traps are not expected to reduce noticeably the number of beetles, but serve to give an idea of the relative abundance of the insects in any particular area. In 1937 111,000 traps were set in 25 States scattered from Florida to Vermont.

On the basis of the past three years of trapping, it seems that the abundance of beetles in several of the locally-infested areas has decreased. This is especially noticeable in the middle western States. In St. Louis in 1934 the catch was 1,351 beetles; in 1935, 1,232; in 1936, 88; and in 1937 only one lone beetle, despite the fact that the trapping was more intensive than ever and that more than 12,000 traps were in use in that one region. In Detroit the catch fell from 128 in 1936 to 67 in 1937. In Chicago there were 3,740 beetles trapped in 1936, but only 384 in 1937.

This great reduction in the number of Japanese beetles trapped is a good indication that the number of beetles and resulting larvae in these particular areas is decreasing.

Treatment of turf with arsenate of lead is a necessary part of turf maintenance in the areas of continuous infestation and isolated places where the turf is definitely known to be infested by the Japanese beetle larvae. However, the above examples of reduced infestation indicate that there need not be any haste in poisoning golf courses as a precaution against Japanese beetle damage merely because the insects have been observed in the neighborhood.

An instructive article on the Japanese beetle and its habits is contained in a bulletin issued by the United States Department of Agriculture in December, 1934.

Chinch Bugs

CHINCH BUG injury to golf course turf has been recognized for many years. Recently this pest has become increasingly troublesome in eastern States, especially in rather restricted areas of New York, New Jersey, Connecticut, Pennsylvania and Ohio.

Three common varieties of chinch bugs—the common chinch bug (Blissus leucopterus), the hairy chinch bug (Blissus leucopterus hirtus) and the southern chinch bug (Blissus leucopterus insularis) — cause extensive damage to turfed areas and farm crops in the United States.

Until a few years ago these were all regarded as one type, but recent work has disclosed that the variety which causes severe injury to turf in the eastern States is more hairy in appearance and more difficult to control than the common one which attacks farm crops in the Middle West. Because of its hairy appearance it is commonly called the hairy chinch bug. This type is more vigorous, less susceptible to insecticides and able to withstand more moisture than the common farm chinch bug.

The common variety which is found in the Middle West, especially in the regions drained by the Mississippi, Missouri and Ohio Rivers, frequently causes severe damage to grain crops. However, injury to pastures and other turfed areas has been reported. The hairy chinch bug has been reported in the States along the Atlantic Coast, being abundant in Long Island and surrounding areas of New Jersey, Pennsylvania, Connecticut and occurring westward to Ohio.

The southern variety occurs in the extreme southeastern United States, especially in Florida, where it severely injures lawns and fairways.

Since the general distribution, life history, habits and methods of control when attacking turf are much the same, they will be discussed collectively.

Description and Habits

These pests are native to the United States and probably infested the native grasses when the white man first settled here. Chinch bugs are probably present in grassland every season, but escape attention because of their small size and habit of feeding near the ground. Unfavorable weather conditions may prevent serious outbreaks, and since the pest is not easily noticed its injury is usually attributed to other factors.

The adult chinch bug is slightly less than one-eighth inch long, and about one-half as broad as long, being oblong-oval in shape. The insect is black in color, with fine white markings. Its general appearance is a black fore part with the rest of its body dark gray. Its legs, beak and antennae are dark yellow to brown. The wing covers are white with brown veins. There are two adult forms, long-winged and short-winged. The short-winged, which is incapable of flight, is by far the more numerous, especially in the eastern variety.

Chinch bugs over-winter as adults under the shelter of grasses, leaves or other cover. In the spring after several days of warm weather the adults leave their winter quarters and settle in turfed areas. After a short period of feeding and mating, the females lay their eggs. Each female is capable of laying several hundred eggs.
at the rate of 15 to 20 a day, requiring from
three to four weeks to lay her full quota. These
are laid on the stems of the grass close to the
ground or, if the soil is loose, upon the roots
just below the soil surface. The eggs are usually
hatched in from one to five weeks, depending on
the temperature. The young bugs are extremely
small and are reddish in color, with a transverse
band of white. As the insect grows it sheds its
skin five times, becoming darker in color each
time. This immature form has no wings and
crawls from one place to another. In an infested
area the insects can usually be found in all stages
of growth.

There are two generations each season, except
in the extreme South, where three to five genera-
tions usually develop. The first brood of the
eastern and common variety hatches any time
from April to the middle of June, and the second
from mid-July to mid-September. Chinch bugs
are readily distinguished from other small bugs
infesting turf by their strong repugnant odor.

So far as is known, chinch bugs feed only on
plants belonging to the grass family. They are
sucking insects, obtaining their food by inserting
a sharp beak-like organ into the plant tissues,
where they suck out the plant sap in much the
same manner as a mosquito feeds on animals.
They never devour the foliage or the roots of the
grass, which explains why stomach poisons such
as lead arsenate are not effective in the control
of the pest.

In the northern States the hairy chinch bug
attacks bent grasses in preference to all others.
Certain varieties of velvet bent grass, seaside
creeping bent and redtop seem to be particularly
susceptible to attacks. The southern species pre-
fers St. Augustine grass. It also infests Bermuda
and other grasses. Neglected areas such as sod
nurseries are usually more infested than a closely-
cut green. Approaches and areas surrounding
greens often are severely attacked while the turf
on the green is only moderately damaged. Injury
usually first appears in high, dry or sandy loca-
tions that are exposed to direct sunlight. Areas
surrounded by gravel drives or pavements are
favorite locations for infestations.

Turf injured by chinch bugs somewhat re-
sembles that suffering from soil moisture de-
ciciency. The grass becomes shriveled and brown
in many small spots, which enlarge as the in-
jury increases. Usually there is a distinct border
of yellowed grass immediately surrounding the
browned areas. These spots are more or less
circular and therefore are often confused with
brownpatch or scald. The chinch bugs are usually
found at the border of these areas, feeding on
the grass just above the soil surface. Since this
pest never attacks clover or broad-leafed weeds,
the death or weakened condition of the grass
favors their growth in these areas.

The abundance and activities of chinch bugs
are greatly influenced by the weather. They are
active and easily found on warm, sunny days,
but hide and are not easily detected during
periods of cool, cloudy weather. Frequent heavy
rains may destroy large numbers of newly-
hatched bugs and cover the eggs with mud,
which prevents their hatching. These storms
may also prevent the female from laying her
full quota of eggs. Severe outbreaks of chinch
bug injury usually occur during seasons of less
than normal rainfall. Warm, damp weather
favors the rapid development of a white fungus
which is very destructive to this insect. During
prolonged or frequent periods of this weather
the fungus practically keeps the pest under
control.

Natural enemies such as parasitic insects and
birds help to destroy the pest, but are not im-
portant factors in its control.

**Methods of Control**

The hairy chinch bug is less susceptible to
the effects of the usual insecticides than are other
turf insects. Because of its feeding habits,
stomach poisons such as lead arsenate give
no control. Contact sprays or dusts are usually
resorted to with more or less success.

A spray that is frequently recommended con-
sists of one-half ounce of four per cent. nicotine
sulphate and two ounces of soap, dissolved in
one gallon of water. The grass should be thor-
oughly soaked with the spray, as the liquid must
come in contact with the bugs to be effective.
Another spray that has been used consists of
nicotine sulphate one gallon, soap three gallons,
and water 300 gallons. This particular spray
is applied at the rate of 150 gallons to 1,000
square feet.

In general, all dust treatments give a fair
degree of control, with tobacco dust being the
most satisfactory. Two applications of tobacco
dust (one per cent. nicotine) per brood applied
at the rate of 25 pounds to 1,000 square feet
seem to give a fair degree of control. Certain
sprays and dusts of derris, rotenone and pyre-
thrum are also effective if properly applied.

None of the treatments developed so far
completely eradicates the pest. Its rapid repro-
duction and migration from untreated areas soon
result in renewed heavy infestations, so that
treatments must be repeated. The cost of these
treatments limits their use to comparatively small
areas.