

## **Cedar Hollow Creek: Nickel Preserve**

NE SE NW

Section 31-18N-23E

Cherokee County

Latitude N35.99871

Longitude W-94.89736

WBID# OK121700-03-0110J

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

Cedar Hollow Creek is a crystal clear, spring fed creek in northeast Cherokee County, OK flowing through the steep, rocky hills of The Nickel Preserve in the Ozark Highlands ecoregion. The hills rise 300-400' above the creek bed. At the monitoring site, the creek bed sits at about 780' above sea level. When The Nature Conservancy began the protection of the +14,000 acre Nickel Preserve in 2000, Cedar Hollow Creek was described as being the most permanent flowing water source on the property. However, since then, northeastern Oklahoma has been affected by yearly extreme variations in rainfall.

According to the Oklahoma Climatological Survey ([www.ocs.ou.edu](http://www.ocs.ou.edu)), Cherokee County averages about 47.5" rainfall per year. Generally, that average rises in the eastern part of the county. Looking both at OCS records and our private measurements of rainfall, it has not been unusual since 2000 to have as much as a 20" rainfall change year to year. Furthermore, in that time frame, even years with average or above average rainfall may have months with drought conditions. So, while the most obvious of diminished yearly rainfall was drought, there also was a compression of rainfall into narrow windows, often with flooding creek flows adjacent to drought conditions.

In times of low, or no, rainfall, Cedar Hollow Creek sometimes maintains surface flow over its limestone ledges while losing surface flow over the rocky, porous stretches. Since the primary sampling site is such a rocky stretch, we designated an area upstream on a limestone bench to be an alternate sampling site. However, sometimes all surface water flow stops.

The creek flows roughly north to south and drains an area of about 5 square miles. Although the drainage basin historically was the site of homesteads, cattle ranching and landscape modification, it has been protected for many years, even in advance of The Nickel Preserve. Cedar Hollow Creek crosses Cherokee County Road D4569 at a point known as "The Bathtub Rocks" and enters the Illinois River about 3000' downstream. The primary Blue Thumb monitoring site is about 1500' upstream from the road in a valley that gets limited use. The alternate site sits on a limestone ledge is another 400' upstream from the primary site. The highly eroded limestone feature called the Bathtub Rocks has a vertical drop of more than 30' and is marked by small pools or bathtubs that make a well-known and well used recreational site. Even though the Rocks were on private property for many years prior to 2000 and are now on Nickel Preserve property, no attempt is made to restrict access because doing so would require 24 hour per day supervision. Since the Bathtub Rocks attract a fair amount of trash, part of the Blue Thumb mission there is to pick up trash once a month.

## **Stream Condition & Habitat Overview:**

Cedar Hollow Creek has a rocky stream bed with elevated rock/sand bars and floods with high rainfall events. Occasionally, the stream opens onto a limestone ledge. We've measured events that filled the channel up to at least 4' up on the banks. Periodic high flows do move a lot of black sand, rocks up to 12" in diameter, and large logs. The Creek has many straight runs and is not very sinuous (curvy). There are relatively permanent pools in the stream bed, but their depth changes with rainfall events. The monitoring site has a lot of in-stream and streamside cover, and the banks are structurally stable. Canopy cover is strong, but bank vegetation is only moderately strong. Despite its limitations, the 2010 habitat score of 90.1 for Cedar Hollow Creek is close to the Ozark Highlands ecoregion reference score of 122.4.

## **Biological Conditions:**

### **Fish**

The summer 2010 fish collection was quite different from the Ozark Highlands reference condition. Cedar Hollow Creek had only 3 fish species present with the most abundant fish (90% of the population collected), the Southern Redbelly Dace, being an intolerant species. Reference conditions averaged 17 species of fish and 11 of those being sensitive species. An analysis of diversity and tolerance scored the overall fish collection of Cedar Hollow Creek 38% (lowest grade of an "E") when compared to reference conditions. The lower part of the Creek below the Bathtub Rocks is more reflective of fishes that move up out of the Illinois River, but this area was not tested.

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

The winter 2010 and winter 2011 bug collection data are quite different. The 2010 macroinvertebrate counts and species mix had a score of 63% ("B" grade) when compared to reference conditions while the 2011 collection only scored 12% ("C" grade). Both collections had 15 different species (reference averaged 22 species) but the numbers of sensitive species dropped in just one year from 8 species to 5 species, reference conditions averaged 13 sensitive species. The 2011 bug collection also showed that the bugs collected were more tolerant to organic pollution than in 2010. Cedar Hollow Creek appears to be in a state of flux in regard to its populations of invertebrates. Perhaps the more tolerant species that dominated in 2011 represent an adaptive change.

### **Bacteria Testing:**

At a mean of 14.3 CFUs/100 mL water with several totally negative samples, E. coli does not appear to be an issue in Cedar Hollow Creek. As a general rule, we have to use 10 ml water samples in order to find any E. coli.

### **Chemical Testing:**

Chemical data were collected monthly between 11/4/2009 and 2/22/2013.

- DO Cedar Hollow Creek is well oxygenated with a mean of 98.5% saturation which well within the normal range of 80-130%. From 2009 through 2013 and when flowing water was present, the lowest oxygen saturation was 73% on 7/7/2010.
- pH The measured pH varied from 7.3 to 7.8 with a mean of 7.5, well within the normal range.
- Nitrogen Nitrogen values (Nitrate, Nitrite, and Ammonia) were all below detection.
- Phosphorus Orthophosphate phosphorous values were below detection.
- Chloride Chloride averaged 5.625mg/L Cl. Chloride is not an issue in Cedar Hollow Creek.

### **Synopsis:**

At Cedar Hollow creek the surface water above the Bathtub Rocks stopped flowing in September 2010 leaving only the deeper pools. The fish, even larger ones, and invertebrates survived this. In August and September of 2011, the creek again lost flowing surface water and even the deeper pools. This event seemed to change the biology of the creek and was reinforced in 2012 when surface water again stopped flowing and the pools disappeared, this time in July, August and September. These conditions restricted the collection of fish and macroinvertebrate samples and seemed to have fundamentally altered stream biology. Since the long term OCS data show periodic drought conditions in Cherokee County on a 15-20 year cycle, we suspect that smaller creeks like Cedar Hollow Creek pass through a repetitive reestablishment of fish and aquatic invertebrate species. Whether or not this ability is sufficiently deep to withstand extreme yearly variations in rainfall is unknown.

Cedar Hollow Creek is a clear, intermittent, small creek that can show a decent diverse collection of aquatic invertebrate species. The most prevalent fish species is intolerant of pollution. The E. coli and water chemistry values indicate that its flowing water is very pure. The puzzle about this small Ozark Highlands creek, and others like it, is understanding its cyclical response to drought and the consequential loss of surface water flow. We believe the surface flow to be an expression of a more resilient subsurface flow and wonder how much of the fish and macroinvertebrate fauna is maintained in the subsurface flow. We also noticed that when the fish population was nearly eliminated by drought and surface water reformed, woodland salamanders became quite obvious. Also, when the intolerance- rich invertebrate fauna was diminished by drought, isopods, snails, and crayfish were more abundant when the surface flow returned.

