Successful Control of *Globodera rostochiensis* (golden nematode) in New York State

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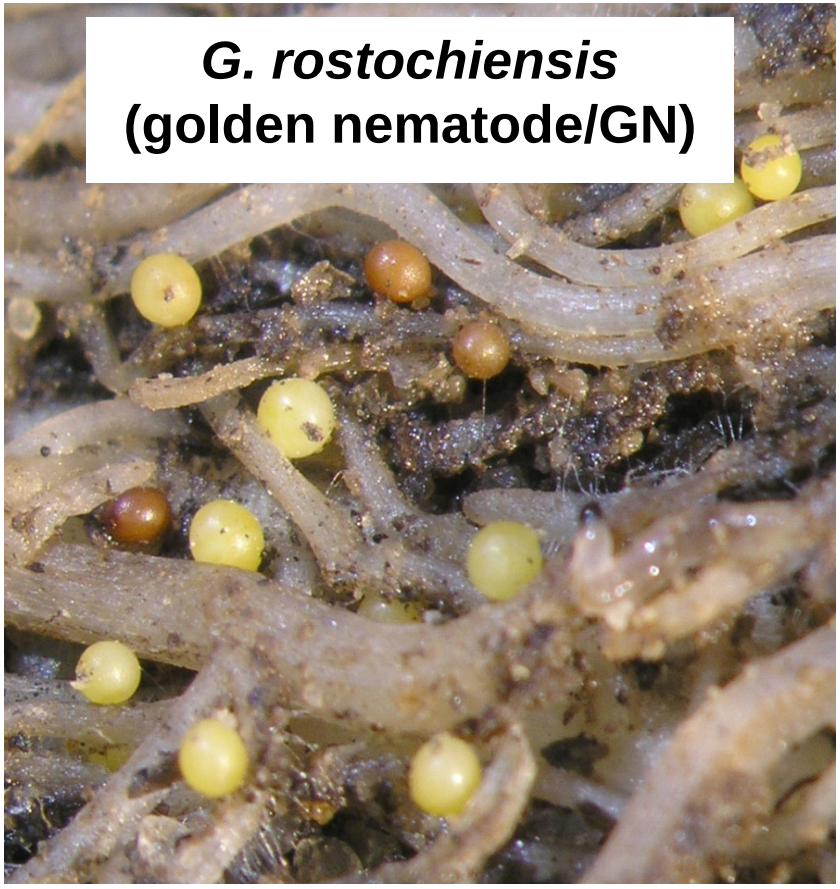
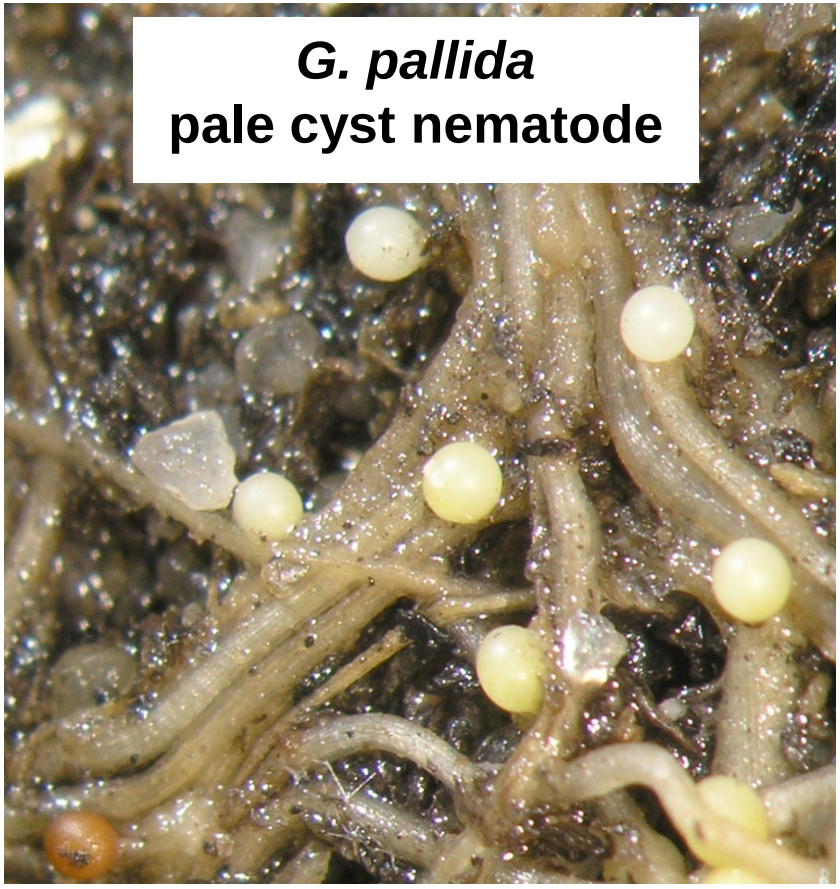
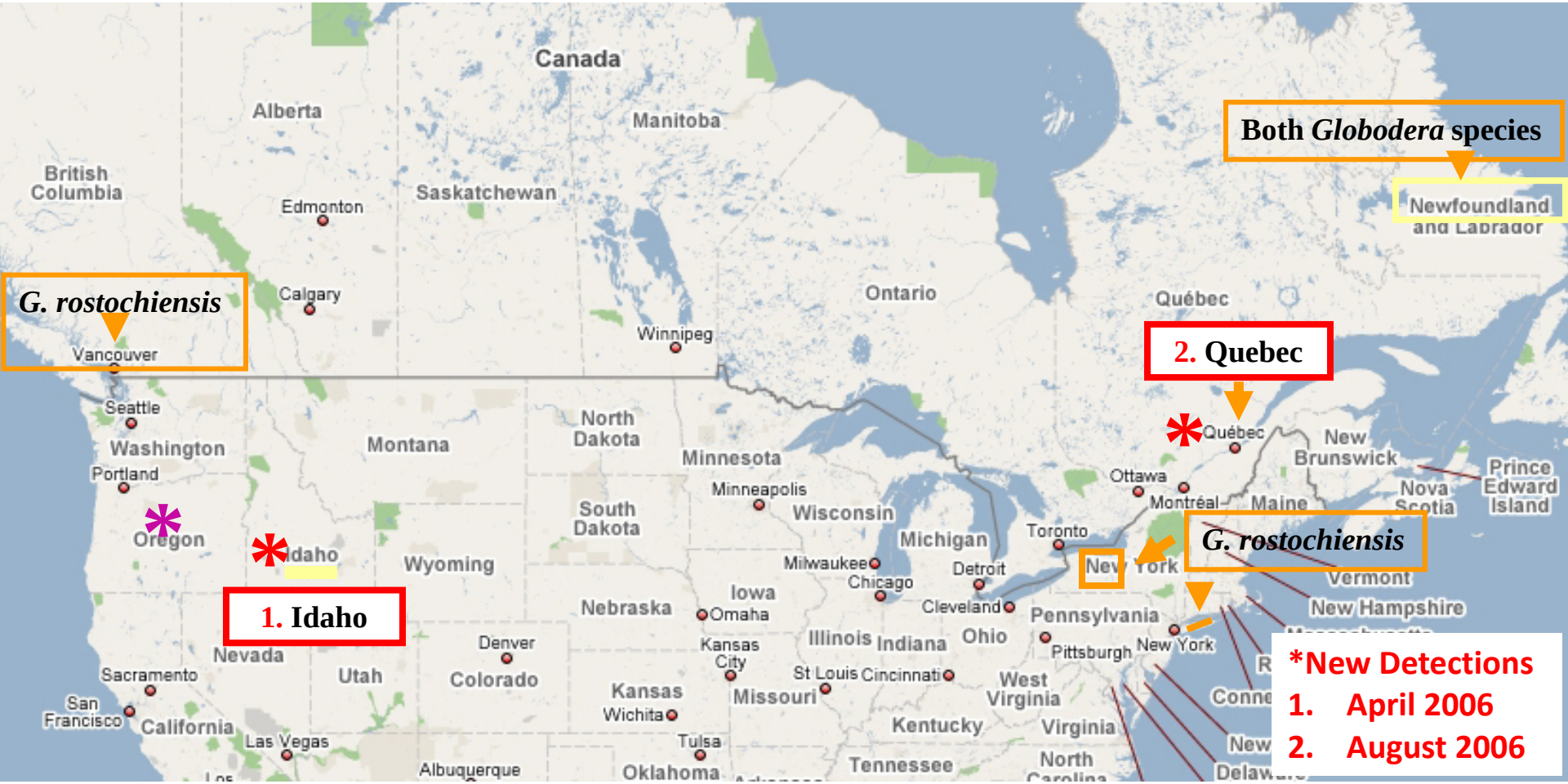
Potato Cyst Nematodes (PCN)

- **Two species: golden nematode/GN and pale cyst nematode**
- **Hosts: potato, tomato, eggplant, and some weeds**





Distribution of Potato Cyst Nematodes (*Globodera rostochiensis* & *G. pallida*) in North America

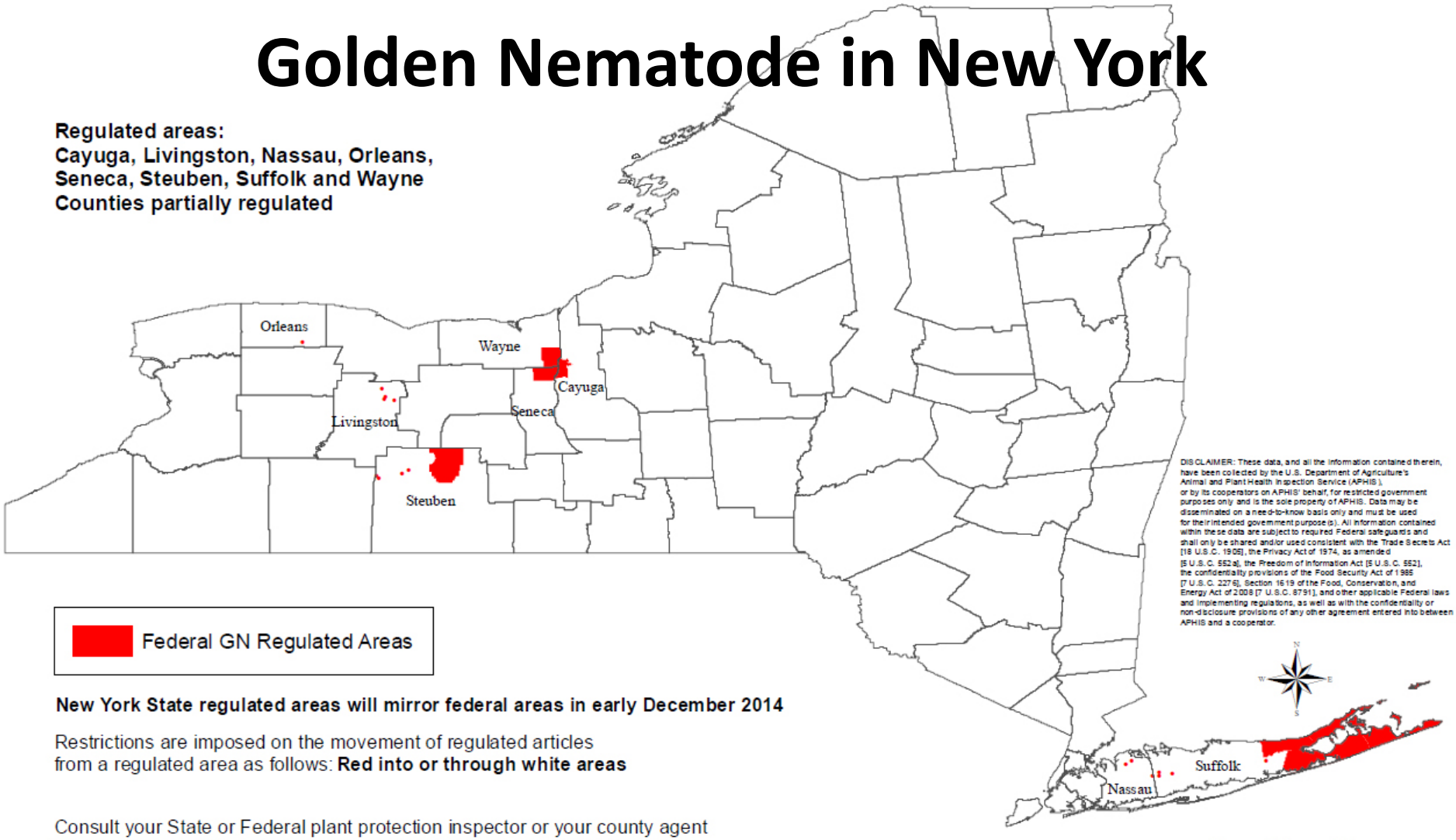


Discovery of Golden Nematode in New York

- In late 1930's, a grower on Long Island, NY noticed disease symptoms
- In 1941, the pathogen was identified as golden nematode
- Introduced by military equipment returning from Europe after WWI
- It took about 20 years before noticed

Successful Control of Golden Nematode in New York

Regulated areas:
Cayuga, Livingston, Nassau, Orleans, Seneca, Steuben, Suffolk and Wayne Counties partially regulated



Federal GN Regulated Areas

New York State regulated areas will mirror federal areas in early December 2014

Restrictions are imposed on the movement of regulated articles from a regulated area as follows: **Red into or through white areas**

Consult your State or Federal plant protection inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles.

For detailed information see 7 CFR 301.85-2a for quarantine and regulations.

-USDA/APHIS/PPQ
-State cooperators
-September 2014

Successful Control of Golden Nematode in New York

- **A cooperative research program involving USDA/ARS and Cornell University**
  - -fundamental biology of PCN-potato interactions
  - -resistant potato variety development and adoption
  - -GN management strategies

- **A regulatory program involving USDA/APHIS and NY State Department of Agriculture and Markets**
  - -soil surveys, sanitations, and regulatory and monitoring

A Longstanding Collaborative Effort

for developing and releasing nematode resistant potato varieties

50-200 crosses (Cornell Greenhouses)
20,000 seedlings in pots
Early generation selection in fields

Walter De Jong
Plant Breeding, CU

Nematode resistance evaluations

USDA-ARS
Xiaohong Wang

Trials (research farm sites, grower farms)

Walter De Jong

Production of disease-free seed on Uihlein Farm

Keith Perry
Plant Pathology, CU

Development of GN Res

Breeding Programs

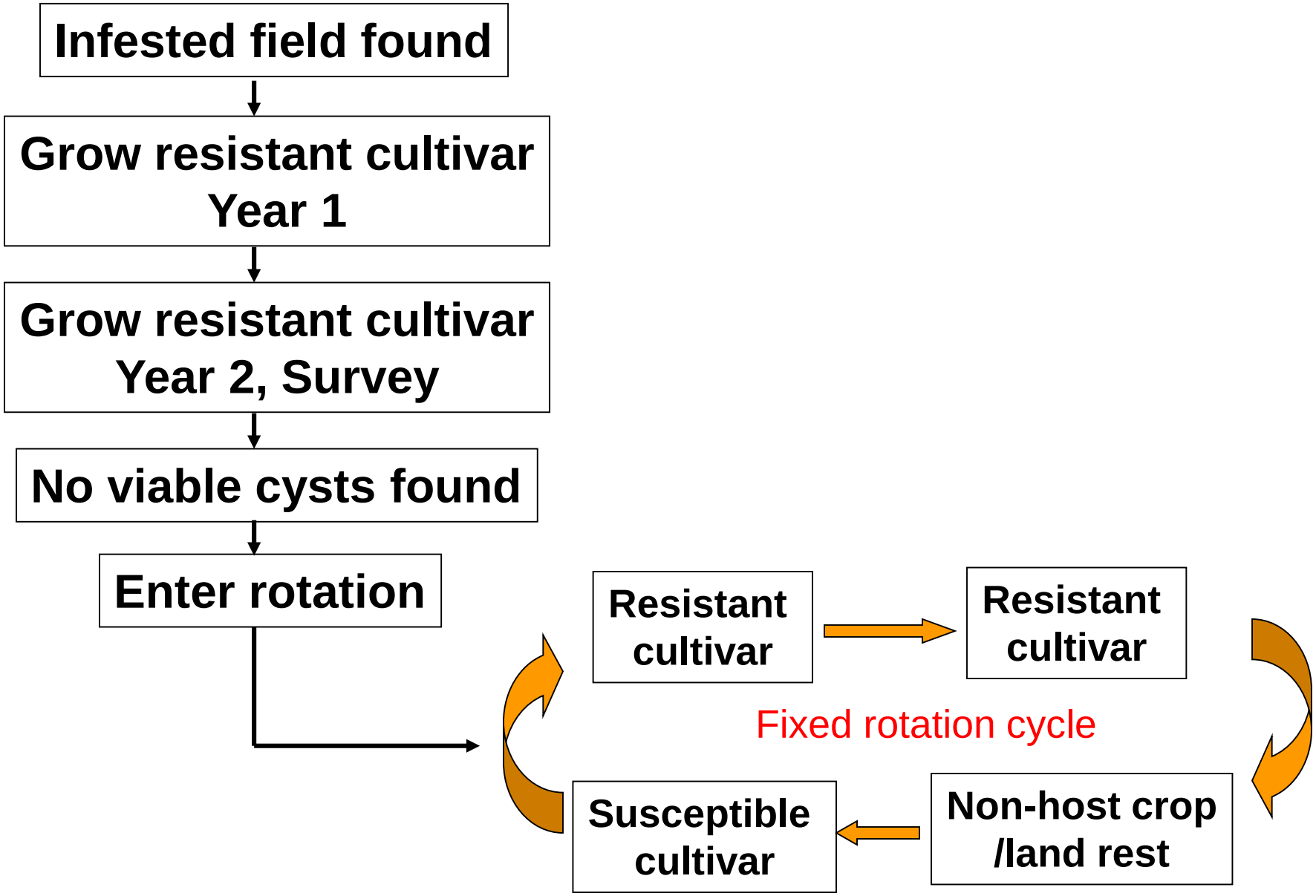
Cornell University Plant Breeding
Cornell Horticulture
Frito-Lay Inc.
University of Maine
University of Michigan
University of Wisconsin
Texas A & M
USDA Potato Breeding project
Canada Potato Research Center
Oregon State University
USDA-ARS, Aberdeen, ID
PLSJ-Quebec

1966
Peconic (**CU**)
1967
Wauseon (USDA, MD)
1972
Hudson **(CU)**
1976
Atlantic (USDA, MD)
1977
Campbell 11 (CS)
1978
Campbell 13 (CS)
1979
Belchip (USDA, MD)
1980
Highlat Russet (USDA, AK)
1981
Rosa **(CU)**
Chipbelle (USDA, MD)
1982
Simcoe (AC)
1984
Islander (ME)
Yankee Chipper (ME)
1985
Elba (**CU**)
Hampton (**CU**)
Sunrise (ME)
1986
Donna (AC)
1989
Kanona (**CU**)
NemaRus (USDA, MD)
1990
Allegany (**CU**)
Steuben (**CU**)
AC Domino (AC)

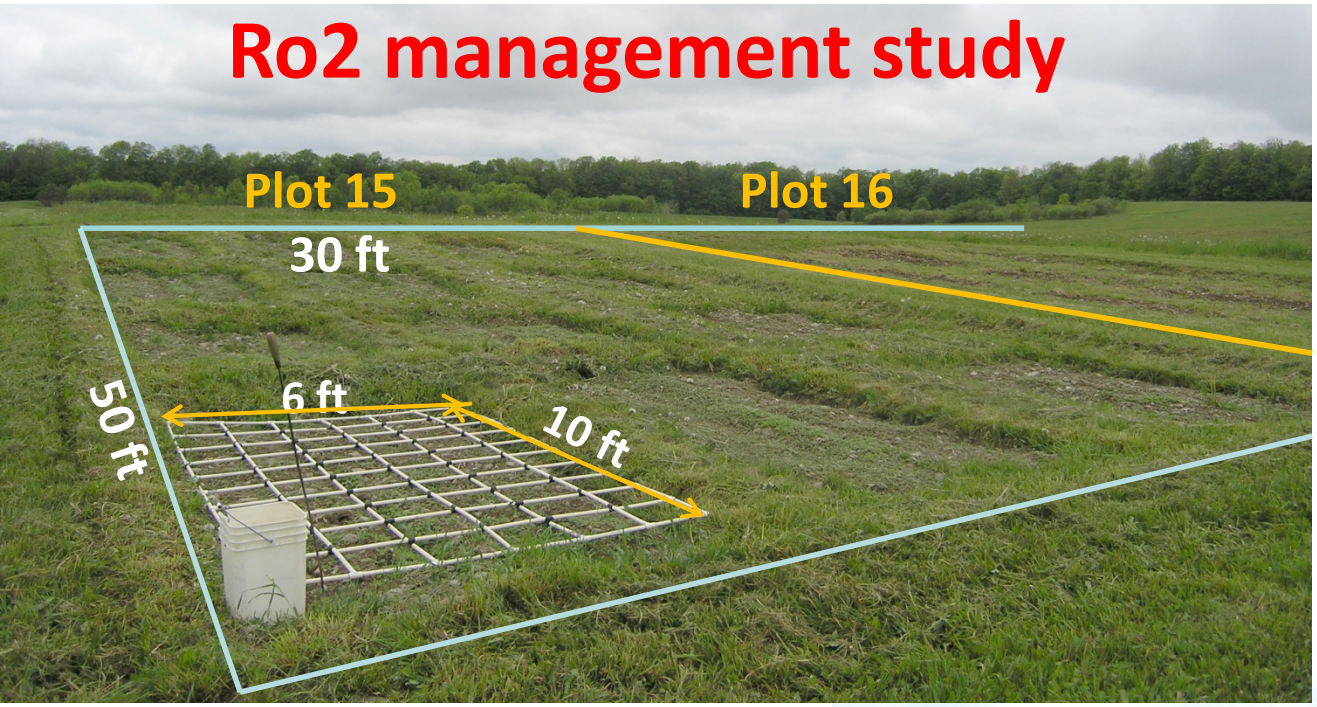
1991
Castile (**CU** & USDA, MD)
LaBelle (LA)
1992
Coastal Chip (USDA)
Sparton Pearl (MI)
Michigold (MI)
1993
Genesee (NY78) (**CU**)
St. John's (AF838-5) (ME)
Sunchip (USDA, MD)
1995
Pike (**CU**)
Andover (**CU**)
1997
Salem (**CU**)
Reba (**CU**)
1999
Keuka Gold (**CU**)
Eva (**CU**)
Amey (USDA, MD)
2003
Marcy (**CU**)
Monticello (**CU**, Maine)
2007
Lehigh (**CU**)
2010
Red Maria (**CU**)
2011
Waneta (**CU**)
Lamoka (**CU)**
2013
Huckleberry Gold (USDA, ID)

(22 CU / 44)

Ro1 Management Scheme



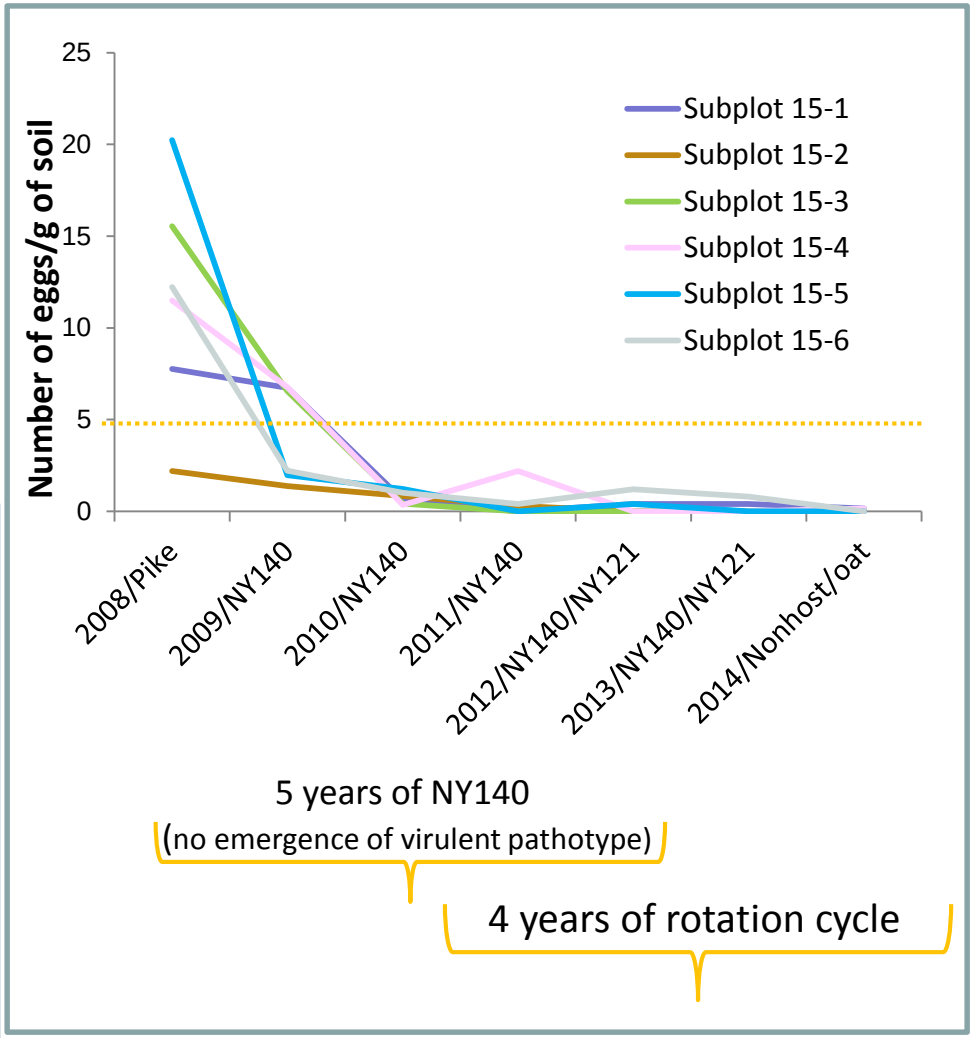
Ro2 management study

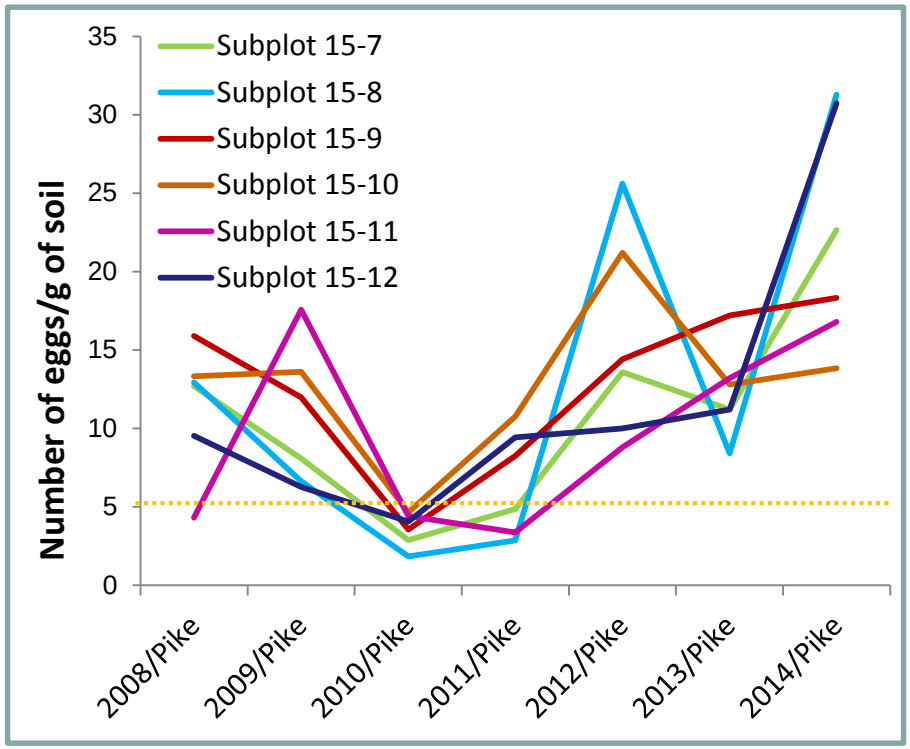


	15-4	15-5	15-6	16-4	16-5	16-6
2012	NY140	NY121		NY140	NY140	NY140
2013	NY140	NY121		Sassy		
2014	NH	NH		Sassy		
2015	Ro1 s/r	Ro1 s/r		NH		
2016				Ro1 s/r		

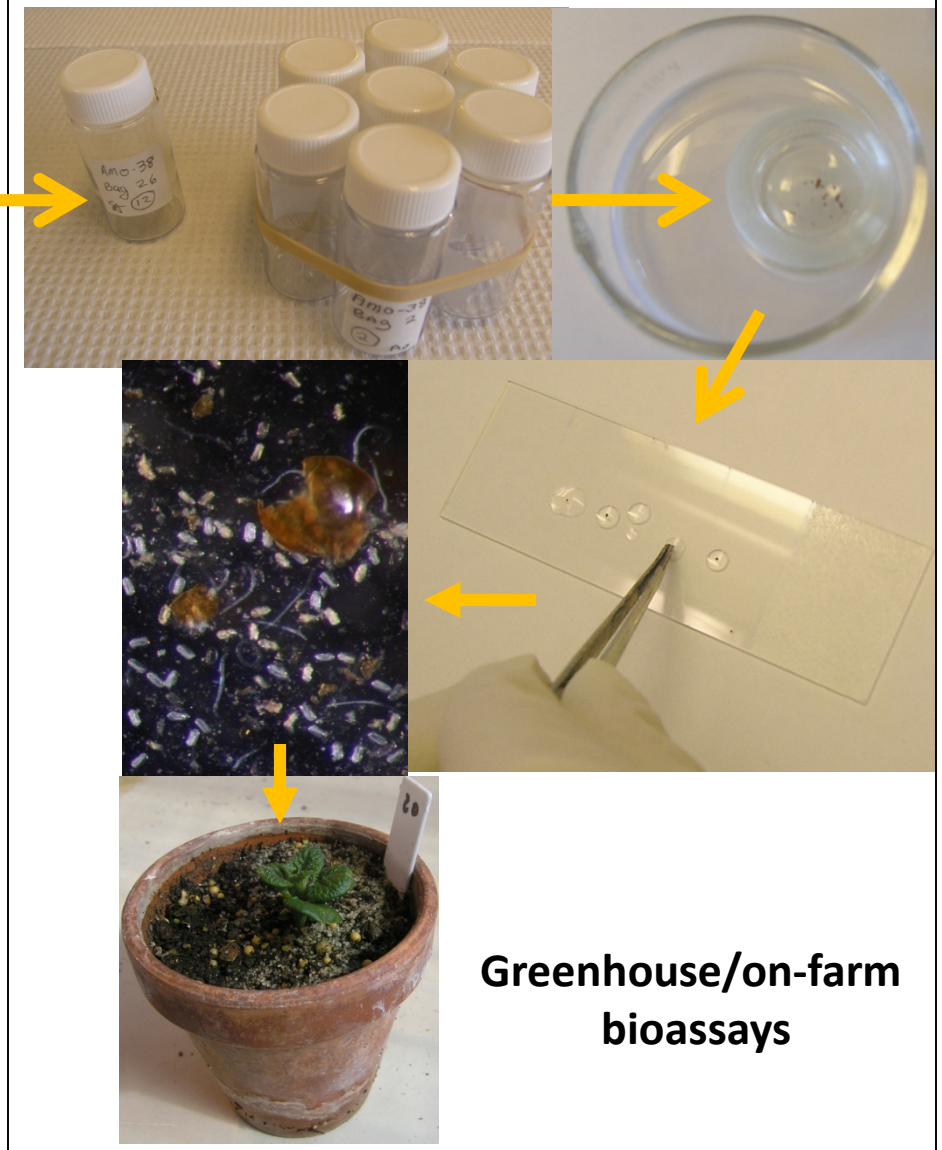
	15-1	15-2	15-3	16-1	16-2	16-3
2012				NY140	NY140	NY140
2013						
2014						
2015						
2016						

Ro2 management study (2008 – 2014)





Scientific & Technical Support
to Nematode Quarantine and Regulatory Activities



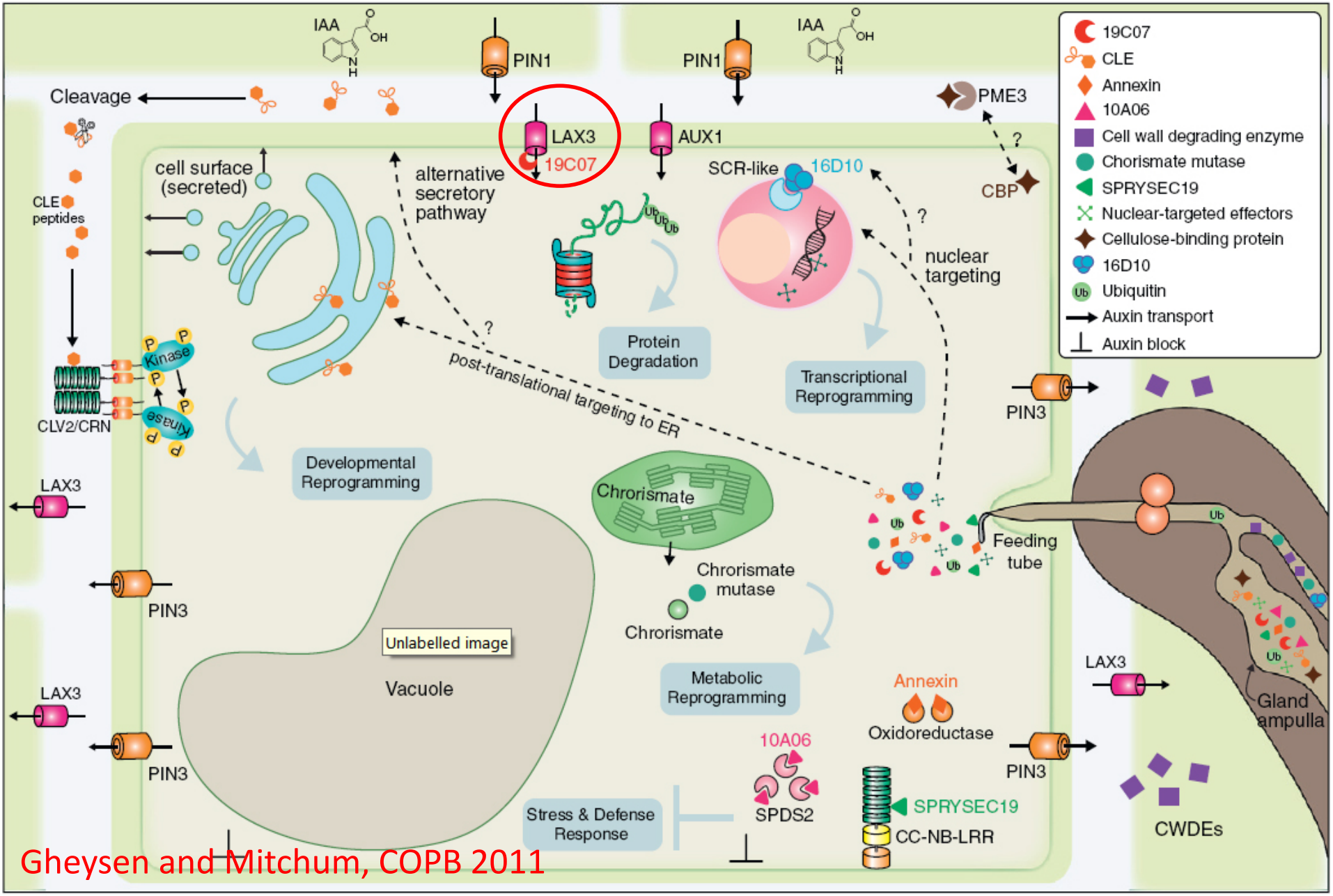
i. Cyst samples from surveyed fields--bioassay to determine nematode pathotypes (Ro1 or Ro2?)

ii. Cyst samples from fields determined for deregulation—bioassay to determine cyst viability

iii. Ro2 management

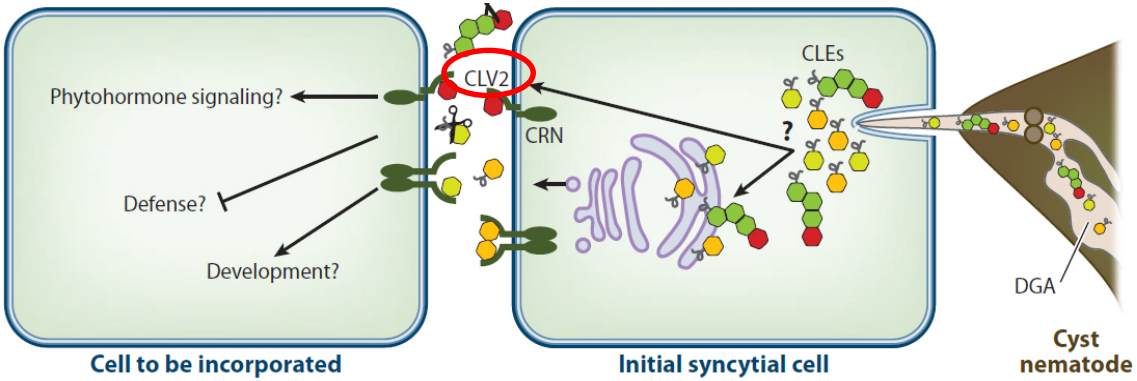
Greenhouse/on-farm bioassays

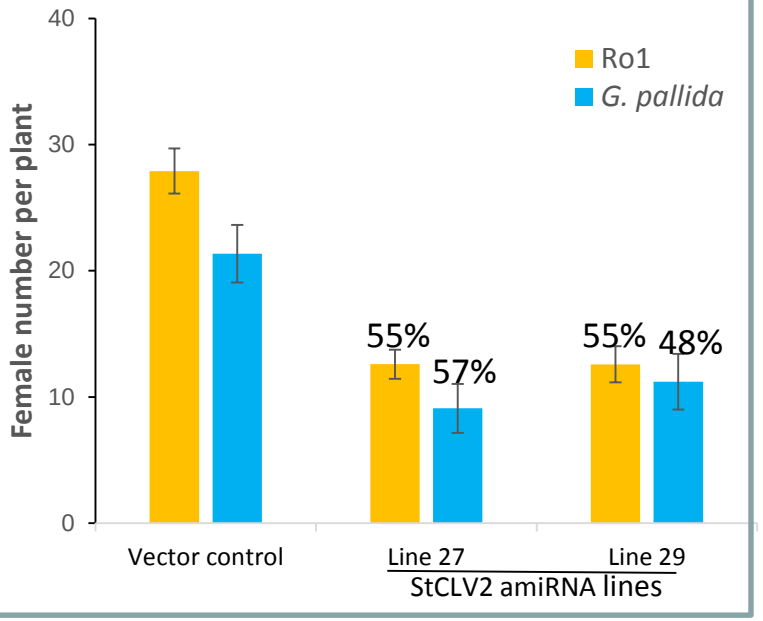
Fundamental Biology of PCN-Potato Interactions



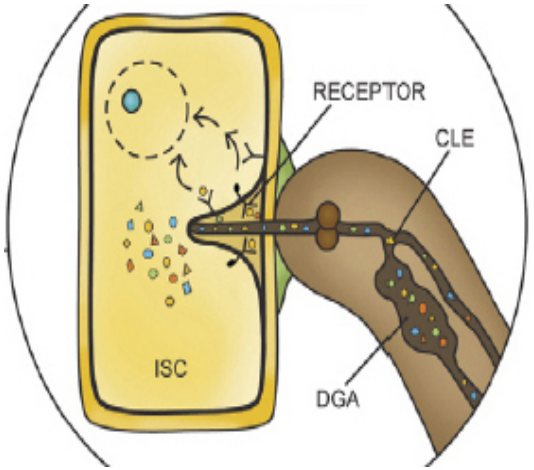
Gheysen and Mitchum, COPB 2011

Manipulating of host CLE receptors resulted in increased resistance to PCN

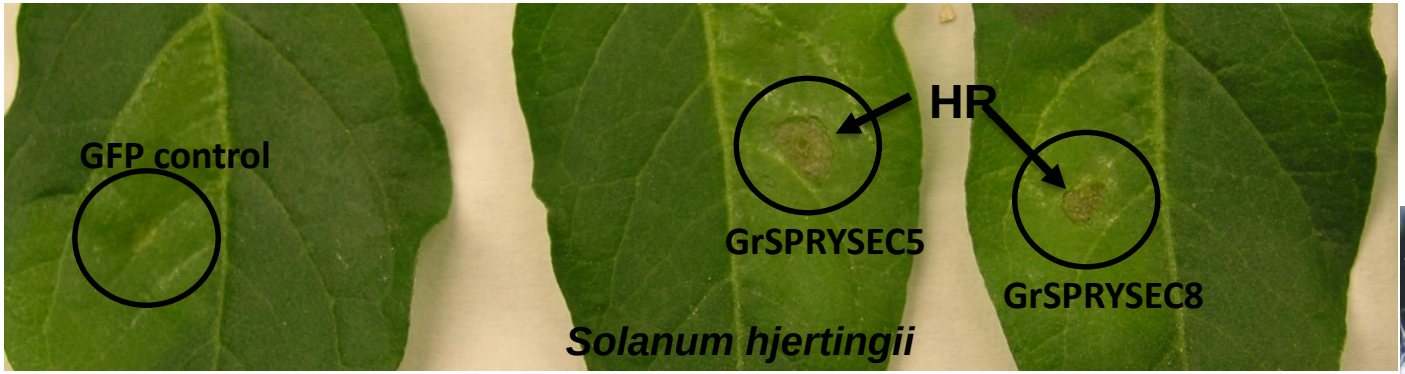


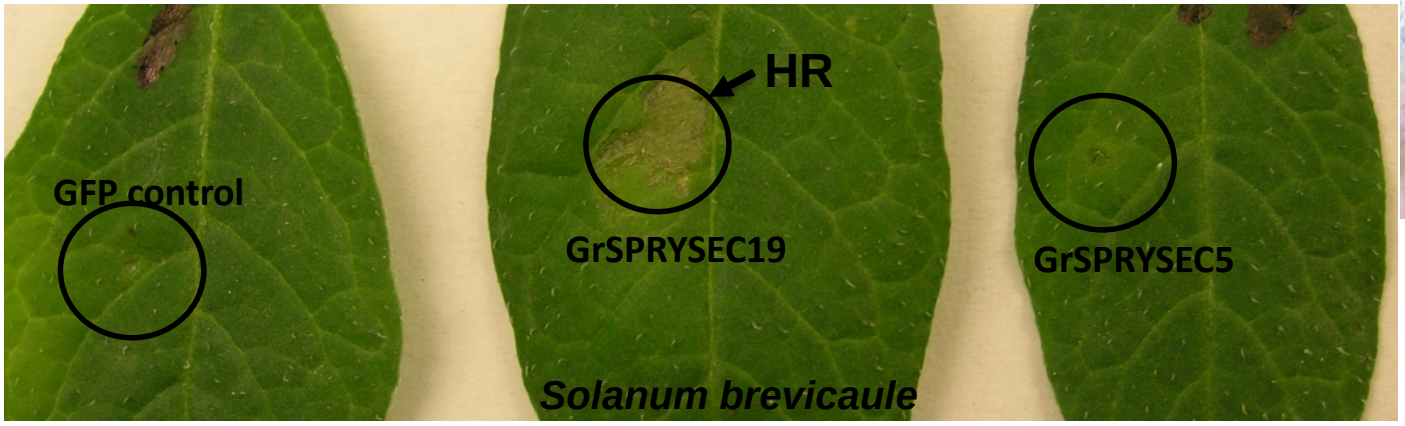


Exploration of wild potato species for nematode resistance



Use nematode-secreted proteins to discovery new resistance genes





Conclusions:

1. Quarantine and the use of resistant potato varieties are essential for the successful confinement and control of PCN in New York.

2. Basic research is necessary for supporting nematode quarantine and regulatory activities and for developing novel nematode control and management strategies.

Acknowledgements:

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