on March 22, a bright sunny day. Three days later, all small puddles were again frozen over, yet several were seen and one collected. On March 27, (the day the river ice broke at Saskatoon) two females were collected and both were in breeding condition. Nearly four weeks later, April 21 and 23, three females collected were pregnant and near term as evidenced by the size of the embryos. This is in close agreement with Brown & Ray's statement that the gestation period is 27 days. The number of embryos observed in 1947 was smaller than in 1946, and there was evidence that some had died and were being reabsorbed.

Ground squirrels are regularly infested with parasites; fleas, lice and ticks in their fur and various round and flat worms in their internal organs. The fleas and ticks, on account of their disease-transmitting propensities, are reasonably well known, however, much study is still needed on the species of internal parasites, their life histories and general effect on the animals.

The economic importance of the Richardson ground squirrel is overwhelmingly on the negative side. The destruction it wreaks on agricultural crops is too well known to prairie people to need enlargement here. A note on its role as a vector of disease, however, may be of some interest. It may be a reservoir for at least three serious diseases to which man is subject. The first of these, bubonic plague, or black death, has spread through the western United States, into Alberta, and is now known to be in Saskatchewan. It is transmitted from animal to animal and to man by fleas of various species. At least 3 species of fleas, capable of transmitting plague, infest Saskatchewan ground squirrels. Humans may also acquire the disease by handling infected animals. Tularemia, also known to be in Saskatchewan, is transmitted by numerous methods including ticks and handling infected animals. Rocky Mountain Spotted Fever, also transmitted by ticks, has not yet been reported from Saskatchewan, although it is prevalent in Montana and Alberta.

It should be obvious, then, that the payment of a bounty for tails removed from ground squirrels is an unsound policy from the public health point of view. Other artificial means of control are legion and will not be entered into here. A quotation from Brown & Ray, concerning the role of natural predators should be of interest, however. "Hawks are the greatest single factor in the natural contest of ground squirrels and every effort should be made to encourage their increase by declaring them a protected bird." Other important predators are owls, weasels, badgers, coyotes and snakes.

This outline is by no means a complete study and is based mainly on fragmentary observations. It may, however, serve to illustrate that much remains to be discovered about even our commonest mammals, and that chance observations, accurately recorded, may ultimately prove to be of some value.

Reference: Brown, J. H. & G. D. Ray, 1943 - The Richardson ground squirrel Cittellus richardsonii Sabine, in southern Alberta: its importance and control. Scientific Agric. Vol. 24, No. 4, Sec. 1943.

ENTOMOLOGY

TREE & SHRUB INSECTS

by L.O.T. Peterson

In the survey of tree and shrub insects carried out in the Agricultural Areas of the Prairie Provinces during the 1947 season, more attention was given to middle eastern Saskatchewan than had been possible in preceding years. In this

work, considerable time was spent by J. L. Green, Forest Insect Ranger, and assistance was also given by persons living in the area who co-operated in the Survey undertaking. In consequence, many pests of importance to trees and shrubs, and of interest to rural and urban residents were encountered. The following notes give some information on the more important species. For purposes of simplicifcation, these are grouped according to the trees and shrubs which they attack.

SPRUCE PESTS

Yellow-Headed Spruce Sawfly - The larvae of this sawfly devour the needles of spruce. They are first seen on the trees in late June or early July and may continue to be present until mid August. The larvae are greenish with brownish longitudinal stripes and a reddish-brown head. When full grown they are about one inch long. This sawfly is chiefly destructive to planted shelterbelts and to ornamental spruce, though trees in native stands may also be attacked. During the 1947 season the yellow-headed spruce sawfly was observed at Archerwill, Barford, Barrier Creek, Canora, Churchbridge, Dahlton, Elfros, Foam Lake, Fosston, Gerald, Goodeve, Hazel Dell, Invermay, Ituna, Jasmine, Kamsack, Kelvington, Ketchen, Langenburg, Lemberg, Lorlie, Margo Mehan, Nora, Norquay, Oakla, Preeceville, Rama, Rose Valley, Saltcoats, Sasman, Stenan, Stockholm, Sturgis, Theodore, Tisdale, Wadena, and Yorkton.

Balsam Fir Sawfly - Like the yellow-headed spruce sawfly, this insect also feeds on the foliage of spruce. The larvae are olive green with jet-black heads. The cocoons formed by mature larvae are attached to the needles whereas those of the yellow-headed spruce sawfly occur in the soil. The balsam fir sawfly is more abundant in Manitoba than the yellow-headed spruce sawfly, but less abundant in Saskatchewan. In middle eastern Saskatchewan, it was encountered at Archerwill, Barrier Creek, Crystal Lake, Dahlton, Hyas, Nora, Norquay, Pelly, Saltcoats, Stenan, Sturgis, Wadena and Yorkton.

Pine Needle Scale - Although this scale often infests pine, its principle host in the Prairie Provinces is spruce. Trees grown under shelterbelt conditions or for shade or ornamental purposes are often seriously attacked, whereas trees in native stands seem almost immune. Very heavy populations of this scale occurred in some locations in the City of Yorkton and serious damage from it was already much in evidence.

Balsam fir aphid - This small light green aphid infests the new growth. The honeydew which it secretes causes the needles to adhere to one another in a sticky mass. Occasionally it is quite abundant. Only a few light and scattered infestations were encountered.

Spruce Gall Aphids - The aphids belonging to the Adelges group cause the new terminal growth of the twigs to swell into compact, almost pineapple-like growths or galls. In the Pineus group only the basal portion of the needles are affected, and the resultant galls have a small diameter and are less compact in structure. Both kinds of galls were present throughout the area and occurred in native stands as well as in planted shetler belts and on ornamental trees.

Spruce Mite - Though not an insect this mite is a very important pest. Very often it causes serious damage to spruce grown in shelterbelts and as shade and ornamental trees. It is too small to be seen with the unaided eye but its presence is usually revealed by a dull mottled discoloration of the needles and by the occurrence between the needles of a fine compact webbing which is readily

observed from the undersides of the branches and twigs. Heavy infestations of this mite were encountered at Esterhazy, Kelliher, and in the City of Yorkton. Lighter infestations were observed at Canora, Churchbridge, Foam Lake, Gerald, Invermay, Ituna, Kamsack, Kelvington, Mehan, Theodore, Tisdale and Wadena.

Since the spruce mite may give rise to as many as six generations annually, its numbers can increase very rapidly.

LARCH PESTS

The Larch Sawfly - Tamarack, and native and introduced larches are hosts of this sawfly. In colour and size the larvae resemble somewhat the balsam fir sawfly larvae. They are more gregarious, however, and usually occur in clusters on the foliage. The larch sawfly was found at Archerwill, Barrier Creek, Gerald, Langenburg, Norquay, Pelly, Sturgis, Tisdale and Yorkton.

POPLAR AND WILLOW PESTS

The Western Willow Leaf Beetle - The fire-swept appearance of native willow noticeable during the summer months, and the stripping of poplar, especially young aspen during the spring and fall are typical of the damage caused by this insect. The adults are small brownish-black beetles which may be seen on both willow and poplar, occasionally in very large numbers. The larvae are small black grubs, found only on willow. Both adults and larvae are gregarious.

In general, damage to poplar and willow from this pest occurred throughout the whole of middle eastern Saskatchewan as well as in much wider areas also covered by the Survey. The damage was not continuous and varied from light to severe.

Besides being a very important pest of poplar and willow, the western willow leaf beetle is very interesting because of its swarming and migratory habits. Observations made during several seasons have revealed that just prior to egg laying in the spring, literally millions of adults may be seen clustered on willows and poplars, in a comparatively small area, and for reasons unknown, may take to flight and travel long distances, before coming to rest on trees again.

Poplar Borer This borer is best known as the large white grub which forms large open galleries in aspen trees. It was present in almost all stands of native poplar examined in the area. Although other species of poplar may be attacked by it, aspen is the preferred host. In dense stands, marginal trees are usually the only ones affected.

MANITOBA MAPLE PESTS

Boxelder Leaf Roller - The presence of this insect is first indicated by the occurrence in the spring of small white-appearing tortuous mines in the leaves. Later these are followed by the formation of blotch-like mines, and when the larvae emerge from the latter, by the curling of the leaves, beginning at one of the tips. Small amounts of damage by this insect was observed at Kelvington, Lorlie, Sasman, Theodore and Yorkton. When abundant, the boxelder leaf roller is capable of causing very severe defoliation.

Manitoba maple Payllid - This small fawn-coloured aphid-like insect is often very abundant on Manitoba maple. Like aphids it secretes a sticky substance known as honeydew which gives the leaves a shiny appearance. When winged, this insect flies out from the foliage in "swarms" upon the slightest disturbance. This payllid was encountered in several districts throughout the area.

Salt and Pepper Currant Moth - The caterpillars of this moth are loopers. They vary in colour from dull green to brown, and when full grown are nearly two inches long. Very light infestations were observed at Elfros, Goodeve, Lorlie and Yorkton. Caterpillars of the salt and pepper currant moth may also attack caragana.

Spotted Halisidote - The black and yellow-banded woolly bears of this arctiid moth are present in the late summer and fall. Rarely have they become sufficiently numerous to cause much stripping of the foliage. Manitoba maple appears to be their preferred food plant. Small numbers of these woolly bears were seen at Goodeve and Melville, and at Lorlie noticeable defoliation by this insect was noted in one Manitoba maple shelterbelt.

Manitoba Maple Twig Borer - The larvae of this small moth burrow into the succulent growing tips of Manitoba maple, causing them to develop into long spindle-shaped woody galls. Very often such growing tips are killed, resulting in a pruning effect on the trees. Damage from this borer was noticed in several districts in the area.

AMERICAN ELM PESTS

Two species of aphids were encountered in a few districts visited. The one species, Eriosoma americanum Riley, causes the leaves to curl, usually beginning at one of the margins. Within these curls, large numbers of aphids are present. The other species, Eriosoma lanigerum Haus, causes a rosette-like development of the leaves. It is usually less common than the former species.

VIRGINIA CREEPER PESTS

The Grape Leafhopper - This leafhopper was present on Virginia creeper in several districts and in many cases very severe damage to the foliage was caused.

The grape leafhopper is a small fawn coloured insect. In its immature stage it is wingless and the young may be seen on the undersides of the leaves. In the adult stage it is winged and very active, and has the habit of flying out from infested vines in large numbers, whenever the latter are disturbed or approached.

ENTOMOLOGY

A PLEA FOR MORE ASSISTANCE

For some years the Shelterbelt Insect Laboratory at Indian Head, Saskatchewan, has endeavoured to develop and carry out an annual survey of insects affecting trees and shrubs in the Agricultural Areas of the Prairie Provinces. To achieve an undertaking of this kind, a great deal of co-operation and help must be obtained from private persons, as laboratory personnel will never be adequate to do the job alone. Such assistance has been forthcoming in many districts, and is indeed very much appreciated. In numerous other districts, however, it has not been obtained, with the result that much