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October 24, 2006

Ms. Gail L. Mowry, P.E.
Clean Water Engineer
Marion County Transportation Department
412 SE 25th Avenue
Ocala, FL 34471

RE: Marion County Aquifer Vulnerability Assessment Progress Report #1

Dear Ms. Mowry:

We are please to present you with the first progress report for the MCAVA project detailing work we have completed during the first seven-week project period. An invoice for work completed to date is also attached. Please call if you have any questions.

Best regards,

Alex Wood

Alex Wood, President
Advanced GeoSpatial Inc.

AW/aw

attachments

MARION COUNTY AQUIFER VULNERABILITY ASSESSMENT PROJECT PROGRESS REPORT #1 – WEEK 7 (OCTOBER 19-26)

As agreed upon between Marion County and Advanced GeoSpatial Inc., AGI will provide progress reports along with invoices at four intervals throughout the 27-week project period. Each report will be submitted to Marion County approximately every seven weeks, and will detail the progress and metrics of the MCAVA project and accompany each invoice. This first report details the development of the training point theme and the majority of the evidential theme input data (soil permeability theme, Intermediate Aquifer System/overburden thickness theme, karst features, and other evidential themes under consideration).

Training Point Theme

In the MCAVA analysis, training points are ground-water wells tapping the Floridan Aquifer System (FAS) with water quality indicative of high recharge. AGI is relying on dissolved oxygen data to develop the training point dataset (during model validation, dissolved nitrogen concentrations will be explored).

Water quality data sources explored include the Florida Department of Environmental Protection (FDEP) background water quality network, FDEP STATUS network, St. John's River Water Management District (SJRWMD), Southwest Florida Water Management District (SWFWMD), and U.S. Geological Survey. From these data sources, 72 wells measured for dissolved oxygen were identified as being potential candidates for training points.

Statistical analyses revealed that there were no wells considered statistical outliers. Taking the upper 25th percentile of this set resulted in a training point dataset of 18 wells. Figure 1 displays the distribution of water quality wells used to develop training points and the resulting training point dataset across the study area. The development of training points is 100% complete.

Soil Permeability Theme

According to the National Soil Survey Handbook [Natural Resource Conservation Service (NRCS), 2005] saturated hydraulic conductivity is defined as "the amount of water that would move vertically through a unit area of saturated soil in unit time under unit hydraulic gradient." Source of this data is the NRCS website.

In 2006, the area west of the Ocklawaha was redesigned in Marion County, whereas areas east of the River were completed in 1979 and there is, as a result, a difference in dataset resolution for the county coverage AGI has developed.

Multiple values may be reported for any given soil column underlying a particular soil polygon. To generate a continuous coverage of soil permeability across the study area site, each column's weighted average was summed into a single value. Figure 2 displays the soil permeability coverage across the study area. This task is 100% complete.

Intermediate Aquifer System or Overburden Thickness Theme

AGI's past experience has shown that aquifer confinement either in the form of overburden overlying the FAS, or as the intermediate aquifer system, is typically the most critical layer in determining aquifer vulnerability. Additional or recently-collected well boring data results in a more resolute output vulnerability map. Sources of borehole and gamma log data include the Florida Geological Survey, SJRWMD, and SWFWMD.

Information from each of these sources was combined into one dataset which includes information about hydrostratigraphic surfaces. These data points will be combined with County LIDAR data and used to predict tops and thickness of the FAS and aquifer confinement, respectively. The wells to be used in this effort are displayed in Figure 3. The green box in the figure was developed to capture wells beyond the boundary for use in surface prediction. The box was drawn approximately five miles beyond the rectangular extent of Marion County. Results of the geostatistical methods used to predict these surfaces will be of higher value using wells beyond the county boundary. This task is approximately 50% complete.

Karst Feature Theme

Karst features can provide preferential pathways for the movement of ground water into the underlying aquifer system and can act as short circuits for any confining layers present in the area. Closed topographic depressions were extracted from the county's 10-ft LIDAR dataset (raster format). These depressions may or may not be true karst features. Two analytical processes will be applied to the closed topographic depressions dataset to filter out features which are considered to have little or no impact on the underlying aquifer system: a shape-feature analysis, and a vertical proximity to FAS. Figure 4 displays the distribution of the closed topographic depressions extracted from the LIDAR dataset. This task is approximately 50% complete.

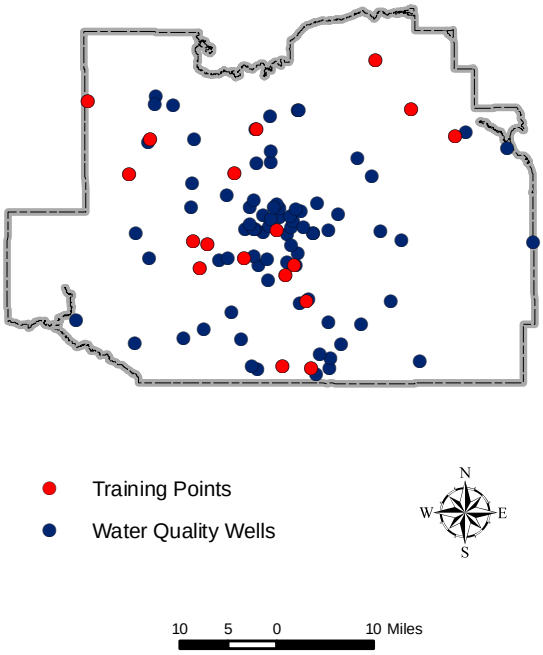
Other Evidential Themes

AGI has tested one dataset for use as an evidential theme and is continuing to develop a second dataset for consideration. The area's hydraulic head difference (FAS potentiometric surface – water table level) was initially considered as input in to the model. Upon further consideration, this layer will not be implemented for two main reasons: (1) in much of the study area, there is a single aquifer system (FAS) and therefore no hydraulic head difference (i.e., equal to zero). The overwhelming number of raster cell values with zero values in these areas has the tendency to bias the statistical analysis for this layer, and (2) any dataset representing potentiometric levels/water table surface is merely a snapshot in time which will not reflect various seasonal fluctuations.

A coverage representing recharge values for the study area is currently still under consideration. Data has been obtained for the entire county; however, AGI is still awaiting data for the SWFWMD area of the county to develop a dataset of consistent resolution countywide. No other themes are currently under consideration. This task is approximately 75% complete.

Overall, the project is on schedule. The second TAC meeting is tentatively scheduled for December 14, 2006 in Ocala. The week prior to this meeting, AGI is scheduled to deliver the second progress report detailing the bulk of the results of the sensitivity analysis and test modeling phase of this project, and the finished evidential theme data.

1.



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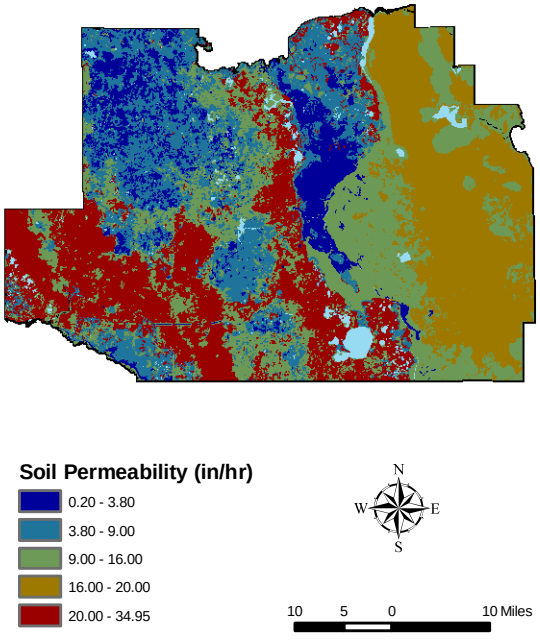

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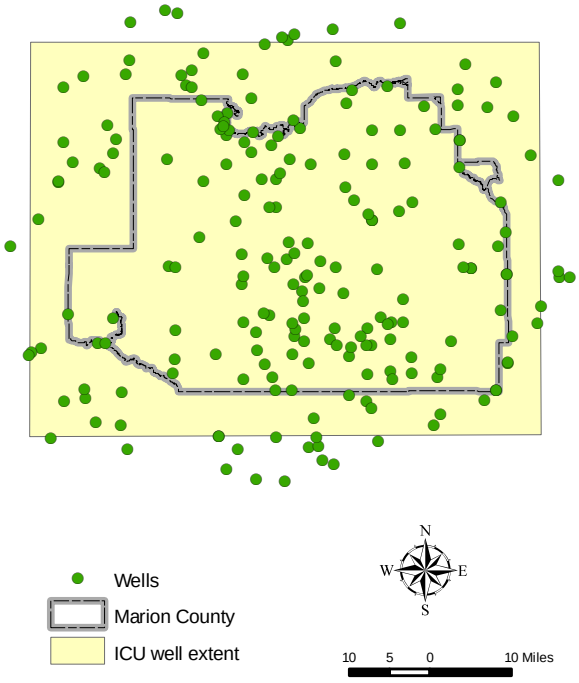

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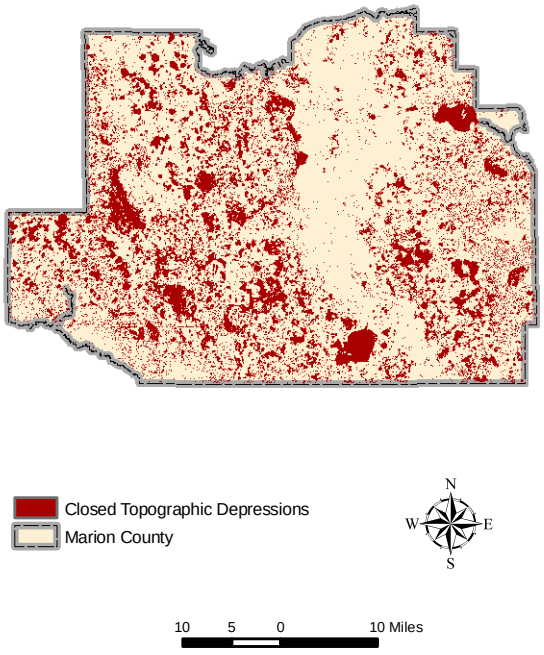

Figure 1. Dissolved oxygen data points and derivative training point dataset. | Figure 2. Calculated sum of the weighted averages for soil permeability. | Figure 3. Wells selected to model surface of FAS and thickness of aquifer confinement. | Figure 4. Closed topographic depressions extracted from LIDAR data.