Baron Fork Creek: Welling Road

SE NE NE Section 18-16N-23E
Cherokee County
Lat: N35° 52’ 05.2” (35.8681111°)
Long: W 94° 53’ 50.4” (-94.8973333°)
WBID#: OK 121700-05-0010G

Blue Thumb Volunteer Monitoring Data Review – Dec 2010
Written by George Fulk

Watershed and Monitoring Site

The Baron Fork Creek begins in Lincoln, Arkansas; and, flowing west for about 35 miles, empties into the Illinois River near Welling, Oklahoma. It drains an area of several hundred square miles. In Arkansas it receives water from Jordan Creek. After crossing the state line it receives Evansville Creek, Shell Branch, Peavine Creek, and Tyner Creek as well as several smaller streams. It drains a rural landscape, flowing past these small communities: Dutch Mills (AR), Baron, Christie, Proctor, Eldon, and Welling in Oklahoma.

The monitoring site is immediately downstream of the Welling bridge, where 785 Rd crosses the creek south of the village of Welling. This bridge provides public access to the stream and is a popular swimming hole and picnic area. There are trash barrels located at the monitoring site. Those barrels are currently emptied on a regular basis.

Stream Condition and Habitat Overview

The bed of the Baron Fork Creek is entirely gravel. There are places where cattle enter the stream, although bank erosion does not seem be a serious problem, at

least not along the lower 10 miles of the stream, an area with which I have experience.

The stream's physical habitat was assessed for 400 meters upstream from the monitoring site on August 4, 2008. This assessment considered such factors as the amount of shade over the stream, the stability of the bank, the plant growth on the banks, the cover for fish and invertebrates within the stream, the flow of water, and other factors likely to affect the quality of this aquatic habitat. The total score from that assessment was 104.4, which is below the average of 122.4 for Ozark Highland reference streams. Reference streams are selected because they are thought to represent unaltered, high quality streams for that particular biological ecoregion. The low amount of water in the Baron Fork at the time of the assessment in August may have affected the overall physical habitat score, which thus may not reflect the average conditions for the stream over most years.

The Baron Fork near the monitoring site scored high with respect cover within the stream, shading, the presence of riffles, and the stability and vegetative cover on the bank.

Instream cover is the component of habitat that organisms hide behind, within, or under. High quality cover consists of things like submerged logs, cobbles and boulders, root wads, and beds of aquatic plants. Cover required by smaller members of the stream community consists of gravel, cobbles, small woody debris and dense beds of fine aquatic plants.

Canopy cover assesses the shading of the stream section. Plants lie at the base of almost all food chains. Since plants require light for growth and survival, a stream that is functioning well needs some amount of light. Moderation is optimal, however, because light is associated with heat, and most aquatic organisms are more stressed by the warmer waters and the lower oxygen solubility and higher metabolic rates that accompany the warming of water.

Banks that are stabilized with vegetation benefit the aquatic community more than those stabilized with other materials. This is because the vegetation offers several extra advantages beyond that of bank stability. The riparian plants of the stream bank offer a high quality source of food and shade to the aquatic community. Riparian vegetation stabilized point bars and contributes greatly to structure in the form of root wads and woody debris.

Rocky runs and riffles offer a unique combination of highly oxygenated, turbulent water, flowing over high quality cover and substrate. Turbulence prevents the formation of nutrient concentration gradients from cell membranes outward so that algae and other plants grow at a much higher rate than they would at the same concentration in pools. More food means more growth. Larger crops of algae are translated into larger invertebrate crops. It is these invertebrates, reared in riffle areas, that feed many of the fish in the stream. Because turbulent water is so well oxygenated, there has been no selection pressure for riffle dwelling organisms to develop tolerance to poorly oxygenated waters. These are often the first animals to disappear from the stream if oxygen becomes scarce. The presence of rocky runs and riffles offers habitat for many highly adapted animals that will increase diversity of samples collected from the streams they occupy.

Fish collection

Fish were collected from 400 meters of the creek at the monitoring site by seining on August 4, 2008. The number of fish collected in each species was recorded and samples of each species were preserved to verify the on-site identifications.

Careful assessment of the fish population is a very effective way to assess the overall quality of a stream. Some species of fish can live only in high quality aquatic environments and are sensitive to pollutants. Such fish are called “intolerant”. Tolerant species can survive in low quality water and/or habitat. Intolerant species make up a large percentage of the total fish population in high quality streams. Unpolluted streams also support a greater diversity of fish, i.e. a

larger number of different species, than low quality habitats. Furthermore, low quality streams will have a large proportion of omnivorous and herbivorous fish compared to fish that eat insects or other fish.

The fish population in Baron Fork Creek indicates that this is a very high quality stream. Five hundred and ninety four fish of 23 species were collected. Only five species were tolerant, five were intermediate, and the remaining 13 fish species collected were intolerant of pollution. Over sixty percent were insectivores and 14.1 percent were piscivores (eat other fish).

Fish that live in the gravel bottom are referred to as "benthic" species. Such fish are intolerant of low oxygen and siltation. They weak swimmers; so, if their populations are lowered due to deterioration in the habitat, their numbers are slow to recover. Thus a high number of benthic species suggests good water quality both now and in the past. At least 6 species of benthic fish live in the Baron Fork. That compares favorably with reference streams.

Seven species of sunfish were collected in the sample. That indicates a healthy aquatic habitat. Sunfish require a stable bottom in which to spawn and do not reproduce well if sediment enters the stream.

Overall, the fish sampling indicated that the Barron Fork river is similar in quality to the best streams in the Ozark Highland ecoregion.

Macroinvertebrates

Invertebrates are animals without a backbone. Many are so small they cannot be seen with the naked eye. "Macro" invertebrates are large enough to be seen and picked up with tweezers. Macro invertebrates include crayfish, sowbugs, and many types of insect larvae. As is the case with fish, they are excellent indicators of stream health.

Macroinvertebrates are too numerous to permit the counting of every individual of every species. Instead, a series of random samples is taken from each collection. The sample is sent to specialists for identification after sorting by volunteers. Within each sample the number of individuals of each type, or "taxa", is recorded. A "taxa" is any phylogenic grouping. It may be a family, subfamily, genus, or species. For this report, not all invertebrate specimens were identified to species.

As with fish, macroinvertebrates can be classified as "intolerant" (unable to live in low-quality habitats) or "tolerant". Mayflies, stoneflies, and caddis flies are insect families that are intolerant, with the exception of a few species within those families. Species in those three families are called "EPT taxa", after the latin names for those families. An unpolluted stream will have many intolerant species (or EPT taxa) and few tolerant ones. Also a high quality aquatic habitat will have many species; as pollution increases, diversity declines. In high quality habitats, no one species is represented by an extremely large number of individuals. Various indices of water quality have been developed based on those principles.

Macroinvertebrates were collected from the monitoring area twice a year, in the winter and in the summer. The results here are from collections made between 2002 and 2008, a total of 14 collections.

The number of taxa collected ranged from 15 to 27, with 8 of 14 collections having 19 or more taxa. That compares favorably with reference streams which average 22 tax in the winter and 20 in the summer. From all but two collections, over half the taxa were EPT or intolerant of pollution, a ratio that compares favorably with reference streams.

In reference streams most individual specimens are from intolerant families. That was the case for most collections from the Baron Fork.

A single letter score has been developed that is based on 6 indices of diversity and tolerance. Those scores range from A for the best steams to F for the poorest.

Out of the 14 collections, the Baron Fork scored A 12 times and B twice. Scores of B were from the winter collections of 2004 and 2005. Overall, sampling of macroinvertebrates confirms the findings of the fish collection and indicates that the Baron Fork is a high quality aquatic habitat.

Water Chemistry

Blue Thumb volunteers gather data on water chemistry every month. This report is based on data gathered in each of 96 months from December 2001 through July 2009. At each sampling the following information is gathered: percent oxygen saturation, pH, and concentrations of soluble nitrogen, orthophosphate phosphorus, and chloride. Gathering this information is laborious and not as useful in assessing stream health as studies based on collections of insects and fish. However, visiting the same sampling site every month and gathering chemical data allows volunteers to keep a constant watch on the stream. This provides an early warning for any sudden or dramatic changes that might occur due to an influx of harmful material.

Oxygen levels 80% of saturation or better are considered normal. Levels between 80 and 50 % indicate caution, below 50% is poor. The median level of oxygen concentration for all samples from the Baron Fork was 93%. Only one collection of the 96 indicated poor oxygen saturation. Orthophosphate levels also indicated good water quality, with the median concentration being 0.013 mg/L, well within the normal range. Only 3 collections gave orthophosphate levels above 0.05 mg/L which were in the caution range. Chloride levels and the pH were always in the normal range.

The concentration of soluble nitrogen was frequently in the caution zone between 0.8 and 1.5 mg/L. The median level was 1. Approximately 25% of all collections gave nitrogen levels in the poor zone, i.e. above 1.5 mg/L. Obviously, the nitrogen concentration is higher than ideal; but at this point it does not seem to affect the quality of this aquatic habitat. The cause of the slightly high nitrogen

levels is not known, but the close proximity of a swimming area to the sampling site and the occasional presence of cattle in the stream are possible causes.

Synopsis

The Baron Fork Creek compares favorably with the best streams in the Ozark Highland region. As such it is a valuable resource and is enjoyed by sport fishers and anyone seeking a cool dip in a clear stream. The fact that many streams are being degraded makes this stream all the more precious. It is important to watch this stream carefully in order to maintain the high quality of this aquatic treasure.