



USDA

Agricultural Research Service

Biological Control of *Arundo donax*



John Lydon

National Program Leader, Weed Science



United States
Department of
Agriculture

George Washington Carver Center
Room 4-2238
5601 Sunnyside Avenue
Beltsville, Maryland 20705



Agricultural
Research
Service

301-504-6470
john.lydon@ars.usda.gov

ARS National Programs

Natural Resources & Sustainable Agricultural Systems

- Soil Resource Management
- Air Quality
- Global Change
- Manure & Byproduct Utilization
- Integrated Agricultural Systems
- Water Availability & Watershed Management
- Pasture, Forage & Range Land Systems
- Agricultural Systems Competitiveness & Sustainability
- Bioenergy

Crop Production & Protection

- Plant Genetic Resources, Genomics & Genetic Improvement
- Plant Biological & Molecular Processes
- Plant Diseases
- Crop Protection & Quarantine
- Crop Production
- Methyl Bromide Alternatives

Animal Production & Protection

- Food Animal Production
- Animal Health
- Veterinary Medicine & Urban Entomology
- Aquaculture

Nutrition, Food Safety & Quality

- Human Nutrition
- Food Safety
- Quality & Utilization of Agricultural Products

Crop Production and Protection

NP 304

- * Systematics and Identification**
- * Protection of Agricultural and Horticultural Crops**
- * Protection of Natural Ecosystems**
- * Protection of Post-Harvest Commodities and Quarantine**

Weed Research NP 304

- * **Systematics and Identification**
- * **Herbicides**
 - Application
 - Resistance
 - Registration
 - Degradation
 - Natural products
- * **Multitactic Approach – IWM**
 - Chemical
 - Cultural
 - Mechanical
 - Biological
- * **Invasiveness**
 - Genomics
 - Climate change
 - Bioenergy crops
- * **Biological Control**
 - Plant pathogens
 - Insects
 - Phylogenetics

Weed Targets

African rue

air potato

Brazilian pepper

Brazilian waterweed

Brazilian pepper

camelthorn

Canada thistle

cheatgrass

Chinese tallow

common tansy

curlyleaf pondweed

downy rose myrtle

elephant ear

Eurasian watermilfoil

Peganum harmala

Dioscorea bulbifera

Schinus terebinthifolius

Egeria densa

Schinus terebinthifolius

Alhagi maurorum

Cirsium arvense

Bromus tectorum

Triadica sebifera

Tanacetum vulgare

Potamogeton crispus

Rhodomyrtus tomentosa

Colocasia esculentua

Myriophyllum spicatum

Weed Targets

giant reed

guineagrass

hawkweeds

hydrilla

kudzu

leafyspurge

medusahead

melaleuca

old world climbing fern

pale and black swallow-wort

pennywort

perennial pepperweed

rose myrtle

Arundo donax

Panicum maximum

Hieracium spp.

Hydrilla verticillata

Pueraria lobata

Euphorbia esula

Taeniatherum caput-medusae

Melaleuca quinquenervia

Lygodium microphyllum

Vincetoxicum spp.

Hydrocotyle spp.

Lepidium latifolium

Rhodomyrtus tomentosa

Weed Targets

Russian knapweed

Russian olive

Russian thistle

saltcedar

Scotch thistle

skunk vine

sponge plant

water hyacinth

water lettuce

water primrose

waterhemp

waterhyacinth

waterprimrose

whitetop/hoary cress

yellow starthistle

Acroptilon repens

Elaeagnus angustifolia

Salsola tragus

Tamarix spp.

Onopordum acanthium

Paederia foetida

Limnobium laevigatum

Eichornia crassipes

Pistia stratiotes

Ludwigia hexapetala

Amaranthus spp.

Eichornia crassipes

Ludwigia hexapetala

Lepidium draba

Centaurea solstitialis

Overseas Biological Control Labs

**European
Biological Control Lab
Montpellier, France
Director: Walker Jones**



**South American
Biological Control Lab
Buenos Aires, Argentina
Director: Juan Briano**

Overseas Biological Control Labs

**Australian
Biological Control Lab
Brisbane, Australia
Director: Matthew Purcell**



**Sino-American
Biological Control Laboratory
Beijing, China
Director: Hongyin Chen**

Arundo donax



- * Common names: giant reed, carrizo cane, carrizo gigante
- * Introduced into N. America in early 1500s
- * Clonal – spreads by movement of rhizomes and canes
- * Invasive in Australia and South America

Arundo donax

- * Invasiveness well documented in CA & TX, declared a noxious weed in Texas
- * Mechanical and chemical controls not sufficient in large areas such as the Rio Grande Basin
- * Water loss from *A. donax* invasions is a critical factor in the Southwest
- * National security issue along the southern boarder
- * Habitat destruction and species displacement



Eagle Pass

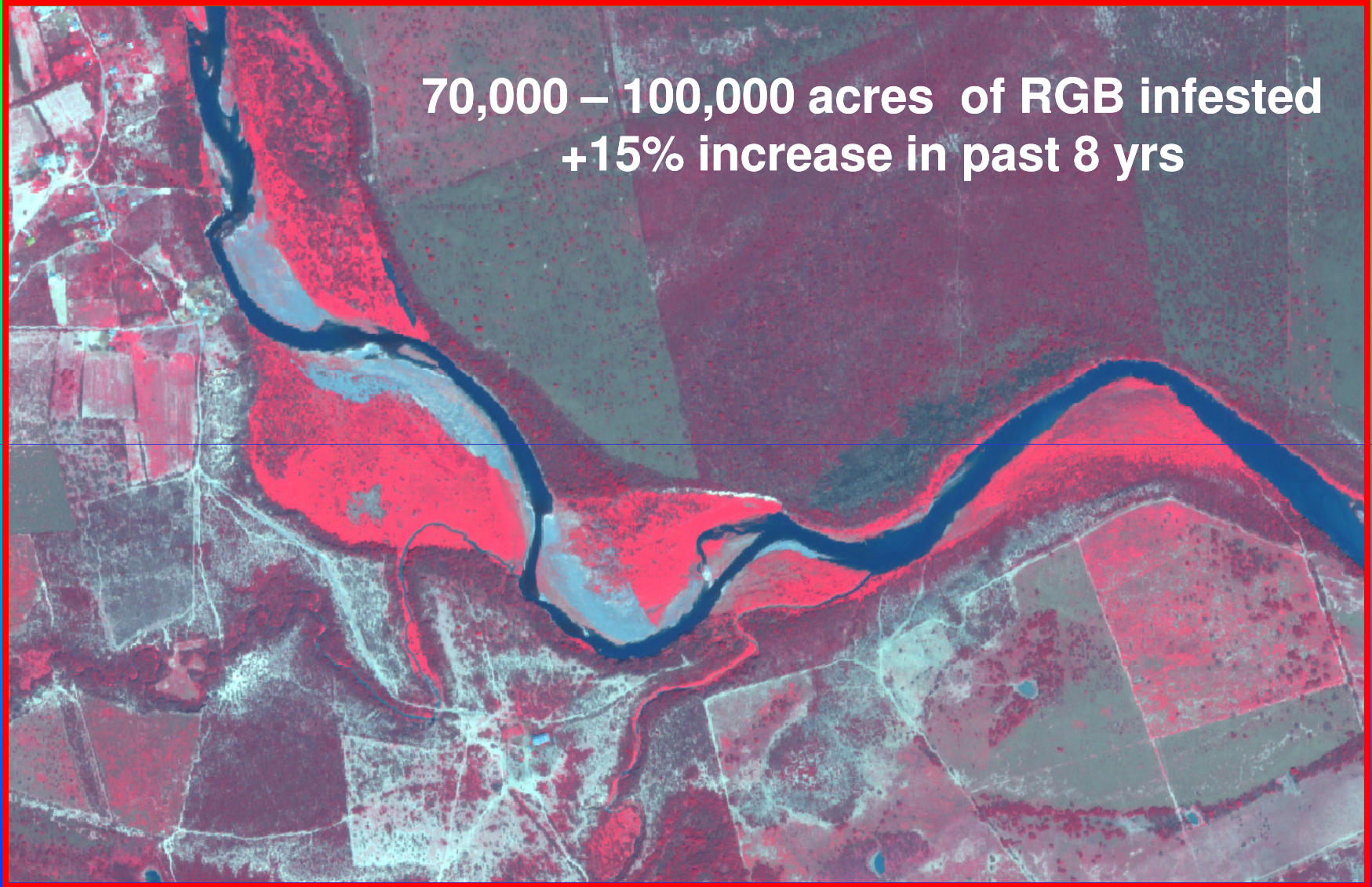


South of Del Rio



Nuevo Laredo

**70,000 – 100,000 acres of RGB infested
+15% increase in past 8 yrs**





Weslaco

Arundo donax Research Team

John Goolsby, Patrick Moran, Alex Racelis, John Adamczyk – USDA-ARS, Weslaco, TX, Host range testing, biology of agents, project coordination

Jim Everitt, Chenghai Yang – USDA-ARS, Weslaco, TX, Remote sensing of Arundo in Rio Grande Basin

Alan Kirk, Walker Jones – USDA-ARS, Montpellier, France, Foreign exploration for biological control agents in Europe

David Spencer – USDA-ARS, Davis, CA, Plant architecture model for agent impact

Prasana Gowda – USDA-ARS, Bushland, TX, Water use of Arundo

Georgianne Moore, David Watts – Texas A&M, College Station, Water use of Arundo

Jim Manhart, Alan Pepper, Daniel Tarin – Texas A&M, College Station, Molecular genetics of Arundo and biological control agents

Ron Lacewell, Ed Rister, Alan Sturdivant, Emily Seawright – Texas A&M/TAES, College Station, Economic impact of Arundo donax in the Rio Grande Basin

Tom Vaughn, Amede Rubio – Texas A&M, Laredo, Riverbank plant transition studies

Fred Nibling – Bureau of Reclamation: Denver, CO, Liaison with Mexico, Arundo water loss

Earl Chilton – TX Parks & Wildlife

Leeda Wood, Paul Parker, Tim Roland, Ray Penk, Ken Jones – USDA-APHIS, Edinburg, TX, Mass rearing of Arundo biological control agents, aerial release of agents at Pilot Study Site

AI Cohen – Insect Diet and Rearing Research, Raleigh, NC, Development of artificial diet for Arundo wasp

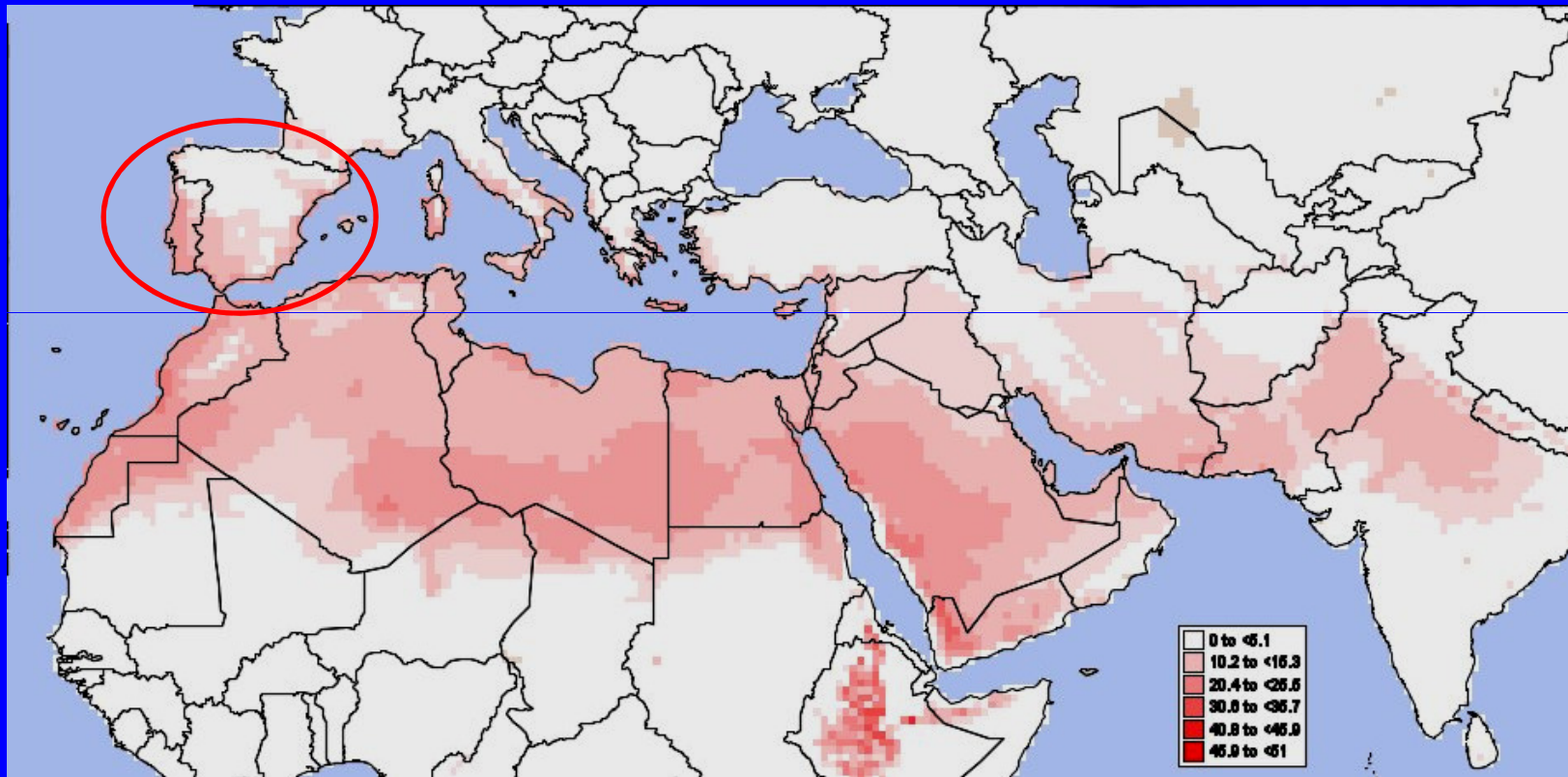
Maricela Martinez Jimenez – IMTA – Cuernavaca, Mexico, Evaluation of biological control agents in Mexico

Eduardo Galante, Maria Angeles Marcos, Elena Cortez Mendoza – Universidad de Alicante, Spain, Phenology and field ecology of the Arundo scale in Spain

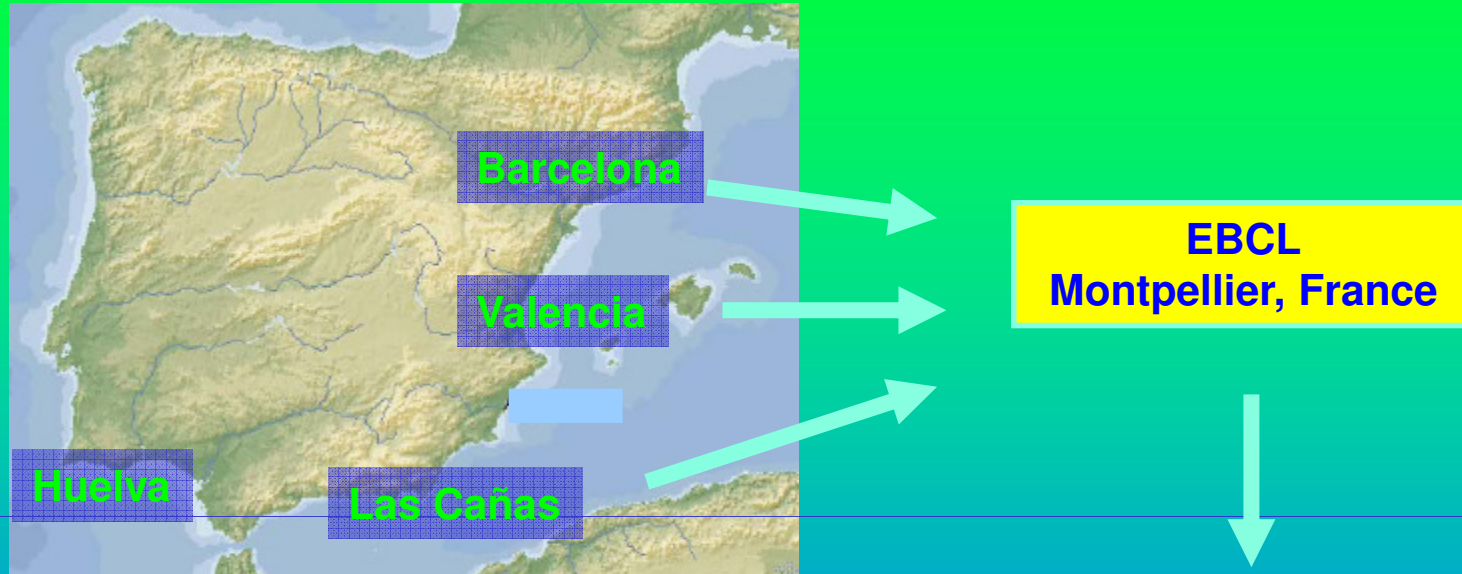
Avinoam Danin, Dan Gerling – Tel Aviv University- Israel, Field collection of Arundo species in eastern Mediterranean for genetics & exploration for bc agents in Israel

Abida Zeddami, Algiers, Algeria – Field collection of Arundo species in N. Africa for genetics & exploration for bc agents in Algeria

Native range of *Arundo donax*



Agent Exploration



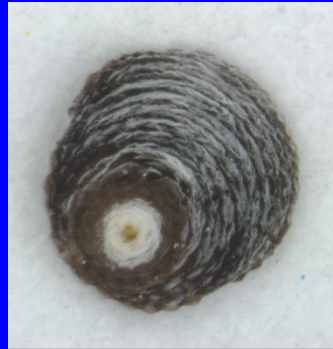
USDA Quarantine Lab, Mission, TX

Status of Arundo Biological Control Agents

Arundo wasp



Arundo scale



Arundo fly



Arundo leafminer



Tetramesa romana

Larvae feed on stems & side shoots adult stingless

Released April 29, 2009

Rhizaspidiotus donacis

Scale insects feed on roots and side shoots

TAG Approval August 2009

Cryptonevra spp.

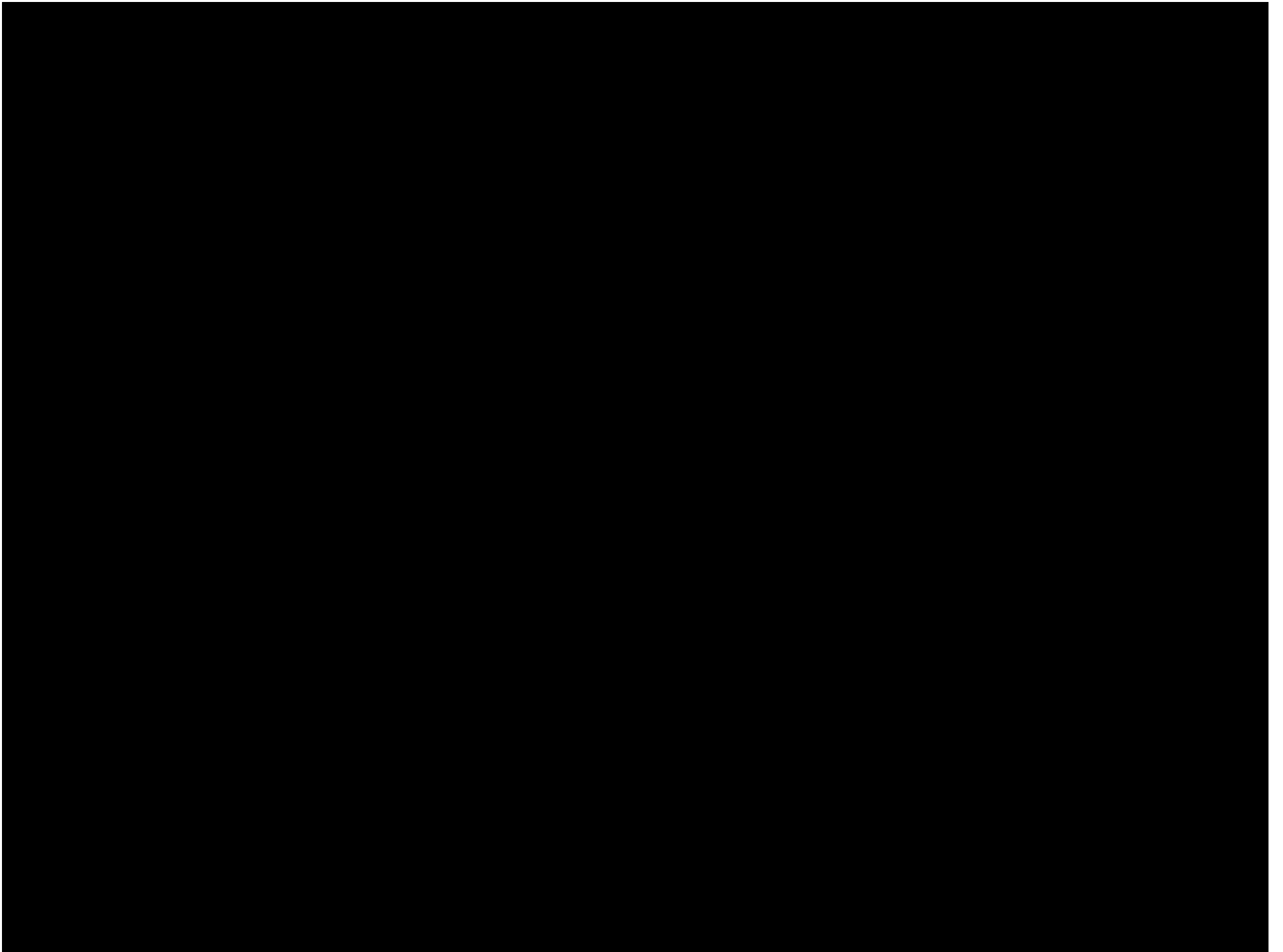
Larvae feed on new stem shoots

In testing

Lasioptera donacis

Larvae are leaf sheath miners causing defoliation

Developing rearing methods



Invasive Species and Noxious Weeds

U.S. Executive Order (E.O.) 131121

Defines invasive species as “alien [non-native] species whose introduction does or is likely to cause economic or environmental harm or harm to human health”

Invasive Species and Noxious Weeds

U.S. Executive Order (E.O.) 131121

Each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law” “not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Invasive Species and Noxious Weeds

Plant Protection Act, Public Law 106-224 (2000)

Defines “noxious weed” as any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment.

Invasive Species and Noxious Weeds

Plant Protection Act, Public Law 106-224 (2000)

To facilitate control of noxious weeds, the Secretary may develop a classification system to describe the status and action levels for noxious weeds.

The classification system may include the current geographic distribution, relative threat, and actions initiated to prevent introduction or distribution.

In conjunction with the classification system, the Secretary may develop integrated management plans for noxious weeds for the geographic region or ecological range where the noxious weed is found in the United States.