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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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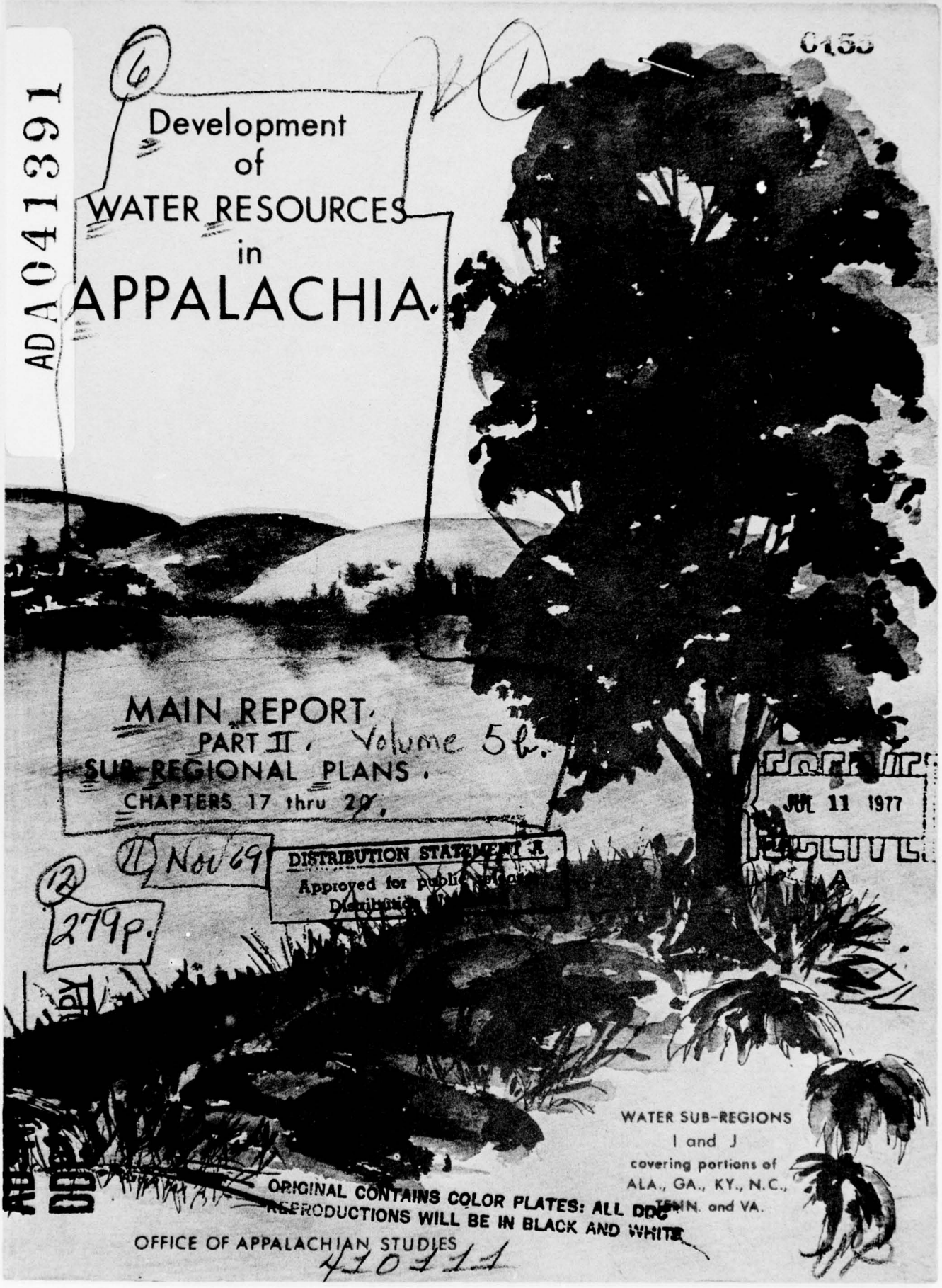
Development of WATER RESOURCES in APPALACHIA.



MAIN REPORT.
PART II. Volume 5b.
SUB-REGIONAL PLANS.
CHAPTERS 17 thru 20.

(11) Nov 69

(12) 279p.

WATER SUB-REGIONS
I and J
covering portions of
ALA., GA., KY., N.C.,
TENN. and VA.

OFFICE OF APPALACHIAN STUDIES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DEVELOPMENT
OF
WATER RESOURCES
IN
APPALACHIA

MAIN REPORT
PART II

CHAPTER 17 - WATER SUB-REGION I TODAY

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CHAPTER 17 - WATER SUB-REGION I TODAY

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CHAPTER 17 - WATER SUB-REGION I TODAY

SECTION I - THE REGION TODAY

1. POLITICAL

Sub-region I (see Figure 17-1) is comprised of 30 counties of which 18 are in southeastern Kentucky and 12 are in northern middle Tennessee. The 18 Kentucky counties comprise the southwestern portion of that state in Appalachia. Immediately adjoining the Kentucky counties are the 12 Tennessee counties. The Cumberland River, formed by the confluence of Poor and Clover Forks near Harlan, Kentucky, is the main stream in the sub-region, extending in a generally southwesterly direction across the sub-region. The principal tributaries are the Laurel, Rockcastle, Big South Fork, Obey, and Caney Fork Rivers.

The Green River, in the northwest portion of the sub-region, flows across Casey, Adair, and Green Counties in Kentucky. The headwaters of the South Fork, Kentucky River flow through Clay County in the northeast part of the sub-region.

Some of the major cities within the sub-region follow. In Kentucky, the eastern portion of the sub-region contains the cities of London, Corbin, Williamsburg, Barbourville, Pineville, Middlesboro, and Harlan. The largest cities in this portion of the sub-region are Corbin and Middlesboro. Through the western portion of the Kentucky sub-region, the larger cities are Somerset, Columbia, and Burkesville. In Tennessee, in the central-north central portion of the state within the sub-region, lie the cities of Gainesboro, Smithville, Cookeville, Sparta, and Crossville. Within 40 miles of the sub-region's boundaries in Tennessee lie the cities of Nashville and Knoxville to the west and east, respectively. Forty miles north of the eastern portion of the sub-region's boundary in Kentucky lies the city of Lexington. To the south, in a direct line, lies Knoxville, Tennessee.

Several planning districts have been organized in Sub-region I and are: Kentucky Development Districts of Hart, Barren, Metcalfe and Taylor Counties: Tennessee counties operating private groups: Appalchian Regional Commission Planning Districts 29A, 29B, 30, 31, 38 (see Figure 17-13, page II-17-41). State organizations have arisen to operate in the Appalachian Regional Commission districts and are the Cumberland Development Council (ARC No. 31), East Lake Cumberland Council (ARC No. 30), West Lake Cumberland Development Council (ARC No. 29), and Upper Cumberland Development District (ARC No. 38), plus Warren and Van Buren Counties. Each county in the sub-region is a Soil Conservation District locally organized and managed which means that the research and consultation of the Soil Conservation Service is available to people planning in the sub-region.

2. PHYSICAL

Physiography and Geology

Water Sub-region I has an area of about 11,200 square miles. The physical features are shown on Figure 17-2. The topography of the area varies from hilly terrain in the western edge of the Cumberland Plateau. Elevation varies from 445 feet above m.s.l., near Carthage, Tennessee, to 4,150 feet above m.s.l. at the summit of the "Double" which forms part of the divide between the watersheds of the Cumberland and Tennessee Rivers in the Cumberland Mountains near Cumberland, Kentucky.

Generally, Water Sub-region I is in the southwestern part of Appalachia. It includes parts of two physiographic provinces - the Appalachian Plateau Province and the Interior Low Plateau Province. Historically, most transportation routes have followed the ridges and valleys, which run in a southwesterly direction. This transportation net has followed the faults and folded rock in the eastern part of the sub-region and the fracture zones in the western part. The sub-region is underlain by rocks that range from Ordovician to Pennsylvanian in age. The rocks are generally massive sandstones, limestones and shales.

About two-thirds of the 7.2 million acres in the sub-region are forest lands. Most of this land is available for commercial, industrial, or agricultural use; however, the steep, hilly topography severely limits development potential. With few exceptions (such as at Columbia, Kentucky) water supplies are adequate. In some cases, low flow augmentation is needed in Harlan, Bell, Whitley, McCreary, and Jackson Counties in Kentucky, and Fentress and Overton Counties in Tennessee. Water supplies are adequate for present municipal demands, but specific areas will need additional supply.

Climate

The sub-region has a moderate continental type climate with temperatures rarely below zero in the winter or above 100 degrees in the summer. Maximum summer temperatures are around 85 degrees Fahrenheit. Considerable precipitation, moderate cloudiness, wind movement and high humidity are also general characteristics of the weather in this sub-region. Weather changes are frequent, especially in the winter.

Maximum temperatures occur in July, with the average temperatures between 75 and 80 degrees. Minimum temperatures occur in January,

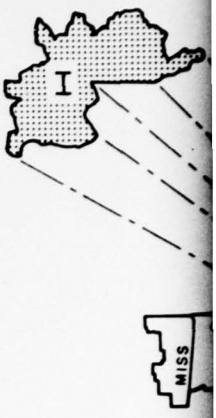

Frankfort
Lexington
Richmond
HERRINGTON LAKE
Danville
Rolling Fork
McKee
Mt. Vernon
JACKSON
ROCKCASTLE
CASEY
Liberty
GREEN
Greensburg
London
CLAY
ADAIR
Columbia
PULASKI
Somerset
LAUREL
RUSSELL
Burnside
Corbin
KNOX
LAKE CUMBERLAND
Monticello
WAYNE
Whitley City
MC CREARY
WHITLEY
Williamsburg
Pineville
CUMBERLAND
Burkesville
MONROE
Tomkinsville
CLINTON
Albany
PICKETT
Lafayette
MACON
CLAY
Celina
Jamestown
Livingston
FENTRESS
JACKSON
Gainesboro
OVERTON
Carthage
SMITH
Cookeville
OLD HICKORY RES (CE)
Nashville
Lebanon
PUTNAM
DEKALB
Sparta
CUMBERLAND
Crossville
Knoxville
CANNON
Woodbury
WHITE
Fork
McMinnville
FORT LOUDOUN LAKE (TVA)
10 5 0 10 20 30
SCALE IN MILES

1

2

ankfort

O Lexington



O Richmond

O Danville

McKee O

Mt. Vernon JACKSON

ROCKCASTLE

North Fork Middle

BUCKHORN RES

London

CLAY

O Manchester

PULASKI

O Somerset

LAUREL

Cumberland O Lynch

Burnside

HARLAN

Corbin

KNOX

O Barbourville

O Harlan

Whitley City

WHITLEY

Pineville O

MC CREARY

Williamsburg

BELL

CRANKS CREEK

O Middlesboro

O Kingsport

River

Clinch

MORRIS LAKE (TVA)

Knoxville

NORTH HILL LAKE (TVA)

FORT LOUDOUN LAKE (TVA)

WATTS BAR LAKE (TVA)

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SCALE IN MILES

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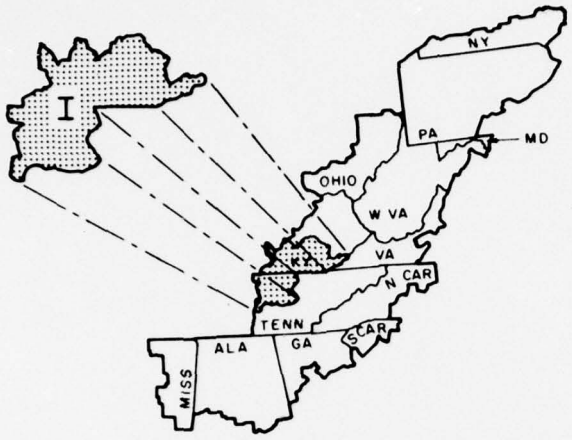


VICINITY MAP

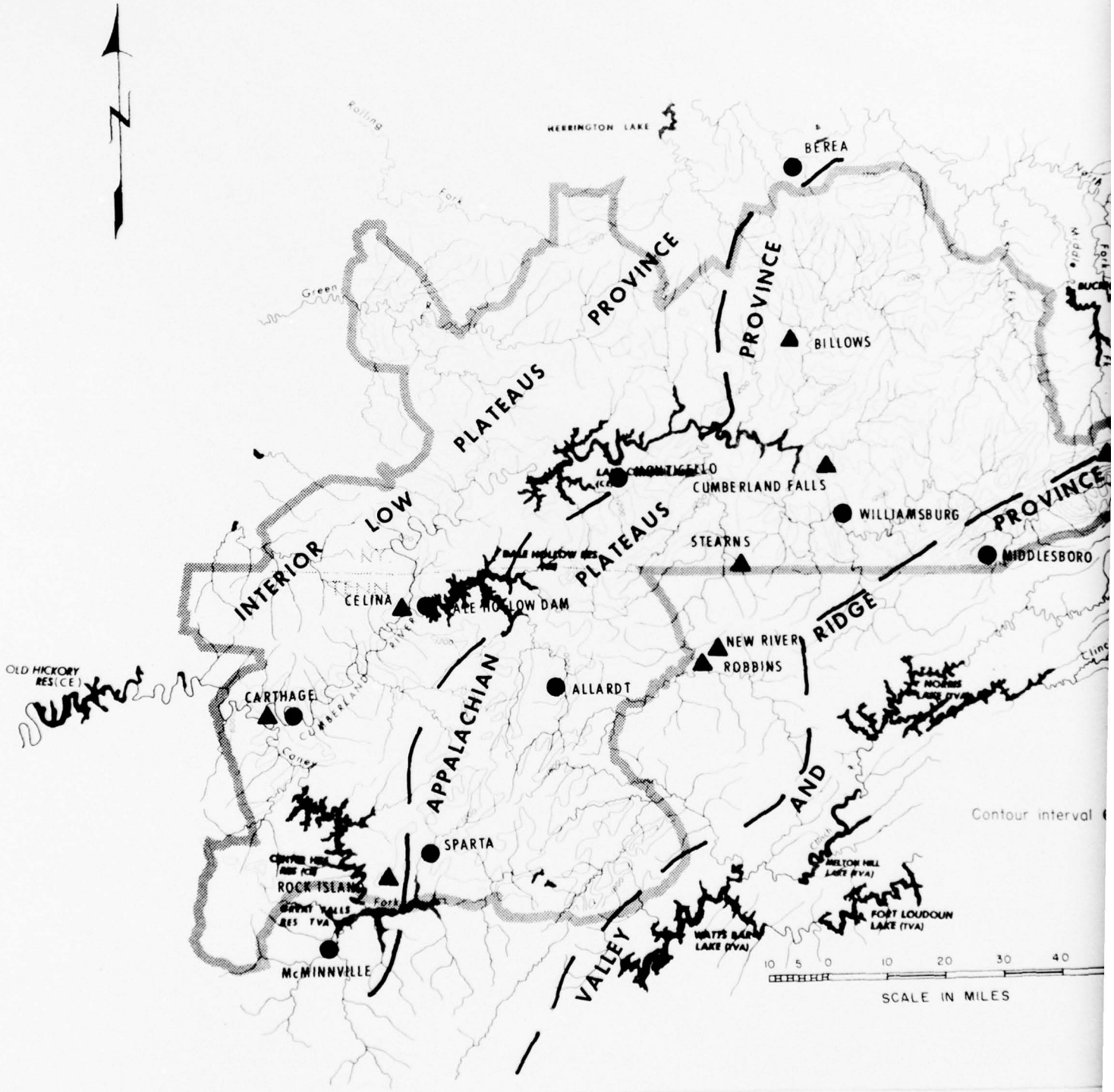
REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

LOCATION MAP

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-3 FIGURE 17-1


N
HERRINGTON LAKE
BEREA
PROVINCE
PROVINCE
BILLOWS
PLATEAUS
CUMBERLAND FALLS
WILLIAMSBURG
PROVINCE
INTERIOR LOW
PLATEAUS
STEARNS
MIDDLESBORO
CELINA
DALE HOLLOW DAM
RIDGE
NEW RIVER
ROBBINS
OLD HICKORY RES (CE)
CARTHAGE
ALLARDT
APPALACHIAN
AND
SPARTA
ROCK ISLAND
VALLEY
McMINNVILLE
WATTS BAR LAKE (TVA)
FORT LOUDOUN LAKE (TVA)
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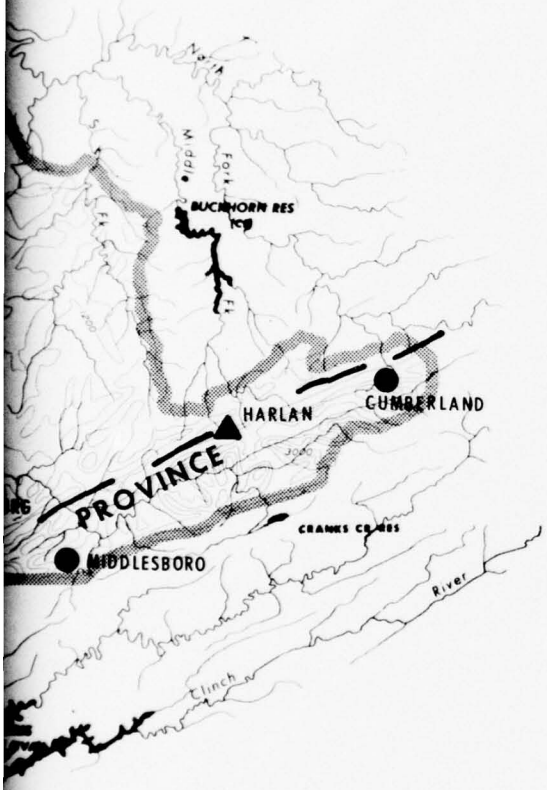
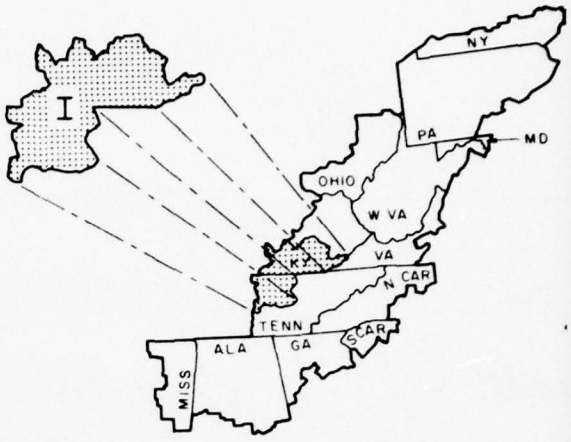
SCALE IN MILES



Contour interval 600 feet

0 30 40 50

N MILES



VICINITY MAP

LEGEND

- PRECIPITATION STATIONS
- STREAM GAGING STATIONS
- PHYSIOGRAPHIC BOUNDARY

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

PHYSICAL FEATURES

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-5 FIGURE 17-2

annual temperature for the region ranges from 55 degrees at some of the higher Cumberland Mountain elevations to about 60 degrees in the southern and western portions.

Annual precipitation over the region is 50 inches, with a small portion occurring as snow. The rainfall amounts are well distributed throughout the year with the largest amounts falling during winter and early spring. Average monthly amounts range about five inches in March to about 2.5 inches in October. Monthly extremes have ranged from a maximum of over 20 inches to a minimum of zero. Precipitation data for selected stations are given in Table 17-1 (see Figure 17-2 for station location).

Major storms of the sub-region are generally of the frontal or convective types. Only occasionally do storms of tropical origin (hurricanes) occur. Thunderstorms of all types occur in all months, but are most common during June, July and August. Severe localized "thermal" type thunderstorms occur in hot humid weather, usually over the highest mountain tops and ridges.

Sub-region I snowfall amounts vary widely from an annual average of about 10 inches in the southwestern part of the region to an estimated 30 inches in the mountainous areas in the eastern part of the region. Intermittent mild periods preclude accumulations which would become flood threats. Seasonal totals of 75 inches or more have been occasionally recorded in the mountain area while, on rare occasions, some areas have had no snowfall for a complete season. Single storm totals of 24 inches or more have been recorded.

Runoff

Since the Cumberland River system drains about 80 percent of the sub-region, subsequent discussions of surface water will largely deal with the Cumberland River Basin. The small areas near the boundaries of the sub-region which are drained by other river systems have runoff characteristics similar to those of headwater tributaries of the Cumberland. The analysis of surface runoff and design data pertaining to water resource development projects for these areas will be covered by other reporting offices, as appropriate.

Surface Runoff

Average discharge of the Cumberland River at Carthage, Tennessee, based on the entire period of record, is 17,090 cubic feet per second, which is equivalent to 21.7 inches runoff from the 10,690 square mile watershed above the point. At Cumberland Falls, comparable values are 3,134 cubic feet per second and 21.5 inches, respectively. Some tributaries along the southern side of the basin have over 25 inches

TABLE 17-1

PRECIPITATION DATA FOR SELECTED STATIONS

Station	Elevation Ft. m.s.l.	Record Begins	Average Annual Temperature (Degrees F.)	Average Annual Precipitation (Inches)	Average Annual Snow (Inches)	Maximum 24-hour Precipitation Amount (Inches)	Maximum 24-hour Precipitation Date
KENTUCKY							
Berea College	1,070	1901	56.8	47.20	17.9	5.38	6/12/23
Cumberland1/	1,463	1936	55.4	53.92	43.4	3.78	3/1 /54
Middlesboro	1,135	1891	57.2	49.79	12.7	8.44	7/24/65
Monticello	928	1936	56.5	47.82	12.0	5.36	11/3 /36
Williamsburg	1,100	1887	57.2	48.32	8.8	4.45	7/21/41
TENNESSEE							
Allardt2/	1,672	1889	55.2	54.13	12.0	5.90	3/28/02
Carthage	540	18834/	60.3	52.11	7.8	4.72	6/16/49
Dale Hollow Dam3/	560	1903	58.2	51.73	7.9	6.04	6/23/69
McMinnville	1,015	1883	59.8	52.00	6.3	11.00	3/28/02
Sparta	960	18974/	58.5	53.58	7.5	6.10	7/24/57

1/ Includes records for nearby Station of Benham, Kentucky.
2/ Station located at Rugby, Tennessee, prior to 6/23/40.
3/ Station located at Celina, Tennessee, prior to 3/13/50.
4/ Broken record.

average annual runoff, but other areas along the northern side have slightly less than 20 inches annually. There is a wide seasonal variation of flow in all streams. This may range from extensive flooding one or more times almost every winter and spring to very low flows almost every fall. Many small streams cease flowing completely in extremely dry years, when even the larger streams have periods of very low flow. Approximately 50 percent of the annual runoff occurs in the three months, January, February, and March, whereas less than 20 percent occurs in the six-month period, June through November. Annual runoff at several representative stations in the region are given in Table 17-2.

As a general rule, flood rises equaling or exceeding bankfull or flood stage occur about once per year on unregulated streams in the region. On the larger streams, major floods usually result from storms of several days' duration and are almost all confined to the so-called flood season, from mid-December to mid-April. On the small streams, particularly in the more mountainous areas, flash floods from high-intensity rainfall are characteristic; these can occur at any time of the year, although more frequently in winter and early spring. Runoff volumes of up to five inches have been experienced in single flood events. However, the dominant factor causing extreme flood peaks in most of this generally mountainous region is the relative intensity of rainfall producing the flood, rather than the flood volume.

Hydrographs representing inflow to full pool conditions have been developed for all reservoirs studied. Standard procedures were used, including segmenting the various inflow streams. Significant differences between natural and inflow to full pool conditions for peak inflow rate and peaking time have been indicated for all large storage reservoirs.

No one flood produced the highest known stages in all portions of the region. In fact, there are at least 10 floods that have produced maximum stages at various gaging stations, and even on the main stem of the Cumberland there are several critical floods. Table 17-3 (page II-17-12) presents data for the five largest floods at three selected stations.

As in the case of hydrographs, extensive flood frequency computations have been made for most areas of the Cumberland Basin as a part of survey report and advanced planning studies. A completely coordinated analysis of both natural and regulated flood frequencies has been made for the main stem of the Cumberland below Wolf Creek Dam. The results of this analysis, for the Cumberland River station at Celina, are included in Table 17-4 (page II-17-13) to demonstrate the high degree of protection afforded by the flood control storage in the existing reservoirs. Frequency analysis for short record stations have been partially correlated with long record stations; however, no regionalized study of frequencies for development of regression equations has been made. Stage and discharge frequency data for selected locations are given in Table 17-4. Figure 17-3 shows the modification of seasonal runoff distribution by reservoir operations above Carthage, Tennessee.

TABLE 17-2

ANNUAL RUNOFF AT SELECTED STATIONS

Stream and Station	Drainage Area (Sq. mi.)	Period of Record	Mean Q (cfs)	Annual (Water Year) Runoff (inches) Mean	Max.	Min.
Cumberland R. Harlan, Ky.	374	1940-65	665	24.22	33.19	10.65
Cumberland R. Cumberland Falls, Ky.	1,977	1907-65*	3,134	21.58	35.68	9.77
New River New River, Tenn.	382	1922-65	712	25.84	44.82	12.89
Clear Fork Robbins, Tenn.	272	1930-65	469	23.41	36.89	10.74
S. Fork Cumberland R. Stearns, Ky.	954	1942-65	1,739	24.78	36.76	15.96
Rockcastle R. Billows, Ky.	604	1936-65	894	20.16	31.15	7.74
Cumberland R. Celina, Tenn. (a)	7,307	1951-65	11,727	21.80	32.65	11.03
Caney Fork R. Rock Island, Tenn. (b)	1,678	1911-65*	3,198	25.99	41.77	10.48
Cumberland R. Carthage, Tenn. (c)	10,690	1922-43	16,833	21.39	34.72	10.13
Cumberland R. Carthage, Tenn. (d)	10,690	1951-65	17,219	21.88	30.55	12.70

*Broken record.

(a) Flow regulated by Lake Cumberland and Dale Hollow Reservoir.
(b) Flow regulated by Great Falls Reservoir.
(c) Prior to regulation.
(d) Flow regulated by Lake Cumberland, Dale Hollow and Center Hill Reservoirs.

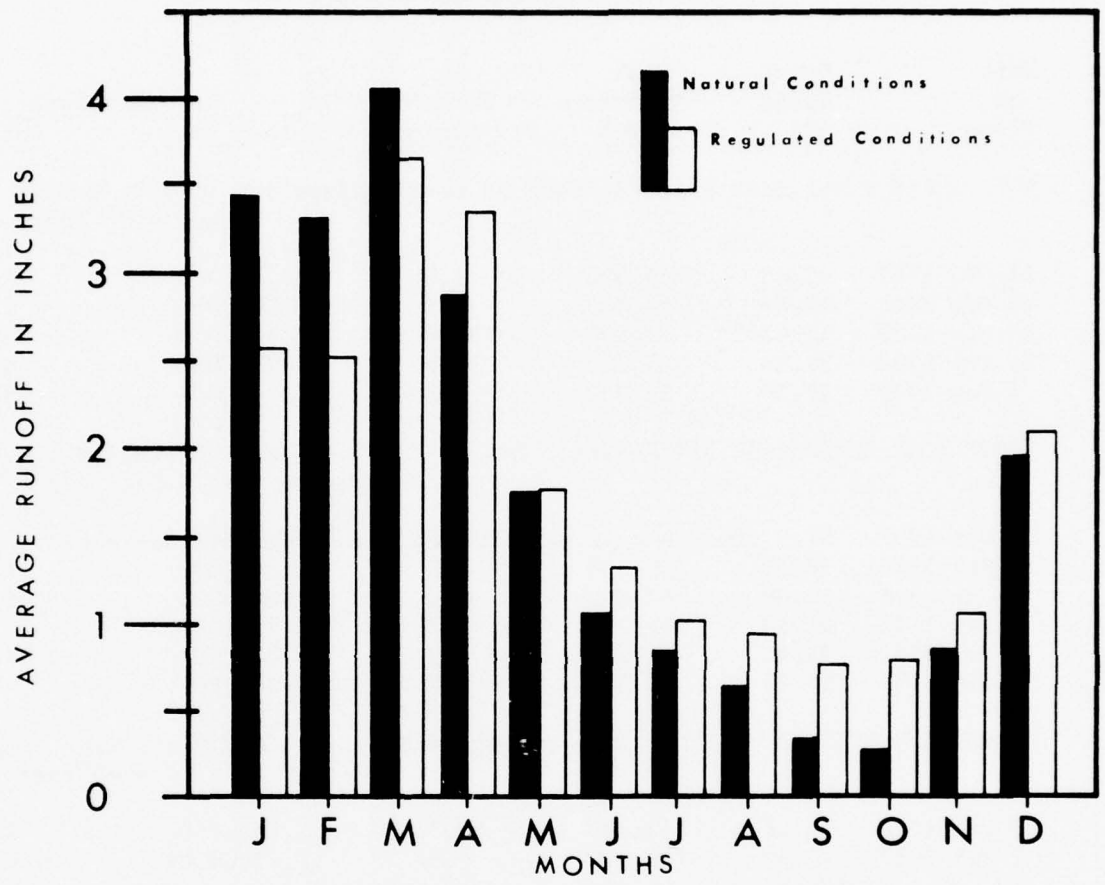


Figure 17-3 - Monthly Runoff - Cumberland River, Carthage, Tennessee.

TABLE 17-3

FLOOD DATA AT SELECTED STATIONS

Date of Flood	Crest Stage (Ft.)	Peak Discharge (cfs)	Duration (Days)	Runoff Volume Acre Feet	Runoff Volume Inches
ROCKCASTLE RIVER NEAR BILLOWS; Zero of Gage = Elevation 802.90; Damage Stage = 25 Feet					
29 Jun 1947	45.48	46,800	1.8	150,000	4.7
28 Feb 1962	43.85	43,700	2.5	192,000	6.0
23 Mar 1952	41.63	39,800	1.8	122,000	3.8
14 Feb 1948	39.18	35,700	1.7	133,000	4.1
3 Feb 1939	37.50	32,200	1.3	86,000	2.7
SOUTH FORK CUMBERLAND RIVER NEAR STEARNS; Zero of Gage = Elevation 764.81; Damage Stage = 25 Feet (1)					
23 Mar 1929	52.9 (Before gage established, no other data available)				
13 Feb 1948	38.50	69,600	1.8	247,000	4.9
8 Jan 1946	37.90	67,800	1.7	249,000	5.0
1 Feb 1951	37.30	64,700	1.3	190,000	3.8
12 Mar 1963	36.45	62,100	1.0	147,000	2.9
29 Jan 1957	36.25	61,500	1.7	224,000	4.5
CUMBERLAND RIVER AT CELINA; Zero of Gage = Elevation 488.97; Damage Stage = 40 Feet					
29 Dec 1926	57.25	145,000	12.1	2,813,000	7.2
2 Feb 1957	56.5*	149,000*	9.9*	2,479,000*	6.4*
a (34.1		66,500	Observed modified data)		
1 Feb 1918	55.2	141,000	7.8	1,892,000	4.8
12 Jan 1946	54.8*	139,000*	8.5*	1,946,000*	5.0*
b (54.09		134,000	Observed modified data)		
27 Feb 1962	54.8*	138,000*	8.5*	2,452,000*	6.3*
a (34.62		67,900	Observed modified data)		

(1) Assumed bankfull stage, no damage in reach.

* Computed natural values for regulated floods.

a Modified by Lake Cumberland and Dale Hollow Reservoir.

b Modified by Dale Hollow Reservoir.

TABLE 17-4

STAGE AND DISCHARGE FREQUENCIES FOR SELECTED STATIONS

Freq. In Years	Rockcastle River Billows, Kentucky (gage zero, Elevation 802.90)		S. Fork Cumberland River, Stearns, Kentucky (gage zero, Elevation 764.81)		Cumberland River Celina, Tennessee (Gage zero, Elevation 488.97)			
					Natural		Regulated	
	Stage (Ft.)	Discharge (cfs)	Stage (Ft.)	Discharge (cfs)	Stage (Ft.)	Discharge (cfs)	Stage (Ft.)	Discharge (cfs)
0.5	21.4	12,700	24.2	29,000	-	-	-	-
1	26.8	18,500	28.4	39,000	38.4	71,000	24.2	43,000
2	29.8	22,300	30.8	45,500	45.1	89,000	28.7	52,000
3	32.6	26,000	33.4	53,000	47.7	98,000	31.0	58,000
5	36.0	30,800	35.8	60,000	50.0	110,000	33.4	63,000
10	40.7	38,200	39.0	70,000	52.7	125,000	35.1	67,000
25	46.5	48,700	43.3	84,000	55.5	142,000	36.5	70,000
50	50.4	57,000	47.5	95,000	57.7	156,000	37.7	73,000
100	54.3	66,000	50.8	105,000	59.6	170,000	39.3	76,000
200	58.5	76,000	54.7	117,000	61.5	183,000	41.3	79,000
Flood Stage	25		None		40		40	

Transportation

Current inadequacy of transportation facilities within the sub-region is a hindrance to economic development. Plans are in progress to improve transportation throughout the sub-region. The highway plan includes completion of Appalachian Corridors "J" and "T", as well as Interstate Routes 40 and 75. Improvements in existing roads and new roads are shown in Figure 17-5. Railroads are available in only nine Kentucky and six Tennessee counties (see Figure 17-4).

Navigation on the Cumberland River extends from the mouth to mile 313.5, just above Carthage, Tennessee, and from Wolf Creek Dam in Russell County, Kentucky, to the vicinity of the Rockcastle River. Upon completion of Cordell Hull Dam, currently scheduled for the fall of 1971, a navigable channel will be provided to Celina, Tennessee, near the Kentucky state line (see Figure 17-4).

Scheduled airline service is available to Crossville, Tennessee, and London, Kentucky, while a number of other communities have small general utility airports. The Tennessee airport plan calls for completion of facilities at Lafayette, Celina, Smithville, Carthage, and Sparta during the next five years, thus, providing airports for all Tennessee counties in the sub-region except Pickett. General utility airports are also planned for Columbia, Jamestown, Russell Springs, and Monticello, Kentucky, and existing facilities at Somerset, London, and Williamsburg are scheduled for expansion (see Figure 17-5).

3. RESOURCE DEVELOPMENT

Human

The 1960 population of Sub-region I was 504,030, with 79,386 persons residing in urban areas. Only Pickett County, Tennessee had less than 5,000 persons and only Harlan County, Kentucky exceeded 50,000 persons. In 1960, approximately 348,000 persons lived in the Kentucky portion of the sub-region. In 1960, Sub-region I had a population that was about 16 percent urban and 84 percent rural. Of the total population, 32 percent was farm resident and 52 percent was rural non-farm. A comparison of the sub-region population categories with the nation is in Figure 17-6 (page II-17-19). Water Area I-1 (the Kentucky counties), with 17 percent of urban population, was slightly more urbanized than Water Area I-2 (the Tennessee counties) with 13 percent urban.

In 1960, there were 16 urban communities in the sub-region (towns or incorporated places with 2,500 or more population). Only one town, Middlesboro, Kentucky, exceeded 10,000 population and contained about 2.5 percent of the sub-region's population. Just outside the sub-region (see Figure 17-1, page II-17-3) lie the major cities of Nashville and Knoxville, Tennessee, and to the north is Lexington, Kentucky.


Frankfort
Lexington
Richmond
Danville
McKee
Mt. Vernon
Liberty
Greensburg
London
Columbia
Somerset
Russell Springs
Burnside
Corbin
Monticello
Barbourville
Whitley City
Pineville
Burkesville
Williamsburg
Tomkinsville
KY.
Albany
TENN.
Lafayette
Celina
Byrdstown
RIVER
Jamestown
Livingston
Gainesboro
CUMBERLAND
Cookeville
Nashville
Knoxville
Sparta
Smithville
Crossville
Woodbury
McMinnville
10 5 0 10 20 30
SCALE IN MILES


Frankfort
Lexington
Richmond
Danville
McKee
Mt. Vernon
Liberty
London
Manchester
Somerset
Cumberland
Lynch
Corbin
Barbourville
Harlan
Monticello
Whitley City
Pineville
Williamsburg
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Kingsport
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SCALE IN MILES

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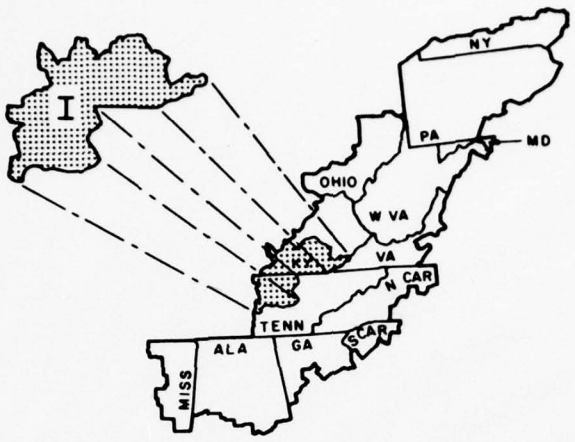

VICINITY MAP

—— EXISTING NAVIGATION

Kingsport

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

RAILROADS & NAVIGATION

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-15 FIGURE 17-4

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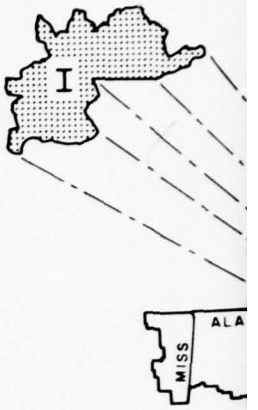

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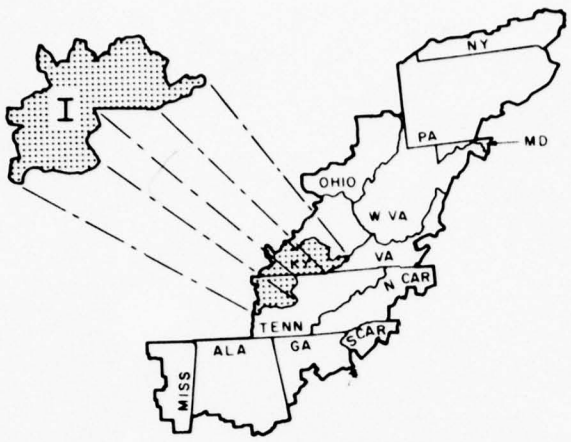

VICINITY MAP

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REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

HIGHWAYS & AIRPORTS

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-17 FIGURE 17-5

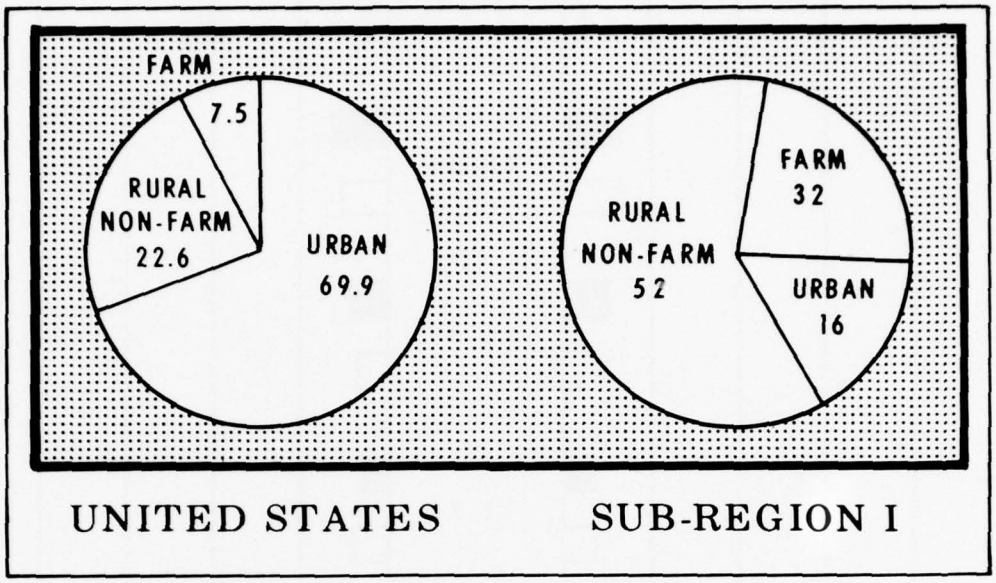


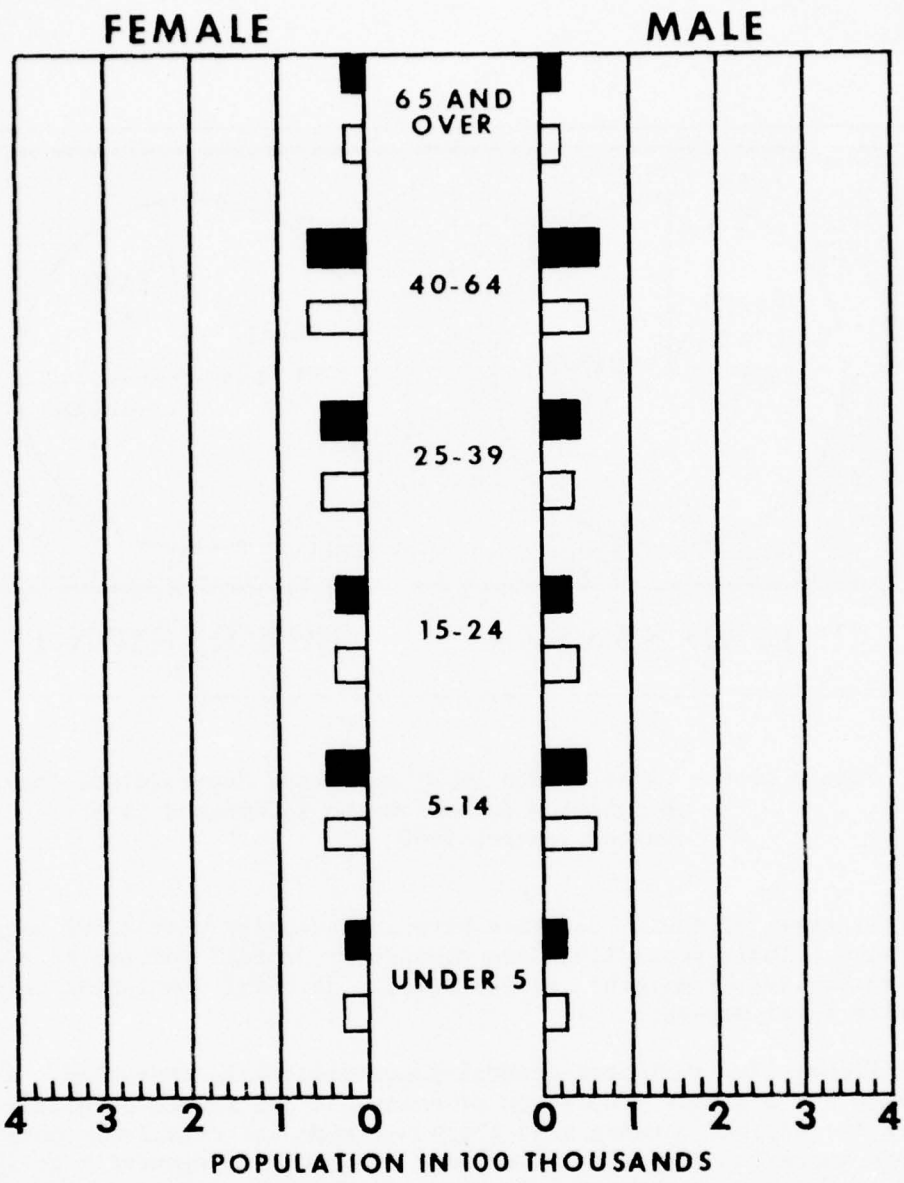
Figure 17-6 - Distribution of Urban, Rural Non-farm and Farm Population in Sub-region I Compared to the United States, 1960.

Nineteen of the 30 counties have no community with 2,500 persons or more. Their populations are completely "rural" and are in areas characterized by marginal agriculture. The rural population is primarily rural non-farm.

Figure 17-7 indicates general population characteristics. The sub-region has a larger proportion of young and old in its population than does the nation, meaning that the sub-region has relatively more youngsters requiring education investment and oldsters requiring geriatric services. If out-migration is stemmed and roads and education provided, the area will have the labor force to develop in the future.

The sub-region tends to have more females than males in the 25-39, 40-64, 65 and over age groups. In the other age groups there are more males than females.

In the 30-county sub-region, median education attainment is below the national median school years completed and also below Kentucky and Tennessee State median. (Figure 17-8).



UNITED STATES -NUMBER THAT WOULD BE IN EACH AGE GROUP IF TOTAL 1960 U.S. POPULATION WERE EQUAL TO THAT OF WATER SUB-REGION I

WATER SUB-REGION I

FIGURE 17-7 POPULATION DISTRIBUTION

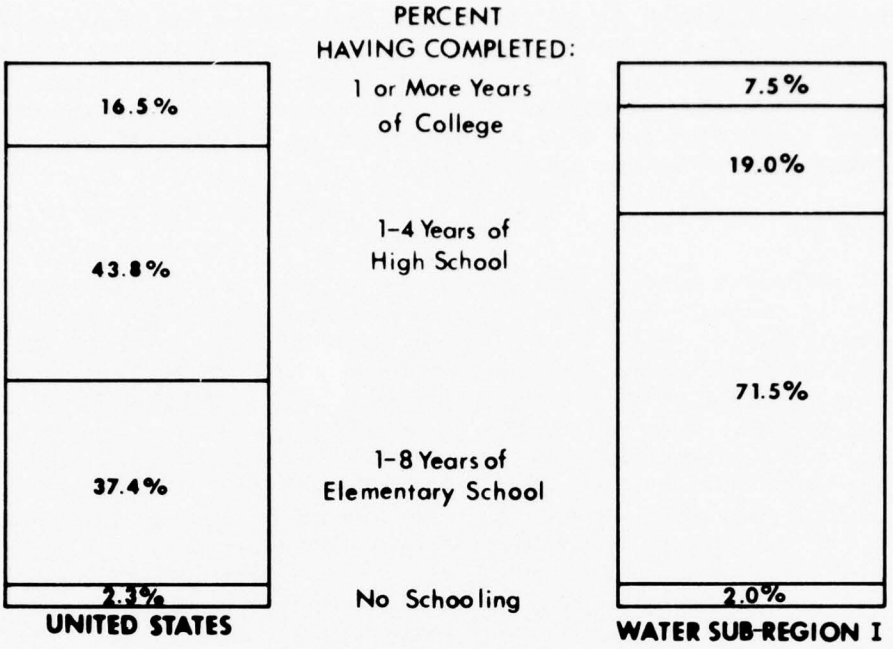


Figure 17-8 - Population Distribution by Educational Attainment in Water Sub-region I.

Higher education and retraining opportunities are available in the sub-region provided by three colleges and universities, junior colleges, and ten vocational and technical schools (see Figure 17-9). Area vocational schools are located at Livingston and Crossville, Tennessee, and Harlan and Somerset, Kentucky, with extensions at Pineville, Manchester, Barbourville, and Russell Springs. Additional vocational classes are offered in at least one high school of every county of the sub-region. Practical nurse training is available in hospitals at Crossville, Jamestown, Cookeville and Carthage, Tennessee, and Pineville and Somerset, Kentucky. Area vocational schools in Hartsville and McMinnville, Tennessee, lie outside the sub-region, but serve Macon, Smith, White, and DeKalb Counties, and the facility at Paintsville, Kentucky, serves Jackson County in that state. In addition to the vocational and technical training opportunity provided young people, adults may utilize many of the facilities as well.

The existing facilities are not adequate to meet foreseeable needs; however, an expanding vocational and technical education system should provide needed skills for sub-regional industrialization. Kentucky has plans for extensions of the Somerset area vocational school to be located

at Albany and London. Other facilities are planned for Rockcastle and Green Counties. Tennessee has requested funds from the Appalachian Regional Commission to improve training facilities at Tennessee Technical University at Cookeville. Both states have the objective of providing a training facility within commuting distance of every interested citizen in the sub-region.

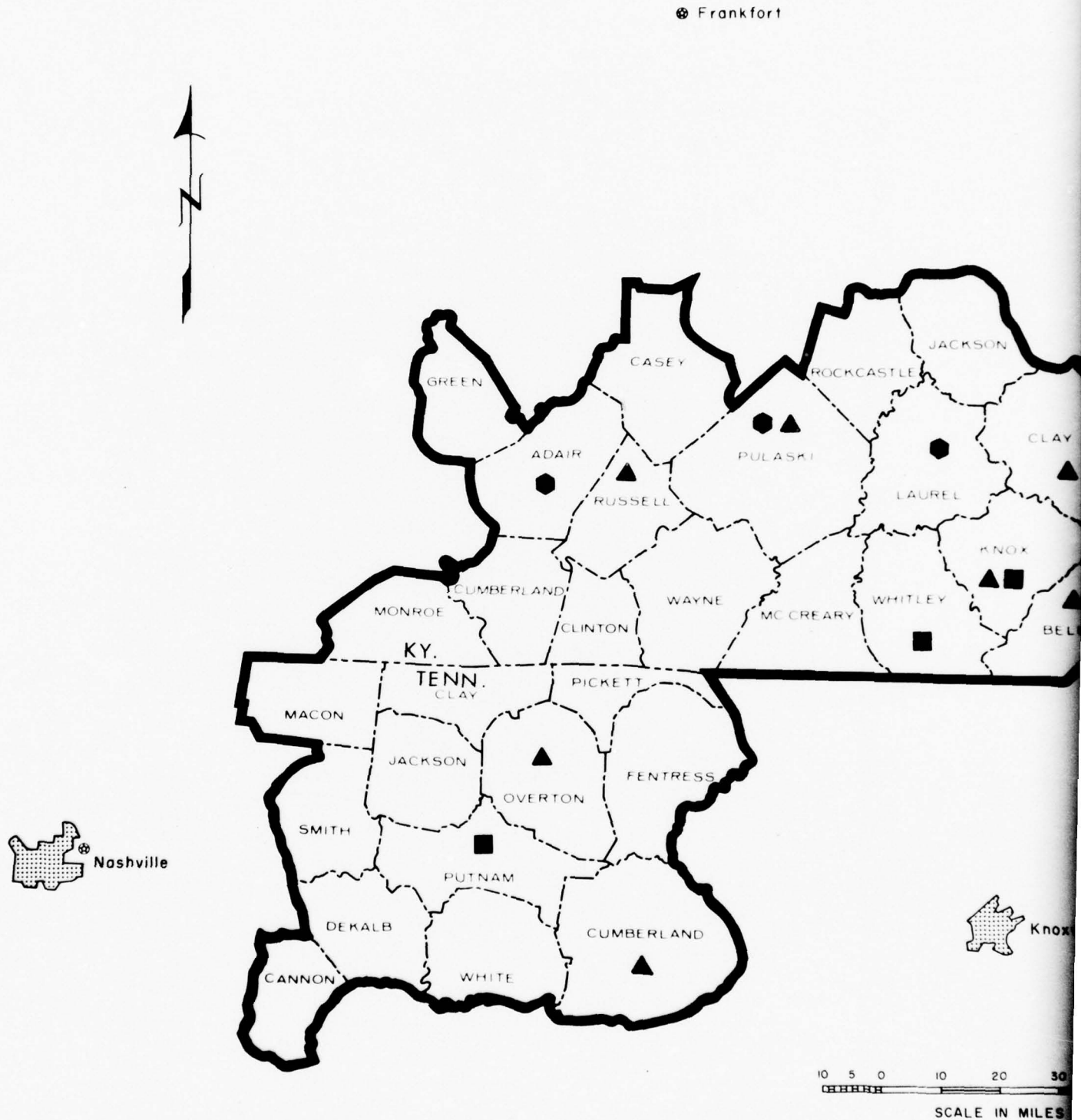
Minerals

The principal mineral resource is bituminous coal. Deposits are found in 12 Kentucky and six Tennessee counties of the sub-region; and recoverable reserves are estimated to exceed seven billion tons. The fact that production has been averaging about 11 million tons annually in recent years indicates reserves are sufficient for many years of mining. Considering the 18 counties in which reserves are located, all but two have more than 38 million tons. Mining operations have been suspended in some of the large coalfields, but could be resumed with increased demand, more economical methods of transporting the product to market, and efficient production methods.

Recent innovations in coal transportation may make production feasible at some locations not now being mined. Some of the new developments are the "unit train", operating between a single mine and a single generating plant and utilizing special equipment, the movement of coal in slurry form by pipeline, and the construction of power generating stations at the mine with transmission of power to distant points by extra high voltage. A conventional mode of transportation, which is often the lowest in cost, is water transport by inland barge. Construction of a lock and dam near Celina, Tennessee, and a cargo lift over Wolf Creek Dam would provide water transportation to seven of the coal-producing counties in the sub-region.

There is an abundance of mineral resources other than coal. Oil is produced in 19 sub-region counties and is an important industry in six. Limestone, sandstone, shale, clay, and silica sands and sand and gravel are also significant to the economy. Development of these industries will help support and influence growth in the sub-region.

During the last three years for which records are available, coal production has shown an overall increase of just over one percent annually (see Figure 17-10). The projected growth rate for the bituminous coal industry in Appalachia, as reported by U.S. Department of the Interior, is three and one-half percent annually, with the trend holding steady as far as the year 1980. The Department of Commerce, however, predicts a decrease in employment in the industry, at the rate of 1.9 percent annually. Bureau of Mines, in Appendix I, gives further information on the mineral industry.


Frankfort
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WAYNE
MC CREARY
WHITLEY
CLINTON
KY.
TENN.
CLAY
PICKETT
MACON
JACKSON
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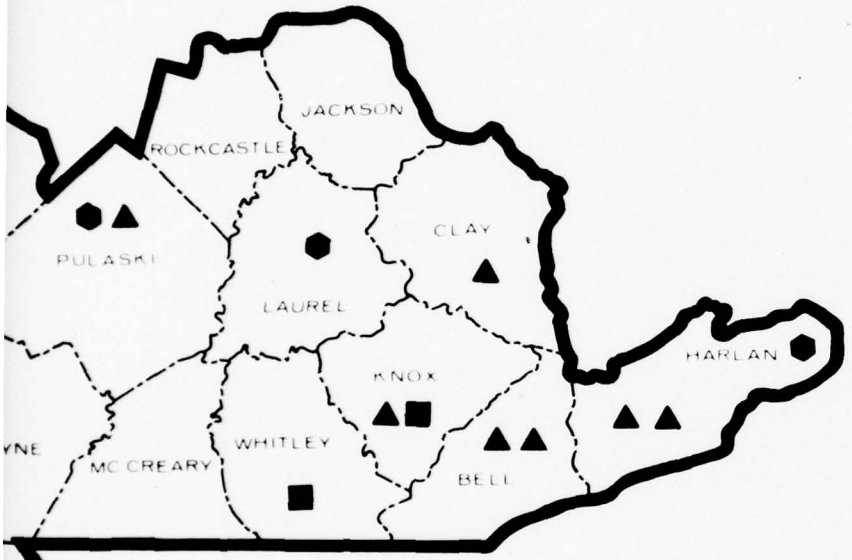

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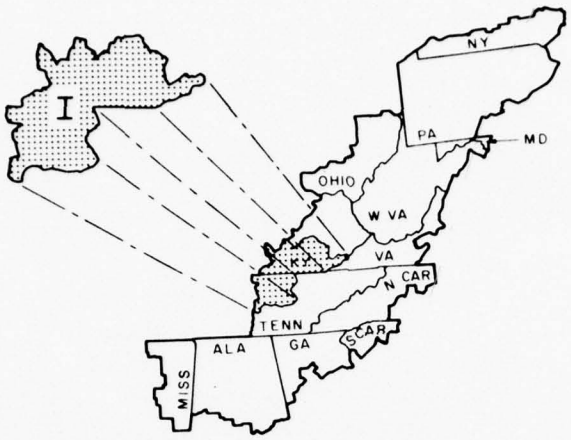


VICINITY MAP

LEGEND

- ■ COLLEGE OR UNIVERSITY
- ⬢ JUNIOR COLLEGE
- ▲ VOCATIONAL SCHOOL OR COLLEGE

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

HIGHER EDUCATION FACILITIES

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-23 FIGURE 17-9

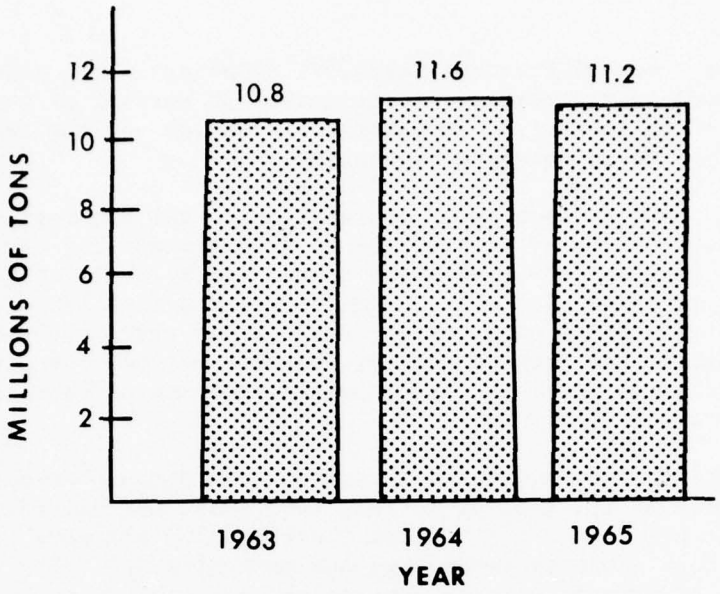


Figure 17-10 - Coal Production in the Sub-region, 1963-1965.

Lands

The total land area of the sub-region is 7,166,000 acres, of which 6,925,600 is in agricultural use. Agricultural land use acreage is as follows: cropland, 1,235,800; pasture, 884,200; state and private forest and woodland, 4,085,300; and other land, 375,900. There are 344,400 acres of National Forest land in the sub-region.

The 1964 U.S. Census of Agriculture shows that 3,908,700 acres of the sub-region is farmland; this amount is expected to decrease steadily for the next several years, mainly because of increases in federal or state-owned land, that occupied by reservoirs, and that taken for urban development. Topography of the area varies from narrow ridgetops with steep slopes separated by narrow valleys to broad, smooth sections with relief. For agricultural use, about two percent of the area's soils are nearly level deep, well drained, and highly productive, 37 percent have characteristics which limit the choice of crops and require special conservation and management practices, and 61 percent are generally unsuited for cultivation, with their use limited to pasture, woodland, and wildlife habitat. Erosion by surface water flow is a dominant problem for about 73 percent of the sub-region, and excess water caused

by a high water table or frequent temporary flooding is the main problem for an additional four percent. Approximately 30 percent of the sub-region is suited to intensive, long-term cultivation and the remainder only to growth of permanent-type vegetation.

A downward trend in most types of farmland in the sub-region is shown by the U.S. Census of Agriculture on farm acreage for five-year intervals from 1949 to 1964. In 1949, there were 4.7 million acres of land in farms, compared with only 3.9 million acres in 1964. Total cropland comprised the largest acreage each census year, but moved downward throughout the period. During the same period, the number of farms decreased by 41 percent, while the average size of farms increased from 71 to 100 acres.

The general decline in total farm acreage and corresponding increase in average farm size are part of a trend throughout the United States during the same period, resulting from higher yields and more efficient production through improved technology and mechanization. For the most part, in spite of reduced acreage, demand has not kept up with supply, so that amounts of land required have been decreasing for a number of years. This change has resulted in the following adjustments: (1) many marginal farm operators have abandoned farming to seek other employment; (2) part of their land has been acquired by the more efficient operators who remained in agriculture production; and (3) the remaining land of displaced farm operators has shifted to non-farm uses.

These adjustments have occurred with accelerated rapidity throughout almost all of Appalachia, where the natural, inherent handicaps of mountainous terrain keep the region's agriculture at a comparative disadvantage with that of the nation's better farming areas - where topography is little or no problem. These trends are, therefore, expected to continue indefinitely in this sub-region. Urban and highway expansion have contributed to shifting land out of agriculture, and these adjustments are also expected to continue.

The decline in agriculture and consequential shift in land use accounts for an increase of approximately six percent in forest land from 1950 through 1961. About 60 percent of the sub-region is in commercial and government-owned forest and farm woodlands. This timber is predominantly hardwood. Present cover serves reasonably well to hold the soil in place. However, past misuse of the forest resource has destroyed much of the humus and organic matter in the upper surface, leaving over one-half of the forest land in poor hydrologic condition and materially reducing its capacity to absorb and store precipitation. Of this forest land, about 65 percent has a high-to-medium potential to improve hydrologically, if given proper management and protection. The water area amounts to 30,800 acres or about 0.4 percent of the total land area.

Sub-region I has suffered the ravages of uncontrolled strip mining, resulting in destruction of forest growth and stream siltation.

Environmental Aspects

The scope of this survey includes the investigation of water resource projects which could satisfy environmental problems that inhibit economic growth. The strategy of preservation plays only a minor role because of the frequent contradictions between the value systems which encourage economic growth as opposed to those interests seeking to minimize change. However, the plan has sought not only to identify those environmental resources which may be adversely affected by water resource development, and sought to minimize them, but also to enhance the environment in conjunction with the plan.

Sub-region I is an area of outstanding natural beauty. Topography ranges from flat agricultural land to precipitous bluffs. Rugged, heavily wooded lands, rising high above valley floors, give the impression of a wilderness area in places, while others present pastoral scenery with gently rolling farmlands backed by wooded hilltops. Extraordinary scenic beauty is displayed by rivers which, cutting a circuitous channel through limestone and sandstone strata, form relatively narrow valleys confined by steep slopes rising above the stream and rimmed by precipitous escarpments. Main natural scenic attractions of the area include the Daniel Boone National Forest, Cumberland Gap, and Cumberland Falls in Kentucky. Also included are several outstanding state parks. (See Figure 17-11).

Sub-region I is steeped in historical and archeological lore. Various pre-history and historic Indian tribes roamed through the region leaving archeological remains of value. The westward migrations of the early settlers passed through the area also, settling the country and leaving a rich heritage. The Dr. Thomas Walker State Shrine commemorates the first permanent dwelling in Kentucky. Cumberland Gap was the gateway to Kentucky for the settlers and is now within the Cumberland Gap National Historical Park. Several engagements during the War Between the States took place, one memorial being the Mill Springs National Cemetery. Burnside was named for one of the Federal generals who led troops within the region.

Daniel Boone National Forest, which extends through the Kentucky portion of the sub-region, provides 344,000 acres for public recreation use. There are 4,085,300 acres of state and private forest land in the sub-region.

Waters and lands of the sub-region are well adapted to the production of fish and wildlife. Cumberland Falls is an effective barrier to upstream migration of undesirable fish from Lake Cumberland; therefore, the river system above the falls has remained a natural-stream-type fishery, providing a habitat for various types of bass, blue gills, and other sunfish. Below the falls, reservoir-type fish are

harvested as well, and the river section is a major spawning area for Lake Cumberland walleye. The U.S. Bureau of Sport Fisheries and Wildlife has constructed a trout hatchery below Dale Hollow Dam and is preparing to build another below Wolf Creek Dam. The reach one mile below the Wolf Creek project is managed by the State of Kentucky as a trout fishery; the remaining mileage supports a stream and reservoir fishery of moderate value. Fish resources in the Big South Fork system vary from poor to very good, and the main stream and most major tributaries produce good populations of various game-fish species. The Rockcastle and its tributaries above the Narrows constitute a high-value habitat and support an excellent stream-type fishery. Center Hill and Dale Hollow Reservoirs provide outstanding opportunities for fishermen.

Habitat for farm-game species, such as rabbit and quail, is rated of moderate quality for the agricultural areas of the main stream and of low quality in upstream tributary areas. Principal wildlife forms are forest-dwelling species of big game and upland game, including deer, squirrel, raccoon, grouse, and a moderate population of turkey. Waterfowl population is light.

The U.S. Department of Agriculture's Upstream Watershed Projects, authorized for operation as of July 1967, include additional storage and developments for recreation. These developments provide 72 acres of water surface with adjacent land areas that will accommodate 18,800 recreation days. In addition, there are 19,285 farm ponds with water surface of 5,790 acres.

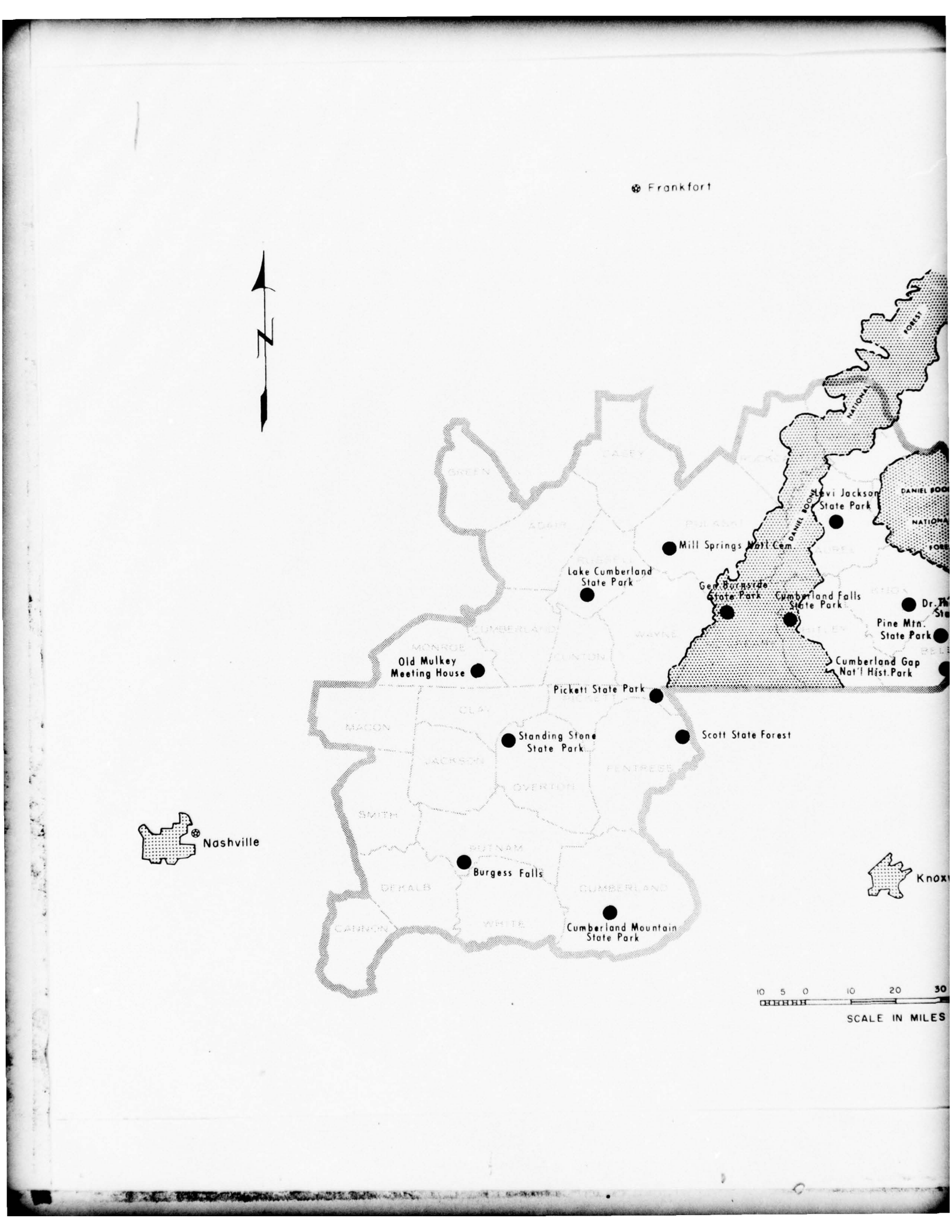
Most of the land adjoining and east of the Daniel Boone National Forest is forested, interspersed with farmland, except in the western part where land use is in reverse proportions. Fishing is primarily for warm water species. A total of 585 farm ponds are being stocked and managed for the production of fish.

Water Resources Development - Federal (see Figure 17-12, page II-17-35)

Corps of Engineers

Major Reservoirs. Lake Cumberland, created by Wolf Creek Dam, is located on the Cumberland River in Russell, Clinton, Wayne, Pulaski, Laurel, McCreary, and Whitley Counties, Kentucky. The dam is 460.9 miles above the mouth of the river. The reservoir, which extends about 100 miles up the main stream, provides flood control, hydroelectric power, and recreation. It was constructed by the Corps of Engineers, Nashville District, and completed in 1952.

Cordell Hull Lock and Dam, in Smith County, Tennessee, 313.5 miles above the mouth of the Cumberland River, will create a reservoir extending into Jackson and Clay Counties, about 72 miles up the main stream. The reservoir, being constructed by the Nashville District, Corps of Engineers, will provide for navigation, hydroelectric power, and recreation. This project, when completed, will extend navigation up the Cumberland River to the vicinity of Celina, Tennessee.


Frankfort
N
Levi Jackson State Park
Mill Springs Nat'l Cem.
Lake Cumberland State Park
Gen. Burnside State Park
Cumberland Falls State Park
Pine Mtn. State Park
Old Mulkey Meeting House
Cumberland Gap Nat'l Hist. Park
Pickett State Park
Standing Stone State Park
Scott State Forest
Nashville
Burgess Falls
Cumberland Mountain State Park
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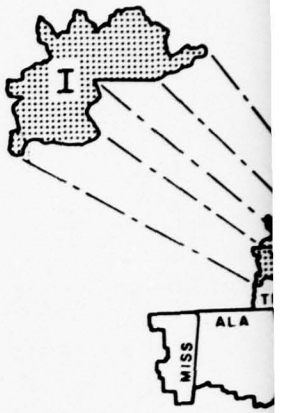

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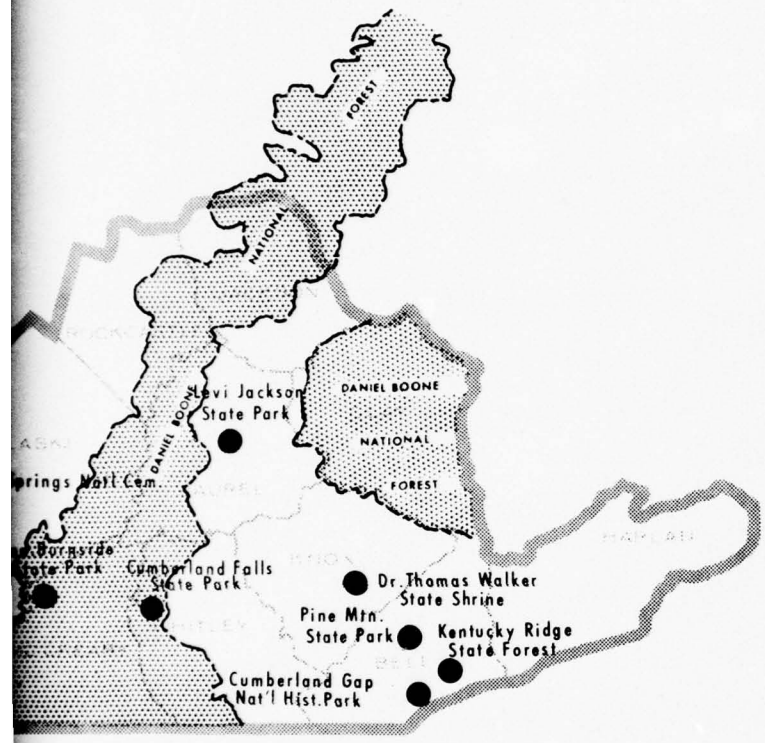

ott State Forest

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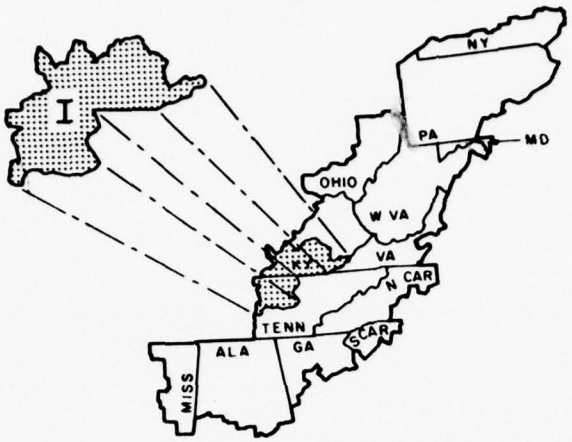


VICINITY MAP

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

SCENIC AND HISTORICAL SITES

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-29 FIGURE 17-11

Laurel River Dam, when completed, will create a reservoir on the Laurel River in Laurel and Whitley Counties, Kentucky. The damsite is 2.3 miles above the confluence with the Cumberland River. The reservoir, which will extend about 19 miles up the main stream, will provide for hydroelectric power and recreation. It is being constructed by the Nashville District, Corps of Engineers and recreation facilities will be developed and administered by the U.S. Forest Service.

Dale Hollow Reservoir is on the Obey River in Clay, Overton, Pickett, and Fentress Counties, Tennessee, and Cumberland and Clinton Counties, Kentucky. The dam is 7.3 miles above the confluence of the stream with the Cumberland River. The reservoir extends 51 miles up the main stream. The project was constructed by the Nashville District, Corps of Engineers, and completed for flood control in 1943. It now provides flood control, hydroelectric power, and recreation.

Center Hill Reservoir is on the Caney Fork River in DeKalb, Putnam, and Warren Counties, Tennessee. The dam is 26.6 miles above the confluence of the stream with the Cumberland River. The reservoir extends 64 miles up the main stream. The project was constructed by the Nashville District, Corps of Engineers, and completed in 1951. It provides flood control, power, and recreation. A water supply system for the city of Cookeville, Tennessee, utilizing water from Center Hill Reservoir, is being planned.

Booneville Reservoir, created by a dam on the South Fork of the Kentucky River, 17 miles above its mouth in Owsley County, Kentucky, would extend into Clay County. The reservoir, now in advanced engineering and design by the Louisville District, Corps of Engineers, will provide flood control, hydroelectric power, and recreation.

Green River Reservoir is in Taylor, Adair, and Casey Counties, Kentucky. The dam is 305.7 miles above the mouth of the river. The reservoir, being constructed by the Louisville District, Corps of Engineers, will provide flood control, water quality control, and recreation.

Martins Fork Reservoir is planned in Harlan County, Kentucky. The dam, as authorized, would be constructed 14.8 miles above the confluence of Martins Fork and Clover Fork. The project will be constructed by the Nashville District, Corps of Engineers, and will provide flood control and water quality control in the vicinity of Harlan and downstream, in addition to recreational opportunities.

Pertinent data for the reservoir projects are given in Table 17-5 and their locations are shown in figure 17-12.

Local Protection Projects. Corps of Engineers local flood protection projects which have been completed in Water Sub-region I are located in Barbourville, Corbin, Middlesboro (two projects), and Pineville, Kentucky. In addition, five other projects are awaiting local

cooperation and an eleventh project has been deferred for restudy. Pertinent data for the projects are shown in Table 17-6 and depicted in Figure 17-12.

Navigation. The Cordell Hull Lock and Dam project currently under construction at mile 313.5 on the Cumberland River will extend the navigable waterway to Celina, just south of the Tennessee-Kentucky border. The lock facility will provide clear chamber dimensions of 84' x 400' and a total lift of 59 feet at normal pool level. Some downstream excavation was required to furnish a 9-foot navigable channel. The project is scheduled to be operable for navigation by late 1971.

Outstanding or Going Studies. The Nashville District Corps of Engineers has outstanding survey reports on the Cumberland and Rockcastle Rivers. A study was made of the Cumberland River near the mouth of Bunches Creek in Whitley and McCreary Counties, Kentucky, with a view to whether improvements in the interests of flood control, navigation, hydroelectric power and other allied functions were advisable. The Upper Cumberland River basin above Cumberland Falls has been investigated for the feasible provision of flood control and allied purposes. The Rockcastle River and its tributaries were studied to determine if water resource development is justified in that basin. These investigations, tentatively completed for preliminary review, are subject to further study under current conditions and evaluation criteria.

Section 218 of the 1968 Flood Control Act directs the Corps of Engineers to review its previous study on the Big South Fork, Cumberland River and update the economic feasibility of the Devils Jumps reservoir recommended therein. Section 218 further directs that the Corps of Engineers, the Department of the Interior, and the Department of Agriculture enter into another study that will consider alternatives available for development of the Big South Fork and its contiguous areas. This latter study is being prepared jointly by the agencies and will consider acceleration of current development programs, reservoirs, scenic rivers, national recreation areas, national forests, national parks and combinations of these means of maintaining and enhancing the natural environment. The report will present alternatives as a basis for selection of the most feasible development for the basin. Both studies are to be completed and submitted to Congress by the end of 1969.

U.S. Department of Agriculture

Completed Watershed Projects. Two upstream watersheds have been completely installed. These watersheds have a project area of 28.64 square miles, approximately equally divided between the two states. In the first project case, 7.3 miles of channel improvement have been constructed and in the second case, 5.3 miles of channel improvement have been completed.

TABLE 17-5

SUMMARY OF PERTINENT DATA
MAJOR RESERVOIRS, WATER SUB-REGION I

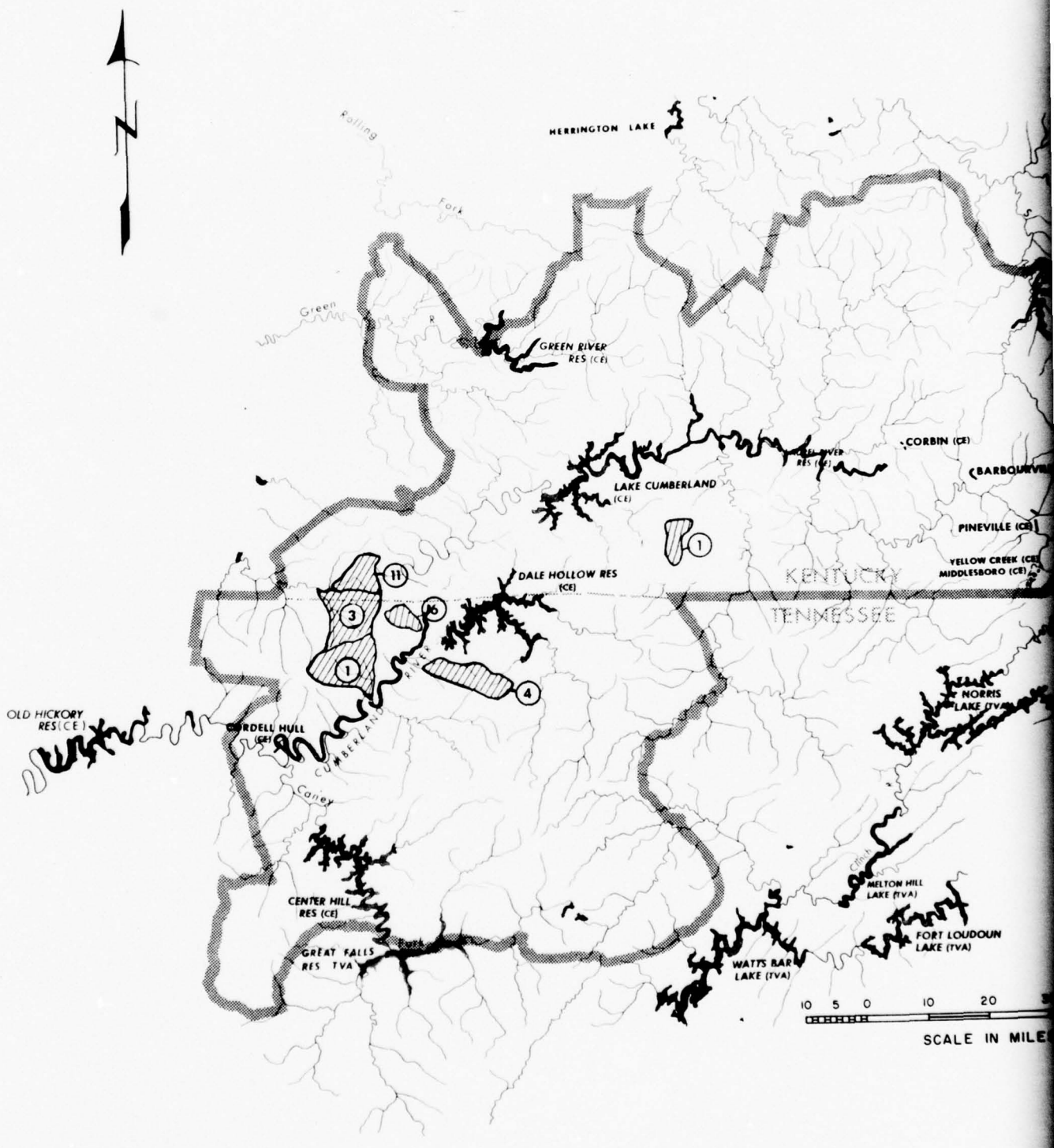
Item	Lake Cumberland (Wolf Creek Dam)	Cordell Hull Reservoir	Laurel Reservoir	Dale Hollow Reservoir	Center Hill Reservoir	Booneville Reservoir	Green River Reservoir	Martins Fork Reservoir(6)
Location								
Stream	Cumberland R.	Cumberland R.	Laurel R.	Obey R.	Chaney Fork	South Fork Kentucky R.	Green R.	Martins Fork
River Mile	460.9	313.5	2.3	7.3	26.6	16.9	305.7	14.8
County	Russell	Smith	Laurel-Whitley	Clay	De Kalb	Owsley	Taylor	Harlan
State	Ky.	Tenn.	Ky.	Tenn.	Tenn.	Ky.	Ky.	Ky.
Status	Operating	Under Const.	Under Const.	Operating	Operating	AE&D	Under Const.	AE&D
Authorized purpose	FC,P	N,P	P,R	P,FC	P,FC	FC	FC,WQC,R	FC,R,WQC
Completion date (1)	1952	1972	1974	1953	1951	-	1968	-
Drainage area above (sq. mi.)	5,789	8,096	282	935	2,174	686	682	56.1
Elevation (ft.-msl)								
Top of upper pool (FC/Power)	760.0	508.0	1,018.5	663	685	780	713	1,338.0(3)
Top of conservation pool	673.0	499.0	982.0	631	618	700	653	1,300.0(3)
Storage allocated to (acre-ft.)								
Flood control	2,094,000	51,800(2)		353,000	762,000	301,030	560,600	14,800(4)
Power	2,142,000	54,300	185,000	496,000	492,000			
Water quality							64,500	3,300(5)
Conservation	1,853,000	204,800	250,600	857,000	838,000	16,070	98,100	3,700(3)
Sediment silt reserve	(8)	(8)	(8)	(8)	(8)			(8)
TOTAL	6,089,000	310,900	435,600	1,706,000	2,092,000	317,000	723,200	21,800
Surface area (acres)								
Top of upper pool (FC/Power)	63,530	13,920	6,060	30,990	23,060	6,980	19,100	675
Top of conservation pool	35,820	9,820	4,200	21,880	14,590	1,100	5,070	270
Power Installation (Hydro)								
Capacity (1000 KW)	270	100	61	54	135	-	-	-
No. of units	6	3	1	3	3	-	-	-
Yield (MGD)								
Water supply	-	-	-	-	-	-	-	-
Water quality	-	-	-	-	-	-	-	2.94(7)

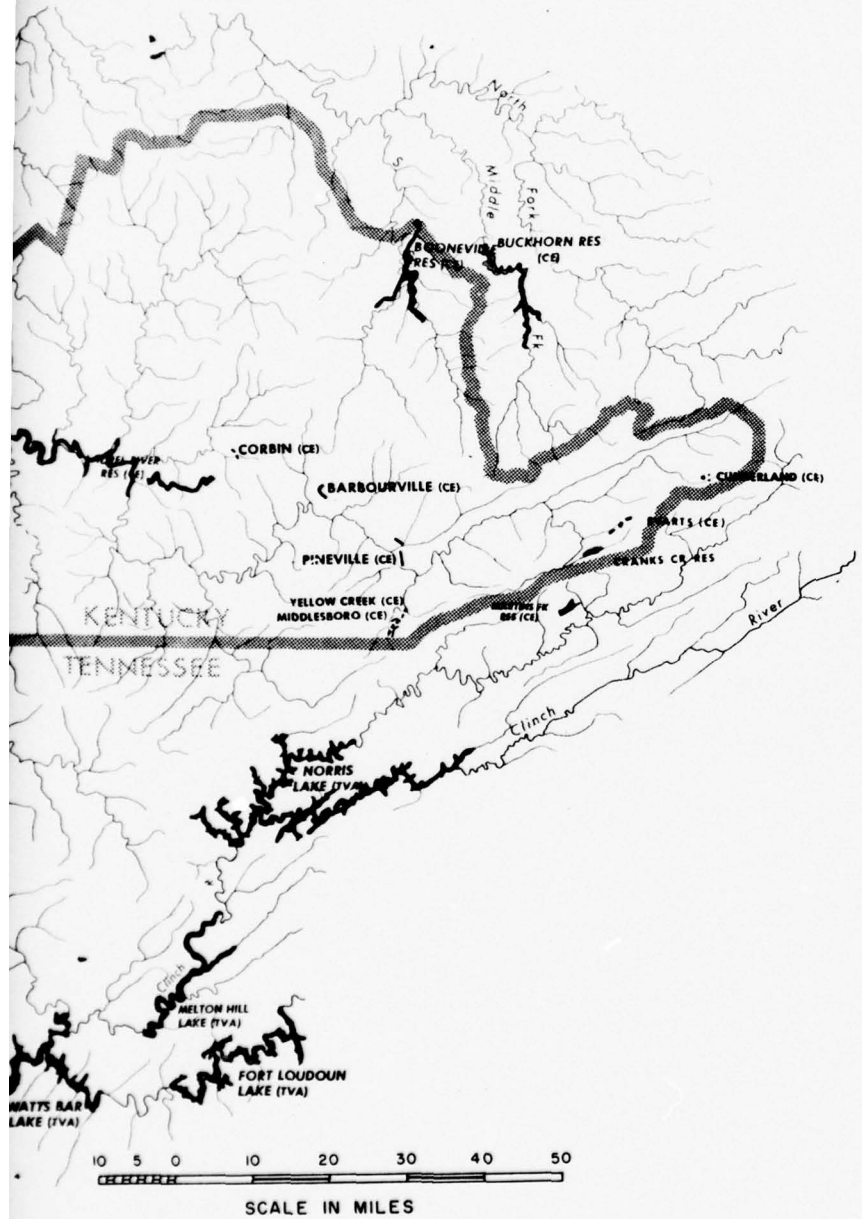
NOTE:
(1) Completion date shown is that date when the project becomes fully operational for all authorized purposes.
(2) Normal operation nonflood season; surcharge allowance of 85,600 acre-feet (el. 501-508) during period of major flood flows, 1 December-15April.
(3) During flood season 1 December-1 April flood control storage, 18,400 acre-ft.
(4) Nonflood recreation season 1 May-1 October.
(5) Storage for streamflow requirements provided through seasonal variation in minimum pool level, El. 1300-1310.
(6) Survey report data.
(7) Based on release of storage for water quality over period of 365 days.
(8) The inactive storage capacity is greater than the estimated sediment accumulation over the life of the project

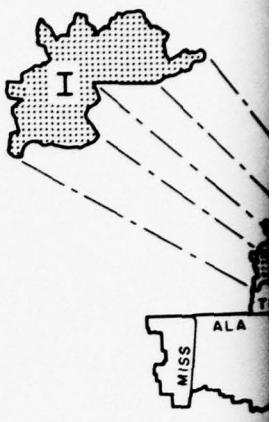
TABLE 17-6

SUMMARY OF PERTINENT DATA
LOCAL FLOOD PROTECTION PROJECTS - WATER SUB-REGION I

Location	Barbourville	Corbin	Cawood	Cumberland	Evarts	Middlesboro	Middlesboro	Middlesboro	Pineville	Pineville	Manchester
County	Knox	Knox-Whitley	Harlan	Harlan	Harlan	Bell	Bell	Bell	Bell	Bell	Clay
State	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.	Ky.
Stream	Cumerland R.	Lynn Camp Cr.	Crummies Cr.	Poor Fork	Yocum Cr. Clover Fk.	Yellow Cr.	Yellow Cr.	Yellow Cr.	Cumberland R.	Straight Creek	Goose Creek
Drainage area above (sq.Mi.)	960	53.8	11.9	82.3	82.4	37.8	56.2	57	770	93	
Type improvement	Levees	Channel imp.	Channel imp.	Channel imp.	Channel imp.	Canal-levee	Levees	Snagging & clearing	Flood wall-levees	Channel imp.	Channel imp.
Status	Operating	Operating	Awaiting local cooperation	Awaiting local cooperation	Awaiting local cooperation	Operating	Deferred for restudy	Operating	Operating	Awaiting local coop.	Awaiting local coop.
Completion date	1962	1964	-	-	-	1939	-	1952	1957	-	-


N
HERRINGTON LAKE
Rolling
Fork
Green
R.
GREEN RIVER RES (CE)
CORBIN (CE)
LAKE CUMBERLAND (CE)
PINEVILLE (CE)
YELLOW CREEK (CE)
MIDDLESBORO (CE)
KENTUCKY
TENNESSEE
DALE HOLLOW RES (CE)
11
3
6
1
4
1
OLD HICKORY RES (CE)
CORDELL HULL (CE)
CUMBERLAND RIVER
Caney
NORRIS LAKE (TVA)
CENTER HILL RES (CE)
GREAT FALLS RES TVA
MELTON HILL LAKE (TVA)
FORT LOUDOUN LAKE (TVA)
WATTS BAR LAKE (TVA)
10 5 0 10 20
SCALE IN MILE





VICINI

COMPLETED

UPSTREAM WATERSHED

MAJOR RESERVOIR

CHANNEL IMPROVEMENT

LEVEE OR WALL

DEVELOPMENT

WATER

WATER

DEV

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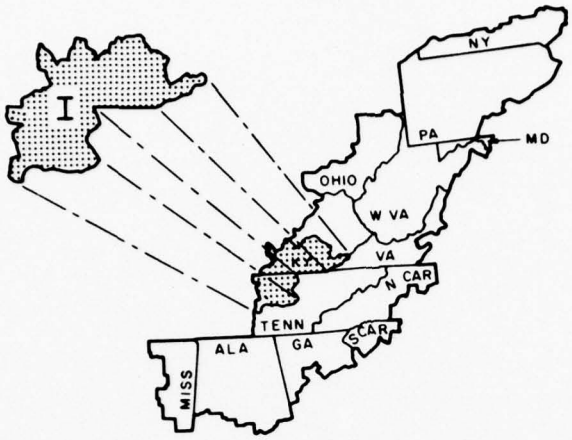


VICINITY MAP

	COMPLETED	EXPECTED TO BE COMPLETED BY 1980
UPSTREAM WATERSHED	①	
MAJOR RESERVOIR		①
CHANNEL IMPROVEMENT	------	
LEVEE OR WALL	——	------

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

WATER RESOURCES DEVELOPMENT

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-35 FIGURE 17-12

The estimated installation cost for the structural measures in the two watersheds totals about $302,300 and $315,000 for land treatment. Average annual flood water damages before projects were installed totaled an estimated $14,200. The average annual benefits from the installation of the projects are an estimated $18,200.

Approved Watershed Projects. An additional four upstream watershed projects have been approved and are being installed. These watersheds comprise an area of 206.63 square miles. When completed, the 20 structures will control 85.19 square miles of drainage area and 61.57 miles of channel improvement. The reservoirs contain 2,380 acre feet of storage for sediment, 17,767 acre feet for flood control, 735 acre feet for municipal and industrial water supply, and 445 acre feet for recreation. About 5,400 acres of flood plain receive varying degrees of flood protection and 18,100 recreation days are provided annually.

The estimated installation cost for the structural measures in the four projects totals about $4,530,000 and $1,000,000 for land treatment measures. Average annual flood water damages before project completion totaled an estimated $255,500. The average annual benefits from installation of the projects are an estimated $256,900. Watershed development is portrayed in Figure 17-12 and pertinent data is shown in Table 17-7.

Land Use Programs. The land use, treatment, and management programs of the U.S. Department of Agriculture are contributing to improvements in water quality, primarily through reduction of erosion and sedimentation. Also, over 4.3 million feet of open drainage ditch and 3.8 million feet of tile drains have been installed to increase farm production. These programs also contribute to increased farm efficiency and thus improve economic returns. Conservation plans are being put into effect for 1,665,900 acres, and as of June 30, 1967, a total of 733,300 acres (10 percent of land in the sub-region) have been treated by conservation practices.

Other Water Resources Programs. The Farmers Home Administration (FHA), USDA, as of June 30, 1967, has received applications for water and sewer comprehensive planning grants from seven counties, totaling about $51,960. In addition, applications have been received for loans and grants for improving, enlarging, or constructing sewer systems, waste treatment plants, or storm drains from six communities, associations, public service districts, and towns. The total estimated cost exceeds $2,463,000. This agency also has on hand grant and loan applications for improvement, development, and construction of public water systems from 40 communities, towns, or cities. Total estimated costs will exceed $71,799,000.

Additional feasible watersheds are indicated by the U.S. Department of Agriculture in Appendix A.

TABLE 17-7

SUMMARY OF PERTINENT DATA
UPSTREAM WATERSHED PROJECTS, SUB-REGION I*/

Map Reference Number (Figure 17-12)	Name of Watershed	Status	Drainage Area of Watershed (sq. mi.)	Drainage Area Regulated (sq. mi.)	Number of Structures		Storage Volume by Purpose (Acre Feet)			
					Flood Retention	Multi-purpose	Flood Water	Recreation	M&I Water Supply	Other**/
Kentucky 1	Meadow Creek	Completed	15.4		-	-	(No storage in project)			
Tennessee 6	Proctor Creek	Completed	13.2		-	-	(No storage in project)			
Kentucky 11	Mill Creek	Authorized	33.1	7.3	0	1	1,612	445	735	568
Tennessee 1	Jennings Creek	Authorized	72.1	29.3	13	0	5,442	-	-	930
Tennessee 3	Line Creek	Authorized	63.0	30.8	5	0	8,217	-	-	678
Tennessee 4	Mill Creek	Authorized	38.4	17.9	1	0	2,496	-	-	204

*/ Includes only those projects that have been completed or authorized.
**/ Includes Sediment, Irrigation and Fish and Wildlife.

Water Resources Development - Non-Federal

Commonwealth of Kentucky

Cranks Creek Reservoir is located in Harlan County, Kentucky, and was constructed by the Kentucky Department of Fish and Wildlife for the purpose of recreation.

Two impoundments under the Kentucky Small Lakes Program are under construction; they are Wood Creek Lake in Laurel County and Renfro Creek Lake in Rockcastle County. Both will provide public water supply and recreation.

Municipal

Table 17-8 presents an inventory of water supply sources for cities exceeding 5,000 population in the sub-region.

TABLE 17-8

MUNICIPAL WATER FACILITIES - CITIES EXCEEDING 5,000 POPULATION

City	Est. Pop. Served	Source of Supply	Rated Plant Cap. MGD	Average Plant Output MGD
Cookeville, Tenn.	12,000	Falling Water River	4.800	1.300
Middlesboro, Ky.	14,000	Fern Lake	2.900	0.800
Somerset, Ky.	14,250	Lake Cumberland	1.800	0.850
Corbin, Ky.	10,500	Laurel River	2.000	0.960

4. INTRODUCTION

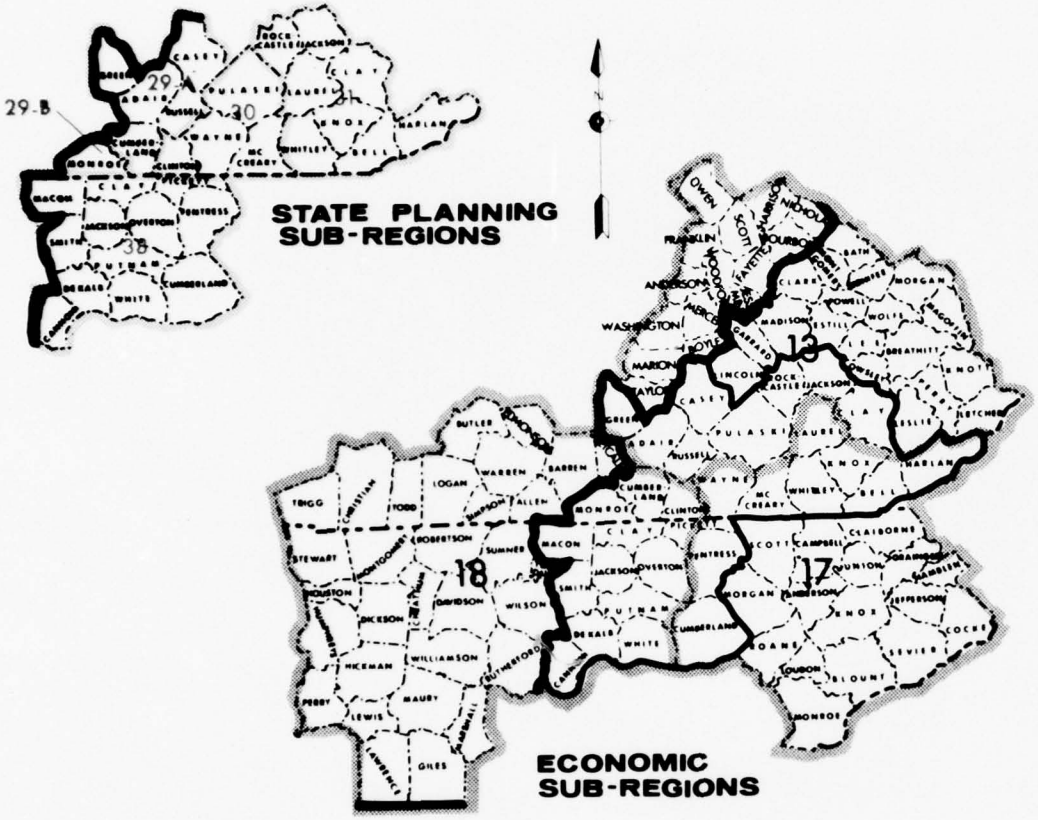
Planning Devices

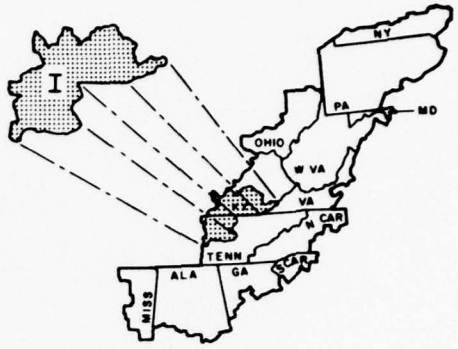
A number of sub-regional geographic divisions have been utilized in studying the socio-economic aspects of Appalachia. In general, the Appalachian Regional Commission (ARC) has been concerned with immediate and near future problems, whereas water resources analysis requires projections of economic activity 50 to 100 years in the future. As a result, the best current data available is that prepared by the Office of Business Economics (OBE) for the Corps of Engineers and the benchmarks prepared therefrom by the Office of Appalachian Studies. The projections are by water sub-regions and sub-areas, while the ARC data are by state planning sub-regions.

In this chapter, ARC data are utilized; therefore, the information is presented by state planning sub-regions and their associated growth areas. The long-range projections by water sub-regions and water sub-areas follow in the next chapter.

There are five state development districts in Sub-region I which have been subdivided into five state planning sub-regions as identified in the following tabulation and delineated on Figure 17-13.

State Development District	Name	State	Growth Center
29A	West Lake Cumberland Development District	Kentucky	Campbellsville, Burkesville, Columbia
29B	Barren River Development District (Monroe County only)	Kentucky	
30	East Lake Cumberland Development District	Kentucky	Somerset, Monticello
31	Cumberland Valley Development District	Kentucky	London, Corbin, Williamsburg, Middlesboro, Pineville, Barbourville, Harlan
38	Upper Cumberland Development District	Tennessee	Cookeville, Crossville, Smithville, Sparta, Gainesboro





VICINITY MAP

LEGEND

APPALACHIAN REGIONAL BOUNDARY

WATER SUB-REGION I BOUNDARY

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

PLANNING AREAS

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-41

FIGURE 17-13

An additional delineation for planning purposes has been made by the Office of Business Economics. The delineation is based on various measures of economic interdependence and the tendency towards homogeneous clusters of counties (see Figure 17-13). Adair, Casey, Clay, Green, Jackson, Pulaski, Rockcastle and Russell Counties in Kentucky comprise the lower fringe of OBE Sub-region 13 (about 25 percent of the counties in OBE Sub-region 13 lie in Water Sub-region I). Bell, Harlan, Knox, Laurel, McCreary, Wayne and Whitley Counties, Kentucky; and Cumberland and Fentress Counties in Tennessee are in OBE Sub-region 17. Clinton, Cumberland and Monroe Counties, Kentucky; and Cannon, Clay, DeKalb, Jackson, Macon, Overton, Pickett, Putnam, Smith, and White Counties, Tennessee, are in OBE Sub-region 18.

OBE Economic Sub-area 13 has its economic focus or center on Lexington, Kentucky, which lies outside Appalachia. OBE Economic Sub-region 17 has its economic focus or center on Knoxville, Tennessee, which lies in Appalachia. OBE Economic Sub-area 18 has its economic focus or center on Nashville, Tennessee, which lies outside Appalachia.

The growth areas designated by ARC lie in a line running north-south in Kentucky along Interstate 75. A secondary growth area lies along the northern shore (edge) of the Cumberland River. In Tennessee, the growth areas lie along a line between Nashville and Knoxville, but closer to Nashville.

The state of Kentucky does not designate any community within the Kentucky portion of Sub-region I as a metropolitan service or existing service area. Although the areas mentioned in the above paragraph are emerging urban places, at the present an incomplete or limited service area for their hinterlands and business is competitive only at the small retailer level.

Planning agencies are developing plans for the area and are providing assistance to the development councils above. These agencies include U.S. Army Corps of Engineers, USDA Soil Conservation Service, Conservation and Development Program of the Forest Service and state industrialization agencies.

The following paragraphs discuss the socio-economic characteristics of the water sub-region, later expanded to a more intensive analysis of each state planning sub-region.

Economic Characteristics

About 19 percent of those employed in the sub-region (1960) were engaged in manufacturing; about 26 percent were engaged in agriculture, and 32 percent in trade and services. A comparison with national employment groups is provided in Figure 17-14.

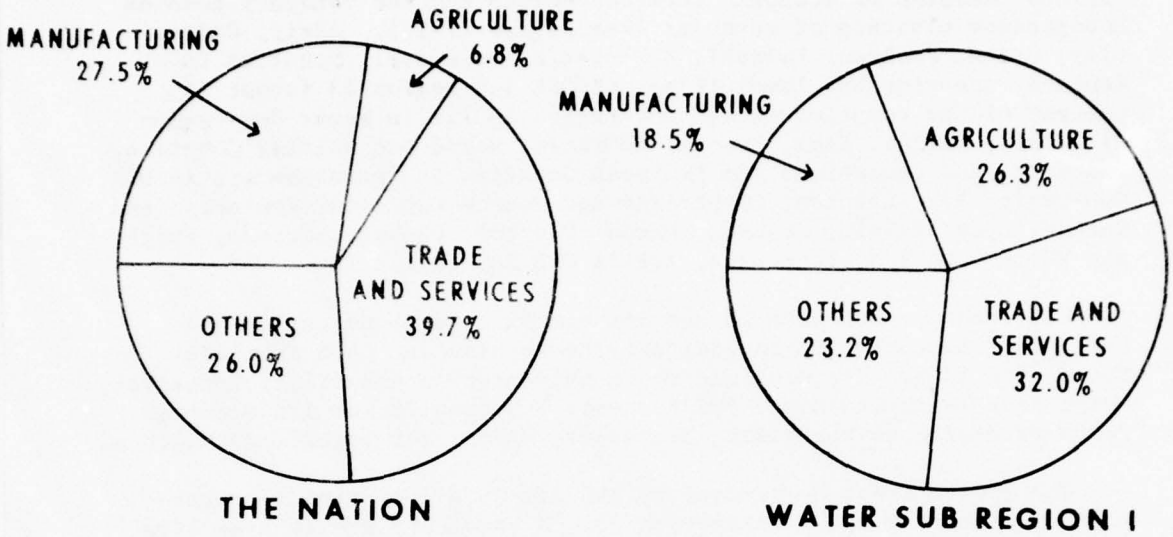


Figure 17-14 - Employment by Major Sector in Water Sub-region I Compared to the Nation, 1960.

Total income of sub-region inhabitants was 448 million dollars in 1960 and income was derived principally from trade and services, agriculture, and manufacturing. Wages and salaries accounted for 52 percent of the income total; proprietors income, 27 percent; transfer payments, 15 percent; and property income, six percent. Sources of 1966 earning by major sectors are shown in Figure 17-15. The figure compares Water Sub-region I with both the United States and Appalachia.

Hay and corn are the major crops and cattle and hogs are the principal livestock raised in the sub-region. In 1964, about 42 percent of the sub-region was in forest, exclusive of farm woodland.

Only about 2 percent of the area's soils are deep, well drained, and highly productive, 37 percent of the soil is productive with conservation and careful management, and 61 percent of the soils are unsuited for cultivation.

Farmland is decreasingly utilized in the sub-region. From 1950 to 1964, the acreage in farmland declined from 4.7 million acres to 3.9 million acres. The number of farms decreased 41 percent, while the average size of farms increased from 71 to 100 acres.

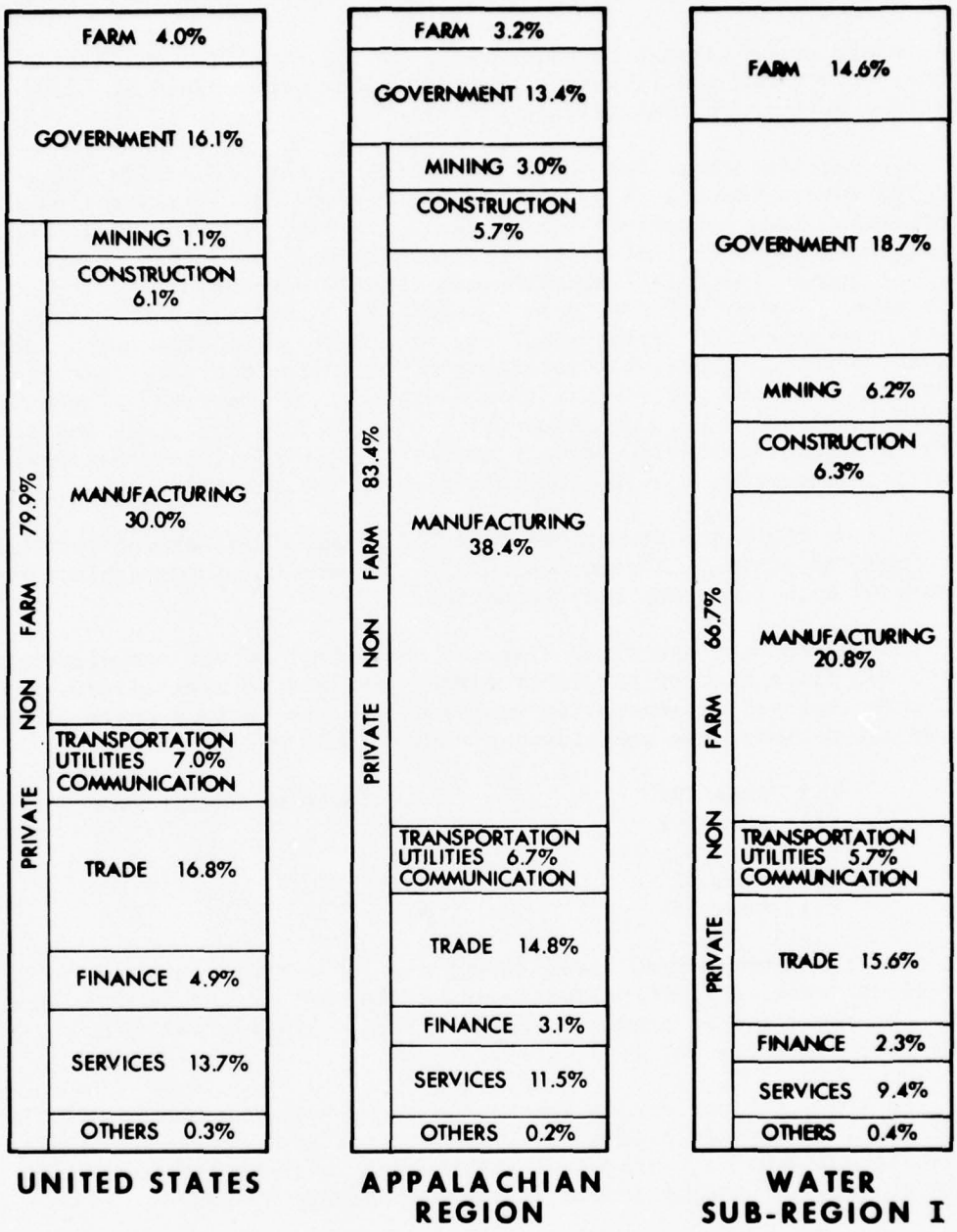


FIGURE 17-15 SOURCES OF INCOME

For the sub-region, the value of all farm products at wholesale prices (1957-1959 = 100) increased about 1 percent from 1949 to 1954, 24 percent from 1954 to 1959, and 17 percent from 1959 to 1964.

Field crops sales were valued at about 52.2 million dollars in 1964. Livestock and livestock products sales were valued at 52.0 million dollars in 1964 (Figure 17-16).

Forest land comprises about two-thirds of the 7.2 million acres in the sub-region and 99 percent of the forest land is classified as commercial (see Appendix A for detail). In 1962, the sub-region had 2,755 million cubic feet of merchantable timber, but about 60 percent of the commercial forest area is less than 70 percent stocked. The net annual timber cut from growing stock is 55 million cubic feet. In 1962, the volume of timber products output was 36 million cubic feet of sawlogs, veneer logs, and miscellaneous products; six million cubic feet of pulpwood; and five million cubic feet of fuelwood. The estimated total value of the output was 9.9 million dollars. In addition, the forests also provide outdoor recreation. Daniel Boone National Forest alone provides 471,700 visitor-day's use annually.

One of the major deviations from the national employment pattern is found in mining. The region had 7.4 percent in mining employment compared with 1 percent for the nation.

Employment estimates may disguise the extent of the unemployment problem, since much of the labor force, involved in agriculture, may be underemployed or seasonally employed. In the various state planning sub-regions, the unemployment rates (1965) were:

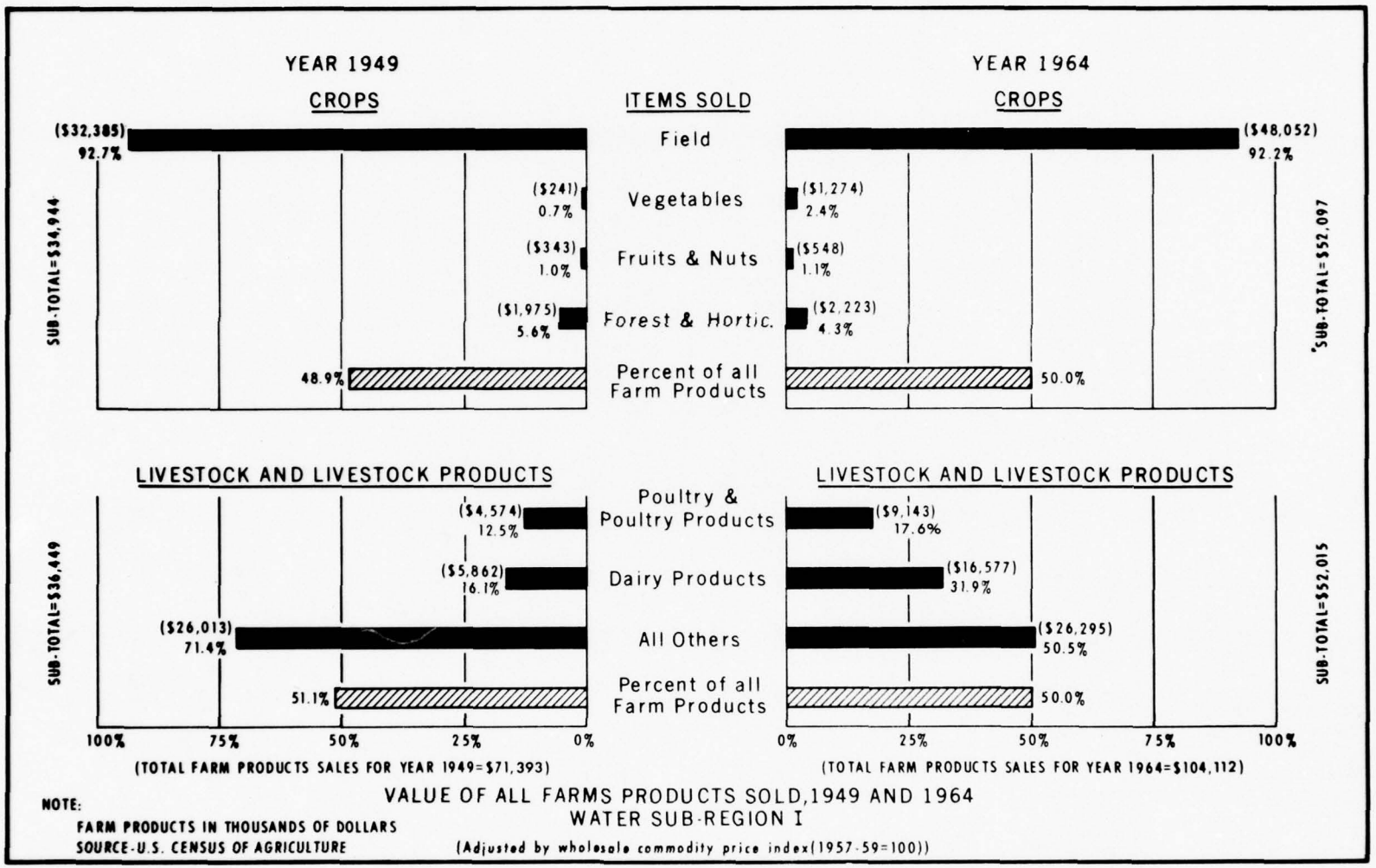
(1)	Area 29A	7.0 (Rate of Unemployment)
(2)	Area 29B	3.0 " " "
(3)	Area 30	14.7 " " "
(4)	Area 31	5.8 " " "
(5)	Area 38	4.7 " " "

Most of the unemployment rates (1966) are lower than the rates in previous years, reflecting increasing employment in the sub-region and out-migration in Areas 29 and 30. Figure 17-17 shows county unemployment rates for 1966.

In 1960, the per capita income for the sub-region was $1,011 (1954 dollars). This figure is about 69 percent of that for Appalachia as a whole and about 51 percent of the national average for that year. Distribution of family income is shown in Figure 17-18.

Capital Availability

Capital funds flow from a number of public and private sources. Public funds include those programs administered by federal, state



NOTE:
FARM PRODUCTS IN THOUSANDS OF DOLLARS
SOURCE-U.S. CENSUS OF AGRICULTURE

VALUE OF ALL FARMS PRODUCTS SOLD, 1949 AND 1964
WATER SUB-REGION I
(Adjusted by wholesale commodity price index(1957-59=100))

FIGURE II-17-16

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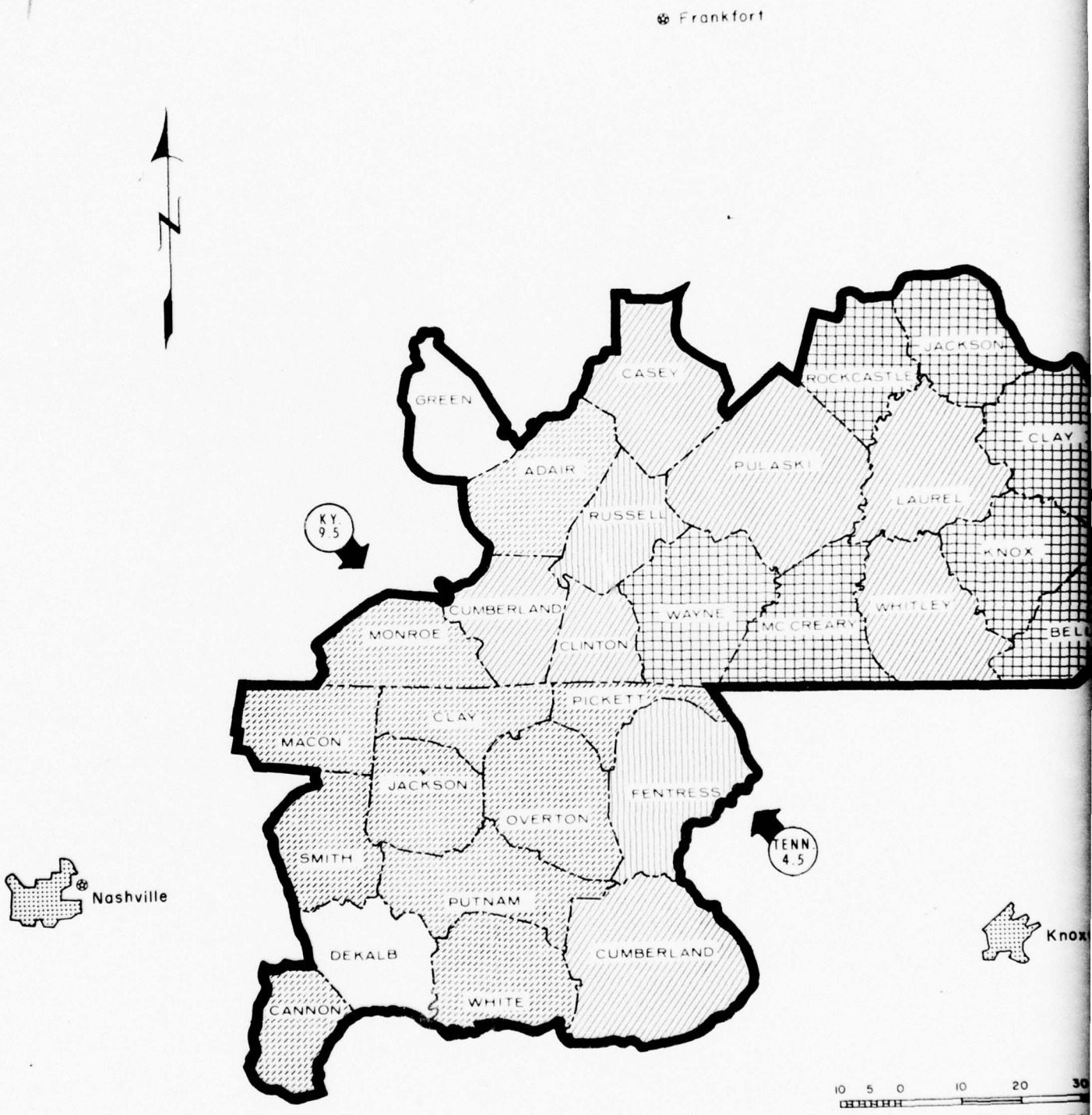

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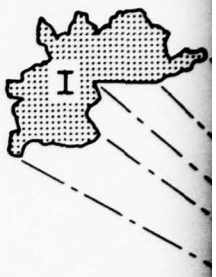
nkfort



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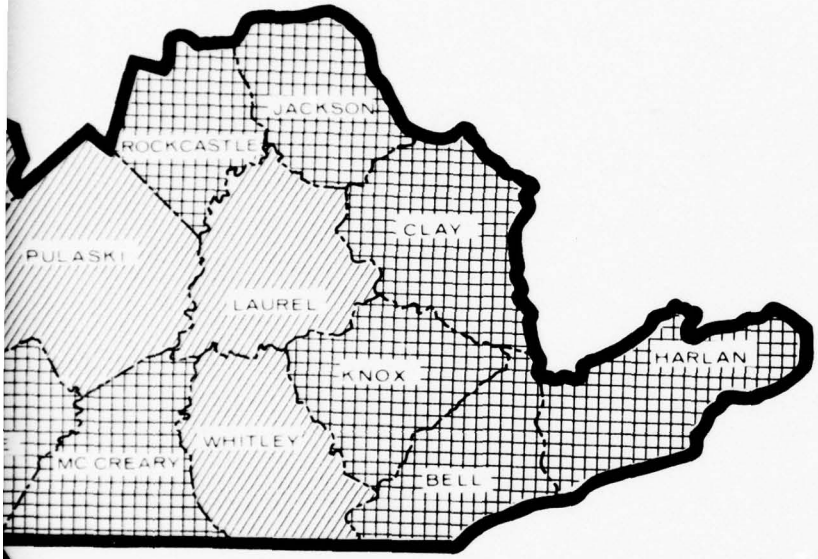

TENN. 4.5

Knoxville

LEGEND

COUNTIES HA
LESS THAN 3.

COUNTIES HA
3.0%–4.9%

COUNTIES HA
5.0%–6.9%

COUNTIES HA
7.0%–10.0%

COUNTIES HA
10.0%–20.0%

KY. 9.5

PERCENT OF
BY PORTION

NOTE

VALUES SHOWN ARE
PERCENTAGE OF CIVILIAN
LABOR FORCE FOR 1966

10 5 0 10 20 30 40 50

SCALE IN MILES

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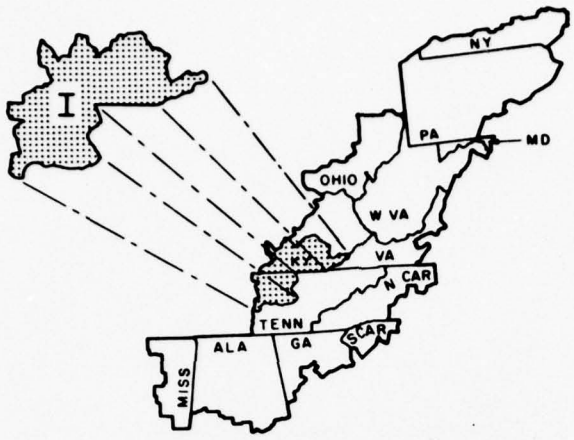

VICINITY MAP

LEGEND

COUNTIES HAVING LESS THAN 3.0%

COUNTIES HAVING 3.0%–4.9%

COUNTIES HAVING 5.0%–6.9%

COUNTIES HAVING 7.0%–10.0%

COUNTIES HAVING 10.0%–20.0%

KY. 9.5 — PERCENT OF UNEMPLOYMENT BY PORTION OF STATE SHOWN

)WN ARE
E OF CIVILIAN
CE FOR 1966

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DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

UNEMPLOYMENT

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-49 FIGURE 17-17

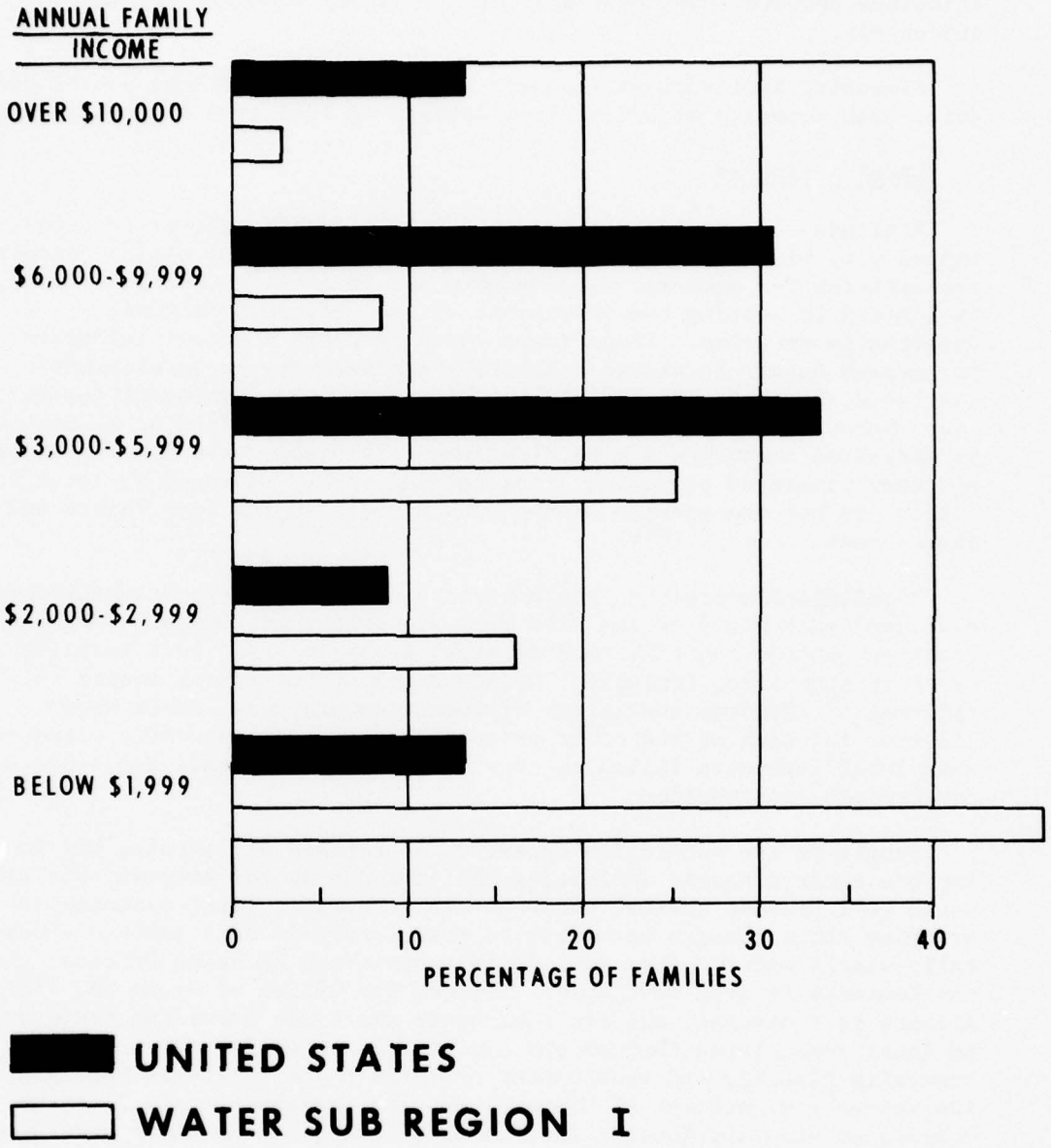


FIGURE 17-18 FAMILY INCOME

and local governments. In this framework of Appalachian development are various programs which provide developmental capital for public facilities, health, education and other purposes which serve to stimulate private investment and thereby employ economic factors of production.

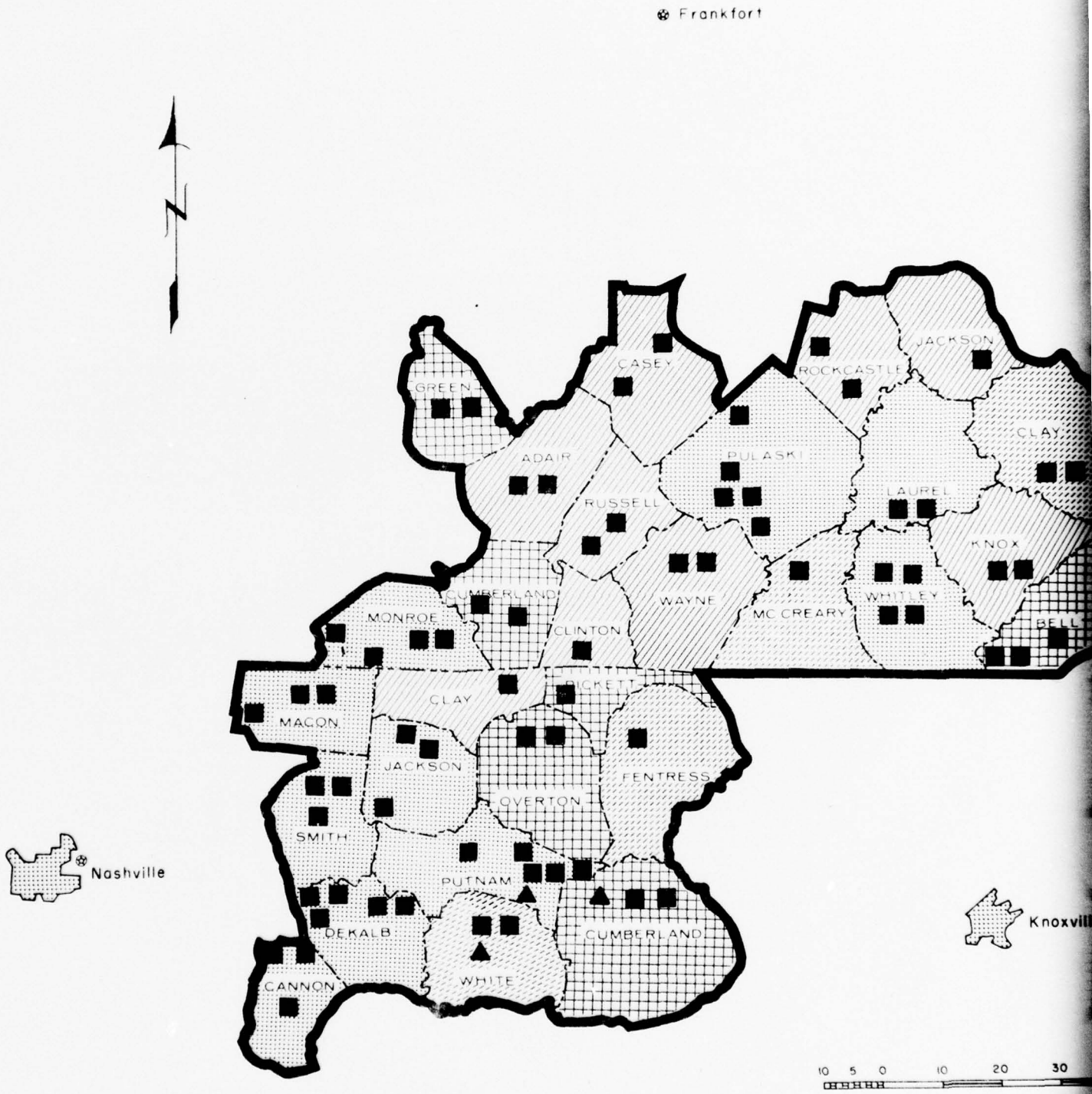
Financial institutions (commercial and savings and loan banks) had total bank deposits of 370 million dollars in 1965 (see Figure 17-19).

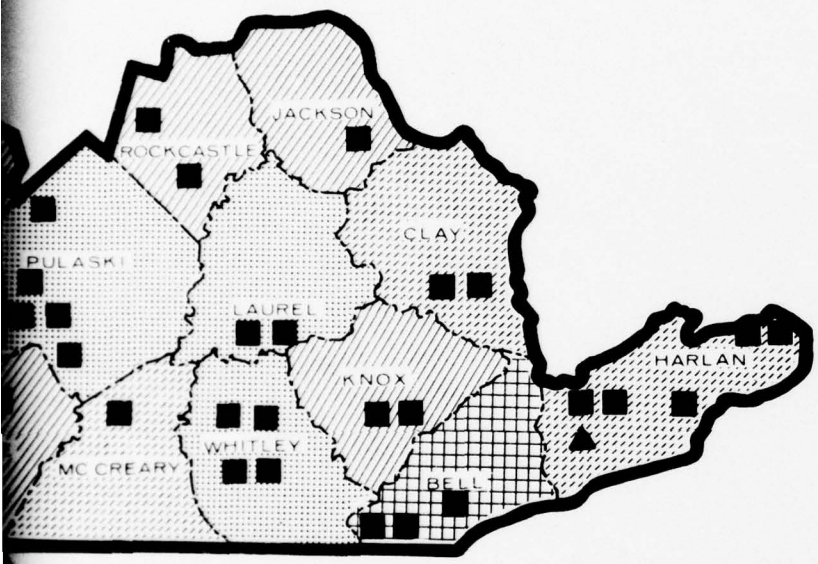
Local Attitudes

Attitudes concerning the future economic development of the sub-region vary widely among the inhabitants. In many communities, leaders are striving for economic development, but in other areas the planning is limited to meeting the provisions of the Office of Economic Opportunity programs. Those towns which have the physical resources for growth appear to assume a positive attitude toward development. The residents want jobs for the unemployed and underemployed; however, many workers wish to preserve their contact with the land by continuing as part-time farmers while holding industrial jobs. The four authorized upstream watershed projects, initiated and partly financed by local people, is but one example of the people's desire for improvement and development.

Local flood protection projects in the form of channel improvements have been authorized on the Poor Fork at Cumberland, Kentucky; Crummies Creek at Cawood, Kentucky, and Straight Creek and Left Fork Straight Creek at Pineville, Kentucky. Construction at Cumberland awaits fulfillment of required conditions of local cooperation. Funds were allotted for each of the other projects but were subsequently withdrawn when local interests failed to provide the required lands and easements for project construction.

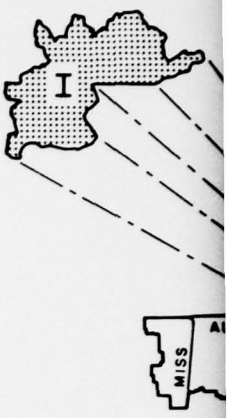
People in the sub-region appear to be capable of learning how to improve their economic well-being and eager to do so; however, the states could well provide greater cohesion and concurrent joint planning in bringing about changes necessary to transform this area into an economically viable entity. Movement in this direction is being effected through the Kentucky Program Development Office, the Office of Urban and Federal Affairs in Tennessee, and state elements which are providing assistance to local communities through the administration of federal programs. Community planning and development assistance are available through the Kentucky Department of Commerce and the Tennessee State Planning Commission upon application from local interests. The state development plans for Kentucky and Tennessee provide additional state assistance by determining where investments by ARC would have the greatest impact in aiding the economic growth, not only of the individual communities, but also of the region. These investments are intended to accelerate and expand such programs as vocational education, water and sewage treatment, medical facilities, and airports.


Frankfort
N
GREEN
CASEY
ROCKCASTLE
JACKSON
CLAY
ADAIR
PULASKI
LAUREL
RUSSELL
KNOX
WAYNE
WHITLEY
MC CREARY
BELL
CUMBERLAND
MONROE
CLINTON
CLAY
MACON
JACKSON
FENTRESS
OVERTON
SMITH
PUTNAM
DEKALB
CUMBERLAND
CANNON
WHITE
Nashville
Knoxvill
10 5 0 10 20 30
SCALE IN MILES



10 5 0 10 20 30 40 50

SCALE IN MILES



LEGEND

SAVINGS & LO

COMMERCIAL

BANK DEPOSI
BY COUNTY: A

LESS THAN $3

$300—$499

$500—$799

$800—$999

$1000 OR MO

DEVELOPME

WATE

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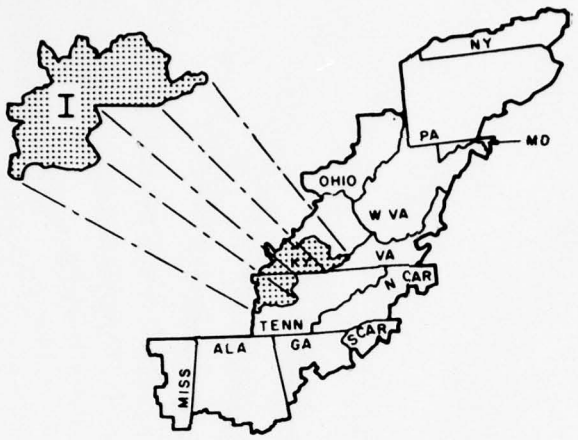
II-17-53

3



VICINITY MAP

LEGEND

▲ **SAVINGS & LOAN ASSOCIATIONS**

■ **COMMERCIAL BANKS**

BANK DEPOSITS, PER CAPITA BY COUNTY: AS OF 30 JUNE 1966

LESS THAN $300

$300—$499

$500—$799

$800—$999

$1000 OR MORE

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APPALACHIA

WATER SUB - REGION I

FINANCIAL SITUATION

OFFICE OF APPALACHIAN STUDIES JUNE 1968

II-17-53 FIGURE 17-19

The motivation, investigation, and engineering studies leading to funding and implementation of public investment projects draw heavily upon local initiative to bring the community needs to the attention of the appropriate state agencies.

5. WATER SUB-AREAS

The two water sub-areas in Water Sub-region I have been divided into four state planning sub-regions. The delineation of state planning sub-regions within Water Sub-region I has been described and discussed in Paragraph 4, and is indicated on Figure 17-13. The state planning sub-regions are used in Sub-region I as the principal geographic division for display of economic data. Graphical comparisons of the state planning sub-regions with the water sub-region have been included in each of the following sections to aid in orienting the reader to the state planning sub-region.

Water Sub-Area I-1

Water Sub-Area I-1, which includes all of the Kentucky portion of Water Sub-region I, contains Kentucky State Planning Sub-regions 29A and B, 30, and 31.

State Planning Sub-region 29A

State Planning Sub-region 29A, along with 29B, make up the westernmost portion of three state planning areas in Kentucky. Textiles, lumber, food, processing, and subsistence agriculture dominate the economies of all the counties in the state planning sub-region. The area, as a whole, is oriented to the Burkesville, Somerset areas along Corridor "J." The state planning sub-region is rural in nature and contains only a small proportion of the total population and employment in Water Sub-region I (see Figure 17-20).

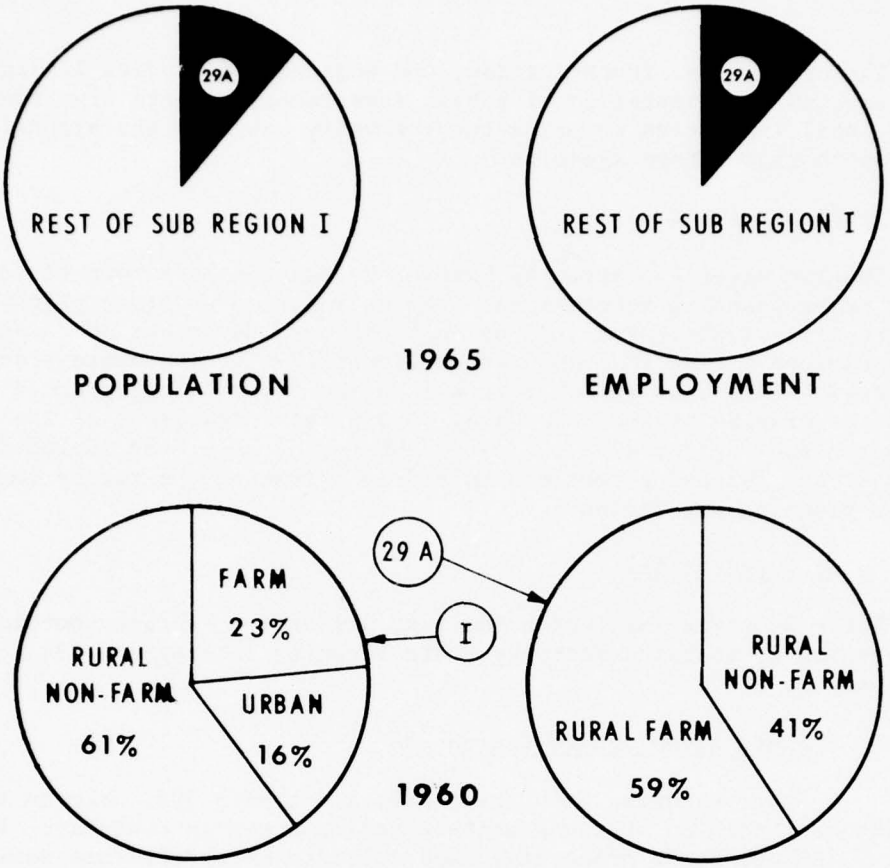

Figure 17-20 - Population, Employment, and Urban-Rural Population Distribution for State Planning Sub-region 29A Compared to Water Sub-region I.

The five-county area of State Planning Sub-region 29A has experienced continued out-migration ranging from 2.3 percent in Casey County to 5.2 percent in Russell County (1960-1966). The population of the state planning sub-region changed from 59,186 to an estimated 56,900 persons during the period 1960-1966. Figure 17-21 shows the percentage change of population and employment from 1950 to 1965.

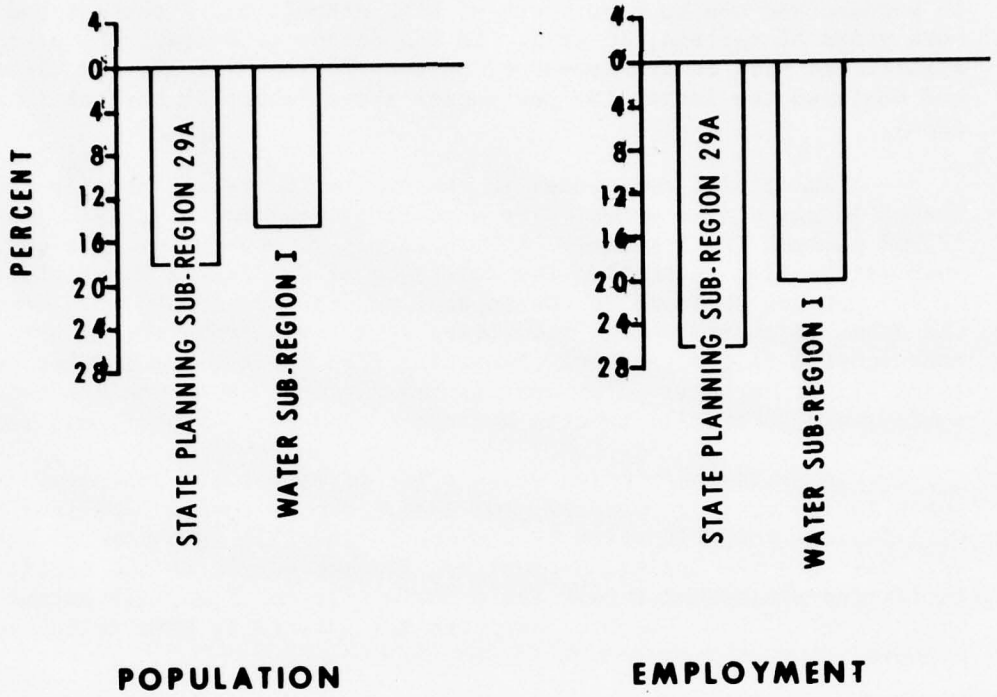

Figure 17-21 - Population and Employment Changes from 1950-1965 in State Planning Sub-region 29A Compared to Water Sub-region I.

In 1960, 50.8 percent of families had incomes of under $2,000. Further, 65.5 percent of families had incomes under $3,000. About 3.3 percent of families had incomes over $10,000. This reflects the high unemployment rates as well as the rural, subsistence agricultural economy.

Real unemployment is above state and national averages. In 1965, the unemployment rate for the area was 7.0 percent, and has remained constant since 1962 (7.2 percent). In contrast, the Appalachian Region has had a decline in the unemployment rate from 7.1 percent to 5.2 percent.

Education attainment in State Planning Sub-region 29A is illustrative of an area with rural, subsistence agriculture orientation where 76 percent of the population had one to eight years of elementary school, 14 percent had one to four years of high school, and 7 percent had one or more years of college, in 1960. In the decade 1950-1960, there was a significant rise in the number of persons 25 years of age and older who had achieved the latter two categories above (about 25 percent in each case).

Industrial employment in the sub-region is not heavily concentrated in any single group. The area total employment in 1960 was 17,903 persons (both sexes). Approximately 20 percent of this employment was female, reflecting the existence of needlework and textiles. Of 991 persons employed in the apparel manufacturing, 948 were women. The other major employment industries were agriculture (8,117 persons), construction (1,102 persons), furniture (783 persons), and other retail trade (1,431 persons). The area is heavily dependent upon subsistence agriculture (primarily tobacco and pastoral crops), timber, and textiles.

Poor transportation means exist in almost all counties. Most roads in the area are winding, two-lane, country roads. Corridor "J" will improve this situation by linking Burkesville with Somerset to the northeast and the Sparta, Cookeville, Tennessee area to the south. Rail facilities are absent except for a Louisville and Nashville extension to Greensburg in Casey County. Airports are private or have unlighted turf runways.

The state planning sub-region is best characterized as a bedroom area for the cities of Glasgow, Somerset, and Danville, Kentucky.

The tabulations in Tables 17-9 and 17-10 present the most recent socio-economic data for the state planning sub-region.

Burkesville, Kentucky. Burkesville is strategically located to become a service center for a large area of State Planning Area 29A. In contrast to adjoining Russell County, it is engaged in a dynamic program to improve and expand its water and sewage facilities, widening and modernizing city streets, and has a dynamic leadership, interested in and actively pursuing a program to acquire industrial sites.

Burkesville is a small town of 1,688 persons (1960 census) that will lie on Corridor "J" and thus be accessible to Somerset to the north and the primary growth centers of Cookeville, Sparta, Carthage, and Crossville, Tennessee.

TABLE 17-9

EMPLOYMENT BY SECTORS FOR 1950 AND 1960
KENTUCKY STATE PLANNING SUB-REGION 29A

	1950	1960	Absolute Change
TOTAL ALL SECTORS	21,518	17,911	- 3,607
PRIMARY ACTIVITIES	14,208	8,586	- 5,622
Agriculture	14,157	8,117	- 6,040
Forestry & Fisheries	1	9	8
Mining	50	460	410
SECONDARY ACTIVITIES	2,594	3,316	722
Contract Construction	1,268	1,012	- 256
Food & Kindred Products	98	230	132
Textile Mill Products	5	26	21
Apparel	129	991	862
Lumber, Wood Products, Furniture	966	783	- 183
Printing & Publishing	34	21	- 13
Chemicals & Allied Products	7	12	5
Electrical & Other Machinery	23	61	38
Motor Vehicles & Equipment	5	40	35
Other Transportation Equipt.	3	4	1
Other & Miscellaneous	56	136	80
TERTIARY ACTIVITIES	4,173	5,694	1,521
Transportation & Communications	349	346	- 3
Utilities & Sanitary Service	42	97	55
Wholesale Trade	185	212	27
Retail Trade	1,430	2,122	692
Finance, Ins. & Real Estate	123	163	40
Personal Services	1,038	1,065	27
Professional Services	607	1,134	527
Recreational Services	72	96	24
Public Administration	320	451	131
Armed Forces	7	8	1
NOT REPORTED	543	315	- 228

TABLE 17-10

SOCIO-ECONOMIC CHARACTERISTICS
KENTUCKY STATE PLANNING SUB-REGION 29A
(For Dates and Periods Indicated)

ESTIMATED POPULATION 1965		POPULATION 1960						
			Total	Male	Female	Rural Farm	Rural Non-Farm	Urban
Total	57,300	Number	59,186	29,846	29,340	35,021	24,165	-
Absolute Change 1960-1965	-1,900	Percent Distribution	100.00	50.43	49.57	59.17	40.83	-
Percent Change 1960-1965	- 3.2	Percent Change 1950-1960	-14.64	-15.79	-13.44	-31.69	33.73	-

DISTRIBUTION OF FAMILIES BY INCOME, 1960

	Under $2000	$2000-$2999	$3000-$5999	$6000-$9999	$10,000 & Over	Total
Number	7,731	2,249	3,549	1,194	507	15,230
Percent Distribution	50.76	14.77	23.30	7.84	3.33	100.00
Percent Change 1950-1960	-41.17	28.15	196.99	670.32	821.82	-9.70

EDUCATION OF PERSONS 25 YRS. AND OVER, 1960

	Total	1-8 Years Elementary School	1-4 Years High School	1 or More Yrs. of College
Number	31,879	24,278	4,534	2,103
Percent Distribution	100.00	76.16	14.22	6.60
Percent Change 1950-1960	-7.36	-10.71	27.36	22.63

Total includes persons who have never attended school, or who have less than one year of schooling.

EMPLOYMENT STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number	17,903	737	14,054	576	3,849	161
Percent Distribution	96.05	3.95	96.06	3.94	95.99	4.01
Percent Change 1950-1960	-16.77	107.02	-27.20	102.82	74.56	123.61

RATE OF UNEMPLOYMENT, 1962-65

1962	7.2
1963	6.5
1964	7.0
1965	7.0

LABOR FORCE STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force
Number	18,648	23,042	14,638	6,267	4,010	16,775
Percent Distribution	44.73	55.27	70.02	29.98	19.29	80.71
Percent Change 1950-1960	-14.75	-9.27	-25.30	39.76	75.95	-19.79

PERCENT CHANGE 1962-65 IN WORK FORCE, EMPLOYMENT AND UNEMPLOYMENT

	1965 Number	Chng. 1962-65 No.	Chng. 1962-65 %
Tot. Work Force	17.2	0.5	3.0
Tot. Employment	16.0	0.5	3.2
Unemployment	1.2	0.0	0.0

Includes persons in the Armed Forces.

State Planning Sub-region 29B

Monroe County is the lone element in State Planning Sub-region 29B that falls in Appalachia. It is separated for analysis from those counties that make up State Planning Sub-region 29A because its economic orientation is to Glasgow, Kentucky, to the west of Appalachia. In contrast, 29A is economically oriented to the east and north (Somerset and Danville, Kentucky). Tompkinsville is the county seat and has a population of 2,000 persons (1960). Figure 17-22 shows the portion of population and employment in Water Sub-region I that is located in State Planning Sub-region 29B.

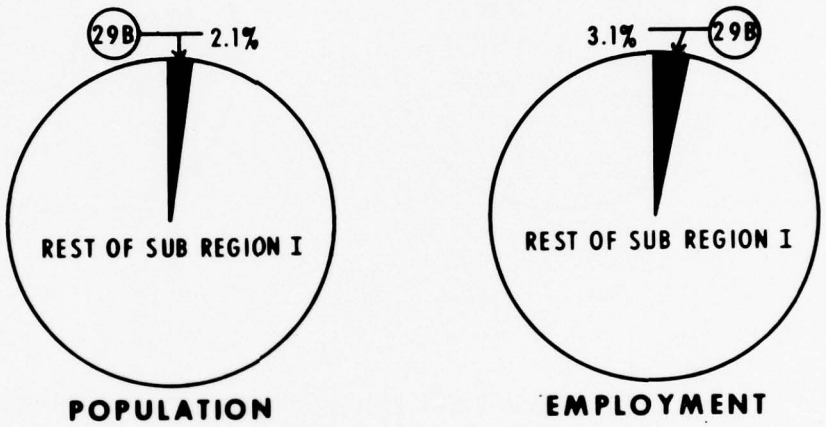

Figure 17-22 - Population and Employment in State Planning Sub-region 29B Compared to Water Sub-region I, 1965.

In 1960, there were 11,799 persons living in the county. Of these persons, 57 percent were rural farm, while 43 percent were classified as rural non-farm. Tompkinsville, with its very limited urban services, had a population of 2,000 persons, but was considered to be a small town rather than an urban center. Figure 17-23 shows the urban-rural population distribution for 1960.

Seventy percent of the population over 25 years of age has one

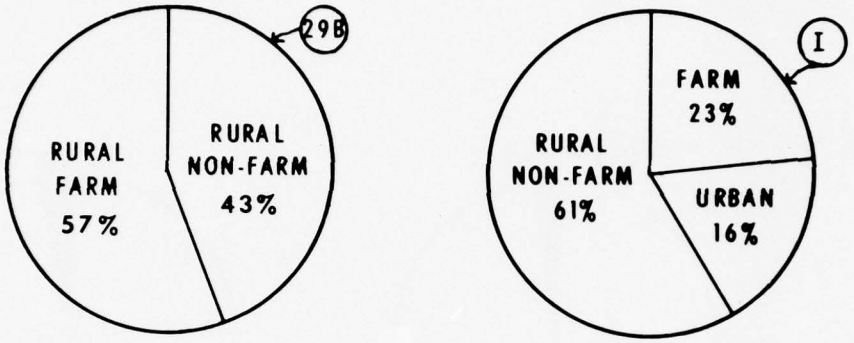

Figure 17-23 - Urban-Rural Population Distribution in State Planning Sub-region 29B Compared to Water Sub-region I, 1960.

Population loss through out-migration has been common. From 1960 to 1965, the county lost an estimated 4.2 percent of its population. From 1950 to 1960, the county experienced a decrease in population of 14.31 percent. Figure 17-24 shows percentage change in population and employment during the period 1950-1965.

Unemployment problems are not readily apparent, as unemployment rates have declined since 1962 (4.1 percent to 3.0 percent in 1965). When the distribution of income is examined, however, the marginal nature of the employment is revealed.

In 1960, 70 percent of the families had incomes below $3,000 per year. This figure is unchanged over that for 1950 except that more families have incomes closer to $13,000 in 1960. Only 3 percent of families have incomes of $10,000 or over.

TABLE 17-15

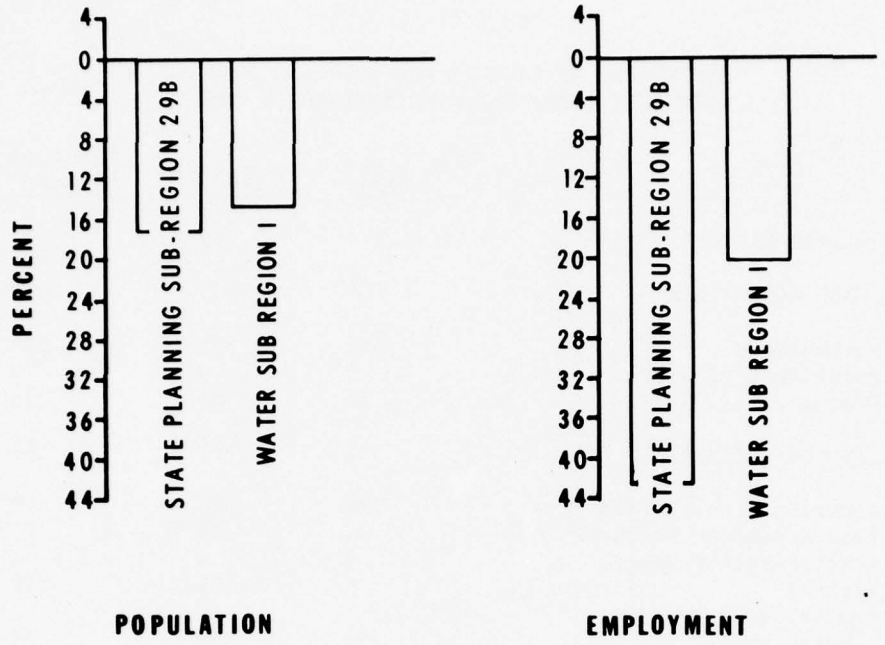

Figure 17-24 - Population and Employment Changes from 1950-1965 in State Planning Sub-region 29B Compared to Water Sub-region I.

Employment in the sub-region is primarily agricultural. Two small garment plants, and a concrete block and lumber mill, are extant. Underemployment is high, and many of the men are employed in Glasgow.

The entire state planning sub-region is one devoted to subsistence agriculture with no effective leadership dedicated to bringing about change. The road network is primarily country roads, which, with improvement, would facilitate commuting to Glasgow. Heavy rains produce water in the streets of Tompkinsville, but no serious flooding problems exist. There is developable land, but at the present time it has very limited accessibility and no utilities. The water supply in Tompkinsville is being used to capacity, as is the sewage treatment plant. The county is primarily a bedroom community for the service center of Glasgow.

The tabulation in Table 17-11 and 17-12 present the most recent socio-economic data for the state planning sub-region.

TABLE 17-16

SOCIO-ECONOMIC CHARACTERISTICS

TABLE 17-11

EMPLOYMENT BY SECTORS FOR 1950 AND 1960
KENTUCKY STATE PLANNING SUB-REGION 29B

	1950	1960	Absolute Change
TOTAL ALL SECTORS	4,274	3,949	- 325
PRIMARY ACTIVITIES	2,686	1,845	- 841
Agriculture	2,669	1,794	- 875
Forestry & Fisheries	1	0	- 1
Mining	16	51	35
SECONDARY ACTIVITIES	552	721	169
Contract Construction	198	208	10
Food & Kindred Products	34	63	29
Textile Mill Products	1	0	- 1
Apparel	5	223	218
Lumber, Wood Products, Furniture	289	188	- 101
Printing & Publishing	10	14	4
Chemicals & Allied Products	0	0	0
Electrical & Other Machinery	1	0	- 1
Motor Vehicles & Equipment	3	0	- 3
Other Transportation Equipt.	0	4	4
Other & Miscellaneous	11	21	10
TERTIARY ACTIVITIES	919	1,268	349
Transportation & Communications	89	47	- 42
Utilities & Sanitary Service	29	34	5
Wholesale Trade	48	37	- 11
Retail Trade	330	447	117
Finance, Ins. & Real Estate	24	44	25
Personal Services	211	260	49
Professional Services	114	302	188
Recreational Services	5	12	7
Public Administration	69	85	16
Armed Forces	0	0	0
NOT REPORTED	117	115	- 2

TABLE 17-12

SOCIO-ECONOMIC CHARACTERISTICS
KENTUCKY STATE PLANNING SUB-REGION 29B
(For Dates and Periods Indicated)

ESTIMATED POPULATION 1965	
Total	11,300
Absolute Change 1960-1965	- 500
Percent Change 1960-1965	- 4.2

POPULATION 1960						
	Total	Male	Female	Rural Farm	Rural Non-Farm	Urban
Number	11,799	5,995	5,804	6,687	5,112	-
Percent Distribution	100.00	50.81	49.19	56.67	43.33	-
Percent Change 1950-1960	-14.31	-16.28	-12.18	-32.41	31.85	-

DISTRIBUTION OF FAMILIES BY INCOME, 1960

	Under $2000	$2000-$2999	$3000-$5999	$6000-$9999	$10,000 & Over	Total
Number	1,629	503	660	148	90	3,030
Percent Distribution	53.76	16.60	21.78	4.88	2.97	100.00
Percent Change 1950-1960	-40.33	52.42	221.95	492.00	500.00	-12.05

EDUCATION OF PERSONS 25 YRS. AND OVER, 1960

	Total	1-8 Years Elementary School	1-4 Years High School	1 or More Yrs. of College
Number	6,386	4,828	963	349
Percent Distribution	100.00	75.60	15.08	5.47
Percent Change 1950-1960	-7.18	-16.47	75.09	66.19

Total includes persons who have never attended school, or who have less than one year of schooling.

EMPLOYMENT STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number	3,949	213	3,038	128	911	85
Percent Distribution	94.88	5.12	95.96	4.04	91.47	8.53
Percent Change 1950-1960	-7.60	419.51	-22.20	265.71	146.88	1,316.67

RATE OF UNEMPLOYMENT, 1962-65

1962	4.1
1963	3.7
1964	3.8
1965	3.0

LABOR FORCE STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force
Number	4,162	4,217	3,166	1,045	996	3,172
Percent Distribution	49.67	50.33	75.18	24.82	23.90	76.10
Percent Change 1950-1960	-3.55	-17.88	-19.65	10.93	165.60	-24.35

Includes persons in the Armed Forces.

PERCENT CHANGE 1962-65 IN WORK FORCE, EMPLOYMENT AND UNEMPLOYMENT

	1965 Number	Chng.1962-65 No.	Chng.1962-65 %
Tot.Work Force	4.2	0.4	10.5
Tot.Employment	4.0	0.3	8.1
Unemployment	0.2	0.1	100.0

State Planning Sub-region 30

This sub-region lies to the east of State Planning Sub-region 29A and north of the Tennessee line. The area is composed of four Kentucky counties; Clinton, Wayne, McCreary and Pulaski. Subsistence agriculture (pastoral crops), textiles and lumber (furniture) dominate the economy. Somerset, in Pulaski County, is the dominant urban place.

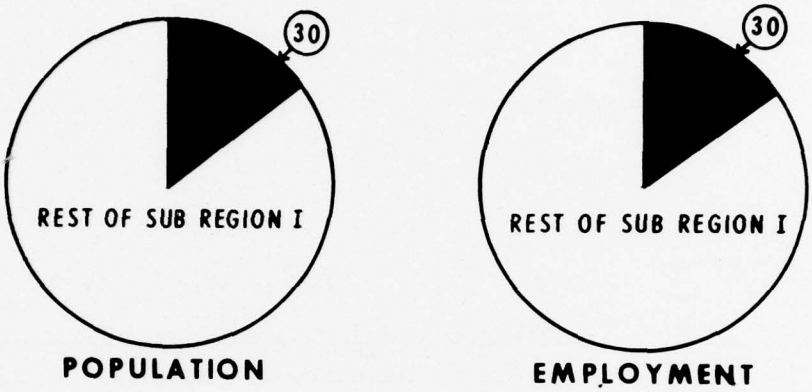

Figure 17-25 - Population and Employment in State Planning Sub-region 30 Compared to Water Sub-region I, 1965.

The population of the area has decreased since 1950, and has stabilized at about 70,500 persons since 1960. Somerset has been the one town to gain significantly in population (to 7,112 persons). Area population has declined 14.1 percent since 1950. The urbanized area of Monticello in Wayne County has maintained its population and Somerset has grown.

Unemployment in the sub-region has been above state and national averages. Disguised unemployment persists in rural areas, although migration to urban areas, at least for unemployment, has reduced the rural farm population 44.8 percent (1950-1960). Unemployment rates have declined from 9.9 percent in 1962, to 7.6 percent in 1965. In 1964, the unemployment rate was 10.0 percent, a deviation from the trend.

Education attainment statistics in 1960 indicated that 75 percent of the population had one to eight years of school, 17.3 percent had one to four years of high school and 6 percent had one or more years of college. A rising trend in attainment (1950-1960) had occurred.

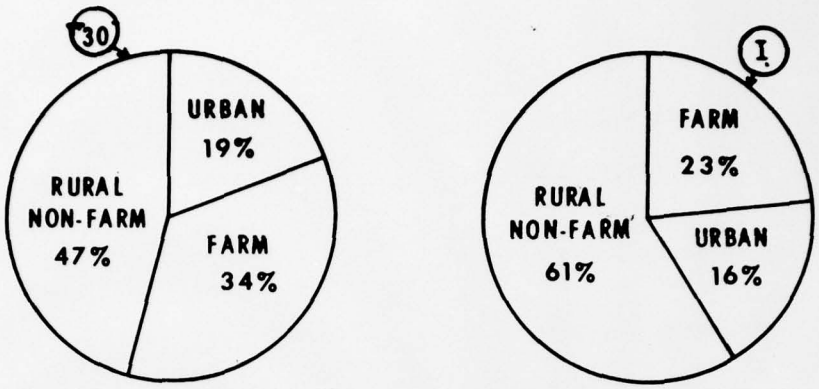

Figure 17-26 - Urban-Rural Population Distribution in State Planning Sub-region 30 Compared to Water Sub-region I, 1960.

In the state planning sub-region, 66 percent of the families had an income of less than $3,000 in 1960. Seven percent had incomes of $6,000-$9,999 and only 2.7 percent had incomes of $10,000 or more. The highest income per family was in Pulaski County.

Employment is not heavily concentrated in any one industry. Agriculture dominates the economy, primarily in beef, tobacco and lumber (timber). Furniture, apparel and retail trade are the most important industry employments, most of which occurs in Somerset. Agriculture accounts for 35 percent of the employment, while another 20 percent is in manufacturing (as above). Retail trade accounts for about 40 percent of the remaining.

Transportation is generally inadequate. Airports exist at Somerset, with paved and lighted runways; unpaved and unlighted runways are at the airports in Albany and Monticello. The Cincinnati, New Orleans and Texas Pacific Railroad runs from Lexington through Somerset, Burnside and Whitley City to Chattanooga, Tennessee, and Birmingham, Alabama. Corridor "J" will run from Burkesville in Cumberland County (State Planning Sub-region 29A) northeastward through Monticello in Wayne County and Somerset in Pulaski County. The tabulations in Tables 17-13 and 17-14 present the most recent socio-economic data for the state planning sub-region.

TABLE 17-13

EMPLOYMENT BY SECTORS FOR 1950 AND 1960
KENTUCKY STATE PLANNING SUB-REGION 30

	1950	1960	Absolute Change
TOTAL ALL SECTORS	22,465	18,616	- 3,849
PRIMARY ACTIVITIES	11,360	6,493	- 4,867
Agriculture	9,988	5,771	- 4,217
Forestry & Fisheries	23	77	54
Mining	1,349	645	- 704
SECONDARY ACTIVITIES	3,781	4,038	257
Contract Construction	1,651	1,098	- 553
Food & Kindred Products	132	362	230
Textile Mill Products	8	-	- 8
Apparel	343	971	628
Lumber, Wood Products, Furniture	1,322	1,045	- 277
Printing & Publishing	58	61	3
Chemicals & Allied Products	28	143	115
Electrical & Other Machinery	62	117	55
Motor Vehicles & Equipment	20	28	8
Other Transportation Equipt.	-	8	8
Other & Miscellaneous	157	205	48
TERTIARY ACTIVITIES	6,850	7,357	507
Transportation & Communications	1,171	908	- 263
Utilities & Sanitary Service	145	186	41
Wholesale Trade	377	331	- 46
Retail Trade	2,228	2,400	172
Finance, Ins. & Real Estate	214	228	14
Personal Services	1,230	1,327	97
Professional Services	950	1,351	401
Recreational Services	81	84	3
Public Administration	441	520	79
Armed Forces	13	22	9
NOT REPORTED	474	728	254

TABLE 17-14

SOCIO-ECONOMIC CHARACTERISTICS
KENTUCKY STATE PLANNING SUB-REGION 30
(For Dates and Periods Indicated)

ESTIMATED POPULATION 1965	
Total	70,600
Absolute Change 1960-1965	100
Percent Change 1960-1965	0.14

POPULATION 1960						
	Total	Male	Female	Rural Farm	Rural Non-Farm	Urban
Number	70,452	35,241	35,211	23,729	33,026	13,697
Percent Distribution	100.00	50.02	49.98	33.68	46.88	19.44
Percent Change 1950-1960	-14.28	-15.39	-13.14	-44.82	13.25	36.54

DISTRIBUTION OF FAMILIES BY INCOME, 1960

	Under $2000	$2000-$2999	$3000-$5999	$6000-$9999	$10,000 & Over	Total
Number	8,645	2,810	4,106	1,256	462	17,279
Percent Distribution	50.03	16.26	23.76	7.27	2.67	100.00
Percent Change 1950-1960	-34.88	6.24	110.56	373.96	443.53	-7.62

EDUCATION OF PERSONS 25 YRS. AND OVER, 1960

	Total	1-8 Years Elementary School	1-4 Years High School	1 or More Yrs. of College
Number	35,860	26,345	6,205	2,162
Percent Distribution	100.00	73.47	17.30	6.03
Percent Change 1950-1960	-6.03	-11.49	20.37	12.90

Total includes persons who have never attended school, or who have less than one year of schooling.

EMPLOYMENT STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number	18,594	1,167	14,321	930	4,273	273
Percent Distribution	94.09	5.91	93.90	6.10	94.75	5.25
Percent Change 1950-1960	-17.18	41.11	-26.26	29.17	40.93	121.50

RATE OF UNEMPLOYMENT, 1962-65

1962	9.9
1963	8.6
1964	10.0
1965	7.6

LABOR FORCE STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force
Number	19,783	28,140	15,273	8,409	4,510	19,731
Percent Distribution	41.28	58.72	64.49	35.51	18.60	81.40
Percent Change 1950-1960	-15.07	-8.87	-24.21	17.05	43.58	-16.73

Includes persons in the Armed Forces.

PERCENT CHANGE 1962-65 IN WORK FORCE, EMPLOYMENT AND UNEMPLOYMENT

	1965 Number	Chng. 1962-65 No.	Chng. 1962-65 %
Tot. Work Force	19.8	0.5	2.6
Tot. Employment	18.3	0.9	5.2
Unemployment	1.5	-0.4	-21.1

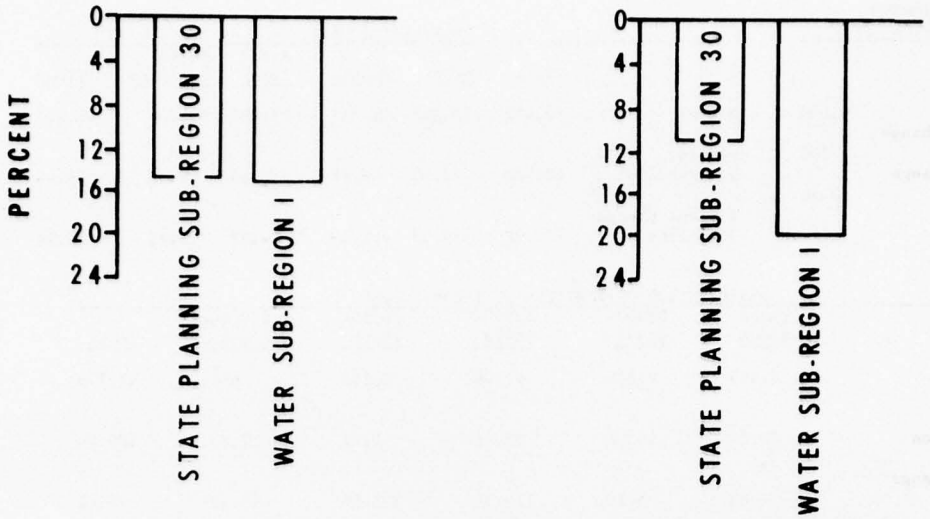

Figure 17-27 - Population and Employment Changes from 1950-1965 in State Planning Sub-region 30 Compared to Water Sub-region I.

Somerset, Kentucky. Somerset has complete utilities and a virtually unlimited water supply due to its proximity to Lake Cumberland. Corridor "J" will connect Somerset with London and I-75 to the east and Burkesville, Kentucky, Sparta-Cookeville, Tennessee to the south. The school system has been improved and the University of Kentucky has an extension in the area.

Medical facilities in existence have made Somerset a center for south central Kentucky. Open land in Pulaski County exists to permit expansion of industry.

The area leaders have created a Planning and Zoning Commission in an effort to control growth and protect sites. Railroad facilities make the location of industries producing goods with high value to weight, attractive.

Financial services are in abundance here in Pulaski County, which has five commercial banks.

McCreary County, Kentucky. Almost 70 percent of McCreary County lies in national forest. This county, along with Clinton, does not provide urbanized areas for growth. Lack of industry or transportation in all counties but Pulaski inhibit their growth.

State Planning Sub-region 31

This state planning area differs radically from the other three in the Kentucky portion of Sub-region I. The difference stems from the potential of the area and the amount of development that has occurred. There are eight counties that comprise this planning sub-region; Rockcastle, Jackson, Clay, Laurel, Whitley, Knox, Bell, and Harlan. Economic orientation is toward the communities of London, Corbin, and Williamsburg, which lie along Interstate 75 (north-south from Lexington to Knoxville), in the counties of Laurel and Whitley. Another economic linkage exists along the cities of Barbourville, Pineville, Harlan, and Middlesboro. The first three cities in this second group are characterized by limited area for expansion and Middlesboro is closely linked with Knoxville to the south and Bristol to the east. Furniture, lumber, light manufacturing, mining, and textiles provide the greatest employment in industry, while subsistence agriculture and beef comprise the largest single employment group.

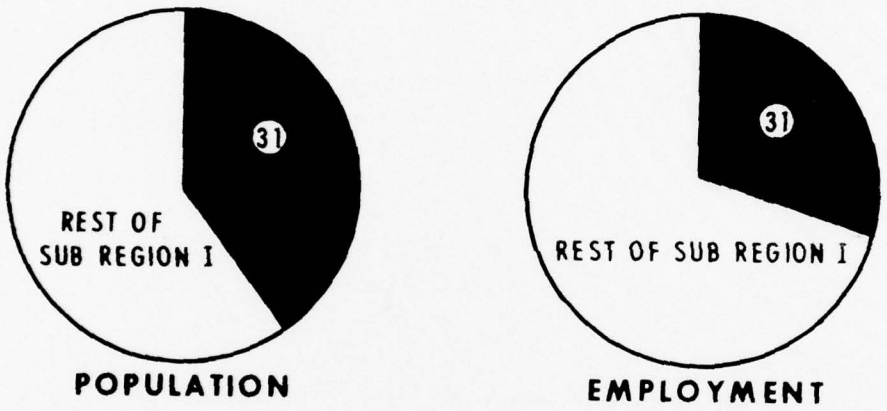

Figure 17-28 - Population and Employment in State Planning Sub-region 31 Compared to Water Sub-region I, 1965.

The population within the region is decreasing; however, some of the urbanized areas have either maintained their absolute level of population or have increased in population. Barbourville, Williamsburg, and London have increased in population.

Figure 17-29 - Urban-Rural Population Distribution in State Planning Sub-region 31 Compared to Water Sub-region I, 1960.

Sub-regional population declined 3.0 percent from 1960 to 1965. Out-migration from all areas has occurred, with the exception of Barbourville (Knox County) and London (Laurel County). The major growth will continue to occur in the London-Corbin-Williamsburg area as I-75 is extended toward Knoxville, Tennessee.

The rate of unemployment has remained higher than Appalachian and United States averages. Disguised unemployment among males persists in this state planning sub-region.

Median family incomes vary by county groupings. The northern four counties of State Planning Sub-region 31 had a median family income of $1,944 in 1960 (Clay, Jackson, Laurel, and Rockcastle Counties). The southern group of counties had a median income of $2,452 in 1960 (Bell, Harlan, Knox, and Whitley Counties). The Kentucky median income was approximately $2,500 for 1960. The U.S. median income for 1960 was $5,660.

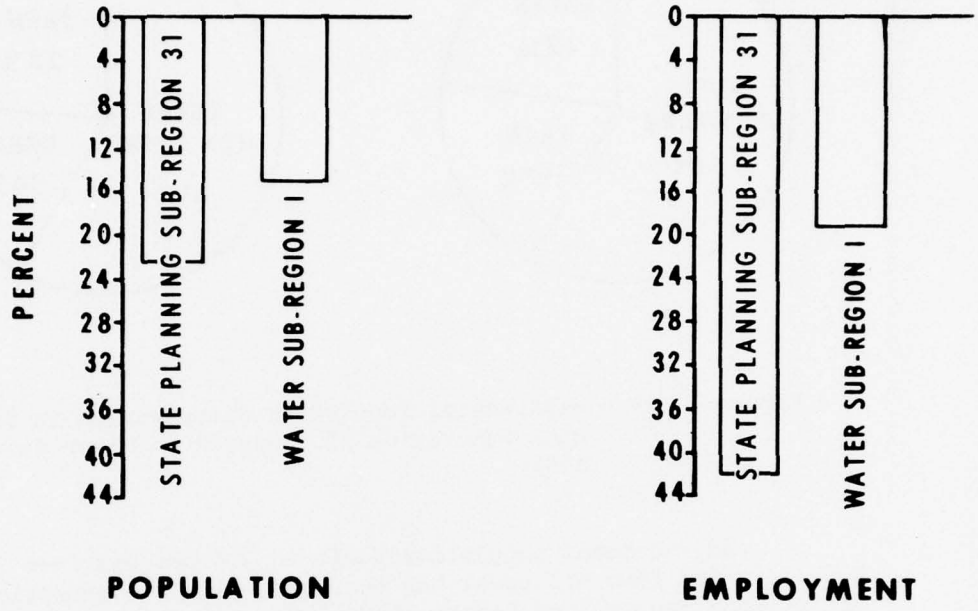

Figure 17-30 - Population and Employment Changes from 1950-1965 in State Planning Sub-region 31 Compared to Water Sub-region I.

Seventy percent of the population over 25 years of age has one to eight years of elementary schooling. Twenty percent have one to four years of high school and only seven percent have one or more years of college. Education attainment is highest in Laurel and Whitley Counties (8.1 and 8.3 years average, respectively).

Employment varies with the grouping of counties. In the northern group of counties (Clay, Jackson, Laurel, and Rockcastle) total employment was 15,111 persons in 1960. Of this total, 4,401 were in agriculture, 1,511 in mining, 1,348 in manufacturing (furniture and food products), 2,200 in retail trade, and the largest remaining group in services (approximately 3,000).

In the southern group of counties (Bell, Harlan, Knox, and Whitley) total employment was 28,912 persons in 1960. Of this total, 1,450 were in agriculture, 6,200 in mining, 3,000 in manufacturing (furniture and food products), 6,000 in retail trade, and 7,000 in services.

Most of the employment in manufacturing is located in Middlesboro (Bell County) and along I-75 in London-Corbin-Williamsburg.

Transportation facilities are mixed in their ability to handle further growth. Interstate 75 will provide the best road facilities (London-Corbin-Williamsburg) and already has generated development along finished portions. Improved State Route 119 connecting Harlan, Pineville, and Middlesboro with improved 25E will serve that area. Improved airports are located at London and Williamsburg; however, London is the only city in the area with scheduled airline service. New airport facilities are scheduled for Harlan.

The tabulations in Tables 17-15 and 17-16 present the most recent socio-economic data for the state planning sub-region.

London-Corbin-Williamsburg, Kentucky. Because of common characteristics - close proximity along I-75, similar industrial economic orientation, and topographical constraints to development - these three cities are considered together. This area is located midway between Lexington, Kentucky, and Knoxville, Tennessee. Rail and commercial air facilities are available and the terrain is level to rolling to the west of these towns, thus providing sites for development.

With the feeder routes improved, this three-city growth node could provide employment for much of eastern Kentucky. Leadership is progressive and is attempting to make the area attractive to potential developers.

London has all utilities; gas, water, and electricity. A junior college is located there, and the school system is undergoing

TABLE 17-15

EMPLOYMENT BY SECTORS FOR 1950 AND 1960
KENTUCKY STATE PLANNING SUB-REGION 31

	1950	1960	Absolute Change
TOTAL ALL SECTORS	66,526	44,060	-22,466
PRIMARY ACTIVITIES	35,816	13,612	-22,204
Agriculture	16,086	5,852	-10,234
Forestry & Fisheries	51	89	38
Mining	19,679	7,671	-12,008
SECONDARY ACTIVITIES	7,011	6,569	- 442
Contract Construction	2,550	2,307	- 243
Food & Kindred Products	593	785	192
Textile Mill Products	214	36	- 178
Apparel	293	372	79
Lumber, Wood Products, Furniture	2,203	1,629	- 574
Printing & Publishing	179	223	44
Chemicals & Allied Products	82	95	13
Electrical & Other Machinery	190	226	36
Motor Vehicles & Equipment	204	185	- 19
Other Transportation Equipt.	6	106	100
Other & Miscellaneous	497	605	108
TERTIARY ACTIVITIES	22,694	22,468	- 226
Transportation & Communications	4,407	2,855	- 1,552
Utilities & Sanitary Service	536	505	- 31
Wholesale Trade	1,138	966	- 172
Retail Trade	7,049	6,910	- 139
Finance, Ins.& Real Estate	535	679	144
Personal Services	3,997	3,724	- 273
Professional Services	3,306	5,079	1,773
Recreational Services	381	250	- 131
Public Administration	1,309	1,463	154
Armed Forces	36	37	1
NOT REPORTED	1,005	1,411	406

TABLE 17-16

SOCIO-ECONOMIC CHARACTERISTICS
KENTUCKY STATE PLANNING SUB-REGION 31
(For Dates and Periods Indicated)

ESTIMATED POPULATION 1965		POPULATION 1960						
			Total	Male	Female	Rural Farm	Rural Non-Farm	Urban
Total	200,000	Number	206,176	102,345	103,831	34,688	125,599	45,889
Absolute Change 1960-1965	-6,200	Percent Distribution	100.00	49.64	50.36	16.82	60.92	22.26
Percent Change 1960-1965	- 3.0	Percent Change 1950-1960	-19.98	-21.34	-18.58	-60.38	10.30	-18.38

DISTRIBUTION OF FAMILIES BY INCOME, 1960

	Under $2000	$2000-$2999	$3000-$5999	$6000-$9999	$10,000 & Over	Total
Number	21,946	7,245	12,256	4,789	1,399	47,635
Percent Distribution	46.07	15.21	25.71	10.05	2.94	100.00
Percent Change 1950-1960	-35.23	-35.80	37.09	409.47	171.65	-16.09

EDUCATION OF PERSONS 25 YRS. AND OVER, 1960

	Total	1-8 Years Elementary School	1-4 Years High School	1 or More Yrs. of College
Number	99,512	68,767	19,715	7,051
Percent Distribution	100.00	69.10	19.81	7.09
Percent Change 1950-1960	-12.49	-17.79	12.85	0.09

Total includes persons who have never attended school, or who have less than one year of schooling.

EMPLOYMENT STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number	44,023	4,953	33,234	4,280	10,789	673
Percent Distribution	89.89	10.11	88.59	11.41	94.13	5.87
Percent Change 1950-1960	-33.79	85.71	-41.79	92.36	14.85	52.26

RATE OF UNEMPLOYMENT, 1962-65

1962	13.7
1963	12.3
1964	11.9
1965	12.5

LABOR FORCE STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force
Number	49,013	88,035	37,551	29,388	11,462	58,647
Percent Distribution	35.76	64.24	56.10	43.90	14.35	85.65
Percent Change 1950-1960	-29.16	-7.15	-36.73	28.79	16.47	-18.54

Includes persons in the Armed Forces.

PERCENT CHANGE 1962-65 IN WORK FORCE, EMPLOYMENT AND UNEMPLOYMENT

	1965 Number	Chng.1962-65 No.	%
Tot.Work Force	43,300	300	0.7
Tot.Employment	37,900	800	2.2
Unemployment	5,400	-500	-8.5

consolidation. Industry has located here, but its attraction has been low wages (needlework). Beef is becoming the principal "cash" crop. Land is available for industrial development.

Corbin has been experiencing industrial growth in recent years, and additional land suitable for development is available.

Williamsburg is on the Cumberland River and has more limited land for expansion. Corbin is more closely tied to Laurel and Knox Counties than to the rest of Whitley County. Corbin's sewage and water systems have been improved and the leaders in Corbin have actively sought industry. Corbin is seeking legal permission (ability) to annex surrounding territory and to zone and plan its development. Needlework, and its associated cheap labor, is being supplanted by other industries ranging from greeting cards to metals fabricating. Adequate water supply will be available for foreseeable future upon completion of Laurel River Reservoir.

Williamsburg, with its proximity to the Daniel Boone National Forest, will provide recreational and residential facilities for those employed in Corbin, London, and Middlesboro.

Middlesboro, Kentucky. This community of 15,000 persons is located in southeastern Kentucky, where Kentucky, Virginia, and Tennessee converge. It is located in a natural basin, approximately five miles in diameter. It is a planned city, one of the few in the U.S., and thus has wide streets capable of handling high traffic volume. It has a complete utilities system.

The school system is reported to be outstanding in eastern Kentucky. Two four-year liberal arts colleges are within commuting distance. Outdoor recreation facilities abound within easy driving distances and the city is improving its parks and playgrounds.

Most level land is currently utilized; however, about 150 acres, in three different sites, exists for further industrial expansion. In addition, there are large tracts of developable land on nearby sites in Virginia and Tennessee.

Although rail facilities are available, the highway network has been a limiting factor in this area's economic development. Corridor "F" (to the south of Middlesboro) and improvement of U.S. 25E will improve access to I-75 and the growth nodes of London, Corbin, and Williamsburg. Middlesboro has a small airport, but the facility does not provide scheduled commercial service.

Improved flood protection in Middlesboro will facilitate construction of houses and aid in the development of the community as a population center providing the labor force for the London-Corbin-Williamsburg area as well as cities to the east. The recently completed flood plain information report for Middlesboro will provide data which will assist planners in the wise use and development of flood plain lands.

Water Sub-Area I-2

Water Sub-Area I-2 is comprised of State Planning Sub-region 38 and contains all of the Tennessee portion of Water Sub-region I.

State Planning Sub-region 38

Twelve counties in north-central Tennessee comprise this planning sub-region. The counties comprising the region are Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Overton, Macon, Pickett, Putnam, Smith, and White. The region is directly below the Kentucky portion of Sub-region I and between Nashville and Knoxville, Tennessee. Economically, the area is dependent upon subsistence agriculture (beef), textiles, and recreation. Light manufacturing has developed along Interstate 40 (extending east-west between Nashville and Knoxville, Tennessee) and along the proposed route of Corridor "J" (extending north-south from Rockcastle County, Kentucky, through Clay, Putnam, and White Counties in Tennessee).

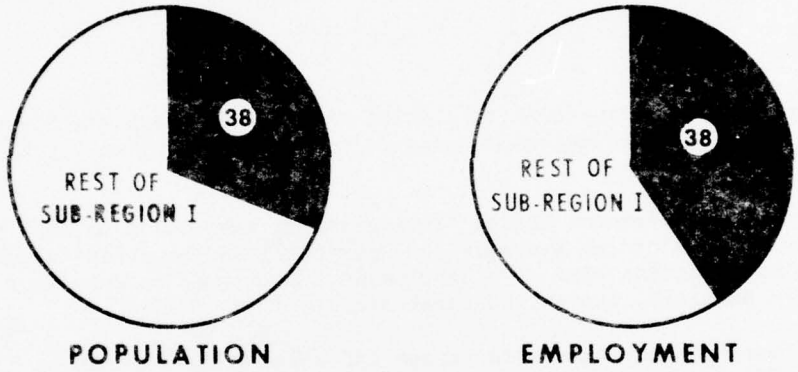

Figure 17-31 - Population and Employment in State Planning Sub-region 38 Compared to Water Sub-region I, 1965.

The population has increased in State Planning Sub-region 38 between 1960-1965 (4.5 percent). The increase has occurred in Cumberland, DeKalb, Fentress, Overton, Putnam, Smith, and White Counties. The largest increase occurred in Putnam County (12.1 percent). The other counties in the sub-region have decreased with the largest decrease occurring in Pickett County (-8.3 percent).

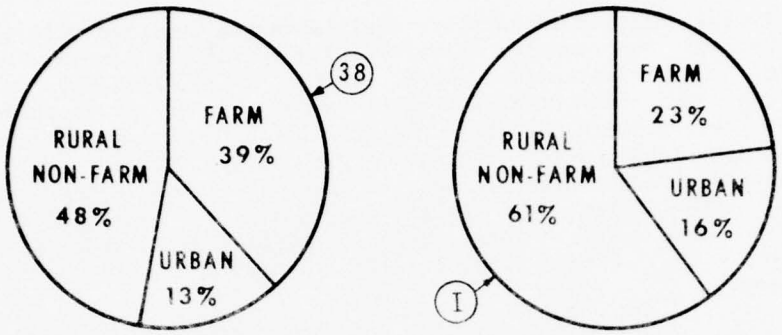

Figure 17-32 - Urban-Rural Population Distribution in State Planning Sub-region 38 Compared to Water Sub-region I, 1960.

Real unemployment in the state planning sub-region is less than Tennessee and Appalachian averages (4.7 percent), and compares favorably with the United States rate of unemployment. Disguised unemployment among males persists, though, in rural areas.

Median family income in Putnam ($2,839) is the highest in Planning Area 38, a dramatic contrast to the national average ($5,660). Planning area counties vary in median income from $1,684 (Jackson County) to $2,839 (Putnam County). The state median family income is $3,949.

The average educational attainment is greatest in DeKalb, Fentress, and Smith Counties (8.3 years). The state average educational attainment is 8.8 years.

Employment is not heavily concentrated in any industry, being relatively equally divided between primary, secondary, and tertiary activities (14,037; 18,049; and 17,782, respectively). Agriculture is the largest single employment group (12,975). In manufacturing, the principal industries are apparel (8,202), contract construction (3,680), and lumber, wood products, and furniture (2,668). In the tertiary activities, the major employment groups are retail trade (5,928), professional services (4,129), personal services (3,113), public administration (1,354), and transportation and communications (1,298).

The tabulation in Tables 17-17 and 17-18 present the most recent socio-economic data for the state planning sub-region.

Cookeville, Tennessee. Located at the intersection of Appalachian Corridor "J" and Interstate 40, Cookeville has demonstrated its potential by doubling its population between 1960 and 1967. Historically, the city and Putnam County have depended upon agriculture and light manufacturing for their livelihood. Recently Cookeville has been selected to participate in the "model cities" program.

Agriculture production consists of cash grain, tobacco, and fruit and nut products. Tobacco is the largest volume crop. Cash grain crops have grown from negligible amounts in 1959 to a level involving 31 farms by 1964. Mineral resources in the area consist of coal mined for local consumption and crushed and agricultural limestone.

Industry is of the light manufacturing type. In order of importance (by number of employees) the industries are filtration equipment, clothing, automotive accessories, brushes and brush handles, and furniture. Two new industrial locations have occurred along I-40 at the proposed junction with the Appalachian Corridor.

Cookeville is the location of Tennessee Technological University. The coeducational, technical university offers programs leading to Bachelors and Masters degrees. The faculty of 200 serves approximately 5,200 students and the college is accredited by the Southern Association of Secondary Schools and Colleges.

Two commercial banks with assets of about 42 million dollars are in Cookeville. In additon, there is one savings and loan bank with assets of 15 million dollars.

Electric and gas utilities are available within Putnam County. Cookeville has no gravity flow/lift station sewage disposal system. Water lines have been extended from Cookeville to subdivisions and nearby utility districts.

In 1966, total industrial employment in the Cookeville area was 6,341 persons. Manufacturing employment was 4,130 persons and the average wage was $3,661 in 1966. Total payroll was approximately 22 million dollars in 1966. In additon, there were 1,870 farmers in the county. Approximately 300 high school graduates are available for employment in the county every year.

Recreation is a growing industry in the Cookeville area. Fifteen hotels and motels exist there, with 10 restaurants, one park, two golf courses, and two country clubs.

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TABLE 17-17

EMPLOYMENT BY SECTORS FOR 1950 AND 1960
TENNESSEE STATE PLANNING SUB-REGION 38

	1950	1960	Absolute Change
TOTAL ALL SECTORS	51,416	51,119	- 297
PRIMARY ACTIVITIES	26,834	14,037	- 12,297
Agriculture	25,021	12,975	- 12,046
Forestry & Fisheries	110	134	24
Mining	1,703	928	- 775
SECONDARY ACTIVITIES	9,946	18,049	8,103
Contract Construction	3,047	3,680	633
Food & Kindred Products	407	667	260
Textile Mill Products	357	274	83
Apparel	1,701	8,202	6,501
Lumber, Wood Products, Furniture	3,452	2,668	- 784
Printing & Publishing	125	207	82
Chemicals & Allied Products	59	148	89
Electrical & Other Machinery	48	227	179
Motor Vehicles & Equipment	69	321	252
Other Transportation Equipt.	8	104	96
Other & Miscellaneous	673	1,551	878
TERTIARY ACTIVITIES	13,577	17,782	4,205
Transportation & Communi-cations	1,274	1,298	24
Utilities & Sanitary Service	338	321	- 17
Wholesale Trade	520	805	285
Retail Trade	4,456	5,928	1,472
Finance, Ins. & Real Estate	356	621	265
Personal Services	2,332	3,113	781
Professional Services	3,043	4,129	1,086
Recreational Services	168	155	- 13
Public Administration	1,061	1,354	293
Armed Forces	29	58	29
NOT REPORTED	1,059	1,251	192

TABLE 17-18

SOCIO-ECONOMIC CHARACTERISTICS
TENNESSEE STATE PLANNING SUB-REGION 38
(For Dates and Periods Indicated)

ESTIMATED POPULATION 1965	
Total	163,400
Absolute Change 1960-1965	7,000
Percent Change 1960-1965	4.5

POPULATION 1960						
	Total	Male	Female	Rural Farm	Rural Non-Farm	Urban
Number	156,417	77,804	78,613	61,857	74,760	19,800
Percent Distribution	100.00	49.74	50.26	39.55	47.80	12.66
Percent Change 1950-1960	-9.13	-10.54	-7.68	-42.09	38.22	76.42

DISTRIBUTION OF FAMILIES BY INCOME, 1960

	Under $2000	$2000-$2999	$3000-$5999	$6000-$9999	$10,000 & Over	Total
Number	17,728	6,978	10,609	3,406	1,046	39,767
Percent Distribution	44.58	17.55	26.68	8.56	2.63	100.00
Percent Change 1950-1960	-39.88	29.94	187.90	508.21	345.11	-2.16

EDUCATION OF PERSONS 25 YRS. AND OVER, 1960

	Total	1-8 Years Elementary School	1-4 Years High School	1 or More Yrs. of College
Number	83,479	58,385	16,806	5,403
Percent Distribution	100.00	69.94	20.13	6.47
Percent Change 1950-1960	-1.78	-8.03	32.75	14.96

Total includes persons who have never attended school, or who have less than one year of schooling.

EMPLOYMENT STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number	51,061	3,056	34,676	2,104	16,385	952
Percent Distribution	94.35	5.65	94.28	5.72	94.51	5.49
Percent Change 1950-1960	-0.63	100.26	-20.07	76.51	104.71	185.03

RATE OF UNEMPLOYMENT, 1962-65

1962	6.6
1963	7.0
1964	6.6
1965	4.5

LABOR FORCE STATUS BY SEX - 14 AND OVER, 1960

	Total		Male		Female	
	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force	In Labor Force	Out of Labor Force
Number	54,175	57,557	36,838	18,251	17,337	39,306
Percent Distribution	48.49	51.51	66.87	33.13	30.61	69.39
Percent Change 1950-1960	2.69	-11.54	-17.05	23.19	107.78	-21.78

Includes persons in the Armed Forces.

PERCENT CHANGE 1962-65 IN WORK FORCE, EMPLOYMENT AND UNEMPLOYMENT

	1965 Number	Chng. 1962-65 No.	%
Tot. Work Force	57,700	2,600	4.7
Tot. Employment	55,100	3,600	7.0
Unemployment	2,600	-1,000	-27.8

A transportation network is provided by Interstate 40, U.S. 70-N, and four state highways. The Louisville and Nashville Railroad, Continental Trailways Bus Company, and five trucking companies are available for commercial freight. Commercial air traffic is routed through Nashville.

Gainesboro, Tennessee. Located at the intersection of three state highways (53, 56 and 85) in Jackson County, Gainesboro has experienced modest population gain since 1960. Historically, Jackson County has been agriculturally oriented. The apparel industry accounts for the bulk of industrial employment.

Agriculture production consists of tobacco and cash grain crops. In addition, livestock, poultry, and dairy products contribute almost half of the value of the total agricultural product. The value of all agricultural products sold in 1964 was 2.8 million dollars. Of a total of 477 farms engaged in vegetable, fruit, and nut production, 441 were engaged in tobacco. Two hundred and eighty six farms are in husbandry. The major mineral resource of the area is limestone. Large quantities of sand and gravel are also available.

Industry is limited virtually to apparel. In 1966, of 672 people employed in industry, 596 were in apparel manufacturing. Two other major industries are represented, each employing about 90 workers; they are aircraft parts and living room suites.

The public school system of Jackson County has 1,803 pupils, 67 teachers, and 28 schools. There is one senior high school (of the remaining schools, half are elementary, half are junior high), graduating 110 students in 1967.

Electric and gas utilities are available within Jackson County. Gainesboro has an activated sludge type sewage plant which is being utilized at 45 percent of its capacity. About 90 percent of the city uses the treatment facilities.

In 1966, total employment in the Gainesboro area was 2,397 persons. Manufacturing employment was 892 persons and the average wage per worker was $2,776. Total payroll was 2.3 million dollars in 1966.

Gainesboro is located adjacent to Standing Stone State Park and Forest. It is situated halfway between Dale Hollow and Center Hill Lakes.

Although not served by airport (the nearest is in Cookeville, 22 miles away), bus service, or railroads, the area is served by two motor freight lines. Neither of the motor freight companies have terminal facilities in Gainesboro.

Sparta, Tennessee. Located at the intersection of State Routes 26, 42, 84, U.S. Route 70 and Appalachian Corridor J, and about 15 miles south of I-40, Sparta has experienced modest population gains in spite of a general population decline in White County. Historically, White County has been dependent upon agriculture (livestock, dairy, and poultry) and apparel manufacture for employment.

Agriculture production consists primarily of tobacco and cash grain crops. In addition, accounting for slightly over half the total value of agricultural products (4.2 million dollars), there is livestock, poultry, and dairy production. The greatest growth in the agricultural sector has occurred in the tobacco and cash grain farms (from 165 in 1959 to 210 in 1964).

The largest industrial employer is apparel. Apparel, electrical machinery, and lumber manufactures account for 3,042 employees of a total industrial employment of 3,313 persons. The average wage per worker, including salaried personnel, was $3,404.

Eleven public schools are in the area. It is estimated that of the 215 high school graduates per year, approximately 105 would be available for employment in the area.

There are two commercial banks in Sparta, with combined assets of 330 million dollars. In addition, there is one savings and loan bank with assets of six million dollars.

Electric power is furnished to the county and city by TVA. Natural gas is distributed in the city. Coal is supplied to the area by nearby mines.

The county is served by two motor freight lines. One line has a terminal in Sparta. Facilities for pick-up and delivery are available for the branch lines of the Louisville and Nashville Railroad. Private airport facilities are available in Cookeville, 16 miles away. Commercial air traffic is routed through Nashville Municipal Airport. Inter- and intra-state bus service is provided by four bus lines, the largest of which are Greyhound and Continental.

The city is situated near Center Hill Lake and Great Falls Lake, thus furnishing almost unlimited water-type recreation. A country club and nine-hole golf course provide additional activity.

Smithville, Tennessee. In the center of DeKalb County, Smithville is located west of Center Hill Lake at the intersection of State Routes 26, 56, 146, and U.S. Route 70. It is about 19 miles south of I-40. Smithville's population remained constant over the period 1960-1965. Historically, the area has depended upon agriculture (tobacco and dairy) and light industry (apparel and lumber). Development potential was recently enhanced when Smithville was selected to participate in the Model Cities Program.

Agriculture production consists mainly of tobacco and dairy crops. There are 215 tobacco farms in the area (of a total of 233 field crop farms). In addition, 156 dairy farms exist. Of the total value of agricultural products (3.5 million dollars in 1964), approximately half was in dairy production. The greatest increase in farms was in tobacco, increasing from 175 farms in 1954 to 215 farms in 1964.

Total manufacturing employment in 1966 was 2,134 persons. The average wage per worker was $4,110. The most prominent manufacturing categories were (in order of importance) apparel, leather, and lumber manufactures. Total payroll was 5.8 million dollars. Retail trade employed 141 persons and there were 1,235 farmers in the county. There are 21 public schools in the county. The senior high school graduates 140 students per year and, of these, 75 are estimated to be available for local employment. Vocational and technical training is available in McMinnville, 20 miles away.

There are two commercial banks in Smithville. Their combined assets are nine million dollars.

The principal natural resources are limestone and clay. Uranium exists in the Cumberland shale, but no economic means of recovery currently exists.

Electric power is supplied by TVA. Natural gas is distributed in Smithville. Coal is brought in from Monterey, 65 miles from Smithville.

Two motor freight lines are available. One is a local firm, while the other serves the city once a day. There are no rail facilities, and commercial air freight must be routed through Nashville. Continental Trailways Bus Lines serve the city.

Because of the city location adjacent to Center Hill Lake, recreation potential is large. Six hotels, motels and restaurants exist, plus a country club and golf course.

Crossville, Tennessee. Located at the intersection of U.S. Routes 127 and 70, Crossville is approximately three miles south of I-40. The city's population increased from 4,668 to about 5,000 persons during the period 1960-1965.

Crossville is experiencing growth as a multi-purpose resort community. "Holiday Hills" is being developed near Crossville and will contain 1,200 residential lots, a lake, a golf course, and theater. A full-scale ski resort, "Renegade" is nearing completion. The city's downtown area is developing, and is being aided by the TVA "Townlift" program. Two hotels, nine motels and numerous associated facilities provide services to those who seek the available recreational opportunities.

The major natural resources of the area are coal, limestone, and sandstone. Timber resources are oak, pine, and gum. The major agricultural products are tobacco, soybeans, corn and strawberries.

Transportation service is provided by motor freight, railroad, bus lines and air. Commercial air freight is routed through Knoxville, 70 miles to the east. Three motor freight lines serve Crossville, and two of these have terminal facilities.

The public school system is a county-type, with 15 elementary schools and one high school. Approximately 180 students graduate from high school per year, and, of these, about one-half would be available for local employment. There is one vocational training center in Crossville and a college resident center.

Gas and electric utilities are available. Sewage treatment in Crossville is of the trickling filter type, with approximately 30 percent of the city being covered by sewage treatment.

DEVELOPMENT
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MAIN REPORT
PART II
SHAPING A PLAN

CHAPTER 18 - SHAPING THE PLAN FOR SUB-REGION I

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SECTION I - FUTURE GROWTH PATTERN

1. WATER SUB-REGION I

Projections of population and emmmployment were prepared by the Office of Business Economics for economic Sub-regions 13, 17, and 18. A detailed presentation of these data is contained in Appendix E, and the economic sub-regions are delineated on Figure 18-1, The projections were disaggregated into Water Sub-areas I-1 and I-2, as shown in the following tabulations:

	Years			
	1960	1980	2000	2020
I-1				
Population	347,613	359,000	390,000	308,000
Employment	84,516	88,000	113,000	154,000
I-2				
Population	156,417	184,000	246,000	362,000
Employment	51,119	63,000	90,000	136,000
I				
Population	504,030	543,000	636,000	770,000
Employment	135,635	151,000	203,000	290,000

These projections reflect the historical growth rate for the study area and indicate that Water Sub-region I will continue to experience a rate of growth which will lag behind the rest of the Nation. Thus, much of the past economic distress may be expected to continue unless the historical trends are changed.

Planning estimates, identified as developmental benchmarks, have been developed to describe and quantify the population and employment required for the sub-region to achieve a semblance of parity with the rest of the Nation. These projections quantify a goal statement for development which reflect the contribution which could be made to the objectives of the Appalachian program by the resources and capabilities of this sub-region. Developmental benchmark growth objectives are as follows:

	Years			
	1960	1980	2000	2020
I-1				
Population	347,613	363,000	422,000	521,000
Employment	84,516	100,000	175,000	202,000
I-2				
Population	156,417	184,000	285,000	416,000
Employment	51,119	69,000	108,000	161,000
I				
Population	504,030	547,000	707,000	937,000
Employment	135,635	169,000	283,000	363,000

2. STATE PLANNING SUB-REGIONS

Water Sub-region I includes State Planning Sub-regions 29A, 29B, 30, and 31 in Kentucky and 38 in Tennessee (See Figure 18-1). This sub-regionalization was determined by the individual states in their work with the Appalachian Regional Commission. The developmental benchmark objectives have been disaggregated on this set of boundaries and are shown as follows:

		Years			
State planning sub-region		1960	1980	2000	2020
29A:	Population	59,186	59,200	73,400	101,700
	Employment	17,917	18,000	27,900	38,600
29B:	Population	11,799	11,800	14,600	20,300
	Employment	3,923	4,000	6,100	8,400
30:	Population	70,452	73,000	85,000	105,000
	Employment	18,616	20,000	35,000	40,000
31:	Population	206,716	219,000	249,000	294,000
	Employment	44,060	58,000	106,000	115,000
38:	Population	156,417	184,000	285,000	416,000
	Employment	51,119	69,000	108,000	161,000

3. DEVELOPMENTAL CONSTRAINTS

Inadequacy of transportation facilities within Sub-region I is a hindrance to economic development. Railroad service is available in only 15 of the 30 counties comprising the sub-region. The inadequate transportation system has reinforced the area's insularity and made it extremely difficult for the residents to get to jobs that may be developed in the area. Narrow roads steep grades, and sharp curves are

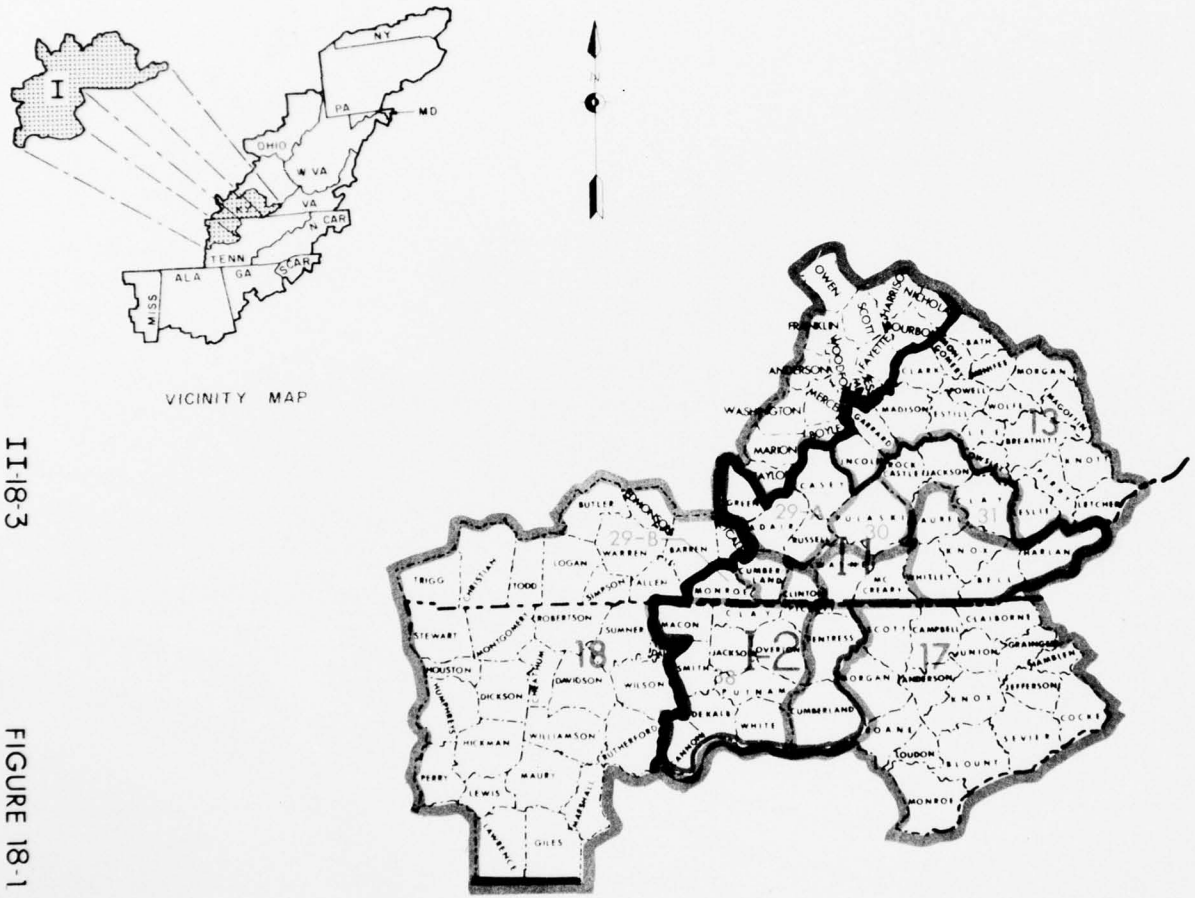

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FIGURE 18-1

general characteristics of the sub-region's network of Federal, State, and County highways. Plans are underway to improve the road network by completing Appalachian Developmental Corridors "J" and "F" and Interstate routes 40 and 75 through the sub-region, as well as improving and constructing other State routes to include an access road from Smithville, Tennessee, to Interstate 40, crossing Center Hill Lake and basically following the alignment of State Route 56. Continuing improvements to the transportation network will be required to stimulate economic development. (See Figure 17-5, Page II-17-17.)

Hilly topography and flood problems limit development potential at some communities in the sub-region, principally in the Upper Cumberland River area and especially at the town of Harlan, Kentucky.

Attitudes concerning the future economic development of the sub-region vary widely among the inhabitants. In many communities, leaders are striving for economic development, but in other communities the planning for economic development is limited to meeting the provisions of the Office of Economic Opportunity programs. There is a need for further efforts to stimulate enthusiasm throughout the sub-region for coordinated planning of economic development. This would encourage the State to expend greater efforts toward economic development in this sub-region.

Average educational attainment in the sub-region is below the national median and is also less than Tennessee-Kentucky State median. The labor force in the sub-region does not possess technical skills sufficient to attract industries requiring relatively large numbers of skilled workers. Educational deficiencies point to the need for added vocational training facilities and upgraded public school curricula.

In some communities of the sub-region, there are health problems related to lack of medical care and sanitation. Many such health problems can be relieved by provision of additional health facilities, expansion of existing ones, and by provision of adequate water and sewage facilities.

Increased demand for electric power will result from economic development. Due to resources of coal and water, it appears that both hydropower and thermal stations will be built in the sub-region to meet the increasing demand for electric power.

Generally, water is available in sufficient quantities for present and future municipal and industrial use. Additiional facilities for water and sewage treatment and a continuing water supply of satisfactory quality, however, are needed to meet the present and future requirements of the sub-region. Local programs for the construction of adequate facilities must continue, and surface and ground water must be protected from excessive pollution.

4. PATTERN OF GROWTH ANTICIPATED

The economy of Sub-region I has been primarily based on agriculture and mining activities. In 1950, about 49 percent of total earnings were from these industries. By 1966, these earnings declined to about 21 percent. Earnings have been increasing in other sectors with the largest gain in manufacturing.

Population and employment of the sub-region declined by more than 91,000 and 30,000, respectively, between 1950 and 1960. Population declined by only about 2,000 between 1960 and 1965. This lessening rate of population decline suggests that the sub-region has begun an upward trend in economic development. Manufacturing employment in the sub-region increased at a rate faster than the nation between 1940 and 1960. During that period, manufacturing increased by about 70 percent in the nation and 230 percent in the sub-region. Agricultural employment during the same period declined by about 48 percent in the nation and by about 60 percent in the sub-region. Employment in mining declined by about 27 percent and 58 percent in the nation and sub-region, respectively.

The emerging economy in the sub-region is one of continuing decline in employment associated with agriculture and mining and increasing employment in manufacturing and other sectors. Apparel plants and manufacturers producing furniture and other wood products are dispersed throughout the sub-region. In 1960, about 44 percent of manufacturing employment in the sub-region was in apparel and other fabricated textile products, and about 26 percent was in furniture and other wood products. This represented a gain of about 335 percent for apparel and a decrease of 23 percent for furniture and other wood products over 1950. Assuming the developmental benchmarks will be achieved, large-scale growth will continue in these categories of manufacturing along with significant growth in chemicals and food. To achieve developmental benchmarks, large-scale growth must occur in some other sectors of the sub-region's economy as indicated by the following tabulation which shows 1960 employment by sector along with 2020 employment as projected in benchmarks.

Employment Sector	1960	2020	Percent Increase (1960-2020)
Agriculture	34,862	8,000	(-) 77
Mining	10,085	4,000	(-) 60
Construction	8,281	20,000	142
Manufacturing	27,138	125,000	361
Transportation, etc.	6,711	9,000	34
Trade	20,434	75,000	267
Finance, etc.	1,730	14,000	709
Services	22,368	96,000	329
Public Administration	3,902	12,000	208
Armed Forces	124	a/	-
Total	135,635	363,000	168

a/ Data not of sufficient size to warrant projection.

The Appalachian Regional Commission has designated eleven primary growth centers in Sub-region I, four in Tennessee and seven in Kentucky. In Tennessee, the primary centers are Crossville, Cookeville, Sparta, and Smithville. Crossville, undergoing a rather rapid industrialization, is very strategically located in the transportation system. I-40 provides an improved route for the movement of goods into and out of the area. The Crossville area is experiencing substantial recreation-oriented commercial activity. A multipurpose resort community and a full scale ski resort are being developed and the downtown area shows evidence of a face lifting by the business owners.

Cookeville, in Putnam County, is very near the center of Water Sub-area I-2. Appalachian Corridor J and I-40, the major transportation arteries through the water sub-area, are both adjacent to Cookeville and provide vastly improved access. The area is served by the Louisville and Nashville Railroad. A good manufacturing base exists from which additional growth can spring. The community is already experiencing rapid industrialization and was recently designated to participate in the Model Cities Program.

Sparta and Smithville should experience growth rates that are somewhat lower than Crossville and Cookeville. Smithville has been designated to participate in the Model Cities Program which should provide

the impetus required to stimulate economic development in the area. Sparta is expected to become an employment center, but the city will require a large investment in public utilities to open the way for industrial growth.

Primary growth centers in the Kentucky portion of Sub-region I are Middlesboro, Pineville, Barbourville, Corbin, London, Williamsburg, and Somerset. The communities of Middlesboro, Pineville, and Barbourville, are considered a growth complex. Each town has a local flood control project providing protection from floods of various magnitudes. The project at Middlesboro would divert the standard project flood, and the features at Pineville and Barbourville provide protection against the maximum flood of record. Lands available for development inside the protection works at Pineville and Barbourville are limited, but sufficient sites exist on the higher flood free lands outside. Additional lands in the Middlesboro area are available on a limited basis. Pineville is not developing as fast as Middlesboro and is more restricted due to topography. Barbourville has experienced rapid growth and has development potential for future expansion. The three-city complex will benefit from improved access provided by the Appalachian Developmental Corridor F between Pineville and Middlesboro, eventually connecting with I-75 and I-81 to the south. Each city is served by the L&N Railroad.

Williamsburg, Corbin, and London are also considered as a growth complex. They are located along I-75 which provides a vastly improved north-south transportation system and each city has railroad service. Corbin has established industrial parks and made other efforts to attract industry. The success of these efforts is reflected by the extensive industrialization which has taken place at Corbin, making it the most rapidly growing city in the Kentucky portion of the sub-region. London is experiencing economic growth similar to Corbin, and Williamsburg is expected to display substantial growth but less extensive than Corbin and London.

A comprehensive program here will create a new and major urban service area encompassing the two growth complexes and expand urban service capabilities in the secondary growth centers.

The major growth area in the center of the Kentucky portion of the sub-region is Somerset. Appalachian Corridor J will provide an improved road east to I-40 and south to Tennessee, and the area is served by the L&N Railroad. A toll road from Bowling Green to Hazard, Kentucky is scheduled for completion in 1972. This road will generally follow Kentucky Highway 80 and traverse the area from Columbia to Manchester. Somerset has an adequate supply of developable land which, along with its proximity to Lake Cumberland, provides an added stimulus as a logical place for growth to occur.

5. ADDITIONAL CENTERS HAVING GROWTH POTENTIAL

Gainesboro, Tennessee, has been designated as a secondary growth center in Water Sub-area I-2. Access has been a constraint to this community but Appalachian Developmental Corridor J and the navigable waterway provided by the Cordell Hull Reservoir will help relieve the problem. Rough topography has somewhat restricted development in the past and vacant land suitable for urban development is virtually nonexistent.

Development in Harlan, a secondary growth center and the largest city in Harlan County, Kentucky, is severely restricted by topography. Some land is available for industrial expansion, and other land could be made available as the result of redevelopment activities. Appalachian Corridor F will provide a vastly improved road system between Middlesboro, Pineville, and Harlan, as well as connections to Corridors B and G. This road can be utilized to provide an improved commuting artery into and out of Harlan County. The L&N Railroad serves the city.

Corridor J should provide a stimulus to economic development in the secondary growth centers of Monticello and Burkesville, Kentucky. Growth at Burkesville is expected to exceed that of Monticello and would be further enhanced by the extension of the navigable waterway from Celina to Wolf Creek Dam.

Columbia, Kentucky, is a potential growth center. The primary impediment to growth is lack of an adequate dependable water supply. Provision of a water supply coupled with the advantages the area has should propel the city onto a path of economic development.

SECTION II - WATER RELATED NEEDS

6. INTRODUCTION

The analysis of water needs in the context of the developmental objectives of PL 89-4 is based on several considerations. These include:

a. Immediate needs;

b. The needs that result from the continued development of the sub-region and contiguous areas, with a normal water development program;

c. The needs that will result from accelerated development that is generic to development of an economy within the full capacity of the area to supply industrial sites, provide labor, developmental capital, and other needs.

The latter aspect has been approached by the setting of the benchmarks for populations, employment, and income. These higher planning goals reflect potential, more than historical, trends.

From the socio-economic analysis of the region and the overlay of the benchmark projections, a judgment of the developmental impediments associated with water resource management has evolved. The procedure used to make this judgment was to spatially locate the benchmark projection on the sub-region. This process is by the way of successive disaggregation of the projections from larger to smaller areas. Of course, error limits increase as the process narrows the projections to smaller areas. This is an inherent risk associated with long-range planning, but the validity of the analysis can be improved by design of greater flexibility into project recommendations and by hedging future needs by the method of staged construction.

Water resources planning is dominated by the hydrologic delimitation of space. Since water can be reused many times on its way to the sea or back to the atmosphere, the regions delimited for economic analysis were overlain on watersheds for the derivation of water needs. Benchmark projections were allocated (by the disaggregation procedures) to state planning sub-regions thence to river basins. If the analysis indicates a new set of water problems or water related impediments to the attainment of the developing region to its potential, these problems or impediments become the needs against which water management proposals would be designed.

7. WATER RESOURCE NEEDS IN SUB-REGION I

The Problem in General

The pertinent water and related land development needs required to stimulate economic activity are primarily related to accelerating existing plans and programs for water resources development. Priority should provide those projects which would better enhance the opportunities of creating employment and increasing incomes. The problem types will be discussed in general to establish a frame of reference and subsequently identified by state planning sub-regions and growth centers.

The term "needs" is used here in a specialized sense. It refers to projected demands less the supply that will be available by virtue of the present development plus additional installation expected through 1980.

Water Damage Prevention

The relatively high annual rainfall coupled with a terrain notable for its narrow valleys has led to frequent flooding and severe damage to many communities. It has also prevented the use of valley floors for industrial site development.

The floodwater damages to urban, rural, and agricultural areas must be reduced to provide the opportunity for economic growth and development in the sub-region. This can be accomplished by acceleration of land treatment; continued protection of woodlands against damage by fire, insects, and diseases; construction of flood protection works; and wise use of the flood plain for development.

A number of growth centers are located in flood plains and subject to damage from stream overflow. Urban areas in Sub-region I which are subject to periodic flooding include the Kentucky communities of Cumberland on the Poor Fork, Harlan on the Clover Fork, Williamsburg on the main stem of the Cumberland River, and Manchester on the South Fork of the Kentucky River. Flooding has hampered economic growth in Harlan and its hinterlands, including Cumberland, but the constraint at Williamsburg has been to a lesser degree. Although the Martins Fork project will alleviate the flood problem at Harlan, the community will remain susceptible to damage from floods on Clover Fork. Completion of the authorized flood control project at Cumberland would reduce the frequency of flooding, but the community would still be susceptible to damage by stream overflow from rare events. Levees and a floodwall at Pineville and levees at Barbourville provide those communities with protection from the flood of record, 25 and 40 year frequencies, respectively. Flood control storage available in the Wolf Creek project provides reduction in flood stages for those main stem communities downstream. Minor flooding from tributary streams is experienced at many communities, but notably at Evarts,

Manchester, and Middlesboro, Kentucky. Yellow Creek flows through Middlesboro's industrial development area, and although the plants in the new complex have not sustained flood damage, they are susceptible to rises of greater magnitude than has been experienced in recent years. Manchester, Kentucky, experienced severe flood damage in 1947, and investigations were made to determine solutions to the flood problem. Flood control reservoir projects were studied on Buzzard, Goose, Horse, and Otter Creeks in 1958, but none were determined to be feasible at that time. A channel clearing project was authorized for Manchester in 1964, but local assurances have not been provided. Annual average damages amount to $25,500 (1964 prices).

Flooding occurs occasionally at Sparta, Tennessee, but it is of minor consequence. Interior drainage problems exist at Middlesboro and Somerset, Kentucky, and Smithville, Tennessee. Occasional flooding of this sort occurs at the lower elevations of Middlesboro's main street, resulting in disrupted access to the business district and consequent disruption of economic activity. However, the city recently completed a local drainage project to alleviate this situation. The flooding problem is less severe at Somerset and Smithville.

Water damage in rural areas is caused by conditions varying from shallow floods on level bottom lands to mountain torrents of great destructive force. Damages affect building, fences, roads, bridges, and utilities.

Many upstream watersheds regularly experience flood damage to farm improvements, lands, and crops as a result of water, sheet erosion, scouring, and sedimentation. Frequent flooding of fertile bottoms prevents that land from being used to its highest level of economic productivity. Prevention of flood damage by upstream watershed projects would allow some bottom lands to be more fully utilized and others to be reclaimed for crops. Such projects make possible enhancement of opportunity for public and private recreation, fish and wildlife resources and improvement of the environment. Further development could be accomplished by acceleration of land treatment measures such as contour farming, pasture improvement, pond construction, and adequate field drainage. Flood damage of relatively limited degree is experienced in the hinterlands of Sparta and Cookeville, Tennessee, growth centers; in Columbia, Kentucky, a secondary growth center; and in Monroe County, Kentucky. Basically, every county in the sub-region sustains some rural flood damages.

Land Development

Shortage of land suitable for industrial site development and residential construction activity is particularly critical in the area upstream from Cumberland Falls. The mountainous character of the terrain limits readily available sites to the narrow flood plains, which are subject to frequent flooding. Industrial sites in the Upper Cumberland as well as other more desirable ones located throughout the

sub-region, are hindered by inadequate water and sewerage facilities and other utilities, and lack of access to major transportation networks. A limited number of fully developed and sizeable industrial sites are available in most counties of both the Kentucky and Tennessee portions of the sub-region, but projections of population and employment indicate that programs of investment in land development near selected service centers may proceed without fear of extended vacancy.

Extensive site development would provide lands suitable for residential or industrial expansion in Williamsburg, and expenditures in utilities would be required for additional sites in Sparta. Improved access furnished by the interstate highways and Appalachian corridors will present a more attractive outlook for developable lands in secondary growth centers and hinterlands of Burkesville, Monticello, Gainesboro, Carthage, Smithville, and Sparta.

Visitations to existing reservoirs in the Appalachian region and the fact that present tourist facilities along interstate and development highways and state facilities are filled to capacity during tourist seasons, indicate a necessity for land development to meet the demands of outdoor recreation enthusiasts. Future economic development, increased population, more employment, and better transportation networks will create a greater need for additional recreation facilities.

The future economic development of this sub-region is very dependent on the proper use and management of all land. This includes both agricultural and non-agricultural land. Projections indicate that by 1980 a total of 15,000 acres of agricultural land will be needed for non-agricultural purposes. With this expected reduction in agricultural land and the estimated increased demand for food, fiber, and outdoor recreation, there is an urgent and vital need for the application of conservation practices and the adoption of improved treatment and management techniques. There is also a great need to convert 185,300 acres now being used for cropland to other less intensive agricultural or non-agricultural uses in order to maintain soil productivity and best satisfy the ever-increasing demands on land resources. Conservation needs on most of the land are mainly due to the problems of unfavorable geological and soil conditions and improper use and management of land.

The demand for land for industrial, commercial, and urban residential site development in the sub-region, is projected to be 4,400, 13,400, and 18,200 acres during each of the 20 year periods, 1960-1980, 1980-2000, and 2000-2020, respectively. This totals about 36,000 acres or about twice the present area in urban use. These acreages are based on population and employment projections, as described from developmental benchmark goals and allow 24 workers per acre for manufacturing, 10 per acre for transportation, 30 per acre for trades, and 150 per acre for services. Residential land needs are based on 15 persons per acre.

Water Supply

Table 18-1 presents the estimated gross demands developed by the Corps of Engineers for water supply by growth centers, or complexes, as of 1980, 2000, and 2020. The increment between gross demand in 2020 and dependable supply expected to be available in 1980 is referred to as unmet needs in this table.

The estimated daily demand on municipal water supply systems in 1960 was about 13 mgd. By the year 2020, it is estimated that total daily demands on municipal water supply systems in Sub-Region I will be about 85 mgd and the total manufacturing use will be about 185 mgd.

Estimated water supply needs by growth complexes or centers vary slightly from the needs developed by FWPCA in Appendix D due to differences in magnitude of water use per unit of manufacturing output and other factors that could influence the intensity of water use.

The aggregate demand values for the sub-region are adequate indicators of the magnitude of water needs. However, for more detailed analysis, an estimate of gross water needs by growth areas over time was related to the supply which could reasonably be expected to be available as a source of potable water for each growth area by 1980. The difference between gross needs and estimated available supplies were calculated to indicate the magnitude of water supply sources that are available or should be developed to meet the regional development objectives.

Maintenance of Stream Quality

The establishment and maintenance of stream classification standards is primarily a state function, but a Federal interest is exerted through the Federal Water Pollution Control Administration (FWPCA). All water resource planning must be concerned with maintaining water quality.

Projected stream pollution loadings for the sub-region are given in Appendix D of this report, written by the FWPCA. This appendix shows that untreated waste loadings, expressed in thousands of population equivalents, will be 360, 770 and 1,400 in 1980, 2000 and 2020, respectively. These figures refer to loadings before treatment, and are specific indicators of the investment required in new treatment facilities. While this appendix does not pinpoint specific problem areas, certain problem areas have been studied separately in some detail by the FWPCA.

After completion of Martins Fork Reservoir, no low flow augmentation will be required for communities along the Cumberland River and its tributaries within the sub-region, provided that adequate

TABLE 18-1
ESTIMATED GROSS NEEDS FOR WATER SUPPLY IN MGD
GROWTH CENTERS IN WATER SUB-REGION I

Item	1980	2000	2020	Dependable Supply - MGD By (1980)	Unmet Needs
KENTUCKY					
London-Corbin-Williamsburg	3.2	5.4	6.3	> 6.3	-
Middlesboro-Pineville-Barbourville	3.8	5.6	8.7	> 8.7	-
Harlan	3.0	4.0	5.3	4.8	.5
Somerset	3.2	3.5	5.8	> 5.8	
Monticello	.5	.8	1.4	.7	.7
Burkesville	.2	.5	1.0	> 1.0	
Columbia	.4	.9	2.0	1.0	1.0
TENNESSEE					
Cookeville-Crossville-Smithville and Sparta	5.3	10.5	18.6	>18.6	
Gainesboro	.3	.8	3.0	> 3.0	

waste treatment and control measures are placed in effect; however, stream samplings obtained during 1966 by the Federal Water Pollution Control Administration and information from other agencies, Federal and State, show a number of streams in the sub-region to be significantly polluted by acid mine drainage. Those streams in the Appalachian portion of the Cumberland River Basin are discussed in pages 231 through 235, Attachment A, Appendix C.

Middlesboro, Pineville, and Harlan are located on streams which are significantly polluted by acid mine drainage. Stony and Bennetts Forks converge to form Yellow Creek which flows around Middlesboro. However, that community gets its entire water supply from Fern Lake which is not polluted from mine drainage. Pineville, Kentucky, on the Cumberland River, downstream of Yellow and Straight Creeks, receives polluted water from both of those streams. The town gets its municipal water from wells which are fed by the Cumberland River. While not all of the acidity observed in the Cumberland at Pineville is from coal mine drainage, this source is judged to be a major contributor. Harlan, Kentucky, at the confluence of Poor and Clover Forks, takes water from both of those streams, the latter is polluted with acid mine drainage.

Where stream quality is affected seriously by coal mine drainage, many economic limitations are placed on the value of the water for municipal, industrial, and recreational use. While Pineville's present water supply is adequate and Harlan's new water treatment plant will be able to produce potable water, acid mine drainage could be an inhibiting factor in the future growth of these two towns and their surrounding communities. Reclamation of surface mined areas and control of drainage from underground mines is needed to relieve the condition which exists at Pineville and Harlan.

Improved municipal and industrial sewage treatment facilities will be required to maintain stream quality. Accelerated and continual emphasis is needed on proper land use and those conservation measures and practices which will stabilize gullies, channels, roadbanks, stripmine spoil, and new construction in order to establish or improve vegetative cover and keep erosion to a minimum. These programs will provide improved water quality management.

Navigation

Completion of Cordell Hull Dam will provide a navigable channel from the mouth of Cumberland River to Celina, Tennessee, a distance of 381 miles. Field studies indicate that the shipment of coal, shale, timber, and gasoline may offer sufficient potential to justify extension of the channel farther upstream for barge movement. Zinc explorations are currently underway in Jackson County and if mining operations are initiated, the resulting products could be transported by barge. Extension of the waterway would provide a

method of transporting raw materials derived from the area's natural resources to downstream markets and importing commodities to serve the region. Coal reserves adequate to satisfy present and projected demands are available in Clinton and Wayne Counties, Kentucky. This coal is not currently being mined in large quantities due to lack of access by rail; however, a navigable waterway would provide economical transport of the commodity to downstream markets near Nashville. Shale reserves are available along Lake Cumberland and in Russell and Casey Counties, Kentucky. Expanded shale has promise as an aggregate in highway surfacing, and processing plants for the material are proposed near Nashville. Studies indicate that gasoline moving into the area would be distributed from Burkesville. An extension of the waterway would stimulate the economy of the area by providing a competitive method of transporting commodities and providing employment opportunity through development of natural resources. It is estimated that nearly 300 local workers would be required annually to mine the coal and transport the various commodities to the river ports.

Power

The Federal Power Commission has prepared estimates for the future electric power requirements in the Appalachian Region and its contiguous territory and has designated Power Supply Areas 12, 19, and 20 as potential customers for power produced in Sub-region I (see Appendix B). A discussion concerning electric power needs, probable future installation of generation capacity and cooling water needs for the Appalachian Region on a regional basis is contained in Chapter 4, Part I.

New generating facilities to meet future increased requirements will be provided chiefly by base load thermal electric plants and peak load conventional and pumped storage hydroelectric plants. The thermal plants require large quantities of water for steam condensing purposes, and the conventional hydroelectric plants must be located in waterways having proper terrain and adequate water supply available to convert the natural river flow to power. The resources of the sub-region are unique for the production of both base load and peak load power. The topography is favorable for the development of hydroelectric plants, and adequate cooling water and coal are available for use with thermal plants. It is reasonable to assume that a great number of the new power sources required for the future supply will be located in the sub-region, with power transmitted to areas both within and adjacent to the sub-region.

Recreation

The projected recreation demand is far greater than the present facilities can supply and recreation developments, both general and water oriented, must be greatly accelerated to meet the requirements of Sub-region I as defined in Appendices F and G. The Bureau of Sport Fisheries and Wildlife indicates a surplus through the year 2020 for fishing opportunities but a need for hunting opportunities

by 1980. The Bureau of Outdoor Recreation shows an immediate need for facilities for both water oriented and other types of activities, with the need rapidly increasing, as shown in Figure 18-2. Total recreation demand for all activities is projected to increase from 19,600,000 annual recreation days in 1965 to 157,400,000 by 2020. Projections indicate that by 2020 about 20 percent of the demand will be for boating, swimming, and fishing. Projected water needs for recreation are shown in Figure 18-3.

Although the growth centers in the sub-region are all within approximately one hour's driving time of existing recreation facilities at reservoirs in operation or facilities at reservoirs already under construction, these communities will require additional recreation developments to support future growth.

The Appalachian Regional Commission, several Federal agencies, and ten states have conducted a cooperative study of Appalachian Highlands Recreation. The study was focused upon an area of Appalachia where recreation and certain resource activities appear to be the most significant fields for future development. The objective was to determine a strategy of recreational development which would bring the most significant benefits to the people of the area through increased incomes and employment, while at the same time meeting national goals for the conservation and preservation of precious scenic and natural resources. The study recommended some terminal complexes for further detailed study to determine market potential. One such complex, Norris Reservoir - Cumberland Gap - Scenic Riverway Interstate Complex, is located partially in Sub-region I and will be discussed later in this chapter with the appropriate state-planning sub-region.

Other Problems

In addition to measures to give relief from flood damage, the installation of drainage works is needed on much of the agricultural land in the sub-region. Such measures, used in conjunction with proper land management, would bring additional yields from the land.

Strip mining operations have left scarred slopes and refuse piles in many locations in the sub-region, marring the otherwise beautiful and rugged countryside. This is particularly evident in the area of Middlesboro, Kentucky. Other environmental considerations derive also from unreclaimed strip-mined areas. Vegetation has been destroyed during initial operations, residue is washed into streambeds, and reservoirs formed behind piles of overburden are contaminated and subject to failure, creating a hazard for the inhabitants in the valleys below. Reclamation of such exploited lands is needed for the future development of the sub-region and the well being of its inhabitants.

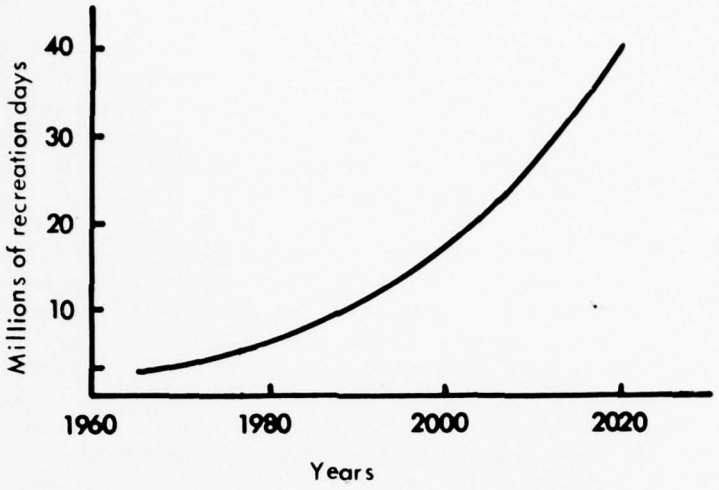


Figure 18-2 Outdoor Recreation Needs

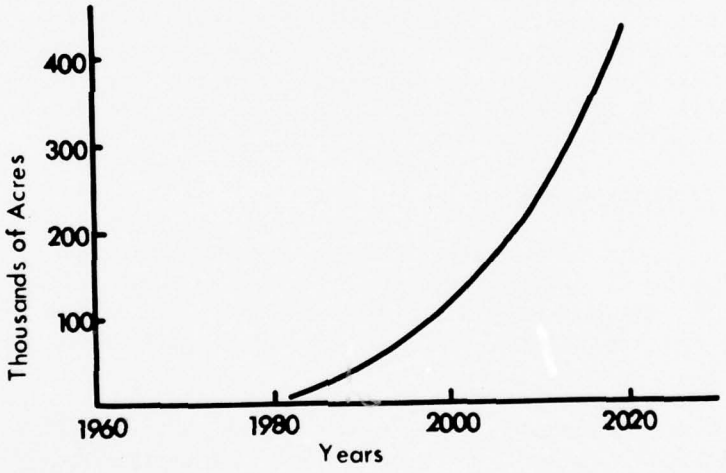


Figure 18-3 Needs for Water-Oriented Recreation

8. WATER RESOURCE NEEDS BY GROWTH CENTERS AND STATE PLANNING SUB-REGIONS

Water resource development needs in Sub-region I are primarily associated with the demands for water supply, flood control, navigation, and recreation relating to the growth centers and contiguous hinterlands. With the exception of recreation, the broad water needs previously discussed for water sub-areas are further separated and discussed by state planning sub-regions. It may be necessary to develop water related recreation opportunities to exceed the demands for a particular water sub-area in order to provide needs for an adjacent sub-area which does not contain adequate sites and to satisfy the ultimate demand for Sub-region I. Thus, recreation needs are discussed in general, rather than on a state planning sub-region basis.

State Planning Sub-region 31 - Kentucky

The communities of Middlesboro, Pineville, and Barbourville form a primary growth complex and are subject to flooding. Local protection projects consisting of a diversion canal, levees, and channel clearing provide Middlesboro with substantial protection from flows in excess of the flood of record from Yellow Creek headwaters and a project has been authorized to alleviate the flooding problem caused by backwater from Yellow Creek and headwaters of Little Yellow Creek. However, development of industrial sites has raised the elevation of a contemplated ponding area, and solution of the flood problem will require further investigation. A system of floodwalls and levees at Pineville and a levee at Barbourville provide those communities with protection from the flood of record on the Cumberland River, but they are subject to damage from floods of greater magnitude.

Williamsburg is also subject to flooding from the Cumberland River, but investigations have determined that a local protection project for that community is not feasible. A recently completed flood plain information report for the community contains data which will be helpful in planning the wise use of flood plain lands.

A local protection project consisting of channel improvement has been completed at Corbin. The new channel provides essentially complete protection.

Harlan is subject to flooding, and although the proposed Martins Fork Dam will reduce flood stages, the community will experience residual damages from rarer events. A recently completed flood plain information study contains data which will be a valuable planning tool for future developments in Harlan. Without additional source development, Harlan would experience a water supply deficiency by 1980. However, the city contracted a water supply study and engineering design for a new treatment plant. The facility, now under construction, has a capacity of 2 mgd and, when operated in conjunc-

tion with the old plant which will remain operational for peak demands, will satisfy the projected water supply needs.

Cumberland is not a growth center but could be considered a service center for the general area. The community experiences periodic flooding from Poor Fork. A local protection project consisting of channel improvement has been authorized for Cumberland, but the conditions of local cooperation have not as yet been fulfilled.

State Planning Sub-region 30 - Kentucky

Somerset has an occasional flood problem in the low-lying areas along Sinking Creek. A reconnaissance of the area determined that the problem is basically caused by channel encroachments and drainage structures of inadequate size. Solution to such problems is a local responsibility.

There are no water related problems within this state planning sub-region which cause a constraint to economic development in the primary or secondary growth centers.

State Planning Sub-region 29 - Kentucky

Without additional source development, Columbia is expected to experience a water supply deficiency.

Extension of the navigable waterway from Celina, Tennessee, to Wolf Creek Dam would provide a method of transporting raw materials derived from the area's natural resources to downstream markets and importing commodities to serve the region. Coal reserves in Clinton and Wayne Counties, Kentucky, are not being mined extensively due to lack of access by rail. Employment and economic stimulus should result from the waterway extension and provision of a means to bypass Wolf Creek Dam.

State Planning Sub-region 38 - Tennessee

Cookeville experienced water supply problems during the summer of 1968 and without additional source development is expected to have a deficiency by 1980. However, the community contracted an engineering study to determine the most feasible water supply for the greater Cookeville area. The investigation concluded that Center Hill Reservoir would be the more economical source to supply an adequate quantity of good quality water.

Smithville experiences flooding in the low-lying areas along Town Creek. Investigations indicated the problem is caused by encroachments to the channel and the unstable character of the streambed. The flooding is minimal and not considered a constraint to economic development. The nature of the problem indicates a solution by local interests rather than Federal expenditures.

Other Problem Areas in Sub-region I

Most counties in the sub-region indicate a growing need for planning and application of soil and water conservation practices. Reduction of erosion and resulting stream sediment would reduce flood and sediment damages, maintain productivity of affected upstream lands and improve water quality. Land treatment and upstream watershed developments will help the agricultural lands meet future demands by improving farm production and income, and improve the environment.

9. INTERBASIN AND INTERSTATE TRANSFER OF WATER

The water resource needs of the area can be satisfied without diversion of water from outside the respective basins since water availability above communities with identified needs should provide required flows to meet downstream demands. However, transfer to other watersheds should be considered as an alternative to satisfy water supply needs in upper reaches of tributaries or to transport waste effluent from treatment plants to larger streams which can assimilate residual organic material.

SECTION III - ALTERNATIVES FOR MEETING NEEDS

10. STRUCTURAL

An array of structural alternatives from Federal, State, and private water resource development opportunities were considered in determining satisfactory solutions to identified water related needs in Sub-region I. Reservoir storage, levees, floodwalls, channel improvement, and combinations of these were evaluated as structural flood control measures. Surface and ground water sources were considered as means of providing water supply. Improvement of water quality could be provided by low flow augmentation, a high degree of treatment, and diversion of polluted flows.

11. NON-STRUCTURAL

An active program of flood plain information studies, flood plain zoning and management policies, evacuation and flood forecasting services are non-structural measures which would prevent increases in future flood damages by restricting damage to its present level through developmental controls. Such programs should accompany any structural water control plan. Alert action based on sound hydrologic and hydraulic studies can guide the development potential, minimize the unwitting encroachment into areas of high risk flooding hazards and promote wise land use policies. Enactment and enforcement of legislation and policies regarding regulation of strip mine reclamation programs and acid discharge from operating and future mines would serve as measures to reduce potential stream pollution from acid mine drainage.

Non-structural means of minimizing water quality and quantity problems are important components of any effective water management plan. The combined Federal and State program for establishing and controlling water quality standards will contribute to the wise use of this resource. Technological improvements in treatment systems, in reuse or closed cycle processes in industrial plants and other applications promise gains for both quality and quantity problems.

These and other relevant non-structural alternatives have been carefully considered in the development of the comprehensive water resource plan.

12. APPLICATION OF ALTERNATIVES

Structural and non-structural alternatives considered in satisfying the water resource needs of Sub-region I are discussed by state planning sub-regions. See Figure 18-1 for the boundaries of these state planning sub-regions.

Figures 18-4 and 18-5 present the water needs and alternative solutions discussed in this section for the study area. Figure 18-4, Page II-18-31, presents the needs and alternatives for the Cumberland River Basin above Celina. Figure 18-5, Page II-18-35, presents the needs and alternatives for the Central Cumberland River Basin.

State Planning Sub-region 31 - Kentucky

Although a levee and canal system diverts Yellow Creek headwaters around the city of Middlesboro, the community is still subject to back-water flooding from the canal and headwater flows of Little Yellow Creek. Possible solutions include extension of existing protective works and detention reservoirs.

The local protection project at Pineville protects the city from floods equal in magnitude to the flood of record. Due to the flood of 1963 which approached the top of the wall and levee system, and in view of the catastrophic damage which would result from an overtopping of the present system, considerable local interest has been shown in altering the existing project to provide additional protection. Alternative measures to provide the solution include replacing the existing wall with a higher wall or levee, channel improvement, or upstream reservoir development.

Local interests were also concerned about the possibility of overtopping the levee at Barbourville. Methods considered to provide additional protection for Barbourville are raising the existing levee, channel improvement, channel cutoffs, upstream watershed developments, and diversion dikes.

The average annual flood damage for Williamsburg is estimated as $10,000. Possible measures considered as solutions to the flood problem include channel improvement, levees, and floodwalls.

After the authorized Martins Fork project is in operation, the average annual flood damages at Harlan are expected to be about $20,000. Measures considered to satisfy the flood problem at Harlan include levees, floodwalls, and upstream watershed development.

Natural flow of the Poor and Clover Forks is considered adequate to satisfy Harlan's water supply needs. A new water treatment plant under construction is designed to provide sufficient capacity through 2020.

The U. S. Department of Agriculture has investigated a potential watershed development on Richland Creek in Knox County. It would provide 7,810 acre-feet of storage for prevention of flood

damage to agricultural lands, roads, and bridges, and a 50-acre pool for an estimated visitation of 20,000 recreation days annually.

The Appalachian Highlands Recreation Study recommended further detailed study to determine the market potential of the Norris Reservoir - Cumberland Gap - Scenic Riverway Interstate Complex. The area involved would include Bell and Harlan Counties in this state planning sub-region. The project would include reservoirs, state parks, wildlife management areas, historical sites, and supporting areas which would provide a broad range of recreation opportunities to satisfy a portion of the demand for such activities in the sub-region.

State Planning Sub-region 30 - Kentucky

The United States Department of Agriculture has investigated a watershed development project on Marsh Creek in McCreary County which includes 8 miles of channel improvement and two structures which would provide 1,014 acre-feet of flood control storage. Flood damage prevented by this project would accrue to crops and other agricultural lands.

McCreary County would be included in the recreation complex described under State Planning Sub-region 31.

State Planning Sub-region 29 - Kentucky

Extension of the navigable waterway on the Cumberland River could be provided by constructing Celina Lock and Dam at the Tennessee-Kentucky state line and developing a method of bypassing Wolf Creek Dam in order to utilize Lake Cumberland. Possible solutions to transporting commodities over Wolf Creek are barge lifts, power lifts, pneumatic systems, bucket or belt conveyors, and pipelines.

An upstream watershed development on Russell Creek is an alternative source of water supply for Columbia.

The United States Department of Agriculture has one authorized and three potential upstream watershed developments in this planning sub-region which would provide flood damage reductions, municipal and industrial water supply, and recreation in rural and urban areas. An authorized project on Mill Creek in Monroe County includes one structure which would provide 568 acre-feet of storage for sediment, 1,612 acre-feet for flood control, 735 acre-feet for water supply, and a 72-acre pool for recreation. Potential projects have been studied on Casey, Marrowbone, and Russell Creeks. Casey Creek, located in Adair and Casey Counties, would consist of eight structures which would provide 6,100 acre-feet of flood control storage and a 65-acre lake for recreation. The Marrowbone Creek watershed development would have eight structures furnishing 9,135 acre-feet of storage for flood

control, 190 acre-feet for municipal and industrial water supply, and a 50-acre pool for recreation. The Russell Creek project would include seven structures with 40,244 acre-feet of storage for flood control, 1,000 acre-feet for water supply, and a 185-acre water surface for recreation.

State Planning Sub-region 38 - Tennessee

The water supply problem at Cookeville could be satisfied by upstream watershed development, increasing capacity of present source, or obtaining water from Center Hill Reservoir.

United States Department of Agriculture has three authorized, two investigated, and four potential upstream watershed developments in the planning sub-region. Jennings Creek, an authorized project which is nearing completion, includes 19.3 miles of channel improvement and 13 structures which would provide 930 acre-feet of storage for sediment and 5,442 acre-feet for flood control. Line Creek is an authorized project, consisting of 29.6 miles of channel improvement and five structures providing 678 acre-feet of sediment storage and 8,217 acre-feet for flood control. Another authorized project, Mill Creek, would include 12.7 miles of channel improvement and one structure which would furnish 204 acre-feet of storage for sediment and 2,496 acre-feet for flood control.

Investigated or planned watershed developments are Roaring River and Smith Fork Creek. The Roaring River project would consist of three structures which provide 13,171 acre-feet of storage for flood control, 8,160 acre-feet for municipal and industrial water supply, and a recreation pool of 900 acres. Smith Fork Creek development would include 72 miles of channel improvement and six structures which would furnish 36,840 acre-feet of flood control storage and 300 acre-feet for water supply.

Potential watershed projects have been investigated on Calfkiller River, Putnam-Cane Creek, Little Indian Creek - Buffalo Creek, and Salt Lick Creek. The Calfkiller River project would consist of five structures providing 22,830 acre-feet of storage for flood control, 3,500 for municipal and industrial water supply, and an 880-acre pool for recreation. The Putnam-Cane Creek development would contain 8.8 miles of channel improvement and two structures which would provide 880 acre-feet of flood control storage and a 65-acre recreation pool. The Little Indian Creek and Buffalo Creek project would comprise 13.3 miles of channel improvement and two structures providing 4,100 acre-feet of flood control storage. Salt Lick Creek watershed development would consist of 40.5 miles of channel improvement and nine structures which would furnish 12,495 acre-feet of storage for flood control, 2,200 acre-feet for municipal and industrial water supply, and a 250-acre lake for recreation.

SECTION IV - EVOLUTION OF THE SUB-REGION WATER RESOURCES DEVELOPMENT PLAN

13. SELECTION OF BEST SOLUTIONS

Plan formulation study of Appalachian Sub-region I utilized data based on detailed planning efforts under survey investigations for the Upper Cumberland River Basin, Rockcastle River, and Big South Fork Cumberland River, and feasibility studies for navigation facilities at Celina and Wolf Creek Dams. Water resource needs for the growth centers of Sub-region I have been discussed in Section II and potential methods of satisfying these needs were described in Section III. Selection of the best solutions to satisfy the identified needs while being compatible with the studies mentioned above was the basis for derivation of a water resource development plan which could feasibly stimulate the economy of the sub-region. The plan is considered in three components as follows: (1) those projects which have been authorized and where early implementation would help provide the means of developing goods and services to increase economic activity; (2) projects and measures studied in survey report scope but which require authorization; and (3) potential projects which could provide a solution to identified needs but which require further detailed study before recommendation. Existing, authorized, and potential projects developed by the Corps of Engineers, Department of Agriculture, state, city, or public utility have been considered.

The solutions selected as elements of the water resources development plan for Sub-region I are discussed by state planning sub-regions. Maps and schematic diagrams of the various alternatives considered for the Upper and Central Cumberland River Basin in Kentucky and Tennessee are shown on Figures 18-4 and 18-5.

State Planning Sub-region 31 - Kentucky

The Martins Fork project will provide for reduction of flood damages at Harlan, Pineville, and Barbourville, and intervening rural areas between the damsite and Williamsburg. Measures to provide additional protection and reduce residual damages at these and other communities in the Upper Cumberland River basin are being considered in the survey report, Upper Cumberland River Basin, Kentucky and Tennessee.

The Norris Reservoir - Cumberland Gap - Scenic Riverway Interstate Complex has been recommended for detailed planning by the Appalachian Regional Commission. The preliminary report gave the following indication: the needs, demand minus supply, are 7,640,000 activity days at the present time and will increase to 22,805,000 activity days by the year 1980. This complex would meet some of the sub-region's demand for recreation facilities.

State Planning Sub-region 30 - Kentucky

The most feasible development of the Big South Fork, Cumberland River basin, will be determined upon completion of the alternative studies directed by Section 218 of the 1968 Flood Control Act, as discussed on page II-17-32.

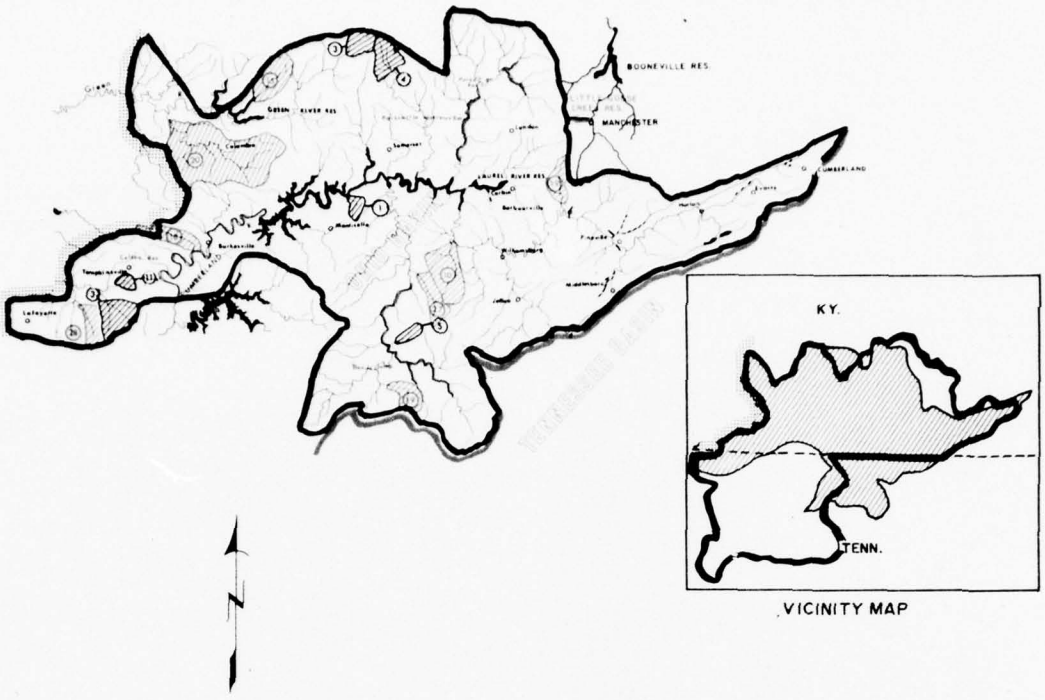
The Marsh Creek upstream watershed development which has been investigated by the United States Department of Agriculture will require authorization and would provide average annual flood control benefits of about $3,800 accruable to crops, pasture, and other agricultural lands in McCreary County, Kentucky, and Scott County, Tennessee.

State Planning Sub-region 29 - Kentucky

The most feasible alternative for satisfying the water supply needs at Columbia appears to be by pipelining water from Russell Creek upstream watershed development. The project would also reduce flood damages to agricultural lands and provide a recreation pool. The Russell Creek Watershed development would provide annual flood damage reduction benefits of $19,300, visitations of 40,000 recreation days, and 4.0 mgd water supply for the city of Columbia.

Construction of the Celina Lock and Dam and a cargo lift over Wolf Creek Dam would provide a navigable waterway through the planning sub-region and stimulate economic activity as earlier described. The Celina project is authorized to include a navigation feature when that purpose can be determined as economically feasible. Additional studies will be required to determine the potential traffic on the waterway and benefits attributable to that mode of transportation in the sub-region. Consideration of a cargo lift over Wolf Creek Dam is dependent upon navigation through Celina dam.

The authorized upstream watershed development on Mill Creek would satisfy a portion of the water resource needs in the urban and rural areas of Monroe County. The project would furnish flood control benefits of some $2,700 accruing mostly to roads, bridges, and crops; a water supply for the town of Tompkinsville; and recreation potential for a visitation of 18,000 recreation days.



VICINITY MAP

LEGEND

- BASIN BOUNDARY
- WATER SUB-REGION BOUNDARY
- STUDY AREA BOUNDARY
- APPALACHIAN REGION BOUNDARY

EXPECTED TO EXIST BY 1980

- MAJOR RESERVOR
- UPSTREAM WATERSHED PROJECT
- LPP PROJECT

PLANNING ALTERNATIVES

- MAJOR RESERVOR
- UPSTREAM WATERSHED PROJECT
- LPP PROJECT

UPSTREAM WATERSHED PROJECT IDENTIFICATION

EXPECTED TO EXIST BY 1980

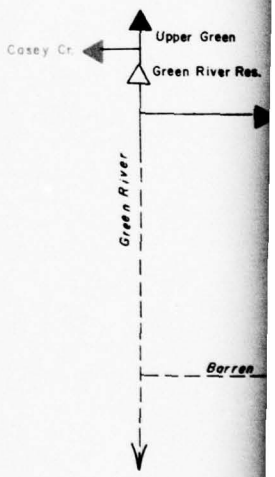
1 Meadow Cr.
3 Line Cr. (Tenn.)
3 Upper Green (Ky.)
4 Buck Cr.
5 Pine Cr.
11 Mill Cr.

ALTERNATIVE AVAILALABLE FOR PLANNING

10 Marsh Creek
15 Casey Creek
18 Marrowbone Creek
19 Richland Creek (KY.)
19 Black Wolf Creek (TENN.)
20 Russell Creek
27 Perkins Creek
28 Salt Lick Creek

CUMBERLAND RIVER BASIN
ABOVE CELINA

LOCATION MAP



INITY MAP

ARY

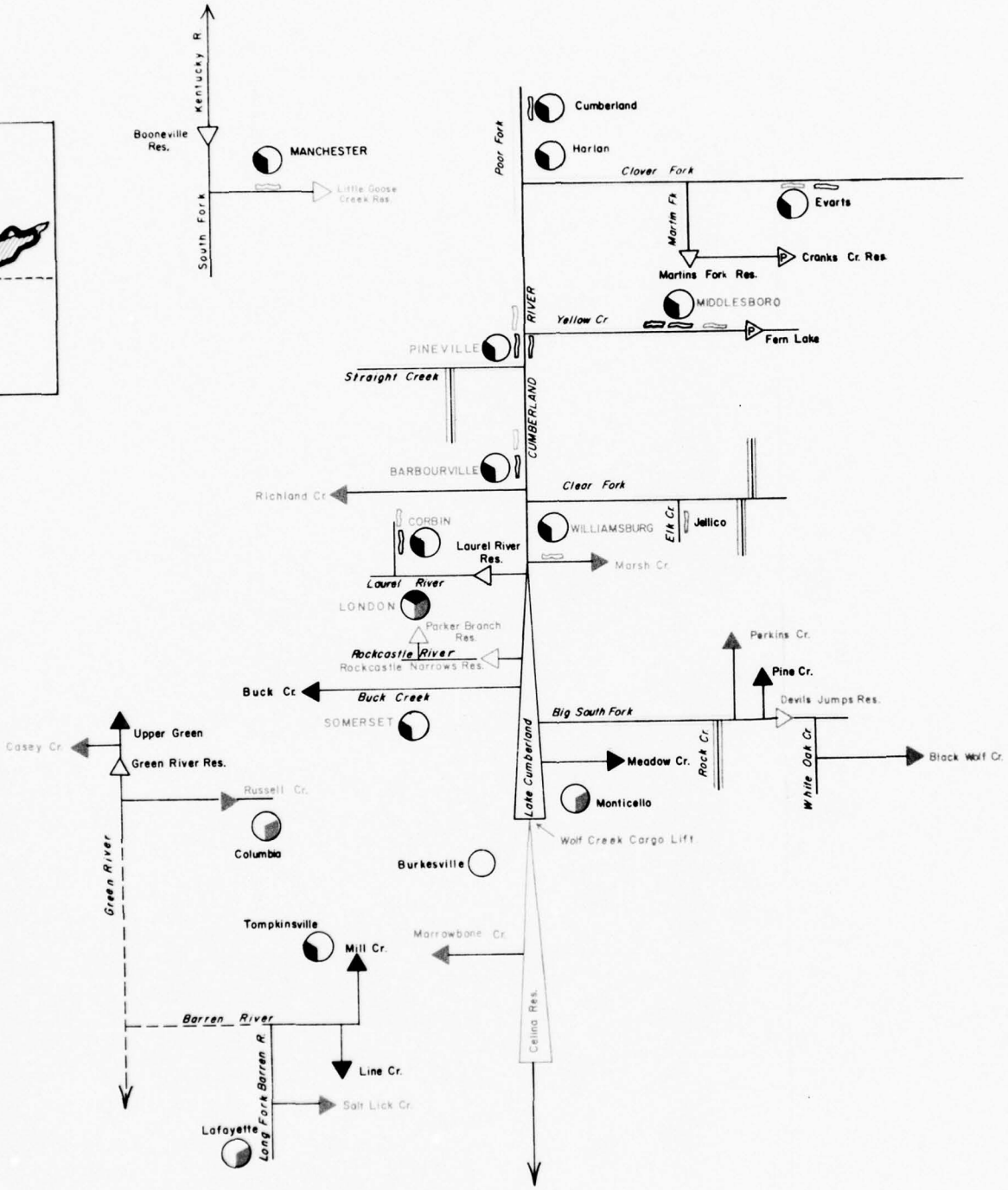
UNDARY

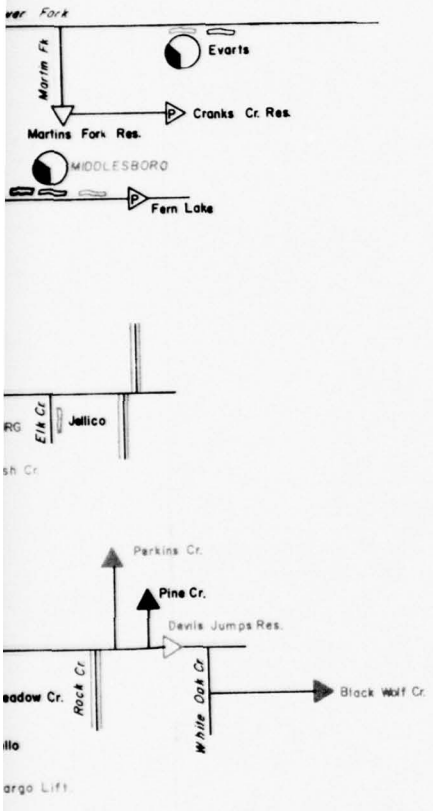
PROJECT

PROJECT

RIVER BASIN
CELINA

N MAP





LEGEND

NEEDS

- WATER QUALITY
- WATER SUPPLY
- FLOOD CONTROL

ALTERNATIVES

EXPECTED TO EXIST BY 1980:

- △ MAJOR RESERVOIR; P INDICATES NON-FEDERAL OWNER
- ▲ UPSTREAM WATERSHED PROJECT
- ▭ LPP PROJECT

PLANNING ALTERNATIVES:

- △ MAJOR RESERVOIR
- ▲ UPSTREAM WATERSHED PROJECT
- ▭ LPP PROJECT

OTHER

TOWN NAME PRIMARY GROWTH CENTER

Town Name SECONDARY GROWTH CENTER

STREAM AFFECTED BY POLLUTION

- CONTINUOUSLY
- INTERMITTENTLY

CUMBERLAND RIVER BASIN
ABOVE CELINA

SCHEMATIC OF WATER NEEDS AND ALTERNATIVE SOLUTIONS

II-18-31 FIGURE 18-4

State Planning Sub-region 38 - Tennessee

The water supply problem at Cookeville can best be satisfied by obtaining water from Center Hill reservoir. This project is being pursued by local interests and apparently will be under construction in the near future.

Authorized upstream watershed projects should be added to the plan to satisfy a portion of the water resource needs in the planning sub-region. The Jennings Creek project is nearing completion and is estimated to provide average annual flood damage reductions of about $109,200 to crops and other agricultural lands, roads, bridges, and commercial and residential improvements. Line Creek and Mill Creek would provide flood damage reductions of about $54,500 and $22,900, respectively, basically to roads, bridges and crops.

The Smith Fork Creek upstream watershed project was investigated by the United States Department of Agriculture but will require authorization. The proposal would reduce average annual flood damages to crops, pasture, roads, bridges, and residential and commercial improvements by $82,000 and furnish about 1.6 mgd water supply to Aubertown, presently serving about 1,000 people.

An upstream watershed development on Salt Lick Creek has the potential of reducing average annual flood damages by $58,300 with benefits accruing mostly to crops, pastures, roads, and bridges; providing a water supply of 4.3 mgd to Lafayette and 1.0 mgd to Red Boiling Springs; and producing an annual visitation of 37,000 recreation days.

Other Problem Areas

A potential for hydroelectric power production exists in project purposes of the Celina, Devils Jumps, and Rockcastle River projects. The power features of these individual projects will be investigated and formulated during future studies.

Sub-region I contains five major reservoirs which provide opportunities for water oriented recreation. The Daniel Boone National Forest and several State parks furnish other recreation activities. However, the recreation potential is not being fully utilized to the economic advantage of the area. A comprehensive study of the recreational potential and a subsequent master plan of development are needed to further intensify use of existing facilities and stimulate a recreation industry in the sub-region.

Summary of Development Plan for Sub-region I

The following tabulation of projects selected for the Appalachian development plan identifies those elements which should be implemented by 1980, those which require authorization, and those which are potential but need additional investigation to determine full economic impact.

ELEMENTS OF COMPONENT 1

Authorized projects for early implementation

	Project	Location	State Planning Sub-region
1.	Martins Fork Reservoir	Kentucky	31
2.	Booneville Reservoir	Kentucky	31
3.	Laurel River Reservoir	Kentucky	31
4.	Green River Reservoir	Kentucky	29
5.	Cordell Hull Lock and Dam	Tennessee	38
6.	Upstream watershed projects		
	a. Mill Creek	Kentucky	29
	b. Jennings Creek	Tennessee	38
	c. Line Creek	Tennessee	38
	d. Mill Creek	Tennessee	38
7.	Flood Plain Information Studies		
	a. Corbin	Kentucky	31
	b. Barbourville	Kentucky	31
	c. Pineville	Kentucky	31
	d. Cumberland	Kentucky	31
	e. Burkesville	Kentucky	29
	f. Woodbury	Tennessee	38

ELEMENTS OF COMPONENT 2

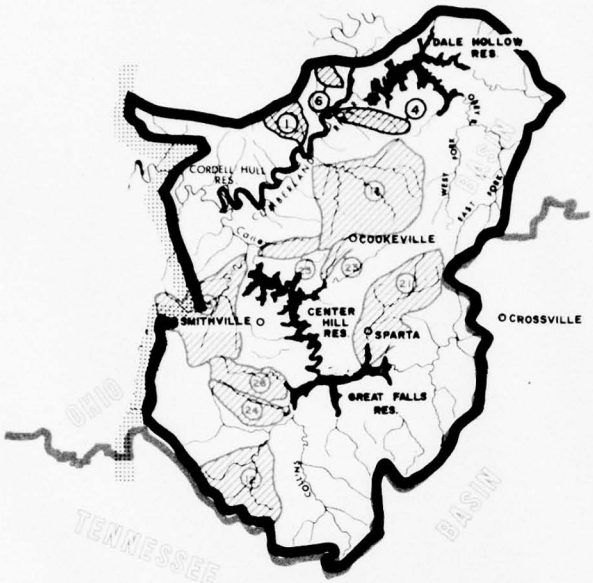
Projects requiring authorization

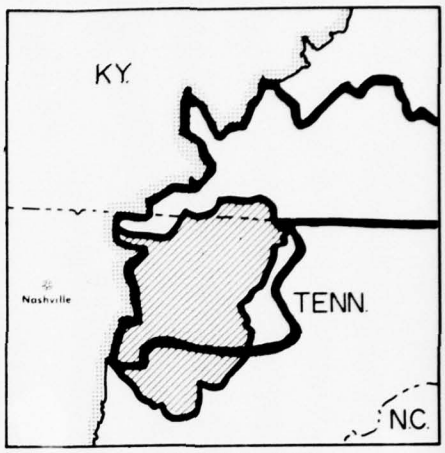
	Project	Location	State Planning Sub-region
1.	Upstream watershed projects		
	a. Marsh Creek	Kentucky	30
	b. Smith Fork Creek	Tennessee	38

ELEMENTS OF COMPONENT 3

Proposals which require additional study

1.	Devils Jumps Reservoir and Alternative Studies, Big South Fork, Cumberland River	Kentucky and Tennessee	30
2.	Celina Lock and Dam	Kentucky	29
3.	Wolf Creek Cargo Lift	Kentucky	29





VICINITY MAP

LEGEND

RIVER BASIN BOUNDARY

STUDY AREA BOUNDARY

APPALACHIAN REGION BOUNDARY

EXPECTED TO EXIST BY 1980

MAJOR RESERVOIR

UPSTREAM WATERSHED PROJECT

PLANNING ALTERNATIVES

UPSTREAM WATERSHED PROJECT

UPSTREAM WATERSHED PROJECT IDENTIFICATION

EXPECTED TO EXIST BY 1980

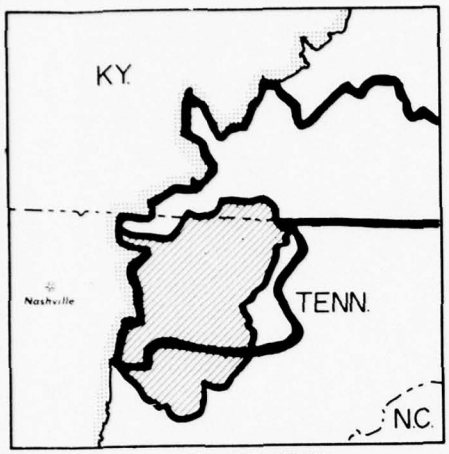
1 Jennings Creek
4 Mill Creek
6 Proctor Creek

ALTERNATIVES AVAILABLE FOR PLANNING

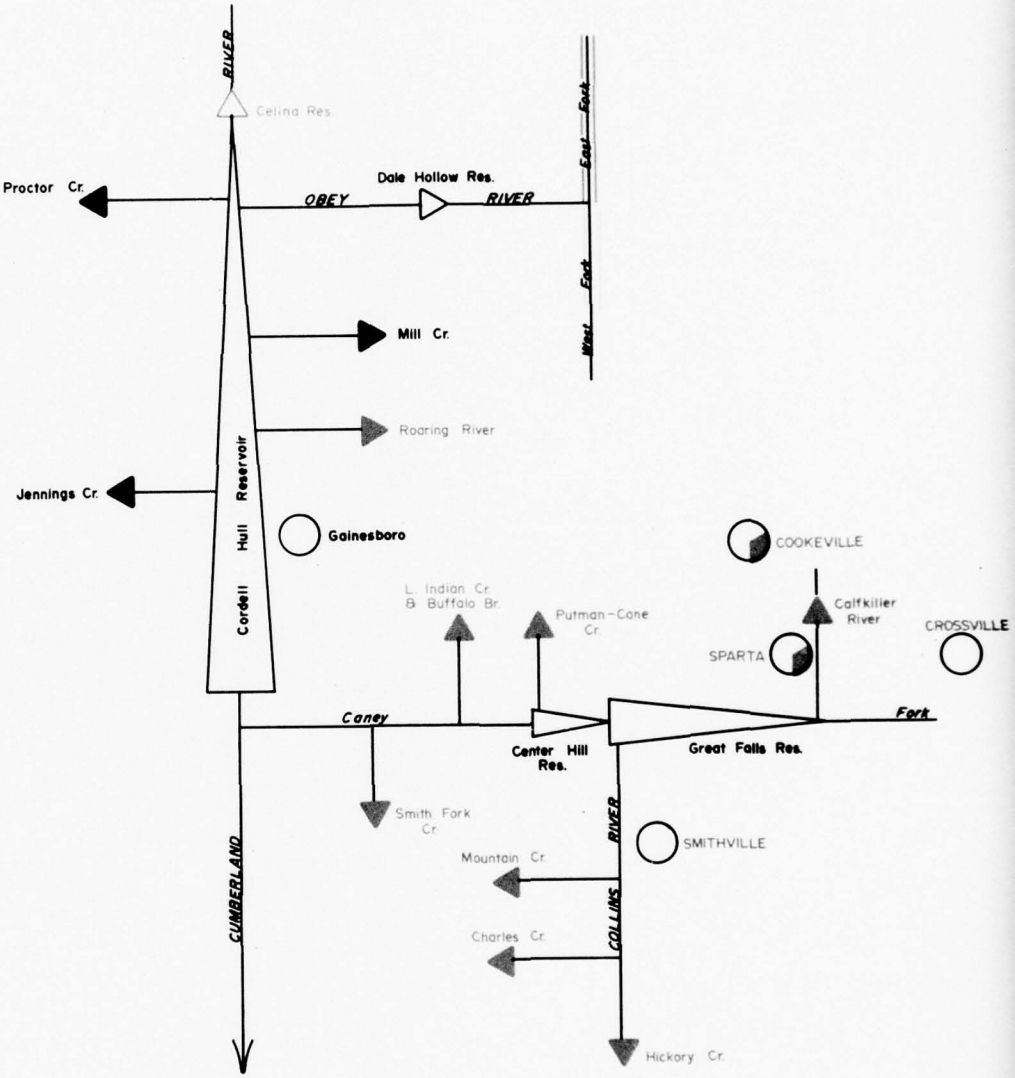
12 Hickory Creek
14 Roaring River
15 Smith-Fork Creek
21 Calfkiller River
23 Putnam-Cane Creek
24 Charles Creek
25 Little Indian & Buffalo Branch
26 Moutain Creek

CENTRAL CUMBERLAND RIVER BASIN

LOCATION MAP



VICINITY MAP



LEGEND

ER BASIN BOUNDARY
DY AREA BOUNDARY
PALACHIAN REGION BOUNDARY

O EXIST BY 1980

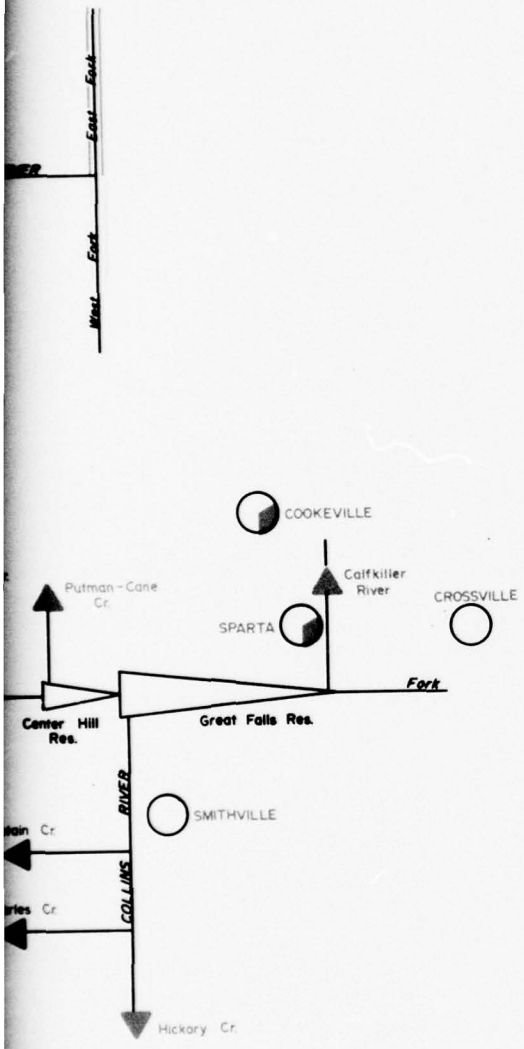
OR RESERVOIR
TREAM WATERSHED PROJECT

TERNATIVES

TREAM WATERSHED PROJECT

CENTRAL CUMBERLAND RIVER BASIN

LOCATION MAP



LEGEND

NEEDS

WATER SUPPLY

ALTERNATIVES

EXPECTED TO EXIST BY 1980:

△ MAJOR RESERVOIR

▲ UPSTREAM WATERSHED PROJECT

PLANNING ALTERNATIVES:

△ MAJOR RESERVOIR

▲ UPSTREAM WATERSHED PROJECT

OTHERS

TOWN NAME PRIMARY GROWTH CENTER

Town Name SECONDARY GROWTH CENTER

STREAM AFFECTED BY POLLUTION

CONTINUOUSLY

INTERMITTENTLY

CENTRAL CUMBERLAND RIVER BASIN

SCHEMATIC OF WATER NEEDS AND ALTERNATIVE SOLUTIONS

II-18-35 FIGURE 18-5

ELEMENTS OF COMPONENT 3

Proposals which require additional study (Cont'd)

Project	Location	State Planning Sub-region
4. River Basin Studies		
a. Rockcastle River	Kentucky	31
b. Cumberland River basin	Kentucky	31
5. Local Protection Project, Middlesboro	Kentucky	31
6. Norris Reservoir-Cumberland Gap - Scenic Riverway Interstate Complex	Kentucky	30, 31
7. Comprehensive Recreation Study	Kentucky and Tennessee	29, 30, 31, 38
8. Upstream Watershed Studies		
a. Salt Lick Creek	Tennessee	38
b. Russell Creek	Kentucky	29

Effectiveness of Plan

The plan displayed here for the water sub-region was developed in the assumption that the counties in Kentucky and Tennessee with the stimulation provided by the Appalachian Development Act of 1965 and related measures to raise their economy to a level approximating the national level of economic development. For Sub-region I this would mean a population of 770,000 in the year 2020 compared to 504,030 in 1960. For employment it would mean 290,000 jobs in 2020 compared to 135,635 in 1960.

The needs of areas of demonstrated growth and areas with clear growth potential are emphasized and the needs of all communities are given consideration in the planning process.

The effectiveness of the selected plan can be appraised, in part, by the magnitude of flood damage and water supply needs for the Sub-region. Serious flood problems exist for some of the growth centers but much has been accomplished to alleviate the situation through the construction of flood protection works. Development expansion for the Sub-region is not dependent upon the flood plain areas. Likewise the present water supplies are adequate for municipal and industrial demands for the growth centers. To accommodate the future growth as projected by the

benchmark goals, the existing supply is adequate but will require expansion of facilities and installation of conveyance systems. The best alternate for Cookeville and Smithville future supplies is Center Hill Reservoir.

Upstream watershed projects, in various stages of planning, have been selected to satisfy some of the water resource needs in urban and rural areas. The water supply needs for Columbia, Tompkinsville, Red Boiling Springs, Lafayette and Aubertown will be supplied by reservoir storage in those projects selected for the plan. The impacts of the upstream watershed proposals are presented in Appendix A of the main report.

In some instances, it is clear that further studies must be made to determine the best way of meeting sub-regional needs, but solutions have been found for most immediate needs and those occurring in the early future. Potential upstream watershed projects studied for the Appalachian Water Resources Survey which should be further investigated when local needs and interest become apparent are Casey, Marrowbone and Richland Creeks in Kentucky and Roaring River, Calfkiller River and Putnam-Cane Creek in Tennessee.

SECTION V - PLAN ELEMENTS DESCRIPTION

14. THE PLAN

Descriptions of the elements contained in the water resources development plan for Water Sub-region I are contained in the following paragraphs. See Figure 18-6 for the appropriate geographic locations.

Reservoir Projects to be Implemented by 1980

The Laurel River, Green River and Cordell Hull projects, now under construction and the Booneville and Martins Fork projects, currently in advanced engineering and design status, are described in Part II, Chapter 17.

Upstream Watershed Projects

Upstream watershed development has been mentioned in preceding paragraphs when discussing the problems of the various growth centers. However, there are many problems over the sub-region that revolve around floodwater damage, erosion and sediment damage, agricultural water management, and the management of cropland, grazing land, and the forested areas. These are all problems that fall under the purview of the Department of Agriculture and particularly to the Soil Conservation Service and the Forest Service.

Construction of the upstream watershed projects found feasible in preliminary studies could provide varying degrees of protection to damaged flood plains within these watersheds. These damaged flood plains contain crop and pasture lands, urban and industrial developments, roads and bridges, and other transportation facilities. In addition, to the flood prevention storage in these structures, some could be multiple-purpose structures providing additional storage for other uses.

Storage for recreational use could be contained in the above structures. These developments would provide recreation pools and would include basic facilities, such as parking lots, roads and trails, boat docks and ramps, picnic shelters, and other similar or related permanent type facilities needed for public health and safety.

A portion of the municipal and industrial water supply needs could be satisfied by storage, providing a source to serve a sector of the population. The developments would provide only the physical storage for water supplies, and many of the municipalities would need to develop a water system to convey and distribute the water to users.

Accelerated Land Treatment Measures

Land treatment measures proposed by the U.S. Department of Agriculture, over and above present rate of accomplishments, include the acceleration of conservation measures by 1980 to provide:

a. An additional 138,000 acres of adequately treated cropland;

b. Improved vegetative cover for an additional 376,500 acres of pasture;

c. 373,600 acres of pasture, newly seeded to permanent adapted perennial vegetation;

d. Stabilization of critical areas on 4,400 acres of roadbank and 28,600 acres surface mine areas;

e. Increase recreational opportunities and fish and wildlife by the construction of 604 farm ponds; management of 1,090 farm ponds for improved fishing; improve 2,470 acres for recreation by planting grasses, legumes, trees and shrubs; construct 36 miles of recreation access roads; develop 4,150 acres for wildlife habitat; plan preservation of 46,000 acres for wildlife; and develop 5,370 acres and 2,140 acres for picnic and camping areas; and

f. Development of 14,720 basic conservation plans and complete detailed soil survey on 1,229,500 acres of land.

Forest Land Treatment Measures

Accelerated State and private forest land treatment measures would include by 1980:

a. 84,000 acres of tree planting;

b. 118,000 acres of erosion control;

c. 119,000 acres of hydrologic stand improvement;

d. 147,000 acres of woodland grazing control; and

e. Develop 1,220 forest and woodland management plans.

Accelerated National forest land treatment and structural measures would include by 1980:

	Acres
Tree Planting	20,630
Timber Stand Improvement	78,910
Soil and Water:	
Gully Stabilization	1,000
Sheet Erosion Control	2,530
Streambank Stabilization	1,700
Stream Channel Clearing	670
Rehab. Abandoned Roads & Trails	1,860
Mined Area Stabilization	1,520
Soil Surveys	200,000
Watershed Analysis	300,000
Fish and Wildlife:	
Big Game Range Analysis	172,000
Small Game Range Analysis	172,000
Wildlife Openings	8,700
Seeding and Planting	2,800
Release of Forage Plants	3,500

The structural measures include: construction of 3 heliports and 500 helispots for fire protection, 200 acres surface of waterholes for wildlife, 2,870 acres of developments and 4 special projects for recreation, and 968 miles of access roads and trails; improvement of 330 acres of streams and lake habitat for fish and wildlife; and acquisition of 250,000 acres of land.

Flood Plain Management Services

An important non-structural feature of the water resources development plan for the water sub-region is the program for flood plain management services. This element would include flood plain information studies which provide local officials and planners with technical data relating to historical and potential flooding situations, and maps delineating such floods so that development in urban and rural areas can be planned and regulated to decrease the potential of future flood damages. Close coordination is being maintained with the responsible state agencies, State Planning Commission in Tennessee and Division of Water in Kentucky, to program studies which facilitate proper development of flood plain lands in growth centers. Several flood plain information studies are included in the current plan, but additional studies will be scheduled and accomplished as the plan progresses.

The technical services phase of the flood plain management services program will provide on a continuing basis technical data concerning the flood potential of specific sites for development by Federal, State and local governments; private business; or individual owners. This assistance is provided to further enhance the potential for wise use of flood plain lands.

Additional Studies

The interagency study of alternatives to the Devils Jumps Reservoir on the Big South Fork Cumberland River will present the feasible measures for development of the basin and a basis from which Congress should select a proposal to meet the objectives of the Appalachian development program.

Further consideration of the Celina Lock and Dam will necessitate an updated study of the potential for commodity movement by barge traffic on the Cumberland River upstream from the limits of the Cordell Hull navigation pool. When the navigation feature of the Celina project is determined to be justified, it would be appropriate to investigate the feasibility of a cargo lift over Wolf Creek Dam to provide for commodity movement between the Celina Reservoir and Lake Cumberland.

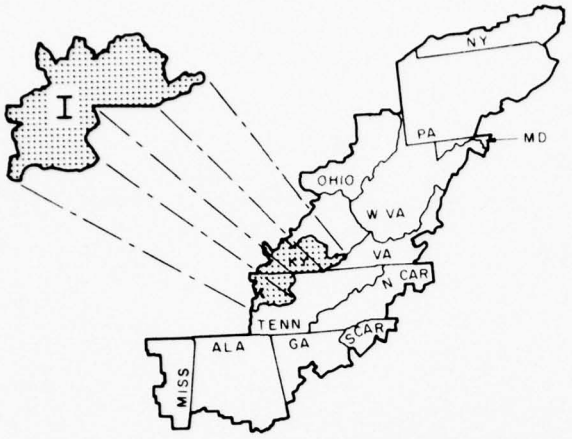
Outstanding survey reports for the Cumberland and Rockcastle Rivers are described on Page II-17-32 will be completed to investigate the water resource development potential in view of the objectives of the Appalachian Act and to discharge the outstanding resolutions.

Additional studies will be required to determine the feasibility and economic justification of the Middlesboro local protection projects, the Norris Recreation Complex and the potential upstream watershed projects in component 3 of the plan. Each of these studies has been discussed in previous sections of this Chapter.

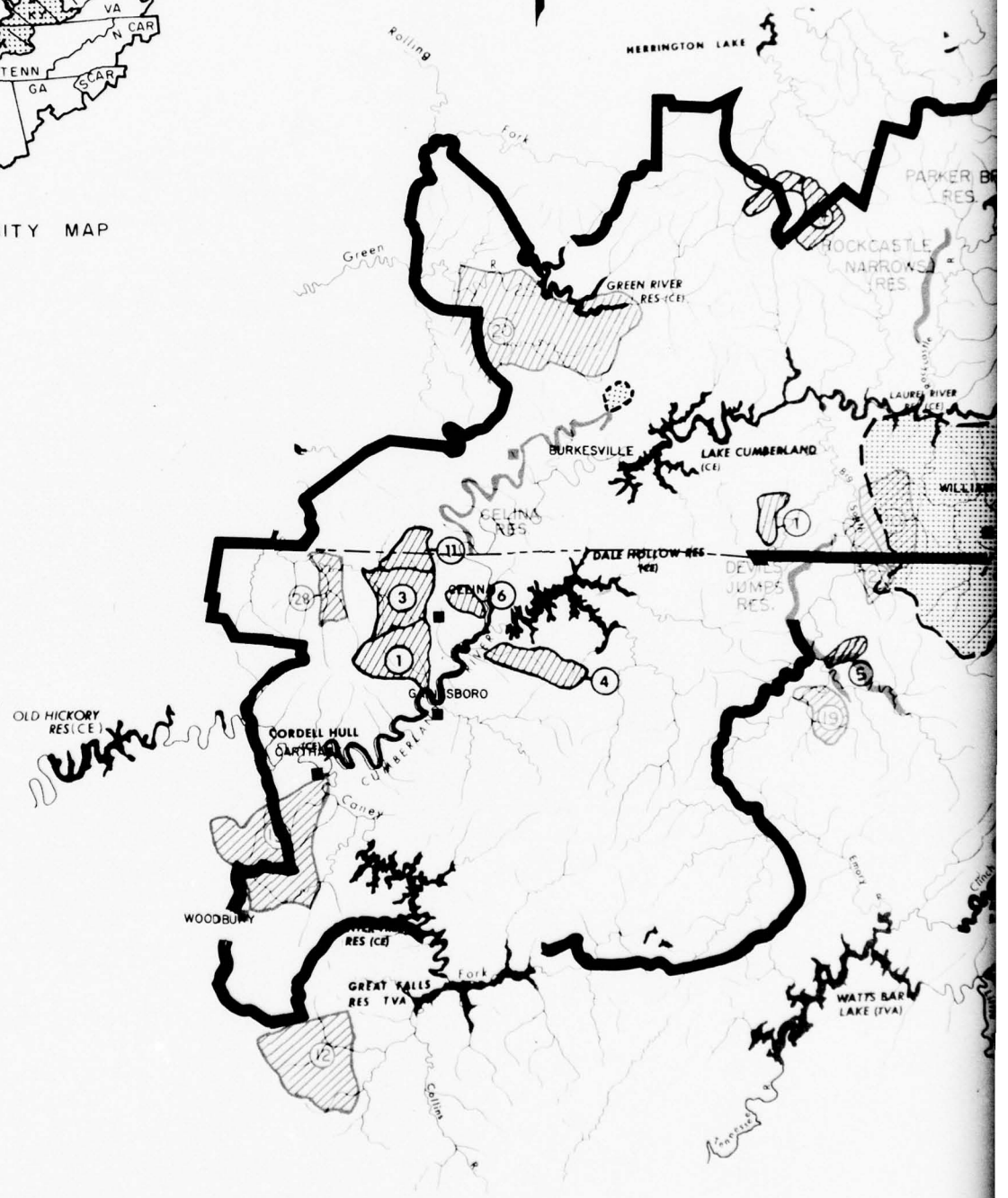
The area bounded by Water Sub-region I has excellent potential for water-related recreation development. The development of water-related recreation in this area is not constrained since numerous reservoirs have been completed, or are under construction.

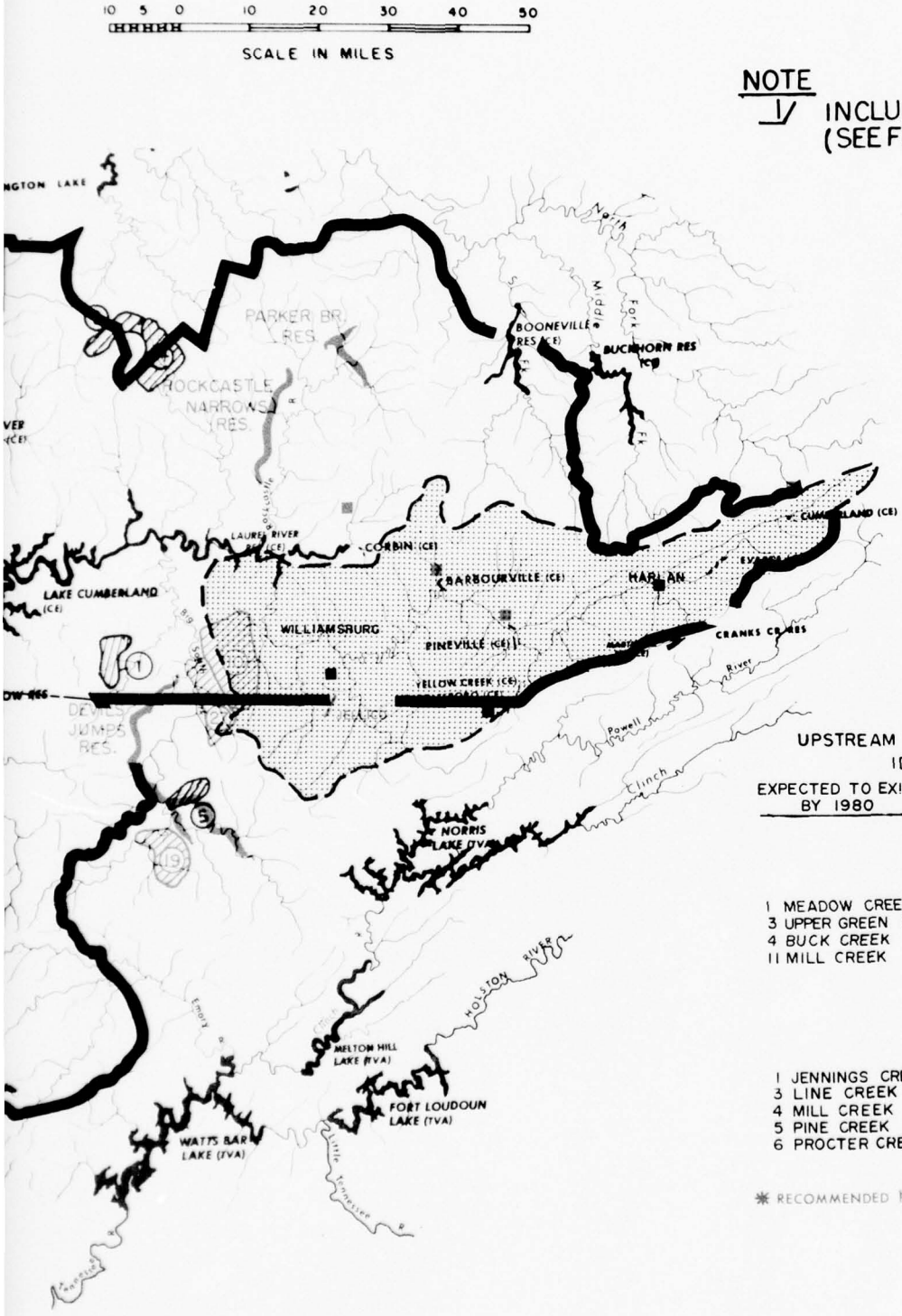
The numerous streams and reservoirs located in the Cumberland River Basin within Water Sub-region I and in the Kentucky and Tennessee River watersheds provide many opportunities for water oriented recreation. A recreation terminal complex (the Norris-Cumberland Complex), which is located in Harlan, McCreary, Whitley and Bell Counties in Kentucky and Scott, Campbell, Clairborne, Union and Anderson Counties in Tennessee, is also being studied by the Appalachian Regional Commission. In view of these many opportunities for water associated recreational activities, a study should be made to develop a "Master Plan for Recreation" for the sub-region so that each project can be developed to its best advantages, and so that each project will enhance the others. The master plan should be cognizant of the potential for the Norris-Cumberland Terminal Complex and develop a plan for vacation type as well as day-use recreation.

A master plan as opposed to smaller individual plans protects the recreation resource by providing the careful planning in and around it. A master plan provides for and maintains a proper ecological relationship while fulfilling the water-related recreation needs. The plan would provide recreation opportunity for the people of Appalachia as well as attract people from outside the region.



VICINITY MAP





NOTE

1/ INCLUDES EXISTING ELEMENTS (SEE FIGURE 17-12 FOR DISTINCTION)

UPSTREAM WATERSHED PROJECT IDENTIFICATION

EXPECTED TO EXIST BY 1980	FOR CONTINUING PLANNING

KENTUCKY

1 MEADOW CREEK	10 MARSH CREEK
3 UPPER GREEN CR.	20 RUSSELL CREEK
4 BUCK CREEK	27 PERKINS CREEK
11 MILL CREEK	

TENN.

1 JENNINGS CREEK	12 HICKORY CREEK
3 LINE CREEK	15 SMITH-FORK CREEK
4 MILL CREEK	19 BLACK WOLF CREEK
5 PINE CREEK	* 28 SALT LICK CREEK
6 PROCTER CREEK	

* RECOMMENDED FOR EARLY ACTION

UPSTRE

MAJOR

LOCAL

FLOOD

FUT

PLAN

3

STRUCTURAL

UPSTREAM WATERSHED PROJECT

(1) EXPECTED TO EXIST BY 1980 1/

(20) FOR CONTINUING PLANNING

EXISTING ELEMENTS
E 17-12 FOR DISTINCTION)

MAJOR RESERVOIR

EXPECTED TO EXIST BY 1980 1/

FOR CONTINUING PLANNING

LOCAL PROTECTION PROJECT

EXPECTED TO EXIST BY 1980

FOR CONTINUING PLANNING

NON-STRUCTURAL

FLOOD PLAIN INFORMATION STUDY

EXISTING

FOR ACCOMPLISHMENT

FUTURE STUDY (ONLY EMPHASIS LIMITS SHOWN)

RSHED PROJECT
ICATION
FOR CONTINUING PLANNING

UCKY

MARSH CREEK
RUSSELL CREEK
PERKINS CREEK

ENN.

HICKORY CREEK
SMITH-FORK CREEK
BLACK WOLF CREEK
SALT LICK CREEK

LY ACTION

REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN
APPALACHIA

WATER SUB - REGION I

PLAN OF DEVELOPMENT

OFFICE OF APPALACHIAN STUDIES JULY 1969

II-18-43 FIGURE 18-6

DEVELOPMENT
OF
WATER RESOURCES
IN
APPALACHIA

MAIN REPORT
PART II
SHAPING A PLAN

CHAPTER 19 - A FRAMEWORK AND PLANNING
FOR DEVELOPMENT IN SUB-REGION J

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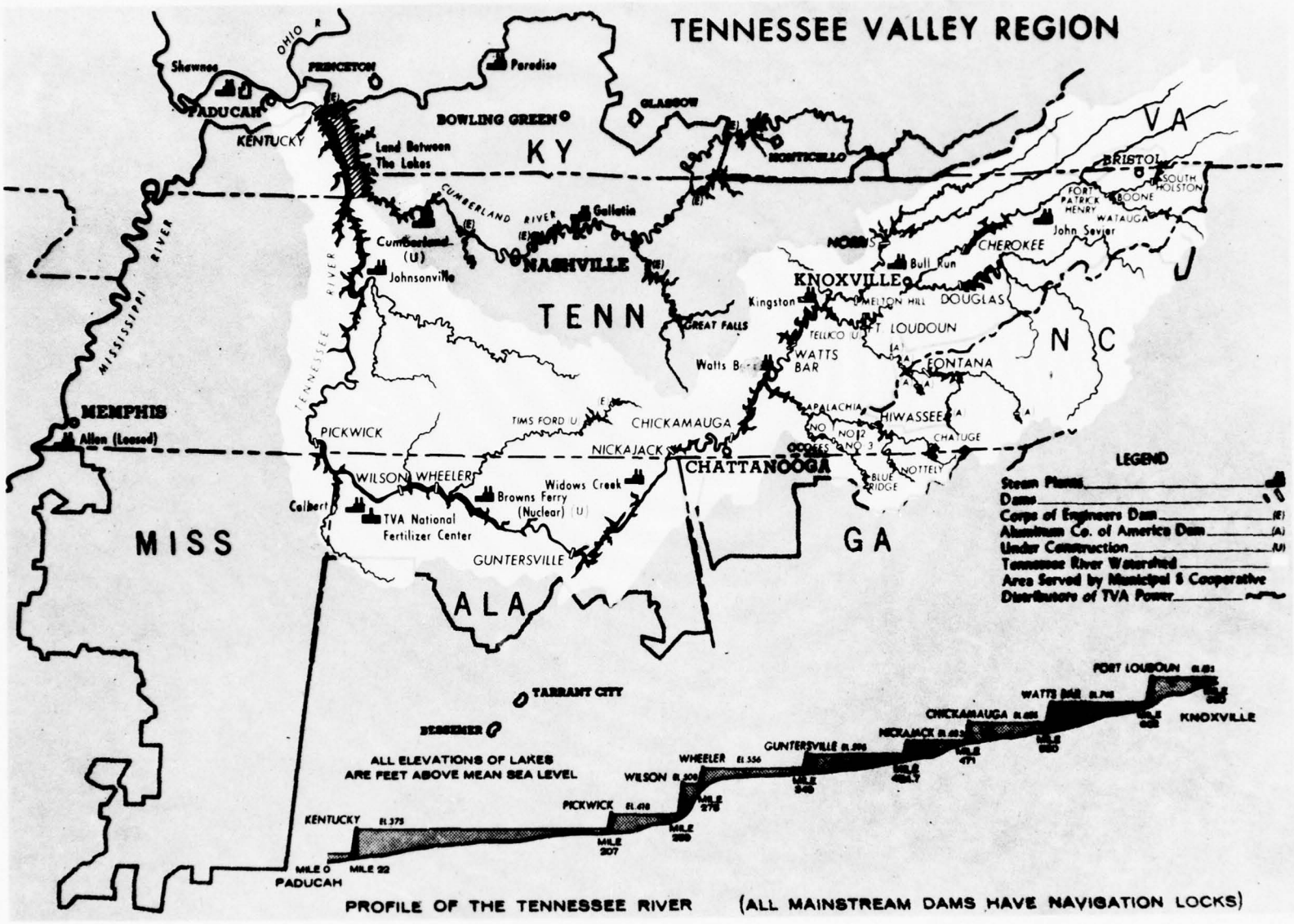


FIGURE 19-1 -- TENNESSEE VALLEY REGION

CHAPTER 19 - WATER SUB-REGION J

SECTION I - A FRAMEWORK FOR DEVELOPMENT

1. INTRODUCTION

This report is a summary of existing and potential economic development in Water Sub-region J and an examination of the water and other resource needs associated with that development. Water Sub-region J roughly coincides with the Appalachian portion of the Tennessee River Valley. The water needs must be viewed largely as a part of the Tennessee River System, the development of which is primarily the responsibility of the Tennessee Valley Authority under the TVA Act of 1933.

Since 1933, TVA has worked in conjunction with other federal, state and local authorities to develop the resources of the Valley and its people. Today those efforts provide a sound basis for continuing development, but much remains to be done. While Water Sub-region J has made progress in solving old problems of eroding soils, neglected forests, and wasted rivers, new problems are emerging with the growth of modern cities, industrial expansion, and greater recreational use of the area. The danger to natural resources is due less to neglect and underdevelopment, as in the past, than to the possibility that overuse or improvident use may, in the future, diminish their utility. Consequently, before damage is done, governmental organizations and the people of the sub-region must achieve a public consciousness that they have entered a "new generation" of potential resource management problems requiring not only vigilance but serious, deliberate counter-attack to hold them in check.

Economic Progress - In 1933, the economy of Water Sub-region J was built principally around an inefficient agriculture. Water, one of the most abundant natural resources was one of the most significant elements hindering development; flooding was a frequent problem. Other natural resources were underutilized or misused. Industrial development was needed to provide employment opportunities and to raise income levels. The abused physical resources contributed to an attitude of despair.

In 1968, the economy of the sub-region was in a far different condition than it was when TVA began planning for the development of the Valley and adjoining areas (figure 19-1). The magnitude of this change, discussed in detail later in this chapter, is illustrated by data for the entire Tennessee Valley region. Manufacturing activity has become the major driving force of the economy. As industrial employment has grown, outmigration has been reduced. Per capita income levels have risen from 45 percent of the U. S. average in 1933 to 70 percent of the U. S. average in 1966 (figure 19-2).

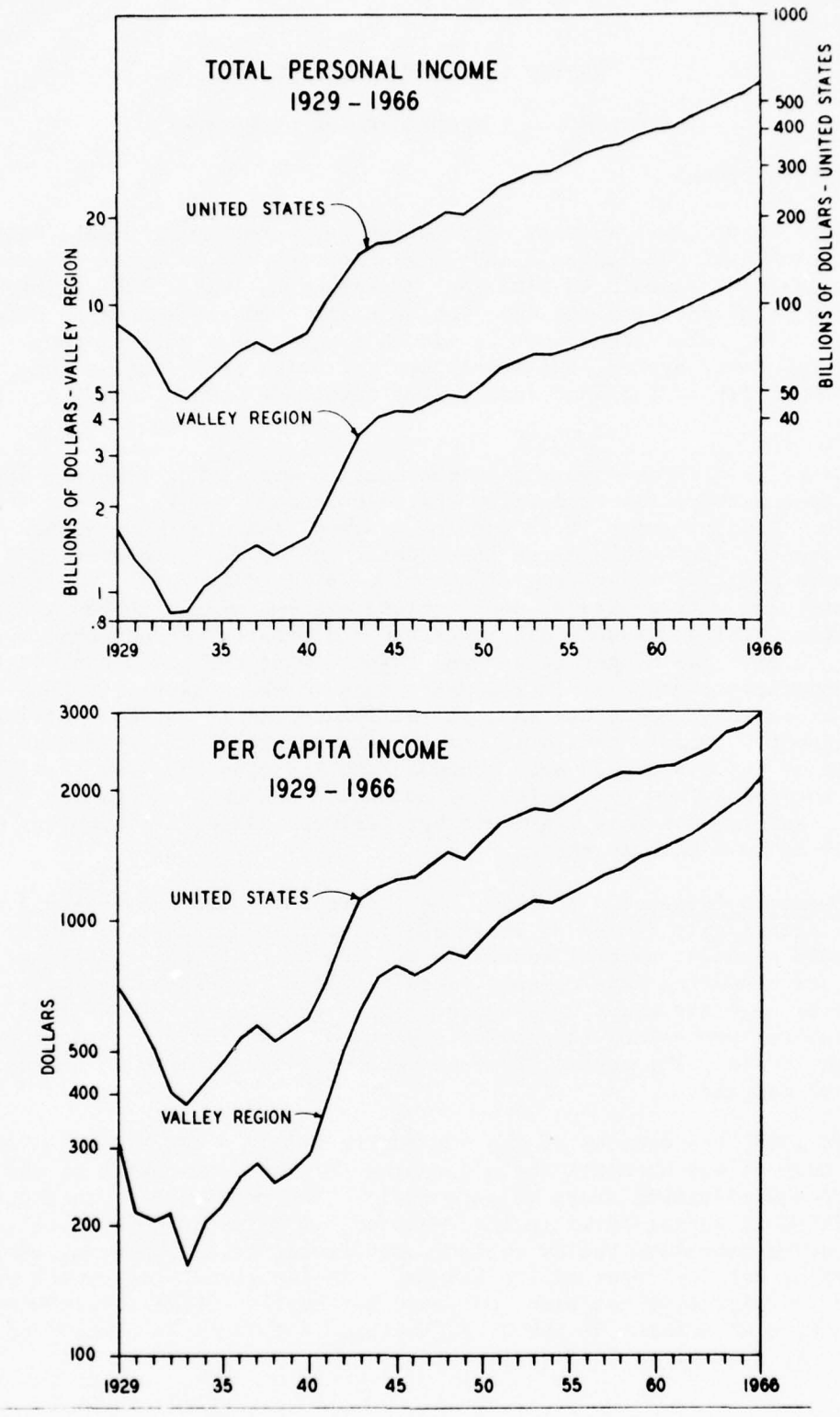


FIGURE 19-2 -- INCOME TRENDS, 1929-1966

Unfortunately, skill and education levels reflect a past history of inefficient agriculture and outmigration. While unemployment has been reduced, wage levels are still low and underemployment high. Low skill levels often hindered the growth of capital-intensive industry.

Pockets of poverty still exist in the less accessible areas where opportunity remains limited. Urban services are not highly developed; commercial and recreational facilities are inadequate. Emerging from the industrial transition are new demands for recreation and residential amenities and an increasing concern for the quality of the environment.

Development of Water and Related Resources - In 1936, when the TVA Board reported to the Congress on a plan and policy for The Unified Development of the Tennessee River System, the three-fold objective of water resource development was navigation, flood control, and power. As development of the system proceeded, other objectives--recreation, water supply, water quality, fish and wildlife--emerged as important needs and opportunities to be reflected in system planning and development.

Since the early years of TVA, developmental efforts have also been directed to the tributary areas, where water and related resource needs and opportunities differ from those along the main stream of the Tennessee. While flood control remains an important need in the tributary areas, development for navigation and power is often not economically feasible. On the other hand, benefits to recreation, water supply, water quality, and other purposes are usually of major importance.

Similar problems exist in the smaller upstream watersheds, where water resource planning for flood control, water supply, recreation, and improved water quality is needed. A concurrent area of concern is land and water management for erosion and sediment control, particularly on nonagricultural lands.

Need for Further Planning - Water and related resource development programs have been varied to reflect a wide divergence in developmental needs and opportunities. In many areas, growth and development have brought new resource demands, some far different from those of the past. New facilities and programs have been developed to help meet these demands and encourage continued growth and development. Future growth and development, however, will require continued efforts to meet the challenges of the years ahead.

2. BRIEF DESCRIPTION OF THE WATER SUB-REGION

Water Sub-region J, divided into five Water Areas (see map 19-1), is located in the southwestern part of the Appalachian region. The sub-region consists of portions of Tennessee, North Carolina, Virginia, Georgia, and Alabama. Of the 32,000 square miles in the sub-region,

the Tennessee River drains about 28,000 square miles or 87 percent. Slightly more than 10 percent is drained by other Ohio River tributaries, principally the Cumberland and Big Sandy Rivers. The remaining 800 square miles is about equally divided into areas drained by streams in the Atlantic Coast drainage and the Gulf Coast drainage.

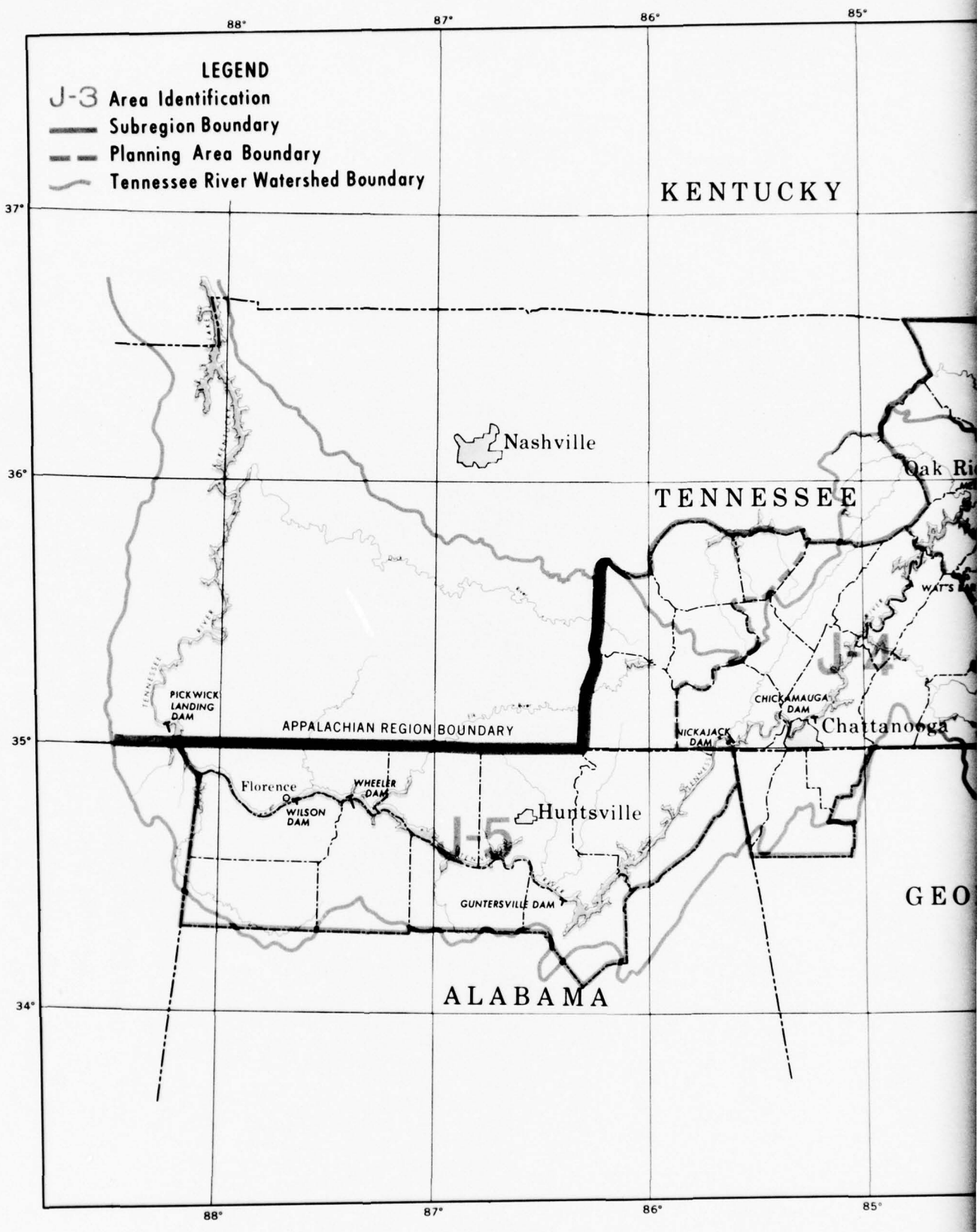
Location and General Characteristics - The sub-region is an elongated area which extends northeastward for 430 miles from the northeast border of Mississippi to the southwest border of West Virginia. Its width varies from 40 miles in northern Alabama to 130 miles in the vicinity of Knoxville, Tennessee, and Asheville, North Carolina. Physiographically and topographically, the sub-region is more diverse than any other area of equal size in the eastern United States. In elevation above sea level, it ranges from 414 feet at Pickwick Landing Lake in northwestern Alabama to 6,684 feet on Mount Mitchell in North Carolina.

The transportation network of Water Sub-region J affords generally good connections with other parts of the country (see map 19-2). Planned Interstate and Appalachian highways will improve access for many of the sub-region's communities. However, local access may remain less than adequate in some instances even with this improved regional transportation system.

Climate and Rainfall - The area is characterized by a moderate climate with temperatures rarely falling below zero in the winter or rising above 100 degrees in the summer. The average annual temperature ranges from 63 degrees in northern Alabama down to 46 degrees at high elevations in the mountains of Tennessee and North Carolina. January is usually the coldest month with average temperatures ranging from 43 to 30 degrees, and July is the warmest month with average temperatures ranging from 63 to 81 degrees.

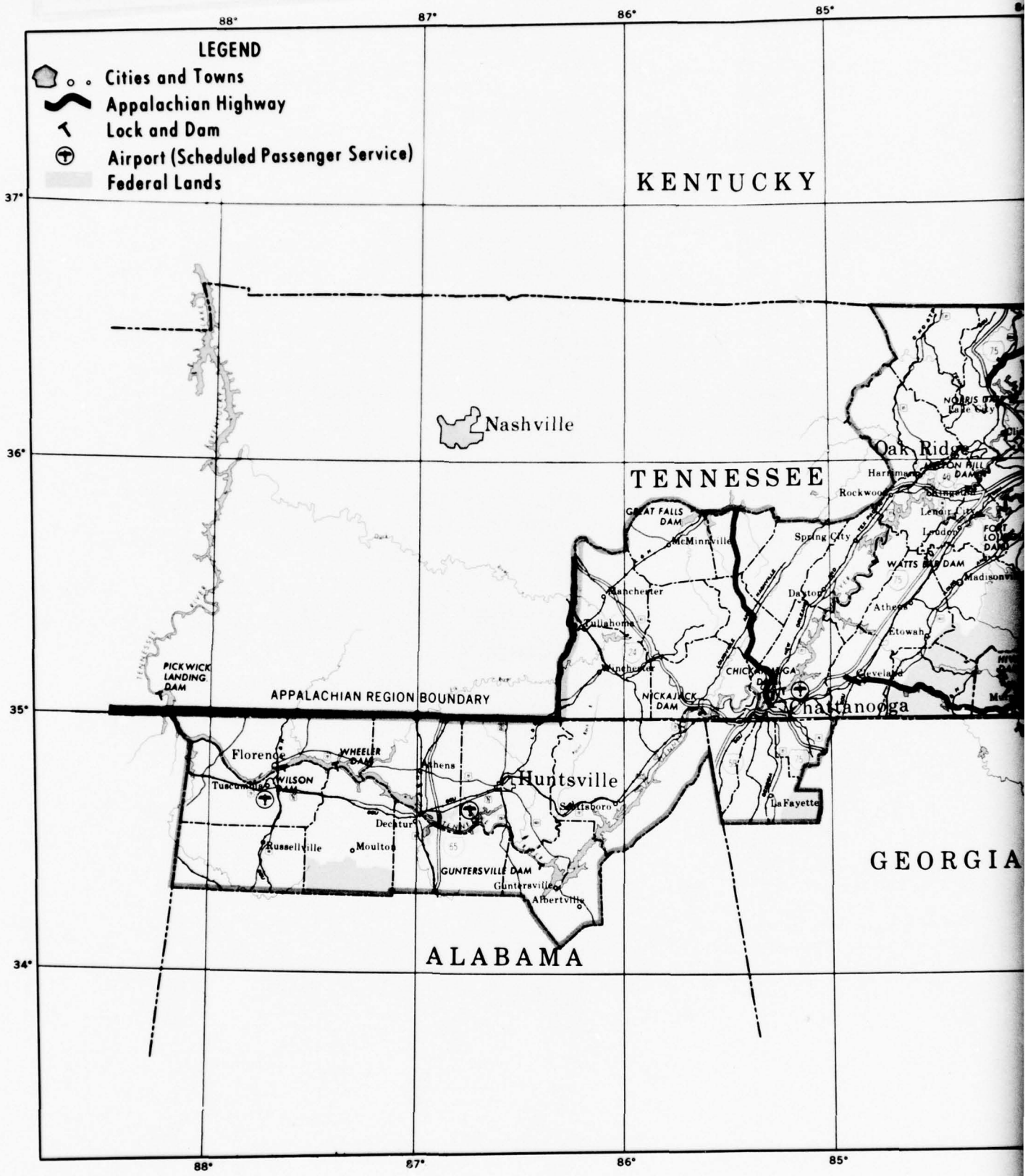
The average annual rainfall for the area is 52 inches. More than half of the annual total is received in winter and early spring, from November to mid-April. March is generally the wettest month, although at some locations in the eastern sections of the Valley, midsummer brings the highest precipitation. Early autumn, September and October, is likely to be the driest season.

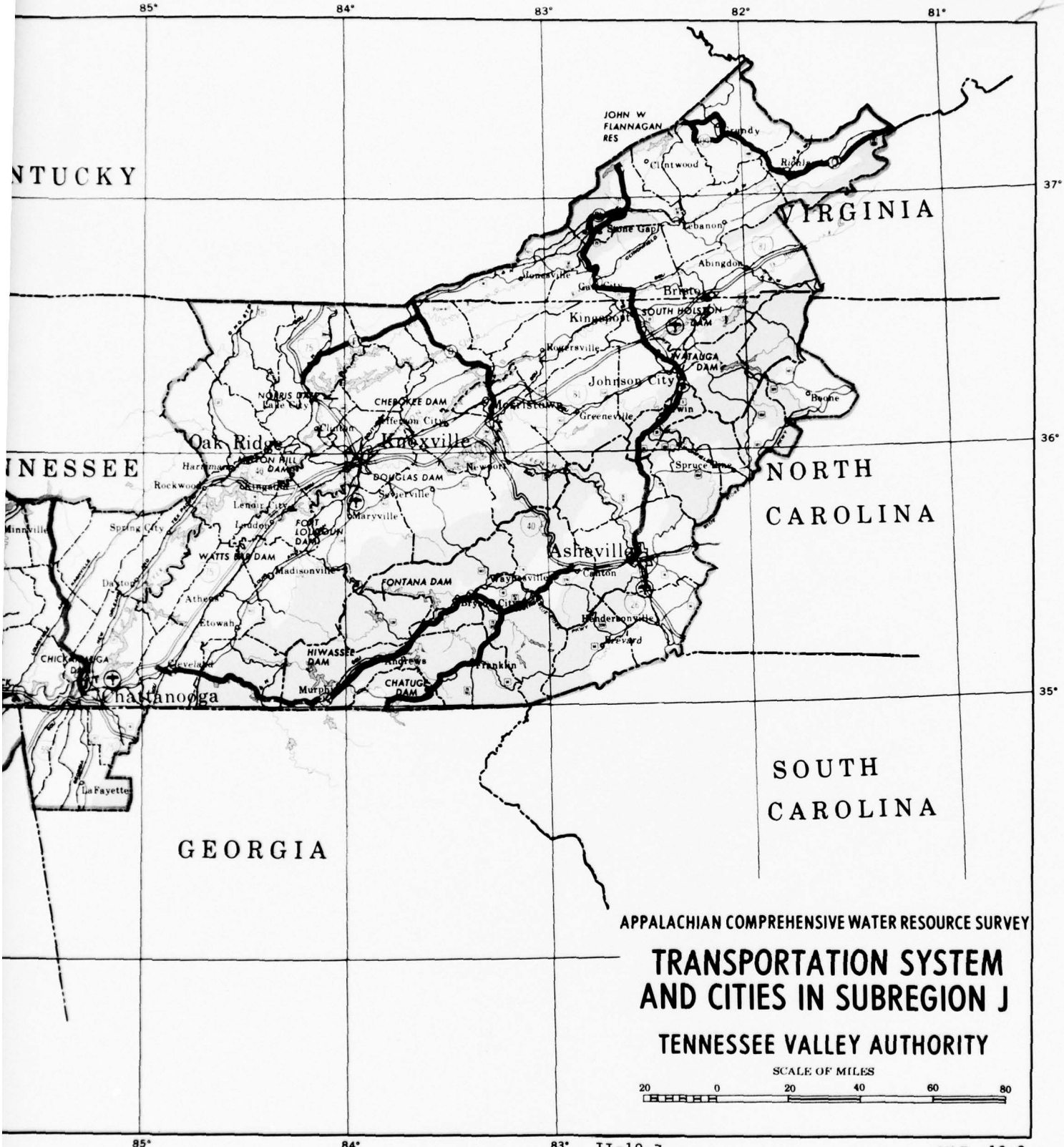
The Water Resource - The main stream is the Tennessee River, now improved by a series of eight reservoirs extending from Pickwick Landing Dam near the downstream limits of the Appalachian region to the head of the river at Knoxville, a distance of 445 river miles. The controlling depth is 11 feet and provides year-round navigation for boats of 9-foot draft. Backwater from these reservoirs extends as far as 30 miles up some of the major tributaries of the river. Many of the sub-region's largest industries and communities receive all or part of their water supplies from these reservoirs.


LEGEND
J-3 Area Identification
Subregion Boundary
Planning Area Boundary
Tennessee River Watershed Boundary
KENTUCKY
TENNESSEE
ALABAMA
Nashville
Oak Ri
WAT'S
J-4
CHICKAMAUGA DAM
Chattanooga
NICKAJACK DAM
PICKWICK LANDING DAM
APPALACHIAN REGION BOUNDARY
Florence
WILSON DAM
WHEELER DAM
Huntsville
J-5
GUNTERSVILLE DAM
GEO
88°
87°
86°
85°
37°
36°
35°
34°

II-19-5

MAP 19-1





APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

TRANSPORTATION SYSTEM AND CITIES IN SUBREGION J

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

20 0 20 40 60 80

MAP 19-2

Many other communities and industries obtain water from tributary streams of the Tennessee, Cumberland, and Big Sandy Rivers. Flow condition on these tributaries varies significantly, depending upon stream characteristics and the extent of regulation. In some instances, local water supply problems exist.

The principal means of water supply for most farms and many smaller municipal systems in the sub-region is ground water from wells and springs. The importance of such sources is declining rapidly as an increasing number of water utility districts and expanding municipal systems extend their services to the rural areas. As municipal systems expand, and as utility districts are organized, most of them turn to surface water as their source of supply.

Although the quality of ground water in this region is generally good, the yield from wells over most of the sub-region is usually low. With few exceptions, wells rarely exceed 200 or 300 gallons per minute and the majority provide less than 50 gallons per minute. A 1967 investigation of public water supply systems in the area showed that the systems serving 1,000 or more individuals obtained about 12 percent of the total volume of water from wells and springs.

The Tennessee river and its tributaries have been extensively developed for hydroelectric power. Facilities all or partly within the sub-region have an installed capacity of 3.2 million kw. While these facilities will continue to play a significant role in meeting the area's total power needs, additional capacity must be largely provided by thermal generation.

Other Resources - The topography and ground cover, being quite varied, gives the sub-region a setting of unusual scenic quality. This quality environment can be enjoyed the year round. This natural endowment is as real and important a resource as soils, minerals, and water. The abundance of scenic resources in the sub-region has great potential for the provisions of facilities and opportunities to satisfy regional and national recreation needs and to complement the development of other resources.

Soil conditions vary in slope, drainage, stoniness, and depth, all of which affect the suitability of a soil for agricultural uses and cause considerable differences in land use from place to place. Land presently used for agricultural and forestry purposes is estimated to be 18.8 million acres, which consists of 4.1 million acres of cropland, 2.5 million acres of pasture, 9.7 million acres of state and private forest and woodland, 0.9 million acres of other land, and 1.6 million acres of National Forest land. This total is expected to decrease slightly by 1980.

Of the 20.5 million acres of land in the sub-region, more than one-half of the total is in forest. A considerable amount of investment has gone into forestry since the early 1930's when the region's forests were thinly stocked, ravaged by fire, quantity and quality of timber were declining, and erosion was rampant. Today annual fire losses are controlled to less than 0.5 percent of forest area, woodlands are restocking rapidly with more and better-quality trees, and hydrologic

conditions are much improved. However, the unrealized potential of the forest is substantial. Some 30 percent of the area is still not under systematic management; cattle grazing causes damage on 16 percent of the commercial forest and this problem is not yet solved; fire losses should be reduced to 0.25 percent of the forest area per year; wood use and product value should be trebled. Realization of the potential will enhance hydrologic benefits and opportunities for recreation and wildlife as well as increase economic opportunities.

In 1965, the total value of mineral production in the sub-region was $294.2 million. This included slightly less than 40 million tons of coal, more than 85 percent of which was produced in the Virginia portion of the sub-region. Coal production accounted for about 60 percent of the value of total mineral production. Other important mineral products included stone, zinc, copper, and portland cement.

Water Resource Development - Existing water resource development on the Tennessee River and its tributaries includes the unified TVA system of 32 major reservoirs. This system has been developed for navigation, power, flood control and other benefits. Twenty-nine of these reservoirs are totally or partially within Water Sub-region J (see map 19-1), six of which are owned by the Aluminum Company of America. In addition to the navigation channel across two-thirds of the sub-region, these 29 reservoirs provide 10.6 million acre-feet of controlled storage and 3.2 million kw of installed hydroelectric generating capacity. The reservoirs now receive 40 million annual recreation visits* and provide significant opportunities for sport and commercial fishing.

Other federal agencies also have projects in the sub-region. The Corps of Engineers has three local flood protection (channel improvement) projects within the Tennessee Valley--Lake City and Spring City, Tennessee, and Paint Rock River, Alabama--and two multi-purpose reservoir projects on the Big Sandy River in southwestern Virginia, outside the Tennessee River watershed. The Tennessee Valley Authority has one hydroelectric power project on Caney Fork in the Cumberland River watershed. The U. S. Department of Agriculture, under its upstream watershed program, as of June 30, 1967, had completed two upstream watershed projects in the Alabama portion of the sub-region. Nine additional upstream projects, some of which include water supply and recreation features, are authorized for installation. For project location, see map 20-11, page II-20-65.

Population, Employment, and Growth Centers - In 1960, population and industrial employment in the sub-region was clustered around six centers, all located in the valley of the Tennessee River or its major tributaries:

*A recreation visit is defined as an entry into an area without regard to time spent or activity.

the Florence and Decatur-Huntsville areas in northern Alabama, the Chattanooga and Knoxville areas in east Tennessee, the Bristol-Kingsport-Johnson City area in upper east Tennessee and southwestern Virginia, and the Asheville area in North Carolina. Expansion of industrial activity is expected to continue in these areas and expand to the surrounding areas. This expansion will result in a pattern of higher population density in the existing urban areas and in the surrounding valley. There are also a few centers located outside the valley that have growth potential. The probable effect of this trend is shown in figure 19-3.

The more mountainous counties surrounding the valleys are not particularly suitable for industrial development and are not likely to develop high concentrations of population. It is here that recreation development can be expected to occur as the squeeze of increased population reduces the opportunities for open space reservation nearer the centers, and as overcrowding increases at existing recreation facilities.

3. THE NEED FOR AND SOURCES OF ECONOMIC DEVELOPMENT

The economy of Appalachian Water Sub-region J has been in a great transition in the past few decades. The sub-region, once largely rural has become more urban and industrialized. The relative importance of agriculture and mining has declined. Future development will reflect the continued impact of this transition.

Agriculture - Except in portions of northern Alabama and the Great Valley in Tennessee, the topography of the sub-region is unsuitable for contiguous large-scale, intensive, and highly mechanized farming operations. The agricultural sector has moved from a row-crop economy toward the production of livestock and forages. Commercial farms have increased in numbers but the total number of farms and of persons in farm employment has declined significantly. This trend is expected to continue in the near future, but at a lessened pace.

Mining - The impact of a decline in mining employment has not been so significant in relative terms as the decline in agricultural employment. Nevertheless, it has had a great effect in some places, particularly in Virginia where coal mining remains an important part of the economy. Employment in the mineral industries is projected to decrease slightly by 1980, partly because of increasing automation.

Forestry - Forests supply timber for an industry that turns out products worth more than $500 million a year, in addition to protecting watershed soils from erosion, improving hydrologic conditions, giving food and cover for wildlife, and offering opportunities for recreation. Forest industry investment exceeds $390 million; their payrolls

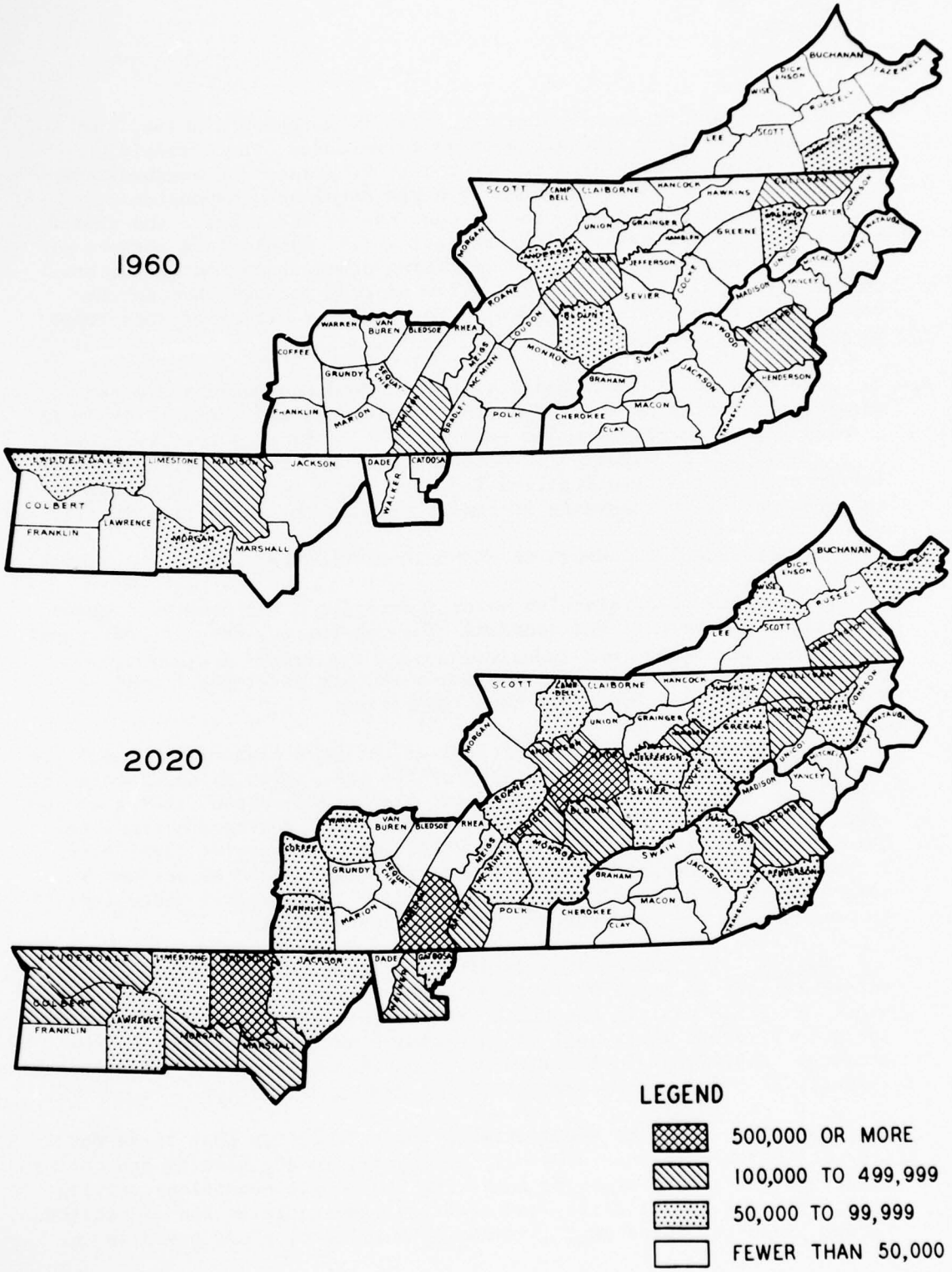


FIGURE 19-3 -- POPULATION BY COUNTIES, 1960 and 2020

total some $120 million and go to 29,000 millworkers each year. In the woods another 10,000 workers harvest and haul timber that feeds operations of more than 500 mills. Recent years have shown a steady growth in manufacturing activities related to forest products, and the potential has not been reached. Volume of growing stock on commercial forest land is 8.8 billion cubic feet. Volume of saw timber is 25.4 billion cubic feet.

Manufacturing - Future economic development of the sub-region depends heavily upon the industrial sector of the economy (figure 19-4). The growth of this sector has been rapid in recent years and should continue at a rapid pace in the near future. As the rate of decline in the agriculture and mining sectors diminishes, continued growth of the industrial sector will have a greater net effect upon the economy of the sub-region. However, the sub-region will not realize a large part of the potential benefits of industrialization until there is a change in the composition of new industry. The largest increase in manufacturing employment in recent years has been in apparel manufacturing, which has the lowest average earnings of all the major manufacturing categories. The need in the sub-region now is for more capital-intensive, high-productivity-per-worker industry to raise the average wage level. There is a great need to identify the locational advantages that might attract high-wage industries and to use this information effectively.

Trades and Services - The trades and services sector has not developed proportionately in Water Sub-region J to its growth in the nation. This is, to a great extent, the result of the relatively low income levels of the sub-region. While the expansion of the industrial sector generates a growing demand for trade and service employment, the relatively low wages paid by many of the industry categories tend to slow down the increase in per capita income and hence the growth of purchasing power. Thus, increased growth in trades and services depends partly upon a shift in the composition of increases in the industrial sector.

The trades and services sector, however, can be a source of growth as well as a result of growth. The sub-region needs to develop better retail and wholesale facilities and service centers. Investments which lead to the development of trade and service facilities can complement other types of development and aid sub-regional growth and development.

Education and Environmental Improvement - One of the factors limiting growth and development is the low level of educational attainment. In many areas the quality of education is wholly inadequate, and the educational system needs considerable improvement. The most urgent and immediate need is probably for the type of training that is furnished by technical schools, both at high school and adult levels,

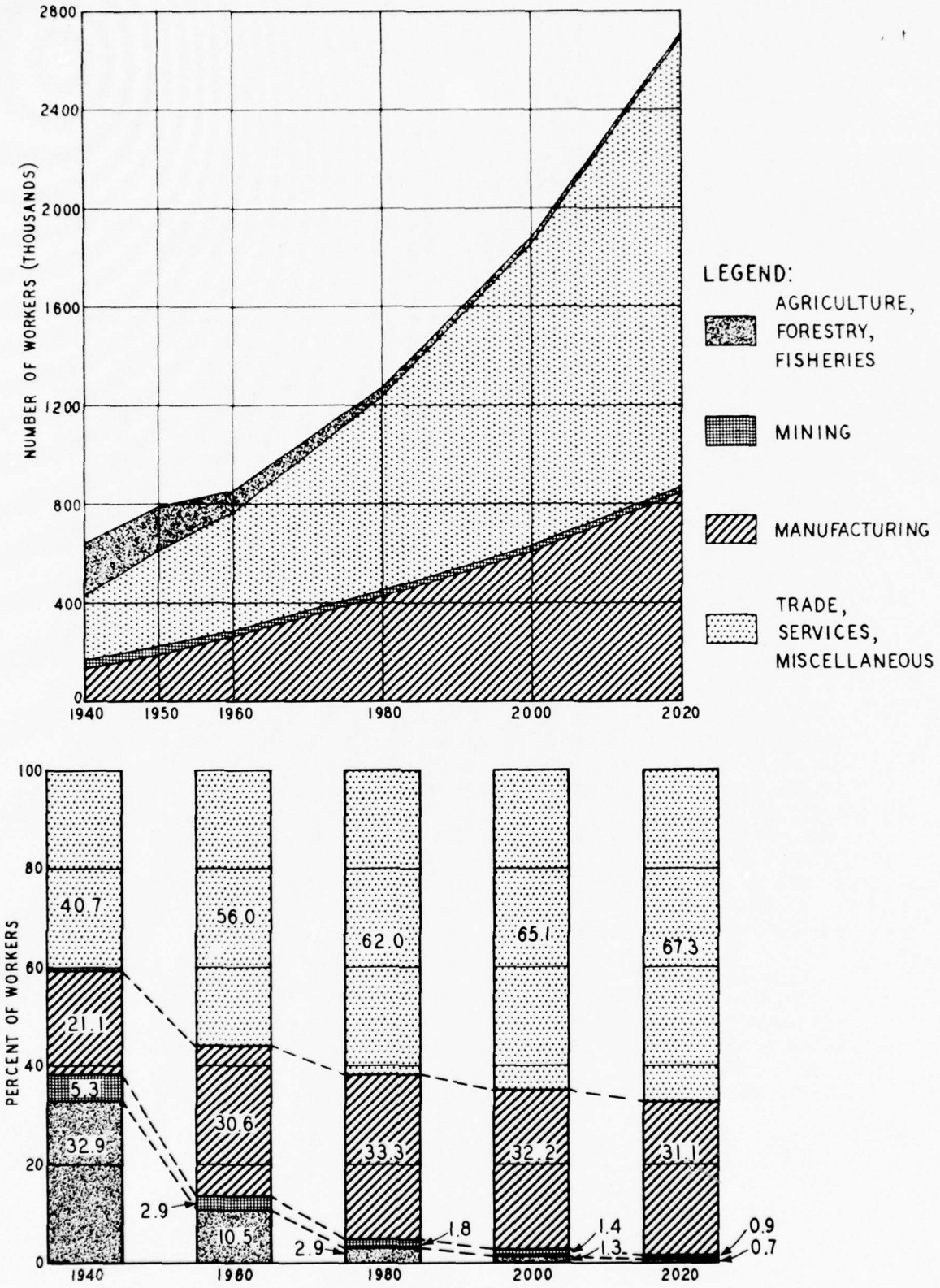


FIGURE 19-4 -- EMPLOYMENT BY MAJOR CATEGORIES, SUB-REGION J

and by junior colleges.

Environmental problems are increasingly being reflected in development programs. Concern about water and air pollution has reached the point where concerted efforts are being made to alleviate these problems in critical areas. Urban redevelopment and beautification are pressing needs throughout the sub-region. As population becomes more densely concentrated, there is an increasing need for improved outdoor recreation facilities.

4. DEVELOPMENT PRIORITIES

The stage of economic development of Water Sub-region J has reached a point where job opportunities are no longer limiting population growth. The level of resource utilization is far different from what it was in 1933, when water was wasted and constituted a threat to life and property and erosion was an awesome problem. Today per capita income has risen to 70 percent of the average reported for a more affluent Nation, and the proportion of employment in manufacturing has more than doubled. About 30 percent of the sub-region's workers had jobs in manufacturing industry in 1965, while a more efficient agriculture used the labor of fewer than 15 percent of the manpower of the area.

Thousands of men and women are employed in industries, many of which use the navigation channel of the Tennessee River and the dependable, low-cost power it helps to provide or rely upon the dependable supply of water which the regulated streamflow guarantees. Continued growth will bring increased demands upon the water resource and the facilities which enable it to be used.

Implications for Planning - Existing water resource facilities will meet part of these needs, but growth will also bring need for new facilities. In some cases, investment will not be in water resource development. For example, the peak demand upon power systems in power supply area 20, which includes the area served by distributors of TVA power, is estimated to increase to 33,600 mw by 1980. This is more than double the existing level. Except for the possible development of pumped-storage facilities, little of this increased demand will be met by hydroelectric installations.

On the other hand, there are a number of areas where existing and potential water resource needs and opportunities will require further investment in water resource development. These needs and opportunities are discussed generally in Section II of this Chapter, which is concerned with the implication of continued economic growth and development for future investment.

Need for Priorities - The magnitude of these needs and opportunities

requires that the investment of public funds be concentrated in areas where there is a significant potential for future growth and where the expected return on the public dollar invested will yield the greatest benefit. Discharge of this responsibility becomes a problem of (1) selecting the areas of greatest need and potential for development and (2) coordinating the efforts of existing federal, state, and local agencies toward meeting these needs and realizing these potentials.

One indication of present and future developmental needs can be seen in a comparison of the projected employment in each Appalachian planning area with the developmental benchmark employment for the same area. Benchmarks, described in more detail in Appendix E, indicate the level of employment needed to bring the Water Areas to within 95 percent of national per capita income in 2020 and maintain a rate of population growth equal to the Nation after 1980.

In figure 19-5, comparison of the projections and benchmarks is made for Water Sub-region J by Water Areas for the year 2020. The comparison reveals significant differences among planning areas. These differences provide one measure of the relative need for acceleration of economic development programs.

Areas of Greatest Priority - The greatest developmental problems are in the Tri-Cities (J-1) and Asheville (J-2) water areas, where the relative differences between projected and benchmark employment are greatest. The Knoxville Water Area (J-3) has a smaller, yet substantial, problem of economic lag. While all of these areas have growth centers, employment opportunities have not developed adequately in parts of these planning areas. The ability of these planning areas to attain benchmark levels depends upon solutions to the problems of unemployment and underemployment which exist in parts of these areas, as well as upon the continued development of major centers.

Chattanooga (J-4) and Huntsville (J-5) water areas are more advanced in their development. While both have experienced large decreases in agricultural employment, employment alternatives have been more abundant than in the other planning areas. Because transition to an industrial economy has been easier in these two areas, the difference between projected and benchmark levels of employment is small.

There are certain problems that are common to all the water planning areas. Most important among these is the need for upgrading skill and education levels to accelerate a shift in the employment mix to provide more high-wage employment. Only if this problem is solved can any of the planning areas hope to attain benchmark levels.

Environmental Aspects - Environmental enhancement is also a common development need. In addition to action needed to correct existing environmental deficiencies, it is important that resource planning seek to enhance the environment through positive development actions. Some priority areas in this regard are indicated in subsequent sections of this report.

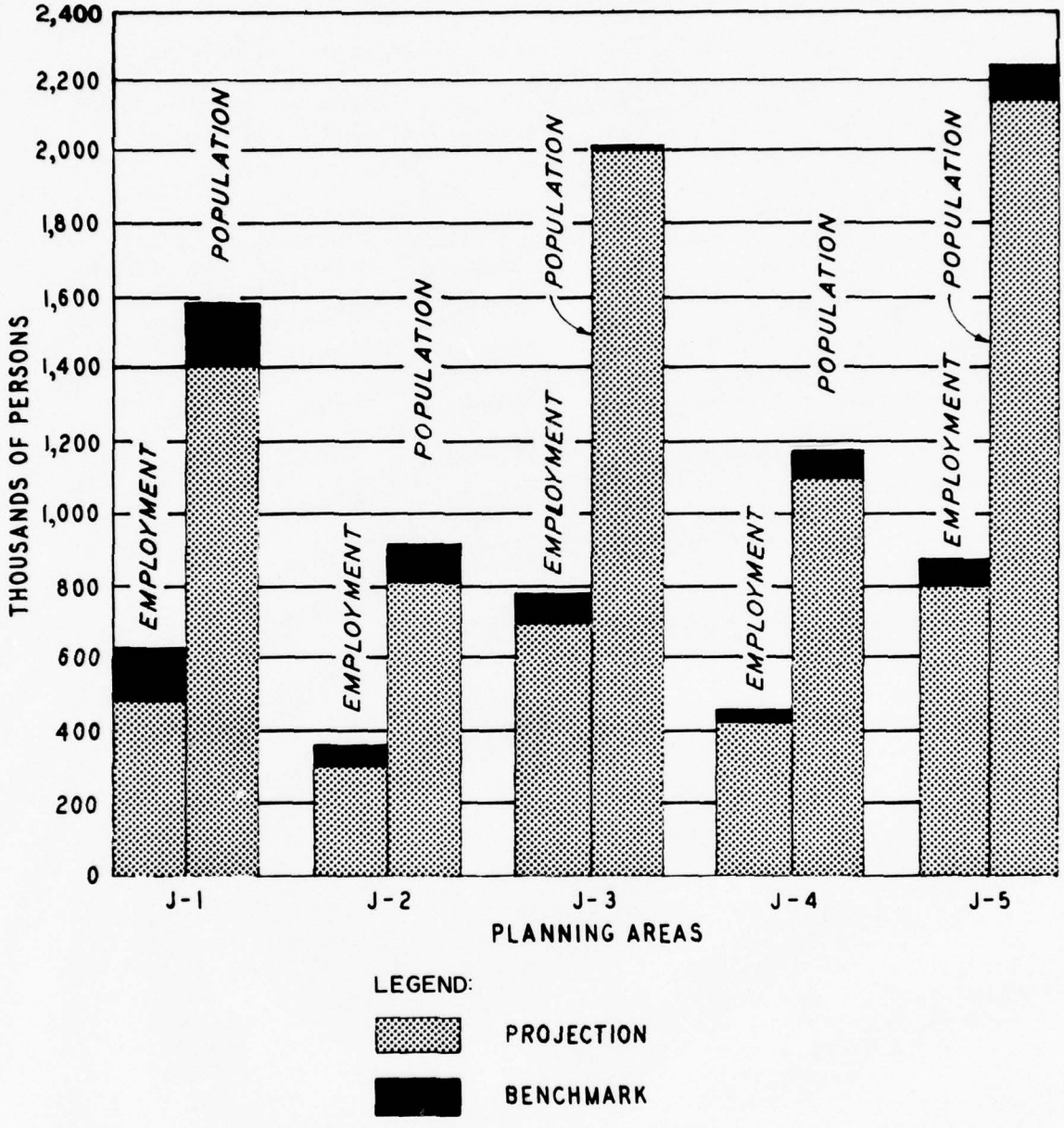


FIGURE 19-5 -- POPULATION AND EMPLOYMENT IN 2020

SECTION II - PLANNING FOR FUTURE DEVELOPMENT

5. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

Investments in the water and related resources of the sub-region can contribute toward economic growth and development if they are made in facilities designed to serve better the sub-region's changing needs and potentials. At present there are six identified categories where additional investment is required.

Improved Water Supply and Waste Treatment Facilities - One of the sub-region's greatest assets is an abundance of clean water. There are, nevertheless, reaches of the watercourses where the volume and kind of waste discharge to streamflow restricts water use and inhibits the development of the area. In many cases, municipal water treatment and distribution systems are not adequate to meet developmental needs. Construction of improved water supply and waste treatment facilities is needed for regional growth and development.

While water supply and water quality problems exist throughout the sub-region, these problems are most difficult where population and industry are concentrated along streams with low or unregulated flow. In recent years, water quality problems have been most acute in the Asheville (J-2) and Tri-Cities (J-1) water areas, which are dependent upon tributary streams of the Tennessee River for assimilation. The rapid population and economic growth projected for this Water Sub-region will result in rapid growth of waste loads in future years.

TVA and FWPCA, in a cooperative venture, are preparing a comprehensive plan for water quality management. In addition to delineating the present water quality of the streams within the basin, present water uses, and known sources of pollution, the study will project future waste loads and identify alternative means to alleviate existing and potential problems and maintain desired levels of water quality. This work is being coordinated with appropriate state agencies.

Local Flood Damage Prevention - The orderly development of urban areas requires consideration of flood damage problems and appropriate damage prevention measures. In a number of towns and local communities, flood damage potential has been created by inappropriate development. In these areas and others where urban expansion is occurring near or around the flood plains, there is a need to control more effectively the use of land through zoning and subdivision regulations. Many communities have already adopted some form of regulations, but there is a continuing need for further action as developmental pressures increase. In other instances, redevelopment and renewal may be appropriate.

In a pioneering program to encourage flood damage reduction by non-structural measures, flood plain information reports have been developed

for 120 communities within the Tennessee Valley, 102 of which are in Water Sub-region J, to provide them with a basis for flood plain management programs. Other nonstructural flood damage reduction measures include a flood warning service provided by the U. S. Weather Bureau for Asheville, Bryson City, North Carolina, and Gatlinburg, Tennessee. An improved and extended flood warning service and a flood insurance program would be helpful supplements to this program. The widespread nature of urban flood damage potential indicates that local flood damage prevention should continue to be given high priority in all planning areas.

Navigation Development - The availability of navigation in combination with vital rail and highway transportation facilities, abundant electric power, flood-free plant sites, proximity to important markets and raw materials, and a large, dependable water supply has attracted many manufacturing plants and terminals to the Tennessee River waterway. Investment in 145 private manufacturing plants and terminal facilities along the navigable channel in the Knoxville, Chattanooga, and Huntsville planning areas from 1933 to 1968 was about $1.3 billion. In 1968, waterfront facilities employed more than 30,000 persons and had an estimated annual payroll of $200 million.

Increasingly, this development is depleting the supply of readily developable land. Extensions of channel, railroad, or highway facilities will be required to maintain an adequate supply of industrial sites for further growth and development. Construction of Tellico Dam and Reservoir, now in progress on the Little Tennessee River near its mouth, will enlarge the amount of waterfront industrial land in the Knoxville (J-3) area by approximately 5,000 acres. Channel improvement on the lower Hiwassee River near Charleston-Calhoun and elsewhere along the Tennessee has been necessitated by the rapid development of waterfront industry in the Chattanooga (J-4) (see figure 19-6) and Huntsville (J-5) areas. Continued priority should be given to navigation development in these three areas. The involvement of many agencies, including TVA, the U. S. Army Corps of Engineers, and the U. S. Coast Guard, will necessarily be increased as this development proceeds.

Improved Recreation Facilities - Recreational use of reservoirs, forests, and streams is increasing with continued urbanization and industrial development. Total outdoor recreational needs in the subregion are projected to increase by about 26 million annual recreation-days between 1965 and 1980 (See Appendices F and G).

These increasing demands for recreational opportunities increase the need for further investment in recreation facilities and for protection of scenic and free-flowing streams. Hunting and fishing pressures on the lakes, National Forests, and other lands are expected

FIGURE 19-6 -- INDUSTRIES ON LFFT BANK OF TENNESSEE RIVER AT CHATTANOOGA, TENN.

to rise steadily. Accelerated programs will be needed to meet these demands.

Recreational use of reservoir impoundments has developed into a significant factor in water resource planning and development (see figure 19-7). Existing reservoir use rates reflect heavy utilization of reservoirs by nonresidents in the Huntsville (J-5) sub-region, a relative lack of supply of water-recreation opportunities in the Asheville (J-2) sub-region and inadequate facilities in the Tri-Cities (J-1) sub-region. These areas should have priority in planning for recreational facilities and shoreline development.

Reduction in Sedimentation, Erosion, and Agricultural Flood Damage - Future economic development has some implications for the proper use and management of both agricultural and nonagricultural lands. Although erosion of farm lands is no longer so serious as it has been, about 322,000 acres now being used for cropland need to be converted to less intensive agricultural or nonagricultural uses in order to maintain soil productivity and to satisfy best the demands on our land resources. USDA estimates indicate that about 55 percent of the sub-region needs some type of conservation treatment. This percentage includes 7.0 million acres of woodland, 2.2 million acres of cropland, and 2.1 million acres of pasture. In addition, about 652,000 acres of upstream watershed flood plains are estimated to have a significant flood hazard for which treatment might be feasible.

Some of the most serious erosion and sedimentation problems in the sub-region are found in nonagricultural areas. Better erosion control is needed for industrial, residential, and highway construction, together with reclamation of strip-mined and other critically eroding areas. The proper application of conservation practices and techniques on these areas would reduce the amount of sediment being transported downstream, where it adversely affects the channel capacity and water quality.

There are areas in the sub-region needing sediment control measures to encourage development to meet future needs. Such areas include 93,200 acres of strip-mined areas, roadbanks, and critically eroded areas. Through adequate land treatment and management and upstream watershed projects, sediment damage can be significantly reduced. The Cherokee, Nantahala, Bankhead, Chattahoochee, Pisgah, and Jefferson National Forests need stabilization of 123 miles of gullies, 2,620 miles of eroding abandoned roads and trails, and 6,948 acres for sheet erosion and mined-area restoration (see Appendix A).

Extension of Streamflow Control in Tributary Areas - Although the TVA reservoir system is one of the most complete river control systems in the Nation, there remain some communities and areas on unregulated streams with flood problems in the winter and spring and drought

FIGURE 19-7 -- RECREATIONAL USE OF CHICKAMAUGA LAKE

problems in the summer and fall. In the western part of the area, some streams cease to flow during drought periods and water supply for municipal, industrial, waste dilution, and irrigational purposes is inadequate. On some streams storage reservoirs are needed to help control floods during the rainy season and augment low flow during the drought season.

Studies undertaken by TVA in the 1950's and early 1960's indicated that low streamflow was inadequate for provision of industrial, municipal, and agricultural water supply in parts of the Duck, Elk, and Bear tributary basins during seasons of drought. Flood problems for both urban and rural areas were also identified along with other water needs such as recreation. Tributary area development programs in these areas have resulted in initial water resource development being either under construction or planned for these tributaries. Twelve watersheds investigated under USDA upstream watershed program show needs for municipal and industrial water supply. Other areas where streamflow control may be required to meet the needs of growth and development are discussed in Chapter 20.

6. RELATIONSHIP OF STATE PLANNING AND INVESTMENT PROGRAMS TO WATER AND RELATED RESOURCE DEVELOPMENT

The development of the resources of Appalachia will not be undertaken exclusively by the federal government or by the states and localities involved. There has been, and there will remain, a need for coordinated action. Achieving the most efficient use from each dollar invested demands coordination of federal, state, and local planning and investment programs.

In Sub-region J, as elsewhere in Appalachia, the states have delineated areas for Appalachian planning. Figure 19-8 shows the county groups, all or partly in Sub-region J, which have been designated as Appalachian state planning sub-regions.

State planning and investment programs include many kinds of activities directly or indirectly related to water resources. Planning and investment are being conducted in programs of highway development, water supply and waste treatment, recreation, land conservation, strip mine reclamation, reforestation, wildlife protection, and in many other areas. The requirement of the Appalachian Act of 1965, that all projects initiated in the states be submitted to the Commission through the state's member on the Commission, encourages each state to evolve a strategy for growth and to develop criteria for assigning a priority to each project. The evaluation of these criteria by states in the Tennessee Valley is progressing, and in time allocation of funds will be based upon long-range plans for each state.

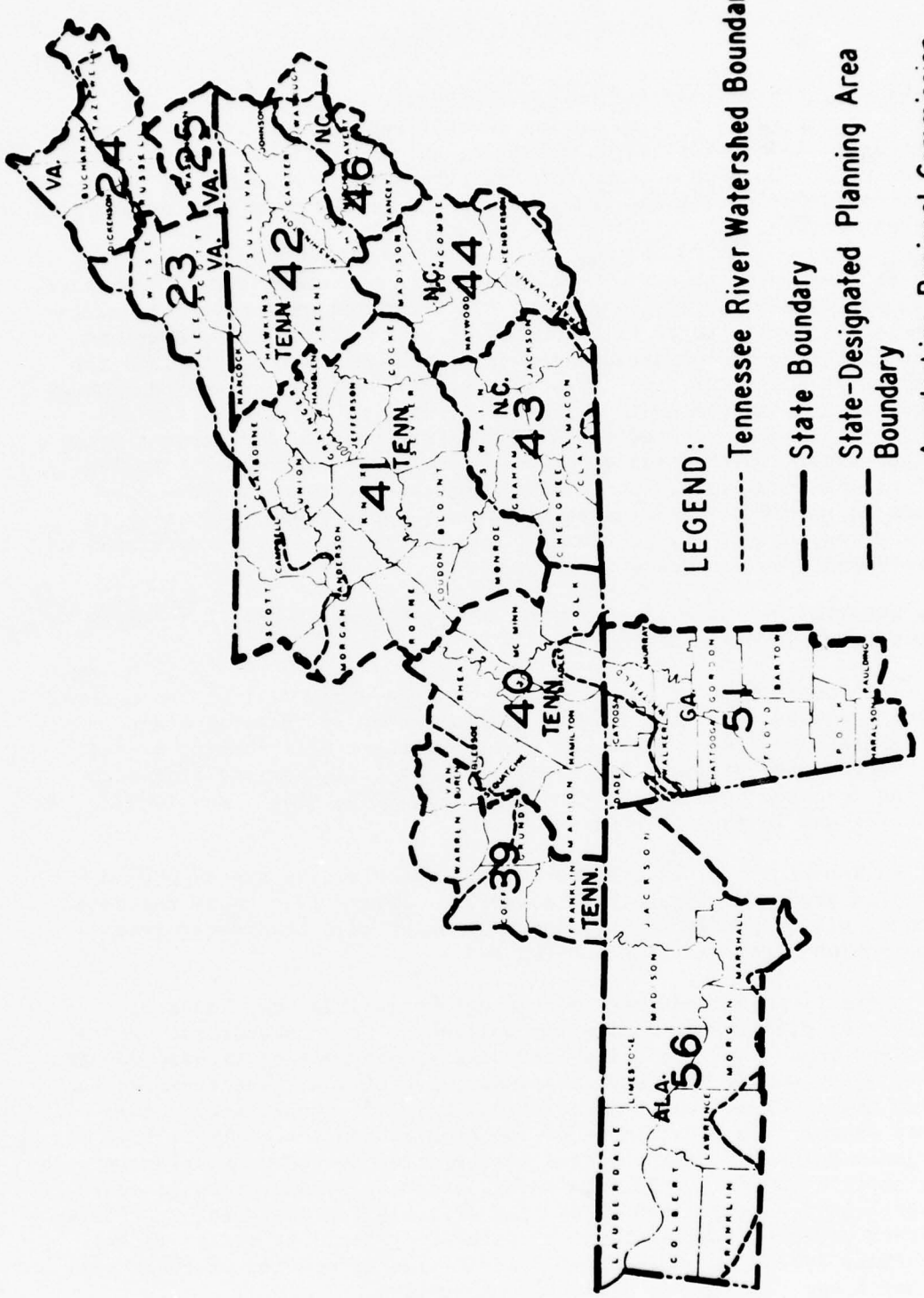


FIGURE 19-8 -- STATE PLANNING SUB-REGIONS IN WATER SUB-REGION J

The following brief discussion provides some idea of how far along advanced plans are to relate state planning and investment to the Appalachian Program in Sub-region J.

Tennessee - The State Planning Office of the Department of Finance and Administration published in April 1966 the "Appalachian Regional Development Act of 1965, A Rationale and Model for Its Application in Tennessee." The "Rationale" has been incorporated in the State's 1967-68 Investment Program.

Virginia - The Division of Industrial Development has prepared a report that deals with the designation of growth areas, examines the relative financial resources of local areas, describes state research projects relating to economic development, and sets out, in broad terms, goals and objectives for the Appalachian portion of the state.

North Carolina - The economic consultant firm of Hammer, Greene, Siler Associates has prepared "Investment Guidelines for the North Carolina Appalachian Region." This report sets out investment guidelines, in fairly broad terms, establishes criteria for the identification of areas of significant growth potential, and points out factors contributing to retardation of existing growth centers.

Alabama - The "Development Plan for Appalachian Alabama for 1968" establishes the goals and objectives of the Appalachian program in Alabama. As a guide for development planning, the report identifies groups of counties where there is significant potential for growth.

Georgia - The "1968 Investment Plan, Georgia Appalachia" sets forth a program to make Georgia Appalachia more attractive to outside investment by (1) assisting the region's growth centers in developing adequate facilities and services and (2) providing improved vocational education opportunities for the school-age population.

These reports provide a basis for relating planned water resource investments and investigations to the state strategy for development. While in most cases the state investment plans have a more limited time horizon than does water resource planning, identification of growth centers and development corridors provides a framework for evaluating the contribution of water resources to Appalachian growth and development

7. PARTICIPATION IN AREA DEVELOPMENT

Future investments in the water and related resources of Sub-region J will be made in facilities designed to serve the sub-region's changing needs. To be effective as tools for development, these investments must be coordinated with investments in other public and

private facilities. It is for this reason that water resources investment planning must be considered in the context of a comprehensive resource development program.

The comprehensive resource development concept recognizes that programs designed to develop the water resources of an area cannot stop with the provision of physical facilities. Continuing developmental planning is necessary if the full utilization of the investment is to be achieved. This developmental planning is a joint responsibility of the investing agency and the community and area groups. Future development plans should recognize that programs for change will have the greatest chance of success when they do not run counter to the hopes and desires of the local community and do provide for local citizen participation in the decision-making process. Future plans should also be made in light of the fact that much of the energies and finances involved will come from the local level.

TVA Activities - Since its inception in 1933, TVA has concerned itself with development of the tributary areas of the Tennessee Valley. This effort was given added impetus and scope when in the early 1950's TVA began working with local citizen organizations in various subareas of the Valley where special problems were found to have inhibited economic growth and where local interest in resource development has been evidenced through the formation of active and effective local organizations. The tributary area development program presently includes a broad range of development activities within organized subareas as well as community development activities elsewhere in the Valley. Locally organized citizen associations now have memberships exceeding 8,500. These organizations work with TVA and local, state, and other Federal agencies in a program of comprehensive resource development aimed at economic and social improvement.

The type of organization varies in the different areas from the citizen association, mentioned above, to specially created state agencies or authorities having broad developmental responsibilities within the multi-county tributary area. In some of the areas, the developmental efforts are undertaken by a partnership of both types of organizations. Despite substantial differences in organization arrangements and wide variations in the resource base, all of the tributary areas share a common desire and willingness of their people to work in a concerted, comprehensive effort toward accelerated economic and social progress.

In developing multi-purpose water resource projects, TVA consults affected or interested public agencies to inform them regarding the project and to seek their recommendations on needed facilities. When appropriate and mutually desirable, TVA transfers land to public agencies for them to develop for recreation and other purposes. Other recreation lands are sold or leased to public agencies, private groups,

or individuals. Appropriate portions of waterfront lands retained by TVA are developed and maintained as public access areas to assure adequate access to reservoirs and to complement recreation facilities provided by others.

Other Agency Programs - Several development districts which are all or partly in Sub-regin J receive support under the Appalachian Act, the Public Works and Economic Development Act, the programs of the Department of Housing and Urban Development, and other federally financed programs. Included in this category are LENOWISCO in southwestern Virginia; the First Tennessee-Virginia and East Tennessee Economic Development Districts; the Upper French Broad, Mountain Scenic, and Southwestern Economic Development Commission in North Carolina and the Coosa Valley Area Planning and Development Commission in Georgia. Councils of local governments presently operate in the Knoxville, Chattanooga, Muscle Shoals, and Top of Alabama areas and others are being formed within the sub-region. Multicounty regional planning commissions exist in the upper Duck and Elk River areas of Tennessee, in western North Carolina, and in north-central Alabama.

The U. S. Department of Agriculture administers most of its resource-oriented programs through memoranda of understanding with state, county, and other legal subdivisions. Technical and financial assistance is provided through the many state and county agencies and local rural cooperatives having responsibilities in the use, development, and conservation of natural resources.

Of particular significance are the many special-purpose and public districts organized under state law as legal entities of the states. Included in this group are locally organized and managed soil conservation districts and watershed districts. The 70 organized soil conservation districts include all agricultural and rural land of the sub-region.

The objectives of the National Park Service include preservation and enhancement of areas of unique scenic, archeological, historic, and natural science values. Public Law 89-996, the National Historic Preservation Act of 1966, requires than any Federal or Federally assisted undertaking in any state take into account its effect on any historic site or structure listed in the National Register of Historic Places. Studies by the National Park Service to carry out these objectives are provided upon request of the agency having responsibility for construction of projects.

8. NEED FOR INDIVIDUAL PLANNING AREA EVALUATIONS

Since Sub-region J is an extremely diverse area, Chapter 20 will deal with each of the five Appalachian water planning areas individually rather than the sub-region as a whole. Any treatment of the sub-region as a single unit would be likely to generalize across important differences of topography, existing patterns of employment and income, existing water resource investments (figure 19-9), prospective future type of growth and needed developmental strategy, and the related water needs, together with opportunities to meet them. Chapter 20 deals with these topics for each of the five Appalachian water areas which were identified on map 19-1.

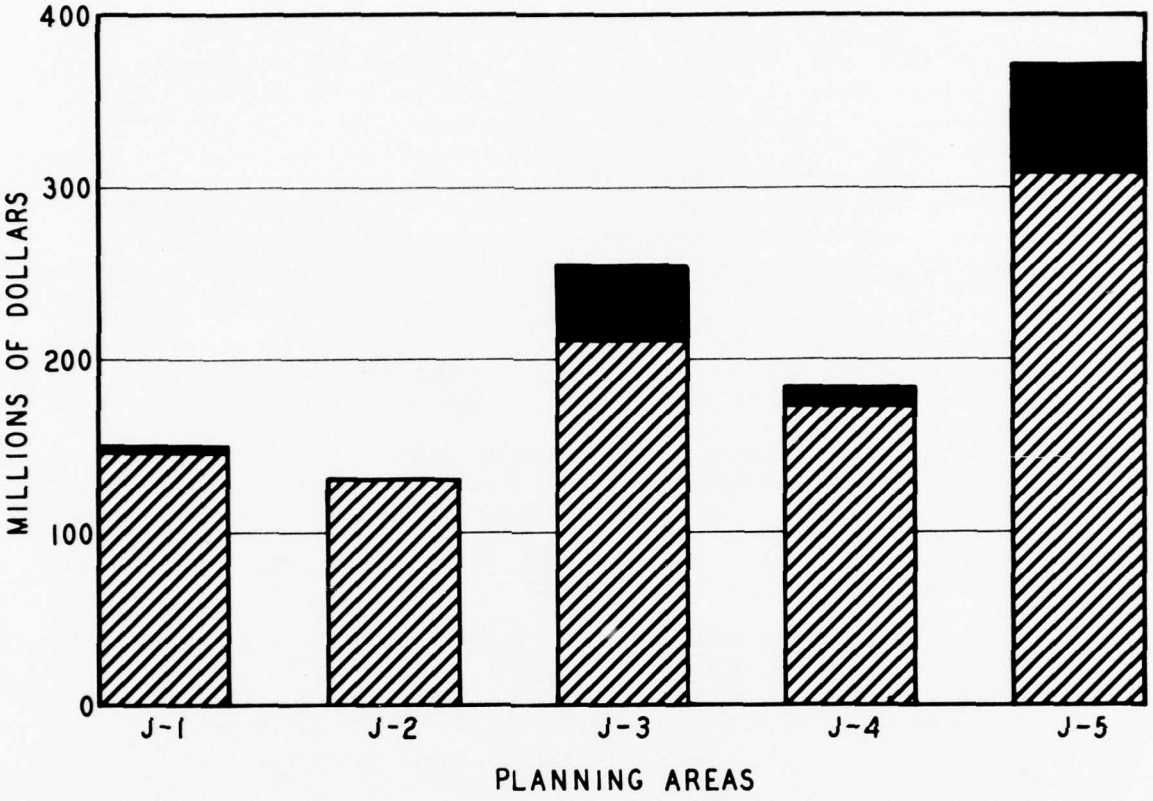


FIGURE 19-9 -- SUMMARY OF WATER RESOURCES PROJECT INVESTMENT* WATER SUB-REGION J

*Data obtained from Tennessee Valley Authority, U. S. Corps of Engineers, and U. S. Department of Agriculture as of June 1967.

DEVELOPMENT
OF
WATER RESOURCES
IN
APPALACHIA

MAIN REPORT
PART II
SHAPING A PLAN

CHAPTER 20 - SHAPING A PLAN FOR SUB-REGION J

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SECTION I - TRI-CITIES WATER AREA (J-1)

1. BRIEF DESCRIPTION OF THE AREA AND EXISTING DEVELOPMENT

The Tri-Cities Water Area (see map 20-1) includes eight counties in Tennessee and eight counties in Virginia with a total land area of about 6,700 square miles. Approximately 5,600 square miles, including all of the eight Tennessee counties and all or a substantial part of six Virginia counties, are in the Tennessee River watershed. The remaining 16 percent of the area is in other Ohio River drainage.

The principal streams in the Tennessee Valley portion of the water area are the Powell and Clinch Rivers; the Holston and its tributaries, the North Fork, Middle Fork, South Fork, and Watauga Rivers; and the Nolichucky River, a tributary of the French Broad River. The other Ohio River Basin drainage contains headwater tributaries of the Big Sandy River and a small upstream portion of the New River. Along the northern and southern boundaries of the area, the topography is extremely rugged, with deep stream gorges. It is only along the lower portions of the rivers that the valleys become broad with rolling hills and relatively flat stream gradients.

Existing Water Resource Development - Existing water resource development in the Tri-Cities Water Area includes four major reservoirs on the South Fork of the Holston River and its tributaries. These reservoirs, built primarily for flood control and power production and to aid navigation on the Tennessee River, currently receive almost 4,000,000 recreation visits annually and regulate flow on the South Fork in the Tri-Cities area. No storage presently exists on the North Fork of the Holston.

In addition, the Corps of Engineers has completed two multipurpose reservoir projects on tributaries of the Levisa Fork of the Big Sandy River. These projects provide storage for flood control, water quality control, and recreation. Recreational attendance at these two projects exceeded 600,000 in 1967.

Population and Employment - The Tri-Cities planning area (J-1) is not dominated by one central city, but has three centers of approximately equal size and growth potential: Kingsport in Sullivan County, Johnson City in Washington County, and Bristol in Sullivan County, Tennessee, and Washington County, Virginia. Each of the three cities is an urban unit of approximately 40,000 persons, located about 20 to 25 miles from the other centers. All three cities are expected to generate growth within the area, as are the nearby centers of Greeneville, Elizabethton, and other growth areas indicated on map 20-1.

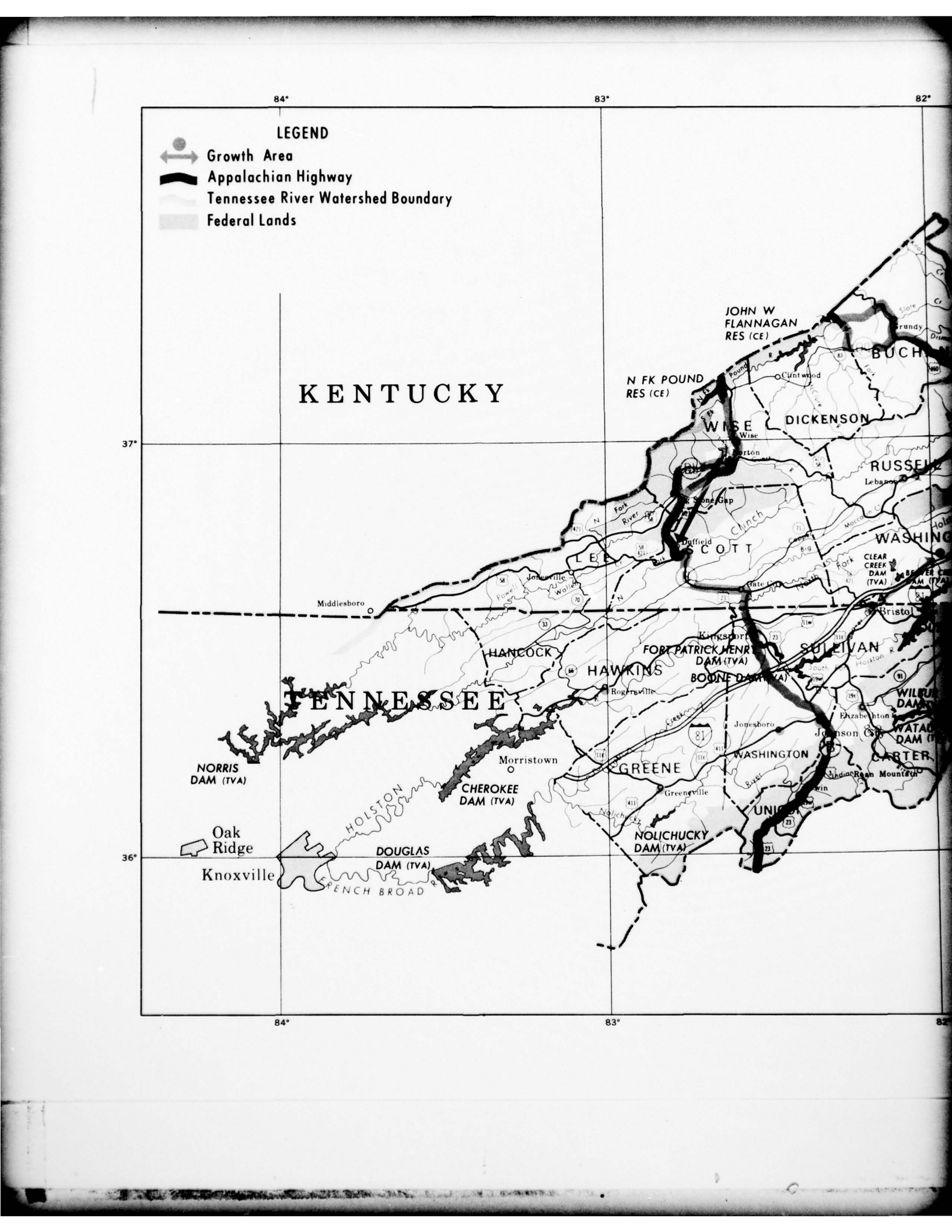
Largely because of the industrial growth occurring and projected in and near the Tri-Cities, the water area will experience significant increases in population and employment in the future (see figure 20-1). Within the major urban areas, and extending along the highway corridors, manufacturing, construction, and both private and public services will provide the bulk of the new, high-wage job opportunities as agriculture and mining continue to decline in relative importance. In the manufacturing sector, chemicals, printing and publishing, fabricated metals, plastic products, and machinery will be the important growth elements. Almost the entire range of services must grow both quantatively and qualitatively as the Tri-Cities water area joins the more affluent parts of the nation in a service-oriented economic structure.

Transportation Improvements - A major factor in the future development of the district will be the linkage created by Interstate Highway 81, which will connect the area to Knoxville and to Roanoke, Virginia, and places farther north. All counties will be within one hour's drive of Interstate 81; and the Tri-Cities and Washington County, Virginia, will be bisected by the road. An improved transportation network will further connect the area when the proposed Appalachian Corridor B (U. S. Highway 23) and Corridor Q (U. S. Highway 460) are completed.

The completion of these and other highway improvements will aid growth in the Virginia portion of the area, particularly along I-81 in Washington County, Virginia; along U. S. 23 through Duffield, Big Stone Gap, Norton, and Wise; and along U. S. 460 through Bluefield, Tazewell, and Richlands. Except for Washington County, these areas have historically been dependent upon their coal and timber resources and have experienced heavy outmigration in recent years. Almost one-half of the value of mineral production in Water Sub-region J is generated within the Virginia portion of this planning area.

The future of the Virginia counties will be influenced by the future of the coal industry, development of the presently underutilized forest resources, and better highway communications with the principal development axis running northeast to southwest down the Great Valley. Some of the counties will undoubtedly develop small manufacturing establishments, and some towns such as Wise, Virginia will develop to provide such needed services as higher education and adequate health facilities.

Outlook for Development - Primarily because of declining employment in the mining counties, the Tri-Cities planning area has been going through a period of severe economic adjustment. It now appears that much of the task of adapting to new conditions of demand for coal has been accomplished and that the future will be influenced primarily by the rate of industrial growth. As in much of Appalachia, education is, and will continue to be for some time, a critical element.


LEGEND
Growth Area
Appalachian Highway
Tennessee River Watershed Boundary
Federal Lands
84°
83°
82°
37°
36°
KENTUCKY
TENNESSEE
JOHN W FLANNAGAN RES (CE)
N FK POUND RES (CE)
Clintwood
WISE
DICKENSON
Wise
Norton
RUSSELL
Lebanon
Big Stone Gap
Fork River
Duffield
SCOTT
Clinch
LEE
Jonesville
Powell
Wallen
Middlesboro
CLEAR CREEK DAM (TVA)
Gate City
Bristol
Kingsport
FORT PATRICK HENRY DAM (TVA)
BOONE DAM (TVA)
HANCOCK
HAWKINS
SULLIVAN
Rogersville
Holston R.
Elizabethton
Jonesboro
Johnson City
WASHINGTON
CARTER
Roan Mountain
GREENE
Greeneville
Nolichucky R.
UNICOI
NOLICHUCKY DAM (TVA)
Morristown
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Knoxville
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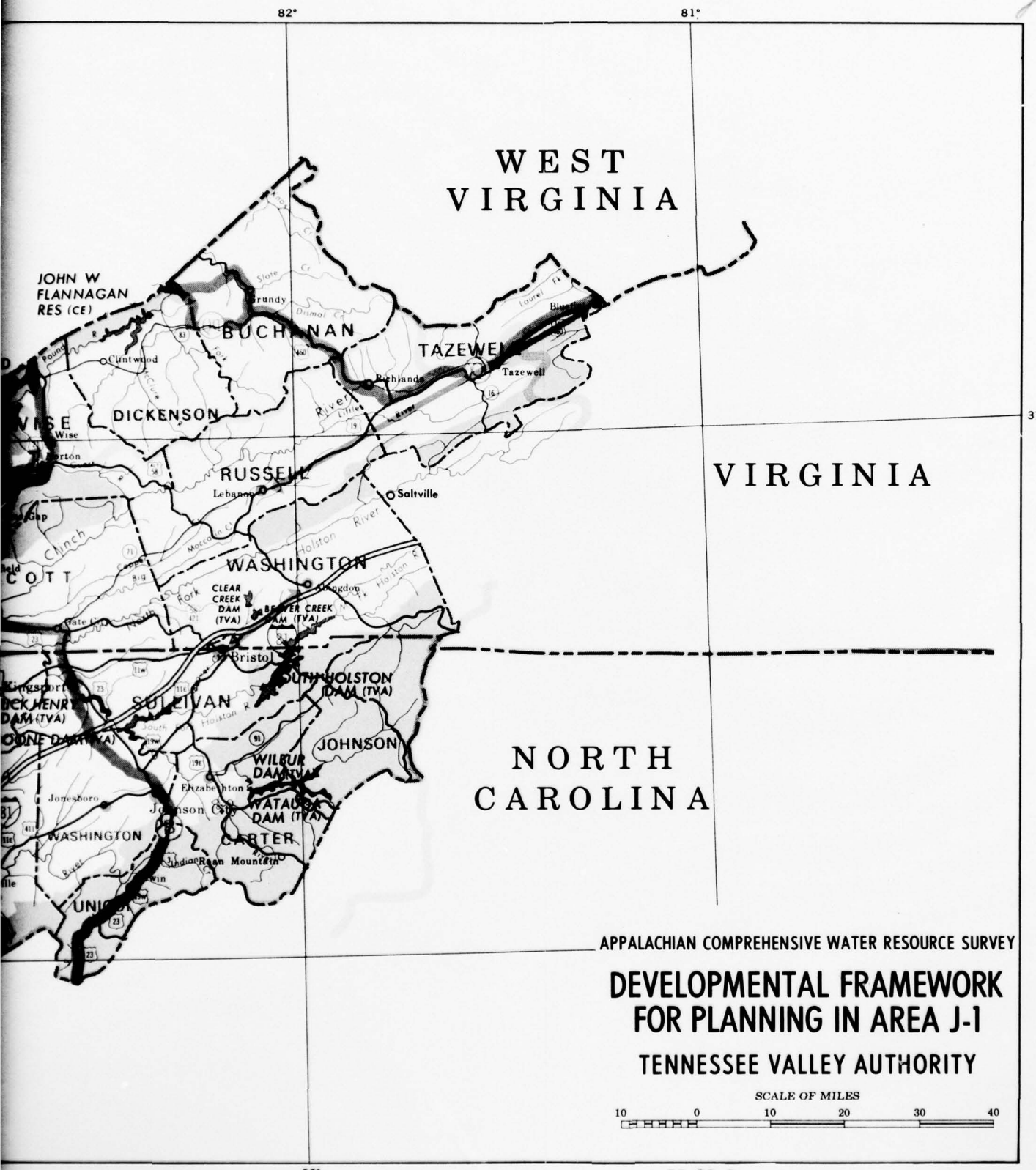

APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

DEVELOPMENTAL FRAMEWORK FOR PLANNING IN AREA J-1

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40

MAP 20-1

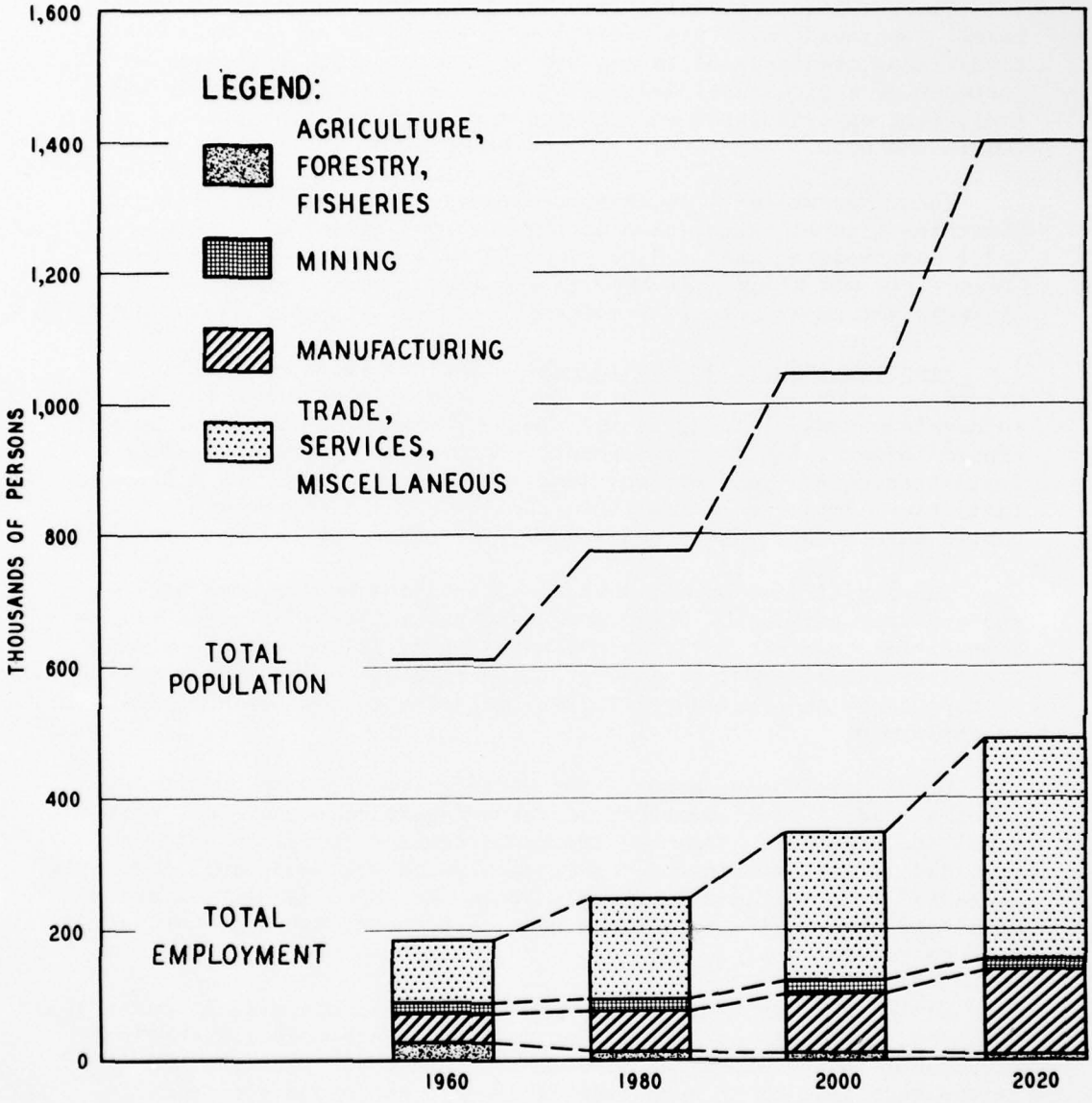

FIGURE 20-1 Population and Employment, 1960, and Projections to 2020
Water Area J-1

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2. DEVELOPMENTAL STRATEGY

The Tri-Cities planning area has a sound and growing industrial base. Continued industrial development should bring the area closer to national standards of income and well-being. The continued adjustment of agricultural and mining areas in the region to declining employment opportunities remains the most serious developmental problem in the area.

Future growth will concentrate around the Tri-Cities, bringing about the gradual integration of these communities into a single major metropolitan area. Significant growth will also occur around Greeneville and along I-81 through the area. Other communities in the area may experience relative stability or, at best, slow growth.

Need for Industrial Development - The provision of facilities needed to encourage industrial growth and development has top priority in developmental planning in the area. The area has need for continued industrial site development, improvement in transportation facilities, quality education, improved water distribution and sewer facilities, improved recreational facilities, and improvement of public structures. These needs apply throughout the area.

Industrial development must be accompanied by improved housing and consumer services. These needs are particularly acute in the communities in areas formerly dependent upon agriculture and mining. The future development of many of these communities will be restricted by topography and the necessity for residents to commute some distance to employment.

Other Development Needs - Industrial development should bring about a gradual development of trades and service activities, both local and regional. Regional trade and service functions will be provided largely within the Tri-Cities, which are beginning to develop increased self-sufficienty in this area. As these facilities are developed, the area's dependence upon surrounding metropolitan areas will be reduced.

Mining will continue to be a major economic activity in parts of the area, but mining areas will be faced with the need for continued adjustment to the improving of mining technology. Forestry and agriculture will be of some significance to the economy. Unless extensive development occurs, recreation will remain largely of local significance.

3. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

The economic development of the Tri-Cities planning area, which in the past has been impeded by rugged terrain, high rates of unemployment, heavy out-migration, lack of good highways and poor public

services, is gaining momentum. Growth in the district, which is expected to occur in and around metropolitan areas and along the proposed improved highway system, will bring new demands upon water and related land resources.

Approximately 23 percent of the public water supply comes from springs and wells. Although there is an abundance of surface water in the region, its use in certain areas is limited because of degraded stream water quality. Major problems affecting the use of surface waters are the result of high calcium chloride concentrations in the North Fork Holston River from industrial waste discharges at Saltville, Virginia, and excessive waste loads downstream from the large chemical industries at Kingsport, Tennessee. To a lesser extent, pollution caused by acid mine drainage exists in Tazewell, Wise, and Lee Counties in Virginia.

Water Distribution and Sewerage Facilities - Inadequate water distribution and sewerage facilities represent additional water resource development problems in the planning area. Both facilities are pertinent in attracting high-wage industries and promoting economic growth. Improved sewage treatment is also necessary for the improvement of health in the district. Efforts by individual counties in overall planning have helped to alleviate the problems to a certain extent; however, much work remains to be done.

To meet the continuing growth of population, new water systems must be developed or the existing water services of the major cities must be extended to outlying areas. The cities themselves, as urban population expands, must meet increasing demands for water. For example, Johnson City, a growth center, is studying ways to augment its domestic water supply which is inadequate during extended dry periods. Limited water supply systems are a barrier to continued industrialization.

Sewerage facilities are also inadequate in the area. Only Greeneville, among the major cities in the area, has 100 percent coverage by both storm and sanitary sewers. As the cities expand and new industries locate, increasing pressure is placed on existing sewerage facilities. Not only are the proper treatment and disposal of sewage important for health and sanitary purposes, but also adequate facilities are necessary to preserve the natural beauty and recreational potential of the area's water resources.

Industrial Waste Discharges - Industrial waste discharges cause significant water quality problems at three major points in the area.

At Elizabethton two rayon plants discharge industrial wastes that, even after treatment, are potentially toxic to aquatic life in Watauga River and in Boone Reservoir. One of the rayon plants releases a zinc waste, and the other plant releases both copper and ammonia. Each of these materials is toxic to fish and other aquatic life under certain conditions. Synergistic effects may also exist.

At Kingsport there are several major sources of pollution, but the source of the largest single load is an industrial complex that employs over 10,000 people and produces some 275 products in four principal categories: chemicals, plastics, dyes, and fibers for textiles and cigarette filters. The treated waste discharged to the stream by this complex is equivalent in strength to domestic sewage from a population of several hundred thousand people.

This load, combined with the other industrial and municipal pollution loads here, depresses oxygen concentrations in the South Fork Holston River to zero when minimum flows are released from Fort Patrick Henry Reservoir immediately above the city for a period of three or more consecutive days. The problem is compounded during the summer months when oxygen concentrations are low in the water released from the reservoir. During periods of full power generation at Fort Patrick Henry Dam, the resulting flow at Kingsport is sufficient to absorb the pollution loads without serious depression of oxygen concentrations in the flowing water. However, excessive fertilization of the stream has resulted in severe nuisance growths of aquatic weeds in some 40 miles of the Holston River downstream from Kingsport.

At Saltville, Virginia, a chemical plant making soda ash continues after some 70 years of operation to pollute very seriously some 80 miles of the North Fork Holston River. The pollution discharged from this plant is chemically stable and consists primarily of calcium chloride and some sodium chloride. These salts are extremely soluble in water, but they do not discolor or otherwise impair the appearance of the streams except immediately below Saltville. These chemical wastes render the North Fork Holston River practically unusable for any purpose other than waste disposal. The water is extremely hard and corrosive. It is not potable, even for livestock, and not acceptable for many industrial process uses. Because of this discharge, water in the Holston River below the confluence of the North and South Forks is quite hard and, when the flow of the South Fork Holston is low, is unsuitable as a source of boiler water makeup at the John Sevier Steam Plant located some 36 miles below the confluence and 118 miles from Saltville.

The Public Health Service has estimated that the increased hardness of Holston River water is costing domestic users at Morristown and Knoxville a total of some $257,000 a year. Industrial costs and costs to other water users are also significant and the value of industrial development along the Holston River precluded by this pollution may also be substantial. Several alternatives are presently being investigated for alleviating this problem by a task force formed by the North Fork Holston River Technical Committee.

Local Flooding - The other major current water resource problem in this area is local flooding, which is a constant threat in the narrow valleys of some of the small mining communities found in the

mountainous parts of the area and on low flatlands in and around the potential growth centers. Some progress has been made toward flood damage control by physical engineering works and regulating use of flood-plain lands through appropriate zoning ordinances, subdivision regulations, and building codes. Present examples are recently completed channel improvements of Guest River and Toms and Little Toms Creeks at Coeburn, Virginia; flood control reservoirs on Beaver and Clear Creeks above Bristol, Tennessee-Virginia; and land-use controls and floodproofing encouragement at both places. Other areas may warrant local engineering control works, and all of them need to make maximum use of land control measures to avoid aggravating their future flood problems.

The existing multiple-purpose Watauga and South Holston Reservoirs provide a high degree of flood control within their primary zone of influence. The sections of Kingsport lying along South Fork Holston River are relatively safe from floods comparable with those of the past. The sections of Elizabethton in the flood plain of the Watauga River have a slightly lower degree of control. Yet uncontrolled Reedy Creek at Kingsport (see figure 20-2) and Doe River, Laurel Fork, and Buffalo Creek in the vicinity of Elizabethton pose flood threats. Flood-vulnerable areas include residential, commercial, and industrial developments.

Flooding on Brush Creek is a constant threat to Johnson City, Tennessee, and environs. The largest floods of the past resulted from intense local thunderstorms during the late spring and summer months. Considerable damage was reported on these occasions. Studies have indicated that flooding can occur on Brush Creek at any time of the year and that greater and more damaging floods can be expected. Although past feasibility studies have shown flood control to be uneconomical, some control measures may become feasible when evaluated in conjunction with urban redevelopment and local highway modifications currently in the planning stage.

Related Problems - Feasibility of local flood protection is often restricted considerably by the low value of structures in the flood plain. In some cases, removal of structures may be more appropriate than protection. Redevelopment and renewal are possibilities where flood damage potential exists in growing or static communities. Such solutions require better local planning than currently exists in many of the flood-prone communities.

The community of Big Stone Gap, located at the junction of the Powell and South Fork Powell Rivers, is subject to flooding from both streams. Norton, the largest town in Wise County, is prone to flood damage from the Guest River, and nearby areas are subject to flooding by the Powell River. Flooding serves to limit the amount of developable land in these communities, both of which are on a growth corridor designated by the Commonwealth of Virginia.

FIGURE 20-2 -- Flood of March 12, 1963 -- Reedy Creek at Kingsport, Tenn.

Flooding problems at Gate City and Weber City are chiefly the result of high waters on the Little and Big Moccasin Creeks, respectively. The Nolichucky River and its tributaries, North and South Indian Creeks, are a threat to the city of Erwin. Other points in the area where flooding is a threat are in the vicinity of Surgoinsville and Church Hill, located on the Holston River.

Richlands, a town on the banks of the Clinch River, has long suffered from a flood problem from three sources -- the Clinch River, Big Creek, and Indian Creek. The highest known flood occurred in 1901, but the flood of January 1957 caused greater damage, with estimates as high as $250,000. Past floods have caused damage in the city of Tazewell, Virginia, but a project currently proposed by USDA will alleviate part of this problem.

A flood problem also exists at Duffield, where LENOWISCO (Lee-Scott-Wise-Norton Economic Development Commission) is investigating the feasibility of a major industrial area. Planning for development of this industrial area will require proper allowance for or alleviation of the flood problems.

The town of Bluefield, Virginia, experiences flooding in the downtown area from Beaverpond Creek. Studies of the problem by the Corps of Engineers have not resulted in an economically feasible project. Town officials are continuing studies for alleviation of this problem and will investigate other sources of financial assistance.

Recreation and Conservation - Recreational use of reservoirs in the planning area has not increased in recent years, and per capita use is estimated to have declined. This condition may be attributed, at least in part, to lack of adequate access and facilities at South Holston and Watauga Reservoirs and to the heavy urban residential buildup that has occurred along the shores of Boone and Fort Patrick Henry Reservoirs. There is also a need for improved motel and restaurant facilities in much of the area, as well as promotion of the natural and historical attractions of the area.

Conservation treatment needs identified by USDA in this planning area include protecting some 1.3 million acres of forest and woodland, 924,000 acres of pasture needing treatment, and 372,600 acres of cropland needing treatment by 1980. (See Appendix A for greater detail.)

4. PLANNED PROJECTS AND INVESTIGATIONS

TVA Investigations - The proposed industrial site at Duffield has significant potential for expanding the economy of the LENOWISCO area, where potential large industrial sites are limited. However, this development will have to take account of the flood, water supply, and waste water disposal problems at the site. Appropriate investigations

are underway in conjunction with other studies of the project. Within the major growth complex of the area, Kingsport, Johnson City, and the adjoining community of Elizabethton have varying degrees of local flood problems, the solution of which will require further investigation. Studies are currently in progress on the flood problem along Reedy Creek in Kingsport. Additional investigations should be carried out at Johnson City in conjunction with urban redevelopment and highway planning. Investigations for flood control structures on the Doe River above Elizabethton should also consider opportunities for water-based recreation in conjunction with the proposed state park at Roan Mountain (see map 20-2). Local planning in these three communities is sufficiently advanced for these investigations to be undertaken.

Additional studies at Big Stone Gap are scheduled to aid in determining the feasibility of incorporating flood damage prevention measures into a community redevelopment program.

Local development districts in the area, such as the First Tennessee-Virginia Economic Development District, are taking an active role in promoting improved water supply and waste treatment facilities. State water pollution control authorities are actively promoting improved waste water treatment and improved water quality. Investigations designed to support these activities should be continued, particularly on the North Fork Holston River where both treatment and storage for dilution may be required for improved water quality.

USDA Projects and Investigations - National Forest lands are, and will continue to be, managed under the principles of multiple use and sustained yield for timber, recreation, water, and wildlife and fish. The accelerated recreation development program recommended for the National Forest lands in this planning area includes development of facilities on South Holston Reservoir to accommodate 7,000 persons at one time and facilities on Watauga Lake to accommodate 11,000 persons at one time. In addition, the program includes a plan for development of a major recreation complex in the Norton area of Wise County, Virginia, to provide accommodations for recreationalists utilizing the proposed Alleghany Parkway. The estimated cost of these projects is $14.2 million. (See Appendix F for greater detail.)

The upstream watershed program includes investigations or planning for ten watersheds in Water Area J-1. Installation of project measures has been initiated only for Shady Valley watershed in Johnson City, Tennessee, where channel improvements are essentially complete to provide rural flood protection.[1/] Three other watershed projects shown

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1/ A project was also authorized for Lick Creek in Greene County, Tennessee, but has become inactive.


LEGEND
Completed Channel Improvement Project
Investigation Underway or Planned
Local Flood Control Investigation (TVA)
Upstream Project or Investigation (USDA)
II-Project Authorized for Installation
III-Investigated or Planned (Regular Programs)
Tennessee River Watershed Boundary
84°
83°
37°
36°
KENTUCKY
TENNESSEE
JOHN W FLANNAGAN RES (CE)
N FK POUND RES (CE)
WISE
DICKENSON
Clintwood
Wise
Norton
COEBURN (TVA)
Big Stone Gap
Lebanon
Duffield
SCOTT
LEE
Jonesville
Gate City
CLEAR CREEK DAM (TVA)
Middlesboro
Bristol
SOUTH HOLSTON DAM (TVA)
Kingsport
FORT PATRICK HENRY DAM (TVA)
SULLIVAN
HANCOCK
HAWKINS
BOONE DAM (TVA)
HORSE CREEK
Rogersville
Jonesboro
Elizabethton
Johnson City
WASHINGTON
Morristown
GREENE
Greeneville
Erwin
UNICOI
NORRIS DAM (TVA)
CHEROKEE DAM (TVA)
HOLSTON
NOLICHUCKY DAM (TVA)
Oak Ridge
Knoxville
DOUGLAS DAM (TVA)
FRENCH BROAD

APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

WATER DEVELOPMENT PLAN FOR AREA J-1

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40

on map 20-2 are included in the water development plan because of potential developmental impact in meeting identified water needs near designated growth areas. These three projects are (1) Upper Bluestone River, Virginia, which includes flood protection for Bluefield, Virginia, and storage for water quality management downstream from Bluefield; (2) Upper Clinch Valley, Virginia, which includes flood protection and water supply for the town of Tazewell; and (3) Horse Creek, Tennessee, which includes flood control for potential industrial sites in the growing Kingsport area. In addition, the Headwaters of Holston River project upstream in Water Sub-region G could have a beneficial effect on water quality in the North Fork Holston River by providing increased industrial water supply at Saltville, Virginia. Of the remaining watersheds investigated, three - Indian and Martin Creeks in Lee County, Virginia and Blackwater Creek in Lee County, Virginia and Hancock County, Tennessee require further investigation.

SECTION II - ASHEVILLE WATER AREA (J-2)

5. BRIEF DESCRIPTION OF THE WATER AREA AND EXISTING DEVELOPMENT

The Asheville Water Area (see map 20-3), in the extreme western portion of North Carolina, contains 15 counties with a total land area of 6,007 square miles. About 92 percent of this area is in the Tennessee River watershed, and the remainder is divided among the New, Yadkin, Santee, and Savannah Rivers. The area is bounded by two great mountain ranges, the Great Smoky Mountains on the north and west and the Blue Ridge Mountains on the south and east. The principal streams in the area are the Nolichucky, French Broad, Pigeon, Little Tennessee, and Hiwassee Rivers, all of which flow in a northwesterly direction and cross the Tennessee state line in their course. The Pisgah and Nantahala National Forests and the Great Smoky Mountains National Park encompass most of the planning area outside the Asheville basin. The area, because of its geographical location and mountainous terrain, is subject to intense rainstorms and has one of the highest annual rates of rainfall in the United States.

Existing Water Resource Development - Existing water resource development in this planning area includes four TVA projects, seventeen private hydroelectric power projects, and two municipal water supply projects owned by the City of Asheville. Recreational use of many of these projects is limited because of inadequate size and lack of accessibility. The four TVA projects received about 1.4 million recreation visits in 1967.

Population and Employment - The population and employment of the water area is projected to increase significantly in the future (figure 20-3); but the projected change, based upon past trends, will not be enough to raise the standard of living of the area's residents to the target level expressed in the developmental benchmarks. Even if projected increases are realized, the gap between projected employment and benchmark employment will be 8 percent of total benchmark employment in 1980 and 14 percent in the years 2000 and 2020.

The estimated per capita income of the area, as a percent of the national average, has been rising and by 1962 was almost 70 percent compared with the 1950 figure of 63 percent. This increase in relative per capita income can be attributed largely to the gradual adjustment of the economy of the area from an agricultural to a manufacturing base. This adjustment is projected to continue and per capita income should increase relative to the nation.

Development Needs - Accelerated industrial development will be required if the area is to meet the developmental benchmarks. If area income goals are to be achieved, much future industrial growth must occur in industries other than the traditional textile, apparel,

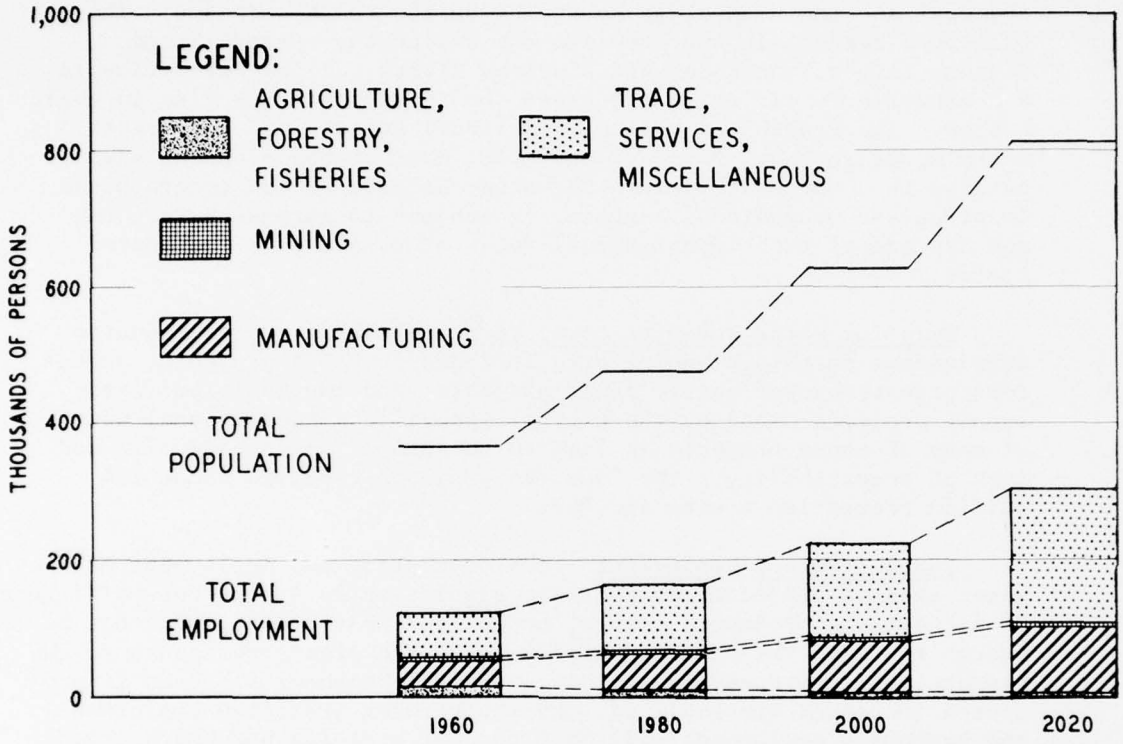
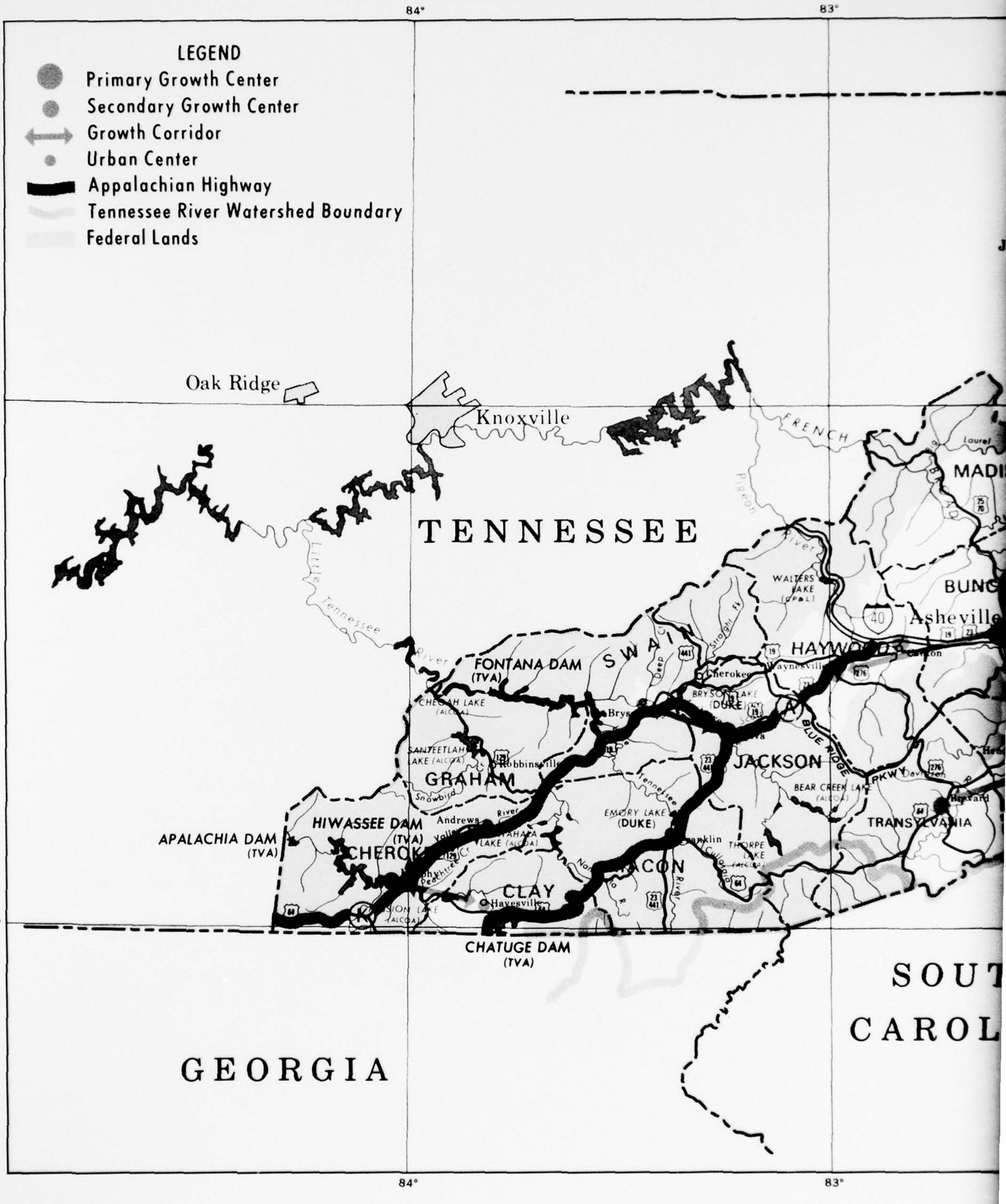
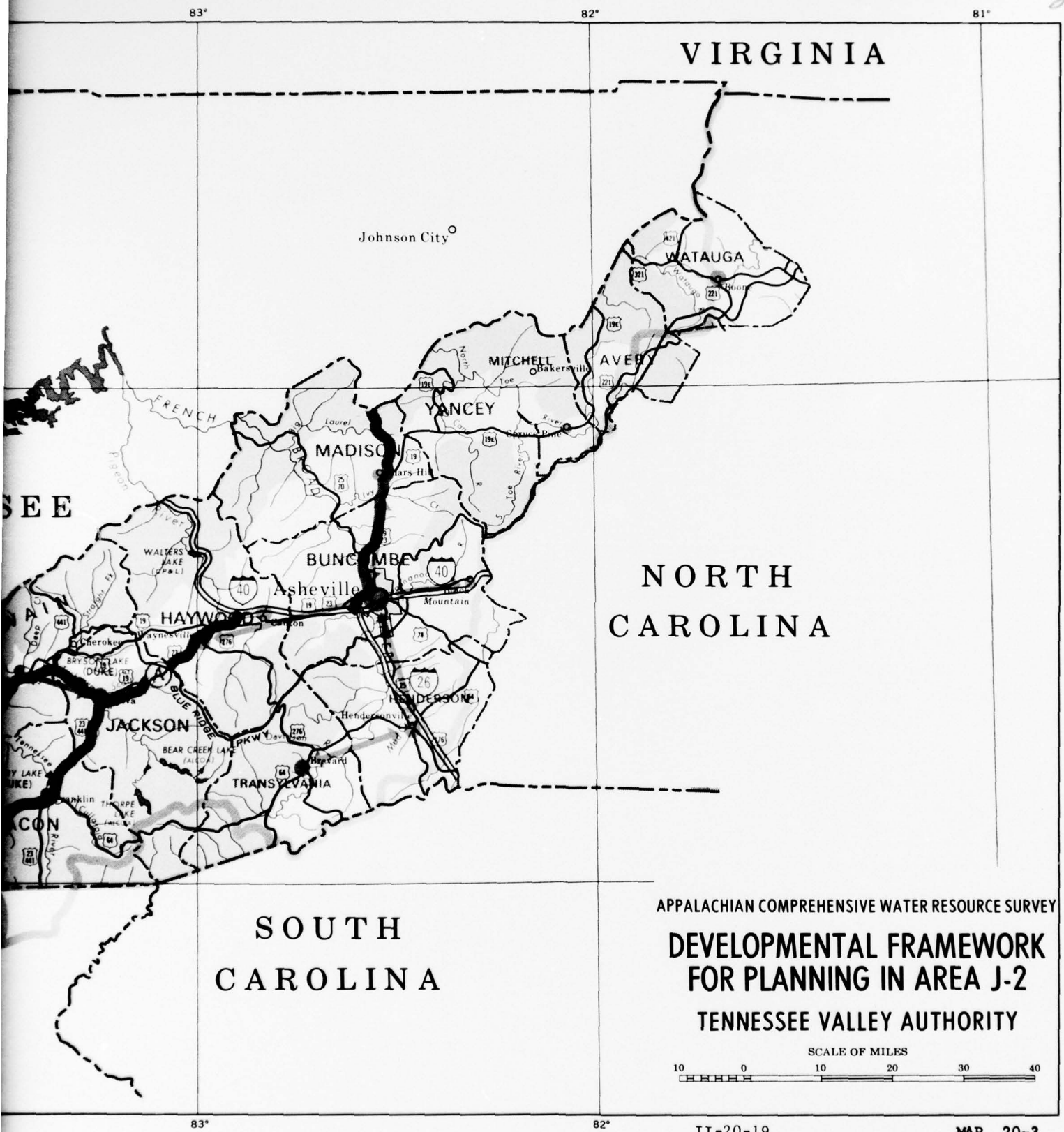


FIGURE 20-3 -- Population and Employment, 1960, and Projections to 2020
Water Area J-2


LEGEND
Primary Growth Center
Secondary Growth Center
Growth Corridor
Urban Center
Appalachian Highway
Tennessee River Watershed Boundary
Federal Lands
84°
83°
36°
35°
Oak Ridge
Knoxville
TENNESSEE
GEORGIA
FONTANA DAM
(TVA)
CHEOAH LAKE
GRAHAM
HIWASSEE DAM
(TVA)
APALACHIA DAM
(TVA)
CLAY
Hayesville
CHATUGE DAM
(TVA)
JACKSON
EMORY LAKE
(DUKE)
BEAR CREEK LAKE
TRANSYLVANIA
HAYWOOD
WALTERS LAKE
Asheville
Andrews
Robbinsville
Cherokee
BLUE RIDGE PKWY
Little Tennessee River
French
Pigeon River
MADIS
BUNC
SOUT
CAROL



APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

DEVELOPMENTAL FRAMEWORK FOR PLANNING IN AREA J-2

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40

II-20-19

MAP 20-3

furniture, and tobacco lines. Paper, chemicals, plastics, machinery, metals, and aerospace industries have potential in the area. Employment based upon the processing of the area's primary resources, especially the forest resources, can also be an important source of growth in this planning area.

Specialized agriculture and tourist recreation will continue to be significant sources of income and employment in the area. Both the climate and the market for agricultural products are such that the production of high-quality vegetable, flower, and fruit crops offers good possibilities for expansion.

Related Considerations - Historically, the Asheville area has been a major national recreational destination for residents of the eastern United States. The continued national growth of leisure-time activities will encourage further development in the Asheville-Great Smoky Mountains National Park area, in the northern part of the area near Boone, and along the Blue Ridge Parkway. Development will also occur in the southern part of the area to serve the growing Southern market.

Continued economic growth will both require and cause growth to occur in trades and services, both public and private. Currently, the supply of both public and private services is limited. Development of trades and service activities will occur largely around Asheville, the only primary growth center in the area, and to a lesser extent in the numerous secondary growth and urban centers of the area.

When completed, the Interstate and Appalachian highway systems will provide good access to the planning area, especially to the city of Asheville. Like much of the rest of Appalachia, there is need for stronger education and training programs designed to facilitate adaptation of the human resource to changing economic conditions.

6. DEVELOPMENTAL STRATEGY

The Asheville water area will experience significant growth in the future, even in the absence of substantial external assistance. The transition of the area economy from agriculture to manufacturing is well advanced, with agricultural production already concentrated in specialty crops. The recreation potential of the area is firmly established; further development can be expected in the future. With the continued growth of manufacturing employment, the area economy should experience balanced growth.

Concentration of Development - This growth will increasingly tend to concentrate in the Asheville area, which includes the Pigeon and upper French Broad River drainages. Manufacturing and the larger

trade and service activities will particularly tend to concentrate in this area. Continued development will result in a gradual fusion of Asheville with the surrounding communities of Brevard, Canton, Hendersonville and Waynesville.

Recreational development will dominate in the areas to the north and southwest of the Asheville basin. Growth in these areas will be less balanced, although some manufacturing employment will be found in most of the major towns of the planning area. Most of the growth will occur around existing centers, such as Boone and Spruce Pine in the north and Murphy, Andrews, Hayesville, Sylva, Franklin and Bryson City in the south.

Effects of Urbanization - This urbanization, already in progress will be accompanied by increasing competition for the limited amount of developable land, much of which is currently in agriculture. It will result in continued decline of some of the smaller communities in the more mountainous parts of the area and increased pressure for the development of the flood plains. Regulations governing the use of flood plain lands are needed now to direct development to safe sites.

Urbanization will increase waste disposal problems and require increasing investment in municipal waste treatment facilities. Expansion of these and other municipal facilities will be required if urban growth is not to damage the natural environmental advantages of the area. If the developmental benchmarks are realized, most of the population of the area will be urbanized by the year 2020.

Accordingly, planning in this area should provide for rapid urbanization, based upon an increasingly high-wage manufacturing industry, extensive recreational development, and a specialized agriculture. Priority should be given to planning development in the Asheville area and around existing centers located throughout the area. Water resource development, like other area investments, should be designed to accommodate rapid urban growth.

7. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

Average annual rainfall in the Asheville water area ranges from about 38 inches in the lowlands around Asheville and up to 80 inches in the highlands. Use of the abundant surface-water supply is largely concentrated in the basin of the Pigeon and French Broad River, primarily in Haywood, Buncombe, Transylvania and Henderson Counties.

Geologically, this water area lies in the Blue Ridge Region, which is the least productive ground-water province in Appalachia, being underlain by dense, sparsely fractured, poorly permeable, crystalline rocks that yield little water to wells. Although the

rural population is primarily supplied by private wells and springs, ground-water sources account for only about 5 percent of the water being supplied by public water facilities in this area. Most of the ground water produced in the region is of high quality, being low in dissolved minerals and quite soft.

Water Quality - The surface waters of the region are of good quality in their natural state, but domestic and industrial pollution is a serious problem at several points in the area. Several municipalities and a few large pulp, paper, and chemical plants have, in past years, overloaded the area streams with organic wastes resulting in zero oxygen levels. If allowed to continue unchecked, increased nutrient concentrations could result in nuisance aquatic plant growth, a problem which is particularly undesirable from the standpoint of recreation, fish and wildlife habitat, and process waters for industries.

For many years the main stream of the French Board River between Davidson River and Mud Creek has been grossly polluted. This condition resulted largely from one industrial plant which discharged a highly colored, untreated waste into the river which had a biochemical oxygen demand equivalent to the waste loads of 360,000 people. Industries in the city of Asheville added waste loads to the upper French Broad River equivalent to 114,000 people. All sources of wastes tributary to this segment of the river have installed waste treatment facilities adequate to maintain presently assigned water quality standards. To achieve water quality higher than that required by presently assigned standards, either low-flow augmentation will be required or provisions made for advanced waste treatment where such may be indicated.

The pollution in Pigeon River for the most part results from a paper company at Canton which employs the Kraft process in producing about 1,250 tons of pulp per day. All waste water resulting from pulping, bleaching, and paper making is presently treated in a primary type plant. The company is presently developing plans for the addition of secondary waste treatment processes which, when completed in 1969, will increase reduction in pollution (BOD) from the 32 percent presently being accomplished to greater than 90 percent. When reductions of this magnitude are accomplished and the pollution abatement measures at the other points of waste discharge have been completed, the receiving stream will be protected for its best usage. Further development of the area or expansions of existing industry will require low-flow augmentation and further upgrading of water quality could well require advanced waste treatment.

Water quality problems also exist on both the upper Little Tennessee and the Tuckasegee Rivers. The main source of pollution in the Tuckasegee River is a paper mill, which discharges industrial wastes into Scott Creek and discolors the otherwise clear stream water.

Both industrial and domestic wastes pollute the upper Little Tennessee. Plans are being prepared for treatment plants to improve the water quality on both these streams.

Flooding - Floods on the main rivers and their tributaries have been frequent and damaging to agricultural and urban areas. There is relatively little flood storage above the population centers of the planning area. No flood storage exists at present on either the French Broad or the Pigeon River in the area. There is presently no planned flood detention capacity on the Little Tennessee above Fontana Dam. Only the Hiwassee is relatively controlled.

The climate and soils of the area are favorable for the production of specialty agricultural crops, such as various vegetables, and flowers. The productive soils suited for these crops, however, are predominantly in flood plains which may experience damaging floods as often as two or three times during the crop season. Past floods have caused major losses to agricultural producers in the area and currently prevent some potential production of specialty crops. Substantial erosion occurs on the flood plains from stream action. Conservation treatment needs have been identified on 1.5 million acres of forest and woodland, 263,000 acres of pasture, 205,000 acres of cropland, and 29,000 acres of other land in the area by 1980.

Local flood information reports have been prepared for eighteen communities within the planning area. Only five communities have adopted flood plain regulations; others are considering such action. Activity in this field has increased in recent months as more planning assistance has been provided by the Western North Carolina Regional Planning Commission.

Resulting Conditions - There are currently some eighteen areas of urban development along the French Broad River and its tributaries which are subject to flooding. Flooding in these communities restricts opportunities for urban and industrial expansion, and has contributed to decay of part of the Asheville waterfront (see figure 20-4). The flood plains of the French Broad River, along with the valleys of its principal tributaries, constitute a significant portion of the developable land within the upper French Broad River basin. Flooding of these lands hampers the development of the area and causes stiff competition for flood-free industrial land.

Flooding on other streams also hinders urban development but to a lesser extent. The town of Franklin, an urban center in the planning area, has industrial and commercial developments located on the flood plain areas on both sides of the Little Tennessee River. A water control system for this area could enhance potential industrial sites by providing flood control and an improved industrial water supply and could provide opportunities for recreation development.

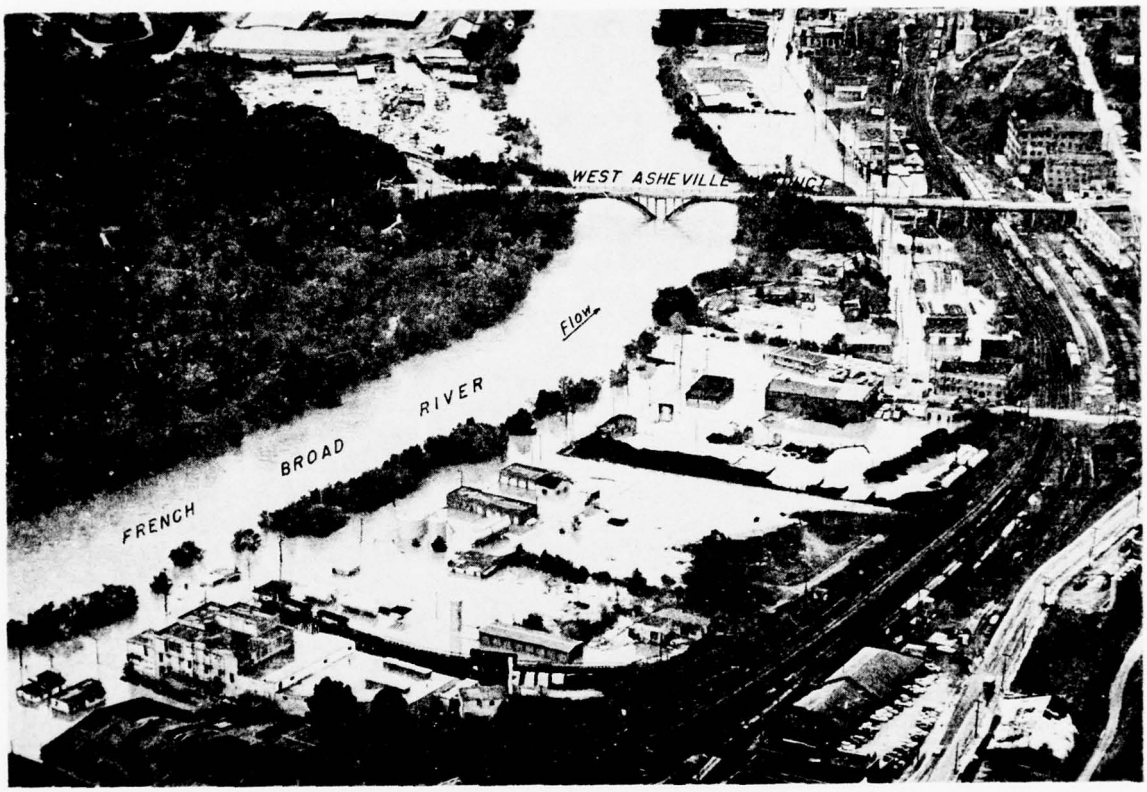


FIGURE 20-4 -- Waterfront at Asheville, N.C., in the October 1964 Flood

At Bryson City, a secondary growth center, the Tuckasegee River passes through much of the business district where bridges and other obstructions constrict flood flows. Scott Creek, a tributary of the Tuckasegee, flows through the center of Sylva and flooding tends to restrict urban expansion in that community.

Flood problems at Murphy and vicinity are chiefly the result of high water on the Hiwassee and its tributaries. Land along the Hiwassee River above Murphy and along Peachtree Creek and Valley River would have value for industrial use if it were not subject to flooding. Spruce Pine, another urban center in the area, also suffers from local flooding.

Recreation - This mountainous water area contains many small streams that have significant scenic qualities. In addition, the area has several other natural and man-made recreational assets that provide considerable potential for future development. The Great Smoky Mountains National Park, which lies partly within the planning area, has the highest visitation rate of the U. S. park system. The Asheville area's reputation as a summer resort mecca was well established even in ante-bellum times.

While recreation is very important to the regional economy, water-based recreation is relatively underdeveloped, and the water resource could play a larger role in recreation development in the region. The Asheville planning area has a smaller per capita acreage of water available for recreation purposes than any other planning area in the sub-region except the Tri-Cities area. In addition, most of the available acreage in the planning area is located a considerable distance from the major population and tourist center of Asheville. Planning of water control facilities in this area should recognize the role which reservoirs can play in developing the recreation potential in the area and meeting future demands for water-based recreation in the sub-region (see Appendix F).

Efforts to develop the recreation resources of the southern part of the planning area should recognize that this area will increasingly become a recreation area for Atlanta and other parts of the South as the Appalachian corridor system is completed. Recreation development programs in this area should emphasize both promotion and facility development. In addition to lakes and mountains, the area should have golf courses, cultural attractions, and amusement facilities. New motels and restaurants will be required to serve the recreation industry as it develops.

8. PLANNED PROJECTS AND INVESTIGATIONS

Upper French Broad River Development - Recognizing the need for a comprehensive development plan which would make the maximum contribution to the economic and social development objectives of the basin,

the Western North Carolina Regional Planning Commission through the North Carolina Department of Water Resources requested the Tennessee Valley Authority in March 1961 to undertake a program to develop and implement a plan for comprehensive unified resource development of the French Broad area as a basis for accelerating economic growth. Later that year these agencies and North Carolina State University undertook an inventory of basic data and natural resources of the area. This work was completed, and in May 1964 a two-volume report was published entitled "Economic Development of the Upper French Broad Area." About this time an engineering study was initiated by TVA which has resulted in a well articulated plan for multi-purpose development of the water resources of the upper French Broad basin, and this plan is a part of a program for the overall economic advancement of the area.

The plan recommended by TVA consists of a system of 14 dams, 58 miles of channel enlargement, 16 miles of selective bank clearing along the channel, and a levee along 1.4 miles of the Asheville waterfront. The project would provide benefits resulting from protecting some 13,000 acres of agricultural lands and provide urban flood relief to nine communities, 24,500 acre-feet of storage for water supply for Asheville, Hendersonville, Brevard, and several potential industrial sites. Ten of the reservoirs would have 76,900 acre-feet of storage reserved for water quality control releases that would increase the low flow of the French Broad River at mile 190.6 to 315 cubic feet per second and the dissolved oxygen level to a minimum of 4 milligrams per liter. In addition to the above benefits, thirteen of the reservoirs would contain a total of 6,755 acres at normal pool and 183 miles of shorelines. All 13 impoundments will provide fishing and 11 will serve other types of water-based recreation. Usage of these impoundments is expected to exceed 650,000 recreation days annually, including both fishing and other recreation. Map 20-4 shows the locations of the structures in the plan of development.

Estimated cost of construction for the Upper French Broad project is $100 million. It would provide benefits resulting from urban and agricultural flood relief, water supply, water quality, fish and wildlife, and area development. Flood control and water quality account for 49 and 24 percent of user benefits respectively, and no other category accounts for as much as 10 percent. Project-induced increases in industrial, related trades and services, and recreational jobs in the region are estimated to provide increased wages equivalent to $15.4 million per year. Of this amount $3.9 million is estimated as a national benefit from more productive use of the otherwise underemployed.

As a complement to the project planning studies made by TVA, the North Carolina State Planning Task Force, with TVA encouragement and assistance, undertook an investigation of the degree to which the proposed water control system would enhance the land uses of the area.

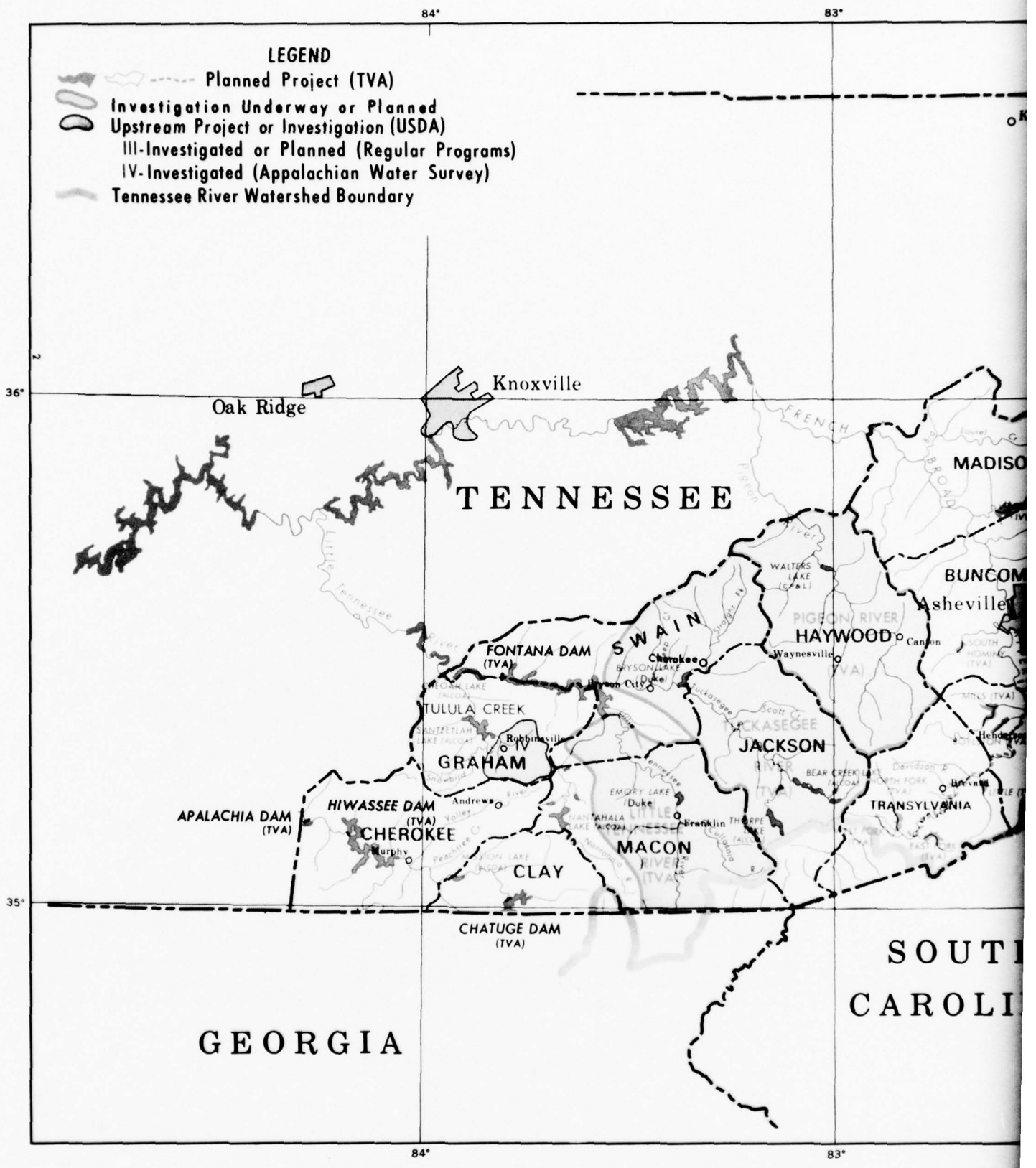
Particular attention was given to the reservoirs and how they would affect the activities that are presently occurring and those that are most likely to occur in the future. These investigations also resulted in an appraisal of the kinds and amounts of public and private investment that can be expected to be associated with the water control system. Although conditioned upon the continuation of the present strong organizational arrangements and an active developmental and promotional effort throughout and beyond the construction period, the magnitude of these investments is expected to exceed substantially $150 million.

State and local organizations have agreed to cooperate in implementing this plan by either contributing directly to the costs of certain phases of the work or by agreeing to operate and maintain some elements of the plan. North Carolina has agreed to share costs for both water supply and recreation. Asheville will participate in construction of the levee system and assume all its operation and maintenance responsibility. Buncombe County will operate and maintain a pumping station required in connection with the Swannanoa Reservoir. Although not a party to the fiscal arrangements, the Upper French Broad Economic Development Commission will continue to be the basic local point of contact and TVA's principal advisor to matters related to the water control system and its impact on the local area. Appropriate flood plain regulation still needs to be enacted by local interests to insure that future development does not create new flood problems.

TVA Investigations - Water resource investigations are currently in progress or scheduled in the Pigeon River, Upper Little Tennessee, and Tuckasegee River basins in conjunction with other developmental planning in the areas. The Pigeon River investigation is directed toward solution of local flooding problems at Canton and several other communities, reduction of the industrial waste problem at Canton, provision of an improved industrial water supply, and recreation development.

Present investigations in the upper Little Tennessee River basin are confined to the portion of the Little Tennessee River above Franklin and the Tuckasegee River above the headwaters of Fontana Reservoir near Bryson City. These investigations are being directed toward reduction of the urban flood problems at Franklin, Sylva, Bryson City, and nearby communities, agricultural flood damage reduction, alleviation of the industrial waste problem, enhancement of industrial sites through flood control and provision of industrial water supply, and provision of water-based recreation facilities.

The local flood problem at Cherokee is the subject of an investigation currently in progress. The Tuckasegee River basin studies include some flood relief for this developing Indian community. However, other improvements may be needed to provide additional relief within the urban area.


LEGEND
Planned Project (TVA)
Investigation Underway or Planned
Upstream Project or Investigation (USDA)
III-Investigated or Planned (Regular Programs)
IV-Investigated (Appalachian Water Survey)
Tennessee River Watershed Boundary
84°
83°
36°
35°
Knoxville
Oak Ridge
TENNESSEE
GEORGIA
FONTANA DAM (TVA)
SWAIN
HAYWOOD
JACKSON
GRAHAM
TULULA CREEK
HIWASSEE DAM (TVA)
APALACHIA DAM (TVA)
CHEROKEE
CLAY
MACON
TRANSYLVANIA
BUNCOM
MADISO
CHATUGE DAM (TVA)
SOUTH CAROLI
Cherokee
Waynesville
Asheville
Robbinsville
Andrews
Murphy
Franklin
Duke
Bryson City
Canton

II-20-29

MAP 20-4

USDA Projects and Investigations - National Forest lands are, and will continue to be, managed under the principles of multiple use and sustained yield for timber, recreation, water, and wildlife and fish. The accelerated recreation development program recommended for the National Forest lands of this planning area includes development in the Pisgah Forest Recreation Area, including completion of the historic "Cradle of Forestry in America" in Transylvania County, North Carolina. The cost of this special program is estimated at $27,800,000. The project would accommodate 30,000 persons at one time. (See Appendix F for greater detail).

The upstream watershed program includes investigations or planning for four watersheds in area J-2. No project measures have been installed since the only authorized project, Mud Creek, is inactive. Investigations in the upstream part of the French Broad River have been deferred in favor of the more comprehensive TVA basinwide plan. The two remaining watershed projects, which are included in the water development plan and shown on map 20-4, are (1) Cane Creek which includes flood protection for Bakersville and (2) Tulula Creek which includes municipal and industrial water supply and flood protection for Robbinsville.

SECTION III - KNOXVILLE WATER AREA (J-3)

9. BRIEF DESCRIPTION OF THE AREA AND EXISTING DEVELOPMENT

The 16-county Knoxville Water Area (see map 20-5), located in eastern Tennessee, is bounded on the north by the Cumberland Plateau and on the south by the Great Smoky Mountains. Along these boundaries the topography is extremely rugged, but within the Great Valley of the Tennessee the topography is characterized by generally narrow, flat to rolling valleys between high ridges that trend in a northeast-southwest direction.

The Holston and French Broad Rivers join at Knoxville, in the center of the area, to form the Tennessee River. Other major streams are the Clinch and the Little Tennessee Rivers, both tributaries of the Tennessee, and the South Fork of the Cumberland River. All or part of 15 counties with land area of 5,690 square miles lies within the Tennessee River watershed. The remaining 898 square miles, including all of Scott County, lie in the Cumberland River drainage.

Existing Water Resource Development - With completion of the Tellico project at the mouth of the Little Tennessee River, there will be seven major impoundments on the Tennessee River and its tributaries which are all or partly within the Knoxville planning area. In addition, there are two hydroelectric power projects owned by the Duke Power Company located within the area. There are no major impoundments on the tributaries of the Cumberland River within the water area. Existing reservoirs receive over 7 million recreation visits annually.

Population and Employment - The water area is economically dominated by the three-county (Knox, Anderson, and Blout) Knoxville Standard Metropolitan Statistical Area with an estimated 1965 population of approximately 390,000. The influence of Knoxville pervades the area in education, health, retail and wholesale trade, transportation facilities, and cultural/amenity attractions. While the Knoxville SMSA is a major source of employment in the planning area, growth in employment has, in recent years, been fairly well distributed between the metropolitan and non-metropolitan counties.

Per capita personal income for the Knoxville water area, estimated to be about $1,250 in 1962, is expected to double by 1980, and will more nearly approach the developmental benchmark figures in future years. Nevertheless, some disparity between projected growth and benchmark growth exists and outside assistance will be needed to close this income gap. Both population and employment are projected to increase substantially in the future (see figure 20-5).

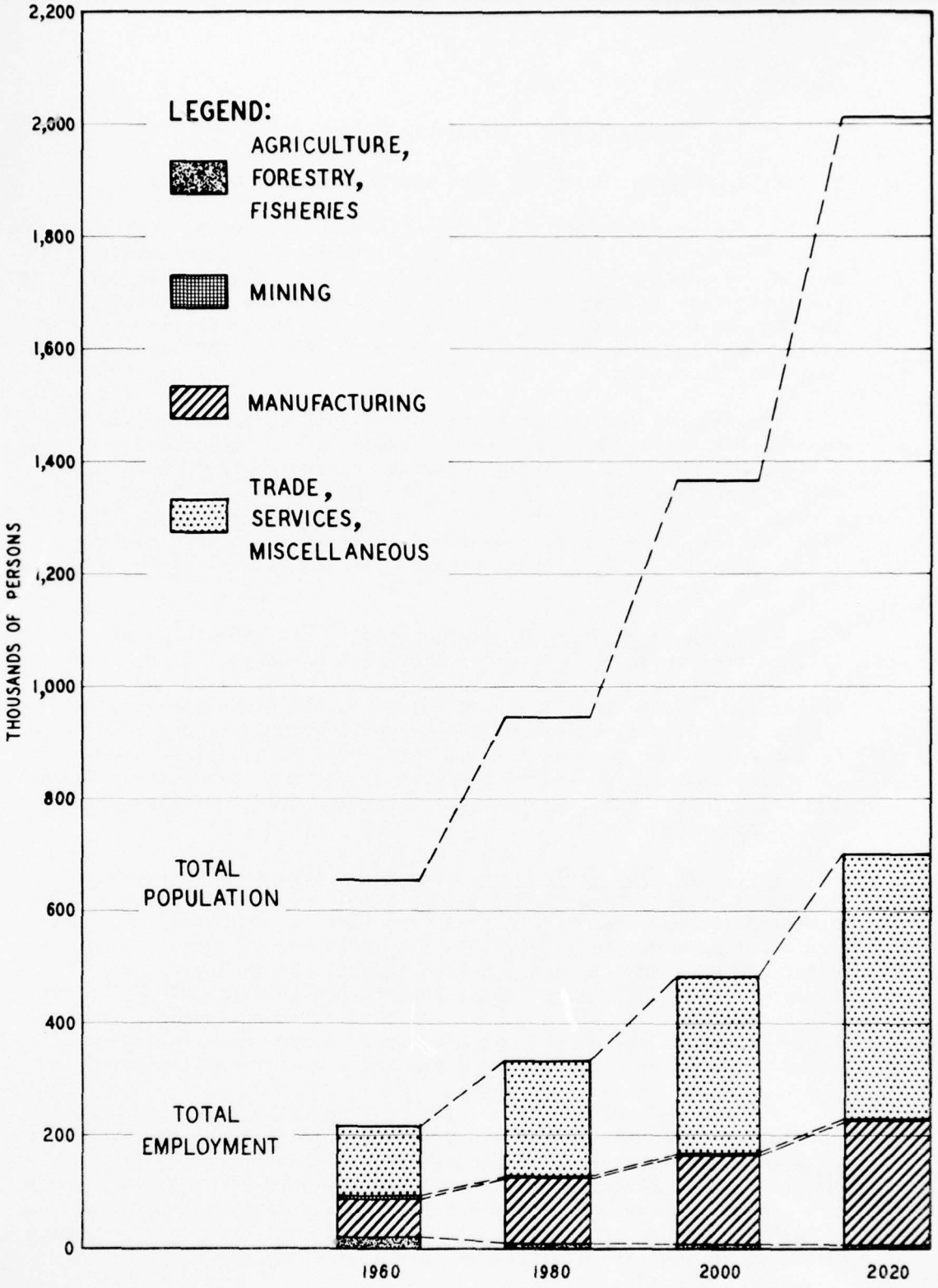
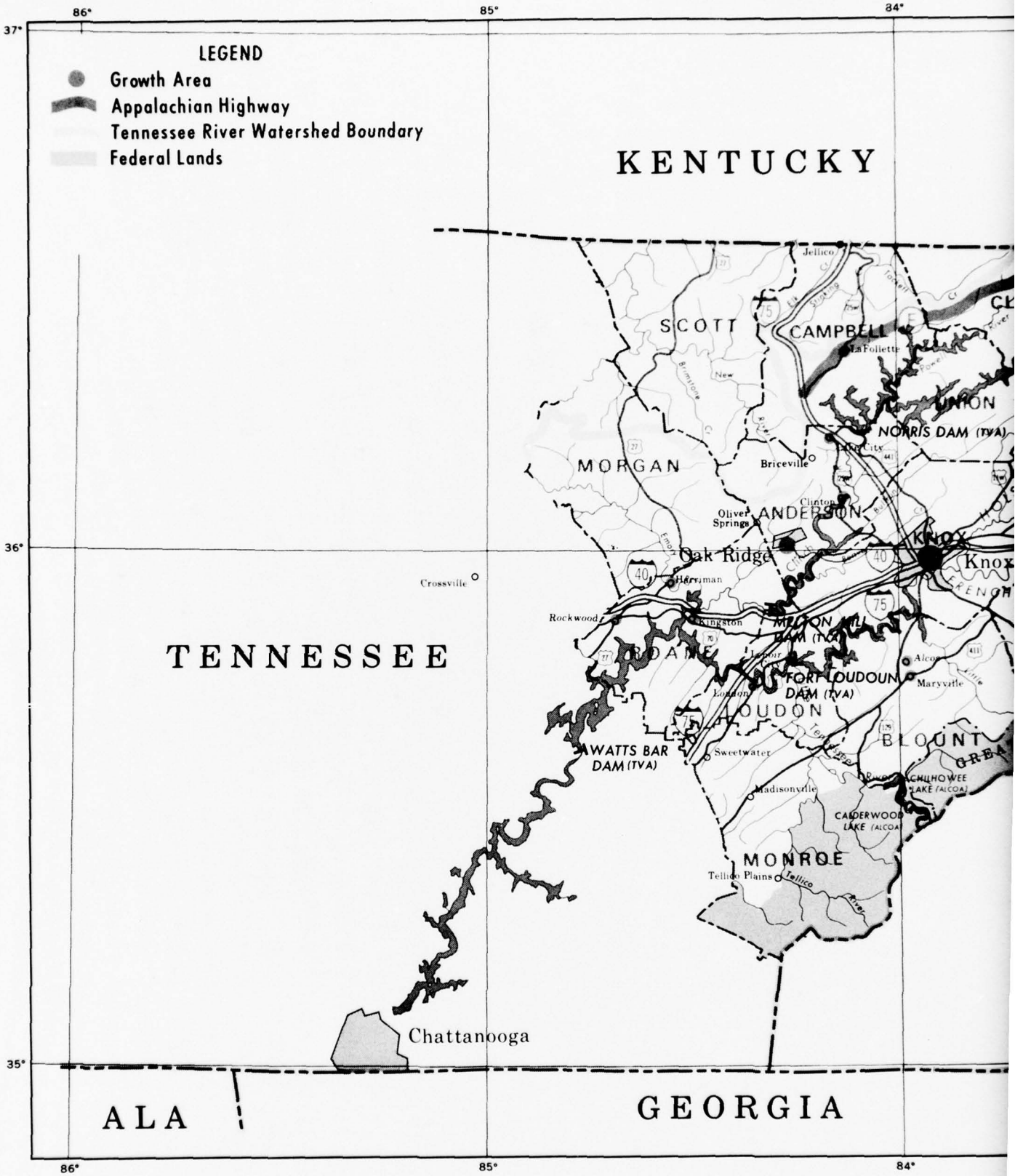
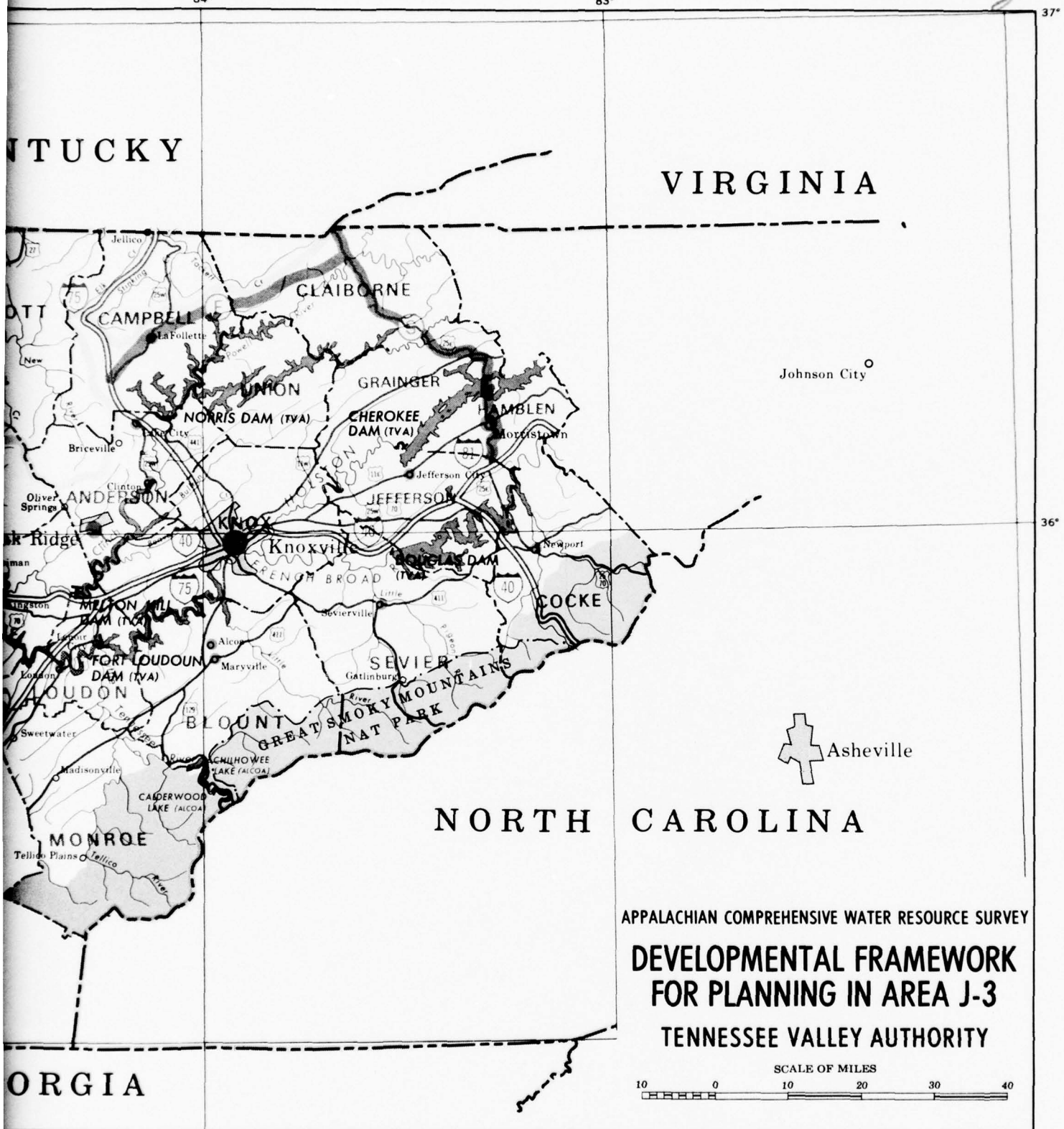


FIGURE 20-5 -- Population and Employment, 1960, and Projections to 2020
Water Area J-3


LEGEND
Growth Area
Appalachian Highway
Tennessee River Watershed Boundary
Federal Lands
KENTUCKY
TENNESSEE
GEORGIA
ALA
SCOTT
CAMPBELL
MORGAN
ANDERSON
KNOX
Knox
UNION
ROANE
LOUDON
BLOUNT
MONROE
NORRIS DAM (TVA)
WATTS BAR DAM (TVA)
FORT LOUDOUN DAM (TVA)
CHILHOWEE LAKE (ALCOA)
CALDERWOOD LAKE (ALCOA)
Jellico
La Follette
Briceville
Oliver Springs
Oak Ridge
Clinton
Harriman
Crossville
Rockwood
Kingston
Lenoir City
Loudon
Sweetwater
Madisonville
Maryville
Alcoa
Tellico Plains
Chattanooga
86°
85°
84°
37°
36°
35°



APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

DEVELOPMENTAL FRAMEWORK FOR PLANNING IN AREA J-3

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40

II-20-35

MAP 20-5

Industrial Development - The economic base of the metropolitan counties is characterized by a heavy dependence upon trades and services; the government employment provided by TVA, the Atomic Energy Commission and related activities at Oak Ridge, and the University of Tennessee; the Aluminum Company of America; and low-wage manufacturing, primarily apparel. In general, this base does not lend itself to rapid development. Growth of the metropolitan counties is, to a large degree, dependent upon the ability of the surrounding counties to develop industrially.

In general, the counties outside the metropolitan area have been undergoing a transition from a historical base in agriculture and mining to an industrial orientation. Hamblen County has shown rapid growth based upon the growth of the furniture complex in Morristown. Cocke, Roane, Sevier, and Jefferson Counties have all experienced significant industrial development in recent years.

Continued industrial development will contribute to increased per capita income, especially if it occurs in relatively high-wage industries. The future development of the metropolitan counties will most likely continue to be based upon the provision of the trade and service activities needed for continued industrial growth. If per capita income rises as projected, the increased demand for services will require quantitative and qualitative increases in the range and type of services provided.

Other Factors - Out-migration has been a serious problem in the planning area, which experienced a net out-migration of 11.8 percent between 1950 and 1960. Out-migration will continue to be a problem in some counties, primarily those on the Cumberland Plateau, where agricultural employment continues to decline. There is some employment left in coal mining in the planning area, but mining is not expected to be a major source of future growth.

Completion of the Interstate and Appalachian highway systems will be beneficial to continued industrial growth and development and will further encourage development of the recreation complex developing around the Foothills Parkway and the Great Smoky Mountains National Park. Education, as well as most other governmental services, will require significant additional financial support if acceptable standards are to be met.

10. DEVELOPMENTAL STRATEGY

The future growth of the Knoxville planning area depends, in large part, upon the extent to which the area can develop a true regional approach to industrial development and urban growth. The recent creation of an economic development district for the area should promote regional industrial growth.

Industrial Growth - Industrial development will likely continue in several areas: in Morristown in Hamblen County, around Newport in Cocke County, around Jefferson City in Jefferson County, in the Harriman-Rockwood-Kingston area of Roane County, and at other identified growth centers. A primary objective of developmental planning must be to strengthen these development centers to promote industrial growth.

Greater development along the navigable channel, which extends from the southwestern boundary of the planning area to Knoxville on the Tennessee River, to Clinton on the Clinch River, and to Harriman on the Emory River is expected in the future. Industrial development is occurring at industrial sites on Melton Hill Reservoir on the Clinch River. Figure 20-6 shows the navigable waterway and related industrial sites in the Knoxville planning area, including about 5,000 acres of land suitable for heavy industrial development along the Tellico project, which is now under construction. (Figure 20-7.)

The chemical industry is particularly suited to take advantage of the navigable channel. Other industries showing potential for growth are primary metals, fabricated metals, and electrical and nonelectrical machinery.

Environmental Improvement - Population growth and industrial development will place new demands for services upon the metropolitan counties, particularly the city of Knoxville. Historically, the services provided by Knoxville have been oriented principally to an agricultural and mining economy. Emergence of an industrial economy in the planning area will require new services based upon new skills and attitudes. The ability to provide these services will depend upon the creation and maintenance of an urban environment comparable with that found elsewhere in the nation.

Continued industrial growth will also require an improved environment in and around the growth centers of the nonmetropolitan counties. Improved education, public services, local recreation, and commercial facilities will be required if these communities are to prosper and grow. Improved water supply and waste treatment facilities will also be required.

Recreational Development - The Tellico project is also expected to contribute substantially to the growth of the recreation complex surrounding the Great Smoky Mountains National Park by providing additional opportunities for public and commercial recreation development on National Forest and other land. This complex, already one of the major recreation centers of the nation, should be further strengthened by appropriate investment in recreation facilities.

In the northwestern part of the planning area, the Cumberland Plateau offers an opportunity for meeting other types of recreation needs. This relatively undeveloped area has the potential for many alternative types of recreation activities, including those associated with scenic and free-flowing streams.

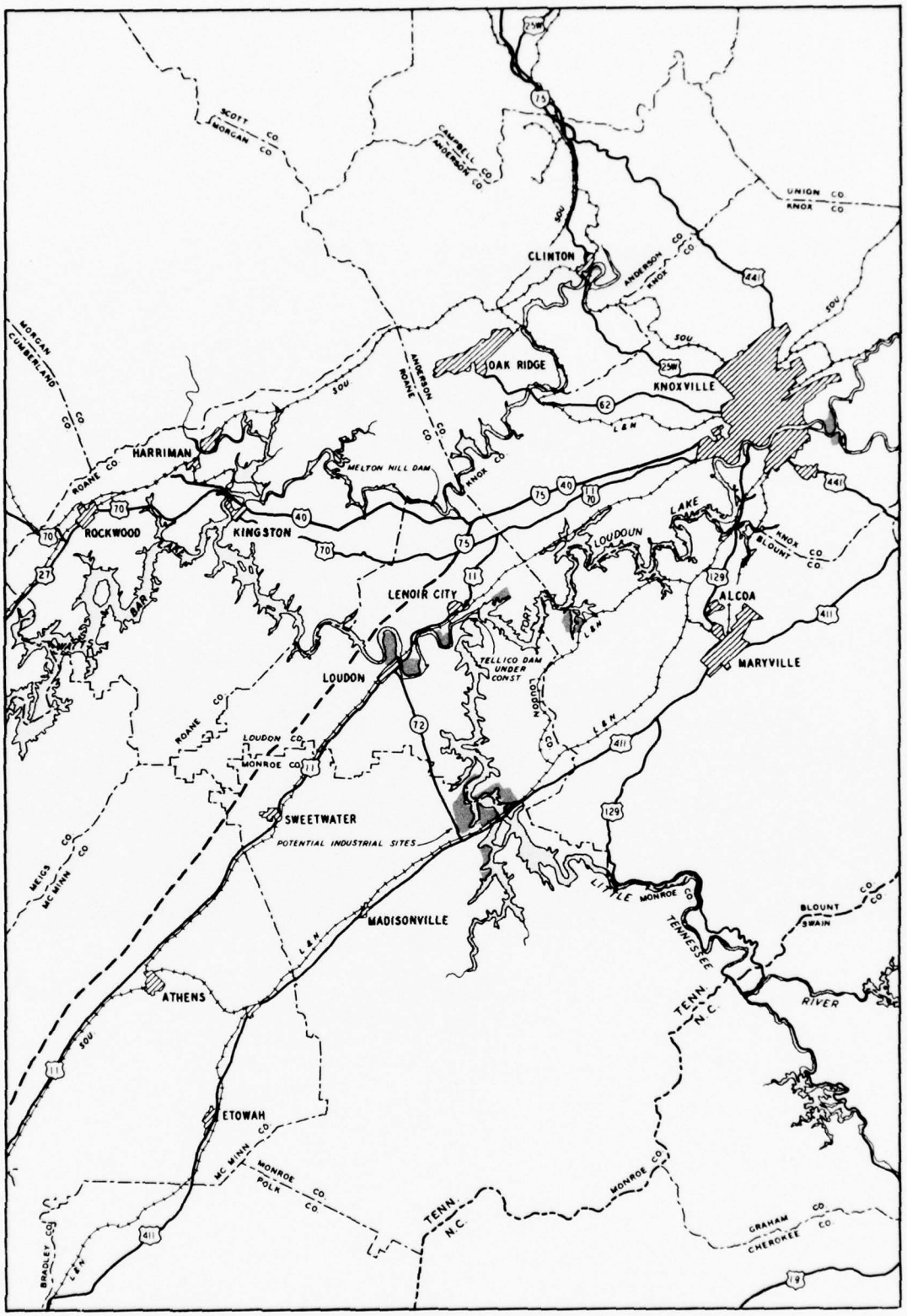


FIGURE 20-6 -- Navigable Waterway and Related Industrial Sites, Knoxville Planning Area (J-3)

FIGURE 20-7 -- Status of Construction, May 21, 1968, of Tellico Dam on Little Tennessee River

The Knoxville planning area is fortunate in having some of the finest natural recreational advantages in the nation. The preservation and augmentation of these advantages through appropriate planning and development should be pursued. This will require heavier local investment in public and private recreation facilities than has been forthcoming in the past.

11. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

Navigational Development - The major contribution of water and related resources to economic growth and development in the Knoxville planning area must come in part through greater utilization of land along the navigable channel. Less than $50 million of the more than $1.4 billion invested by private industry along the Tennessee River has occurred in this planning area. Greater efforts for industrial development are needed to capitalize on this opportunity for growth.

Water Quality - Water quality constitutes one of the more severe water resource problems in the Knoxville planning area primarily because of inadequate treatment of sanitary wastes. The major source of water pollution in the past has been the city of Knoxville, but the city has now completed construction of facilities to provide secondary treatment for all sewered wastes and has enlarged waste collection facilities substantially.

Even with improved facilities, water quality problems will remain to some extent at Knoxville, Maryville, Alcoa, Lenoir City, Newport, and other areas. Excessive hardness due to high calcium chloride concentrations in the Holston River resulting from industrial waste discharges at Saltville, Virginia, causes an estimated $257,000 cost annually to domestic water users, at Knoxville and Morristown. If projected growth is realized, water quality will remain a serious problem in this planning area.

Local Flooding - Local flooding in the planning area is a serious problem at approximately 26 places. The estimated average annual urban damage potential is much over $1 million under present-day conditions and values. Recently, considerable efforts have been made to reduce this damage, but significant problems remain. Technical planning assistance is available in the area through the Tennessee State Planning Commission and other planning agencies. Most of the communities in the area have adopted modern codes and ordinances, many of which contain flood plain regulations.

Channel improvement projects for flood control have been completed by the Corps of Engineers at Lake City and by TVA at Sevierville. Investigations for flood relief are well advanced at Briceville and at Sweetwater, where the possibility of combining flood control with other beneficial storage is being explored. Considerable flood relief has been provided at Knoxville and Morristown through urban renewal and local programs. Maryville and Alcoa are currently implementing a local flood damage prevention plan.

Studies are currently in progress on the flood problems at Gatlinburg, which is the principal source of services to visitors to the Great Smoky Mountains National Park. Intense development has resulted in development of land that is adjacent to streams and subject to flooding. Motels and other developments have been built right up to the banks and, in some cases, overhang the stream. Much of this development has taken place in spite of repeated warnings of flood hazards.

Oliver Springs Community Development - Indian Creek and its tributaries pose serious threats to the town of Oliver Springs, where over $500,000 in damage resulted from flooding in July 1967. In addition to flood protection, the town is in urgent need of better streets and highways, public housing, renovation of its central business district, commercial and industrial expansion, and water and sewer improvements. A comprehensive program has been prepared for overall community redevelopment of the town, which includes the flood abatement works.

Other Problem Areas - Industrial plants located in the flood plain at Harriman have been subjected to flooding from the Emory River in the past, and significant damage could occur to existing development from future flooding. Relatively minor flood problems also exist within this area at Kingston and Rockwood.

The greater Knoxville area experiences local flooding from a number of minor tributaries of the Tennessee and Clinch Rivers. Floods on these streams cause periodic damage and inconvenience and limit the usefulness of adjacent lands. Active programs of flood plain zoning and urban renewal, highway improvements, and limited channel improvements have reduced, but not eliminated these problems.

A flood hazard exists at Jellico because of the overflow of Elk Creek resulting from the backwater effects of Clear Fork. Public and private investments in Jellico during the past three years have totaled approximately $4 million. Future development plans include conversion of a deep strip-mine area, located in the flood plain and now municipally owned, into a recreational complex; improvements of the main commercial section of the city; and construction of a new hospital, public housing, and water and sewage treatment plants. The plan calls for extensive improvement in and around the flood plain area including excavation and widening of the Elk Creek channel to contain floods of 1- to 5-year frequency. Recent Corps of Engineers studies indicate that there is no apparent likelihood of providing a higher degree of protection at present, but further studies may be justified as the community development program proceeds.

Among other points where flooding hinders development are the vicinity of Maryville and Alcoa, where flooding from Pistol Creek limits development and disrupts traffic and public services at times; La Follette, primarily because of heading up from a highway bridge; and Newport, where the Pigeon and French Broad Rivers and Sinking Creek threaten rapidly developing commercial and industrial areas. Flood control is one objective included in current studies being conducted in the Pigeon and French Broad River watersheds.

Recreation - The recreational development of reservoirs in the planning area has not approached its potential. Recreation facilities are scattered and unrelated. The small size of most of the public access areas causes overcrowding and limits use. Commercial facilities are often inadequate. Water quality is a problem on Fort Loudoun Lake at Knoxville and for some distance downstream.

The most promising developmental opportunities are on Tellico Lake adjoining the national park and national forest, on Cherokee Lake where land has recently been acquired by the State of Tennessee for a park, on the Big South Fork Cumberland River, on the Central Peninsula of Norris Reservoir where more intensive hunting and recreation use could be developed, and on Fort Loudoun and Melton Hill Lakes where recreation facilities are needed for the metropolitan population.

The topography of the area is such that there are many natural scenic attractions. Some uncontrolled streams and portions of riverways below dams provide excellent opportunities for float fishing, canoeing, and related uses. These opportunities could be further exploited with local investment and promotion.

Conservation Needs - Conservation treatment needs were identified by USDA on 1,332,000 acres of woodland, 533,000 acres of cropland, and 417,000 acres of pasture by 1980. (See Appendix A for further detail.)

12. PLANNED PROJECTS AND INVESTIGATIONS

Oliver Springs Project - A comprehensive program has been prepared for overall community redevelopment which includes flood abatement works. Details of the program are presented by TVA in its July 1968 planning report No. 70-100. Construction of channel improvements by TVA began in March 1969. Commitments for other program objectives have been made by the town, TVA, and state and federal agencies.

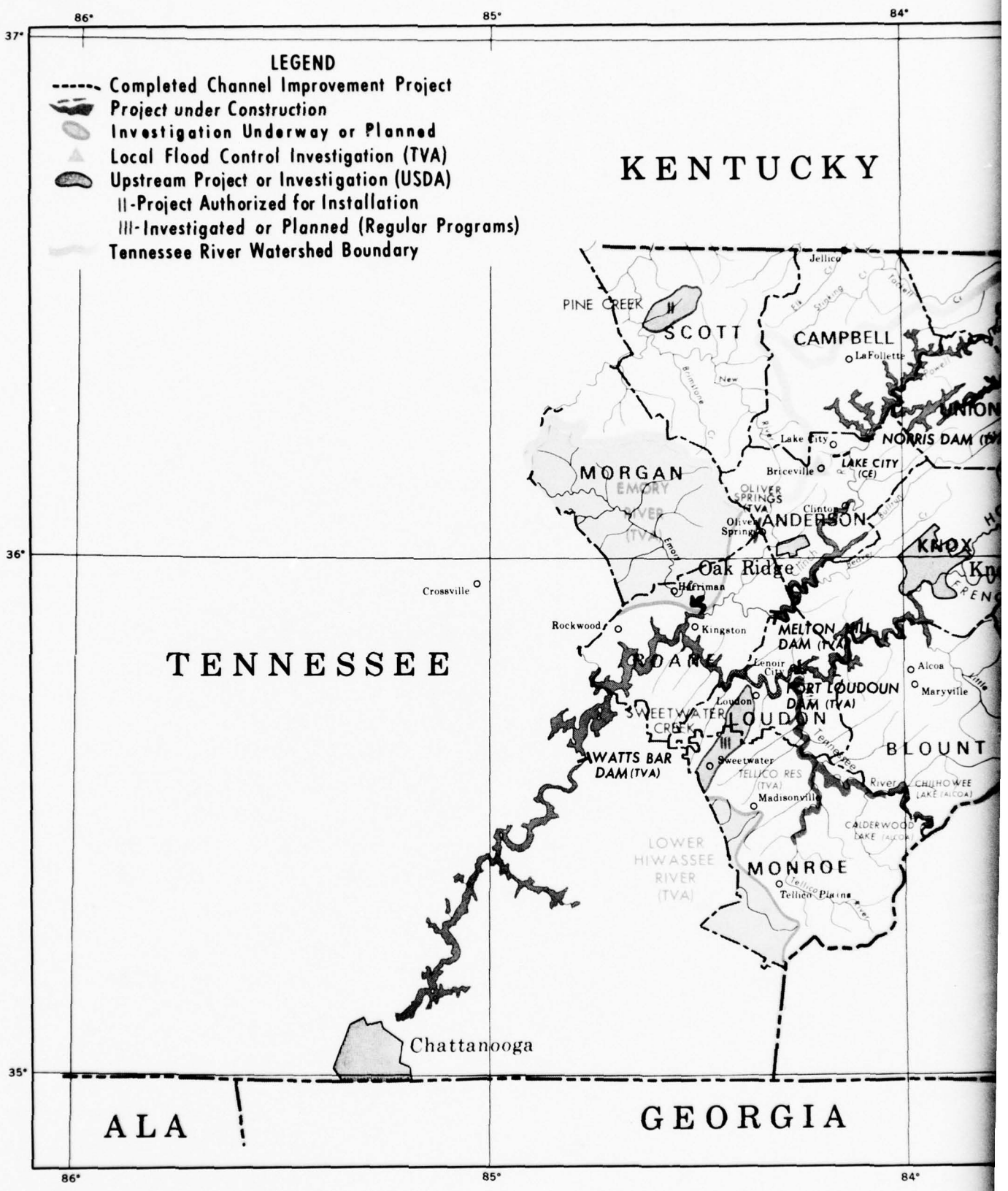
TVA Investigations - Investigations are currently being conducted in the Emory River basin directed to reduction of the local flood problem at Harriman and provision of improved water quality, water supply, and recreation opportunities to complement the complex developing outside the planning area near Crossville on the Cumberland Plateau (see map 20-6). Local flood relief investigations are in progress at Gatlinburg and Briceville.

USDA Projects and Investigations - National Forest lands are, and will continue to be, managed under the principles of multiple use and sustained yield for timber, recreation, water, and wildlife and fish. The accelerated recreation development program for the National Forests of this planning area includes development of facilities to accommodate 4,000 people at the Indian Boundary complex to coincide with the opening of the Tellico Plains-Robbinsville scenic highway and the development of facilities to accommodate 4,500 persons on the reservoir to be created by Tellico Dam. These two projects have an estimated cost of 4.5 million. (See Appendix F for further detail.)

The upstream watershed program includes investigations or planning for six watersheds in area J-3. One project, Pine Creek in Scott County, is under construction and includes water supply, flood protection, and recreation. One other watershed shown on map 20-6 and included in the water development plan is Sweetwater Creek, which includes flood protection for the town of Sweetwater and could also include municipal and industrial water supply.

The remaining four watersheds investigated - Bent Creek in Hamblen County, Black Wolf Creek in Morgan and Scott Counties, Bull Run Creek in Knox and Union Counties, and Perkins Creek in Scott County require further investigations.

Corps of Engineers - Section 218 of the 1968 Flood Control Act directs the Corps of Engineers to review its previous study on the Big South Fork, Cumberland River and update the economic feasibility of the Devils Jumps reservoir recommended therein. Section 218 further directs that the Corps of Engineers, the Department of the Interior and the Department of Agriculture enter into another study that will consider alternatives available for development of the Big South Fork and its contiguous areas. This latter study is expected to be prepared jointly by the agencies and will cover potential reservoirs, preservation features, scenic waterways, land rehabilitation and other phases of maintaining and enhancing the natural environment. Both studies are to be completed and submitted to Congress by the end of 1969. A further, more detailed, discussion of these studies is contained in Chapters 17 and 18 of this Part.


LEGEND
Completed Channel Improvement Project
Project under Construction
Investigation Underway or Planned
Local Flood Control Investigation (TVA)
Upstream Project or Investigation (USDA)
II-Project Authorized for Installation
III-Investigated or Planned (Regular Programs)
Tennessee River Watershed Boundary
KENTUCKY
TENNESSEE
GEORGIA
ALA
86°
85°
84°
37°
36°
35°
PINE CREEK
SCOTT
CAMPBELL
Jellico
LaFollette
Lake City
NORRIS DAM (TVA)
LAKE CITY (CE)
Briceville
MORGAN
OLIVER SPRINGS (TVA)
Oliver Springs
ANDERSON
Clinton
KNOX
Oak Ridge
Harriman
Crossville
Rockwood
Kingston
MELTON HILL DAM (TVA)
ROANE
Lenoir City
Alcoa
Maryville
FORT LOUDOUN DAM (TVA)
Loudon
SWEETWATER CREEK
LOUDON
BLOUNT
WATTS BAR DAM (TVA)
Sweetwater
TELLICO RES (TVA)
Madisonville
CHILHOWEE LAKE (ALCOA)
CALDERWOOD LAKE (ALCOA)
LOWER HIWASSEE RIVER (TVA)
MONROE
Tellico Plains
Chattanooga

II-20-45

MAP 20-6

SECTION IV - CHATTANOOGA WATER AREA (J-4)

13. BRIEF DESCRIPTION OF THE AREA AND EXISTING DEVELOPMENT

The Chattanooga Water Area (see map 20-7) is located in the mid-portion of the Tennessee Valley and contains nine counties in southeastern Tennessee and three in northwestern Georgia. About 91 percent of this 4,275-square-mile area is in the Tennessee River watershed. Most of the topography of the area is relatively flat and rolling, especially so along the main stem of the Tennessee River, but it becomes rugged in the gorge section of the river below Chattanooga and along the tributary Sequatchie and lower Hiwassee Rivers.

Existing Water Resource Development - Existing development in this planning area includes all or part of four major impoundments on the Tennessee River, including the recently completed Nickajack Dam and Reservoir which replaces Hales Bar. In addition, there are three smaller TVA projects on the Ocoee River in Polk County. The Corps of Engineers has constructed a local flood protection project at Spring City in the northern portion of the planning area.

Population and Employment - The area is basically dominated by the central growth center of Chattanooga. The city developed originally as a strategic transportation and communication center. It has attracted the investment needed to build the economic base necessary to support both the city's growth and, more recently, the growth of part of the surrounding counties. The Chattanooga Standard Metropolitan Statistical Area, which includes Hamilton County, Tennessee, and Walker County, Georgia, now has a population of about 300,000.

In recent years, two smaller manufacturing and service centers have developed in this area - one in Cleveland (Bradley County) and another in Athens (McMinn County). Rapid growth has also been occurring in the Georgia portion of the planning area, which is closely related to Chattanooga and the textile center of Dalton, Georgia.

In marked contrast with many regions in Appalachia, the population of the area increased by approximately 12 percent between 1950 and 1960. Future growth (see figure 20-8) is anticipated to be reasonably close to developmental benchmark levels.

Economic Progress - Although the total area manufacturing employment has not grown rapidly, major increases in wage payments have taken place because of a gradual transition of area manufacturing to a high-wage base. For example, in 1959 there were about 58,999 employees in manufacturing with a total payroll of $237 million. By 1965, these figures had increased to 66,000 employees with a payroll of $335 million.

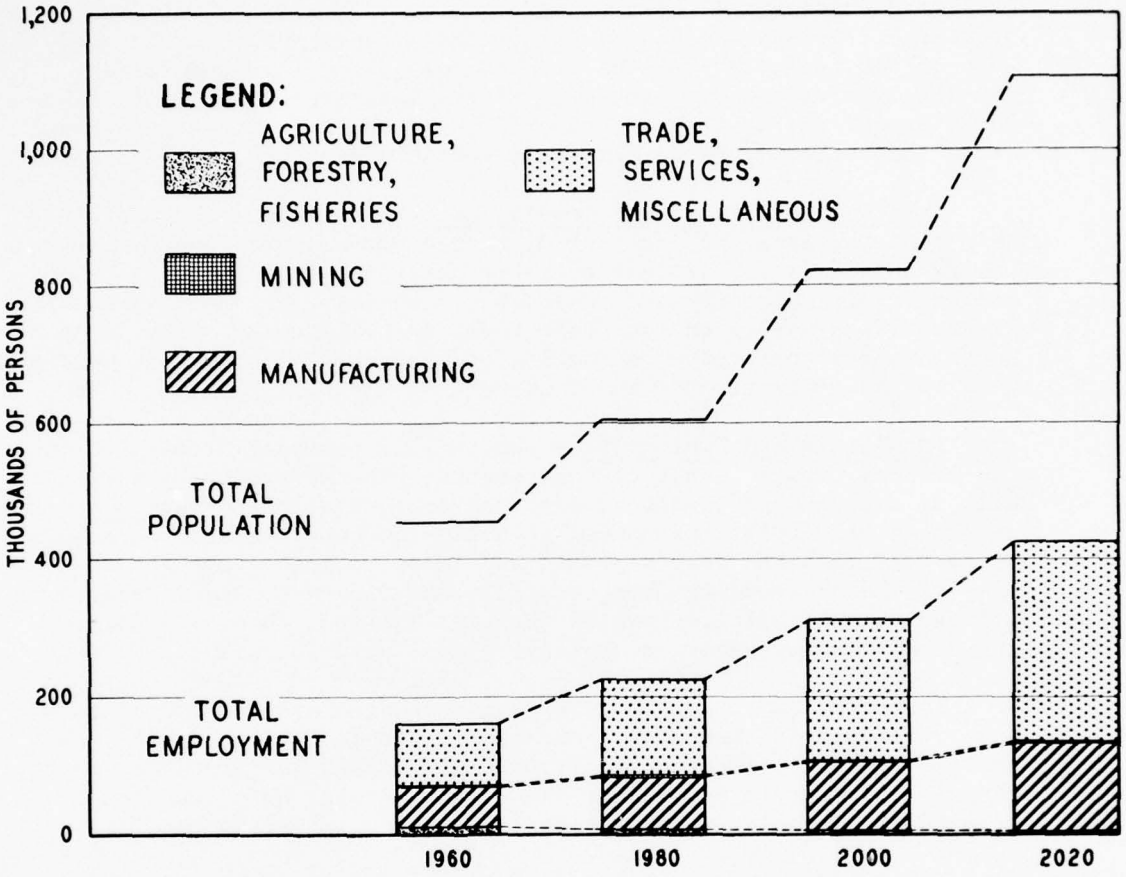
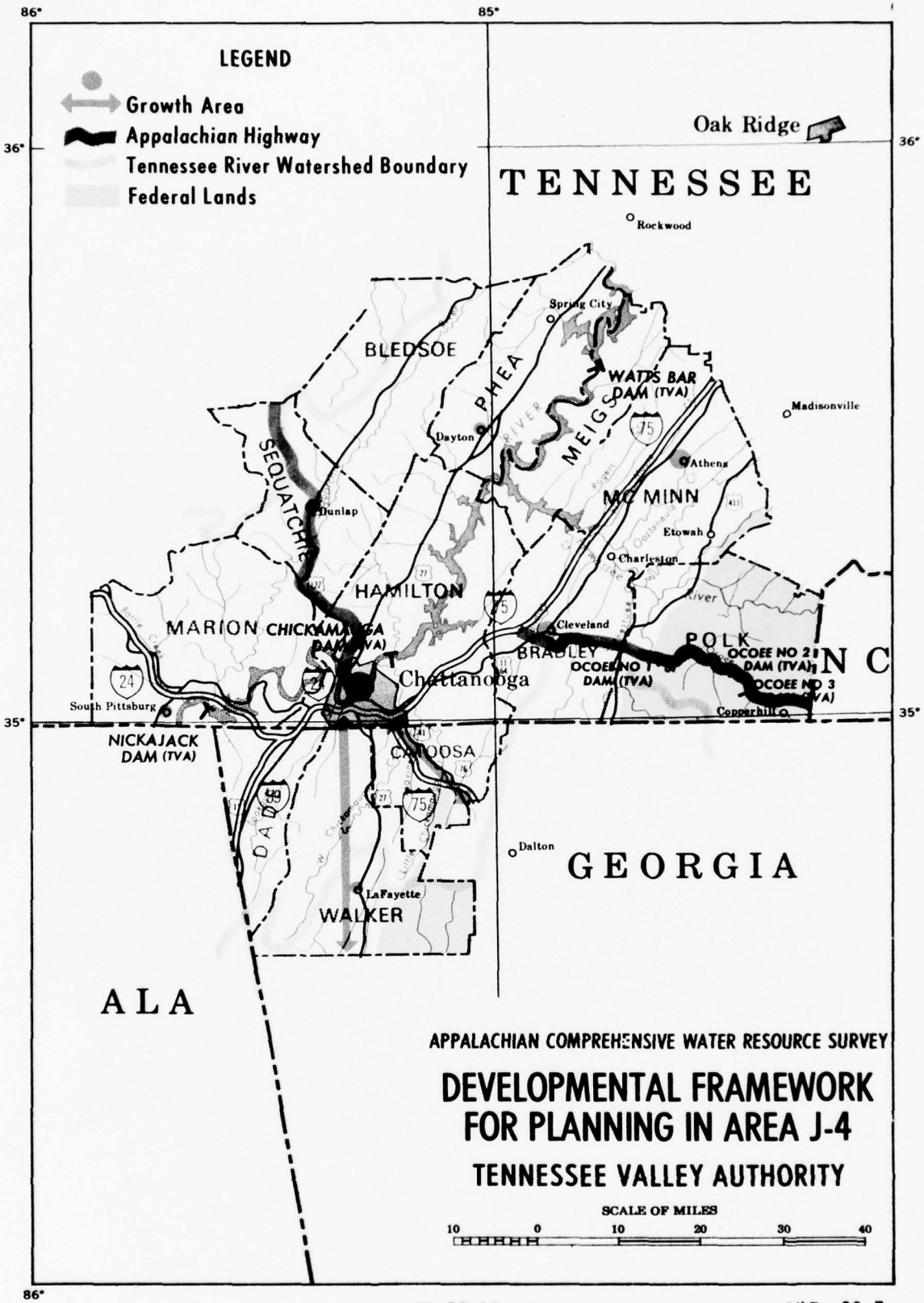


FIGURE 20-8 -- Population and Employment, 1960, and Projections to 2020 Water Area J-4



II-20-49

MAP 20-7

The area had an estimated per capita income of about $1,400 in 1962. This figure should rise to about $2,500 by 1980. Manufacturing and service employment will account for the bulk of the increase. Growth sectors in manufacturing are chemicals, machinery, paper and paper products, and, to a smaller degree, textiles. The service sector should grow rapidly as trade, both wholesale and retail, and finance and insurance employment rises. The city of Chattanooga has been and will remain an important transportation center.

Future Outlook - The Chattanooga area is one of the stronger economic areas of Appalachia. It has developed all of the attributes - although to varying degree and quality - of an industrial metropolitan area, but remains small in size and in volume of output and services when compared with manufacturing belt cities or the new West Coast urban-industrial complexes. The twelve-county area has a well established educational center (The University of Chattanooga), a wide range of service industries - hospitals, retail and wholesale trade establishments, banks, insurance, and other business consulting firms, etc. - and the amenities normally found in large urban centers or their environs.

The area has an abundance of heavily used recreational facilities and the potential for much more extensive development. Annual recreation visits to TVA reservoirs in the planning area exceed six million.

14. DEVELOPMENTAL STRATEGY

Economic growth in the Chattanooga planning area will depend largely upon the extent to which the twelve counties complete the shift of employment out of low-wage agriculture and mining by attracting investment in new manufacturing. Manufacturing employment is expected to concentrate in Hamilton, Bradley, McMinn, Marion, Catoosa, and Walker Counties. Chattanooga should continue to develop as a retail and service center for the area.

Industrial Growth - In total, approximately $365 million worth of industrial development has taken place along the Tennessee River in the Chattanooga planning area since 1933 (see figure 20-9). All of the main-river counties in the Chattanooga area have been served by year-round barge transportation since the 9-foot channel to Chattanooga was completed in 1945. In addition to the main river, the channel has been recently extended up the Hiwassee River tributary to serve several potential industrial waterfront sites.

In recent years, growth has occurred in chemical and metal industries as the transition toward higher-skill employment has proceeded. General investment in infrastructure, both under the Appalachian program and under other local, state, and Federal programs, can assist in

FIGURE 20-9 -- Industrial Area on Hiwassee River Embayment of Chickamauga Lake

the attraction and development of additional high-wage industries and services.

Existing Development - Although the city of Chattanooga is well situated, potential industrial land is not abundant in the core county, Hamilton; however, an expansion to new industrial sites is possible to the northeast, toward Cleveland, Tennessee; and to the northwest, into the Sequatchie valley where the proposed I-24 from Chattanooga to Nashville will remove the principal causes of isolation. The Georgia counties, particularly Catoosa, will also experience significant industrial growth in the future.

With the completion of I-24, the Appalachian Highway, and other planned improvement the upper and lower Sequatchie valleys will be tied closer together, and the lower valley will gradually develop as a suburb of Chattanooga. This will enhance the locational advantage of the industrial and recreational tracts along and near Nickjack Reservoir and provide new developmental opportunities.

Economic growth has been particularly rapid during the past 15 years in the lower Hiwassee area, which is composed of Bradley, McMinn, and Polk Counties. Principal economic activities are clustered at five points: the mining and chemical operations at Copperhill, the newsprint and chemical industry complex at Charleston-Calhoun, and the cities of Cleveland, Athens, and Etowah. Continued development of this area will require rapid expansion of public facilities and careful planning for residential expansion.

Recreation and Environmental Improvement - Continued development in the Chattanooga planning area will require additional investment in recreation facilities, primarily to meet the needs of a growing and increasingly affluent local population. Extensive development has already occurred on Chickamauga Reservoir, which is one of the most intensively developed lakes in the TVA system.

Future development should concentrate on providing opportunities at alternative locations and expanding the variety of available recreation facilities. In addition to a number of commercial developments, available recreation facilities include a number of historical sites in and near Chattanooga, including the Chickamauga and Chattanooga National Military Park, which provide a basis for continued development.

Continued efforts are needed to reduce the environmental problems that now exist in the Chattanooga metropolitan area. Air pollution, water pollution, and local flooding are all major problems which may tend to restrict further growth and development in both the Georgia and Tennessee portions of the metropolitan area.

15. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

Navigational Development - As indicated above, substantial industrial development has occurred along the Tennessee waterway in the Chattanooga water area. Continued development, supported by strong local leadership, will be possible only if sites are available for development. The need for additional industrial sites along the navigable waterway has already resulted in some channel improvement work being undertaken in the area. Provision of other sites for industrial development will be needed to support industrial growth in the future.

Water Quality - Water quality is a significant problem in the planning area, primarily because of inadequate treatment of industrial and municipal wastes. Water quality problems restrict recreational use of impoundments and may be impeding industrial growth below Chattanooga. Waste discharges from industrial plants near Chattanooga have made the waters of Waconda Bay (Chickamauga Reservoir) undesirable for recreational use, and numerous fish kills in the area have been investigated. Industrial and municipal waste discharges contaminate Nickajack Reservoir below Chattanooga and make it unfit for recreational use. This problem will not be alleviated until projected plans for secondary waste treatment at Chattanooga are complete. In addition, improved municipal and industrial waste collection and treatment facilities are needed in other parts of the Chattanooga metropolitan area. In recent years, a water quality problem developed on the main-stream reservoirs, where growth of an aquatic weed, watermilfoil, has reduced the desirability of the reservoirs for fishing, boating and swimming.

Flood Damage Prevention - The Chattanooga area has historically been subjected to severe flooding. Despite the flood protection afforded by the TVA river control system which has averted damages of almost $300 million since 1936, Chattanooga is still subject to damage from large floods which cannot be controlled by available upstream storage. In addition, several tributary rivers and streams periodically overflow their banks, causing property damage to the urban, industrial, and commercial development in the area.

A project to reduce flood damage in the most heavily developed part of Red Bank has one unit of channel improvement completed and is classified as "under construction" pending the construction of a second unit on Stringers Branch. A significant problem still exists on South Chickamauga Creek in the Brainard area of Chattanooga where plans are being completed for a local flood protection project that are compatible with improvements now being made to the Chattanooga Municipal Airport (TVA Planning Report No. 0-6668, August, 1967).

Another potentially dangerous situation exists at Athens,

Tennessee, where the central business district is subject to damaging floods from Oostanaula Creek. The flood of March 1963 caused $149,000 damage. The maximum probable flood would damage 89 homes and 114 commercial, industrial, and public properties, causing damage estimated at almost $4.5 million.

Flooding on the Sequatchie River causes damage to lands along the lower stretches of the river, primarily in Marion County. While much of the floodable land is presently in agriculture, significant development is expected in this area in the future, primarily as a result of the expansion of Chattanooga and the development of Nickajack Reservoir.

Other Needs - Approximately 10 percent of the Chattanooga planning area's public water supply comes from springs or wells, although surface water is abundant in most of the area. In some areas, however, local water supply problems exist. Unregulated flows in Oostanaula Creek are not adequate to maintain sufficient water for anticipated municipal and industrial use and, more immediately, adequate waste dilution at Athens, Tennessee.

Continued growth of the area will necessitate additional expenditure for recreation facilities. The areas with greatest potential for new development appear to be in the forested area of McMinn and Polk Counties and in the upper section of the Sequatchie valley.

Conservation needs were identified by USDA on 1,036,000 acres of woodland, 238,000 acres of cropland, and 257,000 acres of pasture by 1980. (See Appendix A for further detail).

16. PLANNED PROJECTS AND INVESTIGATIONS

South Chickamauga Creek Local Flood Protection - A flood control plan for the Brainerd section of Chattanooga is presented by TVA in its August, 1967, planning report No. 0-6668. This plan is designed to mitigate potential flood damage to a highly developed urban area lying at comparatively low elevation along South Chickamauga Creek near the municipal airport. The design of the South Chickamauga Creek project is such that a large amount of the spoil which must be disposed of in the flood control project can be used as fill material for the planned runway expansion at the Chattanooga Airport, Lovell Field. The project includes channel enlargement and relocation also needed for the airport expansion; about 4 miles of levee; a ponding area; and 3 pumping stations. The interrelationship of the flood control and airport expansion projects also extends to possible savings from joint land acquisition. The city of Chattanooga and TVA have entered into a contract which recognizes these relationships and defines cost-sharing responsibilities for the flood control project.

TVA Investigations - The continued development of the lower Hiwassee River area is being impeded by a number of related water resource problems (see map 20-8). Investigations are currently being conducted with regard to a number of these problems, including local flood problems at or near Athens and Cleveland, provision of needed water for municipal and industrial use and waste dilution at Athens, and extension of the navigable channel to additional industrial sites.

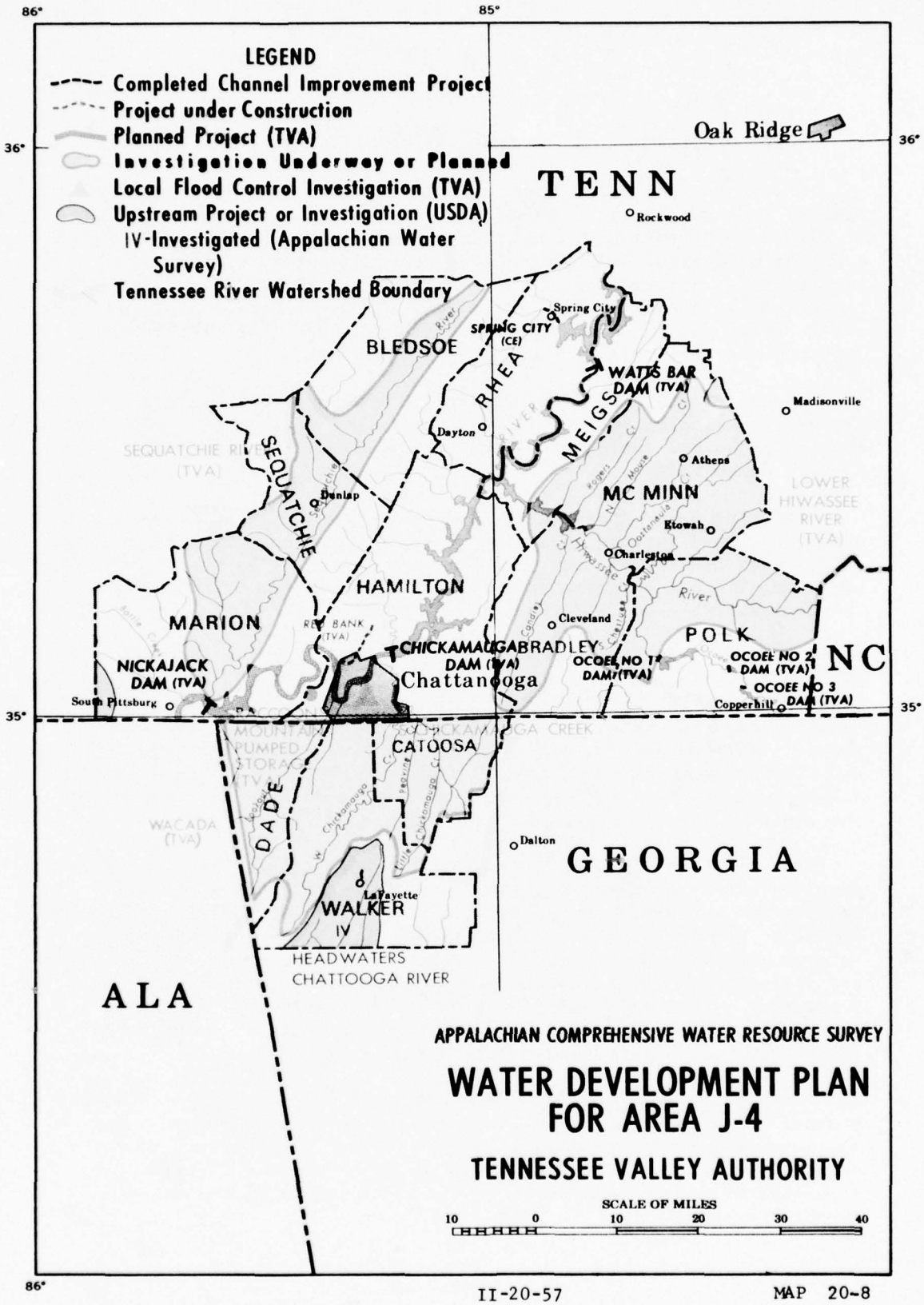
Investigations are also being undertaken on the Sequatchie River. These investigations are being directed toward flood damage reduction, provision of municipal and industrial water supply, and recreation development.

Investigations of additional flood problems in the Chattanooga metropolitan area will be required. Investigations are far advanced for a pumped-storage power facility on Raccoon Mountain, near Chattanooga, which would provide additional peaking capacity for the TVA power system.

A reconnaissance survey for water resource development is under way for the northwest Georgia area of Walker, Catoosa, and Dade Counties. Consideration is being given to flood damage reduction; improvement of water quality; development of the recreation potential, including fishing and hunting; reservoir shoreline development possibilities; and the possibility of more productive employment of the local labor force. The investigation is a part of the overall planning for economic development for the region.

USDA Projects and Investigations - The accelerated recreation development program in the National Forests of this planning area includes construction of the Starr Mountain complex in McMinn and Monroe Counties and the Chilhowee complex in Polk County. The Starr Mountain complex, which is partly located in the Knoxville planning area, would include a 120-acre lake with related facilities to accommodate 7,500 persons at one time. The Chilhowee complex would provide two 30-acre lakes with facilities for 8,500 people. The cost of the two projects is estimated at $7,300,000 (see Appendix F for further detail).

There are no existing upstream watershed projects in this water area, and none has yet been planned under Public Law 566. Three watersheds, however, have been investigated under the Appalachian Water Resource Survey to provide water supply, recreation, and flood control for rural and urban fringe areas. One of these watersheds shown on may 20-8 and included in water resource plan is Headwaters Chattooga River, which includes municipal and industrial water supply, flood protection, and recreation for the growing Georgia town of La Fayette. Peavine Creek in Catoosa and Walker Counties, Georgia and Coahulla Creek in Bradley County, Tennessee and Whitfield County, Georgia (Sub-region E) require further investigation. For information on the Coahulla Creek Watershed, see the Sub-region E report.



II-20-57

MAP 20-8

SECTION V - HUNTSVILLE WATER AREA (J-5)

17. BRIEF DESCRIPTION OF THE AREA AND EXISTING DEVELOPMENT

The Huntsville Water Area, in south-central Tennessee and northern Alabama (see map 20-9), includes five counties in Tennessee and nine in Alabama. Of this area approximately 85 percent, about 7,100 square miles of land area, lies within the Tennessee Valley portion of Appalachia. The remainder is largely in the Cumberland drainage. The topography is generally flat to rolling in most of the Alabama portion of the area, but the eastern part and the Tennessee portion have the rugged characteristics of the Cumberland Plateau.

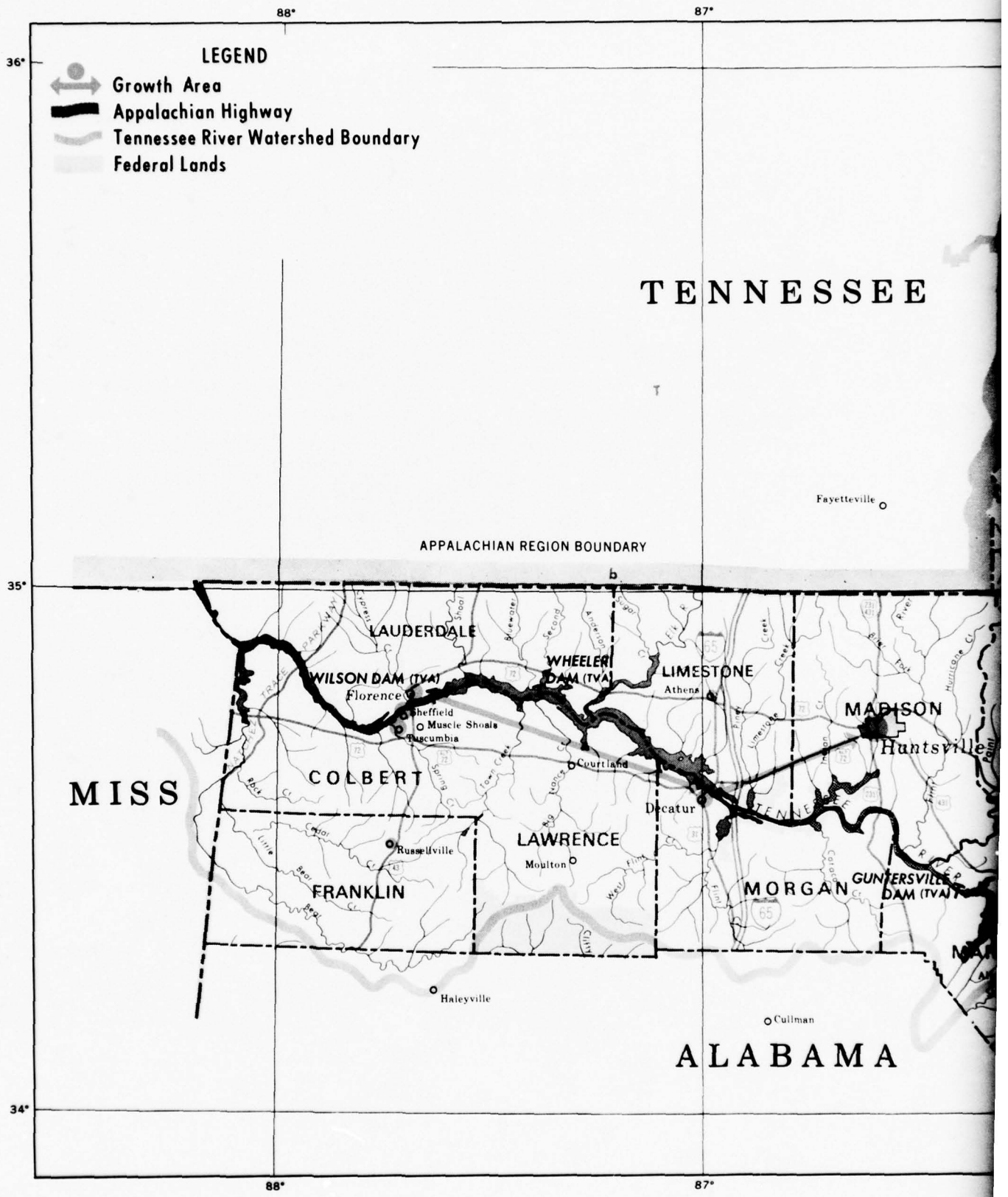
The major streams of the area are the Tennessee and its tributaries -- including Bear Creek, Elk River, and upper portions of the Duck River -- and the Collins River tributary of the Cumberland River's Caney Fork.

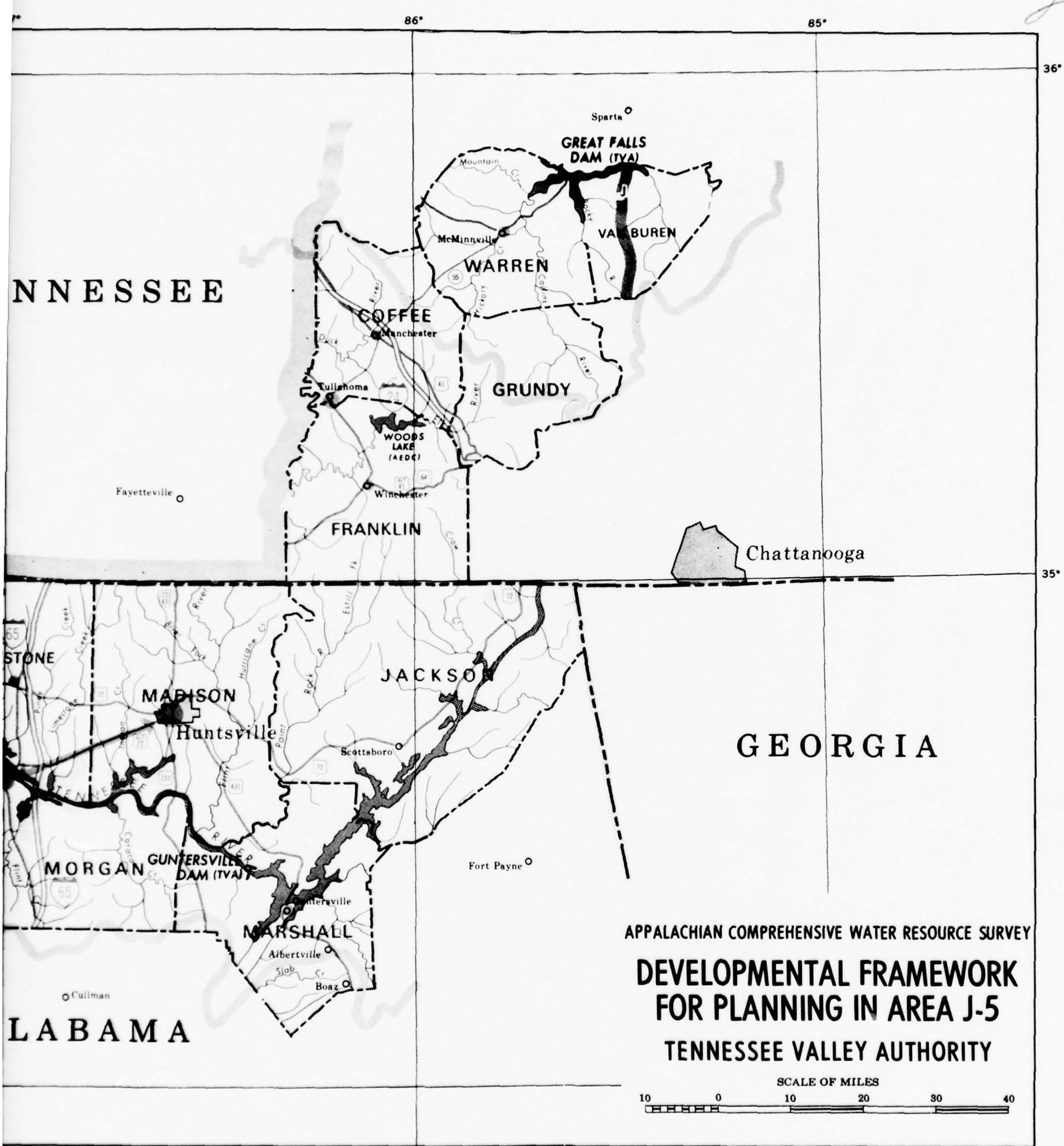
Existing Water Resource Development - The Tennessee River is fully developed through the planning area, which contains all or part of Pickwick Landing, Wilson, Wheeler, and Guntersville Reservoirs. In addition, TVA has projects under construction on two tributaries of the Tennessee --- Bear Creek and Elk River.

The Bear Creek project consists of four reservoirs and about 62 miles of channel improvements which would substantially reduce crop damages on about 17,600 acres of farmland now unprotected, provide opportunities for fish and wildlife and recreational development, provide additional municipal and industrial water supply at Haleyville and other communities in the area, improve water quality, and enhance development opportunities on some 5,100 acres of land surrounding the reservoirs. The Bear Creek unit was completed in early 1969.

The Tims Ford project will regulate flows on the Elk River from a point 37 miles below the Elk River Dam of the Arnold Engineering Development Center and generate an average of 64,000,000 kwh of power annually. The project will have 225,000 acre-feet of flood control storage, will improve local water supplies at Winchester and Tullahoma, and will improve water quality below the dam. A projected 1,850,000 recreation visits will be made to the project annually, exclusive of hunting and fishing. The project will also provide sites suitable for use by water-using industries.

Population and Employment - The Huntsville water area has experienced rapid growth in recent years. The population of the area increased 14 percent between 1950 and 1960 and an estimated 22 percent between 1960 and 1965. Madision County, which includes Huntsville, accounted for about 55 percent of the population increase in this 15-year period.


88°
87°
36°
35°
34°
LEGEND
Growth Area
Appalachian Highway
Tennessee River Watershed Boundary
Federal Lands
TENNESSEE
Fayetteville
APPALACHIAN REGION BOUNDARY
LAUDERDALE
WILSON DAM (TVA)
Florence
WHEELER DAM (TVA)
LIMESTONE
Athens
MADISON
Huntsville
Sheffield
Muscle Shoals
Tuscumbia
Courtland
COLBERT
MISS
Decatur
LAWRENCE
Moulton
Russellville
FRANKLIN
MORGAN
GUNTERSVILLE DAM (TVA)
Haleyville
Cullman
ALABAMA



APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

DEVELOPMENTAL FRAMEWORK FOR PLANNING IN AREA J-5

TENNESSEE VALLEY AUTHORITY

II-20-59

MAP 20-9

Urban population in the planning area is largely concentrated in four areas; the adjoining cities of Muscle Shoals, Florence, Sheffield, and Tuscumbia, Alabama; Huntsville and Decatur, Alabama; Tullahoma, Tennessee; and McMinnville, Tennessee. Together, these four areas accounted for almost 74 percent of the 1960 urban population of the area. At that time, about 45 percent of the population of the area was urban.

In the Alabama portion of the area, development has occurred primarily along the Tennessee River, which is navigable throughout the water area. The metal and chemical industries dominate the economy of the Muscle Shoals area. Huntsville, home of the George C. Marshall Space Flight Center, is dominated by the aerospace industry. Decatur's economic base, more diversified than Huntsville's, includes synthetic fibers, copper tubing, electrical hardware, fabricated metal products, and machines.

Tullahoma, the major city in the five Tennessee counties in the planning area, is the home of the Arnold Engineering Development Center, a major Air Force aviation research facility. McMinnville, Manchester, and Winchester are other significant cities in the Tennessee subarea.

Manufacturing, including employment related to the area's aerospace development centers, has been the primary source of economic growth in the planning area. Statistics from state employment security agencies indicate that employment in manufacturing increased from 32,000 to 53,000 from 1959 to 1965. During the same period, payrolls increased by 114 percent and average annual manufacturing wages by 31.5 percent. One-third of Alabama's growth in manufacturing between 1959 and 1965 was concentrated in the nine Alabama counties in the area, which experienced an increase of almost 16,000 new jobs and $132 million in annual payrolls during the period.

Future Growth - Although much of the recent growth in the planning area is related to government aerospace expenditures, the future of the area is not completely dominated by this factor. Huntsville and Tullahoma are heavily dependent upon these activities, but Decatur and the Muscle Shoals area have developed heavy industrial complexes that are not dominated by government expenditures. Recently, significant industrial development has occurred near Scottsboro, Alabama, and near McMinnville, Tennessee. Industrial development is also occurring at other points throughout the planning area.

Both agriculture and forestry make significant contributions to the area economy. The Alabama counties contain the finest agricultural land in the Tennessee Valley. Growth prospects for the forest products industry, which currently provides employment for less than 2,000 people in the area, are probably greater in this area than in any other

planning area in Sub-region J.

The population and employment of the Huntsville planning area are expected to continue to grow rapidly in the future (see figure 20-10). The area had an estimated per capita income of $1,576 in 1962, the highest of any of the five water areas. Projected employment and income closely approximate the developmental benchmark goals.

18. DEVELOPMENTAL STRATEGY

Future economic growth in the 14-county Huntsville water area will be linked to further expansion of the manufacturing and aerospace industries. Agriculture, once the area's largest employer and the mainstay of the economy, has experienced a continuous employment decline over the past several years but will continue to be a major activity in the area. Mining is not significant in the area economy.

Industrial Growth - A large part of future industrial growth will result from development of water - and power-oriented industries. Chemical operations, particularly the processing of chemical intermediates, is a most likely possibility and, because a strong primary metals base already exists within the area, locational advantages exist for nonferrous and ferro-alloy processing and fabricating industries. A large paper company is presently constructing a $100 million complex near Courtland.

Huntsville has acted to capitalize on its space laurels by establishing a 2,000-acre research park, which has already attracted several "big-name" companies in the field of space research and design. Service and supporting industries can be expected to expand and thereby to diversify the planning area's industrial economy. Cotton textiles and other long established industries continue to figure importantly in terms of employment, but their growth potential is insignificant in comparison with ordnance, aircraft parts, and electronic components.

Other Considerations - The importance of water-based recreation in the planning area is revealed in the fact that, of the recreation visits to all TVA reservoirs in 1967, some 18 million to almost 40 percent of the total were to the four main-river reservoirs all or partly in north Alabama. More than one-third of the total private recreational investments on TVA reservoirs has been made in this area, but the significance of this development has been limited by lack of public recreation facilities and services. With continued population growth expected, the need for recreation opportunities for local use will increase. The states of Alabama and Tennessee, the counties -- particularly those adjacent to the reservoirs -- and the cities need to incorporate recreation planning more effectively into their overall planning.

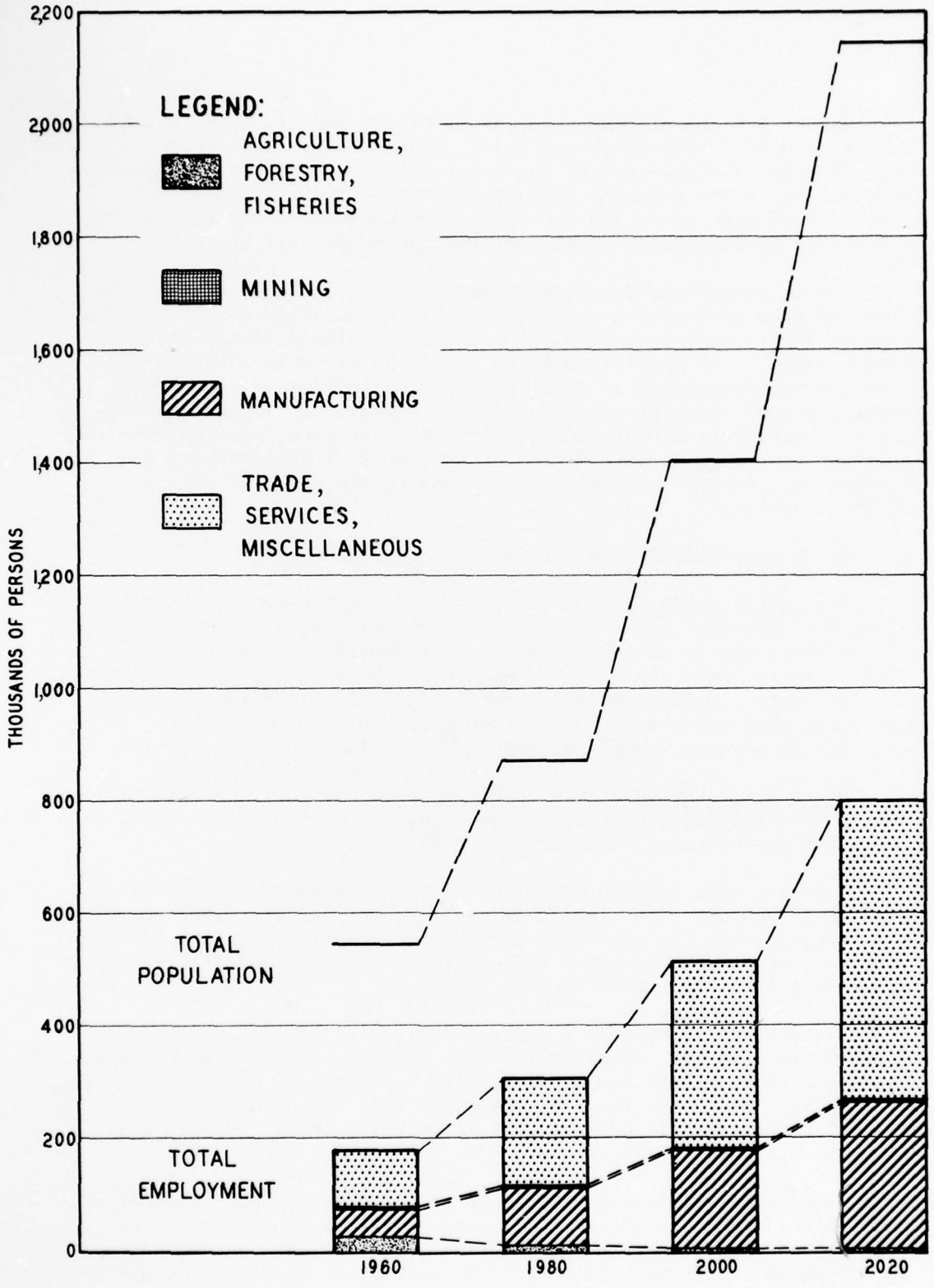


FIGURE 20-10 -- Population and Employment, 1960, and Projections to 2020 Planning Area J-5

Except for the plateau counties of Grundy and Van Buren which suffer from infertile soils and hilly, broken land, farming in the area is reasonably prosperous and diversified because there are both many general farms and many crop specialties. The most important agricultural need is to aid the further adjustment of the area agriculture to an intensive, highly capitalized commercial basis.

Future growth and development should bring increasing urbanization and greater need for urban services and facilities. The primary need is for stronger regional planning, particularly around the major urban areas. Much greater emphasis should be given to planning for flood damage prevention in local planning activities. In addition, if the water area is to grow to its full potential, improvements in the existing transportation network will have to be made, particularly the east-west highway system. A modern expressway linking Atlanta and Memphis--via northern Alabama--would enhance the economic growth of northern Alabama.

19. WATER AND RELATED RESOURCE NEEDS AND OPPORTUNITIES

Navigation Development - Attractiveness of the industrial sites along the waterway in the Huntsville planning area, which has resulted in the construction of industrial facilities valued at almost $900 million in the area since 1950 (see figure 20-11), will continue to be a major factor in the growth and development of this planning area. Rail, highway, and channel extensions will, however, be required to maintain an adequate supply of sites for development.

Flood Damage Prevention - While projects currently under construction will significantly reduce flood damage potential in the area, both urban and agricultural flood damage problems remain.

The estimated average annual urban flood damage potential in the area is $2,300,000, the highest of the five water areas. Fortunately, the topography of the area does not restrict development; and flooding, while a serious problem, does not generally hinder community growth to the extent found in other planning areas.

Flooding is a problem of varying degrees at Athens, Alabama, where a flood plain zoning ordinance has been recently adopted; at Tullahoma, Tennessee, where flood damage prevention measures are being considered by the city; and at Huntsville, where the city has an active program of channel improvement in progress. Some local flooding problems also exist at Florence and Decatur.

Flood damages are experienced in the middle and lower reaches of the Collins River basin, and it is estimated that lands subject to flooding consist of nearly 14,000 acres along the main stream and about 15,000 acres in the tributary valleys. Principal flood losses are

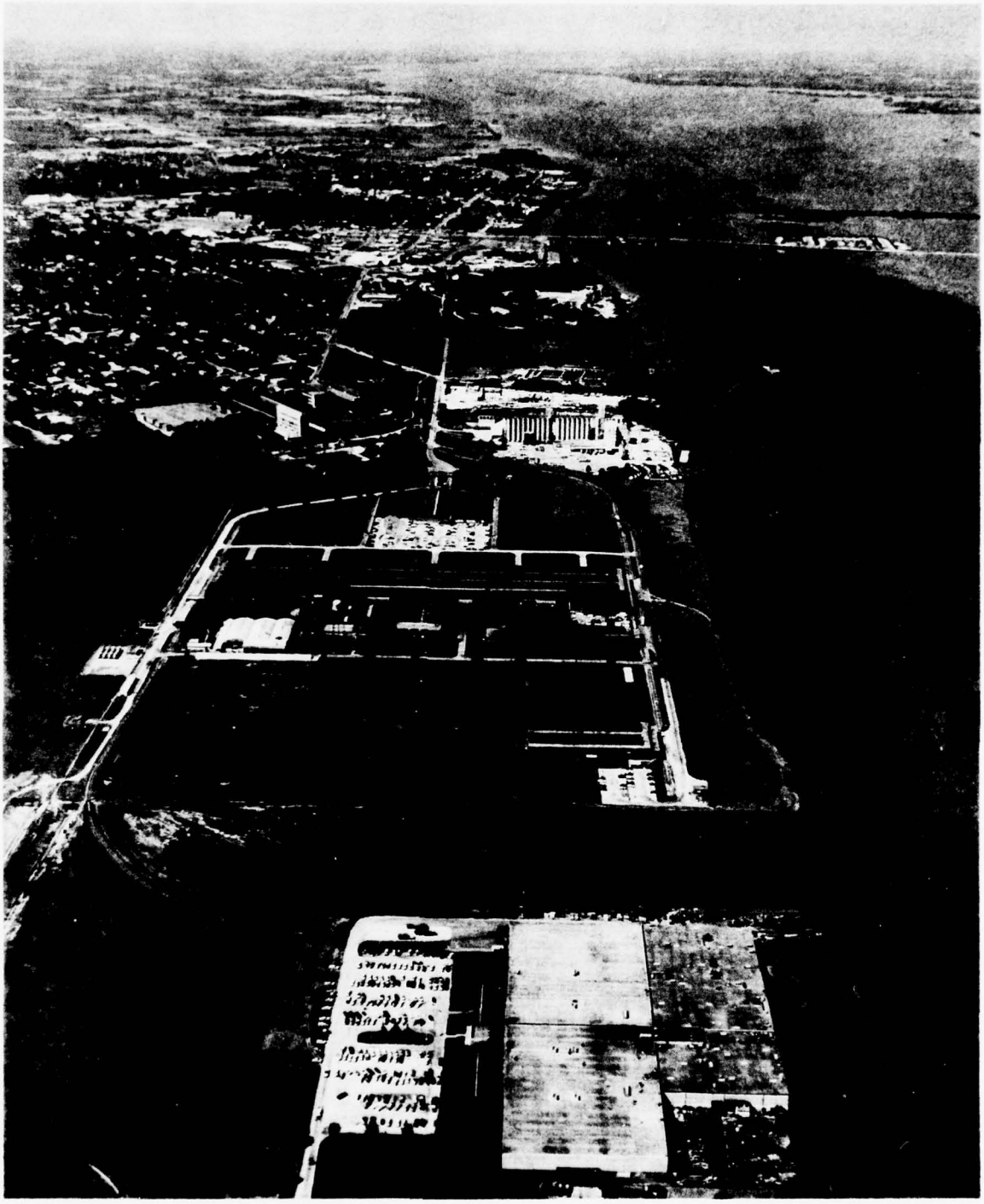


FIGURE 20-11 -- Industrial Waterfront on Tennessee River at Decatur, Alabama

incurred from damages to growing and unharvested crops, lands, and improvements.

Recreation - Recreation development along the Tennessee River in Alabama includes a number of small county and municipal parks; two small state parks; a number of commercial resorts, private clubs, and boat harbors; and the large Wheeler National Wildlife Refuge. The partially completed Natchez Trace Parkway crosses the northwestern corner of the water area. There is need for improvement of public recreation facilities, including expansion of Joe Wheeler State Park and the development of one or two new major facilities.

The recreation potential of the Tennessee portion of the planning area, including the Tims Ford Reservoir (see figure 20-12), needs to be further developed. The State of Tennessee has proposed a state park, known as Rock Island, on the headwaters of Caney Fork, just below the existing Great Falls Dam on Center Hill Reservoir. Another state park, known as Old Stone Fort, is being planned at the confluence of the Duck and Little Duck Rivers.

Other Needs - Approximately 17 percent of the public water supply in the Huntsville planning area comes from springs or wells. Surface water is abundant, but water quality problems exist at some points in the planning area, primarily because of inadequate treatment of municipal and industrial wastes. While considerable progress has been made toward improved waste treatment in recent years, further efforts are required. Water quality problems remain, to some extent, at Huntsville-Decatur, Athens, and Florence-Sheffield-Tuscumbia-Muscle Shoals.

Conservation treatment needs were identified by USDA on 1,342,000 acres of woodland, 890,000 acres of cropland, and 765,000 acres of pasture by 1980. (See Appendix A for further detail).

20. PLANNED PROJECTS AND INVESTIGATIONS

The Duck River Project - The Normandy Reservoir on the Duck River near Tullahoma, Tennessee, is part of a 2-unit project planned by TVA to meet the water needs of the upstream portion of the basin. Only about 6 percent of the project area is in Appalachia and the planned Normandy dam site is on the Appalachian boundary. The Normandy Reservoir would serve water supply and recreation needs within Appalachia, but its flood control and water quality functions would be primarily for the benefit of downstream areas. Since Normandy is the smaller of the units in the Duck River project, and since part of its benefits and most of the larger unit's benefits fall outside Appalachia, the project is not presented in detail in this water development plan for Appalachia. Details on the project are available in TVA Planning Report No. 65-100-1 dated September 1968.

FIGURE 20-12 -- Tims Ford Dam on Elk River in First Construction Stage, March 26, 1968

TVA Investigations - Local flood relief investigations are in progress at Athens and are scheduled at Tullahoma. Additional studies for Huntsville may be needed after the city completes the channel improvements now in progress. These communities all have significant growth potential.

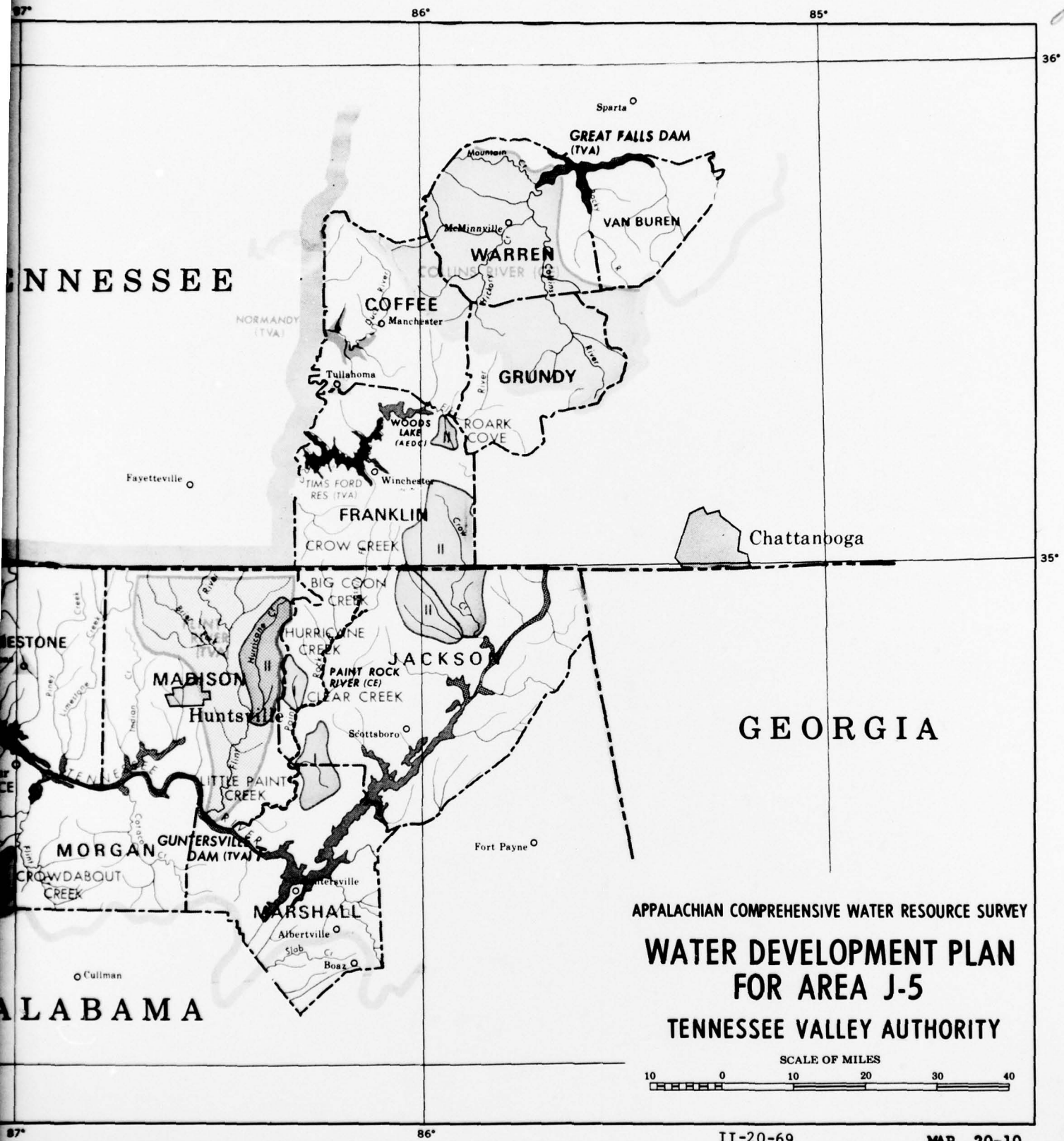
Corps of Engineers Investigations - A survey report on the Flint River, Alabama and Tennessee is scheduled for completion in 1969. The study is to determine the advisability of rural flood protection and major drainage along the Flint River. Investigations are currently in progress in the Collins River basin by the Corps of Engineers, directed toward the provision of flood control in Warren and Grundy Counties.

USDA Projects and Investigations - National Forest lands are, and will continue to be, managed under the principles of multiple use and sustained yield for timber, recreation, water, and wildlife and fish. There are no projects recommended under the accelerated recreation development program for the National Forest lands of this water area. The upstream watershed program is, however, extremely active and involves 17 watersheds in various stages of planning and installation. There are two completed upstream watershed projects and seven additional authorized ones (see map 20-10).

Eight additional watersheds listed below require further investigation.

Watershed	County (s)	State
Cane Creek	Colbert	Alabama
Little Bear	Colbert	Alabama
Cypress Creek	Lauderdale	Alabama
Limestone Creek	Limestone	Alabama
	Madison	Alabama
Boiling Fork Creek	Franklin	Tennessee
Hickory Creek	Coffee	Tennessee
	Grundy	Tennessee
	Warren	Tennessee
Charles Creek	Warren	Tennessee
Mountain Creek	Warren	Tennessee


LEGEND
Completed Channel Improvement Project
Project under Construction
Planned Project
Investigation Underway or Planned
Local Flood Control Investigation (TVA)
Upstream Project or Investigation (USDA)
I-Completed Project (June 30, 1967)
II-Project Authorized for Installation
Tennessee River Watershed Boundary
88°
87°
36°
35°
34°
TENNESSEE
APPALACHIAN REGION BOUNDARY
Fayetteville
LAUDERDALE
WILSON DAM (TVA)
Florence
Sheffield
Muscle Shoals
Tuscumbia
WHEELER DAM (TVA)
LIMESTONE
Athens
MADISON
Huntsville
COLBERT
Courtland
TOWN CREEK
LAWRENCE
Moulton
Decatur
BIG NANCE CREEK
LITTLE PAINT CREEK
MISS
CEDAR CR RES (TVA)
Russellville
LITTLE BEAR CR RES (TVA)
FRANKLIN
BEAR CR RES (TVA)
UPPER BEAR CR RES (TVA)
Haleyville
MORGAN
GUNTERSVILLE DAM (TVA)
CROWDABOUT CREEK
Culiman
ALABAMA



APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

WATER DEVELOPMENT PLAN FOR AREA J-5

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40

II-20-69

MAP 20-10

SECTION VI - SUMMARY OF PLANNED PROJECTS AND INVESTIGATIONS

Sub-region J is quite different from what it was in 1933, when water, one of the most abundant natural resources of the area, was one of the destructive factors hindering economic growth and development. Today, because of the efforts of TVA and other federal, state, and local agencies, the water resources of the sub-region are no longer a liability but an asset.

The main stream of the sub-region, the Tennessee River, is now a series of eight slack-water lakes extending from northwest Alabama to Knoxville, Tennessee. Twenty-nine of the 32 major reservoirs on the Tennessee River and its tributaries, including six projects owned by the Aluminum Company of America, are in the confines of Sub-region J, providing a year-round 9-foot navigation channel, 10.6 million acre-feet of controlled storage, 3.2 million kw of installed generating capacity, and attracting 40 million annual recreation visits. Other facilities developed include two Corps of Engineers reservoir projects, and three TVA and two Corps of Engineers local flood protection projects. The upstream watershed program in this sub-region included two completed projects as of June 30, 1967.

These completed projects have had a substantial impact upon growth and development, but change has also brought new needs and opportunities. Meeting these needs and realizing these opportunities require coordinated planning on the part of all federal, state, and local agencies involved in the overall water resource development program.

There are six identified categories where additional investment is required to improve and extend the existing water resource system: (1) improved water supply and waste treatment facilities; (2) local flood damage prevention; (3) navigation development; (4) improved recreation facilities; (5) reduction in sedimentation, erosion, and agricultural flood damage; and (6) extension of streamflow control in tributary areas.

Several water resource projects and investigations have been identified by TVA, the Corps of Engineers, and USDA which would help to alleviate some of the obstacles hindering economic growth and development and to promote further private investment in the sub-region. These projects and investigations are shown on map 20-11. Water resource development with proper coordination and direction, as a harmonious component of the total resource development program, can help the sub-region reach levels of development more comparable with other areas in the nation.

21. TVA PROJECTS

There are three major TVA water resource projects presently under construction in Sub-region J: The Tellico project on the Little Tennessee River in the Knoxville water area (J-3); the Tims Ford project on the Elk River in the Tennessee portion of the Huntsville water area (J-5); and the Bear Creek project in the Alabama portion of the Huntsville water area. In addition a comprehensive community redevelopment project including flood abatement works is under construction at Oliver Springs in the Knoxville water ares (J-3). A local flood protection project at Red Bank, Tennessee, in the Chattanooga water area (J-4) has one unit of channel improvement completed and is classed as "under construction" pending the construction of a second unit. Also in the Chattanooga area, TVA has planned a local flood protection project for South Chickamauga Creek at Brainerd (TVA Planning Report No. 0-6668, August, 1967). Part of a major 2-unit project TVA has planned for the Duck River in south central Tennessee is located in Appalachia within the Huntsville water area (TVA Planning Report No. 65-100-1, September, 1968).

In addition to these projects, construction of the upper French Broad River multipurpose system in the Asheville water area (J-2) would promote the continued growth and development of the sub-region. Another project planned by TVA, the Yellow Creek Port in Mississippi, is in Sub-region E and is covered in that section of this report. Details of the French Broad River and Yellow Creek port projects are provided in chapters 17 and 18 respectively of Part III of the main report.

22. TVA INVESTIGATIONS

Investigations are required to assess further the needs and opportunities and to evaluate the impact of potential projects in the following areas:

Tri-Cities Water Area (J-1) - Investigations are indicated in conjunction with the proposed industrial development at Duffield, Virginia; local flood problems at Kingsport, Johnson City, and Big Stone Gap; the recreation potential on the Doe River and local flood problems above Elizabethton; and water quality problems on the North Fork Holston River.

Asheville Water Area (J-2) - Multi-purpose investigations are currently in progress on the Pigeon River, upper Little Tennessee River basin, and the Tuckasegee River tributary of the Little Tennessee River. The local flood problem at Cherokee is currently under investigation.

Knoxville Water Area (J-3) - Investigations related to local flood problems are indicated at Gatlinburg and Briceville. Investigations are currently in progress on the Emory River basin.

Chattanooga Water Area (J-4) - Investigations of several related local flood problems in or around Chattanooga are indicated. Multipurpose investigations are in progress on the Sequatchie and lower Hiwassee Rivers. Investigations are also well advanced for a large pumped-storage hydroelectric project on Raccoon Mountain. Investigation of water resource development possibilities in the Walker, Catoosa, and Dade County area in northwest Georgia is underway.

Huntsville Water Area (J-5) - Investigations of local flood problems are in progress at Athens, Alabama and are scheduled at Tullahoma, Tennessee.

23. CORPS OF ENGINEERS

Investigations are currently in progress in the Flint and Collins River basins of water area J-5 by the Corps of Engineers. The Corps is also reviewing its previous study of the Big South Fork which is mostly in water area J-3, to update the economic analysis of the Devils Jumps reservoir recommended therein. This project and the current study are discussed in more detail in chapters 17 and 18 of this Part.

24. USDA PROGRAMS

Acceleration of various existing USDA programs will support additional growth in Sub-region J. These programs can be divided into three main parts as follows: (1) acceleration of the planning and application of land treatment measures and management techniques on nonfederal public and privately owned lands; (2) acceleration of programs in National Forests for development of recreation, fish and wildlife, timber production, fire protection, and soil and water management on the 1.6 million acres of Federally owned lands in the six National forests; and (3) acceleration of the Watershed Protection and Flood Prevention Program (PL 83-566), providing planning and installation of both land treatment and structural measures.

In addition to two watershed projects which were completed as of June 30, 1967, the upstream watershed program in Sub-region J includes eleven other watershed projects which are under construction or authorized and which are shown on map 20-11 in the status II category.*/ Seven other watersheds shown in categories III and IV are included in

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*/ Two of the eleven are inactive and not shown on may 20-11; another, Crowdabout Creek in Alabama, is officially inactive but is shown on the map in anticipation of its reactivation.

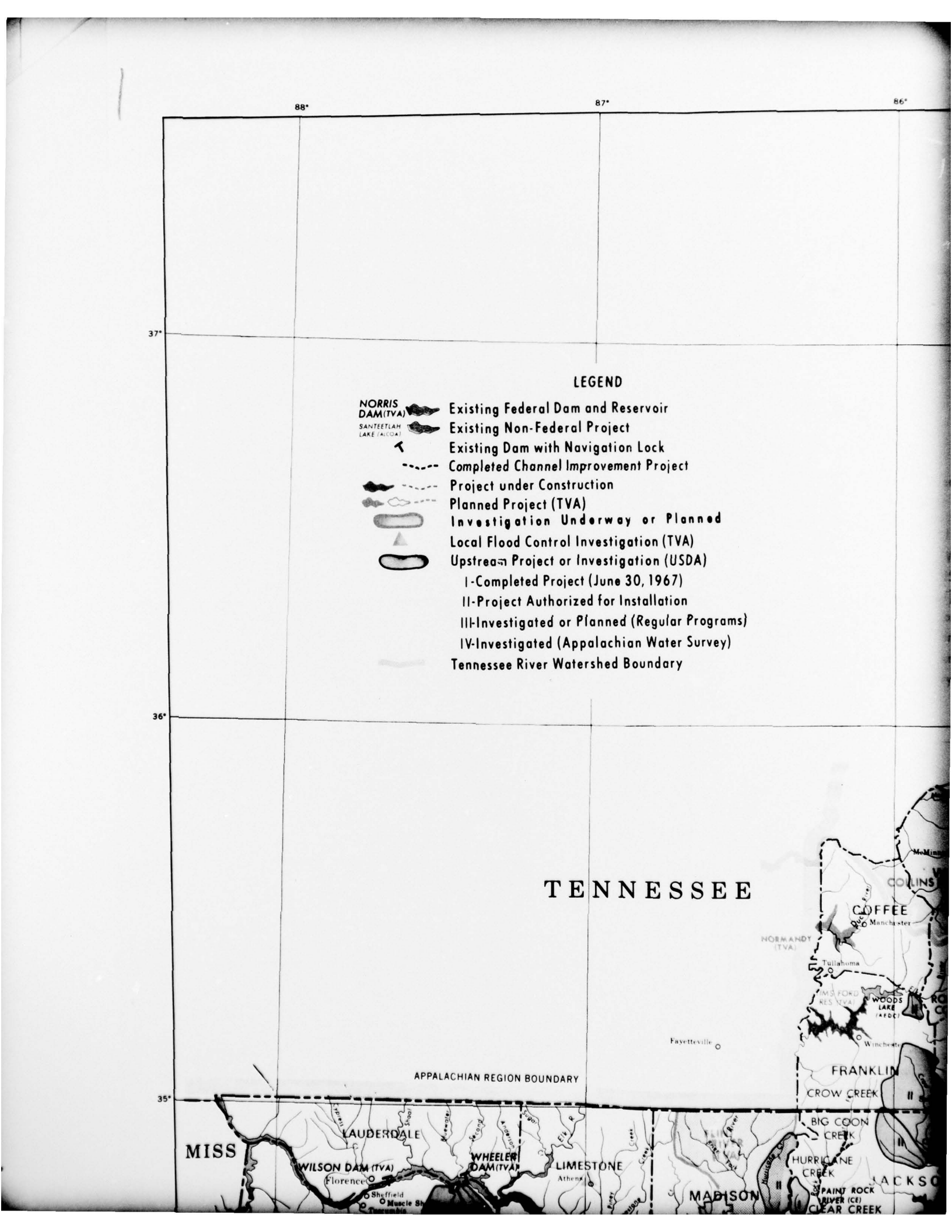
the water development plan because of potential developmental impact resulting from meeting certain of the sub-region's identified water-needs. Seventeen additional watersheds require further investigation. An accelerated recreation development program is proposed for the National Forests of Sub-region J which would provide facilities costing approximately $56.3 million to accommodate an additional 77,500 persons at one time. The accelerated land treatment and watershed programs and the individual projects in them are presented in more detail in Appendix A. Supplement B of Appendix F contains detailed information on the National Forest recreation program.

25. OTHER

A joint study by the Corps of Engineers, the Department of Agriculture and the Department of Interior is in progress that will consider alternatives available for development of the Big South Fork and its contiguous areas which are partially in water area J-3. This study is covered in more detail in chapters 17 and 18 of this Part.

26. RELATIONSHIP TO TYPE I STUDY

Emphasis in chapters 19 and 20 for Sub-region J is on the more immediate water resource needs and opportunities and their relationship to regional growth and development. A Type I comprehensive study of water and related lands, which has been proposed by TVA and other agencies, is planned for early initiation in the Tennessee basin portion of the sub-region. This Type I study, combined with similar efforts in adjacent basins, will provide an opportunity for a more extensive evaluation of future demands and the formulation of a more comprehensive program for specific future time periods. Such studies are expected to identify projects and programs which should be implemented subsequent to the priority efforts identified in this report.

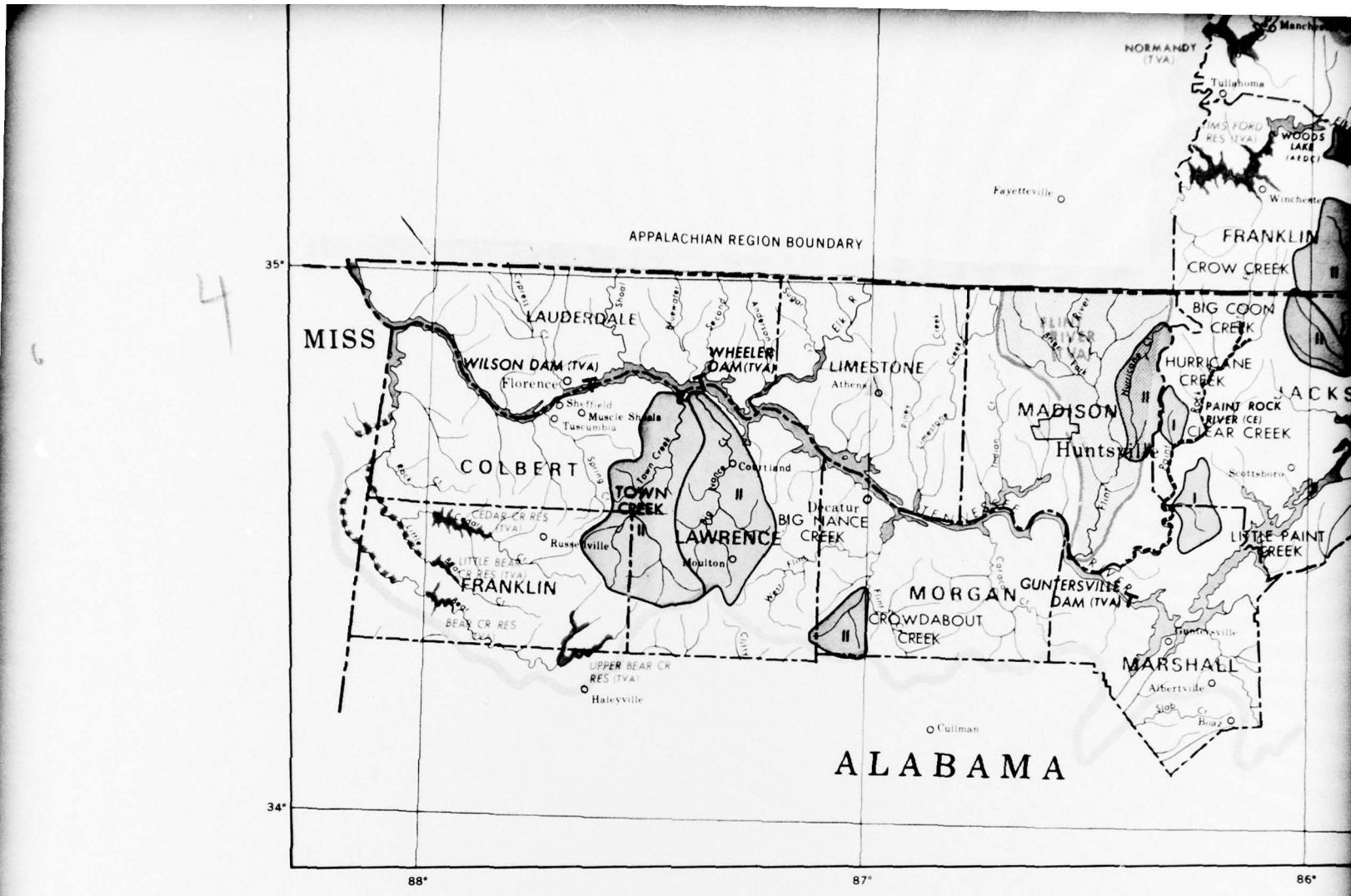

88°
87°
86°
37°
36°
35°
LEGEND
NORRIS DAM (TVA)
Existing Federal Dam and Reservoir
SANTEETLAH LAKE (ALCOA)
Existing Non-Federal Project
Existing Dam with Navigation Lock
Completed Channel Improvement Project
Project under Construction
Planned Project (TVA)
Investigation Underway or Planned
Local Flood Control Investigation (TVA)
Upstream Project or Investigation (USDA)
I-Completed Project (June 30, 1967)
II-Project Authorized for Installation
III-Investigated or Planned (Regular Programs)
IV-Investigated (Appalachian Water Survey)
Tennessee River Watershed Boundary
TENNESSEE
APPALACHIAN REGION BOUNDARY
MISS
LAUDERDALE
WILSON DAM (TVA)
Florence
Sheffield
WHEELER DAM (TVA)
LIMESTONE
Athens
MADISON
COFFEE
Manchester
NORMANDY (TVA)
Tullahoma
WOODS LAKE (AEDC)
Fayetteville
Winchester
FRANKLIN
CROW CREEK
BIG COON CREEK
HURRICANE CREEK
PAINT ROCK RIVER (CE)
CLEAR CREEK

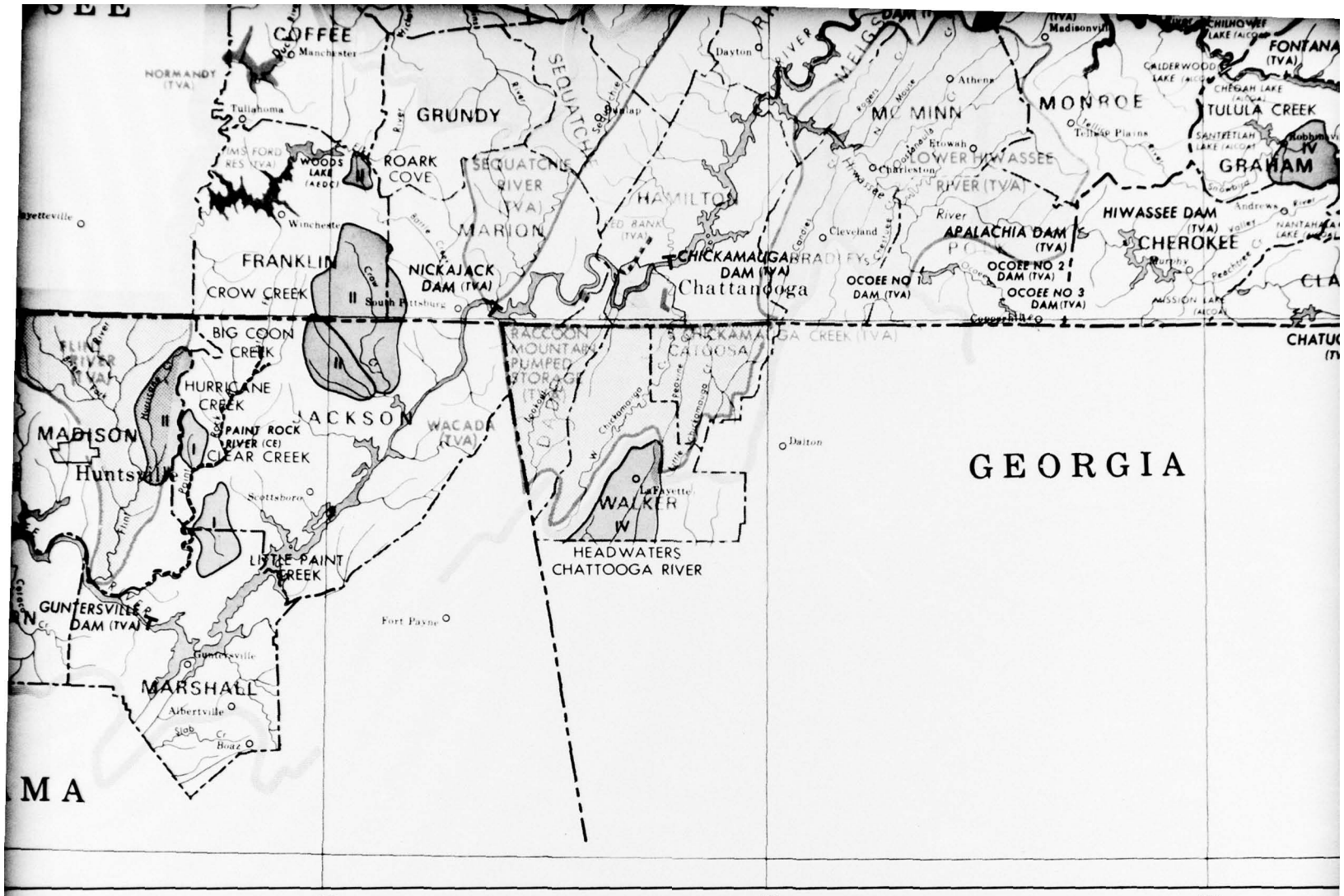
2

86°
85°
84°
KENTUC
SEE
Middlesboro
PINE CREEK
SCOTT
CAMPBELL
CLAIBORN
LaFollette
Jellico
UNION
NORRIS DAM (TVA)
Lake City
LAKE CITY (CE)
MORGAN
EMORY RIVER (TVA)
OLIVER SPRINGS (TVA)
Oliver Springs
Clinton
ANDERSON
KNOX
Knoxville
Oak Ridge
Harriman
MELTON HILL DAM (TVA)
Kingston
Rockwood
Crossville
Sparta
GREAT FALLS DAM (TVA)
VAN BUREN
WARREN
McMinnville
COLLINS RIVER (CE)
BLEDSOE
SPRING CITY (CE)
Spring City
ROANE
SWEETWATER CREEK
LOUDON
FORT LOUDOUN DAM (TVA)
Alcoa
Maryville
Sevierville
BLOUNT
Sweetwater
TELLICO RES (TVA)
Madisonville
WATTS BAR DAM (TVA)
RHEA
MEIGS
Dayton
COFFEE
Manchester
NORMANDY (TVA)
Tullahoma
GRUNDY
SEQUATCHIE
Dunlap
Athens
MC MINN
MONROE
Tellico Plains
CHILHOWEE LAKE (ALCOA)
FONTANA DAM (TVA)
CALDERWOOD LAKE (ALCOA)
CHEOAH LAKE (ALCOA)
TULULA CREEK
SANTEETLAH LAKE (ALCOA)
Robbinsville
GRAHAM
WOODS LAKE (AEDC)
ROARK COVE
SEQUATCHIE RIVER (TVA)
Etowah
LOWER HIWASSEE RIVER (TVA)
Charleston
HAMILTON
Winchester
MARION
Cleveland
APALACHIA DAM (TVA)
HIWASSEE DAM (TVA)
CHEROKEE
Andrews
NANTAHALA LAKE (ALCOA)
FRANKLIN
NICKAJACK DAM (TVA)
CHICKAMAUGA DAM (TVA)
Chattanooga
BRADLEY
OCOEE NO 1 DAM (TVA)
OCOEE NO 2 DAM (TVA)
OCOEE NO 3 DAM (TVA)
Murphy
CLAY
MISSION LAKE (ALCOA)
CROW CREEK
South Pittsburg
Copperhill
CHATUGE DAM (TVA)
BIG COON CREEK
RACCOON MOUNTAIN PUMPED STORAGE (TVA)
CHICKAMAUGA CREEK (TVA)
CATOOSA
HURRICANE CREEK
JACKSON
WACADA
Dalton

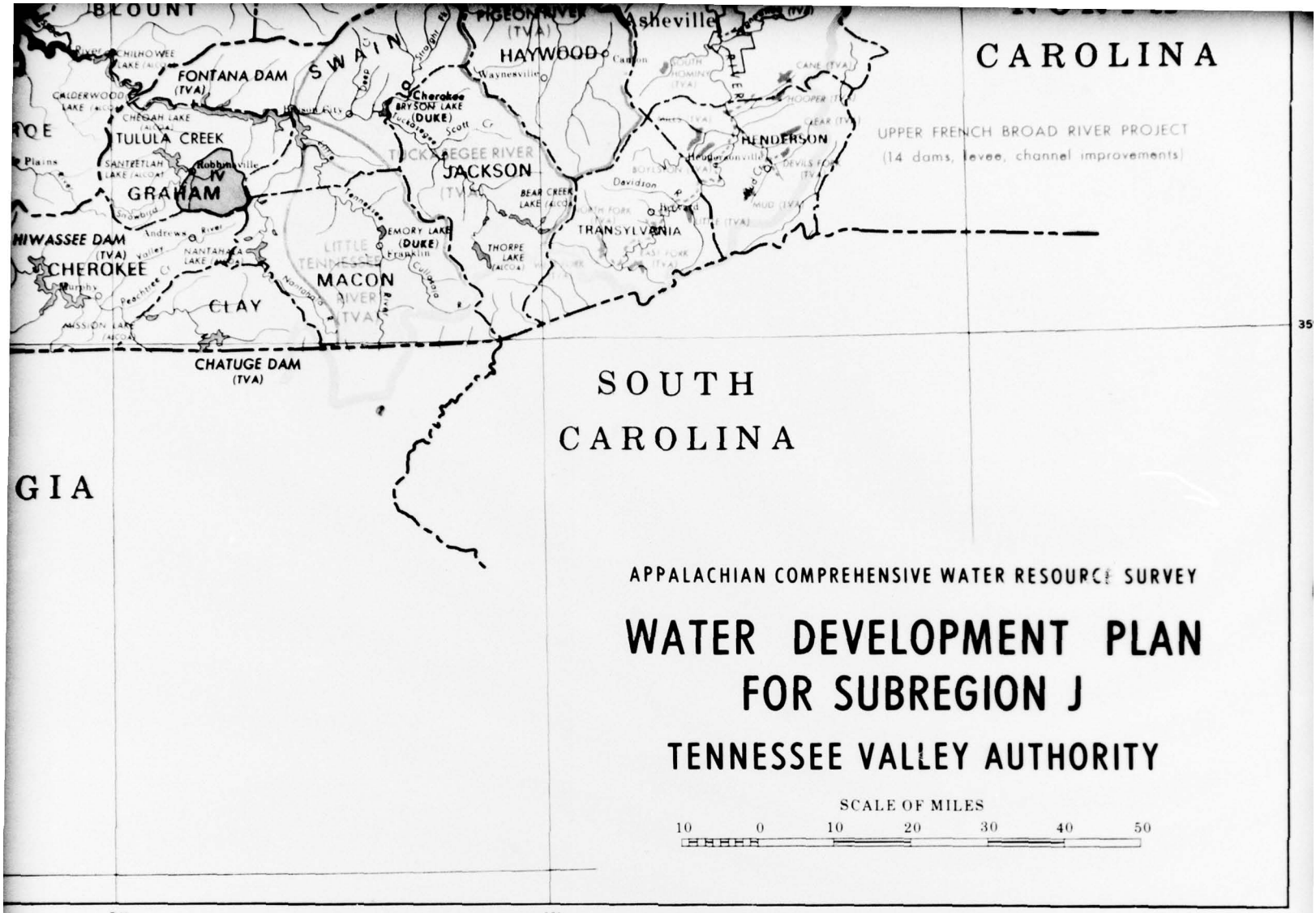
3


84°
83°
82°
37°
36°
35°
KENTUCKY
W VA
VA
NORTH CAROLINA
SOUTH CAROLINA
JOHN W FLANNAGAN RES (CE)
N FK POUND RES (CE)
UPPER BLUESTONE RIVER
UPPER CLINCH VALLEY
NORTH FORK HOLSTON RIVER (TVA)
BUCHANAN
TAZEWELL
DICKENSON
WISE
RUSSELL
COEBURN (TVA)
LEE
SCOTT
WASHINGTON
CLEAR CREEK DAM (TVA)
BEAVER CREEK DAM (TVA)
SHADY VALLEY
SOUTH HOLSTON DAM (TVA)
FORT PATRICK HENRY DAM (TVA)
BOONE DAM (TVA)
HORSE CREEK
CLAIBORNE
HANCOCK
HAWKINS
SULLIVAN
JOHNSON
WILBUR DAM (TVA)
WATAUGA DAM (TVA)
WATAUGA
CAMPBELL
UNION
NORRIS DAM (TVA)
LAKE CITY (CE)
GRAINGER
CHEROKEE DAM (TVA)
HAMBLEN
GREENE
WASHINGTON
CARTER
UNICOI
CANE CREEK
MITCHELL
AVERY
JEFFERSON
NOLICHUCKY DAM (TVA)
KNOX
Knoxville
DOUGLAS DAM (TVA)
SEVIERVILLE (TVA)
COCKE
MADISON
YANCEY
SEVIER
LOUDOUN DAM (TVA)
BLOUNT
BUNCOMBE
Asheville
HAYWOOD
SWAIN
FONTANA DAM (TVA)
CHILHOWEE LAKE (ALCOA)
CALDERWOOD LAKE (ALCOA)
CHEOAH LAKE (ALCOA)
TULULA CREEK
SANTEETLAH LAKE (ALCOA)
GRAHAM
BRYSON LAKE (DUKE)
JACKSON
BEAR CREEK LAKE (ALCOA)
HENDERSON
TRANSYLVANIA
EMORY LAKE (DUKE)
THORPE LAKE (ALCOA)
HIWASSEE DAM (TVA)
CHEROKEE
MACON
CLAY
MISSION LAKE (ALCOA)
CHATUGE DAM (TVA)
UPPER FRENCH BROAD RIVER PROJECT
(14 dams, levee, channel improvements)


APPALACHIAN REGION BOUNDARY
NORMANDY (TVA)
Tullahoma
WOODS LAKE (AEDC)
Fayetteville
Winchester
FRANKLIN
CROW CREEK
BIG COON CREEK
HURRICANE CREEK
PAINT ROCK RIVER (CE)
CLEAR CREEK
LITTLE PAINT CREEK
MADISON
Huntsville
Scottsboro
LAUDERDALE
MISS
WILSON DAM (TVA)
Florence
Sheffield
Muscle Shoals
Tuscumbia
WHEELER DAM (TVA)
LIMESTONE
Athens
COLBERT
TOWN CREEK
Courtland
Decatur
BIG NANCE CREEK
LAWRENCE
Moulton
Russellville
CEDAR CR RES (TVA)
LITTLE BEAR CR RES (TVA)
FRANKLIN
BEAR CR RES
UPPER BEAR CR RES (TVA)
Haleyville
MORGAN
CROWDABOUT CREEK
GUNTERSVILLE DAM (TVA)
Guntersville
MARSHALL
Albertville
Boaz
Cullman
ALABAMA
35°
34°
88°
87°
86°


COFFEE
Manchester
NORMANDY (TVA)
Tullahoma
GRUNDY
WOODS LAKE (AEDC)
ROARK COVE
SEQUATCHIE RIVER (TVA)
Winchester
FRANKLIN
CROW CREEK
NICKAJACK DAM (TVA)
South Pittsburg
MARION
HAMILTON
CHICKAMAUGA DAM (TVA)
Chattanooga
Dayton
Cleveland
BRADLEY
OCOEE NO 1 DAM (TVA)
APALACHIA DAM (TVA)
OCOEE NO 2 DAM (TVA)
OCOEE NO 3 DAM (TVA)
HIWASSEE DAM (TVA)
CHEROKEE
Murphy
MONROE
Athens
Madisonville
CHILHOWEE LAKE (TVA)
FONTANA (TVA)
CALDERWOOD LAKE (TVA)
CHEOAH LAKE (TVA)
TULULA CREEK
Tellico Plains
GRAHAM
Robbinsville
BIG COON CREEK
HURRICANE CREEK
PAINT ROCK RIVER (CE)
CLEAR CREEK
JACKSON
WACADA (TVA)
MADISON
Huntsville
Scottsboro
LITTLE PAINT CREEK
GUNTERSVILLE DAM (TVA)
Guntersville
MARSHALL
Albertville
Boaz
Fort Payne
RACCOON MOUNTAIN PUMPED STORAGE (TVA)
WALKER
LaFayette
HEADWATERS CHATTOOGA RIVER
Dalton
GEORGIA
86°
85°
84°

5



APPALACHIAN COMPREHENSIVE WATER RESOURCE SURVEY

WATER DEVELOPMENT PLAN FOR SUBREGION J

TENNESSEE VALLEY AUTHORITY

SCALE OF MILES

10 0 10 20 30 40 50

II-20-75

MAP 20-11

CORPS OF ENGINEERS

U. S. ARMY