Section 5

Assessment

This section provides an evaluation of current conditions in the Flint River basin, and includes assessment of both water quantity (Section 5.1) and water quality (Section 5.2) issues. The assessment results are combined with the evaluation of environmental stressors (Section 4) to produce a listing of Concerns and Priority Issues in Section 6.

5.1 Assessment of Water Quantity

Water quantity issues in the Flint basin are being addressed comprehensively as part of the ACT/ACF study. In that process an Interstate Compact is to be established for the purpose of administering a water allocation formula which will partition the flow of the Chattahoochee and Flint Rivers among Alabama, Florida, and Georgia. The following sections provide a summary of preliminary findings from this study.

5.1.1 Municipal and Industrial Water Uses

As noted in section 3.2, municipal and industrial (M&I) demands in the Flint River basin are expected to increase by 10 percent through 2005 and by another 14 percent by 2050. Approximately 40 percent of the supply will come from ground water sources, though that withdrawal may also reduce surface water stream flows by as much as 1 mgd for every 3 mgd pumped out of the aquifer. Approximately 40 percent of the withdrawal quantity is returned to the surface streams. M&I demands should be met easily for the foreseeable future and at the established quality standards.

Overall the surface water quality is good for use as drinking water. However, surface water quality problems due to non-point source pollution such as timber harvesting, agricultural and urban storm water runoff are concerns to municipalities which withdraw surface water from the Flint River and tributaries. The contaminant of most concern is higher turbidity due to erosion and sediment runoff. Water higher in turbidity can clog filters, interrupt the proper treatment of raw water, and increase the cost of the water to the consumers because more chemicals are needed to settle out the sediment. Fortunately almost all surface water plants in the state of Georgia have either reservoirs that allow for ample storage and time to settle out runoff sediments or have intakes located in tributaries with lower runoff sediments. All public water systems in the state of Georgia that use surface water meet the federal Surface Water Treatment Rules for filtration and treatment.

Overall ground water quality is very good for use as drinking water from wells. Since most wells used in public water systems are constructed by licensed well drillers and draw from deeper confined aquifers, the number of contaminated wells is small. However, in the Flint basin some public water system wells have been contaminated by local pollution sources such as leaky underground storage tanks, malfunctioning septic tank systems, spills, and possible agricultural activities. One significant contaminant of concern in the lower half of the Flint basin is nitrate. Although a couple of public water system wells have exceeded the MCL for nitrate, individual domestic wells which are usually shallow have raised concern. The responsibility of regulating domestic wells is the local county health depart but the DWP has provided special

testing and technical assistance when needed. Those public water system wells that exceed the Maximum Contaminant Level (MCL) for a contaminant are either removed from service or added treatment. Also a few wells in the basin have been found to be under the direct influence of surface water. These wells are monitored and have additional treatment. The DWP plans to conduct additional testing for ground water under the influence of surface water in public water system wells located the lower Flint basin since the geology of the area is predisposed to karst.

5.1.2 Agriculture

Agricultural water demand is very great in the Flint River basin (primarily in the lower basin south of Cordele). It has been estimated that over 80% of water demand for irrigation in the Flint basin comes from groundwater sources. Total agricultural water demand is expected to increase from 83,000 million gallons (MG) in 1995 to about 154,000 MG in 2010 and perhaps to 220,000 MG in 2050.However, because the demand for irrigation is concentrated in the months of May through August, and because demand is much greater during a drought, the withdrawal rate could be 2,000 million gallons per day (MGD) in 2010 and 3,000 MGD in 2050. At these rates of withdrawal, coming as they do in the summer when stream flows often diminish as a result of inconsistent rainfall, there is a real potential for short-term effects on aquifer levels and, in part because of reduced recharge rates, on significantly lower stream flows. This possibility has significant implications for the ability of farmers in southwest Georgia to provide sufficient water to produce a quality crop in a severe drought under a high agricultural growth scenario.

5.1.3 Recreation

Water-based recreation in the Flint basin is primarily dependent on sufficient water flow in the streams to support low density boating and fishing activities. It is unlikely that there will be any significant effect on these activities due to unavailability of water, with the possible exception of short term stream flows during droughts when agricultural irrigation is very high.

5.1.4 Hydropower

There is no significant hydropower production in the Flint basin. Both the Warwick Dam and the Flint River Dam, the two dams of the Flint River basin, are operated for hydropower but have very little storage capacity and impound run-of-the-river reservoirs.

5.1.5 Navigation

The Flint River is navigable only to Bainbridge, a few miles above Lake Seminole. As with the Chattahoochee, navigation is primarily dependent on channel depths in the Apalachicola River. The ACT/ACF Study will likewise have a significant effect on future navigation predictability.

5.1.6 Waste Assimilation Capacity

There are presently no known segments of surface waters in the Flint River basin in which there is a critical need for sufficient flow to meet water quality standards. At this time there does not appear to be such a need in the foreseeable future. To protect aquatic wildlife, it has been recommended that a minimum instream flow of 30 percent of average annual discharge be maintained (Evans and England, 1995).

5.2 Assessment of Water Quality

The assessment of water quality is generally consistent with Georgia's water quality assessments for CWA Section 305(b) reporting to EPA. It begins with a discussion of (1) water quality standards; (2) monitoring programs; and (3) data analyses to assess compliance with water quality standards and determine use support. Following this introductory material, detailed assessment results by sub-basin are presented in Section 5.2.4.

5.2.1 Water Quality Standards

Assessment of water quality requires a baseline for comparison. A statewide baseline is provided by Georgia's water quality standards, which contain water use classifications, numeric standards for chemical concentrations, and narrative requirements for water quality.

Georgia's water use classifications and standards were first established by the Georgia Water Quality Control Board in 1966. The water use classification system was applied to interstate waters in 1972 by EPD. The standards were upgraded in 1989 to eliminate use classifications for Agriculture, Industrial, Navigation and Urban Stream uses. Table 5-1 provides a summary of water use classifications and basic water quality criteria for each use currently designated.

Georgia also has general narrative water quality standards, which apply to all waters. These narrative standards are summarized in Table 5-2.

In addition to the basic water quality standards shown above, Congress made changes in the Clean Water Act in 1987 which required each State to adopt numeric limits for toxic substances for the protection of aquatic life and human health. In order to comply with these

Table 5-1. Georgia Water Use Classifications And Instream Water Quality Standards for Each Use

	Bacteria (fecal coliform)		Dissolved Oxygen (other than trout streams)[1]		pH	Temperature (other than trout streams)[1]	
Use Classification	30-Day Geometric Mean[2] (MPN/100 ml)	Maximum (MPN./100 ml)	Daily Average (mg/l)	Minimum (mg/l)	Std. Units	Maximum Rise (°F)	Maximum (°F)
Drinking Water requiring treatment	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Recreation	200 (Freshwater) 100 Coastal)	--	5.0	4.0	6.0-8.5	5	90
Fishing Coastal Fishing[3]	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Wild River	No alteration of natural water quality						
Scenic River	No alteration of natural water quality						

1 Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/l and a minimum of 5.0 mg/l. No temperature alteration is allowed in Primary Trout Streams and a temperature change of 2°F is allowed in Secondary Trout Streams.

2 Geometric means should be "based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours." The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.

3 Standards are same as fishing with the exception of dissolved oxygen which is site specific.

Table 5-2. Georgia Narrative Water Quality Standards for All Waters (Excerpt from Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 - Water Use Classifications and Water Quality Standards)

(5) General Criteria for All Waters. The following criteria are deemed to be necessary and applicable to all waters of the State:

- (a) All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly or otherwise objectionable.
- (b) All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amounts sufficient to be unsightly or to interfere with legitimate water uses.
- (c) All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.
- (d) All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.
- (e) All waters shall be free from turbidity which results in a substantial visual contrast in a water body due to man-made activity. The upstream appearance of a body of water shall be observed at a point immediately upstream of a turbidity-causing man-made activity. The upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation and maintenance of best management practices and compliance with issued permits shall constitute compliance with [this] Paragraph...

requirements, the Board of Natural Resources adopted 31 numeric standards for protection of aquatic life and 90 numeric standards for the protection of human health. Appendix B provides a complete list of the toxic substance standards that apply to all waters in Georgia.

Georgia is also developing site-specific standards for major lakes where control of nutrient loading is required to prevent problems associated with eutrophication. Thus far, the Board of Natural Resources has adopted site-specific standards for three lakes: West Point Lake, Lake Walter F. George and Lake Jackson. Standards were adopted for chlorophyll *a*, pH, total nitrogen, phosphorus, fecal coliform bacteria, dissolved oxygen, and temperature. Site-specific standards may be proposed for lakes in the Flint basin as needed.

5.2.2 Surface Water Quality Monitoring

EPD monitoring program integrates physical, chemical, and biological monitoring to provide information for water quality and use attainment assessments and for basin planning. EPD monitors the surface waters of the State to establish baseline and trend data, document existing conditions, study impacts of specific discharges, determine improvements resulting from upgraded water pollution control plants, support enforcement actions, establish wasteload allocations for new and existing facilities, verify water pollution control plant compliance, document water use impairment and reasons for problems causing less than full support of designated wateruses, and establish TMDLs. Trend monitoring, intensive surveys, lake, estuary, biological, and toxic substance monitoring, fish tissue testing, and facility compliance sampling are the major monitoring tools used by EPD.

Trend Monitoring. Long term monitoring of streams at strategic locations throughout Georgia, trend or ambient monitoring, was initiated by EPD during the late 1960s. This work was and continues to be accomplished to a large extent through cooperative agreements with federal, state, and local agencies who collect samples from groups of stations at specific, fixed locations throughout the year. The cooperating agencies conduct certain tests in the field and send stream samples to EPD for additional laboratory analyses. Although there have been a number of changes over the years, routine chemical trend monitoring is still accomplished through similar cooperative agreements.

Today EPD contracts with the United States Geological Survey (USGS) for the majority of the trend sampling work. In addition to monthly stream sampling, a portion of the work with the USGS involves continuous monitoring at several locations across the State.

In addition to work done by cooperative agreements, EPD associates collect water and sediment samples for toxic substance analyses. EPD associates also collect macroinvertebrate samples to characterize the biological community at selected locations as a part of the trend monitoring effort. The trend monitoring network in place in the Flint in 1994 is shown in Figure 5-1.

In 1995, EPD adopted and implemented significant changes to the strategy for trend monitoring in Georgia. The changes were implemented to support the River Basin Management Planning program. The number of fixed stations statewide was reduced in order to focus resources for sampling and analysis in a particular group of basins in any one year in accordance with the basin planning schedule.

Figure 5-2 shows the redirected trend monitoring network for 1995. The focus for trend monitoring was in the Chattahoochee and Flint River basins. Statewide trend monitoring was continued at the 37 core station locations statewide, in the Savannah Harbor, and at all continuous monitoring locations. The remainder of the trend monitoring resources were devoted to the Chattahoochee and Flint River basins. In addition to chemical sampling, new work on macro-invertebrate sampling was done as a part of the Chattahoochee/Flint river basin monitoring work. As a result, more sampling was conducted along the mainstem and in the smaller tributaries of the two river basins. Increasing the resolution of the water quality monitoring will improve the opportunity to identify impaired waters as well as the causes of impairment.

Toxic Substance Stream Monitoring. EPD has focused resources on the management and control of toxic substances in the State's waters for many years. Toxic substance analyses have been conducted on samples from selected trend monitoring stations since 1973. Wherever discharges were found to have toxic impacts or to include toxic pollutants, EPD has incorporated specific limitations on toxic pollutants in NPDES discharge permits.

In 1983 EPD intensified toxic substance stream monitoring efforts. This expanded toxic substance stream monitoring project includes facility effluent, stream, sediment, and fish sampling at specific sites downstream of selected industrial and municipal discharges. From 1983 through 1991, ten to twenty sites per year were sampled as part of this project. During the 1994-1995 period, this effort was reduced significantly due to use of limited laboratory resources for different types of analysis. Future work will be conducted as a part of the River Basin Management Planning process.

Figure 5-1. Flint River Basin Trend Monitoring Station Network, 1994

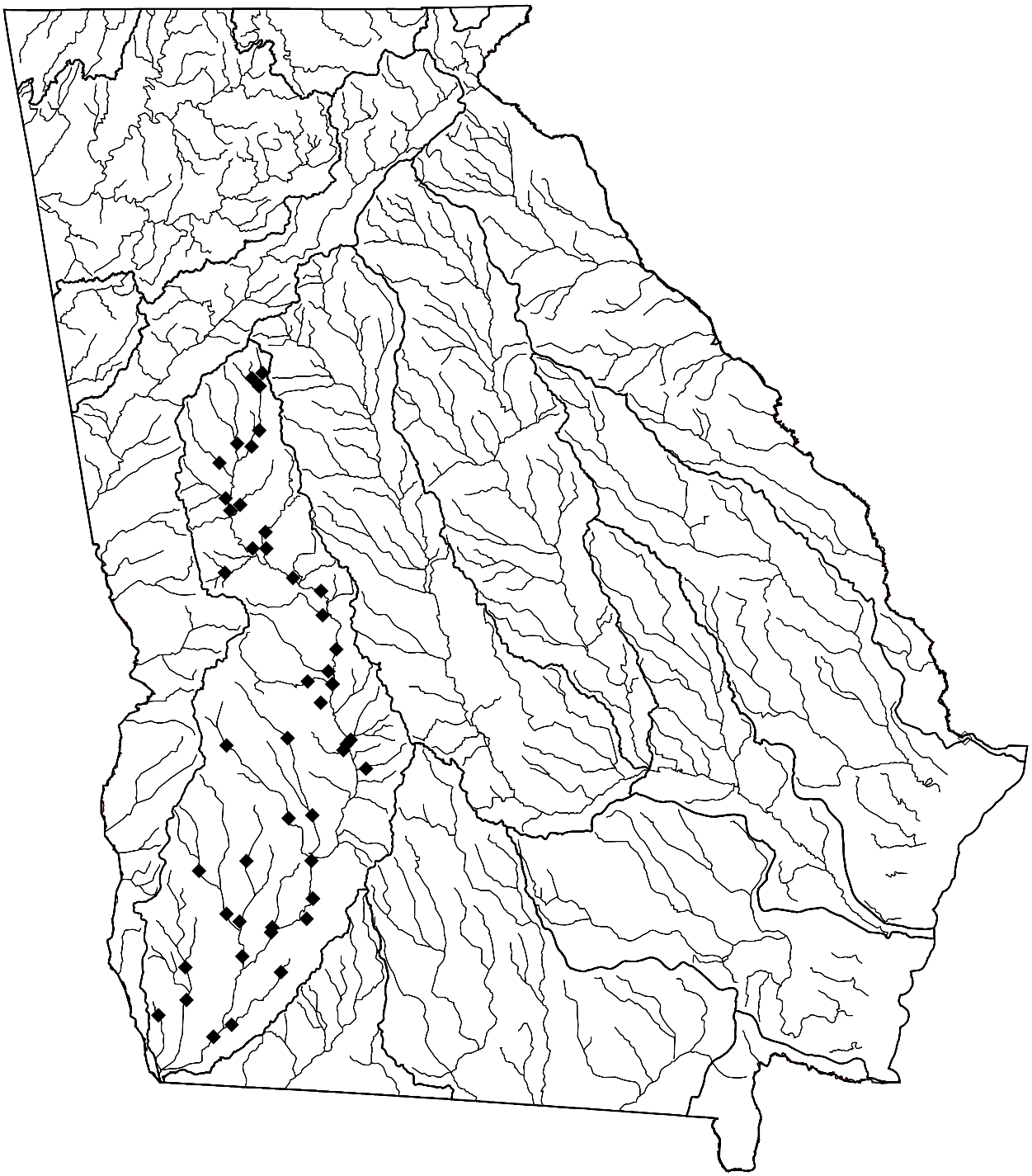

Figure 5-2. Flint River Basin Trend Monitoring Station Network, 1995

Intensive Surveys. Intensive surveys complement long term fixed station monitoring as these studies involve intensive monitoring of a particular issue or problem over a shorter period of time. Several basic types of intensive surveys are conducted including model calibration surveys and impact studies. The purpose of a model calibration survey is to collect data to calibrate a mathematical water quality model. Models are used for wasteload allocations and/or TMDLs and as tools for use in making regulatory decisions. Impact studies are conducted where information on the cause and effect relationships between pollutant sources and receiving waters is needed. In many cases biological information is collected along with chemical data for use in assessing environmental impacts.

Lake Monitoring. EPD has maintained monitoring programs for Georgia's public access lakes for many years. In the late 1960's, a comprehensive statewide study was conducted to assess fecal coliform levels at public beaches on major lakes in Georgia as the basis for water use classifications and establishment of water quality standards for recreational waters. In 1972, EPD staff participated in the USEPA National Eutrophication Survey which included fourteen lakes in Georgia. Additional lake monitoring continued through the 1970s. The focus of these studies was primarily problem/solution oriented and served as the basis for regulatory decisions. Georgia's water quality monitoring network has collected long term data from sites in four major lakes including Lake Lanier, West Point Lake, Lake Harding, and West Point Lake (none of which are in the Flint basin).

In 1980-1981, EPD conducted a statewide survey of public access freshwater lakes. The study was funded in part by USEPA Clean Lakes Program funds. The survey objectives were to identify freshwater lakes with public access, assess each lake's trophic condition, and develop a priority listing of lakes as to need for restoration and/or protection. In the course of the survey, data and information were collected on 175 identified lakes in 340 sampling trips. The data collected included depth profiles for dissolved oxygen, temperature, pH, and specific conductance, Secchi disk transparency, and chemical analyses for chlorophyll *a*, total phosphorus, nitrogen compounds, and turbidity. The three measures of Carlson's Trophic State Index were combined into a single trophic state index (TTSI) and used with other field data and observations to assess the trophic condition of each lake.

Monitoring efforts have continued since the 1980-1981 Lake Classification Survey with a focus on major lakes (those with a surface area greater than 500 acres), and have continued to use the TTSI as a tool to mark trophic state trends. The major lakes in the Flint basin are listed in Table 5-3 and are ranked according to the TTSI for the period 1984-1993. Greater study emphasis has been placed on those lakes with consistently higher rankings. The major lakes monitoring project was suspended in 1994 due to a lack of field and laboratory resources resulting from the focus on the Chattahoochee River Modeling Project work (discussed in the Chattahoochee River Basin Management Plan). The work on major lakes in the future will be a part of the RBMP process.

Fish Tissue Monitoring. The DNR conducts fish tissue monitoring for toxic chemicals and issues fish consumption guidelines as needed to protect human health. It is not possible for the DNR to sample fish from every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs which make up more than 90 percent of the total lake acreage. These lakes will continue to be sampled as part of the River Basin Management Planning five year rotating schedule to track any trends in fish contaminant levels. The DNR has also made sampling fish in rivers and streams down-stream of urban and/or industrial areas a high

Table 5-3. Major Lakes in The Flint Basin Ranked by Sum of Trophic State Index Values, 1980-1993

1984	1985	1986	1987	1988
Blackshear 177 Worth 167 range for state: 120-205	Blackshear 181 Worth 167 range for state: 116-188	Worth 164 Blackshear 162 range for state: 114-177	Worth 167 Blackshearh <167 range for state:<108-184	Blackshear 177 Worth 164 range for state: 111-178
1989	1990	1991	1992	1993
Blackshear 209 Worth 170 range for state: 123-209	Blackshear 178 Worth 163 range for state: 118-182	Blackshear 193 Worth 176 range for state: 121-193	Blackshear 176 Worth 157 range for state: 131-194	Blackshear 185 Worth 172 range for state: 122-195

Note: Higher values represent more eutrophic conditions.

priority. In addition, DNR will focus attention on areas which are frequented by a large number of anglers.

The program includes testing of fish tissue samples for the metals, organic chemicals and pesticides listed in Table 5-4. Of the 43 constituents tested, only PCBs, chlordane, and mercury have been found in fish at concentrations which create a fish consumption problem.The test results have been used to develop consumption guidelines which are updated annually and provided to fishermen when they purchase fishing licenses. This program will continue and will be coordinated as a part of the River Basin Management Planning process in the future.

Facility Compliance Sampling. In addition to surface water quality monitoring, EPD conducts evaluations and compliance sampling inspections of municipal and industrial water pollution control plants. Compliance sampling inspections include the collection of 24-hour composite samples, and an evaluation of the permittee sampling and flow monitoring requirements.

Table 5-4. Parameters for Fish Tissue Testing

Antimony	a-BHC	Heptachlor
Arsenic	b-BHC	Heptachlor Epoxide
Beryllium	d-BHC	Toxaphene
Cadmium	g-BHC (Lindane)	PCB-1016
Chromium, Total	Chlordane	PCB-1221
Copper	4,4-DDD	PCB-1232
Lead	4,4-DDE	PCB-1242
Mercury	4,4-DDT	PCB-1248
Nickel	Dieldrin	PCB-1254
Selenium	Endosulfan I	PCB-1260
Silver	Endosulfan II	Methoxychlor
Thallium	Endosulfan Sulfate	HCB
Zinc	Endrin	Mirex
Aldrin	Endrin Aldehyde	Pentachloroanisole
		Chlorpyrifos

In excess of 350 sampling inspections were conducted by EPD staff statewide in 1994-1995. The results were used, in part, to verify the validity of permittee self-monitoring data and as supporting evidence, as applicable, in enforcement actions. Also, sampling inspections can lead to identification of illegal discharges. In 1995 this work was focused in the Chattahoochee and Flint River basins in support of the River Basin Management Planning process.

Aquatic Toxicity Testing. In 1982 EPD incorporated aquatic toxicity testing in selected industrial NPDES permits. In January 1995, EPD issued approved NPDES Reasonable Potential Procedures which further delineated required conditions for conducting whole effluent toxicity (WET) testing for municipal and industrial discharges. Today, toxicity testing is addressed in all municipal and industrial NPDES permits. EPD began conducting aquatic toxicity tests on effluents and surface waters in 1985. In 1988, EPD constructed laboratory facilities to support chronic and acute testing capabilities. All toxicity testing is conducted in accordance with appropriate USEPA methods. Over the 1994-1995 period, EPD conducted 106 chronic tests and 19 acute tests on effluents or surface waters. In 1995, priority was given to testing of facility effluents in the Flint and Chattahoochee River basins in accordance with the River Basin Management Planning approach. Test results are used to manage and control the discharge of toxic substances in toxic amounts to the waters of the State. Toxicity testing at the EPD lab will be phased out in July, 1997.

5.2.3 Data Analysis

Assessment of Use Support. Water quality data is assessed to determine if standards are met and if the waterbody supports its classified use. If monitoring data shows that standards are not achieved, depending on the frequency standards are not met, the waterbody is said to be not supporting or partially supporting the designated use.

Appendix E includes lists of all streams and rivers in the basin for which data have been assessed. The lists include information on the location, data source, designated water use classification, criterion violated, potential cause, actions planned to alleviate the problem, and estimates of stream miles affected. The list is further coded to indicate status of each waterbody under several sections of the Federal Clean Water Act (CWA). Different sections of the CWA require states to assess water quality [Section 305(b)], to list waters still requiring TMDLs [Section 303(d)], and to document waters with nonpoint source problems (Section 319).

The assessed waters are described in three categories: waters supporting designated uses, waters partially supporting designated uses, and waters not supporting designated uses. Waters were placed on the partially supporting list if:

- the chemical data (dissolved oxygen, pH, temperature) indicated an exceedence of a water quality standard in 11%-25% of the samples collected or
- a fish consumption guideline was in place for the waterbody.

The partially supporting list also includes stream reaches based on predicted concentrations of metals at low streamflow (7Q10 flows) in excess of State standards as opposed to actual measurements on a stream sample.

Generally, a stream reach was placed on the not supporting list if:

- the chemical data (dissolved oxygen, pH, temperature) indicated an exceedence of a water quality standard in greater than 25% of the samples collected,
- a fish consumption ban was in place for the waterbody, or
- acute or chronic toxicity tests documented or predicted toxicity at low streamflow (7Q10) due to a municipal or industrial discharge to the waterbody.

Additional specific detail is provided in the following paragraphs on analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, fish / shellfish consumption advisories, and biotic data.

Fecal Coliform Bacteria. Georgia water quality standards establish a fecal coliform criterion of a geometric mean (four samples collected over a thirty day period) of 200 MPN / 100 ml for all waters in Georgia during the recreational season of May- October. This is the year-round standard for waters with the water use classification of recreation. Although the standard is based on a geometric mean, most of the data for Georgia and other states is based on once per month sampling as resources are not available to conduct sampling and analysis four times per month. Thus, for the purposes of this report USEPA recommends the use of a review criterion of 400 MPN / 100 ml to evaluate once per month sample results.

This density, 400 MPN / 100 ml, was used to evaluate data for the months from May through October for all waters. For waters with the water use classification of recreation, this guidance criterion was used to evaluate data for the entire year. For waters classified as drinking water, fishing, or coastal fishing, the maximum Georgia standard for fecal coliform bacteria is 4000 MPN / 100 ml (November-April). This standard was used to evaluate data collected during November through April for these waters. Waters were deemed not supporting uses when 25% of the samples had fecal coliform bacteria densities greater than the applicable review criteria (400 or 4000 MPN / 100 ml) and partially supporting when 11% to 25% of the samples were in excess of the review criteria.

Metals. In general, data on metals from any one given site are not frequent. As the data are infrequent, using the general evaluation technique of 25% exceedence to indicate nonsupport and 11%-25% exceedence to indicate partial support was not meaningful. Streams were placed in the non-supporting category if multiple exceedences of state criteria occurred and the data were based on more than four samples per year. With less frequent sampling, streams with exceedences were placed on the partially supporting list. In addition, an asterisk is placed beside metals data in those cases where there is a minimal database. This is in accordance with USEPA guidance which suggests any single exceedence of a metals criteria be listed.

Toxicity Testing/Toxic Substances. Data from EPD toxicity testing of water pollution control plant effluents were used to demonstrate or predict toxicity in the receiving waterbody. Based on the effluent toxicity, receiving waters were evaluated as not supporting when one or more tests gave a clear indication of instream toxicity and as partially supporting when based on predicted instream toxicity. Effluent data for toxic substances were used to designate either partial support or non-support based on whether instream corroborating data were available. When instream data were available, the stream was determined to be not supporting. When instream data were not available, the stream is listed as partially supporting.

Dissolved Oxygen, pH, Temperature. When available data indicated that these parameters were out of compliance with state standards more than 25% of the time, the waters were evaluated as not supporting the designated use. Between 11% and 25% non-compliance resulted in a partially supporting evaluation.

Fish/Shellfish Consumption Guidelines. A waterbody was included in the not supporting category when an advisory was for no consumption of fish, a commercial fishing ban, or a shellfishing ban was in effect. Waterbodies were placed in the partially supporting category if a guideline for restricted consumption of fish had been issued for the waters.

Biotic Data. A "Biota Impacted" designation for "Criterion Violated" indicates that studies showed a modification of the biotic community. Communities utilized were fish. Studies of fish populations by the DNR Wildlife Resources Division used the Index of Biotic Integrity (IBI) to identify impacted fish populations. The IBI values were used to classify the population as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as "Poor" or "Very Poor" were included in the partially supporting list.

5.2.4 Assessment of Water Quality and Use Support

This section provides a summary of the assessment of water quality and support of designated uses for streams and major lakes in the Flint River basin. Most of these results were previously provided in the report "Water Quality in Georgia, 1994-1995" (Georgia DNR, 1996). Results are grouped by the three major sections in the basin. A geographic summary of assessment results is provided by HUC in Figures 5-3 through 5-8.

5.2.4.1 Upper Flint River Basin (HUC 03130005)

Stream Water Quality

Data from the mainstem stations indicate that water quality conditions are being affected by both point and nonpoint source pollution.

Water Quality Sampling. Violations in the dissolved oxygen water standard due to urban runoff were noted at three sites between the headwaters at Hartsfield International Airport and Flat Shoals. Violations in the dissolved oxygen standard were also measured in Flat Creek near Peachtree City, Camp Creek in Fulton County, and Beaver Creek in Crawford County, due mainly to nonpoint sources. A violation of the pH standard in Avera Creek in Crawford County was attributed to nonpoint sources.

Two stations on the mainstem between Hartsfield International Airport and Flat Shoals had violations of the lead standard as a result of urban runoff. Three monitored tributaries draining the metropolitan Atlanta area of the subbasin had violations of standards for lead, and one of these had additional standard violations for copper and zinc. Twelve monitored tributaries had violations of the standard for fecal coliforms due to nonpoint sources in the metropolitan Atlanta area and the cities of Thomaston and Griffin. An additional tributary near Greenville had violations of the fecal coliform standard due to a municipal discharge that has since been eliminated.

Benthic Invertebrate Sampling. Benthic macroinvertebrates were collected from a single location on the mainstem of the Flint River in 1995. Water quality based on benthic macroinvertebrate data was Very Good.

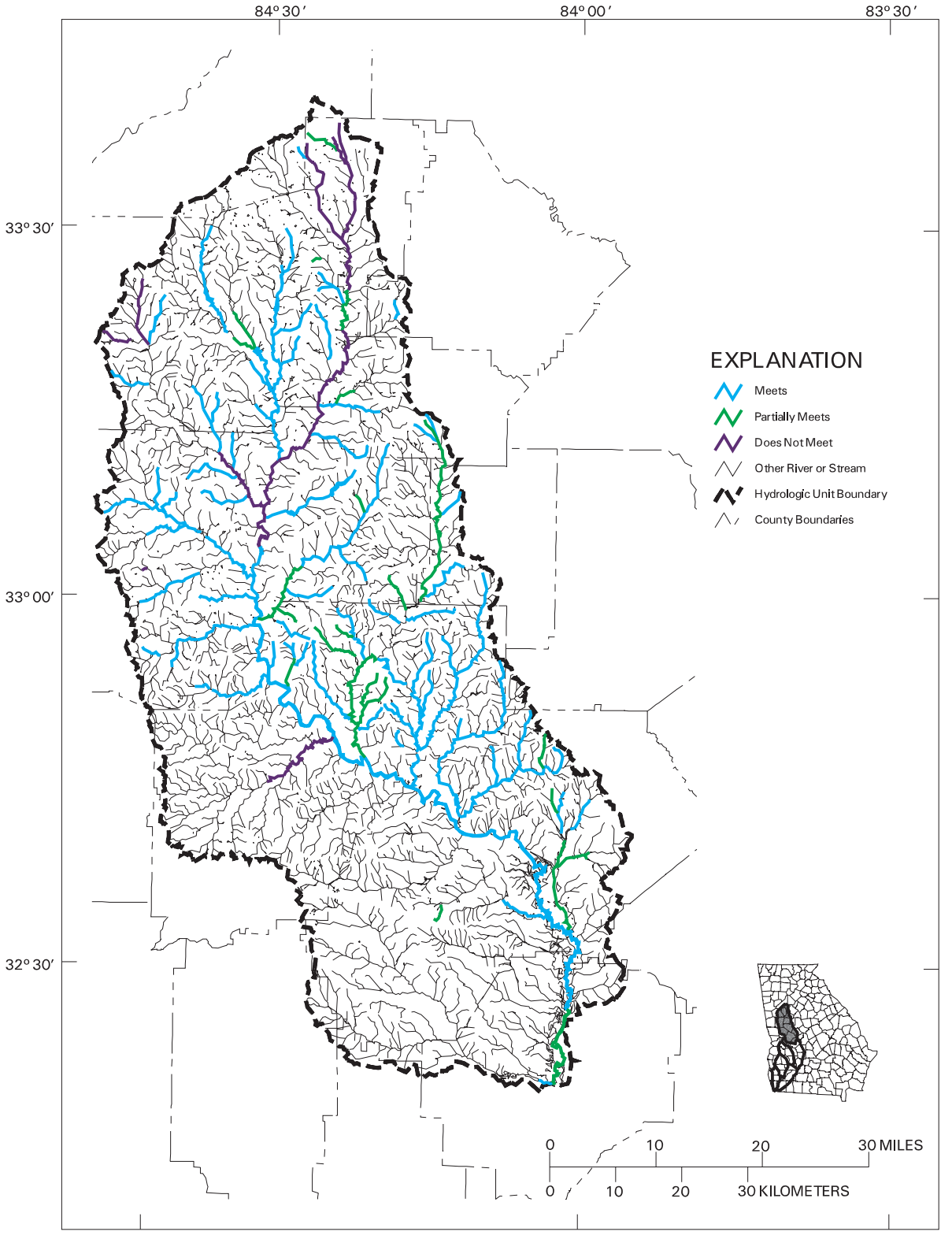

Figure 5-3. Assessment of Water Quality Use Support in the Upper Flint River Basin, HUC 03130005

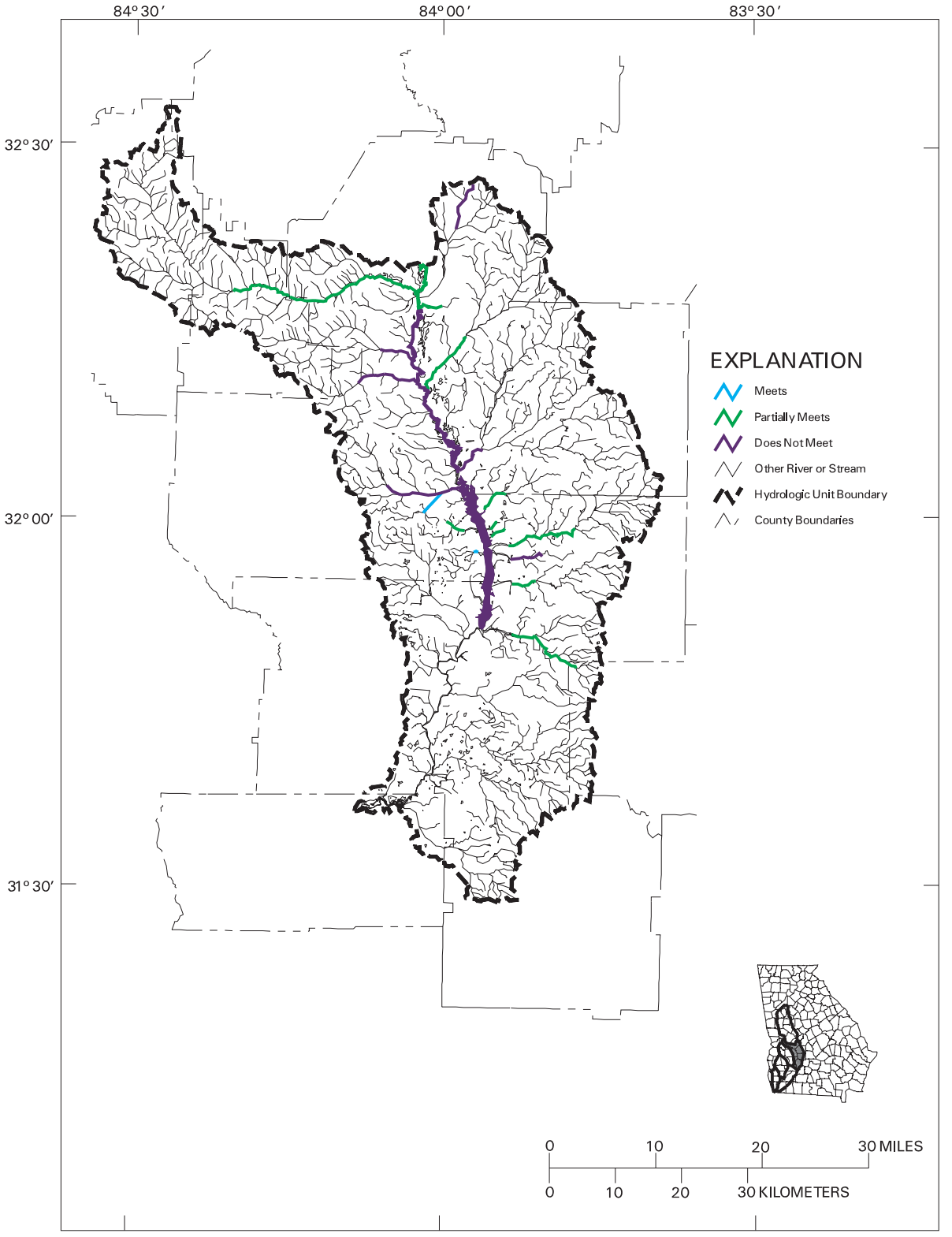

Figure 5-4. Assessment of Water Quality Use Support in the Middle Flint River Basin, HUC 03130006

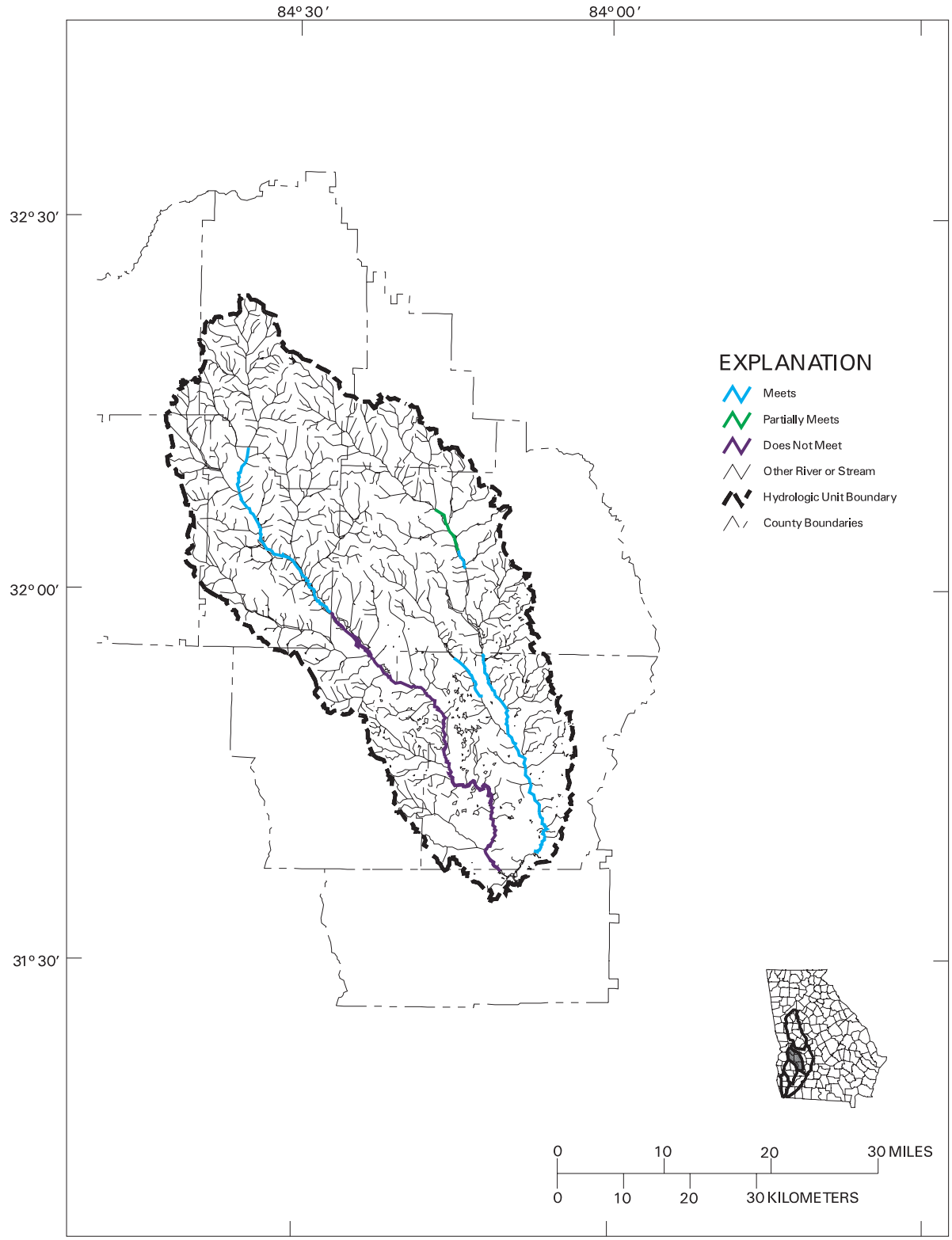

Figure 5-5. Assessment of Water Quality Use Support in the Middle Flint River Basin, HUC 03130007

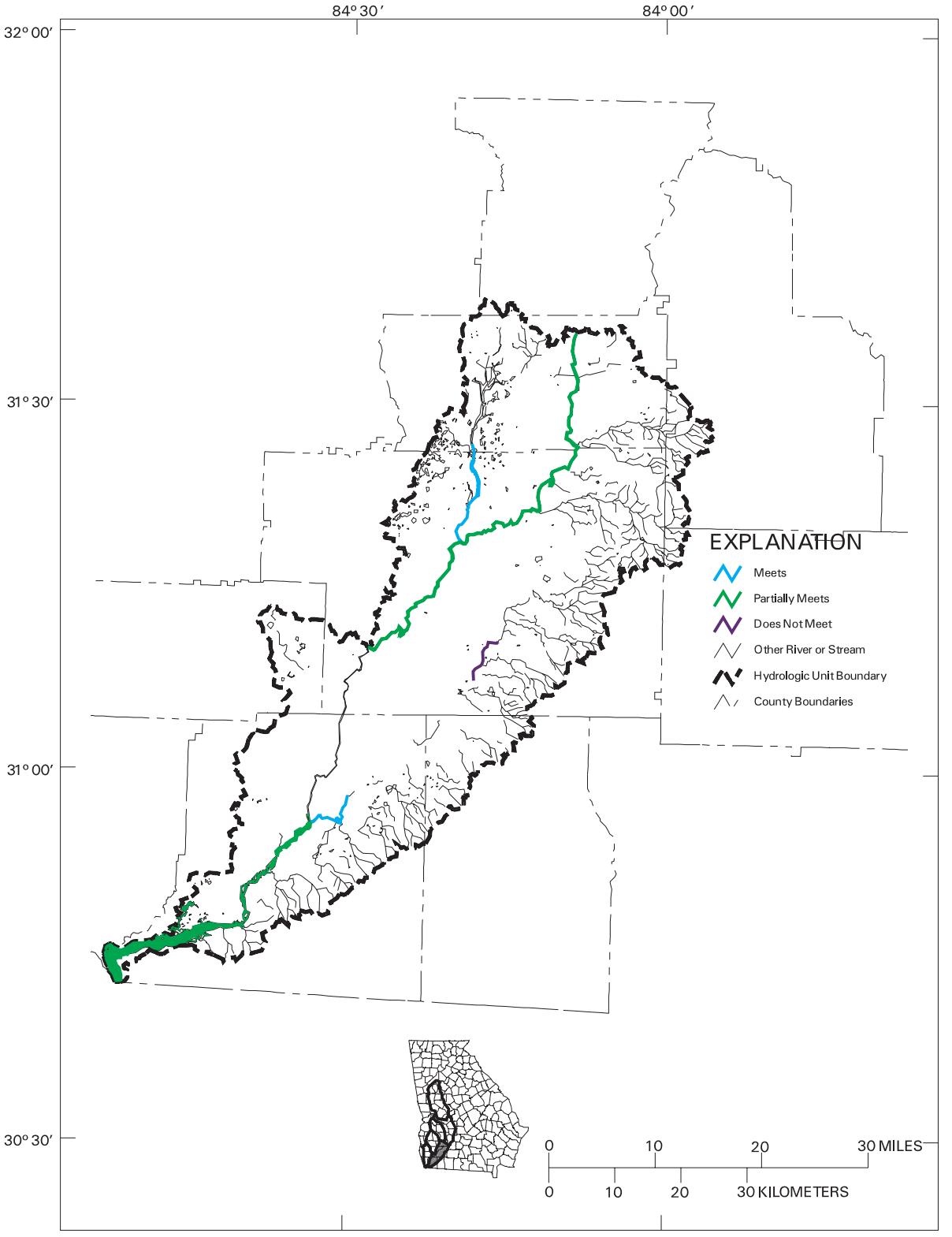

Figure 5-6. Assessment of Water Quality Use Support in the Lower Flint River Basin, HUC 0130008

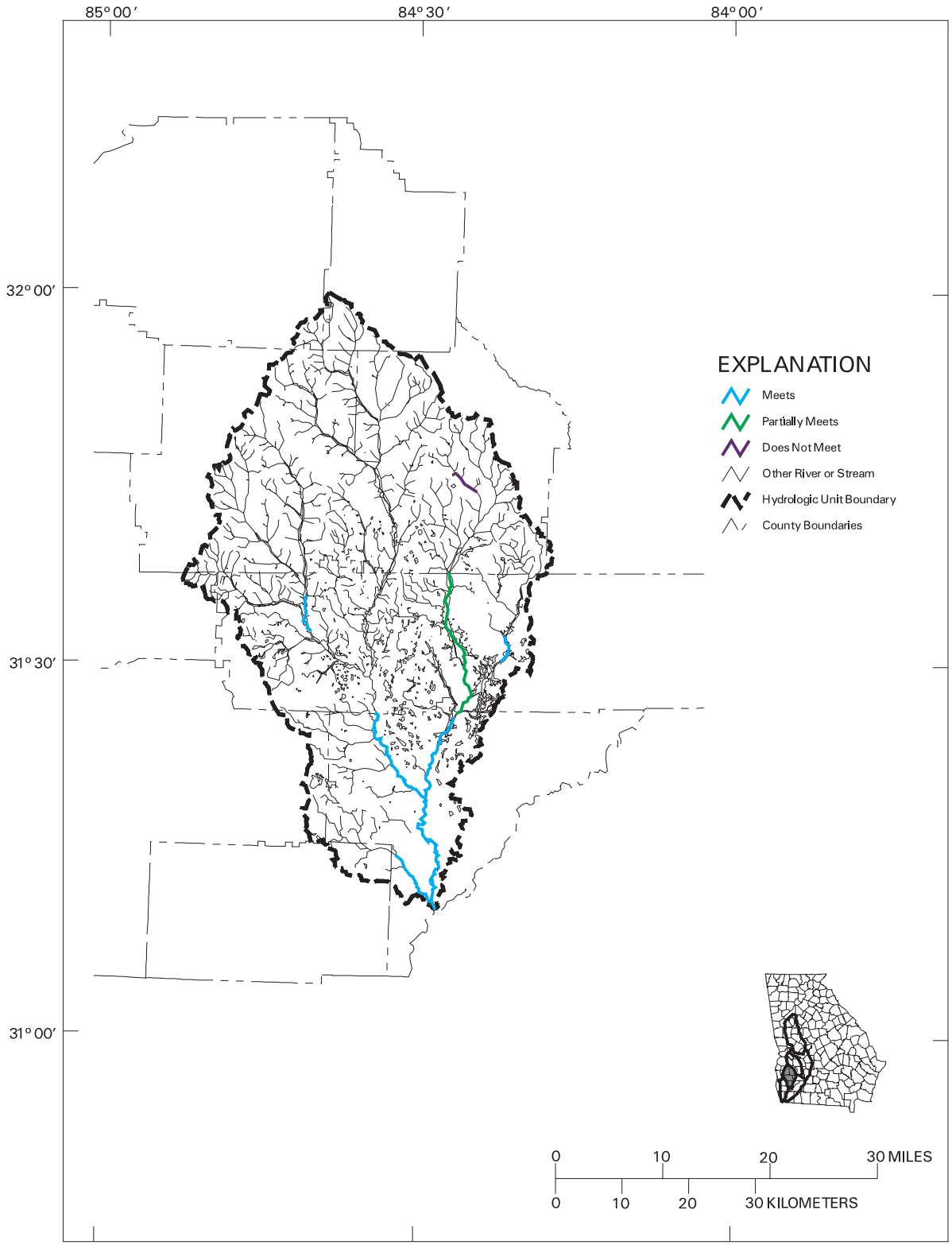

Figure 5-7. Assessment of Water Quality Use Support in the Lower Flint River Basin, HUC 03130009

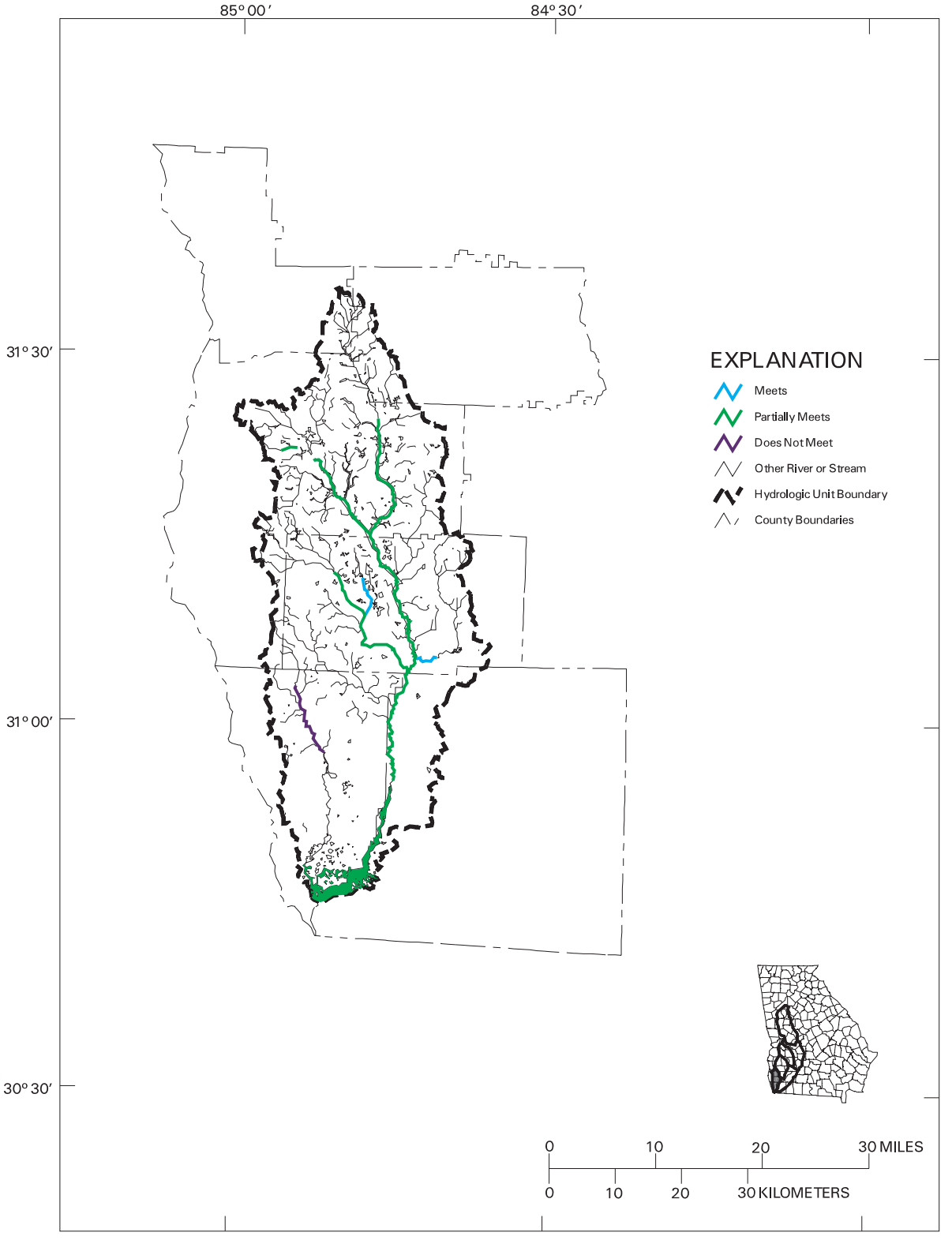

Figure 5-8. Assessment of Water Quality Use Support in the Lower Flint River Basin, HUC 03130010

Fish Tissue Sampling. Fish tissue sampling in this region prompted fish consumption guidelines to be issued for two species of fish (largemouth bass and shoal bass) based on mercury contamination. The guideline restricted consumption of the fish to one meal per week.

Fisheries

Many of the headwater tributaries are impacted by various forms of urban runoff, but continue to support struggling populations of various fish species. The longest free-flowing stream section in Georgia exists from the headwaters of the Flint River and continues to the Lake Blackshear dam. This section of the Flint River is thought to have considerable potential for supporting the natural reproduction of the highly recreational striped bass sport fishery.

5.2.4.2 Middle Flint River Basin (HUC 03130006 and HUC 03130007)

Stream Water Quality

Data from the mainstem stations indicate that water quality conditions are being affected by both point and nonpoint source pollution.

Water Quality Sampling. Violations in the dissolved oxygen water standard due to nonpoint sources were measured in Gulley Creek, upstream from Lake Blackshear. Nine monitored tributaries in the Lake Blackshear area had violations of standards for lead, copper, and zinc. Six monitored tributaries had violations of the fecal coliform standard.

Data from one station on Kinchafoonee Creek near Dawson and from one station on Muckalee Creek upstream from the city of Americus had violations of the fecal coliform standard due to nonpoint sources.

Benthic Macroinvertebrates. Benthic macroinvertebrates were collected at seven locations in subbasin 03130006 during the basin assessment in 1995. Water quality based on benthic macroinvertebrate data ranged from Very Good to Poor. Instream habitat destruction with few EPT taxa (*Ephemeroptera, Plecoptera, Tricoptera*: i.e., mayflies, stoneflies and caddisflies) were the causes of the Poor rating given to the Red Oak Creek site. In addition, there was some evidence of old stream alteration impacts at the Red Oak Creek location. Big Lazar Creek received a Poor biological condition rating due in part to instream habitat destruction. Nonpoint runoff may be contributing to much of the impact found at both sites.

Benthic macroinvertebrates were collected from two locations on Potato Creek, above and below the city of Thomaston. The benthos data collected from the upstream location yielded a Good biological condition rating, but the downstream Pobiddy Road location was rated as Poor. This result suggests a moderate impact on the biota due in part to a combination of point source and nonpoint source impacts, most likely from the city of Thomaston.

Benthic macroinvertebrates were collected from a single location in subbasin 03130007 in 1995, in Muckaloochee Creek, a major tributary of Muckalee Creek. The data collected yield a Very Good biological condition rating.

Fish Tissue Sampling. This area of the Flint River basin has not been tested because fish collections in Lake Blackshear indicate that there are no problems in this section of the River.

Similary, both the Kinchafoonee and Muckalee Creeks and their tributaries have not been tested because fish collections from Lake Worth indicate that there are no problems upstream of the lake impoundment.

Lake Water Quality: Lake Blackshear

Water Quality Sampling. In addition to early studies, water quality monitoring of Lake Blackshear by EPD was conducted as part of the Georgia Lake Classification Survey (1980-1981) and major lake monitoring studies conducted from 1984 to 1993. Lake Blackshear was one of the 14 Georgia lakes sampled in 1973 as part of the USEPA National Eutrophication Survey; it was rated as eutrophic. Of Georgia lakes larger than 1000 acres, Blackshear ranks high in the amount of nutrient loading it receives due to the large amount of agricultural land use, particularly in row-crops, present in the Middle Flint and surrounding watersheds providing inflow to the lake. Nuisance conditions caused by aquatic macrophyte growth (giant cutgrass, *Zizaniopsis miliacea*) and large mats of the blue-green algae *Lyngbya* have been historical problems that have necessitated ongoing control programs such as herbicide applications and biological control methods, including the introduction of more desirable, competitive aquatic vegetation.

Results of metals analysis documented concentrations of copper, nickel, lead, and zinc in some water samples collected in the lake; these results, in addition to fecal coliform densities, led to Lake Blackshear's being listed as not supporting designated use in the Georgia 1994-1995 305(b) Report. The Gum Creek watershed is one of the most highly developed of the watersheds having input to Lake Blackshear. The elevated metals and fecal coliform was attributed to various nonpoint and urban sources. Future sampling and analysis of metals should follow recent methodology developed for trace level concentrations (USEPA Clean Sampling and Analysis).

In February 1991, EPD applied for funding under the Clean Lakes Grant Program to conduct a Phase I Diagnostic/Feasibility Study. Grant funding was obtained by EPD, and a contract cooperative agreement with the Lake Blackshear Watershed Association (LBWA) was approved in September 1991. The Association provided the matching funds required for the grant. The primary investigators in this study are Georgia Southwestern College and Clemson University. When the study is completed, EPD will use the findings in developing specific lake water quality standards for Lake Blackshear.

During the period of July 3-7, 1994, the passage of Tropical Storm Alberto resulted in as much as 28 inches of rainfall over parts of southwestern and central Georgia, causing record flooding on the Flint River and several of its tributaries. The earthen dike at the Lake Blackshear Warwick Dam was breached and suffered extensive damage from the record flood levels that ensued. With the receding of flood waters, Lake Blackshear was dewatered. In August 1994, Georgia Southwestern College and the Lake Blackshear Watershed Association organized a meeting of involved organizations to discuss investigative and corrective opportunities presented with the lake dewatering event. Repair of the earthern dike was achieved with reservoir refilling begun in 1995.

Fish Tissue Sampling. Tissue sampling of largemouth bass and spotted sucker have yielded no fish consumption restrictions for Lake Blackshear.

Lake Water Quality: Lake Worth

Water Quality Sampling. Monitoring of Lake Worth was conducted as part of the Georgia Lake Classification Survey in 1980-1981 and as part of major lake monitoring conducted from 1984 through 1993 by EPD. The Total Trophic State Index (TTSI) for Lake Worth over the 1980-1981 and 1984-1993 period has ranged from 142 to 177. The Georgia 1994-1995 305(b) Report includes the Lower Kinchafoonee Creek and Muckalee Creek (Schley and Sumter Counties) as watersheds potentially impacted by agricultural nonpoint source inputs.

Lake Worth contains a substantial littoral zone (and shallow mud flat areas), and because of this and the run-of-river operation that maintains a stable water level, conditions favor the growth of submerged and emergent aquatic vegetation. Many aquatic macrophytes are represented, but Georgia Power cites Giant Cutgrass, *Zizaniopsis miliacea,* as causing current nuisance conditions. The Georgia Power Company has continued to participate as a cooperator with the Georgia Wildlife Resources Division in an aquatic macrophyte control program involving annual herbicide applications (since about 1983). It has also funded research since 1991 to study the blue-green alga *Lyngbya,* which periodically forms nuisance floating mats in areas of Lake Worth (KMF).

During the period of July 3-7, 1994, the passage of Tropical Storm Alberto resulted in as much as 28 inches of rainfall over parts of southwestern and central Georgia, causing record flooding on the Flint River and several of its tributaries. Following the failure of the earthen dike at the upstream Lake Blackshear Warwick Dam, increased flow also washed out the earthen dike located between the Muckafoonee Diversion Dam and the Flint River Dam, including the substation. With the receding of flood waters, both impoundments were drained. The dike was rebuilt and both impoundments refilled.

Fish Tissue Sampling. Fish tissue sampling yielded no consumption restrictions for largemouth bass or spotted sucker.

Fisheries

Both the Crisp County Power Commission dam which impounds Lake Blackshear and the Georgia Power Company dam which impounds Lake Worth were badly damaged due to flooding caused by Tropical Storm Alberto in 1994. As a result, the lakes were drained for long periods of time to allow for rebuilding of the dams and the majority of the existing fisheries contained in the two reservoirs was lost. Today, the fish population of the two reservoirs is much like that of a new impoundment.

5.2.4.3 Lower Flint River Basin (HUC 03130008, HUC 03130009 and HUC 03130010)

Stream Water Quality

Water Quality Sampling. The fecal coliform standard was exceeded due to urban runoff in samples collected from Chickasawhatchee Creek in Dougherty County. In HUC 03130010, Aycocks Creek in Miller County and Spring Creek downstream from the cities of Arlington and Colquitt had violations of the fecal coliform standard due to nonpoint sources. Dry Creek downstream from the city of Blakely had violations of the fecal coliform standard due to urban runoff and a municipal discharge. Baptist Branch downstream from the city of Blakely had a violation of the lead standard due to a municipal discharge.

Benthic Macroinvertebrates. Benthic macroinvertebrates were collected at two locations within the 03130008 subbasin in 1995. Samples from Cooleewahee Creek yielded a biological rating of Good while the sample from the Flint River yield a biological rating of Very Good.

Benthic macroinvertebrates were collected from one location in subbasin 03130009 during the summer of 1995. Few EPT taxa were collected at this location. Previous reconnaissance surveys suggest a significant fluctuation in the benthic community throughout the seasons. Samples from Chickasawhatchee Creek yielded a biological rating of Good.

Benthic macroinvertebrates were collected at a Spring Creek location in subbasin 03130010 in 1995. Samples in Spring Creek yielded a biological rating of Very Good.

Fish Tissue Sampling. Fish tissue sampling in Dougherty, Baker, and Mitchell counties yielded no restrictions for largemouth bass, suckers, flathead catfish, and spotted suckers.

Groundwater Quality

Water Quality Sampling. In the southwest portion of the City of Albany, near the Albany Airport, a survey of nitrates in 221 shallow wells has indicated an elevated nitrate level in the groundwater. Sixty percent of the wells tested had nitrate levels greater than 4 ppm, denoting a broad area of concern of about 11.5 square miles. Within this area, in a subarea of about 1 square mile, the concentration of nitrates in the groundwater exceeded the drinking water MCL of 10 ppm.

Fisheries

Below Albany, from Lake Worth dam to Lake Seminole, is the only stream section in the State of Georgia where gulf race striped bass are known to reproduce successfully. These striped bass rely heavily on the cool groundwater springs which feed into the Flint River. Thus, groundwater withdrawal for agriculture and other purposes poses a potential threat to the survival of this important native game fish.

References

EPD. 1996. Water Quality in Georgia, 1994-1995. Georgia Department of Natural Resources, Atlanta, Georgia.

Evans, J.W. and R.H. England. 1995. A recommended Method to Protect Instream Flows in Georgia. Georgia Department of Natural Resources, Wildlife Resources Division, Social Circle, Georgia.