

## **Blackboy Creek: Limestone Crossing (aka: Bigheart Creek)**

NW NW NE Section 36 – 20N – 11E

Osage County, Oklahoma

Latitude N36° 10' 21.4"

Longitude W96° 04' 57.3"

WBID# OK 120420-01-0140T

Blue Thumb Volunteer Monitoring Data Review – November 20, 2007

Written by: Marie K. Martin

The watershed of Blackboy Creek is approximately 1600 acres, roughly 40% of which is steep hillside, 30% flat to gently sloping ridges and, 30% is low hills and bottomland. The creek is a first order, intermittent stream located in southeast Osage County, just northwest of downtown Tulsa. The monitoring location, at an elevation of 720 ft., is a mile from the headwaters, which are 950 ft. in elevation.

The creek and its watershed are in the Northern Cross Timbers ecoregion. Land use is typical of the ecoregion; primarily horse and cattle grazing, lots of wildlife and rural residential. Within the past five years 10 coal bed methane wells and a more urban type residential subdivision have been developed in the watershed. Additional rural residential subdivisions are planned for the area.

### Stream Condition and Habitat Overview

Most hillsides in the watershed are heavily wooded. Pasture/bottom land is well vegetated with both native and non-native grass species. Riparian vegetation along the creek plays a very important role in the health of an aquatic system. This area is thick with cottonwood, sycamore, black walnut, pecan, birch and other native tree and shrub species creating a good canopy cover. The canopy cover shades and helps maintain cooler water temperatures. Trees contribute woody & organic debris that creates riffles and pools and provides a food source and habitat for aquatic invertebrates. There has not been channel alteration, however the creek tends to flow in a somewhat straight manner along the bottom of a hill, making just a few 90° turns. The monitoring site is a pool at one of these turns.

The stream substrate is generally flat rock, sandstone and limestone, cobble and gravel with minimal sand. Moderate sedimentation can be found in some areas as a result of previously mentioned drilling and residential development activities. Instream cover and bank vegetation stability are moderate due to an extreme 3 year drought. There is little pool variability; pool substrate is mostly flat rock.

Due to the continuing drought, there was no flow, hence no rocky runs or riffles. These stream features provide important habitat and oxygenated water for stream organisms.

The Habitat Assessment points totaled 90, an excellent score for the ecoregion; the average of high quality sites in the Cross Timbers is 84.

### Fish

Fish were collected from pools on June 13, 2006. The total number of species collected was 6, compared to 19 for the Cross Timbers high quality sites. Three of these were the green sunfish and the black and yellow bullhead catfish. There were no sensitive benthic species and no intolerant species collected, compared to 4 and 2 respectively collected from Cross Timbers reference conditions. The metric score for Blackboy creek was 6, only 27% of the ecoregion reference, earning an Index of Biotic Integrity score of E. According to Karr's Index of Biotic Integrity, attributes of E are "Few species and individuals present; tolerant species dominant; diseased fish frequent".

Prior to the fish collection, there had been only intermittent flow in the creek since January 2005 and there was no flow at the time of collection. Flow, runs and riffles are critical to sensitive species. Low water levels allow for easy predation of fish by birds, raccoons and other wildlife. Many of the fish remaining in the pools were catfish which also serve to reduce the numbers of other fish. The fish collection results are an indication of how serious the drought has been.

### Benthic Macroinvertebrates

Benthic macroinvertebrates live on the stream bottom and on debris found in the stream. They are a link in the aquatic food chain as both consumers of nutrients and food for fish. Many are intolerant of pollution or poor quality water and as such are good indicators of stream condition. In general, the greater the diversity of the benthic macroinvertebrate population, the healthier the stream. EPT richness (the number of mayflies, caddisflies & stoneflies found) is important since these are some of the most sensitive to pollution, poor quality water and poor habitat.

Benthic macroinvertebrates were collected January 9, 2004 and January 11, 2005. No summer collections have been possible due to low/no flow drought conditions.

Taxa Richness scored 88% and 94% for 2004 and 2005 respectively when compared to the Cross Timbers high quality winter riffle average. EPT Taxa Richness scored 140% and 160%. Both Mayflies and Stoneflies were found but no caddisflies. Overall total scores were 30 and 28 compared to 26 for the Cross Timbers reference conditions.

### Bacterial Testing

Samples for bacterial testing were collected June – August, 2003, May – August, 2004, June, July & September, 2005, August, 2006 and May – August, 2007. *E. Coli* results have ranged from a low of 8 CFU/100mL in August 2004 to a high of 2400 CFU/100mL in June 2003. This can most likely be explained by the use of the watershed, the riparian area and the creek itself by both wildlife and livestock.

## Chemical Testing

Chemical data were collected monthly between May 29, 2003 and May 24, 2007 except May, June, July and September, 2006 when there was neither flow nor water in pools from which to sample. Water is tested for Dissolved Oxygen (DO), pH, chloride and nutrients.

## Dissolved Oxygen Saturation

Dissolved Oxygen (DO) Saturation can indicate when there is too little or too much oxygen available to support aquatic life. Chemical data show DO saturation to be low for the ecoregion. Since the concentration of DO is affected by both temperature and flow among other factors, lack of flow over an extended period of time can explain low DO saturation levels.

## pH

pH is the measure of acidity or alkalinity of a solution. pH is a critical chemical factor for aquatic life. Macro invertebrates and fish are sensitive to solution pH with an optimal range for life of 6.5 – 8.2. Data show the pH of Blackboy Creek ranges from 6.30 – 7.75 with a median value of 7.0.

## Nitrogen

An estimate of soluble Nitrogen is made by adding the amounts of Ammonia-Nitrogen and Nitrate/Nitrite-Nitrogen found in the water. Levels of soluble Nitrogen are very low, with many results below detection limits. A one time high of 0.7 mg/L on 11/17/2005 could have been the result of animal waste in the creek.

## Phosphorus

Like Nitrogen, Phosphorus is a nutrient required by living organisms for life. In excess amounts growth of aquatic plants and algae can clog the stream. When the vegetation dies and begins to decompose, DO levels can drop to very low levels. Ortho-phosphate data for Blackboy Creek show low levels, with a high result of 0.027 mg/L for each of 3 sampling events (5/29/2003, 11/17/2005 and 10/26/2006).

## Chloride

Typically, in Northeastern Oklahoma, chloride is naturally present in water at less than 20 ppm. Chloride pollution can occur as a result of petroleum production and from street de-icing activities. Some sensitive aquatic species can be affected at levels of 100 –

200 ppm but most species won't be affected until concentrations are greater than 300 – 400 ppm. Monitoring data show chloride consistently at 5 – 10 ppm.

Overall, with the exception of lower than optimum DO saturation, the chemistry of the stream is excellent.

### Synopsis

Chemical data collected show there is no pollution from sources such as fertilizer runoff, septic tank overflow, street de-icing, etc. Animal waste is likely the sole source of nutrients and *E. Coli* in the stream.

Drought appears to be the most significant detriment to a healthy fish population, resulting in low/no flow and consequently low dissolved oxygen levels. Habitat is good and would be much better if there was consistent rain to feed the stream.

At the present time, Blackboy Creek is healthy with good physical habitat, water chemistry, and macroinvertebrate collections. Fish have been affected by recent drought conditions. Future water quality status is uncertain due to the presence of a salt water line, related to the coal bed methane wells, which intersects the creek. The integrity of the line is questionable since it has broken in two different spots, one spill contaminating a nearby pond.