

Little Deep Creek: Weatherford

NE SE NE

Section 17-12N-14W

Custer County

N 35° 31' 06.7"

W 98° 42' 00.3"

WBID#: OK520620-06-0040C

Blue Thumb Volunteer Monitoring Data Review – October 2013

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Description of Watershed and Monitoring Site

Little Deep Creek is a second order stream in the Level 3 Central Great Plains and Level 4 Cross Timbers Transition ecoregion that begins about 3 miles WNW of Weatherford, OK and eventually empties into Deer Creek about 4 miles ENE of Weatherford. The monitoring site is located south of I-40 and southwest of the City of Weatherford Waste Water Treatment Plant. The manager of the plant has kindly maintained a rough access trail down to the site. The monitoring site on Little Deep Creek is approximately 100 m upstream from the plant effluent. It is noteworthy that regular monitoring of the effluent is performed by plant staff. There is approximately 10 square miles of land that drains into Little Deep Creek to the point where it is being monitored. Land-use adjacent to or near the watershed includes waste water treatment, agriculture, industry, local businesses, and Interstate 40.

Stream Condition and Habitat Overview

Little Deep Creek runs along the base of a bluff and is fairly straight in the monitoring area. There are deep and shallow pools connected by a few rocky runs and riffles. The banks have vegetative cover (trees, shrubs, undergrowth), although the pool bottoms are soft indicating sediment deposition from upstream erosion. The monitoring site is downstream from an old landfill that we suspect was active during the early and middle 1900s. As a result, most of the trash that is observed in the stream includes older bottles, cans, and broken porcelain.

Habitat Assessments were conducted on Little Deep Creek starting at the monitoring site and going upstream for 400 meters (about ¼ mile). In August 2006, Little Deep Creek received a habitat score of 84.8. In July 2010, the score declined to 78.9. However, habitat scores for Little Deep Creek are comparable with the Central Great Plains Region (average of 77.6). Canopy cover shading and streamside cover continue to receive high scores. Pool variability drastically dropped from 2006 to 2010 due to the loss of deep pools. This is likely due to recent periods of severe or extreme drought in the region. Pool bottom substrate, channel alteration, channel sinuosity, and bank vegetation stability continue to receive low scores. Despite drought, the region has experienced several severe storms over the past few years which resulted in significant alteration to bank vegetation and channel alteration (several point bars in the creek formed by sediment building up). During the period from 2006 to 2010, scores for the presence of rocky runs or riffles and flow increased to a medium level and instream cover improved to a good level.

Biological Conditions

Fish:

Fish were collected (seined) at the same time as the habitat assessments and from the same 400 meters. The total number of fish species increased from 12 in 2006 to 14 in 2010 (average of 13 species in the ecoregion), which suggests that water and habitat quality is at least stable. However, the number of sensitive benthic species remains zero (ecoregion average is 2), which is not favorable and may reflect, in part, the consistently high level of siltation in the stream. The number of sunfish species increased from 4 in 2006 to 6 in 2010 (ecoregion average is 4), which indicates more favorable pool quality and cover. The number of intolerant species remains at 1, which is identical to the ecoregion average and indicates a stream of moderate quality. However, the proportion of tolerant individuals declined to 47% in 2010 (compared to 59% in 2006) and is significantly below the ecoregion average of 74%. This finding suggests that the overall stream quality is improving. Similarly, the proportion of insectivorous cyprinid individuals (minnows that eat insects) increased in 2010 to 51% and is significantly greater than the average of the ecoregion at 21%. This indicates that the quality and quantity of the invertebrate food base increased from 2006 to 2010. A total of 1672 fish were collected in 2010, which represents almost a 75% increase from 2006. The Shannon's Diversity Index (increases as community balance increases) was 1.71 in 2010, which is above the ecoregion average of 1.62 and stable compared to the 1.77 level in 2006. Overall, the Index of Biotic Integrity (IBI) score for fish, as compared to the Central Great Plains as a reference, increased from 83% (condition grade B) in 2006 to 92% (condition grade B/A) in 2010.

Benthic Macroinvertebrates (bugs):

Macroinvertebrates were collected from a rocky riffle in Little Deep Creek twice yearly, winter and summer, since summer 2004. The number of different species of bugs at Little Deep Creek for winter collections has been comparable to the ecoregion average since 2006 and summer collections since 2009. However, the EPT Taxa Richness (mayflies, stoneflies, and caddisflies - bug species most sensitive to pollution) have been lower than the ecoregion average every winter except 2009 and every summer except 2008 and 2010. The population of these EPT bugs has also severely suffered, especially in winters 2007, 2011, 2012 and summers 2005, 2007, 2011. This decrease in sensitive taxa may be explained, in part, by the effects of extreme drought since 2010. The Low scores observed in 2007 were likely due to severe storms and heavy rains. In addition, the majority of the summer bug populations are more tolerant of organic pollution as were the winter collections of 2011 and 2012. Also notable were the relatively higher percent dominant taxon values for summers 2008, 2009, 2010 and 2011, as well as winters 2007, 2009 and 2012. A well balanced community that is not stressed by pollution should not have a single bug species composing more than 20% of the total sample. These findings indicate fluctuations in stream quality during these time periods secondary to higher levels of pollution. With the exception of a lower score in summers 2008 and 2009, the Shannon-Weaver Diversity Index (community balance) for Little Deep Creek has been comparable to, if not higher than the ecoregion average. All the winter collections, excluding 2007, were higher than ecoregion average for the Shannon-Weaver Diversity Index. Overall, bug bioassessment scores have fluctuated. Most notable is the trend toward higher condition grades during summers 2007, 2008, and 2009 (C, B, and A, respectively), followed by a declining trend during summers 2009, 2010, and 2011 (A, B, and C, respectively). As discussed above, the impact of extreme weather experiences, including a severe drought, may be responsible for these findings.

Bacteria Screening

Bacteria screening was performed May-August of 2009-2012. In each testing, total coliforms were too numerous to count. It should be noted that in one or two of the summer months during each year, E. coli counts were significantly elevated compared to the initial May samplings. E. coli counts for July 2009, June 2010, July 2011, and June 2012 were 5,953 CFUs/100ml, 2,322 CFUs/100ml, 1,477 CFUs/100ml, and 777 CFUs/100ml, respectively. It is common to observe E. coli counts > 400 CFUs/100ml during the summer months. Consistently high levels of coliforms and E. coli are likely due to adjacent farm and cattle grazing areas.

Chemical Testing

Chemical data were collected monthly between 6/19/2004 and 1/26/2013.

Mean Dissolved Oxygen for Little Deep Creek collections during the 2004-2008 period was 10.1mg/L with a lowest value of 6mg/L measured in July 2006 and a highest value of 16mg/L in January 2006. Mean value during 2009-2013 period was 8.4mg/L with a lowest value of 6 mg/L measured in June 2010, July 2011, and July 2012 and a highest value of 13mg/L measured in January 2009 and January 2013.

Mean Percent Oxygen Saturation from 2009-2013 was 88%. Although in the normal range (80-130%), this represents a reduction from a mean of 95% during 2004-2008. During 2004-2008 the highest reading was 150% in July 2007 and lowest was 74% in July 2006. During 2009-2013 the highest reading was 148% in June 2009 and the lowest was 62% in July 2011.

Mean pH values were 7.8 during 2009-2013 and 2004-2008, with minimal fluctuation during these periods.

Mean Nitrate/Nitrite Nitrogen continues to be consistently in the poor range (>1.5mg/L N). During 2004-2008 the mean nitrate/nitrite nitrogen was 3.2mg/L N, which is comparable to 3.3mg/L N for 2009-2013. The consistently elevated nitrate/nitrite nitrogen likely reflects the impact of adjacent agriculture and livestock activities.

Ammonia Nitrogen measurements have been consistently between below detection and 0.2mg/L N, with one reading of 0.4mg/L N in June 2005.

Mean Orthophosphate Phosphorous of 0.007mg/L P during 2009-2013 was within the normal range (< 0.05mg/L P) and less than the 2004-2008 mean of 0.033mg/L P. However, there were three elevated measurements during 2009-2013 within the caution range (0.05-0.1mg/L P): November 2010, July 2012, and November 2012. These three measurements are still less than the six highly elevated measurements in 2004-2008 in the poor level (>0.1mg/L P): November 2004, June 2005, August 2005, June 2006, October 2006, and June 2007. In the past, isolated incidences of orthophosphate spikes have correlated with recent periods of increased rainfall.

Mean Chloride for 2009-2013 was 30mg/L Cl, which represented a slight increase from a mean of 25mg/L Cl for 2004-2008. Chloride levels have been consistently in the 25-35mg/L Cl range over the years.

Synopsis

The physical habitat of Little Deep Creek from 2006 and 2010 was relatively good and comparable to the Central Great Plains ecoregion. It is noteworthy that despite periods of extreme drought, the stream has never been observed to be completely dry, although there have been periods of low flow. Pool bottom substrate, channel alteration, channel sinuosity, and bank vegetation stability continue to receive low scores. The stream has historically been presented with periods of increased filtration and the straight nature along a bluff predisposes toward low channel sinuosity. Although pool variability has declined significantly from the previous review period, instream cover and the presence of rocky runs or riffles has improved. Despite recent lower scores in respect to macroinvertebrate collections, secondary to drought and storms, the overall condition grades are close to comparable to the Central Great Plains ecoregion. Based on counts and the degree of diversity identified in macroinvertebrate and fish collections, it appears that the habitat and water quality of Little Deep Creek is sufficient to support a range of species, but there is still a small lack in the most sensitive species of both bugs and fish. Nitrate/nitrite nitrogen levels have been consistently high in Little Deep Creek samples, as well as poor bank stability and bank vegetation stability. These factors continue to be the likely basis for high coliform bacteria counts. Perhaps educating people in the watershed about better land-use practices such as fencing off cattle from the stream, what a riparian area is and why it is important, proper timing and application of fertilizers, etc. would reduce the nitrogen levels, bacteria levels, and sediment problems of Little Deep Creek. This might allow the sensitive bugs and fish to populate the creek.