

Crow Creek: Zink Park Blue Thumb Data Report

NW NE NW
Section 19-19N-13E
Tulsa County
Latitude N 36° 7' 5"
Longitude W 95° 58' 13"
WBID OK 120420-01-0090G

December 7, 2006

Data Review By: Graham Brannin, Steve Schaal

Watershed and Monitoring Site Characteristics:

Crow Creek is a small stream located primarily in a fully developed mixed residential and commercial neighborhood of Tulsa in northeast Oklahoma. Crow Creek flows generally from northeast to southwest through mostly affluent neighborhoods in an older section of the city. The watershed drains the city from near Wilson Middle School and Lanier Elementary School. Monte Casino and Cascia Hall Schools, St. John Hospital, Utica Square, and Philbrook Art Museum are all in this watershed. Crow Creek drains into the Arkansas River at about 33rd Street. Crow Creek is considered a second order stream and is in the Central Irregular Plains ecoregion.

The monitoring site is located within Zink Park near the intersection of East 31st Street and Trenton Avenue. Residential houses with large, well-manicured yards surround the park on all sides. The site is well shaded by large trees and there is a small riparian zone with some smaller brush along part of the monitoring site. Several sections of the stream are channelized with a mix of stone walls and riprap. The walls are falling down in some areas. The west side of the site has a small floodplain with some grass and large rocks. There are two large sanitary sewer lines running along and in the creek. Sections of these lines in the sample area were replaced about six years ago. Upstream of the monitoring location is the Philbrook Art Museum with its many gardens.

Stream Health based on Habitat Assessment:

A habitat assessment is designed to assess physical habitat available to support the biological community. The data is compared with a "reference stream" (an average of high quality streams) chosen from the same ecoregion. Crow Creek is a low flow stream that is not very curvy (moderate to low sinuosity). The average depth of the stream within the 400-meter sampling reach is 0.29 meters, with the deepest parts being around 1.5 meters. Over half of the stream is pooled, 14% is run and 15% is riffle. There is excellent shade over the water helping keep it cool.

Habitat assessments were performed in 1996 and 2000. Both of the assessment scores are slightly higher than the reference average. The habitat is ranked as **very good**. The score would be better had several stream sections not been channelized. Comparing the two assessments shows mixed results when trying to determine the trend of habitat quality. Three parameter ratings went down (pool variability, channel alteration, instream cover) and three went up (pool bottom substrate, rocky runs/riffles, streamside cover).

The channel alteration score was good during the 1996 assessment and moderate during the 2000 assessment. One possible reason for this change is the presence of newly formed point bars. Point bars are new, unstable streambeds that support fewer types of animals than more stable streambeds. They indicate sediment deposition.

Observations indicate sedimentation is a consistent phenomenon. This may be due to erosion from infill development. The aesthetic value of Crow Creek is harmed by frequent channel alterations. Any stream management decision should consider the potential impact to aesthetics and the aquatic community.

Finally, Crow Creek has an unusually consistent flow. The stream has not been dry or even extremely low for the last 10 years. This is purely observation and does not imply a good or bad connotation.

Stream Health Based on Biological Conditions:

Fish Collection Data

Fish populations are used to assess stream health. Data from each collection are compared to identify trends in fish populations. Crow Creek data is compared to an average of high quality reference streams in the Central Irregular Plain ecoregion to assess relative stream health.

Fish collections were conducted in 1995, 1996 and 2000. A number of the different tools of measuring stream health based on fish population indicate Crow Creek is in **very poor** health. The parameters measured include number of fish, number of species, Shannon's diversity, sensitive benthic species and intolerant species. Some specific numbers include about three species found in Crow Creek versus 22 in reference conditions. No sensitive benthic species were collected in Crow Creek versus six species for the reference stream.

The trend of quality regarding the fish community is a flat line remaining in the very poor range. One puzzling observation is 230 fish were collected in 1995 compared to only five and nine fish collected in 1996 and 2000, respectively. The 1995 collection, conducted on September 12th, still did not indicate a healthy stream but at least the total number was okay. Blue Thumb volunteers conducted chlorpyrifos (Dursban) pesticide screening during the fish collection years. Most screenings indicated very low or below

detection levels. However, there were positive readings after the fish collection in 1995 and before the collections in 1996 & 2000 (0.51 – 0.88 ppb). Although these tests are for screening purposes, they do indicate a possibly toxic environment. Oklahoma Water Quality Standards indicate acute toxicity for chlorpyrifos at 0.083 ppb. There is not conclusive data but, perhaps, occasionally high pesticide levels have impacted subsequent fish collections. The recent ban on the general public's access to chlorpyrifos could have a positive impact on the aquatic life in Crow Creek.

Observations indicate that the green sunfish, which is highly tolerant to pollution, appears to be the only species that can consistently survive in Crow Creek. Several other species, including the large mouth bass, should be enjoyed at Crow Creek.

Benthic Macroinvertebrate Data

The benthic macroinvertebrate population and diversity provide clues to help assess stream health. Data from each collection are compared to identify trends. Crow Creek data from rocky riffles was compared to the rocky riffle average reference conditions in the Central Irregular Plains to assess relative stream health. The data is grouped by sample season (winter or summer) for proper comparison.

The macroinvertebrates from Crow Creek were gathered and analyzed in both the winter and summer for at least six years. A comparison to reference indicates a **consistently poor** macroinvertebrate population.

In the summer collections, Crow Creek had only one of the EPT taxa that made up 4% of the total collection while reference conditions had seven EPT taxa that comprised 50% of the collection. These numbers indicate that Crow Creek has lost most pollutant intolerant forms. *(The "EPT Index" is the number of different taxa from the orders Ephemeroptera, Plecoptera, and Trichoptera, the mayflies, stoneflies, and caddisflies respectively. With few exceptions, these insects are more sensitive to pollution than any other groups. As a stream deteriorates in quality, members of this group will be the first to disappear.)*

However, a few trends show a slight improvement. The last year analyzed, 2005, show the best results for both winter and summer. The data from these macroinvertebrate collections are encouraging. An analysis of the 2006 samples may continue a positive trend.

As noted in the Fish Collection section above, positive results for the pesticide Chlorpyrifos in the years 1995 – 2000 could have had an impact on the macroinvertebrate sampling. The banning of its use could have positive impact with macroinvertebrates in Crow Creek.

It is hard not to note the long filamentous algae and that when one picks up a stone from the bottom of Crow Creek it usually feels slimy. This streamside observation seems consistent with the poor macroinvertebrate population.

Biological Conditions Summary

Both the fish and macroinvertebrate data indicate a stream not attaining the diversity and numbers that it should. Crow Creek has very good physical habitat, but is not sustaining a healthy biological community. This is clearly seen when the creek is compared to reference conditions.

The fish data does not indicate any credible reason for optimism. However, the macroinvertebrate data does hint at improvement. It will be informative to note any improvement in fish populations if, as hoped, the macroinvertebrate population and diversity both improve. Perhaps, as the macroinvertebrate community improves, the fish community will follow.

Stream Health based on Bacteria Data:

Escherichia coli data has been gathered for warm weather months (May – September) since 2001. The data is not consistently high or low. This data indicate no significant sanitary sewer discharges near the collection site.

Stream Health Based on Chemical Testing Data:

Chemical testing data provides a snapshot of stream health. There is a vast amount of chemical data for the monitoring location that goes back to July 1995. The monthly data has very few gaps. Although the data does indicate frequently elevated and occasionally high nutrient levels, the results do not indicate a toxic environment for aquatic life.

Perhaps the most critical parameter measured to indicate an inhabitable environment is Dissolved Oxygen (DO). The DO measured in Crow Creek was usually in the healthy range. In the last five years the oxygen saturation was below 50% three times: 35% on 12/3/2002, 26% on 12/28/2005, and 48% on 6/29/2006. There is a hint at a decline in DO recently but this is not conclusive and no cause is known.

Nitrate nitrogen has been 1.0 mg/L or more about 40% of the time. Values greater than or equal to 2 mg/L nitrogen were measured as follows: 2.2 mg/L N on 1/29/2004, 2 mg/L N on 6/24/2004, 2 mg/L N on 10/27/2005, 2 mg/L N on 3/30/2006, and 2 mg/L N on 6/29/2006.

Orthophosphate phosphorus has been above 0.1 mg/L P about 30% of the time. The highest value in the last five years was 0.33 mg/L P on 9/19/2002.

Stream Evaluation Synopsis:

Crow Creek is a relatively short stream in a small, commercially and residentially developed watershed in the middle of a large city. The sample location has a remarkably

good habitat and should support a healthy biological community. Water chemistry data indicates the stream maintains frequent moderate to high nutrient levels but the DO and other critical parameters are acceptable for sustaining a healthy biological community.

Nevertheless, Crow Creek has a very poor biological community. Both fish and macroinvertebrates indicate an unhealthy stream. At this time, it is not known why the stream does not support the type of aquatic community seen in reference streams. Some possible causes could be physical barriers to fish migration from the Arkansas River, insufficient stream flow regimes and unidentified toxics in the water. More in-depth analysis by qualified professionals is required to make any further conclusions or to modify management plans.