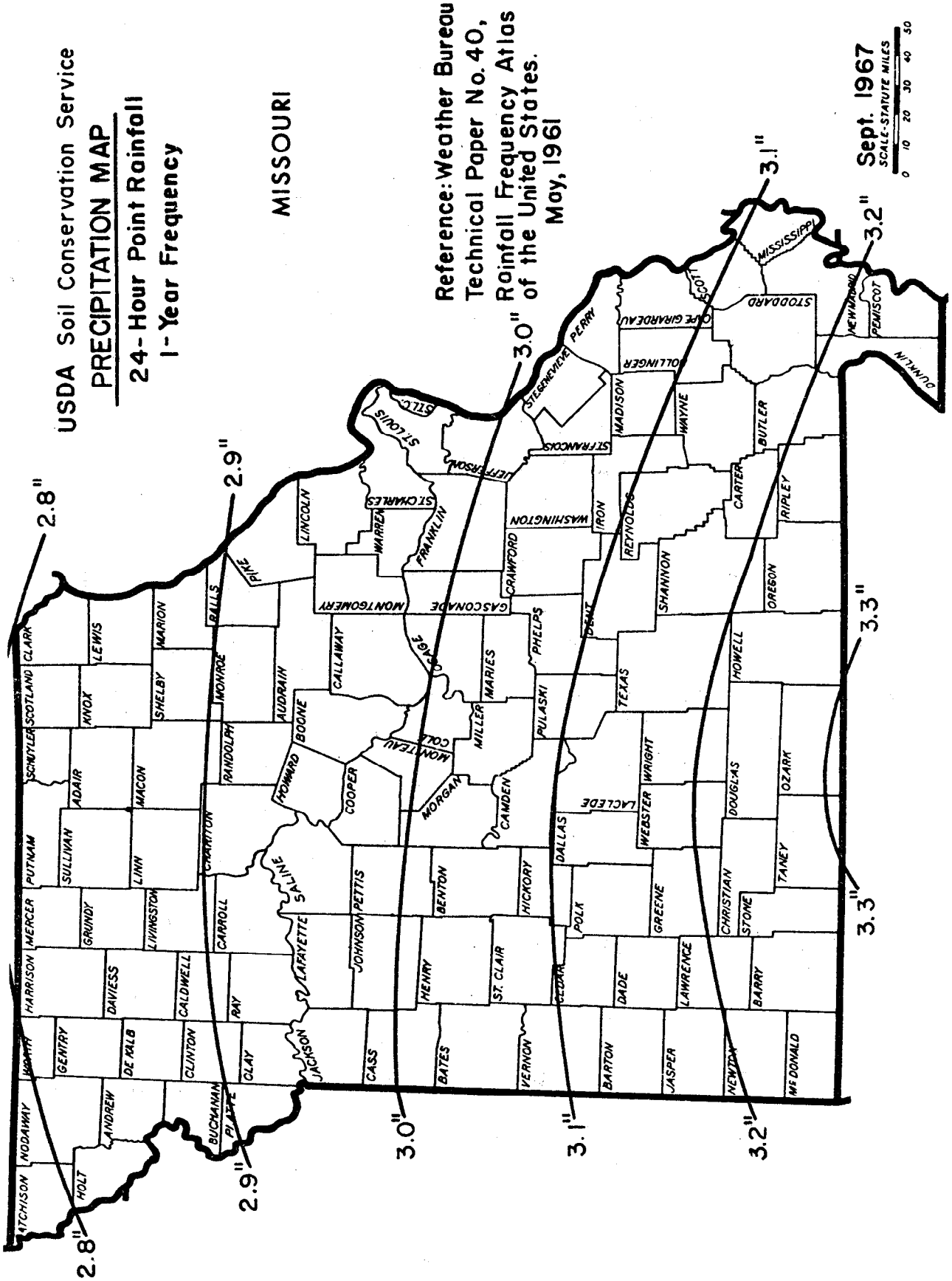
USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
1-Year Frequency
MISSOURI
Reference: Weather Bureau
Technical Paper No. 40,
Rainfall Frequency Atlas
of the United States.
May, 1961
Sept. 1967
SCALE-STATUTE MILES
0 10 20 30 40 50
2.8"
2.9"
3.0"
3.1"
3.2"
3.3"
ATCHISON
NODAWAY
HOLT
ANDREW
BUCHANAN
PLATTE
CLAY
JACKSON
CASS
BATES
VERNON
BARTON
JASPER
NEWTON
MC DONALD
WORTH
GENTRY
DE KALB
CLINTON
RAY
HENRY
ST. CLAIR
CEDAR
DADE
LAWRENCE
BARRY
HARRISON
DAVIESS
CALDWELL
CARROLL
LAFAYETTE
JOHNSON
PETTIS
BENTON
HICKORY
DALLAS
POLK
GREENE
CHRISTIAN
STONE
TANEY
MERCER
GRUNDY
LIVINGSTON
CHARITON
SALINE
PUTNAM
SULLIVAN
LINN
MACON
RANDOLPH
HOWARD
COOPER
MORGAN
CAMDEN
LACLEDE
WEBSTER
WRIGHT
DOUGLAS
OZARK
SCHUYLER
ADAIR
SCOTLAND
KNOX
SHELBY
MONROE
AUDRAIN
BOONE
CALLAWAY
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PULASKI
TEXAS
HOWELL
CLARK
LEWIS
MARION
PIKE
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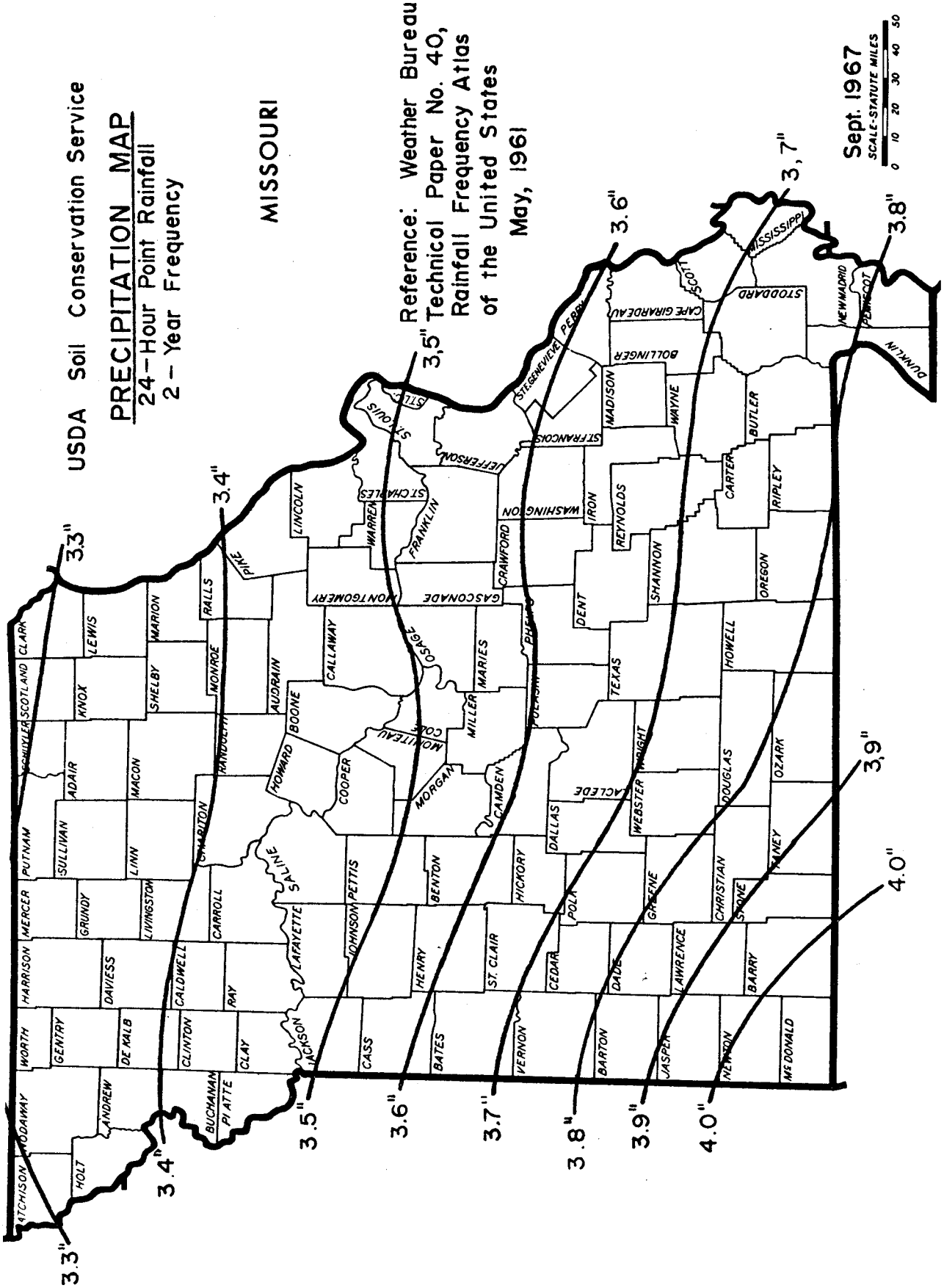
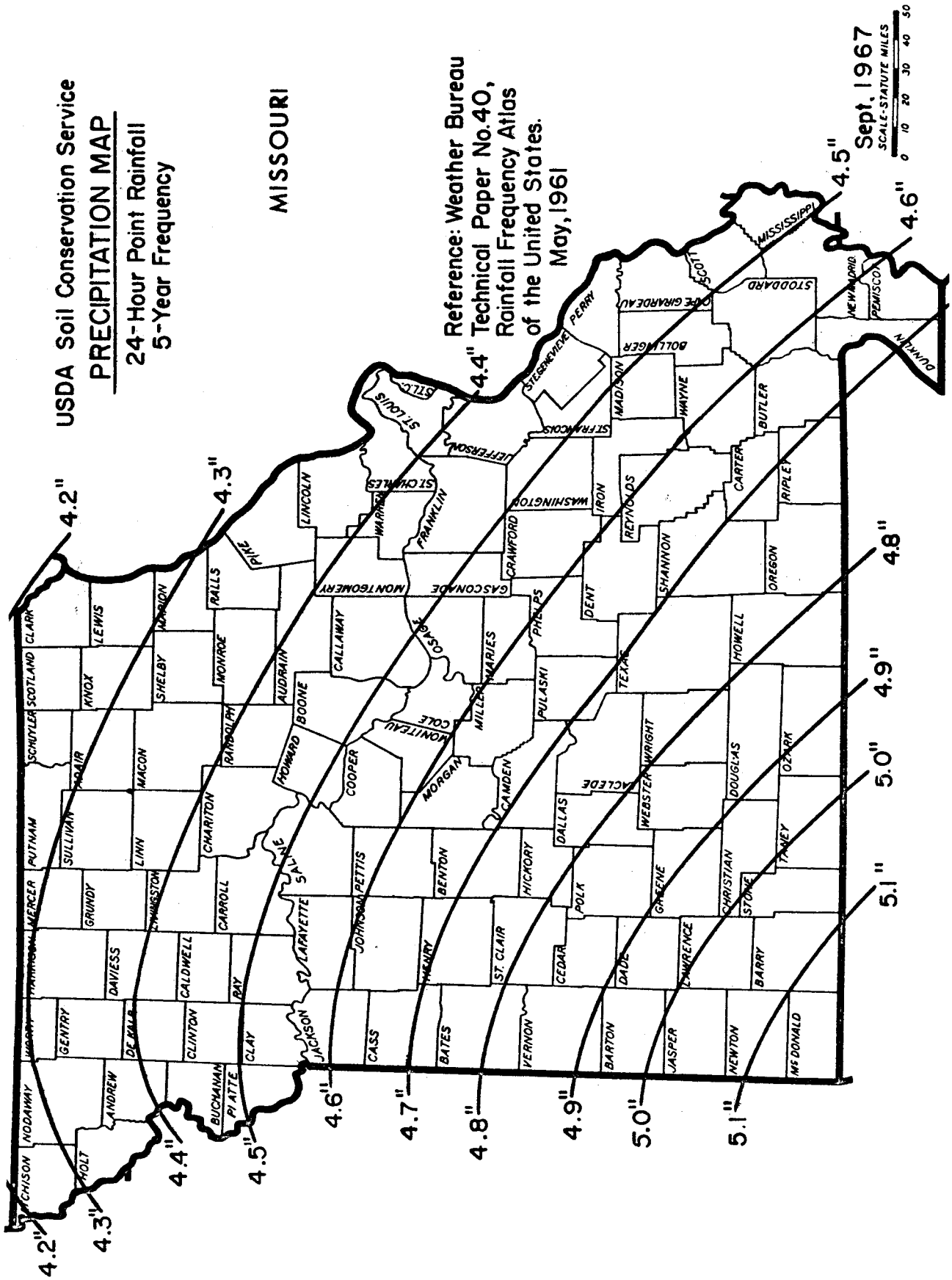
WARREN
ST. CHARLES
FRANKLIN
GASCONADE
MONTGOMERY
CRAWFORD
PHELPS
DENT
SHANNON
OREGON
ST. LOUIS
JEFFERSON
WASHINGTON
IRON
REYNOLDS
CARTER
RIPLEY
ST. FRANCOIS
MADISON
WAYNE
BUTLER
STE. GENEVIEVE
PERRY
CAPE GIRARDEAU
BOLLINGER
SCOTT
STODDARD
MISSISSIPPI
NEW MADRID
PEMISCOT
DUNKLIN


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
2 - Year Frequency
MISSOURI
Reference: Weather Bureau Technical Paper No. 40, Rainfall Frequency Atlas of the United States May, 1961
Sept. 1967
SCALE-STATUTE MILES
0 10 20 30 40 50
3.3"
3.4"
3.5"
3.6"
3.7"
3.8"
3.9"
4.0"
ATCHISON
NODAWAY
WORTH
HARRISON
MERCER
PUTNAM
SCHUYLER
SCOTLAND
CLARK
HOLT
ANDREW
GENTRY
GRUNDY
SULLIVAN
ADAIR
KNOX
LEWIS
DE KALB
DAVIESS
LINN
MACON
SHELBY
MARION
BUCHANAN
PLATTE
CLINTON
CALDWELL
LIVINGSTON
CARROLL
RAY
CLAY
CHARITON
RANDOLPH
MONROE
RALLS
PIKE
SALINE
LAFAYETTE
JACKSON
HOWARD
BOONE
AUDRAIN
LINCOLN
COOPER
CALLAWAY
MONTGOMERY
WARREN
ST. CHARLES
ST. LOUIS
MONITEAU
COLE
JOHNSON
PETTIS
CASS
FRANKLIN
GASCONADE
OSAGE
MORGAN
BENTON
HENRY
BATES
MILLER
MARIES
CRAWFORD
JEFFERSON
WASHINGTON
STE. GENEVIEVE
PERRY
CAMDEN
HICKORY
ST. CLAIR
VERNON
DALLAS
POLK
CEDAR
DADE
BARTON
LACLEDE
WEBSTER
WRIGHT
TEXAS
DENT
IRON
REYNOLDS
ST. FRANCOIS
MADISON
BOLLINGER
CAPE GIRARDEAU
SCOTT
MISSISSIPPI
STODDARD
WAYNE
SHANNON
CARTER
RIPLEY
BUTLER
DUNKLIN
NEW MADRID
PEMISCOT
OREGON
HOWELL
OZARK
DOUGLAS
WEBSTER
GREENE
LAWRENCE
CHRISTIAN
STONE
TANEY
BARRY
NEWTON
JASPER
MC DONALD


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
5-Year Frequency
MISSOURI
Reference: Weather Bureau
Technical Paper No.40,
Rainfall Frequency Atlas
of the United States.
May, 1961
Sept. 1967
SCALE-STATUTE MILES
0 10 20 30 40 50
4.2"
4.3"
4.4"
4.5"
4.6"
4.7"
4.8"
4.9"
5.0"
5.1"
CLARK
LEWIS
ADAIR
SCOTLAND
KNOX
SHELBY
MONROE
RALLS
PIKE
LINCOLN
WARREN
ST. CHARLES
ST. LOUIS
STE. GENEVIEVE
PERRY
MISSISSIPPI
SCOTT
CAPE GIRARDEAU
STODDARD
NEW MADRID
PEMISCOT
DUNKLIN
SCHUYLER
PUTNAM
SULLIVAN
MACON
RANDOLPH
AUDRAIN
BOONE
CALLAWAY
MONTGOMERY
GASCONADE
FRANKLIN
JEFFERSON
ST. FRANCOIS
MADISON
WAYNE
BUTLER
MERCER
GRUNDY
LINN
CHARITON
HOWARD
COOPER
MONITEAU
COLE
OSAGE
MILLER
MARIES
PHELPS
CRAWFORD
WASHINGTON
IRON
REYNOLDS
CARTER
RIPLEY
DENT
SHANNON
OREGON
HOWELL
TEXAS
PULASKI
MORGAN
CAMDEN
WEBSTER
WRIGHT
DOUGLAS
OZARK
MACLEDE
DALLAS
HICKORY
BENTON
PETTIS
JOHNSON
LAFAYETTE
SALINE
CARROLL
CHARITON
LINN
MACON
GRUNDY
DAVIESS
CALDWELL
RAY
CLAY
CLINTON
DE KALB
GENTRY
ANDREW
BUCHANAN
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BARTON
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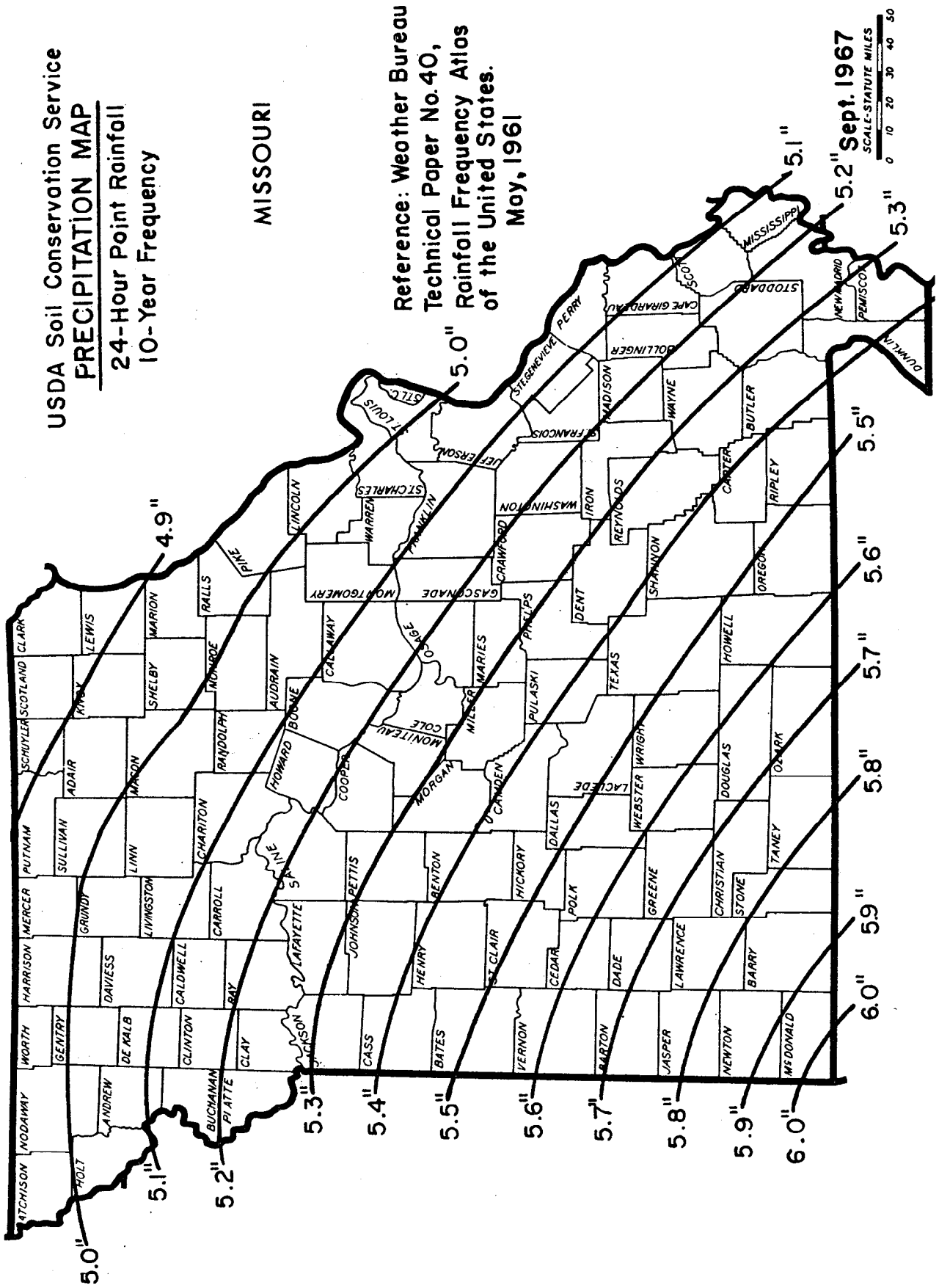
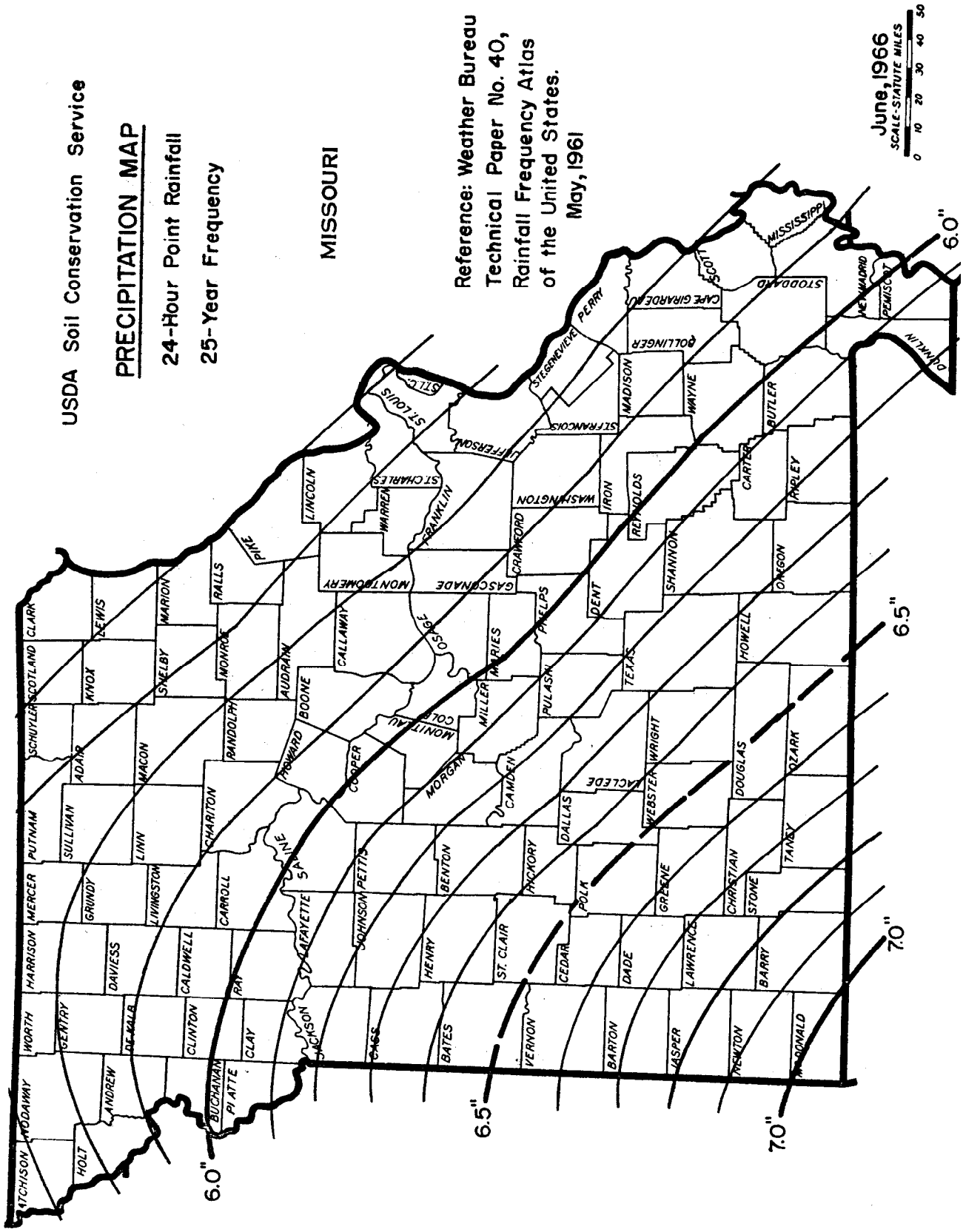
BARRY
NEWTON
MCDONALD
NODAWAY
HOLT
CHISON


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
10-Year Frequency
MISSOURI
Reference: Weather Bureau
Technical Paper No. 40,
Rainfall Frequency Atlas
of the United States.
May, 1961
Sept. 1967
SCALE-STATUTE MILES
0 10 20 30 40 50
4.9"
5.0"
5.1"
5.2"
5.3"
5.4"
5.5"
5.6"
5.7"
5.8"
5.9"
6.0"


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
25-Year Frequency
MISSOURI
Reference: Weather Bureau Technical Paper No. 40, Rainfall Frequency Atlas of the United States. May, 1961
June, 1966
SCALE-STATUTE MILES
0 10 20 30 40 50
6.0"
6.5"
7.0"
ATCHISON
HOLT
NODAWAY
WORTH
GENTRY
DE KALB
ANDREW
BUCHANAN
PLATTE
CLAY
JACKSON
CASS
BATES
VERNON
BARTON
JASPER
NEWTON
McDONALD
HARRISON
DAVIESS
CALDWELL
CLINTON
RAY
LAFAYETTE
JOHNSON
HENRY
ST. CLAIR
CEDAR
DADE
LAWRENCE
BARRY
MERCER
GRUNDY
LIVINGSTON
CARROLL
SALINE
PETTIS
BENTON
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POLK
GREENE
CHRISTIAN
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SULLIVAN
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CALLAWAY
MARIES
PHELPS
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SHANNON
OREGON
MARION
RALLS
PIKE
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WARREN
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CRAWFORD
IRON
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WAYNE
BUTLER
ST. FRANCOIS
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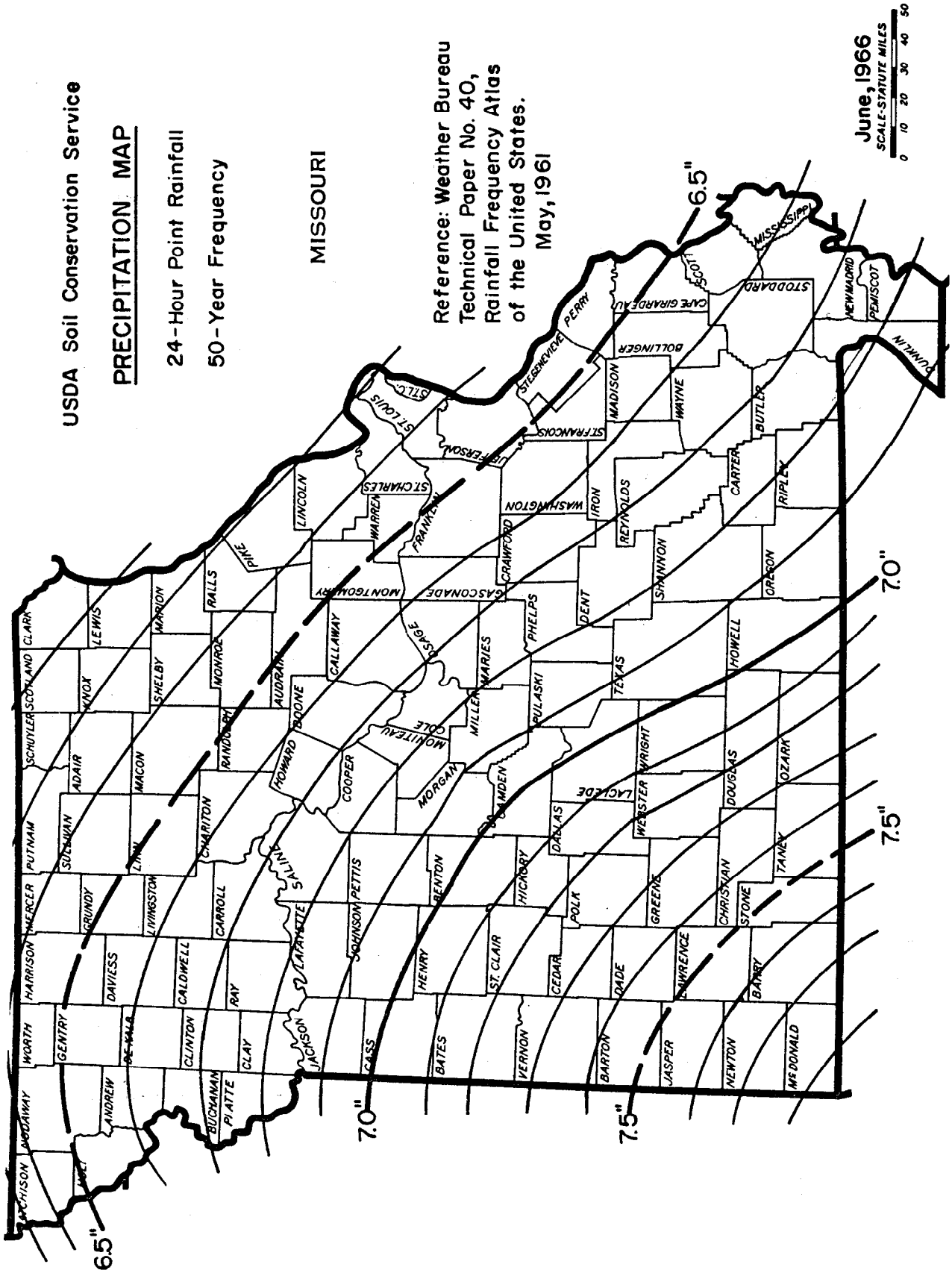
PEMISCOT
DUNKLIN


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
50-Year Frequency
MISSOURI
Reference: Weather Bureau
Technical Paper No. 40,
Rainfall Frequency Atlas
of the United States.
May, 1961
June, 1966
SCALE-STATUTE MILES
0 10 20 30 40 50
6.5"
7.0"
7.5"
MISSISSIPPI
STODDARD
CAPE GIRARDEAU
BOLLINGER
PERRY
STEGENEVIEVE
ST. LOUIS
ST. FRANCOIS
JEFFERSON
ST. CHARLES
WARREN
FRANKLIN
LINCOLN
PIKE
RALLS
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CLARK
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AUDRAIN
CALLAWAY
MONTGOMERY
GASCONADE
CRAWFORD
WASHINGTON
IRON
REYNOLDS
MADISON
WAYNE
BUTLER
CARTER
RIPLEY
SHANNON
OREGON
DENT
PHELPS
OSAGE
MARIES
MILLER
PULASKI
TEXAS
HOWELL
SCHUYLER
ADAIR
MACON
RANDOLPH
BOONE
HOWARD
COOPER
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SALINE
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PETTIS
BENTON
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POLK
GREENE
CHRISTIAN
STONE
HARRISON
DAVIESS
CALDWELL
RAY
HENRY
ST. CLAIR
CEDAR
DADE
LAWRENCE
BARRY
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DE KALB
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BATES
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BARTON
JASPER
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NODAWAY
ANDREW
BUCHANAN
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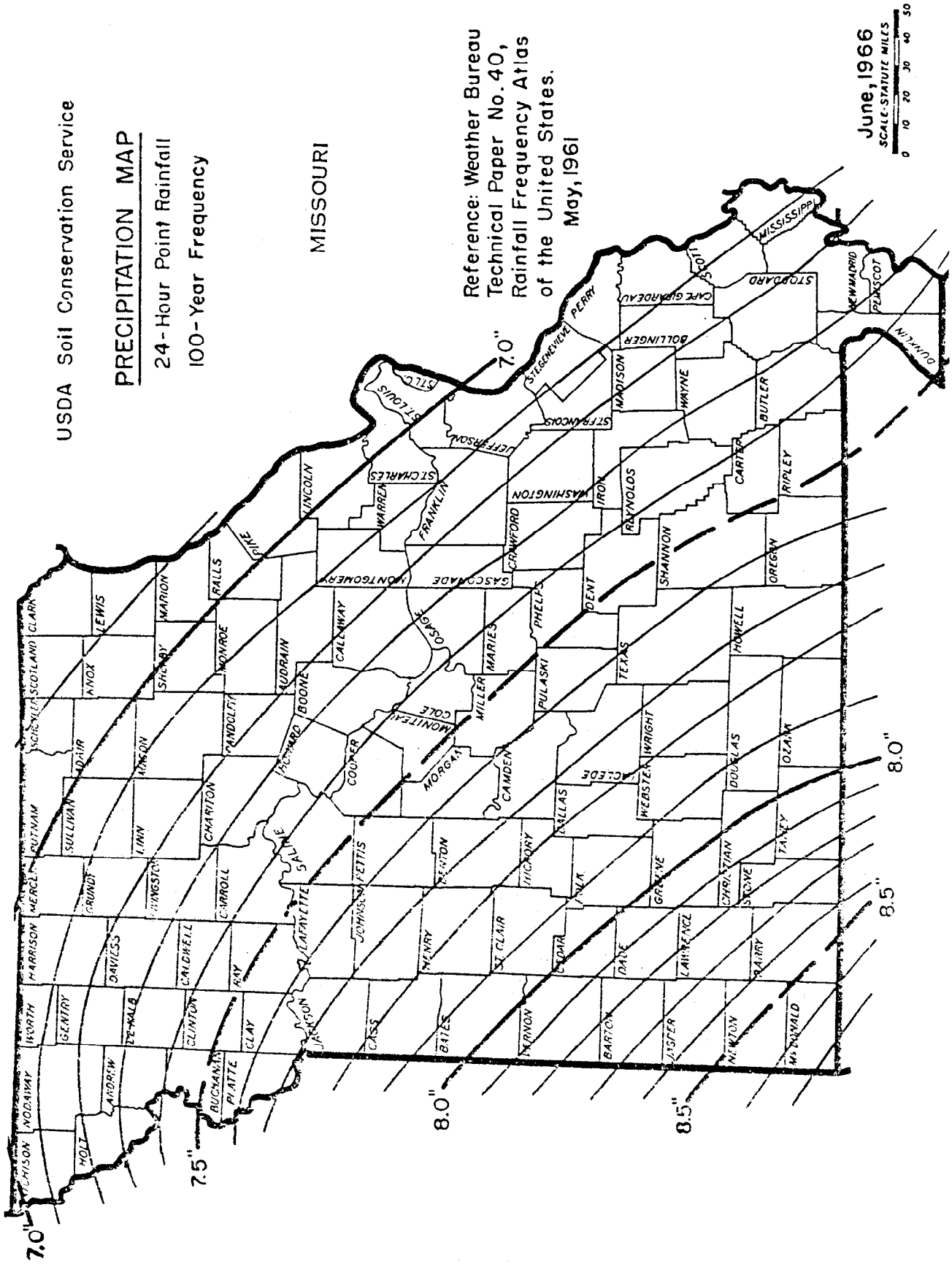
ATCHISON
MOLT
PUNKLIN
NEW MADRID
PEMISCOT


USDA Soil Conservation Service
PRECIPITATION MAP
24-Hour Point Rainfall
100-Year Frequency
MISSOURI
Reference: Weather Bureau
Technical Paper No. 40,
Rainfall Frequency Atlas
of the United States.
May, 1961
June, 1966
SCALE-STATUTE MILES
0 10 20 30 40 50
7.0"
7.5"
8.0"
8.5"

RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL-COVER COMPLEXES

Cover			Hydrologic soil group			
Land Use	Treatment or practice	Hydrologic condition 1/	A	B	C	D
Row crops	Straight row	Poor	72	81	88	91
	" "	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	Contoured & terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
	" "	Good	63	75	83	87
	Contoured	Poor	63	74	82	85
	"	Good	61	73	81	84
	Contoured & terraced	Poor	61	72	79	82
	" " "	Good	59	70	78	81
Close-seeded legumes or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	Contoured & terraced	Poor	63	73	80	83
	" " "	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Open Spaces, Lawns, parks, golf courses, cemeteries, etc.						
good condition: grass cover on 75% or more of the area			39	61	74	80
fair condition: grass cover on 50% to 75% of the area			49	69	79	84

Cover		Hydrologic soil group			
		A	B	C	D
Commercial and business areas (85% impervious)		89	92	94	95
Industrial districts (72% impervious)		81	88	91	93
Residential: 2/					
Average lot size	Average % Impervious 3/				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved parking lots, roofs, driveways, etc.		98	98	98	98
Streets and roads:					
paved with curbs and storm sewers		98	98	98	98
gravel		76	85	89	91
dirt		72	82	87	89

1/ Hydrologic condition of cover rated good or poor.
Examples:

Poor - Continuous row crops, continuous small grain or combinations or row crops and small grain; native pasture or range heavily grazed, no mulch or plant cover on less than 1/2 the area; woods heavily grazed, litter, small trees and brush are destroyed.

Good - Rotations containing grass or legumes to improve soil tilth; native pasture or range lightly grazed, plant cover on more than 3/4 the area; woods protected from burning and grazing, litter and shrubs cover soil.

2/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

3/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

Procedure to Estimate Effects of Conservation Tillage on Reducing Direct Runoff Using the SCS Curve Number 1/

This is an optional procedure which may be used where good conservation tillage is practiced. Conservation tillage is a form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. Conservation tillage practices include till planting, chisel planting, strip tillage, sweep tillage, chop planting and no-till. Of these, only no-till has not consistently reduced direct runoff when applied year after year on experimental plots and watersheds. Direct runoff and associated peak discharges are reduced by crop residue cover which increases infiltration potential through 1) lessening rainfall impact and surface crusting, 2) decreasing runoff velocity by lengthening flow paths and increasing surface roughness, 3) creating additional surface storage, and 4) by providing organic matter to improve the soil structure.

Direct runoff is computed using the SCS runoff curve number technique as described in Chapter 2 of the Engineering Field Manual. The selected runoff curve number can be reduced by a percentage to account for the effects of conservation tillage and residue management practices. To take advantage of this reduction of runoff for design, one must have a commitment to continue with conservation tillage and residue management for the expected life of the engineering practice. The adaptability of the tillage practices to the local soil and crop growth conditions should be checked. This includes drainage limitations of the soils, pest control problems, equipment on hand, and the attitude and abilities of the farmers. No reductions should be used with continuous no-till or similar practices that do not significantly increase infiltration.

An estimate of the amount and type of residue cover remaining after harvest, is necessary for this procedure. Assumptions incorporated into the procedure are 1) normal decomposition of residue over the dormant season, and 2) no carry over of residue from year to year.

The amount of residue can be estimated using Section III-A of the Technical Guide.

The type of residue is classified according to the maximum amount of residue the crop will produce. Crops considered in the medium residue classification will produce residue amounts up to about 4000 lbs. per acre and include wheat, oats, barley, rye, sorghum, and soybeans. A crop such as corn classified as a large residue crop can produce from about 4000 to about 8000 lbs. per acre of residue

1/ Procedure developed from analysis of research data described in paper submitted for publication in ASAE Transactions, "Residue and Tillage Effects on SCS Runoff Curve Numbers." W. J. Rawls, C. A. Onstad and H. H. Richardson, 1979. Background information is available at the USDA-SEA-AR Hydrology Laboratory, Beltsville, Maryland.