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WATER RESOURCES OF THE CUMBERLAND AREA, MARYLAND-WEST VIRGINIA

By

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INTRODUCTION

The area covered by this report consists of Garrett and Allegany Counties, the two westernmost counties of Maryland, and Mineral County, West Virginia. The city of Cumberland, population 37,732 (1950 census), which is the economic and commercial center of the area, is on the North Branch of the Potomac River in Allegany County.

The report was prepared in response to a request from the United States Department of Commerce, which desired an appraisal of the water resources of the Cumberland area in order to evaluate the effect of the availability of water on the economic development of the area. Accordingly, the purpose of this report is to summarize the available water information and to describe the hydrologic factors that affect the availability of water.

SUMMARY AND CONCLUSIONS

Water-bearing formations capable of yielding adequate supplies of water to wells for private domestic use underlie practically all parts of the Cumberland area. Ground water for large public supplies and industries is more limited in occurrence, as only a small part of the area is underlain by aquifers capable of yielding more than 50 gallons per minute to wells.

The total consumption of ground water from public supplies is about 1,350,000 gallons per day. Practically no ground water is used by large industries; although small commercial establishments may obtain some water from ground-water sources, the quantity probably is small.

During prolonged dry periods there may be inadequate supplies of ground water with existing developments, in some parts of the area, but in general there has been little or no permanent depletion of the aquifers.

The streams in the Cumberland area are generally characterized by relatively steep gradients and narrow valleys, and surface runoff is rapid. Stream-flow measurements show that, in general, the unit runoff is less in the eastern than in the western part of the area. According to records of stream flow at six gaging stations, the period of record averaging about 19 years, the minimum daily yield is about 0.04 cubic feet per second per square mile of drainage area. Floods have occurred in the area, particularly in the North Branch of the Potomac River, and flood-protection structures are now under construction at Ridgeley and Cumberland.

The total quantity of water diverted from streams for public supplies is about 14,000,000 gallons per day, of which about 85 percent (12,000,000 gallons per day) is used for the public supply at Cumberland. The total quantity of water diverted from streams for private industrial supplies is about 156,000,000 gallons per day; however, most of this water is used in cooling operations and is returned to the streams. Practically all the water withdrawn for private industrial supplies is obtained from the North Branch of the Potomac River between Luke and Cumberland.

The new Savage River dam, now under construction, will increase the availability of water of good quality in the area. For example, it is expected that the minimum flow of the North Branch of the Potomac River downstream from the mouth of the Savage River will be increased to 93 cubic feet per second.

The availability of water suitable for public supply and some industrial uses, especially in the North Branch of the Potomac River between Luke and Cumberland and in Georges and Wills Creeks, is directly affected by pollution, consisting of sanitary sewage, acid water from coal mines, and industrial wastes. In an attempt to reduce the degree of contamination, some abandoned coal mines have been sealed and industries and governmental agencies are investigating the pollution problems in order to formulate additional effective remedial measures. At present the water in Evitts Creek and Savage River is free from mine wastes, and is of good quality.

In general the amount of water available appears to be adequate for existing demands but, before concluding that the water resources are adequate for large industrial expansion, it would be prudent to make detailed studies of the potential reservoir sites, stream discharge, and ground-water resources.

Systematic sampling of water for chemical analysis, sediment loads, and temperature would furnish information basic to the planning of remedial measures. Snow surveys should be added to the known hydrologic data in order to predict downstream conditions more accurately.

GENERAL GEOLOGY AND PHYSICAL FEATURES

The Cumberland area is underlain by sedimentary rock several thousand feet thick consisting chiefly of beds of consolidated shale, limestone, and sandstone, which have been folded into arches and troughs that are relatively broad in the western part of the area and narrow in the eastern part. (See geologic section, pl. 1.) These sediments have been classified according to geologic age; those exposed in the area, from oldest to youngest, are as follows: Ordovician, Silurian, Devonian, and Carboniferous. The area distribution of these rock units is shown on plate 1.

In general the western part of the Cumberland area, consisting mostly of Garrett County, Md., is characterized by high hills or mountains; however, undissected plateaus or flat uplands occur in some places. The topography in the eastern part of the area, consisting chiefly of a series of northeast-trending mountains, is rugged; however, the land surface along the major stream valleys separating the mountains is generally flat.

In the Cumberland area, surface water is drained into two major streams, the Ohio and the Potomac. The northwestern part of Garrett County is drained by the Youghiogheny River, a tributary of the Ohio River; the remaining and greater part of the area is drained by the North Branch of the Potomac River and its tributaries. Plate 2 shows the major streams mentioned in this report.

CLIMATE

The Cumberland area is in the humid temperate zone. The average annual temperature at Cumberland is 53.0°F., and the average precipitation is 34.58 inches. The precipitation is relatively uniform throughout the year, the wettest month being June with an average precipitation of 3.88 inches, and the driest month, November, with 2.18 inches.

During the period from 1871 through 1949 the records of precipitation at Cumberland show pronounced differences in the annual totals. The driest year during the period was 1930 when only 18.11 inches was recorded, and the wettest year was 1890 when the total precipitation was 52.42 inches.

OCCURRENCE OF GROUND WATER

The rocks in the Cumberland area consist chiefly of layers of indurated shale, sandstone, and limestone; owing chiefly to their high degree of consolidation, most of them do not form good water-bearing formations. With the exception of some of the layers of sandstone, all the rocks probably were originally too impervious to be classed as water-bearing formations, but earth movements and weathering have formed fractures and solutional openings which may store and transmit water.

Inasmuch as the occurrence of ground water is controlled largely by the character of the rocks, which varies considerably in the Cumberland area, the availability of ground water is by no means uniform throughout the area. In general, small supplies of water for private domestic use can be obtained from relatively shallow wells in all parts of the area. In many places, however, larger supplies for public supply and industrial use may not be available from ground-water sources.

The areal distribution of the exposed rock strata, which are classified by their geologic age, is shown in plate 1. Only the upper part of the rocks of Ordovician age is exposed in the area and, inasmuch as they have not been adequately tested, their productivity is not well known. It is likely, however, that except as a source of water for private domestic wells these rocks do not form an important water-bearing formation.

The rocks of Silurian age, which consist largely of shale and sandstone in the lower part and limestone in the upper part, are sufficiently permeable in some places to yield moderately large supplies of water to wells. For example, one well, 470 feet deep, at the Celanese Corp. near Cumberland, yielded 245 gallons a minute from the Clinton formation. Another well of the Celanese Corp. yielded 175 gallons per minute with a drawdown of 300 feet. Whether yields of this magnitude are exceptional is not known, but some industrialwells drilled to the Clinton formation in the vicinity of Cumberland are reported to have yielded no water, showing that this formation has a wide range in permeability.

The Kelly-Springfield Co. near Cumberland, drilled 12 wells in the Wills Creek shale, of Silurian age. Two of the wells were unsuccessful and the others had yields ranging from 16 to 190 gallons per minute. The average yield of seven of the most productive wells was 93 gallons per minute.

The uppermost formation of Silurian age, exposed in the area, the Tonoloway limestone, and the overlying Helderberg limestone of

Devonian age probably are hydrologically connected and form a single aquifer. Few large-diameter wells have been drilled to this aquifer in Maryland, but in the nearby part of Pennsylvania two wells are reported to have been successful, one of them yielding as much as 500 gallons per minute. In general, however, it is not likely that the yields of wells in this aquifer will exceed 50 gallons per minute.

Although few data are available, it is likely that the only other rocks of Devonian age capable of yielding large supplies of water are those of the Oriskany group. This group, which is in the lower part of the Devonian rocks, consists chiefly of sandstone. Wells ending in it at one locality in Pennsylvania are reported to yield 125 to 300 gallons per minute. It is possible that similar yields might be obtained from the Oriskany in some parts of the Cumberland area.

The other formations of Devonian age in the Cumberland area consist chiefly of shale and generally yield only small supplies of water to wells.

The rocks of Carboniferous age probably contain the most important water-bearing formations in the area. The Pocono formation, consisting chiefly of sandstone, is reported to be a good aquifer in some parts of southern Pennsylvania. It has not been tested adequately in Maryland, but in favorable localities it probably would yield at least 50 gallons per minute to large-diameter wells. The city of Oakland, in Garrett County, Md., drilled seven wells into the Pocono formation. These wells, which range in depth from 125 to 380 feet, had an average yield of about 50 gallons per minute; the maximum yield was 150 gallons per minute.

The formations comprising the upper part of rocks of Carboniferous age contain many sandstone beds and some of these appear to be sufficiently permeable to yield moderately large supplies of water to wells. At Grantsville, Md., a 300-foot well has a flow of 8 gallons per minute. A public-supply well near Barton, Md., had a maximum yield of 50 gallons per minute. In southern Pennsylvania many wells ending in these rocks yield more than 100 gallons per minute.

Very few data are available on the chemical quality of the ground water in the Cumberland area. Doubtless the quantity of dissolved minerals in the water has a wide range, depending on the type of rock forming the aquifer and the depth at which it occurs. Near the outcrops the water in the sandstone aquifers probably is relatively low in mineral content, although the iron content may be high in some places. Where the aquifers are deeply buried beneath younger formations the water may be highly mineralized.

Water in the limestone aquifers, such as the Tonoloway and Helderberg, may be very hard.

Although the geologic structure is such that water may occur under artesian conditions in some parts of the area, it seems likely that a large part of the ground water occurs under water-table conditions, the configuration of the water table conforming generally to the shape of the land surface. Under these conditions water enters the aquifers in interstream areas and then moves slowly to the streams where it is discharged. Thus the base or "dry weather" flow of the streams consists largely of water derived from springs and seeps from the aquifers.

STREAM DISCHARGE

The available records of stream discharges are summarized in table 1; the locations of the gaging stations are shown on plate 2. As shown in table 1, the yield of water, in cubic feet per second per square mile, is generally less in the eastern part of the area than in the western part. The most severe drought recorded in the area was in 1930, when the precipitation in the State of Maryland averaged 24 inches, as compared to a 54-year average of about 42 inches. The minimum daily discharge at several of the gaging stations in the upper Potomac River basin occurred late in September 1932, as shown in table 1, although drought conditions prevailed from 1930 through 1934. Records of stream flow at six stations, the period of record averaging about 19 years, show a minimum daily yield of about 0.04 cubic foot per second per square mile of the drainage area. For a more detailed study of droughts see U. S. Geological Survey Water-Supply Paper 680, Droughts of 1930-34.

In contrast to periods of low flow, the Cumberland area has experienced several major floods in the North Branch of the Potomac River and its tributaries. Old accounts mention a flood in 1810 when Wills Creek rose to unprecedented heights, and later that year there was a notable flood in Georges Creek. A major flood occurred in the North Branch of the Potomac River above Cumberland in March 1924; however, that flood was exceeded slightly at Cumberland and points downstream by the flood in March 1936. More detailed data on floods in the Cumberland area are given in U. S. Geological Survey Water-Supply Paper 800, The Floods of March 1936.

A flood-protection project for Cumberland, Md., and Ridgeley, W. Va., is now under construction by the U. S. Engineer Corps. According to reports, this project will cost $12,400,000, and is scheduled for completion in 1956, provided that funds are made available as required. The critical flood flow is from Wills Creek, whereas the upper North Branch of the Potomac River has had only one serious flood during the period of record. Model studies of the Wills Creek confluence with the North Branch of the Potomac River have been made at the Vicksburg Experimental Station. To date there have been some pressure conduits laid to transport local and small-valley storm waters directly to the main stream to relieve the Wills Creek channel. Eventually the channel and sidewalls, and possibly the levee walls, will be paved. When completed, the project will provide protection for the two cities from floods on both rivers, but the greater part of this protection will be for Cumberland.

WATER-SUPPLY DEVELOPMENTS

Ground Water

Public supplies.--Several towns or communities in the area obtain water for their public supplies from ground-water sources; however, the total capacity of these ground-water developments is relatively small. (For a summary of water-supply developments in the Cumberland area see table 2, appended to this report.)

One of the largest ground-water developments is at Frostburg, where about 220,000 gallons of water daily is obtained from springs and flowing wells. Mount Savage derives practically all its public supply from springs, although the supply is augmented at times by water from a well near one of the basins that collects water from the springs. The total consumption of water from the public supply at Mount Savage is estimated to average about 150,000 gallons per day. The Oakland public supply is derived entirely from wells. The total consumption from this supply is about 125,000 gallons per day. The public supply at Keyser is obtained from a large spring issuing from limestone. The total consumption from this supply is about 600,000 gallons per day.

Some other towns and communities use ground water for their public supplies but most of these developments are relatively small.

The total consumption of ground water from public supplies in the Cumberland area is estimated to average about 1,350,000 gallons per day.

Private industrial supplies.-So far as could be determined no large ground-water developments are in use by private industries at the present time. At one time, apparently many years ago, several industries in Cumberland developed ground-water supplies through wells, but practically all these supplies have been abandoned. The Kelly-Springfield Co. at Cumberland has wells equipped for use but they are considered as an emergency supply and seldom have been used.

Water-level fluctuations.-The few available records show that, in general, the water table in the Cumberland area is highest in early spring and lowest in late summer and fall. The amplitude of these seasonal fluctuations probably is large in those parts of the area where the porosity or storage capacity of the rocks is small.

Inasmuch as the quantity of ground water pumped in the area is relatively small, there has been no general dewatering of the aquifers.

Surface Water

Public supplies.-After the quality of water in the North Branch of the Potomac River deteriorated so that it was no longer a satisfactory source of supply, the city of Cumberland, in 1913, developed a new public supply from the Lake Gordon reservoir on Evitts Creek. The drainage area of Evitts Creek, above the dam, is 66 square miles and yields an average of about 20,000,000 gallons of water daily. In 1932 Koon dam was built in the upstream end of the Lake Gordon reservoir to increase the total storage capacity. The physical features of these reservoirs are as follows:

	Lake Gordon	Lake Koon	Unit
Storage capacity	1,400	2,300	Million gallons
Length of dam	235	620	Ft.
Height above creek bed	85	67	Ft.
Spillway crest, length	150	240	Ft.
Spillway crest, elevation	950.3	1,017	Ft. above mean sea level
Spillway crest, discharge	230 (9.5-ft. depth)		Cubic ft. per sec. per sq. mi.
Spillway crest, flooded area	163	268	Acres

All the water drawn from these reservoirs passes through the Lake Gordon filter plant, which has a total filter capacity of 12,000,000 gallons per day. It is planned, however, to increase the capacity to 20,000,000 gallons per day by the spring of 1951.

Water is transmitted by gravity to Cumberland through two 36-inch concrete pipe lines. The features of the two distributing reservoirs connected to the system are as follows:

	Fort Hill reservoir	Ridgedale reservoir	Unit
Storage capacity	3.5	7.5	Million gallons
Altitude	910	890	Ft. above sea level
Depth	25	-	Ft.

During 1945-50 the total consumption of water, in gallons per day from the public supply was as follows:

Year	Total consumption (gal.per day)	Domestic consumption (gal.per day)	Industrial consumption (gal. per day)
1950 (fiscal year ending June 30)	11,837,000	7,241,000	4,596,000
1949	15,292,000	9,434,000	5,858,000
1948	12,960,000	-	-
1947	11,969,000	-	-
1946	11,024,000	-	-
1945	10,450,000	-	-

According to public-water-supply officials it is expected that consumption will increase in the future. Several suburban towns, for example, Cresaptown, Md., and Ridgeley and Wiley Ford, W. Va., now obtain their water supply from the Cumberland public supply. La Vale, Md., also will obtain its supply from Cumberland in the near future.

It was reported that it would be practicable to increase the height of the spillway at the Lake Gordon dam by 18 inches and thereby increase the storage capacity of the reservoir. It also was reported that a third dam constructed at the upper end of the Lake Koon reservoir would serve to regulate the flood flows, which are partly wasted at times.

In July 1950 there were twelve major types of users of water from the Cumberland public-supply system. Their average daily water consumption during July 1950 was as follows:

Name or type of industry	Number of plants	Consumption (gal. per day)
Celanese Corp. of America	1	1,919,000
Kelly-Springfield Tire Co.	1	1,241,000
Railroads	2	931,000
Breweries	2	450,000
Suburban towns	3	149,000
Dairies and ice cream	6	121,000
Laundries	3	56,000
Bakeries and food	4	52,000
Bottling	4	45,000
Potomac Edison Power Co.	1	44,000
City Ice & Fuel Co.	1	37,000
Hotels, theatres, stores, organizations	9	67,000
Total	37	5,112,000

Several other towns or communities in the Cumberland area have developed public supplies, but the consumption of water from them is relatively small. The principal features of these supplies are given in table 2.

The water consumed from the public supplies at Cumberland and Frostburg is metered and water rates are based on the quantity of water used; the other public supplies in the area use flat monthly rates.

Cumberland has a domestic rate scaled from $0.60 to $0.20 per 1,000 gallons, according to the amount purchased per month. The industrial rate is scaled from $0.30 per 1,000 gallons for a total quantity less than 15,000 gallons per month to $0.05 per 1,000 gallons for a total quantity exceeding 10,000,000 gallons per month.

Frostburg has a monthly rate of $0.40 per 1,000 gallons within the city limits and $0.50 per 1,000 gallons outside the city limits.

Westernport has rates scaled in accordance with the size of the house and the number of facilities that require water. For example, the basic water rate for a house of six rooms or less is $0.75 per month; with bathtub and outside hydrant the rate is respectively $0.375 and $0.75 additional.

The Barton public supply has a monthly rate of $1.50 for each spigot, with additional charge for toilet and bath.

The Lonaconing public supply has a base rate of $1.00 per month for each spigot; the rate is $1.25 with toilet and $1.50 with toilet and bath.

The West Vindex public supply has a flat rate of $1.26 per month, and LaVale bases its water rate partly on the amount of front footage of the lot and the property tax.

A number of small towns are company-owned, and are dependent upon the company for water supply, viz., the towns of Shallmar, Vindex, and Luke; the towns of Kempton, Barrelville, and Borden Shaft are community-owned, with property owners sharing expenses.

Private industrial supplies.-All large industries in the Cumberland area are situated along the North Branch of the Potomac River between Luke and Cumberland, Md. These industries pump large quantities of water from the river, but most of the water is used in cooling operations and is returned to the river. The most important of these industries, in downstream order, are described in the following paragraphs.

The West Virginia Pulp and Paper Co. at Luke, Md., about 30 miles upstream from Cumberland, has an investment of about $1,000,000 in dams and water-supply equipment. Its storage-regulating dam at Stony River Dam, W. Va., has a capacity of 2,000,000,000 gallons. A small pool at the plant has a capacity of 6,000,000 gallons; however, the pool has been nearly filled with silt, and storage is possible only through use of flashboards. The total consumption of water at the plant is 35,000,000 gallons per day, of which about 37 percent (13,000,000 gallons per day) is treated in the filtration plant. (The capacity of the filter plant is 18,000,000 gallons per day.) During those times when the flow of the river is low, a part of the water is recirculated, which decreases the total consumption to about 20,000,000 to 22,000,000 gallons per day. The town of Luke is populated mostly by employees of the West Virginia Pulp and Paper Co.; the water used for domestic purposes is furnished by the industrial water-supply system. In 1950 the domestic consumption of water averaged about 60,000 gallons per day. Savage River Dam, now nearing completion, will stabilize low flow, which would make it possible for the Company to use raw water from

Savage River except for about 10 percent of the time, when treatment for turbidity would be required. The Company could connect to the lower reach of Savage River with a pipe line about half a mile long.

The Celanese Corp. of America at Amcelle, Md., has an investment of $453,000 in filtration and treatment works. The filter plant has a nominal capacity of 10,000,000 gallons per day. There are no storage facilities. The total consumption of water, according to recent records, is 47,000,000 gallons per day, of which 44,000,000 gallons per day is untreated water from the North Branch of the Potomac River; 800,000 gallons per day treated water from the river; and 2,000,000 gallons per day treated water purchased from the Cumberland public supply. The average cost per 1,000 gallons of water used at the Celanese Corp. is as follows: Untreated river water, $0.012; treated river water, $0.23; and water purchased from the Cumberland public supply, $0.059.

The Kelly-Springfield Co. at Cumberland generally uses about 1,200,000 gallons of untreated water per day from the North Branch of the Potomac River. There are no storage facilities. In addition, the plant purchases 1,170,000 gallons of water daily from the Cumberland public supply. Some of the processing operations in the plant require water of low bacterial content. For example, the untreated river water, which presumably is facterially polluted, in part by sewage introduced in the river upstream from the plant, causes a froth or scum to form when used in some processing.

The Potomac Edison Power Co. in Cumberland uses about 75,000,000 gallons of water per day from the North Branch of the Potomac River. This water is taken from the pool formed by a dam, 10 feet high, on the old Chesapeake and Ohio canal. The dam is now owned by the National Park Service, U. S. Department of Interior. Deep Creek Reservoir, the largest in the area, is utilized only for the generation of hydroelectric power. Power generated at the Deep Creek power plant is used in Pennsylvania, and none in Maryland. The remainder of the power in the area is steam-generated.

The Western Maryland Railway Co. shops at Maryland Junction, W. Va., formerly used water from the North Branch of the Potomac River, but because the water became unsatisfactory for use in boilers this source of supply was abandoned. The company now purchases about 300,000 gallons of water daily from the Cumberland public supply.

The Baltimore and Ohio Railroad at Keyser, W. Va., uses about 900,000 gallons of water daily from the North Branch of the Potomac River through its own water-supply system.

<u>New Savage River dam</u>.-Construction of a new dam on the Savage River, 4.5 miles upstream from its junction with the North Branch of the Potomac River, was started in September 1939 but because of the war was discontinued in 1942. Construction was resumed by the U. S. Engineer Corps in the spring of 1948 and it is expected that the dam will be completed by June 30, 1951. The total cost will probably approach $7,000,000, including a previous expenditure of about $4,000,000 by the W.P.A.

The dam, consisting of earth and rock fill, will enable regulation of stream flow for industrial use, alleviation of pollution, and incidental flood control. Generation of hydroelectric power is not contemplated.

The reservoir formed by the dam will have a storage capacity of about 6,500,000,000 gallons when filled to the level of the spillway crest and will cover an area of 360 acres. This is considered to be near the maximum potential capacity, as the Baltimore and Ohio Railroad tracks are nearby at an altitude about 80 feet higher than the crest of the spillway. The crest of the 320-foot side-channel spillway will be at an altitude of 1,468.5 feet, which is 184 feet above the stream bed. The maximum capacity of the spillway will be about 100,000 cubic feet per second. It is planned to establish a flood-warning system, which will include three telemark river gages, many rain gages, and periodic snow surveys.

It is expected that the regulation of the discharge from the Savage River dam will enable the minimum flow of the North Branch of the Potomac River, downstream from the mouth of the Savage River, to be increased to 93 cubic feet per second. This will increase the availability of water, during periods of low flow, to the four large industrial plants between Luke and Cumberland - the West Virginia Pulp and Paper Co., the Celanese Corp., the Kelly-Springfield Co., and the Potomac Edison Co. It has been estimated that these industries, with employment at 70 percent of capacity, could use an additional 30,000,000 gallons of water per day, or about 46 cubic feet per second.

The existing public water-supply reservoir of Westernport will be flooded out by the reservoir formed by the new Savage River dam, but the town will obtain its supply from the new reservoir. The water will be conducted through a 16-inch pipe from the reservoir to the town; the water will be treated in the existing chlorinator tower. The towns of Franklin and Bloomington now purchase water from the Westernport public supply.

Pollution.-Before the Cumberland area was heavily populated the water in the streams was essentially uncontaminated and contained a relatively low content of dissolved minerals. However, the disposal of sanitary sewage, industrial wastes, and drainage of acid water from coal mines has, in places, made the water unsatisfactory for most uses. The most severely contaminated streams are the North Branch of the Potomac River, between Luke and Cumberland, and Georges and Wills Creeks. The problem of eliminating all the contamination apparently would be difficult, but plans that presumably will alleviate the contamination considerably have been formulated. On June 15, 1950, the Maryland Water Pollution Control Commission ordered the City of Cumberland, the Celanese Corp. of America, and the West Virginia Pulp and Paper Co. at Luke, Md., to build waste treatment plants to reduce pollution in the Potomac River. Under the order of the Commission, operations are to begin by Sept. 15, 1951. The City of Cumberland plans to construct a one million dollar primary treatment plant, and the other two firms already have made some changes in their disposal of waste.

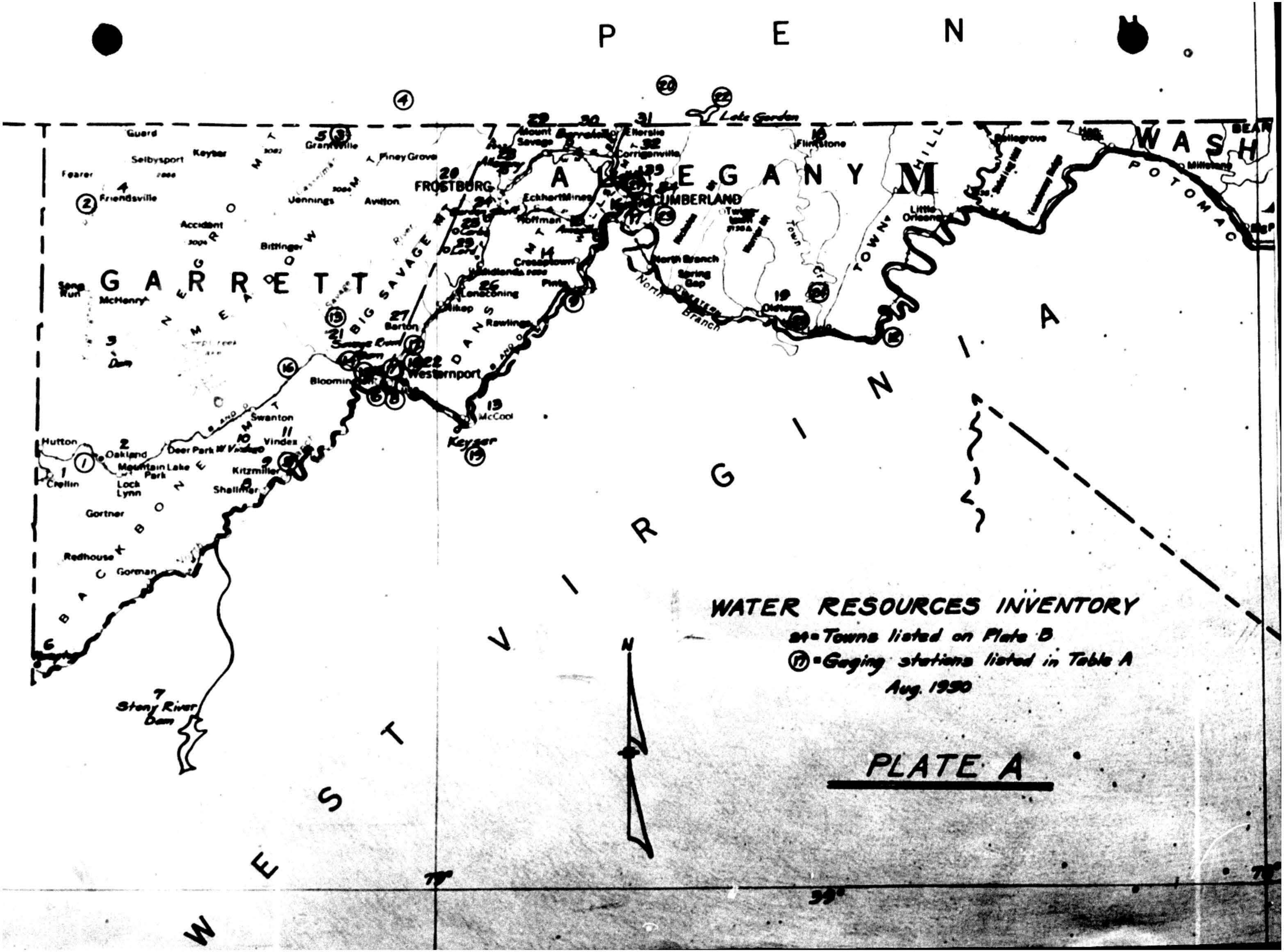
WATER RESOURCES INVENTORY
24 = Towns listed on Plate B
(17) = Gaging stations listed in Table A
Aug. 1950
PLATE A
GARRETT
ALLEGANY
WEST VIRGINIA
PENN
WASH
POTOMAC
CUMBERLAND
FROSTBURG
Westernport
Keyser
Oakland
Friendsville
Grantsville
Lake Gordon
Stony River Dam
N

TABLE 1 - U. S. Geological Survey Stream-Gaging Stations

Map No.	Gaging Station	Drainage area (sq.mi.)	Records available Period	Years	Daily discharge Minimum c.f.s.	Average c.f.s.	Ave. Yield (c.f.s. per sq.mi.)
	Ohio River Basin						
1.	Youghiogheny R. near Oakland,Md.	134	1941-48	7	7.8	276	2.06
2.	Youghiogheny R. at Friendsville,Md.	295	1940-48	7	45	585	1.98
3.	Casselman R. at Grantsville, Md.	62.5	1947-48	-	--	---	---
4.	Big Piney Run near Salisbury, Pa.	24.5	1932-48	16	.1	37.7	1.54
	Potomac River Basin						
5.	N. Br.Potomac R. at Kitzmiller,Md.	225	1949-	-	--	---	---
6.	N. Br.Potomac R. at Bloomington,Md.	287	1924-27 1929-48	21	5.4	494	1.72
7.	N. Br.Potomac R. at Luke, Md.	404	1949	-	--	---	---
8.	N. Br.Potomac R. at Piedmont,W.Va.	410	1899-1906	6	6.0	677	1.65
9.	N. Br.Potomac R. at Pinto, Md.	596	1938-48	10	31	829	1.39
10.	N. Br.Potomac R. at Cumberland,Md.	873	1894-97	-	--	---	---
11.	N. Br.Potomac R. near " "	875	1929-48	19	38	1,179	1.35
12.	Potomac R. at Paw Paw, W.Va.	3,109	1938-48	10	219	2,917	.94
13.	Savage R.(above dam)near Barton,Md.	49.1	1948	-	--	---	---
14.	Savage R.(below dam) near Bloomington, Md.	106	1948	-	--	---	---
15.	Savage R. near Bloomington, Md.	115	1925-27 1929-48	21	5.2	165	1.43
16.	Crabtree Creek near Swanton,Md.	16.7	1948	-	--	---	---
17.	Georges Creek at Franklin, Md.	72.4	1929-48	19	1.6	73.3	1.01
18.	Georges Creek at Westernport, Md.	72.7	1905-06	-	6.0	---	---
19.	New Creek near Keyser, W. Va.	45.7	1930-31 1947	1	.6	32	.70
20.	Wills Creek at Hyndman, Pa.		1948	-	--	---	---
21.	Wills Creek near Cumberland,Md.	247	1905-06 1929-48	19	10	307	1.24
22.	Evitts Cr. near Bedford Valley,Pa.	30.2	1932-48	16	1.2	29.5	.98
23.	Evitts Cr. near Cumberland, Md.	89.0	1929-32	-	1.4	---	---
24.	Town Creek near Oldtown, Md.	148	1928-35	7	0.9	122	.82
25.	Sawpit Run near Oldtown, Md.	5.0	1947-48	-	0.	---	---
26.	Patterson Cr. near Headsville,W.Va.	219	1938-48	9	3.7	155	.71
27.	Patterson Cr. at Alaska, W.Va.	249	1930-31	1	.4	132	.53

TABLE 2

9-230-a
(October 1947)

COMPUTATION FORM—DOUBLE

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FILE

Water-supply developments in Mineral County, West Virginia, August 1950
Arranged in downstream order.

Map No.	Location	Drainage Basin	Source of water supply	Population 1940	Population Served	Consumption: Domestic Ground water M.G.D.	Consumption: Domestic Surface water M.G.D.	Consumption: Industrial M.G.D.	Storage: Reservoir	Storage: Capacity M.G.	Filter plant capacity M.G.D.	Springs Number	Springs Yield M.G.D.	Wells Number	Wells Yield M.G.D.	Wells Depth Feet	Producing Formation	Remarks
	Blaine	N. Br. Potomac R.	spring						none									Privately-owned shallow dug wells, which are reported polluted from nearby privies, and are unsafe
	Elk Garden	"		342								1						
	Beryl P.O.	"	W. Va. Pulp & Paper Co. at Luke, Md.															
	Piedmont	"	Savage River	2,677	2,675		.350	.050	tank		0.6							W. Va. Pulp & Paper Co. at Luke, Md. diverts 0.4 M.G.D. before city treats the water.
	Keyser (B.&O. R.R.)	"	N. Br. Potomac R.					.900										During low water, R.R. receive from Keyser public supply.
	Ridgeley	"	Cumberland, Md.	1,907	1,910		.038	.075	Cumberland, Md.									Privately-owned drilled and dug wells. Ground reported saturated with privy sewage.
	Wiley Ford P.O.	"	Some from Cumberland, Md.															
	Hartmansville	Abram Creek																Privately-owned wells.
	Sulphur City	Deep Run																Privately-owned wells.
	Laurel Dale P.O.	New Creek																Privately-owned wells.
	New Creek P.O.	"	spring						none		none							Water supply reported unsafe.
	Keyser	"	New Creek								2							Used when spring flow is inadequate
	Keyser	Limestone Run	spring	6,177			.500		Limestone Run	33	chlorin.	1	.003					Supplies 0.45 M.G.D. to B&O R.R. when flow of N. Br. Potomac R. is inadequate.
	Headsville	Patterson Cr.		small farm community.														Privately-owned wells.
	Reeses Mill	"		small farm community.														Privately-owned wells.
	Fort Ashby P.O.	"		50-75 houses														Privately-owned wells. Many wells condemned owing to contamination from privies.
	Patterson Cr. P.O.	"																Privately-owned wells. Many wells condemned owing to contamination from privies.

Note: Only 1940 census figures available for West Virginia.

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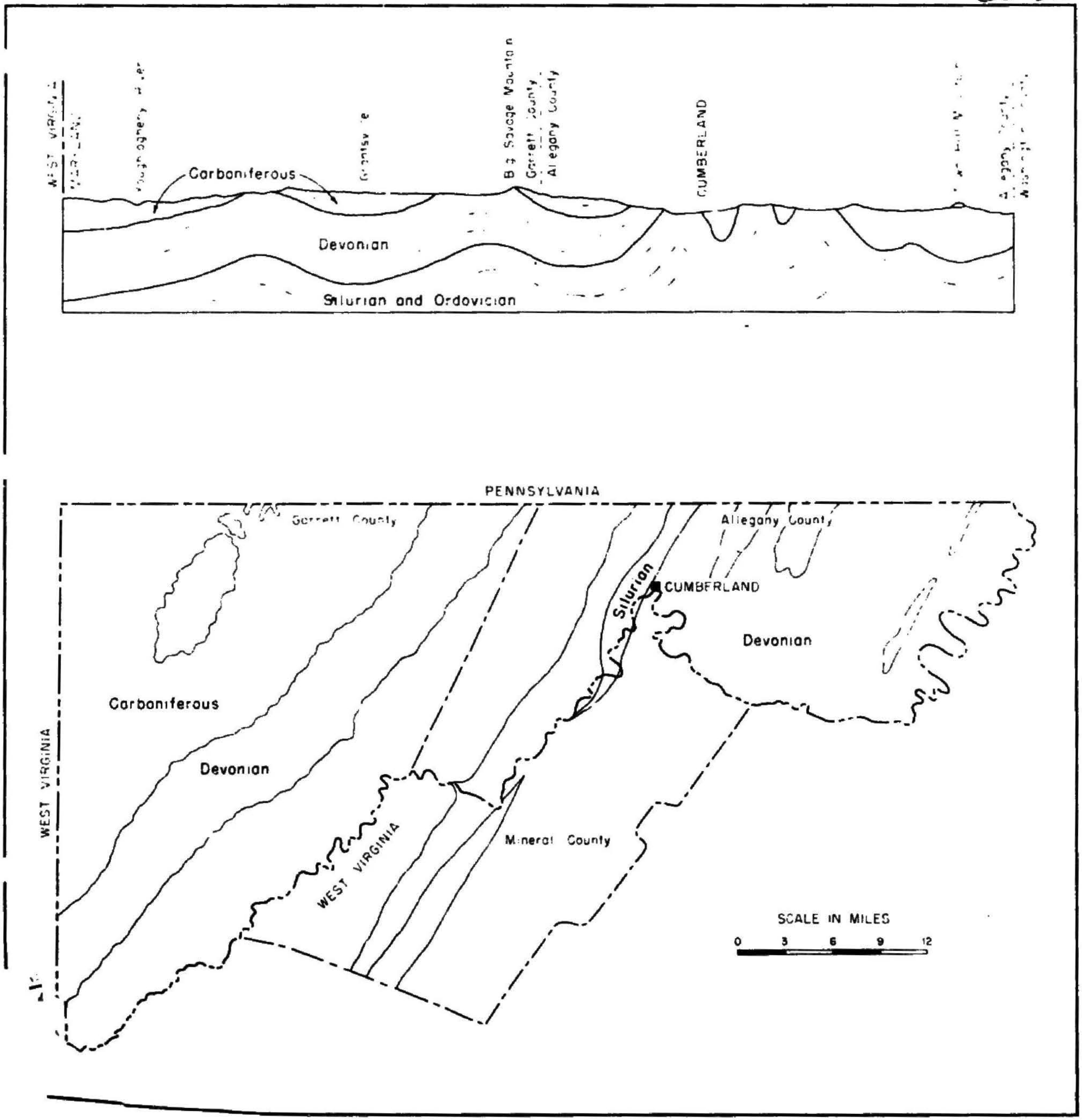

GEOLOGIC MAP AND SECTION OF CUMBERLAND AREA, MARYLAND