II. STUDY RESULTS

In our opinion the following results may be presented based on the data contained in this report.

STREAM QUALITY

General: Seventy-one (71) stream reading stations were established on Raccoon Creek and its tributaries for the purpose of monitoring the stream quality at specific points of the study area. Three (3) of the seventy-one (71) stream reading stations were established on major tributaries to Raccoon Creek which were not part of the study area. They were established because influx from these tributaries significantly affects the water quality of Raccoon Creek. Identification and location of these three stations are:

SR-68 at Burgetts Fork about 200 yards upstream of its confluence with Raccoon Creek.

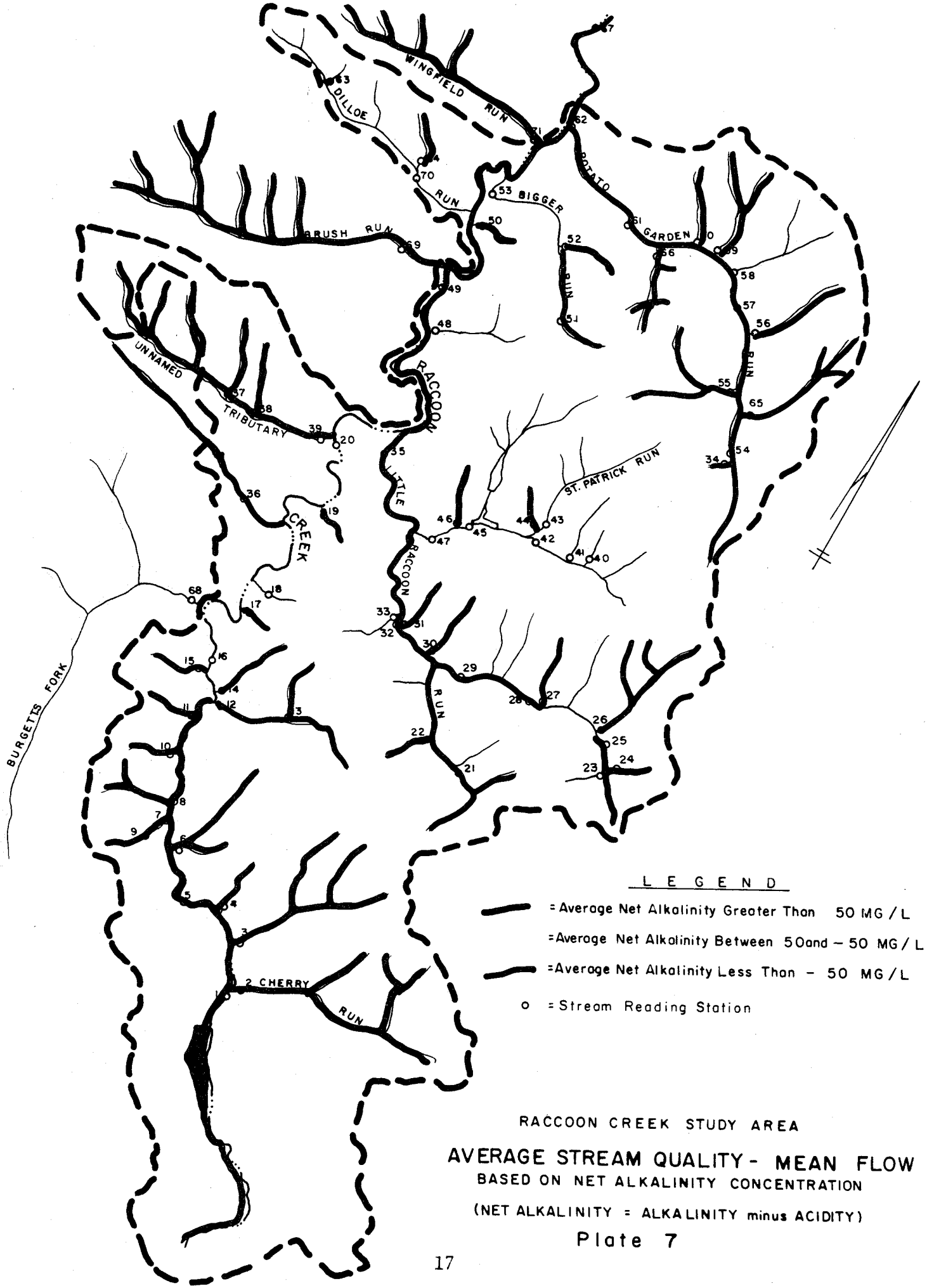
SR-69 at Brush Run about 500 yards upstream of its confluence with Raccoon Creek.

SR-71 at Wingfield Run about 300 yards upstream of its confluence with Raccoon Creek.

One hundred-fifteen (115) sources of AMD) were identified and monitored on a monthly basis. Water quality parameters used to identify AMD sources were pH, net acid concentration (mg/l) and net acid load (pounds per day). For the purpose of developing abatement plans to reduce acid mine drainage, it was assumed that one pound of alkalinity neutralized one pound of acidity. Further explanation of the above assumption is provided in the Technical Appendix.

Present Stream Quality: Plate No. 7 shows the average stream quality of the Raccoon Creek study area as monitored during the study period. It is evident from Plate 7 that there are four tributaries responsible for the majority of the deterioration in Raccoon Creek water quality. They are Potato Garden Run, Little Raccoon Run, the major unnamed tributary from Joffre Basin and the tributary flowing from the state gamelands as monitored at SR-36. Three other large tributaries are marginally degraded by mine drainage. They are Dilloe Run, Burgetts Fork and the unnamed tributary which drains St. Patrick Run and is monitored at Station SR-47. It is also evident that Raccoon Creek at its headwaters within the Cherry Valley Subwatershed is non-polluted by acid mine drainage.

Flow characteristics of the streams in the study area vary considerably with rainfall and time of sampling within a month. As an indication of the variability in flow, Plate Nos. 8 and 9 show the stream quality at periods of low flow and high flow. The net alkalinity concentrations reported on Plate Nos. 8 and 9 corresponded to the lowest and highest recorded flows of the 13-month sampling period. Plate No. 10 is a graphic representation of the net alkalinity and net acidity of Raccoon Creek at the various stream reading locations in the study area. Plate No. 11 shows graphically the relationship of the concentration of alkalinity and acid flow and the net acid loading of Raccoon Creek at the various stream reading stations.



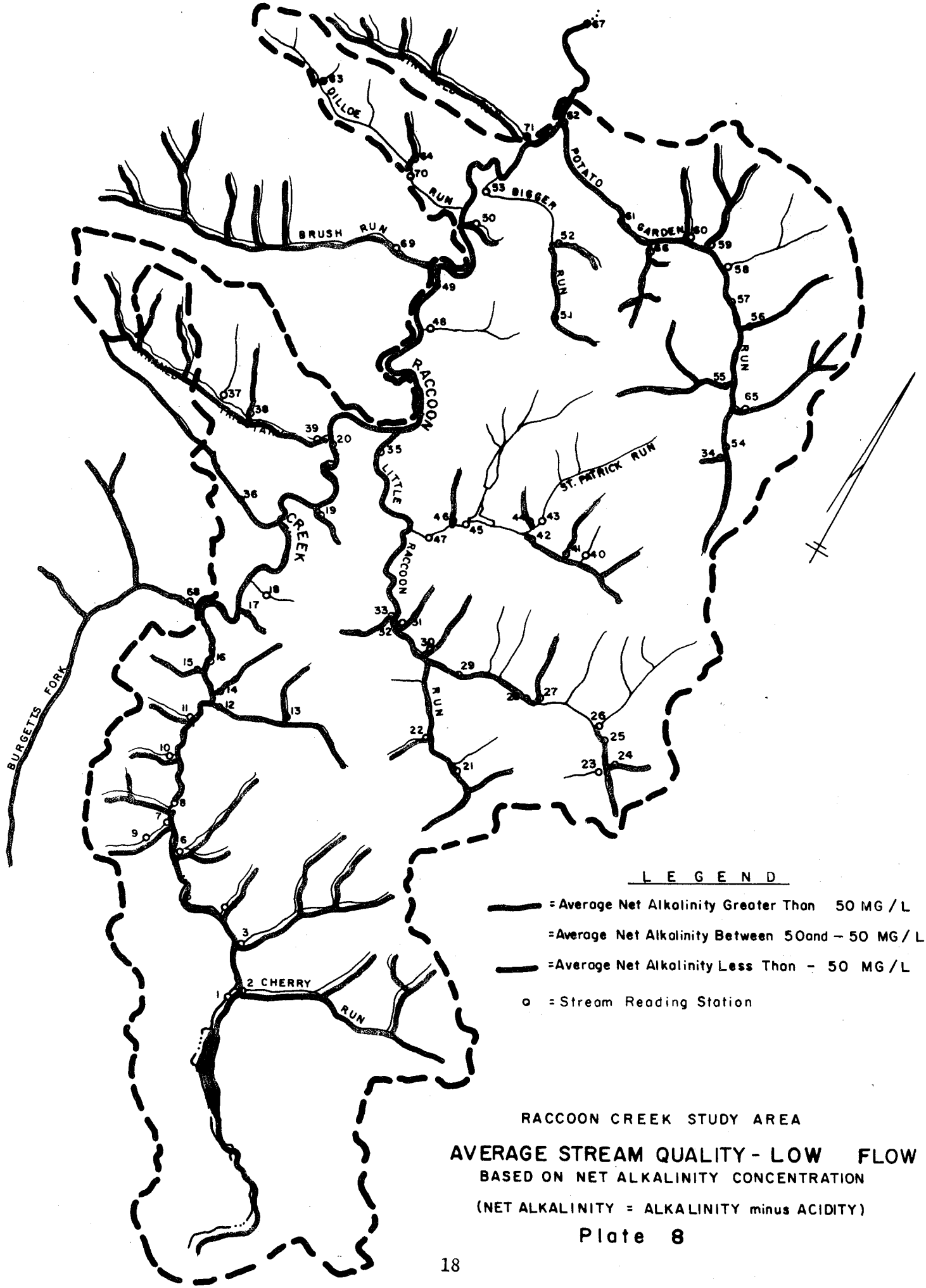
RACCOON CREEK STUDY AREA

AVERAGE STREAM QUALITY - MEAN FLOW

BASED ON NET ALKALINITY CONCENTRATION

(NET ALKALINITY = ALKALINITY minus ACIDITY)

Plate 7



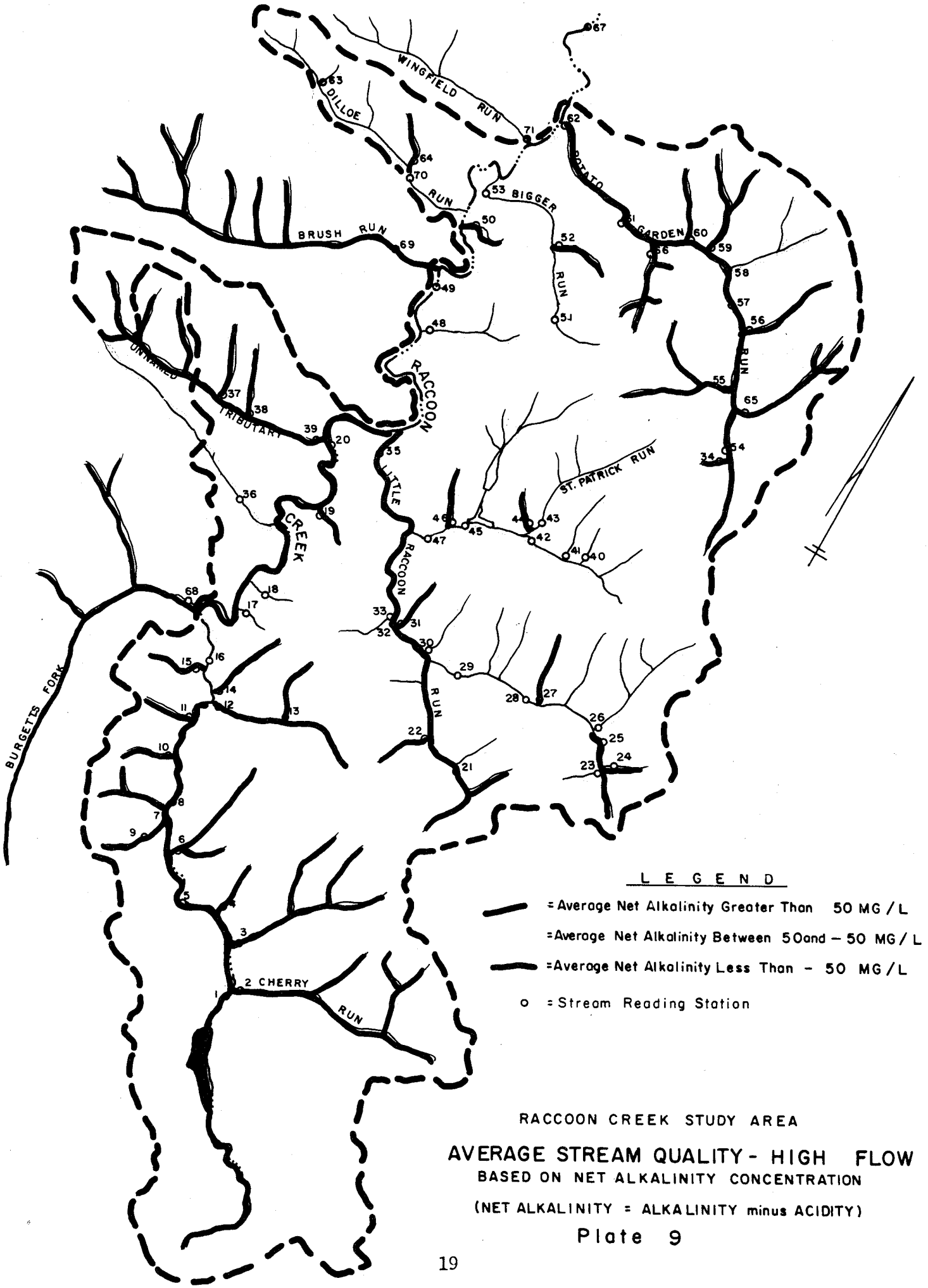
RACCOON CREEK STUDY AREA

AVERAGE STREAM QUALITY - LOW FLOW

BASED ON NET ALKALINITY CONCENTRATION

(NET ALKALINITY = ALKALINITY minus ACIDITY)

Plate 8



RACCOON CREEK STUDY AREA

AVERAGE STREAM QUALITY - HIGH FLOW

BASED ON NET ALKALINITY CONCENTRATION

(NET ALKALINITY = ALKALINITY minus ACIDITY)

Plate 9

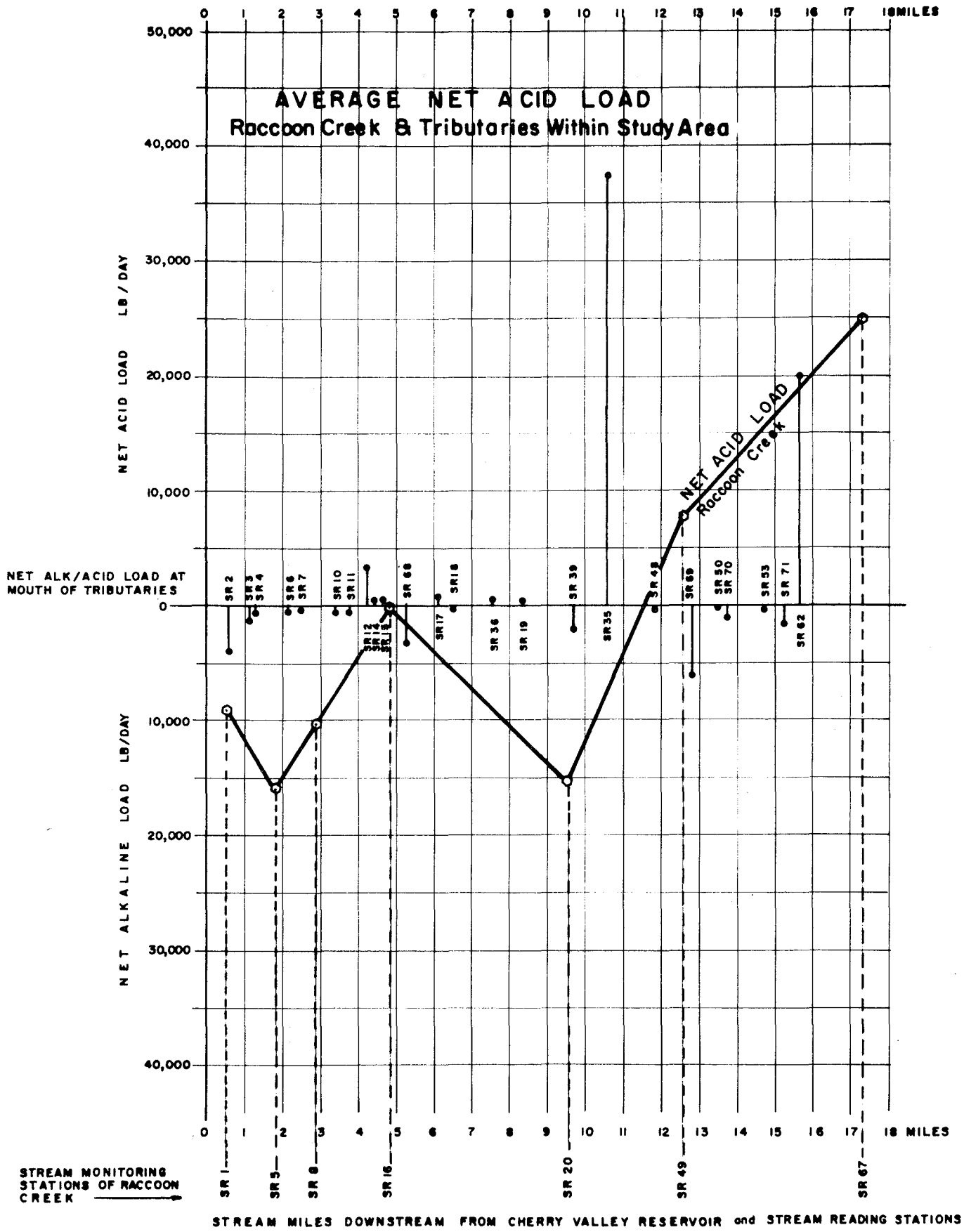

AVERAGE NET ACID LOAD
Raccoon Creek & Tributaries Within Study Area
NET ACID LOAD LB / DAY
NET ALKALINE LOAD LB/DAY
NET ALK/ACID LOAD AT MOUTH OF TRIBUTARIES
NET ACID LOAD Raccoon Creek
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 MILES
50,000
40,000
30,000
20,000
10,000
0
SR 2
SR 3
SR 4
SR 6
SR 7
SR 10
SR 11
SR 12
SR 14
SR 15
SR 66
SR 17
SR 18
SR 36
SR 19
SR 39
SR 35
SR 48
SR 69
SR 50
SR 70
SR 53
SR 71
SR 62
STREAM MONITORING STATIONS OF RACCOON CREEK
SR 1
SR 5
SR 8
SR 16
SR 20
SR 49
SR 67
STREAM MILES DOWNSTREAM FROM CHERRY VALLEY RESERVOIR and STREAM READING STATIONS

Plate 10

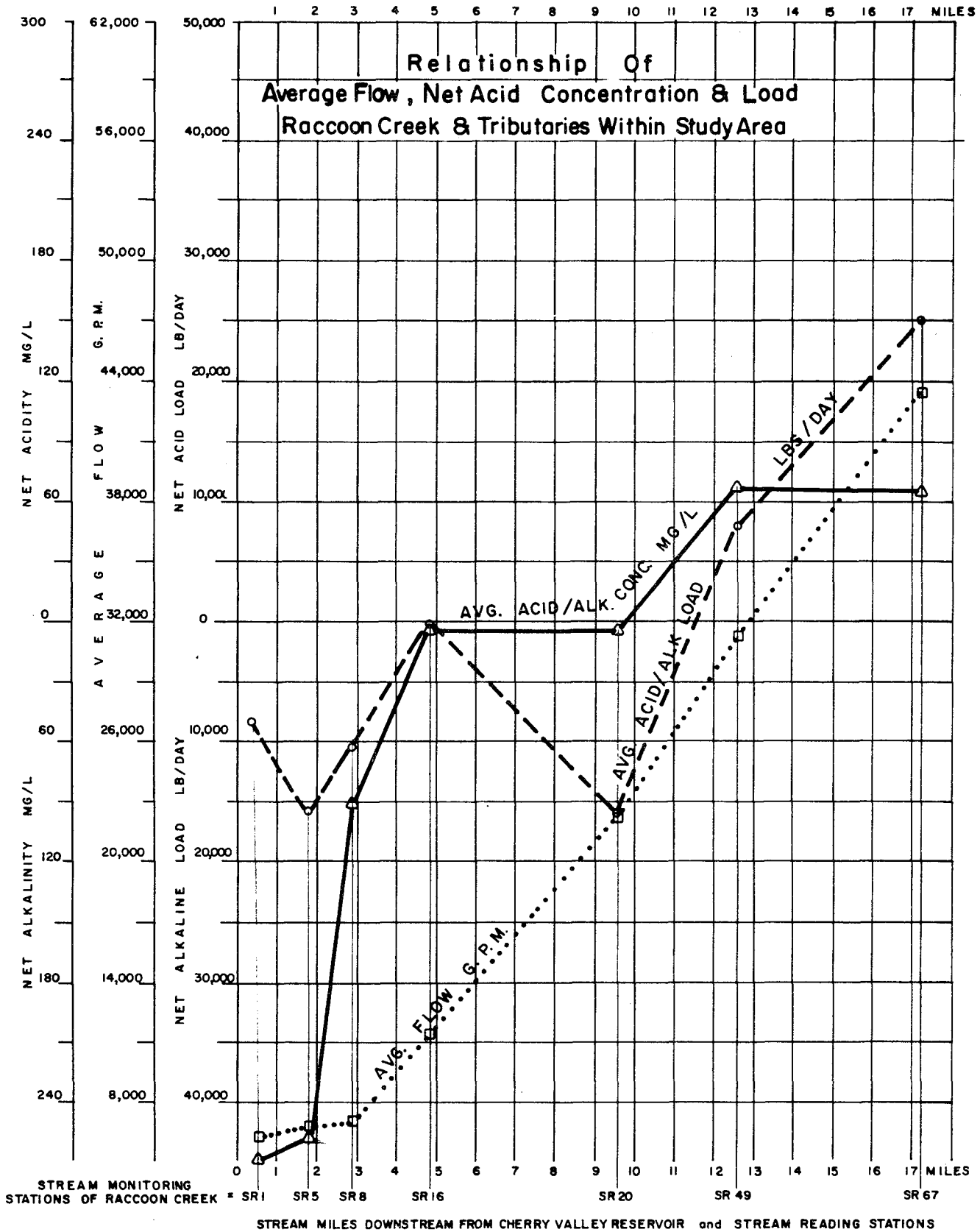

Relationship Of
Average Flow, Net Acid Concentration & Load
Raccoon Creek & Tributaries Within Study Area
NET ACIDITY MG/L
NET ALKALINITY MG/L
AVERAGE FLOW G.P.M.
NET ACID LOAD LB/DAY
NET ALKALINE LOAD LB/DAY
AVG. ACID/ALK. CONC. MG/L
AVG. ACID/ALK LOAD LBS/DAY
AVG. FLOW G.P.M.
STREAM MONITORING STATIONS OF RACCOON CREEK * SR1 SR5 SR8 SR16 SR20 SR49 SR67
STREAM MILES DOWNSTREAM FROM CHERRY VALLEY RESERVOIR and STREAM READING STATIONS

Plate II

Sources of Pollution: Table 1 gives a summary of the average net acid load for the study period of the major and minor sources identified in the study area, tabulated by subwatershed:

TABLE 1. SUMMARY OF SOURCES - RACCOON CREEK WATERSHED

Subwatershed	Source	Number	Net Acid Load lbs/day	Percent Total
Joffre	Major	7	8,910	18.5
	Minor	24	2,783	5.8
Sub-Total:		31	11,693	24.3
Little Raccoon	Major	5	16,267	33.7
	Minor	12	l,014	2.l
Sub-Total:		17	17,281	35.8
St. Patrick's	Major	1	440	.9
	Minor	23	1,214	2.5
Sub-Total:		24	1,654	3.4
Potato Garden	Major	6	14,560	30.2
	Minor	28	2,443	5.l
Sub-Total:		34	17,003	35.3
Bigger Run	Major	0	0	0
	Minor	8	523	1.1
Sub-Total:		8	523	l.l
Raccoon West	Major	0	0	0
	Minor	1	100	.2
Sub-Total:		1	100	.2
Dilloe and	Major	0	0	0
Cherry Valley	Minor	0	0	0
Sub-Total:		0	0	0
TOTAL OF ENTIRE STUDY AREA:		115	48,254	100

Several types of sources have been identified within the study area which may be broadly categorized as fallung under private responsibility. We have defined a source' of private responsibility as that which discharges from property which is privately owned and is currently being used for those industrial purposes which should have a discharge permit. Based on the data contained in this report, the pollution sources of private responsibility contribute approximately 600 of the total acid load of all pollution sources in the study area. In our opinion, the comprehensive abatement plan for the Raccoon Creek Watershed requires a joint effort of state agencies and private concerns. Cooperation between the Division of Mine Area Restoration of DER along with the private concerns discharging polluted water into the Watershed can greatly reduce the acid load now entering Raccoon Creek. Pollution sources assumed to be under private responsibility are tabulated on Table 2.

TABLE 2 - POLLUTION SOURCES ASSUMED TO BE UNDER PRIVATE RESPONSIBILITY

Source Designation	Stream Station Affected	Average Net Acid Load Lbs/day	%Total
Mill Service, Inc. Industrial Waste Treatment Facility:			
LR-1	SR-21	7,410	15.4
LR-2	SR-21	2,090	4.3
LR-3	SR-21	5,290	11.0
Total Net Acid Load:		14,790	30.7
Consolidation Coal Company- Coal Refuse Disposal Area:			
LR-4	SR-28	27	.l
LR-6	SR-28	224	.5
LR-7	SR-28	497	1.0
LR-8	SR-28	20	.0
LR-10	SR-28	213	.4
LR-11	SR-28	99	.2
LR-12	SR-28	98	.2
LR-13	SR-28	980	2.0
SP-2	SR-42	223	.5
SP-3	SR-42	440	.9
Total Net Acid Load:		2,821	5.8
Aloe Coal Company - Coal Preparation Plant and Settling Basin:			
PG-2	SR-66	700	1.4
Total Net Acid Load:		700	l.4

Source Designation	Stream Station Affected	Average Net Acid Load Lbs/Day	% Total
Aloe Coal Company - Coal Refuse Disposal Area:			
PG-13	SR-55	60	0.1
Total Net Acid Load:		60	0.l
Aloe Coal Company - Active Strip Mine Area:			
PG-24	SR-54	169	.3
PG-25	SR-54	80	.2
PG-26	SR-54	10,280	21.3
Total Net Acid Load:		10,529	21.8
TOTALNET ACID LOAD FROM PRIVATE SOURCES:		28,900	59.8