

# **Tahlequah Ross Branch: Town Confluence**

NE SW NE  
Section 4-16N-22E  
Cherokee County  
N 35° 53.771'  
W 94° 58.255'  
WBID#: OK121700-03-0030G

Blue Thumb Volunteer Monitoring Data Review – October 31, 2013  
Written by: Clint Johnson

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

The headwaters of Ross Branch begin on the north side of Stick Ross Mountain, a large hill located in the Southwest corner of Tahlequah, Oklahoma. The run-off from Stick Ross collects at the base of the “mountain” and flows northeasterly through pasture land for approximately 2.25 miles before entering the urbanized environment of Tahlequah. It is here where stormwater begins to affect water quality of Ross Branch, which receives the parking lot and roof drain runoff from both Lowe’s Home Improvement store and Walmart. Ross Branch then passes Kentucky Fried Chicken on the North side of the property, and then passes under Muskogee Avenue. The creek daylights on the east side of Muskogee Avenue, on the South side of Bryant’s Donuts property and continues easterly behind McDonald’s, all of which discharge stormwater into Ross Branch. Once past McDonald’s, Ross Branch combines with an unnamed urban tributary and then passes under South Parkhill Road. It then daylights on the east side of Park Hill Road and flows for approximately 0.25 miles along the southern property line of the Tahlequah Farmer’s CO-OP and the Tahlequah Municipal Solid Waste Transfer Station and another 0.25 miles of undeveloped land before passing the monitoring spot which is 400 feet upstream from the confluence with Tahlequah Creek – Town Branch.

## **Stream Condition and Habitat Overview**

The habitat assessments conducted on Ross Branch in 1996 and 2010 indicate that conditions have degraded slightly. In 1996 it scored 100.2 and in 2010 scored 97.4; Ozark Highlands eco-region reference conditions averaged a score of 122.4. Both Ross Branch assessments started at the confluence of Ross Branch and Town Branch and went upstream ¼ mile. According to the 1996 assessment, bank stability and bank vegetation stability ranked high quality when compared to Ozark Highlands eco-region reference streams; however the 2010 assessment ranked both categories as medium quality as both scores decreased by 50%. All other conditions were consistent in both assessments. In the non-urbanized areas the instream cover, canopy cover shading, streamside cover, bank stability, and bank vegetation are high quality. Throughout Ross Branch pool variability, flow and channel sinuosity are considered low quality, possibly because the majority of the creek bottom is entirely made up of bedrock.

## **Biological Conditions**

### **Fish**

Fish were collected from the same ¼ mile and on the same day as the habitat assessments. Based on the average of high quality reference streams in the Ozark Highlands eco-region, Ross Branch ranked above average with regards to diversity and proportion of insectivorous cyprinid species (minnows that eat insects) in 2010. This is an improvement when compared with the results of the 1996 assessment. The total number of fish collected increased from 172 in 1996 to 303 in 2010. The total number of species was 15 in 1996 and 13 in 2010; however the number of total fish for each particular species dramatically increased in 2010. The Cardinal Shiner increased from 5 fish to 73 fish in 2010, the Ozark Minnow increased from 0 to 72 in 2010, and the Mosquito Fish increased from 5 fish to 35 fish in 2010. While this appears to be an improvement and increases the diversity, other species did decrease from 1996 to 2010. The Southern Red-belly Dace fell from 14 fish to 0 fish, and Green Sunfish fell from 10 fish to 0 fish in 2010. However, the total intolerant species remained steady at 6 species for both the 1996 and 2010 assessment. The proportion of insectivorous cyprinid species increased from 6% in 1996 to 31% in 2010. The low number identified in 1996 may have been due to a decrease that was observed in macroinvertebrates in the 1995 and 1996 collections. The number of sunfish species also decreased from 4 species in 1996 to 1 specie in 2010. Overall, Ross Branch in 1996 scored a 64% and in 2010 a 71% when compared to the Ozark Highlands reference conditions. Ross Branch score improved but is still lacking in sensitive species.

### **Benthic Macroinvertebrates (bugs)**

Macroinvertebrates were collected sporadically from 1991 to 2011.

Winter collections were conducted in 1991, 1995-1999, 2008-2009 and 2011. The 1991 collection was the highest score ever at 88% as good as reference conditions. This collection was just lacking some of the more sensitive species. In the group of data from 1995-1999 something happened to cause the 1996 collection to score the worst at only 19% as good as reference conditions and having zero sensitive species present. The scores then gradually increased. In 2008 and 2009 Ross Branch was at 81%, near its highest score but then fell to 50% in 2011. This drop could be due to serious drought conditions the state suffered in 2010 and 2011.

Summer collections were conducted 1991, 1995-1997, 2007, 2010-2011. Ross Branch started out fair in 1991 with a 67% score. Just as in the 1996 winter, the summer of 1996 was the lowest score, 40%, of all the summer collections. There were 6 different species of sensitive bugs which is great to see but ½ of the total sample was from one midgefly specie, that is really poor distribution and is a pollution tolerable specie. Summer 1997 was the highest score of 100%. Great to see this in a summer collection as the summer is usually the more stressful season on the bugs. In 2007 there was a bit of drop to 87% and then in 2010 the score dropped to 47% most likely due to the drought. 2011 showed a bit of recovery as the score increased to 60%.

The low scores could also be due to the urban runoff Ross Branch is subjected to upstream and near the sampling site, which results in siltation from a number of gravel parking lots and chemical runoff due to the application of chemicals by commercial lawn services and exterminators. Also, the presence of the City of Tahlequah Municipal Solid Waste Transfer Station is located along the bank of Ross Branch about 200 feet upstream from the sampling site.

## **Chemical Conditions**

Ross Branch was sampled monthly by Blue Thumb volunteers from 6/29/2007 to 5/15/2011 and also on 1/27/2013.

### **Dissolved Oxygen**

The oxygen saturation levels can indicate where there are problems with the amount of oxygen available in the water for aquatic life. Too little or too much are indicators of a problem. The oxygen saturation level generally follows the summer/winter rise and falls with temperature. The dissolved oxygen ranged from 6mg/L to 15mg/L and had an average of 9.8mg/L. The oxygen levels at Ross Branch are normal.

### **pH**

The pH ranged from 4.5 to 8.0, however the 4.5 on 6/29/2007 and 5.0 on 12/21/2007 appears to have been an anomaly, as it was only recorded this significantly low twice. Excluding the anomaly, the pH ranged from 7.0 to 8.0, within acceptable and expected levels.

### **Nitrogen**

Levels of soluble nitrogen (grouping nitrate, nitrite, and ammonia nitrogen's together) ranged from below the detectable limit to 5.3mg/L N on 1/1/2009 and 2/1/2010, and had an average of 1.4mg/L N. This average is well within the caution range (0.8mg/L N - 1.5mg/L N) and nearly in the poor range (>1.5mg/L N). The data from 2007-2008 were very tight together around 1.3mg/L N. The data from 2009-2013 had a lot bigger distribution with over half the data being in the poor range. Ammonia levels were below the detectable limit from June 2007 through January 2013. So it has mainly been the nitrate nitrogen that has been increasing, with some low hits of nitrite nitrogen. According to the United States Geological Survey, nitrate concentrations greater than 5mg/L N begin to contribute to excessive algae growth in lakes and streams.

### **Phosphorus**

Orthophosphate phosphorous levels have dropped, and that is very good to see. From 2007-2008 the data ranged from below detectable levels to 0.110mg/L P with a spike of 0.470mg/L P on 9/26/2007 and an average of 0.037mg/L P. From 2009-2013 the data was well within the normal range, below 0.05mg/L P, except for two readings of 0.067mg/L P on 7/15/2009 and 1/27/2013 which were in the caution range. The standard for the Scenic Illinois River is 0.037mg/L P.

### **Chloride**

Chloride levels ranged from 10mg/L Cl to 20mg/L Cl which is normal for this area.

## **Synopsis**

After the Ross Branch confluence with Town Branch, is the beginning of what is actually considered by most in the area as Tahlequah Creek, which flows southeasterly approximately 1.75 miles before flowing into the Illinois River. The Illinois River is designated as a Scenic River, which means it is an Outstanding Resource Water and therefore more stringent pollutant discharge requirements exist for water that enters it. Although continued urbanization of the watershed is occurring, a large improvement of the watershed is scheduled to occur in the near future, as the City of Tahlequah Municipal Solid Waste Transfer Station will be closed, cleaned, and replaced with a green space for a new city park. Another contributor of pollutant loading in Ross Branch are point sources from parking lots and roof drain runoff from a relatively few large retail businesses, which allows for a realistic possibility of some retrofit

treatment infrastructure to accomplish a significant reduction in pollutant loads. There has been a lot of education and city improvement practices put in place in the last few years and there is proof from Ross Branch that it is working. A big marked improvement has been the drastic drop in orthophosphate phosphorous since the start of 2010. The fish have shown an improvement from 1996 to 2010. The bugs have also improved, in general, since around 1997. If the state did not have the extreme drought in 2010-2011 the bug collections could have stayed on the road to improvement. Ross Branch is a struggling creek but is showing signs of healing and is still in need of help from the community.