Biological Control of Tropical Soda Apple, *Solanum viarum* (Solanaceae) in Florida
A Successful Project

Julio Medal

Florida Department of Agriculture and Consumer Services
Division of Plant Industry

Topics

- **Introduction**
- ***Gratiana boliviana* (Chrysomelidae)**
- **Post-release evaluation**

Invasive Plants

The second most important factor worldwide that reduce plant and animal biodiversity after urban development (house construction and roads)

Invasive Plants in Florida

-1,392 non-native species established in Florida

-76 species in Category I: alter plant communities displacing native species, changing community structures or ecological functions (FEPPC)

-Invade 10% of Florida's natural areas

-Cost $ 32 million/year to control in public land

One the Most Invasive Plants in Florida

- **Tropical Soda Apple (Solanaceae: *Solanum viarum*)**

Example of a Successful Biocontrol Project in Florida: Tropical Soda Apple

Julio Medal, Raghavan Charudattan, Jeff Mullahey, William Overholt, Rodrigo Diaz, Phillip Stansly, Brent Seller, Nikary Bustamante, Bobbie Jo Davis, Roberto Medal, Judy Gillmore, Lance Osborne, James Cuda , Veronica Manrique, Divina Amalin, Kenneth Gioeli, Susan Munyan, Jason Ferrell, Larry Markle, Ernest Hiebert, Joe Walter

Steven Hight, Don Sudbrink, Shaharra Usnick

BRAZIL: Robinson Pitelli, Aldo Santana, Renan Gravena, J. Henriique Pedrosa, Edgard Bredow, Marcelo Vitorino, Andre Buss, Liliam Beal, Charles Wikler, Robert Barreto
ARGENTINA: Daniel Gandolfo, Diana Ohashi, Fernando Mackay, Hugo Cordo
PARAGUAY: Bolivar Garcete
SOUTH-AFRICA: Terence Olcker

Michael Shannon, Dale Meyerdirk, Amy Roda, Paul Hornby, Daniel Flores

Richard Gaskalla Abbie Fox, Edward Burns, Kenneth Hibbard, Jose Diaz, Joe DeMarco, Vincent Morris

Brian Nelson, Mike Terry

Michael Thomas, David Harding, Tajudeen Salaudeen

Tropical Soda Apple

-Native to South America
(Brazil, Argentina, Paraguay, Uruguay)

-First found in Glade County, Florida in 1988

>0.4 million Hectares in 11 states

Spiny bush (1-2 m high) known as 'The Plant from Hell'

Seeds (40,000/plant) dispersal by cattle and wildlife feeding on fruits (50-100 fruits/plant)
Foliage unpalatable

The plant is a host for at least six crop viruses (tomato mosaic virus, tomato mottle virus, potato leaf-roll virus, potato virus Y, tobacco etch virus, cucumber mosaic virus) and several crop pests

Tropical soda apple reduces biodiversity in natural areas and grasslands by displacing native plants and altering ecological processes

Florida grasses replaced by Tropical Soda Apple

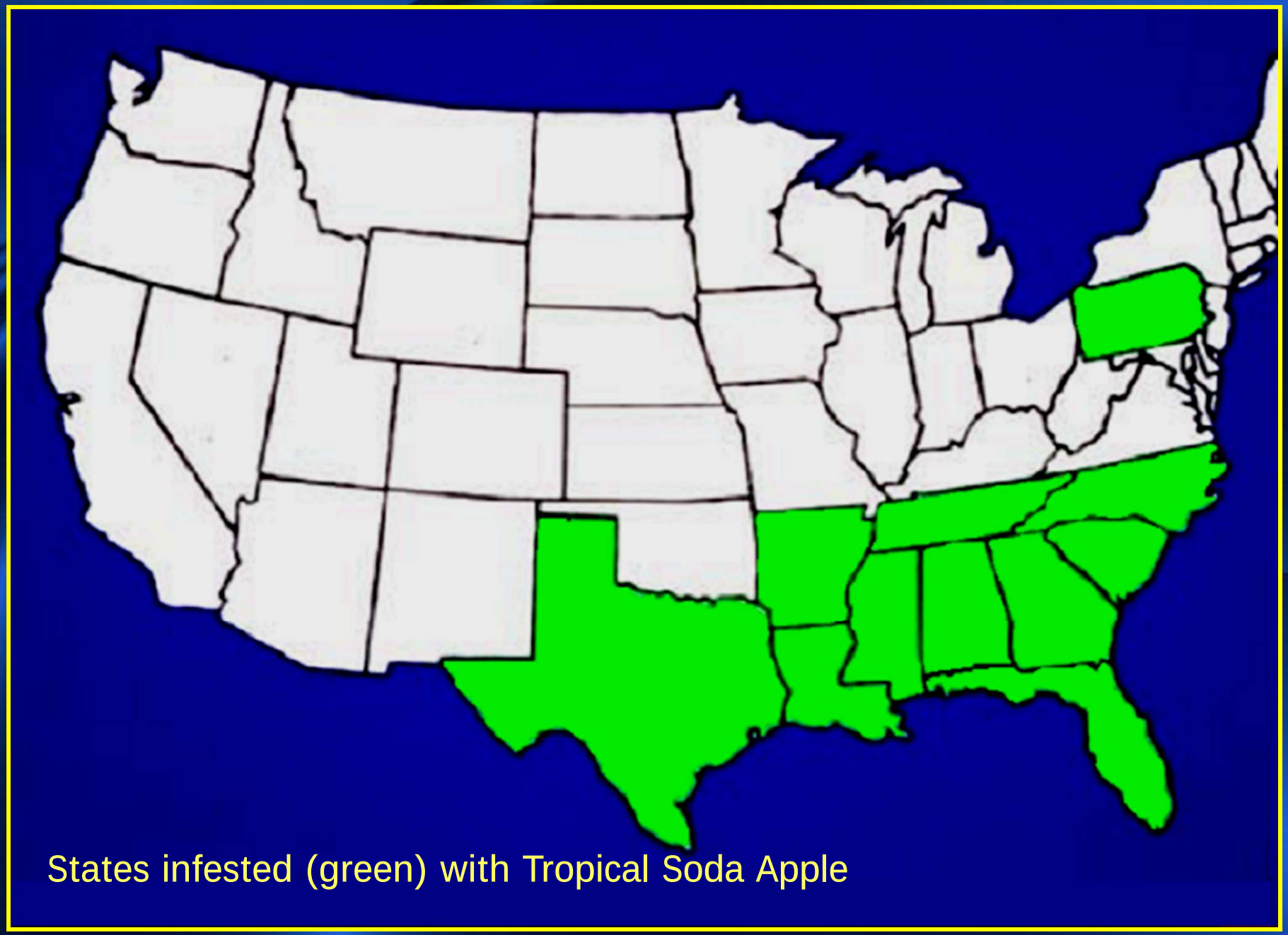
Florida ranchers were losing US $6.5 to 16 million annually

Chemical control

Mechanical control

Reduction in livestock carrying capacity

Distribution (yellow) of *Solanum viarum* in South America



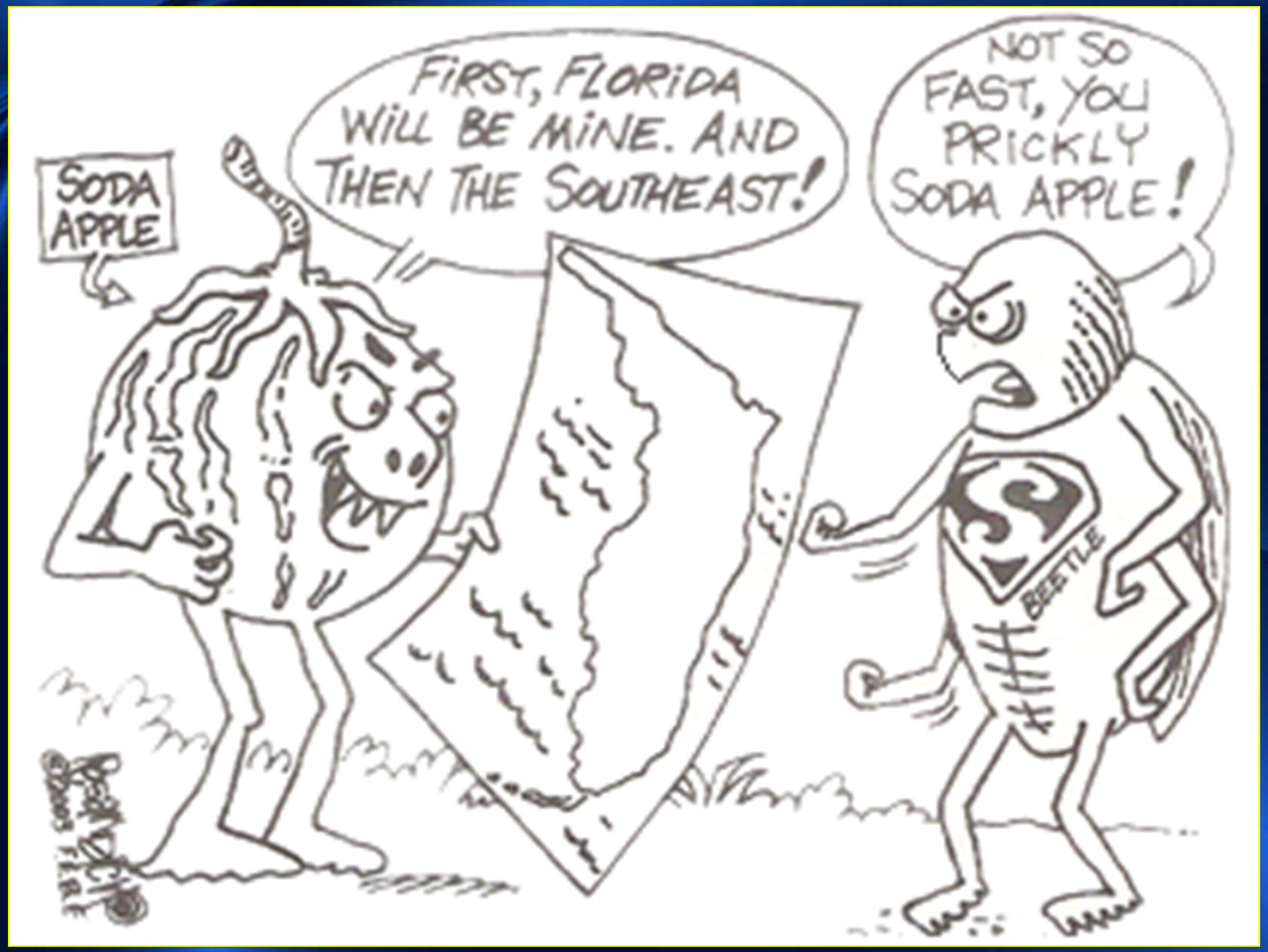
States infested (green) with Tropical Soda Apple

Florida

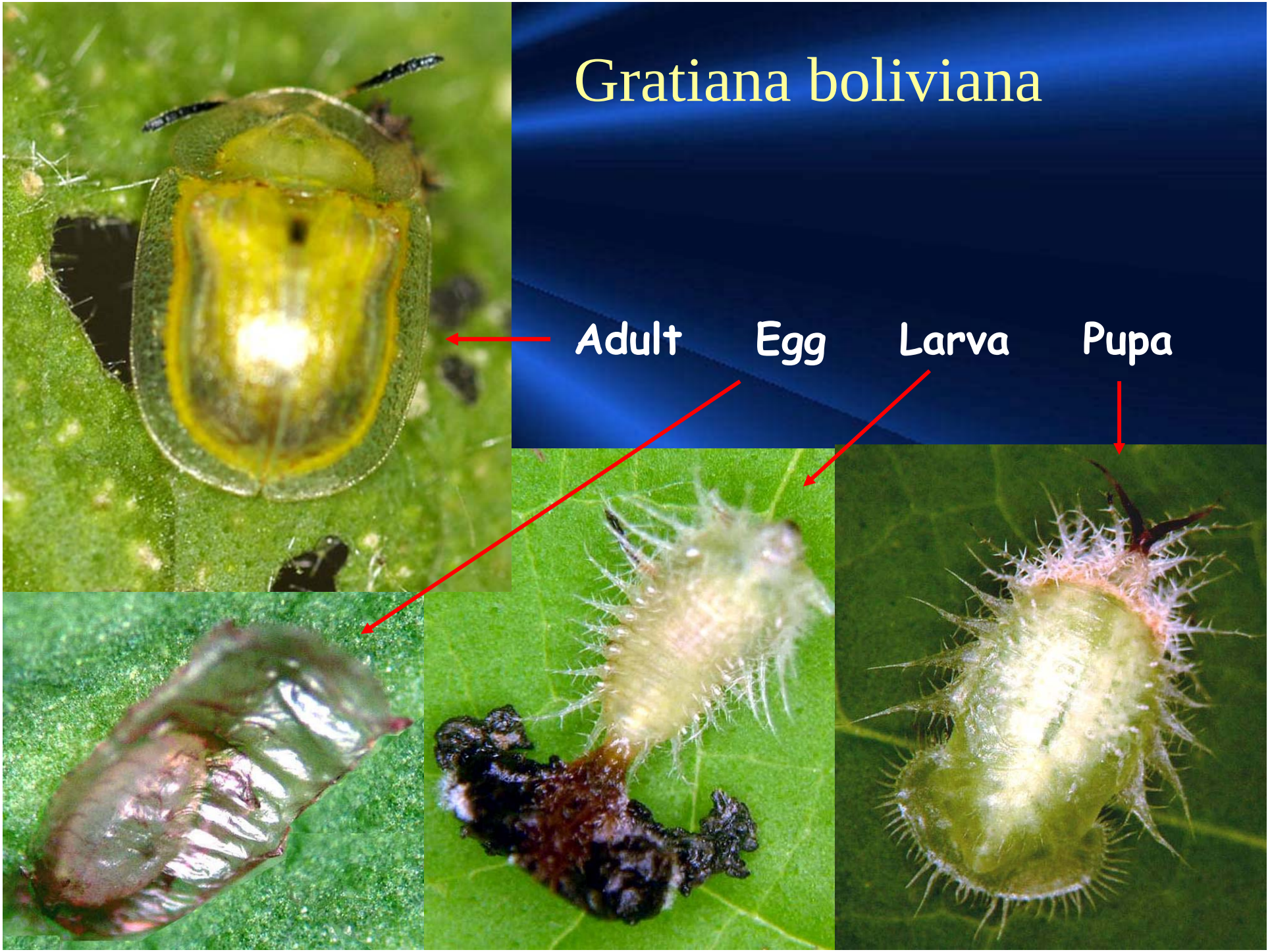
Florida

Brazil

Argentina


SODA APPLE
FIRST, FLORIDA WILL BE MINE. AND THEN THE SOUTHEAST!
NOT SO FAST, YOU PRICKLY SODA APPLE!
BEETLE

Gratiana boliviana



Leaf-beetle field release Florida, May 2003

Beetles Released in Florida

Sumter County, June 2007

Sumter County, June 2007

Lake County, August 2008

Marion County, August 2008

Lake County, July 2009

Beetles Released in Florida

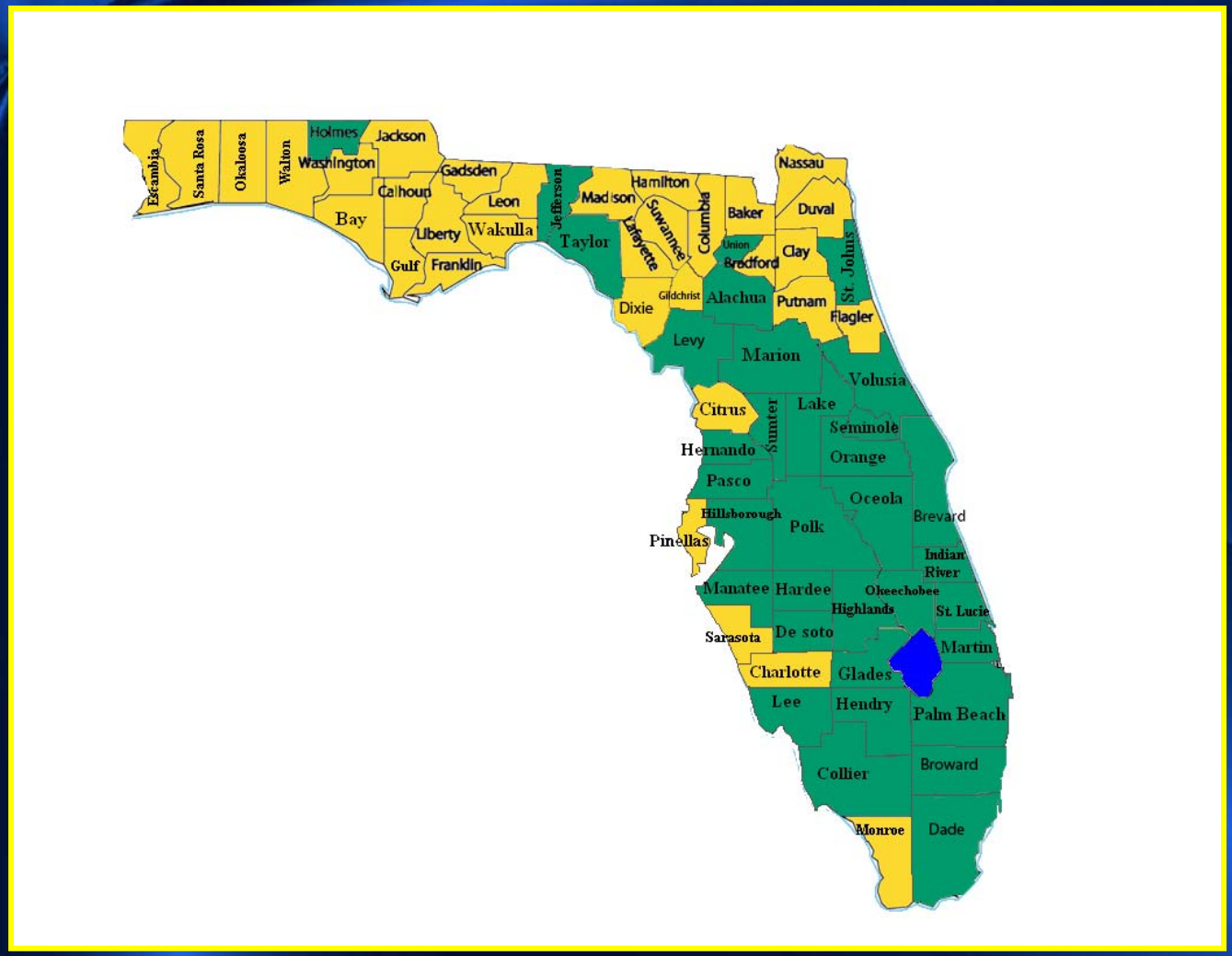
Okeechobee County, August 2007

Pasco County, July 2008

Sumter County, July 2008

Hernando County, July 2007

Lake County, June 2008



Florida counties where beetles have been released (green)

Polk County Field Cage 2003

May 14, 2003
Before beetles released

August 21, 2003
After beetles were released

Okeechobee County

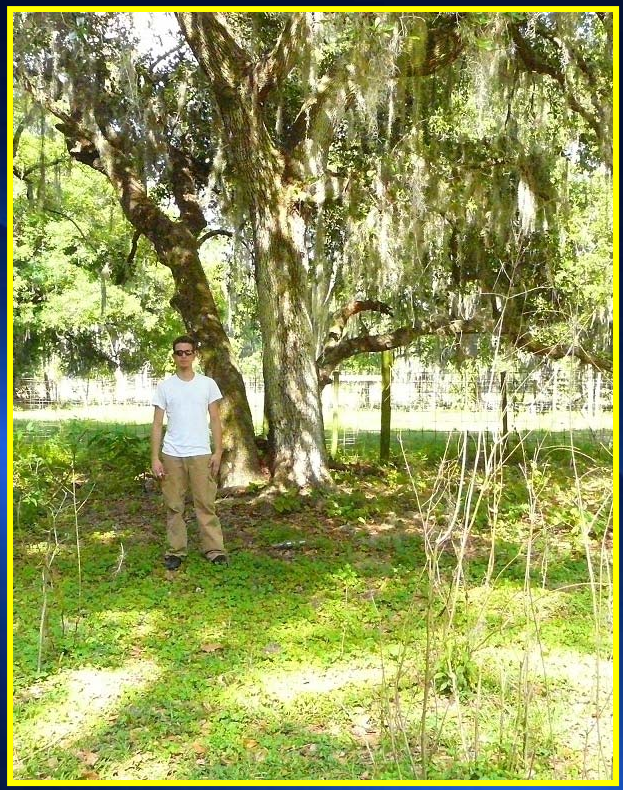
August 11, 2004
Beetles being released

October 26, 2004
After beetles were released

Polk County

May 2003

June 2007



April 2008

Sumter County

June 2006

June 2007

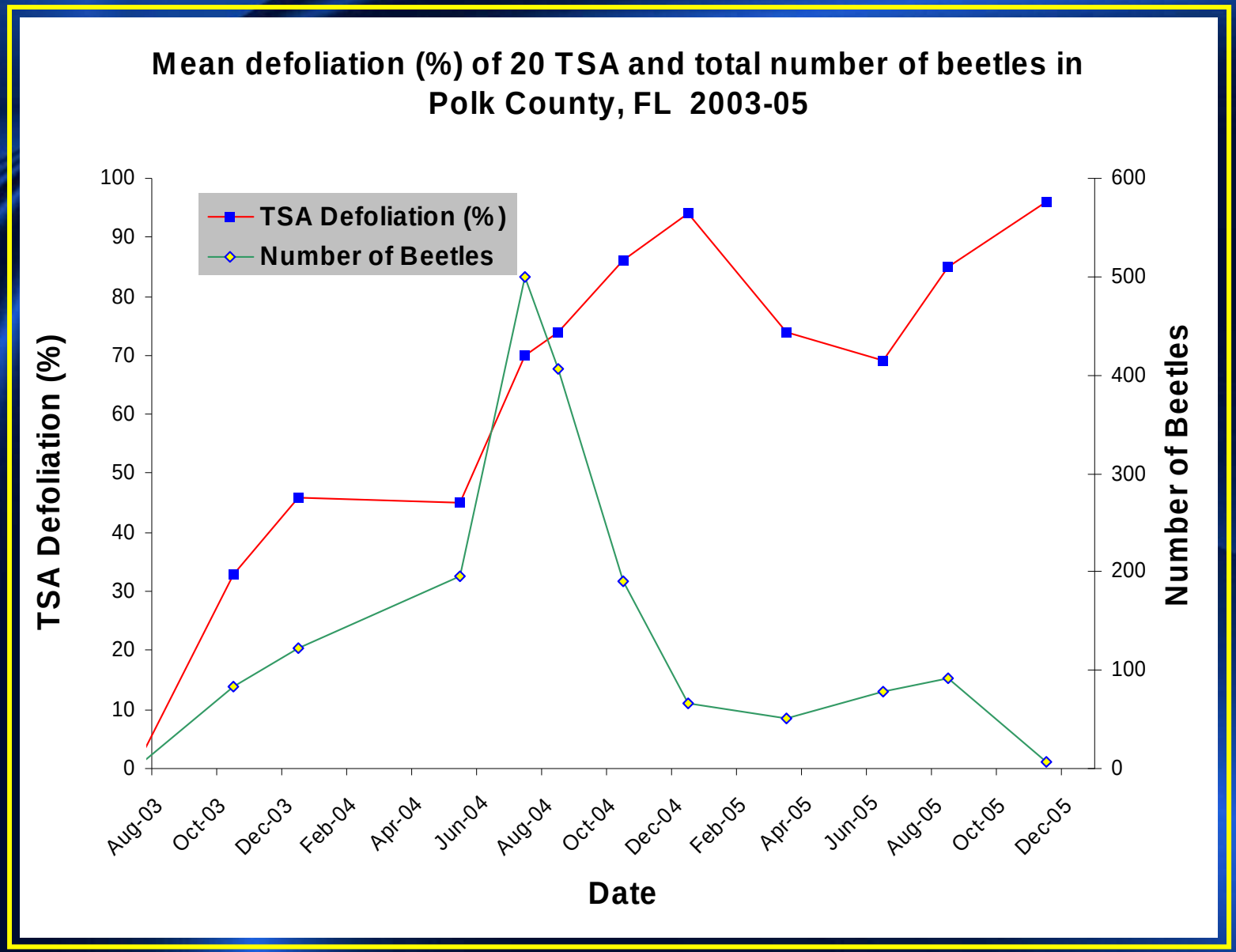
April 2008

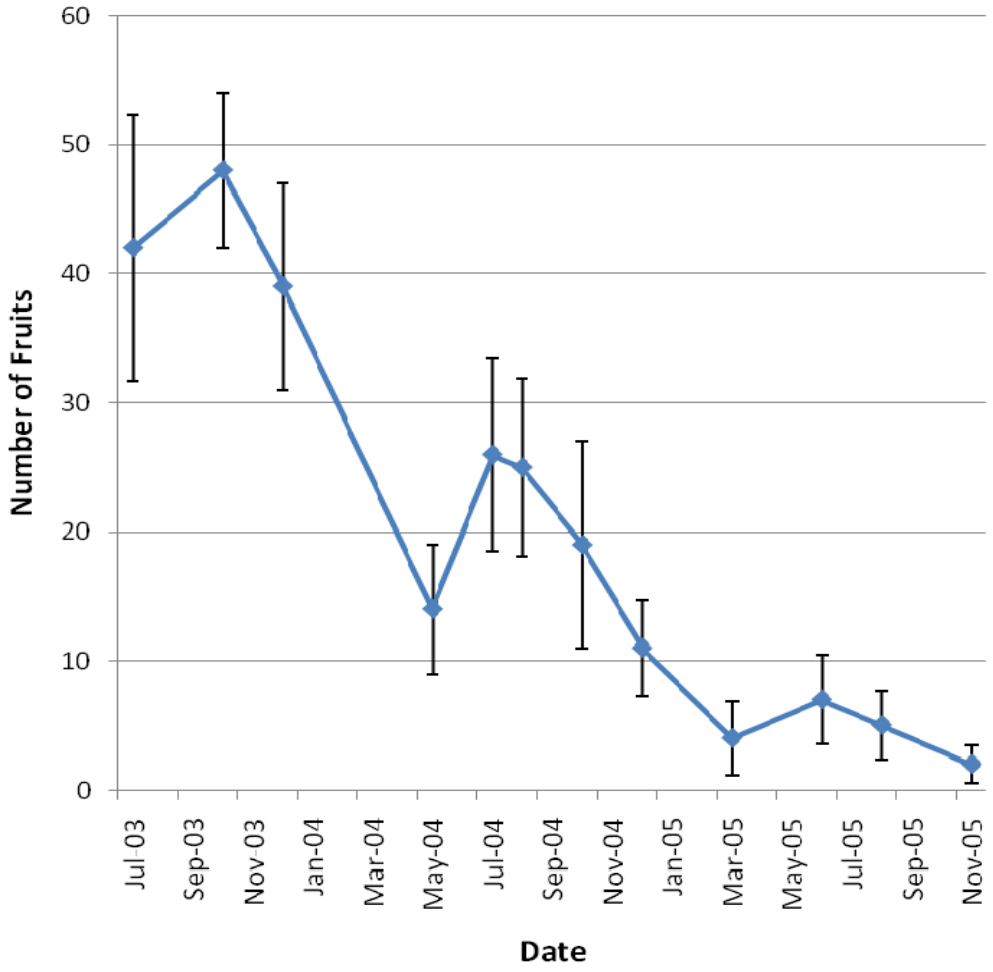
Post Release Evaluations in Florida

-Monitoring

-Mark plants and quadrants at each location

-Changes in the target weed and biocontrol agent recorded


Mean defoliation (%) of 20 TSA and total number of beetles in Polk County, FL 2003-05
TSA Defoliation (%)
Number of Beetles
TSA Defoliation (%)
Number of Beetles
Date
0
10
20
30
40
50
60
70
80
90
100
0
100
200
300
400
500
600
Aug-03
Oct-03
Dec-03
Feb-04
Apr-04
Jun-04
Aug-04
Oct-04
Dec-04
Feb-05
Apr-05
Jun-05
Aug-05
Oct-05
Dec-05


60
50
40
30
20
10
0
Number of Fruits
Jul-03
Sep-03
Nov-03
Jan-04
Mar-04
May-04
Jul-04
Sep-04
Nov-04
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Date

How Far *Gratiana boliviana* Disperse

- 1-2 miles/year (Polk, Martin counties)
- 8.3 miles/year (Lee County)
- 4-5 miles/year (Hendry County)
- 10 miles/year (Hardee County)

Lee County August 2006

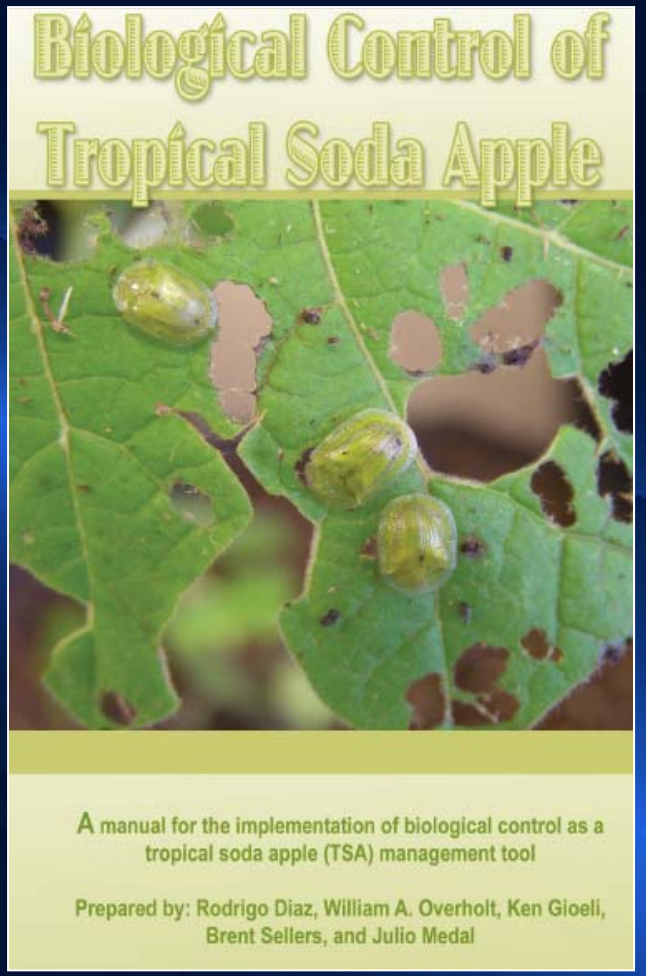
Polk County August 2006

b1

Manual sent to 1400 members of the Florida Cattlemen Association

Manual includes sections on:

- How to recognize TSA
- Beetle biology
- Damage/impact to TSA
- How to get beetles
- Where to release
- Monitoring and beetle harvest
- Integration of beetles with mowing and herbicides



b1 minor point, but it was sent only to FCA members in central and south Florida (about 1400 out of 4000 members)
billover, 10/25/2010

Articles in newspapers and magazines facilitated the spread of word about the biological control program

The Florida Cattleman
AND LIVESTOCK JOURNAL

Checkoff-Funded...
(Continued from page 38)

ing demand for beef, instead of scrambling to regain lost market share. We may never be able to put a price on that as producers, but we know it was one of the best investments we ever made."

New Circle W Canvas Top Stock with 50/50 Rear Gates, Center Divider and Escape Gate
Also Available in 28' and 32' Lengths
16' - $4,750
20' - $6,200
24' - $6,900
LARGE INVENTORY
FRIENDLY SERVICE
FINANCING AVAILABLE

New Cherokee Aluminum Stockman With Escape Door, Swing/Slide Rear Gate and Center Divider Gate
20' Model Shown, Available in 16', 20' and 24' Lengths
16' - $9,700
20' - $10,700
24' - $11,700
UNBEATABLE PRICES
FULL SERVICE & REPAIR
TRADES WELCOME

A Super Beetle Fighting the 'Plant from Hell': Tropical Soda Apple

By: Julio Medal

Finally, after five years of intensive plant feeding and oviposition tests, a south American leaf-feeder beetle (Gratiana boliviana) was approved (May 2003) for field release in Florida to join the battle against Tropical Soda Apple (TSA), known by the nickname 'The Plant from Hell'.

TSA is a perennial prickly weed native to south America that has been spreading rapidly in Florida since it was first found in Glades County in 1988, and as many other non-native plants nobody knows how it got there. This weed is invading pastures, vegetable fields, hammocks, and conservation areas not only in Florida but also in at least five other southeastern states. It is estimated, that at least one million acres are infested with this non-native noxious plant. Control efforts since the early 1990s have included chemical herbicides and mowing. However, these control tactics are relatively expensive, provide a temporary solution, and may have negative effects on non-target plants and animals.

A biocontrol program searching for bugs in the place of origin of TSA (Brazil, Argentina, Paraguay), was initiated by Dr. Julio Medal of the University of Florida in 1997 funded by the USDA-APHIS and FLDACS-DPI, and working in collaboration with Brazilian University researchers, and the USDA-ARS Biological Control Laboratory in Argentina. Medal and collaborators research showed that the beetle would only eat TSA and no other plants in Florida of economic/or ecological value. Feeding tests that included approximately 150 plant species in almost 40 families indicated the beetle to be 'Highly specific and Safe' to control TSA.

Initial field releases of the beetle began in August 2003 in Costine Family Ranch in Polk County, and since then almost 10,000 beetles have been released in 14 locations in 11 Florida counties. We did not want to create a lot of expectation on the effectiveness of the biocontrol agent to prevent the spread of TSA, because we knew that when a new species is released into a new environment, it would encounter many natural enemies including the so common spiders and fire ants. However, the recently released south American beetle has showed in a few months a tremendous ability to establish, feed voraciously on TSA plant foliage, reproduce in large numbers, and overcome many of the adverse conditions (biotic and abiotics) in the subtropical Florida climate including

(Continued on page 41)

UF UNIVERSITY of FLORIDA
IFAS Extension

ENY-826

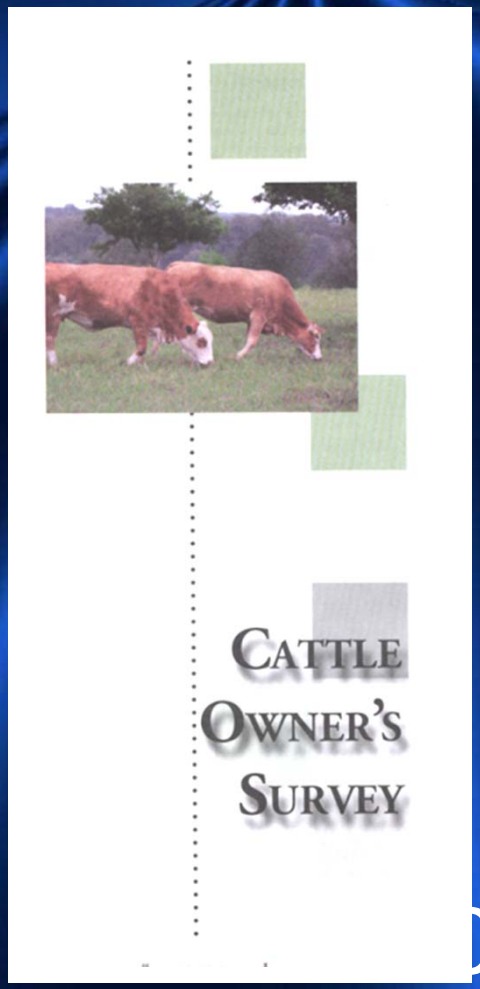
Biology of *Gratiana boliviana*, the First Biocontrol Agent Released to Control Tropical Soda Apple in the USA[1]

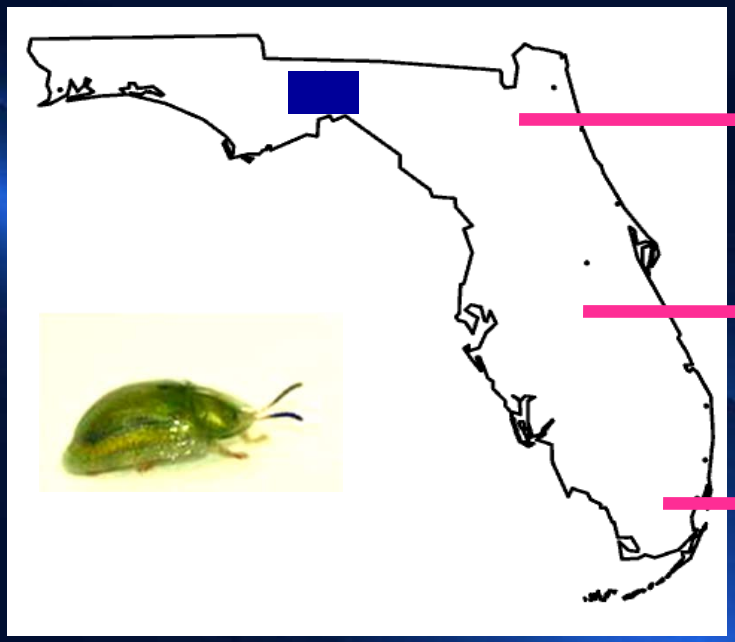
J. C. Medal, D. Gandolfo and J. P. Cuda[2]

Introduction

Tropical soda apple (TSA), *Solanum viarum* Dunal (Solanaceae) (Figure 1), is a perennial weed,

Survey-2010 of ranchers to assess the effectiveness of the program (3500 mailed, 30% responses)





Ranchers were more aware of the beetle in Central and South Florida

Florida Cattlemen's Association

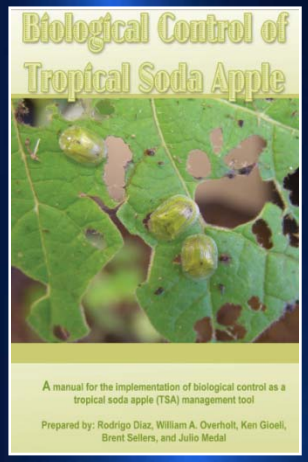
FAMU - CESTA
Center for Biological Control

Interagency cooperation in the implementation of the biological control of TSA played a key role for the overall success of the program

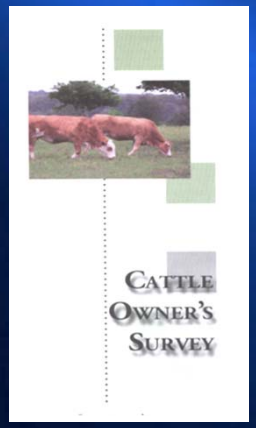
1. Impact of TSA and availability of beetles

2. Development of technology

3. Diverse methods to deliver information

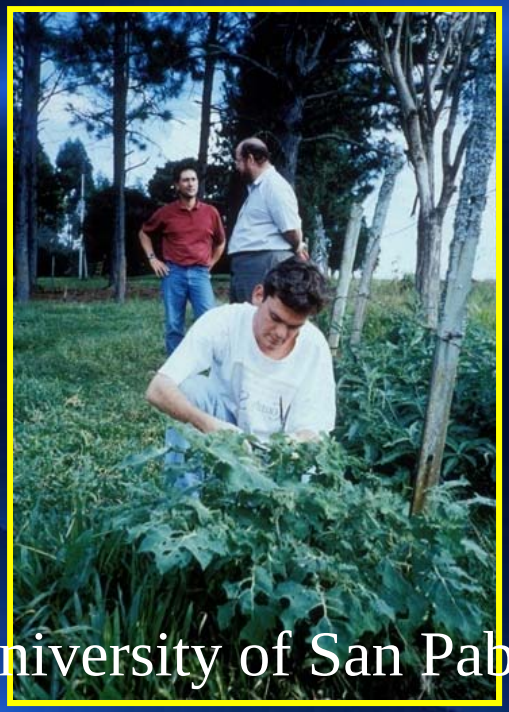


4. Feedback from stakeholders



Brazilian Collaborators

University of Blumenau



University of San Pablo

University of Irati

University of Curitiba

Amazon river, Brazil