Watershed Based Plan Wilkerson Creek

Name of Project: Wilkerson Creek Watershed Project
Lead Organization: Obed Watershed Community Association (OWCA)

Watershed Identification (name, location, 12-digit HUC, etc.): Caney Fork Headwaters (TN051301080301) is the HUC-12 watershed. Wilkerson Creek (TN05130108036_0500) is the largest of the initial streams that join with the Caney Fork. Wilkerson Creek and its tributaries, both named and un-named are unassessed by TDEC, but potential projects have been identified there. The total size of the HUC 12 watershed is roughly 37,000 acres. The subwatershed for Wilkerson Creek has roughly 7,500 acres. Wilkerson Creek watershed is located north and west of Pleasant Hill, TN, north of US Hwy 70. A tiny portion of the watershed is located in Putnam County with the majority located in Cumberland County, TN. A location map follows this plan.

Causes and Sources of Nonpoint Source Pollution in the Watershed

According to the DataViewer on the TDEC website, much of the Caney Fork Headwaters streams have not been assessed. That is true for Wilkerson Creek. Only two segments in the whole HUC-12 watershed have been assessed and they were found impaired. The very beginning of the Caney Fork is impaired by cattle grazing and a small tributary named Duncan Creek is impaired due to impoundments. In the Caney Fork Watershed Plan on the TDEC website, it cites a 2000 assessment which showed most of the streams within the HUC-12 as both assessed and supporting for recreation and livestock though they were not assessed for biological health. The discrepancy between these two reports is likely due to reduced manpower and the inability of TDEC to monitor all these streams on even a five year basis. From OWCA's observations in the Wilkerson Creek part of the HUC-12, the streams are high quality headwaters stream, limited in number of aquatic species by their size, but home to many species of small fish and amphibians, as well as riparian and water-loving plants. TDEC's biologists from the Cookeville office have designated Wilkerson Creek as a high quality watershed because of the presence of two indicator species – the Pristine Crayfish (*Cambarus pristinus*) and the Allegheny Snaketail dragonfly (*Ophiogomphus incurvatus alleghaniensis*) who are also listed species under the Endangered Species Act.

Land use and changes for the Wilkerson Creek sub-watershed is summarized in the chart below

	Units in Acres									
								Linear Extrapolation		
NLCD Landuse Type	2001	2004	2006	2008	2011	2013	2016	2019	2022	2025
Open Water	22	22	21	20	20	18	19	18	18	17
Developed, Open Space	330	330	330	330	360	360	363	363	363	363
Developed, Low Intensity	97	97	97	97	99	99	104	104	105	105
Developed, Medium Intensity	15	15	15	15	17	17	20	20	21	21
Developed, High Intensity	3	3	3	3	3	3	3	3	3	3
Barren Land	16	16	16	16	16	16	16	16	16	16

Deciduous Forest	5,112	5,039	4,922	4,902	4,934	4,960	4,791	4,791	4,791	4,791	4
Evergreen Forest	72	70	59	60	66	64	58	58	58	58	
Mixed Forest	572	569	552	551	555	554	542	542	542	542	
Shrub/Scrub	25	48	35	207	67	129	87	87	87	87	
Herbaceous	48	133	289	136	209	118	355	355	355	355	
Hay/Pasture	1,128	1,098	1,099	1,102	1,093	1,100	1,076	1,076	1,076	1,076	1

These trends are essentially the same for the whole Caney Fork Headwaters watershed.

Note two trends that can impact the streams in this watershed. First there is a significant reduction in forest lands as lands are cleared for other purposes, primarily development as the amount of hay and pasture also declined. Second, there is in fact an increase in development, though it is not primarily high intensity development. Construction activities of over an acre are required to have erosion control methods in place but this is a relatively new practice in Cumberland County and it is not always enforced. Some of the individual homesites are directly adjoining streams. Clearing land is considered a forestry practice and is not regulated for run off, though voluntary best practices are encouraged. These two practices have contributed significant amounts of sediment to these headwater streams and because the streams are small, the impacts can be significant and it can take many years for the sediment to "flush out" of the impacted area. There are many small impoundments of these headwaters streams, and these can also be significantly impacted by upstream sedimentation. While these impoundments can initially serve as "traps" for sediment, it can lead to two negative impacts. The first is the need by landowners to use large equipment to remove the sediment to restore the capacity of the ponds. This is both expensive and is disruptive to both the species living in the ponds and the species immediately downstream that will experience high turbidity when the excavation is occurring. The second possibility is that the ponds simply "silt-in" and eventually heavy rain events will flush sediment out of these basins and into downstream reaches of the stream.

In addition to these more widespread impacts, "rock harvesting" of sandstone is a common activity on the Cumberland Plateau. While large operations are regulated and buffers from streams are required, many small operators operate without permits and harvest surface rock and outcroppings with a backhoe and by hand and sell to the larger rockyards. There are no currently large scale quarries in the watershed, but there are both active and abandoned small quarries which can be a source of sediment.

Estimate of Load Reductions

Because these are small headwaters streams, the range of practices that can be used to remediate damage is limited. Where sedimentation is limiting habitat within a small stream, a combination of in-stream structures and bio-engineered bank stabilization structures can both re-mobilize sediment deposits and provide a place to trap those sediments into a repaired bank. A trapping bay at the inlet to a pond or small lake, either beaver-produced or man-made can create a wetland that can trap sediment instead of letting it move into the pond or lake. Similarly, stormwater control measures, though not required, could reduce the impact of stormwater when land is converted from forest or pasture. While such stormwater BMPs will be included in the educational components, their potential impact is not included in the load reduction calculation since this is not a rapidly developing part of the county.

Unfortunately, Wilkerson Creek has not been assessed so how many feet of bank needs stabilization is unknown as is the number of feet of stream that have been impacted by sediment. Frey Branch a tributary to Wilkerson Creek has been assessed and the results there may serve as a sample of the watershed as a whole that can be extrapolated. The ratios are as follows: For every 1,000 feet of stream, 260 feet of streambank needs stabilization and 3 grade structures need to be installed. Given that this sample of Frey Branch was selected because it was impacted, those numbers will be halved for this purpose. That yields an estimate of 14,820 feet of streambank needing stabilization and 171 grade structures needed. In addition, from aerial photos there are 8,200 feet of stream with inadequate vegetated buffer.

Using the TN NPS Program's Pollutant Load Reduction Estimation Tool, the following load reductions are possible.
Grade Stabilization Structures (NRCS code 410) could reduce N by 42,206 lbs/yr,, P by 4,410 lbs/yr, and Sediment by 722.3 tons/yr.
Bank Stabilization (NRCS Code 580) could reduce N by 25,935 lbs/yr, P by 2,519 lbs/yr and Sediment by 696.5 tons/yr.
The establishment of Riparian Forest Buffers, where needed (NRCS Code 391) could reduce N by 1,748 lbs/yr, P by 128 lbs/yr, and Sediment by 17 ton/yr.

Total estimated benefit of correcting these estimated deficiencies would be N reduction of 69,889 lbs/yr, P reduction of 7,057, and Sediment reduction of 1435.8 tons/yr.

BMP List, Educational Activities and Budget

BMP Name	**Quantity**	**Cost/Unit**	**Budget Estimate**
Reforest Riparian Buffer	5.7 Ac	$1200/ac	$6,840
Streambank Stabilization	14820 ft	$80/ft	$1,185,600
Infiltration/Detention Structures	10 Ac	$25,000/acre	$250,000
Educational Event	**Quantity**	**Cost/Unit**	**Budget Estimate**
Training for homebuilders	1/yr/5 yrs	$1000 ea	$5,000
Training for farmers	1/yr/5 yrs	$1000 ea	$5,000
Training for homeowners and outreach	1/yr/5yrs	$1000 ea	$5,000
Training for loggers and land clearers	1yr/5 yrs	$1000 ea	$5,000
Outreach to developers and HOAs	5yrs	$3000/yr	$15,000
Total Budget for Project:	**$1,477,440**		

Timeline, Tasks, and Assessment of Progress

A timeline for restoring the complete Caney Fork Headwaters HUC12 watershed, as described here, depends most heavily on adequate funding and landowner interest and cooperation. With only two stream segments on the 303(d) list, and one of them because of an impoundment

(which is unlikely to be reversed), and the rest of the watershed listed as unassessed, it is difficult to set priorities until additional assessment has been done. However, because of the high quality of Wilkerson Creek, efforts to restore and enhance segments that have been impacted takes priority until more information about other stream segments is gained. Of course, landowners who self-identify as having segments needing work can trigger an assessment and project development. Were Cumberland County to be designated an MS4, erosion control and stormwater BMPs would be more widely employed. The $1.477 million budget estimate given above is not precise but does give an idea of the scale of the need. Additional assessment may well increase the number. Also, as noted above, these estimates were based on the Wilkerson Creek watershed alone. Funding for restoration work within the whole Caney Fork Headwaters would be proportionately greater. With 319 funding, and our limited capacity to raise matching funds, we are limited to about $50,000 worth of work a year. At that rate, it will take many years to complete all the restoration and mitigation work needed, even in Wilkerson Creek.

The process that makes the most sense is to start with streams and sites that have already been identified as impaired to address these needs with willing landowners. Each year, OWCA will assess additional stream miles and identify potential projects and each year, OWCA will develop and implement restoration and mitigation projects on damaged streams. Assessment work occurs primarily in the fall, winter, and spring when there is most likely to be water in the streams. Planting activities for riparian zones or to repair stream banks occurs in the late winter and early spring, and bank stabilization work can occur at any time of the year, though winter is often a less desirable time to be working in the cold and higher water.

Educational activities are on-going, but are weighted most heavily to the first few years of the project where the number of uninformed builders, developers, and landowners will be highest. As more and more information is put out to these targeted groups, the level and type of educational activities will change, with more emphasis on self-assessment and self-help.

Progress is measured against annual timelines. The primary goal is to improve or maintain high water quality and high biological health in these streams. Annual assessments of biological measures are part of the timeline, conducted in the spring. Water quality monitoring, particularly for sedimentation, is on-going. A stream that does not show improvement or which degrades over time, is cause for concern and special attention. At that point, a modification of work plans to direct additional resources to those streams will occur.

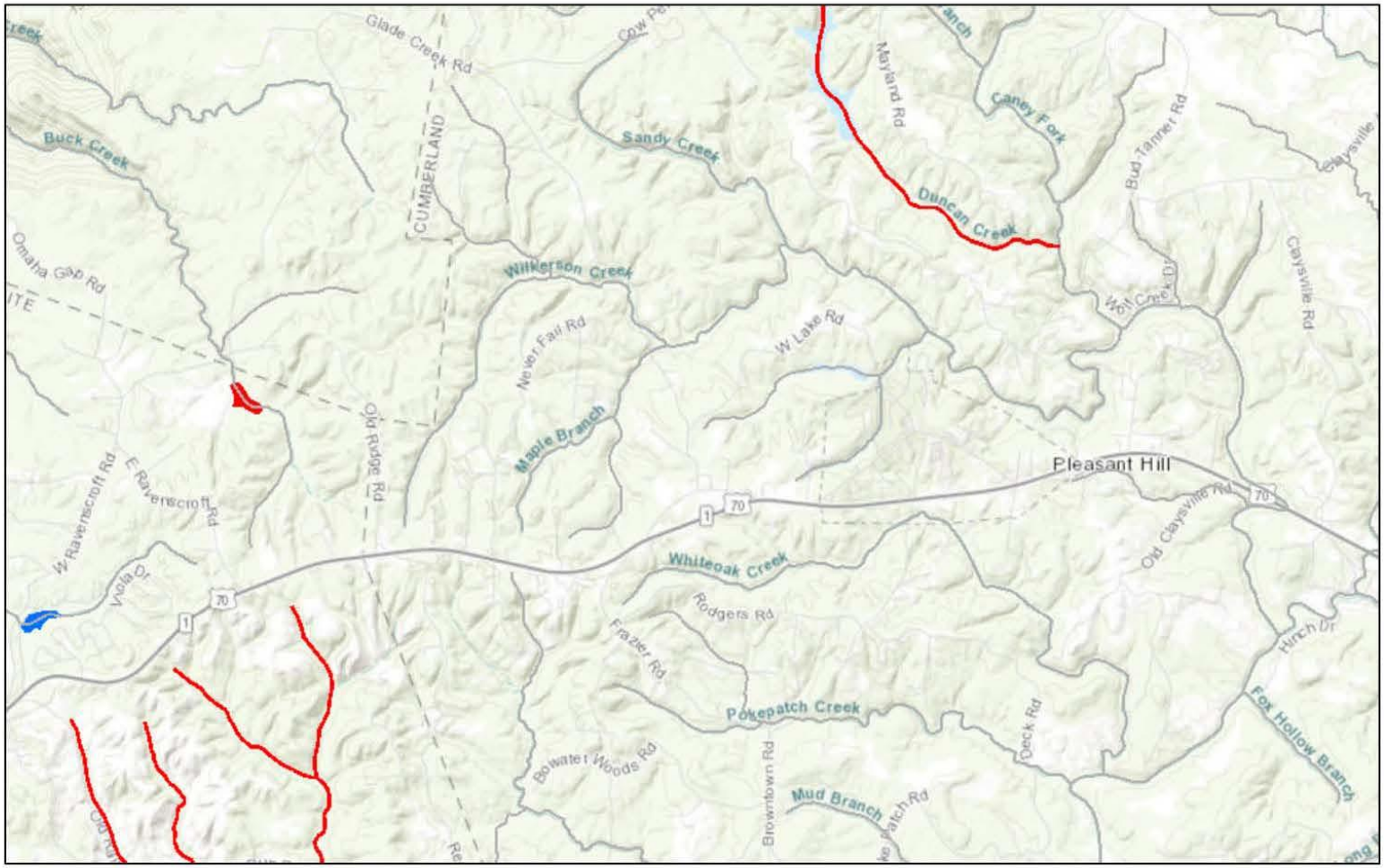
Monitoring and Documenting Success

TDEC's regional office in Cookeville, TN participates with the Obed Watershed Community Association by serving on it Technical Advisory Committee (TAC). The TAC meets periodically to discuss the watershed improvement activities that are currently underway and to plan for future activities. As such, TDEC will not only be informed but will have an opportunity to help shape the type and nature of specific activities that OWCA undertakes.

As siltation is the primary impairment identified so far, monitoring will focus on measuring silt loads at monitoring sites. Monitoring will be done by volunteers using turbidity tubes, and samples will then be measured with a turbidity meter to develop correlation standards for the watershed. Particular attention is paid to run off from problem areas. As remediation and restoration projects are completed, the silt loads should decline in the particular branches and ultimately for the streams overall. As monitors collect samples for turbidity, they also record approximate volumes as well. While differences in storm flows can be difficult to separate from changes in land-use and highly local variations in rainfall, as detention structures are added to the system, volumes of peak storm surges should decline.

A second type of monitoring is Visual Assessment. A local group of the Uplands Retirement Community, called the Green Team, is being trained in visual assessment and will be collecting new assessment data from un-assessed streams and will do follow-up assessments after projects have been completed.

ArcGIS Web Map



June 22, 2019

2016 Water Quality Assessment (DRAFT)

- Fully Supporting
- Fully Supporting (evaluated)
- Not Assessed
- Not Supporting
- Not Supporting (evaluated)
- Threatened

2016 WQA Waterbodies (DRAFT)

- Fully Supporting

1:72,224

0 0.5 1 2 mi

0 0.75 1.5 3 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS,

Web AppBuilder for ArcGIS

Tennessee STS GIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA |