Section 3

Water Quantity

Georgia historically has been blessed with an abundant supply of freshwater. However, population growth and economic development have led to competing demands for water in areas where water resources are limited.

This section addresses water quantity issues (availability and use), while water quality in the Flint basin is the subject of Section 4. Water use in the Flint River Basin is measured by estimates of freshwater withdrawn from ground and surface water sources, while water availability is assessed based on annual surface water flows and groundwater storage. Saline water is not used in the basin. Uses of water include both consumptive uses (in which the water is no longer available to the basin) and non-consumptive uses (in which the water is returned to the basin after use).

Surface water is the primary water source in the Piedmont Province of the Flint River Basin because groundwater yields from crystalline rock aquifers tend to be low. Within the Coastal Plain province, aquifer yields are higher and groundwater withdrawals are an important part of the total water budget. Although most public-supply withdrawals in the Piedmont Province are from surface-water sources, with the exception of counties near or immediately below the Fall Line, all public-supply water in the Coastal Plain comes from groundwater sources. The Floridan aquifer system supplied most of the ground water used in the basin in 1990, followed by the Claiborne, Clayton, crystalline-rock, and the Providence aquifer systems. As previously mentioned, the two sources of supply are not independent, because groundwater discharge to streams is important in maintaining dry-weather flow. Thus, withdrawal of ground water can, under certain conditions, also result in reduction in surface water flow.

Water use in the Flint basin is increasing, resulting in greater demands on what are essentially finite supplies. Total water withdrawals in the Apalachicola-Chattahoochee-Flint basin increased by 42 percent between 1970 and 1990 (Couch et al., 1996). During this period, total surface-water withdrawals increased by 29 percent; however, groundwater withdrawals increased by 240 percent.

In the following sections, water availability is discussed from a number of viewpoints. First, the important topic of drinking water is presented, which includes both surface and groundwater supplies. Then, general surface water availability is presented, followed by ground water availability.

3.1 Drinking Water Supply

3.1.1 Drinking Water Sources

The Flint River Basin is the drinking water source for a majority of the Southwest Atlanta metro population including Clayton, Fayette and Coweta counties, as well as the city of Albany. Most surface water intakes are located on the headwaters and smaller tributaries of the Flint River. However, below Talbot County, the majority of the communities including Albany utilize ground water pumped from wells as a source of drinking water. The locations of surface water intakes within each of the six Hydrologic Units of the Flint River Basin are shown in Figures 3-1 through 3-6.

The Flint River Basin provides drinking water for about 554,100 people in the state of Georgia by municipal or privately owned public water systems. A public water system pipes water for human consumption and has at least 15 service connections or regularly serves at least 25 individuals 60 or more days out of the year. Public water systems sources include surface water pumped from rivers and creeks or ground water pumped to the surface from wells or naturally flowing from springs. There are three different types of public water systems: community, non-community non-transient, and non-community transient.

A community public water system serves at least 15 service connections used by year round residents or regularly serves at least 25 year-round residents. Examples of community water systems are municipalities, such as cities, counties, and authorities which serve residential homes and businesses located in the areas. Other types of community public water systems include rural subdivisions or mobile home parks which have a large number of homes connected to a private public water system, usually a small number of wells.

A non-community non-transient public water system serves at least 25 of the same persons over six months per year. Examples of non-community non-transient systems are schools, office buildings, and factories which are served by a well.

A non-community transient public water system does not meet the definition of a non-community non-transient. A non-community transient public water system provides piped water for human consumption to at least 15 service connections or which regularly serves at least 25 persons at least 60 days a year. Examples of a non-community transient are highway rest stops, restaurants, motels, and golf courses.

Private domestic wells serving individual houses are not covered by the state's public water system regulations. However, the regulations for drilling domestic wells are set by the Water Well Standards Act and the local health department is responsible for insuring water quality.

In the Flint River Basin there are approximately 16 community public water systems utilizing surface water and serving 317,545 people and 200 community public water systems utilizing ground water and serving approximately 236,127 people.

3.1.2 Drinking Water Demands

Drinking water demands are expected to increase due to the growth in the Atlanta Metro area including the subdivision communities in Clayton, Fayette and Coweta counties. Due to current and forecasted growth, many of the Atlanta Metro counties have adopted water conservation techniques, including ordinances for low flow household plumbing in new construction, limits on outside watering during the summer months, increased water rates to curb excess use, and public education. Demands on ground water are expected to increase in south Georgia especially in the Albany which is utilizing the Floridan, Claiborne, Clayton and Providence aquifer systems. Projections of drinking water demands are discussed in Section 3.2 and 3.3.

3.1.3 Drinking Water Permitting

The Georgia Safe Drinking Water Act of 1977 and the Rules for Safe Drinking Water (391-3-5) adopted under the act require any person who owns and/or operates a public water system to

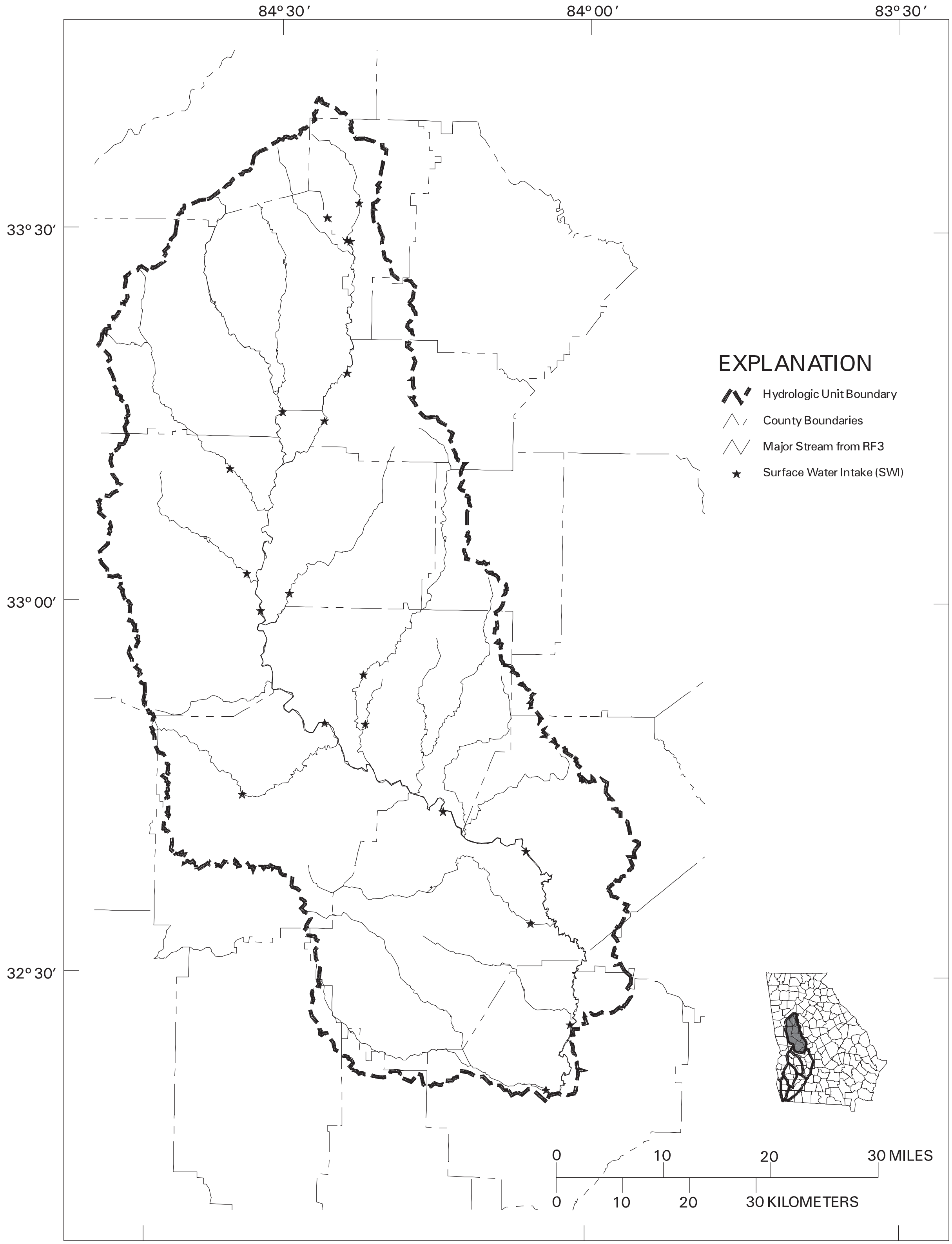

Figure 3-1. Surface Water Intakes, Upper Flint River Basin, HUC 03130005

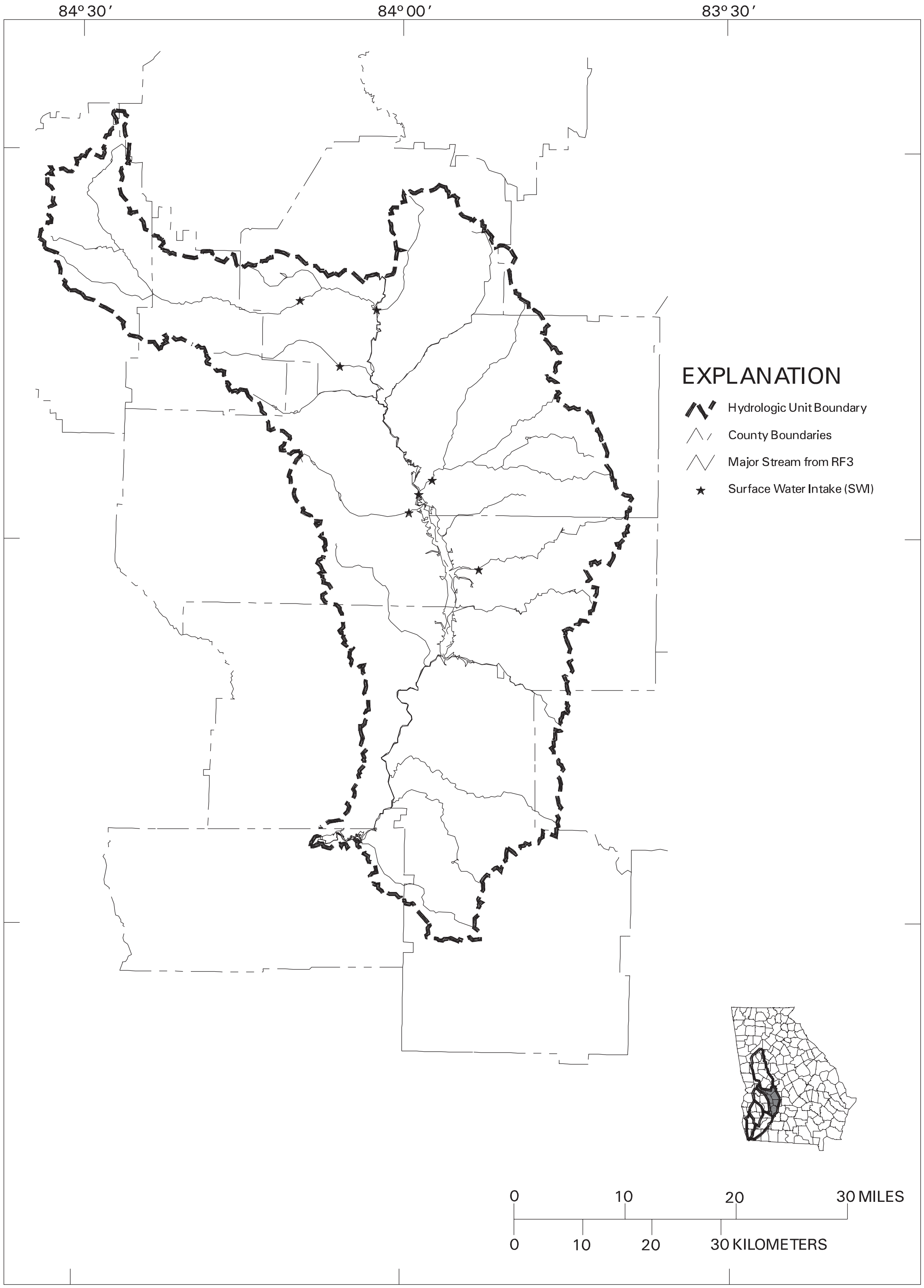

Figure 3-2. Surface Water Intakes, Middle Flint River Basin, HUC 03130006

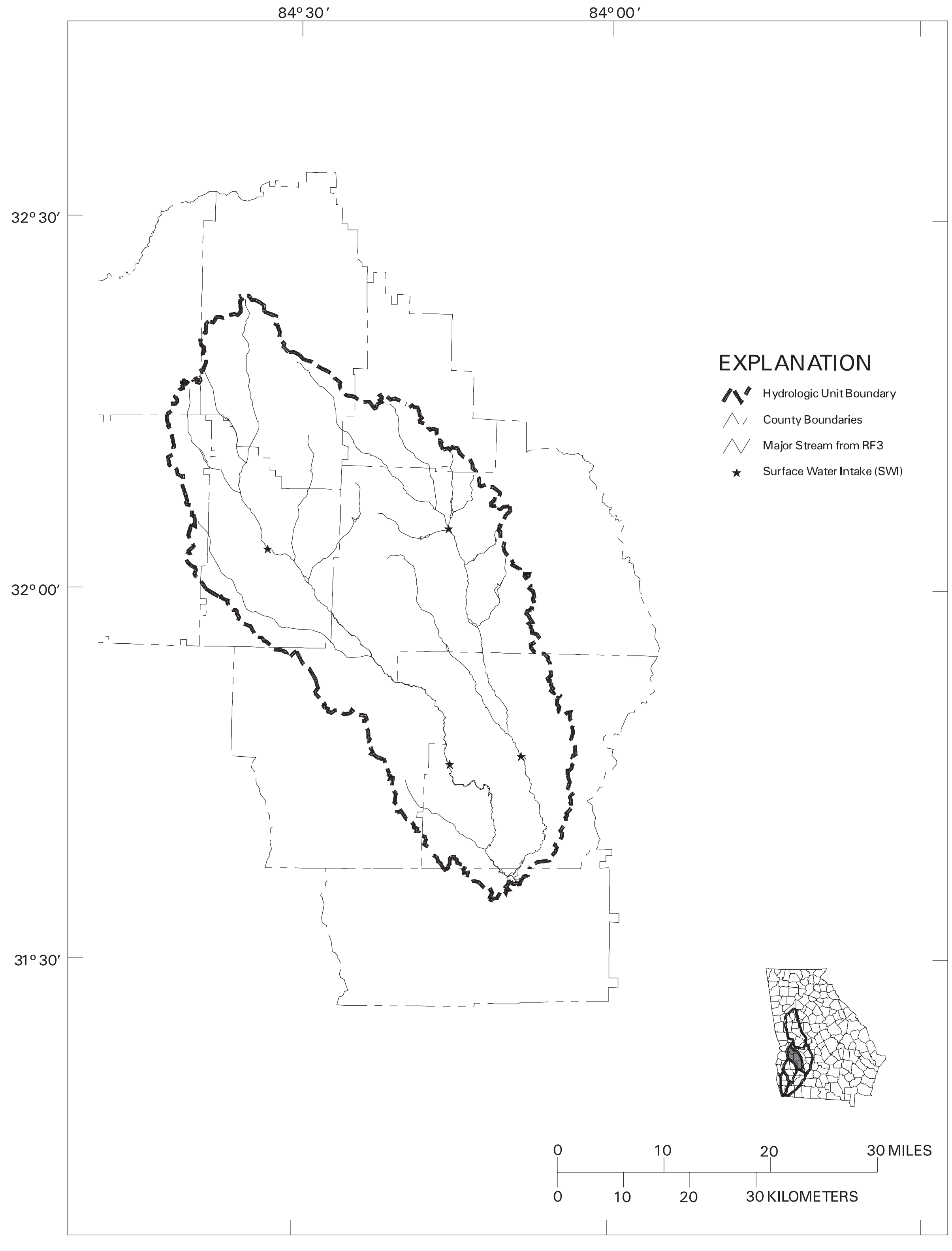

Figure 3-3. Surface Water Intakes, Kinchafoonee-Muckalee Creeks Basin, HUC 03130007

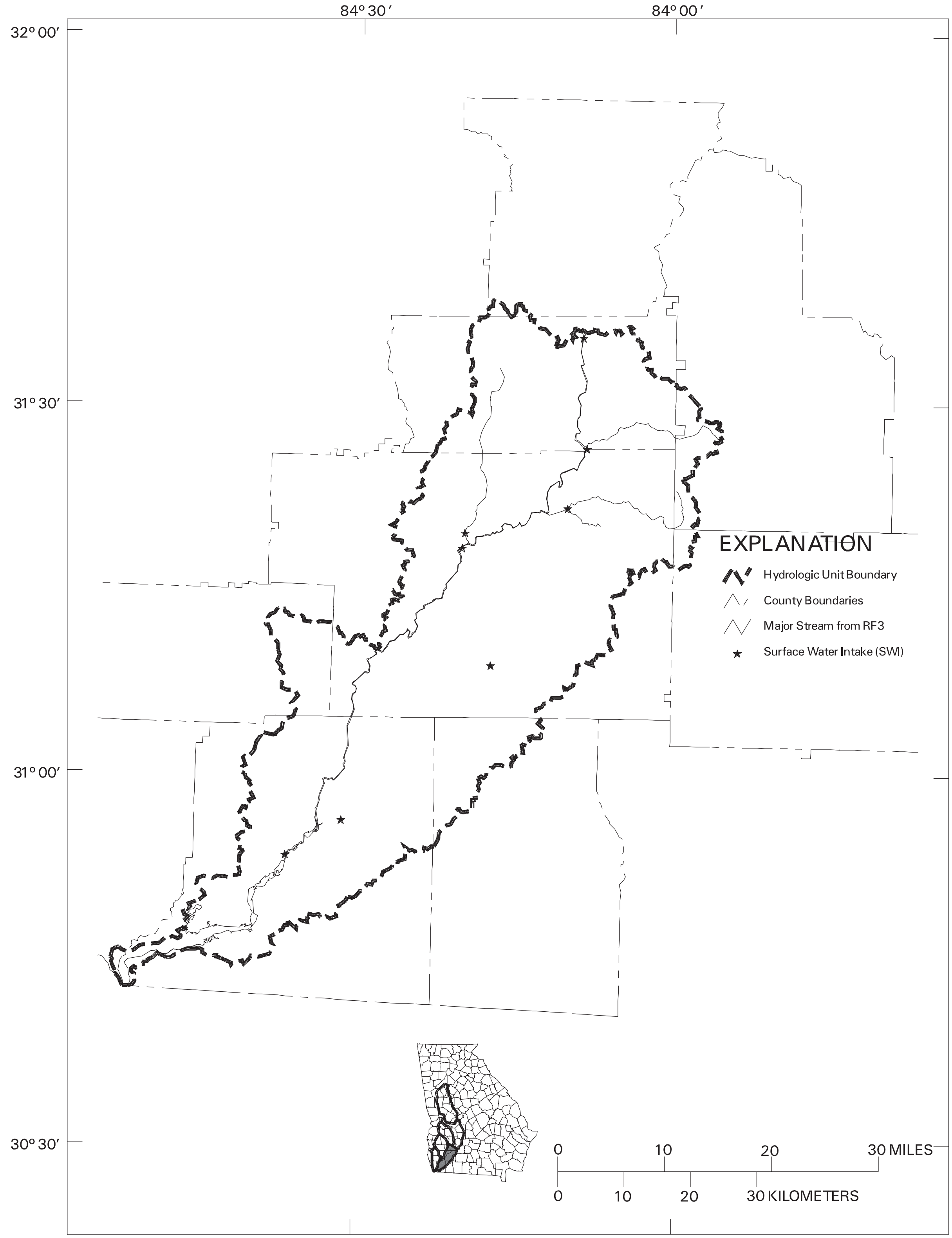

Figure 3-4. Surface Water Intakes, Lower Flint River Basin, HUC 03130008

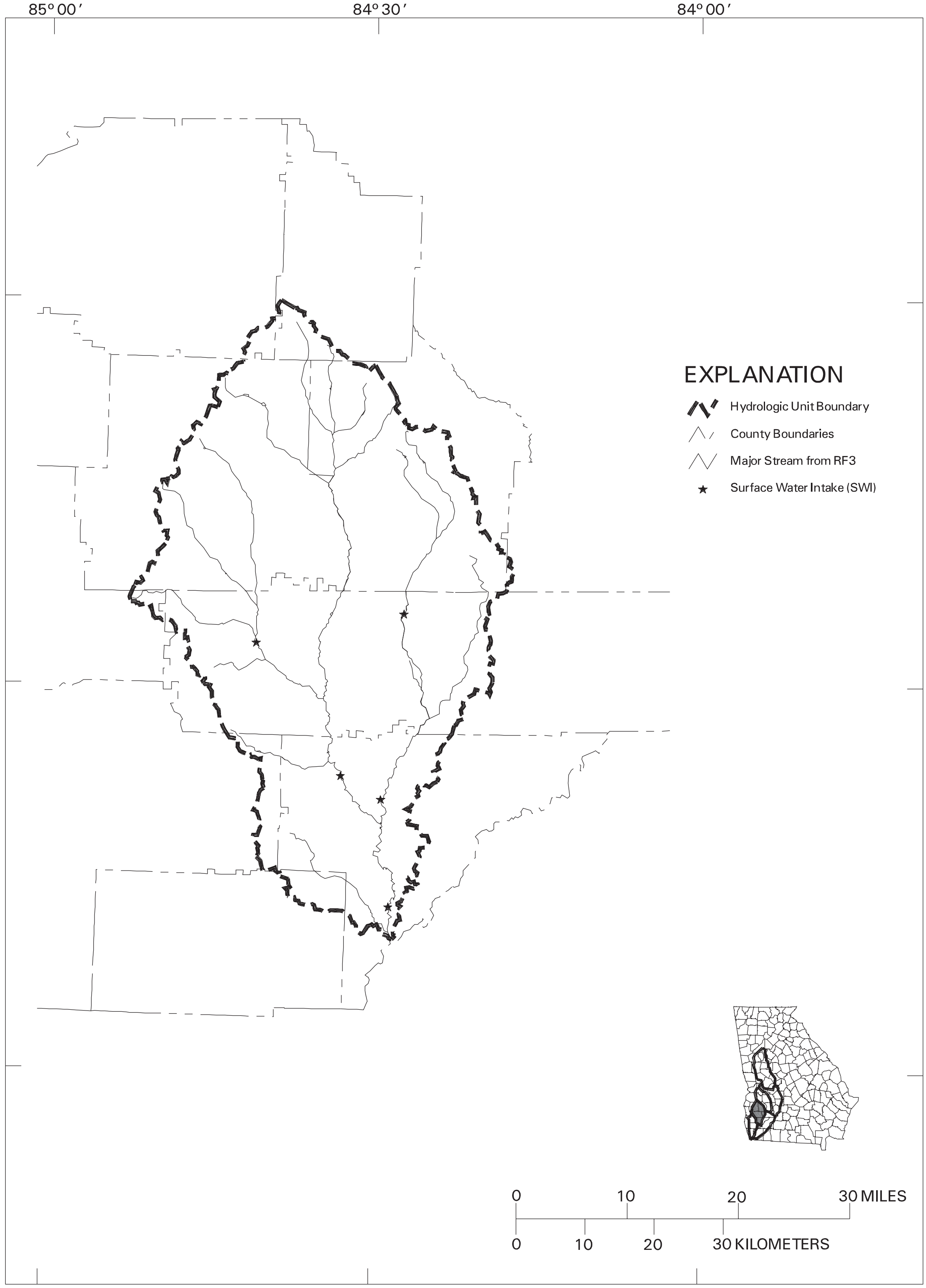

Figure 3-5. Surface Water Intakes, Ichawaynochaway Creek Basin, HUC 03130009

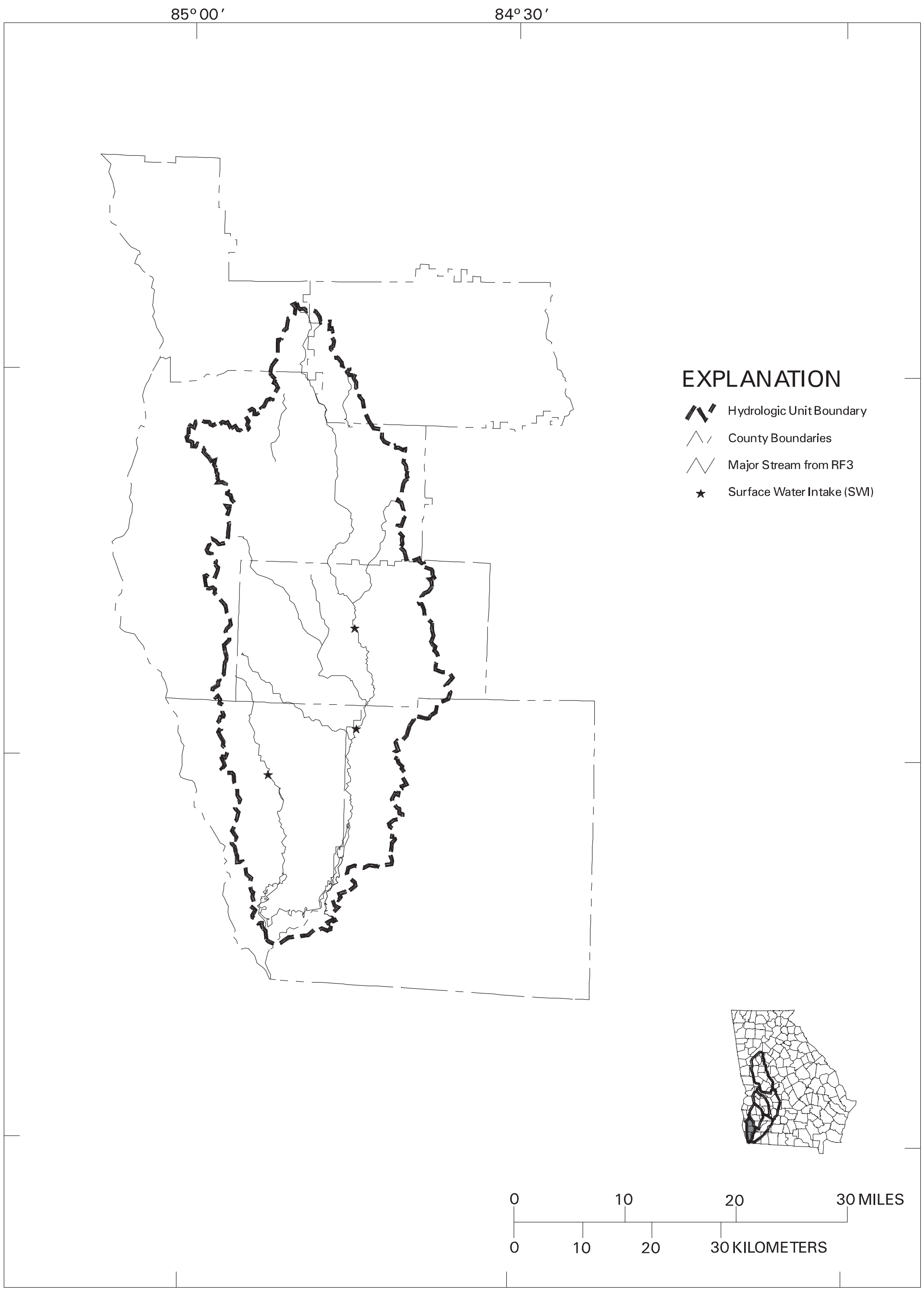

Figure 3-6. Surface Water Intakes, Spring Creek Basin, HUC 03130010

obtain a permit to operate a public water system from the Environmental Protection Division. The permitting process is set in three phases: Inquiry & Discovery, Technical Review and Permitting. During these phases the owner must provide detailed description of the project; demonstrate the reliability of water source site; render plans and specifications of demonstrating construction integrity of wells, plants and distribution system; conduct preliminary water sample testing; and submit legal documentation including application to operate a public water system. Permits contain specific conditions the owner must meet for different types of water sources, plants, and distribution systems, including list of approved water sources, filter rates, disinfection and treatment requirements, operator certification, documentation and reporting requirements, compliance with water sample testing schedule, and number of allowed service connections. Permits are issued for ten (10) years and are renewable. There are 315 active and permitted systems in the Flint River Basin

3.1.3.1 Summary of the EPD Drinking Water Program

The Federal Environmental Protection Agency (EPA) promulgates the rules and regulations for drinking water and passes the responsibility of enforcing the rules to the states with primacy, such as the state of Georgia. In Georgia, public water systems are regulated by the Drinking Water Program (DWP) of the Environmental Protection Division (EPD). The Drinking Water Program in the state of Georgia is divided into Drinking Water Compliance Program (DWCP) and Drinking Water Permitting Program (DWPP). Both programs oversee the 2618 public water systems in the state of Georgia, including the 315 public water systems in the Flint River Basin.

3.2 Surface Water Quantity

3.2.1 Surface Water Supply Sources

Surface water supplies in the Flint basin include water in rivers, ponds, and reservoirs, including two major impoundments on the Flint mainstem (see Section 2.1.4). Total annual flow in the Flint is estimated at 2,060,000 million gallons per year. Reservoirs provide a storage capacity within the basin of 1,470 million gallons (4,500 acre feet).

3.2.2 Surface Water Supply Demands and Uses

Municipal and Industrial Demands

Municipal and Industrial (M&I) water demands include publicly supplied and privately supplied residential, commercial, governmental, institutional, industrial, manufacturing, and other demands such as distribution system water losses. Total demand for M&I water for the Flint River Basin is expected to increase from 164 million gallons per day (MGD) in 1995 to 172 MGD in 2000 and to 181 MGD in 2005 (Davis et al., 1996) with passive conservation programs in place (see Table 3-1). These passive conservation measures include increases in water use efficiency resulting from recently implemented plumbing codes, the natural replacement of water fixtures, and known increases in water and wastewater prices since 1990.

Existing permits for municipal and industrial (non-agricultural) surface water withdrawals in the Flint River Basin are shown in Table 3-2. About 60 percent of the 2005 Flint basin demand is expected to come from surface water. The residential sector accounted for 44 percent of the 1990 water demand in the Flint basin. By 2050, nearly half (47 percent) of the basins M&I demand for water is expected to be for the residential sector. The manufacturing sector demand for water in the Flint basin is projected to increase from 30 percent in 1990 to 33 percent in 2010 and then drop to 25 percent of the subbasins demand in 2050.

Table 3-1. Projected Municipal and Industrial Demands Including Percent Returned

	Demand (MGD)	% Returned to Flint River
1990	158	35
1995	164	37
2000	172	38
2005	181	39
2010	189	40
2015	194	41
2020	196	40
2025	196	40
2030	195	40
2050	206	38

Sixty percent (109 MGD) of the 2005 Flint basin demand is projected to be supplied by surface water withdrawals and 40 percent (72 MGD) by ground water withdrawals. Ground water pumpage is expected to intercept some water that would have surfaced in the streams, and this amount can be viewed as ground water demand that is effectively supplied by surface water. In the Flint, the ground water to surface water relationship is complicated; however, the 72 MGD ground water demand is expected to ultimately reduce Flint river flow by 22 MGD.

Much of the M&I demand is not consumed, but is instead returned back to the river as treated wastewater. In 2005 approximately 39 percent of the demand quantity is projected to be returned to the Flint River Basin (Table 3-1).

While there has generally been adequate water to meet the needs of most users, there have been periods of low water flows and drought dating back to the 1920's in the Flint River Basin. With increased growth and development, the droughts of 1981, 1986, and 1988 created greater competition among users for limited water resources than had been experienced before. The defining hydrologic conditions of the 1980's droughts were that the preceding winters and springs were dry to the point that ground water and major headwaters storage reservoirs did not recover from the preceding fall dry periods. With flows and reservoirs low at the beginning of the summer, the ability to meet the various project purposes was more dependent on water stored in conservation storage zones of the various reservoirs.

Agricultural Water Demand

Current Agricultural Water Demands

The demands on water resources for agricultural activities includes irrigation for crops, nursery, and turf, drinking water for livestock and poultry, and aquacultural activities.

In 1992, 655,000 acres (50 percent) of the 1.3 million acres used to harvest a commodity were irrigated. Almost all of the acres under irrigation in 1992 were for crops and orchards. Agricultural withdrawal permits are too numerous to list in this document.

Approximately 70 percent of the water used for crop and orchard commodities in 1992 came from ground sources. Much of this is attributed to the widespread irrigation taking place in the lower Flint. It is estimated that only 18 percent of the water used for irrigation in the lower Flint

Table 3-2. Permits for Surface Water Withdrawals in the Flint River Basin

Facility	Source	24 Hour Max (Mgd)	Monthly Avg. (Mgd)	County
Clayton County Water Auth - Flint	Flint River	40.00	40.00	Clayton
Clayton County Water Auth - Shoal	J.W. Smith Res./Shoal Cr.	12.00	12.00	Clayton
Newnan Water Supply & Light Comm	White Oak Creek	7.00	7.00	Coweta
Newnan Water Supply & Light Comm	Raw Water Reservoirs	14.00	14.00	Coweta
Newnan Water Supply & Light Comm	Line Creek	12.00	12.00	Coweta
Newnan Water Supply & Light Comm	Sandy/Browns Creek	8.00	8.00	Coweta
Senoia, City of	Hutchins Lake	0.30	0.30	Coweta
Georgia Power Co - Mitchell	Flint River	232.00	232.00	Dougherty
Board of Commissioners of Fayette Co.	Whitewater Creek	2.00	2.00	Fayette
Fayette County	Flint River	10.00	10.00	Fayette
Fayette County	Lake Horton	8.00	8.00	Fayette
Fayette County	Line Cr (Mcintosh Site)	2.00	2.00	Fayette
Fayette County Water System	Lake Peachtree	0.55	0.50	Fayette
Fayette County Water System - Flat	Flat Creek Reservoir	4.50	4.00	Fayette
Fayetteville, City of - Ginger Cake	Ginger Cake Creek	0.15	0.15	Fayette
Martin Marietta Aggregates	Pit Sump	1.80	0.09	Lee
Weyerhauser Company	Flint River	14.50	12.50	Macon
Greenville, City of	Toen Creek	0.16	0.15	Meriwether
Manchester, City of	Pigeon Creek	1.00	0.75	Meriwether
Roosevelt Warm Springs Rehab	Cascade Creek	0.14	0.14	Meriwether
Woodbury, City of	Cain Cr Res on Pond Cr	0.75	0.50	Meriwether
Zebulon, City of	Elkins Creek	0.40	0.30	Pike
Griffin, City of	Flint River	13.20	12.00	Spalding
Georgia Game and Fish	Gum Creek	0.00	0.00	Talbot
Manchester, City of	Rush Creek Reservoir	2.00	1.44	Talbot
Southern Mills, Inc.	Thundering Springs Lake	0.65	0.50	Upson
Thomaston Mills, Inc.	Potato Creek	4.40	3.40	Upson
Thomaston, City of	Raw Water Cr Res	4.30	4.30	Upson
Westek, Inc.	Potato Creek	1.44	0.40	Upson
Crisp County Power Comm - Hydro	Lake Blackshear			Worth
Crisp County Power Comm - Steam	Lake Blackshear	15.00	15.00	Worth

Note: Permits are not required for withdrawals of less than 100,000 gallons per day on a monthly average.

is surface water, the rest coming from ground water. However, groundwater withdrawals in the Flint basin affect the surface water supply. One study has estimated that, in the lower Flint, every ten gallons of ground water withdrawn may ultimately diminish the surface water supply by about three gallons.

The most important variable in the demand for supplemental agricultural water is rainfall. The Chattahoochee and Flint basins received an estimated 60 inches of rain in 1992; the 30-year average for the study area is 51 inches. This additional 9 inches of rainfall in 1992 certainly reduced irrigation needs for that year. However, the magnitude of these reductions is difficult to quantify reliably for the entire basin. In 1987, growers and producers withdrew 460 MGD when rainfall for the basins was only 43 inches, about 8 inches below the 30 year average. In 1987 rainfall was 17 inches less than that in 1992, and irrigation was approximately 233 MGD more in 1987 than in 1992.

For comparison purposes, collective water use of all growers and producers in the Flint River Basin totaled 82,900 million gallons (227 MGD) in 1992. Of the 227 MGD, 94 percent went to crop and orchard irrigation; livestock and poultry consumed 2 percent, aquaculture used 1 percent, and nursery and turf accounted for the remaining 3 percent.

Future Agricultural Water Demands

It is anticipated that the number of total agricultural acres in the Flint River Basin will decline through the year 2000 due to a short term drop in peanut acreage. The number of total agricultural acres is expected to drop from 1.3 million in 1992 to 1.2 million in 2000, and the number of irrigated acres from 655,000 to 636,000. There is considerable uncertainty, however, in the projected growth of agricultural land, and irrigated land in particular. Year 2050 estimates of irrigated land range from about 780,000 to more than 1.5 million acres in the Flint River Basin. The projection of irrigation water demand varies accordingly under normal rainfall conditions.

Future demand for agricultural water in the Flint basin is driven by projected increases in crop and orchard irrigation. The 94 percent allocation of water to crop / orchard commodities in 1992 is expected to rise to 95 percent of the projected 124,000 MG (340 MGD) by 2000. Research has demonstrated that producers are not currently applying sufficient quantities of water to achieve optimum yields. Part of the reason is economics, part is technology, and part is education. As more producers become aware of the relationship of water application to plant yield and profits, they are expected to begin applying more water. Therefore, projections regarding future water demands were made assuming producers would gradually increase the amount of irrigation water applied until recommended levels are reached.

Table 3-3 shows the projected increases in total water demand. Total agricultural water demand (ground water and surface water) is expected to increase from 82,900 million gallons in 1992 to 146,000 million gallons in 2010. Much of this increase will begin after the year 2000 as peanut acreage stabilizes and producers begin to irrigate an increasing percentage of their crops. The increase in water demand between 1992 and 1995 is largely attributed to the less than “typical” water application by producers in 1992, a high rainfall year. In drought conditions, the agricultural demand would be higher, possibly 1.5 to 2 times the amount under normal rainfall.

Even though the demand for agricultural water exists throughout the year, the months of May through August account for 81 percent of annual demand. These months reflect the heart of the growing season for crop and orchard commodities. This means that the 146,000-million gallon demand for the year 2010 would result in a withdrawal of 118,300 million gallons between May and August. Instead of 400 MGD average annual demand, the June demand would be 59,480 million gallons or 1,980 MGD.

Power Generation Water Demand

Four power-generating plants located along the mainstem Flint River use the water resources of the basin (Figure 2-11), including two hydropower facilities and two fossil fuel generating (Couch et al., 1996). The two hydroelectric plants located along the mainstem of the Flint River

Table 3-3. Agricultural Water Demand Including Crops/Orchards, Turf, Nursery, Livestock/Poultry, and Aquaculture (MG per year, including crops/orchards, turf, nursery, livestock/poultry, and aquaculture demand, from NRCS, 1996, Based on Medium Demand Projections without Water Conservation)

Year	Upper Flint	Middle Flint	Lower Flint	Total
1992	3,337	17,722	61,874	82,933
1995	6,099	24,840	80,595	111,534
2000	7,057	26,186	86,671	119,914
2010	9,638	32,905	103,530	146,073
2020	10,672	35,830	109,027	155,529
2050	14,730	47,825	134,239	196,794

impound run-of-the-river reservoirs which do not appreciably influence the flow of the Flint River, and are therefore essentially nonconsumptive. The total hydroelectric generation capacity is 699,720 kilowatts in the ACF River basin (Fanning et al., 1991).

Water used for thermoelectric-power generation is considered an offstream use of water, and generally is moderately consumptive to non-consumptive. Thermoelectric power is generated at two fossil-fuel plants located in the Flint River Basin, in Crisp County and Mitchell County.

Navigation Water Demand

Navigation in the Flint River Basin does not pose a significant use of the water resources. The U.S. Army Corps of Engineers maintains a navigation channel from the mouth of the Apalachicola River to Bainbridge, Georgia, which is in the southern portion of the basin.

Recreation Water Demand

The demand for outdoor recreation continues to increase as Georgia’s population increases. As a result, the Flint River, its reservoirs, and its tributaries are heavily used for recreational activities such as boating, fishing, hunting, water sports, and sight-seeing. The majority of the recreational activities conducted in the Flint River Basin are tubing, rafting, sight-seeing, and fishing. Many local businesses and services (i.e., bait and tackle shops, restaurants, guide services, and hotels) rely on the economically significant impacts associated with the freshwater bass tournaments and other warm water fish species.

South of the metropolitan Atlanta area, the Flint River is a significant attraction for fishermen and other recreational river users. The Flint River shoal bass is a prized sport fish that attracts considerable fishing pressure. Other important recreational sport fish species include largemouth bass, catfish, and various species of sunfish.

Lake Blackshear is a popular recreation area. Lake levels are managed primarily to support recreational uses, including sportfishing. The GADNR operates the Georgia Veterans State Park, which has approximately 5 miles of shoreline along the lake, and provides various recreational facilities.

Waste Assimilation Water Demand

Water quantity, wastewater treatment, and wastewater discharge permitting are addressed in Section 4. However, it should be noted that the guidelines for discharge of treated effluent into the rivers and streams of the Flint River Basin assume that sufficient surface water flow will be available to assimilate waste and ensure that water quality criteria will be met.

Environmental Water Demands

EPD recognizes the importance of maintaining suitable aquatic habitat in Georgia's lakes and streams for support of viable communities of fish and other aquatic organisms. From a water quantity perspective, aquatic habitat is adversely affected by unnatural extreme variations in lake levels and river flow. One significant issue which is receiving increasing attention from EPD is that of the minimum stream flow rate which must be maintained below a reservoir. This is not a major issue in the Flint basin, where the two major dams create run-of-the-river impoundments that do not significantly alter flow.

In September of 1996, the Directors of the Environmental Protection Division (EPD) and the Wildlife Resources Divison (WRD) empaneled a multi-disciplinary group of stakeholders to reveiw EPD's current minimum streamflow policy to determine if modifications should be made. EPD's current minimum flow policy is to protect the lowest seven-day average flow which would have occurred during any ten-year period for a stream (commonly called the 7Q10). Over a period of a year, the stakeholder group worked through a number of issues related to the current policy, and determined that it was not in the best interest of instream biological diversity and protection of aquatic habitats to continue with a 7Q10 minimum flow policy. The group also concluded that an insuficient number of instream flow studies had been conducted in Georgia in which to base a long-term modification to the current policy; however there was sufficient relevant national scientific information on which to base several interim modifications to the current policy. Consequently, on November 20, 1997, the stakeholder group submitted a final recommendation paper to Directors of EPD and WRD in which an interim flow policy was described.

This interim policy recommended by the stakeholder group allows future new surface water permit applicants, as well as those current permit holders who seek modifications in their permitted withdrawal quanitities, to select one of three methods for determining the streamflow quantities to be protected the withdrawal site. These options are as follows:

A. Monthly 7Q10

For a water supply reservoir, the applicant is at all times required to release the lesser of the monthly 7Q10 or the inflow to the reservoir. For an instream withdrawal, the applicant is at all times required to pass the lesser of the monthly 7Q10 or the inflow to the withdrawal point.

B. Site-Specific Instream Flow Study

The applicant may perform a site-specific instream flow study to determine what minimum flow conditions must be maintained for protection of aquatic habitat. Prior to commencing such an instream flow study, the applicant must receive prior approval of the study design from the Department of Natural Resources. Upon the applicant's completion of the instream flow study, the Department of Natural Resources will evaluate the study results and render a decision regarding the minimum flows which must be preserved by the applicant.

C. Wildlife Resources Division Recommendation

30 Percent Mean Annual Flow (Unregulated)
On unregulated streams (i.e., streams with no stream flow regulation structures), the applicant is at all times required to allow the lesser of 30 percent of the mean annual flow of the stream, or the inflow, to pass the instream withdrawal point.

30/60/40 Percent Mean Annual Flow (Regulated Streams)
On regulated streams, the applicant is at all times required to release from a water supply reservoir, the lesser of 30 percent of the mean annual flow or inflow during the months of July through November; 60 percent of the mean annual flow or inflow during the months of January through April; and 40 percent of the mean annual flow or inflow during the months of May, June, and December.

These options would be available to applicants for new and modified permits until sufficient site-specific information is available in Georgia to develop a permanent modification of the current policy. Current holders of surface water withdrawal permits would be "grandfathered" for the current permit limits.

The Directors of EPD and WRD are currently considering the recommendation, and are expected to make a decision regarding the recommendation in early 1998. At that time an implementation schedule will be determined.

3.2.3 Surface Water Withdrawal Permitting

The 1977 Surface Water Amendments to the Georgia Water Quality Control Act of 1964 require all non-agricultural users of more than 100,000 gallons per day (GPD) on a monthly average (from any Georgia surface water body) to obtain a permit for this withdrawal from EPD. These users include municipalities, industries, military installations, and all other nonagricultural users. The statute stipulates that all pre-1977 users who could establish the quantity of their use prior to 1977 would be "grandfathered" for that amount of withdrawal. Table 3-2 lists the permits in effect for the Flint River Basin.

Applicants are required to submit details relating to the source of withdrawals, demand projections, water conservation measures, low flow protection measures (for nongrandfathered withdrawals), and raw water storage capacities. EPD-issued permit identifies the source of withdrawal, the monthly average and maximum 24-hour withdrawal, the standard and special conditions under which the permit is valid, and the expiration date of the permit. The standard conditions section of the permit generally defines the reporting requirements (usually annual submission of monthly average withdrawals); the special conditions section of the permit usually specifies measures the permittee is required to undertake so as to protect downstream users and instream uses (e.g., waste assimilation, aquatic habitat). The objective of these permits is to manage and allocate water resources in a manner that both efficiently and equitably meets the needs of all the users.

The 1988 Amendments to the Water Quality Control Act establish the permitting authority within EPD to issue farm irrigation water use permits. As with the previously mentioned surface water permitting statute, the lower threshold is 100,000 gallons per day; however, users of less may apply for and be granted a permit. With two exceptions, farm use is defined as irrigation of any land used for general farming, aquaculture, pasture, turf production, orchards, nurseries, watering for farm animals and poultry, and related farm activities.

Applicants for these permits who could establish that their use existed prior to July 1, 1988, and submitted their applications prior to July 1, 1991, are “grandfathered” for the operating capacity in place prior to July 1, 1988. Other applications are reviewed and granted with an eye toward protection of grandfathered users and the integrity of the resource. Generally, agricultural users are not required to submit any water use reports.

3.2.4 Flooding and Floodplain Management

Sometimes the issue is not the lack of water, but too much water. Floods, as well as droughts, can be very damaging natural hazards. Almost all of Georgia is susceptible to the threat of floods. The Georgia Emergency Management Agency (GEMA) ranks floods as the number one natural hazard in Georgia. Over the past nineteen years, 57 Georgians have lost their lives due to flooding. The Flood of 1994 (Tropical Storm Alberto) is considered the worst flooding event in Georgia since 1841, which is the beginning of the State’s recorded flood history. Much of the flooding in 1994 resulted from the overflowing of the Flint River and the Ocmulgee River and, to a much lesser extent, the Chattahoochee River.

In July 1994, rainfall from Tropical Storm Alberto caused severe flooding in the Flint River Basin. These floods affected hundreds of thousands of people, damaging or destroying highways, water-supply systems, wastewater treatment plants, crops, and homes. Damage from such a severe flood cannot be averted completely, but with sound hydrologic information, reliable estimates of river stages and of discharges can be made. Using these data, emergency management personnel can provide ample warning of impending danger to communities.

Development within the floodplains of these rivers is also a concern, especially when a community has no means of regulating the development. Development within floodplain areas can increase flood levels, thereby increasing the number of people and the amount of property at risk. Although the term “floodplain management” is often used as a synonym for program or agency-specific projects and regulations, it is in fact quite a broad concept. It is a continuous process of making decisions about whether floodplains are to be used for development and how they are to be developed. It encompasses the choices made by owners of floodplain homes and businesses, developers, and officials at all levels of government.

3.3 Ground Water Quantity

3.3.1 Ground Water Sources

Ground water provides a significant source of both drinking water and a source for irrigation for agricultural purposes throughout the Flint River Basin. Within the Coastal Plain Province, aquifer yields are high and groundwater withdrawals are an important part of the total water budget. The majority of public supply withdrawals in the Coastal Plain Province come from groundwater sources. The Floridan aquifer system supplied most of the ground water used in the basin in 1990, followed by the Claiborne, Clayton, crystalline-rock, and Providence aquifers.

As part of the Apalachicola-Chattahoochee-Flint and Alabama-Coosa-Tallapoosa (ACF/ACT) Comprehensive Basin Study, scientists at USGS completed studies of groundwater resources in each of eight geographic subareas of the ACF/ACT basins. The Flint River Basin is coincident with subareas 2 through 4 of this study.

Groundwater Subarea 2 includes the upper Flint River Basin from the headwaters to the Fall Line, and is within the Piedmont physiographic province (Chapman and Peck, 1995). This province is underlain by crystalline-rock aquifers (metamorphic and igneous rocks) having little or no primary permeability. Ground-water exploration in the Piedmont province of Georgia has had the reputation of being "difficult and unpredictable". The yield of bedrock wells depends on the characteristics of the water-bearing zones penetrated by the open borehole. Well yields greater than 100 gal/min (0.144 MGD) are considered to be high-yielding. Yields of 200 to 300 gal/min (0.288 to 0.432 MGD) are not uncommon when wells are properly sited. Chapman and Peck conclude that groundwater resources in Subarea 2 are underutilized. Today, as historically, the rural population relies on ground water as their principal source of water supply, whereas most populated areas, such as the metropolitan-Atlanta area, rely on surface water resources for supply. Ground water could serve as a supplemental resource during many peak demand periods and under drought conditions. Ground water also contributes to surface flow within Subarea 2. The estimated mean annual ground-water discharge contribution to the Flint River near Thomaston, Georgia is estimated to be about 690 cubic feet per second.

Groundwater Subarea 3 includes the part of the Flint River Basin between the Fall Line and Lake Blackshear, and is within the Coastal Plain physiographic province (Southern Coastal Plain and Georgia Sand Hills land-resource areas) (Mayer, 1995). The aquifer system in Subarea 3 is comprised of sedimentary rock sequences that dip and thicken to the south. The outcrop area of the sedimentary rocks functions as the recharge area of the aquifers, receiving precipitation that infiltrates down to the saturated zone. Most of the water that enters the aquifers as recharge is eventually discharged to nearby streams or rivers. Under mean conditions, 1,812 cfs is discharged from the groundwater flow system to the Flint River. In contrast, during the severe drought of 1986, 525 cfs was discharged to the Flint River. Total 1990 groundwater withdrawals in the Flint River Basin portion of Subarea 3 equaled about 3 percent of the mean annual ground-water discharge, and about 10 ½ percent of the 1986 drought discharge.

Groundwater Subarea 4 includes the lower Flint River Basin from Lake Blackshear to Lake Seminole (Torak and McDowell, 1994), and is also within the Southern Coastal Plain province. This area is underlain by Coastal Plain sediments consisting of alternative units of sand, clay, sandstone, dolomite and limestone that gradually thicken and dip gently to the southeast. The primary water-bearing system is the Upper Floridan aquifer. This aquifer has a high capacity to store and transmit water, attributable to the fractured nature of the constituent Ocala limestone and associated dissolution of limestone by ground water

3.3.2 Ground Water Supply Demands and Uses

Municipal and Industrial Water Uses

Sixty percent (109 MGD) of the Flint River M & I basin demand in 2005 is projected to be supplied by surface water withdrawals and 40 percent (72 MGD) by groundwater withdrawals. Ground water pumpage is expected to intercept some water that would have surfaced in the streams, and this amount can be viewed as groundwater demand that is effectively supplied by surface water. The ground water to surface water relationship is complicated; however, the 72

MGD groundwater demand is expected to ultimately reduce Flint River flow by about 22 MGD. Refer to section 3.2.2 for a detailed discussion of municipal and industrial water demand.

Agricultural Water Demand

Information from the Georgia Geological Survey suggests that 70 percent of the water used for crop and orchard commodities in 1992 came from ground sources. Much of this is attributed to the widespread irrigation taking place in the lower Flint basin. It is estimated that 82 percent of the water used for irrigation in the lower Flint basin is ground water. Of the other agricultural sectors inventoried, nurseries appear to be the only one to obtain water primarily from ground sources. Agricultural water sources in the Flint basin are not expected to change appreciably. Groundwater withdrawals in the Flint basin affect the surface water supply. In the lower Flint basin, every ten gallons of ground water withdrawn ultimately diminishes the surface water supply by about three gallons. Refer to section 3.2.2 for a detailed discussion of current and projected agricultural water demand.

3.3.3 Ground Water Supply Permitting

The Georgia Groundwater Use Act of 1972 requires permits from EPD for all non-agricultural users of more than 100,000 GPD of ground water. General information required of the applicant includes location (latitude and longitude); past, present, and expected water demand; expected unreasonable adverse effects on other users; the aquifer system from which the water is to be withdrawn; and well construction data. The permits issued by EPD stipulate the allowable monthly average and annual average withdrawal rates, standard and special conditions under which the permit is valid, and the expiration date of the permit. Groundwater use reports are generally required of the applicant on a semi-annual basis. The objective here is the same as with surface water permits. A list of active M & I ground water permits is provided in Table 3-4.

The 1988 Amendments to the Groundwater Use Act established the permitting authority within EPD to issue farm irrigation water use permits. As with the previously mentioned ground water permitting statute, the lower threshold is 100,000 GPD; however, users of less may apply and be granted a permit. Agricultural withdrawal permits are too numerous to list in this document.

Applicants for these permits who could establish that their use existed prior to July 1, 1988, and submitted their applications are received prior to July 1, 1991, are “grandfathered” for the operating capacity in place prior to July 1, 1988. Other applications are reviewed and granted with an eye toward protection of grandfathered users and the integrity of the resource. Generally, agricultural users are not required to submit any water use reports.

Table 3-4. Active Municipal and Industrial Ground Water Withdrawal Permits in the Flint River Basin

County	Permit #	Type	Permit User	Monthly Permitted Flow (MGD)	Yearly Permitted Flow (MGD)	Aquifer
Baker	004-0001	M	Newton, City of	0.250	0.250	Claiborne
Calhoun	019-0003	M	Arlington, City of	0.350	0.300	Floridan
Calhoun	019-0002	M	Edison, City of	0.300	0.200	Clayton
Calhoun	019-0001	M	Leary, City of	0.300	0.300	Claiborne, Tallahatta
Calhoun	019-0004	M	Morgan, City of	0.300	0.250	Clayton
Crawford	039-0001	M	Roberta, City of	0.240	0.180	Cretaceous Sand
Crisp	040-0001	M	Cordele, City of	4.100	3.000	Floridan, Tallahatta, Wilcox
Crisp	040-0002	I	Masonite Corporation	0.225	0.207	Floridan
Decatur	043-0002	I	Amoco Fabrics & Fibers Co - Bainbridge Mills	0.900	0.750	Floridan
Decatur	043-0003	M	Bainbridge, City of	3.000	2.400	Floridan
Decatur	043-0004	I	Decator County Industrial Airpark	0.650	0.550	Floridan
Decatur	043-0001	I	Southern Concrete Construction Company	0.285	0.235	Floridan
Dooly	046-0002	M	Vienna, City of	2.609	2.153	Cretaceous Sand, Claiborne
Dougherty	047-0002	M	Albany, City of - Water, Gas & Light Com	31.500	20.000	Clayton, PR, Tallahatta, Floridan
Dougherty	047-0001	I	Cooper Tire Company	0.720	0.720	Floridan
Dougherty	047-0011	I	Doublegate Country Club	0.720	0.720	Floridan
Dougherty	047-0012	I	Georgia Power Company - Plant Mitchell	0.250	0.250	Floridan
Dougherty	047-0008	I	Marine Corps Logistics Base	2.000	1.500	Tallahatta, Wilcox, Clayton, UK
Dougherty	047-0003	I	Merck & Company, Inc	10.440	8.550	Floridan
Dougherty	047-0007	I	Miller Brewing Company	3.000	3.000	Clayton, Tallahatta
Dougherty	047-0005	I	Procter & Gamble Paper Products Co	8.500	8.500	Floridan
Dougherty	047-0004	I	Southern Concrete Construction Company	0.250	0.160	Floridan
Dougherty	047-0013	I	Viking Distillery, Inc	0.100	0.100	Clayton
Dougherty	047-0010	I	Young Pecan Company - Nut Tree Division	0.180	0.100	Floridan

County	Permit #	Type	Permit User	Monthly Permitted Flow (MGD)	Yearly Permitted Flow (MGD)	Aquifer
Fayette	056-0001	M	Fayette County Water System	0.875	0.825	Crystalline Rock
Fayette	056-0002	M	Fayetteville, City of	0.937	0.937	Crystalline Rock
Lee	088-0001	M	Leesburg, City of	0.320	0.300	Tallahatta, Wilcox, Paleocene
Macon	094-0004	I	C-E Minerals - Plant #5 Mulcoa	0.100	0.100	Midway, Providence
Macon	094-0003	M	Marshallville,City of	0.155	0.120	Cretaceous Sand
Macon	094-0001	M	Montezuma, City of	1.250	0.810	Cretaceous Sand
Macon	094-0006	M	Oglethorpe, City of	0.370	0.330	Cretaceous Sand
Macon	094-0002	I	Southern Frozen Foods,Inc	2.000	1.000	Cretaceous Sand
Macon	094-0005	I	Weyerhaeuser Company	1.836	1.836	Providence Sand, Cusseta Sand
Marion	096-0001	M	Buena Vista, City of	2.000	1.750	Cretaceous Sand
Meriwether	099-0002	M	Greenville, City of	0.400	0.300	Crystalline Rock
Miller	100-0001	M	Colquitt, City of	0.420	0.300	Floridan
Mitchell	101-0002	M	Camilla, City of	3.500	3.000	Floridan
Randolph	120-0001	M	Cuthbert, City of	0.800	0.600	Clayton
Randolph	120-0003	I	Georgia Feed Products, Inc	0.200	0.200	Clayton
Randolph	120-0002	M	Shellman, City of	0.180	0.150	Claiborne
Schley	123-0001	M	Ellaville, City of	0.350	0.275	Cretaceous Sand
Seminole	125-0002	I	Columbia Yeast, Inc	1.200	1.200	Floridan
Seminole	125-0001	M	Donaldsonville, City of	1.000	0.800	Floridan
Stewart	128-0001	M	Richland, City of	0.100	0.100	Cretaceous Sand
Sumter	129-0001	M	Americus, City of	4.200	3.750	Cretaceous Sand
Sumter	129-0002	M	Plains, City of	0.220	0.195	Claiborne (Tallahatta)
Talbot	130-0001	M	Talbotton, City of	0.100	0.100	Crystalline Rock
Taylor	133-0003	M	Butler, City of	0.750	0.550	Cretaceous Sand
Taylor	133-0002	M	Reynolds, City of	0.450	0.255	Cretaceous Sand
Terrell	135-0001	M	Dawson, City of	3.000	2.000	Clayton
Upson	145-0001	M	Sunset Village Water System	0.106	0.106	Crystalline Rock

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