

# WATER-QUALITY CONDITIONS IN A NATIONAL CONTEXT

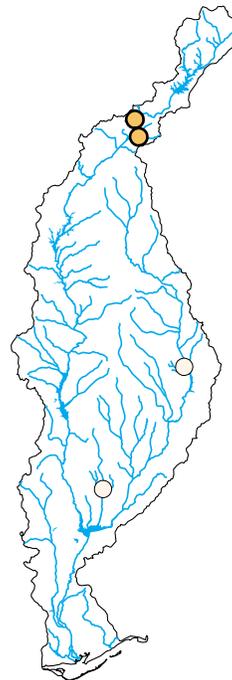
## Comparison of Stream-Water Quality in the Apalachicola–Chattahoochee–Flint River Basin with Nationwide NAWQA Findings

Seven major water-quality characteristics were evaluated for stream sites in each NAWQA Study Unit. Summary scores for each characteristic were computed for all sites that had adequate data. Scores for each site in the ACF River Basin were compared with scores for all sites sampled in the 20 NAWQA Study Units during 1992–95. Results are summarized by percentiles; higher percentile values generally indicate poorer quality compared with other NAWQA sites. Water-quality conditions at each site also are compared to established criteria for protection of aquatic life. Applicable criteria are limited to nutrients and pesticides in water, and semivolatile organic compounds, organochlorine pesticides and PCBs in sediment. (Methods used to compute rankings and evaluate aquatic-life criteria are described by Gilliom and others, *in press*.)



### NUTRIENTS IN WATER

Median nutrient concentrations at nine streams were generally lower in the ACF River Basin than for 219 NAWQA sites ranked nationally. Median phosphorus concentrations were only above national medians downstream from Atlanta. Nitrate concentrations were highest at the poultry site (West Fork Little River) and the Chattahoochee River downstream from Atlanta. Like most of the United States (Mueller and others, 1995), all nitrate concentrations in surface water in the ACF River Basin were well below the drinking-water standard. Ammonia concentrations were highest downstream from Atlanta and at the urban site (Peachtree Creek). Aquatic-life criteria for ammonia were not exceeded at these nine sites during the study period.



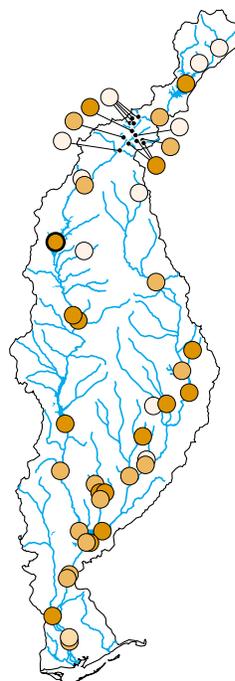
### PESTICIDES IN WATER

Pesticide levels at the urban (Peachtree Creek) and suburban (Sope Creek) sites were in the third quartile of 61 NAWQA sites ranked nationally, primarily because insecticides were frequently detected. Median monthly concentrations of the insecticides diazinon and carbaryl exceeded aquatic-life criteria at the urban and suburban sites, and chlorpyrifos exceeded aquatic-life criteria at the urban site. Pesticide scores at the cropland sites (Lime and Aycocks Creeks) were in the lowest quartile of NAWQA sites, although pesticide use is widespread in these areas.

### EXPLANATION

**Ranking of stream quality relative to all NAWQA stream sites**—Darker colored circles generally indicate poorer quality. Bold outline of circle indicates one or more aquatic life criteria were exceeded.

- Greater than the 75th percentile (among the highest 25 percent of NAWQA stream water studies)
- Between the median and the 75th percentile
- Between the 25th percentile and the median
- Less than the 25th percentile (among the lowest 25 percent of NAWQA stream water studies)



### ORGANOCHLORINE PESTICIDES AND PCBs IN BED SEDIMENT AND BIOLOGICAL TISSUE

The scores for organochlorine pesticides and PCBs (sediment and tissue data combined) at 71 percent of ACF River Basin sites were higher than the median score of 202 NAWQA sites. Higher scores in the ACF River Basin were primarily at urban, cropland, and mixed land-use sites. DDT\* or its degradation products (DDD, DDE) were detected in 41 percent of tissue samples and 52 percent of bed-sediment samples; however, concentrations measured in 1992–94 generally were lower than those reported in historical data (1965–91). The termiticides chlordane\* and dieldrin\* were primarily detected at sites associated with urban areas. The fire-ant-control insecticide mirex\* was detected at four agricultural sites in the Coastal Plain. Organochlorine pesticides and PCBs\* were not detected in poultry, forested, and six of seven suburban sites sampled. West Point Lake bed sediment had the only exceedances of aquatic-life criteria for organochlorine insecticides (total chlordane) and PCBs within the ACF River Basin.

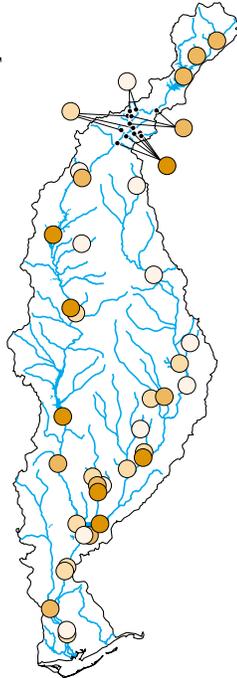
\*Used extensively in the Southeastern United States prior to legal uses being banned: DDT, 1973; chlordane, 1974 (agriculture), 1988 (termiticide); dieldrin, 1974 (agriculture), 1987 (termiticide); mirex, 1976; and PCBs, 1979.

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## Comparison of Stream-Water Quality in the Apalachicola–Chattahoochee–Flint River Basin with Nationwide NAWQA Findings

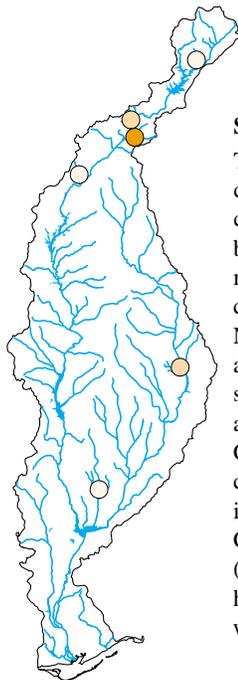
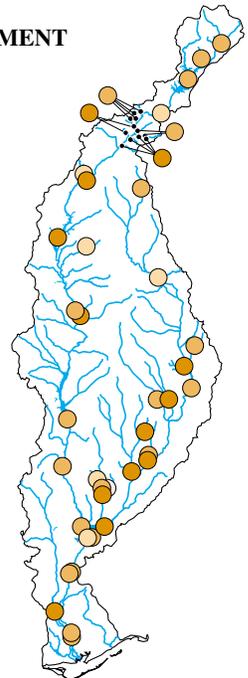
### SEMIVOLATILE ORGANIC COMPOUNDS IN BED SEDIMENT

Semivolatile organic compound (SVOC) concentrations in the ACF River Basin were highest in tributary streams in areas of urban land use and in main-stem rivers downstream from Metropolitan Atlanta and Albany. SVOC concentrations were relatively low at poultry, suburban, forested, and cropland sites. The distribution of SVOC standardized scores in the ACF River Basin are similar to 198 NAWQA sites ranked across the Nation. No exceedances of aquatic-life criteria for SVOCs were measured within the ACF River Basin.



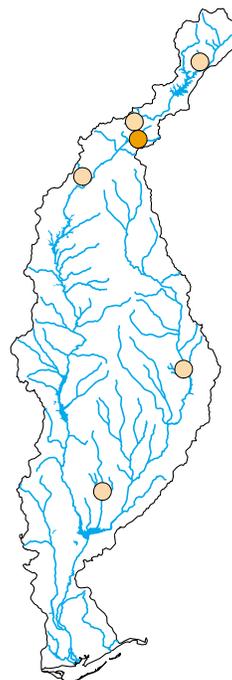
### TRACE ELEMENTS IN BED SEDIMENT

Trace-element concentrations of zinc, cadmium, lead, copper, and mercury in bed sediment were highest downstream from urban areas in the ACF River Basin. Concentrations of arsenic, nickel, and chromium were elevated at some agricultural sites in the Coastal Plain. The trace-element scores for 41 of 48 sites (85 percent) in the ACF River Basin were above the median for 198 NAWQA sites. Although trace elements occur naturally in rocks and sediments, measured concentrations in bed sediments at many of these sites were enriched relative to background conditions.



### STREAM HABITAT DEGRADATION

The capacity of a stream to support biological communities is influenced by physical habitat characteristics including the stability of streambanks, the presence of riparian buffers, and modifications such as channelization. In comparison to 181 NAWQA sites across the Nation, two agricultural sites (Aycocks Creek and West Fork Little River) and one forested site (Snake Creek) in the ACF River Basin had among the best and one urban site (Peachtree Creek) had among the worst stream-habitat conditions. Two sites were not among the best in the Nation because an agricultural site (Lime Creek) was channelized and the suburban site (Sope Creek) had eroding streambanks. Stream habitat was not evaluated at large river sites within the ACF River Basin.



### FISH COMMUNITY DEGRADATION

Increasing percentages of diseased, pollution-tolerant, omnivorous, and non-native fish are generally associated with degraded fish communities. The status of fish communities at five out of six sites in the ACF River Basin were ranked better than the median for 172 NAWQA sites. The fish community at the urban site (Peachtree Creek) was among the most degraded of sites across the Nation. Fish communities were not evaluated at large river sites within the ACF River Basin.

## CONCLUSIONS

Compared with other NAWQA Study Units, in the Apalachicola-Chattahoochee-Flint (ACF) River Basin:

- Urban tributaries and the Chattahoochee River downstream from Atlanta were among the most degraded sites evaluated by NAWQA during 1992–95. Suburban and agricultural (cropland and poultry) tributaries and the Chattahoochee River upstream from Atlanta showed varying degrees of degradation that were comparable to many sites evaluated in the Nation. A forested tributary and the Apalachicola River were among the least-degraded sites evaluated in the Nation.
- Aquatic-life criteria for bed sediment were exceeded downstream from Atlanta in West Point Lake (chlordan and PCBs).
- Aquatic-life criteria for surface water were exceeded by median monthly concentrations of insecticides in the urban site, Peachtree Creek (three insecticides), and the suburban site, Sope Creek (two insecticides).

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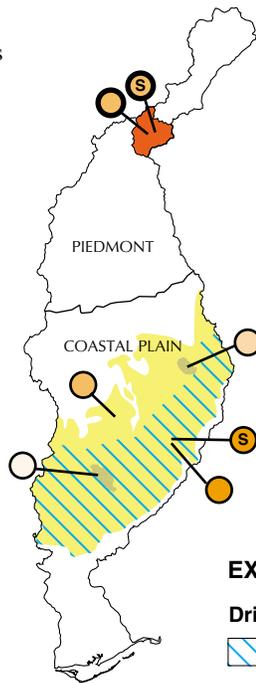
### Comparison of Ground-Water Quality in the Apalachicola–Chattahoochee–Flint River Basin with Nationwide NAWQA Findings

Five major water-quality characteristics were evaluated for ground-water studies in each NAWQA Study Unit. Ground-water resources were divided into two categories: (1) drinking-water aquifers, and (2) shallow ground water underlying agricultural or urban areas. Summary scores were computed for each characteristic for all aquifers and shallow ground-water areas that had adequate data. Scores for each aquifer and shallow ground-water area in the ACF River Basin were compared with scores for all aquifers and shallow ground-water areas sampled in the 20 NAWQA Study Units during 1992–95. Results are summarized by percentiles; higher percentile values may indicate poorer quality compared with other NAWQA ground-water studies. Water-quality conditions for each drinking-water aquifer also are compared to established drinking-water standards and criteria for protection of human health. (Methods used to compute rankings and evaluate standards and criteria are described by Gilliom and others, *in press*.)



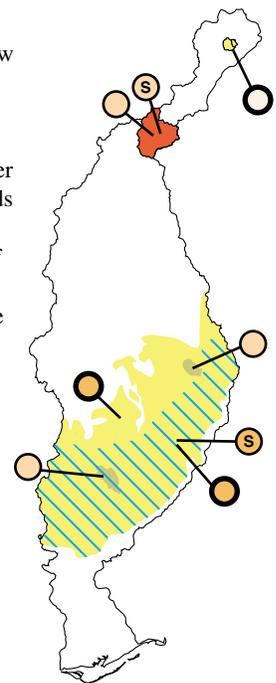
#### PESTICIDES

For five ground-water study components in the ACF River Basin, one or more pesticides were detected at 57 to 81 percent of sites sampled, placing these components in the highest two quartiles compared to other NAWQA ground-water study areas. Highly sensitive analytical methods have shown that low concentrations of some widely used pesticides are present in shallow ground water underlying urban and suburban areas, cropland, and the Upper Floridan aquifer. However, pesticide concentrations in ground water rarely exceeded drinking-water standards or guidelines. The banned insecticide, dieldrin, exceeded the current drinking-water guideline in water samples from 5 of 37 locations in suburban and urban land use in Metropolitan Atlanta. The source of this persistent compound probably is residual quantities of dieldrin and aldrin that were applied prior to 1987 for termite control of homes and commercial buildings.



#### NITRATE

Nitrate generally is present in shallow aquifers in the ACF River Basin. Median nitrate concentrations in the ACF River Basin were typical of those in other NAWQA ground-water study areas. Drinking-water standards for nitrate were exceeded in water samples from less than 10 percent of wells near poultry production and cropland and the recharge area to the Upper Floridan aquifer. No exceedances occurred in ground-water samples from wells and springs in Metropolitan Atlanta or in springs from the Upper Floridan aquifer.



#### EXPLANATION

##### Drinking-water aquifer

Upper Floridan aquifer

##### Shallow ground-water areas

Cropland—Darker color represents area with a higher density of wells sampled

Urban and suburban

##### Ranking of ground-water quality relative to all NAWQA ground-water studies—Darker colored circles generally indicate poorer quality. Bold outline of circle indicates one or more standards or criteria were exceeded.

"s" indicates spring data

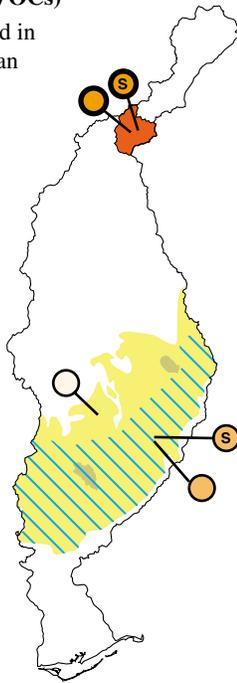
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**VOLATILE ORGANIC COMPOUND (VOCs)**

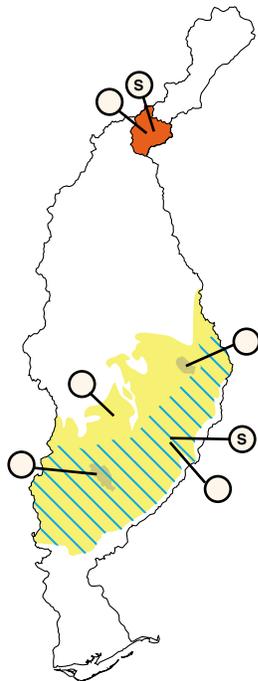
In Metropolitan Atlanta, VOCs were detected in ground-water samples from slightly more than 50 percent of the sites sampled, placing this study area in the highest quartile for springs and wells compared to other NAWQA ground-water study areas. Twenty-six VOCs commonly associated with fuel products, industrial chemicals, solvents, and degreasers were detected. Chloroform, the most commonly detected VOC, is a by-product of disinfecting drinking water with chlorine and may be present in ground-water recharge from septic systems and leaking water and sewer lines. Concentrations of tetrachloroethene (used extensively in the dry cleaning industry) and benzene and naphthalene (components of gasoline) exceeded drinking-water standards in ground-water samples from 3 of 37 sites sampled.

In the Coastal Plain, VOCs were detected in ground-water samples from approximately 15 percent of wells and springs in the Upper Floridan aquifer and in only 1 of 37 wells in shallow ground-water areas near cropland, placing these study components in the third and first quartiles, respectively. VOCs detected include compounds present in gasoline, compounds used as degreasers or solvents, and the banned soil fumigant 1,2-dichloropropane.



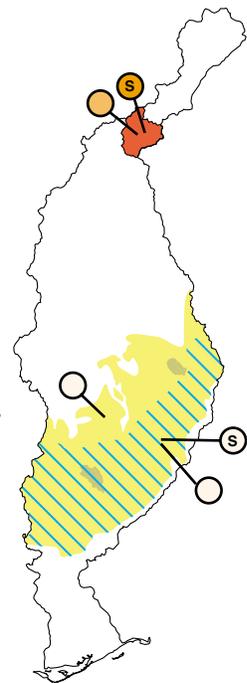
**DISSOLVED SOLIDS**

Low dissolved-solids concentrations placed all the ACF ground-water study areas in the lowest quartile compared to other NAWQA study areas. Dissolved-solids concentrations in ground water are generally related to climatic conditions and the composition of rocks and soils more than land use. Dissolved-solids concentrations generally are low in the ACF River Basin because there is plentiful rainfall and most aquifer materials are only slightly soluble in water.



**RADON**

Radon is a short-lived radioactive gas that is common in ground water. It is introduced into ground water by the radioactive decay of uranium present in aquifer materials and soils. Therefore, the occurrence of radon is controlled to a great extent by bedrock geology—not land use. Metropolitan Atlanta is underlain by igneous and metamorphic rocks that generally contain higher concentrations of uranium than most other rock types in the Study Unit and the Nation. Median radon concentrations in shallow ground water in Metropolitan Atlanta were in the highest quartile for springs and the third quartile for wells compared to other NAWQA ground-water study areas. Median radon concentrations in the studies within sediments of the Coastal Plain Physiographic Province were in the lowest quartile.



**CONCLUSIONS**

Compared with other NAWQA Study Units, in the Apalachicola–Chattahoochee–Flint River Basin:

- Median nitrate concentrations in the ground-water study areas varied from the lowest to the third highest quartile of the NAWQA study areas across the Nation; however, nitrate concentrations only rarely exceeded the drinking-water standard in samples from wells (located near cropland and in the Upper Floridan aquifer) and did not exceed the standard in samples from springs.
- Pesticides and VOCs were detected more frequently in ground-water samples from Metropolitan Atlanta and the Upper Floridan aquifer than in most NAWQA study areas across the Nation. Although traces of these compounds are widely distributed in ground water from these study areas, the only exceedances of drinking-water standards occurred in samples from three springs and five wells located in Metropolitan Atlanta. These exceedances in shallow ground water in Metropolitan Atlanta indicate a potential water-quality concern for developing future public drinking-water supplies in the underlying fractured-rock aquifer.