



syngenta

Wireworm Field Guide

A guide to the identification and control of wireworms

Wireworms and Stand Establishment

Achieving strong stand establishment is key to crop success. Plants that get off to a strong, vigorous start are better able to overcome most early-season challenges, such as cool weather, disease and insect attack.

Successful stand establishment is a result of an integrated approach to crop production – one that looks at every management practice that can affect germination and emergence, such as seeding rates, seeding dates and seedbed quality, and one that uses every crop production tool, such as seed treatments and pedigreed seed, to anticipate and overcome early season crop stressors.

In Western Canada, wireworms are one of the most economically significant early-season stress factors for many crops. They prefer to feed on cereal crops, but wireworms can also cause significant damage to pulses, canola and potatoes, among others. The unpredictable nature of wireworm behaviour makes it impossible to quantify populations and geographic distribution, but anecdotal evidence indicates the problem is increasing in all crop-growing regions.

The larval form of click beetles, wireworms are wily creatures that live for several years in the soil and seem utterly resistant to adverse conditions. It makes them difficult to detect and even more difficult to control.

This guide was designed to help you do both with information and images to help you correctly identify wireworm damage, better understand factors that influence their behaviour and develop control strategies that will help you protect your crop so it can get off to the best possible start.

Wireworm Identification

There are about 30 species of wireworm in Canada, and they all look and behave in a similar fashion. Being able to correctly identify them at all stages throughout their life cycle is an important start to developing a management strategy.

Appearance

- **Larvae** are slender, with hard, smooth, jointed bodies. They are usually reddish-brown in colour, but can be yellow or white, as well. There are three pairs of legs behind the head, and the tail segment is notched.
- **Pupae** are white and contained within earthen cells in the soil.
- **Adult** wireworms, or click beetles, are hard-shelled, black-brown in colour and cause no crop damage at this stage in their life cycle. They make a distinctive clicking sound when they flip from their backs to their feet.
- **Size.** Full-grown larvae range from $\frac{1}{2}$ an inch to $1\frac{1}{2}$ inches in length and adult click beetles range from $\frac{1}{4}$ to $\frac{1}{2}$ an inch long.



Click beetles don't damage crops, but their presence is a strong indicator of a wireworm problem

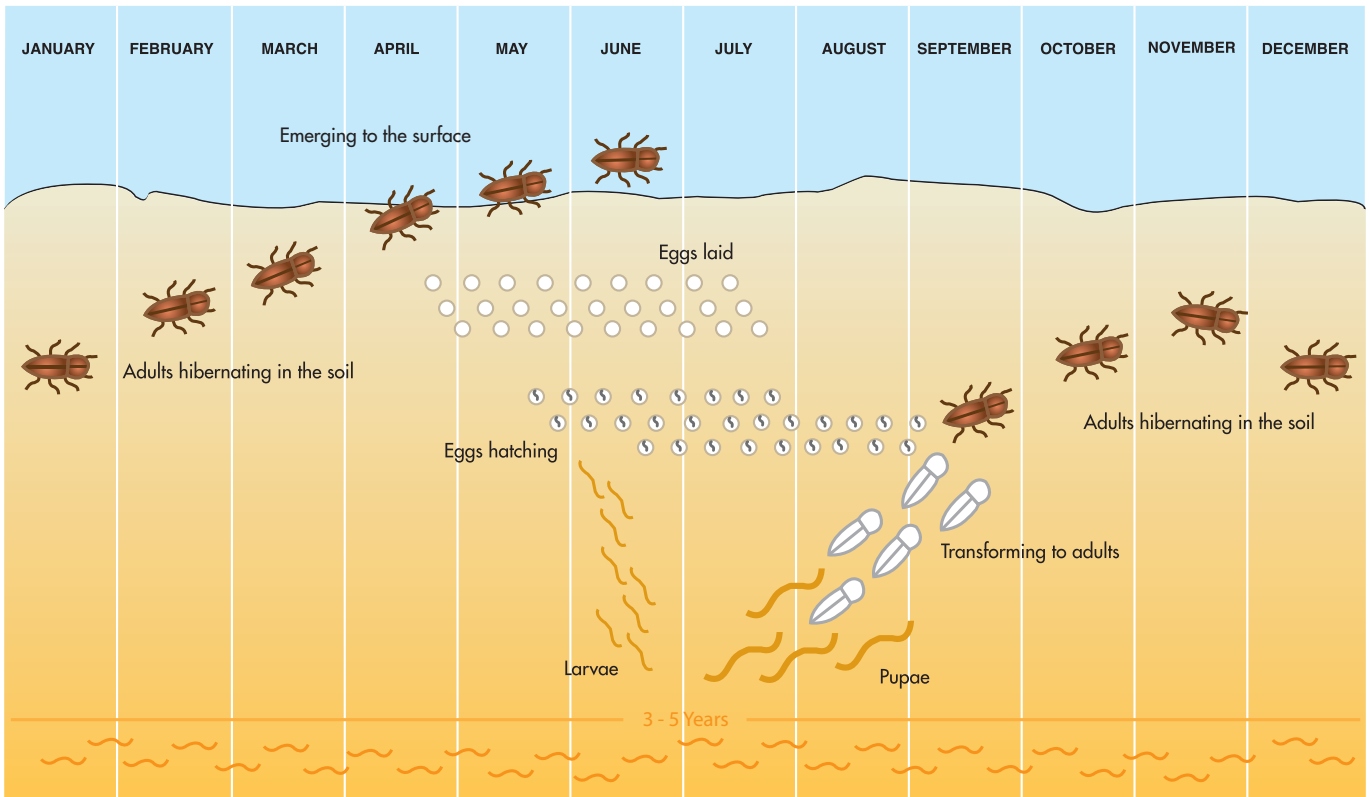
Wireworm Life Cycle

Adult click beetles overwinter in the soil and emerge in the early spring, around late April to early May. Each female lays between 200 and 400 eggs between late May and early June, depositing those eggs on the soil surface down to a depth of 15 cm, or nearly six inches.

The larvae hatch within three to seven weeks and spend the next three to five years feeding on roots and germinating seeds and moving up and down in the soil profile as conditions dictate (see *Factors Affecting Outbreak*).

When they're ready, larvae go through a short pupation, about a month long, and emerge as adult click beetles in the soil. They overwinter there and emerge the following spring to lay eggs and begin the cycle again.

Because of their long and somewhat variable life cycle, it's important to note that a field infested with wireworms is likely to contain populations at all growth stages, at the same time.



Factors Affecting Outbreak

It's a bit of a misnomer to talk about outbreaks of wireworm since the term usually refers to sudden infestations while, with wireworms, a single generation can live in the soil for up to five years. It is true, however, that weather conditions, food supply and soil conditions can influence wireworm feeding activity. Being aware of what prompts or suppresses that activity is important for the development of a management plan.

Weather

- When soil temperatures rise to about 10° C in the spring (perfect for crop germination), wireworms will move up into the top few inches of the field.

- Hot, dry weather of about 25° C or over will send wireworms deeper into the soil; they can burrow down as far as a metre into the soil profile (over three feet).
- Cool, damp weather tends to bring wireworms closer to the surface, but cold winter weather drives them down again.

Soil Condition

- Fields planted with cereal crops are highly susceptible to wireworm infestation.
- Recently broken sod is prone to high wireworm populations.
- Silty, medium-textured, well-drained soils appear to be favourable to wireworm damage.
- Wireworms love summerfallow – it has no effect on mature larvae and wireworm damage is often worse following a fallow year.
- Heavily tilled soil pushes organic matter under where it creates CO₂ as it decomposes, attracting wireworms to the surface. Fields that have been cultivated for 10 years or more tend to suffer from wireworm damage.

Food Supply

- Wireworm feeding activity is highly influenced by available food supply. Attracted to the CO₂ released by germinating seeds, they move up in the soil profile to feed just as the crop is beginning to emerge.
- When a food source is unavailable, they will move back down into the soil and can survive on nothing but humus for up to two years.

Identifying Wireworm Feeding Damage

Because they exist entirely underground and are extremely elusive, it's often difficult to accurately identify crop damage caused by wireworms. Many times, wireworm damage can be mistaken for a seeder miss, a poor seed lot, dry growing conditions, cutworm damage or herbicide carryover, so careful examination is needed for an accurate diagnosis of the problem.

Wireworms feed on germinating seeds, roots and young seedlings, killing plants directly as well as creating wounds that are ideal for disease establishment. Telltale signs of wireworm feeding include:

- Hollowed out seeds and dead seedlings.
- Stems that are shredded, but not cut off (cut off stems are a sign of cutworm damage).
- Plants that are wilted and discoloured, but still attached to the root.
- Plants where the central leaves are dead, but outer leaves are still green.
- Row sections are missing in otherwise healthy stands – wireworms tend to feed along crop rows.
- Thin stands/no stand.



Wireworm feeding damage occurs mainly underground and leaves wounds that are ideal for disease establishment.



Wireworm feeding on a cranberry bean



Shredding and discolouration typical of wireworm feeding



Severe wireworm damage can result in no crop stand at all

Assessing the Problem

Wireworm larvae tend to remain where they hatch, moving mainly up and down in the soil profile rather than laterally through a field. It means that infestation levels can vary widely from farm to farm, field to field, even acre to acre.

When you first see what you think is wireworm damage in the crop, dig into the soil to find the insects. They move fast and will burrow away from the light, but if you dig early in the spring, when warm soil temperatures and germinating seeds are attracting them to the surface, chances are that digging will confirm the presence of wireworms.

Bait balls will then help you assess where in the field those wireworms are. Bait balls are typically made from wheat flour or oatmeal and work by releasing CO₂, which attracts wireworms looking for food.

It's important to keep in mind that bait balls are a good measure of insect presence, but not density.

To make one bait ball, mix 1 to 1½ cups of oatmeal or wheat flour with two tablespoons of honey and up to ½ a cup of water until the mixture sticks together enough to make a ball. You can put the ball directly into the ground, or tie it up in a mesh bag, like an onion bag (old socks or cheesecloth also work well), which will make it easier to retrieve.

Bury the bait balls in 4- to 6-inch deep holes and mark them with flags. You will need about 20 evenly spaced bait balls per acre to get a reasonable assessment of the presence of wireworms. Check the baits every four to five days to see if they've attracted any wireworms.

Bait balls are not always fool proof. If wireworms are sufficiently fed, they will not be attracted by the presence of a new food source and will not go to the trap. If the ground has recently been tilled and is rife with CO₂ sources, they will not go to the trap. Still, bait balls are the best means of determining the extent of a wireworm problem and are an excellent assessment tool.



Bait balls attract wireworms by releasing CO₂



About 20 bait balls per acre should be buried 4 to 6 inches deep

Management Options

Wireworms are unpredictable. They don't always rise to an available food source and they can completely disappear into the soil depths for unspecified periods of time, only to reappear when you least want them to.

It's fair to say that, once in a field, wireworms cannot be eradicated, but they can be controlled so your crop has the best possible chance to achieve strong stand establishment, which will, in turn, reduce the impact of wireworm damage. ***Your management plan should include a test strip, which can be used as a baseline to assess how well your wireworm control strategies are working.***

There are a number of cultural and chemical wireworm control options available to growers, and all should be included as part of an integrated crop management plan.

Seedbed Preparation. Ensure the seedbed is level, uniform, well packed and warm. The goal is to achieve good seed-to-soil contact for quick, even germination and emergence, which are key for strong stand establishment.

Seeding Date. Seeding early is good, but too early into conditions that are too cool can lead to delayed or reduced emergence and reduced vigour. This kind of delay leaves crops vulnerable to insect attack for a longer period of time than if they were seeded into optimal conditions.

Seeding Rate. Always use recommended seeding rates to achieve optimal plant populations per square foot. Cutting seeding rates tends to result in thinner stands, leaving no room for recovery should the crop suffer

wireworm damage. If you know the field has a wireworm infestation, you might even want to consider boosting the seeding rate by as much as a bushel per acre for cereals.

Seeding Depth. Seed too deep and plants will struggle to get out of the ground, weakening them and leaving them vulnerable to wireworm attack. The goal is always to seed into moisture, but consider this: for every unnecessary inch of seeding depth in cereals, yield can be reduced by as much as 10%. Optimal seeding depth for most cereals is one to two inches, canola is one inch, and pulses are 1½ to 3 inches, depending on the crop.

Seed Treatment. There is no post-emergent insecticide option for wireworm control, but there is a pre-emergent one: seed treatment. The Cruiser Maxx® family of seed treatments for use on cereals, pulses and potatoes, all contain thiamethoxam, an insecticide active against wireworm.

Thiamethoxam has systemic activity and moves through the seed, roots and young seedling to protect the plant from the inside out. When wireworms feed on any part of a treated plant, their feeding impulse is interrupted and they stop eating, allowing the plant time to develop root and stem structures strong enough to outgrow any further attack.

In fields where wireworm infestation is known to be high, or has been clearly evident over a long period of time, Cruiser Maxx seed treatment should be used as the first line of defence.



Insecticidal seed treatment is an effective way to protect crops from wireworms



Wilting and discolouration along a seed row can indicate wireworm damage

Be Part of the Solution

One of the biggest challenges when it comes to wireworm management is having a clear picture of which species live where, and what factors influence their behaviour.

To that end, Dr. Bob Vernon with Agriculture and Agri-Food Canada is heading up a wireworm tracking survey. The objective is to create an interactive map that tracks the location and habits of more than 30 species of wireworm that live on the Prairies so that researchers can develop a better understanding of the insect and develop better control strategies.

You can help in this effort by submitting wireworms from your farm to the study. If you have wireworms and want to participate, here is what you need to do:

1. Collect wireworms, along with some moist soil, in a plastic container. You can also put an entire bait ball full of wireworms into a container, like a sour cream or yoghurt container.
2. Clearly and securely label the container with the following information:
 - Your name.
 - Your phone number.
 - A detailed land description where wireworms were found; a legal or GPS description is ideal.
 - Indicate the crop in which the wireworms were found.
 - Indicate if the land is irrigated.

3. Mail the container **immediately** to:

Dr. Bob Vernon
Agriculture and Agri-Food Canada
6947 Highway 7
PO Box 1000
Agassiz, BC V0M 1A0

The information learned during this survey will be shared with participating growers, which is why it's important to include your contact information when you send in samples.

Ship fast!

It is extremely important that wireworms are shipped as soon as they are collected, and no later than four days after collection. If left too long, they will desiccate and be of no use to the researchers. If you cannot ship the container quickly, please call your Syngenta Territory Manager or Seed Care Specialist to arrange for a pick up.





Syngenta Crop Protection Canada, Inc.
300-6700 Macleod Trail South
Calgary, Alberta
T2H 0L3

For further information, please contact our Customer Resource Centre
at 1-87-SYNGENTA (1-877-964-3682) or visit SyngentaFarm.ca.

Dr. Bob Vernon

Agriculture and Agri-Food Canada

Ph: 604-796-1708

E-mail: bob.vernon@agr.gc.ca

Always read and follow label directions.

Beyond Seed Protection™, Cruiser Maxx®, Seedcare™ and the Syngenta word mark are trademarks
of a Syngenta Group Company. © 2010 Syngenta Crop Protection Canada, Inc