

ABRAHAM E. SPRINGER

School of Earth Sciences and Environmental Sustainability
Northern Arizona University
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EDUCATION

Ph.D. Hydrogeology, The Ohio State University, Columbus, Ohio, 1994.
M.S. Hydrogeology, The Ohio State University, Columbus, Ohio, 1990.
B.A. Geology with Departmental Honors, The College of Wooster, Wooster, Ohio, 1987.

PROFESSIONAL POSITIONS

Academic

Northern Arizona University – School of Earth Sciences and Environmental Sustainability,
2008-present, **Professor**

University of Lethbridge, Alberta, Canada, 2007.

Fulbright Visiting Chair in Water and the Environment

Alberta Ingenuity Centre for Water Resources

Northern Arizona University - Department of Geology, 1999-2008

Associate Professor: Taught new University Colloquium, Applied Geology

University of Wisconsin - Madison, Spring 2001

Visiting Associate Professor - sabbatical research

Northern Arizona University - Department of Geology, 1994-1999

Assistant Professor: Taught classes in Hydrogeology, Ground-Water Flow Modeling,
Contaminant Hydrogeology, Environmental Geology, Introductory Geology

The Ohio State University, Department of Geological Sciences, 1989-1994

Graduate Research Associate: Conducted research on wellhead protection, agricultural
water quality, and tracer tests.

The Ohio State University - Department of Geological Sciences, 1990

Instructor: Taught Geological Sciences 204, Water Resources.

The Ohio State University, Department of Geological Sciences, 1987-1989

Graduate Teaching Associate.

Administrative

Northern Arizona University – School of Earth Sciences and Environmental Sustainability
2009-2013, **Founder and Inaugural Director**, Interdisciplinary SESES PhD Program

Northern Arizona University - School of Earth Sciences and Environmental Sustainability,
2009-2011, **Inaugural Director**; led academic unit (23 faculty, > 500 majors and grad)

Continuing education instruction

Springs Stewardship Institute, 2010-present

Lead Instructor: Teaching Springs Ecosystems Inventory and Assessment courses.

HBCU/MIA Consortium (Department of Energy), 1996-2001

Lead Instructor: Developed web sites, videotaped 42 lectures each for three Environmental Geology web-based courses, taught all three courses via internet. Environmental Education Enterprises, 1993-2000

Instructor: Teaching "Modeling Techniques for Delineating Capture Zones" 4-day professional short course. Environmental Education Enterprises, 1995-2000

Instructor: Teaching "Introduction to Physical Processes in Contaminant Hydrogeology" 3-day professional short course.

The Association of Ground Water Scientists and Engineers - NGWA, 1992-1993

Instructor: Taught "Capture-Zone Analysis for Contaminant Remediation and Wellhead Protection" 4-day short course.

PROFESSIONAL AFFILIATIONS

Sigma Xi (since 1987)

Assoc. of Ground Water Scientists and Engineers, National Ground Water Assoc. (since 1988)

Geological Society of America (since 1990)

American Geophysical Union (since 1990)

Arizona Hydrological Society (since 1994)

Arizona Riparian Council (since 1995)

Society for Ecological Restoration (1998-2006)

International Association of Hydrogeologists (since 2001)

AWARDS

2008 Civic Award, Verde River Citizens's Alliance

2007 Fellow, Geological Society of America

1990 Graduate Research Award, Graduate Research Forum, The Ohio State University

1988 Outstanding Teaching Associate, Dept. of Geological Sciences, The Ohio State Univ.

1987 Charles B. Moke Prize in Geology, College of Wooster

PUBLICATIONS

Books and Book Chapters

Coles-Ritchie, Marc; Solem, Stephen J.; Springer, Abraham E.; Pendleton, Burton. 2014. Framework for Springs Stewardship Program and proposed action development: Spring Mountains National Recreation Area, Humboldt-Toiyabe National Forest. Gen. Tech. Rep. RMRS-GTR-330. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 63 p.

Eamus, D., B. Fu, A.E. Springer, and L.E. Stevens. In press. Chapter 11 Groundwater Dependent Ecosystems, in Integrated Groundwater Management, Springer.

Bair, E.S., **A.E. Springer**, and G.S. Roadcap, 1992. *CAPZONE - An Analytical Flow Model for Simulating Confined, Leaky Confined, and Unconfined Flow to Wells with Superposition of*

Regional Water Levels: International Ground Water Modeling Centers, Colorado School of Mines, Golden, Colorado; TNO Institute of Applied Geoscience, Delft, The Netherlands, 193 p.

Journal articles (23 peer reviewed, Student co-authors underlined)
[citations on 11/01/13 by Web of Science, and Google Scholar]

Sankey, T., J. Donald, J. McVay, M. Ashley, F. O'Donnell, S. Masek Lopez, **A. Springer**. 2015. Multi-scale analysis of snow dynamics at the southern margin of the North American continental snow distribution, *Remote Sensing of Environment*, doi:10.1016/j.rse.2015.08.028.

Springer, A.E., L.E. Stevens, J.D. Ledbetter, E.M. Schaller, K. Gill, and S.B. Rood. 2015. Ecohydrology and Stewardship of Alberta Springs Ecosystems. *Ecohydrology*, doi: 10.1002/eco.1596.

Ha, W., T.E. Kolb, **A.E. Springer**, S. Dore, S. Masek Lopez, F.C. O'Donnell, R.M. Morales, G.W. Koch. 2014. Evapotranspiration comparisons among eddy covariance, meteorological and remote sensing-based models in disturbed ponderosa pine forests, *Ecohydrology*, doi: 10.1002/eco.1586.

Wyatt, C.J.W. F.C. O'Donnell, and **A.E. Springer**. 2014. Semi-arid aquifer responses to forest restoration treatments and climate change, *Groundwater*, doi:10.1111/gwat.12184.

Sabol, T.A., and **Springer, A.E.** 2013. Transient simulation of groundwater levels within a sandbar of the Colorado River, Marble Canyon, Arizona, 2004: U.S. Geological Survey Open-File Report 2013-1277, 22 p, <http://dx.doi.org/10.3133/ofr20131277>.

Mueller, J., W. Swaffar, E. Nielsen, **A.E. Springer**, S. Masek Lopez. 2013. Estimating the value of watershed services following forest restoration, *Water Resources Research*, 49, 1773-1781, doi:10.1002/wrcr.20163, [0,0]

Ramsted, K.M., J.A. Allen, **A.E. Springer**. 2012. Have wet meadow restoration projects in the southwestern U.S. been effective in restoring geomorphology, hydrology, soils and plant species composition? *Environmental Evidence* 1:11, doi:10.1186/2047-2382-1-11. [-,-]

Davis, C.J., **A.E. Springer**, L.E. Stevens. 2011. Have arid land springs restoration projects been effective in restoring hydrology, geomorphology, and invertebrate and plant species composition comparable to natural springs with minimal anthropogenic disturbance?, *Collaboration for Environmental Evidence*, Systematic Review CEE 10-002, 72 p. [-,-]

Fry, M.C., **A.E. Springer**, and P.J. Umhoefer, 2011. Hydrogeologic implications of a fault scaling relationship in bedrock aquifers, *Environmental and Engineering Geoscience.*, 17:4,377-389. [-,-]

Androwski, J., **A. Springer**, T. Acker, and M. Manone. 2010. Wind-powered desalination: An appraisal of saline groundwater in the U.S. *Journal of the American Water Resources Association* (JAWRA) 1-10. Doi: 10.1111/j.1752-1688.2010.00493.x. [0, -]

Crossey, L.J., K.E. Karlstrom, **A.E. Springer**, D. Newell, D.R. Hilton, T. Fischer. 2009. Degassing of mantle-derived CO₂ and He from springs in the southern Colorado Plateau region—neotectonic connections and implications for groundwater system, *Geological Society of America Bulletin.*, 121:1034-1053, doi: 10.1130/B26394.1 [20, 37]

Springer, A.E. and L.E. Stevens. 2009. Spheres of Discharge of Springs, *Hydrogeology Journal*, doi: 10.1007/s10040-008-0341-y. [11, 23]

Griffiths, R.E., D.E. Anderson, and **A.E. Springer**. 2008. The morphology and hydrology of small spring-dominated channels, *Geomorphology*, doi:10/1016/j.geomorph.2008.05.038.[0,0]

Kreamer, D.K. and **A.E. Springer**, 2008. The hydrology of desert springs in North America, in *Aridland Springs in North America: Ecology and Conservation*, Univ. Arizona Press, Tucson, eds. Stevens, L.E. and V.J. Meretsky.

Springer, A.E., L.E. Stevens, D.E. Anderson, R.A. Parnell, D.K. Kreamer, S.P. Flora, 2008. A comprehensive springs classification system: Integrating geomorphic, hydrogeochemical, and ecological criteria. in *Aridland Springs in North America: Ecology and Conservation*, Univ. Arizona Press, Tucson, eds. Stevens, L.E. and V.J. Meretsky. [-, 10]

Adams, E.A., S.A. Monroe, **A.E. Springer**, K.W. Blasch, D.J. Bills. 2006. Flow Timing of South Rim Springs of Grand Canyon, Arizona, Using Electrical Resistance Sensors, *Ground Water*, 44:630-641, doi:10.1111/j.1745-6584.2006.00223.x . [2, 1]

Mullen, R.M. **A.E. Springer**, T.E. Kolb. 2006. Complex effects of prescribed fire on restoring the soil-water content in a high-elevation riparian meadow, Arizona, *Restoration Ecology*, 14(2):242-250, doi:j.1526-100X.2006.00126x. [5, 7]

Springer, A.E., M.A. Amentt, T.E. Kolb, R.M. Mullen. 2006. Evapotranspiration of two vegetation communities in a high-elevation riparian meadow at Hart Prairie, Arizona. *Water Resources Research*, 42, W03412, doi:10.1029/2004WR003863. [2, 1]

Stevens, L.E., T.J. Ayers, J.B. Bennett, K. Christiansen, M.J.C. Kearsley, V.J. Meretsky, A.M. Phillips, R.A. Parnell, J. Spence, M.K. Sogge, **A.E. Springer**, D.L. Wegner, 2001. Planned flooding and Colorado River riparian trade-offs downstream from Glen Canyon Dam, Arizona. *Ecological Applications*, 11(3):701-710. [28, 57]

Springer, A.E., Wright, J.M., P.B. Shafroth, J.C. Stromberg, D.T. Patten, 1999. Coupling ground-water and riparian vegetation models to simulate riparian vegetation changes due to a reservoir release, *Water Resources Research*, v. 35, no. 12, pp. 3621-3630. [28, 43]

DeWald, L.E. and **A.E. Springer**, 1999. Riparian restoration improves a rare Bebb willow community (Arizona), *Ecological Restoration: North America*, v. 17, no. 4, pp. 233-234.

Springer, A.E., W.D. Petroustou, B.A. Semmens, 1999. Spatial and temporal variability of hydraulic conductivity in active reattachment bars of the Colorado River, Grand Canyon, *Ground Water*, vol. 37, no. 3, pp. 338-344. [21, 36]

Springer, A.E. and E.S. Bair, 1998. Natural-gradient tracer test using bromide, atrazine, and alachlor in a high-organic carbon aquifer, *J. of Environmental Quality*, 27:1200-1208. [6, 8]

Springer, A.E., E.S. Bair, and D. Beak, 1996. Natural gradient, surface-applied tracer test at the Ohio Management Systems Evaluation Area, *Environmental and Engineering Geoscience*, v. 2, no. 4. pp. 453-464. [-, 9]

Jagucki, M.L., C.D. Finton, **A.E. Springer**, and E.S. Bair, 1995. *Hydrogeology and water quality at the Management Systems Evaluation Area near Piketon, Ohio*, U.S. Geological Survey Water Resources Investigation Report 95-4139, 117 p. [-, 6]

Springer, A.E. and E.S. Bair, 1992. Comparison of methods used to delineate capture zones of wells: 2. Stratified-Drift Buried-Valley Aquifer, *Ground Water*, v.30, p. 908-917. [15, 25]

Bair, E.S., **A.E. Springer**, G.S. Roadcap, 1991. Delineation of traveltime-related capture areas of wells using analytical flow models and particle-tracking analysis, *Ground Water*, v.29, p. 387-397. [21, 43]

Springer, A.E. and E.S. Bair, 1990. The effectiveness of semianalytical methods for delineating wellfield-protection areas in stratified-drift valley aquifers, *Ground Water Management*, v.1, p. 413-429.

Journal articles in press (peer reviewed)

Journal articles in review

Mueller, J., R. Lima, A.E. Springer, Does distance impact willingness to pay for forested watershed restoration? A spatial probit analysis. *American Journal of Agricultural Economics* (submitted 8/15)

O'Donnell, F.C., S. Masek Lopez, and **A.E. Springer**, Understanding forest restoration effects on water balance: the 4FRI paired watershed study, proceedings of the Colorado Plateau Biennial Symposium, Flagstaff, AZ, 9/13. (submitted 1/14, revised 9/14)

Journal articles in preparation

Ha, W., F.C. O'Donnell, A.E. Springer, T.E. Kolb. Sensitivity of evapotranspiration models to on-site and off-site meteorological data for a ponderosa pine forest, *Forest Science* (submitted 06/15, rejected 08/15).

Zhao, X., D. Du, **A.E. Springer**, S. Masek Lopez. An econometric analysis of the impact of forest restoration on agriculture in the Verde River Watershed, Arizona, *Journal American Water Resources Association*, (submitted November 2012, rejected April 2013, revised/resubmitted *Journal of the American Water Resources Association* May, rejected 9/14).

Springer, A.E., L.E. Stevens, J.D. Ledbetter, K. Junghans. Distribution and density of springs ecosystems for improving stewardship, *Freshwater Science* (to be submitted xxx 2015).

Paffett, K., L.E. Stevens, and **A.E. Springer**. Assessing semi-arid springs ecosystems for stewardship, *Ecological Applications* (to be submitted xxx 2015)

Schaller, E.M. **A.E. Springer**, and K. Junghans. Local vs. regional groundwater flow from stable isotopes at springs across Western North America, *Groundwater* (to be submitted xxxx 2015).

Sparks, K.D., A.E. Springer, L.E. Stevens. The role of geomorphological diversity on plant diversity of North American Springs, *Ecohydrology* (to be submitted xxxx 2015)

Wyatt, C., S.M. Lopez, and A.E. Springer. Systematic review of forest treatment effects on watershed budgets—Implications for surface water and groundwater, *Ground Water* (submitted February 2013, rejected May 2013, revised and resubmitted xxxx).

Green, L.M. **A.E. Springer**, P.J. Umhoefer, L. Crossey, K. Karlstrom, R. Blakey. Delineating the structural edge of the Colorado Plateau in Central Arizona with new structural, geochemical, and hydrogeological relationships, *Lithosphere*.

Conference proceedings (7 peer reviewed)

Schlinger, C.M. and **A. Springer**, 2002. Navajo Aquifer Water Supplies for the Kayenta Community School, *in* *Fractured-Rock Aquifers 2002*, National Ground Water Association, Westerville, OH, pp. 32-35.

DeWald, L.E. and **A.E. Springer**. 2001. Balancing cultural, aesthetic, wildlife, and recreation of a rare, high-elevation Bebb willow riparian community, *in* Vance, R.K, C.B. Edminster, W.W. Covington, J.A. Blake. Ponderosa pine ecosystems restoration and conservation: steps toward stewardship; 2000 April 25-27; Flagstaff, AZ. Proceedings RMRS-P-22. Ogden, UT: U.S. Dept. of Ag., Forest Service, Rocky Mountain Research Station, p. 134-137.

Springer, A.E. and J.A. Kessler, 2000. Seeps, Springs, and Capture Zones of the Coconino Plateau: In a Context of Sustainability, *in* Proceedings of the 1st Coconino Plateau Hydrology Workshop, October 27-27, 2000, Center for Sustainable Environments, Northern Arizona University, Flagstaff, AZ, p. 43-51.

Springer, A.E. and E.S. Wilson, 2000. Sustaining ecosystems and cultures dependent on springs of the Grand Canyon, USA. *in* Groundwater: Past Achievements and Future Challenges, Sillio *et al* (eds.), Balkema, Rotterdam, Netherlands, pp. 1047-1051.

DeWald, Laura, **A.E. Springer**, Ch.C. Avery, 1998. Attempts to restore spring discharge and soil-moisture patterns which determine the survival of a rare plant community in Arizona, USA. American Institute of Hydrology/International Association of Hydrogeologists, International Conference, September 27-October 2, 1998, Las Vegas, NV, p. 379-383.

Springer, A., S. Bair, and D. Beak, 1993. Transport of atrazine, alachlor, and nitrate relative to the tracer bromide at the Ohio Management Systems Evaluation Area, *in* proceedings of the Agricultural Research to Protect Water Quality Conference, Minneapolis, Minnesota, Soil and Water Conservation Society, Ankeny, Iowa, p. 102-104.

Field trip guides (peer reviewed)

Schlinger, C. and A. Springer. 2008. Fossil Creek (with stop at Clover Springs. AIPG-AHS Symposium, Field trip guide.

Springer, A.E. 2008. Flagstaff area hydrology. AIPG-AHS Symposium, field trip guide.

Springer, A.E. and D. Bills, 1998. Exploration for and ecological importance of shallow and deep ground-water around San Francisco Mountain, *in* Geological Excursions in Northern and Central Arizona, Field trip guidebook for Geological Society of America, Rocky Mountain Section Meeting, Flagstaff, Arizona, May 1988, ed. Duebendorfer, E., p. 27-34.

Book reviews (peer reviewed)

Springer, A.E. 2014. Groundwater and Ecosystems, by Ribeiro, L. T.Y. Stigter, A. Chambel, M.T. Condesso de Melo, J.P. Monteiro, A. Medeiros, ed, *Groundwater*, doi:10.1111/gwat.12163.

Springer, A.E., 1999. Perspectives on Sustainable development of Water Resources in Kansas by Marios Sophocleous, ed., *Geotimes*, v. 44, no. 4, p. 39.

Springer, A.E., 1998. Applied Ground-Water Hydrology and Well Hydraulics by Michael Kasenow, *Ground Water*, v. 36, no. 6, p. 869.

ABSTRACTS IN REVIEW

Junghans, K. A. Springer, L. Stevens, J. Allen. 2015. Estimating Springs density in Death Valley National Park, Arizona Riparian Council meeting, Flagstaff, Arizona, October 15-16.

Springer, A.E., V.J. Aldridge, G.M. Schindel, B. Tobin. 2015. Innovative spatial and temporal measurements of recharge to the deep aquifers of the Grand Canyon regional, Geological Society of America annual meeting, Baltimore, MD, November 1-4.

Springer, A.E., V.J. Aldridge, G.M. Schindel, B. Tobin. 2015. Innovative spatial and temporal measurements of recharge to deep regional aquifers of Northern Arizona, Arizona Hydrological Society Symposium, Phoenix, AZ, September.

ABSTRACTS OF PRESENTATIONS IN PRESS (all peer reviewed, students underlined)

ABSTRACTS OF PRESENTATIONS PUBLISHED (all peer reviewed, students underlined)
(2013 6; 2012 8, 2011 4, 2010 5, 2009 5, 2008 10, 2007 6, 2006 13; 2005 9; 2004 5; 2003 12;
2002 11; 2001 4; 2000 12; 1999 9; 1998 7; 1997 9; 1996 5; 1995 3; 1994 1; Total 138)

O'Donnell, F.C., W.T. Flatley, A.E. Springer, P.Z. Fule. 2015. Linking forest landscape management and climate change to the conservation of riparian habitat in the Grand Canyon, Colorado and Rio Grande Riparian Restoration Workshop, June 23-25.

O'Donnell, F., A.E Springer, S. Masek Lopez, T. Sankey, 2015. Snow water equivalence (SWE) and soil moisture response to restoration treatments in headwater ponderosa pine forests, 4th International Conference Forests and Water in a Changing Environment, Kelowna, BC, July 6-9.

Aldridge, V., A.E. Springer, S. Masek Lopez. 2015. Closing the water balance in semi-arid forests with a precipitation-sourced chloride mass balance technique to measure groundwater recharge, 4th International Conference Forests and Water in a Changing Environment, Kelowna, BC, July 6-9.

Springer, A.E., L. Stevens, J. Ledbetter, K. Junghans. 2015. Determining the distribution of springs ecosystems, Universities Council of Water Resources Annual Conference, Henderson, NV, June 16-18.

Aldridge, V.J., S. Masek Lopez, A.E. Springer, 2015. Using precipitation-sources chloride mass balance technique to monitor groundwater recharge response to tree-thinning restoration projects, National Ground Water Association, Groundwater Summit, San Antonio, TX, March 17-20.

Mueller, J.M., R. Lima, A.E. Springer. 2015 Investigating the impact of wildfire and post-fire flooding on house prices in Flagstaff, W3133-Annual Conference, Pensacola, FL, February.

O'Donnell, F., A.E. Springer, T. Sankey, and S.M. Lopez. 2014. Growing season soil moisture

following restoration treatments of varying intensity in semi-arid ponderosa pine forests, American Geophysical Union Fall Meeting, San Francisco, CA. December.

(invited) Springer, A.E. G. Schindel, S. Rice. 2014. Past and Present Hydrogeology Research at Grand Canyon National Park, Geological Society of America meeting, Vancouver, BC, Canada, October 19-22.

Springer, A.E., L.E. Stevens, and J.D. Ledbetter, M. Hendrie, 2014. Springs Ecosystems: Global distribution, International Association of Hydrogeologists, Marakesh, Morocco, September 15-19.

Aldridge, V.J., S. Masek Lopez, A.E. Springer, 2014. Estimating groundwater recharge in semi-arid, ponderosa pine forest using a precipitation sources chloride mass balance technique, AIPG/AHS National Conference, Prescott, AZ, September 15-16.

Stempniewicz, V., A.E. Springer, S Masek Lopez, D. Elder. Evaluating erosion risk mitigation from forest restoration treatments using alluvial chronology and hydraulic modeling, AIPG/AHS National Conference, Prescott, AZ, September 15-16.

Sparks, K.S., L.E. Stevens, and A.E. Springer. 2014 A multivariate analysis of the influence of geomorphologic diversity on flora species richness around springs, Joint Aquatic Sciences Meeting, Portland, Oregon, May 18-23.

Springer, A.E., L.E. Stevens, and J.D. Ledbetter, M. Hendrie, 2014. Springs: Their global distribution, Joint Aquatic Sciences Meeting, Portland, Oregon, May 18-23.

Aldridge, V.J., S. Masek Lopez, S.R. Tjaden, A.E. Springer, 2014. Quantifying recharge in semi-arid, ponderosa pine forests using chloride mass balance, WRRRC Conference, Tucson, AZ, April 8.

Ha, W., A.E. Springer, T.E. Kolb, S. Dore, S.M. Lopez, F.C. O'Donnell, R.M. Morales, G.W. Koch. 2014. Comparing evapotranspiration between model predictions and eddy covariance measurements in ponderosa pine forests, Northern Arizona. American Society of Agricultural and Biological Engineers, Annual Symposium, Raleigh, NC, April 7-11.

Springer, A.E. 2013. Implementing watershed investment programs to restore fire-adapted forests for watershed services, American Geophysical Union Fall Meeting, San Francisco, CA. December 2013.

Stempniewicz, V.A., D. Elder, A.E. Springer. 2013. Challenges of modeling post-fire runoff and sediment transport in ephemeral forested watersheds in the arid southwest. Geological Society of America meeting, Denver, CO, October 2013.

(invited) Springer, A.E. 2013. Mountain snow to thriving deserts: New challenges and solutions

for managing forests for watershed services. Geological Society of America meeting, Denver, CO, October 2013.

Masek Lopez, S. and A.E. Springer. 2013 The Four Forest Restoration Initiative Paired Watershed Study—Understanding forest restoration effects on water balance. Arizona Hydrological Society Annual Symposium, Tucson, AZ, September 2013.

Stempniewicz, V., D. Elder, A.E. Springer. 2013. Use of Sediment-Derived Paleoflood Records to Analyze Prehistoric Depositional Characteristics of a Fire-susceptible Forested Watershed. AGU Chapman Conference, Estes Park, CO, August 2013.

Stempniewicz, V., A.E. Springer, E. Nielsen, S.M. Lopez. 2013. Flagstaff Proposition #405: Watershed investment program funded by a city bond, Water Resources Research Center Annual Conference, Tucson, AZ, March 2013.

Paffett, K. L.E. Stevens, and A.E. Springer, 2013. Prioritization of remediation projects through statistical analysis of springs ecosystem assessments in Western semiarid forests. 66th Annual International Meeting of the Society for Range Management, Oklahoma City, OK.

Springer, A.E. 2013. Watershed investment programs to help support evidence-based ecological restoration in fire adapted forests. NCSE Annual Meeting, Washington, DC

Springer, A.E., 2012. Utilizing groundwater flow models and contingent valuation surveys to inform watershed investment programs, Geological Society of America annual meeting, Charlotte, NC, November 4-7.

Springer, A.E., L.E. Stevens, J. Ledbetter, S.B. Rood, and K. Gill. 2012. The ecohydrology of springs of Alberta, Canada, International Association of Hydrogeologists Congress, Niagara Falls, Ontario.

Wyatt, C.J. and A.E Springer. 2012. Predicting groundwater yield following landscape-scale restoration in a semi-arid region, International Association of Hydrogeologists Congress, Niagara Falls, Ontario.

Lopez, S.M. and A.E. Springer. 2012. Toward healthier forests and more sustainable water supplies: Studying forest restoration treatment effects on water balance. Arizona Hydrological Society Symposium, Phoenix, AZ.

Stevens, L.E., J.D. Ledbetter, A.E. Springer. 2012. The demise of springs ecosystems: A global ecological crisis. 97th Annual meeting of the Ecological Society of America, Portland, OR, August 5-10.

Stevens, L.E., J.D. Ledbetter, A.E Springer. 2012. Springs Stewardship: An emerging environmental crisis in point-source biocultural diversity, Society for Conservation Biology

North America Congress for Conservation Biology, Oakland, CA July 15-18.

Zhao, Xiaobing, A. Springer, and S. Masek Lopez. 2012. An Econometric Analysis of the Impact of Forest Restoration on Agriculture in the Verde River Watershed, Arizona. Northeastern Agricultural and Resource Economics Association

Schaller, E. A.E. Springer, J. Ledbetter, L. Stevens. 2012. Influence of springs water geochemistry on geomorphology and vegetation cover at springs ecosystems, National Ground Water Association 2012 Ground Water Summit, Garden Grove, California.

Schaller, E., A.E. Springer, L.E. Stevens, J. Ledbetter, 2011. Influence of springs water geochemistry on geomorphology and vegetation cover at springs ecosystems, GSA Annual Meeting, Minneapolis, MN.

Springer, A.E. and C.J. Davis, 2011. Assessing springs ecosystems data of two national forests, GSA Annual Meeting, Minneapolis, MN.

Springer, A.E. 2011. Sustainable large-scale restoration treatments in Arizona with watershed benefits: The groundwater story. Arizona Hydrological Annual Symposium, September 18-20, Flagstaff, AZ.

Masek Lopez, S.R, S.A. Heffelfinger, R. Decker, A.E. Springer. 2011. Designing effective forest restoration treatments to augment snow water, National Workshop on Climate Change: Planning tools and perspectives on adaptation and mitigation options, May 16-18, Flagstaff, AZ.

Springer, A.E., C.J. Davis, and S.M. Lopez. 2010. Hydrogeology of a sustainable large-scale forest restoration treatment, GSA Annual Meeting, Denver, CO.

Davis, C.J., A.E. Springer, and L.E. Stevens. 2010. Sustaining arid land springs ecosystems through management and restoration, GSA Annual Meeting, Denver, CO.

Springer, A.E. 2010. Aridland Springs Ecosystems Assessment and Management, Arizona Hydrological Society Annual Symposium, September 1-3, Tucson, AZ.

Springer, A.E. 2010. Sustainable large-scale forest restoration treatments in Arizona with watershed benefits, National Council for Science in the Environment, Annual Conference, Washington, DC.

Rood, S., K. Gill, and **A. Springer**. 2010. The Alberta Springs Project, Southeastern Alberta Watershed Alliance Groundwater Conference, March 11-12, 2010, Medicine Hat, Alberta.

(Invited) Springer, A.E. and L.E. Stevens. 2009. Hydroecological assessment of springs ecosystem conditions and risks with a new springs ecosystem assessment protocol, GSA Annual Meeting, Portland, Oregon.

Hallam, V.G., **A.E. Springer**, L.E. Stevens, D.E. Anderson. 2009. Statistical comparisons of geomorphic and species indices for springs ecosystems, GSA Annual Meeting, Portland, Oregon.

Springer, A.E. and W.W. Covington, 2009. Role of large-scale restoration treatments on the ecohydrology of semi-arid catchments, Chapman Conference on Examining Ecohydrological Feedbacks of Landscape Change along Elevation Gradients in Semiarid Regions, Sun Valley, Idaho.

Ross, R.P., and **A.E. Springer**. 2009. Verde Valley geospatial database and hydraulic model, 23rd Annual meeting of the Arizona Riparian Council, Camp Verde, AZ, April 16-19.

Springer, A.E. and L.E. Stevens. 2009. Determining the sustainability of springs and baseflow streams through ecological flow needs assessment and values-risks methodology, 2009 NGWA Ground Water Summit, Tucson, AZ, April 19-23, 2009.

Springer, A.E. and L.E. Stevens. 2008. Importance of springs and springs ecosystems to species and habitats of the Colorado River. Colorado River Basin Science and Resource Management Symposium, Scottsdale, AZ November 18-20, 2008.

Brown, C.R., **A.E. Springer**, J. Hogan, S.E. Rice. 2008. Chemical and Isotopic Variability of Spring Discharge: Implications for Groundwater Flow Pathways and Residence Times in the R-aquifer, Grand Canyon, Arizona. Fall meeting of the American Geophysical Union, December 15-19, 2008, San Francisco, CA.

Springer, A.E. and L.E. Stevens. 2008. Assessing ecological flow needs and risks for springs and baseflow streams with growth and climate change, Fall meeting of the American Geophysical Union, December 15-19, 2008, San Francisco, CA.

Brown, C.R., S.P. Flora, **A.E. Springer**. 2008. Delineation of Recharge Areas, Groundwater Flow Pathways, and Travel Times on the Kaibab Plateau, Arizona. Joint Meeting of The Geological Society of America, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Gulf Coast Association of Geological Societies with the Gulf Coast Section of SEPM, Houston, TX, October 2008.

Springer, A.E. 2008. Determining ecological baseflow needs for streams and springs in arid and semi-arid regions, Joint Meeting of The Geological Society of America, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Gulf Coast Association of Geological Societies with the Gulf Coast Section of SEPM, Houston, TX, October 2008.

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Society, September 20-24, 2008, Flagstaff, AZ.

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Ross, R. and **A. Springer**. 2008. Final report, Phase I Verde Valley Geospatial Database Project, Yavapai County Water Advisory Committee, 17 p. cd with GIS.

Green, L.M. and **A. Springer**, 2007. West Mogollon Mesa 3-D Hydrogeologic Framework Model, Town of Payson, 14 p.

Rice, S.E. and **A. Springer**, 2007. East Verde River stream loss study, Salt River Project contract No. 06.0606, 32 p.

Timmons, D. and **A. Springer**, 2006. Prescott AMA groundwater flow model update report, ADWR contract #2005-2592, 77 p.

Rice, S.E. and **A. Springer**, 2006. Level 2 springs inventory of the Escalante River Headwaters area, Grant Staircase-Escalante National Monument, BLM Cooperative Agreement No. JSA041002, 20 p.

Springer, A. and M. Fry. 2006. 3-D Hydrogeological model framework and visualization, Arizona Water Protection Fund Grant #04-120WPF, 66 p.

Sabol, T. and **A. Springer**. 2006. Simulating the phreatic surface within new sediments deposited during the November 2004 High Flow test along the Colorado River, Grand Canyon Arizona, Grand Canyon Monitoring and Research Center, Flagstaff, AZ, 27 p.

Janecek, J., T. Acker, **A. Springer**, J. Theron, M. Manone, G. Brummels, S. Martin, 2005. Mapping Approach to Wind Desalination Opportunities in the U.S., National Renewable Energy Laboratory, 17 p.

Springer, A.E., L.E. Stevens and R. Harms, 2006. Inventory and classification of selected National Park Service springs on the Colorado Plateau, NPS Coop Agreement CA 1200-99-009, Task #NAU-118, 1,010 p.

Young, E. A. Springer, and T. Ferre, 2005. Frost penetration depth and frost heave at Camp Navajo: Year 2 Sponsor Award #23446.270, Brown & Caldwell for National Guard Bureau, 92 p.

Young, E. A. Springer, and T. Ferre, 2004. Frost penetration depth and frost heave at Camp Navajo: Year 1 Sponsor Award #23446.270, Brown & Caldwell for National Guard Bureau, 55 p.

Stevens, L.E., **A.E. Springer**, H. Kloeppe. 2004. Development and testing conceptual models and protocols for classification, inventory and monitoring of Colorado Plateau springs ecosystems, NPS Cooperative Agreement #CA 1200-99-009, 428 p.

DeWald, L.E., **A.E. Springer**, R. Mullen. 2004. Watershed restoration of a high-elevation riparian community. Final progress report, Arizona Water Protection Fund Grant #98-050, 450 p.

Springer, A.E., T.E. Kolb, R. Mullen. 2004. Fire effects on soil-water content in a high-elevation riparian meadow at Hart Prairie, AZ, Final project report submitted to BLM-SW Fire Initiative, NAU ERI35AK-03, 34 p.

Ross, L. and **A. Springer**. 2004. Impacts of conservation measures and alternative water supplies on groundwater. Final Project Report, Federal Grant #01-HQ-GR-0113. Arizona Water Resources Research Center, 33 p.

Anderson, D. E., Welch, S., Odem, W., **Springer, A.**, DeWald, L., Kennedy, J., and Fleishman, D. 2004. "Wetland revitalization and channel stabilization at Clover Springs, Mogollon Rim, Arizona." A final report submitted to the Arizona Water Protection Fund for Grant #98-059 "Verde River Riparian Restoration Demonstration Project." Arizona Department of Water Resources. 61 pp.

Springer, A.E., J. Welch, J. Peeler, C. Schlinger. 2002. Final Project Report for "Wastewater Disposition Project for the Big Park Wastewater Treatment District", 50 p.

Masek Lopez, S. and **A. E. Springer**. 2001. Final Project Report for "Upper Verde Valley riparian area historical analysis", Arizona Water Protection Fund, Arizona Water Protection Fund Grant No: 98-0057WPF, 26 p, with 42 p. Task 6 report.

Springer, A.E., T. Godwin, L. DeWald, J. Hink, 1999. Final Project Report for “Hoxworth Springs Riparian Restoration”, Arizona Water Protection Fund Grant No: 96-003WPF, 62 p.

Springer, A.E., T. Godwin, L. DeWald, S. Church, M. Silbert, E. Smith, 1999. Final Project Report “Critical riparian habitat restoration along a perennial reach of a Verde River tributary”, Arizona Water Protection Fund Grant No: 95-006WPF, 97 p.

Springer, A.E. and M. Gavette. 1997. Final project report, Analysis and Interpretation of well cuttings from Black Mesa, Arizona. submitted to U.S. Geological Survey, award # 1434-WR-97-5A-00477.

Springer, A.E. and M. Gavette. 1997. Final project report, Analysis and Interpretation of well cuttings from the Flagstaff, Arizona, area. submitted to U.S. Geological Survey, award # 1434-WR-97-5A-00455.

Parnell, R., **A. Springer**, L. Stevens, 1998. Flood-induced backwater rejuvenation along the Colorado River in Grand Canyon, Arizona (continuation): 1997 final report.

Parnell, R., **A. Springer**, L. Stevens, 1997. Flood-induced backwater rejuvenation along the Colorado River in Grand Canyon, Arizona: 1996 final report.

Quarterly progress reports and annual technical reports submitted for Arizona Water Protection Fund grant numbers 95-005WPF (4 per year since 3/96) and 96-006WPF (4 per year since 4/97). There are over 200 total pages in these progress reports..

Shafroth, P.B., J.C. Stromberg, D.T. Patten, **A.E. Springer**, J.M Wright, Dec. 1996. Ground-water recharge and riparian habitat enhancement from water discharge from New Waddell Dam into the Agua Fria River: Phase I--Planning and Feasibility, submitted to Arizona Dept. of Water Resources- Phoenix AMA, Grant #AUG94PH-4-00.

GRANTS AWARDED (2010 \$280,000; 2009 \$xx,xxx; 2008 \$104,452; 2007 \$113,575; 2006 \$128,222; 2005 \$102,202; 2004 \$136,678; 2003 \$249,333; 2002 \$105,769; 2001 \$178,000; 2000 \$20,291; 1999 \$557,923; 1998 \$6,100; 1997 \$173,665; 1996 \$240,690; 1995 \$52,585; Total ~\$2,000,000)

Middle Sycamore Hydrologic Response to Forest Restoration, \$36,209, Salt River Project, 6/1/15-12/15/15.

Environmental Flows database for the Desert Landscape Conservation Cooperative, subcontractor to UA-WRRC, NAU budget \$24,000, Desert Landscape Conservation Cooperative, 11/1/14-12/31/16 (id 1002656).

Developing a geodatabase and geocollaborative tools to support springs and springs-dependent

species management in the Southern Rockies LCC, Lead L. Stevens (MNA-SSI), Consultant A. Springer, \$100,000, Southern Rockies LCC (U.S. Bureau Reclamation), 9/14-8/16

Linking forest landscape management and climate change to the conservation of riparian habitat in Grand Canyon, Lead PI Will Flatley (Forestry), co-PI A. Springer, \$96,535, Southern Rockies LCC (U.S. Bureau Reclamation), 9/14-8/16.

NAU-SRP Collaborative project on ecosystem responses to restoration: FY15, Lead PI W. Covington (ERI), co-PI A. Springer, \$402,000, Salt River Project 5/1/14-4/30/15, (id xxxxxxx).

Paired watershed observation pilot studies, Lead PI W. Covington (ERI), co-PI A. Springer, \$88,860, Salt River Project, 10/1/13-4/30/14, (ID 1002318).

Predicting Snow Water Equivalence and Soil Moisture Response to Restoration Treatments in Headwater Ponderosa Pine Forests of the Desert LCC, Lead PI Sankey, T., co-PI A. Springer, \$149,866, U.S. Bureau Reclamation-Water Smart Program, 10/1/13-9/30/15 (ID 1002289)

Assessing evapotranspiration rate changes for proposed restoration of the forested uplands of the Desert LCC, Lead P.I., Co-PI T. Kolb, \$135,332, U.S. Bureau of Reclamation-Water Smart Program, 9/12-12/14, (ID 1001947).

Ecohydrologist Post-Doctoral Fellow, Technology and Research Initiative, Support for Post-Doctoral Associations Program, Co-PI D Huntzinger, \$100,000, NAU 6/13-6/15.

Action plan for landscape-scale spring restoration on the Coconino and Kaibab National Forests, \$146,000, Nina Mason Pulliam Charitable Trust, 1/1/12-12/31/13 (ID 1001359).

Predicting hydrologic and other natural resource responses to forest restoration treatments in the Verde and Salt River watersheds, Lead PI W Covington, \$472,000, Salt River Project, 11/1/11-4/30/14 (ERI3924).

Monitoring water quality of Oak Creek and authoring a watershed improvement plan, Oak Creek Watershed Council, \$10,000, 7/01/11-9/30/12, (GLG39ZP).

Building an economically sustainable restoration and monitoring plan for forested watershed in Northern Arizona, Lead PI, Co-PIs E. Nielsen, J. Mueller, X. Zhao. NSF-EAR1038842, \$149,814, 01/01/11-12/31/13. (Submitted 4/15/10, awarded 9/27/10) (ID 1000147)

Spring Mountains Springs Inventory Program, USDA-USFS, \$73,402 (year 1), \$74,407 (year 2), \$74,564 (year 3), 09/02/10-3/31/13. (GLG 34JR).

Hydrogeological investigations and water table monitoring at Deadman Wash and Little Colorado River confluence area, National Park Service, \$10,000, 08/31/10-12/31/12. (GLG 3ER9)

Changes in Aquifer Recharge from Climate Change or Watershed Management, Ecological Restoration Institute, \$248,546, 7/1/09-6/30/11. (ERI xxxx)

Springs inventory and water quality assessment in Kanab Creek Watershed, Grand Canyon National Park, National Park Service, \$11,212, 5/18/2009-6/30/10 (GLG3504)

Alberta Springs Project, University of Lethbridge, Alberta (from Imperial Oil Foundation), \$121,895 (renewals of \$20,000 per year for 5 years), 07/01/08-12/31/12 (AWI38UX)

Investigating the opportunity for wind-powered desalination in Arizona, U.S. Bureau of Reclamation, \$20,000, 05/17/08-05/18/09 (AWI35XQ)

Tribal springs ecosystem inventory and assessment, Museum of Northern Arizona (from Christensen Fund), \$8,873, 05/01/08-12/31/09 (AWI39SW)

Verde Valley Irrigation Monitoring, Salt River Project, \$15,533, 09/01/08-04/30/09 (AWI39TA)

Verde River ecological flows study Phase II: Integrated research for refining flow-ecology response models, Arizona Water Institute, \$32,394, 01/08-12/08 (AWI1140)

Developing a methodology for identifying and prioritizing at-risk water resources for the Coconino Plateau, Arizona Water Institute, \$27,652, 01/08-12/08 (AWI1140)

Verde Valley GeoSpatial Database, Yavapai County, \$105,000, 08/07-05/10 (AWI38SB).

Verde springs monitoring demonstration study, Salt River Project, \$19,983, 05/07-05/08. (GLG39NA)

Delineation of recharge areas, groundwater flow pathways, and travel times on the Kaibab Plateau, Grand Canyon Association, \$34,250, 06/07-12/08. (GLG39PX)

Ecohydrology of Springs in Western Canada, Chair in Water and the Environment, Alberta Ingenuity Centre for Water Research, Fulbright Scholar Program, US \$26,000, 9/07-12/07.

Identification and Characterization of Arizona Heritage Waters, Arizona Water Institute, \$46,000, Lead scientist on multi-institution project, 12/06-11/07 (RES1140HW)

Verde River Ecological Flow Science—A Collaborative Approach, Arizona Water Institute, \$47,628 (\$5,400 Geology), Project lead on multi-institution project, 12/06-11/07. (RES1140VR)

Collaborative Restoration, Monitoring at Fossil Creek Year 3, Nina Mason Pulliam Trust, \$70,000 (\$9,000 Geology), 4/06-5/07. (ENS 39MU)

East Verde River seepage loss study, Salt River Project, \$15,487, 5/1/06-4/30/07. (GLG39NA)

Escalante Level 2 Springs Inventory, BLM-Grand Staircase Escalante, \$10,107, 02/06-09/06. (GLG35SK)

Springs monitoring in the Middle Verde River watershed of Arizona, U.S. Bureau of Reclamation, \$3,000, 9/05-9/06. (GLG35RU)

Collaborative Research: CO₂ Springs and travertines of the Southwestern US: Hydrologic pathways linking tectonism to water quality, co-P.I. with L. Crossey, National Science Foundation, \$49,596 to NAU of \$200,000 project, 2/06-12/08. (GLG326D)

West Mogollon Mesa 3-D Digital Hydrogeologic Framework Model, Town of Payson, \$15,008, 10/05-08/07 (GLG38NQ).

Analysis of Desalination, co-P.I. with Tom Acker and Jan Theron, National Renewable Energy Laboratory, ~\$45,000, 2004-2007. (EGR35NS, EGR35TL)

Verde Basin Drought Planning, SAHRA U. of Arizona, \$45,000, 7/05-12/07. (GLG38LH)

Prescott AMA Model Update and Future Conditions Scenarios, Year 1, ADWR, \$37,194, 8/05-8/06. (GLG379H)

Restoration, Monitoring and Planning at Fossil Creek in the First Year after Hydropower Decommissioning, Nina Mason Pulliam Trust, \$140,000 (\$18,000 Geology), 4/05-5/06. (ENS 39KH)

Arizona Virtual Water University planning, NAU Provost and NAU MPCER, \$23,000, 1/05-6/05.

Big Chino Basin 3-D Digital Hydrogeologic Framework Model, USGS Section 104b, \$9,000, 3/05-2/06. (GLG38KV)

Sandbar hydrogeology and stability changes with flood flows, USGS, \$50,041, (GLG35LD modification) 11/04-5/05.

Science Initiative-Year 2, Grand Canyon springs ephemeral discharge study, USGS, \$12,000, 6/04-6/05. (GLG35LE)

Monitoring plan for Fossil Creek - Sedimentation & Hydrology, Pulliam Charitable Trust, \$145,000 total to 4 departments (\$2,800 Geology), 3/04 - 4/05 (EGR39HD)

Frost heave affects on small objects-Year 2, Arizona Department of Emergency Management (through Brown & Caldwell), \$25,203, 7/04-10/05. (GLG39JG)

Verde Headwaters 3-D Hydrogeological Model Framework and Visualization, Arizona Water Protection Fund, \$46,634, 7/04-2/07 (GLG377F)

Water Collaborative, NAU-ERDENE (Proposition 301), \$30,000, 7/03-6/04.

Verde well inventory database, USGS \$5,000, 9/03-8/04. (GLG35KA)

2004 (2005) Field Inventory of Springs and Seeps in Northern and Southern Colorado Plateau Network Parks, NPS, \$80,000, 9/03-2/06. (GLG35JG)

Development and Testing Conceptual Models and Protocols for Classification, Inventory and Monitoring of Colorado Plateau Springs Ecosystems, NPS, \$45,000, 8/03-8/04. (GLG35JH)

Frost heave affects on small objects, Arizona Department of Emergency Management (through Brown & Caldwell), \$67,656, 5/03-10/04. (GLG39FZ)

Science Initiative-Year 1, Grand Canyon springs ephemeral discharge study, USGS (passed through Univ. Arizona), \$12,000, 10/03-9/04. (GLG38FV)

Impacts of Conservation Measures and Alternative Water Supplies on Groundwater USGS Section 104B through U of A Water Resources Research Center, \$9,677, 3/03-2/04. (GLG

Grand Canyon Springs/Ecosystems Coupled Models, National Park Service, \$40,000, 8/02-12/04. (GLG35FC)

NAU GeoWall, co-P.I. Tom Hoisch, ELearning Initiative, Proposition 301, \$23,500, 2/02-6/02.

Middle Verde Springs Monitoring Study, USDA-FS (Coconino, Tonto, Prescott), \$9,997, 6/02-12/15/05.

Delineation of capture zones of the Kaibab Paiute Reservation (Year 2), U.S. EPA (through Kaibab Paiute), \$20,407, 5/30/02-12/31/02

Regional aquifers characterization through spring discharge analysis, USGS Section 104B through U of A Water Resources Research Center, \$11,865, 3/02-2/03.

Middle Verde Springs monitoring study, Salt River Project, \$20,000, 7/01-9/02

Delineation of capture zones of the Kaibab Paiute Reservation, U.S. EPA (through Kaibab Paiute), \$14,175, 5/01/01 to 5/31/02

Ecological Restoration Institute, PI-Diana Elder Anderson, co-PIs, K. Anderson and Abe Springer, \$65,682, 09/01/10 to 08/31/03

Restoration of wet meadows: Influence of burning herbaceous communities on groundwater recharge, Bureau of Land Management, co-P.I. Tom Kolb, \$57,216, 6/01 to 12/03.

Big Park Wastewater Recharge Project, Big Park Wastewater District, co P.I. C. Schlinger, \$20,947, 1/01-12/01.

Coconino Plateau Hydrology Workshop, Arizona Department of Water Resources and U.S. Bureau of Reclamation, \$4,500, 10/00-8/31.

Rates and amounts of discharge from seeps and springs of the Redwall-Muav aquifer, Grand Canyon, Arizona, Grand Canyon Association, \$4,416, 6/00-5/01.

Ponderosa pine water balance at Hart Prairie: Role of herbaceous transpiration, co-P.I. Tom Kolb, Water Resources Research Center, \$10,375, 6/00-12/01.

Massie Pilot Project, Environmental Research and Education Center, Department of Energy, \$50,000, (Rich Foust is P.I., but I'm using 80 % of funds), 10/99 to 5/02

Review of WQARF Remedial Actions, Arizona Department of Environmental Quality, \$4,000, 5/99 to 6/00.

Upper Verde Valley riparian area historical analysis, Arizona Water Protection Fund, \$44,019, 5/99 to 2/01.

Watershed restoration of a high-elevation riparian community, Arizona Water Protection Fund, co-P.I. with L. DeWald, W. Odem, \$286,275, 8/99 to 12/03.

Verde River headwaters riparian restoration demonstration project, Arizona Water Protection Fund, co-P.I. with D. Anderson, W. Odem, L. DeWald, \$193,629, 9/99 to 12/02.

Fracture and conduit flow characterization of a deep regional carbonate aquifer, HBCU/MIA consortium, Department of Energy, \$6,100, 10/98 to 9/99.

Bioremediation of hydrocarbon spills in the Coconino National Forest, U.S. Forest Service, co-P.I. with G. Southam, \$40,000, 1997.

Investigation of attenuation and natural remediation of acid mine drainage, Iron King Mine, Verde Valley, Arizona, Phelps Dodge, co-P.I. with R. Parnell, \$24,843, 5/97 to 4/98.

Analysis and interpretation of well cuttings from the Flagstaff, Arizona, area. U.S. Geological Survey, lead P.I., co-P.I. with R. Parnell, \$4,300, 4/97 to 9/97.

Analysis and interpretation of well cuttings from Black Mesa, Arizona, U.S. Geological Survey, lead P.I., co-P.I. with R. Parnell, \$7,865, 4/97 to 9/97.

Unanticipated Glen Canyon Dam high flows: Impacts on nutrient cycling and backwaters, co-P.I. with R. Parnell, \$16,440, 2/13/97 to 12/31/97.

Influence of regional ground-water on the Grand Canyon, NAU Organized Research, \$14,920, 7/97 to 6/98.

Hoxworth Springs Riparian Restoration, Arizona Water Protection Fund, lead P.I., co-P.I. with L. E. DeWald, \$31,545, 2/1/97 to 1/31/99.

Response of Bebb Willow to Riparian Restoration, Arizona Water Protection Fund, co-P.I. with L.E. DeWald, \$33,752, 2/1/97 to 1/31/99.

A proposal to continue monitoring backwater rejuvenation along the Colorado River, Grand Canyon, Arizona, Bureau of Reclamation, co-P.I. with L.E. Stevens and R. Parnell, \$75,999, 10/96 to 9/97.

Analysis and interpretation of well cutting from three separate wells around Flagstaff, Arizona, U.S. Geological Survey, P.I., \$4,500, 6/96 to 8/96.

Evaluation of backwater rejuvenation along the Colorado River in the Grand Canyon, Arizona, U.S. Bureau of Reclamation, co-P.I. with R.A. Parnell, and L. Stevens, \$33,000, 10/95 to 9/96.

Evaluation and exploration of ground-water resources using remote sensing, geologic mapping and geophysical techniques, U.S. Geological Survey, \$39,876, 1/96 to 10/96.

Critical riparian habitat restoration along a perennial reach of a Verde River Tributary, Arizona Water Protection Fund, lead P.I., co-P.I. with L. DeWald (Forestry), \$102,535, 3/96 to 3/99.

Development of a water budget for water discharged from New Waddell Dam into the Agua Fria River, Arizona Department of Water Resources, \$5,000, 10/95 to 10/96.

Transient ground-water flow and storage in perched volcanic aquifers, Organized Research, NAU, P.I., \$17,780, 7/96 to 6/97.

Hydrogeologic computer curriculum, Instructional & Curricular Development Grant, Northern Arizona University, P.I., \$2,435, 7/95 to 6/96.

"Safe Yield" of an aquifer supplying baseflow to a stream in Arizona, Organized Research, Northern Arizona University, P.I., \$12,150, 7/95 to 6/96.

GRANTS PENDING

NRT-DESE: Big Data Applications to Climate Change: Remote Sensing Meets Massively Parallel Sequencing (RESPonSE), participating faculty.

GRANTS IN PROGRESS

GRANTS NOT FUNDED

Between 1994 and 2010, non-funded proposals included 20 other proposals submitted either as a principal or co-principal investigator to the U.S. Environmental Protection Agency, U.S. Department of Agriculture, and National Science Foundation.

POST-DOCTORAL SCHOLAR MENTORING

Frances O'Donnell, Ecohydrologist, TRIF-SPA, June 3, 2013 to June 2, 2015

Wonsoon Ha, Ecohydrologist, U.S. Bureau of Reclamation and Desert Landscape Conservation Cooperative, February 18, 2013 to December 31, 2014.

GRADUATE THESIS INVOLVEMENT

P.D. Students in Earth Sciences and Environmental Sustainability (advisor): 0 completed, 1 in progress

Completed: none

In progress: Anastasia Begley (start 8/15)

Masters Students in Geology (advisor): 36 completed, 0 in progress

Completed

39-Aldridge, Vaden J. 2015. Measuring groundwater recharge in Northern Arizona, using an atmospheric-sourced chloride mass balance technique, 96 p.

38-Schindel, Graham M. 2015. Determining Groundwater Residence Times of the Kaibab Plateau, R-Aquifer using Temperature, Grand Canyon National Park, Arizona, 112 p.

37-Stempniewicz, Victoria. 2014. Evaluating erosion risk mitigation due to forest restoration treatments using alluvial chronology and hydraulic modeling, 158 p.

36-Sparks, Krista D. 2014. The role of geomorphologic diversity on floral diversity of North American Springs, 65 p.

35-Paffett, Kyle. 2014. Analysis of springs assessment data for stewardship in the Coconino and Kaibab National Forests, Northern Arizona, 84 p.

34-Schaller, Elizabeth (Lisa).2013. Isotopic flow determination and geochemical and geomorphic impacts on vegetation for Western North American Springs, 131 p.

33-Wyatt, Clinton, J.W. 2013. Estimating aquifer response following forest restoration and climate change along the Mogollon Rim, Northern Arizona, 100 p.

32-Robinson, Ken. 2011. Characterizing hydrologic and contaminant transport characteristics of scoriated lipillistone for emplacement of municipal solid waste, 86 p.

31-Davis, Christina. 2011. Springs ecosystem conditions and risks as revealed by monitoring efforts in Northern Arizona forests, 162 p.

30-Brown, Christopher. 2011. Physical, geochemical, and isotopic analyses of Redwall-Aquifer springs, North Rim, Grand Canyon, Arizona, 135 p.

29-Ross, Robert P. 2010. One-dimensional hydraulic model of Verde River near Camp Verde, Arizona including irrigation ditch discharge, 156 p.

- 28-Hallam, Valerie. 2010. Detailed statistical analyses of fundamental properties of springs ecosystems in relation to their geomorphological and ecological diversity, 117 p.
- 26-Fortezzo, Corey. 2009. Geology, geomorphology, and hypsometry of southeast Margaritifer Terra, Mars, and the Escalante River, Utah, 113 p. (co-advised with Ken Tanaka, USGS)
- 25-Green, L. Megan. 2008. A conceptual hydrogeologic model for Fossil Springs, West Mogollon Mesa, Arizona: Implications for regional springs processes, 90 p.
- 24-Rice, Steven E. 2007. Springs as indicators of drought: Physical and geochemical analyses in the Middle Verde River watershed, Arizona, 153 p.
- 22-Fry, Matt C. 2006. Digital hydrogeologic framework models and implications for fault scaling, Upper Verde River headwaters, Arizona, 142 p.
- 21-Young, Erin M. 2006. Maximum frost depth and freeze-thaw frequency measurements and simulations at Bellemont, Arizona, 98 p.
- 20-Ross, Lanya E. 2005. Interpretive three-dimensional numerical groundwater flow modeling, Roaring Springs, Grand Canyon, Arizona, 120 p.
- 19-Griffiths, Ron. 2005. Geomorphology and sedimentology of spring-dominated channels: Implications for restoration along the Mogollon Rim, Arizona, (0.5)(co-advised with Diana Anderson), 138 p.
- 18-Adams, Eric A. 2005. Determining ephemeral spring flow timing with laboratory and field techniques: Applications to Grand Canyon, Arizona, 80 p.
- 17-Sabol, Thomas. 2005. Delineation of wellhead and springhead protection areas for the Kaibab Paiute Indian Reservation, Arizona, 181 p.
- 15-Godwin, Timothy N. 2004. Evaluation of streambed restoration and occurrence of Hoxworth Springs, Coconino, County, Arizona, 191 p.
- 14-Kobor, Jeremy. 2004. Simulating water availability in a spring-fed aquifer with surface water/groundwater flow models, Grand Canyon, Arizona, 125 p.
- 13-Flora, Stephen P. 2004. Hydrogeological characterization and discharge variability of springs in the Middle Verde River Watershed, Central, Arizona. 237 p.
- 12-Kessler, James A. 2002. Grand Canyon springs and the Redwall-Muav aquifer: Comparison of geologic framework and groundwater flow models, 122 p.

11-Amentt, Melissa A. 2002. Hydrogeology and evapotranspiration of the herbaceous understory at a high-elevation riparian community, Hart Prairie, Arizona, 170 p.

10-Navarro, Luis F. 2002. Characterization and ground-water flow modeling of the Mint Wash/Williamson Valley area, Yavapai County, 158 p.

9-Wilkinson, Randall, 2000. Water resources of Bellemont Park, Coconino County, Arizona, p. 262.

8-Kelly, Sarah, 2000. Ground-water flow simulation and recharge sources for a fractured sandstone aquifer, Coconino, County, Arizona, 145 p.

7-Wilson, Eric, 2000. Geologic framework and numerical flow models of the Coconino Plateau Aquifer, Grand Canyon, Arizona, 72 p.

6-Semmens, Betsy A., 1999. Hydrogeologic characterization and numerical transport simulations of a reattachment-bar aquifer in the Colorado River, 184 p.

5-Higgins, Daniel P., 1998. Leakage simulations from a perched mountain aquifer in the Inner Basin, San Francisco Mountain, Arizona, 141 p.

4-Gavin, Andrew J., 1998. Hydrogeology and numerical simulation of a spring-dominated, high-elevation riparian community, Hart Prairie, Arizona, 177 p.

3-Wright, Julie M., 1997. Coupling ground-water and riparian vegetation models to simulate impacts of a reservoir release from Lake Pleasant, Maricopa County, Arizona, 116 p.

2-Petroutson, William D., 1997. Interpretive simulations of advective flowpaths across a reattachment bar during different Colorado River flow regimes, 159 p.

1-Dohm, Stephan, 1995. Hydrogeology and ground-water availability of the Bird Springs alluvial aquifer on the Navajo Indian Reservation, 133 p.

In Progress: none

Masters Students in Environmental Science and Policy (advisor): 3 completed, 3 in progress

Completed:

27-Androwski, James P. 2009. An assessment of brackish groundwater and wind-powered desalination opportunities in the United States and Arizona, 183 p.

23-Timmons, Daniel L. 2007. Groundwater flow modeling and scenario development in the Prescott Active Management Area, Yavapai County, Arizona, 220 p.

16-Mullen, Regina. 2004. Prescribed Burning and Ecological Restoration: Implementation and Impacts on Soil Moisture at Hart Prairie, Arizona, 109 p.

In Progress: Ryan Lima, Katie Junghans, Casey Rutherford Jones

Masters Students in Geology (committee): 11 completed, 0 in progress

Completed: Corey Allen ('95), Dana Strength ('97), Katie Cumming ('97), Jeff Bennett ('97), John Malusa ('98), Sarah Rogers ('99), Andrew Schroth ('01), Amy Welty ('03), Gwen Holzschuh ('04), Joe Giovinazzo ('12); Daniel Hadley ('14)

In Progress: none

Master Students in Environmental Science and Policy (committee): 9 completed, 1 in progress

Completed: Chas Jones ('03), Nathan Schott ('07), Sharon Masek Lopez ('08), Rachael Brown ('09), Rajani Maharjan ('11), Wes Swaffer ('12), Mariah Giardina ('12), Bill Hoblitzell ('13), Amber Wilson ('13)

In Progress: Megan Burke

Masters Students in Earth Science (committee): 1 completed, 0 in progress

Completed: Elsbeth Antencio ('96)

In Progress: none

Masters Students in Forestry (committee): 4 completed, 0 in progress

Completed: Brad Baum ('99), Stephanie Church ('00), Dylan Fisher ('01), Karissa Ramstead ('11)

In Progress: none

Masters of Arts in Sustainable Communities (committee): 1 completed, 0 in progress

Completed: Eleanor McTyre ('14)

In progress: none

Doctoral Students in Forestry (committee): 1 completed, 0 in progress

Completed: Jonathan Horton (Comprehensive exam '99, Defense '00)

In Progress: none

Doctoral Students in Political Science (committee): 1 completed, 0 in progress

Completed: Jane Whitmire ('13)

In progress: none

Masters Students in Biology (committee): 1 completed, 0 in progress

Completed: Debbie Wong ('98)

In Progress: none

Other Institutions:

Masters Students in Biological Science (external examiner): 1 completed

University of Lethbridge, Alberta, Canada

Completed: Karen Gill ('07)

SENIOR THESIS/RESEARCH ADVISING: 10 theses and 6 research projects completed

21-Garrett Erickson, 2015. Flow relations of Hoxworth Springs.

20-Rae Byars, 2015. A geologic inquiry of Upper Lake Mary's rising turbidity levels and the effects on the reservoir quality.

19-Garcia, Alex, 2014. Friends of the Rio de Flag internship, ENV408.

18-Tjaden, Savannah, 2014. Chloride mass balance study.

17-Harris, Spencer, 2014.

16-Coston, Natalie, 2010. Statistical examination of water data in the Coconino Plateau for use as sustainability indicators, 26, p.

15-Carr, Alden, 2010. Long-term hydrologic and vegetation monitoring of restoration in a high-elevation, wet meadow: Hart Prairie, Arizona

14-Miller, Jacob, 2005. Temporal variability of isotopes in precipitation of the North Rim.

13-Patricia Pursell, 2005. Tree rings as a proxy for determining permanence of spring discharge at Hoxworth Springs, AZ, 10 p.

12-Joe Welch, 2001. Big Park wastewater disposition project, (supervised senior research).

11-Tower, Lisa, 2000. Baseflow of Oak Creek, West Clear Creek, and Wet Beaver Creek, (supervised ENV485/490 research).

10-Kennedy, Jeff, 2000. Channel incision and straightening on the Southern Colorado Plateau at Clover Spring, Arizona. 39 p. (co-advised with Diana Anderson, CESE)

9-Vanderbilt, Mark, 1998. Analysis of Southern Oscillation Influence on water levels in the Lake Mary and Woody Mountain aquifers (senior research project), 200 p.

8-Puhn, Ken, 1998. An analysis of sublimation in the Hart Prairie area of Arizona, 38 p.

7-Gavette, Matthew, 1997. Analysis and interpretation of well cuttings from the Flagstaff and Black Mesa areas, Arizona, 239 p.

6-Reymers, Vanessa J., 1997. Analysis and interpretation of a numerical model of the perched aquifer system at Hoxworth Springs, Coconino County, Arizona, 32 p.

5-Curry, Patrick J., 1997. Hydrological restoration of a high elevation watershed and associated

riparian community Hart Prairie, Arizona, 48 p.

4-Kay, John T., 1997. Saturated and unsaturated flow of water through hydrocarbon contaminated soils, 78 p.

3-O'Brien, G. 1997. The effects of test beach/habitat building flows on hydraulic conductivity in the reattachment bar and return current channel at 55.5R mile on the Colorado River in Grand Canyon, 69 p.

2-Lee, Robert C.L., 1996. Characterization and spatial variability of hydraulic conductivity and soil texture in a seep dominated riparian community, Hart Prairie, Arizona.

1-Shetter, Timothy C., 1996. Analysis and interpretation of well cuttings from two deep water wells in Northern Arizona.

In Progress: Daniel Boggs, William Woods, Carl Thompson

OTHER ADVISING

Mentor for NSF REU student for 10 weeks in Summer 2004 related to Fossil Springs.

Mentor for NASA SHARP Plus summer program. Mentored gifted high school student (Nicholas Negrete) for 8 weeks in the summer of 1997.

NOTEWORTHY ACCOMPLISHMENTS OF STUDENTS

Vaden Aldridge, 2015 – Montgomery Prize in Geology

Ryan Lima, 2015 – Wyss Scholar

Katie Junghans, 2015 – Charles Avery AHS Intern Scholar

Rae Byars, 2014 – Charles Avery AHS Intern Scholar

Rae Byars, 2014 - Hooper Undergraduate Research Award

Garrett Erickson, 2014 – Hooper Undergraduate Research Award

Savannah Tjaden, 2014-2016 – EPA Growing Research Opportunities Fellowship (\$50,000)

Victoria Stempniewicz, 2013 – WREP award (\$14,500)

Clint Wyatt, 2012 – WREP award (\$4,000)

Kyle Paffett, 2012 – WREP award (\$1,200)

Chris Brown, 2008 - Watershed Research and Education Program Award, \$4,000

Chris Brown, 2008 - AGU student travel award, \$150

Chris Brown, 2008 - GSA Student Research Award, \$1,650

Megan Green, 2007 - Watershed Research Education Program Award, \$4,000.

James Androwski, 2006 - AHS Scholarship, \$3,000

Daniel Timmons, 2006 - ARCS Scholarship, \$6,000

Daniel Timmons, 2006 - Watershed Research Education Program Award, \$4,000

Steve Rice, 2006 - GSA Student Research Award, \$900

Patricia Magowan, 2004 - AHS Halpenny Intern
 Jacob Miller, 2004 - Hooper Undergraduate Research Award
 Matt Fry, 2004, 2005 - Watershed Research and Education Program Student Award, \$3,000
 Steve Flora, 2003 - Merriam-Powell Fellowship, \$6,126
 Steve Flora, 2002 - Verde Watershed Research and Education Program Student Award, \$3,000
 Lanya Ross, 2002 - Geological Society of America Student Research Award, \$1,300
 Jeff Kennedy, 2000 - Hooper Undergraduate Research Award
 Sarah Kelly, 1998 - ARCS Scholarship, \$6,000
 Betsy Gilbert, 1997 - Arizona Hydrological Society Scholarship, \$500
 Betsy Gilbert, 1997 - ARCS Scholarship, \$6,000
 Julie Wright, 1997 - Errol L. Montgomery Prize in Geology, \$1,000
 Julie Wright, 1996 - ARCS Scholarship, \$6,000
 Bill Petroustson, 1995 - Arizona Hydrological Society Scholarship, \$500
 Stephan Dohm, 1995 - National Ground Water Association Student Fellowship, \$1,000
 Stephan Dohm, 1994 - Arizona Hydrological Society Scholarship, \$500

VISITING LECTURES

2015 University of Texas-Austin
 2014 Desert Research Institute, Reno, NV
 2007 University of Edmonton; University of Calgary; University of Saskatoon
 2002 University of Nevada-Las Vegas, Geology
 2001 The College of Wooster, Dept. of Geology
 2001 The Ohio State University, Dept. of Geological Sciences
 2001 Illinois State Water Survey, Champaign-Urbana, Illinois
 2001 University of Wisconsin-Madison, Dept. of Geology and Geophysics
 2001 University of Minnesota, Dept. of Geology and Geophysics
 2000 University of Arizona, Dept. of Hydrology and Water Resources
 2000 University of New Mexico, Dept. of Geology
 1999 California State University, Sacramento, Dept. of Geology
 1998 University of Texas, Dept. of Geological Sciences

INVITED LECTURES

2015 Distinguished Lecturer, Edwards Aquifer Authority, San Antonio, TX
 2013 El Dia del Agua, Keynote Presenter, University of Arizona
 2011 University of Kentucky
 2010 Little Colorado River Annual Watershed Conference, Show Low
 2009 James Madison University
 2008 Arizona Riparian Council Annual Meeting, Prescott, Arizona, Plenary speaker
 2008 Climate and Deserts Workshop: Adaptive Management of Desert Ecosystems in a Changing Climate, Laughlin, Nevada.
 2008 Joint Annual Meeting of the AZ/NM Chapter of the American Fisheries Society and the Arizona and New Mexico Chapters of the Wildlife Society, Prescott, Arizona, Plenary speaker

- 2007 Trans-Boundary Water Policy Issues: The Western North American Region symposium, Calgary, Alberta, Canada, plenary speaker
- 2006 AHS - Annual Symposium - Plenary speaker on Verde River
- 2006 The Nature Conservancy - Ecological Flows Workshop for Verde River
- 2001 Arizona Hydrological Society - Annual Symposium - Luncheon speaker
- 1997 Arizona State University, Dept. of Plant Biology,
- 1997 Arizona Hydrological Society - Phoenix Chapter
- 1995 Arizona Hydrological Society - Phoenix Chapter

SERVICE- Academic

School/Department

2011-2013	Coordinator for new SESES PhD program
2008-2009	Chair Alumni, Development and Marketing committee
2006-2007	Alumni coordinator (newsletter and alumni group meetings)
2002-present	Invited and hosted Jahns Distinguished Lectures of the Association of Engineering Geology
2002-2003	Planning for Advisory Committee
2001-present	Geological Society of America Campus Representative
2001-2007	Flagstaff Earth Science Seminar Series coordinator
2001-2004	GIS and GeoWall committees
1999-2000	External relations committee (newsletters, development, river trip)
1997-1998	Chair, Screening committee for Assistant Professor position in Geology and Environmental Sciences specializing in geomorphology, 68 applications, 2 hired
1998-1999	Undergraduate curriculum/Liberal Studies committee
1995-1998	Graduate Committee, reviewed 40 to 60 graduate applications per year
1999-2000	Graduate Committee
1995-1997	Computer Committee, helped write successful grant proposal for new computer lab (1995/96)
1997-present	Invited and hosted National Ground Water Association Distinguished Darcy Lecturers
1995-present	Invited and hosted Birdsall Dreiss Distinguished Lecturers of the Hydrogeology Division of the Geological Society of America
1997	Presentation in Flagstaff Earth Science Seminar Series entitled <i>The geology of conservation: the physical science components of conservation science.</i>
1996	Organized a workshop in the Geology Department on remote sensing methods for finding water resources in the Flagstaff area.
1994-1995	Undergraduate Committee

College

2003	Seminar in Merriam-Powell Center for Environmental Research
2003	GeoWall presentation to College Computing seminar series
2001-2002	College curriculum committee
1999-2000	College representative on Campus-Wide ad-hoc GIS subcommittee
1998	Served on a grade appeal committee
1996-1999	Marshall for three commencements and Reader for one commencement

University

2005-2007	Made posters for and attended annual Arizona Legislature Water Expo in Phoenix
2005-2009	NAU Water Coordinator for Arizona Water Institute
2003-2004	Director, NAU Water Collaborative

- 2004 Board of Directors, Consortium of Universities for Advancement of Hydrological Sciences, Inc.
- 2005-2007 Advisory Board, GeoSpatial Research and Information Lab NAU (GRAIL)
- 2002-2007 Advisory Board, Merriam-Powell Center for Environmental Research
- 2001-2008 Advisory Board, Watershed Research and Education Program
- 2000-2001 Co-coordinator of Verde Watershed Research and Education Program in Center for Sustainable Environments at NAU
- 2000 Gave 2-hour presentation to 15 high school, Native Americans for Earth Circles Environmental Conference
- 1999-2000 Member planning committee for Salt River Project Centennial gift
- 1999-2000 Planned, developed, reviewed, and assessed new Colloquium curriculum for new Liberal Studies Program and taught new UC101 course.
- 1999-2000 Member Center for Environmental Sustainability Outreach/Development Committee
- 1998-2000 Liberal Studies Council member, reviewed 100s of syllabi, participated in many discussions related to the new Liberal Studies curriculum (met 2 to 4 hrs/week)
- 1998 Resource expert, Ponderosa Group workshop, one of 4 experts to present research information and to facilitate discussions among 20 NAU faculty on incorporating principles of sustainability into the curriculum.
- 1996-2000 Member, Planning Committee for Ponderosa Group, a University-wide group committed to incorporating principles of sustainability into curriculum.
- 1996-1997 Member, Planning Committee for five-day workshop for university educators entitled "Southwest Institute for Sustainability in Higher Education"

SERVICE- Professional

National/international professional societies

- 2014-2015 Second-Vice Chair, Hydrogeology Division, Geological Society of America (elected)
- 2013 Emcee. 2013. Restoration Investment Strategies for Arizona's Forests and Watersheds Workshop, October 3 and 4, Scottsdale, AZ
- 2011 Co-convended session "Springs as sites of dynamic physical, geochemical, and ecological processes", GSA 2011 Annual meeting in Minneapolis
- 2011-present Desert Landscape Conservation Cooperative Science Working Group
- 2009 Co-convended session "Importance of groundwater-surface water interactions for sustainability of river systems, NGWA Ground Water Summit, Tucson.
- 2008 Mid-Career Faculty Issues: Mapping Your Career, luncheon panel discussion at 2008 GSA Annual meeting
- 2008-2009 Organizing Committee, National Ground Water Assoc, 2009 Tucson Summit
- 2007-2011 Editorial Board, *Environmental And Engineering Geoscience* (GSA rep)
- 2007 Developed short course for NGWA Ground Water Summit in Albuquerque
- 2006 Convended theme session "Emerging and Innovative Approaches to Groundwater Modeling" GSA annual meeting in Philadelphia

- 2005 Developed short course for GSA annual meeting in Salt Lake City on springs
- 2002-2007 Associate Editor for *Environmental & Engineering Geoscience*
- 2003 Created and co-organized theme session on Springs for GSA meeting in Seattle
- 2001-2003 GSA Hydrogeology Division Distinguished Service Award Committee (Chair in 2002 and 2003)
- 2000 Created and organized theme session for annual GSA meeting in Reno entitled "Restoring and Sustaining Aquifers for their In-Situ Values"
- 1998 Created and organized theme session for annual Geological Society of America meeting in Toronto entitled "Ground-Water Sustainability".
- 1997 Co-organized and co-lead 2-day workshop for Historically Black Colleges and Universities/Minorities Consortium related to 3 Environmental Science courses developed at NAU and Clark Atlanta University.
- 1997 Created and organized theme session for annual Geological Society of America meeting in Salt Lake City entitled "Conservation Geology: Restoring and Maintaining Earth's Ecosystems".

Local/state/regional professional societies

- 2011-present Desert Landscape Conservation Cooperative, Science Working Group and Critical Management Question team (annual 2-day in person meeting, monthly teleconference).
- 2010-2011 Planning committee for 2011 Arizona Hydrological Society symposium
- 2010 Co-led Flagstaff area field trip for Arizona Hydrological Society with R. Holm
- 2009-2014 Member of the Technical Working Group of the Central Yavapai Highlands Water Resources Management Study (monthly meetings)
- 2009 Organized and moderated discussion session at AHS Symposium in Scottsdale on *Future of Earth Sciences at Arizona's Universities* with ASU and UA
- 2008 Organized two field trips for joint AHS AIPG meetings in Flagstaff
- 2007-2014 Appointed member of Technical Advisory Committee of the Yavapai Water Advisory Council (monthly meetings)
- 2006-2008 Member peer review panel for USGS Northern Arizona regional model
- 2006 Organized short course and theme session for Rocky Mountain section GSA
- 2005 Organized field trip for 2005 AHS Symposium
- 2004-2005 Member planning committee for 2005 AHS Symposium
- 2001-2002 Member planning committee for 2002 AHS Symposium
- 2002 Coordinated and led Flagstaff Water Supply field trip for AHS Symposium
- 2001 Co-coordinator of Verde Watershed Symposium and Field Trip to Verde Headwaters
- 2000-present Member of Technical Advisory Committee of the Coconino Plateau Water Advisory Council (monthly meetings).
- 2000-2001 Member planning committee and editor of proceedings volume for Coconino Plateau Hydrology Workshop, 1 ½ day technical workshop held at NAU to discuss Grand Canyon Hydrology, edited proceedings volume
- 2000-2006 Arizona Water Resources Research Center Advisory Council, met twice a year,

- reviewed about 10 grant proposals per year
- 1999 Member planning committee for 1999 Arizona Hydrological Society Symposium (participated in biweekly 1-2 hour conference calls for 3 months)
- 1999 Led field trip for Commissioners of the Arizona Water Protection Fund to Hart Prairie
- 1999 Organized and managed first AHS-Flagstaff Chapter Internship, awarded \$2,000 to one student and coordinated 240 hours of work.
- 1999 Organizer and co-leader for field trip of the Arizona Riparian Council annual meeting to Hoxworth Springs and Hart Prairie.
- 1997-1998 Organized and led field trip and chaired theme session for 1998 Rocky Mountain Section meeting of GSA in Flagstaff.
- 1995-1999 President, Flagstaff Chapter of the Arizona Hydrological Society, coordinated monthly activities for over 30 members of local chapter.
- 1997-1999 Vice-President, State Corporate Board, Arizona Hydrological Society.
- 1995-1999 Member, Corporate Board of Arizona Hydrological Society, 9 member state-wide board to manage the society, met quarterly.
- 1997 Co-Leader for 35 person Arizona Hydrogeological Society Hydrology/Geology Bus tour of Verde Valley, Flagstaff area, and Payson area.
- 1997 Participated in workshop with 30+ experts in Arizona to develop riparian area rapid assessment program
- 1997 Co-coordinated field trip to Camp Navajo, Bellemont, Arizona, for Flagstaff Chapter of the Arizona Hydrological Society
- 1997 Participated in scientific review panel to address comments submitted to USFS about the Tusayan Growth Draft Environmental Impact Statement
- 1995-1996 Co-Chair, 9th Annual Symposium of the Arizona Hydrological Society, over 70 presentations over two days with 250 in attendance and a \$45,000 budget, organized a one day field trip
- 1996 Participated an all-day workshop with 30 other experts in Tucson for establishing riparian research priorities.
- 1996 Participated in workshops for the development of monitoring and research programming for the Grand Canyon Monitoring and Research Center.

Journal/book/other reviewer

- 2015 Hydrogeology journal (2), Environmental Management, Journal Arid Environs
- 2013 *Ground Water* (2), *Journal Arid Environments*
- 2012 Reviewed manuscript for *Environmental & Engineering Geoscience*
- 2012 Reviewed book chapter for volume on Great Artesian Basin, Australia
- 2012 Served on NSF review panel, lead reviewer for 14 proposals, scribe for 4
- 2012 Reviewed 2 manuscripts for journal *Ground Water*
- 2011 (b) Reviewed manuscript for journal *Ground Water*
- 2011 Reviewed manuscript for journal *Ground Water*
- 2011 Reviewed NPS Mojave Network Carbonate and Valley Fill Aquifer Springs Monitoring Protocols

2010 Reviewed USFS National Ground Water Dependent Ecosystems Protocols

2010 Reviewed Northern Arizona Regional Groundwater Flow Model Scientific Investigations Report for USGS (180 pages + 33 figures)

2009 (b) Reviewed manuscript for journal *Ground Water*

2009 (b) Reviewed manuscript for *Environmental Research Letters*

2009 Reviewed manuscript for *Hydrogeology Journal*

2009 Reviewed manuscript for *GSA Bulletin*

2008(b) Reviewed manuscript for journal *Ground Water*

2008 Reviewed book proposal for Univ. Arizona Press

2008 Reviewed manuscript for *Environmental & Engineering Geoscience*

2008 Reviewed manuscript for *Hydrogeology Journal*

2007 Reviewed manuscript for *Water Resources Research*

2006 Reviewed manuscript for *Environmental & Engineering Geoscience*

2006 Reviewed manuscript for *Water Resources Research*

2006 Reviewed 1 chapter for text book

2005 Reviewed manuscript for *Trans. Am. Soc. Ag. Engineering*

2005 Reviewed 3 chapters of book *Visualizing Physical Geology*

2005 Reviewed manuscript for *Vadose Zone Journal*

2005 Reviewed manuscript for *Water Resources Research*

2004 Reviewed manuscript for *Environmental Management*

2004 Reviewed manuscript for 7th Biennial Conference Colorado Plateau

2004 Reviewed manuscript for *Earth, Planets and Space*

2004 Reviewed manuscript for *Hydrogeology Journal*

2004 Reviewed two manuscripts for *Environmental & Engineering Geoscience*

2003 Reviewed manuscript for USGS prior to submittal to *Hydrogeology*

2003 Reviewed manuscript for *Environmental & Engineering Geoscience*

2003 Reviewed manuscript for *Hydrogeology Journal*

2002 Reviewed manuscript for journal *Ecological Applications*

2002 Reviewed manuscript for journal *Ecoscience*, ECO-2526

2002 Reviewed manuscript for Proceedings volume of Colorado Plateau Biennial Symposium

2002 Reviewed tenure and promotion file for peer at another university

2002 Reviewed manuscript for *Environmental and Engineering Geoscience*

2002 Reviewed chapter for *Ecological Restoration of Southwestern Ponderosa Pine Forests* book

2001 Reviewed manuscript for *J. of Hydrology*

1998 Diary reviewer for book *Environmental Geology: An Earth Systems Science Approach*

1998 Reviewed manuscript for USDA National Soil Tilth Lab for submission to JEQ

1998 Reviewed the book *Perspectives on Sustainable Development of Water Resources in Kansas* for the journal *Geotimes*.

1998 Reviewed manuscripts WR98-203 and WR98-204 for the journal *Water Resources Research*

1998 Reviewed a book proposal for W.H. Freeman and Co. Publishers

- 1998 Reviewed the book *Applied Ground-Water Hydrology and Well Hydraulics* for the journal *Ground Water*
- 1998 Reviewed manuscript Q98-39 for the *Journal of Environmental Quality*
- 1996 Reviewed journal article for *Contaminant Hydrology*

Grant proposal reviewer

- 2015 NSF proposal x 2
- 2014 NSF proposal
- 2013 Reviewed one NSF proposal. Wisconsin Water Resources Institute proposal
- 2012 NSF Water Sustainability and Climate panel reviewer (14 proposals)
- 2010&11 Reviewed Great Lakes Fish and Wildlife Restoration Act Proposal
- 2009 Reviewed Wisconsin Water Resources Institute proposal
- 2008 Reviewed Southern Nevada Agency Partnership proposal
- 2007 Reviewed one NSF Environmental Sustainability proposal
- 2007 Reviewed 12 Canon National Parks Science Scholars proposals for AAAS
- 2006 Reviewed one NSF Earth Sciences proposal
- 2006 Reviewed 6 Canon National Parks Science Scholars proposals for AAAS
- 2001 Reviewed one NSF proposal
- 2000 Reviewed one NSF proposal
- 2000 Reviewed one Coop. Inst. for Coastal and Estuarine Environ. Tech. proposal
- 1999 Reviewed two NSF proposals
- 1998 Reviewed one NSF proposal
- 1997 Reviewed two NSF proposals
- 1997 Reviewed two American Chemical Society proposals.

SERVICE – Community/Outreach

- 2014 Two Presentations to Friends of the Rio de Flag
- 2014 Expert for Friends of Rio de Flag Panel “Water Works IV”
- 2013 Expert for City of Flagstaff workshop: Creating performance appraisal actions and measures for climate change resiliency and preparedness study
- 2013 Decision Center for a Desert City Water/Climate Briefing – ASU
- 2013 Flagstaff Leadership Program Sustainability Day presentation on water
- 2012-2013 Flagstaff Forest Restoration Steering Committee (City of Flagstaff)
- 2011-2014 Board member of Friends of Rio de Flag (monthly meetings)
- 2011 Guest speaker on field trip to Hart Prairie on water and fire for National Science Writers Association Field Trip
- 2011 Panel discussion at ASU-GIOS on Climate Change and Arizona: Current Knowledge and future collaborations among the state universities
- 2011 Coconino County Parks Science Advisory Committee
- 1997 Provided information for KNAU series on water issues in Northern Arizona
- 1997 Presented talk entitled "How much water for Flagstaff?" at Flagstaff Science Issues day of the Flagstaff leadership program to 40 leaders in Flagstaff

- 1997 Wrote letter to editor of Arizona Daily Sun concerning Canyon Forest Village Growth Draft Environmental Impact Statement
- 1997 Wrote 6 page comment letter to Kaibab National Forest concerning Canyon Forest Village Growth Draft Environmental Impact Statement
- 1997 Co-led field trip at Hart Prairie Preserve as part of Flagstaff Festival of Science
- 1997 Co-coordinated with the Grand Canyon Trust a public forum on ground-water issues related to the Tusayan Growth Environmental Impact
- 1995-1997 Coordinated volunteer work days at The Nature Conservancy preserve for hydrological restoration
- 1996 Presented talk entitled "Springs, Seeps, and Shallow Ground Water" for over 100 persons at Flagstaff Festival of Science.
- 1996 Participated in NAU on the Move video related to research at Hart Prairie
- 1996 Appeared on evening news segments on channels 3 and 5 in Phoenix related to research at Hart Prairie

Testimony

- 2010 Provided written and oral testimony for Congressional Subcommittee on National Parks, Forests and Public Lands and the Subcommittee on Water and Power of the Committee on Natural Resources for panel "On the Edge: Challenges Facing Grand Canyon National Park", Shrine of the Ages, Grand Canyon
- 2009 Testified for ADWR Administrative Review Hearing regarding Assured Water Supply Designation for Big Chino aquifer, Prescott, AZ.

OTHER ACTIVITIES

Academic advisor to MacGillivray Freeman Films project *Water Planet*, 2004-2006.

Science advisor for Coconino County Comprehensive Plan development, 2001-2003.

Consultant for Environmental Experiences, naturalist guide for 9-day, Colorado River trips, 1998-present.

Aquifer tests of Second Mesa Day School wells, analyzed and reviewed and made recommendations based on constant rate pumping, and step tests of wells, 2002.

Aquifer tests of Kayenta Boarding School wells, analyzed and reviewed and made recommendations based on pumping and step tests of well, 2000-2001.

Bioremediation feasibility study at former flammable storage areas, Coconino National Forest, Mormon Lake Ranger District, 1996-1997.

Expert for the City of Flagstaff for a case, *Crawley vs. the City of Flagstaff*, reviewed hydrological reports and studies, 1995-1997

Hydrogeology of Colorado River beach deposits, U.S. Dept. of Interior, Bureau of Reclamation, Glen Canyon Environmental Studies, conducted and analyzed pneumatic slug tests for over 60 wells in Colorado River beaches, measured and analyzed water levels, 1995-1997.

On-site hydrogeologist, Ohio Management Systems Evaluation Area, Piketon, Ohio, oversaw drilling and logging of over 90 monitoring wells, conducted tracer tests, supervised collection of over 7,000 ground-water samples, constructed flow and transport models, 1991-1994.

Ground-water resource evaluation for a 105 lot subdivision, Price Development Corp., Fairfield County, Ohio, conducted and analyzed aquifer tests, logged wells, constructed geologic maps and cross sections, 1993.

Field investigations for a trial, Brady Lake Citizens Assoc. vs. the City of Kent, Ohio, conducted lakebed permeability measurements and analysis, 1991.

Ground-water flow assessment, Frito Lay, Wooster, Ohio, summarized geology and ground-water flow in Killbuck Creek alluvial valley aquifer, 1990.

Ground-water modeling project, City of Wooster, Ohio, concerning delineation of Wellhead Protection Areas of municipal wellfields in an alluvial valley aquifer, 1989-1990.