



AGRICULTURAL LAND USE AND GROUNDWATER QUALITY IN THE LAFAYETTE COUNTY, FLORIDA VERY INTENSE STUDY AREA (VISA) by Gary Maddox, Cindy Cosper & Penn Craig

INTRODUCTION

The Very Intense Study Area (VISA) Monitoring Network was established in the late 1980's, and was designed to quantify the effects of various land use types on regional (non-point source) groundwater quality. The network consists of 575 wells in 22 distinct VISA areas within the State of Florida. These areas were chosen based on 1) predominance of a particular land use type or group, 2) relative aquifer vulnerability, and 3) geographic distribution. The major land use categories targeted for investigation include agriculture, single-family residential, mixed urban-suburban, and industrial. VISA wells may tap all major potable aquifers within the confines of the study area, with the majority of wells completed within the uppermost aquifer present.

Each VISA consists of 8 - 43 wells located within an area of up to 120 square miles. Existing wells supplemented by newly-installed monitoring wells comprise a VISA. Wells were selected or installed beginning in 1988, and were first sampled in 1989. Each VISA has been sampled two to four times.

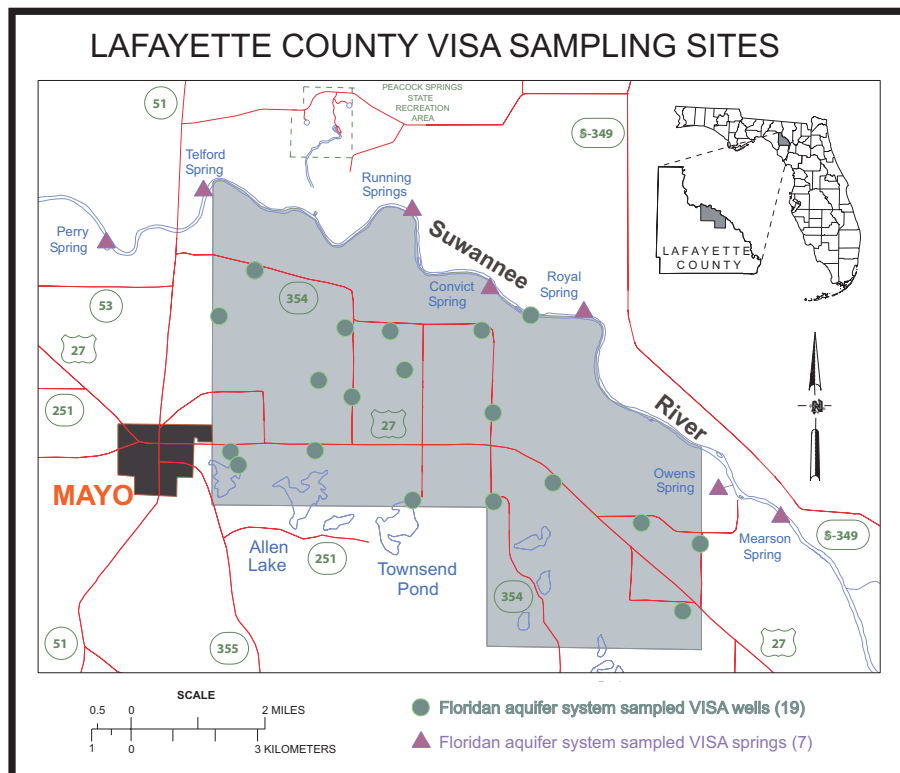
Groundwater chemistry data from wells and springs within each VISA were statistically compared to nearby Background Network wells sampled for the same parameters within the same time period, in order to determine the potential effects of land use on groundwater quality. The Background Network consists of over 1800 wells throughout Florida which are located in areas believed to have been minimally impacted by human activities. The Background Network wells used for comparison to VISA wells were selected based on having similar depth, well construction and aquifer characteristics. The locations of the Background Network wells were important. They had to be close enough to the VISA to monitor hydrogeologically equivalent aquifer segments, but not lie within the same predominant land use (or land use intensity) as the VISA.

The timing of sampling of Background and VISA wells was coordinated so that the effects of seasonal water quality variations could be minimized. Earlier sampling of Background and VISA wells occurred within the same two month time period.

Most of the sampling for the VISA program was performed by Florida's five Water Management Districts, under the direction of the Florida Department of Environmental Protection's (DEP) Ambient Monitoring Program. Standardized procedures were used by all sampling teams to decrease potential sampler-induced variability.

Each VISA is sampled periodically for a list of standard analytes, supplemented by an extended list of specialized analytes ([Table 1](#)). The standard analyte group includes major cations, major anions, nutrients, and field parameters. Extended list analytes include trace metals, pesticides, and volatile organic compounds. These analyte groups allow for general water quality characterization (major cations and anions), as well as detection monitoring for ground water contaminants which might specifically threaten public health or otherwise endanger the surrounding environment (pesticides, nutrients, trace metals).

Continued on Page 2



LAFAYETTE COUNTY VISA

The Lafayette County VISA comprises a 28 square mile area adjacent to the Suwannee River in the north-central portion of the county (Figure 1). Three existing wells, sixteen newly installed wells, and seven springs were selected for groundwater sampling. This area was chosen because of the intensity of agricultural land use within an area characterized by a highly vulnerable portion of the Floridan aquifer system. Land use within the VISA consists primarily of dairies and cattle, row crops, poultry operations and, to a lesser degree, silviculture (Bonds, 1990). Figure 2 depicts the relative density of non-silvicultural, agricultural land use within the VISA area.

The VISA and adjacent Background Network wells were sampled in 1990, 1991 and 1994. They were sampled again in June, 1997. However, not all 1997 Background sampling results were available at press time.

Figure 1 Lafayette County VISA

GEOLOGICAL OVERVIEW

The VISA area lies within the Gulf Coastal Lowlands geomorphic region (White, 1970), and within the lower Suwannee River Basin. The top of the Floridan aquifer system is at or near land surface adjacent to the river corridor. The unconfined upper portion of the Floridan aquifer system lies within Eocene Ocala Group carbonates and overlying Oligocene Suwannee Limestone. These formations are variably exposed along the banks of the river and within sinkholes in and adjacent to the river flood plain within the bounds of the VISA. The Suwannee Limestone in this area is mantled by a thin sequence of Miocene to Recent interbedded sands and discontinuous sandy clays which form a slight ridge 3-6 miles wide adjacent to and along the southern bank of the river.

The upper limestone surface beneath the mantle of sand and clay is highly variable topographically, with numerous sand and clay-filled paleo-sinkholes. This area is highly susceptible to ground water contamination from pollutants introduced at land surface.

A steep potentiometric gradient exists, from the study area, north toward the Suwannee River. This gradient reflects ground water discharge from the Floridan aquifer system through numerous springs located along this reach of the river. The potentiometric gradient varies with seasonal changes in river level; during periods of low to moderate river stage the Floridan discharges to the Suwannee River. During periods of high river stage, the slope of the potentiometric surface is reversed adjacent to the river corridor, allowing surface water in the river to dynamically recharge the aquifer. During these conditions, springs reverse flow, and tannic river water flows into normally dry sink-holes up to several miles away. Groundwater chemistry is noticeably affected by the infusion of river water into the aquifer during these periods. Thus, surfacewater - groundwater exchange is very high in this area. Impacted ground water can contaminate surface water and vice versa.

LAND USE HISTORY

Lafayette County has a land area of 534 square miles and a population density of 10.3 persons per square mile (Fla. Dept. of Commerce, 1994). Silviculture is the predominant areal land use. In contrast to the majority of the county, the low ridge area adjacent to the Suwannee River is predominantly characterized by intensive agricultural land usage, consisting of large numbers of dairy farms, pasture, commercial chicken houses and, to a much lesser degree, silviculture and row crops (Figure 2).

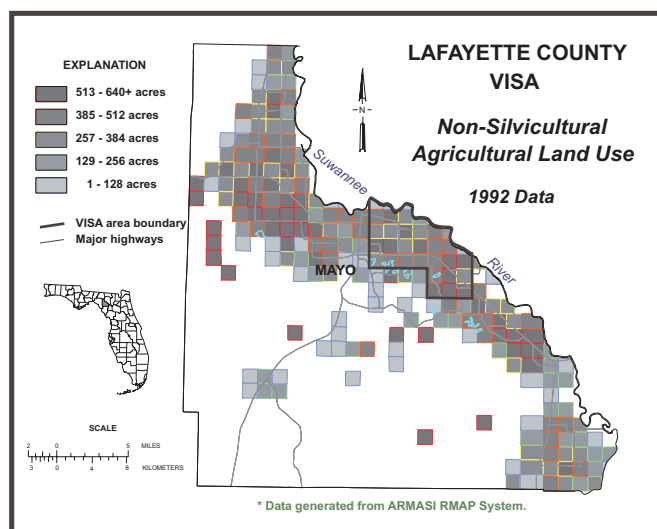


Figure 2 - Lafayette County Non-Silvacultural Land Use

SAMPLING RESULTS

The Lafayette County VISA was sampled in April 1990, March 1991, and June 1994 for all analytes shown in [Table 1](#). The VISA was also sampled in June 1997 for the *Standard analyte list* plus the *Trace Metals extended analyte list* shown in [Table 1](#). Although DEP is interested in the results of all sampling, this discussion is restricted to chemical analytes which are believed to be related to agricultural land use activities, such as pesticides, herbicides and nutrients.

Elevated pesticide, herbicide and/or nutrient levels in ground water often result from intensive agricultural activities in areas where the aquifer is at or near land surface, and is not protected by overlying aquicludes or aquitards (Andrews, 1994). The importance of monitoring for these parameters in the Floridan aquifer system in the vicinity of the Lafayette County VISA becomes apparent since all potable water used in the region comes from ground water. Some pesticides and herbicides may be

carcinogenic or mutagenic at very low concentrations. Nitrate levels in excess of 10 mg/L in drinking water can cause acquired methemoglobinemia ("Blue Baby syndrome"), a potentially fatal infant disorder, but have not been shown to adversely affect older humans (Plumb, 1988).

Pesticides and Herbicides

No pesticides or herbicides were detected from samples collected during the 1990, 1991 or 1994 sampling events. Therefore, as of 1994, land use activities within the Lafayette County VISA were not found to contribute measurable amounts of these parameters to ground water. The 1997 sampling did not include pesticides or herbicides.

Nitrate ($\text{NO}_3 + \text{NO}_2$, measured as Nitrogen)

Nitrate + Nitrite concentrations measured from the Lafayette County VISA were compared to those from selected nearby Background Network wells using a Mann-Whitney nonparametric statistical test (Mendenhall et al., 1981). The Mann-Whitney test compares the distribution of two populations. For the Lafayette County VISA, the test was used to compare the median (magnitude of the middle observation) of nitrate values in the VISA wells to the median of nitrate in the Background wells for the 1990, 1991 and the 1994 sample runs. As previously mentioned, the results of the chemical analyses for the Background wells for 1997 were unavailable at press time. Thus, no comparison was made for the 1997 data. In all situations where the concentrations were below the detection limit, the concentrations were considered to be equal to the detection level (0.020 mg/L) for these Mann-Whitney tests.

[Table 2](#) summarizes the results from the Mann-Whitney comparisons. For the 1990 nitrate sample data, the median value of the VISA (V) wells and springs was 1.140 mg/L and for the Background (B) wells it was 0.020 mg/L. Since the value of P (probability or error) was less than α (0.05), we are 95% confident that nitrate concen-

**Table 1
Sampled Parameters**

Standard Analyte List	Extended Analyte List
Field	Trace Metals (dissolved and/or total)
Conductivity	Aluminum
Dissolved Oxygen	Arsenic
Eh	Barium
pH	Cadmium
Temperature	Chromium
Water Depth	Copper
Major Constituents	Iron
Alkalinity, Dissolved	Lead
Calcium, Dissolved	Manganese
Chloride, Dissolved	Mercury
Fluoride, Dissolved	Nickel
Magnesium, Dissolved	Selenium
Organic Carbon, Total	Silver
Potassium, Dissolved	Strontium
Silica, Dissolved	Zinc
Sodium, Dissolved	Pesticides
Sulfate, Dissolved	Carbamate Pesticides
Nutrients	Carbamate and Urea Pesticides
Ammonia	Chlorinated Herbicides
Ammonia + Organic Nitrogen	Fumigant Pesticides
Phosphorus	Organohalide Pesticides
Ortho-Phosphated	Organonitrogen Pesticides
Miscellaneous	Organophosphorus Pesticides
Specific Conductance, Lab	Organics
Turbidity	Base Neutral & Acid Extractables
	Purgeable Organics

Continued on Page 4

trations are significantly greater in the VISA wells and springs than in the Background wells. An inspection of the 1991 and 1994 data also indicates that nitrate concentrations in the VISA wells and springs are significantly greater at the 95% confidence level than in the Background wells.

Note that in 1991, the magnitude of the difference between the median values in the VISA and Background wells were much less than in either of the 1990 or the 1994 data sets. This is due to the unusually high stage of the Suwannee River in 1991, which was in flood when the sampling was conducted. 1991 results are from well

sites only, as river conditions made spring sampling impossible. The decrease in nitrate concentrations in that year was most likely due to the localized influx of lower-nitrate river water into the aquifer. Accelerated chemical denitrification may also occur where ground water and surface waters mix.

Table 2 - Nitrate Comparisons

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□□□□□□		26	1.520		
Background (B)		9	0.020	0.0001	V>B

1991				
Category	Number of Observations	Median (mg/L)	P	Conclusions
VISA(V)	18	0.130		
Background (B)	17	0.075	0.0311	V>B

1994				
Category	Number of Observations	Median (mg/L)	P	Conclusions
VISA(V)	25	1.900		
Background (B)	22	0.020	0.0000	V>B

1997				
Category	Number of Observations	Median (mg/L)	P	Conclusions
VISA(V)	25	2.200		
Background (B)	NA	NA	NA	NA

Mann-Whitney Test*
 H_0 : Median (V) = Median (B)
 H_A : Median (V) > Median (B)
 Significance Level (α) equals 0.05

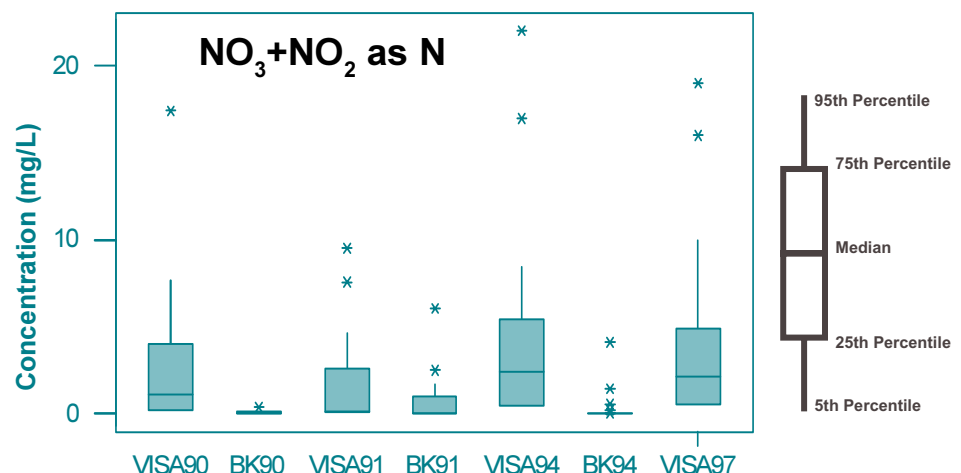
* The hypothesis we wish to test is referred to as the null hypothesis; since acceptance of it commonly implies "no effect" or "no difference". It is denoted by the symbol H_0 . For the tests above, we are testing whether the magnitude of the median nitrate-nitrogen concentration value from the samples collected within the VISA (V) is statistically equal to the median nitrate-nitrogen concentration value of Background (B). The alternate hypothesis, denoted H_A , represents the hypothesis we will accept if we reject H_0 . The level of significance, symbolized by α , represents the probability that the null hypothesis is true, but is rejected by the test. For the tests represented in this table, α is equal to 0.05. If the calculated probability of error of the test, labeled P, is less than α , we reject H_0 . As an example, for the 1990 data, P equals 0.0001. Thus, P is less than α and we reject H_0 . We infer that the median nitrate-nitrogen value within the VISA is significantly greater than it is in the background.

Figure 3

VISA - Visa Samplings & Sample Year

BK - Background Samplings & Sampling Year

* - Statistical Outliers



Box plots of nitrate values for the VISA and Background wells are depicted in [Figure 3](#). The box plots can be used to visually compare the distribution of the concentration of nitrates. For example, the box plot of the 1990 Background data indicates that the spread of the data is much narrower than the corresponding VISA data. The same can be said for a comparison of the 1991 and the 1994 data sets. The wet year of 1991 shows that nitrate concentrations in both the VISA and Background decreased relative to the 1990 and 1994 Background/VISA and 1997 VISA data sets.

CONCLUSIONS

With the exception of nitrate, the current ground water quality within the VISA is generally good. Significantly higher concentrations of nitrate exist in the ground water beneath the VISA,

relative to concentrations in surrounding Background Network wells. These values appear to result from different land use activities and/or intensity, coupled with the highly vulnerable nature of the Floridan aquifer system in this area.

High nitrate concentrations have been well documented in other areas of north Florida (Andrews, 1992). Preliminary isotopic studies have indicated that the sources of nitrate are due primarily to organic nitrogen derived from animal wastes within the area encompassing the Lafayette VISA south of the Suwannee River (Hornsby, 1994) and to inorganic sources (fertilizers) on the north side of the river.

DEP has been working with the Suwannee River Water Management District and others to develop and implement Best Management Prac-

tices among dairy farmers to reduce nitrate loading to the Floridan aquifer system. Although dairy wastes are suspected as a major source of nitrates in the area's ground water, other land uses (particularly poultry operations, row crops and possibly septic tanks) likely contribute to the problem as well. The relative nitrate contribution by each land use type has yet to be determined. Additional surface and ground water monitoring results indicate that this problem is potentially widespread within the lower Suwannee River corridor in Suwannee, Lafayette, Dixie and Gilchrist counties (Maddox et al., 1992). Long-term groundwater monitoring is needed to determine the temporal variability and extent of the problem. DEP, SRWMD, the Florida Department of Health and other state and local officials are currently working together to answer these questions.

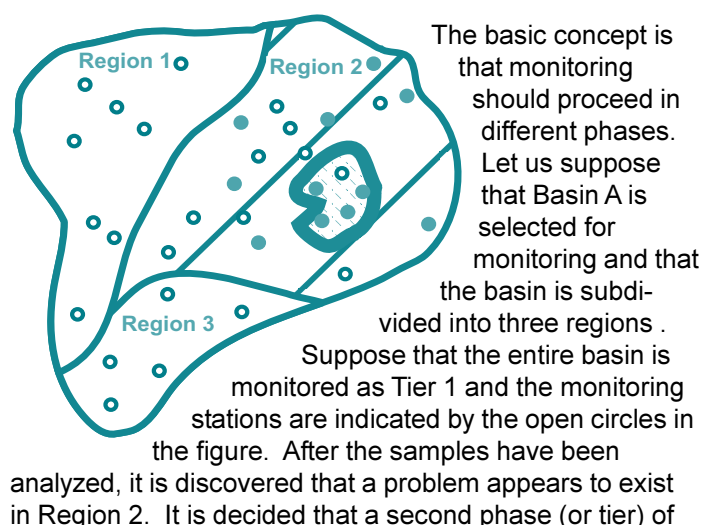
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Integrated Water Resources Monitoring Network Update An Illustrative Example for Tier 1 Monitoring

by Tony Janicki, Coastal Environmental Inc. and Rick Copeland

Over the past several months, the Integrated Water Resources Monitoring (IWRM) Network Committee has been developing a monitoring network for the Division of Water Facilities. The Division has approved the development of a three-tiered IWRM Network.



sampling should be conducted in Region 2. Tier 2 sampling stations are indicated by the solid circles in the figure. A third phase or tier of monitoring is conducted within the large polygon to determine the specifics of the problem. We might want to think that the first tier of monitoring is to establish the conditions of the water resources of the basin. The purpose of the second tier is to assess potential problems within the basin and the purpose of the third tier is to identify and fix the problem.

Over the past several months, the IWRM Committee has been developing a design for Tier 1. It is hoped that a draft model of Tier 1 will be ready for the May, 1998 issue of this newsletter. The draft designs for Tiers 2 and 3 should be developed several months later. Note, the final plan of the IWRM Network is scheduled for completion in December, 1998.

In the meantime, enough is known about Tier 1 that an illustrative example as to what type of questions the Tier 1 monitoring can answer has been prepared and is given below. Please note, the example is only illustrative. It is a fictitious report.

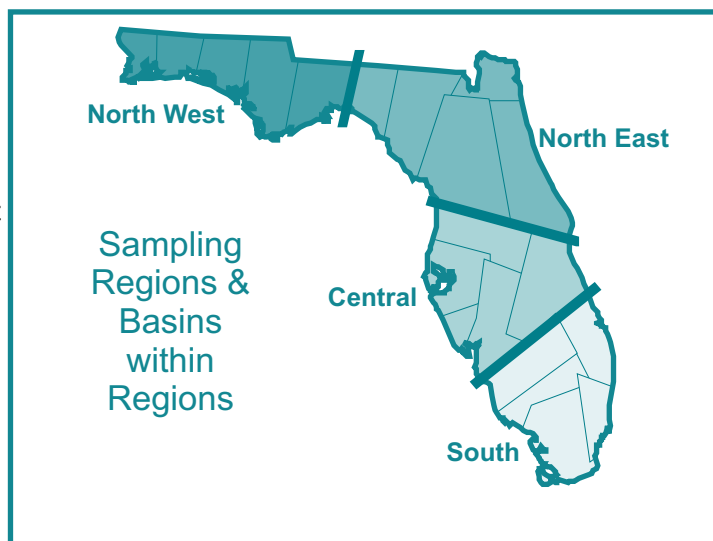
Tier 1 Assessments The Multi-Year Monitoring Network

The purpose of Tier 1 assessments is to address generalized, overall characteristics of the water resources of the state, and to address general conditions in each of the major basins within the state. For example, Tier 1 assessments are intended to answer questions like:

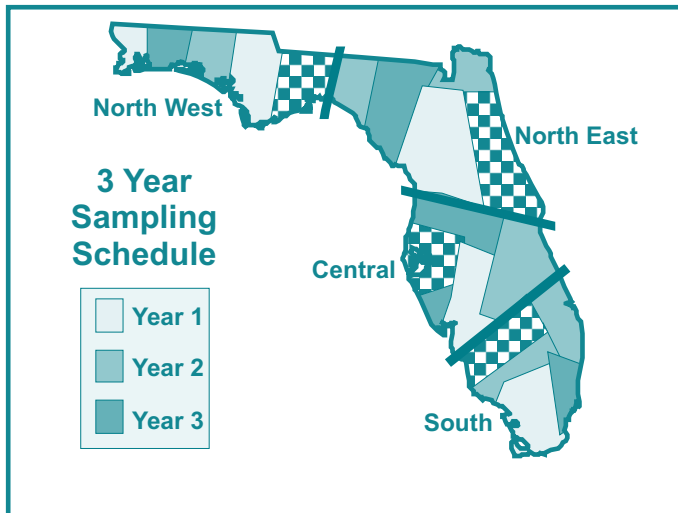
- ◆ "What percent of all miles of streams within the state meet designated use criteria?", or
- ◆ "Of all miles of streams within Basin A that do not meet designated use criteria, what was the most prevalent reason for non-attainment?"

In order to achieve this purpose, consistent methods of sample collection are used throughout the state. Specially trained teams across the state conduct the sampling. In order to distribute the sampling effort evenly among these teams, the state is divided into 4 regions with a roughly equal number of samples collected in each region. Each region consists of 5 basins or watershed.

The Tier one sampling plan is organized around 4 sampling regions that consist of 5 basins each.



Due to the large size of the state and the limited number of sampling teams, not all basins can be sampled in each year. Therefore, 2 basins within each region are sampled each year on a 3-year rotating cycle. With this sampling design, each basin is sampled once every three years. In addition, one basin within each region is sampled twice in each 3-year cycle (i.e., the basins with a patterned fill in the figure below).



The Tier 1 Monitoring Program samples all basins within the state on a 3-year cycle.

This sampling design accommodates the logistical and cost constraints of the monitoring program while producing scientifically rigorous information on the condition of Florida's water resources. Unbiased statewide estimates of condition are produced annually, based on the 2 basins sampled per region in each year. Also, 3-year average estimates are produced based on the data collected from all basins during a 3-year cycle. In addition, basin-specific and region-specific estimates are produced.

Within each basin, data are collected on 5 types of water resources:

Streams and rivers,
Lakes,
Wetlands,
Estuaries, and
Ground water.

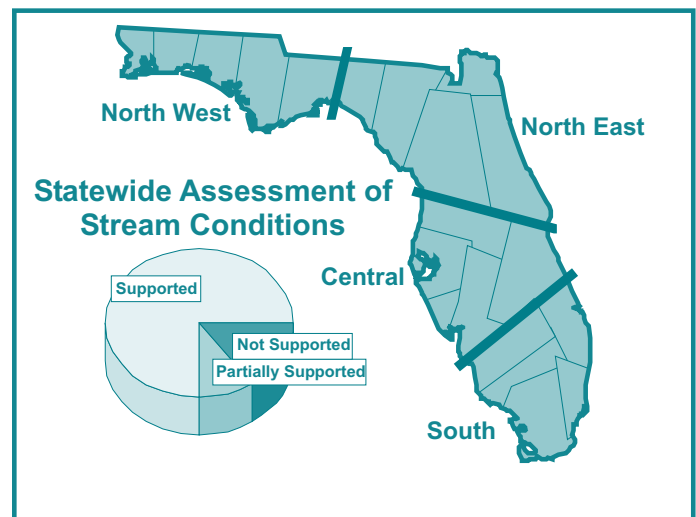
Separate assessments are conducted for each type of water resource, and assessments that combine information for multiple types of water resources are also conducted.

Monitoring Results for Streams

One general indicator of the health of a stream is whether or not the designated use for the stream is supported by the condition of the stream. Depending on the designated use (i.e., drinking water, shellfish, recreation-fish-wildlife, agriculture, industrial use) different criteria are used to determine support for the use. For example, the criteria for drinking water are more stringent than the criteria for recreation-fish-wildlife, although both consider the presence of pathogens.

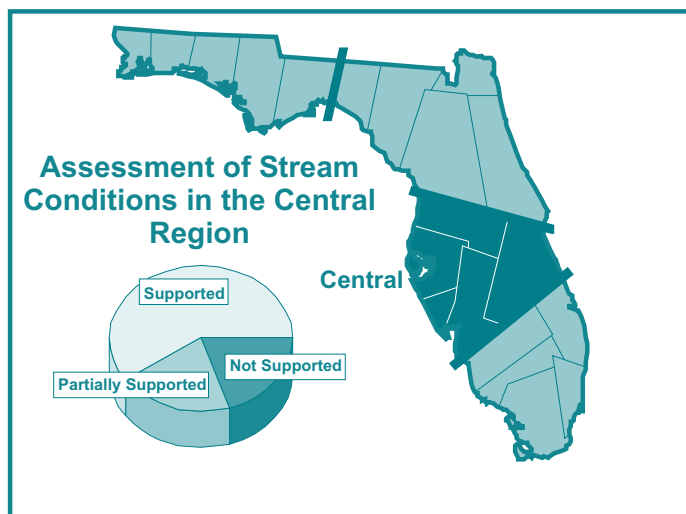
Data from the Tier 1 Monitoring Network are used to estimate the percentage of stream miles that support designated uses. In addition, these data are used to characterize the condition of streams with respect to each component indicator that is used to determine support for designated uses (e.g., dissolved oxygen concentration as one criterion applicable to the recreation-fish-wildlife designated use).

Results from the statewide assessment are summarized below.



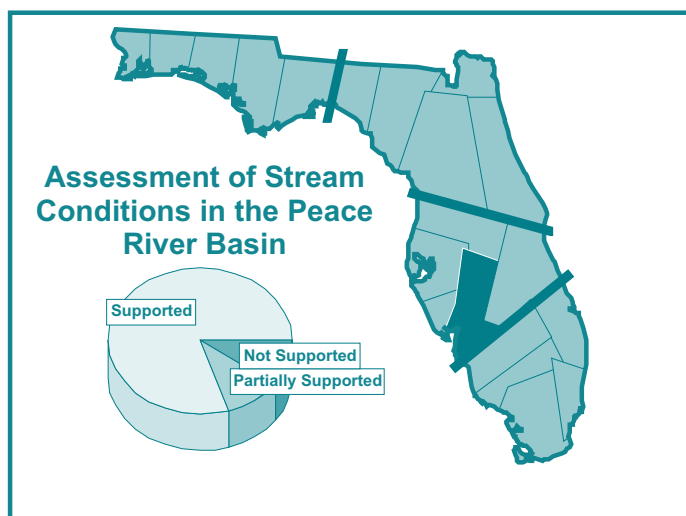
- ◆ 75% ($\pm 7\%$) of Florida's streams supported their designated uses.
- ◆ 10% ($\pm 1\%$) partially supported designated uses.
- ◆ 15% ($\pm 2\%$) did not support designated uses.

An assessment of support for designated uses was also conducted for each of the 4 sampling regions. Results of the region-specific assessment for the Central Region are summarized below.

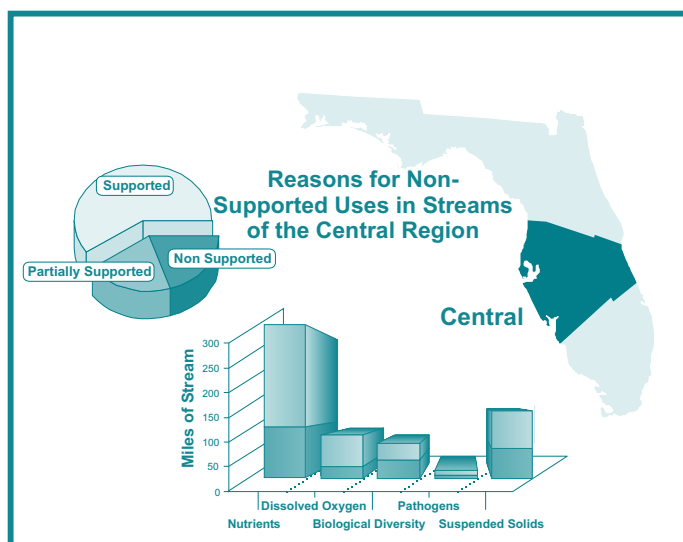


60% ($\pm 10\%$) of stream miles in the Central Region supported designated uses.
 20% ($\pm 5\%$) of stream miles partially supported designated uses.
 20% ($\pm 5\%$) of stream miles did not support designated uses.

In addition to the statewide and region-specific assessments, assessments of support for designated uses were also conducted for each basin. Results of the basin-specific assessment for the Peace River Basin are summarized below.



For the stream miles that do not support their designated uses, the reasons for the determination of non-support are summarized. Separate summaries are prepared on a statewide, region-specific and basin-specific basis. For example, in the Central Region most of the non-support determinations were due to high nutrient concentrations, the next most prevalent reason was high suspended solids. The number of miles of streams with each condition (e.g., nutrient concentrations or suspended solids in excess of the criteria) are estimated from the Tier 1 data.

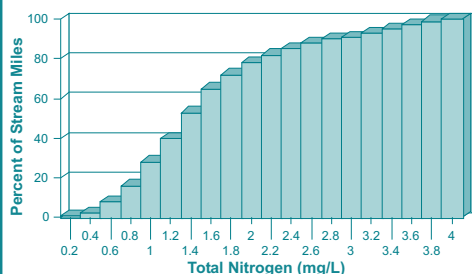


This type of summary from the Tier 1 assessments may lead to Tier 2 investigations in specific regions or basins. For example, if the Central Region was the only region with many miles of high nutrient levels, a targeted monitoring program to examine the relationship between high nutrient concentrations and adjacent land use practices in that Region might be undertaken.

Data from the Tier 1 Monitoring Program are also used for characterizations that are not linked to designated use criteria. For example, the distribution of total nitrogen concentrations within a region can be estimated from the Tier 1 data. The entire distribution is displayed as a CDF (cumulative distribution function) which depicts the percent of stream miles (y-axis) that have total nitrogen concentrations less than concentration indicated on the x-axis.

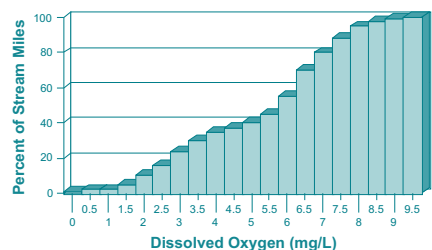
80% ($\pm 10\%$) of stream miles in the Peace River Basin supported designated uses.
 10% ($\pm 1\%$) of stream miles partially supported designated uses.
 10% ($\pm 1\%$) of stream miles did not support designated uses.

Nutrient Conditions in Streams of the Central Region



A similar type of assessment could be conducted on a statewide basis, or for individual basins. For example, the distribution of dissolved oxygen in the Peace River Basin could be characterized using Tier 1 data. Differences in distribution patterns among basins, or observed changes in distribution patterns over time within a basin, could lead to Tier 2 or Tier 3 investigations.

Dissolved Oxygen Conditions in the Streams of the Peace River Basin



September Meeting Notes

Importance of Geodetic Datum in Geolocational Information

Collection by Joe North

Geodetic Datum are mathematical models describing reference systems that provide a framework for the mapping of geolocational coordinate information. As differing datum have unique points of origin and may be based on differing reference systems, interpreting coordinate values based on one datum as though they were in another can cause position errors of up to one kilometer.

A recent survey conducted by Jay Silvanima revealed that locational information being submitted to the Ambient Monitoring section by water management districts and other contracting agencies is based on differing geodetic datum. Specifically, North American datums 27 and 83, High Precision GPS North American Datum and World Geodetic System 84.

In an effort to resolve datum differences in the OGWIS database, Suvrat Kher and the Division of Water Facilities GIS support section have written an ARC/INFO aml that selects locational information by contracting agency, and recasts it into a common HPGN datum.

Awareness of datum in the collection of geolocational information is necessary for the accurate employment of this data. Raw data files containing geolocational information should contain fields specifying datum. Archival data should retain information collected in original map interpolated or GPS datum.

Data Base Revisions by Jay Silvanima

A recent revision of the Ambient Monitoring Program's water quality data base was completed. The impetus of the revision was the inclusion of surface water data in the data base. Updated versions of the Ambient Monitoring Section's Data Management Standard Operating Procedures (DMSOP) and Data Dictionaries are available in hardcopy or as MS WORD version 6.0 files. The new data base will be distributed with the new release of GWIS (the AMS's data retrieval program, Generalized Water Information System version 3). DEP staff will be responsible for updating and maintaining the data base. Copies of the DMSOP and Data Base Data Dictionaries may be obtained by contacting Jay Silvanima, at (850) 921-9427.

**Draft Agenda
Quarterly Ambient Monitoring Meeting
January 12-14, 1998 in Ft. Myers
Ft. Myers, Florida**

Monday, January 12, 1998

8:30 AM SHORT COURSE

Applications of Probability & Statistics with Regards
to the Proposed Status & Trend Network (Tier I)

Sam Upchurch, ERM-S

4:30 PM ADJOURN

Tuesday, January 13, 1998

8:30 AM Ambient Monitoring Business Meeting

Introduction

Network Operation Issues

QA/QC Issues

Introduction

Reference Sample Results

Equipment Blank Results

Duplicate Sample Results

Other QA/QC Checks

Audits, Reports & Training

Data Management Issues

Ambient Monitoring Web Page

GWIS3 & Data Distribution

Rick Copeland, DEP

Gary Maddox, DEP

Paul Hansard, DEP

Paul Hansard

Penn Craig, DEP

Jay Silvanima, DEP

David Ouellette, DEP

Paul Hansard

Paul Hansard

Paul Hansard

David Ouellette, DEP

Paul Hansard, DEP

Special Topics

Stormwater Impact on Savanna State Reserve

Determining Sources of Pb in Florida Ground Water

Elemental Analysis of Fine-Grained Fresh Water

Sediments from Stations with Varying Land Use

Water Resources in Lee County

Kissimmee River Restoration

A Geostatistical Analysis of the Upper Floridan

Aquifer Potentiometric Network for the SJRWMD

Discussions

Rick Copeland

Greg Graves, DEP

Brian Katz, USGS

Mike Turtora, USGS

Keith Kibbey, Lee Co.

Steve Krupa, SFWMD

Bill Osburn, SJRWMD

Rick Copeland

5:00 PM ADJOURN

Wednesday, January 14, 1997

8:30 AM Implementation of the Status & Trend Network

Introduction

Modification of the TREND Network

Implementation of the STATUS Network

Aspects of Biological Monitoring in the Status Network
Discussions

Rick Copeland, DEP

Gary Maddox, DEP

Mary Paulic, DEP

Rick Copeland

Tony Janicki, PBS&J

Sam Upchurch

Mike Turtora, USGS

Rick Copeland

5:00 PM ADJOURN

Quarterly Meeting Info

The next Ambient Monitoring Program "Quarterly" Meeting will be held January 12-14, 1998. It will take place at the Lee County Government Office Building, 1500 Monroe Street, Ft. Myers, Florida.

A list of area hotels and motels, along with their phone numbers can be found in the table blow. In addition, a draft agenda for the meeting can be found to the left.

For further information regarding the "Quarterly" Meeting, please contact Rick Copeland at 850/921-9421.

Hotel	Phone
Ft. Myers Travelodge	941-334-2284
Sheraton Harbor Place	941-334-2284
Drum House Inn	941-332-5668
Holiday Inn Sunspree	941-334-3434
Central Holiday Inn	941-332-3232
Towne House Motel	941-334-3743
Sea Chest Motel	941-332-1545
Tides Motel	941-334-1231
Ta Ki Ki Motel	941-334-2135
Royal Palm Motel	941-334-1267
Coral Court Motel	941-332-0395
Floridian Motel	941-332-1330
Edison Court Motel	941-334-3242
Rock Lake Motel	941-334-3242





Ambient Monitoring Home Page

The Ambient Monitoring Program's new Home Page is now on-line. You can access general program information regarding both surface and ground water monitoring activities, as well as download ground water quality data files. In addition, electronic (PDF format) copies of important Program publications, such as FGS Special Publication #32 and the 305(b) Report for Florida, can be downloaded.

You can reach the Ambient Monitoring Program's Home page by entering the following URL:

www.dep.state.fl.us/water/division/monitoring/



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