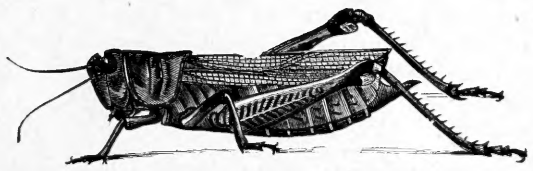
AGRICULTURAL EDUCATION

Nebraska Boys and Girls Club

Some Common Weeds and Insects

OF

Nebraska Corn Fields and Potato Patches



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DEPARTMENT OF PUBLIC INSTRUCTION
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DEPARTMENT OF FARMERS' INSTITUTES
University of Nebraska, Lincoln

July, 1910

INTRODUCTION

This bulletin is one of the series published jointly by the State Department of Public Instruction and the Department of Farmers' Institutes, University of Nebraska, for the encouragement of the work of the Nebraska boys' and girls' club. The subject matter was written and compiled by A. E. Nelson. The bulletin is designed for the use of members in studying some of the problems in the growing of corn and potatoes. A few of the most troublesome weeds and insects are described.

It is expected that by following the instructions and studying the weeds and insects described, observation and investigation by members will be sharpened and increased to such an extent that they will continue the study of these pests and work out methods and means for their eradication. One is never thoroughly acquainted with a plant until he can call it by name. We recommend that each member learn the names of the weeds studied. The accompanying blanks are intended as a means to aid in observing the essential points connected with the study of weeds.

For many of the illustrations in this bulletin, we are indebted to the agricultural colleges of Kansas, Iowa, and Illinois, from which states the cuts were borrowed. We have also rephotographed some of the excellent illustrations in the text entitled "Weeds of Canada."

One of the most encouraging features of our work is the co-operation of those most interested in the encouragement of good things for the state. This bulletin is printed for us by the Nebraska Farmer Publishing Company as a substantial evidence of their appreciation of the boys' and girls' work in Nebraska. The Nebraska Farmer takes this means of expressing its desire to do all they can for the promotion of the work.

The following bulletins relating to the September and October work in the ear to row test and the seed piece experiment and on harvesting corn and potatoes, and on the acre and husking contest will be sent to all members who make the required reports. The reports on weeds and insects should be mailed not later than August 15, 1910.

E. C. BISHOP,
State Superintendent Public Instruction.

VAL KEYSER,
Superintendent Farmers' Institutes,
University of Nebraska.

July 1, 1910.

WEEDS

The old saying, "The Weed follows the Plow," has stood the test of time and experience. When Nebraska was a wild prairie, unmolested by man, very few weeds were found; but as the plow broke the soil, weeds came in from other states by railroads, by streams, by birds, rabbits, horses, and other animals, until at the present time they have become a serious pest.

Any plant out of place might be considered a weed; for instance, oats or corn in a potato patch could be considered a weed, as such plants would doubtless be injurious to the best development of the potato crop. However, from the farmer's standpoint a weed is "any injurious, troublesome, or unsightly plant that is at the same time useless, or comparatively so."

Weeds cause considerable loss by:

1. Robbing the soil of plant food and moisture that should develop the crop.
2. Reducing the value of the farm by making it unsightly, unprofitable, etc.
3. Choking out other crops by shading and excluding the sunlight.
4. Increasing the cost of every operation on the farm, as harrowing, fanning, plowing.
5. Harboring many insects or fungus diseases which later attack cultivated plants.
6. Poisoning or injuring stock, tainting milk, irritating the mouth of stock when eating hay containing weeds.

One should always bear in mind that preventing weeds from coming on to the place is much more profitable and sensible than to try to destroy them after they have once gained a foothold. However, any weed can be destroyed by persistent effort and a perfect understanding of its nature and habits. The farmer should always plant seed that is free from weed seed. No weed seeds should be allowed to mature. When animals are transferred from one farm to another their hair should be carefully examined for cockleburs, burdocks, etc. This is especially true of horses and sheep. Every precaution should be taken to prevent the introduction of weeds. **A short rotation of crops is without doubt the most sensible and practical method of preventing or eradicating most of the common weeds and insects which infest the fields of Nebraska.**

CLASSIFICATION AND METHODS OF DESTRUCTION:

Generally speaking, weeds are divided into three classes—annual, biennial, and perennial.

Annual: When speaking of annual plants we mean those which live but one year and then die down. Black Mustard, Great Rag Weed, and Foxtail for examples. These can be destroyed by stopping the production of seed. However, it will be necessary to watch them very closely, as the seeds of some annual plants can live in the ground for a number of years. As these seeds are moved near the surface of the soil by plowing and harrowing they will begin to grow. Therefore, by merely cutting off the tops each year and thus preventing seeding, one only reduces the number of weeds. If the plants have been allowed to seed, some farmers practice burning off the dead weeds and in doing so destroy a great many of the seeds that would otherwise form plants. They then plow shallow, leaving the seeds near the surface. This causes the seeds to germinate quickly, when they can be destroyed by shallow cultivation.

Many farmers do not put any crop on the land when they are treating it as mentioned above, but in most sections this is considered a needless waste. Crops that can be cultivated the greater part of the season, such as corn, potatoes, beets, cabbage, etc., can be raised at the same time that the weeds are being destroyed without materially interfering with the operation.

These annual weeds usually grow where the ground has been plowed. Therefore, it does not seem wise to allow ground to remain without a crop after it has once been broken. Sometimes such weeds as Foxtail, Barnyard Grass, and many others are often allowed to go to seed in gardens, potato patches, etc. These can be destroyed by mowing a short time after the harvesting is done.

Biennials:—These are plants that live two years and then die. They spend the first year in storing up nourishment which they use the second year in producing a good crop of seeds. A great many biennial plants, such as radishes, have fleshy or taproots. Examples of biennial weeds are wild carrot, burdock, and wild parsnip.

These plants are often caused to spread or send out more shoots when cut off above the ground. If cut off below the crown with a spade, dandelion digger, or hoe they generally die. In the fall of the first year one will often see biennial plants sending up small shoots upon which to produce next year's seed. They should be cut below the crown with some sharp instrument at this time, as they are more tender than they would be a year later.

Biennial weeds are easily destroyed by putting the ground into such crops as beets, corn, potatoes, etc. They are, however, often found in fence lines, old hay meadows, waste places, etc., where it is impossible to cultivate. In such places the mower, spade, fire, etc., can be brought into use.

Perennials:—Plants which live from year to year for an indefinite length of time are called perennials. Some of the immense trees in the forests of California and Mexico are known to be hundreds of years old. Canada Thistle, Soap Weed, Quack Grass, and Yellow Dock are examples of perennial weeds. Some perennials die down each winter, while others keep a rosette of green leaves above the ground the entire year.

Many of these plants not only produce seeds, but also have "underground stems" that travel through the soil and send up shoots at irregular distances. Quack Grass, Milk Weed, and many other weeds are propagated in this way. Others reproduce themselves by sending out roots wherever a joint of the stem touches the ground. To destroy weeds of this class, all production of seeds must be stopped and in most cases the roots and other parts below the surface of the ground must be destroyed. The production of seeds can be prevented by mowing before the seeds are formed. One must pursue different methods when destroying the portion below the ground, as much depends on the size of the piece of ground infested, the character of the plant and soil, etc. The following suggestions can be beneficially employed when combating weeds of the perennial class.

Where only small plots are affected, tar or building paper can be laid on the ground over the plants, and small pegs driven into the ground along the edges to hold the paper in place. The roots can also be dug up and removed. Certain chemicals, such as crude sulphuric acid, coal oil, and carbolic acid have been used very successfully, their great drawback being the expense necessarily involved when applied. When the plot is near the barnyard it is often advisable to place a hog lot over it. If the hogs are fed on the worst infested place they soon stamp out the weeds. Another method commonly used in pasture is to place lumps of rock salt on the areas affected. The rains dissolve the salt, which either hinders materially or entirely destroys the weeds. As the cattle generally visit the salt several times in the course of a day, they stamp out the remainder of the weeds.

The building of hay and straw stacks upon small patches has met with limited success. Sheep, hogs, and the unlimited use of the hoe and spade are to be recommended. In fact, any method that will keep the plant from coming above the ground for one season will destroy it forever. Where larger areas are infested, "smother crops" are often used. Examples of these crops are Hemp, Buckwheat, Millet, Cane, Milo Maize, Sorghum, and Kafir Corn. When this method is to be employed, the ground should be stirred from early spring until the crop is sown. This cultivation can best be done with the plow, disk, and harrow. When the plow is used it should be very sharp, otherwise the roots and vines are dragged to other parts of the field where they may again start to grow, hence enlarging the area infested. Sow the seed at such a time as will encourage quick germination. The heavy foliage of the plants cover the ground, excluding sunlight and air. If a piece of ground infested is properly planted to smother crops two or three years in succession, the soil will be left practically free of all obnoxious weeds.

SUNFLOWERS

(Genus-Helianthus)

The different varieties of sunflowers of Nebraska are so well known that little description is necessary. They are rough, annual plants, growing from four to ten feet in height. Their leaves are ovate with rough edges and very distinct veining. The flowers appear from July to September, and are brownish in the center with a fringe of yellow sepals. The sunflower is reproduced by angular grayish-white seeds about one-half inch long.

Owing to the long period of time the sunflower seeds will retain their vitality in the ground, they are especially hard to eradicate. As the plant is an annual, any method that will stop the production of seeds each season will in the end destroy the pest.

REDROOT PIGWEED

(Genus-Amaranthus)

Redroot Pigweed

This weed is an annual with a pinkish fleshy taproot; grows from two to four feet high and has a rough prickly stem. The leaves are ovate in shape and heavily veined. The pale green flowers appear in bunches. The seeds are circular, shiny, and of different shades of black. They are commonly found in all grass seeds and are its only means of spreading. The methods commonly employed in destroying annuals—pulling, preventing the production of seed by mowing, short rotation of crops, etc.—will destroy pigweeds.

HORSE NETTLE OR BULL NETTLE

(Genus-Solanum)

The horse nettle is seldom injurious in Nebraska except in the eastern part. This plant spreads rather slowly, as the seeds are very seldom found in commercial seeds. Practically the only method it has of spreading from one section of the country to another is by means of birds.

The purplish white flowers of the horse nettle which appear from June to October resemble those of the potato, to which it is closely related. It grows from eight to twenty-four inches in height and its branches are covered with stiff hairs and sharp spines or "stickers." The leaves are shaped somewhat like those of an oak tree and have spines on the larger veins. The seeds are produced on the branches in little berries. The plant is also reproduced by rootstocks which send up shoots at irregular distances. This plant thrives best in loose, sandy soil which is easily penetrated by its roots and it is very little affected by ordinary cultivation. It can be destroyed by pulling, grubbing, and spudding and by the use of smother crops.

DOCKS

(Genus-Rumex)

Curled Dock

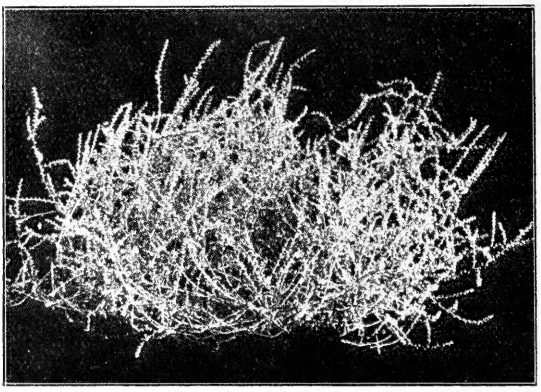
There are many kinds of docks but the two most common in this section are the pale-leaved and the curled. Both are perennial. The leaves of the pale-leaved species are somewhat paler and larger than the curled, wrinkled leaves of the curled variety. The pale green flowers appear during June and August. The angular seeds are ripe by September. The hull surrounding

the seed is so constructed that the seeds float easily. This is the chief reason why docks are so commonly found on low or overflow ground.

Pulling by hand when the ground is wet is one of the most successful methods of eradicating the pest. However, when they are too numerous the spade and mower must be used. Care in planting clean seed and when possible a rotation of crops are the best preventives.

THE RUSSIAN THISTLE

(Genus-Satsota)



Russian Thistle

The Russian thistle is an annual found in nearly every part of the state. Once it was thought to be one of our most serious weed pests, but at the present time it is not so considered. It is a much-branched plant that grows from one to three feet high. As the plant matures it becomes more spherical in shape. The flowers are small and not easily detected. The seeds are dull gray in color, irregular in shape, rather small, and are commonly found in commercial grass seeds. In the fall, the plant breaks loose at its base and rolls over the ground, scattering seeds at every bound.

The Russian thistle dies when cut off at the surface of the ground; therefore it is not a serious pest in well-cultivated fields. The roadsides, pastures, meadows, etc., where the thistle is common should be mowed before seeding time. If this practice is continued for two or three years the Russian thistle can easily be eradicated. However, one man who fails to destroy the thistles growing on his place can infest the entire neighborhood because of the tumbling nature of the weed.

BUFFALO-BUR

(Genus-Solanum)

The buffalo-bur is a native of the west but has gradually worked east until it is found in all parts of Nebraska. It resembles the horse nettle, and, like it, is related to the potato. However, it differs in that it has very spiny burs, in place of smooth berries, and has yellow flowers, also more and stranger spines than are generally found on the horse nettle. The burs become fastened to rabbits and other animals, by which means the black, irregular seeds are scattered far and wide. As the plants are somewhat bushy, they sometimes break loose at the surface of the ground and tumble long distances, scattering their seeds as they go.

As the buffalo-bur is an annual, it can be destroyed by cutting before seeding. The seeds are found in alfalfa and clover. The plants are seldom found in fields that are thoroly cultivated.

Ragweed

RAGWEEDS

(Genus-Ambrosia)

The two ragweeds commonly seen in this country are the "smaller" and "greater" ragweeds. These pests are both annuals. Both are found along roadsides, low ground and waste places, but the smaller ragweed is very common in cornfields. The greater ragweed grows from four to eight feet high but the smaller species seldom attain a height to exceed four feet. The stems of both kinds are very rough and the leaves divided. The flowers are pale green in color and during a certain stage in their development will leave a red stain on the skin if pressed between the thumb and first finger. The brown, urn-shaped, beaked, tapering seeds are found in oats, wheat, barley, and other grains, from which they are especially hard to separate. The seeds retain their vitality for many years. This weed may be eradicated by pulling, mowing, burning, or any other method that will either prevent seeding or destroy all seeds formed.

SANDBUR

(Genus-Solanum)

Sandbur

The sandbur is an annual so well known that very little description is necessary. When small it somewhat resembles foxtail. It grows to be about one foot high and is much branched. The seeds ripen from July to November and are enclosed in a many-pointed bur, which is much more painful to come in contact with than the cocklebur, as the points are much sharper. The burs are scattered by becoming attached to passing animals.

The sandbur can be eradicated by destroying the plant with fire or the mower each year. Land planted to corn or other hoed crops should be cultivated thoroly.

DEVIL'S SHOESTRING OR MARSH SMARTWEED

(Genus-Polygonum)

Marsh Smartweed

This perennial weed is especially troublesome in low, wet places and is very hard to destroy. It grows from one to three feet in height. The flowers which appear during July and August resemble those of the heart's-ease. The leaves are much the same shape as those of the heart's-ease, altho they are somewhat larger and much more numerous. The plant grows from seeds which ripen during August and September and from large, heavy, woody rootstocks that make ground containing the pest especially hard to plow. Turning the rootstocks to the sun by deep plowing is effective as well as other methods employed in destroying perennials mentioned in the fore part of this bulletin

HEART'S-EASE
(Genus-Polygonum)

Heart's-Ease

This plant is an annual, growing from one to two and one-half feet high. The leaves are rather long and narrow, with a distinctly bitter taste. The flowers are usually of a pink color and appear during July and August. The seeds ripen during August and September. This weed is most commonly found on low ground in cornfields. It is also often seen along fence lines and hog lots, where it is not eaten because of its bitter, acid taste. It can be eradicated by thoro cultivation and the prevention of seeding.

BARNYARD GRASS

(Genus-Panicum)

This weed does its greatest damage to hoed crops in low wet places. It is also commonly found along fence lines, in waste places, etc. Barnyard grass is an annual of heavy foliage growing from one to three feet high. The leaves are wide, with a very heavy midrib. Its green flowers appear from June to August. The seeds ripen from July to September. The seeds are produced on rather a loose spike resembling somewhat German millet. Thoro cultivation and preventing the formation of seeds will destroy this pest.

Barnyard Grass

Crab Grass

CRAB GRASS OR FINGER GRASS

(Genus-Panicum)

Crab grass is an annual commonly found in lawns and in some cases troublesome in cornfields. It varies in height from six inches to three feet and spreads on the ground. It frequently takes roots where the joints come in contact with the earth, making it rather hard to eradicate. The seeds are produced on spikes, hence the name "Finger grass." Thoro cultivation and continual mowing to prevent seeding will destroy crab grass.

QUACK GRASS

(Genus-Agropyrum)

Quackgrass

Quack grass has been a troublesome perennial weed in certain sections east of the Missouri river for many years, but it is only recently that it has become well established in Nebraska. Quack grass is of little value as hay, for the leaves are too rough to be palatable and the growth is so sparse that very little is produced on an acre. When the plant is young it greatly resembles timothy. When it becomes older the leaves become narrow, somewhat light in color, and rough on the edges. It grows to a height varying from sixteen to twenty-four inches. The seeds are borne on a stem which is bare at the base. The arrangement of the seeds is similar to perennial rye grass. This weed is also propagated by underground stems which send up sprouts at irregular intervals. Owing to the ease with which the roots start to grow, it is an especially hard weed to eradicate. Pieces of roots catch in the plow, harrow, cultivator, or other machinery and scatter the pest over great areas. It seems that any part of the root, no matter how small, which is broken off and carried to another place will start to grow.

The most practical method of combating quack grass depends much on the area infested. Where only found in spots, digging up and removing the roots will be found the most effective method of destruction. In case an acre or more is infested, the use of smother crops described in the fore part of this bulletin is more practical.

FOXTAILS

(Genus-Setaria)

Foxtail

These weeds are annuals. The two kinds of foxtails commonly found in our cornfields are yellow and green. However, the same general method of eradication applies to each. They grow from one to two feet high, with leaves about five or six inches long. The seeds are borne at the end of spikes and somewhat resemble millet. These weeds are so well known that a detailed description is not necessary. It is estimated that one plant will produce about three thousand seeds. These seeds retain their vitality for a long time. Clean cultivation and not allowing the plants to bear seeds are the best known remedies of eradication.

COCKLEBUR

(Genus-Xanthium)

Cocklebur

The cocklebur is an annual so well known that a description seems useless. It is commonly found on low and flood ground. Each bur contains two flowers which later produce seeds. One of these seeds germinates the first spring while the other usually does not start to grow until some later season; however, both seeds have been known to produce plants the same year. The cocklebur not only damages the growing crop, but because of the indigestibility of the husks and the barbs with which they are protected, it is especially injurious to stock. The burs are scattered from one field to another by water, also by rabbits, dogs, and other animals. Stock transferred from one farm to another should be examined carefully and all burs removed.

Pulling all plants before seeding, year after year until all the seeds in the ground have germinated, is practically the only successful method of destroying cockleburs. This usually takes three or four years. Seeding to grass and pasturing close with hogs has also proved effective. However, if the plants become large the hogs will refuse to eat them.

MORNING-GLORIES

(Genus-Convolulus)

Morning-Glory

The most troublesome morning-glories are the deep-rooted perennial kinds with many fleshy rootstocks which send up shoots at irregular intervals. These twine themselves around any plant growing within reach, using them for supports and smothering them out. The leaves are about one and one-half inches long and heart-shaped. The funnel or trumpet-shaped flowers are usually white, altho some varieties produce pink or purplish flowers. The flowers appear thruout the summer, while the brown, rather large, pear-shaped, flat-sided seeds are ripe by August. Because of the numerous rootstocks and the abundance of seed produced, this weed spreads badly and is very hard to destroy. Any part of a root dragged by a cultivator, harrow, or plow to another part of the field will at once begin to grow. When the morning-glories are found in clover, alfalfa, or in other hay or pasture crops, it has been found practical to pasture to sheep or hogs. Many farmers let their spring lambs run in a cornfield infested with morning-glories. They report that very little damage is done to the corn after August, but many morning-glories are destroyed. A short rotation of crops, the liberal use of the hoe with the broad-shared surface cultivator have proved very effective. When large areas are affected, smother crops are practical and will eradicate the pests after one or two years.

THE CANADA THISTLE

(Genus-Cuicus)

The Canada thistle is a perennial; grows to be about three or four feet high, and has very deep rootstocks. The leaves are irregular and deeply lobed with many spines on the veins and edges. The underside of its leaves are covered with fuzz or down. The pinkish flowers appear in July and August. The seeds are light brown, about one-eighth inch long, smooth, somewhat flattened and are often found in alfalfa and clover seed, chick feed, etc. The plant grows from both the seeds and the running rootstocks which send up shoots every few feet. When a plant is pulled up it usually breaks off a few inches below the surface of the ground. This does not kill the pest, as another bud along the rootstock starts to grow at once. Any of the methods used to destroy the perennials will be found effective.

Canada Thistle

Lamb's-Quarter

LAMB'S-QUARTER

(Genus-Chenopodium)

Lamb's-quarter is an annual of such variable form that a definite description is very difficult. It is usually, however, a much-branched plant with pale rough-edged leaves. It grows from two to six feet high. When small the plant is generally covered with small, mealy particles. The pale green flowers are borne on spikes at the attachment of the leaf to the stem of the plant. The seeds appear from August to November and are shiny, black, round, flat on one side, but convex on the other. These seeds are very common in commercial grass seed. As these plants are annuals, any method that will prevent the formation of seeds will eradicate them.

INSECTS

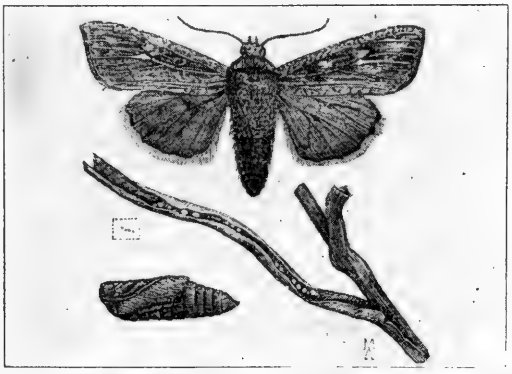
Definition:—A jointed animal, having six legs and breathing thru tubes running thru the body.

Classes:—For all practical purposes and from the standpoint of the farmer, all insects may be divided into two classes: sucking and biting. The method by which the insect secures its food determines its class. Sucking insects insert their tube-like mouths thru the outer bark into the softer tissues and suck the sap, ruining the vitality of the plant and often causing its death. Chinch bugs, squash bugs and corn root aphis are insects of this class. The biting insects are those that have mouths provided with jaws and which chew and swallow their food. Armyworms, grasshoppers, cutworms, etc., are classed as biting insects.

Because of this division, different sprays and emulsions must be used to combat each class. The sucking insects can best be destroyed by having the poison come into direct contact with the body. This clogs the tubes thru which they breathe and of course results in death. The biting insects are destroyed by poison placed on the plants eaten by them.

No one can successfully combat insects without knowing something of the life history and habits of the pests with which he has to deal. It is with this point in mind that this bulletin has been prepared.

ARMYWORM



Army Worm Moth, Pupa and Eggs on Grass Leaf

Grass is the natural home of the armyworm. The adult form of the armyworm is a brownish moth bearing a white spot in the center of each anterior wing. This moth usually lays its small, round, white eggs in the terminal leaf sheaths of small grain, timothy and other grasses. Eggs have been found in hay stacks, old cornstalks, and other unusual places. One female moth is estimated to lay in the neighborhood of six hundred eggs, which hatch in from eight to ten days. The larva feeds on any succulent

food during its early life and when grown attains a length of about one and one-half inches. It has a broad stripe on each side, longitudinal stripes on its back, is dark in color and has very few hairs.

The larva pupates in rubbish and waste places. This stage lasts about

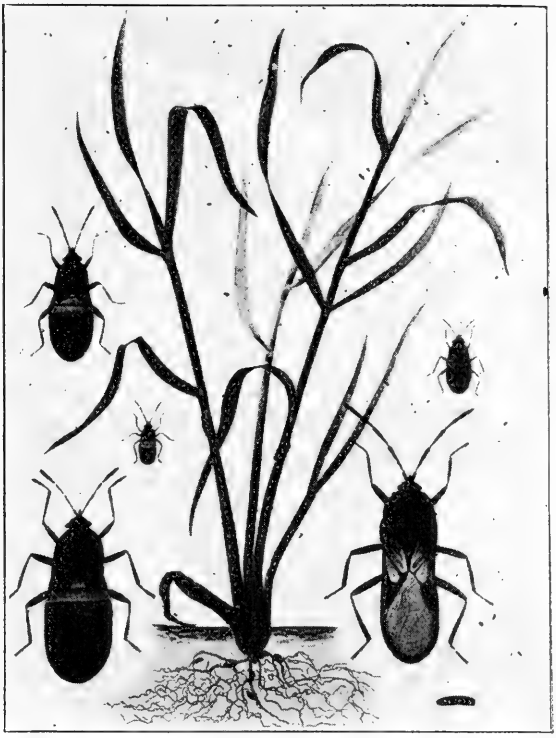
Army Worms at Work on Corn Plant

two weeks. There are, as a rule, two to three broods in one season. The last brood hibernates either as a pupa, larva or moth.

One type of armyworm, known as the fall armyworm, differs from the true armyworm inasmuch as it is slightly more hairy, having large and more prominent black tubercles, and by a white inverted "V" on its forehead. The fall armyworm is especially injurious in the alfalfa fields of the west.

Certain diseases attack the larva, and insect parasites destroy a great many, yet it is found necessary to combat the pest in other ways. When the worms march in great armies from field to field it has been found very effective to plow a deep furrow in front of them. Holes should be dug in the furrows every ten or fifteen feet. As the worms fall into the holes, they can be crushed or killed with kerosene. In smooth pasture land and short meadows the worms can be killed with a heavy roller.

THE CHINCH BUG



Chinch Bug—Five Stages of Development, and the Eggs on Roots

The chinch bug is a small black bug about one-fourth of an inch long, with white and black wings which when folded make a white cross on the back. The chinch bug is a sucking insect and gets its food by inserting its beak into the plant. When first hatched it is red in color and quite small. Chinch bugs have a very offensive odor.

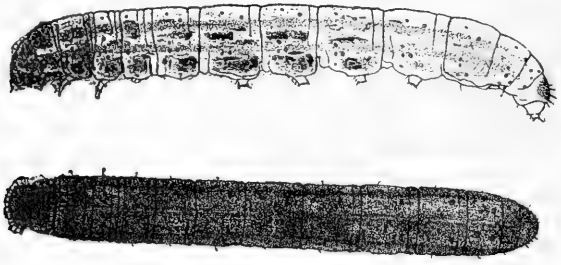
The parent bugs live over the winter under old rubbish, along fence lines and in other waste places. The mother bug comes out when warm spring days appear and lays eggs in the wheat and other grain fields. The eggs begin to hatch in May and continue until late in the summer. The eggs for later broods are usually laid at the base of weeds in the cornfield.

Chinch bugs are more numerous and do much more damage in dry seasons than in wet. They have caused thousands of dollars of damage to crops in this state. They may increase in number for three or four years, and then almost entirely disappear There is a white fungus called the chinch bug fungus, the growth of which is favored by wet seasons. This fungus grows on the body of the chinch bug and kills it.

The fence lines around the fields should be kept free from all trash and rubbish, and the weeds should be mowed and burned. Chinch bugs rarely ever do serious damage to the oat crop. But in seasons favorable to them may do serious damage to wheat, rye, barley, and forage crops. When the wheat is cut about the 4th of July, they may pass from this field into the cornfield. When they appear in such numbers, it is advisable to plow a

strip ten to fifteen feet wide between the infested field and the cornfield. Plow a furrow thru this broken strip, making the sides as vertical as possible. Pulverize a narrow strip on each side of the furrows, dig holes two feet deep in the bottom of this furrow, about ten to fifteen feet apart. The insects upon reaching the ditch will tumble in, and are unable to climb up the steep sides. They can then be killed by dragging a log up and down the furrow with a horse. Those which fall into the deeper holes can be destroyed with coal-oil. Some farmers place a tar line between the affected fields and the first trench. This will prove very effective.

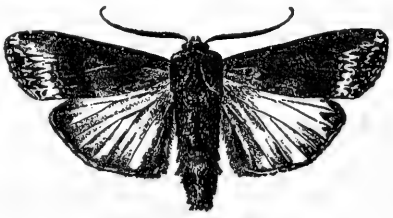
CUTWORMS



Cutworm

The cutworms vary in color from light brown to dark brown. They have a smooth skin and often stripes running the long way of their bodies. Cutworms injure the plant by eating off the leaves and often cut the plant off close to the ground. They work at night and spend the day time curled up under clods, or bury themselves just beneath the surface of the ground.

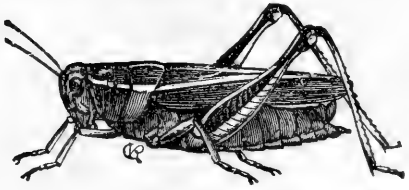
The eggs from which these worms are hatched are laid in grass lands late in the season by grayish-brown moths. These eggs hatch the same fall and the young larvae live on the roots of grass until severe weather sets in. They then bury themselves in the ground until the next spring. The num-



Moth of Cut Worm

ber of broods varies from one to three, depending on the species. In most cases the larva has reached its maturity by the first of July, after which it pupates. The moth appears toward the latter part of the season. It is always advisable to plant a field affected with cutworms late in the season, as they are most injurious the year following sod. Early plowing is one of the best methods of preventing it from destroying the crop. Poisoning has also proved effective. When a field is located along the side of a meadow, it has been found effective to poison fresh clover with a solution of one pound of Paris green to fifty gallons of water and sprinkle along the border rows. It is also beneficial to mix one pound of Paris green with thirty pounds of bran and apply to the field with a drill.

GRASSHOPPERS



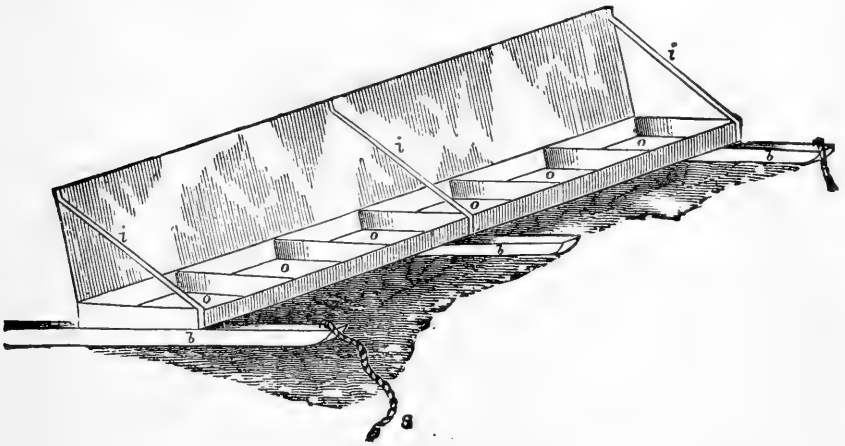
Grasshopper

There are many forms of grasshoppers, but the same methods of destruction apply to practically all. Grasshoppers are so generally known that it is not necessary to give a description of them in this bulletin.

In the fall the female lays her eggs in bunches or pods in the ground. These pods contain from twenty to fifty eggs and are usually buried about one inch deep. The eggs are usually deposited along fence rows, ditches, waste corners, meadows, etc. The hoppers are hatched the following spring. At first the damage of the nymphs, as the young hoppers are called, is not very noticeable but after they grow older their presence is often disastrous to certain growing crops.

Late fall plowing and deep disking has been found very effective in destroying these pests. Either implement disturbs the egg pods by breaking, burying, and turning them to the surface where they can be destroyed by the sun, birds, and other natural enemies.

The jumping kind of grasshoppers can be destroyed by mixing one pound of Paris green with twenty pounds of bran together with enough water to thoroly moisten the mixture. This mixture can be made into balls and scattered along the edge of the field where the hoppers are doing the injury. The only objection to this mixture is that birds and poultry are likely to eat it and be killed. This can be largely avoided by using fresh horse manure instead of bran.



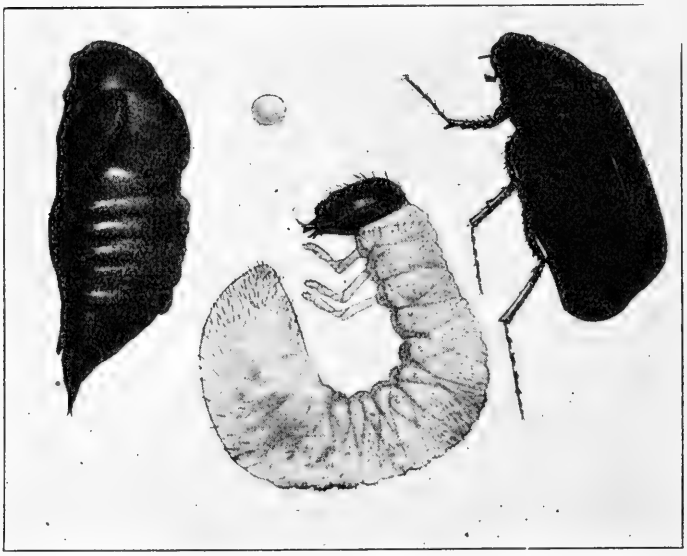
"Hopper-Dozer"

Where the ground is level, a hopper dozer can be used to good advantage. This machine can be easily and cheaply made. It consists only of a long sheet iron pan fastened to two runners and having a strong piece of cloth

fastened to the back of the pan to an upright frame. Place water in the pan and add enough coal-oil to form a thin film over the surface. Hitch a horse to one of the outside runners and bring a rope from the other outside runner to the hame-staple of the harness. As the hopper dozer is dragged thru the field many of the grasshoppers fly against the apron and drop into the solution. The hopper dozer has proved most successful on alfalfa and clover fields.

Certain fungus diseases have proved effective in some localities.

WHITE GRUBS



White Grub, Beetle, Egg, Larva and Pupa

The life cycle of white grubs is very interesting. The eggs which produce them are laid by the female "June Bugs" or "May Beetles." These beetles are thick-bodied and brown in color. They are often seen flying about electric lights, lamps, etc., at night. The beetles live but a short time. The females usually lay their eggs during June. The eggs are generally deposited two inches in the ground and hatch in from ten days to three weeks. The young grubs eat the roots of grass the first season. They hibernate as a larva and appear in the same form the next spring. In June or July of the second year they pupate and during August they appear in the adult stage. The adult usually does not leave its birthplace until the next spring, when it comes forth in the form of a "June Bug."

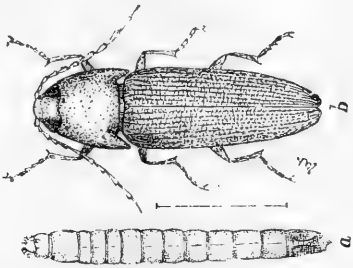
When corn is attacked by white grubs it turns yellow and the roots are very short and frayed at the end. If the grub is not found at the root of a plant that appears to be affected, it may often be located by digging in the earth a foot or two on each side.

Owing to the fact that the life-history of the white grubs extends over nearly three years and that they damage so many different kinds of plants, it has been found difficult to entirely destroy the pest. Fall plowing is one of the most effective methods of destruction. It is also advisable to turn hogs on fall plowed soil. The first crop of corn should be kept as clean as possible; this will prevent the beetles from depositing eggs in the field. As clover is seldom attacked by the white grub, one or two years of clover will materially aid in its destruction.

WIREWORMS

Wireworms are usually of a reddish-brown color, and vary from three fourths of an inch to one inch and a half in length. The body, which is almost bare, is very slender and about the same width thruout. The surface of the wireworm is hard. The body is composed of thirteen segments or sections. The six pairs of short legs are fastened on the three segments just back of the head. A single leg which somewhat resembles a sucker is located on the thirteenth segment.

The click-beetles, so called because of the snapping noise they make when laid on their backs, lay the eggs that produce the wireworms in the earth. These eggs are usually laid in meadows, pastures, or other grass lands.



Wire Worm, and Adult or "Clickbeetle"

In the spring the wireworm comes forth from the ground and feeds on the young roots. These insects are often found in our lawn grasses but not in sufficient number to do great damage. After the ground is broken up and planted to corn, we find them attacking the hills of corn in great numbers. They may not only destroy the roots of the young plants, but often eat the grain itself before it has germinated.

They remain in this worm or larva stage for two years. They then pupate or pass into a dormant stage. This generally occurs late in the summer—July or August. After three or four weeks a long, brownish beetle, known as the click-beetle, comes forth. This beetle either buries itself in the ground or hides under rubbish, or in other sheltered places.

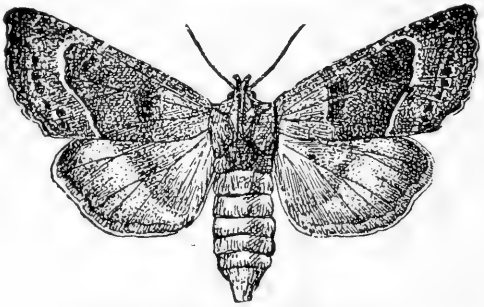
The wireworms do not confine their ravages to corn alone, but injure almost every crop on the farm.

After the worm has once attacked a plant no poison can be applied that will kill the worm and yet not injure the plant. As the larva lives two years, rotation of crops does not entirely eradicate this pest, which often does its worst damage the second year after plowing. When the sod is plowed in the fall it is often advisable to sow to winter-wheat. If clover or oats follow the winter-wheat the two years necessary to develop the larva will have passed.

The ground should be fall plowed as this will turn the pupa to the surface where they can be eaten by birds and destroyed by freezing.

When it is necessary to replant the corn, it is advisable to straddle the old rows. The worms will stay around the old plants for some time if left; otherwise, they would immediately attack the corn last planted. The first planting can be plowed out later on.

STALK-BORER



Adult Moth of the Stalkborer

Because of the nature of its injury this pest is sometimes called the "Heart Worm." The stalk-borer attacks wheat, oats, timothy, potatoes, corn —in fact, a large number of plants with soft or pithy stems.

Larva of the Stalkborer Working in Wheat

The larva is from an inch to an inch and a quarter in length and of various shades of purplish brown, the color depending on the age of the larva. This pest is easily recognized by five white stripes running the entire length of its back and a white stripe on each side extending back from the fourth segment. The mouse-colored, night-flying moth of the stalk-borer lays the eggs that produce the larvae. These eggs are laid in the fall in the grass and either hatch the same fall or the next spring. The larvae live on weeds and grasses when first hatched, but when more mature attack cultivated crops. Plants injured by the stalk-borer usually turn white at the top, although the remainder of the plant may remain its usual color. This light color of the top is due to the larvae boring into the stem. Corn is usually attacked when it is less than two feet high. The stalk-borer enters thru a small hole made in the stem and burrows upward from this entrance. After the larva has once entered the stem, no remedy can be applied that will eradicate the pest without injury to the plant. However, one can do much toward its eradication by destroying the grass lands in which the larva first appear. When the heads of timothy and other grasses begin to turn white, due to the presence of the stalk-borer, it should be made into hay and removed at once. It is very seldom that an entire field is destroyed, as the ravages of the stalk-borer is usually confined to the borders.

CORN-ROOT APHIS

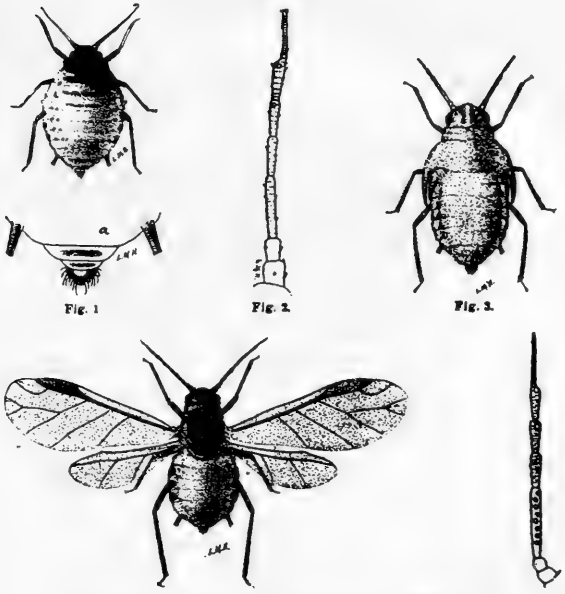


Fig. 1 Fig. 2 Fig. 3

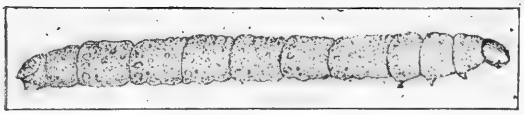
Corn-Root Aphis, Winged and Wingless

The corn-root aphis, also known as the corn-root louse, is a pest which has been rapidly increasing the last few years. Plants affected by corn-root aphis will appear yellow and warped. No other signs may be visible, as the aphis works on the roots, where it sucks the liquid nourishment from the plant.

The corn-root aphis is a soft bluish green insect. It is so sluggish and helpless that it is unable to make its own way about. Therefore it is carried from place to place by the common red field ant. This ant does not injure the corn directly, but it takes care of the eggs of the aphis which are laid in the fall. Very little injury is done by the aphis when alone, as it moves so very slowly, but when the field ant and the root aphis work in conjunction great damage is sometimes done. The first generation of aphids are wingless; the second generation contains both winged and wingless young. Aphids are also known to produce living young which lay the eggs in the late fall for the ants to store away. There are about twelve generations in one season. One female will give birth to ten or fifteen living young.

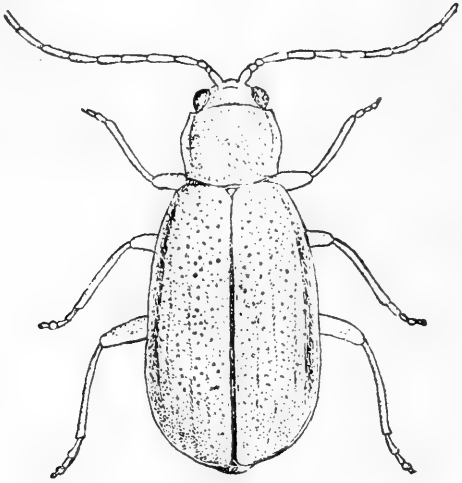
Since the corn-root aphis is found in greater quantities on ground which has been in corn several years, a short rotation period in corn is advisable. This is especially effective during quite dry years. Deep plowing, either spring or fall, together with deep disking is one of the best known preventives. This method of cultivation destroys many of the ant burrows which contain the eggs of the aphis. It will also rid the field of weeds upon which the young root lice feed until the corn begins to grow.

NORTHERN CORN-ROOT WORM



Northern Corn-Root Worm Larva

Egg of Northern Corn-Root Worm



Northern Corn Root Worm, Adult Beetle

The northern corn-root worm is about as large around as a common needle and varies in length from one-half to three-fifths of an inch. It is white thruout with the exception of its head, a spot on the last segment, and the top of the first segment, which are of a light brown color.

The beetle lays the eggs that produce the larvae in the cornfield about one inch beneath the surface of the ground, where they remain thruout the winter. In June the larvae come forth and immediately attacks the roots of the young corn plants.

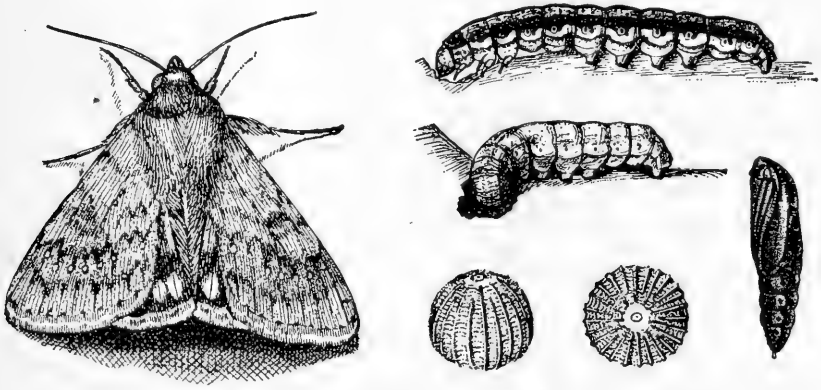
The corn-root worm does its greatest damage during the months of June, July and August. When the larva has reached its maturity it buries itself in the ground and pupates. From these pupas come little pale-green beetles, about one-fourth of an inch long, which are the adult form of the corn-root worm. These beetles feed on the silks of the ears, but do very little damage. The female beetles deposit their eggs in the ground, in cornfields, during September and October.

The first indication that a field is infested with corn-root worms is the stunted, dwarfed appearance of the corn. This is due to the fact that some of the roots have been cut, diminishing the amount of nourishment. Ground planted to corn for several years is sometimes so badly infested that the stalks will bear nothing but nubbins. When wind strikes a field in which

corn-root worms have been working, the whole plant falls, often exposing the injured roots. This uprooting of the corn is often incorrectly attributed to wornout soil. Often after a heavy rain the short, lacerated roots will give way and the stalks lodge.

These pests are easily destroyed by a rotation of crops, as they eat nothing but corn roots. When the corn roots are removed they starve to death. It is advisable not to keep the same piece of ground in corn more than two years in succession but change with small grains, clover, and alfalfa.

THE EARWORM



The Corn-Ear Worm, Adult Moth, Larvae, Pupa and Eggs

The corn earworm varies in color from light green to dark brown and has stripes running lengthwise of its body, which is nearly bare. Its head is yellow and its legs are almost black. It feeds on over seventy different plants and is known as the corn worm, cotton ballworm, tomato worm, etc.

The corn earworm passes the winter in the pupa stage three or four inches below the surface of the ground. The moth emerges from the pupa during the latter part of May and the first part of June. One female moth can produce about two thousand eggs, but they probably average in the neighborhood of five hundred. These eggs are usually laid in the curled leaf of the young plant and soon hatch. The caterpillars are full grown in three weeks. There are three generations in one year. The leaves of the young corn plant are eaten by the first generation, the larvae of the second generation destroy the silks and tassels, the larvae of the third generation attack the hardening ears.

No remedy is known that will entirely destroy these pests. However, the following suggestions may prove helpful: Plow late in the fall or early in the winter. This will turn many of the pupa to the surface. Give clean cultivation and keep down weeds along fence lines. Planting corn early has doubtless proved the most successful.

Corn Plant Infested by Corn-Ear Worm

Young Corn Plant Injured by the Corn-Ear Worm

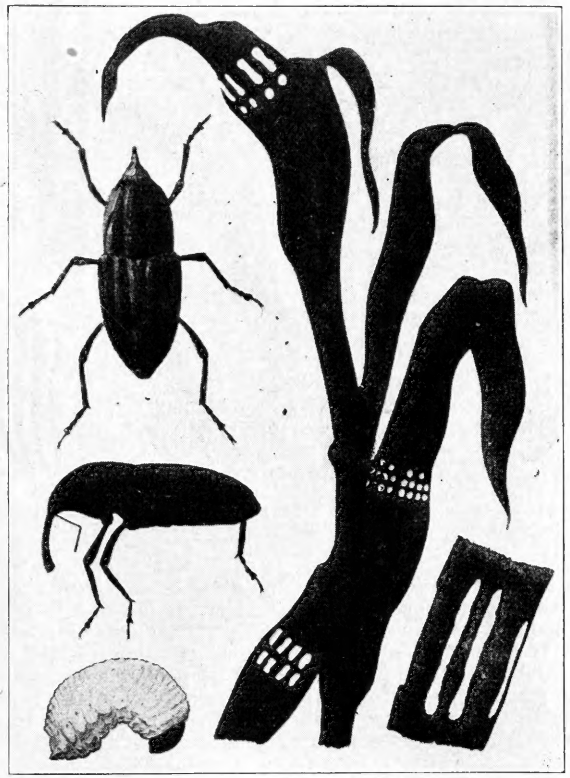
A Corn Root Entirely Destroyed by the Corn-Root Worm

Ears Injured by the Corn Ear Worm

CORN BILL-BUGS

These are some of the very few corn destroying insects that do their greatest damage in the adult stage. Corn on sod land is most commonly injured.

The corn bill-bugs are rather large, black or dark brown in color, and have a strong snout or beak, at the lower end of which are strong, sharp jaws. The footless larva of the bill-bug is white, with a hard, dark brown head. It feeds on the roots of timothy and other grasses. The larva pupates in the fall, and the winter is passed in the adult stage. The bill-bug attacks the stem and leaves of the corn plant. Working with its head down it eats long, irregular holes in the stem and tissues of the young plant



Corn Bill-Bugs—Adults, Larva, With Injured Corn Plant

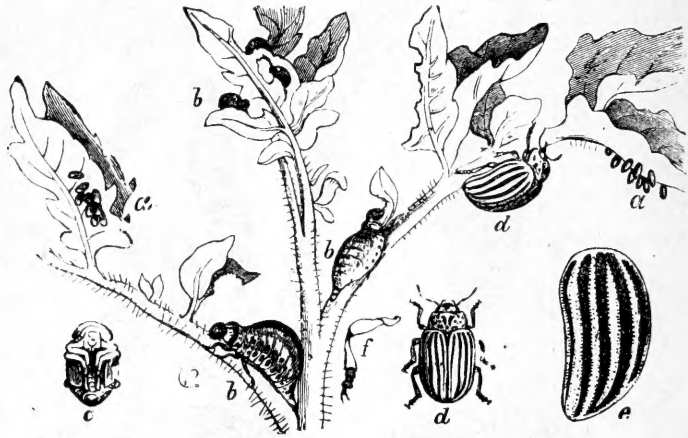
which is very noticeable as the plant develops. The damage done each year by these pests varies greatly.

Late planted corn is rarely greatly injured by the bill-bug. This is a very common practice among experienced farmers. However, there is one species found in low, swampy places that attacks the corn as late as June. Fall plowing is injurious to the development of all known species of bill-bugs.

THE COLORADO POTATO BEETLE

There is no insect that is so injurious to the potato crop as the potato beetle or "bug." The original home of this pest was doubtless the upper Mississippi Valley, altho at the present time potato beetles are found in practically all potato-growing localities. It is so well known that a description seems hardly necessary. However, as it is often confused with the ladybug and blister beetle, the amateur potato grower may find a brief description helpful.

The potato beetle is about three-eighths of an inch long, very plump, being almost as wide as it is long. It is light yellow in color with ten black stripes running lengthwise of the wings. The larvae are ugly, soft, slim creatures. They are dark red when first hatched but become lighter in color as they mature. There are generally two generations in one season, altho some authorities have reported three. The beetles hibernate; that is, pass into the "resting" stage in the ground generally at a depth of



Potato Beetle, Showing Different Stages of Development

eight or ten inches. They appear again early in the spring. At this season they fly a great deal during the warmer part of the day. These flights generally take place before the potatoes appear above the ground. As soon as the potatoes are up the beetles turn their attention to the tender sprouts. After a few days of feeding, the females deposit the eggs, which number from five hundred to one thousand in a single year. These eggs which usually hatch in from four to seven days are deposited on the underside of leaves. The larvae which pass thru four stages, mature in from sixteen days to three weeks, after which they pupate. They remain in the pupa stage about ten days.

The Colorado potato beetle has many natural enemies. Many insects, the most common of which is the ladybug, feed on the larvae and eggs. Quails, robins, crows, and many other birds destroy these pests by the millions each season. Chickens, ducks, skunks, snakes, and toads eat potato bugs with relish. However, these natural methods are not sufficient to completely control the beetle, and sprays are often resorted to in order to save the crop. A very effective spray can be made by mixing one pound of Paris green and one pound of lime with one hundred gallons of water. This solution should be applied with a hand sprinkler or a spray pump.