ADEQ Arizona Department of Environmental Quality
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FACT SHEET

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Little Colorado River TMDL Implementation

Fig. 1 – Stormflow runoff on the Little Colorado River at Woodruff.

TMDL Background

The Little Colorado River begins in the White Mountains of eastern Arizona and western New Mexico and flows approximately 356 miles northwest to its confluence with the Colorado River. The surface water quality standards developed for the Little Colorado River segments are intended to protect the river's designated uses: domestic water source, aquatic and wildlife (cold water/warm water), full body contact, fish consumption, agricultural livestock and irrigation.

The 2004 305(b) Assessment Report concluded that two stream reaches in the Little Colorado River did not meet surface water quality standards. These two reaches were listed on Arizona's 2004 303(d) List of Impaired Waters and Total Maximum Daily Load (TMDL) studies were initiated to analyze the impairments. A TMDL on a 6 mile reach of the Little Colorado River (Reach 004) from Silver Creek (north of Snowflake) to Carr Wash concentrated on exceedances in *Escherichia coli (E. coli)* and suspended sediment. Concurrently, a 17- mile reach between Porter Tank Draw (west of Holbrook) and McDonalds Wash (Reach 017) was examined for copper, silver, and suspended sediment exceedances. Upon more detailed study, Reach 017 was delisted for all constituents during the study period. TMDLs were written for *E. coli* and suspended sediment on Reach 004.

The Little Colorado River (LCR) is generally perennial in the TMDL reach. Silver Creek above the LCR confluence at the upper end of the reach is perennial, and the LCR above Silver Creek is ephemeral to the St. Johns vicinity. Flow has steadily decreased in the last 100 years because of the construction of a dam in the upper basin, which created Lyman Lake for recreation and provided storage for irrigation diversions. Some reaches along the river are intermittent flowing seasonally in response to climatic and water use variables. Most other drainages to the river are ephemeral, flowing only in direct response to precipitation.

TMDL Findings

Escherichia coli

Data collected throughout the TMDL project confirms that the great majority of *E. coli* exceedances occur when the LCR is flowing above Silver Creek. Typically, this occurs in stormflow conditions. In mid-range, dry and low-flow conditions, when flow persists in the impaired reach due to the flow of Silver Creek alone, exceedances rarely occur. Storm conditions causing the LCR to flow contribute a sizable increase in both the percentage of exceedances and the magnitude of *E. coli* values present in those exceedances. Silver Creek contributes to those exceedances, but LCR inputs add an order or magnitude or more to the loads measured at the Woodruff sample site under stormflow conditions. Flow of the LCR above the Silver Creek confluence due to precipitation constituted a major critical condition identified for subsequent analysis. *E. coli* loads are exceeding water quality standards when stormflow dominates the hydrologic flow regime and overland flow is occurring. Loading

Fig. 2 – Silver Creek waterfall above the Little Colorado River confluence.

is greatly exacerbated by contributions from the LCR subwatershed above the Silver Creek confluence during stormflow events.

Load duration analysis suggests that point sources are not an issue for the impairment; low flow categories exhibit no problems. Rather, a mix of bank contributions, upland overland flows, storm water from impervious developed areas, and riparian zone/floodplain contributions are the likely stressors in descending order of significance. Grazing, urban stormwater runoff, and agricultural practices are identified as nonpoint source stressors in the area contributing to the *E. coli* impairment in stormflow events. Implementation ideas and efforts undertaken in these areas will contribute greatly to the improvement of the LCR's water quality for *E. coli*. The TMDL document has suggestions on more detailed and specific measures that might be applicable for specific problem areas.

Suspended sediment

In contrast to the findings of the *E. coli* TMDL, the cumulative suspended sediment data for the LCR at Woodruff indicates that reductions are called for in all flow classes from the highest to the lowest. In the low flow classes that were quantifiable, there were no contributions from the LCR above the Silver Creek confluence present; all necessary quantifiable reductions are attributable to the Silver Creek watershed alone.

Loads are exceeding the system's assimilation capacity in nonstorm conditions due almost entirely to contributions from the Silver Creek watershed. Loading is further exacerbated by contributions from the LCR subwatershed above the Silver Creek confluence in those few events where the LCR above Silver Creek is flowing in nonstorm - stable flow conditions. However, these are rare occasions. The 48-hour exclusion window for storm events in the suspended sediment concentration (SSC) water quality standard greatly reduces the sample population available for evaluation in the upper three flow classes. Consequently, sources that contribute on a local basis absent overland flows are implicated in the need for nonpoint source loading improvement.

Load duration analysis suggests that land use activities aggravating local sediment loading in the stream channel or immediately adjacent to the stream is an issue for the impairment, since low flow categories exhibit problems. Additionally, a mix of runoff from impervious developed areas and riparian zone/floodplain contributions are contributing stressors. Promise is shown for the improvement of riparian buffers and implementation of filter strips and additional local controls for areas identified as particular problems. Field reconnaissance, field data, and desktop GIS analyses pinpoint the Shumway-Taylor-Snowflake corridor with its extensive farmland and pasture areas adjacent to Silver Creek, along with urban contributions from the towns in the proximity as being the areas where the most improvement in nonpoint source sediment pollution may be achieved.

Summary of study conclusions and recommendations

ADEQ has observed statewide over many years of data collection that sediment and *E. coli* water quality standard exceedances often go hand-in-hand. Where high sediment and particulate loads exist, bacterial water quality is often highly degraded. Both can often be traced to a shared common hydrologic cause of high storm flows resulting from rapid and intense precipitation events, which typically cause erosion and the suspension and entrainment of all matter on the land's surface on lands and in water courses that are not adequately protected against such events. Fortuitously, this means that best management practices (BMPs) addressing one of the impairment analytes will often result in improvement of both analytes.

Though different flow classes are implicated in the SSC and *E. coli* LCR TMDL data analyses, the differences are

Fig. 3 – Little Colorado River receding stormflow above Silver Creek.

partially attributable to a 48-hour exclusion of data in the SSC water quality standard after stormflow events. ADEQ believes similar dynamics to those outlined above are operational for the impaired reaches in these studies. Particular attention is urged for suggested BMPs that are common to both TMDLs. The slowing or infiltration of overland flows, and the reduction of the erosive and carrying capacity of flow will in and of itself contribute greatly to water quality improvements. BMPs that focus on these objectives have the capacity of providing the greatest opportunity for beneficial and noticeable water quality improvement. Stakeholders may notice that the improvement of one water quality constituent will accompany a likely improvement in the other.

TMDL Implementation: What Can Be Done?

Whereas the TMDL study establishes a pollution budget for an impaired surface water, the TMDL implementation plan provides an action plan outlining affordable, efficient, and effective alternatives to restore water quality. Many BMP proposals are included in the appendices of the TMDL documents. ADEQ stands ready to coordinate implementation efforts by stakeholders and assist stakeholders in identifying funding sources (such as Water Quality Improvement Grants) that can help pay for water quality improvements.

Actual on-the-ground improvement in water quality relies upon the voluntary initiative and actions of stakeholder groups and interested individuals employing standard BMPs at a local scale throughout the entire watershed. Water quality improvement for the LCR will ultimately come in incremental steps from many different directions and through many different benefactors. Consequently, the implementation plan consists of providing a general framework in this TMDL for addressing the problem with broad-brush guidance. More focused and region-specific recommendations and guidance for the implementation of more specific improvement measures on a sub-basin scale will be provided as stakeholders and interested parties come forward with location-specific proposals.

Water Quality Improvement Grants

ADEQ's Water Quality Improvement Grant (WQIG) Program allocates money from the U.S. Environmental Protection Agency (EPA) to interested parties for implementation of nonpoint source management and watershed protection. The distribution of grant funds from the EPA is provided pursuant to Section 319(h) of the Clean Water Act and administered by the ADEQ Water Quality Division. ADEQ uses these federal funds to implement on-the-ground water quality improvement projects to control nonpoint source pollution.

Nonpoint source pollution is polluted runoff from many different sources and remains the nation's largest source of water quality problems. It occurs when rainfall, snowmelt or irrigation runs over land or through the ground, picks up pollutants and deposits them into rivers, lakes and coastal waters or introduces them into ground water. Agriculture, forestry, grazing, septic systems, recreational boating, urban runoff, construction, physical changes to stream channels and habitat degradation are potential sources of nonpoint source pollution. Projects must focus on improving or protecting water quality within the state of Arizona.

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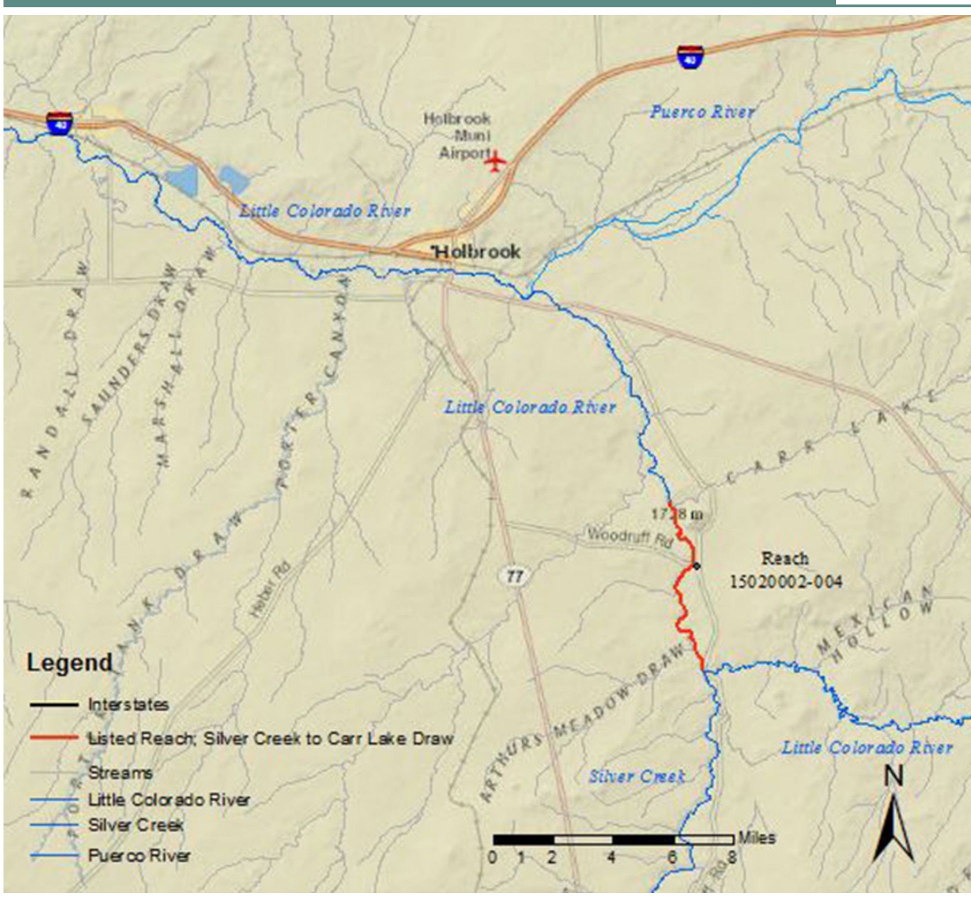

FOR MORE INFORMATION:

ADEQ encourages public involvement in the implementation of the Little Colorado River *E. coli* and suspended sediment TMDLs.

For more information on these TMDLs, please refer to the ADEQ Web site: *www.azdeq.gov/environ/water/assessment/tmdl.html*

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