

Memorandum

Date: February 14, 2014
To: Files
From: Doug McCarty, TMDL Hydrologist
Subject: Location and application of LCR nutrient standards

Comment was solicited on the location and extent of regions of the upper Little Colorado River watershed called out in the 2009 Water Quality Standards nutrient section (R18-11-109.F.) for clarification. ADHS's 1982 report "The Little Colorado River Watershed above Lyman Lake: Water Chemistry, Nutrients, and Nutrient Standards" served as the research resource for conclusions drawn in this memo.

The 2009 water quality standards include the following locations, among others, for the application of specific nitrogen and phosphorus water quality standards:

Nutrient criteria. The following water quality standards for total phosphorus and total nitrogen are expressed in milligrams per liter (mg/L). A minimum of 10 samples, each taken at least 10 days apart in a consecutive 12-month period, are required to determine a 90th percentile. Not more than 10 percent of the samples may exceed the 90th percentile value listed below:

Surface Water	Annual Mean	90th Percentile	Single Sample Maximum
<i>5. Little Colorado River and its tributaries above River Reservoir in Greer; South Fork of Little Colorado River above South Fork Campground; and Water Canyon Creek above Apache-Sitgreaves National Forest boundary:</i>			
<i>Total phosphorus</i>	<i>0.08</i>	<i>0.10</i>	<i>0.75</i>
<i>Total nitrogen</i>	<i>0.60</i>	<i>0.75</i>	<i>1.10</i>
<i>6. Little Colorado River at the crossing of Apache County Road No. 124:</i>			
<i>Total phosphorus</i>			<i>0.75</i>
<i>Total nitrogen</i>			<i>1.80</i>
<i>7. Little Colorado River above Lyman Lake to above the Amity Ditch diversion near crossing of Arizona Highway 273 (applies only when in-stream turbidity is less than 50 NTU):</i>			
<i>Total phosphorus</i>	<i>0.20</i>	<i>0.30</i>	<i>0.75</i>
<i>Total nitrogen</i>	<i>0.70</i>	<i>1.20</i>	<i>1.50</i>

Some ambiguity is present in the location descriptions, and Item #6 is presented as a point location as opposed to reach descriptions and extents presented in the other two items. The proposed changes in the water quality standards drop the point location and extend uniform water quality standards as reflected in Item #5 down to Lyman Lake.

The intent of the 1982 report is more accurately reflected in the standards as currently expressed than in the newly-proposed standards. However, there are errors in the report's discussion of the geographic extent and various tiers of coverage. The "Nutrient Standards" section of the report (p. 57) states:

The fundamental reason for the promulgation of nutrient standards in the Little Colorado drainage are the maintenance of high-quality waters in the upper reaches of the watershed, and the prevention of further degradation in the lower reaches of the watershed. The upper and lower watershed differ markedly in water chemistry as a result in differences in biome type, land use, geology, and population density. Single standards cannot be formulated for the entire watershed that would be at the same time enforceable and protective of sensitive habitats. Different sets of standards have been set for different parts of the watershed...

While some ambiguity in what constitutes the upper and lower watersheds remains, repeated (and apparently interchangeable) reference is made in the report to the upper watershed /Greer area and the lower watershed/Springerville area. These are mentioned, in a few instances, on pp. 20 (2 discussions), 28, 35, 39 (Table 11), and 41 (Table 12). Proposed quantitative standards are made for the Greer area (p. 58) and the Springerville area (p. 60). Discussion of the geographic extent of the standards is found on p. 61:

The standards set for the Greer area apply to all waters upstream of the Greer Lakes in the Little Colorado drainage. Also included are the South Fork of the LCR upstream of the South Fork campground, and Water Canyon Creek upstream of the Apache National Forest boundary. Standards set for the Springerville area apply to the mainstem of the LCR from Highway 273 (sic) downstream to Lyman Lake. ...

It is noted here of an apparent error in the report's statement (marked by "sic") that has carried over into the water quality standards. State Hwy 273 (near Sunrise ski area) is more commonly known as Forest Service Road 113 where it crosses the upper forks of the LCR. It is an improved dirt/gravel road beyond the ski area used as an alternative access route to Big Lake and Crescent Lake in the Apache National Forest. This is reflected in Figure 1 (p. 7) of the report. Taken at face value, the narrative discussion actually applies double geographic coverage, with conflicting standard recommendations, for the areas of the LCR northeast (downstream) of State Route 273 (FSR 113) and upstream of the Greer Lakes and the town of Greer. The first statement of the excerpt applies one set of criteria to all areas upstream of the Greer Lakes, presumably on the LCR hydrologic system; the second set of criteria, supposedly reflecting the Springerville area, overlaps the first in applying from SR 273 downstream all the way to Lyman

Lake, which as written includes the Town of Greer and the Greer Lakes. Clearly, this was not the authors' intent. The narrative intended to apply an intermediate set of check-points/suggested standards for *"intervening reaches of the LCR, the Greer Lakes, Hall Creek, and the South Fork below SF Campground."* The best interpretation of this intermediate region extends from the LCR's Hwy 260 crossing just outside of Eagar (river mile 343.80) up to and including the Greer Lakes (River Reservoir, upper end river mile 358.00). This interpretation is supported by Tables 9 and 13 (pp. 36, 45), which address sites grouped together as "middle reach" sites and include the tributaries of Rosey and Hall Creeks (both hydrologically downstream of the Greer Lakes), two main stem sites on the LCR and one site on the South Fork. It is also supported by an historic highway identifier reference in the standards abstract on page iv of the report, which refers to "Hwy 73," not Hwy 273. Site 055 in the report (Table 1) is also located at the "Hwy 73" crossing; more importantly, it is grouped with the lower watershed sites (Tables 11, 14). It appears that a previous interpretation now appearing in the WQ standards has defensibly placed this region division (though still using an incorrect highway reference) at *"above the Amity Ditch diversion near crossing of Arizona Highway 273"* which is currently LCR river mile 346.0, only 2.2 miles upstream of what was most likely intended by the report's authors.

An ADOT history reference (http://www.azdot.gov/docs/default-source/historical-roads/sr260_highwayhistory.pdf?sfvrsn=2) identifies the current Hwy (SR) 260 as "Old SR 73:"

In 1928, when these roads became part of the State Highway System, the road between McNary and Springerville/Eager became part of SR 73. The Arizona Highway Department (Arizona Department of Transportation) renumbered this route SR 260 sometime after 1975.

The standards as currently written should have read "Hwy 261" with the Amity Ditch reference. If modified as it is believed the report authors originally intended, reference to Amity Ditch should be dropped, and "Little Colorado River crossing at Hwy 260" should be substituted.

Questions have arisen as to why Item #6 of the nutrient water quality standards is a point location, and not a defined reach as the other sites are. The report explains (p. 61):

D. Proposed Quantitative Standards, South Fork Area Check Point at County Road 124

...

3. The standards for nitrogen and phosphorus reflect the high nutrient levels encountered in this reach of the LCR, and the need for further study in this area...These standards are proposed on an interim basis until further study determines the source of the nutrients in the LCR in this area and what remedial actions are available. Monitoring should be initiated to assess the nutrient inputs of Hall Creek, the Greer Lakes, and the development in the South Fork area to develop management strategies for nutrient reduction. More complete nutrient standards should be promulgated on the basis of further monitoring and data already gathered by ADHS.

...

Paragraph E (Geographic Extent of the Proposed Standards) adds:

The intervening reaches of the LCR, the Greer Lakes, Hall Creek, and the South Fork below South Fork Campground require further study before comprehensive standards can be set. A single site is proposed as a monitoring point for portion of the watershed...A discriminant function based on nutrients, turbidity, and TDS provided excellent resolution between upper and lower watershed samples. Classification of waters collected from the South Fork area and Hall Creek by discriminant analysis was problematic due to high nutrient levels.

Recommendations:

- If it is believed that sufficient additional data has been collected and analyzed to justify
 - A.) further extension of the point location on County Road 124 to the area between LCR river mile 343.8 and LCR river mile 358, the lower reach area of the South Fork of the LCR, and Hall and Rosey Creeks, and
 - B.) further refinement and application of the nutrient standards applied,

The point description could be replaced with this more complete reach extent description. Latitudes and longitudes could easily be provided at that point.

- Alternatively, since the report presents this area's standards as "check-point" standards, justification is present to drop Item #6 from the water quality standards altogether. The standards appear to be provisional and more informal in nature than other recommended standards. The authors clearly stated that more monitoring was required, and that numbers should be refined further, citing "an interim basis" and the need for "more complete nutrient standards" in the report. They also mention that a clear statistical distinction from other areas in this data was lacking. In the absence of data to clarify the picture and to justify extending the extent of this point location, assuming the location is not currently on the impaired waters list, dropping of Item #6 would be justifiable.
- All references to "Hwy 273" should be removed from the water quality standards.
- Item #7 should drop reference to "above Amity Ditch" and adjust the upper end of the reach description to "LCR crossing at Highway 260" with its associated lat/long.
- Proposed change language for new standards should not be used, as not only does it lump high quality and low quality LCR sites together from the upper and lower basins with no distinctions made between the two, but it also appears to create the possibility of revoking protection for the LCR system above the Greer Lakes. The proposed language is ambiguous and could easily cause misunderstanding.