

Wolf Creek: Gore Blvd.  
NE NW NE Section 34-2N-12W  
Comanche County  
Latitude: N 34.60876  
Longitude: W -98.44398  
WBID#: OK311300-02-0040X

Blue Thumb Volunteer Monitoring Review – June 2018  
Written by Clinton D. Bryan

### **Description of Watershed and Monitoring Site**

The watershed of Wolf Creek is found entirely within Comanche County, and it is considered to reside in the Central Great Plains ecoregion. The Wolf Creek: Gore Blvd. monitoring site is located about 400 meters southeast of the convergence of East Branch Wolf Creek and West Branch Wolf Creek. The drainage area of Wolf Creek at the confluence of the east and west branches is 26.06 square miles (<https://www.lawtonok.gov/sites/default/files/publications/2017-04/FIS40031CV001A.pdf>). The EPA watershed maps indicate that the headwaters of East Branch Wolf Creek are found at Signal Mountain on the Fort Sill Military Reservation (<https://watersgeo.epa.gov/mywaterway/map.html>). In addition, the East Branch Wolf Creek watershed covers the region extending roughly one thousand meters north, approximately five thousand meters east, and about two thousand meters south of Signal Mountain. While on the Fort Sill Military Reservation, East Branch Wolf Creek flows through mostly undeveloped lands; the closest approach to buildings or parking lots is about 200 meters. The north and west tributaries to East Branch Wolf Creek on Fort Sill form a watershed that is mostly undeveloped. On the other hand, the east tributaries to East Branch Wolf Creek on Fort Sill are mainly runoff from parking lots and streets along the close approach. After the East Branch Wolf Creek has flowed about four miles, it exits Fort Sill onto the Lawton municipality. The two miles through which the creek flows from Fort Sill to the monitoring site is mostly residential. The EPA watershed maps indicate that the headwaters of West Branch Wolf Creek are found about two miles northeast of Signal Mountain on the west side of the convergence of Jones Ridge and March Ridge (<https://watersgeo.epa.gov/mywaterway/map.html>). The watershed encompasses the area roughly three thousand meters west of Signal Mountain. The entire West Branch Wolf Creek watershed on the Fort Sill Reservation is undeveloped save for road crossings. After West Branch Wolf Creek leaves Fort Sill, it skirts the west edge of Lawton for almost two miles. The creek then makes a turn to the east. It flows three miles through residential regions including a golf course which the creek exits about two hundred meters before merging with East Branch Wolf Creek. Wolf Creek flows roughly another seven miles through decreasing community development until merging with East Cache Creek. The drainage area of Wolf Creek at the

confluence with East Cache Creek is 48.14 square miles  
(<https://www.lawtonok.gov/sites/default/files/publications/2017-04/FIS40031CV001A.pdf>).

Wolf Creek at the monitoring site is located on a mostly undeveloped area of the Cameron University campus just south of Gore Boulevard, a paved, major four-lane thoroughfare that crosses the creek. Trees and brush are allowed to grow on the inclined portion of both creek banks so that there is a mixture of old and new trees in the riparian zone. The impact of flowing through two miles of the Lawton municipality is reflected in the significant amount of trash that can be found on the creek bank flora and on the stream bed following heavy rains. On the west side of the creek outside the trees and brush, there is the University's golf practice field. A grassy field roughly two hundred meters across separates the paved baseball field parking lot from the trees and brush of the riparian zone on the east side of the monitoring site. The drainage from university parking lots enters Wolf Creek downstream of the monitoring site in the form of two small tributaries.

### **Stream Condition and Habitat Overview**

An assessment of the Wolf Creek habitat surrounding the monitoring site was performed on July 28, 2016. It started at the Gore Boulevard bridge and continued southeast about four hundred meters downstream. A habitat assessment score of 60.5 was determined using the 180-point scale. An average assessment score of 77.6 was established for the highest quality reference streams in the Central Great Plains. This suggests that Wolf Creek currently offers a physical habitat quality that is below average for supporting a thriving biological community. The Oklahoma Conservation Commission has maintained a Rotating Basin Monitoring Program (RBMP) since 2001 in which habitat assessment was included. Different regions of the state are assessed annually on a five-year cycle. The third cycle of the region that includes Wolf Creek was recently reported. The average habitat assessment scores reported for all creeks assessed in the Central Great Plains ecosystem were 63.1, 65.6, and 65.8 were indicated by the 2007, 2013, and 2017 RBMP reports, respectively. These also suggest that Wolf Creek is below average as a habitat at the Gore Boulevard monitoring site.

The streamside cover is the only parameter for Wolf Creek that was determined to have the relatively high rating of 10. The rating was based upon observations of a large diversity of plant life. There are trees of a wide variety of sizes. Under the tree canopy, a diversity of vegetation forms a very brushy ground cover. The ground cover includes grasses, vines, and bushes. The instream cover was assessed to be of medium quality with a rating of 10.7. Less than fifty percent of the stream's area has stable, high quality cover. The creek has large areas of silt and hardpan. Along the water's edge, there are numerous root wads exposed. There are areas of gravel, but there is not much cobble. Canopy cover received a medium rating of 14.9. The numerous trees offer morning and afternoon shade, but much of the stream is exposed to the sunlight during midday. Bank stability received a medium rating of 7.3. The bank shows erosion that reveals numerous tree and bush roots. Near the Gore Boulevard bridge, the city has

brought in basketball-sized boulders in an attempt to slow the erosion of the west bank. A couple of trees that are still green have been undercut so that their trunks are horizontal. The erosional process is exhibited in significant sediment in the stream channel. Bank vegetation stability received a rating of 6.4 which is considered medium quality. Pool bottom substrate was assessed to be of low quality with a rating of 3.7. This low rating reflects the significant amount of sediment and hardpan. Significantly less than half of the pool bottom was stable substrate to provide habitat. Pool variability was quite low; very few, if any, pools neared 0.5 meters. Therefore, the pool variability rated a relatively low 1.3. Due to the lack of cobble, there was a significant lack of rocky runs. Most of the riffles were found in gravel. This led to a low rating assessment of 5.9 concerning rocky runs or riffles. Flow and channel sinuosity were very low. The stream channel is very straight as could be illustrated by an aerial photograph. There was only one short stretch where the stream channel made an S-curve. Finally, the channel alteration was obvious as there was so much fine sediment. The point bars showed no plant growth which suggested that they were relatively new. The channels of obvious flow were relatively small and were located between point bars or islands of unstable substrate for more than half of the assessment. The assessment rating for channel alteration was the very low 0.4.

## **Biological Conditions Overview**

### **Fish**

A fish collection was obtained from the prescribed reach at the Wolf Creek near Gore Boulevard monitoring site using a seining technique on July 28, 2016. The total number of fish collected, 1107, and the total number of species collected, 18, compares favorably to the Central Great Plains highest quality stream reference averages of 596 and 13, respectively. One (1) intolerant fish species and 3 sensitive fish species were identified within this collection. This collection compares favorably to the regional reference averages of 1 intolerant and 2 sensitive benthic species. The intolerant species was identified as suckermouth minnow and the sensitive species were identified as central stoneroller, orangethroat darter, and suckermouth minnow. Fish collected that are considered of intermediate tolerance were identified as central stoneroller, sand shiner, redear sunfish, orangethroat darter, and spotted bass. The proportion of tolerant individuals was 0.72 which again compares favorably to the regional reference average of 0.78. Tolerant species identified included green sunfish, longear sunfish, bluegill sunfish, orangespotted sunfish, mosquitofish, golden shiner, red shiner, channel catfish, gizzard shad, largemouth bass, and bullhead minnow. The Shannon's diversity value for Wolf Creek at Gore Boulevard is 2.27 while the reference average for the regional ecosystem is 1.44. These numbers suggest an ecosystem that is more diverse than average and is slightly more supportive of fish species that are sensitive to pollution. This fish collection received a score of 23 which was equal to that of the regional reference average; therefore, the site received a rating of A. The Index of Biotic Integrity score classifies Wolf Creek as Excellent.

## **Benthic Macroinvertebrates (Bugs)**

Winter and summer macroinvertebrate collections were attempted at the Wolf Creek near Gore Boulevard monitoring site from 2015 through 2017. The winter 2015 collection was vacated because the riffles were too shallow for collection. The summer 2017 collection was vacated due to unusually abundant, significant rains in southwest Oklahoma during July and August.

The summer 2015 collection utilized the riffle sampling method consisting of three, one-square meter kicknet samples. The total number of taxonomically different types of macroinvertebrates (taxa richness) was 5 while the Central Great Plains highest quality reference summer average was 16. The total number of sensitive species from the Ephemeroptera, Plecoptera, or Trichoptera groups (EPT taxa richness) was found to be 1. When compared to the reference summer average of 6, it suggests that the stream was not very robust. The percentage of the macroinvertebrate collection classified as from the pollution-sensitive EPT groups (EPT abundance) was 1%; the reference summer average was 56%. The low percentage suggests that the EPT species were stressed significantly. The Modified Hilsenhoff Biotic Index (HBI) was determined to be 7.60 on a scale between 0 and 10. This relatively high HBI value suggests that the invertebrate community was dominated by species resistant to organic pollution; this result suggests that the species sensitive to organic pollution were stressed as the summer reference average was 4.55. The Shannon-Weaver Diversity (SWD) was found to be 0.63 compared to the summer reference average of 1.96. This suggests a relatively low diversity. The summer 2015 collection received a score of 2 which, when compared to the reference average of 32, indicates the stream was severely impaired. The stream condition was rated D.

The winter 2016 collection using the same method indicated that the stream condition was improving from summer 2015 conditions. The taxa richness was still a 5, but the winter reference average was lower than summer at 12.6. The EPT taxa richness was still a 1, but the winter reference average was lower than summer at 2.7. The EPT abundance was still at 1%, but the winter reference average was lower than summer at 11%. The HBI was significantly lower at 3.48 while the winter reference average was higher at 5.57 relative to the summer. The HBI suggests that the community was not nearly so sensitive to organic pollution. The SWD dropped to 0.45 and the winter reference average decreased to 1.48 relative to the summer. The diversity was still relatively low and received a score of 6. When the score was compared to the winter reference average of 22, the stream is classified as only moderately impaired. The stream condition had improved to a rating of C.

The summer 2016 collection using the same method indicated that the stream condition was continuing to significantly improve. The taxa richness had improved to 13 which is comparable to the reference summer average of 16. The EPT taxa richness had improved to 5 which is very comparable to the summer reference average of 6. The EPT abundance had improved to 49% which again is comparable to 56%, the summer reference average for highest quality streams in the Central Great Plains. The HBI was determined to be 4.80 which again was comparable to the

summer reference average of 4.55. This suggests that the macroinvertebrate community was nearing the regional average for sensitivity to organic pollution. The SWD had risen to 2.00 which is almost equivalent to the summer reference average of 1.96. The SWD suggests a robust diversity in the macroinvertebrate community. The diversity received a score of 30; the stream is classified as non-impaired when compared to the reference average score of 32. The stream condition had improved to a rating of A.

The winter 2017 collection using the same method indicated that the stream condition had maintained a rating of A. The taxa richness was 10 while the winter reference average is 12.6. The EPT taxa richness was 2 compared to the winter reference average of 2.7. The EPT abundance was at 17% while the reference winter average is 11%. This suggests that the stream quality may be continuing to improve as the more sensitive species are growing in relative proportion. The HBI of 6.99 indicates more sensitivity to organic pollution when compared to the winter reference average of 5.57. The SWD determined to be 1.50 was very close to the reference average for the region's highest quality streams, 1.48. The diversity received a score of 18 which is comparable to the reference average of 22.

Overall, the macroinvertebrate collections suggest that the stream quality is improving. This is supported by the emerging populations of pollution-sensitive species.

### **Bacteria Testing**

No bacteriological testing was performed from 2015 through 2017.

### **Chemical Testing**

Chemical data were collected monthly between September 16, 2014 and December 8, 2017. The median dissolved oxygen saturation was 100%. The upper quartile falls entirely with the normal range while the lower quartile reaches slightly below the caution threshold at 80% saturation. The upper and lower whiskers reach into the caution regions above 130% saturation and below 80% saturation, respectively. On the average, the stream maintained ample oxygen to support an aquatic community. July and August exhibited the lowest dissolved oxygen concentrations while January exhibited the highest dissolved oxygen concentrations. As anticipated, the analysis does show seasonal adjustments because higher temperature reduces the solubility of oxygen in water.

An estimate of total soluble nitrogen was determined as the sum of nitrate nitrogen, nitrite nitrogen, and ammonia nitrogen found in the water. The total soluble nitrogen was below detection limits in 67% of the monthly analyses. The median value in the remaining analyses was determined to be 0.63 mg/L. This value is in the normal range. During the monitoring period covering forty months, only three times did the total soluble nitrogen surpass 0.8 mg/L, the upper limit for normal concentration. Overall, the stream is maintained relatively free of soluble nitrogen pollution.

Orthophosphate phosphorus was monitored as well. The median concentration was determined to be 0.03 mg/L which is well below the lower limit for cautionary status. The upper and lower quartiles are within the normal range. The phosphorus levels were observed to reach the poor range twice and to reach the caution range three times within the forty months of the monitoring period. Overall, the stream seems relatively free from major impact from phosphorus pollution.

pH ranged from 7 to 8 during the monitoring period. The median pH was determined to be 7.8. This is an optimum range for aquatic life.

The median chloride concentration during the monitoring period was 75 mg/L. The range of chloride concentration was 25 to 160 mg/L with a single outlier at 320 mg/L. Chloride concentrations between 1 and 100 mg/L are considered normal in freshwater. Therefore, Wolf Creek is, on the average, normal with respect to chloride concentration.

Overall, the chemical testing suggests that the Wolf Creek monitoring site near Gore Boulevard is rather normal. None of the water-soluble pollutants have average concentrations that merit caution. No long term trends were noted for increasing or decreasing water-soluble pollutants.

### **Synopsis**

Wolf Creek is mainly an urban stream that has three major branches that have the opportunity to be impacted by Fort Sill and the north half of Lawton before merging just north of the Gore Boulevard monitoring site. The habitat at the creek monitoring site falls significantly short of the reference conditions of the Central Great Plains ecosystem. The macroinvertebrate bioassay indicates that the creek has improved from severely impaired to non-impaired over the forty months of the monitoring period. The fish bioassay supports the apparent improvement by its broad diversity and large numbers. The chemical testing suggests that the long term improvement of the creek's aquatic community will not be hindered by systematic pollution issues; rather, the normal average of the chemical parameters should support the aquatic community.