

Figure 1. Stages of the sugar-beet wireworm: Left to right, full-grown larva, pupa, adult beetle. USDA photo.

From 1946 until recently, three highly effective chlorinated hydrocarbons were available for wireworm control in Idaho. They were persistent in the soil and gave satisfactory control for several years. Two of these materials, which gave excellent control in potatoes the year they were applied, no longer have federal registration for this use. The third material, DDT, is still registered and will continue to be recommended in Idaho. It is an equally effective material but is slow in its action and must be applied at least 6 months before planting to give satisfactory control of large wireworms in soils growing potatoes. To prevent residues in sugar beet pulp, DDT must be applied 24 months or 2 growing seasons before planting.

Control is now difficult because:

1. DDT requires planning crop rotations and land use 1 to 3 seasons in advance.
2. Chlorinated hydrocarbons previously used to treat irrigated lands are near the end of their effective life in the soil. These lands must be re-treated soon.
3. Insecticides approved for use during the season requiring control are shortlived in the soil. Timing of insecticide treatments with the wireworm's seasonal history is essential.

4. Susceptible crops such as potatoes grown on newly irrigated land taken out of sagebrush are being severely damaged by dry-land wireworms during the first and second crop years.

#### DESCRIPTION

Wireworms are hard-bodied, slender, cylindrical, shiny, yellow-to-brown larvae or "worms" found in the soil. When full grown, they are  $\frac{3}{4}$  inch in length. They have 3 pairs of legs that cannot be seen from above and are slow moving. The last segment of the body is pronged or forked. The adults are the familiar click beetles so



Figure 2. Potato tuber showing typical wireworm damage.

AGRICULTURAL EXTENSION SERVICE  
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## WIREWORM CONTROL

irrigated farming  
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1966 recommendations for  
 potatoes, sugar beets, beans and corn

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named because of their habit of snapping and flipping their bodies into the air to right themselves when placed on their backs. The adults are slender, tan-to-brown-to-black beetles  $\frac{1}{3}$  to  $\frac{1}{2}$  inch in length. Many different kinds of wireworms are found in Idaho soils. The predominant species on irrigated lands are the Pacific Coast wireworm<sup>1</sup> and sugar-beet wireworm.<sup>2</sup> In southern Idaho the most common species under dry land conditions is the Great Basin wireworm.<sup>3</sup>

### SEASONAL AND LIFE HISTORY

The life cycle of our predominant wireworm species requires three to four years for completion under favorable conditions. Wireworms spend the winter in the soil as partially grown larvae or as new adults in overwintering cells. The adults leave the soil in the spring when the soil temperature reaches 55 F or higher. The adults mate and the females return to the soil for egg-laying. Wireworms in the adult stage feed little if at all and cause no damage. Each female will lay up to 300 eggs in moist soil at depths of from one to several inches and then die. The eggs hatch in 2 to 4 weeks. The newly hatched larvae, no longer than  $\frac{1}{16}$  inch, are subject to a high mortality. This, coupled with the fact that females do not readily migrate, accounts for the spotty appearance of wireworm infestations in many of our fields. Soil preferences for egg-laying sites and/or for larval establishment determine where dry-land or irrigated wireworms will occur and predominate.

The larvae cause severe feeding damage during their second and third year. In the spring when soil temperatures reach 50 F wireworm larvae move upward toward the soil surface

<sup>1</sup> *Limonius canus* LeConte  
<sup>2</sup> *L. californicus* (Mannerheim)  
<sup>3</sup> *Ctenicera pruinina* (Horn)



from depths of 6 inches or more where they have spent the winter. When soil surface temperatures reach 80 F and higher they move downward again. During the third and fourth seasons mature larvae transform to fragile pupae in earthen cells. Adults emerge in 3 to 4 weeks and remain inactive in the soil until the following spring at which time a new generation is started. Wireworms in all stages of development may be present in the soil during any growing season.

### NATURE OF DAMAGE

Wireworm feeding damage to crops includes destroying seeds and seedlings and injuring tubers, bulbs and roots. In spring wireworms may cut off seedlings causing bare areas or thin stands. They may hollow out corn and bean seeds before they can sprout. They also feed on roots and stems of young plants reducing vigor. Later in the season they tunnel or scar maturing tubers, bulbs or roots reducing the market value of these crops.

### CONTROL

There is no easy method for determining severity of infestation or potential for damage in dealing with wireworms. Infestations will vary with areas and from year to year. They will vary within a field and between fields.

Sometimes past cropping history, records of previous soil treatments, or previous damage will serve as an indicator. Soil sampling is an aid to estimating wireworm populations and can serve as a basis for control measures. At least 20 well-spaced samples are required for each 40 acres of land. Soil temperatures should be near 50 F. Samples can be taken with a 6-inch posthole auger or an irrigation shovel. Sample to a 12-inch depth. Spread each sample out on a tarp or piece of burlap or run it through a sifter with an 8- to 16-mesh screen and count the number of wireworms. If as many as 5 wireworms are found in 20 samples, damage can be expected, particularly in beans and potatoes, and if 10 or more are found, damage may be severe.



Figure 3. Peeled potato tuber showing internal wireworm damage.



**Complete chemical soil treatment is the best control** for wireworms on irrigated land. DDT is very effective if properly applied. Crops grown in DDT-treated soils will be protected from wireworms for at least 8 years. Results with granular parathion and diazinon soil treatments have not always been effective. Granular parathion and diazinon can be applied just before planting and should be effective if the soil has warmed up adequately for wireworm activity. These materials remain toxic in the soil for no longer than 6 weeks. Soil fumigants such as ethylene dibromide kill wireworms on contact. Fumigants are expensive and application is frequently impractical for large acreages. Other materials are registered with USDA for wireworm control but are not recommended for Idaho growers at this time.

**Certain cultural practices are also effective** in holding down wireworm populations. Avoid clovers and grasses in crop rotations on lands infested with wireworms. Soil dryness is harmful to wireworms and will kill many if the drying period is prolonged. Alfalfa can be a key crop. A good stand will reduce wireworms each year if it is weed free. The last year a field is in alfalfa it should not be watered. Plowing of the stubble during the first 10 days of August will break up

the pupae cases and destroys most of the wireworms. Follow alfalfa in the crop rotation with a susceptible crop such as potatoes and then with less susceptible crops such as sugar beets, beans, or corn.

### CAUTION—POISON

All of the insecticides used for wireworm control are poisonous to both man and insects. This is especially true for the organophosphorus insecticides. They are safe to use in granular form when all safety precautions prescribed on the labels are strictly followed. Parathion is extremely toxic while diazinon is somewhat less toxic. When using parathion, humans and animals must be kept off the treated area for 48 hours.

The first rule in using insecticides safely is to read the label and completely understand it each time the material is used. Secondly, follow the manufacturer's directions on safety precautions to the letter.

### FOR HIGHLY TOXIC CHEMICALS

Wear protective equipment such as, rubber gloves, long-sleeved shirt or coveralls, goggles, hat, and a proper respirator when opening contain-

## CHEMICAL CONTROLS FOR WIREWORMS

| INSECTICIDE  | APPLICATION   |  | LIMITATIONS   |
|--|---|--|---|
| <p><b>DDT wettable powder or emulsifiable concentrate</b></p> <p><b>Parathion granules (10% G) See Caution</b></p> <p><b>Diazinon granules (5 or 14%G)</b></p> | <p><b>Broadcast 10 pounds actual per acre</b></p> <p><b>Broadcast 4 to 6 pounds actual per acre</b></p> <p><b>Broadcast 3 to 4 pounds actual per acre</b></p>   | <p><b>Application must be followed with disking, plowing and cross-disking to thoroughly mix the insecticide with the soil to a depth of 6 to 8 inches</b></p>                             | <p><b>Apply 6 to 12 months ahead of potatoes and 24 months ahead of sugar beets</b></p> <p><b>Apply 1 week before planting and only after the soil temperature has reached 50 F at a depth of 6 inches. Incorporate into the soil immediately following application</b></p> |
| <p><b>Ethylene dibromide</b></p> <p><b>D-D mixture</b></p>   | <p><b>Mix 3 gallons of 83% material with 20 gallons of No. 2 fuel oil and inject into soil in 12-inch rows at a depth of 8 inches</b></p> <p><b>Inject 25 gallons per acre in 12-inch rows at a depth of 8 inches</b></p> | <p><b>Apply at least 3 weeks before planting and only after the soil temperature has reached 50 F at a depth of 6 inches. Harrow, roll or sprinkle immediately following injection</b></p> |   |



ers, filling insecticide hoppers and applying the chemicals.

Remove protective clothing as soon as possible after use. If chemicals are accidentally spilled on clothing or yourself, remove contaminated clothing and wash yourself thoroughly. Never wear contaminated clothing.

Burn or destroy insecticide containers when they are empty. Bury spilled insecticides. Break or crush and bury glass or metal containers.

Store all insecticides in a safe place away from children and pets.

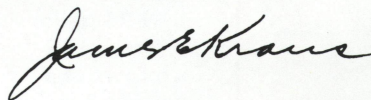
If there is any chance that you may have been accidentally poisoned, see your doctor immediately.

Keep accurate records of the pesticides you apply.

**"PESTICIDES RESIDUES:** These recommendations for use are based on the best information currently available for each chemical listed. If followed carefully, residues should not exceed the tolerance established for any particular chemical. To avoid excessive residues, follow recommendations carefully with respect to dosage levels, number of applications, and minimum intervals between application and harvest." **"THE GROWER IS RESPONSIBLE FOR** residues on his crops as well as for problems caused by drift from his property to other properties or crops."

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