Exhibit 1

Comments of Professor John Van Brahana, Ph.D., P.G.

Department of Geosciences
20 Ozark Hall
University of Arkansas
Fayetteville, Arkansas 72701

Comments of Professor John Van Brahana on
Draft Environmental Assessment for C&H Hog Farm

Prepared by:
John Van Brahana, Ph.D., P.G.
Professor Emeritus, University of Arkansas
Research Hydrologist Emeritus, U.S. Geological Survey

This statement summarizes and documents my opinion that the "Draft Environmental Assessment C & H Hog Farms Newton County, Arkansas," dated August 2015 and prepared by Cardno-GS (Dana Banwart, Project Manager) and Ecosphere Environmental Services, Inc. (Elizabeth Burak, Project Manager) for the U.S. Department of Agriculture Farm Service Agency and the U.S. Small Business Agency is flawed.

This draft does not consider major flaws in C & H's Notice of Intent (see Hovis, 2014 for discussion of the shortcomings of C & H's nutrient management plan); it does not address major relevant geologic, karst, and hydrologic publications; and it provides no apparent field verification. Numerous omissions, errors, and misrepresentations are present in the Draft Environmental Assessment, but I limit my discussion to four areas in which I have particularly relevant professional expertise and experience: 1) the karst, 2) the hydrogeology, 3) the interaction of surface and groundwater, and 4) the water quality of surface water, soil water, and groundwater in Big Creek and contiguous surface water drainages that are tributaries to the Buffalo National River.

PROFESSIONAL BACKGROUND AND EXPERTISE

I have more than 50 years of professional experience as a groundwater geologist (Research Hydrologist Emeritus with the U.S. Geological Survey; Professor of Geosciences Emeritus at the University of Arkansas; Adjunct Professor at Vanderbilt University). My Curriculum Vitae is attached.

For the last two years I have been serving *pro bono* as the technical advisor of the Karst Hydrogeology of the Buffalo National River (KHBNR). The KHBNR team is an independent, diverse scientific research team made up of volunteer citizen scientists, including retirees and students with work experience from agriculture, industry, environmental

consultants, universities, federal agencies, and even Arkansas Department of Environmental Quality (ADEQ). We have been collecting field data continuously during that interval, including water quality samples and dye tracing studies, using rigorous standards of verification, QA/QC, and documentation. Our procedures follow those of the U.S. Geological Survey (USGS), and our study results are being prepared for peer-reviewed journals, among other outlets. Our findings are summarized below in order to clarify incorrect statements and conclusions in the Draft EA.

1. THE KARST

The Buffalo River Watershed in north-central Arkansas is a region of uplifted, slightly deformed, Paleozoic-age sedimentary rocks. The uplift and concomitant tilting, which in general has less than several degrees of dip, were caused by farfield stresses along reactivated basement faults in response to the Ouachita orogeny about 150 kilometers to the south. Although deformation in the area appears to be slight, and the rocks are nearly flat-lying, uplift has resulted in numerous fractures, joints and faults which facilitate vertical groundwater movement (Hudson, 2000; Hudson and Cox, 2003). Uplift is responsible for the downcutting of the rivers, resulting in the steep bluffs and vertical cave entrances for which the region is known.

Typical of the southern Ozarks region, approximately 64 percent of the Watershed area is underlain by limestone and dolomite (also carbonate rock) formations. The Boone Formation, uplifted and fractured interbedded chert and limestone that has well-developed karst, occupies the largest part and underlies many tributaries and a substantial part of the mainstream Buffalo River (Scott and Smith, 1994).

Karst is formed in the following manner: Precipitation of relatively pure water (H_2O) gains carbon dioxide (CO_2) from the atmosphere as it falls as rain, but mostly from the soil zone where CO_2 partial pressures are higher because of decaying vegetation. Mixing H_2O with CO_2 yields carbonic acid (H^2CO_3), which dissociates into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-). The H^+ reacts with the limestone ($CaCO_3$), generating calcium ions in solution (Ca^{+2}) ions in solution, and HCO_3^-. These are the dominant dissolved species we find in spring and well water that originates in the Boone and St. Joe Formations, and that create the karst over the huge time interval that these rocks have been exposed at the land surface. The limestone is being dissolved, creating void space where solid rock once existed.

The evidence that the Boone Formation is a mantled karst has been well-established in the geologic literature (Adamski et al., 1995; Mott et al., 2000; Ting, 2002; Ting, 2005; Hobza, 2005; Hudson et al., 2005; Leh, 2006; Leh et al., 2008; Wagner, 2007; Brahana et al., 2009; Brahana, 2011; Brahana et al., 2014; Jarvie et al., 2014), and is based on irrefutable scientific evidence that includes the following:

- strong interaction between surface water and groundwater;
- field observation of major springs and caves in the basin;
- rapid groundwater flow defined by dye-trace studies;
- field observation of conduits in the limestone between chert layers that have been intensively dissolved;

- dispersive groundwater flow along highly dissolved limestone layers that lie between impermeable chert layers, based on the distribution of dye retrieval during dye tracing;
- stream sections that are dry down-gradient from continuously flowing sections, indicating that these are losing reaches where all of the surface water discharge flows underground under low-flow conditions;
- the major-element geochemistry of water from the Boone Formation that is shown to be a predominantly calcium-bicarbonate type, which are the two dominant dissolved ions resulting from the dissolution of limestone by aggressive recharge water.

If further evidence is needed it can be found in the number of caves, conduits, pits, sinkholes, swallets (sinkholes in stream beds that capture water), karst aquifers, and springs—all karst features.

The hog factory lies on the Boone Formation. The Draft Environmental Assessment claims that it is not known if karst exists "within the C & H Hog Farms parcel," but I offer the following documentation that it does, and question the veracity and the overall lack of field data collection of anyone who would claim differently.

- The geologic map of Mt. Judea describes the underlying Boone Formation wherein "springs and sinkholes are abundant" (Braden and Ausbrooks, 2003).
- The existence of known caves directly downgradient from the waste-spreading area near the C & H hog factory owner's house and Big Creek; downstream from C & H near Vendor, and further downstream at a cave stream within 400 feet of the Buffalo National River (Katarina Kosic, Ph.D. student, written commun. 2015; Mott et al., 2003; figure 3) are integral parts of the definition of karst.
- The topographic map of the Mt. Judea 7.5-minute quadrangle shows Big Creek tributaries named Cave Creek, Dry Creek, Dry Branch, names that are descriptive of features indicative of karst (U.S. Geological Survey, 1980).
- The drilling record for the well drilled to provide water for C & H shows that limestone underlies the soil (Arnold, written commun., 2013).[1]
- The discharge of that well (30 gallons per minute) is consistent with conduit flow in zones of dissolution of the limestone (Palmer, 2007).
- Documents associated with the University of Arkansas's Big Creek Research and Extension Team (BCRET) acknowledge that karst exists in Big Creek basin (BCRET Peer Review, written commun., 2014).
- Geophysical resistivity studies of C & H's spreading fields show epikarst underlying the alluvial flood plain on which the pig waste is spread (Fields and Halihan, 2015). Epikarst is a weathered zone of enhanced porosity on or near the surface or at the soil/bedrock contact of many karst areas (Jones, 2013).
- KHBNR dye tracing from a dug well 40 feet east of C & H property and beneath

[1] It is incorrect to conclude, as the Draft Environmental Assessment does, that the "geologic investigation" that is alleged to have occurred as part of C&H's General Permit application "indicate there is no karst features within the C&H Hog Farms parcel." The soil core sampling that was conducted could not have tested for karst because karst is present in the underlying bedrock and is not indicated in soil.

spreading field 5 (incorrectly identified in the NOI as a spreading field. C & H never received permission to spread waste on this field, and to this date has not corrected the original documents). The dye was observed as a bright fluorescent green at a known subsurface spring beneath the surface of Big Creek, and provided visual and instrumental proof that groundwater flow from the injection point to the spring moved 2200 feet in 30.5 hours (KHBNR, written commun., 2014).

- KHBNR dye tracing from another dug well surrounded by three C & H hog-waste spreading fields showed the dye moved to wells and springs in contiguous surface-water drainage basins a distance of 3.5 miles in 7 days (about 2500 feet per day) at high flow, and thence to the Buffalo National River (KHBNR, written commun., 2015). These velocities and discharges unique to karst in this geologic setting along Big Creek, and secondary dissolution voids of the limestone are prevalent, easily observed, and reflect the open nature the karst plays in water transmission (figure 1).
- A swallet, a sinkhole in the creek bed upgradient from spreading field 16 captured all streamflow from Dry Creek upstream of the feature (figure 2).

For all of these reasons, the existence of karst in Big Creek basin is not speculative. Implying that it doesn't exist or ignoring its existence dramatically alters an assessment of the C & H hog factory's effects on the ecosystem and on water quality reliant on downgradient flow.

Figure 1.—Dissolution of limestone between chert layers along Big Creek, showing rapid flowpaths.

Figure 2.—A swallet, a sinkhole in Dry Creek, captures all streamflow under low flow conditions, and routes it into the karst aquifer. This swallet served as a dye-injection point for the KHBNR team.

Figure 3.—Cave showing the large conduit dimensions within 400 feet of the Buffalo National River, which received dye that had been injected into a well surrounded by the C & H spreading fields about 5 miles south (upstream) of the cave.

2. THE HYDROGEOLOGY

Groundwater flows from high energy to low energy, along paths of least resistance, which in Big Creek basin are the dissolution conduits in the karst. At land surface, gradients are downward, precipitation recharges the shallow aquifers and most flow underground to resurge at springs along the valleys. Intersection of three water-bearing zones in the karstified limestone with an open borehole, which this is, integrates the water levels, and allows flow to move from the high-yielding zone to the upper zone at 135 feet below land surface (data from Arnold, written commun., 2013). This explains the 135 foot water level reported in the 325 foot deep open hole (well) at the C & H factory that supplies 30 gallons per minute (Arnold, written commun., 2013).

Most of the karstification in the Buffalo River Watershed is concentrated where soluble rocks outcrop in the valleys, or near zones of faulting that concentrate flow. Fracturing, tilting of permeability zones, and especially faulting are the major facilitator of interbasin flow of groundwater beneath surface divides. The water budget is significantly skewed in settings like this, inasmuch as much more subsurface flow exits in a karst area than in a non-karst area. The ability to identify groundwater resurgence points (springs) and the physical boundaries of the system is essential. Property and political boundaries do not reflect where the water is moving, and for that reason, dye tracing is essential (Quinlan et al., 1991).

KHBNR's dye tracing was conducted under a range of conditions. During high flow, which is common during the spring months (when most of the hog waste is being spread on the fields), groundwater flow tends to be dispersive, and flows rapidly downgradient to the main drain, the Buffalo National River (figure 4).

3. THE INTERACTION OF SURFACE WATER AND GROUNDWATER

Because the nature of the karst involves rapid exchange between surface and groundwater (Winter et al., 1998), one of the most important measures of the water budget involves quantifying the lag time between precipitation and water level rises in wells and increase in stream flow. Based on continuous records of precipitation and well levels within the Big Creek valley and flow in Big Creek, the KHBNR team determined that the temporal variation between water levels in wells and stream levels is within hours of one another (Figure 5). This is another indicator that the karst is well developed, that groundwater and surface water are intimately interactive, and that fast-flow dominates in this groundwater system.

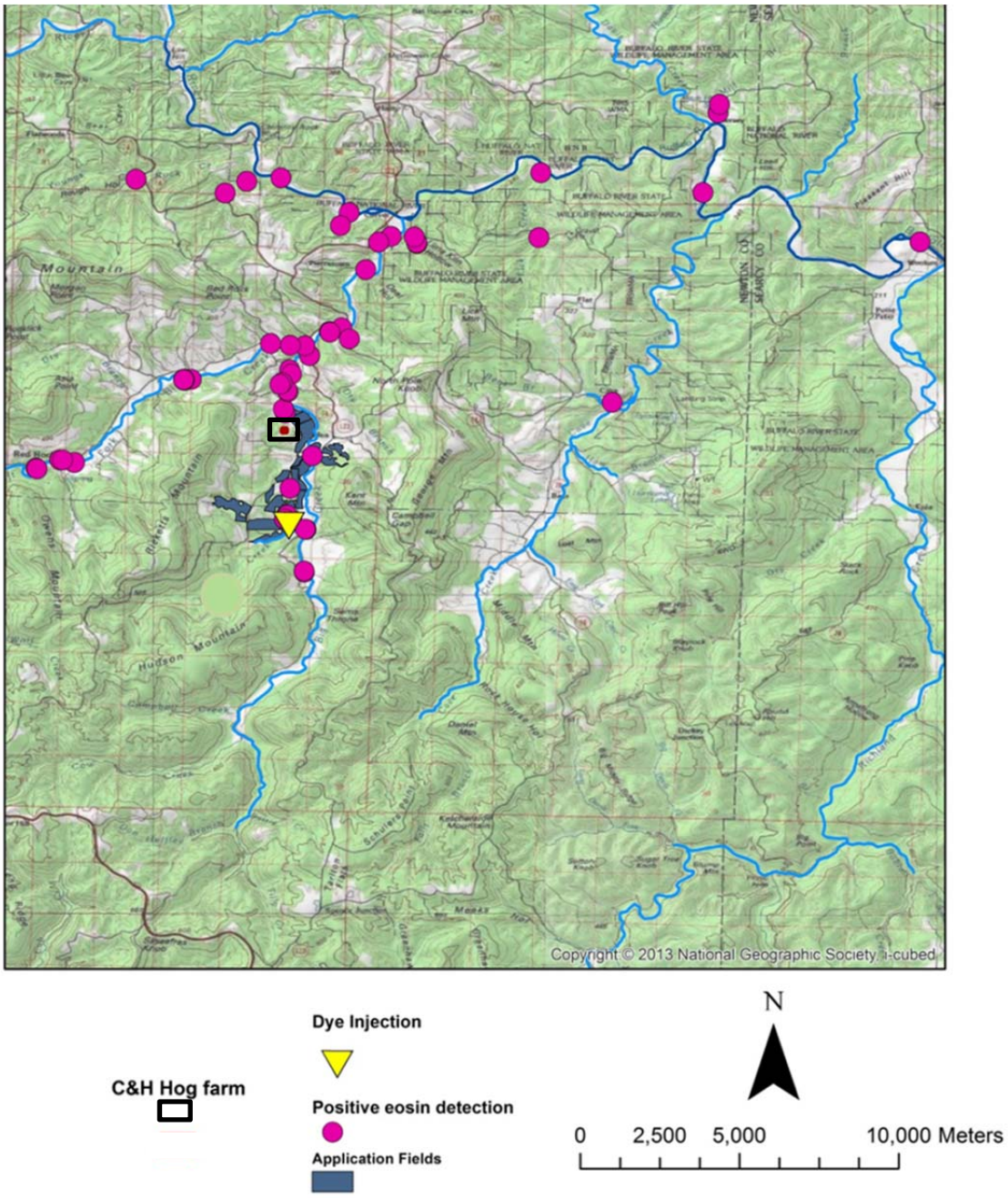

Figure 4.—Results of eosin dye trace after extremely high precipitation event during early summer of 2014. All locations lie at lower elevation than the injection point, which is surrounded on three sides by hog waste spreading fields. Dispersion of dye is explained by tilting of permeability zones (chert layers) caused by uplift (Bolyard, 2007) and by faulting, which is well documented throughout the area (Mark Hudson and various co-authors, multiple dates). The dye tracing is reinforced by our water quality sampling, which is ongoing.

Worthy of note are the omissions of this Draft Environmental Assessment, which include the wealth of data contained in the peer-reviewed literature, National Park Service publications, U.S. Geological Survey geologic maps of the Buffalo National River area, and student theses and publications of the Savoy Experimental Watershed (SEW), a research property of the Division of Agriculture at the University of Arkansas with identical hydrogeology and karst setting as Big Creek. The SEW is a long-term, interdisciplinary research site devoted to the study of process-oriented research of karst hydrogeology and animal-waste management in the southern Ozarks; more than 50 publications and theses encompassing the physics, the chemistry, the biology, the geology, the hydrology, the soils, and the agricultural considerations of animal production on karst of the Boone and St. Joe Formations were not mentioned in the Draft Environmental Assessment, nor does it appear the wisdom gained from these was even considered. Any claim that these studies are irrelevant to the environmental impact of the C & H hog factory is egregiously flawed. It is synthesis of science that helps form the background and understanding on which environmental laws are based. Physical, chemical, and biological laws of science are established rigorously, and to ignore them for special interests or political favoritism is unethical and unsafe.

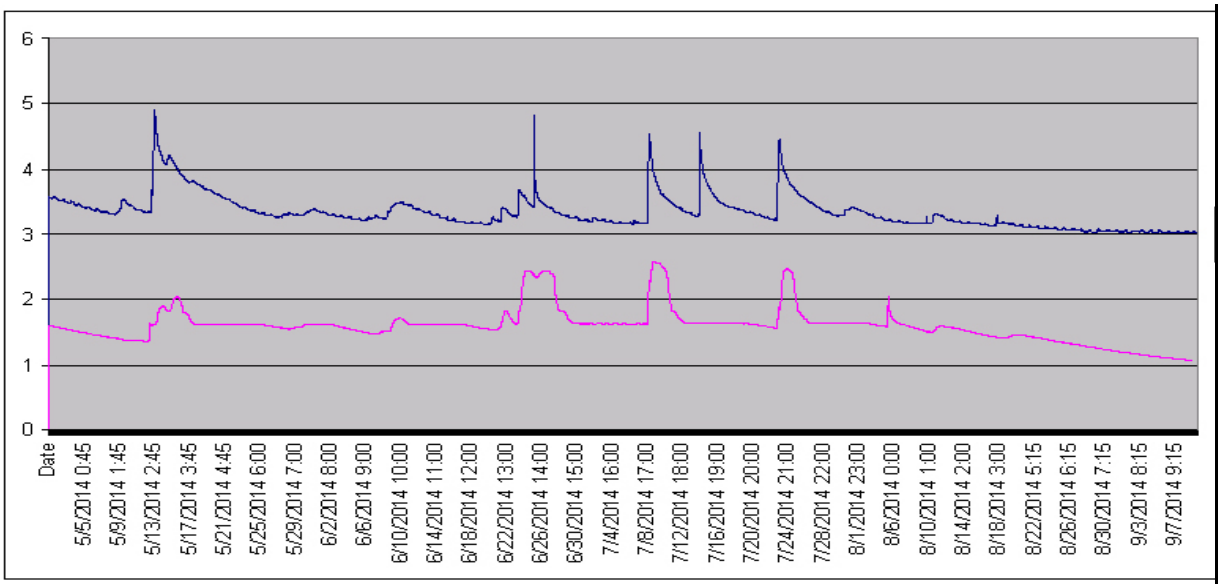

Figure 5.—Water levels in the dye-injection well (pink) and Big Creek (dark blue) showing the close relation and similar lagtimes between groundwater and surface water near C & H hog factory

4. THE QUALITY OF SURFACE WATER, GROUNDWATER, AND SOIL WATER

The Draft Environmental Assessment's analysis of impacts to surface and groundwater is fundamentally flawed. Especially disconcerting is the lack of discussion of the summary results of the BCRET Expert Panel (2014, p. 11), with their final summary observation that BCRET "monitoring activities thus far are important but perhaps not fully adequate in scope and duration to address the long-term potential for impacts to the quality of surface and groundwater resources"

KHBNR acted quickly to get background water-quality data before C & H began operations and our field sampling began on July 16, 2013, as none were collected as part of C & H's Notice of Intent to be covered under the state's general permit. Based on our dye tracing, we have since expanded the area of water quality sampling far beyond the footprint of the hog factory and its waste-spreading fields, for the natural boundaries of the system are what control the transport of pollution, not the property boundaries of the operation.

For the most part, the major dissolved constituents in the water reflect the dissolution of limestone as the source of most of the dissolved constituents, and these waters are primarily calcium bicarbonate type. However, within Big Creek valley, we initially observed, even before C & H began operations, highly variable dissolved concentration of nutrients and microbial constituents, reflecting land-use patterns consistent with a karst area that was operating near its limit of accommodating animal wastes.

With the addition of the full complement of sows and piglets at the C & H hog factory, we have seen increases in indicator microbes, nitrates, and selected trace constituents in wells, springs, and suction lysimeters (soil water samplers) where contaminants have moved offsite. Not surprisingly, microbial constituents are high during high-flow events, but by far the highest values (20,000 mpn/100 mL) we have seen have come from springs (with no surface runoff) and surface channels that lie closest to the spreading fields (KHBNR, written commun., 2015). KHBNR has installed suction lysimeters near the boundaries of selected fields that have been receiving C & H hog waste. Selected trace metals that are sampled from these sites reflect anomalously high values of constituents that are typically found in hog feed (KHBNR, written commun., 2015). Recent BCRET data showing the remarkable level of 85% of nitrate values higher downstream of the hog factory on Big Creek than upstream of the hog factory on Big Creek is another troubling observation of water impacts from this factory (*data in* BCRET, 2015b).

These data are consistent with the water-quality problems we are seeing at several wells used for domestic supply near waste-spreading fields that have reported human health problems. At this point, we do not claim that health problems are a result from the nearby hog-waste spreading fields. The illnesses reported may have another source, but one obvious source, the source for which no groundwater testing beyond our own has been conducted is the wastes spread on nearby fields by the hog factory. The temporally increasing presence of *E. coli* in the well drilled for the hog factory (*data in* BCRET, 2015b) is another warning signal that pig waste is likely entering the well, in this case, from the waste lagoons nearby.

Dissolved oxygen (DO) in water provides a rapid assessment of suitability of water for aquatic species. The National Park Service (Faron Usrey, National Park Service, written commun., 2015; Usrey, 2013) has historically been involved in these data collection, and the U.S. Geological Survey recently provided assistance in developing protocols for continuously monitoring for DO in Big Creek (Green and Usrey, 2014) . DO concentration in Big Creek shows a daily pattern of high concentrations during daylight hours, and low concentrations during the nighttime. During the day, algae in the creek generates oxygen, which is added to

the water as it absorbs sunlight (photosynthesizes). At night, it takes in oxygen from the water, thus pulling down the amount of oxygen available for fish and other aquatic life. This is a natural variation, and is observed in streams and rivers almost everywhere. However, if measurements show the stream has dropped lower than the critical level, the stream is in an impaired state.

The critical level for DO in this part of the Ozarks varies by temperature and pressure, and APC&E Regulation 2 sets the lower limit of dissolved oxygen concentration to 6 or 5 parts per million (ppm), depending on temperature, basin size, and pressure variables. For the past month, Big Creek has been below 6 ppm for roughly 29 percent of the time (Faron Usrey, National Park Service, written commun., 2015). Last year around the end of August and early September, the DO was below 6 ppm for about 49 percent of the time over a period of 25 days. In fact, the DO concentrations in Big Creek went below 5 parts per million for a total of 120 nighttime hours last summer (on the nights of July 22, and 23; and for each night of the period August 23 through September 2, and again from September 4 through 7, and September 9 through 10). This is not the first time low DO values have been observed in Big Creek, but they do strongly reinforce the field measurements that indicate the valley was previously close to its capacity to accommodate the nutrients from all animal wastes which cause algae to proliferate.

The duration of the low nighttime DO last summer reinforces the observation that the added burden of waste from C & H's 6500 pigs, more than 2 million gallons per year, is producing an impact downstream in the Buffalo. Observation of local landowners along the creek was that the algae was particularly luxuriant last summer, after about 6 months of waste spreading on nearby fields. Also observed by measurement of *E. coli* (in Big Creek and upstream and downstream from its confluence with the Buffalo prior to spreading in 2013, the "average" (geometric mean) the contribution from Big Creek increased concentrations of *E. coli* in the Buffalo by more than 37%. Values of *E. coli* from 2014 taken as grab samples (random) show a marked increase from 2013. On April 13, 2015, *E. coli* values at KHBNR data collections sites (2 springs and Dry Creek) near spreading fields 13, 15, 16 were 20,000 mpn/100 mL, 16,000 mpn/100 mL, and 6,500 mpn/100 mL (KHBNR, written commun. 2015). These water sources sampled are all tributary to Big Creek.

All of these observations are consistent with the fact that Big Creek and its ecosystem are being stressed. These alone are not necessarily proof that the C & H hog factory is the only cause of the degraded water quality, but they do suggest it has added to the total agricultural loading from this valley. This impaired water is flowing directly into the Buffalo National River.

As a comparison of water quality on a nearby river, the DO concentration in the Little Buffalo River, 7 miles upstream from the confluence of Big Creek and the Buffalo River, dropped below 6 parts per million only 1 time (less than 3 hours total for the period measured) during the sampling interval of summer 2013 (Faron Usrey, National Park Service, written commun., 2015). The drainage area of the Little Buffalo River has similar land use and karst geology; what is not similar is that it does not have a 6500-hog factory upstream.

Dynamically flowing water moving through hog waste on karst serves as the medium by

which the contamination is carried downstream. The data described here indicate that contamination from the hog factory and its spreading fields is moving offsite. At most current flow conditions, contamination levels may not exceed EPA standards now. However, assessment of the entire suite of data, with the glaring holes of missing data for karst and hydrogeology, suggest that contamination levels will continue to increase. Degradation of the Buffalo National River, an Extraordinary Resource Waters (Tier 3), is absolutely prohibited (Gaba, 2007).

References Cited

Adamski, J.C., Petersen, J.C., Freiwald, D.A., and Davis, J.V., 1995, Environmental and hydrologic setting of the Ozark Plateaus study unit, Arkansas, Kansas, Missouri, and Oklahoma: U.S. Geological Survey Water-Resources Investigation Report 94–4022, 69 p.

Arnold, Joshua, 2013, State of Arkansas report on water well construction & pump installation: unpublished document, 1 page.

Big Creek Research and Extension Team (BCRET), 2015b, Demonstrating and monitoring the sustainable management of nutrients on C&H Farm in Big Creek Watershed: Quarterly Report –April 1 to June 30, 2015: University of Arkansas System, Division of Agriculture, 68 p.

Bolyard, Susan E., 2007, Migration of landfill contaminants in a tilted-block, mantled-karst setting in northwestern Arkansas: University of Arkansas, unpublished M.S. thesis, 69 p.

Braden, Angela, and Ausbrooks, Scott, 2003, Geologic map of the Mt. Judea Quadrangle, Newton County, Arkansas: Arkansas Geological Survey, Digital Geological Quadrangle Map, DGM-AR-00590, 1 sheet.

Brahana, Van, 2011, Ten relevant karst hydrogeologic insights gained from 15 years of in situ field studies at the Savoy Experimental Watershed; in Kuniansky, E.L., ed., U.S. Geological Survey Karst Interest Group Proceedings, Fayetteville, Arkansas, April 26-29, 2011, U.S. Geological Survey Scientific Investigations Report 2011-5031, p. 132-141.

Fields, Jon, and Halihan, Todd, 2015, Preliminary electrical resistivity surveys of Mt. Judea alluvial sites—2nd Quarter 2015 Report (draft): unpublished report to the Big Creek Research and Extension Team, Oklahoma State University, Boone Pickens School of Geology, Stillwater, Oklahoma, 24 p.

Gaba, Jeffrey M., 2007, Generally illegal: NPDES General Permits under the Clean Water Act: Harvard Environmental Law Review, v. 31, p. 410-473.

Green, W. Reed, and Usrey, Faron D., 2014, Guidelines and procedures for monitoring dissolved oxygen in streams within Buffalo National River, Arkansas: U.S. Geological Survey, Administrative Report, 30 p.

Hobza, Christopher, 2005, Ground-water quality near a swine waste lagoon in a mantled karst terrane in northwestern Arkansas: unpublished M.S. thesis, University of Arkansas, 76 p.

Hovis, Samantha, 2014, C & H Hog Farms: An investigation into the permitting of a concentrated animal feeding operation in the Buffalo River watershed: University of Arkansas, unpublished M.S. thesis, 89 p.

Hudson, M.R., Mott, D.N., Turner, K.J., and Murray, K.E., 2005, Geologic controls on a transition between karst aquifers at Buffalo National River, northern Arkansas, in Kuniansky, E.L., 2005, U.S. Geological Survey Karst Interest Group proceedings, Rapid City, South Dakota, September12–15, 2005: U.S. Geological Survey Scientific Investigations Report 2005–5160, 296 p., http://pubs.usgs.gov/sir/2005/5160/.

Hudson, M.R., 2000, Coordinated strike-slip and normal faulting in the southern Ozark dome of northern Arkansas: Deformation in a late Paleozoic foreland: Geology, v. 28, p. 511–514.

Hudson, M.R., and Cox, R.T., 2003, Late Paleozoic tectonics of the southern Ozark dome, in Cox, R.T., compiler, Field trip guidebook for Joint South-Central and Southeastern Sections, Geological Society of America: Tennessee Division of Geology Report of Investigations 51, p. 15–32.

Jarvie, Helen, P., Andrew N. Sharpley, Van Brahana, Tarra Simmons, April Price, Colin Neal, Alan J. Lawlor, Darren Sleep4, Sarah Thacker, Brian E. Haggard, 2014, .Phosphorus retention and remobilization along hydrological pathways in karst terrain: Environmental Science and Technology, v. 48, no. 9, p. 4860-4868. DOI: 10.1021/es405585b.

Jones, William K., 2013, Physical Structures of the Epikarst: ACTA Carsologica 42/2-3, 311-314.

Karst Hydrogeology of the Buffalo National River (KHBNR), 2015, CAFO in paradise—Benefits, risks, and the cost of ignoring science: unpublished document, including powerpoint presentation.

Leh, Mansour, 2006, Quantification of rainfall-runoff mechanisms in a pasture-dominated watershed: unpublished M.S. thesis, University of Arkansas, 98 p.

Leh, M.D., Chaubey, I., Murdoch, J.F., Brahana, J.V., and Haggard, B.E., 2008, Delineating Runoff Processes and Critical Runoff Source Areas in a Pasture Hillslope of the Ozark Highlands: Hydrological Processes, Wiley Interscience, DOI: 10.1002/hyp7021, 15 p.

Mott, D., 2003, Delineation and Characterization of Karst Ground Water Recharge in the Vicinity of Davis Creek and John Eddings Cave, Buffalo National River, Arkansas. U.S. Dept. of Interior, National Park Service, Buffalo National River, Open-File Report of the Water Resource Division, 157 p.

Mott, D.N., Hudson, M.R., and Aley, T., 2000, Hydrologic investigations reveal interbasin recharge contributes significantly to detrimental nutrient loads at Buffalo National River, Arkansas: Proceedings of Arkansas Water Resources Center Annual Conference MSC–284, Fayetteville, Ark., p. 13–20.

Palmer, Arthur N., 2007, Cave geology: Cave Books, Dayton, Ohio, 454 p.

Quinlan, J.F., Smart, P.L., Schindel, G.M., Alexander, Jr., E.C., Edwards, A.J., and Smith, A.R., 1991, Recommended administrative/regulatory definition of karst aquifer, principles of classification of carbonate aquifers, practical evaluation of vulnerability of karst aquifers, and determination of optimum sampling frequency at springs, *in* Quinlan, J.F., ed., Proceedings of the third conference on hydrogeology, ecology, monitoring, and management of ground water in karst terranes: Dublin, Ohio, National Ground Water Association, p. 573-635.

Scott, H. D. and P. A. Smith, 1994, The predictions of sediment and nutrient transport in the Buffalo River Watershed using a Geographic Information System: Arkansas Water Resources Research Center, University of Arkansas, Fayetteville, AR

Stanton, Gregory P., 1993, Processes and controls affecting anisotropic flow in the Boone-St. Joe aquifer in northwestern Arkansas: unpublished M.S. thesis, University of Arkansas, 212 p.

Ting, Tiong Ee, 2002, Development of a bacterial tracer for water quality studies in mantled karst basin using indigenous Escherichia coli labeled with europium: unpublished M.S. thesis, University of Arkansas, 106 p.

Ting, Tiong Ee, 2005, Assessing bacterial transport, storage and viability in mantled karst of northwest Arkansas using clay and Escherichia coli labeled with lanthanide-series metals: unpublished Ph.D. dissertation, University of Arkansas, 279 p

Usrey, Faron D., 2013, Assessment of *Escherichia coli* concentrations in the surface waters of the Buffalo National River 2009-2012: Buffalo National River Report NPS/B-0100/2013, U.S. Department of the Interior, National Park Service, Buffalo National River, Harrison, Arkansas.

U.S. Geological Survey, 1980, 7.5-minute topographic map of Mt. Judea, Arkansas, scale 1:24,000, 1 sheet.

Wagner, Dan, 2007, In-situ assessment of waste storage effectiveness in karst using stable isotope biogeochemistry: Unpublished M.S. thesis, University of Arkansas, Fayetteville, 58 p.

Winter, Thomas C., Harvey, Judson W., Franke, O. Lehn, and Alley, William M., 1998, Ground water and surface water A single resource: U.S. Geological Survey Circular 1139,

CURRICULUM VITAE

John Van Brahana

December 2014

POSITIONS: Emeritus Professor, University of Arkansas (Department of Geosciences and Program of Environmental Dynamics) 2013-present; Professor, University of Arkansas (Department of Geosciences and Program of Environmental Dynamics 1990-2013; Research Hydrologist, Emeritus (U.S. Geological Survey) 1999-present; Research Hydrologist, U.S. Geological Survey 1971-1999; Consulting Hydrogeologist (GeoSculpt), with emphasis on groundwater in karst, tracing of groundwater, and engineering geology

PROFESSIONAL REGISTRATION:
American Institute of Professional Geologists-2275
State of Arkansas-Board of Registration for Professional Geologists-1884

MAILING ADDRESS: 20 Ozark Hall
University of Arkansas
Fayetteville, AR 72701

PHONE: (479) 575-3355
FAX: (479) 575-3846
CELL: (479) 236-1347
EMail: brahana@uark.edu
WEB: http://comp.uark.edu/~brahana

RESEARCH PROJECTS--SHORT TITLES:
Flow and Transport--Karst Hydrogeology; Subsurface Flow in Fractured-Rock; Savoy Experimental Watershed—Long-Term Karst Monitoring; ; Structural Controls on Ground-Water Flow Boundaries; Agroforestry Effects on Water Quality; Wetlands and Karst

EDUCATION:

University of Missouri Ph. D. 12/73	Advisor: Stanley N. Davis	Hydrogeology
University of Missouri M.A. 6/68		Geology
University of Illinois A. B. 6/65		Arts and Sciences (Geology)

SELECTED ASPECTS OF PROFESSIONAL HISTORY:

2013-present	Professor Emeritus, Dept. of Geosciences, U. of Arkansas, Fayetteville, AR.
1999-2013:	Professor, Dept. of Geosciences, U. of Arkansas, Fayetteville, AR.
1999-present:	Research Hydrologist Emeritus, U.S. Geological Survey, Fayetteville, AR.
1990-1999:	Adjunct Professor, Dept. of Geology, U. of Arkansas, Fayetteville, AR.
1990-1999:	Research Hydrologist, U.S. Geological Survey, Fayetteville, AR.
1988-1990:	Research Hydrologist, U.S. Geological Survey, Nashville, TN
1976-1988:	Adjunct Professor, Geology, Vanderbilt Univ., Nashville, TN.
1975	Adjunct Professor, Univ. of Southern Mississippi (Univ. Center), Jackson, MS
1971-1988:	Hydrologist, U.S. Geological Survey, Nashville, TN, Jackson, MS, and Denver, CO.
1964-1965:	J.W. Mack and Assoc. Geophysical Consultants, Madison, WI.
1962-1966:	Lab. Tech., Illinois State Geological Survey, Urbana, IL.

PROFESSIONAL SOCIETIES:
Geological Society of America (Fellow)
American Geophysical Union
American Institute of Professional Geologists
National Speleological Society
International Association of Hydrogeologists (lapsed)
National Ground Water Association (lapsed)
Sigma Xi, Scientific Research Society of America (lapsed)

AWARDS AND HONORS:

25 Arkansas Visionaries-selected by Arkansas Times newsmagazine 2014
Harold Alexander Conservationist of the Year Award-Arkansas Wildlife Federation 2014
Hydrogeology Scholarship at University of Arkansas established in my name 2014
Sigma Gamma Epsilon Geology Faculty of the Year Award University of Arkansas 2011-12
Edwards Aquifer Authority, San Antonio, TX- Distinguished Lecturer (12) March 2012
Distinguished Service Award-Hydrogeology Division of Geological Society of America 2010
Sigma Gamma Epsilon Geology Faculty of the Year Award University of Arkansas 2009-10
University of Arkansas Honors Thesis Mentor Award 2009
University of Arkansas Off Campus Duty Assignment (sabbatical) January-August 2009
State of Arkansas, Professional Geologist Certification, Certificate-1884 2005-present
Baum Teaching Grant Award--University of Arkansas 2002
Scientist Emeritus -- U.S. Geological Survey 1999
STAR Award – U.S. Geological Survey 1998
Special Act Service Award - U.S. Geological Survey 1996
Superior Service Award - U.S. Geological Survey 1994
Sigma Gamma Epsilon Outstanding Teacher - Geology Department - University of Arkansas 1994
Special Achievement Award - U. S. Geological Survey 1993
Sigma Gamma Epsilon Outstanding Teacher - Geology Department - University of Arkansas 1992
Awarded State of Tennessee Professional Geologist — Certificate TN0096 1988
Election to membership in Sigma Xi (Vanderbilt University Chapter) 1978
Awarded American Institute of Professional Geologists
Certified Professional Geologist – Certificate 2752 1975-present
Univ. of Missouri Post-Residence Doctoral Fellowship 1971
National Science Foundation Travel Grant (Birch Symposium) 1970
Illinois State Scholarship 1961-63

PROFESSIONAL SERVICE, INCLUDING TECHNICAL CONSULTING OR EXPERT WITNESS REPRESENTATION— SELECTED CLIENTS:

WalMart, Inc.	Husch & Eppenberger, LLC
Waste Management, Inc.	Northstar Holdings, LLC
City of Memphis, Tennessee	KB Amber
City of Eureka Springs, Arkansas	FTN Associates, Ltd.

SELECTED SERVICE TO THE PROFESSION, THE COMMUNITY, AND THE UNIVERSITY

Independent Groundwater Panel-Oak Ridge National Lab-DOE Oversight 2012-present
Crystal Bridges Museum of American Art, Trainer of Trail Guides in Hydrogeology 2012-present
Osher Lifelong Learning Institute, Fayetteville, Arkansas Teacher 2011-present
Edwards Aquifer Authority, San Antonio, TX-Aquifer Scientific and Advisory Panel 2009-present
Chair-Fulbright College Cabinet, University of Arkansas 2009-2010
Vice Chair-Fulbright College Fiscal and Planning Committee 2009-2011
Fulbright College Representative--Faculty Senate 2008-2012
Steering Committee--Program of Environmental Dynamics University of Arkansas 2001-2013
Technical peer reviewer for numerous professional journals, and water agency and NSF proposals
Mentor and advisor to more than 10 REU and Honors students University of Arkansas 2003-2013
External thesis reviewer, Memorial University, Newfoundland, Canada 2010
External field mentor, Honors Thesis-Acadia Rohr, Barnard College, New York 2010
Congress XXVIII Chair, Joint AIH/IAH International Groundwater Conference, Las Vegas, NV 1998
Secretary-Treasurer Hydrogeology Division, Geological Society of America 1994-1996
Geology Development Board, University of Missouri 1994-2000; Vice Chair 1996-2000
Chair, Hydrogeology Technical Division, GSA Annual Meeting, New Orleans, LA 1985

BIBLIOGRAPHY—Published Reports—Peer Reviewed

Brahana, Van, Nix, Joe, Bitting, Carol, Bitting, Chuck, Quick, Ray, Murdoch, John, Roland, Victor, West. Amie. Robertson, Sarah, Scarsdale, Grant, and North, Vanya, 2014, CAFOs on karst—Meaningful data collection to adequately define environmental risk, with specific application from the southern Ozarks of northern Arkansas: *in* Kuniansky, E.L., and Spangler, L.E., eds., U.S. Geological Survey Karst Interest Group Proceedings, Carlsbad, New Mexico, April 29-May 2, 2014, U.S. Geological Survey Scientific Investigations Report 2014-5035, p. 87-96.

Jarvie, Helen P., Sharpley, Andrew N., Brahana, Van, Simmons, Tarra , Price, April, Neal , Colin , Lawlor, Alan J. Sleep, Darren, Thacker, Sarah, Haggard , Brian E., 2014, Phosphorus retention and remobilization along hydrological pathways in karst terrain: Environmental Science & Technology, v. 1, no. 48, p. 3860-4868. (DOI**:** 10.1021/es405585b)

Al-Qinna, Mohammed, Scott, H.D., Brye, K.R., Brahana, J.V., Sauer, T.J., and Sharpley, A.N., 2014, Coarse fragment effects on soil physical and hydraulic properties in a mantled-karst landscape in the Ozark Highlands: Soil Science, v. 179, no. 1, p. 42-50,

Sauer, Thomas J., Coblentz, W.K., Defauw, S.L., Brye, K.R., Brauer, D.K., Skinner, J.V., Thomas, A.L., Brahana, J.V.**,** Hays, P.D., Moffitt, D.C., Robinson, J.L., James, T.A., and Hickie, K.A., 2014, Nutrient cycling in an agroforestry alley cropping system receiving poultry litter or nitrogen fertilizer: Nutrient Cycling in Agroecosystems, v. 100, no. 3, 15 p. (DOI 10.1007/s10705-014-9667-0)

Brahana, Van, 2011, Ten relevant karst hydrogeologic insights gained from 15 years of *in situ* field studies at the Savoy Experimental Watershed; *in* Kuniansky, E.L., ed., U.S. Geological Survey Karst Interest Group Proceedings, Fayetteville, Arkansas, April 26-29, 2011, U.S. Geological Survey Scientific Investigations Report 2011-5031, p. 132-141.

Brahana, Van, 2011, Natural Groundwater Quality: Geofluids, Blackwell Publishing Ltd., v. 11, no. 2, p. 242-244. (DOI: 10.1111/j.1468-8123.2011.00332.x)

Pennington, Darrell and Brahana, J. Van, 2011, A hydrograph-recession technique for karst springs with quickflow components that do not exhibit simple, zero-order decay: *in* Kuniansky, E.L., ed., U.S. Geological Survey Karst Interest Group Proceedings, Fayetteville, Arkansas, April 26-29, 2011, U.S. Geological Survey Scientific Investigations Report 2011-5031, p. 172-181.

Brion, G., Brye, K., Haggard, B., West, C., and Brahana, V., 2010, Land-use effects on water quality of a first-order stream in the Ozark-Highlands, mid-southern United States: River Research and Applications, DOI: 10.1002/rra.1394, 19 p.

Brahana, Van, 2009, The Savoy Experimental Watershed—A long-term research site for karst hydrogeology: *in* Palmer, A.N. and Palmer, Margaret V., Caves and Karst of the USA, National Speleological Society Guidebook for the International Congress of Speleology, section 5-Ozark Plateaus, p. 179.

Brahana, John Van, Tennyson, Rodney, Terry, Jim, Hays, P.D., Pollock, Erik, 2009, Reactivated basement faulting as a hydrogeologic control of hypogene speleogenesis in the southern Ozarks of Arkansas, USA: *in* Stafford, Kevin, ed., Advances in Hypogene Karst Studies, National Cave and Karst Research Institute Symposium 1, p. 99-110.

Daigh, Aaron L., Brye, Kristofor R., Sharpley, Andrew N., Miller, David M., West, Charles P., and Brahana, J. Van, 2009, Five-year change in soil profile chemical properties as affected by broiler litter application rate: Soil Science, v. 174, no. 10, DOI: 10.1097/SS.0b013e3181bdbdb3, p. 531-542.

Hollingsworth, E., Brahana, V., Inlander, E., and Slay, M., 2009, Creation of an international digital karst database and an interactive worldwide map of karst: International Congress of Speleology Proceedings, v. 1, Symposia, part 1, p. 442-446.

Varnell, Curtis J., Thawaba, Salem, and Brahana, J. Van, 2009, Constructed wetlands for the pre-treatment of drinking water obtained from coal mines: The Open Environmental Engineering Journal, v. 2, p. 1-8.

Leh, M.D., Chaubey, I., Murdoch, J.F., Brahana, J.V., and Haggard, B.E., 2008, Delineating Runoff Processes and Critical Runoff Source Areas in a Pasture Hillslope of the Ozark Highlands: Hydrological Processes, Wiley Interscience, DOI: 10.1002/hyp7021, 15 p.

Hollingsworth, E., Brahana, V., Inlander, E., and Slay, M., 2008, Karst Regions of the World (KROW)—Populating Global Karst Datasets and Generating Maps to Advance the Protection of Karst Species and Habitats Worldwide: *in* Kuniansky, E.L., ed., U.S. Geological survey Karst Interest Group Proceedings, Bowling Green, Kentucky, May 27-29, 2008: U.S. Geological Survey Scientific Investigations Report 2008-5023, p. 17-24.

Sauer, T.J., Alexander, R.B., Brahana, J.V., and Smith, R.A., 2008, The importance and role of watersheds in the transport of nitrogen: in Follett, R.F., and Hatfield, J.L., eds., Nitrogen in the Environment: Sources, Problems, and Management, Second Edition: ch. 8, p. 203-240.

Tennyson, Rodney, Terry, Jim, Brahana, Van, Hays, Phil, and Pollock, Erik, 2008, Tectonic control of hypogene speleogenesis in the southern Ozarks—Implications for NAWQA and beyond: *in* Kuniansky, E.L., ed., U.S. Geological survey Karst Interest Group Proceedings, Bowling Green, Kentucky, May 27-29, 2008: U.S. Geolological Survey Scientific Investigations Report 2008-5023, p. 37-46.

Hobza, Christopher M., Moffit, David C., Goodwin, Danny P., Kresse, Timothy, Fazio, John, Brahana, J.V., and Hays, Phillip D., 2005, Ground-water quality near a swine waste lagoon in a mantled karst terrane in northwestern Arkansas: *in* Kuniansky, E.L., 2005, U.S. Geological Survey Karst Interest Group proceedings, Rapid City, South Dakota, September 12-15, 2005: U.S. Geological Survey Scientific Investigations Report 2005-5160, p. 155-162.

Sauer, T.J., Logsdon, S.D., Brahana, J.V., and Murdoch, J.F., 2005, Variation in infiltration with landscape position: Implications for forest productivity and surface water quality: Forest Ecology and Management, v. 220, Issues 1-3, p. 118-127.

Varnel, C.J., and Brahana, J.V., and Steele, K.F., 2004, The influence of coal quality variation on utilization of water from abandoned coal mines as a municipal water source: Mine Water and the Environment, v. 23, no. 4, p. 204-208.

Brahana, J.V., 2003, Karst aquifers: in Stewart, B.A., and Howell, Terry, eds., The Encyclopedia of Water Science: Marcel Dekker, Inc., New York, p. 37-40.

Brahana, J.V., 2003, Water quality in karst aquifers: in Stewart, B.A., and Howell, Terry, eds., The Encyclopedia of Water Science: Marcel Dekker, Inc., New York, p.41-42.

Brahana, J.V., 2003, The Hydrologic cycle: in Stewart, B.A., and Howell, Terry, eds., The Encyclopedia of Water Science: Marcel Dekker, Inc., New York, p. 412-414

Hays, P.D., and Brahana, J.V., 2003, Ground water observation wells: in Stewart, B.A., and Howell, Terry, eds., The Encyclopedia of Water Science: Marcel Dekker, Inc., New York., p. 633-635.

Varnel, C.J., and Brahana, J.V., 2003, Neuse River-Impact of Animal Production on Water Quality: in Stewart, B.A., and Howell, Terry, eds., The Encyclopedia of Water Science: Marcel Dekker, Inc., New York, p.622-624.

Peterson, E.W., Davis, R.K., Brahana, J.V., and Orndorff, H.O., 2002, Movement of nitrate through regolith covered karst terrane, northwest Arkansas: Journal of Hydrology, v. 256, p. 35-47.

Steele, K.F., Davis, R.K., Brahana, J.V., Godfrey, Lyle, and Tatom, Ginger, 2002, Research and regulatory water-quality perspectives, Ozark Mountain Region, Arkansas: American Water Resources Association, Ground Water/Surface Water Interactions, p. 199-204

Davis, R.K., Brahana, J.V., and Johnston, 2000, Ground water in northwest Arkansas: Minimizing nutrient contamination from non-point sources in karst terrane: Arkansas Water Resources Center, University of Arkansas, Fayetteville, 59 p.

Peterson, E.W., Davis, R.K., and Brahana, J.V., 2000, The use of regression analysis to predict nitrate-nitrogen in springs in northwest Arkansas: *in* Sasowsky, I.D. and Wicks, C.M., editors, Groundwater flow and contaminant transport in carbonate aquifers: A.A. Balkema, Rotterdam, p. 43-63.

Sauer, T.J., Alexander, R.B., Brahana, J.V., and Smith, R.A., 2001, The importance and role of watersheds in the transport of nitrogen: in Follett, R.F., and Hatfield, J.L., eds., Nitrogen in the Environment: Sources, Problems, and Management: ch. 7, p. 147-181.

Brahana, J.V. and Broshears, R.E., 2001, Hydrogeology and ground-water flow in the Memphis and Fort Pillow aquifers in the Memphis area, Tennessee: U.S. Geological Survey Water Resources Investigations Report 89-4131, 56 p.

Brahana, J.V., Sauer, T.J., Murdoch, John, Little, Paul, Al-Rashidy, Said, and Cole, Jack, 2000, Geomorphology, hydrology, and environmental issues in a mantled karst terrane: Geological Society of America, South Central Field Trip Guidebook #2, 23 p.

Brahana, J.V., and Sauer, T.J., 2000, Geomorphology, hydrology, and environmental issues in a mantled karst terrane: South Central Regional Meeting—National Association of Conservation Districts, Field Trip Guidebook #2, 14 p.

Brahana, J.V., 1999, Book review of "Hydrogeology in Practice—A Guide to characterizing ground-water systems" by William J. Stone: Journal of Ground Water, v. 37, no. 3, p 328.

Brahana, J.V., Hays, P.D., Kresse, T.M., Sauer, T.J., and Stanton, G.P., 1999, The Savoy Experimental Watershed—Early lessons for hydrogeologic modeling from a well-characterized karst research site: in Palmer, A.N., Palmer, M.V., and Sasowsky, I.D., editors, Karst Modeling: Special Publication 5, Karst Waters Institute, Charles Town, WV, p. 247-254.

Funkhouser, J.E., Little, P.R., Brahana, J.V., Kresse, T.M., Anderson, M., Formica, S., and Huetter, T., 1999, Methodology to study the effects of animal production in mantled karst aquifers of the southern Ozarks: in

Palmer, A.N., Palmer, M.V., and Sasowsky, I.D., editors, Karst Modeling: Special Publication 5, Karst Waters Institute, Charles Town, WV, p. 255-258.

Brahana, John Van, Eckstein, Yoram, Ongley, Lois K., Schneider, Robert, and Moore, John E., 1998, editors, Gambling with groundwater—Physical, chemical, and biological aspects of aquifer-stream relations: Proceedings Volume of the International Association of Hydrogeologists Congress XXVIII and the Annual Meeting of the American Institute of Hydrology, Las Vegas, 753 p.

Brahana, J.V., Sauer, T.J., Kresse, Tim, Al-Rashidy, Said, Shirley, Tracy, and McKee, Paul, 1998, Tipping the scale in long-term karst research—Hydrogeologic characterization of the Savoy Experimental Watershed: Proceedings Volume, Water Quality of Surface and Ground Water and Best Management Practice, Arkansas Water Resources Center, p. 9-17.

Brahana, J.V., Stanton, G.P., Hays, P.D., and Davis, R.K., 1998, Workbook—Field Hydrogeology—Theory, Techniques, and Applications: Department of Geology, University of Arkansas, Fayetteville, Arkansas, 69 p.

Marshall, David, Brahana, J.V., and Davis, R.K., 1998, Resuspension of viable sediment-bound enteric pathogens in shallow karst aquifers: *in* Brahana, John Van, Eckstein, Yoram, Ongley, Lois K., Schneider, Robert, and Moore, John E., 1998, editors, Gambling with groundwater—Physical, chemical, and biological aspects of aquifer-stream relations: Proceedings Volume of the International Association of Hydrogeologists Congress XXVIII and the Annual Meeting of the American Institute of Hydrology, Las Vegas, p. 179-186.

Brahana, J.V., 1997, Rationale and methodology for approximating spring-basin boundaries in the mantled karst terrane of the Springfield Plateau, northwestern Arkansas: in Beck, B.F. and Stephenson, J. Brad, eds., Sixth Multidisciplinary Conference on Engineering Geology and Hydrogeology of Karst Terranes, A.A. Balkema, Rotterdam, p. 77-82.

Brahana, J.V., 1995, Controlling influences on ground-water flow and transport in the shallow karst aquifer of northeastern Oklahoma and northwestern Arkansas: Proceedings Volume, Hydrologic Problems Along the Arkansas-Oklahoma Border, Arkansas Water Resources Center Publication No. MSC-168, p. 25-30.

Brahana, J.V. and Mesko, T.O., 1994, Hydrology of the McNairy-Nacatoch and adjacent aquifers in the northern Mississippi embayment: U.S. Geological Survey Professional Paper 1416-K, 276 p.

Brahana, J.V., Leidy, Valarie A., Lindt, John, and Hodge, S.A., 1993, Hydrogeologic data for Carroll County, Arkansas: U.S. Geological Survey Open-File Report 93-150, 32 p.

Ford, G.L., and Brahana, J.V., 1992, Soil-gas data for the underground hydrocarbon contamination site in the Highland Avenue Area, Fayetteville, Arkansas: U.S. Geological Survey Open-File Report 92-77, 11 p.

Brahana, J.V., Gonthier, Gerard J., and Remsing, Larry M., 1991, Hydrogeologic data for Boone County, Arkansas: U.S. Geological Survey Open-File Report 91-518, 36 p.

Brahana, J.V., Haugh, C.J., Mahoney, L.N., and Hanchar, D.W., 1991, Hydrogeology of Arnold Air Force Base, Tennessee--Preliminary conceptual model of ground-water flow: U.S. Geological Survey Administrative Report, 69 p.

Vourvopoulos, G., Brahana, J.V., Nolte, E., Korschinek, G., Priller, A., and Dockhorn, B., 1990, ^{36}Cl measurements and hydrology of an acid injection site: Nuclear Instruments and Methods in Physics Research, Elsevier Science Publishers, B.V., B52, p. 451-454.

Brahana, J. V., and Hollyday, E. F., 1988a, Dry stream reaches in dense carbonate terranes--surface indicators of ground-water reservoir: Water Resources Bulletin, v. 24, no. 3, p. 577-580.

Brahana, J. V., and Hollyday, E. F., 1988b, Relation between the hydrogeology of carbonate rocks and the development of karst landforms: Proceedings of 21st Congress--International Association of Hydrogeologists, Guilin City, China, p. 270-275.

Brahana, J. V., and Mesko, T. O., 1988, Hydrogeology and preliminary assessment of regional flow in the upper Cretaceous and adjacent aquifers in the northern Mississippi embayment: U.S. Geological Survey Water Resources Investigations Report 87-4000, 65 p.

Brahana, J. V., Thrailkill, John, Freeman, Tom, and Ward, W. C., 1988, Comparative hydrogeology of carbonate rocks, in Back, William, Seaber, P. R., and Rosenshein, J. S., eds., Ground Water Hydrogeology: Volume of Decade of North American Geology (DNAG) Series, v. 0-2, ch. 38, p. 333-352.

Seaber, P. R., Brahana, J. V., and Hollyday, E. F., 1988, Appalachian Plateaus and Valley and Ridge: in Back, William, Seaber, P. R., and Rosenshein, J. S., eds., Ground Water Hydrogeology: Hydrogeology Volume of Decade of North American Geology (DNAG) Series, v. 0-2, ch. 23, p. 189-200

Brahana, J. V., 1987, The role of a multilayer model in refining understanding of deep regional ground-water flow in a tectonically active area: Proceedings of National Water Well Association Conference, Solving Ground-Water Problems with Models, v. 2, p. 1051-1070.

Brahana, J. V., Parks, W. S., and Gaydos, M. W., 1987, Quality of water from freshwater aquifers and principal well fields in the Memphis area, Tennessee: U.S. Geological Survey Water-Resources Investigations Report 87-4052, 22 p.

Brahana, J. V., and Bradley, M. W., 1986a, Delineation and description of the regional aquifers of Tennessee - The Central Basin aquifer system: U.S. Geological Survey Water-Resources Investigations Report 82-4002, 35 p.

Brahana, J. V., and Bradley, M. W., 1986b, Delineation and description of the regional aquifers of Tennessee - Highland Rim aquifer system: U.S. Geological Survey Water-Resources Investigations Report 82-4054, 38 p.

Brahana, J.V., and Bradley, M.W., and Macy, J.A., 1986, Delineation and description of the regional aquifers of Tennessee--The East Tennessee aquifer system: U.S. Geological Survey Water-Resources Investigations Report 82-4091, 30 p.

Brahana, J. V., Bradley, M. W., Macy, J. A., and Mulderink, Dolores, 1986, Delineation and description of the regional aquifers of Tennessee - Basal Sandstone aquifer west of the Valley and Ridge province: U.S. Geological Survey Water-Resources Investigations Report 82-762, 21 p.

Brahana, J. V., Macy, J. A., Mulderink, Dolores, and Zemo, Dawn, 1986, Delineation and description of the regional aquifers of Tennessee - Cumberland Plateau aquifer system: U.S. Geological Survey Open-File Report 82-338, 24 p.

Brahana, J. V., Bradley, M.W., and Mulderink, Dolores, 1986, Delineation and description of the regional aquifers of Tennessee - Tertiary aquifer system: U.S. Geological Survey Water-Resources Investigations Report 83-4011, 23 p.

Brahana, J. V., Mesko, T. O., Busby, J. F., and Kraemer, T. F., 1986, Ground-water quality data from the northern Mississippi embayment -- Arkansas, Missouri, Kentucky, Tennessee, and Mississippi: U.S. Geological Survey Open-File Report 85-683, 15 p.

Brahana, J. V., Mulderink, Dolores, and Bradley, M. W., 1986, Delineation and description of the regional aquifers of Tennessee - The Cretaceous aquifer system: U.S. Geological Survey Water-Resources Investigations Report 83-4039, 20 p.

Brahana, J. V., and Bradley, M. W., 1985, Delineation and description of the regional aquifer of Tennessee - The Knox aquifer system: U.S. Geological Survey Water-Resources Investigations Report 83-4012, 32 p.

Brahana, J. V., 1983a, Physiography, in May, V. Jeff and others, Hydrology of area 21, eastern coal province, Tennessee, Alabama, and Georgia: U.S. Geological Survey Open-File Report 82-679, p. 10-11.

Brahana, J. V., 1983b, Geology, in May, V. Jeff and others, Hydrology of Area 21, eastern coal province, Tennessee, Alabama, and Georgia: U.S. Geological Survey Open-File Report 82-679, p. 12-13.

Brahana, J. V., 1982, Underground water supply: Chapter 3 in Memphis Metropolitan Area Urban Water Resources Study, U.S. Army Corps of Engineers, Memphis, 30 p.

Brahana, J. V., 1982, Digital ground-water model of the Memphis Sand and equivalent units, Tennessee-Arkansas-Mississippi: U.S. Geological Survey Open File Report 82-99, 55 p.

Brahana, J. V., 1981, Ground-water occurrence, in May, V. Jeff and others, Hydrology of area 18, eastern coal province, Tennessee: U.S. Geological Survey Open-File Report 81-492, p. 42-43.

Brahana, J. V., 1978, Digital ground-water model of the Memphis Sand, and equivalent units, Tennessee, Arkansas, and Mississippi: U.S. Geological Survey Administrative Report, 80 p.

Brahana, J. V., and Dalsin, G. J., 1977, Water for industrial development in George, Hancock, Pearl River, and Stone Counties, Mississippi: Mississippi Research and Development Center Bulletin, 70 p.

Brahana, J. V., 1976, Beneath the Tenn-Tom: Water Spectrum, Winter 1975-76, p. 17-24.

Brahana, J.V., German, E. R., Davis, M. E., and Wasson, B. E., 1976, Predicted effects of the Tennessee-Tombigbee Waterway on the hydrologic environment - Mississippi - Alabama: First Supplemental Environmental Report - Continuing Environmental Series - Tennessee Tombigbee Waterway - Alabama and Mississippi, U.S. Army Corps of Engineers, Mobile, Ala, Vol. II-IV.

Rima, D. R., and Brahana, J. V., 1976, Hydrogeology of the Milan Arsenal area, Tennessee: U.S. Geological Survey Administrative Report, 89 p.

Brahana, J. V., 1974, Hydrologic monitoring in the area of the Tennessee -Tombigbee Waterway, Mississippi-Alabama--Ground-water levels and surface-water quality, April 1973 through June 1974: U.S. Geological Survey Administrative Report, 95 p.

Brahana, J. V., German, E. R., Davis, M. E., and Wasson, B. E., 1974, Predicted effects of the Tennessee-Tombigbee Waterway on the hydrologic environment, Mississippi-Alabama: U.S. Geological Survey Administrative Report, 88 p.

Brahana, J. V., Lambert, M. B., and Viele, G. W., (eds.), 1971, Field trip guide - Boone County, Missouri: Technical Education Services Press, 40 p.

Brahana, J. V., and Johnson, C. H., (eds.), 1970, Field trip guide - Boone County, Missouri; Technical Education Services Press, 40 p.

BIBLIOGRAPHY—Unpublished Academic Theses

Brahana, J. V., 1973, Systematic jointing in slightly deformed rocks: Columbia, Missouri, University of Missouri unpublished Ph.D. dissertation, 130 p.

Brahana, J. V., 1969, Gravity and tectonic analysis of the northwestern Illinois zinc-lead district: Columbia, Missouri, University of Missouri unpublished M.A. thesis, 82 p.

BIBLIOGRAPHY—Published Abstracts—Peer Reviewed, and Presentations

Brahana, Van, 2012, Far-field tectonic factors of the Ouachita orogeny and their influence on the karst hydrogeology of the southern Ozarks; published in Proceedings with Abstracts, Geological Society of America Annual Meeting, abstract.

Moore, Safarie, Ivey, Mack, and Brahana, J. Van, 2011, Comparative analysis of fecal coliform bacteria in springs within the Savoy Experimental Watershed: Proceedings of the National Association of Black Geologists and Geophysicists Annual Meeting, abstract.

Brahana, Van, and Pennington, Darrell, 2010, Observations and speculation on the role of the Potosi Formation on regional ground-water flow and large springs of the Ozark Plateaus, midcontinent U.S.: Geological Society of America Abstracts with Program, v. 42, no. 5.

Pennington, Darrell W. and Brahana, Van, 2010, A new hydrograph-decompostion methology for karst springs with recession coefficients that increase with time: Geological Society of America Abstracts with Programs, v. 42, no. 5.

Brahana, Van, Davis, Ralph, Hays, Phillip D., and Steele, Kenneth F., 2009, Flow characterization from epikarst and shallow bedrock springs across a range of hydrologic conditions, Savoy Experimental Watershed, Ozark Region, USA: International Congress of Speleology Proceedings, p. 1428

Brahana, J.V., 2008, The hydrogeology of thermal springs—Tectonic settings, origins, and necessary tools to document our understanding: Geological Society of America Abstracts with Programs, v. 40, no.3.

Brahana, John Van, Tennyson, Rodney, Terry, Jim, Hays, Phillip D., and Pollock, Erik, 2008, Reactivated basement faulting as a hydrogeologic control of hypogene speleogenesis in the southern Ozarks of Arkansas: Geological Society of America Abstracts with Programs, v. 40, no.3.

Hays, P.D., Kresse, Tim, Brahana, J. Van, and Bolyard, Susan, 2008, Influence of locally derived recharge on the water quality and temperature of springs in Hot Springs National Park, Arkansas: Geological Society of America Abstracts with Programs, v. 40, no.3.

Hollingsworth, E., Brahana, V., Inlander, E., and Slay, M., 2008, Karst Regions of the World (KROW)—Populating Global Karst Datasets and Generating Maps to Advance the Protection of Karst Species and Habitats Worldwide: Geological Society of America Abstracts with Programs, v. 40, no.3

Pennington, Darrell, and Brahana, John V., 2008, Investigation flow paths and mixing relationships in a shallow, mantled-karst aquifer using chemical analyses, geophysical well logs, and continuous monitoring of temperatures and water levels at the Savoy Experimental Watershed: Geological Brahana, J.V., Killingbeck, Jonathan J., Stielstra, Clare, Leh, Mansour, Murdoch, John, and Chaubey, Indrajeet, 2006, Elucidationg flow characteristics of epikarst springs using long-term records that encompass extreme hydrogeologic stresses: Geological Society of America Abstracts with Programs, v. 38, no.6.

Brahana, J.V., 2007, Medical geology, anomalous health distributions, and geologic control of transport mechanisms—A case study of arsenic in Northwest Arkansas: Geological Society of America Abstracts with Programs, v. 39, no.6.

Varnell, C.J. and Brahana, J.V., 2006, Establishing hydraulic connections between flooded underground coal mines using continuous monitoring of surface flood pulses: Geological Society of America Abstracts with Programs, v. 38, no.6.

Killingbeck, Jonathan J., and Brahana, J.V., 2006, Delineation of three contiguous karst spring basins and their daily evapotranspiration at the Savoy Experimental Watershed in Northwest Arkansas: Geological Society of America Abstracts with Programs, v. 38, no.5.

Laincz, Jozef, Hays, P.D., Ziegler, Sue, Winston, Byron, Murdoch, John F., Brahana, J.V., Steele, K.F., Chaubey, Indrajeet, and Davis, R.K., 2005, Characterization of nutrient processing at the field and basin scale in the mantled karst of the Savoy Experimental Watershed, Arkansas: : *in* Kuniansky, E.L., 2005, U.S. Geological Survey Karst Interest Group proceedings, Rapid City, South Dakota, September 12-15, 2005: U.S. Geological Survey Scientific Investigations Report 2005-5160, p. 153.

Leh, M.D., I. Chaubey, J. Murdoch and J.V. Brahana, 2005, Quantification of runoff-contributing areas in a pasture watershed -A field-scale approach: Proceedings of American Water Resources Association Annual Conference, Seattle, WA. November 7-10, 2005.

Leh, M.D., I. Chaubey, J. Murdoch and J.V. Brahana, 2005, Quantification of critical runoff contributing areas in a pasture watershed: Poster presented at t*he* Annual Conference of the Arkansas Water Resources Center. Fayetteville, AR. April 19, 2005.

Davis, R. K., Ting, Tiong Ee, Thoma, G., Brahana, J.V., Unger, T., Androes, D., and Perkins, R., 2005, Application of multiple tracers to elucidate complex transport phenomena in a karst spring system: Geological Society of America Abstracts with Programs, v. 37, no.5.

Chaubey, I., M.D. Leh, K.L. White, J. Murdoch and J.V. Brahana, 2005, Development of Field Scale Methodology to Identify Runoff Source Areas in a Pasture Dominated Watershed'. Proceedings of USDA-CSREES National Water Quality Conference, San Diego, CA. February 7-9, 2005.

Ting, Tiong Ee, Davis, R.K, Brahana, J.V., Hays, P.D., and Thoma, G., 2005, Application of multiple tracers to characterize complex sediment and pathogen transport in karst: *in* Kuniansky, E.L., 2005, U.S. Geological Survey Karst Interest Group proceedings, Rapid City, South Dakota, September 12-15, 2005: U.S. Geological Survey Scientific Investigations Report 2005-5160, p. 114.

Brahana, John V., Hays, Phillip, Davis, R.K., Kresse, T.M., and Sauer, T.J, 2004, Case studies from a long-term karst research site illustrating data requirements necessary to adequately characterize and represent flow in karst aquifers at meaningful scales: Geological Society of America Abstracts with Programs, v. 36, no. 5, p. 32.

DeFauw, S.L., Hays, P. D., Brye , K.R., Brahana, J.V., and T. J. Sauer, 2004, Hydrodynamics of an Experimental Silvopastoral Field in the Ozark Plateau of Northwestern Arkansas, USA. Poster Abstract for the First World Congress of Agroforestry, 27 June-02 July 2004, Orlando, FL.

Thomas A.L., DeFauw, S.L., Sauer, T.J., and D. Brauer, 2004, Hydrologic Influences on the Growth of Young Grafted Black Walnut Trees. Poster Abstract for the First World Congress of Agroforestry, 27 June-02 July 2004, Orlando, FL.

Sauer, T. J., J. V. Brahana, J. V. Skinner, S. L. DeFauw, P. D. Hays, W. K. Coblentz, D. C. Moffitt, J. L. Robinson, T. A. James, and K. X. Hickie. 2003. Nutrient Assimilation by a Silvopastoral System Receiving Annual Applications of Poultry Litter. Poster Abstract for 8th North American Agroforestry Conference, 22-25 June 2003, Corvallis, OR.

McGuire, T., Varnell, Curtis J., Rogers, J.A., Thawaba, S., and Brahana, J. Van, 2003, The Effects of Rice Production on Water Quality and Growth of an Invasive Plant Species in the Wetlands of Palo Verde National Park, Costa Rica: Poster, Arkansas Environmental Federation Annual Meeting, Hot Springs, Arkansas, October 21-23.

McGuire, T., Varnell, Curtis J., Rogers, J.A., Thawaba, S., and Brahana, J. Van, 2003, The Effects of Rice Production on Water Quality and Growth of an Invasive Plant Species in the Wetlands of Palo Verde National Park, Costa Rica: Poster, University of Arkansas Center for Advanced Spatial Technologies, Fayetteville, Arkansas, November 19.

Thawaba, S., Varnell, Curtis J., and Brahana, J. Van, 2003, Anthropogenic Impact on Water Quality—A Case Study from the West Bank, Palestine: Poster, Arkansas Environmental Federation Annual Meeting, Hot Springs, Arkansas, October 21-23.

Thawaba, S., Varnell, Curtis J., and Brahana, J. Van, 2003, Anthropogenic Impact on Water Quality—A Case Study from the West Bank, Palestine: Poster, University of Arkansas Center for Advanced Spatial Technologies, Fayetteville, Arkansas, November 19.

Varnell, Curtis J., and Brahana, J. Van, 2003, The Social, Economic, and Political Impact of Coal Mining in the Arkansas River Valley: Plains Anthropological Conference, Fayetteville, Arkansas, October 24, 2003.

Brahana, J.V., Davis, R.K., Sauer, T.J., Ting, Tiong Ee, Al-Rashidy, Said, Whitsett, Kelly, and Al-Qinna, Mohammed, 2002, Recurring, multicomponent ground-water tracing experiments at a well characterized basin in mantled karst--Lessons from the Savoy Experimental Watershed: Geological Society of America, Abstracts with Programs, v. 34, no. 6, p. 158-159.

Rutledge, E.M., Owens, P.R., Steele, M.A., Morrison, A.S., DeFauw, S.L. and J.V. Brahana. 2002. Relict Redoximorphic Features in the Soils of the Southern Mississippi Valley Alluvium, USA. Poster Abstract for the 17th World Congress of Soil Science, 14-21 August 2002, Bangkok, Thailand.

Ting, Tiong Ee, Thoma, G.J., Davis, R.K., and Brahana, J.V., 2002, Development of Europium-labeled Escherichia Coli as a bacterial tracer for water-quality studies: Geological Society of America, Abstracts with Programs, v. 34, no. 6, p. 157.

Whitsett, K.S., Davis, R.K., Thoma, G.T., Tiong-Ee, T. and Brahana, J.V., 2001, Sediment and bacterial tracing in mantled karst of northwest Arkansas: Geological Society of America, Abstracts with Programs, v. 33, no. 6.

Ting, Tiong-Ee, Whitsett, K.S., Thoma, G.T., Davis, R.K., Brahana, J.V., 2001, Sediment and bacterial tracing in mantled karst of northwest Arkansas: EOS, Transactions of the American Geophysical Union, v. 82, no 47, abstract H41B-0290.

Brahana, J.V., Davis, R.K., and Marshall, D., 2000, Integrating empirical and theoretical considerations into a viable conceptual model of pathogen transport and storage in shallow karst aquifers of the southern Ozarks: Geological Society of America, Abstracts with Programs, v. 32, no. 7, p. A432.

Brahana, J.V., Sauer, T.J., Kresse, T.M., and Murdoch, John, 2000, Hydrogeologic and water-quality effects of brittle fractures in shallow spring basins of the Springfield Plateau in northwestern Arkansas: Geological Society of America, Abstracts with Programs, v. 32, no. 3, p. A4.

Cole, J.H., and Brahana, J.V., 2000, The University of Arkansas Savoy Field Research Facility: A developmental status report: Geological Society of America, Abstracts with Programs, v. 32, no. 3, p. A6.

Little, P.R., Brahana, J.V., Sauer, T.J., and Cole, J.H., 2000, The role of interflow in a mantled-karst aquifer, Basin 2, Savoy Experimental Watershed: Geological Society of America, Abstracts with Programs, v. 32, no. 3, p. A34.

Russell, R.A., Brahana, J.V., and Cole, J.H., 2000, Ground-water and surface-water interaction in mantled karst: Geological Society of America, Abstracts with Programs, v. 32, no. 3, p. A40.

Al-Rashidy, Said, Shirley, Tracy, Brahana, J.V., Sauer, T.J., Kresse, Tim, and Woodstrom, Freya, 1998, Application of continuous hydrologic monitoring to characterize dominant groundwater flow and transport in mantled karst terrane, Northwest Arkansas: in Gambling with groundwater--Physical, chemical, and biological aspects of aquifer-stream relations, Abstracts with Program of the International Association of Hydrogeologists Congress XXVIII and the Annual Meeting of the American Institute of Hydrology, Las Vegas, p. 19-20.

Brahana, J.V., 1998, Integrated hydrochemical methods to constrain conceptual models of deeply-buried groundwater flow boundaries: in Gambling with groundwater--Physical, chemical, and biological aspects of aquifer-stream relations, Abstracts with Program of the International Association of Hydrogeologists Congress XXVIII and the Annual Meeting of the American Institute of Hydrology, Las Vegas, p. 23-24.

Brahana, J.V., 1997, Aqueous geomicrobiology--The new frontier of chemical hydrogeology: Geological Society of America, Abstracts with Programs, v. 29, no. 6, p. A288.

Brahana, J.V., Hays, P.D., Stanton, T.M., Sauer, T.J., and Coffey, K., 1997, Controlling influences affecting surface-water and ground-water interaction at the Savoy Experimental Watershed (Illinois River) Northwest Arkansas: 7th Biennial State Water Conference and 10th Annual Arkansas Ground Water Association and American Water Resources Association Joint Symposium , Proceedings, Little Rock, AR, p.10.

Orndorff, H.A., Davis, Ralph K., and Brahana, John V., 1997, Comparison of shallow aquifer flow systems in Northwest Arkansas: Geological Society of America, Abstracts with Programs, v. 29, no. 6, p. A328.

Peterson, E.W., Davis, R.K., and Brahana, J.V., 1997a, The use of regression analysis and soil coring in monitoring nitrate-nitrogen concentrations in Stafford Spring, Carroll County, Arkansas: Geological Society of America, Abstracts with Programs, v. 29, no. 6, p. A182.

Peterson, E.W., Davis, R.K., and Brahana, J.V., 1997b, The use of regression analysis and soil coring in monitoring nitrate-nitrogen concentrations in Stafford Spring, Carroll County, Arkansas: 7th Biennial State Water Conference of Arkansas Ground Water Association and American Water Resources Association, Proceedings, Little Rock, AR, p. 14.

Sinor, N.J., Davis, Ralph K., and Brahana, J.V. 1997a, Storm event analysis of two Washington County springs in Northwest Arkansas to determine the impacts to groundwater quality from land applied animal wastes: Geological Society of America, Abstracts with Programs, v. 29, no. 6, p. A329.

Sinor, N.J., Davis, Ralph K., and Brahana, J.V. 1997b, Dye-trace analyses of two spring watersheds in Washington County, Arkansas: EOS, Transactions of the American Geophysical Union, Fall 1997 meeting, San Francisco, CA.

Sauer, T.J., Brahana, J.V., Kresse, T.M., Moore, P.A., Jr., Logsdon, S.D., Coffey, K.P., Daniel, T.C., Maxwell, C.V., West, C.P., and Braum, S.M., 1997, Using landscape position and soil information to optimize manure application: Soil and Water Conservation Society Proceedings, Managing Manure in Harmony with the Environment and Society, Ames, IA.

Sauer, T.J., Moore, P.A., Brahana, J.V., and Coffey, K.P., 1997, Characterizing the surface hydrology at different landscape positions adjacent to the Illinois River: 7th Biennial State Water Conference and 10th Annual Arkansas Ground Water Association and American Water Resources Association Joint Symposium , Proceedings, Little Rock, AR, p. 12.

Bostian, Rick, and Brahana, J.V., 1996, Regional tectonic and structural control on the hydrogeology of the Boone-St. Joe aquifer, Northwest Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 5-6.

Brahana, J.V., 1996a, The role of fractures as tectonically-controlled ground-water flow boundaries in deep aquifers of the northern Mississippi embayment: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 6.

Brahana, J.V., 1996b, Arkansas ground water in the 21st Century--New directions for an old science: Arkansas Ground Water Association and American Water Resources Association Joint Symposium, Proceedings, p.7.

Brahana, J.V., Davis, Ralph K., Stanton, G.P., Doherty, E.H., and Bartholmey, E.C., 1996, A conceptual model for preliminary spring-basin delineation in the mantled karst terrane of the southern Ozarks: Geological Society of America, Abstracts with Programs, v. 28, no. 7, p. 344.

Doherty, Eloise, and Brahana, J.V., 1996a, Use of remote-sensing data and GIS models for mapping hydrogeology and structure in the karst terraine of northwestern Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 11.

Doherty, Eloise, and Brahana, J.V., 1996b, Delineation of structural controls on the Boone-St. Joe aquifer of northwestern Arkansas using GIS-based predictive modeling, remotely-sensed data, and ground-truth determination: EOS, v. 77, no. 17 (April 23), p. S117.

Ford, G.L., and Brahana, J.V., 1996, U.S. Geological Survey's self-supporting hydrogeologic research office: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 13-14.

Monk, Richard G., Davis, Ralph K., and Brahana, John V., 1996a, Fault control of ground-water flow to Decatur spring, Northwest Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 54.

Monk, Richard G., Davis, Ralph K., and Brahana, J. V., 1996b, Waste management and its effects on Decatur spring, Northwest Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 7, p. 345.

Roggio, Robin G., Ford, Grace L., and Brahana, J.V., 1996, Hydrogeologic controls of the springs in northern Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 1, p. 61.

Stanton, Gregory P., and Brahana, J. Van, 1996, Structural control on hydrogeology of a mantled karst aquifer in northwestern Arkansas: Geological Society of America, Abstracts with Programs, v. 28, no. 7, p. 344.

Bartholmey, E.C., Martin, J.W., Kresse, T.M., and Brahana, J.V., 1995, Influence of fractures and faults on the hydrogeology of springs in the Springfield Plateau of northwestern Arkansas: Geological Society of America, Abstracts with Programs, v. 27, no. 6, p. A-100.

Brahana, J.V., 1995a, Field Hydrogeology--Theory, techniques, and applications or How we spent our summer vacation: University of Arkansas Teaching Academy, 3rd Annual Teaching and Research Ideas Exchange Workshop, Abstracts, p. 50.

Brahana, J.V., 1995c, Hydrogeological delineation and continuous monitoring of the shallow karst aquifers of northen Arkansas--Practical implications for land-use planning: Proceedings of the 6th Biennial State Water Conference and 8th Annual American Water Resources Association and Arkansas Ground-Water Association Joint Symposium, p. 21-22.

Hays, T.S., Scott, H.D., Parker, D.G., and Brahana, J.V., 1995, An assessment of potential phosphorus contamination in the upper Illinois River watershed: Southern Association of Agricultural Scientists, Abstracts for 92nd Annual Meeting, New Orleans, Louisiana.

Martin, Jerry W., and Brahana, J.V., 1995, Comparative hydrogeology of large springs of the Springfield Plateau in northwestern Arkansas: Geological Society of America, Abstracts with Programs, v. 27, no. 6, p. A-181.

Stanton, G.P., Brahana, J.V., and Hays, P.D., 1995, Field Hydrogeology--Theory, techniques, and applications or How we spent our summer vacation: Geological Society of America, Abstracts with Programs, v. 27, no. 6, p. A-148

Walters, Dorothy, and Brahana, J.V., 1995, Methodology development and preliminary field assessment of infectious bursal disease virus as a tracer in shallow karst aquifers: University of Arkansas Teaching Academy, 3rd Annual Teaching and Research Ideas Exchange Workshop, Abstracts, p. 49.

Brahana, J.V., and Martin, J.W., 1994, Temporal variability in discharge and water quality from large springs in northwestern Arkansas--Implications for data collection: Geological Society of America Abstracts with Programs, v. 26, p. A-286.

Brahana, J.V., and Walters, Dorothy, 1994, Methodology development and preliminary field assessment of host-specific viruses as tracers in shallow karst aquifers: Conference Proceedings of Breakthroughs in Karst Geomicrobiology and Redox Geochemistry, Colorado Springs, Colorado, p.2-3.

Brahana, J.V., 1993, Tectonic control of regional ground-water flow in deeply buried aquifers of the northern Mississippi embayment, Missouri and Arkansas: Geological Society of America Abstracts with Programs, v.25, p 9.

Brahana, J.V., 1993, Conceptual model of hydrogeology in the Ozark Plateaus Region during Pennsylvanian Time: Geological Society of America Abstracts with Programs, v.25, p. 9.

Brahana, J.V., 1993, Dominant factors affecting ground-water flow and transport in the carbonate-rock aquifers of Northwestern Arkansas, in Proceedings of Abstracts, December 9, 1993, Sixth Annual AWRA/AGWA Symposium, Ground Water Issues of the 90's--Quantity and Quality, p. 5-6.

Fanning, Bobby J., and Brahana, J.V., 1993, Hydrogeologic factors affecting cavern morphology within rocks of Mississippian Age in Northwestern Arkansas: Geological Society of America Abstracts with Programs, v. 25, p. 13.

Brahana, J.V., Hollyday, E.F., Bradley, M.W., and Hileman, G.E., 1991, Lithologic controls on the evolution of permeability in chart-bearing carbonate rocks of Mississippian Age from the southern United States: Geological Society of America Abstracts with Programs, v. 23, p. A266.

Hollyday, E.F., Hileman, G.E., and Brahana, J.V., 1991, Relation of potential yield of water wells to depositional sequences in Paleozoic Rocks of the Valley and Ridge Province, Maryland, New Jersey, and Pennsylvania: Geological Society of America Abstracts with Programs, v. 23, p. A26-A27.

Mahoney, E.M., and Brahana, J.V., 1991, Inhomogeneity and anisotropy in variably thick, non-indurated coastal plain confining units in the Memphis Area--facts or faults?: Geological Society of America Abstracts with Programs, v.23, p. A323.

Hollyday, E. F., Brahana, J. V., and Pavlicek, D. J., 1989, Conceptualization of ground-water flow in the Valley and Ridge province, New Jersey to Alabama: Geological Society of America Abstracts with Programs, v. 21, no. 7, p. A41.

Vourvopoulos, G., Brahana, J. V., Nolte, E., Korschinek, G., Priller, A., and Dockhorn, B.,1990, ^{36}Cl measurements and the hydrology of an acid injection site: Accelerator Mass Spectrometry Abstracts, Annual meeting--Paris.

Vourvopoulos, G., Brahana, J. V., Kraemer, T. F., Wolfli, W., Synal, M., Sutter, A., 1989, Applied research using chlorine-36 as a hydrogeologic tool: U.S. Geological Survey Open-File Report 89-409, p 104. (Second National Symposium on Water Quality)

Seaber, P. R., and Brahana, J. V., 1989, Application of regional aquifer coefficients to evaluate hydrogeologic controls on permeability and porosity: International Geological Congress Abstracts, v. 3, p. 3-64 - 3-65.

Brahana, J. V., and Hollyday, E. F., 1988, Dry stream reaches in dense carbonate rock terranes--surface indicators of ground-water reservoirs: First Tennessee Hydrology Symposium Proceedings, p. 7,

Brahana, J. V., and Vourvopoulos, George, 1988, Regional ground-water flow boundary delineation using radioisotopes: American Institute of Hydrology Conference Abstracts--Advances in Ground-Water Hydrology, p. 20.

Broshears, R. E., and Brahana, J. V., 1988, A risk assessment algorithm for hazardous and radioactive waste sites: Geological Society of America Abstracts with Programs, v. 20, no. 4, p. 255.

Kraemer, T. F., and Brahana, J. V., 1988, Radioisotopes of chlorine, uranium, and radium used in defining tectonically controlled ground-water flow boundaries: Geological Society of America Abstracts with Programs, v. 20, no. 7, p. A364.

Brahana, J. V., 1985, The use of a ground-water flow model as an aid to water management in the Memphis area, Tennessee, metropolitan area (abs.): Proceedings, Mississippi Water Resources Research Institute.

Brahana, J. V., 1983, Techniques for defining the hydrogeologic environment and their application to studies of ground-water contamination: Proceedings, First Atlantic Workshop, Organic Chemical Contamination of Ground Water.

Brahana, J. V., Reesman, A. L., and Reesman, R. H., 1982, Stable carbon isotopes as a tool for interpreting the origin of sodium-bicarbonate ground water in Cretaceous and Tertiary aquifers in the northern Mississippi embayment [abs.]: Geological Society of America Abstracts with Programs, v. 14, no. 7, p. 451.

Hollyday, E. F., Brahana, J. V., Harvey, E. J., and Skelton, John, 1981, Comparative regional hydrogeology of three Lower Paleozoic carbonate aquifer systems of Missouri, Kentucky, and Tennessee: Geological Society of America Abstracts with Programs, v. 13, no. 7, p. 475.

Burchett, C. R., Brahana, J. V., and Hollyday, E. F., 1980, The occurrence of ground water in relation to facies within the Fort Payne Formation in Tennessee: Geological Society of America Abstracts with Programs, p. 395.

Hollyday, E. F., and Brahana, J. V., 1980, Karst hydrogeology of the Salem Plateau of Central Missouri compared to the Central Basin of Tennessee: Geological Society of America Abstracts with Programs, p. 448.

Brahana, J. V., and Davis, S. N., 1973, Effect of short-term stress on jointed rock near the land surface: Geological Society of America Abstracts with Programs, v. 5, no. 5, p. 379-380.

Brahana, J. V., 1971, Localization of strain along joints in bedrock: Transaction of Missouri Academy of Sciences, v. 5, p. 138.

Brahana, J.V., 1969, Gravity and tectonic analysis of northwestern Illinois zinc-lead district [abs.]: Transactions of Missouri Academy of Sciences, v. 3, p. 104.

EXTERNAL FUNDING GENERATED--Partial

Title: Quantitative Evaluation of Processes and Controls Affecting Flow and Transport in Carbonate Rock Aquifers of Northern Arkansas
Funding Agency: U.S. Geological Survey
Amount: $46,800
Collaborators: W.L. Manger, PI; and J.V. Brahana, proposal author and director.

Title: The Effect of Best Management Practices on Water Quality in Springs of Northwest Arkansas--Hydrogeologic Delineation of Springhead Protection Areas
Funding Agency: Arkansas Soil and Water Conservation Commission
Amount: $40,000
J.V. Brahana, PI

Title: Temporal Variability of Water Quality in the Carbonate Aquifers of Northwestern Arkansas
Funding Agency: Arkansas Department of Pollution Control and Ecology
Amount: $45,000
J.V. Brahana, PI

Title: Integrated Spatial Modeling of Ground-Water Vulnerability to Pesticide Contamination in the Arkansas Delta.
Funding Agency: U.S. Department of Agriculture
Amount: $222,000
Collaborators: H. D. Scott, co-PI; Hangsheng Lin, co-PI; V. Quisenberry, and J.V. Brahana,

Title: The Effect of Best Management Practices on Water Quality in Springs of Northwest Arkansas--Hydrogeologic Delineation of Springhead Protection Areas (continuation)
Funding Agency: Arkansas Soil and Water Conservation Commission
Amount: $20,000
J.V. Brahana, PI

Title: Temporal Variability of Water Quality in the Carbonate Aquifers of Northwestern Arkansas (continuation)
Funding Agency: Arkansas Department of Pollution Control and Ecology
Amount: $14,000
J.V. Brahana, PI

Title: Quantitative Evaluation of Processes and Controls Affecting Flow and Transport in Carbonate Rock Aquifers of Northern Arkansas
Funding Agency: U.S. Geological Survey
Amount: $23,650
Collaborators: S.K. Boss, PI; and J.V. Brahana, proposal author and director.

Title: Preliminary Quantification of Hydrologic and Nutrient-Flux Budgets at the Savoy Experimental Watershed, Illinois River Basin, Northwest Arkansas
Funding Agency: Arkansas Department of Pollution Control and Ecology
Amount: $25,000
J.V. Brahana, PI

Title: Quantitative Evaluation of Processes and Controls Affecting Flow and Transport in Carbonate Rock Aquifers of Northern Arkansas (continuation)
Funding Agency: U.S. Geological Survey
Amount: $23,650
Period: October 1997 to September 1998
Collaborators: S.K. Boss, PI; and J.V. Brahana, proposal author and director.

Title: Preliminary Quantification of Hydrologic and Nutrient-Flux Budgets at the Savoy Experimental Watershed, Illinois River Basin, Northwest Arkansas
Funding Agency: Arkansas Department of Pollution Control and Ecology
Amount: $25,000
Period: June 1997 to October 1998
J.V. Brahana, PI

Title: Investigating Environmental Quality and Trophic Dynamics in Sensitive Subterranean Habitats of the Ozark Plateaus.
Funding Agency: U.S. Fish and Wildlife Service
Amount: $21,422 (awarded)
Period: August 2000 through October 2001
Art Brown and J.V. Brahana, PIs

Title: Assessment of Using Flooded Coal Mines As a Safe, Viable Supplement to Existing Drinking-Water Supplies in the Area of Greenwood, Arkansas
Funding Agency: City of Greenwood, Arkansas
Amount: $40,382 (awarded), renewal $25,000 (awarded), renewal $24,882 (awarded)
Period: August 2001 through September 2004
J.V. Brahana, PI

Title: Ground-Water Vulnerability Delineation Using Neural Networks, Fuzzy Logic and Neurofuzzy Methods.
Funding Agency: U.S. Department of Agriculture (National Resources Initiative).
Amount: $305,000 (awarded).
Period: September 2001 through September 2004.
Barnali Dixon, H.D. Scott, J.C. Dixon, A. Mauromoustakos, and J.V. Brahana, PIs

Title: Characterization of the Hydrogeology of Prairie Grove, Arkansas, Emphasizing Ground-Water/Surface-Water Interaction, Flow, and Water Quality.
Funding Source: Lundy and Davis, L.L.B.
Amount: $81,375 (awarded). April 2002 through June 2003.
J.V. Brahana, P.I.

Title: Effectiveness of Engineered Solid-Waste Landfills in Karst—Processes, Mechanisms for Sampling, and Transport Assessment of the Tontitown Landfill
Funding Agency: Citizen's Group through Arkansas Department of Environmental Quality
Amount: $75,000 (funded). January 2004 through December 2006
Ralph Davis and J.V. Brahana, PIs

Title: Hydrodynamics of a Karst Soil Catena in the Ozark Plateau, USA
Funding Agency: U.S. Geological Survey
Amount: $19,500 (funded). January 2004 through August 2005
J.V. Brahana and P.D. Hays, PIs

Title: Water Quality Sampling, Analysis and Annual Load Determinations for Nutrients and Sediment at the Arkansas Highway 45 Bridge on the White River just above Beaver Lake
Funding Agency: Arkansas Natural Resources Commission
Amount: $15,467 (funded). July 2006 through June 2007
M.A. Nelson and J.V. Brahana, PIs

Title: A Hydrogeological Investigation of Nitrate Porcessing within a Karst Watershed
Funding Agency: U.S. Geological Survey
Amount: $17,818 (funded). March 1, 2006 through February 28, 2007
J.V. Brahana, PI

Title: Water Quality Sampling, Analysis and Annual Load Determinations for Nutrients and Solids at the Washington County Road 76 Bridge on Ballard Creek
Funding Agency: Arkansas Natural Resources Commission
Amount: $15,467 (funded). July 2006 through June 2007
M.A. Nelson, J.V. Brahana, and K.F. Steele, PIs

Title: Interdisciplinary Honors Colloquium in Environmental Justice
Funding Agency: Honors College, University of Arkansas
Amount: $24,745 (funded). June 2006 through June 2007
J.V. Brahana and Janie Hipp, PIs

Title: The Karst Conservation Toolbox: Advancing the Protection of Karst Species and Habitats Globally
Funding Agency: The Nature Conservancy
Amount: $50,000 (funded) August 2007 through December 2008
E.Inlander, M. Slay, J.V. Brahana, and J.A. Tullis

Title: Water, Carbon, and Nutrient Cycling in a Critical Zone Developed on Karst: Mid-Continent Karst Critical Zone Observatory
Funding Agency: National Science Foundation
Amount: $5,000,000 (requested) 10/01/13 through 9/30/18 (proposal pending)
Ralph Davis, PI, + 4 co-PIs + 6 senior researchers (including Brahana)

TEACHING

Honors Course in Geology of Our National Parks, University of Arkansas, Fayetteville, Professor, Spring Semester, 2003-2012.

Course in Environmental Justice, University of Arkansas, Fayetteville, Professor, Spring Semester 2003-2012.

Course in Engineering Geology, University of Arkansas, Fayetteville, Professor, Fall Semester 2001 through 2004.

Course in Field Geology. University of Arkansas, Dillon, Montana, Professor, Summer Semester 2001-2011.

Course in General Geology. University of Arkansas, Fayetteville, Professor. Fall Semester 2000 through 2002.

Course in Karst Hydrogeology, University of Arkansas, Fayetteville, Professor, Fall Semester 1996 through 2012.

Course in Field Hydrogeology, University of Arkansas, Fayetteville, Adjunct. Prof. and Director, Summer Semester 1994 through 2006

Courses in Introductory Hydrogeology, University of Arkansas, Fayetteville, Adjunct. Prof. and Professor,
Spring Semester 1991 through 2011

Research Problems--Quantitative Hydrogeology and Flow Modeling, University of Arkansas Fayetteville, Adjunct Prof., Spring 1991

Courses in Advanced Hydrogeology, University of Arkansas, Fayetteville, Adjunct. Prof., Fall Semester 1990 through 1994

Course in Environmental Geology. Vanderbilt University, Adjunct Prof., Spring 1983

Course in Structural Geology. Vanderbilt University, Adjunct Prof., Spring 1981.

Course in Geomorphology. University Tennessee-Nashville, Adjunct Asst. Prof., Winter 1979.

Course in Geomorphology (with Dr. R. S. Parker). Vanderbilt University, Adjunct Prof., Spring 1978.

Course in Hydrology. University Southern Mississippi, as Adjunct Assistant Prof., Spring 1975.

GRADUATE-STUDENT RESEARCH SUPERVISED AND FUNDING SUPPORT PROVIDED, M.S.

NAME	PROJECT	STATUS
Liz Mahoney	Ground-Water Flow Modeling to Refine Hydrogeologic Concepts-Memphis area Vanderbilt Univ.	M.S. Completed 1989 (GEOL) ***Support***
Grace Ford	Factors Controlling Hydrocarbon Transport in a Fractured-Rock Aquifer	M.S. Completed 1992 (GEOL) ***Support***
Greg Stanton	Processes and Controls Affecting Anisotropic Flow in Boone-St. Joe Limestone, Northwest Arkansas	M.S. Completed 1993 (GEOL) ***Support***
Bobby Fanning	Geospeleologic Analysis of Karst and Cave Development Within the Springfield Plateau of Northwest Arkansas	M.S. Completed 1994 (GEOL) ***Support***
Scott Smith	Ground-Water Quality and Transport Processes in the Boone-St. Joe Aquifer Near Two Landfills, Benton County, Arkansas	M.S.—Completed 1998 (GEOL) ***Support***
Said Al-Rashidy	Hydrogeologic Controls of Ground-Water Flow and Transport in the Shallow Mantled Karst Aquifer, Copperhead Spring, Basin 1, Savoy Experimental Watershed	M.S.—Completed 1999 (GEOL)
Jerry Martin	Control on Groundwater Flow and Quality in the Boone-St. Joe Aquifer, Big Spring Basin. North-Central Benton County, Arkansas	M.S.--Completed 1999 (GEOL) ***Support***
E. C. Bartholmey	Hydrogeology and Structural Control of the Stroud Spring Basin, Benton County, Arkansas	M.S.—Completed 2001 (GEOL) ***Support***
Ethan Reese-Whiting	Numerical Simulation of the Cave Springs Ground-Water Basin in Northwestern Arkansas – Feasibility at Watershed Scales	M.S.--Completed 2003 (GEOL)
Matt Edmonds	Hydrogeology and Geochemical Processes Affecting Water Quality in the Prairie Grove Area, Arkansas	M.S.—Completed 2004 (GEOL) ***Support***
Susan Bolyard	Hydrogeology and Geochemical Processes and Water-Quality Evolution Related to the Parsons Landfill near the Beaver Reservoir Area, Arkansas	M.S.—2007 (GEOL)
Emily Hollingsworth	GIS Utilization for Generating a Karst Map of the World	M.S.—2009 (GEOS) ***Support***
Darrell Pennington	Application of Continuous Monitoring of Water Levels and Temperatures of Wells and Springs at Savoy Experimental Watershed to Elucidate Multicomponent Mixing in a Shallow, Mantled Karst Environment	M.S.—2011 (GEOL) ***Support***

GRADUATE-STUDENT RESEARCH SUPERVISED AND FUNDING SUPPORT PROVIDED, M.S.--Continued

NAME	PROJECT	STATUS
Jennifer Adkins	Assessment of groundwater flow in the Edwards aquifer through the Knippa Gap in Uvalde County, Texas	M.S.—2013 (GEOL) ***Support***
Paul Little	Hydrogeologic Factors Controlling Groundwater Flow in Basin 2, Savoy Experimental Watershed, Northwest Arkansas	M.S.—Inactive (GEOL) ***Support***
Keri Walker Cooper	Application of Surface Geophysics to Understanding Ground-Water Flow in Mantled Karst, Savoy Experimental Watershed, Northwest Arkansas	M.S.—Inactive (GEOL) ***Support***
Eloise Doherty	Remote Sensing and Image-Processing Application to Mapping of Hydrogeologic Resources, with Integration of GIS Data Bases	M.S.--Deceased (GEOL) ***Support***
Tracy Shirley	Characterization of the Groundwater Flow in Langle Spring Basin of the Savoy Experimental Watershed in the Mantled Karst of Northwest Arkansas	M.S.--Inactive (GEOL) ***Support***
Wendy Karna	Delineation of the Elm Springs Groundwater Basin, Benton and Washington Counties, Arkansas	M.S.--Inactive (GEOL) ***Support***
Dorothy Walters	Methodology Development and in situ Assessment of Infectious Bursal Disease Virus and Other Host-Specific Viruses in Karst	M.S.--Inactive (GEOL) ***Support***

INTERDISCIPLINARY GRADUATE-STUDENT RESEARCH SUPPORT AND THESIS COMMITTEE INVOLVEMENT, M.S.

NAME	PROJECT	STATUS
Andy Austin	Ground-Water Quality Variations by Season, Madison County, Arkansas	M.S.--Completed 1991 (GEOL) Advisor-Steele
Chuck Smith	Ground-Water Quality Variations by Season, Benton County, Arkansas	M.S.--Completed 1992 (GEOL) Advisor-Steele
Ward McMurtrey	Structural Geology in the Vicinity of Crowleys Ridge, Arkansas	M.S.--Completed 1993 (GEOL) Advisor-VanArsdale
Tina Hays	Assessment of Potential Phosphorus Contamination in the Upper Illinois River Watershed	M.S.--Completed 1995 (SOILS) Advisor-Scott ***Support***
Paul McKee	Modeling Hydrology and Solute Transport at Two Sewage Lagoons, Ft. Chaffee Military Reservation, Arkansas	M.S.—Completed 1995 (CVEG) Advisor-Moore ***Support***
Matt Parse	Relation of Regolith Thickness to Karst Processes in the Springfield Plateau Petroleum Hydrocarbon Contaminated Soil	M.A.—Completed 1995 (GEOG) Advisor-Dixon ***Support***
Prasad Chirumamilla	Numerical Simulation of Ground-Water Flow and Transport at Wurtsmith Air Force Base	M.S.--Completed 1995 (CVEG) Advisor-Moore
Will Clayton	Water Quality and Pesticide Contamination in Craighead and Pointsett Counties, Arkansas	M.S.--Completed 1995 (GEOL) Advisor-Steele
Don Nichols	Bioremediation Potential of Microbial Populations in the Rhizosphere of a Petroleum Hydrocarbon Contaminated Soil	M.S.—Completed 1995 (SOILS) Advisor-Wolf
Jonathan Miller	Pesticide Occurrence in Sediments and Water St. Francis Sunklands, Crittenden County	M.S.—Completed 1996 (GEOL) Advisor- Guccione ***Support***
Lynne Hehr	Fluvial Architecture of Big Lake Sunklands	M.S.—Completed 1996 (GEOL) Advisor-Guccione

INTERDISCIPLINARY GRADUATE-STUDENT RESEARCH SUPPORT AND THESIS COMMITTEE INVOLVEMENT, M.S.--Continued

NAME	PROJECT	STATUS
Ginny Boyd Adams	Metabolic Rates and Life History of Aquatic Organisms Inhabiting Logan Cave Stream in Northwest Arkansas	M.S.—Completed 1996 (BIOL) Advisor-Johnson
Zack Brown	Population Dynamics of Ozark Cavefish in Logan Cave, Benton County, Arkansas	M.S.—Completed 1996 (BIOL) Advisor-Johnson
David Marshall	Effect of Resuspending Fecal Coliforms into the Water Column	M.S.—Completed 1996 (GEOL) Advisor-Steele
Sean Chenoweth	Geomorphic Quantification of Karst Development in the Ponca 7.5-Minute Quadrangle, Arkansas	M.A.—Completed 1997 (GEOG) Advisor-Dixon ***Support***
Steve Hill	Water Quality and Pesticide Contamination in Woodruff County, Arkansas	M.S.—Completed 1997 (GEOL) Advisor-Steele ***Support***
Rick Monk	Effect of Best-Management Practices on the Karst Terrane near Decatur, Benton County, Arkansas	M.S.—Completed 1997 (GEOL) Advisor-Davis ***Support***
Nasser Fakhro	Identifying Depression Suitability for Ground-Water Recharge in the State of Qatar Using GIS	M.A.— Completed 1999 (GEOG) Advisor-Cleaveland
Jaysson Funkhouser	Characterization of the Hydrogeology of Northern Arkansas, and Effects of Best- Management Practeces on Water Quality	M.S.--Completed 1999 (CVEG) Advisor-Sorens ***Support***
Ana Ghanem	Characterization of DNAPLs in Water- Saturated Porous Media Using Partitioning Fluorescent Dyes	M.S.—Completed 1999 (CVEG) Advisor-Sorens
Freya Woodstrom	Analysis of Karst Springs to Evaluate Potential Nitrate and Bacterial Contamination, Groundwater, Northeast Part of Savoy Experimental Watershed, Benton County, AR	M.A.—Completed 1999 (GEOG) Advisor-Dixon ***Support***

INTERDISCIPLINARY GRADUATE-STUDENT RESEARCH SUPPORT AND THESIS COMMITTEE INVOLVEMENT--Continued

NAME	PROJECT	STATUS
Mantez McDonald	Fluvial Architecture and Hydrology of Flooding on the Red River of the North	M.S.--Completed 2000 (GEOL) Advisor-Boss
Chris King	Lithology and Structural Geology of the Proposed Weddington Landfill Site, Northwest Arkansas	M.S.--Completed 2000 (GEOL) Advisor-Manger ***Support***
Holly Orndorff	Comparison of Flow System for Batesville Sandstone Aquifer to Flow System of Surrounding Boone Aquifer by Analysis of Tanyard Spring and Nearby Boone Limestone Springs	M.S.—Completed 2000 (GEOL) Advisor-Davis
Terri Phelan	The Use of GIS and 3-D Model Visualization in a Karstic Environment Near Savoy, Arkansas	M.A.—Completed 2000 (GEOG) Advisor-Dixon
Sandra Chandler	Origin and Relevance of Walsortian-Type Mud Mounds in the St. Joe Formation, Benton, County, Arkansas	M.S.--Completed 2001 (GEOL) Advisor-Manger ***Support***
Tiong Ee Ting	Uptake of Europium by Bacteria for Use as Hydrologic Tracers	M.S.—Completed 2002 (CHEN) Advisor-Thoma
Katie Fausett	Sandstone Weathering in Petra, Jordan	M.A.--Completed 2002 (GEOG) Advisor-Dixon
Amanda Keen	Geomorphology of Skull Creek	M.A.--Completed 2002 (GEOG) Advisor-Dixon
Fiona Trewby	Water quality of the Okagonga River in Namibia	M.A.--Completed 2003 (GEOG) Advisor-Dixon
Judy Rogers	Factors Affecting Water Quality in the Prairie Grove, Arkansas Area	M.S.--Completed 2003 (FORESTRY) Stephen F. Austin Univ., (Adjunct Prof)
Danny FitzGerald	Response of Mississippi River Tributaries to Wisconsin Glaciation and Deglaciation, Lower Mississippi Valley, Northern Mississippi and Northeastern Louisiana	M.S.—Completed 2004 (GEOL) Advisor-Guccione

INTERDISCIPLINARY GRADUATE-STUDENT RESEARCH SUPPORT AND THESIS COMMITTEE INVOLVEMENT--Continued

NAME	PROJECT	STATUS
Voon Huei Wong	Comparative Study of Time Domain Reflectometry and Inclinometer Use for Slope Stability Monitoring	M.S.—Completed 2005 (CVEG) Advisor-Dennis
Kevin McVey	Late Pleistocene and early Holocene Aggradation of Tributary Valleys Within the Lower Mississippi Valley Alluvial Valley	M.S.—Complete 2005 (GEOL) Advisor-Guccione
John Horn	Formation and Abandonment of a Middle Holocene Mississippi Meander Belt and a Late Holocene Distributary Channel, Tyronza, Arkansas	M.S.—Complete 2005 (GEOL) Advisor-Guccione
Chris Hobza	Ground-Water Quality Near a Swine Waste Lagoon in a Mantled Karst Terrane in Northwestern Arkansas	M.S.—Completed 2006 (GEOL) Advisor-Hays
John Pennington	Effects of Grazing Management on Pasture Hydrology and Nutrient Runoff	M.S.—Completed 2006 (SOILS) Advisor-Moore
Mansour Leh	Quantification of Rainfall-Runoff Mechanisms in Pasture-Dominated Watersheds	M.S.—Completed 2006 (BAEG) Advisor-Chaubey
Michael Sarhan	Comparative Assessment of Flooding from Hurricane Jeanne in Haiti and the Dominican Republic	M.S.—Completed 2006 (GEOG) Advisor-Paradise
Maysoun Thawaba	Comparative Analysis of Urban Growth in Meso-scale Cities: A Case Study from Fayetteville, Arkansas, and Tulkarm, Palestine	M.A.--Completed 2006 (GEOS) Advisor-Paradise
Erik Pollock	Methodological and Paleoclimatic Considerations for a Speleothem Stable-Isotope Record from Southwestern Missouri	M.S.—Completed 2006 (GEOL) Advisor-Hays
Aaron Laubhan	Hydrogeologic Controls on Flow and Transport in the Vicinity of the Tontitown Landfill, Northwest Arkansas	M.S.—Completed 2007 (GEOL) Advisor-Davis
Kammie Wood	Reservoir Assessment of the Pennsylvanian Hartshorne Sandstone, Arkoma Basin, Arkansas	M.S.—Completed 2007 (GEOL) Advisor-Zachry
Eric Gross	Lithostratigraphy and Sequence Stratigraphy Controls of Hydrocarbons in the Arkoma Basin	M.S.—Completed 2007 (GEOL) Advisor-Manger

INTERDISCIPLINARY GRADUATE-STUDENT RESEARCH SUPPORT AND THESIS COMMITTEE INVOLVEMENT--Continued

NAME	PROJECT	STATUS
Matt Boyce	Sequence stratigraphy and lithostratigraphy of Devonian reservoir Successions, Arkoma Basin, northeastern Oklahoma and northern Arkansas	M.S.—Completed 2007 (GEOL) Advisor--Manger
Geneva Brion	Land use effects on water quality of a first-order stream in the Ozark Highlands	M.S.—In Preparation (CSES)- Advisor-Brye
Aaron Daigh	Effects of poultry litter application on heavy metal accumulation in Soil profiles of fescue pastures	M.S.—In Preparation (SOILS) Advisor-Daniel
Chris Angel	GIS and Demographics of the area proximate to Petra, Jordan	M.A.—In Preparation (GEOG) Advisor-Paradise
Dana Austin	Hydrogeologic Characterization of Basin 6 and the Area of the Proposed Swine Facility, Savoy Experimental Watershed	M.S.—Inactive (GEOL) ***Support*** Advisor-Hays
Naomi Sinor	Spring Monitoring to Assess the Impacts to Ground-Water Quality from Land-Applied Animal Wastes, Washington County, Arkansas	M.S.--Inactive (GEOL) Advisor-Davis ***Support***

Ph.D. RESEARCH SUPERVISED AND FUNDING SUPPORT PROVIDED

NAME	PROJECT	STATUS
Curtis Varnell	Integration of Hydrogeologic Evidence with Social, Political, and Economic Considerations in Developing Water Supplies in Abandoned Coal Mines	Ph.D.—2006 (ENDY)—***Support***
Gary Hanson	Environmental Changes Resulting From Human Activities Preserved in Lacustrine Sediments of Wallace Lake, Louisiana—Pre-Impoundment (circa 1930) to Present	Ph.D.--Withdrawn (ENDY)

Ph.D. RESEARCH COMMITTEE
(AND FUNDING SUPPORT PROVIDED)

NAME	PROJECT	STATUS
Dan Pote	Relation of Soil-Test Levels of Phosphorus to Losses in Runoff	Ph.D.--Completed 1997 (AGRI) Advisor-Daniel
Reed Green	Relation Between Hydraulic Residence Time in a Longitudinal Distribution of Physical, Chemical, and Biological Parameters in Beaver, Table Rock, Bull Shoals, and Norfolk Reservoirs, Northern Arkansas and Southern Missouri	Ph.D.--Completed 1998 (BIOL) Advisor-Meyer
Misty Pope	Benthic and Planktonic Meiofauna Dynamics in Gravelbed Stream Ecosystems	Ph.D.— Completed 1999 (BIOL) Advisor-Brown
G.O. Graening	Ecosystem Dynamics of an Ozark Cave	Ph.D.— Completed 2000 (BIOL) Advisor-Brown
Darrin Curtis	Conceptual and Numerical Development of a Model to Trace Contaminant Spills in the Fractured Karst Aquifers of Northern Arkansas	Ph.D.— Completed 2000 (CVEG) Advisor-Gross
Barnali Dixon	Application of Neural Networks and Fuzzy Logic to Understanding the Role of Land-Applied Manure on Water Quality in Mantled Karst	Ph.D.—Completed 2001 (ENDY) Advisor—Scott
Shelly McGinnis	Environmental Justice as Related to Water Quality of the Santee Sioux in the Northern Great Plains	Ph.D.--Completed 2002 (ENDY) Advisor—Davis
Amy Freese-Smith	Colonization Dynamics of Meiofauna in Response to Flow-Regime Variations	Ph.D.–Completed 2002 (BIOL) Advisor-Brown
Ben Odhiambo	Watershed Physiography, Bathymetry, Sedimentation, and Historical Water Quality of Two Arkansas Lakes, Lee Creek Reservoir and Lake Shepherd Springs	Ph.D.— Completed 2002 (ENDY) Advisor—Boss
Ana Ghanem	Processes in Balasted Flocculation	Ph.D.--Completed 2002 (CVEG) Advisor--Young
Quanyan Liao	Processes and Controls Affecting Landslides Along Interstate 540 in Northwestern Arkansas	Ph.D.--Completed 2004 (ENGR) Advisor—Dennis
Salem Thawaba	Green Structure and City Planning—Fayetteville, Arkansas	Ph.D.—Completed 2005 (ENDY) ***Support*** Advisor—Paradise

Ph.D. RESEARCH COMMITTEES
(AND FUNDING SUPPORT PROVIDED)

NAME	PROJECT	STATUS
Tiong Ee Ting	Chemical Procedures for Tagging Bacteria and Clays with Lanthanides For Use as Hydrologic Tracers	Ph.D.—Completed (CHEN) 2005 Advisor--Thoma
Jeff Briggler	Habitats and Environmental Requirements of Woodland Amphibians In the Ozark National Forest, Arkansas	Ph.D.—Completed 2005 (BIOL) Advisor—James
Sherri DeFauw	Processes and Controls Affecting Ground Water in the Epikarst of an Agroforestry Research Site, Southern Ozarks	Ph.D.--Completed 2006 (ENDY)-- ***Support*** Advisor--Hays
Issac Howard	Highway Strength and Fracture Propagation Using Continuous Monitoring Methodologies	Ph.D.—Completed 2006 (CVEN) Advisor-Dennis
Mohammed Sharif	Controls of Arsenic Occurrence in Ground Water, Eastern Arkansaas	Ph.D.—Completed 2008 (ENDY) Advisor-Davis
Manmohan Lal	Development of Biosep-Permeable Reactive Barrier to Remediate MTBE-Contaminated Groundwater	Ph.D.—Completed (CHEN) Advisor-Thoma
Ruwaya Al-Kendi	Development of a Bacterial Source Tracking and Apportionment Methodology Using DNA Micro Arrays and Luminex Micro Beads, and Its Application to To the Ozark Plateau	Ph.D.—Completed 2009 (ENDY) Advisor-Davis
Kathy Knierim	Quantification of water sources in a cave stream during storm events to better assess how organic substrate and nutrients impact cave ecosystems and spring water quality	Ph.D.—In Progress (ENDY) Advisor-Hays
Kwasi Asante	Land-cover change and stormwater runoff effects in shale-gas exploitation In the Little Red River Watershed, Arkansas	Ph.D.—In Progress (ENDY) Advisor-Cothren
Kate GillIam	Determination of the redox front produced by groundwater and acidic mine Waters, Eagle Bird Mine, South Dakota	Ph.D.—In Progress (ENDY) Advisor-Davis
Brian Shreve	Biogeochemistry of Phosphorus and Metals in Constructed Wetlands Receiving Swine Lagoon Effluent	Ph.D.–Inactive (AGRI) Advisor—Moore
Dan Van Leeuwen	Ecological Controls of Sockeye Salmon Fry Survival in Glacier Bay National Park, Alasaka	Ph.D.—Inactive (BIOL) Advisor—Brown

ADDITIONAL SCIENTIFIC CONTRIBUTIONS

1. Invited Lectures Given at Universities:

Tectonic features as hydrogeologic boundaries. Memphis State University, Department of Geophysics, 1984.

Effects of tectonics on deep regional hydrogeology of the Northern Mississippi embayment. Vanderbilt University, Department of Geology, 1987.

Processes and controls affecting hydrogeology of carbonate rocks in North America. Xiangtan Mining College, Department of Geology, Xiangtan, Hunan Province, China, 1988.

Selected topics of current research in the U. S. Geological Survey. Xiangtan Mining College, Department of Geology, Xiangtan, Hunan Province, China, 1988.

Indiana University, 2003

Missouri State University, 2008

Oklahoma State University, 2005

University of Missouri September 2011

University of Texas, Austin March 2012.

Colby College, 2007

Edwards Aquifer Authority—Distinguished Lecture Series (XII) 8 lectures, March 2012

2. Papers Given at Scientific Meetings:

In addition to the papers referenced on pages 9 through 16 in this CV for which I was the first author, the following presentations we given:

Techniques for defining the hydrogeologic environment and their application to studies of ground-water contamination. AWWA First Atlantic Workshop (International) on Organic Chemical Contamination of Ground Water, 1982, Nashville, TN.

Evaluating management alternatives using a multilayer ground-water flow model. Memphis Engineers Club, 1984, Memphis, TN.

The use of a ground-water flow model as an aid to water management in the Memphis area. Mississippi Water Resources Conferences, 1985, Jackson, MS.

The role of a multilayer model in refining understanding of deep regional ground-water flow in a tectonically active area. National Water Well Association Conference, 1987, Denver, CO.

Controls on water quality in the deep aquifers of the northern Mississippi embayment. Society of Environmental Toxicology and Chemistry, 1988, Memphis, TN.

Regional ground-water flow boundary delineation using radioisotopes: American Institute of Hydrology Conference, 1988, Tampa, FL.

Relation between the hydrogeology of carbonate rocks and the development of karst landforms: 21st Congress--International Association of Hydrogeologists, 1988, Guilin City, China.

Applied research using chlorine-36 as a hydrologic tool: U.S. Geological Survey Second National Symposium on Water Quality, 1989, Orlando, FL.

Delineation of regional ground-water flow boundaries in northeastern Arkansas and southeastern Missouri using selected radioisotopes: Arkansas State Water Conference, 1989, Little Rock, AR.

Preliminary conceptual model of flow and solute transport in the shallow carbonate aquifers of northwest Arkansas: Joint American Water Resources/Arkansas Ground-Water Association Meeting, 1990, Little Rock, Arkansas.

Dominant factors affecting ground-water flow and transport in the carbonate-rock aquifers of Northwestern Arkansas, December 9, 1993, Sixth Annual AWRA/AGWA Symposium, Ground Water Issues of the 90's--Quantity and Quality, Little Rock, Arkansas.

Methodology development and preliminary field assessment of host-specific viruses as tracers in shallow karst aquifers: Breakthroughs in Karst Geomicrobiology and Redox Geochemistry, 1994, Colorado Springs, Colorado.

Modeling discrete, tectonically-controlled ground-water flow boundaries using a continuum approach: Presentations at the Advanced Ground-Water Seminar of the U.S. Geological Survey-- Session 1: Ground-water Flow in Fractured Rocks: Denver, Colorado, October 18, 1994.

Quantification of hydrogeologic factors controlling ground-water/surface-water interaction in shallow karst environments: Presentations at the Advanced Ground-Water Seminar- of the U.S. Geological Survey-- Session 3: Ground-Water and Surface-Water Interactions--The Karst Landscape: Denver, Colorado, October 20, 1994.

3. Training Given at USGS National Training Center:

Computer Programming and Applications.
Ground-water 2-D flow-modeling course. 1979, 1980.

4. Professional Society Offices and Committee Assignments:

Geological Society of America, Decade of North American Geology, Hydrogeology Volume Committee, 1983-84.

International Association of Hydrogeologists, Commission of Mineral and Thermal Waters, 1993-1998. Hosted first conference in U.S. of this Commission in July 1992.

Geological Society of America, Joint Technical Program Committee, 1994-1996.

Program Chairman for Hydrogeology Division of the Geological Society of America, Annual Meeting, New Orleans, 1995.

Secretary-Treasurer of Hydrogeology Division of the Geological Society of America, 1997-2000.

General Chair of Congress XXVIII of the International Association of Hydrogeologists, Las Vegas, Nevada, 1998.

South-Central Geological Society of America Board of Directors, 1998-2000.

Technical Program Chair for South-Central the Geological Society of America meeting, Fayetteville, Arkansas, April 2000.

5. Other Committee Assignments:

Safford Centennial Society (Nashville Geology Society) - President and Executive Committee, 1980.

Tennessee Ground-water Conference - Research and Technical Needs, Recorder, 1987.

Karst Committee of the State of Tennessee Solid Waste Disposal Control Board, 1989.

U.S. Geological Survey--RGE Ground-Water Discipline Peer Panel, 1989.

U.S. Geological Survey--RGE Ground-Water Discipline Peer Panel, 1992.

U.S. Geological Survey--Southeast Region Agricultural Hydrology Oversight Committee, 1993.

U.S. Geological Survey--Toxic Hydrology Site-Selection Committee, 1994.

Louisiana Board of Regents--Review committee for enhancement proposals in earth and environmental sciences 1995; 1998; 2001; 2004.

University of Arkansas, Department of Geosciences, Committee for the Future, 2000.

University of Arkansas, Department of Geosciences,Tenure and Promotion Committee, 2000.

University of Arkansas, Program of Environmental Dynamics, Steering Committee, 2002-present

University of Arkansas, Department of Geosciences, Committee to Evaluate Chair, 2008

University of Arkansas, Department of Geosciences, Committee to Modify Introductory Geology Lab Text, 2007-08

University of Arkansas, Fulbright College of Arts and Sciences, Faculty Senate, 2008-2012.

University of Arkansas, Fulbright College of Arts and Sciences, Planning and Fiscal Committee, 2009-2011, Vice Chair 2010-2011.

Chair, Fulbright College Cabinet, J.William Fulbright College of Arts and Sciences, University of Arkansas 2010-2011

6. Informal Seminars Given to U.S. Geological Survey:

Assisted with New Professionals Training Course, Tennessee District, WRD, from June 1977 to January 1978.

Conducted seminar in modeling flow in porous media-Mississippi embayment. USGS/USCE meeting in Baton Rouge, La., at request of A. N. Turcan, 1979.

Introduction to ground-water modeling: WRD-SR workshop on Ground-water fundamentals and concepts at the request of SR GW Specialist; from December 1976 to May 1981, (4 classes), in Atlanta, Ga.

Seminar to Illinois District, WRD, and cooperators, summarizing flow modeling and isotope studies conducted in northern Mississippi embayment, June 1987.

Assisted with RGE conference for Southeast Region - Session chairman Tampa, December, 1987.

Advisor to Ground-Water Concepts Self-Paced Course, Office of Ground Water of the U. S. Geological Survey, 1988 to present.

Developed course materials and taught Level 1 training--WRD-SR workshop on Ground-Water Principles (System concepts as applied to ground-water investigations) at the request of SR GW Specialist; April and July 1993, in Atlanta, GA.

Development and presentation of U.S. Geological Survey Borehole Geophysics Workshop at the Savoy Experimental Watershed, October 2000.

7. Other Tasks:

Detailed to USGS Headquarters to work with Sol Lang on feasibility of standardizing ground-water data reports. Worked with Walter Langbein to develop a streamflow index to evaluate intensity and duration of droughts. 3 weeks, March 1977.

Conducted workshop on the use of the three-dimensional ground-water flow model for Cooperator's staff. Nashville, Tennessee, February 1980 for 2 days at request of Cooperator.

Lectured on the role of paleokarst in regional aquifer development in the mid-continent Karst Hydrogeology Workshop - Sponsored by EPA and coordinated by Center for Cave and Karst Studies, Dept. of Geography and Geology, Western Kentucky University, 1982. Invited presentation.

Assisted with leading a field trip for visiting Chinese delegation of hydrogeologists, central Tennessee. 1985.

Assisted with the training of M. Natarajan (Madras, India), a fellowship trainee of the United Nations program. Topics included hydrogeology and isotope studies. Three weeks, March 1987.

Assisted with the training of Dr. J. A. Cuchi (Zaragosa, Spain), in the karst of Tennessee. Topics included karst hydrogeology and isotope studies. Two months, 1988, and six months from October 1989 to March 1990.

Identified ongoing research to Dr. Yuan Daoxian, Director of the Karst Institute in Guilin, China, of karst areas in Tennessee on Dr. Yuan's North American visit in July 1989 associated with his travel after the International Geological Congress.

Served as faculty advisor for 21 Master of Science candidates in the Geology Department at Vanderbilt University (1988-1990) and the University of Arkansas (1990-present), and 2 Ph.D. candidates in Environmental Dynamics at the University of Arkansas.

Associate Reviewer, Journal of Ground Water, 1988-1993.

Provided field training and introduction to ongoing research in the karst area of northwest Arkansas to Nasser Al-Ghilani, foreign trainee from Oman, July 1990.

Served as advocate and coconvenor (with Professor Richard Parizek) for a Geological Society of America Theme Session, "Discovery in Hydrogeology--Heritage, Wisdom, Vision" at the 1992 Annual Meeting in Cincinnati.

Textbook reviewer for John Wiley--Physical and Chemical Hydrogeology, 1993.

Served as Program Chairman for the First U.S. Convening of the Commission of Mineral and Thermal Waters of the International Association of Hydrogeologists, July 1993, Hot Springs, Arkansas.

Recruited and supervised a total of 13 Volunteers for Science. These individuals assisted Arkansas District personnel in field data collection and coding for data base input. 1992-present.

Served as NSF/Arkansas Department of Education Mentor for high-school teacher in PROJECT STRIVE, in which 30 of the top teachers in Arkansas develop enhanced research skills at selected institutes. June-August 1993; June-August 2000.

Hosted noted karst researcher Lu Yaoru (Chinese Academy of Sciences) on two occasions, and collaborated on preliminary field projects in the carbonate terrane of the southern Ozarks. September 1992 and September 1993.

Hosted Chinese hydrologist Guo Fang (Xiangtan Mining College) and secured funding for collaborative field project to test magnetotelluric methods of surface geophysics as a research tool to identify major conduits in regolith covered karst terrane.

Geology Development Board, University of Missouri-Columbia, 1994 to 2000; Vice Chairman, 1996-2000.

Field Trip Leader, South-Central Geological Society of America Hydrogeology Field Trip to the Savoy Experimental Watershed—Geomorphology, hydrology, and environmental issues in a mantled karst terrane, April 2000.

Field Trip Leader, South Central Regional Meeting—National Association of Conservation Districts Geomorphology, hydrology, and environmental issues in a mantled karst terrane: July 2000.

Initiated and hosted HydroDays Field Conference for karst researchers in the mid-continent U.S., drawing attendees each April from Arkansas, Missouri, Oklahoma, Texas, Louisiana, Mississippi, Indiana, Illinois, and Minnesota. Annually, April.

Hosted Karst Interest Group of the U.S. Geological Survey meeting in Fayetteville, in conjuction with HydroDays, April 2011.

(Invited) Webinar for American Water Works Association-November 2012, one of three presentations on hydraulic fracturing and its impact on shallow groundwater aquifers and water supplies. Title: Fracking—Fears, Facts, and Fallacies. Reported audience of 90 participants.

Edwards Aquifer Authority, San Antonio, TX-Aquifer Scientific and Advisory Panel 2009-present

University of Memphis Ground-Water Institute, Technical Advisory Board 2011-present

Independent Groundwater Panel-Oak Ridge National Lab-DOE Oversight 2012-present