Are Nematodes Really a Problem on Corn?

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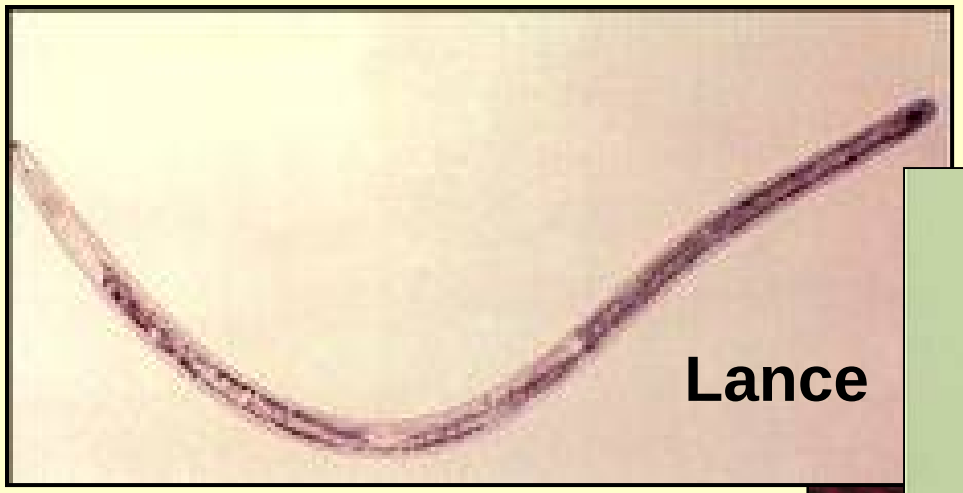
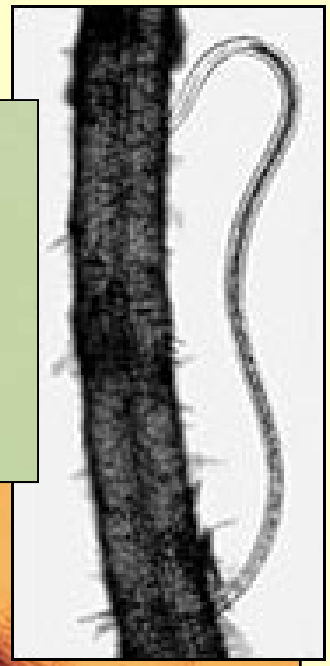
WISCONSIN SOYBEAN MARKETING BOARD

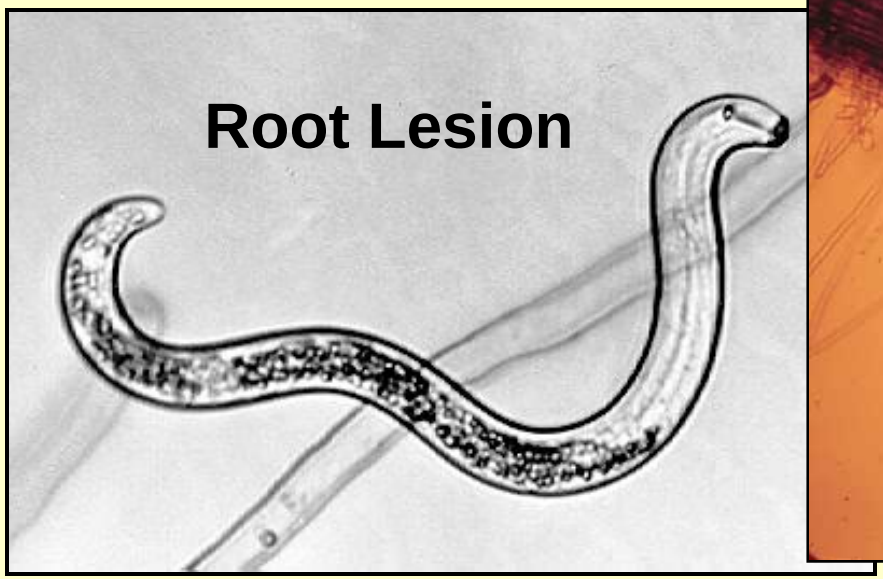
WISCONSIN CORN PROMOTION BOARD, INC.

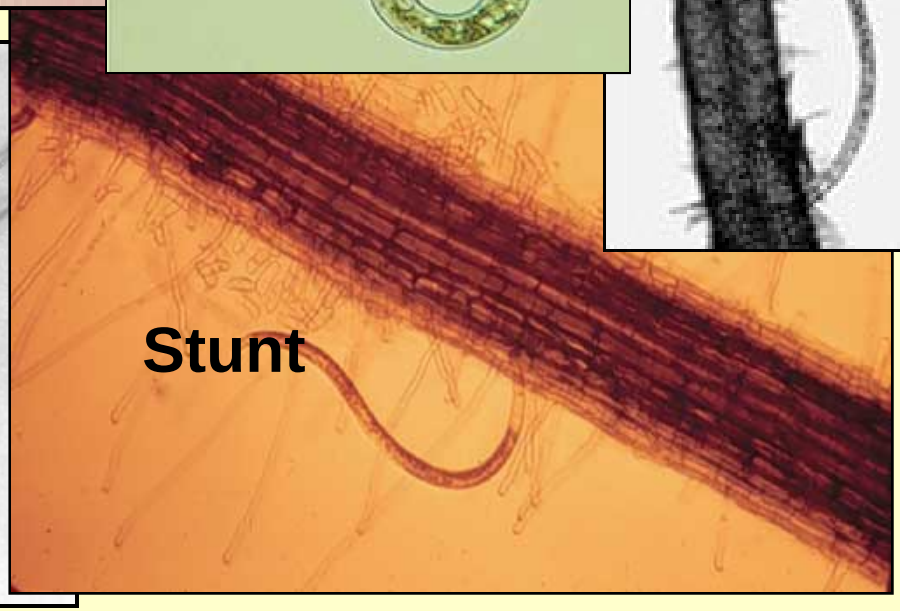
- WI studies show root lesion nematodes reduce corn yield
- 20% of fields have a “high risk” of damage
- pest nematodes occur in almost every corn field, so the potential for populations to build to damaging levels is wide-spread
- nematodes that attack corn also feed on soybean and small grains

Most nematode pests of corn have a broad host range that includes soybean





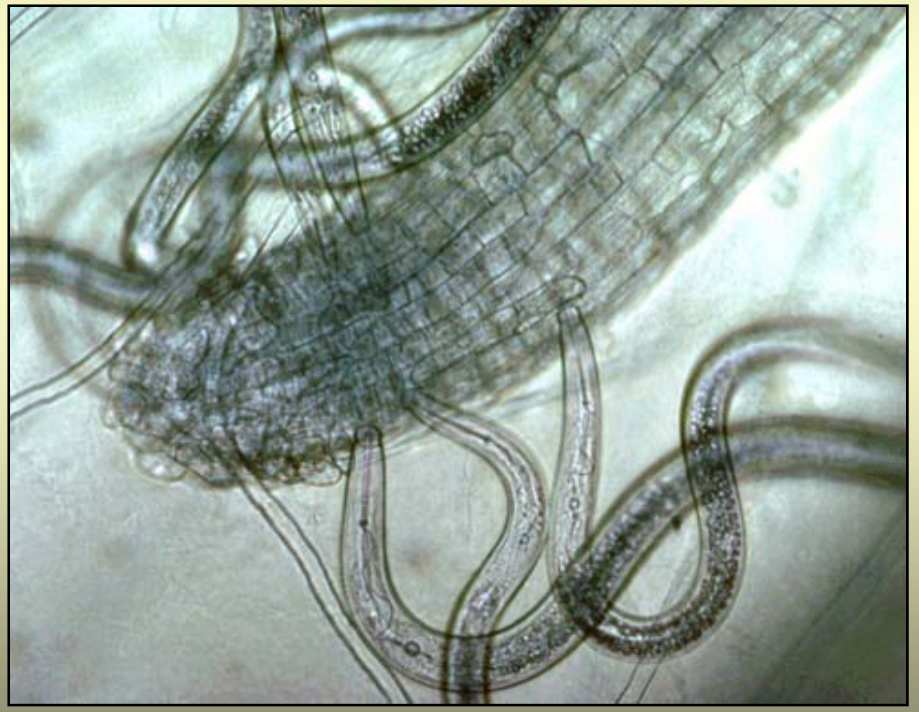


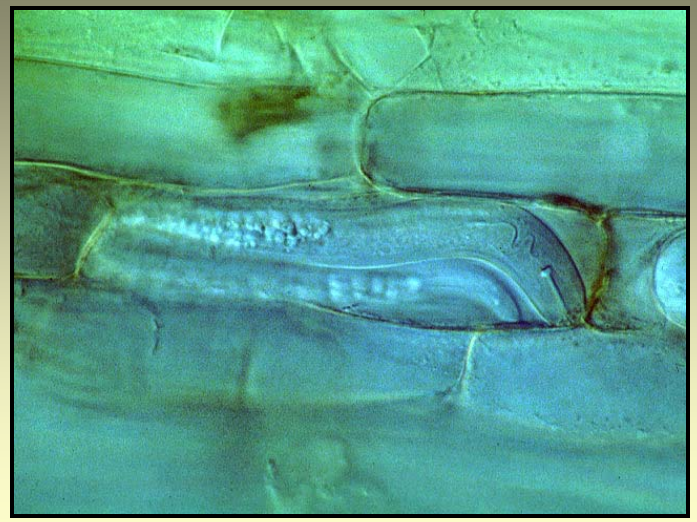


Some nematode pests feed at root tips,

stunting root growth.

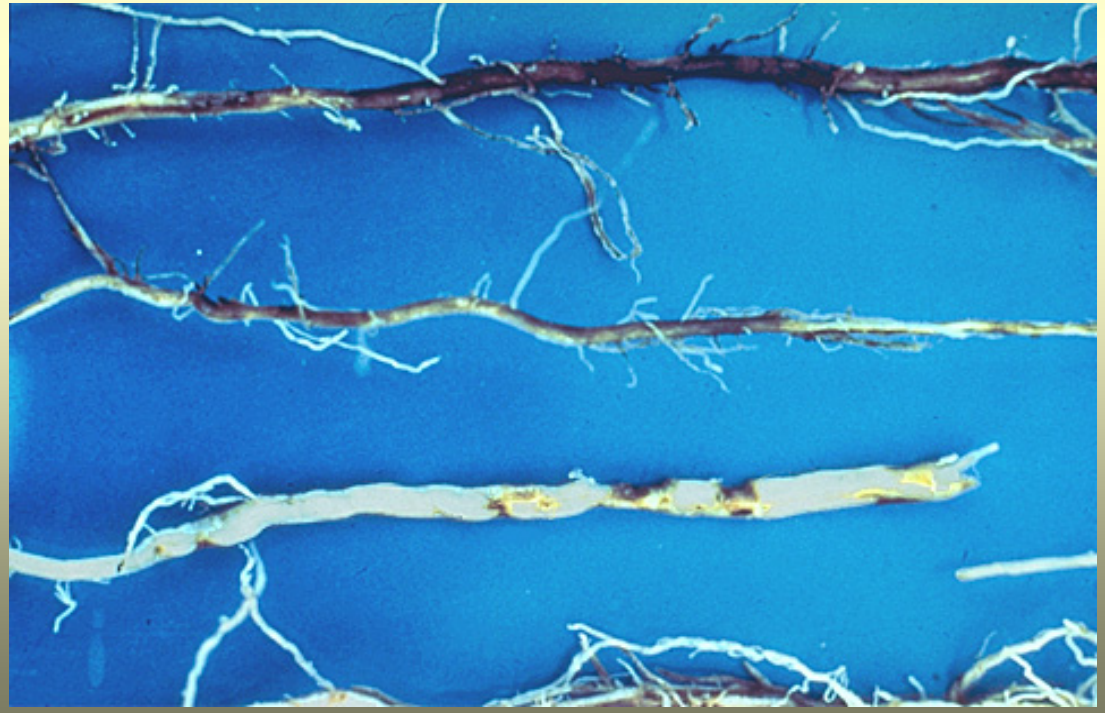
- Needle
- Dagger
- Stubby Root
- Spiral



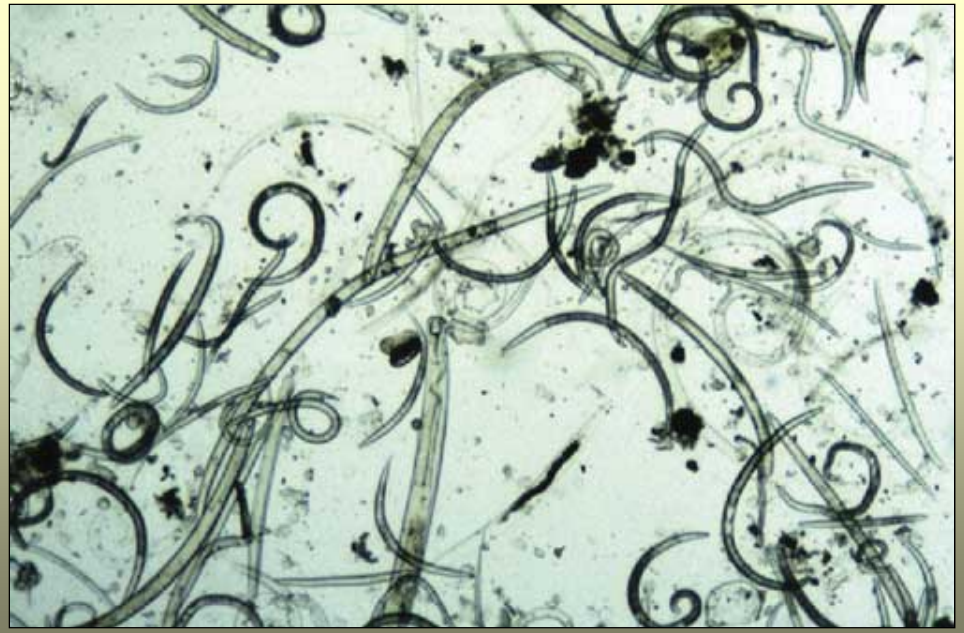


Some nematodes kill roots or portions of roots.

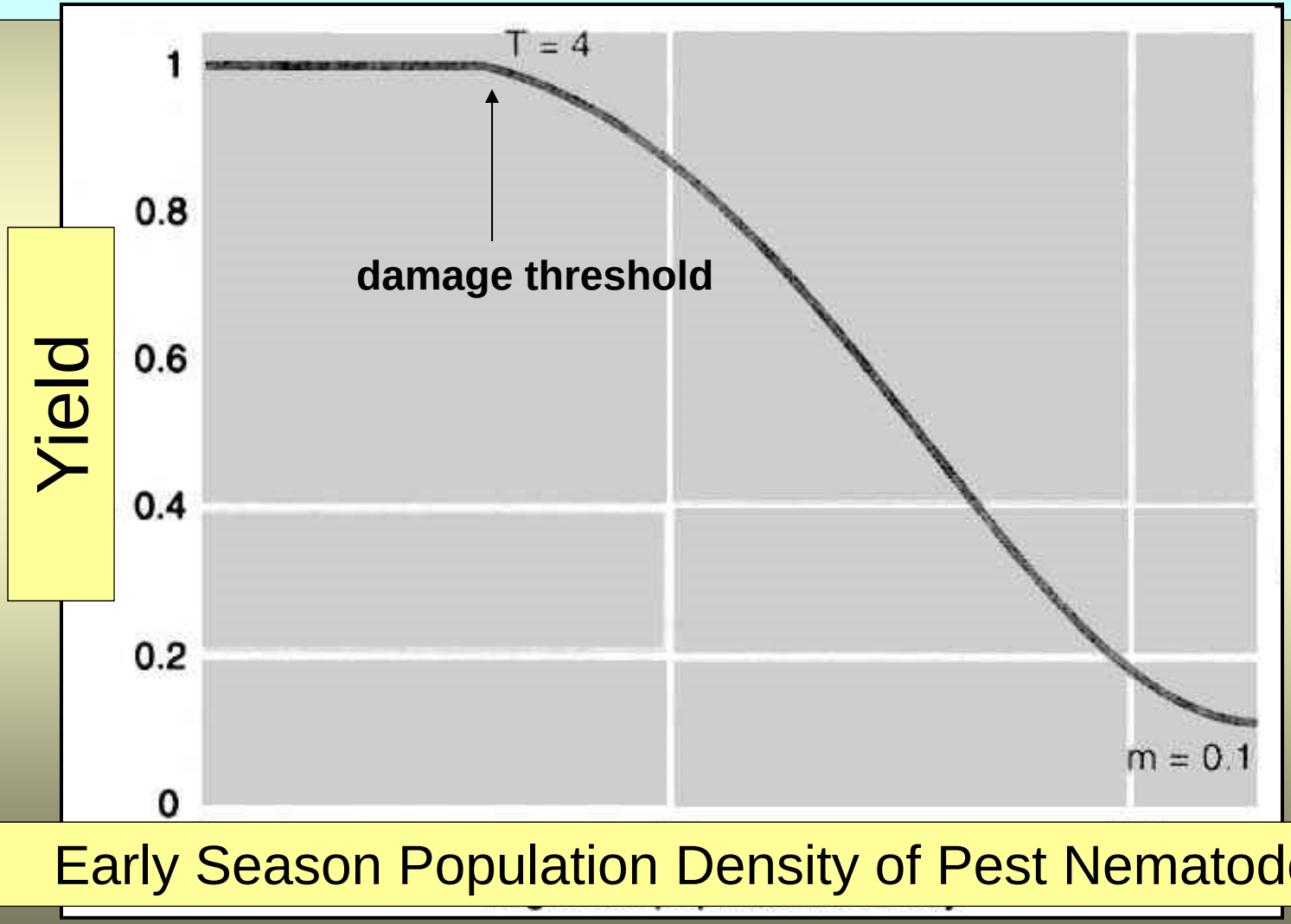
- Root Lesion
- Lance



Pest nematodes recovered from soil samples (& roots in the soil) are counted to determine if the crop is at risk from nematode damage.



Early season nematode population densities are predictive of yield for the **current crop**



Some nematodes are more damaging than others – threshold values for soil samples collected from corn fields up to V4

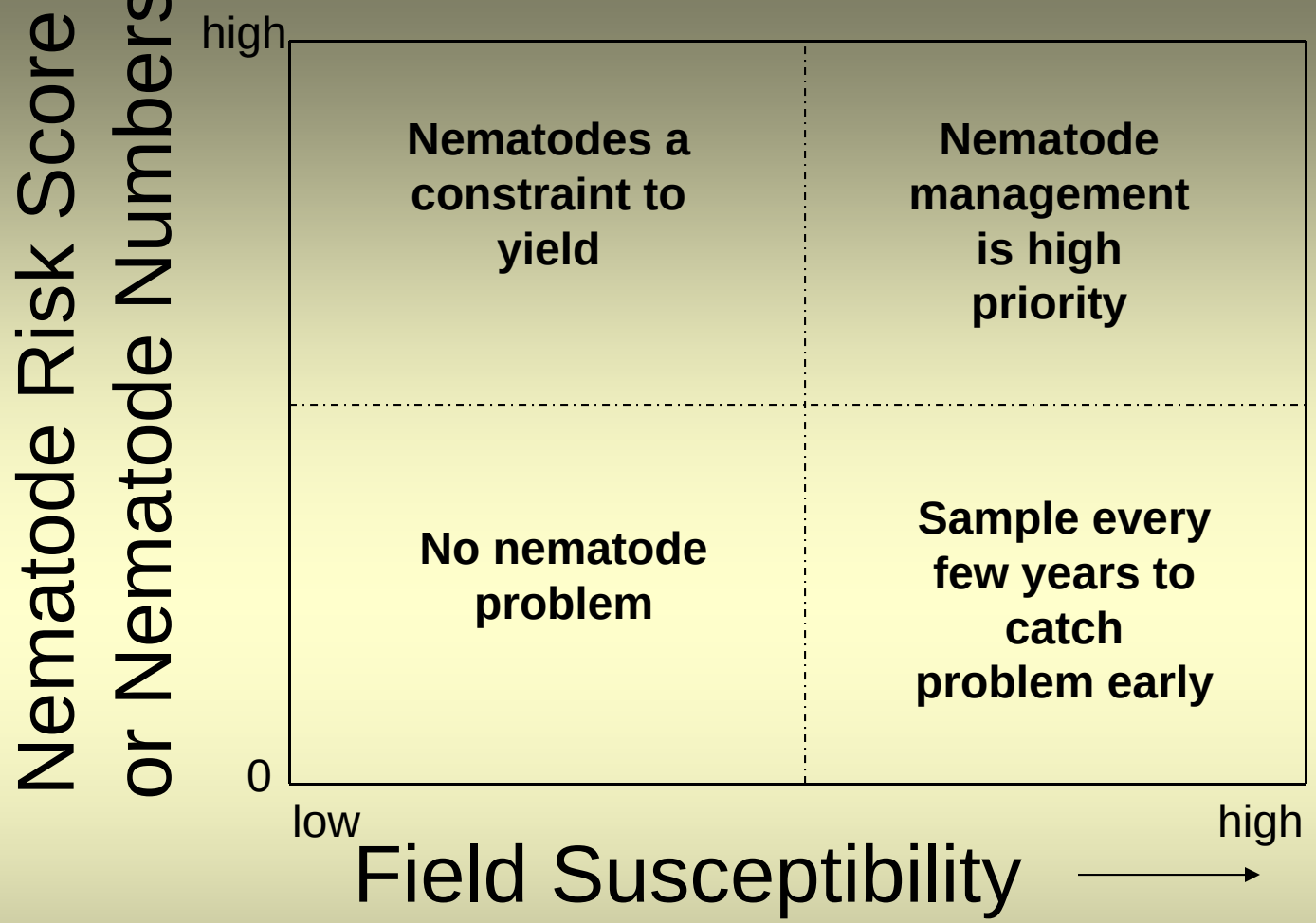
Genus	Common Name	Risk Level That Damage Will Occur		
		low	mod	high
Longidorus	needle			≥1
Hoplolaimus	lance	< 50	51 - 100	> 100
Paratrichodorus	stubby root	< 50	51 - 200	> 200
Pratylenchus	root lesion	< 100	101 - 200	> 200
Xiphinema	dagger	< 100	101 - 200	> 200
Helicotylenchus	spiral	< 500	> 500	
Tylenchorhynchus	stunt	< 500	> 500	
Criconemella	ring	> 500		
Paratylenchus	pin	> 500		

Samples collected after July 1st

- Have little predictive value for the **current crop**
  - Young seedlings most susceptible to nematode damage
  - Some pest nematodes move deep into the soil as plants grow and are missed when sampling

- BUT can be useful for predicting risk to **next year's crop** once you account for
  - further increase for the current season
  - decline over the winter months

UW Nematode Diagnostic Service: fall threshold = 2x spring threshold



- Soil texture: clay – loam - sand
- Irrigation: yes - no
- Years since last corn crop: many - none

Percent samples positive (n = 326) for nematode pests of corn, soybean, and wheat

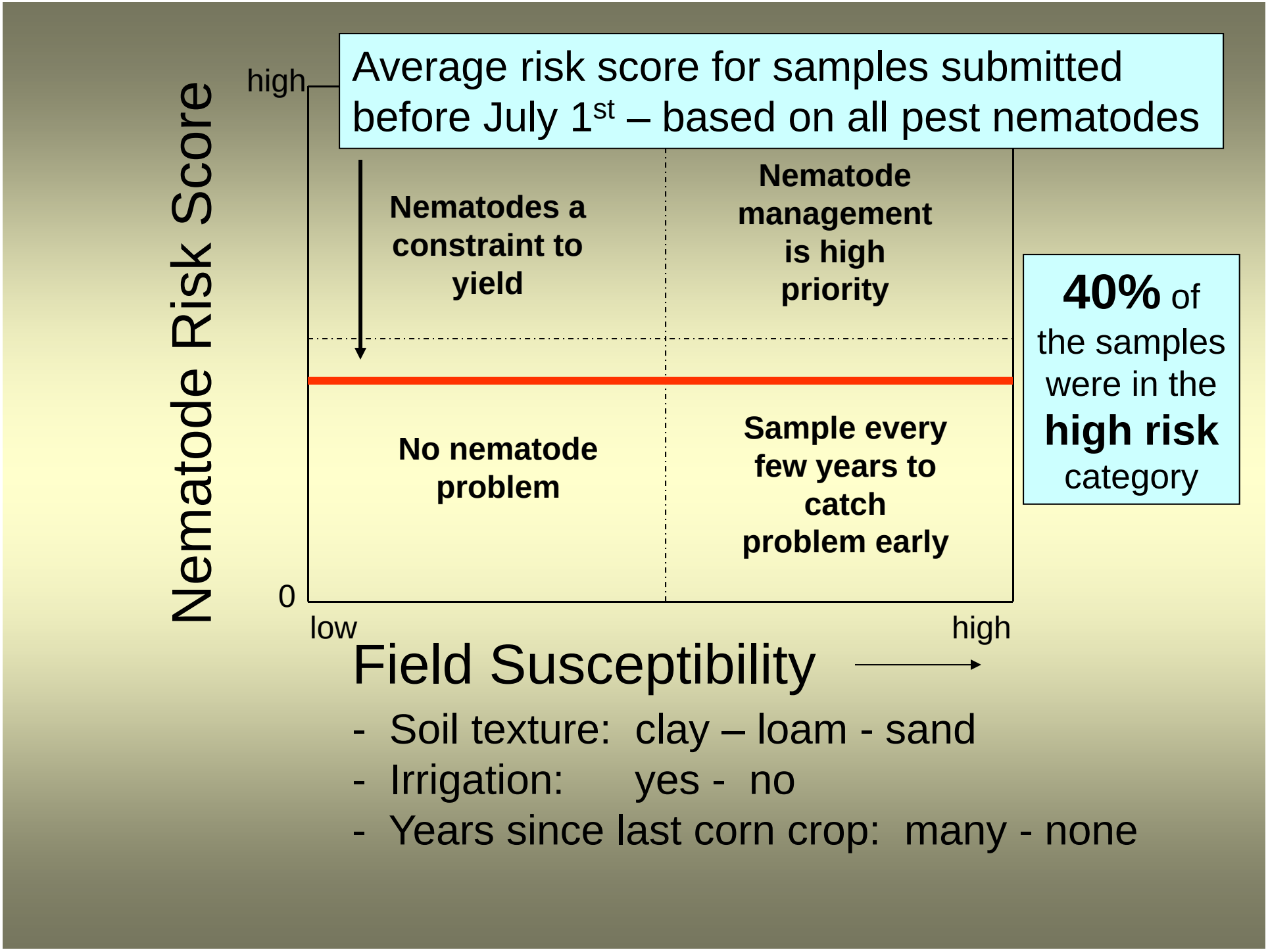
- WSMB-sponsored SCN testing program 2012

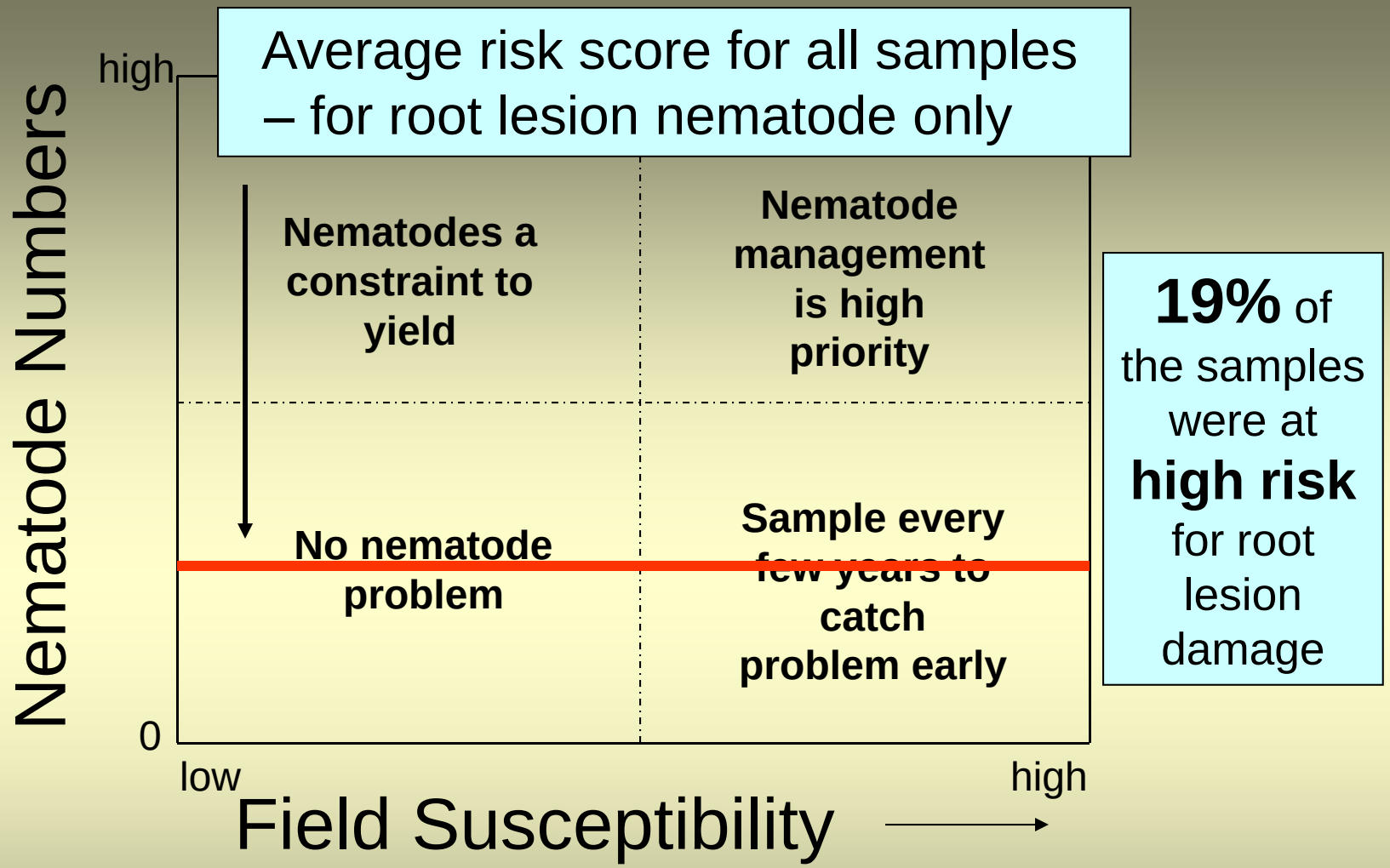
Nematode Pest	% incidence
Root lesion	**94**
Spiral	**77**
Dagger	**32**
Lance	**8**
Stunt	**13**
Stubby root	**3**
Pin	**9**
Ring	**1**

Incidence of Soybean Cyst Nematode = 21%

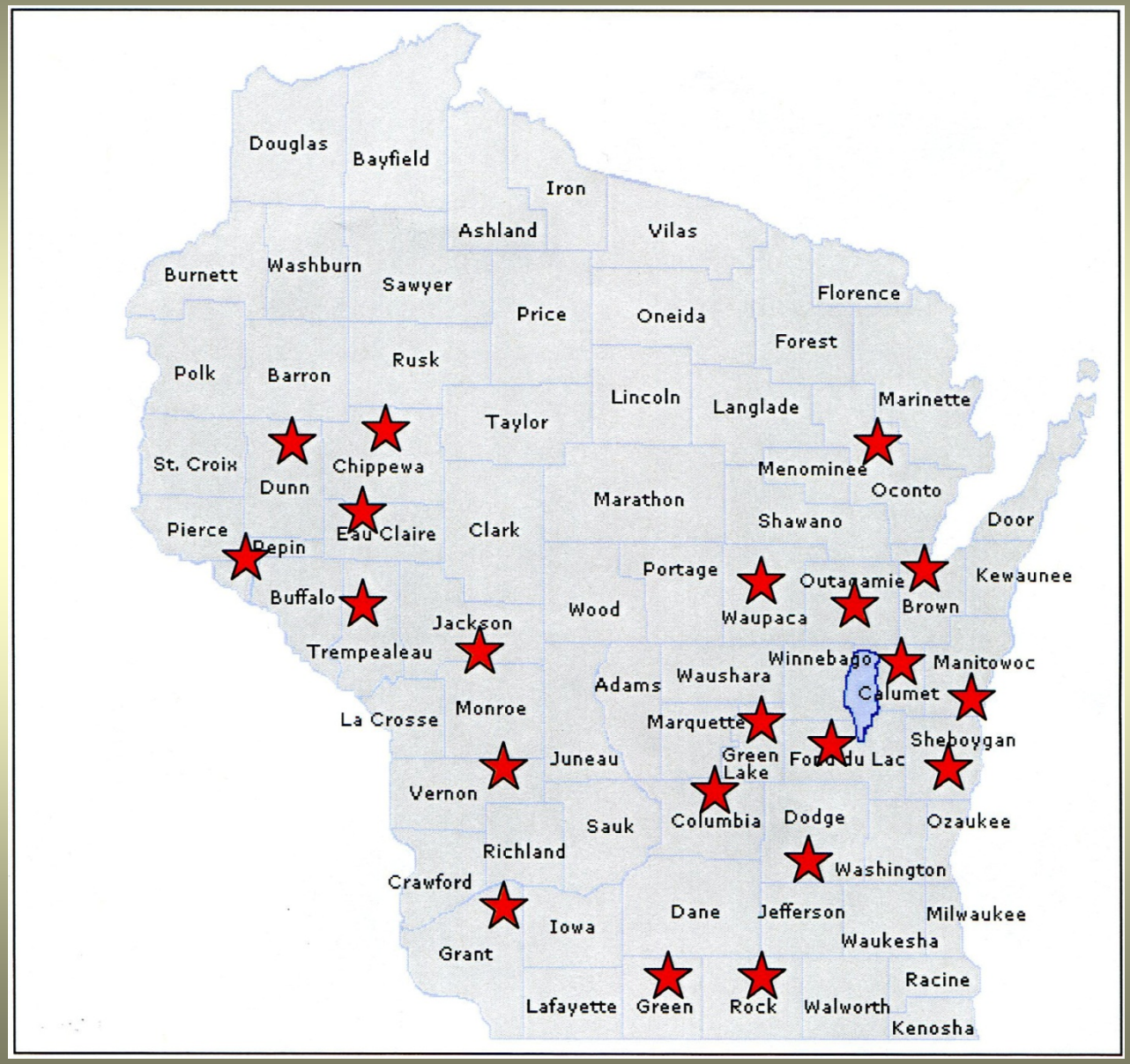
Average number of pest nematodes per 100 cc soil (including root fragments) in samples submitted to the WSMB-sponsored soil testing program in 2012

Time of Year	# samples received	Root lesion	Spiral	Dagger	Lance	Stunt	Stubby Root	Pin	Ring
4/15 to 6/30	35	121	101	1	4	4	1	1	0
7/1 to 8/31	29	73	43	3	4	3	3	0	2
after 9/1	262	254	103	5	1	3	1	16	1


Average risk score for samples submitted before July 1st – based on all pest nematodes
Nematode Risk Score
high
0
low
high
Nematodes a constraint to yield
Nematode management is high priority
No nematode problem
Sample every few years to catch problem early
40% of the samples were in the high risk category
Field Susceptibility
- Soil texture: clay – loam - sand
- Irrigation: yes - no
- Years since last corn crop: many - none


Average risk score for all samples
– for root lesion nematode only
Nematode Numbers
high
0
low
high
Nematodes a constraint to yield
Nematode management is high priority
No nematode problem
Sample every few years to catch problem early
Field Susceptibility
19% of the samples were at high risk for root lesion damage
- Soil texture: clay – loam - sand
- Irrigation: yes - no
- Years since last corn crop: many - none

Counties with samples exceeding the “high risk” threshold for root lesion



Background of fields at high risk for root lesion damage

Previous Crop	% of Samples
soybean	57
corn	35
other or unknown	8

Soil Texture	% of Samples
sand or sandy loam	22
silt loam or loam	41
clay or clay loam	11
not designated	26

Relationship between population densities of root lesion nematodes and corn yield

Year	Nematodes per 100 cc Soil VE	Nematodes per g Root V2-V4
2008	P = 0.01	NS
2009	P = 0.07	P = 0.01
2010	P = 0.08	P = 0.02

This data is for loamy sand soil / experiments are in progress for loam soils

Visual differences at V4

Corn seed treatment experiment 2012 loamy sand soil

5 corn hybrids with fungicide &

- Cruiser only

  or

- Cruiser + Avicta

nematicide provided:

5% yield increase - average

0 – 10% increase - by hybrid

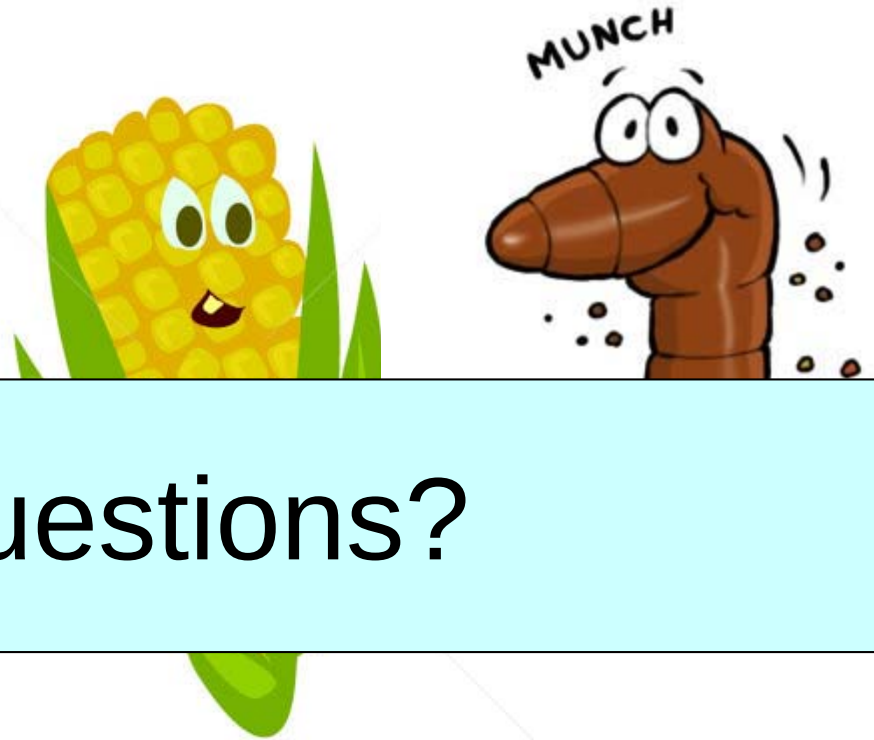
Yes, nematodes (root lesion) are a problem on corn (& other crops) in Wisconsin!

- root lesion is native to WI and therefore, widespread

- risk of yield loss due to root lesion is related to nematode population densities

- 20% of soil samples were at the “high risk” of damage level for root lesion in 2012

- damage can be mitigated using cultural practices and chemical controls



Questions?

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Cruiser vs Cruiser + Avicta for yield of 5 corn hybrids

2012 Hancock Research Station

Average of 12 bu/acre yield gain with Avicta (P < 0.01)

Hybrid	Yield Gain (bu/acre)	Statistical Difference?
1	-4	no
2	10	no
3	**12**	yes
4	**19**	yes
5	**24**	yes

Sieves are used to separate nematodes from soil. Sieves used for SCN samples DO NOT catch other nematodes.

Incubation methods are also used:

Roots in soil samples are incubated for 2 days. Nematodes exit roots and are trapped in a water reservoir.