Coffee Creek: State Highway 66

NE/NW/SW 29-14N-1W
Oklahoma County
Latitude N35.65996
Longitude W-97.33218
WBID#: OK520710-01-0090C

Blue Thumb Volunteer Monitoring Data Review
Written by Melinda West - October 2013

Description of Watershed and Monitoring Site:

The Coffee Creek watershed comprises approximately forty square miles in north central Oklahoma County. The stream originates in north Edmond in the region of Broadway and Coffee Creek Road. Flow is west to east on the west side of Interstate 35 then it turns to the southeast around Air Depot Road. It continues in a southeastern direction until it curves south to cross State Highway 66 just inside the Arcadia city limits. It turns back east and empties into the Deep Fork River less than one mile east of the Highway 66 Bridge. Coffee Creek passes through a golf course, numerous housing additions, forested and pasture lands, and the City of Edmond's Water Treatment Plant.

The monitoring site is located at the point where Coffee Creek passes under the State Highway 66 Bridge on the west side of Arcadia, OK. The creek makes an "S" curve under the bridge. Monthly chemical monitoring takes place on the south side of the bridge where the stream turns from south to east. A large amount of concrete "chunks" characterize the area possibly belonging to an older railroad bridge. Fast water flow in this area has resulted in bank erosion primarily on the south side. The creek "sits" well below the level of the surrounding land and road. In the early years of monthly monitoring there was a lot of rocky debris in the creek bed that created riffles, presently much of this has since silted in.

Stream Condition & Habitat Overview:

The Oklahoma Conservation Commission's habitat assessment adheres to a modified version of the EPA Rapid Bioassessment Protocols and is designed to assess habitat quality in relation to its ability to support biological communities in the stream. This assessment is based on parameters grouped into three categories. These categories include micro scale habitat, macro scale habitat, and riparian/bank structure. Micro scale habitat includes substrate makeup, stable cover, canopy, depth, and velocity. Macro scale assesses the channel morphology, sediment deposits, and other parameters. The third category looks at the riparian zone quality, width, and general makeup (trees, shrubs, vines, and grasses) as well as bank features. This section also includes bank erosion and streamside vegetative cover. These various features are scored on different scales. There are twenty possible points for "Instream cover, pool bottom substrate, pool variability, canopy cover shading, presence of rocky runs or riffles, and flow." "Channel alteration and channel sinuosity" have 15 possible points each. "Bank stability, bank vegetation stability and streamside cover" each have a possible 10 points. The total habitat score can reach 180 points with the score increasing as habitat quality increases. No stream will score the highest value in every parameter. Streams in different ecoregions are very different. Each stream should be compared to known high quality streams in the same ecoregion and vicinity.

Habitat assessment scores are presented in Table 1. Habitat assessment was conducted on an area 400 meters upstream of the monthly monitoring site along a relatively straight west to east section of the stream north of the bridge. The habitat assessment score for August 11, 2006 was 87.9. It dropped to 39.7 for the July 19, 2010 assessment date. The average score for high quality streams in the Cross Timber ecoregion is 84.0.

Table 1. Habitat Assessment Scores

	8/11/2006	7/19/2010
Instream Cover	12.8	5.5
Pool Bottom Substrate	2.2	0.4
Pool Variability	16.5	0
Canopy Cover Shading	3.8	4.2
Presence of Rocky Runs or Riffles	10.3	2.2
Flow	15.6	17.7
Channel Alteration	8.7	0.5
Channel Sinuosity	0	0.3
Bank Stability	4.6	3.2
Bank Vegetation Stability	4.6	2.5
Streamside Cover	8.9	3.2
Total Points	**87.9**	**39.7**

In 2006 Coffee Creek had high scores for pool variability (16.5), flow (15.6) and streamside cover (8.9). **Pool variability** refers to the depths of pools. Healthy diverse communities of aquatic organisms require both deep and shallow pools. The value for 2010 dropped to zero (0). **Flow** is representative of stream size. The score here increased slightly from 2006 (15.6) to 2010 (17.7). One possible reason for the higher scores here is that the Edmond Water Treatment Plant discharges into Coffee Creek. **Streamside cover** is important in the transfer of food and energy into the stream. A mixture of grasses, forbs, shrubs, vines, saplings, and large trees make this transfer more efficient than would a single vegetative type. For 2006 streamside cover scored 8.9 while dropping to 3.2 for 2010. Due to the fact that the creek is constantly incising the banks are often too steep to provide much cover.

In 2006 Coffee Creek had several habitat parameters with moderate or mid level scores, such as: instream cover, percent of rocky runs and riffles, channel alteration, bank erosion, and bank stability. By 2010 only two parameters were in the medium range: bank stability & streamside cover. **Instream cover** is the component of habitat that organisms hide behind, within or under. It consists of such items as submerged logs, cobbles and boulders, root wads and beds of aquatic plants. At least 50% of a stream's area should be occupied by a mixture of stable cover types for this category to be optimal. This parameter dropped from 12.8 in 2006 to 5.5 in 2010. This could be due to the numerous flooding events that occur on the watershed. Rocky runs and riffles provide highly oxygenated, turbulent water flowing over high quality cover and substrate. Sensitive macroinvertebrates in these areas are some of the first to vanish when oxygen levels decrease. The **percent of rocky runs and riffles** was 10.3 in 2006, but dropped to 2.2 in 2010. This may be due to increased siltation. **Channel alteration** also dropped drastically from 8.7 in 2006 to 0.5 in 2010. Unstable stream beds support fewer types of animals. Few or no signs of stream alteration (newly formed point bars) are considered optimal. Due to the number of "objects" in the stream and the flow rate and more silt/sand Coffee Creek's channel is often altered. **Bank stability** continues to decrease (4.6 to 3.2). Due to the creek bed being incised so drastically heavy rainfall often causes large areas of the bank to slough off. **Banks stabilized with vegetation** benefit the aquatic community more than those stabilized with other materials such as rock or concrete. Stream bank vegetation provides a food source for aquatic animals. Coffee Creek is deficient in bank vegetation due to the almost vertical nature of the bank.

In 2006 only pool bottom substrate, canopy cover shading and channel sinuosity had low scores. The **pool bottom substrate** does not provide the habitat necessary for bottom spawning fish and smaller vertebrates and invertebrates to successfully live and reproduce. It has continued to drop (2.2 to 0.4) due to increased erosion and more silt washing into the creek. Light in a stream is of course necessary for plant growth. **Canopy cover**

moderates this light so the stream doesn't heat up too much. Aquatic organisms are more stressed by warm water, lower oxygen stability and higher metabolic rates that accompany warmer waters. Canopy cover has increased somewhat (3.8 to 4.2); however it is still in the low range. Part of this cover may actually be coming from the steep banks rather than any vegetative canopy. The 400 meter habitat assessment area is very straight. The stream as a whole only curves at the area where it passes under the bridge. **Channel sinuosity** measures how far a channel deviates from a straight line. More sinuous channels tend to have more undercut banks, root wads, submerged logs, etc. thus providing more habitat and slowing the speed of the water. For 2010 it has actually increased very slightly (0 to 0.3).

During the four years between the August 11, 2006 and the July 19, 2010 habitat assessments the total points for Coffee Creek dropped considerably. The 2006 score was actually a bit higher (87.9) than that for a high quality stream in the Cross Timbers ecoregion (84.0). The 2010 score (39.7) was less than one half of this. The creek has silted in so much that the very deep pool (over 7 feet deep) on the north side of the bridge in 2006 was only waste deep in 2010, with the rest of the creek ankle deep or less. There was also more erosion in 2010 and considerably less streamside vegetation. I believe that many of the low scoring parameters are due at least in part to the scouring effect of the high flow rate. Even in times of drought there is significant flow in Coffee Creek due to the discharge from the Edmond Water Treatment Plant. I believe another factor affecting this is the substantial increase in the number of housing additions in the watershed. Historically (pre 1889) the watershed was forestland and then later (post 1889) pasture and crop land. All of these land uses serve to slow down and decrease the amount of runoff from the watershed into the creek. East Edmond (east of I-35) has grown by leaps and bounds of the last 10-15 years. Vast amounts of land are now paved or covered in such a way that rainfall does not soak into the ground, but runs off into smaller creeks and eventually into Coffee Creek. In many ways Coffee creek is becoming nothing more than a large drainage ditch.

Biological Conditions:

Fish

Fish were collected by seining from the same 400 meter section as the habitat assessment. The condition of the fish community is based on indices of species richness, community quality, trophic structure and by comparison to the average score for high quality streams in the same Cross Timber ecoregion.

The **total number of fish species** collected for Coffee Creek was 10 in 2006 and 9 in 2010 while the number for Cross Timber reference streams was nearly double at 19. The total number of species decreases with decreasing water or habitat quality. There were no **sensitive benthic species** such as darters, madtoms, and sculpins collected from Coffee Creek. The number for Cross Timber reference streams was 4. These species decrease with increasing siltation and increasing benthic oxygen demand. These species are good indicators of conditions which make the microenvironment of the stream inhospitable. Only three **species of sunfish** were collected: Bluegill, Longear, Largemouth Bass in 2006 and Green, Bluegill, Longear in 2010. These decrease in number with decreasing pool quality and decreasing cover. They also require a fairly stable substrate for spawning. Their long term success is tied to conditions that affect the amount of sediment that enters and exits a stream. The number of sunfish species for Cross Timber reference streams was 7. Only one **intolerant species of fish** (suckermouth minnow) was collected in 2006 and none in 2010. Two were collected for Cross Timber reference streams. This characteristic of the fish community separates high quality from moderate quality streams. The **proportion of tolerant species** was 96% in 2006 and 64% in 2010 (70% for Cross Timber reference streams). So this is a parameter that got better in 2010 vs. 2006, and was better than reference streams. This characteristic separates moderate from low quality streams. These are opportunistic, tolerant fish that dominate communities that have lost their competitors through loss of habitat or water quality. Only 4% of the fish collected in 2006 were **insectivorous cyprinids** (7% for Cross Timber reference streams). This jumped to 34% in 2010. These minnow fish that eat insects increase as quality and quantity of the invertebrate food base

increases. This is the second parameter where the 2010 collection beat out the 2006 collection and the reference streams.

The “overall score” for the fish community at the Coffee Creek site was a “D” in both 2006 and 2010 collections. This indicates that top carnivores and many expected species were absent or rare while omnivores and tolerant species dominant. An increase in omnivores and a loss of predatory fish indicate the stream quality is decreasing.

Table 2. Species Collected

Species	**# Fish 2006**	**% of Sample 2006**	**# Fish 2010**	**% of Sample 2010**	**Combined Tolerance**	**Food**
Gizzard Shad *Dorosoma cepedicnum*			1	0.25	Tolerant	Omnivore
Threadfin Shad *Dorosoma petenense*			7	1.75	Intermediate	Omnivore
Red shiner *Cyprinella lutrensis*	21	13.46	237	59.40	Tolerant	Omnivore
Common carp *Cyprinus carpio*	2	1.28			Tolerant	Omnivore
Sand shiner *Notropis stramineus*	6	3.85	136	34.09	Intermediate	Insectivore
Bluntnose Minnow *Pimephales notatus*			1	0.25	Intermediate	Omnivore
Suckermouth minnow *Phenacobius mirabilis*	1	0.64			Intolerant	Insectivore
Plains Killifish *Fundulus zebrinus*			4	1.0	Tolerant	Insectivore
Black bullhead catfish *Ameiurus melas*	1	0.64			Tolerant	Generalist/ Insectivore
Channel catfish *Ictalurus punctatus*	1	0.64			Tolerant	Generalist/ Piscivore
Mosquitofish *Gambusia affinis*	49	31.41			Tolerant	Insectivore
Green Sunfish *Lepomis cyanellus*			6	1.5	Tolerant	Generalist/ Insectivore
Bluegill sunfish *Lepomis macrochirus*	17	10.90	4	1.0	Tolerant	Insectivore
Longear sunfish *Lepomis megalotis*	51	32.69	3	0.75	Tolerant	Insectivore
Largemouth bass *Micropterus salmoides*	7	4.49			Tolerant	Piscivore

Macroinvertebrates (bugs)

Collection of macroinvertebrates took place in the summers of 2005, 2006, 2008 and 2010 and winters of 2006-2011. These seasons represent relative community stability providing an opportunity for meaningful site comparisons. Samples were taken from areas of rocky riffles at the monthly monitoring site.

Six metrics were used to assess the macroinvertebrate community. **Taxa richness** refers to the total number of different species. This number rises with increasing water and/or habitat quality. Cross Timber reference streams averaged 20 species in the summer and 16 species in the winter. Coffee Creek summer collections started with 10-12 species until the final collection in 2010 had 15 species. Coffee Creek winter collections varied in taxa richness with the lowest of 12 species in 2010 and the highest of 16 species (equal to reference streams) in 2007 and 2011. The **EPT Index** is the number of different taxa from the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). Generally these insects are more sensitive to pollution than any other groups. As stream quality deteriorates members of this group are the first to disappear. The percent EPT is a measure of how many individuals in the sample are members of this group. This score helps to separate high quality streams from those of moderately high quality. Summer Coffee Creek collections had 3-4 EPT species except only 1 EPT species in 2006; reference streams averaged 7 EPT species. Winter Coffee Creek collections had 2-3 EPT species except only 1 EPT species in 2010; reference streams averaged 5 EPT species. EPT abundance was better in the summer then in the winter for Coffee Creek. **Percent dominant taxon** is the percentage of the collection composed of the most common taxon. As more species are excluded by increasing pollution, the remaining species increase in number. This helps separate the high quality streams from those of moderate quality. Summers 2005 and 2010 scored the worst and summers 2006 and 2008 scored very close to reference conditions. For winter samples; 2010 scored the worst while 2006 and 2009 were better than reference conditions. The **Shannon-Weaver Species Diversity Index** measures the evenness of the species distribution. It increases as more and more taxa are found in the collection and as individual taxa become less dominant. Summers 2005 and 2006 were below reference conditions but very close. Summer 2008 had the best diversity, and summer 2010 was barely above reference conditions. All Coffee Creek winter collections scored better than reference conditions in Shannon-Weaver Diversity.

The overall grade for Coffee Creek summer collections started as a “C” and increased to a “B”. Summer time is more stressful for the bugs due to the heat and lower oxygen levels due to warmer water; thus it is very good to see the summer collections getting a better grade with time. The story is different for the winter collections the scores jumped around with the highest grade of a low “A” in 2006 and 2009, lowest grade of a low “C” is 2010 and a “B” grade the rest of the years. The EPT abundance and Percent dominant taxon were the big differences.

I believe the variation in samples from season to season and year to year is probably a direct result of the ever changing flow of Coffee Creek. Populations have a hard time maintaining themselves when their habitat is always changing.

Bacterial Screening:

Fecal coliforms are a group of organisms common to the intestinal tracts of humans and other animals. Their presence is an indicator of pollution and potentially dangerous bacterial contamination. Bacterial screening for E.coli and total fecal coliforms was conducted July-September 2006, May-September 2007, 2009 and 2010 at the monthly monitoring site. According to Oklahoma's Water Quality Standard's for **secondary body contact recreation** (i.e. ingestion not anticipated) the geometric mean of 10 samples taken between May 1 and September 30 should not exceed 2000 colonies/100 ml or 25% or fewer of the individual samples shall not exceed 2000 colonies/100 ml. E.coli colonies should not exceed 630/100 ml. The values obtained for Coffee Creek are really too variable to draw any real conclusions. This variability could be due to the lack of experience that the sampler had with this technique. The source of this bacterial contamination could possibly be the sewage treatment plant, runoff from areas where cattle graze or leaking septic systems upstream.

Table 3. Bacterial Counts

Date (month/day/year)	EColi CFU*/100 ml	Fecal Coliform CFU/100 ml
7/12/2006	1300	24600
8/15/2006	300	TNTC^
9/14/2006	100	TNTC
5/12/2007	5300	13800
6/9/2007	700	3800
7/15/2007	380	TNTC
8/11/2007	300	2700
9/15/2007	240	1740
5/10/2009	240	1540
6/13/2009	300	1546
7/12/2009	100	TNTC
8/9/2009	426	3573
9/12/2009	453	TNTC
5/8/2010	80	2633
6/12/2010	86	5120
7/10/2010	166	TNTC
9/11/2010	520	TNTC

*CFU = colony forming unit, ^TNTC = too numerous to count

Chemical Testing:

Chemical data were collected monthly between June 3, 2005 and April 10, 2011. Eight chemical parameters were measured along with air and water temperature.

Dissolved oxygen saturation is a measure of the amount of oxygen for aquatic life. At any given time the amount of oxygen in a stream depends on water temperature, partial pressure of oxygen in the atmosphere at water contact, the concentration of dissolved organic substances and physical aeration of the water. Both too little and too much oxygen can indicate problems. Dissolved oxygen for Coffee Creek ranged from 0.6mg/L on 5/10/2009 to 13mg/L on 2/10/2007. The corresponding percent oxygen saturation was 7% and 104% respectively with the highest of 150% on 8/4/2005. Percent oxygen saturation averaged 96% for the 2005-2006 data and 90% for the 2007-2011 data. Normal oxygen saturation is 80-130%. Overall Coffee Creek has normal oxygen saturation levels but the 2007-2011 data has a lot more outliers in the low caution and poor levels.

pH measures the hydrogen ions present in the water. It indicates how acidic or alkaline the water is. pH scale ranges from 0 to 14 with 7 being neutral. Normal pH range for streams is 6.5 to 7.75. Coffee Creek ranges from 7.3 to 8.8 with an average of 7.8.

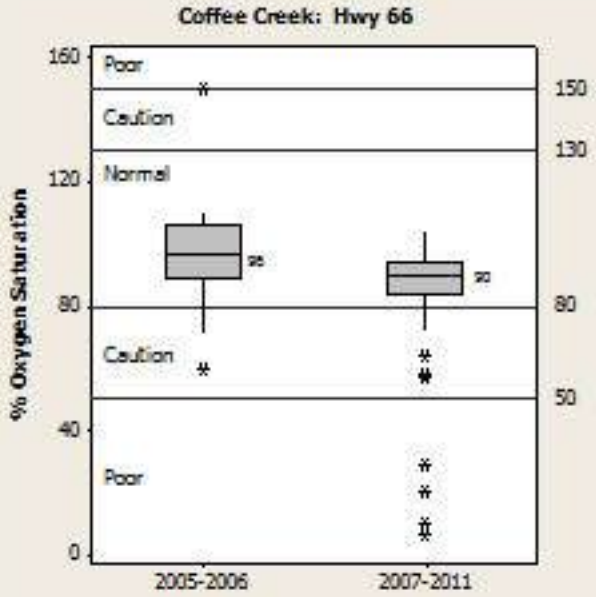
An estimate of **available nitrogen** is made by adding the amount of ammonia nitrogen and nitrate/nitrite nitrogen found in the water. Levels of available nitrogen for Coffee Creek averaged 4.5mg/L N for the 2005-2006 data and 2.25mg/L N for the 2007-2011 data. The range for this parameter is 0-0.8 “normal”, 0.8-1.5 “caution” & >1.5 “poor.” The amount of these three sources of nitrogen varies a great deal at Coffee Creek. This could be due to the water treatment plant, to runoff from manure on pasturelands or to fertilizer runoff from all those new lawns in the housing additions. Coffee Creek does have high levels of available nitrogen but that level decrease by half between the two data periods, so that is good to see.

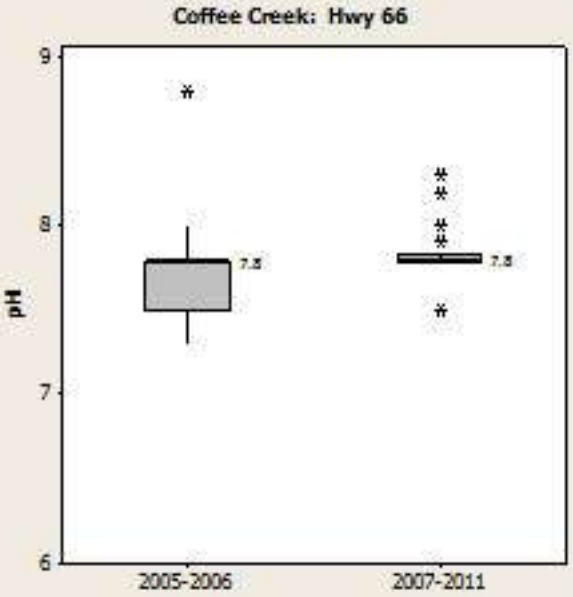
Phosphorous is measured as orthophosphate in mg/L P. This too has a wide range at the Coffee Creek site; 0.113mg/L P on 7/8/2005 to 4.167mg/L P on 11/11/2006 with one outlier of 16.333mg/L P on 11/14/2010. Most creeks monitored in the Cross Timber region have levels less than 2mg/L P. Anything above 0.1mg/L P gives poor water quality. Coffee Creek averaged 2.67mg/L P for 2005-2006 and 1.05mg/L P for 2007-2011, so at least the average has significantly dropped over the years.

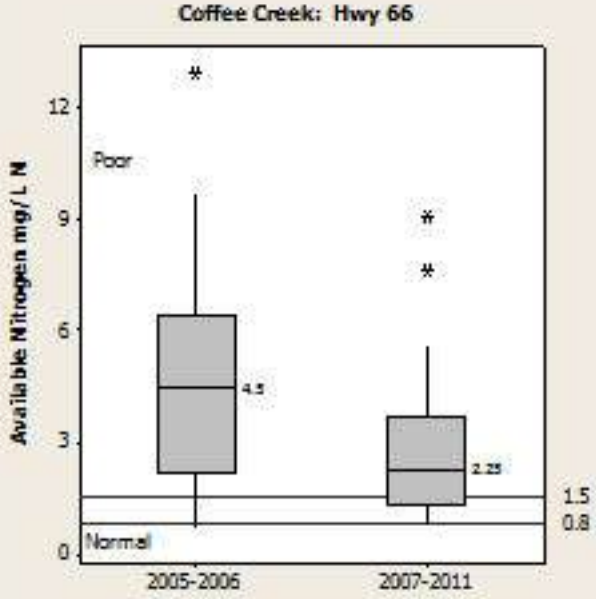
Chloride is measured in mg/L Cl. Coffee Creek’s ranges from 35mg/L Cl on 9/15/2005 to 180mg/L Cl in early 2009 with an average of 120mg/L Cl for 2005-2006 and 100mg/L Cl for 2007-2011. Chloride is a “natural” pollutant in much of Oklahoma due to its geology. Chloride content of the Deep Fork (into which Coffee Creek flows) approaches the maximum allowable under Safe Drinking Water standards. Other possible sources include septic waste, waste water treatment plant effluent, industrial and animal waste, fertilizer runoff, road salting/de-icing runoff, and oilfield operations.

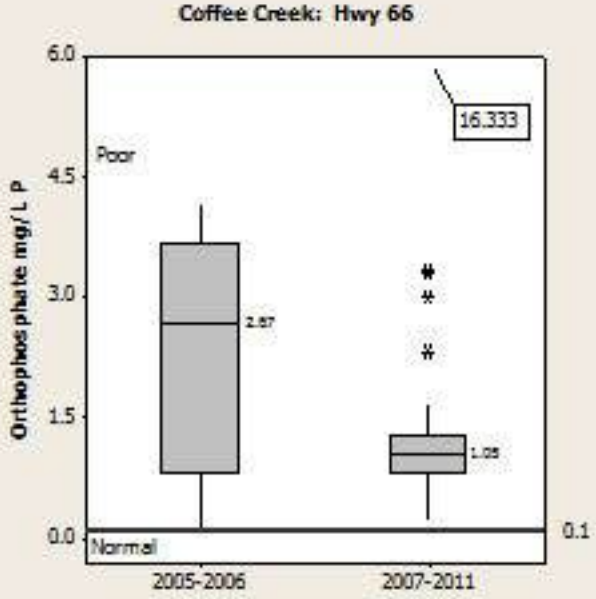
Coffee Creek: Hwy 66

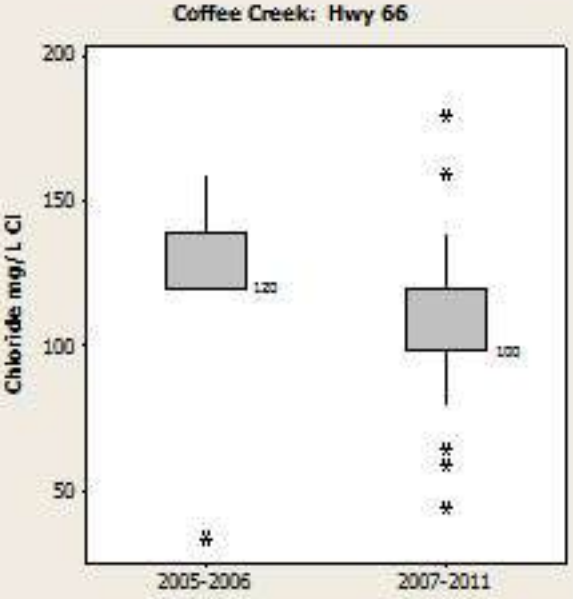
NE NW SW
Section 29-14N-1W
Oklahoma County
OK520710-01-0090C











The chemical parameters measured vary greatly at the Highway 66 Coffee Creek site. In an effort to understand this variation this stream was checked at a site upstream of the Edmond Water Treatment Plant and one just downstream of the plant a day after sampling at the usual site.

Table 5. Upstream & Downstream Results

SITE	Coffee Creek HWY 66 April 6, 2006	Coffee Creek Midwest Blvd (upstream) April 7, 2006	Coffee Creek Danforth (downstream) April 7, 2006
pH	7.9	7.8	7.8
Nitrate	3 mg/L	BDL	1.8 mg/L
Nitrite	1 mg/L	BDL	0.6 mg/L
Ammonia	0.5 mg/L (dilution required)	BDL	2.5 mg/L
Orthophosphate	2.3 mg/L	0.04 mg/L	2 mg/L
Chloride	140 mg/L	120 mg/L	120 mg/L

mg/L = milligrams per liter, BDL = below detection limit

The plant is operated under an Oklahoma Pollution Discharge Elimination System permit, issued by the Oklahoma Department of Environmental Quality (ODEQ). The plants' current permit runs until February 1, 2009. During 2007, ODEQ conducted four plant inspections. The plant has a record of 100% compliance with all regulatory parameters for wastewater treatment. The process of wastewater treatment involves removal of carbonaceous organic material, oxidation of ammonia to nitrate, removal of nitrate and removal of phosphorus. The treated water is then filtered to remove remaining solids, chlorinated to kill any potentially harmful microorganisms, de-chlorinated to eliminate excess chlorine that could be harmful to living organisms. The effluent is then discharged into Coffee Creek. According to the water resources superintendent Fred Rice the plant has never been out of compliance with its permit. Table 5 gives a summary of the permit with regard to parameters monitored by Blue Thumb.

The plant is not required to monitor phosphorus levels in the effluent. This is one parameter that usually has a high value at the monitoring site at Highway 66.

Table 5. Edmond NPDES Permit.

Effluent Characteristics	**Discharge Limitations**		**Monitoring Requirements**
	Concentration (mg/L)		
	30 day Average	7 day Average	
Spring (April-May)			
Ammonia (NH3-N)	4.1	9.9 (daily max)	1/week
Fecal Coliform (May)	200 (geometric mean)	400 (daily max)	1/week
Dissolved Oxygen (DO)	Instantaneous Minimum	5	1/week
Summer (June-October)			
Ammonia (NH3-N)	3.0	5.0	1/week
Fecal Coliform (May)	200 (geometric mean)	400 (daily max)	1/week
Dissolved Oxygen (DO)	Instantaneous Minimum	4	1/week
Winter (November-March)			
Ammonia (NH3-N)	4.1	9.9 (daily max)	1/week
Dissolved Oxygen (DO)	Instantaneous Minimum	5	1/week
Other year round requirements			
No discharge of floating solids or visible foam in other than trace amounts			
No discharge of any visible sheen of oil or globules of oil or grease			
pH shall not be less than 6.5 nor more than 9.0 at any time, sampled 4X/week			

“A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses” (Code of Federal Regulations). Water Quality Standards (WQS) are established to serve as goals for the water quality management plans. The Clean Water Act requires each state to develop and prepare WQS and at least once every three years it must review and evaluate existing standards and determine if they are appropriate or if modifications are needed. Oklahoma’s Water Quality Standards are written by the Oklahoma Water Resources Board with input from many agencies (Oklahoma Conservation Commission, Oklahoma Corporation Commission, Oklahoma Department of Environmental Quality, Oklahoma Department of Mines, Oklahoma Department of Wildlife Conservation, Oklahoma State Department of Agriculture and the Office of the Secretary of Environment). The most recent EPA approved WQS for the states are found at http://www.epa.gov/waterscience/standards/wqalibrary/ok/index.html.

Oklahoma's WQS are composed of three basic elements:

• **Beneficial uses**: a classification of the waters of the State according to their best uses in the interest of the public. Beneficial uses include: Public and Private Water Supply, Emergency Water Supply, Fish and Wildlife Propagation, Agriculture, Hydroelectric Power, Municipal and Industrial Process and Cooling Water, Primary Body Contact Recreation, Secondary Body Contact Recreation, Navigation, and Aesthetics.

• **Criteria to protect those uses**: numerical or narrative guides on the physical, chemical, or biological aspects, which will assure achievement of the designated use.

• **Antidegradation Policy**: a statement of the State's position on the use of waters, which are protected at levels considered above that required for beneficial use maintenance.

Two additional components involve special requirements set forth within the Standards document.

• **Compliance Schedules**: establish a reasonable time for new criteria to be implemented into permits.

• **Variances**: allow for deviations from certain criteria for various reasons.

The WQS are very long and written with a large amount of "jargon." From my understanding these are the standards for the parameters that Blue Thumb measures. For a *habitat limited aquatic community* (Coffee Creek) dissolved oxygen should be at least 3.0mg/L (4.0mg/L from April 1 – June 15). pH should be between 6.5 and 9.0. Chronic ammonia toxicity value varies with pH and temperature of the water. For temperatures and pH values reported the ammonia screening values range from 4.73mg/L N to 1.02mg/L N. Chloride should not exceed 250mg/L Cl. I could find no numerical values for nitrogen. The phosphorus water quality standard applies to waters designated as a Scenic River, which Coffee Creek is not.

Synopsis:

Coffee Creek at Highway 66 is a stream in need of help. The habitat assessment score of 87.9 in 2006 indicated that the stream had the potential of being "healthy". The drop to 39.7 in 2010 indicates that potential is not being realized. Biological assessment of fish and macroinvertebrates indicate that the stream is continuing to have trouble. Life is there, but could be better if it was more diverse and had pollution sensitive organisms. The chemical data is "troubling". Without the wide fluctuations and high values of P, N and Cl this stream could be healthy. Comments made at each monthly sampling reveal that available nitrogen, orthophosphate and chloride tend to drop when there has been a significant rain event. Higher levels of orthophosphate are accompanied by more "persistent bubbles" and "scum". The orthophosphate seems to be acting as a detergent. The question can be asked "what is the source of these fluctuating chemicals?" It is not clear to me that the wastewater plant is this source. It very well could be, but I don't think we have the data to support that. The one set of data from extra sampling sites done in spring 2006 is just not enough. After having sampled the creek for seven years now I can confirm that the parameters are too variable to rely on just one set. Because Coffee Creek flows through many types of land use it is possible there are other sources of pollution (leaking septic systems, over fertilization of lawns & fields, manure from agricultural use, etc.). During the last few years of sampling I noted increased siltation and habitat alteration occurring. Increasingly more of the watershed is covered by housing additions. This leads to first the land being stripped bare during construction and then much of it covered in either concrete or newly planted lawns. The concrete certainly contributes to increased runoff. The new lawns just don't have the same absorption ability as a mature forest or grassland. Under these conditions even relatively mild rain events will result in major runoff and siltation. The drought of the last few years has not helped any. Once the land is parched it requires gentle rains to be able to soak into the soil. Hard rain simply runs off.

ODEQ has often been sent a copy of the monthly sampling results and to my knowledge has never inquired about them. This leads me to believe the values are within Oklahoma's water quality standards. Perhaps the problem lies with the standards. To adequately understand what is affecting Coffee Creek a series of sampling sites along its entire length would need to be sampled for at least a year. Land usage of the surrounding areas would need to be noted. I think this would be a good project for a high school or college biology, chemistry or ecology class or even a graduate student in stream ecology or conservation.