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 – Feb. 2023 Written by Clinton D. Bryan and Ezandra Scott

# 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. 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 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. 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 where 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.topozone.com/oklahoma/comanche-ok/stream/wolf-creek-361/).](http://www.topozone.com/oklahoma/comanche-ok/stream/wolf-creek-361/%29)

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

A small portion of Wolf Creek habitat was assessed on July 28, 2016, and more recently on July 12, 2019. Both assessments started at the Gore Boulevard bridge and continued southeast about four hundred meters downstream. Using a 180-point scale, this area of Wolf Creek habitat assessment scored 60.5 points in 2016 and was slightly better in 2019 scoring 68.2 points. 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 offers a physical habitat quality that is below average for supporting a thriving biological community.

The streamside cover scored well in both assessments. 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 in 2016 with a rating of 10.7 which increased to higher quality in 2019 with a rating of 16.2. Canopy cover received a medium rating in both assessments, as did bank vegetation stability. The numerous trees offer morning and afternoon shade, but much of the stream is exposed to the sunlight during midday. The bank shows erosion that reveals numerous tree and bush roots. Bank stability was slightly better in 2019, increasing from medium quality in 2016 to high quality in 2019. Pool bottom substrate was assessed to be of low quality in both assessments. 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 also quite low; very few, if any, pools neared 0.5 meters. 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 in 2016 but in 2019 there was slight increase to the medium rating concerning rocky runs or riffles. Flow and channel sinuosity were consistently 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 for both assessments.

# Biological Conditions Overview Fish

Fish collections were obtained from the prescribed reach at the Wolf Creek near Gore Boulevard monitoring site using a seining technique on July 28, 2016, and July 12, 2019. There were 18 species collected in 2016 and 16 species in 2019, both samples better then the Central Great Plains highest quality stream reference average of 13 species. One intolerant fish species, suckermouth minnow, was found in both samples; reference averaged one intolerant specie. For sensitive bottom dwelling fish, 3 species were found in Wolf Creek both times and reference averaged just 2 species. The proportion of tolerant individuals was 72% in 2016 which compares favorably to the regional reference average of 78%. This category scored better in 2019 with only 25% of the fish caught being of the tolerant to pollution nature. The Shannon’s diversity value for Wolf Creek at Gore Boulevard is 2.27 in 2016 and a slight fall to 1.56 in 2019 but both scores still better than the reference average for the regional ecosystem of 1.44. These numbers for this site on Wolf Creek suggest an ecosystem that is more diverse than average and is slightly more supportive of fish species that are sensitive to pollution. The 2016 collection scored as good as reference conditions while the 2019 collection scored slightly better than reference. The Index of Biotic Integrity score classifies Wolf Creek as Excellent for fish.

# Benthic Macroinvertebrates (Bugs)

Winter and summer macroinvertebrate collections were attempted at the Wolf Creek near Gore Boulevard monitoring since Winter 2015. The winter 2015 and summer 2018 collections were 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 collections utilized the riffle sampling method consisting of three, one-square meter kicknet samples.

The winter collections have had a big scoring range when compared to the ecoregion reference average; from 27% in 2016 to 136% in 2021 and show a trend of steadily increasing. In the winter of 2019, we interviewed an official of the golf course that is upstream of the monitoring site and found that they had applied pesticides less than a week before our collection which scored 55%. More samples in the future will need to be taken to see if this upward trend, comparing as well or better than reference, is true.

The summer collections are fewer but have scored slightly better overall; 6% in 2015, 94% in 2016 and 75% in both 2019 and 2020. No one category seems to be very low. Each of the six categories are slightly low thus adding up to even lower scores overall. More summer samples are needed to see if there is any sort of trend.

# Chemical Testing

#  *2014-2018 Period*

Chemical data were collected almost monthly between September 16, 2014 and September 29, 2018. The median dissolved oxygen saturation was 101%. Nearly ¾ of the data falls in the normal range (80%-130%). The upper and lower whiskers reach into the caution regions above 130% saturation and below 80% saturation, respectively. There is one data point in the caution region >150%, August 28, 2018. 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 this monitoring period, 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 low concentrations 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 (0.05 mg/L). Most of the upper quartile is within the caution range (0.05 – 0.1 mg/L). The phosphorus levels were observed to reach the poor range (>0.1 mg/L) twice. Overall, the stream seems relatively low 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 80 mg/L. The range of chloride concentration was 25 - 160 mg/L with a single outlier at 320 mg/L July 25, 2016 which seems a really odd time of year to be high. Wolf Creek on the average is 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.

 ***2018-2022 Period***

Chemical data were collected almost monthly between October 30, 2018 and June 24, 2022. The median dissolved oxygen saturation was 109%. Nearly ¾ of the data falls in the normal range (80% - 130%). 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.

An estimate of total soluble nitrogen was determined as the sum of nitrate nitrogen, nitrite nitrogen, and ammonia nitrogen found in the water. All data points except for one were in the normal range, below 0.8 mg/L. The one data point was in the middle of the caution range (0.8 – 1.5 mg/L). Overall, the stream is maintained relatively low 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. Nearly ¾ of the data are within the normal range. The upper whisker is mostly in the caution range (0.05 – 0.1 mg/L) and there is one data point in the poor range, >0.1 mg/L.

pH stayed consistent 7.3 to 8.3 during the monitoring period. The median pH was determined to be 8. This is an optimum range for aquatic life.

The median chloride concentration during this monitoring period was 57.5 mg/L. The range of chloride concentration was 30 to 140 mg/L with no outliers. 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.

# 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 ninety-six (96) months of the monitoring period. One anomalous bioassay could be explained by a documented recent large scale pesticide application less than a quarter mile upstream. The fish bioassay compares evenly to the ecoregion reference conditions. 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.