established north of the town of Taloga on US Highway 183. The station is positioned near the upper end of stream segment 520620020010 and is classified within the Lower Canadian River - Deer Creek 8 digit HUC watershed (11090201). Water enters the stream system from several tributaries including Turkey Creek, Red Creek, Gyp Creek, Trail Creek, Lone Creek, Squirrel Creek, and Deer Creek, among others.

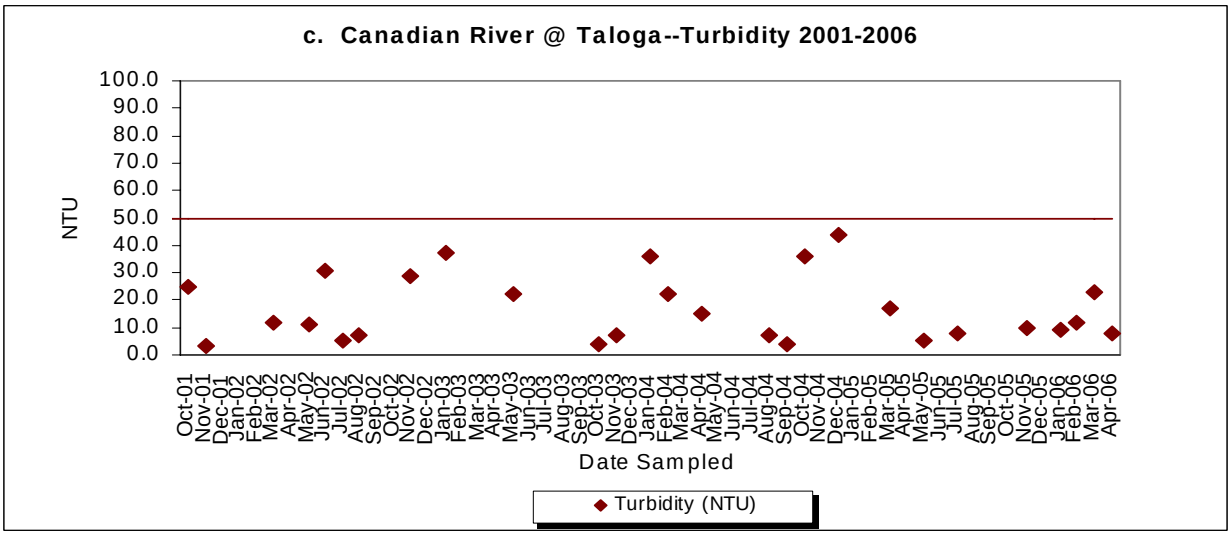
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected October of 2001 through April of 2006, when the river dried up for the season. For purposes of reporting, this station is representative of the Canadian River from the confluence of Turkey Creek (99.3783, 36.0127) downstream to confluence of Deer Creek with the Canadian River (98.4737, 35.5580). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 38a), pH (Figure 38b), turbidity (Figure 38c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 38d and e). Of the thirty-five (35) total dissolved solids concentrations, four (4) samples (or 11%) exceeded the sample standard of 1849.0 mg/L, and the geometric mean (1610.4 mg/L) exceeded the yearly mean standard (1458 mg/L). Of the 35 chloride concentrations, eight (8) samples (or 23%) exceeded the sample standard of 488.0 mg/L, and the geometric mean (487.0 mg/L) exceeded the yearly mean standard (336 mg/L). Of the 35 sulfate concentrations, six (6) samples (or 17%) exceeded the sample standard of 724.0 mg/L. The PBCR beneficial use is not supported (Table 18). Of the twelve (12) enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (218.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 38f).

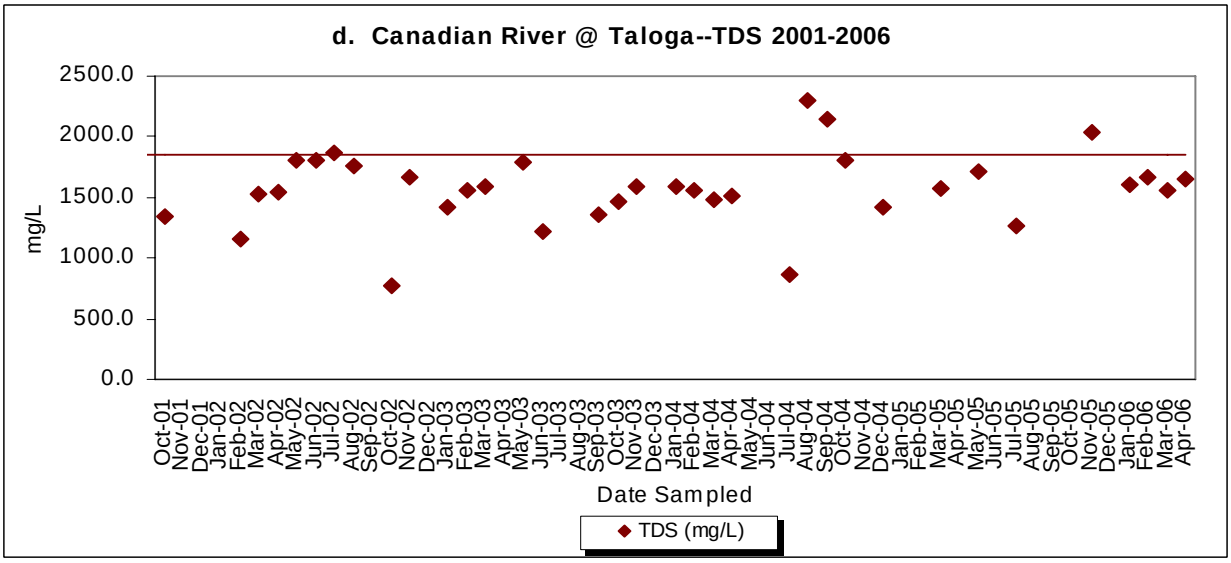
Figure 38 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Taloga (AT228250), 2001-2006.

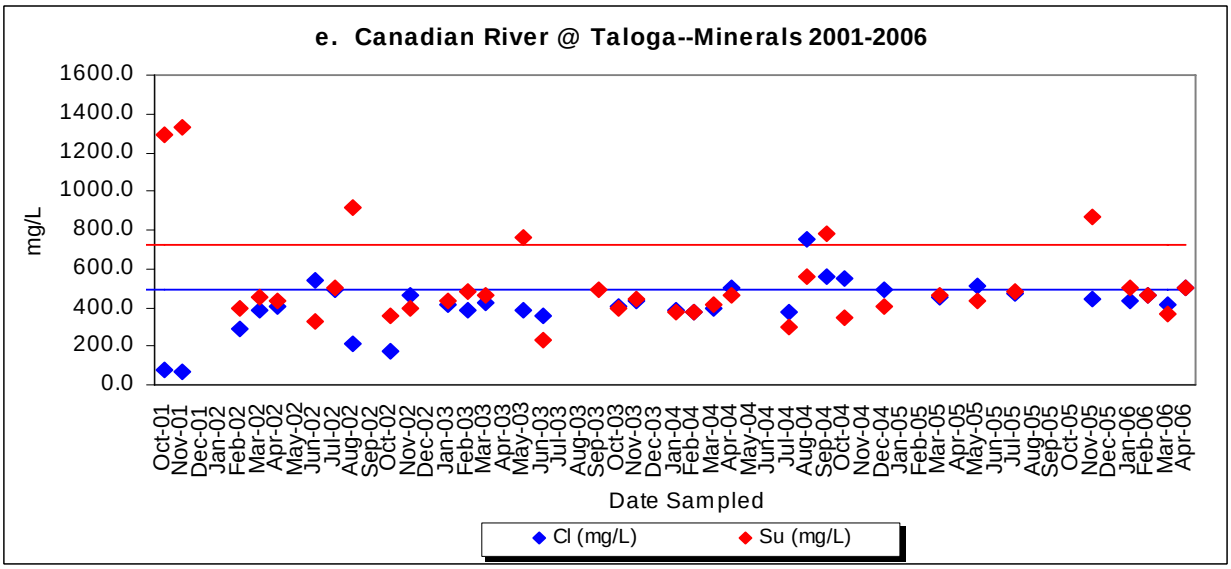


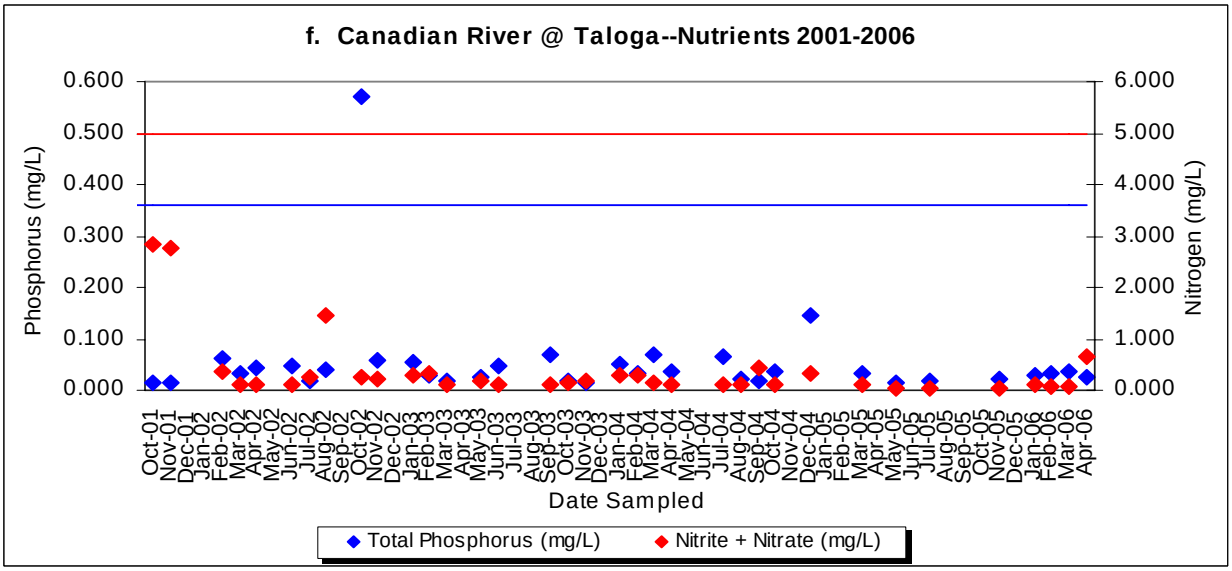




HUC 1109


d. Canadian River @ Taloga--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Canadian River @ Taloga--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian River @ Taloga--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

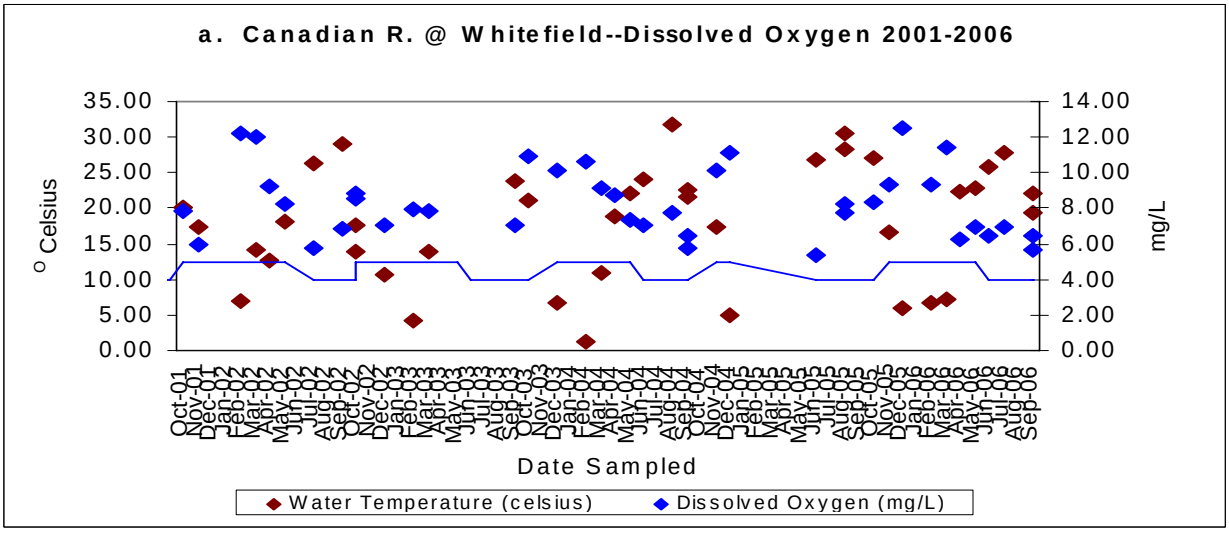
Canadian River near Whitefield

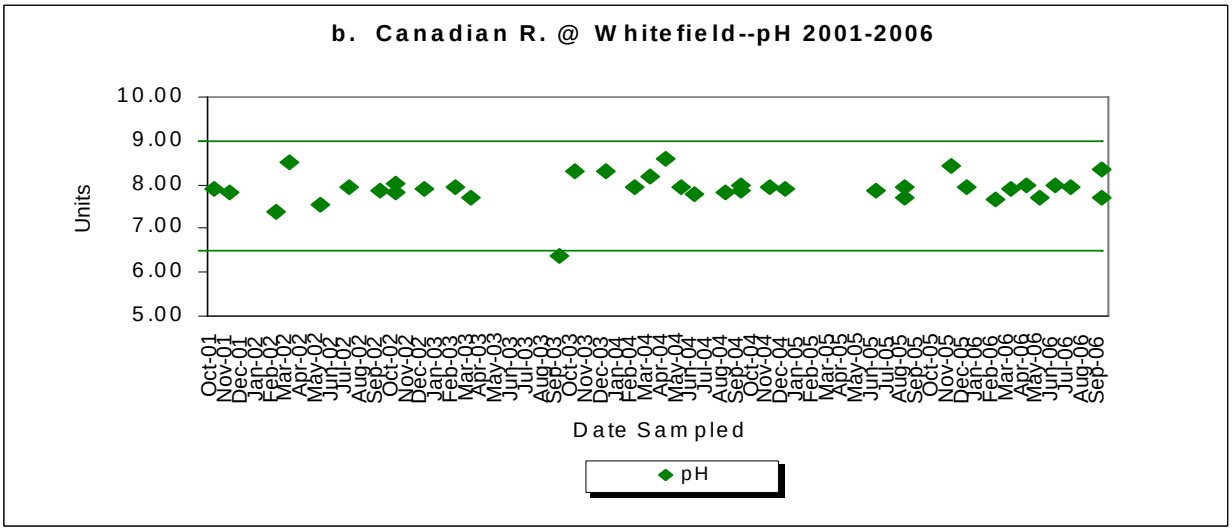
Station AT245000 (220300000010-001AT) is a permanent ambient trend monitoring station near the lower end of the Canadian River in Oklahoma. Situated in the northwestern portion of Haskell County, the site was established north of the town of Whitefield on State Highway 2. The station is positioned between the upper end and the midpoint of stream segment 2203 00000010 and is classified within the Lower Canadian River 8 digit HUC watershed (11090204). Water enters the stream system from Eufaula Lake and several tributaries including Emachaya Creek and Taloka Creek, among others.

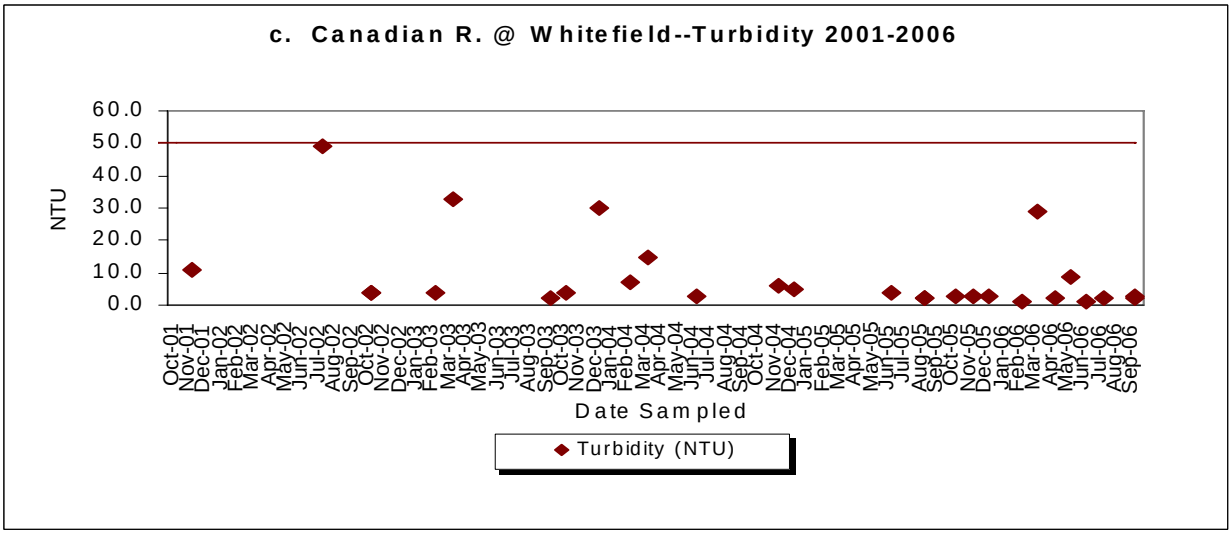
This station on the Canadian River has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October 2001 through September of 2006. For purposes of reporting, this station is representative of the Canadian River from the confluence with Lake Eufaula (95.3582, 35.3065) downstream to the Canadian River's confluence with Robert S. Kerr Reservoir (95.0776, 35.4325). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 39a), pH (Figure 39b), turbidity (Figure 39c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 39d and e). The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci. This segment of the Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 39f).

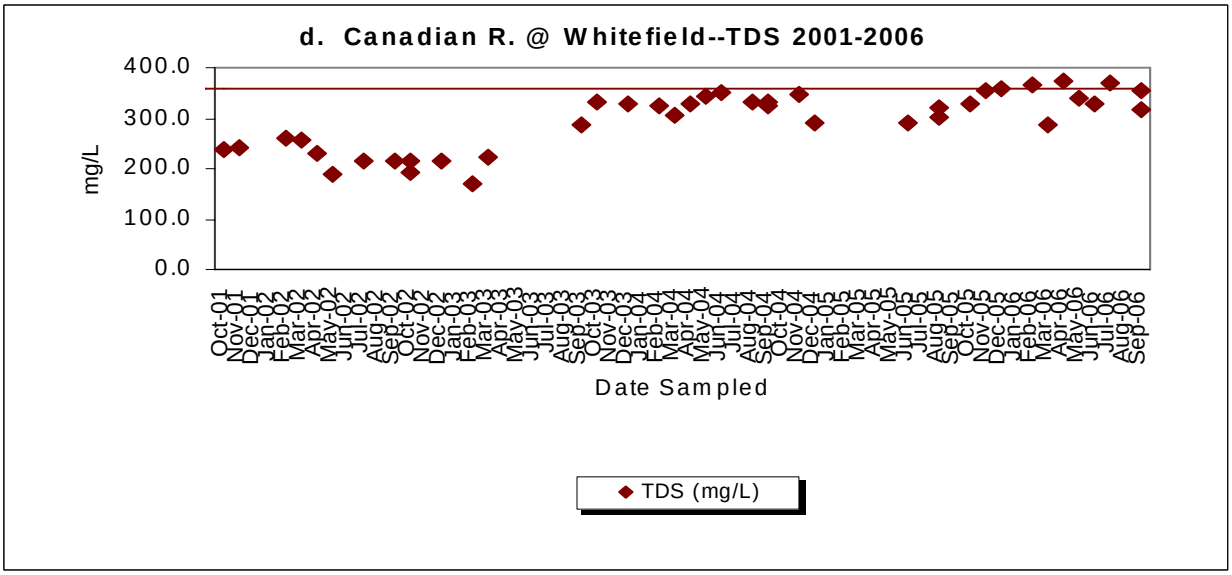
Figure 39 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Canadian River at Whitefield (AT245000), 2001-2006.

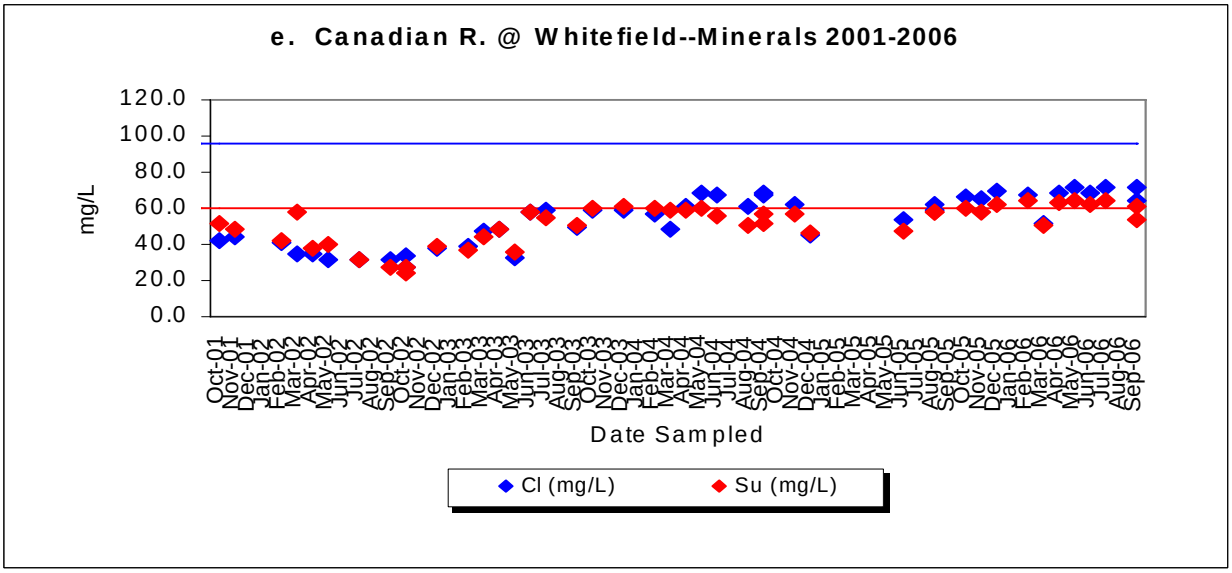


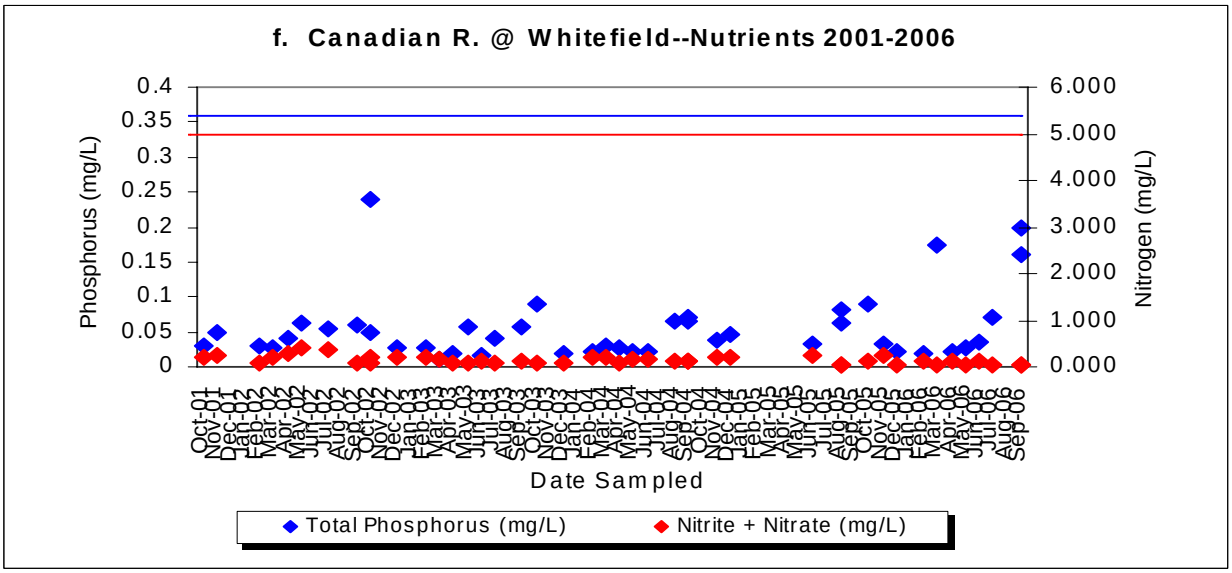




HUC 1109


d. Canadian R. @ Whitefield--TDS 2001-2006
mg/L
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Canadian R. @ Whitefield--Minerals 2001-2006
mg/L
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Canadian R. @ Whitefield--Nutrients 2001-2006
Phosphorus (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

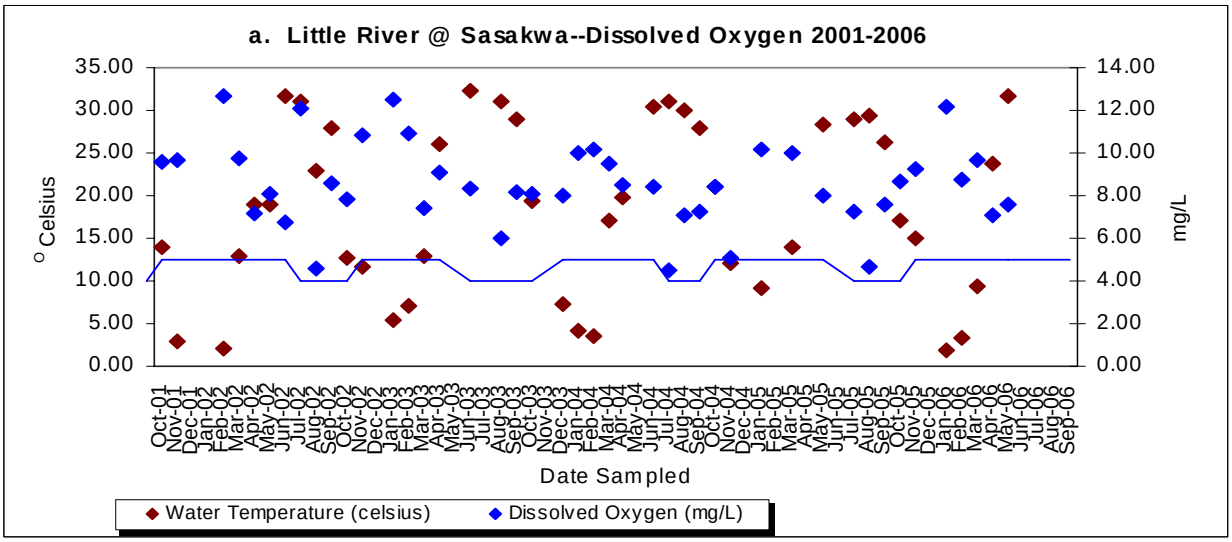
Little River near Sasakwa

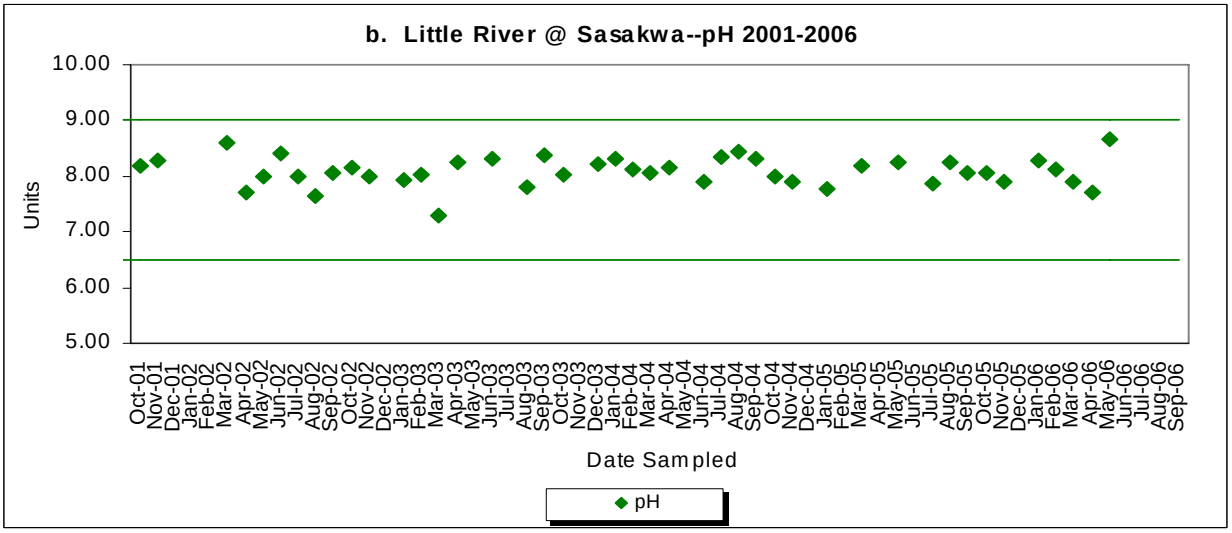
Station AT231000 (520800010010-001AT) is a permanent ambient trend monitoring station located on the Little River. Situated in the southeastern portion of Seminole County, the site was established north-northeast of the town of Sasakwa on State Highway 56. The station is positioned near the midpoint of stream segment 520800010010 and is classified within the Little River 8 digit HUC watershed (11090203). Water enters the stream system from several tributaries including Salt Creek and Bird Creek, among others.

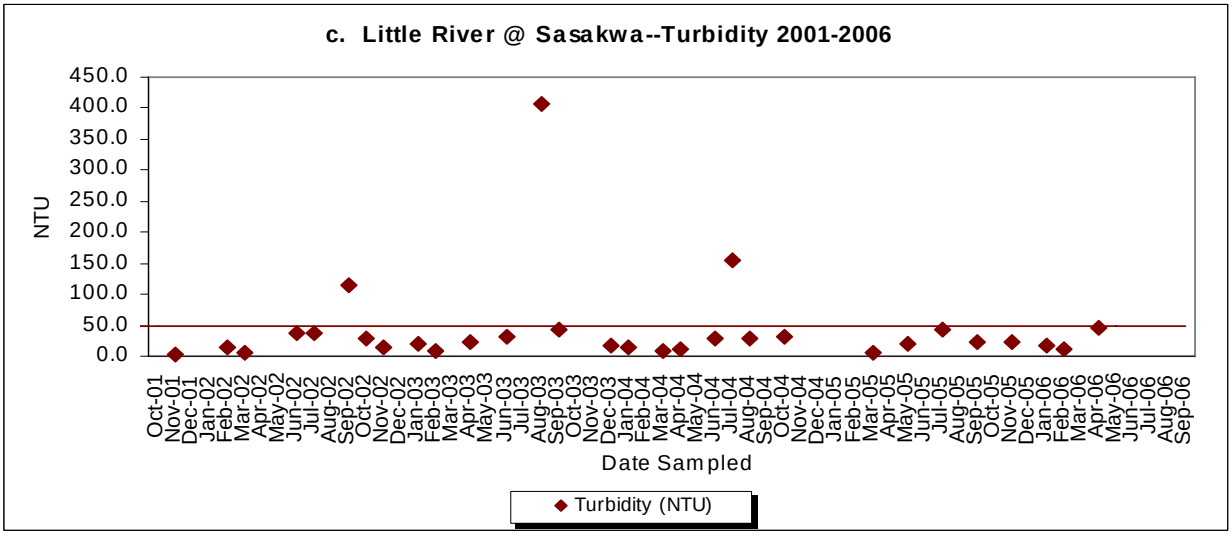
This station on the Little River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through of September 2006. For purposes of reporting, this station is representative of the Little River from the confluence of Salt Creek (96.6130, 35.0213) downstream to confluence of the Little River with the Canadian River (96.3637, 34.9962). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the eleven (11) lead samples collected, two (2) of the concentrations (or 20%) exceeded the prescribed, hardness-dependent chronic criteria of 11.31 ug/L (Table 17). Dissolved oxygen (Figure 40a), pH (Figure 40b), and turbidity (Figure 40c) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 40d and e). The PBCR beneficial use is not supported (Table 18). Of the eighteen (18) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (146.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Little River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 40f).

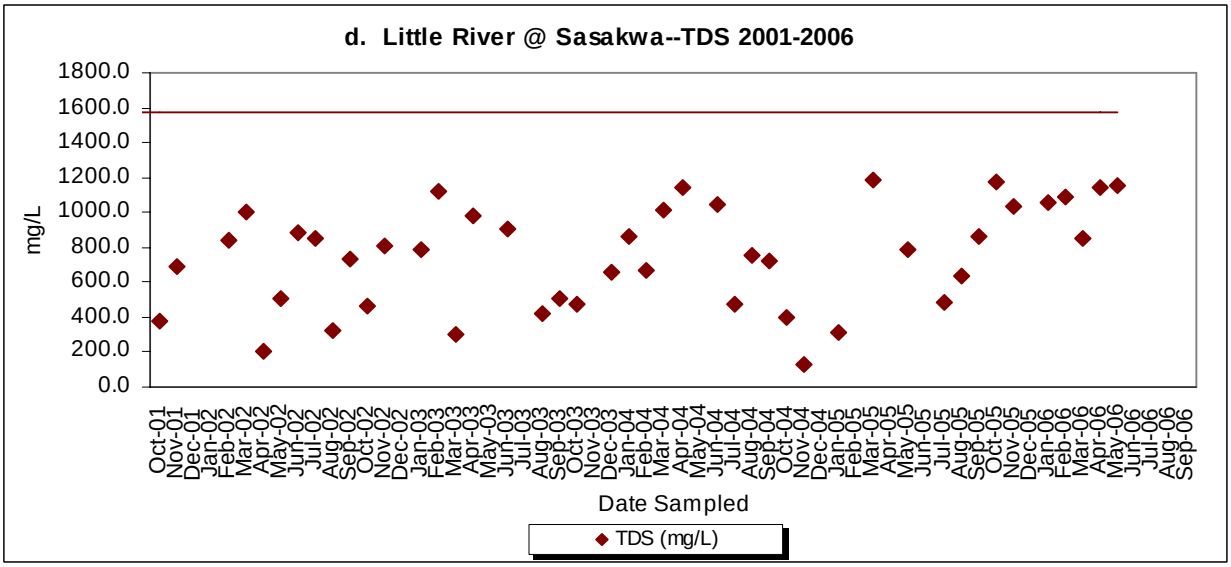
Figure 40 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Sasakwa (AT231000), 2001-2006.

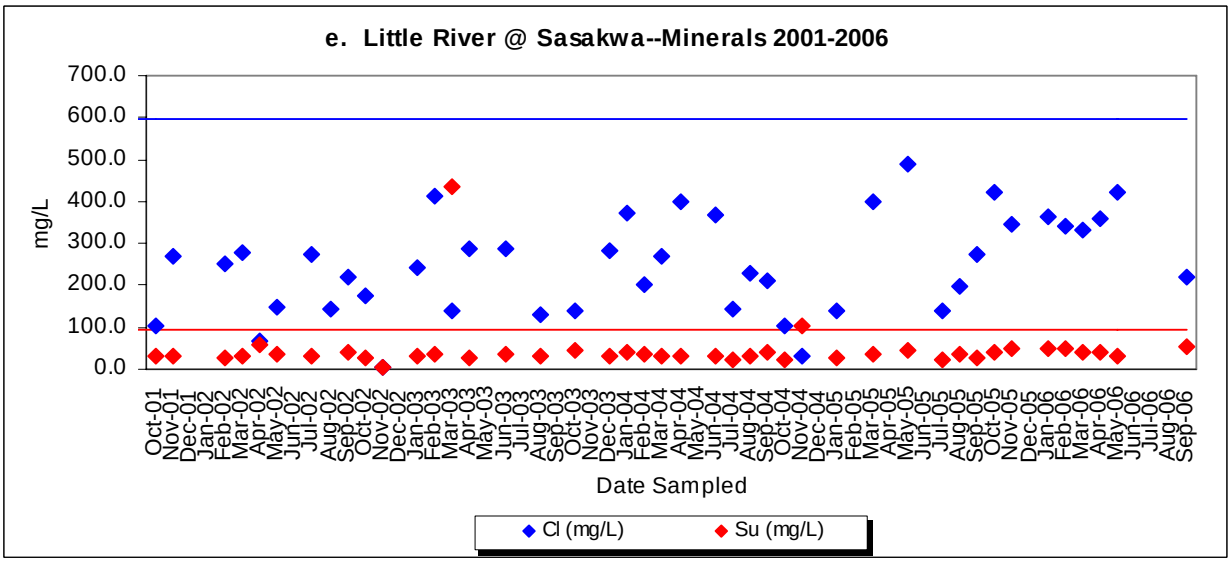


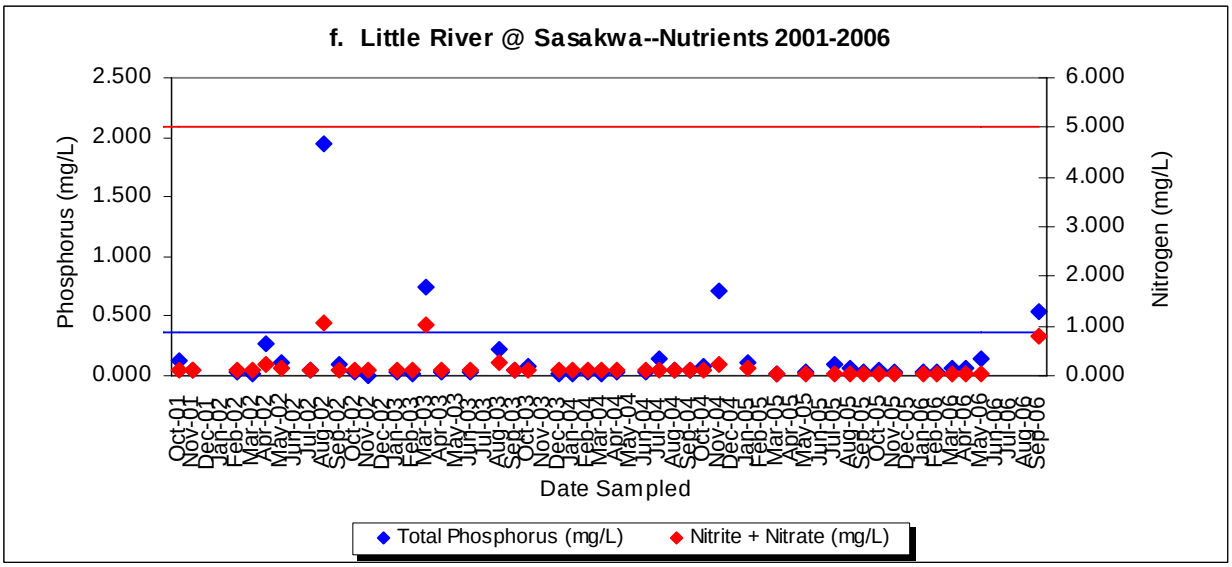




HUC 1109


d. Little River @ Sasakwa--TDS 2001-2006
mg/L
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


e. Little River @ Sasakwa--Minerals 2001-2006
mg/L
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Little River @ Sasakwa--Nutrients 2001-2006
Phosphorus (mg/L)
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1109

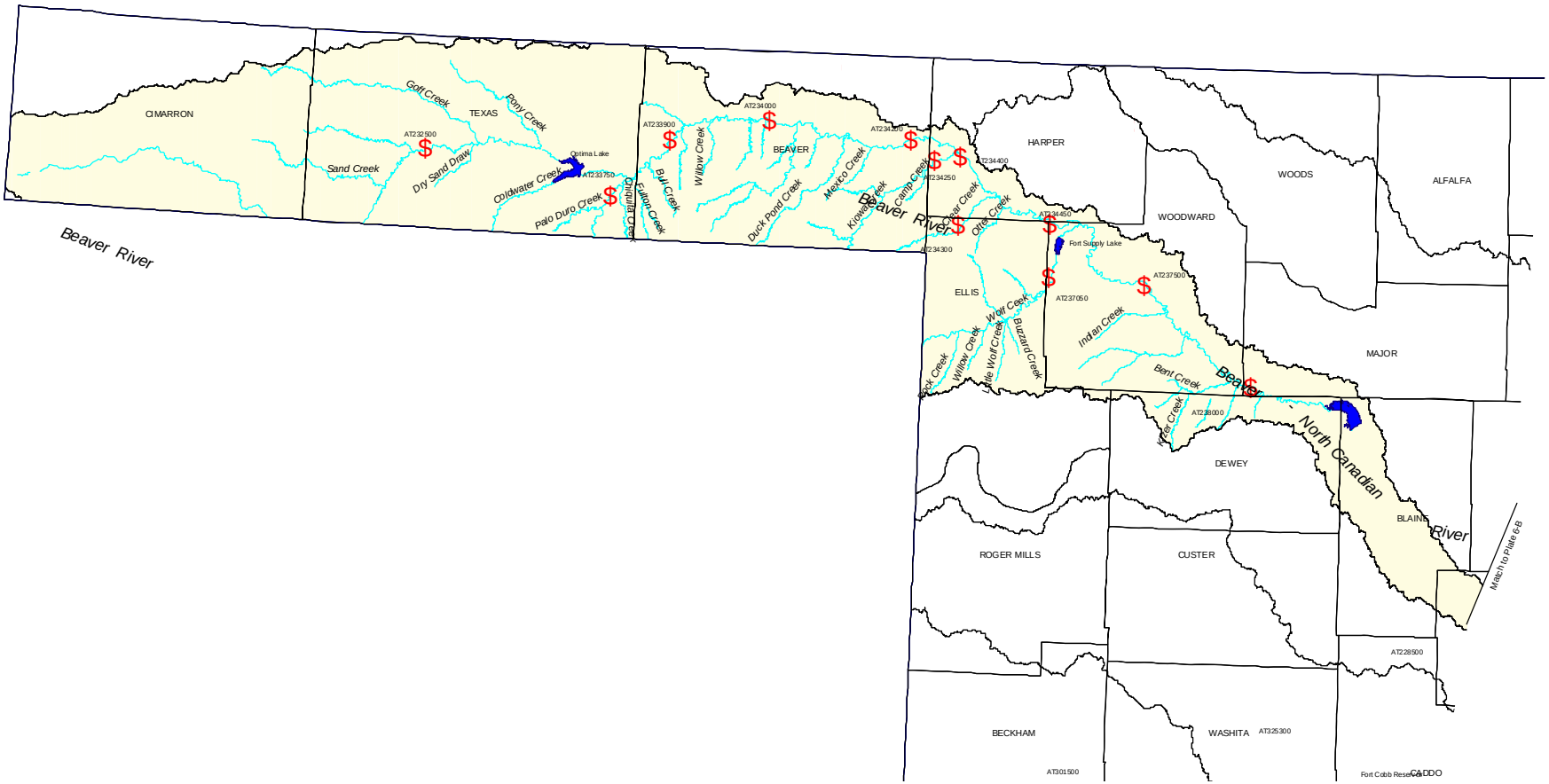


Plate 62-A
BEAVER-NORTH CANADIAN SUBBASIN
Above Canton Lake (HUC 1110)
Water Quality Programs Division
Oklahoma Water Resources Board

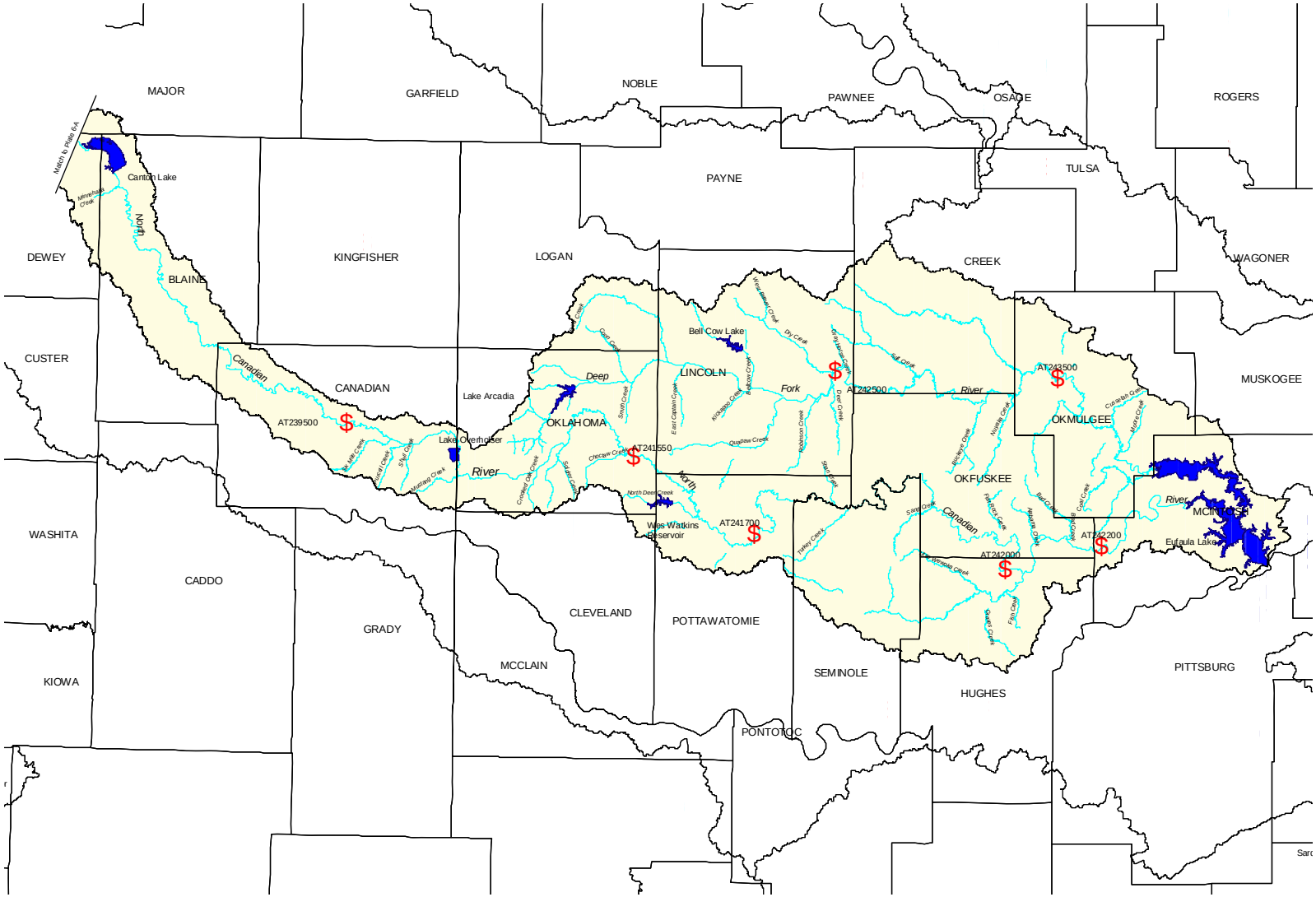


Plate 62-B
BEAVER-NORTH CANADIAN SUBBASIN
Canton Lake and Below (HUC 1110)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1110

BEAVER/NORTH CANADIAN SUB-BASIN

The Beaver/North Canadian sub-basin (4-digit hydrologic unit 1110) is situated in the Panhandle, northwest, and central portions of the state. It originates in Cimarron County, continues eastward through portions of Texas, Beaver, Harper, Ellis, Woodward, Major, Dewey, Blaine, Canadian, Oklahoma, Logan, Lincoln, Pottawatomie, Seminole, Creek, Okfuskee, Hughes, and Okmulgee Counties and terminates in the central part of McIntosh County. Major cities and County seats located within the basin include Boise City, Guymon, Beaver, Woodward, Watonga, El Reno, Yukon, Oklahoma City, Midwest City, Del City, Choctaw, Harrah, Edmond, Chandler, Shawnee, Tecumseh, Seminole, Bristow, Okemah, Wewoka, Okmulgee, Henryetta, and Eufaula. Minor cities of note include Goodwell, Laverne, Shattuck, Seiling, Meeker, Stroud, Prague, Wetumka, and Beggs.

The sub-basin is subdivided into nine 8-digit hydrologic units (HUC) within the state. These HUC's are the Upper Beaver (11100101), the Middle Beaver (11100102), the Coldwater (11100103), the Palo Duro (11100104), the Lower Beaver (11100201), the Lower Wolf (11100203), the Middle North Canadian (11100301), the Lower North Canadian (11100302), and the Deep Fork (11100303). The major surface water in the sub-basin is the Beaver/North Canadian River. Major tributaries include Goff Creek, Palo Duro Creek, Kiowa Creek, Clear Creek, Wolf Creek, Wewoka Creek, the Deep Fork River, and Little Deep Fork Creek. Ten major lakes are located in the sub-basin—Optima Lake formed by the Beaver River and Coldwater Creek, Fort Supply Lake formed by Wolf Creek, Canton Lake formed by the North Canadian River, Lake Overholser formed by the North Canadian River, Lake Hefner, Lake Arcadia formed by the Deep Fork River, Wes Watkins Lake formed by North Deer Creek, the Shawnee Twin Lakes, Bell Cow Lake formed by Bell Cow Creek, and the upper portion of Eufaula Lake formed by the North Canadian and Deep Fork Rivers. Seventeen active permanent water quality-monitoring stations (Table 19) are located in the basin—AT232500, AT233900, AT234000, AT234200, AT234400 (recently reactivated), AT234450, AT237050, AT237500, AT238000, AT239500, AT241550, AT241700, AT242000, AT242200, AT242500, and AT243500. Three inactive water quality-monitoring stations (AT233750, AT234250, AT234300) are located in the sub-basin and were last assessed in the 2000 BUMP report. The Laverne station will not be assessed in this report due to lack of data.

The basin is characterized by five ecoregions. The Western High Plains cover all Cimarron County, most of Texas County, and half of Beaver County. The Southwestern Tablelands begin in Texas County and terminate in Ellis and Woodward Counties. The Central Great Plains begins in Ellis County and terminates in western Oklahoma County. The Central Oklahoma/Texas Plains begin in eastern Oklahoma County and end in western Okmulgee and McIntosh Counties. The Central Irregular Plains cover eastern Okmulgee and McIntosh Counties. The primary land usage in the sub-basin is rangeland (open grasslands and woody areas). It is prevalent throughout the sub-basin with areas of concentration west central and central portions. The secondary land use is cropland, which is prevalent in the western and central portions and is interspersed throughout the eastern portion. The tertiary land uses is pastureland (brushy or mixed) and forestland (post oak, blackjack oak and bottomland hardwoods). Pastureland is prevalent in the eastern portion and is interspersed through the rest

of the sub-basin. Forestland is prevalent in the eastern part of the sub-basin. Other land uses of note are farmsteads, major urban areas, wetlands, and confined animal feeding operations.

Table 19. Permanent Ambient Trend Monitoring Stations Located in HUC 1110.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
720500020290	AT234000	Beaver River, SH 23, Beaver	Active 11/98-P	FWP, AES	NONE	AG, PBCR	NONE
720500020010	AT234450	Beaver River, US 183, Fort Supply	Active 10/00-P	AG, FWP, AES	NONE	PBCR	NONE
720500020140	AT234200	Beaver River, CR N1650, Gate	Active 10/00-P	FWP, AES	NONE	AG, PBCR	NONE
720510000190	AT232500	Beaver River, off US 64, Guymon	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
720500020010	AT234400	Beaver River, US 283, Laverne	Active 11/98-P	AG, FWP, AES	NONE	PBCR	NONE
720500020450	AT233900	Beaver River, US 83, Turpin	Active 10/00-P	FWP, AES	NONE	AG, PBCR	NONE
520700020010	AT243500	Deep Fork River, off SH 16, Beggs	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
520700040010	AT242500	Deep Fork River, US 377, Stroud	Active 11/98-P	AG	PPWS	FWP, PBCR, AES	NONE
520500010110	AT242200	North Canadian River, SH 82., Dustin	Active 11/98-P	AG, PPWS	NONE	FWP, PBCR, AES	NONE
520530000010	AT239500	North Canadian River, US 81, El Reno	Active 11/98-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
520520000010	AT241550	North Canadian River, off US 62, Harrah	Active 11/98-P	AG	FWP	PBCR, AES	NONE
720500010010	AT238000	North Canadian River, US 281, Seiling	Active 11/98-P	AG, AES, PPWS, FWP	NONE	PBCR	NONE
520510000110	AT241700	North Canadian River, SH 3E, Shawnee	Active 10/00-P	AG	NONE	FWP, PBCR, AES	NONE
520530000010	AT239300	North Canadian River, US 270, Watonga	Active 1/03-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
520510000010	AT242000	North Canadian River, US 75, Wetumka	Active 9/99-P	AG, PPWS	NONE	FWP, PBCR, AES	NONE
720500010140	AT237500	North Canadian River, US 412, Woodward	Active 10/00-P	AG, FWP, AES	NONE	PBCR	NONE
720500030010	AT237050	Wolf Creek, off US 270, Fort Supply	Active 11/98-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 20. Toxicant exceedances in HUC 1110.

STATION #	STATION NAME	DATE	Chromium (ug/L)	Lead (ug/L)
AT243500	Deep Fork River, off SH 16, Beggs	10/23/2000		10.00
AT242500	Deep Fork River, US 377, Stroud	10/23/2000	165.00	44.00
		04/08/2002	55.00	25.00
AT242200	North Canadian River, Ind. Nat. Tpk., Dustin	10/23/2000		12.00
		04/17/2002		20.00
		03/18/2003		19.00
AT241700	North Canadian River, SH 3E, Shawnee	10/23/2000		43.00

STATION #	STATION NAME	DATE	Chromium (ug/L)	Lead (ug/L)
		06/06/2001		15.00
		04/15/2002		26.00
		03/18/2003		13.00
AT242000	NORTH CANADIAN RIVER, US 75, WETUMKA	06/06/2001		32.00
		04/16/2002		27.00
		03/19/2003		15.00

Table 21. Exceedances of fecal coliform, enterococci, and E. coli screening limits in HUC 1110. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT234000	BEAVER RIVER, SH 23, BEAVER	06/07/2000	780	800	
		07/12/2000	4200	3000	
		08/09/2000		3700	
		07/10/2001	2600	4000	
		08/07/2001			
		09/25/2001	2000		
		05/15/2002	8000	7000	
		06/18/2002	500	1100	
		05/04/2004		500	
		05/18/2004		3000	
		06/02/2004	600	800	
		07/06/2004	500		
		07/27/2004		900	
AT234450	Beaver River, US 183, Fort Supply	05/09/2001		1200	
		06/06/2001		800	
		07/11/2001		2000	
		05/14/2002		600	
		08/13/2002		3000	
		08/25/2003		1200	
AT234200	Beaver River, CR N1650, Gate	06/07/2000	450		
		07/12/2000		490	
		06/05/2001	600	600	
		05/14/2002	5000	2000	
		07/05/2004	2600	700	
		07/27/2004	600	2900	
AT232500	Beaver River, off US 64, Guymon	06/07/2000	450		
		07/12/2000		490	
		06/18/2002		600	
		07/16/2002	500	6000	
		08/13/2002			500

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		06/02/2004	700	3800	464
		06/22/2004	1100		
		07/06/2004	3700		869
		08/10/2004	510	670	480
		09/14/2004	430		
AT234400	Beaver River, US 283, Laverne	08/09/2004		540	
AT233900	Beaver River, US 83, Turpin	05/08/2001	3000		
		06/05/2001	2100	800	
		07/10/2001	1000		
		08/07/2001	500	700	882
		05/15/2002		800	
		06/18/2002	28000	24000	6867
		06/02/2004	15100	1300	
		06/22/2004	2300		1674
		07/06/2004	610	500	
		08/10/2004	490	640	
		09/22/2004	5388	6488	5794
AT243500	Deep Fork River, off SH 16, Beggs	09/25/2000		1400	
		05/03/2004		5000	
		06/14/2004		1000	
		08/16/2004		520	
AT242500	Deep Fork River, US 377, Stroud	09/25/2000		156000	
		06/04/2001		1900	
		09/10/2001		3000	
		05/03/2004		3000	
		05/19/2004		1000	
		06/07/2004		1700	
		07/12/2004		600	
		07/27/2004		3100	
		08/16/2004		680	
AT239500	North Canadian River, US 81, El Reno	05/03/2000		2300	
		07/12/2000		450	
		09/07/2000		460	
		06/06/2001		500	
		08/14/2002		6000	
		05/27/2003		500	
		07/21/2003		700	
AT241550	North Canadian River, off US 62, Harrah	06/04/2001		5000	
		08/06/2001		1300	
		09/19/2001	37000	33000	
		05/15/2002		12000	
		07/16/2002		500	

HUC 1110

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		08/26/2002	4000		
		09/18/2002	600		
		05/13/2003		500	
		07/22/2003	3000		
		08/26/2003	2800		
		06/02/2004	900	700	
AT242200	NORTH CANADIAN RIVER, IND. NAT. TPK., DUSTIN	07/31/2000	500		
		09/25/2000	9000	34000	
		06/06/2001	700	12000	
		09/19/2001	3000	18000	
		05/15/2002	600	4000	
		08/13/2002	4000		
		06/17/2003		600	
		07/22/2003		500	
		08/06/2003	1900	900	
		09/30/2003		700	
AT238000	NORTH CANADIAN RIVER, US 281, SEILING	09/07/2000		500	
		05/14/2002		500	
		07/17/2002		900	
		08/14/2002		76000	
		05/04/2004		1000	
		06/22/2004		3100	
AT241700	NORTH CANADIAN RIVER, SH 3E, SHAWNEE	06/06/2001		2000	
		05/13/2002		5000	
		08/12/2002		5000	
		09/16/2002		1400	
		09/08/2003		500	
		09/30/2003		900	
AT239300	NORTH CANADIAN RIVER, US 270, NEAR WATONGA	06/16/2003	600.000	500.000	
		06/30/2003	3000.000		536.000
		07/21/2003			1178.000
		08/06/2003	600.000		
		08/25/2003	3900.000		988.000
		09/08/2003		900.000	
		09/29/2003	2200.000	2100.000	1095.000
AT242000	NORTH CANADIAN RIVER, US 75, WETUMKA	09/25/2000	3700	10000	
		05/09/2001	500		
		06/06/2001	1000	6000	
		05/13/2002	7000	34000	
		08/12/2002	900		

HUC 1110

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		05/13/2003		500	
		06/17/2003	1000	4000	
AT237500	North Canadian River, US 412, Woodward	07/16/2002		1900	
		08/13/2002		600	
		09/17/2002		3000	
		06/16/2003		3000	
		07/21/2003		3000	
		09/29/2003		700	
AT237050	Wolf Creek, off US 270, Fort Supply	07/12/2000		680	
		09/07/2000		4900	
		08/08/2001		5000	
		08/13/2002		1700	
		06/16/2003		10000	
		08/06/2003		1000	
		08/25/2003		900	
		09/29/2003		1300	

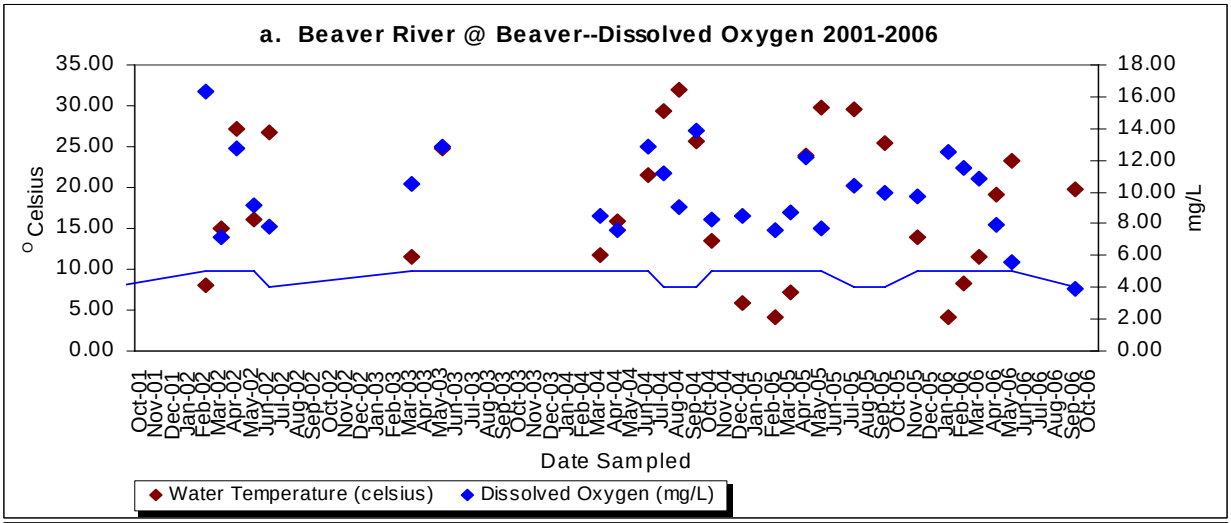
Beaver River near Beaver

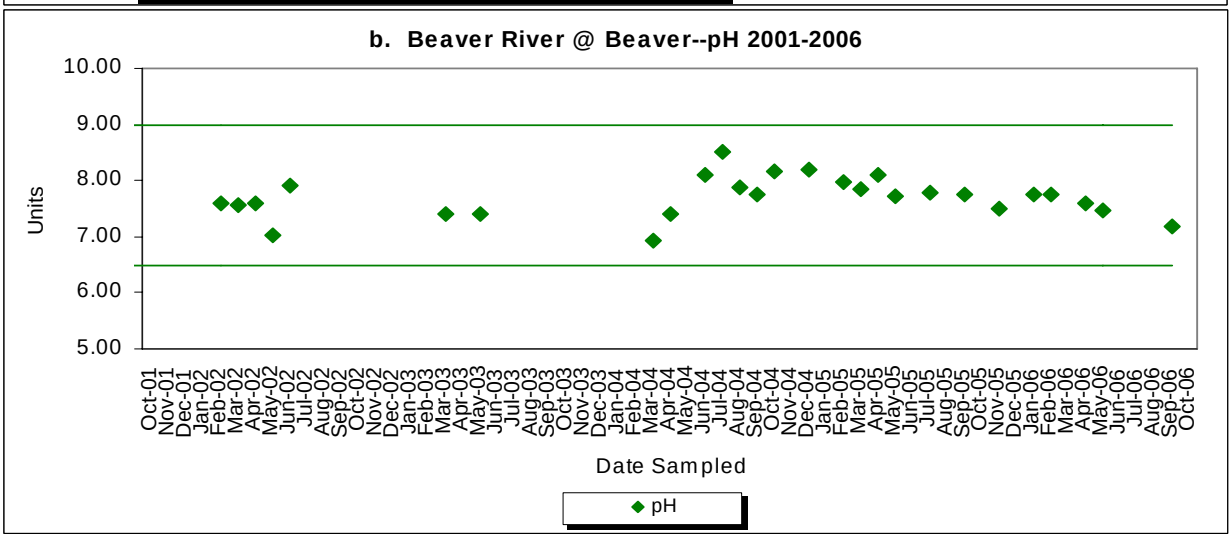
Station AT234000 (720500020290-001AT) is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the north central portion of Beaver County, the site was established north of the city of Beaver on state highway 23. The station is positioned near the midpoint of stream segment 720500020290 and is classified within the Middle Beaver River 8 digit HUC watershed (11100102). Water enters the stream system from several tributaries including Willow Creek, Sixmile Creek, Home Creek, and Clear Creek, among others.

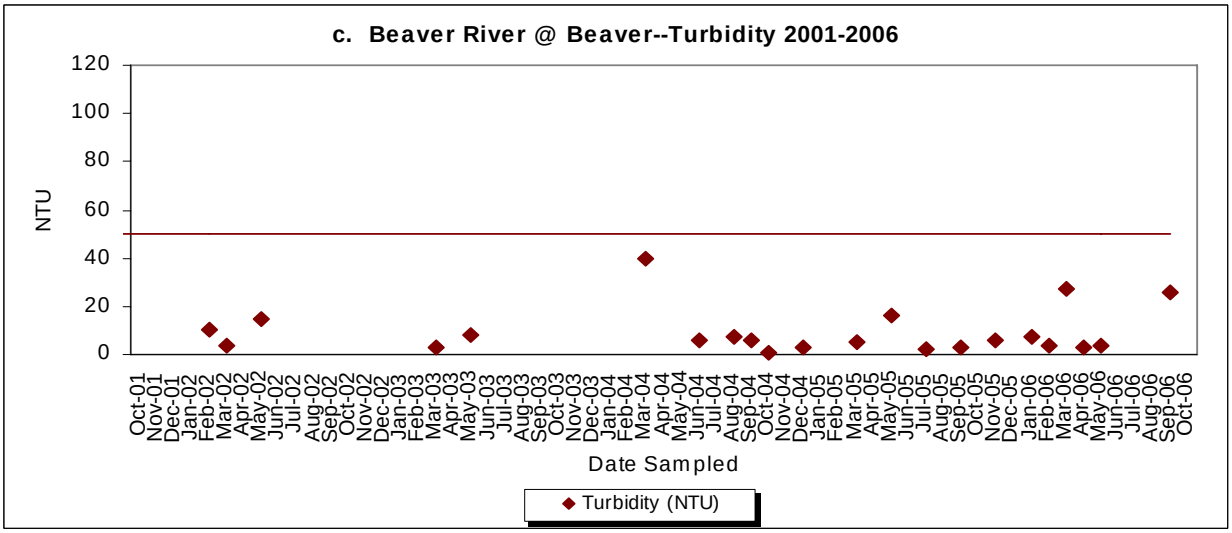
This station on the Beaver River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from February 2001 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from below the confluence of Sharp Creek (100.8064, 36.7972) downstream to below the confluence of Clear Creek with the Beaver River (100.4400, 36.8169). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 41a), pH (Figure 41b), turbidity (Figure 41c), and toxicant data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2006. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 9 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 20. However, because biocriteria have not been developed for the Southwestern Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is not supported (Figure 41d and e). Of the twenty-eight (28) total dissolved solids concentrations, twenty-six (26) samples (or 93%) exceeded the sample standard of 3010.0 mg/L, and the geometric mean (4949.2 mg/L) exceeded the yearly mean standard (2442 mg/L). Of the twenty-seven (27) chloride concentrations, twenty-four (24) samples (or 89%) exceeded the sample standard of 945.0 mg/L, and the geometric mean (1996.9 mg/L) exceeded the yearly mean standard (735 mg/L). Of the 27 sulfate concentrations, five (5) samples (or 19%) exceeded the sample standard of 977.0 mg/L, and the geometric mean (737.2 mg/L) exceeded the yearly mean standard (723 mg/L). The PBCR beneficial use is not supported (Table 21). Of the thirteen (13) fecal coliform concentrations, six (6) samples (or 46%) exceeded the prescribed screening level of 400 cfu/mL, however the geometric mean (180.1 cfu/mL) did not exceed the prescribed mean standard of 400 cfu/mL. Of the fifteen (15) enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (281.9 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Beaver River is not nutrient-threatened. T he total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 41f).

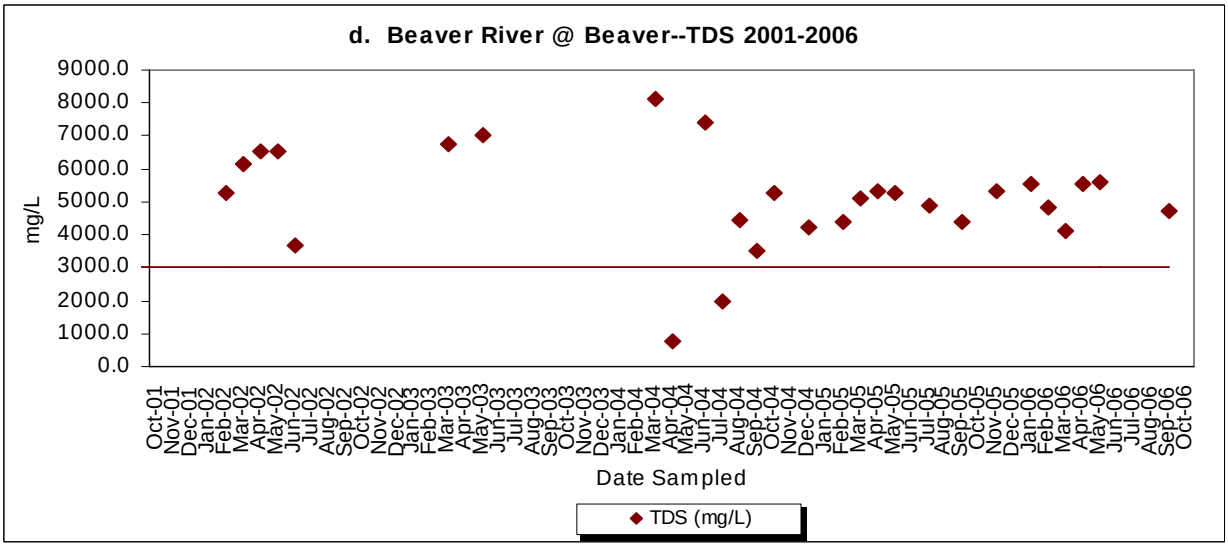
Figure 41 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Beaver (AT234000), 2001-2006.

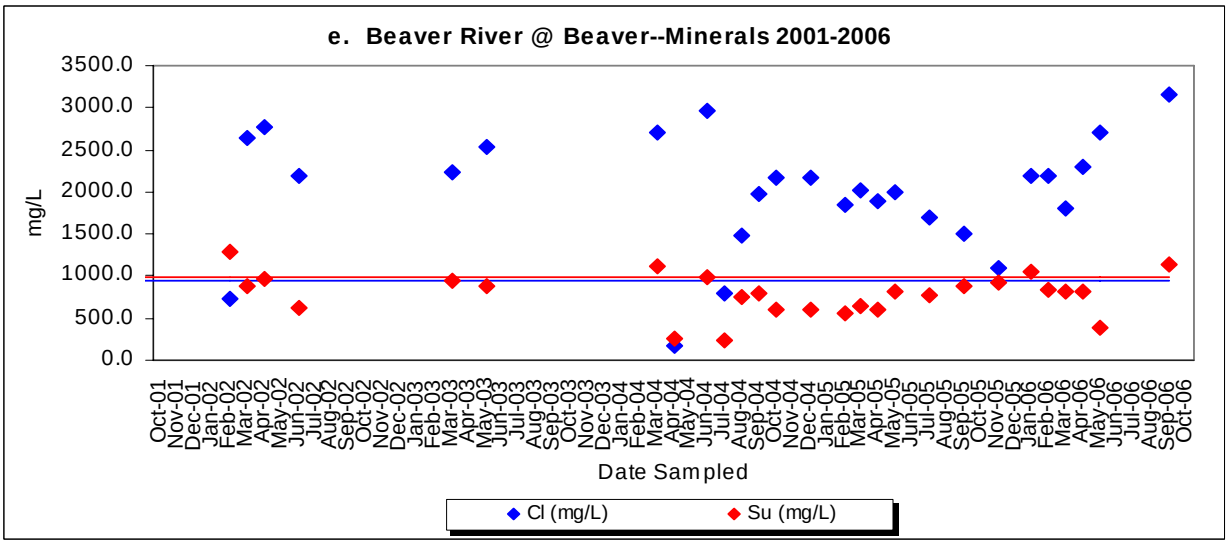


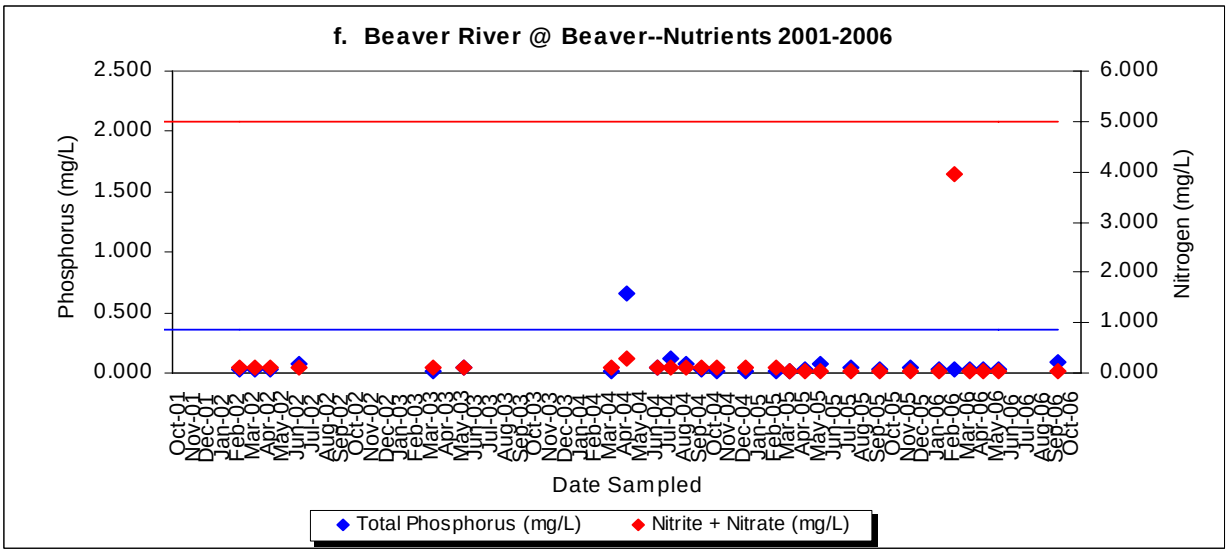




HUC 1110


d. Beaver River @ Beaver--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Beaver River @ Beaver--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Beaver River @ Beaver--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

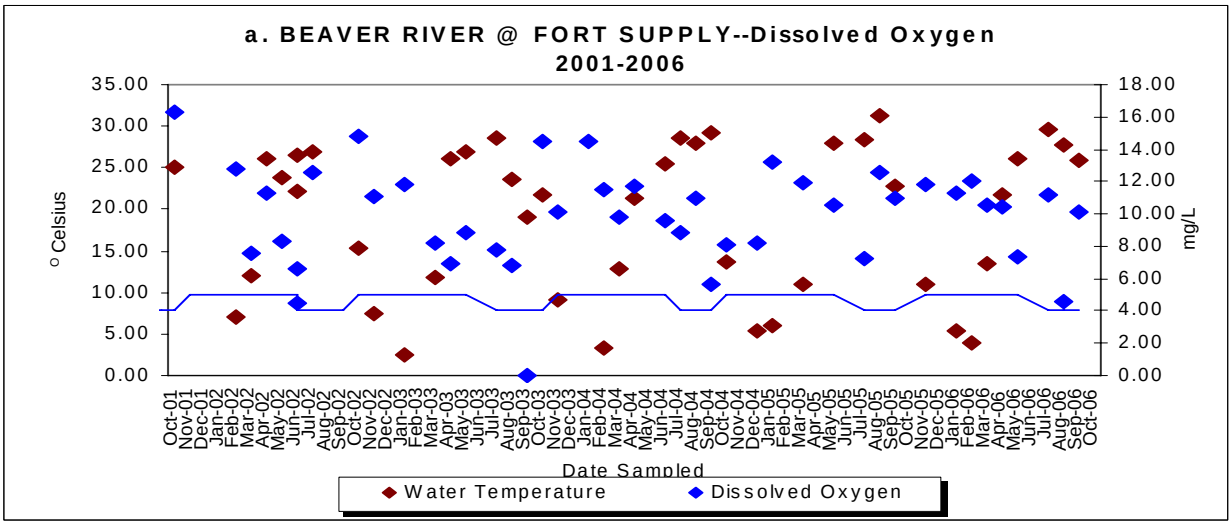
Beaver River near Fort Supply

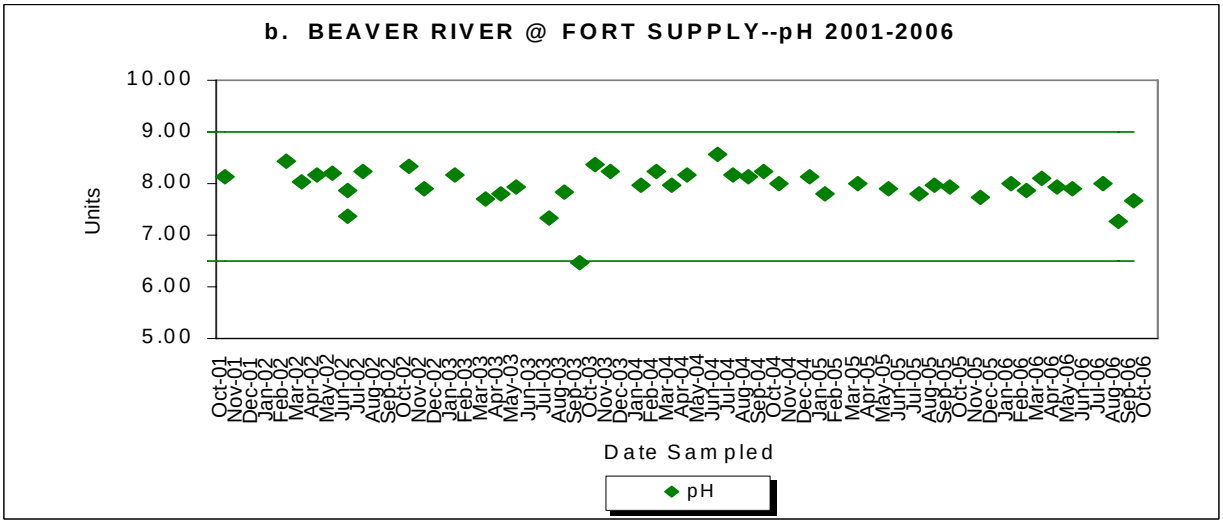
Station AT234450 (720500020010-002AT) is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the extreme northwest corner of Woodward County, the site was established northwest of the town of Fort Supply on US Highway 183. The station is positioned near the terminal end of stream segment 720500020010 and is classified within the Lower Beaver River 8 digit HUC watershed (11100201). Water enters the stream system from Clear Creek and Otter Creek, among others.

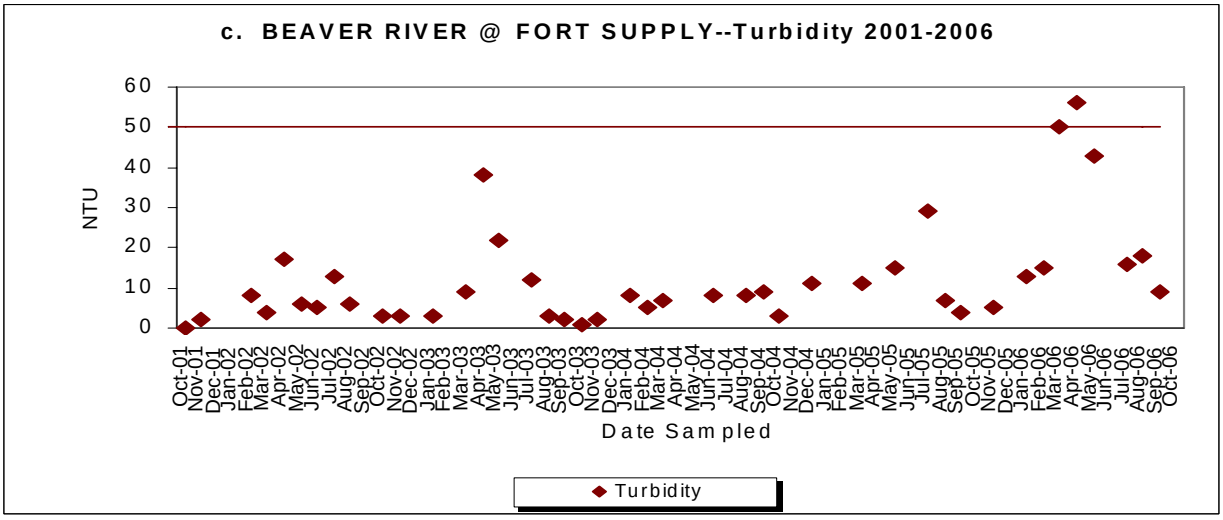
This station on the Beaver River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from the confluence of Clear Creek (99.7681, 36.6469) downstream to the confluence of Wolf Creek with the Beaver River (99.5019, 36.5886). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 42a), pH (Figure 42b), turbidity (Figure 42c), and toxicant data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2006. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 15 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 26. However, because biocriteria have not been developed for the Southwestern Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 42d and e). The PBCR beneficial use is not supported (Table 21). Of the eighteen (18) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (175.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Beaver River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 42f).

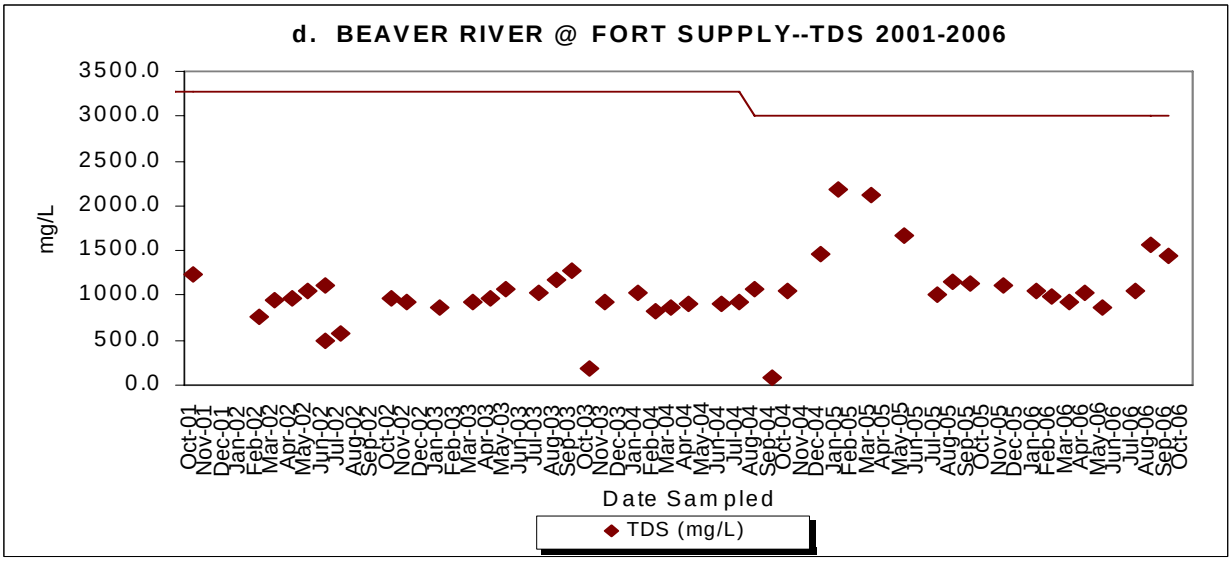
Figure 42 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Fort Supply (AT234450), 2001-2006.

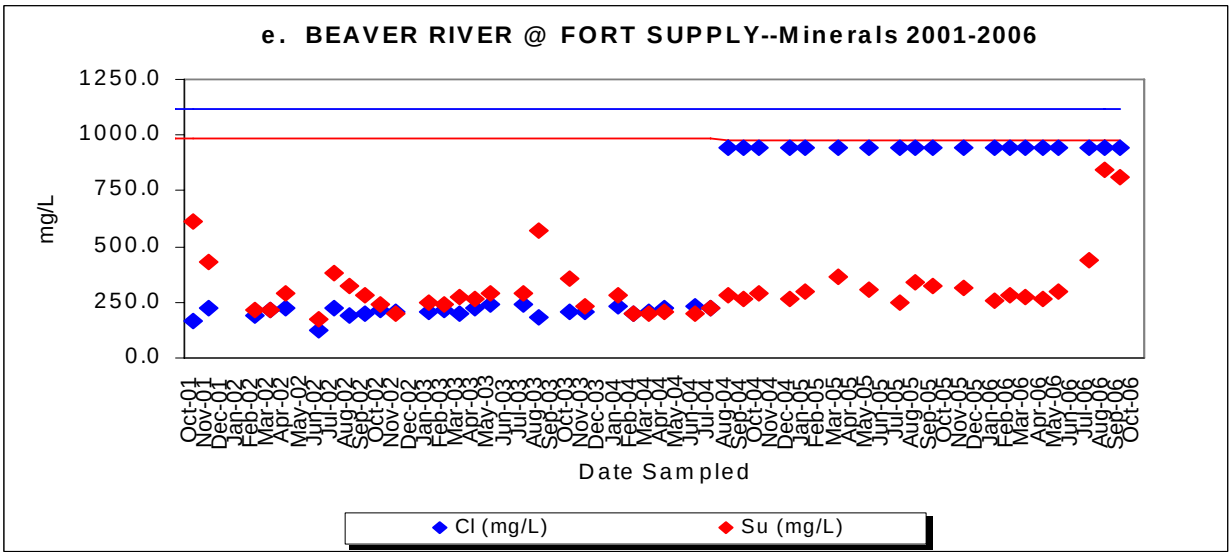


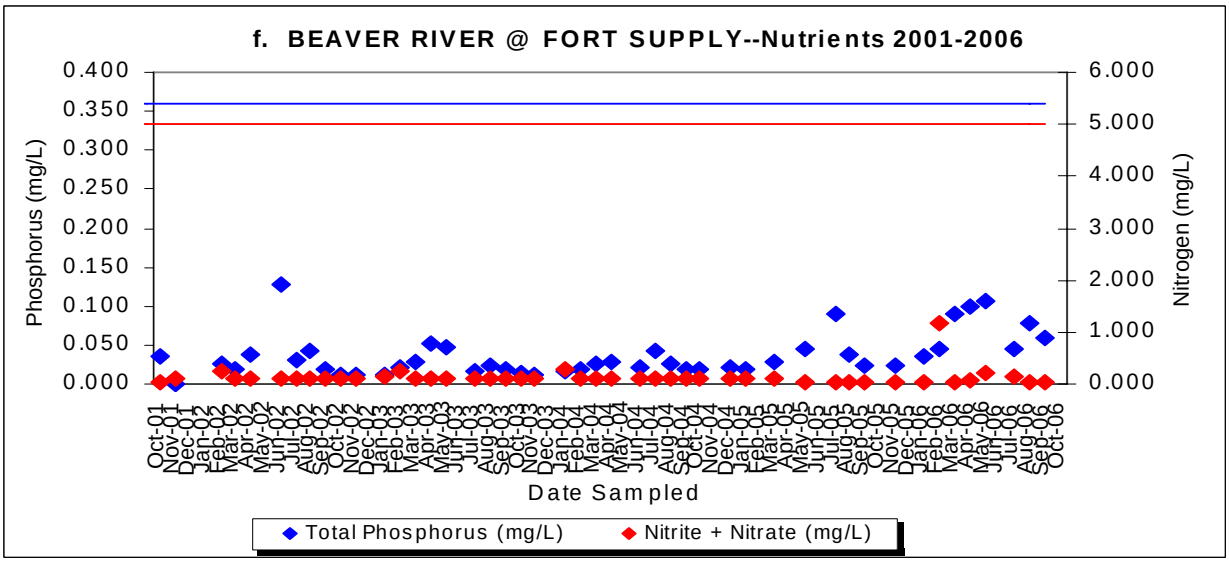




HUC 1110


d. BEAVER RIVER @ FORT SUPPLY--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. BEAVER RIVER @ FORT SUPPLY--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. BEAVER RIVER @ FORT SUPPLY--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

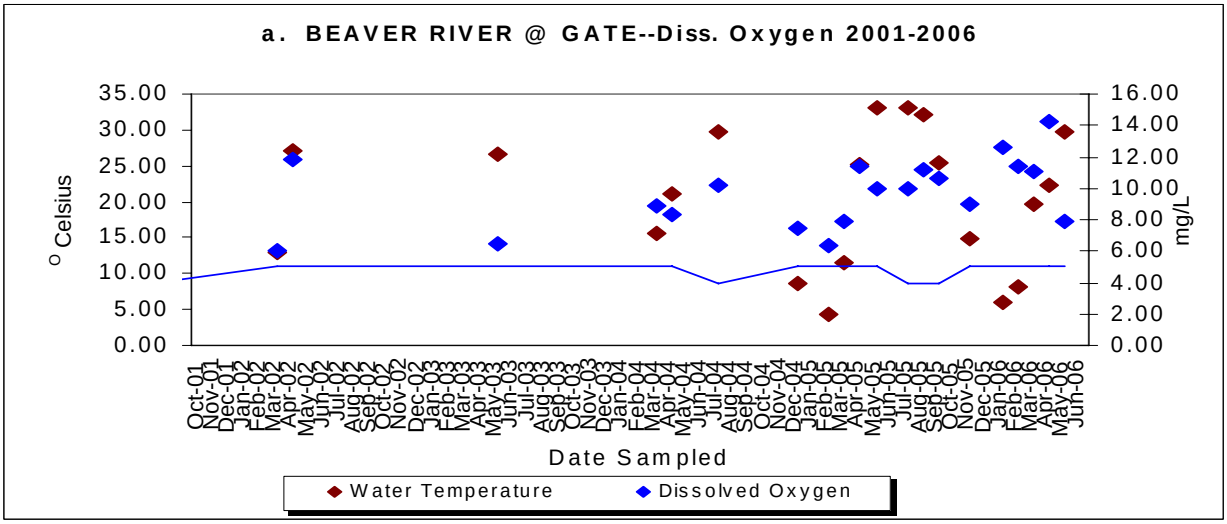
Beaver River near Gate

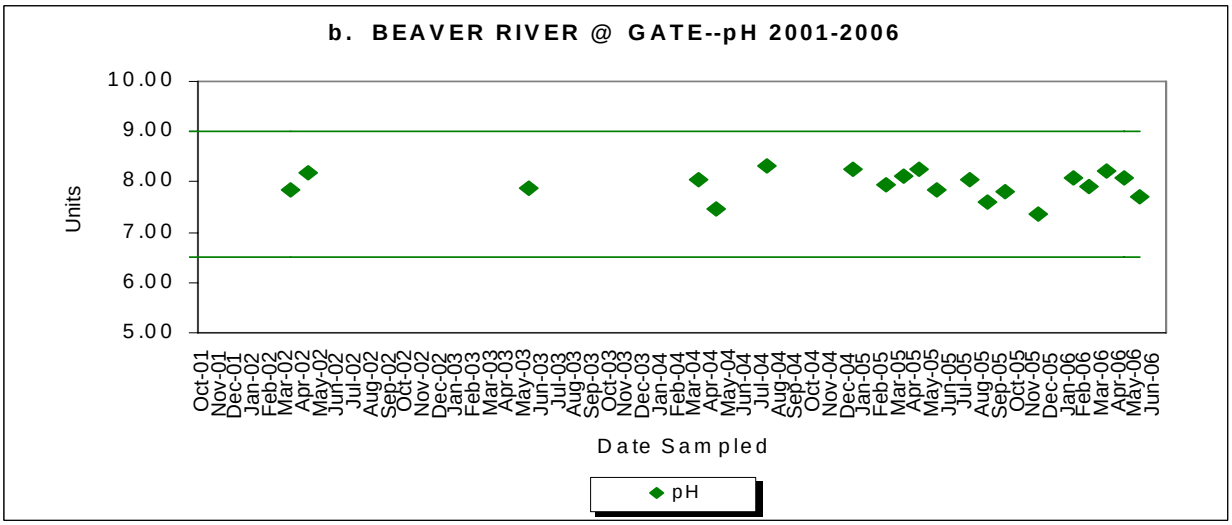
Station AT234200 (720500020140-001AT) is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the east central portion of Beaver County, the site was established south of the town of Gate on County Road 1650N. The station is positioned near the terminal end of stream segment 720500020140 and is classified within the Lower Beaver River 8 digit HUC watershed (11100201). Water enters the stream system from Clear Creek, Duck Pond Creek, and Mexico Creek (Evans Chambers Lake), among others.

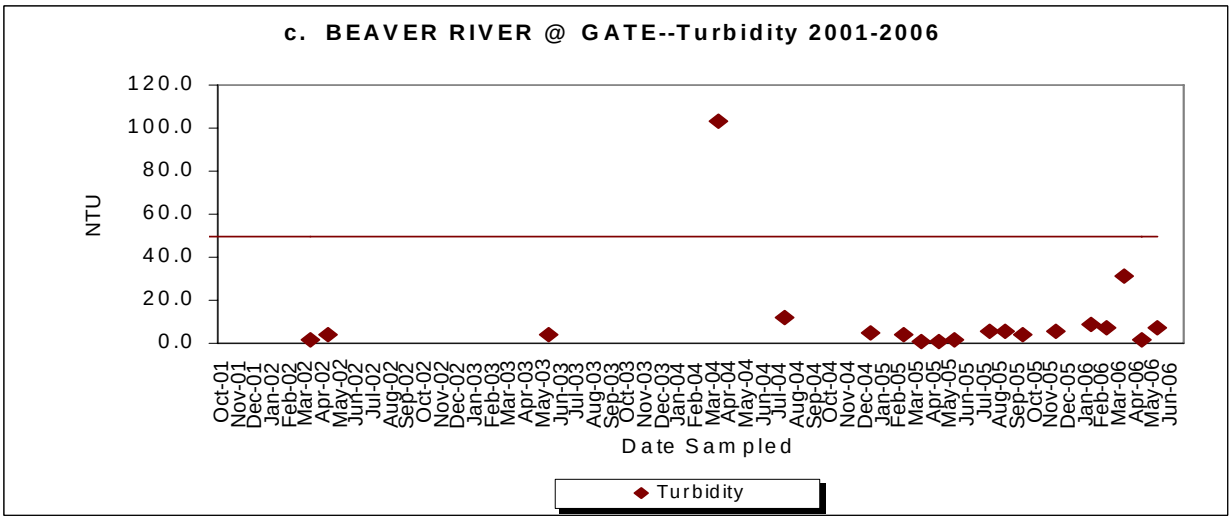
This station on the Beaver River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from March of 2002 through May of 2006. Data is not included for all typical sampling months because of the ephemeral nature of this section of the Beaver River. For purposes of reporting, this station is representative of the Beaver River from the confluence of Clear Creek (100.4400, 36.8169) downstream to the confluence of the Beaver River with Kiowa Creek (99.9060, 36.7591). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 43a), pH (Figure 43b), and turbidity (Figure 43c) data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2006. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 9 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 20. However, because biocriteria have not been developed for the Southwestern Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is not supported (Figure 43d and e). Of the twenty (20) total dissolved solids concentrations, five (5) samples (or 25%) exceeded the sample standard of 3010.0 mg/L, and the geometric mean (2579.1 mg/L) exceeded the yearly mean standard (2442 mg/L). Of the twenty (20) chloride concentrations, seven (7) samples (or 35%) exceeded the sample standard of 945.0 mg/L, and the geometric mean (947.2 mg/L) exceeded the yearly mean standard (735 mg/L). Sulfate values met the segment-specific criterion. The PBCR beneficial use is not supported (Table 21). Of the nine (9) enterococci concentrations, 5 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (317.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the eight (8) fecal Coliform concentrations, 5 samples (or 63 %) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (776.4 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. This segment of the Beaver River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 43f).

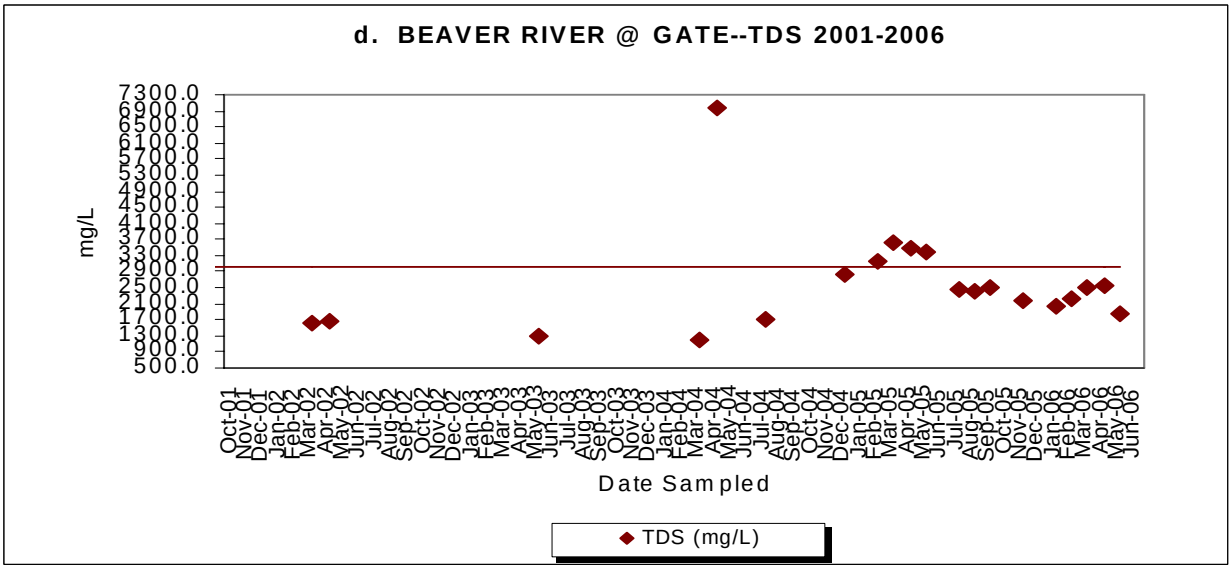
Figure 43 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Gate (AT234200), 2001-2006.

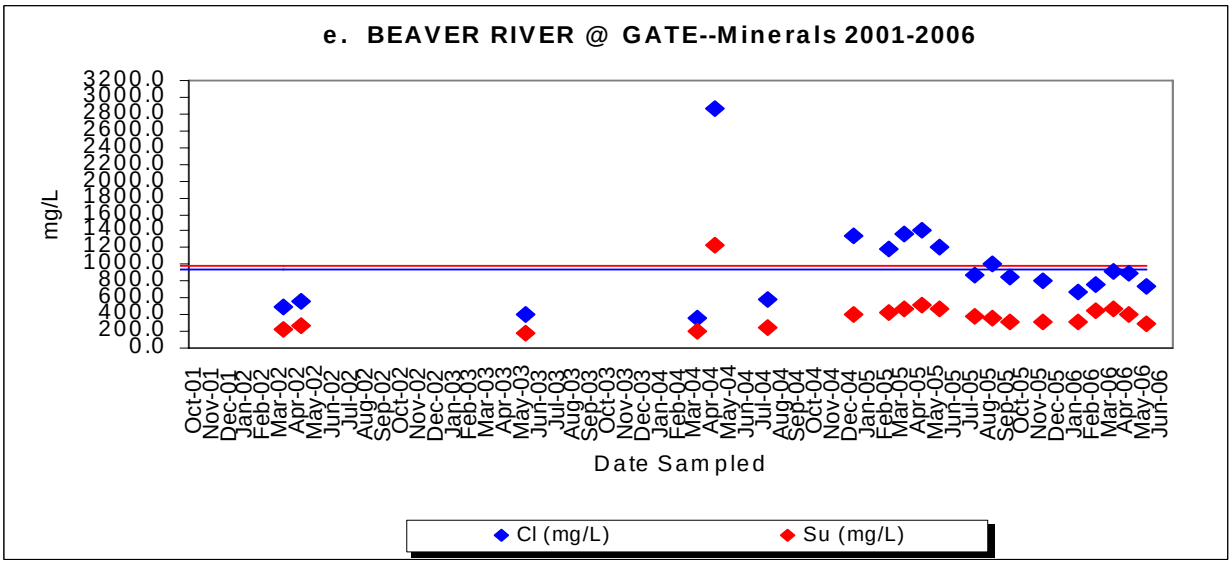


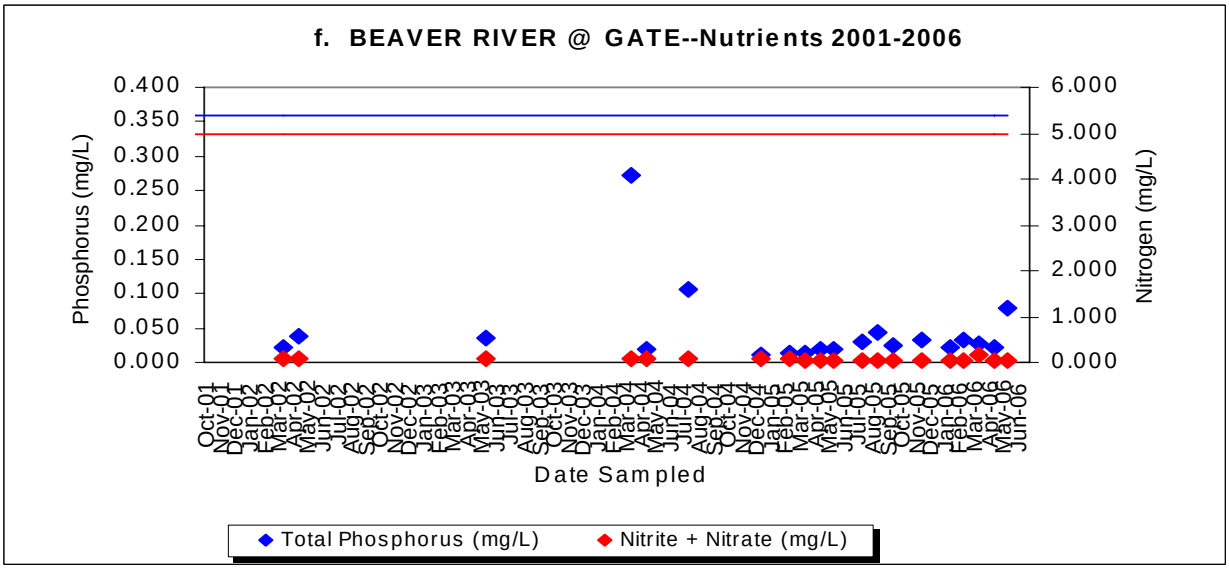




HUC 1110


d. BEAVER RIVER @ GATE--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. BEAVER RIVER @ GATE--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. BEAVER RIVER @ GATE--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

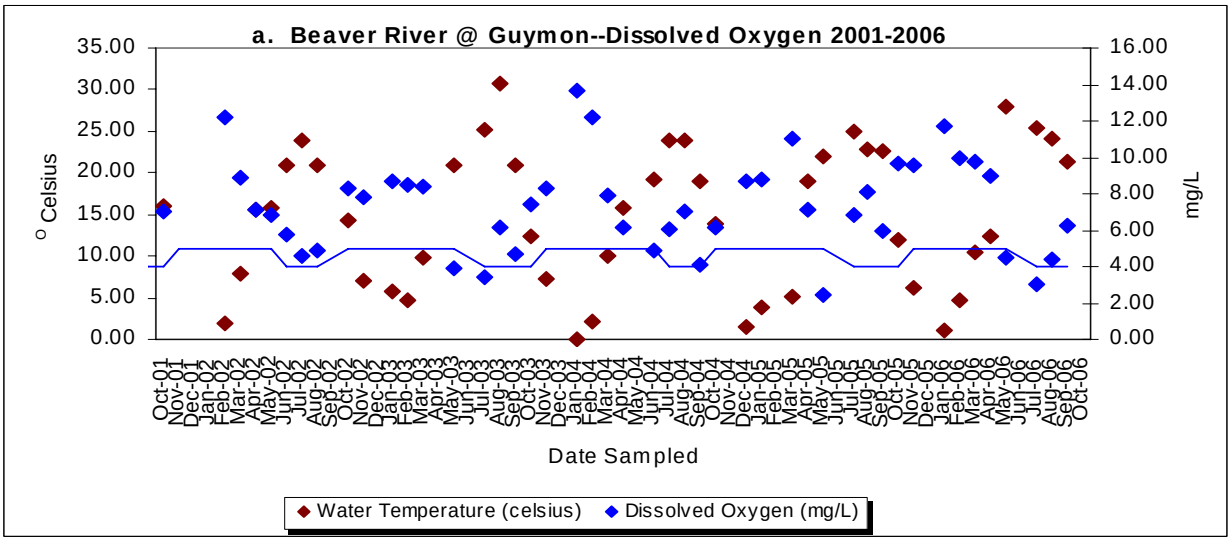
Beaver River near Guymon

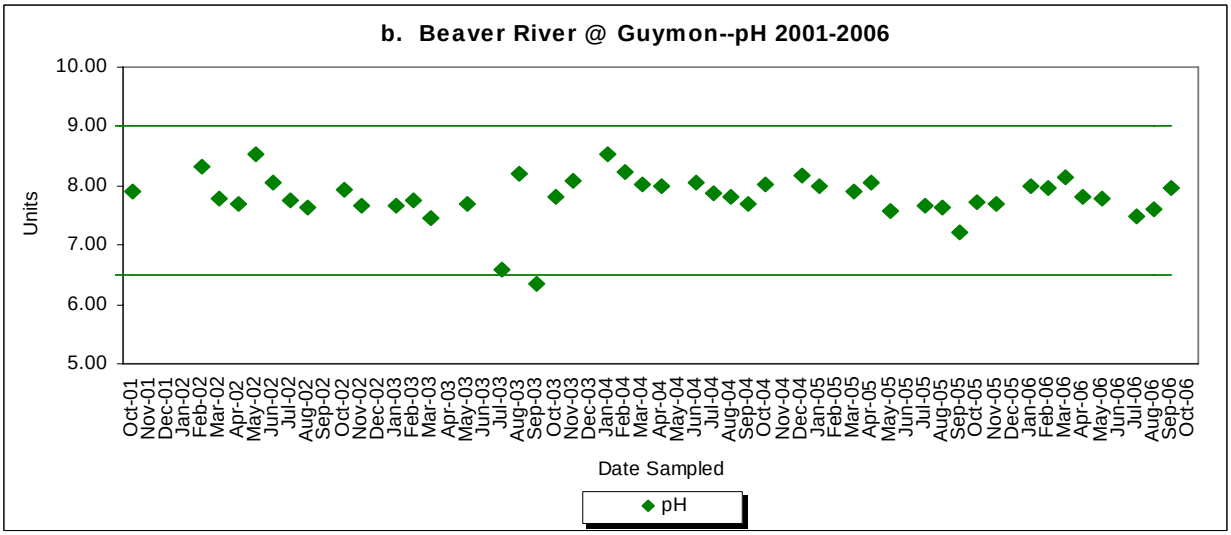
Station AT232500 (720510000190-001AT) is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the central portion of Texas County, the site was established west of the city of Guymon off of US Highway 64 on County Road 40. The station is positioned near the midpoint of stream segment 720510000190 and is classified within the Upper Beaver River 8 digit HUC watershed (11100101). Water enters the stream system from several tributaries including Sand Creek, Tepee Creek, Dry Sand Creek, and Goff Creek, among others.

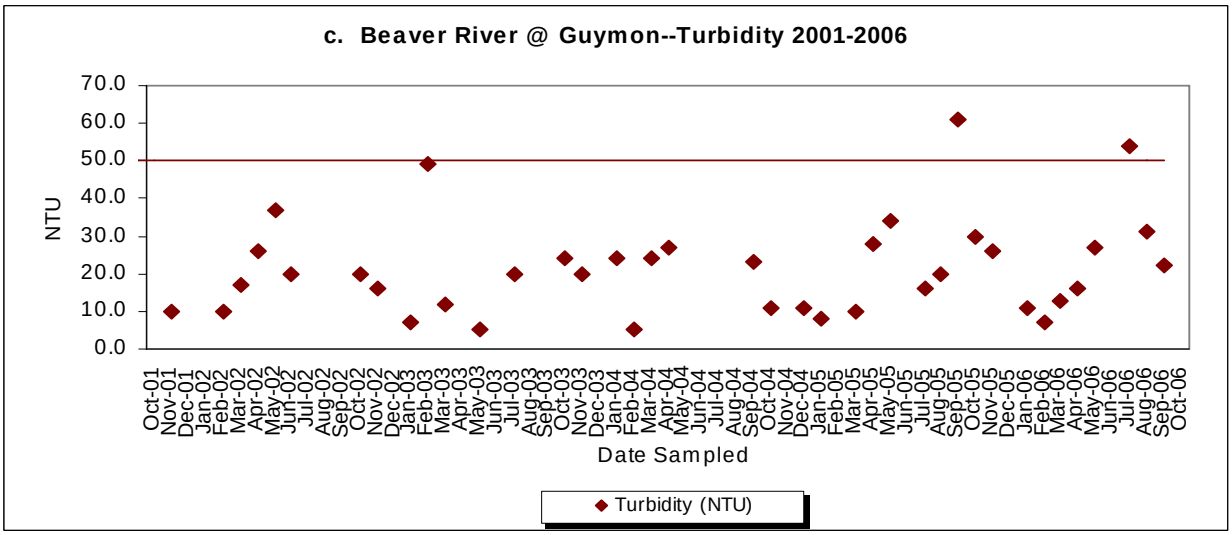
This station on the Beaver River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from the confluence of Sand Creek (101.7692, 36.5976) downstream to confluence of Goff Creek with the Beaver River (101.4709, 36.7255). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the forty-six (46) dissolved oxygen (Figure 44a) concentrations, six (6) samples (or 13%) were below the prescribed screening level for a WWAC. The pH (Figure 44b), turbidity (Figure 44c), and toxicant data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2005. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 14 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 25. However, because biocriteria have not been developed for the Western High Plains ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 44d and e). The PBCR beneficial use is not supported (Table 21). Of the thirteen (13) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (454.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the fourteen (14) *E. coli* concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (256.9 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. Of the 13 fecal coliform concentrations, six (6) samples (or 48%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (707.1 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. This segment of the Beaver River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 44f).

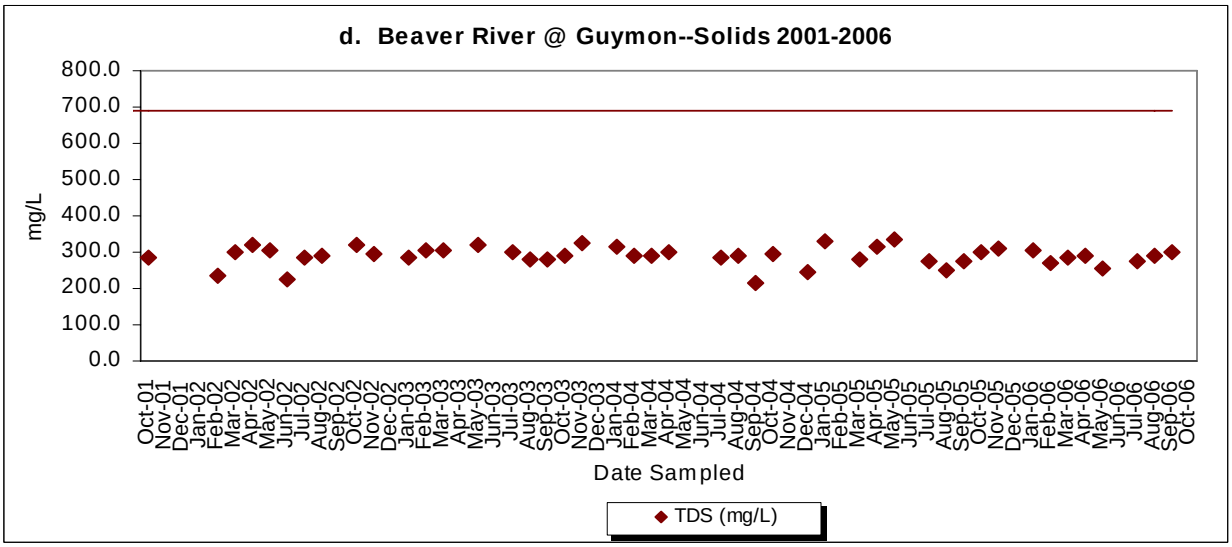
Figure 44 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Guymon (AT232500), 2001-2006.

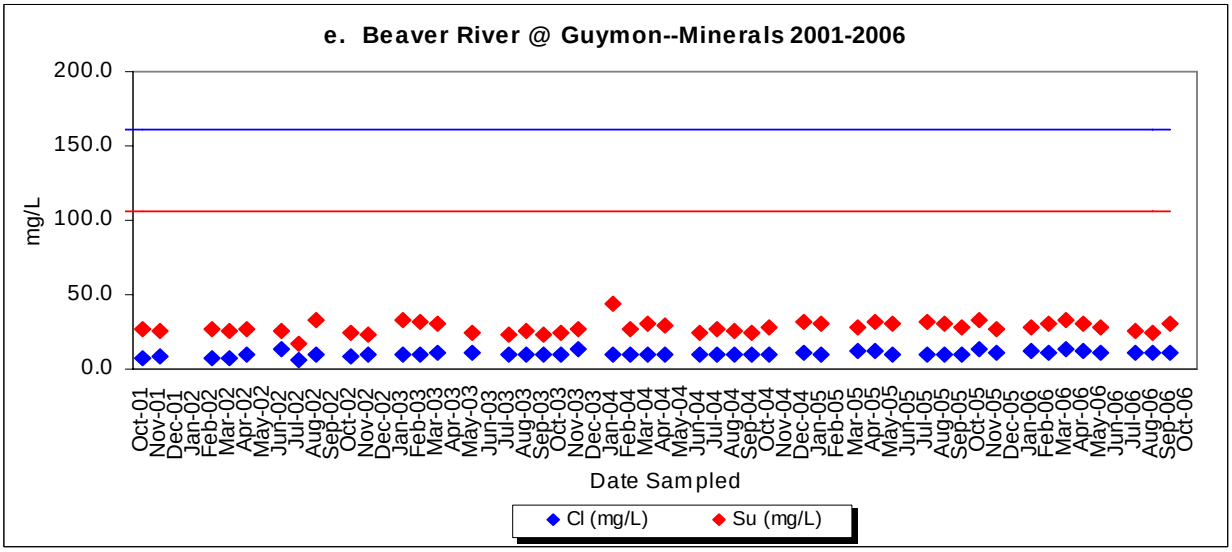


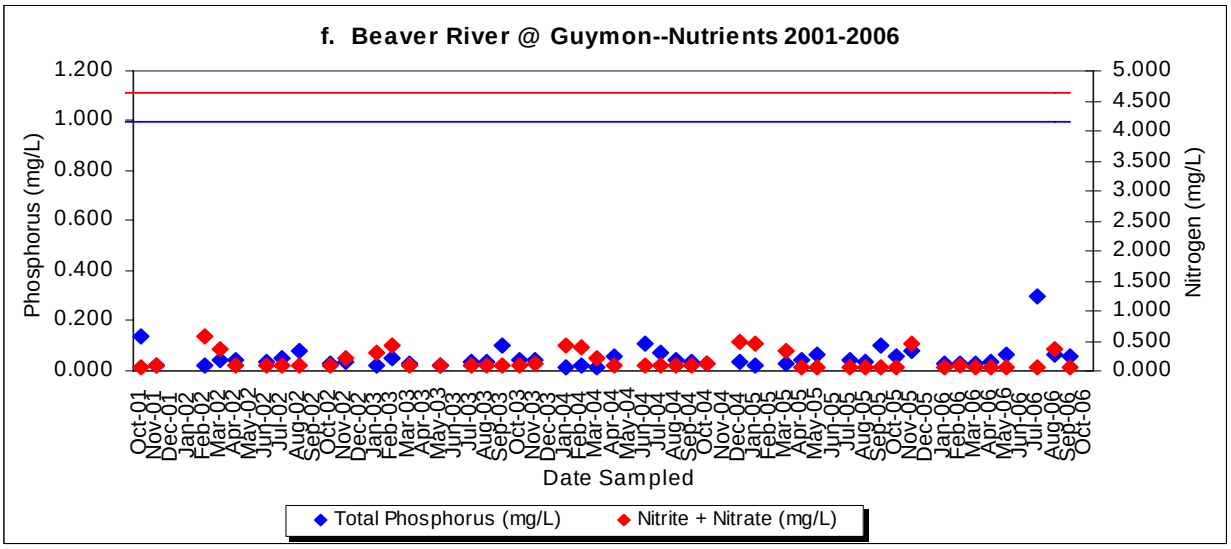




HUC 1110


d. Beaver River @ Guymon--Solids 2001-2006
mg/L
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Beaver River @ Guymon--Minerals 2001-2006
mg/L
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Beaver River @ Guymon--Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

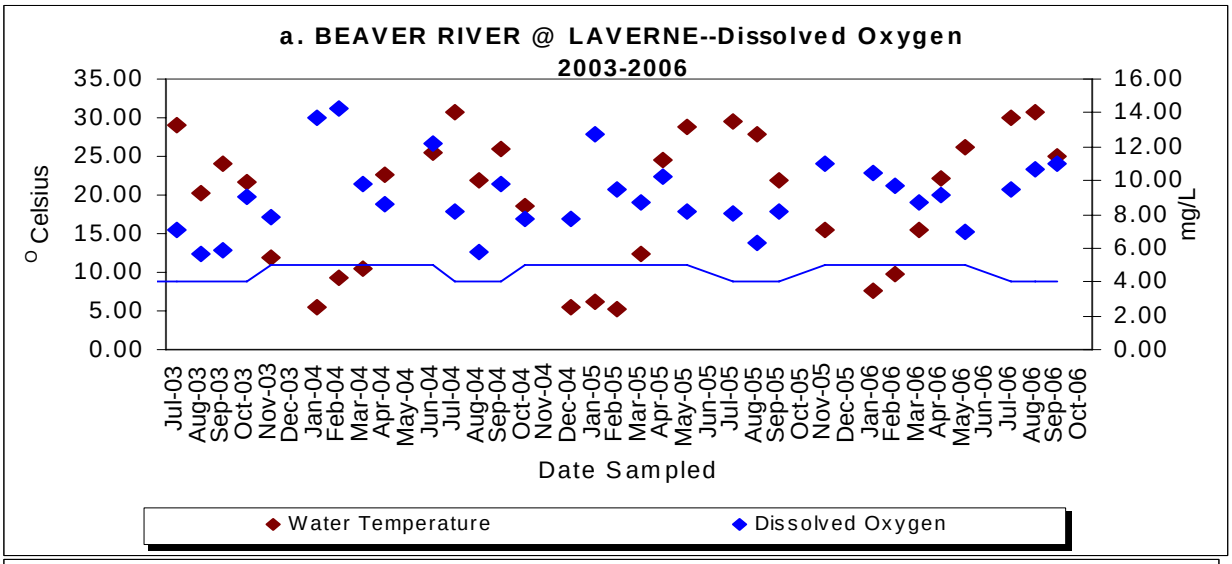
Beaver River near Laverne

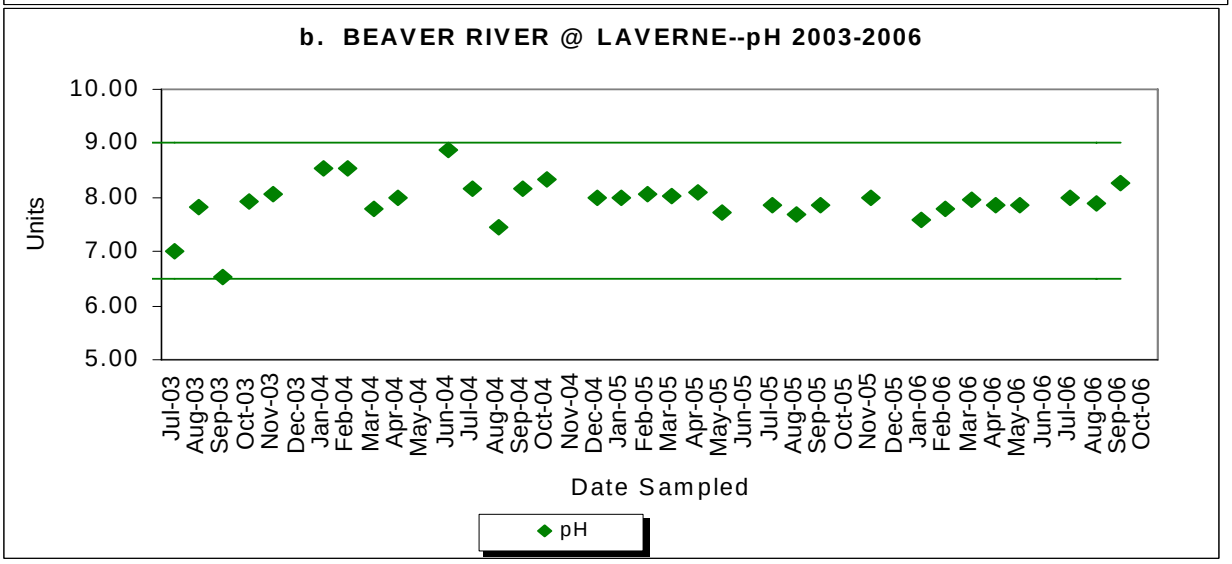
Station AT234400 is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the west central portion of Harper County, the site was established north of the town of Laverne on US Highway 283. The station is positioned near the upper end of stream segment 720500020010 and is classified within the Lower Beaver River 8 digit HUC watershed (11100201). Water enters the stream system from several tributaries including Kiowa Creek, Clear Creek, Otter Creek, and Wolf Creek, among others.

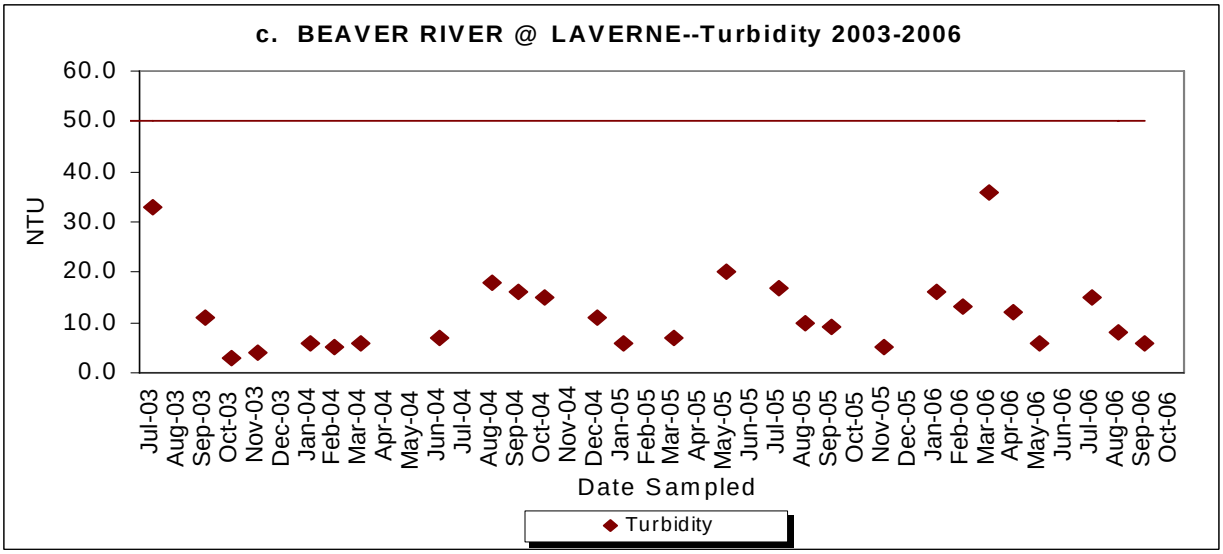
This station on the Beaver River became active for all water quality variables in November of 1998. The station was discontinued in September of 2000 and replaced with another station, the Beaver River at Fort Supply (AT234450). Because the Fort Supply station may not be representative of this section of the Beaver River, the Laverne station has been reactivated. The following assessment of beneficial uses is based on data collected from July of 2003 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from the confluence of Kiowa Creek (99.9060, 36.7591) downstream to confluence of Wolf Creek with the Beaver River (99.5019, 36.5886). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 45a), pH (Figure 45b), turbidity (Figure 45c), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2006. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 16 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 27. However, because biocriteria have not been developed for the Southwestern Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 45d and e). The PBCR beneficial use is not supported (Table 21). Of the eight (8) Enterococci concentrations, one (1) sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (119.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Beaver River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 45f).

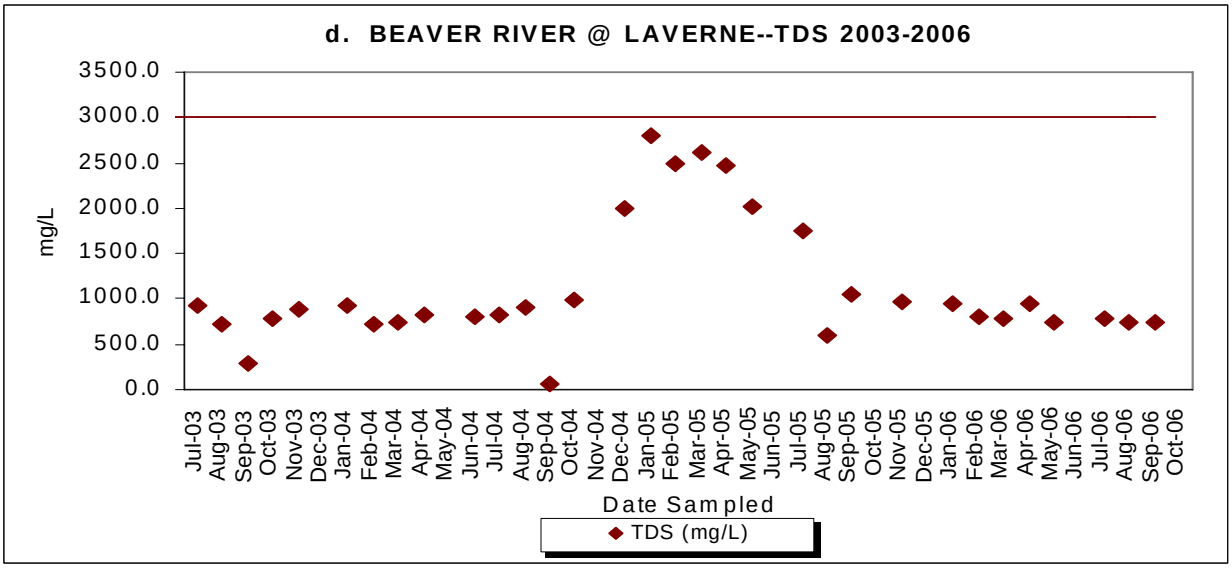
Figure 45 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Laverne (AT234400), 2003-2006.

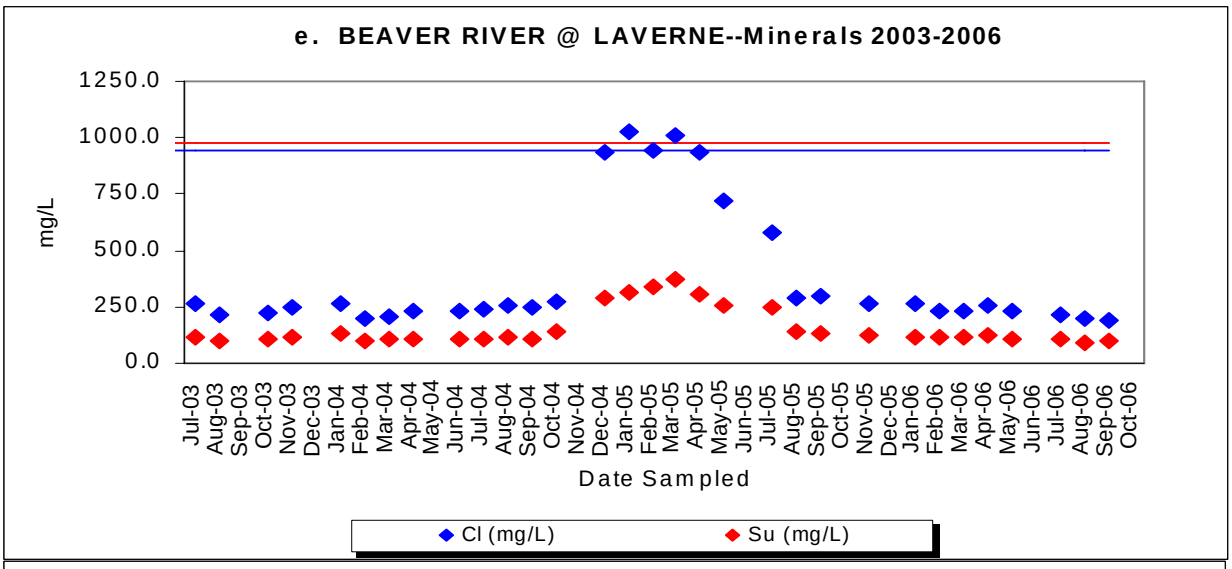


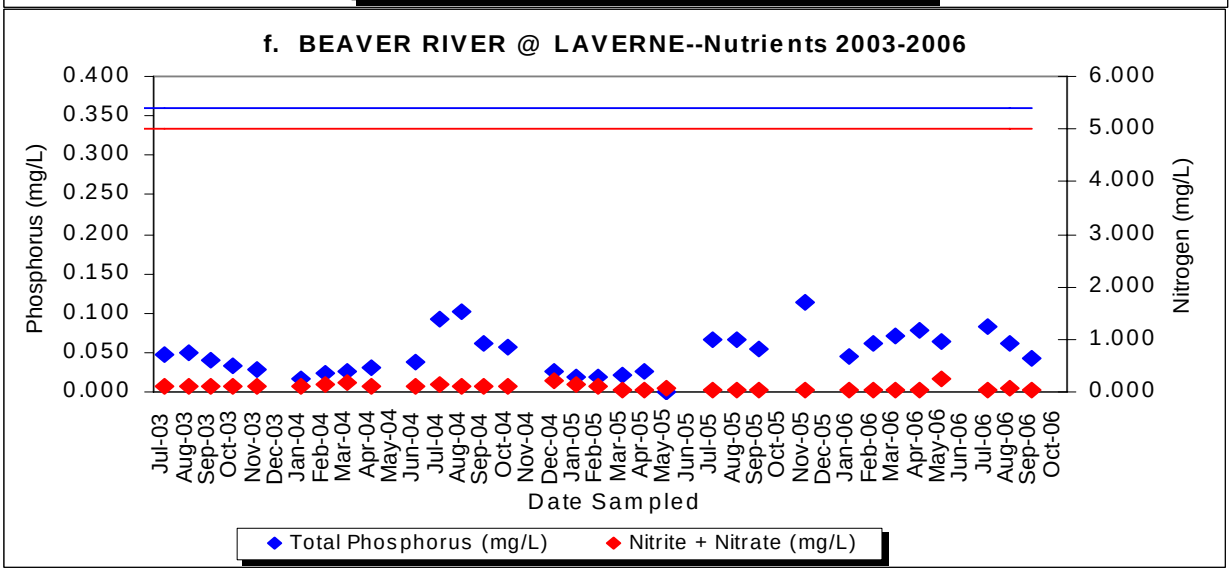




HUC 1110


d. BEAVER RIVER @ LAVERNE--TDS 2003-2006
mg/L
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06 Oct-06
Date Sampled
TDS (mg/L)


e. BEAVER RIVER @ LAVERNE--Minerals 2003-2006
mg/L
1250.0
1000.0
750.0
500.0
250.0
0.0
Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06 Oct-06
Date Sampled
Cl (mg/L)
Su (mg/L)


f. BEAVER RIVER @ LAVERNE--Nutrients 2003-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06 Oct-06
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

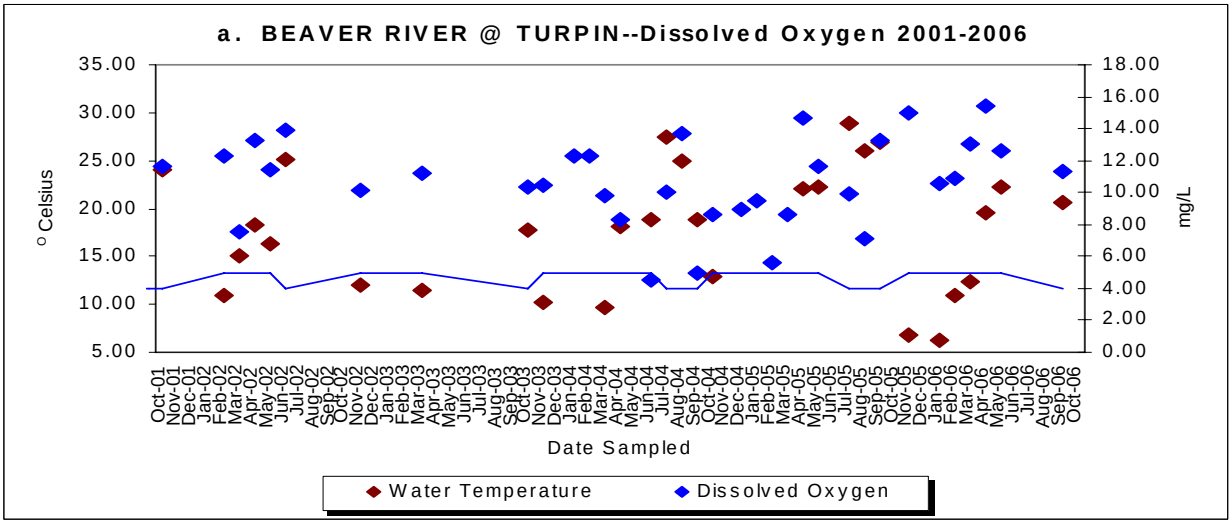
Beaver River near Turpin

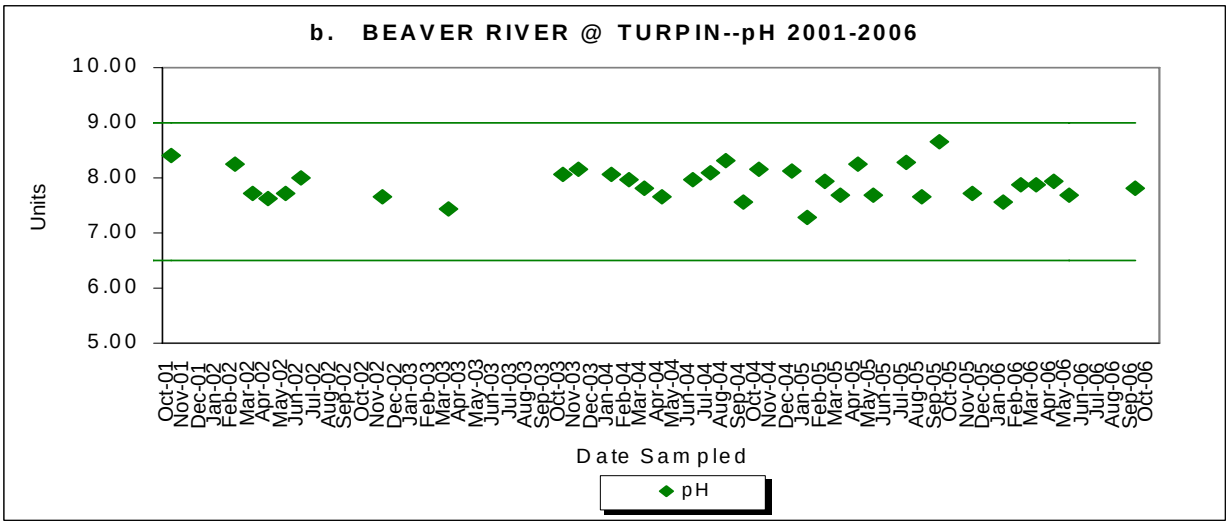
Station AT233900 (720500020450-001AT) is a permanent ambient trend monitoring station located on the Beaver River in Oklahoma. Situated in the west central portion of Beaver County, the site was established south of the town of Turpin on US Highway 83. The station is positioned near the terminal end of stream segment 720500020450 and is classified within the Middle Beaver River 8 digit HUC watershed (11100102). Water enters the stream system from Optima Lake and from several tributaries including Fulton Creek (Palo Duro Creek), Bull Creek, and Jackson Creek, among others.

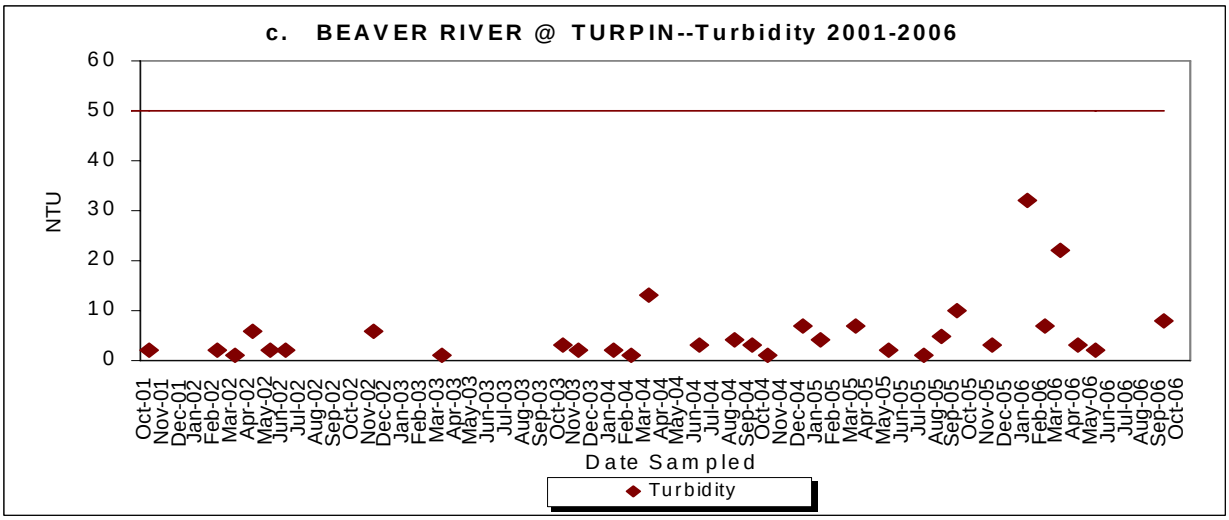
This station on the Beaver River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from just downstream of Optima Lake (101.0968, 36.6651) downstream to the confluence of the Beaver River with Sharp Creek (100.8064, 36.7972). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 46a), pH (Figure 46b), turbidity (Figure 46c), and toxicant data met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2006. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 5 (maximum 30) and fish condition score of 10 (maximum 15) for a total score of 15. However, because biocriteria have not been developed for the Southwestern Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is not supported (Figure 46d and e). Of the thirty-five (35) total dissolved solids concentrations, thirty-four (34) samples (or 97%) exceeded the sample standard of 3010.0 mg/L, and the geometric mean (6225.1 mg/L) exceeded the yearly mean standard (2442 mg/L). Of the 34 chloride concentrations, thirty-two (32) samples (or 94%) exceeded the sample standard of 945.0 mg/L, and the geometric mean (2483.3 mg/L) exceeded the yearly mean standard (735 mg/L). Sulfate values met the segment-specific criterion. The PBCR beneficial use is not supported (Table 21). Of the thirteen (13) fecal coliform concentrations, nine (9) samples (or 69%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (769.5 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the 13 enterococci concentrations, eight (8) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (318.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the twelve (12) *E. coli* concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (217.3 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Beaver River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 46f).

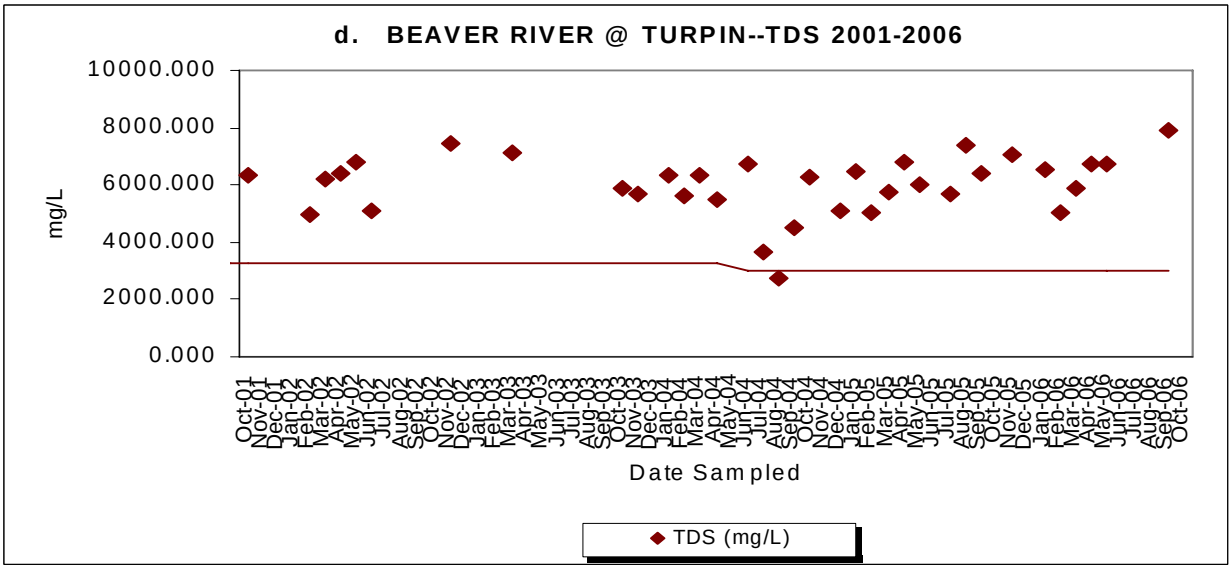
Figure 46 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Beaver River at Turpin (AT233900), 2001-2006.

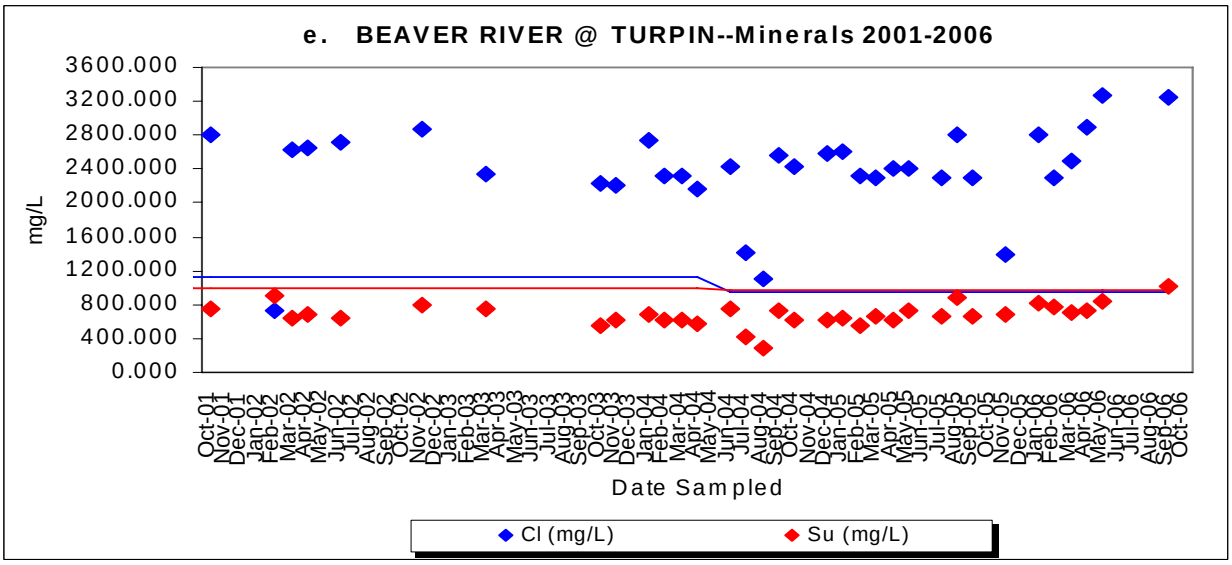


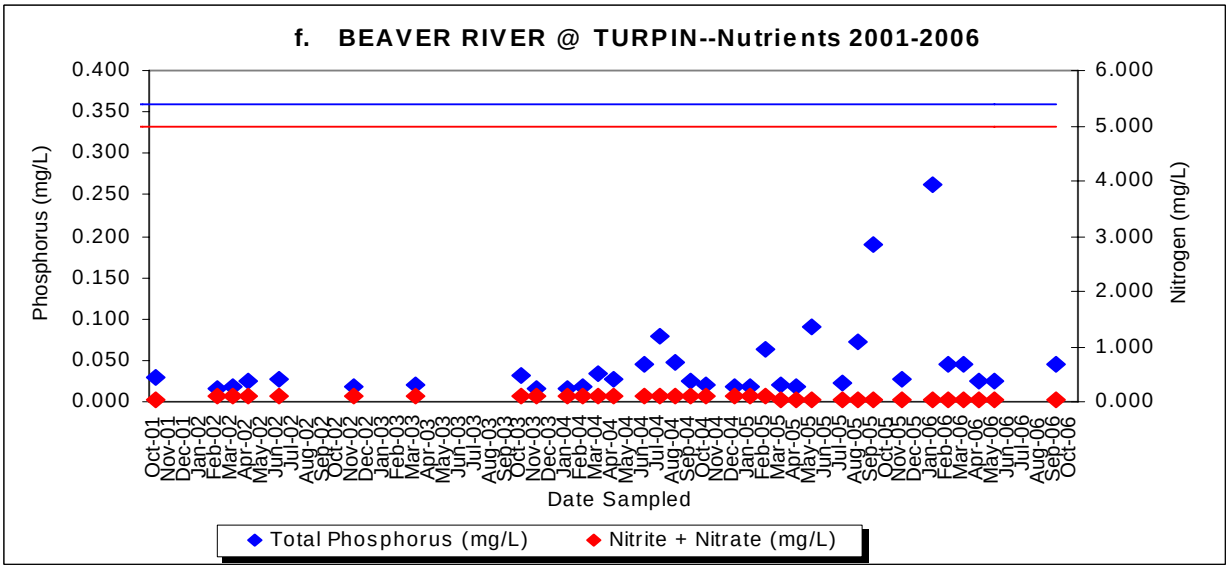




HUC 1110


d. BEAVER RIVER @ TURPIN--TDS 2001-2006
mg/L
10000.000
8000.000
6000.000
4000.000
2000.000
0.000
Date Sampled
TDS (mg/L)


e. BEAVER RIVER @ TURPIN--Minerals 2001-2006
mg/L
3600.000
3200.000
2800.000
2400.000
2000.000
1600.000
1200.000
800.000
400.000
0.000
Date Sampled
Cl (mg/L)
Su (mg/L)


f. BEAVER RIVER @ TURPIN--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

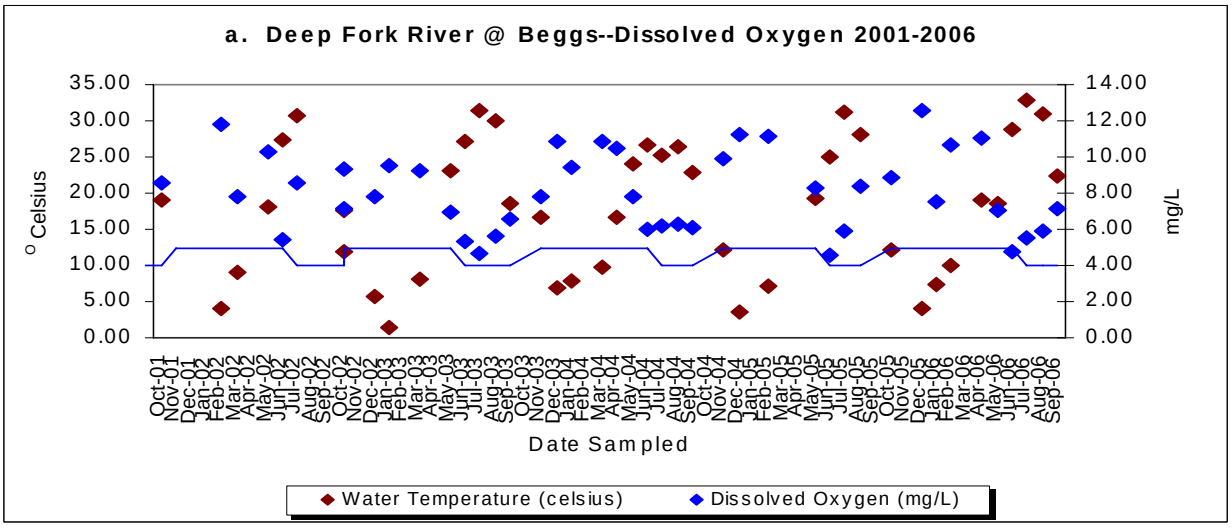
Deep Fork River near Beggs

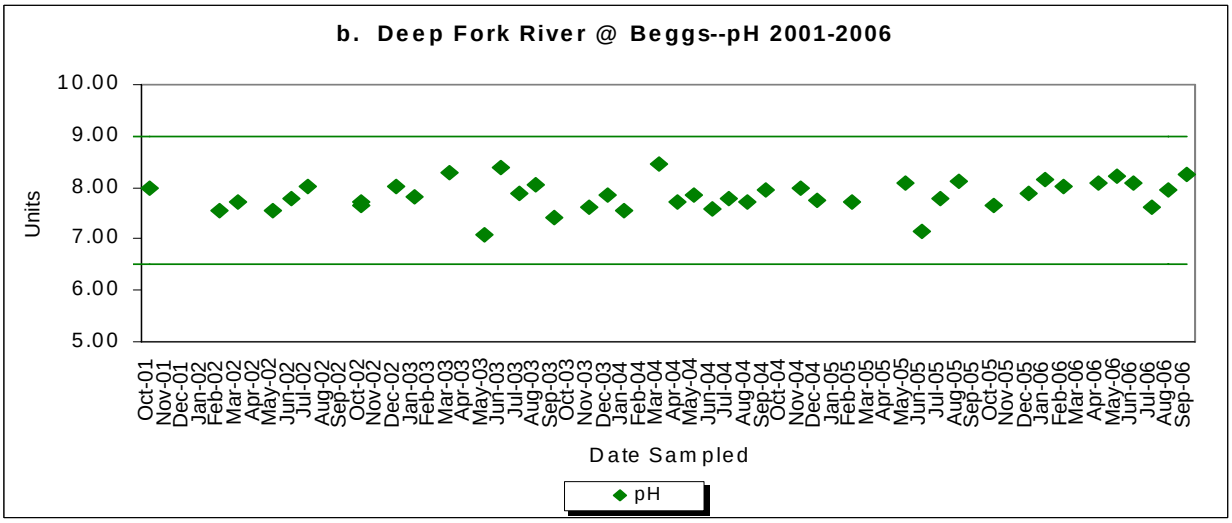
Station AT243500 (520700020010-001AT) is a permanent ambient trend monitoring station located on the Deep Fork River in Oklahoma. Situated in the west central portion of Okmulgee County, the site was established south of the town of Beggs off State Highway 16 on County Road N3900. The station is positioned near the terminal end of stream segment 520700020010 and is classified within the Deep Fork River 8 digit HUC watershed (11110303). Water enters the stream system from Todd Lake and from several tributaries including Buckeye Creek (Okemah Lake), Nuyaka Creek, Little Deep Fork Creek, and Salt Creek, among others.

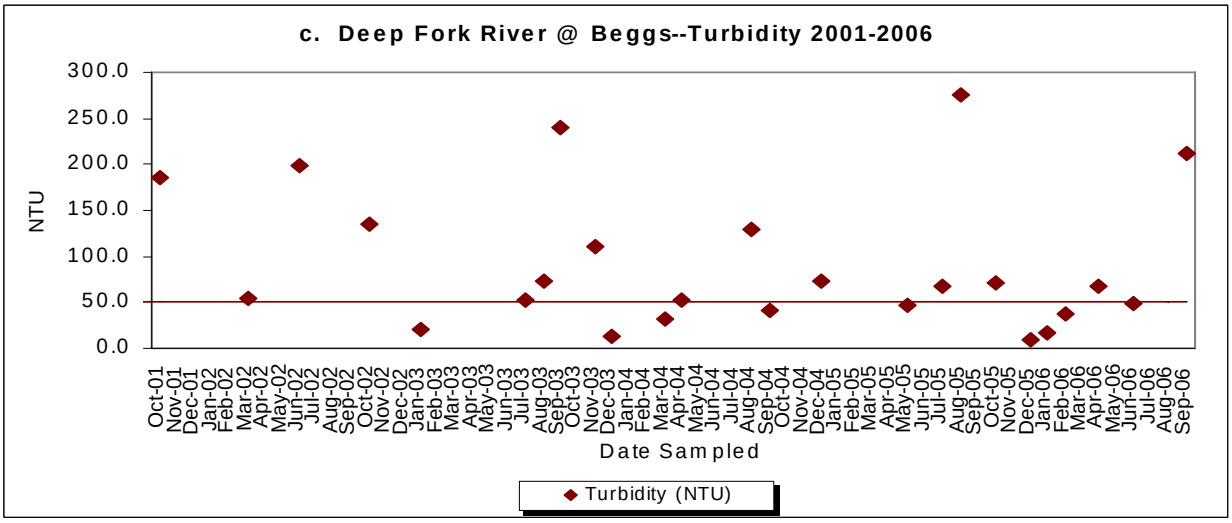
This station on the Deep Fork River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Deep Fork River from the confluence of Buckeye Creek (96.2682, 35.6225) downstream to confluence of Salt Creek with the Deep Fork River (96.0242, 35.5887). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-five (25) turbidity samples (Figure 47c), sixteen (16) samples (or 64%) exceeded the numerical criteria of 50 NTU. Of the eight (8) lead samples collected, one (1) of the concentrations (or 14%) exceeded the prescribed, hardness-dependant chronic criterion of 8.26 ug/L (Table 20). Dissolved oxygen (Figure 47a) and pH (Figure 47b) data met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 47d and e). The PBCR beneficial use is not supported (Table 21). Of the fourteen (14) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (201.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Deep Fork River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 47f).

Figure 47 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Deep Fork River at Beggs (AT243500), 2001-2006.







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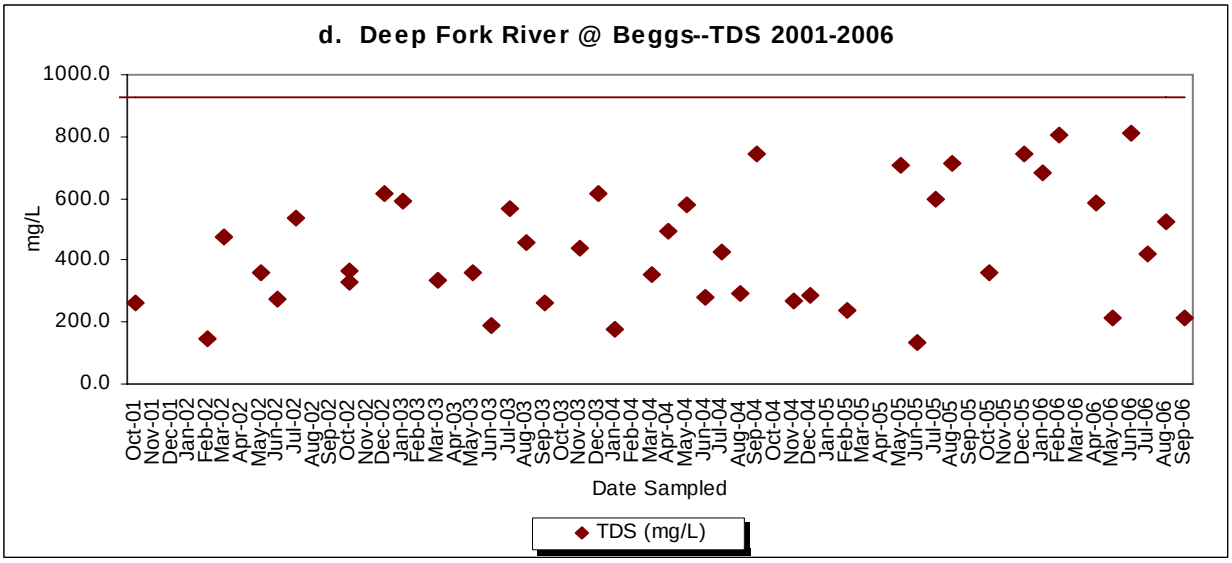
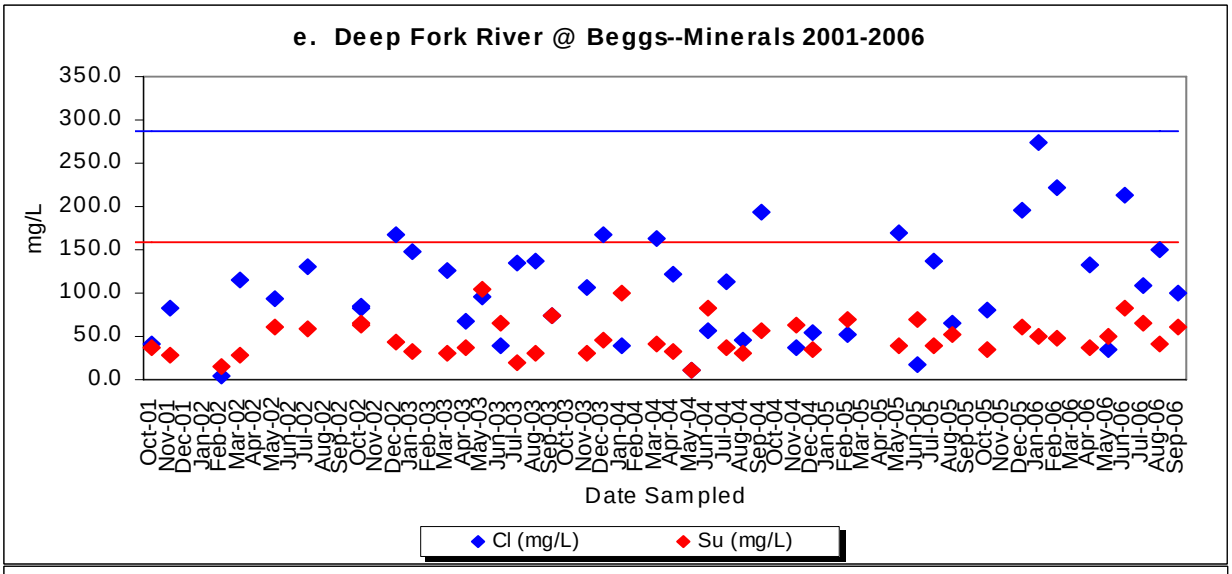
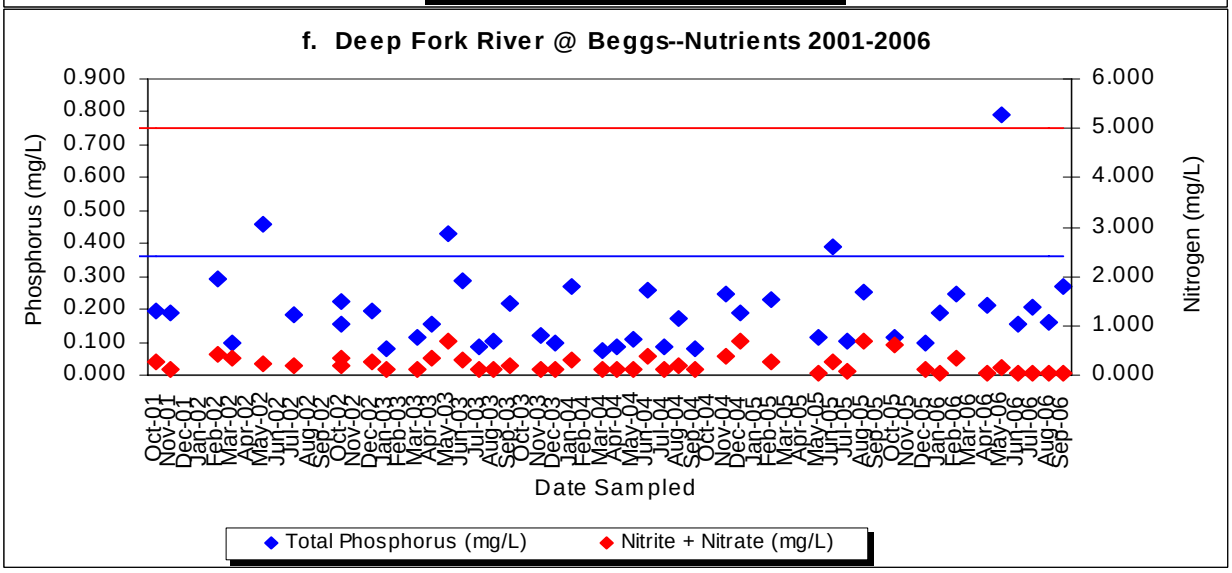

d. Deep Fork River @ Beggs--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Deep Fork River @ Beggs--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Deep Fork River @ Beggs--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

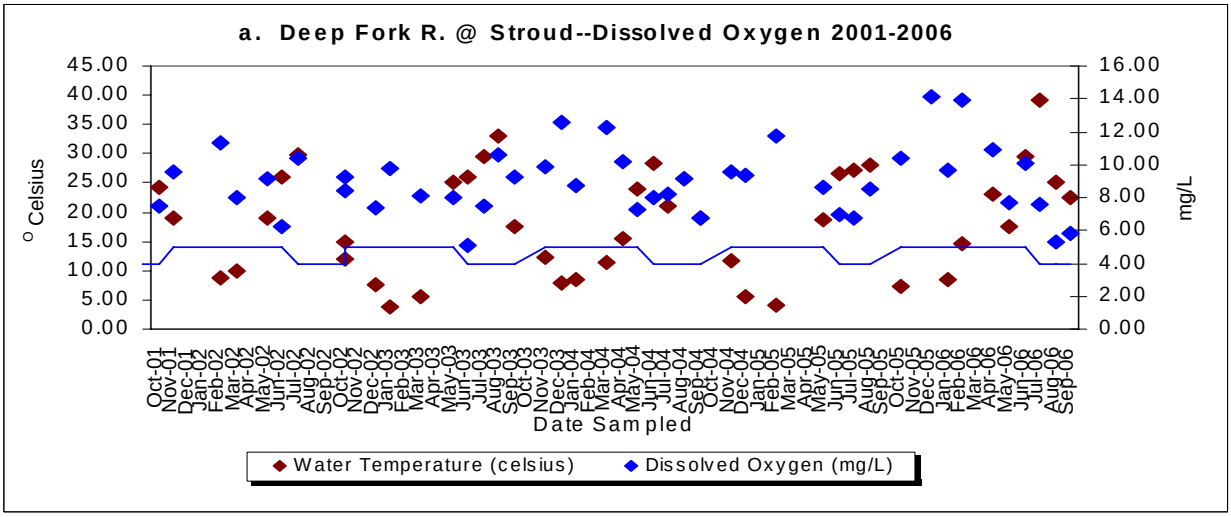
Deep Fork River near Stroud

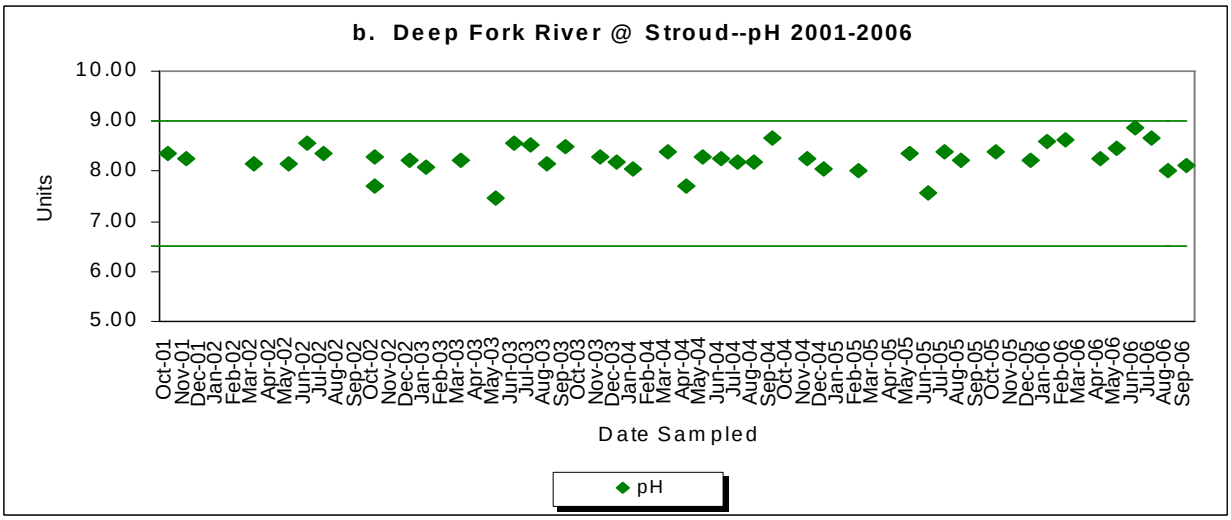
Station AT242500 (520700040010-001AT) is a permanent ambient trend monitoring station located on the Deep Fork River in Oklahoma. Situated in the east central portion of Lincoln County, the site was established south of the city of Stroud on US Highway 377. The station is positioned near the terminal end of stream segment 520700040010 and is classified within the Deep Fork River 8 digit HUC watershed (11100303). Water enters the stream system from Browns Lake and Lake Todd and from several tributaries including Quapaw Creek, Robinson Creek, Dry Creek, Deer Creek, and Grayhorse Creek, among others.

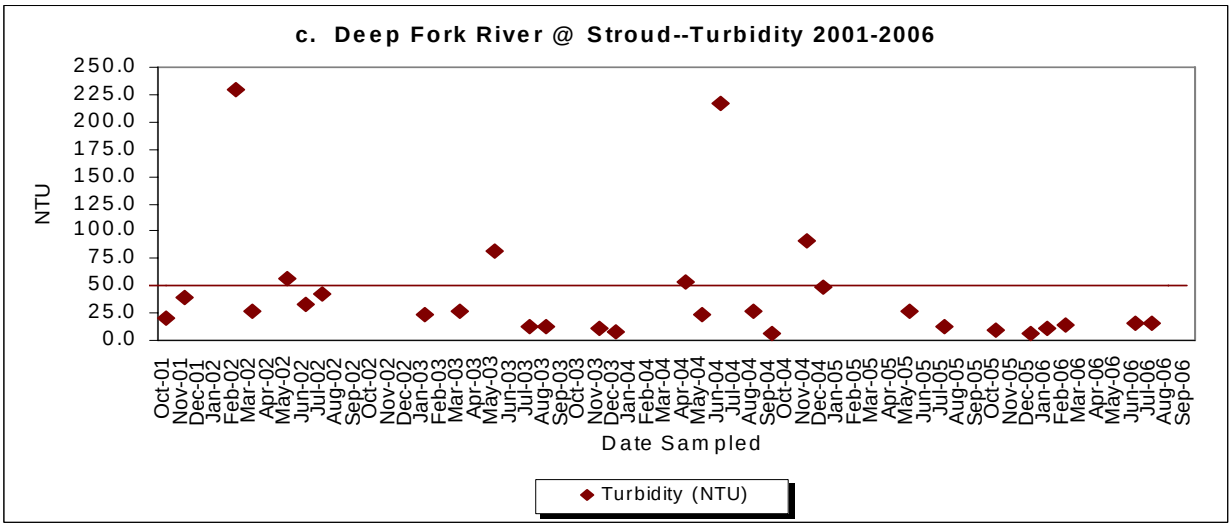
This station on the Deep Fork River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Deep Fork River from the confluence of Quapaw Creek (96.8059, 35.6287) downstream to confluence of Todd Lake with the Deep Fork River (96.6220, 35.6554). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is partially supported but impaired per the CPP. Of the eight (8) chromium samples collected, two (2) of the concentrations (or 20% of the required 10) exceeded the prescribed criterion of 50 ug/L (Table 20). The WWAC beneficial use is not supported. Of the 8 lead samples collected, 2 of the concentrations (or 20% of the required 10) exceeded the prescribed, hardness-dependant chronic criterion of 11.05 ug/L (Table 20). Of the 8 chromium samples collected, 2 of the concentrations (or 20% of the required 10) exceeded the prescribed, hardness-dependant chronic criterion of 50 ug/L (Table 20). Of the twenty-nine (29) turbidity samples (Figure 48c), six (6) samples (or 21%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 48a) and pH (Figure 48b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 48d and e). The PBCR beneficial use is not supported (Table 21). Of the twenty (20) enterococci concentrations, 8 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (448.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Deep Fork River is nutrient-threatened. The median of the total phosphorus concentrations (0.415 mg/L) exceeded the threshold median of 0.36 mg/L, and the median of all baseflow turbidity is 17 NTU. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 48f).

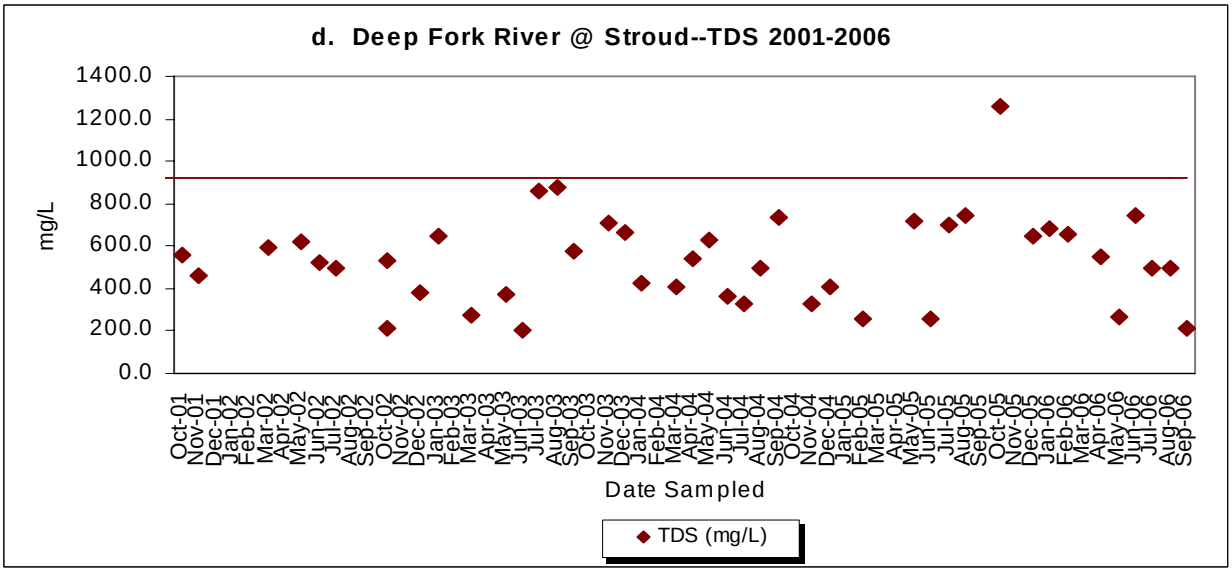
Figure 48 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Deep Fork River at Stroud (AT242500), 2001-2006.

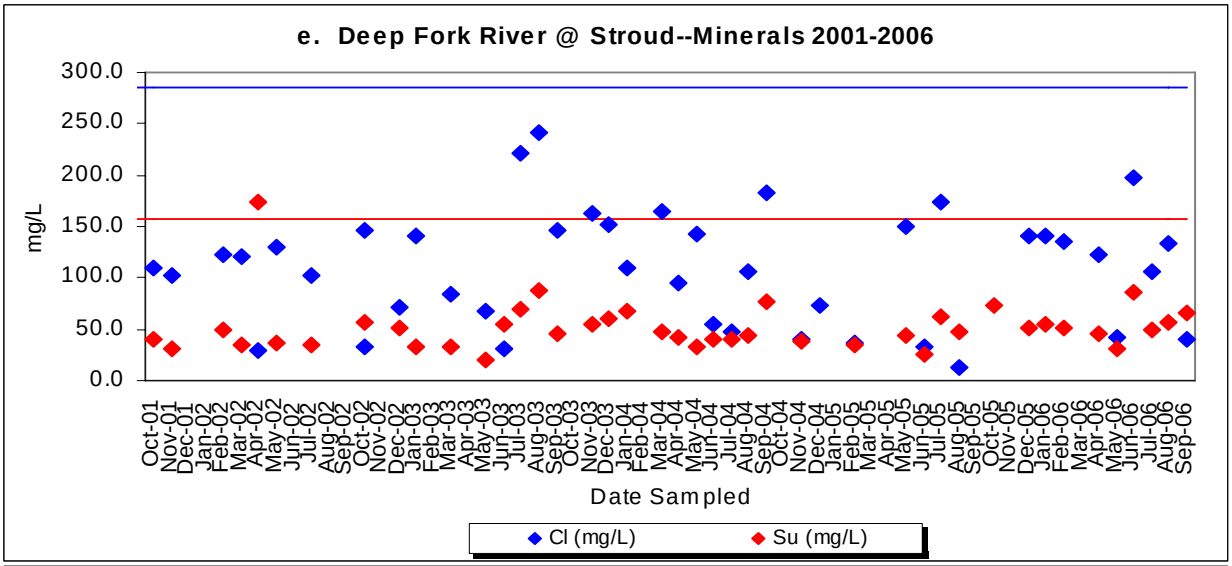


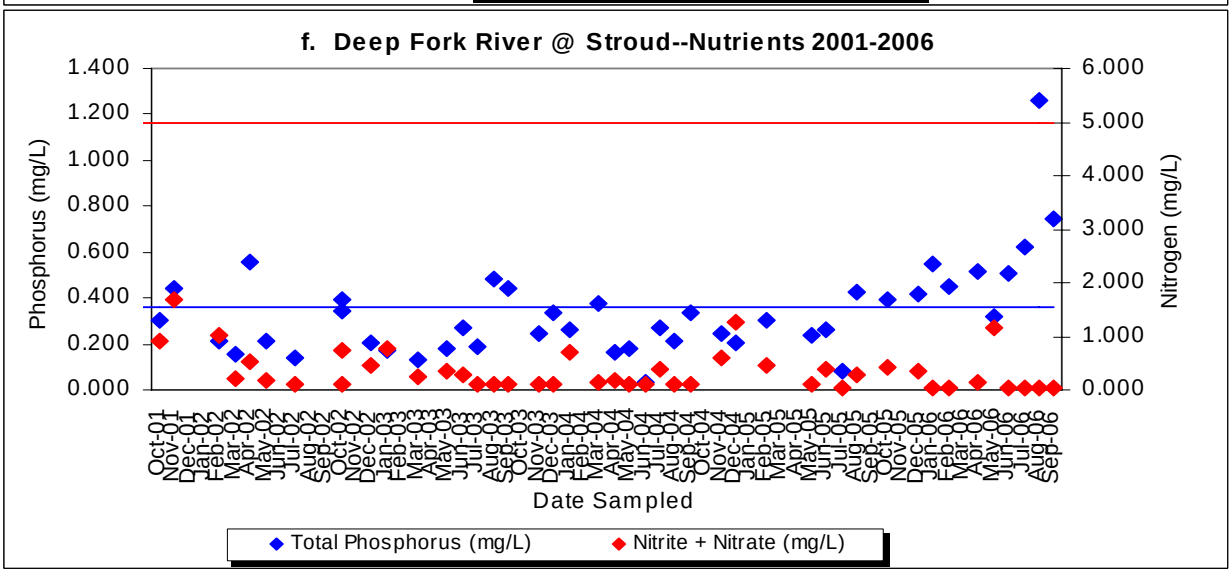




HUC 1110


d. Deep Fork River @ Stroud--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Deep Fork River @ Stroud--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Deep Fork River @ Stroud--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

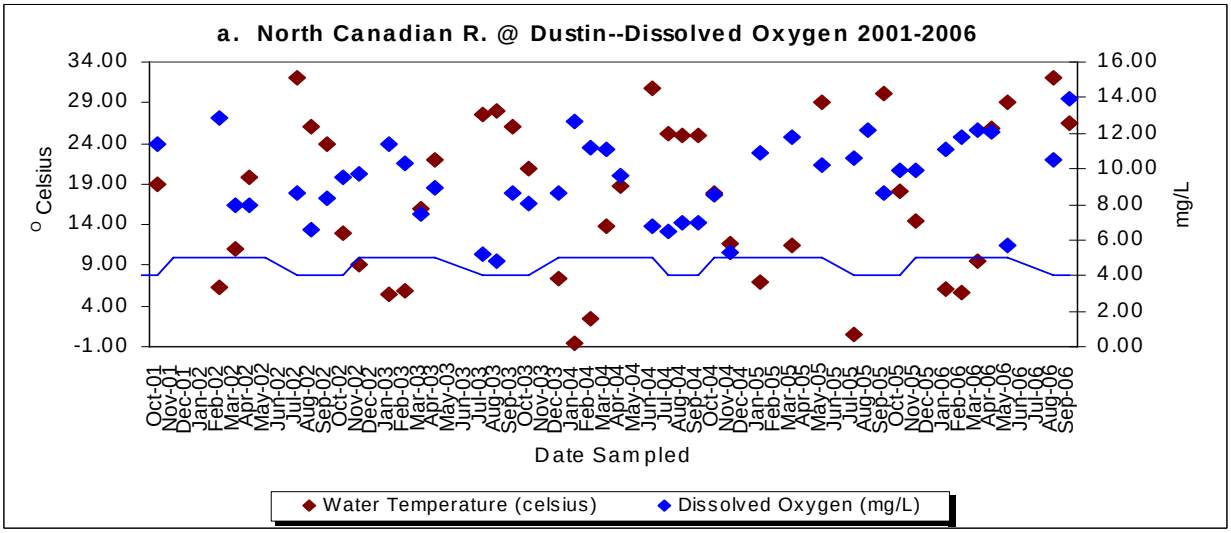
North Canadian River at Dustin

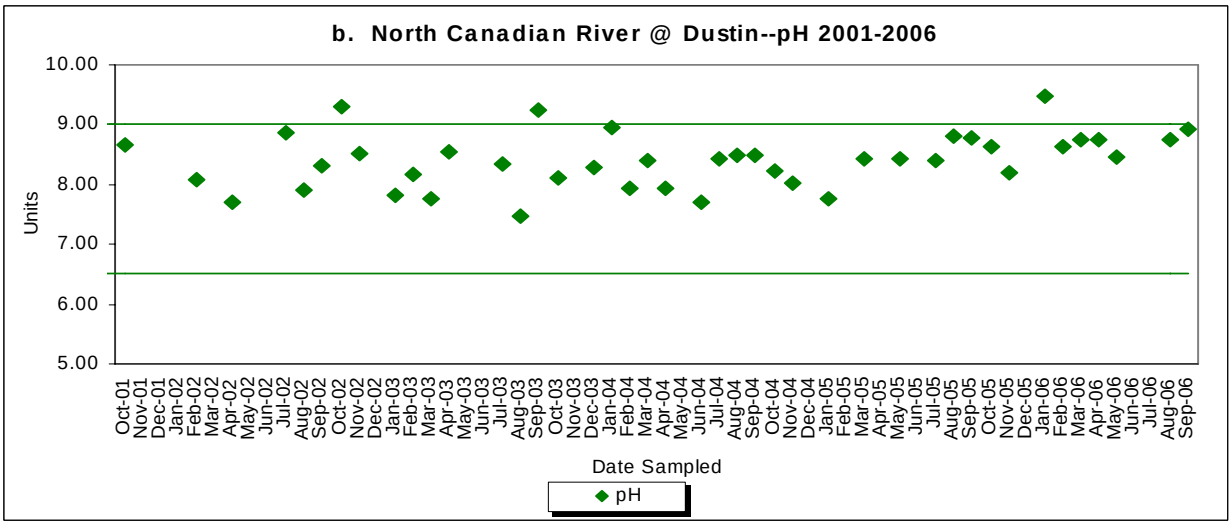
Station AT242200 (520500010110-001AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the west central portion of McIntosh County, the site was established on the Indian Nation Turnpike. The station is positioned near the upper end of stream segment 520500010110 and is classified within the Lower North Canadian River 8 digit HUC watershed (11100302). Water enters the stream system from Wewoka Creek (Lake Wewoka), Alabama Creek, and Bad Creek, among others.

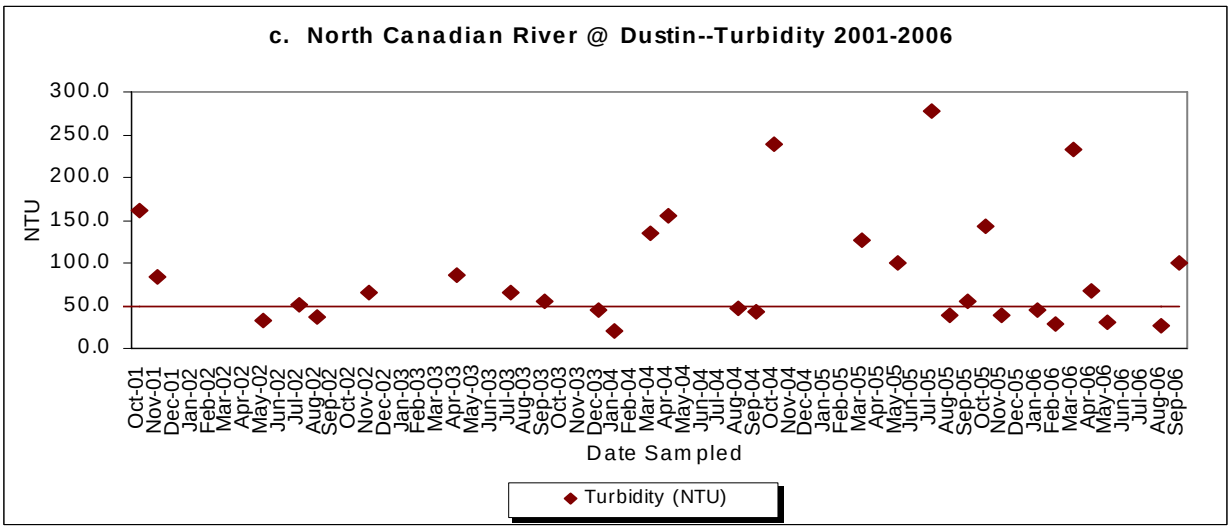
This station on the North Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the confluence of Wetumka Creek (96.1690, 35.2556) downstream to confluence of the North Canadian River with Lake Eufaula (95.8105, 35.4048). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty (30) turbidity samples (Figure 49c), eighteen (18) samples (or 60%) exceeded the numerical criterion of 50 NTU. Of the seven (7) lead samples collected, three (3) of the concentrations (or 30% of the required 10) exceeded the prescribed, hardness-dependant chronic criteria of 8.48 ug/L (Table 20). Dissolved oxygen (Figure 49a) and pH (Figure 49b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 49d and e). The PBCR beneficial use is not supported (Table 21). Of the 22 fecal coliform concentrations, seven (7) samples (or 32%) exceeded the prescribed screening level of 400 cfu/mL. Of the 22 enterococci concentrations, eight (8) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (301.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is nutrient-threatened. The median of the segment wide total phosphorus concentrations (0.955 mg/L) exceeded the threshold median of 0.36 mg/L and has a mean baseflow organic turbidity of 103 NTU. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 49f).

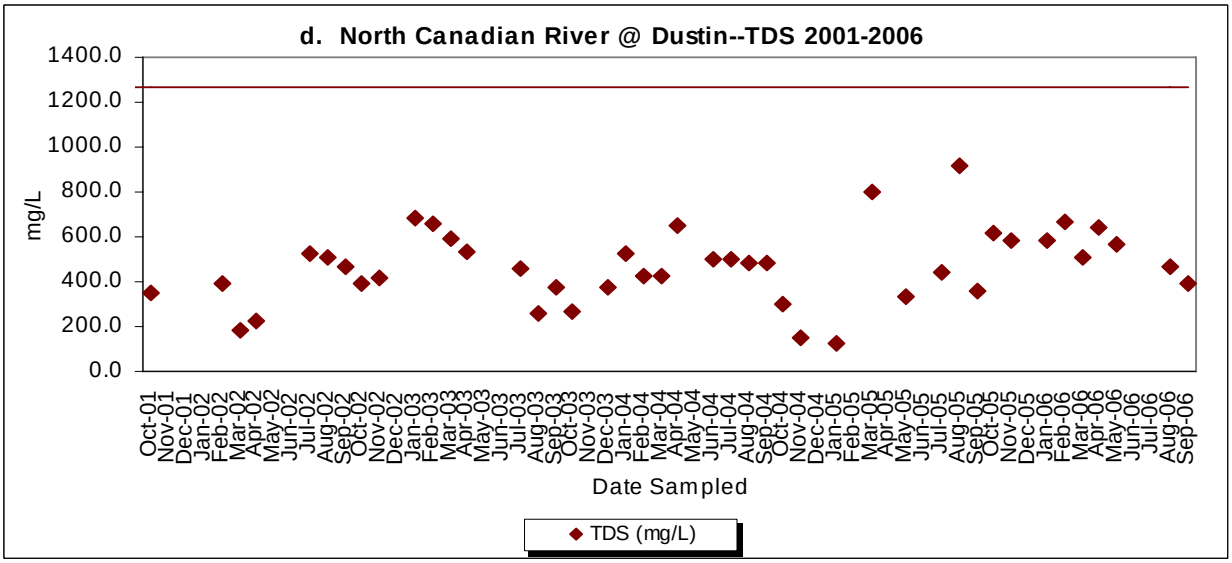
Figure 49 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Dustin (AT242200), 2001-2006.

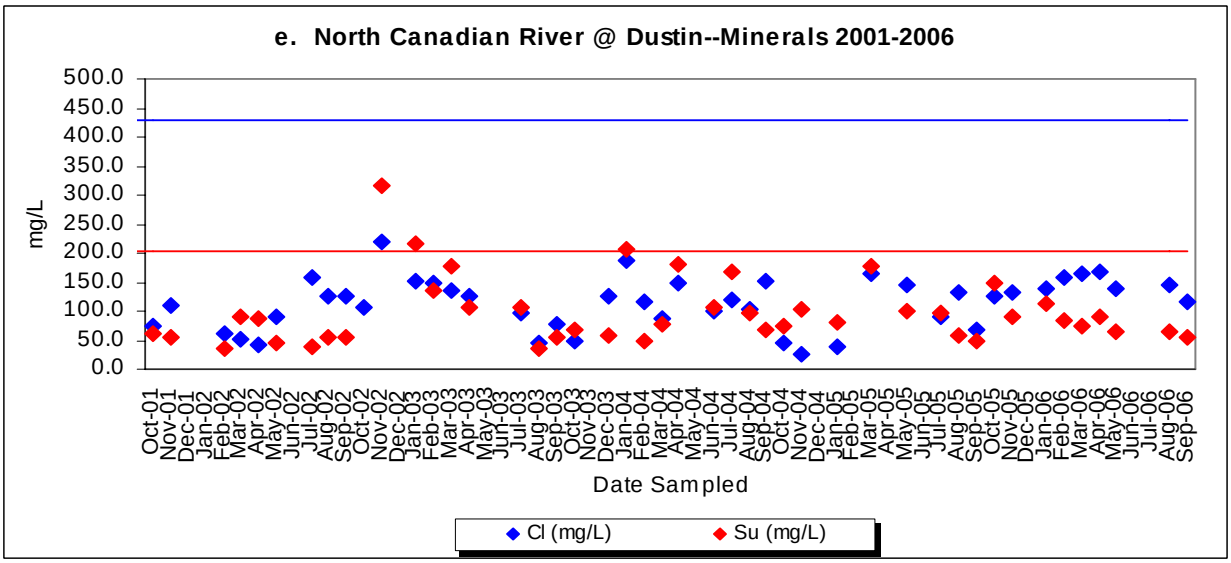


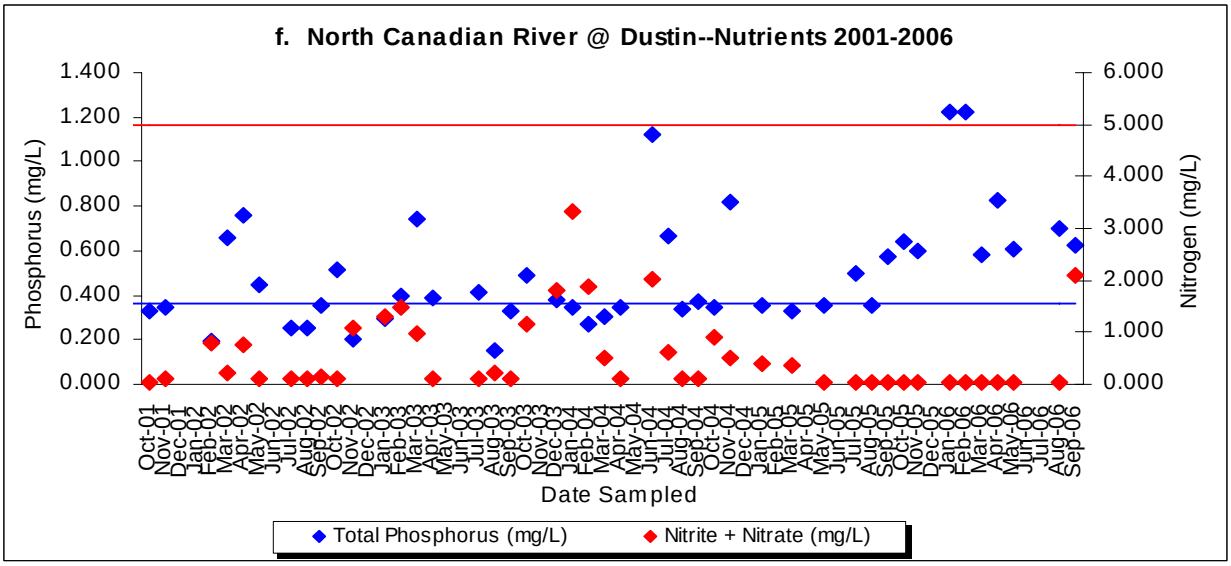




HUC 1110


d. North Canadian River @ Dustin--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Canadian River @ Dustin--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ Dustin--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

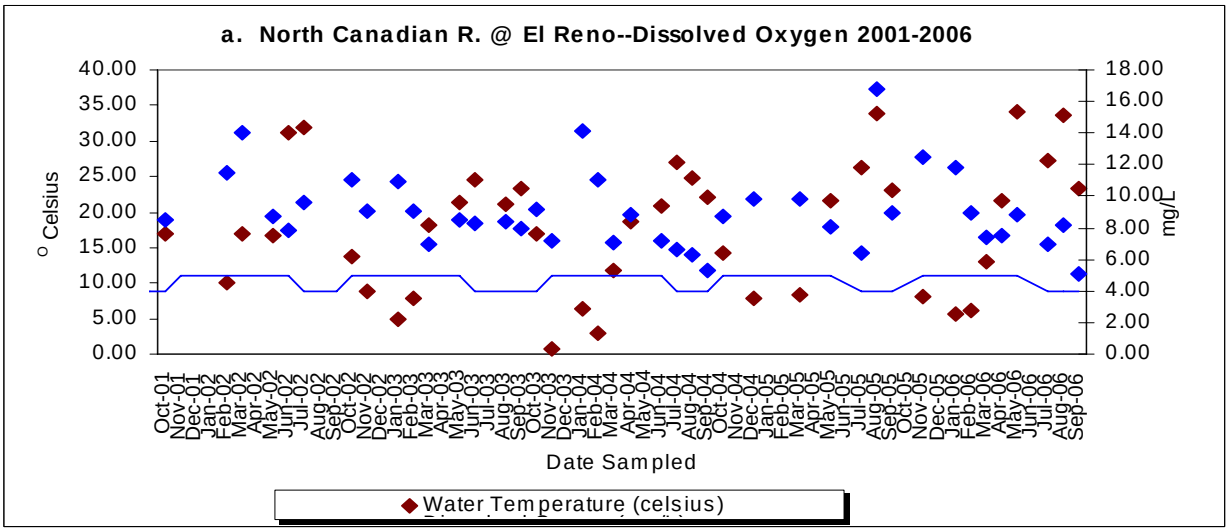
North Canadian River near El Reno

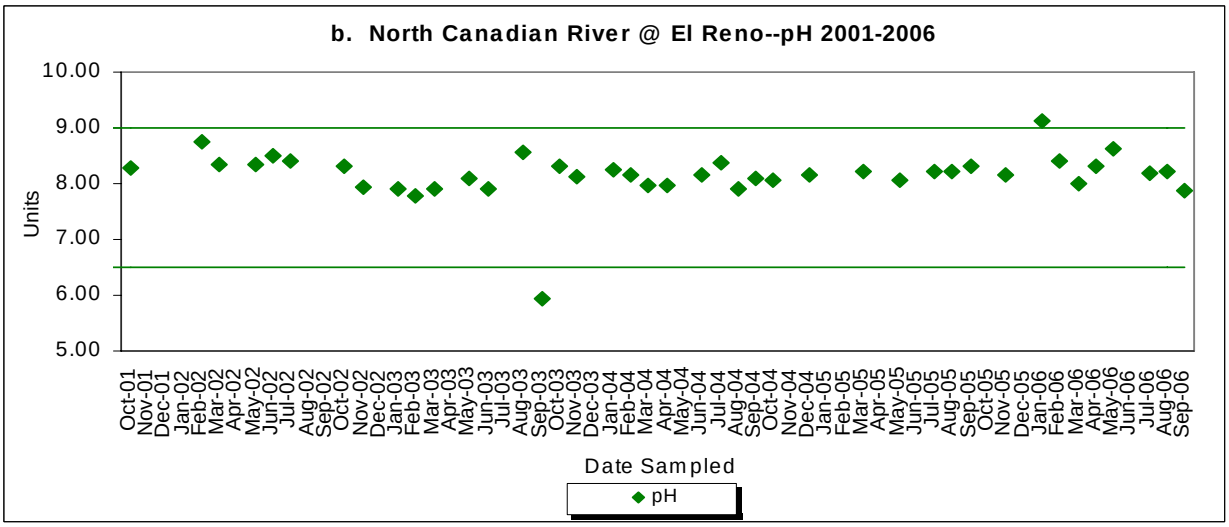
Station AT239500 (520530000010-001AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the central portion of Canadian County, the site was established within the city of El Reno on US Highway 81. The station is positioned between the midpoint and the lower end of stream segment 520530000010 and is classified within the Middle North Canadian River 8 digit HUC watershed (11100301). Water enters the stream system from several tributaries including Sixmile Creek, Purcell Creek, and Shell Creek, among others.

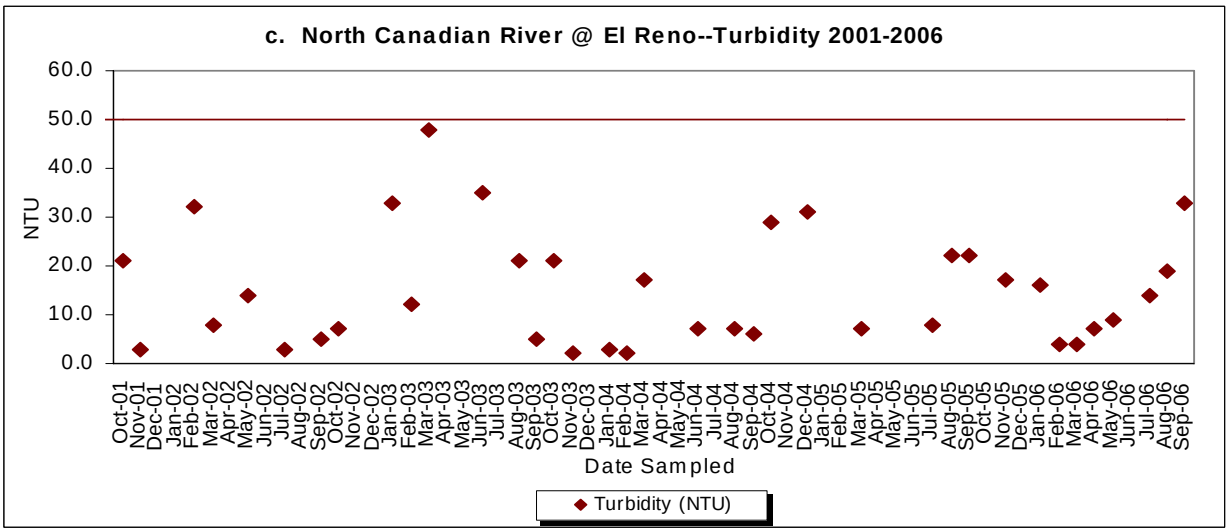
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from where it intersects the Canadian/Blaine County Line (98.3134, 35.7180) downstream to confluence of the North Canadian River with Lake Overholser (97.6776, 35.5370). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 50a), pH (Figure 50b), turbidity (Figure 50c) and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 50d and e). The PBCR beneficial use is not supported (Table 21). Of the eighteen (18) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (147.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 50f). Furthermore, the mean sestonic chlorophyll-a concentration (15.4 mg/M^3) produced a TSI of 57, which is below the threshold TSI of 62.

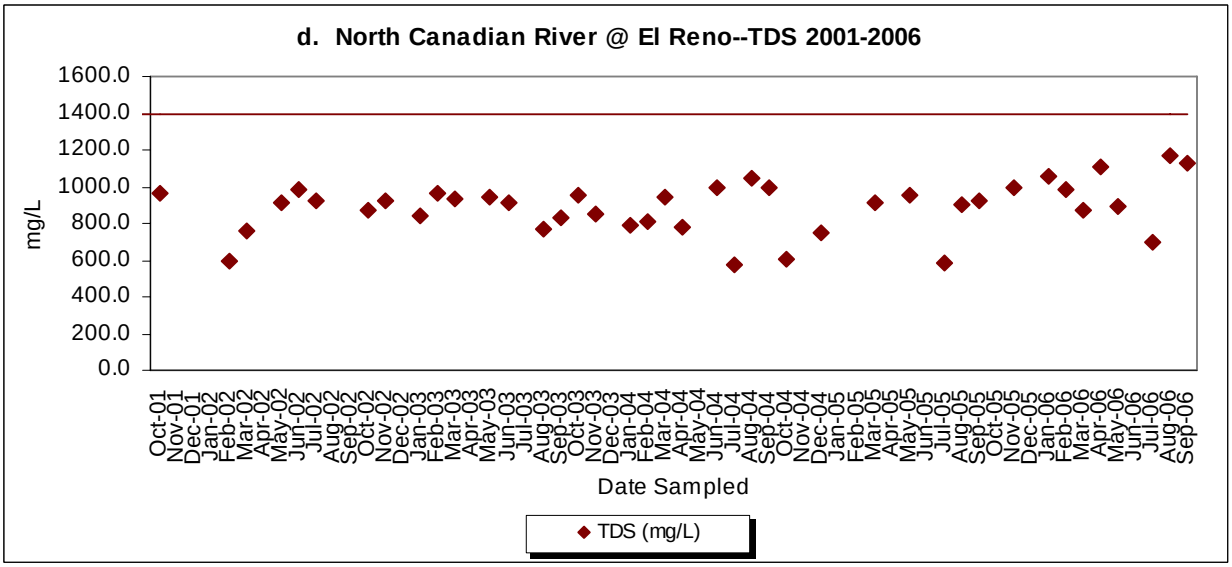
Figure 50 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at El Reno (AT239500), 2001-2006.

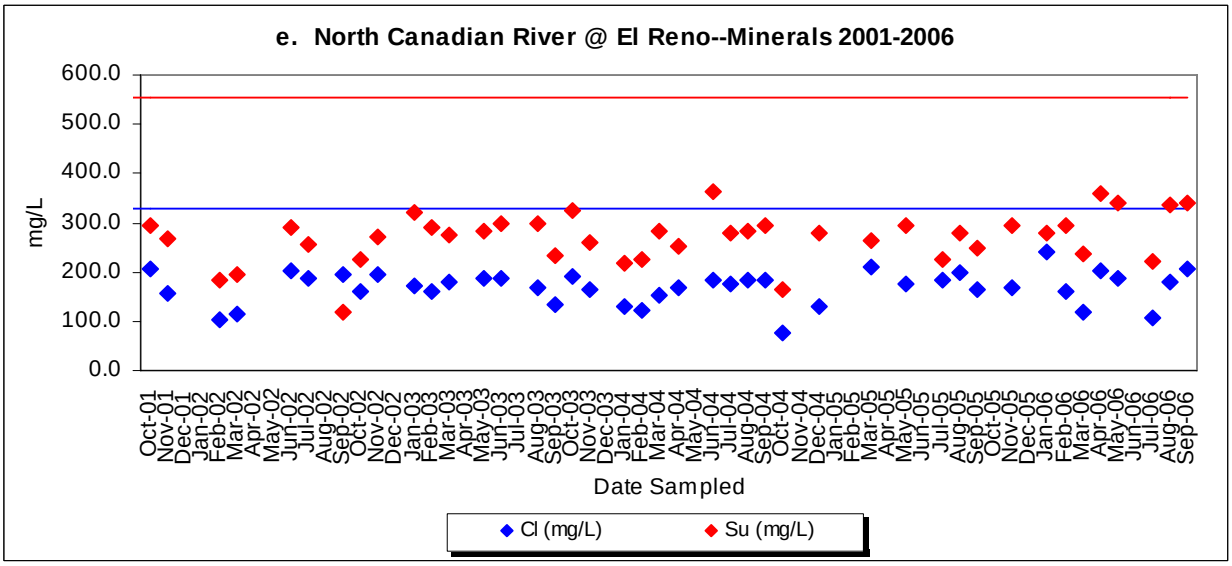


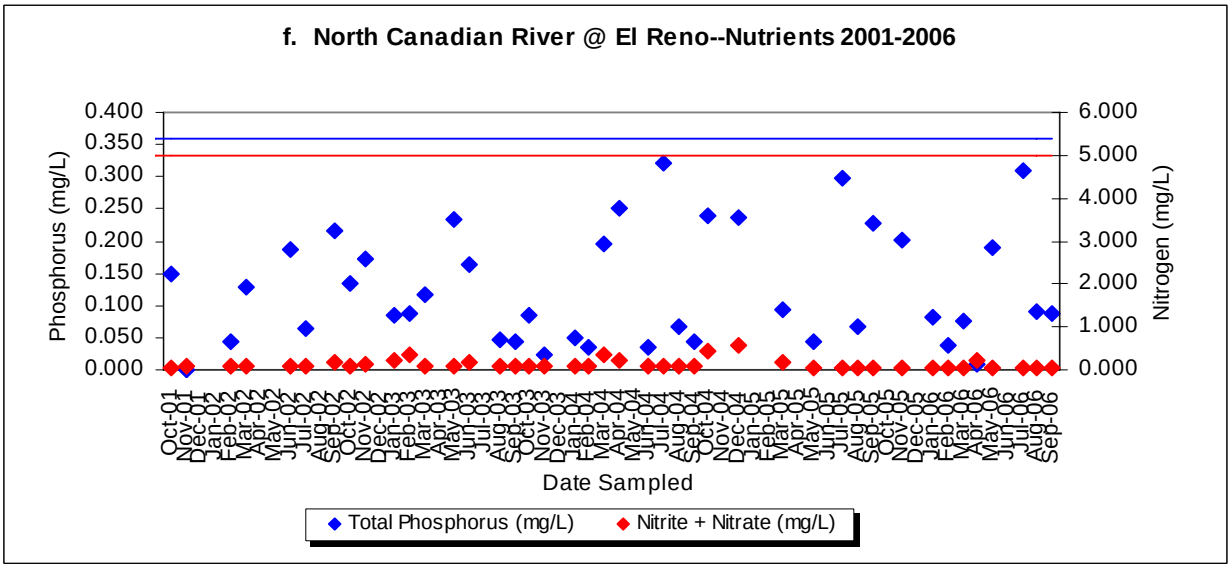




HUC 1110


d. North Canadian River @ El Reno--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Canadian River @ El Reno--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ El Reno--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

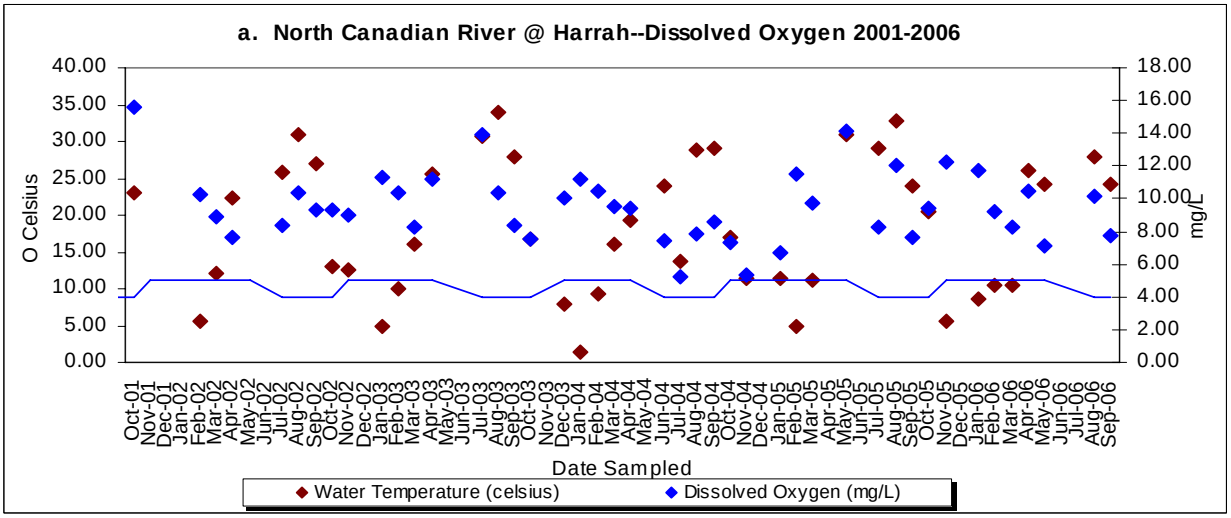
North Canadian River near Harrah

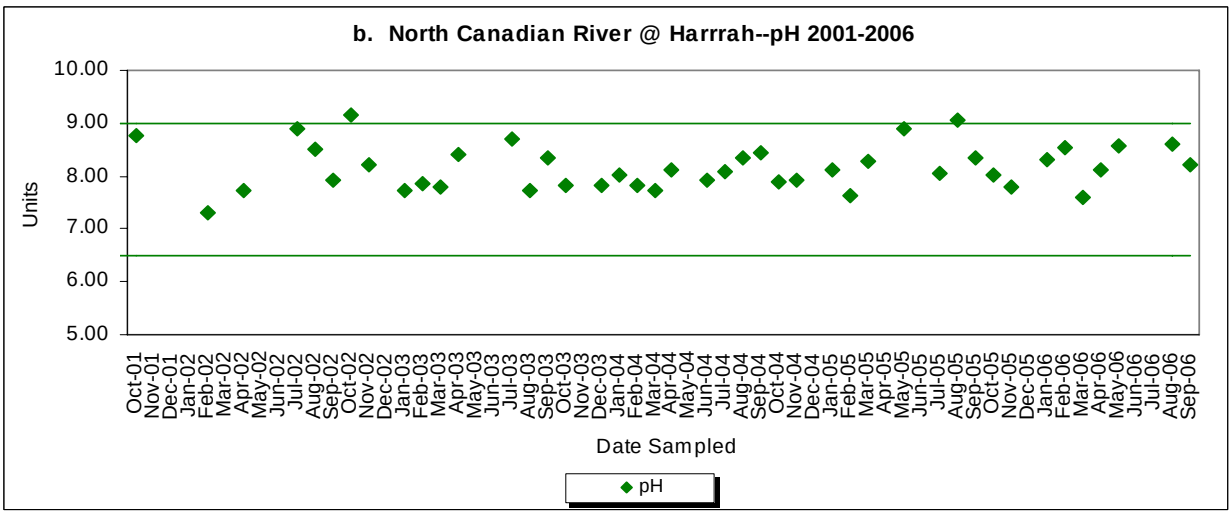
Station 241550 (520510000110-001AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the southeastern portion of Oklahoma County, the site was established east of the city of Harrah on US Highway 62. The station is positioned near the lower end of stream segment 520520000010 and is classified within the Lower North Canadian River 8 digit HUC watershed (11100302). Water enters the stream system from Lake Overholser and Horseshoe Lake and from several tributaries including Mustang Creek, Crooked Oak Creek, Crutcho Creek, and Choctaw Creek, among others.

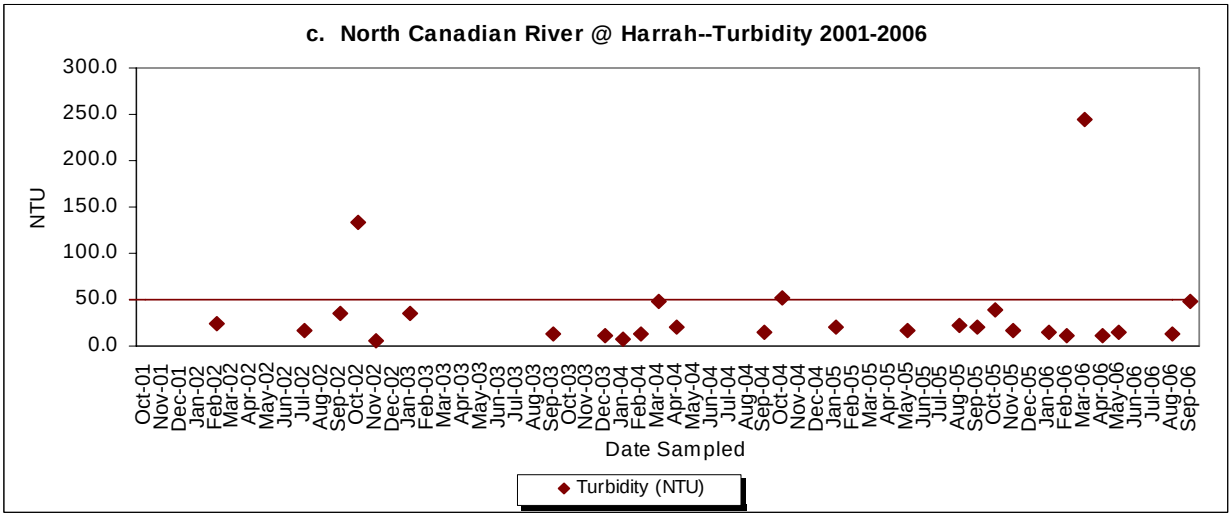
This station on the Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the confluence of Crooked Oak Creek (97.4604, 35.4684) downstream to the confluence of an unnamed tributary near Horseshoe Lake with the North Canadian River (97.1797, 35.5027). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is partially supported but impaired per the CPP. Of the twenty-eight (28) turbidity samples (Figure 51c), three (3) samples (or 11%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 51a), pH (Figure 51b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 51d and e). The PBCR beneficial use is not supported (Table 21). Of the nineteen (19) fecal coliform concentrations, 6 samples (or 32%) exceeded the prescribed screening level of 400 cfu/mL. Of the 19 enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (131.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is nutrient-threatened. The median of the total phosphorus concentrations (1.300 mg/L) exceeded the threshold median of 0.36 mg/L, and has a mean baseflow organic turbidity of 39 NTU. Moreover, the mean sestonic chlorophyll-a concentration (40.0 mg/M^3) produced a TSI of 67, which is above the threshold TSI of 62. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 51f).

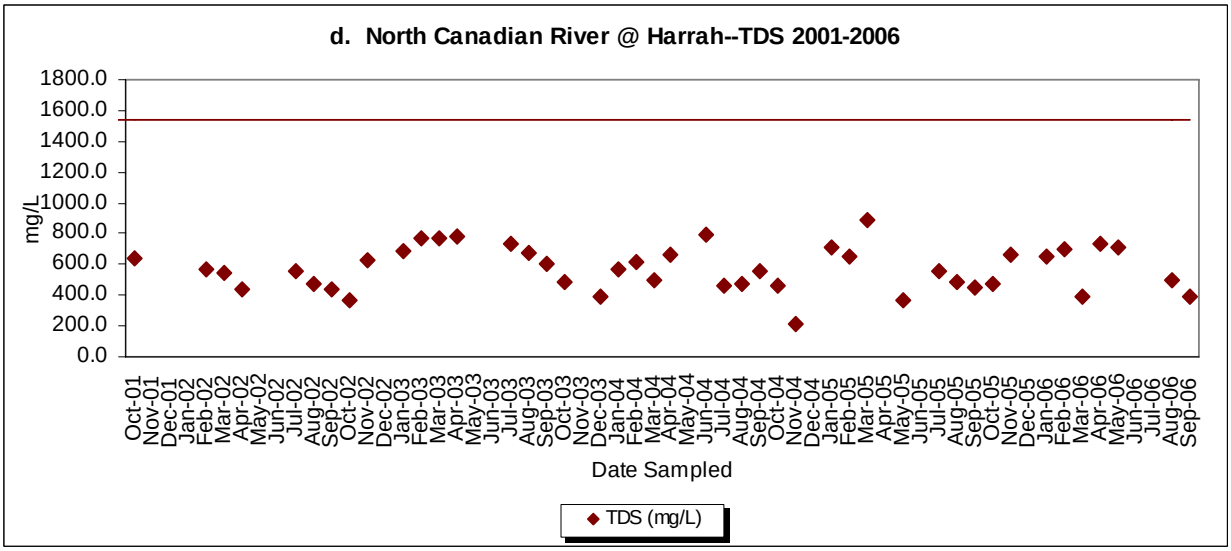
Figure 51 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Harrah (AT241550), 2000-2005.

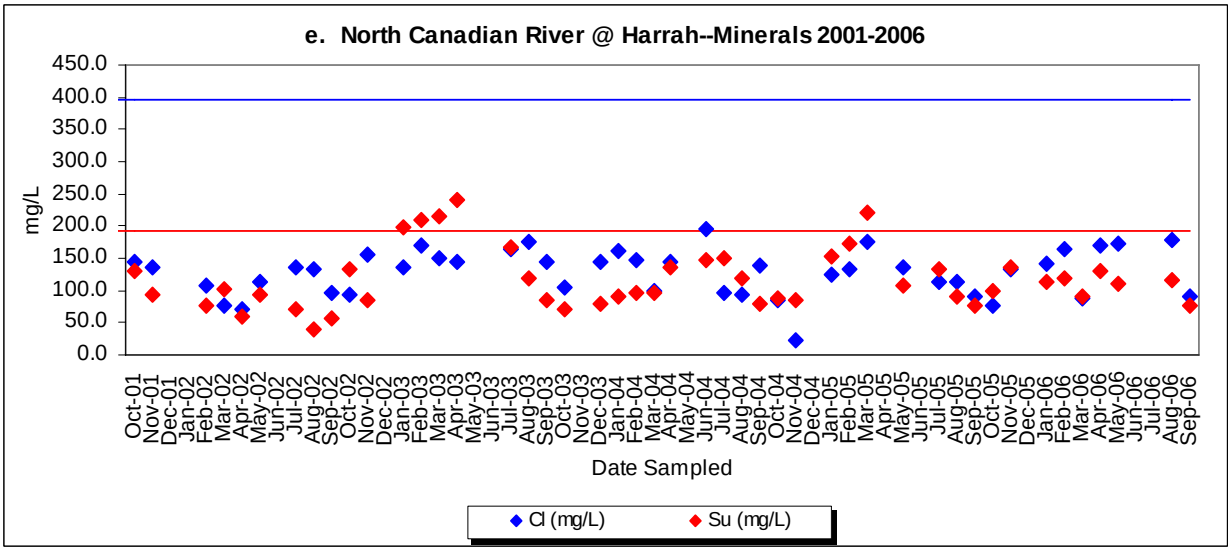


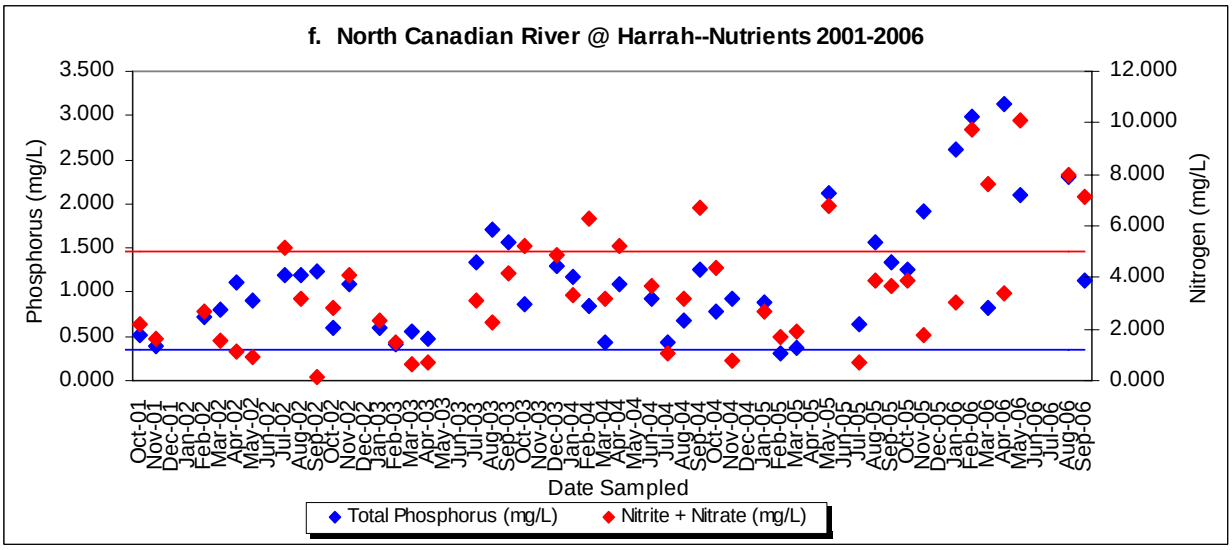




HUC 1110


d. North Canadian River @ Harrah--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Canadian River @ Harrah--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ Harrah--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

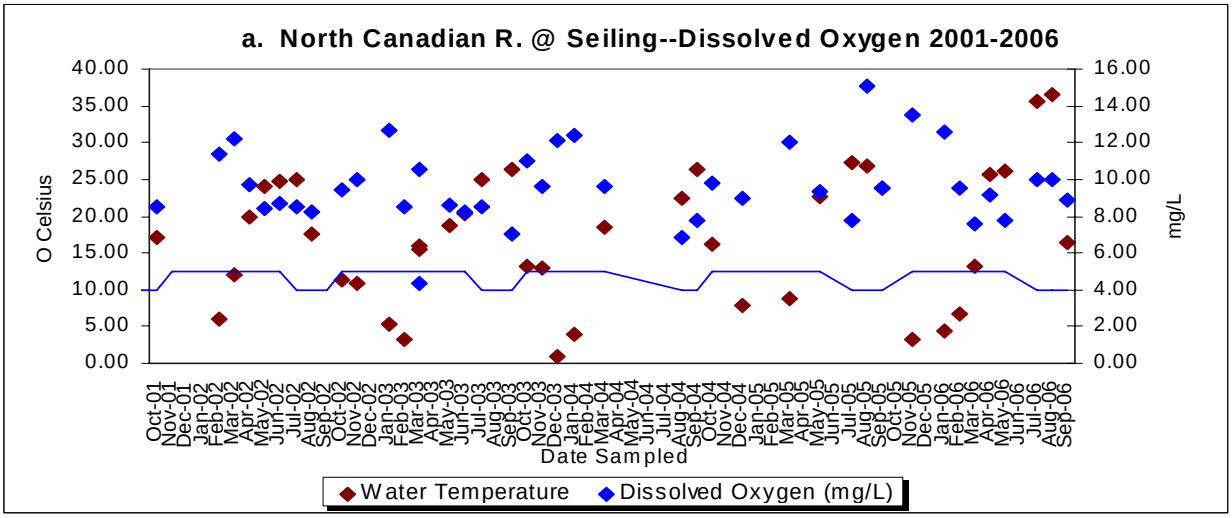
North Canadian River near Seiling

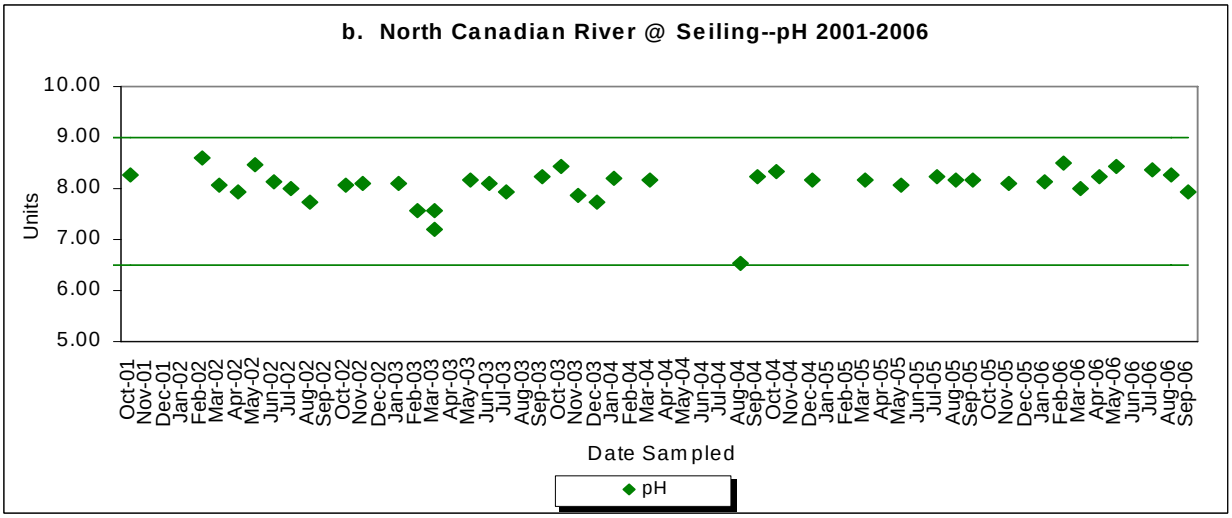
Station AT238000 (720500010010-001AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the southwestern portion of Major County, the site was established north of the town of Seiling on US Highway 281. The station is positioned near the midpoint of stream segment 720500010010 and is classified within the Middle North Canadian River 8 digit HUC watershed (11100301). Water enters the stream system from several tributaries including Bent Creek, Deep Creek, and Cheyenne Creek, among others.

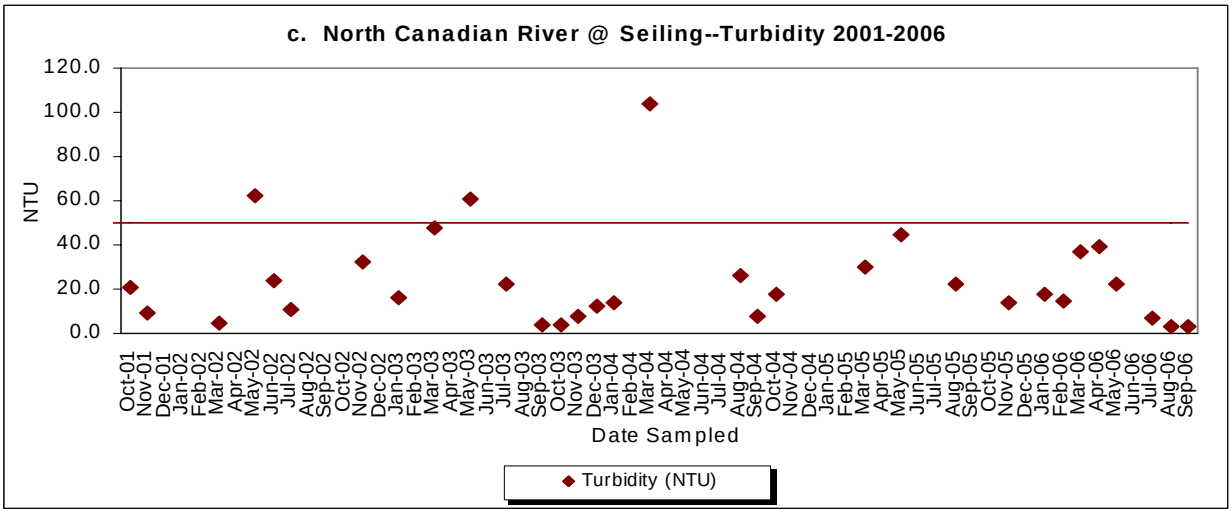
This station on the North Canadian River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the confluence of an unnamed tributary near Mutual, Oklahoma (99.0817, 36.2638) downstream to confluence of the North Canadian River with Canton Lake (98.6641, 36.1355). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 52a), pH (Figure 52b), turbidity (Figure 52c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2006 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 16 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 27. This is above the assigned supporting threshold of 22 for Central Great Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 52d and e). The PBCR beneficial use is not supported (Table 21). Of the fifteen (15) enterococci concentrations, 4 samples exceeded the prescribed screening level of 406cfu/mL, and the geometric mean (224.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 52f).

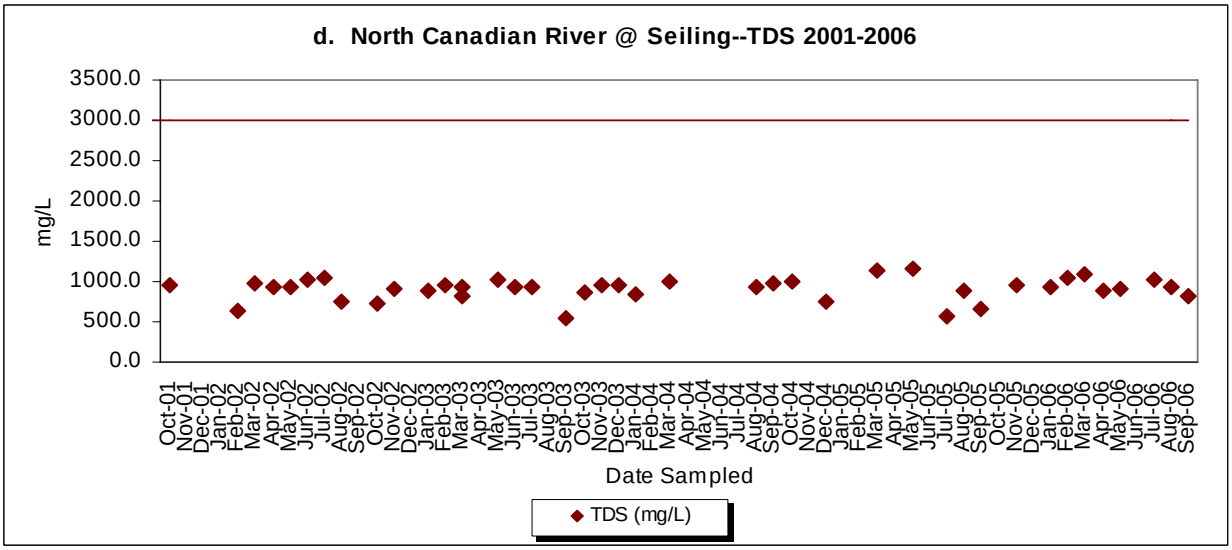
Figure 52 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Seiling (AT238000), 2001-2006.

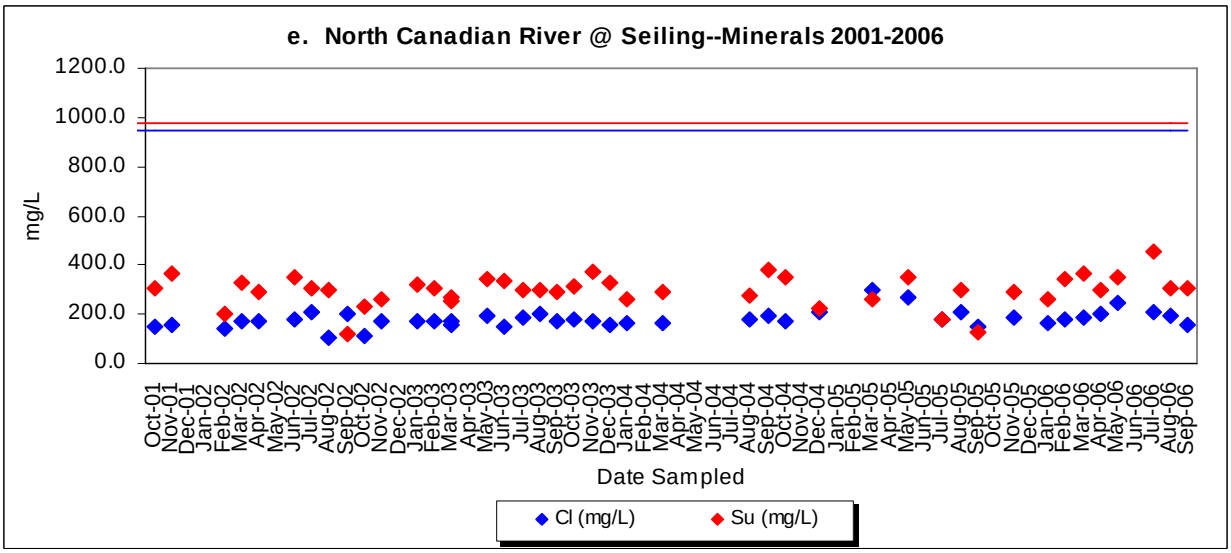


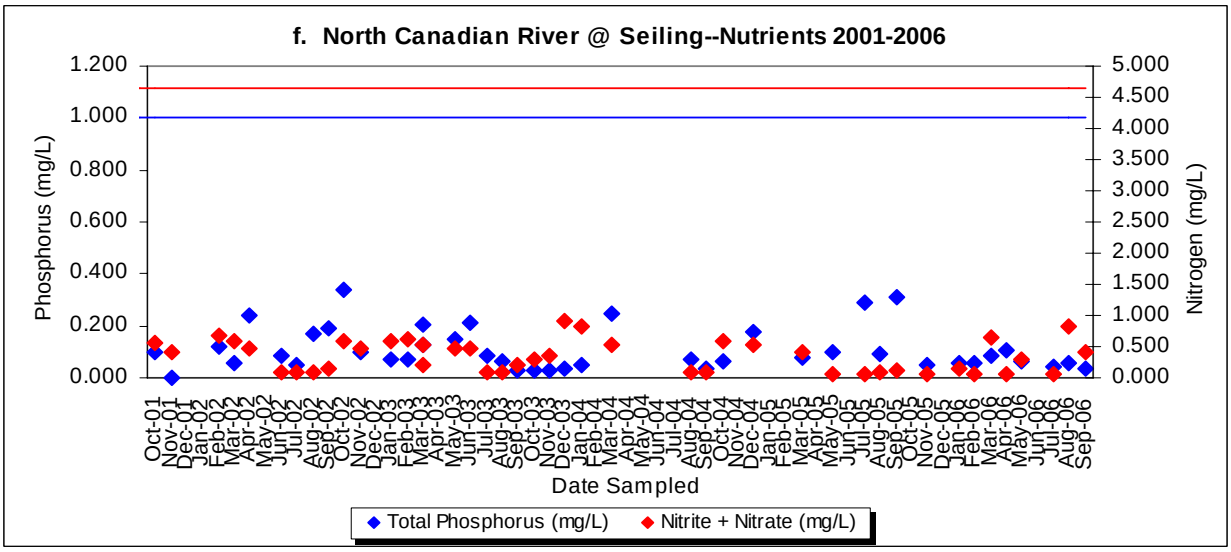




HUC 1110


d. North Canadian River @ Seiling--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Canadian River @ Seiling--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ Seiling--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

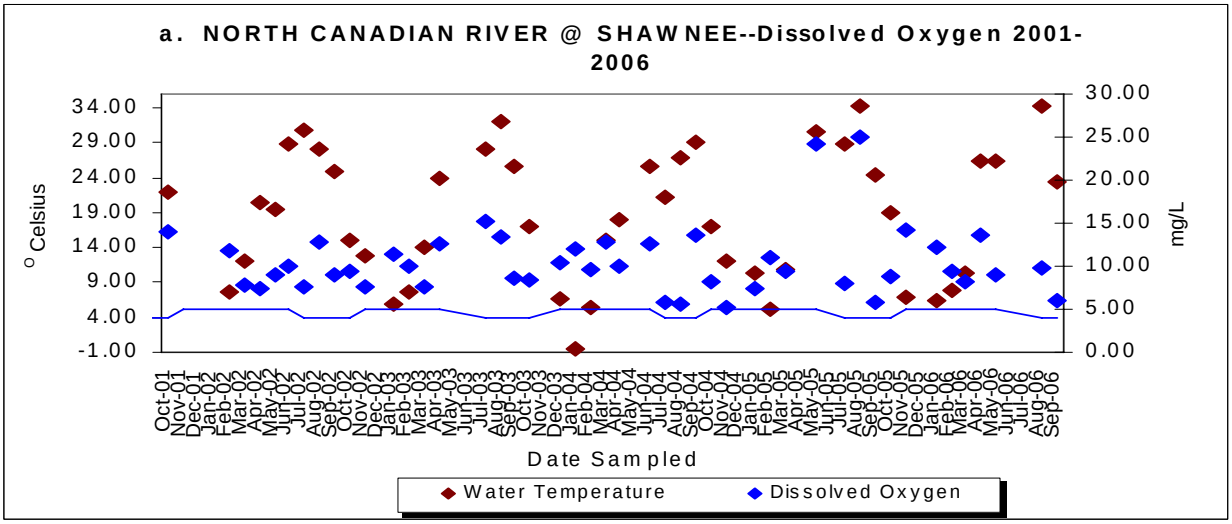
North Canadian River near Shawnee

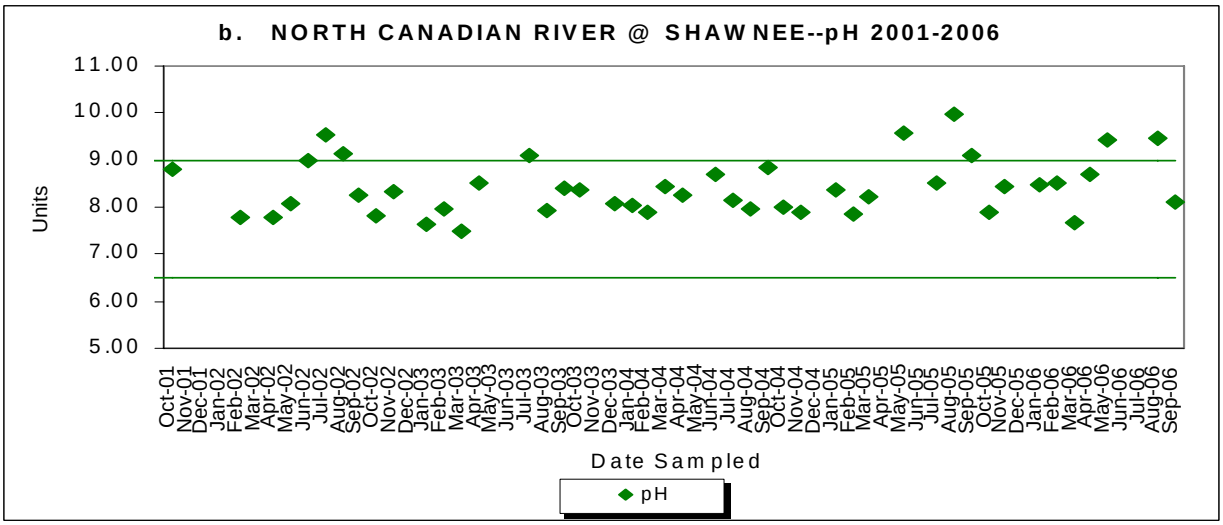
Station AT241700 (520510000110-005AT) is a permanent ambient trend monitoring station located on the North Canadian River in Oklahoma. Situated in the extreme northeast corner of Pottawatomie County, the site was established east of the city of Shawnee off of Interstate 40. In October of 2002, the station was moved to the state highway 3E bridge to facilitate the gathering of discharge data. The station is positioned near the terminal end of stream segment 520510000110 and is classified within the Lower North Canadian River 8 digit HUC watershed (11100302). Water enters the stream system from Shawnee Twin Reservoirs and Tecumseh Lake and from several tributaries including North Deer Creek (Wes Watkins Lake), among others.

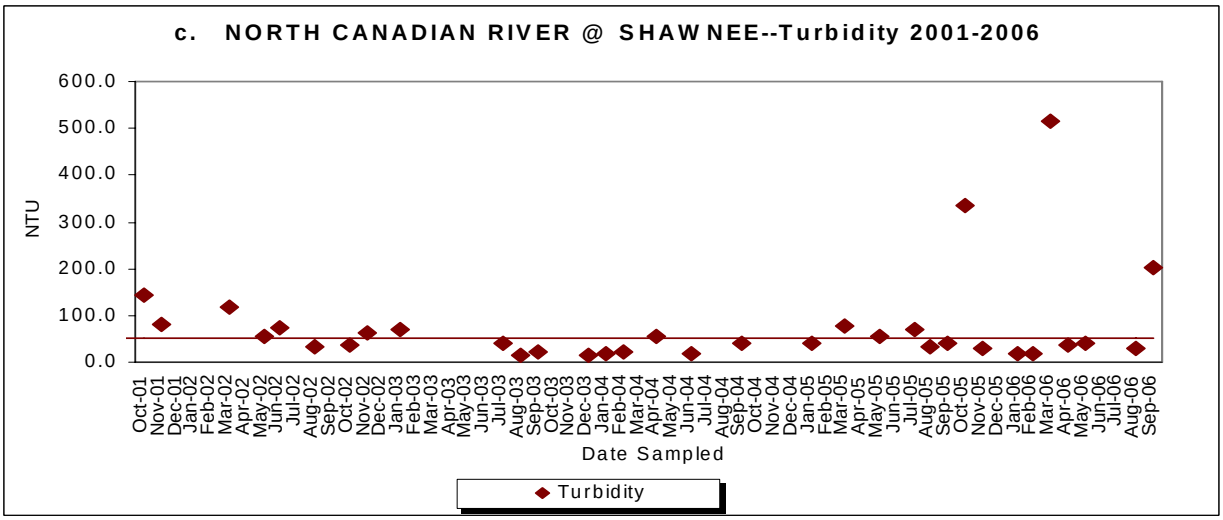
This station on the North Canadian River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the confluence of an unnamed tributary near Horseshoe Lake (97.1797, 35.5027) downstream to the confluence of Turkey Creek with the North Canadian River (96.632, 35.3922). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported. Of thirty-three (33) turbidity samples (Figure 53c), fourteen (14) samples (or 42%) exceeded the numerical criterion of 50 NTU. Of the forty-five (45) pH values (Figure 53b), eight (8) samples (or 34%) exceeded the maximum criterion of 9.0 units. Of the 9 lead samples collected, four (4) of the concentrations (or 44%) exceeded the prescribed, hardness-dependant chronic criterion of 10.51 ug/L (Table 20). Dissolved oxygen (Figure 53a) and organics samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 13 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 24. This is between the assigned non-supporting and supporting thresholds of 20-25 for Central Oklahoma/Texas Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 53d and e). The PBCR beneficial use is not supported (Table 21). Of the eighteen (18) enterococci concentrations, 6 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (87.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is nutrient-threatened. The median of the total phosphorus concentrations (0.853 mg/L) exceeded the threshold median of 0.36 mg/L, and has a mean organic turbidity of 103 NTU. Furthermore, the mean sestonic chlorophyll-a concentration (107.3 mg/M^3) produced a TSI of 76, which is above the threshold TSI of 62. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 53f).

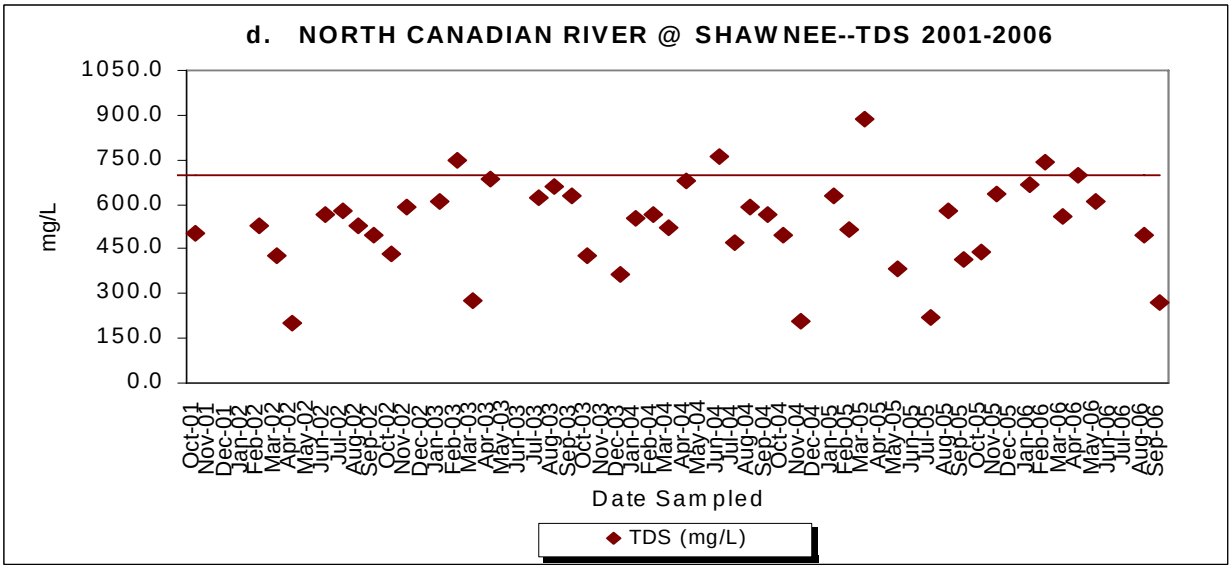
Figure 53 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Shawnee (AT241700), 2001-2006.

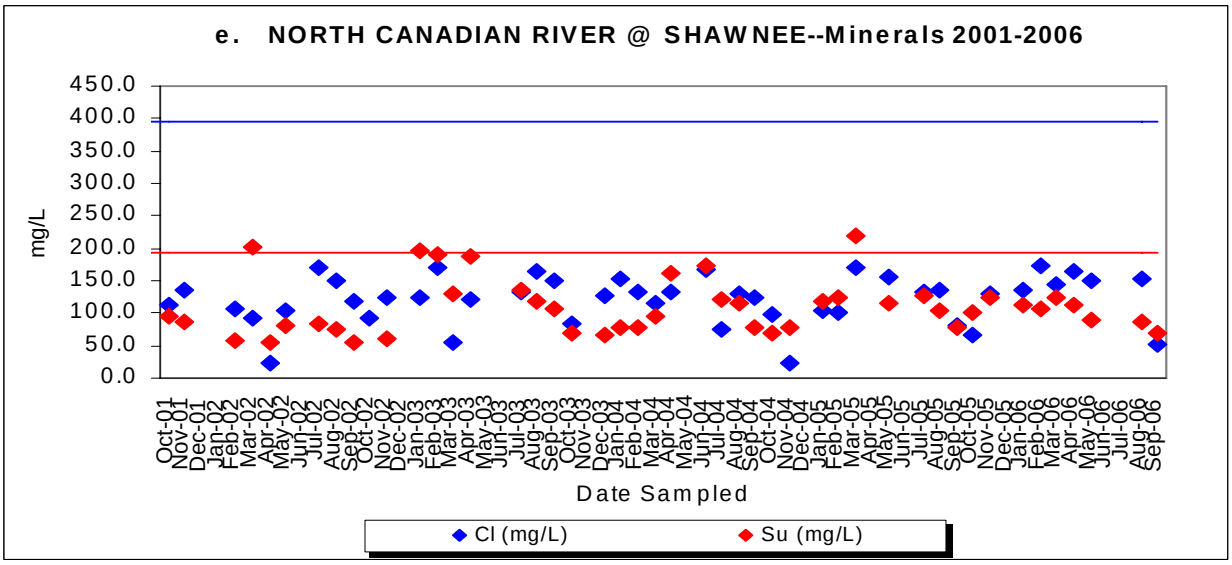


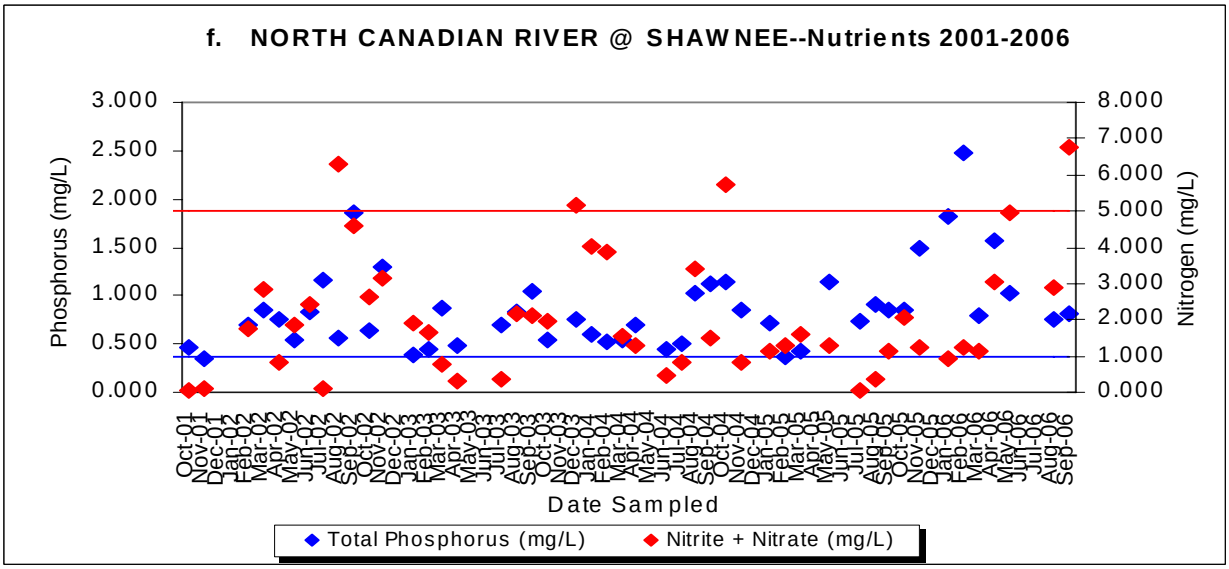




HUC 1110


d. NORTH CANADIAN RIVER @ SHAWNEE--TDS 2001-2006
mg/L
1050.0
900.0
750.0
600.0
450.0
300.0
150.0
0.0
Date Sampled
TDS (mg/L)


e. NORTH CANADIAN RIVER @ SHAWNEE--Minerals 2001-2006
mg/L
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. NORTH CANADIAN RIVER @ SHAWNEE--Nutrients 2001-2006
Phosphorus (mg/L)
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

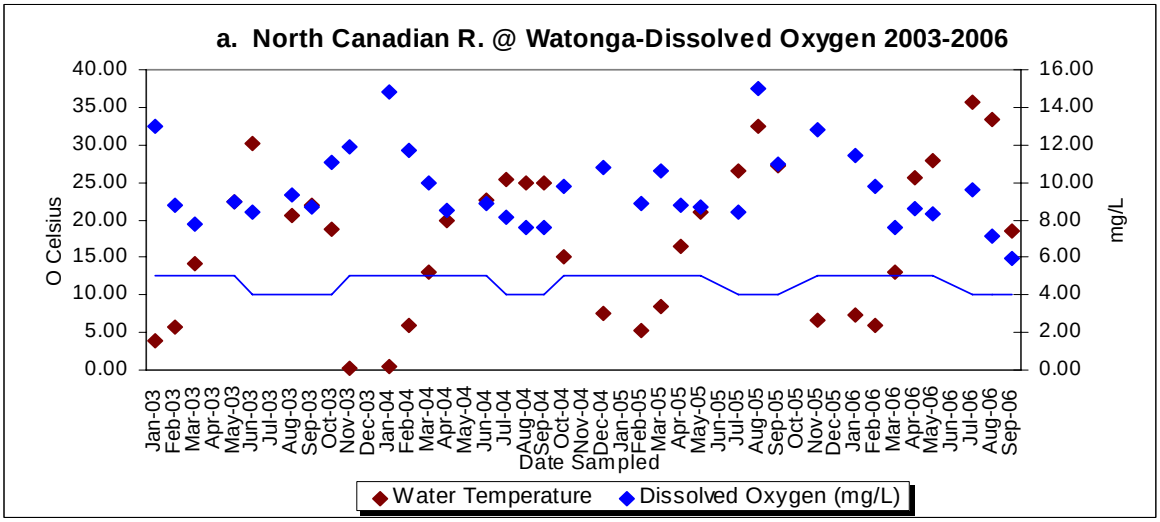
North Canadian River near Watonga

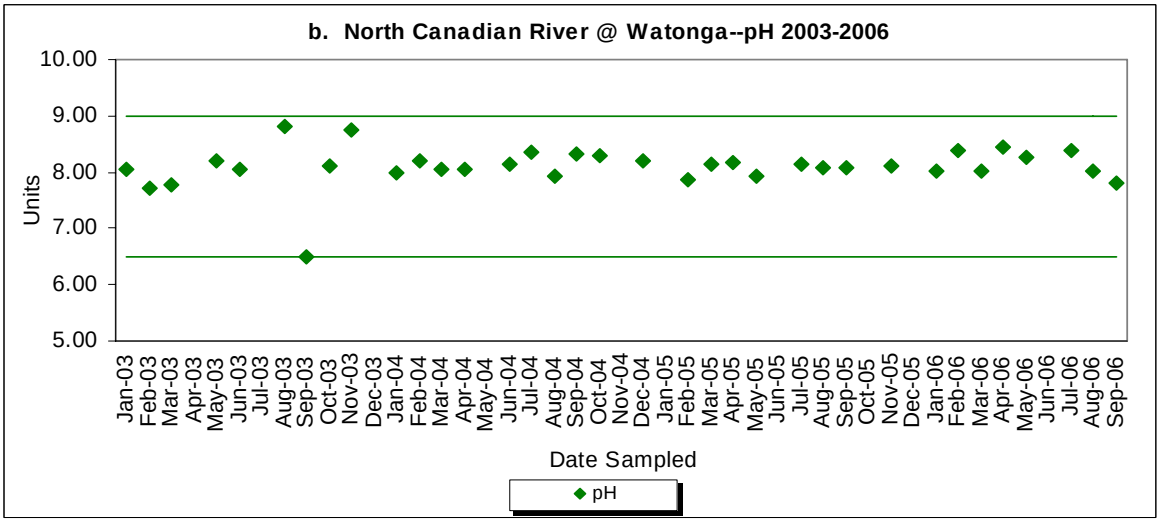
Station AT239300 (520530000010-002AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the central portion of Blaine County, the site was established south of the town of Watonga on US Highway 270. The station is positioned between the upper end and the midpoint of stream segment 520530000010 and is classified within the Middle North Canadian River 8 digit HUC watershed (11100301). Water enters the stream system from several tributaries including Canton Lake, Minnehaha Creek, Ninemile Creek, and Weavers Creek, among others.

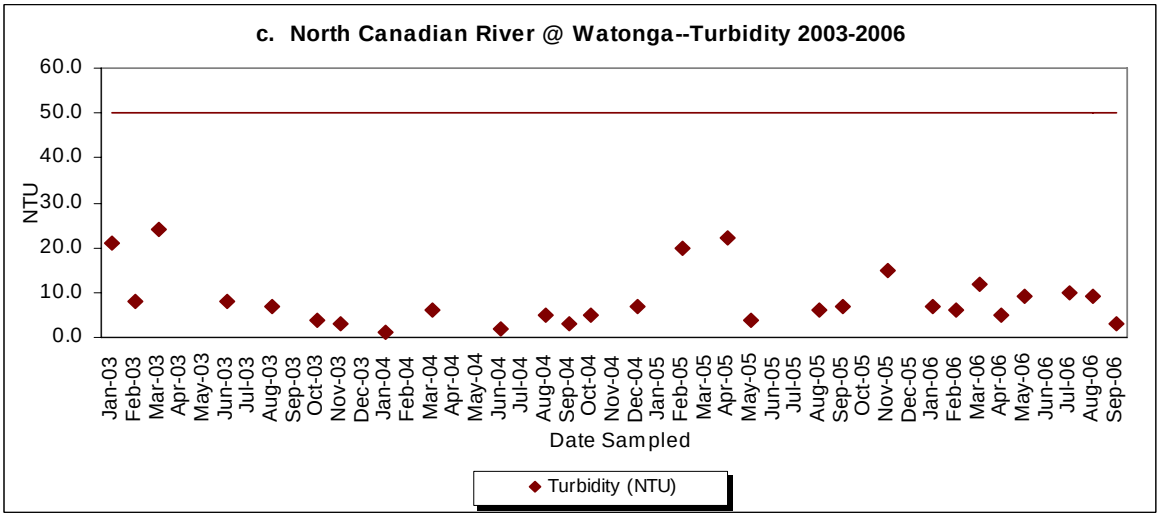
This station on the North Canadian River has been active for all water quality variables since January of 2003. The following assessment of beneficial uses is based on data collected from January of 2003 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the Canton Lake dam near Canton, Oklahoma (98.6019, 36.0813) downstream to where it intersects the Canadian/Blaine County Line (98.3134, 35.7180). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 54a), pH (Figure 54b), turbidity (Figure 54c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 54d and e). The PBCR beneficial use is not supported (Table 21). Of the seven (7) fecal coliform concentrations, five (5) samples (or 50% of the required 10) exceeded the prescribed screening level of 400 cfu/mL and the geometric mean (820.4 mg/L) exceeded the prescribed mean standard of 400 mg/L. Of the eight (8) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406cfu/mL, and the geometric mean (242.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 8 *E. coli* concentrations, four (4) samples exceeded the prescribed screening level of 406cfu/mL, and the geometric mean (257.5 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the North Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 54f).

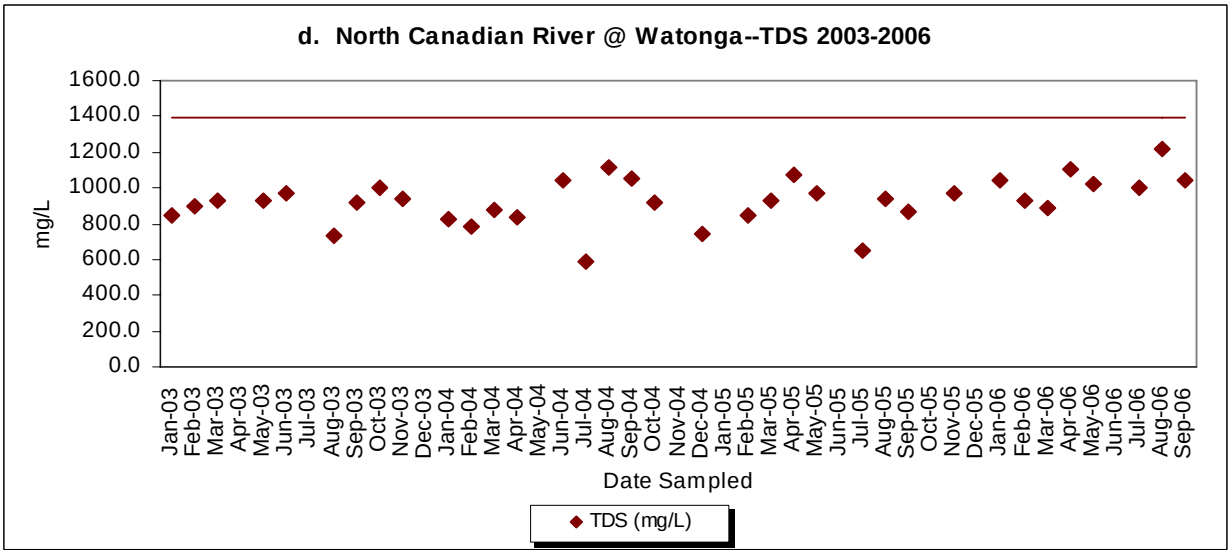
Figure 54 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Watonga (AT2393000), 2003-2006.

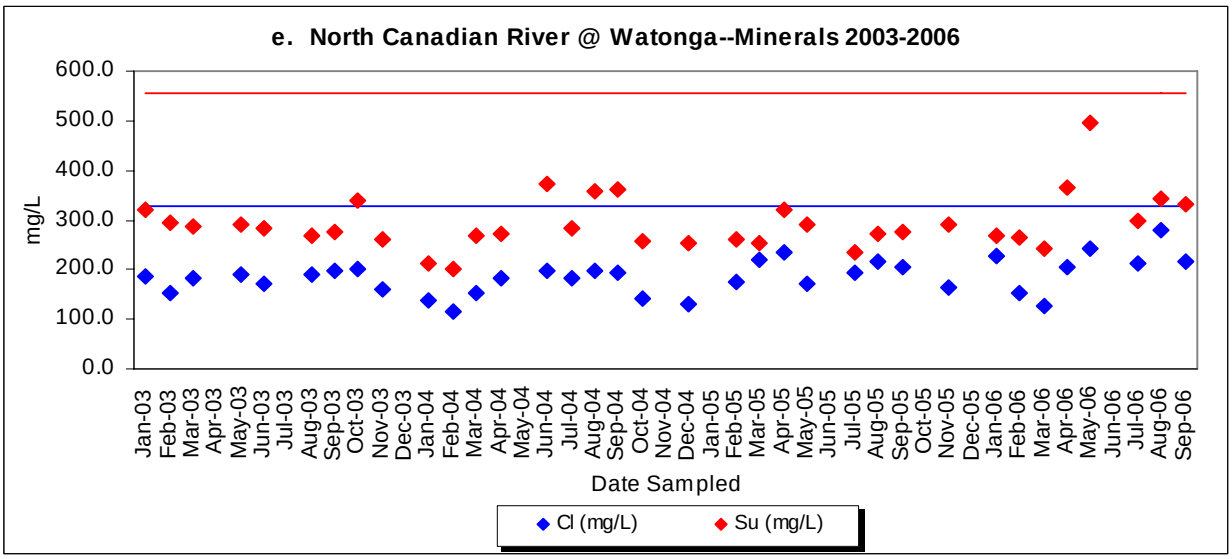


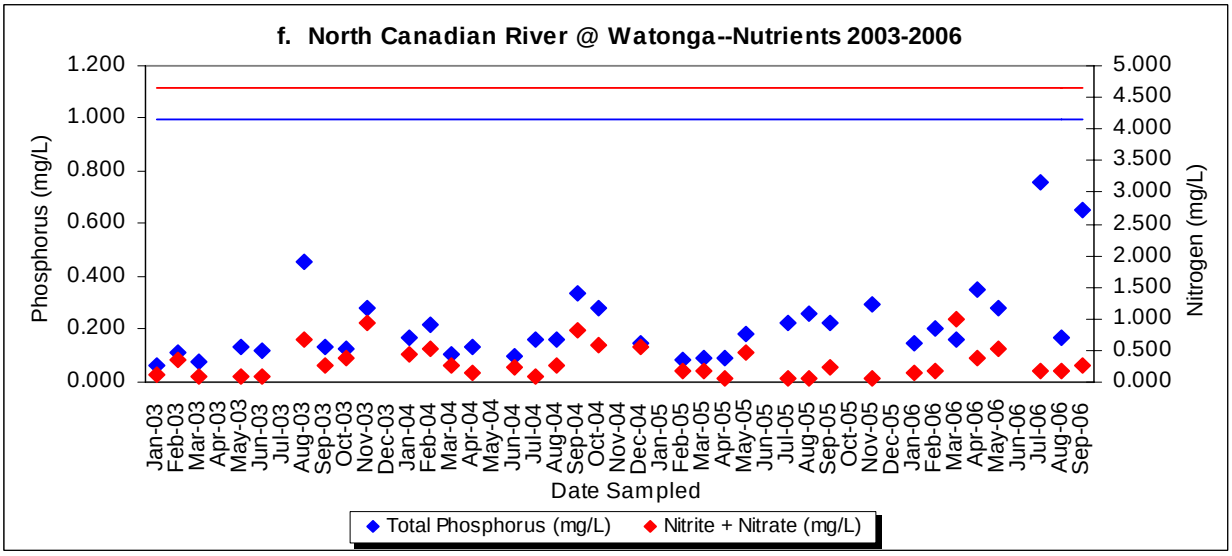




HUC 1110


d. North Canadian River @ Watonga--TDS 2003-2006
mg/L
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


e. North Canadian River @ Watonga--Minerals 2003-2006
mg/L
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ Watonga--Nutrients 2003-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

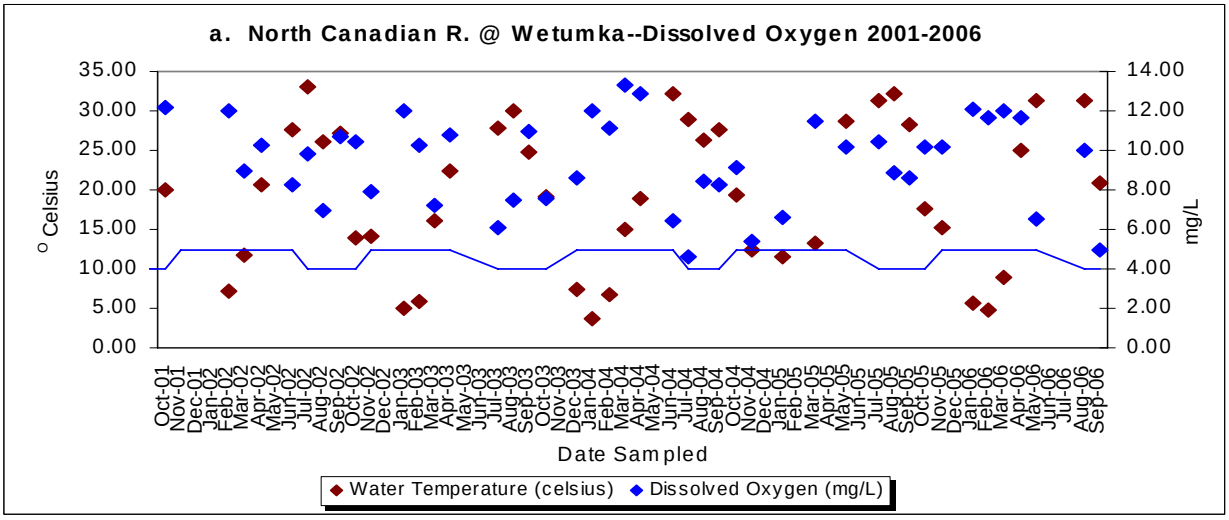
North Canadian River near Wetumka

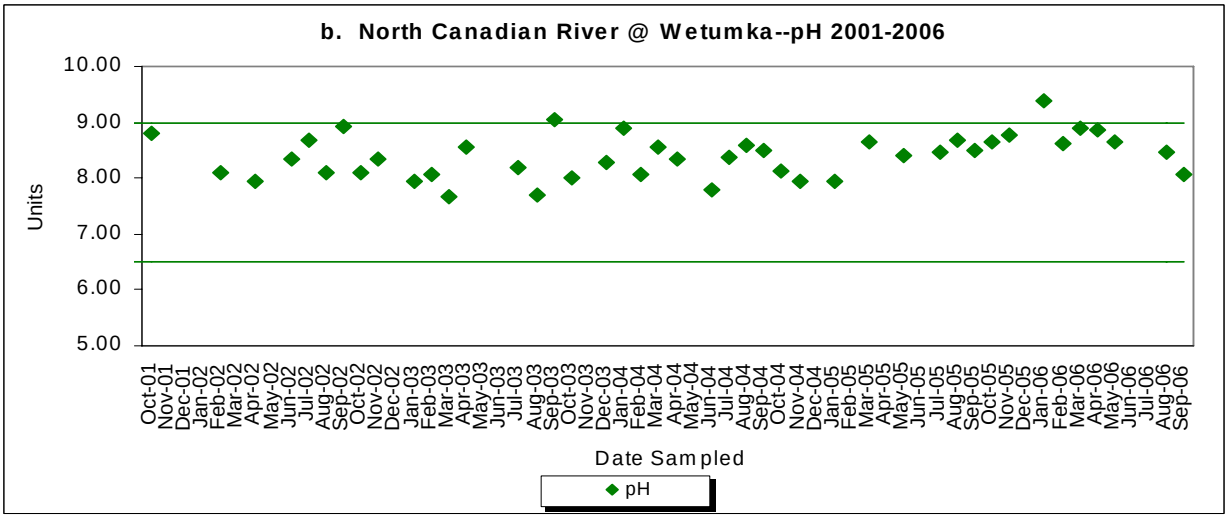
Station AT242000 (520510000010-001AT) is a permanent ambient trend monitoring station located on the North Canadian River. Situated in the north central portion of Hughes County, the site was established northeast of the city of Wetumka on US Highway 75. The station is positioned near the upper end of stream segment 520510000010 and is classified within the Lower North Canadian River 8 digit HUC watershed (11100302). Water enters the stream system from Cohee Lake and Lake Wetumka and from several tributaries including Turkey Creek, Sand Creek, Flat Rock Creek, among others.

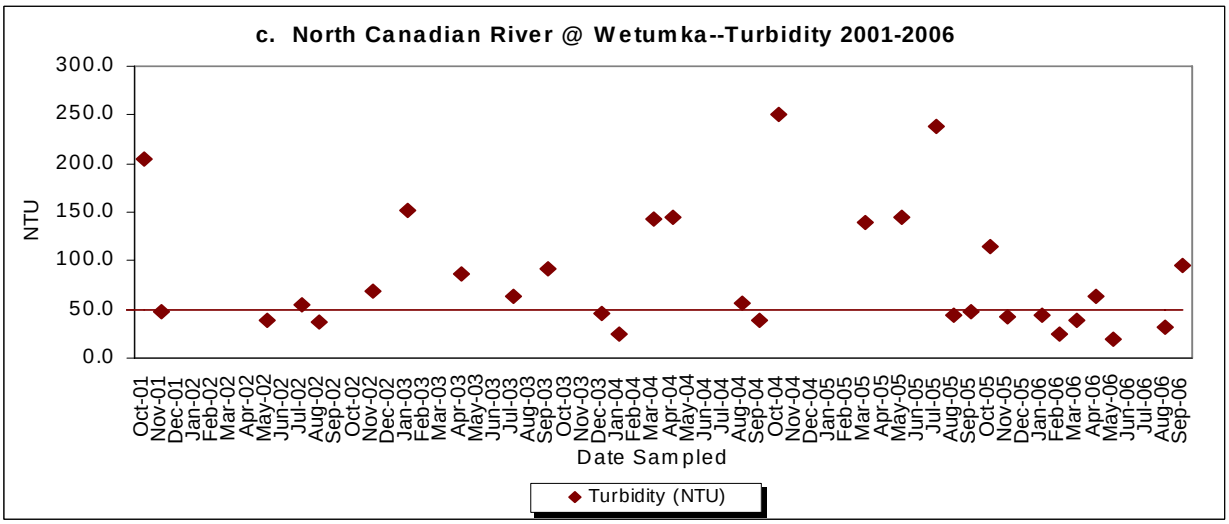
This station on the North Canadian River has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Canadian River from the confluence of Sand Creek (96.3996, 35.3964) downstream to above the confluence of Wewoka Creek with the North Canadian River (96.1690, 35.2556). As per Appendix A, Table 5 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-one (31) segment wide turbidity samples (Figure 55c), seventeen (17) samples (or 55%) exceed the numerical criteria of 50 NTU. Of the ten (10) lead samples collected, three (3) of the concentrations (or 30%) exceeded the prescribed, hardness-dependant chronic criterion of 8.35 ug/L (Table 20). Dissolved oxygen (Figure 55a) and pH (Figure 55b) samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 9 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 20. This is between the assigned non-supporting and supporting thresholds of 20-25 for Central Oklahoma/Texas Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 55d and e). The PBCR beneficial use is not supported (Table 21). Of the sixteen (16) fecal coliform concentrations, 5 samples (or 31%) exceeded the prescribed screening level of 400 cfu/mL. Of the 16 enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (196.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is nutrient-threatened. The median of the segment wide total phosphorus concentrations (0.756 mg/L) exceeded the threshold median of 0.36 mg/L. Furthermore, the mean sestonic chlorophyll-a concentration (106.0 mg/M^3) produced a TSI of 76, which is above the threshold TSI of 62. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 55f).

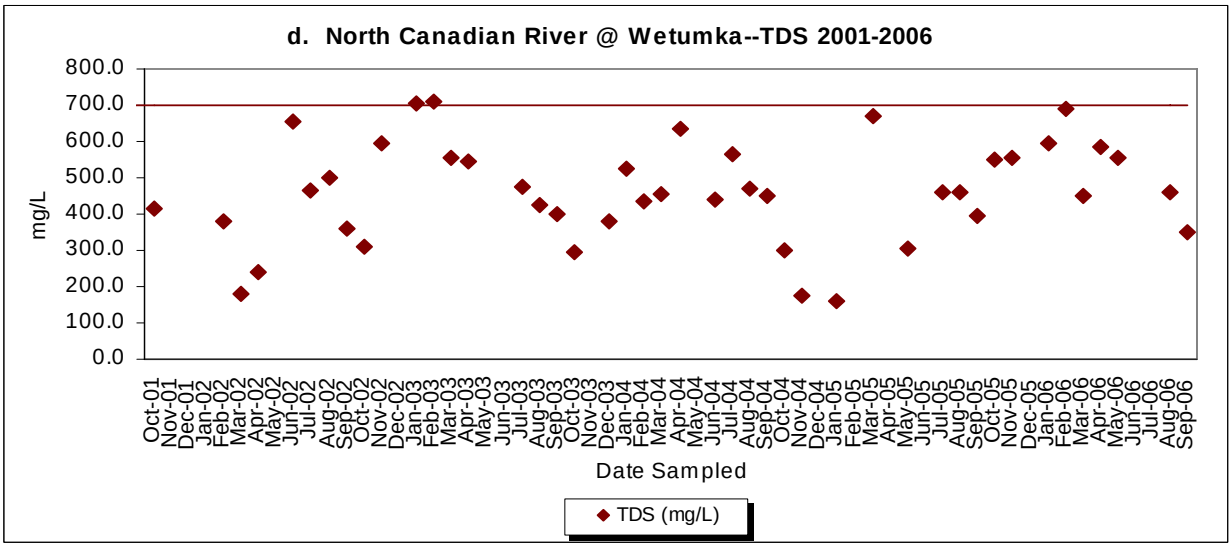
Figure 55 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Wetumka (AT242000), 2001-2006.

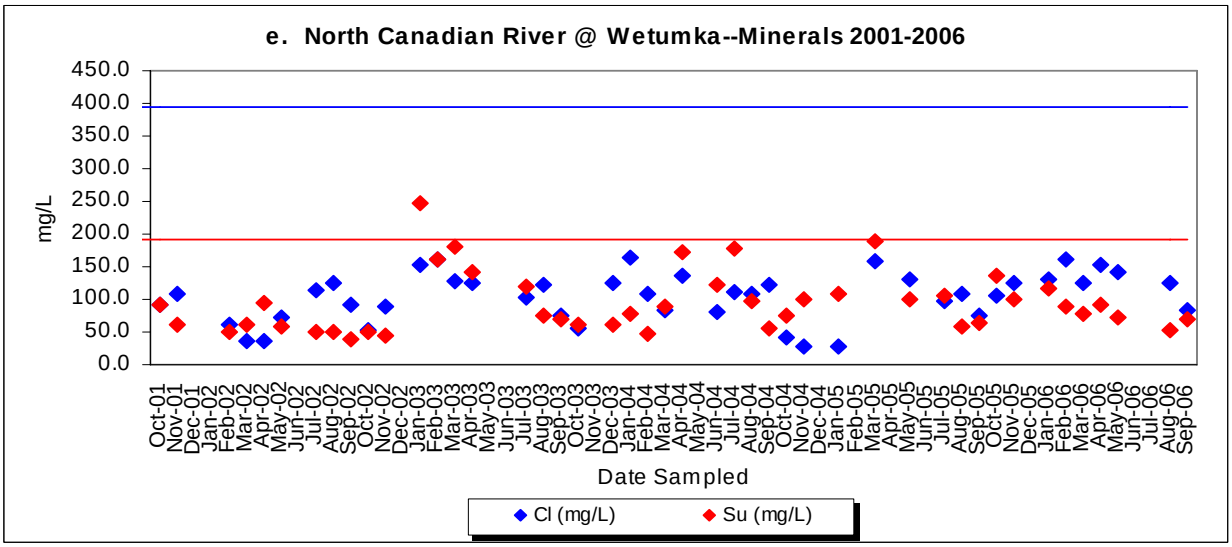


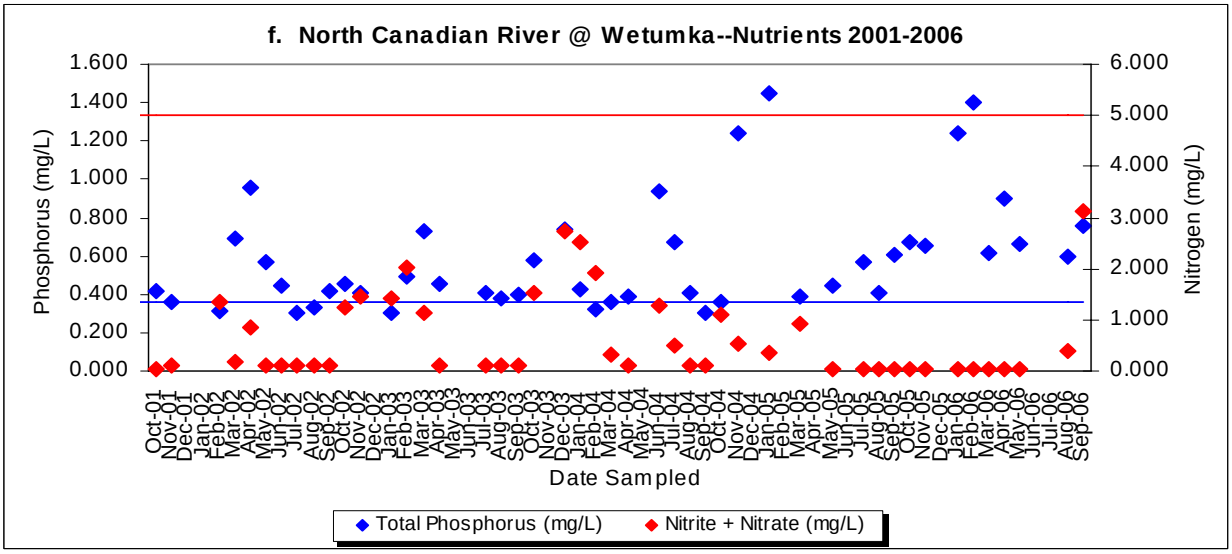




HUC 1110


d. North Canadian River @ Wetumka--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Canadian River @ Wetumka--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Canadian River @ Wetumka--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

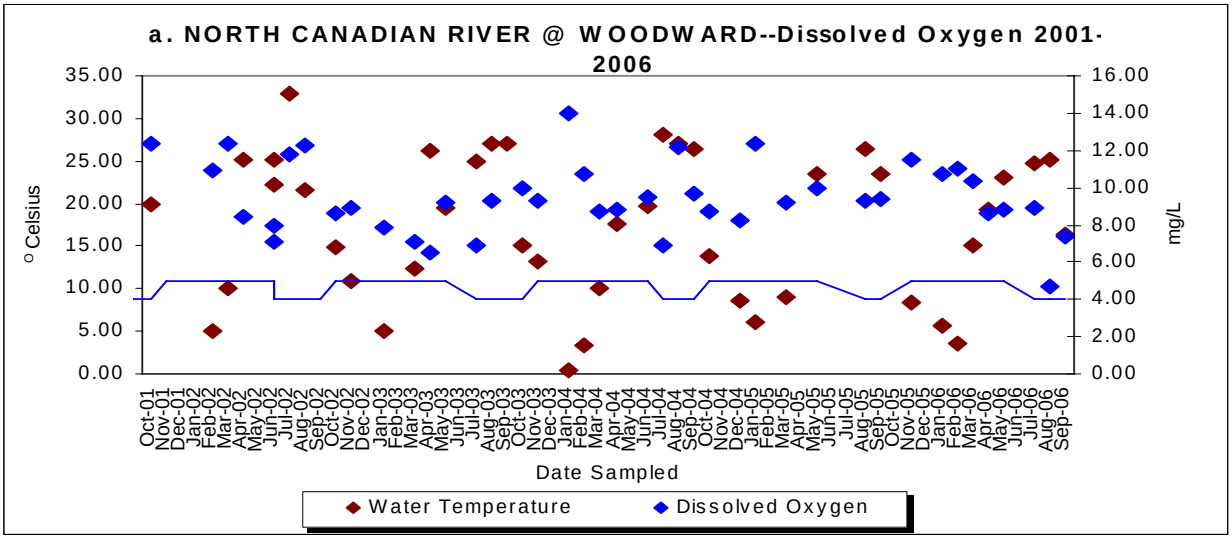
North Canadian River near Woodward

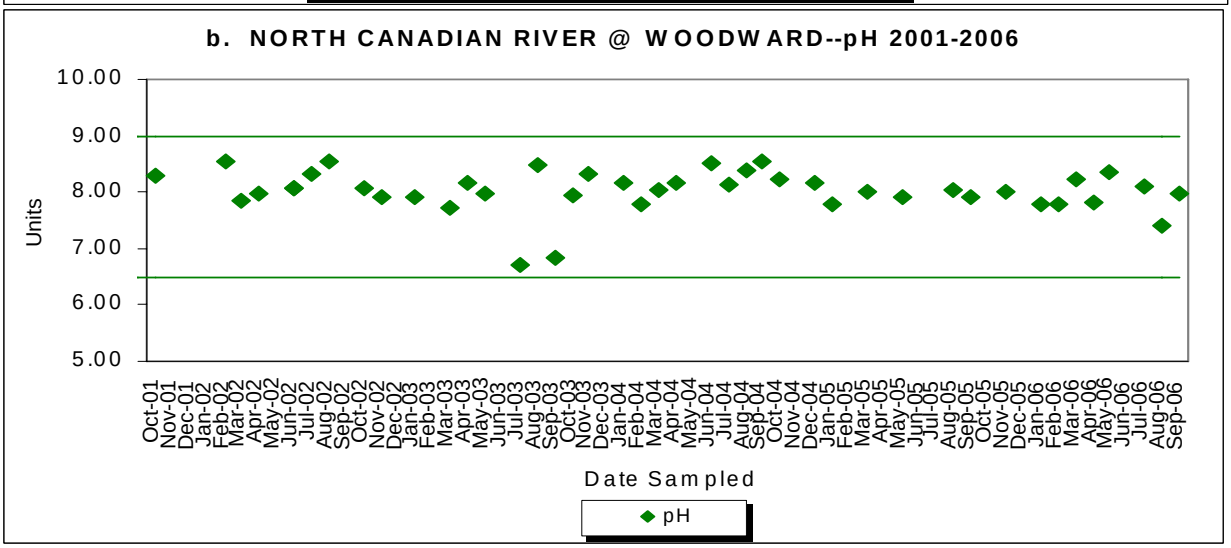
Station AT237500 (720500010140-001AT) is a permanent ambient trend monitoring station located on the North Canadian River in Oklahoma. Situated in the center portion of Woodward County, the site was established east of the city of Woodward on US Highway 412. The station is positioned near the terminal end of stream segment 720500010140 and is classified within the Middle North Canadian River 8 digit HUC watershed (11100301). Water enters the stream system from Clear Creek and Otter Creek, among others.

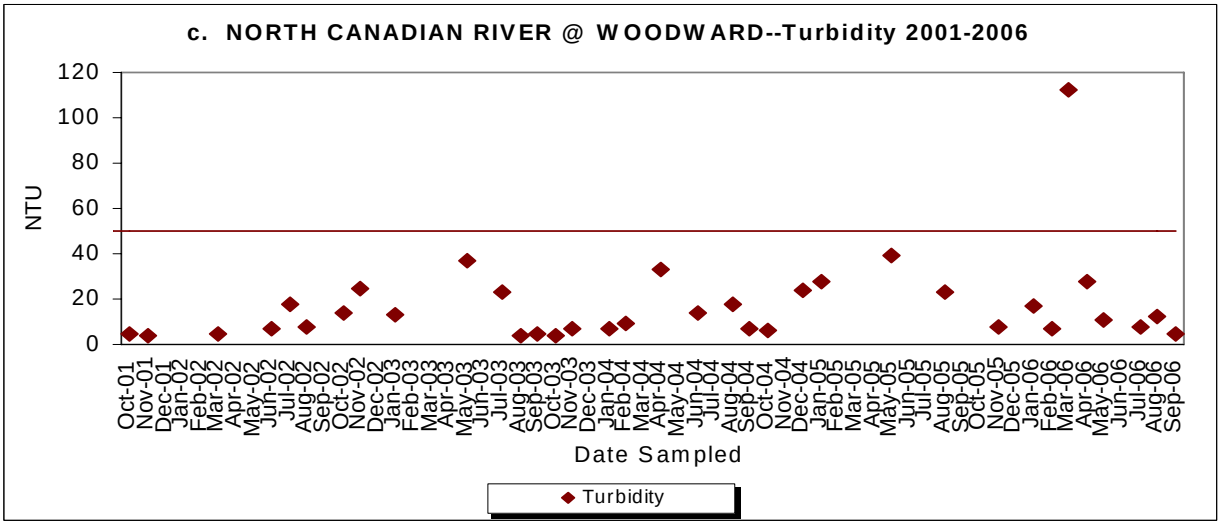
This station on the North Canadian River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Beaver River from the confluence of Wolf Creek (99.5019, 36.5886) downstream to the confluence of an unnamed tributary near Mutual, Oklahoma (99.0817, 36.2638). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 2) Agriculture—Class III Irrigation (AG), and 3) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 56a), pH (Figure 56b), turbidity (Figure 56c), and toxicant data met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 56d and e). The PBCR beneficial use is not supported (Table 21). Of the seventeen (17) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (377.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Canadian River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 56f).

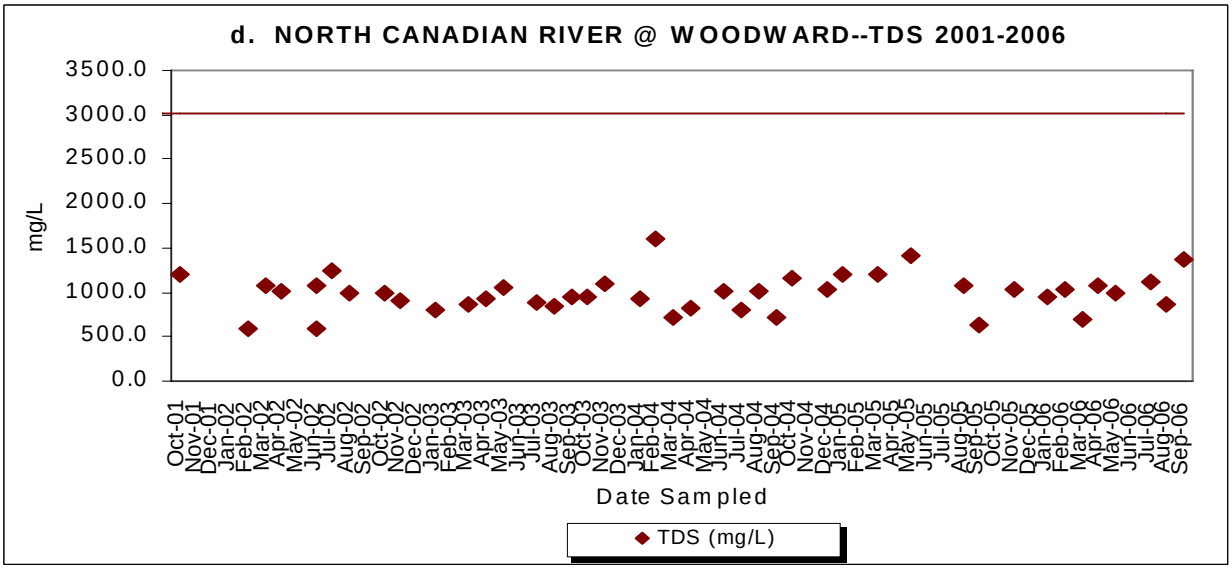
Figure 56 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Canadian River at Woodward (AT237500), 2001-2006.

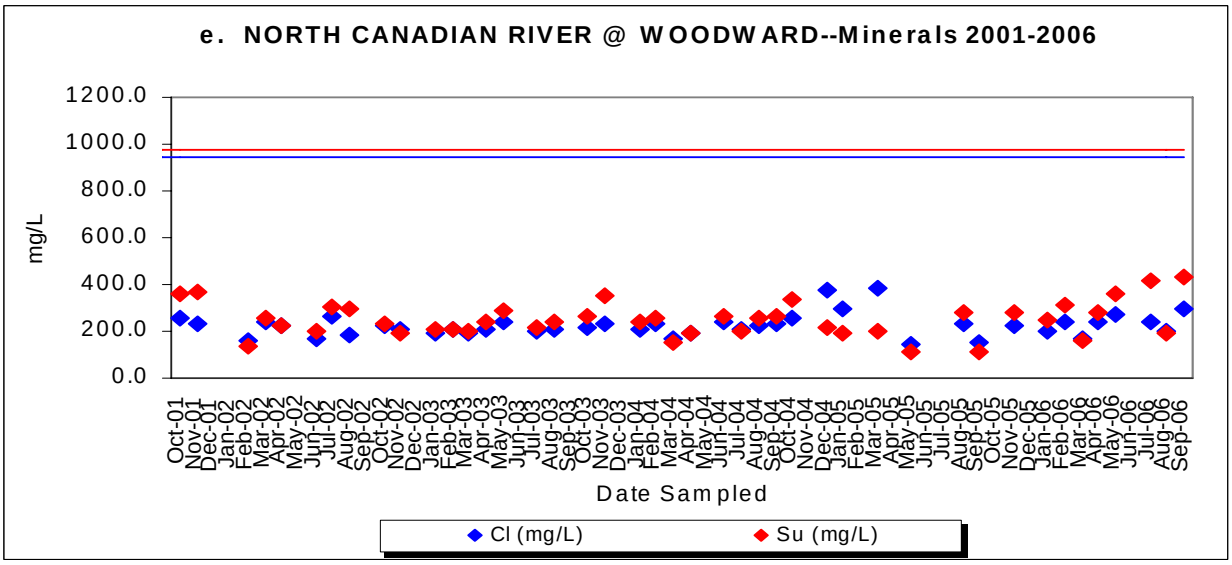


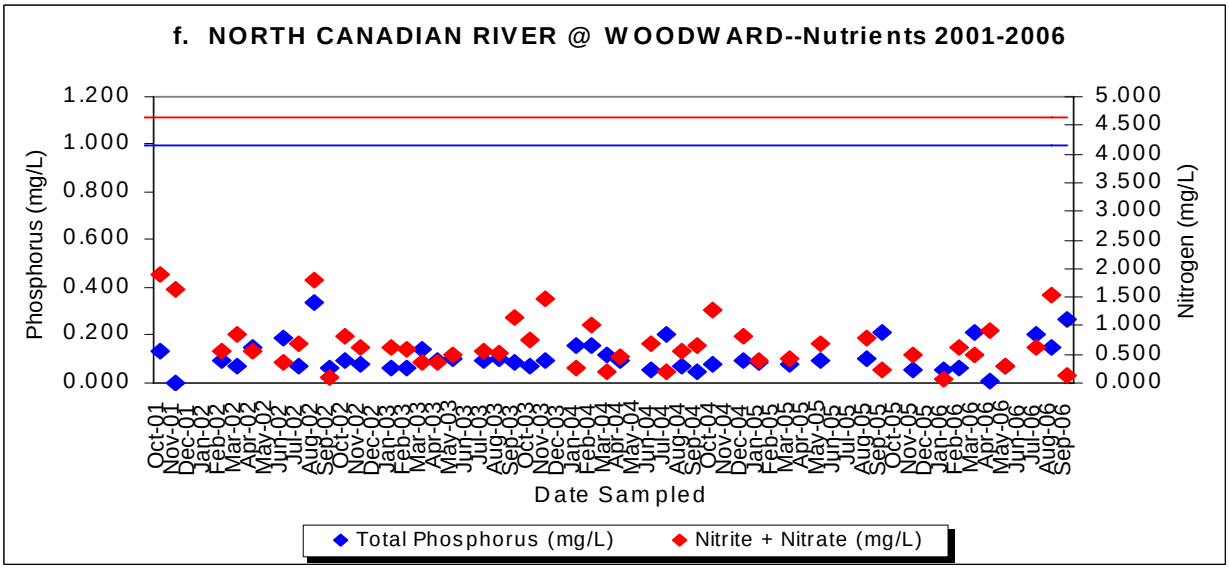




HUC 1110


d. NORTH CANADIAN RIVER @ WOODWARD--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. NORTH CANADIAN RIVER @ WOODWARD--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. NORTH CANADIAN RIVER @ WOODWARD--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

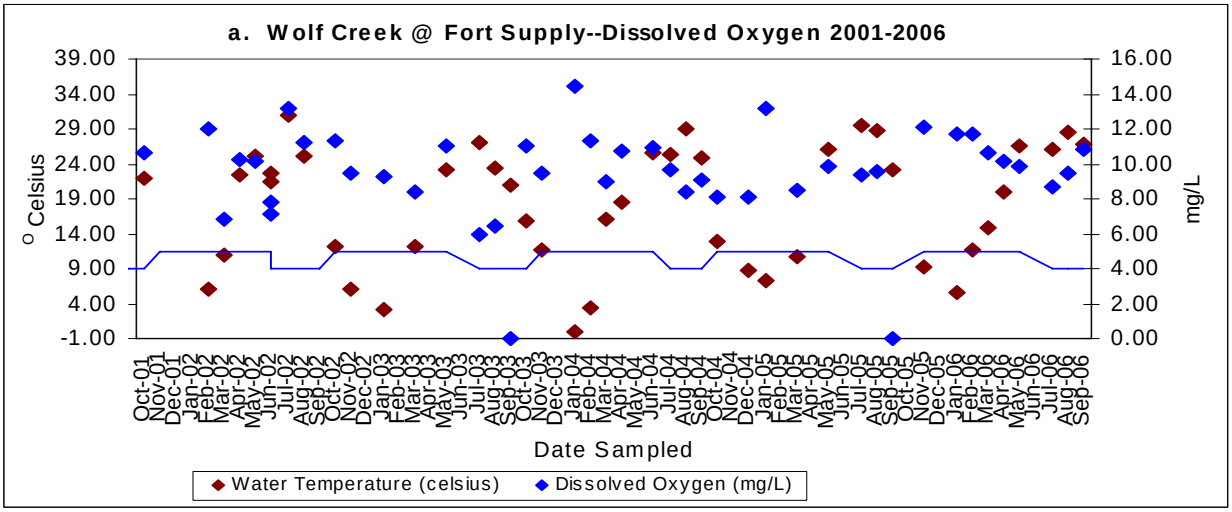
Wolf Creek near Fort Supply

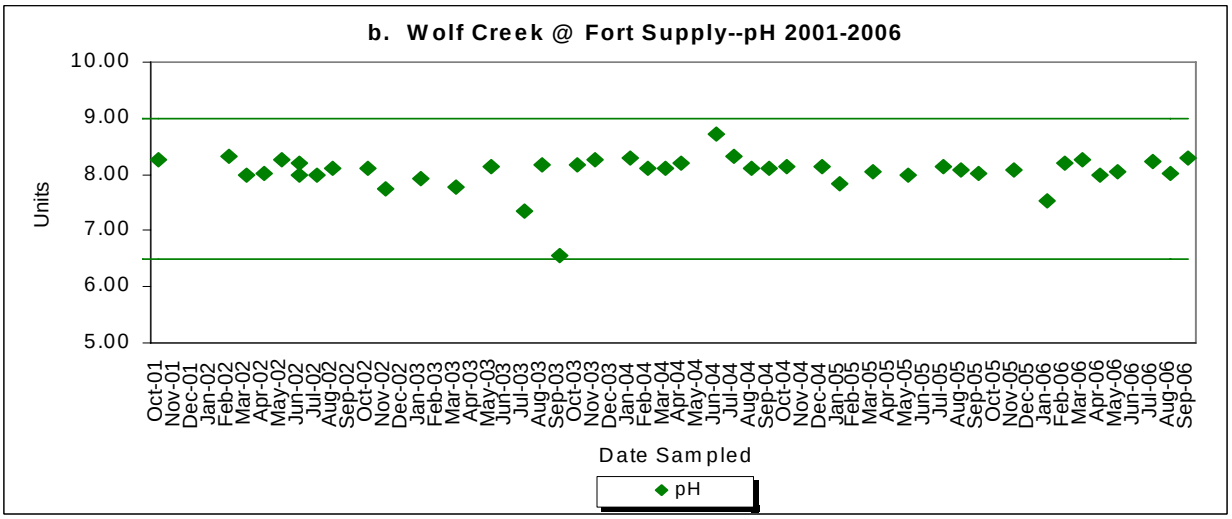
Station AT237050 (720500030010-001AT) is a permanent ambient trend monitoring station located on Wolf Creek in Oklahoma. Situated in the west central portion of Woodward County, the site was established south of the town of Fort Supply off US Highway 270. The station is positioned near the terminal end of stream segment 720500030010 and is classified within the Lower Wolf Creek 8 digit HUC watershed (11100203). Water enters the stream system from Texas and from several tributaries including Twenty-five Mile Creek, Little Wolf Creek, and Sixteen-mile Creek, among others.

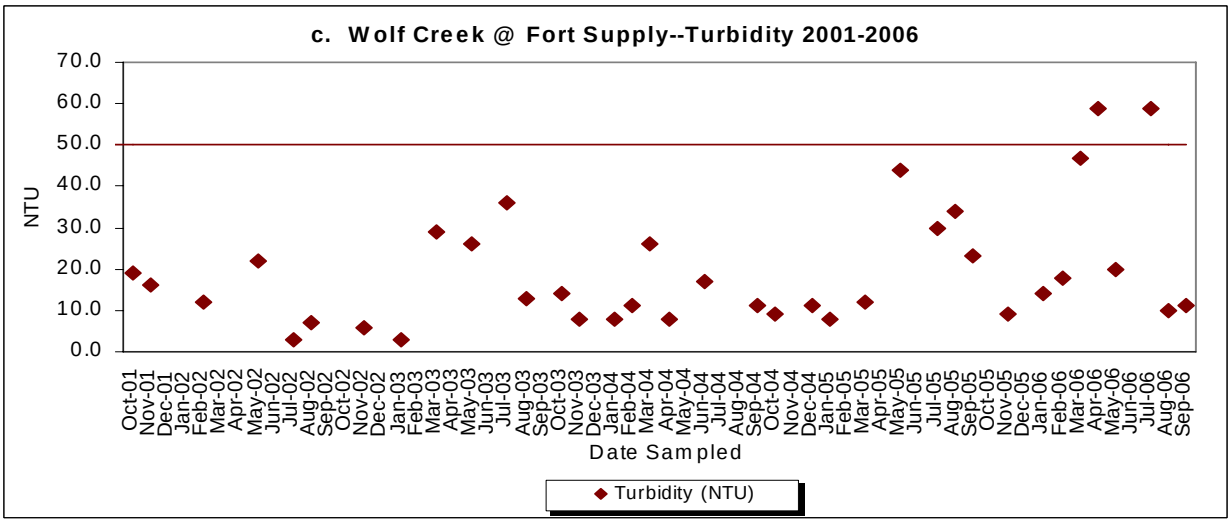
This station on Wolf Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Wolf Creek from the confluence of Twenty-five Mile Creek (99.7333, 36.3337) downstream to confluence of Wolf Creek with Fort Supply Reservoir (99.5762, 36.5094). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 57a), pH (Figure 57b), turbidity (Figure 57c), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 57d and e). The PBCR beneficial use is not supported (Table 21). Of the seventeen (17) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (475.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Wolf Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 57f).

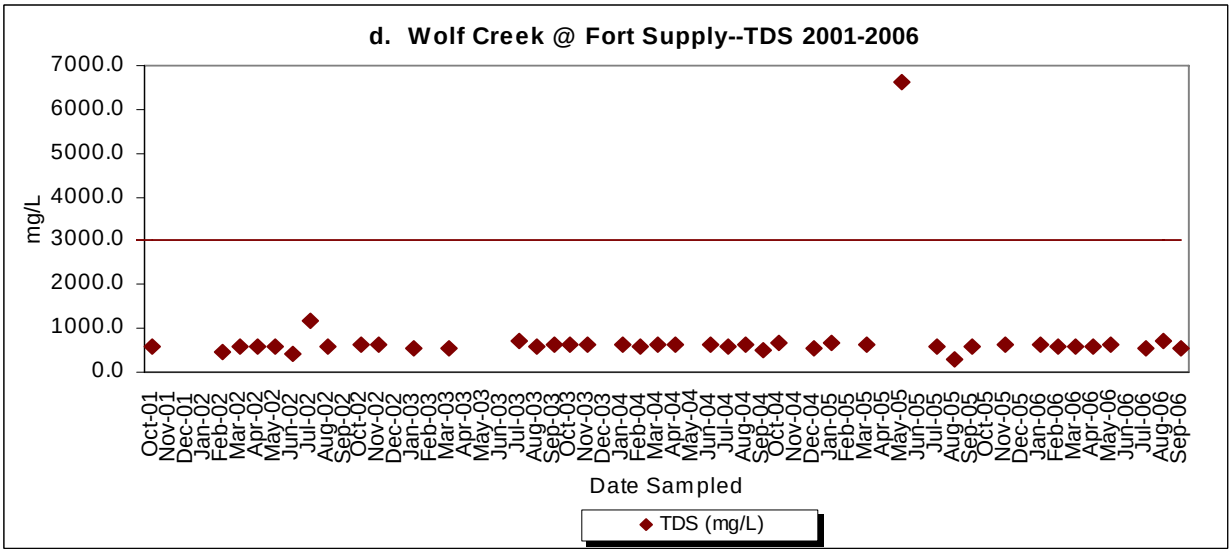
Figure 57 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Wolf Creek at Fort Supply (AT237050), 2001-2006.

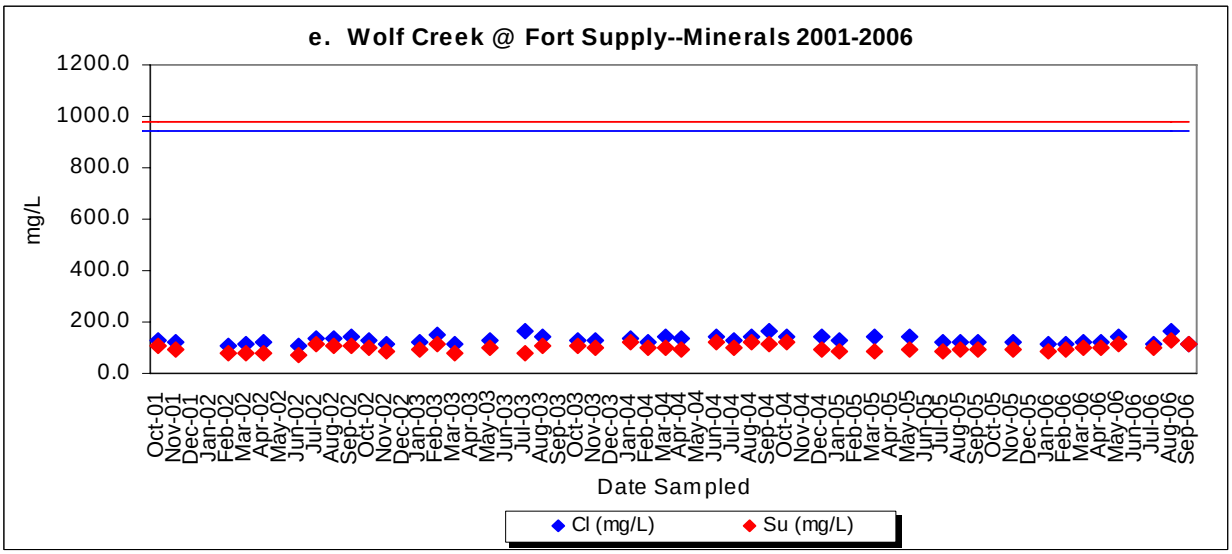


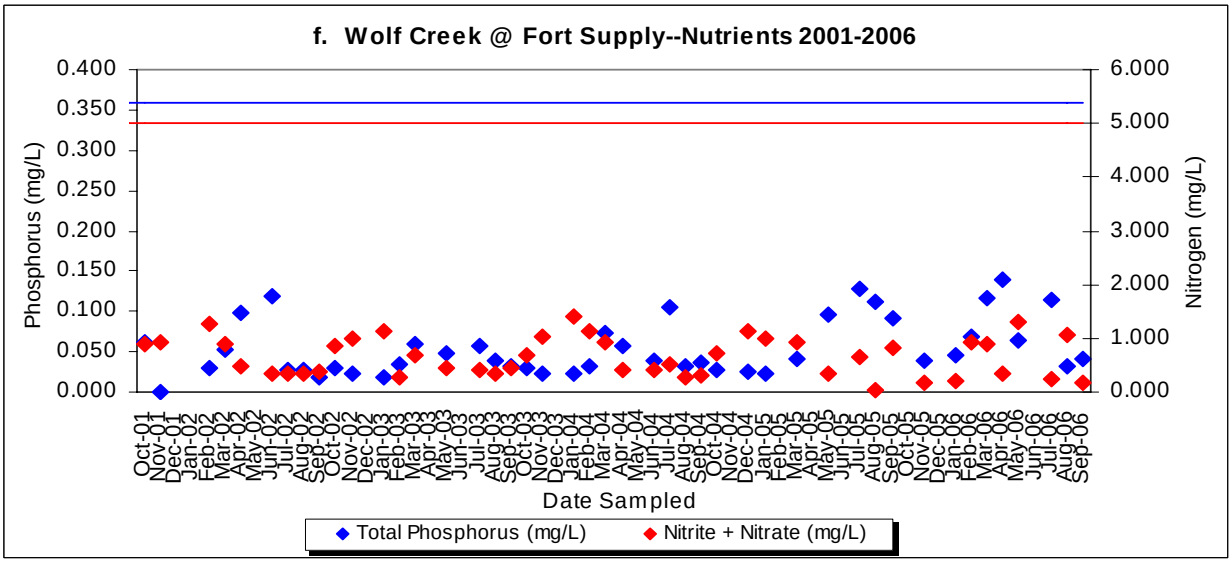




HUC 1110


d. Wolf Creek @ Fort Supply--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Wolf Creek @ Fort Supply--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Wolf Creek @ Fort Supply--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1110

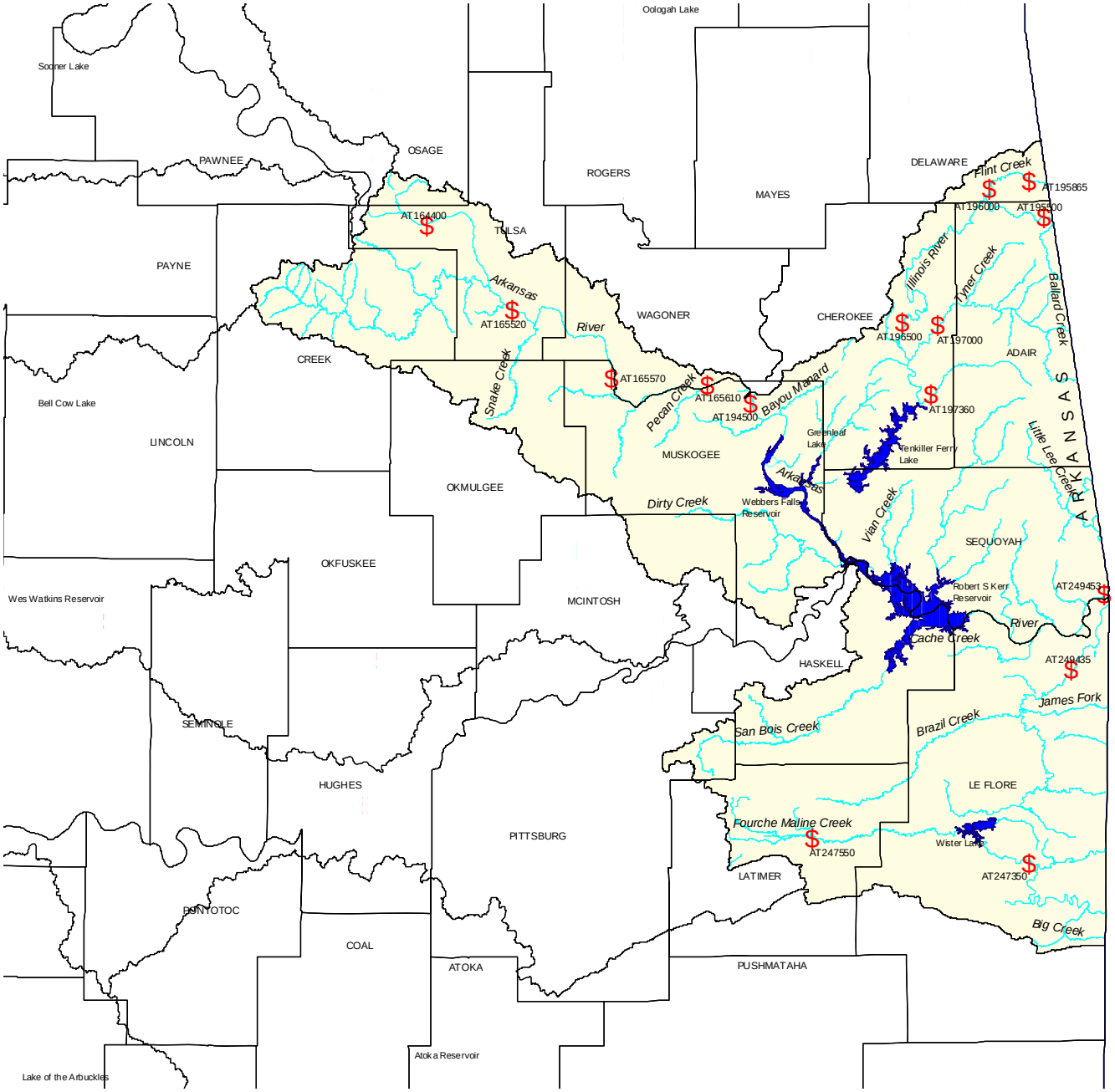


Plate 63
LOWER ARKANSAS SUBBASIN (HUC 1111)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1111

LOWER ARKANSAS SUB-BASIN

The Lower Arkansas sub-basin (4-digit hydrologic unit 1111) is situated in the central eastern portion of the state. It originates in the western portion of Creek and Tulsa Counties, continues eastward through portions of Okmulgee, Wagoner, Muskogee, McIntosh, Cherokee, Delaware, Haskell, and Latimer Counties, and terminates in the eastern parts of Adair, Sequoyah, and LeFlore Counties. Major cities and County seats located within the basin include Sand Springs, Tulsa, Broken Arrow, Sapulpa, Jenks, Glenpool, Bixby, Coweta, Muskogee, Tahlequah, Stillwell, Sallisaw, Wilburton, and Poteau. Minor cities of note include Kellyville, Haskell, Checotah, Warner, Gore, Roland, Heavener, and Spiro.

The basin is subdivided into five 8-digit hydrologic units (HUC) within the state. These HUC's are the Polecat–Snake (11110101), the Dirty–Greenleaf (11110102), the Illinois (11110103), the Robert S. Kerr Reservoir (11110104), and the Poteau (11110105). The major surface water in the basin is the lower Arkansas River (McClellan-Kerr Navigational System). Major tributaries include the Illinois River, the Poteau River, Polecat Creek, Bayou Manard, Greenleaf Creek, Sager Creek, Flint Creek, Barren Fork, Caney Creek, Dirty Creek, Sallisaw Creek, Big Skin Bayou, Lee Creek, Cache Creek, San Bois Creek, Brazil Creek, Fourche-Maline Creek, Caston Creek, Black Fork, and James Fork. Five major lakes are located in the basin—Heyburn Lake formed by Polecat Creek, Webbers Falls Reservoir formed by the Arkansas River and Greenleaf Creek, Tenkiller Ferry Lake formed by the Illinois River and Caney Creek, Robert S. Kerr Reservoir formed by the Arkansas River and several tributaries, and Wister Lake formed by the Poteau River and Fourche-Maline Creek. Fifteen active permanent monitoring stations (Table 22) are located in the basin—AT164400, AT165520, AT165570, AT194500, AT195500, AT195865, AT196000, AT196500, AT197000, AT197360, AT247350, AT247550, AT249435, AT249453, and AT249800. Station AT249800, Lee Creek near Short, was added in the beginning of 2003 and will not be assessed in this report due to lack of data. One inactive water quality-monitoring station (AT165610) is located in the sub-basin. This station was last assessed in the 2000 BUMP Report.

The basin is characterized by five ecoregions. The Central Irregular Plains begins in eastern Okmulgee County, covers the majority of Muskogee County, and continues through parts of McIntosh, Delaware, Sequoyah and eastern Cherokee Counties. The Ozark Highlands begins in Delaware County, continuing through the northern one-half (½) of Adair County, and is also in northern Cherokee County. The Boston Mountains begin in eastern Cherokee County, continue through the southern one-half (½) of Adair County, and end in northern Sequoyah County. The Arkansas Valley covers the southern three-quarters (¾) of Sequoyah County, southeast Muskogee County, Haskell County, the northern one-half (½) of Latimer County, and the northern one-third of LeFlore County. The Ouachita Mountains cover the southern one-half (½) of Latimer County and the southern two-thirds of LeFlore County. The primary land uses in the sub-basin are forestland (post oak–blackjack oak, hickory–oak, bottomland hardwoods, and shortleaf pine) and pastureland (brushy and mixed). Forestland is prevalent throughout the sub-basin with concentrations in the central, northeast and southeast portions. Pastureland is prevalent in the northwest and central eastern portions. Rangeland (post – blackjack oak scrub and open grasslands) is the secondary land use. It is prevalent in the western portion of the sub-basin and is interspersed throughout the central and eastern portions. The tertiary land use

is cropland in the northern portion of the sub-basin. Other land uses of note are farmsteads, major urban areas, wetlands, and confined animal feeding operations.

Table 22. Permanent Ambient Trend Monitoring Stations Located in HUC 1111.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
120420010010	AT165520	Arkansas River, US 64, Bixby	Active 11/98-P	FWP, AG, AES	NONE	PBCR	NONE
120410010080	AT165570	Arkansas River, SH 104, Haskell	Active 11/98-P	FWP, AES, PBCR	NONE	AG	NONE
220200010010	AT249453	Arkansas River, US 64, Moffett	Active 11/98-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
121410010260	AT194500	Arkansas River, US 62, Muskogee	Active 9/99-P	NONE	NONE	AG, FWP, AES PBCR	NONE
120420010130	AT164400	Arkansas River, SH 97, Sand Springs	Active 9/99-P	AG, FWP, AES, PBCR	NONE	NONE	NONE
121700050010	AT197000	Barren Fork, SH 51, Eldon	Active 11/98-P	AG, FWP, PPWS	NONE	PBCR, AES	NONE
121700040010	AT197360	Caney Creek, off SH 100, Barber	Active 9/99-P	AG, FWP, AES, PBCR, PPWS	NONE	NONE	NONE
121700060010	AT196000	Flint Creek, US 412, Flint	Active 11/98-P	AG, FWP, PPWS	NONE	PBCR, AES	NONE
220100040020	AT247550	Fourche-Maline Creek, off US 270, Red Oak	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121700030010	AT196500	Illinois River, US 62, Tahlequah	Active 11/98-P	AG, FWP, PPWS	NONE	AES, PBCR	NONE
121700030350	AT195500	Illinois River, US 59, Watts	Active 11/98-P	AG, PPWS	FWP	PBCR, AES	NONE
220200050010	AT249800	Lee Creek, SH 101, Short	Active 1/03-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
220100020010	AT247350	Poteau River, US 59, Heavener	Active 11/98-P	AG, FWP, AES, PBCR, PPWS	NONE	NONE	NONE
220100010010	AT249435	Poteau River, off SH 112, Pocola	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
121700060080	AT195865	Sager Creek, off US 412, West Siloam Springs	Active 11/98-P	AG, FWP	PPWS	AES, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 23. Toxicant exceedances in HUC 1111.

STATION #	STATION NAME	DATE	Copper (ug/L)	Lead (ug/L)
AT194500	Arkansas River, US 62, Muskogee	05/29/2002		8.74
		02/04/2003		7.00
AT165520	Arkansas River, US 64, Bixby	04/02/2001		12.00
		04/08/2002		12.00
AT247550	Fourche-Maline Creek, off US 270, Red Oak	04/23/2001		2.52
		05/29/2001		3.08
		06/19/2000		2.62
		08/21/2001		1.82
		04/23/2002		1.50
		04/15/2003		2.28

STATION #	STATION NAME	DATE	Copper (ug/L)	Lead (ug/L)
		09/03/2003		2.53
AT249435	POTEAU RIVER, OFF SH 112, POCOLA	11/06/2000	8.00	
		04/23/2001		1.97
		05/29/2001	7.08	6.79
		06/19/2001		2.22
		08/21/2001		1.84
		09/24/2001		2.43
		10/23/2002		1.84
		04/23/2002		1.41
		04/14/2003		2.59

Table 24. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1111. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT165520	ARKANSAS RIVER, US 64, BIXBY	07/25/2000	640		
		09/10/2001	1000		
		06/03/2002	1200		
		06/02/2003	6000	4000	836
		07/07/2003	800		
		08/11/2003	6700	1700	512
		09/15/2003	500	800	
		10/01/2003	1100		408
AT165570	ARKANSAS RIVER, SH 104, HASKELL	06/20/2000		2400	
AT249453	ARKANSAS RIVER, US 64, NEAR MOFFETT	06/22/2004		10400	
AT194500	ARKANSAS RIVER, US 62, NEAR MUSKOGEE	06/19/2000		510	
		07/06/2004		700	
AT197000	BARON FORK, SH 51, ELDON	06/20/2000		800	
		07/25/2000		80	
		05/30/2001		3900	
		06/20/2001		2000	
		07/25/2001		90	
		08/22/2001		80	
		06/03/2002		70	
		07/10/2002		80	
		09/04/2002		120	
		05/13/2003		70	
		06/03/2003		600	
		07/22/2003		200	
		05/04/2004		2000	
		05/18/2004		100	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		06/07/2004		100	
		06/22/2004		800	
		07/13/2004		80	
		07/20/2004		70	
AT196000	Flint Creek, US 412, Kansas	06/20/2000		450	
		07/25/2000		90	
		08/22/2001		100	
		09/25/2001		100	
		06/04/2002		200	
		09/04/2002		100	
		06/03/2003		70	
		06/18/2003		180	
		07/21/2003		3000	
		08/12/2003		500	
		09/16/2003		100	
		09/30/2003		300	
		05/04/2004		230	
		05/18/2004		100	
		06/07/2004		300	
		06/22/2004		500	
		07/13/2004		170	
		07/26/2004		100	
AT247550	Fourche-Maline Creek, off US 270, Red Oak	05/10/2000		1800	
		05/23/2001		2100	
		09/18/2001		3000	
		07/22/2002		500	
		05/05/2003		2000	
		07/14/2003		8000	
AT196500	Illinois River, US 62, Tahlequah	06/20/2000		620	
		07/25/2000		210	
		06/20/2001		130	
		05/08/2002		800	
		07/10/2002		70	
		06/03/2003		1000	
		07/22/2003		100	
		09/16/2003		100	
		05/04/2004		1000	
		05/18/2004		80	
		06/22/2004		1100	
		07/13/2004		120	
		07/27/2004		390	
		08/17/2004		200	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT195500	Illinois River, US 59, Watts	06/20/2000		820	
		09/19/2000		100	
		06/20/2001		100	
		05/22/2002		120	
		07/09/2002		220	
		06/03/2003		6000	
		07/22/2003		500	
		05/04/2004		200	
		05/18/2004		100	
		06/21/2004		500	
		07/13/2004		500	
		07/27/2004		2700	
AT249800	Lee Creek, SH 101, near Short	06/03/2003		1100	
		07/22/2003		100	
		09/16/2003		200	
		05/04/2004		300	
		05/18/2004		100	
		06/22/2004		7100	
		07/20/2004		4700	
		07/27/2004		800	
AT249435	Poteau River, off SH 112, Pocola	09/18/2001		1300	
		06/29/2004		800	
AT195865	Sager Creek, off US 412, West Siloam Springs	06/20/2001		1000	
		08/22/2001		600	
		06/03/2003		500	
		06/18/2003		500	
		07/22/2003		1200	
		06/07/2004		9700	
		06/22/2004		1300	
		07/20/2004		700	

HUC 1111

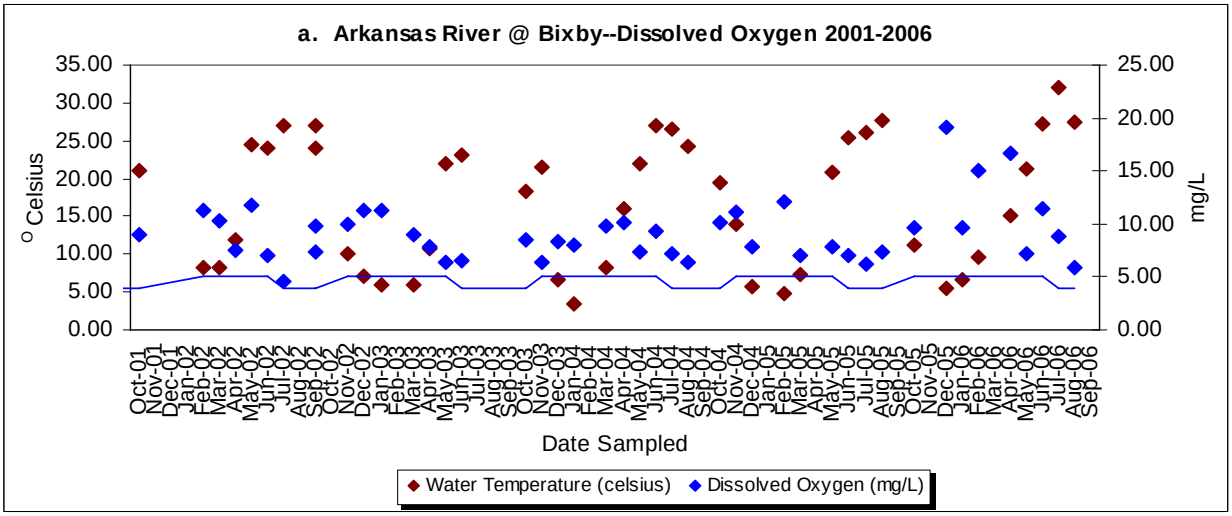
Arkansas River at Bixby

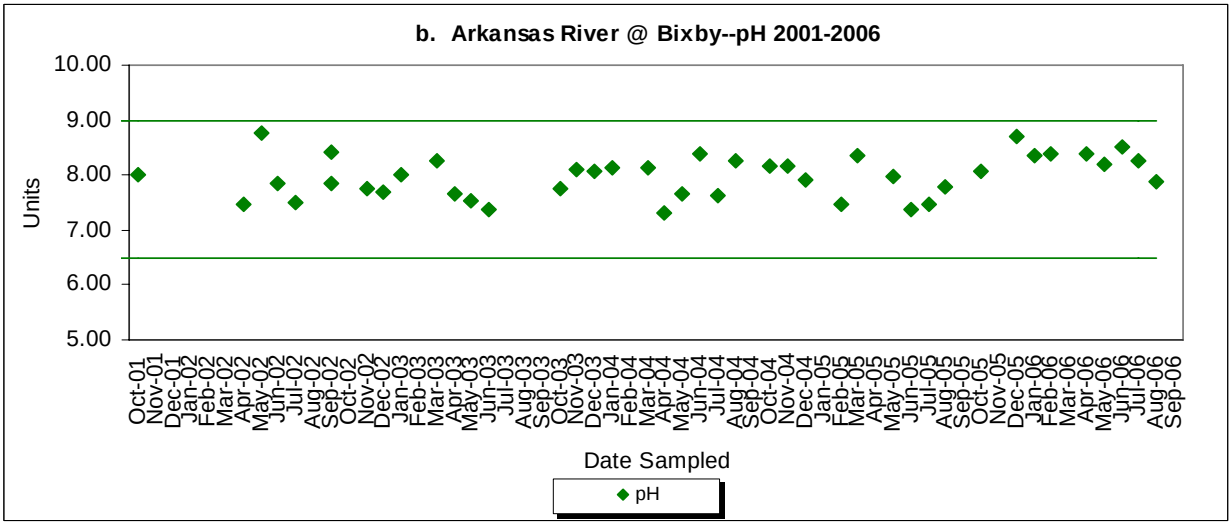
Station AT165520 (120420010010-001AT) is a permanent ambient trend monitoring station near the midpoint of the Arkansas River in Oklahoma. Situated in the south central portion of Tulsa county, the site was established within the city of Bixby on US Highway 64. The station is positioned near the terminal end of stream segment 120420010010 and is classified within the Polecat - Snake Creek 8 digit HUC watershed (11110101). Water enters the stream system from Polecat Creek (Sahoma Reservoir and Heyburn Lake), Posey Creek, and Duck Creek, among others.

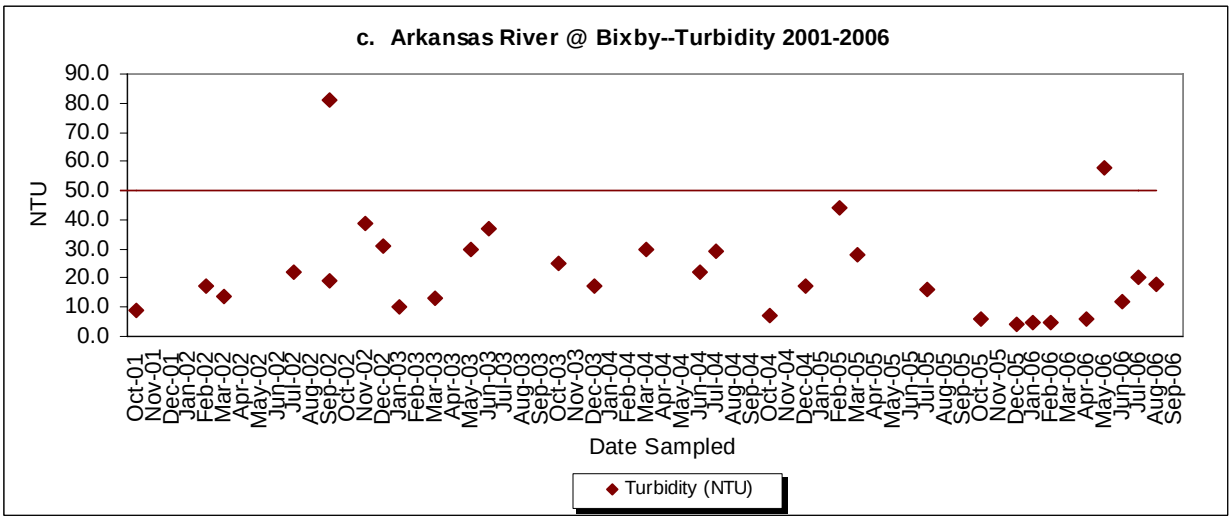
This station on the Arkansas River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Arkansas River from above the city of Tulsa (-96.0569, 36.1392) downstream to confluence of the Arkansas River with Snake Creek (-95.8344, 35.9305). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Secondary Body Contact (2)—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 58a), pH (Figure 58b), turbidity (Figure 58c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 58d and e). The PBCR beneficial use is not supported (Table 24). Of the seventeen (17) fecal coliform concentrations, seven (7) samples (or 41%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (884.8 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the 17 *E. coli* concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (141.8 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. Of the 17 Enterococci concentrations, 3 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (415.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Arkansas River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 58f).

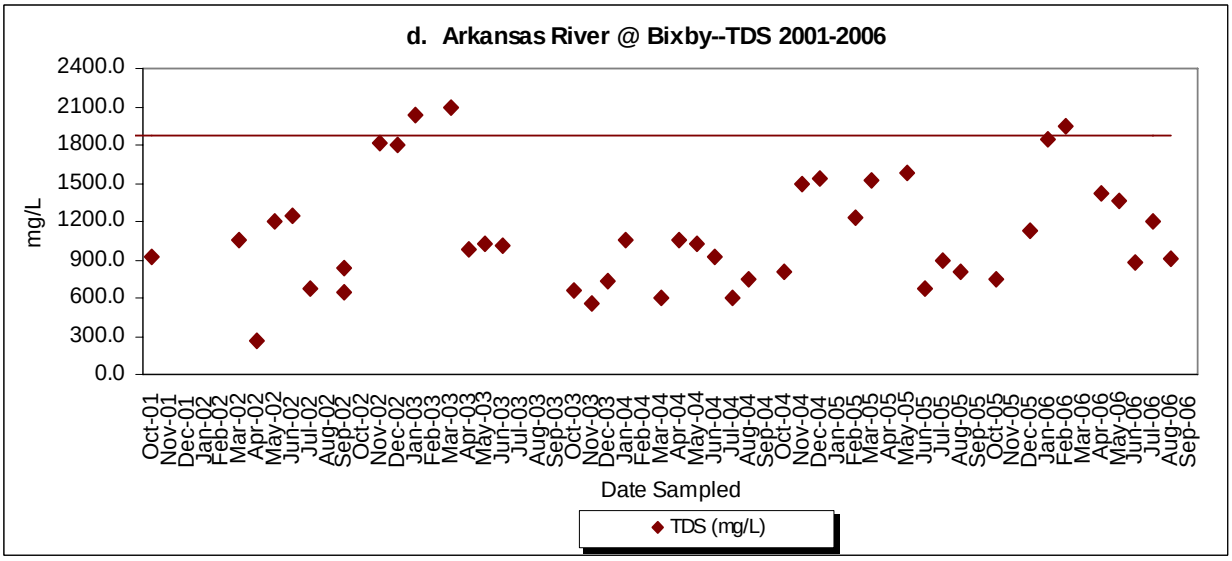
Figure 58 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Bixby (AT165520), 2001-2006.

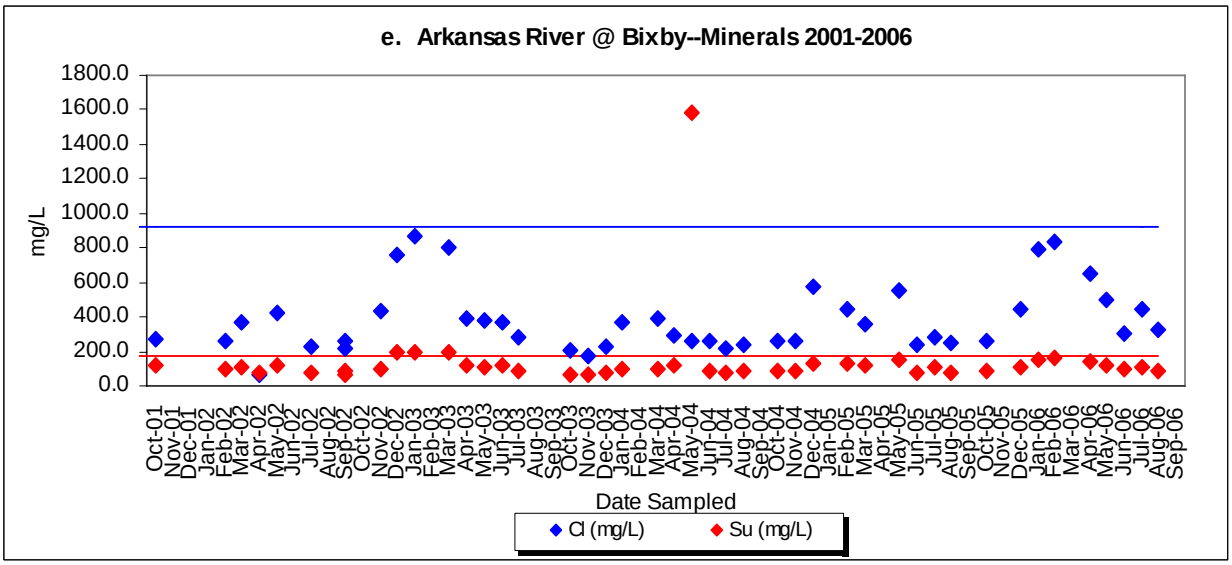


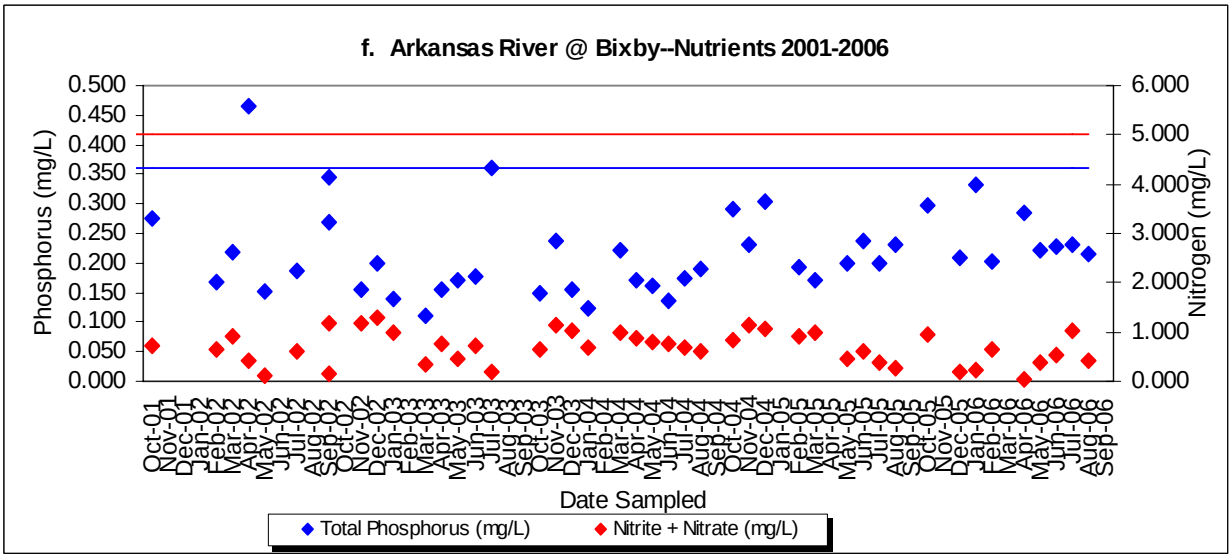




HUC 1111


d. Arkansas River @ Bixby--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Arkansas River @ Bixby--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Bixby--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

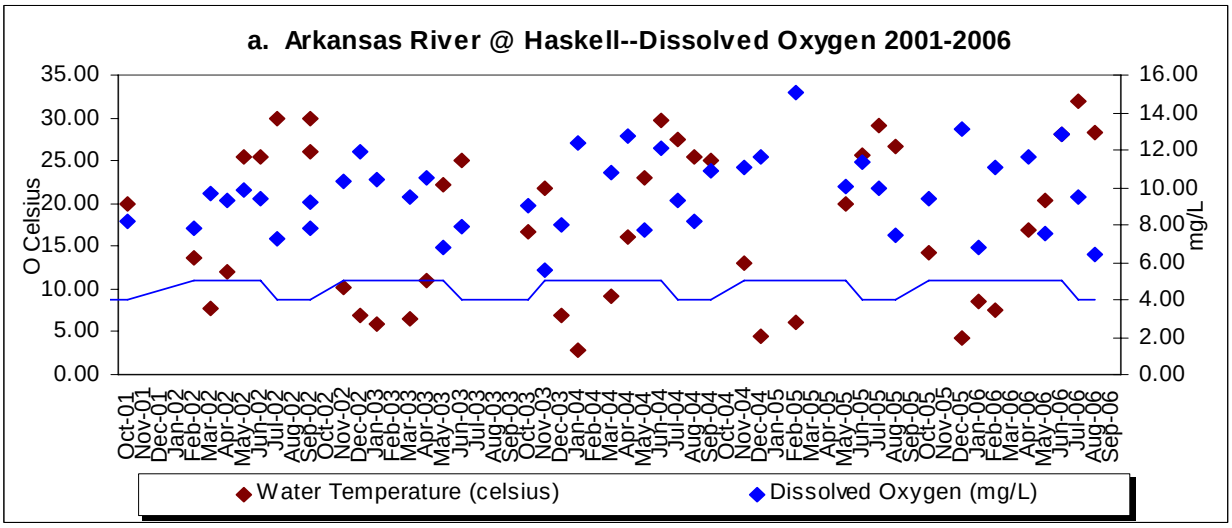
Arkansas River near Haskell

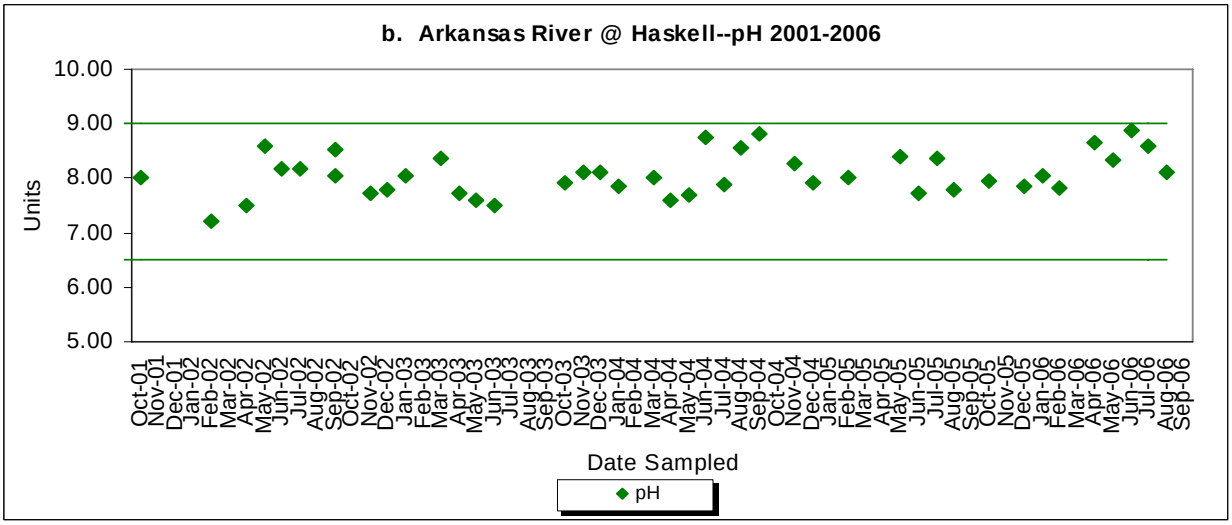
Station AT165570 (120410010080-001AT) is a permanent ambient trend monitoring station near the midpoint of the Arkansas River in Oklahoma. Situated in the northeastern portion of Muskogee County, the site was established east of the town of Haskell on State Highway 104. The station is positioned near the midpoint of stream segment 120410010080 and is classified within the Polecat - Snake Creek 8 digit HUC watershed (11110101). Water enters the stream system from several tributaries including Snake Creek, Ash Creek, Cloud Creek, and Pecan Creek, among others.

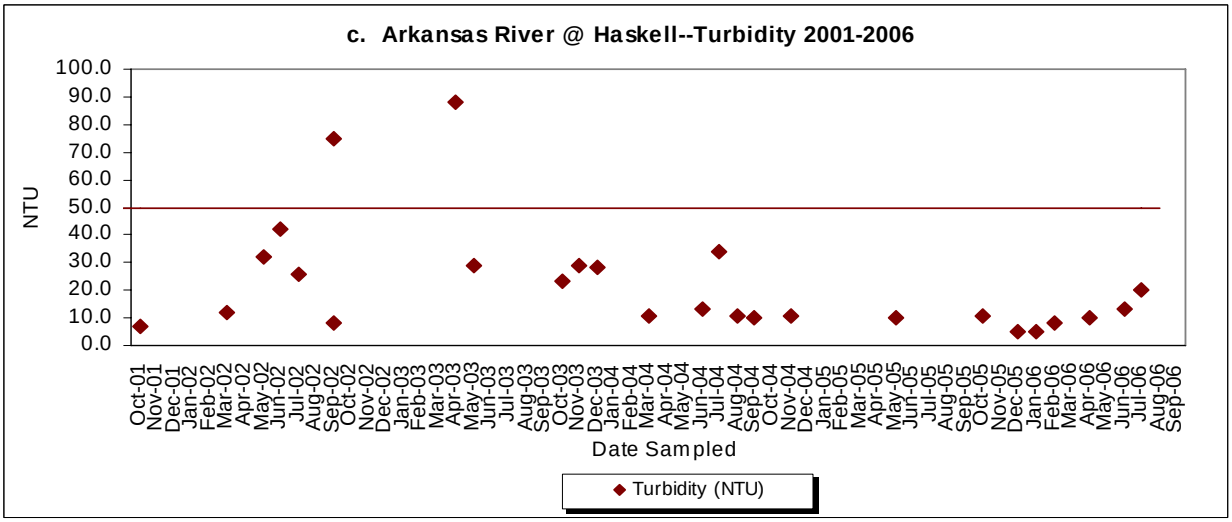
This station on the Arkansas River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Arkansas River from the confluence of Snake Creek (95.8344, 35.9305) downstream to confluence of the Arkansas River with Pecan Creek (95.4348, 35.7990). As per Appendix A, Table 6 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Secondary Body Contact (2)—Recreation (PBCR).

The WWAC beneficial use is supported. Dissolved oxygen (Figure 59a), pH (Figure 59b), turbidity (Figure 59c) and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 59d and e). Of the forty-three (43) total dissolved solids concentrations, twelve (12) of the samples (or 28%) exceeded the minimum sample standard of 1168 mg/L. Chlorides and sulfates are within the prescribed sample standards and yearly means. The PBCR beneficial use is supported for enterococci, *E. coli*, and fecal coliform. This segment of the Arkansas River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 59f).

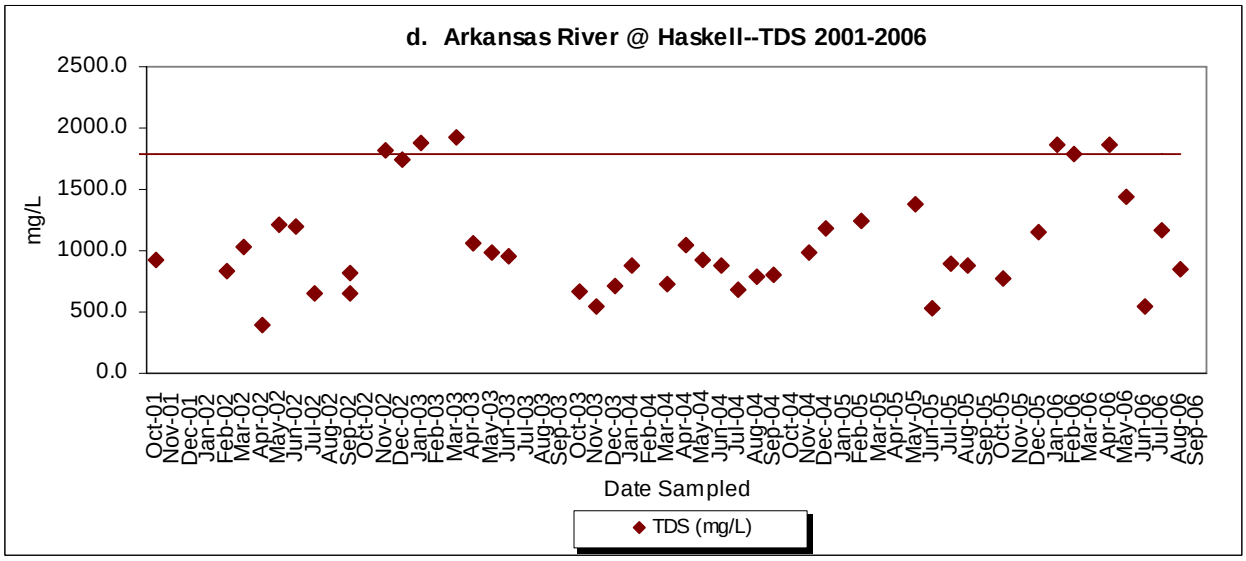
Figure 59 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Haskell (AT165570), 2001-2006.

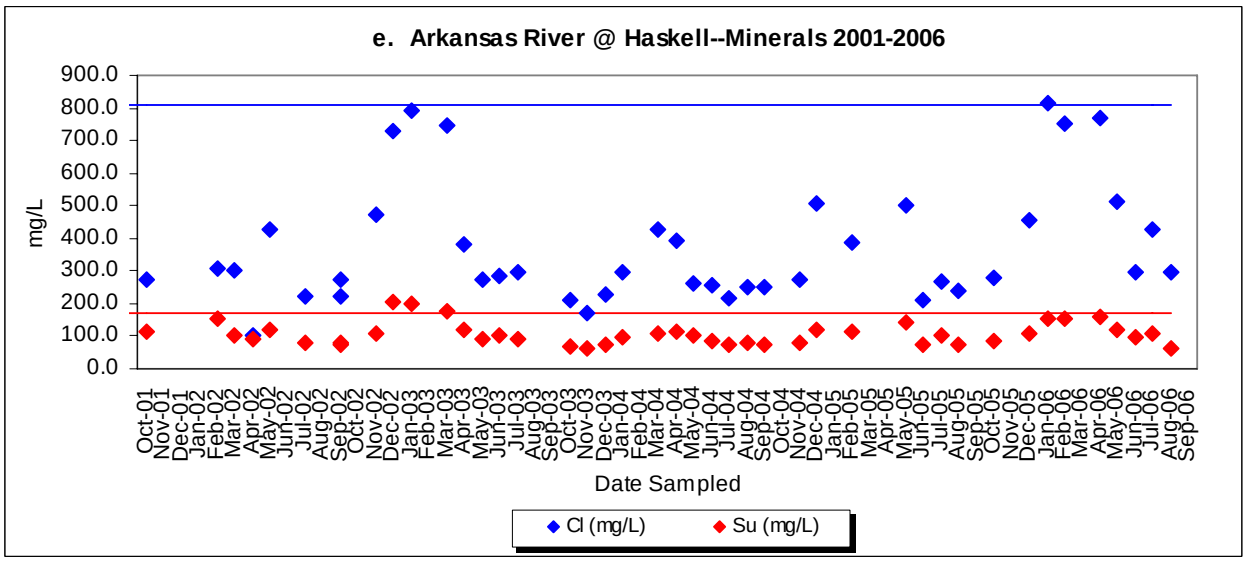


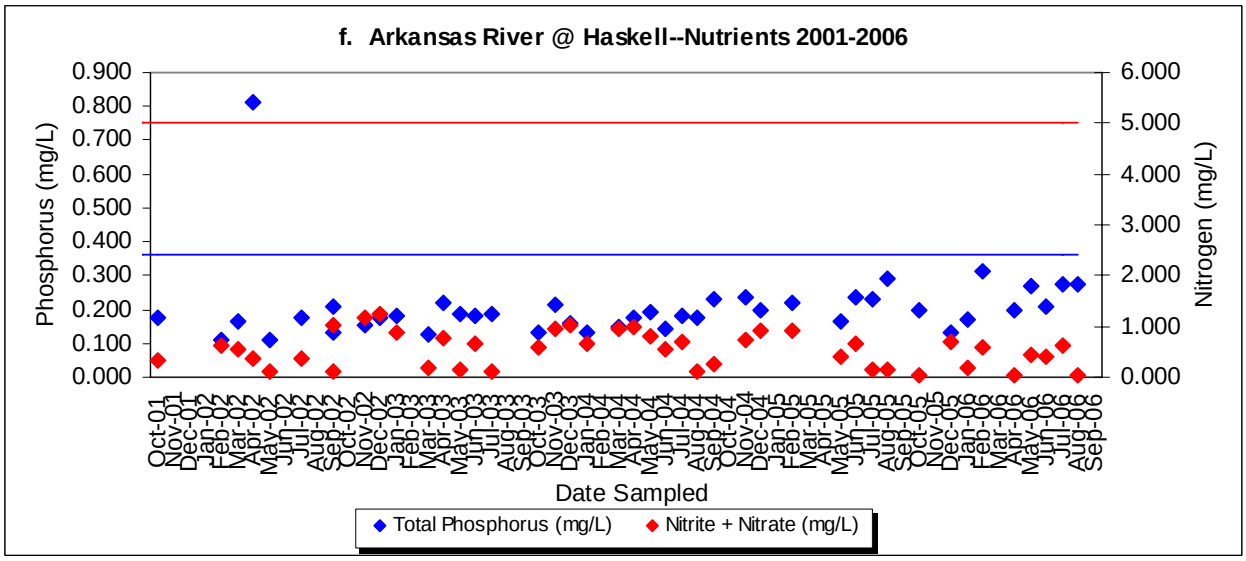




HUC 1111


d. Arkansas River @ Haskell--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Arkansas River @ Haskell--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Haskell--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

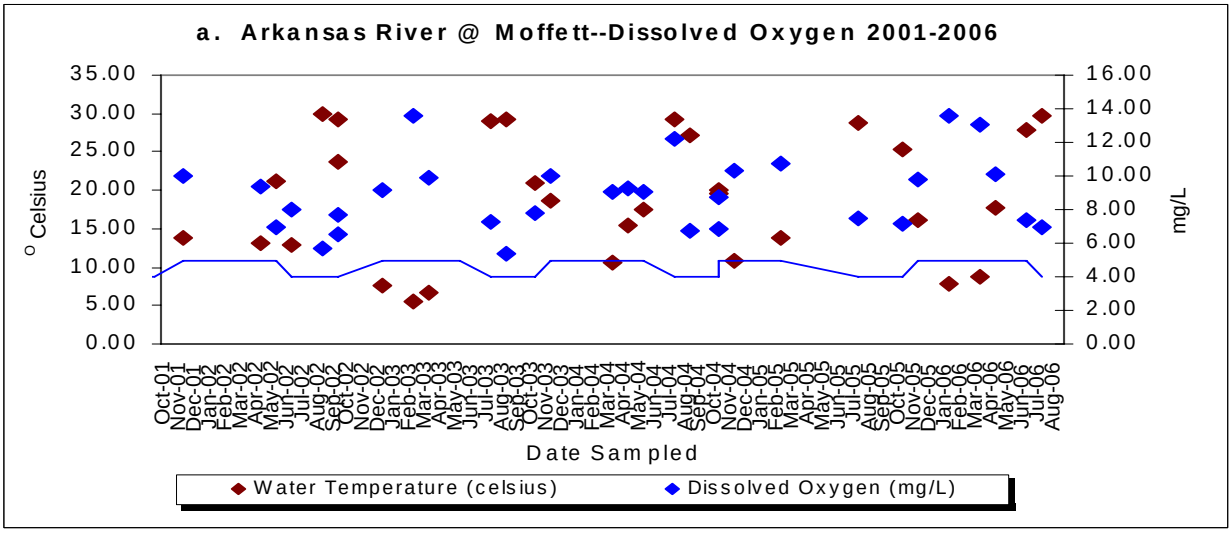
Arkansas River near Moffett

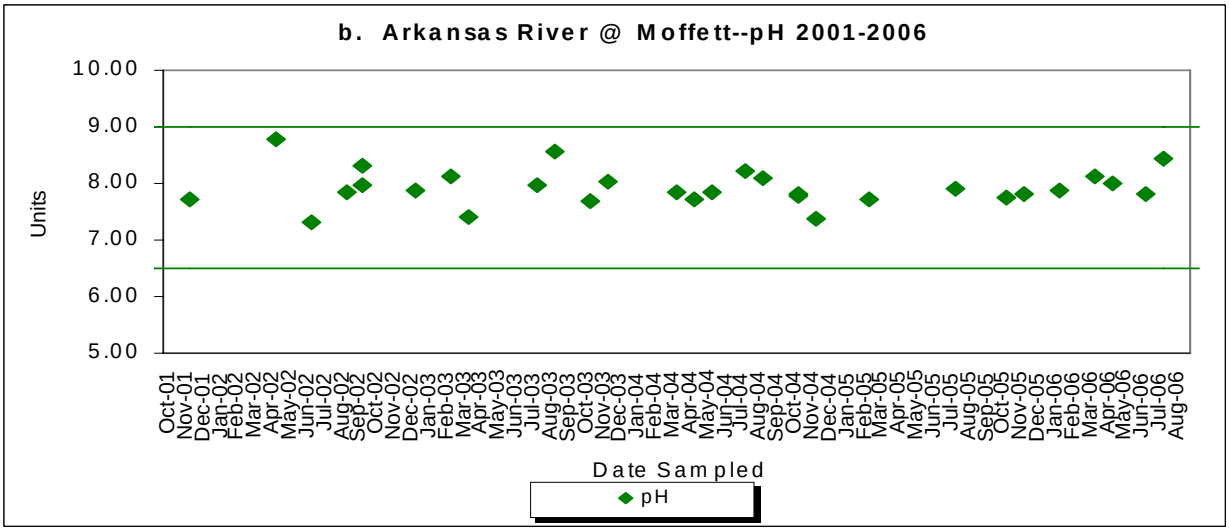
Station AT249453 (220200010010-001AT) is a permanent ambient trend monitoring station located on the Arkansas River (Kerr-McClellan Navigational System) in Oklahoma. Situated in the southeastern portion of Sequoyah County, the site was established east of the town of Moffett on State Highway 64. The station is positioned at the terminal end of stream segment 220200010010 and is classified within the Robert S. Kerr Reservoir 8 digit HUC watershed (11110104). Water enters the stream system from several tributaries including Onion Creek, Cache Creek, Big Skin Bayou, Camp Creek, and the Poteau River, among others.

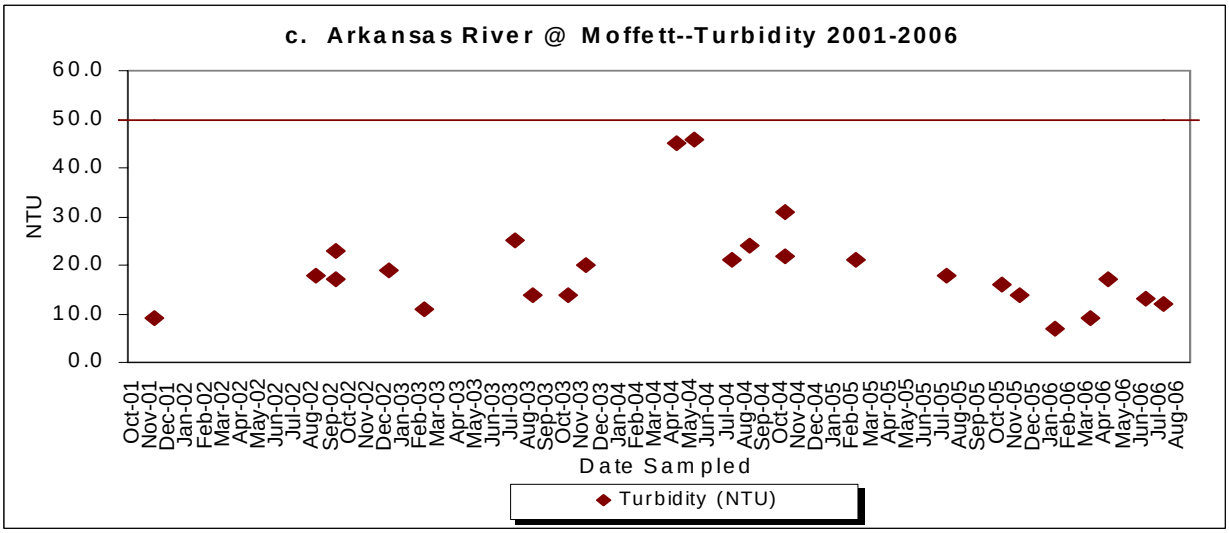
This station on the Arkansas River has been listed on the ambient trend network since November of 1998 but has only been active for all water quality variables since September of 1999 because of access difficulties. The following assessment of beneficial uses is based on data collected from November of 2001 through September of 2006. For purposes of reporting, this station is representative of the Arkansas River from confluence of Onion Creek (94.6744, 35.3006) downstream to its exit from Oklahoma near Moffett, Oklahoma (94.4340, 35.3865). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 60a), pH (Figure 60b), turbidity (Figure 60c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 60d and e). The PBCR beneficial use is not supported (Table 24). Of the fourteen (14) enterococci concentrations, one (1) sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (41.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Arkansas River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 60f). Furthermore, the mean sestonic chlorophyll-a concentration (7.6 mg/M^3) produced a TSI of 51, which is below the threshold TSI of 62.

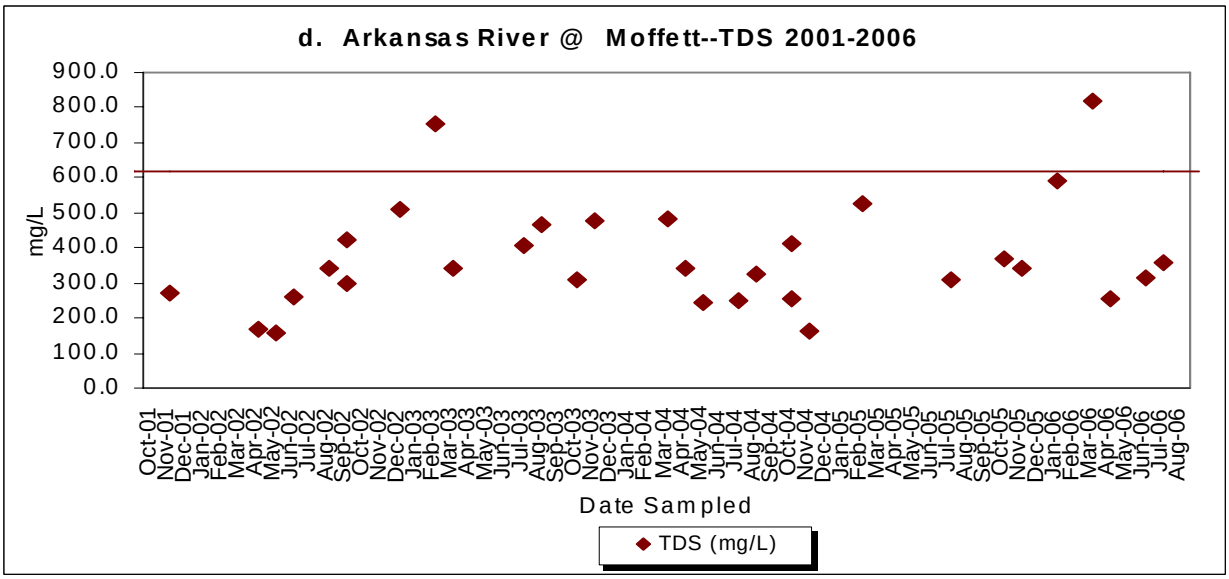
Figure 60 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Arkansas River at Moffett (AT249453), 2001-2006.

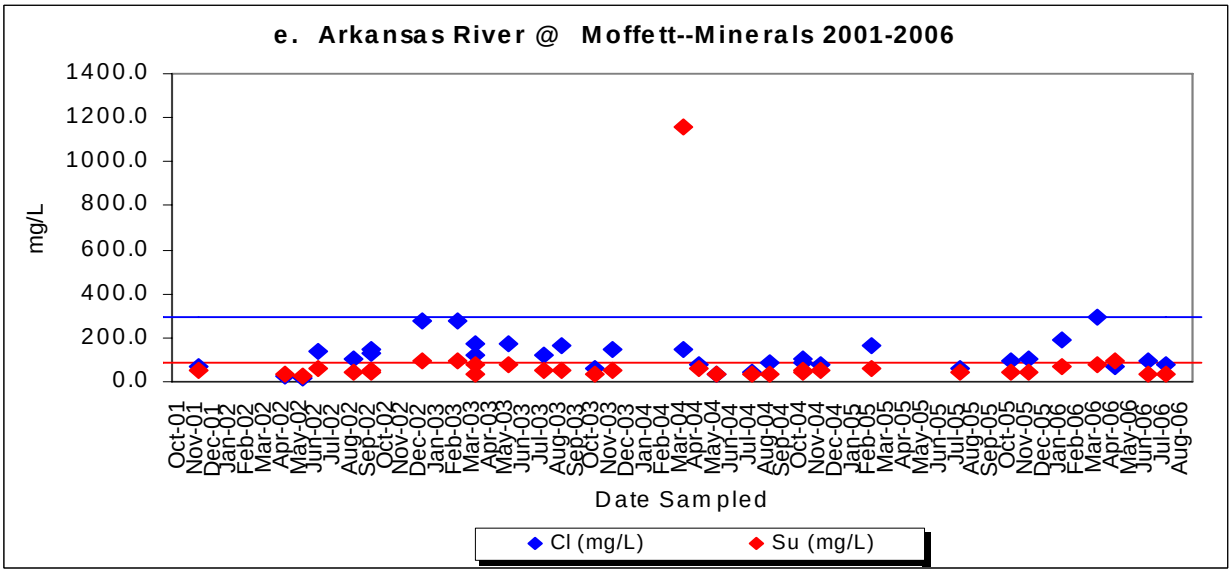


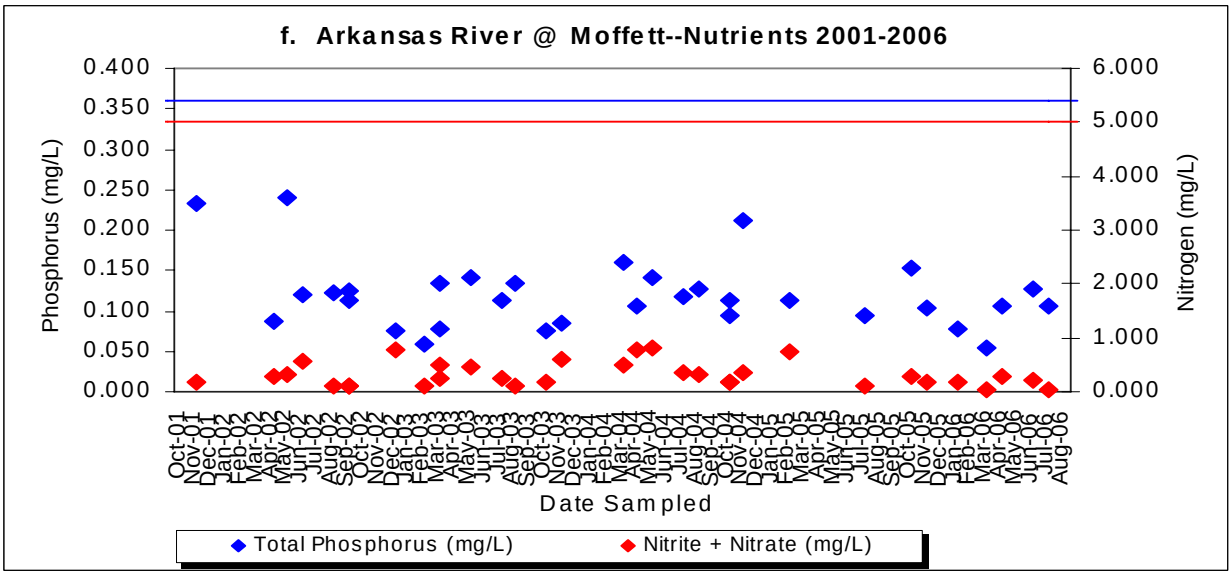




HUC 1111


d. Arkansas River @ Moffett--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Arkansas River @ Moffett--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Moffett--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

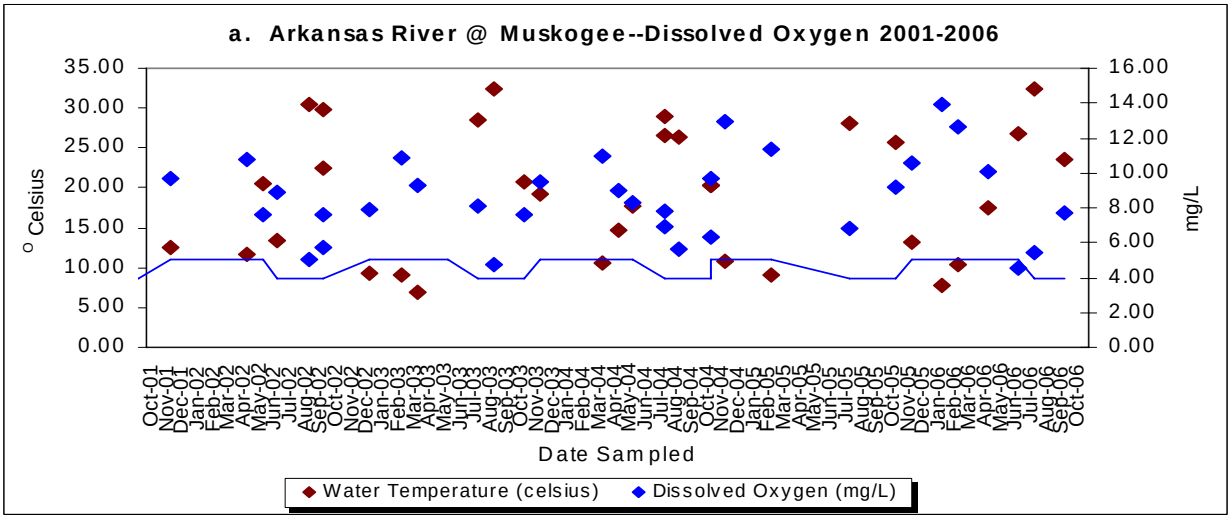
Arkansas River near Muskogee (at US 62)

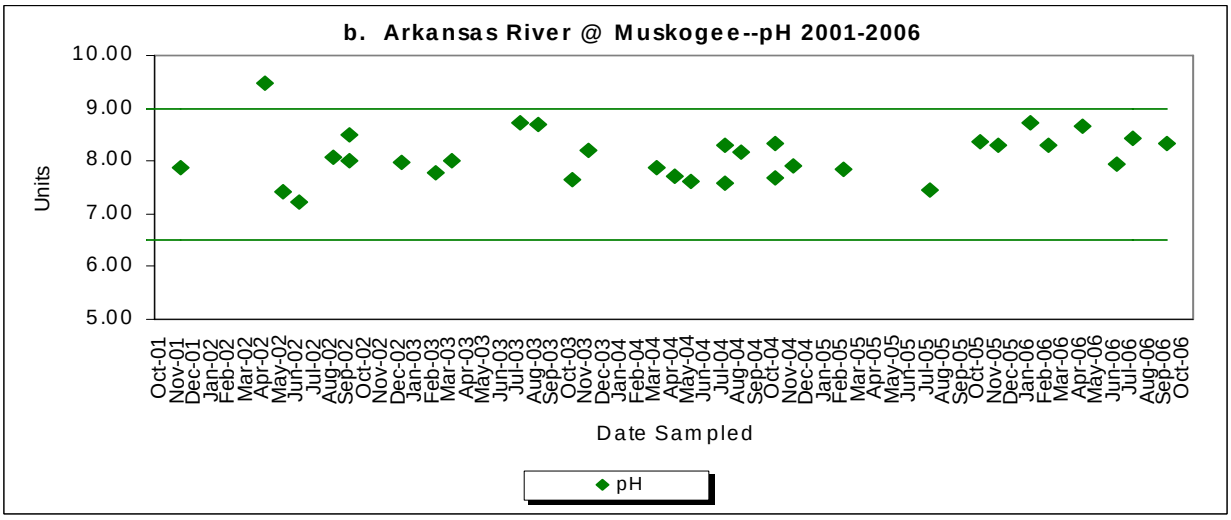
Station AT194500 (121400010260-001AT) is a permanent ambient trend monitoring station located on the Arkansas River (McClellan-Kerr Navigational System) in Oklahoma. Situated in the east central portion of Muskogee County, the site was established east of the city of Muskogee on US Highway 62. The station is positioned near the upper end of stream segment 121400010260 and is classified within the Dirty-Greenleaf Creek 8 digit HUC watershed (11110102). Water enters the stream system from several tributaries including the Verdigris River, the Neosho River (Fort Gibson Reservoir), Coody Creek, and Bayou Manard, among others.

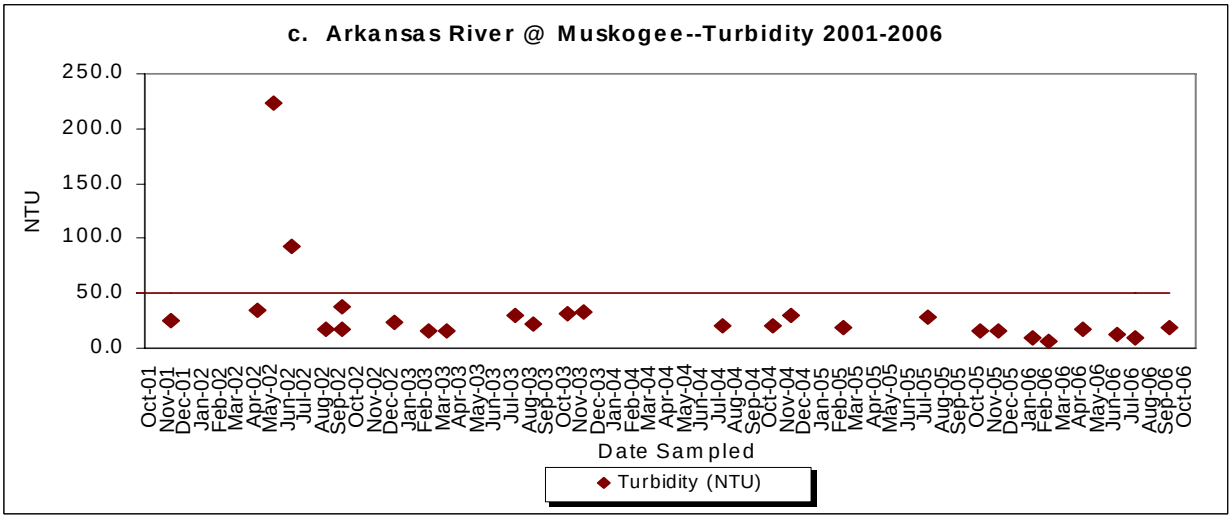
This station on the Arkansas River has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from November of 2001 through September of 2006. For purposes of reporting, this station is representative of the Arkansas River from the confluence of the Verdigris River (-95.3073, 35.7983) downstream to the Arkansas River's confluence with Webber's Falls Reservoir (-95.2275, 35.7036). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The WWAC beneficial use is not supported. Of the eight (8) lead samples collected, two (2) of the concentrations (or 20% of the required 10) exceeded the prescribed hardness-dependant chronic criteria of 6.76 ug/L (Table 23). Dissolved oxygen (Figure 61a), pH (Figure 61b), and turbidity (Figure 61c) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 61d and e). The PBCR beneficial use is not supported (Table 24). Of the thirteen (13) enterococci concentrations, 1 sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (39.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Arkansas River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (25.2 mg/M^3) produced a TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 61f).

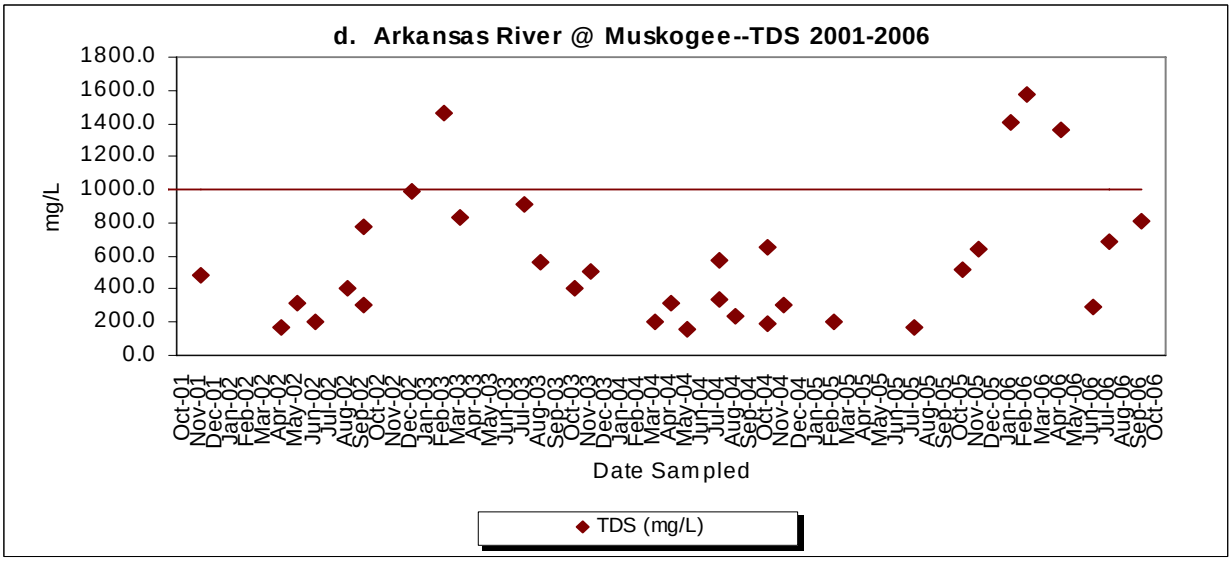
Figure 61 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Arkansas River at Muskogee (AT194500), 2001-2006.

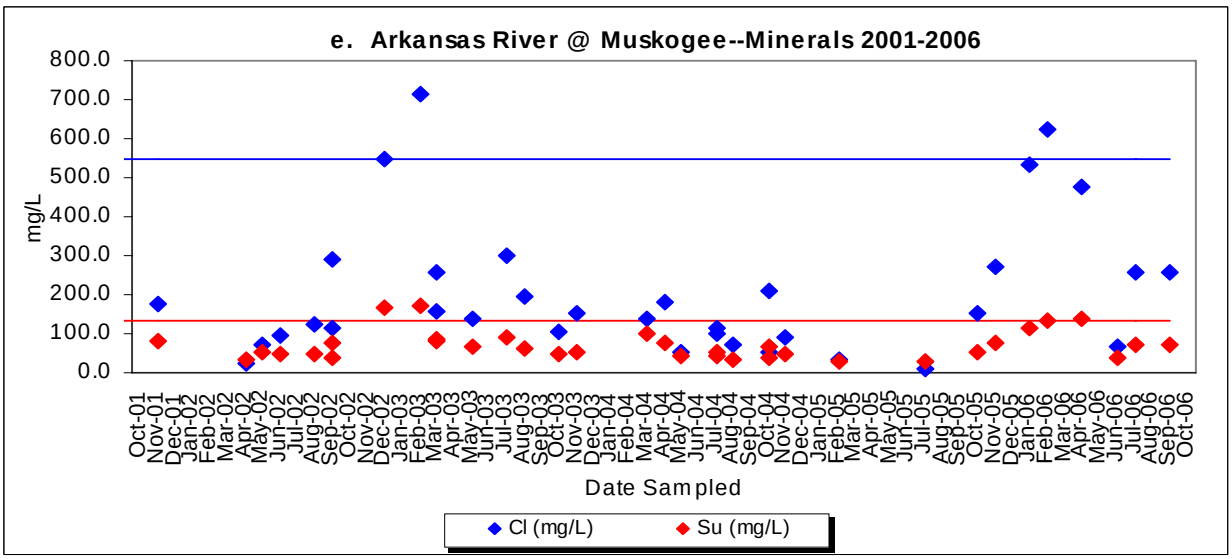


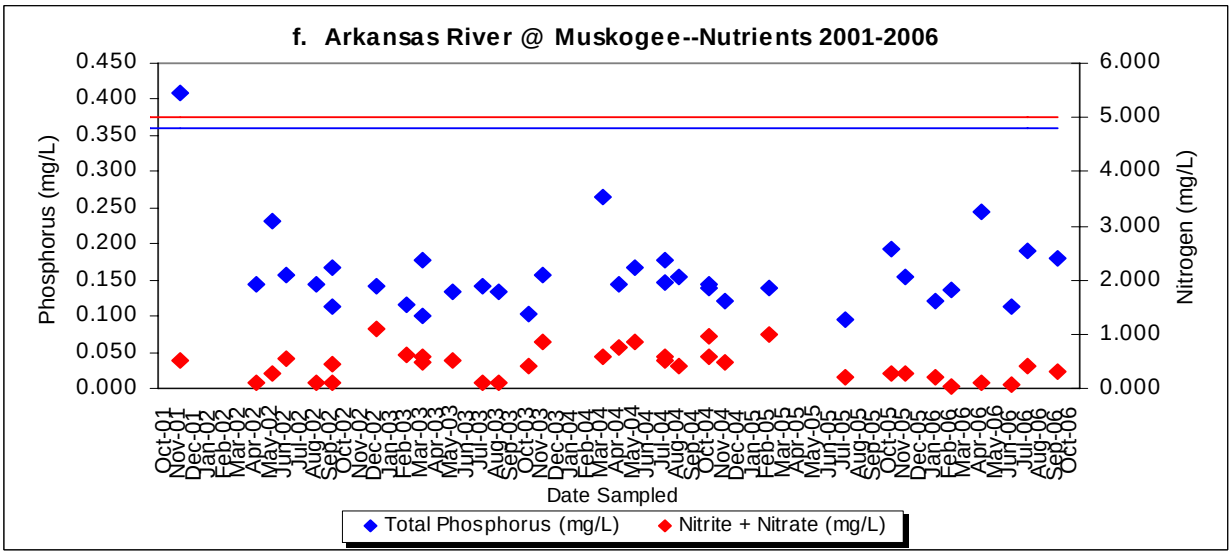




HUC 1111


d. Arkansas River @ Muskogee--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Arkansas River @ Muskogee--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Muskogee--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

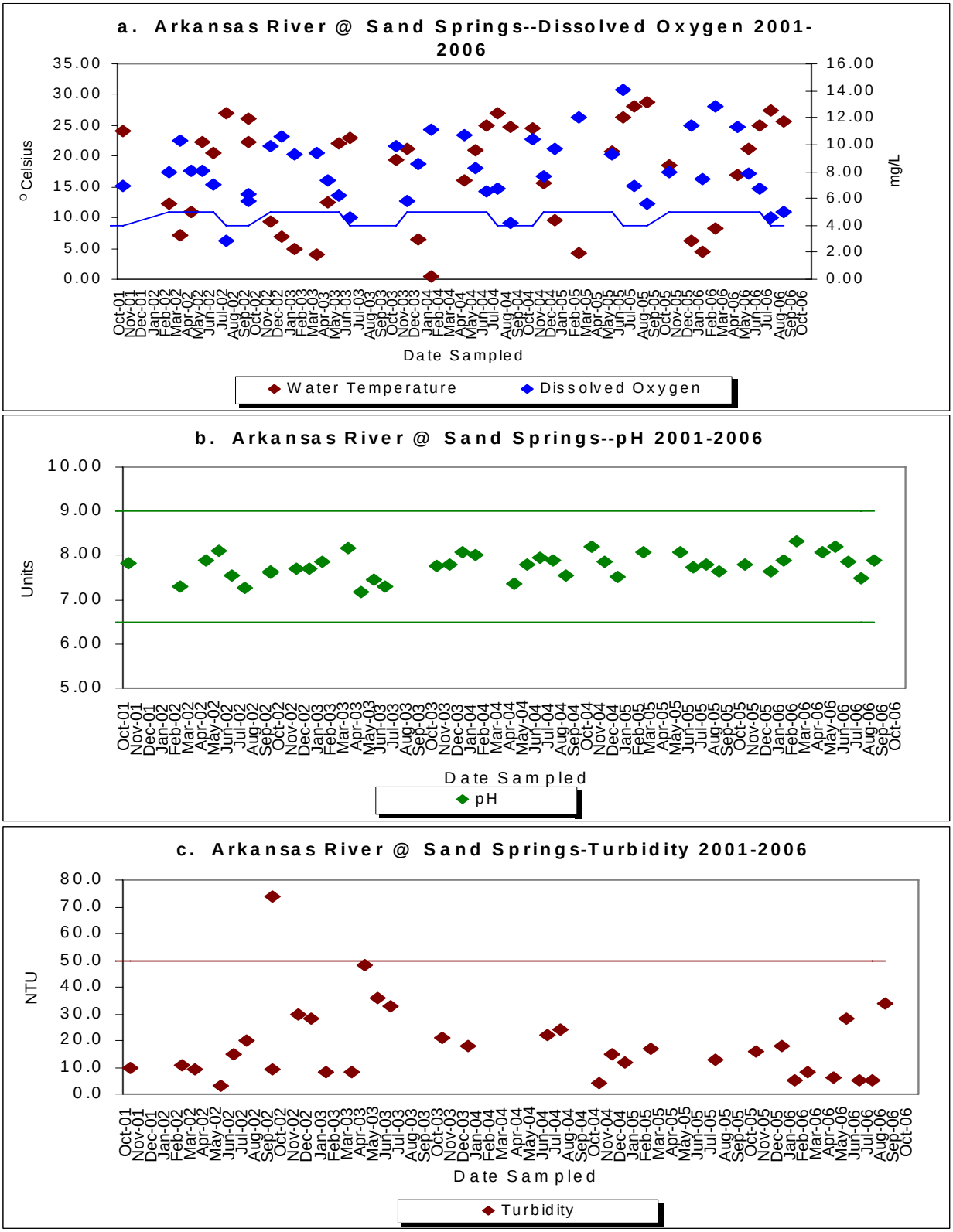
Arkansas River near Sand Springs

Station AT164400 (120420010130-001AT) is a permanent ambient trend monitoring station located on the Arkansas River in Oklahoma. Situated in the west central portion of Tulsa County, the site was established within the city of Sand Springs on State Highway 97. The station is positioned near the terminal end of stream segment 120420010130 and is classified within the Polecat - Snake Creek 8 digit HUC watershed (11110101). Water enters the stream system from Keystone Lake and from several tributaries including Shell Creek (Shell Lake), among others.

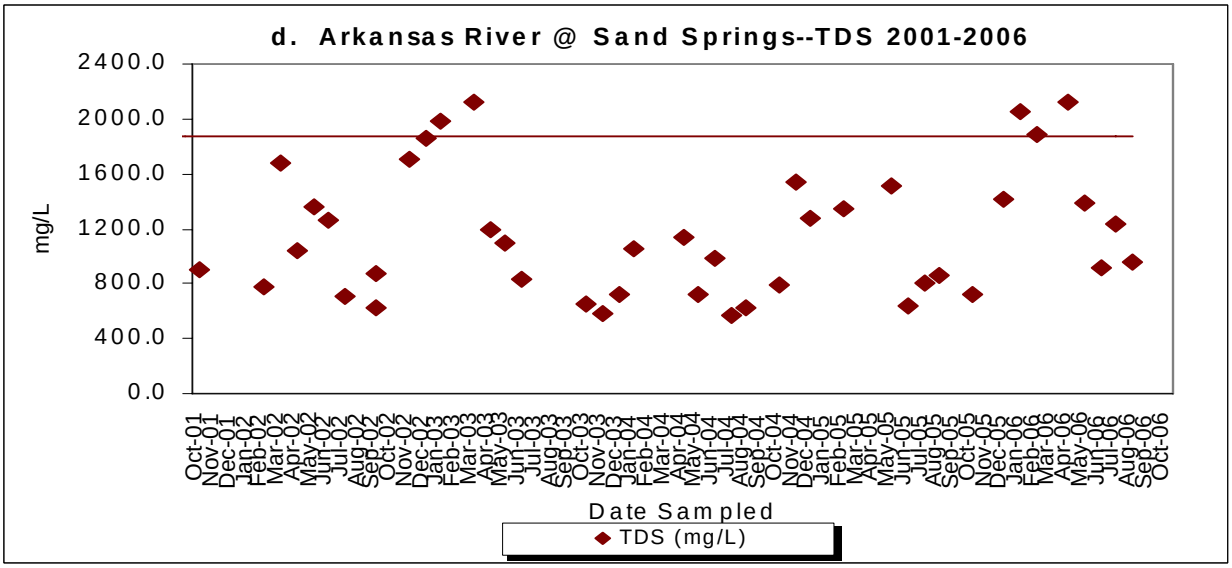
This station on the Arkansas River has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through August of 2006. For purposes of reporting, this station is representative of the Arkansas River from Keystone Reservoir (96.2528, 36.1504) downstream to above the city of Tulsa (96.0569, 36.1392). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Secondary Body Contact (2)—Recreation (PBCR).

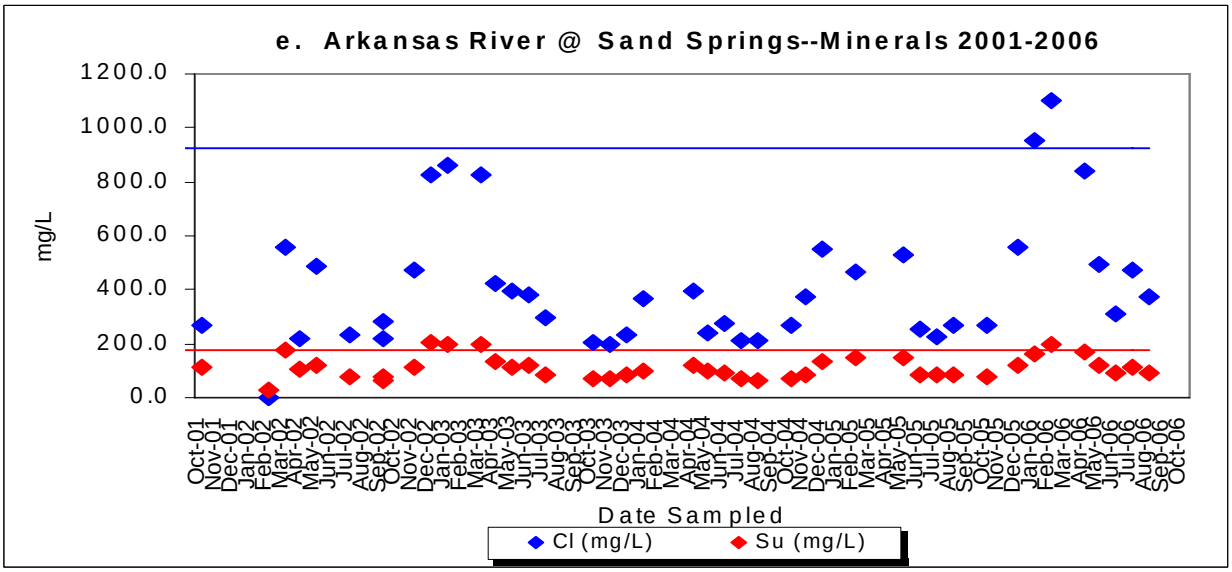
The WWAC beneficial use is supported. Dissolved oxygen (Figure 62a), pH (Figure 62b), turbidity (Figure 62c) and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 62d and e). The PBCR beneficial use is supported for fecal coliform, enterococci, and *E. coli* concentrations. This segment of the Arkansas River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 62f).

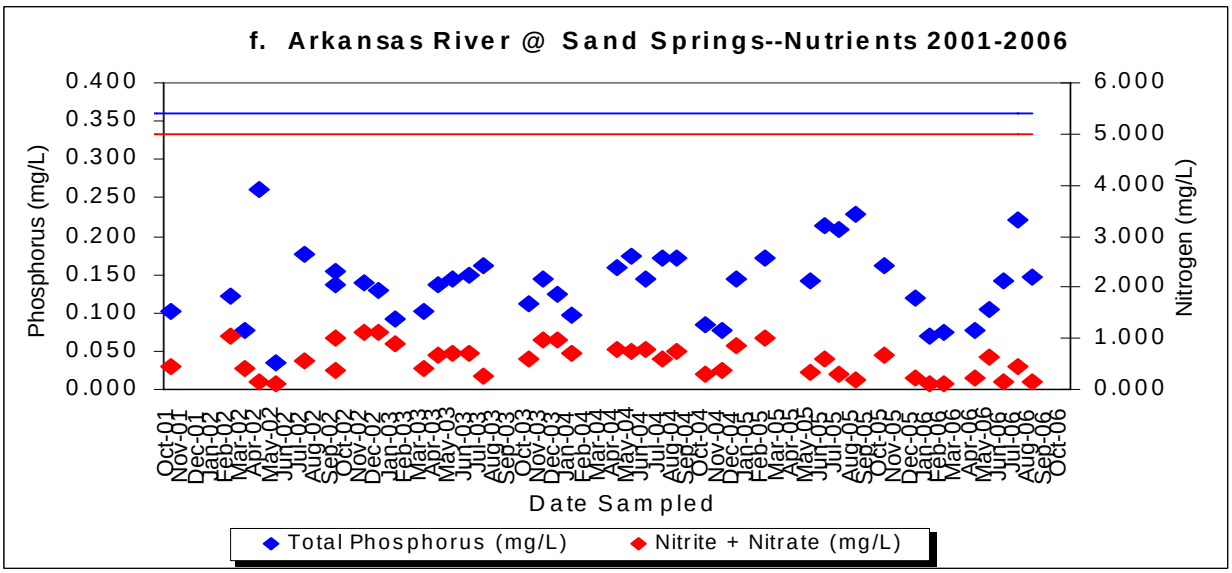
Figure 62 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) for the Arkansas River at Sand Springs (AT164400), 2001-2006.



HUC 1111


d. Arkansas River @ Sand Springs--TDS 2001-2006
mg/L
2400.0
2000.0
1600.0
1200.0
800.0
400.0
0.0
Date Sampled
TDS (mg/L)


e. Arkansas River @ Sand Springs--Minerals 2001-2006
mg/L
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Arkansas River @ Sand Springs--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

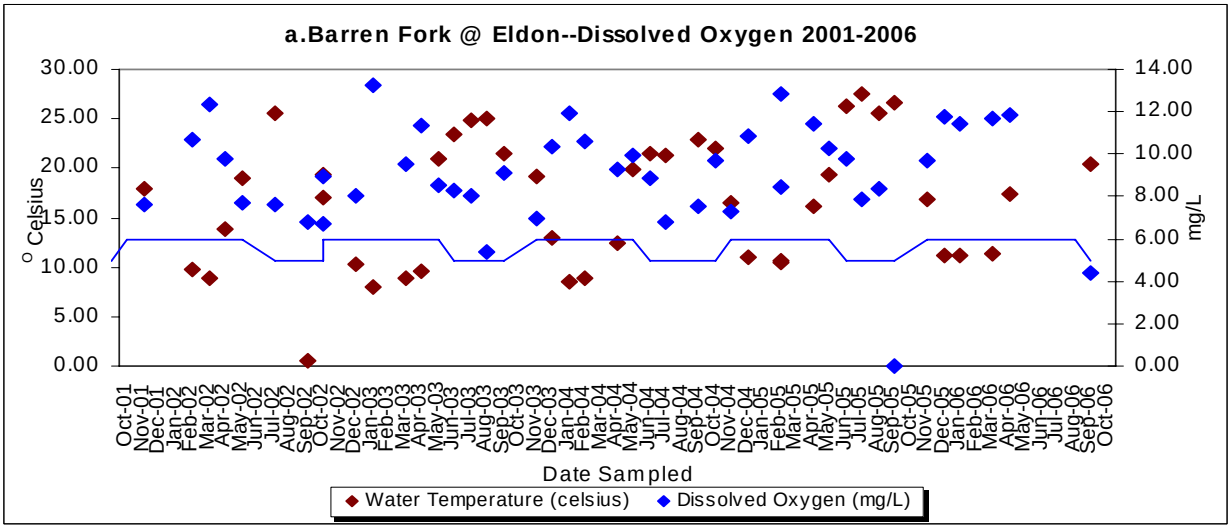
Barren Fork near Eldon

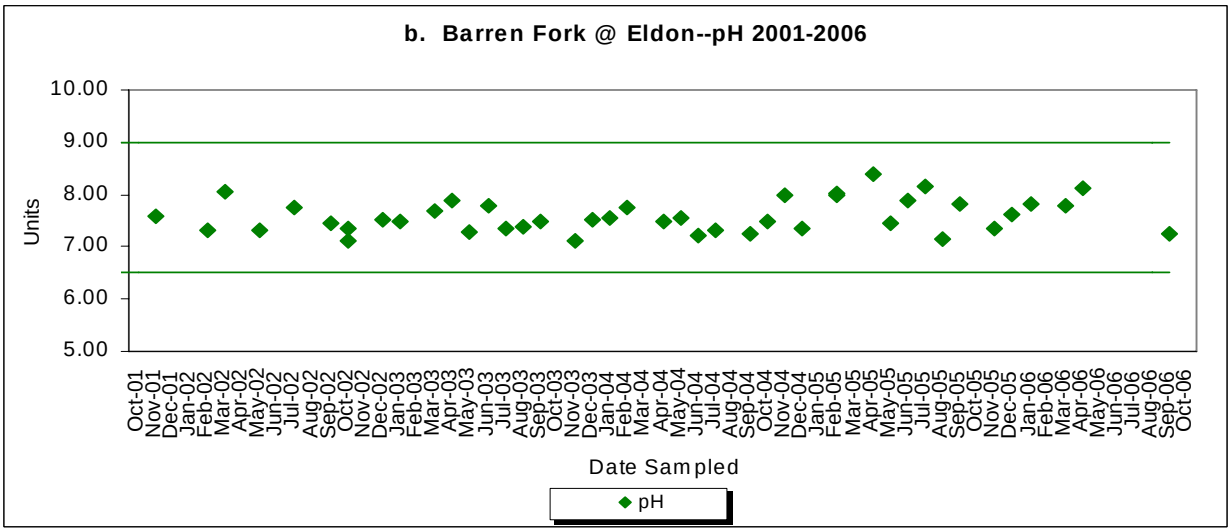
Station AT197000 (121700050010-001AT) is a permanent ambient trend monitoring station located on the Barren Fork River in Oklahoma. Situated in the east central portion of Cherokee County, the site was established west of the town of Eldon on State Highway 51. The station is positioned near the terminal end of stream segment 121700050010 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from Arkansas and from several tributaries including Green Creek (Westville Reservoir), England Hollow Creek, Scraper Hollow Creek, Peacheater Creek, Dennison Hollow Creek, and Tyner Creek, among others

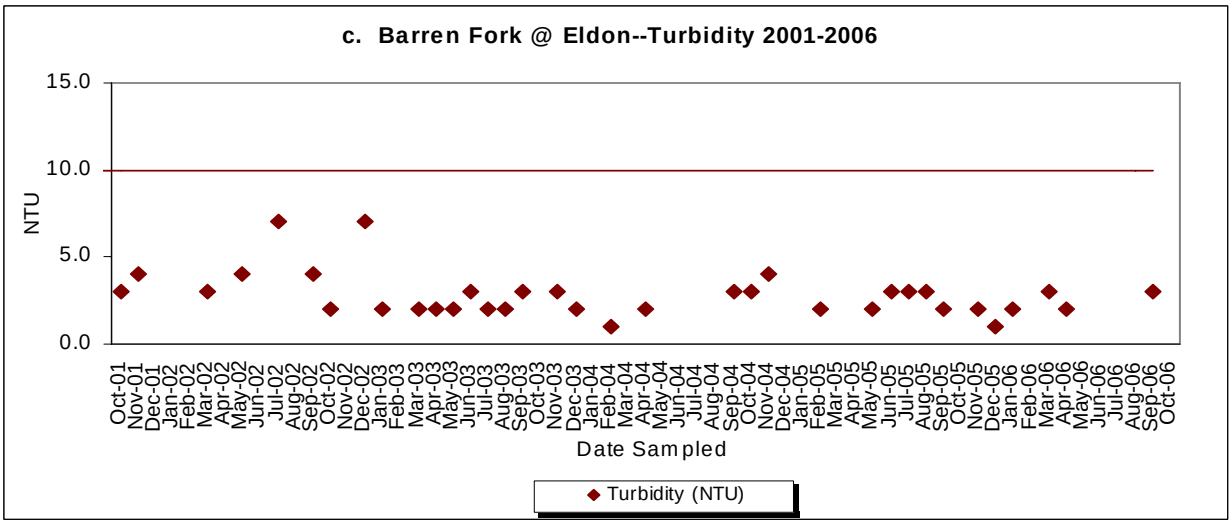
This station on the Barren Fork River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October 2001 through September of 2006. For purposes of reporting, this station is representative of the Barren Fork River from the confluence of Green Creek (94.6506, 35.9495) downstream to confluence of the Barren Fork River with the Illinois River (94.9142, 35.8510). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. The Barren Fork is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 63a), pH (Figure 63b), turbidity (Figure 63c), and toxicant samples met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2005 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 37 for Ozark Highland cool water aquatic communities [OAC 46:15-5(j)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 63d and e). The PBCR beneficial use is not supported (Table 24). Of the thirty-five (35) enterococci concentrations, sixteen (16) samples exceeded the prescribed screening level of 61 cfu/mL, and the geometric mean (37 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. The aesthetics beneficial use is impaired for total phosphorus (Figure 63f). Of the fifty-one (51) 3-month rolling geometric means calculated from total phosphorus samples, eighteen (18) geometric means (or 35%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

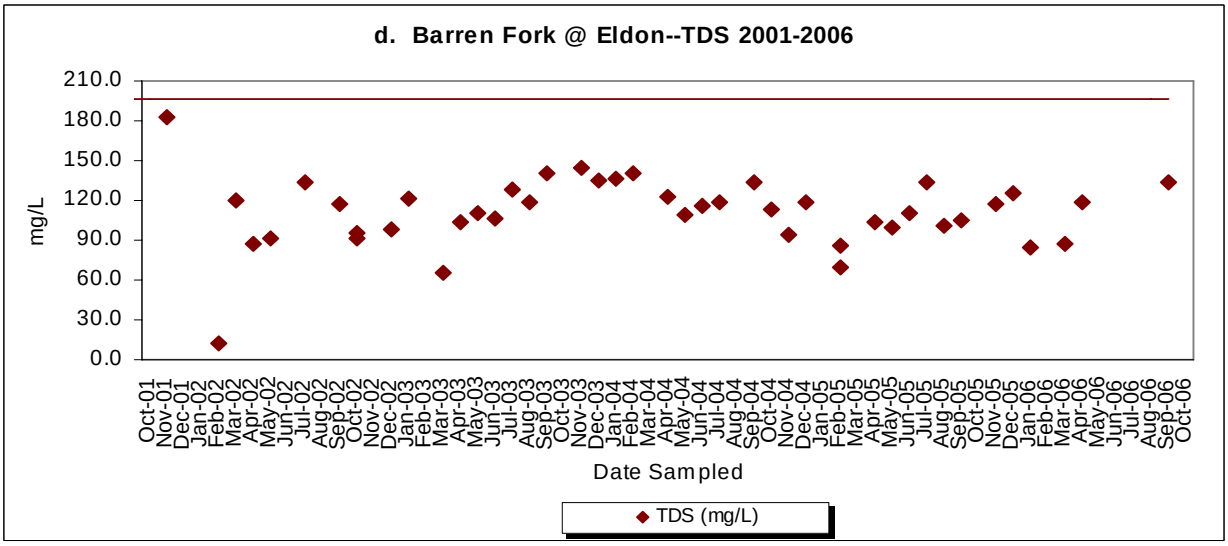
Figure 63 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Barren Fork River at Eldon (AT197000), 2001-2006.

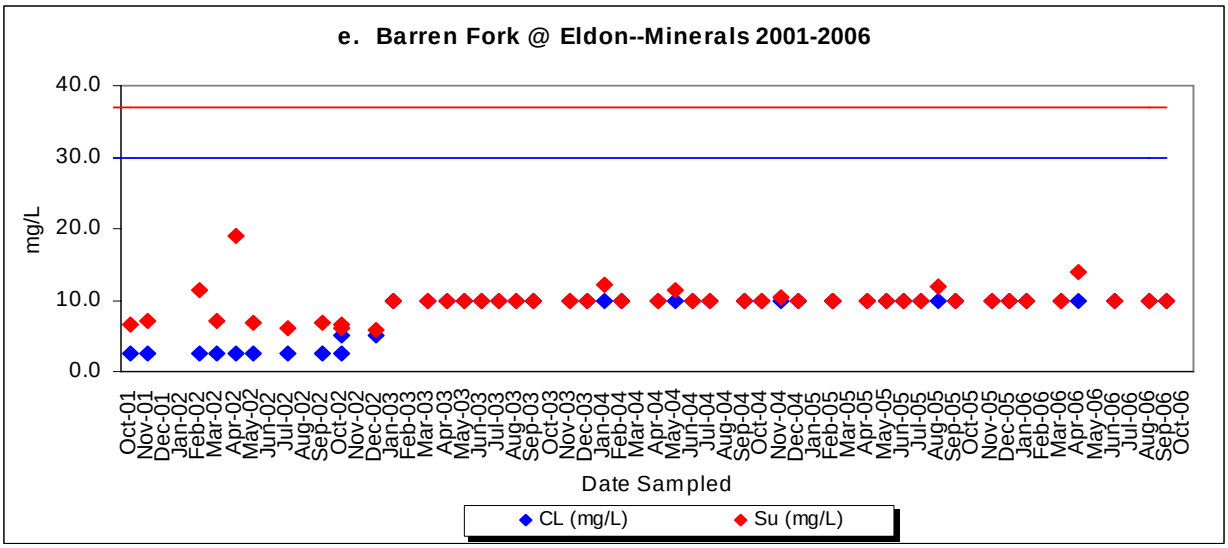


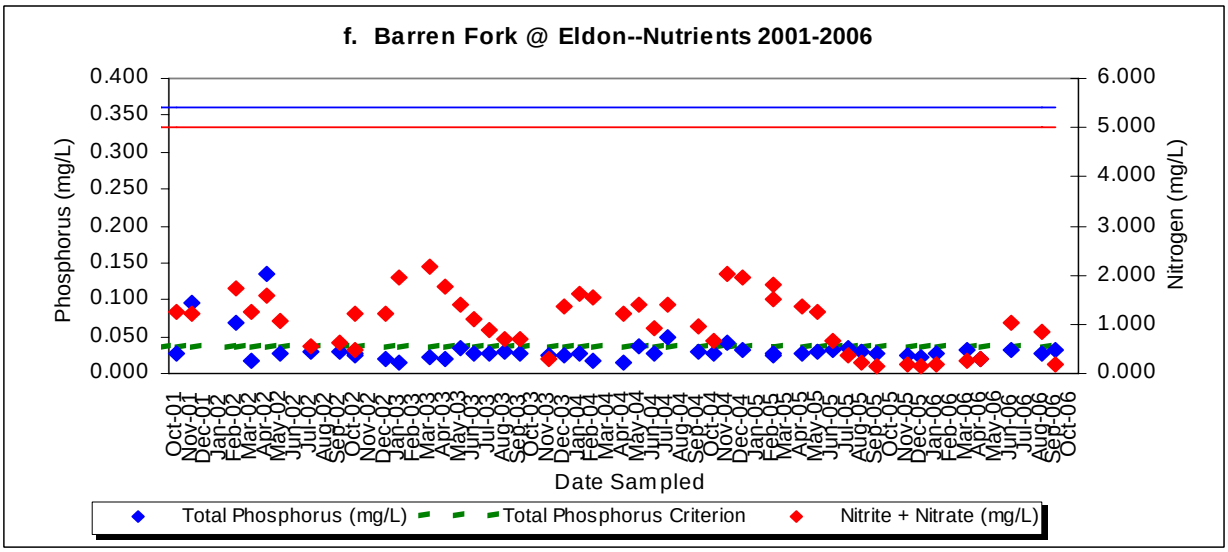




HUC 1111


d. Barren Fork @ Eldon--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Barren Fork @ Eldon--Minerals 2001-2006
mg/L
Date Sampled
CL (mg/L)
Su (mg/L)


f. Barren Fork @ Eldon--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorus Criterion
Nitrite + Nitrate (mg/L)

HUC 1111

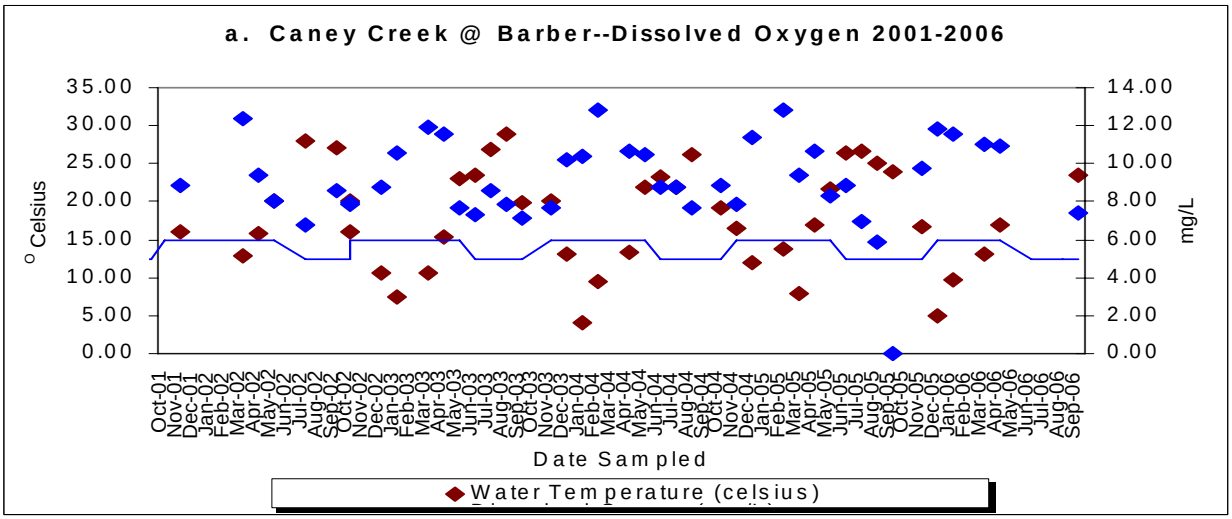
Caney Creek near Barber

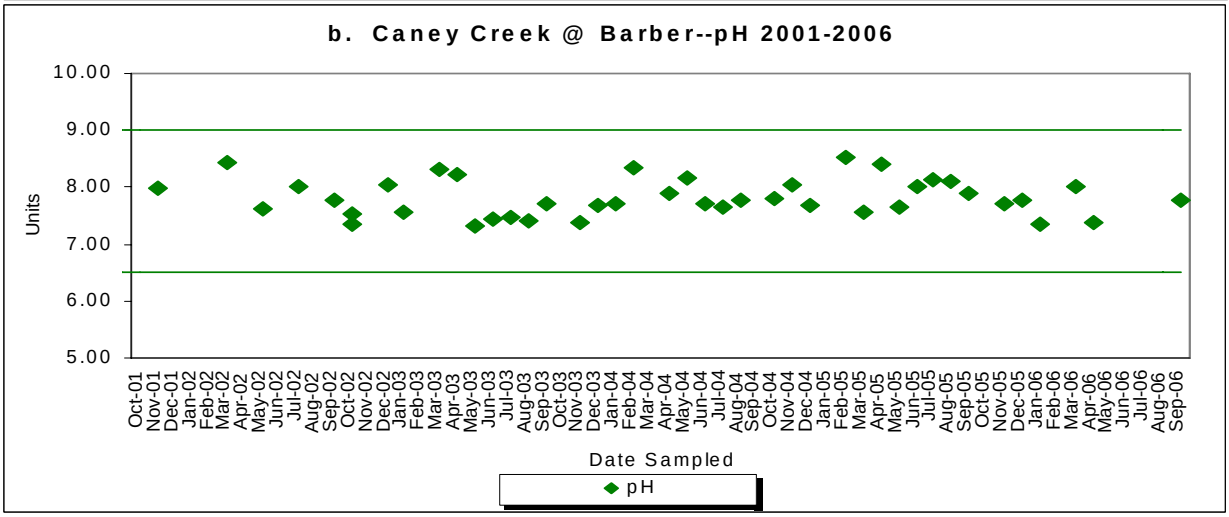
Station AT197360 (121700040010-001AT) is a permanent ambient trend monitoring station located on Caney Creek. Situated in the southeastern portion of Cherokee County, the site was established north-northeast of the town of Barber off of State Highway 100 on Welling Road. The station is positioned near the terminal end of stream segment 121700040010 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from several tributaries.

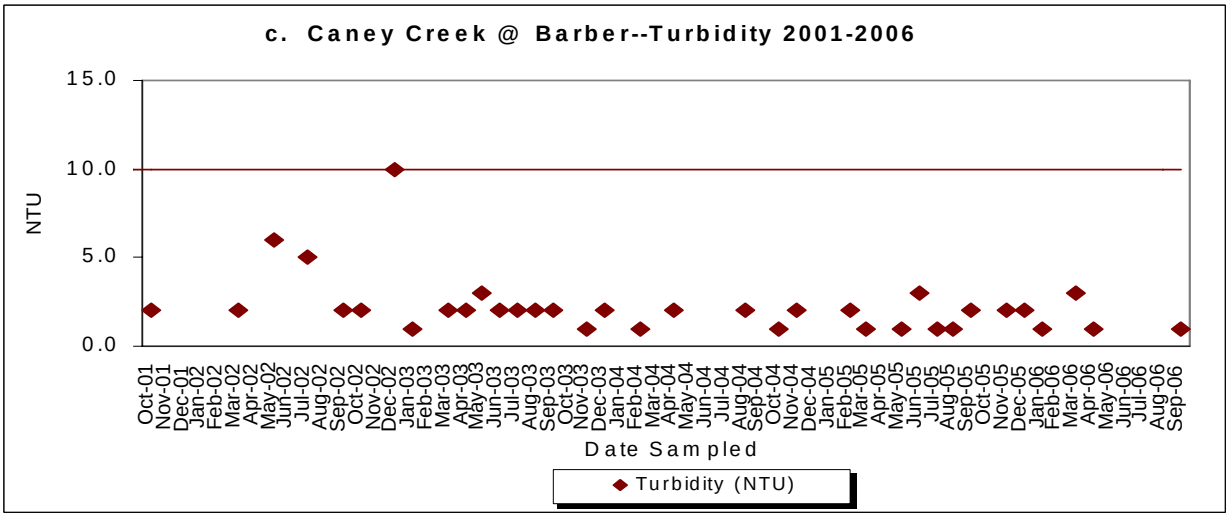
This station on Caney Creek has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Caney Creek from the confluence of the Mulberry Hollow Tributary west of Stilwell, Oklahoma (94.7059, 35.8417) downstream to confluence of Caney Creek with Tenkiller Reservoir (94.8631, 35.7788). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 64a), pH (Figure 64b), turbidity (Figure 64c), and toxicant samples met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2003 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 37 for Boston Mountain cool water aquatic communities [OAC 46:15-5(j)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 64d and e). The PBCR beneficial use is supported for all parameters. This segment of Caney Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 64f).

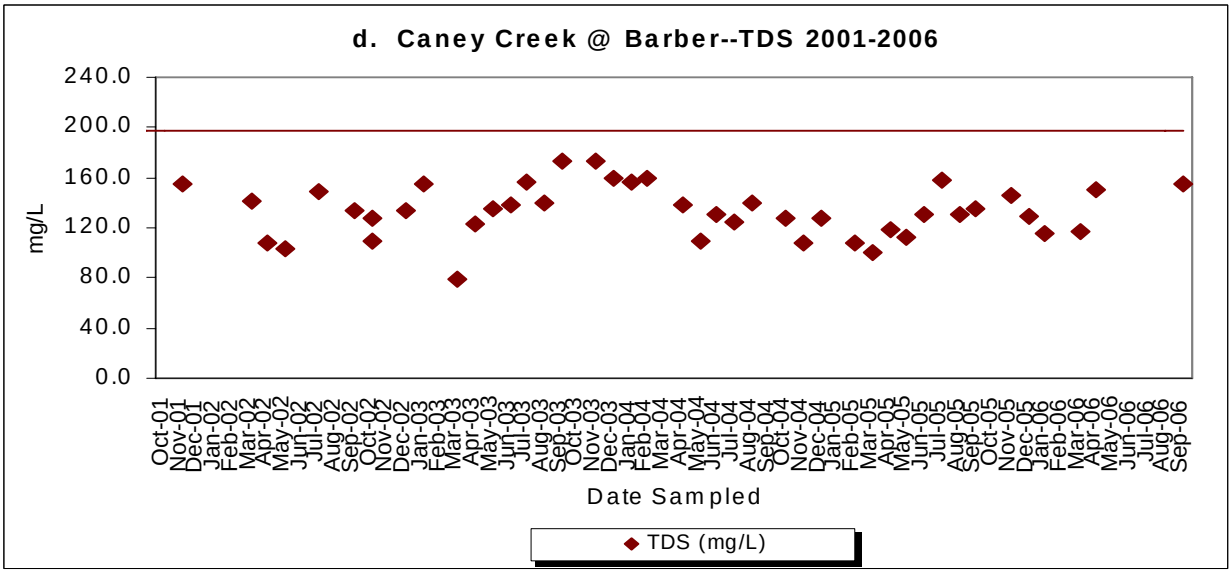
Figure 64 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Caney Creek at Barber (AT197360), 2001-2006.

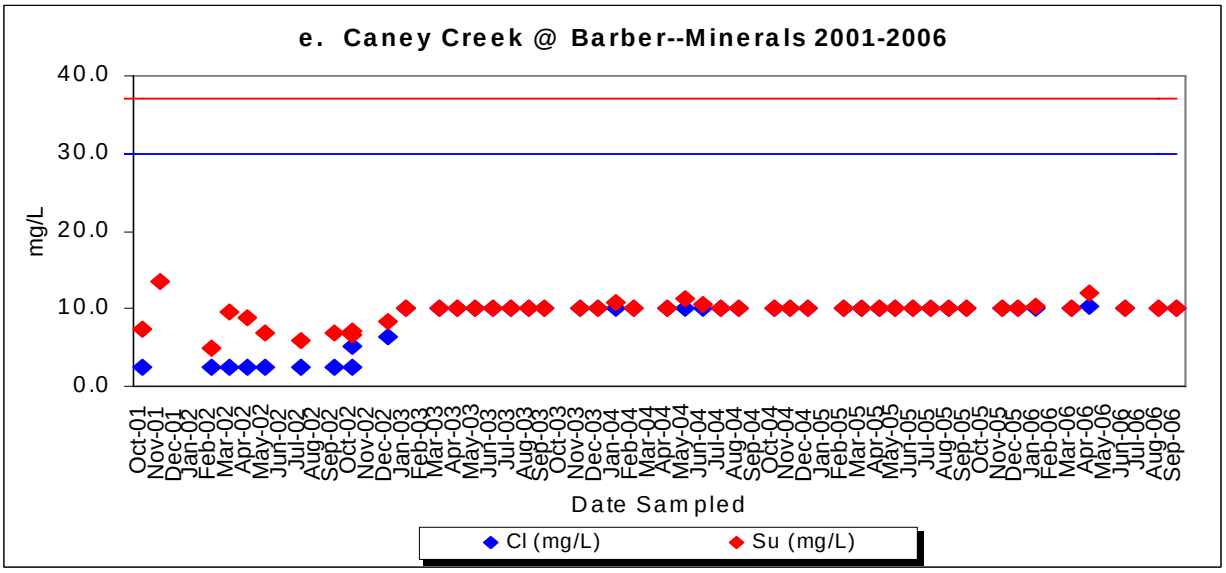


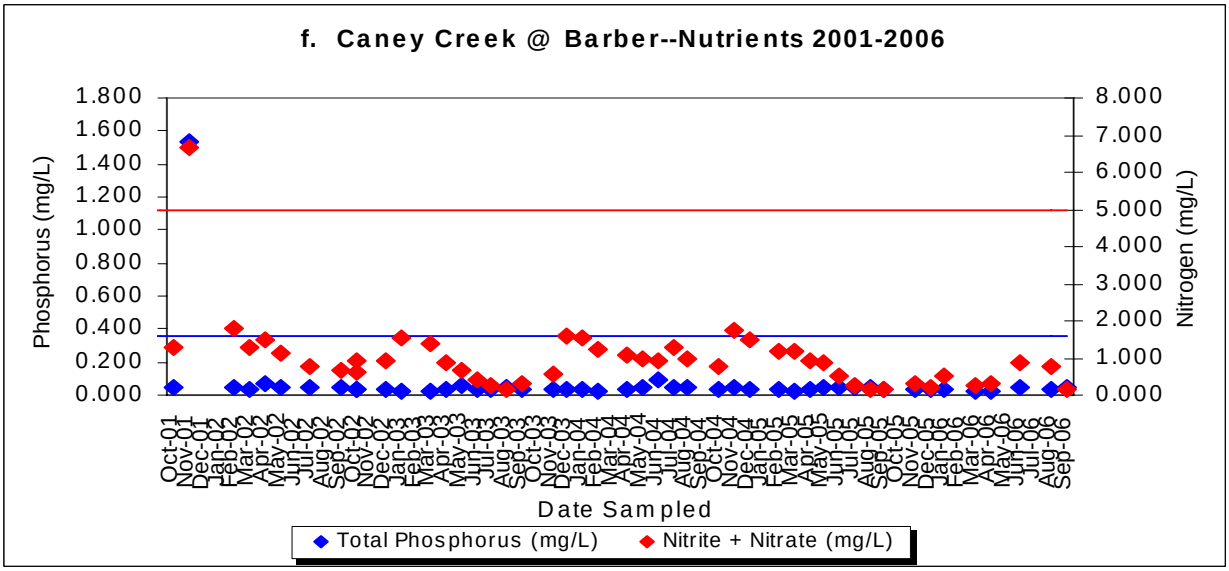




HUC 1111


d. Caney Creek @ Barber--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Caney Creek @ Barber--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Caney Creek @ Barber--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

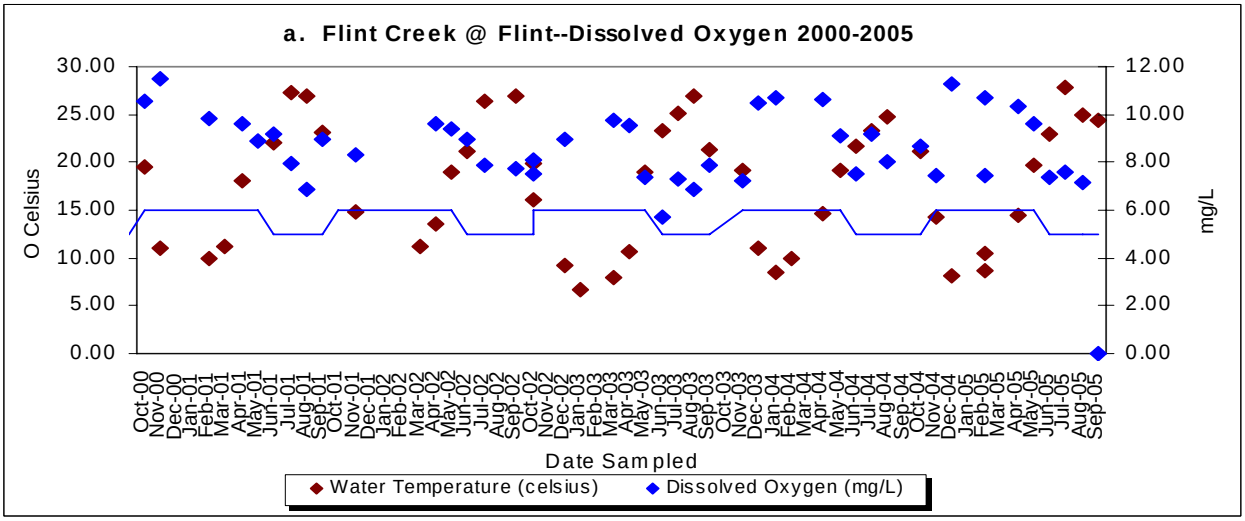
Flint Creek near Flint, OK

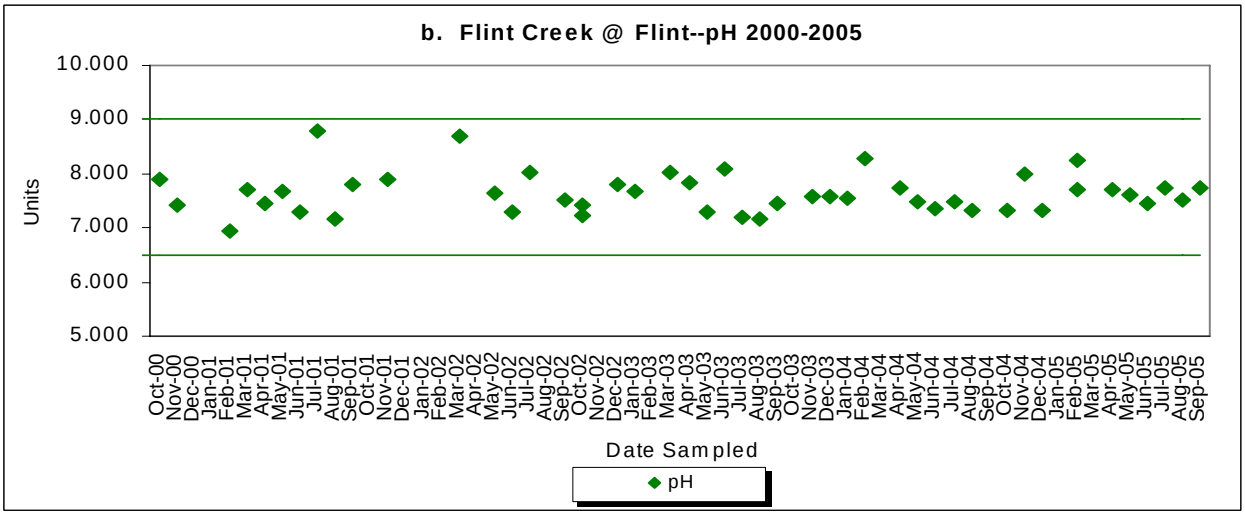
Station AT196000 (121700060010-001AT) is a permanent ambient trend monitoring station located on Flint Creek in Oklahoma. Situated in the southeastern portion of Delaware County, the site was established east of the town of Flint on US Highway 412. The station is positioned near the terminal end of stream segment 121700060010 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from Arkansas and from several tributaries including Sager Creek, among others.

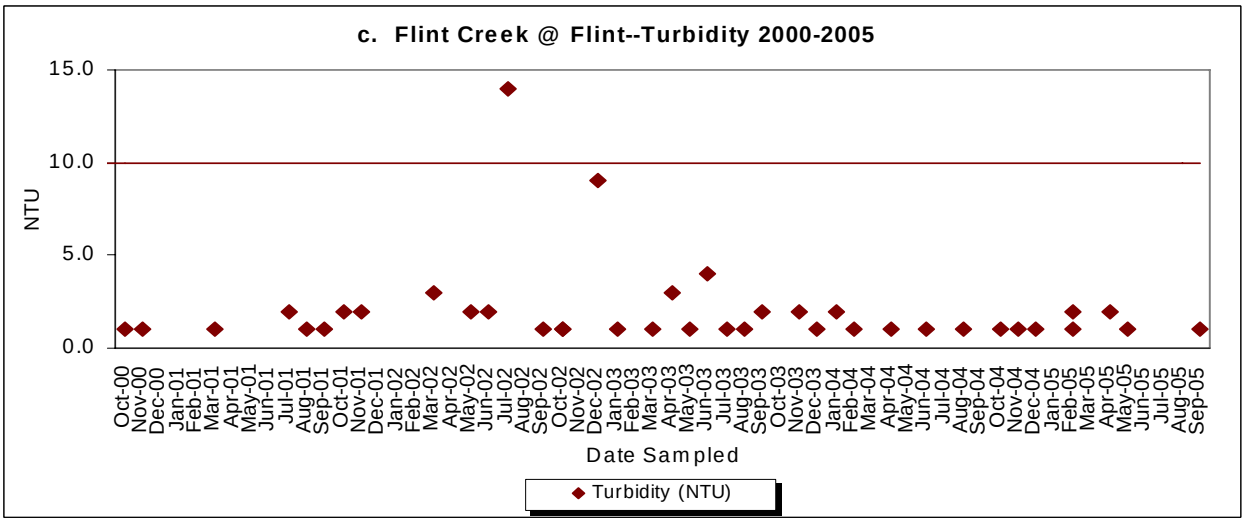
This station on Flint Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Flint Creek from the confluence of an unlisted tributary (94.6318, 36.2169) downstream to a point above Flint Creek's intersection with US Highway 412 (94.7076, 36.1863). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. Flint Creek is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 65a), pH (Figure 65b), turbidity (Figure 65c), and toxicant samples met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2003 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 37 for Ozark Highland cool water aquatic communities [OAC 46:15-5(j)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 65d and e). Although 32% of the TDS concentrations are above the sample standards of 197.0 mg/L and the geometric mean (174.5 mg/L) exceeded the yearly mean standard of 161.0 mg/L, these values are below the prescribed minimum values of 700 mg/L. The PBCR beneficial use is not supported (Table 24). Of the thirty-five (35) enterococci concentrations, nineteen (19) samples exceeded the prescribed screening level of 61 cfu/mL, and the geometric mean (48.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. The aesthetics beneficial use is impaired for total phosphorus (Figure 65f). Of the forty-nine (49) 3-month rolling geometric means calculated from total phosphorus samples, 49 geometric means (or 100%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

Figure 65 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Flint Creek at Flint (AT196000), 2001-2006.







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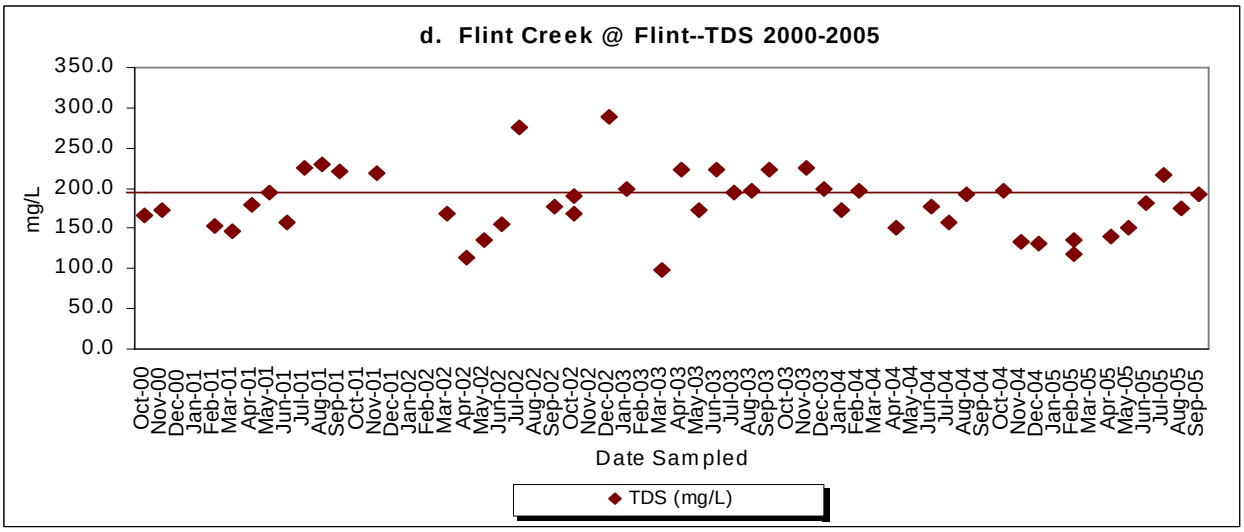
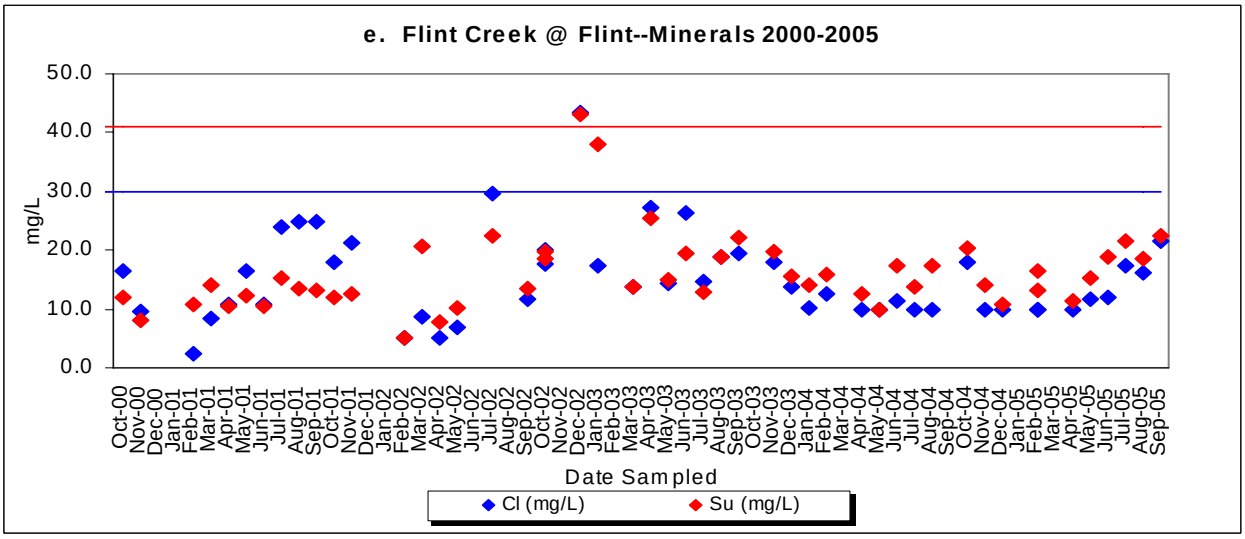
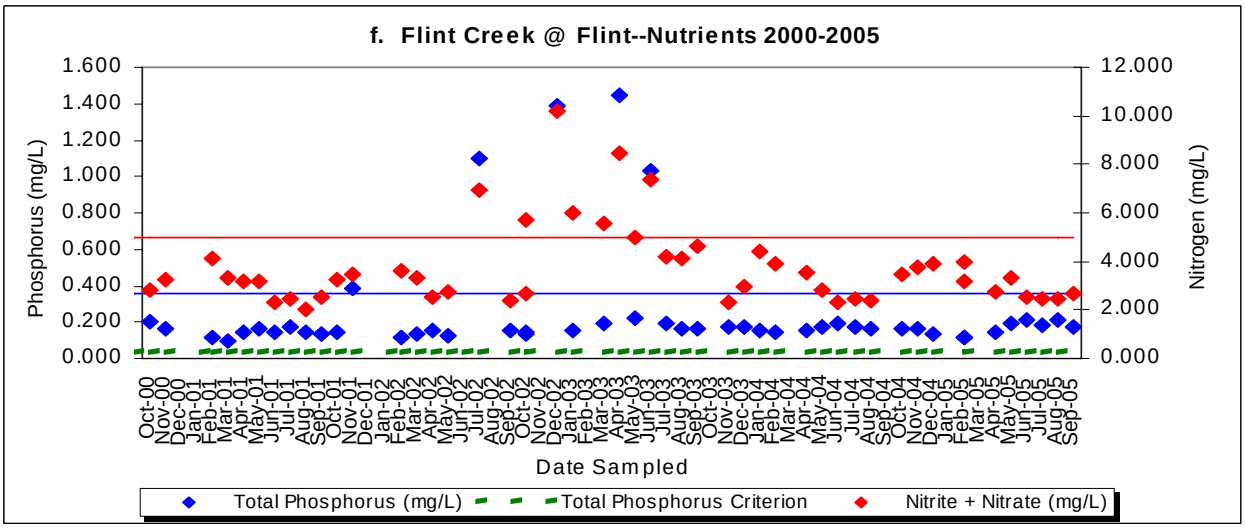

d. Flint Creek @ Flint--TDS 2000-2005
mg/L
Date Sampled
TDS (mg/L)


e. Flint Creek @ Flint--Minerals 2000-2005
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Flint Creek @ Flint--Nutrients 2000-2005
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorus Criterion
Nitrite + Nitrate (mg/L)

HUC 1111

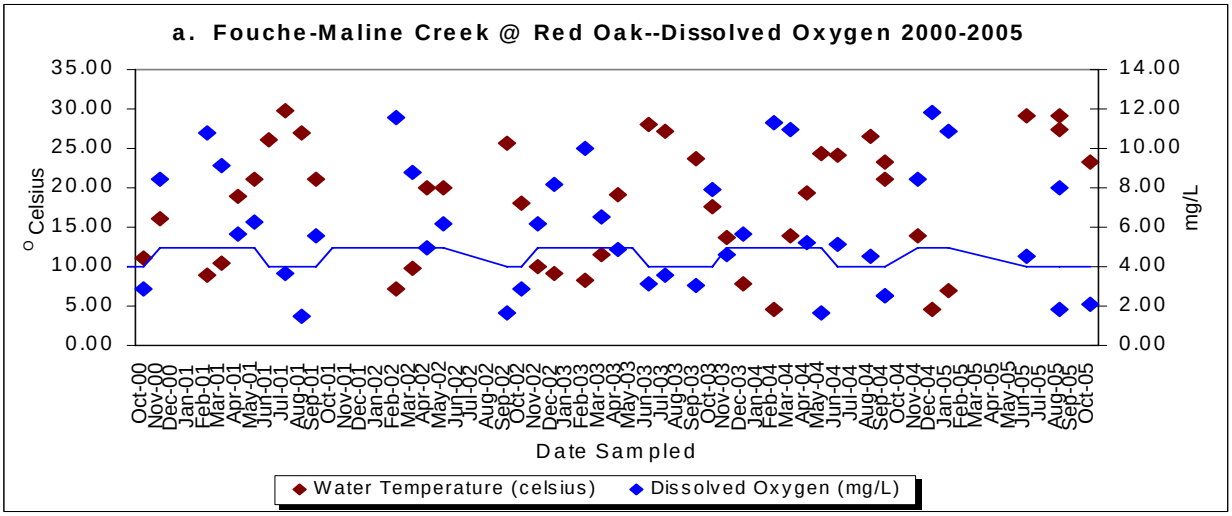
Fourche-Maline Creek near Red Oak

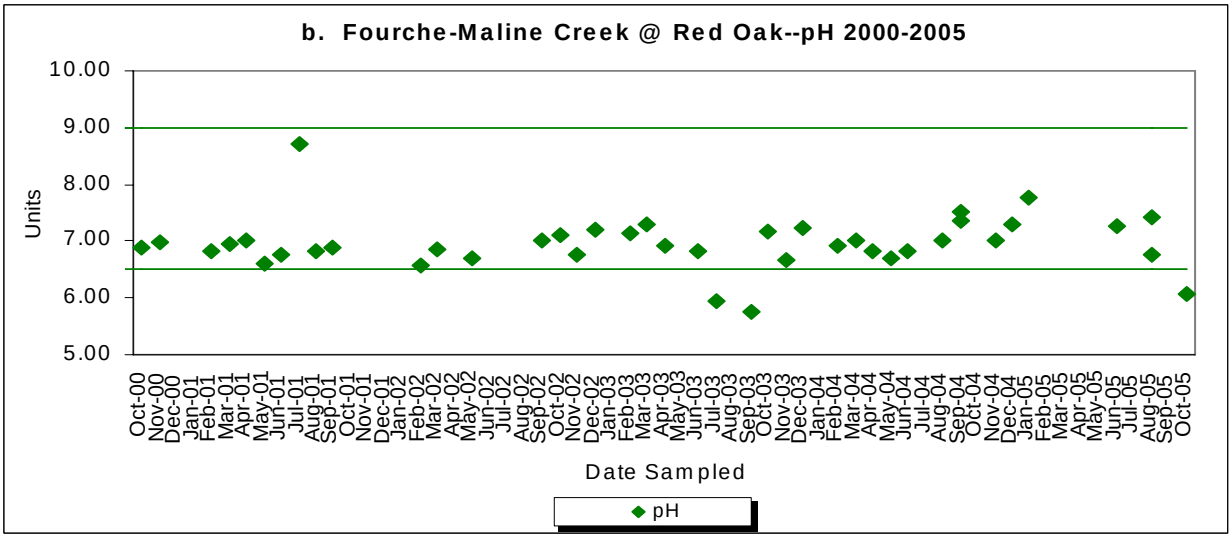
Station AT247550 (220100040020-001AT) is a permanent ambient trend monitoring station located on Fourche-Maline Creek. Situated in the east central portion of Latimer county, the site was established southwest of the town of Red Oak off of US Highway 270 on Craven Road. The station is positioned between the upper end and the midpoint of stream segment 220100040020 and is classified within the Poteau River 8 digit HUC watershed (11110105). Water enters the stream system from several tributaries including Coon Creek (Coon Creek Lake), Bandy Creek, Little Fourche-Maline Creek, and Spring Creek, among others.

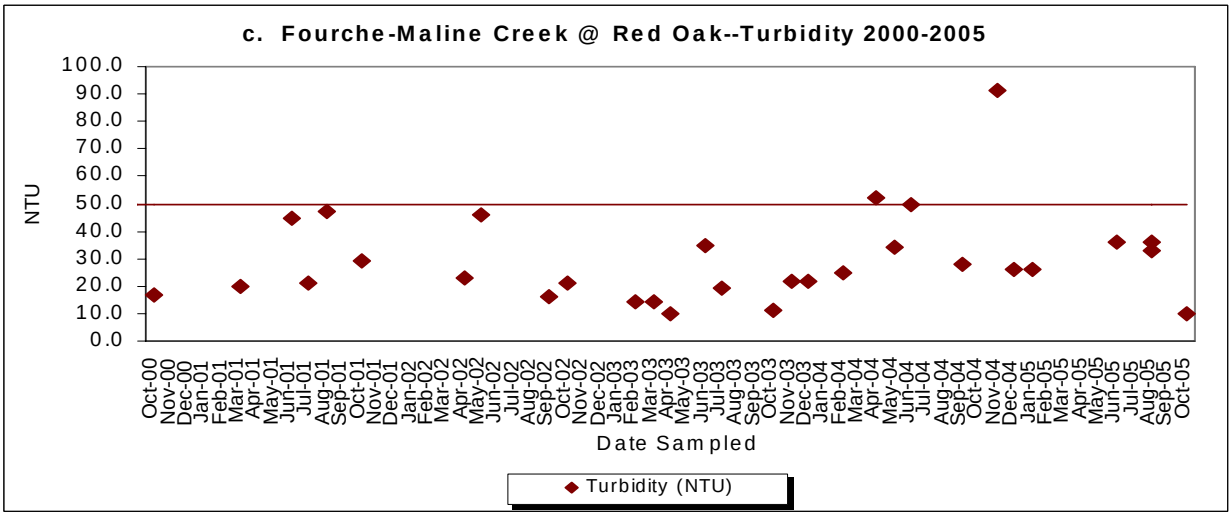
This station on Fourche-Maline Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Fourche-Maline Creek from the confluence of Coon Creek (95.3566, 34.9726) downstream to confluence of Spring Creek with Fourche-Maline Creek (95.1338, 34.9026). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the forty-two (42) dissolved oxygen concentrations (Figure 66a), twenty (20) samples (or 48%) were below the screening level. Of the ten (10) lead samples collected, seven (7) of the concentrations (or 70%) exceeded the prescribed hardness-dependant chronic criteria of 1.32 ug/L (Table 23). The pH (Figure 66b) and turbidity samples (Figure 66c) met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 66d and e). The PBCR beneficial use is not supported (Table 24). Of the eighteen (18) enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (277.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Fourche-Maline Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 66f).

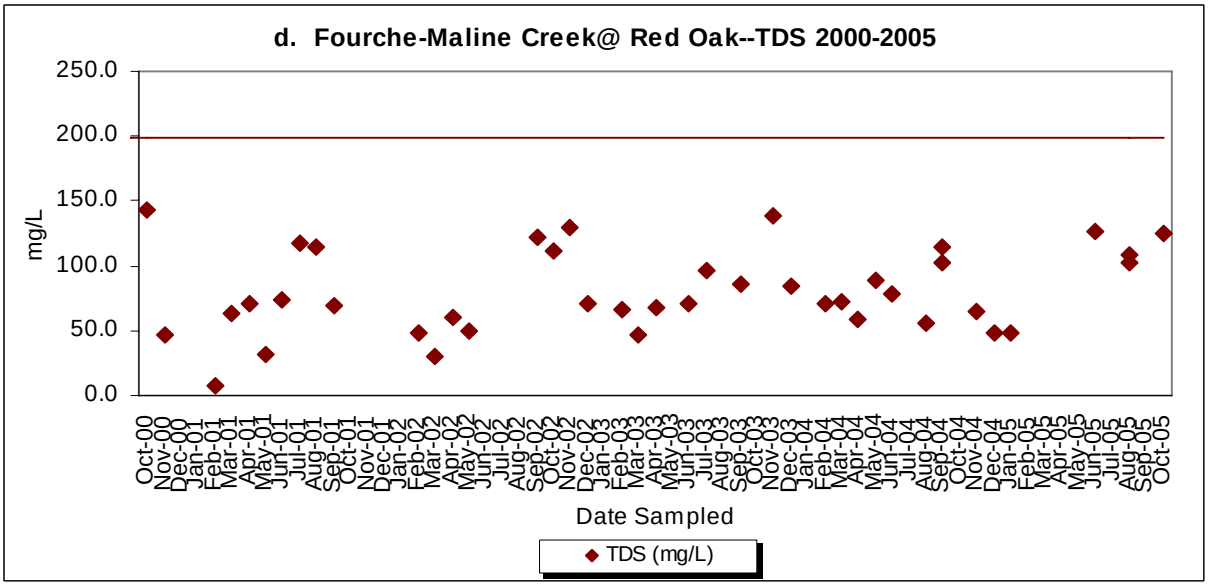
Figure 66 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Fourche-Maline Creek at Red Oak (AT247550), 2001-2006.

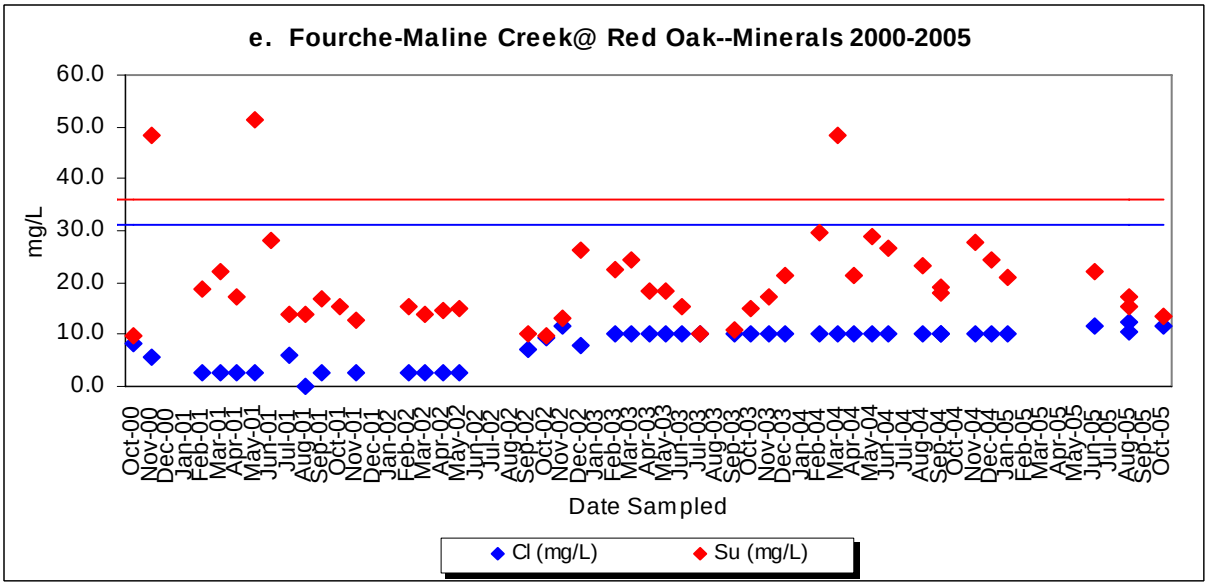


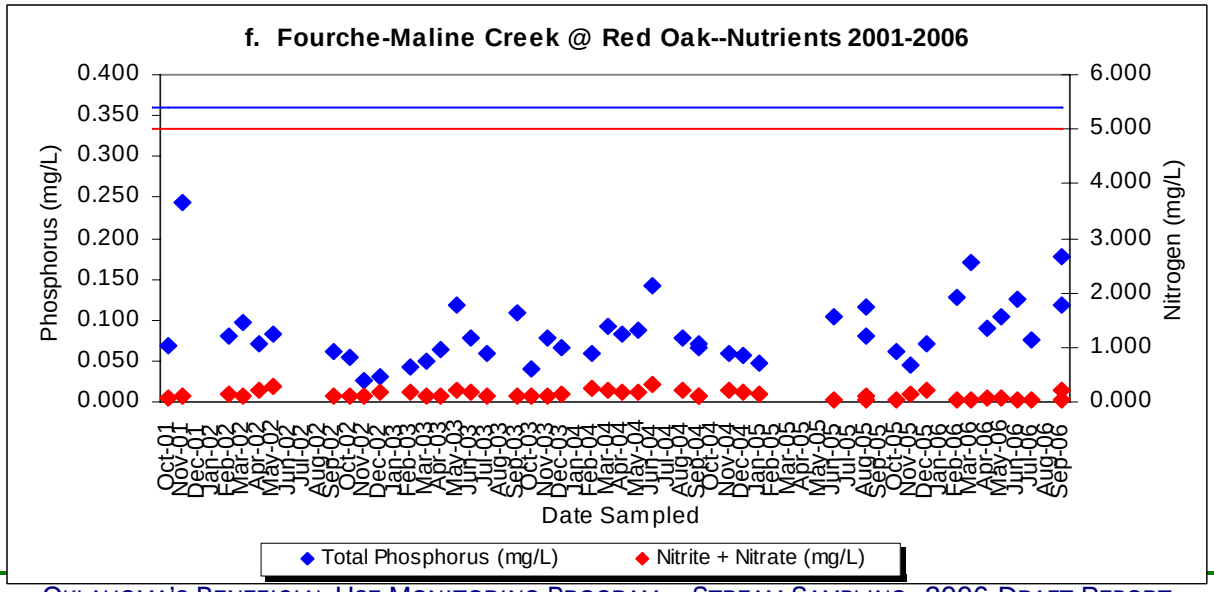




HUC 1111


d. Fourche-Maline Creek@ Red Oak--TDS 2000-2005
mg/L
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Fourche-Maline Creek@ Red Oak--Minerals 2000-2005
mg/L
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Fourche-Maline Creek @ Red Oak--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

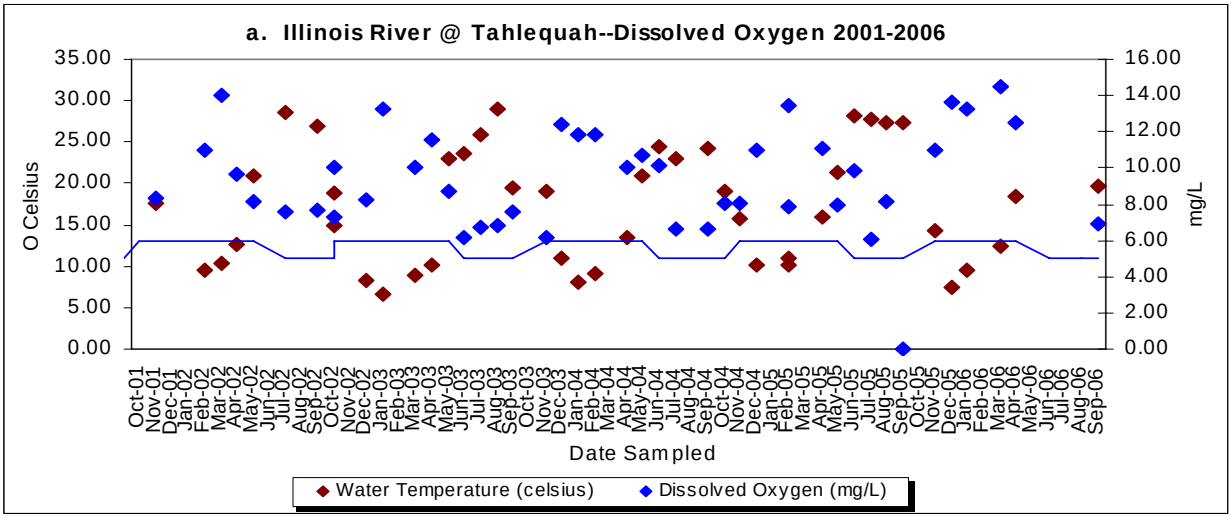
Illinois River near Tahlequah

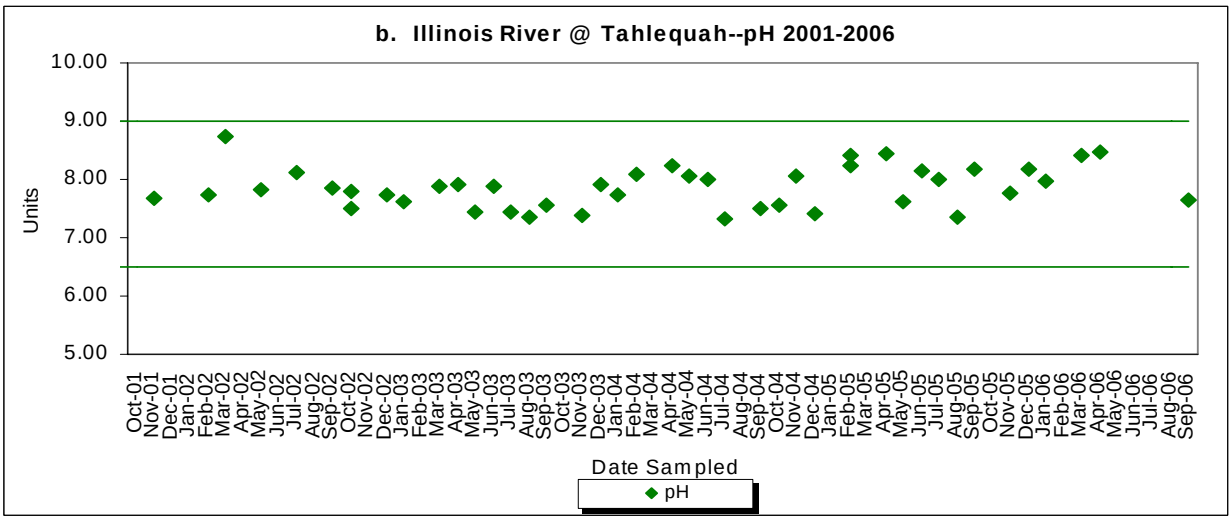
Station AT196500 (121700030010-001AT) is a permanent ambient trend monitoring station located on the Illinois River in Oklahoma. Situated in the east central portion of Cherokee County, the site was established east of the city of Tahlequah on US Highway 62. The station is positioned near the upper end of stream segment 121700030010 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from several tributaries including Tahlequah Creek, among others.

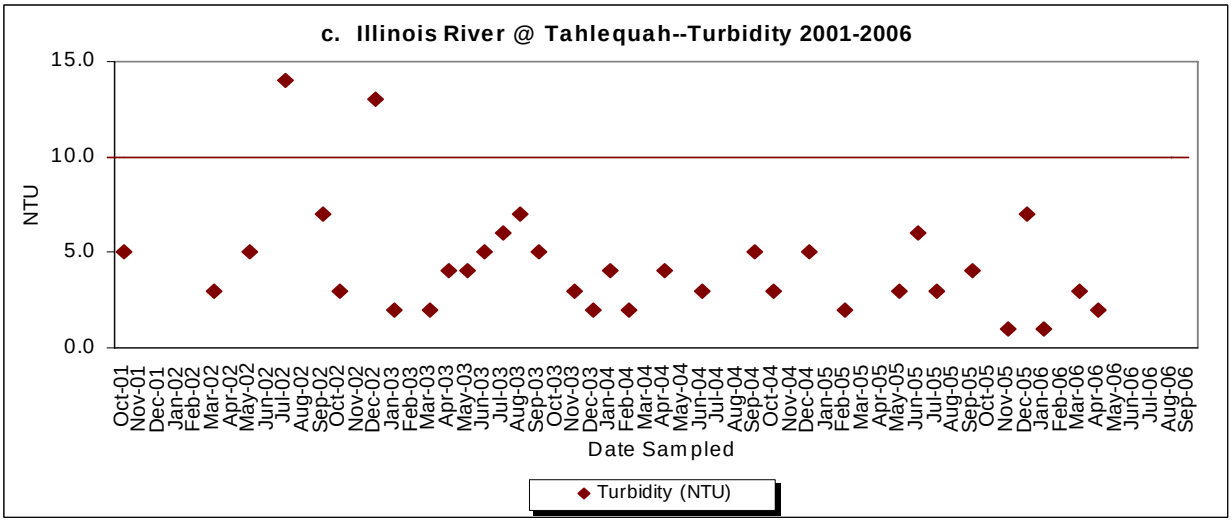
This station on the Illinois River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Illinois River from the confluence of an unlisted tributary near Ellerville, Oklahoma (94.9221, 36.0094) downstream to confluence of Tahlequah Creek with the Illinois River (94.9445, 35.8860). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. The Illinois River is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 67a), pH (Figure 67b), turbidity (Figure 67c), and toxicant data met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 67d and e). The PBCR beneficial use is not supported (Table 24). Of the thirty-six (36) enterococci concentrations, eleven (11) samples exceeded the prescribed screening level of 61 cfu/mL, and the geometric mean (35.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. The aesthetics beneficial use is impaired for total phosphorus (Figure 67f). Of the fifty-one (51) 3-month rolling geometric means calculated from total phosphorus samples, 51 geometric means (or 100%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

Figure 67 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Illinois River at Tahlequah (AT196500), 2001-2006.







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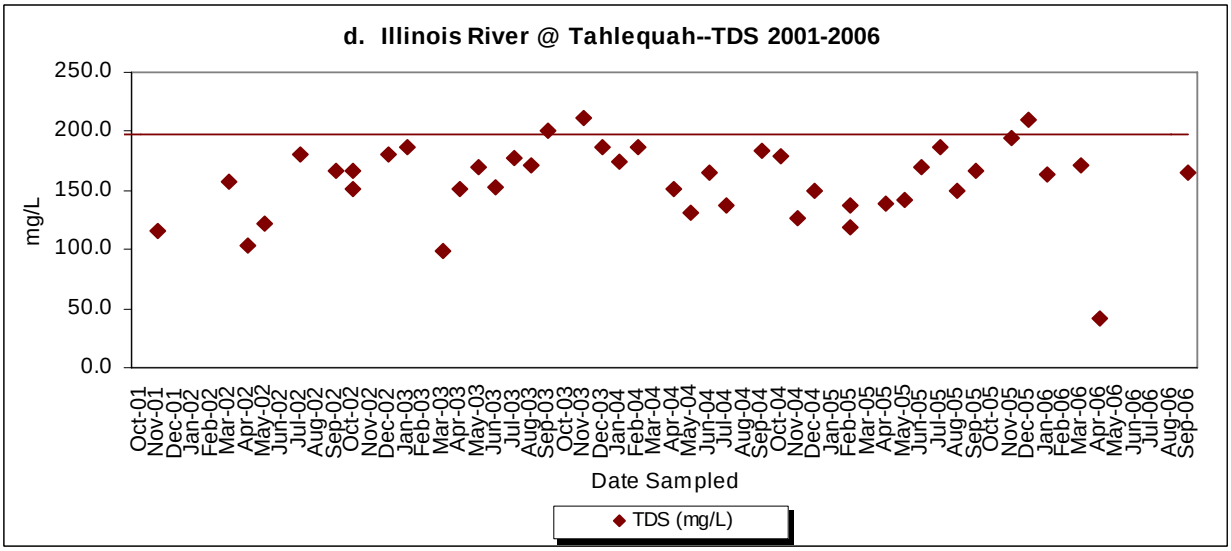
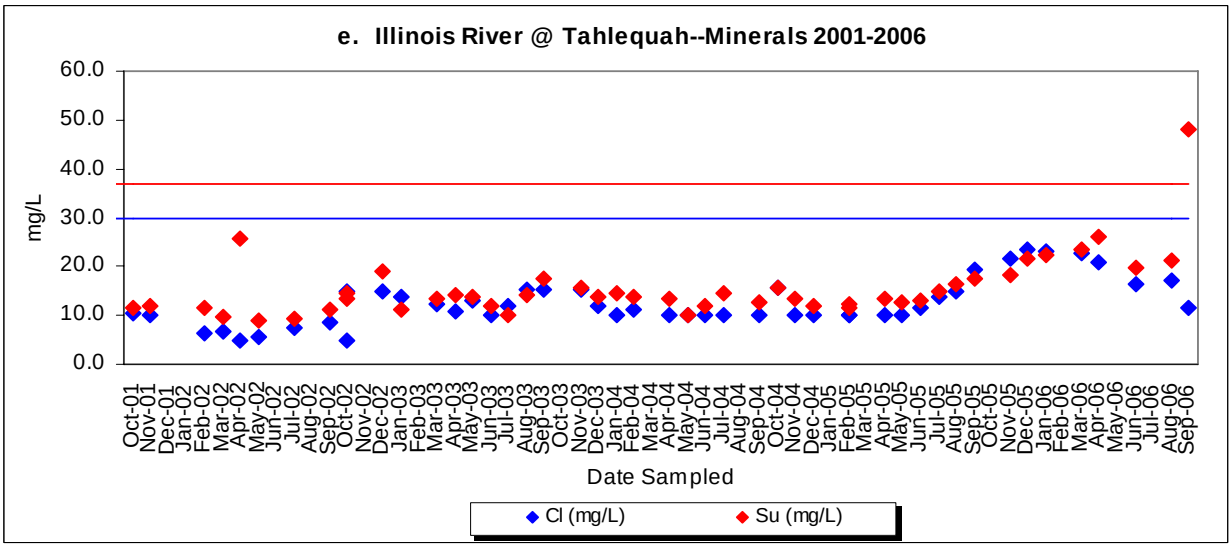
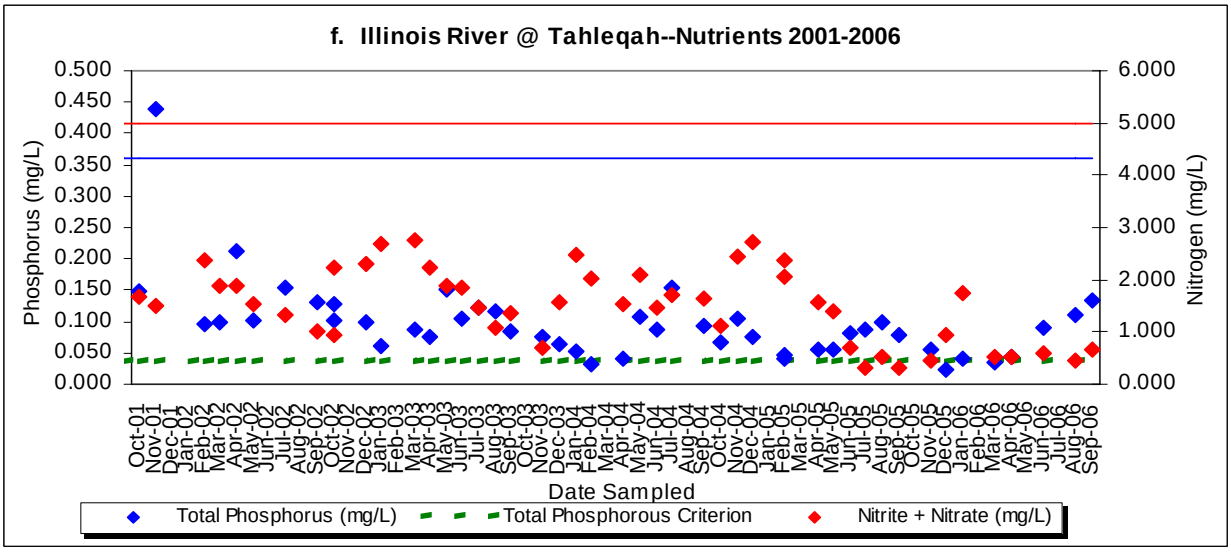

d. Illinois River @ Tahlequah--TDS 2001-2006
mg/L
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Illinois River @ Tahlequah--Minerals 2001-2006
mg/L
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Illinois River @ Tahleqah--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorous Criterion
Nitrite + Nitrate (mg/L)

HUC 1111

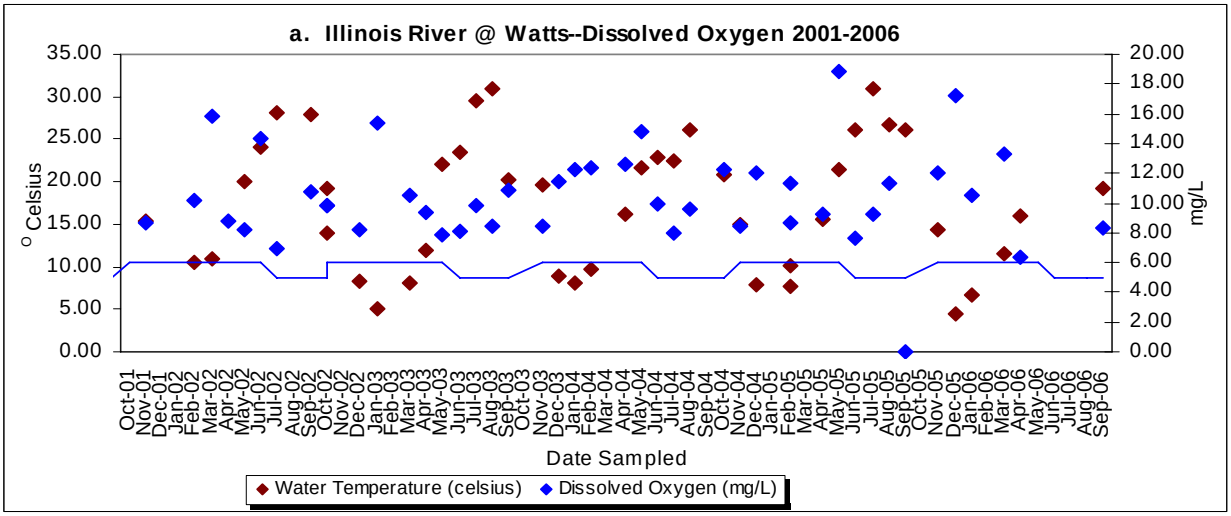
Illinois River near Watts

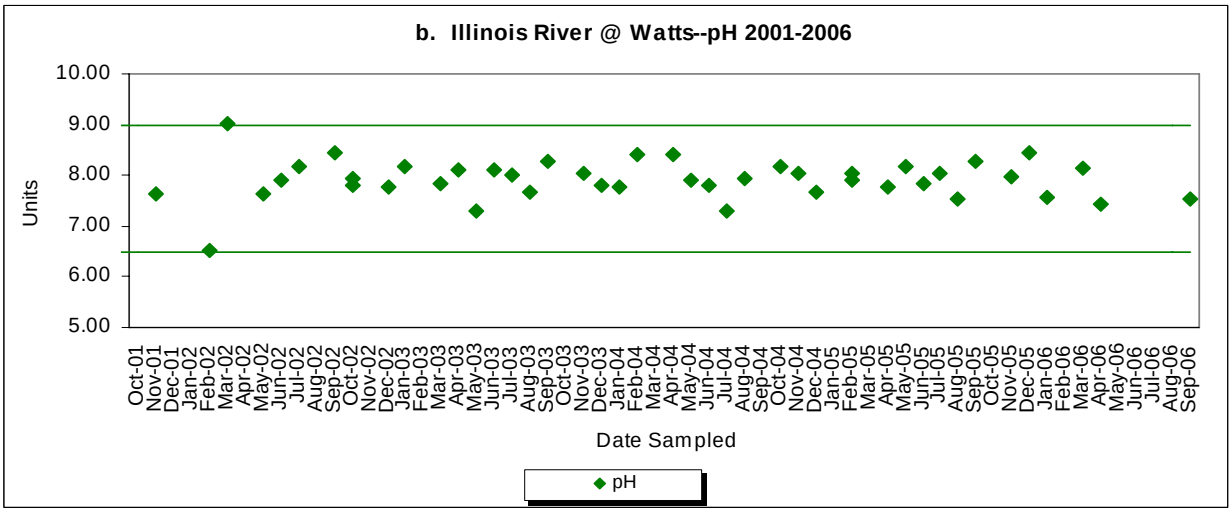
Station AT195500 (121700030350-001AT) is a permanent ambient trend monitoring station located on the Illinois River in Oklahoma. Situated in the northeastern portion of Adair County, the site was established north of the city of Watts on US Highway 59. The station is positioned near the upper end of stream segment 121700030350 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from Arkansas and several tributaries including Ballard Creek and Flint Creek, among others.

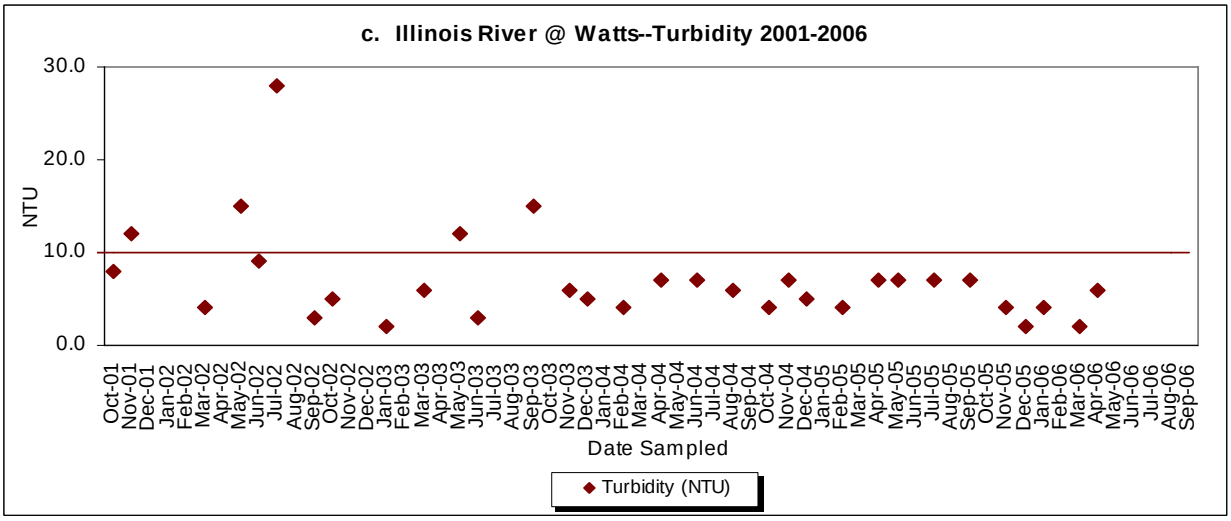
This station on the Illinois River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Illinois River from its entrance into Oklahoma near Watts, Oklahoma (94.5551, 36.1189) downstream to confluence of Flint Creek with the Illinois River (94.7210, 36.1744). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. The Illinois River is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is partially supported but impaired per the CPP. Of the thirty-two (32) turbidity samples (Figure 68c), five (5) samples (or 17%) exceeded the numerical criterion of 10. Dissolved oxygen (Figure 68a), pH (Figure 68b), and toxicant samples met the criteria prescribed in the CWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 68d and e). Although 39% of the TDS concentrations exceeded the sample standard of 197 mg/L and the geometric mean (188.2 mg/L) exceeded the yearly mean standard of 161.0 mg/L, these values are below the prescribed minimum value of 700 mg/L. The PBCR beneficial use is not supported (Table 24). Of the thirty-four (34) enterococci concentrations, eleven (11) samples exceeded the prescribed screening level of 61 cfu/mL, and the geometric mean (41.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. The aesthetics beneficial use is impaired for total phosphorus (Figure 68f). Of the forty-eight (48) 3-month rolling geometric means calculated from total phosphorus samples, 48 geometric means (or 100%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

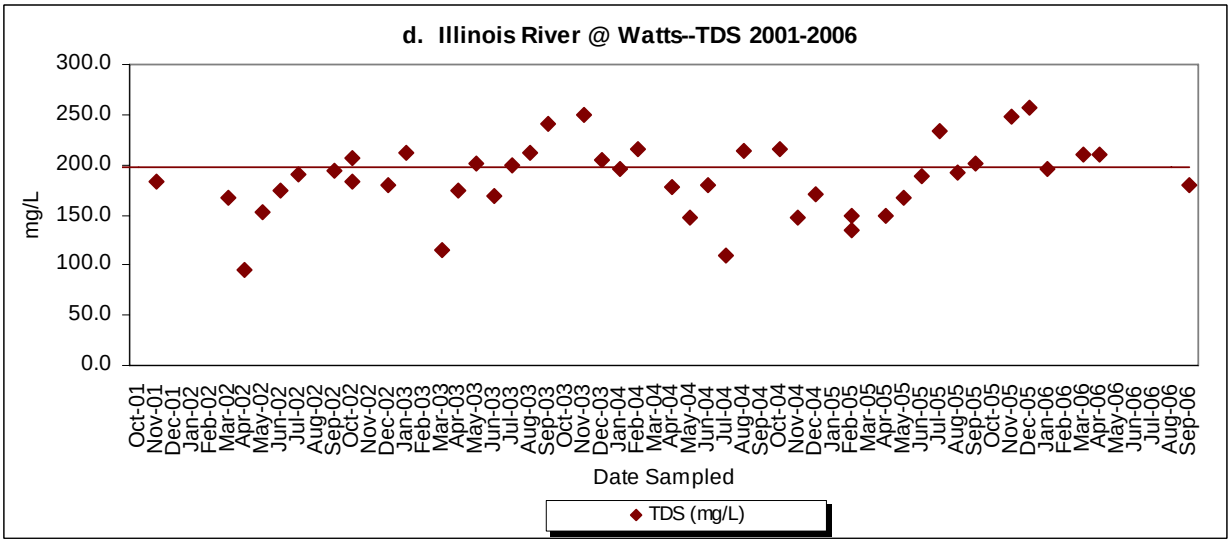
Figure 68 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Illinois River at Watts (AT195500), 2001-2006.

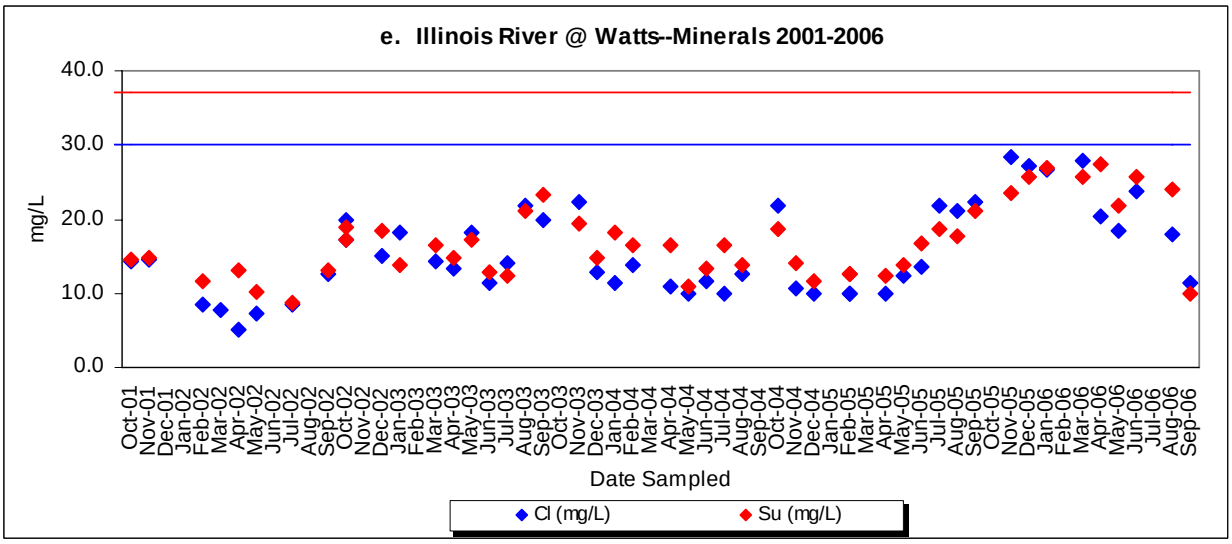


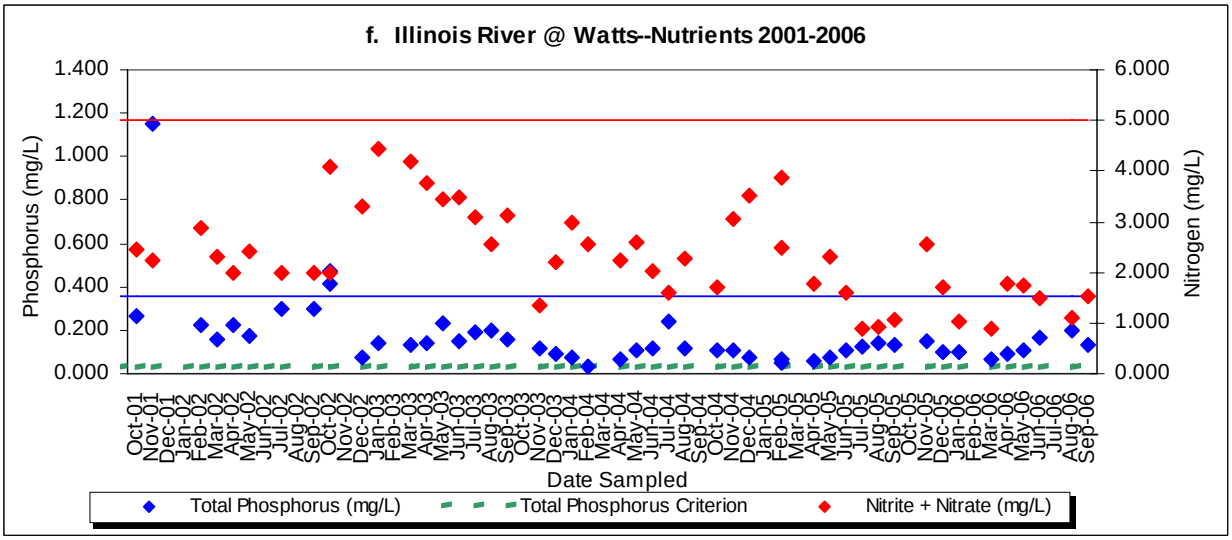




HUC 1111


d. Illinois River @ Watts--TDS 2001-2006
mg/L
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Illinois River @ Watts--Minerals 2001-2006
mg/L
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Illinois River @ Watts--Nutrients 2001-2006
Phosphorus (mg/L)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorus Criterion
Nitrite + Nitrate (mg/L)

HUC 1111

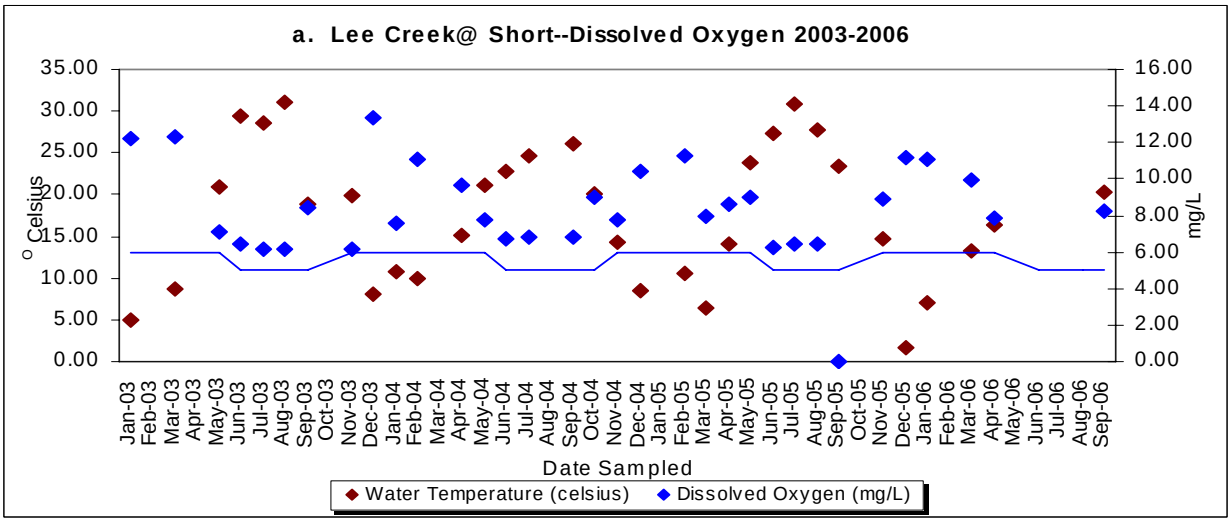
Lee Creek near Short

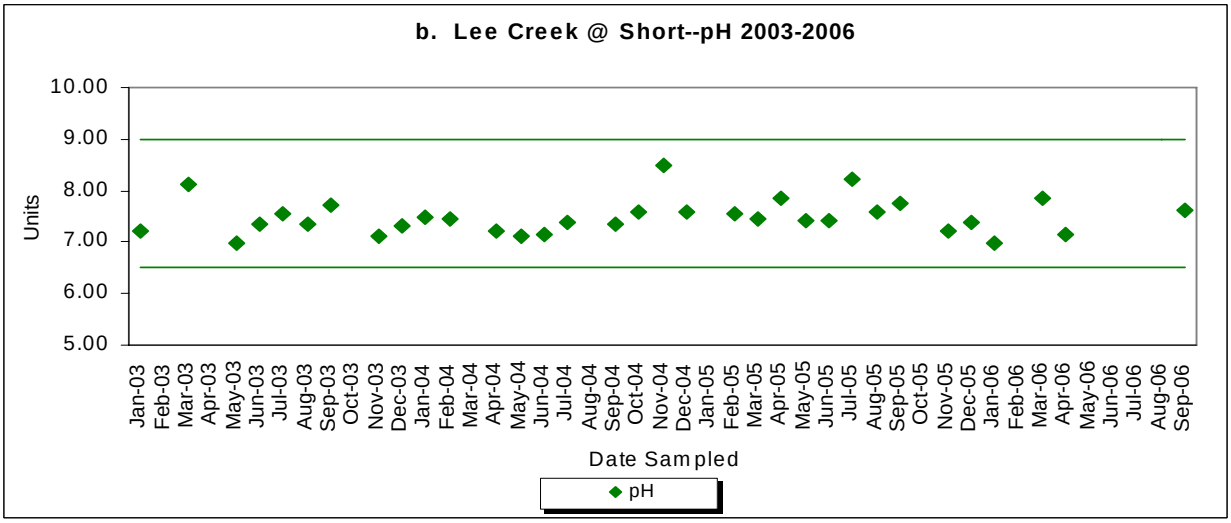
Station AT249800 (220200050010-001AT) is a permanent ambient trend monitoring station located on Lee Creek in Oklahoma. Situated in the northeastern portion of Sequoyah County, the site was established east of the town of Short on State Highway 101. The station is positioned near the midpoint of stream segment 220200050010 and is classified within the Robert S. Kerr Reservoir 8 digit HUC watershed (11110104). Water enters the stream system from Arkansas and from several tributaries including Little Lee Creek, Briar Creek, and Webber Creek among others.

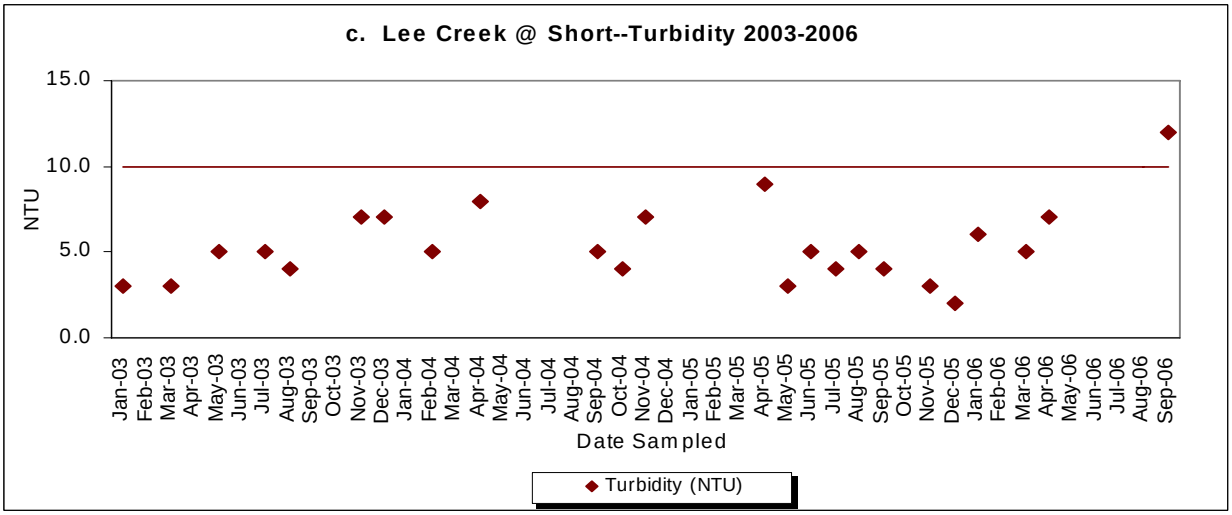
This station on Lee Creek has been active for all water quality variables since January of 2003. The following assessment of beneficial uses is based on data collected from January of 2003 through September of 2006. For purposes of reporting, this station is representative of Lee Creek from its entrance into Oklahoma near Uniontown, Arkansas (94.4682, 35.6109) downstream to the terminus of the stream section at the 420 ft. elevation level (94.4554, 35.5099). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. This portion of Lee Creek is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is supported. Dissolved oxygen (Figure 69a), pH (Figure 69b), and turbidity (Figure 69c) data met the criteria prescribed in the CWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 69d and e). The PBCR beneficial use is not supported (Table 24). Of the twenty-eight (28) enterococci concentrations, eight (8) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (37.9 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. The aesthetics beneficial use is not impaired for total phosphorus (Figure 69f). Of the thirty-two (32) 3-month rolling geometric means calculated from total phosphorus samples, none of the geometric means (or 0%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

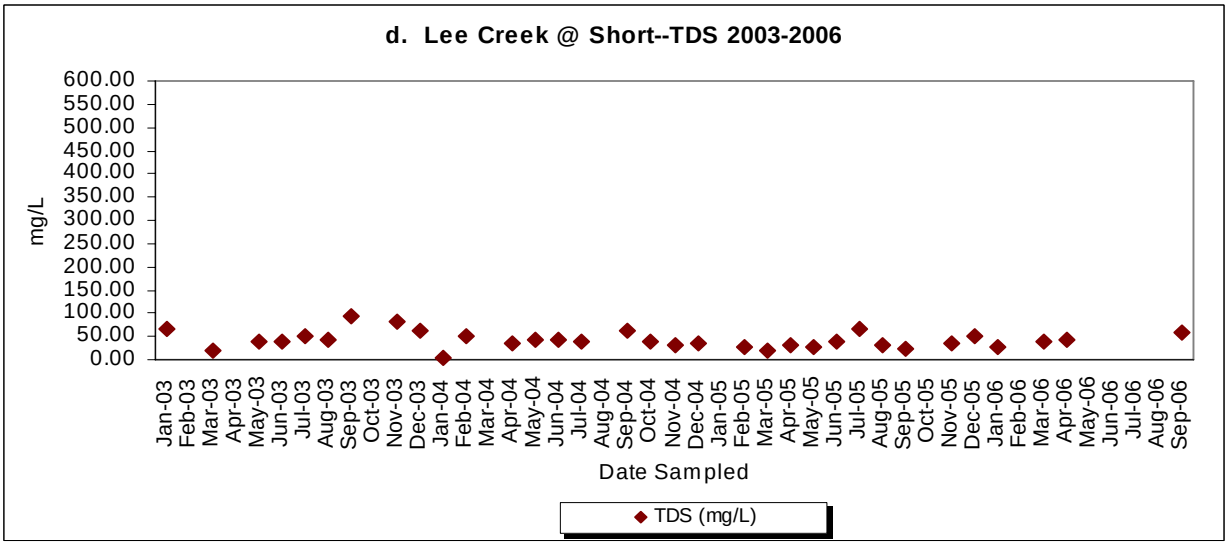
Figure 69 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Lee Creek at Short (AT249800), 2003-2006.

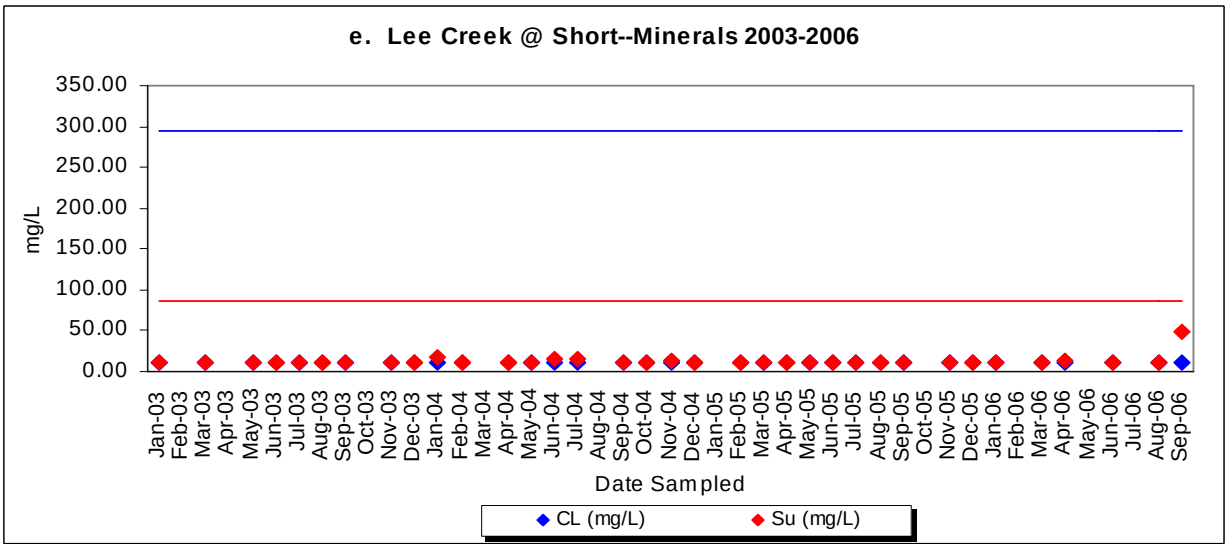


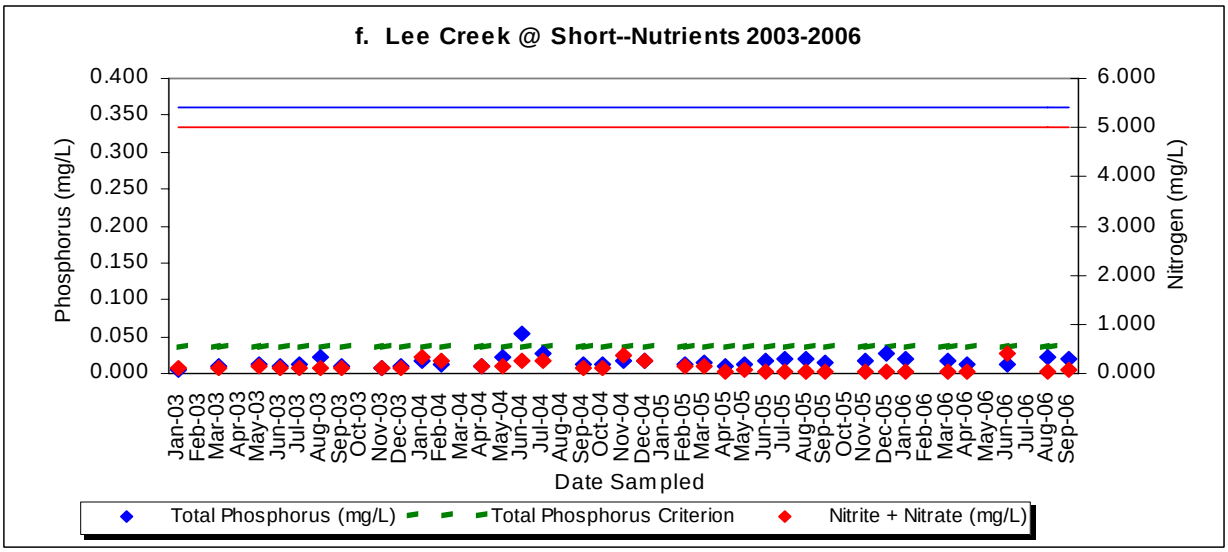




HUC 1111


d. Lee Creek @ Short--TDS 2003-2006
mg/L
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-03 Feb-03 Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
TDS (mg/L)


e. Lee Creek @ Short--Minerals 2003-2006
mg/L
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-03 Feb-03 Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
CL (mg/L)
Su (mg/L)


f. Lee Creek @ Short--Nutrients 2003-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Jan-03 Feb-03 Mar-03 Apr-03 May-03 Jun-03 Jul-03 Aug-03 Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorus Criterion
Nitrite + Nitrate (mg/L)

HUC 1111

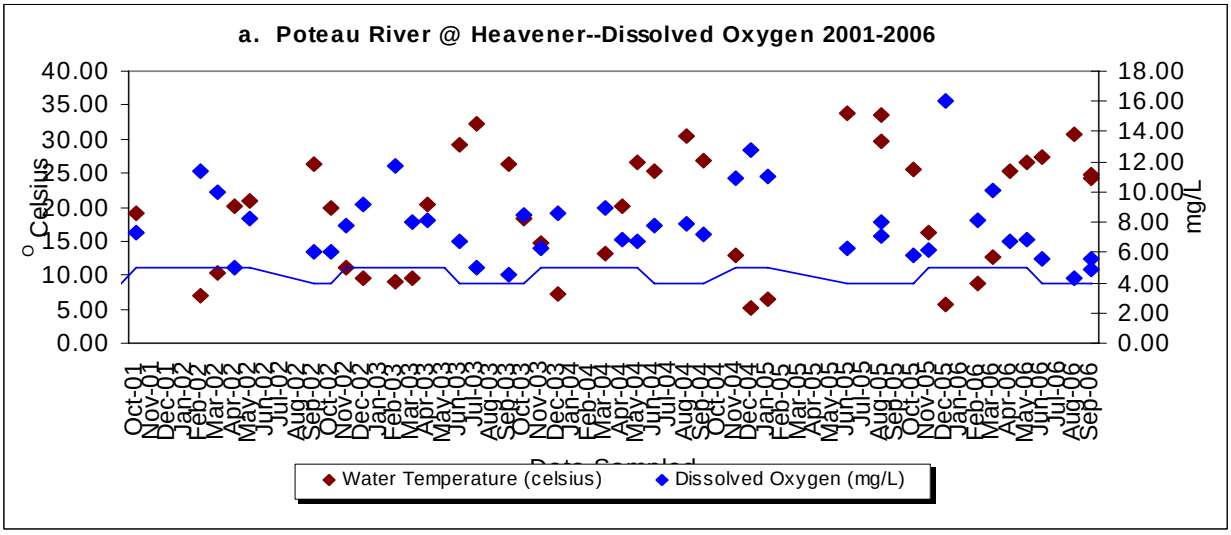
Poteau River near Heavener

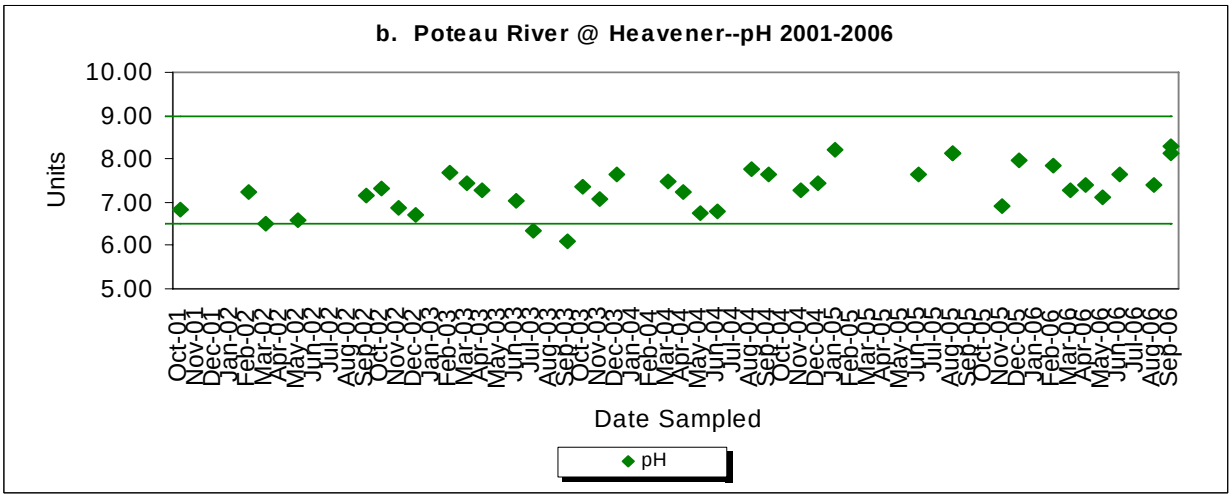
Station AT247350 (220100020010-001AT) is a permanent ambient trend monitoring station located on the Poteau River in Oklahoma. Situated in the central portion of LeFlore County, the site was established south of the city of Heavener on US Highway 59. The station is positioned near the midpoint of stream segment 220100020010 and is classified within the Poteau River 8 digit HUC watershed (11110105). Water enters the stream system from Arkansas and from several tributaries including Oil Branch, Black Fork Creek, and Conser Creek, among others.

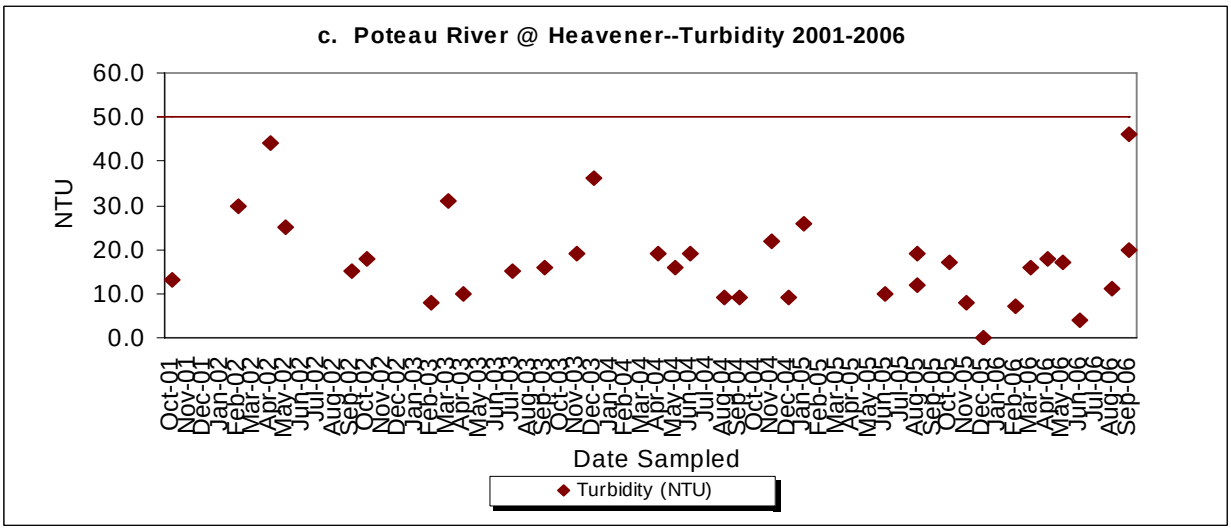
This station on the Poteau River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through of September of 2006. For purposes of reporting, this station is representative of the Poteau River from its entrance into Oklahoma near Loving, Oklahoma (94.4493, 34.8849) downstream to confluence of the Poteau River with Lake Wister (94.7561, 34.9035). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 70a), pH (Figure 70b), turbidity (Figure 70c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 70d and e). Although 15% of the TDS concentrations exceeded the sample standard of 177.0 mg/L, the values are below the minimum standard of 700 mg/L. Although 26% of the sulfate concentrations exceeded the sample standard of 49.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is supported for fecal coliform, enterococci, and *E. coli*. This segment of the Poteau River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 70f).

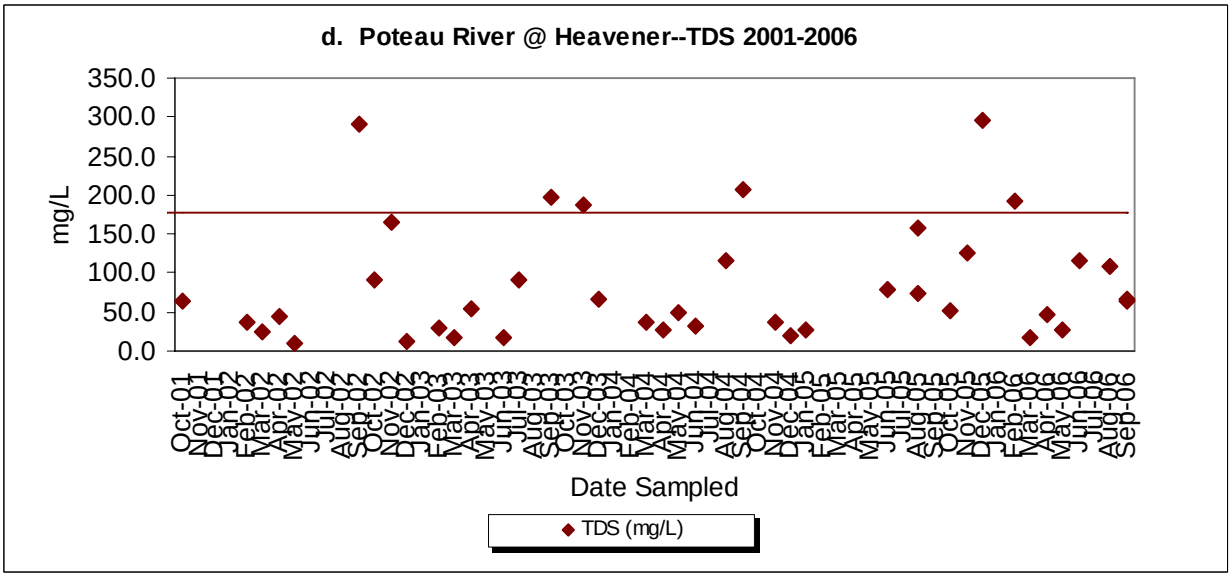
Figure 70 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Poteau River at Heavener (AT247350), 2001-2006.

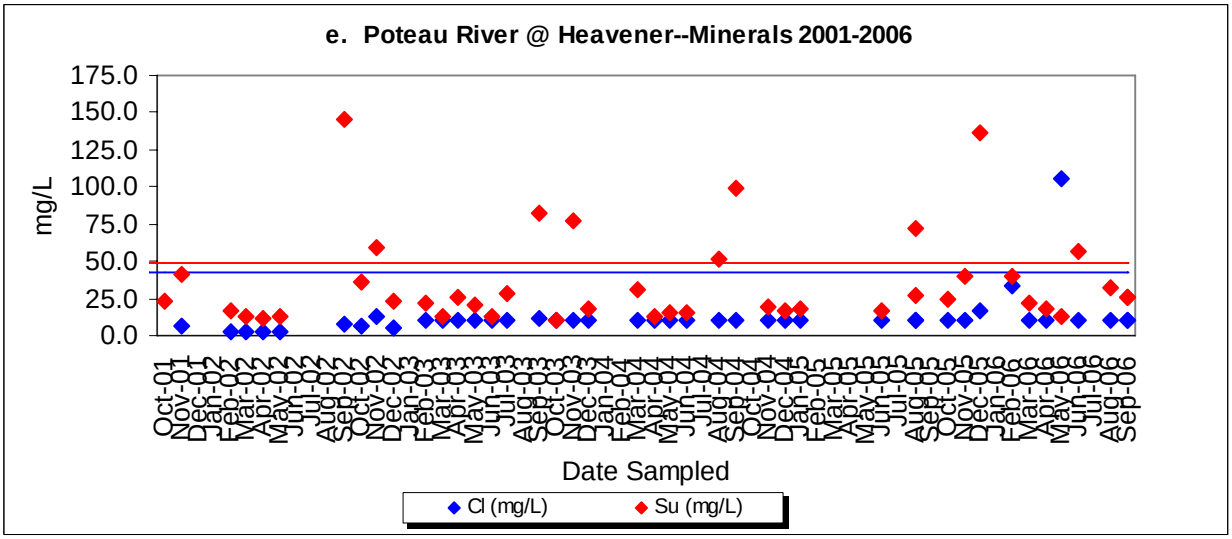


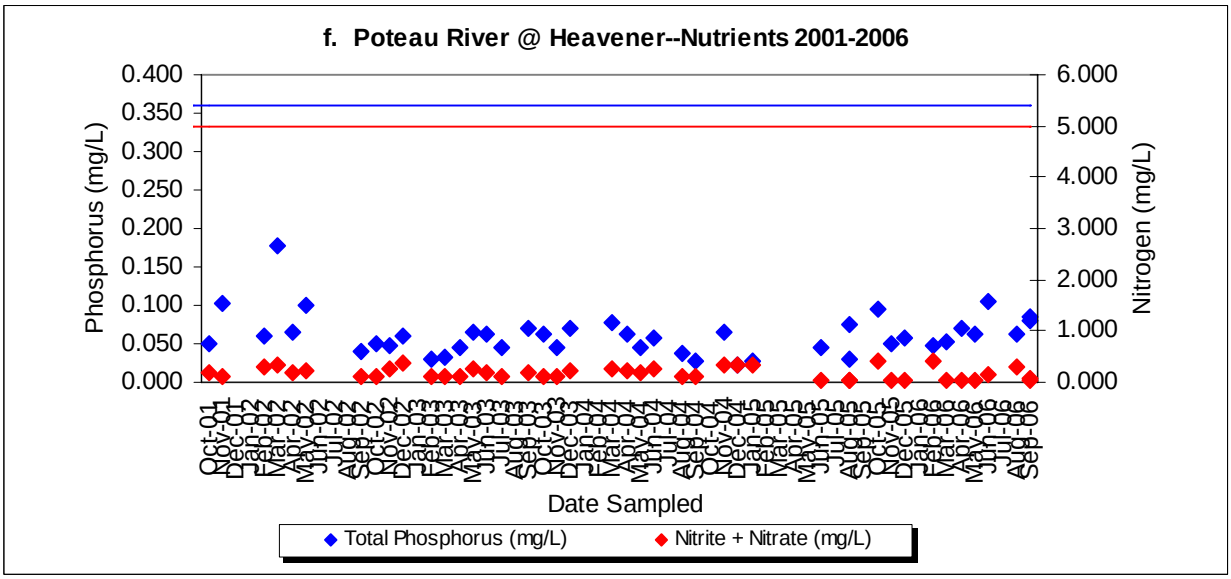




HUC 1111


d. Poteau River @ Heavener--TDS 2001-2006
mg/L
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Poteau River @ Heavener--Minerals 2001-2006
mg/L
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Poteau River @ Heavener--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

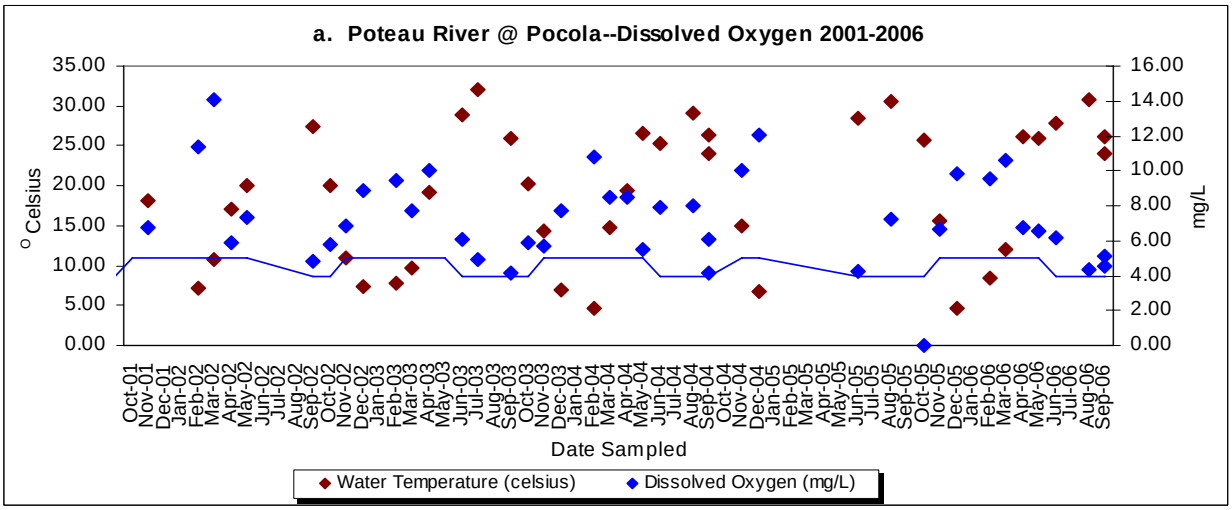
Poteau River near Pocola

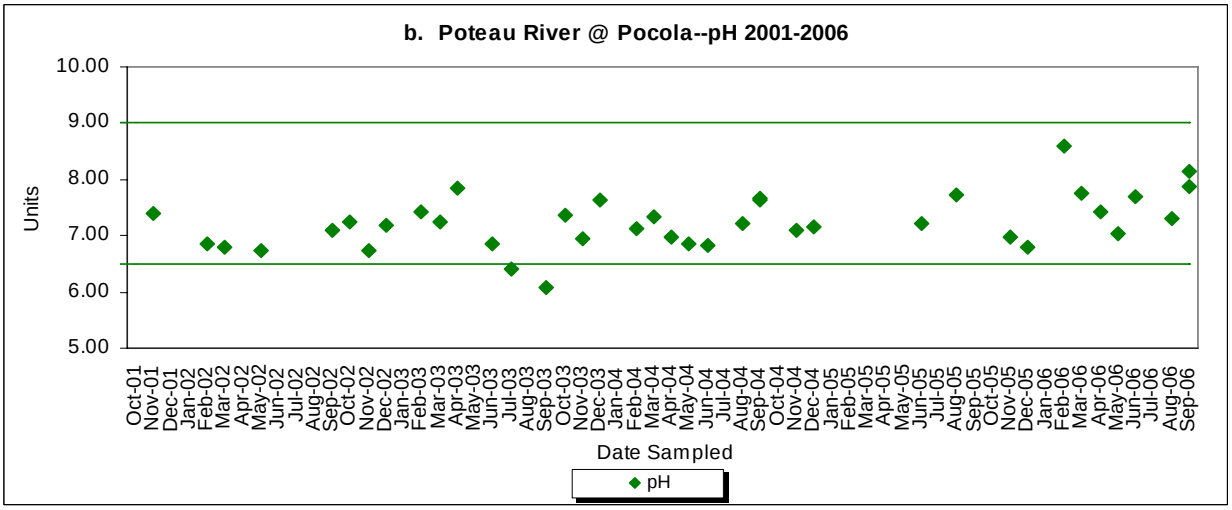
Station AT249435 (220100010010-001AT) is a permanent ambient trend monitoring station located on the Poteau River in Oklahoma. Situated in the northeastern portion of LeFlore County, the site was established west of the city of Pocola off of State Highway 112 on County Road E1220. The station is positioned near the midpoint of stream segment 220100010010 and is classified within the Poteau River 8 digit HUC watershed (11110105). Water enters the stream system from New Spiro Lake and from several tributaries including Brazil Creek, James Fork Creek, and Wells Creek, among others.

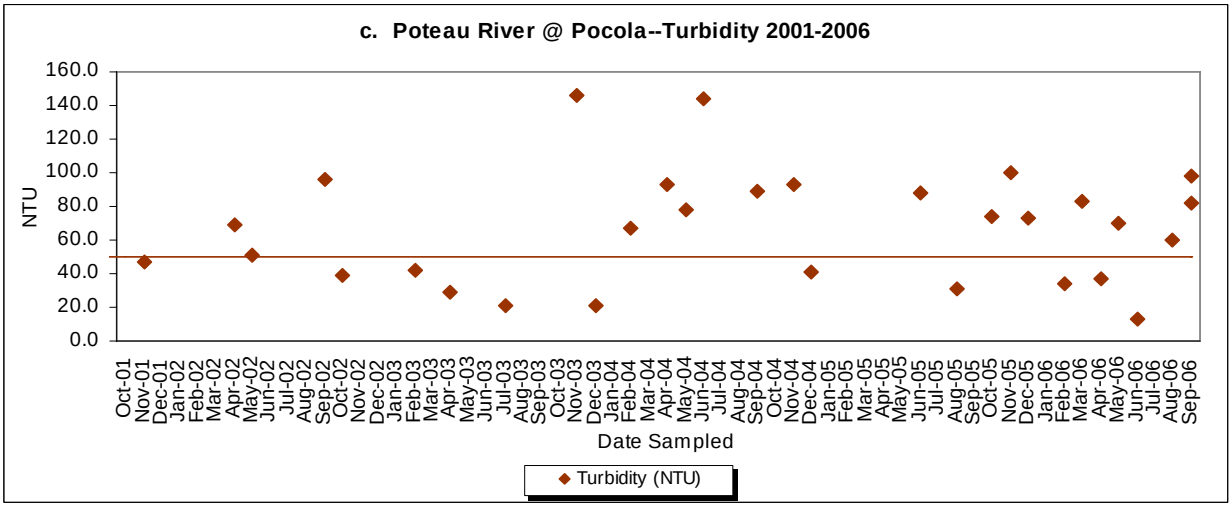
This station on the Poteau River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Poteau River from the confluence of Brazil Creek (94.6538, 35.1510) downstream to confluence of the Poteau River with the Arkansas River (94.4331, 35.3850). As per Appendix A, Table 2 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty (30) turbidity samples (Figure 71c), nineteen (19) samples (or 63%) exceeded the numerical criterion of 50 NTU. Of the eleven (11) copper samples collected, two (2) of the concentrations (or 18%) exceeded the prescribed, hardness-dependant chronic criteria of 6.81 ug/L (Table 23). Of the nine (9) lead samples collected, eight (8) of the concentrations (or 89%) exceeded the prescribed, hardness-dependant chronic criteria of 1.24 ug/L (Table 23). Dissolved oxygen (Figure 71a) and pH (Figure 71b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 71d and e). Although 19% of the sulfate concentrations exceeded the sample standard of 49.0 mg/L, and the geometric mean (39.5 mg/L) exceeded the yearly mean standard of 35.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 24). Of the sixteen (16) enterococci concentrations, 2 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (86.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Poteau River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 71f).

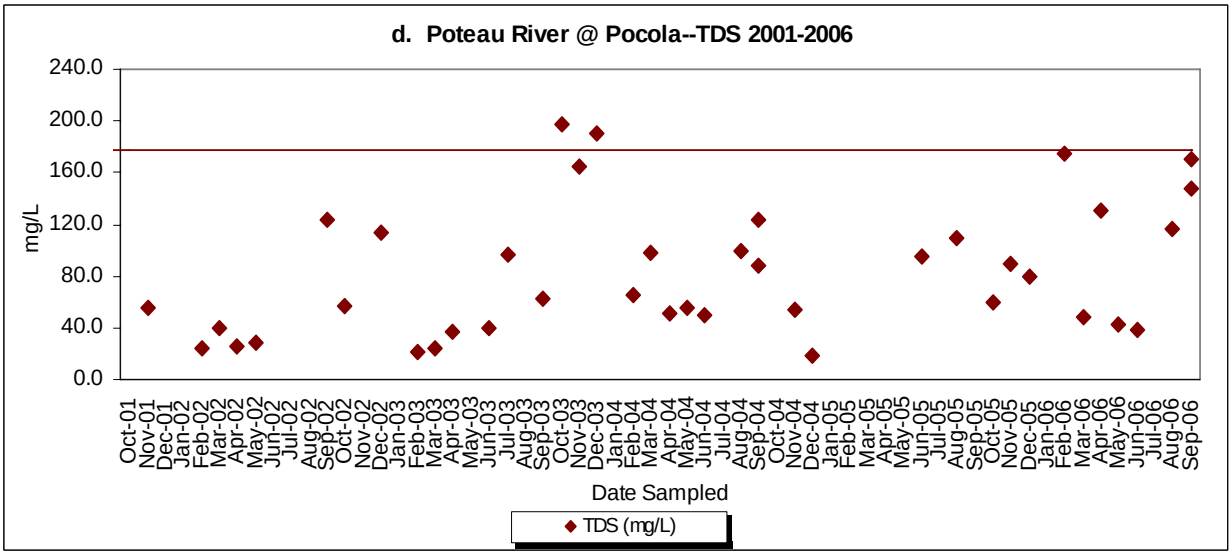
Figure 71 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) the Poteau River at Pocola (AT249435), 2001-2006.

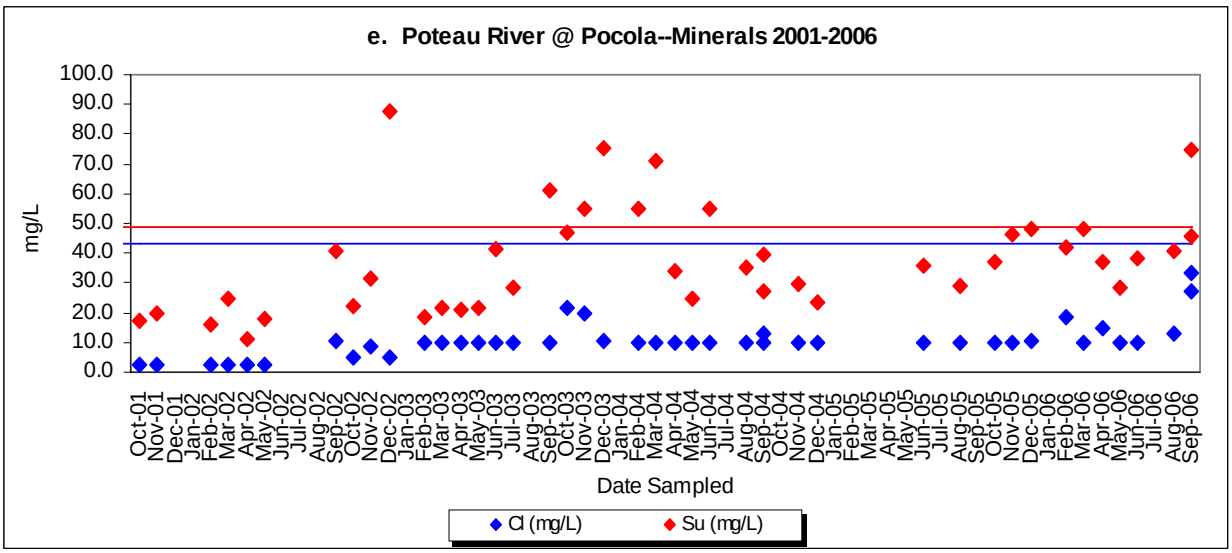


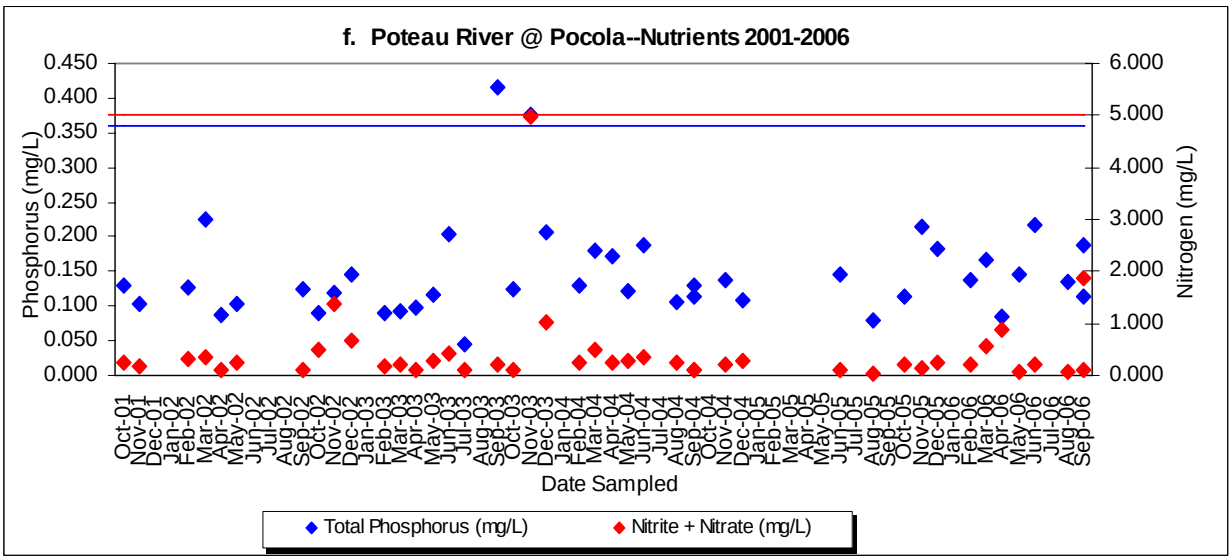




HUC 1111


d. Poteau River @ Pocola--TDS 2001-2006
mg/L
240.0
200.0
160.0
120.0
80.0
40.0
0.0
Date Sampled
TDS (mg/L)


e. Poteau River @ Pocola--Minerals 2001-2006
mg/L
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Poteau River @ Pocola--Nutrients 2001-2006
Phosphorus (mg/L)
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

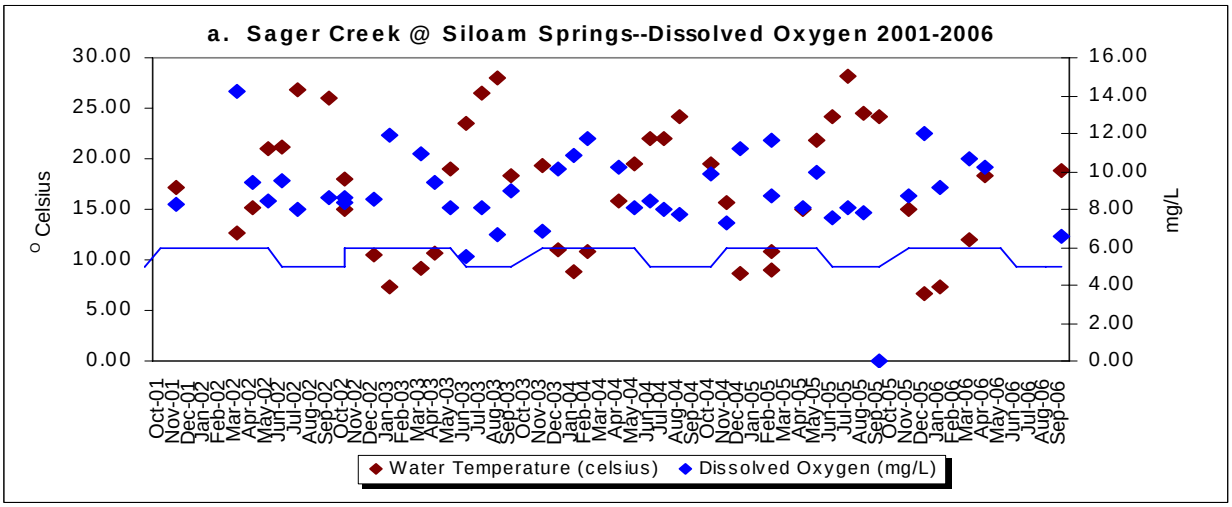
Sager Creek near West Siloam Springs

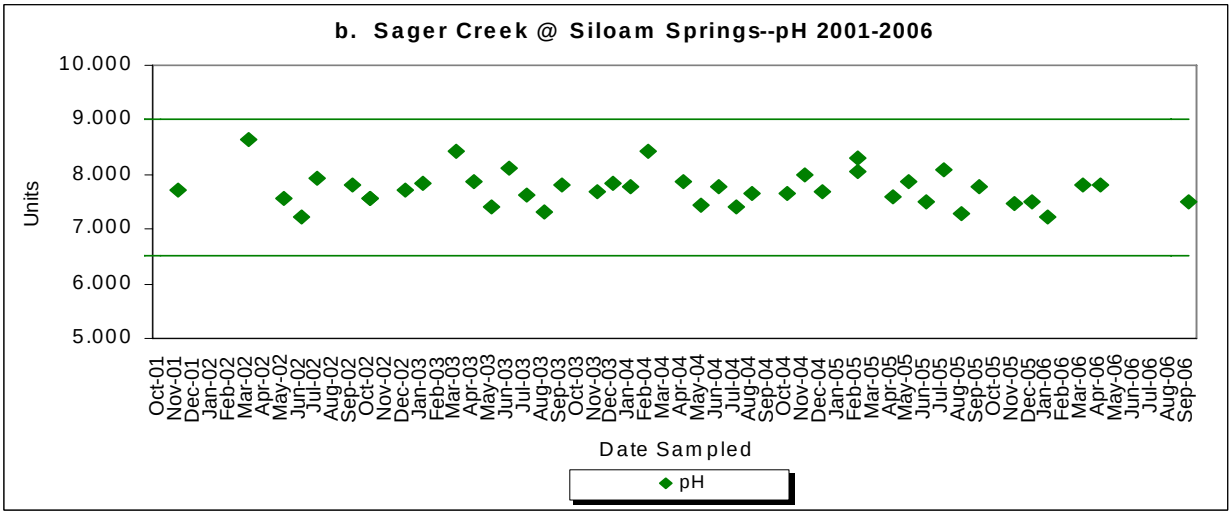
Station AT195865 (121700060080-001AT) is a permanent ambient trend monitoring station located on Sager Creek in Oklahoma. Situated in the southeastern portion of Delaware County, the site was established north of the town of West Siloam Springs off of US Highway 412 on County Road D0565. The station is positioned near the midpoint of stream segment 121700060080 and is classified within the Illinois River 8 digit HUC watershed (11110103). Water enters the stream system from Arkansas.

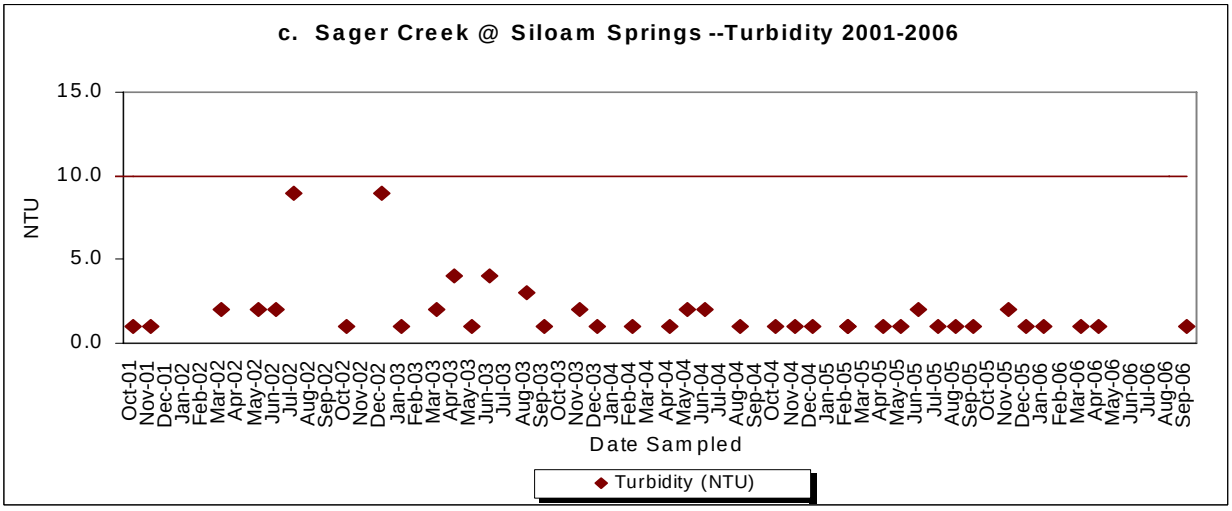
This station on Sager Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Sager Creek from its entrance into Oklahoma near West Siloam Springs, Oklahoma (94.5680, 36.1923) downstream to confluence of Sager Creek with Flint Creek (94.5757, 36.1974). As per Appendix A, Table 1 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is partially supported but impaired per the CPP. Of the forty-eight (48) nitrate concentrations, nine (7) samples (or 19%) exceeded the numerical criterion of 10.0 mg/L (Figure 72f). The CWAC beneficial use is supported. Dissolved oxygen (Figure 72a), pH (Figure 72b), turbidity (Figure 72c), and toxicant samples met the criteria prescribed in the CWAC beneficial use. Fish collected during the summer of 2003 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 26 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 41. This is above the assigned supporting threshold of 37 for Ozark Highland cool water aquatic communities [OAC 46:15-5(j)]. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 72d and e). Although 86% of the TDS concentrations exceeded the sample standard of 197.0 mg/L and the geometric mean (270.4 mg/L) exceeded the yearly mean standard of 161.0 mg/L, the values are below the minimum standard of 700 mg/L. Although 67% of the chloride concentrations exceeded the sample standard of 30.0 mg/L and the geometric mean (33.5 mg/L) exceeded the yearly mean standard of 21.0 mg/L, the values are below the minimum standard of 250 mg/L. Although 31% of the sulfate concentrations exceeded the sample standard of 37.0 mg/L and the geometric mean (34.8 mg/L) exceeded the yearly mean standard of 25.0 mg/L, the values are below the minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 24). Of the thirty-eight (38) enterococci concentrations, nine (9) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (114.9 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Sager Creek is nutrient-threatened. The median of the total phosphorus samples (1.385 mg/L) exceeded the prescribed threshold median of 0.150 mg/L, and the median of the nitrate/nitrite samples (8.445 mg/L) exceeded the prescribed threshold median of 2.40 mg/L (Figure 72f). The station is not light-limited with a mean turbidity of 2 NTU and less than 80% canopy coverage.

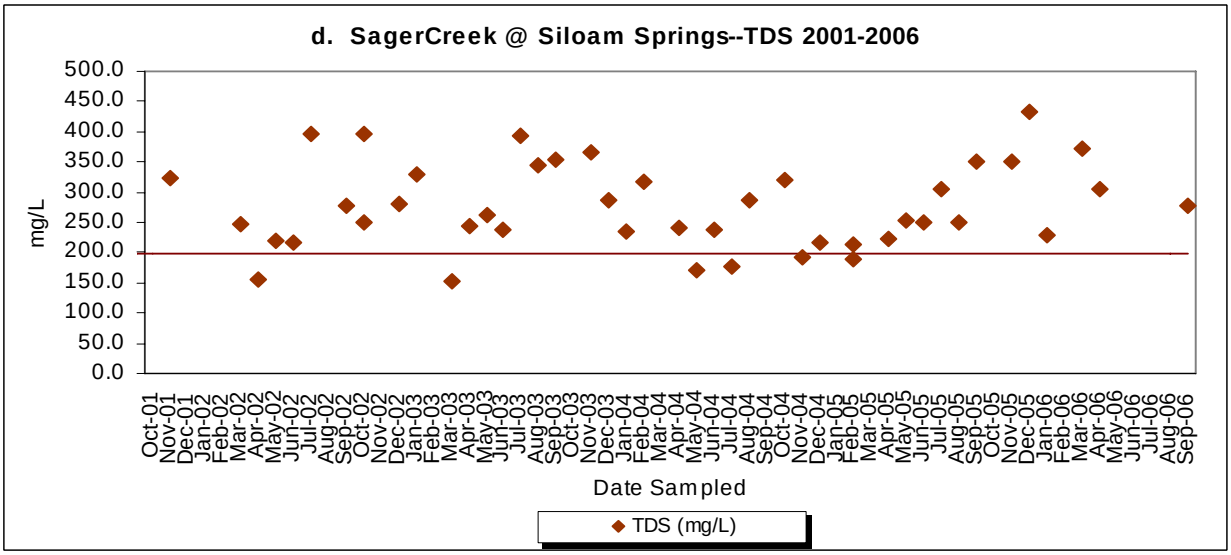
Figure 72 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) Sager Creek at West Siloam Springs (AT195865), 2001-2006.

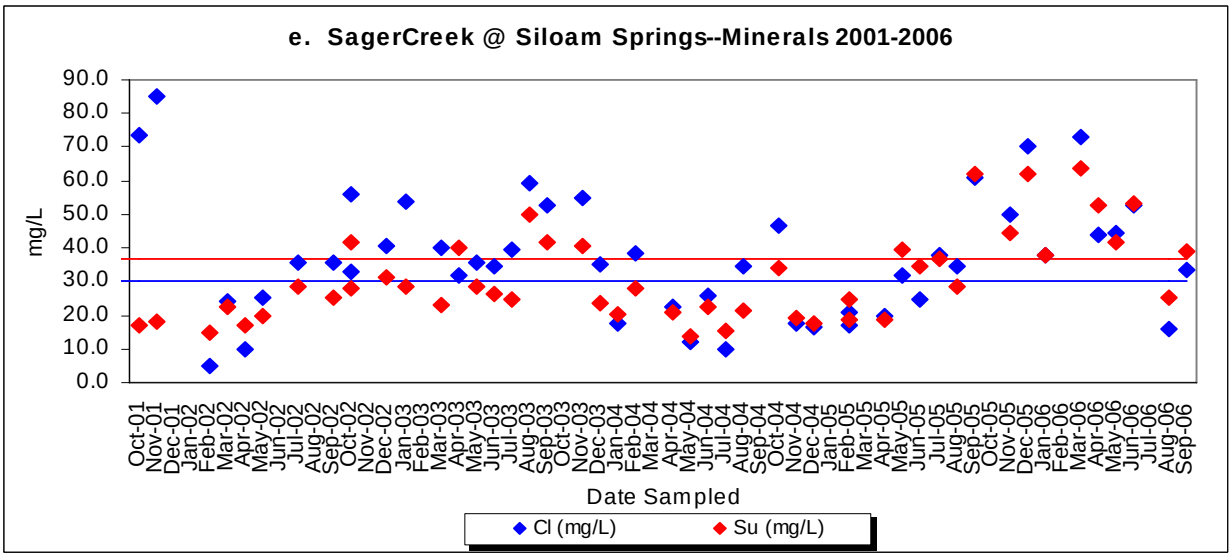


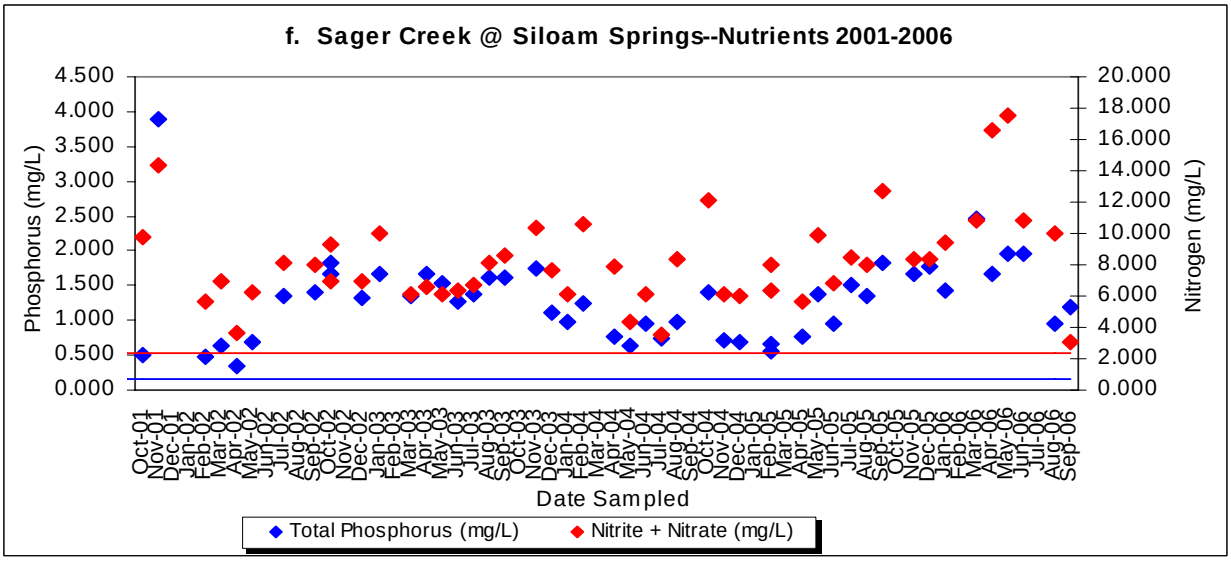




HUC 1111


d. SagerCreek @ Siloam Springs--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. SagerCreek @ Siloam Springs--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Sager Creek @ Siloam Springs--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

HUC 1111

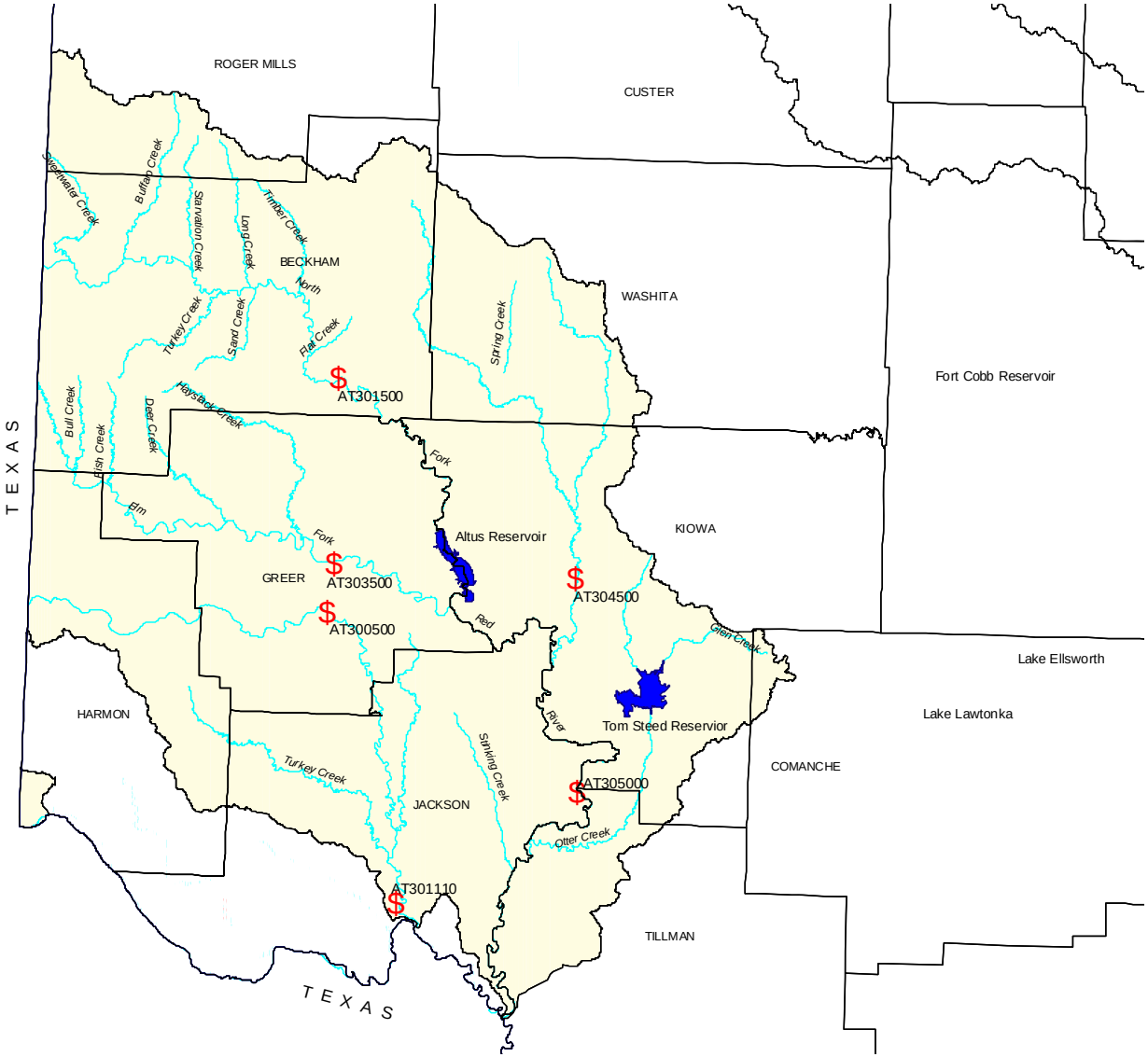


Plate 64
NORTH FORK OF THE RED SUBBASIN (HUC 1112)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1112

NORTH FORK OF THE RED SUB-BASIN

The North Fork of the Red sub-basin (4-digit hydrologic unit 1112) is situated in the southwestern tip of the state. It originates in the western portions of Roger Mills, Beckham and Harmon Counties, continues eastward through portions of Greer, Washita, Kiowa, Jackson, and Tillman Counties and terminates in the northeastern tip of Comanche County. Major cities and County seats located within the basin include Elk City, Sayre, Mangum, Altus, and Hobart. Minor cities of note include Granite, Lone Wolf, Duke, Headrick, and Snyder.

The basin is subdivided into five 8-digit hydrologic units (HUC) within the state. These HUC's are the Lower Prairie Dog Town Fork of the Red (11120105), the Lower Salt Fork of the Red (11120202), the Middle North Fork of the Red (11120302), Lower North Fork of the Red (11120303), and Elm Fork of the Red (11120304). The major surface water in the sub-basin is the North Fork of the Red River. Major tributaries include the Elm Fork of the Red River, the Salt Fork of the Red River, Elk Creek, Turkey Creek, and Otter Creek. Two major lakes are located in the basin—Altus Reservoir formed by the North Fork of the Red River and Tom Steed Reservoir formed by Otter Creek. Six permanent water quality-monitoring stations (Table 25) are located in the basin—AT300500, AT301110, AT301500, AT303520, AT304510, and AT305000. Stations AT303500 and AT304500 were deactivated in the previous year when new stations were established.

The sub-basin is characterized by two ecoregions. The Central Great Plains are the primary ecoregion covering all but a small portion of the sub-basin. The Southwestern Tablelands cover a small portion of the east central portion in Beckham, Greer, and Harmon Counties. The primary land usage in the sub-basin is cropland. It dominates the central south and central east portions of the sub-basin and is interspersed throughout the remainder of the sub-basin. The secondary land use is rangeland (open grassland and mesquite) that dominates the southern part of Beckham County and is prevalent in other southern portions of the sub-basin. It is interspersed throughout the remainder of the sub-basin. The tertiary land use is pastureland, which is dominant in northeastern Greer County and is sparsely interspersed throughout the remainder of the sub-basin. Other land uses of note are woodlands, bottom woodlands, farmsteads, major urban areas, and confined animal feeding operations.

Table 25. Permanent Ambient Trend Monitoring Stations Located in HUC 1112.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
311500030010	AT304510	Elk Creek, off US 183, Roosevelt	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
311800000010	AT303520	Elm Fork River, SH 9, Granite	Active 11/98-P	AG, AES, PPWS	NONE	PBCR, FWP	NONE
311510010010	AT301500	North Fork of the Red River, SH 34, Carter	Active 11/98-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE
311500010020	AT305000	North Fork of the Red River, US 62, Headrick	Active 11/98-P	PPWS	NONE	AG, AES, FWP, PBCR	NONE
311600020010	AT301110	Salt Fork of the Red River, off US 283, Elmer	Active 11/98-P	AES, PPWS	AG	FWP, PBCR	NONE
311600020010	AT300500	Salt Fork of the Red River, SH 34, Mangum	Active 10/00-P	AG, FWP, AES, PPWS	NONE	PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 26. Toxicant exceedances in HUC 1112.

STATION #	STATION NAME	DATE	Selenium (ug/L)
AT301110	Salt Fork of the Red River, off US 283, Elmer	01/14/2003	7.00
		09/21/2004	14.00

Table 27. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1112. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT304500	Elk Creek, off US 183, Roosevelt	09/19/2001		1700	
		05/29/2002		600	
		05/19/2003		900	
		06/23/2003		1100	
		09/02/2003		2100	
		09/24/2003		4200	
AT303500	Elm Fork River, SH 9, granite	06/27/2000	12000	6000	430
		09/26/2000			1211
		05/22/2001		6000	
		07/24/2001			717
		08/21/2001			465
		09/18/2001	1400	900	
		06/24/2002		1200	1860
		08/07/2002			6867
		08/21/2002	700		2851
		09/25/2002			768
		05/07/2003	500		443
		05/19/2003	600	600	1201
		06/03/2003			909
		06/23/2003	800	6000	1515
		07/15/2003			1669
		07/28/2003			6131
		08/20/2003			1421
		09/02/2003	500	1600	1450
		09/24/2003			842
AT301500	North Fork of the Red River, SH 34, Carter	06/27/2000		11000	
		08/29/2000		2400	
		05/22/2001		9000	
		05/19/2003		2100	
AT305000	North Fork of the Red River, US 62, Headrick	07/24/2001		1100	
		05/29/2002		800	
		06/07/2004		700	
AT301110	Salt Fork of the Red River, off US 283, Elmer	05/23/2000	500		
		08/01/2000	11000	1400	
		08/29/2000			
		09/26/2000	69000	15000	
		05/22/2001	1000	21000	
		07/24/2001	9000	900	
		08/21/2001	900		

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		05/29/2002	1200	1000	
		08/06/2002	6000	900	
		06/08/2004	700	4300	
		07/12/2004	410		
		08/16/2004	1100		
		09/21/2004	1210	554	
AT300500	SALT FORK OF THE RED RIVER, SH 34, MANGUM	05/22/2001	1000	1000	
		06/24/2002		4000	
		08/06/2002	600	600	
		06/23/2003	1300	11000	
		07/15/2003	2000	11000	
		09/24/2003		1000	
		06/15/2004		1400	
		06/15/2004		51800	

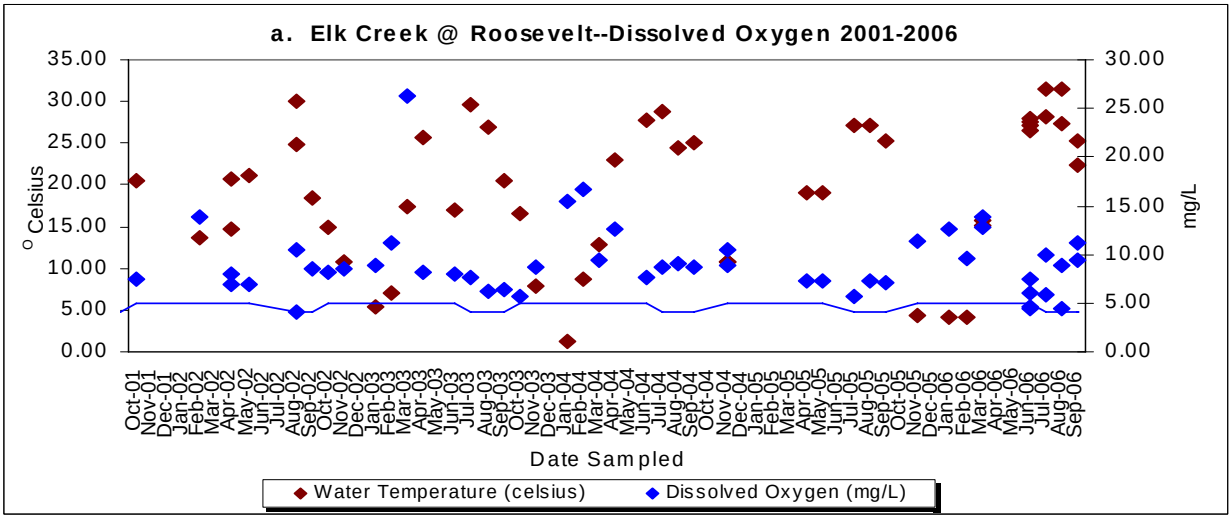
Elk Creek near Roosevelt

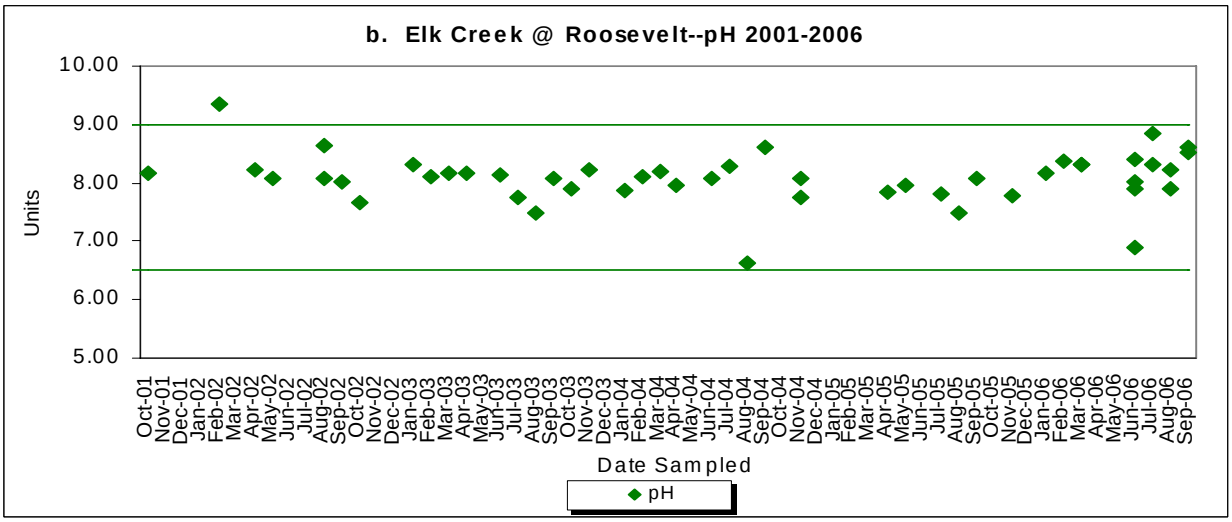
Station AT304500 (311500030010-001AT) is a permanent ambient trend monitoring station located on Elk Creek. Situated in the west central portion of Kiowa county, the site was established south southwest of the city of Hobart off of US Highway 183 on County Road E1450. The station is positioned near the midpoint of stream segment 311500030010 and is classified within the Lower North Fork of the Red River 8 digit HUC watershed (11120303). Water enters the stream system from Lake Elk City and from several tributaries including Little Elk Creek (Lake Hobart), among others.

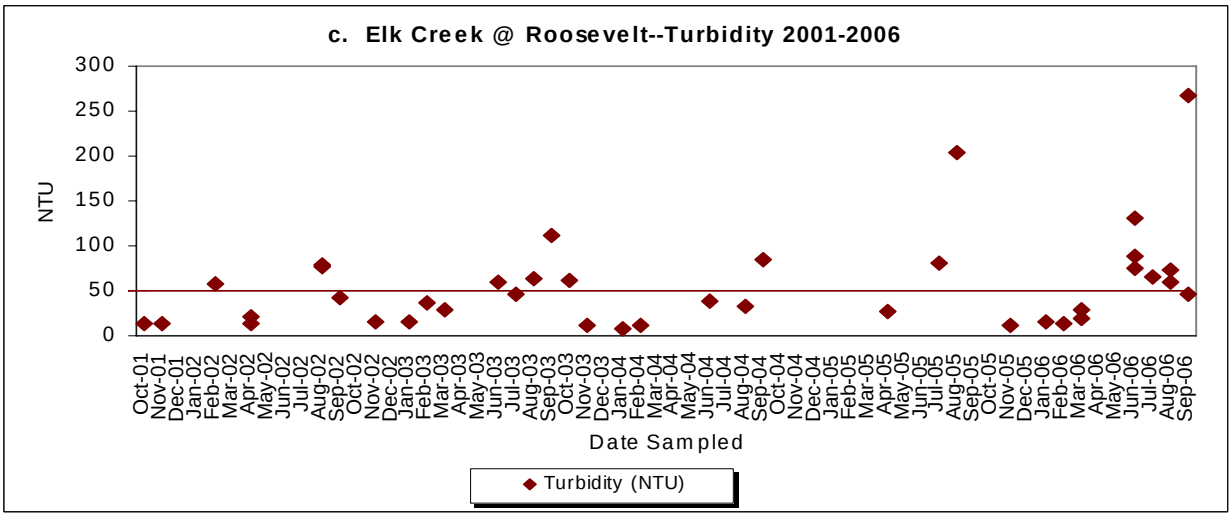
A station on Elk Creek has been active for all water quality variables since November of 1998. The original station near Hobart was deactivated in the spring of 2006. The new site near Roosevelt was established to accommodate future stream gaging and water quality sampling needs as well accessibility issues. The data from the Hobart site will be combined with data from the Roosevelt site and will continue to be used in the assessment of Elk Creek. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Elk Creek from the confluence of Little Elk Creek (99.1214, 35.0008) downstream to confluence of Elk Creek with the North Fork of the Red River (99.1488, 34.7985). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

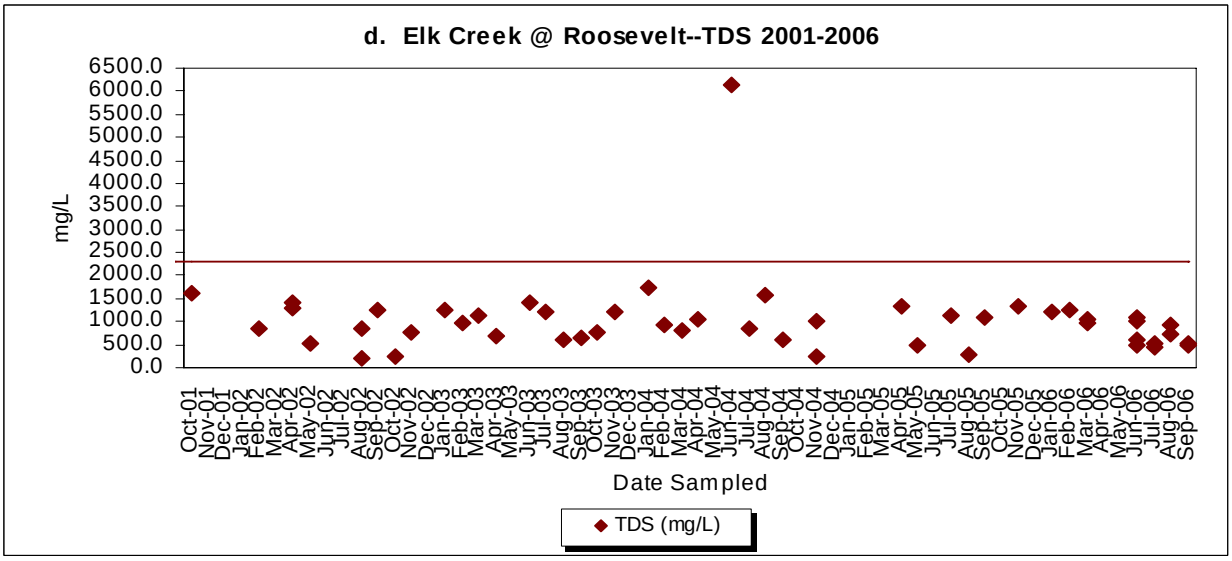
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-nine (39) turbidity samples (Figure 73c), seventeen (17) samples (or 44%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 73a), pH (Figure 73b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 73d and e). The PBCR beneficial use is not supported (Table 27). Of the eighteen (18)) enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (267.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 18 fecal coliform concentrations, five (5) samples (or 28%) exceeded the prescribed screening level of 406 mg/L. This segment of Elk Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 73f).

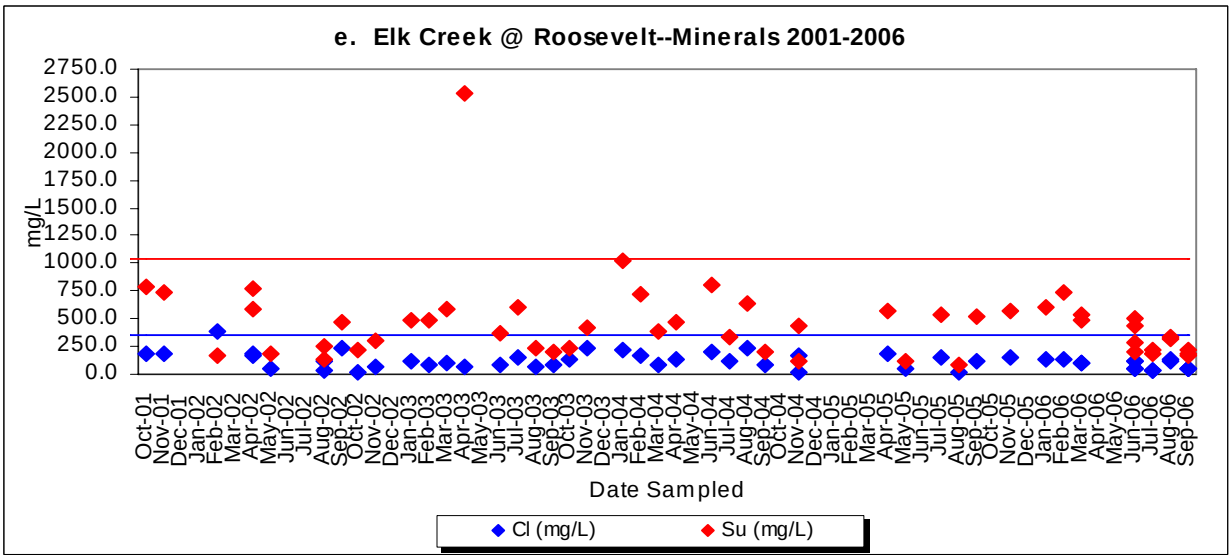
Figure 73 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Elk Creek at Roosevelt (AT304500), 2001-2006.

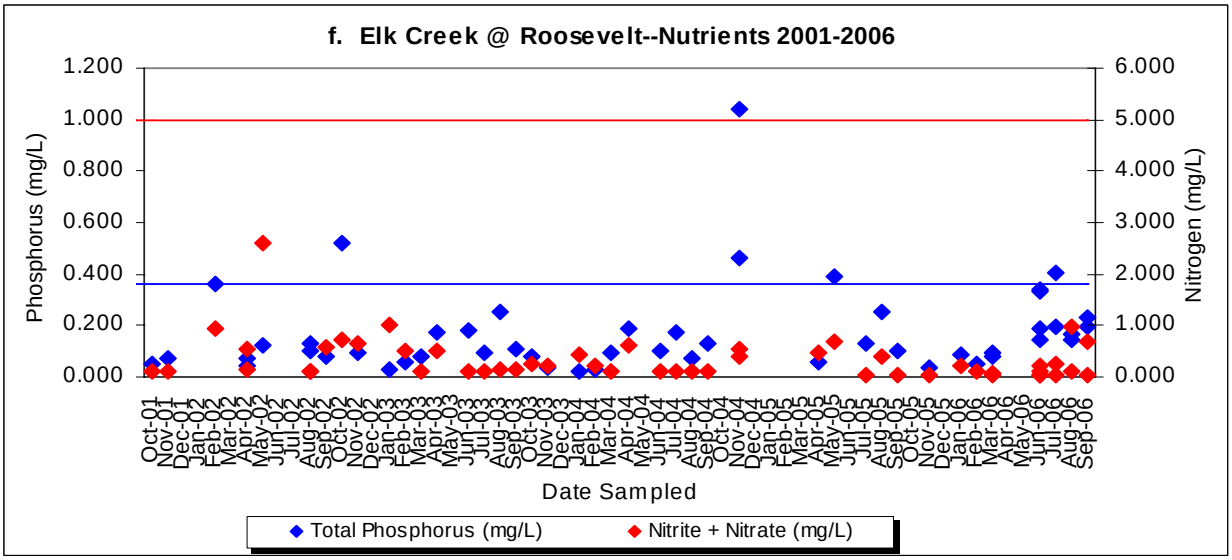







d. Elk Creek @ Roosevelt--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Elk Creek @ Roosevelt--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Elk Creek @ Roosevelt--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

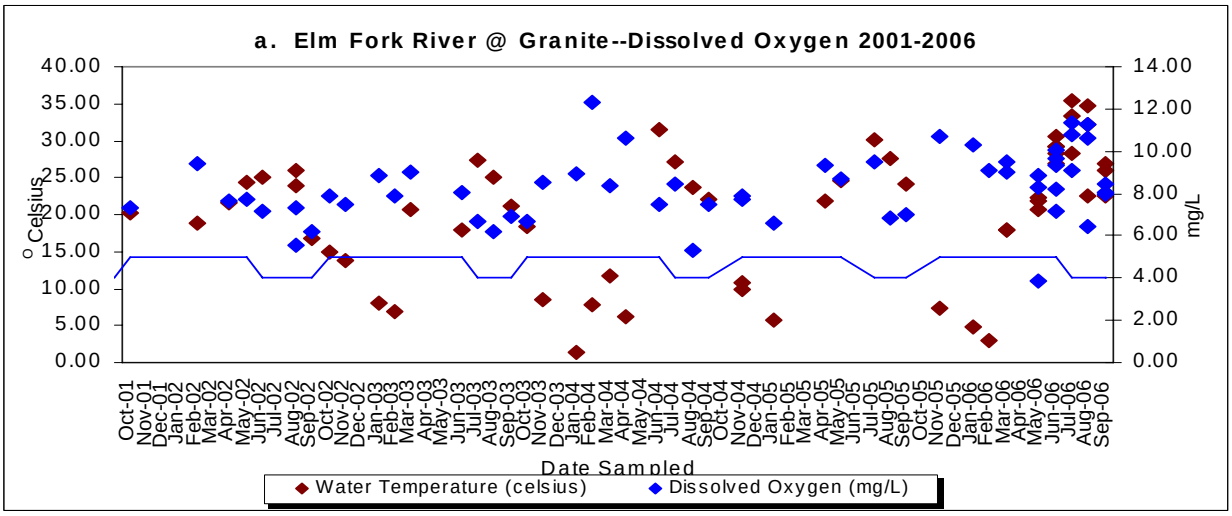
Elm Fork of the Red near Granite

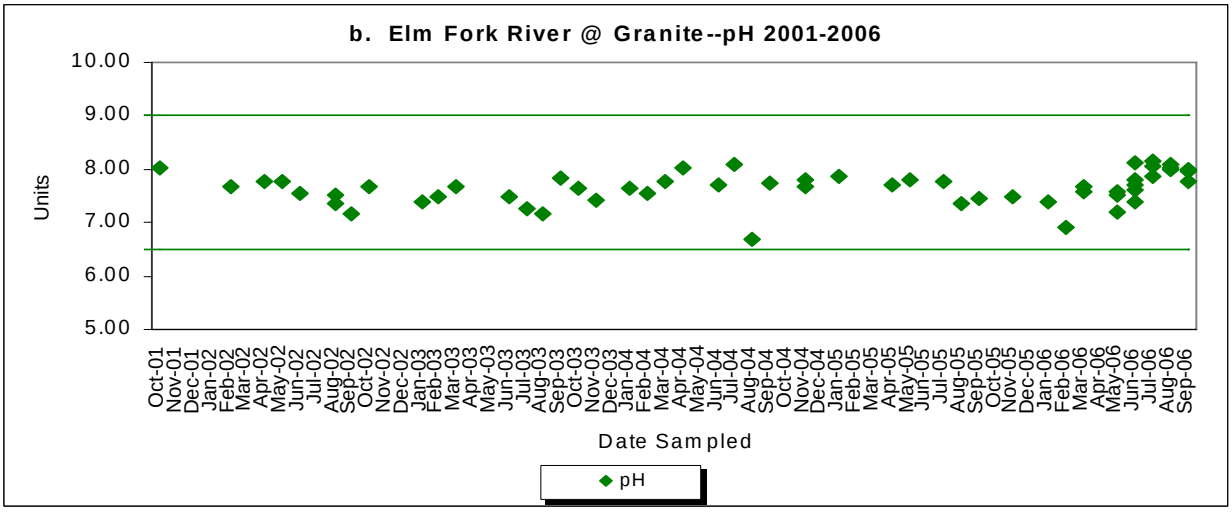
Station AT303500 (311800000010-001AT) is a permanent ambient trend monitoring station located on the Elm Fork of the Red River in Oklahoma. Situated in the central portion of Greer County, the site was established north of the town of Mangum on State Highway 9. The station is positioned between the midpoint and the lower end of stream segment 311800000010 and is classified within the Elm Fork of the Red River 8 digit HUC watershed (11120304). Water enters the stream system from Texas and from several tributaries including Deer Creek and Haystack Creek, among others.

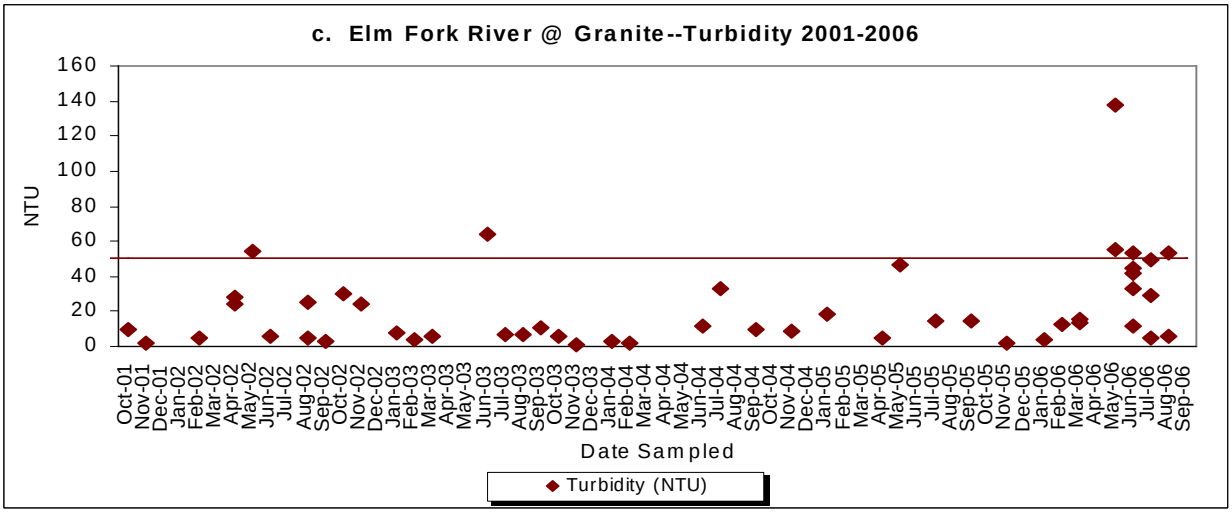
A station on the Elm Fork of the Red River has been active for all water quality variables since November of 1998. The original station near Mangum was deactivated in the spring of 2006. The new site near Granite was established to accommodate future stream gaging and water quality sampling needs as well as accessibility issues. The data from the Mangum site will be combined with data from the Granite site and will continue to be used in the assessment of the Elm Fork of the Red River. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Elm Fork of the Red River from the confluence of Deer Creek (99.6855, 34.9722) downstream to confluence of the Elm Fork of the Red River with the North Fork of the Red River (99.3173, 34.8714). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

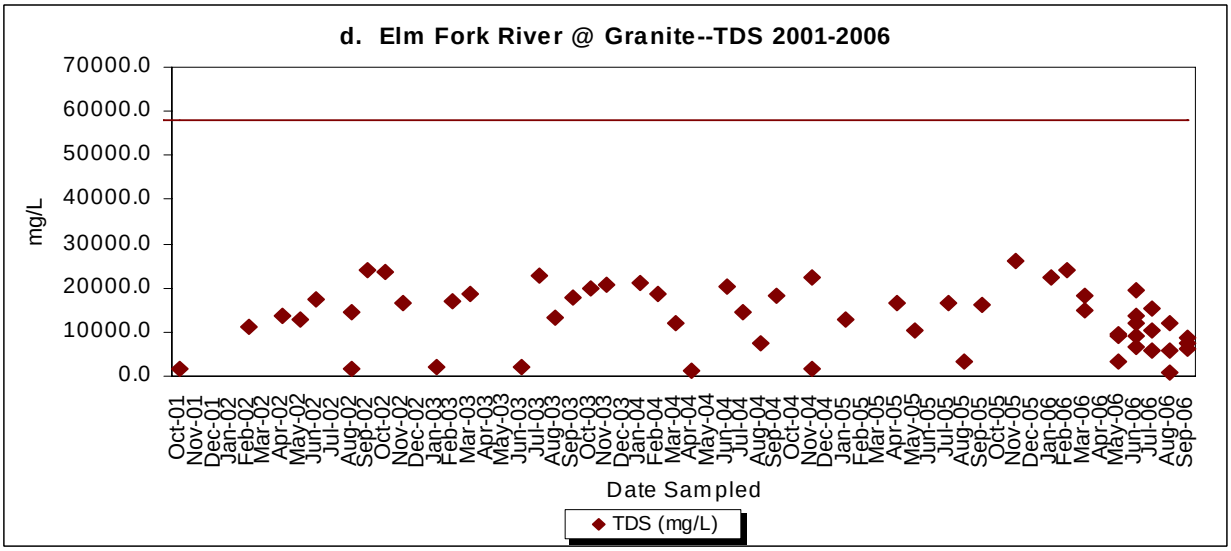
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the forty-nine (39) turbidity samples (Figure 74c), six (6) samples (or 12%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 74a), pH (Figure 74b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 74d and e). The PBCR beneficial use is not supported (Table 27). Of the nineteen (19) fecal coliform concentrations, six (6) samples (or 31%) exceeded the prescribed screening level of 400 cfu/mL. Of the 19 enterococci concentrations, 6 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (244.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 19 *E. coli* concentrations, fifteen (15) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (1329.8 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Elm Fork of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 74f).

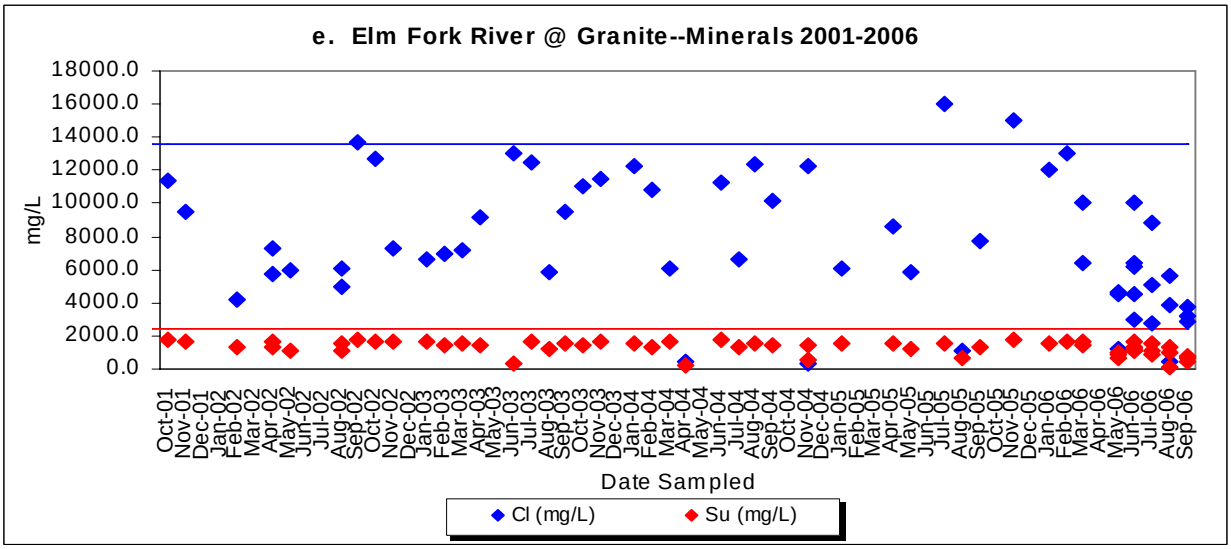
Figure 74 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Elm Fork River at Granite (AT303500), 2001-2006.

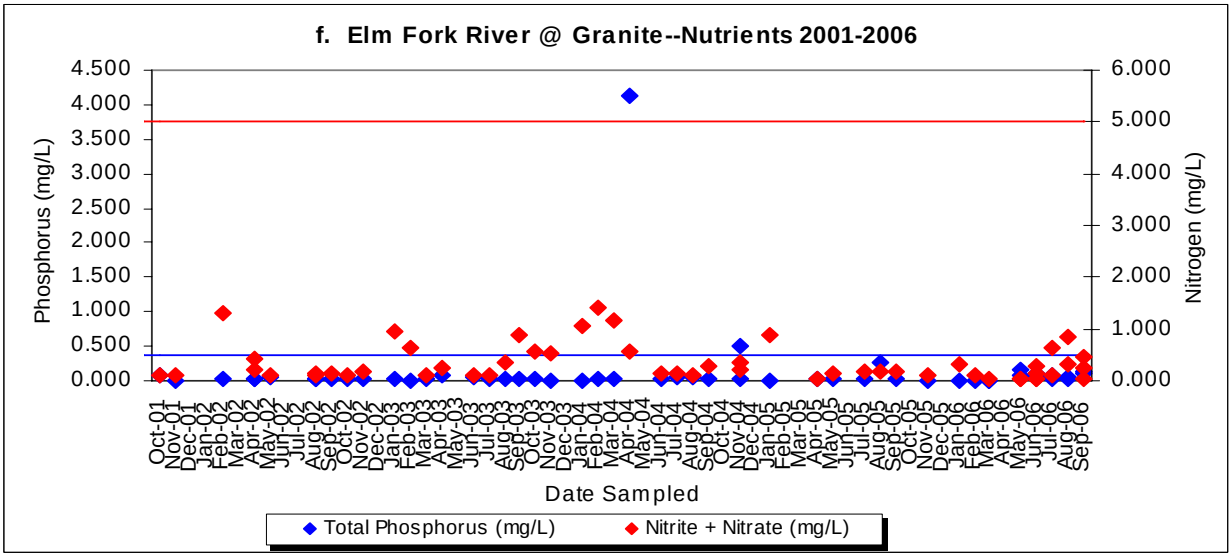







d. Elm Fork River @ Granite--TDS 2001-2006
mg/L
70000.0
60000.0
50000.0
40000.0
30000.0
20000.0
10000.0
0.0
Date Sampled
TDS (mg/L)


e. Elm Fork River @ Granite--Minerals 2001-2006
mg/L
18000.0
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Elm Fork River @ Granite--Nutrients 2001-2006
Phosphorus (mg/L)
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

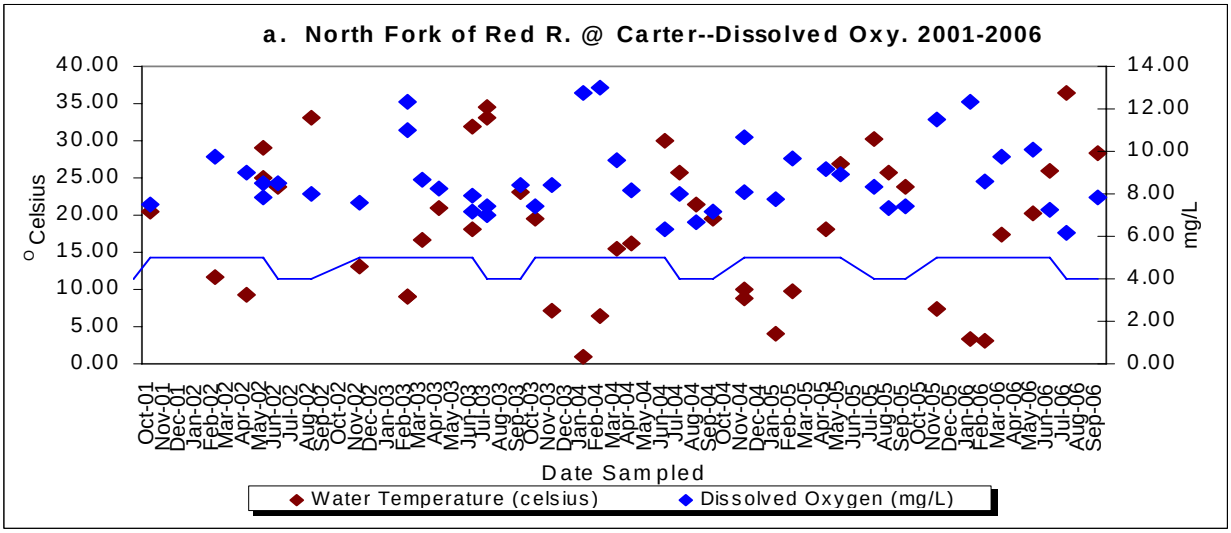
North Fork of the Red near Carter

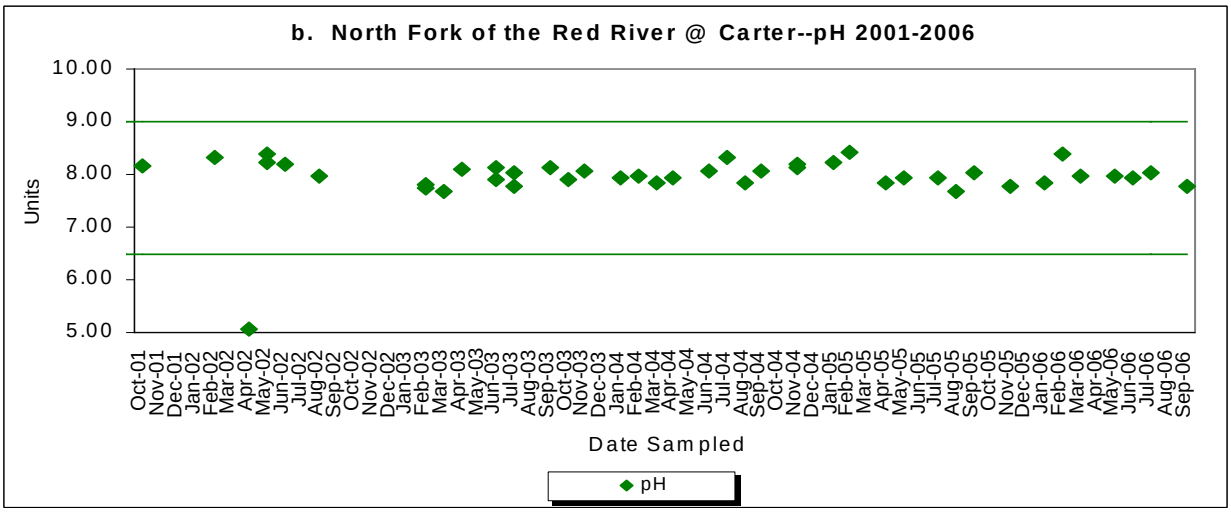
Station AT301500 (311510010010-001AT) is a permanent ambient trend monitoring station located on the North Fork of the Red River in Oklahoma. Situated in the southeastern portion of Beckham County, the site was established south of the town of Carter on State Highway 34. The station is positioned between the upper end and the midpoint of stream segment 311510010010 and is classified within the Middle North Fork of the Red River 8 digit HUC watershed (11120302). Water enters the stream system from several tributaries including Timber Creek and Flat Creek, among others.

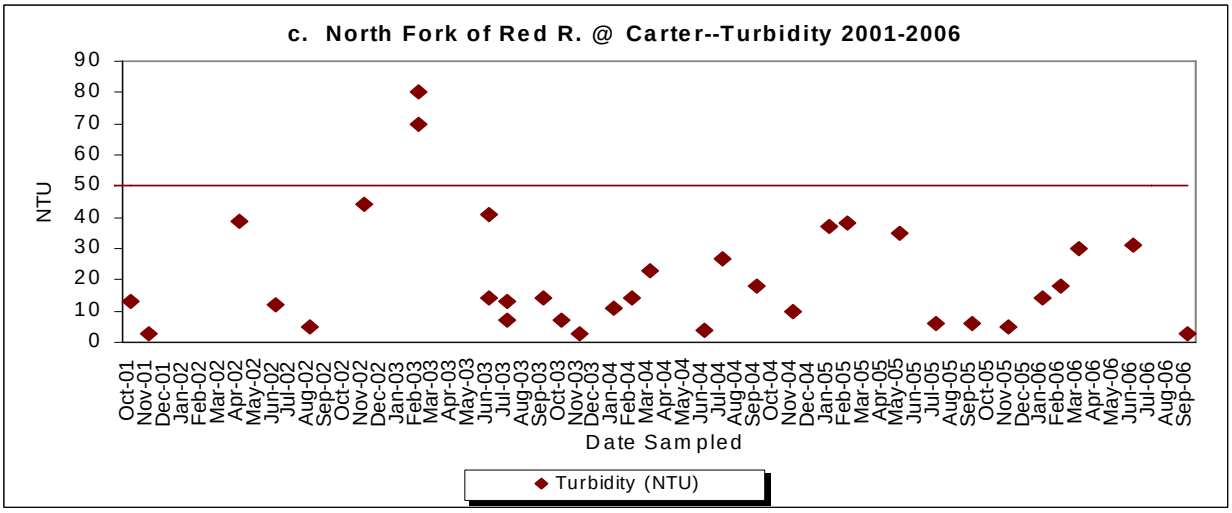
This station on the North Fork of the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Fork of the Red River from the confluence of Timber Creek (99.5759, 35.2753) downstream to confluence of the North Fork of the Red River with Altus Reservoir (99.3413, 34.9715). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

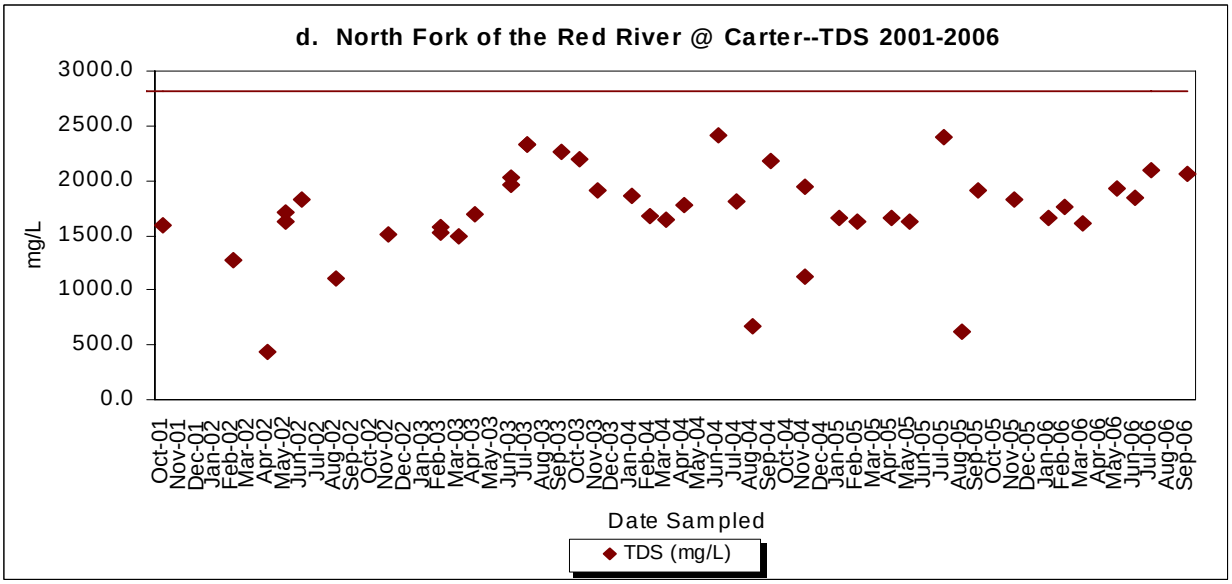
The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 75a), pH (Figure 75b), turbidity (Figure 75c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 8 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 19. This is between the assigned non-supporting and supporting thresholds of 19-21 for Central Great Plains warm water aquatic communities [OAC 46:15-5(m)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 75d and e). The PBCR beneficial use is not supported (Table 27). Of the fourteen (14) enterococci concentrations, two (2) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (114.6 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Fork of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 75f).

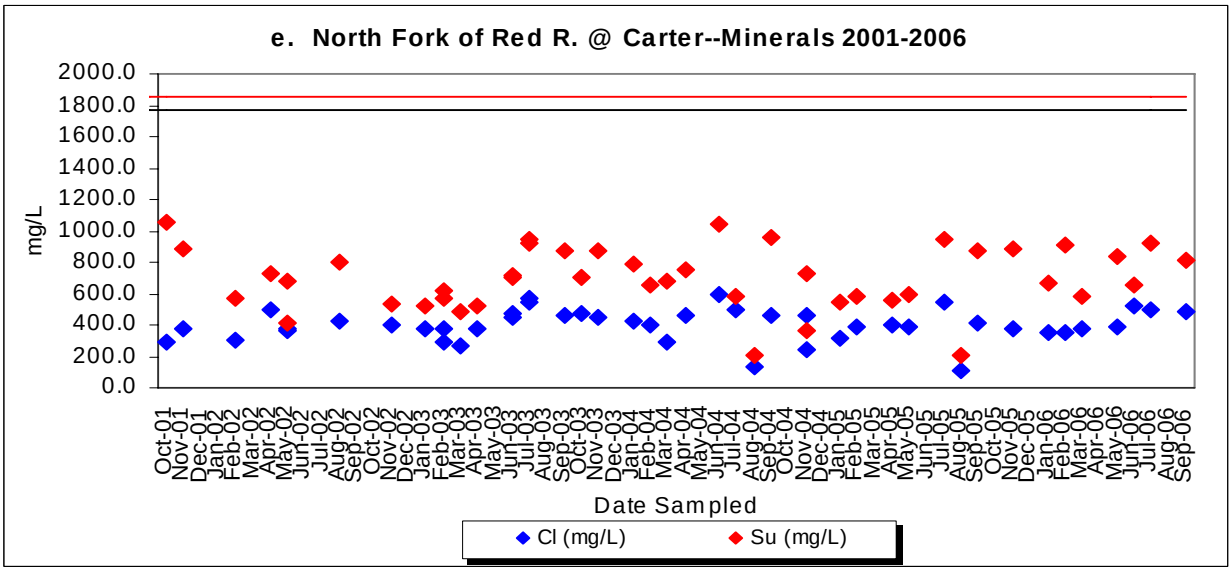
Figure 75 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Fork of the Red River at Carter (AT301500), 2001-2006.

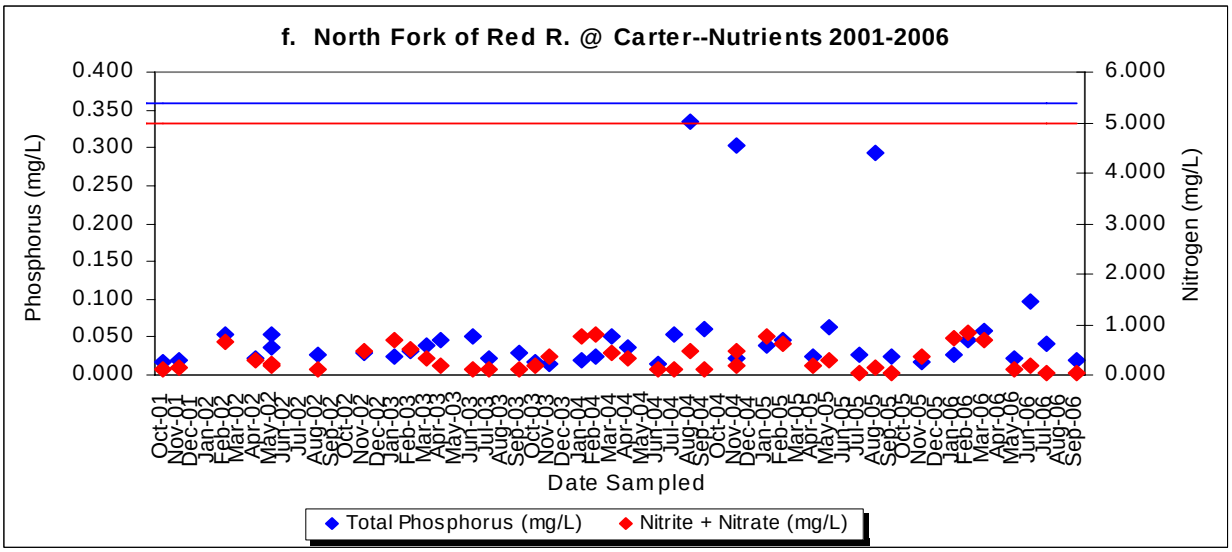







d. North Fork of the Red River @ Carter--TDS 2001-2006
mg/L
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
TDS (mg/L)


e. North Fork of Red R. @ Carter--Minerals 2001-2006
mg/L
2000.0
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Fork of Red R. @ Carter--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

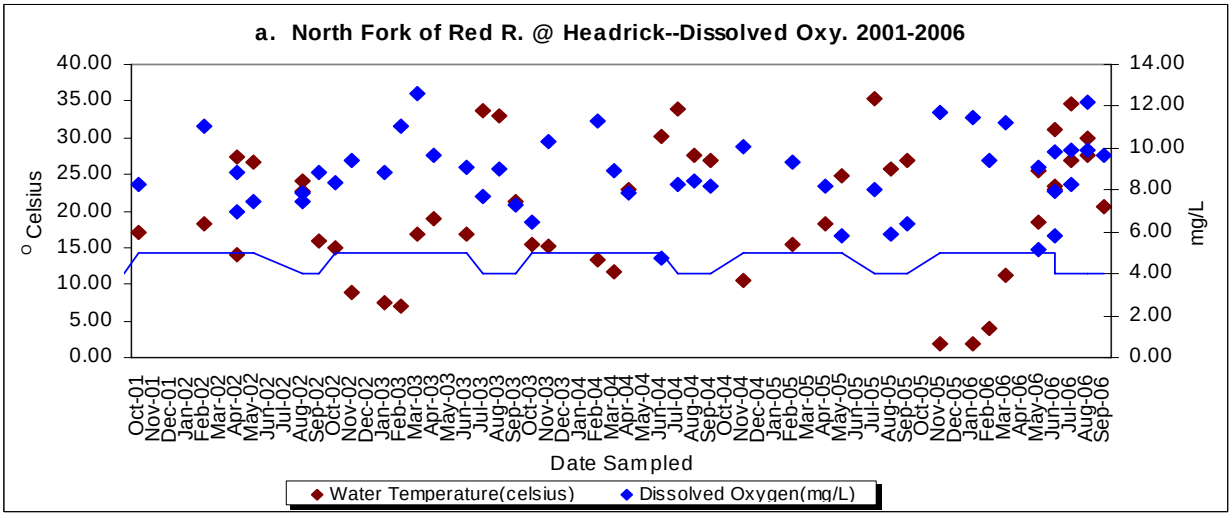
North Fork of the Red near Headrick

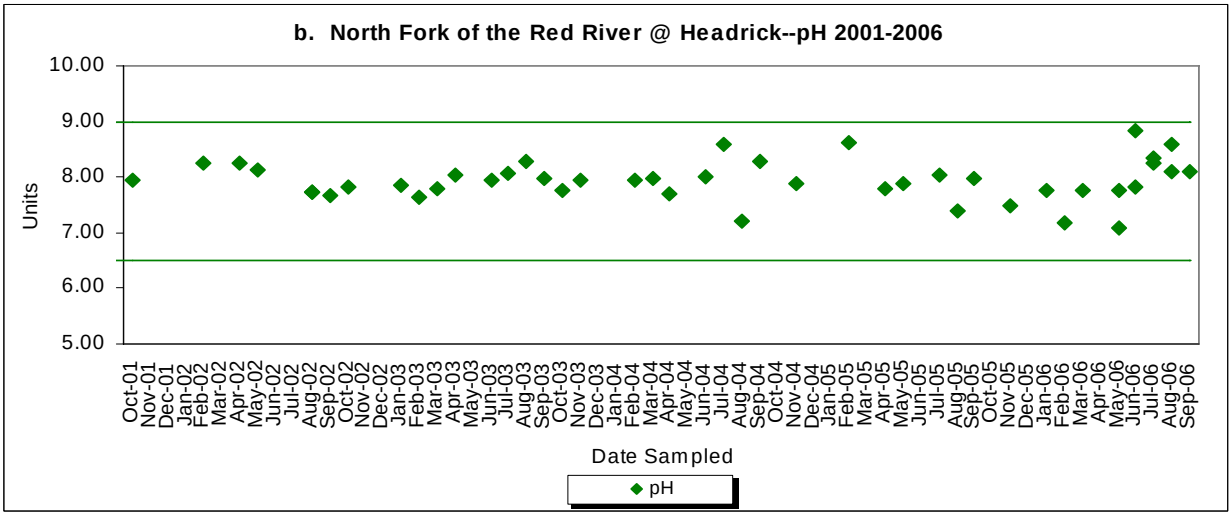
Station AT305000 (311500010020-001AT) is a permanent ambient trend monitoring station located on the North Fork of the Red River in Oklahoma. Situated on the border of Jackson and Tillman counties, the site was established east of the town of Headrick on US Highway 62. The station is positioned near the midpoint of stream segment 31150010020 and is classified within the Lower North Fork of the Red River 8 digit HUC watershed (11120303). Water enters the stream system from several tributaries including Elk Creek, Otter Creek (Tom Steed Reservoir), and Stinking Creek, among others.

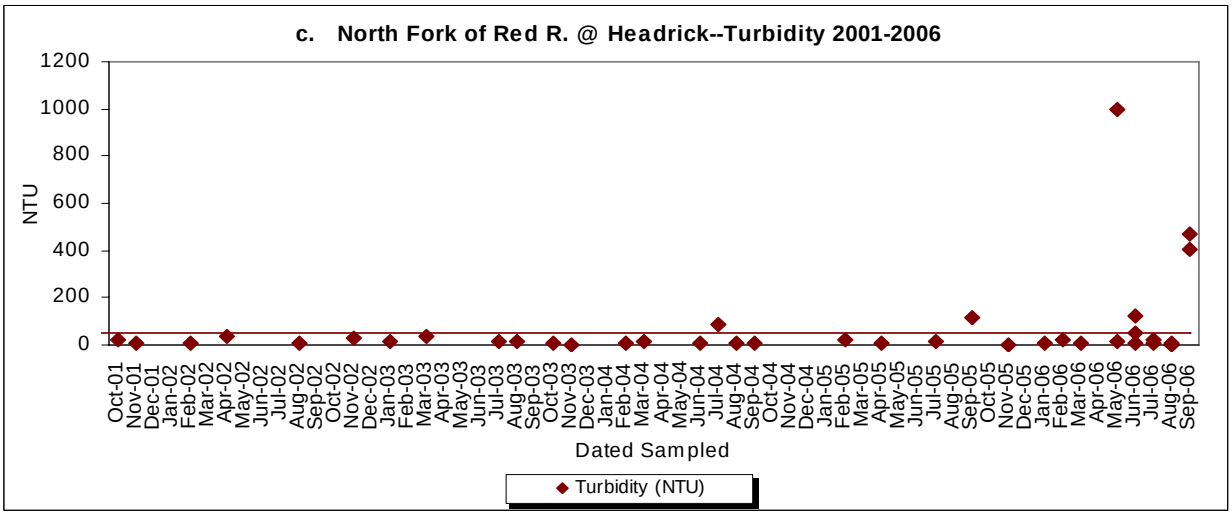
This station on the North Fork of the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the North Fork of the Red River from the confluence of Elk Creek (99.1488, 34.7985) downstream to confluence of Stinking Creek with the North Fork of the Red River (99.2009, 34.5282). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

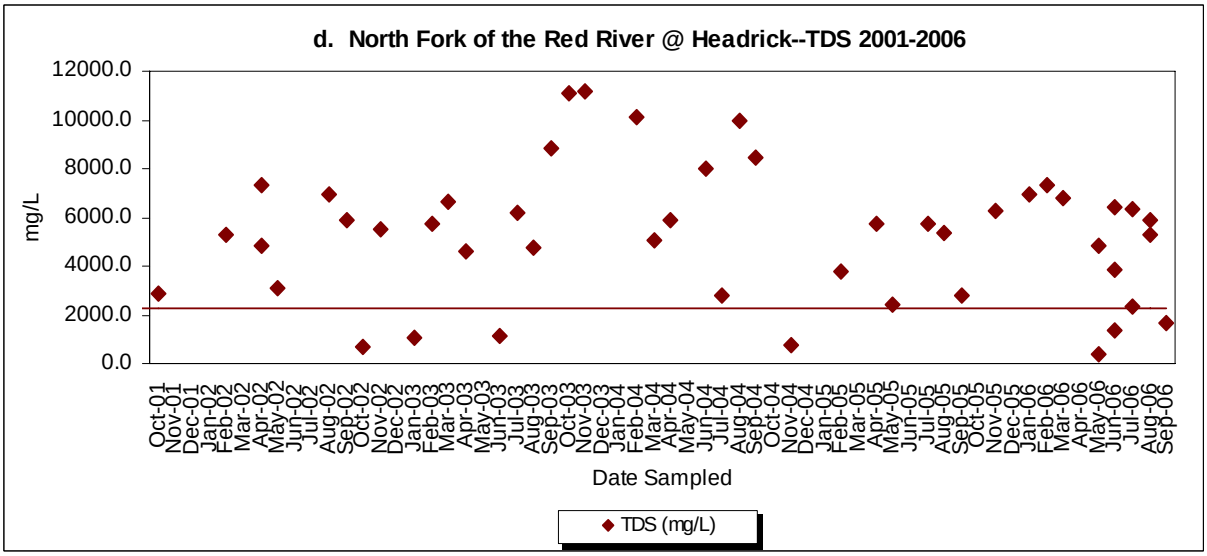
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-three (37) turbidity samples (Figure 76c), seven (7) samples (or 19%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 76a), pH (Figure 76b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 76d and e). Of the forty-eight (48) total dissolved solids concentrations, forty (40) samples (or 83%) exceeded the sample standard of 2284.0 mg/L, and the geometric mean (3540.3 mg/L) exceeded the yearly mean standard (1777 mg/L). Of the fifty (50) chloride concentrations, forty-seven (47) samples (or 94%) exceeded the sample standard of 353.0 mg/L, and the geometric mean (1539.5 mg/L) exceeded the yearly mean standard (347 mg/L). Sulfate samples met the prescribed, site-specific criteria. The PBCR beneficial use is not supported (Table 27). Of the seventeen (17) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (78.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the North Fork of the Red River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (35.8 mg/M^3) produced a TSI of 66, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 76f).

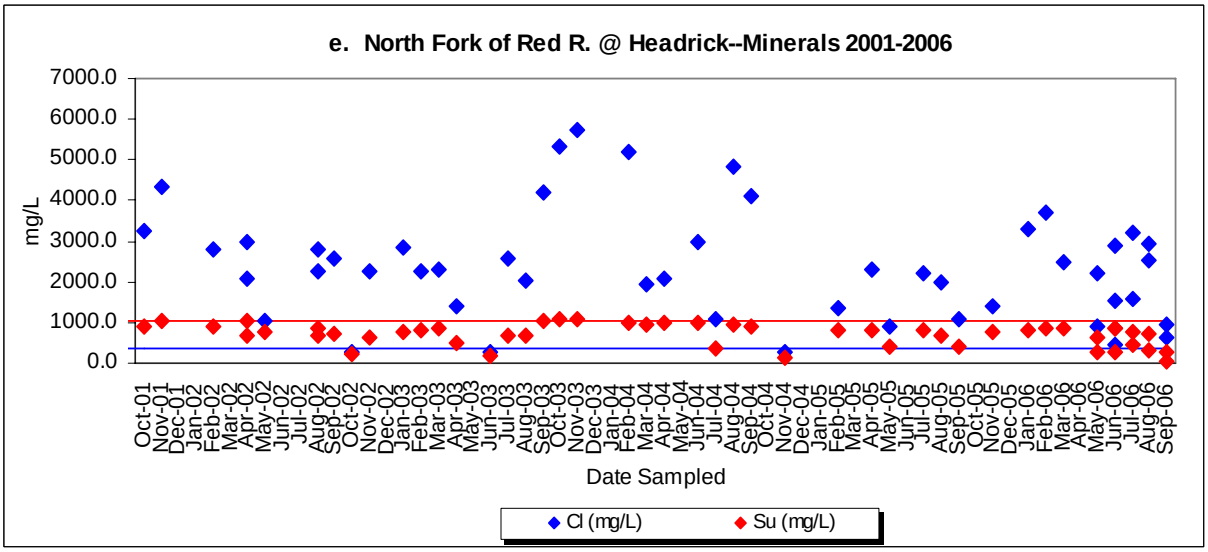
Figure 76 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the North Fork of the Red River at Headrick (AT305000), 2001-2006.

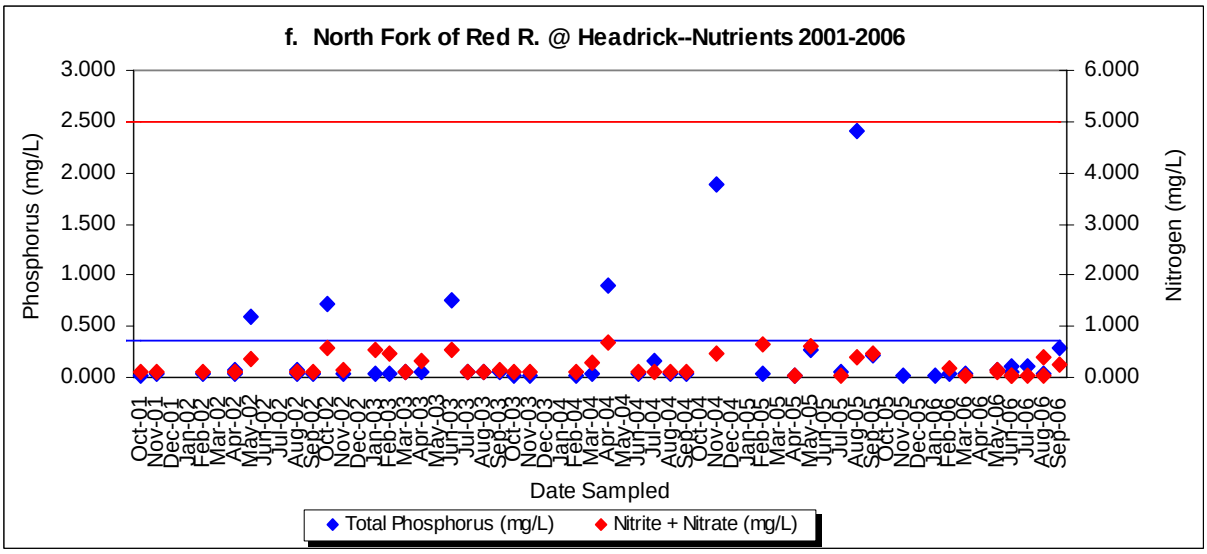







d. North Fork of the Red River @ Headrick--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. North Fork of Red R. @ Headrick--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. North Fork of Red R. @ Headrick--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

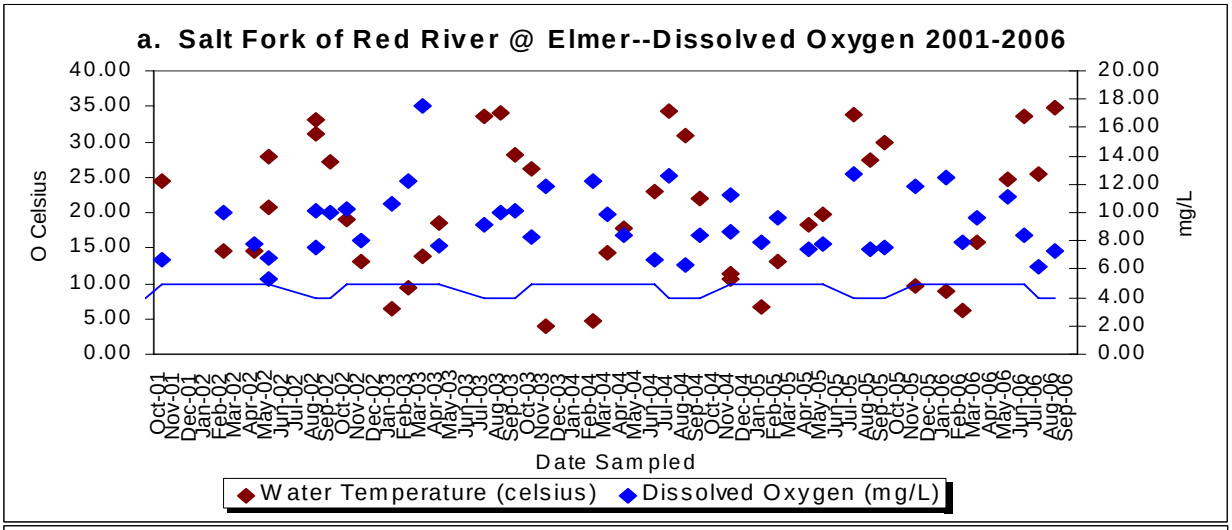
Salt Fork of the Red River near Elmer

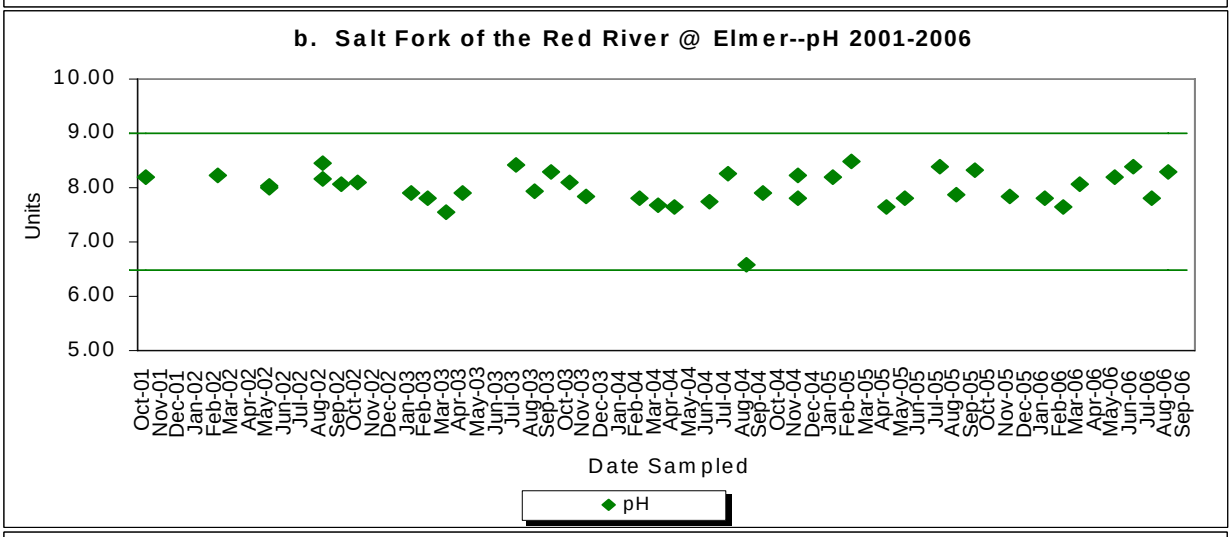
Station AT301110 (311600020010-002AT) is a permanent ambient trend monitoring station located on the Salt Fork of the Red River in Oklahoma. Situated in the south central portion of Jackson County, the site was established west of the town of Elmer off of US Highway 283 on County Road E1750. The station is positioned near the terminal end of stream segment 311600020010 and is classified within the Lower Salt Fork of the Red River 8 digit HUC watershed (11120202). Water enters the stream system from several tributaries including Bitter Creek and Turkey Creek, among others.

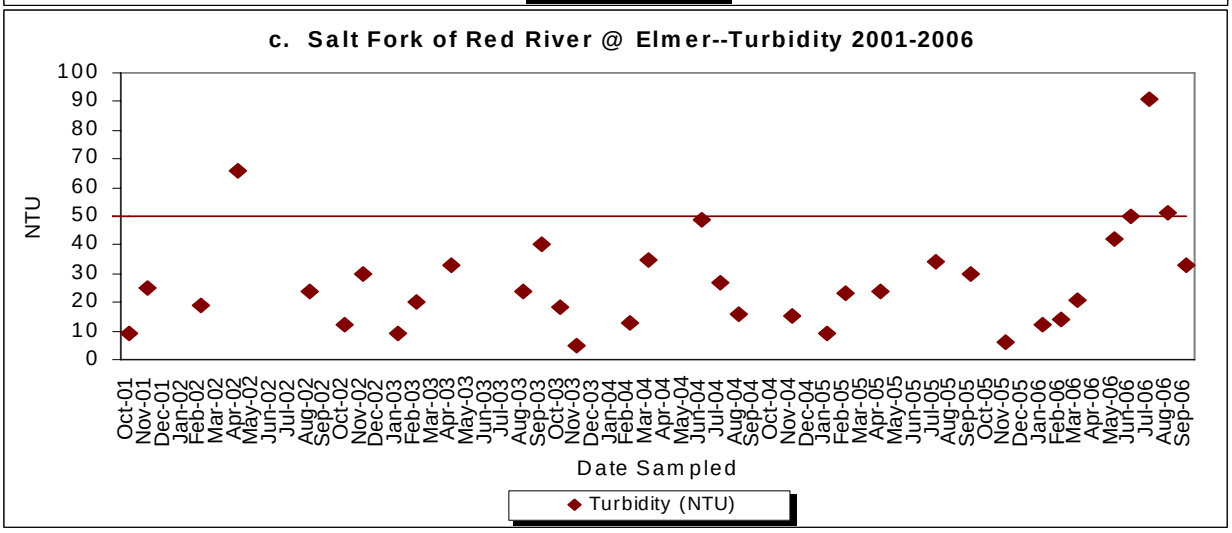
This station on the Salt Fork of the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Salt Fork of the Red River from the confluence of Bitter Creek (99.3923, 34.5751) downstream to confluence of the Salt Fork of the Red River with the Red River (99.3549, 34.4497). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

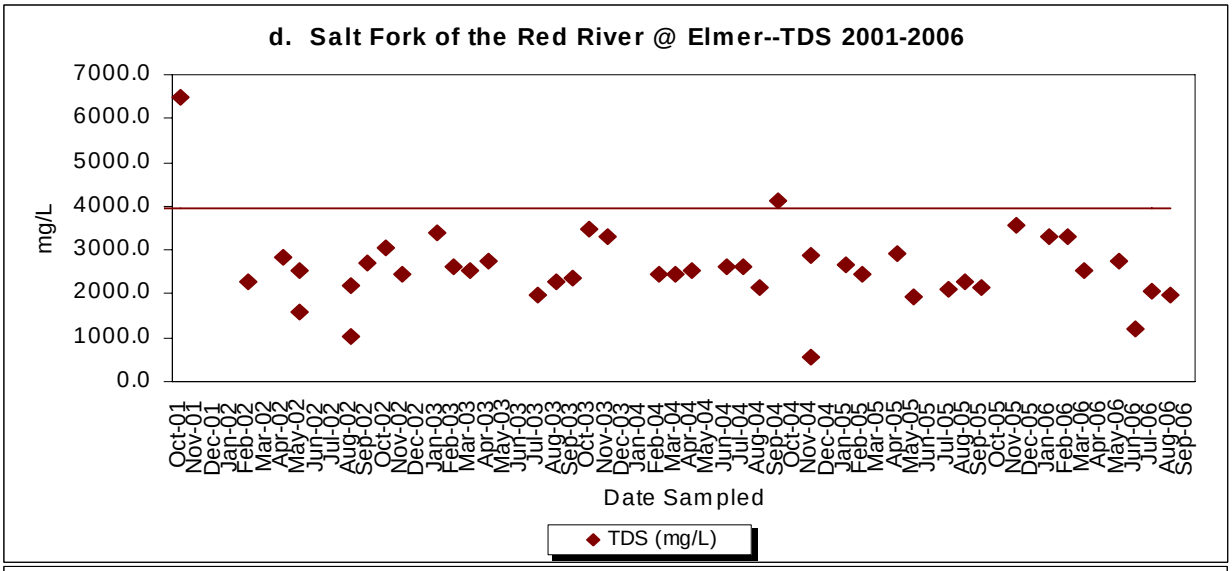
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twelve (12) selenium samples collected, two (2) of the concentrations (or 17%) exceeded the prescribed chronic criteria of 5 ug/L (Table 26). Dissolved oxygen (Figure 77a), pH (Figure 77b), and turbidity (Figure 77c) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is partially supported but impaired per the CPP. Of the forty-five (45) chloride concentrations, six (6) samples (or 13%) exceeded the sample standard of 910.0 mg/L. Total dissolved solids and sulfate values met the segment-specific criteria (Figure 77d and e). The PBCR beneficial use is not supported (Table 27). Of the thirteen (13) fecal coliform concentrations, nine (9) samples (or 69%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (786.2 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the 13 enterococci concentrations, six (6) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (262.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Salt Fork of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 77f).

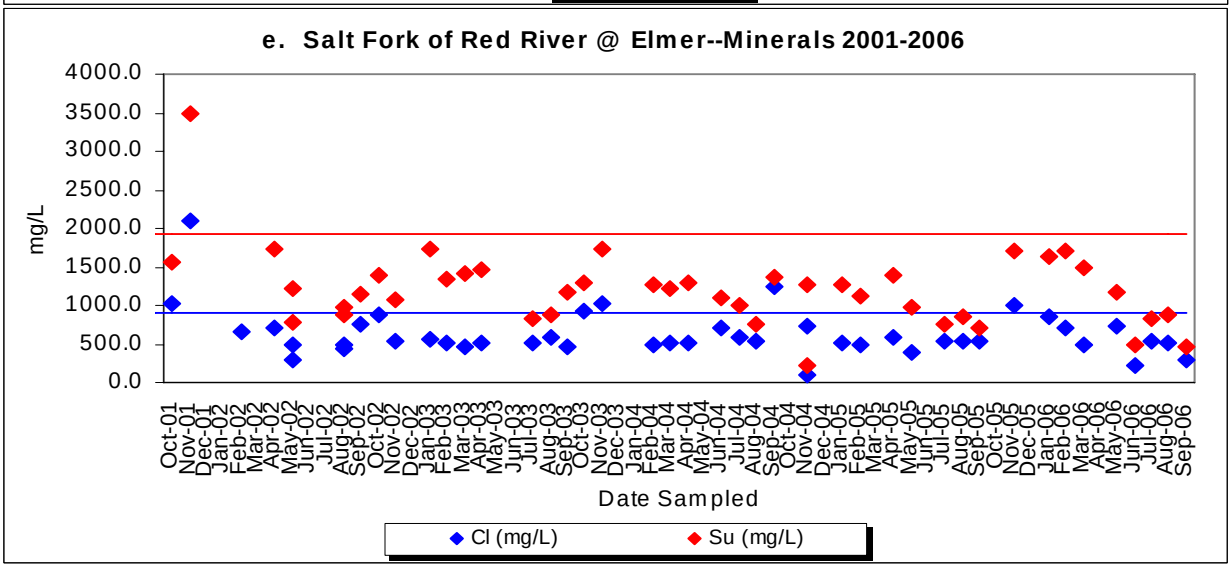
Figure 77 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Salt Fork of the Red River at Elmer (AT301110), 2001-2006.

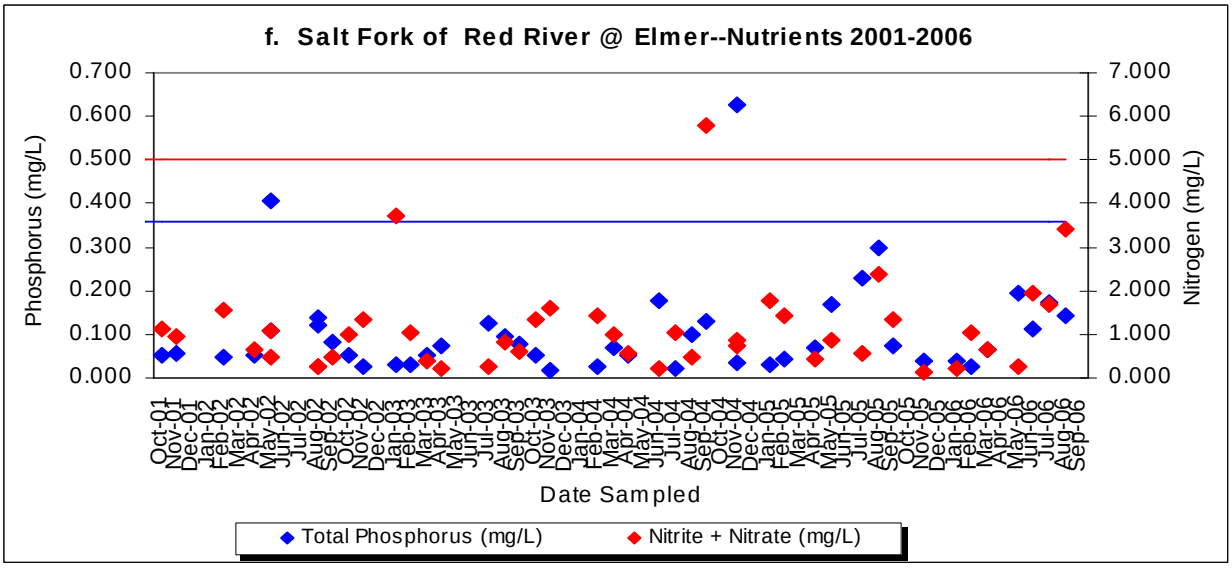







d. Salt Fork of the Red River @ Elmer--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Salt Fork of Red River @ Elmer--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Salt Fork of Red River @ Elmer--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

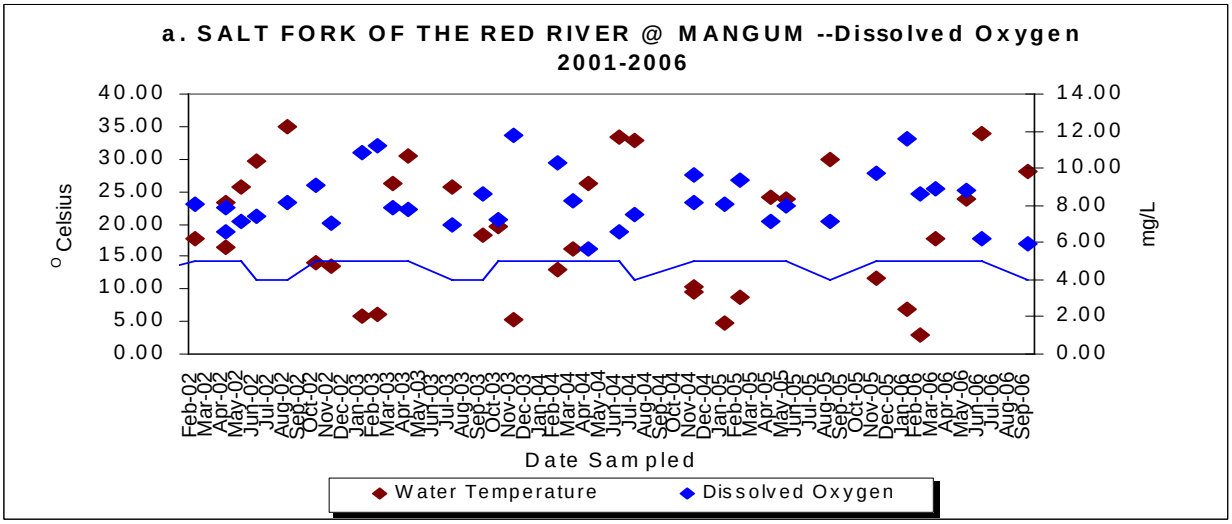
Salt Fork of the Red River near Mangum

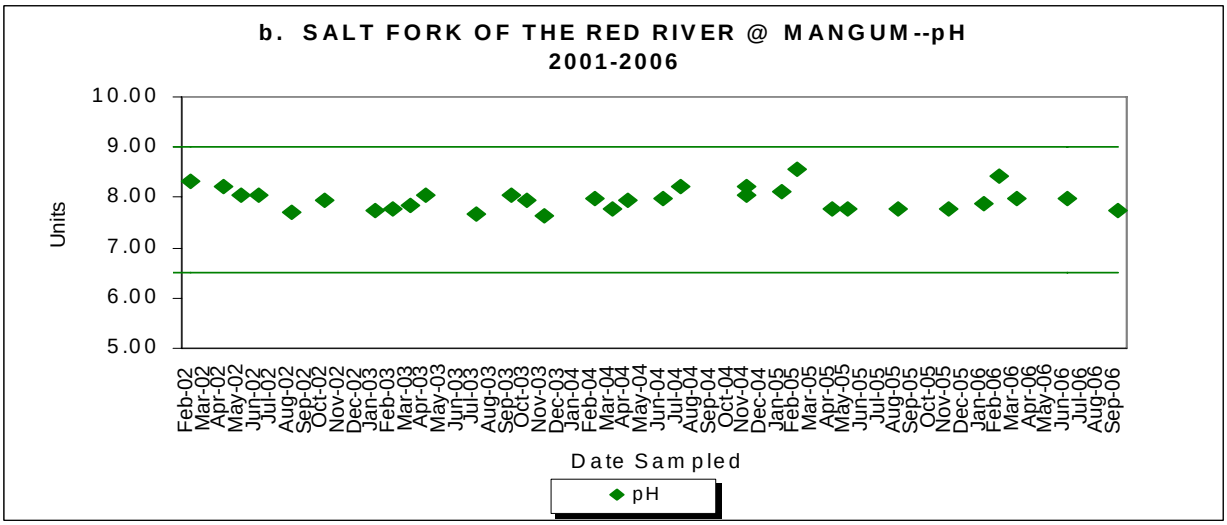
Station AT300500 (311600020010-001AT) is a permanent ambient trend monitoring station located on the Salt Fork of the Red River in Oklahoma. Situated in the south central portion of Greer County, the site was established south of the town of Mangum on State Highway 34. The station is positioned near the midpoint of stream segment 311600020010 and is classified within the Lower Salt Fork of the Red River 8 digit HUC watershed (11120202). Water enters the stream system from Texas, Lake Hall, and several unlisted tributaries within Oklahoma.

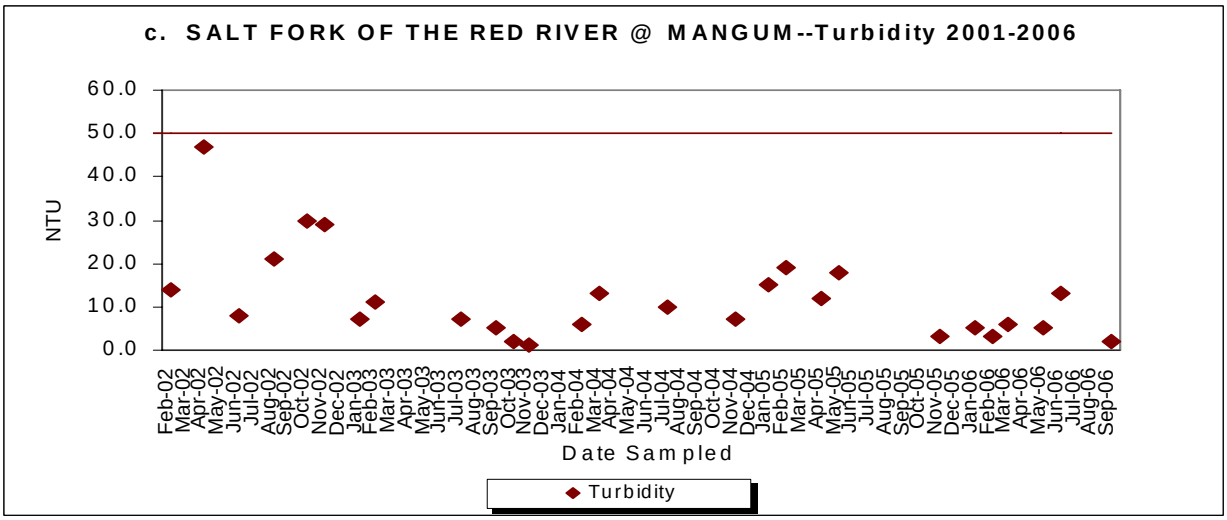
This station on the Salt Fork of the Red River has been active for all water quality variables since October of 2000. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Salt Fork of the Red River from its entrance into Oklahoma (100.0004, 34.8536) downstream to the confluence of the Salt Fork of the Red River with Bitter Creek (99.3923, 34.5751). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class III Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

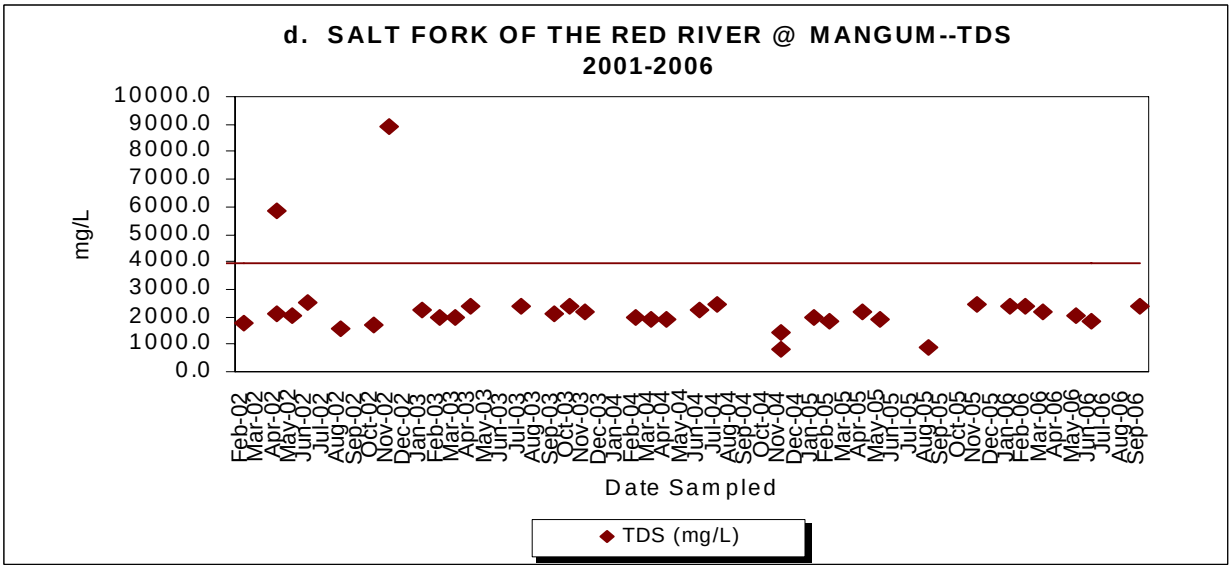
The PPWS beneficial is supported. The WWAC beneficial use is supported for dissolved oxygen (Figure 78a), pH ((Figure 78b), turbidity ((Figure 78c), and toxicants data. The AG beneficial is supported for total dissolved solids, chlorides, and sulfates samples ((Figure 78d and e). The PBCR beneficial use is not supported (Table 27). Of the sixteen (16) enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (259.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Salt Fork of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively ((Figure 78f).

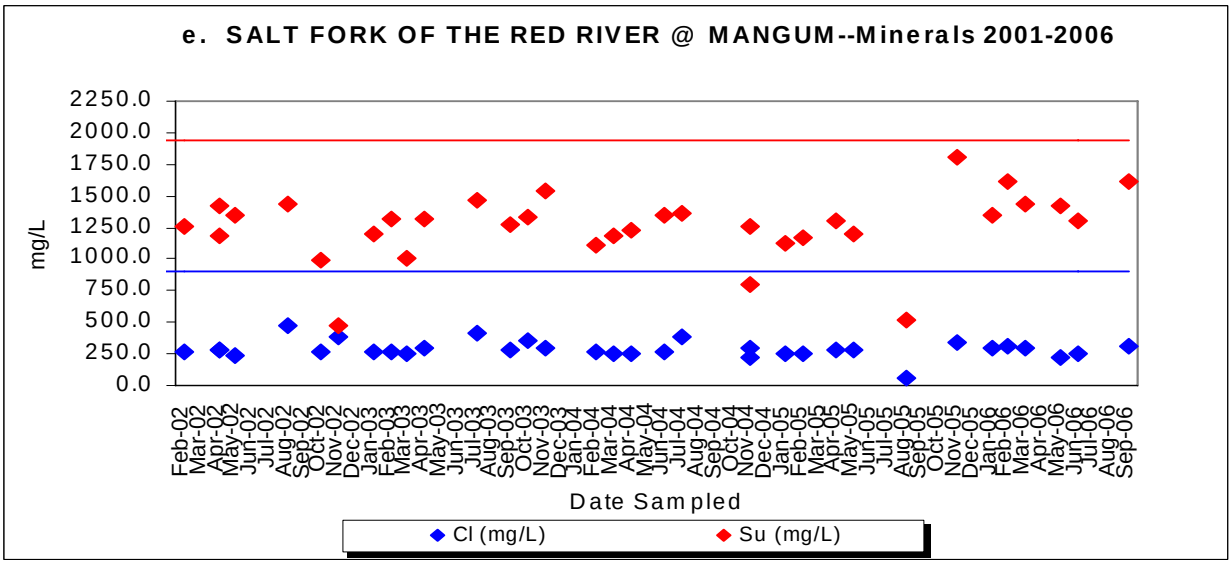
Figure 78 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Salt Fork of the Red River at Mangum (AT300500), 2001-2006.

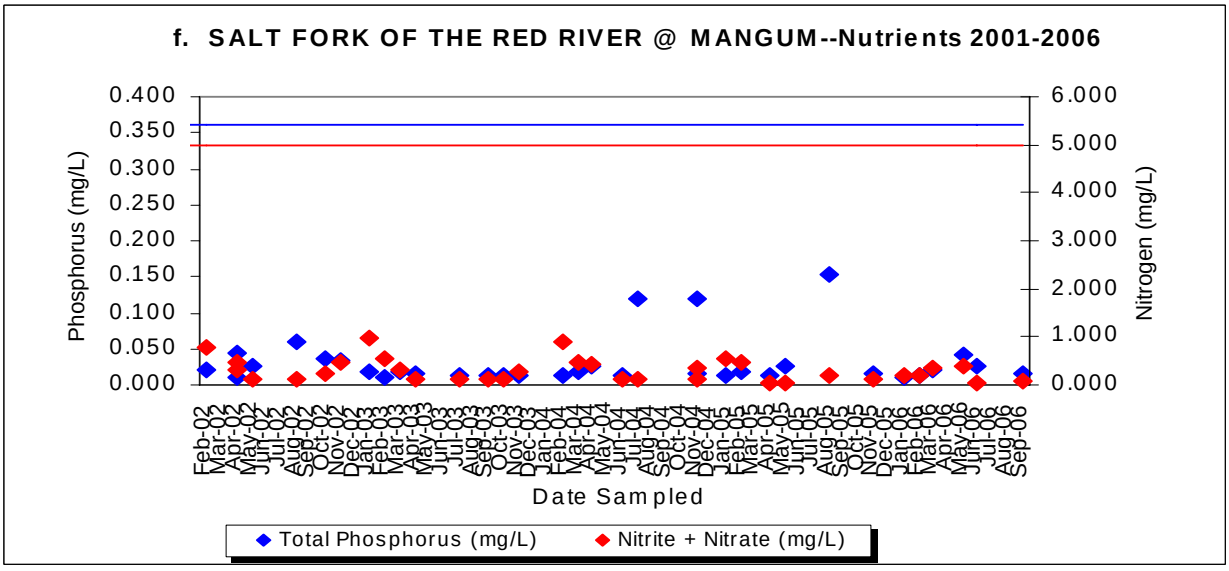







d. SALT FORK OF THE RED RIVER @ MANGUM--TDS
2001-2006
mg/L
10000.0
9000.0
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
Date Sampled
TDS (mg/L)


e. SALT FORK OF THE RED RIVER @ MANGUM--Minerals 2001-2006
mg/L
2250.0
2000.0
1750.0
1500.0
1250.0
1000.0
750.0
500.0
250.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. SALT FORK OF THE RED RIVER @ MANGUM--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

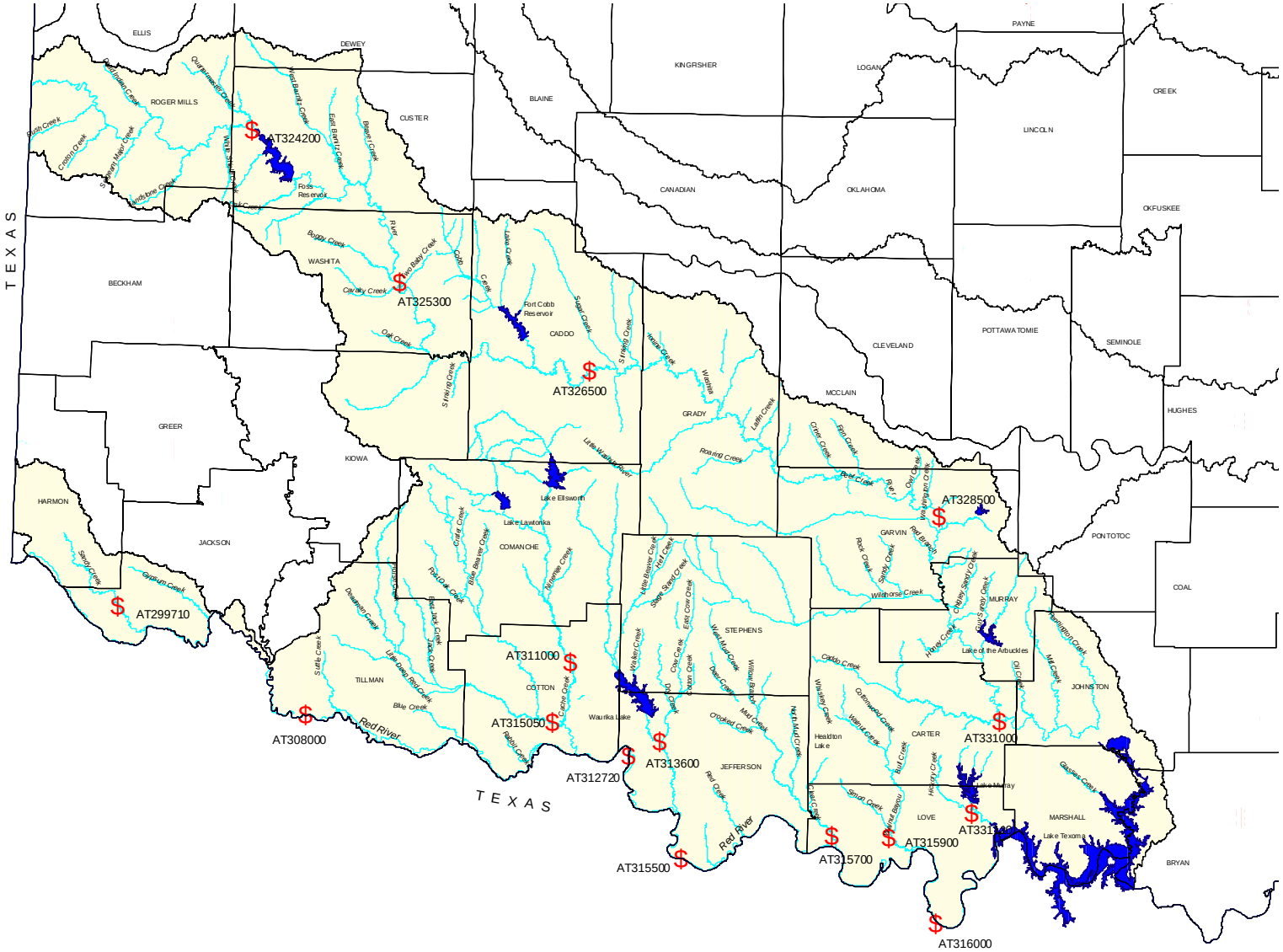


Plate 65
UPPER RED SUBBASIN (HUC 1113)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1113

UPPER RED SUB-BASIN

The Upper Red sub-basin (4-digit hydrologic unit 1113) is situated in the southwestern portion of the state. It originates in the western portion of Roger Mills County, continues eastward through portions of Beckham, Dewey, Custer, Washita, Kiowa, Caddo, Comanche, Tillman, Cotton, Grady, Stephens, Jefferson, McClain, Garvin, Murray, Pontotoc, Carter, Johnston, and Love Counties and terminates in the western part of Marshall and Bryan Counties, briefly touching Harmon and Jackson Counties. Major cities and County seats located within the basin include Cheyenne, Hollis, Arapaho, Clinton, Frederick, Anadarko, Lawton, Walters, Chickasha, Marlow, Duncan, Waurika, Lindsay, Pauls Valley, Sulphur, Lone Grove, Ardmore, Marietta, Madill, and Tishomingo. Minor cities of note include Hammon, Fort Cobb, Binger, Rush Springs, Davis, and Wynnewood.

The basin is subdivided into eleven 8-digit hydrologic units (HUC) within the state. These HUC's are the Groesbeck–Sandy (11130101), the Blue–China (11130102), the Farmer's–Mud (11130201), the Cache (11130202), the West Cache (11130203), the Northern Beaver (11130208), the Lake Texoma (11130210), the Washita Headwaters (11130301), the Upper Washita (11130302), the Middle Washita (11130303), and the Lower Washita (11130304). The major surface water in the basin is the upper Red River. Major tributaries include the Prairie Dog Town Fork of the Red River, the Washita River, the Little Washita River, Barnitz Creek, Cobb Creek, Bitter Creek, Rush Creek, Wildhorse Creek, Rock Creek, Caddo Creek, Mill Creek, Sandy Creek, Deep Red Creek, West Cache Creek, East Cache Creek, Cow Creek, Beaver Creek, Mud Creek, Walnut Bayou, and Hickory Creek. Eight major lakes are located in the basin—Foss Reservoir formed by the Washita River, Fort Cobb Reservoir formed by Cobb Creek, Lake Ellsworth formed by East Cache Creek, Lake Lawtonka formed by Medicine Creek, Waurika Lake formed by Beaver Creek, Lake of the Arbuckles formed by Rock Creek, Lake Murray formed by Anadarche Creek, and Lake Texoma formed by the Red and Washita Rivers and Hickory Creek. Twelve active permanent water quality-monitoring stations (Table 28) are located in the basin—AT299710, AT308000, AT311000, AT315050, AT315500, AT315700, AT324200, AT325300, AT326500, AT328100, AT328500, and AT331000 as well as four inactive water quality-monitoring stations (AT313600, AT315900, AT316000, AT331110). Stations AT315900 and AT331110 were last assessed in the 2000 BUMP report while station AT316000 was last assessed in the 1999 BUMP report. Stations AT313600 and AT312720 were last assessed in the 2003 BUMP report.

The basin is characterized by three ecoregions. The Central Great Plains is the primary ecoregion beginning in the western portion of Roger Mills County and continuing through the western parts of Grady, Stephens, and Jefferson Counties. The Central Oklahoma/Texas Plains begins in the eastern parts of Grady, Stephens, and Jefferson Counties and continues eastward over the rest of the sub-basin. The Southwestern Tablelands typify portions of Roger Mills, Custer, and Beckham Counties. The primary land usage in the sub-basin is rangeland (open grasslands, mesquite, and other woody areas). It is prevalent in the western, southern and central portions of the sub-basin and is interspersed throughout the sub-basin. The secondary land use is cropland, which dominates the southwestern portion and is interspersed throughout the sub-basin. The tertiary land uses are pastureland (brushy or mixed) and

forestland (post oak–blackjack oak, hickory–oak, and bottomland hardwoods). Other land uses of note are woodlands, bottom woodlands, farmsteads, major urban areas, and wetlands.

Table 28. Permanent Ambient Trend Monitoring Stations Located in HUC 1113.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
311300010020	AT311000	East Cache Creek, SH 53, Walters	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
311100040010	AT315700	Mud Creek, SH 32, Courtney	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
311310010010	AT308000	Red River, US 183, Davidson	Active 11/98-P	NONE	NONE	AG, FWP, AES, PBCR	NONE
311100010190	AT315500	Red River, US 81, Terral	Active 11/98-P	AES, PPWS	NONE	AG, FWP, PBCR	NONE
311600010040	AT299710	Sandy Creek, SH 6, Eldorado	Active 11/98-P	AES	NONE	AG, FWP	NONE
310810020010	AT328100	Washita River, off SH 19, Alex	Active 1/03-P	AG, PPWS	NONE	FWP, PBCR, AES	NONE
310830010010	AT326500	Washita River, US 281, Anadarko	Active 11/98-P	AG, PPWS	NONE	AES, FWP, PBCR	NONE
310830030010	AT325300	Washita River, SH 152, Cordell	Active 11/98-P	AG, PPWS	NONE	FWP, AES, PBCR	NONE
310800020010	AT331000	Washita River, US 177, Durwood	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
310840010010	AT324200	Washita River, off SH 33, McClure	Active 11/98-P	AG, AES, PPWS	FWP	PBCR	NONE
310810010010	AT328500	Washita River, SH 19, Pauls Valley	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
311310020010	AT315050	West Cache Creek, SH 5B, Taylor	Active 11/98-P	AES, PPWS	AG	FWP, PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 29. Toxicant exceedances in HUC 1113. Underlined values were measured at the minimum quantification limit (MQL) and are reported at one-half of the MQL per 785:46-15-3(e)(2).

STATION #	STATION NAME	DATE	Selenium (ug/L)
AT308000	Red River, US 183, Davidson	04/18/2001	23.00
		01/14/2003	7.00
		03/25/2003	6.00
AT299710	Sandy Creek, SH 6, Eldorado	06/19/2001	22.00
		08/21/2001	15.00
		09/18/2001	24.00
		05/01/2002	23.00
		01/14/2003	29.00
		03/24/2003	25.00
		08/19/2003	17.00
		09/21/2004	20.00

Table 30. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1113. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT311000	East Cache Creek, SH 53, Walters	06/30/1999		860	
		08/23/1999	1300	930	785
		09/22/1999	1500		
		05/23/2000		600	
		08/29/2000		2200	
		09/26/2000	600	2000	459
		05/16/2001	500	600	
		07/17/2001		500	
		08/14/2001	500		
		09/04/2001	1100	4000	
		05/28/2002		1000	
		08/06/2002	600		
		08/21/2002		1100	
		06/04/2003	500	43000	
		06/23/2003	1000	800	620
		07/28/2003		500	
		08/19/2003	500	800	
		09/02/2003	24100	5300	4352
		09/23/2003		470	
		06/08/2004		1100	
		07/12/2004	700	600	
AT315700	Mud Creek, SH 32, Courtney	09/05/2001		800	
		05/29/2002		17000	
		08/06/2002		600	
		05/10/2004		2000	
		05/25/2004		500	
		06/14/2004		600	
		06/28/2004		1400	
		08/16/2004		600	
AT308000	Red River, US 183, Davidson	09/26/2000	63000	11000	
		05/22/2001	10000	14000	
		08/21/2001	2000	21000	
		09/18/2001			
		05/29/2002	10000	11000	
		08/20/2002	1000		
		05/25/2004	500		
		06/08/2004	1200	5100	
		06/29/2004	1200	3100	
		08/16/2004	800		
AT315500	Red River, US 81, Terral	05/23/2000		410	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		05/15/2001		500	
		05/25/2004		700	
		06/15/2004		500	
		06/28/2004		2100	
AT328100	WASHITA RIVER, OFF SH 19, NEAR ALEX	05/05/2004	5000	11000	
		06/02/2004	700		
		06/30/2004	3300	2900	
		07/07/2004	2500	3600	
		07/28/2004		2700	
		08/11/2004	2610	2890	
		09/01/2004	630		
AT326500	WASHITA RIVER, US 281, ANADARKO	05/09/2000		1200	
		05/16/2001	4000	2000	
		06/12/2001		1000	
		08/14/2001	3000	600	
		07/23/2002		2000	
		05/05/2004	2000	8000	
		05/19/2004	1000		
		06/30/2004		1600	
		07/07/2004	1000	2500	
		07/28/2004		600	
		08/11/2004	610	470	
		09/01/2004	1270	565	
AT325300	WASHITA RIVER, SH 152, CORDELL	05/09/2000	1600	1700	
		07/19/2000		700	
		05/16/2001		3100	3448
		06/12/2001		3000	
		08/14/2001	500		
		05/21/2002	600	1700	
		06/18/2002	600	6000	
		07/23/2002		600	
		05/05/2004	2000		
		06/02/2004		800	
		06/30/2004	4700	4300	1153
		07/07/2004	5700	6200	1106
		07/28/2004		1300	
		09/01/2004	510		
AT331000	WASHITA RIVER, US 177, DURWOOD	05/10/2000	690	1400	
		05/15/2001	500		
		06/11/2001	600	500	
		09/05/2001	800	600	
		06/18/2002	520		

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		08/19/2002	470		
		05/24/2004	1900	1100	
		06/28/2004	700	1900	
		08/16/2004	1700		
AT324200	WASHITA RIVER, SH 33, HAMMON	05/09/2000		600	
		06/13/2000	1800	3800	
		07/19/2000		1800	
		08/16/2000		1600	
		09/13/2000	700	1400	538
		05/22/2001	900		608
		06/19/2001		800	
		07/24/2001		1000	
		08/21/2001	600	7000	
		05/21/2002	600		
		06/18/2002	700	5000	
		07/23/2002	6000		759
		08/21/2002		4000	
		05/05/2004	2000	1000	
		05/19/2004		3000	
		06/30/2004	3900	17900	911
		07/06/2004	800	2100	
		07/28/2004	500	2300	
		09/01/2004	1910	676	772
AT328500	WASHITA RIVER, SH 19, PAULS VALLEY	05/10/2000		680	
		05/15/2001		500	
		06/11/2001		2000	
		08/19/2002		3000	
		09/23/2002		600	
		05/10/2004		5000	
		06/28/2004		1900	
AT315050	WEST CACHE CREEK, SH 5B, TAYLOR	06/30/1999	590	64000	
		05/23/2000		640	
		06/27/2000	600	950	
		05/16/2001	900	2000	
		08/14/2001		600	
		09/04/2001	2800	1200	
		05/28/2002	800	800	
		08/21/2002	22000		
		06/04/2003		600	
		06/23/2003	600		
		08/19/2003	500	500	
		09/02/2003	5300	4100	

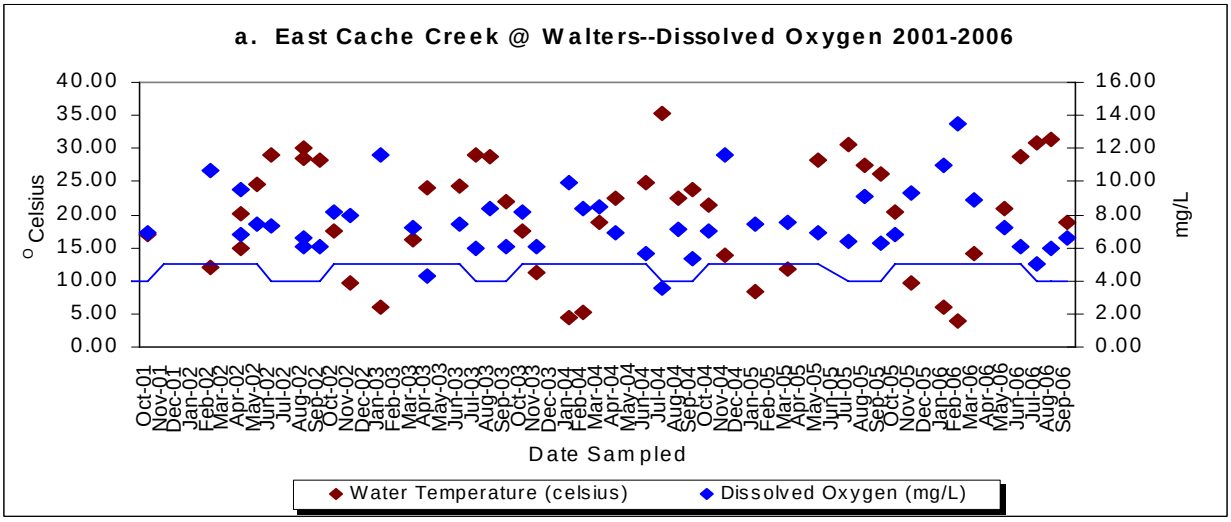
East Cache Creek near Walters

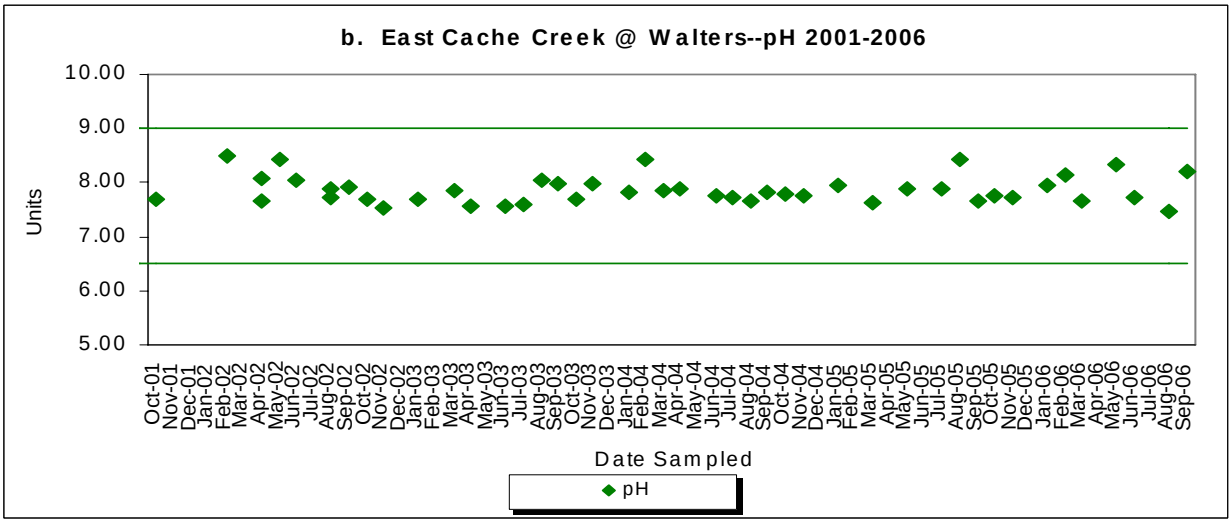
Station AT311000 (311300010020-001AT) is a permanent ambient trend monitoring station located on East Cache Creek. Situated in the northeastern portion of Cotton County, the site was established east of the town of Walters on State Highway 53. The station is positioned near the terminal end of stream segment 311300010020 and is classified within the Cache Creek 8 digit HUC watershed (11130202). Water enters the stream system from Dave Boyer Lake, Walters Lake, and Temple Lake and from several tributaries including Snake Creek, among others.

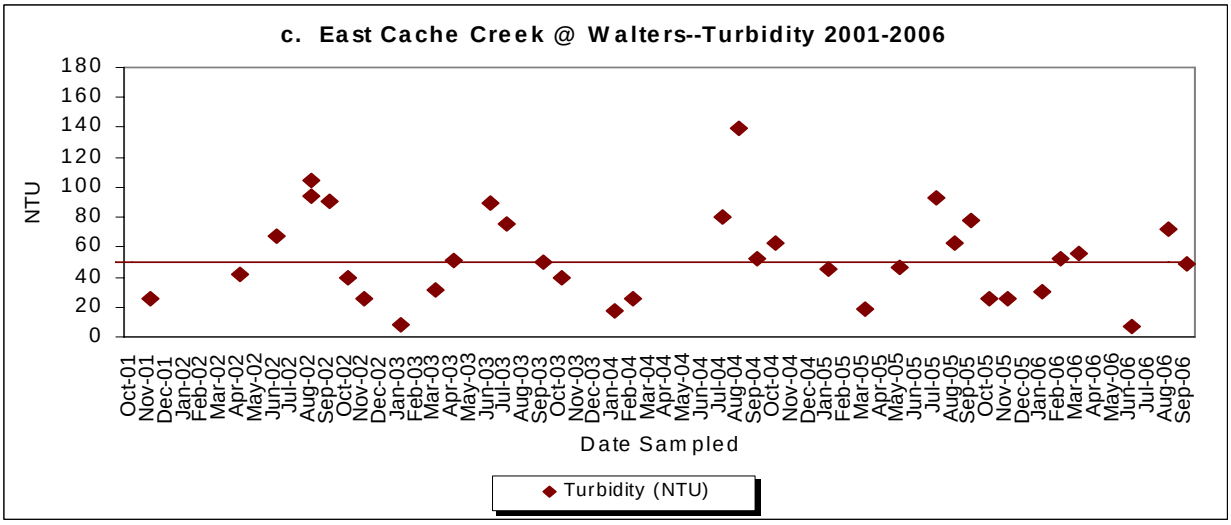
This station on East Cache Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of East Cache Creek from the confluence of Medicine Creek (98.3764, 34.6747) downstream to confluence of East Cache Creek with Cache Creek (98.3070, 34.2066). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

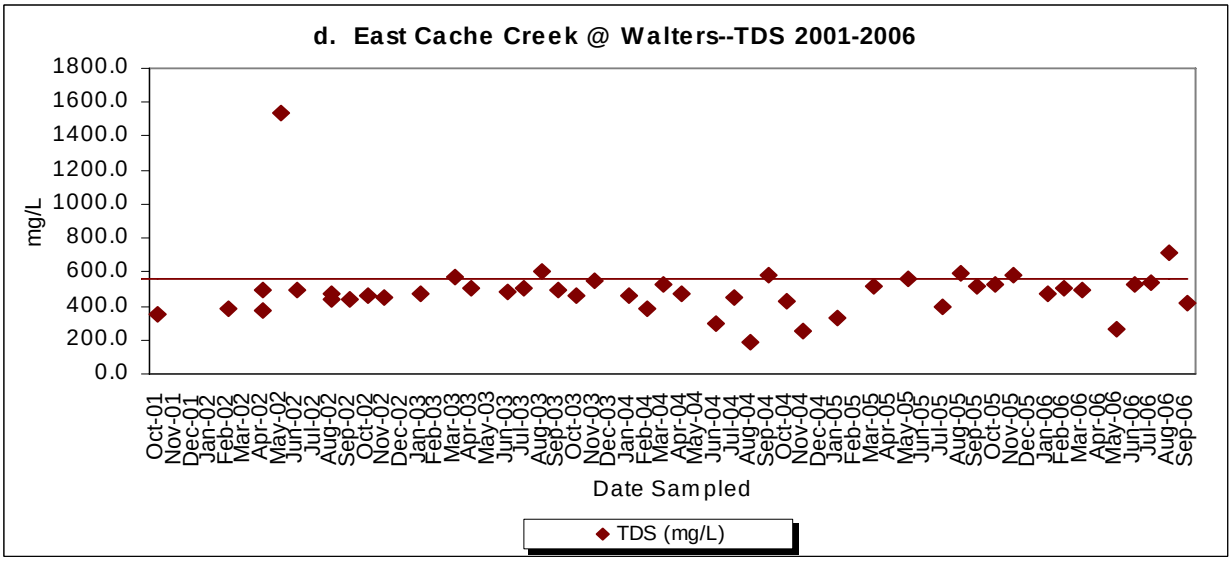
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-six (36) turbidity samples (Figure 79c), seventeen (17) samples (or 47%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 79a), pH (Figure 79b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 79d and e). Although 15% of the total dissolved solids concentrations exceeded the sample standard of 570.0 mg/L, the values are below the prescribed minimum standard of 700 mg/L. Although 20% of the chloride concentrations exceeded the sample standard of 101.0 mg/L, the values are below the prescribed minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 30). Of the twenty-five (25) fecal coliform concentrations, ten (10) samples (or 40%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (600.2 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the 25 enterococci concentrations, sixteen (16) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (888.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 25 *E.coli* concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (174.0 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of East Cache Creek is not nutrient-threatened. Although the median of the total phosphorus concentrations (1.565 mg/L) exceeded the threshold median of 0.36 mg/L, the station is light-limited due to a mean inorganic turbidity of 41 NTU. The nitrate/nitrite median value was below the threshold median of 5.0 mg/L (Figure 79f).

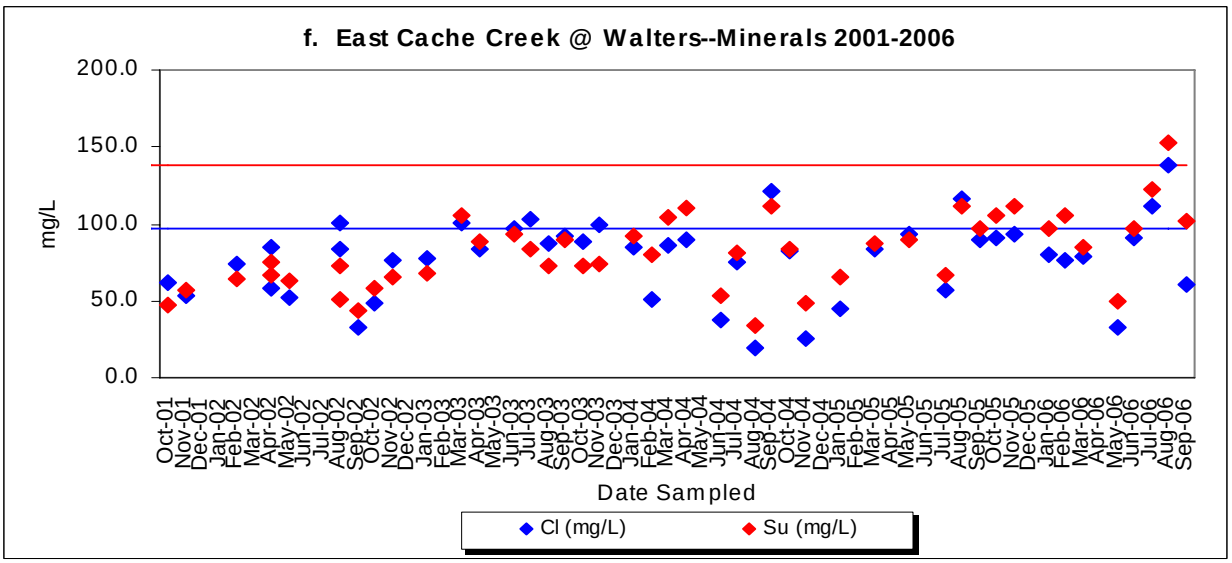
Figure 79 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on East Cache Creek at Walters (AT311000), 2001-2006.

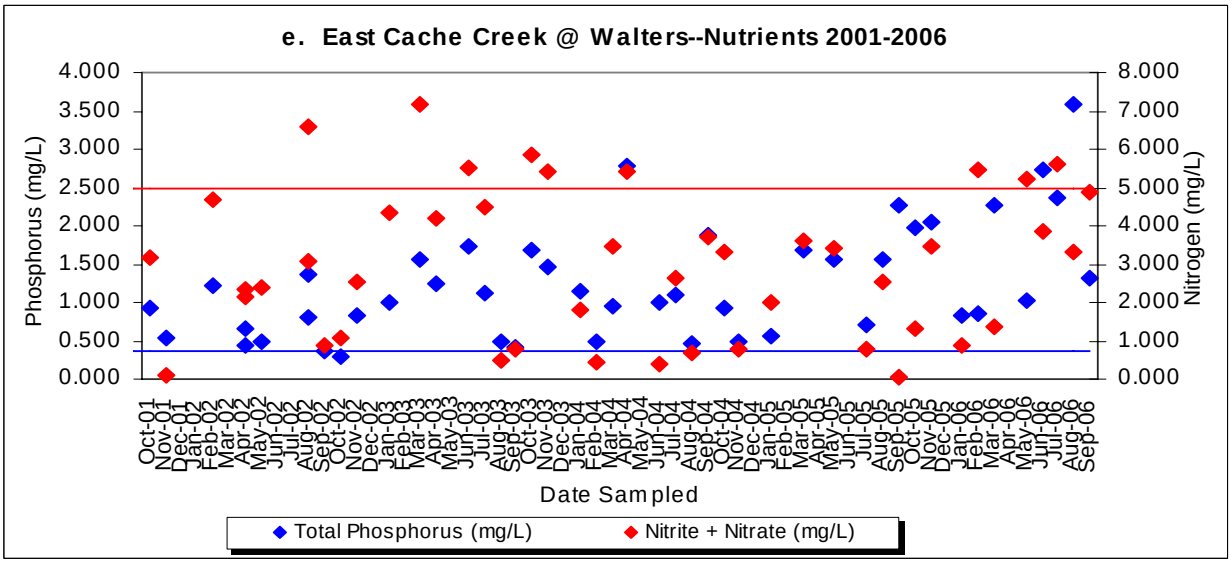







d. East Cache Creek @ Walters--TDS 2001-2006
mg/L
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


f. East Cache Creek @ Walters--Minerals 2001-2006
mg/L
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


e. East Cache Creek @ Walters--Nutrients 2001-2006
Phosphorus (mg/L)
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

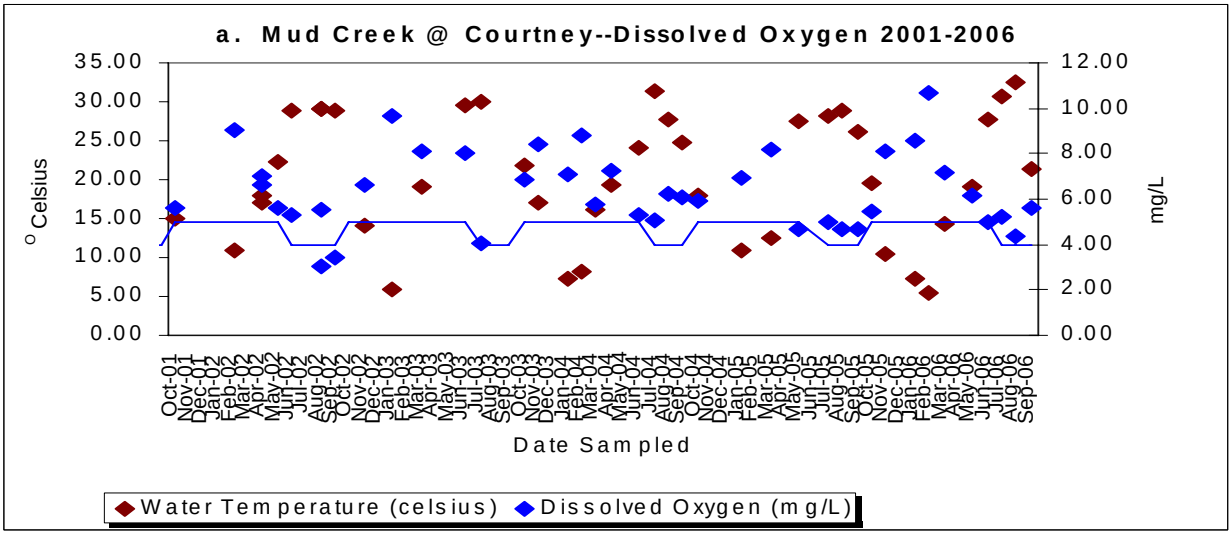
Mud Creek near Courtney

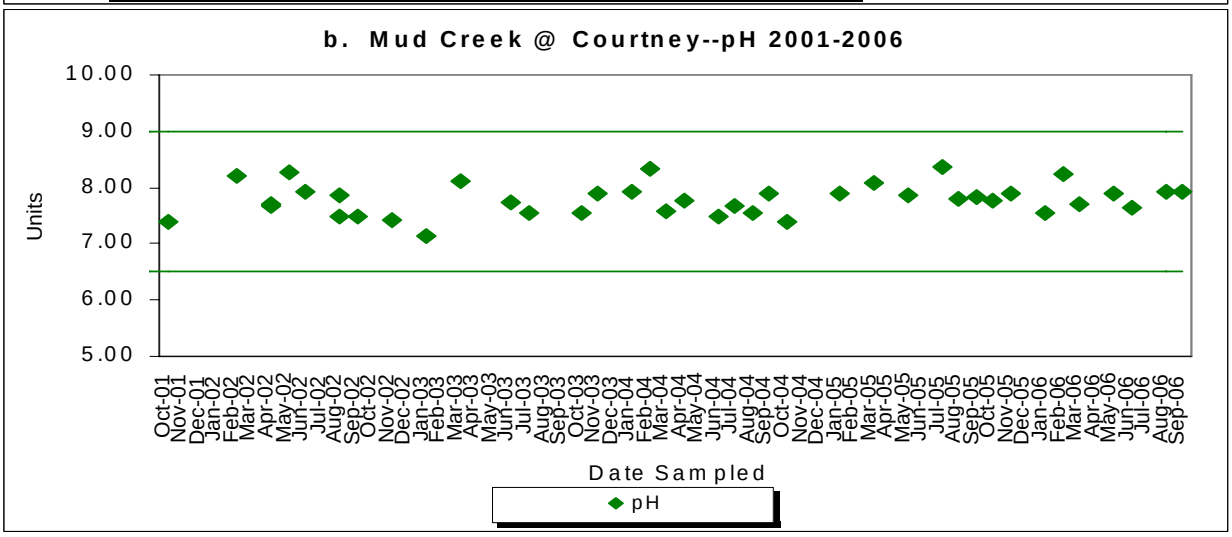
Station AT315700 (311100040010-001AT) is a permanent ambient trend monitoring station located on Mud Creek. Situated in the southwestern portion of Love County, the site was established west of the town of Courtney on State Highway 32. The station is positioned near the terminal end of stream segment 311100040010 and is classified within the Farmer's - Mud Creek 8 digit HUC watershed (11130201). Water enters the stream system from several tributaries including Crooked Creek, Negro Creek, North Mud Creek, and Clear Creek, among others.

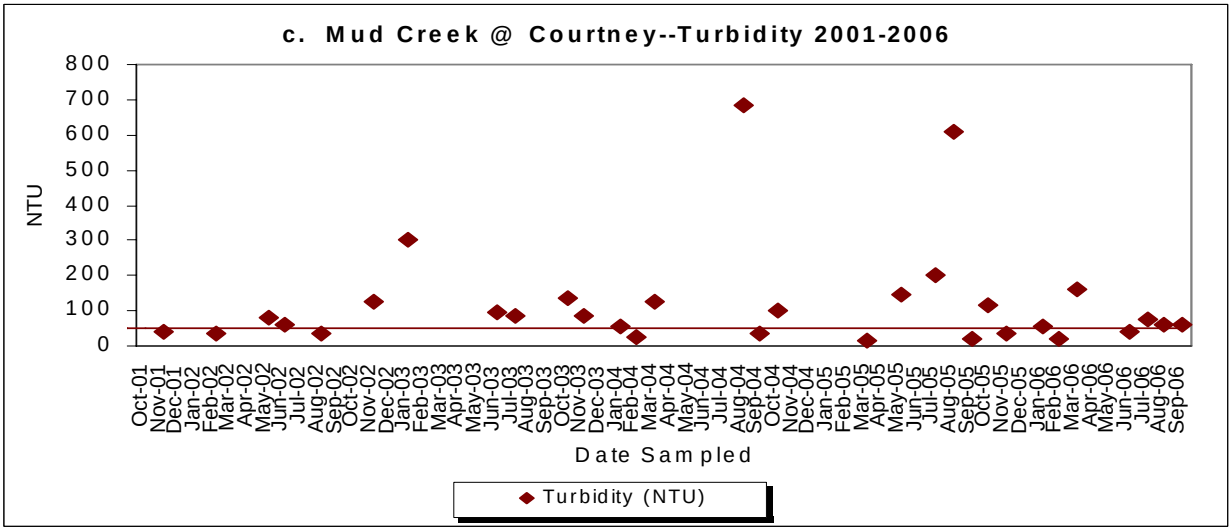
This station on Mud Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Mud Creek from the confluence of Crooked Creek (97.7102, 34.2055) downstream to confluence of Mud Creek with the Red River (97.4740, 33.9120). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

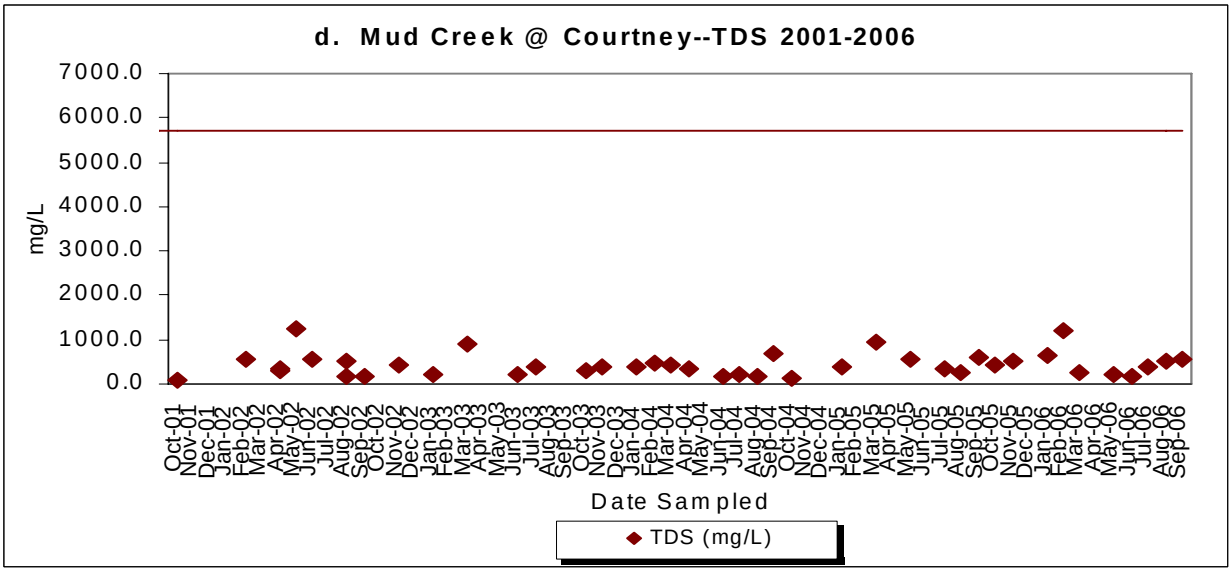
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-two (29) turbidity samples (Figure 80c), twenty-one (21) samples (or 66%) exceeded the numerical criterion of 50 NTU. The dissolved oxygen (Figure 80a), pH (Figure 80b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 13 (maximum 30) and fish condition score of 7 (maximum 15) for a total score of 20. This is between the assigned non-supporting and supporting thresholds of 20-25 for Central Oklahoma/Texas Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 80d and e). The PBCR beneficial use is not supported (Table 30). Of the seventeen (17) enterococci concentrations, seven (7) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (367.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Mud Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 80f).

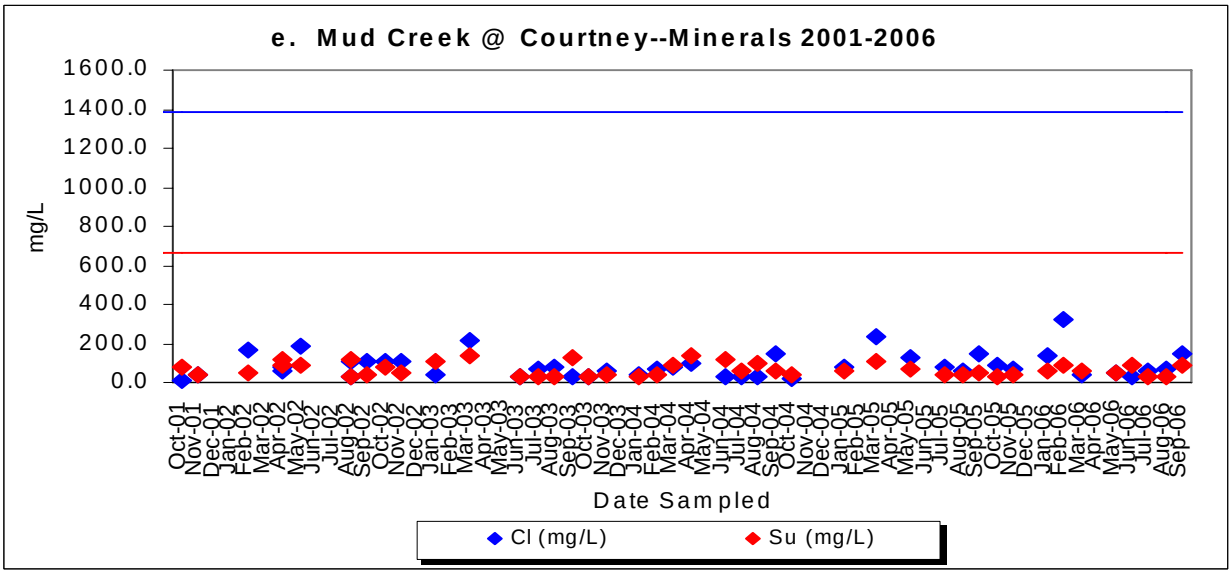
Figure 80 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Mud Creek at Courtney (AT315700), 2001-2006.

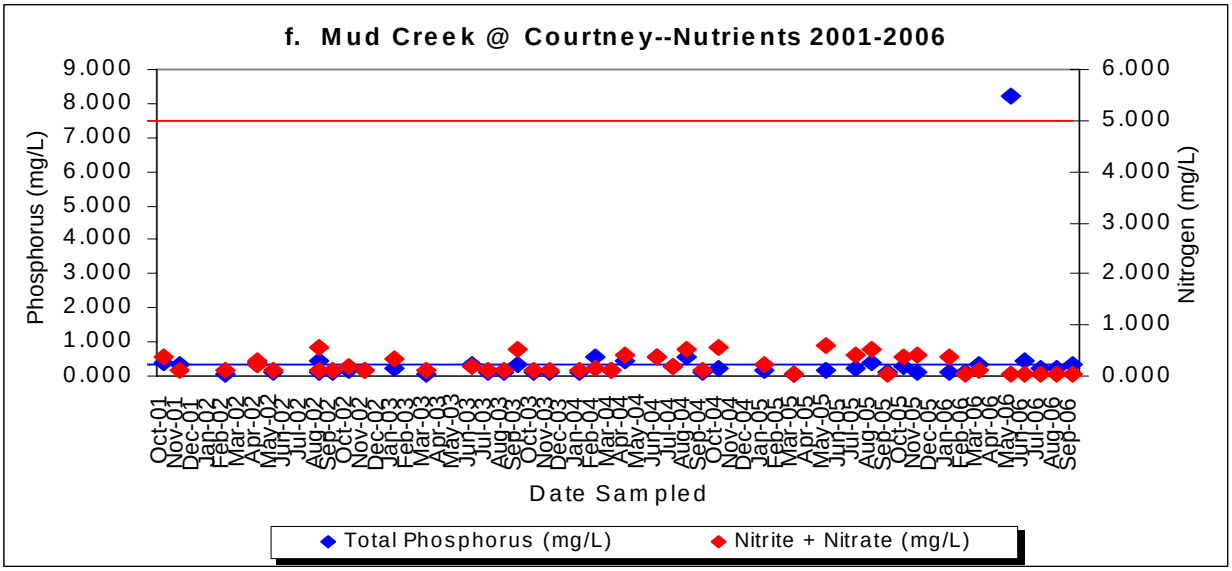







d. Mud Creek @ Courtney--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Mud Creek @ Courtney--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Mud Creek @ Courtney--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

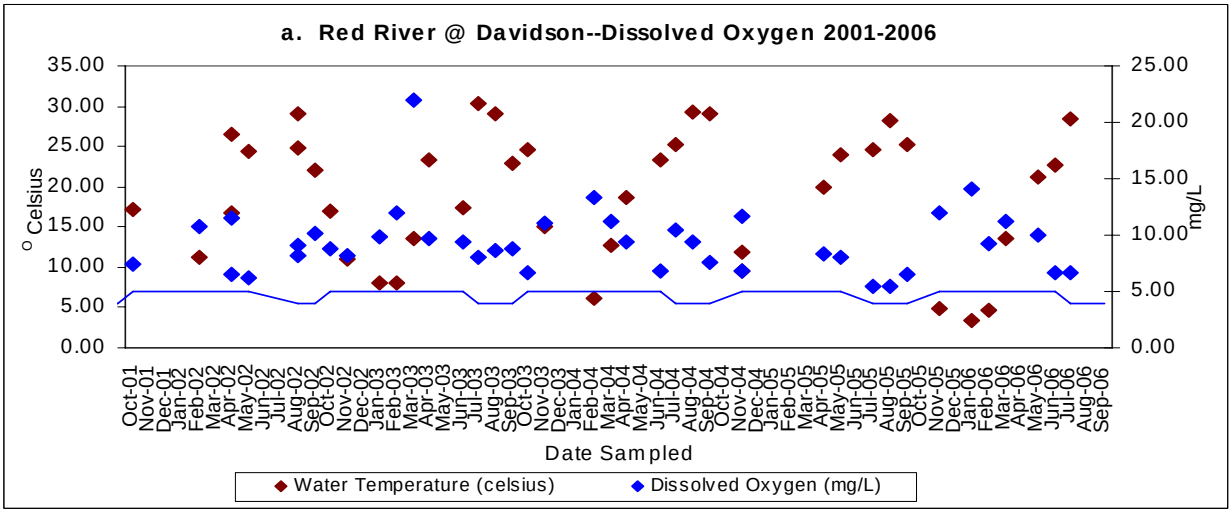
Red River near Davidson

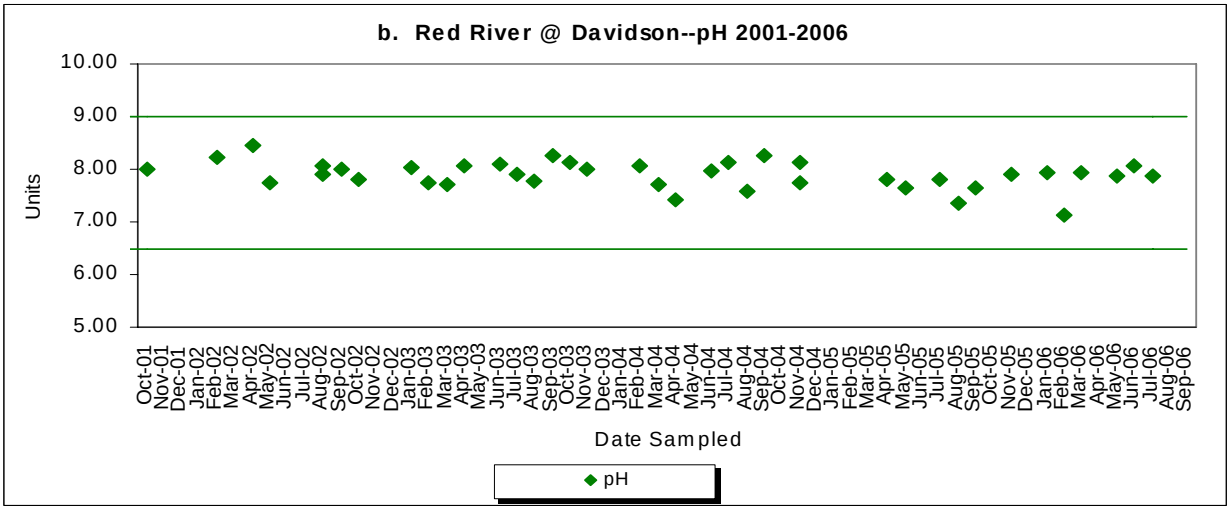
Station AT308000 (311310010010-001AT) is a permanent ambient trend monitoring station located on the Red River in Oklahoma. Situated in the southwestern portion of Tillman County, the site was established south of the town of Davidson on US Highway 183. The station is positioned between the upper end and the midpoint of stream segment 311310010010 and is classified within the Blue Creek - China Creek 8 digit HUC watershed (11130102). Water enters the stream system from several tributaries including the North Fork of the Red River, Suttle Creek, Blue Creek, and Rabbit Creek, among others.

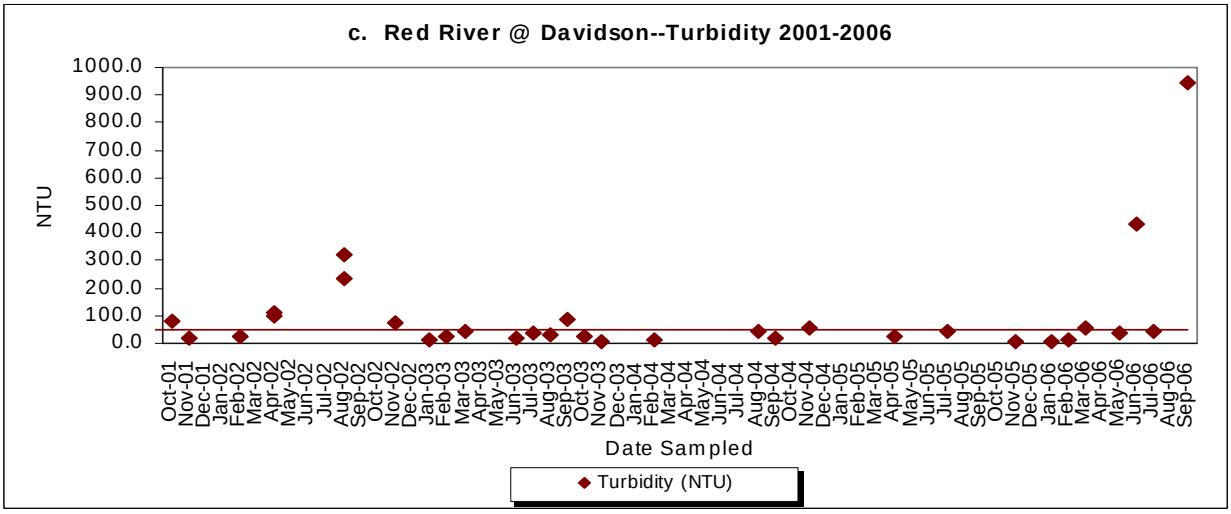
This station on the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2000 through September of 2006. For purposes of reporting, this station is representative of the Red River from the confluence of the North Fork of the Red River (99.2096, 34.3326) downstream to above the confluence of Cache Creek with the Red River (98.2686, 34.1324). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

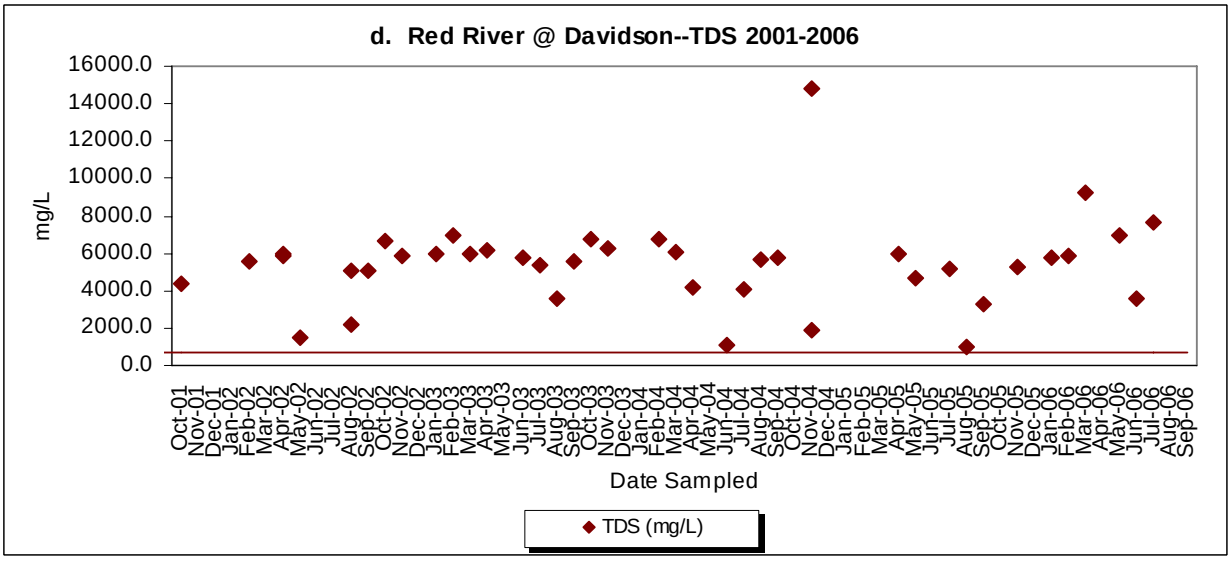
The WWAC beneficial use is not supported. Of the eleven (11) toxicant samples collected, three (3) of the selenium concentrations (or 27%) exceeded the prescribed chronic criteria of 5 ug/L (Table 29). Of the thirty-one (31) turbidity samples (Figure 81c), eleven (11) samples (or 35%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 81a) and pH (Figure 81b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is not supported (Figure 81d and e). Of the forty-one (41) total dissolved solids concentrations, 41 samples (or 100%) exceeded the minimum sample standard of 700 mg/L (App. F sample standard is 151 mg/L), and the geometric mean (4874.8 mg/L) exceeded the minimum yearly mean standard of 700 mg/L (App. F sample standard is 126 mg/L). Of the forty-three (43) chloride concentrations, forty-two (42) samples (or 98%) exceeded the sample standard of 285 mg/L, and the geometric mean (1455.5 mg/L) exceeded the prescribed minimum yearly mean standard (250 mg/L). Of the 43 sulfate concentrations, 43 samples (or 100%) exceeded the prescribed minimum sample standard of 250 mg/L, and the geometric mean (831.1 mg/L) exceeded the yearly mean standard (79 mg/L). The PBCR beneficial use is not supported (Table 30). Of the nineteen (19) fecal coliform concentrations, eight (8) samples (or 42%) exceeded the prescribed screening level of 400 cfu/mL. Of the 19 enterococci concentrations, 5 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (88.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Red River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (42.6 mg/M^3) produced a TSI of 67, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 81f).

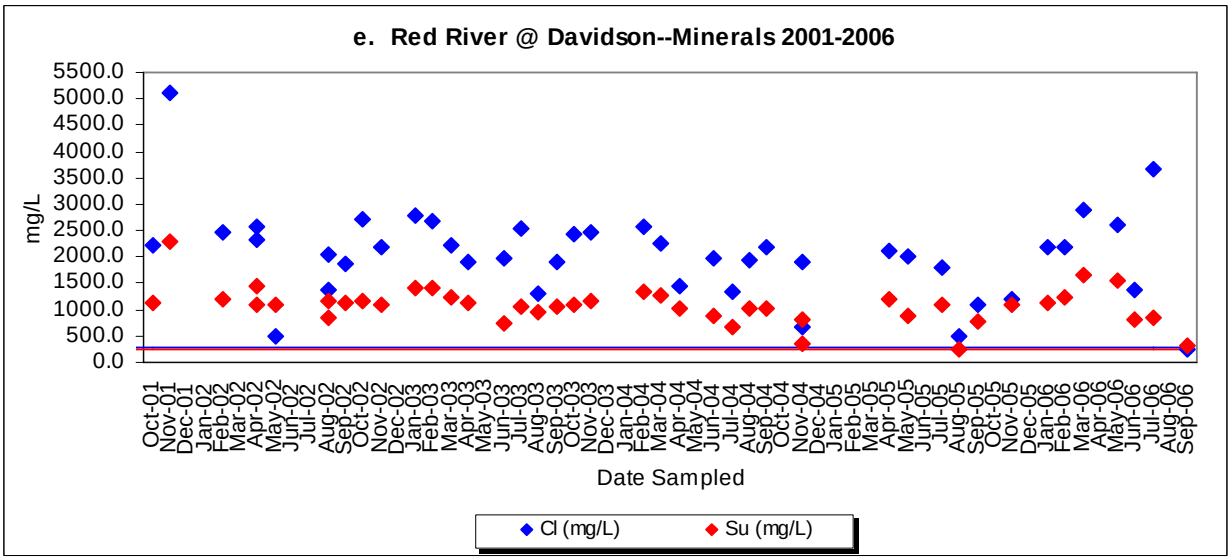
Figure 81 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Davidson (AT308000), 2001-2006.

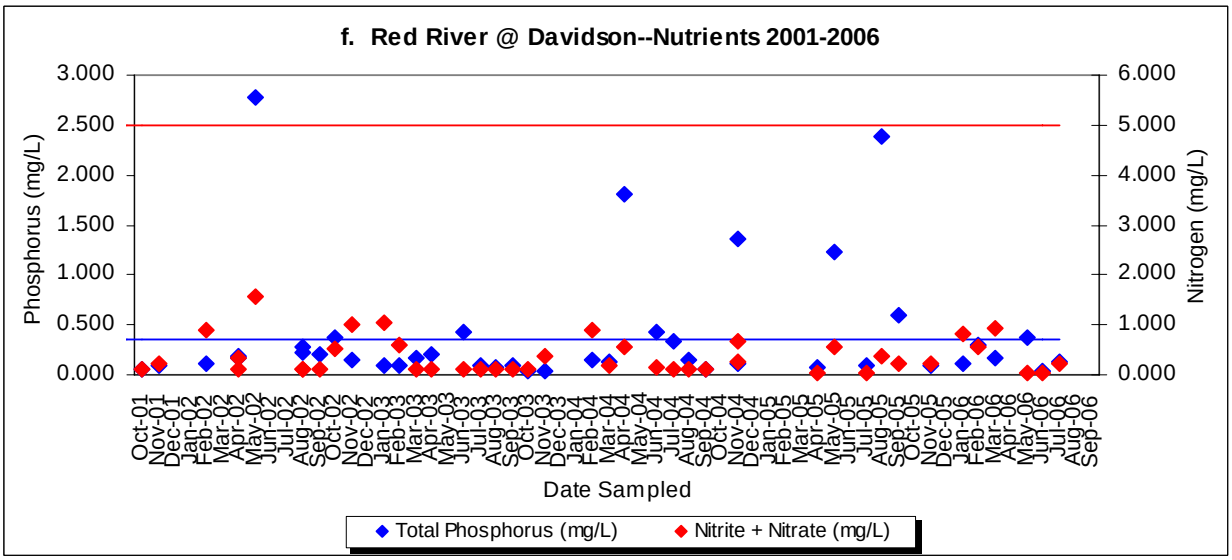







d. Red River @ Davidson--TDS 2001-2006
mg/L
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Date Sampled
TDS (mg/L)


e. Red River @ Davidson--Minerals 2001-2006
mg/L
5500.0
5000.0
4500.0
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Red River @ Davidson--Nutrients 2001-2006
Phosphorus (mg/L)
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

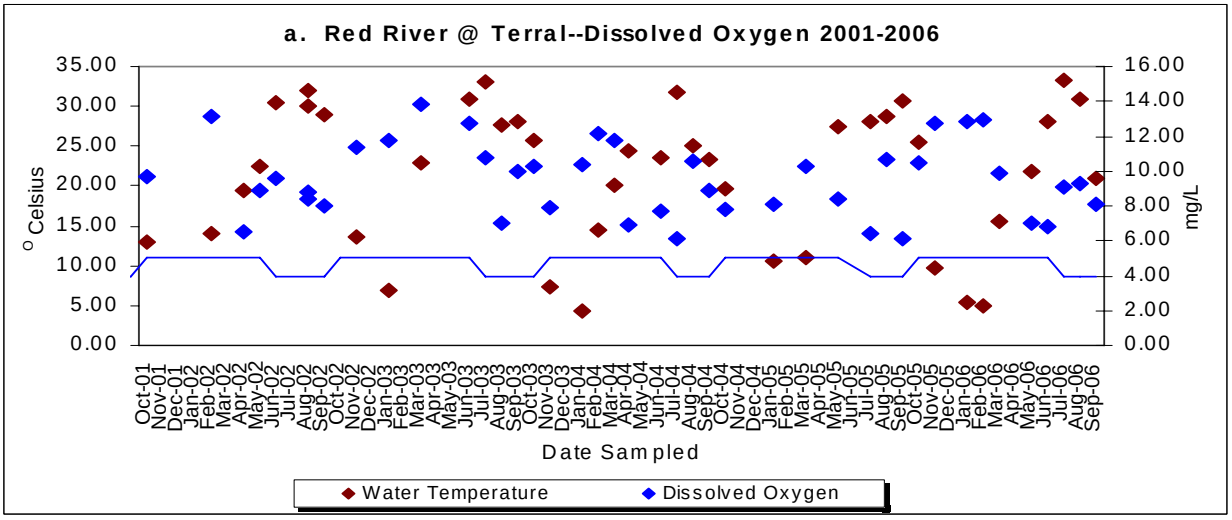
Red River near Terral

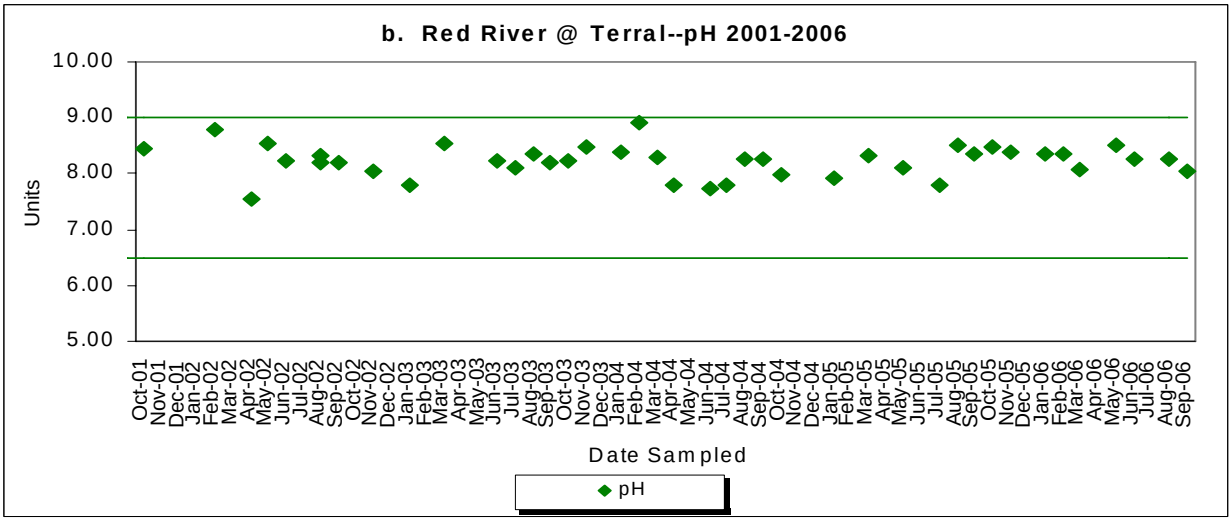
Station AT315500 (311100010190-001AT) is a permanent ambient trend monitoring station located on the Red River in Oklahoma. Situated in the south central portion of Jefferson County, the site was established south of the town of Terral on US Highway 81. The station is positioned near the upper end of stream segment 311100010190 and is classified within the Farmer's - Mud Creek 8 digit HUC watershed (11130201). Water enters the stream system from several tributaries Fleetwood Creek and Red Creek, among others.

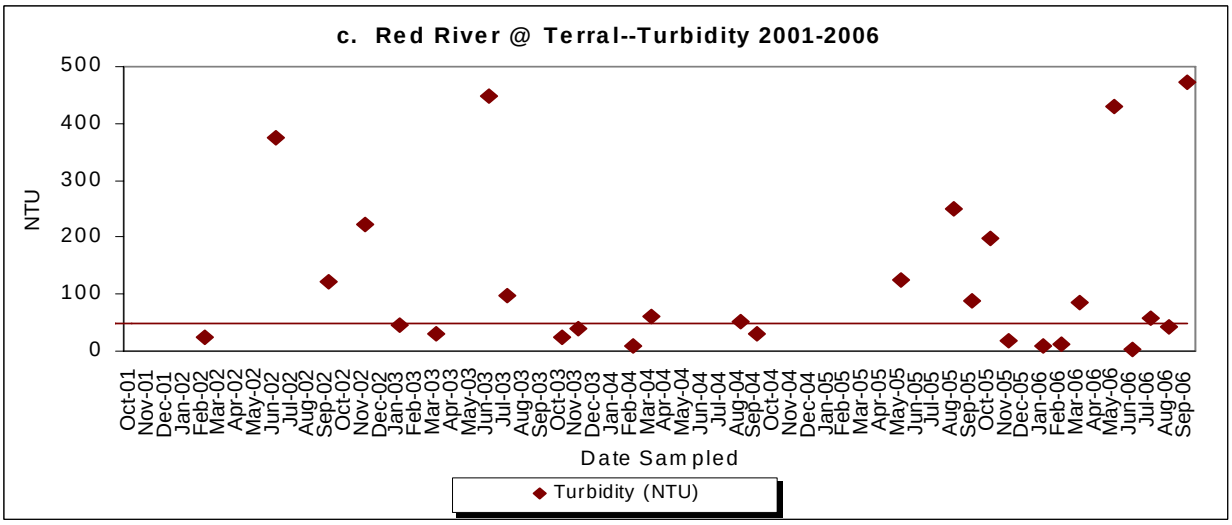
This station on the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from November of 2001 through September 2006. For purposes of reporting, this station is representative of the Red River from below the confluence of Beaver Creek (97.9465, 33.9913) downstream to above the confluence of Mud Creek with the Red River (97.4741, 33.9121). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

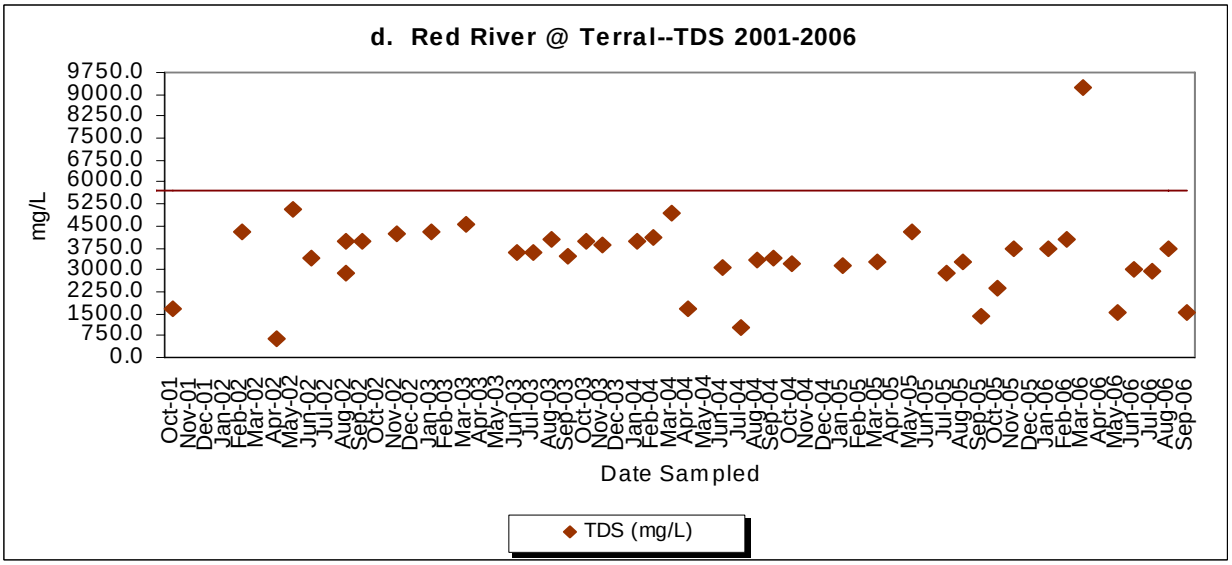
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-seven (27) turbidity samples (Figure 82c), fifteen (15) samples (or 56%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 82a), pH (Figure 82b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 14 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 25. This is between the assigned non-supporting and supporting thresholds of 20-25 for Central Oklahoma/Texas Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is not supported (Figure 82d and e). Of the forty-four (44) sulfate concentrations, twenty-one (21) samples (or 48%) exceeded the sample standard of 666 mg/L, and the geometric mean (570.6 mg/L) exceeded the yearly mean standard (485 mg/L). Of the 44 chloride concentrations, fourteen (14) samples (or 32%) exceeded the sample standard of 1384 mg/L, and the geometric mean (1168.5 mg/L) exceeded the yearly mean standard (1007 mg/L). The PBCR beneficial use is not supported (Table 30). Of the sixteen (16) enterococci concentrations, three (3) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (58.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Red River is not nutrient-threatened. The total phosphorus median value (0.392 mg/L) is above the threshold median of 0.36 mg/L. However, the station is light limited with a baseflow turbidity mean of 50 NTU. The nitrate/nitrite median value was below the threshold median 5.0 mg/L (Figure 82f).

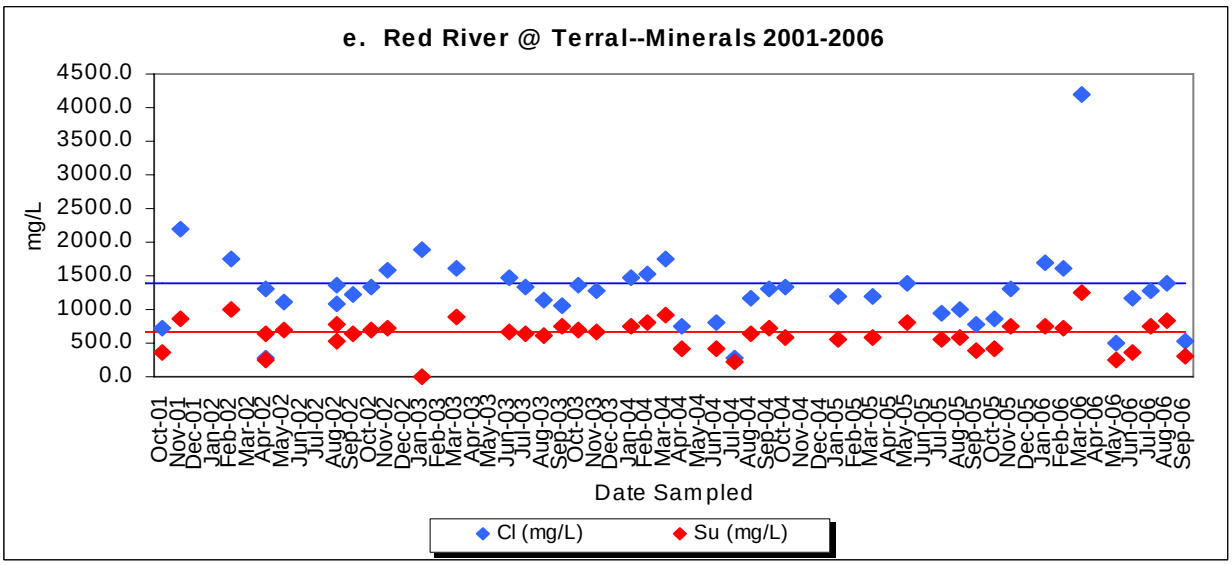
Figure 82 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Terral (AT315500), 2001-2006.

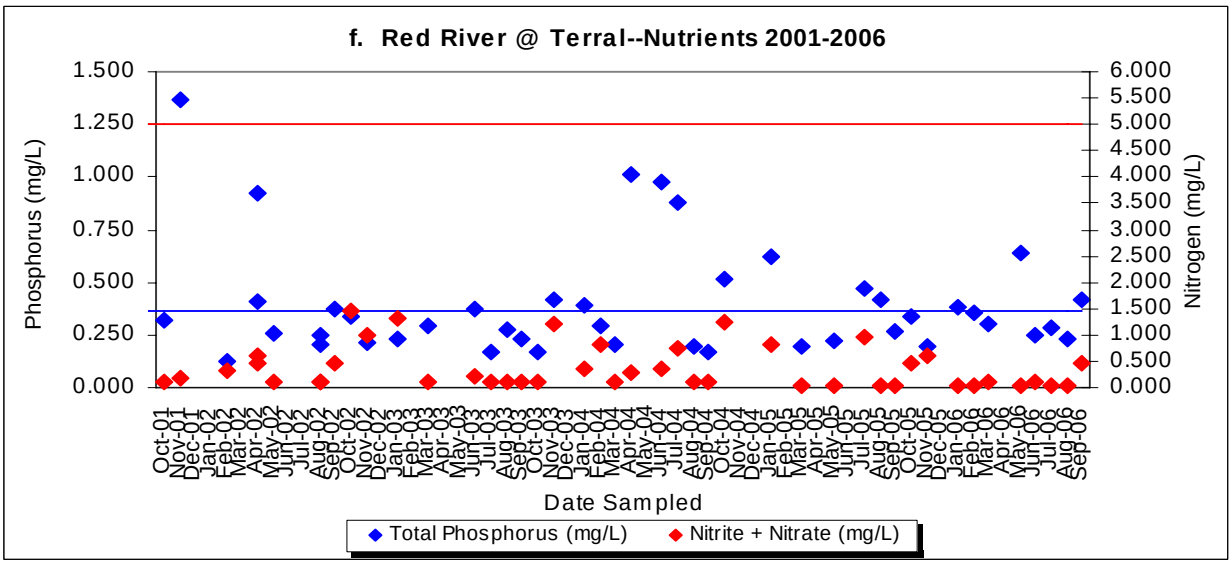







d. Red River @ Terral--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Red River @ Terral--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Red River @ Terral--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

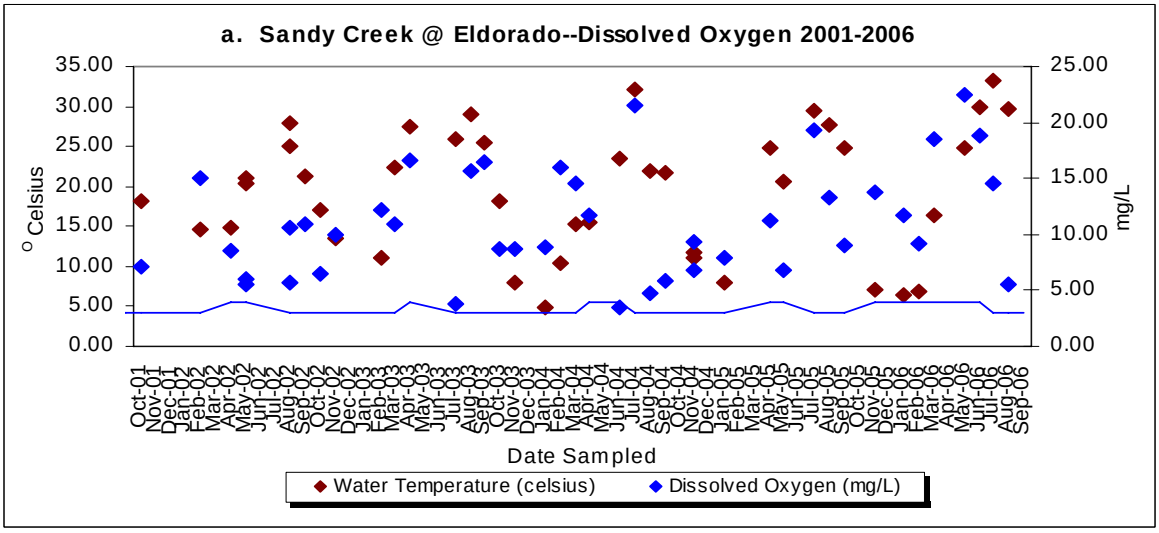
Sandy Creek near Eldorado

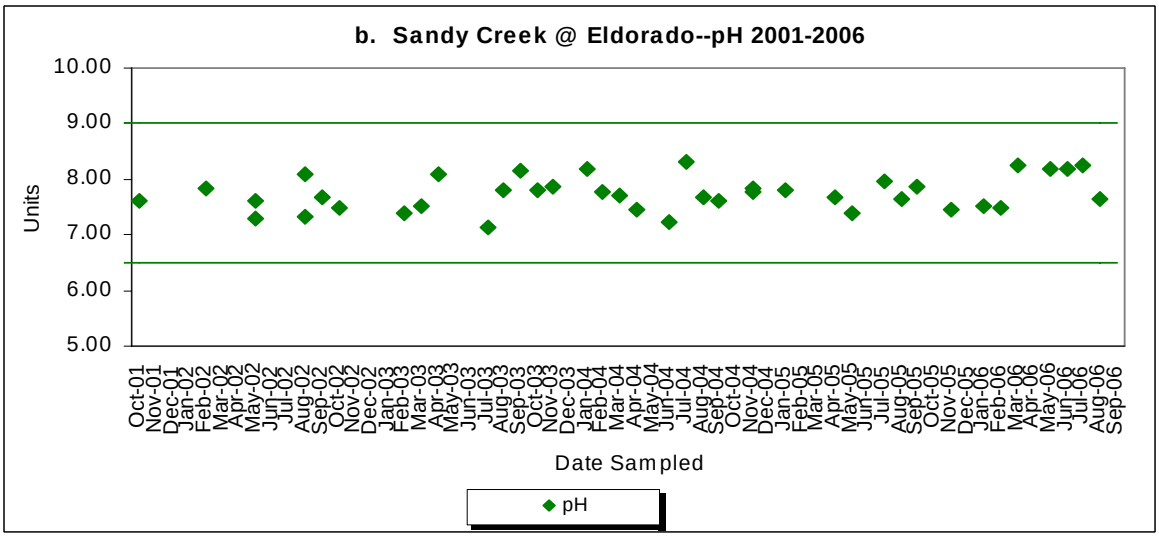
Station AT299710 (311600010040-001AT) is a permanent ambient trend monitoring station located on Sandy Creek. Situated in the southwestern portion of Jackson County, the site was established west of the town of Eldorado on State Highway 6. The station is positioned near the terminal end of stream segment 311600010040 and is classified within the Groesbeck Creek - Sandy Creek 8 digit HUC watershed (11130101). Water enters the stream system from several tributaries including Lebos Creek, among others.

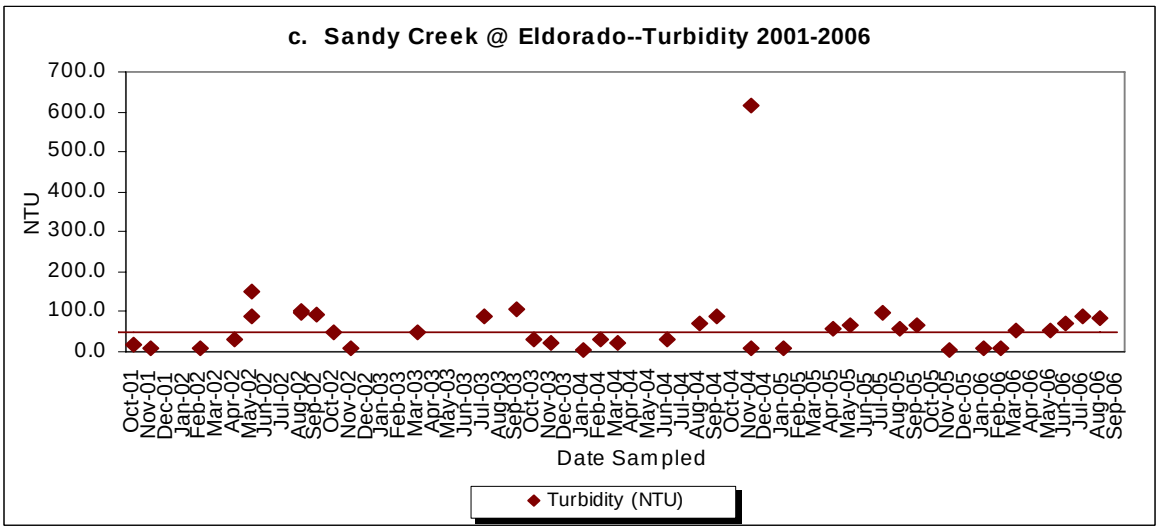
This station on Sandy Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Sandy Creek from the confluence of Lebos Creek (99.8453, 34.6414) downstream to confluence of Sandy Creek with the Red River (99.5800, 34.4166). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Emergency Water Supply (EWS), 2) Habitat Limited Aquatic Community—Fish and Wildlife Propagation (HLAC), 3) Agriculture—Class I Irrigation (AG), and 4) Secondary Body Contact—Recreation (SBCR).

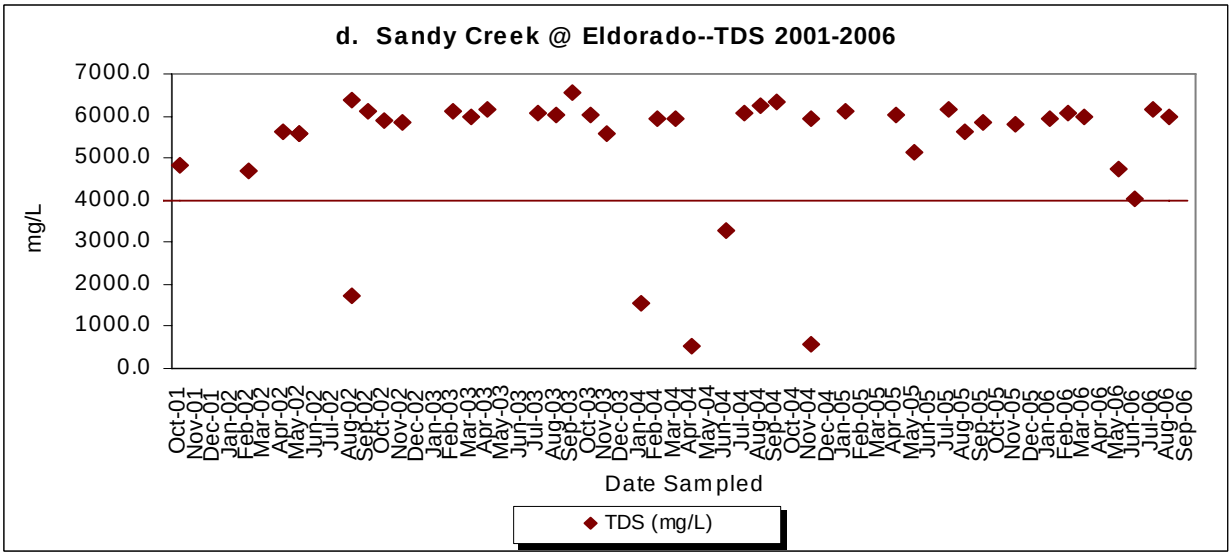
The HLAC beneficial use is not supported. Of the eleven (11) selenium samples collected, eight (8) of the concentrations (or 73%) exceeded the prescribed chronic criteria of 5 ug/L, and five (5) of the concentrations (or 45%) exceeded the prescribed acute criteria of 20 ug/L (Table 29). Of the thirty-nine (39) turbidity samples (Figure 83c), twenty (20) samples (or 51%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 83a) and pH (Figure 83b) samples met the criteria prescribed in the HLAC beneficial use. The AG beneficial use is not supported (Figure 83d and e). Of the forty-two (42) total dissolved solids concentrations, thirty-seven (37) samples (or 88%) exceeded the sample standard of 3969.0 mg/L, and the geometric mean (4913.8 mg/L) exceeded the yearly mean standard of 3331 mg/L. Of the forty-five (45) chloride concentrations, forty-three (43) samples (or 96%) exceeded the sample standard of 910.0 mg/L, and the geometric mean (1538.7 mg/L) exceeded the yearly mean standard of 668 mg/L. Of the forty-four (44) sulfate concentrations, fourteen (14) samples (or 32%) exceeded the sample standard of 1935.0 mg/L, and the geometric mean (1614.4 mg/L) exceeded the yearly mean standard of 1586 mg/L. This segment of Sandy Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 83f).

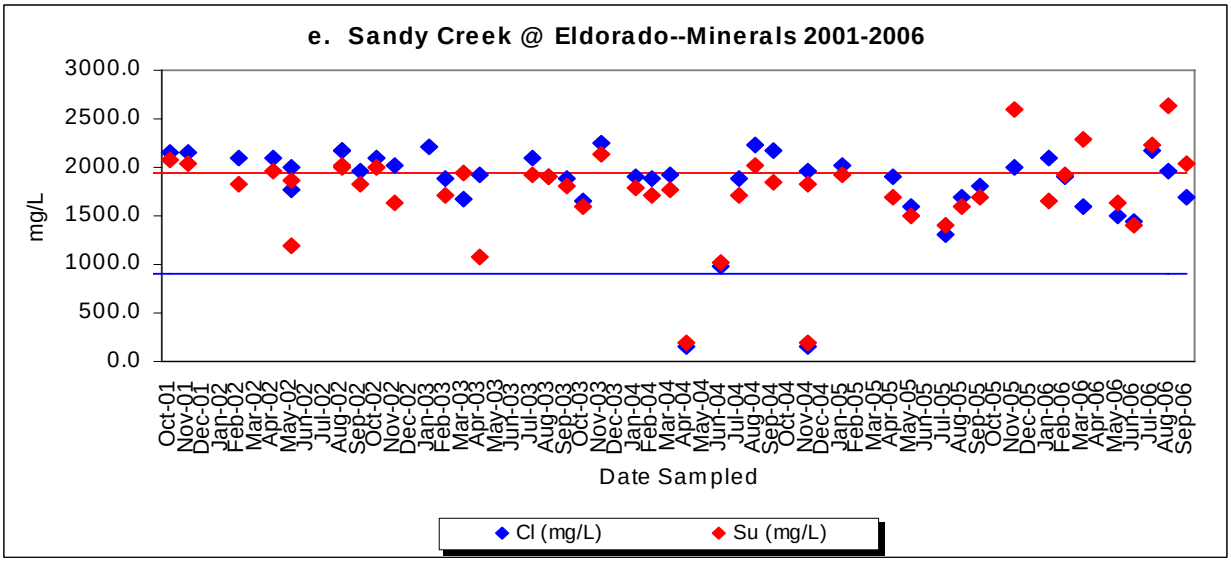
Figure 83 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Sandy Creek at Eldorado (AT299710), 2001-2006.

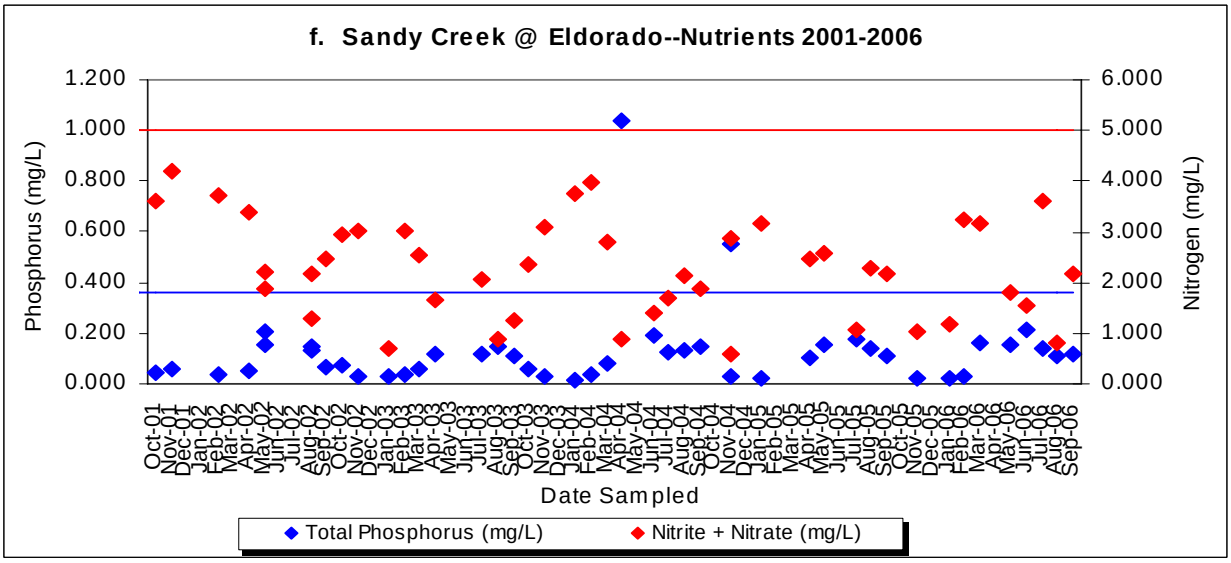







d. Sandy Creek @ Eldorado--TDS 2001-2006
mg/L
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
Date Sampled
TDS (mg/L)


e. Sandy Creek @ Eldorado--Minerals 2001-2006
mg/L
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Sandy Creek @ Eldorado--Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

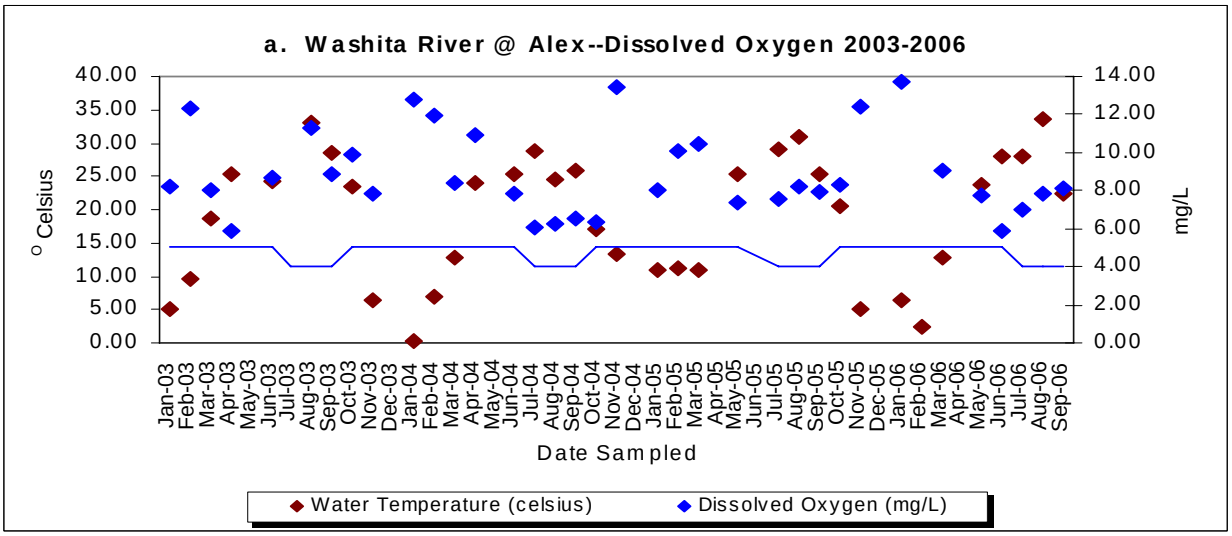
Washita River near Alex

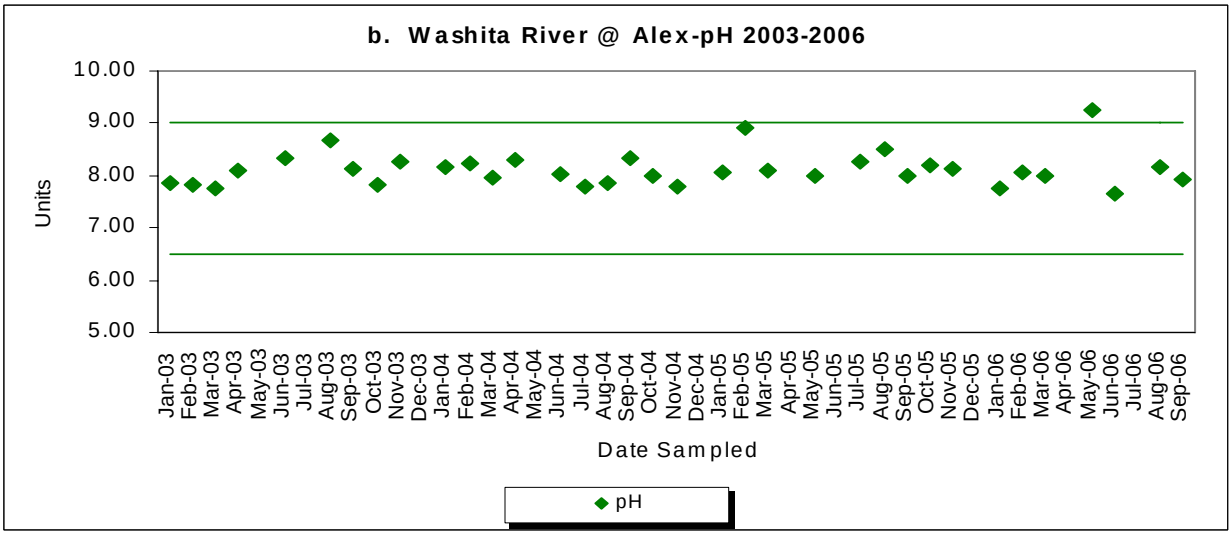
Station AT328100 (310810020010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the east central portion of Grady County, the site was established north of the city of Alex off of State Highway 19. The station is positioned near the upper end of stream segment 310810020010 and is classified within the Middle Washita River 8 digit HUC watershed (11130303). Water enters the stream system from Public Service Lake 3 and from several tributaries including Dry Creek, Winter Creek, Roaring Creek, Laflin Creek, Colbert Creek, and Criner Creek among others.

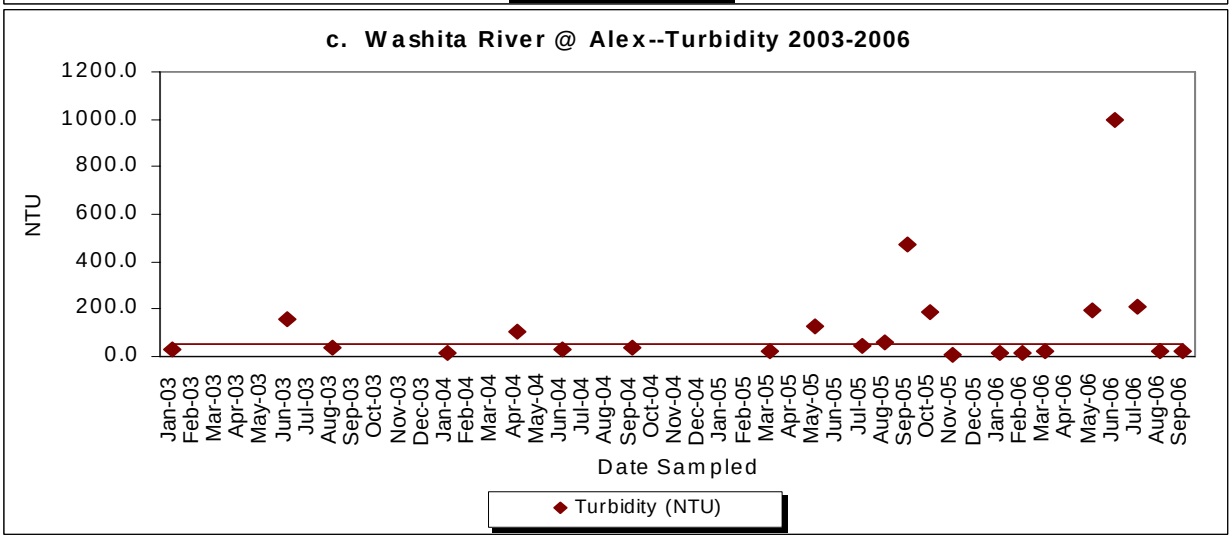
This station on the Washita River has been active for all water quality variables since January of 2003. The following assessment of beneficial uses is based on data collected from January of 2003 through September of 2006. For purposes of reporting, this station is representative of the Washita River from the confluence of Dry Creek (97.7927, 34.9614) downstream to confluence of Beef Creek with the Washita River (97.3902, 34.8169). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

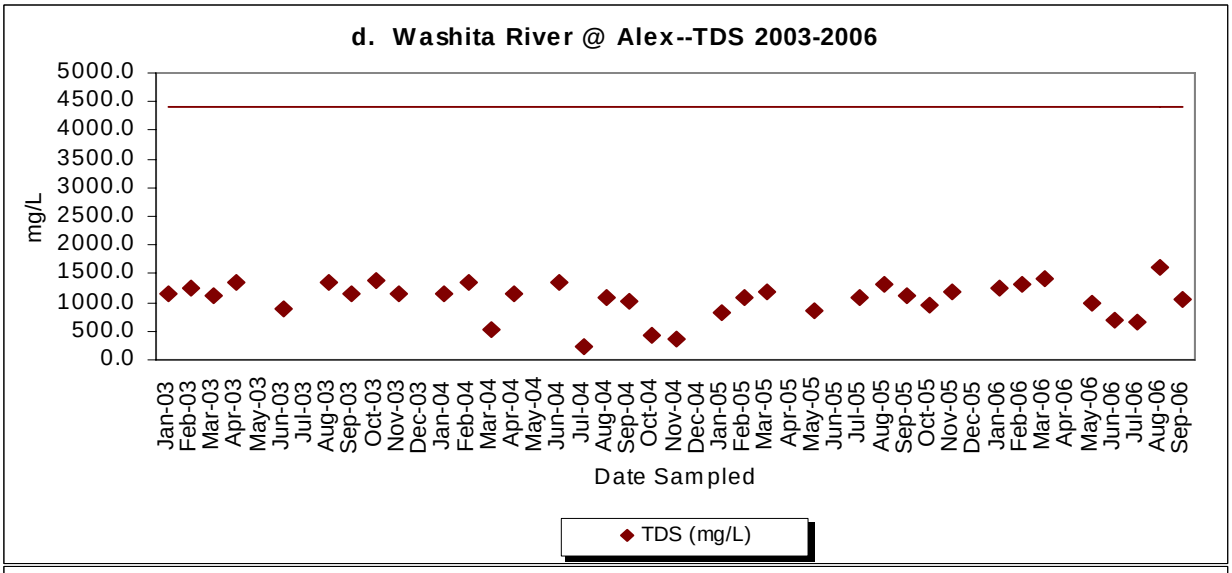
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-two (22) turbidity samples (Figure 84c), nine (9) samples (or 41%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 84a), pH (Figure 84b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides and sulfates (Figure 84d and e). The PBCR beneficial use is not supported (Table 30). Of the ten (10) fecal coliform concentrations, six (6) samples (or 60%) exceeded the prescribed screening level of 400 cfu/mL and the geometric mean (570.4 mg/L) exceeded the prescribed mean standard of 400 mg/L. Of the 10 enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (493.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Washita River is nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 84f). However, the mean sestonic chlorophyll-a concentration (35.1 mg/M^3) produced a TSI of 66, which is above the threshold TSI of 62.

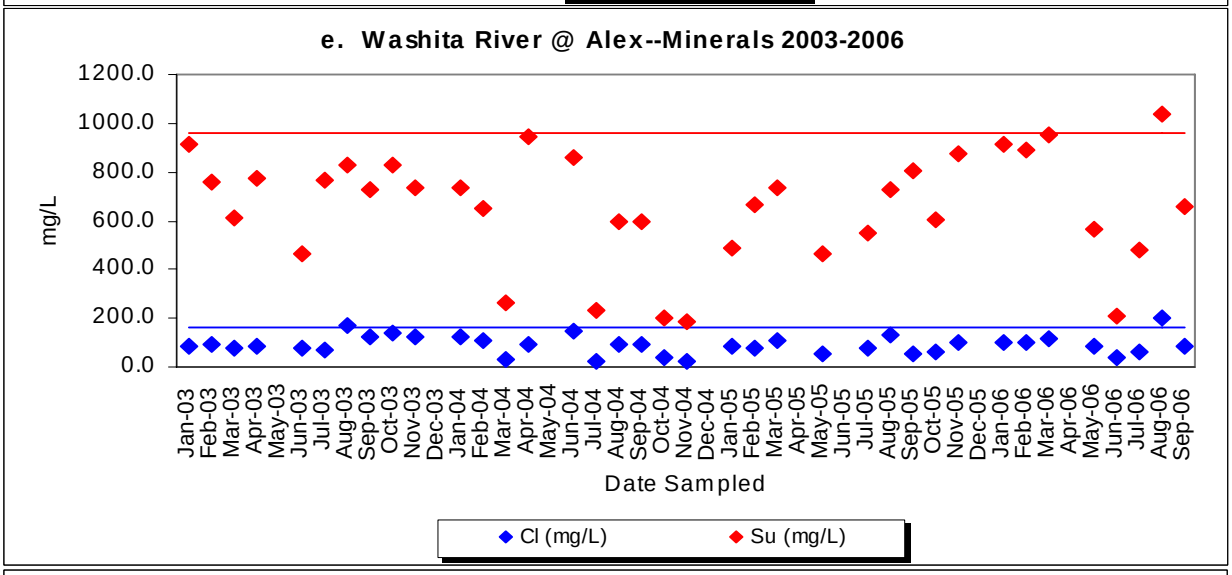
Figure 84 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Alex (AT328100), 2003-2006.

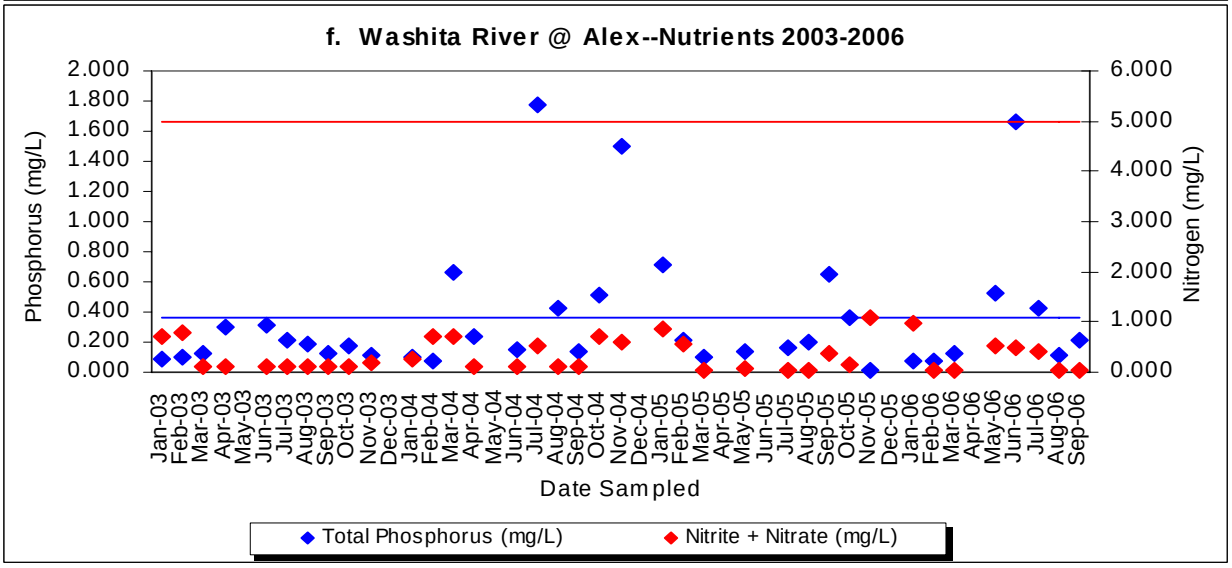







d. Washita River @ Alex--TDS 2003-2006
mg/L
5000.0
4500.0
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
TDS (mg/L)


e. Washita River @ Alex--Minerals 2003-2006
mg/L
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ Alex--Nutrients 2003-2006
Phosphorus (mg/L)
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

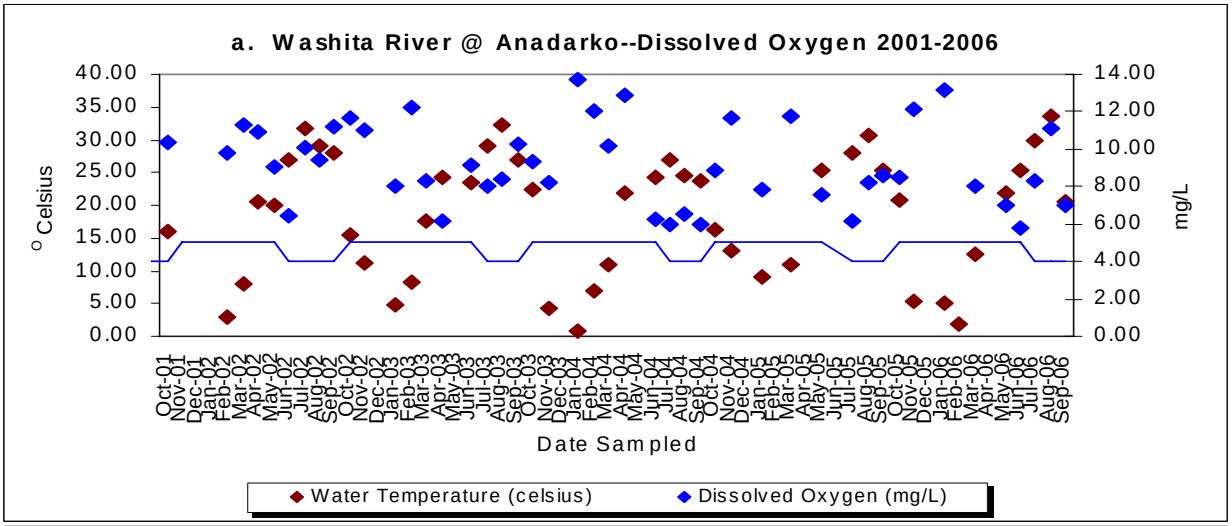
Washita River near Anadarko

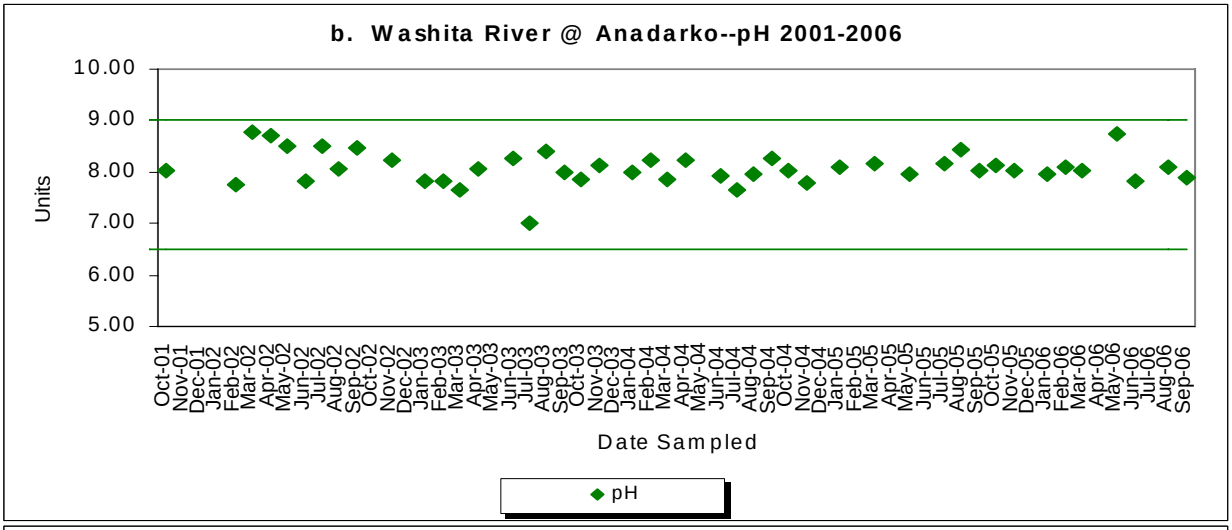
Station AT326500 (310830010010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the east central portion of Caddo County, the site was established south of the city of Anadarko on US Highway 281. The station is positioned between the midpoint and the lower end of stream segment 310830010010 and is classified within the Upper Washita River 8 digit HUC watershed (11130302). Water enters the stream system from Public Service Lake 3 and from several tributaries including Spring Creek, Cobb Creek (Fort Cobb Reservoir), Sugar Creek, Delaware Creek, and Spring Creek (Lake Chickasha), among others.

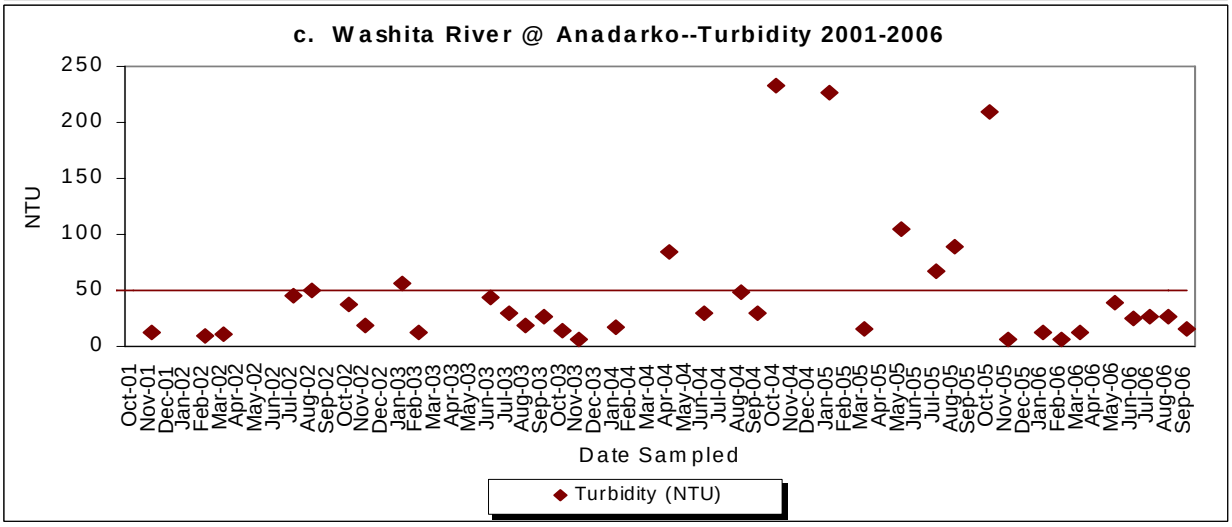
This station on the Washita River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2000 through September of 2006. For purposes of reporting, this station is representative of the Washita River from the confluence of Cobb Creek (98.4279, 35.0906) downstream to confluence of Spring Creek with the Washita River (98.1065, 35.1017). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

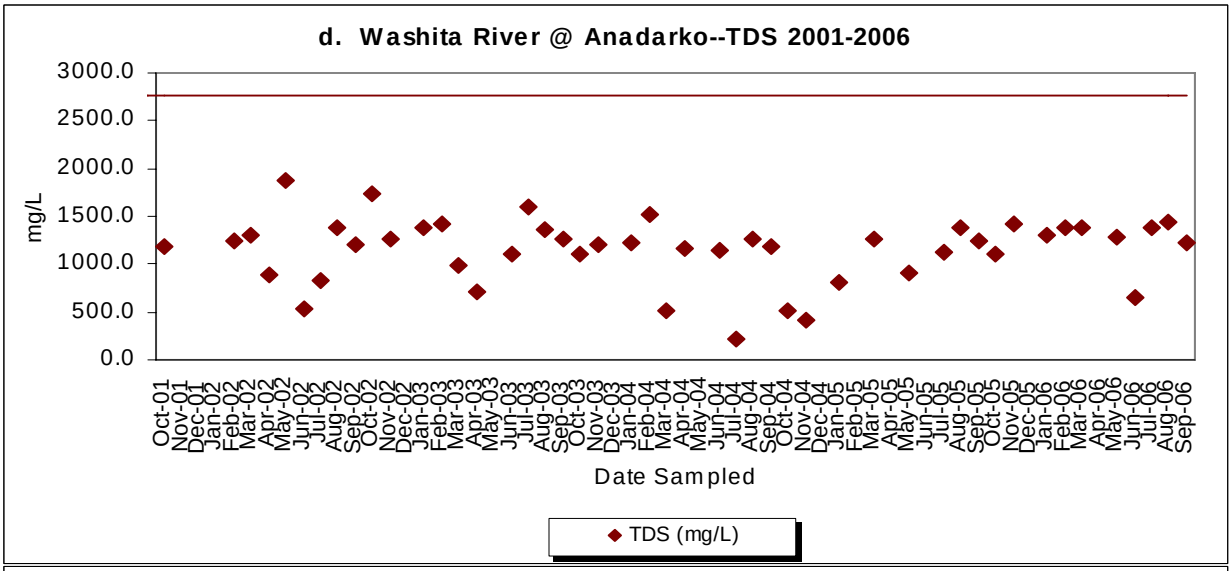
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-six (36) turbidity samples (Figure 85c), eight (8) samples (or 22%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 85a), pH (Figure 85b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2004 indicate that the segment is not supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 5 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 16. This is below the assigned non-supporting threshold of 18 for Central Great Plains warm water aquatic communities [OAC 46:15-5(m)]. The AG beneficial use is supported for total dissolved solids, chloride, and sulfate samples (Figure 85d and e). The PBCR beneficial use is not supported (Table 30). Of the nineteen (19) fecal coliform concentrations, seven (7) samples (or 37%) exceeded the prescribed screening level of 400 cfu/mL. Of the 19 enterococci concentrations, ten (10) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (364.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Washita River is nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 85f). However, the mean sestonic chlorophyll-a concentration (25.5 mg/M^3) produced a TSI of 62, which is above the allowable threshold.

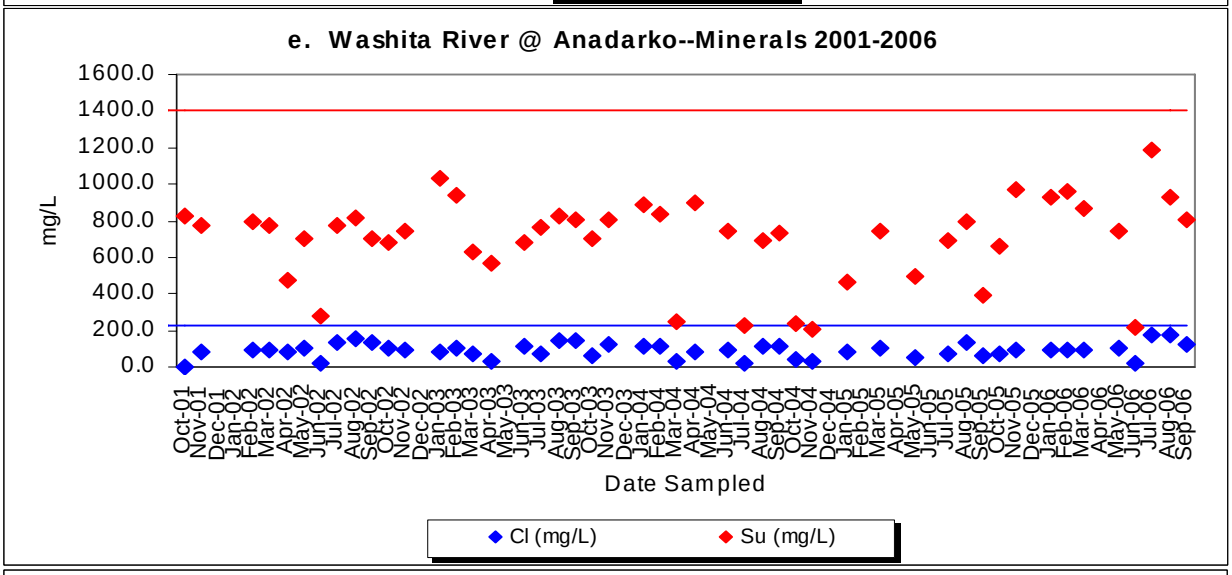
Figure 85 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Anadarko (AT326500), 2001-2006.

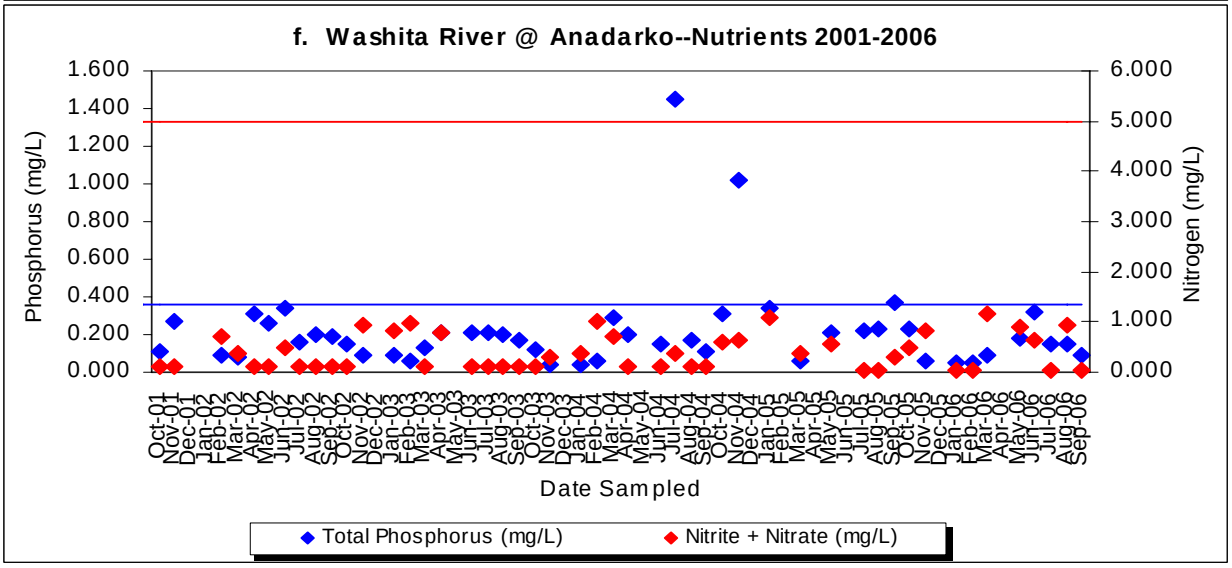







d. Washita River @ Anadarko--TDS 2001-2006
mg/L
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
TDS (mg/L)


e. Washita River @ Anadarko--Minerals 2001-2006
mg/L
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ Anadarko--Nutrients 2001-2006
Phosphorus (mg/L)
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

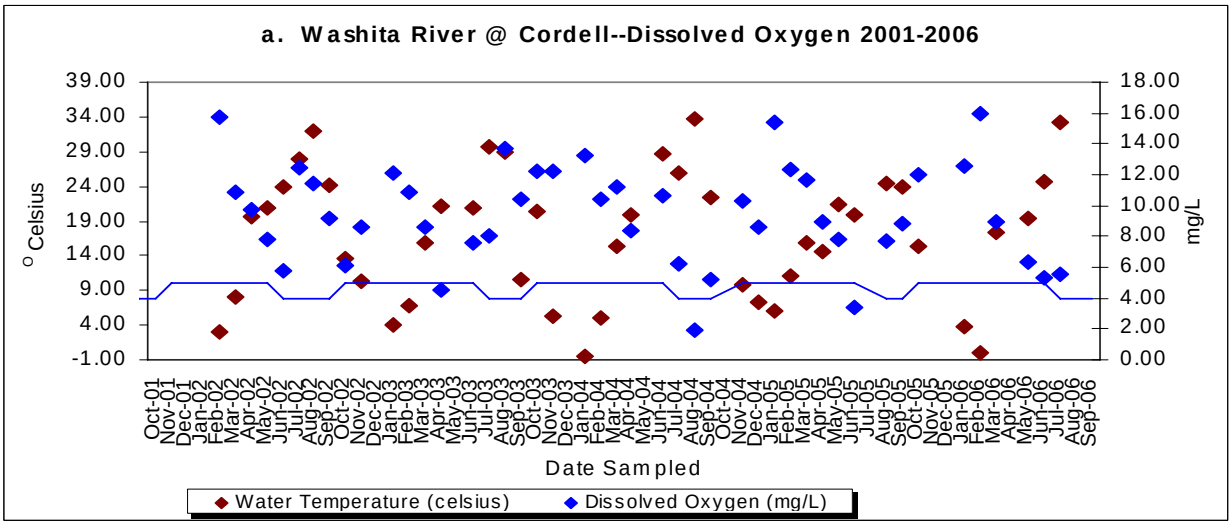
Washita River near Cordell

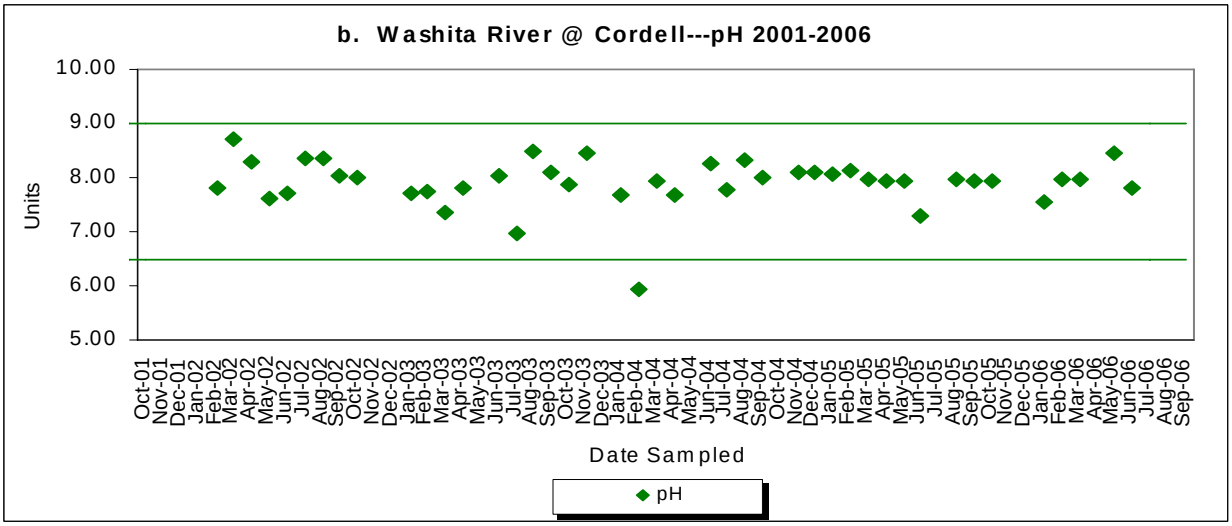
Station AT325300 (310830030010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the east central portion of Washita County, the site was established east of the city of Cordell on State Highway 152. The station is positioned between the midpoint and the lower end of stream segment 310830030010 and is classified within the Upper Washita River 8 digit HUC watershed (11130302). Water enters the stream system from several tributaries including Barnitz Creek, Beaver Creek, Boggy Creek, Cavalry Creek, and Two Baby Creek, among others.

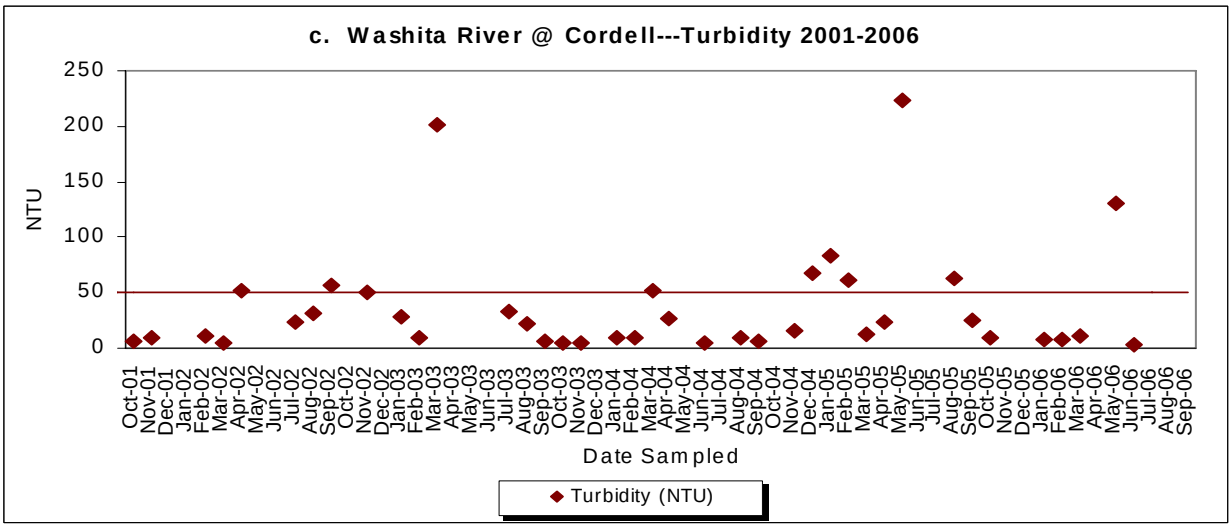
This station on the Washita River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Washita River from the confluence of Barnitz Creek (99.0098, 35.5336) downstream to confluence of Two Baby Creek with the Washita River (98.8382, 35.2761). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

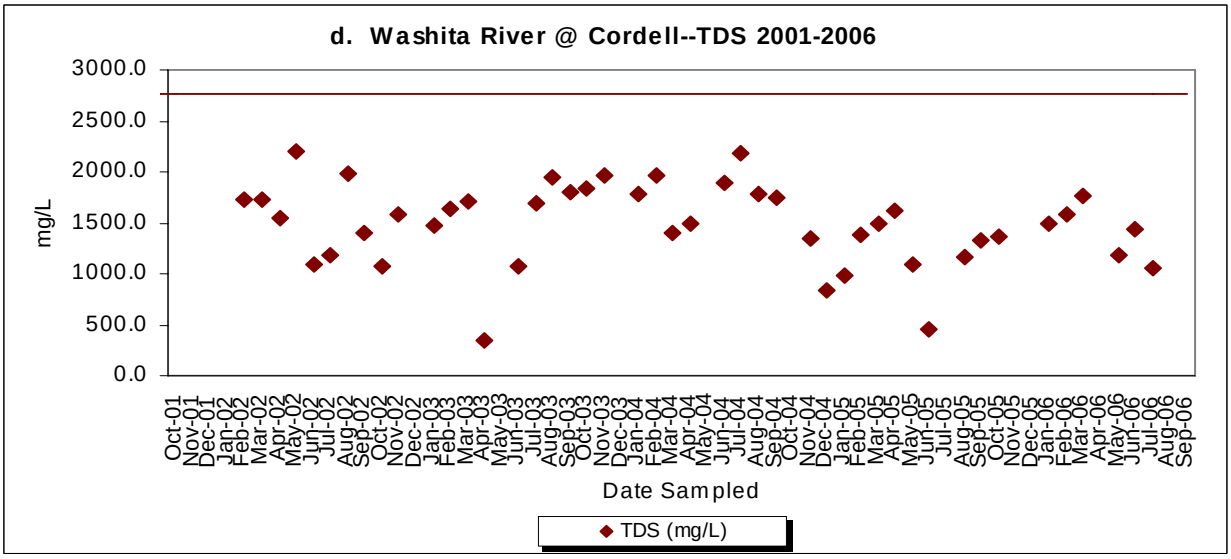
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-nine (39) turbidity samples (Figure 86c), eleven (11) samples (or 28%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen ((Figure 86a), pH ((Figure 86b), and toxicant data collected during the same period met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates ((Figure 86d and e). The PBCR beneficial use is not supported (Table 30). Of the twenty-eight (28) fecal coliform concentrations, 11 samples (or 39%) exceeded the prescribed screening level of 400 cfu/mL, and the geometric mean (417.8 cfu/mL) exceeded the prescribed mean standard of 400 cfu/mL. Of the thirty (30) enterococci concentrations, twelve (12) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (251.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the twenty-nine (29) *E. coli* concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (152.0 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Washita River is nutrient-threatened. The mean sestonic chlorophyll-a concentration (26.1 mg/M^3) produced a TSI of 63, which is above the threshold TSI of 62. However, the total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively ((Figure 86f).

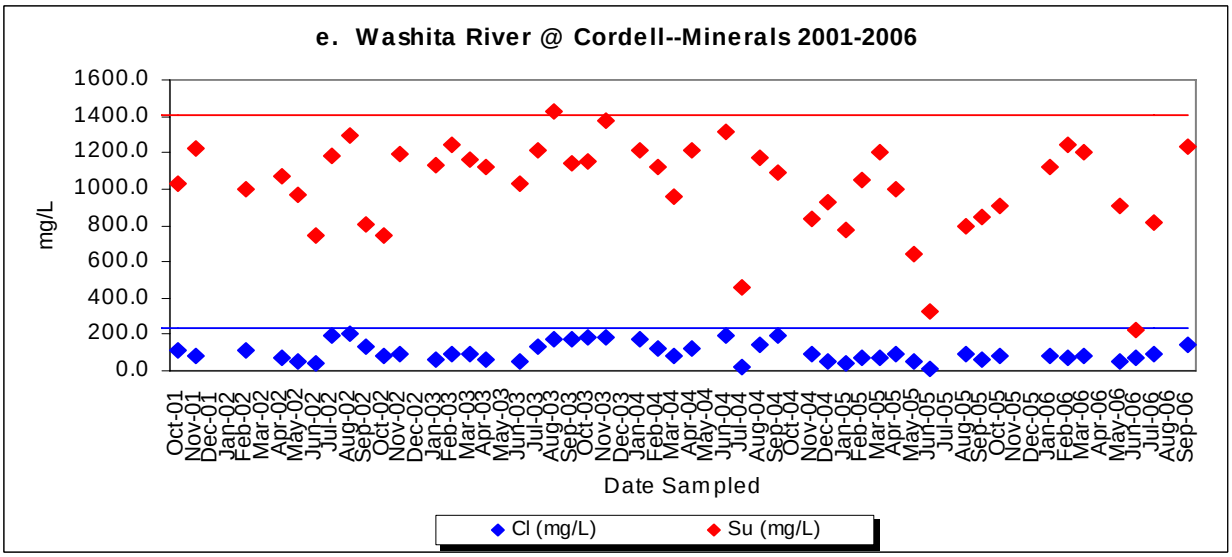
Figure 86 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Cordell (AT325300), 2001-2006.

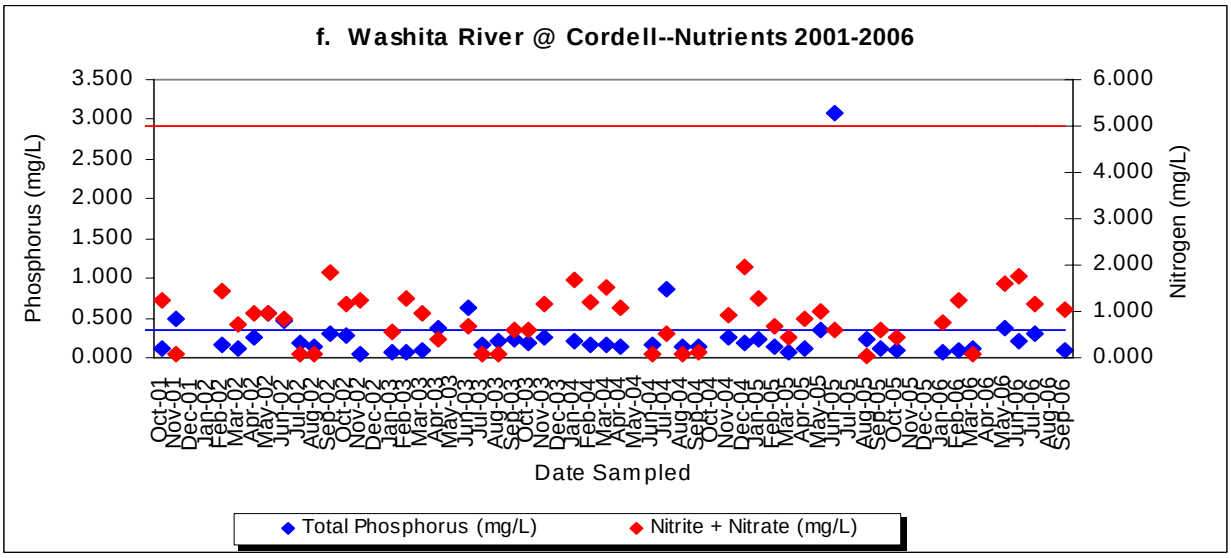







d. Washita River @ Cordell--TDS 2001-2006
mg/L
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Date Sampled
TDS (mg/L)


e. Washita River @ Cordell--Minerals 2001-2006
mg/L
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ Cordell--Nutrients 2001-2006
Phosphorus (mg/L)
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

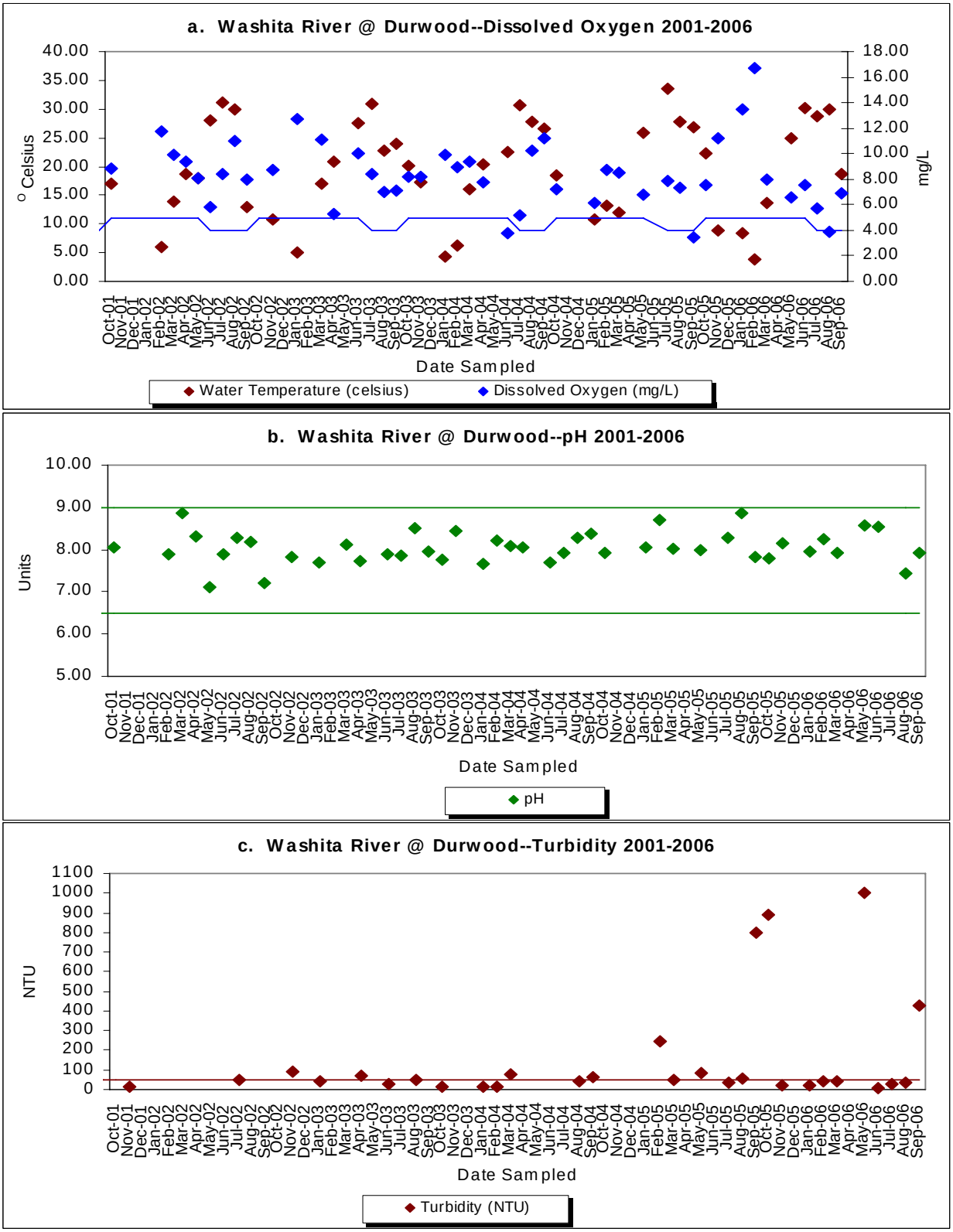
Washita River near Durwood

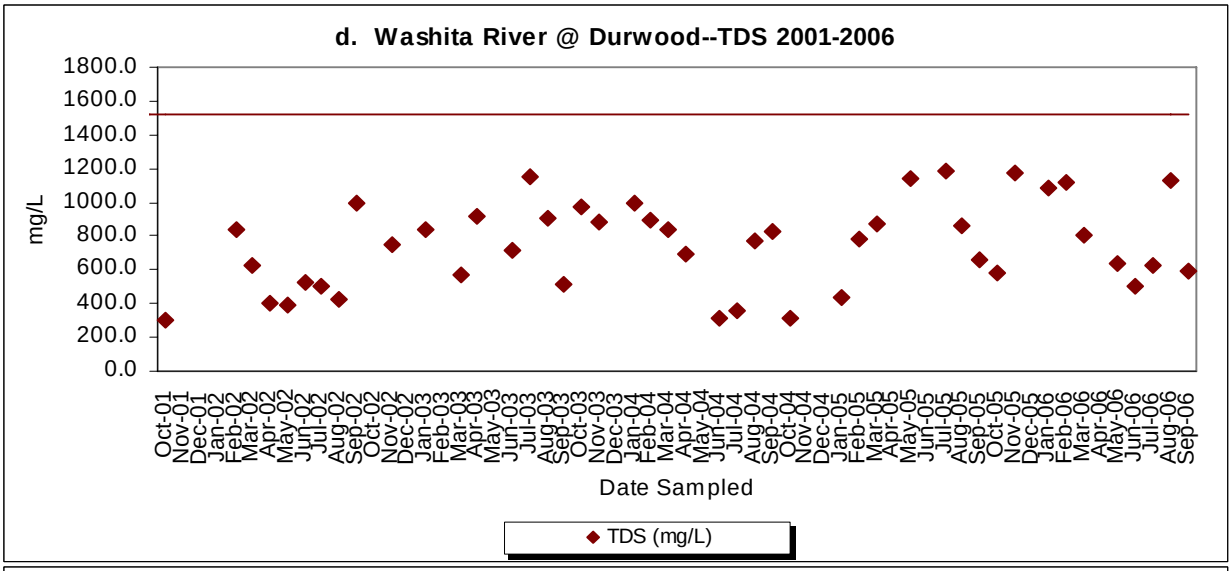
Station AT331000 (310800020010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the east central portion of Carter County, the site was established north of the town of Durwood on US Highway 177. The station is positioned near the terminal end of stream segment 310800020010 and is classified within the Middle Washita River 8 digit HUC watershed (11130303). Water enters the stream system from several tributaries including Rock Creek (Arbuckle Reservoir), Caddo Creek (Lake Jean Neustadt, Rock Creek Reservoir, Lake Ardmore, and the Ardmore City Lake), Oil Creek, Mill Creek, and Pennington Creek, among others.

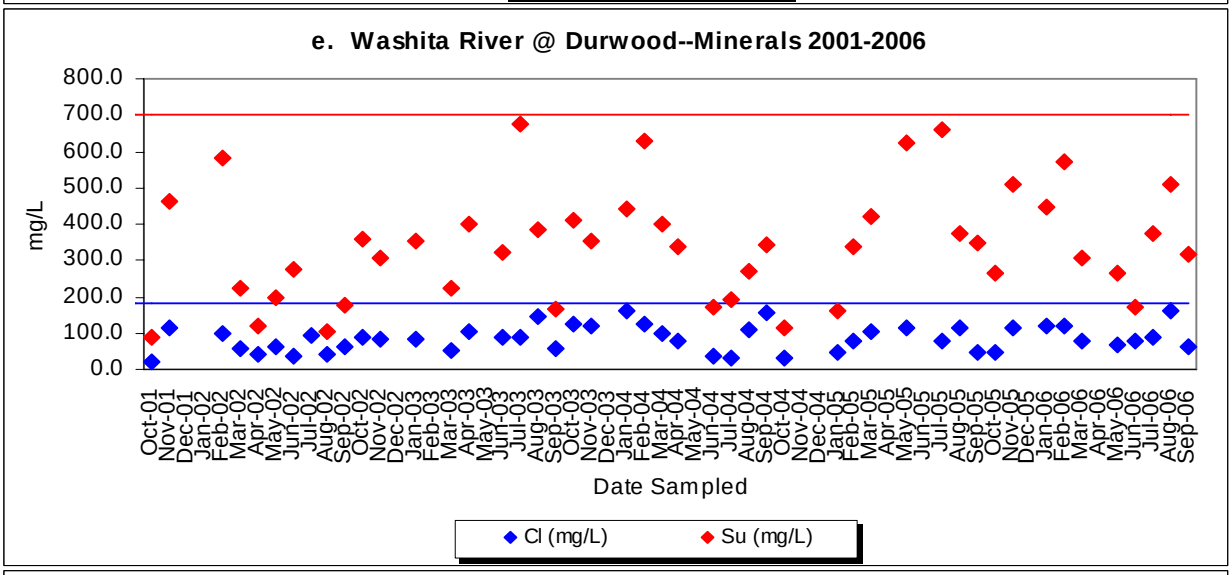
This station on the Washita River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2000 through September of 2006. For purposes of reporting, this station is representative of the Washita River from the confluence of Rock Creek (97.0411, 34.3847) downstream to confluence of Oil Creek with the Washita River (96.8850, 34.2442). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

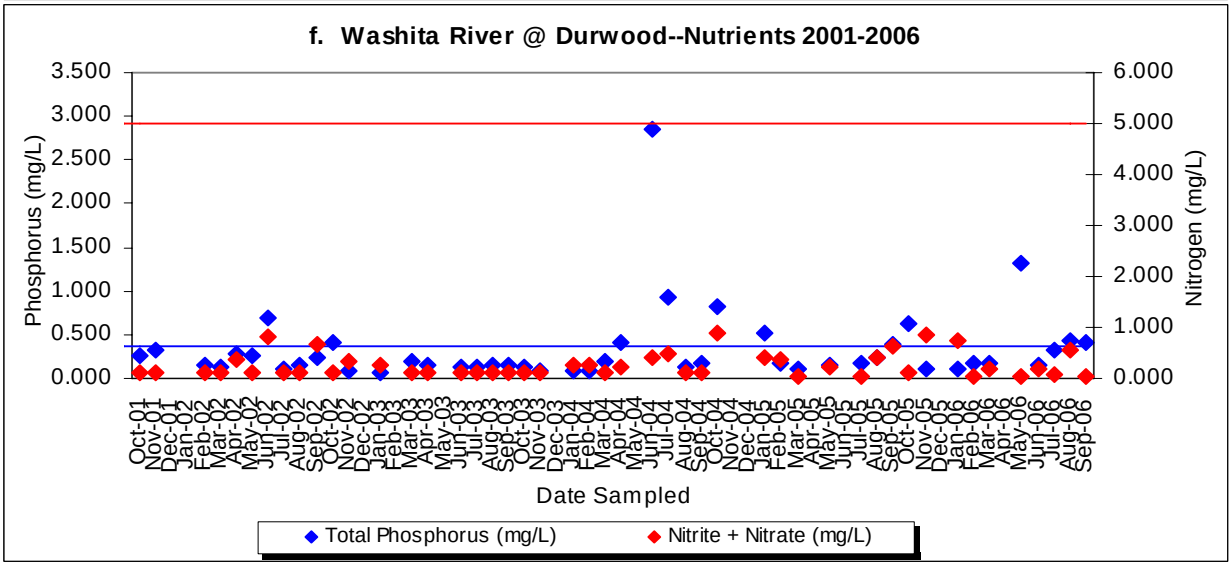
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-nine (29) turbidity samples (Figure 87c), twelve (12) samples (or 41%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 87a), pH (Figure 87b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 87d and e). The PBCR beneficial use is not supported (Table 30). Of the seventeen (17) fecal coliform concentrations, eight (8) samples (or 47%) exceeded the prescribed screening level of 400 cfu/mL. Of the 17 enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (130.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Washita River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 87f). Furthermore, the mean sestonic chlorophyll-a concentration (23.0 mg/M^3) produced a TSI of 61, which is below the threshold TSI of 62.

Figure 87 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Durwood (AT331000), 2001-2006.




d. Washita River @ Durwood--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Washita River @ Durwood--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ Durwood--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

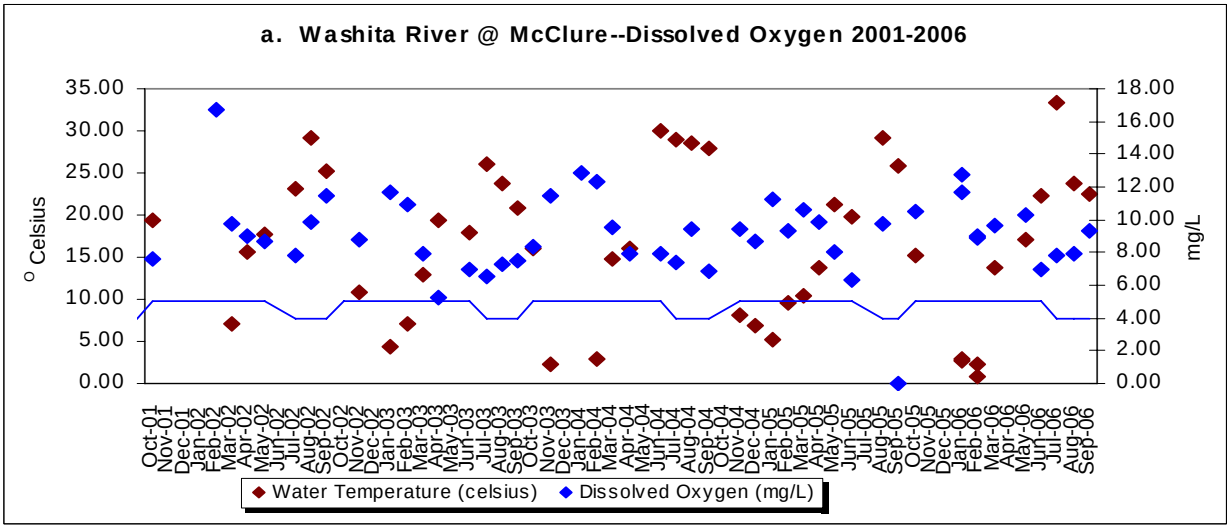
Washita River near McClure

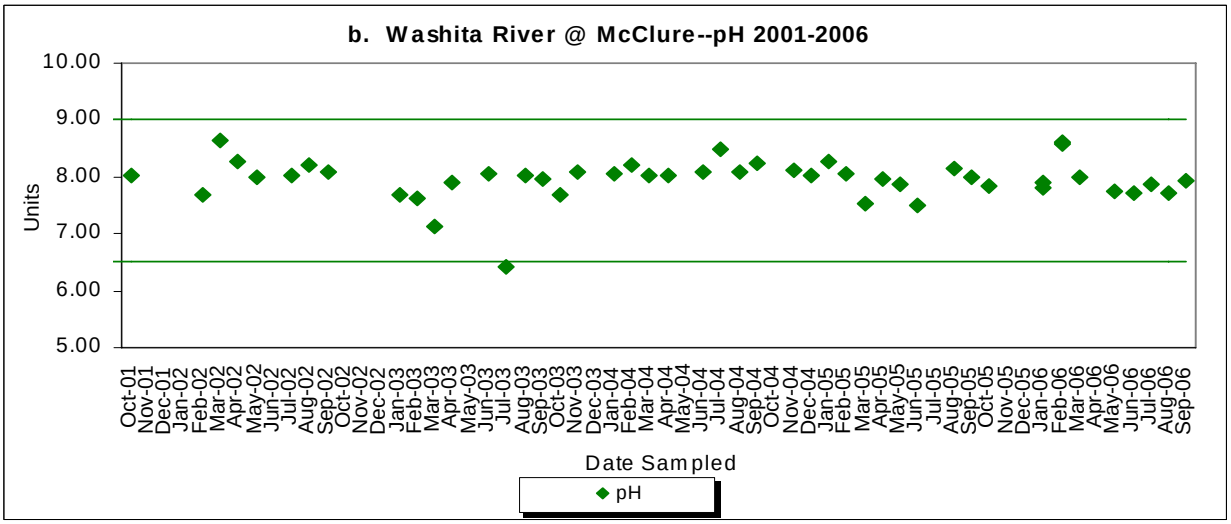
Station AT324200 (310840010010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the west central portion of Custer County, the site was established east of the town of Hammon on State Highway 33. The station is positioned near the midpoint of stream segment 310840010010 and is classified within the Washita Headwaters 8 digit HUC watershed (11130301). Water enters the stream system from several tributaries including Sandstone Creek, White Shield Creek, and Quartermaster Creek, among others.

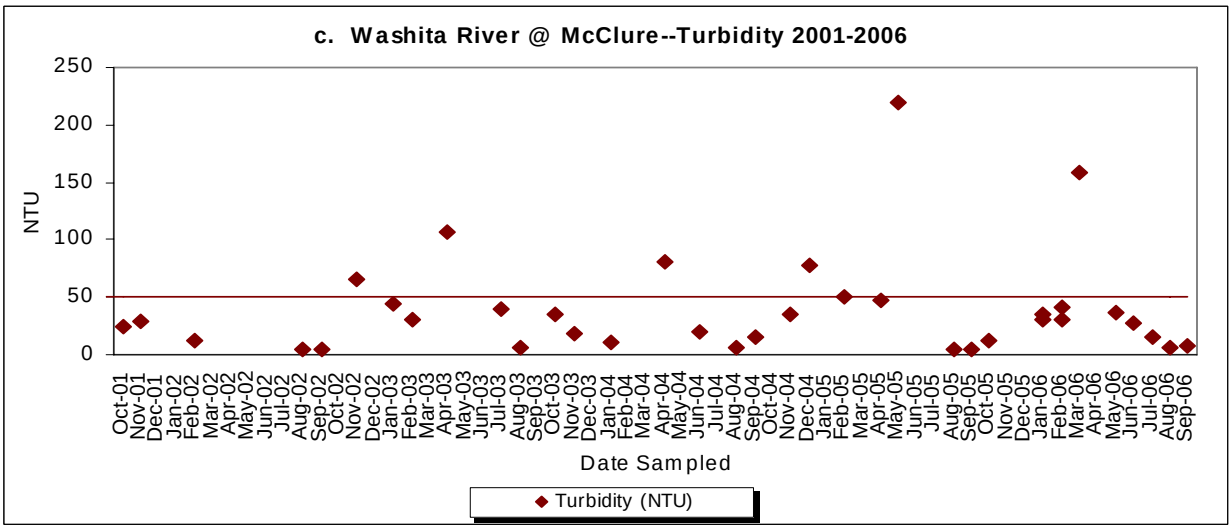
A station on the Washita River has been active for all water quality variables since November of 1998. The original station west of Hammon was deactivated in the winter of 2006. The new site near McClure was established as part of intensive survey of the upper Washita River. When data from the two stations were found to be comparable, the McClure station became the representative BUMP station because of the presence of a long-term data collection platform that accommodates stream gaging needs for the Washita above Foss Reservoir. The data from the two sites will be combined, and data from the original Hammon site will continue to be used in the assessment of the Washita River. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Washita River from the confluence of Sandstone Creek (99.5017, 35.6007) downstream to confluence of the Washita River with Foss Lake (99.3057, 35.6566). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

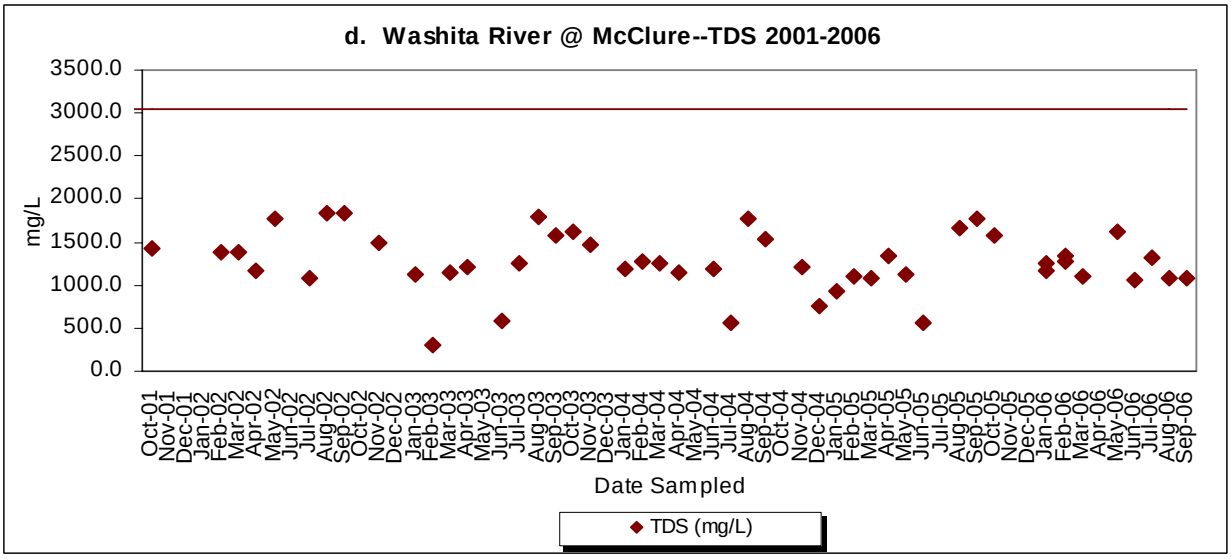
The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the thirty-six (36) turbidity samples (Figure 88c), seven (7) samples (or 19%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 88a), pH (Figure 88b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish were collected during the summer of 2005. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 6 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 17. However, because biocriteria have not been developed for the Southwest Tablelands ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 88d and e). The PBCR beneficial use is not supported (Table 30). Of the twenty-nine (29) fecal coliform concentrations, fifteen (15) samples (or 52%) exceeded the prescribed screening level of 400 cfu/mL. Of the twenty-eight (28) enterococci concentrations, sixteen (16) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (501.9 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 29 *E. coli* concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (434.9 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of the Washita River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 88f). Furthermore, the mean sestonic chlorophyll-a concentration (12.8 mg/M^3) produced a TSI of 56, which is below the threshold TSI of 62.

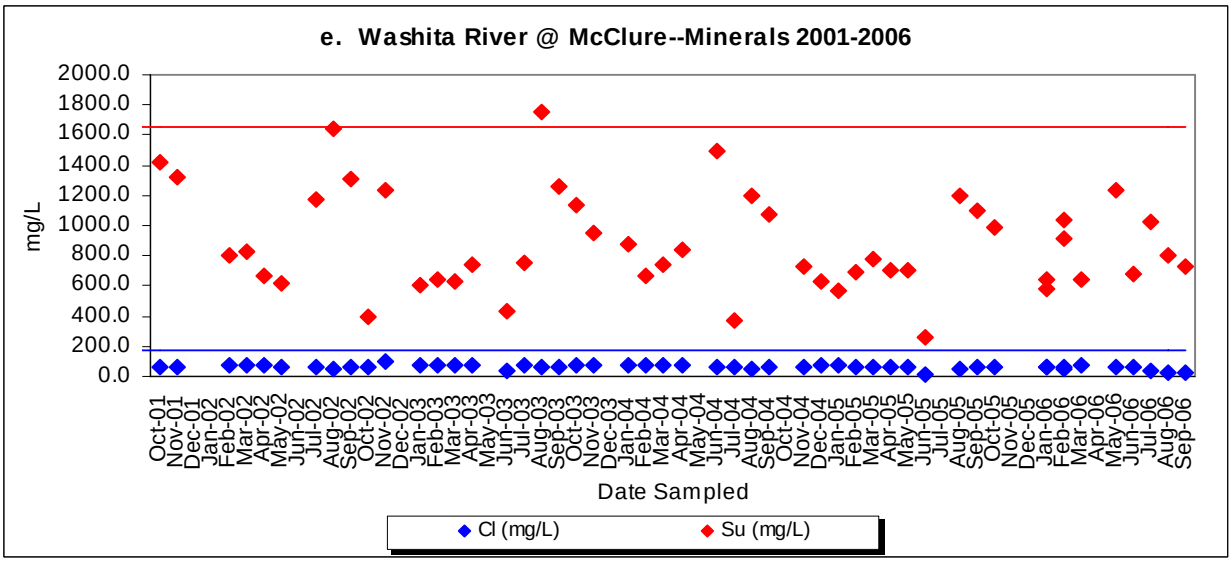
Figure 88 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at McClure (AT324200), 2001-2006.

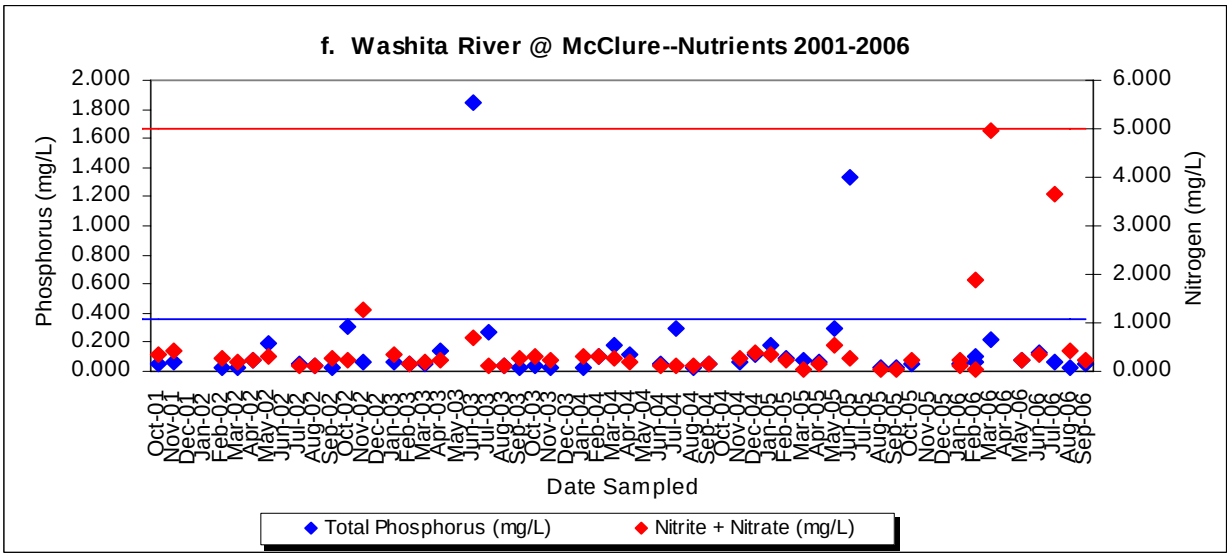







d. Washita River @ McClure--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Washita River @ McClure--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ McClure--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

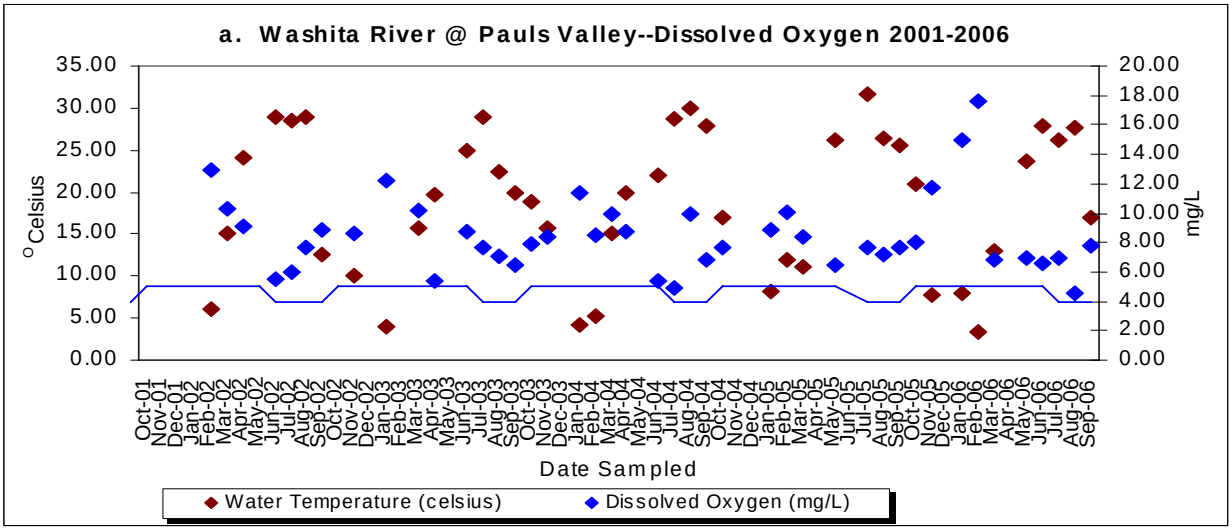
Washita River near Pauls Valley

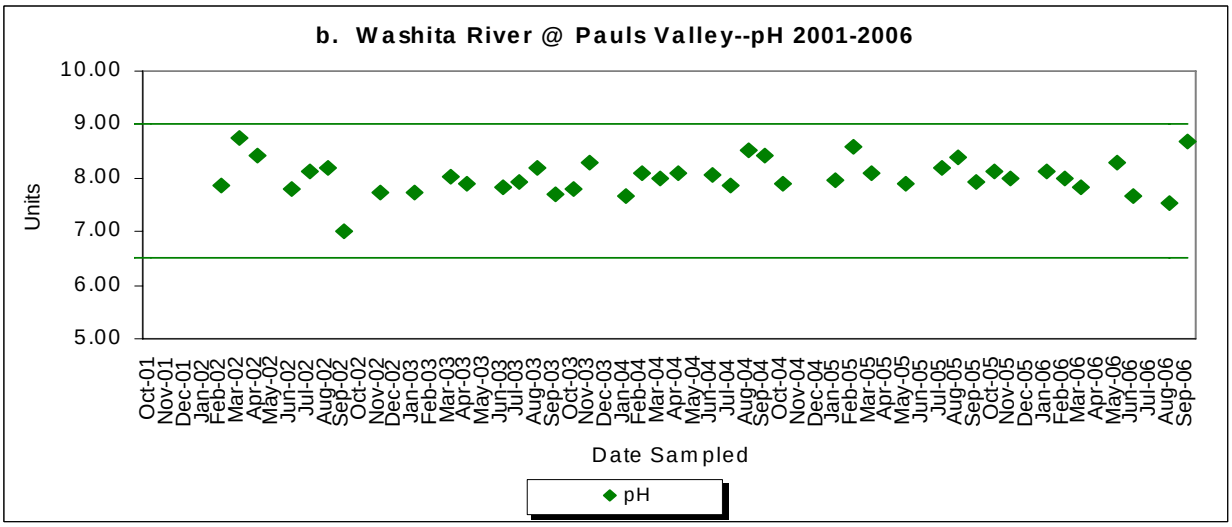
Station AT328500 (310810010010-001AT) is a permanent ambient trend monitoring station located on the Washita River in Oklahoma. Situated in the north central portion of Garvin county, the site was established northeast of the city of Pauls Valley on State Highway 19. The station is positioned near the midpoint of stream segment 310810010010 and is classified within the Middle Washita River 8 digit HUC watershed (11130303). Water enters the stream system from Wiley Post Memorial Lake and from several tributaries including Beef Creek, Owl Creek, Washington Creek (Pauls Valley Lake), Peavine Creek, Cherokee Sandy Creek (R. C. Longmire Lake), and Wildhorse Creek, among others.

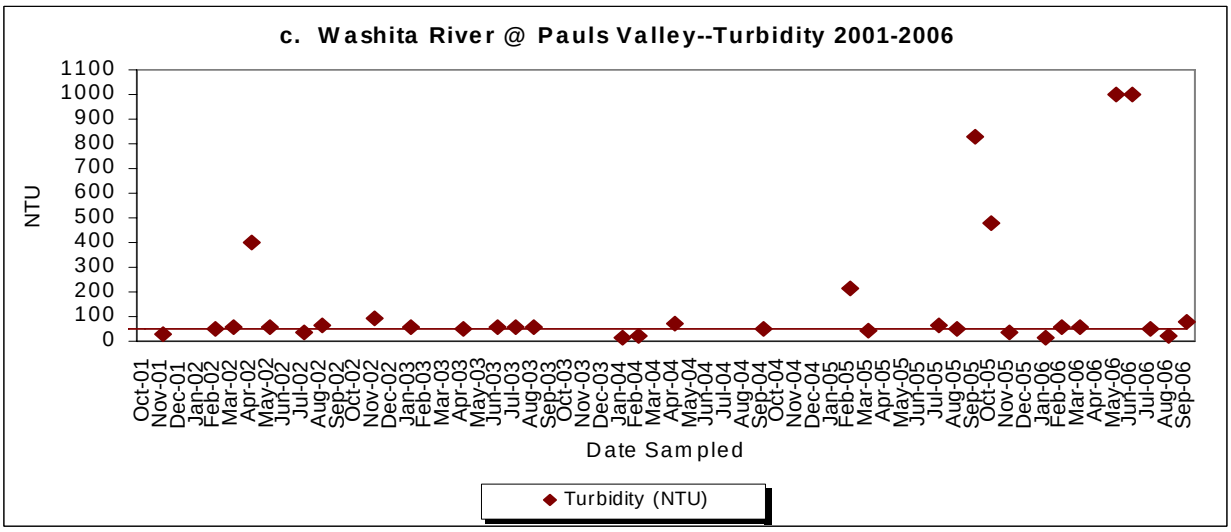
This station on the Washita River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2000 through September of 2005. For purposes of reporting, this station is representative of the Washita River from the confluence of Beef Creek (97.3902, 34.8169) downstream to confluence of Wildhorse Creek with the Washita River (97.1650, 34.5321). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

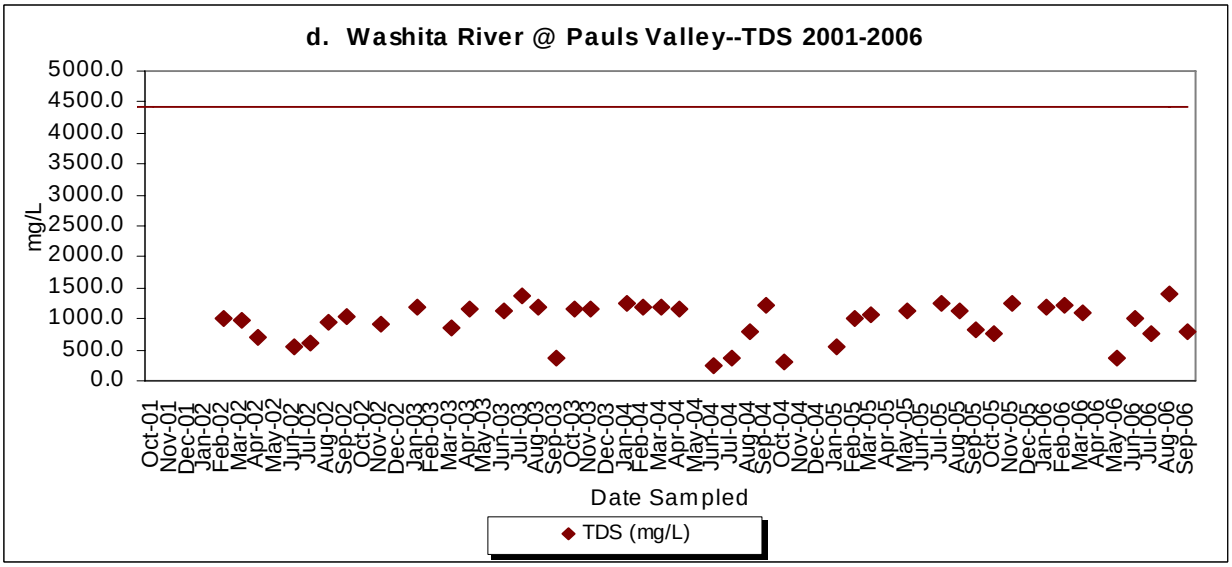
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-eight (28) turbidity samples (Figure 89c), eighteen (18) samples (or 64%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 89a), pH (Figure 89b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 89d and e). The PBCR beneficial use is not supported (Table 30). Of the fifteen (15) enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (191.2 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Washita River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 89f).

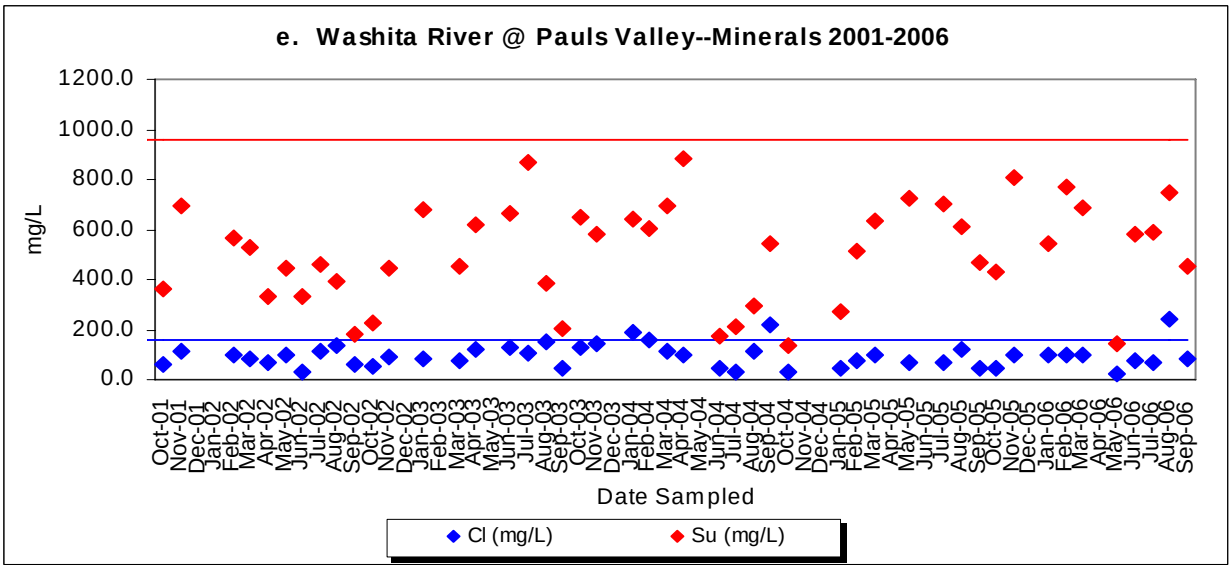
Figure 89 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Washita River at Paul's Valley (AT328500), 2001-2006.

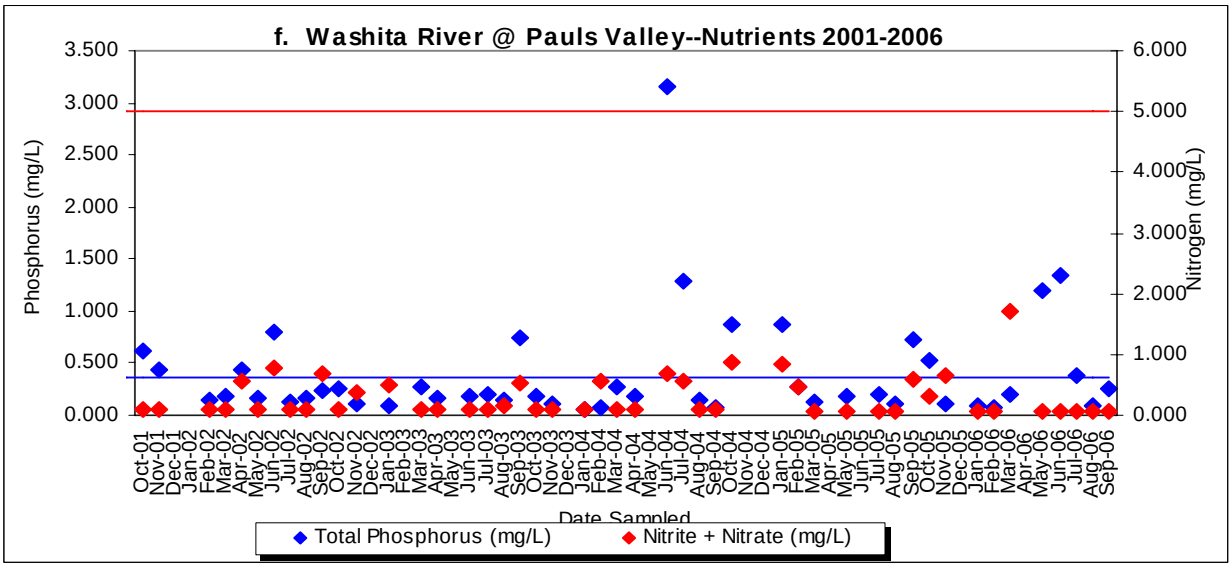







d. Washita River @ Pauls Valley--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Washita River @ Pauls Valley--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Washita River @ Pauls Valley--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

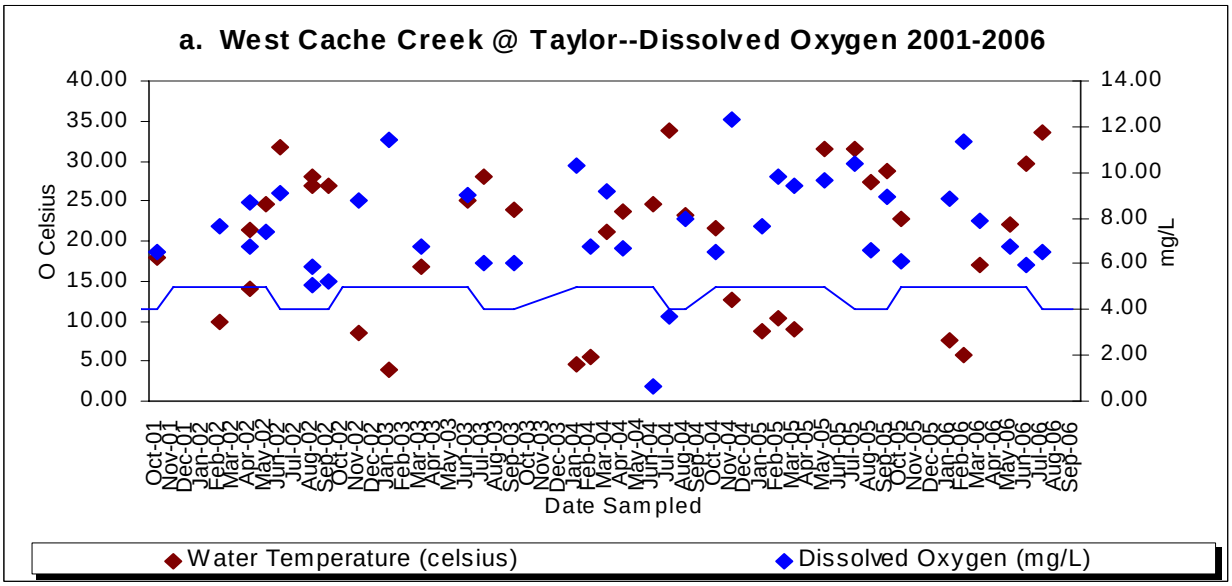
West Cache Creek near Taylor

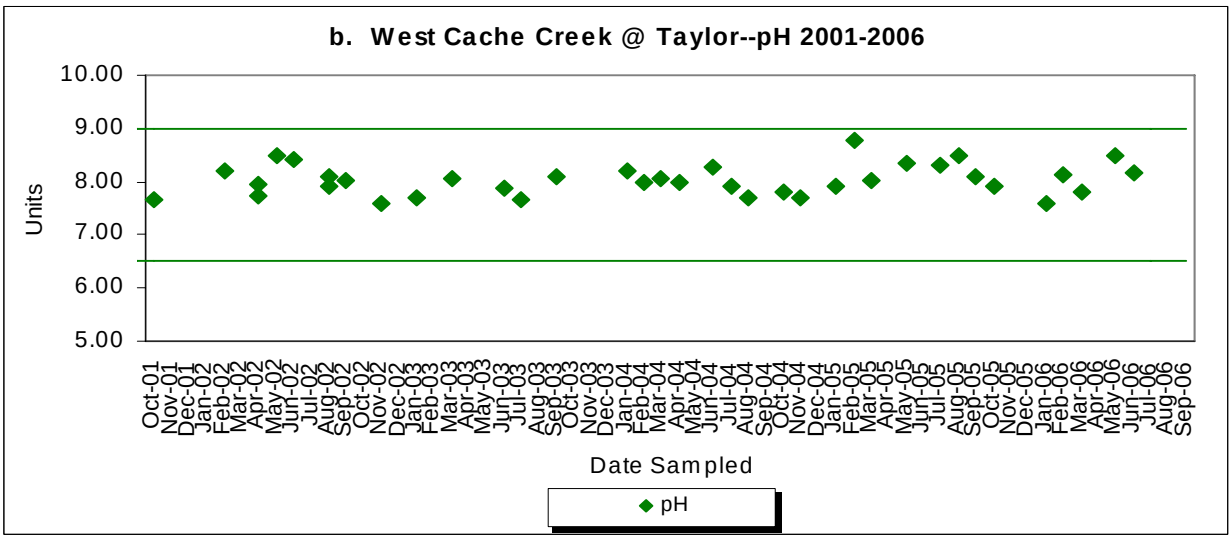
Station AT315050 (311310020010-001AT) is a permanent ambient trend monitoring station located on West Cache Creek. Situated in the south central portion of Cotton County, the site was established north of the town of Taylor on State Highway 5B. The station is positioned near the terminal end of stream segment 311310020010 and is classified within the West Cache Creek 8 digit HUC watershed (11130203). Water enters the stream system from several tributaries including Deep Red Creek (Lake Frederick and Whites Lake), among others.

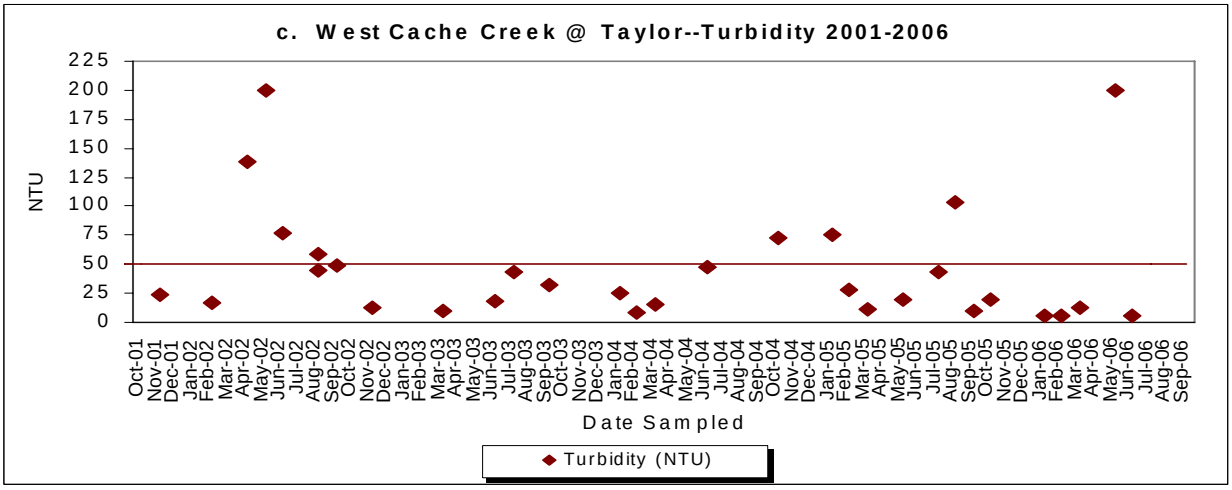
This station on West Cache Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of West Cache Creek from the confluence of Deep Red Creek (98.3800, 34.2154) downstream to confluence of West Cache Creek with Cache Creek (98.3070, 34.2066). As per Appendix A, Table 3 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

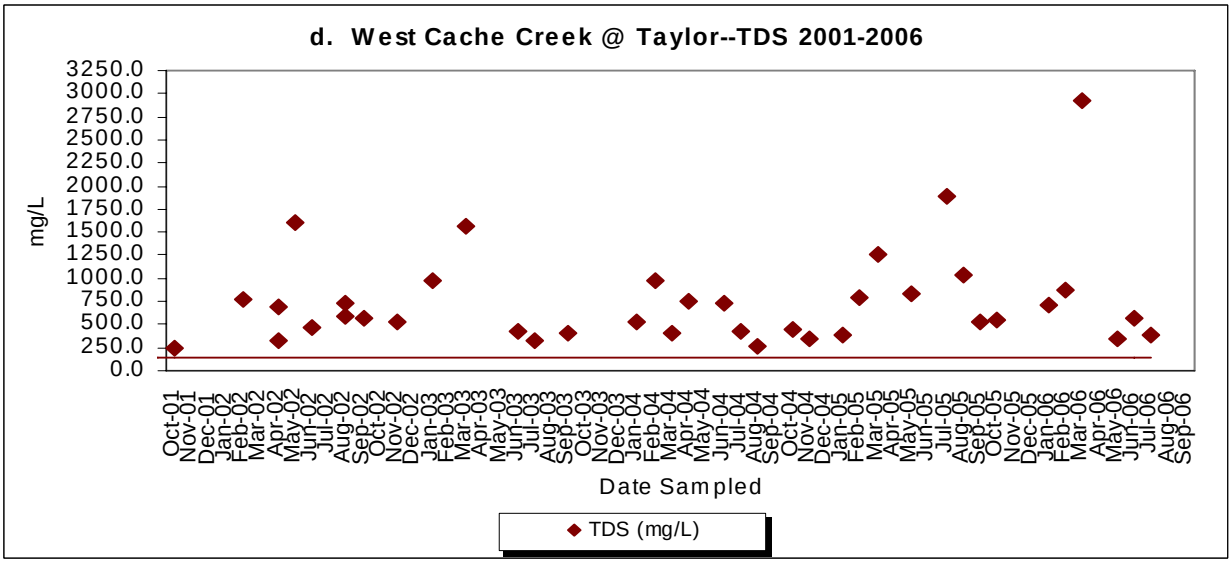
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-one (31) turbidity samples (Figure 90c), eight (8) samples (or 26%) exceeded the numerical criteria of 50 NTU. Dissolved oxygen (Figure 90a), pH (Figure 90b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is partially supported (Figure 90d and e) but impaired per the CPP. Of the thirty-nine (39) total dissolved solid sample concentrations, sixteen (16) samples (or 41%) exceeded the prescribed minimum sample standard of 700 mg/L, and the geometric mean (704.8 mg/L) exceeds the prescribed minimum geometric mean of 700 mg/L. Of the forty (40) chloride sample concentrations, seven (7) samples (or 18%) exceeded the prescribed sample standard of 285 mg/L. Sulfate values met the prescribed segment-specific criteria. The PBCR beneficial use is not supported (Table 30). Of the nineteen (19) fecal coliform concentrations, seven (7) samples (or 37%) exceeded the prescribed screening level of 400 cfu/mL. Of the seventeen (17) enterococci concentrations, 7 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (463.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. Of the 19 *E. coli* concentrations, two (2) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (197.0 cfu/mL) exceeded the prescribed mean standard of 126 cfu/mL. This segment of West Cache Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 90f).

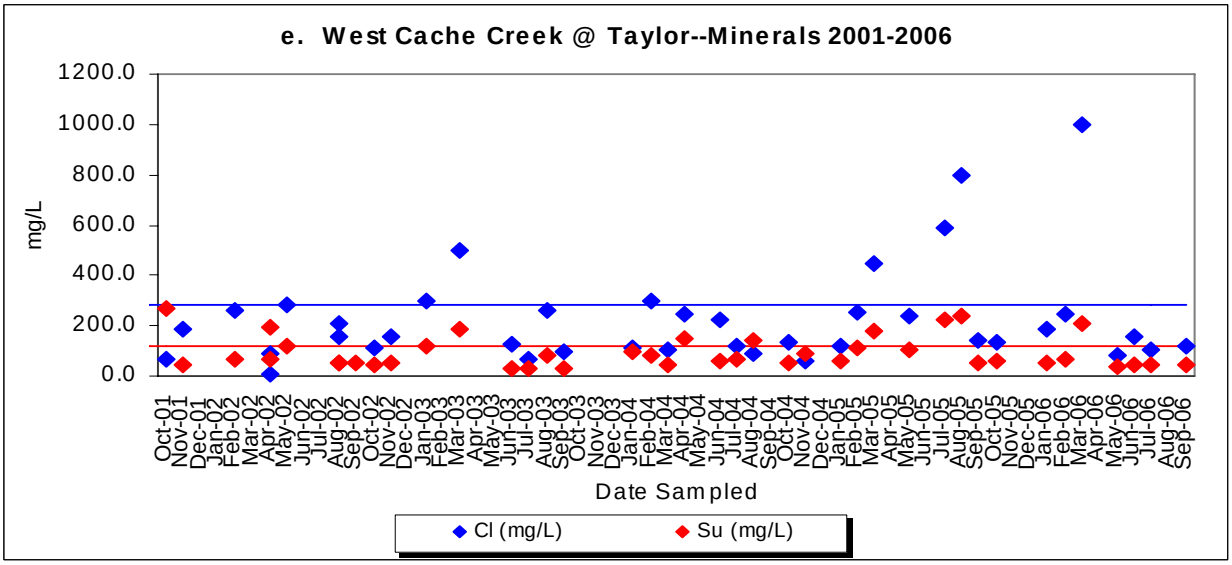
Figure 90 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on West Cache Creek at Taylor (AT315050), 2001-2006.

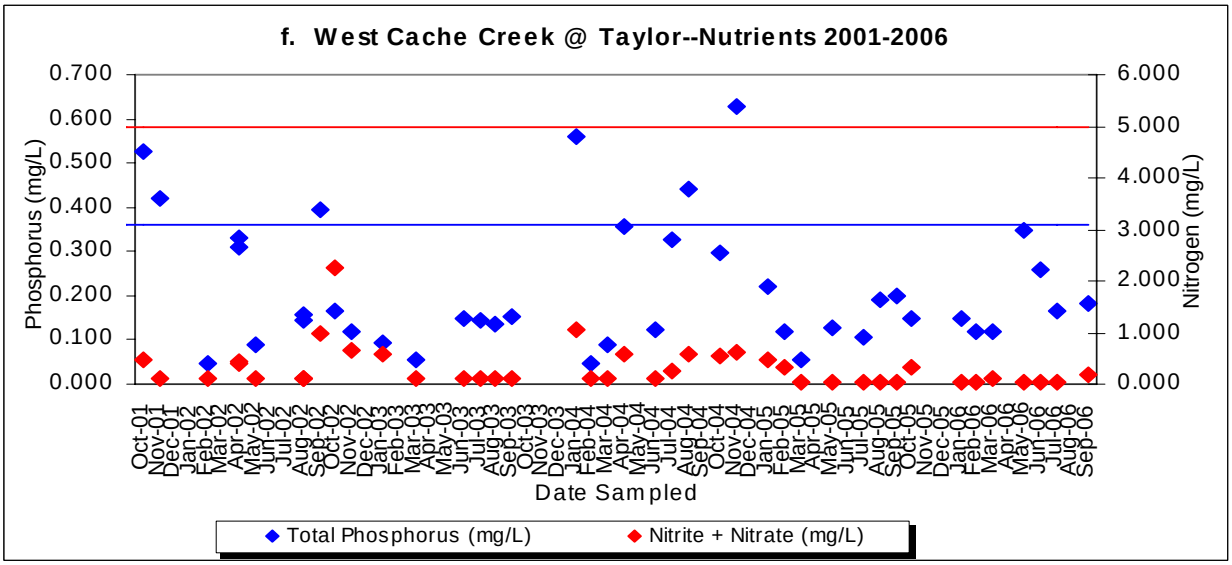







d. West Cache Creek @ Taylor--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. West Cache Creek @ Taylor--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. West Cache Creek @ Taylor--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

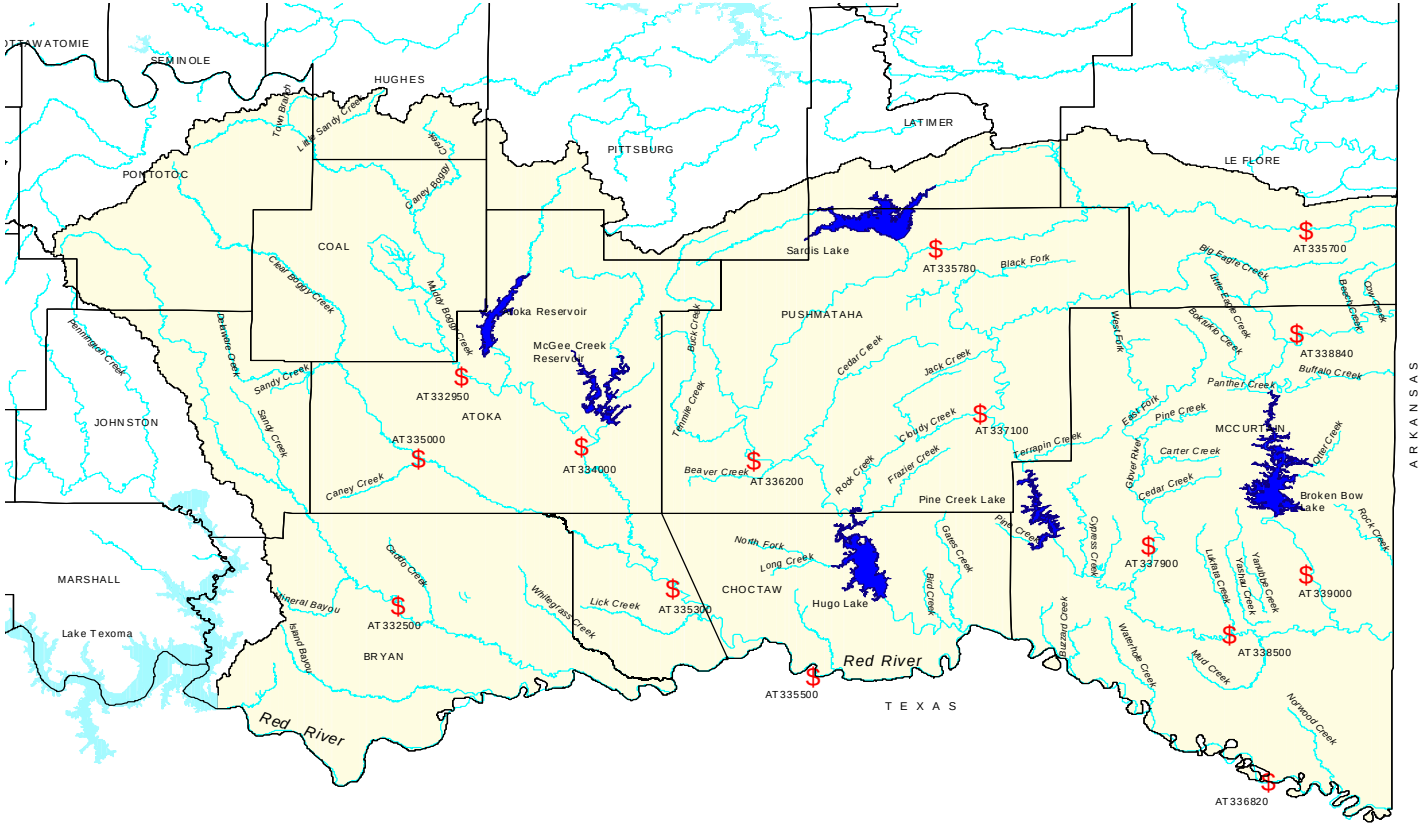


Plate 66
LOWER RED SUBBASIN (HUC 1114)
Water Quality Programs Division
Oklahoma Water Resources Board

HUC 1114

LOWER RED SUB-BASIN

The Lower Red sub-basin (4-digit hydrologic unit 1114) is situated in the southeastern portion of the state. It originates in the central portion of Pontotoc County, continues eastward through portions of Murray, Johnston, Bryan, Hughes, Coal, Atoka, Pittsburg, Latimer, Pushmataha, and Choctaw Counties, and terminates in the eastern parts of LeFlore and McCurtain Counties. Major cities and County seats located within the basin include Coalgate, Atoka, Durant, Antlers, Hugo, Broken Bow, and Idabel. Minor cities of note include Kiowa, Fort Towson, Rattan, Clayton, Talihina, Smithville, and Valliant.

The basin is subdivided into nine 8-digit hydrologic units (HUC) that are all contained wholly within the state. These HUC's are the Bois D'Arc–Island (11140101), the Blue (11140102), the Muddy Boggy (11140103), the Clear Boggy (11140104), the Kiamichi (11140105), the Pecan–Waterhole (11140106), the Upper Little (11140107), the Mountain Fork (11140108), and Lower Little (11140109). The major surface water in the basin is the lower Red River. Major tributaries include the Blue River, the Kiamichi River, the Little River, the Glover River, the Mountain Fork River, Island Bayou, Whitegrass Creek, Clear Boggy Creek, Muddy Boggy Creek, Jackfork Creek, Cedar Creek, Buzzard Creek, Black Fork, Lukfata Creek, and Big Eagle Creek. Six major lakes are located in the basin—Atoka Reservoir formed by North Boggy Creek, McGee Creek Reservoir formed by McGee Creek, Sardis Lake formed by Jackfork and Buffalo Creeks, Hugo Lake formed by the Kiamichi River, Pine Creek Lake formed by the Little River, and Broken Bow Lake formed by the Mountain Fork River. Fifteen active permanent water quality-monitoring stations (Table 31) are located in the basin—AT332500, AT332950, AT335000, AT335300, AT335500, AT335700, AT335780, AT336200, AT336710, AT336820, AT337100, AT337900, AT338000, AT338840, and AT339000. Two inactive water quality-monitoring stations (AT334000 and AT338500) are located in the sub-basin. Station AT33400 was last assessed in the 1999 BUMP report. Station 338500, Little River near Idabel, was last included in the 2003 BUMP report, but will not be assessed further. Because the station is located within a regulatory mixing zone, the OWRB cannot support previously collected data and will not include in future federal and state lists. Station AT338000, Little River near Holly Creek, was established in the beginning of 2003 and will replace the Idabel station.

The basin is characterized by three ecoregions. The Central Oklahoma/Texas Plains is the primary ecoregion beginning in the northwestern portion and continuing through the southern one-half (½) of the sub-basin. The Ouachita Mountains cover the remainder of the northern one-half (½) of the sub-basin. The South Central Plains cover the southeastern quarter (¼) of the McCurtain County. The primary land usage in the sub-basin is forestland (shortleaf pine, loblolly pine, pine plantations, and oak–hickory). It dominates the central and most of the eastern portions and is further interspersed throughout the sub-basin. The secondary land use is pastureland (brushy and mixed) that dominates parts of the western portion of the sub-basin and is interspersed throughout the sub-basin with areas of concentration in Pushmataha and southern McCurtain Counties. The tertiary land use is rangeland (open grasslands and woody areas) that is prevalent in the northwestern portion and is interspersed throughout the central and southern portions of the sub-basin. Other land uses of note are cropland, bottom woodlands, farmsteads, major urban areas, wetlands, and confined animal feeding operations.

Table 31. Permanent Ambient Trend Monitoring Stations Located in HUC 1114.

WBID #	STATION #	STATION NAME	STATUS	FS	PS	NS/T	CBD
410600010010	AT332500	Blue River, US 70, Durant	Active 11/98-P	AG, AES, FWP, PPWS	NONE	PBCR	NONE
410400030010	AT335000	Clear Boggy Creek, off US 69, Caney	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410210080010	AT337900	Glover River, SH 3, Glover	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410300030010	AT336200	Kiamichi River, US 271, Antlers	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410310020010	AT335700	Kiamichi River, SH 63, Big Cedar	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410300010010	AT336710	Kiamichi River, SH 109, Fort Towson	Active 02/02-P	AG, AES, PPWS, FWP	NONE	PBCR	NONE
410310010010	AT335780	Kiamichi River, off US 271, Tuskahoma	Active 11/98-P	AG, AES, PBCR, PPWS	NONE	FWP	NONE
410210020140	AT337100	Little River, off SH 3, Cloudy	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410200010200	AT338000	Little River, off US 70, Holly Creek	Active 11/03-P	AG, AES, PPWS	NONE	FWP	PBCR
410210040010	AT339000	Mountain Fork, US 70, Eagletown	Active 11/98-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410210060010	AT338840	Mountain Fork, SH 4, Smithville	Active 11/98-P	AG, PBCR, PPWS	NONE	FWP, AES PBCR	NONE
410400050270	AT332950	Muddy Boggy Creek, US 69, Atoka	Active 9/99-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410400010070	AT335300	Muddy Boggy Creek, US 70, Unger	Active 7/99-P	AG, AES, PPWS	NONE	FWP, PBCR	NONE
410100010010	AT336820	Red River, US 259, Harris	Active 11/98-P	AG, AES, PBCR, PPWS	FWP	NONE	NONE
410400010010	AT335500	Red River, US 271, Hugo	Active 11/98-P	AES, PPWS, AG	FWP	PBCR	NONE

ASSIGNED OWQS BENEFICIAL USES AND SUPPORT CODES

PPWS = PUBLIC AND PRIVATE WATER SUPPLY	EWS = EMERGENCY WATER SUPPLY
FWP = FISH & WILDLIFE PROPAGATION	PBCR = PRIMARY BODY CONTACT RECREATION
AG = AGRICULTURE	AES = AESTHETICS
FS = FULLY SUPPORTING	PS = PARTIALLY SUPPORTING
NS/T = NOT SUPPORTING/THREATENED	CBD = CANNOT BE DETERMINED

Table 32. Toxicant exceedances in HUC 1114.

STATION #	STATION NAME	DATE	Cadmium (ug/L)	Copper (ug/L)	Lead (ug/L)
AT335000	Clear Boggy Creek, off US 69, Caney	04/10/2001			12.00
		09/03/2003			14.93
AT337900	Glover River, SH 3, Glover	05/23/2001			0.90
		09/18/2001			0.45
		10/24/2001			1.53
		04/23/2002			0.58
		04/16/2003			1.21
		09/03/2003			0.77
AT336200	Kiamichi River, US 271, Antlers	11/06/2000		5.00	
		04/25/2001			0.66
		05/23/2001			2.50
		06/20/2001			4.42
		08/21/2001			0.88
		09/18/2001		3.90	0.97
		10/24/2001		4.80	1.08
		04/24/2002			2.11

STATION #	STATION NAME	DATE	Cadmium (ug/L)	Copper (ug/L)	Lead (ug/L)
		02/05/2003			1.60
		04/16/2003			1.77
		09/03/2003			1.15
AT335700	KIAMICHI RIVER, SH 63, BIG CEDAR	05/22/2001			0.29
		06/19/2001			0.53
		08/20/2001			0.50
		09/17/2001			0.42
		04/24/2002			0.34
		04/14/2003			1.60
		09/03/2003			0.45
AT335780	KIAMICHI RIVER, OFF US 271, TUSKAHOMA	11/06/2000		8.00	
		04/24/2001			2.26
		05/22/2001		3.88	2.97
		06/19/2001			0.59
		08/20/2001			0.48
		09/17/2001			0.86
		10/23/2001			0.56
		04/15/2003			1.47
		09/03/2003			0.88
AT337100	LITTLE RIVER, OFF SH 3, CLOUDY	04/25/2001			0.34
		05/23/2001			0.69
		06/20/2001			0.52
		08/21/2001			0.55
		09/18/2001			0.68
		10/24/2001			1.16
		04/24/2002			0.68
		02/05/2003			0.46
		04/16/2003			0.97
		09/03/2003			0.47
AT339000	MOUNTAIN FORK, US 70, EAGLETOWN	04/25/2001			1.81
		05/22/2001			5.77
		08/21/2001			0.69
		09/18/2001			4.28
		10/24/2001			19.73
		04/23/2002			8.65
		02/04/2003	0.54		
		04/15/2003	0.30		3.84
		09/02/2003			1.86
AT338840	MOUNTAIN FORK, SH 4, SMITHVILLE	11/07/2000		6.00	
		04/24/2001			0.37
		05/22/2001			0.51
		08/20/2001		6.50	0.68

STATION #	STATION NAME	DATE	Cadmium (ug/L)	Copper (ug/L)	Lead (ug/L)
		09/17/2001			0.78
		04/23/2002			0.57
		04/15/2003			1.09
		09/03/2003			0.47
AT332950	MUDDY BOGGY CREEK, US 69, ATOKA	04/10/2001			2.81
		05/15/2001			3.49
		06/12/2001			2.97
		08/14/2001			3.02
		10/16/2001			3.86
		09/03/2003			13.60
AT335300	MUDDY BOGGY CREEK, US 70, UNGER	11/08/2000			15.00
		05/15/2001			6.72

Table 33. Exceedances of fecal coliform, enterococci, and *E. coli* screening limits in HUC 1114. Only values leading to a determination of not supporting for the Public and Private Water Supply and the Primary Body Contact Recreation beneficial uses are in included.

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
AT332500	BLUE RIVER, US 70, DURANT	08/08/2000		500	
		06/10/2002		1400	
		09/11/2002		5000	
		07/30/2003		1900	
		08/19/2003		500	
		09/03/2003		2300	
AT335000	CLEAR BOGGY CREEK, OFF US 69, CANEY	08/10/1999	440		
		06/06/2000		690	520
		09/13/2000		900	
		05/30/2001	2500		1396
		09/04/2001	1000		2333
		05/15/2002	1600	5000	619
		09/11/2002	600		
		06/10/2003	4000		
		09/03/2003	2700		
		09/23/2003	800		
AT337900	GLOVER RIVER, SH 3, GLOVER	05/23/2001		500	
AT336200	KIAMICHI RIVER, US 271, ANTLERS	05/23/2001		1100	
		09/18/2001		700	
		05/22/2002		6000	
		05/21/2003		800	
		09/03/2003		500	
AT336710	KIAMICHI RIVER, SH 109, NEAR FORT TOWSON	06/15/2004		6700	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		06/29/2004		2300	
AT337100	Little River, off SH 3, Cloudy	08/22/2000		8000	
		09/18/2001		500	
		07/14/2003		700	
		08/18/2003		2800	
		09/03/2003		700	
AT339000	Mountain Fork, US 70, Eagletown	05/02/2000		410	
		08/22/2000		1600	
		08/21/2001		4000	
		05/22/2002		1100	
		07/23/2002		2600	
		09/11/2002		3000	
AT338840	Mountain Fork, SH 4, Smithville	06/13/2000		180	
		07/18/2000		80	
		08/15/2000		120	
		07/24/2001		130	
		07/23/2002		800	
		06/25/2003		100	
		07/14/2003		100	
		09/02/2003		1800	
		09/22/2003		200	
		06/30/2004		3100	
AT332950	Muddy Boggy Creek, US 69, Atoka	06/06/2000	440		
		05/30/2001	1700		
		06/13/2001	15000		
		05/15/2002	5000	3000	
		06/10/2002	900	1300	
		07/17/2002		800	
		06/25/2003	700		
		07/15/2003		900	
		09/03/2003	1400	1600	
		09/23/2003	1500	1270	
AT335300	Muddy Boggy Creek, US 70, Unger	06/06/2000	700		
		09/13/2000	1280		
		05/30/2001	1000		
		09/04/2001	700		
		05/13/2002	500	8000	
		06/10/2002	600	1600	
		09/09/2002	4000	4000	
		06/08/2004		700	
AT335500	Red River, US 271, Hugo	06/06/2000	1120	440	
		09/13/2000	1130		
		05/13/2002	4000	1500	

STATION #	STATION NAME	DATE	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)	*E. coli* (cfu/mL)
		06/10/2002	500		
		09/09/2002	3000	900	
		06/15/2004		900	
		06/29/2004	600	500	

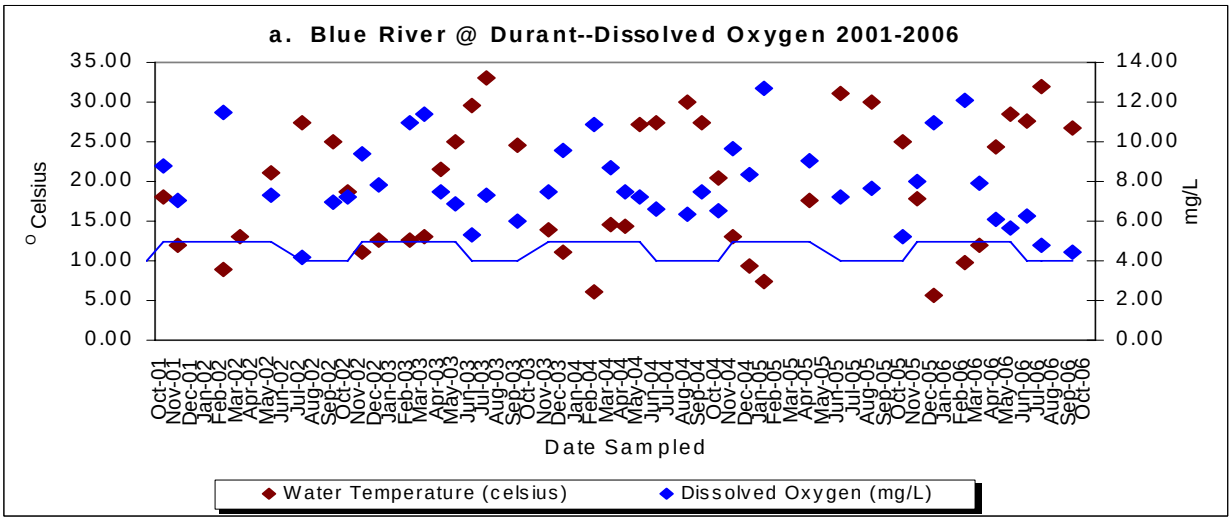
Blue River near Durant

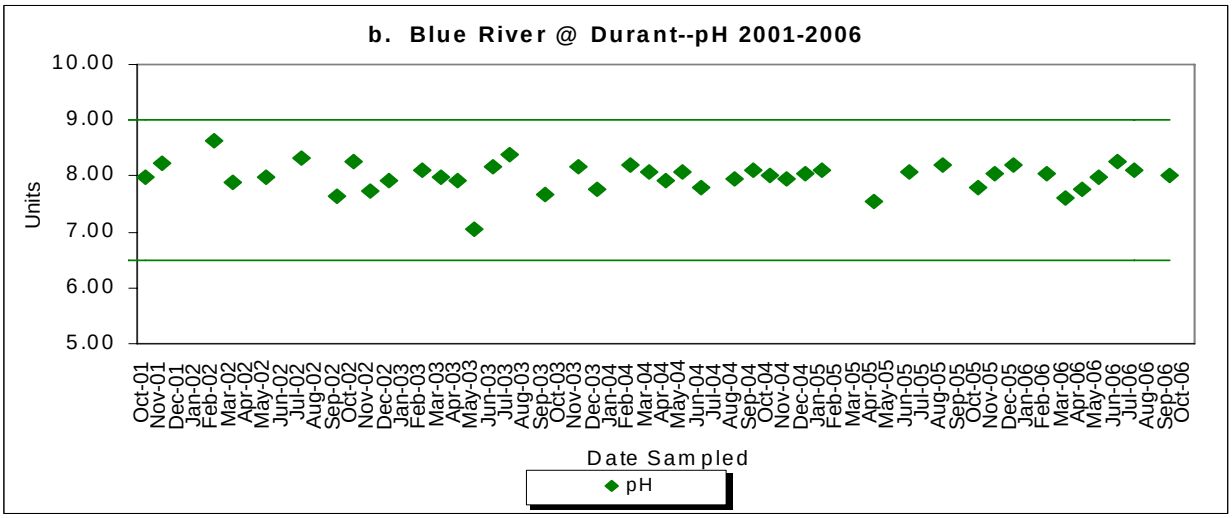
Station AT332500 (410600010010-001AT) is a permanent ambient trend monitoring station located on the Blue River. Situated in the central portion of Bryan County, the site was established east of the city of Durant on US Highway 70. The station is positioned between the upper end and midpoint of stream segment 410600010010 and is classified within the Blue River 8 digit HUC watershed (11140102). Water enters the stream system from several tributaries including Mineral Bayou and Caddo Creek, among others.

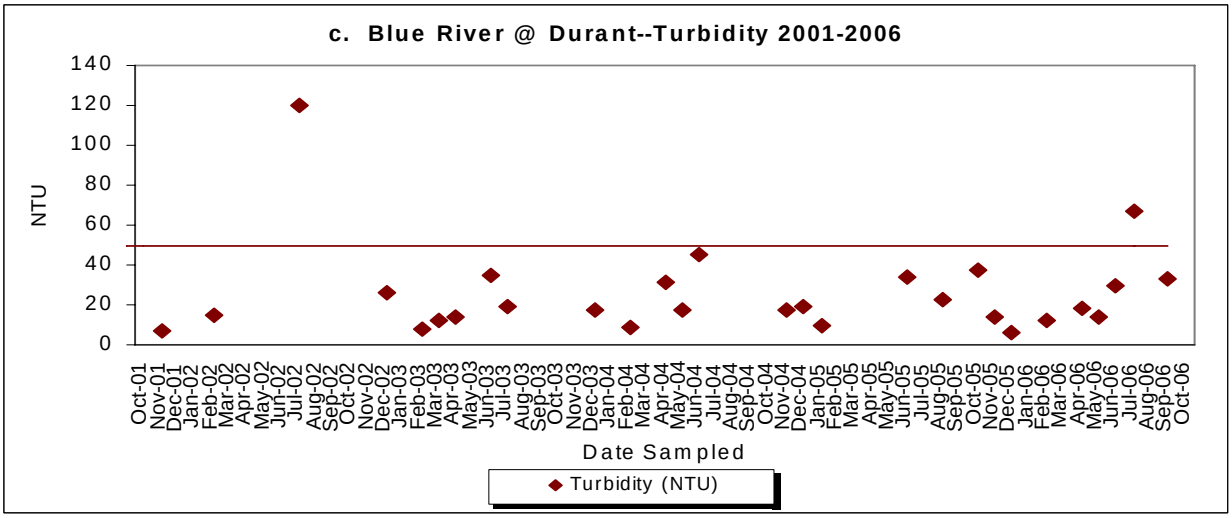
This station on the Blue River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through October of 2006. For purposes of reporting, this station is representative of the Blue River from the confluence of Mineral Bayou (96.3357, 34.0462) downstream to confluence of the Blue River with the Red River (95.9356, 33.8879). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 91a), pH (Figure 91b), turbidity (Figure 91c), and toxicant samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 20 (maximum 30) and fish condition score of 11 (maximum 15) for a total score of 31. This is above the assigned supporting threshold of 26 for Central Oklahoma/Texas Plains warm water aquatic communities [OAC 46:15-5(l)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 91d and e). The PBCR beneficial use is not supported (Table 33). Of the 16 enterococci concentrations, five (5) samples (or 31%) exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (273.7 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Blue River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 91f). Furthermore, the mean sestonic chlorophyll-a concentration (5.0 mg/M^3) produced a TSI of 46, which is below the threshold TSI of 62.

Figure 91 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Blue River at Durant (AT332500), 2001-2006.







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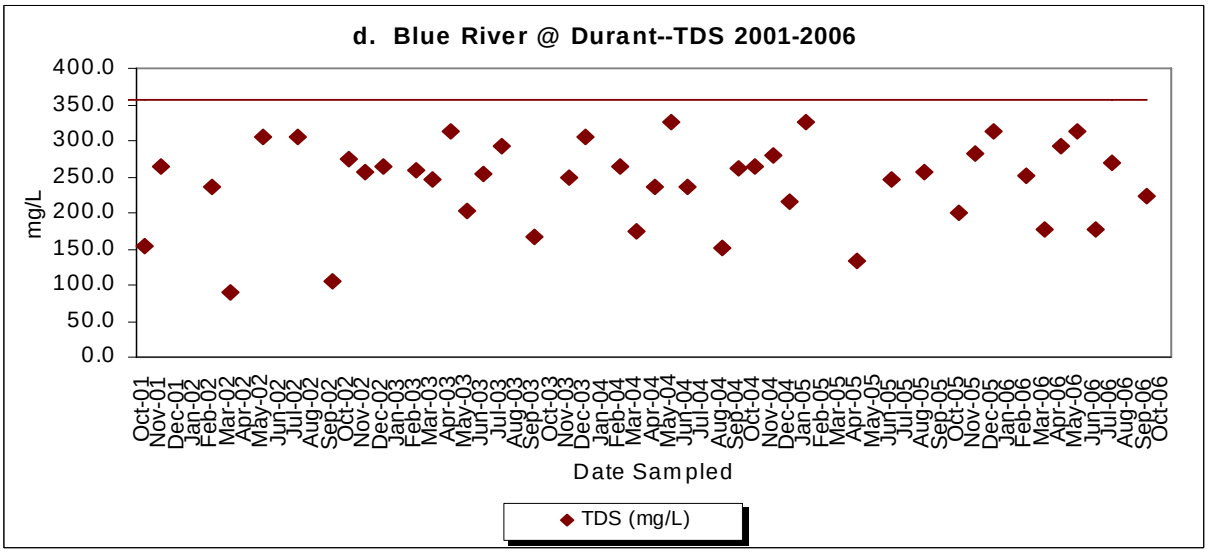
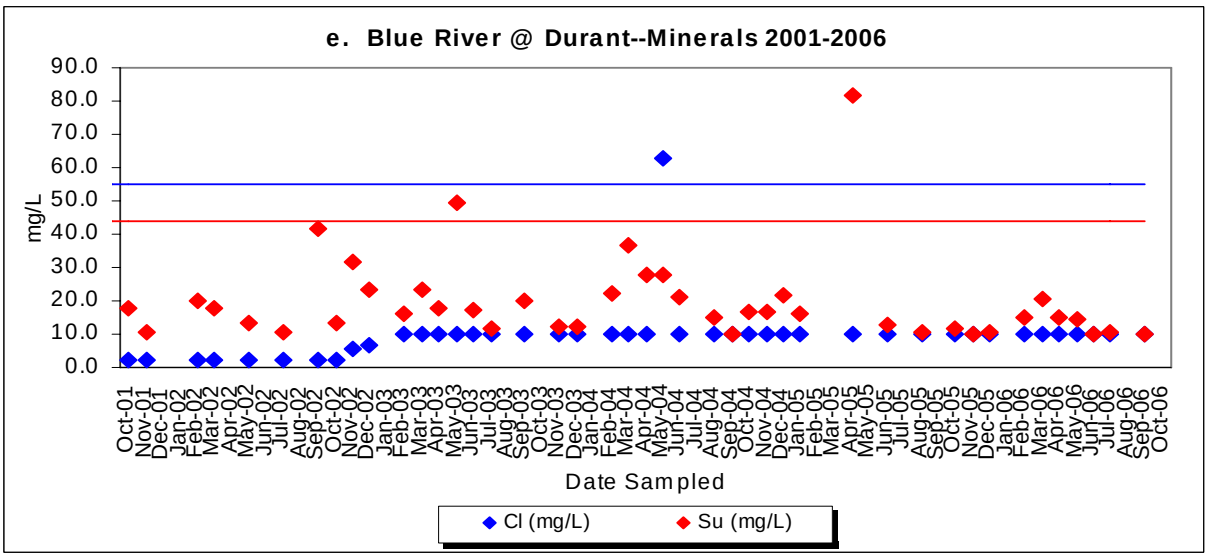
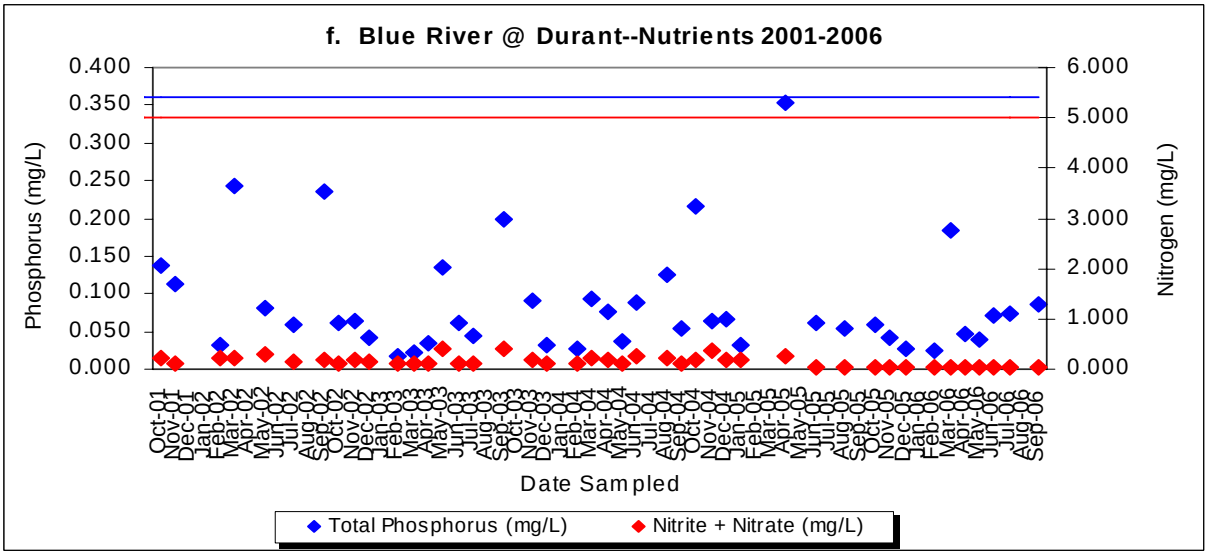

d. Blue River @ Durant--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Blue River @ Durant--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Blue River @ Durant--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

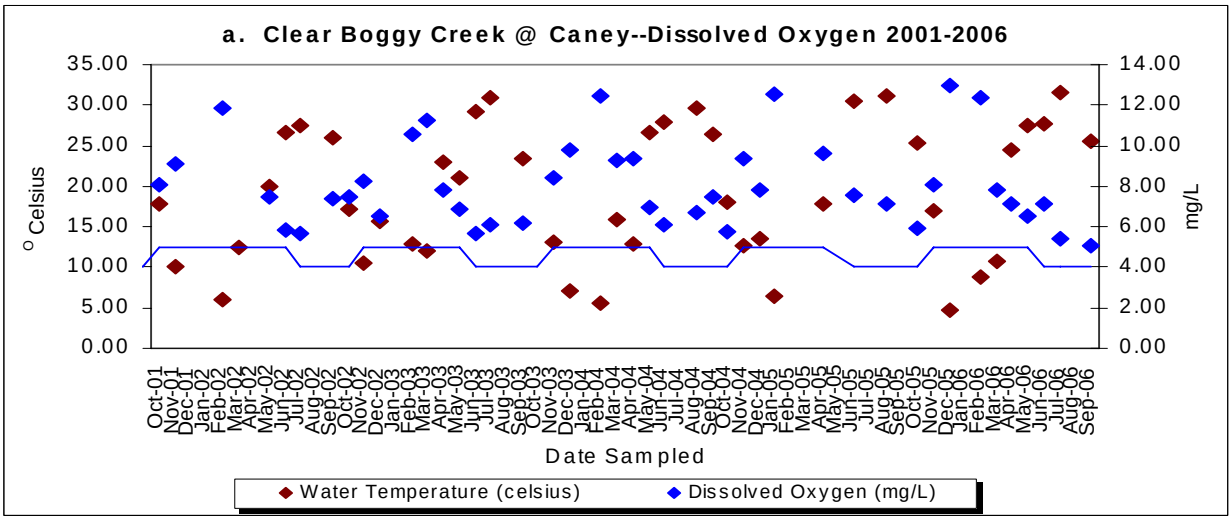
Clear Boggy Creek near Caney

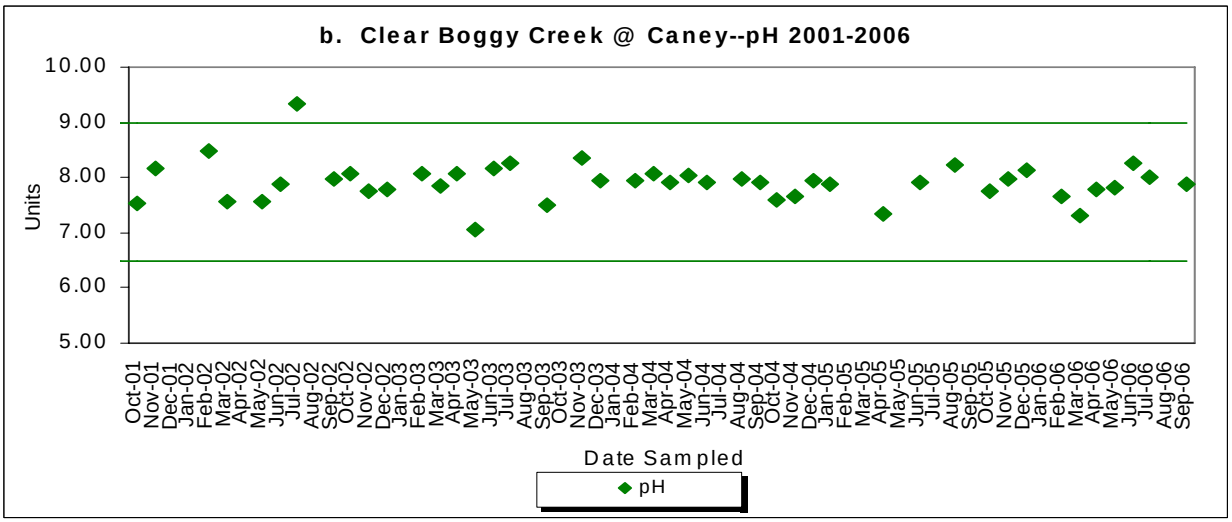
Station AT335000 (410400030010-001AT) is a permanent ambient trend monitoring station between the midpoint and the lower end of Clear Boggy Creek. Situated in the southwestern portion of Atoka County, the site was established north of the town of Caney off of US Highway 69 on Old 69. The station is positioned near the terminal end of stream segment 410400030010 and is classified within the Clear Boggy Creek 8 digit HUC watershed (11140104). Water enters the stream system from several tributaries including Delaware Creek, Sandy Creek, Salt Creek, and Caney Creek, among others.

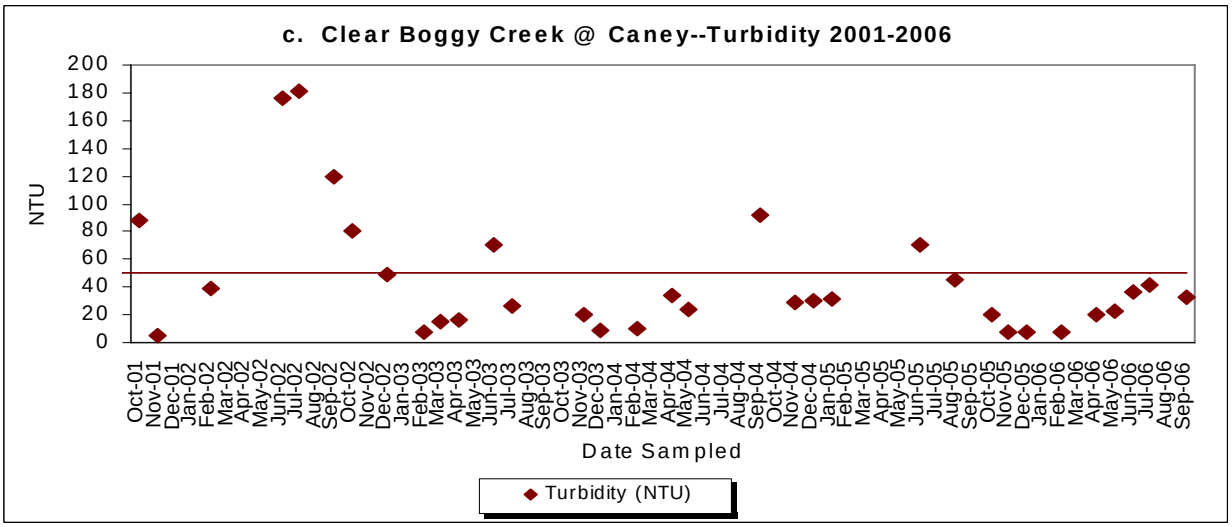
This station on Clear Boggy Creek has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Clear Boggy Creek from the confluence of Delaware Creek (96.3571, 34.4173) downstream to the confluence of an unnamed tributary near Taloah, Oklahoma with Clear Boggy Creek (96.1834, 34.2474). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the thirty-three (33) turbidity samples (Figure 92c), eight (8) samples (or 24%) exceeded the numerical criteria of 50 NTU. Of the 10 lead samples collected, two (2) of the concentrations (or 20%) exceeded the prescribed hardness-dependant chronic criteria of 7.41 ug/L (Table 32). Dissolved oxygen (Figure 92a) and pH (Figure 92b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 92d and e). Although 27% of the TDS concentrations exceeded the sample standard of 331.0 mg/L, the values are below the minimum sample standard 700 mg/L. The PBCR beneficial use is not supported (Table 33). Of the sixteen (16) fecal coliform concentrations, seven (7) samples (or 44%) exceeded the prescribed screening level of 400 cfu/mL. Of the 14 enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (211.5 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Clear Boggy Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 92f).

Figure 92 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Clear Boggy Creek at Caney (AT335000), 2001-2006.







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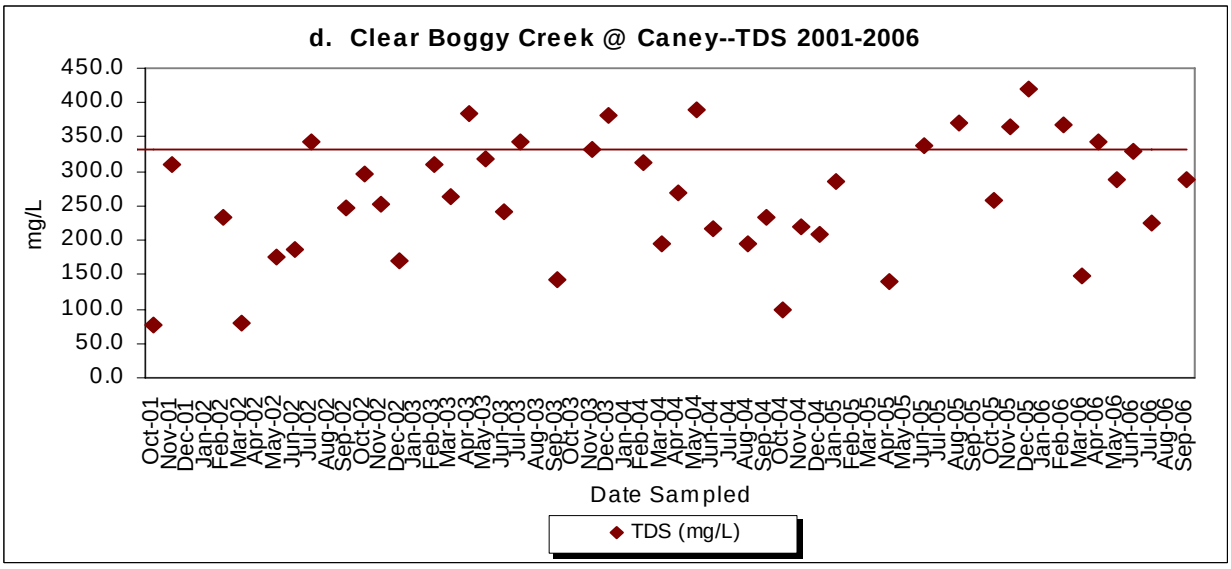
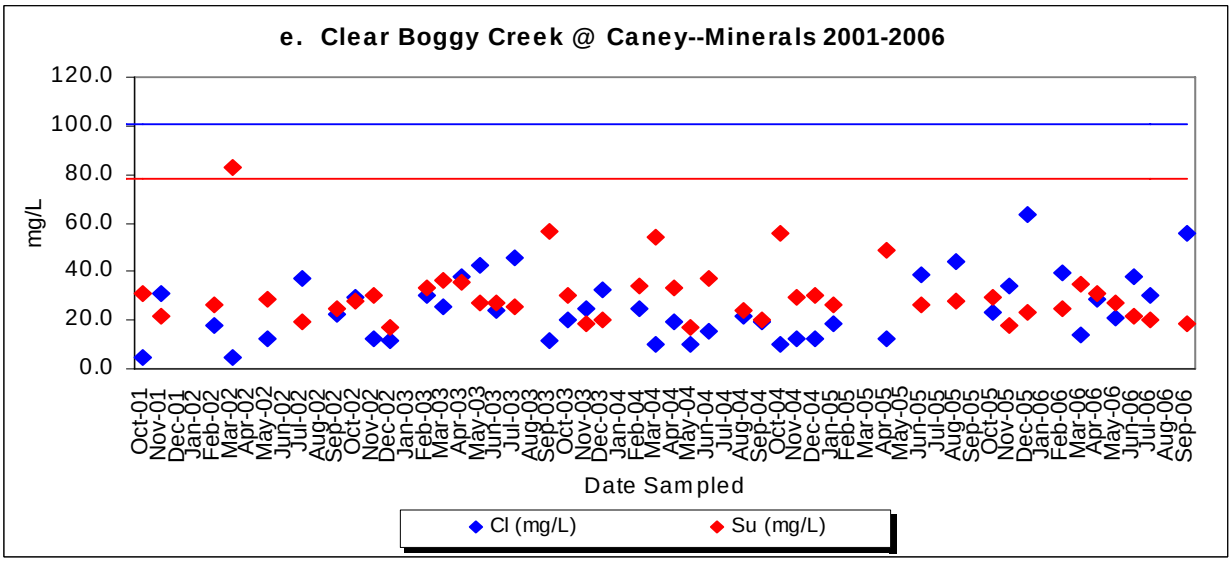
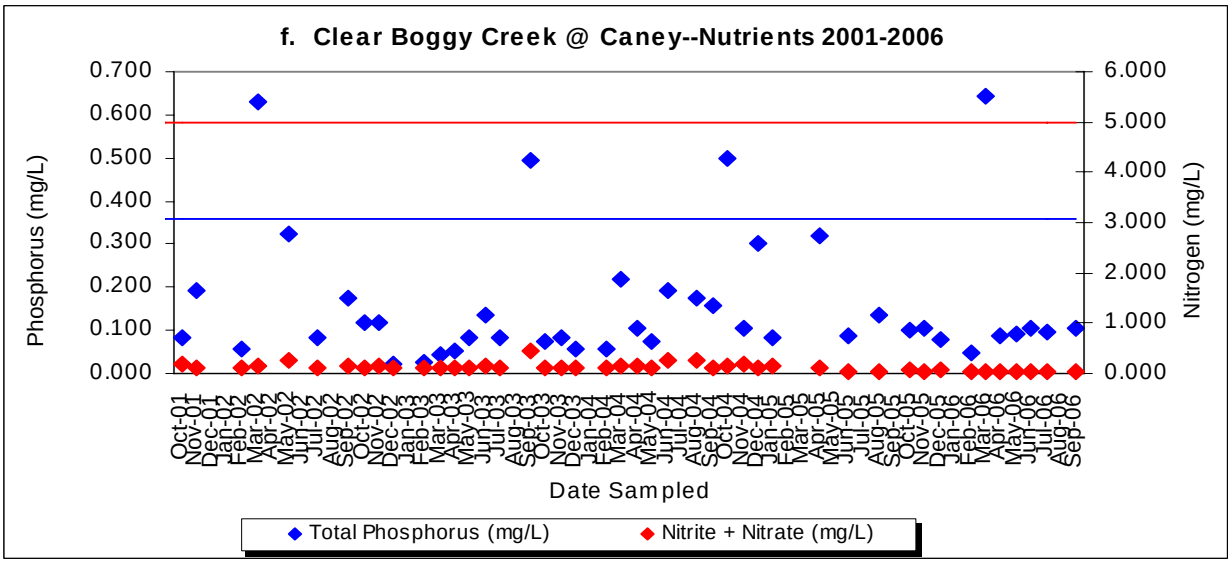

d. Clear Boggy Creek @ Caney--TDS 2001-2006
mg/L
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
TDS (mg/L)


e. Clear Boggy Creek @ Caney--Minerals 2001-2006
mg/L
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Clear Boggy Creek @ Caney--Nutrients 2001-2006
Phosphorus (mg/L)
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

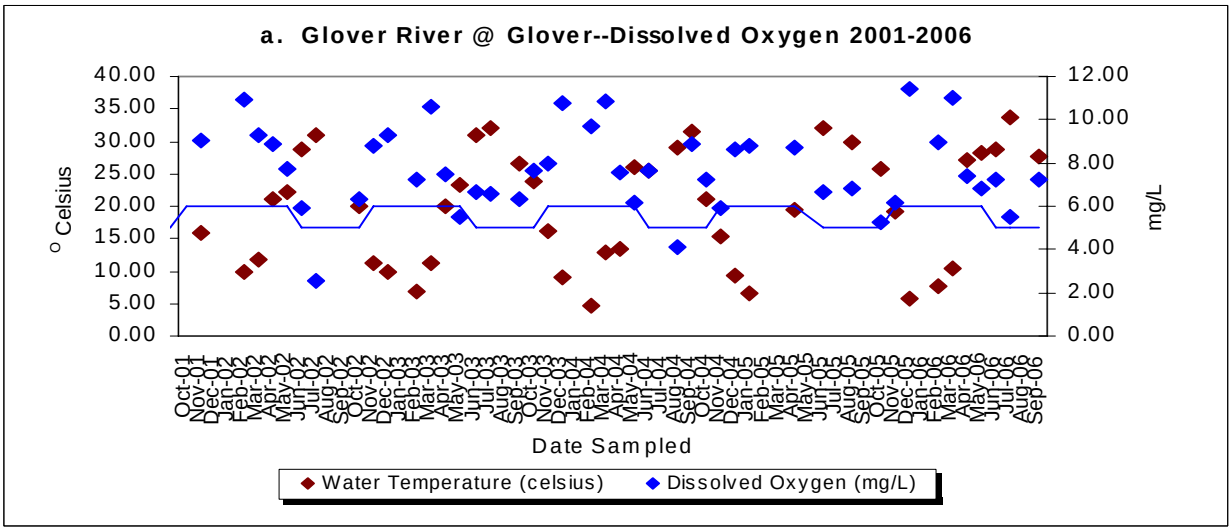
Glover River near Glover

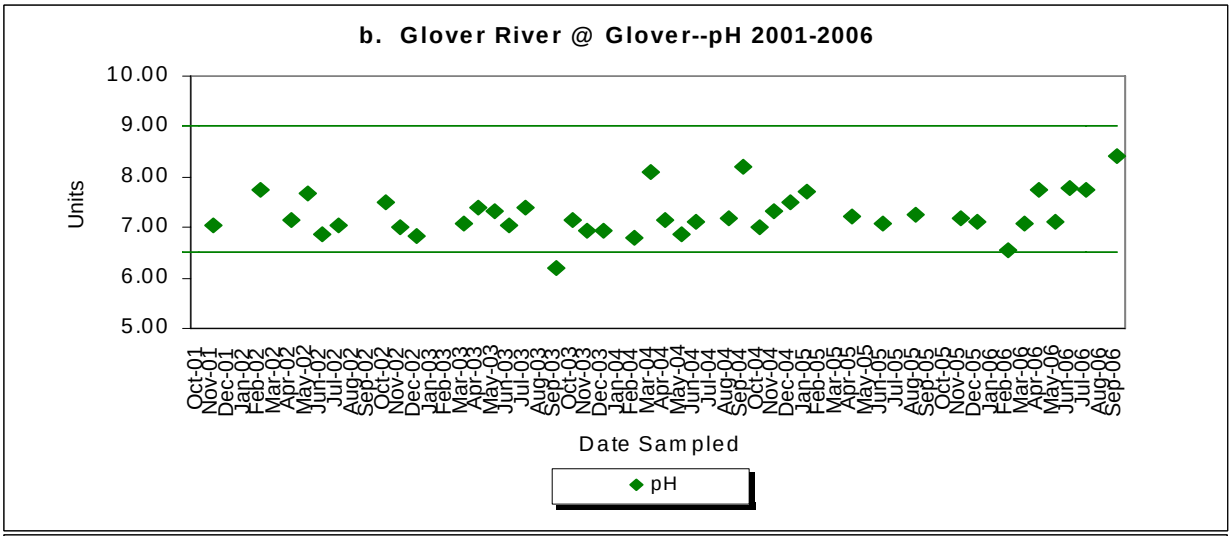
Station AT337900 (410210080010-001AT) is a permanent ambient trend monitoring station located on the Glover River. Situated in the east central portion of McCurtain County, the site was established west of the town of Glover on State Highway 3. The station is positioned near the midpoint end of stream segment 410210080010 and is classified within the Upper Little River 8 digit HUC watershed (11140107). Water enters the stream system from several tributaries including Pine Creek, Beeman Creek, Carter Creek, Shell Rock Creek, Cedar Creek, and Colbert Creek, among others.

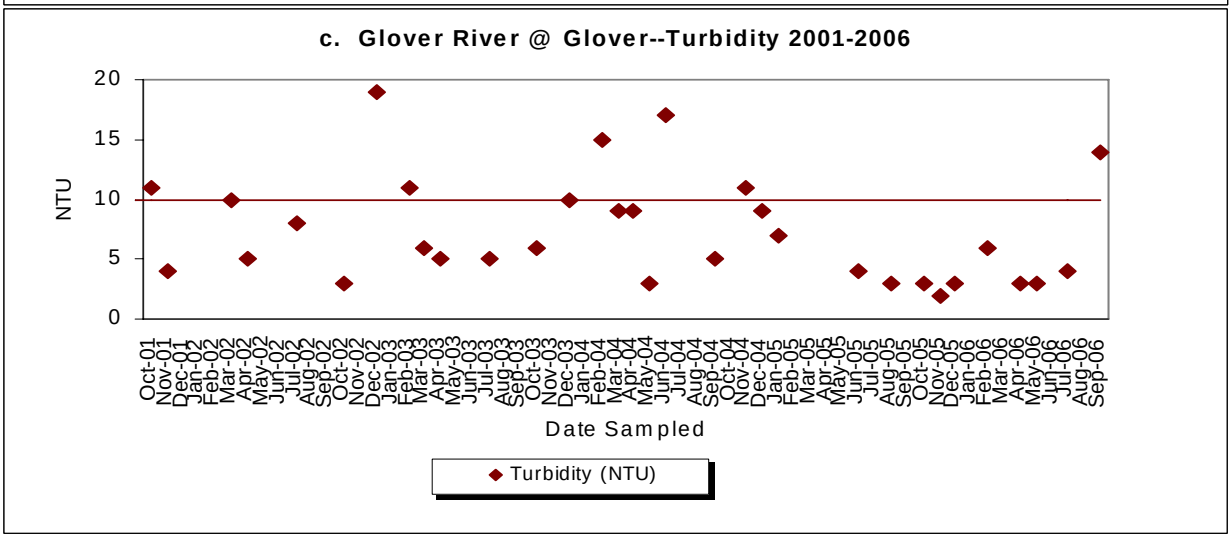
This station on the Glover River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Glover River from the confluence of the West Fork and the East Fork (94.9352, 34.3092) downstream to confluence of the Glover River with the Little River (94.9379, 34.0192). As per Appendix A, Table 7 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the eleven (11) lead samples collected, six (6) of the concentrations (or 65%) exceeded the hardness-specific chronic criteria of 0.37 ug/L (Table 32). Of the thirty-two (32) turbidity samples (Figure 93c), seven (7) samples (or 22%) exceeded the numerical criteria of 10. The dissolved oxygen (Figure 93a) and pH (Figure 93b) samples met the criterion prescribed in the CWAC beneficial use. Fish were collected during the summer of 2005. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 22 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 37. However, because biocriteria have not been developed for cool water aquatic communities in the Ouachita Mountains ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 93d and e). The PBCR beneficial use is not supported (Table 33). Of the twenty (20) enterococci concentrations, one (1) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (38.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Glover River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 93f). Furthermore, the mean sestonic chlorophyll-a concentration (2.2 mg/M^3) produced a TSI of 38, which is below the threshold TSI of 62.

Figure 93 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Glover River at Glover (AT337900), 2001-2006.







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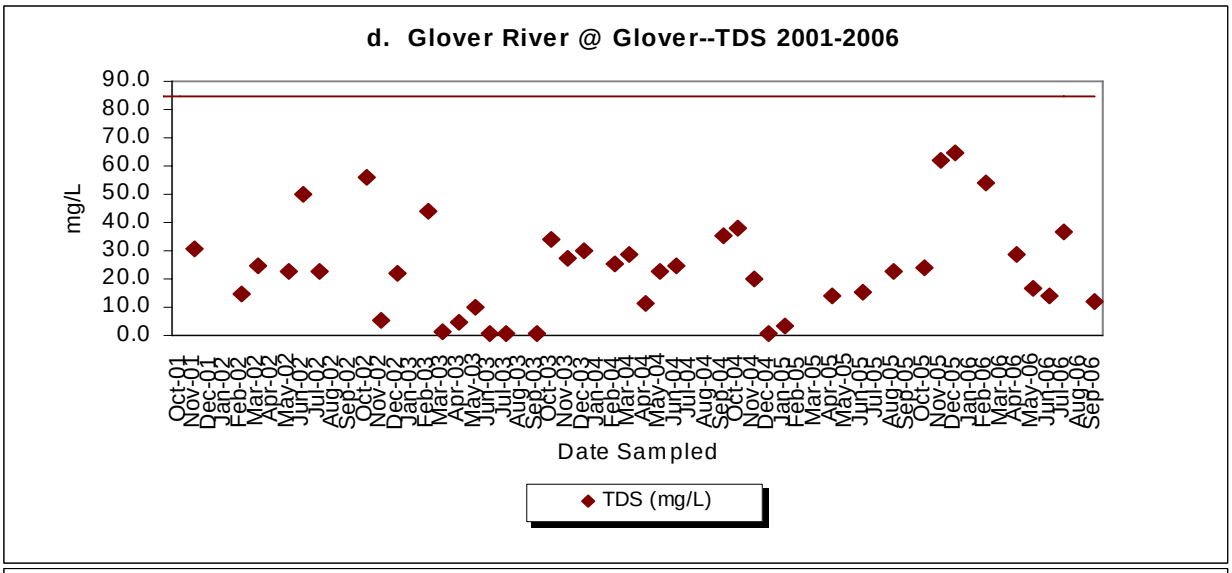
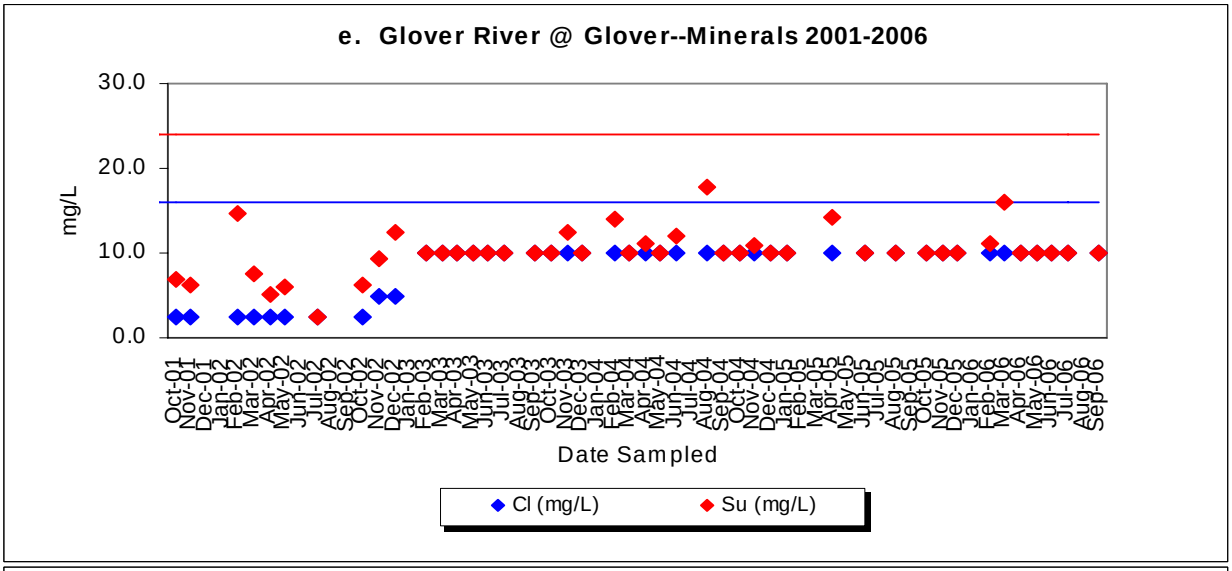
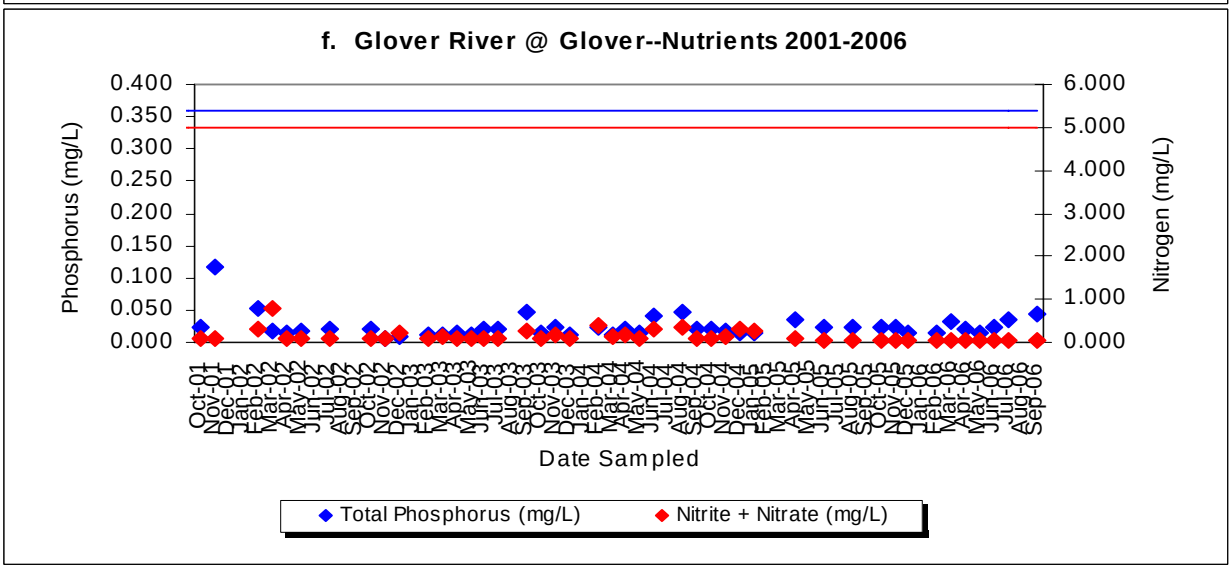

d. Glover River @ Glover--TDS 2001-2006
mg/L
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
TDS (mg/L)


e. Glover River @ Glover--Minerals 2001-2006
mg/L
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Glover River @ Glover--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

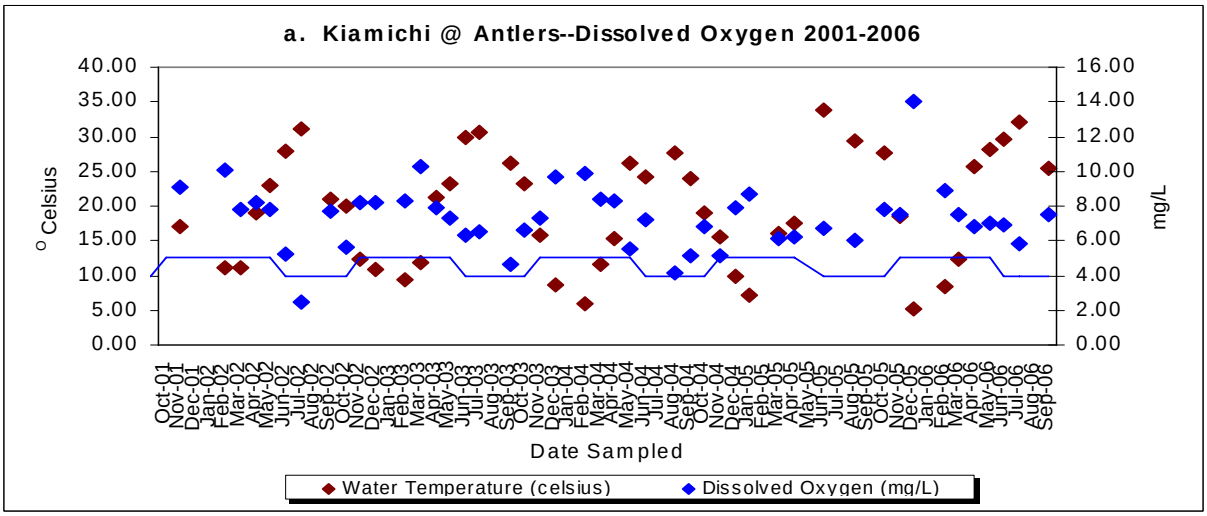
Kiamichi River near Antlers

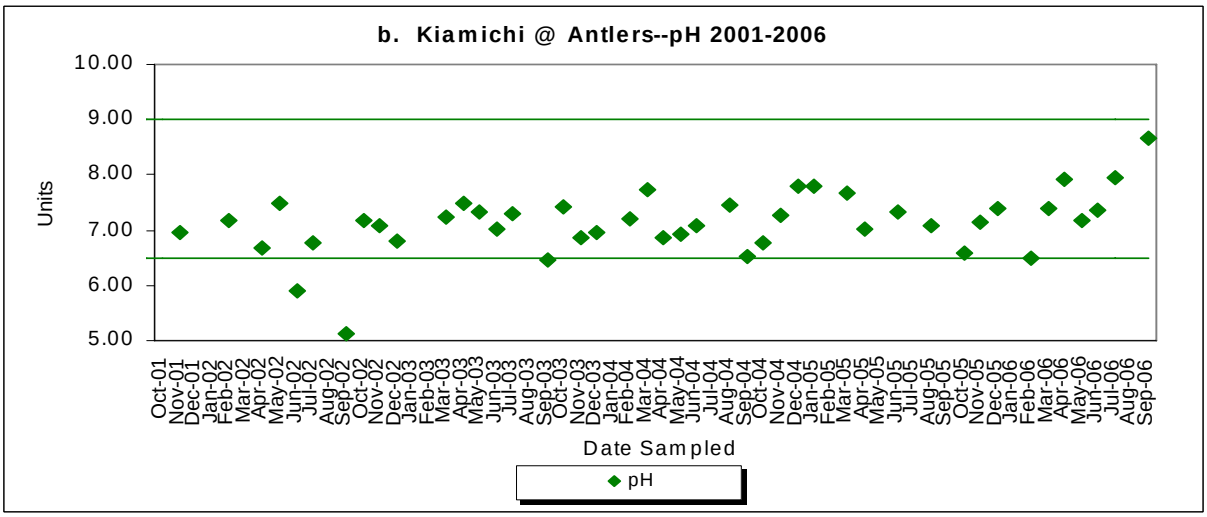
Station AT336200 (410300030010-001AT) is a permanent ambient trend monitoring station located on the Kiamichi River in Oklahoma. Situated in the southwestern portion of Pushmataha County, the site was established north of the town of Antlers on US Highway 271. The station is positioned near the midpoint of stream segment 410300030010 and is classified within the Kiamichi River 8 digit HUC watershed (11140105). Water enters the stream system from several tributaries including Lily Pond Creek, Buck Creek, Tenmile Creek, Cedar Creek, and Duck Creek, among others.

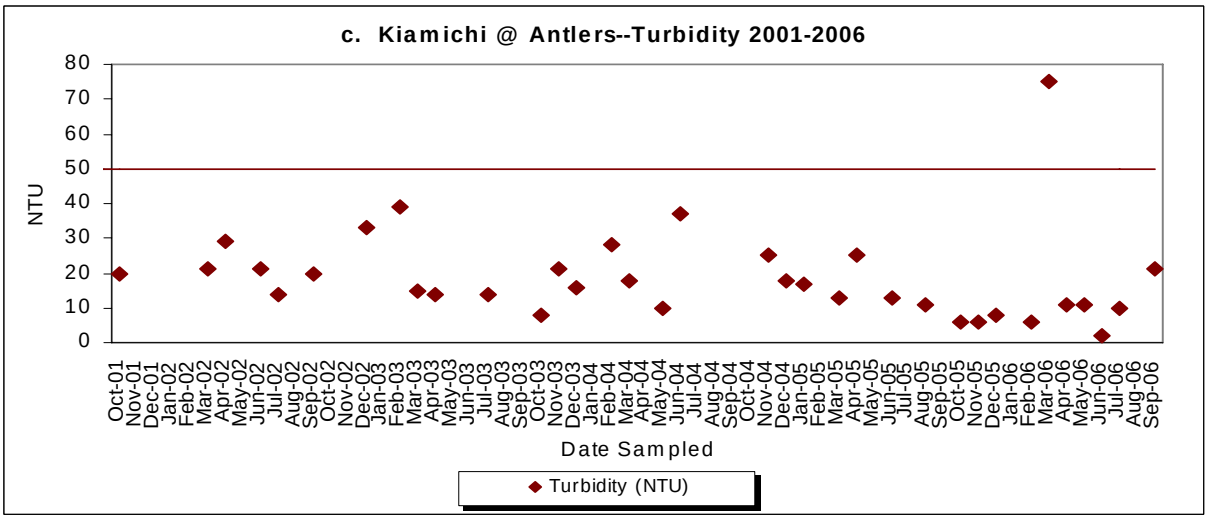
This station on the Kiamichi River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through October of 2006. For purposes of reporting, this station is representative of the Kiamichi River from below the confluence of Caney Creek (95.5955, 34.3819) downstream to below the confluence of Duck Creek with the Kiamichi River (95.4968, 34.2398). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the ten (10) lead samples collected, 10 of the concentrations (or 100%) exceeded the hardness-specific chronic criteria of 0.36 ug/L (Table 32). Of the eleven (11) copper samples collected, three (3) of the concentrations (or 27%) exceeded the hardness-specific acute criterion of 3.85 ug/L (Table 32). Dissolved oxygen (Figure 94a), pH (Figure 94b) and turbidity (Figure 94c) samples met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that the segment is supporting a healthy biological community. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 26 (maximum 30) and fish condition score of 13 (maximum 15) for a total score of 39. This is above the assigned supporting threshold of 35 for Ouachita Mountain warm water aquatic communities [OAC 46:15-5(h)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 94d and e). The PBCR beneficial use is not supported (Table 33). Of the seventeen (17) enterococci concentrations, five (5) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (93.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Kiamichi River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 94f). Furthermore, the mean sestonic chlorophyll-a concentration (10.5 mg/M^3) produced a TSI of 53, which is below the threshold TSI of 62.

Figure 94 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Antlers (AT336200), 2001-2006.







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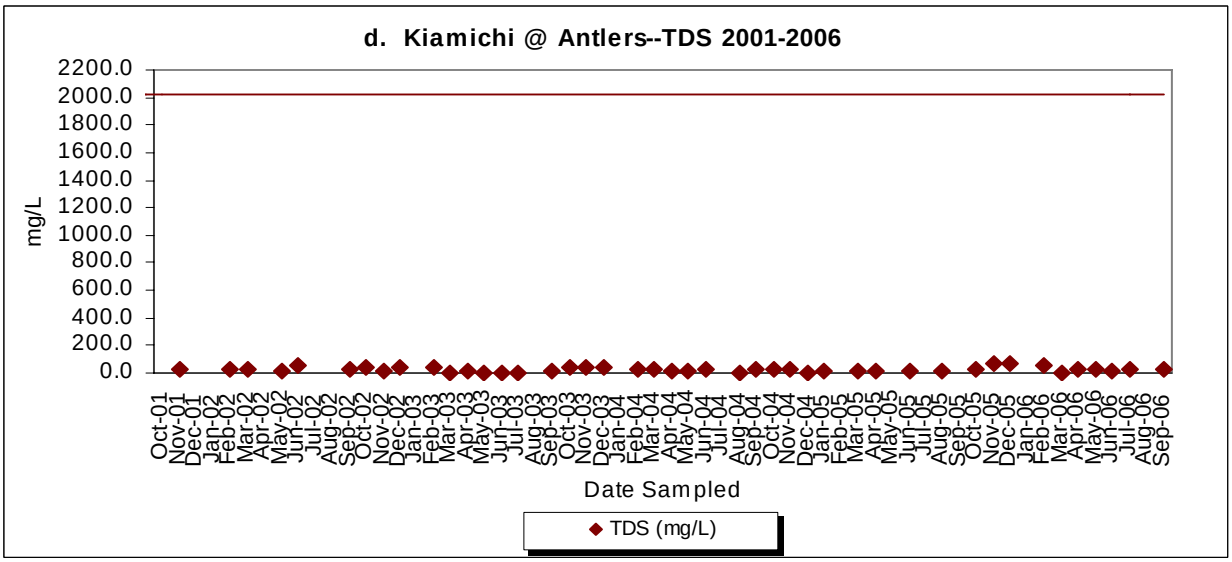
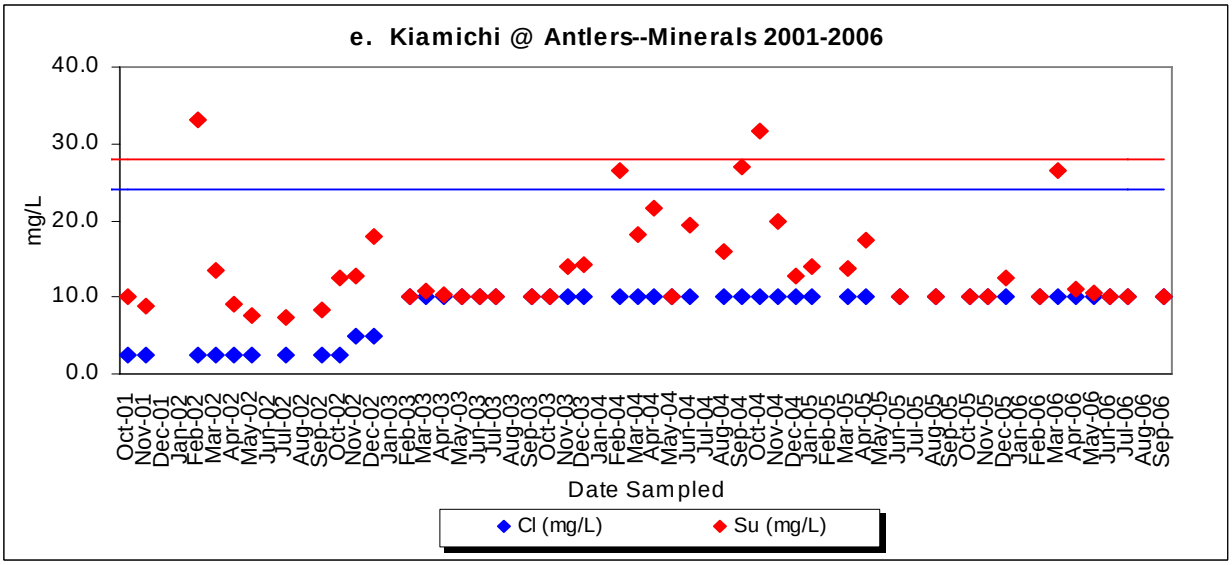
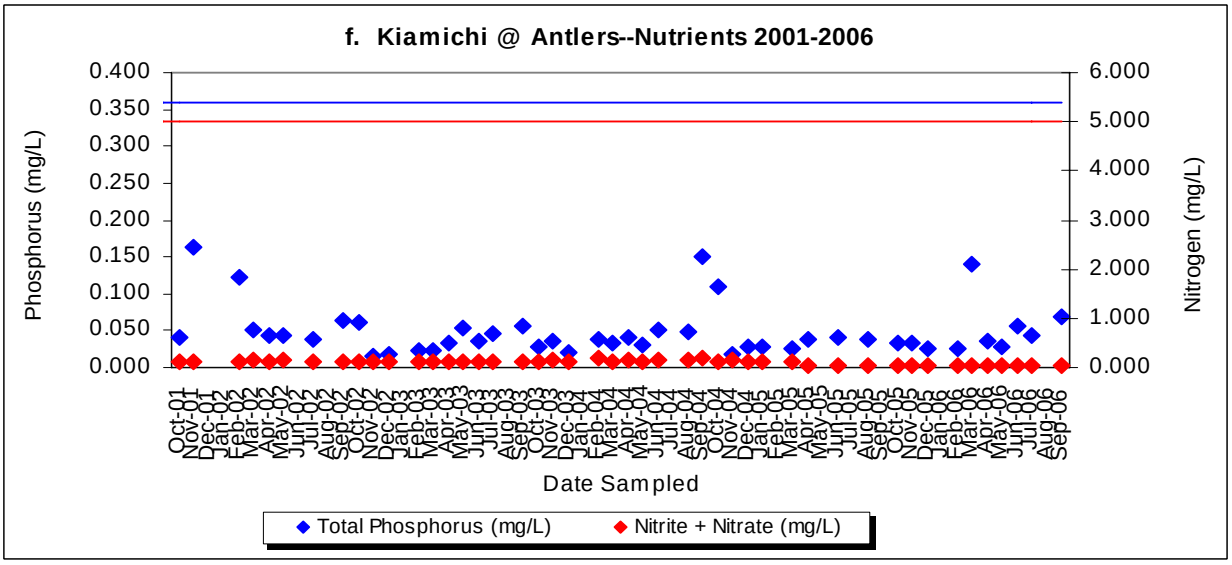

d. Kiamichi @ Antlers--TDS 2001-2006
mg/L
2200.0
2000.0
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


e. Kiamichi @ Antlers--Minerals 2001-2006
mg/L
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Kiamichi @ Antlers--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

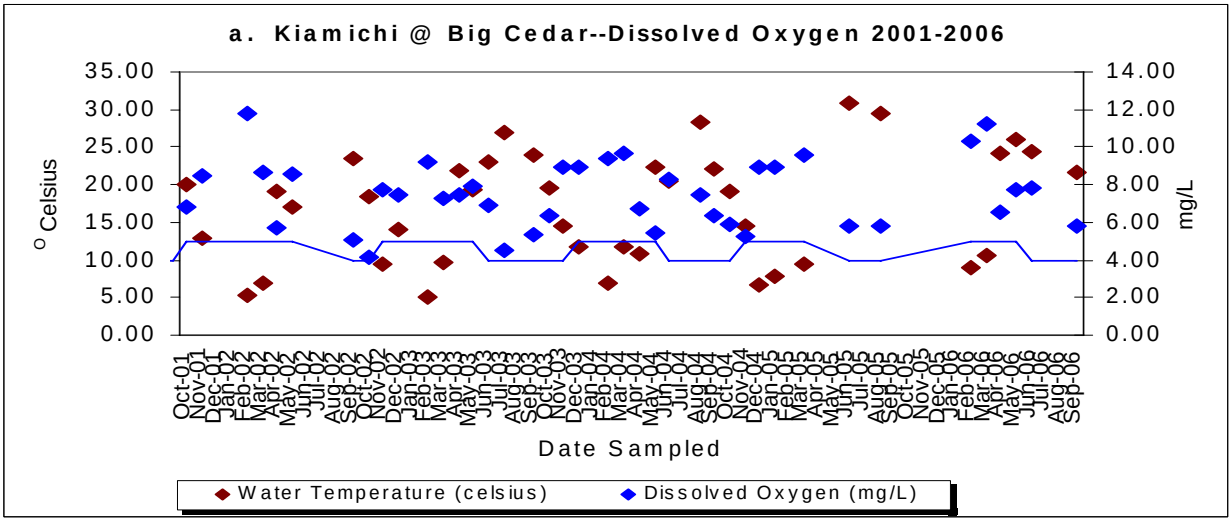
Kiamichi River near Big Cedar

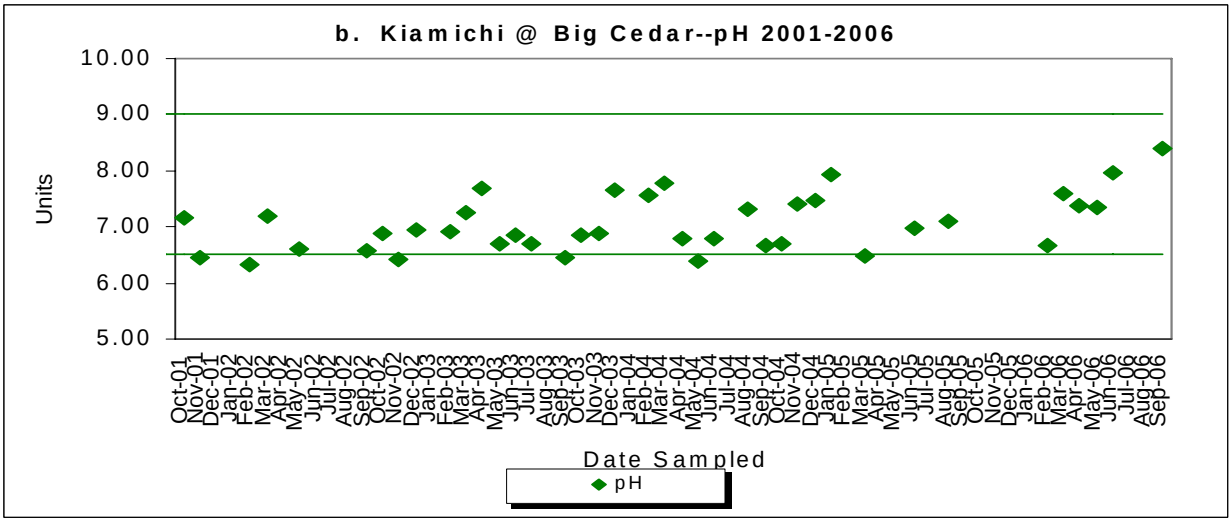
Station AT335700 (410310020010-001AT) is a permanent ambient trend monitoring station located on the Kiamichi River in Oklahoma. Situated in the southeastern portion of LeFlore County, the site was established east of the town of Big Cedar on State Highway 63. The station is positioned near the upper end of stream segment 410310020010 and is classified within the Kiamichi River 8 digit HUC watershed (11140105). Water enters the stream system from Arkansas and from several tributaries including Pigeon Creek and Billy Creek, among others.

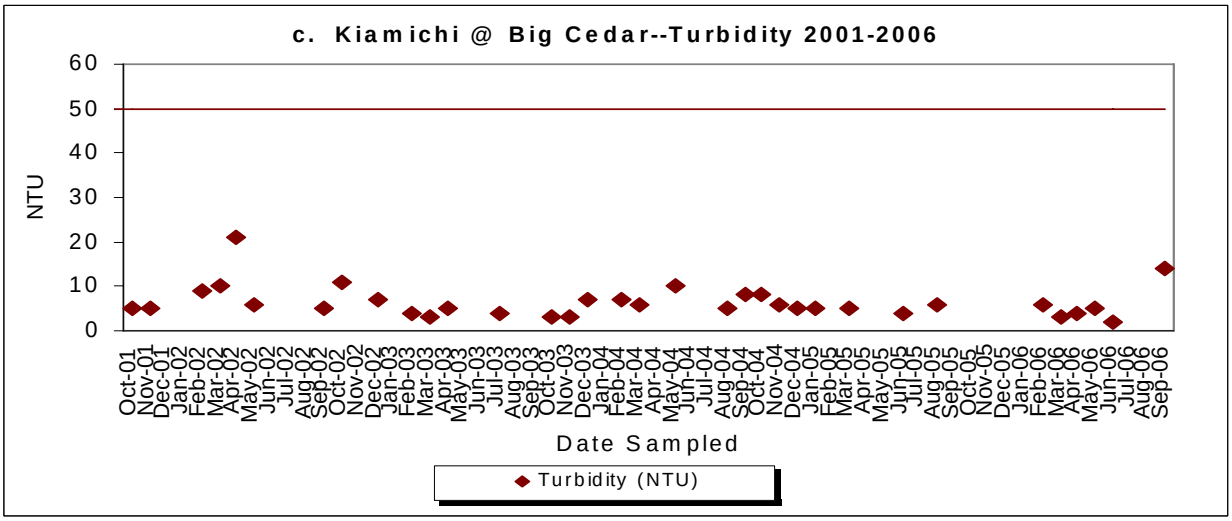
This station on the Kiamichi River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Kiamichi River from its entrance into Oklahoma near Fogel, Arkansas (97.4561, 34.6783) downstream to above the confluence of Rock Creek with the Kiamichi River (95.0157, 34.6813). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the eleven (11) lead samples collected, seven (7) of the concentrations (or 64%) exceeded the hardness-specific chronic criteria of 0.29 ug/L (Table 32). Of the thirty-nine (39) pH concentrations (Figure 95b), six (6) of the samples (or 15%) were below the minimum standard of 6.5 units. Dissolved oxygen (Figure 95a) and turbidity samples (Figure 95c) met the criteria prescribed in the WWAC beneficial use. Fish collected during the summer of 2005 indicate that whether the segment is supporting a healthy biological community is currently indeterminate. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 20 (maximum 30) and fish condition score of 13 (maximum 15) for a total score of 33. This is between the assigned non-supporting and supporting thresholds of 25-34 for Ouachita Mountain warm water aquatic communities [OAC 46:15-5(h)]. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 95d and e). The PBCR beneficial use is not supported (Table 33). Of the sixteen (16) enterococci concentrations, one (1) sample exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (48.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Kiamichi River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 1.0 mg/L and 4.65 mg/L, respectively (Figure 95f).

Figure 95 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Big Cedar (AT335700), 2001-2006.







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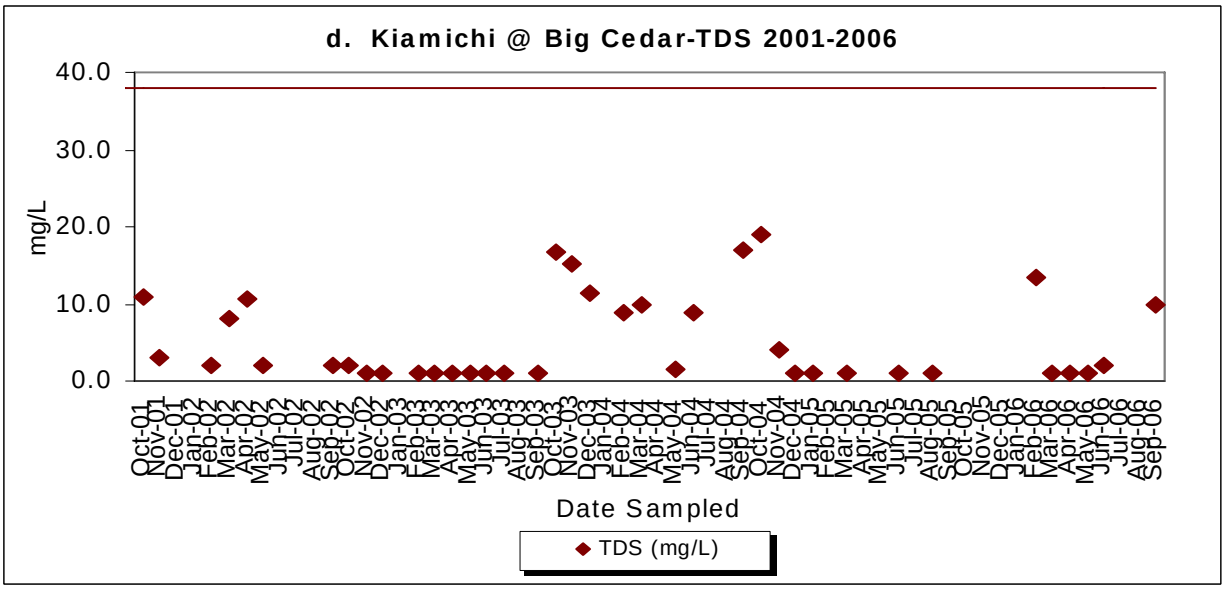
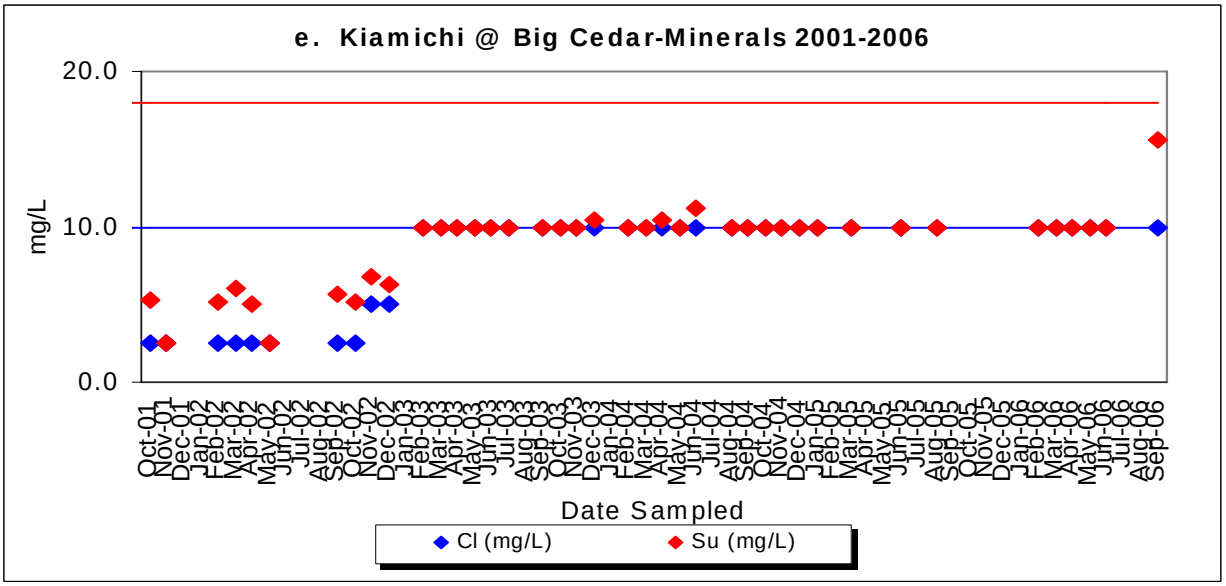
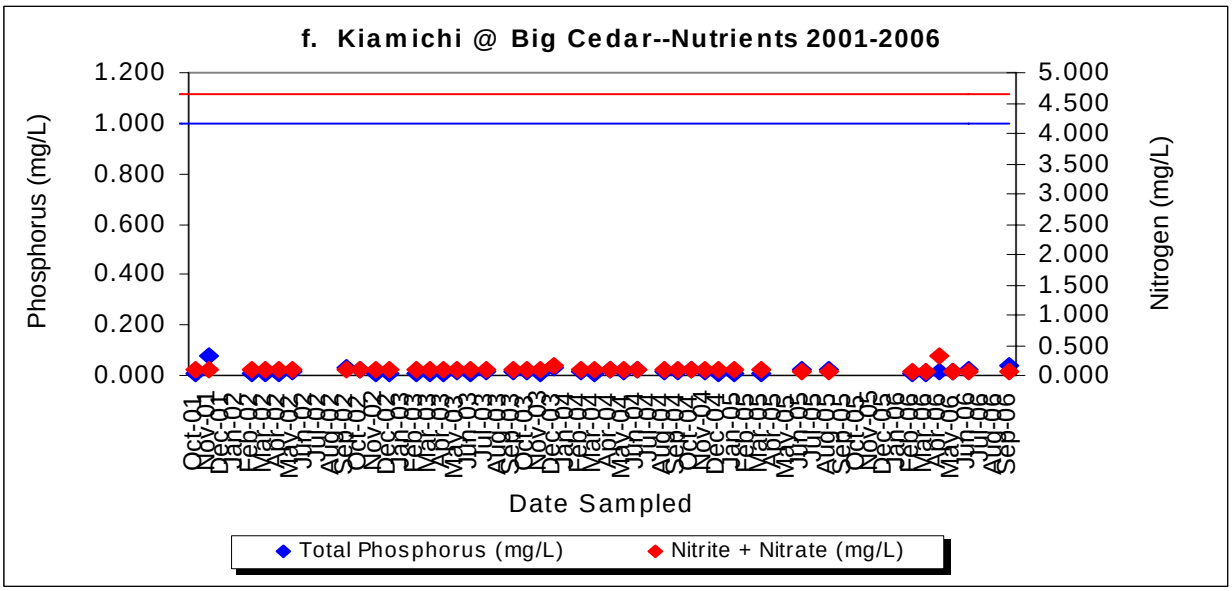

d. Kiamichi @ Big Cedar-TDS 2001-2006
mg/L
40.0
30.0
20.0
10.0
0.0
Date Sampled
TDS (mg/L)


e. Kiamichi @ Big Cedar-Minerals 2001-2006
mg/L
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Kiamichi @ Big Cedar--Nutrients 2001-2006
Phosphorus (mg/L)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
Nitrogen (mg/L)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

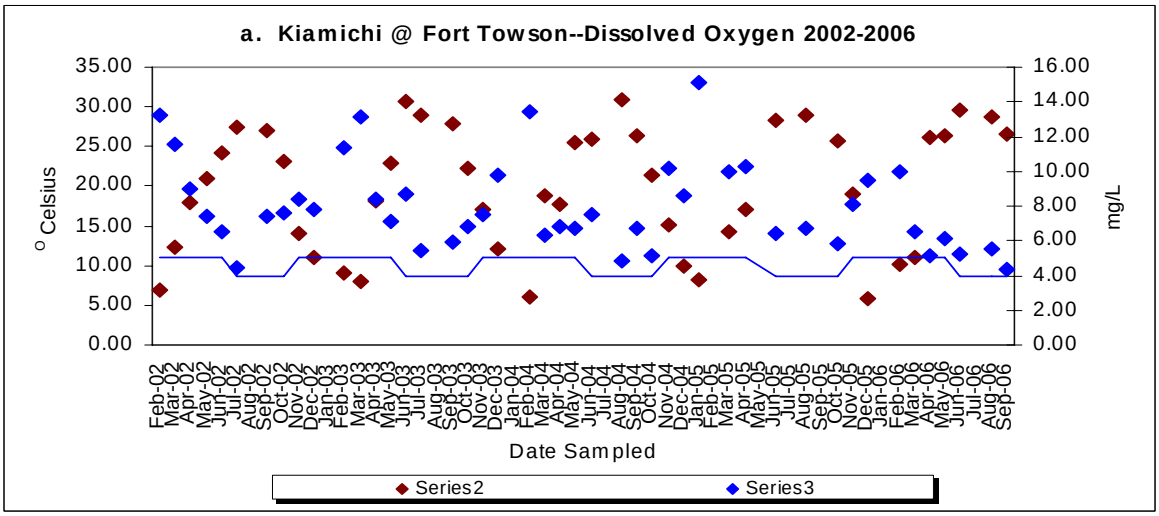
Kiamichi River near Fort Towson

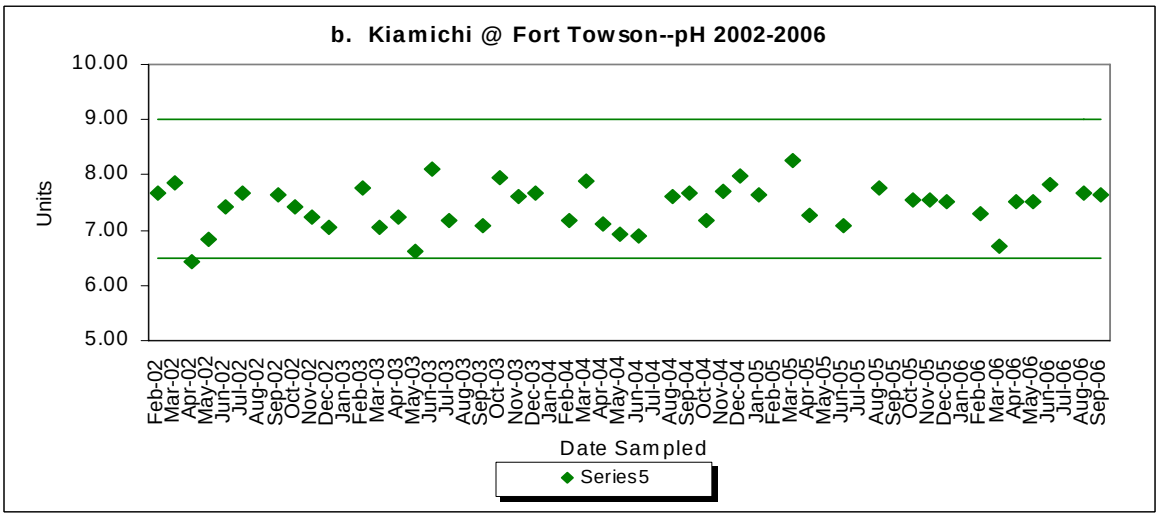
Station AT336710 (410300010010-002AT) is a permanent ambient trend monitoring station located on the Kiamichi River in Oklahoma. Situated in the southeastern portion of Choctaw County, the site was established south of the town of Ft. Towson on State Highway 109. The station is positioned between the midpoint and the terminal end of stream segment 410300010010 and is classified within the Kiamichi River 8 digit HUC watershed (11140105). Water enters the stream system from several tributaries including Hugo Lake and Bird Creek, among others.

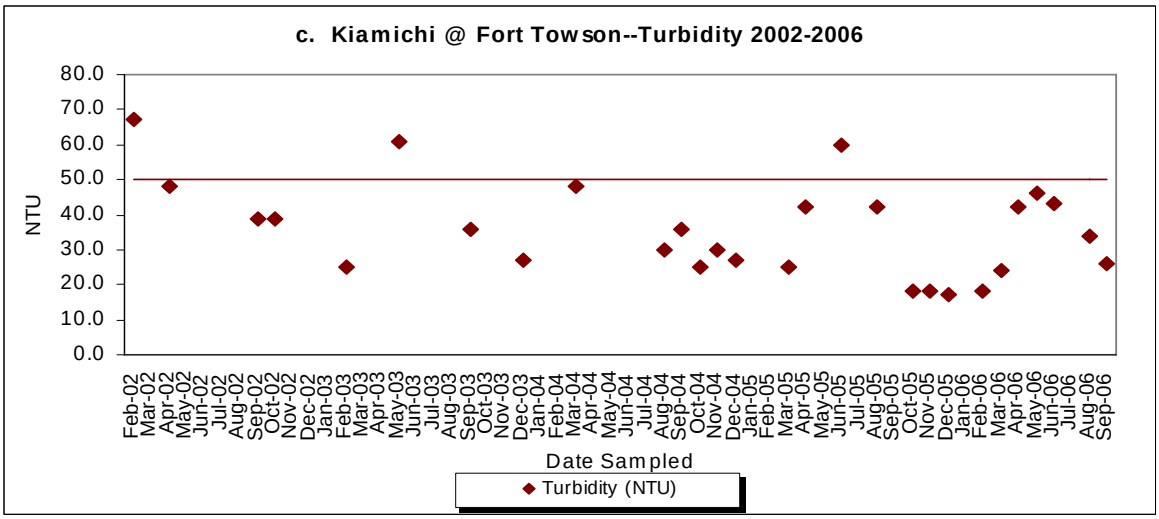
This station on the Kiamichi River has been active for all water quality variables since February of 2002. The following assessment of beneficial uses is based on data collected from February of 2002 through September of 2006. For purposes of reporting, this station is representative of the Kiamichi River from below the Hugo Lake Dam (95.3829, 34.0097) downstream to confluence of the Kiamichi River with the Red River (95.2297, 33.9616). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is supported. Dissolved oxygen (Figure 96a), pH (Figure 96b), and turbidity samples (Figure 96c) met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 96d and e). Although 16% of the sulfate concentrations exceeded the sample standard of 28 mg/L, the values are below the prescribed minimum standard of 250 mg/L. The PBCR beneficial use is not supported (Table 33). Of the fourteen (14) enterococci concentrations, 2 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (50.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Kiamichi River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 96f).

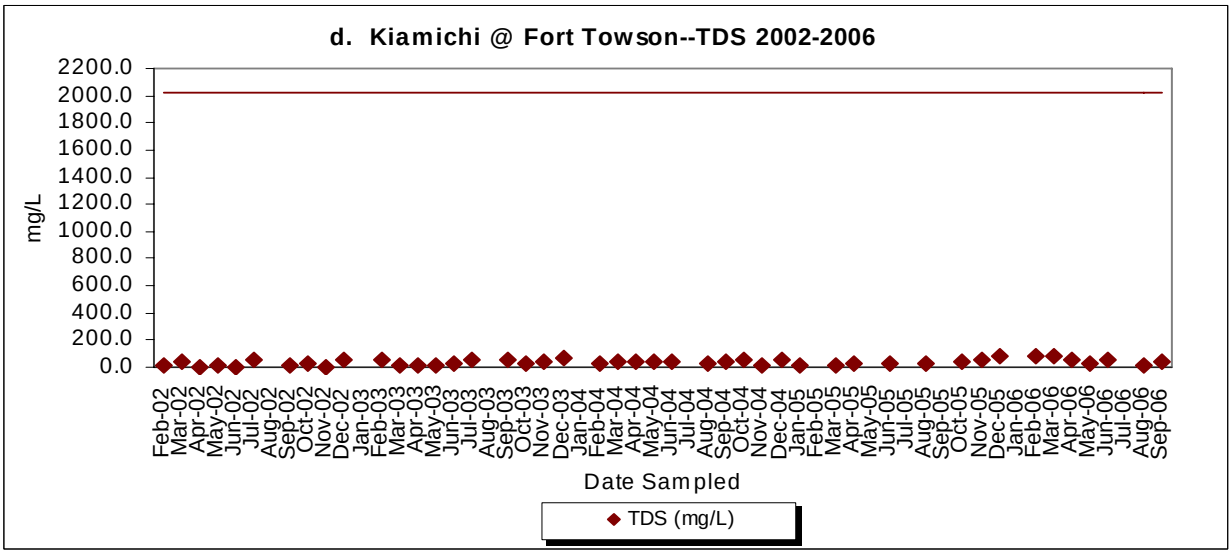
Figure 96 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Fort Townson (AT336710), 2002-2006.

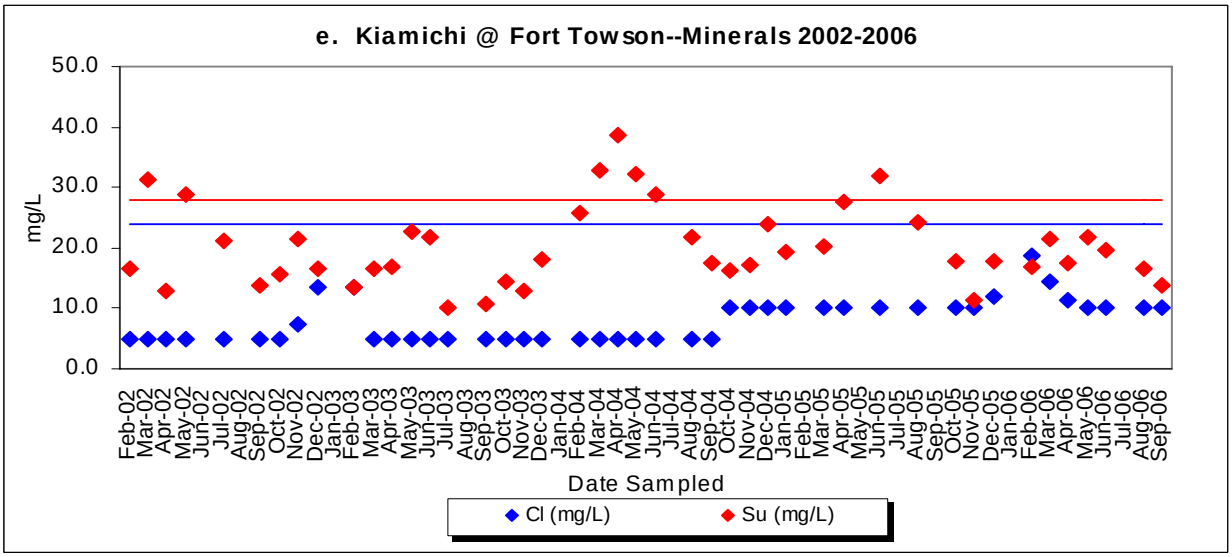


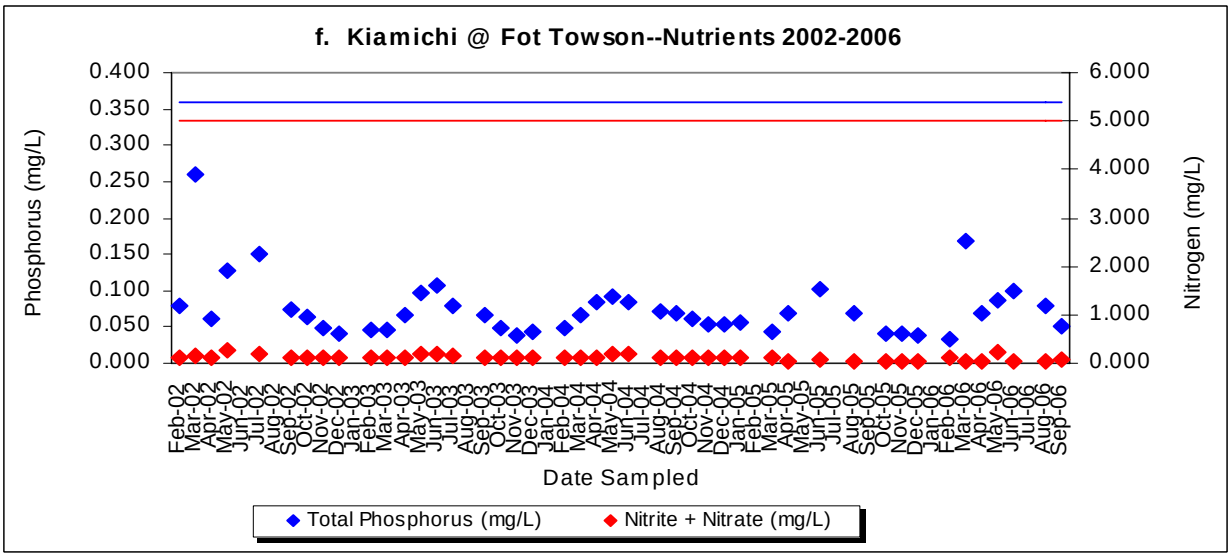




HUC 1114


d. Kiamichi @ Fort Towson--TDS 2002-2006
mg/L
Date Sampled
TDS (mg/L)


e. Kiamichi @ Fort Towson--Minerals 2002-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Kiamichi @ Fot Towson--Nutrients 2002-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

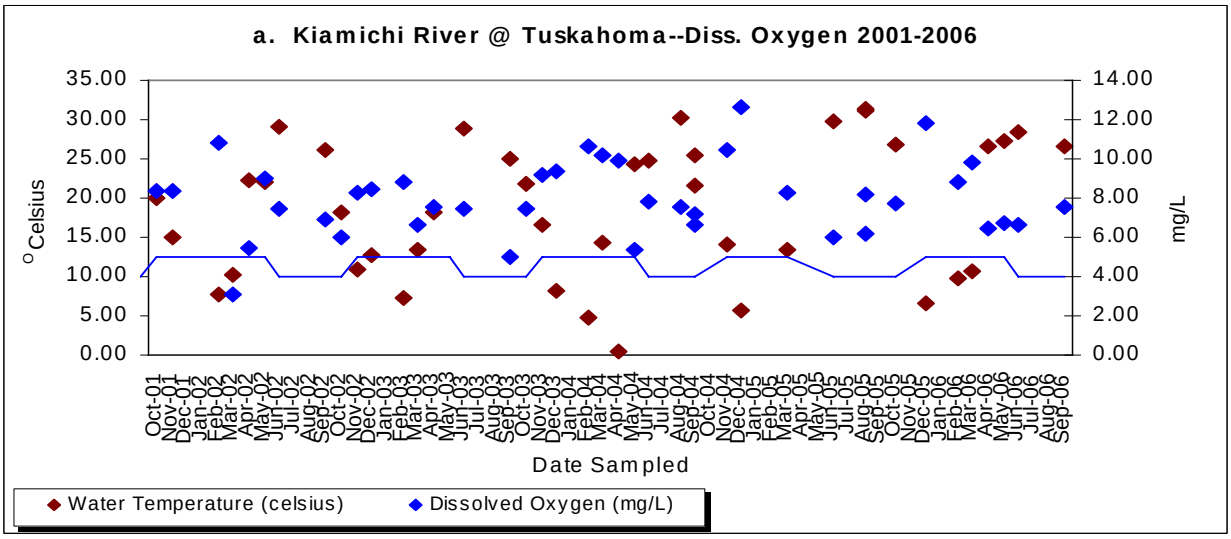
Kiamichi River near Tuskahoma

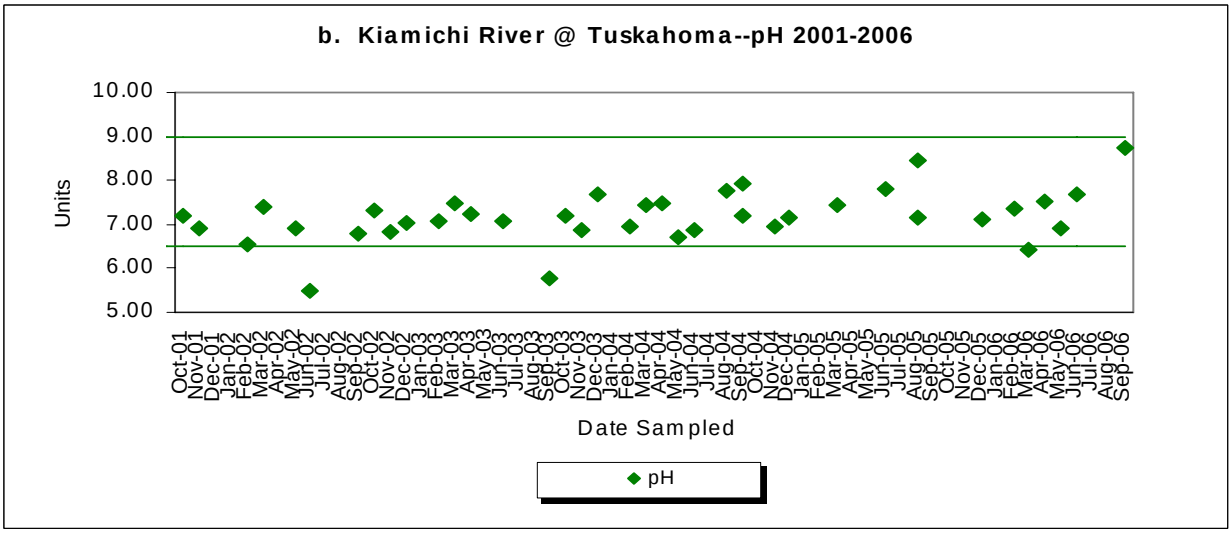
Station AT335780 (410310010010-001AT) is a permanent ambient trend monitoring station located on the Kiamichi River in Oklahoma. Situated in the northeastern portion of Pushmataha County, the site was established south of the town of Tuskahoma off of US Highway 271 on Tuskahoma School Road. The station is positioned near the lower end of stream segment 410310010010 and is classified within the Kiamichi River 8 digit HUC watershed (11140105). Water enters the stream system from several tributaries including Rock Creek (Lake Talihina and Lake Carl Albert), Albion Creek, Cedar Creek, Dry Creek, and Jackfork Creek (Sardis Lake), among others.

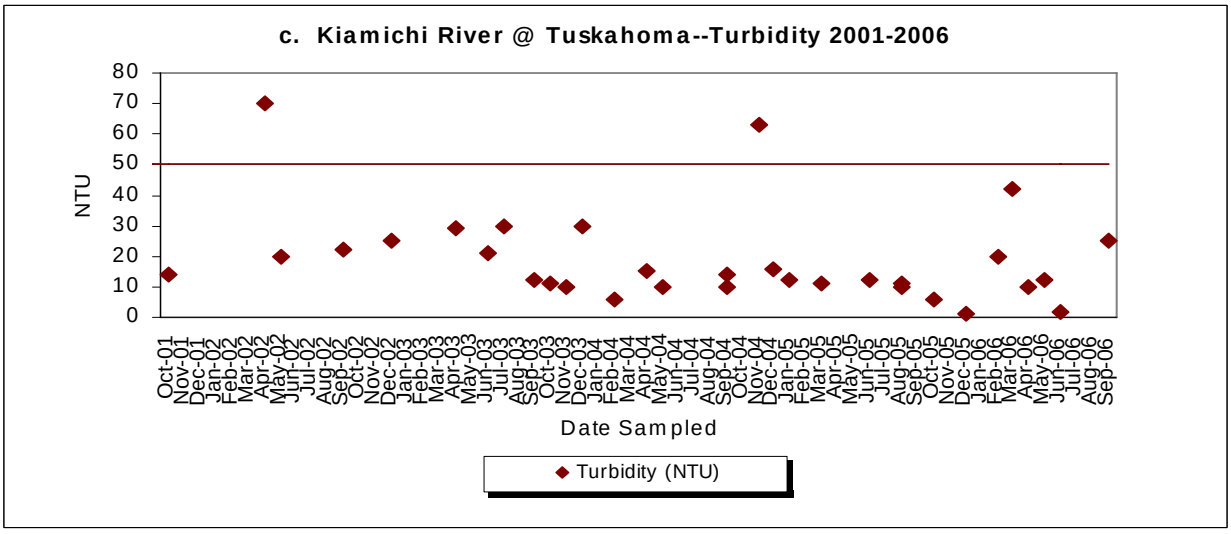
This station on the Kiamichi River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Kiamichi River from the confluence of Rock Creek (95.0157, 34.6813) downstream to confluence of Jackfork Creek with the Kiamichi River (95.3354, 34.5973). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twelve (12) copper samples collected, two (2) of the concentrations (or 17%) exceeded the hardness-specific chronic criterion of 3.37 ug/L (Table 32). Of the eleven (11) lead samples collected, eight (8) of the concentrations (or 73%) exceeded the hardness-specific acute criteria of 0.44 ug/L (Table 32). Dissolved oxygen (Figure 97a), pH (Figure 97b), and turbidity (Figure 97c) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 97d and e). Although 14% of the sulfate concentrations exceeded the sample standard of 18 mg/L, the values are below the prescribed minimum standard of 250 mg/L. The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci samples. This segment of the Kiamichi River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 97f).

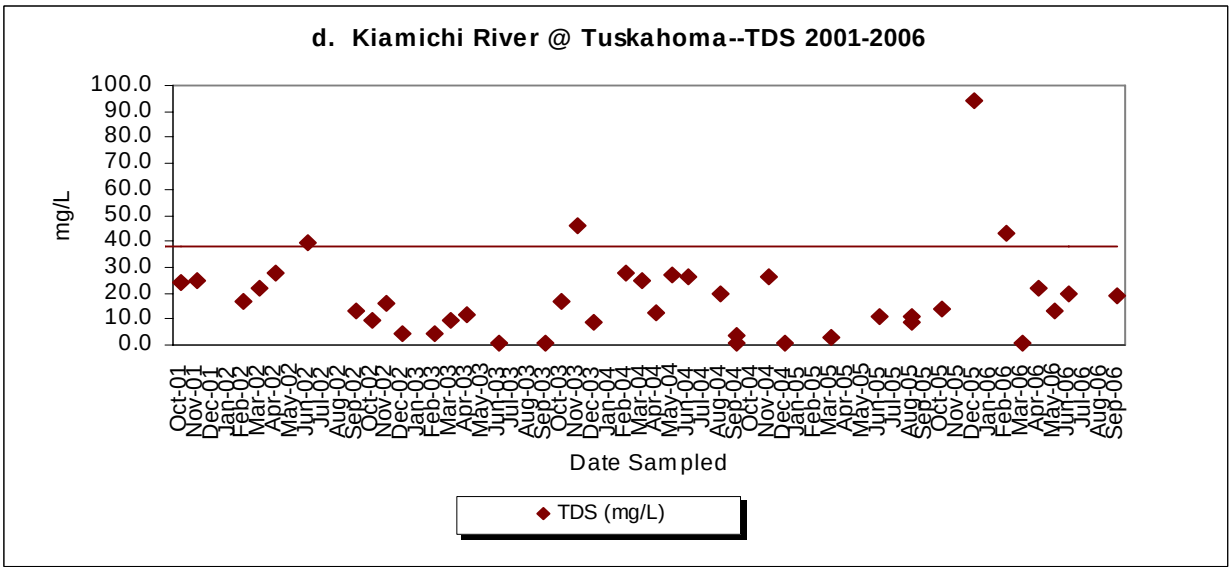
Figure 97 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Kiamichi River at Tuskahoma (AT335780), 2001-2006.

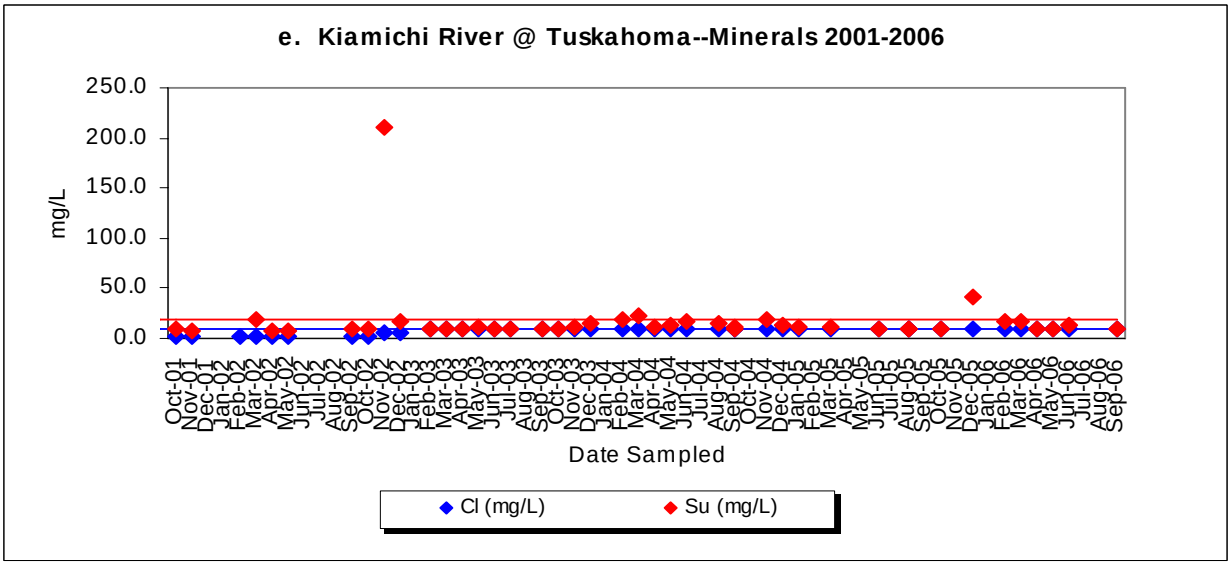


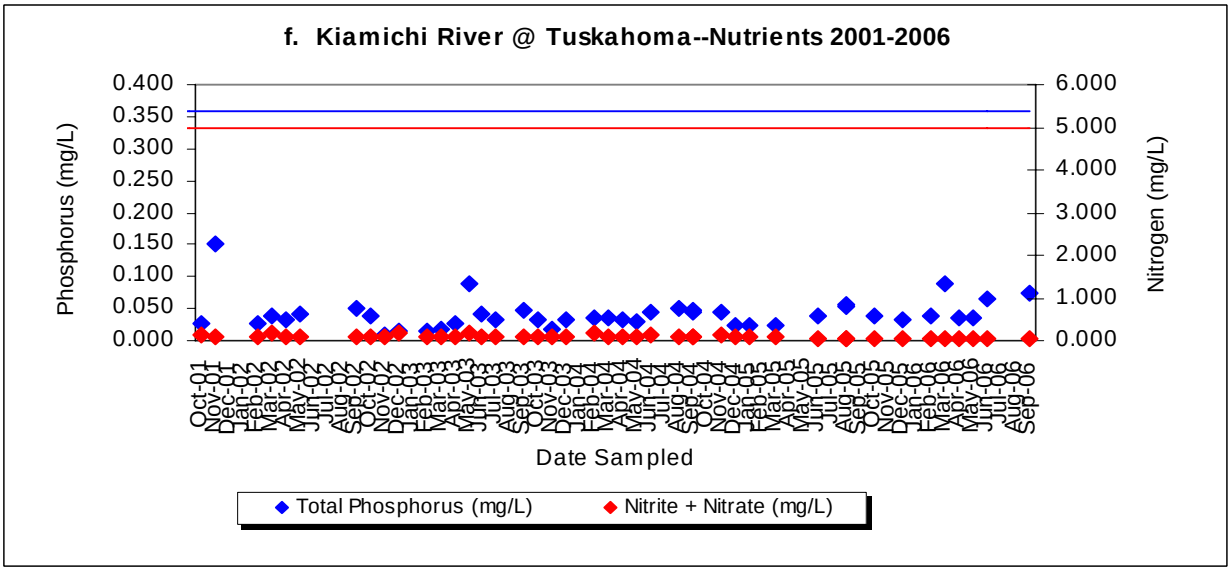




HUC 1114


d. Kiamichi River @ Tuskahoma--TDS 2001-2006
mg/L
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
TDS (mg/L)


e. Kiamichi River @ Tuskahoma--Minerals 2001-2006
mg/L
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Kiamichi River @ Tuskahoma--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

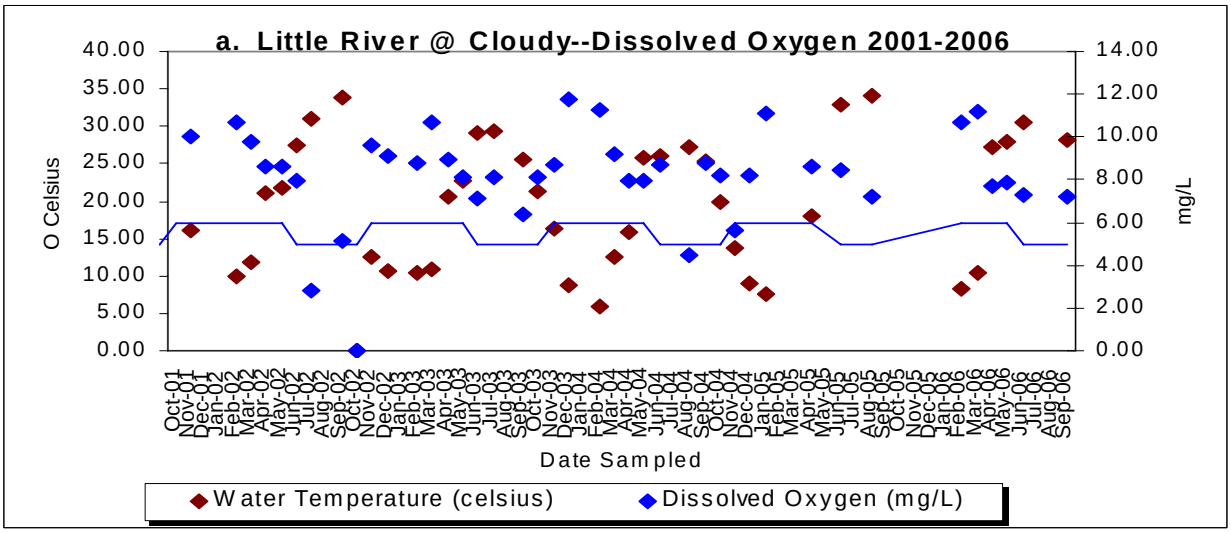
Little River near Cloudy

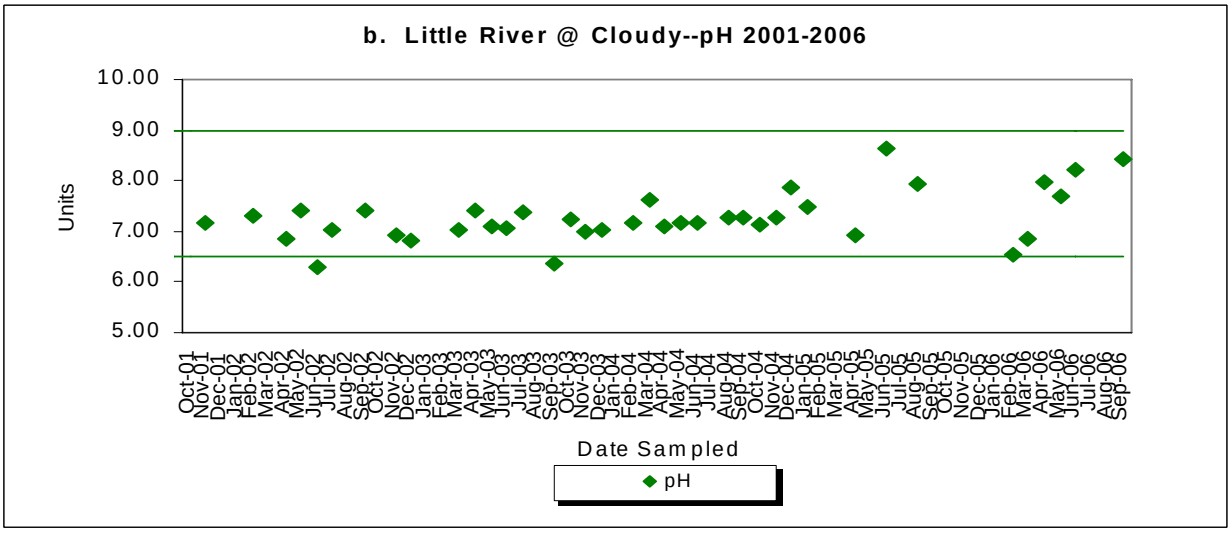
Station AT337100 (410210020140-001AT) is a permanent ambient trend monitoring station located on the Little River in Oklahoma. Situated in the southeastern portion of Pushmataha County, the site was established east-northeast of the town of Cloudy off of State Highway 3 on Cloudy Road. The station is positioned near the midpoint of stream segment 410210020140 and is classified within the Upper Little River 8 digit HUC watershed (11140107). Water enters the stream system from several tributaries including Watson Creek, Jack Creek, Cloudy Creek, Houston Creek, and Terrapin Creek, among others.

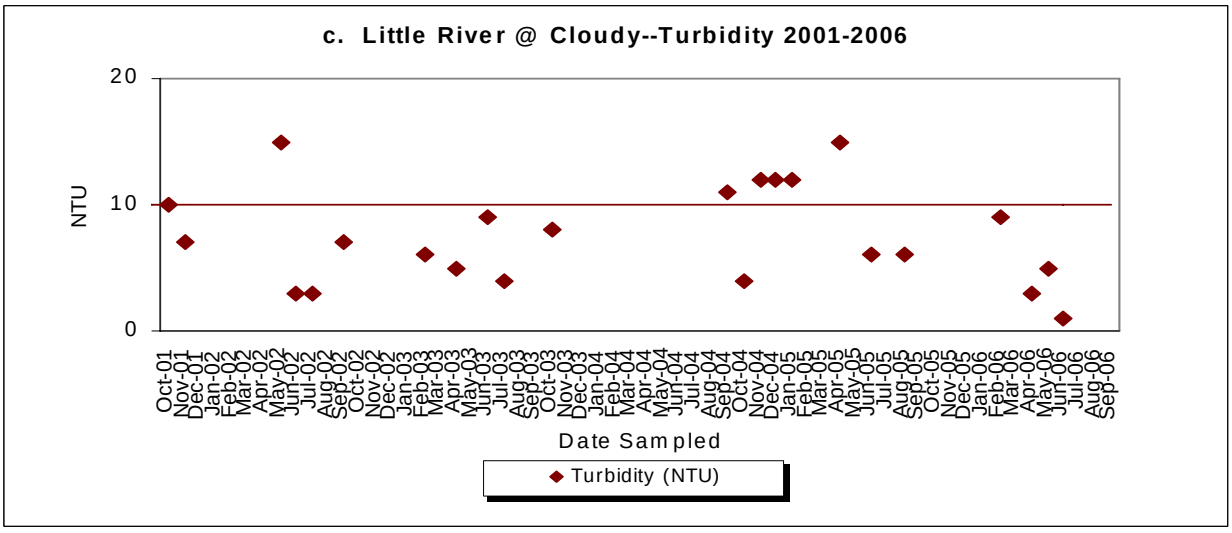
This station on the Little River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Little River from the confluence of Watson Creek (95.1730, 34.4522) downstream to the confluence of the Little River with Pine Creek Lake (95.1293, 34.2264). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the ten (10) lead samples collected, 10 of the concentrations (or 100%) exceeded the hardness-specific chronic criterion of 0.17 ug/L (Table 32). Of the twenty-three (23) turbidity samples (Figure 98c), six (6) samples (or 26%) exceeded the numerical criterion of 10. Dissolved oxygen (Figure 98a) and pH (Figure 98b) data collected during the same period met the criteria prescribed in the CWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 98d and e). The PBCR beneficial use is not supported (Table 33). Of the fifteen (15) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (221.3 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Little River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 98f). Furthermore, the mean sestonic chlorophyll-a concentration (4.3 mg/M^3) produced a TSI of 45, which is below the threshold TSI of 62.

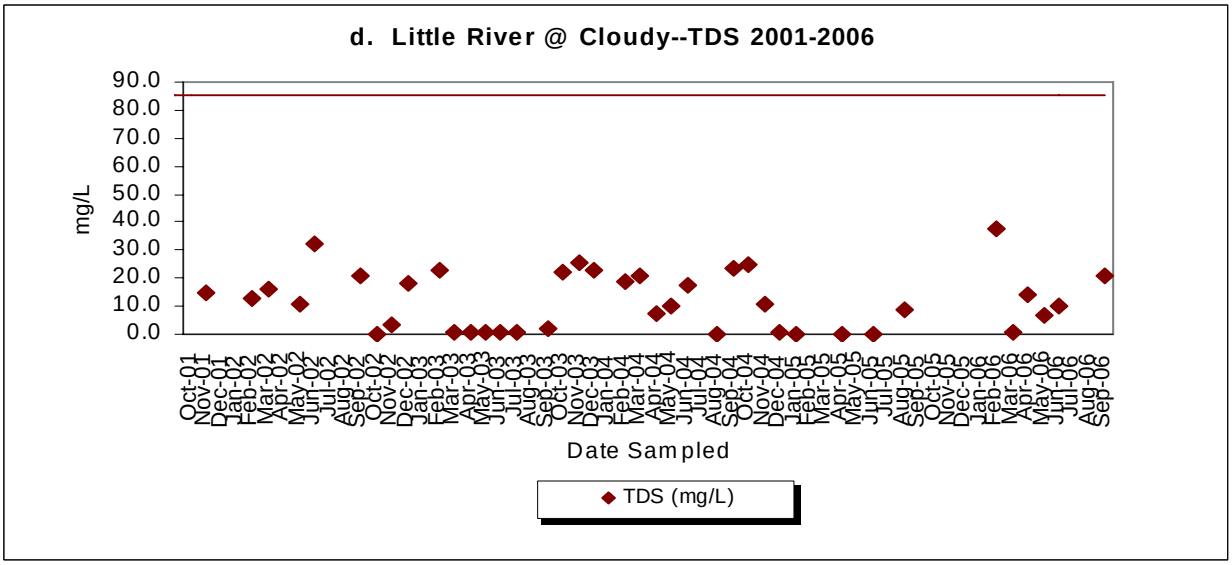
Figure 98 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Cloudy (AT337100), 2001-2006.

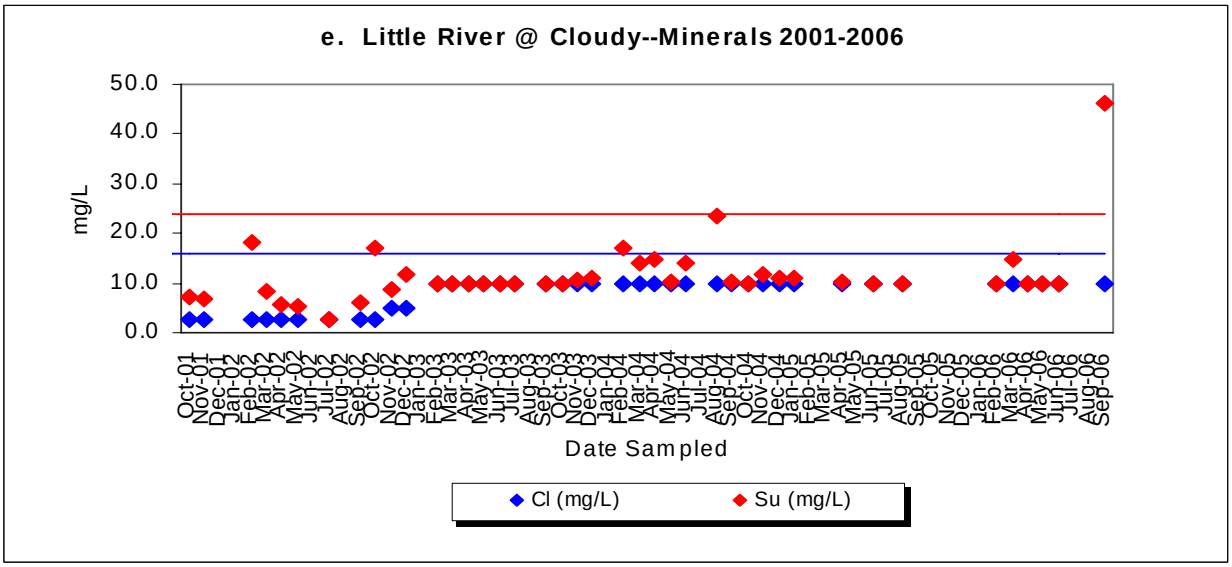


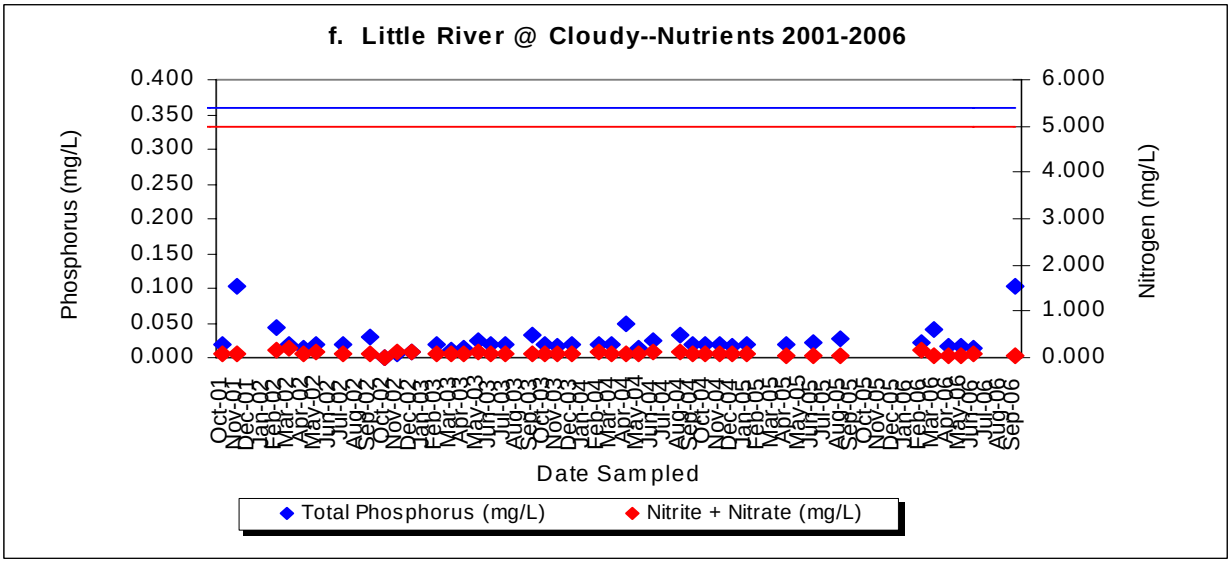




HUC 1114


d. Little River @ Cloudy--TDS 2001-2006
mg/L
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
TDS (mg/L)


e. Little River @ Cloudy--Minerals 2001-2006
mg/L
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Little River @ Cloudy--Nutrients 2001-2006
Phosphorus (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

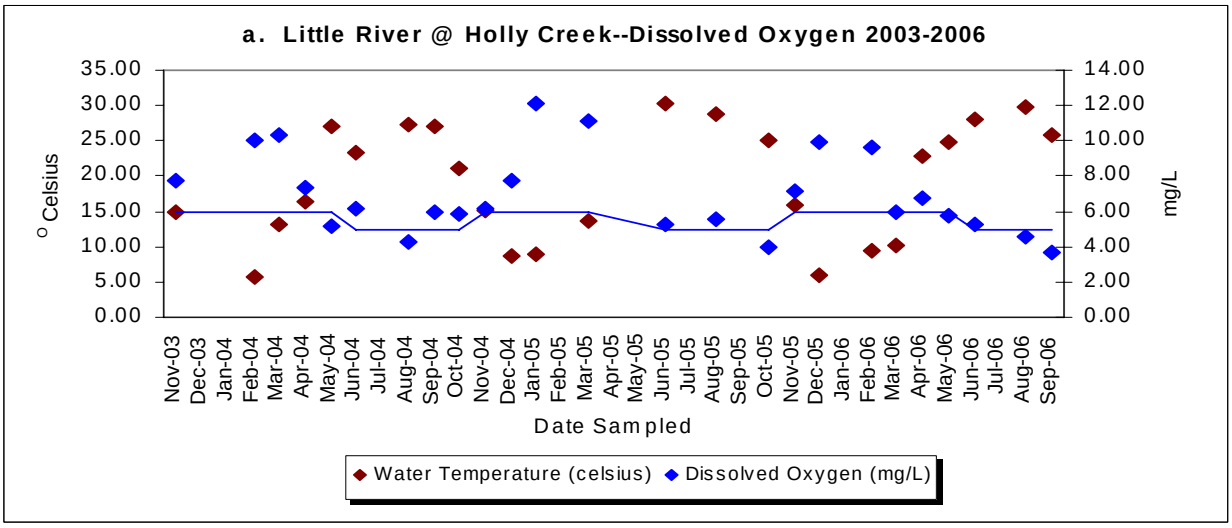
Little River near Holly Creek

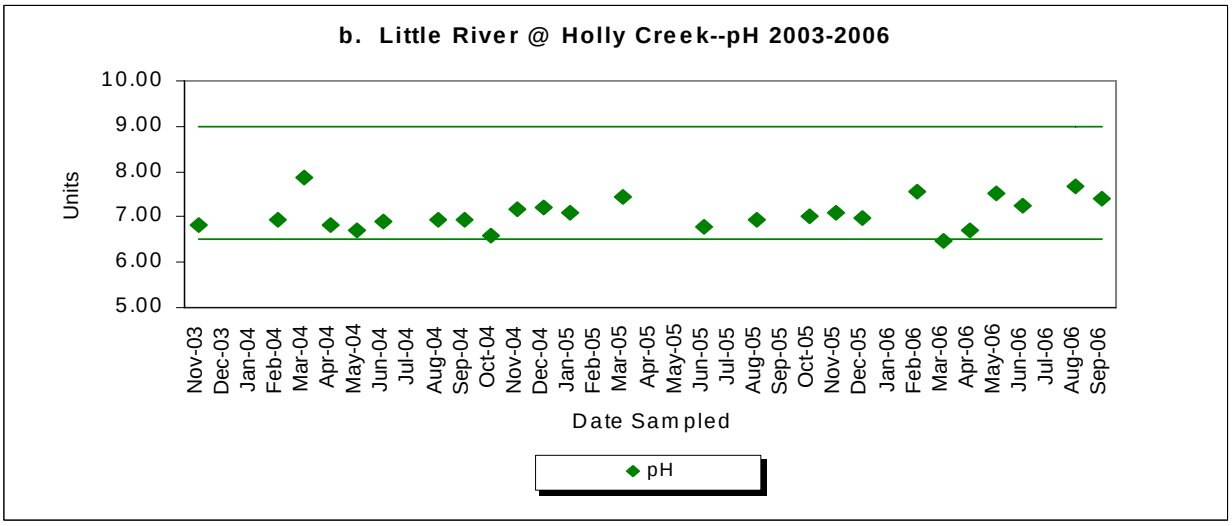
Station AT338000 (410200010200-002AT) is a permanent ambient trend monitoring station located on the Little River in Oklahoma. Situated in the south central portion of McCurtain County, the site was established south of the township of Holly Creek off of US Highway 70. The station is positioned near the lower end of stream segment 410200010200 and is classified within the Upper Little River 8 digit HUC watershed (11140107). Water enters the stream system from several tributaries including the Glover River, Boktuklo Creek, Holly Creek, Lukfata Creek, Yashua Creek, Mud Creek, and Yanubee Creek, among others.

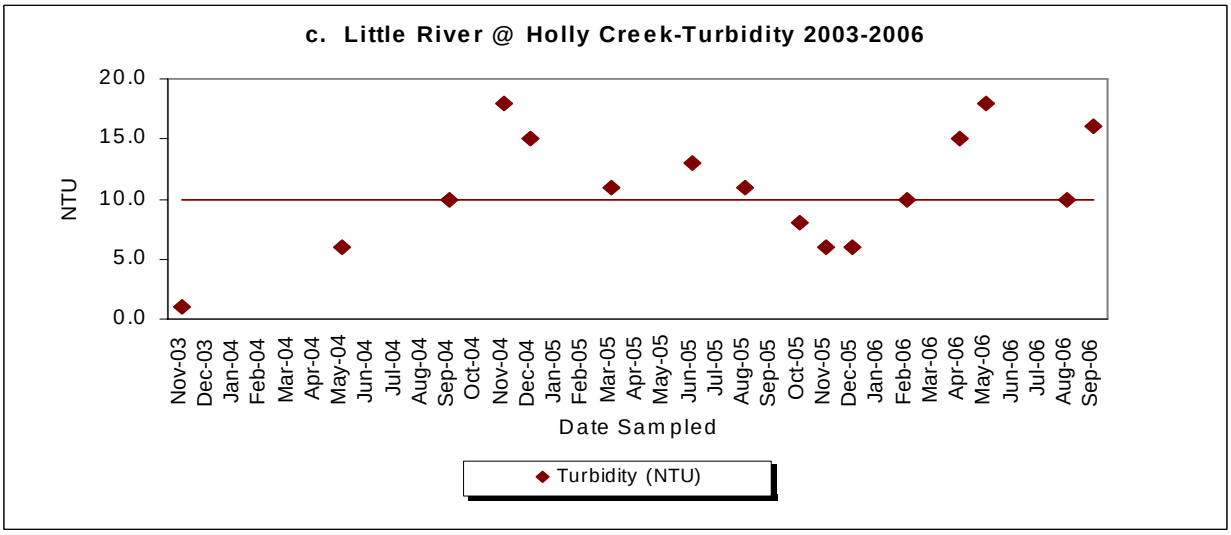
This station on the Little River has been active for all water quality variables since November of 2003. The following assessment of beneficial uses is based on data collected from November 2003 through September of 2006. For purposes of reporting, this station is representative of the Little River from the confluence of the Glover River (94.9379, 34.0192) downstream to confluence of Yanubee Creek with the Little River (94.6887, 33.9443). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the sixteen (16) turbidity samples (Figure 99c), eight (8) samples (or 50%) were above the 10 NTU criterion. Of the twenty-five (25) dissolved oxygen samples (Figure 99a), seven (7) samples (or 28%) were below the screening level. The pH samples (Figure 99b) met the prescribed criterion. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 99d and e). The PBCR beneficial use is indeterminate due to insufficient fecal coliform, *E. coli* and enterococci data. This segment of the Little River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 99f).

Figure 99 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Little River at Holly Creek (AT338000), 2003-2006.







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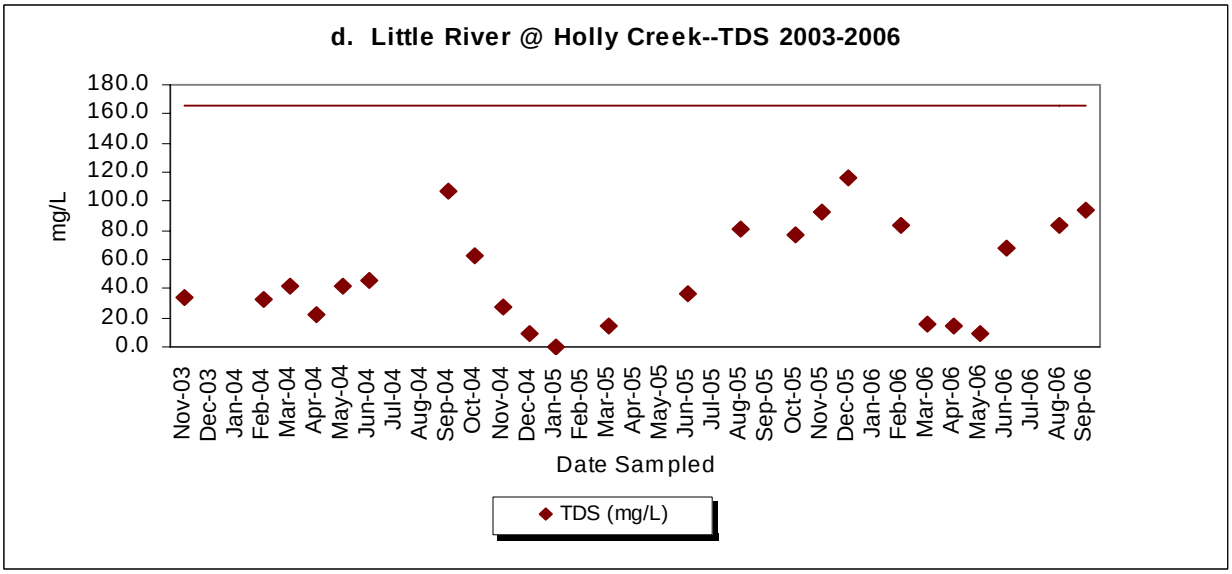
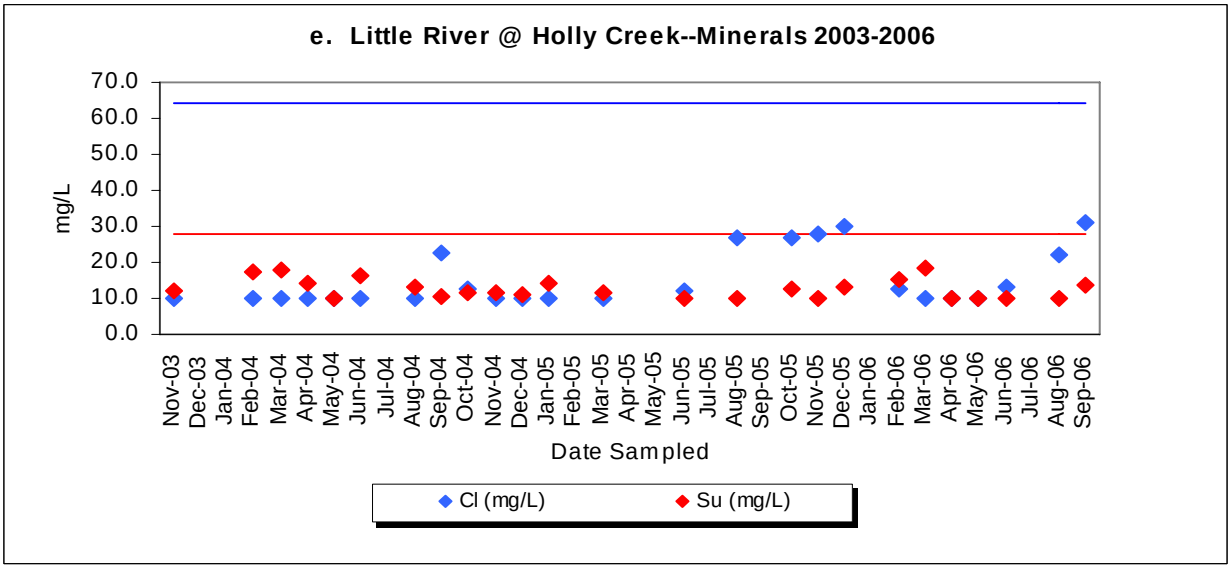
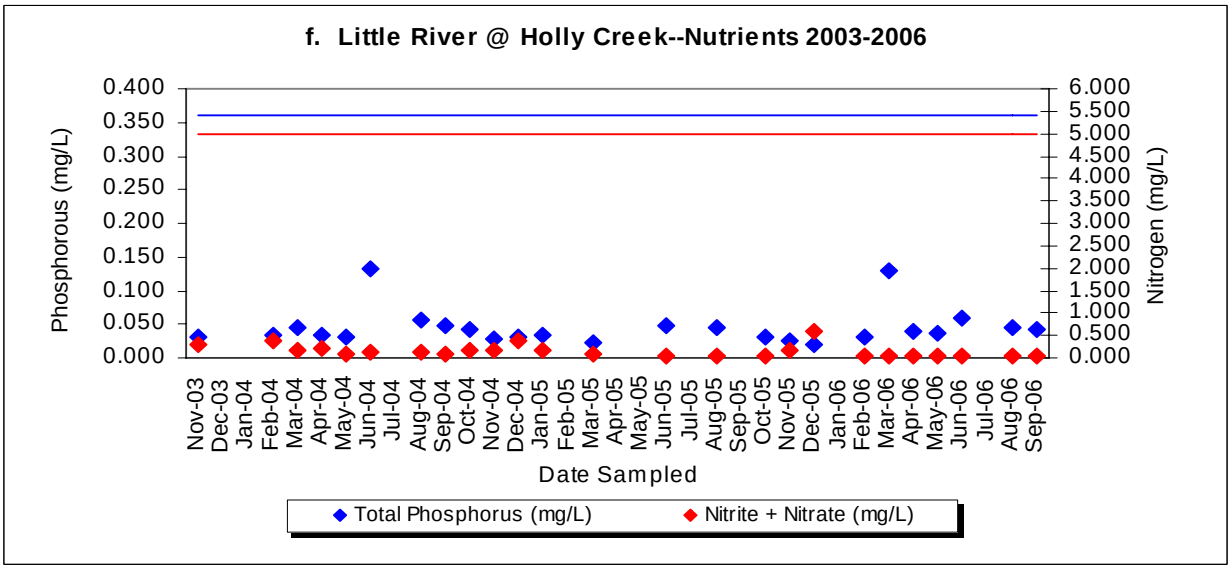

d. Little River @ Holly Creek--TDS 2003-2006
mg/L
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
TDS (mg/L)


e. Little River @ Holly Creek--Minerals 2003-2006
mg/L
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Little River @ Holly Creek--Nutrients 2003-2006
Phosphorous (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.500
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Nov-03 Dec-03 Jan-04 Feb-04 Mar-04 Apr-04 May-04 Jun-04 Jul-04 Aug-04 Sep-04 Oct-04 Nov-04 Dec-04 Jan-05 Feb-05 Mar-05 Apr-05 May-05 Jun-05 Jul-05 Aug-05 Sep-05 Oct-05 Nov-05 Dec-05 Jan-06 Feb-06 Mar-06 Apr-06 May-06 Jun-06 Jul-06 Aug-06 Sep-06
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

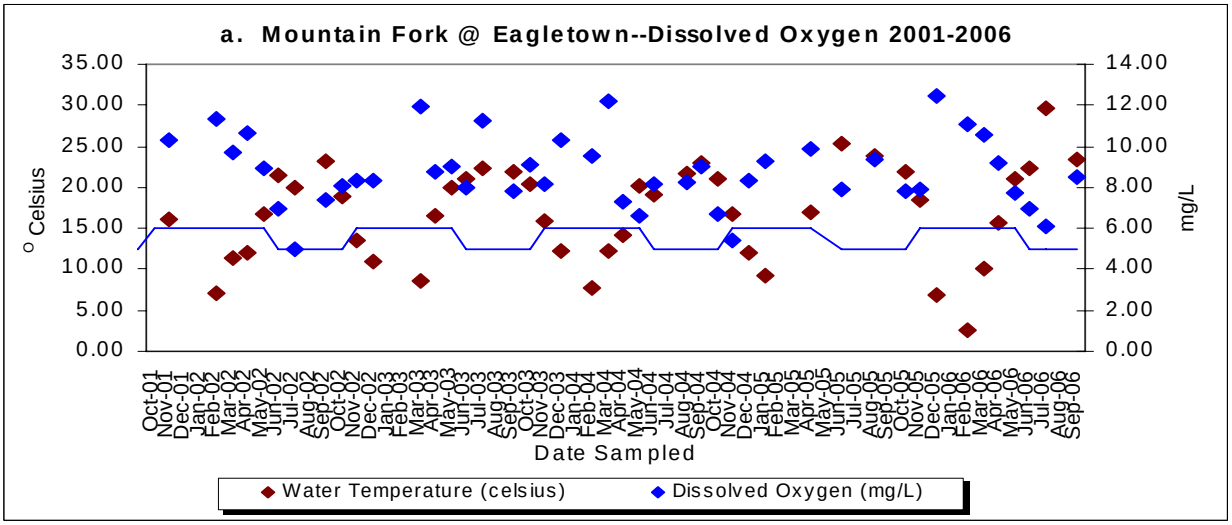
Mountain Fork River near Eagletown

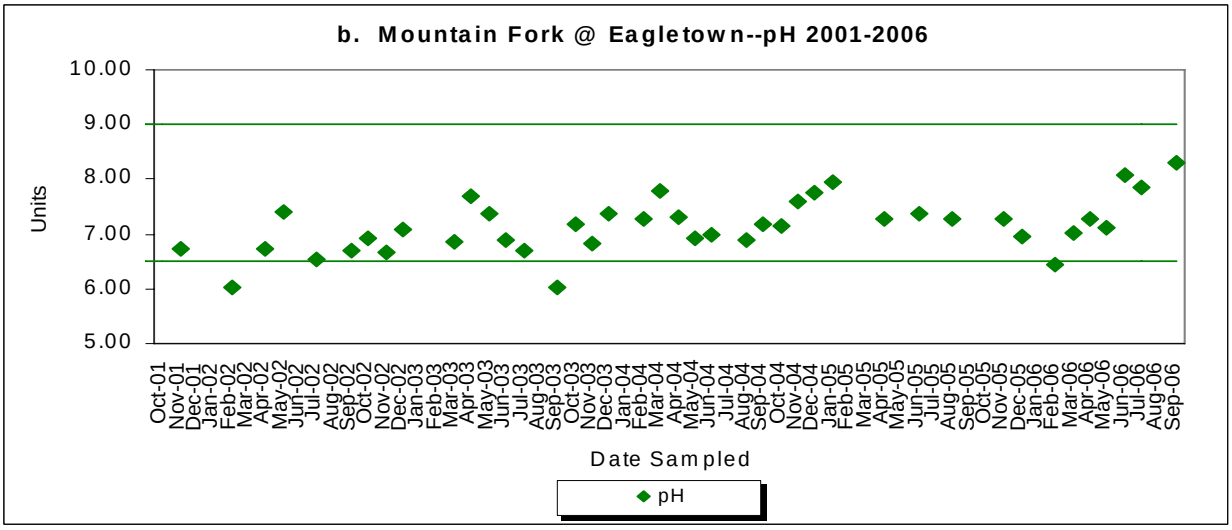
Station AT339000 (410210040010-001AT) is a permanent ambient trend monitoring station located on the Mountain Fork River in Oklahoma. Situated in the east central portion of McCurtain County, the site was established west of the town of Eagletown on US Highway 70. The station is positioned near the upper end of stream segment 410210040010 and is classified within the Mountain Fork River 8 digit HUC watershed (11140108). Water enters the stream system from several tributaries including Cooper Creek, Lick Creek, and Luksuklo Creek, among others.

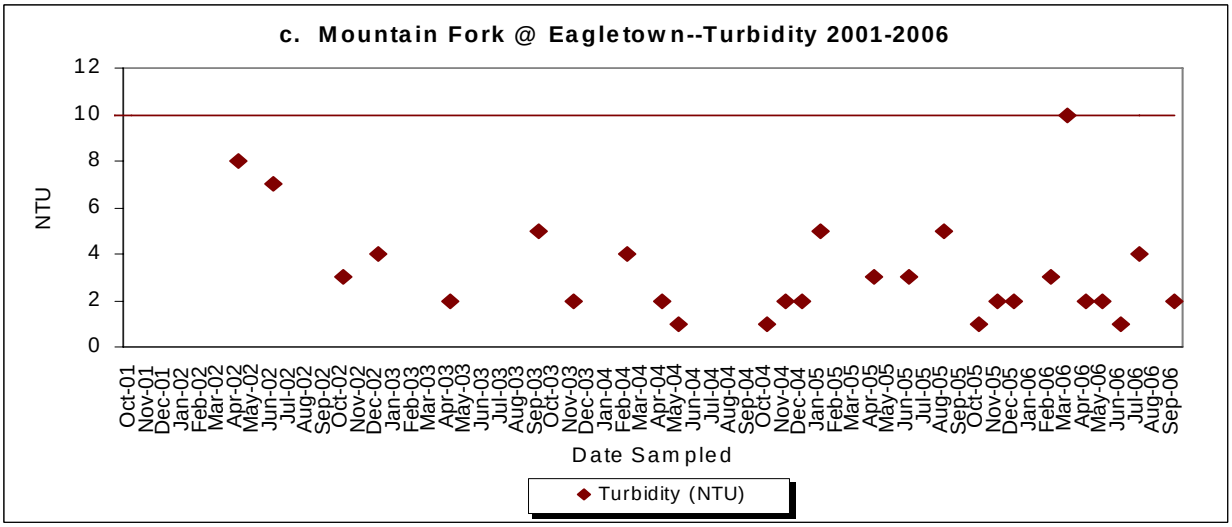
This station on the Mountain Fork River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Mountain Fork River from the confluence of Cooper Creek (94.6195, 34.0567) downstream to confluence of the Mountain Fork River with the Little River (94.5755, 33.9518). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool (Trout) Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the nine (9) lead samples collected, three (3) of the concentrations (or 33%) exceeded the hardness-specific acute criterion of 4.90 ug/L, and eight (8) of the lead concentrations (or 89%) exceeded the hardness-specific chronic criterion of 0.19 ug/L (Table 32). Of the ten 10 cadmium samples collected, two (2) of the concentrations (or 20%) exceeded the hardness-specific chronic criterion of 0.20 ug/L (Table 32). Dissolved oxygen (Figure 100a), pH (Figure 100b), and turbidity (Figure 100c) data met the criteria prescribed in the CWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 100d and e). The PBCR beneficial use is not supported (Table 33). Of the twenty (20) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (81.8 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Mountain Fork River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 100f).

Figure 100 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Mountain Fork River at Eagletown (AT339000), 2001-2006.







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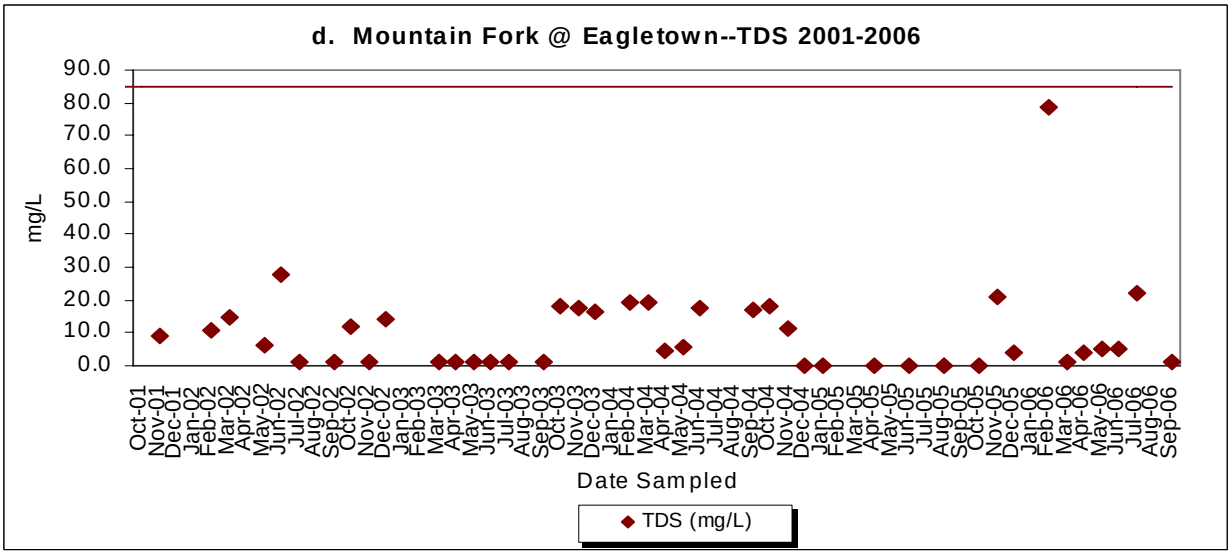
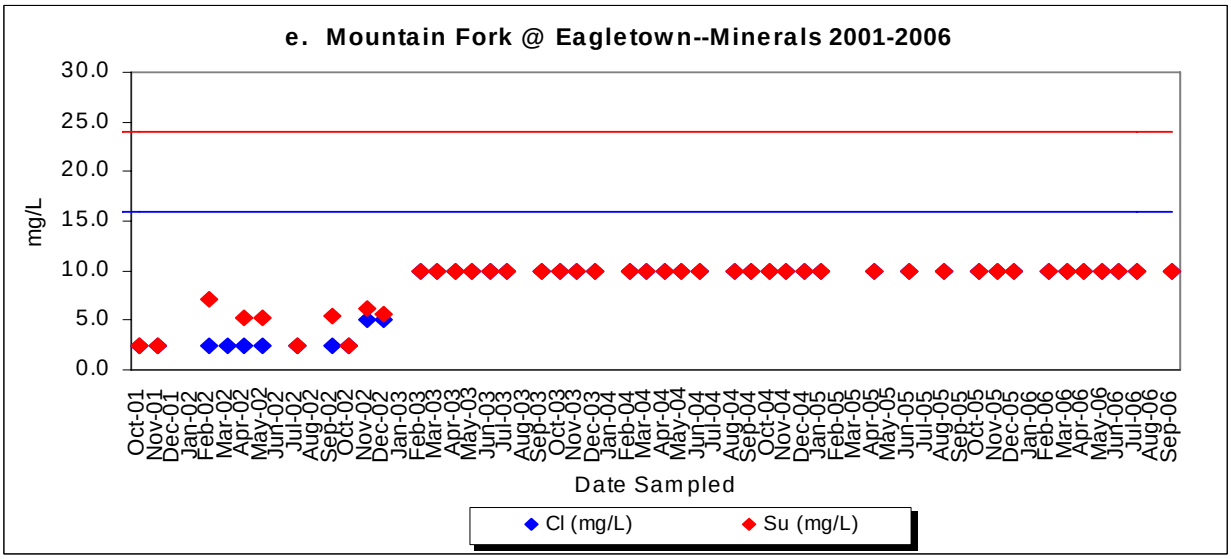
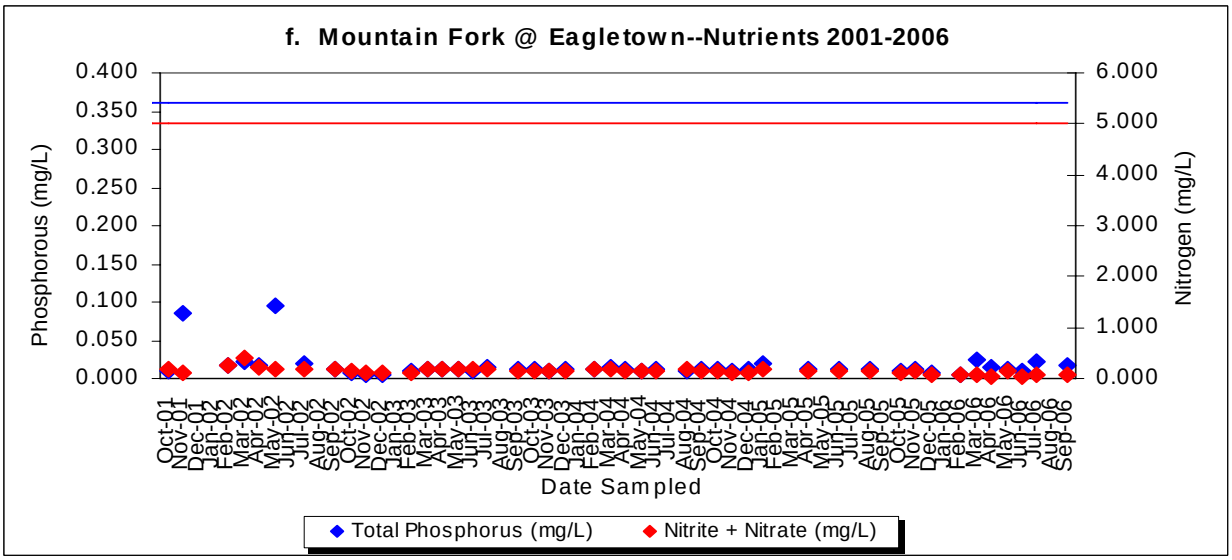

d. Mountain Fork @ Eagletown--TDS 2001-2006
mg/L
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Date Sampled
TDS (mg/L)


e. Mountain Fork @ Eagletown--Minerals 2001-2006
mg/L
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Mountain Fork @ Eagletown--Nutrients 2001-2006
Phosphorous (mg/L)
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

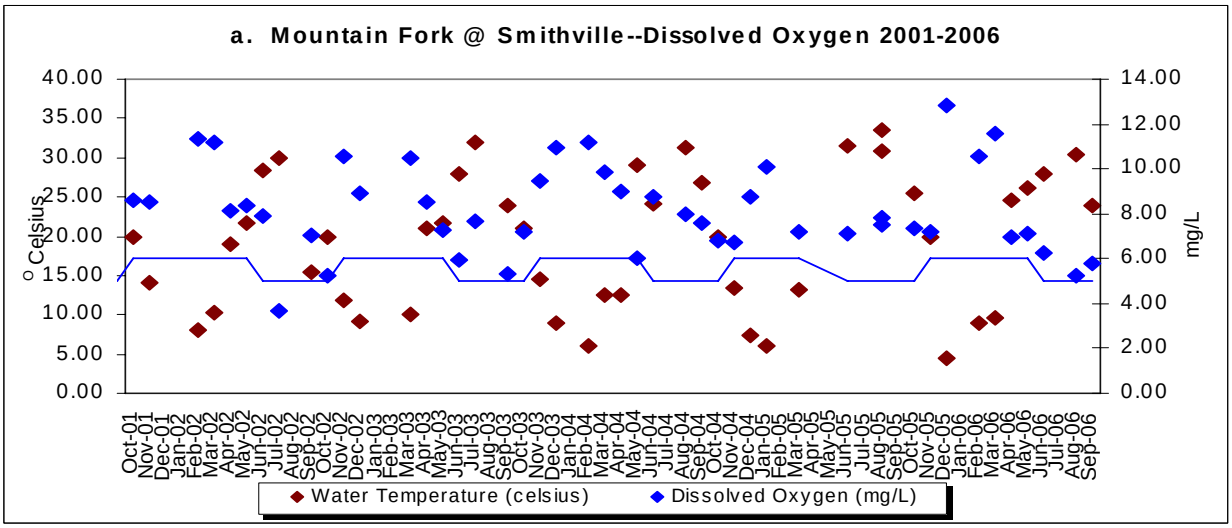
Mountain Fork River near Smithville

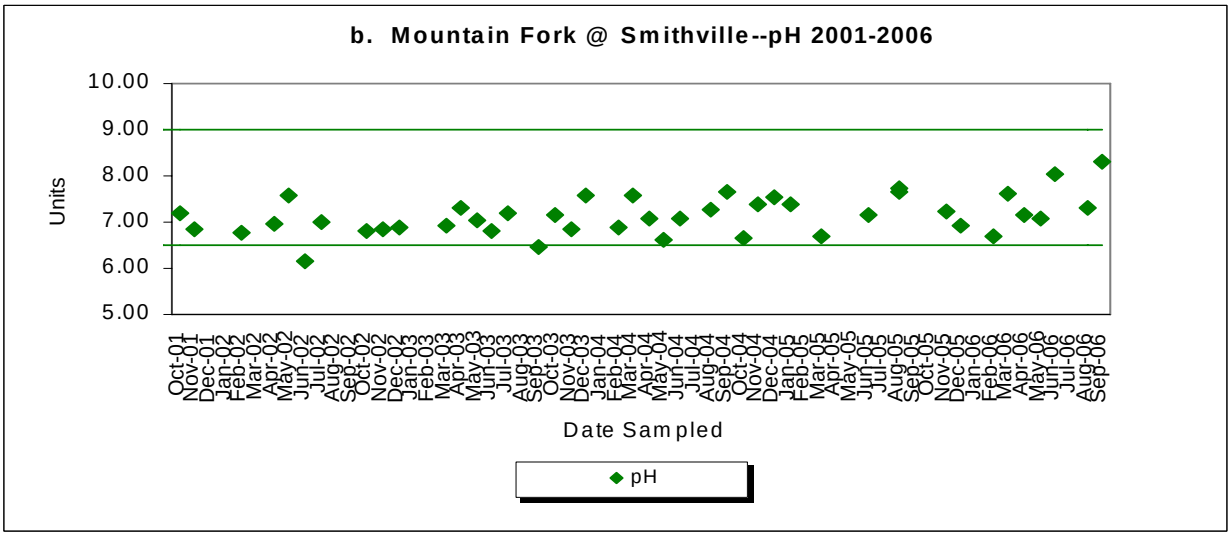
Station AT338750 (410210060010-001AT) is a permanent ambient trend monitoring station located on the Mountain Fork River in Oklahoma. Situated in the northeastern portion of McCurtain County, the site was established east of the town of Smithville on State Highway 4. The station is positioned near the midpoint of stream segment 410210060010 and is classified within the Mountain Fork River 8 digit HUC watershed (11140108). Water enters the stream system from Arkansas and from several tributaries including Cow Creek, Beech Creek, Big Eagle Creek, Boktuklo Creek, and Buffalo Creek, among others.

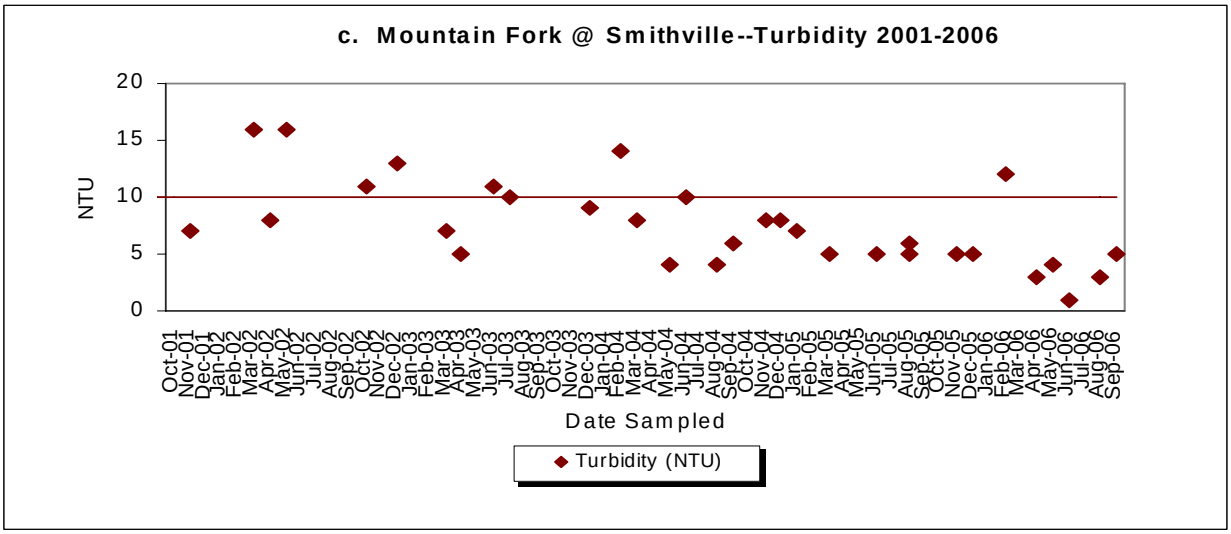
This station on the Mountain Fork River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Mountain Fork River from its entrance into Oklahoma near Hatfield, Arkansas (94.4616, 34.4971) downstream to confluence of the Mountain Fork River with Broken Bow Reservoir (94.6869, 34.3617). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Cool Water Aquatic Community—Fish and Wildlife Propagation (CWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR), and 5) Aesthetics. This portion of the Mountain Fork is also designated as a scenic river.

The PPWS beneficial use is supported. The CWAC beneficial use is not supported. Of the ten (10) lead samples collected, seven (7) of the concentrations (or 70%) exceeded the hardness-specific chronic criteria of 0.34 ug/L (Table 32). Of the eleven (11) copper samples collected, two (2) of the concentrations (or 18%) exceeded the hardness-specific acute criteria of 3.65 ug/L (Table 32). Of the thirty-two (32) turbidity samples (Figure 101c), seven (7) samples (or 22%) exceeded the numerical criterion of 10. Dissolved oxygen (Figure 101a) and pH (Figure 101b) data met the criteria prescribed in the CWAC beneficial use. Fish were collected during the summer of 2005. Based on the Index of Biological Integrity (IBI) outlined in Appendix C of Oklahoma's USAP, the station has a sample composition score of 24 (maximum 30) and fish condition score of 15 (maximum 15) for a total score of 39. However, because biocriteria have not been developed for cool water aquatic communities in the Ouachita Mountains ecoregion, no assessment of community biological health can be made at this time. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 101d and e). The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci samples. The aesthetics beneficial use is impaired for total phosphorus (Figure 101f). Of the forty-two (42) 3-month rolling geometric means calculated from total phosphorus samples, six (6) geometric means (or 14%) exceed the prescribed scenic river total phosphorus criterion of 0.037mg/L.

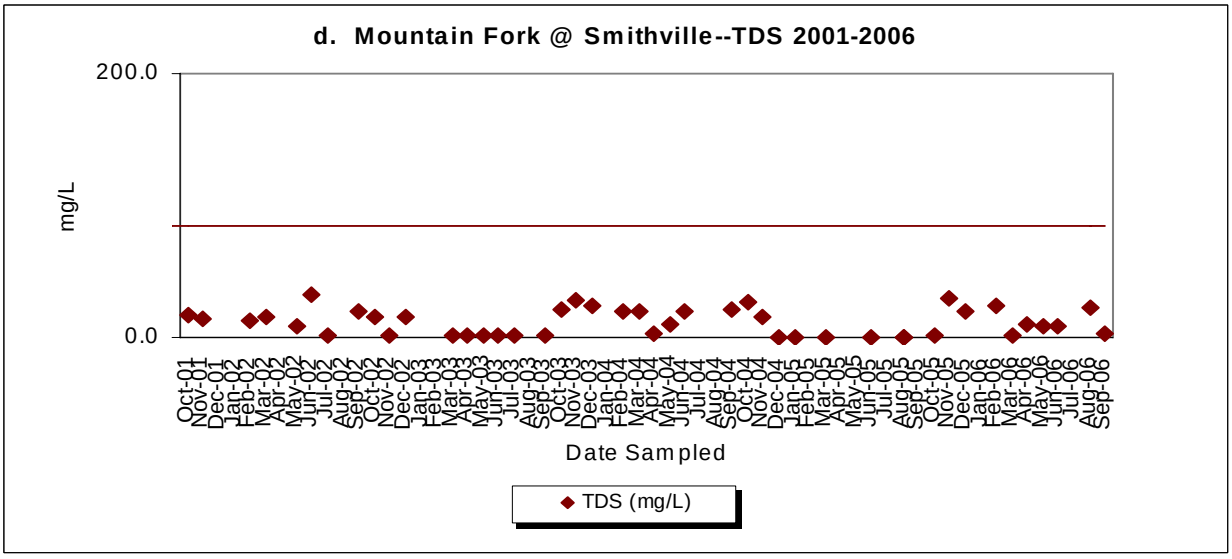
(Figure 101 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Mountain Fork River at Smithville (AT338840), 2001-2006.

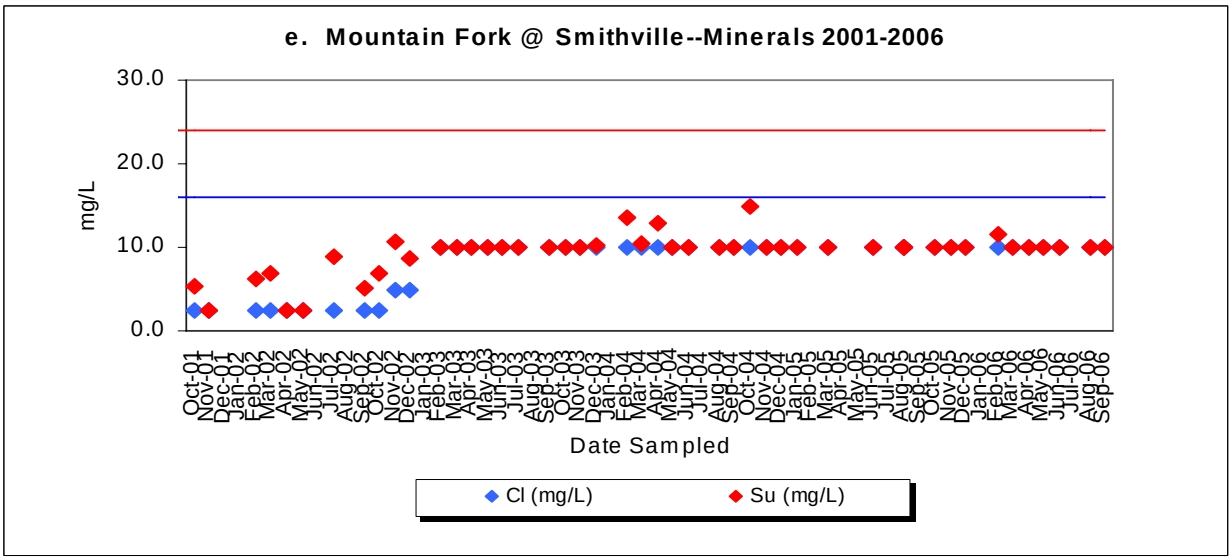


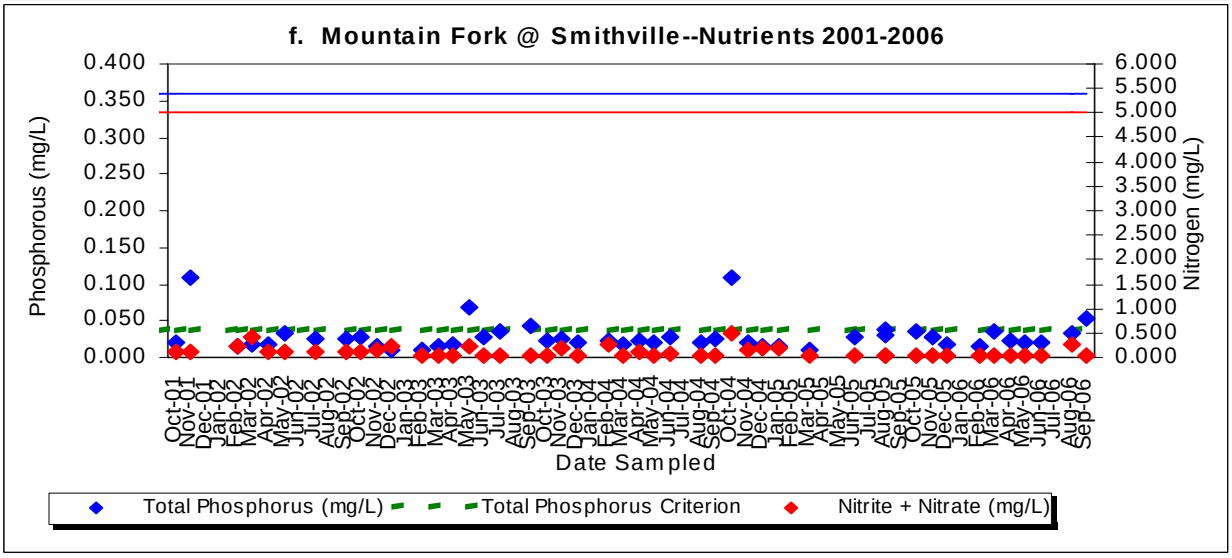




HUC 1114


d. Mountain Fork @ Smithville--TDS 2001-2006
200.0
0.0
mg/L
Date Sampled
TDS (mg/L)


e. Mountain Fork @ Smithville--Minerals 2001-2006
30.0
20.0
10.0
0.0
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Mountain Fork @ Smithville--Nutrients 2001-2006
Phosphorous (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Total Phosphorus Criterion
Nitrite + Nitrate (mg/L)

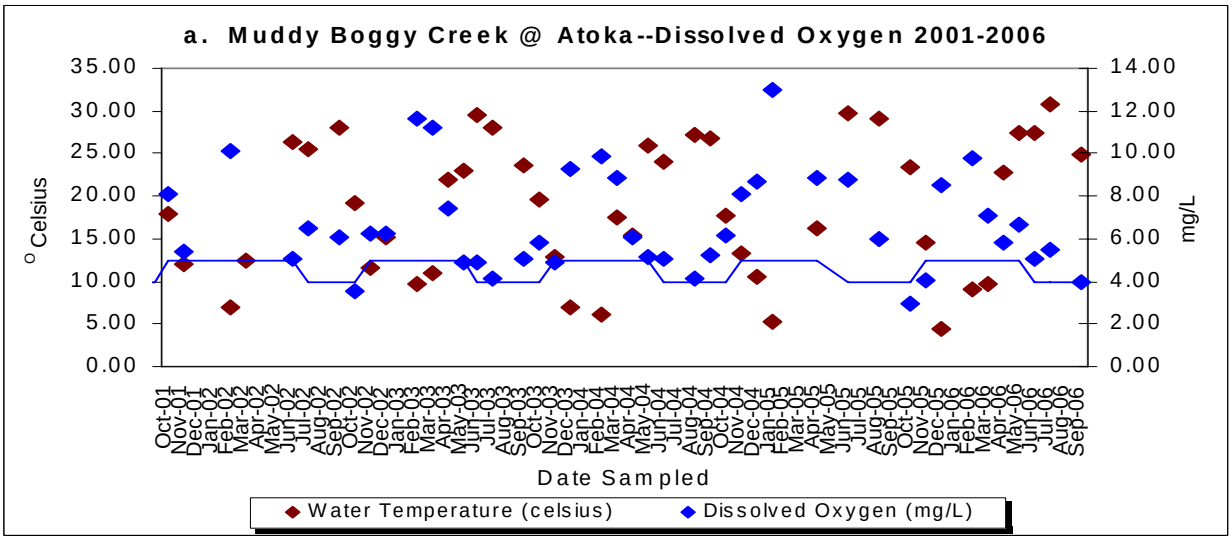
Muddy Boggy Creek near Atoka

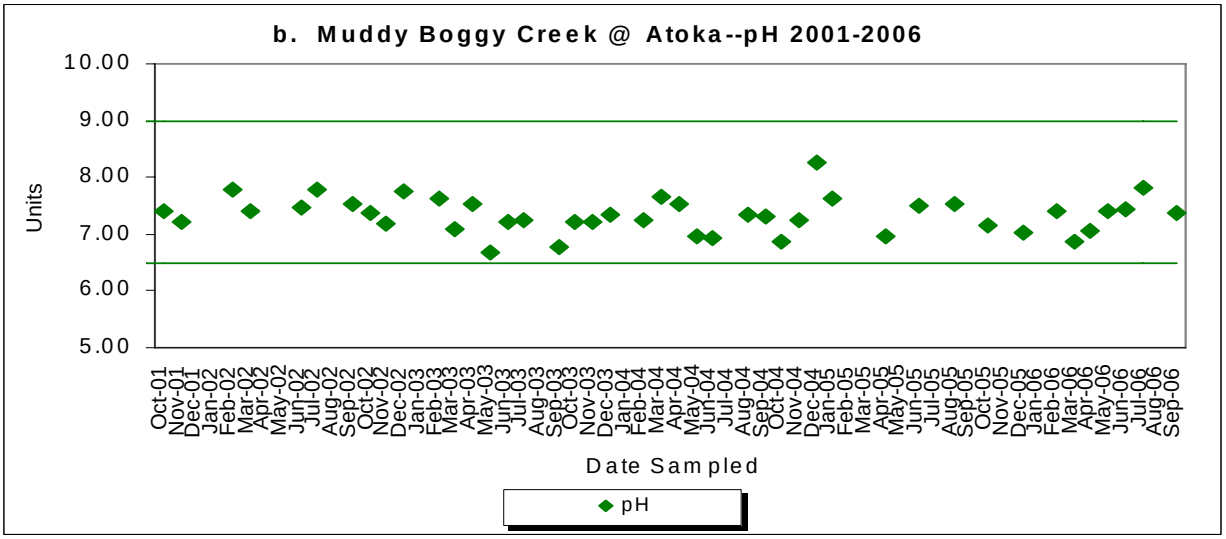
Station AT332950 (410400050270-001AT) is a permanent ambient trend monitoring station near the upper end of Muddy Boggy Creek. Situated in the north central portion of Atoka County, the site was established north of the town of Atoka on US Highway 69. The station is positioned near the midpoint of stream segment 410400050270 and is classified within the Muddy Boggy Creek 8 digit HUC watershed (11140103). Water enters the stream system from several tributaries including Caney Creek, Brier Creek, Coal Creek, and North Boggy Creek (Atoka Reservoir), Campbell Creek, August Creek, and Wilson Creek, among others.

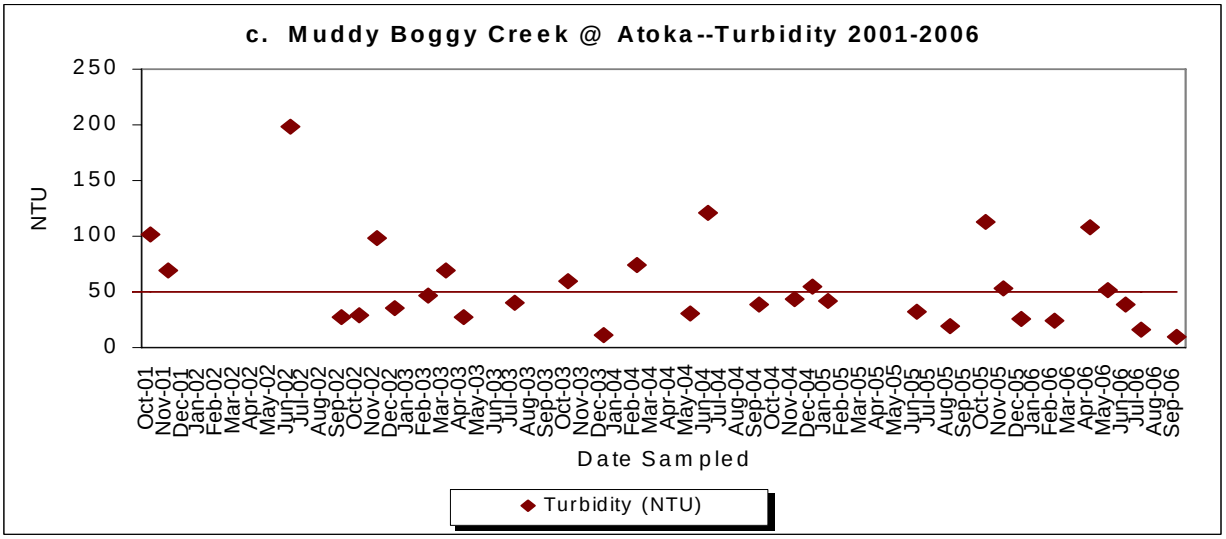
This station on Muddy Boggy Creek has been active for all water quality variables since September of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through of September of 2006. For purposes of reporting, this station is representative of Muddy Boggy Creek from the confluence of Caney Creek (96.1923, 34.5354) downstream to above the confluence of North Boggy Creek with Muddy Boggy Creek (96.0620, 34.3781). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-eight (28) turbidity samples (Figure 102c), twelve (12) samples (or 43%) exceeded the numerical criterion of 50 NTU. Of the forty-four (44) dissolved oxygen samples (Figure 102a), six (6) concentrations (or 14%) were below the prescribed screening level. Of the 12 lead samples collected, 6 of the concentrations (or 50%) exceeded the prescribed hardness-dependant chronic criteria of 2.80 ug/L (Table 32). The pH (Figure 102b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids (TDS), chlorides, and sulfates (Figure 102d and e). Although 16% of the sulfate concentrations exceeded the sample standard of 78.0 mg/L, these values are below the minimum value of 250 mg/L. The PBCR beneficial use is not supported (Table 33). Of the seventeen (17) fecal coliform concentrations, 7 samples (or 41%) exceeded the prescribed screening level of 400 cfu/mL. Of the sixteen (16) enterococci concentrations, 6 samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (256.0 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of Muddy Boggy Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 102f). Furthermore, the mean sestonic chlorophyll-a concentration (10.4 mg/M^3) produced a TSI of 54, which is below the threshold TSI of 62.

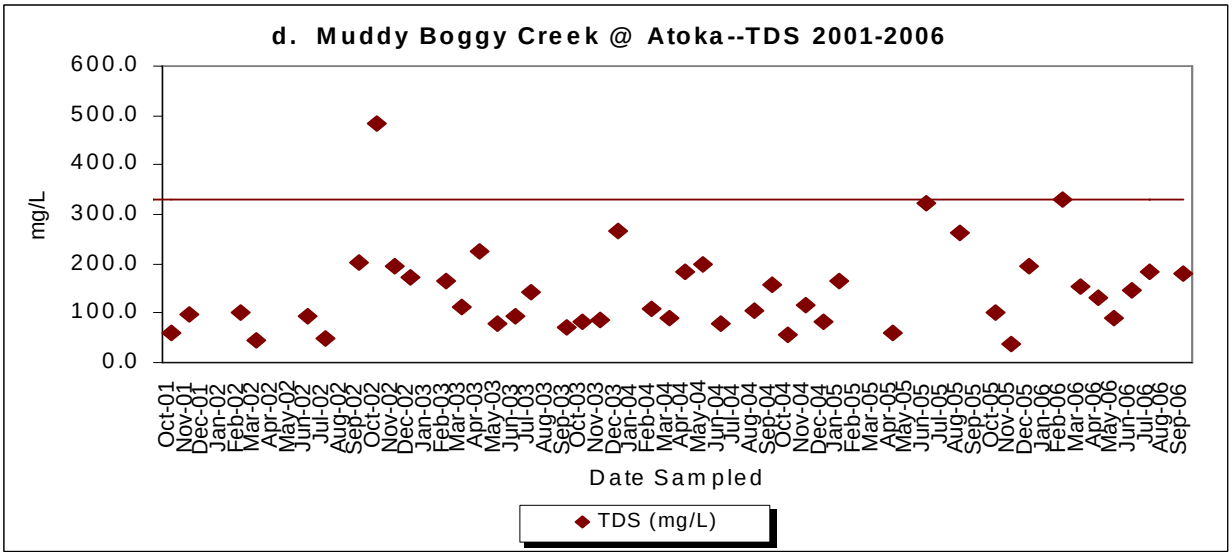
Figure 102 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Muddy Boggy Creek at Atoka (AT332950), 2001-2006.

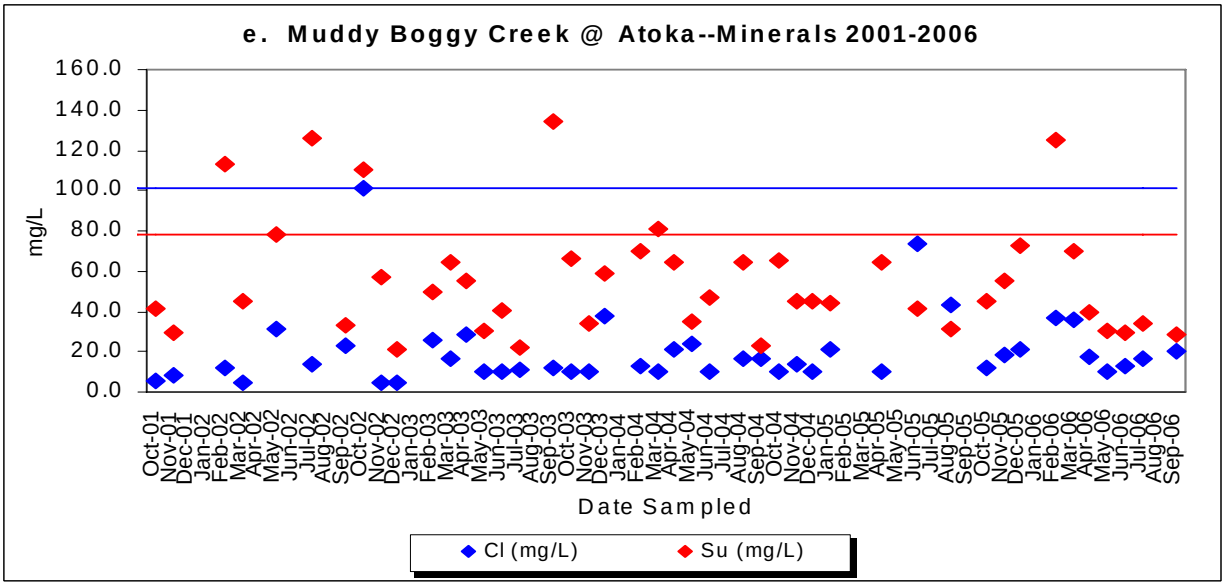


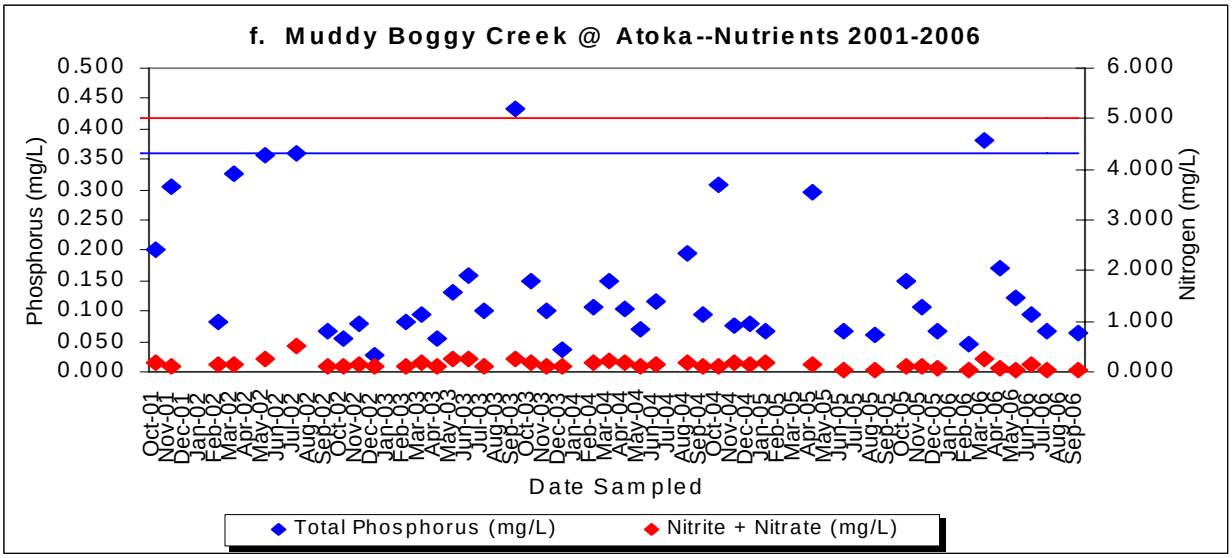




HUC 1114


d. Muddy Boggy Creek @ Atoka--TDS 2001-2006
mg/L
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date Sampled
TDS (mg/L)


e. Muddy Boggy Creek @ Atoka--Minerals 2001-2006
mg/L
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Muddy Boggy Creek @ Atoka--Nutrients 2001-2006
Phosphorus (mg/L)
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

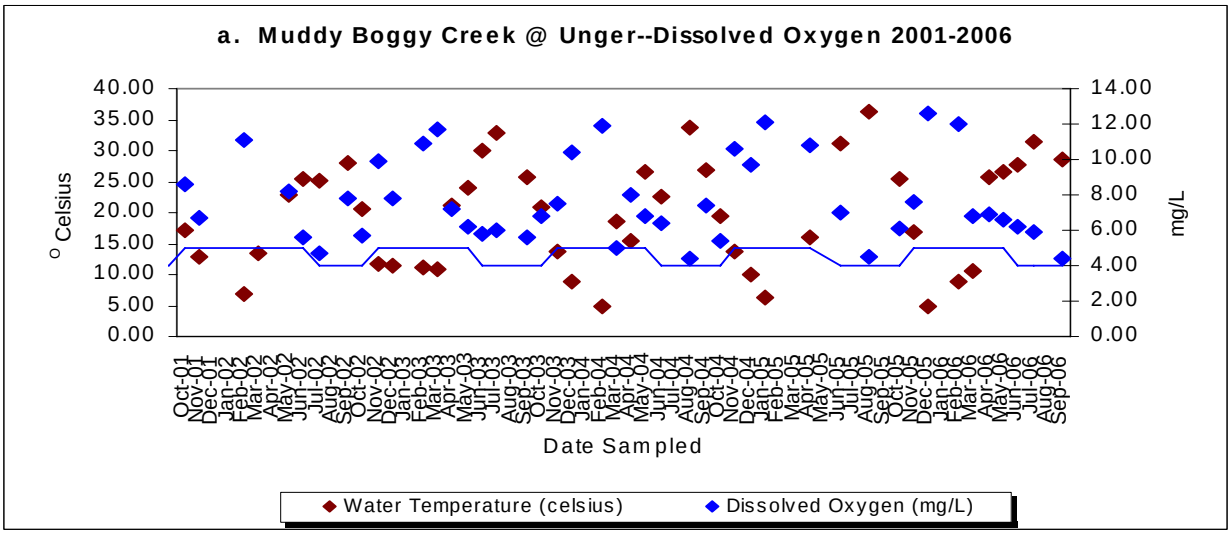
Muddy Boggy Creek near Unger

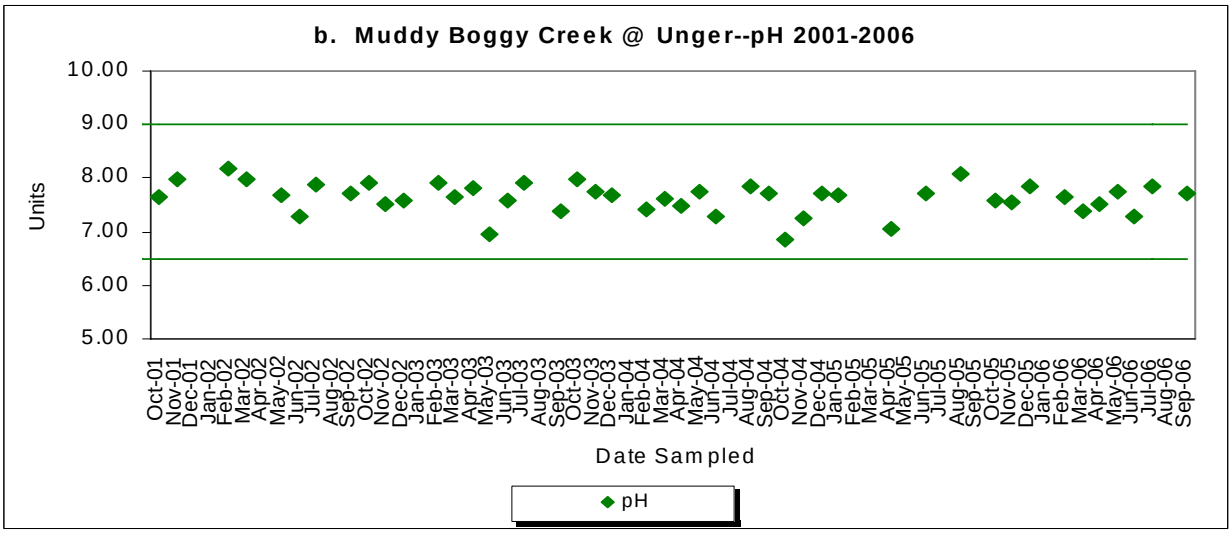
Station AT335300 (410400010070-001AT) is a permanent ambient trend monitoring station near the lower end of Muddy Boggy Creek. Situated in the west central portion of Choctaw County, the site was established east of the town of Unger on US Highway 70. The station is positioned near the upper end of stream segment 410400010070 and is classified within the Muddy Boggy Creek 8 digit HUC watershed (11140103). Water enters the stream system from several tributaries including Clear Boggy Creek, Lick Creek, Bokchito Creek, and Hanubby Creek, among others.

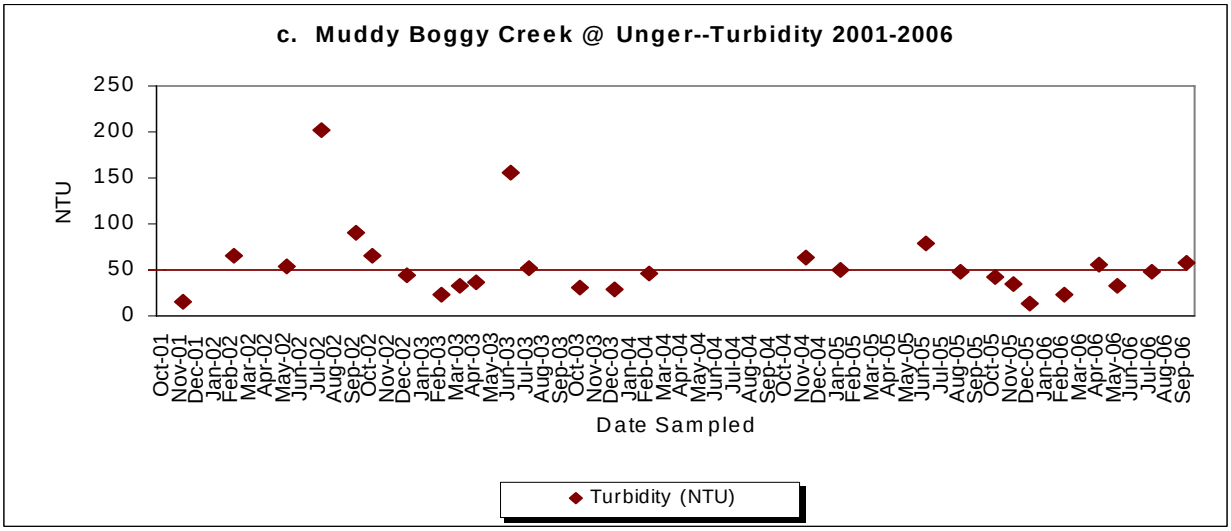
This station on Muddy Boggy Creek has been active for all water quality variables since July of 1999. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of Muddy Boggy Creek from the confluence of Clear Boggy Creek (95.7990, 34.0565) downstream to confluence of Muddy Boggy Creek with the Red River (95.5989, 33.9412). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

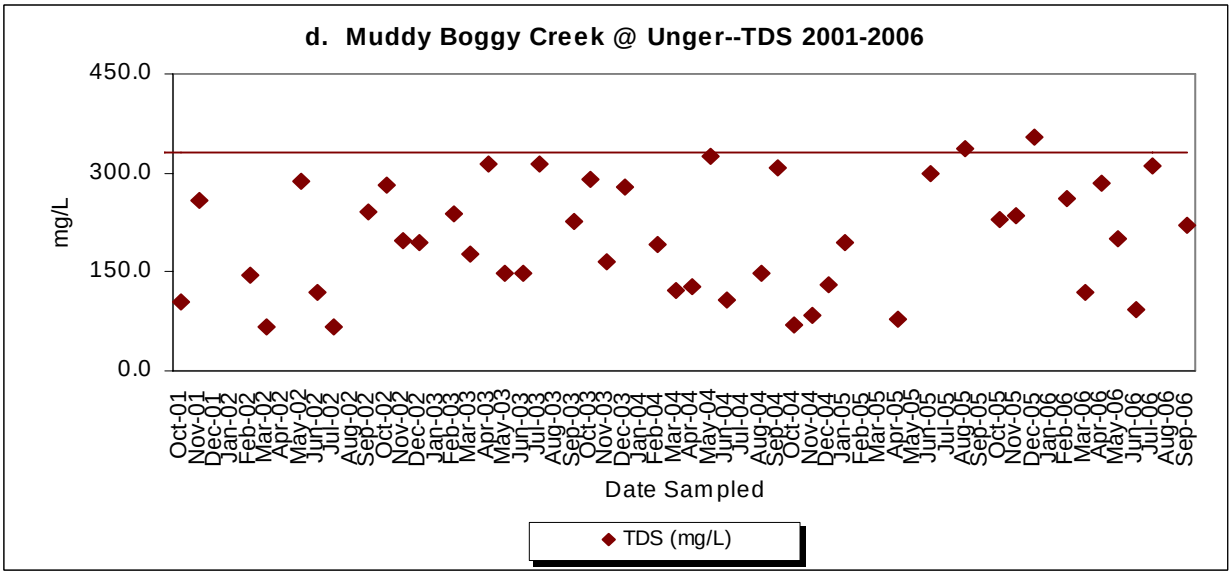
The PPWS beneficial use is supported. The WWAC beneficial use is not supported. Of the twenty-eight (26) turbidity samples (Figure 103c), eleven (11) samples (or 39%) exceeded the numerical criterion of 50 NTU. Of the ten (10) lead samples collected, two (2) of the concentrations (or 20%) exceeded the prescribed hardness-dependant chronic criteria of 4.66 ug/L (Table 32). The dissolved oxygen (Figure 103a) and pH (Figure 103b) samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 103d and e). The PBCR beneficial use is not supported (Table 33). Of the seventeen (17) fecal coliform concentrations, five (5) samples (or 29%) exceeded the prescribed screening level of 400 cfu/mL. Of the sixteen (16) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (62.1 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Muddy Boggy Creek is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 103f). Furthermore, the mean sestonic chlorophyll-a concentration (8.8 mg/M^3) produced a TSI of 52, which is below the threshold TSI of 51.

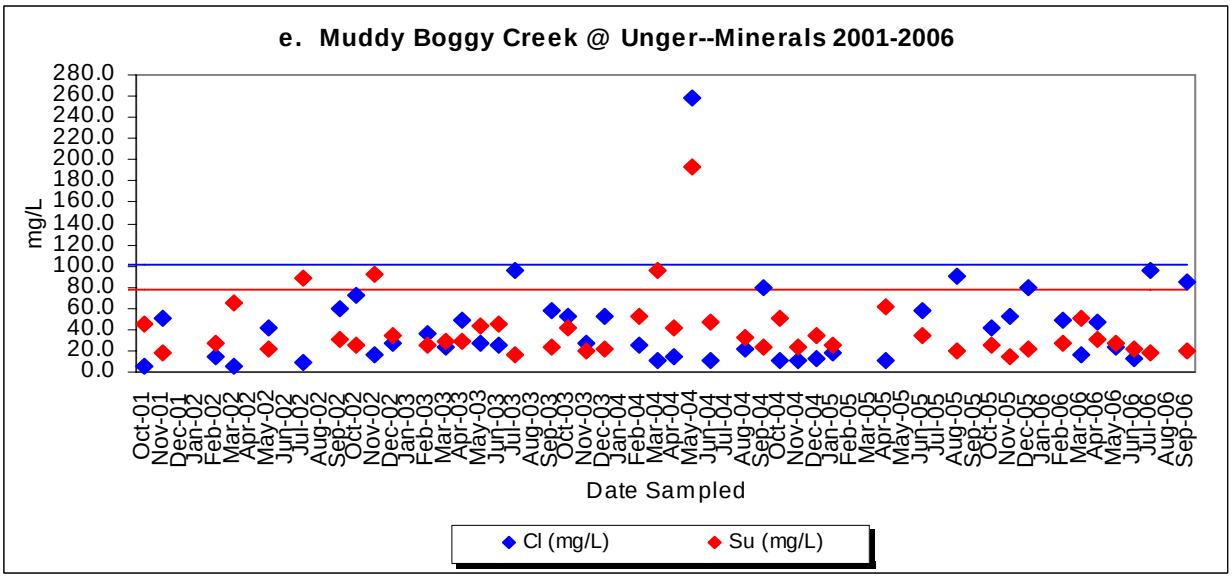
Figure 103 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on Muddy Boggy Creek at Unger (AT335300), 2001-2006.

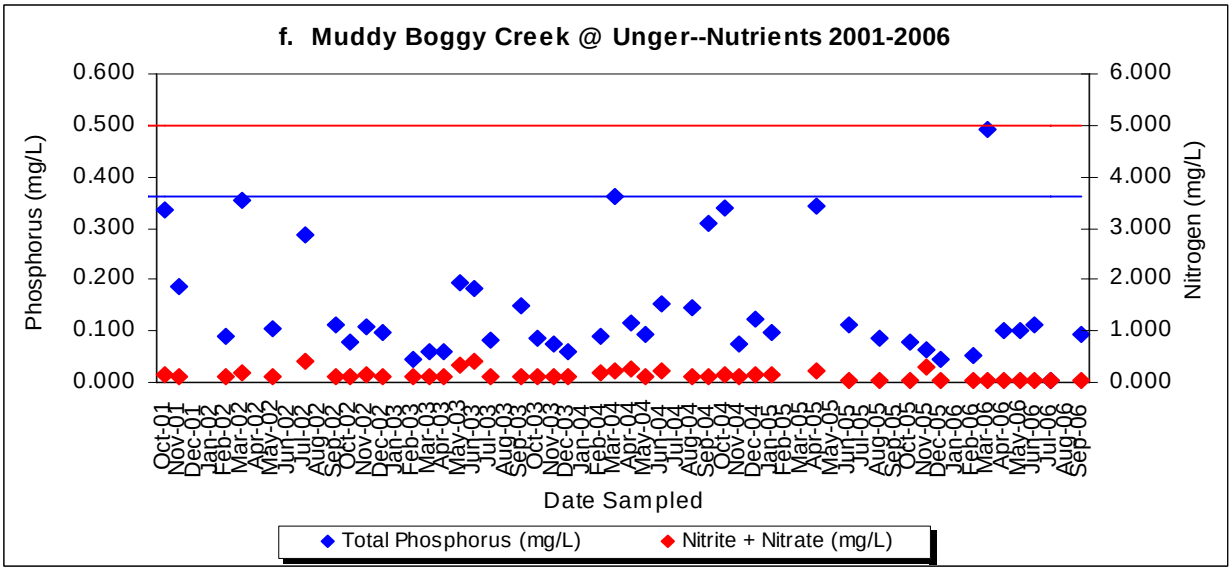







d. Muddy Boggy Creek @ Unger--TDS 2001-2006
450.0
300.0
150.0
0.0
mg/L
Date Sampled
TDS (mg/L)


e. Muddy Boggy Creek @ Unger--Minerals 2001-2006
280.0
260.0
240.0
220.0
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Muddy Boggy Creek @ Unger--Nutrients 2001-2006
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Phosphorus (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

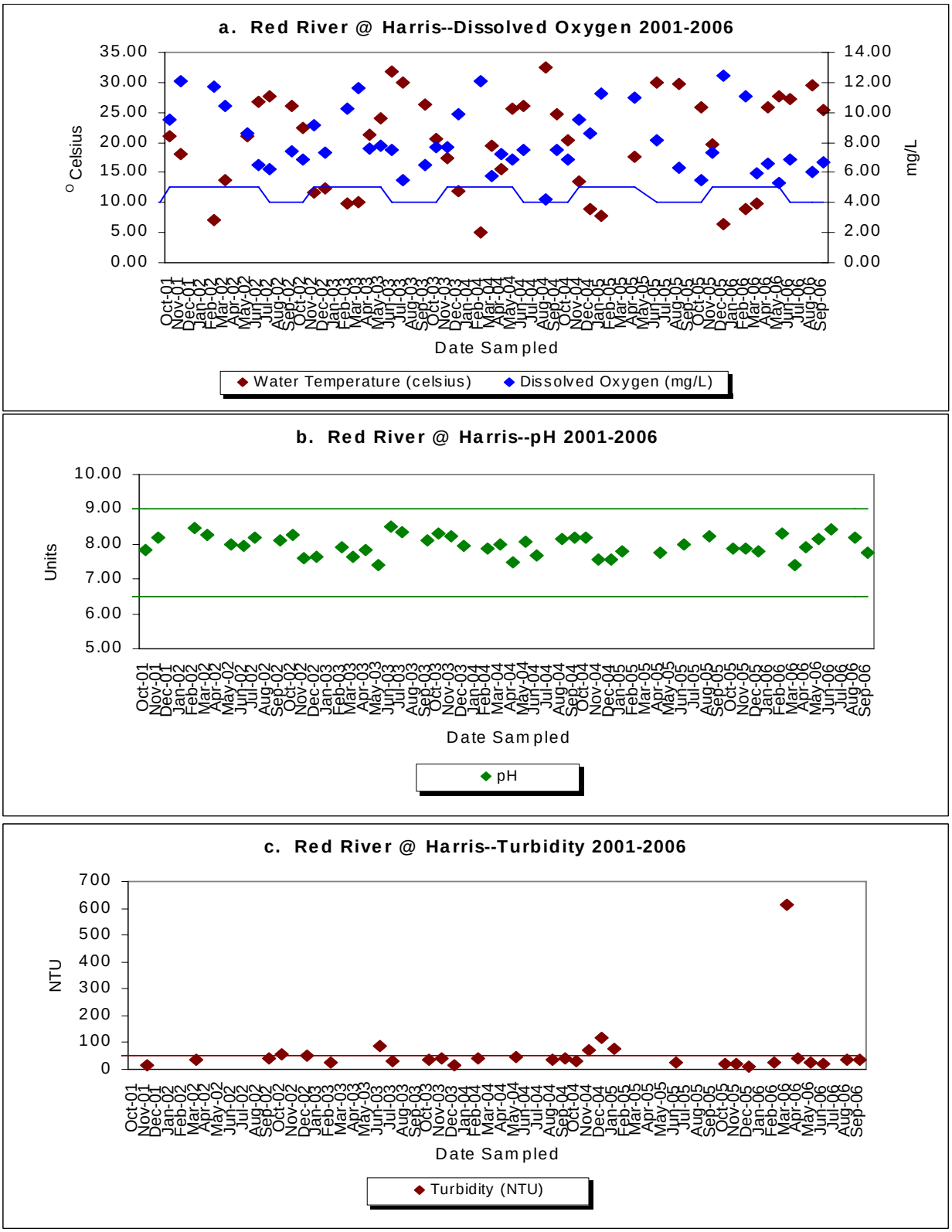
Red River near Harris

Station AT336820 (410100010010-001AT) is a permanent ambient trend monitoring station located on the Red River in Oklahoma. Situated in the southeastern portion of McCurtain County, the site was established south of the town of Harris on US Highway 259. The station is positioned near the terminal end of stream segment 410100010010 and is classified within the Pecan Creek - Waterhole Creek 8 digit HUC watershed (11140106). Water enters the stream system from Hugo Lake, Lake Raymond Gary, and Ward Lake and from several tributaries including Garland Creek, Buzzard Creek, Waterhole Creek, and Norwood Creek (Ward Lake), among others.

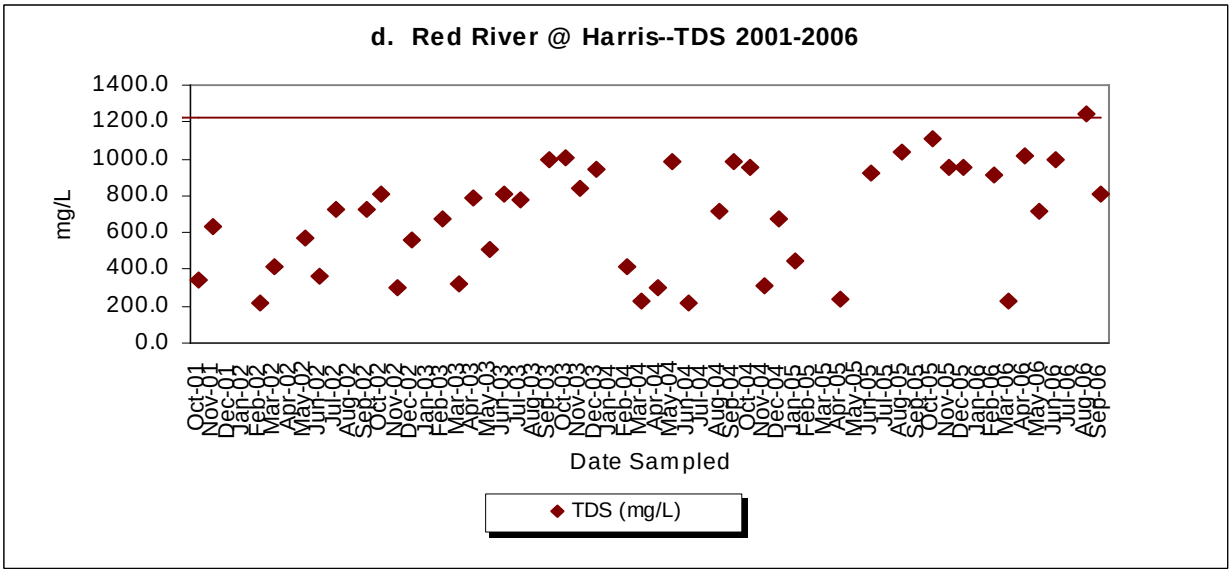
This station on the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2000 through September of 2006. For purposes of reporting, this station is representative of the Red River from below the confluence of the Kiamichi River (95.2272, 33.9625) downstream to where the Red River exits Oklahoma (94.4868, 33.6374). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class II Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

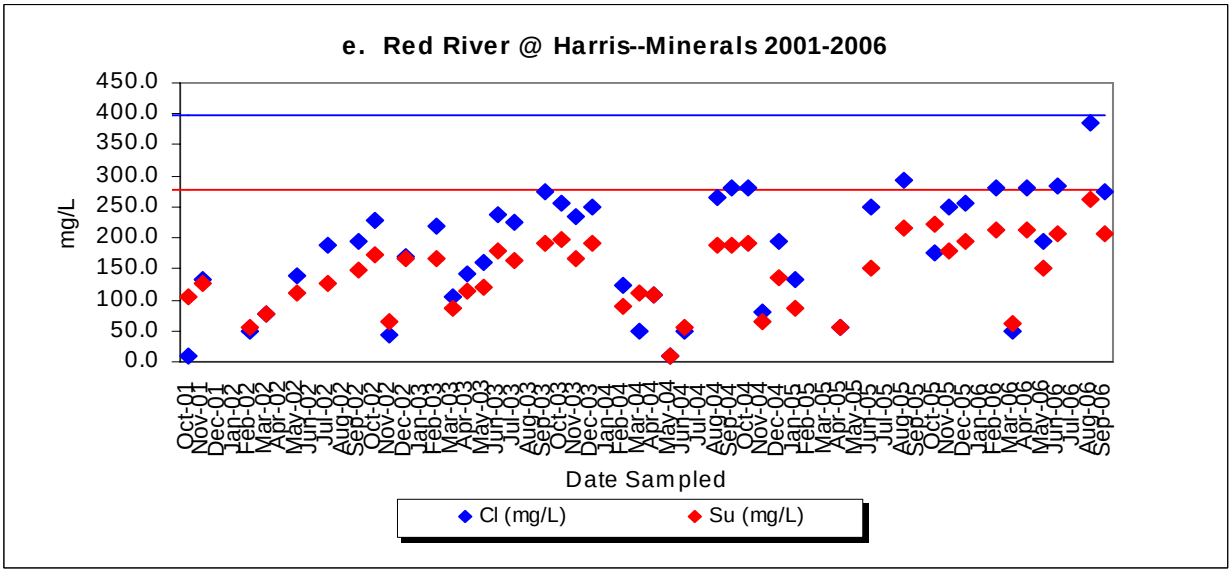
The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the thirty (30) turbidity samples (Figure 104c), six (6) samples (or 20%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 104a), pH (Figure 104b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 104d and e). The PBCR beneficial use is supported for fecal coliform, *E. coli* and enterococci samples. This segment of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 104f).

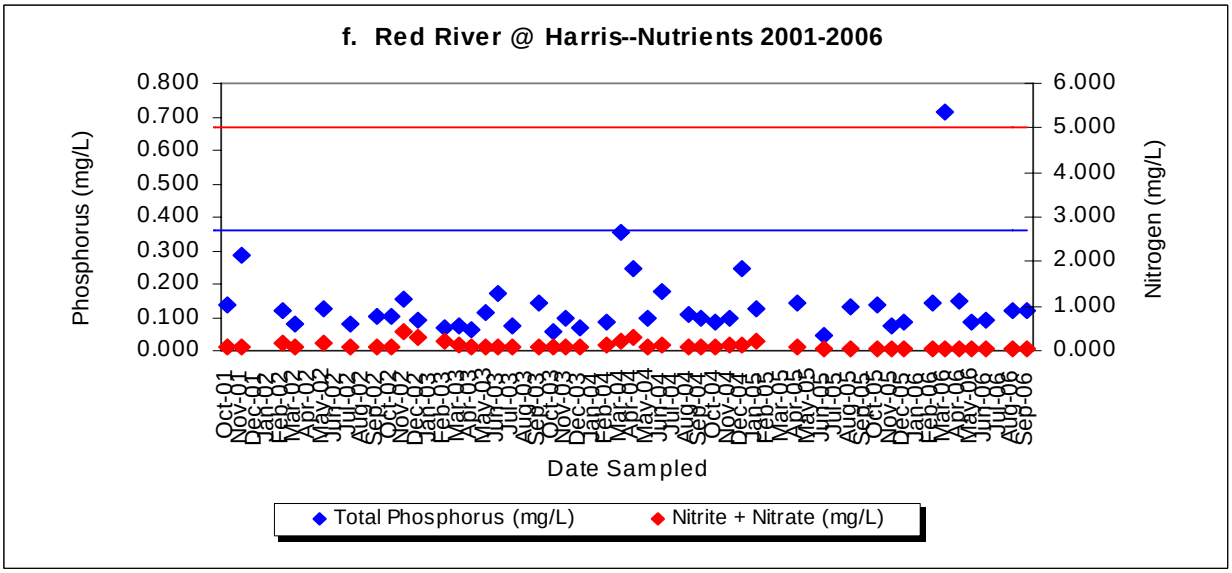
Figure 104 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Harris (AT336820), 2001-2006.



HUC 1114


d. Red River @ Harris--TDS 2001-2006
mg/L
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Date Sampled
TDS (mg/L)


e. Red River @ Harris--Minerals 2001-2006
mg/L
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Red River @ Harris--Nutrients 2001-2006
Phosphorus (mg/L)
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Nitrogen (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

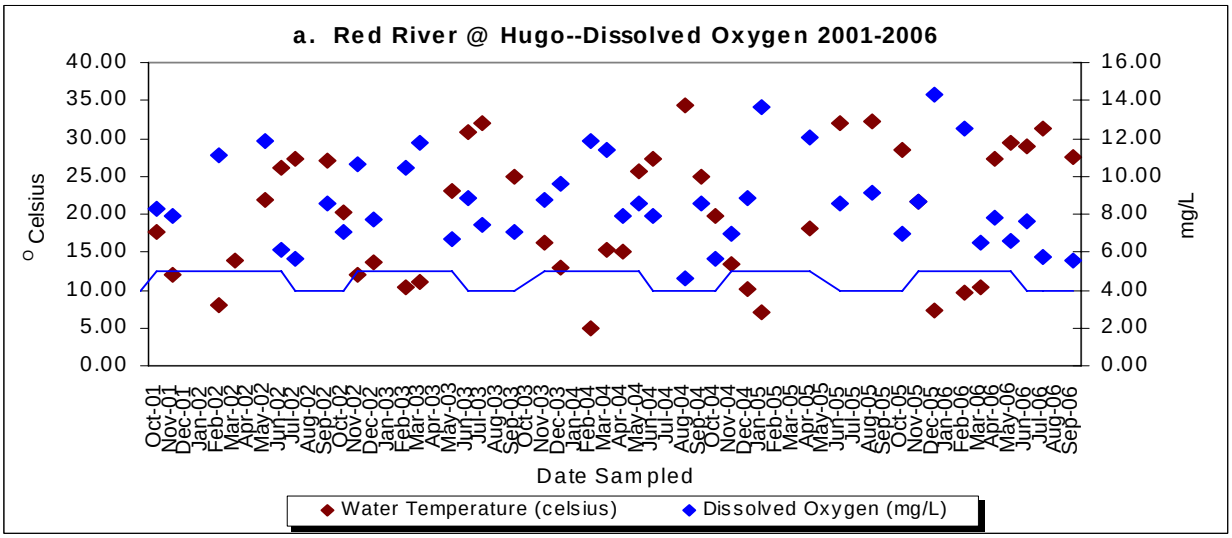
Red River near Hugo

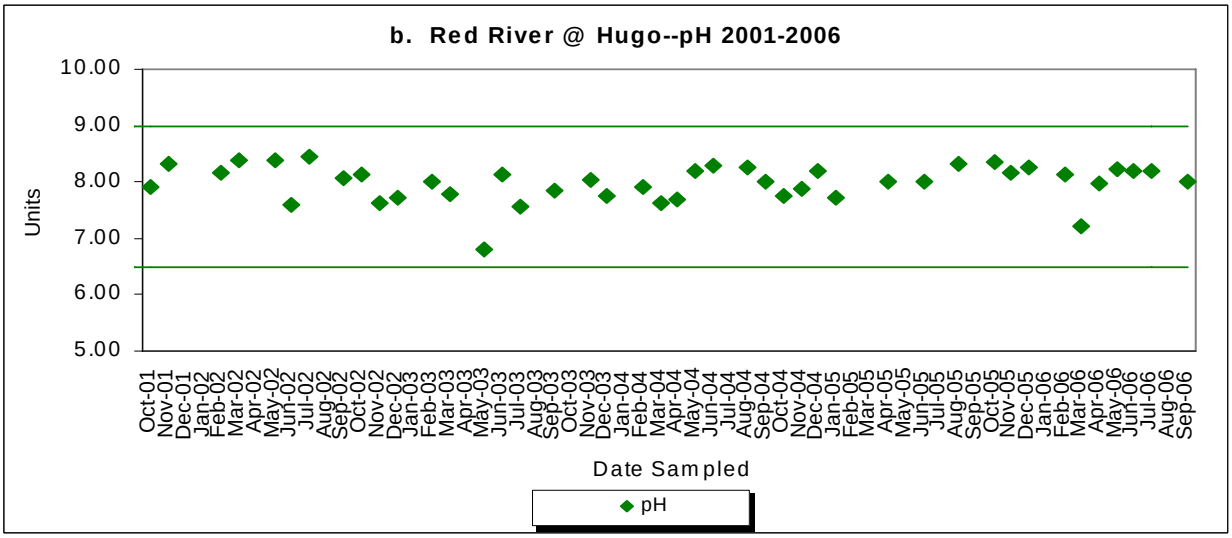
Station AT335500 (410400010010-001AT) is a permanent ambient trend monitoring station located on the Red River in Oklahoma. Situated in the south central portion of Choctaw County, the site was established south of the city of Hugo on US Highway 271. The station is positioned near the midpoint of stream segment 410400010010 and is classified within the Bois D'Arc - Island Creek 8 digit HUC watershed (11140101). Water enters the stream system from several tributaries including the Blue River, Whitegrass Creek, the Muddy Boggy River, Horse Creek, and the Kiamichi River, among others.

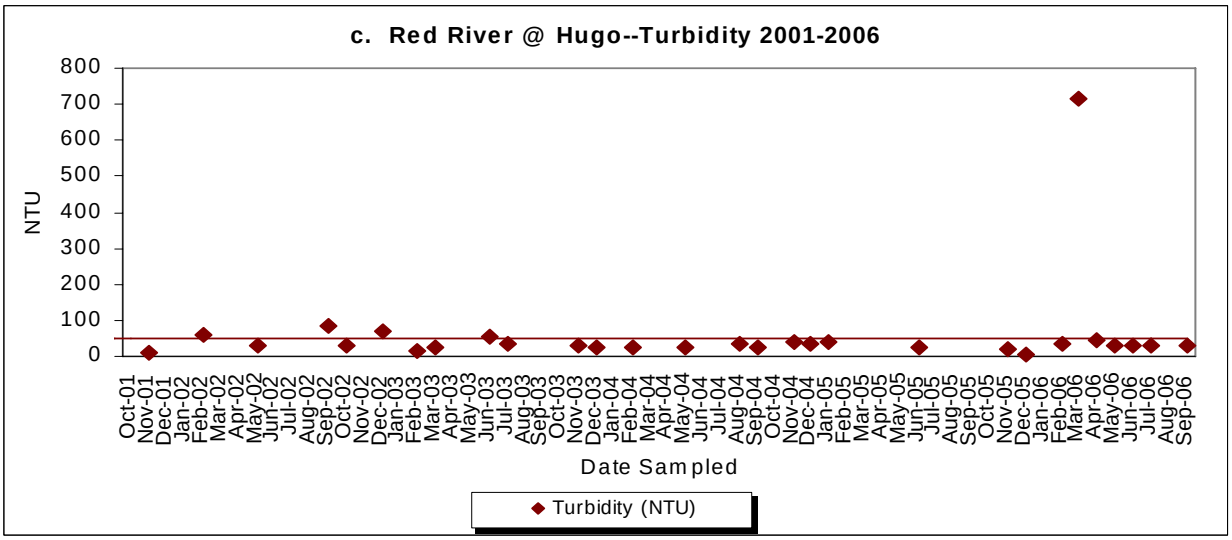
This station on the Red River has been active for all water quality variables since November of 1998. The following assessment of beneficial uses is based on data collected from October of 2001 through September of 2006. For purposes of reporting, this station is representative of the Red River from the confluence of the Blue River (95.9356, 33.8879) downstream to confluence of the Kiamichi River with the (95.2300, 33.9615). As per Appendix A, Table 4 of OAC 785:45, this water quality management segment is assigned the following designated beneficial uses: 1) Public and Private Water Supply (PPWS), 2) Warm Water Aquatic Community—Fish and Wildlife Propagation (WWAC), 3) Agriculture—Class I Irrigation (AG), and 4) Primary Body Contact—Recreation (PBCR).

The PPWS beneficial use is supported. The WWAC beneficial use is partially supported but impaired per the CPP. Of the twenty-nine (29) turbidity samples (Figure 105c), five (5) samples (or 17%) exceeded the numerical criterion of 50 NTU. Dissolved oxygen (Figure 105a), pH (Figure 105b), and toxicant samples met the criteria prescribed in the WWAC beneficial use. The AG beneficial use is supported for total dissolved solids, chlorides, and sulfates (Figure 105d and e). The PBCR beneficial use is not supported (Table 33). Of the nineteen (19) enterococci concentrations, four (4) samples exceeded the prescribed screening level of 406 cfu/mL, and the geometric mean (37.4 cfu/mL) exceeded the prescribed mean standard of 33 cfu/mL. This segment of the Red River is not nutrient-threatened. The total phosphorus and nitrate/nitrite median values were below the threshold medians of 0.36 mg/L and 5.0 mg/L, respectively (Figure 105f).

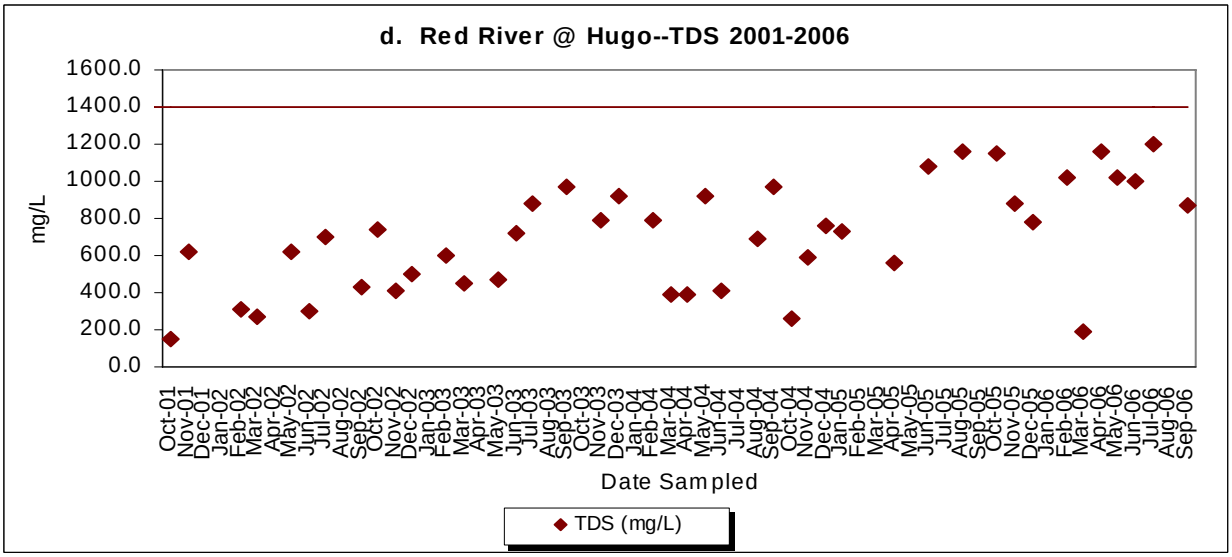
Figure 105 a-f. Dissolved Oxygen (a), pH (b), Turbidity (c), Total Dissolved Solids (d), Minerals (e), and Nutrients (f) on the Red River at Hugo (AT335500), 2001-2006.

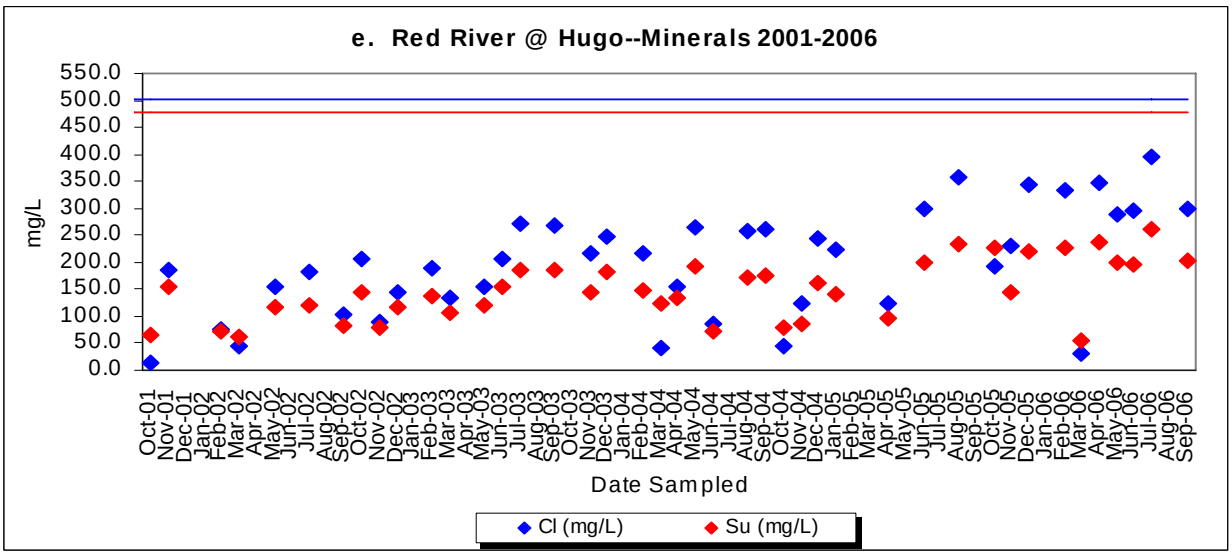


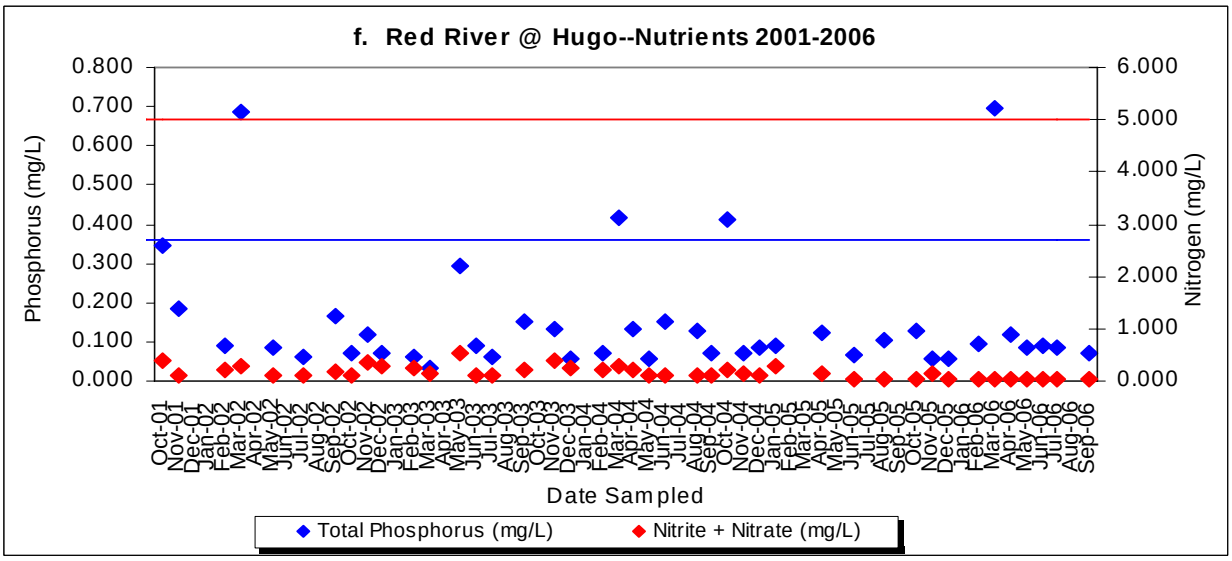




HUC 1114


d. Red River @ Hugo--TDS 2001-2006
mg/L
Date Sampled
TDS (mg/L)


e. Red River @ Hugo--Minerals 2001-2006
mg/L
Date Sampled
Cl (mg/L)
Su (mg/L)


f. Red River @ Hugo--Nutrients 2001-2006
Phosphorus (mg/L)
Nitrogen (mg/L)
Date Sampled
Total Phosphorus (mg/L)
Nitrite + Nitrate (mg/L)

ROTATING STATION MONITORING RESULTS & DISCUSSION

The goal of the rotating portion of the program is to provide short-term assessments on priority waters as identified by a state agency or other party. Two over-arching objectives were identified to aid in the determination of what would qualify as a rotating site. First of all, it was determined that data collection at a particular site should be short-term in nature and not extend past one sampling year. Data collected within that year should allow water quality managers to make the appropriate decisions regarding the segment being monitored. For instance, if a stream reach is listed as impaired due to pH on the 303(d) list, measuring pH throughout one year should allow the requesting agency or entity to either de-list the segment or determine what other monitoring efforts are necessary. Secondly, the monitoring should fall within the framework of the USAP. Since the inception of the program, the staff of the OWRB has met individually with representatives of other state agencies to identify their priority short-term monitoring needs. Once the OWRB receives a list of waters for monitoring from the interested agencies, staff evaluates the nominations and notifies the nominating agency of which waters would be monitored (all of the waters requested for monitoring have been accommodated since program inception). In all, over two hundred twenty (220) monitoring stations have been or are currently being monitored. In most instances, the segments were listed for one or more variables in the state's 303d list. For a comprehensive list of historic rotational monitoring stations, **please contact the Oklahoma Water Resources Board/Water Quality Programs Division at (405) 530-8800.**

INTENSIVE INVESTIGATIONS

If a beneficial use impairment is identified or suspected, then all appropriate state agencies will be alerted and an investigation will be initiated to confirm if a beneficial use impairment is occurring. If routine monitoring cannot definitively identify a threat or impairment, then an intensive study will be undertaken. If impairment is positively identified, the source of the impairment will be identified if possible. Potential causes of beneficial use impairment include but are not limited too; improper beneficial use or criteria (Oklahoma Water Resources Board jurisdiction), point source problems (Oklahoma Department of Environmental Quality or Oklahoma Department of Agriculture, Food & Forestry), non-point source problems (Oklahoma Conservation Commission, Oklahoma Department of Agriculture, Food & Forestry, Oklahoma Corporation Commission, or Oklahoma Department of Environmental Quality), oil and gas contamination (Oklahoma Corporation Commission), agricultural activities (Oklahoma Department of Agriculture, Food & Forestry), or mining activities (Oklahoma Department of Mines). All monitoring activities undertaken will be cooperative in nature with the agency with statutory authority assuming the lead role for intensive monitoring. Other entities (i.e. tribal or governmental units outside of Oklahoma) will be involved as appropriate. All intensive-monitoring activities will be consistent with and driven by the Water Resources Board OWQS and OWQS Implementation Plan.

The latest revisions to the Oklahoma Water Quality Standards states that an intensive monitoring program should be conducted on waters identified as nutrient-limited. The nature of the intensive monitoring is not explained in great detail and it is not envisioned that monies from the Beneficial Use Monitoring Program would be used to conduct these intensive studies. The intent of the intensive monitoring task of the BUMP is to work in priority areas identified by other entities, be they local, state, or federal. Priority areas may be a geographic area or may be a specialized water quality variable or indicator not normally included in the monitoring program (i.e. fish collections for toxics analysis or collection of other biological organisms). It is still the intent of the Water Resources Board to use the intensive monitoring monies for short-term, high priority areas identified by the Water Resources Board or other state/federal environmental agencies.

To date, the OWRB has used BUMP monies in combination with federal Clean Water Act Section 106 and Section 104(b)3 dollars to conduct intensive surveys on water bodies in various parts of the state. These investigations are normally built around permanent monitoring stations and may be more spatially, temporally, and parametrically intensive than traditional BUMP sampling. For example, pesticides, which are not a normal part of the BUMP parametric coverage, are collected at some of the sites. Also, a BUMP station may be on a segment that is over 40 miles in length. These investigations create several stations along the segment and compare results from the various stations to determine if the segment has uniform water quality. For a list of these projects and a copy of the report, **please contact the Oklahoma Water Resources Board/Water Quality Programs Division at (405) 530-8800.**

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INDEX

A

Arkansas River at Bixby 224
Arkansas River near Haskell 227
Arkansas River near Moffett 230
Arkansas River near Muskogee (at US 62) 233
Arkansas River near Ralston 66
Arkansas River near Sand Springs 236

B

Baron Fork near Eldon 239
Beaver River near Beaver 167
Beaver River near Fort Supply 170
Beaver River near Gate 173
Beaver River near Guymon 176
Beaver River near Turpin 179, 182
Big Cabin Creek near Big Cabin 86
Bird Creek near Catoosa 89
Black Bear Creek at Pawnee 69
Blue River near Durant 341
Brushy Creek near Haileyville 135

C

Canadian River near Bridgeport 138
Canadian River near Calvin 141
Canadian River near Konawa 144
Canadian River near Purcell 147
Canadian River near Taloga 150
Canadian River near Whitefield 153
Caney Creek near Barber 242
Caney River near Ramona 92
Chickaskia River near Blackwell 72
Cimarron River Near Buffalo 40
Cimarron River near Dover 43
Cimarron River near Guthrie 46
Cimarron River near Mocane 29
Cimarron River near Oilton 49
Cimarron River near Orienta 37, 52, 55
Clear Boggy Creek near Caney 344

D

Deep Fork River near Beggs 185
Deep Fork River near Stroud 188

E

East Cache Creek near Walters 298
Elk Creek near Hobart 274
Elk River near Tiff City, Missouri 95
Elm Fork of the Red near Mangum 277

F

Flint Creek near Kansas, OK 245
Fourche-Maline Creek near Red Oak 248

G

Glover River near Glover 347

H

Honey Creek near Grove 98

I

Illinois River near Tahlequah 251
Illinois River near Watts 254

K

Kiamichi River near Antlers 350
Kiamichi River near Big Cedar 353
Kiamichi River near Tuskahoma 356, 359

L

Little River near Cloudy 362, 365
Little River near Sasakwa 156

M

Mountain Fork River near Eagletown 368
Mountain Fork River near Smithville 371
Mud Creek near Courtney 301
Muddy Boggy Creek near Atoka 374
Muddy Boggy Creek near Unger 377

N

Neosho River near Chouteau 101
Neosho River near Commerce 104
Neosho River near Connor Bridge 107
Neosho River near Langley 110
North Canadian River at Dustin 191
North Canadian River near El Reno 194

North Canadian River near Harrah 197
North Canadian River near Seiling 200
North Canadian River near Wetumka 206, 209
North Canadian River near Woodward 212
North Fork of the Red near Carter 280
North Fork of the Red near Headrick 283

P

Poteau River near Heavener 257, 260
Poteau River near Pocola 263

R

Red River near Davidson 304
Red River near Harris 380
Red River near Hugo 383
Red River near Terral 307

S

Sager Creek near West Siloam Springs 266
Salt Fork of the Arkansas near Ingersoll 75
Salt Fork of the Arkansas River near Tonkawa 78
Salt Fork of the Red River near Elmer 286
Salt Fork of the Red River near Mangum 289
Sandy Creek near Eldorado 310
Skeleton Creek near Lovell 58
Spring Creek near Murphy 113
Spring River near Quapaw 116

V

Verdigris River near Inola 119
Verdigris River near Keetonville 122
Verdigris River near Lenapah 125
Verdigris River near Wagoner 128

W

Washita River near Anadarko 313, 316
Washita River near Cordell 319
Washita River near Durwood 322
Washita River near Hammon 325
Washita River near Pauls Valley 328
West Cache Creek near Taylor 331
Wolf Creek near Fort Supply 215

APPENDIX A

Oklahoma's Beneficial Use Assessment Protocols

APPENDIX A

TITLE 785. OKLAHOMA WATER RESOURCES BOARD
CHAPTER 46. IMPLEMENTATION OF OKLAHOMA'S WATER QUALITY STANDARDS

[UNOFFICIAL]

SUBCHAPTER 15. - USE SUPPORT ASSESSMENT PROTOCOLS

Section
785:46-15-1. Scope and applicability
785:46-15-2. Definitions
785:46-15-3. Data requirements
785:46-15-4. Default protocols
785:46-15-5. Assessment of Fish and Wildlife Propagation support
785:46-15-6. Assessment of Primary Body Contact Recreation support
785:46-15-7. Assessment of Public and Private Water Supply support
785:46-15-8. Assessment of Agriculture support
785:46-15-9. Assessment of Fish Consumption support
785:46-15-10. Nutrients

785:46-15-1. Scope and applicability
(a) **General.** The rules in this Subchapter provide protocols which shall be used on and after October 1, 2000 to determine whether certain beneficial uses of waters of the state designated in OAC 785:45 are being supported. Such determinations shall be made only to the extent that pertinent provisions of OAC 785:45 apply to a waterbody or its designated uses. The rules in this Subchapter are not intended and should not be construed to limit any actions by federal or state agencies or citizens to prevent pollution or to limit remedies to abate pollution from a single incident or activity or series of incidents or activities.
(b) **Significance of assessment that a use is other than fully supported.** A determination based upon application of the rules in this Subchapter that a waterbody's beneficial use is not supported or is partially supported creates a presumption that the use is impaired.
[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00]

785:46-15-2. Definitions
The following words and terms, when used in this Subchapter, shall have the following meaning, unless the context clearly indicates otherwise:
"Impaired" means one or more designated beneficial uses are not being attained.
"MQL" means minimum quantification level.
"Non-wadable" means a stream which is not wadable.
"Screening level" means an evaluation threshold based upon criteria prescribed in OAC 785:45 to protect a designated beneficial use.
"Seasonal base flow" means the sustained or fair-weather runoff, which includes but is not limited to groundwater runoff and delayed subsurface runoff.
"Wadable" means a stream which under normal conditions may be assessed in its cross section by wading.
"Waterbody" means a body of waters of the state.
[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00; Amended at 18 Ok Reg 3379, eff 8-13-01]

785:46-15-3. Data requirements
(a) **General**. In order to determine whether a given beneficial use of a waterbody is supported, scientific data from the waterbody shall be used as prescribed in this Section. Data shall be collected and analyzed in a manner consistent with testing procedures provided in 785:45-1-4 or other widely accepted and peer-reviewed methods. All existing data available for a waterbody shall be used in the analysis, subject to the spatial, temporal and other requirements of this Section.
(b) **Spatial coverage.**

(1) **General for streams**. The spatial extent of assessment of use support in terms of stream miles shall be determined after taking into account existing data, spatial distribution of monitoring sites, sources of pollution and influence of tributaries. Major hydrological features, such as the confluence of a major tributary or a dam, may limit the spatial extent of an assessment based on one station.

(2) **Non-wadable streams**. Unless it is demonstrated to the contrary, a single monitoring site shall be considered representative of no more than 25 stream miles for non-wadable streams.

(3) **Wadable streams.** Unless it is demonstrated to the contrary, a single monitoring site shall be considered representative of no more than 10 stream miles for wadable streams.

(4) **Lakes**. The spatial extent of assessment of use support in terms of lake surface acres shall be estimated based on the spatial distribution of monitoring sites having the requisite number of samples, sources of pollution, influence of tributaries and best professional judgment. Arms or portions of lake may be treated separately from the main body of a lake. Unless it is demonstrated to the contrary, a single site shall be considered representative of an entire lake or an arm of no more than two hundred and fifty surface acres in size.

(5) **Spatial limitation for sampling sites**. For purposes of this Subchapter, samples shall not be taken within any regulatory mixing zone.

(c) **Temporal coverage.**

(1) **General**. Samples collected for purposes of assessing use support shall be taken to avoid temporal bias, and seasonality shall be represented in the sampling scheme.

(2) **Streams.** Except for circumstances in which 785:46-15-4(b)(3) or 785:46-15-4(c)(3) applies, data more than five years old shall not be utilized in assessing use support for a stream unless no data exists for the preceding five year period.

(3) **Lakes**. Except for circumstances in which 785:46-15-4(b)(3) or 785:46-15-4(c)(3) applies, data more than ten years old shall not be utilized in assessing use support for a lake unless no data exists for the preceding ten year period.

(d) **Minimum number of samples.**

(1) **Streams**. Except when (f) of this Section applies, a minimum of 10 samples shall be required to assess beneficial use support due to field parameters including but not limited to DO, pH and temperature, and due to routine water quality constituents including but not limited to coliform bacteria, dissolved solids and salts. Analyses may be aggregated to meet the 10 sample minimum requirements in non-wadable stream reaches that are 25 miles or less in length, and in wadable stream reaches that are 10 miles or less in length, if water quality conditions are similar at all sites. Provided, a minimum of 10 samples shall not be necessary if the existing samples already assure exceedance of the applicable percentage of a prescribed screening level.

(2) **Lakes**. Except when (f) of this Section applies, a minimum of 20 samples shall be required on lakes of more than 250 surface acres to assess beneficial use support due to water quality parameters including but not limited to DO, pH and temperature. A minimum of 20 samples shall likewise be required on such lakes for other routine water quality constituents including but not limited to coliform bacteria, chlorophyll a, and dissolved solids. A minimum of 10 samples shall be required on lakes or arms of 250 surface acres of less. Samples may be aggregated to meet the minimum requirements of this paragraph.

(3) **Toxicants**. Notwithstanding any other provision of this Subchapter, a minimum of five samples shall be required to determine that a beneficial use is supported with respect to all toxicants in water. A determination that a beneficial use is partially supported or not supported with respect to toxicants may be made upon less than five samples. Samples may be aggregated consistent with the spatial and temporal requirements prescribed in (b) and (c) of this Section in order to satisfy the minimum sample requirement of this paragraph. Additional samples for the calculation of pH and hardness dependent acute and chronic criteria shall be collected as required by OAC 785:46-5-8.

(e) **Application of MQL**.

(1) **Criteria above MQL.** If sample values are below the MQL for an applicable criterion for a given beneficial use whose criterion is above the MQL, appropriate nonparametric statistical measures shall be used.

(2) **Criteria below MQL.** If sample values are below the MQL for an application criterion for a given beneficial use whose criterion is also below the MQL, fifty percent of the criterion may be used.

(f) **Magnitude of criteria exceedance.**

(1) **General.** The magnitude of exceedance, as well as frequency of exceedances, shall be used in determining beneficial use support. Samples shall be taken only during conditions when criteria apply.

(2) **Toxicants.** If two or more concentrations of toxicants exceed criteria or screening levels to protect human health by two orders of magnitude or more, the associated beneficial use shall be deemed to be not supported.

(3) **Dissolved oxygen.** If more than two concentrations of DO in a stream are observed to be below 2 mg/L in any given year, the Fish and Wildlife Propagation beneficial use shall be deemed to be not supported.

(4) **Other parameters**. The magnitude and frequency of exceedances to be used for determining beneficial use support for parameters other than toxicants and DO shall be as prescribed in the rules elsewhere in this Subchapter.

[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00; Amended at 18 Ok Reg 3379, eff 8-13-01]

785:46-15-4. Default protocols

(a) **General**. The protocols prescribed in this Section shall apply whenever the more specific protocols prescribed elsewhere in this Subchapter do not apply.

(b) **Short term average numerical parameters.**

(1) Short term average numerical parameters are based upon exposure periods of less than seven days. Short term average parameters to which this Section applies include, but are not limited to, sample standards and turbidity.

(2) A beneficial use shall be deemed to be fully supported for a given parameter whose criterion is based upon a short term average if 10% or less of the samples for that parameter exceed the applicable screening level prescribed in this Subchapter.

(3) A beneficial use shall be deemed to be fully supported but threatened if the use is supported currently but the appropriate state environmental agency determines that available data indicate that during the next five years the use may become not supported due to anticipated sources or adverse trends of pollution not prevented or controlled. If data from the preceding two year period indicate a trend away from impairment, the appropriate agency shall remove the threatened status.

(4) A beneficial use shall be deemed to be partially supported for a given parameter whose criterion is based upon a short term average if greater than 10% but less than 25% of the samples for that parameter exceed the applicable screening level prescribed in this Subchapter.

(5) A beneficial use shall be deemed to be not supported for a given parameter whose criterion is based upon a short term average if at least 25% of the samples for that parameter exceed the applicable screening level prescribed in this Subchapter.

(c) **Long term average numerical parameters.**

(1) Long term average numerical parameters are based upon exposure periods of seven days or longer. Long term average parameters to which this Section applies include, but are not limited to, fish consumption water column numerical criteria and yearly mean standards.

(2) A beneficial use shall be deemed to be fully supported for a given parameter whose criterion is based upon a long term average if the mean of the sample results does not exceed the long term average.

(3) A beneficial use shall be deemed to be fully supported but threatened if the use is supported currently but the appropriate state environmental agency determines that available data indicate that during the next five years the use may become not supported due to anticipated sources or adverse trends of pollution not prevented or controlled. If data from the preceding two-year period indicate a trend away from impairment, the appropriate agency shall remove the threatened status.

(4) Because means are compared with screening levels when addressing long term average numerical parameters, such parameters are not susceptible to an assessment that a use is partially supported.

(5) A beneficial use shall be deemed to be not supported for a given parameter whose criterion is based upon a long term average if the mean of the sample results exceeds the criterion or screening level.

[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00]

785:46-15-5. Assessment of Fish and Wildlife Propagation support

(a) **Scope.** The provisions of this Section shall be used to determine whether the beneficial use of Fish and Wildlife Propagation or any subcategory thereof designated in OAC 785:45 for a waterbody is supported.

(b) **Dissolved oxygen.**

(1) **Screening levels for DO in streams.**

(A) Screening levels for DO in habitat limited aquatic communities shall be 4.0 mg/L from April 1 through June 15 each year and 3.0 mg/L for the remainder of the year.

(B) Screening levels for DO in warm water aquatic communities shall be 4.0 mg/L from June 16 through October 15 each year and 5.0 mg/L for the remainder of the year.

(C) Screening levels for DO in cool water aquatic communities and trout fisheries shall be 5.0 mg/L from June 1 through October 15 each year and 6.0 mg/L for the remainder of the year.

(2) **Screening levels for DO in lakes.**

(A) If greater than 70% of the volume of water in a lake or an arm of a lake is less than 2 mg/L, the Fish and Wildlife Propagation beneficial use shall be deemed to be not supported.

(B) If 50% or more, but not greater than 70%, of the water volume in a lake or arm of a lake is less than 2 mg/L, the Fish and Wildlife Propagation beneficial use shall be deemed to be partially supported.

(C) The screening level for surface DO in a lake or arm of a lake shall be 4 mg/L from June 16 through October 15 each year and 5.0 mg/L for the remainder of the year.

(3) **Support tests.**

(A) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be fully supported with respect to the DO criterion if no more than 10% of the samples from a waterbody are less than the screening level for DO prescribed in (b)(1) or (b)(2)(C) of this Section.

(B) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be partially supported with respect to the DO criterion if greater than 10% but less than 25% of the samples from a waterbody are less than the screening level for DO prescribed in (b)(1) or (b)(2)(C) of this Section.

(C) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be not supported with respect to the DO criterion if at least 25% of the samples from a waterbody are less than the screening level for DO prescribed in (b)(1) or (b)(2)(C) of this Section.

(c) **Toxicants.**

(1) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be fully supported with respect to any individual toxicant parameter if no more than one of the sample concentrations from the waterbody exceeds the acute or chronic criterion for that toxicant prescribed in the numerical criteria for toxic substances in OAC 785:45-5-12(f)(6)(G).

(2) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be partially supported with respect to any individual toxicant parameter if more than one but not greater than 10% of the sample concentrations from the waterbody exceed the acute or chronic criterion for that toxicant prescribed in the numerical criteria for toxic substances in OAC 785:45-5-12(f)(6)(G).

(3) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be not supported with respect to any individual toxicant parameter if greater than 10% of the sample concentrations from that waterbody exceed the acute or chronic criterion for that toxicant prescribed in the numerical criteria for toxic substances in OAC 785:45-5-12(f)(6)(G).

(d) **pH.**

(1) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be fully supported with respect to pH occurring other than by natural causes if no more than 10% of

the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(f)(3).

(2) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be partially supported with respect to pH occurring other than by natural causes if greater than 10% but less than 25% of the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(f)(3).

(3) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be not supported with respect to pH occurring other than by natural causes if at least 25% of the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(f)(3).

(e) **Biological criteria.** If data demonstrate that an assemblage of fish or macro invertebrates from a waterbody is significantly degraded, according to 785:45-5-12(f)(5), from that expected for the subcategory of Fish and Wildlife Propagation designated in OAC 785:45 for that waterbody, then that subcategory may be deemed by the appropriate state environmental agency to be partially supported or to be not supported.

(f) **Turbidity.** The criteria for turbidity stated in 785:45-5-12(f)(7) shall constitute the screening levels for turbidity. The tests for use support shall follow the default protocol in 785:46-15-4(b).

(g) **Special provisions for Ouachita Mountains wadable streams**. The determination of whether the use of Fish and Wildlife Propagation is supported for wadable streams located in the Ouachita Mountains ecoregion, as defined in EPA's 1997 revision of Omernick, "Ecoregions of the Conterminous United States", Annals of the Association of American Geographers, shall be made according to all of the requirements of this subsection.

(1) All physical assessments and biological collections shall be performed in accordance with the requirements set forth in OWRB Technical Report No. 99-3 entitled "Standard Operating Procedures for Stream Assessments and Biological Collections Related to Biological Criteria in Oklahoma".

(2) Evaluation of the biological collections shall include identification of fish samples to species level.

(3) The determination of use support shall be made according to the application of Appendix C of this Chapter, together with this paragraph, as follows:

(A) Where designated, the subcategory of Warm Water Aquatic Community shall be deemed fully supported if the application of Appendix C produces a score of 35 or more. Such subcategory shall be deemed partially supported if the application of Appendix C produces a score of 25 to 34 inclusive. Such subcategory shall be deemed not supported if the application of Appendix C produces a score of 24 or less.

(B) Where designated, the subcategory of Habitat Limited Aquatic Community shall be deemed fully supported if the application of Appendix C produces a score of 27 or more. Such subcategory shall be deemed partially supported if the application of Appendix C produces a score of 19 to 26 inclusive. Such subcategory shall be deemed not supported if the application of Appendix C produces a score of 18 or less.

[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00; Amended at 18 Ok Reg 3379, eff 8-13-01]

785:46-15-6. Assessment of Primary Body Contact Recreation support

(a) **Scope.** The provisions of this Section shall be used to determine whether the subcategory of Primary Body Contact of the beneficial use of Recreation designated in OAC 785:45 for a waterbody is supported during the recreation season from May 1 through September 30 each year.

(b) **Screening levels.**

(1) The screening level for fecal coliform shall be a density of 400 colonies per 100ml.

(2) The screening level for Escherichia coli shall be a density of 235 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 406 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(3) The screening level for enterococci shall be a density of 61 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 406 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(c) **Fecal coliform.**

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is met and no greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section.

(2) The parameter of fecal coliform is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is not met, or greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(d) **Escherichia coli (*E. coli*).**

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to *E. coli* if the geometric mean of 126 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of *E. coli* is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to *E. coli* if the geometric mean of 126 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

(e) **Enterococci.**

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of enterococci is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00]

785:46-15-7. Assessment of Public and Private Water Supply support

(a) **Scope.** The provisions of this Section shall be used to determine whether the beneficial use of Public and Private Water Supply or any subcategory thereof designated in OAC 785:45 for a waterbody is supported.

(b) **Toxicants.**

(1) The Public and Private Water Supply beneficial use designated for a waterbody shall be deemed to be fully supported with respect to any substance listed in 785:45-5-10(1) or 785:45-5-10(6) if the sample concentrations from that waterbody do not exceed the criterion for that substance prescribed in 785:45-5-10 more than 10% of the time, or drinking water use restrictions are not in effect, or both such conditions exist.

(2) The Public and Private Water Supply beneficial use designated for a waterbody shall be deemed to be partially supported with respect to any substance listed in 785:45-5-10(1) or 785:45-5-10(6) if the sample concentrations from that waterbody exceed the criterion for that substance prescribed in 785:45-5-10 more than 10% but less than 25% of the time, or drinking water use restrictions imposed by an agency with jurisdiction in effect require more than conventional treatment, or both such conditions exist.

(3) The Public and Private Water Supply beneficial use designated for a waterbody shall be deemed to be not supported with respect to any substance listed in 785:45-5-10(1) or 785:45-5-10(6) if the sample concentrations from that waterbody exceed the criterion for that substance prescribed in 785:45-5-10 more than 25% of the time, or drinking water use restrictions imposed by an agency with jurisdiction in effect require closure of the water supply, or both such conditions exist.

(c) **Bacteria.** The screening level for fecal coliform bacteria shall be 5000 colonies per 100 ml. The tests for use support shall follow the default protocol in 785:46-15-4.
(d) **Threatened water supplies.** Waters of the state designated in OAC 785:45 as Public and Private Water Supply shall be presumed to be threatened when toxicants are detected but do not exceed the applicable criteria prescribed in 785:45-5-10, or some drinking water use restrictions have been put into effect by an agency with jurisdiction, or the potential for adverse impacts to water quality exists, or more than one such conditions exist.
[**Source**: Added at 17 Ok Reg 1775, eff 7-1-00]

785:46-15-8. Assessment of Agriculture support
(a) **Scope.** The provisions of this Section shall be used to determine whether the beneficial use of Agriculture designated in OAC 785:45 for a waterbody is supported.
(b) **General support tests for chlorides, sulfates and TDS.**
(1) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to chlorides, sulfates and TDS if the mean of all chlorides, sulfates and TDS sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F of OAC 785:45. Provided, if the TDS sample concentrations are less than 750 mg/L and the chlorides and sulfates are each less than 250 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to those substances.
(2) The Agriculture beneficial use designated for a waterbody shall be deemed to be partially supported with respect to chlorides, sulfates and TDS if the mean of all chlorides, sulfates and TDS sample concentrations from that waterbody does not exceed the yearly mean standard prescribed in Appendix F of OAC 785:45 and more than 10% but less than 25% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F of OAC 785:45.
(3) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to chlorides, sulfates and TDS if the mean of all chlorides, sulfates and TDS sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F of OAC 785:45, or at least 25% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F of OAC 785:45, or both such conditions exist.
(c) **Use of site specific data.** If the appropriate state environmental agency determines that the stream segment averages prescribed in Appendix F of OAC 785:45 are not appropriate for the entirety of a given stream segment, then yearly mean standards and sample standards developed from site specific data may be used to assess whether the use of Agriculture is supported for that waterbody.
[**Source**: Added at 17 Ok Reg 1783, eff 7-1-00]

785:46-15-9. Assessment of Fish Consumption support
(a) **Scope.** The provisions of this Section shall be used to determine whether the beneficial use of Fish Consumption designated in OAC 785:45 for a waterbody is supported.
(b) **Support tests.**
(1) The Fish Consumption beneficial use designated for a waterbody shall be deemed to be partially supported if restricted consumption as imposed by an agency with jurisdiction is in effect or if a fish or shellfish ban is in effect for a sub-population thereof.
(2) The Fish Consumption beneficial use designated for a waterbody shall be deemed to be not supported if an aquatic life closure or if a "no consumption" advisory imposed by an agency with jurisdiction is in effect.
(3) The water column criteria for protection of the Fish Consumption beneficial use stated in 785:45-5-20(b) shall be used according to the default protocol in 785:46-15-4(c) to determine use support.
[**Source**: Added at 17 Ok Reg 1783, eff 7-1-00]

785:46-15-10. Nutrients
(a) **General.** OAC 785:45-3-2(c) prohibits water quality degradation by nutrients which will interfere with the attainment or maintenance of any existing or designated beneficial use. OAC 785:46-13-3(a)(1) requires maintenance of any existing or designated beneficial use. This Section provides a framework

which shall be used in assessing threats or impairments to beneficial uses and waterbodies and watersheds caused by nutrients, and the consequences of such assessments.

(b) **Determining whether a stream is nutrient-threatened.** The dichotomous process stated in this subsection shall be used in the determination of whether a stream is nutrient-threatened.

(1) The stream order shall be identified. If the stream order is 1, 2 or 3, then proceed to paragraph (2). If the stream order is not 1, 2 or 3, then proceed to paragraph (9).

(2) The stream slope shall be identified. If the stream slope is greater than or equal to 17 feet per mile, then proceed to paragraph (3). If the stream slope is less than 17 feet per mile, then proceed to paragraph (4).

(3) Subject to the application of the foregoing paragraphs of this subsection, if phosphorous concentrations in the stream are greater than 0.24 mg/L or if nitrite plus nitrate concentrations in the stream are greater than 4.95 mg/L, then proceed to paragraph (5). If such nutrient concentrations are less than the levels specified in this paragraph, then the stream is not threatened by nutrients.

(4) Subject to the application of the foregoing paragraphs of this subsection, if phosphorous concentrations in the stream are greater than 0.15 mg/L or if nitrite plus nitrate concentrations in the stream are greater than 2.4 mg/L, then proceed to paragraph (5). If such nutrient concentrations are less than the levels specified in this paragraph, then the stream is not threatened by nutrients.

(5) Subject to the application of the foregoing paragraphs of this subsection, if the percentage of canopy shading is greater than or equal to 80%, then the stream is not threatened by nutrients. If the percentage of canopy shading is less than 80%, then proceed to paragraph (6).

(6) Subject to the application of the foregoing paragraphs of this subsection, if the stream's turbidity is organic, then proceed to paragraph (7). If the stream's turbidity is inorganic, then proceed to paragraph (8).

(7) Subject to the application of the foregoing paragraphs of this subsection, if turbidity measured at seasonal base flow conditions is less than 20 NTU, then the stream is not threatened by nutrients. If turbidity measured at seasonal base flow conditions is 20 or more NTU, then the stream is threatened by nutrients.

(8) Subject to the application of the foregoing paragraphs of this subsection, if turbidity measured at seasonal base flow conditions is less than 20 NTU, then the stream is threatened by nutrients. If turbidity measured at seasonal base flow conditions is 20 or more NTU, then the stream is not threatened by nutrients.

(9) Subject to the application of the foregoing paragraphs of this subsection, if the stream slope is greater than or equal to 17 feet per mile, then proceed to paragraph (10). If the stream slope is less than 17 feet per mile, then proceed to paragraph (11).

(10) Subject to the application of the foregoing paragraphs of this subsection, if phosphorous concentrations in the stream are greater than 1.00 mg/L, or if nitrite plus nitrate concentrations in the stream are greater than 4.65 mg/L, then proceed to paragraph (12). If such nutrient concentrations are less than the levels specified in this paragraph, then the stream is not threatened by nutrients.

(11) Subject to the application of the foregoing paragraphs of this subsection, if phosphorous concentrations in the stream are greater than 0.36 mg/L, or if nitrite plus nitrate concentrations in the stream are greater than 5.0 mg/L, then proceed to paragraph (12). If such nutrient concentrations are less than the levels specified in this paragraph, then the stream is not threatened by nutrients.

(12) Subject to the application of the foregoing paragraphs of this subsection, if the stream's inorganic turbidity measured at seasonal base flow conditions is greater than or equal to 20 NTU, then the stream is not threatened by nutrients. If the stream's inorganic turbidity measured at seasonal base flow conditions is less than 20 NTU, then the stream is threatened.

(c) **Alternative to dichotomous process for streams.**

(1) A wadable stream shall be deemed threatened by nutrients if the arithmetic mean of benthic chlorophyll-a data exceeds 100 mg per square meter under seasonal base flow conditions, or if two or more benthic chlorophyll-a measurements exceed 200 mg per square meter under seasonal base flow conditions. A non-wadable stream shall be deemed threatened by nutrients if planktonic chlorophyll-a values in the water column indicate it has a Carlson's Trophic State Index of 62 or greater.

(2) If clear and convincing evidence indicates a result for a stream different from that obtained from application of the dichotomous process in (b) of this Section, then the appropriate state environmental agency may, after completing the public participation process developed by the Secretary of

Environment pursuant to 27A O.S. 1-2-101, accordingly identify the stream as threatened or not threatened by nutrients.

(d) **Demonstration that nutrients may be adversely impacting a beneficial use in a lake.** If it is demonstrated that nutrient loading in a lake may be adversely impacting a beneficial use designated for that waterbody, then the Board may determine that the lake and its watershed is an NLW, and shall identify the lake and watershed as NLW in Appendix A of OAC 785:45.

(e) **Consequence of identification as NLW; results of study.** If a lake or its watershed is identified as NLW in Appendix A of OAC 785:45, then the Board or other appropriate state environmental agency may cause an NLW Impairment Study to be performed. The beneficial uses designated for lakes identified in OAC 785:45 Appendix A as NLW shall be presumed to be fully supported but threatened, unless an NLW Impairment Study demonstrates that the uses are partially supported or not supported; provided, if an NLW Impairment Study demonstrates that the uses are not threatened, then the Board shall consider deleting the NLW identification.

(f) **Consequence of assessment that use is threatened by nutrients.** If it is determined that one or more beneficial uses designated for a waterbody are threatened by nutrients, then that waterbody shall be presumed to be nutrient-threatened. If it is determined or presumed, in accordance with this Section, that a waterbody is nutrient-threatened, then before the waterbody is determined to be nutrient-impaired, an NLW Impairment Study if a lake or an impairment study if a stream must be completed by the appropriate state environmental agency.

(g) **Result of impairment study.**

(1) **Impaired or threatened.** If, independent of or in addition to the process set forth in (b) of this Section, an impairment study of a waterbody demonstrates that a waterbody is impaired or threatened by nutrients, then the appropriate state environmental agency shall initiate the appropriate listing procedure developed by the Secretary of Environment pursuant to 27A O.S. 1-2-101.

(2) **Not threatened nor impaired.** If, independent of or in addition to the process set forth in (b) of this Section, an impairment study of a waterbody demonstrates that a waterbody is neither threatened nor impaired by nutrients, then the appropriate state environmental agency shall initiate the appropriate de-listing procedure developed by the Secretary of Environment pursuant to 27A O.S. 1-2-101.

[**Source:** Added at 17 Ok Reg 1775, eff 7-1-00; Amended at 18 Ok Reg 3379, eff 8-13-01]