Revision History for Scientific Investigations Report 2014-5203

Mebane, C.A., G. Mladenka, L. Van Every, M.L. Williams, M.A. Hardy, and J.R. Garbarino.

Selenium in the upper Blackfoot River watershed, Idaho, 2001-2012

Posted online November 5, 2014

Revised and reposted August 2015

Following a post-publication review (MacDonald and others, 2015), several minor mistakes or unclear presentations were identified and have been revised. These were:

1. On p. 14, the frequency of exceedances of the State of Idaho's chronic criterion for selenium at the USGS monitoring station 13063000 (Blackfoot River above reservoir near Henry, Idaho) was not described correctly at p. 14. The original text stated: *The State of Idaho aquatic-life criterion concentration for selenium (5 µg/L) was equaled or exceeded in 142 of the 450 (31 percent) discrete water samples collected from 2001 to 2012; 80 percent of the samples collected during May exceeded the criterion concentration."* (Incorrect text is underlined). The revised text states: *The State of Idaho aquatic-life criterion concentration for selenium (5 µg/L) was equaled or exceeded in 142 of the 450 (31 percent) discrete water samples collected from 2001 to 2012. Of the criterion exceedances, 80 percent occurred during the month of May."* (Revised text is underlined). The same change was made in the conclusions at p. 27

2. On p. 26, text describing changes in selenium loads carried by the Blackfoot River has been revised. The original text stated: "*Measured loads usually were low on all other tributaries to the Blackfoot River. However, on one occasion, May 2011, loads from Dry Valley Creek (site 10) exceeded those from Spring Creek (fig. 12). Despite these low tributary measurements, the median selenium loads approximately doubled from the Blackfoot River at Slug Creek Road (site 8) to the Blackfoot River at the Trail Creek Road (site 4) (figs. 11 and 2). These load increases are unexplained by the data presented in this report, but suggest that additional investigations are needed to identify potential unmeasured tributary contributions, or instream sources such as remobilization of sediment-sorbed selenium*." (text that has subsequently been replaced is underlined).

The revised text stated: "*Measured loads usually were low on all other tributaries to the Blackfoot River. However, on one occasion, May 2011, loads from Dry Valley Creek (site 10) exceeded those from Spring Creek (fig. 12). Despite these low tributary measurements, the annual synoptic data show that in most years selenium loads increased longitudinally in the Blackfoot River between sites 16 and 8, that is, between the Blackfoot River at the upper bridge and the Blackfoot River at the Slug Creek Road (Appendix D).* (revised text is underlined).

Other than referring to the wrong figure (fig. 11 (concentrations) instead of fig. 12(loads)), the original text was not incorrect: Nor was Figure 12 was incorrect, and Figure 12 did indeed show that the median selenium loads approximately doubled from the Blackfoot River at Slug Creek Road (site 8) to the Blackfoot River at the Trail Creek Road (site 4). However, as described by MacDonald and others (2015), this apparent increase in median loads was dependent on the years of data used. Figure 12 was constructed using all available tributary and mainstem Blackfoot River data collected by the Idaho Department of Environmental Quality (IDEQ), with the number of data points used for each mainstem site ranging from 9 to 12. If the plots were limited to years with common data, or examined year by year, then different patterns would emerge. However, the scope of revising a published report is limited to corrections. New figures would be appropriate for a supplemental report, but not for post-publication revision. Thus, the revision refers readers to the raw data in Appendix D.

3. Also on p. 26, the following sentence was removed: *"Additionally, an interbasin groundwater-flow system moves water from recharge areas in the upper Dry Valley through the trough of a syncline to discharge in the Slug Creek Valley (Ralston and Williams, 1979)."* Although this sentence was accurately attributed to the source cited, with the preceding revisions, it is now somewhat off point at the p.26 discussions. The interbasin groundwater connection had been mentioned earlier in the report (p.2), and deleting this text offset added text above, avoiding pagination and layout changes.

4. On p. 28, conclusion #5 was changed. Conclusion #5 originally read, "*5. Apparent increases in selenium loading downstream of Dry Valley Creek cannot be explained by measured tributary loads, suggesting diffuse groundwater loading as a potential source."* This sentence was replaced by the following sentence: *"Using synoptic data, the selenium loading analyses showed that in 11 of 12 years, loads increased in the Blackfoot River between stations 12 and 8, which are located upstream and downstream of the Dry Valley Creek confluence (Appendix D)."*

The original sentence was not incorrect, nor was the suggestion that diffuse groundwater loading was a potential source of selenium inconsistent with the data. However, through the post-publication review discussions we were requested to replace this with a more specific statement about the sources of selenium loading. While revisions are customarily limited to corrections, rather than wordsmithery, as we were making other needed corrections anyway, we were not opposed to making this change at the same time.

5. While evaluating the review by MacDonald and others (2015), an additional verification review was made of data listed in Appendix D, "*Summary of streamflow measurements and selenium concentration data obtained by Idaho Department of the Environmental Quality in the upper Blackfoot River watershed, southeastern Idaho, 2002-12*". Of the 351 streamflow and concentration measurements listed in Appendix D, 3 were found to be incorrect. These were:

- Cell Q17, streamflow at site 12, the Blackfoot River above the Narrows. The best value is 390.5 cubic feet per second (cfs). The value given in cell Q17 was incorrectly entered by the first author in Appendix D by as 182 cfs. Further inspections of the load calculations behind in Figure 12 showed that the correct streamflow value had been used in the calculations, and thus for an average concentration of 6.32 μg/L, the average selenium load of 6.05 kg/d was correct.
- Cells S18 and AK18, streamflow (44.6 cfs) and selenium concentration (4.49 μg/L) at site 13, Angus Creek (upper) were actually collected from Angus Creek near the mouth.
- Cell S10, streamflow at site 5, Trail Creek for 2011 was incorrectly given as 7.9 cfs. The correct value is 50.7 cfs.

Additional clarifications and additions to Appendix D:

- Cell BC17, selenium load at site 12 (Blackfoot River above the Narrows), 2011, was inadvertently left blank. Selenium daily loads are derived estimated values calculated from streamflow (Q) and concentration (C) as Q x C x 2.447 (unit conversion factor) as described in the report on p. 11. Thus multiplying cell S17 (614 cfs) times cell AK17 (4.13 μg/L selenium) yields the missing load value for cell BC17 (6.21 kg/d).
- While not in error, Row 6, columns L through T (streamflows at site 1, Blackfoot River at China Hat), values given for 2004-2008 and 2011 have been deleted. Because of difficulty measuring high flows at this site, no flows could be measured at that location for those years and the streamflow values listed were estimated values that had actually been measured at site 2 (USGS 13063000). While this was explained in the table notes, this proved confusing for some readers, and thus these repeated values have been removed.
- Prior to 2010, the reporting level by the analytical laboratory was 2 μg/L. Beginning in 2010, the laboratory lowered its practical quantitation limit to 0.2 μg/L, although values less than the previous 2 μg/L reporting limit were still reported as <2 μg/L. In June 2015, the actual measured values were provided, and 14 non-detected values from 2010-2012 have been replaced with measured values that ranged from 0.25 to 1.9 μg/L.
- Figures 11 and 12 incorporated data for Dry Valley Creek from Whetstone Associates (2012). This usage was properly referenced. However, because the Whetstone Associates (2012) report received limited distribution, the raw data used in Figures 11 and 12 for Dry Valley Creek have been added to Appendix D for the convenience of readers.

MacDonald, A., Leone, G., Latham, B., and Fulton, B.A., 2015, Technical Review Summary and Comments Regarding U.S. Geological Survey's 2014 Report: Selenium in the Upper Blackfoot River Watershed, Southeastern Idaho, 2001-12: Prepared by ARCADIS on behalf of Nu-West Industries, Inc./Nu-West Mining, Inc. ARCADIS U.S., Inc., Highlands Ranch, Colorado. April 1, 2015. 21 p.

Whetstone Associates, 2012, North Dry Valley Mine Surface Water and Groundwater Monitoring Results, Year 2012, Prepared for FMC Production LLC, by Whetstone Associates, Gunnison, Colorado. 89 p.