FINAL DRAFT

UPPER OCMULGEE RIVER BASIN
AN ENVIRONMENTAL IMPACT STATEMENT

<u>THE EXISTING ENVIRONMENT</u>

ENVIRONMENTAL PROTECTION AGENCY

REGION IV

ATLANTA, GEORGIA

MAY 16, 1977

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INTRODUCTION

The First Edition, Upper Ocmulgee River Basin Water Quality Management Plan was prepared by the Georgia Department of Natural Resources, Environmental Protection Division (EPD) in accordance with Public Law 92-500 (Section 303 (e)). The Upper Ocmulgee Basin, which is one of 15 basins designated by the State of Georgia for current study, contains approximately 1400 square miles. The Basin is located in the Piedmont region of Georgia and lies in the eastern portions of the Atlanta area.

The Upper Ocmulgee River Basin includes the drainage areas of the South, Yellow and Alcovy Rivers as well as minor tributaries flowing into Lake Jackson. Lake Jackson is a man-made impoundment resulting from the Lloyd Shoals Dam built by the Georgia Power Company in 1911. The Ocmulgee River joins with the Oconee River in southcentral Georgia to form the Altamaha River, which flows to the Atlantic Ocean north of Brunswick, Georgia.

The water quality of the Basin varies according to the river system and generally parallels the degree of urbanization in each of the major subbasins. The headwaters of the South River, which include portions of the downtown area of the City of Atlanta, demonstrate the highest degree of urbanization and consequently the worst water quality condition. Conversely, the Alcovy River drains a rural area and has the best water quality. The Yellow River geographically located between the South and Alcovy Rivers is currently experiencing suburban development, and the maintenance of its presently good water quality is a prime concern of the management plan.

The purpose of this impact statement, therefore, is to (1) predict water quality conditions in the Yellow River Sub-basin in the year 2000, (2) to formulate and evaluate various management system alternatives, (3) to meet future water quality standards, and (4) to recommend implementation of a feasible water quality management strategy.

PROJECT OBJECTIVES

The basic objective of the Environmental Impact Statement is to review the Upper Ocmulgee River Basin Water Quality Management Plan in light of the requirements of Section 303 (e) of Public Law 92-500, giving particular attention to non-point source loading and management alternatives to evolve a management strategy which will assure the maintenance of water quality standards. In pursuance of this basic objective a variety of other objectives are identified:

... Define a water quality management program which will assure the attainment of Georgia water quality standards and where...

... Evaluate state and local policies and programs including those for the management of land and other natural resources which may have a beneficial effect on the maintenance of water quality...

... Identify institutional arrangements and programs to implement coordinated decisions designed to achieve water quality goals and standards...

... Devise, evaluate and test applicable point and non-point source controls, both structural and non-structural, toward the achievement of water quality standards...

... Determine the effects of point and non-point sources resulting from projected population increases for the Yellow River Sub-basin...

... Determine the effects of projected loadings from each of the sub-basins to Lake Jackson...

... Develop an implementable and practical management strategy for the regulation and control of point and non-point sources of pollution, and where possible enhance water quality...

... In pursuing the above objectives, provide for a broad based geographically comprehensive public participation process aimed at informing and involving the public in the water quality management program.

PROJECT SCOPE

The Upper Ocmulgee River Basin contains approximately 1490 square miles including major portions of Gwinnett, Walton, DeKalb, Rockdale, Newton and Henry Counties. Smaller portions of Butts, Jasper, Clayton and Fulton Counties are also contained within the Basin. The Basin extends approximately 40 miles in an east-west direction and 50 miles in a north-south direction. The Basin Figure 13 identifies the Upper Ocmulgee Basin with its major sub-basins, major municipalities, and other physical features.

WATER QUALITY PROBLEMS

The pollution of the South River has been documented since 1890. Periodic re-evaluation since that date has occurred. Beginning in 1970, the Georgia Environmental Protection Division has conducted investigations of water quality on each of the major streams of the Upper Ocmulgee River Basin.

Stream surveys conducted by Georgia Environmental Protection Division since 1970 assessed the South River and many of its tributaries as either "polluted" or "grossly polluted." The water quality of the Yellow River during this time of surveying activitity was shown to be relatively high. Chemical and biological samples demonstrate healthy conditions on the main stem of the Yellow River and on several of its tributaries. Silt, however, presents problems due to past mining activities and runoff from construction activities at several locations in the upper reaches. The same surveys for the Alcovy River determine that the water quality is excellent chemically, bacterially, and from algae and micro-invertebrate analysis.

During 1969, the Georgia Environmental Protection Division, in cooperation with the U. S. EPA, prepared a Water Quality Study of Jackson Lake Upper Reservoir. This study preceded the National Eutrophication Survey conducted in 1975. Both studies indicate that Lake Jackson is in the process of accelerated eutrophication resulting from nutrient loads from the South River and Yellow River (the South River being the primary cause). Algae blooms were reported during the summer and fall months of 1970 and 1975. Concentrations of nitrogen and phosphorus in the South River embayment provide readings four to 25 times greater than theoretical limits of the Bowman-Wilder index. The potential for major fish-kills exists due to the respiration of algae blooms in the lake.

Beginning in March of 1968, the Georgia Environmental Protection Division, in cooperation with the City of Atlanta Water Pollution Control Division, initiated a cooperative water quality monitoring program. Monthly water quality samples are collected at nine locations along the South River with results of these analyses being published annually. During 1973, Georgia EPD began an intensive field investigation of the Yellow River Basin. The results of these monitoring and intensive survey efforts portray the following picture for the South and Yellow River respectively. South River is characterized by low dissolved oxygen concentrations, high concentrations of nutrients and oxygen demanding materials, and extremely high bacterial levels. A dissolved oxygen sag occurs in the vicinity of Flakes Mill Road in DeKalb County with average dissolved oxygen concentrations of 3.1 to 3.3 milligram per liter experienced. During the summer dry months these conditions exist along the main stem of the South River for a distance of 10 to 15 miles.

Conversely, water quality monitoring data on the Yellow and Alcovy Rivers shows high water quality throughout the year. The only reported instances contrary to this finding occur on tributaries to the Yellow River, Brumbelow and Sweetwater Creeks. On these tributaries relatively high BODs have been found. However, generally speaking, water quality of the Yellow and Alcovy Rivers has been found to be excellent with high dissolved oxygen concentrations.

WATER QUALITY STANDARDS

The water quality standards of the State of Georgia are incorporated in the Rules of the Georgia Water Quality Control Board, Chapter 730-3 as amended. While these rules do not specifically identify a non-degradation policy, they do speak to the enhancement of water quality in the State of Georgia by stating..."the purposes and intent of this State in establishing water quality standards are to provide enhancement of water quality and the prevention of pollution... ."

These rules also provide water use classifications and standards for each of the classified water uses. The criteria for each of the water classifications vary, with the Drinking Water classification having the most stringent quality criteria and Urban Systems having the least severe criteria

On the basis of the Water Quality Management Plan, segments of the three major rivers of the Upper Ocmulgee Basin have been classified in accordance with the rules of the Georgia Water Quality Control Board. Stream segments and their classifications are as follows:

Location			Classification
South River	---	headwaters to Ga. Highway 81	Urban
Yellow River	---	Ga. Highway 124 to Porterdale Water Intake	Drinking Water
Jackson Lake	---	South River at Highway 36, Yellow River at Highway 36, Alcovy River at Newton Factory Bridge to Lloyd Shoals Dam	Recreation
Alcovy River	---	Ga. Highway 138 to Covington Water Intake	Drinking Water
Intrenchment Creek	---	headwaters in Atlanta to confluence with South River	Urban
Shoal Creek	---	headwaters in DeKalb County to confluence with South River	Urban
Conley Creek	---	headwaters near Atlanta Army Depot to confluence with South River	Urban
Doolittle Creek	---	headwaters in DeKalb County to confluence with South River	Urban
Snapfinger Creek	---	headwaters in DeKalb County to confluence with South River	Urban

Stream segments in each of the major sub-basins have been classified by Georgia Environmental Protection Division as "limited" to insure that stream quality standards are maintained. Segments which are presently meeting water quality standards or which will with the application of secondary treatment are classified as "effluent limited." Segments that will meet applicable water quality standards with the application of secondary treatment and with effluent dissolved oxygen concentrations of 5.0 mg/l are classified as "effluent limited D.O. exception." Segments which will not meet standards with the application of secondary treatment are classified as "water quality limited." The maximum waste load from point wastewater sources which will allow stream water quality standards to be met is determined. In each instance, these determinations are based largely on point sources without quantification of non-point sources due to the lack of existing data.

The existing condition of the Basin in terms of water supply withdrawals and wastewater treatment facilities demonstrates that 80 percent of the water supply currently used in the Basin occurs as a result of inter-basin transfer, the source of this water supply being the Chattahoochee River including Lake Lanier. There are also five small surface water intakes existing within the Basin, which are identified in the following table:

Surface Water Intakes

County	Owner	Stream Source
Henry	Clayton County Water Authority	Little Cotton Indian Creek
Henry	City of McDonough	Walnut Creek
Rockdale	Conyers Water System	Yellow River
Newton	City of Covington	Alcovy River
Newton	City of Porterdale	Yellow River

Source: Upper Ocmulgee River Basin Water Quality Management Plan, Georgia Department of Natural Resources, Environmental Protection Division, 1974.

WASTEWATER TREAMENT FACILITIES

The Upper Ocmulgee Basin is replete with a variety of wastewater treatment facilities. These facilities range from antiquated Imhoff tanks, providing primary treatment, to more sophisticated biological treatment facilities offering secondary level treatment.

The Upper Ocmulgee River Basin has a total of 102 wastewater treatment facilities that treat domestic sewage. Fifty-two of the facilities are institutionally or privately owned and have a total design capacity of 2.8 MGD. Facility sizes range from 0.006 to 20.0 million gallons per day (MGD).

Thirty-nine of the 50 municipal discharges in the Upper Ocmulgee River Basin have received NPDES permits. In terms of design flow capacity, 65.1 MGD of the Basin total 68.3 MGD are under permit. Six of the 52 privately and institutionally owned facilities are under NPDES permit.

There are less than six direct industrial discharges in the Basin. This is primarily due to the existence of readily available municipal sewage systems to receive industrial wastewater. Industrial discharges that do exist are gravel-crushing operations in the Stone Mountain area which collect, settle and/or reuse their crushed stonewash water to the maximum extent possible. There are no major (EPA definition) industrial discharges in the Basin. Twenty-five percent of the industrial discharges have received NPDES permits.

In the 1974 municipal needs survey conducted by the State of Georgia it was revealed that $209,449,000.00 was needed in the Upper Ocmulgee River Basin alone to install or upgrade treatment facilities, to construct or upgrade collection systems, and to correct combined sewer situations. The same survey reported the need of $236,970,000.00 to treat or control stormwaters in urban areas. Future wastewater treatment expenditures by existing dischargers will comply with the receiving stream water quality standards.

The recently completed AWRS wastewater plan identified a variety of projects which affect the Basin. These projects include land disposal in south Clayton County and Basin transfer of either treated effluent or raw sewage to regional treatment facilities. In addition, an effluent disposal or "re-diversion" project is currently underway which will provide for treated effluent from Atlanta's Intrenchment Creek, South River, and Flint River plants to be pumped over the sub-basin divide for ultimate discharge to the Chattahoochee River. The following identifies the major public wastewater treatment facilities and their flows in million gallons per day as of 1975.

NON-STRUCTURAL PROGRAMS

A variety of non-structural programs are currently in operation or hold promise for a significant improvement in water quality, particularly in the area of pollutants resulting from non-point sources. The AWRS investigated some of these non-structural alternatives concluding that rate structures and building codes which require water-saving devices hold the greatest promise for reducing water consumption.

The study, however, only briefly identifies areas for further investigation regarding non-point sources. Such typical control devices as stormwater retention requirements, erosion and sedimentation control ordinances, flood plain ordinances, and watershed preservation techniques all hold promise for reducing pollutant loads from non-point sources. Some of these techniques are currently being employed by some jurisdictions, but the pattern is not consistent throughout the Basin. Other techniques at this stage are merely concepts without supporting authorizing legislation or practical implementation techniques. One of the major objectives of this EIS is to identify non-structural solutions to reduce pollutant loads from non-point sources and to identify the techniques required to implement them within the framework of a total management system.

PROJECT HISTORY

The First Edition, Upper Ocmulgee River Basin Plan, prepared by the Georgia EPD (DNR), was undertaken in compliance with Section 303 (e) of the Federal Water Pollution Contract Act Amendments of 1972 (PL 92-500). The First Edition Plan was so captioned in that it dealt with existing data and did not involve extensive investigations in all subject areas to develop empirical data. The plan was subjected to public hearing January 31, 1975, following a public notice issued December 27, 1974. The Basin Plan was officially transmitted to Region IV, U. S. Environmental Protection Agency on June 26, 1975.

Review comments of Region IV, U. S. EPA were transmitted to the Water Quality Control Section, EPD, January 29, 1975. The letter identified major points requiring further clarification as follows:

A. Phosphorus limitations to protect Lake Jackson are placed on some plants even when advanced treatment is required. The same limitations on phosphorus should be applied to all plants or the rationale given for allowing exceptions.

B. Recommendations should be given on updating streams classified as "urban" since the models show that all can meet fishing criteria for dissolved oxygen.

C. The NPDES permits should be referenced with effluent limitations and compliance schedules included.

D. A segment priority list is needed and system for ranking segments and facilities should be consistent to that in the State program plan.

E. Municipal waste treatment needs and estimated cost should be included in the plan.

F. A more complete compliance schedule is needed to provide dates for all milestones. Also, the implementation tables should include other effluent objectives in addition to BOD, such as ammonia and phosphorus.

G. Reference should be made to facility planning and other planning in the area.

In July of 1975, EPD (DNR) transmitted the first addendum to the Upper Ocmulgee River Basin Water Quality Management Plan, answering comments received at the public hearing and also those of the Region IV EPA.

A Notice of Intent to prepare an EIS was circulated on December 18, 1975 by Mr. Jack E. Ravan, Regional Administrator, Region IV, EPA. This Notice of Intent specifically identified the Yellow River Sub-basin as a focus of alternative wastewater treatment management systems and also indicated the importance of investigating the secondary effects of development. This decision calling for an EIS was further explained to EPD in a letter from Mr. Ravan dated February 24, 1976. This letter indicated that one of the major considerations of his decision was the request of several parties concerned with the total impact of development upon water quality in the Upper Ocmulgee River Basin.

While undoubtedly many groups and agencies were concerned with the Basin plan, the record indicates that the dominant group was the DeKalb Chapter of the Georgia Conservancy, Incorporated. This group, through their attorney, formally placed their request in the form of a letter petitioning for an EIS on the Yellow River Basin before the Regional Administrator on July 6, 1973. The response of Mr. Ravan, dated August 14, 1973, informed the Conservancy of the ongoing Upper Ocmulgee Basin Water Quality Management Plan and deferred action until the completion of that plan.

The record continues with a subsequent request by the Georgia Conservancy, DeKalb Chapter, dated April 11, 1975 calling for an EIS on the Upper Ocmulgee River Basin, specifically in light of the request for a Step II Grant Application on the South River Advanced Wastewater Treatment Facility. The response to this letter by Mr. Ravan in May of 1975 informed the DeKalb Chapter of the Georgia Conservancy that no decision had yet been reached to perform an EIS, and that the Upper Ocmulgee River Basin Water Quality Management Plan had been returned for additional work. The DeKalb Chapter had officially petitioned for an Environmental Impact Statement on the Yellow River Basin in July of 1973. Subsequently, during April 1975, the Citizens Task Force of the Metropolitan Water Resources Study formally requested an EIS on the entire Upper Ocmulgee River Basin. During this same time period, algae blooms were experienced during the spring and fall seasons on Lake Jackson. The National Eutrophication Survey report of Lake Jackson (July 1975) attributed these blooms to high concentration of nitrogen and phosphorus flowing into the lake, particularly from the South River but to a lesser degree from the Yellow River.

During this time period, the Metropolitan Atlanta Water Resources Study was concluding its wastewater management plan which stated..."the primary non-point source problem in the region is urban runoff from heavily developed areas. Estimated on an annual basis, the urban runoff loading equals the loads from point sources, at current treatment levels."

The Water Supply Plan of the Metropolitan Atlanta Water Resources Study also suggested that the Conyers-Rockdale County Water System anticipate abandoning its water intake on the Yellow River and pursue intergovernmental agreements with Gwinnett and DeKalb Counties for future supplies. The reason given for this recommendation was that ..."future development ..will result in unsuitable water quality unless the watersheds and streams are protected from excessive pollution from wastewater discharges and urban runoff."

The chain of events occurring within a three-year period led to the call for an EIS. The common thread running throughout these historical events is that non-point pollutant loads resulting from increased urbanization, particularly in the Yellow River Sub-basin, poses significant problems for the maintenance of water quality standards.

The action of the Regional Administrator is a forceful acknowledgement that non-point sources and the identification of means to control them are critical to the maintenance of water quality standards. The EIS, therefore, requires a thorough evaluation and analysis of management alternatives to control such sources and to evaluate their consequences to Lake Jackson.

II. THE EXISTING ENVIRONMENT

A. NATURAL ENVIRONMENT

1. Atmosphere

a. Climate -- The Upper Ocmulgee River Basin has a temperate climate and lies within the humid subtropics climatic zone where for most of the year the dominant air masses are moist, warm, and unstable. In summer the area is particularly affected by the Bermuda High pressure system which brings maritime tropical air inland from its anticyclonic circulation. During the winter the basin is affected by the mid-latitude belt of low pressure systems so that polar continental and maritime tropical air masses dominate (Critchfield 1966). The humid subtropical climatic regime is altered somewhat by the presence of the Appalachian mountains to the north of the basin. Elevations in the basin average 700 to 1000 feet (ft) and are not a major climatic factor.

Within the basin, the Atlanta Station of the National Oceanic and Atmospheric Administration (NOAA) at Hartsfield Atlanta International Airport is the only recording station for detailed climatological data (Table 1). Limited information is recorded at Covington and Norcross NOAA stations.

Summer temperatures in the basin are warm with daytime highs averaging 80-90° Fahrenheit (°F) for the months of June, July, August, and September. Covington records a mean daily temperature of 76.8, 79.0, 78.4, and 73.0°F for these months, respectively (U. S. Department of Commerce 1973). The highest temperature ever recorded at the Atlanta Station is 98°F; afternoon high temperatures equal or exceed 90°F less than one day in five (U. S. Department of Commerce 1975).

Winters are mild and cold spells are not prolonged. For the winter months, the Covington station lists these mean temperatures: December 44.9°F, January 44.1°F, and February 46.6°F; Atlanta mean temperatures are between one and two degrees cooler (U. S. Department of Commerce 1973). Freezing temperatures, 32°F and below, occur about 60 times per year (U. S. Department of Commerce 1975).

Annual precipitation for the basin is approximately 50 inches (in.), almost all of which falls as rain. The driest month is usually October with a mean of 2.5 in.

Table 1. Meteorological data: normals, means and extremes for Atlanta, Georgia.[a]

	Temperatures °F					Precipitation in inches				
	Normal[b]			Extremes		Water equivalent				Snow, ice pellets
Month	Daily maximum	Daily minimum	Monthly	Record highest	Record lowest	Normal	Maximum monthly	Minimum monthly	Maximum in 24 hrs.	Maximum monthly
c				15	15		41	41	41	41
Jan	51.4	33.4	42.4	77	-3	4.34	10.82	1.42	3.91	8.3
Feb	54.5	35.5	45.0	79	8	4.41	12.77	0.99	5.67	3.9
Mar	61.1	41.1	51.1	85	20	5.84	11.51	2.44	5.08	4.8
Apr	71.4	50.7	61.1	88	26	4.61	9.86	1.45	4.26	T[d]
May	79.0	59.2	69.1	93	37	3.71	7.83	0.32	5.13	0.0
Jun	84.6	66.6	75.6	98	48	3.67	7.52	0.74	3.41	0.0
Jul	86.5	69.4	78.0	98	53	4.90	11.26	1.20	5.44	0.0
Aug	86.4	68.6	77.5	98	56	3.54	8.69	0.88	5.05	0.0
Sep	81.2	63.4	72.3	96	36	3.15	7.32	0.26	5.46	0.0
Oct	72.5	52.3	62.4	88	29	2.50	7.53	T	3.27	0.0
Nov	61.9	40.8	51.4	84	14	3.43	15.72	0.41	4.11	1.0
Dec	52.7	34.3	43.5	77	1	4.24	9.92	1.08	3.85	2.5
Year	70.3	51.3	60.8	98	-3	48.34	15.72	T	5.67	8.3

Table 1. Continued

Table 1. (continued)

Month	Relative humidity %				Wind				Mean number of days	
	Hour 01	Hour 07 (Local	Hour 13 time)	Hour 19	Mean speed mph	Prevailing direction[e]	Fastest mile Speed mph[f]	Fastest mile Direction	Thunder-storms	Heavy fog, visibility $\leq$ 1/4 mi
	15	15	15	15	37	14	33	33	41	41
Jan	77	80	61	66	10.5	NW	54	NW	1	5
Feb	70	76	55	58	11.0	NW	59	W	1	3
Mar	70	79	52	55	11.0	NW	69	SE	4	3
Apr	72	80	52	53	10.1	NW	68	SW	4	2
May	79	83	55	59	8.6	NW	65	SW	6	1
Jun	84	86	39	65	7.9	NW	70	NE	9	1
Jul	88	90	64	71	7.4	SW	56	SE	11	2
Aug	87	91	62	70	7.1	NW	49	NW	8	2
Sep	84	89	61	69	8.0	ENE	49	N	3	2
Oct	78	84	53	65	8.3	NW	47	NW	1	2
Nov	76	82	54	63	9.1	NW	46	NE	1	3
Dec	76	80	60	67	9.8	NW	63	W	1	5
Year	78	83	57	63	9.1	NW	70	NE	50	31

Table 1. Continued

Table 1. (concluded)

[a]Source: U. S. Department of Commerce. 1975. Local climatological data, annual summary with comparative data, 1975, Atlanta, Georgia. Natl. Clim. Cent., Asheville, N. C. n.p.

[b]Normals are based on record for the 1941-1970 period.

[c]Length of record, in years, through the current year.

[d]T = Trace amount.

[e]Prevailing wind direction -- record through 1963.

[f]Fastest mile wind-speed is fastest observed 1-minute value when the direction is in tens of degrees.

of rain; the wettest month is usually March with a mean of 5.8 to 6.0 in. of rain. Among the three stations in the basin, Norcross, Covington, and Atlanta, similar precipitation normals are recorded and the difference from one station to the next is less than 0.85 in. of rain per month (U. S. Department of Commerce 1973).

Average annual snowfall is about 1.5 in. However, a snow of 4 in. or more occurs about once every five years (U. S. Department of Commerce 1975).

Storms entering the basin are usually fully developed systems, especially in the winter, involving tens of thousands of square miles. These storms, which commonly dominate the basin's weather for several days at a time, are often accompanied by heavy rains. The maximum recorded rainfall in a 24-hour (hr) period at the Atlanta Station during 1975 was 2.25 in. (in April); the maximum 24-hr rainfall recorded in Atlanta in 41 years of observations occurred in February 1961 and equalled 5.7 in. (U. S. Department of Commerce 1975). One type of large storm, the hurricane, reaches the basin only in remnants, since a hurricane loses its tropical characterization as it crosses land /the Upper Ocmulgee River Basin is located approximately 250 miles (mi) from both the Atlantic Ocean and the Gulf of Mexico/. High winds associated with these storms are not as much of a concern as are heavy rains and subsequent flooding. Smaller, localized storms occur throughout the year but are especially frequent during spring and early summer months. The Atlanta Station records approximately ten thundershowers a month during May, June, and July, with a yearly total of about 50 such storms (U. S. Department of Commerce 1975).

Winds are from the northwest for all but two months of the year, July and September, when they prevail from the southwest and east-northeast respectively (Figure 1). Winds average only about 9 miles per hour (mph) during the year (U. S. Department of Commerce 1975).

Tornadoes, with winds up to 200 mph, are most likely to occur in March, April, or May. The counties in the Upper Ocmulgee River Basin list these occurrences for approximately the last 25 years:

Rockdale	1	Gwinnett	4
Clayton	3	DeKalb	5
Newton	3	Walton	6
Henry	4	Fulton	6

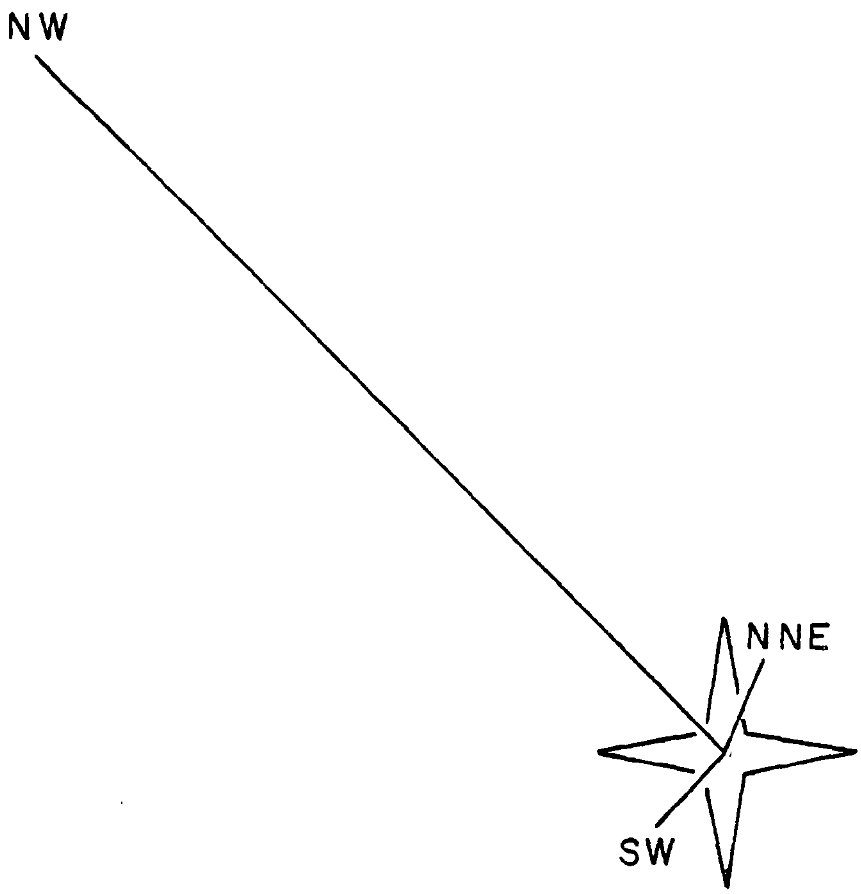


Figure 1. Wind rose diagram for Atlanta, Georgia

Source: U.S. Department of Commerce, NOAA. 1975. Local climatological data, annual summary with comparative dats, 1975, Atlanta, Georgia. Natl. Clim. Center, Asheville, N.C. n.p.

The average path of Georgia tornadoes is about 10 mi long and about 250 yards wide. Typically, tornadoes last only a few minutes, but there is wide variation in size and duration (Carter 1970).

The relative humidity recorded at the Atlanta Station averages 70 percent annually with a typical high of 90 percent for the summer months.

Heavy fog, with visibility 1/4 mi or less occurs throughout the year, but more commonly in the winter, for a yearly average of 31 days (U. S. Department of Commerce 1975).

Stable atmospheric conditions, such as those created by a temperature inversion, occur only occasionally in the Upper Ocmulgee River Basin. Such conditions, which retard the dispersion of airborne contaminants and thus trap pollutants in the lower atmosphere, are generally evidenced by the formation of smog. Based on advisories issued by the Atlanta Weather Service Office, major stagnations occur only once or twice a year, usually during fall or summer months (personal communication, National Weather Service Office, Atlanta, Georgia, 3 December 1976).

b. Air Quality -- Air quality in a specified locality or region describes the state of cleanliness of the ambient air. Air pollutants in the form of gases, liquid droplets, or solid particles are emitted into the ambient air by both natural and man-made sources. Natural sources include vegetation, wind-transported dust, and lightning. Man-made sources include internal combustion engines, industrial processes, heating systems, and waste disposal methods. Although natural sources emit a greater quantity of pollutants on a worldwide basis, man-made sources centered around urban areas emit large concentrations of contaminants that create local and regional pollution problems. Air pollutants reduce visibility, produce obnoxious odors, damage personal property and crops, and create a public health hazard. It has been estimated that the national cost of air pollution damage in 1968 totaled $16.1 billion--$5.2 billion for residential property, $4.7 billion for materials, $6.1 billion for health, and $0.1 billion for vegetation (Barrett and Waddell 1973).

Factors which affect air quality (or conversely air pollution potential) include: 1) the magnitude and distribution of emission sources within a region and 2) the dispersion of these emissions as controlled by wind speed, wind direction, and atmospheric stability which is characterized by rates of diffusion and by the height in the atmosphere where mixing occurs. High wind speeds and high heights of mixing represent conditions of low air pollution potential, while low wind speeds and low heights of mixing represent conditions of high air pollution potential.

Stable atmospheric conditions that retard the dispersion of airborne contaminants and thus trap pollutants in the lower atmosphere are relatively infrequent in the Upper Ocmulgee River Basin. Air stagnation advisories, which indicate occurrence of stable atmospheric conditions (i.e., high air pollution potential), generally are issued only once or twice a year by the Atlanta Weather Service Office, usually during the summer or fall. Prevailing northwesterly winds averaging 9 mph help disperse air pollutants released from facilities in the study area.

The Georgia Department of Natural Resources (GDNR 1975a) has adopted ambient air quality standards which state that "No person shall cause, suffer, permit, or allow emission from any source the quantities of compounds listed below which would cause the ambient air concentrations listed to be exceeded." The aforementioned compounds and ambient air concentrations, as given by the State, are shown in Table 2.

National ambient air quality standards, as set forth by the U. S. Environmental Protection Agency (EPA), are also listed in Table 2. These federal standards are divided into two levels of protection: primary ambient air quality standards are defined as levels of air quality necessary to protect the public health, while secondary ambient air quality standards are defined as levels of air quality necessary to protect the public welfare (primarily property) from any known or anticipated adverse effects of an air pollutant. In addition to establishing these standards, EPA also established a regional classification system based upon measured ambient air quality, where known, or where unknown, upon estimated air quality in the area of maximum pollutant concentration. Each region was classified separately with respect to sulfur oxides, particulate matter, carbon monoxide, nitrogen dioxide, and photochemical oxidants. Priority classifications of these pollutants are defined in Table 3. Classifications of the Air Quality Control Regions (AQCR) represented in the Upper Ocmulgee River Basin with respect to each of these pollutants are shown in Table 4.

Table 2. State and Federal ambient air quality standards.

Pollutant	Units[a]	Time interval[b]	Georgia[c]	EPA[d] Primary	EPA[d] Secondary	Reference measurement method
Suspended particulates	ug/m^3	maximum 24-hour concentration	150	260	150	High volume
	ug/m^3	annual geometric mean	60	75	60	High volume
Sulfur dioxide (SO_2)	ug/m^3 ppm		715(1 hr) 0.28	--	1300(3 hr) 0.50	West-Gaeke
	ug/m^3 ppm	maximum 24-hour concentration	229 0.09	365 0.14	260	West-Gaeke
	ug/m^3 ppm	annual arithmetic mean	43 0.015	80 0.03	60 0.02	West-Gaeke
Nitrogen dioxide (NO_2)	ug/m^3 ppm	maximum 24-hour concentration	300 0.15	--	--	
	ug/m^3 ppm	annual arithmetic mean	100 0.05	100 0.05	100 0.05	Cond. Method-Arsenite Chemiluminescense
Carbon monoxide (CO)	mg/m^3 ppm	maximum 1-hour concentration	40 35	40 35	40 35	Non-dispersive infrared spectrometry
	mg/m^3 ppm	maximum 8-hour concentration	10 9	10 9	10 9	Non-dispersive infrared spectrometry

Table 2. Continued

Table 2. (concluded)

Pollutant	Units[a]	Time interval[b]	Georgia[c]	EPA[d] Primary	EPA[d] Secondary	Reference measurement method
Total non-methane hydrocarbons (HC)	ug/m^3 ppm	maximum 3-hour concentration	98 0.15	160 0.24	160 0.24	Flame ionization detector
Total oxidants (ozone)	ug/m^3 ppm	maximum 1-hour concentration	98 0.15	160 0.08	160 0.08	Chemiluminescense

[a]Standard conditions for determinations: SO_2 at 0^oC, 1 atmosphere; NO_2, CO, HC, and ozone at 25^oC, 1 atmosphere. Unit measurements: ug/m^3 = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter, and ppm = parts per million.

[b]EPA standards specify that maximum 1-hour, 8-hour, and 24-hour concentrations are not to be exceeded more than once per year.

[c]Source: Georgia Department of Natural Resources. 1975. Rules and regulations for air quality control. Environmental Protection Division, Atlanta.

[d]Source: General Services Administration. 1973. Code of federal regulations 40: protection of the environment, part 52. U. S. Gov. Printing Office, Washington, D. C.

Table 3. Ambient concentration limits which define the EPA Priority Classification System.[a]

Pollutant	Priority I	Priority II	Priority III
Sulfur oxides (ug/m^3)[b]	Greater than (>)	From-to	Less than (<)
Annual arithmetic mean	100(0.04)[c]	60-100(0.02-0.04)	60(0.02)
24-hour maximum	455(0.17)	260-455(0.10-0.17)	260(0.10)
3-hour maximum	--	Any conc 1300(0.50) -1300(0.50)	1300(0.50)
Suspended particulates (ug/m^3)	>	From-to	<
Annual geometric mean	95	60-95	60
24-hour maximum	95	150-325	150
Carbon monoxide (mg/m^3)[d]	Greater than or equal to (≥)	From-to	<
1-hour maximum	55	--	55
8-hour maximum	14	--	14
Nitrogen dioxide (ug/m^3)	≥	From-to	<
Annual arithmetic mean	110	--	110
Photochemical oxidants (ug/m^3)	≥	From-to	<
1-hour maximum	195(0.10)	--	195(0.10)
Hydrocarbons (ug/m^3)	≥	From-to	<
1-hour maximum	195(0.10	--	195(0.10)

[a]Source: General Services Administration. 1973. Code of federal regulations 40: protection of the environment, part 51. Washington, D. C.

[b]Micrograms/cubic meter

[c]Values in parentheses are parts per million (ppm).

[d]Milligrams/cubic meter

Table 4. Priority classification of air pollutants in the Air Quality Control Regions (AQCR's) represented in the Upper Ocmulgee River Basin.[a]

AQCR	Pollutant				
	Particulate matter	Sulfur oxides	Nitrogen dioxide	Carbon monoxide	Photochemical oxidants (hydrocarbons)
Metropolitan Atlanta[b] Intrastate	I	I	I	III	III
Central Georgia[c] Intrastate	I	I	III	III	III
Northeast Georgia[d] Intrastate	II	III	III	III	III

[a]Source: General Services Administration. 1973. Code of federal regulations 40: protection of the environment, part 52. U. S. Gov. Printing Office, Washington, D. C.

[b]Metropolitan Atlanta Intrastate AQCR includes Butts, Clayton, DeKalb, Fulton, Gwinnett, Henry, and Rockdale counties.

[c]Central Georgia Intrastate AQCR includes Jasper County.

[d]Northeast Georgia Intrastate AQCR includes Newton and Walton counties.

More specific information regarding ambient air quality in the Upper Ocmulgee River Basin may be obtained from area and point sources emission inventory records compiled by the Air Protection Branch of the Georgia Department of Natural Resources or from monitoring data collected by the Air Quality Evaluation Section, GDNR. These data reveal that suspended particulates and sulfur dioxide are the major concerns within the study area. Area source emission estimates, by county, list no estimated emission values for nitrogen dioxide, carbon monoxide, or hydrocarbons. Emission estimates for suspended particulates range from 85 tons per year in Fulton County to 1 ton per year in Butts County (Table 5). Estimates of sulfur dioxide emissions range from 40 tons per year in Fulton County to 0 tons per year in Butts, Clayton, and Jasper counties (Table 5).

Appendix A (Table A-1) contains a list of identified point sources within the study area (these facilities are listed by county, and therefore all may not be located within actual project boundaries), major air pollutants discharged by each (in tons per year), and allowable pollutant discharges. Figure 2 shows the relative locations of these air pollution sources. Like the area sources data, the point source data indicate that the area's major air pollutants are suspended particulates and sulfur dioxide. These data also reveal that facilities within the area are generally emitting suspended particulates and sulfur oxides far below their maximum allowable emissions for these pollutants. According to EPA, Air Enforcement Branch (personal communication, Atlanta, 7 January 1977), six facilities within the Upper Ocmulgee River Basin are not currently in compliance with state and federal ambient air quality standards. These facilities, however, are meeting an EPA-approved schedule for attaining compliance.

The state maintains air quality monitoring stations in three counties which lie partially within the Upper Ocmulgee drainage. Suspended particulates are measured at one location--the McDonough Health Center--in Henry County; at three locations--the DeKalb County Health Department, Doraville Health Center, and Lithonia Health Center--in DeKalb County; and at 11 locations in Fulton County--representative Fulton County locations chosen for this study are the Fulton County Health Department, South River Treatment Plant, Georgia Tech Placement Center, and Fire Station #34. Of these three counties, only Fulton County has state monitoring data regarding sulfur dioxide, nitrogen dioxide and carbon

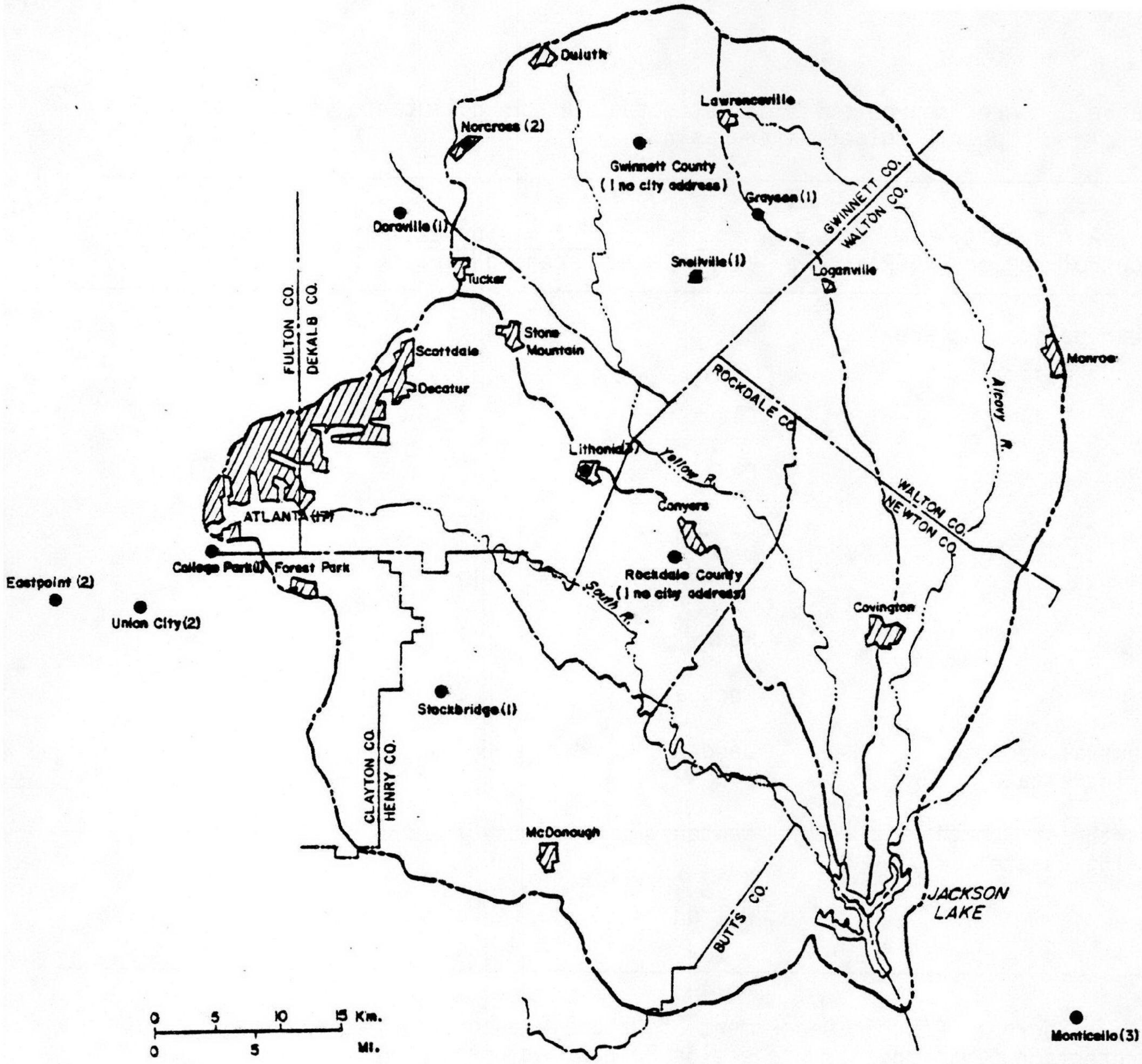
Table 5. Area source emission estimates for air pollutants in the Upper Ocmulgee River Basin.[a]

Air quality control region (AQCR)	County[b]	Emission estimates (tons/year)[c]	
		Suspended particulates	Sulfur dioxide
Metropolitan Atlanta Intrastate	Butts	1	0
	Clayton	3	0
	DeKalb	45	21
	Fulton	85	40
	Gwinnett	13	7
	Henry	7	4
	Rockdale	2	1
Central Georgia Intrastate	Jasper	5	0
Northeast Georgia Intrastate	Newton	7	1
	Walton	7	1

[a]Source: Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch, Atlanta. 1976.

[b]Year of record for each county's data is 1974.

[c]Concentrations of nitrogen oxides, hydrocarbons, and carbon monoxide are extremely low in these counties; area source data sheets provided by Georgia's Air Protection Division list no emission estimates for these pollutants.



UPPER OCMULGEE RIVER BASIN

MAJOR AIR POLLUTION SOURCES

FIGURE 2

monoxide; photochemical oxidants have been monitored in DeKalb County. Hydrocarbons are not currently monitored in the Atlanta area, as the State has experienced some difficulties with their analytical system and is presently awaiting EPA approval of a new analyzer (personal communication, Air Quality Evaluation Section, GDNR, Atlanta, 7 January 1977).

Monitoring data from DeKalb, Fulton, and Henry counties for 1975 and the first and second quarters of 1976 represent a typical air quality picture for the project area. These data, presented in Appendix A (Tables A-2, A-3, and A-4), reveal that suspended particulates, sulfur dioxide, nitrogen dioxide, and carbon monixide, are generally quite low and only once during this time period was any established air quality standard for these four parameters exceeded -- the 24-hour maximum suspended particulates value of 164.0 ug/m^3 recorded at the Georgia Tech Placement Center in 1975 exceeded the State and secondary Federal standard of 150 ug/m^3. Although mean concentrations of photochemical oxidants (ozone) measured at South DeKalb College are also generally rather low, both state and federal maximum 1-hour standards (98 and 160 ug/m^3, respectively) were exceeded in 1975 and in the second and third quarters of 1976 (Table A-5).

Generally all available data indicate the Upper Ocmulgee River Basin currently possesses relatively clean air, with state and federal ambient air quality standards rarely exceeded, except in the case of ozone in DeKalb County. The data reveal that the major pollutants in the area are suspended particulates and sulfur dioxide, but even these pollutants are generally well below adopted ambient air quality standards.

c. Noise -- Noise is a parameter of air quality and excessive noise is classified as an environmental pollutant (U. S. Environmental Protection Agency 1974). Noise is usually measured at the source in decibels (dB), with the dB level inversely proportional to the distance from the source (Table 6). Some of the effects of noise caused by transportation, construction, manufacturing, blasting, etc., are interference with communication and sleep and damage to hearing. Furthermore, the human body interprets loud noise as a stress, and the body's physiological response to such noise is similar to its responses to danger (U. S. Environmental Protection Agency 1972).

Much of the Yellow River sub-basin is rural and excessive noise is not a significant problem at this time. Likely noise pollution sources in the sub-basin would be airports, superhighways and certain industrial operations, such as quarrying. Existing airports and superhighways in the area are shown on Figure 3.

Table 6. Sound levels and human response.[a]

Cause	Noise level in decibels	Human response
	140	
	130	Pain
Jet takeoff from 200 ft Auto horn from 3 ft	120	Maximum vocal effort
	110	
Jet takeoff from 2000 ft Construction site (Estimated) Quarry operation	100	
Heavy truck from 100 ft	90	Hearing damage with 8 hour exposure
	80	Stress reactions
Freeway traffic from 50 ft	70	
Freight train from 50 ft	60	
Light auto traffic from 100 ft	50	Annoyance; interrupts conversation
	40	
(Estimated) rural area		
	30	
	20	
	10	Barely audible
	0	Threshold of hearing

[a]Source: U. S. Environmental Protection Agency. 1972. Noise pollution. Washington, D. C. 12 pp.

Noise pollution is controlled by federal law in the Noise Control Act of 1972. There are no state or local ordinances for the Yellow River sub-basin (personal communication, T. M. Leslie, environmental engineer, Atlanta Regional Commission, Atlanta, Georgia, 2 December 1976); however, the Atlanta Regional Commission (ARC) has proposed a noise policy for its planning district, which includes DeKalb, Gwinnett, and Rockdale counties. The ARC (1976) uses a composite noise rating (a weighted decibel measure that allows for duration and other factors) and its plan states:

> New residential land uses should be prevented in those areas within the 100 composite noise rating contour experiencing most intense noise impacts. Incentive programs should be developed and implemented for the encouragement of industrial, commercial and other land uses in appropriate portions of the 100 composite noise rating contour.

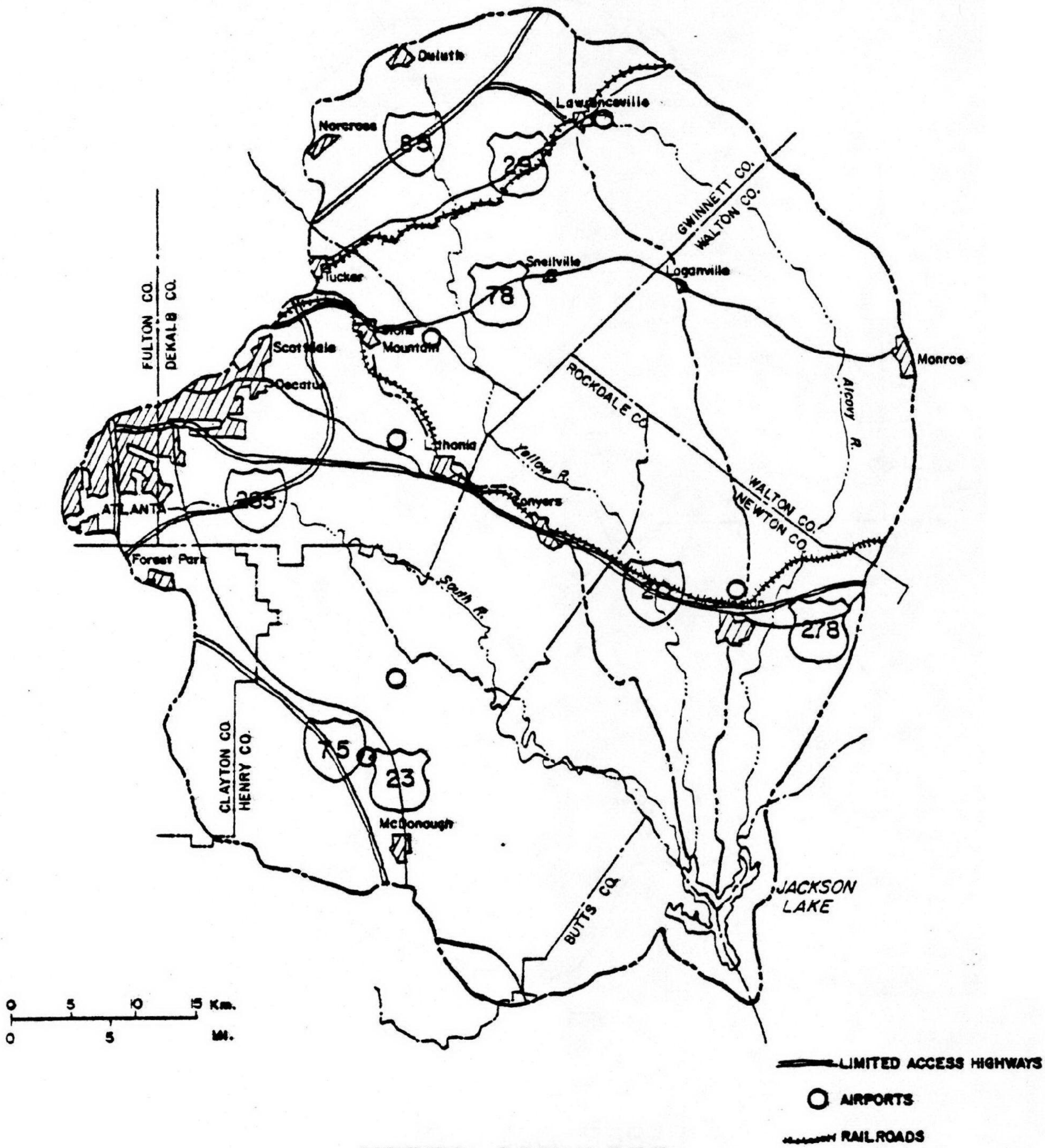
Similar noise policies are expected from the McIntosh Trail and Northeast Georgia Area Planning and Development commissions which cover the remaining counties of the Upper Ocmulgee River Basin.

d. Odor -- A survey was made of the five counties comprising the major portion of Upper Ocmulgee River Basin--DeKalb, Gwinnett, Newton, Rockdale, and Walton--and facilities in these counties that might be major odor producers were listed (Table 7). However, none of these facilities is actually in the Yellow River sub-basin; most are located within 5 mi of the drainage divide, to the northwest (Figure 4). The average prevailing wind direction, from the northwest for most of the year, may bring odors from these industries to the Yellow River sub-basin but there are no data to confirm this. Odor pollution is not currently a problem in the Yellow River sub-basin.

Table 7. Survey of odor-producing facilities in the Yellow River sub-basin area.[a]

Chemical	Number of facilities	Facility location, city
Chlorine, compressed/liquified	0	--
Acetylene, CO_2, and gases elemental compressed/liquified	0	--
Pigments, such as TiO_2 or Zn oxide	0	--
Acids, such as sulfuric or nitric	1	Chamblee
Resins and plastics	1	Tucker
Household bleaches	3	Decatur, Tucker and Conyers
Textile finishes	0	--
Paint products	5	Decatur, Tucker, Norcross and Chamblee
Chemical compounds, cyclic intermediates	0	--
Insecticides	0	--
Total	10	

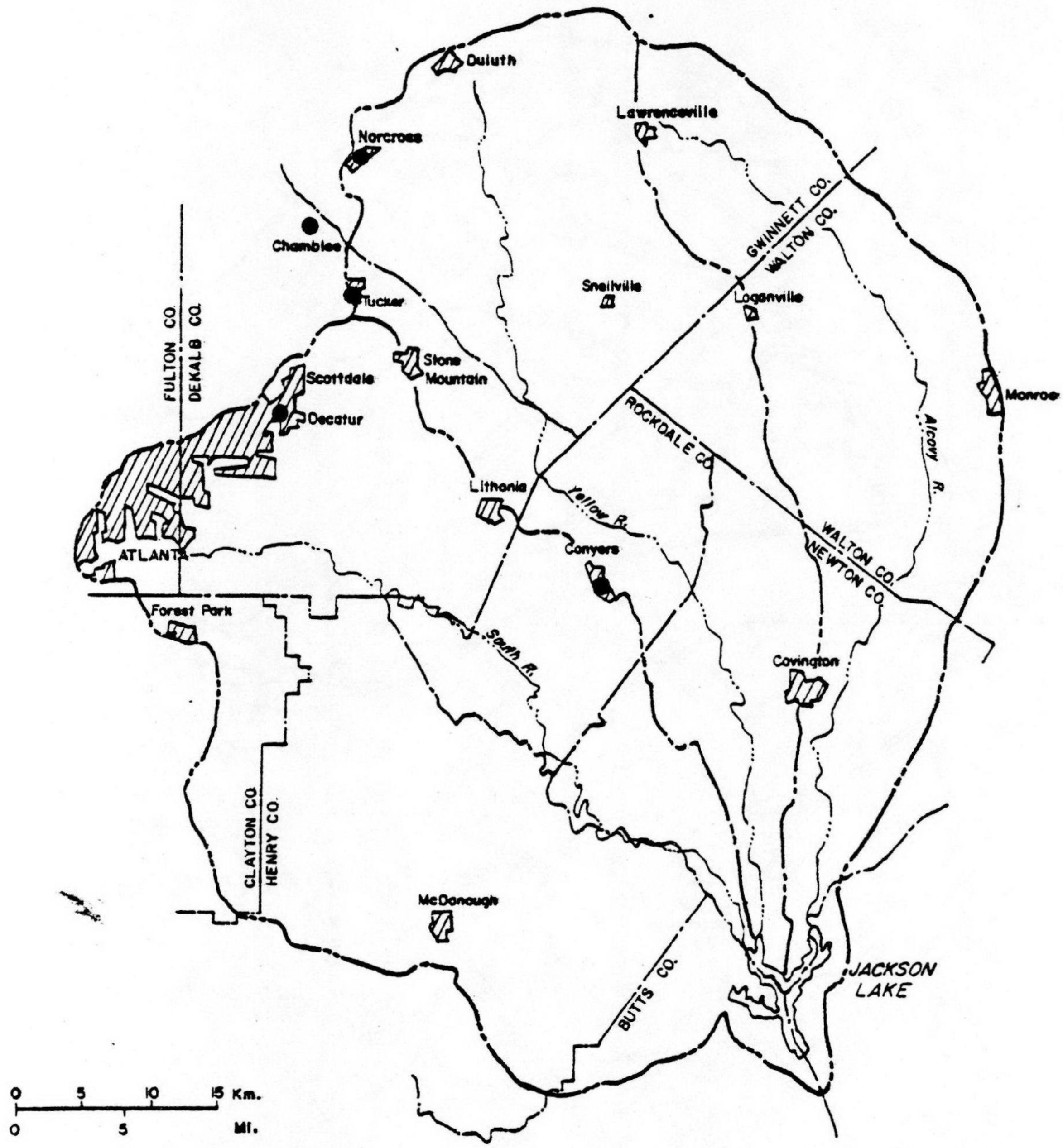
[a]Source: Personal communication, Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch, Atlanta, December 1976.



UPPER OCMULGEE RIVER BASIN

LIMITED ACCESS HIGHWAYS, AIRPORTS & RAILROADS

FIGURE 3



UPPER OCMULGEE
RIVER BASIN

LOCATION OF ODOR PRODUCING FACILITIES

FIGURE 4

2. Land

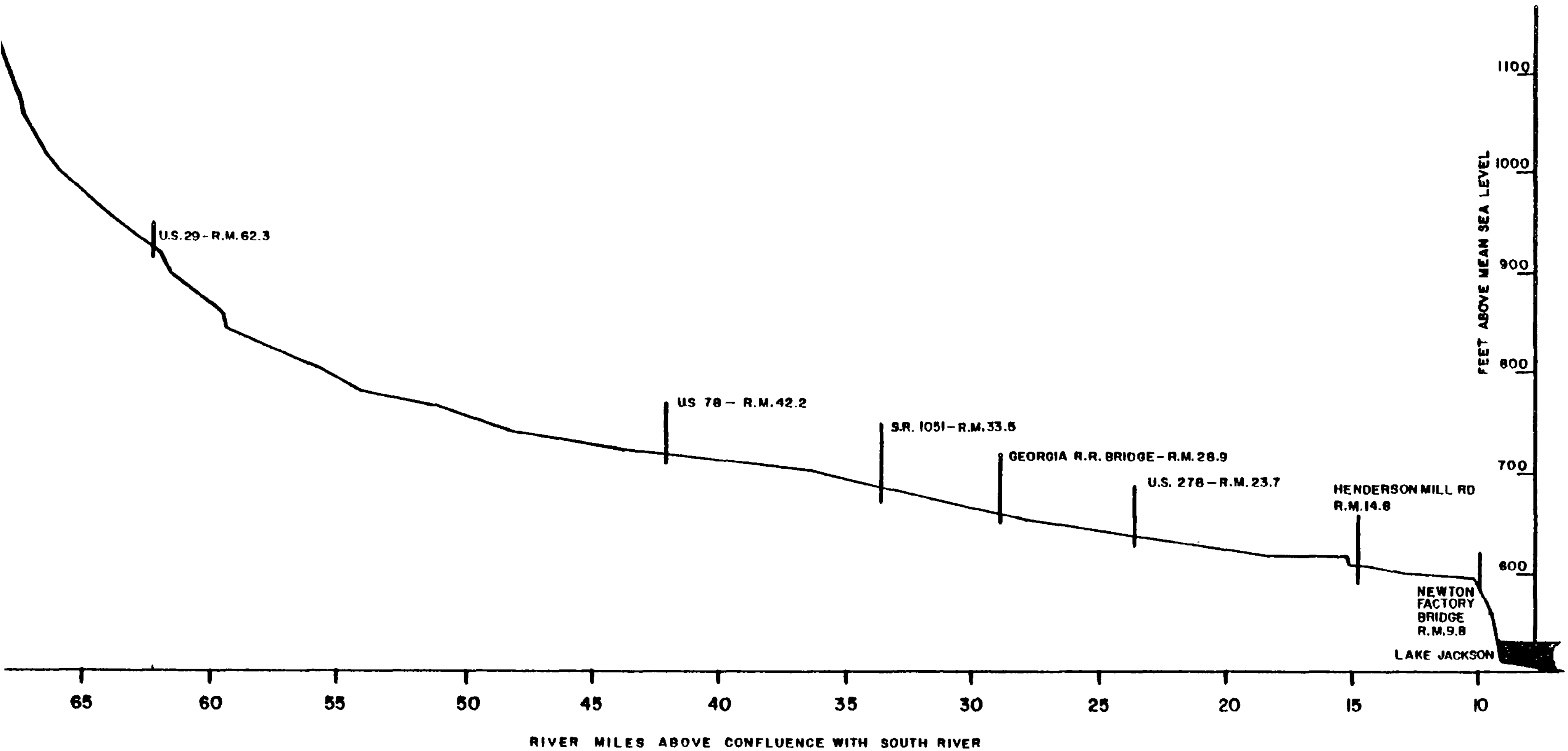
a. Physical and Chemical --

1) Topography. Georgia lies within five physiographic provinces. A small section of the Appalachian Plateaus province is in the extreme northwest corner of the state; the Valley and Ridge province and the Blue Ridge province are in the north; the Piedmont province is south of these, and the Coastal Plain province occupies approximately the southern half of the state. The Upper Ocmulgee River Basin is entirely within the Piedmont province.

The Piedmont province is characterized by rolling and hilly topography, although a few mountains, most of which are outliers of the Blue Ridge, do occur. In the Upper Ocmulgee River Basin there are isolated mountains, such as Stone Mountain and Panola Mountain, which are erosion-resistant and which stand several hundred feet above the surrounding area. However, the basin terrain is generally rolling, with local relief of approximately 100 to 200 ft. Near Jackson Lake the elevations range from about 600 to 800 ft above mean sea level (msl), while elevations near the headwaters range from about 900 to 1100 ft above msl.

The Upper Ocmulgee River Basin is drained by a dendritic stream pattern. The South River drainage is the most striking dendritic system; the Alcovy River drainage displays an almost parallel pattern. The streams have gentle gradients and few rock exposures; many streams are aggrading and have substantial deposits of alluvium (Herrmann 1954). Structural or lithologic control of drainage is often lacking in the Piedmont province (Thornbury 1965) and the overall fluvial cycle of the study area is probably one of maturity.

Streams within the Upper Ocmulgee drainage ultimately empty into the Atlantic Ocean. At the northern end of the basin, in the Duluth, Norcross, and Suwanee quadrangles, the headwaters are cutting within 1 mi of the tributaries of the Chattahoochee River, which flows to the Gulf of Mexico. Stream profiles of the Alcovy, Yellow, and South rivers are shown in Figures 5, 6, and 7, respectively.



STREAM PROFILE
ALCOVY RIVER

FIGURE 5

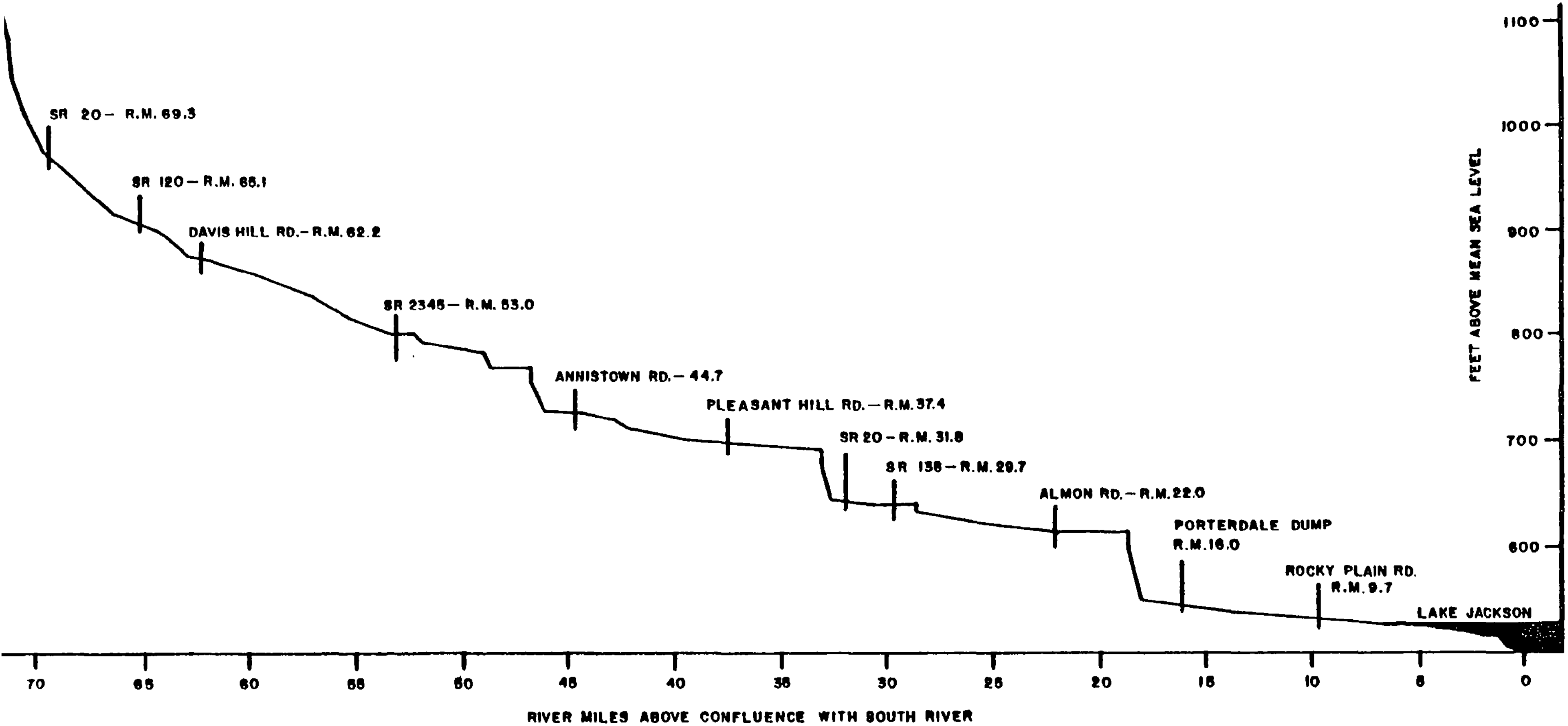
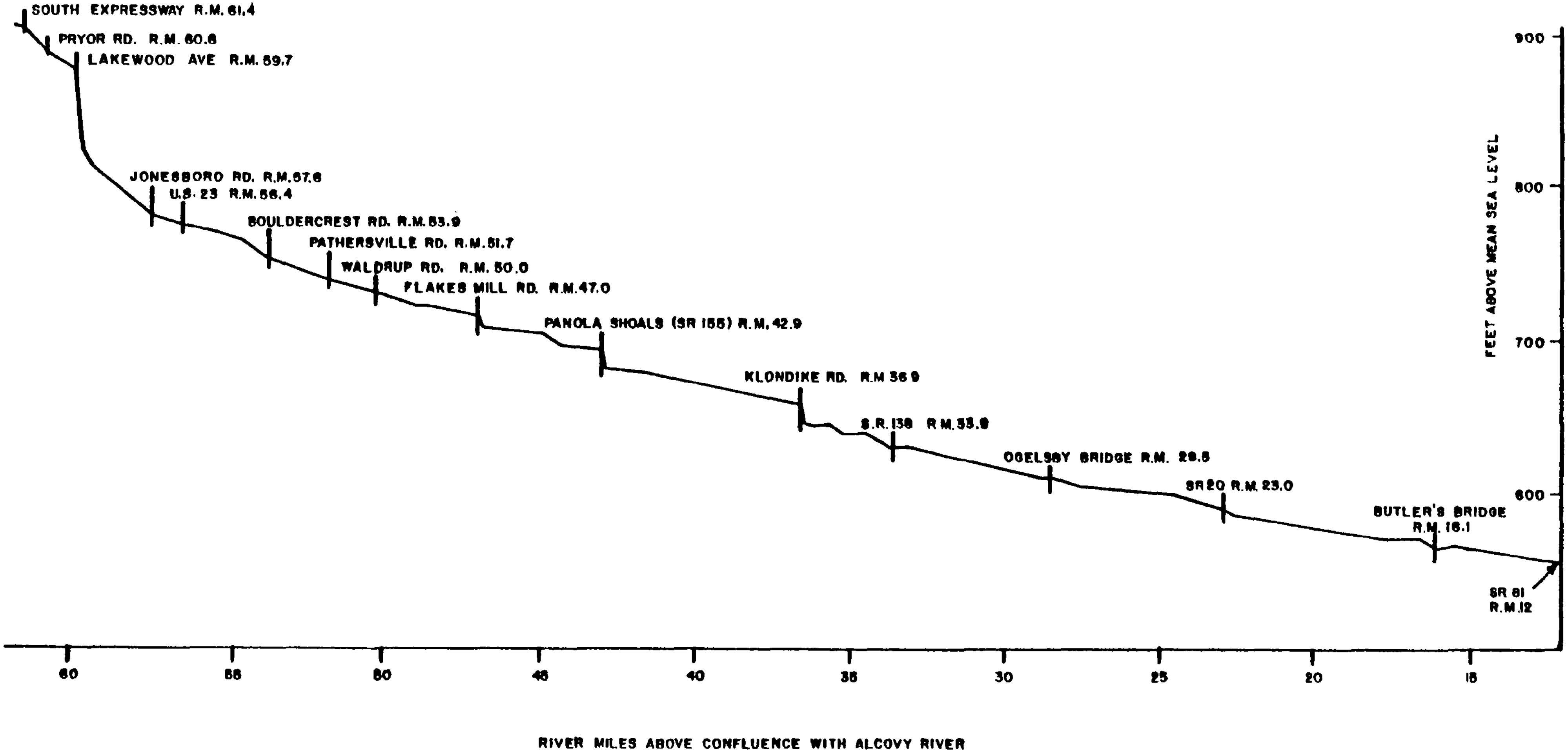


FIG. 6

STREAM PROFILE
YELLOW RIVER
FIGURE 6



STREAM PROFILE SOUTH RIVER

FIG 7

FIGURE 7

The Yellow River displays a gentle gradient as it falls an average of approximately 10 to 12 ft per mi from its headwaters to Jackson Lake.[1] Feet per mile of fall for each designated stream segment in the Yellow River sub-basin are shown in Table 8. Valleys cut by the Yellow River and its tributaries are not unusually deep or narrow. One named escarpment, McDaniels Bluff in the Snellville quadrangle, stands about 100 ft above the river. Shoals are present in the Yellow River in the Porterdale quadrangle. Near Jackson Lake, low-lying lands are likely to be marshy (Worthville quadrangle). Another extensive marsh is located along Big Haynes Creek, a tributary of the Yellow River, in the Milstead quadrangle.

The Yellow River sub-basin is more urban at the western and northern sides near Atlanta, and developed lands, including towns and roads, are usually located at higher elevations on broad ridgetops. Roads are especially likely to follow ridges. For example, Ga-20, which parallels I-20 near Conyers, follows the drainage basin divide of the Yellow River and South River sub-basins in the Conyers quadrangle. In the Lawrenceville quadrangle, Ga-82 follows the divide between the Alcovy River and Yellow River sub-basins.

Areas within the Yellow River sub-basin where the slope of the land is greater than 25 percent are plotted on Figure 8. In the Yellow River sub-basin these slopes are usually found along drainageways, with the greatest frequency occurring in Gwinnett County where the headwaters have cut a more rugged terrain. In Newton County (at the mouth of the Yellow River) there are no slopes greater than 25 percent. Areas of pavement and other rock outcrop are not included in the slope designations.

2) Geology. The rocks of the Upper Ocmulgee River Basin in the Piedmont province are composed of igneous and metamorphic types that are often collectively termed crystalline rocks. As opposed to sedimentary rocks, which usually exist in distinguishable stratified units, crystalline rocks display a very complex structure. The study area has undergone extensive metamorphism with extreme deformation. Much of the Upper Ocmulgee Basin

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[1]The upper reach falls approximately 15 ft/mi, while the lower reach falls an average of 6 ft/mi.

TABLE 8

FALL PER REACH OF SWEETWATER CREEK

(see figure 9 for stream reaches)

NO OF REACH	IDENTIFICATION OF REACH	REACH LENGTH (MILES)	AVERAGE FT OF FALL PER MILE
6-1	WTF 3192	.0	-
2	WTF 3192 to trubutary mouth	1.0	14.0
3	WTF 3545	.0	-
4	WTF 3545 to tributary mouth	1.8	46.667
5	Tributary to sweetwater cr.	.6	16.667
6	Sweetwater cr.	.0	-
7	Sweetwater rd. to tributary	.7	11.429
8	WTF 3221	.0	-
9	WTF 3221 to tributary mouth	1.6	40.00
10	Tributary to Shackleford rd.	.2	10.0
11	Shackleford rd. WTF 3551	.0	-
12	Shackleford rd. to Cruse rd.	.9	20.00
13	Cruse rd WTF 0026	.0	-
14	Cruse rd. to Beaver Ruin cr	1.0	4.00
15	WTF 2275	.0	-
16	WTF 2275 to WTF 0010	.4	100.00
17	WTF 0010	.0	-
18	WTF 0010 to WTF 2268	.4	35.00
19	WTF 2268	.0	-
20	WTF 2268 to Mitchell rd.	.1	10.00
21	Mitchell rd.	.0	-
22	Mitchell rd to WTF 3478,3230	1.0	9.00
23	WTF 3478,3230	.0	-
24	WTF 3478,3230 to I-85	.1	20.0
25	I-85 to WTF 3214	.2	15.0
26	WTF 3214	.0	-
27	WTF 3214 to WTF 3207/tributary	.4	12.5
28	WTF 3207 tributary	.0	-
29	Tributary to Indian Trail rd	.3	13.333
30	Indian Trail rd to WTF 3212	.3	13.333
31	WTF 3212	.0	-
32	WTF 3212 to Hillcrest rd.	.3	16.667
33	Hillcrest rd to WTF 3217	.2	25.000
34	WTF 3217	.0	-
35	WTF 3217 to Beaver Ruin rd	1.8	6.667
36	Beaver Ruin rd to Bromolow cr	1.1	7.273
37	WTF 2259	.0	-
38	WTF 2259	.7	42.857
39	WTF 0018	.0	-
40	WTF 0018 to Hopkins Pond rd	.3	20.00
41	Hopkins Pond to Hopkins Mill	.4	20.00
42	Hopkins Mill rd to cr mouth	.9	13.333
43	WTF 2274,3219	.0	-
44	WTF 2274,3219 to N. Beaver Ruin	1.8	70.00
45	N. Beaver Ruin cr to Shackleford	.7	8.571

NO OF REACH	IDENTIFICATION OF REACH	REACH LENGTH (MILES)	AVERAGE FT. OF FALL PER MILE
6-46	Shackleford rd to trubutary	1.2	6.667
47	WtF 3194	.0	-
48	WTF 3194 to trivutary mouth	1.3	30.769
49	Tributary to Arc Way	.2	5.0
50	Arc Way to Bromolow dr mouth	,6	3.333
51	Bromolow cr to beaver Hills sd	.0	-
52	Beaver Hills S/D to Plsnthill	.5	6.00
53	Pleasanthill rd to Br Cr mouth	.9	4.444
54	Beaver Ruin cr to WTF 0050	.0	-
55	WTF 0050	.0	-
56	WTF 0050 to WTF 3193	.1	10.0
57	WTF 3193	.0	-
58	WTF 3193 to US 29	.1	10.0
59	US 29 to WTF 0024	.8	2.5
60	WTF 0024	.0	-
61	WTF 0024 to Jackson cr	1.0	4.0
62	WTF 3223,3224	.0	-
63	WTF 3223,3224 to tributary mouth	1.8	22.222
64	WTF 2265,2266	.0	-
65	WTF 2265,2266 to Blackwood rd	.2	30.0
66	Blackwood rd to Rockbridge rd	.8	25.0
67	Rockbridge rd to tributary	.4	10.0
68	Tributary to Dickens rd	.2	30.0
69	Dickens rd to WTF 3216,3549	.8	10.0
70	WTF 3216,3549	.0	-
71	WTF 3216,3549 to Hillcrest rd	.4	10.0
72	Hillcrest rd to WTF 0049	.4	10.0
73	WTF 0049	.0	-
74	WTF 0049 to US 29	.2	10.0
75	US 29 to Camp cr	,6	10.0
76	County Line to WTF 3233	.1	40.0
77	WTF 3233	.0	-
78	WTF 3233 to WTF 0036	.2	30.0
79	WTF 0036	.0	-
80	WTF 0036 to Harmony Grove Ch rd	.8	30.0
81=	Harmony Grove rd to Rockbridge	.8	20.0
82	Rockbridge rd to WTF 2263	1.0	16.0
83	WTF 2263	.0	-
84	WTF 2263 to Cole dr	.4	15.0
85	Cole dr to Killian Hill rd	.7	11.429
86	Killian Hill to camp cr mouth	.4	10.000
87	Camp cr to WTF 3195	.5	8.000
88	WTF 3195	.0	-
89	WTF 3195 to Arcado rd	.4	10.000
90	Arcado rd to Lester rd	1.3	6.154
91	Lester rd to Jackson cr mouth	.4	10.0
92	Jackson cr to Sweet cr mouth	1.1	5.455

T A B L E 8

FALL PER REACH OF THE YELLOW RIVER

NO OF REACH	IDENTIFICATION OF REACH	REACH LENGTH (MILES)	AVERAGE FT OF FALL PER MILE
1	OAKLAND RD TO WTF 3550	.8	12.5
2	WTF 3550	.0	-
3	WTF 3550 TO DAVIS HILL RD	.5	4.
4	DAVIS HILL TO US 29	1.6	6.25
5	US 29 TO PEW CR	.9	6.667
6	WTF 2271	.0	-
7	WTF 2271 TOUS 29	2.0	20.
8	US 29 TO WTF 0053/TRIBUTARY	.6	33.333
9	WTF 0053/TRIBUTARY	.0	-
10	TRIBUTARY TO PEW CR MOUTH	1.0	18.0
11	PEW CR TO WTF 0044	.2	5.
12	WTF 0044	.0	-
13	WTF 0044 TO PUGHS CR	1.0	7.
14	WTF 0045	.0	-
15	WTF 0045 TO PUGHS CR MOUTH	.9	31.111
16	PUGHS CR TO ARNOLD RD	.0	-
17	ARNOLD RD TO HUTCHINS RD	1.7	8.235
18	HUTCHINS RD TO BANKSTON CR	.4	7.5
19	BANKSTON CR	.0	-
20	BANKSTON CR TO FORK CR	.5	6.0
21	WTF 3228	.0	-
22	WTF 3228 TO WTF	1.5	17.333
23	WTF 3206	.0	-
24	WTF 3206 TO FORK CR MOUTH	1.5	20.00
25	FORK CR TO SWEETWATER CR	.8	5.0
26	SWEETWATER CREEK	.0	-
27	SWEETWATER CR TO WTF 049A,0057	.0	=
28	WTF 049A,0057	.0	-
29	WTF 049A,0057 TO RIVER DR	.1	10.
30	RIVER DR TO WTF 2505/TRIBUTARY	1.3	6.15
31	WTF 2505/TRIBUTARY	.0	-
32	WTF 2505/TRIBUTARYTO WTF 2276 TRIB	1.2	3.333
33	WTF 2276/TRIBUTARY	.0	-
34	WTF 2276/TRIBUTARY TO FIVE FORKS-T	.4	2.50
35	FIVE FORKS-T RD TO TURKEY CR.	1.4	4.29
36	TURKEY CR	.0	-
37	TURKEY CR TO WATSON CR	.1	10.
38	WATSON CR.	.0	-
39	WATSON CR TO KILLIAN HILL RD	.4	7.5
40	KILLIAN HILL RD TO GARNER CR	.6	5.
41	WTF 0039	.0	-
42	WTF 0039 TO WTF 3199,3552/TRIBUTARY	.5	32.
43	WTF 3199,3552/TRIBUTARY	.0	-
44	WTF/TRIBUTARY TO GARNER CR MOUTH	1.7	27.65
45	GARNER CR TO WTF 0056	1.1	9.0

TABLE 8 (continued)

NO OF REACH	IDENTIFICATION OF REACH	REACH LENGTH (MILES)	AVERAGE FT OF FALL PER MILE
46	WTF 0056	.o	-
47	WTF 0056 TO POUNDS CR	1.0	6.0
48	POUNDS CR	.0	-
49	POUNDS CR TO US 78	.0	-
50	US 78 TO UNNAMED TRIBUTARY	1.5	5.33
51	UNNAMED TRIBUTARY	.0	-
52	UNNAMED TRIBUTARY TO JACKS CR	.9	15.55
53	WTF 3543	.0	-
54	WTF 3543 TO WTF 0041	1.4	35.71
55	WTF 0041	.0	-
56	WTF oo41 TO JACKS CR MOUTH	1.7	37.65
57	JACKS CR TO ANNISTOWN RD	.4	15.00
58	ANNISTOWN RD TO S. ANNISTOWN	1.2	20.00
59	S. ANNISTOWN RD TO WTF 3200/TRIB	.0	-
60	WTF 3200,0058/TRIBUTARY	.0	-
61	WTF/TRIBUTARY TO CENTERVILLE CR	1.2	7.50
62	CENTERVILLE CR	.0	-
63	CENTERVILLE CR TO GA 124	.6	5.00
64	GA 124/WTF 0051	.0	-
65	GA 124 TO STONE MTN CR	.4	5.00
66	WTF 3129	.0	-
67	WTF 3129 TO CROOKED CR	3.5	9,14
68	CROOKED CR	.0	-
69	CROOKED CR TO STN MTN CR MOUTH	1.8	15.56
70	STONE MTN CR TO NORRIS LAKE	1.1	5.45
71	NORRIS LAKE	.0	-
72	NORRIS LAKE TO NORRIS LAKE RD	.!	6.0
73	NORRIS LAKE RD TO SWIFT CR	1.7	4.35
74	SWIFT CR	.0	-
75	SWIFT CR TO PLEASANTHILL RD	.1	4.0
76	PLEASANTHILL RD TO LAKE CAPRI	.6	9.333
77	LAKE CAPRI	.0	-
78	LAKE CAPRI TO OFF WEST WAY	.3	2.667
79	OFF WEST WAY TO LAKE ROCKAWAY	1.3	2.615
80	LAKE ROCKAWAY/WTF 3391	.0	-
81	LAKE ROCKAWAY TO HAMMOCK CR	.2	3.0
82	HAMMOCK CR	.0	-
83	HAMMOCK CR TO NEW IRWIN BR RD	.5	6.0
84	NEW IRWIN BR RD TO MARK BRANCH	.1	4.0
85	WTF 3389	.0	-
86	WTF 2385	1.6	50.63
87	MARK BRANCH OT GA20	2.0	2.5
88	GA 20/ConYERS WATERS INTAKE	.0	-
89	GA 20 TO BOAR TUSK CR	1.2	26.667
90	WTF 72	.0	-
91	WTF 72 TO BOAR TUSK CR MOUTH	1.2	58.333
92	BOAR TUSK CR TO CARR BRANCH .	.6	6.667
93	CARR BRANCH	.0	-
94	CARR BRANCH TO GA 138	.6	6.667
95	GA 138 TO QUIGG BRANCH	1.4	2.857
96	QUIGG BRANCH	.0	-
97	QUIGG BRANCH TO GEES MILL RD	1.2	3.333
98	GEES MILL RD TO UNNAMED TRIBUTARY	1.2	2.500

NO OF REACH	IDENTIFICATION OF REACH	REACH LENGTH (MILES)	AVERAGE FT OF FALL PER MILE
99	UNNAMED TRIBUTARY	.0	-
100	UNNAMED TRIBUTARY TO BIG HAYNES CR	.5	4.0
101	TEMPLE-JOHNSON RD/WTF 0046	.0	-
102	TEMPLE-JOHNSON RD TO PATE RD	.9	11.11
103	PATE RD TO LENORA RD	.9	8,89
104	LENORA RD TO ROCKBRIDGE RD	1.7	9.41
105	ROCKBRIDGE RD TO GA 20	1.3	7.69
106	GA 20 TO INDIAN SHOALS	2.1	38.10
107	INDIAN SHOALS TO ZINGARA RD	1.2	13.33
108	ZINGARA RD TO BLACK SHOALS RD	1.0	20.00
109	BLACK SHOALS RD TO WINFIELD CR	2.1	10.48
110	WINFIELD CR	.0	-
111	WINFIELB CR TO MILLER BOTTOM	.5	12.0
112	MILLER BOTTOM RD TO GA 138	.9	11.11
113	GA 138 TO BELOW MILL POND	.3	13.33
114	BELOW MILL POND TO L HAYNES CR	.3	46.667
115	LITTLE HAYNES CR	.0	-
116	LITTLE HAYNES CR TO PIPELINE	.1	60.00
117	PIPELINE TO BALD ROCK RD	2.8	2.14
118	BALD ROCK RD TO BIG HAYNES MOUTH	.8	6.25
119	BIG HAYNES CR TO MT TABOR RD	1.4	4.29
120	MT TABOR RD TO GUM CR	.9	5.556
121	GUM CR	.0	-
122	GUM CR TO GA 12/US 278	.9	2.222
123	GA 12/US 278 TO UNNAMED TRIBUTARY	.2	5.0
124	UNNAMED TRIBUTARY	.0	-
125	UNNAMED TRIBUTARY TO UNNAMED TRIB	1.7	1.765
126	UNNAMED TRIBUTARY	.0	-
127	UNNAMED TRIBUTARY TO WTF 3359 TRIB	.6	1.667
128	WTF 3359	.0	-
129	WTF 3359 TO TRIBUTARY MOUTH	2.5	20.00
130	UNNAMEED TRIBUTARY TO BROWN BR RD	.2	15.00
131	BROWN BR RD TO BEAVERDAM CR	1.9	2.105
132	BEAVERDAM CR	.0	-
133	BEAVERDAM CR TO GA 81	.6	3.333
134	GA 81 PORTERDALE WATER INTAKE	.0	-
135	GA 81 TO WTF 2498	1.0	42.000
136	WTF 2498	.0	-
137	WTF 2498 TO LANGSTON SHOALS	2.8	6.429
138	LANGSTON SHOALS TO DRIED IND	.2	10.0
139	WTF 3361	.0	-
140	WTF 3361 TO WTF 2359	5.0	25.60
141	WTF 2359	.0	-
142	WTF 2359 TO DRIED IND CR MOUTH	4.1	21.463
143	DRIED IND CR TO DOG BRNACH CR	.8	1.25
144	DOG BRANCH CR	.0	-
145	DOG BRANCH CR TO STEWART RD	.7	1.429
146	STEWART RD TO ROCKY PLAINS RD	1.3	1.538
147	ROCKY PLAINS RD TO UNNAMED TRIB	1.7	1.176
148	UNNAMED TRIBUTARY	.0	-
149	UNNAMED TRIBUTARY TO UNNAMED TRIB	.8	1.250
150	UNNAMED TRIBUTARY	.0	-
151	UNNAMED TRIBUTARY TO LAKE CAMPBELL	1.1	1.818
152	LAKE BULOW COMPBELL	.0	-
153	LAKE CAMPBELL TO GA 212	.5	2.0
154	GA 212 TO POTTS CR	2.4	2.083
155	POTTS CR	.0	-
156	POTTS CR TO GA 36	1.4	2.143

area is affected by the Brevard shear zone in which the Chattahoochee River, located north of the project area, flows. Faults and fracture zones are common.

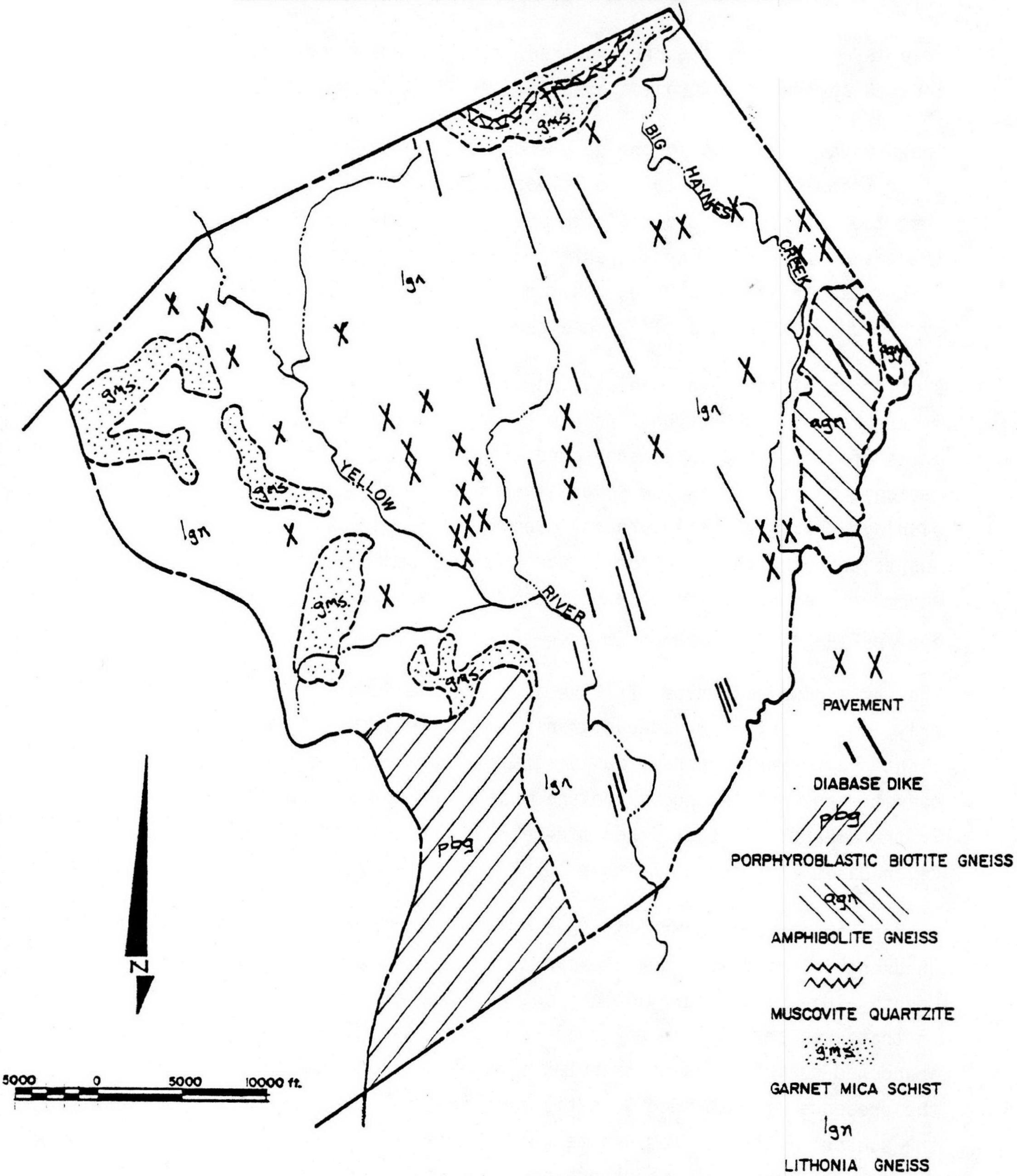
The crystalline rocks in the Upper Ocmulgee River Basin are thought to be dated from Precambrian to late Paleozoic and are thus probably greater than 200 million years old (Thornbury 1965). Numerous outcrops occur in the basin, including large granitic domes such as Stone Mountain and wide flat areas of granitic exposures termed pavements. Other areas are covered by residual soils (saprolite) and parent material of variable depths.

Biotitic gneisses, mica schist, and amphibolite are the most common rocks in the basin. Other types include granites and granitic gneisses. Small areas of ultramafic rocks are found slightly south of Stone Mountain. A geologic map of the Yellow River sub-basin in Rockdale County (Figure 10) displays the northwest-southeast trending diabase dikes and the narrow quartzite veins that are common to the Upper Ocmulgee River Basin area. Pavements, especially frequent in Rockdale County, occur throughout the study area.

The best-known rock types for the area are the Stone Mountain granite, a gray, equigranular, micaceous granite, and the Lithonia gneiss, which is light gray, evenly banded, medium-grained, and extremely hard. These granitic and related rocks are the most important for surface mine operations in the area (Table 9). Other mineral resources for the Upper Ocmulgee River Basin are listed in Table 10.

Current topographic maps (Milstead, Conyers, Loganville, and Snellville quadrangles) list four quarries in the Yellow River sub-basin in Rockdale County. However, Figure 10 plots the quarries present about 25 years ago in that area and also in parts of adjacent counties. The erosion of these abandoned quarries has contributed significant sediment to the streams -- the presence of suspended granitic dust in the Yellow River is said to be the source of that stream's name (Bagby 1969) -- and acid runoff contributes to degradation of the area's surface water quality. The Atlanta Regional Commission (1974) reports:

GEOLOGIC MAP OF ROCKDALE COUNTY



SOURCE: McCOLLUM, M.J. 1966 GROUND WATER RESOURCES AND GEOLOGY OF ROCKDALE COUNTY, GEORGIA. GEORGIA STATE DIVISION OF CONSERVATION, DEPARTMENT OF MINES, MINING AND GEOLOGY, THE GEOLOGICAL SURVEY INFORMATION CIRCULAR 33. ATLANTA. 17 pp. & 1 PLATE.

FIGURE 10

Table 9. Upper Ocmulgee River Basin area surface mine operations.[a]

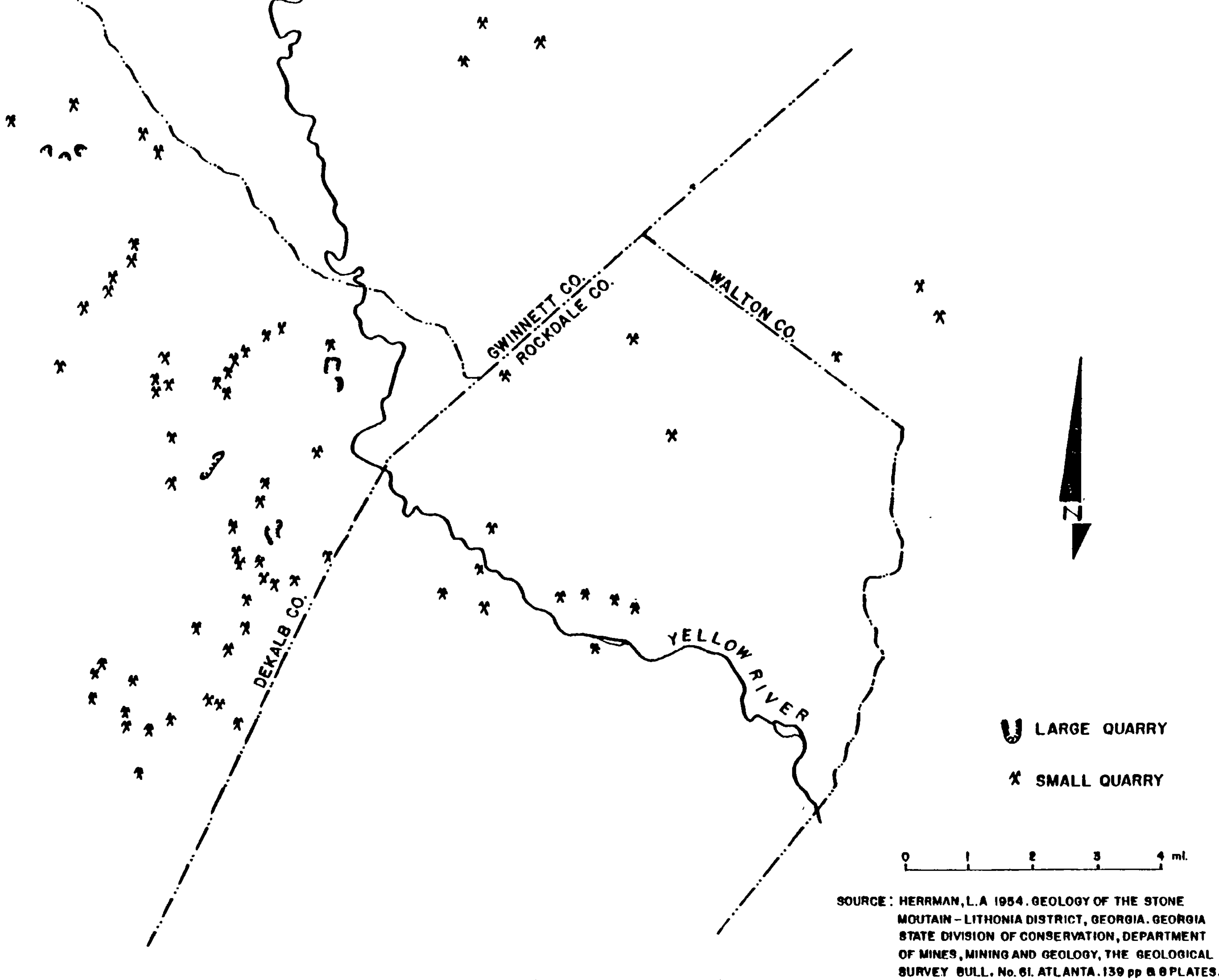
County	Product	Number of facilities
Clayton	Granite	1
DeKalb	Granite	3
Fulton	Clay	3
	Granite	3
	Sand	3
Gwinnett	Granite	2
	Sand	1
Henry	Granite	1
Newton	Sand	1
Rockdale	Sand	2
	Gravel	1
Walton	Granite	1

[a]Source: Georgia Department of Natural Resources. 1974. Georgia surface mine operators. Environ. Protection Div., Land Reclamation Sect., Macon. 52 pp.

Table 10. Mineral resources of the Upper Ocmulgee River Basin area.[a]

Mineral or rock	Principal use
Beryl	Aquamarine is gem variety
Feldspar	Glass, pottery, enamel, abrasives
Gold	Jewelry
Granite, gneiss, schist and related rock	Dimension stone, crushed stone, gravel, poultry grit
Mica	Roofing, cement, paint
Sand	Roadfill, construction
Sillimanite (fibrolite)	Refractory insulation
Structural clay	Pottery, refractories

[a]Source: Georgia Department of Mines, Mining and Geology. 1969. Mineral resource map.



QUARRIES IN YELLOW RIVER SUB-BASIN

FIGURE 11

The State of Georgia now requires all operators of currently active mines to reclaim surface mined lands after mining operations have ceased. Previously abandoned mines, however, are not covered by the new reclamation laws.

In discussing the use of mined lands as sanitary landfills the Commission continues:

.... studies have shown that mined lands can be reclaimed as sanitary landfills without damage to water quality or other environmental detriment. However, full protection of the environment requires careful site selection, site preparation and landfill techniques.

However, no surface-mined lands in the Yellow River sub-basin are now being reclaimed as landfill sites.

The Yellow River sub-basin area is considered tectonicly stable. It is located far within the boundaries of the North American plate, a position where earthquakes are rare (Gross 1972). No locations in the sub-basin are especially susceptible to subsidence or slump. The exfoliation nature of the granite domes, however, may influence rock breakage, particularly where the foliation is at a very steep angle, as on the north side of Stone Mountain.

3) Soils. Most of the soils of the Upper Ocmulgee River Basin are residual (formed by material weathered from the underlying rock). Other factors of climate, relief, and biota also influence the character of these soils, but their chemical and mineral composition is largely due to the parent rocks from which they are derived. This area has been exposed to erosional processes for an extensive period of time and a thick mantle of decomposed rock and soil is present at many locations.

In the Yellow River sub-basin, soils are derived from granite and biotitic gneisses and schists. These rocks commonly produce gray to deep red saprolite (unconsolidated, untransported weathered rock also termed "rotten rock") and distinctive dark red clayey soils. The amount of clay is limited by the felsic and mafic minerals in the parent rocks. In the sub-basin, Appling, Cecil, and Davidson soils contain large amounts of clay derived from weathered feldspars. Madison soils contain clay, but they also contain muscovite, which is resistant to weathering and which is retained in the soil. Louisburg soils are sandy and contain little clay, as they are formed from material high in silicious rock and quartz sand (U. S. Department of Agriculture 1967).

Soils on the uplands and ridgetops in the sub-basin generally have been in place long enough for distinct horizons to develop. Alluvial soils in the sub-basin are more recent and lack horizons. The sub-basin soils are generally acid and range in pH from 4.0 to 6.0 (U. S. Department of Agriculture 1967).

The soils in the Yellow River sub-basin have been grouped by association, a group of one or more major soils and at least one minor soil that occur in a distinctive proportional pattern (Figure 12,Table 11). These associations have been placed in four main categories (Figure 8): floodplain soils, stream terrace soils, ridgetop soils (where the slope is less than 10 percent), and upland side slope soils (where the slope is greater than 10 percent) -- no stream terrace associations occur in the Yellow River sub-basin. These Yellow River sub-basin associations, by county and category, are listed in Table 12.

Not included in the soils associations are the areas of rock outcrop, pavements, or other rock land (land where hard rock is at or near the surface). Rock land is not suited to farming and supports only minimal vegetation. These areas, however, have limited recreational use and, in the Yellow River sub-basin, are often surface mined.

Generalized characteristics for each association in the Yellow River sub-basin are presented below.

Appling-Louisburg-Cecil. This association occurs in Walton County on both ridgetops and upland side slopes. The soils are well-drained to excessively drained and have a friable surface layer of coarse sandy loam. The soils

Table 11. Key to soil associations by category.[a]

Floodplains

County	Number	Soil Association
DeKalb	1	Cartecay-Toccoa-Wehadkee
Gwinnett	1	Chewacla-Congaree-Wehadkee
Newton	1	Chewacla-Wehadkee
Rockdale	1	Chewacla-Wehadkee
	1a	Congaree-Chewacla-Wehadkee
Walton	3	Chewacla-Wehadkee

Ridgetops

County	Number	Soil Association
DeKalb	7	Gwinnett-Hiwassee-Musella
	8	Pacolet-Louisburg-Wedowee
	9	Appling-Cecil-Pacolet
	10	Cecil-Madison-Gwinnett
Gwinnett	3	Appling-Pacolet-Louisburg
	4	Madison-Pacolet-Appling
	5	Gwinnett-Cecil-Davidson
	6	Appling-Pacolet-Gwinnett
Newton	2	Appling-Pacolet-Louisburg
	3	Cecil-Gwinnett
	4	Madison-Pacolet-Gwinnett
Rockdale	5	Madison-Pacolet-Gwinnett
	9	Appling-Louisburg-Pacolet
	10	Madison-Pacolet-Gwinnett
	14	Appling-Pacolet-Louisburg
Walton	2	Appling-Louisburg-Cecil

Upland Side Slopes

County	Number	Soil Association
DeKalb	4	Louisburg-Pacolet-Wedowee
	5	Pacolet-Madison-Gwinnett
	6	Pacolet-Gwinnett-Louisburg
Gwinnett	7	Madison-Pacolet-Louisa
	8	Wedowee-Pacolet-Louisburg
	9	Gwinnett-Musella-Pacolet
	10	Gwinnett-Pacolet-Louisburg
	11	Louisburg-Pacolet-Wedowee
Newton	6	Louisburg-Pacolet-Wedowee
	7	Madison-Pacolet-Gwinnett
Rockdale	8	Louisburg-Wedowee-Pacolet
Walton	2	Appling-Louisburg-Cecil

Table 11. Continued

Table 11 (concluded)

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[a]Sources: Atlanta Regional Metropolitan Planning Commission. 1967. Rockdale County general soil map. Atlanta, Georgia.

Georgia State Highway Department. 1965. Newton County general highway map. Atlanta.

U. S. Department of Agriculture. 1964. Walton County soil survey. Soil Conservation Service, Washington, D. C. 70 pp.

U. S. Department of Agriculture. 1967. Gwinnett County soil survey. Soil Conservation Service, Washington, D. C. 94 pp.

U. S. Department of Agriculture, 1975. DeKalb County general soil map. Soil Conservation Service, Washington, D. C.

Table 12. Yellow River sub-basin soil associations by county and category.

County	Floodplain	Stream terrace	Ridgetop, < 10% slope	Upland side slope, > 10% slope
DeKalb	Cartecay-Toccoa-Wehadkee	-	Gwinnett-Hiwasee-Musella Pacolet-Louisburg-Wedowee Appling-Pacolet-Gwinnett Cecil-Madison-Gwinnett	Louisburg-Pacolet-Wedowee Pacolet-Madison-Gwinnett Pacolet-Gwinnett-Louisburg
Gwinnett	Chewacla-Congaree-Wehadkee	-	Appling-Pacolet-Louisburg Madison-Pacolet-Appling Gwinnett-Cecil-Davidson Appling-Pacolet-Gwinnett	Madison-Pacolet-Louisa Wedowee-Pacolet-Louisburg Gwinnett-Musella-Pacolet Gwinnett-Pacolet-Louisburg Louisburg-Pacolet-Wedowee
Newton	Chewacla-Wehadkee	-	Appling-Pacolet-Louisburg Cecil-Gwinnett Madison-Pacolet-Gwinnett Cecil-Appling-Davidson	Louisburg-Pacolet-Wedowee Madison-Pacolet-Gwinnett
Rockdale	Chewacla-Wehadkee Congaree-Chewacla-Wehadkee	-	Madison-Pacolet-Gwinnett Appling-Louisburg-Pacolet Appling-Pacolet-Louisburg	Madison-Pacolet-Gwinnett Louisburg-Wedowee-Pacolet
Walton	Chewacla-Wehadkee	-	Appling-Louisburg-Cecil	Appling-Louisburg-Cecil

may be stony. The Appling soils are mottled with red and yellow and the Cecil soils have a red, mottle-free subsoil. Much of the association is eroded and does not have a high agricultural potential (U. S. Department of Agriculture 1964).

Appling-Louisburg-Pacolet. This association is found in Rockdale County on gently sloping ridgetops with less than 10 percent slope. The soils have a clayey to loamy subsoil and are well-drained (Georgia Department of Natural Resources 1974b).

Appling-Pacolet-Gwinnett. This association is characterized by well-drained soils with a clayey subsoil that occurs on narrow to broad interstream divides. Much of this association is wooded and most of the acreage is eroded. The soils are well suited to pasture and moderately well suited to tilled crops (U. S. Department of Agriculture 1967).

Appling-Pacolet-Louisburg. This association is common on the ridgetops throughout the Yellow River sub-basin. The soils are well-drained and have a clayey to loamy subsoil. Much of this association is cultivated or pastured; the rest is wooded or idle. The soils are well suited to general farming (U. S. Department of Agriculture 1967).

Cartecay-Toccoa-Wehadkee. This association is characterized by alluvial soils along floodplains. It is found in DeKalb County along drainageways and the soils are subject to frequent flooding. The soils range from poorly drained to well-drained (U. S. Department of Agriculture 1975).

Cecil-Appling-Davidson. This association is found in Newton County on gently sloping ridgetops. These soils are well-drained and have a loamy surface layer with a red clayey subsoil (Georgia State Highway Department 1965).

Cecil-Gwinnett. In Newton County this association is found on gently sloping ridgetops with less than 10 percent slope. These soils are well-drained and have a loamy surface with a clayey subsoil (Georgia State Highway Department 1965).

Cecil-Madison-Gwinnett. This association, in DeKalb County, occurs on moderately sloping ridgetops. The soils are well-drained and have a coarse loamy surface with a clayey subsoil (U. S. Department of Agriculture 1975).

Chewacla-Wehadkee. This association is characterized by nearly level floodplains of recent alluvium along streams that overflow more often than once every 5 years. Streams have well-defined channels. The depth to the water table is generally about 15 to 30 in. Much of the association is too wet for cultivated crops. A small percentage is suitable for tilled crops, without artificial drainage -- those areas are on well-drained alluvial land and well-drained Congaree soils. With adequate drainage this association will produce good to excellent pasture with generally high yields (U. S. Department of Agriculture 1964).

Chewacla-Congaree-Wehadkee. This association is characterized by broad to narrow, nearly level floodplains along streams that are subject to overflow. In most places the areas are flooded once every 5 years. In Gwinnett County, the stream channels are well-defined and in some places have cut into bedrock, but in many places the channels are clogged with silt. The soils are poorly to well-drained. Chewacla soils have a surface layer that is predominantly reddish-brown silt loam. Congaree soils have a surface layer of dark brown or dark yellowish-brown fine loam. Their subsoil is brown fine sandy loam or sandy clay loam. In the Wehadkee soils, the surface layer is light brownish-gray, silty clay loam. Without drainage, only the Congaree soils on floodplains are suitable for tilled crops. Pastures on this association are excellent if the soils are properly drained. Poorly drained areas support mixed hardwoods (U. S. Department of Agriculture 1967).

Congaree-Chewacla-Wehadkee. The soils in this association are well-drained to poorly drained and they occur in Rockdale County along nearly level floodplains. The surface is silty loam and the subsurface is silty clay loam (Georgia Department of Natural Resources 1974b).

Gwinnett-Cecil-Davidson. This association occurs in Gwinnett County on narrow to fairly broad, very gently sloping to gently sloping ridgetops. The surface of the soils is dark reddish-brown to dark red. Because most of the association is eroded, the dusky-red subsoil is often exposed. The soils are well-drained and are suited to farm and non-farm uses (U. S. Department of Agriculture 1967).

Gwinnett-Hiwassee-Musella. This association is found in DeKalb County along stream courses where the slope angles are greater than 10 percent and the soils are well-drained to excessively drained. The surface is generally a sandy to clay loam and the subsoil is red clay (U. S. Department of Agriculture 1975).

Gwinnett-Musella-Pacolet. This association occurs in Gwinnett County and is characterized by short, steep side slopes and many drainageways. The surface layer generally is reddish-brown to dark red, and the subsoil is red, dark red, or dusky-red and is clayey. The Gwinnett and Pacolet soils are well-drained, while the Musella soils are somewhat excessively to well-drained. The Gwinnett and Musella soils are formed in materials weathered chiefly from diorite, hornblende gneiss, and diabase, and the Pacolet in material weathered from granite, gneiss, and similar rocks (U. S. Department of Agriculture 1967).

Gwinnett-Pacolet-Louisburg. This association typically has short, moderately steep to steep side slopes and many well-defined drainageways. In most places the floodplains along the drainageways are narrow. This association is mostly along the Yellow River and the lower reaches of Sweetwater and No Business creeks. Gwinnett soils are formed in material weathered chiefly from diorite, hornblende gneiss, and diabase; the Pacolet and Louisburg soils are formed in material weathered from granite and gneiss. All the soils are well-drained and have a red to yellowish-brown clayey to loamy subsoil (U. S. Department of Agriculture 1967).

Louisburg-Pacolet-Wedowee. This association, found on short, steep side slopes, occurs in the more southern counties of the Yellow River sub-basin. The soils are thin, well- to excessively drained, and have many rock outcrops. The subsoil is yellowish-brown, red, or yellowish-red and loamy to clayey. These soils are poorly suited to farming and most of the association is wooded (U. S. Department of Agriculture 1967).

Louisburg-Wedowee-Pacolet. This association occurs in DeKalb County on steep upland side slopes. The soils are characteristically sandy and stony and are poorly suited to farmland. All the soils in this association are well-drained. The subsoil is sandy clay loam to clay (U. S. Department of Agriculture 1975).

Madison-Pacolet-Appling. This association is found on narrow, very gently sloping to gently sloping ridgetops in Gwinnett County; all of the soils are well-drained. Much of this association is eroded and the clayey subsoil is exposed. In the less eroded areas, the surface layer is gravelly sandy loam to sandy loam, but in the more eroded areas it is sandy clay loam. Most of this association is wooded (U. S. Department of Agriculture 1967).

Madison-Pacolet-Gwinnett. This association is characterized by well-drained sandy and clayey loams to sandy clays. The soils are derived from weathered gneiss, granite and mica schist. The association, found on both ridgetops and upland side slopes with slope angles that range from 5 to 40 percent, occurs in Newton and Rockdale counties. This land is poorly suited to agriculture but rather well suited to woodland productivity (Georgia State Highway Department 1965; Georgia Department of Natural Resources 1974b).

Madison-Pacolet-Louisa. This association occurs in Gwinnett County and consists of moderately steep, short side slopes. The soils, which follow the many branching drainageways in the sub-basin and which thus reflect a prominent dendritic pattern, have a red to yellowish-red clayey to loamy subsoil. The surface layer is friable, gravelly sandy loam. These well- to somewhat excessively drained soils are poorly suited to crops, pasture, or nonfarm uses due to the steep slopes, draughtiness, and severe hazard of erosion (U. S. Department of Agriculture 1967).

Pacolet-Gwinnett-Louisburg. This association is found in DeKalb County along stream courses where the slope angles are greater than 10 percent. The soils are well-drained to excessively drained. The surface is generally a sandy to clay loam and the subsoil is red clay. The Pacolet and Louisburg soils are derived from granite and gneiss (U. S. Department of Agriculture 1975).

Pacolet-Louisburg-Wedowee. This association is found in DeKalb County on very gently sloping ridgetops. The soils are well-drained and have a red, yellowish-brown or strong brown clayey to loamy subsoil (U. S. Department of Agriculture 1975).

Pacolet-Madison-Gwinnett. This association is found in DeKalb County on sloping to steep hillsides adjacent to drainageways. The soils are well-drained and have a dominant red and dark red clayey to loamy subsoil (U. S. Department of Agriculture 1975).

Wedowee-Pacolet-Louisburg. This association occurs in Gwinnett County on steep side slopes along well-defined drainageways. It contains many rock outcrops and most of the soils, which are well- to excessively drained, are eroded. These soils have a yellowish-red to yellowish-brown subsoil and the surface area is sandy loam. The association has a cover of mixed hardwoods and pines, as the acreage is poorly suited to crops or pasture (U. S. Department of Agriculture 1967).

Limitations and suitabilities of the soils in the sub-basin associations are listed in Table 13.

Table 13. Suitabilities of Yellow River sub-basin soils.[a]

Soil name	Roadfill	Residence	Light industry	Septic tank filter fields	Sewage lagoons	Sanitary landfills	Topsoil	Shrink-swell potential
Appling	F[b]	F	M	M	P	F	F	M
Cecil	F	F	M	M	P	F	F	F
Chewacla	P	P	P	P	P	P	P	F
Congaree	F	P	P	P	P	P	G	F
Davidson	F	F	M	F	P	M	P	F
Gwinnett	F	F	M	M	F	F	P	M
Hiwassee[c]	-	-	-	-	-	-	-	-
Louisa	F	P	P	P	P	P	P	F
Louisburg	G	P	P	P	P	P	F	F
Madison	F	F	M	M	P	F	P	M
Musella	P	P	P	P	P	P	P	M
Pacolet	F	F	M	M	P	F	P	M
Wedowee	F	M	P	P	P	P	F	M
Wehadkee	P	P	P	P	P	P	P	M

[a]Source: U. S. Department of Agriculture. 1967. Gwinnett County soil survey. Soil Conservation Service, Washington, D. C. 94 pp.

[b]Key: P -- Poor, severe limitations; F -- Fair, severe to slight limitations; M -- Moderate; G -- Good, little or no limitations

[c]Data on the suitabilities of this soil, which is found only in DeKalb County, are not currently available. The DeKalb County Soil Survey, which will include this data, is scheduled for publication in [illegible]3.

b. Biota (Biotic Communities) -- Recognition, identification, and visual delimitation of biotic communities are based upon a knowledge of interrelationships among physical environmental factors, upon major plant associations, or upon dominant organisms which are grouped together because of physical environmental constraints. In a strict sense the term "biotic community" is conceptual and represents a composite of all physical (climate, geology, hydrology, soils, etc.) and biological (plant and animal) entities. Application of the concept at a regional level such as the Upper Ocmulgee River Basin or the Yellow River sub-basin unavoidably incorporates a certain latitude of error which can be eliminated only by repeated field truthing -- an expensive and time-consuming process. Moreover, in defining communities, it is recognized that environment is dynamic and adjusts both to natural processes and to disturbances resulting from the activities of man. Consequently the characterization of biotic communities, given the variables of spatial arrangement and time, often predicates delineation of boundaries where only gradients exist.

The approach for this investigation utilizes U. S. Geological Survey (USGS) Level II land use mapping with map units as defined by Anderson et al. (1976). Supplementing this baseline information is an expanded description which focuses on the Yellow River sub-basin and which was prepared from a survey of pertinent literature and field reconnaissance[1] by Coastal Zone Resources Corporation personnel. The purpose of this section is to describe the project area biological components as reported in the literature and observed in the field in the context of USGS land use categories. The applicability of community types and descriptions presented in this report are considered valid only for riverine and slope habitats of the central Piedmont.

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[1]The initial field survey was conducted 24-27 November 1976. Plant species observed during this interval are listed in Appendix B. The 28 sites inventoried in detail by CZRC are shown on Figure 12; environmental descriptions of these sites are in Appendix C.

1) Urban or Built-up Land

> Urban or Built-up Land is comprised of areas of intensive use with much of the land covered by structures. Included in this category are cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and areas such as those occupied by mills, shopping centers, industrial and commercial complexes, and institutions that may, in some instances, be isolated from urban areas.
>
> As development progresses, land having less intensive or nonconforming use may be located in the midst of Urban or Built-up areas and will generally be included in this category. Agricultural land, forest, wetland, or water areas on the fringe of Urban or Built-up areas will not be included except where they are surrounded and dominated by urban development. The Urban or Built-up category takes precedence over others when the criteria for more than one category are met. For example, residential areas that have sufficient tree cover to meet Forest Land criteria will be placed in the Residential category. (Anderson et al. 1976)

The Urban or Built-up Land category, which encompasses approximately 16 percent of the Upper Ocmulgee River Basin, is represented by seven major community types (as delineated on USGS Level II land use maps): (a) residential; (b) commercial and services; (c) industrial; (d) transportation, communication, and utilities; (e) industrial and commercial complexes; (f) mixed urban or built-up land; and (g) other urban or built-up land.

The salient factor in terms of biotic abundance in those communities is the level at which site alteration has occurred. Disturbance that has irrevocably altered the setting such that the previous biological composition no longer exists includes such examples as large industrial sites, Hartsville Airport (Atlanta International), and area shopping centers. Occasionally the site alteration may entail major landfills so that even the slope that formerly existed at the site can no longer be ascertained. Forest cover is obliterated and with it the component animals. Small-scale landscaping with ornamental shrubbery usually replaces the previous vegetation except on non-paved transportation areas where grasses are planted for substrate stabilization, aesthetics, or to provide safety margins.

Major alteration in which remnants of the previous vegetation is left -- chiefly for landscaping purposes -- is a second level of site alteration. In this case a few individuals of canopy trees are left, and it is possible to reconstruct the natural history of the former biotic community. Some of the more gregarious species of wildlife are retained, and the site is used by migrants as well as introductory species which find suitable habitat in a scant natural setting.

A third level of alteration probably exemplifies the most current trend in urban development, since it emphasizes the natural environment and recognizes the importance of undeveloped open space and the higher appraisal value of the more desirable and rustic settings. Here the biota still retains part of the character of the former biotic community and the major losses are due principally to vegetation where the structure is now located and to more secretive wildlife species. This level of alteration typifies the higher quality suburban residential setting, light industrial and small business sites, city parks, and other "natural" areas.

Maintained areas, like many other sub-natural communities, provide "edges" or breaks along forested communities in which species diversity may be enhanced. Because of the availability of contiguous habitat types, more animal species[1] can find feeding, cover, and breeding and nesting habitats in close proximity. For game species such as white-tailed deer, turkey, and bobwhite, "edge" is an element of optimum habitat and thus serves as a buffer to the more intensified development. Particularly along streams, these corridors of communities allow the more wide-ranging and elusive species to venture into urban areas, to runway aprons, borrow pits, etc., wherever cover and an abundance of preferred forage food may be found.

(a) Residential

Residential land uses range from high density, represented by the multiple-unit structures or urban cores, to low density, where houses are on lots of more than an acre, on the periphery of urban expansion. Linear residential developments along transportation routes extending outward from urban areas should be in-

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[1]Animal species probably inhabiting communities in the Upper Ocmulgee River Basin are listed in Appendix B.

cluded as residential appendages to urban centers, but care must be taken to distinguish them from commercial strips in the same locality. The residential strips generally have a uniform size and spacing of structures, linear driveways, and lawn areas; the commercial strips are more likely to have buildings of different sizes and spacing, large driveways, and parking areas. Residential development along shorelines is also linear and sometimes extends back only one residential parcel from the shoreline to the first road.

Areas of sparse residential land use, such as farmsteads, will be included in categories to which they are related unless an appropriate compilation scale is being used to indicate such uses separately. Rural residential and recreational subdivisions, however, are included in this category, since the land is almost totally committed to residential use, even though it may have forest or range types of cover. In some places, the boundary will be clear where new housing developments abut against intensively used agricultural areas, but the boundary may be vague and difficult to discern when residential development occurs in small isolated units over an area of mixed or less intensive uses. A careful evaluation of density and the overall relation of the area to the total urban complex must be made.

Residential sections which are integral parts of other uses may be difficult to identify. Housing situations such as those existing on military bases, at colleges and universities, living quarters for laborers near a work base, or lodging for employees of agricultural field operations or resorts thus would be placed within the Industrial, Agricultural, or Commercial and Services categories. (Anderson et al. 1976)

Residential areas make up about 70 percent of all Urban and Built-up Land in the Upper Ocmulgee River Basin. Vegetation in residential areas, particularly in the newer areas that have been constructed in the last few years, still retains much of the character of the previous community. If the area was originally a mixed pine-hardwood slope, then the former biotic community can be generally identified by those trees left for landscape purposes. If an old field site originally, then the site has a well-maintained lawn with ornamental shade trees of various sizes having been added. Rarely is the residential site completely devoid of trees.

Native plants which tend to be left intact, primarily because of their size, desirability, or tolerance to minor landscaping, are white oak

(Quercus alba), black oak (Quercus velutina), sugar maple (Acer saccharum), tulip poplar (Liriodendron tulipifera), American holly (Ilex opaca), flowering dogwood (Cornus florida), loblolly and shortleaf pine (Pinus taeda, P. echinata), sweetgum (Liquidambar styraciflua) -- in brief, any trees which occupy the site are usually protected where reasonably possible during construction activities. The smaller plants, namely shrubs and ground cover herbs are usually eliminated, except in those infrequent but increasingly common instances where the "woodland aspect" is desired.

For those residential areas where all of the covering vegetation has been removed during site preparation, little space is available for native wildflowers and animals to recolonize. Thus animals commonly associated with structures, such as the house sparrow (Passer domesticus), starling (Sturnus vulgaris), or house mouse (Mus musculus), may find nesting and/or feeding areas. Undesirable species such as rock dove (Columbia livia), commonly known as the pigeon, Norway rat (Rattus norvegicus), and black rat (Rattus rattus) frequently invade decrepit and abandoned residential structures.

In areas where a remnant of the former vegetation has been left, many species of wildlife such as migratory songbirds and small mammals find suitable habitat. Typical passerine birds are American robin (Turdus migratorius), gray catbird (Dumetella carolinensis), mockingbird (Mimus polyglottos), blue jay (Cyanocitta cristata), cardinal (Cardinalis cardinalis), yellow-bellied sapsucker (Sphyrapicus varius), and house wren (Troglodytes aedon). Frequent residents of shade trees and lawns are gray squirrel (Sciurus carolinensis), Southern flying squirrel (Glaucomys volans), Eastern chipmunk (Tamias striatus), and Eastern mole (Scalopus aquaticus). If the residential area is located in a particularly wooded habitat, mammals such as Virginia opossum (Didelphis virginiana), gray fox (Urocyon cinereoargenteus), and raccoon (Procyon lotor) may occasionally be sighted.

(b) Commercial and Services

Commercial areas are those used predominantly for the sale of products and services. They are often abutted by residential, agricultural, and other contrasting uses which help define them. Components of the Commercial and Services category are urban central business districts; shopping centers, usually in suburban and outlying areas; commercial strip developments along major highways and access routes to cities; junkyards; resorts; and so forth. The main buildings, secondary structures, and areas supporting the basic use are all included -- office buildings, warehouses, driveways, sheds, parking lots, landscaped areas, and waste disposal areas.

Commercial areas may include some noncommercial uses too small to be separated out. Central business districts commonly include some institutions such as churches and schools, and commercial strip developments may include some residential units. When these noncommercial uses exceed one-third of the total commercial areas, the Mixed Urban or Built-up category should be used. There is no separate category for recreational land uses at Level II since most recreational activity is pervasive throughout many other land uses. Selected areas are predominantly recreation oriented, and some of the more distinctive occurrences such as drive-in theaters can be identified on remote sensor imagery. Most recreational activity, however, necessarily will be identified using supplemental information. Recreational facilities that form an integral part of an institution should be included in this category. There is usually a major visible difference in the form of parking facilities, arrangements for traffic flow, and the general association of buildings and facilities. The intensively developed sections of recreational areas would be included in the Commercial and Services category, but extensive parts of golf courses, riding areas ..., and so forth would be included in the Other Urban or Built-up category.

Institutional land uses, such as the various educational, religious, health, correctional, and military facilities are also components of this category. All buildings, grounds, and parking lots that compose the facility are included within the institutional unit, but areas not specifically related to the purpose of the institution should be placed in the appropriate category. Auxiliary land uses, particularly residential, commercial and services, and other supporting land uses on a military base would be included in this category, but agricultural areas not specifically associated with correctional, educational, or religious institutions are placed in the appropriate agricultural category. Small institutional units, as, for example, many churches and some secondary and elementary schools, would be mappable only at large scales and will usually be included within another category, such as Residential. (Anderson et al. 1976)

Vegetation of commercial and service areas is usually limited to weedy species that thrive in crevices of pavement, in narrow strips of land along sidewalks or adjacent to buildings, and in vacant lots, landscaped beds, and other small patches of soil. The species composition is highly variable with little, if any, predictable occurrences. Members of the grass, pea, and aster families are noted for colonizing wherever space permits, and single plants or clumps of goosegrass (*Eleusine indica*), crabgrass (*Digitaria sanguinalis*), paspalum (*Paspalum boscianum*), ragweed (*Ambrosia artemesiifolia*), dog fennel (*Eupatorium capillifolium*), and dandelion (*Taraxacum officinale*) are common. Other weeds of these sites are horse nettle (*Solanum carolinense*), toad-flax (*Linaria canadensis*), peppergrass (*Lepidium virginicum*), and henbit (*Lamium amplexicaule*). Occasionally one finds naturalized species, escaped from cultivated plots, or persistent cultivars.

A portion of pre-existing land cover is usually maintained around commercial and service structures, and in this respect commercial and service areas sometimes resemble residential areas in both plant and animal composition. Animals of high mobility may feed in one type of community, nest in another, and rest in still a third; consequently, species such as rock dove, starling, house sparrow, domestic dogs and cats, and black rat hardly typify specific community types but are associated with all types of structures in and around which suitable habitat is supplied.

(c) Industrial

Industrial areas include a wide array of land uses from light manufacturing to heavy manufacturing plants. Identification of light industries -- those focused on design, assembly, finishing, processing, and packaging of products -- can often be based on the type of building, parking, and shipping arrangements. Light industrial areas may be, but are not necessarily, directly in contact with urban areas; many are now found at airports or in relatively open country. Heavy industries use raw materials such as iron ore, timber, or coal. Included are steel mills, pulp and lumber mills, electric-power generating stations, oil refineries and tank farms, chemical plants, and brickmaking plants. Stockpiles of raw materials and waste-product disposal areas are usually visible, along with transportation facilities capable of handling heavy materials.

> Surface structures associated with mining operations are included in this category. Surface structures and equipment may range from a minimum of a loading device and trucks to extended areas with access roads, processing facilities, stockpiles, storage sheds, and numerous vehicles. Spoil material and slag heaps usually are found within a short trucking distance of the major mine areas and may be the key indicator of underground mining operations. Uniform identification of all these diverse extractive uses is extremely difficult from remote sensor data alone. Areas of future reserves are included in the appropriate present use category, such as Agricultural Land or Forest Land, regardless of the expected future use. (Anderson et al. 1976)

Industrial sites probably impose the sharpest limits on biota and present the greatest difficulty to survival. The site itself offers little suitable habitat; vehicular traffic and noise may be excessive and, generally, more favorable habitats are nearby. Nesting and feeding space is scarce for animals, and those plants which occur there are species typical of commercial and service areas. Only in exceptional cases, such as grain milling facilities, is the habitat conducive to extensive faunal usage.

(d) Transportation, Communications, and Utilities

> The land uses included in the Transportation, Communications, and Utilities category occur to some degree within all of the other Urban or Built-up categories and actually can be found within many other categories. Unless they can be mapped separately at whatever scale is being employed, they usually are considered an integral part of the land use within which they occur. For that reason, any statistical summary of the area of land uses in this category typically represents only a partial data set. Statistical area summaries of such land uses aggregated from Levels III and IV, though, would include more accurate area estimates.
>
> Major transportation routes and areas greatly influence other land uses, and many land use boundaries are outlined by them. The types and extent of transportation facilities in a locality determine the degree of access and affect both the present and potential use of the area.
>
> Highways and railways are characterized by areas of activity connected in linear patterns. The highways include rights-of-way,

areas used for interchanges, and service and terminal facilities. Rail facilities include stations, parking lots, roundhouses, repair and switching yards, and related areas, as well as overland track and spur connections of sufficient width for delineation at mapping scale.

> Airports, seaports, and major lakeports are isolated areas of high utilization usually with no well-defined intervening connections, although some ports are connected by canals. Airport facilities include the runways, intervening land, terminals, service buildings, navigation aids, fuel storage, parking lots, and a limited buffer zone. Terminal facilities generally include the associated freight and warehousing functions. Small airports (except those on rotated farmland), heliports, and land associated with seaplane bases may be identified if mapping scale permits. Port areas include the docks, shipyards, dry-docks, locks, and waterway control structures.

> Communications and utilities areas such as those involved in processing, treatment, and transportation of water, gas, oil, and electricity and areas used for airwave communications are also included in this category. Pumping stations, electric substations, and areas used for radio, radar, or television antennas are the major types. Small facilities, or those associated with an industrial or commercial land use, are included within the larger category with which they are associated. Long-distance gas, oil, electric, telephone, water, or other transmission facilities rarely constitute the dominant use of the lands with which they are associated. (Anderson et al. 1976)

Transportation, communication, and utility corridors offer locally small but collectively large habitat for many of the plant and animal species that normally occupy the ecotone between open areas and woodlands. After the clearing and construction phases, these corridors may be planted for substrate stabilization, or if left undisturbed will become colonized by herbs, shrubs, vines, and seedlings of trees, similar in total composition to adjacent woodlands. Pine is one of the first tree invaders. After a few years the aspect of these narrow strips is somewhat like that of an abandoned field left to grow up in brush and thickets, maintaining the same types of animals that would be found in old field habitats. When this phase -- the thicket and sapling stage -- is maintained by an infrequent right-of-way clearance program, a straw-and-leaf seed bed is induced, thereby holding moisture, reducing erosion, and providing wildlife food and cover.

The flora of transportation, communication, and utility routes varies with the topography and type of maintenance performed. Near the highway rights-of-way sod-forming grasses are usually planted -- the most commonly planted sod-forming grass is fescue (Festuca octoflora, F. elatior, and F. obtusa) -- while on steep embankments of road cuts and fills, sericea, a type of lespedeza (Lespedeza cuneata) is frequently planted. Railroad rights-of-way through the region frequently support adventive species of plants not found in adjacent biotic communities. If the corridor is treated with herbicides, herbaceous vegetation will usually dominate, particularly annual weeds and robust perennials which seasonally sprout from rootstocks. If the area is maintained by manual or mechanical methods, woody species, characterized by copius stump sprouts, will be more common.

East of the Plesant Hills Road bridge over the Yellow River in extreme eastern DeKalb County, a major utility line crosses the river and floodplain, and through maintenance of the right-of-way, a semi-disturbed bottomland habitat is maintained beneath the high voltage line. As a result of the infrequency of plant removal, together with alluvium and readily available moisture, a vegetation cover of coarse weeds now thrives, including a common Coastal Plain species of bottomland fields, bladder-pod (Glottidium vesicarium). The road shoulder at this crossing also is populated by another typical Coastal Plain inhabitant, the fire ant, which has been known from this part of the Piedmont of Georgia for about 15 years (personal communication, Georgia Department of Agriculture, Plant Industry, Entomology, Atlanta, 14 January 1977).

The dense shrub cover that develops along corridors enables certain small mammals such as the short-tailed shrew (Blarina brevicauda) and white-footed mouse (Peromyscus leucopus), as well as birds such as the song sparrow (Melospiza melodia), rufous-sided towhee (Pipilo erythrophthalmus), and prairie warbler (Dendroica discolor) to take advantage of the abundant seed and berry crops.

Large mammals, such as white-tailed deer (Odocoileus virginianus) and gray fox, that range over extensive areas use these corridors for feeding and travel between woodland communities. Utility poles, together with the low vegetation, provide excellent perches for birds of prey and possible nesting sites for woodpeckers. The open space above these corridors is used during the feeding hours by bats, of which the region's most common species is likely the little brown myotis (Myotis lucifugus).

(e) Industrial and Commercial Complexes

> The Industrial and Commercial Complexes category includes those industrial and commercial land uses that typically occur together or in close functional proximity. Such areas commonly are labeled with terminology such as "Industrial Park", but since functions such as warehousing, wholesaling, and occasionally retailing may be found in the same structures or nearby, the more inclusive category title has been adopted.
>
> Industrial and Commercial complexes have a definite remote sensor image signature which allows their separation from other Urban or Built-up land uses. Because of their intentional development as discrete units of land use, they may border on a wide variety of other land use types, from Residential Land to Agricultural Land to Forest Land. If the separate functions included in the category are identified at Levels III or IV using supplemental data or with ground survey, the land use researcher has the discretion of aggregating these functions into the appropriate Level II Urban or Built-up categories or retaining the unit as an Industrial and Commercial Complex. (Anderson et al. 1976)

The biotic character of industrial and commercial complexes is minor in relation to the project area as a whole, and those species which may reside or forage in these areas are often found in the more intensive residential, commercial and services, and industrial sites. The reader is referred to these sections for appropriate discussion.

(f) Mixed Urban or Built-up Land

> The Mixed Urban or Built-up category is used for a mixture of Level II Urban or Built-up uses where individual uses cannot be separated at mapping scale. Where more than one-third intermixture of another use or uses occurs in a specific area, it is classified as Mixed Urban or Built-up Land. Where the intermixed land use or uses total less than one-third of the specific area, the category appropriate to the dominant land use is applied.
>
> This category typically includes developments along transportation routes and in cities, towns, and built-up areas where separate land uses cannot be mapped individually. Residential, Commercial, Industrial, and occasionally other land uses may be included. A mixture of industrial and commercial uses in Industrial and Commercial Complexes as defined in category 15 are not included in this category. Farmsteads intermixed with strip or cluster settlements will be included within the built-up land, but other agricultural land uses should be excluded. (Anderson et al. 1976)

Mixed urban or built-up land is a biotic community of considerable importance in the study area, primarily due to the potential increase in size of this community as land uses in the project area change. This category currently comprises such a small area that, at the USGS Level II mapping scale of 1:100,000, only 31.88 acres within the Upper Ocmulgee River Basin are so classified. Because the category is an inclusive one -- that is, small tracts of other communities such as residences, small fields, pastures, garden plots, and groves of trees are grouped together -- the biota is likewise varied and characteristic of the component communities.

Plants in this land use category include both native and introduced species. Remnant natural stands of forest, preserved or planted shade trees of lawns, weeds and grasses of pastures, barnyards, vacant lots, vegetable and feed crops, and old field weeds are a few of the assemblages of vegetation to be expected in mixed urban or built-up areas.

The faunal composition of mixed urban sites similarly includes animals from woodlands as well as those more commonly associated with houses and various types of agricultural and commercial buildings. Despite predation by domestic pets, it is in this mosaic of communities that small game animals such as the gray squirrel, Eastern cotton-tail (*Sylvilagus floridanus*), bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura*) are able to subsist within a relatively urban setting. The abundance of rodents, insects, and eggs or juveniles of small animals supports predacious birds such as the screech owl (*Otus asio*) and American kestrel (*Falco sparverius*), reptiles such as the black rat snake (*Elaphe obsoleta obsoleta*) and Eastern hognose snake (*Heterodon platyrhinos*), and amphibians such as the American toad (*Bufo americanus*).

(g) Other Urban or Built-up Land

> Other Urban or Built-up Land typically consists of uses such as golf driving ranges, zoos, urban parks, cemeteries, waste dumps, water-control structures and spillways, the extensive parts of such uses as golf courses ..., and undeveloped land within an urban setting. Open land may be in very intensive use but a use that does not require structures, such as urban playgrounds, botanical gardens, or arboreta. The use of descriptions such as "idle land", "vacant land", or "open land" should be avoided in categorizing undeveloped lands within urban areas on the basis of the use of remote sensor data, since information generally is not available to the interpreter to make such a refinement in categorization. (Anderson et al. 1976)

Plants associated with other urban and built-up lands may consist of only a few species such as the commonly planted Bermuda grass (*Cynodon dactylon*) on golf courses to the hundreds of species found and cultivated in Fernbank Garden Center. The extent of disturbance in large part determines the variety of species; if disturbance is severe, then few species are able to thrive. Conversely, if disturbance is minimal, the composition will be diverse. In mapping this category, the sites are usually narrow and are masked by adjacent communities when remote sensing techniques are employed. Therefore the wildlife that is found in the community often represents transient species that are moving through the zone to less disturbed areas or that are foraging for short periods of time in this community.

2) <u>Agricultural Land</u>

Agricultural Land may be defined broadly as land used primarily for production of food and fiber. On high-altitude imagery, the chief indications of agricultural activity will be distinctive geometric field and road patterns on the landscape and the traces produced by livestock or mechanized equipment. However, pasture and other lands where such equipment is used infrequently may not show as well-defined shapes as other areas. These distinctive geometric patterns are also characteristic of Urban or Built-up Lands because of street layout and development by blocks. Distinguishing between Agricultural and Urban or Built-up Lands ordinarily should be possible on the basis of urban-activity indicators and the associated concentration of population. The number of building complexes is smaller and the density of the road and highway network is much lower in Agricultural Land than in Urban or Built-up Land. Some urban land uses, such as parks and large cemeteries, however, may be mistaken for Agricultural Land, especially when they occur on the periphery of the urban areas.

The interface of Agricultural Land with other categories of land use may sometimes be a transition zone in which there is an intermixture of land uses at first and second levels of categorization. Where farming activities are limited by wetness, the exact boundary also may be difficult to locate, and Agricultural Land may grade into Wetland. When the production of agricultural crops is not hindered by wetland conditions, such cropland should be included in the Agricultural category. This latter stipulation also includes those cases in which agricultural crop production depends on wetland conditions, such as the flooding of ricefields or the development of cranberry bogs. When lands produce economic commodities as a function of their wild state such as wild rice, cattails, or certain forest products commonly associated with wetland, however, they should be included in the Wetland category. Similarly, when wetlands are drained for agricultural purposes, they should be included in the Agricultural Land category. When such drainage enterprises fall into disuse and if wetland vegetation is reestablished, the land reverts to the Wetland category.

The Level II categories of Agricultural Land are: Cropland and Pasture; Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas; Confined Feeding Operations; and Other Agricultural Land. (Anderson et al. 1976)

The most striking characteristic of land use in the Upper Ocmulgee River Basin, perhaps, is the transition from agriculture, which now accounts for approximately 25 percent of all land use in the project area, to urban land use. Cotton, corn, grain sorghum, soybeans, wheat, and other crops are now relegated to a small proportion of the land in the counties surrounding the City of Atlanta, and residential clusters are replacing old fields. The decline in farms, the reduction in farm acreage, and the proportion of all land in farms for the period 1964-69 (Table 14) give an indication of this transition. Particularly notable is the 49 percent reduction of farms in Rockdale County and the nearly 65 percent change in farm acreage in DeKalb County, leaving only 5 percent of the latter county in agricultural production.

As might be expected the production of livestock and poultry, because of the readily available market in Atlanta and nearby satellite cities, exceeds crop production in most cases. Yet the competitive land market and increasing costs of taxes, equipment, seed, fertilizer, utilities, and farm buildings tend to offer an incentive to the farmer to sell his land for residential or commercial purposes and either abandon farming altogether or attempt to resettle. As shown in Table 14, this process is now occurring within the project area, particularly in Rockdale, DeKalb, Gwinnett, and Fulton counties. Outlier counties, located further from the Atlanta metropolitan area, are currently less affected and show a smaller percentage of decline in number of farms and farm acreage. Although agricultural lands are scattered throughout the project area, the conversion from agricultural to urban and built-up lands will undoubtedly intensify in the future.

(a) Cropland and Pasture

The several components of Cropland and Pasture now used for agricultural statistics include: cropland harvested, including bush fruits; cultivated summer-fallow and idle cropland; land on which crop

Table 14. Farms, land use changes of agricultural enterprise, value of products, and source distribution in the Upper Ocmulgee River Basin, Georgia.[a]

	Butts	Clayton	DeKalb	Fulton	Gwinnett	Henry	Jasper	Newton	Rockdale	Walton
Farms (1969)	211	159	115	507	591	531	255	339	184	638
Percent change 1964-1969	-26.5	2.6	-41.6	-37.1	-40.4	-16.2	13.3	-22.4	-49.0	-21.0
Farm acreage (thousands)	52	17	9	56	52	91	81	84	25	112
Percent change 1964-1969	-23.4	-24.1	-63.9	-36.1	-45.1	-15.4	-33.4	-15.9	-42.3	-9.5
Proportion of all land in farms	44.1	17.7	5.2	16.4	18.5	43.0	33.8	48.2	30.6	53.2
Average acres per farm	248	106	78	110	87	171	316	247	136	176
No. farms less than 10 acres	9	9	11	40	34	22	11	6	4	21
No. farms more than 1,000 acres	4	1	0	3	1	8	10	11	5	13
Percent farms with sales of $2500+	66	26	42	59	54	49	82	73	23	65
Value of farm products sold by farms with sales of $2500 and over										
Average sales per farm ($'s)	13,608	20,236	35,482	19,692	46,919	17,023	37,548	29,694	14,438	29,396
Percent from crops	16.6	7.3	13.0	15.3	1.7	21.1	0.8	4.8	13.6	13.0
Percent from dairy products	33.2	withheld	51.1	5.3	2.4	41.6	23.9	34.6	23.0	9.2
Percent from livestock and livestock products	21.3	20.1	15.0	23.2	4.9	25.4	15.7	26.4	30.6	15.5
Percent from poultry and poultry products	24.6	withheld	18.5	54.5	90.6	9.5	59.1	34.1	32.8	61.2

[a]Source: U. S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census. 1973. County and city data book, 1972. U. S. Gov. Printing Office, Washington, D. C. 1020 pp.

failure occurs; cropland in soil-improvement grasses and legumes; cropland used only for pasture in rotation with crops; and pasture on land more or less permanently used for that purpose. From imagery alone, it generally is not possible to make a distinction between Cropland and Pasture with a high degree of accuracy and uniformity, let alone a distinction among the various components of Cropland (Hardy, Belcher, and Phillips, 1971). Moreover, some of the components listed represent the condition of the land at the end of the growing season and will not apply exactly to imagery taken at other times of the year. They will, however, be a guide to identification of Cropland and Pasture. Brushland in the Eastern States, typically used to some extent for pasturing cattle, is included in the Shrub-Brushland Rangeland category since the grazing activity is usually not discernible on remote sensor imagery appropriate to Levels I and II. This activity possibly might be distinguished on low-altitude imagery. Such grazing activities generally occur on land where crop production or intensive pasturing has ceased, for any of a variety of reasons, and which has grown up in brush. Such brushlands often are used for grazing, somewhat analogous to the extensive use of rangelands in the West.

Certain factors vary throughout the United States, and this variability also must be recognized; field size depends on topography, soil types, sizes of farms, kinds of crops and pastures, capital investment, labor availability, and other conditions. Irrigated land in the Western States is recognized easily in contrast to Rangeland, but in the Eastern States, irrigation by use of overhead sprinklers generally cannot be detected from imagery unless distinctive circular patterns are created. Drainage or water control on land used for cropland and pasture also may create a recognizable pattern that may aid in identification of the land use. In areas of quick-growing crops, a field may appear to be in nonagricultural use unless the temporary nature of the inactivity is recognized. (Anderson et al. 1976)

Croplands and pastures are vegetated by a variety of weeds in addition to the customary row crops, small grains, and fodder legumes and grasses. Generally the agricultural lands lie at the eastern and southern extremes of the project area where urban pressure is less pronounced. In Rockdale County where outcrops of granite are exposed or lie close to the surface, the most lucrative farming areas are mostly located on the cleared floodplains where a cover of alluvium provides deep, fertile soil for agricultural pursuits. Even where rocks are present on the uplands, the outcrops are often fenced and provide scanty, low-quality forage. The demise of farming as an occupational activity in the Atlanta region also is evidenced by the presence and relative abundance of old fields -- abandoned agricultural lands not yet grown up in thickets, brush, or trees.

Vegetation development in croplands and pastures depends upon two seed sources -- buried viable seeds (Oosting and Humphries 1940) and dispersal from nearby communities. The combination of these two sources produces a highly diverse assemblage, provided that disturbance from cultivation and seasonal plowing occur. Once the croplands are abandoned, the diversity of annual weeds is replaced by a constituency of perennial weeds, and later by seedlings of tree and shrub species.

A colonizing sequence has long been noticed in plant composition, and the chronological timing has been investigated at numerous sites where the abandoned cropland situation exists. These observations about vegetation changes in old fields considerably strengthened the concept of succession that originated with Warming in Denmark (1891, as cited in Morrison and Yarranton 1974) and that was popularized by Cowles (1899) in his classic study of the Indiana sand dunes. In the southeastern United States the work of Oosting (1942), Keever (1950), Quarterman (1957), and Odum (1960) established "old-field succession" as the model for "ecosystem development" by which croplands and pastures, barring continued disturbance, revert to forests. Therefore the biotic composition of croplands should in a broad sense be viewed as a community in transition with the degree of old field or forest expression directly related to the extensiveness and frequency of disturbance. Considered in this respect, the occasional trees or shrubs in pastures or perennial grasses in old fields can be more lucidly understood.

Characteristic vegetation of fields and pastures includes many species of annuals and perennial asters, grasses, and legumes. In fallow fields, weeds such as Queen Anne's lace (Daucus carota), horseweed (Erigeron canadensis), plantain (Plantago lanceolata, P. virginica, P. aristata), horse nettle, dog fennel, and goosegrass may occur together with or may replace crabgrass, Johnson grass (Sorghum halapense), and morning-glories (Impomea spp.). In older fields that have lain fallow for a few years, there may be other seral stages of old field succession such as broomsedge (Andropogon virginicus), horseweed, and pine seedlings. In still older fields the invasion of pine and hardwood seedling may make aerial distinction between agricultural lands and forested lands impossible since they are truly in a transition period from one type of land use to another.

The plants of pastures often include occasional trees, usually young pines, which are left to give shade to livestock. Fescue, clover (Trifolium spp.), and other varieties of grasses are sown for pasture, and sometimes small grain fields of mixed wheat, oats, rye, or barley are temporarily fenced for livestock grazing. After harvest corn fields are often fenced for swine prior to the fall or winter slaughter. Not infrequently adventive weeds are introduced into pasture lands through livestock feed, contamination of seeds purchased for sowing, by animal vectors, or by wind or other abiotic means.

Croplands and pastures play an integral role in the project area, especially when they are located within close proximity to woodlands or bottomlands. Individuals of many species of birds and mammals often travel several miles and pass through many community types, including croplands, in one day's or one night's hunt. Wintering flocks of waterfowl move more or less regularly from lake to lake or farm pond to farm pond. Crows (Corvus brachyrhynchos), robins, mourning doves, blackbirds (Agelaius phoeniceus), and starlings accumulate in late summer-early fall, and winter roosts numbering 50,000 or more birds fly out as many as 50 to 70 mi each morning to feed in fields, pastures, feedlots, woods, and various ecotones, then return each night to their established roosting site in some 1-3 acres of thicket woodland. In so doing, these birds often "stage" or tarry around such open areas as landfills, hedgerows, fields, and meadows.

Diverse habitats, large open spaces, and unimpaired mobility are necessary to the survival of large birds of prey. Hawks, vultures, and owls nest or roost in various types of woodland habitats but forage across fields and pastures. Wintering flocks of goldfinches (Spinus tristis), evening grosbeaks (Hesperiphona vespertina), and purple finches (Carpodacus purpureus) do not have the local home ranges typical of most small birds but rather roam loosely across several woody communities and old field ecotones. In spring and fall migration, large numbers of species "spill out" of their usual preferred communities and forage wherever proves to be advantageous.

Many of the larger mammals -- opossum, raccoon, striped skunk (Mephitis mephitis), red fox (Vulpes vulpes), gray fox, otter (Lontra canadensis), deer, -- and the bats also range across considerable distances and several community types in single foraging expeditions. Their appearance in croplands and pastures,or overhead in the case of bats, can sometimes be observed during twilight or dawn hours. Croplands and pastures contain the preferred foods of herbivores, which in turn are preyed upon by carnivorous species. As with the birds, each of these mammals has a primary or preferred habitat for breeding and for nesting or resting cover; nevertheless, individuals do exploit additional biotic communities found within their ranges.

(b) Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas

Orchards, groves, and
nut crops. Nurseries and horticultural areas, which include horticultural and seed-and-sod areas and some greenhouses, are used perennially for those purposes. Tree nurseries which provide seedlings for plantation forestry also are included here. Many of these areas may be included in another category, generally Cropland and Pasture, when identification is made by use of small-scale imagery alone. Identification may be aided by recognition of the combination of soil qualities, topography, and local climatological factors needed for these operations: water bodies in close proximity which moderate the effects of short duration temperature fluctuations; site selection

> for air drainage on sloping land; and deep well-drained soils on slopes moderate enough to permit use of machinery. Isolated small orchards, such as the fruit trees on the family farm, usually are not recognizable on high-altitude imagery and are, therefore, not included. (Anderson et al. 1976)

The plants found in orchards, groves, vineyards, nurseries, and ornamental horticultural areas can be extremely diverse, owing to the numbers of cultivated species. In mappable units, these sites are few in number and small in size. The principal orchard trees are peach (*Prunus persica*) and pecan (*Carya illinoensis*). Many rural homes have an occasional fruit tree such as peach and pear (*Pyrus communis*), or bushes such as fig (*Ficus carica*), but these are considered with other units. Vineyards, as one ordinarily thinks of them, are absent in the project area, and nurseries and horticultural areas occupy an insignificant part of the project area total.

Because of the small size of this land use type, there is no distinct biotic composition, and those animals which may be found at any one time in this community type are most likely visitors from other adjacent and nearby habitats.

(c) Confined Feeding Operations

> Confined Feeding Operations are large, specialized livestock production enterprises, chiefly beef cattle feedlots, dairy operations with confined feeding, and large poultry farms, but also including hog feedlots. These operations have large animal populations restricted to relatively small areas. The result is a concentration of waste material that is an environmental concern. The waste-disposal problems justify a separate category for these relatively small areas. Confined Feeding Operations have a built-up appearance, chiefly composed of buildings, much fencing, access paths, and waste-disposal areas. Some are located near an urban area to take advantage of transportation facilities and proximity to processing plants.
>
> Excluded are shipping corrals and other temporary holding facilities. Such occurrences as thoroughbred horse farms generally do not have the animal population densities which would place them in this category. (Anderson et al. 1976)

Although confined feeding operations are scattered along the eastern periphery of the project area, they do not constitute a large area of the Upper Ocmulgee River Basin and hence do not play an important role in sustenance of wildlife species. Practically barren of plants, the confined feeding operations are very important in terms of livestock utilization, and for those non-commercial species of animals which occur here, the most abundant would likely be ubiquitous birds such as the house sparrow and starling, rats, and mice.

An important environmental aspect of confined feeding operations is the potential for water pollution (both surface and sub-surface) from runoff and deep percolation of undesirable minerals and organic compounds from these areas. If located near a surface stream, runoff from confined feedlots can result in increased biochemical oxygen demand and thus decreased levels of dissolved oxygen, as well as increased nutrients which may result in algal blooms.

Pollution of groundwater may also result from confined feeding operations, as nitrates and nitrites, ammonia, phosphorus, potassium, calcium, magnesium, various soluble salts, and organic matter percolate through the soil and enter groundwater aquifers. In an extensive research project in which he took soil samples from 21 beef cattle feedlots in Georgia, Fordham (1973) found that average topsoil nitrate within feedlot areas was less than 20 ppm and that only potassium showed appreciable movement in the soil profile. He concluded that pollution of groundwater from beef cattle feedlots is probably not significant in Georgia. The lack of large groundwater supplies and, in many areas, well-developed soil profiles also reduces concern about potential soil and groundwater pollution from confined feeding operations in the project area.

(d) Other Agricultural Land

Other land uses typically associated with the first three categories of Agricultural Land are the principal components of the Other Agricultural Land category. They include farmsteads, holding

> areas for livestock such as corrals, breeding and training facilities on horse farms, farm lanes and roads, ditches and canals, small farm ponds, and similar uses. Such occurrences generally are quite small in area and often uninterpretable by use of high-altitude data. Even when they are interpretable from such data, it may not be feasible to map them at smaller presentation scales, which generally results in their inclusion with adjacent agricultural use areas. This category should also be used for aggregating data for land uses derived at more detailed levels of classification. (Anderson et al. 1976)

The difference between cropland and pasture and other agricultural land is in many cases extraordinarily subtle. Thus the biotic composition may be slightly or not at all different. The small scale of the differences -- roadside ditches, farm lanes, and roads, etc. -- is advantageous only to those animals and plants which thrive on small space or in areas of frequent disturbance. The Eastern mole and the American toad seem to frequent these kinds of habitats. In the case of small farm ponds, there is often a periphery of marsh or aquatic plants which provides food and cover for wetland species. Muskrat (Ondatra zibethicus) and ducks such as the ring-necked duck (Aythya collaris), hooded merganser (Lophodtyes cucullatus), mallard (Anas platyrhynchos), and gadwall (Anas strepera) frequent these ponds.

Another type of habitat in other agricultural land which cannot be separately mapped but which is one of the most valuable for animals is the habitat provided by hedgerows and narrow strips of thickets. Here small game animals, such as Eastern cottontail, bobwhite, and mourning dove, and numerous species of rodents and songbirds find food, cover, and nesting sites, when fields are harvested, plowed, etc. Close observation reveals that birds of prey such as hawks may perch along hedgerows during the day, while owls use hedgerow trees for observation posts during the night. The plant life which provides all of these amenities for wildlife are such species as blackberry (Rubus argutus), Japanese honeysuckle (Lonicera japonica), sassafras (Sassafras albidum), wild blackcherry (Prunus serotina), red cedar (Juniperus virginiana), and others. Around old house sites there may be remnants of formerly cultivated species of plants such as chinaberry (Melia azederach), hog plum (Prunus umbellata), tree-of-heaven (Ailanthus altissima), or fruit trees such as peach and pear.

3) Forest Land

Forest Lands have a tree-crown areal density (crown closure percentage) of 10 percent or more, are stocked with trees capable of producing timber or other wood products, and exert an influence on the climate or water regime. Forest Land generally can be identified rather easily on high-altitude imagery, although the boundary between it and other categories of land may be difficult to delineate precisely.

Lands from which trees have been removed to less than 10 percent crown closure but which have not been developed for other uses also are included. For example, lands on which there are rotation cycles of clearcutting and block-planting are part of Forest Land. On such lands, when trees reach marketable size, which for pulpwood in the Southeastern United States may occur in 2 to 3 decades, there will be large areas that have little or no visible forest growth. The pattern can sometimes be identified by the presence of cutting operations in the midst of a large expanse of forest. Unless there is evidence of other use, such areas of little or no forest growth should be included in the Forest Land category. Forest land which is grazed extensively, as in the Southeastern States, would be included in this category because the dominant cover is forest and the dominant activities are forest related. Such activities could form the basis for Levels III or IV categorization. Lands that meet the requirements for Forest Land and also for an Urban or Built-up category should be placed in the latter category. The only exceptions in classifying Forest Land are those areas which would otherwise be classified as Wetland if not for the forest cover. Since the wet condition is of much interest to land managers and planning groups and is so important as an environmental surrogate and control, such lands are classified as Forested Wetland.

Auxiliary concepts associated with Forest Land, such as wilderness reservation, water conservation, or ownership classification, are not detectable using remote sensor data. Such concepts may be used for creating categories at the more detailed levels when supplemental information is available.

At Level II, Forest Land is divided into three categories: Deciduous, Evergreen, and Mixed. To differentiate these three categories effectively, sequential data, or at least data

> acquired during the period when deciduous trees are bare, generally will be necessary. (Anderson et al. 1976)

Forest land, totaling 472,444.66 acres, covers about 53 percent of the Upper Ocmulgee River Basin and thus represents the largest single land use category in the study area.

(a) Deciduous Forest Land

> Deciduous Forest Land includes all forest areas having a predominance of trees that lose their leaves at the end of the frost-free season or at the beginning of a dry season. In most parts of the United States, these would be the hardwoods such as oak (Quercus), maple (Acer), or hickory (Carya) and the "soft" hardwoods ... (Shelford, 1963). ... Deciduous forest types characteristic of Wetland, such as tupelo (Nyssa) or cottonwood (Populus deltoides), also are not included in this category. (Anderson et al. 1976)

Two associations of deciduous forests are present in the project area: (1) a rich, usually north-exposure slope component dominated largely by old growth beech (Fagus grandifolia), white oak, tulip poplar, and sugar maple, and (2) a ridge component that is dominated almost exclusively by rock chestnut oak (Quercus prinus). A variant of the slope forest found on excessively steep slopes and bluffs is the laurel bluff in which the understory is dominated by the evergreen shrub, mountain laurel (Kalmia latifolia).

Although the slope component is found on cool north-facing slopes, and therefore maintains a more montane temperature and moisture regime, the most notable characteristic is the deep well-drained soil. Consequently these habitats have a diverse flora, particularly spring wildflowers, a feature that lends considerable appeal to such areas as Soapstone Ridge, McDaniel's Bluff, and other wooded slopes of both the South and Yellow rivers. In contrast, the rock chestnut oak component occurs on thin soils, often over granite, and the subsequent assemblage of wildflowers is more or less an impoverished flora of weedy types, typically members of the pea family and the aster family. (A prominent ridge of this type community lies south of Porterdale -- Ga 81 follows the crest of this ridge.)

An idealized transect down a slope on which the rock chestnut oak community grades into the beech-maple community would have the following aspect: at the top of a ridge with thin soil and occasional exposed boulders would be short broad-crowned trees of rock chestnut oak and occasional scarlet oak (Quercus coccinea) or mockernut hickory (Carya tomentosa). The understory would consist of sourwood (Oxydendron arboreum), black gum (Nyssa sylvatica), sparkleberry (Vaccinium arboreum), and squaw huckleberry (Vaccinium stamineum), while the groundcover would be sparse with only occasional plants of pipsissewa (Chimaphila maculata), goldenrod (Solidago spp.), needle grass (Stipa avenacea), and other xeric woodland species. The midslope would display a slightly more diverse flora, with tulip poplar, sweetgum, and understory saplings of sugar maple, flowering dogwood, etc. scattered among the canopy oaks and hickories. The lower slope vegetation would vary, depending upon exposure, and would probably consist of upper slope species if facing a southerly direction or, if facing a northerly direction, would likely contain beech, tulip poplar, sugar maple, and numerous species of understory trees and shrubs. Christmas fern (Polystichum acrostichoides) would be common ground cover species.

Animals of the deciduous forest may be separated into vertical zones of habitation: ground, understory, and overstory layers. Bird species that feed and/or nest in the ground layer are the ovenbird (Seiurus aurocapillus), veery (Catharus fuscescens), brown thrasher (Toxostoma rufum), fox sparrow (Passerella iliaca), and woodcock (Philohela minor). Woodland game animals include raccoon, opossum, white-tailed deer, gray squirrel, Eastern cottontail, mourning dove, and bobwhite. Small, less mobile mammals typical of this layer include the short-tailed shrew, Eastern chipmunk, white-footed mouse, and woodland vole (Microtus pinetorum). Reptilian species in the deciduous forest are abundant and diverse. Common inhabitants include the Eastern box turtle (Terrapene c. carolina), black rat snake, Eastern hognose snake, and broad-headed skink (Eumeces laticeps). Terrestrial woodland salamanders that use humid microhabitats throughout the ground layer are the spotted salamander (Ambystoma maculatum), marbled salamander (A. opacum), small-mouthed salamander (A. texanum), and Eastern tiger salamander (A. t. tigrinum).

Abundant food and protective cover in the understory layer are utilized by birds such as the wood thrush (Hylocichla mustelina), hooded warbler (Wilsonia citrina), and downy woodpecker (Dendrocopus pubescens). Gray squirrels, opossums, and Southern flying squirrels (Glaucomys volans) nest in snags, hollow trees such as sourwood, and understory trees.

The forest canopy supplies seasonal blossoms, buds, and seeds as well as emergent insects that are used for food by the red-eyed vireo (Vireo olivaceus), scarlet tanager (Piranga olivacea), tufted titmouse (Parus bicolor), common flicker (Colaptes auratus), and various warblers (Dendroica spp.). The abundant birds and small mammals are preyed upon by two typical residents of the deciduous forest -- the great-horned owl (Bubo virginianus) and red-tailed hawk (Buteo jamaicensis). Feeding throughout the forest and roosting in its hollow trees and dense foliage are several bat species that include the little brown myotis, eastern pipistrelle (Pipistrellus subflavus), and red bat (Lasiurus borealis). Although frogs are usually associated with water, the gray treefrog (Hyla versicolor) typically forages and calls high in the deciduous canopy.

Transition zones between the deciduous forest and mixed or evergreen forests and old fields provide habitat diversity suitable for avian species not characteristic of either community. The common crow is a ubiquitous visitor of such ecotones, although for roosting and nesting this bird seems to prefer dense pine woodlands. Birds common to this edge are the song sparrow, indigo bunting (Passerina cyanea), common yellowthroat (Geothlypis trichas), and prairie warbler. The Cooper's hawk (Accipiter cooperii) and sharp-shinned hawk (Accipiter striatus) frequently perch and hunt along the forest-field ecotone.

(b) Evergreen Forest Land

Evergreen Forest Land includes all forested areas in which the trees are predominantly those which remain green throughout the year. Both coniferous and broad-leaved evergreens are included in this

> category. In most areas, the coniferous evergreens predominate, ... [and] are commonly referred to or classified as softwoods. They include such ... species as ... the shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), and other southern yellow pines. ... (Anderson et al. 1976)

Evergreen forests in the project area are composed of loblolly pine plantations or transitional forests of either loblolly pine or shortleaf pine or both. Small stands of red cedar occur only rarely. Pine forests usually occur on soils of low fertility and high acidity, commonly on old fields long abandoned or on sites formerly covered by forests in which the canopy species have been timbered and/or burned. Loblolly pine is the most abundant pine in the project area. Due to decreased light levels as a result of canopy closure, pine seedlings are not as successful as hardwood seedlings and, when the shade tolerant seedlings and saplings of hardwood species survive, young pine saplings often die before reaching full sunlight. The understory, therefore, is usually dominated by hardwood species such as sweetgum, black gum, and sourwood. Under normal succession processes the evergreen forests gradually revert to mixed forests and eventually to deciduous forests, according to the classic papers on Piedmont old field succession.

The complement of herb species is more stereotyped. Pipsissewa, elephant's foot (*Elephantopus tomentosus*), yellow jessamine (*Gelsemium sempervirens*), and Japanese honeysuckle occur predictably throughout this community.

The contribution of biomass to pine forest soil decay organisms is very rapid but is often localized. Piles of bark often accumulate at bases of pine trees, contributing substantially to inhibition of young individuals of other plant species, as well as adding to the recyclable biomass of the forest. The relatively dense groves of pines tend to enhance the density of insect pests such as the Southern pine bark beetle (*Dendroctonus frontalis*) that has reached epidemic proportions in forests in certain parts of the South. This beetle and a related species, the ips beetle (*Dendroctonus ips*), tend to favor trees struck by lightning (which in itself may be fatal). Once bark beetles have infested pine trees, they quickly tunnel beneath the bark into the living tissue or cambium and effectively girdle the tree, preventing movement of minerals and metabolic products between the roots and the branches. An invasion of secondary insects often follows. In addition, the bark beetles serve as the vector for a bluish-black fungus which readily grows into the heartwood, leaving a blue-streaked appearance and rendering the wood virtually useless.

Upland pine forests have less bird life in summer, both in kinds and in numbers, than either deciduous forests or wetland forests. Just the reverse is true in winter -- the hardwood communities are bare and open, while there is a good supply of food and cover amidst the needles of the pines. In summer, the pines are hot, dry, and sunlit, while deciduous woods are shaded, cool, and moist. The yellow-throated warbler (*Dendroica dominica*) and the pine warbler (*D. pinus*) are especially distinctive inhabitants of pines. The ruby-crowned kinglet (*Regulus calendula*) also frequents pine stands.

In winter, pine and mixed pine-hardwood stands characteristically have mixed flocks of birds of up to 15 or more species and 100 or more individuals which slowly forage through the tree canopies. Common members of these groups are permanent and/or winter residents such as woodpeckers (*Centurus carolinus*, *Dryocopus pileatus*, *Dendrocopos borealis*, etc.), nuthatches (*Sitta* spp.), tufted titmice, Carolina chickadees (*Parus carolinensis*), Carolina wrens (*Thryothorus ludovicianus*), and pine warblers.

In pine plantations where a depauperate hardwood understory occurs, the fauna is usually less diverse than in stands which contain patches of hardwoods, thickets, or a relatively diverse understory. In other words, animal diversity is positively correlated with floral diversity. Although amphibians and reptiles are not as abundant in this land use category as in other types of communities, such as wetland forests, the American toad, Eastern box turtle, Eastern fence lizard (Sceloporus undulatus), Eastern hognose snake, Northern black racer (Coluber c. constrictor), and copperhead (Agkistrodon contortrix) are frequent inhabitants. Mammals such as the gray squirrel, Eastern chipmunk, and white-footed mouse are also present in this community.

(c) Mixed Forest Land

> Mixed Forest Land includes all forested areas where both evergreen and deciduous trees are growing and neither predominates. When more than one-third intermixture of either evergreen or deciduous species occurs in a specific area, it is classified as Mixed Forest Land. Where the intermixed land use or uses total less than one-third of the specified area, the category appropriate to the dominant type of Forest Land is applied, whether Deciduous or Evergreen. (Anderson et al. 1976)

In total acreage the mixed forest land occupies the greatest proportion (30 percent) of the Upper Ocmulgee River Basin. Seldom does one encounter an upland forest stand which does not contain at least loblolly pine or red cedar. Much of what has been said of upland hardwood forest and pine forest is applicable to this land use designation. While the mixed forest land may be considered intermediate between hardwood and pine lands since the total plant composition contains features of both types, the overall relative importance of each species may be quite different.

Occurrence of this forest type can be interpreted as (1) a post-mature pine forest in which loblolly pine is becoming less common, (2) a lumbered forest in which the hardwood species have been removed, or (3) a sustained mixed forest in which both hardwoods and pine are intermittently removed. Such hardwood species as sweetgum, black gum, tulip poplar, white oak, and the more xerophytic species of oak and hickory share the canopy dominance with pine. Surprisingly, red maple (Acer rubrum), ordinarily a common constituent of Piedmont forest, was infrequently observed in the Yellow River sub-basin. Understory species are the same as those mentioned for upland hardwood forest, although sourwood may be more abundant.

Near the bases of slopes where the upland forests grade into the floodplain forest, the soil may be deeper, of a heavier texture, and less well-drained. Consequently there may be a subtle mixture of floodplain species migrating upslope into the mixed forest. It is here that one may find a greater abundance of tulip poplar, hop hornbeam (*Ostrya virginiana*), and possibly an occasional sycamore (*Platanus occidentalis*) or ironwood (*Carpinus caroliniana*).

The shrub and herb species are also much the same as in slope hardwoods, varying according to the abundance or virtual absence of pine. Christmas fern is often abundant especially on north slopes. Shrubs include squaw huckleberry, witch hazel (*Hamamelis virginiana*), fringe-tree (*Chionanthus virginicus*), nanny-berry (*Viburnum prunifolium*), bladdernut (*Staphylea trifolia*), while vines include crossvine (*Anisostichus capreolata*), Virginia creeper (*Parthenocissus quinquefolia*), and sawbrier (*Smilax glauca*).

One of the ecological features of the upland mixed pine-hardwood forest compared with the mature hardwood forest is that the former is successionally transitional. Loblolly and shortleaf pine trees are in various stages of senescence, and as they die and decay the subsequent detritus (litter) is recycled in the forest ecosystem. This process is evident by the gradual establishment of new saprophytic organisms (decomposers) that produce changes in the physiochemical nature of the litter and upper soil horizons. These changes contribute to and are reflected by the appearance and development of upland hardwood forest species.

The mixed pine-hardwood community has a more varied terrestrial vertebrate composition than either the upland hardwood or the upland pine forests, because of the greater diversity of plant species and the tendency toward a greater and distinctive stratification. While the mixed forest is a definite vegetation type, both in biotic components and percentage presence in the area, its animal life is perhaps best understood as a combination of the pine and hardwood types. For instance, some nesting birds extending into the mixed woodlands from the pines are pine warbler, ovenbird, and brown-headed nuthatch (*Sitta pusilla*), while some species from the hardwoods are the red-bellied woodpecker (*Centurus carolinus*), downy woodpecker, and great crested flycatcher (*Myiarchus crinitus*). The same mixing of species is true for winter-resident birds, for a number of kinds of mammals, lizards, and snakes, and even for such amphibians as the marbled salamander, slimy salamander (*Plethodon glutinosus*), American toad, gray treefrog, and Eastern narrow-mouthed toad (*Gastrophryne carolinensis*).

4) Barren Land

Barren Land is land of limited ability to support life and in which less than one-third of the area has vegetation or other cover. In general, it is an area of thin soil, sand, or rocks. Vegetation, if present, is more widely spaced and scrubby than that in the Shrub and Brush category of Rangeland. Unusual conditions, such as a heavy rainfall, occasionally result in growth of a short-lived, more luxuriant plant cover. Wet, nonvegetated barren lands are included in the Nonforested Wetland category.

Land may appear barren because of man's activities. When it may reasonably be inferred from the data source that the land will be returned to its former use, it is not included in the Barren category but classified on the basis of its site and situation. Agricultural land, for example, may be temporarily without vegetative cover because of cropping season or tillage practices. Similarly, industrial land may have waste and tailing dumps, and areas of intensively managed forest land may have clear-cut blocks evident.

When neither the former nor the future use can be discerned and the area is obviously in a state of land use transition, it is considered to be Barren Land, in order to avoid inferential errors. (Anderson et al. 1976)

(a) Bare Exposed Rock

> The Bare Exposed Rock category includes areas of bedrock exposure, ..., scarps, talus, slides, ..., and other accumulations of rock without vegetative cover. ... (Anderson et al. 1976)

USGS Level II land use maps show 366.6 acres of Bare Exposed Rock in the Yellow River sub-basin. This acreage includes Stone Mountain and adjacent exposures, but other rock outcrops are scattered throughout the project area. A notable belt extends southeastward from Stone Mountain across Rockdale County and into Newton County. On aerial photographs the characteristic islands of outcrop vegetation tend to be misleading and subsequently some of the exposures have erroneously been mapped as pasture lands. Despite the fact that these rock exposures contain endemic and endangered species and that considerable biological research has been conducted on these "natural laboratories", there is at present no current data on the total acreage or condition of the Piedmont granite outcrops in Georgia.

Exploration and study of these unusual formations in the southeastern United States began in the late eighteenth century. Because Stone Mountain was the national focal point, many species were first collected and described from this locality. Additional research in adjacent states has since determined that the biota is unique and characteristic of similar granite rocks in northern Alabama and the Piedmont of the Carolinas.

The flowering plants that are found on these outcrops are restricted to shallow pools and depressions containing thin, infertile soil. McVaugh (1943) listed more than 40 species of plants occurring on granite outcrops which distinguish these habitats from the adjacent or surrounding Piedmont vegetation. Burbanck and Platt (1964) reported that of the total of 76 species found in 40 island communities on outcrops slightly more than half (39 species) were considered to be characteristic of these habitats; the remaining species were likely invaders from adjacent woodlands, fields, or pastures. In the Panola Mountain area, for example, 406 taxa of flowering plants were recorded by Bostick (1971) -- these taxa included species typical of granite outcrops, introduced and persistent species found around abandoned home sites, and forest species of nearby woodlands.

Soil depths, organic turnover, moisture and temperature stresses, seed availability, and other plant competitors are among the restrictive factors influencing vegetation abundance, survival through the period of fruit maturation, and biotic zonation. The latter feature, zonation, is a conspicuous and noteworthy point since the biophysical interrelationships of the island communities work ever so intricately to produce distinct vegetation patterns. At least while in the herbaceous stages, the plants become arranged in concentric circles, each ring often composed of a single species. In the shallowest depressions only crustose lichens and mosses are able to survive, but as soil accumulates from inorganic weathering and detrital degradation, herbs eventually replace the lichen communities, and these in turn are replaced by woody vegetation. Seldom are the soil depths sufficient for the development of trees, and as Burbanck and Platt (1964) point out, the woody plants are subject to extreme moisture stress, occasionally culminating in death of the plants. Plant diversity is positively correlated with depth of the soil. Furthermore, "soils 2 cm deep have an organic content of about 3% and a pH of about 4.0; those 10 cm deep, an organic content of about 4% and a pH of about 4.2; and those over 15 cm deep, an organic content of about 8% and a pH of about 4.5" (Burbanck and Platt 1964).

In their taxonomic revision of certain outcrop species of the genus Arenaria (Family: Caryophyllaceae), McCormick et al. (1971) postulated that the outcrop flora belonging to this group is composed of relicts of an Arcto-Tertiary flora which once covered the Appalachian Highlands. As erosion occurred along the Piedmont fall line and outcrops were exposed, the habitats of the granites provided refugia where these diminutive plants could survive. In searching sandstone outcrops in Tennessee, these investigators found the same or similar granite outcrop species. Confirming evidence by Whitehouse (1933) on Texas granite outcrops lends credence to the Arcto-Tertiary derivation of this flora.

Within the Upper Ocmulgee River Basin, granite outcrops are protected at Stone Mountain State Park, at Mount Arabia, and at Panola Mountain. A few sites, while not drastically altered, have been fenced for the minimal forage afforded to livestock. Road construction across a prominent outcrop on the east bank of the Yellow River near Bald Rock Road necessitated blasting and loss of habitat, while other outcrops such as the one along Irwin Bridge Road north-northwest of Milstead have been subject to trash disposal. Not to be underestimated are the seasonal forays of biologists and wild flower enthusiasts whose zeal for collecting occasionally surpasses judicious appraisal and specimen selection.

Herbaceous and woody plants found on the outcrops of the Upper Ocmulgee River Basin are of several life forms. Pockets of shallow soil in full sunlight contain such species as Sedum smallii, usually referred to in the literature by its old generic name Diamorpha, prickly-pear (Opuntia compressa), a member of the cactus family, and fameflower (Talinum teretifolium). Inconspicuous but often present in large numbers in the island communities are wiry plants with small leaves such as rushfoil (Crotonopsis elliptica) and orange-grass (Hypericum gentianoides). Grass-like plants such as the endemic sedge Cyperus granitophilus, the rush Juncus georgianus, and bentgrass (Agrostis elliottiana) are present. If ephemeral pools are present, a likely inhabitant is the very rare and endangered Amphianthus pusillus, which sends up floating leaves in mid-April. Trees in the shallow peripheral soils frequently include various species of pine and hickory and also the rare Georgia oak (Quercus georgiana).

The sparseness of vegetation and the scarcity of water and soil make the outcrops unattractive habitat for most wildlife. During the field survey in November, numerous mourning doves were observed on or in nearby trees at the Bald Rock outcrop.

(b) Strip Mines, Quarries, and Gravel Pits

> Those extractive mining activities that have significant surface expression are included in this category. Vegetative cover and overburden are removed to expose ... [mineral] deposits ... [and] stone, ... Quarrying of building and decorative stone and recovery of sand and gravel deposits also result in large open surface pits. Current mining activity is not always distinguishable, and inactive, unreclaimed, and active strip mines, quarries, borrow pits, and gravel pits are included in this category until other cover or use has been established, after which the land would be classified in accordance with the resulting use or cover. Unused pits or quarries that have been flooded, however, are placed in the appropriate Water category. (Anderson et al. 1976)

The biotic composition of strip mines, quarries, and gravel pits varies from nearly negligible to moderately abundant -- especially in sites long abandoned and allowed to grow up in brush. At active mine sites there is often a peripheral area of waste ground where stone has either been removed or where the rock is that which was culled from the commercially exploitable material. Here a few weedy or shrub species begin to grow and provide food for birds and small mammals which seek shelter and nesting sites among the labyrinths of these rock piles. As for the active parts of quarries, the biota is restricted to species that may accidently wander into the area, or to birds which fly over the quarry operation.

(c) Transitional Areas

> The Transitional Areas category is intended for those areas which are in transition from one land use activity to another. They are characterized by the lack of any remote sensor information which would enable the land use interpreter to predict reliably the future use or discern the past use. All that actually can be determined in these situations is that a transition is in progress, and inference about past or future use should be avoided. This transitional phase occurs when, for example, forest lands are cleared for agriculture, wetlands are drained for development, or when any type of land use ceases as areas become temporarily bare

> as construction is planned for such future uses as residences, shopping centers, industrial sites, or suburban and rural residential subdivisions. Land being altered by filling, such as occurs in spoil dumps or sanitary landfills, also is indicative of this transitional phase. (Anderson et al. 1976)

Transitional areas in the Yellow River sub-basin comprise more than 8,000 acres. Many smaller areas which should be included in this category were of inconsequential size and were included in other categories. Diversity of both plant and animal components may be large or small, depending upon the location, the types of previous disturbance, the proximity of forest communities, the availability of water, and the frequency of man's activities in the general vicinity.

In the Atlanta suburbs and the small outlying towns, the considerable disturbance which accompanies construction is widespread. Disruption of cover, food sources, nesting sites, and young is a common occurrence. Landscaping, following the initial construction may alleviate biotic crowding from adjacent communities but the replaced habitats are of dubious benefit to the former wildlife of the site, and as is often the case, other species more tolerant of the disturbed conditions invade the site and compete directly for the reduced resources.

Within a less urbanized environment, certain transitional areas may enhance wildlife populations, as when forest lands are partially cleared, leaving strips of woodlands along ditches or hedgerows to be utilized by small game species. However, in the Atlanta area transition communities are more typically represented by areas like the landfill off Arnold Road in Gwinnett County. Here the common inhabitants are rats and mice, starlings, crows, and other species which nest or feed around carrion, garbage, and trash heaps.

Endangered Species -- The Endangered Species Act of 1973 (PL 93-205) provides for the protection of endangered and threatened animals and plants. The following section discusses those endangered and threatened species which may utilize habitat provided by the biotic communities described under the Land land-use category.

Endangered species are those in danger of extinction throughout all or a significant portion of their ranges; threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges. The United States List of Endangered Fauna (U. S. Department of the Interior 1974) has been published in the Federal Register under the auspices of PL 93-205. An official Federal list of threatened flora for the United States is not currently available; however, a preliminary list of endangered and threatened plants has been published by the Smithsonian Institution (1975).

1) Plants. On June 16, 1976 the Director, U. S. Department of the Interior, Fish and Wildlife Service, issued in the Federal Register (FR 41 (117):24524-24572), "a proposed rulemaking which would determine approximately 1700 native, U. S., vascular plant taxa to be Endangered Species, pursuant to Section 4 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543, 87 Stat, 884: hereinafter, the Act)."

Five major background events led to this proposal:

(a) passage of the Endangered Species Act of 1973 on December 28, 1973;

(b) presentation of a preliminary list of plants by the Secretary of the Smithsonian Institution (House Document No. 94-51);

(c) publication of a notice by the Director "describing the process of determination of 'Critical Habitat' for Endangered and Threatened species, as encouraged by section 2(b) and provided for by section 7 of the Act";

(d) publication of the Director's "acceptance of the report of the Smithsonian Institution as a petition within the context of section 4(c)(2) of the Act, and of his initiation thereby of a review of the status of the plant taxa named therein as well as any habitat of these taxa which might be determined to be critical, pursuant to section 7 of the Act"; and

(e) issuance by the Fish and Wildlife Service of the "proposed rules," /41 CFR(110):22916-22922/ which among other things:

- set forth the procedural steps of determining Endangered or Threatened Species of plants;
- proscribe the prohibitions which apply to such Endangered or Threatened plants or to the seeds, roots, or parts thereof;
- establish procedures, conditions, and criteria for the application for and issuance of permits to conduct otherwise prohibited activities.

The proposal describes the conditions under which a species may be designated Threatened or Endangered:

> Section 4(a) of the Act states that the Secretary may determine a species to be an Endangered Species or a Threatened Species because of any of the five factors following:
> (1) The present or threatened destruction, modification, or curtailment of its habitat or range;
> (2) Overutilization for commercial, sporting, scientific, or educational purposes;
> (3) Disease or predation;
> (4) The inadequacy of existing regulatory mechanisms; or
> (5) Other natural or mandate factors affecting its continued existence. /41 CFR(117):24524/

Ramifications of the proposal are also stated:

> Determination that a plant is a Threatened or Endangered Species would, among other things, make that species, including its seeds, roots, or other parts, subject to the prohibitions of section 9(a)(2) of the Act which reads as follows:
> (2) Except as provided in sections 6(g) (2) and 10 of this Act, with respect to any endangered species of plants listed pursuant to section 4 of this Act, it is unlawful for any person subject to the jurisdiction of the United States to-
> (A) Import any such species into, or export any such species from the United States;
> (B) Deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of a commercial activity, any such species;

(C) Sell or offer for sale in interstate or foreign commerce any such species; or

(D) Violate any regulation pertaining to such species or to any threatened species of plants listed pursuant to section 4 of this Act and promulgated by the Secretary pursuant to authority provided in this Act. /41 CFR(110):22916/

These regulations, as proposed in the June 7, 1976 Federal Register, would provide for the issuance of permits to carry out otherwise prohibited activities under certain circumstances. Such permits would be available for scientific purposes or to enhance the propagation or survival of the species. In some instances permits may be issued during a specified period of time to relieve undue economic hardship which would be suffered if such relief were not available.

In addition to the proposed Federal rules, the Georgia Department of Natural Resources, Game and Fish Division, issued State regulations on September 13, 1976. Entitled "Protection of Endangered, Threatened, Rare, or Unusual Species" (Chapter 391-4-13), the State regulations establish, among other points, (1) purpose and (2) prohibited acts:

The purpose of these rules and regulations is to establish the organizational structure and administrative procedures to be followed in the protection of endangered species of plant and animal life. The Department of Natural Resources is authorized by the Wildflower Preservation Act of 1973 (Ga. Laws 1973, p. 333, et seq.), the Endangered Wildlife Act of 1973 (Ga. Laws 1973, p. 932, et seq.), the laws relating to game and fish (Ga. Laws 1955, p. 483, et seq.) as amended, in particular by (Ga. Laws 1968, p. 497, et seq.) and other laws administered by the Department of Natural Resources, to promulgate rules and regulations for the protection of designated species. The Department of Natural Resources is required by the Endangered Wildlife Act of 1973 and the Wildflower Preservation Act of 1973 to designate all plant and animal species indigenous to the state which are determined by the Department to be "rare", "unusual", or in "danger of extinction". Such species are then "protected species" and subject to the provisions of the above-cited laws and the rules and regulations of the Department of Natural Resources. The Department is required to review periodically its "protected species" list and to make additions or deletions when appropriate.

Species (Common Name)	Habitat
Isoetes virginica (Quillwort)	Of taxonomic question as to whether a distinct species; found in pools on granite outcrops
Nestronia umbelluta (None)	Parasitic on oaks in dry oak-hickory woods
Phacelia dubia var. *georgiana* (None)	Shallow soil of granitic outcrops
Plantago cordata (Plantain)	Shoals and rocky streambeds
Schisandra glabra (None)	Rich hardwoods
Scutellaria ocmulgee (Skullcap)	Riverbanks in the Ocmulgee River Basin
Smilax leptanthera (Greenbrier)	Doubtfully a distinct species; moist woodlands
Talinum mengesii (None)	Shallow soil of granite outcrops
Waldsteinia lobata (Barren strawberry)	Rich bottomland woods and moist wooded slopes

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Two potential litigation conflicts exist over the enforcement of regulations pertaining to the protection of designated "Endangered" or "Threatened" plants. The first of these is general in scope and might be tested anywhere within the State. The controversy stems from the accepted acknowledgement that wildlife species, because of their free-ranging activity, are considered property of the State and hence are subject to the applicable rules and regulations as carried out by wildlife agencies. On the other hand, the plant life is considered the property of the landowner; consequently, there is no legal precedent establishing State jurisdiction over regulations dealing with the vegetation.

The second problem ultimately relates to the first. Noting that all of the confirmed Endangered and Threatened plants in the project area occur in

391-4-13-.06 Prohibited Acts. The following acts regarding protected species of animals and plants are prohibited:

(b) Protected Plant Species. Prohibited acts concerning protected plant species include:

1. No person within this State shall cut, dig, pull up or otherwise remove any protected species from public land unless such person has secured an appropriate permit from the Department.

2. No person within this State shall sell or offer for sale, for any purpose, any protected plant species, unless such species was grown on private land and is being sold by the landowner or with the permission of the landowner.

3. No person within this State shall transport, carry, or otherwise convey any protected plant species from the land of another unless each shipment thereof has affixed a tag supplied by the Department showing that the person so transporting, carrying or conveying such protected species has removed such specimen(s) from the private lands of another person with the permission of such other person and has a written document in his possession evidencing such permission, and further evidencing that such specimen has not been sold in violation of section (b) above. (H.B. 594, Sections 4-6).

Endangered and Threatened plants of the Upper Ocmulgee River Basin are listed in Table 15. These species were either observed during the field survey by Coastal Zone Resources Corporation personnel, or citations for their occurrence in the project area were found in the botanical literature. Certain other species, which were not observed in the project area but for which the distributions were given in regional floras as "Piedmont of Georgia" or for which the preferred habitats were observed are listed below:

Species (Common name)	Habitat
Carex amplisquama (None)	Specific habitat undetermined but associated with granite outcrops

Table 15. (concluded)

Species	Status	Comments
Family POACEAE: Grass		
Panicum lithophilum	T	Reported from granitic outcrops
Family PORTULACACEAE: Purslane		
Portulaca smallii	E	Shallow soil in depressions on granite
Family SCROPHULARIACEAE: Figwort		
Amphianthus pusillus	E	Ephemeral; appearing in April in shallow pools on granite

[a]Source: U. S. Department of the Interior. 1976. Endangered and threatened wildlife and plants. Federal Register 41(117): 24524-24572.

[b]Source: Georgia Department of Natural Resources. 1976. Rules and regulations for the protection of endangered, threatened, rare, and unusual species. Atlanta. 10 pp.

Table 15. Endangered[a,b] or Threatened[b] plants in the Upper Ocmulgee Basin.

Species	Status	Comments
Division PTERIDOPHYTA: Ferns		
Family ISOETACEAE: Quillwort		
Isoetes melanospora	T	Shallow pools on Stone Mt., other granites
Division SPERMATOPHYTA: Seed Plants		
Subdivision ANGIOSPERMAE: Flowering Plants		
Family ASTERACEAE: Aster		
Viguiera porteri	T	Common on granitic outcrops
Family BRASSICACEAE: Mustard		
Draba aprica	E	Shallow soil in depressions on granite
Family CRASSULACEAE: Stonecrop		
Sedum pusillum	T	Shallow soil in depressions on granite
Family CYPERACEAE: Sedge		
Cyperus granitophilus	T	Shallow, moist soil in depressions on granite
Rhynchospora globularis var. *saxicola*	T	Seepages on Stone Mountain
Family FAGACEAE: Beech		
Quercus georgiana	T	Abundant on and around granite outcrops
Family LAMIACEAE: Mint		
Pycnanthemum curvipes	E	Collected in 1905 on Stone Mt.

Table 15. Continued

association with granitic outcrops, a major economic impasse could be imminent for quarrying companies, or even for State agencies such as the Department of Transportation, should the protection of outcrop species be enforced. One mitigative measure written into the proposed Federal rules is that permits may be granted if the applicant can show that the Federal activity (i.e., protection) causes him (the applicant) to suffer undue economic hardship /41 CFR (110):22920/.

2) Animals. The United States List of Endangered Fauna (U. S. Department of the Interior 1974) contains five species (Table 16) which may utilize suitable terrestrial habitat in the Upper Ocmulgee River Basin: Southern bald eagle (*Haliaeetus l. leucocephalus*), peregrine falcon (*Falco peregrinus*), red-cockaded woodpecker (*Dendrocopos borealis*), ivory-billed woodpecker (*Campephilus principalis*), and the Eastern cougar (*Felis concolor cougar*).

Before enactment of the Endangered Species Act of 1973 and the subsequent publication of endangered fauna, the Office of Endangered Species and International Activities of the U. S. Fish and Wildlife Service published the Threatened Wildlife of the United States (U. S. Department of the Interior 1973) under the auspices of the Endangered Species Conservation Act of 1969 (PL 91-135). The document presents the most up-to-date list of fish, amphibians, reptiles, birds, and mammals threatened with extinction, in addition to listing those fish, birds, and mammals extinct or presumed extinct in the United States. Several supplementary categories are included in the publication on threatened wildlife: (1) peripheral species (which occur in the U. S. at the edge of their natural range as a whole) and (2) status - undetermined species (which have been suggested as possibly threatened with extinction but for which a lack of sufficient information prevents an accurate status evaluation). The threatened wildlife list includes two major categories of animals that may occur within the Upper Ocmulgee River Basin (1) threatened -- Southern bald eagle, peregrine falcon,

Table 16 . Endangered (E)[a,b] or Status-undetermined (SU)[c] fauna that may occur in the Upper Ocmulgee River Basin.

Species	Status	Comments
BIRDS		
Southern bald eagle (*Haliaeetus l. leucocephalus*)	E	A scarce permanent resident of the coast; may occur in the project area as a transient.
Peregrine falcon (*Falco peregrinus*)	E	A winter resident in Georgia, primarily along the coast. Probably are rare transients in Upper Ocmulgee River Basin.
Red-cockaded woodpecker (*Dendrocopos borealis*)	E	Has state-wide range in Georgia. Preferred habitat is mature pine woodlands. Probably a scarce permanent resident of Upper Ocmulgee River Basin.
Ivory-billed woodpecker (*Campephilus principalis*)	E	May be extinct -- has not been observed in Georgia for many years.
American osprey (*Pandion haliaetus*)	SU	Coastal summer resident in Georgia. Feeds primarily on fish. Probably an uncommon transient of project area.
Merlin (*Falco columbarius*)	SU	An uncommon transient and winter resident throughout Georgia. May utilize open spaces in the Upper Ocmulgee River Basin.
MAMMALS		
Eastern cougar (*Felis concolor*)	E	Probably has state-wide range in Georgia. Prefers remote wilderness areas. Likely occurs only as a transient in Upper Ocmulgee River Basin.

Table 16. Continued

Table 16 (concluded)

[a]Source: U. S. Department of the Interior. 1974. United States list of endangered fauna. Fish and Wildlife Service, Washington, D. C. 22 pp.

[b]Source: Cranshaw, D., ed. 1976. Endangered wildlife. Pages 22-26 in Outdoors in Georgia, September 1976. Georgia Department of Natural Resources, Atlanta.

[c]Source: U. S. Department of the Interior. 1973. Threatened wildlife of the United States. Fish and Wildlife Service, Washington, D. C. 289 pp.

red-cockaded woodpecker, ivory-billed woodpecker, and Eastern cougar and (2) status-undetermined -- American osprey (Pandion haliaetus) and merlin (Eastern pigeon hawk, Falco columbarius) (U. S. Department of the Interior 1973).

The State of Georgia also has an official list of "protected species" which includes endangered, threatened, rare, and unusual species defined as:

> "Endangered species" means any resident species which is in danger of extinction throughout all or a significant portion of its range, or one which is designated as endangered under the provisions of the federal Endangered Species Act of 1973 (PL 93-205).
>
> "Threatened species" means any resident species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range or one that is designated as threatened under the provisions of the federal Endangered Species Act of 1973 (PL 93-205).
>
> "Rare species" means any resident species which, although not presently endangered or threatened as previously defined, should be protected because of its scarcity.
>
> "Unusual species" means any resident species which exhibits special or unique features and because of these features deserves special consideration in its continued survival in the state.

Animal species on this list that theoretically may be found in the project area are the peregrine falcon, Southern bald eagle, ivory-billed woodpecker, red-cockaded woodpecker, and Eastern cougar (Felis concolor). All of these species are classified as endangered.

The Southern bald eagle was once a fairly common resident on Georgia's coast (Burleigh 1958), but observations throughout the State are now uncommon and appear to be primarily of migrant birds. The bald eagle is currently a scarce permanent resident of the coast (Cranshaw 1976) and, in past years, has been observed in the Atlanta area (Burleigh 1958). No resident bald eagles are known to inhabit the Upper Ocmulgee River Basin, but migrating or transient birds may feed and rest in the area. Although their primary food is fish, the bald eagle may occasionally feed on ducks, coots, rabbits, or other animals, mostly as carrion.

The peregrine falcon, a winter resident that occurs primarily along the coast, prefers open areas (either terrestrial or aquatic) where it preys mainly on birds, although mammals and large insects also make up a small portion of its diet (Reilly 1968). No residents are known within the project area; however, these birds have been observed in the vicinity of the Upper Ocmulgee River Basin (Burleigh 1958) and likely are rare transients in the area.

The red-cockaded woodpecker has a state-wide range in Georgia. It is likely a scarce permanent resident in the Upper Ocmulgee River Basin, as its preferred habitat (mature longleaf or loblolly pines) occurs in the area. These woodpeckers construct nesting and roosting cavities in mature, living pines that are often infested with red heart disease.

The ivory-billed woodpecker has not been observed in Georgia for many years and probably no longer exists in the State. The mature bottomland hardwoods of the project area, however, are the preferred habitat of this species whose decline is thought to be due to elimination of such areas. Large tracts of over-mature timber are necessary to provide adequate food (wood-boring insect larvae) for these birds. Therefore, although the ivory-billed woodpecker could theoretically reside in the project area, it probably is not present.

The Eastern cougar probably has a state-wide range in Georgia. This animal inhabits large tracts of wilderness areas and will not tolerate much human disturbance; its preferred food is deer. Since little of the Upper Ocmulgee River Basin classifies as wild and remote, the Eastern cougar probably occurs only as a transient in the project area.

The American osprey (status undetermined) is an uncommon transient in the project area. This bird feeds entirely on fish and typically inhabits coastal areas; the osprey is a common summer resident on Georgia's coast (Burleigh 1958). Sitings of migrant ospreys have been documented in Athens and Atlanta (Burleigh 1958).

The merlin is an uncommon transient and winter resident throughout Georgia (Burleigh 1958). This species is essentially a bird of open country, feeding primarily on smaller birds. According to Burleigh (1958) the merlin has been observed in Athens (1928) and Atlanta (1932, 1949, and 1952); thus, this species may utilize open spaces in the Upper Ocmulgee River Basin.

No endangered or threatened reptiles or amphibians are known to occur within the project area.

3. Wetlands and Water-land Interfaces

a. Physical and Chemical -- Wetlands and water-land interfaces include freshwater marshes, river swamps and bottomland forests, floodplains, and stream banks and lake shores. These areas generally represent transitions from upland habitat to open water and are characterized by complex physical, chemical, and biological interactions. Biota inhabiting wetlands and water-land interfaces are dependent upon the physical and chemical processes that created and now maintain these areas - i.e., rich alluvial soils; readily available moisture; natural, periodic inundations by floodwaters, etc.

Of great concern to man are the seasonal inundations of water-land interfaces. In the past, due to readily available water, rich alluvial soil, and aesthetic appeal, commercial, agricultural, and residential development often occurred along watercourses. As previously stated, urban development is currently occurring throughout the study area, particularly south and east of Atlanta, and although most of the development is in the higher elevations, some is moving downslope towards the floodplains (U. S. Army, Corps of Engineers 1975). In order to prevent structural loss, and perhaps loss of human lives, the Corps of Engineers is attempting to map flood hazard zones throughout the U. S., and in 1975, at the request of DeKalb County officials, the Savannah District Office prepared a report on special flood hazard information for some minor tributaries in DeKalb County. Only four streams within the Yellow River sub-basin -- Crooked Creek, Little Stone Mountain Creek, and tributaries of Crooked Creek and Stone Mountain Creek -- were included in this study, which mapped 100-year and 500-year flood areas. (The 100-year flood is defined as a flood that has a one percent chance of occurring during any given year, while a 500-year flood is defined as the largest flood that can be expected to occur as a result of a severe combination of meteorological and hydrological conditions that are reasonably characteristic of the area). In 1971, the Savannah District mapped Intermediate Regional Floods (floods that have an average occurrence once in 100 years) and Standard Project Floods (floods of rare occurrence) along the Yellow River in Rockdale and Newton counties. From these studies, and from maps of flood-prone areas prepared by the USGS, a generalized map (Figure 12) showing estimated 100-year flood overflow limits was prepared. The figure shows areas where flood waters will be greatest in areal extent, in some cases greater than 1/2 mile wide, for a 100-year flood. Estimated crest of such a flood is 20-25 feet above normal. This would increase the width of the Yellow River at all points, but for graphics purposes, only the marshlands, floodplains, and exceptionally low-lying junctures are displayed at this scale as flood-damaged areas. Areas particularly susceptible to flooding are numbered on Figure 10; Table 17 is an index to these areas. (USGS and Corps of Engineers data were supplemented by CZRC analyses of the most current 7.5 minute series topographic maps of the Yellow River sub-basin. The lines are estimated boundaries and do not represent exact limits of flood overflow). In Gwinett County, the Yellow River cuts a sinuous, moderately steep valley between the mouth of Jackson Creek and the Annistown Bridge-Horseshoe Bend area. There is little or no floodplain. This section would sustain flood damage in a 100-year flood from greatly increased velocity of high waters, but inundations generally would be confined to the narrow valleys. Because this section would not exhibit widespread (wider than about 0.1 mi) inundation at this scale, it is not color shaded on the map.

Reflecting concern over development in floodplain areas, the Atlanta Regional Development Plan (ARC 1976) proposes that "All structures that can be damaged or land uses that can impede flood waters or reduce storage volume must be built outside the 100-year flood limit."

b. Biota (Biotic Communities) -- Biotic communities of wetlands and waterland interfaces are mapped on USGS Level II land use maps as Wetland. Both forested wetland, wetlands dominated by woody vegetation, and nonforested wetland, wetlands dominated by herbaceous vegetation, occur in the Upper Ocmulgee River Basin. These areas, however, represent only a small portion (approximately 1.5 percent) of the basin.

1) Wetland

> Wetlands are those areas where the water table is at, near, or above the land surface for a significant part of most years. The hydrologic regime is such that aquatic or hydrophytic vegetation usually is established, although alluvial and tidal flats may be

Table 17. Index to flood-prone areas shown on Figure 13.

1. Along Yellow River, floodplain, near Ga 36 bridge
2. Along Yellow River, marshland, (unnamed tributaries), south of Lake Bulow Campbell
3. Along Yellow River, marshland, (unnamed tributaries), north of Lake Bulow Campbell
4. Along Yellow River, marshland (unnamed tributaries), between Lake Bulow Campbell and Rocky Plains road bridge
5. Along Yellow River, at juncture of Dog Branch
6. Along Yellow River, at juncture of Dried Indian Creek
7. Along Yellow River, floodplain, north of Porterdale
8. Along Yellow River, marshland, (unnamed tributary) south of I-20
9. Along Gum Creek at juncture of Little Gum Creek
10. Along Yellow River and Big Haynes Creek, extensive marshland, at the juncture of those streams
11. Along Big Haynes Creek at juncture of Little Haynes Creek
12. Along Little Haynes Creek at juncture of Sandy Creek
13. Along Brushy Fork Creek below Lake Carlton
14. Along Big Haynes Creek, floodplain, (unnamed tributaries), below Johnson Lake
15. Along Yellow River at juncture of Carr Branch
16. Along Yellow River, floodplain, between Lake Rockaway and juncture of Swift Creek
17. Along Jackson Creek, floodplain, by Newton Lake
18. Along Sweetwater and Beaver Ruin creeks, at their juncture

nonvegetated. Wetlands frequently are associated with topographic lows, even in mountainous regions. Examples of wetlands include marshes, mudflats, and swamps situated on the shallow margins of bays, lakes, ponds, streams, and manmade impoundments such as reservoirs. ... Shallow water areas where aquatic vegetation is submerged are classed as open water and are not included in the Wetland category.

Extensive parts of some river flood plains qualify as Wetlands, as do regularly flooded irrigation overflow areas. These do not include agricultural land where seasonal wetness or short-term flooding may provide an important component of the total annual soil moisture necessary for crop production. Areas in which soil wetness or flooding is so short-lived that no typical wetlands vegetation is developed properly belong in other categories.

... Uncultivated wetlands from which ... wood products, ... are harvested, or wetlands grazed by livestock, are retained in the Wetland category.

Remote sensor data provide the primary source of land use and vegetative cover information for the more generalized levels of this classification system. Vegetation types and detectable surface water or soil moisture interpreted from such data provide the most appropriate means of identifying wetlands and wetland boundaries. Inasmuch as vegetation responds to changes in moisture conditions, remote sensor data acquired over a period of time will allow the detection of fluctuations in wetland conditions. Ground surveys of soil types or the duration of flooding may provide supplemental information to be employed at the more detailed levels of classification.

Wetland areas drained for any purpose belong to other land use and land cover categories such as Agricultural Land, Rangeland, Forest Land, or Urban or Built-up Land. When the drainage is discontinued and such use ceases, classification may revert to Wetland. Wetlands managed for wildlife purposes may show short-term changes in land use as different management practices are used but are properly classified Wetland.

Two separate boundaries are important with respect to wetland discrimination: the upper wetland boundary above which practically any category of land use or land cover may exist, and the boundary between wetland and open water beyond which the appropriate Water category should be employed.

Forested Wetland and Nonforested Wetland are the Level II categories of Wetland. (Anderson et al. 1976)

(a) Forested Wetland

Forested Wetlands are wetlands dominated by woody vegetation.

> Forested Wetland includes seasonally flooded bottomland hardwoods, mangrove swamps, shrub swamps, and wooded swamps including those around bogs. Because Forested Wetlands can be detected and mapped by the use of seasonal (winter/summer) imagery, and because delineation of Forested Wetlands is needed for many environmental planning activities, they are separated from other categories of Forest Land.
>
> The following are examples of typical vegetation found in Forested Wetland. Wooded swamps and southern flood plains contain primarily ..., tupelo (*Nyssa*), oaks (*Quercus*), and red maple (*Acer rubrum*). ... Shrub swamp vegetation includes alder (*Alnus*), willow (*Salix*), and buttonbush (*Cephalanthus occidentalis*). (Anderson et al. 1976)

Bottomland forests in the Upper Ocmulgee River Basin are technically of two types: (1) an alluvial component found on silt-sand banks and fluvial terraces and (2) a swamp forest component situated in poorly drained depressions behind levees. The alluvial forest is one of the most common forest types found in the Piedmont floodplains. Its width is a function of stream meandering and relative erodibility of substrate, and hence topography. In broad valleys with alluvial forest, box elder (*Acer negunda*), sycamore, hackberry (*Celtis laevigata*), river birch (*Betula nigra*), sugar maple, and occasional tulip poplar and loblolly pine are the usual dominant species. On higher, better-drained sites, Southern red oak (*Quercus falcata*), black oak, and bitternut hickory may be important dominants, while on the most poorly drained sites sweetgum and willow oak may be more abundant. The swamp forest, on the other hand, may be comprised of sweetgum, black gum (tupelo in the Alcovy drainage), overcup oak (*Quercus lyrata*), and species of ash (*Fraxinus americana* and *F. pennsylvanica*). The standing water regime appears to be the critical and limiting factor to the type of swamp forest development -- if excessive water accumulates and stands for long periods, significant die-back of the forest may occur.

The understory vegetation of the two forests differs markedly. Alluvial forests usually support a considerable variety of small trees and small shrubs such as pawpaw (*Asimina triloba*), ironwood, spicebush (*Lindera benzoin*), sugar maple, occasionally beech and witch hazel (*Hamamelis* virginiana), and the ubiquitous privet (Ligustrum sinense). Swamp forests may or may not have understory vegetation, but if present, the commoner species are alder (Alnus serrulata) and Virginia willow (Itea virginica). The presence or absence of understory evidently depends upon the waterlogged condition of the soils, standing water of long duration, and dispersal mechanisms of swamp-inhabiting species. The forest floor may contain many herbaceous species in alluvial habitats or few in swampy habitats. Cane (Arundinaria gigantea) is an efficient competitor, and where present soon establishes dense clones, forming shady thickets or "canebrakes" that preclude the successful invasion of less shade-tolerant herbaceous species.

In certain sites where selective lumbering has occurred or where the force of floodwaters prevents forest maturation, the floodplain may be colonized by dense tangles of Jananese honeysuckle, common greenbrier (Smilax rotundifolia), catbrier (Smilax bona-nox, S. smallii, and S. walteri), crossvine, blackberry, and other robust perennials which knit together the vegetation and thereby form a near-impenetrable thicket.

The high diversity and typically large size of trees in alluvial forests as contrasted with swamp forests is due to the richness of alluvial soils, the availability of favorable moisture conditions, the dispersal of seeds and nuts by floodwaters and floodplain wildlife, and the lack of man-dominated disturbance. Because many of the alluvial forest trees are of little commercial value, only selective cutting has taken place, and this has occurred primarily in areas with moderately good access.

Occasionally short-lingering woodlands of fast-growing species such as river birch, black willow (Salix nigra), and cottonwood (Populus deltoides) develop off point bars and along river shorelines, but erosion of the banks together with the unpredictability of severe flooding seldom permits anything more than a temporal forest to develop.

The intimate association of wetlands and water-oriented biotic communities makes it difficult to discuss faunal constituents under separate headings. Nearly all animals characteristic of wetlands extensively use both the aquatic and terrestrial portions of their environment. Exceptions include typical woodland species, such as the white-tailed deer, that move into the area to feed on the terrestrial vegetation and several species of salamanders that remain submerged in water or mud for most of their lives. Wetlands, both forested and nonforested, provide a multitude of habitats for wildlife and thus possess perhaps the richest of faunal constituents.

Mammals utilizing forested wetland communities include the raccoon, white-tailed deer, river otter, muskrat, mink (Mustela vision), and beaver (Castor canadensis). Raccoons usually feed in marshes or swamps along streams, ponds, and lakes; their diet includes fruits, nuts, grains, insects, bird eggs, and especially aquatic animals such as frogs and crayfish. Deer are primarily browsers that feed on leaves and twigs of various tree and shrub species; however, they also consume mast, fruits, grasses, and grains. Natural deer foods, including ironwood, yellow jessamine, Japanese honeysuckle, tulip poplar, red bay, black cherry, sassafras, Virginia willow, and various species of oaks, greenbriers, and blackberries (Halls and Ripley 1961) are abundant in the forested wetlands of the project area. River otter, muskrat, and mink may be seen in forested wetlands, but are perhaps best associated with aquatic habitats or nonforested wetlands, as these mammals are semi-aquatic.

Smaller mammals utilizing the forested wetland community include the white-footed mouse and cotton mouse (Peromyscus gossypinus), which are commonly found together in swampy regions. Both the Eastern cottontail and the swamp rabbit (Sylvilagus aquaticus) utilize the Upper Ocmulgee River Basin's forested wetlands.

Reptiles and amphibians are abundant in wetlands and associated bodies of water. The green frog (Rana clamitan melanota), spotted salamander, and marbled salamander, which require ephemeral or permanent bodies of water for breeding, are likely found in this community. Other amphibians probably occurring are the bullfrog (Rana catesbeiana) and the American toad. Reptiles typically found in this community include the common box turtle, black rat snake, copperhead, Eastern kingsnake (Lampropeltis g. getulus), broad-headed skink, and Southeastern five-lined skink (Eumeces inexpectatus).

Avian inhabitants of forested wetlands are extremely diverse. Species that nest in tree cavities in swamps and marshes include the wood duck (Aix sponsa), hooded merganser, prothonotary warbler (Protonotaria citrea), and Carolina wren. Ground-nesting birds include the Savannah sparrow (Passerculus sandwichensis) and common yellowthroat warbler. The great blue-heron (Ardea herodias), green heron (Butorides virescens), and cattle egret (Bubulcus ibis) nest in shrubs or trees in the forested wetland community.

Forested wetlands, although only a small percentage of the project area, are quite valuable communities, as they represent a rapidly disappearing, multiple-use environment. These areas provide valuable habitat for some of America's rarest animal species, natural storage for floodwaters, water treatment for purifying water, extremely high organic productivity [gross primary productivity of southern swamps has been estimated at 20,000 kilocalories per square meter per year ($KCal/m^2/yr$) on average favorable sites, and at 40,000 $KCal/m^2/yr$ on especially favorable sites--personal communication, Eugene Odum, as cited in Wharton 1969], as well as an excellent scientific laboratory where one may study the fundamental ecological interrelationships between the physical and biotic components of the natural environment (Wharton 1969). These areas also represent a large portion of the few remaining true wilderness areas in the southeastern United States and thus possess a great, though intangible, value.

(b) Nonforested Wetland

> Nonforested Wetlands are dominated by wetland herbaceous vegetation or are nonvegetated. ...
>
> The following are examples of vegetation associated with Nonforested Wetland. ... Both narrow-leaved emergents such as cattail (*Typha*), bulrush (*Scirpus*), sedges (*Carex*), ... and other grasses (for example, *Panicum* and *Zizaniopsis miliacea*), and broad-leaved emergents such as waterlily (*Nuphar*, *Nymphea*), pickerelweed (*Pontederia*), arrow arum (*Peltandra*), [and] arrowhead (*Sagittaria*), ... are typical of ... freshwater locations. Mosses (*Sphagnum*) and sedges (*Carex*) grow in wet meadows and bogs. (Anderson et al. 1976)

Nonforested wetland in the project area consists primarily of overgrown ponds covered by marsh species or scattered wetland shrubs and of small areas of freshwater marsh located along streambanks and lakeshores. The typical vegetation is crowded, of low height, perennial, and home for numerous animals of biological interest. Shrubs occur only occasionally in this community and are usually represented by alder and buttonbush (*Cephalanthus occidentalis*); more common are herbaceous growths of lizard's tail (*Saururus cernuus*), arrow arum (*Peltandra virginica*), cattail (*Typha latifolia*), bulrush (*Scirpus cyperinus*), rush (*Juncus effusus*), and knotweed (*Polygonum sagittatum*). The exceptional cover and seeds afforded by these species provide suitable habitat for a wide variety of wildlife, including the muskrat, mink, river otter, and marsh rice rat (*Oryzomys palustris*). Muskrats commonly occur along the freshwater streams, ponds, and lakes where they feed primarily on aquatic vegetation. Their diet also occasionally includes clams, frogs, and fish. Muskrats either build conical houses of marsh vegetation in shallow water or burrow in banks; entrances to houses or den burrows are usually underwater. Mink generally inhabit areas adjacent to streams, ponds, rivers, or other bodies of water; they feed on small mammals, birds, frogs, crayfish, and fish. River otters inhabit the swamps, marshes, and rivers. These furbearers eat fish, frogs, crayfish, and other aquatic invertebrates and den in banks with entrances below water. The marsh rice rat is a common semi-aquatic inhabitant of marshes and wet, grassy areas.

Reptiles and amphibians are generally abundant in this biotic community and include species such as the little grass frog (Hyla ocularis), the Southern chorus frog (Pseudacris nigrita), bullfrog, Eastern glass lizard (Ophisaurus ventralis), copperhead, Eastern cottonmouth (Agkistrodon p. piscivorous), and Eastern mud snake (Farancia a. abacura).

Nonforested wetlands and adjacent open water areas provide valuable feeding, nesting, and resting habitat for wetland birds such as loons, grebes, herons, egrets, geese, ducks, and rails. These birds are perhaps the most striking inhabitants of this community.

Three game species of rails likely occur in the freshwater marshes of the project area. These are the king rail (Rallus elegans), which nests on the ground, Virginia rail (Rallus limicola), which nests on a platform just above the water line, and sora (Porzana carolina), which nests in vegetation just above the marsh.

A wide variety of ducks utilizes the nonforested wetland habitat. Puddle ducks, which generally feed on aquatic vegetation and small amounts of animal matter in shallow water and occasionally on grain in croplands, include the mallard, black duck (Anas rubripes), gadwall, pintail (Anas acuta), blue-winged teal (Anas discors), American wigeon (Anas americana), northern shoveler (Anas clypeata), and wood duck. Diving ducks feed on aquatic organisms usually obtained by diving under the surface of the open waters of lakes and rivers adjacent to wetlands. Ring-neck ducks, lesser scaup (Aythya affinis), buffleheads (Bucephala albeola), and ruddy ducks (Oxyura jamaicensis) are typical diving ducks that occur in the Upper Ocmulgee River Basin.

Three species of mergansers utilize the shallow ponds and nonforested wetlands of the project area. These are the hooded merganser, red-breasted merganser (Mergus serrator), and common merganser (Mergus merganser). Also characteristic of this habitat is the marsh hawk (Circus cyaneus), which preys upon small mammals, reptiles, amphibians, and birds.

Nonforested wetlands, like forested wetlands, serve many functions. These areas provide valuable waterfowl habitat, stabilize shorelines and river banks against erosion, act as sediment traps and water purifiers, contribute to the nutrient input of adjacent streams and lakes, and produce organic matter for many herbivores and omnivores which in turn may be consumed by carnivores. This fragile community with its many available habitats is vital to the survival of many wildlife species, as well as to many fishes whose young utilize wetlands as nursery areas. The complex relationships among species dependent upon the wetland environment provide the balance and stability necessary for the survival of the community as a whole. Man's activities -- home construction, stream channelization, water impounding, waste disposal, etc. -- can quite easily upset this delicate balance and cause irreparable damage to and subsequent loss of our wetlands and their associated wildlife.

Endangered Species -- No endangered species are known to inhabit the wetlands of the Upper Ocmulgee River Basin. Transient bald eagles and peregrine falcons (discussed in Section 2. Endangered Species) may feed in these areas.

4. Water

a. Physical and Chemical --

1) Groundwater. Groundwater in the Upper Ocmulgee River Basin occurs in the pore spaces of saprolite and in the fractures of underlying bedrock, in what is termed water-table conditions. There are no water-bearing sedimentary formations (geologic aquifers) in the basin.

In The Availability and Use of Water in Georgia, Thomson et al. (1956) describe the occurrence of groundwater in the Piedmont-Mountain province, which includes the project area:

> The rocks exposed in the Piedmont-Mountain province are schist, gneiss, granite, quartzite and other metamorphic rocks which have been intruded by a series of granites. ...
>
> The metamorphic rocks are weathered and have a mantle of decayed rock ranging in thickness from 5 to 80 feet, and perhaps more in places. This mantle of decayed rock serves as a giant sponge, absorbing ground water during wet seasons and allowing it to percolate slowly downward into the cracks of the bedrock below. The amount and depth of residuum depends upon the type of rock, as some rocks are more resistant to weathering than others. The residuum varies in thickness from place to place, usually being thickest in valleys and thinnest on hilltops. Usually erosion removes most of the residuum from the hilltops.
>
> ... The amount of ground water available depends on the type of rocks, the amount, distribution and intensity of rainfall, the thickness and permeability of the residuum, and the extent of fracturing of the underlying bedrock.
>
> Ground water is stored in the residuum and in the fractures in the underlying bedrock. Recharge to the ground-water body occurs from rain falling on the ground in the immediate area and moving downward to join the ground-water body. The water table responds rapidly to recharge. Water in excess of the amount capable of being infiltrated and stored flows off at the surface or through wet-weather springs as rejected recharge. Wet-weather springs are common throughout the Piedmont-Mountain area.
>
> The structure of rocks in the Piedmont-Mountain province is a controlling factor for movement and storage. The granites of the area hold but a small amount of water in storage, as the fracture system in a granite represents only a very small percentage of the total volume of the rock. Schist and

> gneiss are made up of many layers of minerals, and partings along the spaces between layers may contain water. These rocks may contain also a system of fracture like those in granite. Where the schistosity is vertical and the parting planes are exposed, water is taken into the ground quite rapidly, but where the schistosity dips, even slightly, less water is absorbed by the rocks.

The relationship of topography to groundwater quantity is strong within the project area. In the basin the top of the zone of saturation (the water-table) has a generalized conformity to surface topography. Groundwater drains away from hills; the largest quantities of groundwater are found in lowlands or draws where there is a thick mantle of soil (U. S. Department of the Interior 1967).

Groundwater, removed by dug, bored, and drilled wells, is used for municipal, industrial, and domestic purposes. In the Upper Ocmulgee River Basin, due to the relatively small amounts of groundwater, most wells sustain only light pumping, providing water for rural homes and mobile home parks. Most drilled wells are less than 500 ft deep and yield approximately 10-50 gallons per minute. Any pumping greater than 100,000 gallons per day requires a groundwater permit issued by the state. Certain operations, such as poultry and agriculture, are excluded (personal communication, GDNR, Water Supply Section, 8 January 1977); however, few wells within the project area can provide a sustained yield of this amount.

Groundwater from the project area is generally of good quality. Table 18 shows value ranges obtained from chemical analyses of groundwater in Rockdale County--these analyses were from 100 to 300-ft deep wells penetrating saprolite and other rocks typical of the Yellow River sub-basin (McCollum 1966). Although the area's groundwater is generally of good quality, some local problems occur. Highly mineralized water with objectionable amounts of iron may be obtained from areas that overlie dark-colored, mafic rocks. Also, local contamination of groundwater may occur from landfills, septic tanks, etc.

2) <u>Surface Water</u>

(a) General. The Upper Ocmulgee River Basin encompasses approximately 1400 square miles (mi^2) in the Piedmont Plateau of north-central

Table 18. Chemical analyses of groundwater from 100 to 300 ft-deep wells in Rockdale County, Georgia.[a]

Parameter[b]	Range	Parameter[b]	Range
Silica (SiO_2)	12-46	Bicarbonate (HCO_3)	8-76
Iron (Fe)	0.0-4.0	Carbonate (CO_3)	0
Calcium (Ca)	0.7-18.0	Sulfate (SO_4)	0.0-10.0
Magnesium (Mg)	0.2-4.0	Chloride (Cl)	0.0-5.5
Sodium (Na)	2.1-12.0	Fluoride (F)	0.0-0.4
Potassium (K)	0.7-2.2	Nitrate (NO_3)	0-12
Dissolved solids	43-125	pH	6.0-7.2
Specific conductance (micromhos at 25°C)	20-128		

[a]Source: McCollum, M. J. 1966. Groundwater resources and geology of Rockdale County, Georgia. Georgia State Div. of Conserv., Dept. of Mines, Mining and Geology, The Geological Surv. Inf. Circ. 33. Atlanta. 17 pp. and 1 plate.

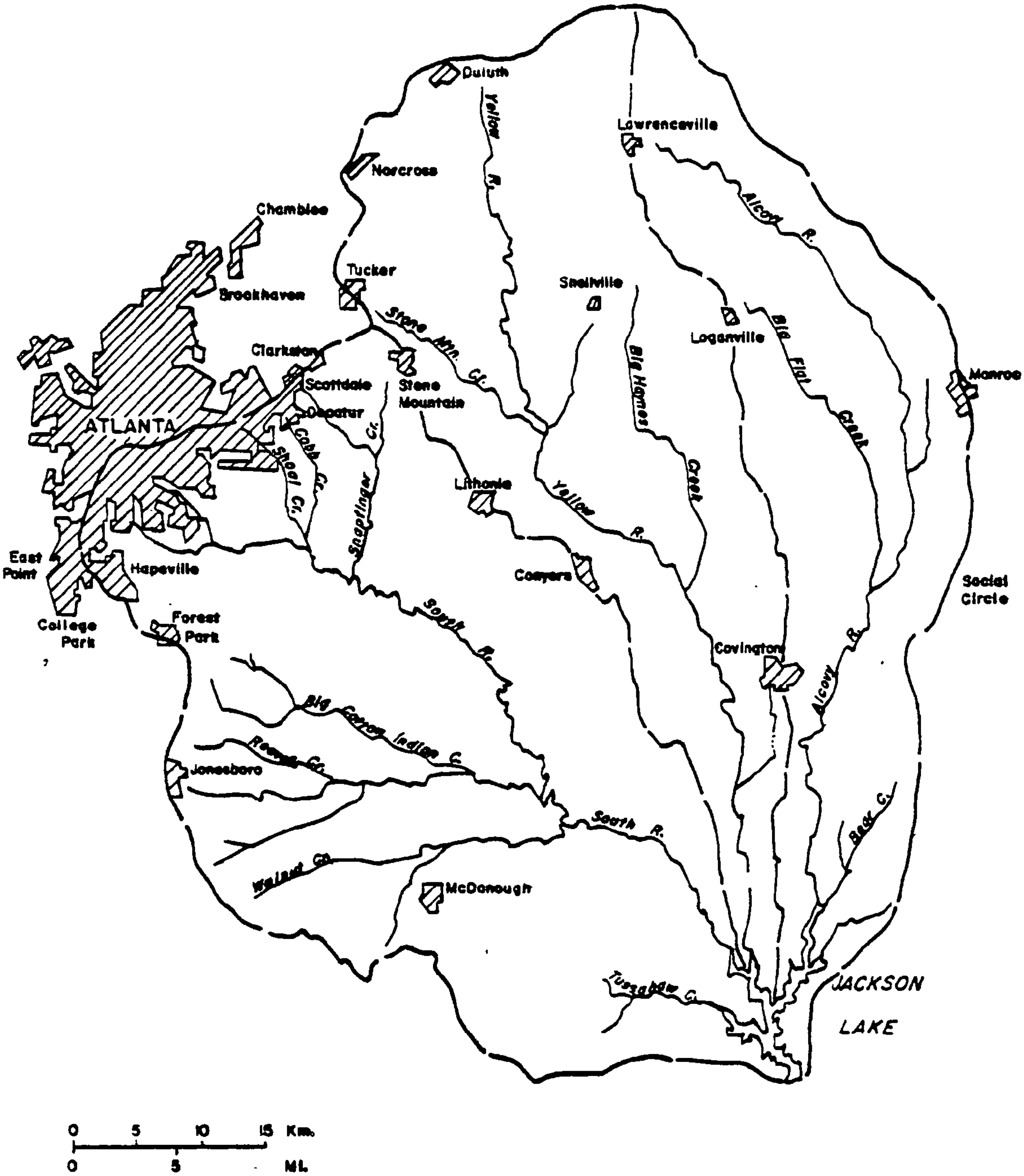
[b]All parameters are in parts per million, except pH and specific conductance.

Georgia. The basin contains three major rivers--the South, Yellow, and Alcovy--which merge to form Jackson Lake (Figure 13). The South River has the largest drainage area, approximately 544 mi^2, followed by the Yellow River with approximately 448 mi^2 and the Alcovy River with approximately 255 mi^2 /Pacific Northwest Environmental Research Laboratory (PNERL) 1975/. The remaining basin area, approximately 150 mi^2, is comprised of the drainages of Tussahaw Creek, Bear Creek, and minor tributaries and immediate drainage to Jackson Lake (PNERL 1975).

The South River arises in southeast Atlanta (approximate elevation = 930 ft) and flows southeasterly over a number of shoals and rapids to its confluence with the Yellow River at Jackson Lake (approximate elevation = 530 ft). Length of the South River is about 63 mi. The Yellow River arises in upper Gwinnett County northeast of Atlanta (approximate elevation = 1,140 ft) and flows southerly through rolling farmland (that is undergoing rapid urbanization) for about 70 mi to its confluence with the South River. The Alcovy River arises in eastern Gwinnett County (approximate elevation = 1,150 ft) and flows southerly through rolling hills and swamplands for 75 mi to Jackson Lake (Georgia Water Quality Control Board 1971). Jackson Lake has a surface area of 7.4 square miles (19.22 square kilometers), mean depth of 22.6 feet (6.9 meters), maximum depth in excess of 87.9 feet (26.8 meters), volume of 4.68 x 10^9 cubic feet (132.6 x 10^6 cubic meters), and mean hydraulic retention time of about 31 days (PNERL 1975).

(b) Quantity. Hydrology of the Upper Ocmulgee River Basin has been altered as a result of a 50 million gallon per day (mgd) diversion of water for drinking purposes from the Chattahoochee River by the City of Atlanta (DeKalb and Gwinnett counties). Wastewater is subsequently discharged into the South and Yellow rivers, thereby increasing their discharges. The amount of diverted wastewater often exceeds the natural flow of the South River during dry weather (Georgia Water Quality Control Board 1971).

Stream flow data for rivers and streams of the Upper Ocmulgee River Basin are scarce. Discharge data for four selected sites on the main rivers are presented in Table 19. The mean annual discharge for South River recorded at Butler Bridge was 559 cubic feet per second (cfs).



UPPER OCMULGEE RIVER BASIN

MAJOR SUB-BASINS, RIVERS & TRIBUTARIES

FIGURE 14

Table 19. Discharge data for rivers of the Upper Ocmulgee River Basin.[a]

River name	Site of measurement	Drainage area in square miles	Mean annual discharge in cfs[b]	Period of record	Arithmetic mean discharge by month in cfs[b]											
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
South River	Butler Bridge, 4.5 mi downstream from Cotton River	456	559	1939-1960	760	828	1096	866	518	389	423	316	276	238	464	545
Yellow River	Highway 12 Bridge, 3.5 mi NW of Covington	378	460	1899-1901 and 1944-1960	641	817	817	735	446	369	281	215	208	192	351	466
	County Highway Bridge, 3.8 mi W of Snellville, 7.5 mi upstream from Stone Mountain Creek	134	171	1942-1968	249	308	345	285	181	119	105	64	54	67	125	173
Alcovy River	Henderson Mill Bridge, 7 mi SE of Covington	244	381	1928-1931 and 1944-1949	516	630	722	488	434	252	212	148	165	199	345	366

[a]Source: Georgia Water Quality Control Board. 1971. Upper Ocmulgee River Basin water quality survey. Atlanta. 86 pp.

[b]Cubic feet per second.

Monthly mean values varied from 1,096 cfs in March to 238 cfs in October. Mean annual discharges for the Yellow River recorded at highway 12 bridge northwest of Covington and at the county highway bridge west of Snellville were 460 cfs and 171 cfs, respectively. Mean monthly discharges at the two stations varied from highs of 817 cfs and 345 cfs, respectively, to lows of 192 cfs and 54 cfs, respectively. Alcovy River mean annual discharge recorded at Henderson Mill Bridge was 381 cfs, with mean monthly extremes of 722 cfs in March and 148 cfs in August (Georgia Water Quality Control Board 1971). Mean flows for the South, Yellow, and Alcovy Rivers, as reported by the Pacific Northwest Environmental Research Laboratory, are 1,139 cfs, 844 cfs, and 478 cfs, respectively.

(c) Stream Classification. The State of Georgia (GDNR 1974c) has established water quality standards "to provide enhancement of water quality and prevention of pollution; to protect the public health or welfare in accordance with the public interest for drinking water supplies, conservation of fish, game and other beneficial aquatic life, and agricultural, industrial, recreational, and other beneficial uses." Water use classifications delineated by the state are 1) drinking water supplies; 2) recreation; 3) fishing, propagation of fish, shellfish, game and other aquatic life; 4) agriculture; 5) industrial; 6) navigation; 7) wild river; 8) scenic river; and 9) urban stream. Streams not listed for specific classification by the state fall into one of the following categories:

A. Streams and stream reaches which are not shown on the Georgia Department of Transportation's official county maps are not classified unless they receive a wastewater discharge. In that case, they are classified as fishing.

B. Streams and stream reaches which are shown as naturally intermittent, ephemeral or a combination thereof on the Georgia Department of Transportation's official county maps or which can be documented as being intermittent by records of the United States Geological Survey are not classified unless they receive a wastewater discharge. In that case, they are classified as fishing.

C. Stream channels, drainage ditches and canals which are naturally intermittent, ephemeral, or a combination thereof are not classified.

D. Streams and stream reaches not specifically classified below and not categorically classified above (A, B, or C) are classified as fishing. (GDNR 1975b)

Streams within the Upper Ocmulgee River Basin are classified for usage as drinking water, recreation, fishing, and urban. Table 20 lists the streams and their classifications; Appendix D contains the specific water quality criteria for these four classifications, as well as the general criteria for all of the State's surface waters.

(d) Quality. Streams of the Upper Ocmulgee River Basin are subject to pollution from domestic sewage, industrial waste, surface runoff, accidental spills, and combined sewer (those receiving treated sewage and surface runoff) overflows. Water quality of streams in the basin is quite variable depending upon topography and proximity of respective streams to pollution sources. The South River sub-basin, which in 1970 contained 89 percent of all sanitary waste treatment design capacity of the Upper Ocmulgee River Basin, has suffered the greatest degradation of water quality. Water quality was generally better in the Yellow River drainage and best in the Alcovy (Georgia Water Quality Control Board 1971).

Measurements of chemical parameters and biological species diversity were utilized in an evaluation of basin water quality during 1970. A dissolved oxygen (DO) concentration of 5 milligrams per liter (mg/l) or greater is generally considered a minimum standard for a healthy stream capable of supporting warmwater fishes (Lagler 1956). However, oxygen resources of the South River were found to be severely depleted, as evidenced by long reaches of the river having DO concentrations less than 2.0 mg/l. This condition resulted from entry of pollutants requiring large amounts of oxygen for decomposition. Five-day biochemical oxygen demand (BOD_5) in unpolluted streams of the region ranged from 0.5 to 1.5 mg/l. BOD_5 concentrations in South River, however, exceeded 50 mg/l in the upper reaches and averaged more than 10 mg/l in reaches down to Ga 138. Fecal coliform bacteria, usually indicators of contamination by human intestinal wastes, exhibited geometric means greater than 35,000 MPN (most probable number) per 100 milliters (ml) at all stations in South River in 1969

Table 20. Stream classifications within the Upper Ocmulgee River Basin.[a]

Stream	Reach	Classification
South River	Headwaters to Georgia Highway 81	Urban
South River	Georgia Highway 81 to Georgia Highway 36	Fishing
Yellow River	Headwaters to Georgia Highway 124	Fishing
Yellow River	Georgia Highway 124 to Porterdale Water Intake	Drinking water
Yellow River	Porterdale Water Intake to Georgia Highway 36	Fishing
Alcovy River	Headwaters to Georgia Highway 138	Fishing
Alcovy River	Georgia Highway 138 to Covington Water Intake	Drinking water
Alcovy River	Covington Water Intake to Newton Factory Road Bridge	Fishing
Jackson Lake	From South River at Georgia Hwy 36 From Yellow River at Georgia Hwy 36 From Alcovy River at Newton Factory Road Bridge to Lloyd Shoals Dam	Recreation
Intrenchment Creek	Headwaters in Atlanta to confluence with South River	Urban
Shoal Creek	Headwaters in DeKalb County to confluence with South River	Urban
Conley Creek	Headwaters near Atlanta Army Depot to confluence with South River	Urban
Doolittle Creek	Headwaters in DeKalb County to confluence with South River	Urban
Snapfinger Creek	Headwaters in DeKalb County to confluence with South River	Urban

[a]Source: Georgia Department of Natural Resources. 1975. Classifications for the waters of the State of Georgia. Environ. Protection Div., Atlanta. n.p.

(Georgia Water Quality Control Board 1971). Contact with such waters represents a distinct human health hazard since maximum geometric mean numbers of fecal coliforms permitted by Georgia law have been set at 50/100 ml, 200/100 ml, and 1000/100 ml for drinking, recreation, and aquatic life, respectively (GDNR 1974c).

Biological evaluation of the South River was conducted in five sections. The four upstream sections were all rated as grossly polluted in accord with macroinvertebrate species occurrence from zero in the most upstream section to 1, 2, and 6 in successive downstream sections. The fifth section (adjacent to Jackson Lake) was inhabited by 27 macroinvertebrate species, 25 of which were considered at least partially tolerant of polluted conditions. This section, though biologically productive, was considered polluted to moderately polluted based on macroinvertebrate indicator species. Biological assessment of eight South River tributaries revealed that all had been altered by siltation or waste discharges, and that even though headwaters were of acceptable quality, all eight streams were degraded in their middle and lower sections (Georgia Water Quality Control Board 1971). The South River is now reported to be improving in quality due to improved waste treatment systems in the sub-basin (letter of 12 December 1976 from Mr. Tim Hess, District Fisheries Biologist, Georgia Department of Natural Resources, Social Circle).

Investigation of chemical and biological water quality indicators in the Yellow River revealed that water quality was good to excellent in most of the river and its tributaries. Exceptions occurred in Dried Indian Creek, which was grossly polluted by organic wastes, and the Yellow River below Porterdale, which was classified as healthy-enriched. Deposits of silt and granitic pebbles from past mining procedures were noted at several locations along the river. Productivity in those areas had been diminished by eradication of many bottom-dwelling organisms by the silt cover (Georgia Water Quality Control Board 1971). Although water quality in the Yellow River sub-basin has been generally good, increased urbanization will place greater stress on aquatic systems of the area, and corresponding deterioration of water quality is likely.

The waters of the Alcovy River were classified as healthy at all stations examined in 1970. Chemical, bacteriological, algal, and macroinvertebrate data all supported this finding (Georgia Water Quality Control Board 1971).

Entry of contaminants from the South, Yellow, and Alcovy rivers into Jackson Lake provides the potential for deterioration of water quality and the associated reduction of recreational values. During 1969 studies, dense algal growths were noted in Jackson Lake, and high nutrient concentrations and fecal coliform counts were recorded for the Yellow River and South River embayments. The study concluded that Jackson Lake was undergoing accelerated eutrophication as a result of nutrient loads from the South and Yellow rivers (Carrick and Hall 1969).

Data gathered during 1973 indicated that Jackson Lake was eutrophic and was deteriorating at a rapid rate. Siltation and heavy blooms of blue-green algae were conspicuous problems. Jackson Lake ranked thirteenth in overall trophic quality of 14 Georgia lakes studied. Twelve lakes had less median total phosphorus, median dissolved phosphorus, median inorganic nitrogen, and mean chlorophyll a; 11 lakes exhibited greater mean Secchi disc transparency (PNERL 1975).

Samples of the 1973 study were collected at four stations on one date each in July, September, and November. Based on inorganic nitrogen to orthophosphate ratios, the limiting nutrient appeared to be phosphorus at three stations in July and at two stations in September, while nitrogen appeared limiting at one station in July, two stations in September, and all four stations in November. Algal assay data indicated, however, that phosphorus was limiting. The study concluded that reversal of enrichment trends was dependent upon phosphorus, not nitrogen, control (PNERL 1975).

During 1973 point sources accounted for 66.4 percent of the total phosphorus input to Jackson Lake. Although 67 wastewater treatment facilities contributed to this total, 5 major facilities serving Atlanta and DeKalb County (and discharging to the South River) accounted for 59.8 percent of the total phosphorus input. Contributions from non-point sources in the

South and Yellow rivers accounted for 25.6 and 5.8 percent, respectively, of the total phosphorus input. The 1973 phosphorus loading rate of 33.38 grams/square meter/year for Jackson Lake (based on mean depth and mean hydraulic retention time) was 19 times that proposed for a eutrophic rate (Vollenweider and Dillon 1974, as cited by PNERL 1975). Net annual nutrient accumulations in Jackson Lake for 1973 were calculated to be 403,950 kilograms phosphorus and 771,825 kilograms nitrogen (PNERL 1975).

b. <u>Biota (Biotic Communities)</u> --

> The delineation of water areas depends on the scale of data presentation and the scale and resolution characteristics of the remote sensor data used for interpretation of land use and land cover. (Water as defined by the Bureau of the Census includes all areas within the land mass of the United States that persistently are water covered, provided that, if linear, they are at least 1/8 mile (200 m) wide and, if extended, cover at least 40 acres (16 hectares).) For many purposes, agencies need information on the size and number of water bodies smaller than Bureau of the Census minimums. These frequently can be obtained from small-scale remote sensor data with considerable accuracy. (Anderson et al. 1976)

According to USGS Level II land use maps, only 2.5 percent of the project area falls into the Water classification. Due to the mapping scale, the South, Yellow, and Alcovy rivers do not appear on the Level II maps under the appropriate category, Streams and Canals. However, since this project is the assessment of a river basin development plan and its impacts on the area's water resources, Streams and Canals will be included in the description of aquatic biotic communities. Two other types of communities--Lakes and Reservoirs--are present in the project area. Although delineated separately by the USGS Level II maps, these communities will be discussed together.

1) <u>Streams and Canals</u>

> The Streams and Canals category includes rivers, creeks, canals, and other linear water bodies. Where the water course is interrupted by a control structure, the impounded area will be placed in the Reservoirs category.
>
> The boundary between streams and other bodies of water is the straight line across the mouth of the stream up to 1 nautical mile (1.85 km). Beyond that

> limit, the classification of the water body changes to the appropriate category, whether it be Lakes, Reservoirs, or Bays and Estuaries. These latter categories are used only if the water body is considered to be "inland water" and therefore included in the total area of the United States. No category is applied to waters classified as "other than inland water" or offshore marine waters beyond the mouths of rivers (U. S. Bureau of the Census, 1970). (Anderson et al. 1976)

Riverweed (Podostemum ceratophyllum) is the most common submerged aquatic vascular plant of the Upper Ocmulgee River Basin. This flowering plant grows tightly attached to stones in rapidly flowing water, typically at shoals such as those in the vicinity of Annistown Bridge in Gwinnett County. During winter this plant may easily be mistaken for debris, roots of shoreline trees, moss, or numerous other materials; yet this plant is extremely important to invertebrate fauna of the stream since it provides substrate for attachment and protection from fast currents. Riverweed is to some extent a natural indicator of good health and water quality of a stream, particularly in areas of rocks and shoals.

Shallow water of river shoals and gravel bars, particularly near shore, often supports emergent species which are tightly rooted in the available substrate. These plants include lizard's tail, water willow (Justicia americana), arrow arum, wapato (Sagittaria latifolia), and monkey-flower (Mimulus ringens). The latter two species were not observed in the project area during the November field survey.

Additional flora reported from rivers and streams of the basin include the aquatic mosses Fissidens sp. and Fontinalis sp.; the green algae Closterium sp., Microspora sp., and Coleochaete sp.; the diatom Asterianella sp.; and the blue-green algae Oscillatoria sp. and Anacystis cyanea (Georgia Water Quality Control Board 1971; Kreiger 1968).

Fish fauna of the Upper Ocmulgee River Basin consists of 69 species comprising 14 families (Appendix B, Table B-5). The most abundant game fish of the rivers and streams are members of the sunfish family and include the bluegill (Lepomis macrochirus), redear sunfish (Lepomis microlophus), redbreast sunfish (Lepomis auritus), and largemouth bass

(*Micropterus salmoides*). The most important non-game fish are the channel catfish (*Ictalurus punctatus*) and bullheads (*Ictalurus* spp.). Healthy streams of the basin are characterized by diverse fish life, including a number of forage species such as shiners (family Cyprinidae) and darters (family Percidae), as well as the larger predatory species. Waters of the project area do not support trout or other coldwater fishes.

Although few extensive stream surveys have been conducted in the project area, the occurrence of a diverse macroinvertebrate fauna has been noted for healthy reaches of the Yellow River and its tributaries. The most common aquatic macroinvertebrates include various species of mollusks and certain life stages of many insects (Appendix B, Table B-6). Taxonomic families of stream insects most frequently found include Elmidae, Tabanidae, Tipulidae, Baetidae, Heptageniidae, Corydalidae, Aeshnidae, Gomphidae, Perlidae, Pteronarcidae, and Hydropsychidae (letter of 26 January 1977 from Mr. Tim Hess, District Fisheries Biologist, Georgia Department of Natural Resources, Game and Fish Div., Social Circle).

2) Lakes and Reservoirs

> Lakes are nonflowing, naturally enclosed bodies of water, including regulated natural lakes but excluding reservoirs. Islands that are too small to delineate should be included in the water area. The delineation of a lake should be based on the areal extent of water at the time the remote sensor data are acquired. (Anderson et al. 1976)
>
> Reservoirs are artificial impoundments of water used for irrigation, flood control, municipal water supplies, recreation, hydroelectric power generation, and so forth. Dams, levees, other water-control structures, or the excavation itself usually will be evident to aid in the identification, although the water-control structures themselves and spillways are included in the Other Urban or Built-up Land category.
>
> In most cases, reservoirs serve multiple purposes and may include all of the land use functions just mentioned. In certain cases like the Tennessee River, the entire length of the trunk stream is impounded. In such a situation, the stream exists as a stairstep series of impoundments with waterway, flood-control, recreation, and power-generation functions but is still considered a reservoir, since the additional functions are the result of impoundment. (Anderson et al. 1976)

Numerous ponds, small lakes, and reservoirs occur throughout the project area. Jackson Lake is considered one of the most important reservoirs in Georgia (Carrick and Hall 1969) and is the most important reservoir of the project area. It is very productive and, because of its proximity to Atlanta, is easily accessible to a large number of sportsmen who seek fishing, boating, and other water-oriented recreation. Waters of Jackson Lake also provide the source of energy for Georgia Power Company's hydroelectric plant at Lloyd Shoals Dam.

Vascular plants of a lake are confined to rocks which are seldom, if ever, exposed; to shallow marsh areas (as discussed in Nonforested Wetlands), and to seasonally exposed bars and flats--rarely do such plants inhabit the main portion of the lake. No submerged aquatic plants were observed in the embayments or upper portion of Jackson Lake during 1969 studies (Carrick and Hall 1969). Utilization of the area by waterfowl, however, does increase the chance of introduction of certain aquatics such as duckweed and pondweed.

Dense growths of emergent aquatic plants, particularly lizard's tail, have been observed in swampy areas adjacent to the embayments, but the steep banks have prevented the spread of these plants to the embayment bed. Shallow areas resulting from silt deposits, such as the mouth of the South River embayment, permit establishment of emergent vegetation, and sparse stands of bulrushes (*Scirpus* sp.) have been noted there (Carrick and Hall 1969).

Dense algal populations were recorded in Jackson Lake in 1969. Predominant species were the green flagellate *Haematococcus buetschilli* (June), the blue-green filament *Raphidiopsis curvata* (August and October), and the green flagellate *Chlamydomonas* sp. (October). Other abundant species included *Cyclotella* sp., *Nitzschia fonticola*, *Navicula* sp., *Ankistrodesmus falcatus*, and *Scenedesmus quadricauda* (Carrick and Hall 1969).

Studies in 1973 revealed that algal populations had shifted toward a predominance of blue-green species. The two most abundant species in July, September, and November were blue-greens. Microcystis sp. (=Anacystis sp.) ranked number one in July and number two in September and November. Other predominants included Oscillatoria (ranked second in July), Raphidiopsis sp. (ranked first in September), and Merismopedia sp. (ranked first in October). Additional blue-green algae present and ranked among the top five in abundance were Anabaena sp., Anabaenopsis sp., and Lyngbya sp. (PNERL 1975). Certain blue-green algae are well-known producers of very foul "pig pen" odors in water and the worst offenders include Microcystis (=Anacystis) and Anabaena (Palmer 1962). Hence, the presence of large numbers of these forms in Jackson Lake may seriously diminish its aesthetic qualities.

Important fauna of Jackson Lake includes several species of game fishes such as the striped bass (Morone saxatilis), white bass (Morone chrysops), hybrid striped x white bass, largemouth bass, bluegill, redear sunfish, and crappie. Non-game fish also important include catfish and bull-heads. The threadfin shad (Dorosoma petenense), an important forage species for bass and crappies, feeds primarily upon planktonic algae and is thus a desirable resident of Jackson Lake.

Endangered Species -- No endangered aquatic species are likely to occur in the project area with the possible exception of a "freshwater clam" mentioned on page A-29 of the Upper Ocmulgee River Basin Water Quality Management Plan (GDNR 1974d). However, this statement includes no scientific name or reference citation so its validity cannot be verified.

The Ocmulgee shiner (Notropis callisema) and the Altamaha shiner (Notropis xaenurus) are both known to occur in the project area. Although neither is currently on an endangered species list, their status has not been accurately determined and the possibility of their becoming classified as rare or endangered does exist (based on Ramsey 1973).

5. Sensitive Natural Areas

Ramifications having to do with sensitive area definition involve site size, degree of wetness, definition of "uniqueness" and "sensitive," and many other aspects. The project area was viewed in a broad sense and sites were evaluated in the condition in which they currently exist;

selected natural areas are those which are (1) habitats of endangered biota, (2) examples of undeveloped and insignificantly disturbed biota, and (3) sites which might be better used for aesthetic and recreational activity rather than for residential, commercial, agricultural, or other land uses. Because the selection process was critically limited by field coverage, and because development in the Greater Atlanta area is rapidly extending outward from the central city and often is focusing on the high river bluff, the forest with the most magnificant trees, and other "sensitive" and "unique" natural areas, the comments of this report could soon become obsolete. Immediate additional project area reconnaissance specifically aimed toward a more intensive survey of sensitive natural areas throughout all of the Upper Ocmulgee River Basin is needed.

Below are descriptions of the sites identified during this study as sensitive natural areas; locations of these areas are shown on Figure 15.

I. Newton County--Bottomland forest along Rocky Plains Road on west side of river, narrowing to a mountain laurel bluff upstream about 0.5 mile from the bridge. This area has no unusual species but is remote with little disturbance, except trash disposal near bridge. Large river birch, sycamore, tulip poplar, are present here.

II. Newton County--Cedar Shoals downstream from the Ga. 81 bridge at Porterdale. This is an extensive shoal area in which the river nearly disappears among crevices of rocks. Bluffs along the west bank offer potential recreational sites.

III. Newton-Rockdale County line--Shrub marsh and swamp north of Bald Rock Road along Big Haynes Creek. This area needs considerable inventorying for those species of wildlife generally associated with wetlands.

IV. Rockdale County--Granite outcrop near the junction of County road (without name on USGS Quad sheets) and Bald Rock Road. This is presumably "Bald Rock." Several rare outcrop species are present, as well as Endangered and Threatened plants (Georgia oak, _Amphianthus pusillus_, _Sedum smallii_, _Isoetes melanospora_, _Viguiera porteri_, etc.).

V. Rockdale--Griffin Mountain is relatively isolated and supports rather nice deciduous forest on north and east slopes; the area needs additional study.

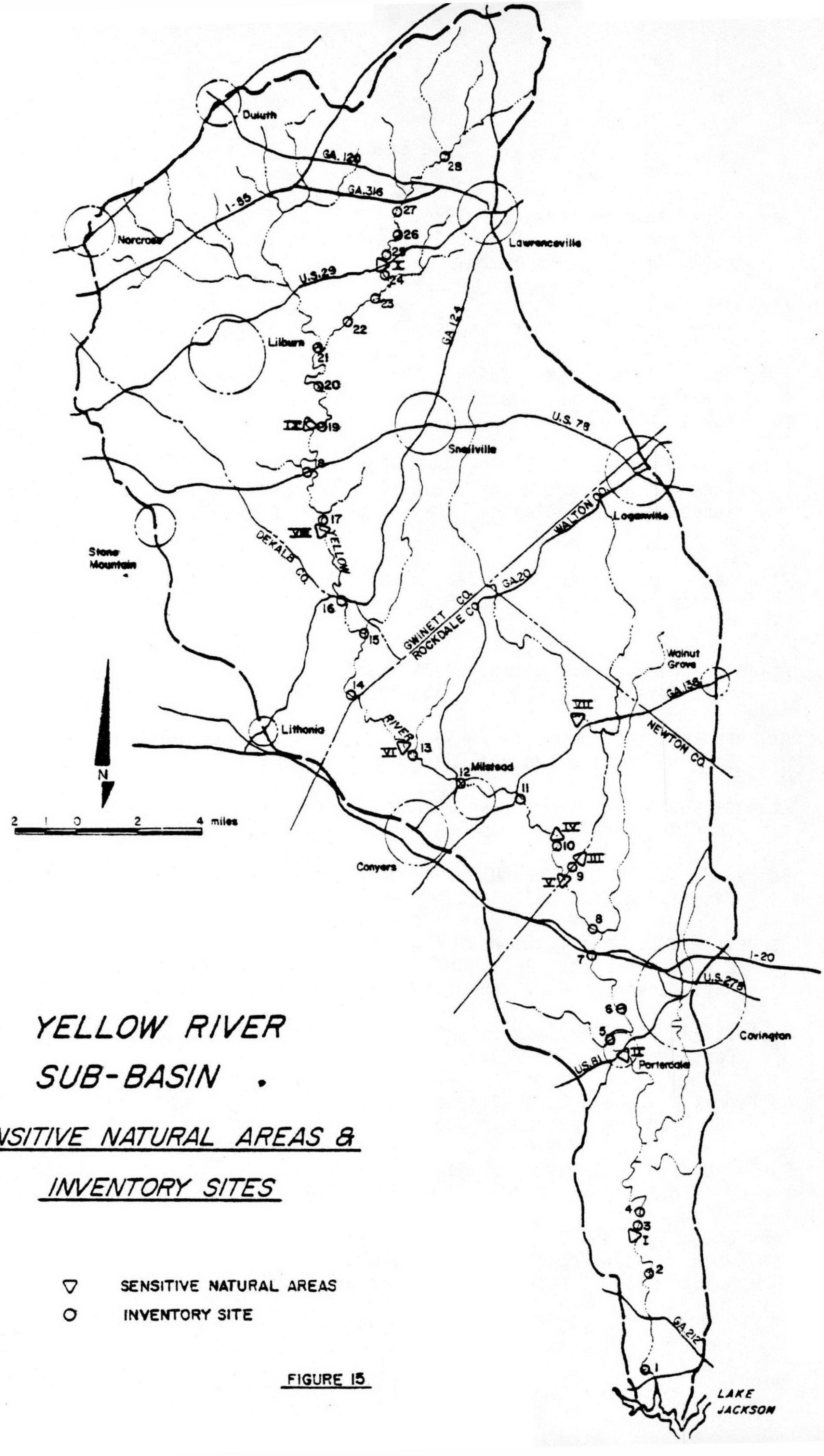
VI. Rockdale County--Outcrop along Irwin Bridge Road. This outcrop is inhabited by Endangered and Threatened plant species, but presently is used for trash disposal.

VII. Rockdale County--Bottomlands of Big Haynes Creek upstream from Ga. 138 bridge. This area represents a large block of relatively undisturbed woodlands, bisected by Bethel Road. These bottomlands could possibly be used as a refuge for wildlife. The area is in need of considerable field reconnaissance.

VIII. Gwinnett County--Shoals at the old Annistown Bridge, about 2 miles west of Centerville. This is the most "rugged" part of the Yellow River sub-basin and potentially possesses unique invertebrates and aquatic plants. High quality housing developments threaten this site. We would suggest that this area be considered for nature study with a minimum of development on and overlooking the prominent bluffs.

IX. Gwinnett County--East bank of Yellow River downstream from the McDaniel's Bluff bridge. This represents an excellent site for a nature trail. Potential exists here for an excellent spring wildflower show, but encroaching development on the east bank of river and southeast of McDaniel's Bridge Road could easily ruin this setting.

X. Gwinett County--Swamp forest northwest of the US-29 crossing. This area probably contains wetland species of mammals, wood ducks, etc. It represents nothing rare but is just a little pocket of habitat different from the rest of the surrounding area, and therefore possesses aesthetic qualities.



YELLOW RIVER SUB-BASIN

SENSITIVE NATURAL AREAS & INVENTORY SITES

▽ SENSITIVE NATURAL AREAS

○ INVENTORY SITE

FIGURE 15

References

American Fisheries Society. 1970. A list of common and scientific names of fishes from the United States and Canada, third edition. Spec. Publ. No. 6. Washington, D. C. 150 pp.

American Ornithologists' Union. 1957. Checklist of North American birds, fifth edition. Port City Press, Inc., Baltimore, Md. 691 pp.

American Ornithologists' Union. 1973. Thirty-second supplement to the American Ornithologists' Union check-list of North American birds. Auk 90:411-491.

Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. Geological Surv. Prof. Pap. 964, U. S. Gov. Printing Office, Washington, D. C. 25 pp., 4 figures, and bibliography.

Atlanta Audubon Society. 1976. A summary of the spring, 1976 Fernbank Forest birdwalks. Pages 5-6 in the October 1976 newsletter. Atlanta, Ga.

Atlanta Regional Commission. 1974. Soils as possible indicators of land development constraints. Atlanta, Ga. n.p.

Atlanta Regional Commission. 1976. Regional development plan. Atlanta, Ga. 84 pp. and regional development plan map.

Atlanta Regional Metropolitan Planning Commission. 1967. Rockdale County general soil map. Atlanta, Ga.

Bagby, G. T. 1969. Our ruined rivers. Pages 1-15 in Georgia Game and Fish Magazine. Georgia Game and Fish Comm., Atlanta.

Barrett, L. B., and T. E. Waddell. 1973. Cost of air pollution damage: a status report. Publ. No. AP-85, Environ. Protection Agency, Natl. Environ. Res. Cent., Research Triangle Park, N. C. 73 pp.

Bostick, P. E. 1971. Vascular plants of Panola Mountain, Georgia. Castanea 36(3):194-209.

Burbanck, M. P., and R. B. Platt. 1964. Granite outcrop communities of the Piedmont Plateau in Georgia. Ecology 45:292-306.

Burleigh, T. D. 1958. Georgia Birds. Univ. of Okla. Press, Norman. 746 pp.

Carrick, L. B., and E. T. Hall, Jr. 1969. A water quality survey of Jackson Lake Upper Reservoir, Georgia, 1969. Fed. Water Quality Admin. and Ga. Water Quality Control Board, Atlanta. 36 pp.

Carter, H. S. 1970. Georgia tornadoes. Environ. Data Serv., Silver Springs, Md. 12 pp. (Supplement, 1973. 1 p.)

Coker, W. C., and H. R. Totten. 1945. Trees of the southeastern states. Univ. of N. C. Press, Chapel Hill. 419 pp.

Conant, R. 1975. A field guide to reptiles and amphibians of eastern and central North America, 2nd edition. Houghton Mifflin Co., Boston, Mass. 429 pp.

Cowles, H. C. 1899. The ecological relations of the vegetation of the sand dunes of Lake Michigan. Botanical Gazette 29:95-117, 167-202, 281-308, 361-391.

Cranshaw, D., ed. 1976. Endangered wildlife. Pages 22-26 in Outdoors in Georgia, September 1976. Ga. Dept. of Nat. Resour., Atlanta.

Critchfield, H. J. 1966. General climatology. Prentice-Hall, Englewood Cliffs, N. J. 420 pp.

Dahlberg, M. D. and D. Scott. 1971. The freshwater fishes of Georgia. Bull. Ga. Acad. Sci. 29:1-64.

Fernald, M. L. 1950. Gray's manual of botany (Eighth ed.). American Book Company, New York. 1632 pp.

Fordham, H. W. 1973. Soil pollution from cattle feedlots in Georgia. Natl. Tech. Inf. Serv., Springfield, Va. 44 pp.

General Services Administration. 1973. Code of federal regulations 40: protection of the environment, part 52. U. S. Gov. Printing Office, Washington, D. C.

Georgia Department of Mines, Mining and Geology. 1969. Mineral resource map.

Georgia Department of Natural Resources. 1974a. Georgia surface mine operators. Environ. Protection Div., Land Reclamation Sect., Macon. 52 pp.

Georgia Department of Natural Resources. 1974b. The Georgia resources assessment program user's guide: resource inventory, soils. Office of Planning and Res., Resour. Planning Sect., Atlanta. 25 pp. and 43 soil charts.

Georgia Department of Natural Resources. 1974c. Rules and regulations for water quality control. Environ. Protection Div., Atlanta.

Georgia Department of Natural Resources. 1974d. Upper Ocmulgee River Basin water quality management plan. Environ. Protection Div., Atlanta.

Georgia Department of Natural Resources. 1975a. Rules and regulations for air quality control. Environ. Protection Div., Atlanta.

Georgia Department of Natural Resources. 1975b. Classification for the waters of the State of Georgia. Environ. Protection Div., Atlanta. n.p.

Georgia Department of Natural Resources. 1976. Rules and regulations for the protection of endangered, threatened, rare, and unusual species. Atlanta. 10 pp.

Georgia State Highway Department. 1965. Newton County general highway map. Atlanta.

Georgia Water Quality Control Board. 1971. Upper Ocmulgee River Basin water quality survey. Atlanta. 86 pp.

Golley, F. B. 1962. Mammals of Georgia. Univ. of Ga. Press, Athens. 218 pp.

Green, E. R., W. W. Griffin, E. P. Odum, H. L. Stoddard, and I. R. Tomkins. 1945. Birds of Georgia. The Univ of Ga. Press, Athens. 111 pp.

Gross, M. G. 1972. Pages 79-141 in Oceanography: a view of the earth. Prentice-Hall, New York.

Halls, L. K., and T. H. Ripley. 1961. Deer browse plants of southern forests. U. S. Dept. of Agric., For. Serv., Atlanta, Ga. 78 pp.

Herrmann, L. A. 1954. Geology of the Stone Mountain-Lithonia District, Georgia. Ga. State Div. of Mines, Mining and Geology, The Geological Surv. Bull. No. 61. Atlanta. 139 pp. and 8 plates.

Hess, Tim B. Unpublished stream survey catch data of 1969 and 1976. Ga. Dept. Nat. Resour., Game and Fish Div., Social Circle.

Jones, J. K., Jr., D. C. Carter, and H. H. Genoways. 1973. Checklist of North American mammals north of Mexico. Occas. Pap. Mus. Texas Tech Univ. 12:1-14.

Keever, C. 1950. Causes of succession on old fields of the Piedmont, North Carolina. Ecol. Monographs 20:229-250.

Kreiger, K. A. 1968. Factors controlling the distribution of Oxytrema suturalis Haldeman in the Yellow River of Georgia. M. S. Thesis, Emory Univ., Atlanta, Ga. 191 pp.

Lagler, K. F. 1956. Freshwater fishery biology, second edition. Wm. C. Brown Publishers, Dubuque, Iowa. 421 pp.

LeGrand, H. E. 1967. Groundwater of the Piedmont and Blue Ridge in the southeastern states. U. S. Geological Surv. Circ. 538. Washington, D. C. 11 pp.

Martof, B. S. 1956. Pages 65-88 in Amphibians and reptiles of Georgia. Univ. of Ga. Press, Athens.

McCollum, M. J. 1966. Ground-water resources and geology of Rockdale County, Georgia. Ga. State Div. of Conserv., Dept. of Mines, Mining and Geology, The Geological Surv. Inf. Circ. 53. Atlanta. 17 pp. and 1 plate.

McCormick, J. F., J. R. Bozeman, & S. Spongberg. 1971. A taxonomic revision of granite outcrop species of Minuartia (Arenaria). Brittonia 23:149-160.

McVaugh, R. 1943. The vegetation of the granitic flat-rocks of the southeastern United States. Ecol. Monographs 13:119-166.

Morrison, R. G. and G. A. Yarranton. 1974. Vegetational heterogeneity during a primary sand dune succession. Can. J. Bot. 52:397-410.

National Audubon Society. 1975. The seventy-fifth Audubon Christmas bird count. Am. Birds 29(2):327; 330-331.

National Audubon Society. 1976. The seventy-sixth Audubon Christmas bird count. Am. Birds 30(2):338-339; 342-343.

Odum, E. P. 1960. Organic production and turnover in old field succession. Ecology 41:34-49.

Oosting, H. J. 1942. An ecological analysis of the plant communities of Piedmont, North Carolina. Amer. Midl. Nat. 28:1-126.

Oosting, H. J., and M. E. Humphries. 1940. Buried viable seeds in a successional series of old field and forest soils. Torrey Bot. Club Bull. 67:253-273.

Pacific Northwest Environmental Research Laboratory. 1975. Report on Jackson Lake; Butts, Jasper, and Newton counties, Georgia: EPA Region IV, Working Paper No. 290. U. S. Environ. Protection Agency. 19 pp. + appendices.

Palmer, C. M. 1962. Algae in water supplies. U. S. Dept. of Health, Education, and Welfare, Public Health Serv., Washington, D. C. 88 pp.

Quarterman, E. 1957. Early plant succession on abandoned cropland in the central basin of Tennessee. Ecology 38:300-309.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the vascular plants of the Carolinas. Univ. of N. C. Press, Chapel Hill. 1183 pp.

Ramsey, J. S. 1973. A preliminary list of extinct and rare freshwater fishes of Georgia. Ala. Coop. Fish. Unit, Auburn Univ., Auburn. 7 pp. mimeograph.

Reilly, E. M., Jr. 1968. The Audubon illustrated handbook of American birds. McGraw-Hill Book Co., New York. 524 pp.

Small, J. K. 1933. Manual of the southeastern flora. Univ. of N. C. Press, Chapel Hill. 1554 pp.

Smithsonian Institution. 1975. Report on endangered and threatened plant species of the United States. U. S. Gov. Printing Office, Washington, D. C. 200 pp.

Thomson, M. T., S. M. Herrick, E. Brown et al. 1956. The availability and use of water in Georgia. Ga. Dept. of Mines, Mining and Geology Bull. No. 65, Atlanta. 329 pp. and 3 plates.

Thornbury, W. D. 1965. Piedmont province. Pages 88-100 in Regional geomorphology of the United States. John Wiley, New York.

U. S. Army, Corps of Engineers. 1971. Flood plain information, Yellow River, Metropolitan Atlanta, Georgia. Savannah District, Savannah, Ga. 35 pp. and 47 plates.

U. S. Army, Corps of Engineers. 1975. Special flood hazard information, DeKalb County, Georgia, minor tributaries. Savannah District, Savannah, Ga. 16 pp. and 57 plates.

U. S. Department of Agriculture. 1964. Walton County soil survey. Soil Conserv. Serv., Washington, D. C. 70 pp.

U. S. Department of Agriculture. 1967. Gwinnett County soil survey. Soil Conserv. Serv., Washington, D. C. 94 pp.

U. S. Department of Agriculture. 1975. DeKalb County general soil map. Soil Conserv. Serv., Washington, D. C.

U. S. Department of Commerce. 1973. Climatography of the United States--Georgia: Monthly normals of temperature, precipitation and heating and cooling degree days 1941-1970. Natl. Clim. Cent., Asheville, N. C. 10 pp.

U. S. Department of Commerce. 1975. Local climatological data, annual summary with comparative data, 1975, Atlanta, Georgia. Natl. Clim. Cent., Asheville, N. C. n.p.

U. S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census. 1973. County and city data book, 1972. U. S. Gov. Printing Office, Washington, D. C. 1020 pp.

U. S. Department of the Interior. 1973. Threatened wildlife of the United States. Fish and Wildl. Serv., Washington, D. C. 289 pp.

U. S. Department of the Interior. 1974. United States list of endangered fauna. Fish and Wildl. Serv., Washington, D. C. 22 pp.

U. S. Department of the Interior. 1976. Endangered and threatened wildlife and plants. Fed. Register 41(117):24524-24572.

U. S. Department of the Interior, Geological Survey, Water Resources. 1969. Flood-prone areas maps: Jersey, Covington, Snellville, Conyers, Porterdale, Worthville, and Milstead quadrangles. Doraville, Ga. (7.5 minute series)

U. S. Department of the Interior, Geological Survey, Water Resources. 1973. Flood-prone areas maps: Loganville, Lawrenceville, and Hog Mountain quadrangles. Doraville, Ga. (7.5 minute series)

U. S. Environmental Protection Agency. 1972. Noise pollution. Washington, D. C. 12 pp.

U. S. Environmental Protection Agency. 1974. Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety. Office of Noise Abatement and Control, Washington, D. C. n.p.

Vollenwelder, R. A., and P. J. Dillon. 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Cent. for Inland Waters, Burlington, Ontario. (As cited in Pacific Northwest Environmental Research Laboratory 1975.)

Warming, E. 1891. De psammophile Vormationer i Danmark. Medd. Naturhist. For. Kbh. (As cited in Morrison and Yarranton 1974.)

Wharton, C. H. 1969. The southern river swamp--a multiple-use environment. Ga. State Univ., Atlanta. 48 pp.

Whitehouse, E. 1933. Plant succession on central Texas granite. Ecology 14:391-405.

B.1 DEMOGRAPHY AND ECONOMICS

Current Population Data

Counties lying totally or partially within the Upper Ocmulgee River Basin have witnessed an ebb and flow of population growth rates since as recently as 1962. Table 21 depicts these rates of change, using two data sources for the periods 1960, 1970, and 1975. Both the official population estimates of the Georgia State Data Center and the U. S. Census population reports are portrayed.

The differences between the two sources, although small, are explained by differences in estimating techniques. While both approaches utilize the multiple regression technique, the State Data Center adds tax returns to their correlation matrix. The Bureau of Census also employs a regression technique but combines this approach with a component method to measure net migration and housing unit estimates.

In addition to the comparison of the two estimates for 1975, Table 21 indicates the relative rank of each county for the years 1970 and 1975. While many of the larger counties in the Basin maintained their rank between 1970-75, significant increases in statewide ranking occurred in the smaller counties; notably Rockdale County.

Before departing from this table, attention should be directed to the relative ranking in growth rates from 1970 to 1975. Gwinnett County increased its ranking statewide from 11 to 9, but achieved the number 1 ranking statewide in rate of change from 1970 to 1975. Additionally, Rockdale (3) and Clayton (6) fell within the top ten counties in terms of rate of population increase for the period. Significantly, the majority of both Gwinnett and Rockdale Counties fell within the Upper Ocmulgee Basin. Such rates of growth occurring within the Basin, particularly within the Yellow River Sub-basin, provide emphasis to the concern for quality growth and careful maintenance of water quality standards.

The existing and projected population distribution for the Upper Ocmulgee River Basin is based on a gross area mean distribution method of population aggregation. 1970 Census data was gathered by census tract within the Atlanta SMSA, while outside the region county data was used. Butts, Jasper, Newton and Walton Counties were found to be outside the SMSA. By superimposing the Water Quality Management Unit (WQMU) boundaries over the census and county boundaries, population levels based on gross acreage were determined. In using this method, the population was assumed to be evenly distributed throughout the census tracts and counties. The immense scale of the Study Area in relation to the size and number of census tracts involved tends to minimize the density deviations within each population unit. Through the use of a mean methodology, deviations inherent in this approach are reduced as the number of independent actions increases, whereby they tend to compensate each other and minimize the error factor.

POPULATION ESTIMATES 1960, 1970, 1975

COUNTY	1960	1970	STATEWIDE 1970 RANK	% CHANGE 1960-70	1975	STATEWIDE 1975 RANK	% CHANGE 1970-75	% CHANGE 1970-75RANK
Butts	8,976	10,560	(93)	17,6	12,700	(84)	20.27	(11)
Clayton	46,365	98,126	(8)	111.5	125,100	(8)	27.49	(6)
DeKalb	256,782	415,387	(2)	61.8	461,600	(2)	11.13	(34)
Fulton	556,326	605,210	(1)	9.2	591,200	(1)	-2.31	(151)
Gwinnett	43,541	72,349	(11)	66.2	112,800	(9)	55.9	(1)
Henry	17,619	23,724	(38)	34.7	27,900	(37)	17.60	(15)
Jasper	6,135	5,760	(141)	-6.1	6,600	(132)	14.58	(26)
Newton	20,999	26,282	(36)	25.2	29,100	(35)	10.72	(40)
Rockdale	10,572	18,152	(54)	71.7	24,900	(41)	37.17	(3)
Walton	20,481	23,404	(41)	14.3	27,200	(38)	16.22	(19)
		1,298,954			1,419,100		9.20	

Source: Annual Estimates of Population for the State of Georgia, 1975, State Data Center, Office of Planning and Budget, July 1976, Atlanta, Georgia.

The population of the Upper Ocmulgee River Basin as of the 1970 Census of Population was approximately 532,400 residents (see Table 22). The general characteristics vary throughout the Basin, which range from the dense urban character of the Atlanta SMSA in the western section to the suburban and then rural character of the eastern counties. Of the total Basin population, the Atlanta SMSA dominates its character and direction of change.

The type of population characteristics depicted in this study are: total population, non-white population and median family income and age. Employment characteristics are discussed later. The non-white portion of the Basin's populace constitutes 26 percent of the total population, which is higher than Atlanta's 22 percent level. The median family income of all families in the Basin was $10,462, which was lower than the Atlanta SMSA, but was higher than State of Georgia or United States levels. The median age of the Upper Ocmulgee River Basin was found to be 26.3 years, which was older than the state's median age, but was younger than the United States median and only slightly younger than Atlanta's 26.4 median age.

Age distribution in the Upper-Ocmulgee River Basin is depicted in the Population Pyramids shown in Figure 16. The pyramids are divided into male and female distributions and depict total and non-white population. The total population pyramid shows that over 40 percent of the population is under 20 years of age. Over 70 percent of the male population and 67 percent of the female population is under the age of 40. This type of distribution typifies the characteristics of an urban growth region that has had a large in-migration of young adults of child-bearing age. Because the bulk of the age distribution was below 40 years, it would appear that the in-migration has occurred in the Basin within the last 10 to 15 years. In contrast, the non-white residents age distribution shows out-migration tendencies. Within the Basin, 48 percent of the non-white males and 43 percent of the non-white females are shown to be under the age of 20 years. A sharp drop in the non-white males is found from the 10 to 19 year age group to the 20-29 year age group. This drop is characteristic of an area that loses its male population because of poor job opportunities when they become of legal age. Females because of social restriction tend to leave at a later age, approximately 30 years. The tendencies are not current and only reflect aspects of the Basin during 1970; present conditions may have revised this distribution.

<u>Population Characteristics by Sub-Basin</u>

The population characteristics of the Basin have been disaggregated into three (3) sub-basins; the South, Yellow and Alcovy Rivers and the twelve (12) Water Quality Managements Units (WQMU) that are displayed in Table 22

TABLE 22

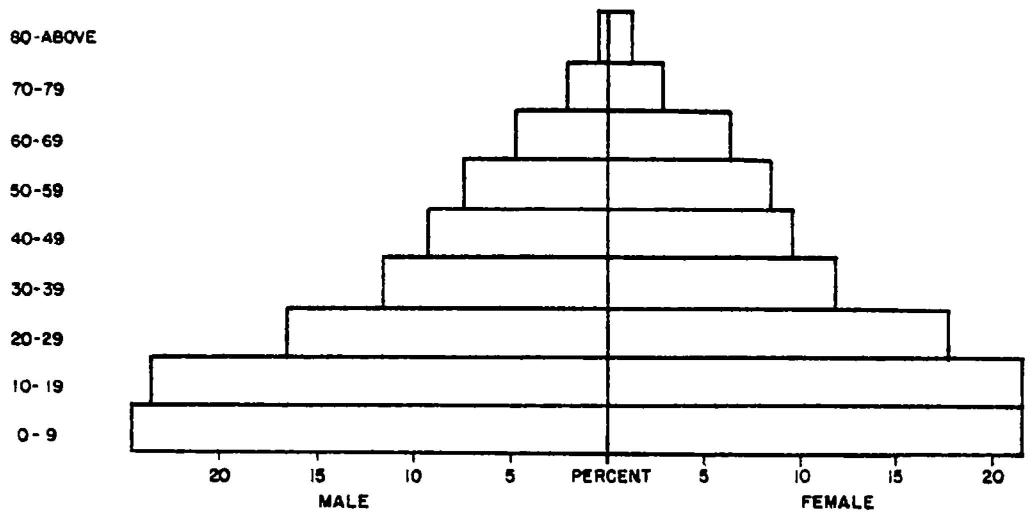
UPPER OCMULGEE RIVER BASIN POPULATION CHARACTERISTICS, 1970

Water Quality Management Unit	Population (thousands) Total	Non White	Median Family Income	Median Age	Employment Mean Percentage Manu-facturing	Trade	Service	Govern-ment	Unemployment Mean Percentage
South River	425.1	123.3	10,758	26.4	17.5	23.8	9.7	15.8	3.0
0401	316.4	106.7	11,073	26.7	16.5	24.6	9.8	15.9	2.9
0402	56.5	6.7	10,001	26.6	17.9	22.7	10.6	15.9	3.2
0403	30.6	3.7	10,279	24.1	20.0	21.6	7.8	15.4	2.9
0404	9.9	1.3	9,805	25.8	28.5	19.6	6.5	13.4	2.4
0405	11.7	4.9	7,967	25.3	26.2	15.8	10.8	17.5	3.8
Yellow River	80.3	8.8	9,656	25.6	31.0	20.8	7.0	12.7	2.2
0406	43.8	1.5	10,215	25.6	28.2	22.8	7.3	13.1	2.1
0407	16.4	1.7	9,143	25.8	34.3	19.5	6.7	12.1	2.1
0408	14.5	3.9	9,438	25.8	31.3	18.6	6.6	12.8	2.4
0409	5.6	1.8	7,839	26.0	43.1	14.6	7.0	10.6	2.5
Alcovy River	27.0	6.6	8,195	26.2	40.2	16.7	7.1	11.4	2.3
0410	16.9	3.3	8,473	26.3	38.9	18.4	7.0	11.5	2.1
0411	9.2	2.9	7,858	25.8	43.1	14.2	7.0	10.5	2.6
0412	0.9	.4	6,495	27.6	36.4	11.4	10.6	18.0	2.8
Upper Ocmulgee River Basin	532.4	138.7	10,462	26.3	20.7	23.0	9.2	15.1	2.8
Atlanta SMSA	1,390.2	309.6	10,693	26.4	19.7	23.5	9.5	15.4	3.0
Georgia	--	--	8,165	26.0	27.2	19.5	9.2	16.2	3.2

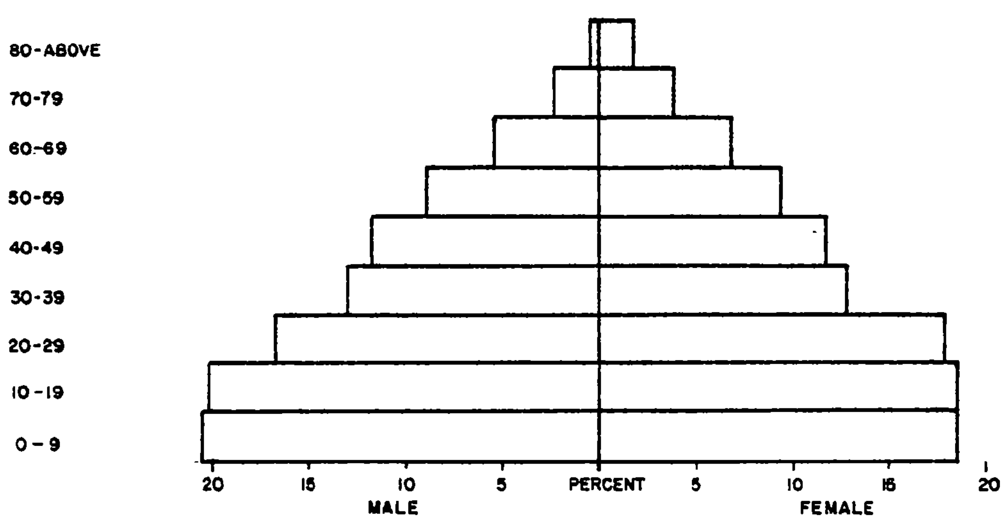
Note: Values for WQMU gained from averaging the factors over each county's population share of each WQMU.

Source: U.S. Department of Commerce Bureau of Census, 1970.

FIGURE 16



BLACK POPULATION
1970



TOTAL POPULATION
1970

AGE DISTRIBUTION

UPPER OCMULGEE RIVER BASIN

South River Sub-basin

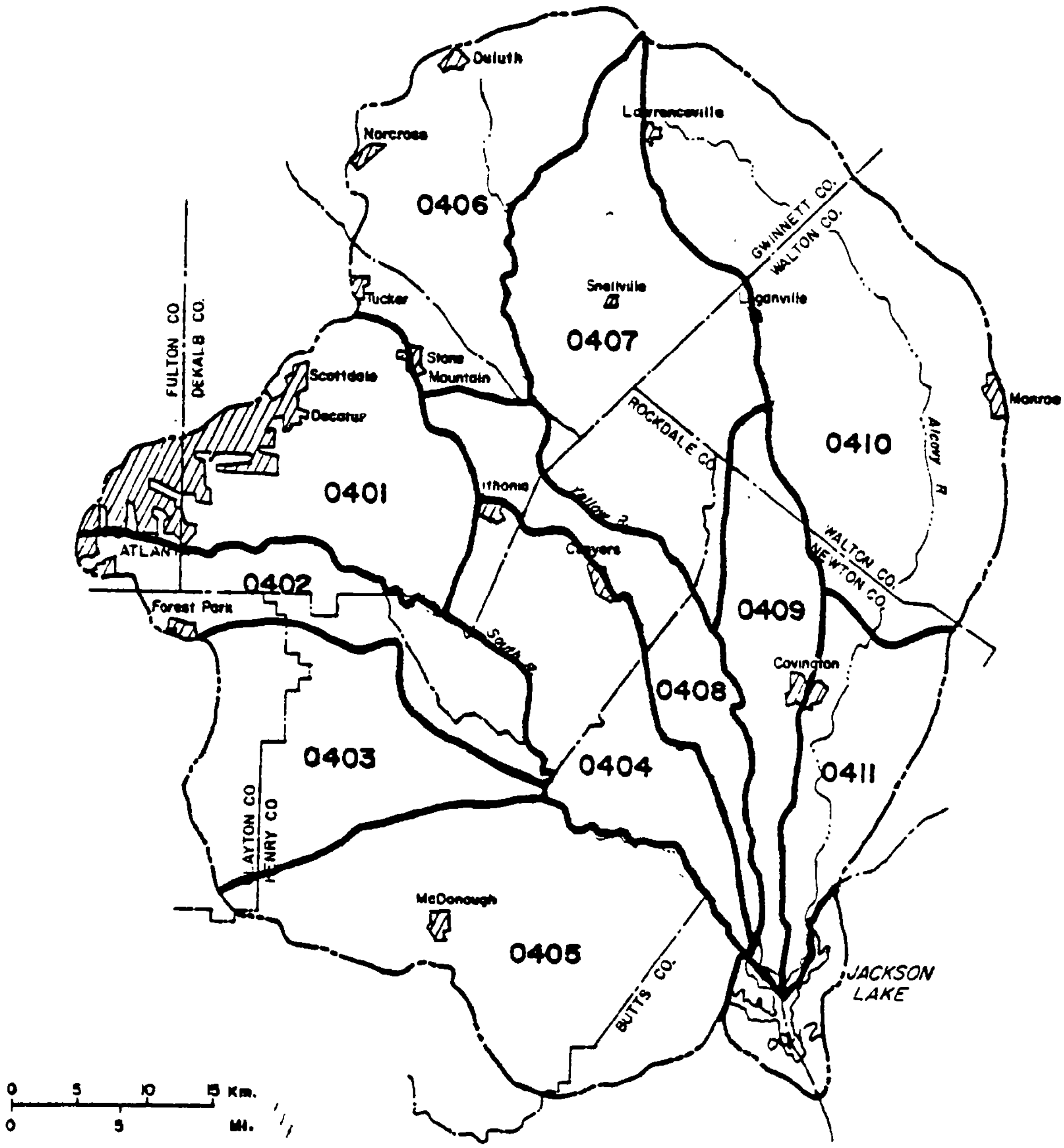
The South River Sub-basin had the largest share of the population; approximately 80 percent, with 425,100 persons. WQMU #0401 had the largest share of the Sub-basin; 74 percent, with a population of 316,400 persons. The South River Sub-basin also has the largest non-white population and the highest percentage of non-whites; 123,300 persons and 29 percent, respectively. WQMU #0401 has the most non-whites of the Basin total and the highest percentage in the Sub-basin; 106,700 persons and 34 percent, respectively. The lowest number of non-whites in the South River were in WQMU #0404 and the lowest percentage was in WQMU #0402; 1,300 persons and 11.8 percent, respectively. The South River's median annual family income was $10,758. The lowest family income level in the Sub-basin was found in WQMU #0405, the highest in WQMU #0401; $7,967 and $11,073, respectively. The median age for the South River Sub-basin residents was 26.4 in 1970. The South River Sub-basin, as stated, has the largest share of the Basin's population, plus the highest median family income and oldest median age.

Alcovy River Sub-Basin

The Alcovy River Sub-basin, in contrast, had the least share of the population in the Basin; 5 percent with 27,000 residents. WQMU# 0410 had the largest population, number of non-white residents and the highest median family income of the Sub-basin; 16,900 persons, 3,300 persons and $8,473, respectively. WQMU #0411 had the lowest median age for its residents; 25.8 years of age. WQMU #0412 had the lowest share of total population, non-white residents and median family income in the Basin; 900 residents, 400 persons and $6,495, respectively. However, it had the highest percentage of non-whites; 44 percent. The Alcovy River Sub-basin had the lowest median family income level ($8,195) and had the least population in the Basin.

Yellow River Sub-Basin

The Yellow River Sub-basin was in between the two extremes of the South River and the Alcovy with a residential population of 80,300 persons. Since the scope of this study is to more closely focus on the Yellow River, Table 23 was developed to further break down the population characteristics into census tracts where available, subdivisions of the counties within the Yellow River Sub-basin, and WQMUs. Population densities by census tract for the Yellow River Sub-basin are indicated in Figure 18 . WQMU #0406 had the greatest share of the population (55 percent) with 43,800 residents and a population of 1,500 non-whites, approximately three (3) percent of the WQMU's population. Seventy-six percent of this WQMU was found in Gwinnett County, with census tract 504 having the largest share (17,900 residents). The least populated census tract in the unit, #233, was found in DeKalb County with a population of 400 residents.



UPPER OCMULGEE RIVER BASIN

WATER QUALITY MANAGEMENT UNITS

FIGURE 17

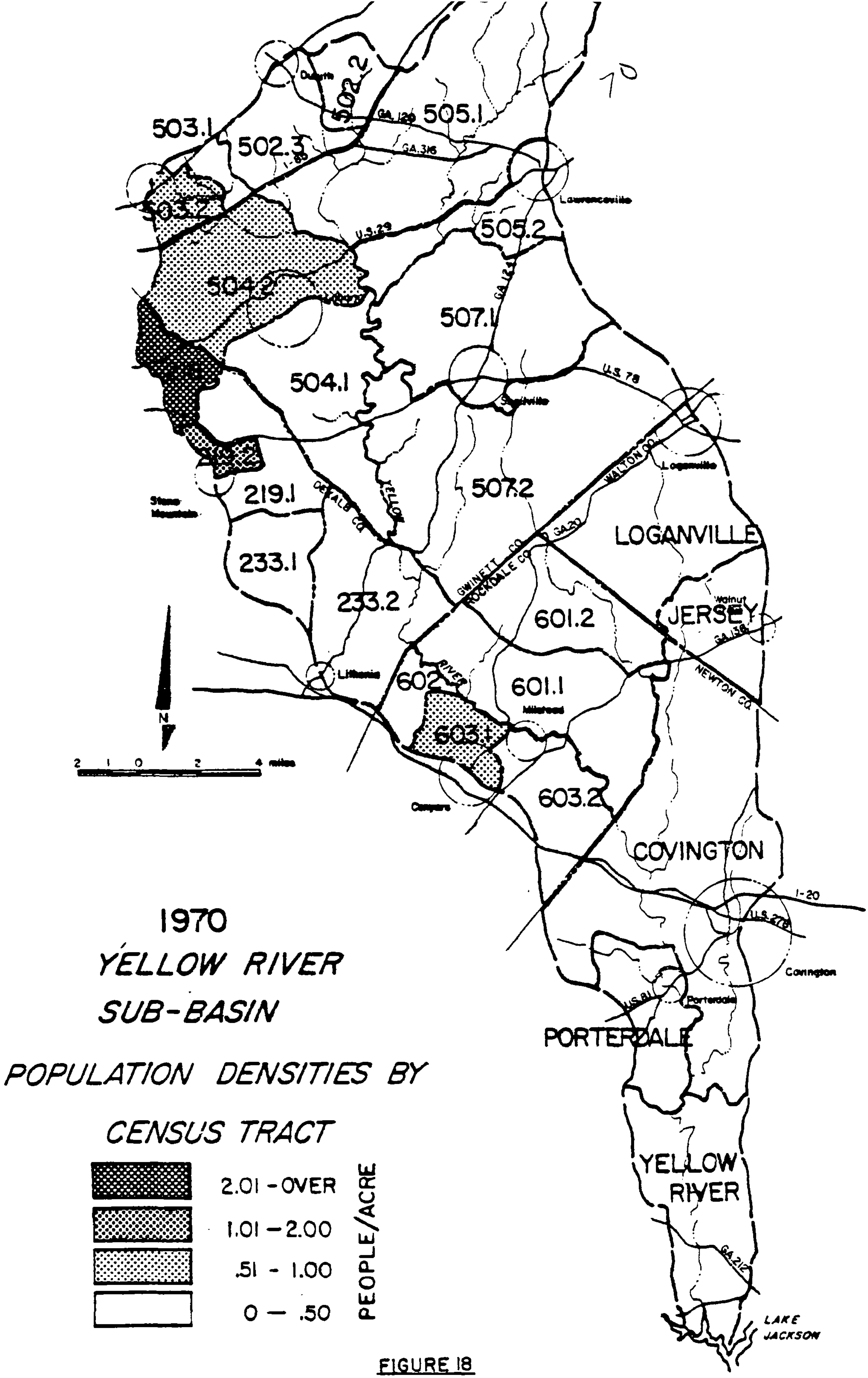

1970
YELLOW RIVER
SUB-BASIN
POPULATION DENSITIES BY
CENSUS TRACT
2.01 - OVER
1.01 - 2.00
.51 - 1.00
0 — .50
PEOPLE/ACRE
503.1
502.3
502.2
505.1
503.2
504.2
505.2
507.1
504.1
507.2
219.1
233.1
233.2
601.2
601.1
602
603.1
603.2
LOGANVILLE
JERSEY
COVINGTON
PORTERDALE
YELLOW
RIVER
Lawrenceville
Loganville
Lithonia
Milstead
Conyers
Covington
Porterdale
Walnut
Stone Mountain
GA.316
GA.120
U.S.29
GA.124
U.S.78
GA.20
GA.138
GA.212
U.S.278
U.S.81
I-20
I-85
DEKALB CO.
GWINNETT CO.
ROCKDALE CO.
WALTON CO.
NEWTON CO.
RIVER
LAKE
JACKSON
N
2 1 0 2 4 miles
70

FIGURE 18

TABLE 23

YELLOW RIVER SUB-BASIN POPULATION CHARACTERISTICS, 1970

BY CENSUS TRACT AND WATER QUALITY MANAGEMENT UNITS

County Census Tract	WQMU	POPULATION (thousands) Total	Non White	Family Income	Median Age	EMPLOYMENT Mean Percentage Manu-facturing	Trade	Service	Govern-ment	Unemployment
	0406	43.8	1.5	10,215	25.6	28.2	22.8	7.3	13.1	2.1
Gwinnett				9,629	25.5	32.0	21.9	6.9	12.3	2.0
502		3.1	0.2							
503		2.9	0.1							
504		17.9	0.1							
505		9.6	0.4							
DeKalb				12,135	26.1	16.0	25.9	8.3	15.6	2.4
219		4.7	0.4							
233		0.4	0.1							
218.01		0.8	0.0							
218.02		4.4	0.2							
	0407	16.4	1.7	9,143	25.8	34.3	19.5	6.7	12.1	2.1
Gwinnett				9,629	25.5	32.0	21.9	6.9	12.3	2.0
505		4.2	0.2							
507		6.2	0.4							
Rockdale				8,881	25.7	33.0	17.2	5.6	12.6	2.4
601		2.9	0.2							
Walton		2.3	0.7	7,744	27.0	43.1	13.6	7.1	11.1	2.0
Newton		0.8	0.2	7,858	25.6	43.1	14.2	7.0	10.5	2.6
	0408	14.5	3.9	9,438	25.8	31.3	18.6	6.6	12.8	2.4
DeKalb				12,135	26.1	16.0	25.9	8.3	15.6	2.4
233		3.6	1.1							
Rockdale				8,881	25.7	33.0	17.2	5.6	12.6	2.4
602		0.2	0.0							
603		7.0	1.6							
Newton		3.7	1.2	9,438	25.6	43.1	14.2	7.0	10.5	2.6
	0409	5.6	1.8	7,839	26.0	43.1	14.6	7.0	10.6	2.5
Walton		0.9	.3	7,744	27.0	43.1	16.6	7.1	11.1	2.0
Newton		4.7	1.5	7,858	25.8	43.1	14.2	7.0	10.5	2.6
Yellow River S/B		80.3	8.9	9,656	25.6	31.0	20.8	7.0	12.7	2.2

Note: Values for WQMU gained from averaging the data over each county's population share of the WQMU.
SOURCE: U.S. Department of Commerce, Bureau of Cencus, 1970.

The median family income of WQMU #0406 ($10,215) was the highest in the Yellow River Sub-basin, along with the youngest median age, 25.6 years. The DeKalb County portion of the WQMU had the higher median family income and the older median age, $12,135 and 26.1 years, respectively. WQMU #0409 was at the other extreme; it had the least share of the Sub-basin population (7 percent) with 5,600 residents and a population of 1,800 non-whites, approximately 32 percent of the WQMU's population.

Portions of Newton and Walton Counties make up this WQMU's population with the Newton County section having the larger portion (4,700 residents).

Both of the counties had similar percentages of non-whites, 32 and 33 percent, respectively. The median family income level of WQMU #0409 was the lowest of the Yellow River, $7,839, but it had the oldest median age, 26.0 years. The Walton County portion of the unit had the lower median family income level and the older median age, $7,744 and 27 years, respectively. WQMU #0407 and #0408 population levels fell between the other two units, 16,400 and 14,500 residents, respectively, as was the percentage share, 20 and 18 percent, respectively. The non-white population in the two units was 10 and 27 percent, respectively, which was also in the middle range for the Yellow River. The median family income level and the median age for WQMU #0407 and #0408 are fairly similar, $9.143 and $9,438, 25.8 and 25.8 years, respectively, and were also in the middle range for the Yellow River. WQMU #0406 seems to have had the youngest and most wealthy portion of the Yellow River Sub-basin population, while WQMU #0409's population was the oldest and the poorest. WQMU #0409 median family income was below the U. S. level, while its median age level was younger than the U. S. level, but was equal to Georgia's median at 26 years.

Table 24 provides information relative to population shifts from rural to urban as well as indicating percentage increases/decreases in total, urban, and rural population for all counties within the study area for the period between 1960 and 1970. Total population increase above the state average occurred in seven counties, four of which are part of the Yellow River Sub-basin, and had the second, third, fourth and fifth highest growth rate for the period. Only Clayton County exceeded these counties in percentage growth for this period.

Significant is DeKalb's 79.3 percent increase in urban population and 34.2 percent decrease in rural population combined with Gwinnett's 48.7 percent and 73.5 percent increase in urban and rural population, respectively. These two counties alone accounted for 40 percent of the ten-county area growth. Add to that the fact that Rockdale County, with the major population center in the Yellow River Sub-basin, increased its total population by 71.7 percent during the same period and the impact on the Yellow River Sub-basin is brought into clearer focus.

TABLE 24

TOTAL POPULATION AND DENSITIES BY URBAN AND RURAL AREAS, 1960-1970

County	Area Sq.Mi.	Population 1960 Total	Density	Urban	Rural	Population 1970 Total	Density	Urban	Rural	% Change 1960-1970 Total	Urban	Rural
Butts	185	8,976	48.5	2,545	6,431	10,560	57.1	3,778	6,782	17.6	48.4	5.5
Clayton	149	46,365	311.2	30,282	16,083	98,043	658.0	79,716	18,327	111.5	163.2	14.0
DeKalb	269	256,782	954.6	217,165	39,617	415,387	1,544.2	389,303	26,084	61.8	79.3	-34.2
Fulton	530	556,326	1,049.7	521,784	34,542	607,592	1,146.4	566,393	41,199	9.2	8.5	19.3
Gwinnett	437	43,541	99.6	12,863	30,678	72,349	165.6	19,132	53,217	66.2	48.7	73.5
Henry	331	17,619	53.2	-	17,619	23,724	71.7	2,675	21,049	34.7	-	19.5
Jasper	373	6,135	16.4	-	6,135	5,760	15.4	-	5,760	-6.1	-	-6.1
Newton	271	20,999	77.5	8,167	12,832	26,282	97.0	10,267	16,015	25.2	25.7	24.8
Rockdale	128	10,572	82.6	2,881	7,691	18,152	141.8	4,890	13,262	71.7	69.7	72.4
Walton	330	20,481	62.1	6,826	13,655	23,404	70.9	8,071	15,333	14.3	18.2	12.3
								Average for area:		40.6	46.2	20.1

The development of transportation corridors such as 1-20 connecting the Atlanta central city to Rockdale County, 1-285 around the central city and I-85 and U. S. 78 connecting the central city to Gwinnett County has helped to spur this significant growth. It is also significant to note that in almost every instance the increase in urban populations closely paralleled the total growth. This trend, experienced in the decade between 1960 and 1970, is anticipated to continue.

Historic Employment Growth Trends

The history of economic growth within the Upper Ocmulgee River Basin can be ascertained through analysis of employment sectoral changes that have occurred within the Basin from 1960 to 1970, based on employment data from the Census. In considering the impact of long-term sectoral changes in employment, it is difficult to note and ascertain the total pattern of change. It is, therefore, more convenient to focus on the components of growth.

Growth in the Basin economy may occur because it has a favorable industrial mix; that is, because there is an excessive amount of nationally high growth industries in the Basin. Growth may also occur in spite of an unfavorable industrial mix if the area is able to capture an increasing share of the national employment gain in slow growth industries. This analysis of the components of sectoral employment changes in the Upper Ocmulgee River Basin economy will be characterized through the use of shift-share analysis.

Shift-share analysis is a technique which allows comparisons between the economic growth performance of a region with the performance of the state and nation. It is a useful technique for both analyzing past trends and for forecasting future trends. By directing all comparisons to the national economy, the potential for bias results is removed. The term shift is used to portray the relative change of any one segment of the economy, i.e., manufacturing versus wholesale trade, over time. The term share is used to indicate the portion of a single employment category that is garnered by a region or state.

Overall employment change for any period can be divided into components: the overall growth of the national economy, the industrial mix effect, and the regional share effect. The regional share effect can be subdivided further with respect to the share held by the State of Georgia, Atlanta SMSA and Upper Ocmulgee River Basin.

The principal standard of reference is the growth rate of the nation as a whole, in terms of total employment and employment within the industrial sectors. The second element that effects a difference in the growth rate of an area from that of the nation is the industrial mix effect; to the extent that an area's economy consists of a large proportion of slow growth industries, employment will expand at a below average rate if its share of the sector remains the same.

The rate of growth of a particular national industrial sector is characterized as rapid or slow in terms of the growth rate of all national industries combined over the same period. The rate of growth of a region within a particular industrial sector may be rapid or slow in terms of the growth rate of the industrial sector nationally. Regional shift within an industrial sector may be rapid or slow in terms of the growth rate of that particular sector nationally. The sum of these sectoral regional shifts within a given area will give rise to an overall regional share effect. Thus, an industry that is growing faster in a given area than its counterparts within the nation as a whole will add to the area's overall growth.

In this study, the Upper Ocmulgee River Basin is not only compared with the United States as a whole, but also with the Atlanta SMSA and the State of Georgia. It should be kept in mind that while shift-share analysis is analytically useful, it makes no attempt to explain or assign degrees of significance to the ultimate causes for the rate of employment change observed in industries within the Basin.

The Upper Ocmulgee River Basin's share of the total covered non-agricultural employment gained through the decade of the sixties (see Table 25). During the sixties, increases occurred in all sectors except manufactured non-durable goods and services, which was in line with Atlanta's growth trends. This contrasted with the State of Georgia's increased share of sector employment in the United States, which increased in every industrial sector. Even though the non-durables and services sectors in Atlanta and the Basin declined, they were more than compensated for by other industrial sectors, to show a capture of a greater share of Georgia and the United States' employment pool.

The Upper Ocmulgee River Basin's 1960 and 1970 employment is presented in Table 26 , along with an analysis of employment changes in national growth, industrial mix, and Georgia, Atlanta SMSA and Basin share components. The rationale for the separation of the regional share effects into three separate components is based on the need to analyze the relative growth trends of the Basin in terms of larger regional activities.

As an illustration of a change in a sector's contribution to employment in the Basin, examine the components that explain the net gain of 3,843 jobs in the Upper Ocmulgee River Basin manufactured non-durable goods sector during the sixties. The national growth components indicate that, if the manufacture of non-durable goods in the Basin had grown at the same rate as total employment in the United States, the

TABLE 25

COMPARISON OF UPPER OCMULGEE RIVER BASIN'S SHARE OF GEORGIA EMPLOYMENT, ATLANTA SMSA'S SHARE OF GEORGIA EMPLOYMENT, AND GEORGIA'S SHARE OF U.S. EMPLOYMENT

Major Industrial Sectors	Upper Ocmulgee River Basin Employment By Sector As A Percentage of Georgia's Employment By Sector (selected years)		Atlanta SMSA Employment By Sector As A Percentage of Georgia's Employment By Sector (selected years)		Georgia Basic Employment By Sector As A Percentage of U.S.'s Employment By Sector (selected years)	
	1960	1970	1960	1970	1960	1970
Agriculture, Forestry & Fisheries	--	--	3.2	2.3	2.9	2.9
Mining & Quarrying	--	--	9.1	13.3	0.8	0.9
Construction	16.8	18.7	30.6	31.9	2.3	2.6
Manufacturing Durable Goods	15.0	19.4	35.1	37.4	1.2	1.5
Nondurable Goods	11.5	10.5	18.3	16.9	3.2	3.7
Transportation, Communication & Public Utilities	21.7	25.9	41.8	47.6	1.9	2.4
Wholesale Trade	20.4	21.1	48.4	53.3	2.1	2.4
Retail Trade	14.5	17.3	31.2	36.9	2.1	2.2
Finance, Insurance & Real Estate	--	--	49.2	54.3	1.8	2.1
Services	12.8	11.2	29.6	27.6	2.3	2.7
Public Administration	14.3	17.0	29.3	35.2	2.3	2.4
Industry not Reporting	10.9	13.3	19.6	--	1.5	--
Total Employment	13.9	15.7	28.5	33.6	2.1	2.3

TABLE 26

COMPONENTS OF CHANGE IN THE UPPER OCMULGEE RIVER BASIN'S EMPLOYMENT IN MAJOR INDUSTRIAL SECTORS, 1960 - 1970

SECTORS	1960	1970	NATIONAL GROWTH	INDUSTRIAL MIX	GEORGIA SHARE	ATLANTA SMSA SHARE	BASIN SHARE	TOTAL REGIONAL EFFECT	1960-1970 TOTAL EMPLOYMENT CHANGE
Construction	14,558	22,138	2,683.5	201.2	2,494.8	865.9	1,334.7	4,695.4	7,580.
Manufacturing Durable Goods	18,346	33,693	3,381.7	189.7	4,036.7	1,704.3	6,034.7	11,775.7	15,347.
Nondurable Goods	27,809	31,652	5,126.0	-3,639.9	5,359.9	-2,651.9	- 351.0	2,357.0	3,843.
Transportation, Communications & Public Utilities	18,818	31,613	3,468.7	- 399.9	4,605.9	3,707.5	1,412.8	9,726.2	12,795.
Wholesale Trade	9,358	15,985	1,725.0	2,165.4	2,226.0	1,571.0	-1,060.4	2,736.6	6,627.
Retail Trade	28,797	45,784	5,308.2	2,689.1	1,572.9	6,945.5	471.4	8,989.4	16,987.
Services	39,156	60,205	7,217.6	11,921.8	10,797.7	-4,706.2	-4,181.9	1,909.6	21,049.
Public Admin.	10,596	17,288	1,953.2	1,352.2	650.4	2,957.3	- 221.0	3,386.7	6,692.
Total Reported	167,438	258,358	30,863.9	14,479.6	31,744.3	10,393.4	3,439.3	45,577.0	90,920.

Sources: Employment Data Supplied by U.S. Department of Commerce, Bureau of Census, 1960 and 1970. Regional Share Changes were Computed by Stottler, Stagg and Associates.

Basin would have gained 5,126 jobs. This estimated increase is overly optimistic, however, because non-durable goods manufacturing employment in the nation did not grow as rapidly as total employment. The industrial mix effect shows that there would have been a loss of 3,640 jobs in the Upper Ocmulgee River Basin if its rate of employment growth had followed that of manufacturing non-durable goods throughout the nation.

The share effect component shows what has happened to growth in the Upper Ocmulgee River Basin's non-durable goods sector relative to the growth of non-durable manufacturing in Georgia and in the Atlanta SMSA. The result is that there would have been an additional net gain of 5,360 non-durable manufacturing jobs in the Basin, if the Basin had grown at the same rate as Georgia. While the State grew in this sector, Atlanta SMSA was growing at a slower rate than Georgia. If the Upper Ocmulgee River Basin's non-durable manufacturing sector had grown at the same rate as the Atlanta SMSA, the Basin would have shown a net loss of 2,652 jobs below the Georgia share. Upper Ocmulgee River Basin non-durable goods section was growing at an even slower rate than the State or Atlanta so that it lost 351 jobs when compared to the Atlanta SMSA share.

The total regional share effect computed by adding the Georgia, Atlanta and the Basin shares shows a net gain of 2,357 non-durable manufacturing jobs in the Basin, because the Basin's growth rate in manufactured non-durable goods employment was higher than the nation's. Thus during the sixties the Upper Ocmulgee River Basin's manufacturing non-durable goods sector was growing faster than the nation, while lagging below the State and Atlanta rates of growth. Finally, adding up all the components of change along the non-durable goods row in Table 26 (national growth, industry mix, Georgia share, Atlanta SMSA share and Basin share) yields the actual net gain of 3,843 jobs during the 1960-1970 period.

Looking at the growth in the Upper Ocmulgee River Basin during the decade of the sixties, the Basin realized an increase in non-agricultural employment of 54 percent. This increase was apportioned evenly across the entire spectrum of the eight major industrial sectors with only the manufacturing sectors showing any substantial deviation. Durable goods had the highest increase while non-durable goods had the lowest; 83 and 14 percent, respectively. The remaining sectors all fell within a range of increases of 52 to 71 percent.

As Table 26 indicates, the Upper Ocmulgee River Basin had a favorable industrial mix effect; that is, the basin exhibited a high concentration of employment in industries that were characterized by above-average national rates of employment growth. There are some industries that lagged during the sixties; the manufactured non-durable goods and transportation sectors' mix, which accounted for 17 and 11 percent, respectively, of the Basin's employment for 1960, were growing nationally at rates below the national rate of employment growth. At the same time, wholesale and retail trade, services and finance, insurance and real estate were growing rapidly, providing an impetus for employment growth during the decade.

Along with the favorable industrial mix effect, the Georgia regional share effect was also experiencing gains. All eight major industrial sectors exhibited increases in employment, when compared with the rate of growth of the sector's national employment. The favorable effects of the Georgia regional share indicate that the State was enjoying a competitive locational advantage and exerting a strong impetus for area growth.

While the impact of the industrial mix and Georgia regional share effect are strongly positive, a review of the Atlanta SMSA and Basin regional shares effects shows that they are also positive, but with some weak points in growth trends. The Atlanta SMSA regional share appears to have gained in total non-agricultural employment as compared to the State. Only two of the eight major industrial sectors registered losses; the manufacturing non-durable goods and services sectors lost employment during the period as compared to Georgia's regional share in those sectors.

The Upper Ocmulgee River Basin's regional share effect was determined by comparing the growth in its major sectors relative to the Atlanta SMSA sectoral growth. The Basin showed gains in the construction, manufacturing durable goods, transportation and retail trade sectors, but the rest of the sectors showed a deterioration in their competitive position to that of the Atlanta SMSA and the State. In other words, the non-durable goods, wholesale trade, services and public administration sectors grew at a slow rate when compared to the State and Atlanta.

The total regional effect column, which compares the overall Upper Ocmulgee River Basin share gains with the national sectoral employment, showed that the Basin gained across the entire spectrum of the major industrial sectors during the sixties. These show the characteristics of a strong growth economy that has some problems in wholesale trade, services and non-durable goods manufacturing.

A census of employment was done on a county-wide basis by the United States Department of Commerce covering employment at places of work at mid-year 1973, and is shown on Table 27 . The employment sectors have been broken into 21 categories that recognize existing employment generators within the ten (10) counties that make up the Upper Ocmulgee River Basin. The retail trade sector was the largest generator of employment reported, with manufacturing being a close second; 119,046 and 114,375 employees, respectively. The furniture, lumber and wood

TABLE 27

UPPER OCMULGEE RIVER BASIN COUNTY EMPLOYMENT BY SECTOR

1973

SECTOR	BUTTS	CLAYTON	DEKALB	FULTON	GWINNETT	HENRY	JASPER	NEWTON	ROCKDALE	WALTON
Agriculture	13	86	609	921	102	13	0	16	(D)	18
Mining/Quarrying	0	(D)	273	298	(D)	(D)	0	0	0	0
Construction	74	2,667	13,389	23,886	2,599	264	21	427	675	525
Manufacturing	704	3,560	20,362	71,014	6,131	1,885	1,005	3,208	2,794	3,712
Furniture, Lumber and Wood Products	0	535(D)	1,915	9,625	500	197	(D)	(D)	115	0
Metal Industries	0	861(D)	1,615	4,955	820(D)	0	0	0	0	(D)
Machinery except Electrical	0	179	1,029	3,034	0	(D)	0	0	0	0
Electrical Equip	0	0	2,152	1,122	(D)	(D)	0	0	(D)	0
Transport. Equip	0	0	(D)	9,785	0	0	0	0	0	0
Miscellaneous	0	482	1,093	4,392	118	0	0	0	135	0
Food and Kindred	0	488	2,445	7,688	(D)	0	0	0	0	(D)
Textile Products	704	(D)	(D)	9,097	377(D)	(D)	(D)	(D)	505	2,387
Printing/Publishing	0	0	1,347	7,137	256	0	0	0	0	0
Chemicals & Related Products	0	0	1,967	4,468	(D)	0	0	(D)	(D)	(D)
Miscellaneous	0	0	476	9,505	633	0	0	0	0	0
Transport, Communications & Utilities	71	1,562	6,477	47,253	545	121	38	378	237	236
Wholesale	73	2,242	12,270	56,664	746	14	7	112	321	237
Retail	509	3,726	28,449	80.165	2,758	684	188	963	727	877
Finance, Insurance & Real Estate	141	792	6,590	44,645	606	101	45	131	119	196
Services	318	1,865	25,327	83,578	1,294	481	59	645	337	401
Unclassified	0	(D)	748	1,628	(D)	(D)	0	15	(D)	17
TOTAL*	1,901	16,729	114,494	409,512	14,981	3,627	1,363	5,895	5,288	6,219

*Not a summation of preceding data as figures withheld to avoid disclosure of operations of individual industries.
(D) Denotes figures withheld to avoid disclosure of operations of individual reporting units.
Source: U.S. Dept. of Commerce, Social & Economic Statistics Adm, Bureau of Census, <u>County Business Patters, 1973, Ga.</u>

products and textile products sectors are the most widely distributed manufacturing employers within the counties as well as the largest.

The Yellow River Sub-basin covers parts of DeKalb, Gwinnett, Newton, Rockdale and Walton Counties whose major sectors, as they were in the rest of the Basin, were the retail trade sector as the highest, closely followed by the manufacturing sector; 33,774 and 32,495 employees, respectively. The textile products sector, of those reported, was the highest employer within the manufacturing group at 3,269 reported workers. Manufacturing employment sectors that reported larger than 2,000 employees were furniture and wood products, metal industries, electrical equipment, and food and kindred products.

Current Economic Conditions

The Atlanta region is composed of relatively affluent families. A quarter of the families earn more than $15,000 annually. In the southeast as a whole, only 13 percent earned $15,000 a year and the figure for the total United States is 21 percent. At the other end of the scale, that is, those families earning less than $3,000 annually, the Atlanta region has a smaller percentage than the southeast or the nation.*

Personal income is used in this study as a source for determining the currency flows within the Upper Ocmulgee River Basin and the export-oriented industrial sectors that generate growth tendencies within the region's economy. The personal incomes for the Atlanta Standard Metropolitan Statistical Area were used as the basis for this analysis because over 90 percent of the residents in the Basin lived within the SMSA as of the 1970 Census. Therefore, trends that could be established for the SMSA would influence almost all of the Basin's currency flows.

Personal income for the Atlanta SMSA are distributed into three (3) major sources: labor and proprietors, income property, income and transfer payments. Labor incomes include wage and salary disbursements, which include personal income taxes, social security contributions and other personal contributions for social insurance. Proprietors' income is income received by owners of unincorporated businesses, which includes farms, professional services and other businesses. Also included in the labor and proprietor income source are other labor income, which consists of supplementary income such as employer contributions to private health plans, workmen's compensation, etc. Property income is rental income of persons, dividends and interest income. Transfer payments are comprised of income from social insurance funds, veteran pensions, and private payments to individuals.

The total personal income between 1965 and 1974 for the Atlanta SMSA reflects the income in the Upper Ocmulgee River Basin and is shown on Table 28 . The major source of income within the SMSA was labor and proprietors' income, with an average of 82 percent of the total personal

*Source: United States Bureau of Census

TABLE 28

Total Personal Income By Major Sources

ATLANTA SMSA

(Thousands of Dollars)

Personal Income ources	1965 INCOME	1965 PERCENTAGE	1970 INCOME	1970 PERCENTAGE	1974 INCOME	1974 PERCENTAGE
Labor and Proprietors ncome	3,479,108	83.2	5,849,683	82.5	8,848,635	80.4
Farm, (Mining)	32,310	0.8	31,076	0.4	33,896	0.3
Nonfarm						
Manufacturing	828,378	19.8	1,154,140	16.2	1,479,417	13.4
Transportation, Communication and Public Utilities	360,743	8.6	650,367	9.2	1,064,149	9.7
Local 1/	1,819,789	43.5	3,177,392	44.8	5,019,746	45.6
State	226,545	5.4	448,655	6.3	771,964	7.0
Federal	211,343	5.1	388,053	5.5	479,463	4.4
Property Income	498,594	11.9	817,577	11.5	1,299,449	11.8
ransfer Payments	205,876	4.9	425,618	6.0	852,602	7.8
ersonal Income by Residence 2/	3,996,913		6,648,062		10,188,383	
otal Income 3/	4,183,578	100.0	7,092,878	100.0	11,000,686	100.0

/ Local Source included: contract construction, wholesale and retail trade, finance, insurance, real estate, services and other industries.

2/ Incomes do not contain personal contributions for social insurance or an adjustment for residences, so personal income is not a summation of the preceding data.

3/ Total income includes: total labor and proprietor's income by place of work, personal contributions for social insurance, transfer payments and property income.

Sources: Department of Commerce, Regional Economics Information System - BEA.

income between 1965 and 1974. Local sources were shown to hold the largest share of the labor and proprietors' income, which increased its share from 43.5 percent in 1965 to 45.6 percent in 1974. Other sources included in labor and proprietors' income that were improving their share of total income were transportation, communications and public utilities, and state government. Manufacturing, the second largest contributor to labor and proprietors' income, reduced its share of the total income from 19.8 percent in 1976 to 13.4 percent in 1974. Other sources included in labor and proprietors' income that had their share reduced were farm (mining) and federal employment income. The whole of the labor and proprietors' income source reduced its share of total income from 83.2 percent in 1965 to 80.4 percent in 1974.

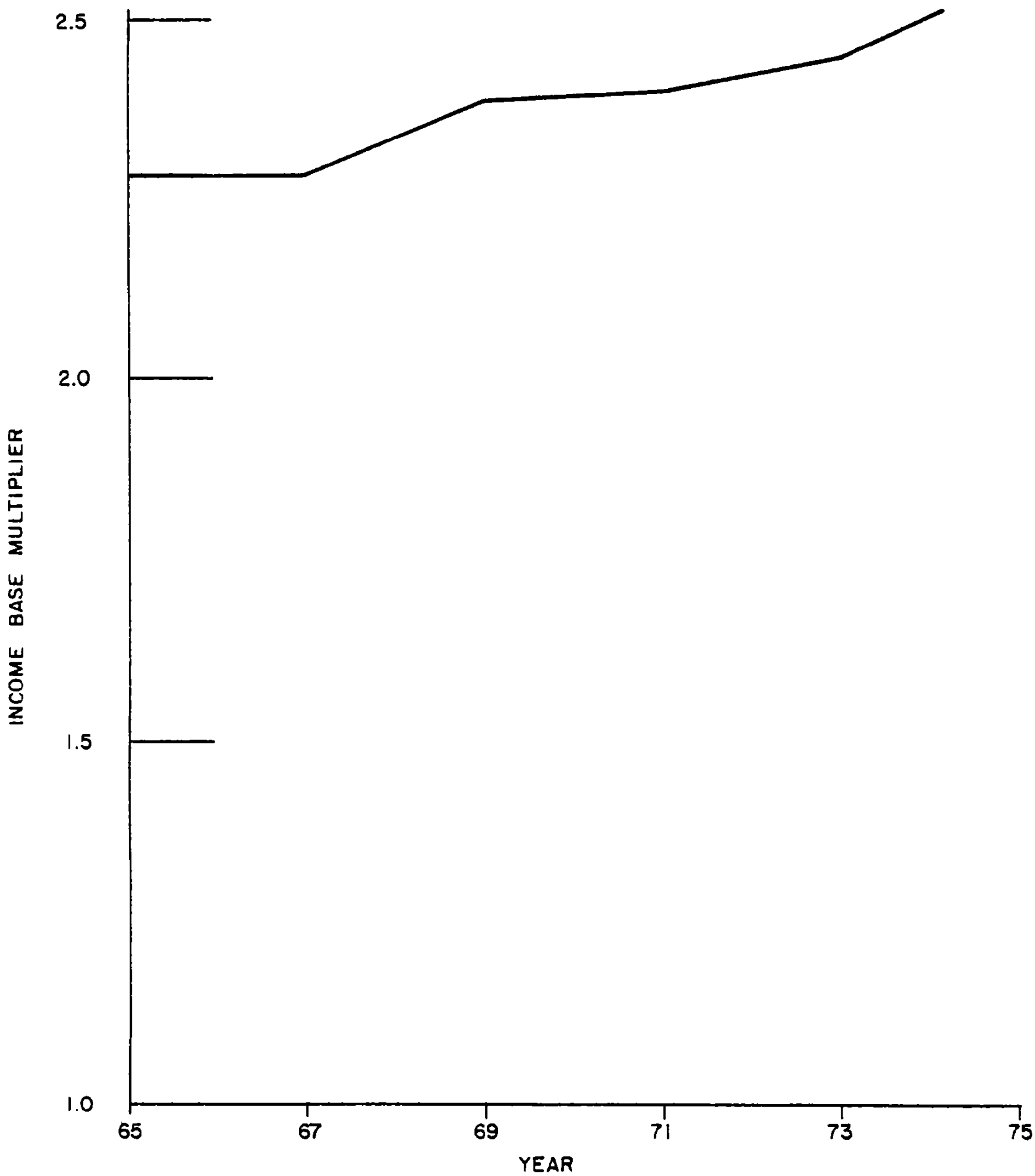
Property incomes and transfer payments are the two remaining sources of income. These sources can be considered not to produce any real goods but do have an influence on the flow of money through the economic system. Property incomes are not as stable as the other sources and tend to fluctuate from year to year. Property incomes share of total income was reduced from 11.9 percent in 1965 to 11.5 in 1970, but was found to rebound in 1974 to 11.8 percent. Transfer payments are usually independent of local conditions, in that they don't follow growth trends in economic conditions. Transfer payments have increasingly captured a larger share of the total personal income from 4.9 percent in 1965 to 7.8 percent in 1974.

The personal income of the Atlanta SMSA was growing at a 10.75 percent average annual rate from 1967 to 1970, but as the national economy was reducing its growth trends, the SMSA also reduced to a 9.5 percent average annual rate from 1970 to 1974. These figures do not reflect fully the real income growth because the inflation factor has not been incorporated into the data, even though it does show consistent growth tendencies.

By looking at the incomes derived from basic employment sectors in the Atlanta SMSA, the effect on local supportive nonfarm sectors can be determined. This effect of the basic employment sector on a local supportive nonfarm sector is known as the "income multiplier," meaning, for every dollar earned in the basic sector, there is a dollar plus effect on the local sector's income. Changes in the multiplier will tend to reflect growth patterns in the SMSA's total personal income; therefore, growth in the basic sector industries will tend to accelerate growth in the local sectors.

During the period 1965 to 1974, the Atlanta SMSA's personal income increased from approximately $4 billion to well over $10 billion. The multiplier increased from 2.29 to 2.51, which shows that development occurred in the basic sectors, local sectors and in their general interrelationship (see Figure 19). This increase showed a steady rise after

FIGURE 19



ATLANTA SMSA ECONOMIC

BASE MULTIPLIER

a stall between 1954 and 1967. If this trend continues, the Atlanta SMSA will continue to capture a greater share of the State of Georgia's growth.

Projected Population

Population growth is not a new phenomenon to the Atlanta region. Since the turn of the century, the region has enjoyed a steady population growth. There are two components of population change; natural increase (births minus deaths) and net in-migration. The chief reason for Atlanta's growth during the sixties and the seventies was net in-migration from other parts of the country. During the decade of the 1960s, net in-migration accounted for more than half of the region's population growth (54.7 percent), while natural increase accounted for the remaining 45.3 percent.

There is ample reason to believe that in-migration will continue to be the chief contributor to the population increases in the Atlanta region. The assumption is based on (1) zero population growth (ZPG) and attitudes on family planning and (2) a continuing demand for employees by industry.

The main purpose for projecting population figures is to make adequate and constructive provisions for the needs and desires of the people, at the present time and in the years ahead. The number of families to be housed and to be served by various types of community services such as stores, churches, recreation facilities; number of jobs required; the amount of traffic to be generated; the amount of land needed for housing, industries, commercial activities, public purposes, etc. are related to the number of people, their characteristics and the economic base of the area.

The 1970 Water Quality Management Unit Populations determined in the previous section were used as a basis for population projections. OBERS and 1975 Census updates for areas larger than the Basin were collected and broken into average annual rates of growth. Employing these growth rates within the WQMU base populations, the year 1980, 1990 and 2000 populations were determined for the WQMU as a comparison analysis to the Atlanta Regional Commission's Regional Development Plan Population Projections.

The population projections for the Upper Ocmulgee River Basin were also partially forecasted by the Atlanta Regional Commission in 1976, in that the projections only cover the ARC Planning Area. The forecasts incorporate estimates of future employment, housing and land use into a comprehensive analysis of population growth into the year 2000. These arrays of forecasts were derived from "An Economic Base Study of the Atlanta Region," published 1975. Three levels of population were developed based on numerous alternatives in a Regional Development Plan (RDP) for alternative transportation and land use plans, which were allocated with the assistance of the EMPIRIC - Activity Allocation Model, and are: average RDP, alternative E and alternative W (see Table 29). The average RDP (Cycle 2) projections were derived from the model program and then averaged from a high, low and most likely forecasts, so that it would not show a bias towards any RDP and does not relate back to any potential policy. The alternative E population projections are related to the final distribution associated with the adopted RDP. The alternative W is based on the adopted RDP policies, the same as alternative E, and assumes that the same forecasts for the year 1980, but beyond that alternative W is associated with a low population projection.

OBERS population projections were accomplished on a county-wide basis. The projections displayed on Table 29 were based on the average annual growth rate established from the OBERS projections in the ten (10) counties composing the Upper Ocmulgee River Basin. These average annual rates of growth were imposed on the 1970 Census of population for Water Quality Management Units and census tracts within the Yellow River Sub-basin, as shown on Table 30. In areas of the Basin outside the ARC Planning Area these projections were used as an average annual rate of growth imposed on the 1970 Census base.

To determine which projections are the most realistic, the most recent United States Census update for 1975 was employed. The data was distributed on a county-wide basis, so an average annual rate of growth was developed and imposed on the 1970 Census data.

As indicated in Table 29 , the population base of the Upper Ocmulgee River Basin is projected to expand rapidly to the year 2000. The South River Sub-basin will continue to be the heaviest populated basin; however, the rate of growth experienced in the Yellow River Sub-basin is projected to be much greater than the South and Alcovy Sub-basins.

The growth rate of the Alcovy River Sub-basin, while smaller than that of the Yellow, also is greater than that of the South River Sub-basin. Some areas in the Upper Ocmulgee River Basin are expected to more than triple by the year 2000. These areas of extreme rapid growth are mainly located in the South and Yellow River Sub-basins. (Figures 20a,20b,and 20c Population Densities by Census Tract for 1980, 1990 and 2000.)

Table 30, which shows a breakdown of the Yellow River Basin by census tract as well as WQMU, provides a better insight as to the exact location of this increased population.

The greatest amount of growth is located just over the Gwinnett County line and in the portion of Rockdale County north of the Yellow River in WQMU #0407, as indicated in Table

Census tract 233 in WQMU #0406 in DeKalb County is expected to increase approximately fivefold. The majority of this population is currently centered around Lithonia, which will continue to be the most densely populated area in this census tract in the year 2000.

The area located just over the DeKalb County line in Gwinnett County (Census tract 504 - WQMU #0406) will also be a rapid growth area due to the accessibility provided by I-85 from Atlanta.

$\frac{405}{583} = \frac{x}{100}$

$583x = 40500$

$\frac{583}{736} = \frac{x}{100}$

$736x = 58{,}300$

$x = 79.2$

$\frac{736}{583} = \frac{x}{100}$

$583x = 73600$

TABLE 29

UPPER OCMULGEE RIVER BASIN

POPULATION PROJECTIONS BY WATER QUALITY MANAGEMENT UNIT
(Population in Thousands)

WQMU	Census 1970	Census 1975	ARC ALT.E&W 1980	RDP 1980	OBERS 1980	ARC ALT.E 1990	ARC ALT.W 1990	RDP 1990	OBERS 1990	ARC ALT.E 2000	ARC ALT.W 2000	RDP 2000	OBERS 2000
South River	425.1	465.7	541.8	536.6	533.5	696.4	626.5	651.9	670.7	845.3	715.5	811.7	805.8
0401	316.4	346.6	371.5	378.4	397.1	461.2	413.3	440.2	499.2	515.0	444.6	493.6	599.8
0402	56.5	61.9	75.4	67.8	70.9	88.3	81.4	82.1	89.1	106.8	92.0	102.0	107.1
0403	30.6	33.5	52.6	52.4	38.4	84.0	75.0	64.9	48.3	130.8	102.8	96.8	58.0
0404	9.9	10.9	21.5	22.1	12.4	32.3	29.0	35.6	15.6	48.6	39.7	77.5	18.7
0405	11.7	12.8	20.8	15.9	14.7	30.6	27.8	29.1	18.5	44.1	36.4	41.8	22.2
Yellow River	80.3	87.9	176.2	179.5	101.9	265.3	240.0	285.5	127.7	385.8	310.2	421.3	153.3
0406	43.8	48.0	104.6	108.6	55.6	147.9	133.4	162.7	69.6	212.8	168.2	236.4	83.5
0407	16.4	17.9	36.2	34.1	20.8	59.2	53.0	60.9	26.1	91.9	74.1	96.8	31.3
0408	14.5	15.8	28.6	30.0	18.4	50.3	45.7	54.0	23.1	72.0	58.8	79.0	27.8
0409	5.6	6.2	6.8	6.8	7.1	7.9	7.9	7.9	8.9	9.1	9.1	9.1	10.7
Alcovy River	27.0	29.6	39.2	39.1	34.4	54.2	51.2	54.1	42.9	69.6	62.1	71.5	49.2
0410	16.9	18.5	26.5	26.4	21.5	38.3	35.3	38.2	27.0	52.8	45.3	54.7	32.4
0411	9.2	10.1	11.7	11.7	11.7	14.7	14.7	14.7	14.7	15.4	15.4	15.4	15.4
0412	0.9	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.4
Upper Ocmulgee River Basin	532.4	583.2	757.2	755.2	669.8	~~[illegible]~~ 1032.0	917.7	991.5	841.3	~~1300.7~~ 1319.0	1087.8	1304.5	1008.3

+736 (alt.E) = 126.124
+425 (OBERS) = 72.89

1319 − 583 = 736

1008 − 736 = 272

1008 − 583 = 425

TABLE 30

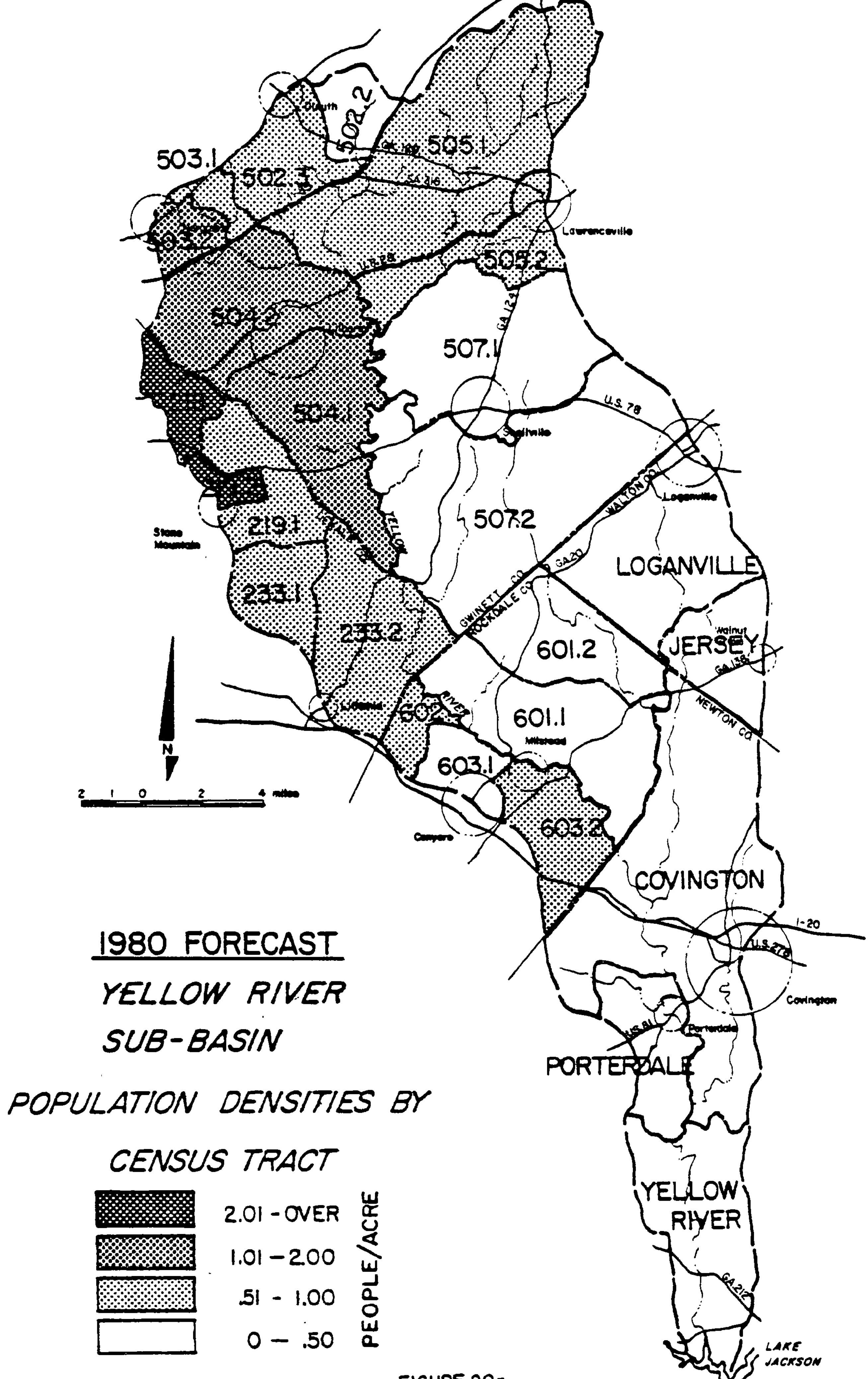
YELLOW RIVER SUBBASIN

POPULATION PROJECTIONS BY CENSUS TRACTS AND WATER QUALITY MANAGEMENT UNIT
(Population in Thousands)

County Census Tract	WQMU	Census 1970	Census 1975	ARC ALT.E&W 1980	RDP 1980	OBERS 1980	ARC ALT.E 1990	ARC ALT.W 1990	RDP 1990	OBERS 1990	ARC ALT.E 2000	ARC ALT.W 2000	RDP 2000	OBERS 2000
	0406	43.8	48.0	104.6	108.6	55.6	147.9	133.4	162.7	69.6	212.8	168.2	236.4	83.5
Gwinnett														
502		3.1	3.4	6.0	6.0	3.9	15.2	13.2	14.8	4.9	22.9	18.3	25.6	5.9
503		2.9	3.2	7.8	7.8	3.7	11.2	10.4	10.9	4.6	14.3	12.5	14.8	5.5
504		17.9	19.6	53.4	54.7	22.7	64.0	58.2	73.8	28.5	97.1	72.4	109.4	34.2
505		9.6	10.5	16.7	17.6	12.2	28.8	25.3	31.3	15.3	41.1	33.5	45.6	18.4
DeKalb														
219		4.7	5.2	13.2	14.5	6.0	17.1	15.9	19.2	7.5	22.1	19.0	23.3	9.0
233		0.4	.4	0.8	1.0	0.5	1.9	1.7	2.1	0.6	2.6	2.1	2.8	0.7
218.01		0.8	.9	1.0	1.0	1.0	1.2	1.1	1.3	1.2	1.4	1.3	1.4	1.4
218.02		4.4	4.8	5.7	6.0	5.6	8.5	7.6	9.3	7.0	11.3	9.1	13.5	8.4
	0407	16.4	17.9	36.2	34.1	20.8	59.2	53.0	60.9	26.1	91.9	74.1	96.8	31.3
Gwinnett														
505		4.2	4.6	10.0	10.6	5.3	17.2	15.2	18.8	6.7	24.6	20.1	27.4	8.0
507		6.2	6.8	17.3	14.9	7.9	25.1	22.5	23.8	9.9	37.4	29.8	36.4	11.9
Rockdale														
601		2.9	3.1	5.3	5.0	3.7	13.0	11.4	14.4	4.6	25.6	19.9	28.7	5.5
Walton		2.3	2.5	2.6	2.6	2.9	2.8	2.8	2.8	3.6	3.0	3.0	3.0	4.3
Newton		0.8	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.3	1.3	1.3	1.3	1.6

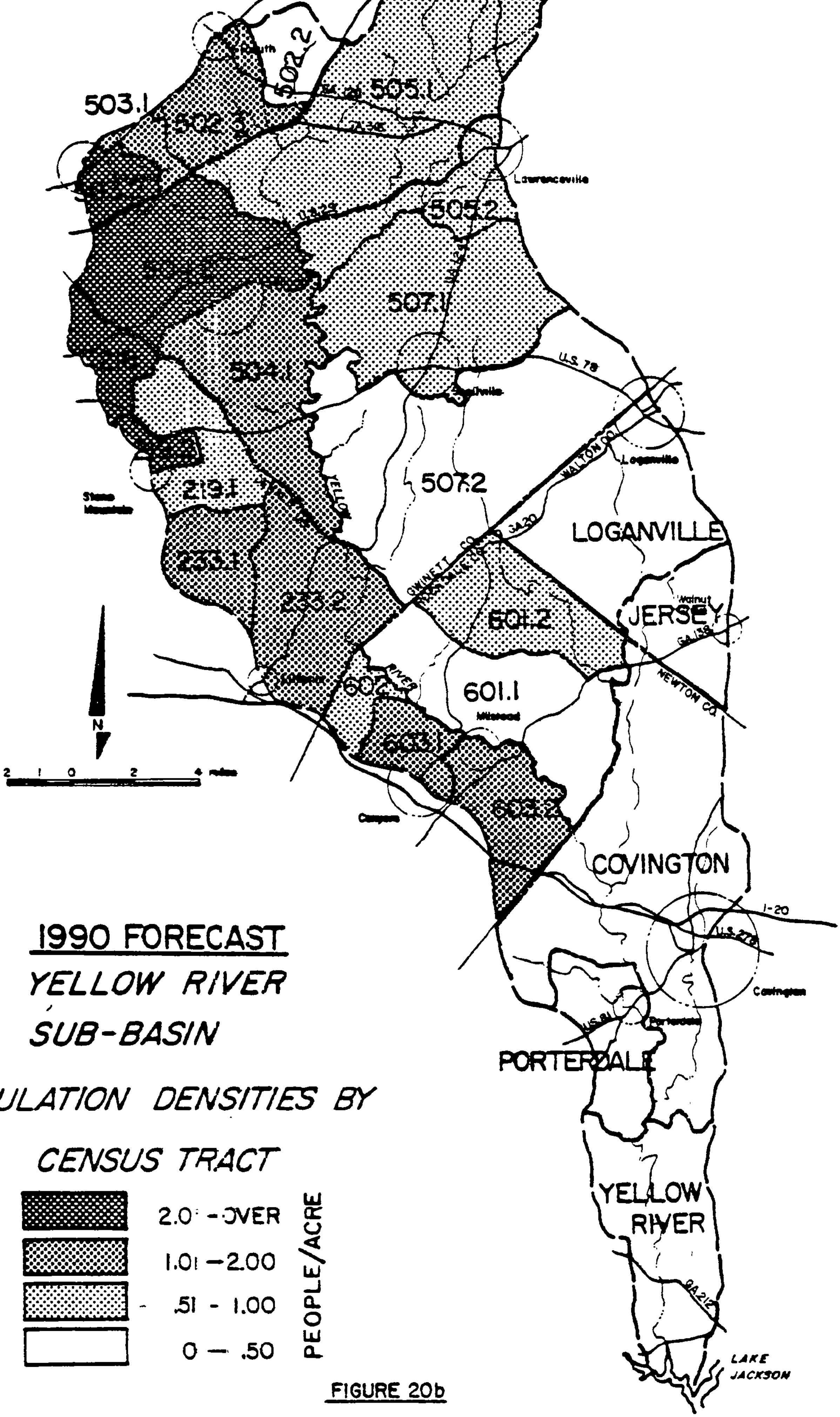
0408	14.5	15.8	28.6	30.0	18.4	50.3	45.7	54.0	23.1	72.0	58.8	79.0	27.8
DeKalb 233	3.6	3.9	7.6	9.1	4.6	17.0	15.3	18.8	5.8	23.6	18.5	25.2	7.0
Rockdale 602	0.2	0.2	2.0	2.2	0.2	2.3	2.1	2.9	0.2	3.3	2.7	4.1	0.2
603	7.0	7.7	14.5	14.2	8.9	25.7	23.0	27.0	11.2	38.9	31.4	43.5	13.5
Newton	3.7	4.0	4.5	4.5	4.7	5.3	5.3	5.3	5.9	6.2	6.2	6.2	7.1
0409	5.6	6.2	6.8	6.8	7.1	7.9	7.9	7.9	8.9	9.1	9.1	9.1	10.7
Walton	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.4	1.2	1.2	1.2	1.7
Newton	4.7	5.2	5.8	5.8	6.0	6.8	6.8	6.8	7.5	7.9	7.9	7.9	9.0
Yellow River Subbasin	80.3	87.9	176.2	179.5	101.9	265.3	240.0	285.5	127.7	385.8	310.2	421.3	153.3

Source: U.S. Department of Commerce, Bureau of the Census, 1970, Census of Population and Housing; Atlanta, Georgia SMSA PHC(1)-14; U.S. Department of Commerce, Bureau of the Census, Estimates of the Population of Georgia Counties and Metropolitan Areas, July 1, 1974 and 1975; U.S. Army Corps of Engineers, Atlanta Regional Commission Water Demand and Wastewater Report Averaged RDP Cycle 2, RDP Alternate E1, and RDP Alternate W, January 15, 1976; E.P.A. Atlanta, Georgia; Population By County Historic (1940-1970) and Projected (1980-2020) Region IV, 1972.



503.1
502.2
505.1
502.3
503.2
Lawrenceville
505.2
504.2
507.1
U.S. 78
Snellville
504.1
Loganville
507.2
219.1
Stone Mountain
LOGANVILLE
233.1
233.2
601.2
JERSEY
Walnut
601.1
602
603.1
603.2
Conyers
COVINGTON
I-20
Covington
Porterdale
PORTERDALE
YELLOW RIVER
LAKE JACKSON
2 1 0 2 4 miles
N
1980 FORECAST
YELLOW RIVER SUB-BASIN
POPULATION DENSITIES BY CENSUS TRACT
2.01 - OVER
1.01 - 2.00
.51 - 1.00
0 - .50
PEOPLE/ACRE

FIGURE 20a



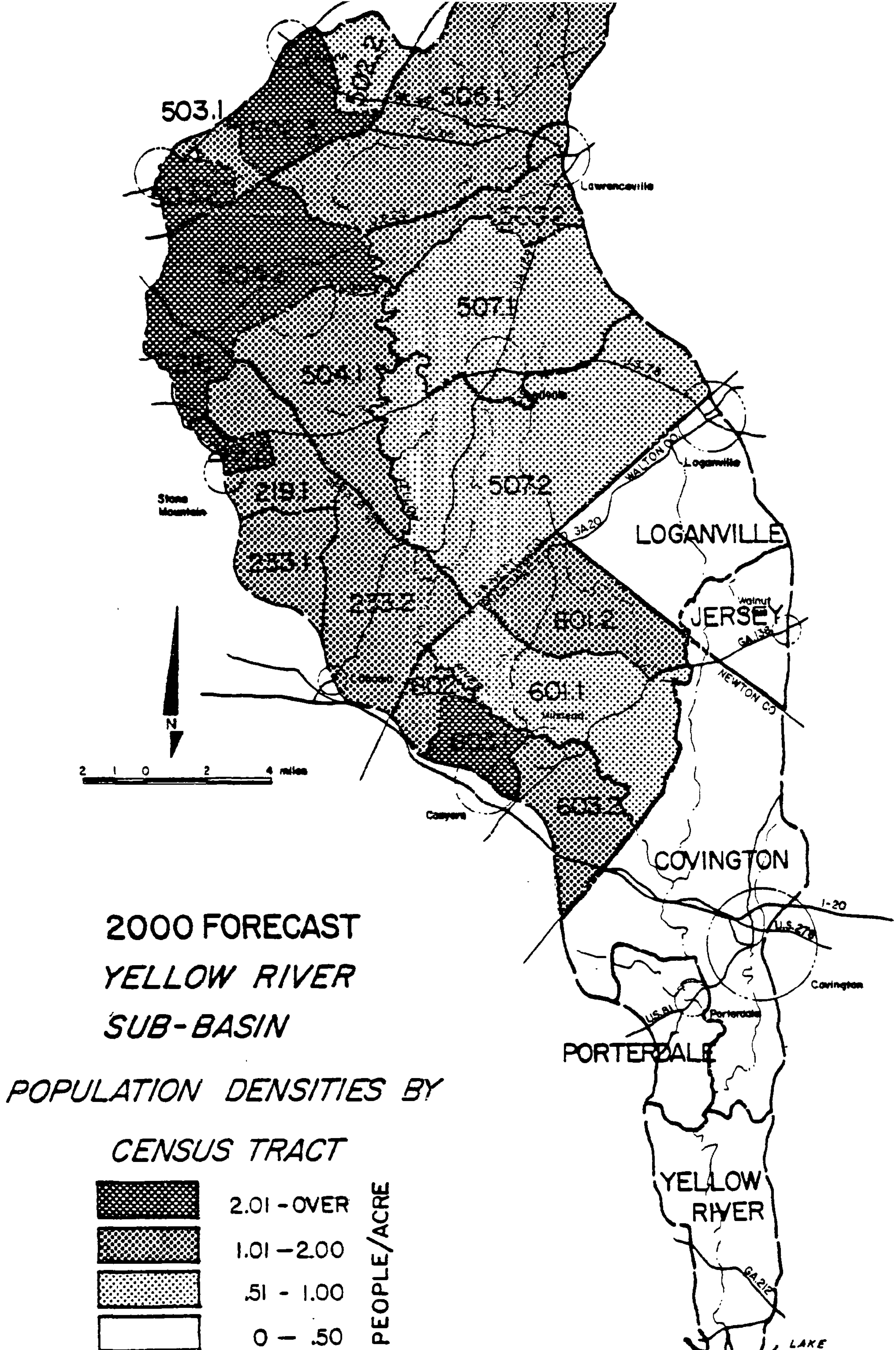
1990 FORECAST
YELLOW RIVER
SUB-BASIN

POPULATION DENSITIES BY
CENSUS TRACT

	2.01 - OVER
	1.01 - 2.00
	.51 - 1.00
	0 - .50

PEOPLE/ACRE

FIGURE 20b



503.1
506.1
Lawrenceville
507.1
504.1
Loganville
507.2
219.1
Stone Mountain
LOGANVILLE
233.1
233.2
Walnut
JERSEY
601.2
601.1
Conyers
603.2
COVINGTON
I-20
Covington
Porterdale
PORTERDALE
YELLOW RIVER
LAKE JACKSON
N
2 1 0 2 4 miles
2000 FORECAST
YELLOW RIVER
SUB-BASIN
POPULATION DENSITIES BY
CENSUS TRACT
2.01 - OVER
1.01 – 2.00
.51 - 1.00
0 – .50
PEOPLE/ACRE

FIGURE 20c

Projected Economic Conditions

The economy in the Atlanta Region will be shaped in part by past and future growth trends in employment, income, population and such prospective developments as the performance of the national economy, the impact of technology and the law of supply and demand.

Projected economic conditions in the Upper Ocmulgee River Basin were obtained from the OBERS projections developed by the United States Water Resources Council for the United States and the SMSAs. Economic growth trends were expressed in constant dollars, based on the value of the dollar in 1967. Through the use of personal income, the growth of the purchasing power of the region and real growth can be projected, leaving out inflation fluctuations that have a tendency to distort real growth patterns.

The Upper Ocmulgee River Basin is strongly influenced by income tendencies of the Atlanta SMSA. Therefore, as in the analysis of past currency flows, projected income trends for the SMSA will be assumed to be the same for the Basin. As such, Table 31 was developed to show the real growth in constant 1967 dollars for the Atlanta SMSA.

OBERS projections for the Atlanta region show a steady growth rate from 1970 to 2000. The largest share of the total personal income in 1970 was in wholesale and retail trade at 21.9 percent; however, by 2000 it is projected that its share will be reduced to 18 percent. Services are projected to gain a larger share of the incomes from 14 percent in 1970 to 18 percent in 2000. Other nonfarm industrial sectors that are to improve their share are finance, insurance, real estate, state and local government sources, while all the others will have their shares reduced.

The average annual rate of growth of the Atlanta region industrial sectors incomes is displayed in Table 32, which relates the rates to United States and Georgia's rates of 1967 constant dollar income growth. The Atlanta SMSA is projected by OBERS to outperform the State and the United States in personal income and earnings from 1970 to 1990. For the period from 1990 to 2000, Atlanta and Georgia are projected to grow at equal rates, but still outperform the United States. Nonfarm industrial sectors that are to outperform the State from 1970 to 1990 in the Atlanta SMSA are transportation, communications, utilities, wholesale and retail trade, services and government. The construction industry in the SMSA will grow faster than the State until 1980 when it will slow to that of Georgia's average annual rate of income growth in that sector. Finance, insurance, real estate and manufacturing are to grow in close alignment with the State of Georgia projected income growth trends to the year 2000.

TABLE 31

PROJECTED EARNINGS BY INDUSTRIAL SECTORS
ATLANTA SMSA, 1970 - 2000

(Thousands of 1967 Dollars)

SECTOR	1970	1980	1990	2000
Agriculture, Forestry & Fisheries	6,899	8,600(s)	8,600(s)	9,500(s)
Mining & Quarrying	3,919	7,700(s)	9,500(s)	11,700(s)
Construction	280,693	502,400	744,000	1,058,300
Manufacturing	988,225	1,453,500	2,080,800	2,870,800
Durable Goods	--	739,000	1,058,300	1,457,300
Nondurable Goods	--	588,300	818,400	1,111,000
Miscellaneous	--	125,400	203,300	301,800
Transportation, Communications & Utilities	559,949	956,800	1,456,100	2,128,800
Wholesale and Retail Trade	1,163,986	1,856,900	2,709,000	3,878,100
Finance, Insurance & Real Estate	367,700	657,800	1,066,400	1,693,300
Services	723,834	1,339,800	2,314,500	3,785,100
Government				
Federal	330,207	423,100	634,300	902,600
State and Local	375,067	645,600	1,074,500	1,694,900
Total Earnings	4,803,628	7,852,700	12,098,100	18,033,600
Total Personal Income	5,319,106	8,719,900	13,790,600	21,013,800

Note: Data may not add to higher level totals due to rounding of figures.

(s) Denotes sector too small to project

Source: U.S. Department of Agriculture Economic Research Service, Natural Resources Economics Division for the U.S. Water Resources Council, 1972 OBERS Projections, Volume 5, Standard Metropolitan Statistical Areas, 1974.

TABLE 32

PROJECTED AVERAGE ANNUAL RATES OF GROWTH BY INDUSTRIAL SECTORS 1970 - 2000

(PERCENTAGE RATES OF 1967 CONSTANT DOLLAR INCOME GROWTH)

SECTOR	1970 - 1980			1980 - 1990			1990 - 2000		
	US	STATE	ATLANTA SMSA	US	STATE	ATLANTA SMSA	US	STATE	ATLANTA SMSA
Agriculture, Forestry, Fisheries	.75	1.75	2.00(s)	.75	1.25	(s)	1.25	1.50	1.00(s)
Mining/Quarrying	1.50	3.50	7.00(s)	1.25	2.50	2.00(s)	1.25	2.00	2.00(s)
Construction	4.00	5.50	6.00	3.00	4.00	4.00	3.00	3.50	3.50
Transp, Communication, Utilities	4.00	5.00	5.50	3.00	4.00	4.50	3.50	4.00	4.00
Wholesale & Retail Trade	3.50	4.50	5.00	3.00	3.50	4.00	3.00	3.50	3.50
Finance, Insurance & Real Estate	5.50	6.00	6.00	4.00	5.00	5.00	4.00	4.50	4.50
Services	6.00	6.00	6.50	4.50	5.00	5.50	4.50	5.00	5.00
Government	4.00	3.50	4.00	4.00	4.50	5.00	4.00	4.00	4.50
Total Earnings	4.00	4.50	5.00	3.50	4.00	4.50	3.50	4.00	4.00
Total Personal Income	4.00	4.50	5.00	3.50	4.00	4.50	3.50	4.00	4.00

(s) Denotes sector too small to project

Source: U.S. Department of Agriculture Economic Research Service, Natural Resources Economics Division for the U.S. Water Resources Council, 1972 OBERS Projections, Volume [illegible], Standard Metropolitan Statistical Areas, and Volume 4, States, 1974.

B.2 LAND USE RESOURCES

Present General Land Use

This section deals with a description of existing land use within the Upper Ocmulgee River Basin and the extent and effectiveness of current land use planning in the Basin by all levels of government as well as a description of the administrative and regulatory land use controls currently in effect.

The Upper Ocmulgee River Basin contains approximately 1400 square miles of which only nineteen percent is classified as developed. Of the remaining eighty-one percent, seventy-seven percent is classified as agricultural and forest land. The highest concentration of developed land is to be found in the South River Sub-basin which also contains the greatest amount of agricultural and forest lands. As can be expected, the greatest percentage of developed land in the South River Sub-basin is found in WQMU #0401, closest to the Atlanta Core. In terms of specific land uses, it can be noted from Table 33 that over seventy-one percent of the Basin's industrial/commercial use is situated in the South River Sub-basin and again is concentrated in WQMU #0401. The next highest concentration of developed land and industrial/commercial land use occurs in the upper reaches of the Yellow River Sub-basin, specifically in WQMU #0406. The existing land use pattern, Figure 21 , is the result of historic growth pattern influences namely utility and transportation availability as well as place of residence related to the employment opportunities of the central city. Although the latter still influences residential growth patterns, existing residential use within the Basin indicates that with improved transportation systems, place of residence is selected more in terms of socio-economic characteristics of an area than close proximity to place of work. The existing network of interstate and other highways within the Basin has contributed to the increased development activity in the Yellow and Alcovy River Sub-basins.

Within the Yellow River Sub-basin, the highest percentage of developed land area occurs in WQMU #0406, in the northwest section of the Sub-basin. However, high concentrations of developed areas are found in the other WQMUs, which compose the remainder of the Sub-basin. Within WQMU #0407, the Interstate 85 and U. S. 78 corridors have helped to promote concentrations of growth in the communities of Lawrenceville, Snellville and Loganville, while the Interstate 20 corridor has promoted increased growth in WQMUs #0408 and #0409, specifically around the communities of Lithonia, Conyers and Covington. As can be noted from the materials presented pertaining to population trends, the upper reaches of the Yellow River Sub-basin, namely those portions of WQMUs #0406 and #0407 within Gwinnett County, have experienced significant growth in terms of both residential and industrial/commercial uses.

TABLE 33

EXISTING LAND USE - RESPECTIVELY SOUTH, YELLOW AND ALCOVY RIVER SUB-BASINS
ACRES

SOUTH RIVER

Land Use Categories Type II, USGS	Water Quality Management Units 0401	0402	0403	0404	0405	Total
11 Residential	32,758.76	7,396.62	9,468.95	5,675.00	3,454.91	58,754.24
12 Commercial	6,232.93	2,407.09	1,912.92	430.41	1,312.99	12,296.34
13 Industrial	940.52	557.94	223.17	47.82	31.88	1,801.33
14 Tranp/Comm/Utility	1,896.98	669.52	1,307.16	781.11	1,153.58	5,808.35
15 Indust/Comm Complexes	3,044.73	621.70	31.88	79.71	-0-	3,778.02
16 Mixed Urban/Built-up Land	-0-	-0-	-0-	-0-	-0-	-0-
17 Other Urban/Built-up Land	3,889.60	860.81	478.23	637.64	207.23	6,073.51
Category TOTAL	47,763.52	12,513.68	13,422.31	7,651.69	6,160.59	88,511.79
21 Cropland & Pasture	3,618.61	8,592.20	20,946.47	21,882.64	35,113.74	90,153.66
22 Orchard, Groves, Vinyards	15.94	-0-	812.99	-0-	701.40	1,530.33
23 Confined Feeding Operations	-0-	-0-	-0-	-0-	63.76	63.76
24 Other Agricultural Land	-0-	-0-	-0-	-0-	-0-	-0-
Category TOTAL	3,634.55	8,592.20	21,759.46	21,882.64	35,878.90	91,747.75
41 Deciduous Forest Land	3,953.37	7,029.20	14,617.90	7,556.03	14,190.58	47,347.86
42 Evergreen Forest Land	7,444.45	5,356.18	4,256.25	7,029.98	15,370.22	39,457.08
43 Mixed Forest Land	14,299.08	11,828.22	23,241.98	20,111.36	34,390.92	103,871.56
Category TOTAL	25,696.90	24,214.38	42,116.13	34,697.37	63,951.72	190,676.50
51 Streams & Canals	-0-	-0-	-0-	-0-	-0-	-0-
52 Lakes	31.88	79.91	15.94	15.94	31.88	175.35
53 Reservoirs	541.99	318.82	2,470.86	1,099.93	2,227.46	6,834.41
Category TOTAL	573.87	398.53	2,486.80	1,115.87	2,259.34	6,834.41
61 Forested Wetlands	-0-	-0-	111.59	-0-	2,147.75	2,259.34
62 Non-Forested Wetlands	-0-	-0-	95.65	-0-	111.59	207.24
Category Total	-0-	-0-	207.24	-0-	2,259.34	2,466.58
74 Bare Exposed Rock	-0-	-0-	-0-	-0-	-0-	-0-
75 Strip Mines, Quar/Gravel Pit	95.65	-0-	334.76	-0-	-0-	430.41
76 Transitional Areas	4,112.78	1,466.57	3,012.85	1,578.16	3,350.70	13,521.06
Category Total	4,208.43	1,466.57	3,347.61	1,578.16	3,350.70	13,951.47
SOUTH RIVER TOTAL (Acres)	82,877.27	47,185.36	83,339.55	66,925.73	113,860.59	394,188.50
(Sq.Miles)	129.50	73.73	130.22	104.57	177.91	615.93

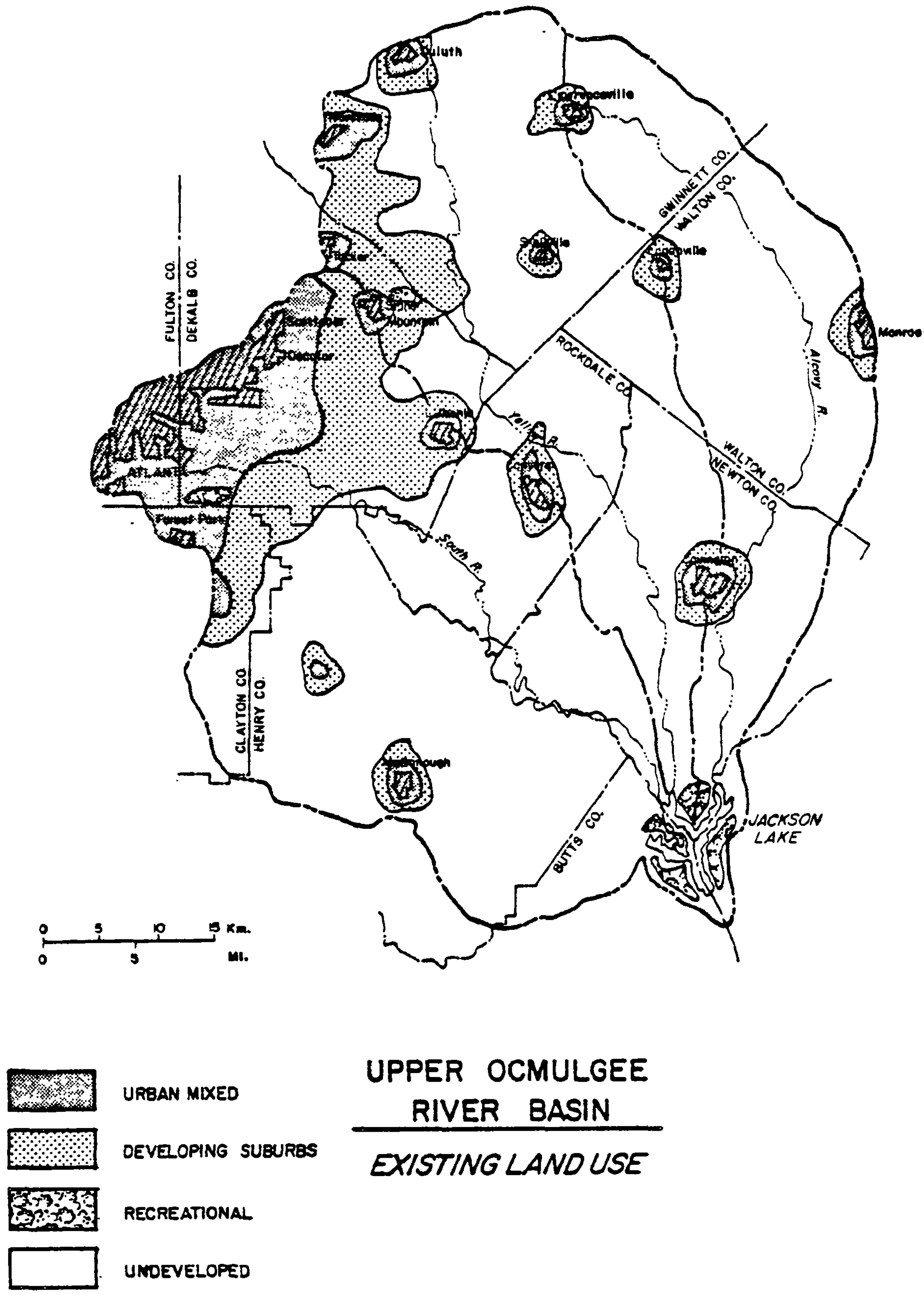
TABLE 33 (continued)

YELLOW RIVER

Land Use Category Type II USGS	Water Quality Management Units 0406	0407	0408	0409	TOTAL
11 Residential	15,409.12	8,257.44	5,977.80	5,802.52	35,446.88
12 Commercial	1,163.69	828.93	765.17	749.70	3,507.49
13 Industrial	63.76	63.76	255.06	366.64	749.22
14 Transp/Comm/Utility	1,811.33	143.37	541.99	446.35	2,943.14
15 Indust/Comm Complexes	797.05	-0-	79.71	-0-	876.76
16 Mixed Urban/Built-up Land	31.88	-0-	-0-	-0-	31.88
17 Other Urban/Built-up Land	1,450.63	127.53	539.82	350.70	2,518.68
Category TOTAL	20,727.46	9,421.13	8,209.55	7,782.91	46,134.08
21 Cropland & Pasture	11,286.23	33,348.57	9,739.95	11,766.64	66,141.39
22 Orchard,Grove,Vinyard	-0-	79.71	-0-	-0-	79.71
23 Confined Feeding Operations	79.71	95.65	-0-	47.82	223.18
24 Other Agricultural Land	-0-	-0-	-0-	-0-	-0-
Category TOTAL	11,365.94	33,523.93	9,739.95	11,814.46	66,444.28
41 Deciduous Forest Land	7,444.45	6,201.05	1,323.10	733.29	15,701.89
42 Evergreen Forest Land	17,348.09	13,135.38	5,611.23	7,428.51	43,523.21
43 Mixed Forest Land	29,745.91	39,007.63	16,371.41	16,313.12	101,438.07
Category TOTAL	54,538.45	58,344.06	23,305.74	24,474.92	160,663.17
51 Streams & Canals	-0-	-0-	-0-	-0-	-0-
52 Lakes	-0-	111.59	-0-	-0-	111.59
53 Reservoirs	1,466.57	1,179.63	781.11	541.99	3,969.30
Category TOTAL	1,466.57	1,291.22	781.11	541.99	4,080.89
61 Forested Wetlands	-0-	286.94	-0-	223.17	510.11
62 Non-Forested Wetlands	-0-	-0-	-0-	-0-	-0-
Category TOTAL	-0-	286.94	-0-	223.17	510.11
74 Bare Exposed Rock	366.64	-0-	-0-	-0-	366.64
75 Strip Mines,Quar.Gravel Pits	446.35	31.88	-0-	-0-	478.23
76 Transitional Areas	3,076.61	3,251.96	908.64	876.76	8,113.97
Category TOTAL	3,889.60	3,283.84	908.64	876.76	8,958.84
YELLOW RIVER TOTAL (Acres)	91,988.02	106,151.12	42,944.99	45,707.21	286,791.34
(Sq. Miles)	143.73	165.86	67.10	71.42	448.11

TABLE 33 (continued)

Land Use Category Type II, USGS	ALCOVY RIVER WATER QUALITY MANAGEMENT UNITS 0410	0411	TOTAL	LAKE JACKSON SUB-BASIN 0412
11 Residential	4,490.40	2,570.93	6,980.33	1,286.94
12 Commercial	594.17	241.29	835.46	63.76
13 Industrial	311.00	15.94	326.94	15.94
14 Transp,Commerc,Utility	279.00	336.94	615.94	143.47
15 Indust,Commercial Complex	-0-	-0-	-0-	-0-
16 Mixed Urban/Built-up Land	-0-	-0-	-0-	-0-
17 Other Urban/Built-up Land	679.17	-0-	679.17	-0-
Category TOTAL	6,272.74	3,165.10	9,437.84	1,510.00
21 Cropland & Pasture	43,763.58	7,357.01	51,120.59	5,522.96
22 Orchards,Groves,Vinyard	-0-	79.71	79.71	31.88
23 Confined Feeding Operation	-0-	143.47	143.47	63.76
24 Other Agricultural Land	-0-	63.76	63.76	15.94
Category TOTAL	43,763.58	7,643.95	51,407.53	5,634.54
41 Deciduous Forest Land	12,521.06	3,049.16	15,570.22	510.11
42 Evergreen Forest Land	32,735.79	2,287.76	35,023.55	2,817.27
43 Mixed Forest Land	38,596.22	21,327.59	59,923.81	7,260.53
Category TOTAL	83,853.07	26,664.51	110,517.58	10,587.91
51 Streams and Canals	-0-	-0-	-0-	-0-
52 Lakes	47.82	-0-	47.82	-0-
53 Reservoirs	789.82	2,183.99	2,973.81	7,099.50
Category TOTAL	837.64	2,183.99	3,021.63	7,099.50
61 Forested Wetlands	5,080.90	2,488.34	7,569.24	2,233.17
62 Non-Forested Wetlands	-0-	-0-	-0-	-0-
Category TOTAL	5,080.90	2,488.34	7,569.24	2,233.17
74 Bare Exposed Rock	-0-	-0-	-0-	-0-
75 Strip Mines,Quarry,Gravel Pit	-0-	127.53	127.53	-0-
76 Transitional Areas	334.76	844.87	1,179.63	723.17
Category TOTAL	334.76	972.40	1,307.16	723.17
TOTAL (Acres)	140,142.69	43,118.29	183,260.98	27,788.40
(Sq. Miles)	218.98	67.37	286.34	43.42



UPPER OCMULGEE RIVER BASIN

EXISTING LAND USE

FIGURE 21

TABLE 33A

SUMMARY - EXISTING LAND USE - UPPER OCMULGEE RIVER BASIN

	TOTALS(acres)	(%)
11 Residential	102,468.39	
12 Commercial	16,703.05	
13 Industrial	2,893.43	
14 Transportation, Commercial & Utilities	9,510.90	
15 Industrial/Commercial Complexes	4,654.78	
16 Mixed Urban/Built-up Land	31.88	
17 Other Urban/Built-up Land	9,271.36	
Urban TOTAL	145,593.79	(16.3%)
21 Cropland and Pasture	212,938.60	
22 Orchard,Groves, Vineyard	1,721.63	
23 Confined Feeding Operations	494.17	
24 Other Agricultural Land	79.70	
Agriculture TOTAL	215,234.10	(24.1%)
41 Deciduous Forest Land	79,130.08	
42 Evergreen Forest Land	120,821.11	
43 Mixed Forest Land	272,493.97	
Forest TOTAL	472,444.66	(53%)
51 Streams and Canals	-0-	
52 Lakes	334.76	
53 Reservoirs	20,701.67	
Water TOTAL	21,036.43	(2.4%)
61 Forested Wetland	12,571.86	
62 Non-Forested Wetland	207.24	
Wetland TOTAL	12,779.10	(1.4%)
74 Bare Exposed Rock	366.64	
75 Strip Mines, Quarries & Gravel Pits	1,036.17	
76 Transitional Areas	23,537.83	
Exposed Land TOTAL	24,940.64	(2.8%)
GRAND TOTAL (Acres)	892,029.22	(100%)
(Sq.Mile)	1,393.80	
Lake Jackson	7.42	
	1,400.22	

Within the South River Sub-basin, as previously mentioned, the highest concentrations of development occurs in WQMU #0401 and #0402 in DeKalb County. The growth influence of U.S. 41, U.S. 23, and I-75 south from Atlanta is readily visible in the corridor which includes the communities of Forest Park, Lake City, Morrow and Jonesboro in the westerly portions of WQMUs #0402 and #0403 in DeKalb and Clayton Counties, respectively. At the present time, the influence of the I-75 corridor, which continues to the south and east, has not generated significant growth in the southern reaches of the South River Sub-basin, specifically WQMU #0405. In addition, the I-20 corridor, which forms the northerly boundary of WQMU #0404, has not influenced additional growth in the South River Sub-basin, since the communities of Lithonia and Conyers are situated on the north side of Interstate 20 in the Yellow River Sub-basin.

Within the Alcovy River Sub-basin, existing developed land uses are concentrated in WQMU #0410 in the communities of Lawrenceville, Loganville and Monroe, and in WQMU #0411 in the communities of Covington and Mansfield.

Again, the influence of the existing transportation network is obvious with U. S. 29 serving Lawrenceville and U. S. 78 serving Loganville and Monroe. In addition, one of the few north-south highways in the Sub-basin, Georgia 81, provides connection between Covington/Oxford and Loganville where Georgia 20 continues to provide connection to Lawrenceville. Existing residential development, although not intense, exists along this corridor in WQMU #0410. The majority of developed land in #WQMU 0411 is found in East Covington and in the community of Mansfield.

The pattern of existing land use within the Yellow River Sub-basin has followed the historic influences of transportation system expansions and improvements. Other influences, however, are also very evident and relate to a large degree to the development policies of counties and communities within the Sub-basin. Although future land use plans and implementation regulatory systems such as zoning ordinances, sub-division regulations and the like have been adopted within the Sub-basin, the policy of allowing septic tank development on minimal sized lots has encouraged a degree of residential land use sprawl. In addition, the practice of water service extensions without regard for other services or considerations further encourages scattered development.

Land Use Control Regulations

The Upper Ocmulgee Basin currently falls within the jurisdiction of four Area Planning and Development Commissions: (1) the Atlanta Regional Commission, (2) the McIntosh Trail APDC, (3) Northeast Georgia APDC, and (4) the Oconee APDC. Each of these APDCs maintains a permanent staff for service to the local participating units of government.

They are also charged with conducting planning and development activities for all of their constituent governments and further, for coordinating regional programs with state plans and activities. The State of Georgia is unique in this regard as being one of the original states to create Area Planning and Development Commission jurisdictions.

A survey of ten (10) counties and ten (10) selected incorporated cities indicates that the full range of basic planning and plan implementation systems are in existence and in use. All governmental units surveyed have adopted new or revised land use plans including population and economic analysis and thoroughfare plans. With two exceptions, all county plans have been adopted within the past five years and one plan is under consideration. In most cases, Area Planning and Development Commissions (APDC) have provided basic plans for their participating counties. Incorporated cities, like the counties, have complete planning documentation, all adopted within the past five years with only three exceptions.

Not all municipalities or counties within the Basin provide full-time staff for the conduct of planning activities. A few cities utilize the services of consultant planners to meet their needs, while certain of the counties provide for full-time professional personnel on a continuing basis. More particularly, within the Yellow River Subbasin, planning assistance at the municipal level is typically contracted to consultants or to the respective Planning and Development Commissions under their local assistance programs. At the county level, the counties of Fulton, Clayton, DeKalb and Gwinnett maintain full-time professional staffs for their planning activities.

The range of services provided by these respective county planning departments varies, as does their staffing, which is determined largely by population. The counties of Fulton and DeKalb, comprising the largest population levels, offer the most extensive planning services and professional staff. The next tier of planning capabilities resides in the counties of Clayton and Gwinnett, each of which maintains a small staff for land use control regulations and for general planning activities. Finally, the remaining counties rely on the services provided by the respective Area Planning and Development Commissions under their local assistance programs to meet their planning needs.

As a general statement, Area Planning and Development Commissions are typically supported by a combination of local funds and state and federal grant programs. To a much lesser degree, county planning activities are dependent upon federal or state grants and more heavily dependent upon the general tax revenues for financing of their programs. City governments more often rely upon general revenues to support their full-time staffs, if available, or upon federal grant programs such as HUD 701 or Community Development funding for the conduct of their planning activities.

FIGURE 22

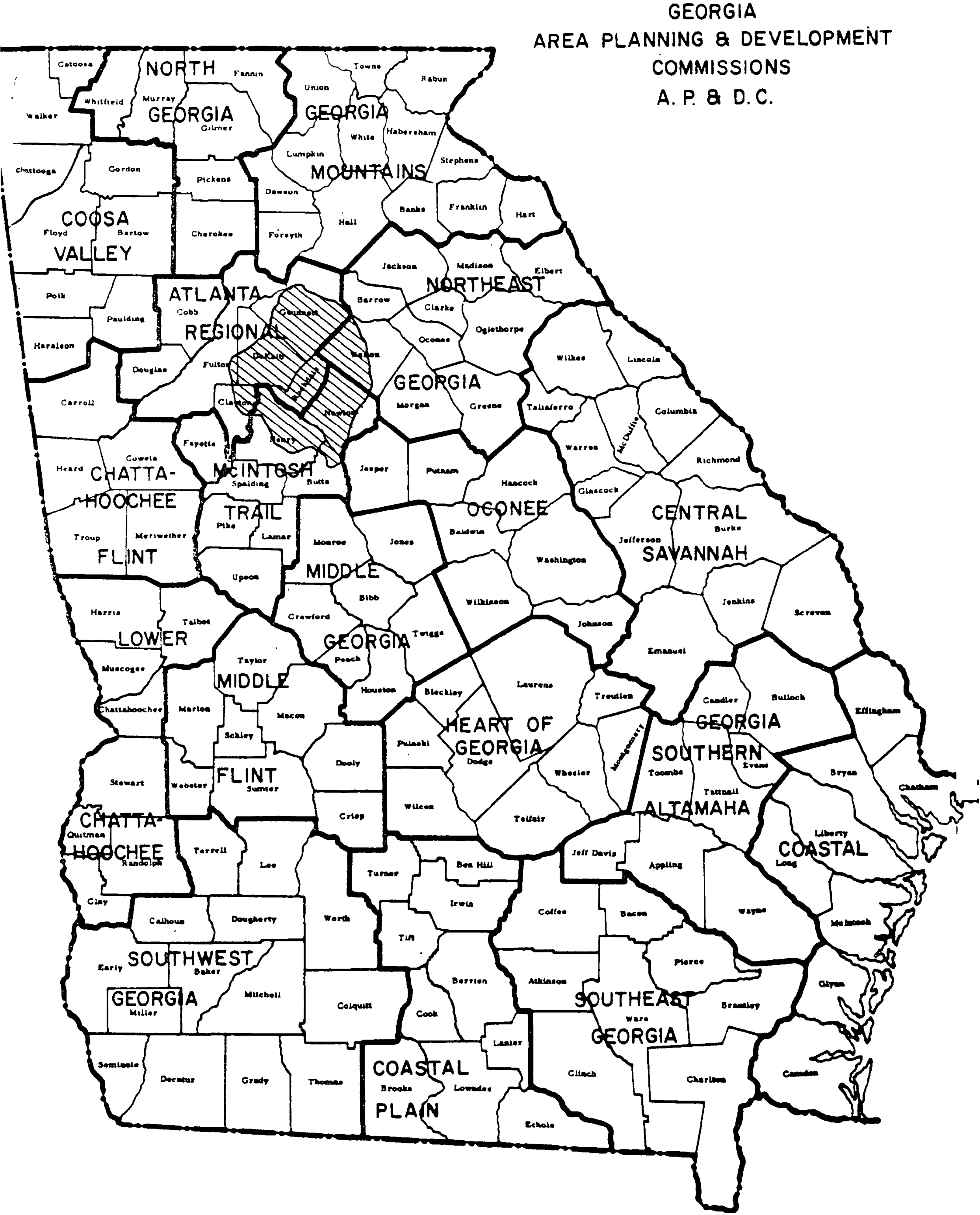

GEORGIA
AREA PLANNING & DEVELOPMENT
COMMISSIONS
A. P. & D.C.
NORTH GEORGIA
GEORGIA MOUNTAINS
COOSA VALLEY
ATLANTA REGIONAL
NORTHEAST GEORGIA
CHATTA-HOOCHEE FLINT
McINTOSH TRAIL
MIDDLE GEORGIA
OCONEE
CENTRAL SAVANNAH
LOWER CHATTA-HOOCHEE
MIDDLE FLINT
HEART OF GEORGIA
SOUTHERN ALTAMAHA
COASTAL
SOUTHWEST GEORGIA
COASTAL PLAIN
SOUTHEAST GEORGIA
Catoosa
Walker
Whitfield
Murray
Fannin
Gilmer
Union
Towns
Rabun
White
Habersham
Lumpkin
Stephens
Chattooga
Gordon
Pickens
Dawson
Banks
Franklin
Hart
Floyd
Bartow
Cherokee
Forsyth
Hall
Jackson
Madison
Elbert
Polk
Paulding
Cobb
Barrow
Clarke
Oglethorpe
Haralson
Douglas
Fulton
DeKalb
Walton
Oconee
Wilkes
Lincoln
Carroll
Clayton
Rockdale
Newton
Morgan
Greene
Taliaferro
Columbia
McDuffie
Fayette
Henry
Heard
Coweta
Spalding
Butts
Jasper
Putnam
Hancock
Warren
Richmond
Glascock
Troup
Meriwether
Pike
Lamar
Monroe
Jones
Baldwin
Jefferson
Burke
Upson
Washington
Bibb
Harris
Talbot
Crawford
Wilkinson
Johnson
Jenkins
Screven
Twiggs
Muscogee
Taylor
Peach
Emanuel
Chattahoochee
Marion
Houston
Bleckley
Laurens
Treutlen
Candler
Bulloch
Effingham
Macon
Schley
Pulaski
Dodge
Wheeler
Montgomery
Toombs
Evans
Bryan
Stewart
Webster
Sumter
Dooly
Tattnall
Chatham
Crisp
Wilcox
Telfair
Quitman
Randolph
Terrell
Lee
Turner
Ben Hill
Jeff Davis
Appling
Liberty
Long
Clay
Irwin
Coffee
Bacon
Wayne
Calhoun
Dougherty
Worth
Tift
McIntosh
Early
Baker
Pierce
Mitchell
Berrien
Atkinson
Glynn
Miller
Colquitt
Cook
Ware
Brantley
Lanier
Seminole
Decatur
Grady
Thomas
Brooks
Lowndes
Clinch
Charlton
Camden
Echols

TABLE 34

FUNDING HISTORY - 701's - UPPER OCMULGEE RIVER BASIN

	ZONING	SUB-DIVISION	POPULATION & ECONOMIC	EXISTING LAND USE	THROUGH-FARE PLAN	FUTURE LAND USE	COMMUNITY FACILITIES	COMMUNITY DEVELOP. PROGRAM	CIP	HOUSING	HOUSING NEEDS	RECREATION & OPEN SPACE	ECONOMIC DEVELOPMENT	WATER & SEWER PLAN	BUILDING CODES
BUTTS	1973		R/76								1972				
CLAYTON	1972	X	R	R/L	R						R				
DE KALB	1972	X	R/L	R/L	R						R/L				
FULTON	1972	X	R/L	R/L	R						R/L				
GWINNETT	1972	X	R	R/L	R						R				
HENRY	1973		1972	R	R/1974	1974					R	L/1974	1973		
JASPER	1975			R/74		R/74								1970	
NEWTON	1972		R 76		R/1975										
ROCKDALE	?		R	R/L	R						R				
WALTON	1973	1973	1967	1973	1973	1973	1974			1967		R/1976	1975	1973	

R - Regional
L - Local
Source: Georgia Bureau of Community Affairs

NOTE: Table indicates 701 funding, not necessarily representative of total planning programs.

For those programs typically dependent upon federal or state grants the funding source used most extensively in recent years has been the Department of Housing and Urban Development 701 Funding for Comprehensive Community Planning. Table 34 indicates the funding history of 701 funds for the respective communities within the Basin and whether that activity was conducted by a local unit of government or a regional planning agency such as an Area Planning and Development Commission.

Land Use Regulatory Systems

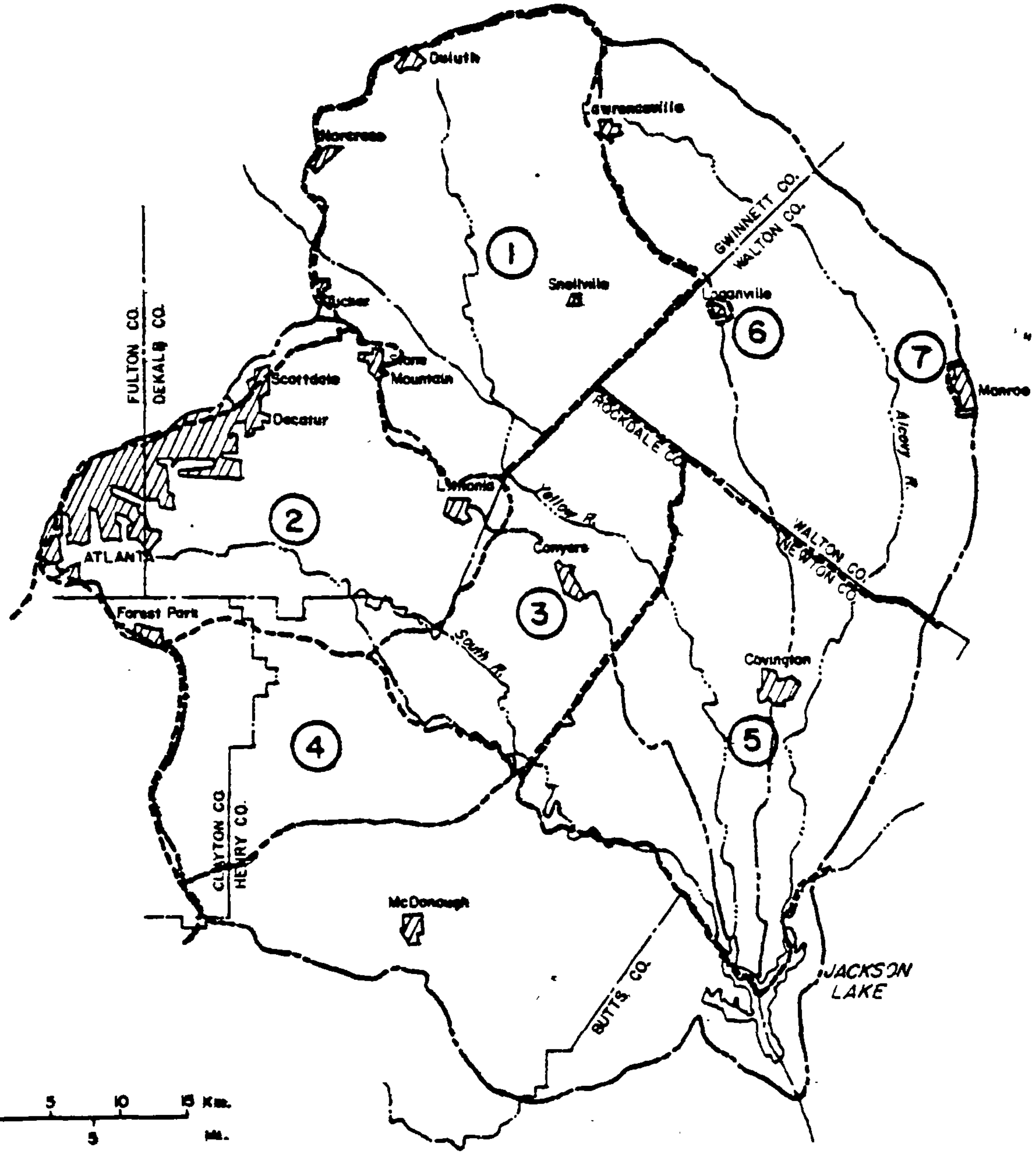
In regard to implementation of regulatory systems, all units of government adopted zoning ordinances and subdivision regulations as part of their total planning package. As in the case of land use plans, most of the regulatory systems have been adopted in the past five years. All governmental units have adopted the Southern Standard Building Code and maintain same with current amendments. Generally, only the more urban counties and cities have adopted Housing Codes, although the communities of Conyers and Covington have Housing Codes and Enforcement Programs.

Water and sewer plans are only barely evident, although most governmental units report anticipated participation in 201 Facilities Programs. Figure 23 delineates 201 facility program areas and Table 35 indicates the status of present programs. Other plan implementation regulatory systems such as Flood Control, Soil Conservation and Solid Waste Management exist in but a few units. Most units are awaiting specific delineation of flood plains prior to adoption of regulations. Soil Conservation, Sediment Control and similar ordinances are in process in many units.

Most of the local units of governments, both municipal and county, offer a standard range of land use regulations. This standard range may be characterized as a package that includes the following:

1. Zoning
2. Subdivision Regulations
3. Building Codes

The degree and effectiveness of enforcement varies, primarily in relationship to the number and professional qualification of enforcement personnel. The larger county jurisdictions lying within the Basin, such as Fulton, DeKalb, Clayton and Gwinnett counties, maintain professional planning departments, and it is in these jurisdictions that the second generation of land use controls are typically being applied. This second generation of controls may be characterized as including



1 YELLOW RIVER
2 SOUTH RIVER
3 ROCKDALE
4 COTTON INDIAN CREEK
5 NEWTON
6 LOGANVILLE
7 MONROE

UPPER OCMULGEE
RIVER BASIN

201 FACILITIES PLANS

FIGURE 23

the following elements:

1. Drainage and storm water retention
2. Soil and sedimentation control
3. Natural features preservation
4. Site plan review and approval

While there are exceptions to this general aggregation, such as within municipalities, this second generation of land use controls are most commonly applied in the more urbanized counties within the Study Area.

For example, Gwinnett County was the first local unit of government in Georgia and the fourth county government in the United States to implement and formally establish a soil and sedimentation control program. Subsequently, the more urbanized and adjacent counties of DeKalb, Clayton and Fulton have placed such regulations into their inventory. DeKalb County was a leader in establishing storm water retention requirements for all new developments within its jurisdiction. Subsequently, adjacent jurisdictions enacted similar requirements. Fulton County was the leader within the Study Area for site plan review and conditional zoning, allowing the local planning staffs to require extensive detailing of proposed developments and their implication on adjacent jurisdictions. This program has subsequently been duplicated in other jurisdictions.

A third generation of land use controls has recently evolved in Georgia through a greater urban consciousness on the part of the state legislature. These controls concentrate on natural features and significantly insert the broader jurisdictional control of state government into local planning decisions. Included within this third generation of regulations are:

1. The designation of metropolitan transportation and planning organizations with their attendant requirement to provide revolving five-year transportation improvement programs.
2. Airport systems planning by regions of the State.
3. Basin-wide water resource planning under PUblic Law 92-500 Section 303 (e).
4. State-wide soil and sedimentation control requirements authorizing local units of government to establish their own soil and sedimentation control requirements consistent with state law, but in the event that such ordinances are not adopted by local units, the State assumes such power.

TABLE 35

REGULATORY SYSTEMS IN UPPER OCMULGEE RIVER BASIN

	Exist Land Use	Future Land Use	Zoning Ordn.	Sub-Div Reg	Thor-Fare Plan	Pop/ Econ Plan	Growth Mgmt Plan	Bldg Code *	Hsng Code	Water Sewer Plan**	Flood Cntl Ordn	Soil Cons Ordn	Solid Waste Plan	Water Pollution Program	Air Pollution Program
DeKalb	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	Prop	✓	✓	✓	✓
Atlanta	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	✓	✓	✓	✓	✓
Lithonia	✓	No	✓	None	None	None	None	*	✓	Cty.	None	None	None	None	None
Fulton	✓	Prop	✓	✓	✓	✓	Prop	*	Prop	**	✓	✓	✓	✓	✓
Atlanta	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	✓	✓	✓	✓	✓
Gwinnett	✓	✓	✓	✓	✓	✓	✓	*	None	**	✓	✓	✓	✓	✓
Lawrenceville	✓	✓	✓	✓	✓	✓	✓	*	None	**	None	None	None	✓	✓
Newton	✓	✓	✓	None	✓	✓	✓	*	None	✓	None	None	✓	None	None
Covington	✓	✓	✓	✓	✓	✓	None	*	✓	**	FIA	None	Cty.	None	None
Rockdale	✓	✓	✓	✓	✓	✓	✓	*	✓	**	✓	✓	✓	✓	✓
Conyers	✓	✓	✓	✓	✓	✓	✓	*	✓	**	FIA	Prop	None	None	None
Walton	✓	✓	✓	✓	✓	✓	✓	*	None	✓	FIA	Prop	None	None	None
Monroe	✓	✓	✓	✓	✓	None	None	*	✓	**	None	Prop	None	None	None
Loganville	✓	✓	✓	✓	✓	✓	✓	*	None	**	None	None	None	None	None
Henry	✓	✓	✓	✓	✓	✓	✓	*	None	✓	FIA	✓	None	None	None
McDonough	✓	✓	✓	None	✓	✓	None	*	None	✓	FIA	None	✓	✓	✓
Clayton	✓	✓	✓	✓	✓	✓	✓	*	None	✓	✓	✓	None	✓	✓
Forest Park	✓	✓	✓	✓	✓	✓	✓	*	✓	City	None	✓	✓	✓	✓
Jonesboro	✓	✓	✓	✓	None	None	None	*	None	✓	✓	✓	Prop	✓	✓
Butts	Prop	Prop	✓	✓	✓	✓	✓	*	✓	City	✓	Prop	Prop	None	None

* Southern Standard Building Code, Updated every year

** 201 Application now in process

5. Air quality control programs administrated by state agencies through local health departments.

Within the county jurisdictions in the Upper Ocmulgee Basin there is a basic consistency in density of ranges acceptable under existing county regulations. Single family residential densities typically occur within a range of one to four dwelling units per acre. Multifamily densities commonly occur within the range of ten to fourteen dwelling units per acre. Commercial and industrial developments are commonly encouraged within shopping centers or industrial parks, respectively, but also are typically restricted to fifty percent lot coverage regardless of the category involved. These density/intensity patterns are uniquely low when compared to other metropolitan areas of the nation. Inherent to this existing pattern is the local appreciation of the limitations of terrain and soil, and a local awareness of the problems engendered by developments that increase densities.

In response to pressures for increased densities resulting largely from rapidly escalating construction and land cost, most units of local government have responded with planned unit development regulations allowing for large complexes comprised of mixed land uses while retaining a basic density/intensity constraint that is consistent within the respective jurisdictions. Planned unit developments are currently authorized in those counties within the Atlanta metropolitan area, and in many of the cities falling within such counties. In summary, one could equate the level of sophistication in the application of land use regulations with the degree of urbanization encountered by the respective jurisdiction. Characteristically, those county jurisdictions with higher population levels and increased urbanization are more experienced in the application of sophisticated land use techniques than are those more rural counties lying in outer reaches of the Upper Ocmulgee Basin.

Through recent advances in state legislation, however, regulatory tools are evolving that have application to the local level. Specific recent examples include the Soil and Sedimentation Act, which is an act of state-wide application authorizing state agencies to accept control responsibility when local units of government choose to relinquish such authority; state-wide transportation planning for all modes of transportation; and continuing pressures for the adoption of state-wide flood hazard regulations, which would severely restrict development within flood hazard areas throughout the State. Whether the current funding and staffing by state agencies to implement these new inroads result in effective enforcement is a matter yet to be determined. To date the only statewide regulatory program within the environmental arena effectively being staffed and enforced are those activities of the Georgia Environmental Protection Division of the Department of Natural Resources dealing primarily with water quality and the enhancement of flowing streams within the State.

Due to the past few years of general economic depression and a relatively slow home building industry, it is difficult to ascertain the effectiveness of current plans and programs. However, it will become more urgent for governmental units to update existing regulatory systems; specifically subdivision, flood plain, soil conservation and similar ordinances dealing with protection of the natural environment from adverse impacts of development, in light of the increasing concern to protect the water quantity and quality within the Basin.

Table 35 indicates the types of regulatory systems prevalent in the Basin and indicates which of the counties and selected incorporated cities have adopted systems.

Trends in Land Use Control

Planned Unit Developments

In addition to the standard inventory of land use control devices historically applied by local units of government, many of the metropolitan jurisdictions have increased their capabilities through initiating new techniques to supplement and improve upon the historical role of zoning and subdivision relations. Such techniques, which have gained widespread acceptance from both the developing community and citizens, are the concept of planned unit developments. These techniques have been increasingly authorized by local units of government with significant results.

The concept of a planned unit development is to allow greater flexibility in site design and greater freedom to the developer to combine building types and lotting patterns in rather unconventional configurations so long as an acceptable plan is submitted and approved by the local unit of government and the basic density parameters for the total development do not exceed those that would otherwise be acceptable. Typically, planned unit developments allow for a mixture of land uses, including in some cases commercial or industrial activities. Within the residential spectrum, a mixture of densities of the very low to mid range are also authorized so long as the overall density remains consistent with conventional zoning patterns in the vicinity. The amount of land devoted to open space, recreation and other amenities becomes a significant feature of the total package.

The objective of such developments is to provide for a "totally planned" community developed over an extended period of time on a phased basis.

Conditional Zoning

Some jurisdictions within the Basin have now had ten years of experience with conditional zoning. This practice, while once considered suspect by the courts, has recently seen Georgia's Supreme Court uphold not only the concept, but its application.

The significant aspect of conditional zoning is that the owner wishing to rezone property will not only request a standard zoning classification but, in addition, will place further limiting restraints or conditions on the uses and siting of development on the property. The controlling device is typically a site plan buttressed by conditioning statements frequently in the form of a letter of intent, which is made a part of the record and becomes limiting on the eventual use of the property. The City of Atlanta, Fulton County and DeKalb County are currently employing this technique as well as many other municipalities within the Basin.

Impact Zoning

This type of zoning activity is founded on the premises that zoning will be approved or disapproved based on the effects of the proposed development on the community in which it would be located. Conventional zoning is based on density restrictions and placement of structures on a lot, but has little to say of the potential impacts of the new development upon public facilities or the environmental significance of the area.

To implement impact zoning the local units of government must first quantify through rather detailed procedures the relative ability of many of the communities' infrastructures to accommodate growth. For example, what is the unused carrying capacity of the abutting road system and what percentage of that carrying capacity would be consumed by the proposed development? Further, if the added increase in traffic exceeds the remaining carrying capacity available, what improvements must be made by the developer to abutting and distant road networks so that the system does not become overloaded?

To date, there have been some fledgling attempts at impact zoning within the Study Area. DeKalb County, for example, calls for a summary evaluation of the net effects of development as part of its application procedures for development permits. Fulton County has taken steps to establish computer evaluations designed to assess the carrying capacity of its infrastructure by small geographic breakdowns, to plot trends of development and to contrast trends with infrastructure assessment so that overload conditions can be anticipated. One reason this technique has not been more fully implemented is the obvious expense and the requirement for sophisticated inventories and evaluations of numerous community facilitities.

Preservation Techniques

A variety of regulatory devices have been implemented by local units of government designed to preserve environmentally significant aspects of the respective jurisdictions. Preservation ordinances have become a rather common requirement in many of the jurisdictions. DeKalb

County has implemented its environmental control ordinance, which includes tree preservation, historic preservation, soil and sedimentation control and water retention requirements in a single coordinated set of regulations. As mentioned earlier, Gwinnett County has been the leader in the metropolitan area in utilizing soil survey data as a foundation for both flood hazard zoning and for the implementation of soil and sedimentation controls. Flood plain zoning has, in fact, become a common requirement throughout the Study Area.

The increased concern for the preservation of elements key to our heritage has been demonstrated in the creation of numerous historical societies and renewed interest in submitting nominations for the National Register of Historic Places. Archaeological work has achieved a position of significance in the activities of local governments, largely through the enactment of Section 201 requirements. Cobb and Fulton Counties have been supporting archaeological survey and research for more than five years, and similar activities are now being undertaken by other units of government, most recently Gwinnett County in its archaeological survey of the Yellow River corridor in relation to its 201 planning.

Managed Growth Ordinances

While in recent years there has been a flurry of attention centered on a few communities that have enacted "no growth" or "controlled growth" regulations, such activities have not yet found a level of acceptance within the Study Area.

The most renowned case of a controlled growth ordinance is that enacted by the City of Ramapo, New York, which had as its foundation a preset program for the provision of public services and required private development to be in concert. In fact, aspects of development timing have been historically applied, whereby an outlying development paid a premium through minimum lot sizes far in excess of those otherwise allowed in areas with such services. Further, the general rule that has applied throughout the metropolitan area of restricting the installation of packaged sewage treatment plants has had the secondary effect of limiting commercial and multi-family activities to those locations that have public utility service. A positive inducement to manage growth patterns has been the history of providing urban services such as garbage collection or fire protection through special districts. The establishment of such districts provides a positive incentive through increased service levels. The inability of more dispersed developments falling outside such districts to finance the creation of the district is inversely an example of managed growth.

A true managed growth approach requires a substantial investment by local governments and a more formal commitment to phased extensions within selected areas.

Two historical facts remain; first, that no unit of government has yet successfully provided an equivalent level of service throughout its total jurisdiction at one point in time, and secondly, such approaches require a coordinated effort of all public services working in a coordinated fashion to make the system function. Moratoria, for whatever reasons, have been applied within the Study Area but have met with limited success. No one service or utility can in and of itself control growth or growth rates. If any of the jurisdictions within the Study Area make the political decision to enact managed growth techniques, they should first assess the requirements of such a program in terms of staffing and regulations. Next, the political consequences of concentrating major public expenditures and activities to preselected areas while denying these same service levels to other areas within the same jurisdiction must be evaluated.

The only balancing aspect to such a technique for managing growth is the recently adopted amendment known as the Mulherin Amendment. This amendment to the Georgia Constitution allows counties to create multi-purpose service districts. Inherent in this approach is the proposition that property owners falling within such districts contribute through district levies toward the provision of the services received. In essence, this is a second level of taxation closely related to user charges. This concept has many favorable aspects for developing counties in that areas of concentrated development could be made to pay through user charges for the urban level services they demand, while the more rural portion of the county not included within such districts only pay the base ad valorem tax rate. Unfortunately, the amendment is still so recent as to have had limited application within the State. With time and experience of application the creation of multi-purpose districts could play an important role in the coordinated growth of local governments.

Future State Initiatives

During the general elections of November 1976, a Constitutional Amendment was offered and approved by the people of Georgia, revising and updating the State Constitution. While this amendment was portrayed as a codification and classification of the existing Constitution, it did have the effect of shifting the basic authorization for planning from the 1957 Act to the Home Rule provisions of the Constitution. The ramifications of this basic shift in authority for planning are currently vague and will require further clarification by the legislature.

Significantly, the new Georgia Constitution authorized the General Assembly:

> ". . . to provide restrictions upon land use in order to protect and preserve the natural resources and environmental areas of this State . . ."

Additionally, the legislature is empowered to enact laws regulating, restricting, or limiting planning and zoning powers, but does not have the authority to withdraw such power from local governments. Again, legislative clarification is needed to set the boundaries between these possibly conflicting provisions.

Future General Land Use

This section deals with projected future land use for the Upper Ocmulgee River Basin with particular attention paid to the Yellow River Sub-basin. The Upper Ocmulgee Basin encompasses a large land area of 1400 square miles. The existing land use inventory as previously discussed portrayed the intense urban nature of the upper reaches of the South River, the developing or suburban nature of the upper reaches of the Yellow River and the currently rural characteristics of the Alcovy River Basin. As all three river systems flow toward Lake Jackson the level of urban development decreases to the point of totally rural activities for the southern half of the entire basin. This pattern is broken only by the rural concentration associated with the Cities of Lithonia, Conyers and Covington, all adjacent to the Interstate 20 transportation corridor.

Existing land uses have been documented according to U.S.G.C. Type II classifications. These classifications result from a remote sense of mapping and interpretation. The classification system used by U.S.G.S. attempts to portray all uses of land but generally aggregates the more urban classifications into a few categories. Conversely, most planning activities undertaken by counties and municipalities utilize classification systems more attuned to urban development and less attuned to rural land uses. As a consequence, one should be aware that the existing and future land use sections of this environmental impact statement are founded on two separate and distinctive base lines for classification. As such, comparison can only be drawn in a general fashion.

Procedure

Procedure utilized for projecting land uses is an extension of the system utilized for disaggregating population. Since Atlanta Regional Commission 1990 Cycle II Land Use Projections are being utilized, efforts were directed toward developing a compatible system to that employed by ARC in projecting populations for the Atlanta Water Resources Study. Through the cooperation of ARC and the AWRS the base line data and the procedures utilized were obtained for the area of the basin falling within the ARC jurisdiction. Finally, future land use plans for those counties and municipalities not covered by ARC were researched and discussions held with appropriate planning officials to incorporate their future land use plans in a manner compatible with the methodology employed by ARC.

This methodology also results in the basic distribution of land use consistent with population disaggregations. The next setps were those of evaluating trends of the Basin, particularly for the Yellow River Sub-basin and quantifying developmentally unsuitable lands.

The following discussion deals with growth inducers and restraints to determine modifications, if necessary, as well as land use disaggregations to account for natural systems and historic trends.

Growth Inducers - Restraints

The City of Atlanta began as a surveyor's stake in the ground identifying the end of a one-way road line and the point of junction with another. From that stake and the railroad construction camp established at that location, the City of Atlanta was born. Thus, it had its earliest reason for existence founded on a transportation system. Transportation continued to be the dominant force in the growth and development of the Atlanta metropolitan area.

Employment centers, while not as dominant a locational incentive for growth, create an inverse inducement for growth in that utility systems needed to serve industry are typically sized to the extent that additional capacities are available for adjacent uses.

The existence of public facilities, when available, can be considered an inducement for growth, particularly public water supply and more recently the addition of sanitary sewage systems. While provision of public water supply is a direct inducement to growth, lack of an adequate sewage system causes that growth to be typically of a low density (if restraints are placed on the installation of package treatment systems). Once public sewage systems are made available, the growth induced offers a second tier of opportunities in that more intensive land use can be accommodated.

Less direct, but still influential on growth directions, are a host of other facilities offered by local units of government. Such subjective evaluations as the quality of the school system and governmental attitudes toward quality growth can play a role but are difficult to quantify. Tax rates can be an incentive if one jurisdiction's rates are substantially lower than adjacent jurisdictions. However, tax rates are a relatively inelastic inducement for residential activity but can show signs of elasticity for commercial and industrial activities.

Growth restraints involve a variety of natural and man-made features that either individually or in combination make development difficult if not prohibitive. Such restraints can include flood plains, land within an approach zone to major airports, areas without basic utility services, and a host of natural restraints including:

... High water table
... Steep slopes
... Publicly-held land
... Shallow depth to rock or exposed rock
... Swamps ... and
... Cultural or historic features scheduled for preservation.

Such areas were identified prior to the forecasting of the land use and aggregated into the category of lands unsuitable for development. Terminology used is meant to indicate unsuitable in a relative sense to other lands not suffering the problems inherent in developing lands of the above characteristics. Factors inducing or restraining growth in the Yellow River Sub-basin are shown in Figure 24.

Trends

The historic trend development within the Upper Ocmulgee River Basin portrayed associated preference for areas offering accessibility to the remainder of the metropolitan area and employment opportunities. The availability of public utilities (or community interest structures) also offers a strong correlation to development trends.

The compositing of these major influences in development, transportation, employment center, and utility service areas strongly influences existing development patterns, particularly in the Yellow River Sub-basin. This compositing of growth inducement factors reinforces the existing concentration of development along the U.S. 23/I-85 corridor leading to Lawrenceville in the Upper Yellow River Sub-basin as well as along the I-20 corridor leading from I-285 and servicing the communities of Lithonia, Conyers and Covington. Conversely, the absence of such compositing effects south of U.S. 78 in Gwinnett County in the Alcovy River Basin, and in the southern reaches of the South River Basin, account for the rather sparse development.

As previously discussed under existing and projected population, many of the counties within the Upper Ocmulgee River Basin have experienced some of the most rapid rates of increased population and changes in land use in the entire State. These rates are reported as percentages and one must be aware of the low base with which they originate. However, the relatively recent rapid increases in population in the Upper Ocmulgee River Basin can be directly related to the construction of I-20 and the improved accessibility to the metropolitan core that it provided counties such as Rockdale, Newton and southern DeKalb.

General Observations

In projecting land use one is immediately struck with the magnitude of the project area. The Upper Ocmulgee River Basin comprises 1400 square miles or approximately 900,000 acres. Given such a large Study Area the portrayal of land uses necessarily resorts to aggregations of numbers for the total Basin with less emphasis on individual municipalities or individual developments. However, a general portrayal of future land use is shown in Figure 25, and disaggregated by WQMU and sub-basin for 1980, 1990, and 2000, (Table 36) and by WQMU and sub-drainage Basin for 1980, 1990, and 2000, (Table 37).

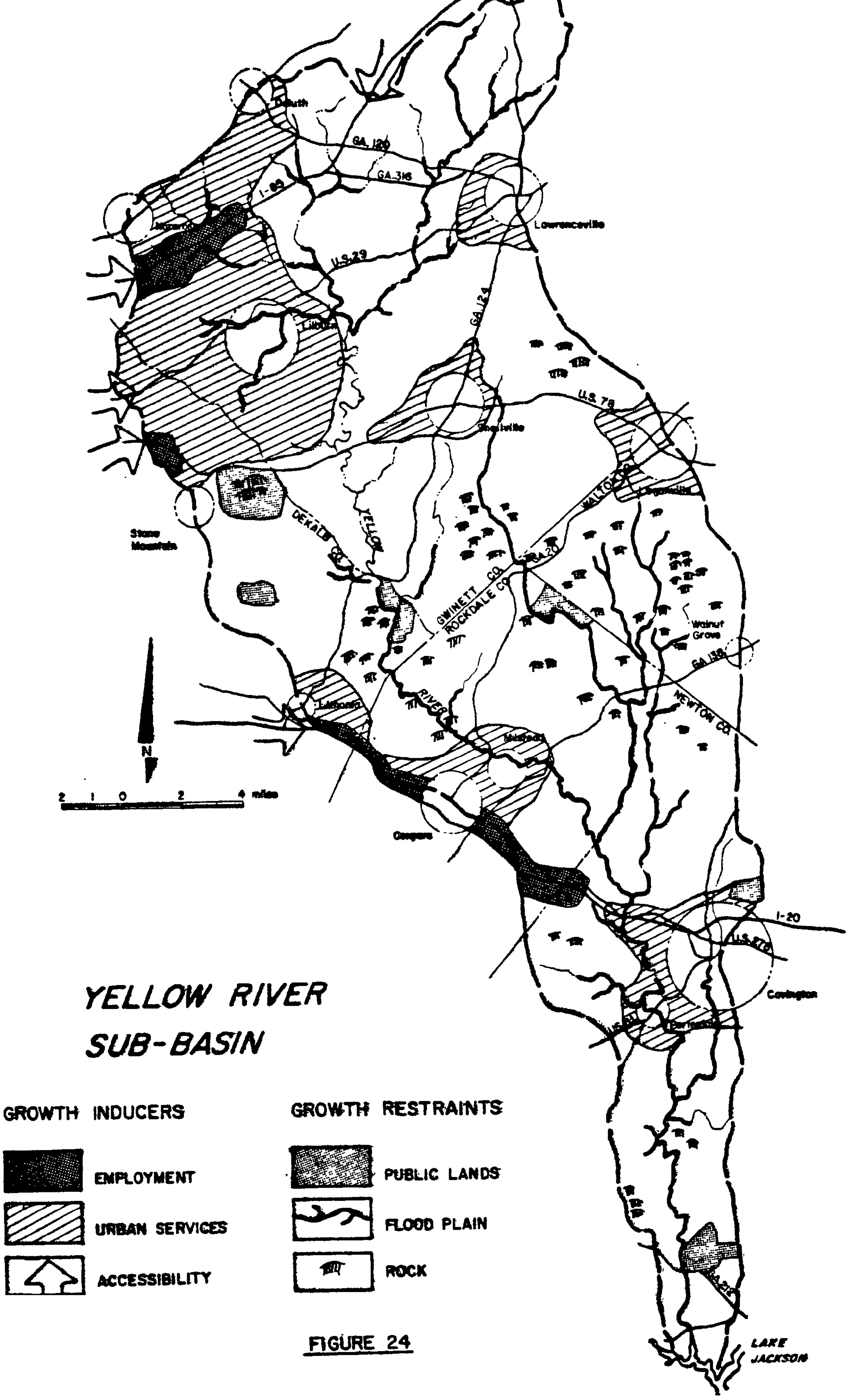

YELLOW RIVER
SUB-BASIN
GROWTH INDUCERS
EMPLOYMENT
URBAN SERVICES
ACCESSIBILITY
GROWTH RESTRAINTS
PUBLIC LANDS
FLOOD PLAIN
ROCK
Duluth
GA. 120
GA. 316
I-85
Lawrenceville
U.S. 29
GA. 124
U.S. 78
Snellville
Stone Mountain
DEKALB CO.
YELLOW
GWINETT CO.
ROCKDALE CO.
WALTON CO.
GA. 20
Walnut Grove
GA. 138
NEWTON CO.
RIVER
Lithonia
Conyers
I-20
Covington
LAKE JACKSON
N
2 1 0 2 4 miles

FIGURE 24

South River Basin is characterized by a relatively stable land use pattern over the forecast period while major redevelopment activities are programmed to occur in WQMU #0401, resulting primarily from impact of transit stations along the MARTA system leading toward Decatur. The remainder of the Basin portrays a relatively stable patterns of development with gradual increases for northern Henry County and northeastern Clayton County.

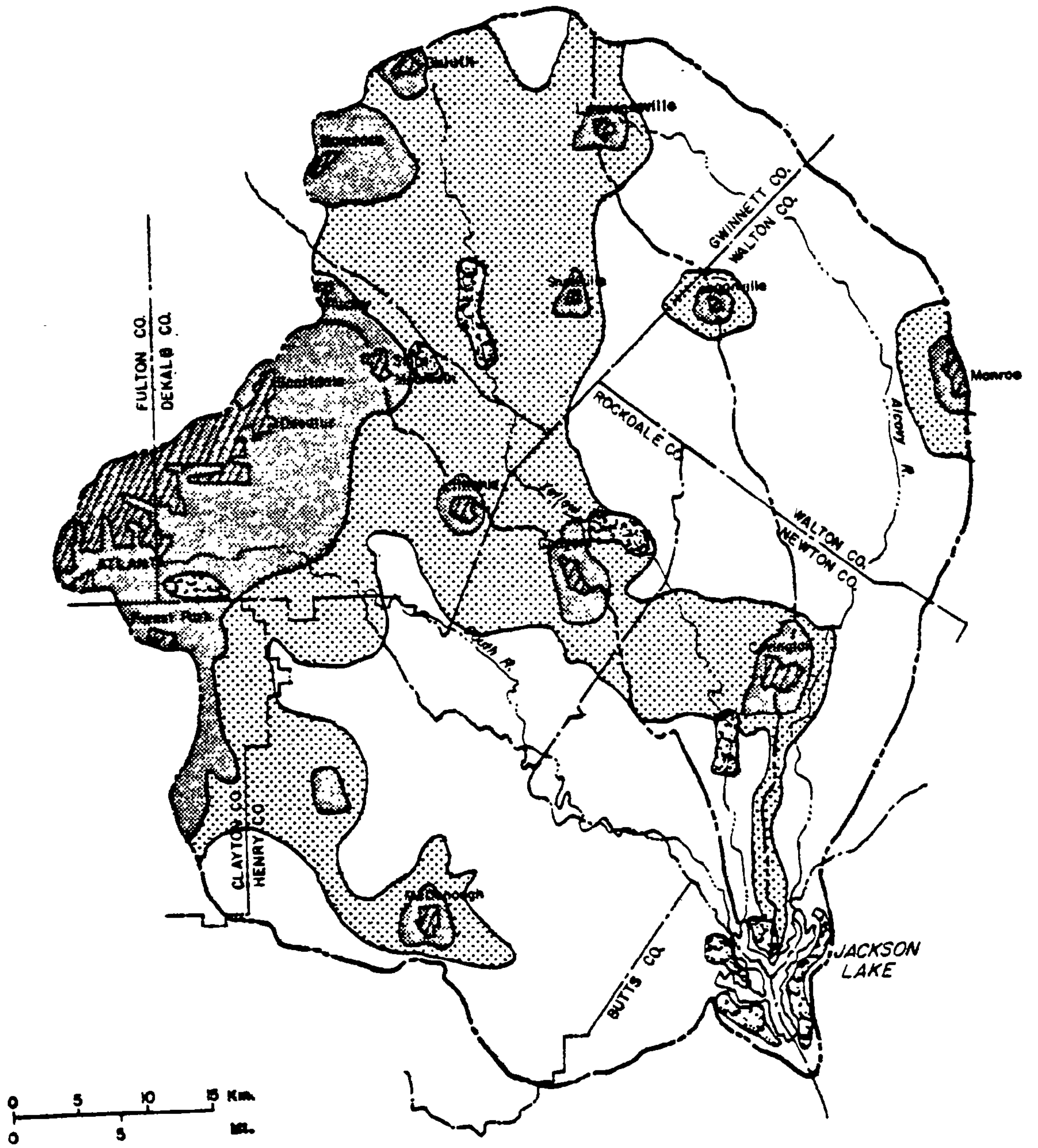
In the Yellow River, development pressure and forecasted land use offer major changes from the current baseline. The majority of new development is forecasted for the northern or headwaters area of the Basin primarily in Gwinnett and secondarily in eastern-most DeKalb County. Major transportation and industrial opportunities forms the foundation for this rationale. Existence of the Southern and Seaboard Railways at Peachtree - Industrial Boulevard and the presence of I-85, U.S. 29 and U.S. 78, in combination offer these areas of Gwinnett County the accessibility to services, jobs, and cultural activities that are conducive to residential development. It is within these same areas that there are relatively few restraints on development from a man-made or natural perspective. Within this river basin the exceptions to this pattern generally occur south of U.S. 78 and particularly within the Big Haynes Creek drainage basin, the latter indicating a recommended policy procedure of basin preservation for possible future use as an impoundment location. The other exception to the pattern is the I-20 corridor development particularly in the Yellow River Sub-basin where it spans the existing urban centers of Lithonia, Conyers and Covington. Substantial growth is projected within this corridor.

In the Alcovy River Basin only two areas bear mentioning in terms of forecasted population increases and land use changes. One of those areas is in northern Gwinnett County, generally north and east of Lawrenceville, which itself is situated on a basin divide. The other location is again near I-20 at Covington where the increased development of that municipality will generate land use changes within the Alcovy Basin.

Since transportation has historically been the major motivation for growth and amply demonstrates its dominant role within the Yellow River Sub-basin, the discussion that follows addresses these major transportation corridors and their influences on development.

Interstate 75 Corridor

I-75 travels in a southeasterly direction from South Atlanta, through WQMUs #0403 and #0405 in the South River Sub-basin. The counties affected include Clayton (northeast corner) and Henry. This portion of Clayton County (WQMU #0403) has already experienced rapid growth and major land use changes are not anticipated. The I-75 corridor's impact on Henry County has not yet been experienced and will probably not be



URBAN MIXED

DEVELOPING SUBURBS

RECREATIONAL

UNDEVELOPED

UPPER OCMULGEE RIVER BASIN

FUTURE LAND USE

FIGURE 25

felt to any great degree during the planning period, although the future land use plan for Henry County delineates substantial growth in the northern portion of the county.

Interstate 20 Corridor

I-20 travels in an easterly direction through WQMUs #0401 and #0404 in the South River Sub-basin, #0408 and #0409 in the Yellow River Sub-basin and #0411 in the Alcovy River Sub-basin. The counties impacted by this corridor include DeKalb, Rockdale and Newton. The impact on DeKalb County will probably result in changes from less dense and dispersed uses to higher density and greater intensity uses combined with an increase in non-residential uses. This shift will further impact the growing residential suburbs as the population moves further away from the central core.

The impact of Rockdale County is expected to be significant, but not only because of the ease of access to the central core. A progressive climate exists in the county, more particularly in the City of Conyers, which is situated directly in the corridor. Rockdale County had the highest percentage of growth in the period 1960 to 1970 and is projected to continue in a growth direction. Conyers has an active planning and development program, and has a full range of regulatory systems, water and sewer plans and the like. The importance to this area of the I-20 corridor is the impact on both the Yellow and South River Sub-basins since Conyers is situated almost directly on the dividing line for WQMUs #0406 and #0404.

The impact on Newton County will be similar to that on Rockdale County in that both the county and its major incorporated center, the City of Covington, maintain active programs. The City of Covington, like Conyers, has active planning and plan implementation programs and its growth will have an impact on the Yellow and Alcovy River Sub-basins. Although Newton County's growth rate from 1960 to 1970 was below the regional average, it was concentrated in and around the City of Covington. This pattern should continue during the planning period.

U. S. 78 Corridor

U. S. 78 travels from northeast Atlanta through WQMUs #0406, #0407 and #0410 in the Yellow and Alcovy River Sub-basins, primarily in Gwinnett and Walton Counties. The portion of the corridor in WQMU #0401 in DeKalb County will witness similar changes in land use as in the case of I-20 in DeKalb County. The Stone Mountain area presently has considerable industrial uses which will, in most cases, continue to expand due to ease of highway access to regional, state and national markets. The remainder of the corridor through Snellville, Loganville and Monroe, once U. S. 78 is improved to four lanes, will induce significant growth depending on the availability of water and sewer services.

TABLE 36

PROJECTED FUTURE LAND USE BY WQMU & SUB-BASIN - - 1980, 1990 & 2000

	LAND USE										
	Single Family	Multi-Family	Commercial	Industrial	Public	Parks	Transportation	Agriculture	Silva	Unsuitable	TOTAL
SOUTH RIVER											
WQMU#0401											
1980	17,802	3,735	1,863	1,376	3,162	3,460	9,337	3,259	26,114	4,293	74,401
1990	18,472	5,419	2,312	1,965	3,251	3,499	9,694	2,790	22,707	4,293	74,402
2000	17,818	6,257	2,999	2,434	3,400	3,638	9,865	1,228	22,469	4,293	74,401
WQMU#0402											
1980	8,187	2,041	1,592	1,879	10	110	58	9,517	26,830	2,065	52,289
1990	8,617	3,125	2,027	2,084	816	1,443	2,269	4,936	24,906	2,065	52,288
2000	8,675	4,102	2,483	2,443	1,051	1,746	4,727	4,303	20,696	2,065	52,291
WQMU#0403											
1980	11,033	617	476	577	223	519	2,594	20,830	37,160	5,786	79,815
1990	14,433	1,681	839	854	495	1,046	3,248	18,221	33,209	5,786	79,812
2000	18,073	3,918	1,312	1,174	623	1,205	3,895	14,613	29,210	5,786	79,809
WQMU#0404											
1980	4,820	174	258	530	116	491	1,406	22,311	35,370	2,750	68,226
1990	6,845	503	507	705	239	662	1,856	20,312	33,856	2,750	68,235
2000	9,150	1,308	899	938	314	873	2,061	18,729	31,215	2,750	68,237
WQMU#0405											
1980	2,603	5	944	9	156	204	782	36,691	70,557	8,310	120,261
1990	4,319	9	9	21	289	325	1,179	35,513	70,292	8,310	120,266
2000	5,089	19	26	45	397	433	1,443	34,479	70,015	8,310	120,256
SOUTH RIVER TOTALS											
1980	44,445	6,572	5,133	4,371	3,667	4,784	14,177	92,608	196,031	23,204	394,992
1990	52,686	10,737	5,694	5,629	5,090	6,975	18,246	81,772	184,970	23,200	395,003
2000	58,805	15,604	7,719	7,034	5,785	7,895	21,991	73,352	173,605	23,204	394,994
YELLOW RIVER											
WQMU#0406											
1980	11,533	577	629	1,734	414	3,699	3,726	11,372	52,970	5,355	92,009
1990	14,296	1,383	1,213	2,213	764	4,104	5,392	10,296	46,999	5,355	92,015

TABLE 36

PROJECTED FUTURE LAND USE BY WQMU & SUB-BASIN - - 1980, 1990 & 2000(continued)

	LAND USE										
	Single Family	Multi-Family	Commer-cial	Indus-trial	Public	Parks	Trans-portation	Agri-culture	Silva	Unsuitable	TOTAL
YELLOW RIVER(cont.)											
WQMU#0406											
2000	17,404	2,823	2,021	3,921	948	4,444	6,137	9,937	40,015	5,355	92,005
WQMU#0407											
1980	5,828	126	214	273	340	902	1,741	33,528	58,351	4,863	106,166
1990	7,629	373	488	437	435	1,624	2,622	32,074	55,622	4,863	106,167
2000	9,804	730	848	729	478	1,890	3,928	30,248	52,650	4,863	106,168
WQMU#0408											
1980	3,121	83	147	651	294	376	1,284	12,106	23,455	1,703	43,220
1990	4,547	281	310	757	359	748	1,400	10,598	22,513	1,703	43,216
2000	5,888	607	492	965	467	903	1,582	8,869	21,740	1,703	43,216
WQMU#0409											
1980	2,581	345	334	250	1,137	146	461	12,242	26,545	1,640	45,681
1990	3,467	537	522	401	1,357	169	525	11,708	25,352	1,640	45,678
2000	4,238	749	673	564	1,549	196	685	11,484	23,900	1,640	45,678
YELLOW RIVER TOTALS											
1980	23,063	1,131	1,324	2,908	2,185	5,123	7,212	69,248	161,321	13,561	287,076
1990	29,939	2,574	2,533	3,808	2,915	6,645	9,939	64,676	150,486	13,561	287,076
2000	37,334	4,909	4,034	5,179	3,442	7,433	12,332	60,538	138,305	13,561	287,068
ALCOVY RIVER											
WQMU#0410											
1980	3,826	42	28	14	911	1,009	378	43,835	83,846	6,250	140,139
1990	5,353	56	42	28	1,009	1,009	448	42,617	83,327	6,250	140,139
2000	7,175	70	56	42	1,093	1,009	448	41,215	82,781	6,250	140,139
WQMU#0411											
1980	1,777	4	4	4	125	99	505	7,645	27,312	5,644	43,119
1990	2,083	22	9	4	134	181	617	7,563	26,864	5,644	43,121
2000	2,264	39	13	9	138	198	845	7,537	26,433	5,644	43,120

TABLE 36

PROJECTED FUTURE LAND USE BY WQMU & SUB-BASIN - - 1980, 1990 & 2000

	LAND USE										
	Single Family	Multi-Family	Commer-cial	Indus-trial	Public	Parks	Trans-portation	Agri-culture	Silva	Unsuitable	TOTAL
LAKE JACKSON											
WQMU#0412											
1980	625	3	6	3	217	364	600	5,636	10,288	10,057	27,799
1990	725	3	6	3	225	403	648	5,522	10,199	10,057	27,791
2000	786	6	8	3	258	422	709	5,489	10,052	10,057	27,790
ALCOVY RIVER TOTALS											
1980	6,228	49	38	21	1,253	1,472	1,483	57,116	121,446	21,951	211,057
1990	8,161	81	57	35	1,368	1,593	1,713	55,702	120,390	21,951	211,051
2000	10,225	115	77	54	1,489	1,629	2,002	54,241	119,266	21,951	211,049

Note: all figures are in acres.

TABLE 37

YELLOW RIVER -- PROJECTED FUTURE LAND USE BY RIVER, WQMU & SUB-DRAINAGE BASIN
1980, 1990 & 2000

	Acres	[Rounded Square Miles	Acres]	1980 Single Family	Multi= Family	Commer- cial	Indus- trial	Open	
WQMU # 0406									
Stone Mt. Creek	18,969.79	29.64	18,970	1,910	129	118	499	16,312	
0406B	11,461.58	17.91	11,460	2,303	28	42	49	9,037	
Jackson Creek	12,602.10	19.69	12,600	2,633	180	134	281	9,372	
Bromolow Creek	14,490.37	22.64	14,490	1,975	172	187	514	11,643	
Sweetwater Creek	14,936.72	23.34	14,940	1,123	33	64	254	13,464	
0406A	18,156.86	28.38	18,160	1,415	25	74	120	16,526	
Omit	1,386.87	2.17	1,390	174	10	10	17	1,180	
Sub-Total	92,004.23	143.77	92,010	11,533	577	629	1,734	77,534	
							GRAND TOTAL	92,007	
WQMU # 0407									
No Business Creek	8,656.96	13.53	8,660	378	5	10	8	8,259	
0407A	30,511.07	47.67	30,510	2,435	70	116	122	27,767	
0407B	13,335.38	20.83	13,330	589	3	13	68	12,656	
Big Haynes Creek	53,673.35	83.86	53,670	2,426	48	75	75	51,046	
Sub-Total	106,176.76	165.89	106,170	5,828	126	214	273	99,728	
							GRAND TOTAL	106,169	
WQMU # 0408									
0408B	5,414.11	8.45	5,410	487	18	32	233	4,640	
0408A	19,213.19	30.02	19,210	2,061	60	111	415	16,563	
0408C	7,938.62	12.41	7,940	248	3	2	2	7,684	
0408D	10,664.52	16.66	10,660	325	2	2	1	10,330	
Sub-Total	43,230.44	67.54	43,220	3,121	83	147	651	39,217	
							GRAND TOTAL	43,219	
WQMU # 0409									
0409A	5,898.17	9.22	5,900	493	55	62	57	5,233	
Gun Creek	19,520.35	30.50	19,520	463	10	12	16	19,020	
Dried Indian Creek	9,855.82	15.41	9,860	1,307	279	258	176	7,839	
0409B	10,397.82	16.25	10,400	318	1	2	1	10,079	
Sub-Total	45,672.16	71.38	45,680	2,581	345	334	250	42,171	
							GRAND TOTAL	45,681	GRAND TOTAL
GRAND TOTAL	287,083.59	448.56	287,080	23,063	1,131	1,324	2,908	258,650	287,076.

TABLE 37

YELLOW RIVER -- PROJECTED FUTURE LAND USE BY RIVER, WQMU & SUB-DRAINAGE BASIN

1980, 1990 & 2000

	1990					2000				
	Single Family	Multi Family	Commer-cial	Indus-trial	Open	Single Family	Multi Family	Commer-cial	Indus-trial	Open
WQMU # 0406										
Stone Mt. Creek	2,546	319	249	486	15,373	3,291	605	391	637	14,045
0406B	2,417	113	103	97	8,728	2,450	174	176	163	8,494
Jackson Creek	2,781	333	222	379	8,887	3.048	673	315	479	8,084
Bromolow Creek	2,402	354	317	659	10,756	2,839	732	478	804	9,637
Sweetwater Creek	1,851	142	148	375	12,424	2,531	350	291	498	11,271
0406A	2,092	104	156	191	15,618	2,989	251	340	305	14,274
Omit	207	18	18	26	1,122	256	38	30	35	1,031
Sub-Total	14,296	1,383	1,213	2,213	72,908	17,404	2,823	2,021	2,921	66,836
				GRAND TOTAL	92,013					92,005
WQMU # 0407										
No Business Creek	474	18	26	17	8,125	611	35	62	43	7,908
0407A	3,097	150	247	207	26,809	3,991	272	430	363	25,451
0407B	849	55	33	84	12,309	1,177	171	88	135	11,760
Big Haynes Creek	3,209	150	182	129	49,999	4,025	252	268	188	48,936
Sub-Total	7,629	373	488	437	97,242	9,804	730	848	729	94,055
				GRAND TOTAL	106,169					106,166
WQMU # 0408										
0408B	866	63	78	260	4,143	1,195	128	111	333	3,643
0408A	3,041	209	225	492	15,241	4,005	467	371	624	13,741
0408C	299	6	4	3	7,628	326	8	6	5	7,595
0408D	341	3	3	2	10,310	362	4	4	3	10,286
Sub-Total	4,547	281	310	757	37,322	5,888	607	492	965	35,265
				GRAND TOTAL	43,217					43,217
WQMU # 0409										
0409A	765	178	173	110	4,675	990	193	214	126	4,376
Gun Creek	560	20	25	31	18,884	695	29	45	68	18,683
Dried Indian Creek	1,822	337	320	258	7,122	2,343	524	409	367	6,218
0409B	320	2	4	2	10,071	210	3	5	3	10,178
Sub-Total	3,467	537	522	401	40,752	4,238	749	673	564	39,455
				GRAND TOTAL	45,679					45,679
GRAND TOTALS	29,939	2,574	2,533	3,787	248,234	37,334	4,909	4,034	5,179	235,611
								GRAND TOTAL		287,067

Gwinnett County, with the second highest percentage of growth in the Region will continue to grow. However, significant growth for Loganville and Monroe is not anticipated for some time, due in part to their distance from the Atlanta Core, smaller employment opportunities, and general economic situation.

Interstate 85 Corridor

The I-85 corridor that travels northwest through the upper reaches of WQMU #0406 in Gwinnett County combined with Georgia 316 has had significant impact on the area. Georgia 316, built to interstate standards to a point just west of Lawrenceville, is proposed for extension to the east side of Lawrenceville. This corridor provides connection to an area of heavy concentration of commercial/industrial activity in and around the I-285 belt in the north portion of DeKalb County. The most significant growth in the Basin is projected to occur in this corridor.

Yellow River Sub-Basin Future Land Use

The future land use map for the Yellow River Sub-basin (Figure 26) delineates community centers (incorporated places with mixed land uses), suburban (low to medium density areas with service, commercial, and recreational uses), industrial (heavy concentrations of industrial including quarries), and recreational (major camp sites, parks, etc.).

For the purposes of developing future land uses in the Sub-basin, the ARC Land Use Forecast was used where applicable. Forecast District Allocations were assigned to WQMUs and Drainage Sub-basins and then mapped based on transportation corridor, economic and population projection and environmental considerations. For county areas and incorporated places outside ARC jurisdictions, analysis of previously prepared plans and implementation programs served as part of the basis for land use map delineations.

The combination of quantified land use numbers and growth-inducing or deterring factors such as flood plains, prime agricultural lands, lack of water and sewer service programs and population and economic projections was the primary basis for land use mapping.

An analysis of zoning trends for Gwinnett County, ARC 1976, indicates a surge towards non-residential rezonings, wherein non-residential and residential rezoned acres are almost identical. Recognizing that the rural population for Gwinnett County increased 73.5 percent compared to the urban population (Table 24), the historic growth pattern of the exodus from the western, more industrial/commercial portion of the county to the suburbs is evident. The transportation corridors previously discussed, U.S. 78 and I-85, are probably more responsible for this shift than any other factor. What has been commonly called the urban fringe of Atlanta will continue to expand over the planning period. However, it is not anticipated that this fringe and the Lawrenceville fringe will meet.

The City of Snellville is anticipated to accept a portion of new growth in the Sub-basin due in part to an improved U.S. 78, while the Loganville area, further east, should not increase in any category to any major extent. The latter premise is based primarily on considerations of economic and available services. Both WQMUs #0406 and #0407 are targets for careful considerations relative to increased growth proposals.

The southeasterly portion of DeKalb County and the north portion of Rockdale County fall within WQMU #0408. Due to the previously mentioned impact of the I-20 corridor, this portion of WQMU #0408 is subject to tremendous growth in residential, commercial and industrial usage. Industrial growth in this area is supported by not only the impact of I-20, but also the Georgia Railroad and availability of water. Rockdale County had the highest percentage of population growth in the Yellow River Sub-basin (71.7 percent) between 1960 and 1970 of all of the Study Area counties. This trend is expected to continue.

The City of Covington in Newton County, which is situated in WQMU #0409 can be compared directly with the City of Conyers, both lying within the I-20 and Georgia Railroad corridors. Expansion of this area will occur to the west along the corridor and, in all probability, will join the easterly expansion of the City of Conyers. The effect of this corridor influence could become overpowering. There is no reason to doubt the eventuality of this suburban mixed use spine in part due to the frontage/service road feature of I-20, which parallels the route for almost the entire length. The community of Porterdale will also feel the impact of this growth although not as quickly.

Residential Growth

High-density growth within the Yellow River Sub-basin will occur in and around the existing city core, but not to the extent of its growth within the urban fringe. WQMU #0406, in both DeKalb and Gwinnett Counties, will become the environment for higher density residential uses as the suburban exodus continues and the area becomes more and more urban with increased industrial/commercial growth.

Low-density development will find its way throughout the Sub-basin but will still be influenced by convenient transportation, places of work, shopping and entertainment. Location of residential growth will also be affected by water and sewer policies of governmental units. Greater restrictions on use of septic tanks will slow development, while increased sanitary sewer service will tend to reduce lot sizes and increase densities.

Commercial

Commercial growth will continue in the incorporated areas and in the more urban portions of the Sub-basin. Increased residential densities and improved transportation systems will generate more retail and wholesale commercial activity. Proper planning and development controls should keep the transportation corridors clear of major "strip commercial" developments. As previously mentioned, the I-20 corridor is a prime target for this type of development. The future land use plan is based on the recognition of more sophisticated approaches to development and, therefore, does not anticipate a "strip commercial" character.

Industrial

Industrial growth, like commercial growth, will occur along the major transportation corridors in and around the urban fringe and established cities. The heaviest concentration of industrial land use is expected to continue to be in WQMU #0406 with a lighter growth in WQMU #0408, although all are desirous of attracting new industries. The continued extension of the industrial/warehouse activity associated with the I-85/Peachtree-Industrial spine is perhaps the most meaningful development influence in the Basin. While this development occurs in the extreme northern reaches of the Yellow River Basin, the employment opportunities combined with its unparalleled accessibility account for the greatest development increases portrayed in the headwater areas of the basin. The Future Land Use Plan, Figure 26, for the Yellow River does not anticipate any new major industrial growth in the outlying WQMUs #0407 and #0409.

Recreation

Two major recreational areas are proposed in the Yellow River Sub-basin. One on the Yellow River in DeKalb County in WQMU #0407 and another in Rockdale County at the Walton County line, also in WQMU #0407. Of course, one of the major benefits of a Water Quality Management Program and possibly one of the results of this effort will be the return of portions of the Yellow River and its contiguous land area to recreational use. Once accomplished, the Yellow River will be the major recreational land use in the Sub-basin.

Existing major facilities include Stone Mountain Memorial State Park and Julian Harris Park, both in WQMU #0406.

B.3 ARCHAEOLOGICAL, CULTURAL, HISTORIC AND RECREATIONAL RESOURCES

In the same sense that water, air and earth are nonrenewable natural resources whose abuse and pollution can endanger the physical existence of man, the historical and archaeological remnants of human existence are nonrenewable man-made resources whose destruction can threaten the social and spiritual culture of humankind. In the same manner in which a legal framework has been established in recent years on the national level to protect the natural environment, a similar framework has been established to provide a measure of protection to the nation's cultural resources. Governmental agencies at both the state and federal level have been charged with implementing legislation designed to protect the natural and cultural environment.

As early as 1909, the Congress enacted legislation which placed upon federal agencies the responsibility for protecting the nation's cultural resources. However, it was not until the last decade that this responsibility was broadened to include not only federal projects but also all federally assisted and licensed projects. Since municipal governments must often apply for federal assistance to undertake necessary planning and capital improvements, it is these latest federal requirements that are most applicable:

National Historic Preservation Act of 1966

Public Law 89-665 (80 Stat. 915) provides for an expanded National Register of Historic Places to register districts, sites, buildings, structures and objects significant in American history, architecture, or local significance. This act further provides the funding for the State Historic Preservation Officer and his staff to conduct historical surveys and comprehensive preservation planning.

Of particular importance to municipalities is Section 106 of this Act. Section 106 requires that federal agencies having direct or indirect jurisdiction over a proposed federal, federally assisted, or federally licensed undertaking prior to approval of the expenditure of funds or the issuance of a license, take into account the effect of the undertaking on any district, site, building, structure, or object included in the National Register. They must then afford the Advisory Council on Historic Preservation a reasonable opportunity to comment with regard to the undertaking. The Advisory Council, created by this Act, is appointed by the President and has implemented procedures to facilitate compliance with this provision.

Executive Order 11593, Protection and Enhancement of the Cultural Environment 16 U.S.C. 470 (Supp. 1, 1971)

This Executive Order requires federal agencies to take a leadership role in the preservation of the nation's cultural resources. This is to be accomplished through two principal sources. First, for all property under federal jurisdiction or control, federal agencies must survey and nominate all properties of cultural significance to the National Register while at the same time maintaining and preserving them.

Second, and most important, for every action funded, licensed, or executed by the federal government, the agency involved must determine if any property in the impacted area is eligible for the National Register. In short, the National Register criteria must be applied to every such project in order to take into account any item heretofore unidentified as being eligible for inclusion on the National Register. The Executive Order then, in conjunction with the National Historic Preservation Act of 1966, requires federal agencies to address both properties on the National Register and also those eligible for inclusion on the National Register. This is further clarified below in the discussion of the Advisory Council's procedures.

The criteria of eligibility have been specifically defined and codified (36 CFR 60) as follows:

The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feel and association, and:

A. that are associated with events that have make a significant contribution to the broad patterns of our history; or

B. that are associated with the lives of persons significant in our past; or

C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinquishable entity whose components may lack individual distinction; or

D. that have yielded or may be likely to yield, information important to prehistory or history.

Generally, cemeteries, birthplaces or graves of historic figures, properties owned by religious institutions or used for religious purposes, structures moved from their original locations, reconstructed buildings, properties primarily commemorative in nature, and properties less than fifty years old are not eligible for inclusion unless they form an integral part of a district.

<u>National Environmental Policy Act, Public Law 91-190 42 U.S.C. 4321 Et. Seq. (1970)</u>

This legislation obligates federal agencies to prepare an environmental impact statement for every major federal action affecting the natural and man-made environment in order that they might exercise their responsibility:

> to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources to the end that the nation may . . . preserve important historic, cultural, and natural aspects of our national heritage . . . (Section 101 (b) (4)).

The federal government further reinforces this position in its codification of "Council on Environmental Quality Guidelines for the Preparation of Environmental Impact Statements" (40 CRF Part 1500). The environmental impact statements must include the comments of the Advisory Council on Historic Preservation as Section 1500.9 directs federal agencies to combine, to the extent possible, statements or findings concerning environmental impact required by other authorities such as Section 106 of the National Historic Preservation Act and Executive Order 11593.

<u>Procedures for the Protection of Historic and Cultural Properties (36 CFR 800)</u>

In accordance with the requirements placed on federal action by the above referenced mandates, the Advisory Council, an independent agency of the Executive Branch, has promulgated procedures which must be followed in order to insure compliance with these authorities. According to these procedures, the responsible agency official must take several steps. First, at the earliest state of planning or consideration of a proposed undertaking -- "as early as possible and in all cases prior to agency decision concerning an undertaking" -- the agency official shall identify properties in the area of impact that are included in or are eligible for inclusion in the National Register. In order to identify properties already listed, the National Register and monthly supplements can be consulted. To identify properties eligible for the National Register, it is often necessary to conduct a professional cultural resource investigation of the project area.

For properties identified as a result of this investigation, the agency official must be in consultation with the State Historic Preservation Office to apply the National Register criteria. If a property appears to meet the criteria, or it is questionable whether the criteria is met, a formal determination of eligibility must be sought in writing from the Secretary of the Interior.

For those properties in the project area that are in or found to be eligible for inclusion in the National Register, the agency official must proceed to the second step in the Advisory Council's procedures -- determination of effect. For those properties the agency official, in consultation with the State Historic Preservation Office, must determine if the project will have an effect on the properties, and if so, whether the effect is adverse or not. According to Section 800.9:

Generally, adverse effects occur under conditions that include but are not limited to:

(a) destruction or alteration to all or part of a property;

(b) isolation from or alteration of its surrounding environment;

(c) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting . . . (and) . . .

(d) neglect of a property resulting in its deterioration or destruction.

If it is found that project plans will have an adverse effect to properties on or eligible for the National Register, the agency official must then complete the Advisory Council's procedures. This consists primarily of a consultation process between the agency official, the State Historic Preservation Officer and the Advisory Council designed to investigate "feasible and prudent alternatives to satisfactorily avoid or mitigate the adverse effect." It should be emphasized that the National Register, as interpreted by the Advisory Council's procedures, is a planning tool. Final project decision rests with the agency official -- not with the Advisory Council nor the State Historic Preservation Officer. Compliance with these procedures, however, does insure that valuable cultural resources do receive the attention they warrant during the project planning stages.

Historic Sites

The following list (Table 38) includes historical sites that are on the National Register of Historic Sites or are proposed by Georgia Historic Trust to be included on the National Register.

In Atlanta, much of the early architecture was destroyed by Sherman's March to the Sea. The majority of sites, therefore, date in the 1800s and early 1900s. Many anti-bellum homes are included in Table 38, most of which are located outside the present Atlanta metro area. Other notable sites on the register include Cyclorama Museum, the State Capitol and the Old Seminary Building in Lawrenceville.

While not included on the Historic Register, there are several mill sites that are considered important historical sites. During the 1800s and 1900s much of the Upper Ocmulgee River Basin relied on agriculture and agricultural related business as the major source of revenue. These businesses, including lumber cutting, cabinet making, etc., all created demands on mill operations. Today none of the mills are in operating condition, but several foundations are still in existence.

TABLE 38

UPPER OCMULGEE RIVER BASIN
RECREATION FACILITIES

COUNTY	FACILITY	USE	AREA 1/ (acres) Existing	Proposed
Butts	Jackson Lake	Water Resources	4,059	-
Clayton	-	-	-	-
DeKalb	Stone Mountain Memorial Park	Active Recreation	5,407	3,893
	Soap Stone Ridge	Archeological Preserve	-	243
Clayton	Big Cotton Indian Creek	Archeological & Nature Preserve	-	825
Fulton	-	-	-	-
Gwinnett	Yellow River Corridor	Nature Preserve	-	403
Henry	Green Valley Golf Course	Golf	200	-
Jasper	Jackson Lake	Water Resources	4,059	-
Newton	Burt Adams Boy Scout Camp	Active Recreation	1,850	-
	Salem Campground	Active Recreation	80	-
	Poterdale Golf Course	Golf	246	-
	Ulcoufahatchee Natural Area Alcovy River	Nature Preserve	200	-
	State FFA and FHA Camp	Active Recreation	273	-
	Berry's Boat Dock	Active Recreation	50	-
Rocksdale	Panola Mountain State Park	Active Recreation	-	536
		TOTAL	12,365	5,900

1/ Parks facilities described are 50 acres or larger

TABLE 38

HISTORICAL SITES IN THE UPPER OCMULGEE RIVER BASIN

1. Cyclorama, Grant Park, Cherokee Ave., Atlanta, Fulton Co.
2. State Capitol, Capitol Square, Atlanta, Fulton Co.
3. Old Seminary Building, Perry St., Lawrenceville, Gwinnett Co.
4. Jonesboro Historic District, Jonesboro, Clayton Co.
5. Orna Villa, 1008 North Emory St., Oxford, Newton Co.
6. Soapstone Ridge, Atlanta, DeKalb Co.
7. The Texas, Cyclorama Museum, Grant Park, Atlanta, Fulton Co.
8. Staff Row and Old Post Area, Ft. McPherson, Atlanta, Fulton Co.
9. Floyd Street Historic District, Covington, Newton Co.
10. Oxford Historic District, Oxford, Newton Co.
11. Atlanta & West Point Railroad Freight Depot, Atlanta, Fulton Co.
12. Craig House, Gwinnett Co.
13. Billue Homeplace, Gwinnett Co.
14. Webb House, Gwinnett Co.
15. Sawyer House, Gwinnett Co.
16. Cooper Homeplace, Gwinnett Co.
17. Upshow Store, Gwinnett Co.
18. Rockbridge Baptist Church, Gwinnett Co.
19. Maguire House, Gwinnett Co.
20. Armstrong Bridge, Gwinnett Co.
21. Wynn House, Gwinnett Co.
22. Pentecost House, Gwinnett Co.
23. Old Masonic Lodge, Gwinnett Co.
24. Old Poorhouse Site, Gwinnett Co.

Note: Refer to location on Figure 24.

TABLE 38 (continued)

ARCHAEOLOGICAL SITES IN THE UPPER OCMULGEE RIVER BASIN

SITE NO.	SITE TYPE	MATERIALS OR ARTIFACTS
1.	Village & campsite	Stamped, sherds, stone tools
2.	Village	Ceramic collection
3.	Campsite	
4.	Campsite	Worked stone
5.	Campsite	Quartz lithics
6.	Campsite	Quartz lithics
7.	Campsite	Quartz & chert lithics
8.	Campsite	Quartz lithics
9.	Village & campsite	Lithics & ceramics
10.	Village & campsite	Lithics & ceramics
11.	Campsite	Quartz lithics
12.	Village & campsite	Potsherds & lithics
13.	Campsite	Quartz lithics
14.	Village	Quartz bifaces, beryl & quartz crystals, chert & quartz flakes
15.	Campsite	Quartz & chert bifaces, chert flakes, quartz debitage, glass & porcelain fragments, steatite & sand tempered plain sherd
16.	Campsite, Lithic Station	Napier Complicated Stamped, diabase hoe & spalls, patinated flint end-scraper & flakes, quartz biface; quartz & quartzite debitage
17.	Campsite	Stemmed projectile points
18.	Campsite	Quartz biface fragments, quartz & chert flakes, retouched quartz & chert flakes, quartz unifacial side scraper
19.	Campsite	Quartz triangular knife, uni-facial tool fragment, chert projectile point, bifaces, flakes, steatite bowl fragment
20.	Campsite	Quartz bifaces, quart spokeshave, quartz retouched flake, chert utilized flake, chert & quartz flakes, basalt fragment
21.	Campsite	Chert flakes & tools, quartz flakes, sand tempered pottery, Savannah River projectile point base
22.	Campsite	Quartz & chert bifaces, quartz & chert & diabase flakes, ground diabase fragment
23.	Campsite	Quartz lithics
24.	Campsite	Quartz tools & flakes, chert tools & flakes
25.	Campsite	Cartersville check stamped pottery, steatite sherd, chert, quartz tools & flakes
26.	Campsite	Quartz tools & flakes (Quartz biface fragments, unifacial scraper)
27.	Village & campsite	Artifacts
28.	Campsite	Material found on small hill
29.	"Shepard"	2 sections of grist mill & other material found in creek
30.	Site destroyed	
31.	Village	
32.	Campsite	Quartz chips & partial projectile points
33.	Soapstone Quarry	
34.	Village	

TABLE 38 (concluded)

35.	Campsite	Reconstructable steatite bowl fragment
36.	Village	
37.	Lithonia (Village)	
38.	Village	
39.	Village	Site destroyed
40.	Village	Stamped and punctated sherds
41.	Village	
42.	Duncan site	
43.	Campsite	Large quantity of workable quartz, bifacially flaked quartz artifacts
44.	Troup-Hurt House	
45.	Campsite	
46.	Battle of Atlanta Area	2 bullts, belt buckle, shell casing
47.	Village	Redeposited fill dirt
48.	Noah's Arch Meth. Church	
49.	Allen-Carnes Plantation House	
50.	Dorsey Plantation	
51.	Rex Mill	
52.	Civil War Trench	
53.	Orr Site	
54.	Civil War Trench	
55.	Pates Creek - Village	Sparse lithic and ceramic remains
56.	Village	Scattered lithic debris & potsherds
57.	Neal Site Campsite	Quartz chips and chert flakes
58.	Village	Quartz chips
59.	Front Road Site	Chert flake & numerous pieces of chert-like material
60.	Campsite	Potsherd and lithic material
61.	Campsite	Quartz lithic material
62.	Campsite	Quartz and lithic materials
63.	Campsite	Flints, quartz lithic debris
64.	Campsite	Quartz lithic material
65.	Campsite	
66.	Campsite	
67.	Campsite	1 chipped stone projectile point
68.	Campsite	Workable quartz
69.	Workshop & Quarry	Large bowl collection
70.	Campsite	Artifacts, abundance of workable quartz
71.	Campsite	Workable quartz

Note: Refer to location on Figure 24.

There is still a great deal that remains to be done in relation to historic preservation in the Upper Ocmulgee River Basin. While a great effort has been made in many areas of the Basin to identify and research historic sites, many of these important sites have not been included on the National Register of Historic Sites, and a great deal of consideration should be given these areas when developers or the State propose any type of extensive change in the land use. Additional historic sites will be included when they are provided by the Georgia State Historic Preservation Office.

Archaeological Sites

Included in the Upper Ocmulgee River Basin is Soapstone Ridge, one of the largest and best preserved aboriginal steatite quarries in the southeastern United States and the only archaeological site on the National Register in the Basin. Aboriginal remains found on Soapstone date to the Archaic Period (3000 B.C. - 1500 B.C.). Other remains date to the more recent Woodland Period (1000 B.D. - 700 A.D.). The significance of this area is in the soapstone rock that was used to make bowls, tools, carvings, pipes and gorgets.

The majority of the sites listed at the Archaeology Laboratory of the University of Georgia are campsites and villages. Campsites and villages are sites where human habitation occurred on a temporary to seasonal basis. Campsites are distinquished by finds of quartz projectiles, which are commonly known as spear and arrowheads and potsherds, which are pottery fragments. Villages contain projectiles as well as pottery remains.

Much of the archaeological sites are located on or near water. The importance of locating near water wasn't only to have a source of potable drinking water, but to have a source of food. It is suggested that fish dams were located along streams in the Study Area, but none have been positively identified.

Locations of existing known sites are shown on Figure 27 . Even though there are a considerable number of sites recognized, the lack of funding and personnel to search and survey have prevented a thorough evaluation of archaeological sites.

During September 1972 the Georgia Department of Natural Resources placed the Yellow River Basin on the Heritage Trust list of historic, scenic, and recreational areas. This recognition requires that notice be given when a known historic or natural feature is to be destroyed to permit evaluation of preservation alternatives. This designation to the Heritage Trust list does not prevent ultimate destruction and to date has not purchased any sites for preservation.

Federal law is specific with respect to archaeological resources. Federal projects must meet the Standards of Antiquity Act of 1906 (P.L. 59-209), the Historic Preservation Act of 1969 (P.L. 88-665), the National Environmental Policy Act (P.L. 91-190), and the Executive Order 11593. Public Law 93-291 provides federal funding to undertake the recovery, protection and preservation of significant scientific, prehistoric or archaeological resources associated with any federal construction project. These funds are available for such items as preliminary surveys or other investigations as necessary, but must not exceed one percent of the total project cost.

As noted earlier, there is only one archaeological site in the Upper Ocmulgee River Basin on the Historic Register. Efforts are being made by the State Archaeologists as well as other prominent archaeologists in the State, however, to have other important sites preserved in this matter.

Source: Yellow River Basin and Its Environment and Land Use, prepared by DeKalb County Planning Department, Gwinnett County Upper Yellow River Step II Grant Application, Environmental Assessments of Historic and Archaeological Resources Policy and Procedures of the Georgia State Historic Preservation Office, Historic Preservation Section DNR.

Recreation Facilities

Recreation facilities within the Upper Ocmulgee River Basin are scattered throughout the Basin and range from semi-wilderness areas to golf courses. The distribution of the facilities by county are displayed on Table 38 , which also describes the area size and character of its development. Areas discussed were limited to recreational facilities of fifty acres or more. Because of this restriction, Clayton and Fulton Counties are shown as not having any recreational areas within the Basin. The total acres of the facilities surveyed is 12,365 existing and 5,900 projected for acquisition.

The types of recreational development have been aggregated into general categories of recreational activity. This approach was employed because of the scale of the Basin and the weight of the importance of recreation within the scope of the study. Categories used include water resources, active recreation, passive recreation, nature preserves, archaeological preserves and golf courses. Butts and Jasper Counties adjoin the shore line of Jackson Lake, a water resource of the Basin. Active recreation areas are found at Stone Mountain Memorial Park, DeKalb County, Burt Adams Boy Scout Camp, Salem Campgrounds, Georgia State FFA and FHA Camp and Berry's Boat Dock in Newton County. Panola Mountain State Park is proposed to provide active recreation in Rockdale County. Archaeological and nature preserves are proposed for Soapstone Ridge and Big Cotton Indian Creek in Clayton County, and Yellow River Corridor in Gwinnett County. A nature preserve now exists at Ulcoufahatchee Nature Area, Alcovy River in Newton County. Public golf courses are located at Green Valley in Henry County and Porterdale in Newton County. The location for these recreational facilities are displayed on the accompanying Figure 27

Source: Georgia Department of Natural Resources Division of Planning and Research, Narrative Plan Volume II Regional Analysis, Georgia State Comprehensive Outdoor Recreation Plan, 1972; Atlanta Regional Council, ARC Staff Recommended Nature Preserve Sites, First and Second Priority Nature Preserve (acquisition prior to 1980), October 1976.

B.4 TRANSPORTATION

The Upper Ocmulgee River Basin includes three APDCs (Area Planning and Development Commissions) including Northeast Georgia, Atlanta Regional Commission, McIntosh Trail and a small section of the Oconee APDC.

The interrelationship between transportation and growth in an area is important due to the fact that once a mode of transportation is provided or significantly improved, growth generally follows at a proportionately higher rate than the transportation facilities. It is necessary to recognize growth patterns and enforce a land use plan that will enable transportation facilities to support the planned growth rather than trying to provide for urban sprawl.

Highways

Despite the construction and continual improvement of highways to accommodate increased demand, peak hour congestion continues to be a major problem. It now appears that constructing facilities to relieve congestion results in a vicious cycle of stimulating the growth which causes congestion on the very facilities designed to relieve the problem.

Highways are a man-made part of our environment and the pollution associated with their use is a concern. Transportation planners are striving to avoid scenic encroachments and minimize the effect of air and noise pollution. In all of DOT's activities, it must strike a realistic balance between environmental protection and the requirements for a functional efficient highway system.

Append.39 indicates the ingress and egree patterns as well as the intracounty commuting patterns for counties located in the Upper Ocmulgee River Basin for the years 1960 and 1970.

The pattern of commuting of Append 39 shows that the only counties in the Basin area with a positive net commuting figure (more cars entered than left) are Fulton and DeKalb. This would indicate that these counties will experience a less desirable air quality than the counties farther from Atlanta and more urbanized areas.

There are four major highways serving the Upper Ocmulgee River Basin:

<u>1-20</u>: This interstate highway runs east to west across the entire Upper Ocmulgee River Basin and connects Atlanta with Columbia, South Carolina to the east and Birmingham, Alabama to the west. There has been consideragle growth along this corridor as seen in the population tables (Table 24).

<u>I-75</u>: The most extensive interstate routing through Georgia is Interstate 75, connecting Chattanooga with Florida near Valdosta. The interstate runs through the westernmost tip of the South River Basin through

TABLE 39

Commuting Patterns for Counties Located in the Upper Ocmulgee River Basin, 1960-1970

	1960						1970					
COUNTY	INTRA COUNTY	OUT COMMUTING	IN COMMUTING	NET COMMUTING	NOT REPORTED	COMM. RATE	INTRA COUNTY	OUT COMMUTING	IN COMMUTING	NET COMMUTING	NOT REPORTED	COMM. RATE
Butts	2351	-646	87	-559	88	-23.0%	2159	-1111	374	-737	356	-29.1%
Clayton	4772	-11205	4541	-6664	364	-71.6%	11566	-25522	9836	-15686	2171	-75.3%
DeKalb-Fulton	284579	-15048	50460	35412	18197	10.5%	262420	-123782	205603	81821	35650	17.4%
Gwinnett	7094	-7578	1154	-6424	393	-77.9%	9400	-17476	4503	-12973	1750	-93.4%
Henry	2907	-2578	470	-2108	120	-62.5%	3026	-4425	1510	-2915	980	-64.3%
Jasper	1672	-293	42	-256	31	-15.0%	1173	-718	190	-528	195	-38.8%
Newton	6182	-1559	438	-1121	158	-17.0%	6227	-2911	958	-1953	842	-27.2%
Rockdale	2452	-1155	662	-493	118	-15.9%	2834	-3325	1487	-1838	674	-42.6%
Walton	6362	-1304	551	-753	272	-10.9%	5841	-2490	848	-1642	1062	-24.6%

APPENDIX 39

PROPOSED HIGHWAY IMPROVEMENTS FOR THE YELLOW RIVER SUB-BASIN

DEKALB

PROJECT NUMBER / COUNTY / ITEM NUMBER	LOCAL NAME	LIMITS	PROJECT DATA	ANTICIP. AUTH. DATE
RF-195-1-1	COVINGTON HIGHWAY	FROM-PANOLA ROAD	TYPE-WORK--WIDEN & RECONSTRUCT	PE 0275
DEKALB			LENGTH----- 3.4MI	ROW 0177
720270	PE# RF - 046-1- 9-	TO-STATE ROUTE 124 SW	CONG.DIST.-04 PRIORITY SCORE 67.00	
FORMULA	US-278 SR- 12	OF LITHONIA	STATUS-----PRE-CONSTRUCTION STAGE 0578	
RF-F-195-1-2	COVINGTON HIGHWAY	FROM-PERIMETER HWY(I-285)	TYPE-WORK--WIDEN & RECONSTRUCT	PE 0676
DEKALB	(WAS MLP 12 (19)		LENGTH----- 4.5MI	PE 0676
720271	PE# RF - 046-1-15-	TO-PANOLA ROAD	CONG.DIST.-04 PRIORITY SCORE 66.00	ROW 0677
FORMULA	US-278 SR- 12		STATUS-----PRE-CONSTRUCTION STAGE 1178	ROW 0677
F-195-1-3	COVINGTON HWY,SR 12	FROM-MEMORIAL DRIVE	TYPE-WORK--RECONSTRUCTION	PE 0676
DEKALB	(WAS MLP 12(14)		LENGTH----- 1.8MI	ROW 0677
720272	PE# FF - 046-1-14-	TO-I-285	CONG.DIST.-04 PRIORITY SCORE 66.00	
FORMULA	US-278 SR- 12		STATUS-----PRE-CONSTRUCTION STAGE 1177	
I-20-2-71	CT.1: AUGUSTA FWY	FROM-I-285 IN DEKALB CO.	TYPE-WORK--WIDEN ONLY	PE 0277
DEKALB			LENGTH----- 8.7MI	CST FY78
711290	PE# I - 20-2-71-	TO-W.OF TURNER HILL RD	CONG.DIST.-04	
NON-FORMULA	SR-402	(ADD LANES;MED.BAR)	STATUS-----ADVANCE PLANNING STAGE	
I-20-2-71	CT.2:AUGUSTA FWY	FROM-W.OF TURNER HILL RD	TYPE-WORK--WIDEN ONLY	CST FY78
DEKALB	(& ROCKDALE CO)		LENGTH----- 6.8MI	
711291	PE# I - 20-2-71-	TO-EAST OF SR 138	CONG.DIST.-04	
NON-FORMULA	SR-402	(ADD LANE-MED BARR)	STATUS-----ADVANCE PLANNING STAGE	
RF-078-1-2	PPL-124(6) DEKALB	FROM-3 LOCATIONS ON SR124	TYPE-WORK--PASSING LANES	PE 0576
DEKALB	-PASSING LANES-		LENGTH----- 2.1MI	ROW 1176
720470	PE# RS -1235 - 9-	TO-NORTH OF LITHONIA	CONG.DIST.-04 PRIORITY SCORE 57.00	CST 0577
FORMULA	SR-124		STATUS-----PRE-CONSTRUCTION STAGE 0277	
FF-010-2-17	CT.2-MTN INDUSTRIAL	FROM-BRIDGE OVER SEABOARD	TYPE-WORK--RAILROAD SEPARATION	CST 1176
DEKALB	BLVD	COASTLINE RAILROAD	LENGTH----- 0.1MI	CST 1176
720330	PE# FF - 010-2-16-	TO-	CONG.DIST.-04 PRIORITY SCORE 63.00	F/A 0776
FORMULA			STATUS-----UNDER CONSTRUCTION	
			CONTR.1-E R SNELL, CONTRACTOR, INC	
FFG-010-2-15	MTN. INDUSTRIAL BLVD	FROM-RAILROAD XING @ HUGH	TYPE-WORK--FLASH LIGHTS,BELLS,GATES	F/A 0577
DEKALB		HOWELL RD	LENGTH-----	
720430	PE# FFG- 010-2-17-	TO-	CONG.DIST.-04	
FORMULA			STATUS-----ADVANCE PLANNING STAGE	
FF-010-2-17	CT.1-MTN INDUSTRIAL	FROM-HUGH HOWELL RD.TO CC	TYPE-WORK--GRADE & PAVE	PE 1274
DEKALB	BLVD	LINE(EXCEPT GRADING	LENGTH-----1.43MI	ROW 0675
770030	PE# FF - 010-2-16-	TO-ON ROYAL ATL.DEVELOP	CONG.DIST.-04 PRIORITY SCORE 73.00	CST 0676
FORMULA		MENT CORP & RR BR.	STATUS-----UNDER CONSTRUCTION	F/A 1176

U-013-1-34	BUFORD HWY	FROM-0.5 MILE SOUTH OF	TYPE-WORK--	ROW 1174
DEKALB	MLP-13 (26)PE	GWINNETT CO. LINE	LENGTH----- 0.6MI	ROW 0376
760490	PE# - --- -	TO-JUST NORTH OF COUNTY	CONG.DIST.-04	ROW 0176
FORMULA	US- 23 SR- 13	LINE	STATUS-----CONTRACT AWARDED	ROW 1075
				CST 0776

GWINNETT

F-013-1-	BUFORD HWY	FROM-DEKALB CO. LINE	TYPE-WORK--WIDEN & RECONSTRUCT	PE FY78
GWINNETT			LENGTH-----	
120160		TO-MTN. INDUSTRIAL BLVD	CONG.DIST.-09	
FORMULA	US- 23 SR- 13		STATUS-----ADVANCE PLANNING STAGE	
RF-108-1-4	LAWRENCEVILLE BYPASS	FROM-1 MI.W.LAWRENCEVILLE	TYPE-WORK--GRADE & BRIDGES	PE 1060
GWINNETT	(FREE ACCESS)		LENGTH----- 6.0MI	ROW 0774
120340	PE# RF -1081- - 4-	TO-US 29 ONE MI.W.OF	CONG.DIST.-09	
FORMULA	US-29	DACULA	STATUS-----PRE-CONSTRUCTION STAGE 0378	
F-061-1-	ATLANTA-ATHENS HWY	FROM-SR 124 IN SNELLVILLE	TYPE-WORK--WIDEN & RECONSTRUCT	PE FY78
GWINNETT			LENGTH-----	
120353		TO-WALTON CO. LINE	CONG.DIST.-09	
FORMULA	US- 78 SR- 10		STATUS-----ADVANCE PLANNING STAGE	
I-85-2-		FROM-DEKALB COUNTY LINE	TYPE-WORK--INTERSECTION IMPROVEMENT	PE FY78
GWINNETT			LENGTH-----	ROW FY79
110080		TO-SR 316	CONG.DIST.-09	CST FY84
NON-FORMULA			STATUS-----ADVANCE PLANNING STAGE	
RF-061-1-37	STN.MTN.FWY.(PE UNO.	FROM-END OF FOUR-LANING	TYPE-WORK--WIDEN & RECONSTRUCT	PE 0774
GWINNETT	MLP.101 CT.1	OF STONE MTN.FREEWAY	LENGTH----- 5.1MI	ROW 0676
120350	PE# RF - 61- - 1- 32	TO-W C/L OF SNELLVILLE	CONG.DIST.-09 PRIORITY SCORE 75.00	CST 1176
FORMULA	US-78 SR-10	(OLD PI NO.720026)	STATUS-----UNDER CONSTRUCTION	CST 1176
			CONTR.1-INTER-STATE PAVING COMPANY	
RF-061-1-37	CT.2- STN MTN FWY	FROM-RR.& APPR-YELLOW R.	TYPE-WORK--BRIDGE STRUCTURE-STREAM	CST 1276
GWINNETT			LENGTH-----	
120351	PE# RF - 061-1-32-	TO-	CONG.DIST.-09	
FORMULA	US- 78 SR- 10		STATUS-----CONTRACT AWARDED	
			CONTR.1-E R SNELL, CONTRACTOR, INC	
RF-190-1-1	P'TREE IND.BLVD.	FROM-SR 141 CONN.NEAR	TYPE-WORK--NEW CONSTRUCTION	PE 0176
GWINNETT		NORCROSS	LENGTH-----	CST FY78
120420	PE# S -2230- - 4-	TO-SR 120 IN DULUTH	CONG.DIST.-09	
FORMULA			STATUS-----PRE-CONSTRUCTION STAGE 0777	
RF-190-1-2	P'TREE IND.BLVD.	FROM-SR-120 IN DULUTH	TYPE-WORK--NEW CONSTRUCTION	CST FY79
GWINNETT			LENGTH----- 5.0MI	
120421	PE# S -2230- - 4-	TO-SHELTONVILLE RD IN	CONG.DIST.-09 PRIORITY SCORE 50.00	
FORMULA		SUWANEE	STATUS-----PRE-CONSTRUCTION STAGE 0278	
FF-010-2-25	MTN.INDUSTRIAL BLVD.	FROM-S.OF GOSPEN SPGS.RD.	TYPE-WORK--GRADE, PAVE & BRIDGES	PE 0675
GWINNETT	(NORCROSS-TUCKER RD)	NR.I-85 TO N.OF SOU.	LENGTH----- 1.7MI	CST 0776
120360	PE# FF - 010- - 2- 20	TO-RR NW OF NORCROSS	CONG.DIST.-09 PRIORITY SCORE 69.00	CST 1076
FORMULA		(OLD PI NO.730024)	STATUS-----UNDER CONSTRUCTION	F/A 0976
			% COMPLETE-005	

APPENDIX 39 (continued)

FF-010-2-18	MTN INDUSTRIAL BLVD.	FROM-DEKALB COUNTY LINE	TYPE-WORK--NEW CONSTRUCTION	PE 0675
GWINNETT	& ROCKBRIDGE ROAD		LENGTH----- 2.7MI	CST 0775
720350	PE# FF - 010-2-18-	TO-A POINT NEAR	CONG.DIST.-09	F/A 0875
FORMULA		OAKWOOD CIRCLE	STATUS-----CONTRACT AWARDED	
			% COMPLETE-080	
U-013-1-35	BUFORD HWY (SR-13)	FROM-DEKALB COUNTY LINE	TYPE-WORK--WIDEN & RECONSTRUCT	PE 0576
GWINNETT	(US 23)	NE	LENGTH----- 1.9MI	CST 0776
150040		TO-PROPOSED MOUNTAIN	CONG.DIST.-04 PRIORITY SCORE 66.00	
FORMULA	SR-13	INDUSTRIAL BOULEVARD	STATUS-----CONTRACT AWARDED	
			% COMPLETE-022	

NEWTON

F-163-1-2	WASHINGTON ST	FROM-FLAT SHOALS RD	TYPE-WORK--RECONSTRUCTION	PE 0677
NEWTON			LENGTH----- 1.3MI	ROW FY79
220350	PE# F - 163-1- 2-	TO-EMORY ST	CONG.DIST.-10	CST FY80
FORMULA	SR- 81		STATUS-----ADVANCE PLANNING STAGE	
HHS-0957--5		FROM-SR 212 AT SR 81	TYPE-WORK--PVT MARKINGS	PE 0276
NEWTON		APPROX.0.75 MILE N.	LENGTH-----	CST 0876
240690		TO-OF HENRY-NEWTON CO.	CONG.DIST.-10	
FORMULA	SR-212	LINE	STATUS-----UNDER CONSTRUCTION	
RRS-54-1-6	IN COVINGTON	FROM-N.WEST ST @ GA. RR	TYPE-WORK--FLASH LIGHTS,BELLS,GATES	PE 1276
NEWTON	(F-054-1 SPUR)		LENGTH-----	F/A 0677
240890	PE# RRS- 54-1- 6-	TO-	CONG.DIST.-10	
FORMULA			STATUS-----ADVANCE PLANNING STAGE	

ROCKDALE

PF-035-1-11	SR-138	FROM-FLAT SHOALS	TYPE-WORK--WIDEN ONLY	PE 0976
ROCKDALE			LENGTH----- 1.1MI	ROW 0677
720580	PE# PF - 035-1-11-	TO-I-20 BRIDGE	CONG.DIST.-04 PRIORITY SCORE 49.00	
FORMULA			STATUS-----PRE-CONSTRUCTION STAGE 1177	
PF-035-1-7	SR-138	FROM-I-20 BR.	TYPE-WORK--WIDEN ONLY	PE 0976
ROCKDALE			LENGTH----- 1.2MI	ROW 0677
720581	PE# PF - 035-1- 7-	TO-CONYERS BP EXCLUDING	CONG.DIST.-04 PRIORITY SCORE 64.00	CST FY78
FORMULA	SR-138	RR BRIDGE	STATUS-----PRE-CONSTRUCTION STAGE 1177	
PFG-035-1-8	SR-138	FROM-BRIDGE OVER GEORGIA	TYPE-WORK--RAILROAD SEPARATION	PE 0276
ROCKDALE		RAILROAD	LENGTH-----	ROW 0677
720582		TO-SE OF CONYERS	CONG.DIST.-04	CST FY78
FORMULA	SR-138		STATUS-----PRE-CONSTRUCTION STAGE 1177	
RF-035-1-12	STATE ROUTE 138	FROM-BRIDGE WIDENING AT	TYPE-WORK--BRIDGE WIDENING	PE 0275
ROCKDALE		I-20	LENGTH----- 0.3MI	ROW 0477
720584	PE# PF - 046-1-11-	TO-	CONG.DIST.-04 PRIORITY SCORE 100.00	CST 0677
FORMULA	SR-138		STATUS-----PRE-CONSTRUCTION STAGE 0577	
IF-035-1-10	CONYERS TO MONROE RD	FROM-2 LOCATIONS ON SR138	TYPE-WORK--PASSING LANES	PE 0576
ROCKDALE			LENGTH----- 3.3MI	ROW 1274
761330	PE# PSP- 138- -1 -	TO-NE OF CONYERS	CONG.DIST.-04	ROW 0177
FORMULA	SR-138		STATUS-----UNDER CONSTRUCTION	CST 0776
			% COMPLETE-017	

APPENDIX 39 (concluded)

RS-2584--1 ROCKDALE 730710 FORMULA	WEST AVE IN CONYERS PE# RS -1416- - 2-	FROM-BRIDGE & APPROACHES OVER I-20 TO-	TYPE-WORK--BRIDGE WIDENING LENGTH----- CONG.DIST.-04 PRIORITY SCORE 67.00 STATUS-----PRE-CONSTRUCTION STAGE 0577	PE 0475 CST 0677
CAI-20-2-1 ROCKDALE 770090 NON-FORMULA	AUGUSTA HWY PE# CAI- 20-2- 1- SR-402	FROM-DEKALB COUNTY LINE TO-NEWTON COUNTY LINE	TYPE-WORK--SIGN REMOVAL LENGTH----- 8.5MI CONG.DIST.-04 STATUS-----PRE-CONSTRUCTION STAGE 0178	PE 0574 ROW 0574

WALTON

I-RFI-20-2-66 WALTON 220250 FORMULA	AUGUSTA FWY(CMORGAN) PE# RFI- 20-2-66- SR-402	FROM-EAST OF SR 12 INTER- CHANGE IN WALTON CO. TO-EAST OF SR 83 INTER- CHANGE IN MORGAN CO.	TYPE-WORK--RECONSTRUCTION LENGTH-----12.6MI CONG.DIST.-10 STATUS-----UNDER CONSTRUCTION % COMPLETE-073 CONTR.1-SHEPHERD CONSTRUCTION CO, INC	PE 0575 CST 0775 CST 0775
F-061-1-39 WALTON 120330 FORMULA	ATLANTA-ATHENS HWY PE# F - 061-1-39- US- 78 SR- 10	FROM-4-LANE IN MONROE TO-GWINNETT CO. LINE	TYPE-WORK--PRELIMINARY ENGINEERING LENGTH----- 9.2MI CONG.DIST.-10 PRIORITY SCORE 36.00 STATUS-----ADVANCE PLANNING STAGE	PE FY78

Source: Georgia Department of Transportation. Construction Work Program for Fiscal Years 1977-1982. February 1977.

Atlanta. I-75 has caused considerable development pressures within Atlanta, but has had less impact on the Basin.

I-85: Located in the northwest portions of DeKalb and Gwinnett counties, I-85 crosses only the Yellow River Sub-basin. Due to the convenient access to Atlanta and other major cities in the southeast region of the United States, industrial development has increased significantly in the past ten years along this corridor. The largest industry to locate along the I-85 corridor in the Upper Ocmulgee River Basin is Western Electric, located in Gwinnett County.

285: This highway circumferences the Atlanta metro area. The portion of 285 located in the Upper Ocmulgee River Basin is in Fulton and DeKalb Counties. 285 provides the Basin with access to other portions of the Atlanta metro area. The DOT is currently increasing the highway to eight lanes in the northern section of Atlanta.

U.S. 78: This highway provides access from Atlanta to the South, Yellow and Alcovy River Sub-basins. While the highway is not a four-lane in Snellville, DOT plans to expand it to a four-lane highway with limited access from Snellville to Athens.

Rail

The Upper Ocmulgee River Basin is served by numerous rail companies, the largest being Southern Railway. Even though Southern amd AMTRAK made efforts to upgrade equipment and services, both are losing money on passenger operation, although ridership has increased on both lines. Rail freight lines, however, have been instrumental to the industrial and economic growth in the Basin region. The freight lines are employing modern management principles and freight handling techniques, such as piggyback and container; therefore, they are able to operate at a profit. In fact, the Basin's largest railroad, Southern Railway, is one of the most profitable in the country.

Mass Transit

Atlanta is operating a rapid transit system (MARTA) consisting of buses that mainly serve DeKalb and Fulton Counties. Larger bus companies, such as Greyhound, serve other areas of the Basin with a limited number of scheduled trips.

Air Transportation

Although there is not a major airport located in the Upper Ocmulgee River Basin, Hartsfield International Airport is located only a few miles from the Basin boundary in Hapeville in Clayton County and Fulton County.

There are several small airports located in the Basin that provide services principally to business and private individuals in the general vicinity.

A public system airport located in Covington in Newton County has an existing airport capacity of 183,000 and a runway length of 3,000 feet. (Airport capacity is the number of operations an airport can handle in one year, i.e., takeoffs and landings.) In 1978 the demand is expected to drop to 93,000 operations and the length of the runway is projected to be 3,400 feet. There are also two additional proposed air facilities in the McIntosh Trail APDC portion of the Upper Ocmulgee River Basin. The first, to be located in Covington, is proposed for 1983 and will have a capacity of 114,000 and 265,000 in 1993.

The second proposed airport is in Henry County, in the City of McDonough. The estimated capacity will be 110,000 in 1978, 155,000 in 1983 and 586,000 in 1993. This increase is due to the rapid growth rate of population as well as industry in the area. In 1978 and 1983 the proposed runway length is 5,900 feet and in 1993 the proposed length extends to 7,600 feet.

No major airports are located in the Northeast Georgia APDC portion of the Upper Ocmulgee River Basin.

<u>Transportation in the Yellow River Sub-Basin</u>

The Yellow River Sub-basin is composed of a five-county region including parts of DeKalb, Gwinnett, Walton, Rockdale and Newton Counties. These counties are located in three APDCs: Northeast Georgia (Walton), McIntosh Trail (Newton), Atlanta Regional Commission (DeKalb, Gwinnett and Rockdale).

Table 40 shows the section ID numbers as obtained from DOT's traffic survey maps, the average daily travel (ADT), the section length of road that the data includes, the estimated daily vehicle miles, the projections for the last two figures in the year 2000.

The projected figures were derived by using the state growth formula 1+SxL where S, a constant, equals .55 and the L is the factor for each individual county shown below:

DeKalb	1.18	Rockdale	1.92
Gwinnett	1.89	Henry	1.34
Newton	1.25	Butts	1.17
Walton	1.20	Clayton	1.60

I-20: Located in the South, Yellow and Alcovy River Sub-basins, Interstate 20 provides easy access to the Yellow River Sub-basin from the City of Atlanta. I-20 when completed to Birmingham and its interstate connection, should increase the patronage of this facility.

I-20 traverses Fulton, DeKalb, Rockdale and Newton Counties. Rockdale and Newton Counties, however, are the only ones served in the Yellow River Sub-basin. U.S. 278 is contiguous with I-20 through Rockdale County and is the only interstate highway serving the county. The portion of the highway in Rockdale County extends from the Newton County line west for 1.69 miles. The ADT is approximately 9,736 with an estimated daily vehicle mile figure of 24,708.

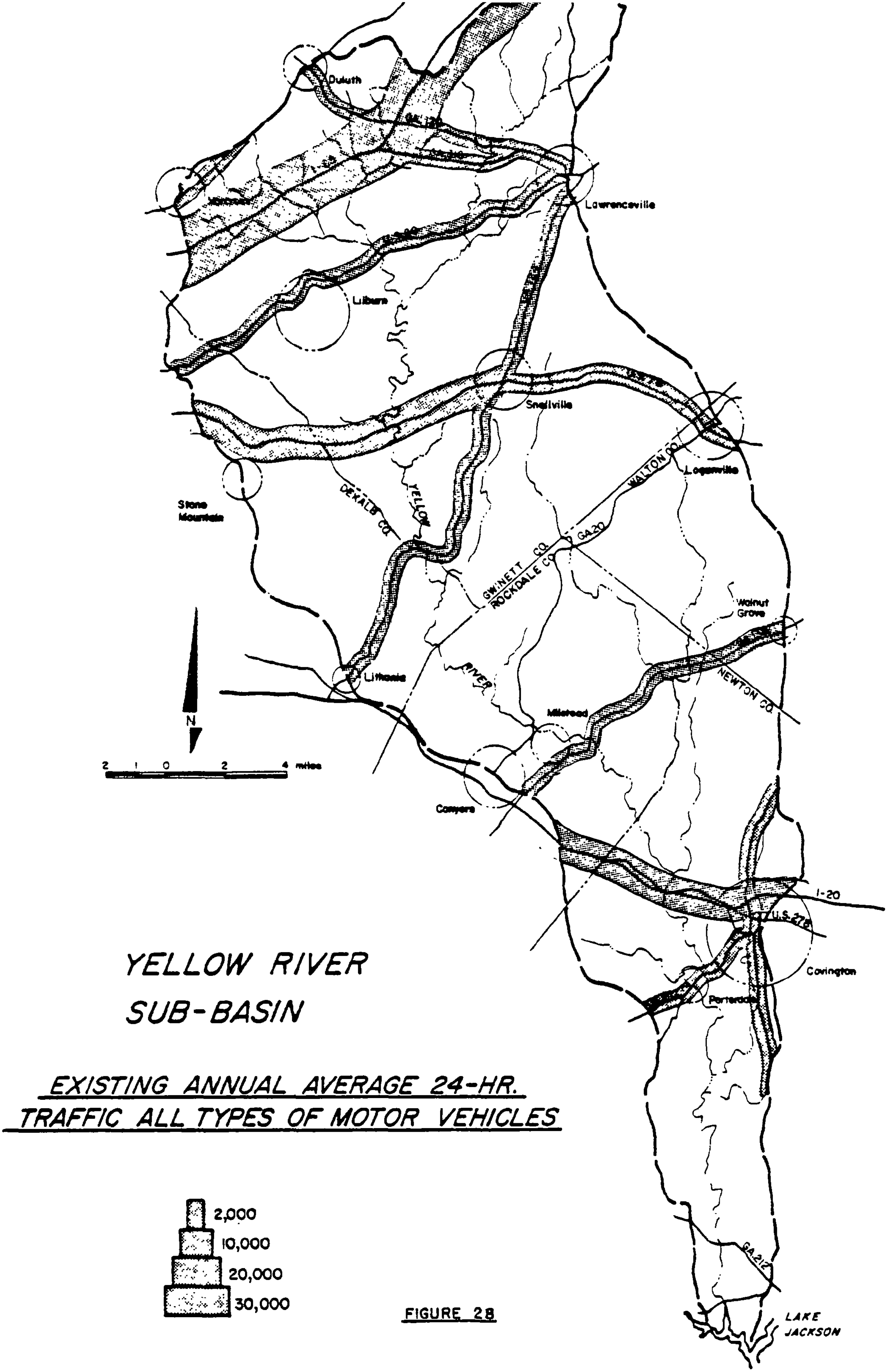
I-20 extends through Newton County and passes directly through the City of Covington. This interstate provides excellent access to Atlanta from the city and surrounding areas. This easy accessibility has created increased development pressure in the area. The projected ADT and daily vehicle miles as shown on Table 40is indicative of the increased population for the Covington metro area.

Georgia Highway 162: This highway outlines the western boundary of the Yellow River Sub-basin from the Rockdale County line southward until it intersects with Georgia Highway 36 near Lake Jackson. The ADT increases steadily from the outer section of Highway 36, as shown on Figure 28 until the ADT reaches an estimated 3,429 at the Newton-Rockdale County line.

The projected ADT figures for Georgia Highway 162 shown on Table 28 indicate that the highest ADT occurs southeast of Covington and continues to Rockdale County line. The projected vehicle miles figure is the greatest at the same location; the projected daily vehicle miles increase gradually until the highway approaches the outskirts of Porterdale, where the figure almost triples to 8,709. The count increases to 9,633 at the Newton-Rockdale County lines.

Georgia Highway 36: This state route delineates the eastern boundary of the Yellow River Sub-basin in Newton County and is one of the principal routes to Jackson Lake. The highway section with the highest ADT, as indicated on Table 40 , is located inside the Covington city limits just south of the CBD. ADT decreases significantly as the highway continues southward towards Lake Jackson and diminishes to approximately 1,305 at the lake.

The estimated daily vehicle miles is greatest in the 1.93 mile length of highway south of Covington city limits, but decreases significantly until the highway approaches the intersection of Highway 36 and Georgia Highway 212, and then decreases significantly near the intersection of Georgia Highway 162 and Georgia Highway 36 near Lake Jackson.



YELLOW RIVER
SUB-BASIN

EXISTING ANNUAL AVERAGE 24-HR.
TRAFFIC ALL TYPES OF MOTOR VEHICLES

FIGURE 28

I-85: This expressway, which is the major highway that connects Gwinnett County with downtown Atlanta, enters the county between Norcross and Lilburn, the two largest populated areas in the county. At the point of entry, the estimated ADT is 62,336, but it drops significantly to an estimated average of 28,434 at Beaver Ruin Road and continues to drop until it reaches an average of 13,774 at the nortern portion of the Yellow River Sub-basin.

The projected ADT for the year 2000, as shown on Table 40 , indicates an increasing use of this highway due to the increased population growth in Gwinnett County from the metro Atlanta area, which will locate in Norcross, Lilburn, Lawrenceville and other towns located off I-85.

The estimated daily vehicle miles, also shown on Table 40 , indicate the same results as the projected ADT for the portion of I-85 from the DeKalb County line; the estimated daily vehicle miles continue to decrease northward to the northern boundary of the Yellow River Sub-basin.

Georgia Highway 23: Georgia 23 serves the northern portion of the Yellow River Sub-basin and runs parallel to I-85 in Gwinnett County. Buford Highway (23) provides another link from Atlanta to the Yellow River Sub-basin. While the highway is extremely congested closer to the city, the portion of the highway in the Yellow River Sub-basin has an estimated ADT of 10,000 and under, except in the city limits of Norcross and at the DeKalb County line where the estimated ADT is between 10,000 and 20,000. The estimated daily vehicle miles are shown as over 30,000 when the highway enters Gwinnett from DeKalb County. The figure drops as many vehicles proceed north on I-85 via Norcross-Tucker Road or take 141 into North Fulton County. As Gwinnett County grows, there will be an increased demand on the portion of Georgia 23 indicated on Table 40 . Both the projected ADT and estimated vehicle miles increase significantly at the point of entry to Gwinnett County. This excessive congestion is due to increased usage of I-85, which creates a need to find alternative routes to Atlanta.

Georgia Highway 124: This corridor extends from Lithonia in DeKalb County northward into Gwinnett County through the center of Snellville and Lawrenceville. The greatest ADT in this area is located in Lithonia (12,351). The ADT was not counted for Lawrenceville in 1976; however, a count will be available in 1977. The estimated vehicle mile figure is varied for Georgia 124. Table 40 indicates, however, that the greatest use of the highway during 1976 was between Lawrenceville and Snellville.

The projected ADT and daily vehicle miles increase around the three major developed areas of the highway: Lithonia, Snellville and Lawrenceville. The increased amount of traffic may require improvements in these specific locations but will probably not require major expansions.

Georgia Highway 20: This highway originates north of the Yellow River Sub-basin and runs southward through Lawrenceville, then proceeds southeastward through Grayson into Walton, Rockdale, Newton and Henry Counties. Georgia Highway 20 is a major interchange off Interstate 85 in the northern portion of the Yellow River Sub-basin in Gwinnett County. Georgia Highway 20 also serves as an important link to I-20 in the southern portion of the Yellow River Sub-basin in Rockdale County.

The estimated ADT and estimated daily vehicle miles are greatest approximately one mile north of the Lawrenceville city limits. There are no permanent county stations located in Lawrenceville at the present time.

The cities of Lawrenceville, Loganville, and Conyers will be most affected by the increased traffic in the year 2000. Georgia 20 has already been widened in Lawrenceville but, due to projected increases in ADT and estimated daily travel, improvements may be necessary in other locations.

Georgia Highway 138: Georgia 138 spans five counties in the Upper Ocmulgee River Basin including Walton, Newton, Rockdale, Henry and Clayton Counties. Portions of the highway in the Yellow River Sub-basin are located in Walton, Rockdale, and Newton Counties.

Highway 138 runs southeastward from Walnut Grove in Walton County 231 miles to the Newton County line, then 1.76 miles through the northernmost tip of Newton County. The largest portion of Georgia Highway 138 is located in Rockdale County where the highway intersects with I-20 just east of Conyers.

The estimated ADT is significantly higher in the three-mile area surrounding the I-20 interchange (see Table 40). The increase in projected ADT and estimated daily vehicle miles is indicative of the increased population that the Conyers area will experience by the year 2000.

U. S. Highway 278: U.S. 278 is contiguous with I-20 in portions of Rockdale and Newton Counties as indicated on Figure 28. This highway extends through the Study Area from DeKalb County, Rockdale County and Newton County, then into the Alcovy River Sub-basin.

The major artery provides easy accessibility for the cities of Covington and Conyers through the southern portion of the Yellow River Sub-basin to the City of Atlanta. This highway along with I-20 will be one of the major causes of expansion to the areas they serve by the year 2000. The estimated ADT increases from under 2,000 at the Newton-Rockdale line to the 2,000 and over category when the highway approaches and enters Covington and extends to the end of the Yellow River Sub-basin.

U.S. Highway 29: U.S. 29, which runs in a northeast direction across from DeKalb County through Gwinnett County, was the major east-west route until the construction of I-85. Even though the interstate has taken much of the pressure off Highway 29, numerous commercial and light industrial developments continue to occur along this corridor due to its convenient location.

The current estimated ADT at the DeKalb-Gwinnett County line is 13,073. This figure decreases steadily with the exception of the portion from Lilburn to the Lawrenceville city limits. (No count will be completed for Lawrenceville until 1977.) It is assumed that the ADT increases in Lawrenceville are due to the fact that the post office, the county courthouse, and the downtown shopping areas are located in U.S. Highway 29. The estimated ADT decreases through the remaining portion of Gwinnett County with a slight increase near Dacula.

The estimated daily vehicle miles generally follow the same pattern as the ADT with the exception of the portion of Highway 29 to the northeast of Lilburn. This area has a high estimated Daily Vehicle Mile count due to the new shopping center in that area.

It is projected that the section of Highway 29 with the greatest ADT is that in Tucker in DeKalb County, which is one of the major growth areas. The area with the greatest number of projected daily vehicle miles is that section of U.S. Highway 29 near the DeKalb-Gwinnett County line, which would indicate an influx of consumers as well as an increased number of residents in this area.

U.S. Highway 78: This transportation system spans counties in the Upper Ocmulgee River Basin (Fulton, DeKalb, Gwinnett and Walton) and provides direct access from downtown Atlanta to Stone Mountain Park in DeKalb County, Snellville in Gwinnett County, Loganville in Walton County and then to Athens. The significance of this highway has been discussed in the previous section.

The ADT and estimated daily vehicle miles is the greatest in the vicinity of Stone Mountain Park, followed closely by the westernmost portion of Highway 78 in the Yellow River Sub-basin. The Lake Lucerne area of U.S. 78 has an estimated ADT of 20,134, which is the largest number for U.S. 78 in Gwinnett County. The ADT for the City of Snellville is 19,013 and 14,570 (see Table 40). The ADT decreases significantly outside Snellville until it reaches 4,436 at the Gwinnett-Walton County line.

Highway 78 is the only direct route from the Yellow River Sub-basin portion of Walton County to the City of Atlanta to the west and Athens to the east. The planned expansion of U.S. 78 will make downtown Atlanta and Athens easily accessible for people living in all portions of the Sub-basin.

Georgia Highway 81: Walton and Newton are the two counties in the Yellow River Sub-basin served by Georgia Highway 81. Highway 81, which is contiguous with the eastern boundary of the Yellow River Sub-basin, extends from the Alcovy River Sub-basin through Loganville and Walnut Grove in Walton County, through Covington in Newton County and then to Jackson Lake. Highway 81 also serves Henry County, which is located in the South River Sub-basin. This highway provides access to Interstate 20 at Covington, which affords commuters easy accessibility to Atlanta. The estimated ADT and daily vehicle miles traveled for Highway 81 (both current and projected) can be seen in Table 28 .

Proposed Transportation Facilities for the Yellow River Sub-basin

The majority of the Yellow River Sub-basin is located in the ARC APDC. Included in this Study Area are DeKalb, Rockdale and Gwinnett Counties. The ARC APDC is not only the largest portion of the Yellow River Sub-basin but is also the most densely populated. This situation requires extensive planning in the areas of improving existing road facilities, new construction of highways and the completion of the mass transportation system (MARTA) that includes both bus and rail service. The goals for this region dictate that transportation facilities should be used to encourage desirable development patterns while respecting the integrity of communities and natural areas through which they pass.

The major highway projects planned for the Yellow River Sub-basin according to ARC's 1976 Regional Development Plan are as follows:

Lawrenceville Bypass: Extending from one mile west of Lawrenceville to U.S. 29 one mile west of Dacula, this project will complete a bypass around Lawrenceville business district for eastbound traffic moving from the Lawrenceville Connector to Atlanta. At present, traffic must pass through the downtown square of Lawrenceville.

Interstate 420: This limited access project extends eastward from the existing Lakewood Freeway near I-75 to I-20 in DeKalb County. Construction of I-420 will provide direct access for vehicles traveling east-west south of the Central Business District and will relieve present travel along I-20, I-285 and congested surface streets.

Interstate 675 and Southeast Connector: These projects are complementary, and along with I-420 provide additional accessibility in the southeastern section of the Atlanta Region. I-675 begins at I-75 near Stockbridge and extends northward to I-285 near Moreland Avenue. The Southeast Connector continues northward to I-420 at I-20 and includes provision for access to I-20 westbound, facilitating travel to downtown. I-75 South is expected to become congested beyond tolerable limits by the year 2000 without the availability of alternate routes. The I-675 system will provide this alternative and reduce future I-75 congestion. In addition, I-675 will provide a link with I-285 to provide a continuous route from the northeast to the south, thus separating this movement from the congested I-285/75 interchange. Construction of new highways must be in conjunction with the construction of new arteries and collector streets. While 675 is not in the Yellow River Sub-basin, it will have a great impact on its growth and development.

With the development of new and improved expressway systems, in conjunction with improved travel conditions on access roads, the number of miles traveled on these highways will increase much larger in proportion to the increased improvements.

Table 40 lists highway improvements proposed for the remaining portion of the Yellow River Sub-basin. These priorities and figures are revised annually.

Proposed Airports

As noted on Figure 3 , this region of the Yellow River Sub-basin has one existing airport and there are three new locations proposed for future sites. There is also the continuation of development at the Hartsfield Airport to accommodate a larger amount of traffic, as well as discussion of building a new airport in either the southern portion of this Study Area or northwest of the Yellow River Sub-basin in Paulding County.

The Gwinnett County area has been designated by ARC as a New General Aviation Airport search area; a specific location, however, has not been determined.

Rail

Rail transportation in the Yellow River Sub-basin provides adequate service for all major development areas. There are no major changes proposed in the Yellow River Sub-basin.

Rapid Transit (MARTA)

Since the beginning of publicly operated mass transportation for the region in 1972, transit ridership has increased over 25 percent, reversing a history of decline. This has been accomplished through the use of a bus system operating almost exclusively in a two-county area. Recent analysis in the Regional Development Plan process shows that such a system is needed and that the transit system should be extended to provide service to areas that are expected to experience significant future growth to aid in the shaping of that growth. Transit, therefore, becomes not only an important mode of transportation, but a shaper of development as well, by providing a real alternative to the use of the automobile.

The only extension to the MARTA rail transit service affecting the Basin that is not shown in the MARTA Engineering Report dated September 1971, is the extension of the northeast line to Norcross. This extension is shown in the RDP to meet forecasted development, but requires Gwinnett County to officially join the MARTA taxing district (previously defeated in a referendum) and possibly to "buy-in" to the system (to establish parity) if voter approval is obtained at some future date.

Bus System Expansion

The expanded rail transit system will, by the year 2000, require a seven-county feeder bus system. The full seven-county system is needed to provide an intra-regional alternative to the automobile to reduce auto congestion and to feed the recommended rail system. Such a system would include approximately 2000 miles of surface bus routes.

Specific routes and schedules for this system cannot be identified at this time. As the rail system evolves and development patterns change, the busy system will be expanded to meet transportation needs. Because of the flexibility of buses, quick and frequent changes can be made as the region grows.

The only county in the Yellow River Basin currently served by MARTA is DeKalb. The expanded service recommended in the Atlanta RDP is also contingent upon voter approval, as discussed above.

TABLE 40

ESTIMATED AVERAGE DAILTY TRAVEL / DAILY VEHICLE MILES TRAVELED IN
YELLOW RIVER SUB-BASIN (CURRENT AND PROJECTED)
COVINGTON METRO AREA

SECTION ID #	ESTIMATED ADT	SECTION LENGTH IN MILES	ESTIMATED DAILY VEHICLE MILES	PROJECTED ADT	PROJECTED ESTIMATED DAILY VEHICLE MILES
I-20 AND I-278:					
0601	9863 10544 20467	.35	1,143	19,109.56 20,429. 39,538.56	13822.12
0604	9087 4744 13831	.20	2,766	17,606.06 9,191.5 26,797.56	5359.12
0607	4922 6146 11067	.10	1,107	9,536.37 11,907.87 21442.31	2144.81
0610	6413 6163 11577	2,23	25,816	12,425.19 11,940.81 22,430.44	56018.5
GA. 81:					
0301	5225	.44	2,299	10,123.44	4454.31
0304	8014	.73	5,851	15,527.12	11336.31
0307	8381	.31	2,598	16,238.19	5033.62
0310	6686	.24	1,605	12,954.12	3109.69
0313	7508	.06	451	14,546.75	873.81
0316	8745	.41	3,586	16,943.44	6947.87
0319	8909	.06	535	17,261.19	1036.56
0322	7418	.49	3,635	14,372.37	7042.81
0325	7826	.68	5,322	15,162.87	10330.75

0328	6106	.53	3,236	11,830.37	6269.75
0331	5286	.40	2,107	10,241.62	4082.31

<u>I-278 IN COVINGTON (SEE I-20):</u>

0901	7169 6971 1410	.80	11,312	13,889.94 13,506.31 2,731.87	21917
0904	7210 6880 14090	.20	2,818	13,969.32 13,330. 27,299.37	5459.87
0907	8874 7499 16373	.29	4.748	17,193.37 14,429.31 31,722.60	999.25
0909	7851 7176 5027	.15	2,254	15,211.31 13,903.5 29,114.81	4367.12
0910	9895 9647 19542	.36	7,035	19,171.56 18,691.06 37,862.62	13630.12
0913	6470 5584 12053	.61	7,353	12,535.62 10,819. 23,352.68	14246.44
0916	3875 3658 7533	.19	1,431	7,507.37 7,087.37 14,595.19	2772.56
0919	4362 3740 8102	.20	1,620	8,451.37 7,246.25 15,697.62	3138.75

0922	6025	.21	1,265	11,673.44	2450.94
0101	5654	1.07	6,050	10.954.62	11721.87
0104	8158	.31	2.529	15.806.12	4899.94
0107	3897	.23	896	7.550.44	1736
0110	3076	.15	461	5,959.75	893.19
GA. 124:					
2316	3265	1.07	3494	5971.68	6390.53
2313	3995	1.06	4235	7366.85	7745.81
2310	4077	1.86	7583	7456.83	13869.31
2307	6228	.89	5543	11391.01	10138.15
2304	6699	.62	4153	12252.47	7595.84
3507	1264	.43	543	2311.86	993.15
3505	3611	.67	2419	6604.52	4424.35
3503	12351	.23	2841	22589.98	5196.19
2216	9955	.20	1991	18207.69	3641.54
2213	12013	.65	7808	21971.78	14280.83

NEWTON COUNTY

SECTION ID #	ESTIMATED ADT	SECTION LENGTH IN MILES	ESTIMATED DAILY VEHICLE MILES	PROJECTED ADT	PROJECTED ESTIMATED DAILY VEHICLE MILES
U.S. 278:(I-20)					
0801	10005 2428	2.15	43,941	19,390 4,724	8507
2301	1957	2.11	4,130	3,826	8002
2304	2384	1.13	2,694	4,619	5220
2307	2641	.94	2.482	5,117	4809
1501	5608	2.09	11,721	10.865	22710
1504	2158	2.77	5,978	4,181	11582

1510	605	2.01	1,216	1,172	
1511	579	1.00	579	1,122	
<u>GA. 20</u>:					
0501	1448	2.47	3,578	2,805	6950
0504	2399	.91	2,183	4,649	4229
0601	1290	1.93	2,493	2,499	4830
0604	1330	1.97	2,621	2,577	5078
~~XXXX~~ 0607	2564	3.11	7,974	4,968	15550
0610	4885	1.60	7,817	9,465	15145
<u>GA. 81</u>:					
0422	2557	2.43	6,214	4,954	12040
1410	1334	2.13	2,841	2,585	5504
1407	1770	1.40	2,478	3,429	4801
0419	3014	1.66	5,003	5,840	9693
0416	3809	1.00	3,809	7,380	7380
0413	5649	.30	1,695	10,945	3284
2403	3961	1.25	4,952	7,674	9594
0410	3143	1.24	3,898	6,089	7552
0407	1536	2.21	3,395	2,976	6578
0404	1100	3.61	3,972	2,131	7696
0401	917	.23	211	1,177	409

TABLE 40 (continued)

GA. 36:					
0219	4559	1.93	8,800	8.833	17050
0216	3588	1.29	4,629	6.952	8968.69
0213	2478	1.64	4,064	4,801	7874
0210	1912	3.05	5,831	3.677	11297.56
0207	1898	2.20	4,176	3.677	8091
0204	1665	2.93	4,880	3,226	9455
0201	1305	.78	1.018	2.528	1972.37
GA. 162:					
2701	940	.75	705	1,821.	1366
0701	2581	1.37	3,536	5,001	6851
0704	2506	1.64	4,110	4,855	7963
0707	3425	.53	1,815	6,636	3516
0710	3429	1.45	4,972	6,644	9633
0301	562	4.53	2,547	1,089	4935
0304	773	2.41	1,863	1,498	3609
0307	1221	3.68	4,495	2,366	8709
0310	2235	1.44	3.218	4,330	6235
0801	10430 10008 20428	2.15	4,394	20,208.12 19,390.5 39,598.62	85135.69
2301	1957	2.11	4,130	3,826	8002
2304	2384	1.13	2,694	4,619	5220
2307	2641	.94	2,482	5,117	4809

0807	6572 6365 12937	.90	11,643	2,733 12,332 25.065	22558
0810	6664 6441 13105	4.30	56,351	12,911 12,479 25,391	109180
0813	5529 5303 10832	3.00	32,496	107.587 10,274 20,987	62961

COVINGTON

SECTION ID #	ESTIMATED ADT	SECTION LENGTH IN MILES	ESTIMATED DAILY VEHICLE MILES	PROJECTED ADT	PROJECTED ESTIMATED DAILY VEHICLE MILES
0101	5654	1.07	6050	10954.62	11721.87
0104	8158	.31	2529	15806.12	4899.94
0107	3897	.23	896	7550.44	1736
0110	3076	.15	461	5959.75	893.19
GA. 212:					
0116	1449	2.10	3,044	2,807	
0113	1234	3.52	4,345	2,391	
0107	1232	3,28	4,043	2.387	
0401	754	4.42	3,334	1,461	6460
0101	1213	1.88	2,281	2.350	

ROCKDALE

SECTION ID #	ESTIMATED ADT	SECTION LENGTH IN MILES	ESTIMATED DAILY VEHICLE MILES	PROJECTED ADT	PROJECTED ESTIMATED DAILY VEHICLE MILES
GA. 278:					
0701	17444 18533 35978	1.00	35,978	51,913.34 55,154.21 10[redacted].52[redacted]	107070.52

1701	3276	.91	2,981	9,749.38	8871.46
0704	15365 16472 31837	2.00	63,673	45,726.24 49,020.67 94,746.91	189490.84
0707	14549 13027 27575	.30	8,273	43,297.82 38,768.35 82,063.2	24620.45
2004	1962	2.07	4,062	5,838.91	12088.51
0710	12376 12468 24845	2.07	51,429	36,830.976 37,104.768 73,938.72	153052.7
0713	7195 7425 14620	1.69	24,708	21,412.32 22,096.8 43,509.12	73531.01
GA. 20:					
1622	2472	.68	1,681	7,356.67	5002.66
1619	1067	2.08	2,219	3,175.39	6603.74
1616	1823	2.14	3,901	5,425.25	11609.38
1613	3760	2.31	8,687	11,189.76	25852.51
1937	5126	.44	2,256	15,254.98	6713.86
1935	5369	.53	2,846	15,978.14	8469.70
1933	6920	.28	1,938	20,593.92	5767.49
1604	6757	3.15	21,285	20,108.83	63344.16
1601	5678	2.50	14,196	16,897.73	42247.30

HIGHWAY 162:					
1501	4790	1.65	7,903	14,255.04	23519.33
1504	7731	.44	3,402	23,007.46	10124.35
1931	5128	.44	2,256		
1929	4479	.38	1,702		
GA. 212:					
0110	1871	1.52	2,843	5,568.10	8460.77
0108	2232	.39	871	6,642.43	2592.10
1007	1927	2.23	4,297	5,734.75	12787.87
0104	1869	2.24	4mk86	5,642.50	12457.54
0101	1735	1.73	3,002	5,163.36	8933.95
GA. 138:					
0201	1261	2.88	3,632	3,752.74	10808.83
0204	1734	2.12	3,677	5,160.38	10942.75
0207	1585	2.54	4,026	4,716.96	11981.38
0210	1950	1.83	3,586	5,803.2	10671.94
0213	7334	1.00	7,334	21,825.98	21825.98
1923	2625	.89	2,337	7,812	6954.91
0216	8430	.85	7,165	25,087.68	21323.04
0219	6423	1.55	9,955	19,114.848	29626.08
0222	5747	3.62	20,803	17,103.07	61909.73
0225	4906	1.12	5,495	14,600.26	16353.12

GWINNETT COUNTY SUPPLEMENT

SECTION ID #	ESTIMATED ADT	SECTION LENGTH IN MILES	ESTIMATED DAILY VEHICLE MILES	PROJECTED ADT	PROJECTED ESTIMATED DAILY VEHICLE MILES
GA. 23					
2097	15307	2.08	31,839	44,841.86	93272.35
3000	13081	.72	9,418	38,320.79	27590.03
3003	17126	1.18	20,209	50,170.62	59202.26
1901	9801	1.87	18,327	28,712.03	53688.95
1904	8788	1.53	13,886	25,744.45	40679.04
1907	9431	.85	8016	27,628.11	23482.87
5905	10254	.66	6768	30,039.09	19826.86
5907	5844	.73	4266	17,120.00 (17119.998)	12497.25
1910	3183	2.42	7703	9324.60	22565.94
I-85:					
0341	62366	2.22	138,453	182,701.(19)	405598.06
0343	61119	1.75	106,958	179,048.(11)	313,333.46
1404	29341 28311 57652	1.09	62,841	85,954.46 82,937.07 168,891.53	184,092.7
1407	33680 24181 57861	1.99	115,144	99,665.86 70,838.24 169.503.79	337,314.34
1410	20587 19486 40075	2.16	86,558	60,309.62 57,084.24 117,393.85	253,571.66
1413	17621 15744 33364	.78	26,024	60,309.72 46,122.05 97,739.84	76,237.31

TABLE 40 (continued)

1416	15778 15155 30933	1.88	58,153	46,221.65 44,396.57 90.618.22	170359.21
<u>U.S. 29:</u>					
1731	13073	3.13	40,917	38,297.35	119866.35
1734	12811	1.92	24,597	37,529.82	72056.91
5807	14943	1.03	15,392	43,775.52	45090.86
1110	10622	.86	9.135	31.117.15	26760.98
1113	9015	1.83	16,498	26,409.44	48330.89
1116	7094	1.32	9.364	20,781.87	27431.84
1119	5653	1.43	8,084	16,560.46	23682.08
6315		1.88	11,952	18,622.83	35013.38
6317					
6319					
1122	8610	.52	4,477	19,759.95	10274.71
1125	6677	2.06	13,755	15,323.71	31567.72
1128	7024	1.25	8,780	16,120.08	20150.1
6205	5706	.70	3,994	13,095.27	9166.23
6207	3829	.61	2,336	9,017.05	5361.12
<u>U.S. 78:</u>					
0373	11352 11850 23202	.95	22,042	33,255.68 34,714.57 67.970.26	64572.04
6504	20134	1.66	33,422	58,982.55	97909.75
0507	12372	1.25	15,465	36,243.77	45304.72

1510	11697	2.16	25,266	34,266.36	14016.75
5705	19013	1.00	19,013	55,698.58	55698.58
5707	14570	1.01	14,716	42,682.81	43110.52
0513	7384	.45	3,323	21,631.43	9734.73
0516	5989	1.98	11,851	17,544.77	34717.50
0519	4436	2.58	11,445	12,995.26	33528.13
5601					
GA. 20:					
3519	5264	2.92	15,371	15,420.89	45029.34
3516	4902	2.13	10,442	14,360.41	30589.84
3513	10090	1.02	10.291	29,558.65	30147.48
6305					
6303					
3510	4746	1.26	5,980	13,903.41	17518.41
3507	3336	1.23	4,103	9,772.81	12019.74
6403	4246	.50	2,123	12,438.66	6219.33
6401	3256	.56	1,823	9,538.45	5340.48
3504	2507	1.99	4,989	7,344.26	14615.27
3501	2225	1.65	3,672	6,518.14	10757.12
5603	2783	.38	1,057	8,152.80	3096.43
GA. 124:					
6311					
6309					
6307					

TABLE 40 (continued)

0216	4383	1.88	8,239	12,840	24136.15
0213	5150	1.85	9,528	15,086.93	27912.28
5703	7176	.99	7,105	21,022.09	20814.10
5701	5128	1.02	5,231	15,022.48	15324.21
0210	3169	2.41	7,367	9,283.59	22372.59
0207	3520	.63	2,218	10,311.84	6497.63
0204	3745	2.27	8,501	10,970.98	24903.68
0201	3262	.74	2,414	9,556.03	7071.81
<u>GA. 78:</u>					
0373	11352 11850 23202	.95	22042	20762.81 21673.65 42436.46	
0370	17061 16999 43060	1.22	41553	31204.57 31091.17 78756.74	
0367	7799 8981 16780	.94	15774	14264.37 16426.25 30690.62	
1647	9358 7793 17150	2.18	37388	17115.78 14253.39 31367.35	
1644	16909 20140 37049	2.13	78914	30926.56 36836.06 67762.62	

<u>WALTON COUNTY</u>

<u>GA. 20:</u>					
0801	1820	1.35	2,457	3,385.(2)	4570.(02)
0804	1900	.89	1,691	3,534	3145.(26)
0807	1872	3.00	5,615	3,481.(92)	10443.(9)

TABLE 40 (continued)

3201	2517	.88	2,215	4,681.(62)	4119.9
3203	2209	.48	1,061		
3217	3343	.40	1,337		
GA. 81:					
3213	1034	.48	496		
3215	1672	.76	1,271		
0513	2996	3.90	11,685	5,572.(56)	21734.(1)
0510	3227	.48	1,549	6,002.(22)	2881.(14)
0507	2318	2.40	5,562	4,311.(48)	10345.(32)
0504	2815	1.28	3,604	5,235.(9)	6703.(44)
0501	1981	1.40	2,774	3,684.(66)	5159.(64)
U.S. 78:					
3205	7809	.35	2,733	14,524.(34)	5083.(38)
3207	6045	.19	1,149	11,243.(7)	2137.(14)
3209	7213	.86	6,204	13,416.(18)	11539.(44)
3211	9307	.27	2,513	17,311.(02)	4674.(18)
1201	5264	.19	1,000	9,791.(04)	1860
1204	4911	2.42	11,885		
1207	4665	2.05	9,563		
1210	4471	.86	3,845		
1213	5506	2.70	14,867		

TABLE 40 (concluded)

GA. 138:					
0701	3846	2.31	8,883	7,153.56	16522.(38)
0704	3572	2.26	8.072		
0707	3648	2.80	10.216		
0710	4559	2.34	=10,669		
I-20:					
2901	3753 3127 6880	1.51	10,388		

B.5 NATURAL RESOURCE USE

Electricity

Except for hydroelectric generation, Georgia is a 100 percent importer of energy -- coal, oil, gas and uranium. Therefore, Georgia's energy position is almost totally dependent on the national energy picture.

Electricity is a derivative form of energy. It cannot be generated without the use of other fuels. The fuels used are coal, oil, natural gas, uranium and falling water. Georgia Power, which serves the majority of this area, uses coal for 80 percent of the power generated, oil for 5 percent, hydropower for 5 percent and nuclear power for 10 percent.

Electric energy supply depends upon two basic considerations -- fuel supply and generating capacity. Time frames are the present (two or three years), the mid-range future (until about 1985), and time beyond.

Georgia has much at stake in national fuel supply questions because of all of our fuel being imported from other states.

Coal is the nation's most plentiful energy source. In 1976, 80 percent of Georgia's electric power was coal fueled. However, present air quality control regulations, principally relating to the sulfur content of fuel, restrict the use of available domestic coal as a basic fuel.

The air quality standards are a desirable goal. Their establishment has severely tested existing technology, and the time required to achieve them from a practical, technological standpoint. To meet these standards, the electric power industry must expend large amounts of money for removing sulfur and other contaminants. The alternative is to use less available, more expensive, low-sulfur coal that also has a lower heat value and more ash. This is currently the practice locally.

There are always trade-offs. In the present and immediate future, the availability of power may test our concern for the quality of our air. In the longer range, a balance of the optimal conditions for both power and environmental quality can be achieved through research and development.

Proven reserves of natural gas have rapidly diminished in recent years and are no longer used in the production of electric power. Hydropower is an important ingredient in the overall availability of electric service. Its availability in a system provides flexibility for meeting peak demand and enhances reliability.

Nuclear power, like hydropower, requires long planning and construction lead times. Solar power is still in its embryonic form and not yet sufficiently advanced technologically to promise near term results for power production. Nuclear power is an available technology but is currently a subject of public debate. Base load nuclear generating units can replace significant amounts of other fuels and reduce air pollutants. However, the current controversy regarding public acceptability of nuclear power must be resolved.

Power Distributors

The system of distribution for Georgia involves power produced by generating plants located throughout the entire state. The power is then transferred into the state grid and is automatically sent to areas that need the power. The Georgia grid is also connected to those operated in Alabama, Mississippi and the Florida panhandle. A computer system determines where the demand is and the location that can produce the power most efficiently.

Production of power in the Basin occurs at three levels: Base Load, Intermediate, and Peak facilities. The computers that automatically control the flow of power also control which of these plants are to be used. The Base Load plants are considered to be most efficient. This classification (most efficient) changes during different times of the day and in different weather conditions. Intermediate plans, which operate at a higher cost, are only operated when needed. This is true for Peak facilities as well, which mainly operate in the summer months (Georgia's peaking period). These Peak facilities also operate when a Base or Intermediate plant is down or being repaired.

The Upper Ocmulgee River Basin is served by the following types of systems*: one investor-owned system (Georgia Power), four Electric Membership Corporations, and four municipally owned systems. Georgia Power is the major supplier of electricity for the region. Various EMCs and municipalities listed below also play an important role in distributing electric power:

EMCs	Municipal Systems
Jackson EMC	Lawrenceville
Walton EMC	Monroe
Snapping Shoals	Covington
Central Georgia	College Park
	East Point

The EMCs of Georgia have joined together under Oglethorpe EMC in order to purchase power at wholesale rates. The municipal systems have also formed an organization known as Municipal Electric Authority of Georgia. The purpose of these organizations has expanded in recent years to purchasing portions of the new power plants and transmission lines built by Georgia Power. Oglethorpe EMC predicts that

* Information on actual usage to be provided.

they will be totally self-sufficient by the year 1985. The MEGA predicts that they will become self-sufficient in 1990.

Plant Location in Basin

The only power plant located in the Upper Ocmulgee River Basin is Lloyd Shoals which is located in Jackson, Georgia, and which forms Lake Jackson. There are six generators located at this hydroelectric plant, which have a combined capacity of 14,400 kw. According to the Georgia Public Service Commission, no power plant sites are proposed for the area in the near future.

Natural Gas

Because of increased consumption of natural gas and a decline in proven reserves, annual sales continue to exceed additions to proven reserves. Environmental considerations and economic factors have delayed development of potential gas sources, and exploratory drilling for new wells has reached its lowest level in a quarter century. Consequently, the Federal Power Commission has directed some gas suppliers to file gas curtailment plans.

The natural gas supply situation in Georgia varies from company to company and from town to town. In general, it appears that gas supply is sufficient to serve the existing residential and commercial customers, but will not be sufficient for all new customers in the near future. Less gas will be available for industry, and all gas will be more expensive.

Since the problems of the Atlanta Gas Light Company are typical of natural gas suppliers in Georgia, a brief description will be given of their operations. The Atlanta Gas Light Company has long-term contracts with two natural gas pipeline suppliers in the Upper Ocmulgee Basin including Transcontinental Gas Pipe Line Corporation and South Georgia Natural Gas Company.

Southern Georgia Natural Gas Company provides natural gas to the metropolitan Atlanta area where it is distributed to DeKalb, Fulton, Clayton, Henry, and portions of Newton Counties by the Atlanta Gas Light Company.

Transcontinental Pipeline Corporation provides gas to Rockdale, portions of Walton, Gwinnett and portions of Henry County.

Municipal Gas systems including Covington, Jackson, Lawrenceville, Monroe and Social Circle purchase natural gas directed from Transcontinental Gas Pipeline. Atlanta Gas Light, however, is the largest distributor for the Upper Ocmulgee River Basin.

The Company's pipeline suppliers have filed curtailment plans with the FPC for the stated purpose of protecting to the extent possible gas supplies to residential and firm commercial customers. The Company's sales of interruptible gas to certain of its industrial customers have been adversely affected by the implementation of these plans. There can be no assurance that limitations on interruptible service will not continue or even increase, or that restrictions will not be imposed limiting the addition of interruptible or firm customers.

There are no plans to increase the number of pipelines to the Basin in the near future.

Natural Resource Users

At present there are no manufacturing operations that use natural resources as part of their production system. The only extraction industry operation in the Basin are granite quarries (6) and extremely small sand dredging operations.

Source: The Energy Problem and Its Implication for Georgia, Georgia Center for Technology Forecasts and Assessment.

B.6 WATER PROGRAMS

This discussion of water programs involves a Review of work currently being concluded for a major portion of the Study Area under the auspices of the Urban Studies Program, the U. S. Army Corps of Engineers. In addition, similar discussions describe the activities of the State of Georgia, Department of Natural Resources, Environmental Protection Division in the area of wastewater collection and treatment systems, stream classification and wasteload allocations established by the Georgia Water Basin Management Plan. Finally, the correlation of the work done for the majority of the Study Area under the Urban Studies Program and the work performed by the Georgia Environmental Protection Division are discussed as a means of balancing both water supply and wastewater treatment.

Existing Water Programs

The Metropolitan Atlanta Water Resources Study was authorized at the request of Senator Herman Talmadge of Georgia by resolution adopted March 1972 by the Public Works Committee of the U. S. Senate. The study encompasses the jurisdiction of the Atlanta Regional Commission and portions of abutting counties. It was undertaken as a three and one-half year effort and financed by a $1.3 million authorization of federal fundings matched by one quarter million dollars of effort by local and state governments. The study was undertaken on a cooperative basis by the principle parties identified below:

... Atlanta Regional Commission
... Georgia Department of Natural Resources
... U. S. Environmental Protection Agency
... U. S. Army Corps of Engineers
... Assistance and cooperation by other federal, state and local agencies

The purpose of the study was to evaluate existing water resources, current and future needs, and to recommend methods of meeting those needs. The primary objective was to develop a comprehensive water resources plan for the Atlanta Region.

While the Study Area was expanded during the course of the work to include contiguous counties of the Atlanta Regional Commission area of jurisdiction, it did not involve itself with Newton, Walton, Butts and Jasper Counties, which are included in the Study Area of this environmental impact statement. However, the vast majority of the population, which consumes water with its attendant needs for treatment, were included within the Metropolitan Atlanta Water Resources Study.

Existing Water Systems

Approximately 90 percent of the population within the Upper Ocmulgee Study Area is dependent upon the Chattahoochee River in conjunction with Lake Lanier for water supply. In excess of 80 percent of the total water supply used to meet the needs of the metropolitan Atlanta

T A B L E 41

EXISTING WATER SOURCES

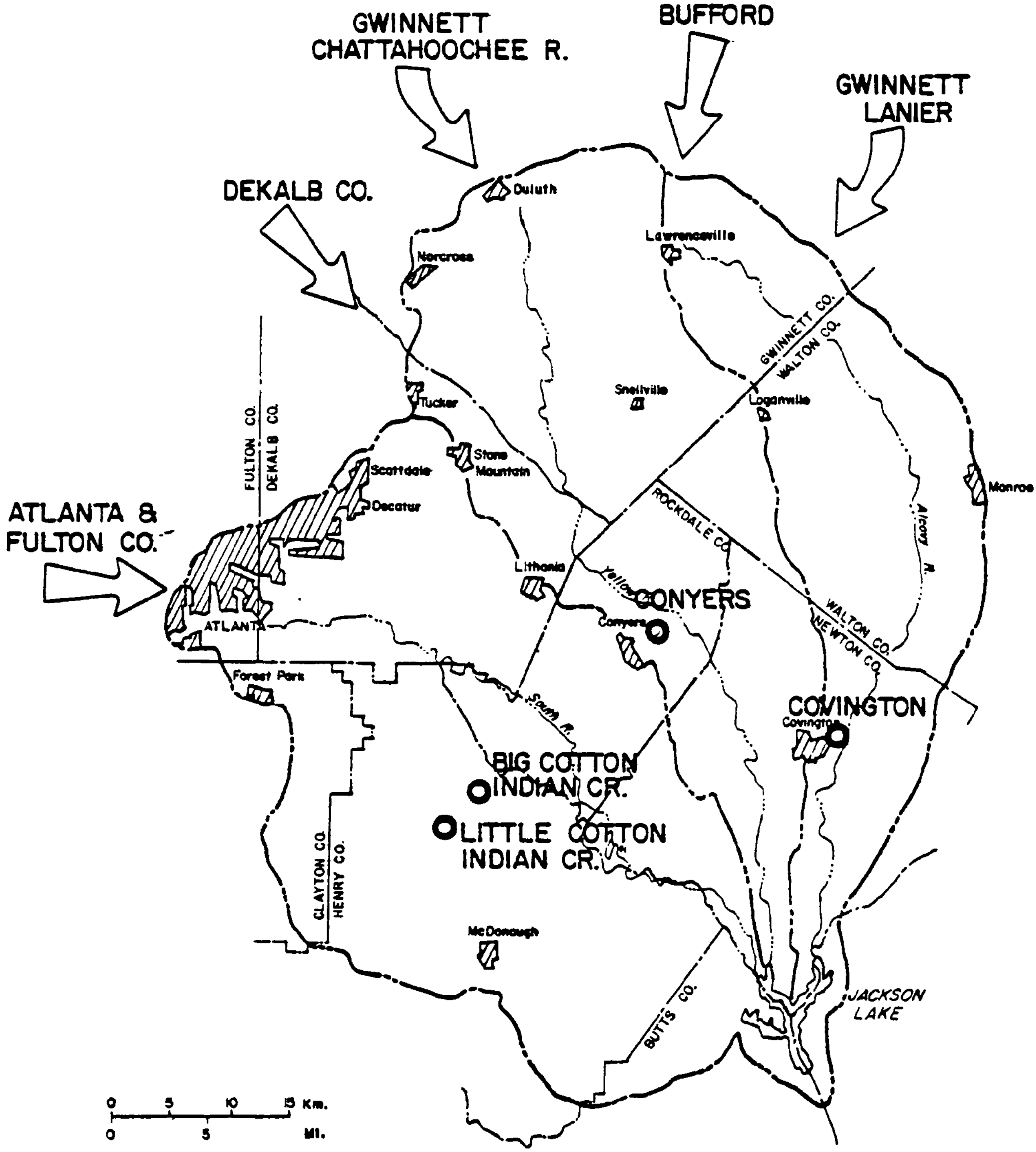
Jurisdiction	Type	Source
Clayton County	Impoundment	Cotton Indian Creek
DeKalb County	Surface	Chattahoochee River
Fulton County/Atlanta	Surface	Chattahoochee River
Gwinnett County	Surface	Chattahoochee River
Gwinnett County	Surface	Lake Lanier
City of Buford	Surface	Chattahoochee River
City of Grayson	Wells	Groundwater
City of Lawrenceville	Wells	Groundwater
Henry County		
City of McDonough	Surface	Walnut Creek
Newton County		
City of Covington	Surface	Alcovy River
City of Porterdale	Surface	Yellow River
Rockdale County		
City of Conyers	Surface	Yellow River
City of Conyers	Wells	Groundwater

TABLE 42

POTENTIAL NEW WATER SUPPLY RESERVOIRS

	Maximum Sustained Yield (MGD)	Surface Area (Acres)
Big Haynes Creek	13	460
Big Cotton Indian Creek	30	514
Shoal Creek	6	303
Yellow River	124	2,850
Alcovy River (Cornish and Big Flat Creeks)	NA	NA

Source: Atlanta Water Resources Study & USDA, Watershed Development in Georgia, Status Report, Sept. 1976.



UPPER OCMULGEE
RIVER BASIN

EXISTING WATER SUPPLY

FIGURE 29

population is drawn from the Chattahoochee River and Lake Sidney Lanier. The remaining 20 percent is drawn from a combination of smaller impoundments, wells, or other river systems. Within the Upper Ocmulgee Basin, Gwinnett County presently has a 12 MGD intake structure on the Chattahoochee River and is completing construction of a 40 MGD intake structure within Lake Lanier. DeKalb and Fulton Counties are totally dependent upon the Chattahoochee River for their source. The Clayton County Water and Sewer Authority maintains impoundments in adjacent Henry County on Big and Little Cotton Indian Creeks. The Conyers-Rockdale County system uses a combination of wells and a water intake structure on the Yellow River at Milstead. The Covington-Newton County System is dependent upon the Alcovy River for its source of supply. Figure 29 shows existing sources of water supply and major points of withdrawal within the Upper Ocmulgee Basin.

Potable Water Systems

The Atlanta Water Resources Study identified all major surface and ground water sources of water supply within their Study Area. The only additional water supply sources not identified by the AWRS are those of the Covington-Newton system and for the City of McDonough within the Upper Ocmulgee Basin. The following table, Table 41 , identifies these major sources of water supply by source and jurisdictions served. This table shows the heavy reliance of the metropolitan area upon the Chattahoochee River and Lake Lanier for its source of water.

The AWRS study also evaluated potential new sources of water supply, typically in the form of reservoir development. Table 42 identifies these potential new water supply reservoirs within the AWRS Study Area. It should be noted that in adjacent jurisdictions falling within the Upper Ocmulgee Basin there have been additional local initiatives toward the creation of new water supply impoundments by Walton and Newton Counties on Big Flat Creek and Cornish Creek, which are tributaries to the Alcovy River. Big Haynes Creek has been investigated by Gwinnett and Rockdale Counties, and Clayton County has investigated Shoal and Big Cotton Indian Creeks. Table 43 , Present and Projected Potable Water Use, is extracted from the 303 Basin Plan. While this table identifies potential withdrawals on a forecasted basis from numerous tributaries as well as main stems of rivers within the Basin, it is a general assessment based on population projections not fully contrasted with sustainable yields from the respective sources.

Specifically, in the AWRS study some of these same tributary and main stem segments are addressed as to their future desirability as a source of water supply. In many of these tributaries as well as in the upper regions of the Yellow and the Alcovy Rivers problems exist that place doubt on their future suitability as a water supply or source.

TABLE 43

UPPER OCMULGEE RIVER BASIN

PRESENT AND PROJECTED
POTABLE WATER USE

MINOR BASINS	1967 GPCPD[1]	1967 MGD[2]	1970 GPCPD	1970 MGD	1980 GPCPD	1980 MGD	1990 GPCPD	1990 MGD	2000 GPCPD	2000 MGD	2020 GPCPD	2020 MGD
1. Shoal Creek	115	3.25	115	3.62	120	4.08	135	4.72	150	6.38	155	8.06
2. Intrenchment Creek	160	9.52	160	9.32	165	9.90	170	10.8	175	11.6	175	12.6
3. East Point	160	14.8	160	15.2	165	16.7	170	18.1	175	20.6	175	28.7
4. Above Snapfinger Creek	115	14.3	115	16.3	120	27.6	135	38.3	150	48.6	155	58.9
5. Above Cotton-Indian Creek	115	1.67	115	1.64	115	2.93	120	5.01	120	6.24	125	8.75
6. Cotton-Indian Creek	115	2.44	115	3.05	115	4.43	120	5.82	120	8.52	125	17.6
7. Walnut Creek	115	0.83	115	0.92	115	1.58	120	2.52	120	3.18	125	3.59
8. Lower South River	115	0.52	115	0.55	115	0.70	120	0.88	120	1.02	125	1.37
9. Upper Yellow River	100	4.60	100	5.40	110	9.57	115	15.9	120	24.7	125	59.8
10. Lower Yellow River	100	1.36	100	1.45	110	1.83	115	2.17	120	2.55	125	3.19
11. Upper Alcovy River	100	0.35	100	0.40	100	0.52	105	0.71	110	0.96	120	1.74
12. Lower Alcovy River	100	2.60	100	2.70	100	3.08	105	3.62	110	4.18	115	4.94
TOTAL FLOWS		56.24		60.55		82.92		108.55		138.53		209.24

[1] GPCPD = Gallons Per Capita Per Day
[2] MGD = Million Gallons Per Day

Since the upper reaches of the Yellow and Alcovy Rivers, as well as many of the tributaries thereto, are headwater areas, they experience great fluctuation in flow. In addition, it is in these same areas that much of the new development is anticipated, thus injecting the problem of maintaining water quality in addition to dependable flow. As a consequence of these two concerns, the AWRS study, while identifying some of these tributaries as potential new water supply sources, is equally concerned with maintenance of water quality in these stream basins in the face of non-point pollution emanating from new urban activities.

Interbasin Transfer

Water supply systems within the Atlanta metropolitan area have historically used the most abundant, high quality water that was most reasonably available. For most of the water supply system, this has meant the Chattahoochee River as the source of supply.

Since domestic water supplies are distributed under pressure, the distribution system need not be restrained by the rolling terrain of the area. Consequently, the source of supply in one basin frequently found its point of use in another basin.

As the area grew in population, the water supply systems grew to meet the demands carrying Chattahoochee water to users in the South, Flint, Yellow and Alcovy Basins. Table 44 provides a rough balance sheet on the interbasin transfers of water that are occurring within the Atlanta region. Both the Chattahoochee and the Etowah have their headwaters in the mountains of north Georgia; thus, as they approach the vicinity of the Atlanta metropolitan area, they are of good quality and ample flow. Conversely, the waters of the Flint, South, Yellow and Alcovy Rivers originate within the Atlanta metropolitan area, have minimal or highly variable rates of flow and are not dependable sources for public water supply unless impounded.

Table 44 also highlights a second significant aspect of interbasin transfer. The waters taken from the Chattahoochee and the Etowah and eventually placed into the Flint, South, Yellow or Alcovy Rivers reach those rivers in the form of treated wastewater. In the South River, where this condition is most prevalent, there are recorded instances during periods of low flow when the discharge of wastewater exceeds the natural flow of the river. This condition obviously compounds efforts toward improving the water quality of the South River.

Interbasin transfer has not gained great public attention, yet historically has been a practice widely employed throughout the State of Georgia. As emphasized in the Atlanta Water Resources Study, the local supply of water, particularly from the Chattahoochee system, is reaching its limit and, without concerted planning and public actions, could become a restricted source of supply after the year 2000.

TABLE 44

MAJOR RIVER BASIN WATER TRANSFERS IN THE ATLANTA REGION
(million gallons per day, average day)

Year	RIVER BASIN						
	Chattahoochee	Etowah	Flint	South	Yellow	Total	
1970							
Water Supply Withdrawal	179	12	0	10	2	203	Consumed: 35
Wastewater Discharge (1)	112	5	9	35	7	168	Transferred: 39
Difference	- 67	-7	+9	+25	+5	-35	
Amount Transferred (2)	- 35	-4	+9	+26	+4	39	
2000							
Water Supply Withdrawal	461	27	4	10	0	492	Consumed: 93
Wastewater Discharge (1)	263	8	25 (3)	75	28	399	Transferred: 117
Difference	-198	-9	+21	+65	+28	-93	
Amount Transferred (2)	-111	-6	+22	+67	+28	117	

Notes:
1. Does not include inflow/infiltration
2. Calculated as follows: (Wastewater flow - Water supply + percentage of water supply that is consumed).
3. Applied to a land treatment site within the basin; not discharged directly to the river.

Source: Atlanta Water Resources Study.

This study has been instrumental in bringing attention to the question of interbasin transfers and the problems that have resulted from them. As a consequence, the study has advanced concepts of rediversions back to the basin from which the water was originally withdrawn.

Numerous recommendations have been made regarding rediversion, but the largest rediversion recommended would involve placing the discharges from Atlanta's Flint River, Intrenchment Creek and South River wastewater treatment facilities into a major interceptor and diverting these discharges from the current receiving streams, the Flint and South Rivers, to the Chattahoochee River. Rediversion has also been advanced and is now being implemented in Clayton County, where treated wastewater flows back to the South River Basin for ultimate land spray disposal. An additional rediversion project is advanced for Gwinnett and DeKalb Counties, taking flow which would otherwise discharge to the Yellow River and diverting it to the South River.

The purpose of these proposed rediversions is only secondarily related to an attempt to balance water withdrawal and wastewater discharges in the same basin. The primary focus is to maintain stream water quality standards within individual river systems and to protect downstream users who must use these streams as their source of water supply. Even in the proposed year 2000 plan the disparity between withdrawals and discharges is proposed to continue and the AWRS study estimates diversion increasing from its current level of 39 million gallons per day in 1970 to a possible 117 million gallons per day in the year 2000 without implementation of rediversion projects.

System Expansions

As one would expect with a growing metropolitan area, water supply systems are faced with the problem of meeting anticipated population growth and their attendant water supply requirements. Within the Upper Ocmulgee Basin, the three major water supply systems are the City of Atlanta system, the DeKalb County system, and the Gwinnett County system. Each of these major systems, as well as the smaller systems of Clayton County, Conyers-Rockdale and Covington-Newton, plans expansion to their systems, both in production capacity and in distribution extensions. The three major systems have all taken steps to increase their supply through new or expanded intake structures on the Chattahoochee River system. The largest of these is the proposed 40 MGD intake structure within Lake Sidney Lanier now being constructed by the Gwinnett County water system. Similarly, DeKalb County is proposing to finance an increased intake capability to service a new mid-county treatment facility in an attempt to meet projected demands and to balance pressure requirements in the southern half of the county. These new intake structures, the Lake Lanier intake in Gwinnett County, a new intake of DeKalb County in the Chattahoochee, and a proposed new intake structure for the City of Atlanta/Fulton County system on the Chattahoochee, are programmed to withdraw 60 MGD, 96 MGD, and 235 MGD, respectively, in the year 2000.

T A B L E 45

COMPARISON OF ATLANTA VERSUS AVERAGE U.S. CAPITA WATER USE

TYPE OF USE	ATLANTA REGION GALLONS PER CAPITA PER DAY	ATLANTA REGION PERCENT	AVERAGE U.S. CITY GALLONS PER CAPITA PER DAY	AVERAGE U.S. CITY PERCENT
Residential	74	52	74	47
Commercial	28	20	28	18
Industrial	20	14	37	23
Public/ Unaccounted	20	14	20	12
TOTAL:	142	100	159	100

Note: Average per capita water use in the Atlanta Region versus average per capita water use in an average U.S. City, 1970. Date for average U.S. city taken from Water Resources Council, The Nation's Water Resources, 1968. p.4-1-2

The smaller water systems of the southern tier of counties are also programming and installing system expansions. Due to their limited source of supply, however, intra-governmental agreements have been reached with many of the systems so that they are interconnected in the event of an emergency or can provide back-up service for extended periods of time. Such agreements are common throughout the metropolitan Atlanta area, and within the Basin such agreements exist between the DeKalb County and Gwinnett County systems, between DeKalb, Gwinnett, and Rockdale and between cities and their respective county systems.

Water Conservation

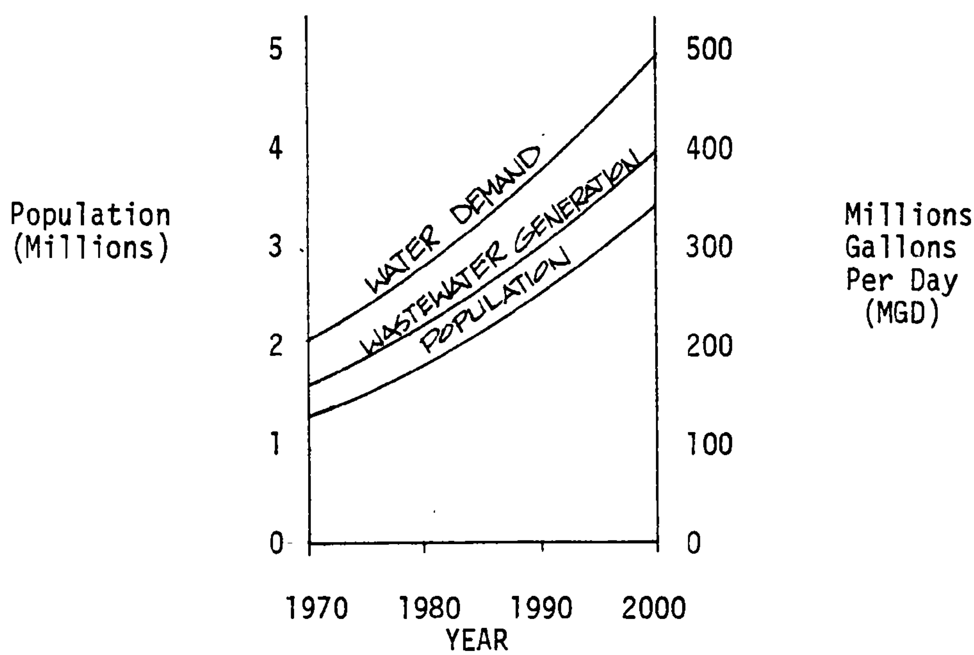
A growing realization of the conservation ethic is challenging many of the old concepts for continually expanding systems and encouraging increased consumption. While the trends leading toward our present energy crisis have been apparent for many years, an oil embargo imposed by a foreign cartel was required to bring the true magnitude of the situation to the understanding of the American people. The national program to clean our nation's streams has brought home the cost of wastewater treatment services to the average taxpayer. The Atlanta Water Resources Study has made public the fact that despite its location in a region with an abundance of water, the Atlanta region can now chart the upper limits of its water supplies.

Due to the direct relationship between water supply and wastewater requirements, any program that results in reduced consumption of water supply will have a direct reduction in the requirement for wastewater treatment.

The residential consumer currently accounts for approximately 50 percent of all water consumption based on a national average as well as within the Atlanta region. Table 45 contrasts the Atlanta region with an average U. S. city. While total annual consumption is somewhat reduced from the average American city, the comparisons by the type of use are quite similar. The correlation between water consumption and the requirement for wastewater treatment is demonstrated in Figure 30

A more detailed look at the water-using activities within a household demonstrates that more than half of the total household consumption can be attributed to personal bathing and toilet flushing. Currently, the average water closet or toilet tank utilizes approximately five gallons of treated water per flush. In contrast, water conserving appliances are currently on the market that perform the same function just as adequately utilizing only 3½ gallons per flush. Showering accounts for approximately 60 percent of all water used for personal bathing. The combination of toilet flushing and personal bathing, whether a tub bath or a shower, accounts for approximately 80 percent of the per capita use of treated water in the average household. Here again, water-saving shower devices are commercially available that can reduce rates of consumption.

F I G U R E 30



Population, water demand, and
wastewater generation in the
Atlanta Region, 1970 to 2000.

If residential consumers account for more than half the total daily water consumption and, further, if 80 percent of that residential consumption can be attributed to toilet flushing and bathing, concentration on these two areas of water conservation can make a meaningful impact on production demands for treated water and in a direct fashion on system expansions required in wastewater treatment. If a conservation effort were launched to reduce water consumption, logically the largest water consuming use (residential) and, further, the major water-consuming devices within the house (toilets and showers) offer two avenues for attacking the problem. A basic program would first correct plumbing codes to require the installation of water-saving toilets and shower heads, both for new construction and for replacement construction and, secondly, a public information campaign directed toward increased awareness would be undertaken.

The Atlanta Regional Commission has performed a conservation evaluation based on two projected year 2000 scenarios. The following table (Table 46 represents the effect of these two scenarios on both water consumption and wastewater flows. The almost one-to-one relationship between reduced water consumption and reduced wastewater flows is demonstrated by this table.

An educational appeal to the public can also result in meaningful conservation practices. During the severe water shortage experienced by the New York metropolitan area in the early 1960s such a program was undertaken and records kept of the results. While the public appeal was buttressed with mandatory restrictions on water-consuming activities like watering lawns and using water for cleaning buildings, the results were indeed impressive (see Table 47).

Since water consumption for personal hygiene is not a major factor with most commercial and industrial activities, other avenues must be pursued to address water conservation techniques for these types of uses. Rate structures offer the greatest promise for encouraging conservation by commercial and industrial enterprises. It is now a standard practice for water supply systems to meter consumption and to bill accordingly. It is also common practice for such utilities to establish their rate structures on the basis of descending block rates. This means that with greater levels of consumption per unit cost is reduced, thus encouraging consumption by high water users. Such basis for rate structures are now being reevaluated by many systems in an effort to encourage conservation.

An important element in this reevaluation are the requirements of the Federal EPA. As part of their grant programs for pollution-control projects, rate structures must be reviewed and meet acceptable standards as a condition for receiving grants. These requirements provide that grant applicants must adopt user charges as a means of assuring that each user contributes his fair share toward operating and capital costs. As a result, the once common practice of assigning flat rates

TABLE 46

WATER CONSERVATION

	Residential	Commercial	Industrial	Public & Unaccounted	Total
Water Use, 1975	129	48	34	33	244
Water Use, 2000 (No Conservation)	281	97	69	56	503
Water Saved, 2000 A*	34 (12%)	-	-	-	34 (7%)
Water Saved, 2000 B**	50 (20%)	11 (11%)	-	6 (11%)	67 (13%)

*2000 A - Conservation in new residential construction. Assume all increases in population after 1975 are served with water-conserving appliances in the residences.

**2000 B - Conservation in new construction and replacements in residential, commercial and public. Assume all increases in population after 1975 and half of the 1975 population are served with new appliances. Assume the percentage of total water demand used by toilets is 41 percent of residential use and 50% of both commercial and public and unaccounted uses (arbitrary). Assume that 22% of residential demand is used by showers, and 0% of commercial and public and unaccountec.

WASTFWATER CONSERVATION

	Residential	Commercial	Industrial	Public & Unaccounted	Total
Waste Flows, 1975	90	46	32	30	198
Waste Flows, 2000 (No Conservation)	197	92	66	50	405
Flow Reduction, 2000 A*	24 (13%)	-	-	-	24 (6%)
Flow Reduction, 2000 B**	35 (18%)	10 (11%)	-	6 (12%)	51 (13%)

*2000 A - Conservation in new residential construction.

**2000 B - Conservation in new and replacement residential, commercial, and public construction.

Source: ARC Staff Working Paper, Possibilities for Water Conservation in Atlanta Region, ARC, March 1976.

TABLE E-47

WATER USE IN THE NEW YORK METROPOLITAN AREA

	NONINDUSTRIAL USE		INDUSTRIAL USE		TOTAL USE	
YEAR	GPCPD	% CHANGE	MGD	% CHANGE	MGD	% CHANGE
1960	118	-	282	-	1157	-
1961	119	+ 0.8	289	+ 2.5	1167	+ 0.9
1962	118	0.0	280	- 0.7	1151	- 0.5
1963	118	0.0	285	+ 1.8	1158	+ 0.0
1964	114	- 3.4	280	- 0.7	1132	- 2.4
1965	97	-17.8	281	- 0.4	994	-14.1
1966	95	-19.5	283	+ 0.4	987	-14.7
1967	110	-6.8	252	-10.5	1076	- 7.0

Note: The effect of public education and use restrictions on water demand in New York City. (Fron Temporary State Commission on the Water Needs of S.E. New York, Measures to Reduce Water Consumption in S.E. New York, 1973, Albany, N.Y.).

1. Lawn sprinkling in municipal parks and golf courses was stopped.
2. Street cleaning by flushing with water was stopped.
3. Hydrant harnesses were installed and laws against illegal hydrant openings were strictly enforced.
4. Water use for cleaning subway cars and buses was reduced.
5. A ban on using water to clean buildings and other structures was instituted.
6. Ornamental fountains were shut down.
7. Water use for lawns and gar-ens was banned.
8. Restrictions on water use for air conditioners were imposed.

Source: ARC Staff Working Paper, Possibilities for Water Conservation in the Atlanta Region, ARC, March 1976.

for sewage service is rapidly evolving into more equitable systems frequently based on water consumption.

A further and equally significant aspect of federal requirements for rate structures requires that any water consumer, such as an industrial process whose sewage effluent inflicts a greater treatment cost on the system relative to the average, is required to pay higher rates or to pretreat their effluent before discharging to the public system.

While it has been shown that rate structures are relatively inelastic for the residential consumer, they are much more elastic for the large water consumer. Due to the combination of EPA grant requirements and generally increasing rates resulting from reevaluation of rate structures, industries or commercial activities -- that are considered high water users -- have investigated and instituted water-saving practices such as cycling, modification of industrial processes, and the pretreatment of industrial discharges.

The improvement of system efficiency is another area in which conservation practices are being implemented. Many of the major systems within the Atlanta metropolitan area maintain monitoring equipment or conduct periodic surveys to determine the losses within their system resulting from breaks, seals, non-metered or illegal connections. In an effort to improve the efficiency of wastewater collection and treatment systems, the Federal EPA requires infiltration/inflow analyses to be performed on collection systems. These evaluations require the monitoring of collection networks to assure ground water or other authorized discharges into the collection system are identified, and the worst problems corrected. The benefits of these programs result in greater efficiency and less cost to the consuming public.

Wastewater Programs

The amendments of 1972 to the Federal Water Pollution Control Act established national standards that all systems utilizing federal grants must obtain within benchmark years. While the Environmental Protection Agency is assigned the overall responsibility to assure compliance, much has been delegated to the Georgia Department of Natural Resources, Environmental Protection Division.

The dates by which standards must be attained are itemized below:

... 1977 Secondary treatment, defined as 85 percent removal of oxygen-demanding pollutants, must be implemented. (Standard)

... 1983 Wherever attainable, an interim goal of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water shall be achieved by July 1, 1983. (National Goal)

T A B L E 48

TREATMENT FACILITY DATA BY SUB-BASINS
Public Systems

NAME	LOCATION	WQMU	FLOW	TREATMENT
YELLOW RIVER				
NEWTON COUNTY WPC	PORTERDALE	0491	1.0	Activated Sludge Secondary
LAWRENCEVILLE	REDLAND CREEK	0407	.63	Trickling Filter
GWINNETT COUNTY SPRINGDALE ESTATES S/D	BEAVER RUIN CREEK	0406	.25	Secondary Activated Sludge
NORCROSS-PIRKLE	BEAVER RUIN CREEK	0406	.25	Aerated Pond Polish Pond
NORCROSS-SHEFFIELD FOREST S/D	BEAVER RUIN CREEK	0406	.09	Aerated Pond Polish Pond
GWINNETT COUNTY	JACKSON CREEK	0406	2.4	Activated Sludge Polish Filter Chemical
GWINNETT COUNTY VALLEY BROOK	JACKSON CREEK	0406	.07	Activated Sludge Polish Pond
CONYERS	BOAR TUSK CREEK	0408	.50	Activated Sludge
GWINNETT COUNTY NORTHWOOD	SWEETWATER CREEK	0407	.05	Activated Sludge Polish Filter
NEWTON COUNTY WPC PLANT	YELLOW RIVER	0491	1.0	Secondary Activated Sludge
SOUTH RIVER				
INTRENCHMENT CREEK	ATLANTA INTRENCHMENT	0401	20.0	Trickling FILTER Secondary
DEKALB COUNTY	HONEY CREEK	0404	1.0	Activated Sludge Secondary
CLAYTON COUNTY	N.E. WPC PLANT	0403	.80	Activated Sludge Polish Pond Secondary
CONYERS	ALMOND BRANCH	0404	1.0	Activated Sludge Secondary
DEKALB COUNTY	SNAPFINGER CREEK	0490	9.6	Activated Sludge Secondary
DEKALB COUNTY	POLEBRIDGE CREEK	0401	.70	Waste Stabilization Pond
STOCKBRIDGE - BRUSH CREEK	COTTON INDIAN CREEK	0403	.50	Secondary Activated Sludge
ATLANTA	SOUTH RIVER	0490	12.0	Activated Sludge

T A B L E 48 (concluded)

TREATMENT FACILITY DATA BY SUB-BASINS
Public Systems

NAME	LOCATION	STREAM	FLOW	TREATMENT
ALCOVY RIVER				
LOGANVILLE-IMHOFF TANK	BIG FLAT	0410	.10	Imhoff Tank Primary
GWINNETT COUNTY LAWRENCEVILLE	SHOAL CREEK	0410	.24	Waste Stabilization Pond
MONROE POND #1	MILL BROOK	0410	.144	Waste Stabilization Pond
MONROE POND #3	MOUNTAIN CREEK	0410	1.10	Aerated Pond

... 1985 Zero discharge; the discharge of pollutant into navigable waters shall be eliminated. (National Goal)

Important to this assessment of goals and standards included in the 1972 Pollution Amendments to the Federal Water Pollution Control Act, is the understanding that the 1977 and 1983 standards must be met by all treatment systems receiving federal grants. The 1983 goal, however, is stated simply as a goal that does not require full attainment by that benchmark year. In fact, the 1983 goal has received repeated criticism as being unattainable within the time frame indicated in the law. As follow-up to the Federal Water Pollution Control Act Amendments, Georgia EPD has set its own standards for streams within the State of Georgia. In some cases the State requirements are more severe than those of the federal government.

Within the Upper Ocmulgee Basin all municipal systems have achieved, or are in the process of achieving, the 1977 standard and are now working toward achieving the 1983 goal of fishable and swimmable waters.

The Georgia EPD has established effluent criteria frequently referred to as 10-2-1-6 for all public wastewater systems in the Basin. This term refers to the level of treatment required in treatment facilities, such that the effluent from such facilities achieves the standard of 10 mg/l five-day biological oxygen demand, 2 mg/l ammonia, 1 mg/l phosphorous, and 6 mg/l dissolved oxygen.

The purpose of imposing this effluent criteria upon all municipal wastewater discharges into the Upper Ocmulgee Basin is to enhance water quality. The standard is severe and requires sophisticated and expensive treatment processes. The goal for establishing such standards is the improvement of water quality in the tributary streams which flow to Lake Jackson.

Major Wastewater Treatment Facilities

Presently there are a number of wastewater treatment facilities, both public and private, discharging to the three major streams comprising the Upper Ocmulgee Basin (see Table 48). By far the largest of these systems, and the greatest quantity of wastewater effluent, are being discharged to the South River. Current projections indicate that with time this situation will not change despite greater discharges being made concurrently to the Yellow and Alcovy River systems. Critical to this evaluation is a recognition that regardless of the sequence of discharges or their magnitude, the impounding reservoir which will receive all non-biodegradable constituents of plant discharges is Lake Jackson.

Municipal Treatment Systems

The City of Atlanta, which contributes the greatest flow, consequently has the largest treatment facilities within the Basin. As mentioned previously, current plans are to re-divert the discharges of three major treatment facilities that currently discharge to the South River, through an interceptor and pumping system to an eventual discharge in the Chattahoochee River. Since two of these three major treatment facilities (Intrenchment Creek and South River wastewater treatment plants) comprise 70 percent of the total discharge to the South River, the diversion of their effluent should result in a major improvement to the stream quality in the upper reaches of that stream.

The mid reaches of the South River and the upper reaches of the Yellow River receive discharges from the DeKalb and Gwinnett County systems. The magnitude of discharges now received by the Yellow River from Gwinnett County facilities may increase to the discharge levels presently experienced in the South River by the year 2000. This growth in discharge quantities reintroduces the prospect of interbasin transfer and whether one stream should be preserved to the detriment of other streams.

Also compounding these problems is the question of combined sewers. Combined sewers are those sewers that collect not only domestic wastewater but also accept stormwater. Combined sewers are found within the South River Basin. Fortunately, the practice of combining storm and wastewater flows into a single sewer system has not been pursued in the more recently developed urban areas of DeKalb and Gwinnett counties. Within the Study Area three such combined sewers discharge to tributaries of the South River. These are McDaniel Street, Boulevard, and Confederate Avenue.

The problem of treating discharges from combined sewers is one of peak flows. Most wastewater treatment facilities are designed to accept peak wastewater flows but are not designed to accept stormwater discharges which occur in an erratic fashion and are of great intensity. The Atlanta Water Resources Study did evaluate methods of treating flows of combined sewers and concluded that while such a program could be effective it would also be extremely costly. However, the Atlanta Three Rivers project as proposed will provide facilities to catch and treat to secondary levels the most highly polluted portions of overflows from City of Atlanta combined sewers prior to release in the South River.

Sources of Wastewater

There are a variety of sources that contribute wastewater to the natural drainage system. In addition to the familiar discharges originating from residential or domestic uses, there are industrial and commercial discharges which may, depending upon the nature of the activity, place minimal or extreme requirements on the treatment facilities that must accept these wastes. For example, an office building will have only minimal wastewater discharges while an industrial enterprise dealing with chemical products may have discharges of such magnitude or concentration as to require pre-treatment before the discharge may be allowed into a municipal system. However, a common characteristic of domestic and industrial discharges is that they are typically collected through a piping system and carried to a central point for treatment before discharge to natural streams.

The other type of wastewater source is less definable as to its origin. Because of this characteristic such sources of pollution are typically referred to as non-point sources. Included within this category is surface runoff from storms which wash streets, lawns and fields, and eventually deposit this runoff into the natural drainage system. Also included are those areas where development has utilized septic tank systems that have at times failed, allowing their untreated discharges to run over the surface of the ground and eventually find their way to natural drainage networks. In a similar fashion, runoff from agricultural areas and forests also find their way eventually to streams and lakes. While these latter sources are not generally of great concern, they can become meaningful in an area of intense agricultural activity utilizing chemical fertilizers.

An immediate characterization of point and non-point sources of pollution can be made between individual river systems of the Upper Ocmulgee Basin. The South River, in addition to receiving intense discharges from point sources, also receives large quantities of discharge from non-point sources through the existing combined sewers and other natural drainage systems. Conversely, the Alcovy River, which has experienced minimal urban development and is characterized as draining an agricultural area, receives minimal point source discharges from the few municipalities along its reaches, but rather substantial agricultural or non-point discharges. The Alcovy is classified by Georgia EPD as a stream of excellent quality, while the South is characterized as grossly polluted.

Between these two extreme situations lies the Yellow River. The Yellow River's drainage area is currently only minimally developed with urban type activities. However, its growth rate is rapid and the forecasted growth to the year 2000 represents a substantial increase in population and conversion to urban type land uses. Its water quality is presently characterized as good, but in its upper reaches the Yellow River receives both point and non-point source pollutants.

These point source pollutants originate from a combination of public municipal treatment facilities and numerous small treatment facilities commonly referred to as "package plants." Non-point sources involve a full range of agricultural and silvacultural activities in addition to runoff from urban developments and, in some areas, septic tank overflows.

The type, size, and treatment characteristics of major treatment facilities within each sub-basin of the Upper Ocmulgee are identified in Table 48 . While the number of treatment facilities -- public, private and industrial -- indicate a rather complex network of collection systems, an evaluation of the flow or discharge characteristics of these systems limits any further consideration of those municipal systems that handle the greatest volumes and therefore have the greatest impact on the receiving streams.

Non-point sources are very much another matter. It has been estimated by the Atlanta Water Resources Study that in certain tributary basins, non-point sources can equate to point source loads during certain periods of the year. If this is true within the Upper Ocmulgee Basin, it is cause for great concern as to methods of collecting and treating non-point sources or, alternatively, restraining their ability to reach receiving streams.

Characterization by River System

The following discussion deals with the general characteristics of the three river systems comprising the Upper Ocmulgee Basin.

South River Basin

The South River originates near the center of the City of Atlanta and flows in a southeasterly then southerly direction until it reaches Lake Jackson. The river is severely polluted due to significant point discharges near the headwaters of the river system where flows are typically low and erratic.

Almost the entire southern half of DeKalb county flows to the South River. While the DeKalb County drainage area is not involved in combined sewer overflows, as is the Atlanta drainage area, the growth experienced in southern DeKalb County has been so rapid as to require major expansion in waste treatment facilities by the DeKalb Water and Sewer Department. A major concern in the South River Basin is the ability to maintain the water quality of tributary streams lying in Clayton and Henry Counties. In this area of the South River Basin the Clayton County water system has a water supply impoundment on Cotton Indian Creek that services not only Clayton but portions of Henry County. If this impoundment is to be protected, concern must be expressed by these jurisdictions for not only point, but non-point sources of pollution.

Yellow River Basin

The Yellow River originates in northern Gwinnett County and flows in a southerly direction for a distance of approximately 70 miles to its confluence with Lake Jackson. The Yellow River is currently characterized as being of good water quality. This is due largely to the limited degree of urban development and the imposed requirements for high levels of treatment for all point discharge facilities. This basin can also be characterized by a large number of rather small and inefficient "package" treatment plants and a large incidence of developments built with septic tank systems that have experienced high rates of failure.

Major efforts are being undertaken by Gwinnett County, DeKalb County and Rockdale County in a cooperative fashion to deal with the burgeoning growth within this Basin in terms of wastewater requirements. Regional facilities highlight the planned activities of these governments. These facilities and their phasing over time are indicated in Figure 31 , which originates from the recommended Areawide Wastewater Management Plan of the Atlanta Regional Commission, May 1976. In order to accomplish this phasing, a high degree of inter-governmental cooperation is required along with a heavy dependence on county systems in deference to municipal systems.

The Alcovy River

The Alcovy River is at this point essentially free of pollution. While the river basin does drain portions of municipalities such as Lawrenceville, Monroe, Social Circle and Covington, the majority of its drainage area is still devoted to agricultural or silvacultural pursuits. Outside of meeting the needs of the existing municipalities that drain to the Alcovy, major expenditures for regional wastewater treatment facilities within this drainage area is not a primary concern.

The Enforcement of Water Quality Standards

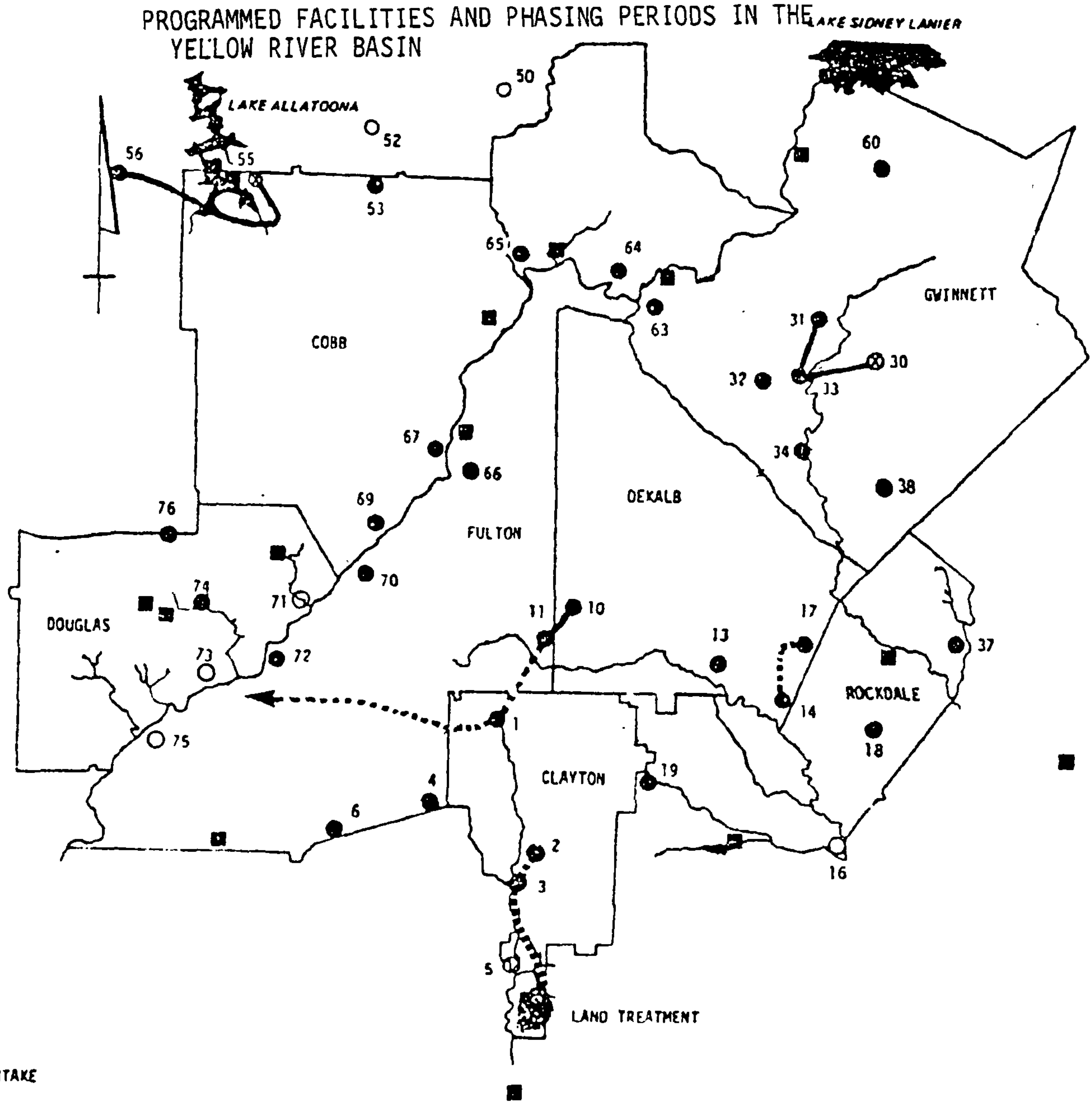
Georgia, like other states, is concerned with the preservation and enhancement of water quality. The basis for many of the regulatory programs enforced by the Georgia EPD is Public Law 92-500. It is this law that established water quality standards and goals and requires the attainment of these standards on a specific timetable.

In order to assure compliance with these standards and to deal with the specific problems of local jurisdictions, the Georgia EPD closely monitors stream water quality, establishes effluent criteria, classifies streams as to the desired standards of purity, and reviews and evaluates the design of all federally assisted treatment facilities. These activities are conducted under a variety of programs. Industrial discharges are required to receive waste discharge permits. The authorization for this program is Section 402 of Public Law 92-500, wherein standards of compliance and timetables are established for each industrial discharger, and periodic reporting to the State is mandated.

In addition, the Georgia EPD may take violators of State standards to court seeking orders to cease violations and assure compliance. Such orders have not been issued within the Upper Ocmulgee Basin. However,

FIGURE 31a

PROGRAMMED FACILITIES AND PHASING PERIODS IN THE YELLOW RIVER BASIN



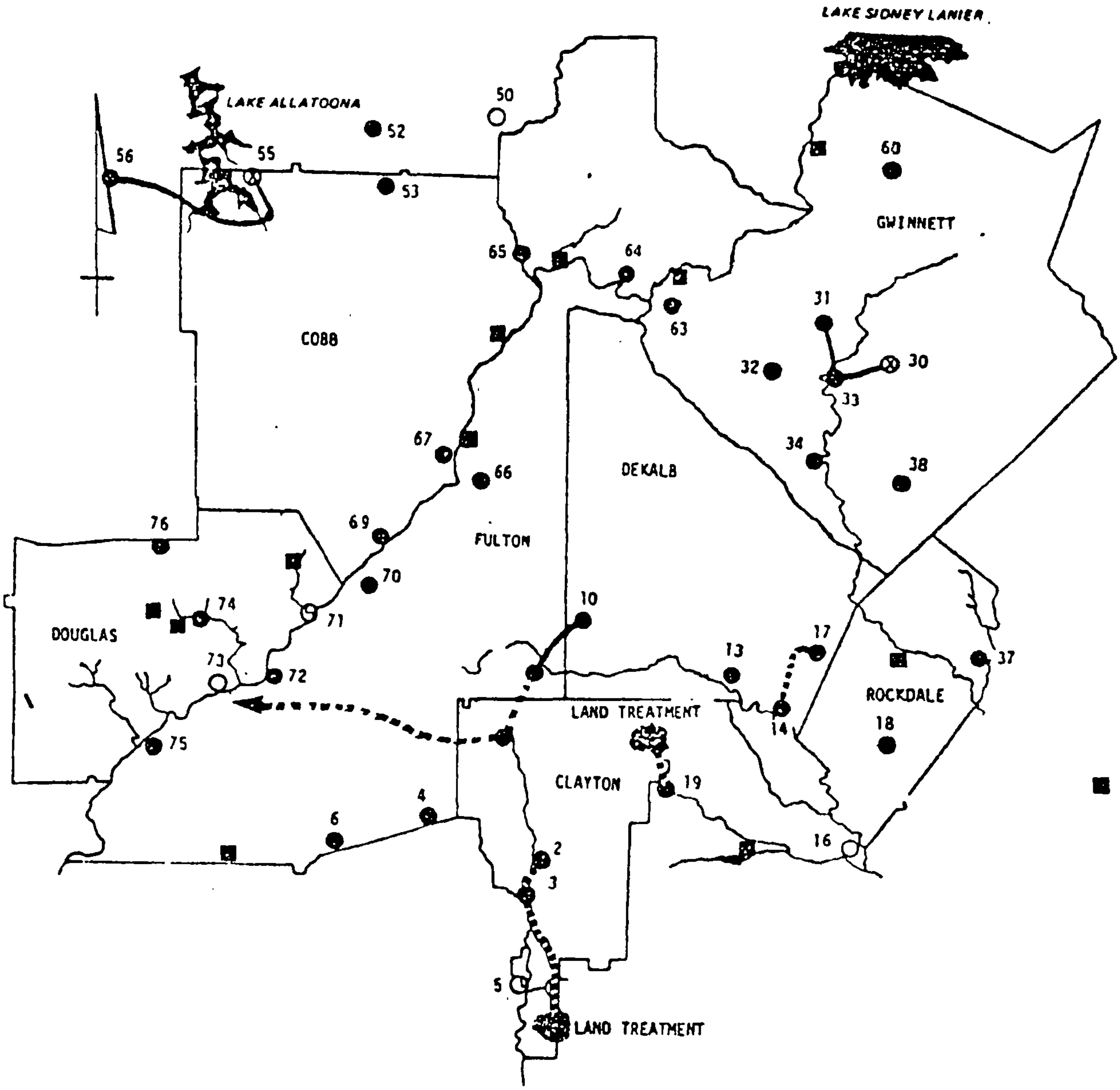
LEGEND

- WATER INTAKE
- OPERATING WASTEWATER TREATMENT FACILITY
- POTENTIAL WASTEWATER TREATMENT FACILITY SITE
- ABANDONED WASTEWATER TREATMENT FACILITY
- 35 WASTEWATER TREATMENT FACILITY IDENTIFYING CODE
- REGIONAL INTERCEPTOR (TREATED WASTEWATER)
- REGIONAL INTERCEPTOR (UNTREATED WASTEWATER)

ADOPTED WASTEWATER MANAGEMENT PLAN
1976-1980

Source: Atlanta Regional Commission, 1976

FIGURE 31b



LEGEND

- WATER INTAKE
- OPERATING WASTEWATER TREATMENT FACILITY
- POTENTIAL WASTEWATER TREATMENT FACILITY SITE
- ABANDONED WASTEWATER TREATMENT FACILITY
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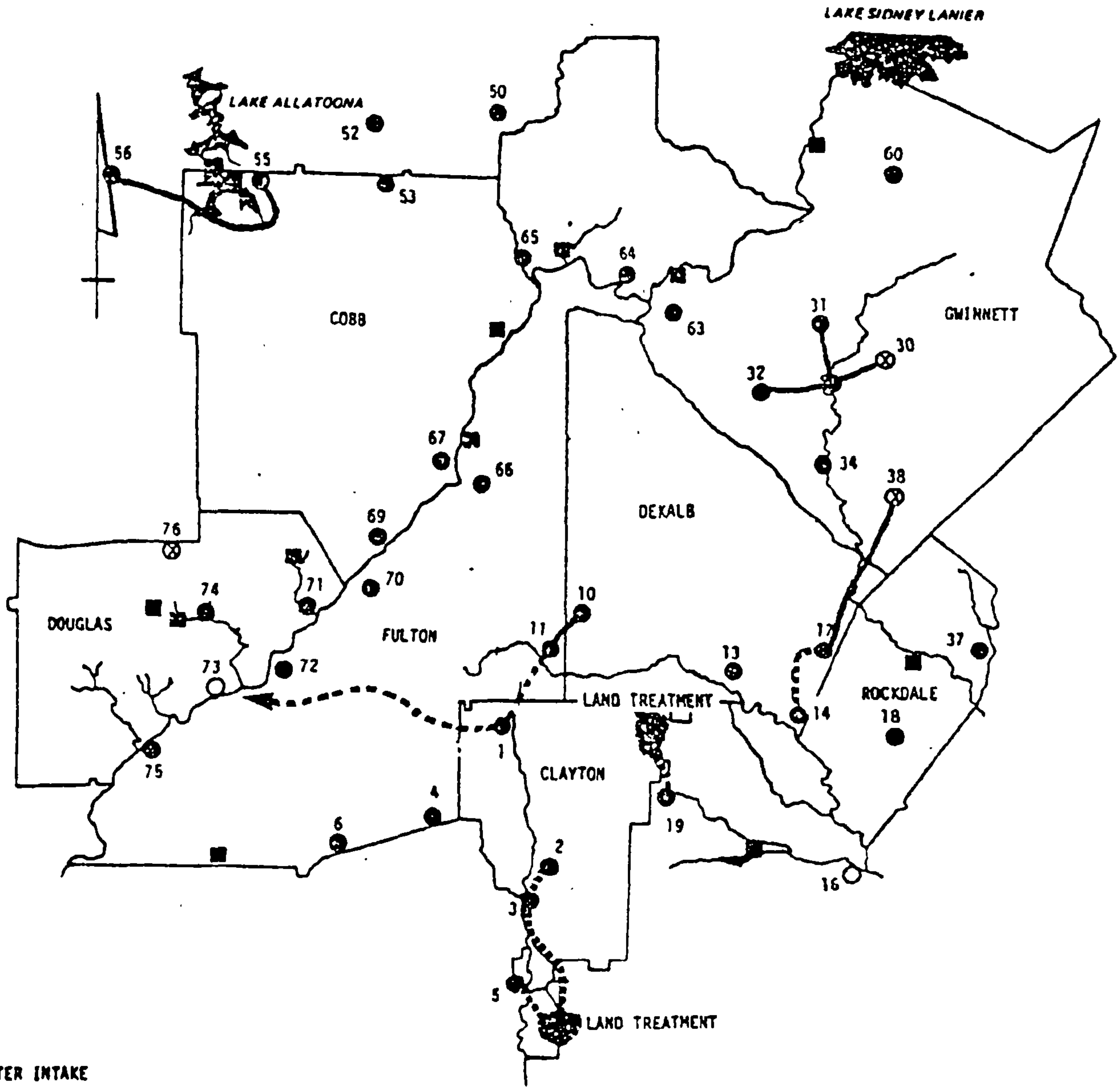
- REGIONAL INTERCEPTOR (UNTREATED WASTEWATER)

ADOPTED WASTEWATER MANAGEMENT PLAN
1981-1985

Source: Atlanta Regional Commission, 1976

F I G U R E 31c

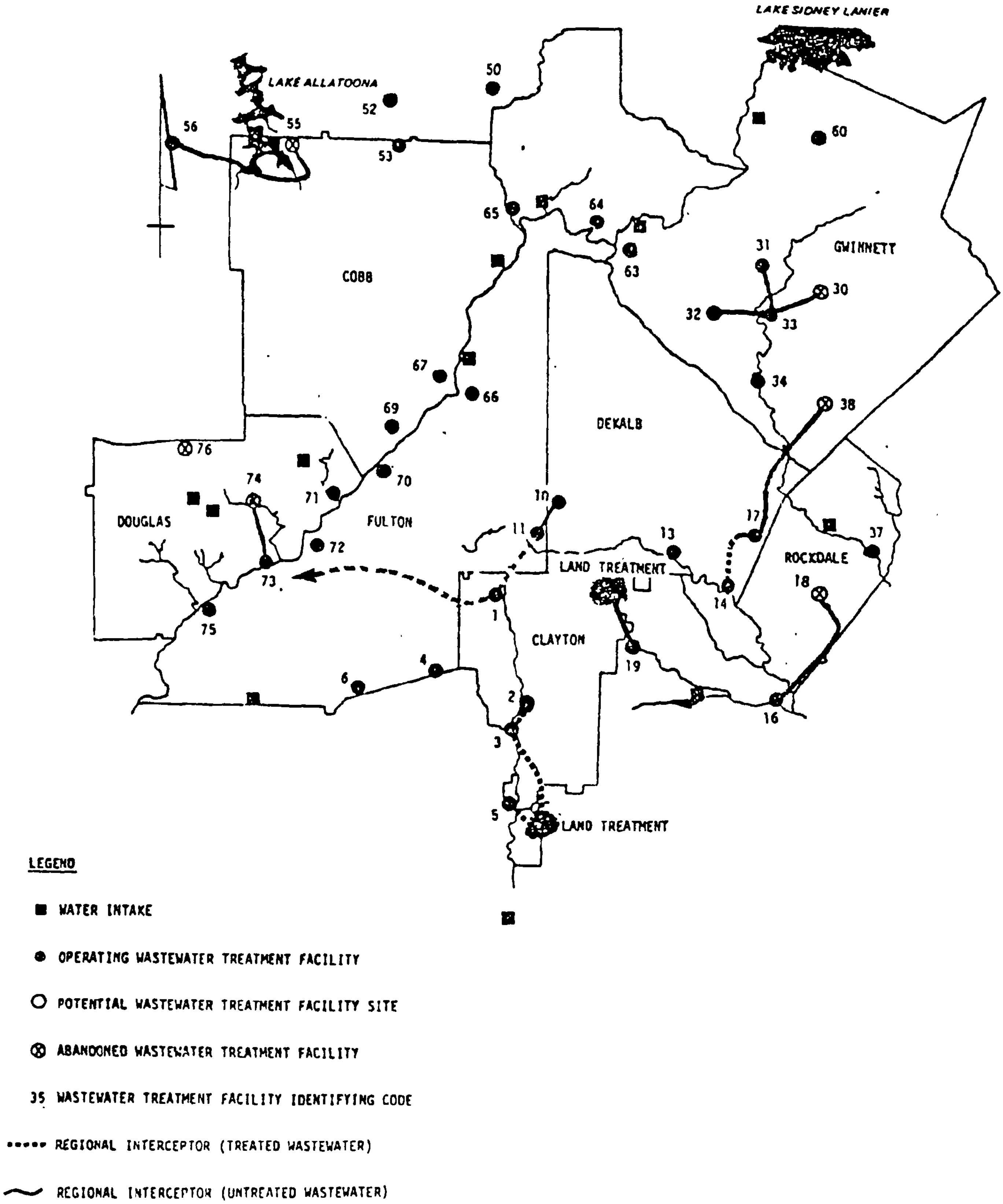


LEGEND

- ■ WATER INTAKE
- ● OPERATING WASTEWATER TREATMENT FACILITY
- O POTENTIAL WASTEWATER TREATMENT FACILITY SITE
- ⊗ ABANDONED WASTEWATER TREATMENT FACILITY
- 35 WASTEWATER TREATMENT FACILITY IDENTIFYING CODE
- ••••• REGIONAL INTERCEPTOR (TREATED WASTEWATER)
- ～ REGIONAL INTERCEPTOR (UNTREATED WASTEWATER)

Source: Atlanta Regional Commission, 1976

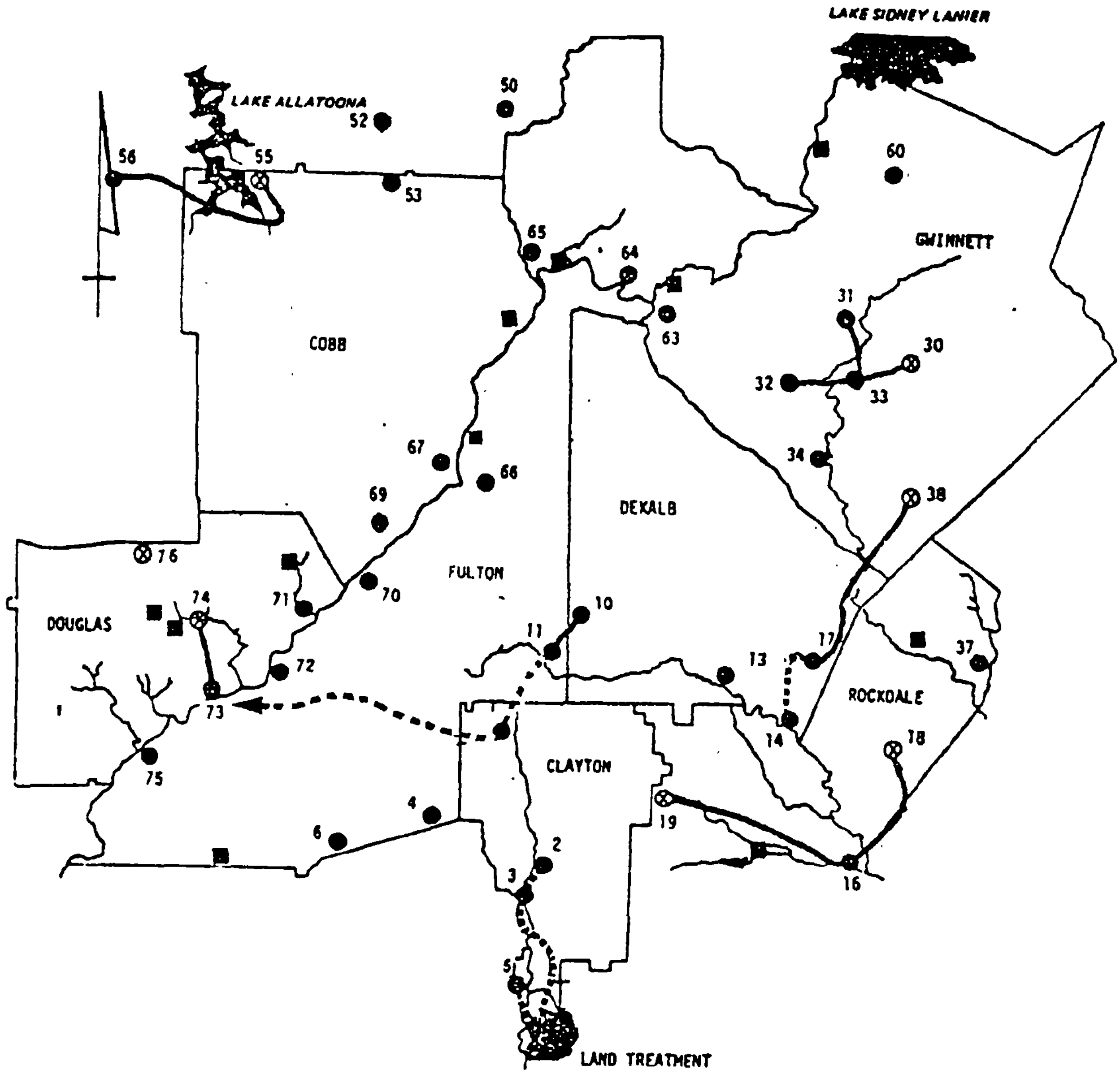
FIGURE 31d



ADOPTED WASTEWATER MANAGEMENT PLAN
1991-1995

Source: Atlanta Regional Commission, 1976

F I G U R E 31e



LEGEND

- WATER INTAKE
- OPERATING WASTEWATER TREATMENT FACILITY
- POTENTIAL WASTEWATER TREATMENT FACILITY SITE
- ABANDONED WASTEWATER TREATMENT FACILITY
- 35 WASTEWATER TREATMENT FACILITY IDENTIFYING CODE
- REGIONAL INTERCEPTOR (TREATED WASTEWATER)
- REGIONAL INTERCEPTOR (UNTREATED WASTEWATER)

ADOPTED WASTEWATER MANAGEMENT PLAN
1996-2000

Source: Atlanta Regional Commission, 1976

administrative orders (not court orders) have been issued to each of the major systems operators in recent years. (Personal interview, Mr. Gene Welch, EPD.)

Basin Plans

The river basin planning activity, which is a continuing planning process required under section 303 (e) of the Federal Water Pollution Control Act Amendments, requires that the State investigate water quality within each major river system flowing within the State boundaries. This investigation should lead to the establishment of stream classifications, water and effluent quality standards, and to an allocation of discharge loads to each segment of each stream within the State. Approval of the Upper Ocmulgee River Basin Water Quality Management Plan, prepared pursuant to Section 303 (3), is the federal action that has precipitated this environmental impact statement.

Facility Plans (201)

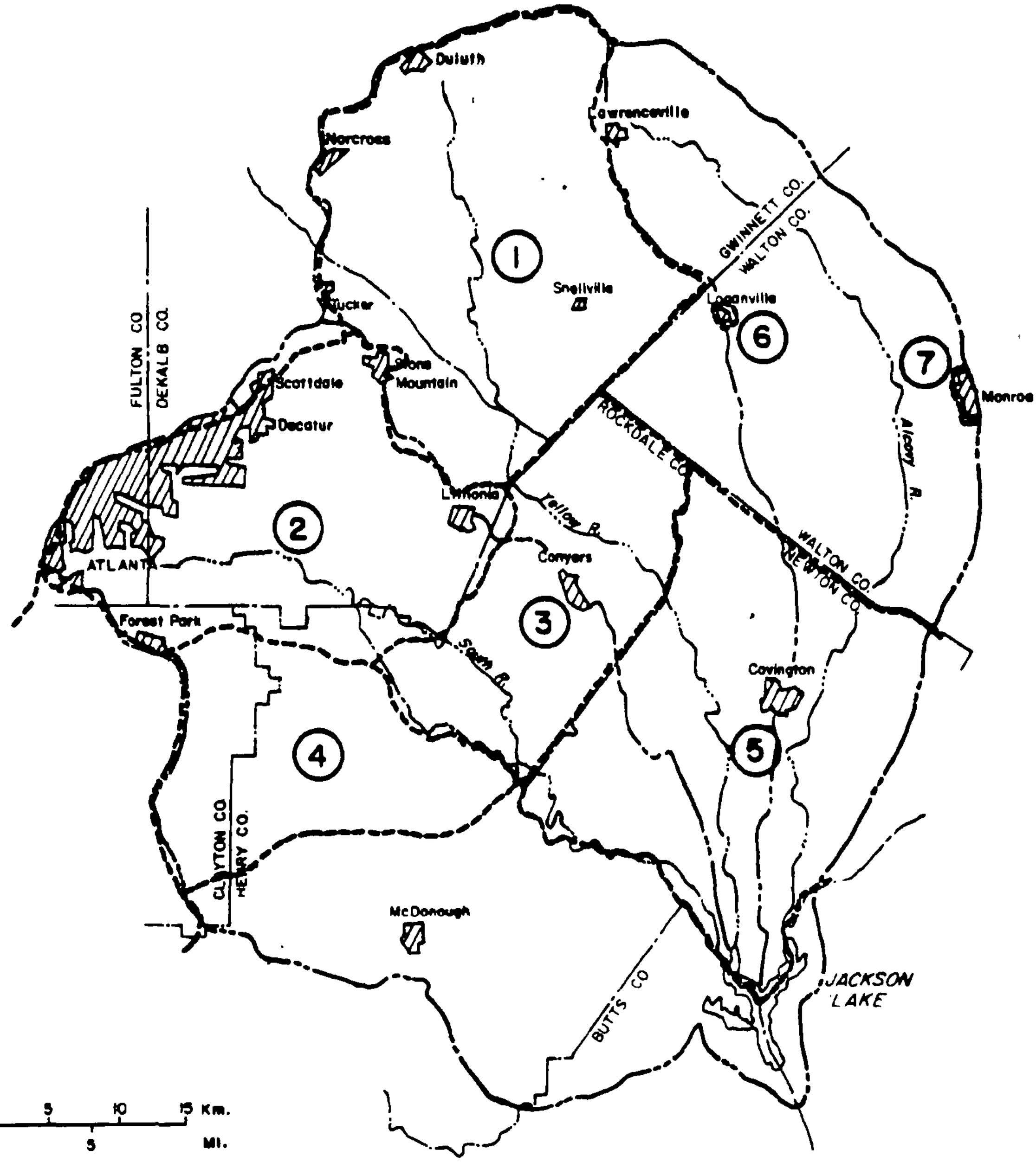
Another area of involvement by the Georgia EPD is the monitoring, financial, and technical assistance and evaluation of construction grant programs, commonly known as the 201 Facility Plan and the 209 Areawide Management Planning Program. Both of these programs receive financial assistance from the U.S. EPA matched by local and state governments. (EPA provides 75 percent of 201 funding.) The facility plans (201) are typically more localized as to the area of concern and result in comprehensive recommendations for the implementation of wastewater treatment requirements.

The broader Section 208 Areawide Management plans address geographic regions of significant urban and industrial development, such as metropolitan areas, in an attempt to coordinate a variety of more localized 201 plans into a comprehensive management system that evaluates not only construction requirements, but also management procedures and financial arrangements through viable local organizations. A significant feature of 208 plans is a full evaluation of non-point sources and their impact on the total pollution abatement requirements of an area.

Currently, only one agency is authorized to pursue 208 areawide wastewater management plans within the Upper Ocmulgee Basin. That agency is the Atlanta Regional Commission, whose jurisdiction extends to a major portion of the Upper Ocmulgee Basin. The remainder of the Basin must await State action under the 208 program.

The more localized 201 facility plans comprise an active program aimed at meeting national and state standards. Such plans have or are being developed for most areas of urban concentration within the Upper Ocmulgee Basin. The status of 201 facility plans and their sponsoring agencies are shown in Table 49 .

FIGURE 32



1 YELLOW RIVER
2 SOUTH RIVER
3 ROCKDALE
4 COTTON INDIAN CREEK
5 NEWTON
6 LOGANVILLE
7 MONROE

UPPER OCMULGEE RIVER BASIN

201 FACILITIES PLANS

NPDES Permits

Under the provisions of Section 402 of Public Law 92-500, the Georgia EPD is authorized to issue permits to industrial and private dischargers. Such permits require a full evaluation of the magnitude and characteristics of the individual discharge, and may require a compliance schedule to achieve improved standards of treatment and discharge effluent and, further, may impose a mandatory timetable to achieve compliance. To date, 78 percent of such dischargers are permitted within the Upper Ocmulgee Basin. The remaining 22 percent contribute such minimal quantities that their impact is insignificant to the receiving streams' water quality. To date, permits have been issued to the dischargers identified in Table 50

Waste Load Allocations

One of the major purposes of a river basin plan is to assess existing water quality by small segments of a river system, to classify these segments as to their desired quality, then to set limitations on discharges by stream segment so that the desired water quality standard may be achieved within the benchmark year. This practice is commonly referred to as waste load allocation and is a key ingredient of 303 (e) river basin plans. The difference between current water quality and the water quality to be achieved by a benchmark year largely determines the allocations of new or increased waste load discharges that may be accepted within any single stream or segment. While this is a general rule, many other factors enter into the establishment of waste load allocations such as proximity to water intakes and the cumulative effect of pollutants which may be accepted for an extended reach of any river system.

In the case of the Upper Ocmulgee River Basin, Water Quality Management Plan, the Georgia EPD has opted for the establishment of effluent criteria as a major factor in waste load allocations. These previously defined effluent criteria, previously defined as 10-2-1-6, address the major chemical constituents of wastewater discharges and set a high standard for existing and any new wastewater treatment facility that will discharge into the basin. This standard is such that treatment levels required to meet it are commonly referred to as Advanced Waste Treatment (AWT) processes.

The 10-2-1-6 effluent criteria is a difficult standard to attain and even more difficult to maintain. Further, it requires considerably more expensive treatment processes than have been typical in the past. A by-product of such systems is an immense quantity of inert material, commonly referred to as sludge. This material requires disposal; the methods by which sludge is handled and disposed of can become a key ingredient in the cost effectiveness of advanced waste treatment processes. The amount of sewage sludge produced by a facility meeting the 10-2-1-6 criteria would be approximately 2.5 tons per MGD of treated domestic waste.

TABLE 49

STATUS OF 201 FACILITY PLANS
UPPER OCMULGEE BASIN

Yellow R. portion to be done by County personnel

Robert & Co, Associates do South R. River basin - available

SOUTH RIVER

City of Atlanta	Step I complete
Clayton County	Step I complete
DeKalb County	~~Step I complete~~ (not complete), award 1969
Henry County	Step I complete

YELLOW RIVER

Gwinnett County	Step I complete
Conyers-Rockdale County	Step I complete (not complete), award 2/27/76
Covington-Newton County	Step I in process

[illegible]

ALCOVY RIVER

Loganville	Step I in process
Monroe	Step I in process
Covington-Newton County	Step I in process

McDonough, Locust Grove, Cotton Indian Creek
all under Step I, none complete
Locust Grove complete July '77

Williams & Singleton
(William Green, John [illegible])

TABLE 50

UPPER OCMULGEE RIVER BASIN NPDES PERMITS ISSUED

MUNICIPAL FACILITIES

Permit No.	Facility
GA0021709	Conyers Boar Tusk Creek
GA0021601	Covington
GA0026557	Gwinnett County Clairborne
GA0030007	Gwinnett County Glen Forest
GA0030732	Gwinnett County Jackson Creek
GA0026522	Gwinnett County Lee Acres S/D
GA0026514	Gwinnett County Lilburn Pond
GA0026531	Gwinnett County River Oak Village
GA0026573	Gwinnett County Valley Brook
GA0030783	Newton County

PRIVATE FACILITIES

GA0030708	Castlewood Estates MHP
GA0022179	Stone Mountain Park

INDUSTRIAL FACILITIES

GA0029815	Peachtree Doors
GA0003140	Vulcan Materials
GA0030406	Ivy Corporation
GA0030066	Georgia Marble

B.7 OTHER COMMUNITY SERVICES AND FACILITIES

To this point in the discussion of the Man-Made environment, the commentary has dealt largest with environmental and community development concerns. While these concerns are a major thrust of the environmental impact statement, the concerns and responsibilities of local units of government are broader based and more representative of the total needs of the respective jurisdictions.

This discussion of the other community services and facilities provided by total units of government is necessary to provide a total perspective of their responsibilities and priorities. Further, it is important to note that the mix of services and facilities provided by cities and counties differs substantially due to their respective differences in historical functions and in the state authorizing legislation.

This section will contrast functions and priorities of cities and counties within the Yellow River Sub-basin. The distinguishing functions and activities of both cities and counties will be identified and discussed. The services and functions provided are contrasted with similar units of government within the State and within the Southeastern United States.

Area of Discussion

This discussion of community services and facilities is restricted to the cities and counties located within the Yellow River Sub-basin. While these cities and counties are dealt with in detail, comparisons are offered for regional and national perspectives.

Within the Yellow River Sub-basin lie portions of five counties and all or portions of fourteen municipalities. Not all of the municipalities within the Sub-basin provide a full range of services. Many of them rely on their county government to perform various services and functions. For example, library services are typically provided by counties although the physical structures are located in areas of population concentration such as cities. Conversely, the provision of utility services such as power and gas are uniquely authorized to municipalities within Georgia, but not to counties.

There exists, however, a tremendous area of overlapping services. These areas of overlap have evolved over time as counties have become more urban in their development. Such functions as parks and recreation, police and fire protection, and garbage and trash collection were historically identified as municipal functions, but in recent years have been functions accepted by county units of government as their populations have increased to urban levels. Even within these areas of overlapping activities, the level of service provided by the respective units of government frequently differ. For example, in the area of garbage and trash collection, municipalities may provide less frequent service and in the more rural areas provide only for pick-up stations at key road junctions.

A further distinguishing characteristic between cities and counties in the Study Area is that many of the overlapping functions are financed through different methods. Specifically, an activity such as parks and recreation or fire protection would typically be financed through the general revenues of the municipality. However, due to the selective service area in counties, these activities are frequently financed through special districts in a fashion that could equate to user charges. Further, since most municipalities are established by charter with broad authority to provide services to their constituents while counties are sub units of the state, the statutory foundation for many of the urban services provided by counties are derived as local legislation.

A recent change not yet fully implemented by counties is the home rule provisions of the Georgia Constitution and the multi-purpose district authorization granted through a constitutional amendment, commonly referred to as the Mulherin Amendment.

Comparisons

The Municipal Yearbook, published by the International City Manager's Association, maintains a listing of the total number of governments within the United States (Table 51). It is curious to note that the local units of governments, cities, counties and townships have been decreasing in number since 1962, while the overall number of governments has been increasing. Obviously, states have remained constant since 1962. The overall national increase is attributed to the increase in school districts.

Since the diversity of functions provided by local units of government varies substantially with population, Tables 52 and 53 provide data on the cumulative distribution of the U.S. counties by population groupings and further on whether the population groupings are central city, suburban or independent. The counties and cities involved within the Yellow River Sub-basin span the gamut of this cumulative distribution.

For comparative purposes, the per capita finances of local governments are portrayed in Table 54 , which distributes per capita expenditures by activity and by type of government. Further, the table provides a distinction of the thirty suburban counties, which are defined as counties with a current population in excess of 200,000 persons located in a Standard Metropolitan Statistical Area (SMSA) with no town or city comprising more than one-third of the total county population. From this table it can be determined that the primary expenditure of local governments, whether city or county, is for public education with the second largest expenditure falling in the realm of public welfare. This pattern holds true for the thirty suburban counties previously identified.

TABLE 51

NUMBER OF GOVERNMENTS IN THE U. S.

Type of Government	1972	1967	1962
Total	79,269	81,299	91,237
U. S. Government	1	1	1
State Governments	50	50	50
Local Governments	78,218	81,248	91,186
Counties	3,044	3,049	3,043
Municipalities	18,517	18,048	18,000
Townships	18,991	17,105	17,142
School Districts	15,781	21,782	34,678
Special Districts	23,885	21,264	18,323

TABLE 52

CUMULATIVE DISTRIBUTION OF U. S. COUNTIES

Classification	All Counties	Counties over 2,500	Counties over 5,000	Counties over 10,000	Counties over 25,000	Counties over 50,000	Counties over 100,000	Counties over 250,000	Counties over 500,00
Total, all counties. .	3,046	2,944	2,741	2,202	1,204	639	313	128	58
Population Group									
Over 1,000,000 . . .	18	18	18	18	18	18	18	18	18
500,000-1,000,000 . .	40	40	40	40	40	40	40	40	40
250,000- 499,999 . .	70	70	70	70	70	70	70	70	
100,000- 249,999 . .	185	185	185	185	185	185	185		
50,000- 99,999 . .	326	326	326	326	326	326			
25,000- 49,999 . .	565	565	565	565	565				
10,000- 24,999 . .	998	998	998	998					
5,000- 9,999 . .	539	539	539						
2,500- 4,999 . .	203	203							
Under 2,500 . .	102								
Geographic Region									
Northeast	196	196	193	189	168	127	78	38	17
North Central . . .	1,051	1,020	993	734	378	183	93	32	14
South	1,378	1,349	1,293	1,036	512	237	89	32	15
West	421	379	322	243	146	92	53	26	12
County Type									
Central	281	281	281	281	280	267	222	101	44
Suburban	315	314	311	293	233	137	64	27	14
Independent	2,450	2,349	2,149	1,628	691	235	27	0	0

TABLE 53

CUMULATIVE DISTRIBUTION OF U. S. MUNICIPALITIES

Classification	All Cities	Cities over 2,500	Cities over 5,000	Cities over 10,000	Cities over 25,000	Cities over 50,000	Cities over 100,000	Cities over 250,000	Cities over 500,000	Cities over 1,000,000
Total, all cities . .	6,246	5,930	3,840	2,290	930	410	154	56	26	6
Population Group										
Over 1,000,000	6	6	6	6	6	6	6	6	6	6
500,000-1,000,000 . .	20	20	20	20	20	20	20	20	20	
250,000- 499,999 . .	30	30	30	30	30	30	30	30		
100,000- 249,999 . .	98	98	98	98	98	98	98			
50,000- 99,999 . .	256	256	256	256	256	256				
25,000- 49,999 . .	520	520	520	520	520					
10,000- 24,999 . .	1,360	1,360	1,360	1,360						
5,000- 9,999 . .	1,550	1,550	1,550							
2,500- 4,999 . .	2,090	2,090								
Under 2,500* . . .	316									
Geographic Region										
Northeast	1,806	1,687	1,182	707	261	102	28	8	4	2
North Central . . .	1,829	1,787	1,135	673	267	109	41	15	8	2
South	1,789	1,690	1,001	541	211	103	53	20	8	1
West	822	766	522	369	191	96	32	13	6	1
City Type/Metro Status										
Central	361	361	361	361	340	260	136	56	26	6
Suburban	3,116	3,051	2,142	1,301	447	150	18	0	0	0
Independent	2,769	2,518	1,337	628	143	0	0	0	0	0
Form of Government . .										
Mayor-council . . .	3,285	3,252	1,801	920	335	165	72	34	21	6
Council-manager . .	2,391	2,109	1,658	1,128	508	215	70	19	5	0
Commission	216	216	162	119	64	25	12	3	0	0
Town meeting . . .	262	262	164	80	5	1	0	0	0	0
Rep. town meeting . .	92	91	55	43	18	4	0	0	0	0

*Limited to municipalities recognized by the International City Management Association as providing for the council-manager plan or providing for a position of overall general management.

TABLE 54

PER CAPITA FINANCES IN LOCAL GOVERNMENTS: 1973-74

Item	All local Governments[1]	City Governments[2]	County Governments[3]	30 Suburban Counties[4]
	1973-74 per capita amounts			
General revenue	$627.75	$334.52	$161.49	$688.70
Intergovernmental revenues	261.39	125.94	74.00	213.51
From state government	212.70	79.27	59.11	181.77
From federal government	48.69	41.35	12.50	31.75
General revenues from own sources	422.21	208.58	87.48	474.97
Taxes	269.80	147.22	62.54	384.47
Property	221.76	92.75	51.34	339.84
Nonproperty	48.04	54.47	11.20	44.64
Current charges	64.79	37.32	17.48	58.74
Miscellaneous	31.78	24.04	7.46	31.74
General expenditure	665.96	322.13	154.88	666.93
Current	496.53	262.57	134.17	578.75
Capital outlay	108.21	59.57	20.71	88.18
Exhibit: Expenditures for personal services	323.25	171.84	60.06	364.67
Expenditure by function:				
Education	267.73	49.03	25.51	337.31
Highways	34.90	25.20	16.72	29.47
Public welfare	45.72	26.44	34.01	36.87
Health and hospitals	40.34	24.40	21.60	33.97
Police protection	29.33	35.26	6.49	34.76
Fire protection	14.50	19.50	1.07	17.05
Parks and recreation	14.09	15.14	3.27	21.42
Financial adminstration	7.55	5.45	4.10	8.49
General control	15.07	9.66	9.15	17.63
Interest on general debt	22.93	14.53	3.73	25.75

Source: Per capita figures are taken from or calculated from the sources listed in the source note to Table .

[1]Population for all local governments is as of 1 April 1973, from U.S. Dept. of Commerce, Bureau of the Census, Current Population Reports: Population Estimates and Projections: Estimates of the Population of the United States to June 1, 1975, Series P-25, No. 606(Washington, D.C. Government Printing Office, 1975)

[2]Population for city governments includes city-county consolidations and independent cities.

[3]Population for counties excludes city-county consolidations and independent cities but includes incorporated and unincorporated areas for all other county-type governments.

[4]See footnote Table

TABLE 55

PER CAPITA EXPENDITURES FOR SELECTED FUNCTIONS IN 30 SUBURBAN COUNTIES: 1973-1974

County, state	Total direct expenditure	Current expenditures	Capital outlay	Selected functions: Education	Public welfare	Health & hospitals	Police protection	Highways	Parks & recreation	Interest on general debt	Financial administration & general contract	All other functions
30 County average	$ 666.93	$578.87	$ 88.18	$337.32	$ 36.87	$ 31.40	$ 29.47	$29.47	$19.89	$25.04	$26.11	$126.19
Nassau, N.Y.	1,051.79	947.20	104.59	483.59	106.74	46.02	73.06	38.99	44.67	39.88	37.05	181.79
Westchester, N.Y.	1,006.49	913.13	93.36	421.63	163.36	46.21	45.97	29.47	31.07	28.77	30.68	209.33
Rockland, N.Y.	998.85	908.74	90.11	545.13	128.42	52.62	34.81	34.50	16.82	42.88	31.47	112.20
Contra Costa,Calif.	892.14	790.64	101.51	373.26	109.14	104.39	35.39	45.41	15.53	15.17	34.61	159.25
San Mateo, Calif.	803.85	737.56	66.28	373.82	71.30	97.38	35.13	26.03	24.29	20.23	31.54	124.12
Ventura, Calif.	765.30	688.99	76.31	344.95	59.63	39.42	38.17	37.76	36.16	15.90	43.17	150.14
Montgomery, Md.	826.47	671.92	154.55	411.45	15.06	29.96	29.08	23.94	86.89	48.24	19.54	171.31
Santa Barbara,Calif.	735.08	688.40	66.68	362.63	66.64	46.65	31.03	29.60	19.84	10.63	43.00	125.06
Morris, N.J.	669.19	591.76	77.43	375.95	26.95	6.29	31.62	41.92	15.65	33.88	36.23	100.70
Orange, Calif.	656.49	554.86	101.63	340.07	37.35	29.96	34.90	28.12	26.21	14.99	32.01	112.88
Oakland, Mich.	642.71	551.48	91.23	336.31	6.17	34.95	26.73	42.14	10.42	42.19	30.64	113.16
Union, N.J.	569.65	540.44	29.21	273.03	37.94	18.14	37.86	19.34	16.36	17.85	26.51	122.62
Fairfax, Va.	624.68	534.00	90.68	366.03	19.02	10.86	22.54	11.45	18.91	25.05	26.88	123.94
Bergen, N.J.	598.49	525.03	73.46	299.41	18.08	25.42	41.43	19.75	20.40	25.62	23.75	114.63
Prince George's,Md.	642.28	525.01	117.27	317.83	35.99	42.65	26.66	28.05	26.85	30.79	16.59	116.87
Norfolk, Mass.	597.05	524.17	72.88	325.25	5.94	33.33	33.46	29.00	15.68	20.26	20.34	113.79
Macomb, Mich.	612.19	522.79	89.40	353.42	3.53	12.02	32.26	41.12	7.93	36.18	29.07	96.66
Waukesha, Wis.	599.41	520.84	78.57	333.71	30.40	15.07	27.30	48.52	12.49	23.65	15.04	93.23
Fairfield, Conn.	607.15	512.28	94.86	311.80	6.93	12.03	38.99	26.41	15.50	26.59	18.73	150.16
DuPage, Ill.	602.05	484.02	118.03	371.39	7.55	17.44	27.54	37.29	32.77	24.70	20.89	62.48
Middlesex, Mass.	530.74	472.13	58.61	276.29	5.19	14.11	31.27	27.17	8.65	21.04	22.63	124.39
Lake, Ill.	534.84	439.81	95.04	321.47	7.39	7.18	26.62	39.59	28.52	16.53	20.48	67.07
Broward, Fla.	516.78	435.31	81.47	215.07	2.33	88.81	34.55	13.09	13.86	20.66	25.34	103.07
Baltimore, Md.	516.76	435.25	81.51	289.89	16.17	10.92	28.81	28.35	8.07	19.74	13.72	100.09
Anne Arundel, Md.	631.13	434.38	196.75	346.51	25.11	1.16	25.69	28.09	12.25	26.91	25.63	139.78
DeKalb, Ga.	481.43	408.94	72.49	224.19	4.16	81.14	22.96	17.92	9.84	18.11	16.03	87.08
Montgomery, Pa.	481.99	414.13	67.85	298.84	11.76	17.92	21.01	17.94	7.06	27.12	18.89	61.35
Delaware, Pa.	472.06	405.57	66.49	311.00	20.02	7.77	21.65	12.68	4.84	17.27	17.80	59.03
Washington, Ore.	498.81	390.87	108.03	310.37	0.31	3.66	15.87	21.39	7.89	17.92	16.93	104.56
Jefferson, La.	395.11	345.18	49.94	156.73	0.37	53.85	24.04	32.75	16.46	29.78	18.56	62.58

Source: U.S. Dept. of Commerce, Bureau of the Census, Local Government Finances in Selected Metropolitan Areas and Large Counties: 1973-1974.

TABLE 56

GROWTH IN GOVERNMENTAL FINANCES BETWEEN FISCAL YEARS 1971-72 and 1973-74

Item	All Local Governments 1971-72 amount (millions)	All Local Governments 1973-74 amount (millions)	All Local Governments % increase from 1972-74	City Governments 1971-72 amount (millions)	City Governments 1973-74 amount (millions)	City Governments % increase from 1972-74
Total revenue	$113,162	$143,193	26.5	$ 42,196	$ 52,822	25.2
Total expenditure	116,913	140,387	20.1	43,884	52,242	19.0
Expenditure by function:						
General expenditure	104,822	124,668	18.9	35,697	42,523	19.1
Police protection	5,077	6,144	21.0	3,942	4,655	18.1
Fire protection	2,577	3,037	17.9	2,208	2,574	16.6
Highways	6,263	7,310	16.7	2,768	3,327	20.2
Sewerage	3,164	4,080	29.0	1.964	2,575	31.1
Public welfare	8,822	9,576	8.5	3,031	3,490	15.1
Education	47,734	56,080	17.5	5,827	6,472	11.1
Libraries	751	896	19.3	465	556	19.6
Health & hospitals	6,858	8,451	23.2	2,773	3,220	16.1
Parks & recreation	2,323	2,951	27.0	1,571	1,998	27.2
Financial administration	1,258	1,581	25.7	565	719	27.3
General control	2,495	3,156	26.5	932	1,275	36.8
General public bldgs.	1,141	1,394	22.2	531	680	28.1
Interest on gen. debt	3,827	4,803	25.5	1,527	1,918	25.6
Other & unallocable	12,533	15,210	21.4	7,543	9,064	20.2
Utility expenditure	9,697	12,487	28.8	6,451	7,923	22.8
Liquor stores expenditure	223	265	18.8	136	150	10.3
Insurance trust expenditure	1,600	2,077	29.8	1,300	1,674	28.8

Item	County Governments 1971-72	County Governments 1973-74	County Governments % increase	30 Suburban Counties 1971-72	30 Suburban Counties 1973-74	30 Suburban Counties % increase
Total revenue	$ 24,169	$ 30,795	27.4	$10,927	$13,615	24.6
Total expenditure	24,410	29,505	20.9	11,124	13,369	20.2
Expenditure by function:						
General expenditure	23,932	28,879	20.7	10,746	12,768	18.8
Police protection	896	1,210	35.0	537	665	23.9
Fire protection	152	200	31.6	264	326	23.5
Highways	2,708	3,118	15.1	510	564	10.7
Sewerage	480	586	22.1	510	512	0.5
Public welfare	5,986	6,342	5.9	680	706	3.9
Education	3,960	4,757	20.1	5,490	6,458	17.6
Libraries	192	228	18.8	...	...	...
Health & hospitals	3,206	4,027	25.6	507	650	28.3
Parks & recreation	440	609	38.4	290	410	41.4
Financial administration	614	765	24.6	133	162	21.9
General control	1,358	1,706	25.6	270	337	25.2
General public bldgs.	540	650	20.4	...	...	...
Interest on gen. debt	550	695	26.4	400	493	23.3
Other & unallocable	2,851	3,985	39.8	1,156	1,483	28.3
Utility expenditure	218	285	30.7	378	601	58.9
Liquor stores expenditure	101	115	13.9	...	...	...
Insurance trust expenditure	159	225	41.5	...	...	...

Source: U.S. Dept. of Commerce, Bureau of the Census, City Government Finances in 1973-74, (Washington, D.C., Government Printing Office, 1975).

A further evaluation of the per capita expenditures (Table 55) for suburban counties demonstrated in greater detail the range of functions performed by such counties and the predominance of the educational requirement upon the public tax rolls. If public welfare, health and hospitals were combined as to their per capita expenditures in such counties, these expenditures would be twice again the expenditures for all other listed activities, yet still be beneath the tax outlay for public education. The "all other functions" category includes a wide range of functions including water, sewage, and other unallocable expenditures.

Finally, in Table 56 , the growth in governmental finances between fiscal years 1971-72 and 1973-74 is presented to reflect the growth by units of government in revenue sources and expenditure levels by function. While all units of government have witnessed a 26.5 percent increase during the period in revenue, expenditure levels have been increasing at a reduced rate. Significant to this evaluation is the reduction in assistance and subsidies regardless of unit of government and the increases in expenditures for sewage activities and general administration. These figures are indicative of the increased concern for compliance with Public Law 92-500 and the increasing level of competence and professionalism being developed by local units of government, whether city or county.

Within the State of Georgia the distinction between municipal and county functions has continued to become more cloudy due to increased utilization of constitutional provisions dealing with home rule, powers of counties, and the multi-purpose district provisions offered by the Mulherin Amendment. While the functional distinction is becoming less clear, the revenue and expenditure division is coming more sharply into focus.

Municipalities in Georgia typically have a broader base of financial support than counties. Counties are more heavily dependent on the ad valorum property tax to finance not only educational activities, but all other activities. Municipalities in Georgia have the prerogative of taxing utilities, gross receipts, intangibles, alcoholic beverages, life insurance, real estate transfers, and hotel and motel incomes. Counties, on the other hand, find themselves with approximately 60 percent of their total revenues emanating from the ad valorum property tax and an increased concentration on user charges via special district taxing procedures. These limitations and restrictions on revenue sources remain the distinguishing characteristics between city and county in governments in Georgia.

Community Services - Yellow River Basin

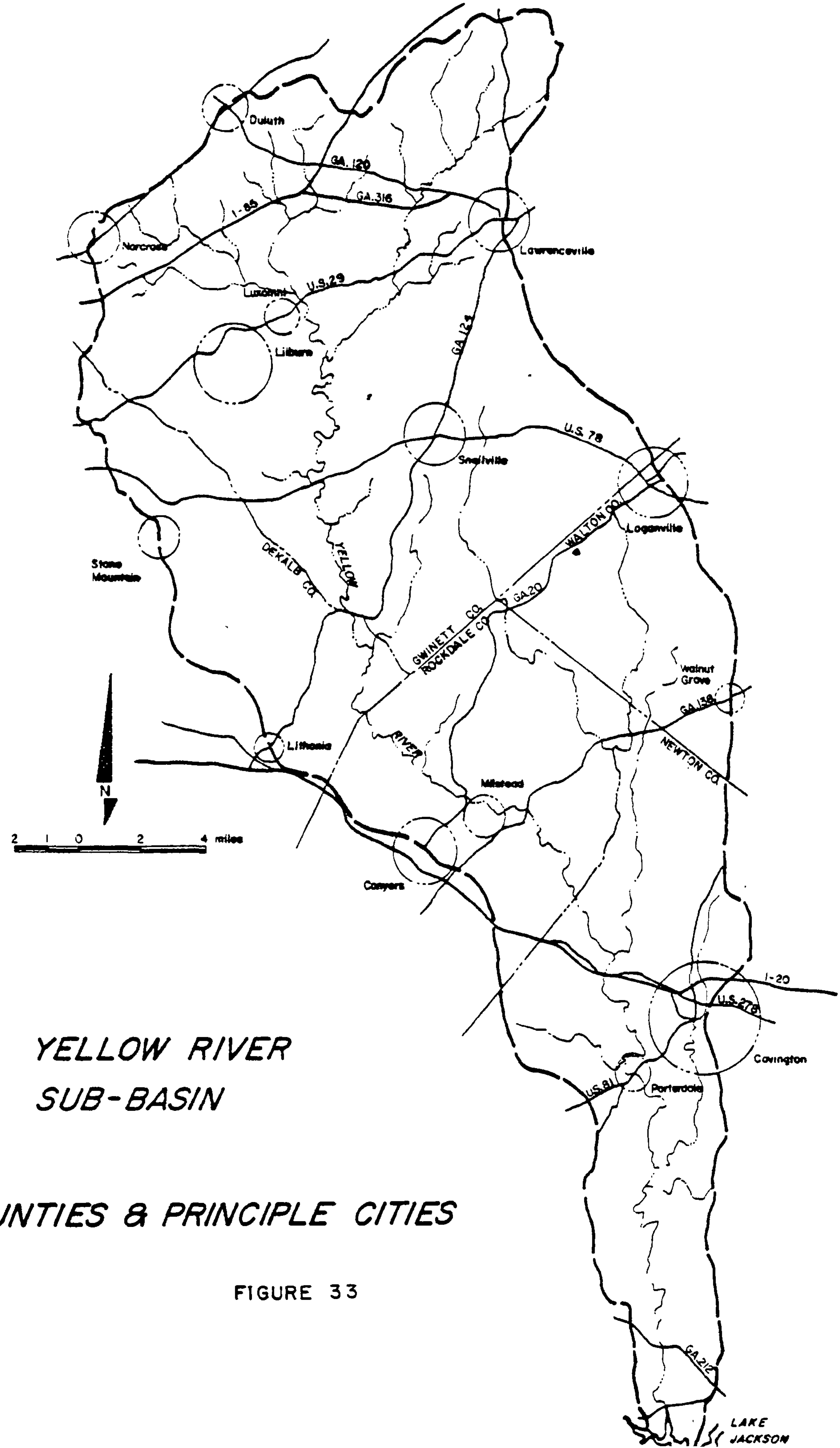
The description of individual services offered by cities and counties (Figure 33) in the Yellow River Basin is developed more extensively in the following

TABLE 57

YELLOW RIVER BASIN

LOCAL GOVERNMENTAL ENTITIES-1976

Counties	Cities (by counties)	Special Purpose Districts (by counties)
DeKalb	Lithonia Stone Mountain	County School District County Hospital Authority M.A.R.T.A. County Housing Authority Lithonia Housing Authority
Gwinnett	Duluth Grayson Lawrenceville Lilburn Norcross Snellville	County School District County Water & Sewer Authority County Airport Authority County Hospital Authority Lawrenceville Housing Authority Norcross Housing Authority
Newton	Covington Oxford Porterdale	County School District County Water & Sewer Authority County Hospital Authority County Covington Housing Authority
Rockdale	Conyers	County School District Rockdale County-Conyers Water Authority (non-functioning) County Hospital Authority Conyers Housing Authority
Walton	Loganville Walnut Grove	County School District Walnut Grove-Youth Water Authority County Hospital Authority Loganville Housing Authority



YELLOW RIVER SUB-BASIN

COUNTIES & PRINCIPLE CITIES

FIGURE 33

TABLE 58

GOVERMENTAL STRUCTRUE AND EMPLOYMENT BY PRINCIPAL CITIES AND COUNTIES FOR THE YELLOW RIVER SUB-BASIN

County - Principal city (2)	*Population	#Employ*	#1,000 Pop.	Govt. Structure	Public Safety Police	Public Safety Fire	Public Works Pickup	Public Works Disp.	Schools-Libr.	Health-Welfare	Administration	WQMU
DeKalb	457,900	3594	7.8	Commission Admin.	455	365	Sanitation 386				103	0406 0408
- Lithonia	2,270	18	7.9	Mayor Council	10	Cty.	County		NA		2	0408
Gwinnett	115,900	809	7.0	Commission	P-128 S-28	160	Franchise				40	0406 0407
- Lawrenceville	7,175	85	11.8	Council Manager	15	3	3		NA		9	0407
Newton	32,000	103	3.2	Commission	25	3	Franchise		STATE	STATE	3	0408 0409
- Covington	10,728	178	16.5	Council Manager	33	22	21	1	NA		16	0409
Rockdale	27,200	185	6.8	Single Commissioner	30	31	Franchise				1	0408 0407
- Conyers	7,618	104	13.6	Council Manager	21	13	10	5	NA		6	0408
Walton	28,700	135	4.7	Commission	21	5	3	2			4	0407
- Loganville	1,118	10	8.9	Council Manager	4		4		NA		2	0407

* Counties: Bureau of the Census, Oct. 1976-July 1975 provisional
Cities: 1974 State Office of Planning and Budget

(2) Principal city in Yellow River Sub-basin.

(1) Bureau of the Census-1970
State Average-#1,000 Pop. - Less than 5,000 - 17
5-10,000 - 11
10-25,000 - 14
over 25,000 - 13

discussion of legal basis and responsibility for service and facility systems. The following discussion addresses only major services offered within the Yellow River Sub-basin and the employment level associated with their delivery. (TABLE 58), The major service areas to be discussed are:

... Public Safety

... Public Works

... Schools and Libraries

... Health and Welfare

... Administration Services

It is important to note the prevalent practice of inter-governmental contracting for service. Frequently, one unit of government will contract with another to assume all or a portion of a service responsibility. Contrasting examples are offered in the area of wastewater treatment services. Within Gwinnett County, the major system operator is the county, although some few cities such as Lawrenceville and Loganville provide their own collection and treatment systems. In Rockdale County the prime operator is the City of Conyers, which in addition services major portions of the unincorporated areas.

Of the listed services, schools, libraries, and health and welfare services are uniquely county-provided. The remaining services are common to both units of local government. Significantly, some of these latter services are performed by a single unit under contract to another unit.

As portrayed in Table 57 , each county and the dominant cities within them that are located in the Yellow River Sub-basin are shown to reflect the relative magnitude of public services, their governmental structure, and the public service manpower associated with each listed service. The principal cities within each county were identified as the municipalities within each county offering a full range of services in an effort to account for the smaller municipalities not offering extensive services or contracting for such services through other units of government.

Given the state dominance in the service areas of health, welfare and libraries, a more accurate reflection of the county supplemental contribution to these services is shown in Table 59 for cities and counties. The figures represent a composite index of all cities and counties within the Atlanta metropolitan area and thus are more reflective of the priorities and levels of effort applied with the Basin.

TABLE 59

AGGREGATE EXPENDITURES BY ACTIVITY

COUNTIES

	Administration	Judicial	Police	Sheriff and Jail	Fire	Health	Welfare	Public Works	Parks & Recreation	Library	Miscellaneous General Government	Other	Total
Dollars ($1000's)	20,553.3	18,958.3	14,537.2	8,474.2	14,954.1	41,693.8	4,421.1	39,743.2	6,109.0	2,179.2	9,126.4	5,590.0	186,342.8
Per cent	11.0	10.2	7.8	4.5	8.0	22.4	2.4	21.3	3.3	1.2	4.9	3.0	100.0
Dollars/ capita	12.44	11.48	8.80	5.13	9.05	25.24	2.68	24.06	3.70	1.32	5.52	3.38	112.80

AGGREGATE EXPENDITURES BY ACTIVITY

CITIES

	General Administration	Police	Fire	Parks & Recreation	Public Works	Library	Misc.	Total
Dollars ($1,000)	34,017.2	34,650.0	9,379.8	12,404.5	35,140.2	3,828.4	1,321.8	130,741.9
Percent	26.0	26.5	7.2	9.5	26.9	2.9	1.0	100.0
Per capita	45.47	46.32	12.54	16.58	46.97	5.12	1.77	174.77

Source: Revenue and Expenditure Survey of the Local Governments in the Atlanta Region, ARC, July 1976.

B.8 TAXES AND CAPITAL BUDGETING

Task Description

This report will identify all existing state and local governmental entities within the Yellow River Sub-basin which have legal jurisdiction or responsibility for the delivery of the following services and facilities:

1) Transportation
2) Police protection
3) Fire protection
4) Schools
5) Libraries
6) Health
7) Public Welfare
8) Solid Waste Disposal, and
9) Water and Sewerage.

In addition, the report will generally describe the revenue sources for each local governmental entity with general powers and a breakdown for wastewater collection and disposal services by source and in each local entity providing this service.

Description of Methodology

The methods used in this report to gather information varied with each portion of the task. The inventory began with a search of the United States Department of the Interior Geological Survey map of the Greater Atlanta Region in the area specifically within the Yellow River Basin. This produced a list of counties and possible municipalities. This list was checked against a computer printout from the U. S. Bureau of the Census of all governmental entities in the counties touching the Basin and this was further checked by a search of Volume 33 of the Georgia Code Annotated, Local and Special Law Index, for law creating municipalities and granting special powers for the designated government services and other local entities in the counties involved. This produced the list in Table 57, minus such local entities as industrial development and coliseum authorities which did not deliver the specified services. This table, and much of the rest of the report, groups cities and special districts by county.

Please note that the cities of Lithonia, Stone Mountain, Duluth, Grayson, Lawrenceville, Norcross, Covington, Conyers, Loganville and Walnut Grove are all only partly in the Basin and that only Lilburn, Snellville, Oxford and Porterdale are completely within the Basin.

The description of general powers to deliver the involved services was gathered from a survey of the Georgia Code Annotated; the Encyclopedia of Georgia Law; the Handbook for Georgia Mayors and Councilmen; Guidebook to Georgia County Government; and two unpublished computer searches by Public Research and Management, Inc. on Georgia municipal and county laws.

The information on actual services delivered was gathered by a telephone survey of each government entity identified, which included a verification of the inventory list in Table 61 and cross-questioning of each entity on the services provided by other entities.

Revenue information was gathered by telephone survey and examination of the latest audits or budgets of the listed general power entities.

Legal Jurisdiction

Generally, county commissioners and city governments in Georgia have extensive constitutional and general statutory authority to provide all of the services involved in this report. The Georgia Constitution (Ga. Code Ann., Sec. 2-7901a) provides that any county, city or any combination of cities and counties may provide, within their respective boundaries:

"1) Police and fire protection;
2) Garbage and solid waste collection and disposal;
3) Public health facilities and services, including hospitals, ambulances, emergency rescue services, and animal control;
4) Street and road construction and maintenance; including curbs, sidewalks, street lights and devices to control the flow of traffic on streets and roads constructed by counties and municipalities or any combination thereof;
5) Parks, recreational areas, programs and facilities;
6) Storm water and sewage collection and disposal systems;
7) Development, storage, treatment and purification and distribution of water;
8) Public housing;
9) Urban redevelopment programs;
10) Public transportation system;
11) Libraries;
12) Terminal and dock facilities and parking facilities;
13) Building, housing, plumbing, and electrical codes;
14) Air pollution control; and
15) Planning and zoning......."

These services may be provided by one jurisdiction within the boundaries of another by consent or contract (Ga. Code Ann., Sec. 2-5901) and the State legislature is banned from in the future legislating on these services by local or special act but the legislature, except for planning

TABLE 61

ACTUAL DELIVERY OF VARIOUS SERVICES BY VARIOUS GOVERNMENTS TO THE YELLOW RIVER SUB-BASIN

Government Entity	Roads	Bus or Train	Air-ports	Water	Sew-age	Police	Fire	Gar-bage	Schools	Lib-raries	Hos-pitals	Health Boards	Wel-fare
Georgia State Govt.	6	-	-	-	-	6	-	-	1	6	6	Yes	1
U. S. Government	6	-	-	-	-	6	-	-	-	-	-	-	6
DeKalb Co.	4	-	Yes	4	4	4	4	4	-	6	-	Yes	1
Lithonia	3	-	-	-	-	3	-	-	-	-	-	-	-
Stone Mountain	3	-	-	3	3	3	-	3	-	6	-	-	-
Gwinnett Co.	4	-	Yes	4	4	4	4	-	-	6	-	Yes	1
Duluth	3	-	-	3	-	3	-	-	-	-	-	-	-
Grayson	-	-	-	3	-	-	-	3	-	-	-	-	-
Lawrence-ville	3	-	-	3	3	3	3	3	-	6	-	-	-
Lilburn	3	-	-	-	-	3	-	3	-	6	-	-	-

1-Joint County-State agency.
2-Service limited to unincorporated area of county.
3-Service limited to city.
4-Service provided to unincorporated and some municipal residents.
5-Service provided for municipal and some county residents.
6-Limited portion of service.
7-Not functioning.
8-City and part of county.
9-Bus only.
10-Bus and train in construction.
11-System in construction.

TABLE 61 (Continued)

Government Entity	Roads	Bus or Train	Air-ports	Water	Sew-age	Police	Fire	Gar-bage	Schools	Lib-raries	Hos-pitals	Health Boards	Wel-fare
(In DeKalb Co.)													
Co. School District	-	-	-	-	-	-	-	-	1	-	-	-	-
M.A.R.T.A.	-	Yes	-	-	-	-	-	-	-	-	-	-	-
Co. Hosp. Authority	-	-	-	-	-	-	-	-	-	-	Yes	-	-
Co. Hous. Authority	-	-	-	-	-	-	-	-	-	-	-	-	6
Lithonia Hous. Auth.	-	-	-	-	-	-	-	-	-	-	-	-	6
(In Gwinnett Co.)													
Co. School District	-	-	-	-	-	-	-	-	1	-	-	-	-
Co. Water & Sewer Auth.	-	-	-	11	11	-	-	-	-	-	-	-	-
Co. Airport Authority	-	-	Yes	-	-	-	-	-	-	-	-	-	-

1-Joint County-State agency.
2-Service limited to unincorporated area of county.
3-Service limited to city.
4-Service provided to unincorporated and some municipal residents.
5-Service provided for municipal and some county residents.
6-Limited portion of service.
7-Not functioning.
8-City and part of county.
9-Bus only.
10-Bus and train in construction.
11-System in construction.

TABLE 61 (Continued)

Government Entity	Roads	Bus or Train	Air-ports	Water	Sew-age	Police	Fire	Gar-bage	Schools	Lib-raries	Hos-pitals	Health Boards	Wel-fare
Norcross	3	-	-	3	3	3	-	3	-	6	-	-	-
Snellville	3	-	-	-	-	3	3	-	-	6	-	-	-
Newton Co.	4	-	-	-	-	4	2	6	-	6	-	Yes	1
Covington	3	-	Yes	5	5	3	3	3	-	6	-	-	-
Oxford	3	-	-	3	11	3	3	3	-	-	-	-	-
Porterdale	3	-	-	-	-	3	3	3	-	-	-	-	-
Rockdale Co.	4	-	-	-	-	4	2	6	-	6	-	Yes	1
Conyers	3	-	-	5	5	3	3	3	-	6	-	-	-
Walton Co.	4	-	-	-	-	4	4	4	-	6	-	Yes	1
Loganville	3	-	-	3	3	3	3	3	-	6	-	-	-
Walnut Grove	3	-	-	-	-	-	3	3	-	-	-	-	-

1-Joint County-State agency.
2-Service limited to unincorporated area of county.
3-Service limited to city.
4-Service provided to unincorporated and some municipal residents.
5-Service provided for municipal and some county residents.
6-Limited portion of service.
7-Not functioning.
8-City and part of county.
9-Bus only.
10-Bus and train in construction.
11-System in construction.

TABLE 61 (concluded)

Government Entity	Roads	Bus or Train	Air-ports	Water	Sew-age	Police	Fire	Gar-bage	Schools	Lib-raries	Hos-pitals	Health Boards	Wel-fare
Co. School District	-	-	-	-	-	-	-	-	1	-	-	-	-
Rockdale-Conyers Water Auth.	-	-	-	7	7	-	-	-	-	-	-	-	-
Co. Hosp. Authority	-	-	-	-	-	-	-	-	-	-	Yes	-	-
Conyers Hous. Authority	-	-	-	-	-	-	-	-	-	-	-	-	6
(In Walton Co.)													
Co. School District	-	-	-	-	-	-	-	-	1	-	-	-	-
Walnut Grove-Youth Water Authority	-	-	-	8	-	-	-	-	-	-	-	-	-
Co. Hosp. Authority	-	-	-	-	-	-	-	-	-	-	Yes	-	-
Loganville Housing Authority	-	-	-	-	-	-	-	-	-	-	-	-	6

1-Joint County-State agency.
2-Service limited to unincorporated area of county.
3-Service limited to city.
4-Service provided to unincorporated and some municipal residents.
5-Service provided for municipal and some county residents.
6-Limited portion of service.
7-Not functioning.
8-City and part of county.
9-Bus only.
10-Bus and train in construction.
11-System in construction.

TABLE 61 (Continued)

Government Entity	Roads	Bus or Train	Air-ports	Water	Sew-age	Police	Fire	Gar-bage	Schools	Lib-raries	Hos-pitals	Health Boards	Wel-fare
Co. Hosp. Authority	-	-	-	-	-	-	-	-	-	-	Yes	-	-
Lawrenceville Housing Authority	-	-	-	-	-	-	-	-	-	-	-	-	6
Norcross Housing Authority	-	-	-	-	-	-	-	-	-	-	-	-	6
(In Newton Co.)													
Co. School District	-	-	-	-	-	-	-	-	1	-	-	-	-
Co. Water & Sewer Auth.	-	-	-	6	6	-	-	-	-	-	-	-	-
Co. Hosp. Authority	-	-	-	-	-	-	-	-	-	-	Yes	-	-
Covington Hous. Auth.	-	-	-	-	-	-	-	-	-	-	-	-	6
(In Rockdale Co.)													

1-Joint County-State agency.
2-Service limited to unincorporated area of county.
3-Service limited to city.
4-Service provided to unincorporated and some municipal residents.
5-Service provided for municipal and some county residents.
6-Limited portion of service.
7-Not functioning.
8-City and part of county.
9-Bus only.
10-Bus and train in construction.
11-System in construction.

TABLE 60

GENERAL GEORGIA STATUTES GRANTING POWERS ON SELECTED LOCAL SERVICES

Service	Ga. Code Ann.	Municipality (M) or County (C)	Authority to Condemn Property (C) or Authority to Issue Bonds (B)
Roads and other land transportation	Title 95A	M and C	B and C
Airports	Ch. 11-2	M and C	B and C
Water Systems	Ch. 87-8, Secs.	M and C	B and C
	69-314, 69-315	C	B and C
Sewer Systems	Ch. 87-8, Secs.	M and C	B and C
	69-314, 69-315	C	B and C
Police	Ch. 23-14	C	-
Solid Wastes	Ch. 87-8	M and C	B and C
Schools	Ch 32-11 (local unit for state)	C	-
Libraries	Ch. 87-8	M and C	B and C
	Ch. 32-27	M and C	-
Health	Ch. 88-2	C	-
Hospitals and Clinics	Ch. 88-18 (create independent authority)	M and C or Joint	B and C
	Secs. 69-311, 69-315	C	B

and zoning, may provide general statewide statutes in these areas or population acts, which apply to any city or county under or over some stated population (Ga. Code Ann., Sec. 2-7901a). General acts authorizing particular services in more detail are listed in Table 60 . Table 61 lists which services are actually provided by each governmental entity in the Yellow River Basin.

Transportation

The federal and state governments have responsibility for building and maintaining state and federal highways in the Basin. This includes parts of Interstate 85 and 20; U.S. highways 23, 29, 78, and 278; and State highways 8, 10, 12, 13, 20, 36, 81, 84, 120, 124, 138, 162, 212, 264 and 316.

Other surfaced roads are maintained by the various local governments paid for out of general funds or by a special assessment against property owners along the road based on their road frontage. In unincorporated areas in the Basin, the various county road departments build and maintain a network of roads, and in the municipalities either the county builds and maintains by contract a network for the city or the city has its own department for this function.

There is no public water transportation in the Basin but various small airports are maintained for air travel. The only airport actually in the Yellow River Basin is the Covington Municipal Airport operated by the city government. The Gwinnett County Airport Authority operates an airport just outside the Basin, northeast of Lawrenceville and the DeKalb County Airport Authority operates the DeKalb Peachtree Airport outside the Basin in the northern part of that county. Each of these airports is financed for operations by a combination of fees, contracts and general funds of the city, or county, and bonds may be issued for any capital improvement.

Police Protection

There is federal law enforcement and assistance by the F.B.I. and state law enforcement and assistance by the Georgia Department of Public Safety and its branches, the State Patrol and the Bureau of Investigation. The primary source of law enforcement is, however, local through various county sheriffs, county police departments and municipal police units, all of which are financed out of general funds except for some portions of the county sheriff's office being directly supported by fees charged for his service functions.

The sheriff's responsibilities vary from county to county. In DeKalb and Gwinnett Counties, the sheriff primarily functions as jailer and handles court service while the county police departments investigate the various criminal acts committed in the county and patrol the highways and roads local school districts. These percentages, of course, vary considerably in each local district since the local support comes primarily from a separate property tax levied by the school board, the total of which depends more on the "wealth" of the district rather than on its educational needs, and state or federal grants are partly based on local needs and programs.

Libraries

Public libraries in Georgia are locally constituted and operated under the authority of a local board of trustees. When no county board has been constituted, the county board of education serves as library board (Ga. Code Ann., Sec. 32-2707). County libraries may merge or participate in multi-county systems (Regional Libraries) with a regional library board as governing authority. Boards of trustees are locally appointed, their representation being determined by the cities or counties agreeing to fund the local libraries.

In the Yellow River Basin, most of the cities and counties participate in regional systems. though they may also use a local board. The regions include Decatur-DeKalb (DeKalb, Newton, and Rockdale), Lake Lanier (Gwinnett) and Piedmont (Walton). These regional systems are generally financed by the local communities providing the library buildings, its utilities and dues for some books bought by the regional board while the region, with state grants, provides some books and all library personnel.

Health

There are three governmental services under this category: hospitals, ambulance service and health board regulation.

There are state hospitals for certain special purposes but none are located in the Yellow River Basin and all public hospital care is provided by hospital authorities in each county.

The state legislature "created" a hospital authority in each county and city. However, a hospital authority may not transact any business unless the governing body of the county or city declares, by proper resolution, that there is a need for a hospital authority, and thus, hospital authorities are effectively created by local resolutions. The members of the authority board are appointed by the governing body of the county or city for the term authorized by the resolution. As in other instances, a county may join with one or more other counties or cities to form one hospital authority (Ga. Code Ann., Sec. 88-1803).

The financing of each authority is a combination of bonds for capital improvements issued by the authority, operating expenses provided by user fees or charges, and indigent care contract payments by the city or county.

in the county and, by agreement, patrol in some cities. In all the other counties the sheriff performs all law enforcement functions in the county and assists the muncipal police forces to some degree.

All cities in the Basin except Grayson and Walnut Grove have police departments which investigate the various criminal acts committed in the city, patrol the city's streets and handle any city court service.

Fire Protection

There are several kinds of fire protection services in the Yellow River Basin. Fire protection service of county forest land is provided by the State Forestry Commission, which has divided the state into fire protection units. These units may comprise one or more counties. For forest fire protection, a county must contract with the State Forestry Commission at the rate of four cents per acre of privately owned forest land. The county may levy a tax to provide the funds for this fire protection (Ga. Code Ann., Sec. 43-231). There are volunteer fire companies which are subsidized from general funds to some degree in Oxford, Porterdale, Loganville and Walnut Grove. There are full-time departments or departments supplemented with volunteers in all the other counties and cities in the Basin except Lithonia, Stone Mountain, Duluth, Lilburn, Grayson, and Norcross, all of which are protected by their county departments. The county departments generally cover most of the unincorporated portions of the counties but some sparsely populated portions have not been organized into fire districts yet. An additional property tax levy for fire protection may be levied by the county, but cities generally support their departments out of general funds.

Schools

Within the Basin, all public education through high school is provided by independent county school districts. These are run by elected boards of education in each county. The responsibility for the administration and financial support of the public school system is divided between the state and the county school systems. The State Board of Education is vested with authority to formulate broad educational and administrative policies and to apportion state school funds among the local school boards as state administrative units. The State Superintendent of Schools, an ex-officio member of the State Board, is charged with the responsibility for executing and administering the policies formulated by the Board (Ga. Code Ann., Ch. 2-65, 2-66). Generally speaking, authority and responsibility relating to public school matters that are not specifically delegated to the State Department of Education are vested by law in the locally elected boards of education.

Financing public education is a three-way partnership. On the average, for fiscal year 1967-68, the state provided 55 percent of the total funds for maintenance and operation of Georgia's public schools; the federal government provided 14 percent; and the remaining 31 percent came from the

Public Welfare

Public welfare is, for the most part, a state service administered through and with the cooperation of the counties with some local and federal funding. Each county has a Board of Family and Children's Services or a welfare board, a county director, and any additional employees as are necessary for efficient performance of welfare services (Ga. Code Ann., Sec. 99-501). The county board has the duty of advising on policy within the framework set down by state and federal regulations. It appoints the county director, subject to the approval of the state department, from a register of qualified applicants.

The county director is responsible for the administration of the major welfare program including aid to the aged; aid to the blind; aid to the disabled; aid to families with dependent children; and he may be in charge of general assistance, if such responsibility is delegated by the county commissioners.

While the state and federal governments constitute the major source of funding in the local public welfare program, the county through its board of commissioners has important responsibilities. For example, the county commissioners approve an operating budget for the department through mutual agreement with the county welfare board. In addition, the commissioners must provide suitable office space, equipment, and supplies to the county departments and appropriate certain funds to maintain the welfare service within the county and to defray the cost of administration of these services.

An additional portion of public welfare services is the public housing provided by various housing authorities in the Basin. Like hospital authorities, the state "created" housing authorities in each city and county, which are activated by local resolutions (Ga. Code Ann., Ch. 99-110). They provide low-cost housing for the poor and aged and have been activated in DeKalb County (unincorporated areas), Lithonia, Lawrenceville, Norcross, Covington, Conyers, and Loganville. Their operation is mostly financed by the project income and bonds issued by the authority.

Solid Waste Disposal

The delivery of this service varies from acre to area. DeKalb has a county garbage service and landfills that handle most all the needs of the unincorporated and many municipal residents. Stone Mountain has a separate garbage pickup service, however. Gwinnett has no county service though it franchises and regulates a private service that handles most of the unincorporated portions of the county. Lawrenceville, Lilburn (by contractors), Norcross and Grayson have city pickup services. Newton has a county dumpster service in the unincorporated areas and operates a central landfill. Each of the cities in that county that are in the Basin (Covington, Oxford and Porterdale) has a municipal

Any county or city may enter into a contract with a hospital authority for use of the services and facilities for indigent care. Sums due and payble under the contract must be determined from year to year during the period of the contract, but may include an annual minimum. These payments may come out of the general funds of the city or county or out of extra tax revenues from a property tax not exceeding seven mills levied annually by counties or cities which have executed contracts with hospital authorities (Ga. Code Ann., Ch. 88-18).

The only city or county government in the Basin which now operates an ambulance service is Newton County. Some hospital authorities operate such services, but most are private services. Some counties, like Rockdale for example, heavily subsidize local private ambulance services, and in DeKalb County the County Fire Department competes with several private services to some extent as a special emergency ambulance service. Rockdale County is also a member of a quasi-public organization or service established by the Atlanta Regional Commission called the Metropolitan Emergency Medical Service (M.E.M.S.) which provides a go-between for consumers and ambulance services to insure quicker service by computer dispatching the nearest ambulance.

Public health is essentially a state program supported with some local and federal funds, modified and organized to meet local needs, and operated by a county appointed board of health. The county board is responsible for overseeing the programs and appointing a director in accordance with state requirements. There are provisions for establishing multi-county districts and the county commissioners must approve the annual budget and appropriate sufficient additional money to provide the service.

The board's responsibilities are to determine county health needs and resources; to develop, in cooperation with the state health department, local programs, activities, and facilities; to secure compliance with state rules and regulations; and to enforce all laws pertaining to health (Ga. Code Ann., Sec. 88-202). In order to carry out these objectives, a county board has the power to exercise authority in all matters pertaining to county health; adopt and enforce local health rules; receive and administer grants and donations; contract, establish, and accept fees for providing mental health and home care services; and contract with other agencies for assistance in performing functions and the exercising of its powers (Ga. Code Ann., Sec. 88-204).

Major county health department programs include: (1) preventative disease measures, (2) alcohol and drug abuse programs, and (3) sanitation regulation and control. The preventative disease measures may include vaccinations, V.D. control, T.B. tests, school hygiene, testing of food and milk handlers, health education, and some maternity services. The alcohol and drug abuse programs may include public education, methadone maintenance, and alcoholic treatment centers. The sanitation aspects may involve inspection and regulation of sewage disposal systems, individual water supply systems and septic tanks, health nuisances, and all food establishments

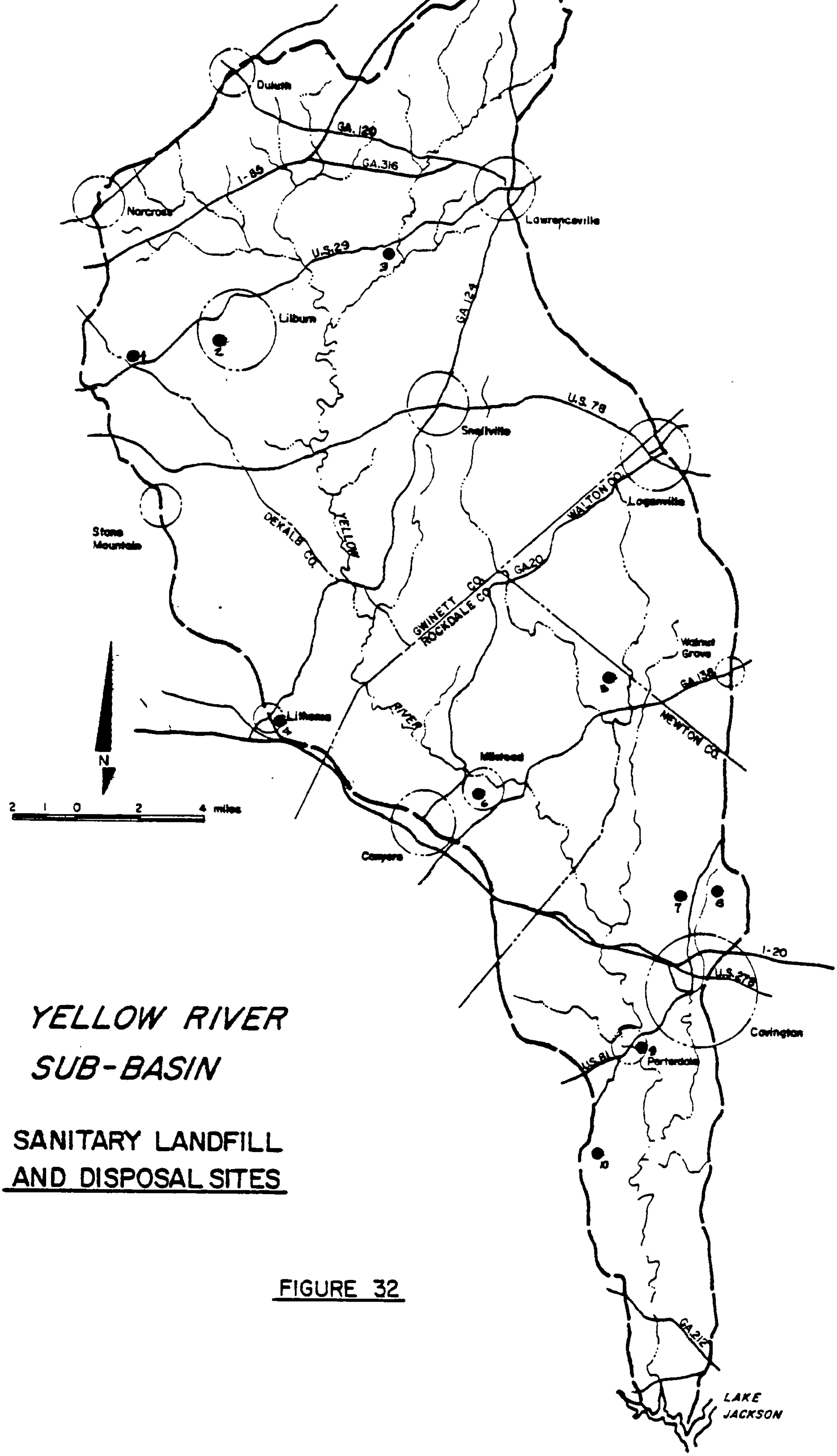
FIGURE 32

COLLECTION SYSTEMS	
DEKALB COUNTY	Served by County
GWINNETT COUNTY	Unincorporated Served by Private Collectors
Resthaven	Private
Grayson	Public
Suwanee	Private
Dacula	Private
Lilburn	Private
Sugar Hill	Public
Duluth	Private
Buford	Public
Snellville	Private
Lawrenceville	Public
WALTON COUNTY	Rural Collection (bulk containers)
ROCKDALE COUNTY	Private
Conyers	Public
NEWTON COUNTY	Private
Covington	Public
Oxford	Public

DISPOSAL

MAP KEY #	LOCATION	STATUS
1	Crymes Sanitary Landfill	Area of site is 97.452 acres. 4000+ tons per month of all kinds of waste.
2	Gartrell A. Nash Landfill	Area less than 5 acres. Demolition and land clearin wastes only.
3	Arnold Sanitary Landfill	Area of site is 35.58 acres. Phase I. 2200 tons pe monty of garbage and rubbish.
4	Phillips Road Landfill	Small private site receiving only industrial wastes
5	Rockdale County Sanitary Landfill	Area of site is 62 acres. 50+ tons per day of various kinds of solid waste.
6	Milstead - Old City	County site not adequately closed.
7	Oxford Landfill	Small site for city nonputrescibles.
8	City of Covington	Approximately 20 acres. Almost used up. Converted from sanitary landfill to site for city nonputrescibles.
9	City of Porterdale	Several acre site situated on 90 acres. Waste quantities disposed are very minimal.
10	Stewart Road	Site closed to further dumping. Closure not adequate.

Source: Georgia State Department of Natural Resources, Environmental Protection Division, Solid Waste Department., 1977



YELLOW RIVER SUB-BASIN

SANITARY LANDFILL AND DISPOSAL SITES

FIGURE 32

Generally, cities and counties may levy only those taxes specifically allowed by general or special state laws, but they may charge user fees for government services in amounts that are "reasonable" if they have the authority to provide that service.

Tables 62 , 63 , and 64 provide some comparison between the general governmental units but because of varying accounting methods, special local exemptions and rates, unusual grants, and contracts and service incomes, exact comparisons are not possible.

Property or ad valorem (according to value) taxes are a primary source of revenue for all cities and counties in the Basin except for Walnut Grove, which does not levy a property tax. This tax is imposed on real property (land, buildings and permanent fixtures), certain personal property (motor vehicles, inventories, machinery and boats), and property of privately owned utilities.

Generally, these properties are valued or assessed by each county tax assessor at 40 percent of the full fair market value with a review of the total digest by the State Revenue Commissioner. There are two exceptions to these rules and they are that the property of privately owned utilities is assessed by the State Revenue Department alone and the percentage assessed on all property is higher in a few cities, such as Covington and Oxford in the Yellow River Basin, which have 75 percent assessments.

The tax rate may be expressed in mills or dollars of tax per thousand of assessed value and is set by the city council or county commission by determining the government's need for revenue which may be raised by this tax divided by the tax assessment or digest. The resulting millage is multiplied by the assessed value of each property and the total is the tax bill for that property.

Table 63 provides the 1976 net assessment, millage rate and tax totals for each of the local entities in the Basin with general powers. Though each unit arranges its tax digest a little differently from each other, the figures for net assessment should include the 40 percent of the total fair market value of the property in the county not exempted from the property tax by the State Constitution. The millage rate for counties may be broken into categories to earmark the money for recreation, fire or hospital districts in the county or for debt service funds. The total tax does not include the state property tax though it may include the property tax on automobiles, intangibles or penalties, interest and late taxes collected in 1976.

Table 64 lists the various taxes other than the property tax actually being used and the amounts collected by Yellow River Basin local governments. The beer, wine and liquor taxes are excise taxes levied on the sale of these products. They are usually paid by the wholesaler for sales to local retailers or the tax may be on retail sales and collected for the pickup service. Rockdale has no county service, but Conyers has a pick-up service which also services much of the county and there is a joint city-county landfill. Walton has a county pickup service for the unincorporated areas and a central landfill, and Loganville and Walnut Grove have city pickup services. All of these services are financed by user fees or charges including landfill fees, and most operate at a slight profit which goes into the local government's general funds. (Figure 32)

Water and Sewage

The extent of these services varies greatly in each community and the details of financing will be provided later in this report. In DeKalb, a county water and sewer system provides service to unincorporated portions of the county, and in the Yellow River Basin it provides service to the City of Lithonia. Stone Mountain has a separate water service and sewage system, but it receives all of its water and has all its sewage treated through the county system.

There is presently a mixed package of city and county services in Gwinnett. A county system provides service to unincorporated areas as well as in Lilburn. Duluth has a separate water system and a few businesses are connected to the county sewer system. Lawrenceville and Norcross have separate water and sewer systems in each city though the county processes the sewage for Norcross, and Snellville residents receive water from the county and a sewer system is being constructed for a portion of the city which will probably be added to the county system. Grayson has a city water system, but no city sewer system. A new independent Gwinnett County Water and Sewer Authority has been organized, which began operations in March but will basically only process the sewage of the county system or other systems in the county.

In Newton County there is a County Water and Sewer Authority operating a system in part of the unincorporated area of the county and in Porterdale and in parts of Oxford, while Covington operates a water and sewer system in that city and some of its surrounding areas. Oxford has a separate city water system, and a private sewer system operates in Porterdale but is processed by the county.

In Rockdale and Walton counties there are no county systems. The City of Conyers does, however, operate a water and sewer system that provides service to much of unincorporated Rockdale County as well as city residents. In the Yellow River Basin portion of Walton County, Loganville operates a water and sewer system and the Walnut Grove-Youth Water Authority provides water in its portion of the county.

Revenue Sources

This portion of the report will describe the type of revenues that are available to cities and counties and how the revenues are generally levied, measured and collected.

TABLE 62 (concluded)

Government Entities with General Powers	Property Tax 4*	Other Local Taxes	Intergovernment Revenues			Service Charges	Court fees, Fines and Forfeitures	Interest	Other	Total Revenues
			State	Federal	Local					
Oxford 7*	50	2	9	5	3	67	5	2	.3	143
Porterdale 7*	189	2	11	26	-	17	29	-	2	276
Rockdale Co. 2*	1,676	200	266i*	395	6	113	216	2	57	2,931
Conyers 1*	362	244	32	143	2	1,299	50	13	12	2,157
Walton Co. 2*	887	.3	381b*	285	-	24	183	-	167c*	1,927
Loganville 2*	73f*	31	5	24		78	35	-	1	247
Walnut Grove	-	g*				g*				g*

* See below.

1-July 76-June 77 Budget
2-July 75-June 76 Audit
3-Jan. 75-Dec. 76 Budget
4-For county or city govt. operation only.
5-Sept. 75-Aug. 76 Audit
6-Apr. 76-May 77 Budget
7-Jan. 75-Dec. 75 Audit

a-Net revenues, sheriff and courts retain portion.
b-Includes a $216,308 state highway contract.
c-Includes interest, tax penalties, special assessment and other.
d-State and Federal grants total
e-Includes $699,994 in profits from city gas and electric systems.
f-Includes insurance premium tax.
g-Figures were not available at printing but the city has no property tax but does impose a beer and wine tax, a business license tax and collects a garbage service charge.
h-Figures were not available at printing but the city has a property tax described in Table 6, other taxes listed in Table 5 and a city water service charge.
i-Includes $79,220 state highway contract.
j-This does not include several hundred thousand in federal L.E.A.A. and C.E.T.A. grants.
k-This includes only the profits from solid waste, water and sewerage operations to the general fund. Totals of these charges are in the tens of millions of dollars.

TABLE 62

REVENUES BY GENERAL SOURCES
(in $1,000's)

Government Entities with General Powers	Property Tax 4*	Other Local Taxes	Intergovernment Revenues			Service Charges	Court fees, Fines and Forfeitures	Interest	Other	Total Revenue
			State	Federal	Local					
DeKalb Co. 7*	39,398	3,735	2,393	8,123	247	2,381k*	3,476	751	1,455	61,959
Lithonia 3*	37	88	15	75	5	-	40	-	3	263
Stone Mountain 7*	134		7	29		190	8	2	3	373
Gwinnett Co. 3*	7,742	984	364	923j*	-	110k*	605	52	4	10,784
Duluth	h*	h*				h*				h
Grayson 7*	5	2	5	2	-	19	-	-	1	34
Lawrenceville 5*	361	62	-	89d*	7	358	31	52	37	997
Lilburn 2*	56	54	11	39	-	-	36	-	12	208
Norcross 3*	139	38	18	25	1	166	51	4	1	443
Snellville 6*	288	157	13	41	-	-	36	9	29	573
Newton Co. 1*	1,297	160	88	323	-	60	197a*	.5	28	2,154
Covington 3*	568	296	85	229	9	997	57	31	749e*	3,021

* See end of Table 4.

TABLE 63 (concluded)

Government Entity	Net Assessed Valuation (in thousands)	Millage Rates by Levies for Separate Activities-per $1,000 in Assessed Value					Total Ad Valorem Revenue
		Gen. Purposes	Fire Districts	Schools	Other	Total Millage	
Oxford	9,994 b	5				5	49,872
Porterdale	13,518	14				14	189,106
Rockdale Co.	147,129	12.25		23		35.25	1,582,052 a
Conyers	24,119	15				15	361,780
Walton Co.	141,289	6.28		10.25		16.53	2,335,515
Loganville	c	9					73,025 c
Walnut Grove	d	-				-	d

a-Does not include schools.
b-75% assessment method.
c-Inc. insurance premium tax and the net assessment was not available at this printing.
d-No property tax.

TABLE 63

1976 AD VALOREM OR PROPERTY TAX
MILLAGE RATES, ASSESSED VALUATION OF PROPERTY (NET)
AND TOTAL REVENUES FROM THIS SOURCE

Government Entity	Net Assessed Valuation (in thousands)	Millage Rates by Levies for Separate Activities-per $1,000 in Assessed Value					Total Ad Valorem Revenue
		Gen. Purposes	Fire Districts	Schools	Other	Total Millage	
DeKalb Co.	2,269,614	11.42	2.55	(26.07)	1.41	15.38 a	39,255,000 a
Lithonia	6,101	6				6	36,606
Stone Mountain							
Gwinnett Co.	450,907	10.5	3.7	-	1.13	15.33 a	6,912,399 a
Duluth	8,998	10				10	89,980
Grayson	1,295	5				5	6,475
Lawrenceville	33,498	9				9	301,484
Lilburn	11,213	5				5	56,066
Norcross	18,439	7				7	129,071
Snellville	31,967	9				9	287,701
Newton Co.	161,088	8.4		18.5	.2	27.1	4,365,472
Covington	103,231 b	5.5				5.5	567,771

a-Does not include schools.
b-75% assessment method.
c-Inc. insurance premium tax and the net assessment was not available at this printing.
d-No property tax.

TABLE 64 (concluded)

Government Entity	Beer, Wine and Liquor Taxes	Business Licenses and Taxes	Franchise Taxes and Fees	Insurance Premium Tax	Parking Meters	Hotel-Motel Tax	Total of Taxes Other Than Propert
Rockdale Co. 2*	152	48	-	-			200
Conyers 1*	58	51	85	50			244
Walton Co. 2*		.3					.3
Loganville 2*	25	6*		c*			31
Walnut Grove	d*	d*					d*

* See below.

1-July 76-June 77 Budget
2-July 75-June 76 Audit
3-Jan. 76-Dec. 76 Budget
4-Sept. 75-Aug. 76 Audit
5-Apr. 76-May 77 Budget
6-Jan. 75-Dec. 75 Audit

a-Inc. Insurance Premium Tax
b-Inc. Beer, Wine and Liquor Business Licenses
c-Included in Property Tax Figure in Table 4
d-Figures not available at printing but the city does impose the indicated taxes.
e-Inc. Building Permit Fees

TABLE 64

LOCAL TAXES OTHER THAN FOR PROPERTY
(in $1,000's)

Government Entity	Beer, Wine and Liquor Taxes	Business Licenses and Taxes	Franchise Taxes and Fees	Insurance Premium Tax	Parking Meters	Hotel-Motel Tax	Total of Taxes Other Than Proper
DeKalb Co.b*	-	3,735	-	-	-	205	3,735
Lithonia 3*	29	13	23	23			88
Stone Mountain 6*	18b*	6*	39	34			
Gwinnett Co.3*	500	484e*	-	-			984
Duluth	d*	d*	d*	d*			d*
Grayson 6*	-	1	1	-			2
Lawrenceville 4*	-	62	34	-			62
Lilburn 2*	12	8	28	6*			54
Norcross 3*	-	9	10	19			38
Snellville 5*	35	72a*	50	-			157
Newton Co. 1*	143	17	-	-			160
Covington 3*	219b*	53	-	21	3		296
Oxford 6*	-	2	-				2
Porterdale 6*	-	2	-				2

* See end of Table.

Intergovernment Revenues were broken down between state, federal, and local sources. From the state it includes any grants, shared revenues collected by the state such as the state fuel tax, payments by the state for county services in state tax collecting and elections, and contracts with the state for the maintenance of state highways. The federal category includes revenue sharing funds, C.E.T.A. payments for certain employees wages, L.E.A.A. grants for law enforcement, community development grants, and other categorical grants-in-aid but not including any payments to local schools, hospitals or other independent local entities. The local portion includes payments in lieu of property taxes by housing authorities and payments by cities for some county services or vice versa, but some local interchange for services may be hidden in other figures such as the service charges category.

The service charges category includes fees or charges for various government services. These include water and sewer user charges and tap-on fees (sewer charges will be described in more detail later), garbage collection fees, landfill or dumping charges, and it may include some charges to other local governments for services like tax collecting and elections. It does not include bills for electricity or gas sold by city utilities or user fees and charges by other local government entities such as hospitals, airports and housing authorities.

Court fees, fines, and forfeitures cover a variety of revenues. For cities it is only the court costs, fines and forfeited bonds in the municipal or police court, but for counties it may include court costs and fines in the county superior and probate courts, candidate election qualifying fees paid to the probate court, and other probate court and sheriff's fees for various services.

The last categories of Interest and Other may overlap somewhat because some local breakdowns mix interest income from invested idle funds with other miscellaneous revenues, or they may include interest income in each category or accounting fund that had interest-bearing funds during the year. the Other category, besides some interest, may include building permit fees, rental of government property, public concessions, inspection fees, sales of government property, paving and lighting assessments, and cash gifts.

Wastewater Collection and Disposal

This portion of the report will describe the operating revenue sources for each public sewage system in the Yellow River Basin, including the rates or service charges and tap-on or connection fees.

DeKalb County has an extensive system of lines and treatment plants covering most of the unincorporated portions of the county and some municipalities and providing processing for other municipal systems in the county. In the Yellow River Basin there are no public processing plants, but some residents are still on septic tanks and some private processing is still used for businesses in the area, particularly rock quarries. Financial information on the DeKalb system is contained in Tables 65 and 66 .

government by the wholesaler from the retailer. The beer tax rate is set uniformly by state law at five cents per 12 ounce container or proportionately for other sizes and six dollars per 15½ gallon container of draft beer or proportionately for other sizes (Ga. Code Ann., Sec. 58-7061). The rate for wine varies greatly, but the maximum rate for liquor is set by state law at 80 cents per gallon (Ga. Code Ann., Sec. 58-1038).

Business licenses and taxes vary considerably from government to government. They are usually a flat rate per year varied as to the type of business, but they may vary on the basis of floor space, number of employees, or inventory. A few areas use a rate based on the gross receipts of the business. Professionals, such as doctors and lawyers may only be taxed up to $200.00 per year and liquor stores up to $2,000.00 per year in any of these manners, and life insurance companies may be taxed or licensed for doing business in a city according to the city population under a schedule established by the State (Ga. Code Ann., Sec. 56-1310).

Cities may charge a tax or fee for a franchise or right to use the city streets for various commercial purposes. This may include private telephones, electric, gas, cable T.V., water, sewer and garbage companies. Some cities even charge a fee to other local government utilities for the right to use their streets, as Oxford does for Covington's gas and electric system.

Cities and counties may impose various other minor taxes. Cities may impose a life insurance premium tax under state law of up to one percent of the gross premium on any life insurance policy issued to city residdents. Cities may establish parking meters (Ga. Code Ann., Sec. 95A-503(g)). Cities and counties may impose a hotel-motel tax of up to three percent on room charges, though if the city imposes the tax, the county may not in that city (Ga. Code Ann., Ch. 52-5). There is also a local optional sales tax of one percent that may be imposed by counties after a referendum or by cities under certain circumstances, which requires a property tax reduction to match that new revenue (Ga. Code Ann. 92-3447a.1).

It must be noted here that Gwinnett County has imposed a business or occupation tax for the unincorporated areas, which began January 10, 1977, and though no local entity has imposed the local option sales tax, Walton County had a referendum scheduled on it in January 1977.

Table provides a listing of the various revenues of the cities and counties in the Yellow River Basin. It does not include revenues raised by other special governmental entities such as school boards or hospital authorities. The Property Tax category includes all but those property taxes that the counties collect for the state and local school boards and may include an intangible property tax, property transfer taxes and late taxes, penalties and interest. the Other Local Taxes are the totals from Table 64

TABLE 65 (concluded)

Sterilization: To insure sterile lines, all new lines 6" or larger must be sterilized before approval by County:

Minimum charge:	$25.00		
6" Water Main:	0.05 per foot	10" Water Main:	0.20 per foot
8" Water Main:	0.10 per foot	12" Water Main:	0.30 per foot

NOTE: Lines smaller than 6" may be sterilized at same fee established for 6" line.

Miscellaneous Service Charges:

Water Restoration: First cut off: $4.00; second: $10.00; removal of meter: $25.00. Special Industrial Waste Sampling: At Cost.

TABLE 65

DEKALB COUNTY SEWER RATES AND SERVICE CHARGES

Minimum or Readiness to Serve Charge: (A base monthly charge for providing service availability regardless of volume used, based on capacity of meter.)

	Meter Size								
	3/4" (for less)	1"	1-1/2"	2"	3"	4"	6"	8"(**)	12"
Sewer	4.80	8.00	16.00	25.60	51.20	80.00	160.00	256.00	400.00

NOTE: Most low and residential users are on bi-monthly meter reading and billings; this includes mainly meters of 1" and under which constitute approx. 97% of meters in water system. Monthly billing is at half this rate.

Commodity Charges: (Based on volume of water metered.)

Sewer: $0.80 per 1,000 gallons

Industrial Waste Surcharge: (Based on routine laboratory tests of commercial and industrial customer discharges to the County Sewer System and on volume of water metered.)

1. BOD (Bio-Chemical Oxygen Demand) level: An additional $0.0004 per 1,000 gallons for each mg/l of BOD in excess of 250 mg/l.

2. SS (Suspended Solids) level: An additional $0.0004 per 1,000 gallons for each mg/l of SS in excess of 250 mg/l.

New Sewers Assessment Rate: The assessment rate is based on actual average cost per lineal foot from previous year - charged per front foot of abutting property along the sanitary sewer and applied as lien against property.

Sewer Tap Fees:

Residential: $200 but if the tap is to sewers built under a petition earlier than 9/72 then it is $50; if between 9/72 and 12/74 then it is $100.

Non-Residential: Fee to be based upon a population equivalent proportionate to a single family unit. (State and National Equivalent Tables

Stone Mountain has a city sewage system for which they charge a user fee and all the city sewage is processed by the county system. The city is generally treated like a large customer under the standard rates. The city charges a $100.00 connection or tap-on fee to all customers and has a monthly commodity charge based on the volume of water metered of $2.50 for the first 5,000 gallons and $0.45 for each 1,000 gallons over that. The city also charges miscellaneous small fees for inspections, tests and the like and establishes a property assessment based on the front footage of each property owner to equal a total cost for new sewers laid by the city or under city contract. Most new sewers are, however, built by developers to city specifications and dedicated free to the city. There were $650,000.00 in water and sewer bonds or revenue certificates of the city outstanding in December 1975, and only interest payments were made on that indebtedness in 1976.

In Gwinnett County, in the early part of 1977, two county-wide local government entities plan to be involved in wastewater disposal. Presently, the county owns and operates a system that distributes water and returns and processes sewage by most of the unincorporated portions of the county and many of the municipalities. A county water and sewer authority will begin operation handling all or most processing of wastewaters for the county system and some municipalities by contract. To finance the expansion and establishment of these systems, the authority has issued $35 million in bonds, the county has added $5 million in 1976 to its $26,415,000 in outstanding water and sewer bonds and federal grants of $15 million from EPA and $1.21 million from other federal agencies are being used.

Table 67 shows the various charges by the county. "Original contract users" means they were on the system within six months of the contract that created the processing plants they are connected to, while "contract user" means within six to 30 months and "non-contract" means after 30 months. Most county package plants and oxidation ponds have been or are in the process of being eliminated so that a portion of the fees is largely obsolete. The ready-to-serve charge is a minimum charge even if no water is used based on the average rate of use for that type of customer. After the water is flowing and the system is in use, the charge is the ready-to-serve charge rate plus the use charge rate on the actual water metered. All new users (contract and non-contract) must pay a connection charge based on the estimate of daily use by each type of customer plus, for users added after a cut-off date for each plant set by the county commission, one year's ready-to-serve charge.

Lawrenceville has a city sewage system which presently treats all the city's sewage. There are $413,000.00 in outstanding water and sewage bonds and no new bonds were issued in 1976. The city charges a flat rate of $0.50 per month to residences and $2.00 per month to commercial establishments. There are some new hookups to the system and the connection fees are $50.00 for a four inch residential tap and $100.00 for a six inch tap

TABLE 66

DEKALB COUNTY WATER AND SEWERAGE SYSTEM FUND
OPERATING FUND-STATEMENT OF INCOME
FOR THE YEAR ENDED DECEMBER 31, 1975

	COMBINED	WATER SYSTEM	SEWERAGE SYSTEM
Operating Revenues:			
Metered sales	$16,917,777	$9,220,119	$7,697,658
Meter installation fees	362,800	362,800	
Sewer tapping fees.	493,215		492,215
Fire sprinkler fees	156,202	156,202	
Sale of materials, supplies, etc.	3,985	3,978	7
Service and repair charges. . . .	13,083	5,586	7,497
Rental.	1,613	1,412	201
Miscellaneous	376,102	44,896	331,206
	18,323,777	9,794,993	8,528,784
Operating Expenses.	12,796,417	6,004,741	6,791,676
Operating Income.	$ 5,527,360	$3,790,252	$1,737,108
Non-operating Income (Expense):			
Interest income-debt retirement funds.	403,904		
Interest income-revenue bond funds.	1,300,286		
Interest income-renewal and replacement funds.	10,588		
Interest-other.	24,232		
Other income.	144,232		
Interest expense-revenue bond funds.	(2,777,179)		
Paying agents' fees	(4,450)		
Net Income.	$ 4,628,973		
Outstanding water and sewer bonds.	$54,413,000		
Lease-purchase obligation on the R.M. Clayton Water Pollution Control Plant.	$16,362,203		

TABLE 68

LAWRENCEVILLE WATER AND SEWER FUNDS
AUGUST 31, 1976

Outstanding Water and Sewer Bonds:	$ 413,000	Principal
	189,847	Interest
	$ 602,847	

NOTE: No new bonds issued in 1976.

Renewal and Extension Fund:

8/31/75 Balance.	$ 153,600
Interest	12,000
Revenue fund transfer (minimum required by bonds).	4,400
8/31/76 Balance	$ 170,000

NOTE: Minimum of $25,000 balance required by bonds.

Revenue Fund:

Tap fees	$ 11,518	(inc. 4,400 transferred to Renew. & Ext. Fund)
Water.	188,265	
Sewer.	26,754	
Miscellaneous.	690	
	$ 227,237	

Cash Balance	$ 92,562
Accrual Balance.	$ 126,000
Deficit over last year (after expenses and required transfers). . . .	$ 25,070

Sinking Fund:

Cash balance	$ 90,562
Accrual balance.	$ 105,000

NOTE: Minimum of $43,000 balance required by bonds.

Income

Interest	$ 3,476	
Transfer from revenue fund	$ 43,590	(minimum required by bonds)
Total.	$ 47,066	

TABLE 67

GWINNETT COUNTY SEWER RATES AND CHARGES

Minimum or Ready-to-Serve Charge:

Original contract user.	$ .35/1,000 gallons/month
Contract user	$ .42/1,000 gallons/month
Non-contract user	$ .49/1,000 gallons/month

Commodity or Use Charges: (Based on volume of water actually metered.)

All users	$ .18 plus ready-to-serve charge/month

Connection Charge:

Original contract user.	None
Contract user	$ .20/gallon of estimated average daily use
Non-contract user	$ .60/gallon of estimated average daily use

Plus for users added after the commission established cut-off date for a particular plant, one year's worth of ready-to-serve charges.

Charge for Schools:

$ .20/student and faculty member each month.

Charge for County Package Plant and Oxidation Pond Connections:

Multi-family (per apartment). . .	$3.60/month
Single family	4.10/month
Small commercial.	7.00/month
Laundromat (per machine).	4.50/month
Industrial and high-water demand user.	By special contract

NOTE: These are charged in place of other sewer charges.

TABLE 69

COVINGTON SEWER SYSTEM RATE, CHARGES, REVENUES, AND BONDS - 1976

Outstanding Water and Sewer Bonds: $ 2,099,000

Monthly Water and Sewer User Rates: (Sewer rates are 70% of corresponding water bill).

Water	Inside City	Outside City
First 3,000 gallons	$ 3.00	$ 4.00
Next 7,000 gallons	.70/1000 gal.	.75/1000 gal.
Next 10,000 gallons	.60/1000 gal.	.65/1000 gal.
Next 30,000 gallons	.55/1000 gal.	.60/1000 gal.
Over 50,000 gallons	.45/1000 gal.	.45/1000 gal.

Sewer connection fee: $ 250.00

NOTE: There is no present special property assessment for new sewer lines.

Revenues:

(1976 Budget)	Water	$436,468
	Sewer	$305,528

plus both are required to pay a $100.00 fee to the sewer extension fund, as required in the city bond ordinances. If a business has more than one outlet to the system, they are charged an additional $100.00 for each up to five and $100.00 for every five or less outlets over the first five. All actual connections are performed by private contractors at the owner's expense. Additional financial information on the system is presented in Table 68

Duluth, Lilburn, Snellville and Grayson either have no sewer system or are connected at least in part to the county on an individual basis, but Norcross does have sewer treatment capacity though it buys its water from the county. Norcross is not presently allowing new hookups though the charge would be $150.00 for residences and a figure based on estimated volume for businesses. The city has no bonded debt on their system. A flat user fee of $2.00 per month is charged to residences, and businesses presently on the system are charged monthly as follows:

Gas Service Stations	$ 10.00
Laundries (per machines)	$ 1.00
Car Wash	$ 15.00
Schools	$ 15.00

And others may be charged as for residences if the use is similar.

Newton County has a water and sewer authority that serves some of the unincorporated areas, some businesses and Emory College in Oxford. Oxford is planning a partial system for the city to hook into the county treatment system. The county charges approximately $400.00 for tap-ons to the system though special contract or promotional rates are sometimes used. All the direct customers of the authority are large contract users with individually negotiated monthly or annual rates. These include Emory College, the County School Board, Covington (part only), Porterdale and the like. The authority has no outstanding debt at this time.

The Covington water and sewer system operates through the city and parts of the county. Though one subdivision's sewage is processed by the county under contract with the city, Covington generally handles its own processing. Financial information on rates, bonds and revenues are in Table 69 .

Rockdale County has no county sewer system, but the Conyers city system operates in much of the county as well. The city charges a $175.00 connection fee to most customers in or out of the city but if the actual cost differs, a fee reflecting that cost is charged to businesses or residences. The city charges $2.00 (minimum) monthly for sewer service and an additional $0.40 per 1,000 gallons of metered water after the first 3,000 gallons. The city system has $5.4 million in water and sewer bonds outstanding and has a portion of an EPA grant still due.

The only public sewer system operating in the Walton County portion of the Yellow River Basin is the Loganville system. The city has no outstanding sewer bonds, but there were $382,000.00 in water bonds outstanding. Though no new tap-ons are allowed, the city was charging $100.00 for a connection. The user fees are a flat $2.00 per month for residences and $4.00 per month for businesses.

Table 70, as a conclusion, shows the collection and treatment relationships in the Yellow River Basin, while Figure 33 indicates treatment facility locations.

Summary

This section has attempted to inventory the local government entities in the Yellow River Basin, to describe the various governmental services available there and who delivers them, to assemble and describe the revenue sources for general local government entities, and to describe in detail the financial and relational arrangements of the various wastewater disposal agencies in the Basin. The inventory has been broken down into counties which contain parts of the Yellow River Basin and cities and special purpose districts in each of these counties which are partly or completely within the Basin. The report concludes that all the cities and counties have the authority to deliver all the services involved in this task, but the actual delivery of those services varies greatly in technique from area to area though some generalization is possible. Services such as transportation are largely by private cars and trucks on locally-maintained roads with main arteries being maintained by the state and federal governments. Police and fire protection is mainly the function of local police and fire units. Schools are a joint state-county operation, and libraries are in regional units with everyone in the Basin within range of some local facilities. Health is basically a county responsibility or the concern of county-wide hospital authorities. Public welfare is a joint state-county operation with federal money and a limited involvement of special local housing authorities. Solid waste disposal varies from no service in some areas to private companies (possibly regulated by the local government) to city or county systems of some sophistication. Similarly, water and sewerage are services lacking in some areas and extensively provided for in others. Finally, the revenue information shows the variety in the types and levels of revenue gathered for the general operation of each government and the variety in the specific financing of wastewater disposal.

TABLE 70

RELATIONSHIP OF WASTE WATER AGENCIES
IN THE YELLOW RIVER BASIN

Collector System	Treatment System
DeKalb (inc. Lithonia)	DeKalb
Stone Mountain	DeKalb
Gwinnett (inc. Grayson, Lilburn, Snellville and some of Duluth)	Gwinnett Co. and Authority
Norcross	Gwinnett Co. and Authority
Lawrenceville	Lawrenceville
Newton (inc. Porterdale Authority and some of Oxford)	Newton Authority (inc. a portion of Covington)
Covington (inc. some of county)	Newton Authority (inc. a portion of Covington) Covington
Conyers (inc. some of Rockdale Co.)	Conyers

B.9 OTHER PROJECTS, PROGRAMS AND EFFORTS

Until recent years most state legislators considered land use controls a truly local endeavor. But the record of the past decade proves an increased involvement by state agencies in matters of land development regulations. This new involvement by states in land use control has been so substantial as to require annual reporting.

The State of Hawaii first enacted statewide zoning in 1961. More recently, additional states have entered this previously barren field for state legislators. The neighboring State of Florida has created state regional planning agencies with "critical areas" subject to special review and approval by these regional agencies. In addition, many states -- Georgia included -- have begun to pay attention to regulatory devices related to coastline or wetlands areas. Georgia's Wetlands Bill can be offered as the first step of the State to engage in critical areas regulation.

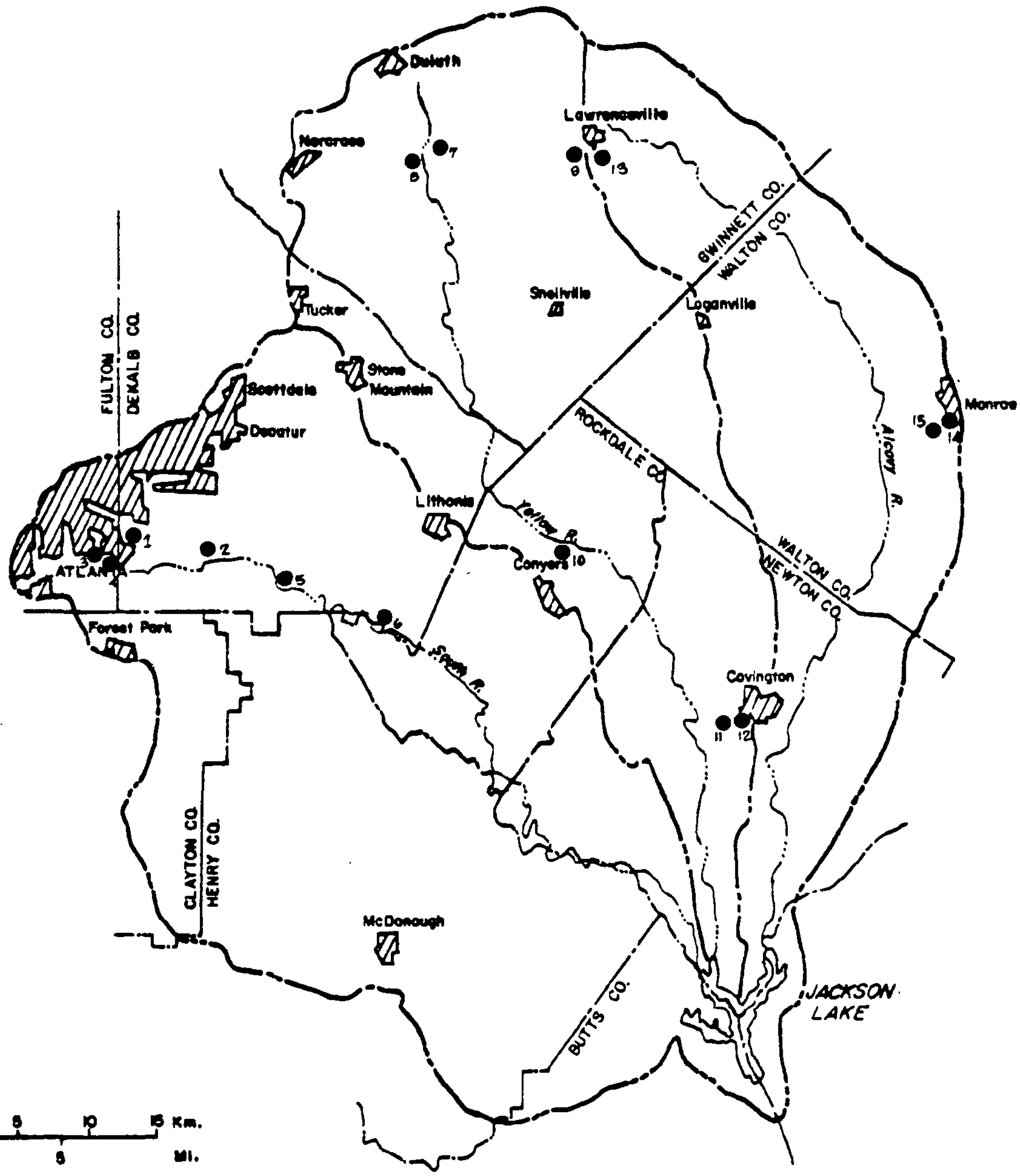
At the federal level, profound steps have been taken in the area of flood plain regulations with the Federal Insurance Administration having the responsibility to identify flood hazard zones within the state and further to restrict lending agencies or members of federally sponsored insurance programs, such as FDIC or FSLIC, from extending mortgage commitments to homes located within such identified flood hazard zones. Wild and scenic rivers legislation has been passed at the federal level with companion bills being offered in many state legislatures offering a preservation device for truly wild and scenic segments of major rivers in the nation.

Approximately 10 years of experience exists under the Highway Beautification Act, which is a regulatory device affecting signage along the interstate and primary highway system. Further, federal grant programs supporting airport construction have recently enacted requirements for flight hazard zones, land acquisition in approach patterns, and other techniques including the identification of areas subject to severe noise pollution and providing funds for the acquisition of structures located within such noise boundaries.

Two major land use regulating bills have been extensively reported and debated by Congress in the areas of strip mining legislation and assistance to states for land use planning. These bills have advanced through Congress to the point of deciding votes in conference committee, and in the end were defeated in close votes.

It should be mentioned that two other significant pieces of legislation have been enacted by the State, which have limited application to the Atlanta metropolitan area. These two land use devices are known as the Metropolitan River Protection Act and the Area Plan Review Procedures granted to the Atlanta Regional Commission (Georgia Act 5).

FIGURE 34



1 ATLANTA - INTRENCHMENT CREEK
2 DEKALB COUNTY - SHOAL CREEK
3 ATLANTA - NEW SOUTH RIVER
4 ATLANTA - OLD SOUTH RIVER
5 DEKALB COUNTY - SNAPFINGER CREEK
6 DEKALB COUNTY - POLE BRIDGE CREEK
7 GWINNETT COUNTY - NORTHWOOD
8 GWINNETT COUNTY - JACKSON CREEK
9 LAWRENCEVILLE - REDLAND CREEK
10 CONYERS - BOAR TUSK CREEK
11 NEWTON COUNTY - WTC PLANT
12 COVINGTON PLANT
13 LAWRENCEVILLE - SHOAL CREEK
14 MONROE - POND No. 1
15 MONROE - POND No. 3

UPPER OCMULGEE RIVER BASIN

MAJOR EXISTING WASTE WATER TREATMENT FACILITIES

B.10 SENSITIVE MAN-MADE AREAS

It is often difficult to precisely separate natural and man-made significant areas. Frequently, the same areas are significant and may be so due to the combination of natural and man-made aspects. An example is Stone Mountain Park, a park based on a natural feature (Stone Mountain) but supplemented by impoundments, trails, amusement features and a host of other recreational activities, all of which have been man-made. Similarly, the Soapstone Ridge in the South River Basin is highly sensitive from the natural viewpoint but man-made features of previous cultures and habitations also impact the ridge to make it significant from a man-made or historical viewpoint.

This discussion will focus on the Yellow River Sub-basin. Before doing so, however, it is important to note that there are significant man-made features in both the South and Alcovy Rivers of consequence to water quality management plans for the entire Basin.

Central to this discussion of sensitive areas is Lake Jackson. This is a man-made impoundment which has for years been serving as a repository for the non-biodegradable materials originating in the Atlanta urban area. It is also an active recreational and fishing resource. Its threatened eutrophication is and remains a central concern for water quality management alternatives throughout the basin. Numerous swamps of the Alcovy River Basin are in many respects man-made and not natural. Through interviews, it was determined that many of the swamp areas in Walton County were in fact man-made during the early decades of this century when row cropping resulted in extensive erosion and sedimentation of the drainage courses. Alledgedly, at one bridge location in Walton County the adjacent farmer can testify to the effect that more than 18 feet of silt had accumulated during his lifetime at that location. These swamp areas, although largely man-made, are still important to water quality through the filtering process they offer for non-point and point discharges.

In the South River Basin the sensitive man-made areas that impact on the water quality management alternatives most significantly are the impoundments and discharge locations of Clayton and Henry Counties to Big and Little Cotton Indian Creeks. While Clayton County is now engaging in an interbasin diversion for ultimate land disposal of effluent as a means of improving water quality in the Flint River system, a similar level of importance should be assigned to the preservation of the drainage basins of the Big and Little Cotton Indian Creeks. Since the impoundment is downstream from the expanding urban area of Clayton and northern Henry Counties, careful attention must be paid by the respective public officials to assure that these impoundments are not endangered from non-point as well as point sources.

Yellow River Sub-Basin -- Sensitive Man-Made Areas

There are numerous historical and cultural facilities of importance located within the Yellow River Sub-basin. These areas have been previously identified and mapped; however, due to the large scale of the Study Area

While both of these review prerogatives are assigned to the Atlanta Regional Commission and are, therefore, unique when compared to the other 16 Area Planning and Development Commissions in the State, the final approval authority rests with local units of government.

Both these bills provide that the Atlanta Regional Commission will pre-identify areas or programs of regional consequence which calls for a review period of 60 days for all development proposals within these designated areas. To date, the most prevalent use of these review prerogatives have applied: (1) to the Chattahoochee River corridor from Peachtree Creek northward to Lake Lanier, (2) along pre-established corridors for the Metropolitan Atlanta Rapid Transit System, and (3) for regional improvements which impact upon two or more of the local governments. When combined with the A-95 review procedures already employed by the Atlanta Regional Commission, these additional legislative prerogatives place the Atlanta Regional Commission in a substantial coordinating role among its constituent governments.

Of significance are the most recent attempts at increased involvement by the State of Georgia upon local land use decisions. Characteristically, such attempts at increasing state jurisdiction have been rejected in the General Assembly but continue to be items for discussion on the legislative calendar. For example, during the 1976 session of the Georgia General Assembly, legislation was again introduced for: (1) vital areas identification and regulation by the State Department of Natural Resources, (2) a noise pollution control act providing for the creation of standards on noise emission and technical assistance to local units of government, (3) a flood hazard bill which would impart to the Board of Natural Resources the power to coordinate, plan and regulate all activities in the state concerning flood plain management, and (4) a proposed bill to create a statewide energy resources conservation activity with the power to implement statewide energy policies through a new energy commission. All of the above bills failed in the 1976 session.

While the record of passage of such legislation has been poor, the fact that it has been introduced in a relatively conservative state legislature, and repeatedly introduced for discussion and vote, indicates the growing awareness of the State to its responsibilities in these areas. The Georgia State Constitution was recently submitted for a voter referendum and approved. This new constitution is a re-editing of the basic constitution and its numerous amendments, but also includes provisions that would allow the General Assembly to again assert itself into areas of natural resources and environmental protection. The ramifications of this new state constitution in these subject areas are yet to be determined.

Prime Agricultural Land

The discussion on existing land use demonstrates adequately the significance of agricultural lands to the total area of the Yellow River Sub-basin. Extensive agricultural areas currently being farmed occur largely in the Big Haynes Creek tributary watershed and southerly to Newton County. Forest resources predominate in the lower Yellow River Sub-basin from Lake Jackson upstream to the vicinity of Porterdale and Covington. While such areas are sensitive and a valuable resource to local and state economies, the major economic impact that determines their survival is one of taxation. Significantly, the Georgia State Legislature has been considering for the past two sessions the prospect of revising the foundation of ad valorem taxation in the state from one of fair market value to one of land use. If such a conversion can be accomplished by the Legislature, significant relief could be achieved for productive farms and farmers and go a long way toward preserving these prime agricultural lands.

High Density Areas

The principal cities of each of the counties within the Yellow River Sub-basin have been previously identified. They do provide high density areas offering a multiplicity of activities and services.

On a more general scale, however, the major transportation corridors that will be achieving high density standards include the I-85 and I-20 corridors. The projected land use plan emphasized this relationship between transportation, jobs and community services and, accordingly, allocates most of the growth to their respective corridors due to those factors.

Water Intakes

Two public water systems draw their supply from the Yellow River. Those water systems are the Conyers Water System with its intake in the Milstead impoundment and the Porterdale Water System in Newton County in the City of Porterdale. In both instances, natural and man-made features also occur at these same vicinities.

Specifically, at Milstead a low head dam (man-made), which previously served a mill complex, offers a significant recreational resource in conjunction with the obvious needs to preserve water quality in the vicinity of the intake.

A similar situation occurs in Porterdale where a low head dam serves the Bibb Manufacturing facilities in Porterdale at Cedar Shoals. The shoal area itself is rather extensive and quite scenic while offering recreational potential. Beside the dam near the bridge abutment is a small parking area, which provides means of public access to this area.

few recommendations can be made toward preservation of any one of the facilities. The burden must be placed on local units of governments and their respective historical or cultural societies to undertake programs of local initiative in concert with State agencies toward preservation.

Archaeological resources, however, are quite another matter. These resources have been generally mapped and cataloged in two prior discussions wherein their frequent occurrence adjacent to or within drainage systems was noted. The cultures of these prior civilizations were heavily dependent on water not only as a staple of life, but also as a means of communication and transport. As a result, by far the greatest concentration of campsites and villages occur along the natural drainage system. These areas are considered sensitive for a variety of reasons but in terms of water quality management alternatives gravity flow interceptor systems run a severe risk of impacting such areas during the construction phase. Such primary impacts can be avoided or in the alternative such sites can be researched and cataloged, but in either event careful attention must be paid to these locations. The general nature of the mapping that portrays these locations is first a function of scale of the Study Area, and secondly an effort to disquise the precise location so that these areas will remain undisturbed by hobbyists.

Recreational Areas

A previously provided recreational inventory locates and describes major recreational facilities in excess of 50 acres. This was the minimum scale that could be shown adequately in the report format. It is significant to note that within or immediately adjacent to the Yellow River Sub-basin many of the major park and recreational facilities such as Stone Mountain, Soapstone Ridge and Mount Arabia are all facilities that have been either purchased or designated for purchase by public agencies for their unique natural resources. Within the Yellow River Sub-basin there are additional regional parks proposed through the State Comprehensive Outdoor Recreation Plan and the Atlanta Regional Commission's Open Space Preserve Plan.

Of key concern is the recommended Yellow River acquisition for park purposes. This river park system is proposed as a ribbon park with major segments for acquisition in Gwinnett County from McDaniel's Bridge south to Annistown Road Bridge and in DeKalb County from near the county line south to the confluence of the Yellow River and Swift Creek. This proposed recreational river system is perhaps the most significant of those recommended for eventual purchase and development within the Yellow River Sub-basin. Others are typically large park facilities focused on a water resource tributary to the Yellow River. While these are significant in their own right, the Yellow River ribbon system is the predominant area of concern in the Yellow River Sub-basin.

relieve existing problems, efforts should be made by respective local governments to insure that soils and minimal lot sizes are acceptable for septic tank installation.

It is curious to note that in certain of the jurisdictions in the Yellow River Sub-basin septic tanks are permissible on lots as small as 18,000 square feet, or approximately 1/2-acre lots. In contrast, the more developed counties of Fulton and DeKalb typically impose minimum lot sizes of an acre or more where septic tanks are installed. The soil characteristics of the adjacent jurisdictions are, however, not radically different. It is conceivable that the lower lot size requirements for septic tanks in some jurisdictions of the Yellow River, while a positive inducement to development, also are a base reason for the high incidence of septic tank failure that has been realized.

Storm Water Retention - -

Of the jurisdictions within the Yellow River Sub-basin, only DeKalb County currently requires on-site stormwater retention for all new developments. Such requirements, while founded on minimizing flood damages, also have the positive effect of providing for the retention and gradual release of the "first flush" of non-point sources. These positive aspects suggest that the jurisdictions of the Yellow River enact similar requirements for the same purposes.

Basin Preservation

While technically not a man-made facility, basin preservation does require man's efforts and activities to accomplish the intended purpose. Accordingly, the following discussion deals with basin preservation techniques. While these techniques could be locally applied to the basins within the Alcovy River or specifically in the South River Basin for the Clayton County Water and Sewer Authority, they are offered here primarily as an impact to Big Haynes Creek watershed, a tributary to the Yellow River.

The AWRD has identified the Big Haynes Creek watershed as a potential future source of water supply. Caution is advanced, however, and appropriate steps must be undertaken to preserve and maintain water quality within the Big Haynes Creek watershed if its potential as a future water source is to be realized. Previous discussion on water programs outlined the nature of water supply within the entire Basin. It was concluded that the northern tier of counties which have access to the Chattahoochee River system can be termed "water rich," while those in the southern tier dependent upon headwaters of numerous rivers and streams can be captioned "water poor." As a result, potential new water sources located convenient to this southern tier of counties are indeed important for future considerations.

The future land use plan portrayed in this chapter attempts to specifically exclude urban development from the Big Haynes Creek watershed. This is consistent with the goal of maintaining this watershed in an undeveloped

Lake Jackson

Lake Jackson is a man-made impoundment built by Georgia Power Company in the early 1900s. The lake has become an active area for water-related recreational activities. In addition, what were originally vacation summer cottages have increased and become full-time residences along the lake shore. The improvement of the water quality in Lake Jackson remains a key concern for the water quality management alternatives to follow.

Man-Made Activities

This section should not be ended without a discussion of man-made activities which have created perhaps the most significant sensitive areas in the Basin. The history of such activities and their increasing occurrence as a result of forecasted additional population growth demands that these topic areas be addressed.

Unsuitable Land

As previously mentioned, the term unsuitable land is a relative term, but is designed to encompass those lands which have such natural features as shallow depth to rock, high water tables, steep slopes, or highly erodible soil. Development activities in such areas can have severe consequences to water quality management alternatives. It is a recommendation of this EIS that the local units of government take appropriate actions to preserve them and to minimize the man-made influences of development that might otherwise create non-point problems as well as the disruption of some truly scenic areas.

A host of man-made activities associated with development and growth have the potential for impacting water quality in the Yellow River Sub-basin. These activities are identified as follows:

Erosion and Sedimentation Control - -

While Gwinnett County was a leader in establishing such regulations, it is now a State Law that all local units of government enact such requirements. This action by the State could significantly improve the silt loads that have been previously experienced in the Yellow River when applied throughout its length. Since the Basin is scheduled for major development, the enactment of soil and sedimentation control can play a major role in reducing an otherwise substantial silt load on the river.

Septic Tanks - -

The Basin has a history of development on septic tanks. Many of these same developments have also experienced high rates of septic tank failures with the attendant problems. While public sewerage systems can

DOCUMENTATION

C.

Chapter I

Georgia Conservancy, Incorporated. DeKalb Chapter. Files.
Metropolitan Water Resources Study Group. Newsletter, Volume 3, No. 7.
U.S. Environmental Protection Agency, Region IV. Library and files.

Interviews:
Billingsley, Linda. Georgia Conservancy, Incorporated. DeKalb Chapter.
Green, Richard D. U.S. Environmental Protection Agency, Region IV.
Ravan, J. U.S. Environmental Protection Agency, Region IV.

Chapter II

Atlanta Regional Commission. Water Demand and Wastewater Report Averaged RDP, Cycle II, RDP Alternative E and RDP Alternative W. January 1976.
Atlanta Regional Commission. Airport System Plan Summary Report. June 1975.
Atlanta Regional Commission. An Economic Base Study of the Atlanta Region. March 1975.
Atlanta Regional Commission. Atlanta Regional Commissions Regional Development Plan and Population Projections. 1976.
Atlanta Regional Commission. Regional Development Plan, Land Use, District Level. December 1975.
Atlanta Regional Commission. Regional Development Plan, Land Use, Super District Level. December 1975.
Atlanta Regional Commission. Regional Development Plan, Population, Jobs, Occupied Housing, Units by Structure Type and Population by Age, Super District Level. December 1975.
Atlanta Regional Commission. Regional Development Plan, Population, Jobs, Occupied Housing Units by Structure Type and Population by Age, District Level. December 1975.
Atlanta Regional Commission. Revenue and Expendeture Survey of the Local Governments in the Atlanta Region. July 1976.
Atlanta Regional Commission. Comparative Revenue Study. September 1973.
Atlanta Regional Commission. ARC Staff Recommended Nature Preserve Sites, First and Second Priority Nature Preserve (acquisition prior to 1980). October 1976.
Atlanta Regional Commission. Recommended Areawide Wastewater Management Plan. May 1976.
Atlanta Regional Commission. Water Supply Program for the Atlanta Region. July 1976.
Atlanta Regional Commission. Possibilities for Water Conservation in the Atlanta Region. March 1976.
Atlanta Regional Commission. Alternative Method for Park and Open Space Acquisition, Development and Maintenance. 1975.
Atlanta Regional Commission. Areawide Outdoor Recreation Planning in the Atlanta Region. 1976.
Atlanta Regional Commission. Resolution to Establish Priorities for Park Acquisition and Develop Projects Proposed for Funding During Fiscal Year (FY) 1977. March 1976.
Atlanta Regional Commission. Public Authorities and Special Districts in the Atlanta Metropolitan Region.. 1974.
Atlanta Regional Commission. A Resolution by the ARC Staff Adopting Proposed Nature Preserves for the Atlanta Region. 1976.
Board of Commissioners of Walton County. Walton County Anticipated Revenue and Budgeted Expenditures for Year July 1, 1976 through June 30, 1977.
City of Covington, Georgia. 1977 Budget.
City of Oxford, Georgia. Financial Report 1975.

state for its possible future use as a water source. A variety of techniques are advanced for maintaining this watershed in a relatively undeveloped state and encouraging its continued use for agricultural pursuits.

Point Sources - -

The AWRS plan suggests that in basins designated for preservation, point sources be prohibited. This practice should be encouraged for Big Haynes Creek so that point source loads can be avoided.

Minimum Services - -

The previous discussion on service districts and district taxation by counties is pertinent to this topic. As areas of counties increase in density, they demand services which have been frequently provided by means of special districts. The avoidance of such special district creation by local units of government could serve as a retardant on development in the Big Haynes Creek watershed.

Land Use Taxation - -

If the proposed shifting of ad valorem tax baselines from market value to land use can be accomplished by the Georgia State Legislature, its impacts on preservation of primarily agricultural lands in the Big Haynes Creek area could prove to be the most meaningful action for basin preservation. It would relieve farmers of the tax burden imposed on counties by burgeoning urban populations.

Low-Density Development - -

While under Georgia law, units of government cannot deny a development of property as long as standards are met. It is within the prerogative of local government to fashion their community service intrastructure such that certain areas, such as Big Haynes Creek, do not receive the full breadth of services otherwise offered to more developed areas. In fact, current planning within Gwinnett County, for example, stresses sewerage improvements to the Yellow River Basin in a prioritized fashion with the Big Haynes Creek watershed receiving a relatively low priority.

It is only logical to assume that large lot zoning could be applied to the Big Haynes Creek watershed. Without a full range of services and given the concern for basin preservation, such zoning practices in conjunction with the careful priority arranging of other public services could offer meaningful progress towards basin preservation.

City of Social Circle, Georgia. Proposed Budget for 1976.

Citizens Advisory Committee on Environmental Quality. Report to the President and to the Council on Environmental Quality. December 1975.

DeKalb County Planning Department. Yellow River Basin and Its Environment and Land Use. 1976.

Executive Order 11593. Protection and Enhancement of the Cultural Environment, 16 U.S.C. 470 (Supp 1, 1977).

Fulton County Commission. Annual Report for Year Ending December 31, 1975, Fulton County, Georgia.

Georgia Bureau of Industry and Trade. Annual 1976 Georgia Manufacturing Directory.

Georgia Center for Technology Forecasting and Assessment. The Energy Problem and Its Implications for Georgia. November 1973.

Georgia Institute of Technology, Water Resources Center. Georgia Laws, Policies and Programs Relating to Water and Related Land Resources. June 1967.

Georgia State Legislature. A Bill to Entitle an Act. H.B. No. 293.

Georgia State Legislature. Georgia Water Quality Control Act, (Ga. Law 1964). March 11, 1964.

Georgia Municipal Association, Incorporated. Water and Sewer Rate Structures in Georgia Municipalities. September 1974.

Georgia Science and Technology Commission. The Energy Problem and Its Implications for Georgia. 1973.

Georgia State Data Center, Office of Planning and Budgeting, Atlanta, Georgia. Annual Estimates of Population for the State of Georgia, 1975. July 1976.

Georgia State Department of Natural Resources, Historic Preservation Section. Resource Policy and Procedures of the Georgia State Historic Preservation Office.

Georgia State Department of Natural Resources, Department of Planning and Research. Narrative Plan Volume II, Regional Analysis.

Georgia State Department of Natural Resources, Historic Preservation Section. Environmental Assessments of Historic and Archaeological Resources Policy and Proceedures of the Georgia State Historic Preservation Office.

Georgia State Department of Conservation. Surface Water Resources of the Yellow River Basin in Gwinnett County, Georgia. 1962.

Govenor George Busbee. Press Release, December 2, 1976.

Gwinnett County Chamber of Commerce. Gwinnett Puts it All Together.

Gwinnett County Board of Commissioners. Approved Sub-division Regulations. 1970.

Gwinnett County Department of Planning. Upper Yellow River STEP II Grant Application, Environmental Assessments of Historic and Archaeological Resources.

International City Managerment Association. Municipal Yearbook 1975, Volume 42. 1975.

International City Management Association with national Association of Cities. The County Yearbook 1976, Volume II. 1976

McIntosh Trail Area Planning Commission, sponsored by the Department of Community Development. McIntosh Trail Areawide Future Land Use Plan. June 1976.

McIntosh Trail Area Planning and Development Commission, sponsored by the Department of Community Development. Future Land Use Plan for Newton County. May 1975.

McIntosh Trail Area Planning and Development Commission. Water and Sewer Plan and Capital Improvement Program. April 1974.

Metropolitan Atlanta Water Resources Study Group. Water-What About Tomorrow? Progress Report. July 1974.

Metropolitan Atlanta Water Resources Study Group. Water-Problems and Solutions, Second Prgress Report. July 1975.

Metropolitan Atlanta Water Resources Study Group. Newsletter, Volume 4, No. 7. July 1976.

Metropolitan Atlanta Water Resources Study Group. Preliminary Background Appendix. October 1974.

Metropolitan Atlanta Water Resources Study Group. Watershed Development in Georgia, Status Report. September 1976.

National Historic Register

Newton County Board of Commissioners. Newton County Zoning Regulations. 1971.
Northeast Georgia Area Planning and Development Commission. Monroe County Comprehensive Plan. March 1976.
Northeast Georgia Area Planning and Development Commission. Walton County Georgia Land Use Plan. Jyly 1972.
Public Law 92-500, 92nd Congress, S. 2770, October 1972.
Public Law 89-886, (80 - Stat. 915).
Public Law 89-665, (80 - Stat. 915).
Public Law 91-190 National Environmental Policy Act. U.S.C. 4321, Et. Seq. (1970).
State of Georgia Department of Transportation. Airport System Plan 1973-1993.
State of Georgia Department of Transportation. A 20 Year Multi-Model Transportation Plan.
State of Georgia Department of Transportation. Proposed Highway Improvements and Costs Rural/Urban Principal and Arterial Routes and Rural Roads Projects by Congressional Districts by County Identified by the Statewide Transportation Plan. October 1974.
Soil Conservation Society of America, Georgia Chapter. Land Use Policy Statement for Georgia. 1974.
State Soil and Water Conservation Committee for Georgia. Model City and County and Municipal Soil Erosion and Sediment Control Ordinance. 1975.
Temporary State Commission on the Water Needs of Southeast New York. Measures to Reduce Water Consumption in Southeast New York. 1973. Albany, New York.
U.S. Army Corps of Engineers, Savannah District. Your Water In Douglas County, Georgia; Your Water In DeKalb County, Georgia; Your Water in Fulton County, Georgia; Your Water in Clayton County, Georgia; Your Water in Rockdale County, Georgia; Your Water in Gwinnett County, Georgia.
U.S. Department of Agriculture. Soil Survey of Gwinnett County, Georgia. July 1967.
U.S. Department of Agriculture, Economic Research Service, Natural Resources Economic Division for the U.S. Water Resources Council. 1972 OBERS Projections, Volume 5, Standard Metropolitan Statistical Areas, 1974. and Volume 4, State. 1974.
U.S. Departmet of Commerce, Bureau of Census, Social and Economic Statistics Administration. City Business Patterns in Georgia. 1973.
U.S. Department of Commerce, Bureau of Census. City Government Finances in 1973-1974. 1975.
U.S. Department of Commerce, Bureau of Census. Local Government Finances in Selected Metropolitan Areas and Larger Cities. 1973-1974. 1975.
U.S. Department of Commerce, Bureau of Census. Current Population Report, Polulation Estimates and Projections, Estimates of the Population of the U.S. to June 1, 1975, Volume P=25, No. 606.
U.S. Department of Commerce, Bureau of the Census. 1970 Census of Population and Housing, Atlanta Georgia, SMSA (PHC (1) - 14); Estimates of Population of Georgia Counties and Metropolitan Areas, July 1, 1974 and 1975.
U.S. Department of Commerce, Bureau of Economic Analysis. Regional Economic Information Systems.
U.S. Environmental Protection Agency, Region IV, Atlanta, Georgia. Population by County Historic (1940 - 1970) and Projected (1980 - 2020). 1972.
U.S. Environmental Protection Agency, Region IV, Office of Water Programs, Atlanta, Ga. Gwinnett County Upper Yellow River Step II Grant Application C130411 -02 -1.
U.S. Geological Survey Department. A Land Use Plan Cover Classification System for Use and Remote Sensor Data, Survey Circular 671. Jyly 1976.
U.S. Department of Housing and Urban Development. National Flood Insurance Program, Atlanta Area. November 1976.
U.S. Department of Housing and Urban Development. Yellow River, Its Environment and Land Use Plans. July 1976.
U.S. Water Resources Council. A Unified National Program for Flood Plain Management. July 1976.

U.S. Department of Commerce, Bureau of Census. Federal State Cooperative Program for Population Estimates, Series P-26, No. 75-10. October 1976.
U.S. Department of Commerce, Bureau of the Census. 1970 Census of Population, PC (Vi) - 12. Final Population Counts in Georgia. December 1970.
U.S. Department of Commerce, Bureau of the Census. Occupancy, Utilization and Financial Charachter of Housing Units, 1970. Table H-1.
U.S. Department of Commerce, Bureau of the Census. General Characteristics of the Population, Table P-1.
U.S. Department of Commerce, Bureau of the Census. Income Characteristics of the Population, Table P-4.
U.S. Department of Commerce, Bureau of the Census. Social Characteristics of the Population, 1970. Table P-2.
U.S. Department of Commerce, Bureau of Economic Analysis. Summary Statistics of Economic Change, 1950 - 1970, United States and Georgia, Table 2.
U.S. Department of Commerce, Bureau of Economic Analysis. Analysis of Average Per Capita Income by Source, United States and Georgia, Table 4.
State of Georgia, State Data Center, Office of Planning and Budgeting. Annual Estimates of Population for the State of Georgia, 1975. July 1976.
State of Georgia, State Data Center, Office of Planning and Budgeting. Population Projections for Georgia Counties, 1980 - 2000. July 1975.

Interviews:

Billingsley, Linda. Yellow River Action Committee.
Brinkley, Lewis. Director of Planning, Gwinnett County, Georgia.
Duncan, Jack. Park Planner, DeKalb County Parks and Recreation Department.
Evans, Edward. Director of Planning, McIntosh Trail Area Planning and Development Commission.
Fromber, Karl. Recreational Planner, Atlanta Regional Commission.
Green, Richard. Project Manager, U.S. Environmental Protection Agency, Region IV.
Herwig, Roy. Georgia State Department of Natural Resources, Water Resources Management Program.
Jenkins, Earl. Soil Conservation Service.
Jordan, Kenneth. Georgia State Department of Natural Resources, Water Resources Management Program.
Maloof, Sally. DeKalb County Historic Society.
Maxey, Robert. Planning Director, Northeast Georgia Area Planning and Development Commission.
Michaels, Stephen. DeKalb County Planning Department.
Mueller, Heinz. DeKalb County Planning Department.
Ravan, J. U.S. Environmental Protection Agency, Region IV.
VanLandingham, David. Director of Water Pollution and Control, Gwinnett County.
Welsh, Gene. Chief - Georgia State Department of Natural Resources, Water Resources Division.
Local officials for the following counties: Butts, DeKalb, Gwinnett, Newton, Rockdale, Walton and Fulton.
Local officials for the following cities: Conyers, Covington, Lawrenceville, Monroe, McDonough, Loganville, Lithonia, Oxford, Social Circle, Porterdale and Lilburn.