



**GLOBAL**  
Globodera Alliance

# Globodera Alliance Newsletter

## PCN BY THE NUMBERS

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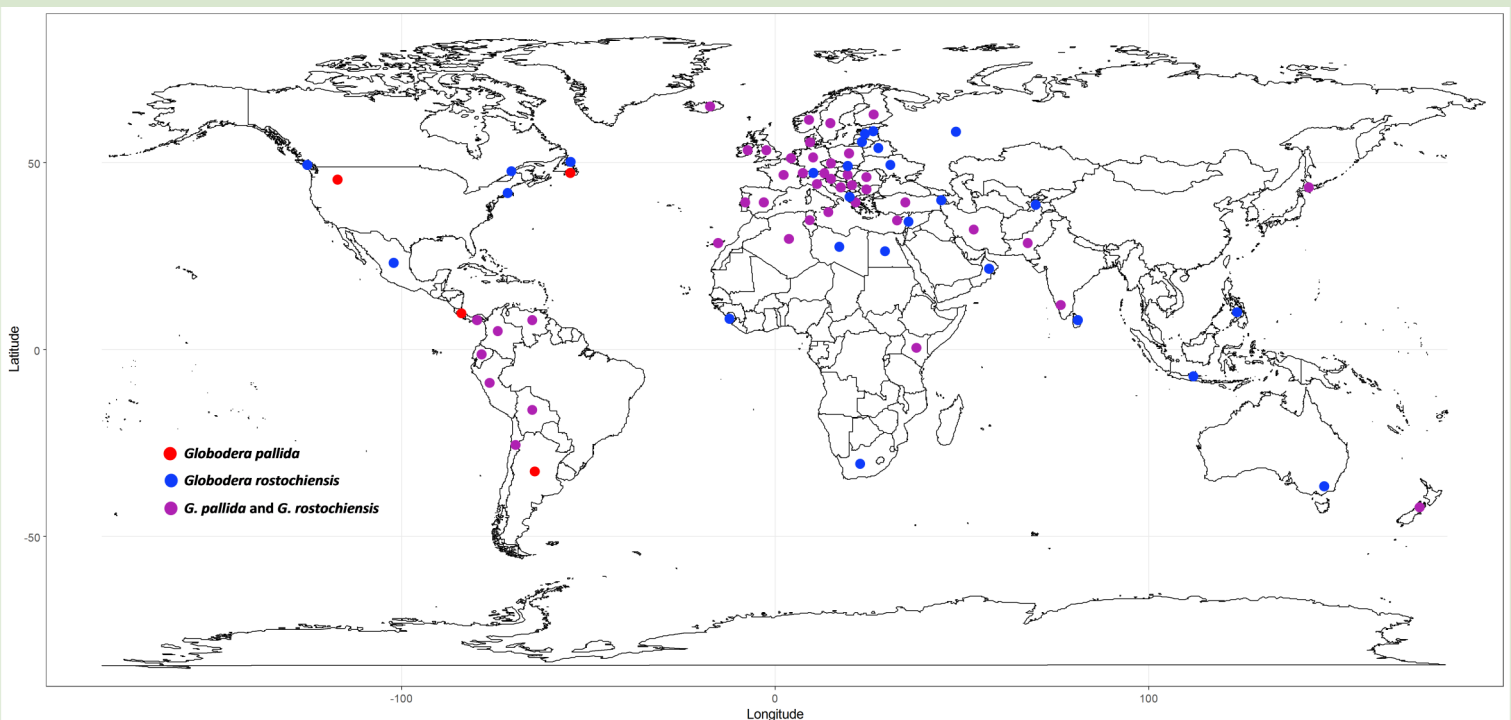
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**Potato cyst nematodes (PCN)** are quarantine pathogens of potato. There are two species of PCN, *Globodera rostochiensis* (the golden nematode) and *G. pallida* (the pale cyst nematode). If these plant-parasitic nematodes are left uncontained, they can cause up to 80% yield loss. The United States has a long history of combatting these invasive nematodes – along with this history comes interesting data on the biology of the nematode and the successes of the regulatory programs put in place to combat these nematodes.

**72**

**Number of countries where *G. rostochiensis* and/or *G. pallida* have been detected.** PCN are native to South American and have been found on every continent except Antarctica. 47 countries have both species; an additional 23 countries have only *G. rostochiensis*; and another 2 countries have only *G. pallida*.



Map created by: Jean Bertrand Contina, University of Idaho

Data Source: CABO/EPPO 2018 Data Sheets on Quarantine Pests: *Globodera rostochiensis* and *Globodera pallida*

# 1941 and 2006

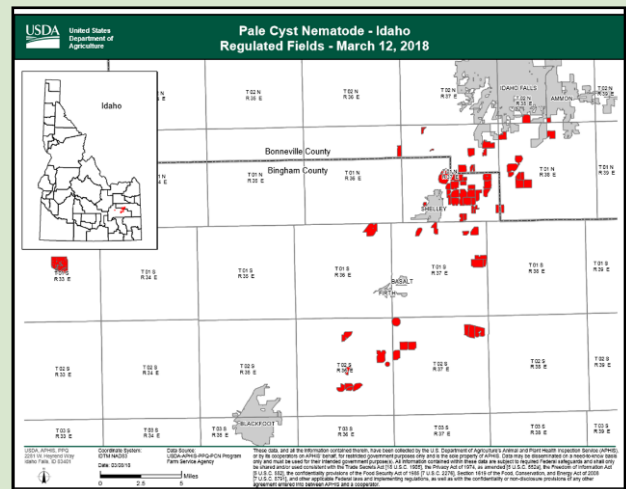
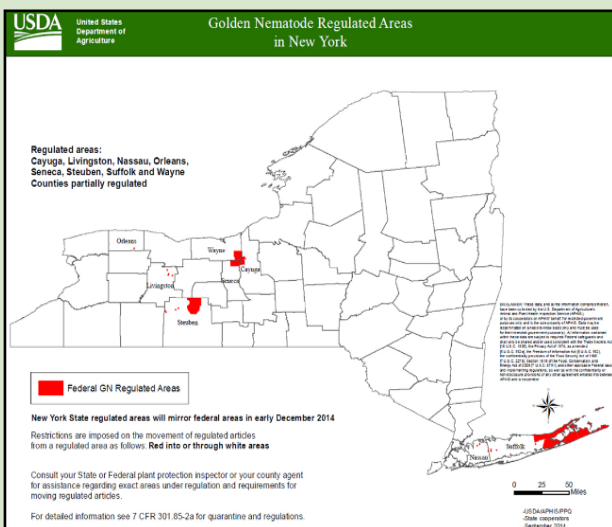
**Dates of first PCN detections in the United States.** The golden nematode was first found in New York in 1941 when it was found to be responsible for serious crop damage in a potato field in Long Island, NY. It is suspected that this nematode was introduced into the U.S. on equipment returning from WWI. In 2006, the pale cyst nematode was found in a tare soil sample in Idaho and we do not know how it was introduced into the U.S.



Left and top right: Impact of PCN on production of potato; Lower right: Potato yield loss caused by PCN; yield on the left was from a nematode-free field; yield on the right was from a nematode invested field. (photos: B. Brodie)

# 0.90

**Percentage of U.S. potato acreage infested with PCN** (based on 1.02 million acres of potatoes harvested in the U.S. in 2016). In New York, APHIS considers 5,945 acres to be infested with *G. rostochiensis* (as of Feb. 21, 2018). In Idaho, APHIS considers 3,277 acres to be infested with *G. pallida* (as of Nov. 2, 2018). When regulated acreage is included (land that is associated with infested acreage by shared farm equipment, movement of material, etc.) then 186,534 and 7,567 acres are regulated in New York and Idaho, respectively.



Left: Golden nematode regulated area in New York ; Right: Pale cyst nematode regulated area in Idaho (maps: USDA-APHIS)

**3,204,425**

**Pounds of soil that have been processed by USDA-APHIS to support eradication efforts of the pale cyst nematode from 2006-2017 in Idaho.** An amount of soil equivalent to the total weight of approximately 226 male elephants!



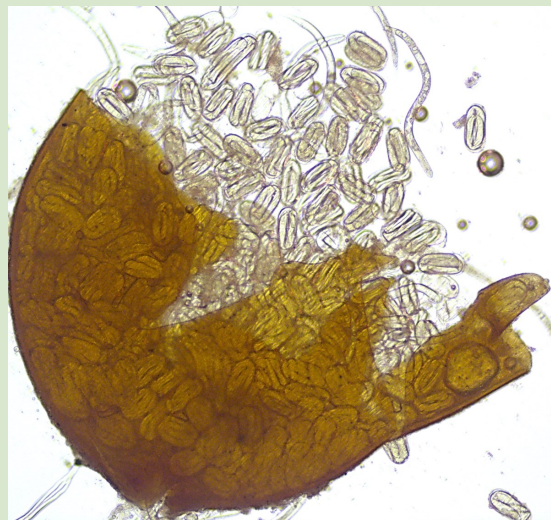
Left: Asian elephant ( [www.Konicaminolta.com](http://www.Konicaminolta.com) ); Right: Sampling for PCN (photo: T. Gresham, USDA-APHIS)

**20 to 30**

**Number of years that encysted PCN eggs can remain viable.**

In addition to being a serious pest of potato, once introduced, nematodes can survive in soil for decades. Female nematodes become leathery sacs (cysts) that can contain up to 500 eggs. The cyst protects the eggs from the soil environment until a host (potato) is present and the eggs are ready to hatch. In Scotland, PCN survived for up to 26 years in the absence of its preferred host, potato.

A crushed *G. pallida* cyst with eggs  
(photo: S. Pillai, University of Idaho)



**29** **Number of fields in Idaho with PCN.** Since the discovery of the pale cyst nematode in Idaho, USDA-APHIS has headed an aggressive eradication effort. This program has primarily relied on soil fumigation, but other eradication methods such as biofumigation and litchi tomato trap crops are being used. All of these fields—totaling 3,277 acres —are at different levels of deregulation, as outlined below.

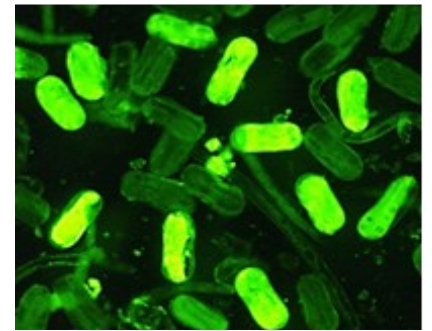
## Steps to Deregulate PCN Infested Fields

### Step 1—No Viable Eggs

Per USDA-APHIS guidelines, all infested fields must be surveyed using a viability assay to determine there are no viable eggs in the soil.

**22 fields—2,142 acres**

Number of quarantined fields in Idaho that have passed Step 1: no viable eggs found after extensive sampling conducted by USDA-APHIS.



Fluorescent is used to illuminate non-viable eggs. (photos: L.M. Dandurand lab)

### Step 2—Greenhouse Bioassay—3 rounds

Three rounds of a greenhouse bioassay of field-sampled cysts are used to confirm lack of reproduction.

**13 fields—1,611 acres**

Number of quarantined fields in Idaho that have passed Step 2.



### Step 3—In-field Bioassay—3 rounds

Lastly, a field can only be released from regulatory control after three more negative viability surveys following harvests of a susceptible crop.

**1 field—136 acres**

To date, one field has passed the first of 3 rounds of in-field bioassay.



89

**Percentage reduction in regulated acres in New York.** The golden nematode has been contained and controlled in New York through an aggressive seven-decade containment and eradication/control program. This program has relied on sampling to delineate where the nematode occurs. Various tactics have been used over the years to eradicate/control this nematode including soil fumigation and nematicides (1941-1980s), and crop rotation and resistant cultivars (1980s to present). On February 21, 2018, USDA APHIS removed 193,782 acres from the golden nematode regulated areas in five counties in New York.

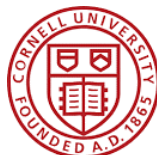
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**Number of potato varieties developed by the Cornell University potato breeding program, with resistance to *G. rostochiensis* pathotype 1 (Ro1) since 1966.** One of these varieties ‘Brodie’ is also resistant to *G. rostochiensis* pathotype 2 (Ro2). It is important to note that there are NO commercially available potato varieties with resistance to *G. pallida* available in the U.S.

Potato varieties—released by Cornell University between 1966 and 2018— with resistance to the golden nematode		
Peconic	Genesee	Monticello
Hudson	Pike	Lehigh
Rosa	Andover	Red Maria
Elba	Salem	Waneta
Hampton	Reba	Lamoka
Kanona	Keuka Gold	Algonquin
Allegany	Eva	Upstate Abundance
Stuben	Marcy	Brodie (Ro2 resistant)

7

**Number of federal and state agencies and universities involved in combating and minimizing the spread of PCN in the U.S.** Parties involved include Idaho State Department of Agriculture (ISDA), New York State Department of Agriculture and Markets, University of Idaho, Cornell University, Oregon State University, USDA Animal and Plant Health Inspection Service (APHIS), and USDA Agricultural Research Service (ARS).



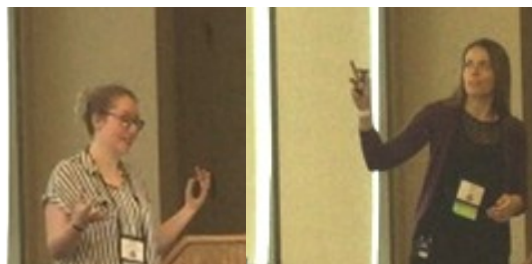
Cornell University



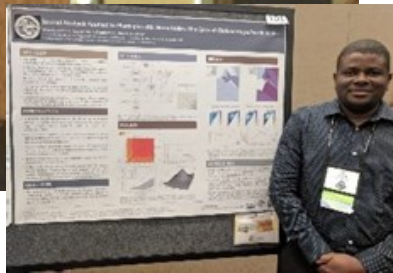
### Globodera Alliance Worldwide:

The Globodera Alliance (GLOBAL) brings scientists, industry, and regulators together to eradicate Globodera species that threaten potato production.

GLOBAL Investigators Jonathan Whitworth and Rich Novy (pictured right), USDA-ARS, along with Joseph Kuhl and Mike Thornton, University of Idaho, presented their plant breeding research at the **10<sup>th</sup> World Potato Congress**, Cusco, Peru, May 2018.



At the **2018 Potato Association of America Conference**, in Boise, ID, the GLOBAL Project hosted a symposium on PCN with presentations from Project Investigators, post doctorates, and students. Among the student presenters (pictured clockwise, from far left): Shona Strachen, The James Hutton Institute, Scotland; and Nejra Solo and Jean Bertrand Contina, University of Idaho.



To see presentations and posters sponsored by GLOBAL Project visit: [www.globodera.org](http://www.globodera.org)



At the **Organization of Nematologists of Tropical America Conference**, in Arequipa, Peru, Aug. 2018, the GLOBAL Project sponsored a symposium, making it possible for GLOBAL affiliated scientists from around the globe to share information about the spread of potato cyst nematodes worldwide. Presenters (clockwise, right): Hugo Pacheco Fuentes, Dept. of Agriculture and Livestock Services (SAG), Chile; Inga Zasada, USDA-ARS, Oregon; Benjamin Mimee, Agriculture and Agri-Food Canada; Sebastian Eves-van den Akker, University of Cambridge, UK; Vivian Blok, The James Hutton Institute, Scotland, and Louise-Marie Dandurand, University of Idaho; and Danny Humphreys, University of Costa Rica.



GLOBAL Investigators, John Jones and Vivian Blok, The James Hutton Institute, Scotland (left) represented the GLOBAL Project at the **33rd Symposium of the European Society of Nematologists**, Ghent, Brussels, September 2018.



## Upcoming Events:

### 2019 Idaho Potato Conference & Ag Expo

January 22-24

Pocatello, Idaho

GLOBAL Project Investigators will be presenting several workshops at the Idaho Potato Conference, including an update on work underway to control PCN and develop PCN resistant potatoes and a workshop about PCN conducted in Spanish. More info will be available at: <https://www.uidaho.edu/cals/potatoes/news/idaho-potato-conference>

### Washington Oregon Potato Conference

January 22-24

Kennewick, Washington

For more information: <https://www.potatoes.com/potatoconference>

### Potato Expo 2019

January 9-10

Austin, Texas

For more information: <http://potato-expo.com/>

## About the GLOBAL Project



GLOBAL stands for “Globodera Alliance,” an international group of research, extension, and education professionals working to eradicate *Globodera spp.* in U.S. potato production.

GLOBAL Project members include scientists from the University of Idaho, Oregon State University, Cornell University, U.S. Department of Agriculture (USDA), Agriculture and Agri-Food Canada, The James Hutton Institute, and the French National Institute of Agricultural Research.

Follow the GLOBAL Project online at:

[www.globodera.org](http://www.globodera.org)

[twitter.com/globodera.org](https://twitter.com/globodera.org)

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- Benjamin Mimee, PhD, Agriculture and Agri-Food Canada
- Rich Novy, PhD, USDA ARS
- Mike Thornton, PhD, University of Idaho
- Xiaohong Wang, PhD, USDA ARS and Cornell University
- Jonathan Whitworth, PhD, USDA



GLOBAL Project scientists, advisory board, and support staff tour the Plant Breeding Facility at Cornell University, a GLOBAL partner agency

**GLOBAL Advisory Committee**

- Bill Brewer, Oregon Potato Commission
- David Chitwood, PhD, USDA ARS
- Lorin Clinger, potato grower
- Tina Gresham, PhD, USDA APHIS PPQ
- Russell Ingham, PhD., Oregon State University
- Andrew Jensen, PhD, Northwest Potato Research Consortium
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- Daniel Kepich, USDA APHIS
- Patrick Kole, JD, Idaho Potato Commission
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- Bryan Searle, potato grower
- Andrea Skantar, PhD, USDA ARS
- Alan Westra, Idaho Crop Improvement Association
- Melanie Wickham, Empire State Potato Growers, Inc.

GLOBAL Advisory Committee consists of potato industry, state and federal regulatory and academic individuals who have volunteered their time and efforts. We thank them!

**Contact us:**

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