Delaware Creek: Camp Simpson Witch Hole

SE NE SW
Section 2-2S-7E
Johnston County
34.409280
-96.540661
WBID# OK410400-03-0240W

Blue Thumb Volunteer Monitoring Data Review – September 27, 2013
Written by: Gregory Mayberry and Valerie Bradshaw

Description of Watershed and Monitoring Site:
The site is owned by: The Boy Scouts of America, Arbuckle Council
Brett Matherly, Council Executive
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Delaware Creek is monitored on the grounds of Camp Simpson, near the small town of Bromide, which is about 24 miles NE from Tishomingo in southern Oklahoma. The creek runs roughly north to south with headwaters running through a Cross Timbers, Oak/Hickory/Elm/Eastern Red Cedar forest and then on down through some range land until it reaches Camp Simpson. Shallow top soil covers limestone bedrock, allowing for rapid percolation and draining of the area. The monitoring site is 217 meters (712 feet) above sea level. This creek is the principal drainage venue for an area of approximately 12-15 square miles. Of particular interest to Blue Thumb, the monitoring site is approximately 3 miles south of a commercial pig farm. Beyond the monitoring site, Delaware Creek eventually turns east and in about 12 miles runs into Clear Boggy Creek which eventually empties into the Red River.

The "Witch Hole" is a deep, natural body of water with a surface area of approximately 2.5 acres and is just a few feet south of the monitoring site. The water from the north drains into the Witch Hole which, in turn, drains to the south.

Stream Condition & Habitat Overview:

The most recent Habitat Assessment was conducted on July 23, 2010. Gregory Mayberry, Valerie Bradshaw and Lacie Rohrick were guided by Kim Shaw, Jean Lemon and a Blue Thumb intern.

The pool depth was highly variable, ranging from 10 – 30 cm. where the creek entered the Witch Hole, to 2 meters upstream, close to the lake spillway. This nice depth variability will support small and big fish. During much of the summers of 2011 and 2012, the creek was completely dry except for the very deep area up near the spillway. They remained dry well into the early

winter months. Riparian coverage consist of sycamore, cottonwood and, interestingly, seaside alder. The creek enjoys a high amount of shading from these trees. Abundant streamside cover is also provided by native grasses. Bank stability is high, due to the limestone composition of the area. Macro algae, large rocks and fallen, submerged trees provide for a medium amount of in-stream cover for bugs and fish in the creek. The pool bottom substrate consists mainly of limestone varying from gravel to cobble in size, with lesser amounts of sand and boulder substrate. The creek is oxygenated by frequent rocky runs and riffles. Bank vegetation is relatively stable, considering the shallowness of the topsoil. Because of the shallowness of the soil, erosion from occasional flooding, and periodic high winds are known to fell trees across the creek. When not considered a hazard to campers, these fallen trees are allowed to decay naturally where fallen. Normal flow is relatively low. The creek's habitat assessment was measured for 400 meters (1/4 mile) and it flowed in virtually a straight line with no curves or bends. Delaware Creek's habitat assessment score was well above the average of the reference conditions for the Cross Timbers Ecoregion.

Biological Conditions:

Fish

Seining the creek yielded 13 different species of fish, compared with 19 in the Cross Timbers Reference (CTR). The Shannon's Diversity Index scored quite low meaning the total number of fish was not evenly divided amongst the different types of species. The Bluegill Sunfish (a very tolerant fish) made of 77% of the total collection. The depth of creek and steepness of the bank made it difficult to keep fish contained in the seine while bringing it to the bank. The day's seining netted a total of 1101 specimens falling into 13 different species. Of the 13 species caught, 8 are considered to be tolerant species, 4 are intermediate, and 1 (Big Eye Shiner) is intolerant. CTR averaged 2 species of intolerant fish. This sample contained a single herbivore (eats plants), 2 omnivores (eats meat and plants), 6 insectivores (eats bugs), 3 piscivores (eats fish), and 1 generalist/insectivore. Delaware Creek only scored a 73%, a C grade, when compared to CTR due to low diversity and few intolerant fish and no insect easting minnows.

Benthic Macroinvertebrates (bugs)

Winter benthic macroinvertebrate collections were conducted in 2010, 2011 and 2012. One summer collection was conducted in 2010. Dry creek conditions caused the 2011 and 2012 summer collections to be cancelled. While the average taxa richness (number of species) was close to the CTR standard, collections always fell short in the critical EPT taxa richness (species of bugs most sensitive to pollution). Three of the four collections were more evenly distributed, had better diversity, then the CTR standard. Winter 2012 had quite poor diversity. Overall, Delaware Creek: Camp Simpson Witch Hole scored a 40% total score at its lowest (winter 2012), and an 87% total score at its best (winter 2011).

Editorial Comment: THIS is the favorite activity, by far, for the students. While they are interested in the chemical testing, it loses appeal after a time or two. The macroinvertebrate collections ALWAYS hold their interest!

Bacteria Testing:

Bacterial testing was completed 4 times since 2008.

On 05/16/2008, water tested had 1,306 *E. coli* colonies.
Total coliforms were too numerous to count.

On 06/19/2010, tests showed 1,200 *E. coli* colonies and 3,626 total coliforms.

On 10/22/2010, tests yielded 1,666 *E. coli* colonies.
Total coliforms too numerous to count.

On 09/05/2011, the cultures showed 933 *E. coli* colonies.
Total coliforms numbered 1,022 colonies.

The two tests that showed total coliforms too numerous to count corresponded to conditions in which significant algae was present in the creek. These were also the two highest *E. coli* counts. Both of the tests with the lowest counts of *E. coli* and total coliforms were recorded when the creek was described under "stream site observations" as being "clean". These results are a screening process performed by Blue Thumb volunteers and not by a laboratory, but the results are high and could be due to all the wildlife in the area or from the pig farm or range land.

Chemical Testing:

Chemical data were collected almost monthly between 02/20/2010 and 01/19/2013.

Dissolved Oxygen levels have ranged from 9 mg/L during the warm summer months, to 14-15 mg/L during the colder winter months. Oxygen saturation has generally ranged from 105% to 135%. The last two times (10/18/2012 and 1/19/2013), however, oxygen saturation has been 99% and 90% respectively. Chemicals have been checked for freshness, and are dated within acceptable limits. The dissolved oxygen levels fall within the preferred range of 80% - 130%. So when the creek is not dry the oxygen levels are normal.

pH level of Delaware creek runs slightly alkaline, which would be expected in a limestone-rich area. The pH ranges from 7.4 – 8.3. All readings have been within the normal surface water range of pH 6.5 – 9.

Nitrate and **Nitrite Nitrogen** levels have always been except for three times; 1/21/2012 nitrate of 3.5mg/L, 10/18/12 nitrate of 2 mg/L, 1/19/2013 nitrate of 1 mg/L and nitrite of 1.5 mg/L.

Ammonia Nitrogen has always been Below Detectable Level.

Orthophosphate Phosphorous levels have been Below Detectable Level for 11 of the 14 tests. Three times, 3/16/2010, 1/21/2012, and 1/19/2013, the level was detected at 0.033 mg/L which is

approaching the ceiling of 0.037 mg/L allowed in Oklahoma's Scenic Rivers. Delaware Creek is not a scenic river but 0.05 mg/L orthophosphate phosphorous is the start of the caution level.

Chloride levels have ranged from 10 – 45 mg/L with a median reading of 25 mg/L. This range is normal for the area.

Summary:

The Delaware Creek: Camp Simpson Witch Hole monitoring site is a relatively low-volume creek situated approximately ¼ mile downstream from a 130 acre lake formed by damming the Delaware Creek. A second, small dam is situated 80 meters upstream from the monitoring site. Flow through the stream can be partially controlled by the camp ranger, as needed by cattlemen downstream. The creek has excellent habitat but the fish and bugs are lacking in sensitive species. The fish collection and winter 2012 bug collection were also lacing in diversity. The water chemistry, for what it was tested for, all looks good except for some recent spikes in nitrogen. The lack of flow and majority of the creek drying up in the summers of 2011 and 2012 is a limiting factor for the bugs and fish. The dams could be limiting the biological diversity as well, among other things that have not been tested. Overall quality of the site is good enough to be used as a recreational/educational area for cub scouts and boy scouts during the summer months and during Christmas break.