SUMMARY OF POLLUTION LOADS IN VARIOUS ZONES

TABLE I

ZONE	DRAINAGE AREA IN SQUARE MILES	AVERAGE FLOW GALLONS/DAY	AVERAGE ACID LOAD LBS/DAY	AVERAGE IRON LOAD LBS/DAY	AVERAGE ALKALINE LOAD LBS/DAY
A	3.87	1,785,000		3.10	214
B	1.43	382,000	+ 195	6.8	---
C	2.29	655,200	+ 282	2	---
D	3.00	1,030,000	+ 452	9	---
E	1.58	452,000	330	28	---
F	4.59	1,457,000	1217	112	---
TOTAL	16.76	5,761,000	2476	160.9	214

The contributing source areas are primarily abandoned deep mines, gas and oil wells and strip mines.

Source abatement of these contributing areas has been recommended after careful analysis of the existing conditions. Source abatement has the advantage of being possibly permanent with auxiliary benefits of improved land use possibilities. Source abatement plans have been outlined for the Zones B to F. The project areas, anticipated results and estimated costs of these plans are summarized in Table II at the end of this section.

The characteristics of the watershed and the stream are such that the proposed projects should cause a noticeable improvement in the water quality. The stream should be monitored after each phase of corrective measures are undertaken. This would insure continued success of the abatement program for this watershed and. would provide valuable data for future use.

TABLE II

SUMMARY OF ABATEMENT PLANS AND COSTS

ZONE	DRAINAGE AREA INVOLVED ACRES	AREA REQUIRING RESTORATION ACRES	POUNDS PER DAY OF ESTIMATED PRODUCTION ACID	POUNDS PER DAY OF ESTIMATED PRODUCTION IRON	POUNDS PER DAY OF ESTIMATED REDUCTION ACID	POUNDS PER DAY OF ESTIMATED REDUCTION IRON	ESTIMATED PERCENT ABATEMENT ACID	ESTIMATED PERCENT ABATEMENT IRON	ESTIMATED COST	COST PER POUND PER DAY REDUCTION
A	2477	438	----	----	----	----	----	----	----	----
B	915	104	195	6.8	156	5.4	80%	80%	$312,000.00	$2,000.00
C	1466	309	282	2	225	1.6	80%	80%	$927,000.00	$4,120.00
D	1920	239	452	9	361	7.2	80%	80%	$717,000.00	$1,986.00
E	1011	118	330	28	264	22.4	80%	80%	$374,000.00	$1,416.00
F	2938	211	1217	112	973	90	80%	80%	$633,000.00	$ 650.00

II WATERSHED DESCRIPTION

The North Branch Bear Creek Watershed drains an area of 10,880 acres (17 square miles) in Northeastern Butler County, Pennsylvania. Beginning near the Borough of Eau Claire, the main stream runs in a southeasterly direction for 6.5 miles to its confluence with Bear Creek. The main stream drops approximately 500 feet from the headwaters to the mouth or approximately 77 feet per mile. The highest point in the watershed is near the Borough of Eau Claire reaching an elevation of 1567 feet above M.S.L. The lowest point in the watershed is 920 feet above M.S.L. and is found at the confluence with Bear Creek. Figure I is a stream map of Butler County showing the North Branch Bear Creek Watershed.

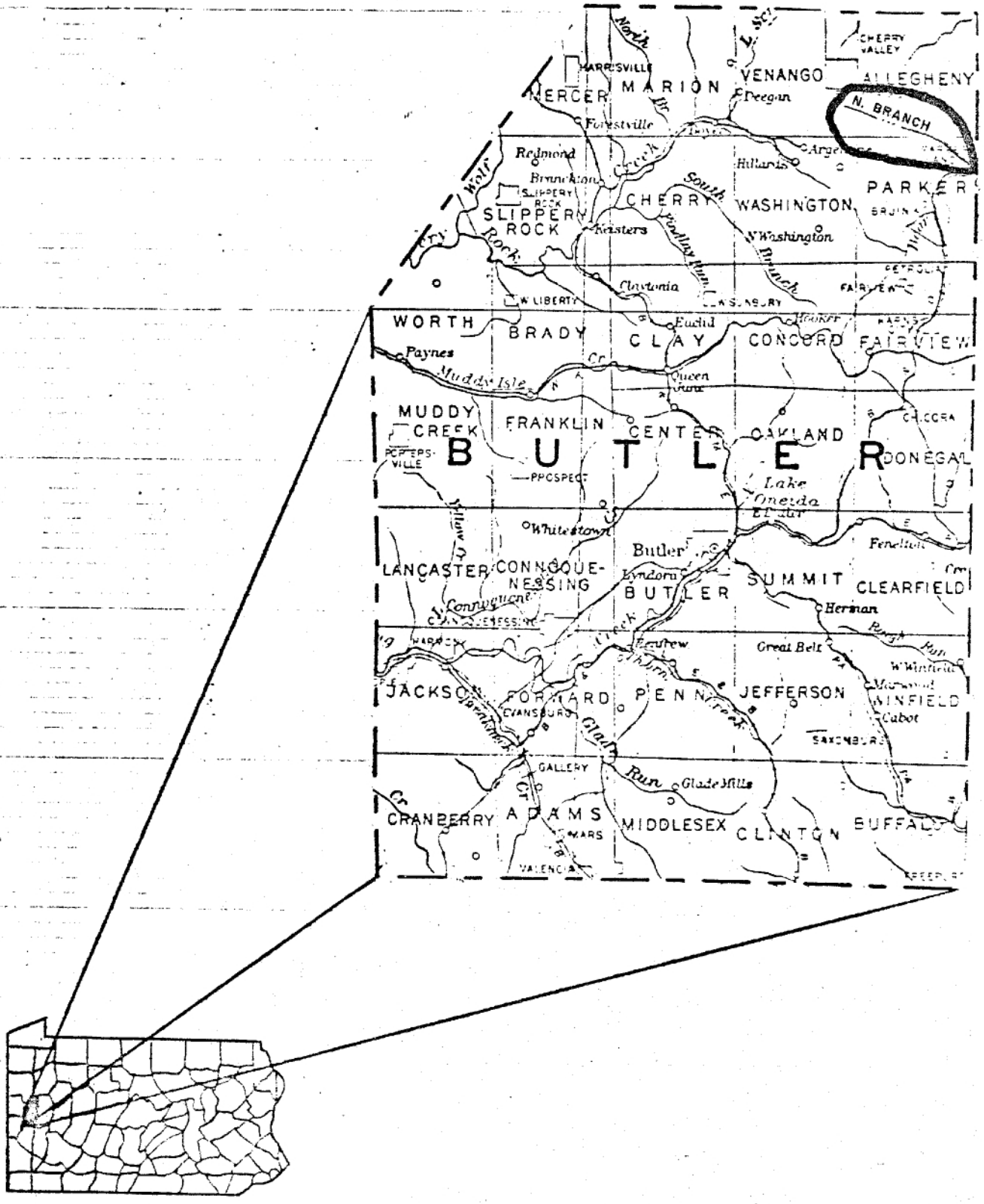

FIGURE 1 - STREAM MAP OF BUTLER COUNTY SHOWING THE LOCATION OF THE NORTH BRANCH BEAR CREEK WATERSHED

III GEOLOGY

This report is concerned with abatement of acid mine drainage from coal mining and discharges from abandoned oil and gas wells. The geologic studies have thus been limited to those aspects which would affect the distribution of coal and oil bearing formations. The North Branch Bear Creek Watershed lies within the Pittsburgh Plateaus Section of the Appalachian Plateau Physiographic Province. (See Figure 2) The watershed lies in the northwest part of the Appalachian foreland, which lies west and north of the closely folded and faulted Appalachian Mountains. The dominant feature of this area is a general southward inclination of regional dip.

The most persistent and easily identifiable formation in the watershed is the Vanport Limestone in the Allegheny Group. It has been quarried in the past both for crushed stone and agricultural lime. The Pottsville Group outcrops on the lower valleys of the watershed. The Allegheny Group has the Brookville Coal Seam at its base. It ranges in thickness from 12 to more than 48 inches and has been mined in the watershed. Several other coal seams in the Allegheny Group occur in the watershed. Table III shows the principal members of the Allegheny Group and their relationship to Vanport Limestone. Figures 3 and 4 show Bedrock Geologic Map and Generalized Stratigraphic Column respectively.

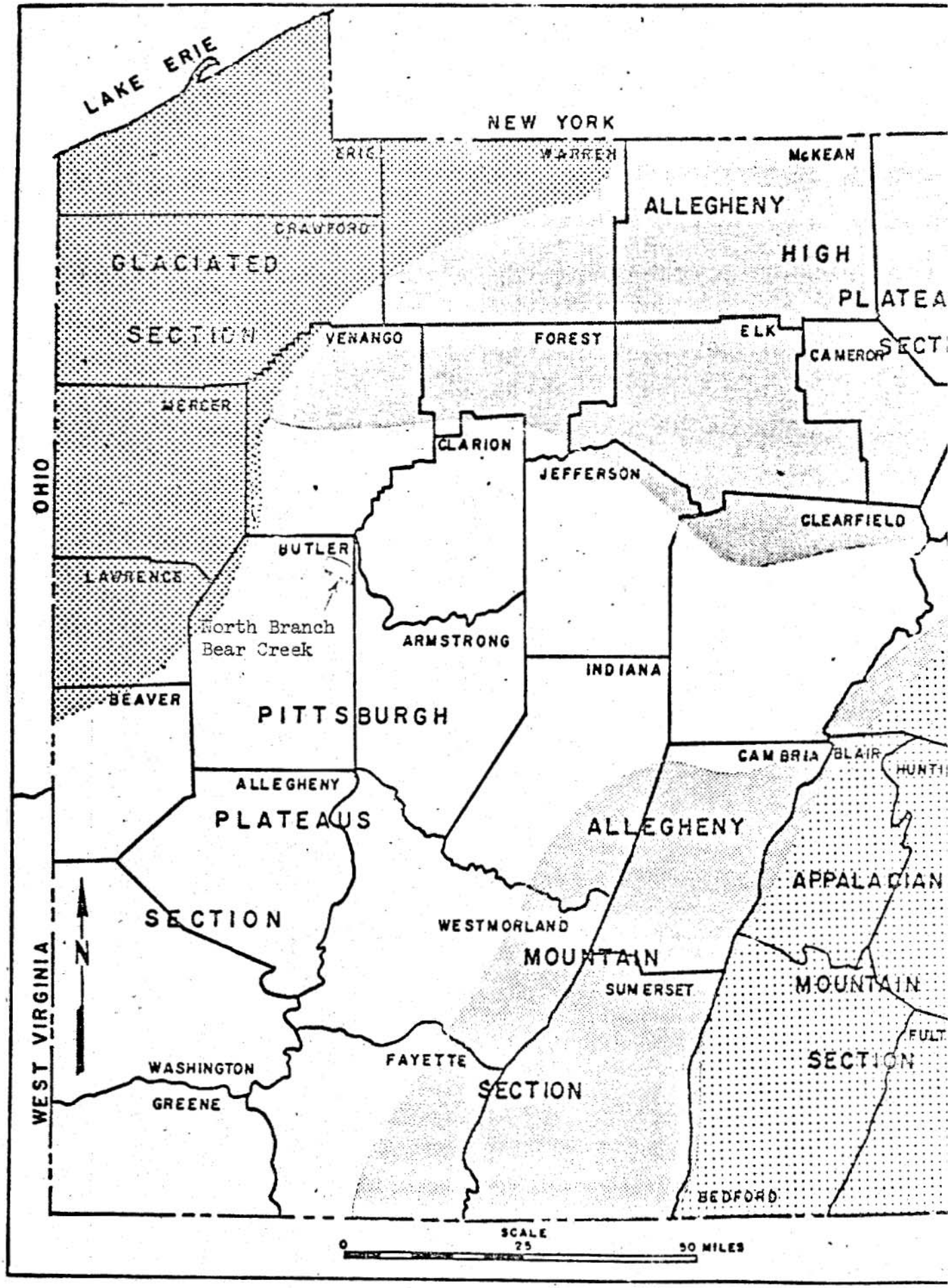

Figure 2. Map of Western Pennsylvania Showing Physiograph Provinces and Location of North Branch Bear Creek Watershed.

TABLE III

PRINCIPAL MEMBERS OF THE ALLEGHENY GROUP

AND THEIR RELATIONSHIP TO VANPORT LIMESTONE

NAME OF SEAM	AVERAGE INTERVAL TO TOP OF VANPORT LIMESTONE IN FEET
Lower Freeport	185 to 195
Middle Kittanning Coal	75 to 85
Lower Kittanning Coal	35 to 45
Vanport Limestone	--
Clarion Coal	20 to 40
Brookville Coal	55 to 65

PENNSYLVANIAN

APPALACHIAN PLATEAU

Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of sections; Brush Creek Limestone in lower part of section.

Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal, numerous commercial coals, limestones thicken westward, Vanport Limestone in lower part of section, includes Freeport, Kittanning, and Clarion Formations

Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals, some coals mineable locally

MISSISSIPPIAN

Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations; includes part of "Oswayo" of M. L. Fuller in Potter and Tioga counties.

FIGURE 3 Bedrock Geologic Map of the North Branch Bear Creek Watershed - From Geologic Map of Pennsylvania, Pennsylvania Topographic and Geologic Survey, 1960

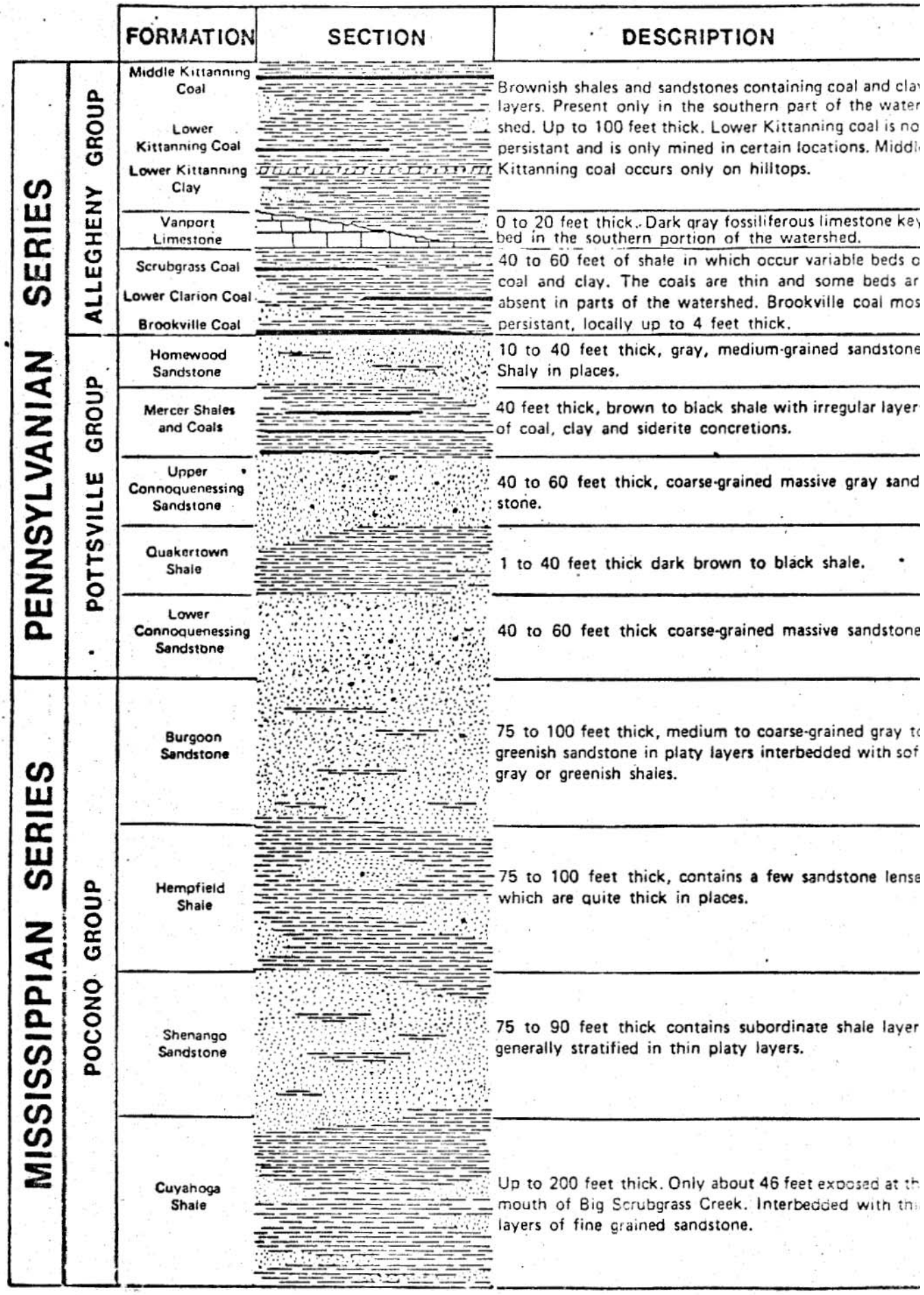

FIGURE 4 Generalized stratigraphic column in North Branch Bear Creek Watershed

IV HISTORY OF MINING

.Brookes Mine of Freedom Mining Company was opened on November 15, 1967, and after abandonment on October 1, 1969, was operated by the Mohawk Mining Company as the Brookes Mine. This deep mine was in the Brookville Seam, the average thickness being 50". The area was 1182 acres to the east and south of Eau Claire, in Allegheny Township. The highest elevation in mine was 1282 feet and the portal elevation was 1265. Mohawk Mining Company operated Brookes Mine under Mining Permit No. 1070302 and completed mining in June, 1972.

The people in the area recall small drift mines most of which were owned and operated by landowners for family fuel supplies. The latter stripping operations have completely disturbed or eliminated many of these small workings.

Strip mining was practiced extensively in the watershed. The Butler County Planning Commission published a report in June, 1971, identifying the stripped areas and classifying them as hazardous, non-hazardous, reclaimed and active. A hazardous classification indicates one or more of the, following: mine acid drainage, steep highwalls, spoil piles, lakes and swamps. Table IV reproduces those areas in North Branch Bear Creek which have been identified by the Planning Commission in this overall report. Location numbers are shown in Figures 5 and 6.

TABLE IV

STRIP MINES OF ALLEGHENY AND PARKER TOWNSHIPS

ALLEGHENY TOWNSHIP

LOCATION NUMBER	ADJACENT LAND USES	APPROXIMATE ACRES	DEGREE OF SLOPE	EVIDENCE OF SILT	EVIDENCE OF EROSION	PROTECTIVE COVER	WATER QUALITY	HAZARDOUS	MISCELLANEOUS COMMENTS
6	Woods and Farming	133.33	Steep	Yes	Yes	Very Little	Acid Lakes	Yes	Not Backfilled or Planted.
7	Farming	97.66	Steep	Yes	Yes	None	Acid Lake	Yes	Not Backfilled or Planted
9	Woods	21.26	Steep	Yes	Yes	None	Acid Drainage	Yes	Not Backfilled or Planted
11	Woods	71.06	Steep	Yes	Yes	None	Swamp	Yes	Not Backfilled or Planted
12	Woods	36.8	Steep	Yes	Yes	Some Deciduous	Lake	Yes	Not Backfilled or Planted
14	Woods	11.5	Steep	Yes	Yes	Evergreens	-------	Yes	
15	Woods	4.6	Steep	Yes	Yes	No Cover	-------	Yes	
16	Woods	52.9	Steep	Yes	Yes	None	2 Lakes	Yes	Not Backfilled or Planted
17	Woods	75.9	Steep	Yes	Yes	None	-------	Yes	Not Backfilled or Planted
20	Woods	361.1	Steep	Yes	Yes	None	A.M.D.	Yes	Not Backfilled or Planted

TABLE IV - CONTINUED

PARKER TOWNSHIP

LOCATION NUMBER	ADJACENT LAND USES	APPROXIMATE ACRES	DEGREE OF SLOPE	EVIDENCE OF SILT	EVIDENCE OF EROSION	PROTECTIVE COVER	WATER QUALITY	HAZARDOUS	MISCELLANEOUS COMMENTS
2	Open	62.1	Steep	Yes	Yes	Some Planting	-----	Yes	Not Backfilled - Some Planting
3	Farming	11.5	Steep	Yes	Yes	None	-----	Yes	Not Backfilled or Planted
4	Woods	98.9	Steep	Yes	Yes			Yes	Not Backfilled
5	Woods	131.1	Steep	Yes	Yes	Planted on East Side Only	Acid Drainage		
8	Dwelling & Woods	147.2	Steep	Yes	Yes	Some Planting	-----	Yes	Not Backfilled
9	Woods	108.1	Steep	Yes	Yes	Very Little Planting	Lakes	Yes	Not Backfilled

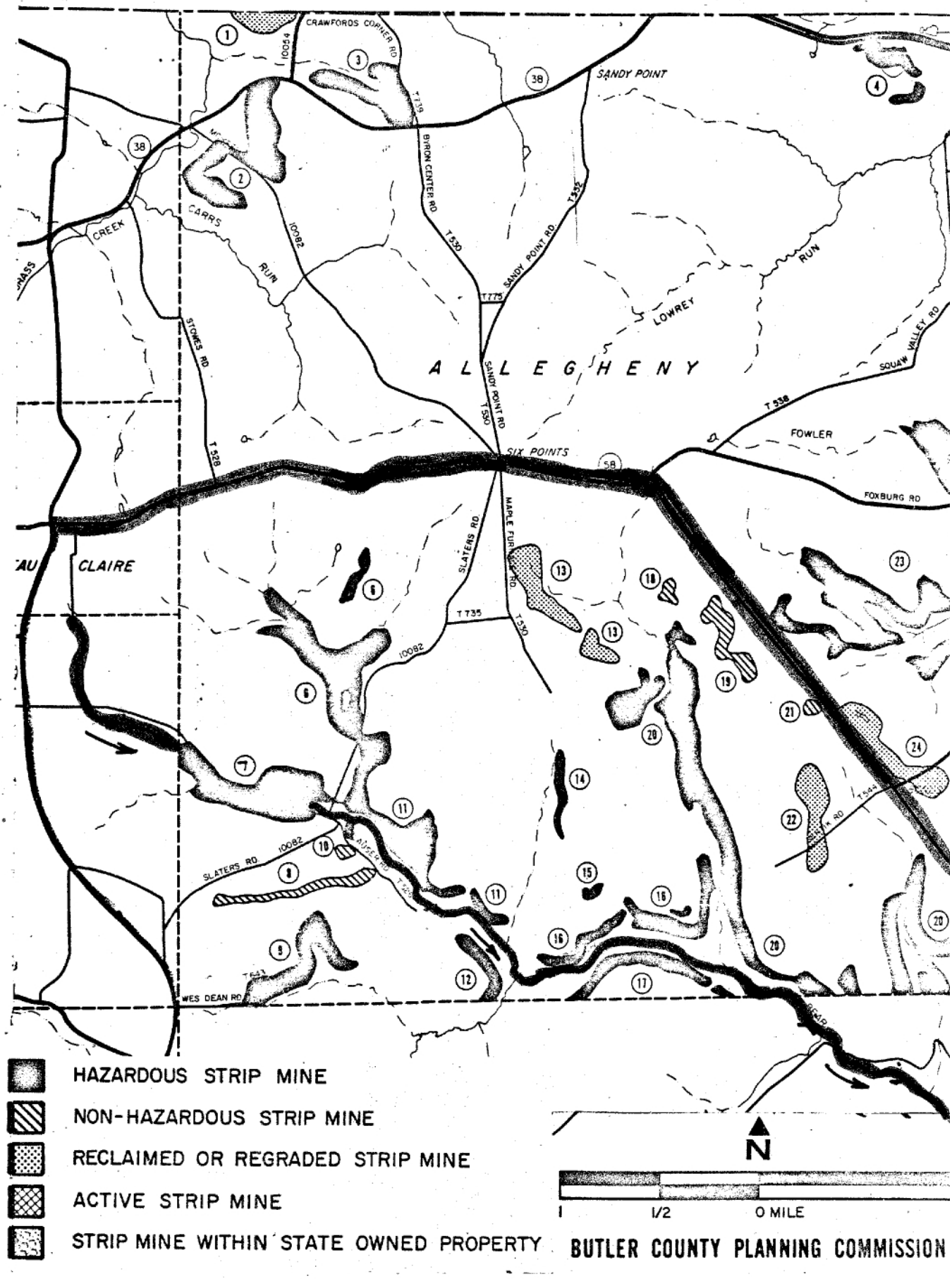

FIGURE 5 - STRIP MINES IN ALLEGHENY TOWNSHIP - BUTLER COUNTY

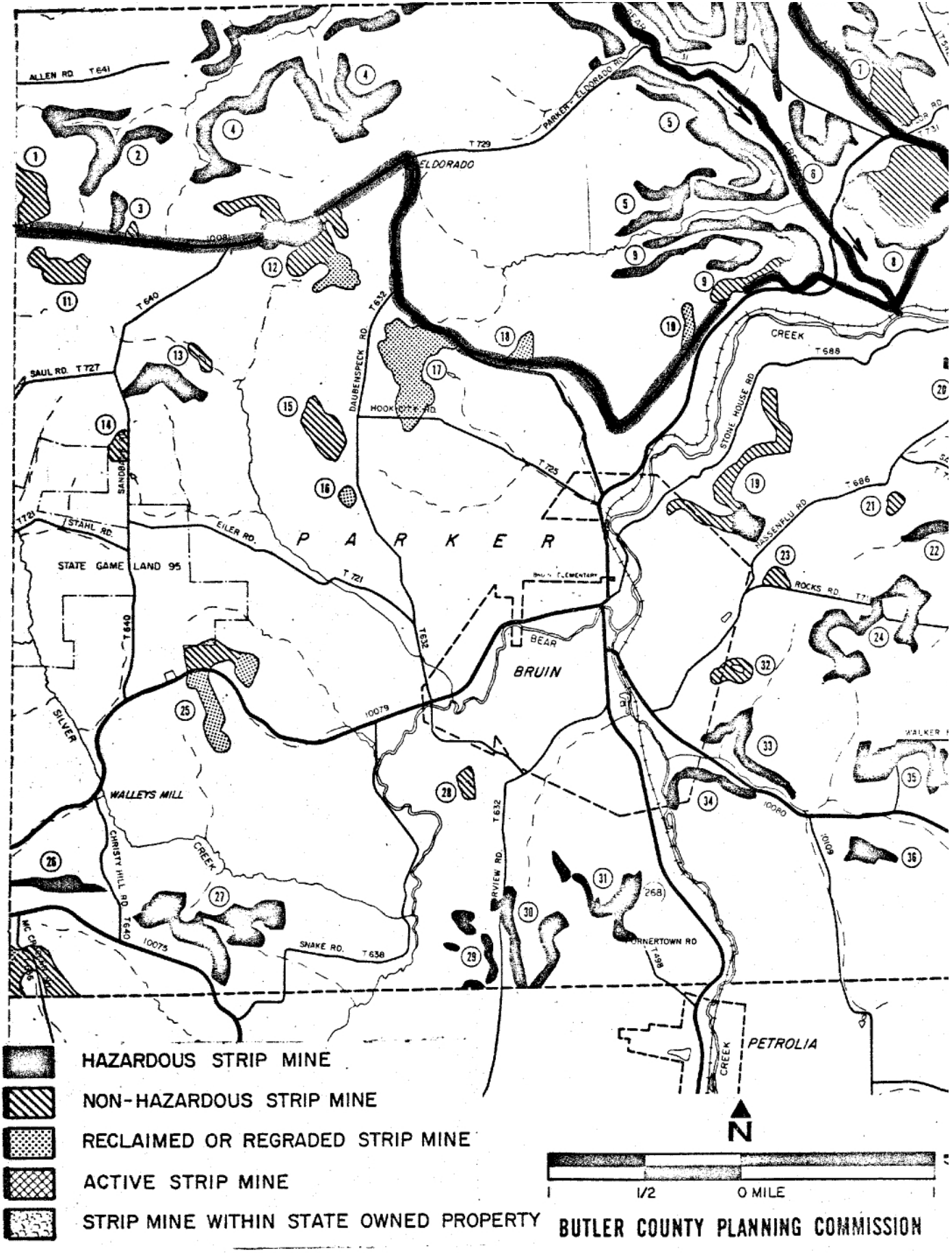

FIGURE 6 - STRIP MINES IN PARKER TOWNSHIP - BUTLER COUNTY

V HYDROLOGY

GENERAL CLIMATE:

The winters in the North Branch Bear Creek Watershed are moderately cold and the summers are warm and humid. The mean annual temperature is about 50°F and average annual precipitation 40 inches out of which 20 inches is during the growing season.

PRECIPITATION:

A United States Weather Bureau rain gauging station is located at Parker which is within 2 miles of the watershed. Figures 7 and 8 show the precipitation on a monthly basis and long term averages. The precipitation records show that, while long term monthly averages do not: fluctuate. greatly throughout the year, the monthly totals measured had considerable fluctuation.

RUNOFF:

Approximately 50% of the average annual rainfall on the North Branch Bear Creek Watershed shows up as runoff to the streams. Figure 9 is a map showing approximate lines of equal average annual runoff in Pennsylvania. The topography and soils on the watershed are a combination which would tend to produce storm runoff hydrographs which would have quick high peaks with rapid rise and fall of the water levels in the streams.

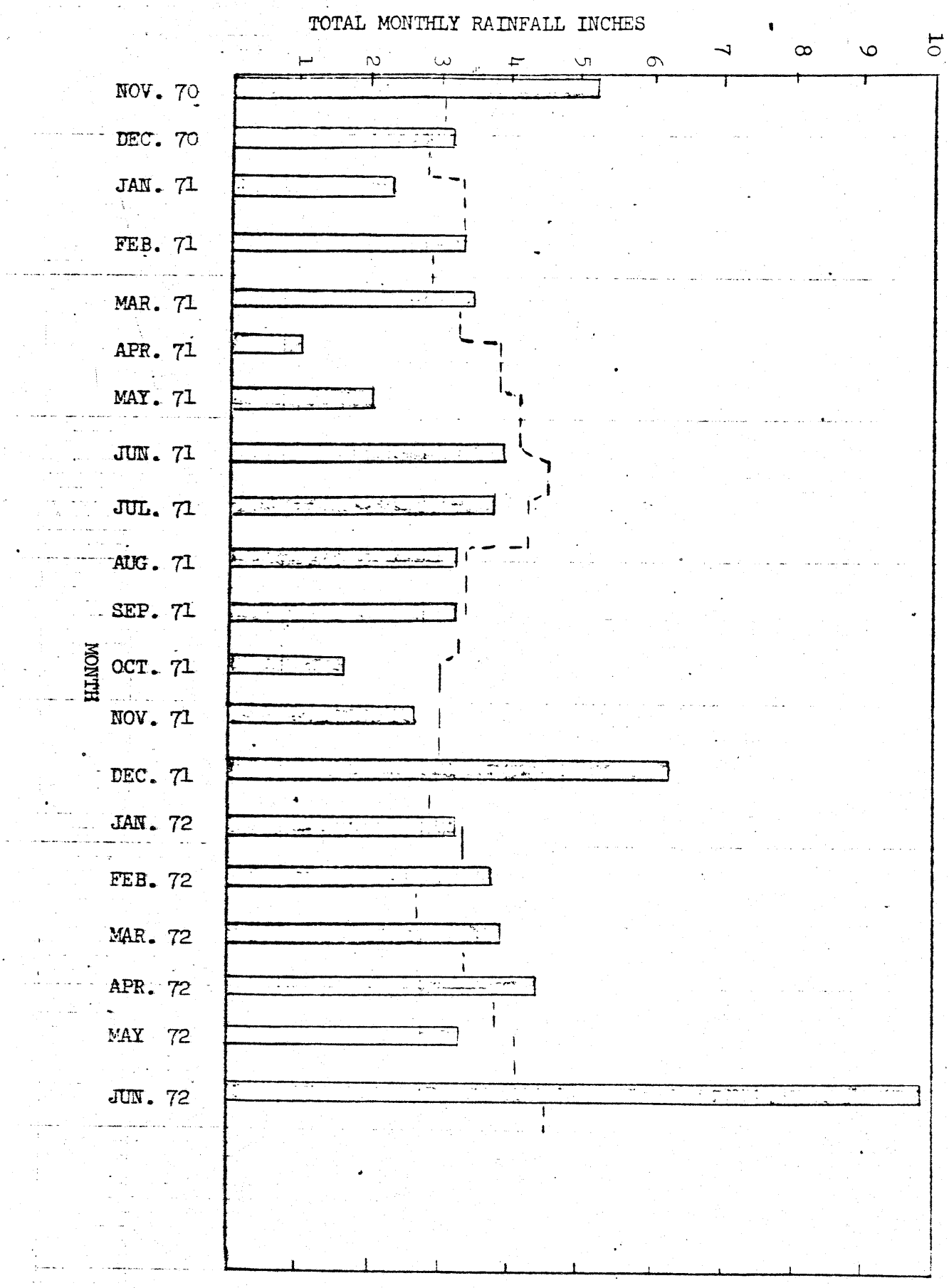
TOTAL MONTHLY RAINFALL INCHES
1
2
3
4
5
6
7
8
9
10
NOV. 70
DEC. 70
JAN. 71
FEB. 71
MAR. 71
APR. 71
MAY. 71
JUN. 71
JUL. 71
AUG. 71
SEP. 71
OCT. 71
NOV. 71
DEC. 71
JAN. 72
FEB. 72
MAR. 72
APR. 72
MAY 72
JUN. 72
MONTH
THIESSEN AVERAGE OF WEATHER BUREAU STATIONS AT SLIPPERY ROCK AND PARKER
LONGTERM THIESSEN AVERAGE

FIGURE 7

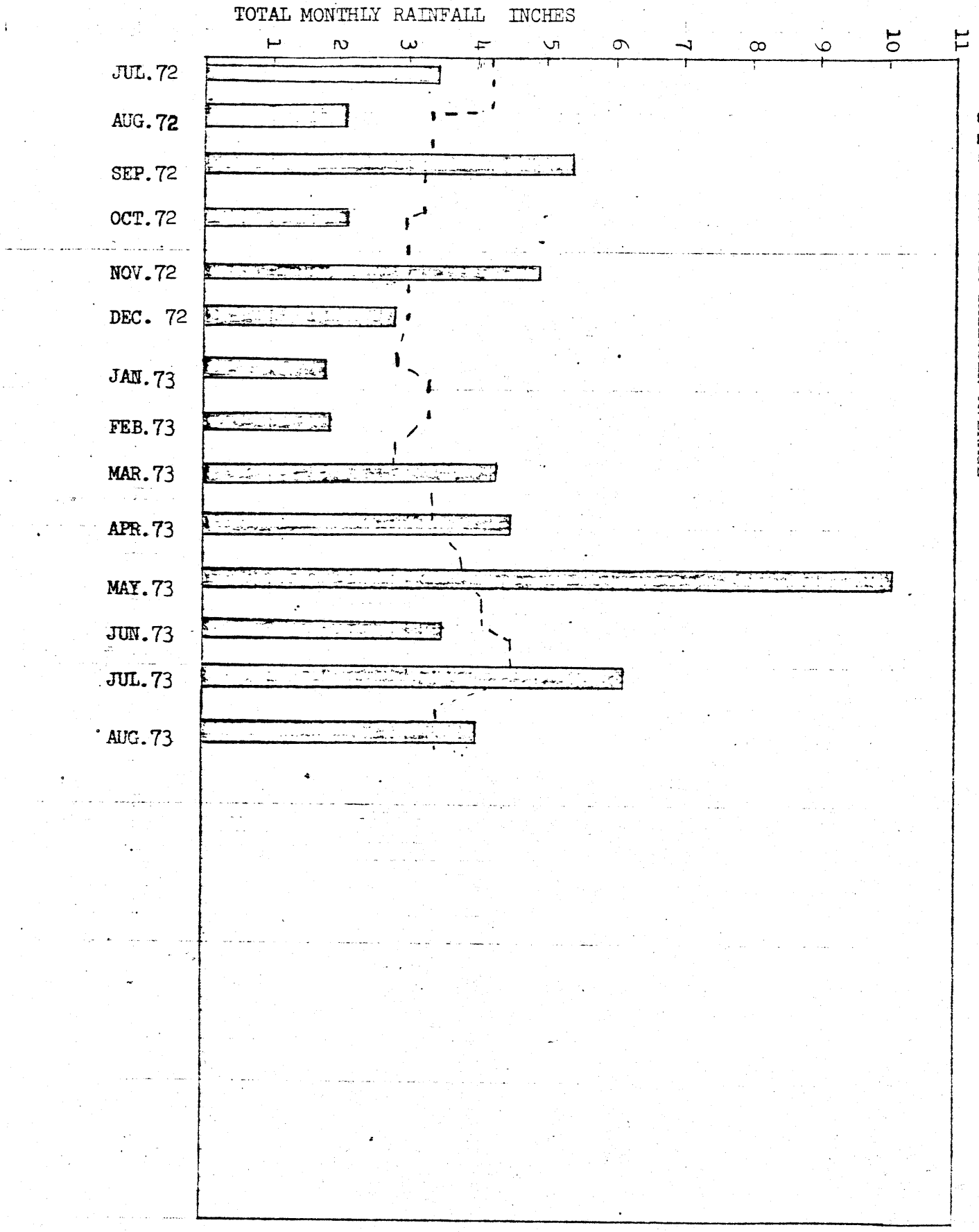
TOTAL MONTHLY RAINFALL INCHES
1
2
3
4
5
6
7
8
9
10
11
JUL. 72
AUG. 72
SEP. 72
OCT. 72
NOV. 72
DEC. 72
JAN. 73
FEB. 73
MAR. 73
APR. 73
MAY. 73
JUN. 73
JUL. 73
AUG. 73
LONG TERM THIESSEN AVERAGE
TOTAL MONTHLY RAINFALL AT LAKE ARTHUR

FIGURE 8

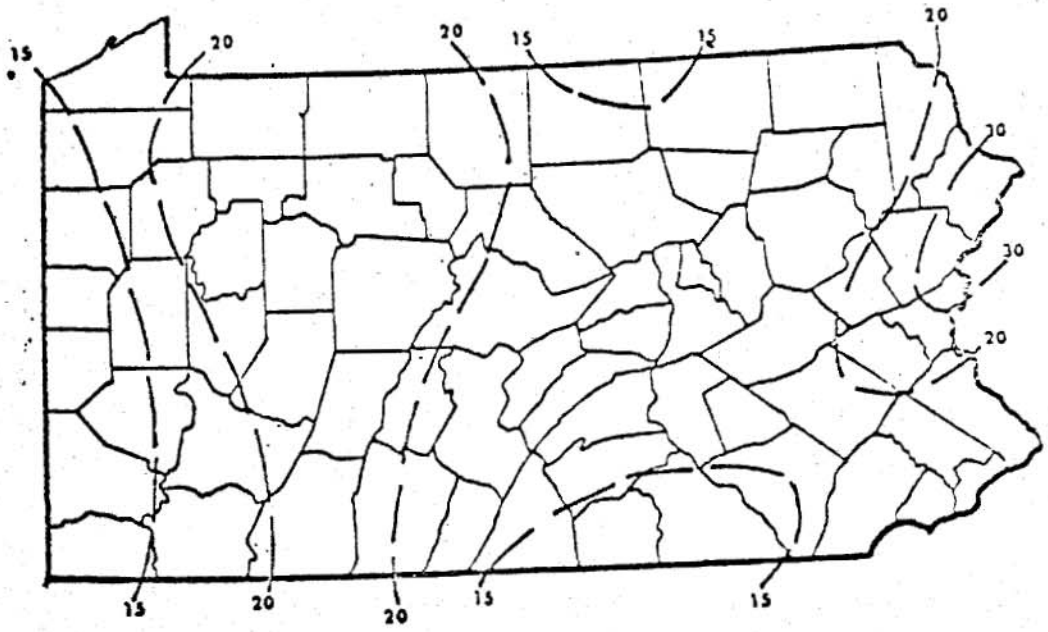

Figure 9 - Average Annual Runoff in Pennsylvania (inches)

Source: U. S. Geological Survey