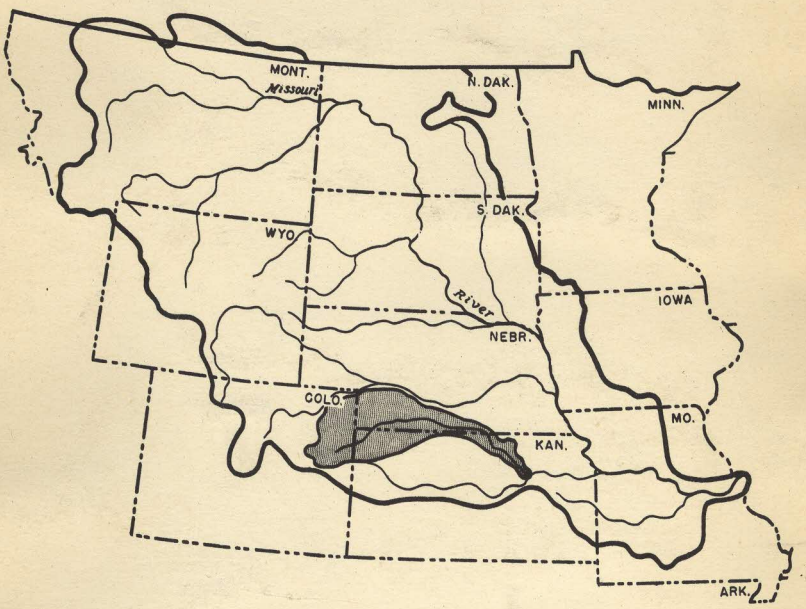
~~Justin M. Andrews~~

MOSQUITO INVESTIGATIONS in the Republican River Basin



LAND
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1951

FEDERAL SECURITY AGENCY
Public Health Service
Communicable Disease Center

December 1951

Federal Security Agency
Public Health Service
U.S. Communicable Disease Center, Atlanta

MOSQUITO INVESTIGATIONS

IN THE

REPUBLICAN RIVER BASIN

Prepared by the Missouri Drainage Basin Unit,
CDC Water Development Section in Cooperation with
the Colorado Department of Public Health, the Kansas State
Board of Health and the Nebraska Department of Health

Kansas City, December 1951

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** Now assigned to CDC Headquarters, Atlanta, Georgia

SUMMARY

The Republican River Drainage Basin includes portions of Northern and Western Kansas, Southern Nebraska and Eastern Colorado. It covers an area of approximately 24,155 square miles of gently rolling plains. The climate of the basin is dry subhumid in the eastern portion and semiarid in the western. The average annual rainfall ranges from sixteen to thirty inches. In this area land and water resources development work is progressing at a rapid rate. Reservoirs, diversion dams, and canals are being constructed, and dry-farm lands being prepared for irrigation. When development plans are completed approximately 165,000 acres lying along the main stem of the Republican River will be irrigated. As a result of this work many environmental changes will take place, some of which will certainly influence the mosquito population of the basin.

In order to have data upon which to base the determination of mosquito population changes following irrigation and the anticipation of mosquito problems arising from irrigation developments, pre-irrigation investigations of the mosquitoes were made in 1949 and 1950. All data available on the mosquitoes of the basin were reviewed and are brought together in this report.

Thirty-three species of mosquitoes are known to occur in the basin. Of all specimens examined three species, Aedes vexans, Culex tarsalis and Psorophora signipennis comprised approximately seventy-seven per cent. Each of these species was found widely distributed in the basin. Other species such as Aedes nigromaculis, Culiseta inornata, Culex pipiens, Aedes trivittatus, Aedes triseriatus, Anopheles punctipennis

and Culex salinarius were commonly found.

Several of these species such as Culex tarsalis, Aedes dorsalis, Culiseta inornata and Aedes nigromaculis are implicated in the transmission of the virus of Western equine encephalomyelitis which is considered to be endemic in the basin. Several species such as Aedes nigromaculis, Aedes dorsalis, Aedes vexans and Psorophora signipennis are severe biters but under present conditions do not normally occur in large numbers.

Adult mosquito populations were sampled by means of nine mosquito light traps operated at six localities in the eastern and middle portions of the basin. Data from these samples indicate that in certain areas during seasons of unusually high rainfall, increases in the populations of Aedes vexans, Culex tarsalis and Psorophora signipennis may occur. However, high populations are not expected to persist over prolonged periods of time.

Mosquito breeding was studied on four representative plots in the eastern half of the basin. Data were secured on the total area of surface water, total area breeding mosquitoes, and the number and kinds of larvae in dipping samples. A limited variety of mosquito breeding places occurred in the areas studied; those found breeding mosquitoes were mainly temporary surface pools. The total amount of surface water present from week to week was relatively small, and an extremely limited portion of the total surface water was found breeding mosquitoes.

Although many species of mosquitoes are known to occur in the basin, present conditions in the dry-subhumid or semiarid climate

are not conducive to the occurrence of continuous high mosquito populations. Unless proper preventive measures are taken, general conditions which are presently unsuitable for sustained high populations of mosquitoes may be reversed following the development of irrigation. It is recommended that all local, state, and Federal agencies, private organizations, and farm groups engaged in the development or use of irrigation water take the necessary actions to prevent conditions which will increase mosquito problems in the basin.

MOSQUITO INVESTIGATIONS IN THE REPUBLICAN RIVER BASIN

INTRODUCTION

Land and water resources development work is progressing at a rapid rate in the Republican River Basin. Reservoirs, diversion dams, and canals are being built and the land is being prepared for irrigation. Within a few years irrigation practices will be started on thousands of acres of farm lands. Many environmental changes will occur as a result of this work; some of them will certainly affect the mosquito populations in the basin.

This report contains information on the mosquitoes of the basin collected during investigations completed prior to 1951 when "dry-crop" farming practices generally prevailed. Most of the data were collected in 1949, however those of certain earlier investigators are also included. The investigations herein reported were prompted by the need for having data upon which to base (1) the anticipation of mosquito problems likely to arise following irrigation and (2) determinations of mosquito population changes following irrigation and the factors causing these changes.

For convenience of the reader, conclusions drawn from the investigations and certain recommendations which appear to be warranted, are placed at the beginning of the report. These are followed by discussions dealing with (1) a description of conditions in the basin, (2) the distribution and seasonal occurrence of mosquito species, (3) adult mosquito populations, (4) larval breeding and (5) reviews of

certain reservoir reports. Tabulations of samples taken in individual light traps and larval inspections, as well as plot maps, station descriptions and sample calculations are given in the appendix.

ACKNOWLEDGMENT

This report is made possible by the efforts of many people. Several individuals who have studied mosquitoes in the basin have given permission to use their records and others have provided excellent suggestions for undertaking the investigations. Certain information pertaining to the program of water resource development work in the basin was obtained from Department of Interior reports and from reports of the Public Health Service, Missouri Drainage Basin office. The help of all individuals, or agencies, who have contributed to these studies is gratefully acknowledged.

CONCLUSIONS

1. Thirty-three species of mosquitoes are reported from the Republican River Basin; it is likely that other species, which have not as yet been collected, also occur. Most of the species may be found throughout the summer months, May to October.

2. Studies of some thirty thousand female specimens collected from six localities indicate that under present conditions, the ten most common species are: Aedes vexans, Culex tarsalis, Psorophora signipennis, Aedes nigromaculis, Culiseta inornata, Culex pipiens, Aedes trivittatus, Aedes triseriatus, Anopheles punctipennis and Culex salinarius. Females of the first three species comprised approximately seventy-seven per cent of all specimens examined.

3. Several species, such as C. tarsalis, Aedes dorsalis, C. inornata and A. nigromaculis, which are implicated in the transmission of the virus encephalitides, are present throughout most of the basin. The common malaria mosquito, Anopheles quadrimaculatus, is found in the middle and eastern counties.

4. Species which are severely pestiferous in irrigated areas of the country, such as A. nigromaculis, A. dorsalis, A. vexans, and P. signipennis are widely distributed in the basin but under present conditions do not normally occur in large numbers.

5. Available data, dealing with populations of adult female mosquitoes under present conditions, indicate that in certain localities, during seasons of unusually high precipitation, populations of the three most common species, A. vexans, C. tarsalis and P. signipennis, may be sufficiently high to be considered nuisances. However, high populations of these species do not normally persist over long periods of time.

6. Data from detailed studies of mosquito breeding places at four representative localities where irrigation is being developed, indicate that, under present conditions, an extremely small portion of the total surface water present (i.e. stock ponds, ditches, streams, surface pools, etc.) is suitable for mosquito breeding.

7. It is believed that information contained in this report provides a "base line" which may be used, by subsequent investigators, to describe and evaluate changes in the mosquito populations of the basin which may occur following irrigation.

8. Under present conditions of dry-crop farming in the basin the ecology is not generally suitable for high and sustained populations of mosquitoes. It is anticipated that when the lands along the main stem of the Republican River become irrigated, changes favorable to mosquitoes will occur. These changes will increase the mosquito populations and may lead to aggravated health and mosquito abatement problems.

RECOMMENDATIONS

In the interest of public welfare steps should be taken to prevent or minimize mosquito problems which may be associated with the development of irrigation in the Republican River Basin. It has been demonstrated that such problems can be reduced if proper consideration is given to mosquito preventive principles by all agencies concerned (16).

1. It is recommended that local and state health agencies in the basin expand and intensify their programs whereby irrigation construction agencies, irrigation districts and farm groups may receive consultation and guidance in mosquito preventive methods and techniques. It is believed that this can best be done by the assignment of qualified personnel to work closely with these groups.

2. In the absenceof such program activities it is recommended that all agencies, organizations and individuals engaged in the development or use of irrigation water in the basin take actions to prevent accumulations of residual surface water resulting from irrigation by:

a. Providing adequate drainage systems for the removal of irrigation water which may stand on highway and railroad rights of way, uncultivated farm lands and "unused" land areas.

b. Leveling and grading all lands to be irrigated by gravity systems.

c. Undertaking measures to prevent the development of seepage areas.

d. Providing outlets for draining residual water from irrigation distribution or drainage structures.

3. Constructing and operating agencies should give proper attention to the prevention or control of mosquito problems on reservoirs.

GENERAL SECTION

Description of the Basin

The Republican River Drainage Basin, figure 1, covers 24,955 square miles of gently rolling plains lying in the States of Colorado, Kansas and Nebraska. The broad western half of the basin averages about one hundred miles in width, while the eastern half narrows to an average of about thirty miles.

The Republican River is a main tributary of the Kansas River. It originates in the high table lands of northeastern Colorado and flows about 422 miles; northeast across the corner of Kansas, east through southern Nebraska to Nuckolls County, then southeast to its confluence with the Smoky Hill to form the Kansas River at Junction City in east-central Kansas.

Physiography, Soils and Natural Vegetation

All of the basin is within the Great Plains physiographic province, being about equally divided between the Western High Plains and the Eastern Plains Border sections, west and east of Medicine Creek respectively. The Western High Plains section is characterized by Northern Dark Brown soils (silt loam). The Eastern Plains Border section has Northern Chernozem soils, the parent materials being loess-windlaid deposits which are characteristically black or dark greyish brown and friable. The soil development process has been one of calcification. The light, sandy soils are dominant in the western end of the basin, but in the East where increased

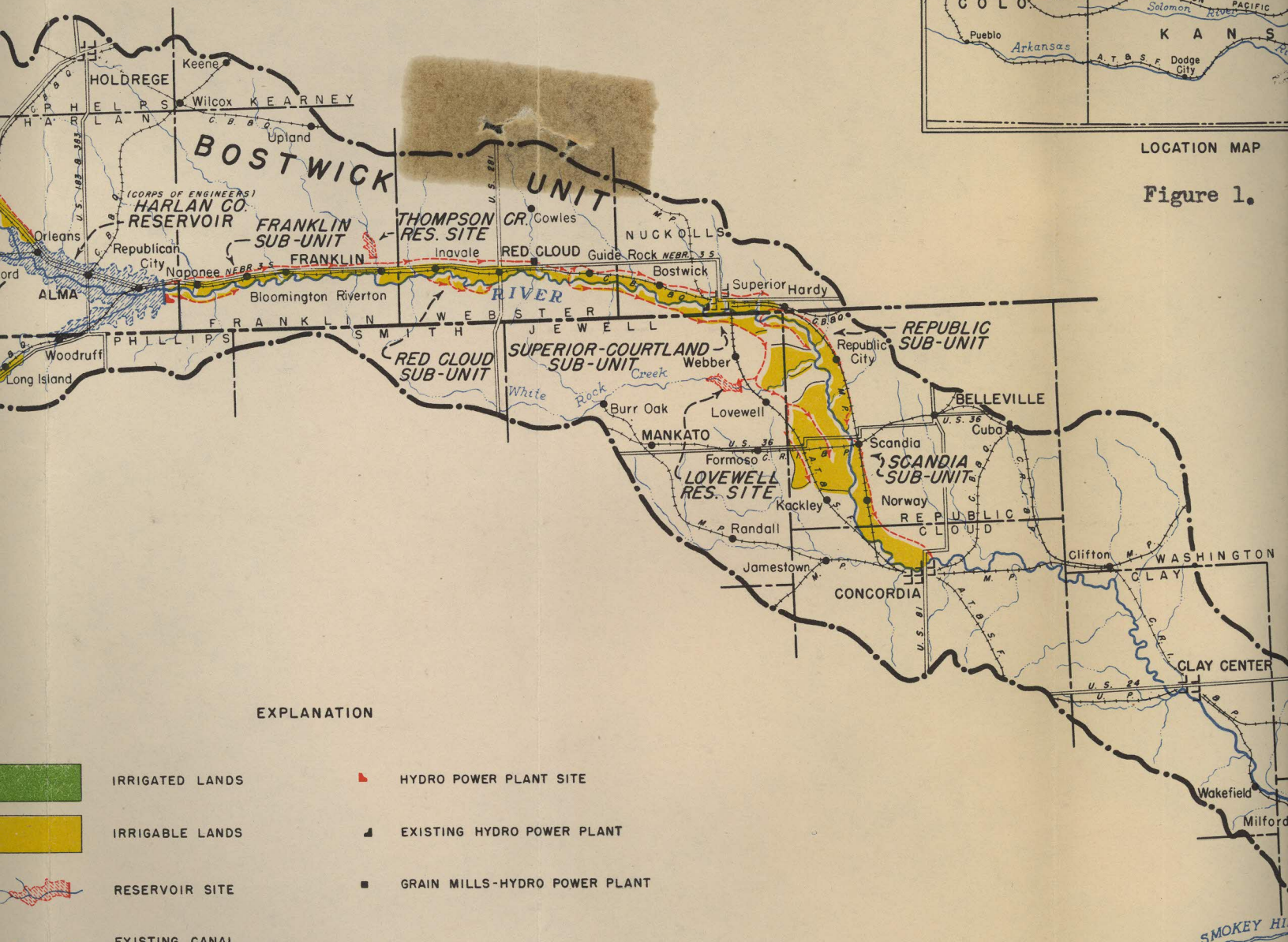

103°
102°
GRANT
Madrid
Wallace
SEDGWICK
PHILLIPS
Venango
Spring Creek
PERKINS
CHASE
Fleming
Haxtun
Amherst
HOLYOKE
Lamar
Frenchman
Stinking Water Creek
FRENC
HAYS CENTER
IMPERIAL
Champion
Enders
Wauneta
Creek
LOGAN
YUMA
NEBRASKA
COLORADO
ENDERS RESERVOIR
DUNDY
WAUNETA SUB-UNIT
Hamlet
Palisade
CULBERTSON RES. SITE
TRENTO
BENKELMAN UNIT
NORTH REPUBLICAN UNIT
ROCK CR. RES. SITE
Stratton
Max
AKRON
U. S. 34
Yuma
C. B. & Q.
WRAY
WRAY RES. SITE
Parks
BENKELMAN
BENKEL
WELLS SUB
HITCHCO
(CORPS OF ENGINEERS)
PIONEER RES. SITE
Haigler
PIONEER UNIT
Republican River
SOUTH FORK WELLS SUB-UNIT
Beecher Island
ATWOOD
ST. FRANCIS UNIT
ST. FRANCIS
Wheeler
U. S. 36
Bird City
Anton
Arikaree
Cope
Creek
Fork
Hale
Beaver
WASHINGTON
LINCOLN
KIT CARSON
South
CHEYENNE
SHERMAN
RAWL
North
BONNY RES. SITE
KANSAS
COLBY
Kanorado
GOODLAND
Genoa
Arriba
Flagler
Seibert
Stratton
BURLINGTON
C. R. I. & P.
U. S. 24
Landsman
103°
102°


101°
100°
GRANT
Madrid
Wallace
Dickens
Wellfleet
PERKINS
CHASE
HAYES
LINCOLN
Maywood
Curtis
Moorefield
FRENCHMAN
CAMBRIDGE UNIT
STOCKVILLE
MEDICINE CR. RES. SITE
IMPERIAL
Champion
Enders
HAYS CENTER
Wauneta
Hamlet
Palisade
St. Ann
RED WILLOW RES. SITE
CAMBRIDGE SUB-UNIT
HOLDREGE
FRONTIER
RED WILLOW
GOSPER
PHELPS
HARLAN
FRENCHMAN SUB-UNIT
WAUNETA SUB-UNIT
McCOOK WELLS SUB-UNIT
INDIANOLA SUB-UNIT
Holbrook
Arapahoe
Edison
Cambridge
Indianola
Oxford
CULBERTSON RES. SITE
McCOOK
REPUBLICAN
BENKELMAN UNIT
TRENTON
Culbertson
Bartley
RED WILLOW SUB-UNIT
BEAVER CITY
Hollinger
Orleans
Republican City
Stratton
Hendley
ROCK CR. RES. SITE
Max
DRIFTWOOD SUB-UNIT
MEEKER SUB-UNIT
Wilsonville
Stamford
BEAVER CITY UNIT
ALMA
Parks
BENKELMAN WELLS SUB-UNIT
BEAVER CITY RES. SITE
Lebanon
Danbury
BENKELMAN
HITCHCOCK
NEBRASKA
DECATUR
NORTON
FURNAS
PHILL
KANSAS
Cedar Bluffs
Woodruff
ALMENA UNIT
Long Island
Herndon
Almena
NORTON RES. SITE
SOUTH FORK WELLS SUB-UNIT
OBERLIN UNIT
Calvert
ATWOOD
OBERLIN
Norcator
NORTON
ST. FRANCIS
Wheeler
OBERLIN RES. SITE
Bird City
Dresden
Jennings
Selden
COLBY
GOODLAND
CHEYENNE
RAWLINS
THOMAS
SHERMAN
IRRIGATED
IRRIGABLE
RESERVOIR
EXISTING
CANAL LOC
DRAINAGE



LOCATION MAP

Figure 1.



EXPLANATION

- IRRIGATED LANDS
- IRRIGABLE LANDS
- RESERVOIR SITE
- EXISTING CANAL
- CANAL LOCATION
- DRAINAGE BASIN BOUNDARY
- HYDRO POWER PLANT SITE
- EXISTING HYDRO POWER PLANT
- GRAIN MILLS-HYDRO POWER PLANT

10 0 10 20 30
SCALE IN MILES

UNI
DEPARTMENT
BUREAU OF R
REPUBLICA
COLORADO -
GENE

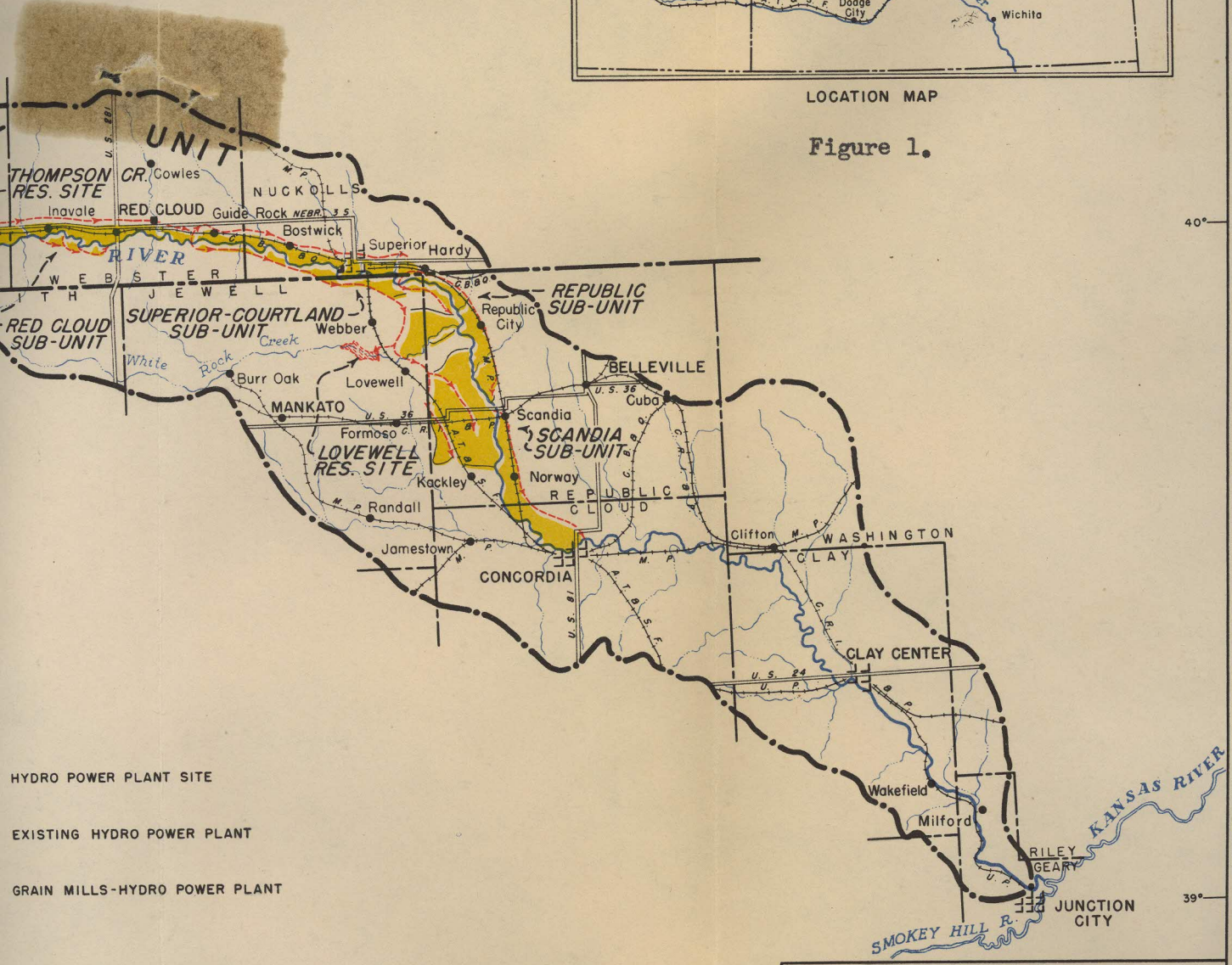
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TRACED: L.C.A. RECOM
CHECKED: N.E.C. APPRO

11.0b-4 INDIANOLA,



LOCATION MAP

Figure 1.



HYDRO POWER PLANT SITE

EXISTING HYDRO POWER PLANT

GRAIN MILLS-HYDRO POWER PLANT

SCALE IN MILES

10 0 10 20 30

98°

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION-REGION 7

REPUBLICAN RIVER BASIN
COLORADO - NEBRASKA - KANSAS

GENERAL MAP

DRAWN: N.E.C.	SUBMITTED: A.W. Redmayne	
TRACED: L.C.A.	RECOMMENDED: W.E. Robinson	
CHECKED: N.E.C.	APPROVED: W.E. Blomgren	
11.0b-4	INDIANOLA, NEBR. OCT. 9, 1947	7-11.0b-1

rainfall has produced more vegetation and humus, the soils are heavier and darker.

The dominant native plants in the Western High Plains section of the basin are wire, grama and buffalo short grasses. The Eastern Plains Border section is characterized by mixed tall and short grasses with big and little bluestem, bunch and needlegrass being the predominant natural vegetation.

Precipitation, Population and Industry

The amount of annual rainfall in the Republican River Basin varies from thirty inches in the East to sixteen inches in the West. This important factor greatly influences the growth of natural vegetation, agriculture and the human populations. There are 103 municipalities in the basin but no large cities. The total population is approximately 80,000, averaging about two individuals per square mile in the semiarid, cattle-producing western area to ten per square mile in the subhumid, grain-producing eastern section.

Agriculture is the principal industry of the basin with corn, wheat, oats and sorghum being the principal crops. Livestock feeding and grazing are important agricultural practices. The productivity of cultivated farms is generally classed as medium to high; and high to very high where irrigation is practiced. It is obvious that the lack of water development, especially in the western part of the basin, has retarded both agricultural and industrial growth and development.

Description of the Water Resources Developments

Extensive water resources development work is in progress along the Republican River and its tributaries. Dams, reservoirs, diversion structures and canals are being constructed for flood control, irrigation and for other multipurposes. Some thirty projects are included in the over-all plan for basin development. To date, most of the construction activity has been confined to the projects shown on table 1. The disastrous Kansas River flood of 1951 may speed the construction of nine other projects proposed under the Pick-Sloan Plan for the basin. These additional reservoirs are the Milford, Lovewell, Norton, Oberlin, Beaver City (Nelson Buck), Red Willow, Rock Creek (Parks), Pioneer and Wray projects.

The Bostwick Division extends from the Harlan County Dam (Nebraska) to Concordia, Kansas. The Harlan County Dam and Reservoir, a Corps of Engineers flood control project, and Lovewell Reservoir will serve as storage reservoirs and provide sufficient water to accomplish the irrigation of about 90,000 acres in the division. This division includes the Scandia and Superior-Courtland Diversion Dams, five main gravity canals, five pumping plants, and a lateral system on either side of the main stem of the Republican River.

The cropland along this portion of the river is highly productive during years of favorable precipitation; however, from the time of the earliest settlement farmers in this area have suffered severe periodic financial losses due to recurrent drought. When the irrigation systems presently planned are built, 90,000 acres should give

Table 1.

Major Projects
in the
Republican River Basin

Project	Status June 30, 1951
Bostwick Division	
Superior-Courtland Diversion Dam and Canal	Completed 1950.
Harlan County Dam	80% complete.
Harlan Reservoir Development	20% complete.
Section of Superior Canal	12.3 miles completed, 1951.
Courtland Canal	14.5 miles, 99% complete.
Section of Superior Canal	7.3 miles, 99% complete.
Section of Superior Canal	27 miles, 13% complete.
Superior Canal Siphon	Completed 1951.
Scandia Diversion Dam	Not yet started.
Milford Dam	Not yet started.
Frenchman-Cambridge Division	
Cambridge Diversion Dam	Completed 1950.
Cambridge Canal	19.2 miles completed.
Enders Dam	Completed 1950.
Enders Reservoir Development	Completed 1951.
Medicine Creek Dam	Completed 1949.
Medicine Cr. Reservoir Devel.	Completed 1950.
Trenton Dam	Started 1950; 18.5% complete.
Trenton Dam Railroad Relocations	75% complete.
Red Willow Creek Diversion Dam	Not yet started.
St. Francis Unit	
Bonny Dam	Completed 1951.
Bonny Reservoir Development	Started 1951.
Pioneer Reservoir	Not yet started.

maximum yield every year.

The Frenchman-Cambridge Division extends from Enders, Nebraska to the Harlan County Reservoir. It includes the Enders, Medicine Creek and Trenton multipurpose dams and storage reservoirs and the Cambridge, Red Willow Creek and Bartley Diversion dams. The latter are necessary to divert irrigation water from the main stem of the Republican River. About two hundred miles of canals are being constructed to convey water to about 52,000 acres of new lands and to about 16,000 additional acres which do not have a full season's supply.

The St. Francis Unit includes the Bonny Dam and plans for canal systems to irrigate from 6,000 to 8,000 acres of new lands in Colorado and Kansas. The dam has been completed but the irrigation development is being delayed until suitable plans for water use can be worked out.

The total extent of land which will eventually be irrigated in the Bostwick and Frenchman-Cambridge divisions, and the St. Francis Unit under the above program of development will approximate 165,000 acres.

Mosquito-borne Diseases

The only mosquito-borne infections of present concern in the basin are those of the virus encephalitides. Western equine encephalomyelitis virus is known to be present in nearly all of the counties of the basin. Historical accounts of equine epizootics date from about 1850 and many residents of the basin still remember the Kansas-Nebraska horse plague of 1912. Table 2 shows the average annual rates for certain counties during the period 1941-1949, inclusive, and the

Table 2

Equine Encephalomyelitis Infections
in Certain
Republican River Basin Counties

State	County	Average Annual Rates* Period 1941-1949 **			Highest Rate for Single Year During 10-Year Period 1940-1949**		
		Less than 1	1-2	Over 2	5 Or More	Less than 5	None
Kansas	Geary	x				x	
	Clay	x				x	
	Cloud	x				x	
	Republic		x			x	
	Jewell		x		x		
	Smith	x				x	
	Phillips	x				x	
	Norton	x				x	
	Decatur	x					x
	Rawlins			x	x		
	Thomas	x				x	
	Cheyenne	x				x	
	Sherman	x				x	
Colo.	Kit Carson	x				x	
	Lincoln	x					x
	Yuma		x			x	
	Phillips	x				x	
Nebr.	Nuckolls	x			x		
	Webster			x	x		
	Franklin	x				x	
	Harlan		x		x		
	Furnas	x				x	
	Gosper	x			x		
	Red Willow			x	x		
	Frontier		x		x		
	Lincoln	x				x	
	Hitchcock	x				x	
	Hayes		x			x	
	Chase		x		x		
	Dundy		x			x	

* Per 1,000 animals
** From B.A.I. Reports

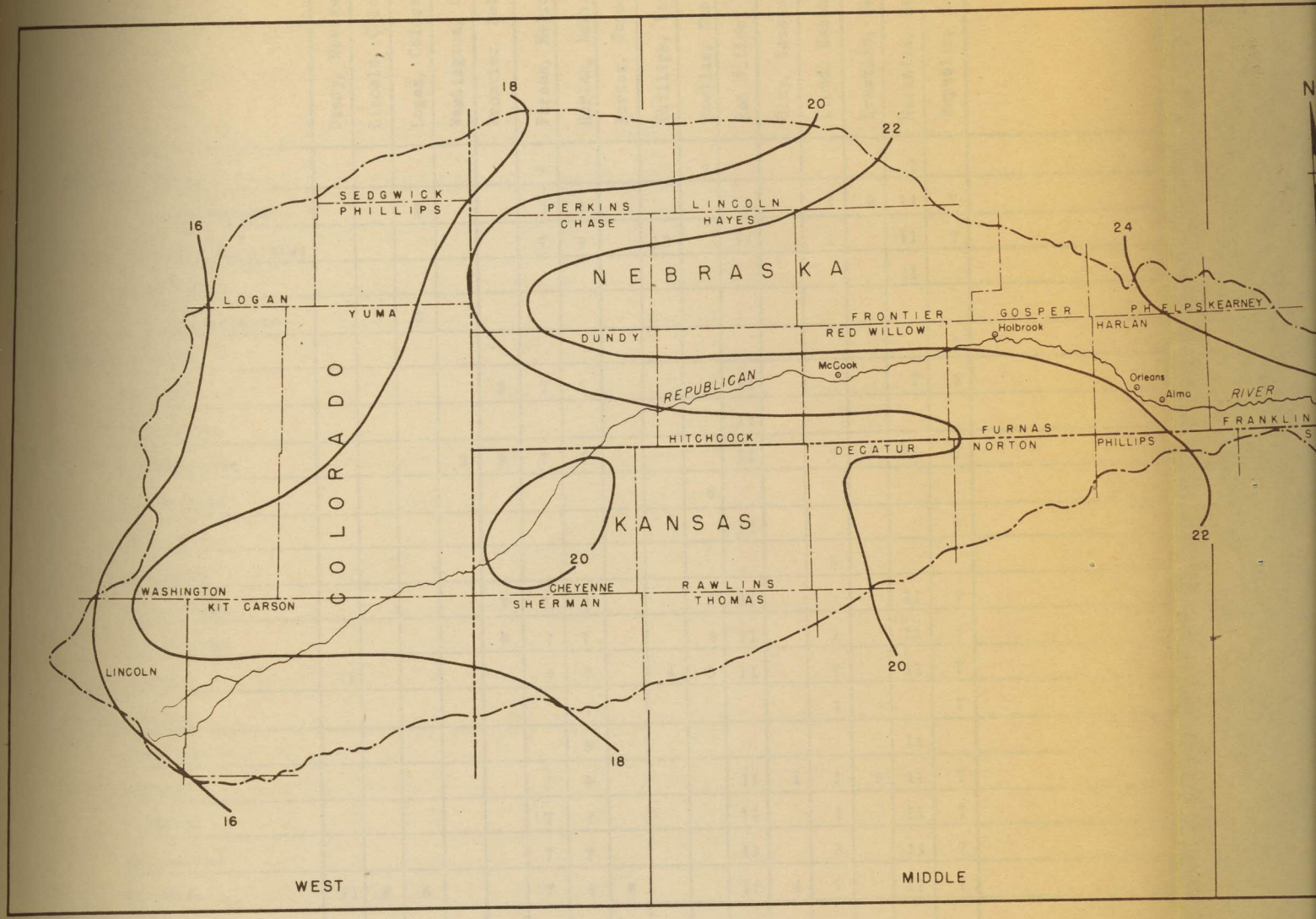
highest rate for a single year during the same period. The virus of this disease is considered to be endemic in the basin and infections have occurred in epizootic proportions in many counties during the past decade. The rate of human infections of the virus encephalitides in the basin is unknown.

DISTRIBUTION AND SEASONAL OCCURRENCE OF MOSQUITOES IN THE REPUBLICAN RIVER BASIN

Mosquitoes have been studied in sixteen counties of the Republican River Basin, namely Clay, Cloud, Norton, Phillips, Republic and Rawlins, Kansas; Dundy, Franklin, Furnas, Frontier, Harlan, Nuckolls, and Red Willow, Nebraska; and Logan, Lincoln and Washington, Colorado. These counties are fairly well distributed throughout the basin; four being in the western, seven in the middle and five in the eastern portions (figure 2). The first mosquitoes from basin counties were reported as early as 1922 but most of the available records were made during the past decade and those obtained specifically for this report were completed in 1949 and 1950.

Table 3 lists the species (thirty-three) which have been found in the western, middle and eastern counties of the basin. Records which were verified by examination of specimens are indicated by a "7". Those which have not been so verified, but which there is no reason to doubt, are indicated by other numbers. References appear in the appendix. Twenty-nine species are reported from eastern counties, twenty-two from middle counties and seven from western counties. Although this might be expected in view of the decrease in annual precipitation from east to west (figure 2), it is believed that more species occur in western counties than are reported. Anopheles punctipennis, Aedes nigromaculis, Aedes vexans, Culex tarsalis and Psorophora ciliipennis are reported from counties in all three sections of the basin and it is likely that other species, such as Aedes dorsalis, Aedes triseriatus,

AVERAGE ANNUAL PRECIPITATION (INCHES) IN THE REPUBL

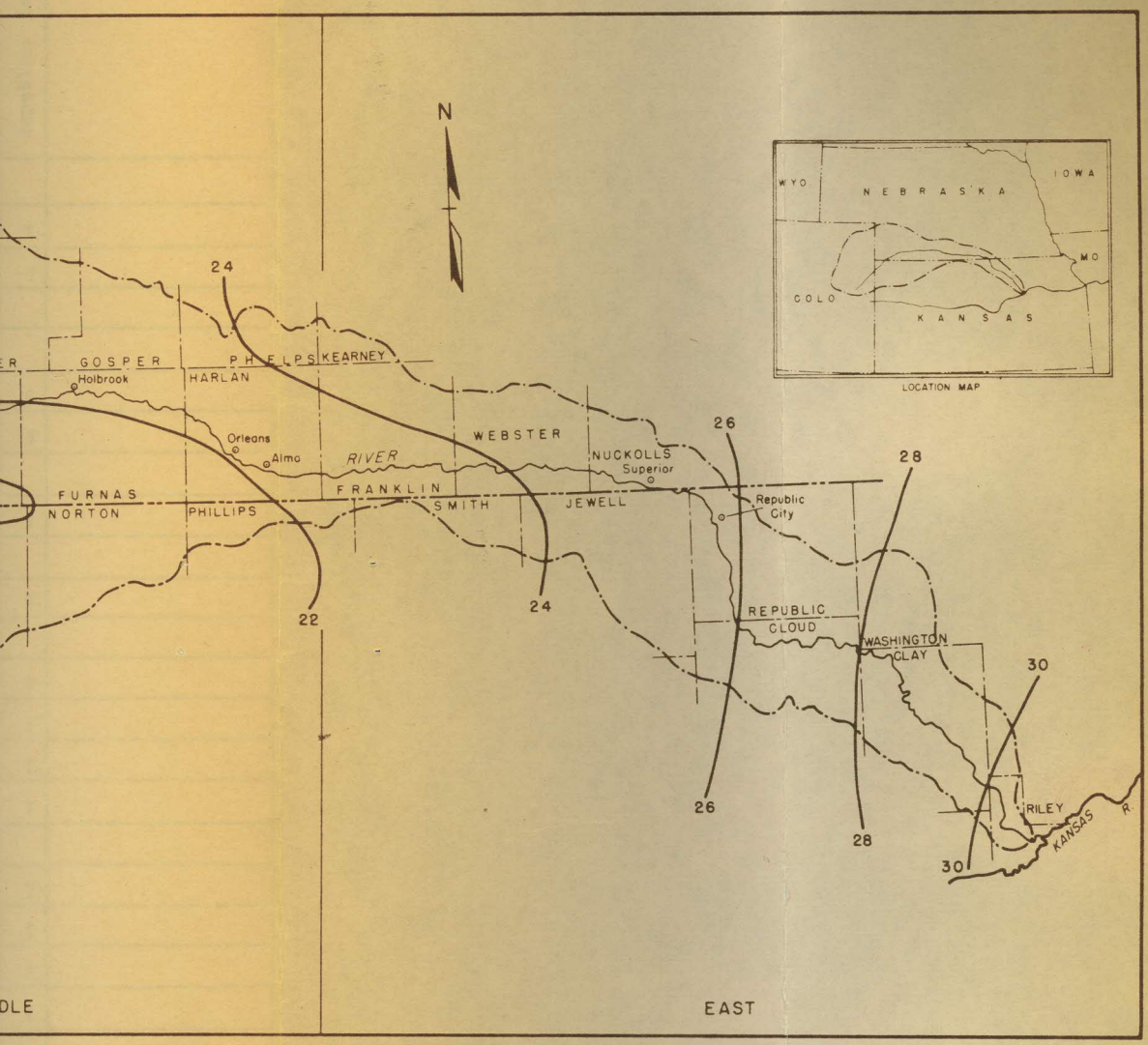


10 0 10 20 30
SCALE IN MILES

FSA - PHS - CDC

Figure 2.

NCHES) IN THE REPUBLICAN RIVER BASIN



10 20 30
CALE IN MILES

ATLANTA, GA. NOV. 1951

Table 3

MOSQUITOES REPORTED FROM WESTERN, MIDDLE AND EASTERN COUNTIES OF THE REPUBLICAN RIVER BASIN*

Species	West				Middle							East					
	Dundy, Nebraska	Lincoln, Colorado	Logan, Colorado	Washington, Colorado	Frontier, Nebraska	Furnas, Nebraska	Harlan, Nebraska	Norton, Kansas	Phillips, Kansas	Rawlins, Kansas	Red Willow, Nebraska	Clay, Kansas	Cloud, Kansas	Franklin, Nebraska	Nuckolls, Nebraska	Republic, Kansas	
Anopheles barberi						7				7					7		
punctipennis			3			7	9				11		1	9	11	7	
quadrimaculatus						7	9		12		11		1		11	7	
walkeri															11		
franciscanus		3	3														
Aedes cinereus																7	
dorsalis					9	7	7				11				7	7	
flavescens											11						
nigromaculis				2	9	7	7				11		7		11	7	
sollicitans										5							
spencerii											11					7	
sticticus													8				
triseriatus					9	7	7			5	11				11	7	
trivittatus					9	7	7			5	11		1		11	7	
vexans	11					7	7		4	5	11		7		11	7	
Culex apicalis							7						1			7	
erraticus							9								11		
pipiens						7	9				11	4	1	9	11	7	
restuans						7	7				11		1		11	7	
salinarius						7	7				11		8		11	7	
tarsalis	11	3	6			7	9	6			11	4	7		11	7	
Culiseta incidens		3															
inornata						7	7				11		1		11	7	
Orthopodomyia sp?															7	7	
Psorophora ciliata						7	7								11	7	
confinnis						7									7	7	
cyanescens															7		
discolor															7	7	
ferox					9	7										7	
horrida													11		7		
howardii															7		
signipennis	11					7	7				11				11	7	
Uranotaenia sapphirina															11	7	

*Numbers refer to references cited.

Aedes trivittatus, Culiseta inornata, and possibly others, are equally widespread. The distribution of certain species, such as, Aedes cinereus, Aedes sollicitans, Aedes sticticus, Culiseta incidens, Psorophora cyanescens, and Psorophora howardii is apparently quite restricted. Anopheles franciscanus and Culiseta incidens are reported only from western counties and Anopheles walkeri, Aedes sticticus, A. cinereus, P. cyanescens, P. discolor, P. horrida, P. howardii, Orthopodomyia sp. Uranotaenia sapphirina were found only in eastern counties. The occurrence of various species in the basin conforms rather well with the generally accepted distributional patterns of the species.

As indicated in table 4, most of the species occur throughout the summer months. Those such as Culiseta incidens and Orthopodomyia sp. were collected only in the late summer, while adults of others, as Aedes flavescens and Aedes spencerii, were found in July or the first part of August. Depending on the local conditions, increases in the populations of various species may occur at any time during the summer. Such increases were observed during each of the summer months except May but appear to occur more frequently in August. Seasonal summaries of various species (females) taken in light trap samples from six localities are included in the appendix.

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Table 4

Seasonal Occurrence of Mosquito Species
May through October in the
Republican River Basin*

X = Species Collected XH = Population increases observed

Species	Month May	June	July	Aug	Sept	Oct
A. barberi	X	X	X	X		X
punctipennis	X	X	X	XH	X	X
quadrimaculatus			X	X	X	X
walkeri					X	
franciscanus					X	
A. cinereus			X		X	
dorsalis		X	X	X	X	X
flavescens			X	X		
nigromaculis	X	XH	X	X	X	X
sollicitans				X		
spencerii			X	X		
sticticus	X					
triseriatus		X	X	XH	X	X
trivittatus	X	X	X	XH	XH	X
vexans	X	XH	XH	XH	XH	XH
C. apicalis			X	X	X	
erraticus		X	X	X	X	X
pipiens	X	X	X	X	X	XH
restuans		X	X	X	X	
salinarius	X	X	X	X	X	X
tarsalis	X	XH	X	XH	XH	XH
C. incidens					X	
inornata	X	X	X	X	X	XH
Orthopodomyia				X	X	
P. ciliata		X	X	X	X	X
confinnis		X			X	
cyanescens				X		
discolor			X	X		
ferox			X	X		
horrida			X			
howardii				X		
signipennis	X	X	XH	XH	XH	X
U. sapphirina			X	X	X	X

* Adult and larval records

ADULT MOSQUITO POPULATIONS

Data on adult mosquito populations which occur in the basin are available from six localities along the main stem of the Republican River where irrigation is being developed. These data are from samples collected in nine light traps (table 5). Although it is generally recognized that mosquito traps cannot be relied upon to give actual censuses of the adult populations, they do provide indexes to population fluctuations during the times they are operated in a particular locality.

Table 5

Mosquito Light Trap Samples
Collected in the
Republican River Basin

City and State	Year	Reference Number	Number Nights Samples Taken	Season	Number Females Collected
Republic, Kans.	1949	7	147	May-Oct	7,849
Holbrook, Nebr.	1949	7	160	May-Oct	10,604
Holbrook, Nebr.	1950	7	153	May-Sep	4,266
Alma, Nebr.	1950	7	153	May-Sep	469
Orleans, Nebr.	1949	7	101	Jun-Oct	956
Superior, Nebr.	1944	13	22	Jun-Oct	1,658
Superior, Nebr.	1949	7	86	Jun-Oct	2,564
McCook, Nebr.	1942	13	64	Jun-Oct	1,997
McCook, Nebr.	1943	13	24	Jun-Oct	548

Trap samples are available for 910 nights; sixty-four in 1942, twenty-four in 1943, twenty-two in 1944, 494 in 1949 and 306 in 1950. Approximately thirty thousand female mosquitoes representing twenty-eight species, were present in all of the samples.

Females of ten species, see Table 6, comprised approximately ninety-eight per cent of all specimens taken. Five species: A. vexans, C. tarsalis, P. signipennis, A. nigromaculis and C. inornata were present in individual samples in numbers which exceeded one hundred. The number of nights such numbers occurred, however, was relatively small. In a large percentage of the samples, females of each of the species numbered less than ten.

Table 6.

Abundance of the More Common Mosquito Species in the Republican River Basin from May to October*

Species	Total Number Collected	Highest Single Catch	Number of Nights When Population Levels (Females) Were:				
			0	<10	10-50	51-99	100+
A. vexans	9,535	233	268	412	195	21	14
C. tarsalis	8,979	428	302	405	167	19	17
P. signipennis	5,337	242	519	285	78	20	8
A. nigromaculis	1,832	138	616	252	38	2	2
C. inornata	1,696	307	701	175	29	3	2
C. pipiens	1,438	47	573	304	33	0	0
A. trivittatus	506	48	832	63	15	0	0
A. triseriatus	440	45	840	57	13	0	0
A. punctipennis	418	25	755	150	5	0	0
C. salinarius	151	8	841	69	0	0	0

* As indicated from nine light traps operated at six localities during 910 nights.

Information on the abundance of all species (females) taken in trap samples is presented in Table 7. These data include not only postiferous species, but also those which rarely, if ever, bite man. It will be noted that seven traps were operated during seasons when rainfall was considerably above normal, one when precipitation was approximately normal and one when the season was unusually dry. It is likely, therefore, that the catches obtained at most of the localities

were somewhat higher than might normally be expected. On approximately forty-six per cent of the nights females in all trap catches were less than ten and on approximately eighty-two per cent they were less than fifty-one. At certain trap locations, however, catches of more than one hundred females were obtained. Such numbers were present in approximately eight per cent of the samples.

Table 7

Abundance of Female Mosquitoes in Samples from Nine Traps Operated at Six Localities

Trap	Year	Number of Trap Nights	Season	Rainfall Departure from Normal	Number of Nights Population Levels (Females) Were:				
					0	<10	10-50	51-99	100+
Republic	1949	147	May-Oct	8.52	3	30	67	22	25
Holbrook	1949	160	May-Oct	2.85	7	30	62	31	30
Holbrook	1950	153	May-Sep	3.52	27	40	64	14	8
Alma	1950	153	May-Sep	-0.63*	58	84	11	0	0
Orleans	1949	101	Jun-Oct	2.41	11	60	29	1	0
Superior	1944	22	Jun-Oct	5.17	0	2	10	4	6
Superior	1949	86	Jun-Oct	2.78	4	13	55	10	4
McCook	1942	64	Jun-Oct	1.59	9	28	24	3	0
McCook	1943	24	Jun-Oct	-4.71	3	12	9	0	0
Totals	xx	910	xx	xx	122	299	331	85	73

* June to September only.

For various reasons it is inadvisable to assign specific nuisance or annoyance values to the light trap catches. However, by comparison with other mosquito population records in irrigated and non-irrigated localities in the midwest, it would appear that the samples reflect low populations (23). During wet seasons populations, which might be considered annoying, may occur for short periods in certain localities, but even so they do not compare in severity with those generally present throughout the year in irrigated areas.

LARVAL BREEDING

In 1949 mosquito breeding studies were made at four selected localities in the basin; Holbrook, Orleans, and Superior, Nebraska; and Republic City, Kansas. Plots, each approximately four square miles in area, and each located in farm lands being developed for irrigation were investigated. Studies, made on a weekly basis, included the estimation of (1) the total area of surface water and (2) the total area breeding mosquitoes on each of the plots. Data were obtained on the precipitation, the average number of larvae per dip and the species found breeding. All surface water bodies (stations) were numbered, described and mapped. See the appendix.

Type and number of surface water bodies

Table 8 shows the number and types of 122 individual water bodies which appeared on the plots during the season, May to October. Ninety-four were temporary and twenty-eight failed to dry up during the study. Nearly fifty per cent of all water bodies were roadside ditches and about thirty per cent were surface pools on farm lands, pastures, or in irrigation canals and drains under construction. A few small stock ponds were present and small streams ran through three of the plots. In general, the surface water bodies on the plots did not exhibit the characteristics generally considered favorable for mosquitoes. A proportionately greater number of permanent water bodies were present on the Republic Plot which was located in the river bottoms where the soil is heavier and more rainfall

occurred. Water bodies on this plot proved to be more suitable for mosquito breeding than those of other plots.

Table 8.

Numbers and Types of Surface Water Bodies
Present on Representative Study Plots
1949

P - Permanent T - Temporary

Types of Surface Water Bodies	Number of Surface Water Bodies								
	Holbrook Plot		Republic Plot		Orleans Plot		Superior Plot		Total
	P	T	P	T	P	T	P	T	
Ponds			2		1		3		6
Roadside Ditches		26	1	6		10		15	58
Sloughs			8			1		3	12
Streams	1				5		2	1	9
Surface Pools		9	3	6			1	3	22
Water in Irrigation Canals*		2							2
Water in Drainage Ditches*	1	12							13
Total all water bodies	51		26		17		28		122
Total Permanent	2		14		6		6		28
Total Temporary		49		12		11		22	94

* Under Construction

Precipitation

The daily rainfall at each of the plots is shown in Figures 3 to 6(A). The departures from normal for the period May through October were as follows: Holbrook, +2.85 inches; Orleans, +2.41 inches; Superior

+2.78 inches; and Republic, +8.52 inches. At each of the plots, more than normal amounts of rain fell during nearly all months while investigations were in progress. These conditions are usually favorable for increased mosquito breeding.

Water Areas and Breeding Areas

During each weekly inspection the size of individual surface water bodies was estimated and, by sample dipping, the area breeding mosquitoes was calculated. The total water area and the actual breeding area on the plots at the time of each inspection is shown on Figures 3 to 6.

On the Holbrook Plot, Figure 3(B), from 1.5 to nearly 2.5 acres of surface water were present during inspections in June and again in August, however areas actually found breeding never totaled more than about 0.25 acres. Practically no surface water bodies contained larvae after the third week of July.

At Orleans, Figure 4(B), about 2.5 acres of surface water were present each week during June and July and about 1.5 acres during the remaining weeks of the season. The actual breeding area totaled approximately 0.5 acres during each of the last three weeks in June and the second week of July. Relatively few water bodies bred larvae after July 13.

Surface water bodies on the Republic Plot, Figure 5(B), were considerably more favorable for mosquito breeding than those on other plots. About five acres were present during each of ten weekly inspections and the minimum area present was never less than one acre.

Nearly all water bodies bred mosquitoes during May and June; breeding was lighter in July; but again in certain weeks of August and September over two acres were found breeding. Water and mosquito breeding conditions on the plot consistently reflected the unusual amount of rainfall which occurred.

Sizable acreages of surface water occurred during the season on the Superior Plot, figure 6 (B). Seven to ten acres were present during each week from June 23 to July 11 and from August 29 to October 13. A minimum of about four acres occurred during the week of July 8. A relatively small proportion of the surface water area present during any week bred mosquitoes. The maximum area breeding at the time of any inspection was about one acre. This amount occurred during the weeks of June 27, July 5, September 8 and September 12. Very few water bodies bred mosquito larvae during the weeks from July 11 to August 17.

Considering all the plots, the area of surface water present during inspections varied from a trace at Holbrook to about ten acres at Superior. However, relatively small percentages of the total surface water areas found on the various plots each week bred mosquitoes. At Holbrook, Orleans, and Superior no larvae at all were found during several weekly inspections. At Republic, larvae were found on the plot each week and during May and June most of the water bodies were breeding mosquitoes. The largest area breeding mosquitoes during any week totaled about five acres at Republic on June 24. It would appear that most of the surface water on the plots studied was not suitable for mosquito breeding.

Numbers of Larvae in Dipping Samples

Mosquito breeding on the plots was determined by dipping with a common four-inch, white-enameled dipper. Consistent efforts were made to dip along the edges and through the center of all water bodies. The average number of larvae per dip for the total area found breeding on each of the plots each week was calculated (table 31 of the appendix). This is shown in figures 3 to 6C. Large numbers of larvae were never found in any of the surface water bodies on the plots. During fifty-six weekly inspections on all the plots when mosquito breeding was found, an average number of larvae per dip of less than five occurred during forty-nine weeks; an average of five to ten during six weeks; and an average of over ten occurred only one week.

Species Found in Dipping Samples

Where present, samples of fourth-stage mosquito larvae were collected during weekly inspections of each water body on the plots. These were identified during the winter months. Figures 3 to 6D show the most common species of larvae taken in the weekly samples from each of the plots. The species common to all the plots were C. tarsalis, P. signipennis, A. vexans, A. punctipennis and C. restuans.

Breeding Indexes

For the purpose of facilitating easy comparisons with studies of these plots which may be undertaken in the future, hypothetical "breeding indexes" are given for each plot, figures 3 to 6E. "Breeding indexes" for each week were calculated by multiplying the average number of larvae per dip by the actual breeding area. The indexes were higher on all plots in June but only Republic and Superior had conspicuous increases in the weekly indexes in September also.

Figure 3.

HOLBROOK PLOT
1949

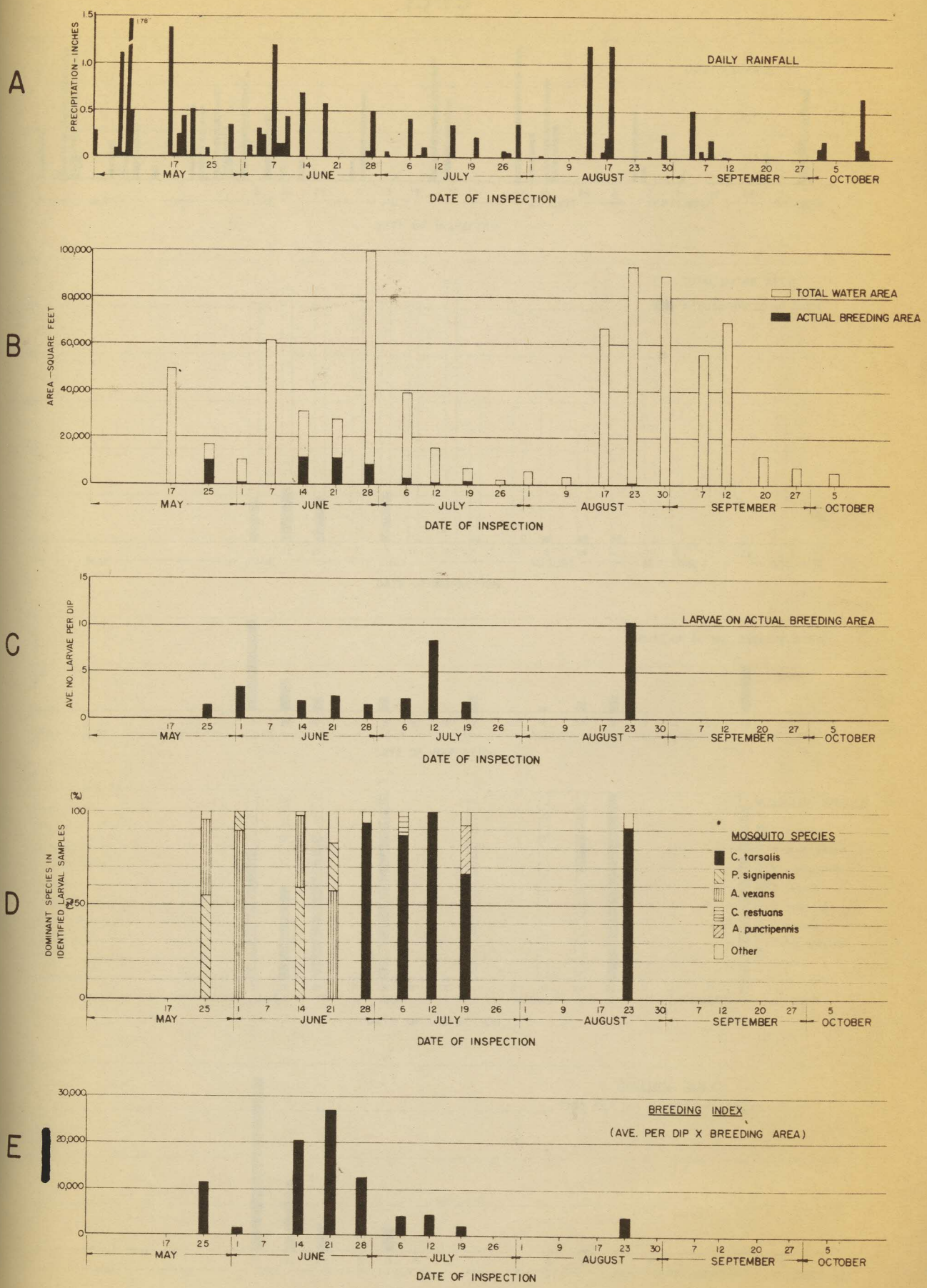
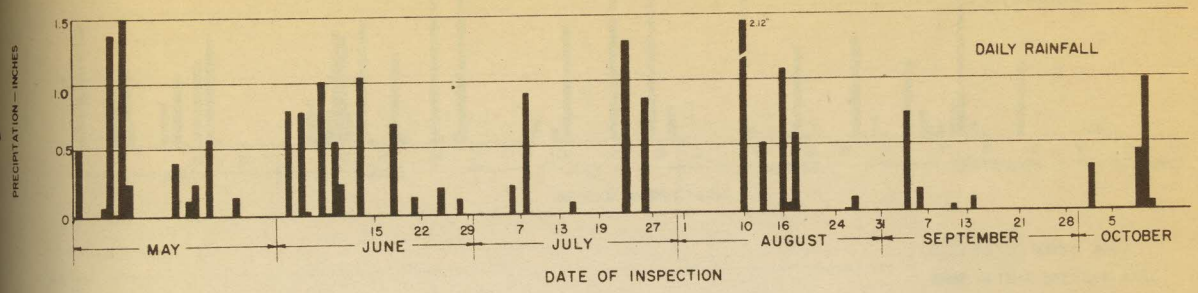
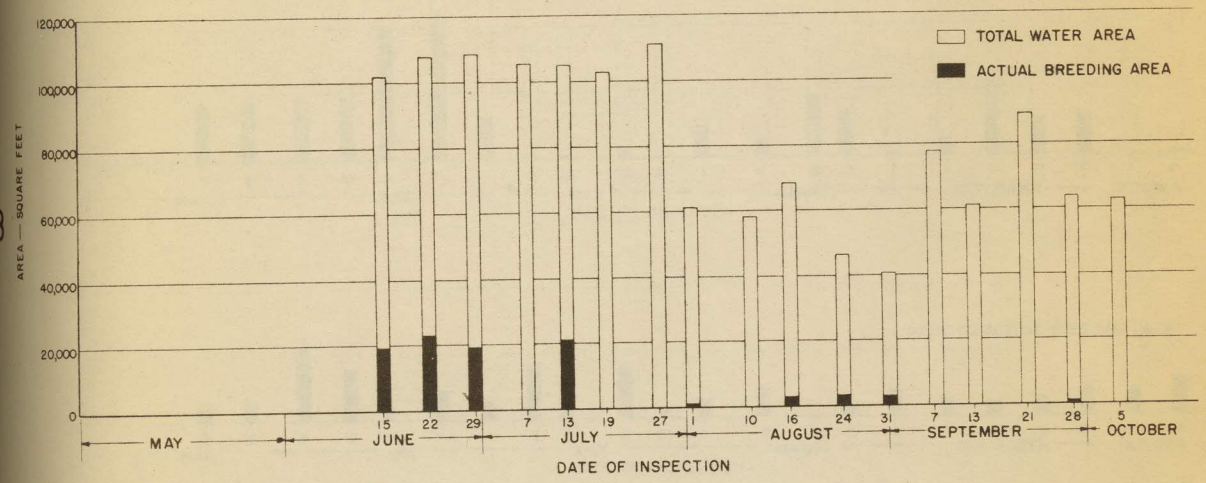
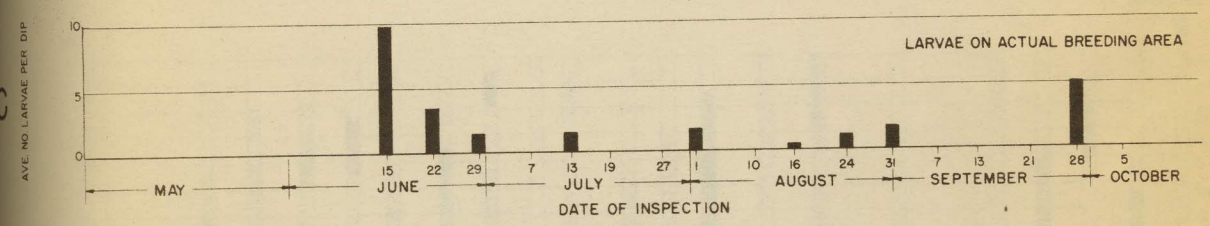


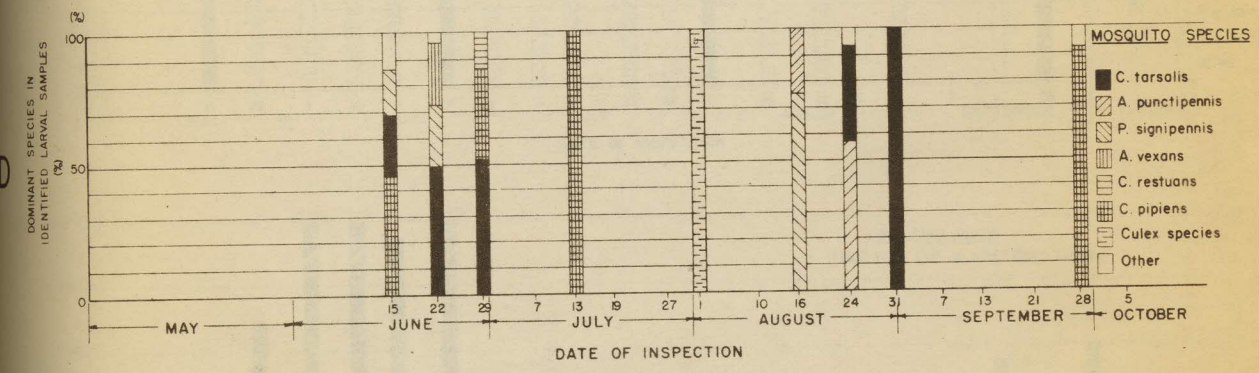
Figure 4.

ORLEANS PLOT
1949









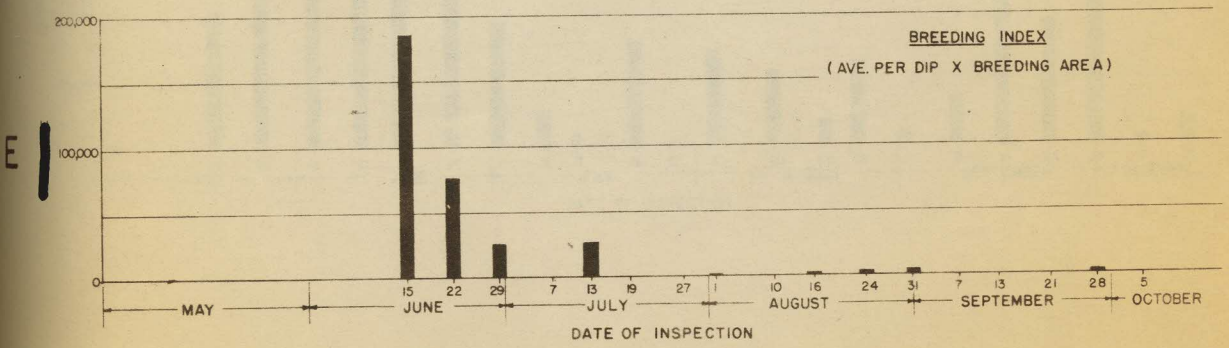


Figure 5.

REPUBLIC PLOT
1949

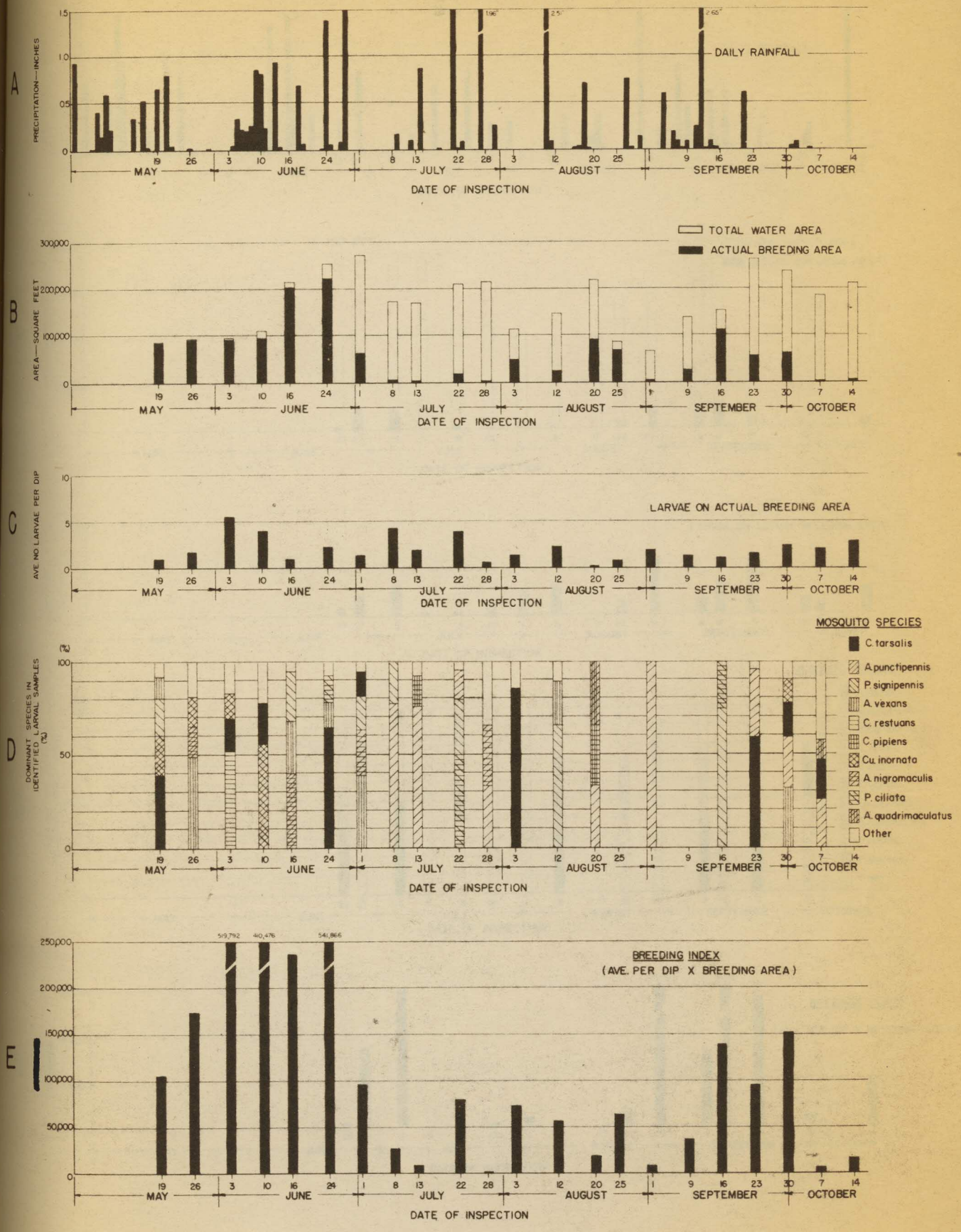
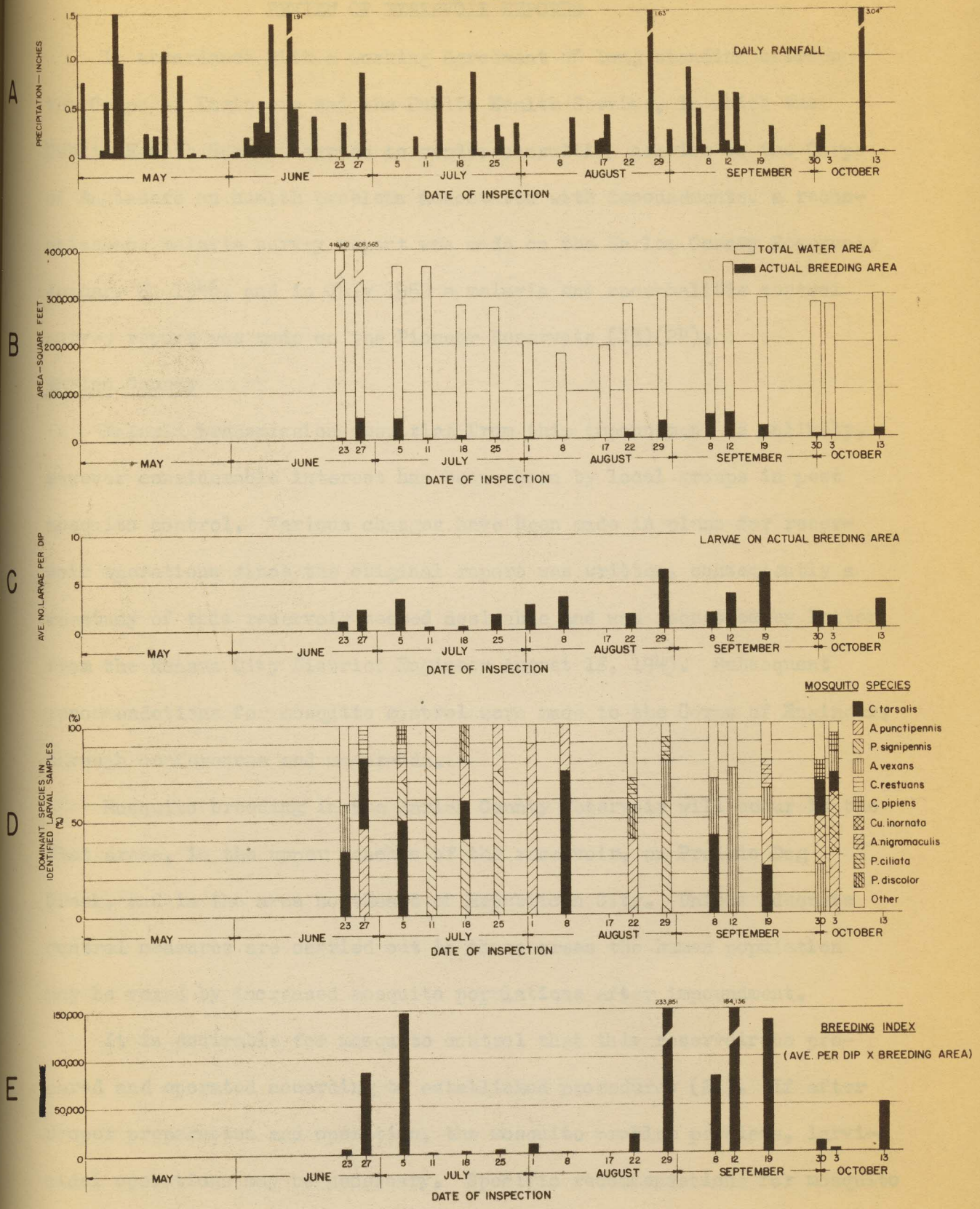


Figure 6.

SUPERIOR PLOT
1949



REVIEW OF RESERVOIR REPORTS

In accordance with a working agreement of long standing between the Corps of Engineers and the Public Health Service, in which the Public Health Service agreed to render consulting service to the Corps of Engineers on health problems associated with impoundments, a reconnaissance malaria survey report was made on the Harlan County Reservoir January 8, 1946, and in July 1950 a malaria and encephalitis control survey report was made on the Pioneer Reservoir (13)(24).

Harlan County

Malaria transmission resulting from this impoundment is unlikely, however considerable interest has been shown by local groups in pest mosquito control. Various changes have been made in plans for reservoir operations since the original report was written, consequently a re-study of this reservoir seemed desirable and was requested by letter from the Kansas City District Engineer August 18, 1949. Subsequent recommendations for mosquito control were made to the Corps of Engineers through conferences and memoranda.

Mosquito breeding in the Harlan County Reservoir will occur in the flat areas, in the upper reaches of the reservoir, on Prairie Dog Creek, and in the area northeast of Republican City. Unless adequate control measures are carried out in these areas the human population may be vexed by increased mosquito populations after impoundment.

It is desirable for mosquito control that this reservoir be prepared and operated according to established procedures (21). If after proper preparation and operation, the mosquito problem persists, larvicidal operations may be necessary. Specific recommendations for mosquito

ntrol will be based on conditions that develop after impoundment and
entomological findings of the State Health Department. In 1949 and
50 a light trap was operated to record the mosquito density at
leans and Alma prior to impoundment. The results of these opera-
ons are discussed in the section dealing with adult mosquito
pulations.

oneer Reservoir

Although certain sections of the proposed Pioneer reservoir
oreline would be expected to provide a suitable habitat for mosquito
reeding, the disease hazard is minimized due to the sparse population
the area.

The need and recommendations for mosquito control operations on
is reservoir should be based on careful epidemiological and entomo-
gical findings by the State Health Departments of Colorado, Kansas
d Nebraska.

At conferences in July 1949 between the Director of Region 7,
ureau of Reclamation, and Public Health Service Representative to the
ssouri Basin Inter-agency Committee, it was agreed that the Public
ealth Service would make entomological studies and submit reports on
e Enders and Medicine Creek Reservoirs. The following are summary
atements of the mosquito problems associated with these reservoirs
4) (15).

ders Reservoir

The mosquito breeding problem is located in the upper reaches of
e Enders Reservoir where approximately 300 acres of flat land will be
vered by shallow water. In this area the water surface will be broken

by islands, stumps, and coppice plus terrestrial and aquatic vegetation. Numerous creek runs, sloughs, marshes and depressions occur in the flood-plain area and thus contribute to a favorable environment for mosquito breeding. It was recommended that:

1. All portions of the lake area at normal operating level be cleared of trees and other debris and that coppice and secondary growth within the zone of water level fluctuation be removed.

2. Marginal pools, depressions and sloughs in the zone of water level fluctuation be connected to the main reservoir by appropriate drainage ditches.

3. The water levels be manipulated so as to produce a clean shoreline during the mosquito breeding season.

4. Other appropriate measures be carried out as needed and recommended by the State Health Department, after periodic inspections.

The mosquito breeding condition in the upper reaches of this reservoir is not expected to result in a serious public health hazard unless the rural population is substantially increased or recreational developments are located within flight range of this area. The lower portion of the reservoir where recreational developments are planned will have steep shorelines exposed to wind and wave action and mosquito breeding in the reservoir itself will be insignificant; however, seepage areas may develop below the dam which will require special mosquito control measures since they will be within flight range of the recreational area.

Medicine Creek Reservoir

the mosquito breeding problem in the Medicine Creek Reservoir at

normal pool level consists of approximately two hundred acres in the upper one-third of the impoundage. At the present time the region within mosquito flight range of this area is sparsely populated and a serious public health hazard is not expected to develop.

It is suggested that the recommendations of the State Health Department relative to necessary clearing, drainage, and water level management for mosquito control be followed.

A constant level lateral impoundage, proposed for Lime Creek near the recreational area, may create a mosquito problem. Otherwise, the middle and lower one-third of the reservoir will have a steep shoreline exposed to wind and wave action and will be relatively free of mosquitoes.

Summary

Mosquito breeding in most of the reservoirs in the Republican River Basin is expected to occur on the flat, floodplain, shallow water areas in the upper reaches of the reservoirs where the water surface will be broken by small islands, stumps and vegetation. However, if the reservoirs are prepared and operated according to established procedures for mosquito control, the number of mosquitoes produced will be minimized and subsequent control will depend upon specific findings and recommendations of the state health departments.

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Table 9.

ALMA, NEBRASKA
1950

Mosquito Light Trap Seasonal Summary
(153 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																					
	May				June				July					August				September				
	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30
A. dorsalis																					*	
nigromaculis							*						*	*	2	1	*	*	1	*	*	
trivittatus													*		*			*				
vexans					*	1	*	*	*		*		2	2	2	1	6	8	2	1	1	*
C. erraticus																		*	*		*	
pipiens										*			*	*	*	*	1	1		1	*	
tarsalis					*	*			*	1	*	*	*	1	1	2	4	4	1	1	4	1
C. inornata		*	*		*	*													*	*	1	1
P. signipennis								*				*	*	*	2	1	*		*			
Avg. Per T.N.		*	*		1	1	1	*	1	1	1	*	3	3	7	5	12	13	4	4	7	3

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 10.

HOLBROOK, NEBRASKA
1949

Mosquito Light Trap Seasonal Summary
(160 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																							
	May		June				July					August				Sept.				Oct.				
	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1	8	15	22	29
A. barberi	*	*	2	1	*	1	*																	
punctipennis		4									*		*	*	*	1	*	1		*		*	*	
quadrimaculatus											*							*						
A. nigromaculis					2	62	34	14	3	8	4	1	1	1	11	4	1	1	4	3	0			
triseriatus									*			*		*										
vexans	1	5	16	15	19	34	27	43	12	5	4	2	2	1	34	22	9	8	12	22	15	3	4	
C. apicalis																		*						
pipiens				2	4	2	2	1	1	1	1	*	*	*	*		1	1	*				*	
salinarius	1	1	*	*															2	1				
tarsalis	7	3		27	45	64	38	31	9	11	16	20	82	84	56	20	50	35		14	*	*		
C. inornata	3	1		*	*	*	*									*	1	3	2	4	9	11	11	1
P. ciliata					*	*	*		*						*									
confinnis			3		*											*			*					
signipennis		13	29	7	13	47	8	45	30	30	9	5	5	4	111	35	3	3	2	1				
U. sapphirina														*		*		*						
Unidentified									*															
Avg. Per T.N.	12	28	50	52	71	210	109	134	56	56	33	28	91	91	213	82	65	51	22	44	22	14	15	1

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 11.

HOLBROOK, NEBRASKA
1950

Mosquito Light Trap Seasonal Summary
(153 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																				
	May				June				July					August				September			
	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30
A. punctipennis																		*	*		*	
A. dorsalis								*		*	*			*	1	1	1	1				*
nigromaculis				2	1	2	3	2	1		*	*	1	1	8	2	10	2	3	*	1	1
triseriatus															*		*	*				
trivittatus										*					*	*				*		
vexans				2	3	14	6	7	2	3	3	3	5	11	15	4	22	43	18	1	5	11
C. pipiens			*		*			*		*	1	*	1	2	1	1	3	3	1	*	1	*
tarsalis		1	2	3	2	3	2	3	2	8	3	3	6	9	14	8	24	71	11	1	3	3
C. inornata	1	*	*	1	*	*										*		1	*	*	1	1
P. ciliata																	*		*			
ferox														*								
signipennis				*	*	2	1	*	*	1	5	12	3	15	50	29	3	36	21		2	*
C. species										*												
A. species							*															
Avg. Per T.N.	1	2	3	8	6	22	12	13	5	13	13	18	5	38	89	44	64	156	53	4	13	17

* Indicates female mosquitoes collected but average for the week was less than 0.5

McCOOK, NEBRASKA
1942

Mosquito Light Trap Seasonal Summary
(64 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																				
	June				July				August					September				October			
	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13	20	27	4	11	18	25
A. punctipennis																	*				
quadrimaculatus																	*				1
A. dorsalis	*			1	*	2	1						*					*			
flavescens					*	*			1												
nigromaculis	2		1	2	5	16	6	1				1	2		*	1	3	1			
spencerii					*	*	1					*									
triseriatus									*												
trivittatus					*	*	*														
vexans	1		*	2	9	29	9	2	1	1	2	8	1	2	*	21	27	46	21	6	6
C. pipiens			*		*				2	8	3	3	5	8		1	4	6	16	1	
restuans	*		1	*	*																
salinarius											1		*	1			1	3	2	1	
tarsalis	1		1		1	9	7	13	16	13	5	4	11	17	1	3	3	5	3	6	19
P. signipennis					1	2	2		1	*		3	4	2		*	2	1			
C. inornata												*				3	1	4	18	46	307
Specimen damaged			*		*		1										1	1	1	3	
Avg. Per T.N.	5		5	5	16	61	27	16	21	22	11	20	24	29	2	30	43	66	65	61	333

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 13.

McCOOK, NEBRASKA
1943

Mosquito Light Trap Seasonal Summary
(24 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																	
	June		July				August					September				October		
	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	3	10	17
A. dorsalis		1	1	1		2	1											
nigromaculis		18	4	22	2	14	4	2			1							
vexans		3	5	68	8	4	6	1		1	6	2	3		2			2
C. salinarius				1			1											
tarsalis	1	3		17	2	4	10	9			16	5	1					1
C. inornata													*		1			
P. signipennis		8	1	1	7	8	1			1	1							
Specimen Damaged		1		3			2	11	2	1	6	3	1		1	1		1
Avg. Per T.N.	1	33	11	111	19	31	23	23	2	3	30	10	5		4	1		4

* Indicates female mosquitoes collected but average for the week was less than 0.5

McCOOK, NEBRASKA
1943

Mosquito Light Trap Seasonal Summary
(24 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																	
	June		July				August					September				October		
	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	3	10	17
A. dorsalis		1	1	1		2	1											
nigromaculis		18	4	22	2	14	4	2			1							
vexans		3	5	68	8	4	6	1		1	6	2	3		2			2
C. salinarius				1			1											
tarsalis	1	3		17	2	4	10	9			16	5	1					1
C. inornata													*		1			
P. signipennis		8	1	1	7	8	1			1	1							
Specimen Damaged		1		3			2	11	2	1	6	3	1		1	1		1
Avg. Per T.N.	1	33	11	111	19	31	23	23	2	3	30	10	5		4	1		4

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 14.

ORLEANS, NEBRASKA
1949

Mosquito Light Trap Seasonal Summary
(101 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																	
	June			July					August				Sept.				Oct.	
	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1	8
A. punctipennis		*			*						1	*	1	*		*		
earlei													*					
A. nigromaculis		1	*	1			1	1	2		*	*		*	*	1		
triseriatus											*		*					
vexans	2	5	4	5	3		1	3	4	2	3	2	2	*	2	7	40	17
C. apicalis		*											*					
erraticus	1	3																
pipiens		*	*	1	1		*	1	*	1	2	1	*	1	*	*		1
restuans									1									
salinarius			*						*									
tarsalis	6	11	10	6	1		1	2	4	1	3	2	3	2	1	1	1	*
C inornata	1	*	*														2	3
P. ciliata									*				*	*				
signipennis		*	*	*			*	1	7	2	2	4	1		*	*	2	
Avg. Per T.N.	11	20	16	12	5		3	7	18	6	10	9	8	3	3	10	45	20

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 15.

REPUBLIC, KANSAS
1949

Mosquito Light Trap Seasonal Summary
(147 Trap Nights)

	Average Number of Females Per Trap Night (7 day period)																						
	May	June				July					August				September				October				
	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1	8	15	22	29
A. barberi													*						*				
punctipennis	*	1	1	1	1	1	1	1	1	1	5	5	2	8	6	1		*	2	*	*	1	1
quadrimaculatus											*		*	*	*		*	*		*	*	*	
A. cinereus								*								1	2						
nigromaculis	*	1		1		1													*				
triseriatus					4	9	1	3	1	2	11	30	3	4	*		*	2	*				
trivittatus	*	2	6	12	7	6	1	3	2	2	2	1		*	*								
vexans	25	63	66	65	44	85	17	11	10	15	19	13	4	10	2	3	1	3	14	22	6	5	*
C. apicalis								*						*	1		*						
pipiens	5	9	13	17	12	19	4	5	4	5	8	10	2	5	1	2	1		1	*		*	*
restuans						*										*		2					
salinarius				*		*	*			*	*			2	1								
tarsalis	4	8	12	43	30	57	9	5	11	8	24	9	6	12	9	5	1	1	1	1	*	*	1
C. inornata	3	2	*	1			*						*		1	2	12	8	9	9	12	29	18
P. ciliata			*	*						1	1	*	*	*					*				
confinnis			*																				
ferox										*	*	*		*									
signipennis	2	11	17	1	1	3	1	3	*	2	6	*	*	3	2								
U. sapphirina								*			1	*	1	3	2	*	*		1	1			
Orthopodomyia sp.														*	*								
Avg. per T. N.	39	98	117	134	100	180	35	32	30	35	77	68	19	49	25	14	16	13	27	33	19	35	20

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 16.

SUPERIOR, NEBRASKA
1944

Mosquito Light Trap Seasonal Summary
(22 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																
	June			July					August				September				Oct.
	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1
A. punctipennis			1	1			1		1	2			1	6		1	1
quadrimaculatus					1						1				1	1	1
walkeri													2	2			
A. nigromaculis			1	4			1				7					1	1
triseriatus				1			1		1								
trivittatus	7		3	13	3	2			1	2	33			3	31	25	7
vexans	34		43	47	23	12	2		2	18			7	34	55	133	48
C. erraticus	1			1	1		1							1			1
salinarius	2		12	3			1				2			2	1	1	2
tarsalis	1			9	2	6	2		7	7	8		3	36	1	1	
C. species						1			1		1			1	2	2	2
P. ciliata			9	1			1							2	1		1
signipennis	6		30	7	4	5	6		55	13	1			10	9	2	
C. inornata													4	1	3	1	1
U. sapphirina				2	1	4	1		1							1	
Specimen damaged	5		13	3					1	1	1		1			4	1
Avg. Per T.N.	56		111	89	35	30	15		87	43	53		18	98	103	171	63

Table 17.

SUPERIOR, NEBRASKA
1949

Mosquito Light Trap Seasonal Summary
(86 trap nights)

Species	Average Number of Females Per Trap Night (7 day period)																
	June	July					August				September			October			
	25	2	9	16	23	30	6	13	20	27	3	17	24	1	8	15	22
A. barberi						*											
punctipennis	*	*	1	2	1	1	3	1	1	3	1		*		*		
quadrimaculatus							*	*		1	1	1					
A. nigromaculis	2	*	1	*	1	1	1			4	*		*				
triseriatus									*		*						
vexans	20	18	11	8	8	6	7	10	2	5	3	3	*	15	14	3	7
C. pipiens			3	3	3	2	5	4	2	4	1					1	
restuans											*						
salinarius				*	1	1	3	1	2	1	*						
tarsalis	18	22	5	2	11	5	9	6	14	17	3	21	*			2	
C. inornata			*					1			*	4	9	2	15	33	4
P. ciliata	3	1		*		*	1	*	*	3	1		*	*			
confinnis								*									
cyanescens										*							
horrida			*														
howardii										*							
signipennis	7	2	3	4	4	9	10	3	2	32	5				1		
U. sapphirina	*									*							
Orthopodomyia sp.									*								
Avg. Per T.N.	50	43	23	20	29	24	38	25	23	69	14	29	11	18	30	38	10

* Indicates female mosquitoes collected but average for the week was less than 0.5

Table 18.

ALMA, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 153 Collector George G. Keener Year 1950 Period Covered May 1 - September 30

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only											
			% of Seasons	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female	Tot.	0	-10	10-20	51-99	100+	No.	Date	No.	Date	
A. vexans	141	181	39	93	57	3			27	8/26	8	9/2	1
C. tarsalis	83	154	33	103	50				9	8/26	4	9/2	1
A. nigromaculis	32	39	8	135	18				7	9/3	2	8/12	*
C. inornata	4	29	6	134	19				4	9/22	1	9/23	*
C. pipiens	18	28	6	131	22				3	8/27	1	8/26	*
P. signipennis	2	27	6	135	18				4	8/7	2	8/12	*
A. trivittatus	0	5	1	148	5				1	8/10	*	8/12	*
C. erraticus	10	5	1	149	4				2	9/8	*	9/9	*
A. dorsalis	0	1	*	152	1				1	9/21	*	9/23	*
A. punctor	3	0	-										-
TOTAL	293	469	100 ±										3

* Average less than 0.5

Table 19.

HOLBROOK, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 160 Collector George G. Keener Year 1949 Period Covered May 17 - October 28

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only										
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100+	No.	Date	No.	Date	
C. tarsalis	824	4184	39	41	44	53	9	13	428	8/13	84	8/20	26
P. signipennis	410	2702	25	58	50	35	12	5	242	8/24	111	8/27	17
A. vexans	1295	2121	20	28	76	50	3	3	167	7/6	43	7/9	13
A. nigromaculis	148	1069	10	75	60	21	2	2	138	6/22	62	6/25	7
C. inornata	10	290	3	111	41	8			34	10/17	11	10/22	2
C. pipiens	2	114	1	109	51				9	6/13	4	6/18	*
A. punctipennis	2	44	*	144	15	1			25	5/26	4	5/28	*
A. barberi	0	27	*	149	11				7	6/22	2	6/4	*
C. salinarius	1	18	*	152	8				4	5/25	1	5/28	*
P. confinnis	0	18	*	151	9				5	6/3	3	6/4	*
P. ciliata	0	6	*	154	6				1	6/22	*	6/25	*
A. triseriatus	0	3	*	157	3				1	8/14	*	8/20	*
U. sapphirina	1	3	*	157	3				1	9/1	*	9/3	*
A. quadrimaculatus	0	2	*	158	2				1	9/11	*	9/17	*
Unidentified	0	2	*	159	1				2	7/19	*	7/23	*
C. apicalis	0	1	*	159	1				1	9/17	*	9/17	*
TOTAL	2693	10,604	100 ±										66

* Average less than 0.5

Table 20.

HOLBROOK, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 153 Collector George G. Keener Year 1950 Period Covered May 1 - September 30

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only										
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100 +	No.	Date	No.	Date	
C. tarsalis	197	1272	30	41	79	28	4	1	118	8/29	71	9/2	8
P. signipennis	26	60	30	79	49	19	3	3	155	8/10	50	8/12	8
A. vexans	923	1251	29	53	65	32	2	1	120	9/2	43	9/2	8
A. nigromaculis	79	279	7	83	63	7			27	8/10	10	8/26	2
C. pipiens	22	106	2	101	51	1			10	7/30	3	8/26	1
C. inornata	2	41	1	130	23				5	9/27	1	9/30	*
A. dorsalis	1	34	1	135	18				6	8/10	1	8/26	*
A. triseriatus	1	6	*	148	5				2	8/9	*	8/12	*
A. trivittatus	0	5	*	148	5				1	7/7	*	7/8	*
A. punctipennis	4	4	*	150	3				2	9/2	*	9/2	*
C. species	0	3	*	152	1				3	7/5	*	7/8	*
P. ciliata	1	2	*	151	2				1	9/3	*	9/9	*
A. species	0	2	*	152	1				2	6/15	*	6/17	*
P. ferox	0	1	*	152	1				1	8/5	*	8/5	*
Unidentified	1	0	--										--
TOTAL	1257	4266	100										28

* Average less than 0.5

Table 21.

McCOOK, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 64 Collector H. Douglas Tate Year 1942 Period Covered June 2 - October 21

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only											
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100+	No.	Date	No.	Date	
A. vexans	258	651	33	15	27	21	1		55	9/28	46	10/4	10
C. inornata	3	480	24	50	8	4	1	1	307	10/21	307	10/25	8
C. tarsalis	162	379	19	13	37	14			33	7/27	19	10/25	6
A. nigromaculis	23	176	9	29	30	5			30	7/9	16	7/12	3
C. pipiens	225	162	8	35	24	5			21	10/9	16	10/11	3
P. signipennis	7	59	3	41	23				6	8/24	4	8/30	1
C. salinarius	20	25	1	55	9				8	9/30	3	10/4	*
Specimen Damaged	8	20	1	50	14				4	10/18	3	10/18	*
A. dorsalis	17	19	1	53	11				4	7/12	2	7/12	*
C. restuans	4	9	*	57	7				3	6/21	1	6/21	*
A. spencerii	2	5	*	60	4				2	7/13	1	7/19	*
A. flavescens	1	4	*	60	4				1	7/29	1	8/2	*
A. trivittatus	0	4	*	61	3				2	7/12	*	7/12	*
A. quadrimaculatus	0	2	*	62	2				1	10/21	1	10/25	*
A. triseriatus	1	1	*	63	1				1	7/27	*	8/2	*
A. punctipennis	0	1	*	63	1				1	9/21	*	9/27	*
TOTAL	731	1997	100 ±										31

* Average less than 0.5

Table 22.

McCOOK, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 24 Collector H. Douglas Tate Year 1943 Period Covered June 17 - October 12

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only										
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-20	51-99	100 —	No.	Date	No.	Date	
A. vexans	63	202	37	6	16	0	2		84	7/5	68	7/11	8
A. nigromaculis	6	123	22	11	9	4			34	6/24	22	7/11	5
C. tarsalis	80	119	22	7	12	5			23	7/5	17	7/11	5
Specimen Damaged	6	47	9	10	13	1			11	8/6	11	8/8	2
P. signipennis	6	44	8	13	10	1			14	7/19	8	7/25	2
A. dorsalis	4	9	2	19	5				4	7/22	2	7/25	*
C. salinarius	0	2	*	22	2				1	7/26	1	8/1	*
C. inornata	0	2	*	22	2				1	9/24	1	9/24	*
C. pipiens	19	0	-										-
TOTAL	184	548	100 ‡										23

* Average less than 0.5

Table 23.

ORLEANS, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 101 Collector George G. Keener Year 1949 Period Covered June 7 - October 4

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only											
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100+	No.	Date	No.	Date	
A. vexans	439	339	35	33	61	7			40	10/1	40	10/1	3
C. tarsalis	216	338	35	32	61	8	1		57	6/18	11	6/18	3
P. signipennis	44	122	13	67	31	3			14	7/31	7	8/6	1
C. pipiens	18	54	6	64	37				5	7/27	2	8/20	1
A. nigromaculis	6	38	4	79	22				4	8/5	2	8/6	*
C. erraticus	1	22	2	95	6				9	6/13	3	6/18	*
A. punctipennis	1	15	2	90	11				5	8/31	1	9/3	*
C. inornata	3	15	2	92	9				3	10/2	3	10/4	*
C. restuans	0	4	*	98	3				2	8/5	1	8/6	*
C. apicalis	0	3	*	98	3				1	8/30	*	9/3	*
A. triseriatus	0	2	*	99	2				1	8/19	*	8/20	*
C. salinarius	0	2	*	99	2				1	8/4	*	8/6	*
A. earlei	0	1	*	100	1				1	8/29	*	9/3	*
P. ciliata	1	1	*	100	1				1	8/31	*	9/3	*
A. barberi	1	0	--										--
TOTAL	730	956	100‡										9

* Average less than 0.5

Table 24.

REPUBLIC, KANSAS

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 147 Collector George G. Keener Year 1949 Period Covered May 23 - October 30

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only											
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100+	No.	Date	No.	Date	
A. vexans	2423	3182	41	25	60	45	8	9	233	6/25	85	7/2	22
C. tarsalis	964	1703	22	42	64	34	4	3	141	6/25	57	7/2	12
C. pipiens	417	803	10	52	69	26			47	6/24	17	6/18	5
C. inornata	75	642	8	80	52	12	2	1	108	10/19	171	10/22	4
A. triseriatus	145	422	5	94	40	13			45	8/11	30	8/13	3
P. signipennis	75	350	4	93	48	5	1		98	6/6	17	6/11	2
A. trivittatus	173	316	4	97	40	10			25	6/24	12	6/18	2
A. punctipennis	133	253	3	70	73	4			12	9/2	8	8/27	2
U. sapphirina	61	60	1	119	28				7	8/29	3	8/27	*
C. salinarius	11	26	*	138	9				8	8/23	2	8/27	*
A. nigromaculis	8	20	*	131	16				3	6/27	1	6/18	*
P. ciliata	1	20	*	131	16				2	8/2	1	8/6	*
A. quadrimaculatus	10	13	*	136	11				2	8/29	*	8/27	*
A. cinereus	0	10	*	143	4				4	9/5	1	9/10	*
C. apicalis	1	9	*	143	4				4	8/29	1	9/3	*
C. restuans	0	6	*	143	4				2	9/22	1	9/24	*
P. ferox	2	5	*	143	4				2	7/31	*	8/6	*
Orthopodomyia Species	8	5	*	142	5				1	8/25	*	8/27	*
A. barberi	14	3	*	144	3				1	9/26	*	10/1	*
P. confinnis	0	1	*	146	1				1	6/6	*	6/11	*
TOTAL	4521	7849	100 ±										53

* Average less than 0.5

Table 25.

SUPERIOR, NEBRASKA

MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 22 Collector H. Douglas Tate Year 1944 Period Covered June 10 - September 29

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only											
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100 +	No.	Date	No.	Date	
A. vexans	364	891	54	1	4	12	4	1	233	9/19	133	9/24	41
P. signipennis	18	258	16	5	10	5	2		71	8/3	55	8/6	12
A. trivittatus	80	176	11	7	10	5			48	9/19	31	9/17	8
C. tarsalis	51	131	8	5	13	4			36	9/4	36	9/10	6
Specimen damaged	18	49	3	11	10	1			26	6/22	13	6/25	2
A. nigromaculis	12	28	2	15	6	1			13	8/16	7	8/20	1
P. ciliata	8	24	1	14	7	1			16	6/22	9	6/25	1
C. salinarius	11	19	1	13	9				5	6/28	3	7/2	1
A. punctipennis	10	18	1	13	9				6	9/4	6	9/10	1
C. species	0	15	1	15	7				4	9/12	2	9/17	1
C. inornata	1	15	1	14	8				5	9/12	4	9/3	1
U. sapphirina	2	13	1	15	7				4	7/13	4	7/16	1
A. quadrimaculatus	3	10	1	15	7				2	9/4	2	9/10	*
C. erraticus	0	6	*	16	6				1	6/10	1	6/11	*
A. triseriatus	16	3	*	19	3				1	7/21	1	7/23	*
A. walkeri	0	2	*	21	1				2	8/31	2	9/3	*
C. pipiens	54	0	-										-
C. restuans	19	0	-										-
A. dorsalis	4	0	-										-
TOTAL	671	1658	100 +										75

* Average less than 0.5

Table 26.

SUPERIOR, NEBRASKA

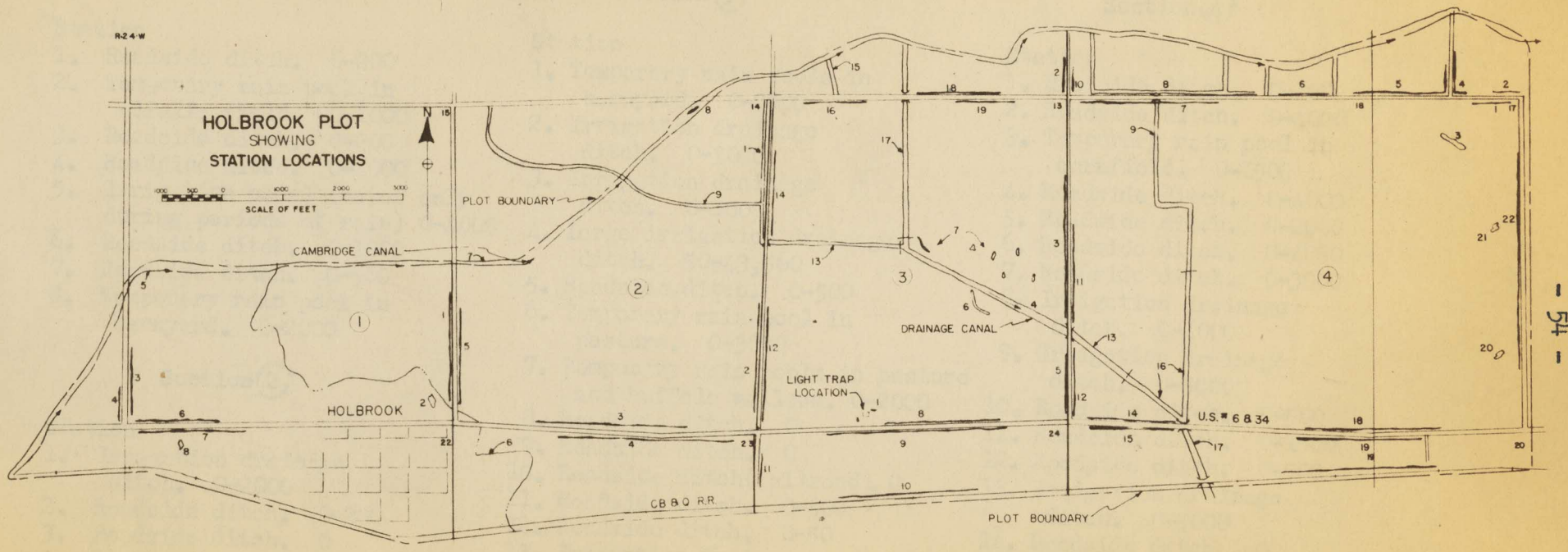
MOSQUITO DENSITY RECORDS

(From Light Trap Catches)

Total No. Trap Nights 86 Collector George G. Keener Year 1949 Period Covered June 21 - October 19

Mosquito Species	Total No. Mosquitoes Collected		Female Mosquitoes Only										
			% of Seasons Tot.	No. Days When Population Levels Were:					Highest Catches				Seasonal Avg. P.T.N.
									Single Nightly		Weekly Average		
	Male	Female		0	-10	10-50	51-99	100 →	No.	Date	No.	Date	
A. vexans	599	717	28	14	46	25	1		51	9/30	20	6/25	8
C. tarsalis	382	699	27	18	46	21	1		79	6/28	22	7/2	8
P. signipennis	134	515	20	27	46	11	2		90	8/23	32	8/27	6
C. inornata	14	182	7	68	13	5			44	9/18	33	10/15	2
C. pipiens	106	171	7	35	50	1			10	8/23	5	8/6	2
A. punctipennis	22	83	3	48	38				7	8/23	3	8/27	1
A. nigromaculis	45	60	2	58	28				8	8/22	4	8/27	1
C. salinarius	21	59	2	56	30				6	8/15	3	8/6	1
P. ciliata	30	56	2	59	27				8	8/25	3	6/25	1
A. quadrimaculatus	1	10	*	79	7				3	8/29	1	9/17	*
A. triseriatus	0	3	*	83	3				1	9/3	*	9/3	*
U. sapphirina	2	2	*	84	2				1	6/22	*	6/25	*
A. barberi	0	1	*	85	1				1	7/24	*	7/30	*
C. restuans	0	1	*	85	1				1	9/3	*	9/3	*
P. howardii	0	1	*	85	1				1	8/22	*	8/27	*
P. horrida	0	1	*	85	1				1	7/8	*	7/9	*
P. confinnis	0	1	*	85	1				1	8/11	*	8/13	*
P. cyanescens	0	1	*	85	1				1	8/22	*	8/27	*
Orthopodomyia Species	0	1	*	85	1				1	8/20	*	8/20	*
TOTAL	1356	2564	100 ‡										30

Figure 7.


R-24-W
HOLBROOK PLOT
SHOWING
STATION LOCATIONS
SCALE OF FEET
PLOT BOUNDARY
CAMBRIDGE CANAL
DRAINAGE CANAL
LIGHT TRAP
LOCATION
HOLBROOK
U.S. # 6 & 34
CB & Q R.R.
PLOT BOUNDARY
1
2
3
4

HOLBROOK PLOT

Number and Types of Stations Inspected Showing the Minimum and Maximum Amount of Surface Water (in Sq. Ft.) for Each During the 1949 Season.

Section (1)

Station

1. Roadside ditch. 0-200
2. Temporary rain pool in alfalfa field. 0-1000
3. Roadside ditch. 0-200
4. Roadside ditch. 0-1000
5. Irrigation canal (water only during periods of rain) 0-4000
6. Roadside ditch. 0-1000
7. Roadside ditch. 0-500
8. Temporary rain pool in barnyard. 0-2000

Section (2)

Station

1. Irrigation drainage ditch. 0-2000
2. Roadside ditch. 0-200
3. Roadside ditch. 0
4. Roadside ditch. 0-50
5. Roadside ditch. 0-500
6. Stream. 200-4000
7. Irrigation canal. 0-4000
8. Temporary rain pool in Kaffir cornfield. 0-5000
9. Irrigation drainage ditch. 0-3000

Section (3)

Station

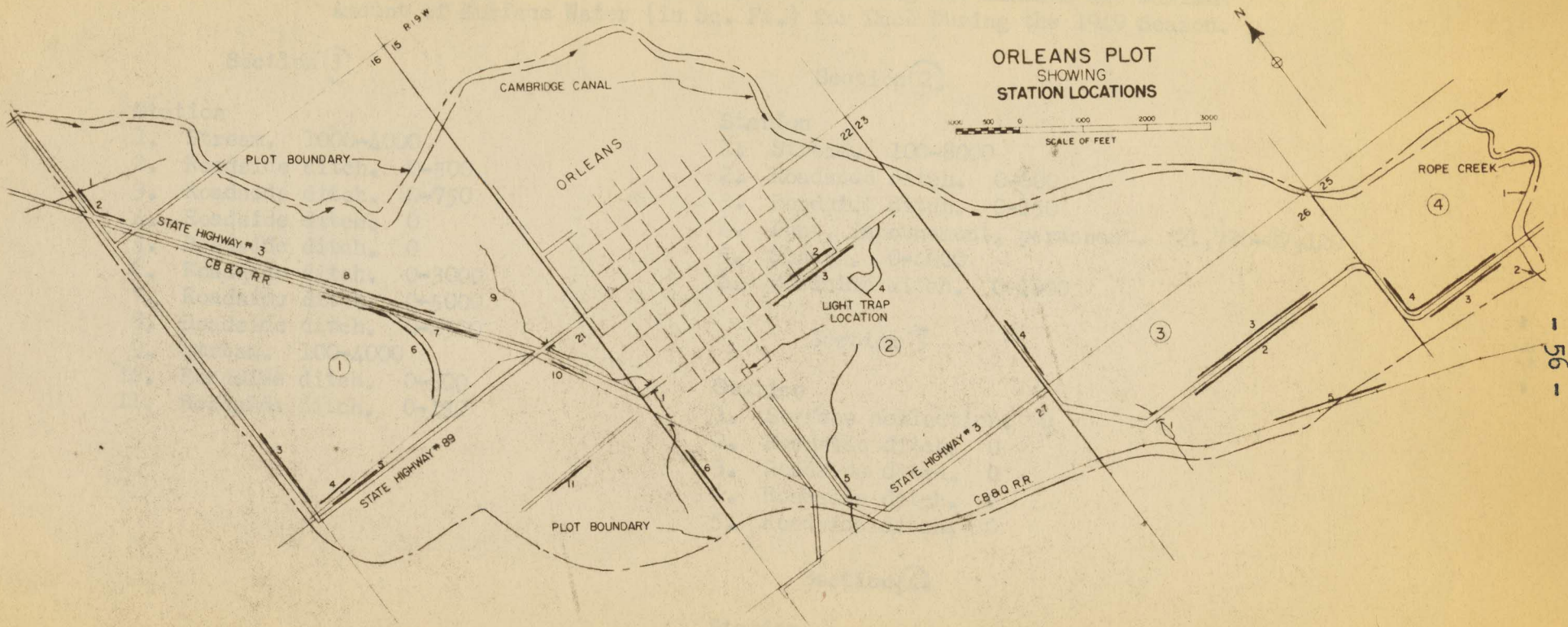
1. Temporary rain pools in barnyard. 0-2500
2. Irrigation drainage ditch. 0-3000
3. Irrigation drainage ditch. 0-1000
4. Large irrigation drainage ditch. 50-43,560
5. Roadside ditch. 0-500
6. Temporary rain pool in pasture. 0-3000
7. Temporary rain pools in pasture and buffalo wallows. 0-2000
8. Roadside ditch. 0
9. Roadside ditch. 0
10. Roadside ditch(railroad). 0
11. Roadside ditch. 0-500
12. Roadside ditch. 0-50
13. Irrigation drainage ditch. 0-5000
14. Roadside ditch. 0
15. Irrigation drainage ditch. 0-2000
16. Roadside ditch. 0-1500
17. Irrig. drainage ditch. 0-5000
18. Roadside ditch. 0-500
19. Roadside ditch. 0-500

Section (4)

Station

1. Roadside ditch. 0-100
2. Roadside ditch. 0-4000
3. Temporary rain pool in cornfield. 0-1500
4. Roadside ditch. 0-4000
5. Roadside ditch. 0-2000
6. Roadside ditch. 0-4000
7. Roadside ditch. 0-3000
8. Irrigation drainage ditch. 0-4000
9. Irrigation drainage ditch. 0-3000
10. Roadside ditch. 0-500
11. Roadside ditch. 0-1500
12. Roadside ditch. 0-500
13. Irrigation drainage ditch. 0-5000
14. Roadside ditch. 0
15. Roadside ditch. 0-10
16. Irrig. dr. ditch. 0-43,560
17. Irrig. dr. ditch. 0-43,560
18. Roadside ditch. 0-500
19. Roadside ditch. 0
20. Temp. rainpool in barnyard. 0-1000
21. Temp. rainpool in pasture. 0-[illegible]0

Figure 8.


ORLEANS PLOT
SHOWING
STATION LOCATIONS
SCALE OF FEET
CAMBRIDGE CANAL
PLOT BOUNDARY
ORLEANS
STATE HIGHWAY # 3
C B & Q R R
STATE HIGHWAY # 89
LIGHT TRAP LOCATION
ROPE CREEK
PLOT BOUNDARY
STATE HIGHWAY # 3
C B & Q R R
1
2
3
4

ORLEANS PLOT

Number and Types of Stations Inspected Showing the Minimum and Maximum Amount of Surface Water (in Sq. Ft.) for Each During the 1949 Season.

Section (1)

Station		
1.	Stream.	1000-4000
2.	Roadside ditch.	0-500
3.	Roadside ditch.	0-750
4.	Roadside ditch.	0
5.	Roadside ditch.	0
6.	Roadside ditch.	0-3000
7.	Roadside ditch.	0-5000
8.	Roadside ditch.	0-2500
9.	Stream.	100-4000
10.	Roadside ditch.	0-300
11.	Roadside ditch.	0-150

Section (2)

Station		
1.	Stream.	100-8000
2.	Roadside ditch.	0-600
3.	Roadside ditch.	0-150
4.	Pond, impoundment, permanent.	21,780-87,120
5.	Slough.	0-4000
6.	Roadside ditch.	0-1000

Section (3)

Station		
1.	Surface collection.	0
2.	Roadside ditch.	0
3.	Roadside ditch.	0
4.	Roadside ditch.	0
5.	Roadside ditch.	0

Section (4)

Station		
1.	Stream.	1000-6000
2.	Stream.	1000-8000
3.	Roadside ditch.	0
4.	Roadside ditch.	0

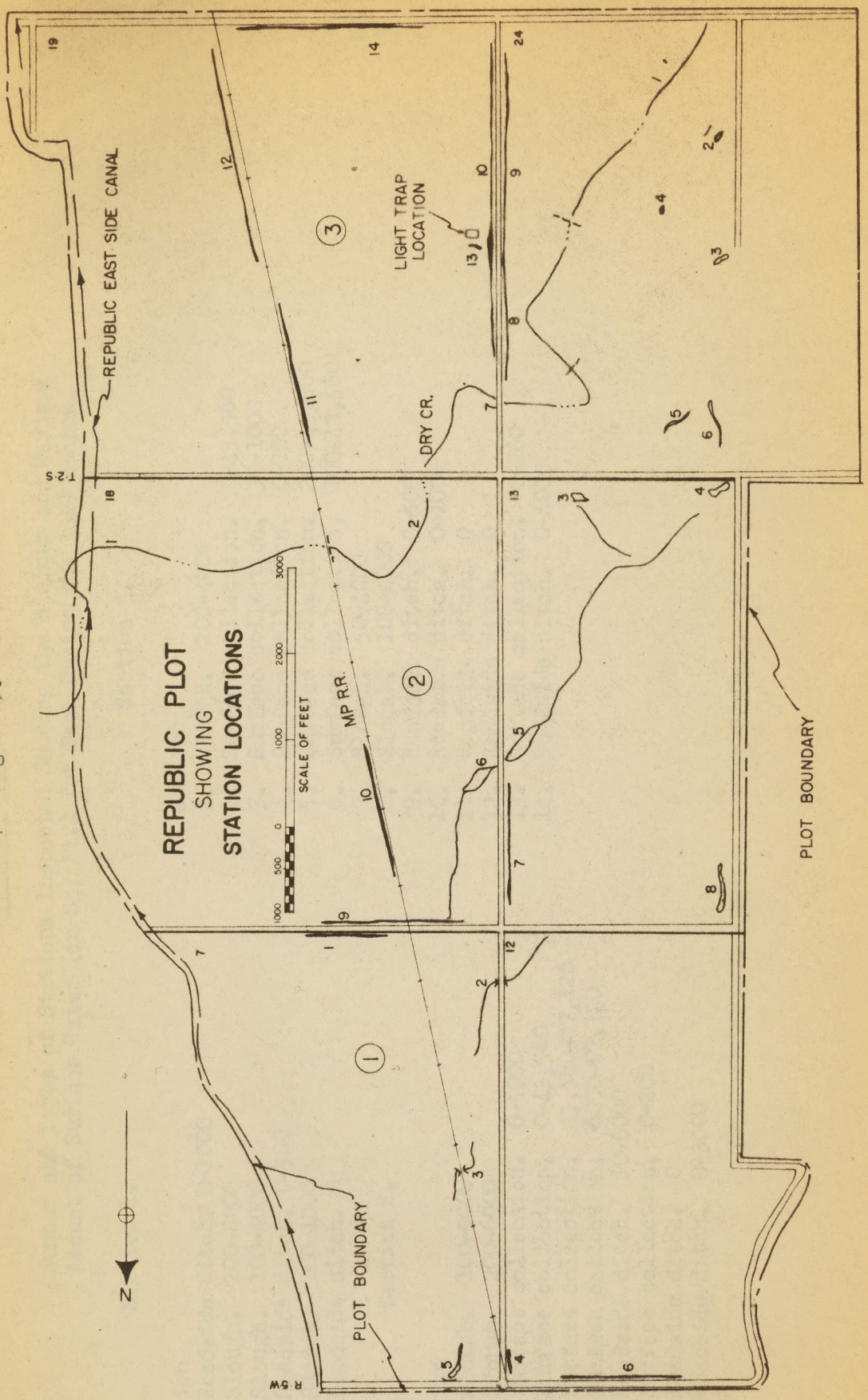

REPUBLIC PLOT
SHOWING
STATION LOCATIONS
REPUBLIC EAST SIDE CANAL
LIGHT TRAP LOCATION
DRY CR.
MP R.R.
SCALE OF FEET
PLOT BOUNDARY
PLOT BOUNDARY
T.2.S
R.5W
N

Figure 9.

REPUBLIC PLOT

Number and Types of Stations Inspected Showing the Minimum and Maximum Amount of Surface Water (in Sq. Ft.) for Each During the 1949 Season.

Section 1.

Station
1. Roadside ditch. 0-1000
2. Slough. 200-8000
3. Slough. 100-4000
4. Roadside ditch. 0-500
5. Slough. 100-1000
6. Roadside ditch. 0

Section 2.

Station
1. Slough. 100-5000
2. Slough. 200-6000
3. Surface collection. 0-5000
4. Surface collection. 0-43,560
5. Surface collection. 43,560-97,120
6. Surface collection. 6000-97,120
7. Roadside ditch. 10-6000
8. Surface collection. 0-200
9. Roadside ditch. 0
10. Roadside ditch. 0-3000

Section 3.

Station
1. Slough. 200-4000
2. Surface collection. 0-43,560
3. Surface collection. 30-1000
4. Surface collection. 0-700
5. Surface collection. 200-43,560
6. Surface collection. 100-43,560
7. Slough. 50-4000
8. Slough. 100-4000
9. Roadside ditch. 0-500
10. Roadside ditch. 0-1000
11. Roadside ditch. 0
12. Roadside ditch. 0
13. Surface collection. 0-200
14. Roadside ditch. 0-4000

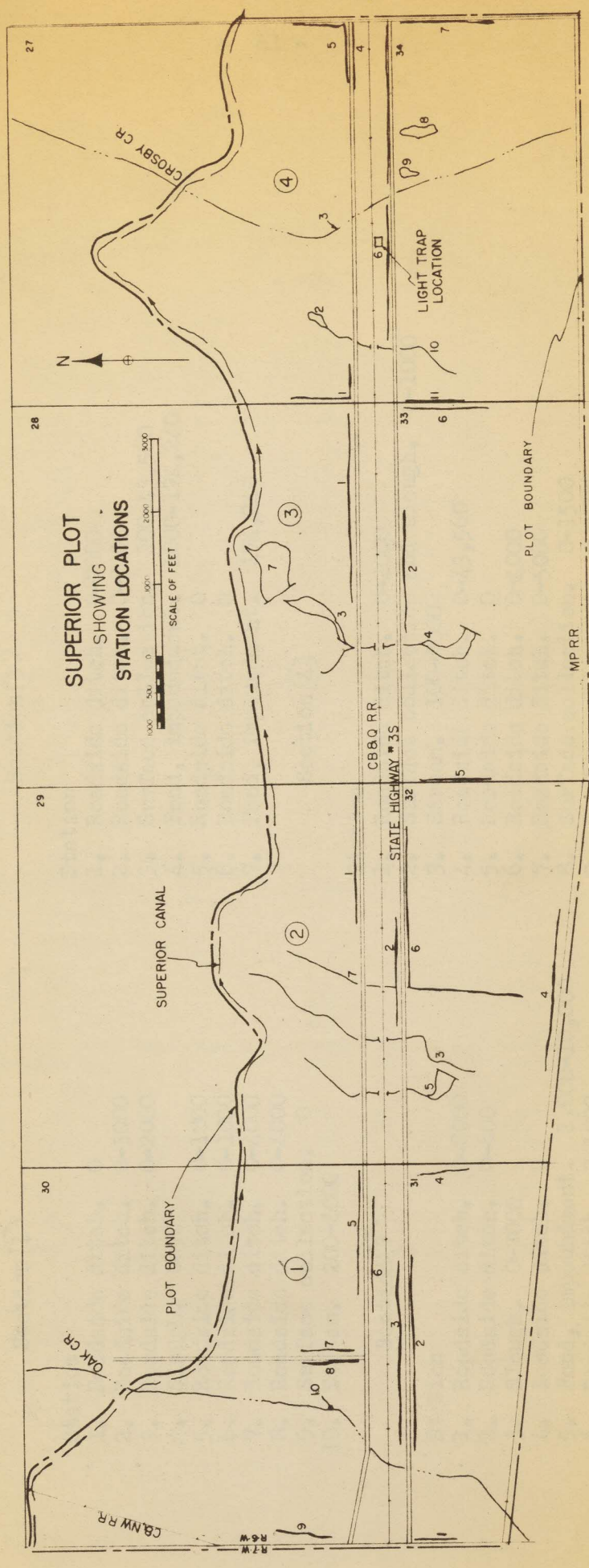

SUPERIOR PLOT
SHOWING
STATION LOCATIONS
SCALE OF FEET
N
CROSBY CR
OAK CR
CB&NW RR
SUPERIOR CANAL
PLOT BOUNDARY
CB&Q RR
STATE HIGHWAY #3S
MP RR
LIGHT TRAP LOCATION
R7W
R6W

Figure 10.

SUPERIOR PLOT

Number and Types of Stations Inspected Showing the Minimum and Maximum Amount of Surface Water (in Sq. Ft.) for Each During the 1949 Season.

Section 1

Station
1. Roadside ditch. 0
2. Roadside ditch. 0-3000
3. Roadside ditch. 0-2000
4. Slough. 0-50
5. Roadside ditch. 0-1000
6. Roadside ditch. 0-1000
7. Roadside ditch. 0-4000
8. Roadside ditch. 0-4000
9. Surface collection. 0
10. Stream. 200-4000

Section 2

Station
1. Roadside ditch. 0-8000
2. Roadside ditch. 0-600
3. Slough. 0-3000
4. Roadside ditch. 0
5. Pond, impoundment. 1,000-10,000
6. Roadside ditch. 0-1000
7. Stream. 0-3000

Section 3

Station
1. Roadside ditch. 0-7000
2. Roadside ditch. 0-9000
3. Surface collection. 100-43,560
4. Pond, impoundment. 1000-174,240
5. Roadside ditch. 0
6. Roadside ditch. 0
7. Pond, impoundment. 174,240

Section 4

Station
1. Roadside ditch. 0-2000
2. Surface collection and slough. 0-1000
3. Stream. 100-8000
4. Roadside ditch. 0-43,560
5. Roadside ditch. 0
6. Roadside ditch. 0-4000
7. Roadside ditch. 0-5000
8. Surface collection. 0-1500
9. Surface collection. 0-2000
10. Slough. 0-1000
11. Roadside ditch. 0

Table 27.

Holbrook Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
5/17	A	19	12,620	0	0.0
	B	9	7,430	0	0.0
	C	2	1,500	0	0.0
	D	12	25,800	0	0.0
	E	1	2,000	0	0.0
Total & Average		43	49,350	0	0.0
5/25	A	14	3,010	2,720	1.3
	B	9	6,100	5,600	1.3
	C	2	750	250	0.3
	D	11	6,125	575	0.8
	E	1	1,000	0	0.0
Total & Average		37	16,985	9,145	1.3
6/1	A	6	825	550	3.5
	B	6	2,980	0	0.0
	C	2	1,600	0	0.0
	D	7	3,715	0	0.0
	E	1	1,000	00	0.0
Total & Average		22	10,120	550	3.5
6/7	A	19	13,700	0	0.0
	B	9	7,900	0	0.0
	C	2	3,000	0	0.0
	D	13	34,500	0	0.0
	E	1	2,000	0	0.0
Total & Average		44	61,100	0	0.0
6/14	A	15	6,995	4,850	1.5
	B	8	6,000	6,000	2.3
	C	2	2,000	0	0.0
	D	11	12,500	1,000	0.7
	E	1	4,000	0	0.0
Total & Average		37	31,495	11,850	1.8

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 27. continued

Holbrook Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Station Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
6/21	A	15	5,475	2,570	3.9
	B	9	5,375	3,875	3.0
	C	2	3,000	1,000	1.4
	D	10	11,650	3,750	1.2
	E	1	2,000	0	0.0
Total & Average		37	27,500	11,195	2.4
6/28	A	14	7,675	800	3.0
	B	9	11,150	2,500	3.6
	C	2	7,000	0	0.0
	D	12	71,110	5,000	0.2
	E	1	2,000	0	0.0
Total & Average		38	98,935	8,300	1.5
7/6	A	5	4,000	200	3.1
	B	8	4,980	2,000	1.9
	C	2	5,000	0	0.0
	D	11	23,350	0	0.0
	E	1	2,000	0	0.0
Total & Average		27	39,330	2,200	2.0
7/12	A	3	1,060	250	14.3
	B	3	650	100	1.3
	C	1	2,000	0	0.0
	D	8	8,700	200	4.3
	E	1	3,000	0	0.0
Total & Average		16	15,410	550	8.3
7/19	A	1	100	100	1.4
	B	1	25	0	0.0
	C	2	2,200	0	0.0
	D	6	1,775	1,225	1.0
	E	1	3,000	0	0.0
Total & Average		11	7,100	1,325	1.7

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 27. continued

Holbrook Plot, 1949

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
7/26	A	0	0	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	4	700	0	0.0
	E	1	1,000	0	0.0
Total & Average		5	1,700	0	0.0
8/1	A	1	1,500	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	3	3,500	0	0.0
	E	1	500	0	0.0
Total & Average		4	5,500	0	0.0
8/9	A	0	0	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	3	3,300	0	0.0
	E	1	200	0	0.0
Total & Average		4	3,500	0	0.0
8/17	A	12	4,900	0	0.0
	B	8	9,700	0	0.0
	C	2	3,500	0	0.0
	D	13	45,500	0	0.0
	E	1	3,000	0	0.0
Total & Average		36	66,600	0	0.0
8/23	A	6	1,830	350	9.5
	B	1	40	40	17.3
	C	1	500	0	0.0
	D	8	90,080	0	0.0
	E	1	1.000	0	0.0
Total & Average		17	93,450	390	10.4

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 27. continued

Holbrook Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
8/30	A	2	300	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	4	87,470	0	0.0
	E	1	1,500	0	0.0
Total & Average		7	89,270	0	0.0
9/7	A	5	2,600	0	0.0
	B	1	200	0	0.0
	C	0	0	0	0.0
	D	9	51,660	0	0.0
	E	1	1,000	0	0.0
Total & Average		16	55,460	0	0.0
9/12	A	6	2,435	0	0.0
	B	1	150	0	0.0
	C	0	0	0	0.0
	D	8	64,860	0	0.0
	E	1	2,000	0	0.0
Total & Average		16	69,445	0	0.0
9/20	A	2	1,500	0	0.0
	B	1	50	0	0.0
	C	0	0	0	0.0
	D	5	6,750	0	0.0
	E	1	4,000	0	0.0
Total & Average		9	12,250	0	0.0
9/27	A	1	500	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	5	6,450	0	0.0
	E	1	1,000	0	0.0
Total & Average		7	7,950	0	0.0

*A-Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E-Streams.

Table 27. continued

Holbrook Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
10/5	A	0	0	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	3	5,000	0	0.0
	E	1	500	0	0.0
Total & Average		4	5,500	0	0.0

*A-Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 28.

Orleans Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
6/15	A	9	9,400	950	6.7
	B	0	0	0	0.0
	C	1	1,000	1,000	0.8
	D	1	87,120	17,430	10.4
	E	5	5,000	0	0.0
Total & Average		16	102,520	19,380	9.7
6/22	A	9	4,825	2,425	6.0
	B	0	0	0	0.0
	C	1	3,000	3,000	6.7
	D	1	87,120	17,430	2.5
	E	5	13,000	0	0.0
Total & Average		16	107,945	22,855	3.4
6/29	A	3	1,175	1,150	0.7
	B	0	0	0	0.0
	C	1	1,000	1,000	5.9
	D	1	87,120	17,340	1.1
	E	5	19,000	0	0.0
Total & Average		10	108,295	19,490	1.3
7/7	A	1	800	0	0.0
	B	0	0	0	0.0
	C	1	500	0	0.0
	D	1	87,120	0	0.0
	E	5	17,000	0	0.0
Total & Average		8	105,420	0	0
7/13	A	1	800	0	0.0
	B	0	0	0	0.0
	C	1	50	50	3.0
	D	1	87,120	21,780	1.3
	E	5	17,000	0	0.0
Total & Average		8	104,970	21,830	1.3

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 28. continued

Orleans Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
7/19	A	0	0	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	1	87,120	0	0.0
	E	5	16,000	0	0.0
Total & Average		6	103,120	0	0
7/27	A	8	7,070	0	0.0
	B	0	0	0	0.0
	C	1	1,000	0	0.0
	D	1	87,120	0	0.0
	E	5	15,000	0	0.0
Total & Average		15	110,190	0	0
8/1	A	1	1,000	0	0.0
	B	0	0	0	0.0
	C	1	1,000	1,000	1.5
	D	1	43,560	0	0.0
	E	5	15,000	0	0.0
Total & Average		8	60,560	1,000	1.5
8/10	A	0	0	0	0.0
	B	0	0	0	0.0
	C	1	1,000	0	0.0
	D	1	43,560	0	0.0
	E	5	13,500	0	0.0
Total & Average		7	58,060	0	0
8/16	A	7	5,850	0	0.0
	B	0	0	0	0.0
	C	1	3,000	3,000	0.4
	D	1	43,560	0	0.0
	E	5	15,500	0	0.0
Total & Average		14	67,910	3,000	0.4

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 28. continued

Orleans Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
8/24	A	2	225	150	7.4
	B	0	0	0	0.0
	C	1	3,000	3,000	0.7
	D	1	31,670	0	0.0
	E	5	11,000	0	0.0
Total & Average		9	45,895	3,150	1.0
8/31	A	0	0	0	0.0
	B	0	0	0	0.0
	C	1	3,000	3,000	1.7
	D	1	21,780	0	0.0
	E	5	15,500	0	0.0
Total & Average		7	40,280	3,000	1.7
9/7	A	2	330	0	0.0
	B	0	0	0	0.0
	C	1	4,000	0	0.0
	D	1	43,560	0	0.0
	E	5	29,000	0	0.0
Total & Average		9	76,890	0	0
9/13	A	1	75	0	0.0
	B	0	0	0	0.0
	C	1	2,000	0	0.0
	D	1	43,560	0	0.0
	E	5	15,000	0	0.0
Total & Average		8	60,635	0	0
9/21	A	0	0	0	0.0
	B	0	0	0	0.0
	C	1	4,000	0	0.0
	D	1	65,340	0	0.0
	E	5	19,000	0	0.0
Total & Average		7	88,340	0	0

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 28. continued

Orleans Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
9/30	A	0	0	0	0.0
	B	0	0	0	0.0
	C	1	800	800	5.0
	D	1	43,560	0	0.0
	E	5	19,000	0	0.0
Total & Average		7	63,360	800	5.0
10/3	A	0	0	0	0.0
	B	0	0	0	0.0
	C	0	0	0	0.0
	D	1	43,560	0	0.0
	E	5	19,000	0	0.0
Total & Average		6	62,560	0	0

*A - Roadside ditches; B - Surface pools; C - Pools in irrigation canals; D - Pools in irrigation drainage ditches; E - Streams.

Table 29.

Republic Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
5/19	A	2	400	0	0.0
	B	6	87,670	87,520	1.2
	C	8	1,100	600	1.9
Total & Average		16	89,170	88,120	1.2
5/26	A	2	725	725	1.5
	B	6	88,470	87,620	1.9
	C	8	4,700	4,700	1.3
Total & Average		16	93,895	93,045	1.9
6/3	A	2	210	0	0.0
	B	6	89,750	88,750	5.8
	C	8	6,650	4,050	1.7
Total & Average		16	96,610	92,800	5.6
6/10	A	4	6,050	4,000	4.6
	B	8	91,520	91,420	4.2
	C	8	12,500	3,100	2.6
Total & Average		20	110,070	98,520	4.2
6/16	A	6	5,550	4,250	0.9
	B	10	197,940	197,740	1.0
	C	8	15,300	3,000	1.4
Total & Average		24	218,790	204,990	1.2
6/24	A	7	9,600	4,000	2.7
	B	10	221,620	213,020	2.4
	C	8	22,300	5,300	1.9
Total & Average		25	253,520	222,320	2.4
7/1	A	3	4,800	4,800	2.7
	B	10	249,800	54,760	1.4
	C	8	15,500	3,000	1.9
Total & Average		21	270,100	62,560	1.5

*A - Roadside ditches; B - Surface pools; C - Slough.

Table 29. continued

Republic Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Station Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
7/8	A	2	1,200	0	0.0
	B	8	148,880	100	3.6
	C	8	20,500	6,000	4.4
Total & Average		18	170,580	6,100	4.4
7/13	A	1	800	0	0.0
	B	8	158,135	200	0.2
	C	8	11,200	4,200	2.2
Total & Average		17	170,135	4,400	2.1
7/22	A	4	6,500	3,500	3.6
	B	9	186,440	12,000	4.9
	C	8	17,500	4,000	1.8
Total & Average		21	210,440	19,500	4.0
7/28	A	4	3,600	500	0.1
	B	8	187,990	750	1.1
	C	8	23,000	0	0.0
Total & Average		20	214,590	1,250	0.7
8/6	A	2	4,000	4,000	0.5
	B	9	95,870	45,060	1.6
	C	8	13,750	0	0.0
Total & Average		19	113,620	49,060	1.5
8/12	A	3	7,200	7,200	2.9
	B	9	120,600	11,700	2.2
	C	8	20,200	5,000	1.8
Total & Average		20	148,000	23,900	2.4
8/20	A	2	3,500	0	0.0
	B	9	184,440	87,620	0.2
	C	8	30,000	4,000	1.3
Total & Average		19	217,940	91,620	0.2

*A - Roadside ditches; B - Surface pools; C - Sloughs.

Table 29. continued

Republic Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
8/25	A	2	1,200	1,200	3.3
	B	6	69,645	65,595	0.9
	C	8	14,650	2,000	0.8
Total & Average		16	85,495	68,795	0.9
9/1	A	1	1,000	1,000	1.8
	B	6	51,460	1,700	2.2
	C	8	12,650	1,500	2.0
Total & Average		15	65,110	4,200	2.0
9/9	A	2	6,250	6,000	0.9
	B	9	97,970	10,300	1.9
	C	8	34,800	10,500	1.1
Total & Average		19	139,020	26,800	1.4
9/16	A	5	15,300	5,000	3.5
	B	8	98,120	95,720	0.1
	C	9	39,250	11,000	3.1
Total & Average		22	152,670	111,720	1.2
9/23	A	5	8,950	4,700	0.5
	B	9	230,000	49,560	1.9
	C	8	24,500	2,500	0.9
Total & Average		22	263,450	56,760	1.7
9/30	A	4	5,125	1,025	10.0
	B	8	205,770	53,310	2.6
	C	8	27,500	7,500	0.6
Total & Average		20	238,395	61,835	2.5
10/7	A	1	3,000	0	0.0
	B	8	158,460	800	3.5
	C	8	25,500	2,000	1.7
Total & Average		17	186,960	2,800	2.2

* A - Roadside Ditches; B - Surface Pools; C - Sloughs.

Table 29. continued

Republic Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
10/14	A	7	6,850	2,500	2.4
	B	9	187,440	3,000	3.3
	C	8	18,500	0	0.0
Total & Average		24	212,790	5,500	2.9

*A - Roadside ditches; B - Surface pools; C - Sloughs.

Table 30.

Superior Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
6/23	A	8	8,100	3,500	0.2
	B	3	44,460	900	2.6
	C	0	0	0	0.0
	D	3	358,480	0	0.0
	E	3	5,100	2,000	1.7
Total & Average		17	416,140	6,400	1.0
6/27	A	8	7,800	1,300	1.7
	B	3	44,260	0	0.0
	C	2	525	525	5.9
	D	3	349,480	35,850	2.2
	E	3	6,500	3,000	1.1
Total & Average		19	408,565	40,675	2.1
7/5	A	8	6,650	5,400	0.7
	B	1	2,000	0	0.0
	C	2	2,100	2,000	8.4
	D	3	351,480	37,850	3.4
	E	3	4,100	0	0.0
Total & Average		17	366,330	45,250	3.3
7/11	A	7	3,275	200	0.3
	B	2	1,200	0	0.0
	C	2	3,050	0	0.0
	D	3	350,480	0	0.0
	E	3	7,000	0	0.0
Total & Average		17	356,005	200	0.3
7/18	A	7	5,650	1,250	0.2
	B	1	2,000	0	0.0
	C	2	500	300	1.2
	D	3	269,360	8,000	0.2
	E	2	7,000	0	0.0
Total & Average		15	284,510	9,550	0.3

*A - Roadside ditches; B - Surface pools; C - Sloughs; D - Permanent ponds; E - Streams.

Table 30. continued

Superior Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type*	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
7/25	A	6	5,820	20	1.7
	B	0	3,000	0	0.0
	C	2	700	500	2.6
	D	3	263,360	2,000	1.3
	E	3	6,600	0	0.0
Total & Average		14	279,480	2,520	1.6
8/1	A	4	2,900	700	0.3
	B	1	800	0	0.0
	C	2	1,250	0	0.0
	D	3	199,020	0	0.0
	E	2	5,000	3,000	3.1
Total & Average		12	208,970	3,700	2.6
8/8	A	2	300	0	0.0
	B	1	5	0	0.0
	C	2	75	75	3.4
	D	3	177,240	0	0.0
	E	2	1,000	0	0.0
Total & Average		10	178,620	75	3.4
8/17	A	4	5,800	0	0.0
	B	1	100	0	0.0
	C	2	3,750	0	0.0
	D	3	178,740	0	0.0
	E	3	9,500	0	0.0
Total & Average		13	197,890	0	0
8/22	A	6	10,535	8,725	2.0
	B	2	1,100	500	2.8
	C	2	1,300	1,300	0.4
	D	3	262,860	1,500	0.5
	E	3	5,500	0	0.0
Total & Average		16	281,295	12,025	1.5

*A - Roadside ditches; B - Surface Pools; C - Sloughs;
D - Permanent ponds; E - Streams.

Table 30. continued

Superior Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
8/29	A	9	33,860	33,360	6.7
	B	1	700	700	2.3
	C	2	2,250	250	2.5
	D	3	264,860	3,500	2.1
	E	3	4,000	0	0.0
Total & Average		18	305,670	37,810	6.2
9/8	A	11	57,185	47,185	1.6
	B	1	3,000	0	0.0
	C	2	1,750	250	3.1
	D	3	264,360	0	0.0
	E	3	11,500	1,500	0.9
Total & Average		20	337,795	48,935	1.6
9/12	A	11	77,360	50,460	3.6
	B	1	3,000	0	0.0
	C	2	6,300	0	0.0
	D	3	270,360	0	0.0
	E	3	11,000	0	0.0
Total & Average		20	368,020	50,460	3.6
9/19	A	10	13,700	10,700	6.9
	B	1	3,000	3,000	20.0
	C	2	2,500	2,000	0.2
	D	3	265,360	4,000	0.3
	E	3	9,000	4,000	0.7
Total & Average		19	293,560	23,700	5.8
9/30	A	7	7,575	3,075	2.4
	B	2	4,000	4,000	0.9
	C	2	2,400	0	0.0
	D	3	265,360	0	0.0
	E	3	5,000	0	0.0
Total & Average		17	284,335	7,075	1.6

*A - Roadside ditches; B - Surface Pools; C - Sloughs;
D - Permanent ponds; E - Streams.

Table 30. continued

Superior Plot, 1949.

SUMMARIES OF STATION INSPECTIONS

Date	Stations Type *	Number Flooded	Total Water Area (Sq. Ft.)	Total Breeding Area (Sq. Ft.)	Avg. No. Larvae Per Dip
10/3	A	6	5,530	1,030	0.8
	B	1	2,000	2,000	1.4
	C	2	2,400	0	0.0
	D	3	264,360	0	0.0
	E	3	6,000	0	0.0
Total & Average		15	280,290	3,030	1.2
10/13	A	11	18,600	17,500	2.9
	B	4	7,000	0	0.0
	C	3	4,050	0	0.0
	D	3	265,360	0	0.0
	E	3	6,000	0	0.0
Total & Average		24	301,010	17,500	2.9

*A - Roadside ditches; B - Surface pools; C - Sloughs;
D - Permanent ponds; E - Streams.

Table 31

Sample Calculations of Average Number of Larvae Per Dip Used for Plot Diagrams (Figures 3C, 4C, 5C 6C)

Example: Republic Plot, July 1, 1949

	Station Number	Type of Breeding Place	Avg. No. Larvae Per Dip	Water Area	Breeding Area	Breeding Index
Section 1	1	A	- [1]	Dry	- [3]	- [4]
	2	C	1.6 [1]	1000 [2]	1000 [3]	1600 [4]
	3	C	2.0	2000	2000	4000
	4	A	-	Dry	-	
	5	C	0	500	0	0
	6	A	-	Dry	-	
Section 2	1	C	0	2000	0	0
	2	C	0	3000	0	0
	3	B	0	500	0	0
	4	B	1.2	43560	43560	52272
	5	B	0	97120	0	0
	6	B	0	97120	0	0
	7	A	4.3	2000	2000	8600
	8	B	-	Dry	-	
	9	A	-	Dry	-	
	10	A	-	Dry	-	
Section 3	1	C	0	3000	0	0
	2	B	1.9	4000	4000	7600
	3	B	9.9	200	200	1980
	4	B	0	200	0	0
	5	B	3.1	3000	3000	9300
	6	B	1.4	4000	4000	5600
	7	C	0	1000	0	0
	8	C	0	3000	0	0
	9	A	-	Dry	-	
	10	A	5.0	800	800	4000
	11	A	-	Dry	-	
	12	A	-	Dry	-	
	13	B	0	100	0	0
	14	A	0.2	2000	2000	400
Totals & Averages			1.5 [5]	270100	62560	95352

[1] Based upon actual dips i.e. $\frac{\text{number of larvae}}{\text{number of dips}}$

[2] Estimated

[3] Estimated from dipping samples

[4] Average number of larvae per dip at station x estimated breeding area or 1.6 X 1000 = 1600

[5] Average number of larvae per dip for plot for week 7/1/49 =

$$\frac{\text{Total Breeding Index}}{\text{Total Breeding Area}} \quad \text{or} \quad \frac{95,352}{62,560} = 1.5$$

Table 32

Sample Calculations of the Average Number of Larvae Per Dip Used in Summaries of Station Inspections (Tables 27-30)

Example: Republic Plot, July 1, 1949

Type of Breeding Place	Average No. Larvae Per Dip	Water Area	Breeding Area	Breeding Index
A	4.3 [1]	2000 [2]	2000 [3]	8600 [4]
A	5.0	800	800	4000
A	0.2	2000	2000	400
Totals & Averages	2.7 [5]	4800	4800	13000
B	0	500	0	0
B	1.2	43560	43560	52272
B	0	97120	0	0
B	0	97120	0	0
B	1.9	4000	4000	7600
B	9.9	200	200	1980
B	0	200	0	0
B	3.1	3000	3000	9300
B	1.4	4000	4000	5600
B	0	100	0	0
Totals & Averages	1.4 [5]	249800	54760	76752
C	1.6	1000	1000	1600
C	2.0	2000	2000	4000
C	0	500	0	0
C	0	2000	0	0
C	0	3000	0	0
C	0	3000	0	0
C	0	1000	0	0
C	0	3000	0	0
Totals & Averages	1.9 [5]	15500	3000	5600

[1] Based upon actual dips, i.e. $\frac{\text{number of larvae}}{\text{number of dips}}$

[2] Estimated

[3] Estimated from dipping samples

[4] Average number of larvae per dip at station X estimated breeding area or 4.3 X 2000 = 8600

[5] $\frac{\text{Total Breeding Index}}{\text{Total Breeding Area}}$ or (for A stations) $\frac{13000}{4800} = 2.7$

Same formula for B and C stations.

Average number of larvae per dip for plot for week 7/1/49 =

$$\frac{\text{Total of Breeding Indexes for A, B \& C Stations}}{\text{Total of Breeding Areas for A, B \& C Stations}}$$

Or

$$\frac{13,000 + 76,752 + 5600}{4800 + 54,760 + 3000} \text{ or } \frac{95,352}{62,560} = 1.5$$

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