

Ground Water Assessment

The Florida Aquifer Vulnerability Assessment Model: A Tool For Aquifer Protection In Karst Settings

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Abstract

Ground-water resources within Florida's aquifer systems, as in many other karst hydrogeologic settings, are vulnerable to contamination due to the relatively open flow structure in carbonate rocks. This flow structure ranges from intergranular flow to conduit flow, as well as through perforations in confining layers due to sinkholes. In these complex hydrogeologic settings, models used in ground-water resource protection should reflect the dynamic and "dual porosity" nature of this flow system. Aquifer recharge and aquifer vulnerability models often serve as the scientific basis for land-use planning decisions. Commonly used for this purpose, DRASTIC is an expert-driven index model developed by the U.S. Environmental Protection Agency and the National Water Well Association. Although DRASTIC may be suitable for many hydrogeologic settings, it does not include a component critical to the understanding of aquifer vulnerability in Florida karst

The Florida Geological Survey is currently developing a geographic information system (GIS) - based model to estimate relative vulnerability within Florida's aquifer systems. Development of this model, the Florida Aquifer Vulnerability Assessment, is underway and five pilot counties have been completed with guidance from a multi-agency advisory committee. The overall intent of the Florida Aquifer Vulnerability Assessment is to develop a tool for environmental, regulatory, and planning professionals to facilitate the protection of Florida's ground-water resources. The model is based on a geostatistical method, Weights of Evidence, which quantifies relationships between spatial data layers and water quality parameters to predict vulnerability. For development of data layers in the Florida Aquifer Vulnerability Assessment model, a new, highly resolved statewide land-surface eleva-

tion model has been developed. From this surface model, two coverages are being created: a topographic depression coverage to reflect proximity to karst features, and a depth to water coverage, which is calculated relative to physiographic province. The Florida Aquifer Vulnerability Assessment also utilizes a statewide soil drainage coverage and a newly developed thickness of confinement coverage. If statistics in the model justify the need, the head difference between the surficial and Floridan aquifer systems will also be included for confined aquifer models.

Adaptability of the Florida Aquifer Vulnerability Assessment model allows for refinement to reflect "local-scale" datasets such as cave maps/conduits, lineaments, sinkhole types, and other hydrogeologic data. Incorporation of these datasets into the model can significantly enhance its application as a predictive tool at

the local scale, such as within a spring recharge area (springshed).

About the Author

Jon Arthur is a licensed Professional Geologist and graduate of Florida State University, where he received his B.S./honors and Ph.D. degrees in geology. His professional memberships include the Geological Society of America, Southeastern Geological Society, International Association of Hydrogeologists and the Hydrogeology Consortium. Jon is currently the President of the Florida Association of Professional Geologists. He began working

at the Florida Geological Survey as a staff geologist in 1987 and currently supervises the Florida Department of Environmental Protection – Florida Geological Survey Hydrogeology Program. Jon's research focus includes hydrogeology and geochemistry. Current projects involve water-rock interaction during aquifer storage and recovery activities, regional hydrogeologic framework mapping, and modeling aquifer vulnerability. Devoted to environmental stewardship, Jon is also active in geology education and outreach. He is producer of the video curriculum, *Florida's Geology Unearthed*, which introduces students and public television audiences to Florida geology.