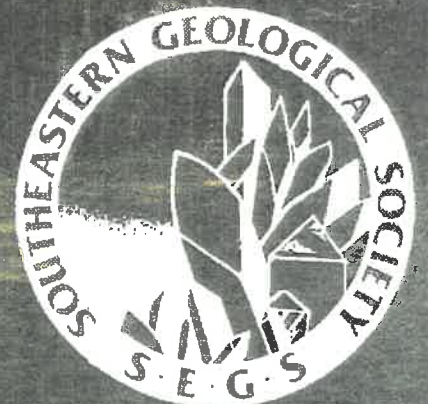


37B

The Upper Hillsborough River Basin

Southeastern Geological Society
Meeting agenda with abstracts
April 17-18, 1998



Southeastern Geological Society

Meeting agenda with abstracts

The Upper Hillsborough River Basin- Water Resources and Management Issues

Speaker Program:

Sid Flannery - SWFWMD - **Land use characteristics and streamflow trends in the Hillsborough River Watershed**

Gregg Jones - SWFWMD - **Water Quality of Crystal Spring with Emphasis on Sources of Nitrate in the Upper Floridan Aquifer, Southeastern Pasco County, Florida**

Don Thompson - SWFWMD - **Using Electromagnetic-induction Logging to correlate natural gamma log traces with field interpreted lithologic descriptions**

Dan Blood - Hillsborough County - **Land Uses in the Upper Hillsborough River Basin**

Bill Wilson - Subsurface Evaluations Inc. - **Buried sinkhole densities and new sinkhole frequencies in karsts of northwest peninsular Florida**

George Sharrock - Florida Dept. of Environmental Protection, Phosphogypsum Program - **The production, management, and disposal of phosphogypsum in Florida**

Robert Peterson - Southwest Florida Water Management District - **Water Use Permitting Regulatory Overview, CF Industries, Inc. Crystal Springs Recreational Preserve, Inc. & Cone Ranch, Northwest Hillsborough County, Southeast Pasco County, Florida**

Meeting agenda:

Friday April 17, 1998

5:00 Attitude adjustment
6:00 Society Business
6:30 Speaker Program - First three speakers
7:30 Dinner
8:30 Speaker Program - Last four speakers

Saturday April 18, 1998

9:00 meet at Canoe Escape prepared to spend the morning (at least 3 to 4 hours) and have lunch on the river. Bring something to drink, lunch provisions, bug spray, sunblock, hat, bathing suit, towel, or anything you might want to have along the river. Pick-up times will be decided by the group.

ACKNOWLEDGMENTS:

Thanks to all the guest speakers for participating in our program.
Thanks to Rick Lee of the Southwest Florida Water Management District for contacting all the speakers and arranging this program.
Thank you to Diana Burdick of the Southwest Florida Water Management District for the color infrared digital orthoquads of the Upper Hillsborough River Basin.

Land use characteristics and streamflow trends in the Hillsborough River Watershed

by

Sid Flannery

Environmental Section, Resource Projects Department
Southwest Florida Water Management District

ABSTRACT

The Hillsborough River basin drains approximately 650 squares, making it the largest drainage basin contributing freshwater flow to Tampa Bay. The main river channel is 54 miles long, extending from its headwaters in the Green Swamp to the river mouth in downtown Tampa. Topography in the watershed is generally flat with the river and its tributaries typically having wide floodplains. Urban and suburban areas comprise 25 percent of the watershed and are concentrated to the south, including portions of Tampa, Plant City and Lakeland. The northern region of the watershed is mostly rural, with 32 percent of the land in agriculture and 39 percent in natural land cover (uplands and wetlands). Approximately two-thirds of these natural lands are wetlands, which are associated primarily with the riverine floodplains.

Rainfall in the watershed averages about 51 inches per year, with about 60 percent of this quantity occurring in a four month period from June through September. The Hillsborough River receives spring flow and upward leakage from the upper Floridan aquifer in various reaches and is a perennial stream over nearly all of its length. Recent analyses have shown there are declining flow trends at several streamflow gaging sites on the river and its tributaries. Flows from Crystal and Sulphur Springs, which discharge to the upper and lower river, respectively, have declined about one-third since the 1960's. At several river and tributary sites the fraction of streamflow contributed by baseflow has decreased over time. Increasing water supply withdrawals and changing land uses may be affecting these trends. In 1994, an average of 132 million gallons of water per day were withdrawn from ground-water sources in the Hillsborough River watershed. Rising population growth, with associated drainage modifications and increased impervious surface areas may also be a factor affecting these trends.

Water Quality of Crystal Spring with Emphasis on Sources of Nitrate in the Upper Floridan Aquifer, Southeastern Pasco County, Florida

by
Gregg W. Jones
Ambient Ground-Water Quality Monitoring Program
Southwest Florida Water Management District

ABSTRACT

Crystal Spring, a second magnitude Floridan aquifer spring located in southeastern Pasco County, is the subject of continuing investigations of ground-water nitrate concentrations in the Southwest Florida Water Management District. The average historical discharge rate of Crystal Spring is 38 mgd (59 cfs), which flows directly into the Hillsborough River. The spring discharge is the dominant contributor of base flow to the Upper Hillsborough River, and is an important source of reservoir water for the City of Tampa. Crystal Spring is also the sole source of spring water for Zephyrhills Bottled Water operated by the Perrier Corporation. Flow measurement data shows a nearly 30 percent decline in spring discharge over a 65 year period. Both declining flows and increasing nitrate concentrations in the upper Floridan aquifer have been observed at Crystal Spring, and are causes for concern regarding future water supplies in the region, and the effects of nutrient loading to the Hillsborough River and Tampa Bay.

Previous water quality studies of springs in the District have shown nitrate levels in the upper Floridan aquifer are elevated above a background concentration of 0.01 mg/l, and nitrate concentrations in Crystal Spring have increased from less than 1.0 mg/l in 1970 to present day concentrations of 2.4 mg/l. A cooperative effort has been initiated to characterize the ground-water basin and determine sources of nitrate discharging from the spring. Hydrogeologic analyses and geochemical techniques will be employed to identify the recharge area of Crystal Spring, and correlate land uses to observed water quality in the upper Floridan aquifer. The study results will be used to provide recommendations for resource management of both Crystal Spring and the Upper Hillsborough River basin.

USING ELECTROMAGNETIC-INDUCTION LOGGING TO CORRELATE NATURAL GAMMA LOG TRACES WITH FIELD INTERPRETED LITHOLOGIC DESCRIPTIONS

by
DON THOMPSON

Resource Data Department Geohydrologic Data Section
Southwest Florida Water Management District
Brooksville, Florida

ABSTRACT

Electromagnetic (EM) induction logging has been commonly used in the petroleum industry since the late 1950's. Slim-line EM-induction probes are now readily available to the ground-water industry and in some cases are an integral part of water resource investigations. The United States Geological Survey relies heavily on the use of EM log data while conducting ground-water quality studies in the northeastern United States. The Southwest Florida Water Management District and the West Coast Regional Water Supply Authority initiated a cooperatively funded hydrogeologic investigation of a proposed wellfield in northeast Hillsborough County. EM-induction logging methods were used to determine the thickness of clayey sediments identified during initial field investigations.

LAND USES IN THE UPPER HILLSBOROUGH RIVER BASIN

by
Dan Blood
Hillsborough County Land-use Planning Department

ABSTRACT

The Upper Hillsborough River watershed is an area which today remains in rural agriculture and public conservation land uses, and is relatively undeveloped due to past private and public land use decisions. However, the River's tributaries are threatened by the potential for future rural residential development, which is a popular lifestyle found 30 minutes away from the Tampa metropolitan area. Agriculture and related extraction industries are the cause of past conversion of the area's natural lands, and public acquisitions for conservation have protected a large portion of the Upper Hillsborough watershed from widespread conversions to urbanizing uses. One large 14,000 acre tract known as the Thomas Ranch is in private ownership, where managed cattle, timber, and recreational uses predominate. Several large tracts of land are in protected public ownership, and are managed for protection of water resources, natural systems and habitat of the upper Hillsborough River watershed. The principal land uses of the upper watershed are natural undeveloped lands, wetlands and uplands, due to this public ownership. There is a rural residential development pressure moving north from the I-4 corridor in Hillsborough County and south from the State Road 54/Zephyrhills corridor in Pasco County which can affect the future of the upper watershed and floodplain. The related effects of residential populations in the tributary watersheds to the upper Hillsborough River can lead to degradation of the river and its related ecosystems. Conversion of the upper river basin agricultural lands to future rural residential development is the largest land use problem for the protection of the Upper Hillsborough watershed.

BURIED SINKHOLE DENSITIES AND NEW SINKHOLE FREQUENCIES IN KARSTS OF NORTHWEST PENINSULAR FLORIDA

By
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ABSTRACT

In karst terranes of the northwest quarter of the Florida Peninsula, topographic maps, having contour intervals of 1.5 or 3 m (5 or 10 feet) at a scale of 1:24,000, depict sinkholes (SH) having modal densities in the 0-3 SH/km² (0-9 SH/mi²) class in the Gulf Coastal Lowlands, 4-7 SH/km² (10-19 SH/mi²) in portions of the Lake Wales and Mt. Dora Ridges, and 15-19 SH/km² (40-49 SH/mi²) in the Western Valley. The topographic sinkholes represent a minor portion of the total karst feature density. Most sinkholes have been buried by sand that was deposited during one or more high stands of sea level. All karsts in the northwest quarter of the Florida Peninsula contain buried sinkholes (BSH) that perforate the subsurface clayey, Miocene to Pliocene formations that overlie the Tertiary carbonates. Ground-penetrating radar surveys have succeeded in mapping 56-250 BSH/km² (145-650 B SH/mi²) at five upland sites and 460-3,400 BSH/km² (1,200-8,700 BSH/mi²) at ten lowland sites. The average buried sinkhole density is 150 BSH/km² (400 BSH/mi²) for upland sites and 1,200 BSH/km² (3,100 BSH/mi²) for lowland sites. Dissolution openings (DO) in the top of the Floridan aquifer occur with densities ranging from 12,300-730,000 DO/km² (32,000-1,900,000 DO/mi²). Actuarial statistical analysis of a database containing more than 2,000 reported new sinkholes (NSH) shows that sinkholes develop at minimum documented frequencies ranging from less than 0.0004 NSH/km²/yr (0.001 NSH/mi²/yr) to a maximum of 1.9 NSH/km²/yr (4.8 NSH/mi²/yr). The typical NSH frequency is approximately 0.04 NSH/km²/yr (0.1 NSH/mi²/yr), but, after adjustment for under-reporting, it is thought to be approximately 0.4 NSH/km²/yr (1 NSH/mi²/yr). The sand-filled buried sinkholes are high permeable pathways through the clay layer. Commonly, contaminant migration from the surficial sand can be concentrated into the buried sinkholes and may pass through the sand-filled throats into cave networks. Contaminants can then be conveyed rapidly to nearby springs, thus bypassing monitoring wells placed in the diffuse-flow portion of the aquifer. This conduit-confined contaminant transport must be considered when designing effective ground-water quality monitoring networks, but it is commonly ignored to the detriment of the monitoring validity and to the benefit of the ground-water polluter. The density of buried sinkholes and dissolution openings demonstrates why the entire karst terrane must be considered vulnerable to ground-water contamination and sinkhole development, rather than merely the areas immediately above and within obvious topographic sinkholes.

THE PRODUCTION, MANAGEMENT, AND DISPOSAL OF PHOSPHOGYPSUM IN FLORIDA

by

George Sharrock

Florida Department of Environmental Protection
Phosphate Management Program

ABSTRACT

Phosphogypsum is a by-product of phosphoric acid production. The reaction of sulfuric acid with the phosphate rock which is mined throughout the west central region of Florida creates the phosphogypsum. For each ton of phosphoric acid produced, approximately 5 tons of phosphogypsum is produced. A typical phosphoric acid chemical plant will produce between 750,000 to 1,000,000 tons of phosphoric acid annually, thereby producing 3,750,000 to 5,000,000 tons of phosphogypsum annually.

The phosphogypsum is pumped in slurry form to an impoundment where it is allowed to settle. A dragline or backhoe is used to raise the dikes of the impoundment as the settled phosphogypsum accumulates. The phosphogypsum stacks can reach heights of 200 feet above grade. Large phosphogypsum stacks typically have base "footprints" of 350 to 500 acres.

Phosphoric acid production has existed in Florida since the 1920's. there are 25 existing phosphogypsum stacks in the State of Florida. These stacks contain a cumulative total of approximately one billion tons of phosphogypsum and displace an area equivalent to about 11 square miles.

A phosphogypsum management rule was promulgated in 1993 to better manage the accumulation of these materials by requiring that new stacks be built with liner systems to prevent seepage from these stacks from impacting the ground water. The rule also requires that unlined stacks be closed by the year 2001.

**Water Use Permitting Regulatory Overview, CF Industries, Inc.
Crystal Springs Recreational Preserve, Inc. & Cone Ranch,
Northwest Hillsborough County,
Southeast Pasco County, Florida**

by
Robert O. Peterson
Tampa Regulation Department
Southwest Florida Water Management District

ABSTRACT

CF Industries, Inc. and the Crystal Springs Recreational Preserve, Inc. account for 4.18 million gallons per day (mgd) Annual Average permitted groundwater withdrawals within the Upper Hillsborough River drainage basin within Northeast Hillsborough County and Southeast Pasco County. In addition to these currently permitted facilities, the West Coast Regional Water Supply Authority (WCRWSA) is proposing to establish a 12 mgd wellfield at the Cone Ranch property currently owned by Hillsborough County. The CF Industries, Inc. permit was recently renewed with a reduction in permitted quantities from 6.35 mgd to 3.88 mgd, accounting for an offset of approximately 38 percent of groundwater withdrawals by the introduction of reuse water from Plant City. CF Industries, Inc., has a contract with Plant City to receive approximately 2.19 mgd Annual Average reuse water to be used for the cooling towers at the phosphate processing facility. In addition, groundwater recovery from 14 remedial action recovery wells were also permitted to provide water to the cooling towers. The remediation at the facility is being conducted in an effort to capture existing groundwater contamination and to minimize the movement of contamination to deeper zones of the Upper Floridan aquifer.

Crystal Springs Recreational Preserve, Inc. is currently permitted to withdraw up to .3 mgd Annual Average from Crystal Springs for the purpose of producing the Zephyrhills Bottled Water product. The Permittee is currently in the process of attempting to modify the permit to increase the Annual Average withdrawal quantity to 1.9 mgd in six years and 2.6 mgd in ten years. A Water Use Permit application is currently being evaluated by the District, and the Permittee is presently in the process of conducting a study to determine the potential impacts of the requested withdrawals and possible mitigation options. The primary issue of concern for the requested withdrawal increases is the potential base-flow impacts to the Hillsborough River and associated effects to existing legal users and the environment.

The Cone Ranch property encompasses an area of about 13,000 acres and is situated in the extreme northeast corner of Hillsborough County, abutting the south and east boundaries of the CF Industries, Inc. property. This property consists primarily of improved pasture land, a pine tree cultivation area, isolated wetlands and the contiguous wetlands to Blackwater and Itchepackesassa Creeks. It is currently indicated by the WCRWSA that a Water Use Permit application for a 12 mgd Public Supply Wellfield at the Cone Ranch property will be submitted to the District for evaluation in the summer of 1999. Currently, the WCRWSA is completing an Aquifer Testing Program to assess the hydrogeology of the proposed wellfield site. Parameters obtained through the testing program will be used in an Integrated Surface Water/Groundwater model (ISGW) to assess the safe yield production capacity of the proposed wellfield and to help in the design and operation of the facility in accordance with minimum flows and levels.