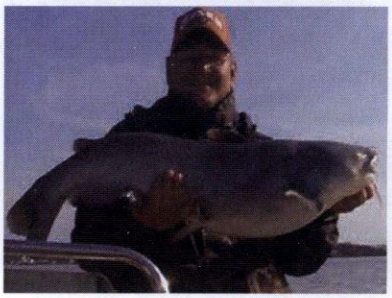

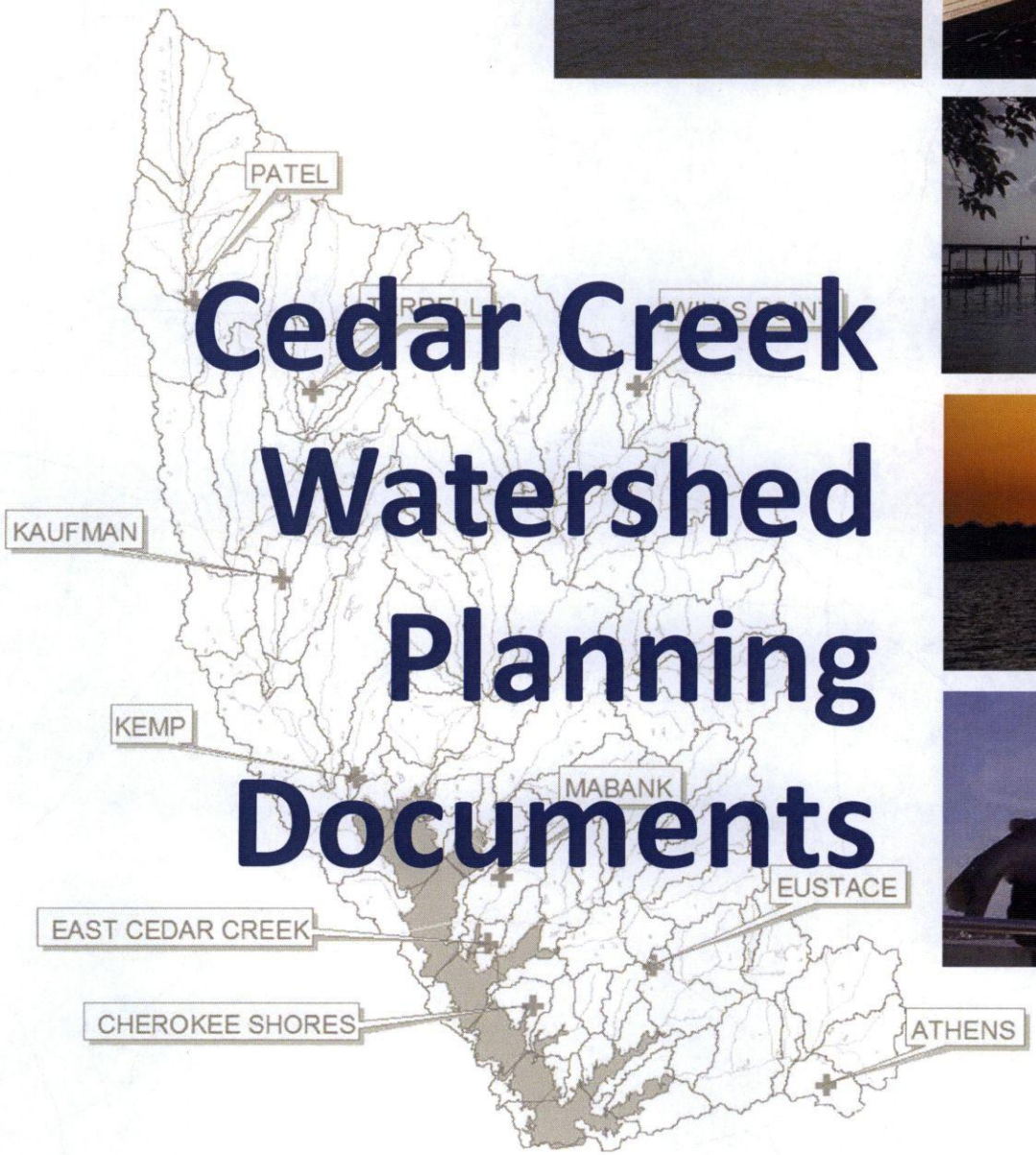

Cedar Creek Watershed Planning Documents

Prepared by

trwd Tarrant Regional Water District
Save Water. Nothing can replace it.

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ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS • DESIGNERS • SCIENTISTS

Contents

CEDAR CREEK WATERSHED PLANNING DOCUMENTS

The designated uses of Cedar Creek Reservoir assigned by the Texas Commission on Environmental Quality (TCEQ) are contact recreation, water supply, fish consumption, and wildlife habitat. Cedar Creek Reservoir has historically met the designated water quality criteria for each of these designated uses.

Long term water quality monitoring of Cedar Creek Reservoir was begun by the Tarrant Regional Water District (TRWD) in 1989. In addition to usage standards, chemical and biological benchmarks are established by TCEQ and monitored as well. Among these are bacteria, temperature, pH, turbidity, Dissolved Oxygen, and salinity. A statewide biannual reporting of water bodies that do not conform to the established standards is known as the Texas Water Quality Inventory or Texas 303(d) list.

Cedar Creek reservoir appeared on the 303(d) list beginning in 2002 through the 2010 version for excessive pH measurements in several segments throughout the lake.

Additionally, the state of Texas has recently added a numeric limit to the level of Chlorophyll-*a* permitted in Texas water bodies of 30.30 micrograms per liter. Based on 20 years of trend analysis data, Cedar Creek Reservoir has a median main pool level of chlorophyll-*a* of 21.48.

Chlorophyll-*a* is a measure of blue-green algae in the water column. Excessive algae growth can impact the health of a water body in a variety of ways. Surface algae growth can block sunlight needed by submerged aquatic vegetation a source of food and shelter for wildlife. Dead and decomposing algae can deplete the water of oxygen content resulting in fish suffocation. Lastly, algae growth can raise pH levels, the listed impairment for Cedar Creek Reservoir.

In 1989, officials with the Tarrant Regional Water District began yearly monitoring and modeling efforts focused on the level and causes of chlorophyll-*a* within Cedar Creek Reservoir. The result of TRWD's most recent trend analysis demonstrated rising levels of chlorophyll-*a* over a 20 year span with fluctuations accounting for years of higher rainfall and years with drought-like conditions.

With the knowledge of chlorophyll-*a* as targeted constituent, TRWD researchers turned to the Spatial Science Laboratory at Texas A&M University to create a comprehensive computer modeling report utilizing the Soil and Water Assessment Tool (SWAT) as a method to identify the sources of nutrient and sediment loadings within the Cedar Creek Reservoir watershed. Based on data layers created to account for land use, soils, climate, waste water treatment plant discharges, and channel erosion, modeling efforts determined that multiple sources of loading exist in the watershed. These include urban influences as well as the historical farming practices of the watershed combined with highly erodible clay soils, the latter representing the leading cause of nutrient pollution in the reservoir.

Coupled with SWAT, TRWD utilized the Water Quality Analysis Simulation Protocol reservoir model (WASP) to simulate the reservoir's conditions. The model was then utilized to predict the impact of different loading scenarios and there probable changes in the watershed.

To confirm concerns about channel erosion, modeling and field analysis of tributary streams in the Cedar Creek watershed were performed by Baylor University researchers along with the environmental engineering firm Espey Consultants. The study and modeling effort confirmed that the tributary streams with the highest levels of erosion matched SWAT results for the areas of the watershed with the highest levels of sediment loss and nutrient loadings.

While WASP modeling confirmed that point sources were not the largest contributor of nutrient loadings within the watershed, reducing pollutants from the nine existing wastewater treatment plants represented a management solution that could be coupled with regularly scheduled permitting requirements. The engineering firm Alan Plummer Associates conducted a thorough review of the existing watershed wastewater treatment plants including site visits, infrastructure analysis, permit reviews and monitoring of discharge for nutrient levels.

With pollution loading numbers gathered by sub-watershed utilizing computer modeling, the research team developed a comprehensive listing of best management practices (BMP) that if implemented in the watershed would reduce point and non-point sources of pollution. Economic analysis of the cost and benefits of each of the BMPs was done by Texas AgriLife Research to assemble a suite of BMPs that if likely implemented would meet reduction goals to decrease reservoir chlorophyll-*a* and pH levels based on watershed and reservoir modeling projections.

The combined results of previous efforts allowed Tarrant Regional Water District to conclude that the development of a stakeholder-based watershed protection plan for Cedar Creek would be a wise strategy for addressing current and future impairments. Reservoir managers viewed the watershed management approach as a method for preempting state establishment of a TMDL for Cedar Creek Reservoir as well as a cost effective alternative to dealing with pollutants via chemical or mechanical treatment. Additionally, it was hoped that the development of a stakeholder-based watershed plan would shift the thinking of local residents toward a view of the resource as not only a water source for regional populations but as the economic engine of the local communities.