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SOYBEAN CYST NEMATODE MANAGEMENT GUIDE

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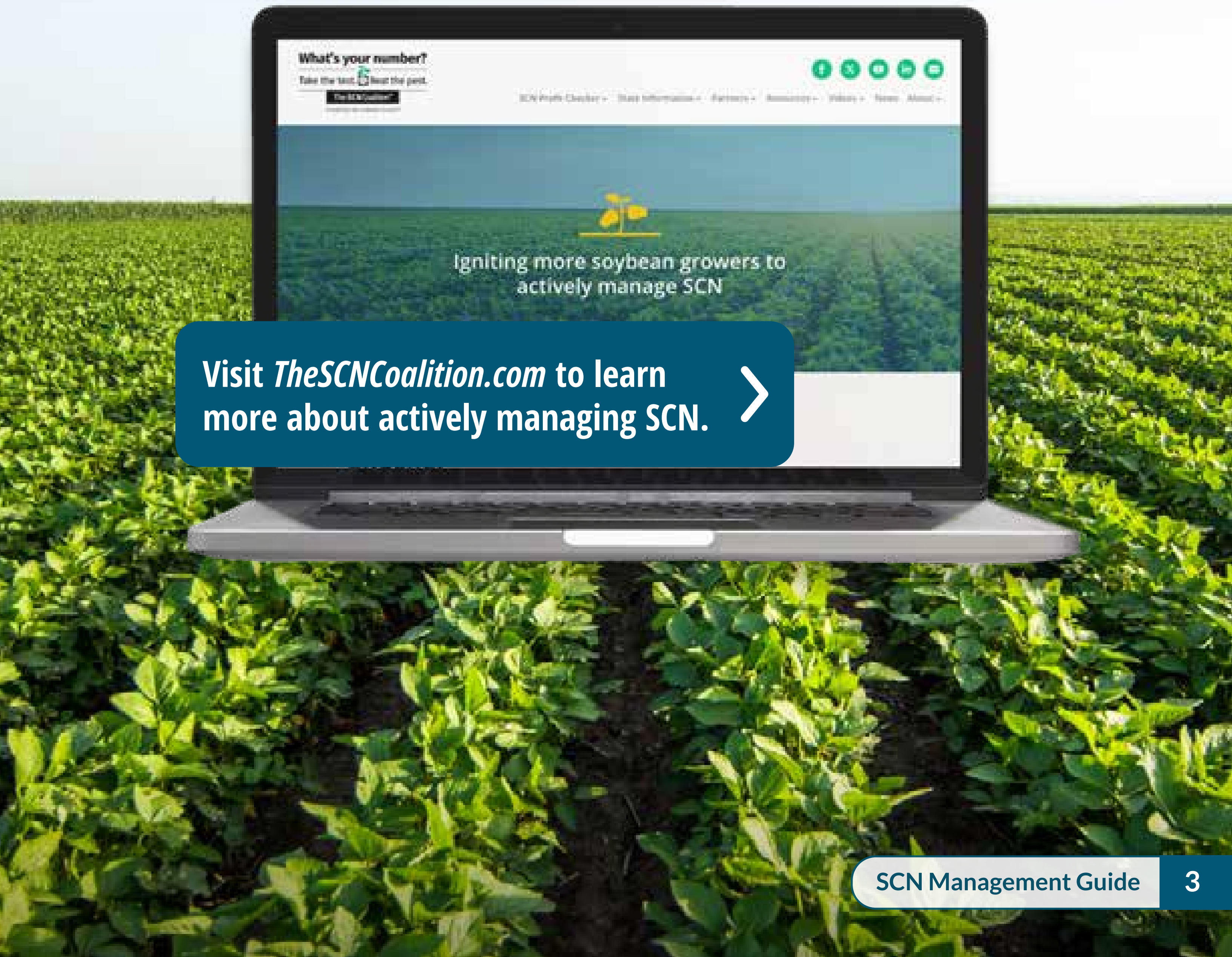
Proven Strategies Farmers Can Implement to Battle Soybean Cyst Nematode

Found in most soybean production regions in the U.S. and Canada, this yield-limiting pest can cause up to 30% yield loss without causing noticeable aboveground symptoms, leading to annual losses exceeding $1.5 billion.

The bad news? Once a field becomes infested with soybean cyst nematode (SCN), this pest cannot be completely eliminated.

The good news? Effective management can keep SCN populations low and protect soybean yield. This guide provides practical tools and science-based strategies to help identify SCN infestations, develop a management plan tailored to your operation and recover lost yield potential.



Is SCN Really a Problem?

Several factors influence how soybeans are affected by SCN:

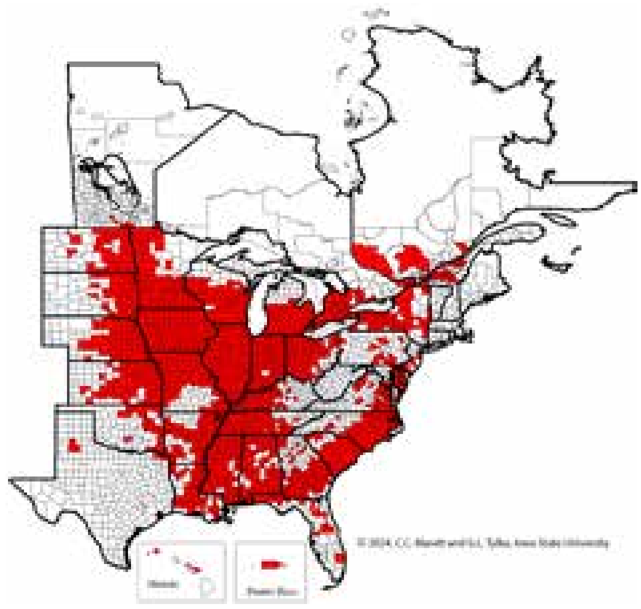
- SCN population density (egg numbers) and SCN (HG) type
- Soil type (including soil pH, moisture, texture)
- Other diseases and nematodes
- Soybean variety
- Environmental conditions

SCN is the leading cause of soybean yield loss in North America and continues to be identified in new fields and regions each season. When high SCN populations combine with environmental stress such as drought, the impact on yield and profit can be severe.

Fortunately, an active management plan can keep SCN in check. The strategies outlined in this guide will help you protect yield potential and limit the pest's impact on your operation.

SCN 101: Biology and Reproduction

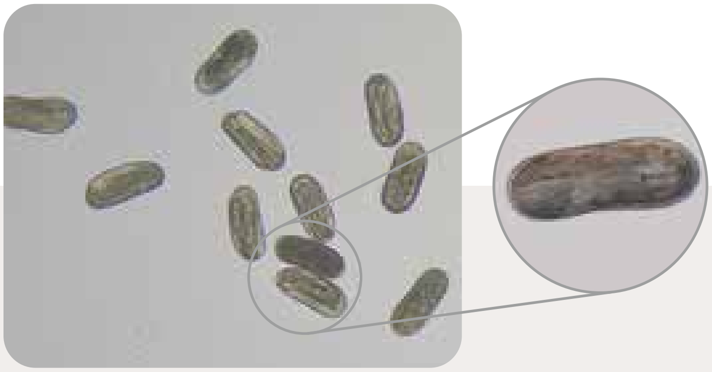
Soybean cyst nematode (SCN), *Heterodera glycines*, is a soilborne microscopic roundworm that feeds on and damages soybean roots. First reported in North Carolina in 1954, SCN is now found in nearly every major soybean-production region in the United States and Canada (see map). It remains the most destructive and costly soybean pathogen in North America.



Known Distribution of the Soybean Cyst Nematode, Heterodera glycines, *in the United States and Canada Through 2023. (Tylka and Marett 2025)*

This plant-parasitic nematode requires a living host plant to complete its life cycle, which typically takes 21 to 24 days at ideal temperatures (76-81 F/25-27 C), but it can take five weeks or more in cooler conditions. Unfortunately, the same environmental conditions that promote soybean growth also favor SCN reproduction. SCN can complete up to six generations in a single growing season, depending on the presence of a suitable host and environmental conditions. Once hatched from eggs, SCN infective second-stage juveniles (J2) penetrate soybean roots and establish feeding sites near the vascular system. After initiating a feeding site, the nematodes become sedentary and cannot move.

Nematode feeding reduces nutrient availability, disrupts water uptake and slows root development. As a result, nodulation is reduced, nitrogen fixation slows and root systems become stunted and lose efficiency, which further compounds stress to the plant.

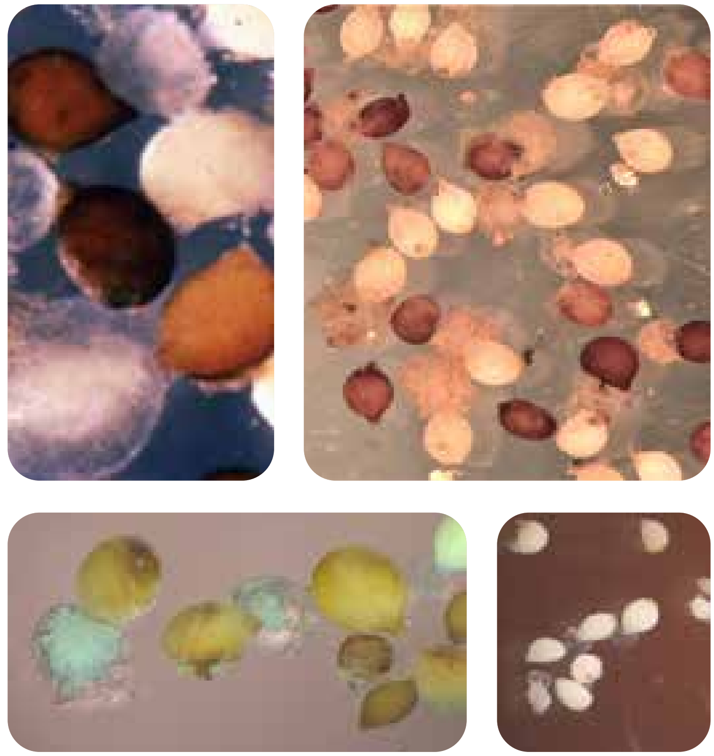


SCN egg containing a folded-up juvenile soybean cyst nematode. (Olivia Dooley and Rebecca Higgins, University of Nebraska-Lincoln; Guiping Yan, North Dakota State University)

Infective second-stage juvenile (J2) SCN after hatching. These nematodes are approximately 0.4-0.5 mm (1/64 inch) long and cannot be seen without magnification. (Zak Ralston, The Ohio State University)

After a few days of feeding, adult male nematodes regain motility, leave the roots, move through the soil to fertilize females and no longer contribute to plant damage. In contrast, female nematodes continue feeding, causing significant root damage and plant stress that leads to yield loss.

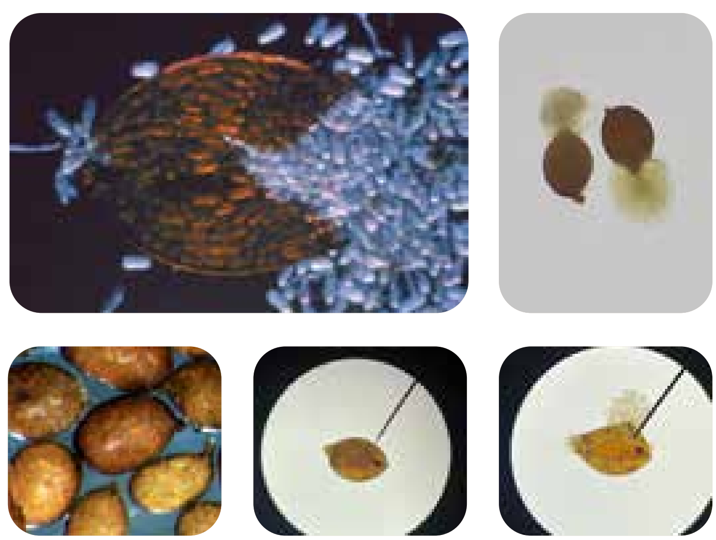
A maturing SCN female, too large to be fully contained within the root. (T. Jackson-Ziems, University of Nebraska)



SCN cysts of different ages: White females are young, yellow to brown females are older and dying or dead. (Zak Ralston, The Ohio State University)

As they mature, females remain sedentary and swell into white, lemon-shaped bodies. Their heads remain embedded in the root's vascular tissue while the rest of their bodies break through the root surface. These "white females" are visible to the naked eye, turning yellow with age and eventually brown as they die and form cysts, the stage that gives SCN its name.

The brown cyst is a tough protective shell, safeguarding the eggs within. Each cyst holds approximately 250 to 500 eggs, depending on field conditions. The tough outer wall of the cyst shields the eggs from harsh soil environments and fumigation, allowing them to survive for many years without a host. Anything that moves soil can move egg-filled cysts, including machinery, wind or water and wildlife, making regular scouting and proactive management essential to limiting SCN's impact.



A dark brown cyst, broken open to reveal the eggs and juvenile nematodes within. (E. Sikora, Auburn University; Guiping Yan, North Dakota State University; Zak Ralston, The Ohio State University)

How to Spot SCN: Signs and Symptoms

SCN can reduce soybean yields by up to 30% without producing noticeable aboveground symptoms, allowing infestations to remain undetected while quietly affecting profitability.

The first indication that SCN may be present is often stagnating or declining yields. In a heavily infested field, SCN can cause yield losses of up to 80%. Aboveground symptoms such as stunted or yellowing plants, canopy closure delays or early plant death are more noticeable under dry or nutrient-poor conditions. However, these symptoms are not unique to SCN-caused damage and may be subtle or even invisible in high-yield environments.

Symptomatic soybean plants growing in an SCN-infested field in Illinois.

Visible symptoms of plant damage such as yellowing and stunting are not always seen, particularly in high-yield environments. Though not apparent, this field is infested and experiencing yield loss.

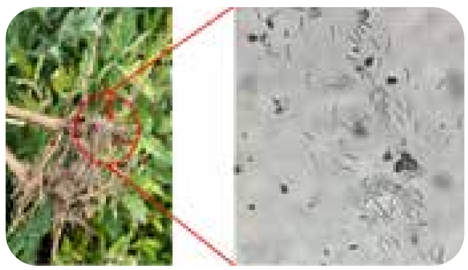
SCN-infected roots on the right are stunted, discolored and have fewer nitrogen-fixing nodules than noninfected roots on the left.

White SCN females are visible on soybean roots. (Albert Tenuta, Ontario Ministry of Agriculture, Food and Agribusiness)

Close inspection of soybean roots for white females is an effective way to verify SCN is present, but females may not be seen on roots. Even if they are, their number does not necessarily indicate the severity of infestation. At the start of soybean flowering, white females can be seen if the root system is carefully dug up and soil gently removed. Keep in mind that the absence of visible white females doesn't confirm absence of SCN. **For this reason, soil testing or identification by a trained professional is the only reliable way to monitor, identify and manage this damaging pest.**

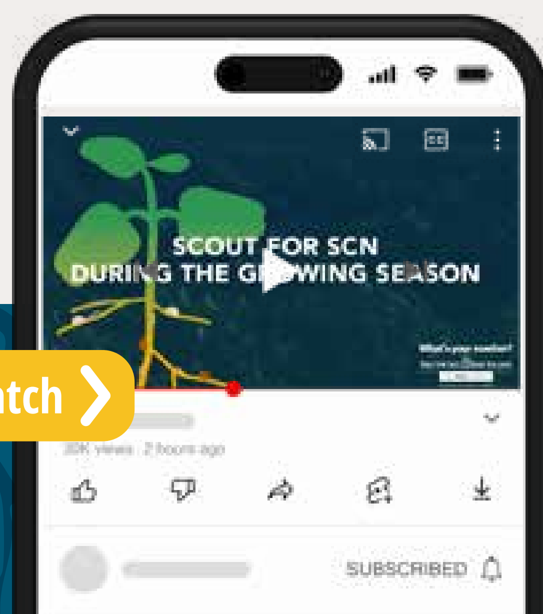
SCN's Common Yield-Loss Partners

SCN does not act alone in the soil environment. When it infects soybean roots, it alters root physiology and stresses the plant, which can influence its interactions with other soilborne pathogens. Research has examined potential associations between SCN and several important fungal and oomycete pathogens, including *Calonectria ilicicola* (red crown rot), *Macrophomina phaseolina* (charcoal rot), *Phytophthora sojae,* and species of *Fusarium, Pythium* and *Rhizoctonia*. In some cases, the presence of SCN has been associated with increased disease severity or plant stress, while other studies have reported little or no interaction. These complex relationships underscore the importance of considering the broader soilborne disease community when managing SCN, as combined infections can amplify plant damage and yield loss.



Soybeans with symptoms of sudden death syndrome. (D. Mangel, University of Nebraska. H. Lopez-Nicora, The Ohio State University)

One notable interaction involves SCN and the sudden death syndrome (SDS) pathogen, *Fusarium virguliforme*. The SDS pathogen can infect soybean roots without SCN being present. However, fields infested with both SCN and *Fusarium virguliforme* often experience more severe SDS symptoms and greater yield loss than fields with either pathogen alone. SCN feeding alters root structure and physiology, creating plant stress that can facilitate SDS infection and exacerbate symptoms. Reducing the SCN population level can help limit SDS impact and protect yield.



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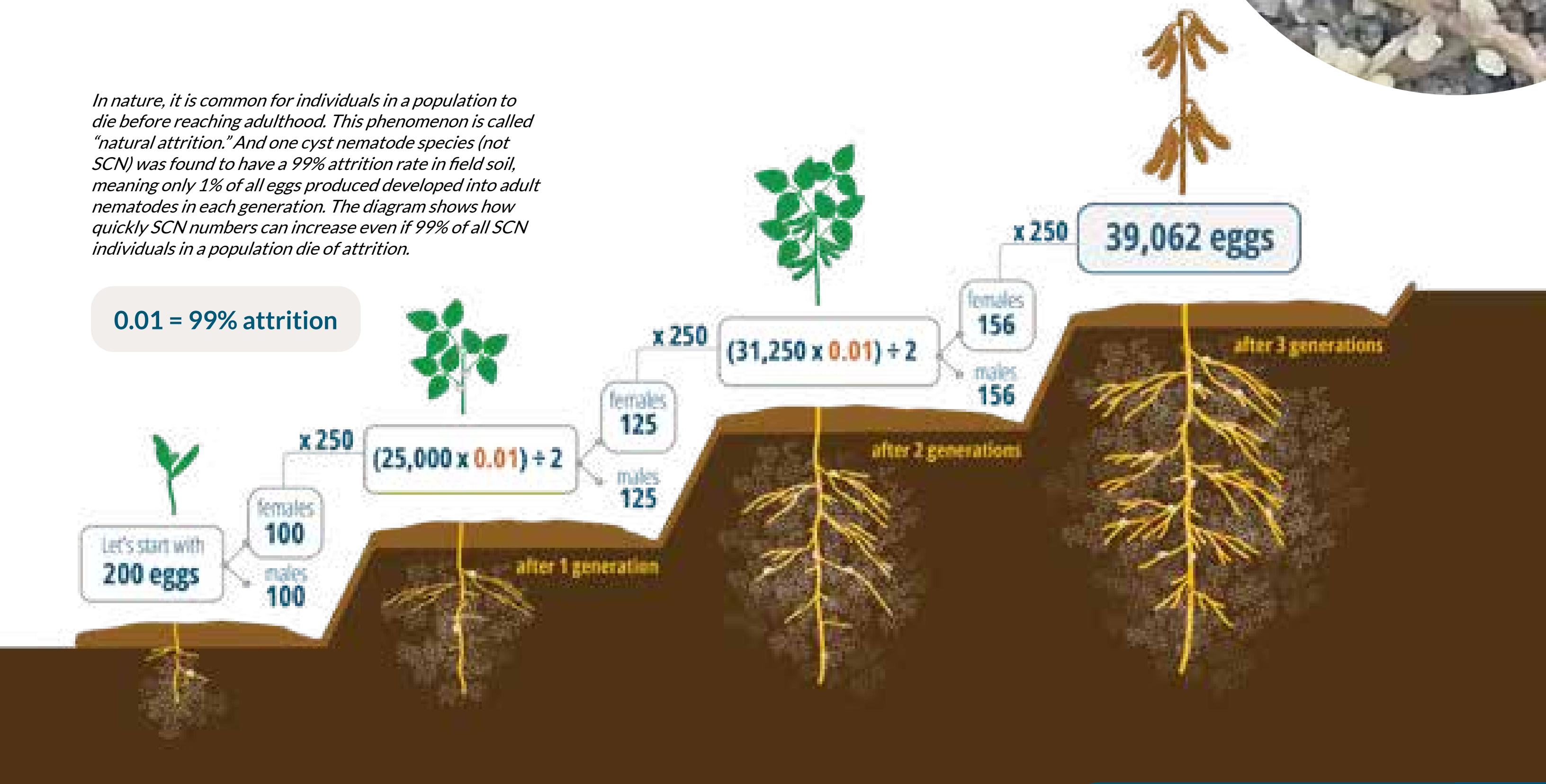
You've Heard About SCN. What's the Next Step?

Once SCN is detected in a field, it cannot be completely eliminated. As more roots are damaged by SCN and more plants become infected, water and nutrient uptake decline, leading to even greater yield loss. With its ability to quickly reproduce, SCN numbers can go from low to high in one season, quickly increasing yield loss potential.

Once the crop is planted, there are no in-season options to reduce yield loss from SCN. However, a post-harvest soil test can provide the information needed to develop long-term management strategies you should implement in subsequent seasons.

In nature, it is common for individuals in a population to die before reaching adulthood. This phenomenon is called "natural attrition." And one cyst nematode species (not SCN) was found to have a 99% attrition rate in field soil, meaning only 1% of all eggs produced developed into adult nematodes in each generation. The diagram shows how quickly SCN numbers can increase even if 99% of all SCN individuals in a population die of attrition.



Start With a Soil Test in a Soybean Field

Soil sampling for SCN is the foundation of an effective SCN management plan, and the reliability of the results depends on the sample's quality and condition. Although soil samples for SCN can be collected at any time, an ideal time is after soybean harvest. Fall sampling provides the best opportunity to estimate potential inoculum levels for the following spring. Collecting samples at this time allows sufficient time to adjust management decisions for the next soybean crop based on the sample results.

Sample fields separately based on natural breaks or agronomic areas such as wet or dry areas, soil texture and depth or cropping history. Collect samples near field entrances or along fence lines; areas with poor yields, high soil pH or premature plant death should be sampled separately. While yearly sampling isn't required, it can be helpful to test fields in which resistant varieties were grown or in fields cropped in a rotation every three years, ideally after soybean harvest when SCN numbers are easier to detect.

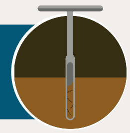
More frequent testing may also be useful in fields with high SCN egg counts to closely monitor management responses.

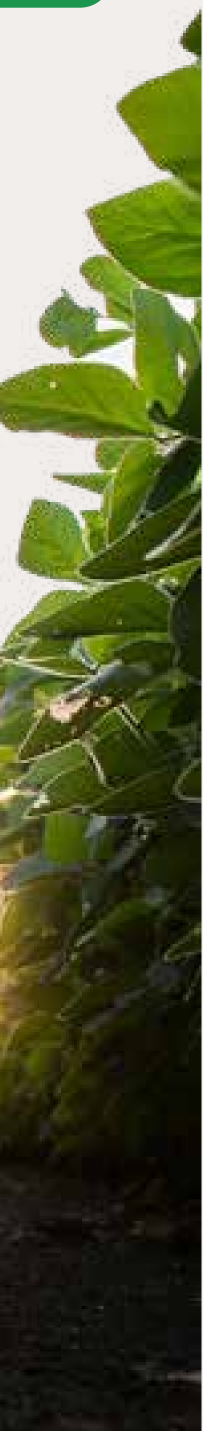
Many state universities and extension services offer free or reduced-cost SCN sample processing. A list of laboratories near you that process SCN soil samples can be found at thescncoalition.com.

Two ways to scout for SCN:

1 Dig roots and look for females. (Dig don't pull.)

2 Collect soil samples for testing.





(Ambria Small, The Ohio State University)

What you need for SCN soil sampling:

- 1-inch (2.5-cm) diameter cylindrical soil probe (or shovel/auger)
- Bucket
- Plastic bags
- Cooler with ice packs (if needed)
- Permanent marker or labels
- Notebook or mobile device

1

Use a cylindrical soil probe and push it into the soil at a slight angle to collect soil cores. Samples should be taken in the root zone near the base of the plant.

2

Collect soil cores that are 6 to 8 inches (15 to 20 cm) deep.

If a cylindrical probe is not available, clear any residue or debris from the soil surface and collect the sample with a shovel. Discard the edges of the soil on the shovel blade and keep the central part of the subsample.

3

Collect 10 to 20 soil cores that are 1-inch (2.5 cm) in diameter. Collect in a zigzag or "W" pattern across the entire area to be sampled.

If you are soil sampling on a standard 2.4- or 2.5-acre grid and would like to collect a 20-acre sample, you can collect two extra cores from every eight or nine grid cells, respectively.

Get a closer look ❯

4

Combine those cores into a separate bucket, then place the soil from the multiple grid cells in a single bag and mix. This creates a single sample that will represent those 20 or so acres.

5

Place the homogenized composite soil sample (at least 2 cups or 500 ml in volume) in a plastic bag and label it with a unique field ID using a permanent marker.

6

High temperatures can reduce sample integrity. Store samples away from sunlight in a cool area or in a cooler until they are shipped to the laboratory. Ship samples within a few days of sampling to obtain the most accurate numbers.

Soil Sampling of Nonhost Crop Fields in Fall Before Planting Soybeans Next Year

Collect SCN soil samples from fields where nonhost crops were grown, especially if soybeans are planned for the next season. Fall sampling provides an estimate of SCN population densities that will be present when soybeans are planted in the spring. These results can guide management decisions, including selecting soybean varieties with alternate SCN-resistance sources, choosing effective seed treatments or adjusting crop rotation to plant corn or another nonhost crop. Population thresholds and economic risk can be assessed using tools such as the SCN Profit Checker calculator (see page 17), which estimates potential yield losses based on SCN population density or egg count and informs which management strategies are economically justified. Additional testing on the same composite soil sample, such as an HG Type test (see page 15), can assess the virulence profile of the SCN population and identify which resistance sources are likely to be effective.

Find a Soil Testing Lab ❯

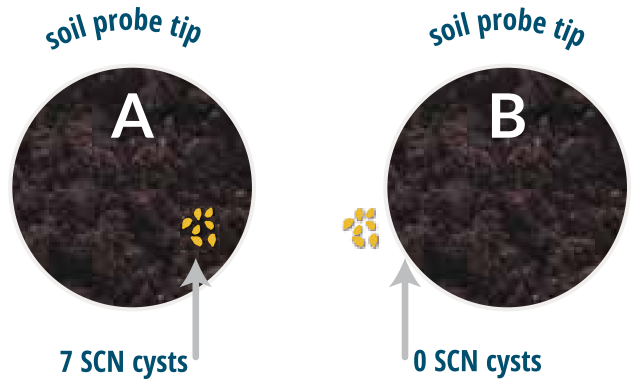
Why are SCN Soil Sample Results so Variable?

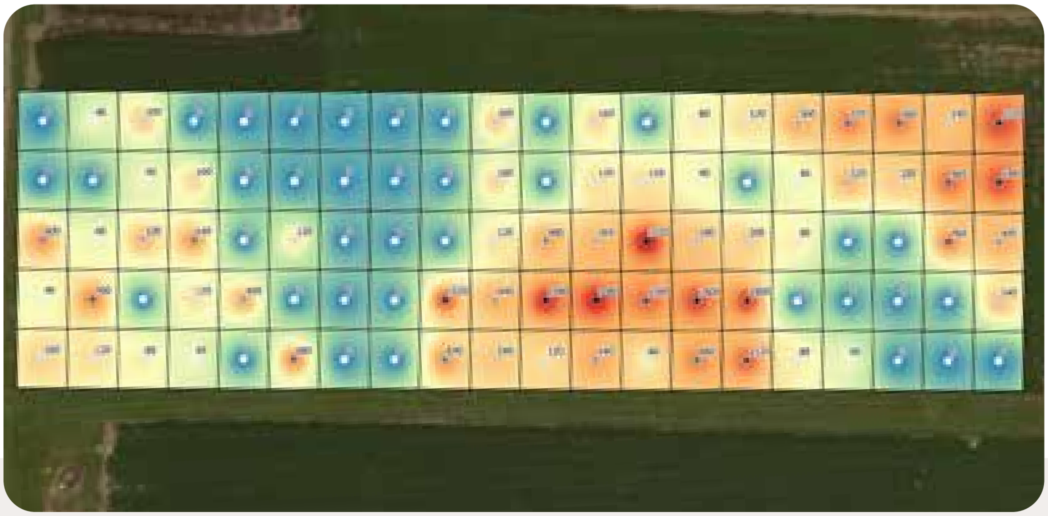
SCN populations are highly aggregated within fields, forming localized hotspots rather than being evenly distributed. Soil texture, topography and past tillage or water flow influence where these hotspots develop. As a result, egg counts can differ widely between nearby soil cores.

A single soil sample may not reflect the patchy, aggregated distribution of SCN within a field, but it can provide an estimate of the average population density across the sampled area. When possible, use intensive or grid sampling. Collect multiple cores per zone, combine them into composite samples and map the results to locate hotspots and support more precise management decisions.

WHY SCN TEST RESULTS ARE VARIABLE

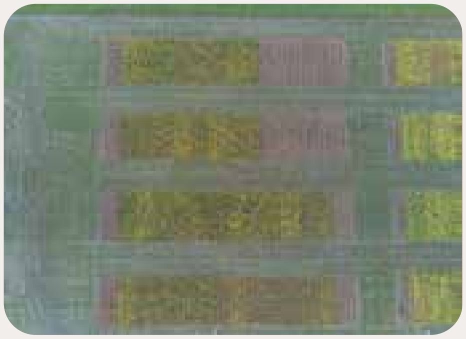
It all depends on where you put the probe. A 1/2 inch difference can mean the difference between zero and 1,500 eggs. (Each cyst can hold 250 to 500 eggs)

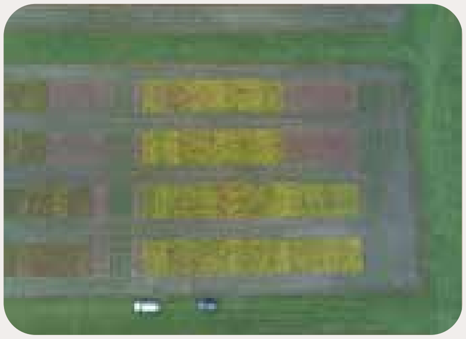




The aerial photos and map illustrate the spatial distribution of SCN egg densities, generated using inverse distance weighting (IDW) interpolation on a natural log-transformed scale. Numbers in each quadrant show SCN egg counts per 100 cm^3 of soil.

(Horacio D. Lopez-Nicora, The Ohio State University)





Interpreting YOUR RESULTS

Laboratories may report SCN populations as the number of cysts, eggs or juveniles per a given volume of soil, typically 100, 250 or 500 cm^3. Egg counts per volume of soil are the most accurate and consistent measure of SCN population density. Cyst counts can be misleading because cysts vary widely in how many eggs they contain, and some cysts may be empty. Juvenile counts are also less reliable, as their numbers vary depending on environmental conditions and the timing of sampling.

When interpreting SCN test results, it's essential to compare values based on the same soil volume and life stage. For example, 200 cysts per 100 cm^3 may sound high, but without knowing the egg content of each cyst, the actual potential for yield loss remains unclear. In contrast, 1,000 eggs per 100 cm^3 provides a more direct and actionable estimate of the SCN population density. For this reason, always request SCN results as the number of eggs per volume of soil, as this provides the clearest and most useful basis for making informed active management decisions.

Determine HG Type

SCN populations differ in their ability to reproduce on soybean varieties marketed as resistant. To understand this variability, scientists classify populations using **HG Types**, which replaced the older "race" classification system (see conversion table). "HG" represents the initials of SCN's scientific name, *Heterodera glycines*, and the classification reflects how the population reproduces on standard soybean lines used as sources of resistance. For growers, HG Type can also be thought of as the **SCN Type**, a more intuitive term describing the population's virulence profile.

HG Type is determined using a set of soybean lines known as plant introductions (PI) that serve as sources of resistance in commercial varieties. SCN from a field is grown on these PI lines and compared to reproduction on a susceptible soybean cultivar such as "Lee 74."

The seven soybean plant introductions used in HG type tests.

HG type index number	HG type indicator line
1	PI 548402 (Peking)
2	PI 88788
3	PI 90763
4	PI 437654
5	PI 209332
6	PI 89772
7	PI 548316 (Cloud)

The **Female Index (FI)** measures the proportion of SCN females a population produces on a resistant line compared to a susceptible cultivar. For growers, FI can also be referred to as **SCN reproductive potential**, as it indicates how effectively the population reproduces on each resistance source. FI is calculated as:

$$\text{FI (\%)} = \frac{\text{Average number of SCN females on resistant line}}{\text{Average number of SCN females on susceptible cultivar}} \times 100$$

An FI of 10% or more indicates that SCN can successfully reproduce on that line, demonstrating its ability to adapt to the resistance source.

Determine HG Type

HG Type uses FI results to classify SCN populations. If a population produces an FI of 10% or more on any standard resistant PI line, that line's number is included in the HG Type designation. For example, a population producing over 10% females on PI 88788, PI 209332 and PI 548316 is **HG Type 2.5.7** (SCN Type 2.5.7). A population that does not reproduce above 10% on any of the standard resistant PI lines is designated as **HG Type 0** (SCN Type 0), indicating it cannot overcome the resistance sources tested.

HG Type alone only tells part of the story. Two populations with the same HG Type, for example HG Type 2 (reproducing ≥10% on PI 88788 compared to a susceptible cultivar), can differ in FI, such as 30% versus 87%. The higher FI indicates more successful reproduction on that resistance source and a greater risk of yield loss.

Knowing both the HG Type and FI (SCN Type and reproductive potential) enables more strategic resistance management. In the example above, varieties with resistance from PI 88788 would not be effective, whereas varieties with different resistance sources, such as Peking (PI 548402), would be better suited for managing SCN and protecting yield.

HG Type testing is particularly useful when SCN populations are high and resistant varieties are underperforming. Since not all diagnostic laboratories offer HG Type testing, check local availability before collecting samples.

Indicator Line	*Number*	Female Index
PI 548402 (Peking)	1	2
PI 88788	2	4
PI 90763	3	4
PI 437654	4	0
PI 209332	5	2
PI 89772	6	9
PI 548316 (Cloud)	7	2
HG Type 0		

Indicator Line	*Number*	Female Index
PI 548402 (Peking)	1	2
PI 88788	2	54
PI 90763	3	4
PI 437654	4	0
PI 209332	5	62
PI 89772	6	9
PI 548316 (Cloud)	7	102
HG Type 2.5.7		

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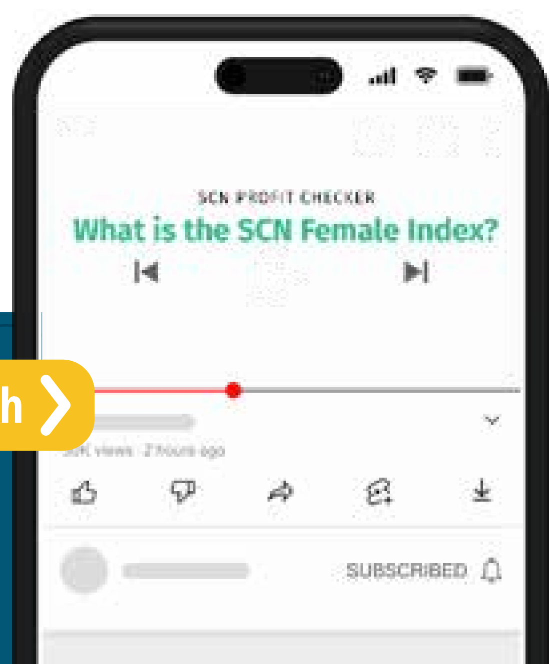

Estimate Loss With the SCN Profit Checker

Once SCN is confirmed in your field and egg counts are determined through soil testing, you can begin to estimate the potential yield loss. To support this, The SCN Coalition developed a decision-support tool called the SCN Profit Checker. This tool combines SCN egg counts with field-specific information, such as soil pH and sand content, to predict expected yield loss if a commercial soybean variety with the most widely used resistance source, PI 88788, is planted.

In addition to these pieces of information, the tool incorporates a regionally estimated value for FI that reflects how effectively SCN populations in your state can reproduce on specific resistance sources. If you have FI data from an HG Type test done on an SCN sample from your own field, you should enter this value in this section of the SCN Profit Checker. This will result in a more field-specific assessment of yield risk to help guide variety selection and management decisions.

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Implement SCN Management Solutions

Once SCN is established in a field, it cannot be eradicated, but it can be managed. While it's impossible to eliminate SCN, proper active management can help you reduce its impact. The goals of active management include:

- Improve soybean health and yield
- Keep SCN numbers low
- Maintain long-term soybean sustainability in your field
- Preserve the yield potential of SCN-resistant varieties
- Maximize return on investment of all crop inputs

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Due to SCN's increasing ability to reproduce on soybean varieties possessing resistance from PI 88788, no single management practice will meet all of the above-stated goals. An integrated approach that combines several components is proven to help reduce SCN's impact on your crop. Even if you've been managing SCN for years, there's always more you can do to stay ahead of this persistent threat. With options like resistant soybean varieties, rotation of soybeans with nonhost crops and use of nematode-protectant seed treatments — all you need to do is determine which strategies are best for your operation.

Resistant Soybean Varieties

Resistant soybean varieties remain the most effective and widely used tool for managing SCN. They limit nematode reproduction and allow profitable soybean production in infested fields. However, resistance is not absolute because varieties differ in their level of resistance, and SCN reproduction still occurs, although at a reduced rate. Even so, years of research show that resistant varieties consistently yield more than susceptible ones in SCN-infested soils, even when plants appear identical aboveground.

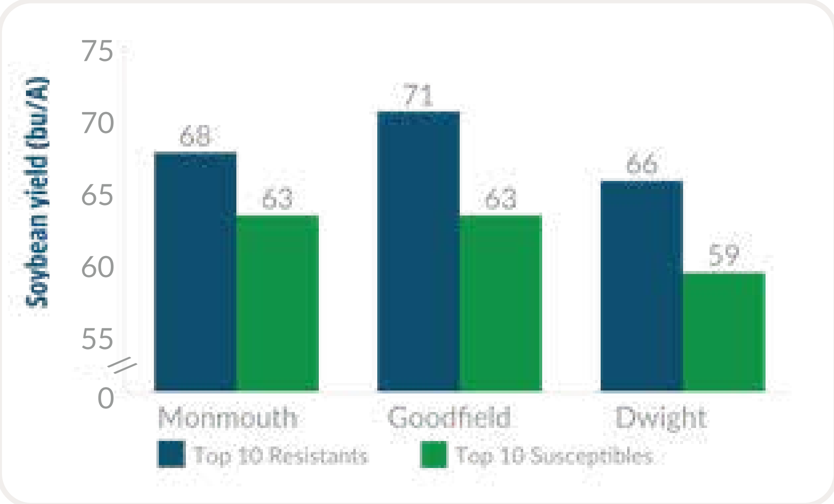
Several different sources of SCN resistance are available (see page 15). However, repeated use of the same resistance source can drive SCN adaptation, allowing the nematode to reproduce more effectively on those varieties. Most commercial varieties rely on a single resistance source, PI 88788. Unfortunately, SCN populations with high Female Index (FI) values on PI 88788 have become common across many soybean-producing regions in North America, reducing the effectiveness of this resistance source.

To slow this adaptation:

- Avoid planting the same resistant variety or varieties with the same resistance source in the same field, even if separated by a year of corn or another nonhost crop.
- Monitor SCN egg population densities every few seasons through soil sampling to ensure your resistant varieties remain effective.
- Rotate resistant varieties with different sources of resistance, when available.

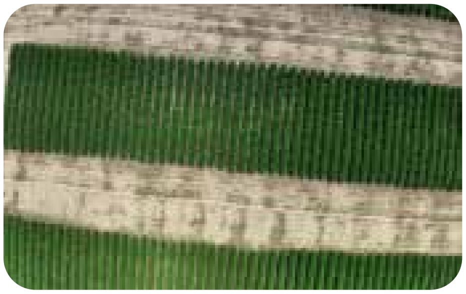
If SCN numbers are increasing despite the use of resistant varieties, it may indicate that the SCN population has adapted to the resistance source. An HG Type test could quantify this adaptation. In that case, switching to a different resistance source or increasing the frequency of growing nonhost crops is recommended.

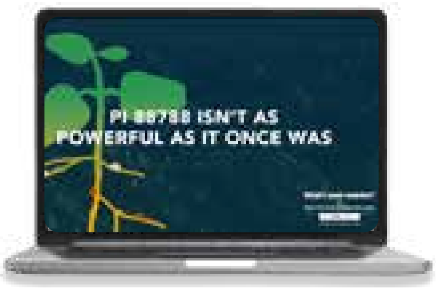
Yield Benefits of SCN-Resistant Varieties



The bars in this graph show "Top 10" comparisons: yields of the 10 highest-yielding SCN-resistant varieties compared with the 10 highest-yielding susceptible varieties in three central Illinois locations in 2006 variety trials. All three locations were infested with moderate SCN population levels.

Aerial and close-up images of a soybean variety trial planted with SCN-resistant and SCN-susceptible varieties in a field infested with 10,000 SCN eggs/100 cm³ soil, high enough to reduce yields by 20% or more. There is no visual evidence of the stunning yield loss suffered by the susceptible varieties. (H. Lopez-Nicora; The Ohio State University)





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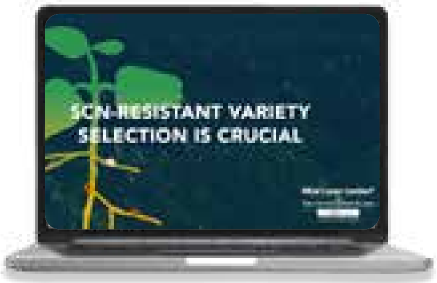

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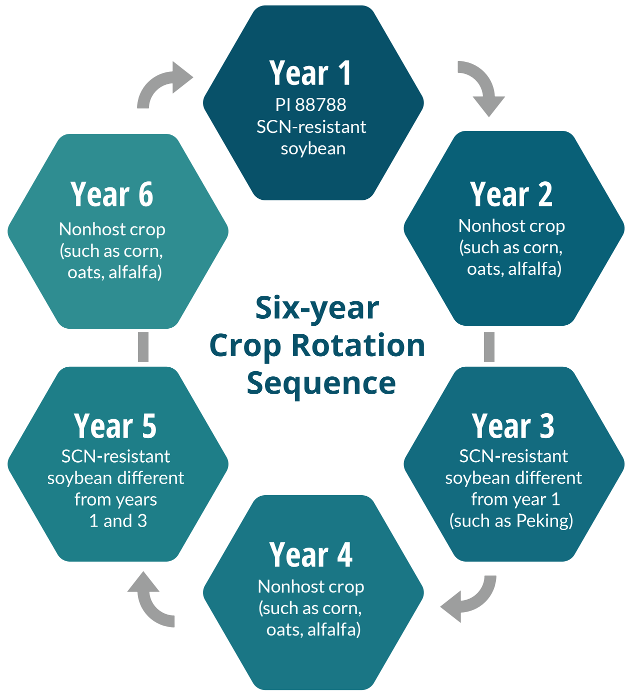
Crop Rotation

Crop rotation is one of the most effective strategies for managing SCN. Many crops commonly grown in rotation with soybeans, such as corn, alfalfa and small grains, are nonhosts, meaning SCN cannot complete its life cycle on them. In fields planted to nonhost crops, juveniles that hatch will starve or be destroyed by natural enemies, gradually lowering SCN egg densities in the soil. However, not all eggs hatch in a single season, so SCN is rarely eliminated completely.

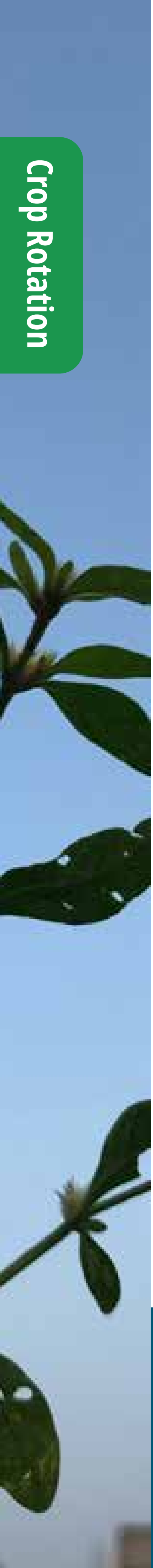
Including nonhost crops in rotation is critical not only for reducing SCN numbers but also for slowing adaptation to resistant soybean varieties. Although no single rotation crop can eradicate SCN, diverse rotations improve soil health, enhance nutrient cycling and fit easily within many existing farm management systems. The most effective rotations combine nonhost crops with resistant soybean varieties that draw from different sources of SCN resistance in alternating seasons. Rotation design depends on geography, field conditions, market opportunities and input costs, but incorporating nonhosts remains a cornerstone of sustainable SCN management.



Example of a six-year crop rotation plan if SCN is detected in a field.

Poor hosts and nonhosts for SCN management rotations		
Alfalfa	Melons	Sugarcane
Barley	Miscanthus	Sweet potato
Canola	Oats	Sweet sorghum
Corn	Peanuts	Switchgrass
Cotton	Red clover	Tobacco
Forage grasses	Rice	Tomato
Grain sorghum	Sugar beet	Wheat

The rate at which SCN numbers decline varies with geography. In southern soybean-production regions, warm soils and reduced winter survival can lower SCN populations by up to 90% in a single nonhost crop cycle. In contrast, reductions are typically much slower in northern regions, where cooler soil temperatures and longer survival of eggs result in declines of only 10% to 40%, even with well-planned rotations. In these areas, nonhost crops may need to be planted more frequently, and several rotation sequences may be required before a noticeable decrease in SCN numbers is achieved. The slower SCN numbers decline, the greater the need to include nonhost crops regularly in rotation plans.



Some other crops and weeds can serve as alternative hosts for SCN, allowing populations to persist or even increase in numbers. Avoid growing known host crops such as edible beans, cowpeas and certain clovers in SCN-infested fields.

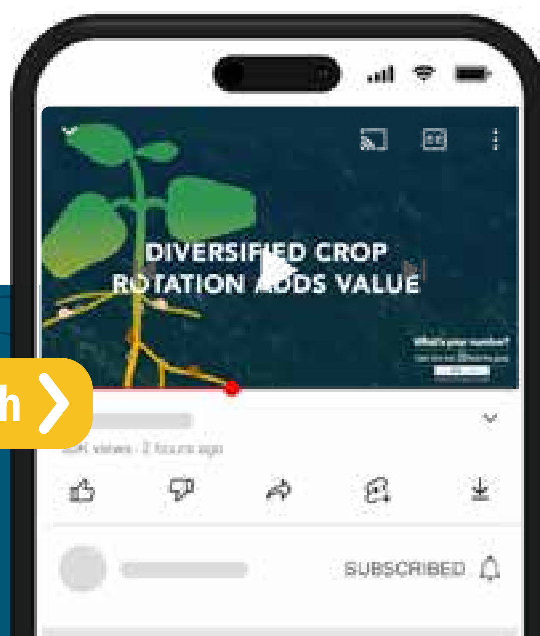
Hosts for soybean cyst nematode

Crop Plants

- Alsike clover
- Bird's-foot trefoil
- Common and hairy vetch
- Cowpea
- Crimson Clover
- Crownvetch
- Edible beans
- Lespedezas
- Pea
- Sweet clover
- White and yellow lupine

Weed Plants

- American and Carolina vetch
- Common and mouse-ear chickweed
- Common mullein
- Field pennycress
- Hemp sesbania
- Henbit
- Hop clover
- Milk and wood vetch
- Pokeweed
- Purple deadnettle
- Purslane
- Shepherd's purse
- Wild mustard



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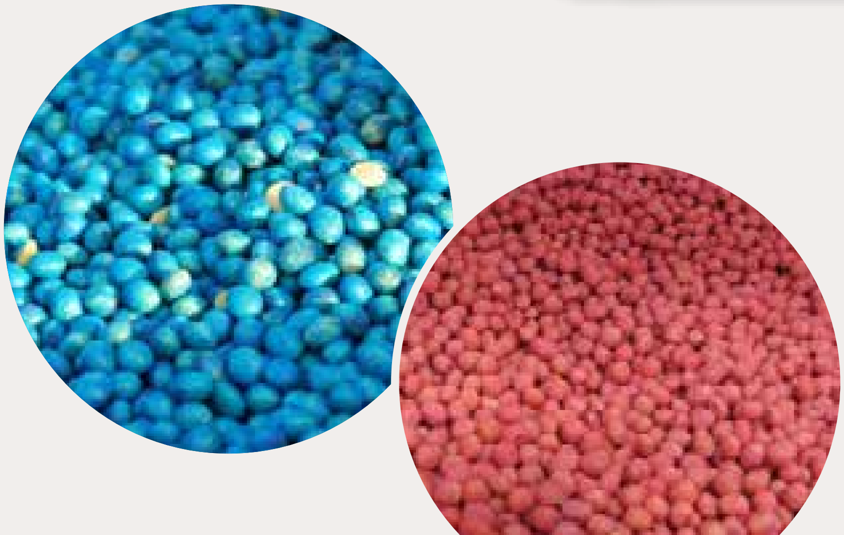
Weed Management

Weed management is also critical. In infested fields and/or when soil temperatures are greater than 50 F (10 C), weeds including henbit, purple deadnettle and field pennycress can support SCN reproduction. There may be periods of time in the spring or fall when soil temperatures are warm enough for SCN reproduction to occur on winter annual weeds, resulting in increases in SCN population densities.

Nematode-Protectant Seed Treatments

Nematode-protectant seed treatments do not provide season-long protection, but they can be useful when host plant resistance is unavailable or when multiple nematode species affect soybeans. Both chemical and biological seed treatments are labeled for SCN management.

In addition to potentially limiting SCN reproduction, these treatments can improve root health and provide some protection against other soilborne pathogens. New seed treatments are continually being developed and tested for efficacy in SCN-infested fields in the United States and Ontario.



Other Cultural Practices

Although robust root systems drive yield, they also create a prime environment for higher nematode population densities and reproduction. However, cultural practices like tillage can be beneficial in compacted soils where root growth is restricted. While it does not directly reduce SCN, alleviating compaction promotes deeper, healthier root systems that help soybeans better tolerate SCN feeding and infection by other soilborne pathogens.

Fertility management is also critical. Nutrient-deficient plants are more vulnerable to nematode damage, and symptoms of nutrient stress may indicate underlying SCN feeding is occurring. Further, SCN has a greater yield impact on nutrient-deficient plants than on those with adequate fertility.

Looking to the Future

Management strategies have continued to evolve as SCN remains the leading yield-limiting pest of soybean. With the effectiveness of existing resistance sources declining, successful control increasingly depends on an integrated pest management approach that combines multiple tactics. Looking ahead, emerging tools and technologies offer promising opportunities to strengthen and sustain SCN management.

Breeding programs are steadily advancing the discovery and incorporation of new genes for SCN defense into soybean varieties. Although progress takes time, continued investment in breeding efforts will ultimately expand the options available to manage this pest.

At the same time, research is driving the development of new seed-applied chemistries and biological products with novel active ingredients and modes of action. These tools aim to enhance protection against SCN in the soil and work in concert with genetic resistance to support long-term, integrated management.

Another advancement is the use of transgenic traits that express Cry proteins, which are naturally occurring insecticidal proteins derived from *Bacillus thuringiensis*. These proteins, which can be made in the plant roots, disrupt SCN digestive systems when ingested, reducing SCN population densities and protecting root health.

Additionally, natural enemies of SCN, including certain fungi, bacteria and predaceous nematodes, occur in most soils and can even suppress SCN populations. Research is ongoing to develop these organisms into commercial products.

While these advancements hold great promise, the adaptability of SCN remains a constant challenge. As new tools become available, they must be integrated thoughtfully with existing practices and stewarded to preserve their long-term effectiveness. Sustainable SCN management will continue to rely on vigilance, diversification and responsible use of all available tools.

For additional soil testing recommendations, state-specific resources or to learn more about actively managing SCN and other damaging nematodes to soybeans, visit:

TheSCNCoalition.com

Connect with us on social ***@thescncoalition***

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