

2010

USGS Research Products Related to Lead-Zinc Mining In and Near the Mark Twain National Forest in Southeastern Missouri, 1989–2009

Christopher J. Schmitt

U.S. Geological Survey, cjschmitt@usgs.gov

Follow this and additional works at: <http://digitalcommons.unl.edu/usgsstaffpub>

Schmitt, Christopher J., "USGS Research Products Related to Lead-Zinc Mining In and Near the Mark Twain National Forest in Southeastern Missouri, 1989–2009" (2010). *USGS Staff-- Published Research*. 880.

<http://digitalcommons.unl.edu/usgsstaffpub/880>

This Article is brought to you for free and open access by the US Geological Survey at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in USGS Staff -- Published Research by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

USGS Research Products Related to Lead-Zinc Mining In and Near the Mark Twain National Forest in Southeastern Missouri, 1989–2009

1. Adamski JC, Petersen JC, Friewald DA, Davis JV, 1995. Environmental and hydrologic setting of the Ozark Plateaus Study Unit, Arkansas, Kansas, Missouri, and Oklahoma. U.S. Geological Survey Water-Resources Investigations Report 94-4022, 69 p.
2. Allert AL, Fairchild JF, DiStefano RJ, Schmitt CJ, Besser JM, Brumbaugh WG, Poulton BC, 2008. Effect of lead-zinc mining on crayfish in the Black River watershed, Missouri. Missouri Department of Conservation *Science Notes* **3**, 2 p.
3. Allert AL, Fairchild JF, DiStefano RJ, Schmitt CJ, Besser JM, Brumbaugh WG, Poulton BC, 2009. Effects of lead-zinc mining on crayfish (*Orconectes hylas*) in the Black River watershed, Missouri. *Freshwater Crayfish* **16**, 97–111.
4. Allert AL, Fairchild JF, DiStefano RJ, Schmitt CJ, Brumbaugh WG, Besser JM, 2009. Ecological effects of lead mining on Ozark streams: In-situ toxicity to woodland crayfish (*Orconectes hylas*). *Ecotoxicology and Environmental Safety* **72**, 1207–1219.
5. Allert AL, Fairchild JF, Schmitt CJ, Besser JM, Brumbaugh WG, Olson SJ, 2009. Effects of mining-derived metals on riffle-dwelling benthic fishes in southeast Missouri, USA. *Ecotoxicology and Environmental Safety* **72**, 1642–1651 (Highlighted article).
6. Besser JM, Brumbaugh WG, Allert AL, Poulton BC, Schmitt CJ, Ingersoll CG, 2009. Ecological impacts of lead mining on Ozark streams: toxicity of sediment pore water. *Ecotoxicology and Environmental Safety* **72**, 516–526.
7. Besser JM, Brumbaugh WG, May TW, Schmitt CJ, 2007. Biomonitoring of lead, zinc, and cadmium in streams draining lead-mining and non-mining areas, southeast Missouri. *Environmental Monitoring and Assessment* **129**, 227–241.
8. Brumbaugh WG, May TW, Besser JM, Allert AL, Schmitt CJ, 2007. Assessment of elemental concentrations in streams of the New Lead Belt in southeastern Missouri, 2002–05. U.S. Geological Survey, Scientific Investigations Report 2007–5057, 57 p. (<http://pubs.usgs.gov/sir/2007/5057/>).
9. Femmer SR, 2003. Background and comparison of water-quality, streambed-sediment, and biological characteristics of streams in the Viburnum Trend and the exploration study areas in southern Missouri, 1995 and 2001. U.S. Geological Survey Scientific Investigations Report 2003–4285, 23 p.
10. Goldhaber MB, Church SE, Doe BR, Aleinikoff JN, Brannon JC, Podosek FA, Mosier EL, Taylor CD, Gent CA, 1995. Lead and sulfur isotope investigations of Paleozoic sedimentary rocks from the southern Midcontinent of the United States—Implications for paleohydrology and ore genesis of the southeastern Missouri lead belts: *Economic Geology* **90**, 1875–1910.
11. Harrison RW, McDowell RC, 2003. Geologic map of the Wilderness and Handy Quadrangles, Oregon, Carter, and Ripley Counties, Missouri. U.S Geological Survey Geologic Investigations Series I-2801 (<http://pubs.usgs.gov/imap/i2801/>).
12. Hauck HS, Nagel CD, 2001. Water resources data—Missouri water year 2000. U.S. Geological Survey Water-Data Report MO–00–1, 430 p.
13. Imes JL, 2002. Geohydrological and biological investigations associated with a new lead-zinc exploration area near Winona, Missouri, and the Viburnum Trend of southeastern Missouri. U.S. Geological Survey Fact Sheet 005-02, 6 p.
14. Imes JL, Fredrick BS, 2002. Using dye-tracing and chemical analyses to determine effects of a wastewater discharge to Jam Up Creek on water quality of Big Spring, southeastern Missouri. U.S. Geological Survey Fact Sheet 103–02, 6 p.

15. Imes JL, Kleeschulte MJ, 1995. Seasonal ground-water level changes (1990–93) and flow patterns in the Fristoe Unit of the Mark Twain National Forest, southern Missouri. U.S. Geological Survey Water-Resources Investigations Report 95–4096, 1 sheet.
16. Imes JL, Plummer LN, Kleeschulte MJ, Schumacher JG, 2007. Recharge Area, Base-Flow and Quick-Flow Discharge Rates and Ages, and General Water Quality of Big Spring in Carter County, Missouri, 2000–04. U.S. Geological Survey Scientific Investigations Report 2007–5049, 79 p.
17. Kleeschulte MJ, 2000. Ground- and surface-water relations in the Eleven Point and Current River basins, south-central Missouri. U.S. Geological Survey Fact Sheet 032-00, 6 p.
18. Kleeschulte MJ, 2000. Depositional environment, stratigraphy, and vertical hydraulic conductivity of the St. Francois confining unit in the Fristoe Unit of the Mark Twain National Forest, Missouri. U.S. Geological Survey Water-Resources Investigations Report 00–4037, 65 p.
19. Kleeschulte MJ, 2001. Effects of lead–zinc mining on ground–water levels in the Ozark aquifer in the Viburnum Trend, southeastern Missouri. U.S. Geological Survey Water–Resources Investigations Report 00–4293, 28 p.
20. Kleeschulte MJ, 2001. Stratigraphy and vertical hydraulic conductivity of the St. Francois confining unit in townships 25–27 N. and ranges 01–02 W., southeastern Missouri. U.S. Geological Survey Water-Resources Investigations Report 01–4270, 64 p.
21. Kleeschulte MJ, 2006. Ground-Water Levels in the Ozark Aquifer along the Viburnum Trend, Southeastern Missouri, 2001–05. U.S. Geological Survey Scientific Investigations Report 2006–5220, 19 p.
22. Kleeschulte MJ (ed.), 2008. Hydrologic investigations concerning lead mining issues in southeastern Missouri. U.S. Geological Survey Scientific Investigations Report 2008–5140, 238 p.
23. Kleeschulte MJ, Seeger CM, 2003. Stratigraphy and Vertical Hydraulic Conductivity of the St. Francois Confining Unit in the Viburnum Trend and Evaluation of the Unit in the Viburnum Trend and Exploration Areas, Southeastern Missouri. U.S. Geological Survey Scientific Investigations Report 2003–4329, 62 p.
24. Kleeschulte MJ, Sutley SJ, 1995. Hydrologic data for the Fristoe Unit of the Mark Twain National Forest, southern Missouri, 1988–93. U.S. Geological Survey Open–File Report 95–106, 106 p.
25. Krizanich GW, 2007. An investigation of lead and other metal contaminants in the sediments of Clearwater Lake, Missouri University of Missouri-Rolla, unpublished Ph.D. thesis, 108 p.
26. Leach DL, 1994. Genesis of the Ozark Mississippi valley–type metallogenic Province, Missouri, Arkansas, Kansas, and Oklahoma, USA, *in* Fontbote, L., and Boni, M., eds., *Sediment–Hosted Zn–Pb Ores: Society for Geology Applied to Mineral Deposits*, Special Publication 10, Springer–Verlag, p. 104–138.
27. Lee RCL, 2000. The effect of Mississippi Valley–type mineralization on the natural background chemistry of groundwater in the Ozark Plateaus region of the United States: Colorado School of Mines, Golden, Colorado, unpublished M.S. thesis.
28. Lee RCL, Goldhaber MB, 2001. The distribution of dissolved MVT–related metals in ground water of the Ozark Plateaus region of the United States. U.S. Geological Survey Open-File Report 01–171, p. 30.

29. Lee RCL, 2001. The distribution of MVT-related metals in acid insoluble residues of Paleozoic rocks in the Ozark Plateaus region of the United States. U.S. Geological Survey Open-File Report 01-0042, 35 p.
30. McDowell RC, 2000. Digital data and geologic map of the Greer quadrangle, Oregon County, Missouri. U.S. Geological Survey Miscellaneous Investigations Series Map I-2618, CD.
31. McDowell RC, Harrison RW, Lagueux KM, 2000. Digital data and geologic map of the Powder Mill Ferry quadrangle, Shannon and Reynolds Counties, Missouri. U.S. Geological Survey Miscellaneous Investigations Series Map I-2722, CD.
32. Orndorff RC, Harrison RW, Weary DJ, 1999. Geologic Map of the Eminence Quadrangle, Shannon County, Missouri: U.S. Geological Survey Miscellaneous Investigations Series Map I-2653.
33. Orndorff RC, Weary DJ, Sebala S, 2001. Geologic framework of the Ozarks of south-central Missouri—Contributions to a conceptual model of karst, in Kuniandy, E.L., ed., U.S. Geological Survey Karst Interest Group Workshop Proceedings, St. Petersburg, Florida. U.S. Geological Survey Water-Resources Investigations Report 01-4011, p. 18-24 (http://water.usgs.gov/ogw/karst/kigconference/rco_geologicozarks.htm).
34. Orndorff RC, Weary DJ, 2009. Geologic map of the Round Spring Quadrangle, Shannon County, Missouri. U.S. Geological Survey Scientific Investigations Map I-3073 (<http://pubs.usgs.gov/sim/3073/>).
35. Petersen JC, Adamaski JC, Bell RW, Davis JV, Femmer SR, Freiwald DA, Joseph RL, 1998. Water quality in the Ozark Plateaus, Arkansas, Kansas, Missouri, and Oklahoma: U.S. Geological Survey Circular 1158, 33 p.
36. Poulton BC, Allert AL, Besser JM, Schmitt CJ, Brumbaugh WG, Fairchild JF, 2009. A macroinvertebrate assessment of Ozark streams located in lead-zinc mining areas of the Viburnum Trend in southeastern Missouri, USA. *Environmental Monitoring and Assessment* (DOI 10.1007/s10661-009-0864-2),
37. Rowan EL, 1987. Homogenization temperatures and salinities of fluid inclusions from the Viburnum Trend, Southeast Missouri, and the northern Arkansas zinc district: U.S. Geological Survey Open-File Report 87-675, 26 p.
38. Rostad CE, Schmitt CJ, Schumacher JG, Leiker TJ. Polar organic chemicals in surface waters from lead-zinc mines. *Environmental Monitoring and Assessment* (in review).
39. Scheuhammer, A.M., Beyer, W.N., and Schmitt, C.J., 2008. Ecotoxicology: Lead. In: Joregensen, S.E., ed., *The Encyclopedia of Ecology. Vol. 3, Ecotoxicology*. Elsevier, New York, pp. 2133-2139.
40. Schmitt CJ, Brumbaugh WG, May TW, 2007. Accumulation of metals in fish from lead-zinc mining areas of southeastern Missouri, USA. *Ecotoxicology and Environmental Safety* **67**, 14-30 (Highlighted article).
41. Schmitt CJ, Brumbaugh WG, May TW, 2009. Concentrations of cadmium, cobalt, lead, nickel, and zinc in blood and fillets of northern hog sucker (*Hypentelium nigricans*) from streams contaminated by lead-zinc mining: Implications for monitoring. *Archives of Environmental Contamination and Toxicology*.
42. Schmitt CJ, Brumbaugh WG, Besser JM, Hinck JE, Bowles DE, Morrison LW, Williams MH, 2008. Protocol for monitoring elemental contaminants in Ozark National Scenic Riverways, Missouri: Version 1.0. U.S. Geological Survey, Open-File Report 2008-1269, 43 p. (<http://pubs.usgs.gov/of/2008/1269/>)

43. Schmitt CJ, Brumbaugh WG, 2007. Evaluation of potentially non-lethal sampling methods for monitoring mercury concentrations in smallmouth bass (*Micropterus dolomieu*). *Archives of Environmental Contamination and Toxicology* **53**, 84–95.
44. Schmitt CJ, Brumbaugh WG, May TW, 2007. Concentrations of metals in aquatic invertebrates from the Ozark National Scenic Riverways, Missouri. U.S. Geological Survey, Open-File Report 2007–1435, 23 p. (<http://pubs.usgs.gov/of/2007/1435/>).
45. Schmitt CJ, Whyte JJ, Roberts AP, Annis ML, May TW, Tillitt DE, 2007. Biomarkers of metal exposure in fish from lead-zinc mining areas of southeastern Missouri, USA. *Ecotoxicology and Environmental Safety* **67**, 31–47.
46. Schmitt CJ, Wildhaber ML, Hunn JB, Nash T, Tieger MN, Steadman BL, 1989. Biomonitoring of lead-contaminated Missouri streams with an assay for erythrocyte δ -aminolevulinic acid dehydratase activity in fish blood. Project Completion Report to the U.S. Fish and Wildlife Service, Columbia Missouri Ecological Services Field Office.
47. Schmitt CJ, Wildhaber ML, Hunn JB, Nash T, Tieger MN, Steadman BL, 1993. Biomonitoring of lead-contaminated Missouri streams with an assay for erythrocyte δ -aminolevulinic acid dehydratase activity in fish blood. *Archives of Environmental Contamination and Toxicology* **25**, 464–475.
48. U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, Bureau of Land Management, 1987. Environmental Analysis Doe Run Exploratory Drilling Project: Rolla, Missouri, U.S. Department of Agriculture, 98 p.
49. U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, Bureau of Land Management, 1988. Final Environmental Impact Statement, Hardrock Mineral Leasing Mark Twain National Forest: Rolla, Missouri, U.S. Department of Agriculture, 129 p. with appendices.
50. U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, Bureau of Land Management, 1991. Environmental analysis Doe Run Exploratory Drilling Project, Bureau of Land Management permits ES 19219 and ES 19220: Rolla, Missouri, U.S. Department of Agriculture, 70 p. with appendices.
51. Weary DJ, McDowell RC, 2006. Geologic map of the Big Spring Quadrangle, Carter County, Missouri. U.S. Geological Survey Scientific Investigations Map 2804 (<http://pubs.usgs.gov/sim/2006/2804/>).
52. Weary DJ, Schindler JS, 2004. Geologic map of the Van Buren South Quadrangle, Carter County, Missouri. U.S. Geological Survey Geologic Investigations Series I-2803 (<http://pubs.usgs.gov/imap/2803/>).
53. Weary DJ, Weems RE, 2005. Geologic map of the Van Buren North Quadrangle, Carter, Reynolds, and Shannon Counties, Missouri. U.S. Geological Survey Geologic Investigations Series I-2802 (<http://pubs.usgs.gov/imap/2802/>).