

Robert L. Knight, Ph.D.



General

Robert L. Knight, Ph.D. is a consulting environmental scientist. He is the founder and president of Wetland Solutions, Inc., and specializes in projects related to treatment wetlands, wetland and aquatic ecology, surface water quality, and environmental studies.

Education

Ph.D., Systems Ecology, University of Florida, Department of Environmental Engineering and Center for Wetlands 1980

M.S.P.H., Environmental Chemistry and Biology, University of North Carolina School of Public Health 1973

B.A., Zoology, University of North Carolina 1970

Work History

- Wetland Solutions, Inc. 1998-present
- CH2M HILL 1981 - 1998
- University of Florida 1977-1981
- University of Georgia Savannah River Ecology Laboratory 1973-1977
- University of North Carolina 1971-1973
- University of Florida 1970

Professional Membership

Certified Professional Wetland Scientist, #466, Society of Wetland Scientists

Distinguishing Qualifications

- Internationally recognized authority in treatment wetland technology and aquatic ecology and co-author of the only comprehensive wetland treatment system design handbook
- Has over 30 years of professional experience in wetland and aquatic ecology including consulting and research experience with more than 200 projects assessing environmental impacts of human activities and designing solutions
- Has served as principal author on more than 100 technical reports on treatment wetland permitting, design, and operation, including the North American

Treatment Wetland Database, assessment of the habitat values of treatment wetlands, and industry-wide reviews of the use of treatment wetlands for the pulp and paper industry, the petroleum industry, and concentrated livestock facilities.

- Principal investigator for research and development of a new technology using periphyton for agricultural stormwater treatment in the Florida Everglades. Developed research plan, coordinated and led Scientific Review Committee, and directed mesocosm research and data analysis.
- Senior wetland process consultant for design of Okeechobee Stormwater Treatment Areas (STAs), Ten Mile Creek Reservoir and STA, and STA-3/4 in the Florida Everglades. Applied revised design model and design parameters considering infiltration, background phosphorus conditions, updated phosphorus performance data, and appropriate hydraulic model.
- Designed and implemented a comprehensive monitoring program in the Wekiva River, Rock Springs Run, Juniper Creek, and Alexander Springs Creek to quantify necessary pollutant load reduction goals
- Served as lead co-principal investigator on the 50-year Silver Springs Retrospective Study to provide a quantitative comparison between current and historical environmental conditions in the upper Silver River and to project possible future impacts
- Developed quantitative methods for assessing minimum flows and levels for Volusia County Blue Spring and Blue Spring Run that would protect ecological resource values from significant harm
- Led a team of scientists and engineers assessing the environmental impacts of groundwater withdrawals throughout the northern Tampa Bay area and developed methods for quantitative ecological inventories and developing minimum flows and levels in regional wetlands and aquatic ecosystems

Relevant Experience

Dr. Knight's professional experience includes all aspects of environmental study, including design and implementation of field studies, data analysis and interpretation, project management, quality assurance and review, environmental systems overview analysis and computer modeling, and impact analysis, prediction, and assessment. He is experienced in a wide range of applied research problems in aquatic, wetland, and terrestrial environments and has completed environmental assessments nationwide.

Dr. Knight has conducted numerous studies on the feasibility of using constructed and natural wetlands for the assimilation of municipal, industrial, and agricultural wastewaters. He has played a major role in site investigations of existing wetland disposal systems and in the development of design and management criteria for new wetland and land treatment systems. Dr. Knight has been instrumental in the research and development of the periphyton-based stormwater treatment area (PSTA) technology, has evaluated the use of submerged aquatic vegetation (SAV) for

phosphorus control, provided senior review on the use of chemical treatment/wetland hybrid systems for phosphorus removal, and designed and directed research on the use of deep water zones for enhancing treatment wetland performance.

State and federal environmental agencies have called on Dr. Knight to provide state-of-the-art knowledge about wetland advanced treatment technology. He was the manager on projects to provide a technology assessment for surface flow wetlands, and prepared a literature review and database on wetlands used for treatment of concentrated livestock wastewaters. He has prepared a literature review on the habitat value of treatment wetlands and prepared a data base to summarize wildlife, human use, and toxicity data from treatment wetlands. He was the leader of the U.S. Environmental Protection Agency (EPA)-sponsored team that developed a standardized data base for treatment wetlands operational data. Dr. Knight has taught numerous short courses on the permitting and design of wetland treatment systems and frequently makes presentations to scientific conferences concerning wetland systems. As a result of this experience, he was invited to be the lead author of a chapter on wetland system design for the Water Environment Federation's Natural Systems Manual of Practice; he authored a chapter for the EPA's revised design manual on constructed wetlands; and he is the coauthor (with Dr. Robert Kadlec) of the only definitive work on wetland treatment system design: *Treatment Wetlands*, published by Lewis Publishers.

Dr. Knight has led design efforts on 20 full-scale wetland treatment systems and has developed and implemented 12 pilot wetland treatment system projects. For a number of these projects, he led workshops to identify project goals and to prepare project conceptual designs prior to detailed engineering. Following design and implementation of wastewater to wetland projects, Dr. Knight has prepared sampling protocols and trained client staff to conduct all essential field monitoring. In some projects where clients have taken charge of monitoring, Dr. Knight provides essential data interpretation and trouble-shooting consultation.

His research experience in wetland ecology in the southeastern United States includes floodplain and riparian forests; coastal plain and inland isolated wetlands, such as pocosins, cypress heads, cypress strands, wet prairies, and freshwater marshes; and coastal wetlands, including *Juncus* and *Spartina* salt marshes, mangrove wetlands, and seagrass beds. His work in wetlands includes botanical studies, wildlife inventories, water quality studies, nutrient assimilation studies, endangered species surveys, hydrological studies, wetland soil surveys, and dredge and fill permitting.

Dr. Knight has extensive experience in the study and analysis of the water quality of natural lakes, streams, wetlands, and estuaries. He has designed and implemented numerous water quality monitoring programs and has assessed the impacts associated with urban development and construction activities on water quality. He has provided recommendations concerning nutrient control and eutrophication abatement for lakes and canals throughout the United States. His lake management expertise also includes identification and control of excessive aquatic plant growths through chemical and biological means. He has conducted field verification studies of the algal assay procedure, studied the effects of power plant entrainment on phytoplankton, and provided taxonomy and enumeration of phytoplankton and periphyton from rivers and

streams. His professional experience includes extensive work on the effects of toxic metals and discharges on streams and wetlands.

Publications

Dr. Knight has written numerous technical papers on wetland ecology, ecosystem metabolism, phytoplankton and periphyton ecology, and heavy metal dynamics in aquatic systems. Representative papers, chapters, and a book include the following:

Knight, R.L., B. Gu, R.A. Clarke, and J.M. Newman. 2003. Long-term phosphorus removal in Florida aquatic systems dominated by submerged aquatic vegetation. *Ecological Engineering* 20: 45-63.

Knight, R.L., R.A. Clarke, and R.K. Bastian. Treatment Wetlands as Habitat for Wildlife and Humans. Presented at the IWA Wetland Conference, Orlando, Florida. November 13-16, 2000.

Knight, R.L., W.E. Walton, G.O'Meara, W.K. Reisen, and R. Wass. Design Strategies for Effective Mosquito Control in Constructed Treatment Wetlands. Presented at the IWA Wetland Conference, Orlando, Florida. November 13-16, 2000.

Knight, R.L., V.W.E. Payne, R.E. Borer, R.A. Clarke, and J.H. Pries. Constructed Wetlands for Livestock Wastewater Management. *Ecological Engineering* 15: 41-55. 2000.

Knight, R.L., R.H. Kadlec, and H.M. Ohlendorf. The Use of Treatment Wetlands for Petroleum Industry Effluents. *Environmental Science & Technology* 33(7):973-980. 1999.

Knight, R.L., R. Adams, C. O'Brien, and E.R. Davis. Beltway 8 Wetland Water Quality Project – Constructed Wetlands for Stormwater Polishing and Wetland Mitigation Banking. *Transportation Research Record No. 1626, Paper No. 98-1382*, pp. 11-20. 1998.

Kadlec, R.H. and R.L. Knight. *Treatment Wetlands*. CRC Press/Lewis Publishers, Boca Raton, FL. 893 pp. 1996.

Knight, R.L. Wildlife Habitat and Public Use Benefits of Treatment Wetlands. in: R. Haberl and R. Perfler (eds.) *Proceedings of the Fifth International Conference on Wetland Systems for Water Pollution Control*. Vienna, Austria. IAWQ. 1996.

Knight, R.L., J. Hilleke, and S. Grayson. Design and Performance of the Champion Pilot Constructed Wetland Treatment System. *TAPPI Journal* 77(5): pp. 240-245. 1994.

Knight, R.L., R.W. Ruble, R.H. Kadlec, and S. Reed. Wetlands for Wastewater Treatment: Performance Database. Chapter 4, pp. 35-58 in: G.A. Moshiri (ed.) *Constructed Wetlands for Water Quality Improvement*. Lewis Publishers. Boca Raton, Florida. 1993.

Knight, R.L. Ancillary Benefits and Potential Problems with the Use of Wetlands for Non-Point Source Control. Presented at a Workshop on the Use of Created and Natural Wetlands in Controlling Rural Non-Point Source Pollution, June 10-12,1991, Arlington, Virginia. EPA Wetlands Research Program. 1991.

- Knight, R.L. Wetland Systems. Natural Systems for Wastewater Treatment. Chapter 9. Manual of Practice FD-16. Water Pollution Control Federation. 1990.
- Knight, R.L. and M.A. Girts. Operations Optimization. Constructed Wetlands for Wastewater Treatment. Chapter 4. D. Hammer, ed. Chelsea, Michigan: Lewis Publishers, Inc. 1989.
- Knight, R.L. and L. Schwartz. Some Ancillary Benefits of a Natural Land Treatment System. Constructed Wetlands for Wastewater Treatment. Chapter 28. D. Hammer, ed. Chelsea, Michigan: Lewis Publishers, Inc. 1989.
- Baughman, D.S., R.L. Knight, W.J. Dunn, and L. Schwartz. Use of A Forested Wetland in South Carolina for Tertiary Treatment of Municipal Wastewater. Water: Laws and Management. American Water Resources Association. September. 1989.
- Watson, J., S. Reed, R. Kadlec, A. Whitehouse, and R.L. Knight. Performance Expectations and Loading Rates for Constructed Wetlands. Constructed Wetlands for Wastewater Treatment. Chapter 27. D. Hammer, ed. Chelsea, Michigan: Lewis Publishers, Inc. 1989.
- Carlson, D. and R.L. Knight. Mosquito Production and Hydrological Capacity of Southeast Florida Impoundments Used for Wastewater Retention. Journal of the American Mosquito Control Association 3:74-83. 1987.
- Knight, R.L. and J.S. Bays. Floral Composition, Soil Relations, and Hydrology of a Carolina Bay in South Carolina. Freshwater Wetlands and Wildlife. SREL. 1989.
- Knight, R.L. Effluent Distribution and Basin Design for Enhanced Pollutant Assimilation by Freshwater Wetlands. Aquatic Plants for Water Treatment and Resource Recovery. K.R. Reddy and W.H. Smith, eds. Magnolia Publishing. pp.913-921. 1987.
- Knight, R.L., J.W. McKim and H.R. Kohl. Performance of Natural Wetland Treatment (NWT) System for Wastewater Management. Journal Water Pollution Control Federation 59:746 754. 1987.
- Knight, R.L., B.H. Winchester and J.C. Higman. Carolina Bay Wetlands – Feasibility for Effluent Treatment and Disposal. Wetlands 4:177-203. 1985.
- Knight, R.L. Energy Model of a Cadmium Stream with Correlation of Embodied Energy and Toxicity Effect. EPA-600/53-048. Athens, Georgia: U.S. Environmental Protection Agency. 1982.
- Knight, R.L. and W.F. Coggins. Record of Estuarine and Salt Marsh Metabolism at Crystal River, Florida, 1977-1981. Prepared as a Final Summary Report for the Florida Power Corporation. Department of Environmental and Engineering Sciences, University of Florida, Gainesville, Florida. 1982.
- Knight, R.L. A Control Hypothesis for Ecosystems – Energetics and Quantification with the Toxic Metal Cadmium. Energy and Ecological Modelling. W. Mitsch, R.W. Bosserman, and J.M. Klopatek, eds. Elsevier Publishing Co. 1981.

Knight, R.L. and D. Swaney. In Defense of Ecosystems. *American Naturalist* 117:991-992. 1981.

Giesy, J.P., J.W. Bowling, H.J. Kania, R.L. Knight, and S. Mashburn. Fates of Cadmium Introduced into Channel Microcosms. *Environment International* 5:159-175. 1981.

Knight, R.L. Energy Basis of Control in Aquatic Ecosystems. Ph.D. Dissertation. University of Florida. 1980.

Bowling, J.W., J.P. Giesy, H.J. Kania, and R.L. Knight. Large-Scale Microcosms for Assessing Fates and Effects of Trace Contaminants. *Microcosms in Ecological Research*. J.P. Giesy, ed. 1980.

Kania, H.J., R.L. Knight, and R.J. Beyers. Fate and Biological Effects of Mercury Introduced into Artificial Streams. EPA-600/3-76-060. U.S. Environmental Protection Agency. Athens, Georgia. 1976.

Knight, R.L. Effects of Entrainment and Thermal Shock on Phytoplankton Numbers and Diversity. Department of Environmental Sciences and Engineering, Publication 336. University of North Carolina, Chapel Hill. 1973.

McMahan, E.A., R.L. Knight, and A.R. Camp. A Comparison of Microarthropod Populations in Sewage-Exposed and Sewage-Free *Spartina* Salt Marshes. *Environmental Entomology* 1(2): 244 - 252. 1972.