Marion County Aquifer Vulnerability Assessment
A Ground-Water Protection and Management Tool

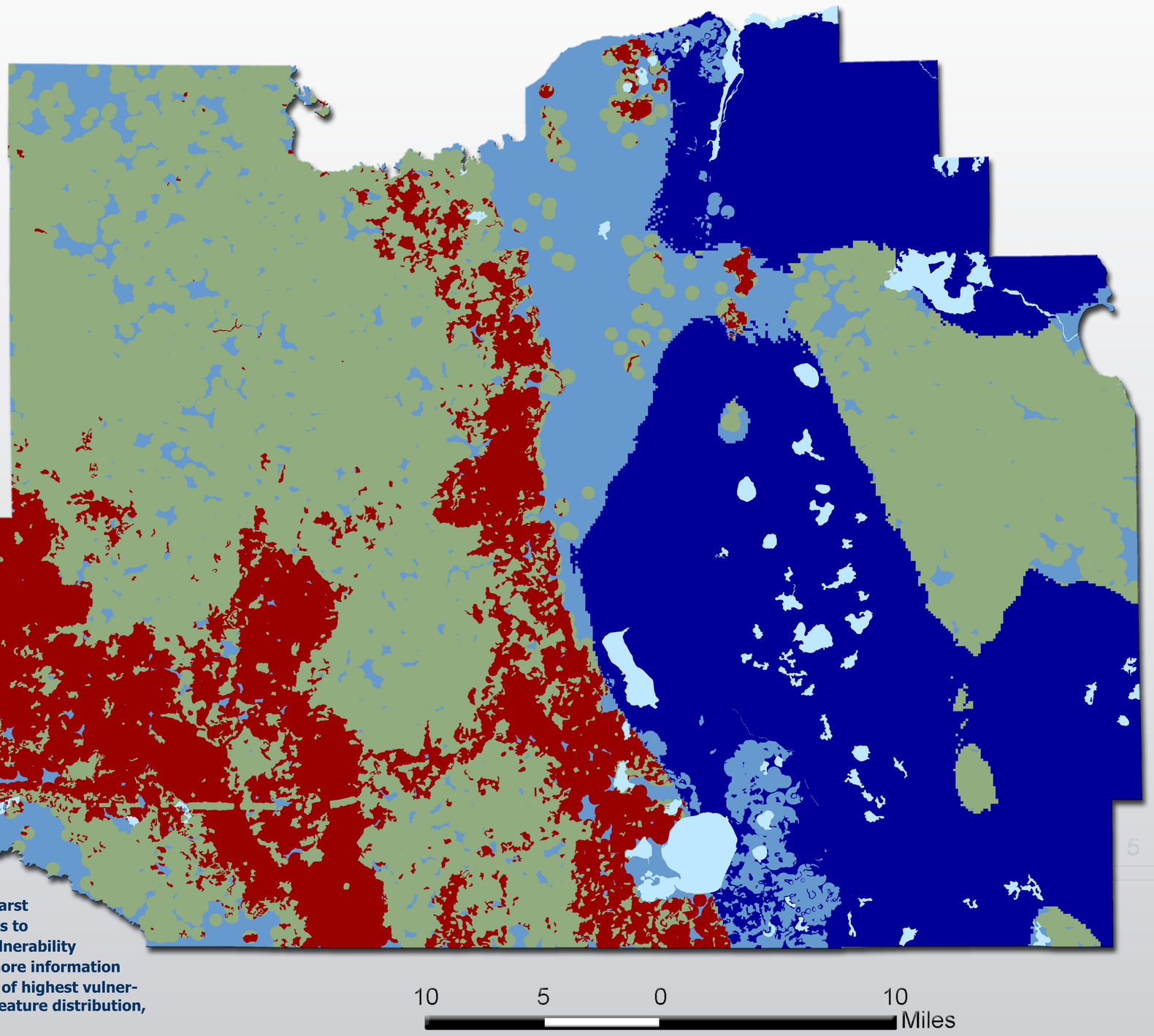
INTRODUCTION

The Floridan Aquifer System (FAS) is the most important and prolific source of fresh water in Marion County. Ground water use from the FAS in Marion County is an estimated 56 million gallons of water per day for public supply, agriculture, domestic, and other uses. As demands for fresh ground water increase in Marion County resulting from continued population growth, identification of zones of relative vulnerability becomes an increasingly important tool for implementation of a successful ground-water protection and management program.

The results of the Marion County Aquifer Vulnerability Assessment (MCAVA) project provide a science-based, water-resource management tool allowing for a proactive approach to protection of the FAS, and, as a result, have the potential to increase the value of protection efforts. Model results will enable improved decisions to be made about aquifer vulnerability based on the input selected, including focused protection of sensitive areas such as springsheds and ground-water recharge areas.

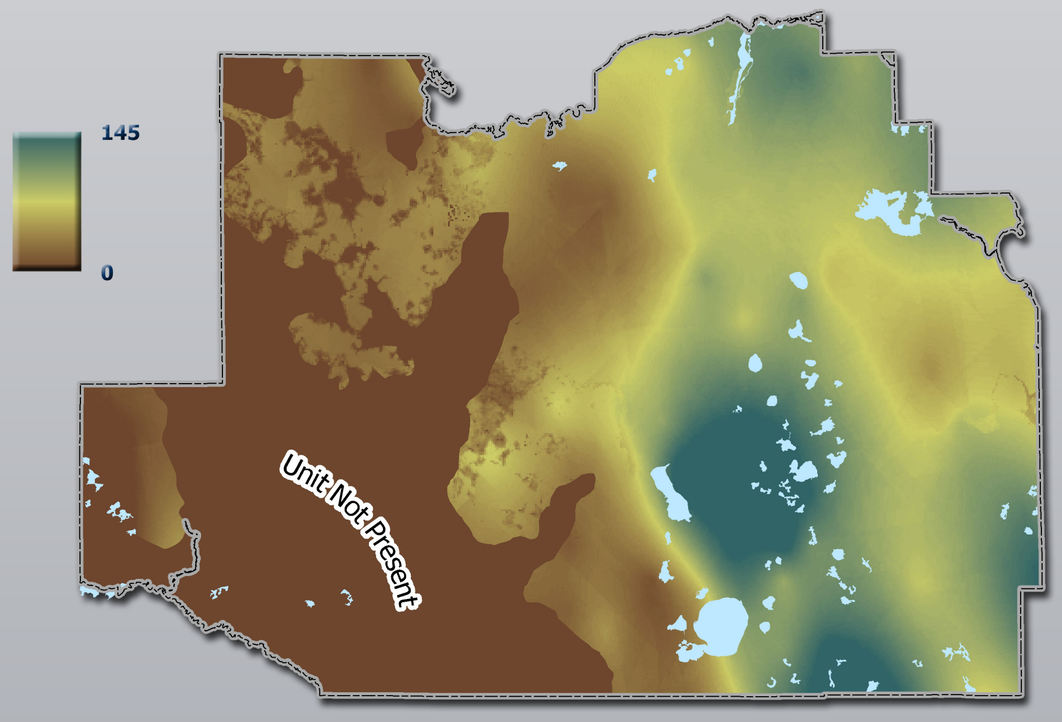
APPROACH

Weights of Evidence was used in the MCAVA project to develop an aquifer vulnerability assessment model of the FAS. The modeling technique is based entirely in a geographic information system (GIS). The primary benefits of applying this technique are that it is a data-driven method, rather than expert-driven, and model generation is dependent upon a training dataset consisting of water quality data resulting in self-validated model output.



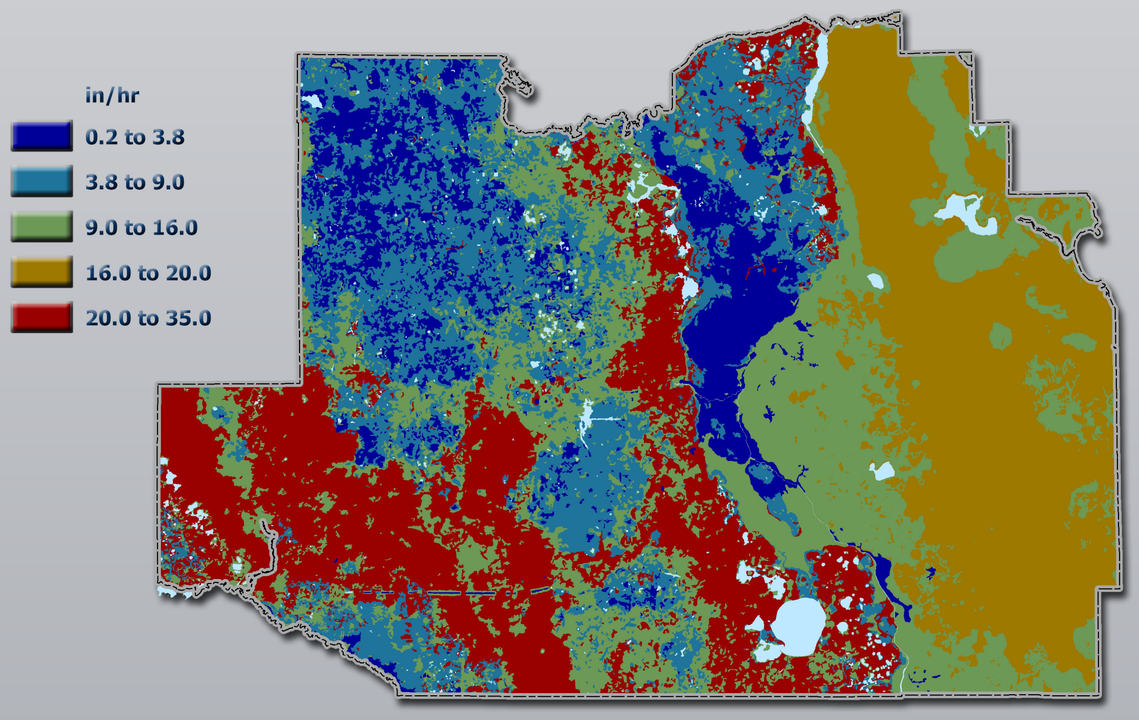
Model Output

Generation of model output is accomplished by combining water-quality data indicative of high aquifer vulnerability (training sites) with data layers representing hydrogeologic conditions which control aquifer vulnerability. Model output is a GIS-based model output displaying relative aquifer vulnerability across the study area. Data layers used for the MCAVA project include karst features, thickness of aquifer confinement, and soil hydraulic conductivity. The goal is to determine which areas of each data layer share a greater association with aquifer vulnerability based on the location of the training sites. Please refer to the associated report for more information on the modeling process. The MCAVA model response theme indicates that the areas of highest vulnerability are associated with areas of thin to absent aquifer confinement, dense karst-feature distribution, and higher soil hydraulic conductivity.



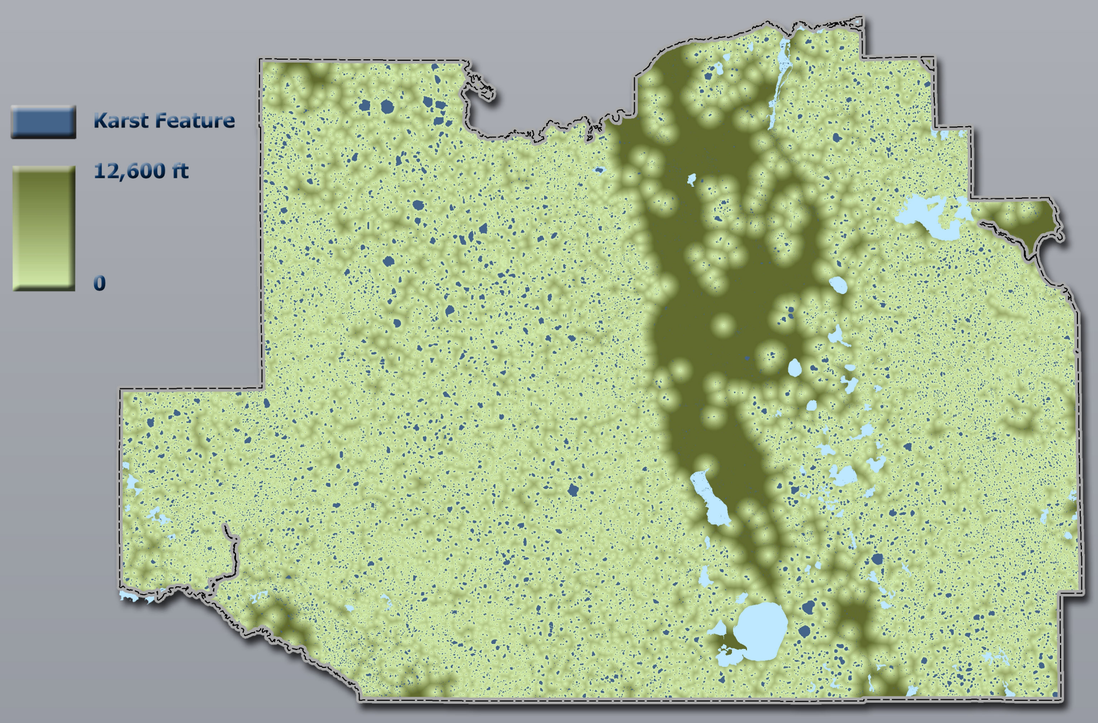
Intermediate Confining Unit Thickness

Where aquifer confinement is thick and the FAS is deeply buried, aquifer vulnerability is lower, whereas in areas of thin to absent confinement, the vulnerability of the FAS is generally higher.



Soil Hydraulic Conductivity Theme

The rate that water moves through soil is a critical component of any aquifer vulnerability analysis, as soil is an aquifer system's first line of defense against potential contamination.



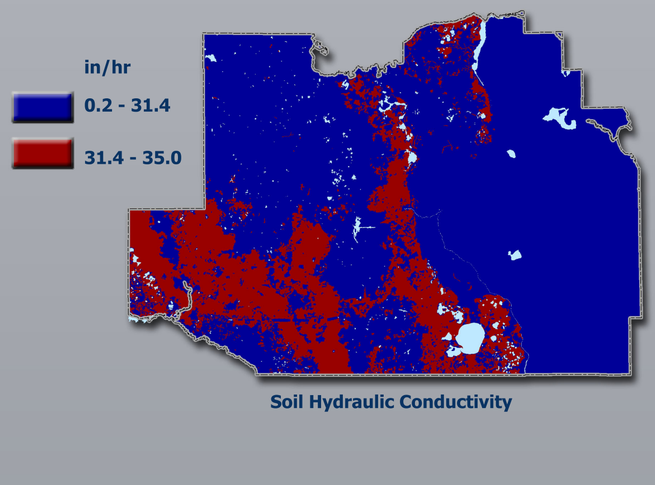
Effective Karst Feature Theme

Karst features, or sinkholes and depressions, can provide preferential pathways for movement of ground water into the underlying aquifer system and enhance an area's aquifer vulnerability where present. Features are buffered in 25-ft zones above.

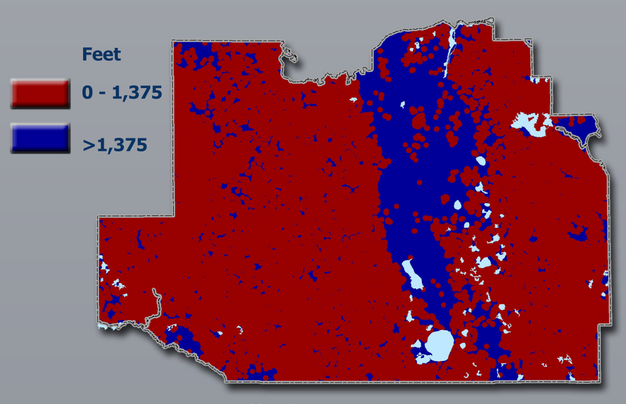
Generalization of Input Data

The modeling process involves generalizing input layers to evaluate which areas of the data share a greater association with locations of training sites, or, simply, aquifer vulnerability.

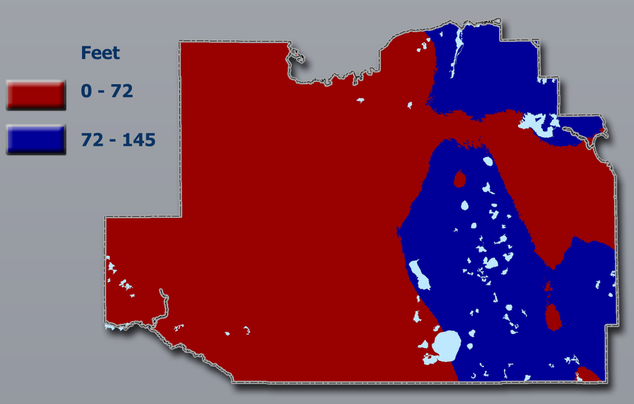
Soil hydraulic conductivity ranges from 0.20 to 34.95 inches per hour (in/hr) across the study area. Modeling indicated that areas underlain by 34.95 to 31.37 in/hr were more associated with higher aquifer vulnerability. The ICU ranges from absent to 145 feet thick across the study area, and the analysis revealed that areas underlain by less than 72 feet of ICU were more associated with higher aquifer vulnerability. Finally, the analysis indicated that areas within 1,375 feet of a karst feature were more associated with higher aquifer vulnerability.



Soil Hydraulic Conductivity



Effective Karst Features



Intermediate Confining Unit Thickness

Map developed for Marion County, Florida (SS06-01) by Advanced GeoSpatial Inc.: www.adgeo.net