

RICHARD S. SOJDA, RESEARCH PROFESSOR & WILDLIFE BIOLOGIST

Department of Computer Science, Montana State University
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Affiliate, Montana institute on Ecosystems

Scientist Emeritus
Northern Rocky Mountain Science Center
USDI - Geological Survey

Fellow, International Environmental Modelling and Software Society

Expertise:

- integration of wildlife management, climate science, and landscape conservation
- artificial intelligence: expert systems, Bayesian belief networks, multiagent systems
- decision support, knowledge engineering, and ecological modelling
- waterfowl and wetland ecology; radar ornithology; public land management
- interdisciplinary studies linking geomorphology, soils, hydrology, plants, and birds

Education:

- B.S. 1974. Cornell University. Natural Resources.
- M.S. 1978. Iowa State University. Wildlife Biology. Thesis: Effects of snowmobile activity on wintering pheasants and wetland vegetation in northern Iowa marshes.
- Ph.D. 2002. Colorado State University. Forest Sciences. Dissertation: Artificial intelligence based decision support for trumpeter swan management.

Professional Experience:

- 2013-present: Research Professor, Computer Science Department, Montana State University, Bozeman, MT
- 1995-2013: Wildlife Biologist, Northern Rocky Mountain Science Center, Geological Survey, U.S. Department of the Interior, Bozeman, MT
- 1990-1995: Wildlife Biologist - Information Transfer Center, Fish & Wildlife Service/National Biological Survey, U.S. Department of the Interior, Fort Collins, CO
- 1987-1990: Regional Refuge Biologist (Delaware, Maryland, and Virginia) – Refuges and Wildlife, Fish & Wildlife Service, U.S. Department of the Interior, Blackwater National Wildlife Refuge, Cambridge, MD
- 1983-1987: Wildlife Biologist - Morris Wetland Management District, Fish & Wildlife Service, U.S. Department of the Interior, Morris, MN
- 1981-1983: Assistant Manager - DeSoto National Wildlife Refuge, Fish & Wildlife Service, U.S. Department of the Interior, Missouri Valley, IA
- 1979-1981: Area Wildlife Biologist (Iowa, Kansas, and Missouri) - Refuges and Wildlife, Fish & Wildlife Service, U.S. Department of the Interior, Kansas City, MO
- 1976-1978: Graduate Research Assistant - Iowa Cooperative Wildlife Research Unit, Iowa State University, Ames, IA

- 1974-1976: Regional Extension Specialist (Lake Ontario) - New York Sea Grant Advisory Service, Cornell University, Brockport, NY

Publications:

Kirsch, E.M., M.J. Wellik, M. Suarez, R.H. Diehl, J. Lutes, W. Woyczik, J. Krapfl, and R.S. Sojda. *in press*. Observation of sandhill crane flight behavior in heavy fog. *Wilson Journal of Ornithology*.

Pierce, K.L., T. Chesley-Preston, and R.S. Sojda. 2014. Surficial geologic map of the Red Rock Lakes area, southwest Montana. USGS Open-File Report: 2014-1157. <http://pubs.er.usgs.gov/publication/ofr20141157>.

Argent, R.M., R.S. Sojda, C. Guipponi, B. McIntosh, and A.A. Voinov. 2014. Best practice in conceptual modelling for environmental software development. *In*: Ames, D.P., Quinn, N.W.T., Rizzoli, A.E. (Eds.), 2014. Proceedings of the 7th International Congress on Environmental Modelling and Software, June 15-19, San Diego, California, USA. ISBN: 978-88-9035-744-2.

Preston, T.M., R.S. Sojda, and R.A. Gleason. 2013. Sediment accretion rates and sediment composition in Prairie Pothole wetlands under varying land use practices, Montana, United States. *Journal of Soil and Water Conservation*. 68(3):199-211. doi:10.2489/jswc.68.3.199.

Sharp, J.L., Sojda, R.S., Greenwood, M., Rosenberry, D.O. and Warren, J.M. 2013. Statistical classification of vegetation and water depths in montane wetlands. *Ecohydrology* 6: 173–181. doi: 10.1002/eco.1252.

Towler, E., M. Roberts, B. Rajagopalan, and R.S. Sojda (2013). Incorporating probabilistic seasonal climate forecasts into river management using a risk-based framework. *Water Resources Research* 49, doi:10.1002/wrcr.20378.

Sojda, R.S., S.H. Chen, S. El Sawah, J.H.A. Guillaume, A.J. Jakeman, S. Lautenbach, B.S. McIntosh, A.E. Rizzoli, R. Seppelt, P. Struss, A.A. Voinov, and M. Volk. 2012. Identifying the decision to be supported: a review of papers from Environmental Modelling and Software. *in*: Proceedings of the Sixth Biennial Meeting of the International Environmental Modelling and Software Society (iEMSS 2012): Managing Resources of a Limited Planet. R. Seppelt, A.A. Voinov, S. Lange, D. Bankamp, eds. Leipzig, Germany. <http://www.iemss.org/society/index.php/iemss-2012-proceedings>.

Towler, E., V.A. Saab, R.S. Sojda, K. Dickinson, C.L. Bruyere, and K.R. Newlon. 2012. A risk-based approach to evaluating wildlife demographics for management in a changing climate: A case study of the Lewis's Woodpecker. *Environmental Management* 50(6):1152-1163.

Greenwood, M.C., R.S. Sojda, J.L. Sharp, R.G. Peck, and D.O. Rosenberry. 2011. Multi-scale clustering of functional data with application to hydraulic gradients in wetlands. *Journal of Data Science* 9:399-426.

Barnett, W., K.M. Irvine, and R.S. Sojda. 2010. Using graphical models to represent wetland ecological processes for wildlife managers. The Wildlife Society 17th Annual Conference. Snowbird, UT.

Greenwood, M.C., R.S. Sojda, T.M. Preston. 2010. Functional linear models to test for differences in prairie wetland hydraulic gradients. *In*: Swayne, D.A., Y. Wanhong, Voinov, A.E., Rizzoli A., Filatova. T., (eds), Proceedings of the iEMSs Firth Biennial Meeting: International Congress on Environmental Modelling and Software (iEMSs 2010). International Environmental Modelling and Software Society, Ottawa, Canada.

Kirsch, E.M., R.S. Sojda, R.H. Diehl, M. Suarez. 2010. A Crane Movement Model Parameterized Using Portable Radar for Evaluating Response to Wind Energy Development. *In*: Swayne, D.A., Y. Wanhong, Voinov, A.E., Rizzoli A., Filatova. T., (eds), Proceedings of the iEMSs Firth Biennial Meeting: International Congress on Environmental Modelling and Software (iEMSs 2010). International Environmental Modelling and Software Society, Ottawa, Canada.

Mead, R., J. Paxton, and R.S. Sojda. 2010. New software methods in radar ornithology using WSR-88D weather data and potential application to monitoring effects of climate change on bird migration. *In*: Swayne, D.A., Y. Wanhong, Voinov, A.E., Rizzoli A., Filatova. T., (eds), Proceedings of the iEMSs Firth Biennial Meeting: International Congress on Environmental Modelling and Software (iEMSs 2010). International Environmental Modelling and Software Society, Ottawa, Canada.

Rizzoli, A.E., G. Leavesley, J.C. Ascough II, R.M. Argent, I.N. Athanasiadis, V. Brilhante, F.H.A. Claeys, O. David, M. Donatelli, P. Gijsbers, D. Havlik, A. Kassahun, P. Krause, N.W.T. Quinn, H. Scholten, R.S. Sojda, and F. Villa. 2009. Integrated modelling frameworks for environmental assessment and decision support. Chapter 7 *in*: Jakeman, A.J., A.A. Voinov, A.E. Rizzoli, and S.H. Chen, eds. Environmental modelling, software and decision support: state of the art and new perspectives. Elsevier. Amsterdam, The Netherlands. 366 pages.

Sánchez-Marrè, M., K. Gibert, R.S. Sojda, J.P. Steyer, P. Struss, I. Rodríguez-Roda, J. Comas, V. Brilhante, and E.A. Roehl. 2009. Intelligent environmental decision support systems. Chapter 8 *in*: Jakeman, A.J., A.A. Voinov, A.E. Rizzoli, and S.H. Chen, eds. Environmental modelling, software and decision support: state of the art and new perspectives. Elsevier. Amsterdam, The Netherlands. 366 pages.

Mead, R., J. Paxton, and R.S. Sojda. 2008. Identifying Biological Echoes in Radar Scans Using Machine Learning. pages 1758-1765 *in*: Sánchez-Marrè, M., J. Béjar, J. Comas, A. Rizzoli and G. Guariso, eds. Proceedings of the Fourth Biennial Meeting of the International Congress on Environmental Modelling and Software: Integrating Sciences and Information Technology for Environmental Assessment and Decision Making. Barcelona, Catalonia.

Ruth, J.M., J.J. Buler, R.H. Diehl, and R.S. Sojda. 2008. Management and research applications of long-range surveillance radar data for birds, bats, and flying insects: U.S. Geological Survey Fact Sheet 2008-3095. 4 pages.

Sojda, R.S. 2007. Empirical evaluation of decision support systems: needs, definitions, potential methods, and an example pertaining to waterfowl management. Environmental Modelling and Software 22(2):269-277. <http://www.sciencedirect.com/science/article/B6VHC-4JB9W57-1/2/a281828776a7fd1209ca763cad415f7c>.

Sojda, R.S., R. Angryk, R. Diehl, R. Klaver, J. Paxton, R. Mead, and J. Paxton. 2007. Can artificial intelligence be used to detect birds in NEXRAD data? *pages 28-29 in*: Ruth, J.M., editor. Applying radar technology to migratory bird conservation and management: strengthening and expanding a collaborative. U.S. Geological Survey, Biological Resources Discipline, Open-File Report 2007–1361. Fort Collins, Colorado.
<http://www.fort.usgs.gov/products/publications/22018/22018.pdf>.

Custer, S.G., and R.S. Sojda. 2006. Hydrologic landscape units and adaptive management of intermountain wetlands. Adaptive Management of Water Resources: American Water Resources Association Summer Specialty Conference. Missoula, Montana.

Mead, R., J. Paxton, and R.S. Sojda. 2006. Applications of Bayesian networks in ecological modelling. The Second IASTED International Conference on Environmental Modelling and Simulation. St. Thomas, Virgin Islands.

Sanchez-Marre, M., K. Gilbert, R.S. Sojda, J. P. Steyer, P. Struss, I. Rodr'guez-Roda, 2006. Uncertainty management, spatial and temporal reasoning, and validation of intelligent environmental decision support systems. *in*: Voinov, A., Jakeman, A., Rizzoli, A., eds., Proceedings of the iEMSs Third Biennial Meeting: "Summit on Environmental Modelling and Software". International Environmental Modelling and Software Society, Burlington, Vermont, USA. <http://www.iemss.org/iemss2006>.

Sojda, R.S., J.M. Ruth, W.C. Barrow, D.K. Dawson, R.H. Diehl, A. Manville, M.T. Green, D.J. Krueper, and S. Johnston. 2005. Using radar to advance migratory bird management: an interagency collaboration. Fort Collins, Colorado: U.S. Geological Survey, Fort Collins Science Center. Fact Sheet 2005-3048. 2 pages.

Covino, T., B.L. McGlynn, and R. Sojda. 2005. Groundwater-Stream Interactions in a Mountain-Valley Transition: Impacts on Catchment Hydrologic Response and Stream Water Chemistry. Montana Chapter of the American Water Resources Association Annual Meeting. [Third place in student paper competition]

Ruth, J. M., W. C. Barrow, R.S. Sojda, D.K. Dawson, R.H. Diehl, R.H. Manville, M.T. Green, D.J. Krueper, and S. Johnston. 2005. Advancing migratory bird conservation and management by using radar: an interagency collaboration. U.S. Geological Survey, Biological Resources Discipline, Open-File Report 2005-1173, 12 pages.

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http://www.iemss.org/iemss2004/proceedings/iEMSs2004_vol2.pdf .

Covino, T., B.L. McGlynn, and R.S. Sojda. 2004. Groundwater-surface water exchange as a hydrologic and water quality buffer. Eos Transactions of the American Geophysical Union, 85(47), Fall Meeting Supplement, Abstract H51B-1125. [First place in student paper competition]

Covino, T., B.L. McGlynn, R. Sojda, and B. Edwards. 2004. Mountain Front Groundwater Recharge: Groundwater-Surface Water Exchange Across an Alpine-Valley Transition. American Geophysical Union Fall Meeting.

Custer, S.G., and R.S. Sojda. 2003. Hydrologic reconnaissance of wetland bird habitat in areas with potential to be influenced by water produced during coalbed methane production in the Northern Powder River Basin, MT. *Eos Transactions of the American Geophysical Union*, 84(46), Fall Meeting Supplement, Abstract H41C-1022.
http://nrmsc.usgs.gov/products/StephanCuster_68af5267_3430.pdf.

Sojda, R.S. 2002. Artificial intelligence based decision support for trumpeter swan management. PhD Dissertation. Colorado State University. Fort Collins, Colorado. 183 pages.

Sojda, R.S., J.E. Cornely, and L.H. Fredrickson. 2002. An application of queuing theory to waterfowl migration. in: Rizzoli, A.E., and A.J. Jakeman. eds. *Integrated Assessment and Decision Support: Proceedings of the First Biennial Meeting of the International Environmental Modelling and Software Society* 1(2):232-238.

Sojda, R.S., J.E. Cornely, and A.E. Howe. 2002. Development of an expert system for assessing trumpeter swan breeding habitat in the Northern Rocky Mountains. *Waterbirds* 25(1):313-318.

Wright, C.K., R.S. Sojda, and D. Goodman. 2002. Bayesian time series analysis of segments of the Rocky Mountain trumpeter swan population. *Waterbirds* 25(1):319-326.

D'Erchia, F., C. Korschgen, M. Nyquist, R. Root, R. Sojda, and P. Stine. 2001. A framework for ecological decision support systems: building the right systems and building the systems right. U.S. Geological Survey, Biological Resources Division, Information and Technology Report USGS/BRD/ITR-2001-0002. 50 pages.

Sojda, R.S., J.E. Cornely, L.H. Fredrickson, and A.E. Howe. 2000. Current research efforts in decision support system technology as applied to trumpeter swan management. *Proceedings of the Trumpeter Swan Society Conference* 17:139-144.

Sojda, R.S., and A.E. Howe. 1999. Applying cooperative distributed problem solving methods to trumpeter swan management. Pages 63-67 in U. Cortes and M. Sanchez-Marre, eds. *Environmental Decision Support Systems and Artificial Intelligence*. American Association for Artificial Intelligence Technical Report WS-99-07. AAAI Press. Menlo Park, California.

Biddle, P.B., D.H. Cross, D.P. Jennings, R.S. Sojda, and R.C. Solomon. 1995. Information needs and technology applications of Department of Interior natural resource professionals. *Wildlife Society Bulletin* 23:(4)627-630.

Sojda, R. S., D. J. Dean, and A. E. Howe. 1994. A decision support system for wetland management on national wildlife refuges. *AI Applications* 8(2):44-50.

Sojda, R.S. and K.L. Solberg. 1993. Management and control of cattails. U.S. Fish Wildlife Service Leaflet No. 13.4.13, in D. Cross, ed. 1988. *Waterfowl Management Handbook*. U.S. Fish and Wildlife Service. Fort Collins, Colorado.

Kirby, R.E., J.K. Ringleman, D.R. Anderson, and R.S. Sojda. 1992. Grazing on national wildlife refuges: do the needs outweigh the problems? Transactions of the North American Wildlife Natural Resource Conference 57:611-626.

Sojda, R.S., Jr. 1978. Effects of snowmobile activity on wintering pheasants and wetland vegetation in northern Iowa marshes. M.S. Thesis. Iowa State University. Ames, Iowa. 67 pages.

Brown, T.L. and R. Sojda. 1976. Guide for estimating recreational fishing pressure. New York Sea Grant Advisory Service Insight Publication No.4. 21 pages.

Conference Presentations:

Sojda, R.S., L. Allen, T. Chesley-Preston, Y. Converse, T. Olliff, S. Finn, and G. Watson. 2012. Developing Priorities for the Great Northern Landscape conservation cooperative: State Wildlife Action Plans (SWAP) as one piece of information. Montana Chapter, The Wildlife Society Annual Meeting. Great Falls, MT.

Sojda, R.S., E. Beever, K. Irvine, and G. Pederson. 2012. Integrating climate and biological data into land management decision models to assess species and habitat vulnerability: A collaboration for Greater Sage-Grouse and their habitats. North Central Climate Science Center Stakeholder Advisory Committee.

Rowland, E., M. Cross, K. Johnson, D. Brewer, M. Haynes, R. Sojda, and K. Irvine. 2012. Scenario Planning as a Tool for Climate Change Adaptation Planning: Project Toward a Guidebook and Trainings. National Landscape Conservation Cooperatives National Workshop. Denver, CO. (poster)

Towler, E.L., and R.S. Sojda. 2012. Linking climate impacts with action: A case study of species conservation. American Geophysical Union. (poster)

Preston, T.M., Tangen, B.A., Chesley-Preston, T.L., Gleason, R.A., Haines, S.S., Post van der Burg, M., Smith, B.D., Sojda, R.S., Thamke J.N. 2011. Risk of Contamination of Aquatic Resources from Energy Development in the Williston Basin Based on a Spatial, Chemical, and Geophysical Assessment. 2011 Geological Society of America Annual Meeting. http://steppe.cr.usgs.gov/pdf/GSA_2011_Final_Small.pdf .

Smith, B.D., R.S. Sojda, R.A. Gleason, J.N. Thamke, T. Preston, and J. Reiten. 2009. Brine Contamination to Prairie Potholes from Energy Development in the Williston Basin: A Developing Integrated Science Project. Geological Society of America Annual Meeting. Portland, OR.

Sojda, R.S., J.L. Sharp, D.O. Rosenberry, and J.M. Warren. 2008. Lower Red Rock Lake and adjacent wetlands: preliminary understanding of their geohydrology. Montana Chapter, The Wildlife Society. Missoula, MT.

Sojda, R.S., K.L. Nelson, and J. Rodriguez. 2008. A proposal for studying wetlands in the face of shifting agricultural practices, energy development, and hydrologic patterns. Montana Chapter, The Wildlife Society. Missoula, MT.

Sojda, R.S., R. Mead, R. H. Diehl, E.M. Kirsch, A. Manville, J. Paxton, and K. Sinclair. 2008. Using NEXRAD for Mapping Bird Migration Corridors to Mitigate Some Effects of Wind Energy Development. Wind Wildlife Research Meeting VII. National Wind Coordinating Collaborative. Milwaukee, WI.

Smith, B.D., K.M. Johnson, K.L. Nelson, R.A. Gleason, R.S. Sojda, J.N. Thamke, M. McCall, and J.C. Reiten. 2008. Terrain conductivity measurements of brine-affected oil production sites on U.S. Fish and Wildlife lands, Williston Basin, Montana and North Dakota. 15th Annual International Petroleum & Biofuels Environmental Conference. Albuquerque, NM.

Sojda, R.S. 2007. Wind power basics. USDI-Geological Survey Spotlight on Science, March 2007, Portland, Oregon. http://www.fsl.orst.edu/cfer/Spotlight/SojdaBasics/Basics_files/Default.htm.

Sojda, R.S. 2007. Some thoughts on wildlife friendly wind power. USDI-Geological Survey Spotlight on Science, March 2007, Portland, Oregon. http://www.fsl.orst.edu/cfer/Spotlight/Sojda/Sojda_files/Default.htm.

Sojda, R., J. Paxton, R. Mead, R. Diehl, and R. Klaver. 2007. Can artificial intelligence be used to detect birds in NEXRAD data?. USDI-Geological Survey's Radar Ornithology Workshop. Albuquerque, New Mexico.

Sojda, R.S., J.L. Sharp, R.H. Buxton, D.O. Rosenberry, and J.M. Warren. 2007. Methods for documenting surface and groundwater patterns in a Northern Rocky Mountain wetland complex. Society of Wetlands Scientists 28th Annual Meeting. Sacramento, CA.

Sojda, R.S. 2007. Interdisciplinary characterization and modelling for management of intermountain wetlands. 2007 United States Geological Survey Conference on Science in the Pacific Northwest. Troutdale, OR.

Schneider, R.L., R.S. Sojda, D.O. Rosenberry, and R.H. Buxton. 2007. Contributions of evapotranspiration to hydrologic processes in a large montane wetland. Society of Wetlands Scientists 28th Annual Meeting. Sacramento, CA.

Sojda, R.S., J.E. Cornely, and L.H. Fredrickson. 2006. A flyway perspective of simulated distributions of trumpeter swans in response to simulated habitat management. 2006 Pacific Flyway Symposium. Otter Rock, Oregon.

Frederick, R.B., and R.S. Sojda. 2006. Delineation of winter and prebreeding habitats of the Rocky Mountain Population of trumpeter swans. 2006 Midwest Fish and Wildlife Conference. Omaha, NE.

Sojda, R.S., B.L. McGlynn, T. Pick, P. Husby, and C.W. Charles. 2005. Instrumentation and Modelling Methods for Studying Pothole Wetlands in an Agricultural Landscape. USGS Central Region Workshop: Environmental Effects of Agricultural Practices. Denver, Colorado.

Mead, R., J. Paxton, and R.S. Sojda. 2006. Applications of Bayesian networks in ecological modelling. The Second IASTED International Conference on Environmental Modelling and Simulation. St. Thomas, Virgin Islands.

Covino, T., B.L. McGlynn, R.S. Sojda, and B. Edwards. 2004. Groundwater surface-water exchange across a mountain-valley transition. 21st Annual Meeting of the Montana Section of the American Water Resources Association, Helena, Montana.

Sojda, R.S. 2003. Vegetative patterns associated with groundwater discharge and saline conditions at Red Rock Lakes National Wildlife Refuge, Montana. Society of Wetlands Scientists 24th Annual Meeting. New Orleans, Louisiana.

Sojda, R.S. 2003. Decision trees within expert systems for modelling ecological knowledge related to water level management for palustrine wetlands. 2003 Annual Meeting of the Geological Society of America. Seattle, Washington.

Sojda, R.S., and D.B. Hamilton. 1998. Developing a decision support system for trumpeter swan management. AIRES'98 (Artificial Intelligence Research in Environmental Sciences) Workshop. Victoria, British Columbia.

Sojda, R.S., and D.B. Hamilton. 1998. Using artificial intelligence in decision support for swan management . 1998 Workshop of the Interagency Decision Support Group. Denver, Colorado.

Sojda, R.S. 1993. Cattail autecology: a basis for management and control. Wetland Symposium, Prairie Ecosystems: Wetland Ecology, Management and Restoration. Jamestown, North Dakota.

Sojda, R.S. 1992. Field biologists' need for goose neck-band information. Seventh North American Arctic Goose Conference. Vallejo, California.

Sojda, R.S. 1988. Renewed emphasis of wildlife programs on Delmarva national wildlife refuges. Annual Meeting, Virginia Chapter -The Wildlife Society. Charlottesville, Virginia.

Sojda, R.S. 1982. Integrating biological farming into DeSoto National Wildlife Refuge's habitat management program. 44th Midwest Fish and Wildlife Conference. Omaha, Nebraska.

Sojda, R.S. 1981. Biological farming at DeSoto National Wildlife Refuge. First Iowa State University Biological Farming Workshop. Ames, Iowa.

Sojda, R.S. 1978. The effects of snowmobiling on wetland vegetation and wintering pheasants in northern Iowa marshes. 40th Midwest Fish and Wildlife Conference. Columbus, Ohio.

Professional Affiliations:

- The Wildlife Society, since 1973
 - National Law Enforcement Committee, 1985-86
 - Continuing Education Committee, 1989
- Society of Wetland Scientists, since 1989

- Association for the Advancement of Artificial Intelligence, since 2001
- International Environmental Modelling and Software Society, since 2002

Other:

- Elected Fellow, International Environmental Modelling and Software Society
- Editorial Board, Environmental Modelling and Software
- Best Decision Support Paper Award, 2007, Environmental Modelling and Software: "Empirical evaluation of decision support systems: needs, definitions, potential methods, and an example pertaining to waterfowl management"
- Board of Directors, International Environmental Modelling and Software Society

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