Information Circular No. 16 August, 1954

DEPARTMENT OF MINES, MINING AND GEOLOGY
STATE DIVISION OF CONSERVATION

425 STATE CAPITOL
ATLANTA, GEORGIA

THE CHARACTERISTICS OF GEORGIA'S WATER RESOURCES AND FACTORS RELATED TO THEIR USE AND CONTROL

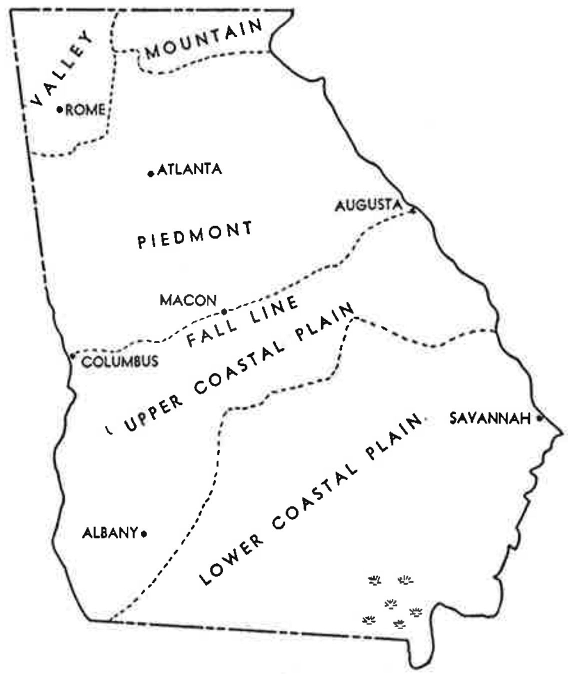
The growing importance to municipalities, industry, and agriculture of Georgia's water resources and the complexity of their occurrence, use, and control requires an appraisal of their many and varied characteristics. This summary tabulates some general water information by regions within which there is a similarity of water features. The regions shown on the map are defined by an investigation of the geology and water by the United States Geological Survey in cooperation with the Georgia Department of Mines, Mining and Geology.

The table shows observed factual values by the range of values which is more significant than averages because of the great variation of water amounts and factors in both time and place. Rainfall and runoff values are given in inches for ready comparison. The differences between rainfall and runoff indicate roughly the consumptive use of water by vegetation, evaporation, and deep percolation. The yield of drilled wells is given in gallons per minute, the most common term used in connection with pumps. The average and minimum stream flows are given in gallons per minute but for each square mile of drainage area of the stream. This is for comparison purposes because stream flows tend to vary in proportion to the area of the drainage basins. The values need to be multiplied by the drainage area of a particular site to give the flow at the site. The values given are applicable to streams draining 30 square miles or more in North Georgia and 300 square miles or more in South Georgia. The flows of smaller streams tend to diminish more rapidly than a corresponding decrease of drainage area. The flood flows are given in cubic feet per second per square mile, the common term for power, flood control, and storage work with stream flow. A cubic foot per second nearly equals 450 gallons per minute, 646,000 gallons a day, an inch per acre per hour, or two acre-feet per day.

The various flow units are used because of the wide range of water quantities. For example, cities now use about 125 gallons per capita per day, but this is a small amount compared to 20,000,000 gallons a day used at a pulp mill, or 430,000,000 gallons a day used for steam power at Plant Atkinson, or 5,500,000,000 gallons a day to run through the turbines at Buford Dam, or the amount consumed by woodlands or crops. An acre of land needs at least 650,000 gallons of rain or irrigation water to grow a crop, but the average farmer's family only needs 100,000 gallons a year and without running water may use only 30,000 gallons a year.

One cubic foot per second of water, or 450 gallons per minute, will fill a gutter a foot wide and three inches deep flowing at the speed of an ordinary walk—three miles an hour. Two fire hoses will throw that amount; so will a 10-horsepower 4-inch centrifugal pump under a 40-foot head. That continuous amount will supply the average needs of a city of 5,000 people. It will supply two inches of irrigation water to 12 acres in 24 hours. It will supply the following industrial production:

GEORGIA WATER REGIONS



GEORGIA WATER RESOURCES AND USE AND CONTROL FACTORS

	MOUNTAIN	VALLEY	PIEDMONT	UPPER COASTAL PLAIN	LOWER COASTAL PLAIN
RAINFALL AND RUNOFF IN INCHES					
AVE. ANNUAL RAIN	53 — 70	49 — 58	45 — 59	45 — 52	45 — 52
MIN. ANNUAL RAIN	41 — 49	31 — 40	28 — 41	28 — 35	26 — 36
AVE. ANNUAL RUNOFF	26 — 41	20 — 25	14 — 21	14 — 28	9 — 13
MIN. ANNUAL RUNOFF	16 — 28	5 — 15	7 — 12	5 — 20	1 — 8
AVERAGE AND MINIMUM STREAM FLOW IN GALLONS PER MINUTE PER SQUARE MILE					
AVE. ANNUAL FLOW	860 — 1350	660 — 830	460 — 700	460 — 920	300 — 430
MIN. ANNUAL FLOW	530 — 920	160 — 500	230 — 400	160 — 670	30 — 270
MIN. FLOW OF RECORD	140 — 270	0 — 170	5 — 80	15 — 580	0 — 10
FLOOD FLOW IN CUBIC FEET PER SECOND PER SQUARE MILE					
2-YEAR FLOOD FLOW	20 — 70	30 — 100	20 — 70	6 — 10	3 — 15
50-YEAR FLOOD FLOW	45 — 200	70 — 220	55 — 200	15 — 30	10 — 45
WELL CHARACTERISTICS AND YIELD IN GALLONS PER MINUTE					
ROCK TYPE	CRYSTALLINE	FOLDED SEDIMENTARY	CRYSTALLINE	SEDIMENTARY (ARTESIAN)	SEDIMENTARY (ARTESIAN)
PERMEABILITY	LOW	LOW-HIGH	LOW	MEDIUM-HIGH	HIGH
WELL DEPTH, FEET	50 — 400	30 — 500	50 — 400	90 — 1000	90 — 1000
YIELD	0 — 100	0 — 400	0 — 200	5 — 2000	5 — 4000
PHYSICAL CHARACTERISTICS					
RIDGES	HIGH, STEEP	NARROW, STEEP	BROAD, ROLLING	WIDE, GENTLE	VERY WIDE, FLAT
VALLEYS	NARROW, STEEP	WIDE, OPEN	NARROW	WIDE, SWAMPY	WIDE, SWAMPY
AVE. FOREST COVER	83	70	66	57	68
TOWNS AND CROPLAND	VALLEY	VALLEY	RIDGE	RIDGE	RIDGE
EROSION	LITTLE	MODERATE	MUCH	LITTLE-MUCH	LITTLE
SWAMP LAND	LITTLE	SOME	SOME	MUCH	VERY MUCH
WATER USE AND CONTROL FACTORS					
HARDNESS, STREAMS	6 — 10	26 — 130	8 — 31	8 — 89	8 — 32
HARDNESS, WELLS	11 — 197	18 — 1100	11 — 197	11 — 189	59 — 578
WATER USING INDUSTRIES	RECREATION	STEAM, PAPER TEXTILES	STEAM, PAPER FOOD, TEXTILES	STEAM, CLAY FOOD, CHEMICAL	STEAM, PAPER FOOD, CHEMICAL
WATER POWER SITES	GOOD, SMALL	GOOD, LOW-HEAD	GOOD, LARGE	FAIR, LOW-HEAD	POOR, LOW-HEAD
MAJOR DAM SITES	FEW, GOOD	FEW, FAIR	MANY, GOOD	FEW, FAIR	FEW, POOR
SMALL DAM SITES	MANY, GOOD	MANY, GOOD	MANY, GOOD	FEW, POOR	MANY, POOR
FLOOD DAMAGE	LITTLE	SEVERE	MODERATE	LITTLE	LITTLE
CITY WATER SOURCE	SPRINGS	RIVER, SPRINGS	RIVERS, CREEKS	WELLS	WELLS
IRRIGATION SOURCE	STREAMS	STREAMS	PONDS	WELLS, PONDS	WELLS, PONDS

Kraft paper—20 tons per day	Tanned leather—40 tons per day
Canned peaches—10,000 cases per day	Meat packing—120,000 hogs per day
Explosives—3 tons per day	Steam power—3,000 kilowatts
Tomato products—9,000 cases per day	Cotton sheets—20,000 pounds per day

The permeability of most of the crystalline and many folded sedimentary rocks in Georgia is low, resulting in generally low yields of the wells in North Georgia. The permeability of some folded sedimentary rocks and practically all the stratified sands and limestones of the Coastal Plain is generally high, resulting in generally high yields of drilled wells in South Georgia. In the Coastal Plain, excellent wells can be drilled into permeable beds in which water is confined by overlying impermeable clay beds, resulting in "artesian wells".

Dug wells are common all over Georgia. They generally yield adequate water for household supplies. In dry years many may go dry in late summer, particularly when they supply running water systems. Generally, they are not dependable to supply adequate water for irrigation purposes.

Springs are numerous in Georgia and large ones yield up to 7,200 gallons per minute. However, the large majority of springs are small and of little consequence for irrigation water.

Minimum stream flows show wide ranges of values, indicating that every site needs to be appraised before development. At present, nearly all municipal and industrial use of water is designed on the minimum flow of record. The only way to improve the dependable flow of a stream over its natural minimum is to build a storage reservoir and operate it so as to conserve the flood waters that are common in the dormant season of winter and early spring and release or pump that water out gradually when it is needed during the drought periods that are common in the growing season of summer and autumn. Normally the maximum dependable flow that can be obtained by the operation of storage reservoirs is the average flow. However, mills, power plants, and irrigation systems use water at higher rates by "pondage" operation, releasing or pumping more than average amounts part of the time when needed—a few hours a day, on workdays, in busy seasons—and storing water the rest of the time when it is not needed—at night, on weekends, or in slack seasons. Therefore, control gates, pumps, turbines, and pipelines usually have higher capacities than the average flows require.

The two-year flood has a one to two chance of being equalled or exceeded in any year. The 50-year flood has a 1 to 50 chance of being equalled or exceeded in any year.

The descriptions of the physical characteristics are very general. There are exceptions in every region.

The hardness is given in parts per million. It is a general indication of the industrial quality of the water. Water with a hardness up to 60 is considered soft, from 60 to 120 moderately hard, above 120 hard. The waters of Georgia are generally excellent for most uses.

Power sites and dam sites for reservoirs depend on many physical and water factors. Low-head dams are built where it is not feasible to flood the valleys. They depend on regulated flow from upstream reservoirs. Little mill dams still exist in all regions. Their power output is small.

Flood damage is relative. Any individual who suffers in floods of course considers it severe. If, however, only a few in the region suffer and only rarely, the damage is described as "little". In general, flood damage in Georgia is less severe than in other States where the flood plains are occupied by cities and industries.

The usual source of city water applies to those cities with over 5,000 population and to large water-using industries. Smaller cities may still use wells in any region.

The sources of water for irrigation depend on the physical relation of the croplands and water supplies. In the mountain and valley regions, croplands are generally near the streams and the streams generally maintain good flows during the irrigation season. In the Piedmont, the ridgetop cropland is too far from the streams and wells would rarely provide adequate water for irrigating many acres, so ponds are needed. In the Coastal Plain, the ridgetop cultivated fields are too far from the dependable streams. Either ponds or wells may be used in some areas and only wells in other areas, depending on local conditions.

The Department of Mines, Mining and Geology, by means of cooperative programs with the U. S. Geological Survey, makes scientific investigations of Georgia's water resources, her streams and lakes, underground waters and springs, and the chemical quality of those waters, to determine the nature of their occurrence, factual data about their quality, rates of yield or flow, their use and control, and publishes reports and other information resulting from water investigations, research, studies, and appraisals. Inquiries should be addressed to the Director, Department of Mines, Mining and Geology, Room 425, State Capitol, Atlanta 3, Georgia.

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