

mer. As one correspondent stated, "it is found mostly in tilled but unused fields." It is quite a striking plant, which reaches a height of three or four feet. The stems are stiff and thickly covered with narrow leaves. They have no branches except those of the flower clusters at the top. The flower heads are only about one-eighth of an inch wide but each contains many indi-

vidual flowers. This weed is often abundant in grain fields which have been stubbled in. It is little seen in fields which receive the usual fall plowing or good spring tillage. It can be controlled by mowing in perennial forage crops and in thin pastures if it is abundant. In the later case, however, plowing and re-seeding may be a better plan.

The Mosquito Problem in North Dakota

By

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THE MOSQUITO PROBLEM in North Dakota is one of long standing as indicated by its rather frequent mention in writings on the early agricultural development of this area. It is a problem which has many features in common with most of the adjoining area of the Northern Great Plains region in that the predominating species and the factors involved in control are very similar.

The earlier references to mosquitoes in this area have largely stressed the annoyance and discomfort caused by their attacks upon man and livestock. Due to the blood-sucking habits of these insects, they are a serious drain on the vitality of their hosts. They molest cattle, horses, and other domestic livestock to such an extent that at times the animals are forced to leave their feeding grounds to seek shelter in buildings, wind-swept areas or in the smoke from smudges sometimes employed by farmers to abate the mosquito nuisance.

Mosquitoes are a serious hindrance to workers in gardens, fruit plantings and fields, in fact, any of the outdoor occupations. Not only are the bites irritating but at times when the danger from encephalitis, a virus disease, is prevalent mosquitoes are a serious menace to health.

Aedes vexans and *A. dorsalis*, species which comprise most of our mosquito population, and other *Aedes* species which are prevalent in North Dakota have under controlled laboratory conditions been incriminated as carriers of encephalitis. During the 1941 outbreak (a year in which encephalitis reached an all-time high in humans in the United States and Canada) 1,101 people and 2,552 horses contracted the disease in North Dakota with a mortality rate of 12.6 percent (139 deaths) and 21 percent (549 deaths) respec-

tively, according to Dr. Frank J. Hill, North Dakota state health officer, and Dr. T. O. Brandenburg, state veterinarian. Practically all cases were the Western type of encephalitis

Of considerable interest is the fact that *Culex tarsalis*, our third most abundant mosquito, has been found infected in nature by the St. Louis and Western types of encephalitis virus. Two species of *Anopheles* mosquitoes have been recovered at various places in North Dakota. The *Anopheles* mosquitoes are of medical significance because of their ability to transmit malaria. However, a mosquito must first feed upon a person who has previously contracted the disease before it is capable of transmitting the disease to a healthy individual. Two sources of infestation which may result in an occasional case of malaria are the increased influx of southern agricultural workers assisting in our harvest fields who may have previously contracted the disease and returning service men from endemic malarial areas.

Observations conducted by the Department of Agricultural Entomology of the North Dakota Agricultural Experiment Station on the relative abundance and distribution of mosquitoes in the state during the past six years have revealed 18 species. Many more will undoubtedly be discovered when more collections are made. Only the females bite. The males feed largely upon plant juices for which their mouth parts are best adapted. While either sex can subsist on plant juices, the females of most species will avail themselves of a blood meal at the slightest opportunity. However, a blood meal is not essential for egg production.

Aedes vexans and other representatives of this genus lay their eggs on the ground where they may remain for varying periods of time awaiting favorable moisture conditions for hatching. The numerous tiny, boat-shaped eggs are laid during the spring and summer but must remain until the following spring before hatching. Not all of the eggs, however, hatch at one time. Many of them remain dormant. This accounts for successive broods of adults which follow each heavy rainfall period.

In 1943 near Fargo we collected both adult *Aedes vexans* and *A. dorsalis* from two distinct emer-

gences in spring and late summer. The latter outbreak began on August 18, which was 10 days following a rainfall of nearly 5 inches on August 8. The fact that the eggs of *Aedes* can survive prolonged periods of drouth and hatch a few at a time following rainfall might account for the great predominance of these species over those of other genera not having these advantages.

Our common species are short lived and seldom survive more than a few weeks under natural conditions. However, those of the genera *Culex* and *Anopheles* live over the winter in cellars, caves, outdoor buildings and other protected places. Members of most genera lay their eggs either singly or in masses on the water; these hatch soon after being laid.

The *Anopheles* mosquitoes lay their eggs singly on the water while *Culex* and several other genera of lesser importance lay their eggs in masses which float about in raft-like manner. Such masses appear as sooty-colored floating specks. Each mass is the product of one female and may contain upwards of 100 or more eggs placed side by side.

The eggs usually require a day or two for hatching into the larvae or "wigglers" so common in stagnant pools. They remain in this stage for

about 1 week before changing to the adult mosquito. The larvae feed largely upon microscopic animals and plants and are usually most abundant in polluted water. In a ½ acre temporary pond which was heavily polluted by drainage from barnyard manure we have found the mosquito larvae in mid-August to occur at the rate of approximately 3,000 per square foot of water surface. The mosquitoes were quickly eradicated by spraying fuel oil on the water before the adults emerged.

While a fair degree of relief may be obtained by treating these pools with oil before the mosquitoes reach the adult stage, there are factors involved which make complete control of mosquitoes in any locality difficult. One of these is the fact that flood-water mosquitoes which predominates in this area are capable of flying a number of miles from the ponds where they were reared. Second, since the ponds which breed these mosquitoes are temporary, the insects may escape notice until after emergence; then it is too late to apply remedial measures.

With the growing appreciation regarding the harmfulness of mosquitoes it is believed that community action in preventing the development of these obnoxious insects would be well worth while. The

success of a mosquito abatement program is contingent on several main factors: the accurate mapping of the infested area, knowledge of the distribution, identification and habits of the species involved, the degree of community participation, the proper timing of oil application to prevent the emergence of the mosquitoes and adequate coverage of the infested area.

It is common knowledge that nature takes a hand in helping to destroy mosquitoes both before and after their emergence from the water. This fact, however, is no justification for our failing to prevent mosquito development. Small native fish in larger ponds and goldfish in garden pools are voracious feeders upon the immature stages of mosquitoes, while dragon flies are very efficient at capturing mosquitoes in flight. Permanent ponds stocked with fish should not be sprayed with oil. To what extent adult mosquitoes are fed upon by dragon flies is beyond comprehension. Dragon flies (mostly of the genus *Symptetrum*) became notably abundant during July and August of 1943 over marshes and other mosquito breeding areas of the State. It was a common sight to observe these insects both in flight and resting side by side on fence and telephone wires for miles along the highways.

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Land Values and Transfers, Second Quarter 1943 North Dakota¹

By

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SUMMARY

Volume: There were 231 recorded voluntary sales this quarter compared with 290 last quarter and 196 for the second quarter of 1942.

Sellers: Individuals sold 56 percent of the land, Federal Land Bank and Federal Farm Mortgage Corporation 14 percent, insurance companies 9 percent, the state and counties 7 percent and estates 7 percent.

Buyers: Farmers acquired 77 percent of the tracts transferred compared with 84 percent of the tracts transferred last quarter.

Prices: Average recorded prices increased 24 percent over the previous quarter.

Financing: Seventy-eight percent of the recorded sales were for cash.

Outlook: Prices are increasing and factors are operating that could easily push prices and sales to boom proportions.

Upward Trend in Voluntary Transfers Continues²

The total recorded voluntary transfers this quarter exceeded the number for the corresponding quarter of 1942 by 18 percent, but were slightly less than were recorded the first part of this year (table 1). The most marked decrease in voluntary transfers this

¹Progress Report in Purnell Project 108, North Dakota Agricultural Experiment Station in Cooperation with the Bureau of Agricultural Economics, U.S.D.A.

²Transfers throughout this report refers to recorded transfers in Traill, Stutsman, Morton and Ward Counties. Contracts for deeds are less often recorded than other types of deeds, therefore, data does not reflect the true importance of this type of instrument.