# Testing the Australian WRA for reducing introduction of invasive plants to Florida

Doria R. Gordon
Associate Director of Science
UF Professor of Botany

UF Collaborators: Alison Fox
Randall Stocker
Daphne Onderdonk

Thanks to: FDEP BIPM
USDA APHIS PPQ
FDACS DPI

# Outline

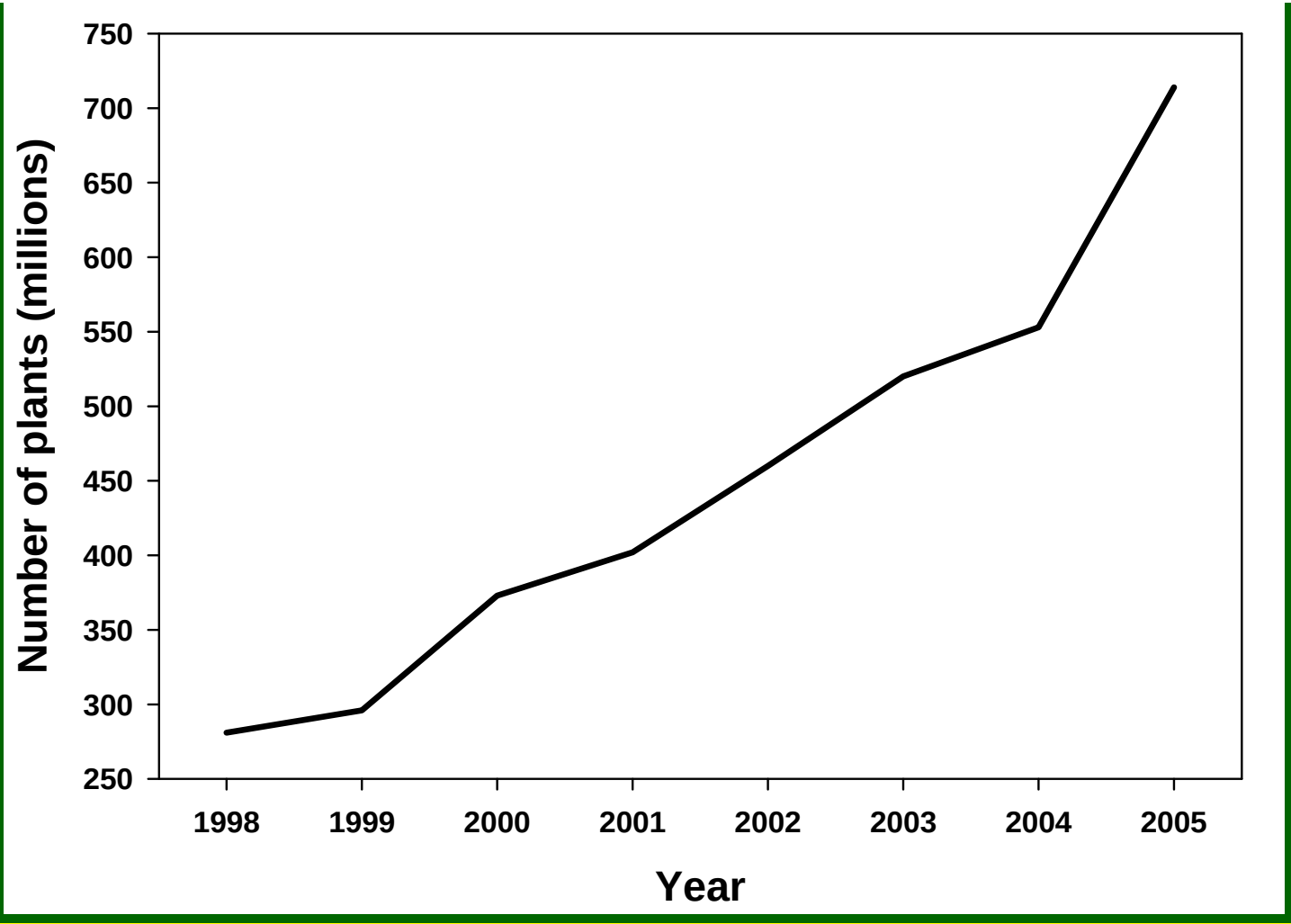
- Why test a predictive tool in Florida?
- Our approach
  - Modified Australian Weed Risk Assessment
  - Data used
  - Results
- Comparison to tests elsewhere
  - Accuracy
  - ROC
- Conclusions

*Imperata cylindrica*

# Why a predictive tool for Florida?

57% of plant shipments, carrying 74% of all plants imported to the U.S., enter through Florida (2006)

Number of Plants Imported through Miami International Airport

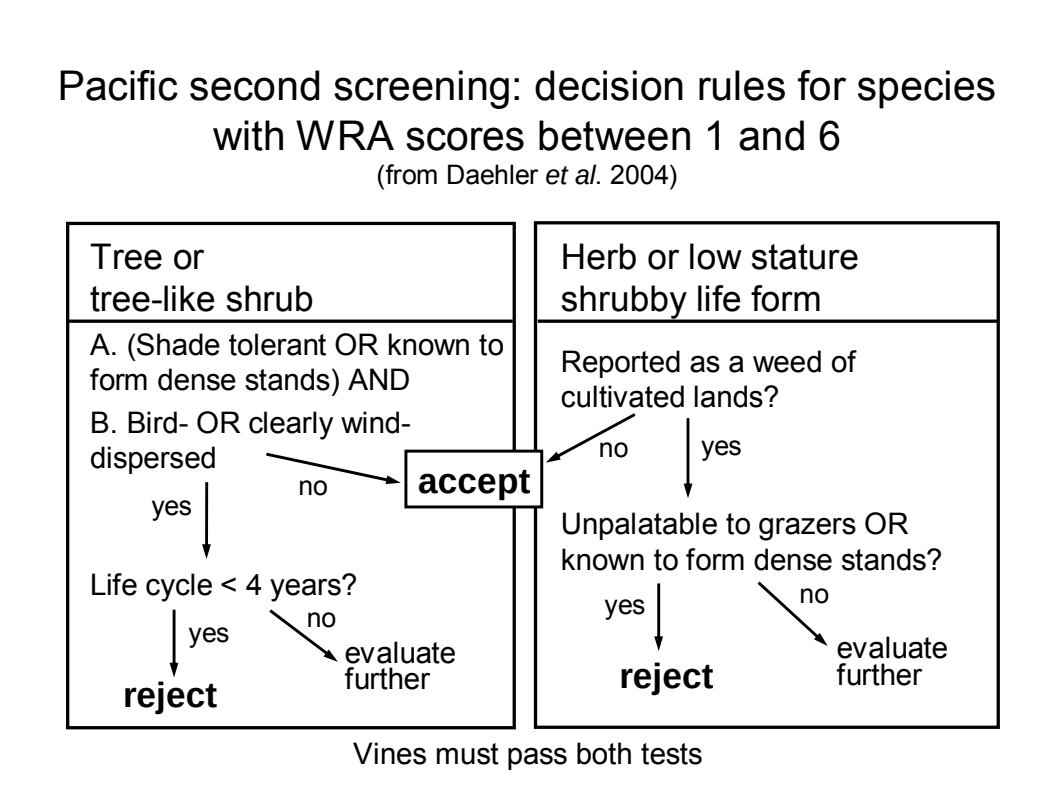


# Hypothesis

- Accuracy in FL will be comparable to that for Australia, HI, and other geographies
  - > 90% of invaders correctly identified
  - > 75% of non-invaders correctly identified
  - < 15% of species require further evaluation

# Florida Test

- Australian WRA with minor modifications to 3 questions for greater relevance to Florida's climate
- Include Daehler et al. (2004) secondary screen for species requiring further evaluation



# Species List

- 158 non-native species in Florida
  - 62 major invaders
    - 31 invasive in natural areas (IFAS Assessment - Fox et al. 2005)
    - 31 invasive in agricultural areas (SWSS lists)
  - 48 minor invaders
    - Documented in Florida's flora but not as invasive
  - 48 non-invasive – after > 50 years in FL
    - Documented in cultivation but not in any flora
- Invaders and non-invaders paired by family and life form as possible
- Assessor had no knowledge of original category or species distribution in Florida

# Species breakdown

**Life form**

| | Non-invader | Minor Invader | Major invader |
|---|---|---|---|
| Forb/herbaceous | 12 | 18 | 23 |
| Graminoid | 3 | 8 | 8 |
| Shrub | 10 | 5 | 8 |
| Subshrub | 1 | 2 | 1 |
| Vine | 7 | 8 | 9 |
| Tree | 15 | 7 | 13 |

**Phylogeny**

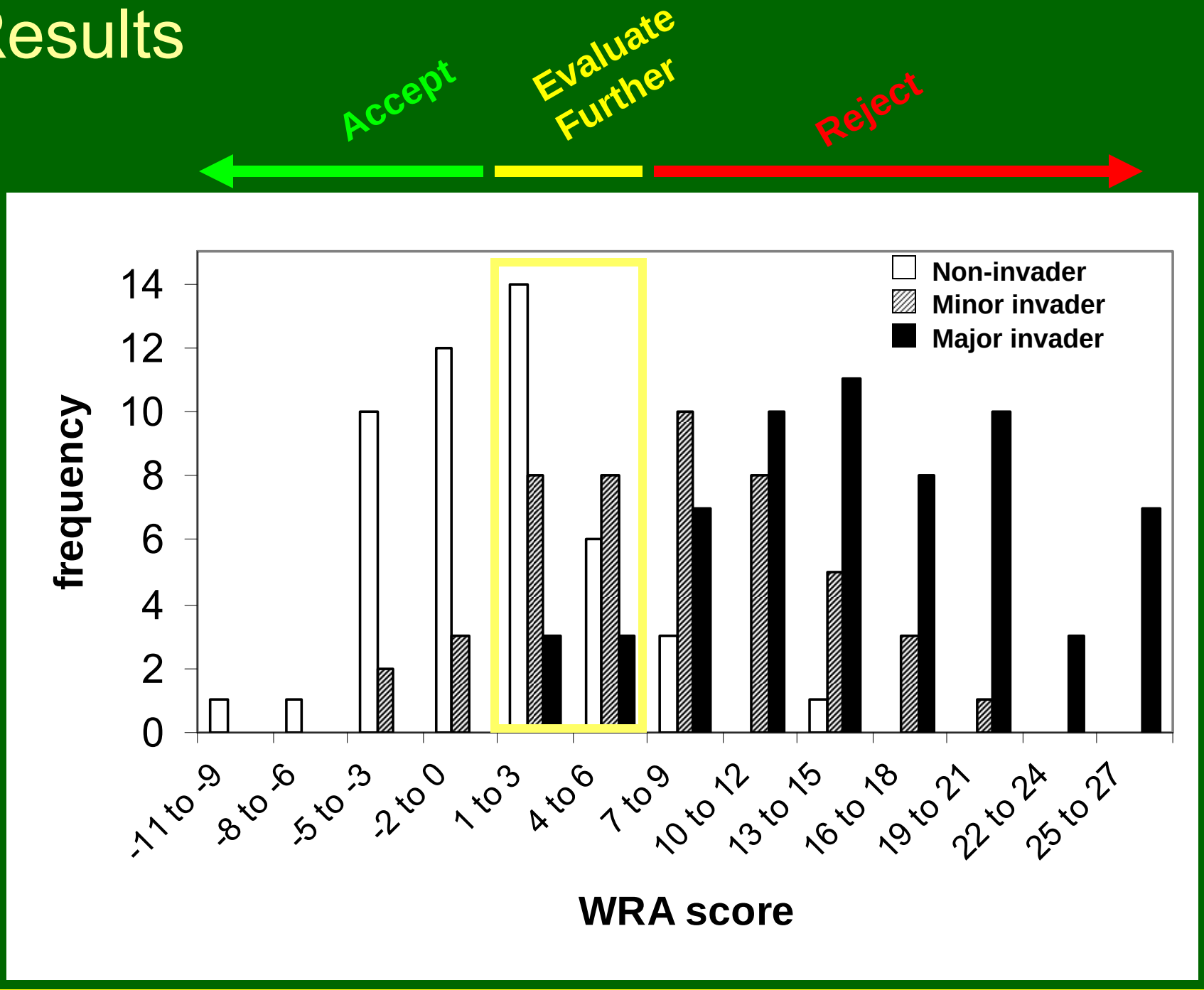
| | | | |
|---|---|---|---|
| **Families** | 35 | 27 | 36 |
| **Orders** | 24 | 14 | 25 |

21% overlap across Families
59% overlap across Orders

# Results

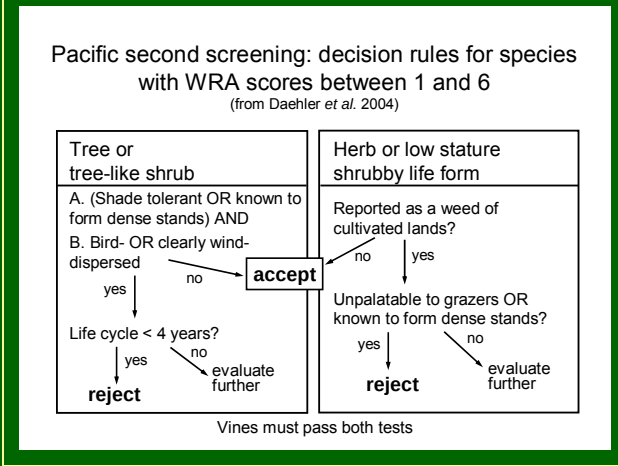
- Sufficient data for all 158 species – 35 questions answered on average
- Natural area = agricultural weeds
- Scores not biased by plant family
- 4 question decision tree (Caley & Kuhnert 2006) correct for 100% of major invaders & 12% of non-invaders
  - 91% of minor invaders rejected
- "Invader elsewhere?" correct for 92% of major invaders & 92% of non-invaders
  - 67% of minor invaders rejected

# Results


Accept
Evaluate Further
Reject
Non-invader
Minor invader
Major invader
frequency
0
2
4
6
8
10
12
14
-11 to -9
-8 to -6
-5 to -3
-2 to 0
1 to 3
4 to 6
7 to 9
10 to 12
13 to 15
16 to 18
19 to 21
22 to 24
25 to 27
WRA score

# Results

- 27% of species (42) in Evaluate Further category
- 10% of species (16) in Evaluate Further after using secondary screen (meets hypothesized < 15%)




| | Non-invaders | Minor Invaders | Major invaders |
|---|---|---|---|
| Accept | 11 | 12 | 1 |
| Reject | 0 | 1 | 1 |


*Ardisia crenata*

# Results

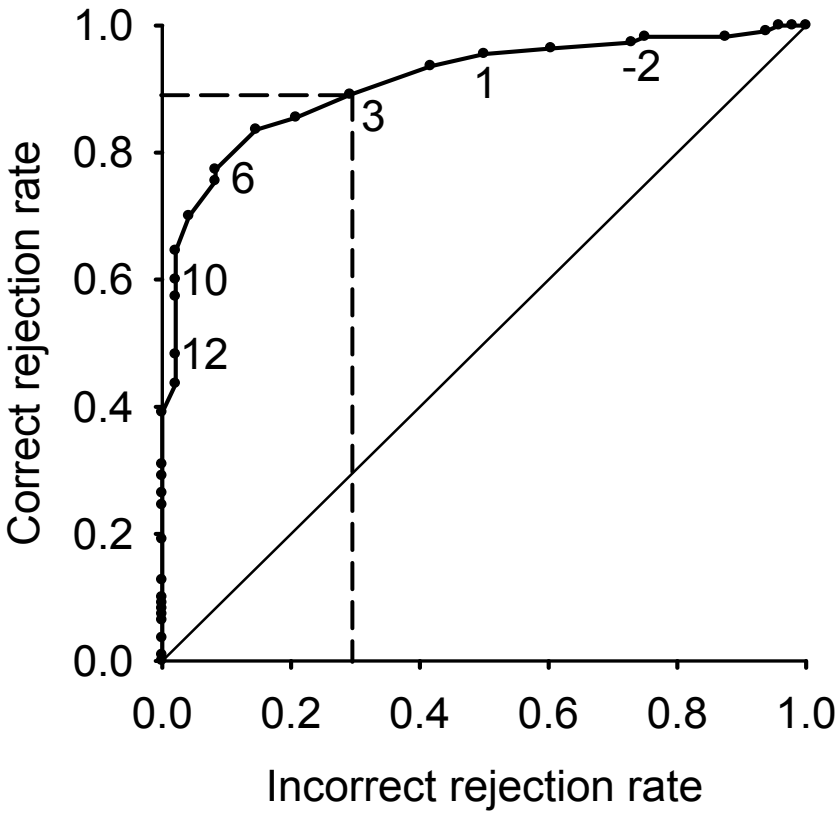
| | Non-invader | Minor invader | Major invader | Overall |
|---|---|---|---|---|
| Accept | 73% (35) | 36% (17) | 2% (1) | |
| Evaluate further | 19% (9) | 6% (3) | 6% (4) | 10% (16) |
| Reject | 8% (4) | 58% (28) | 92% (57) | |
| Total number | 48 | 48 | 62 | 158 |

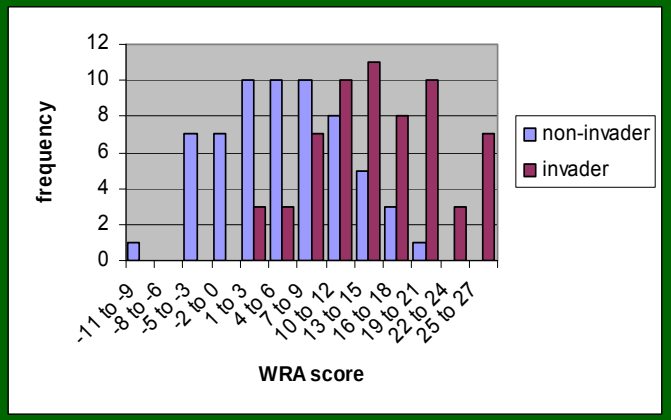
Using secondary screen

- No percentages significantly different than hypothesized

# Receiver Operating Characteristic Curve
## Minor and Major Invaders Combined

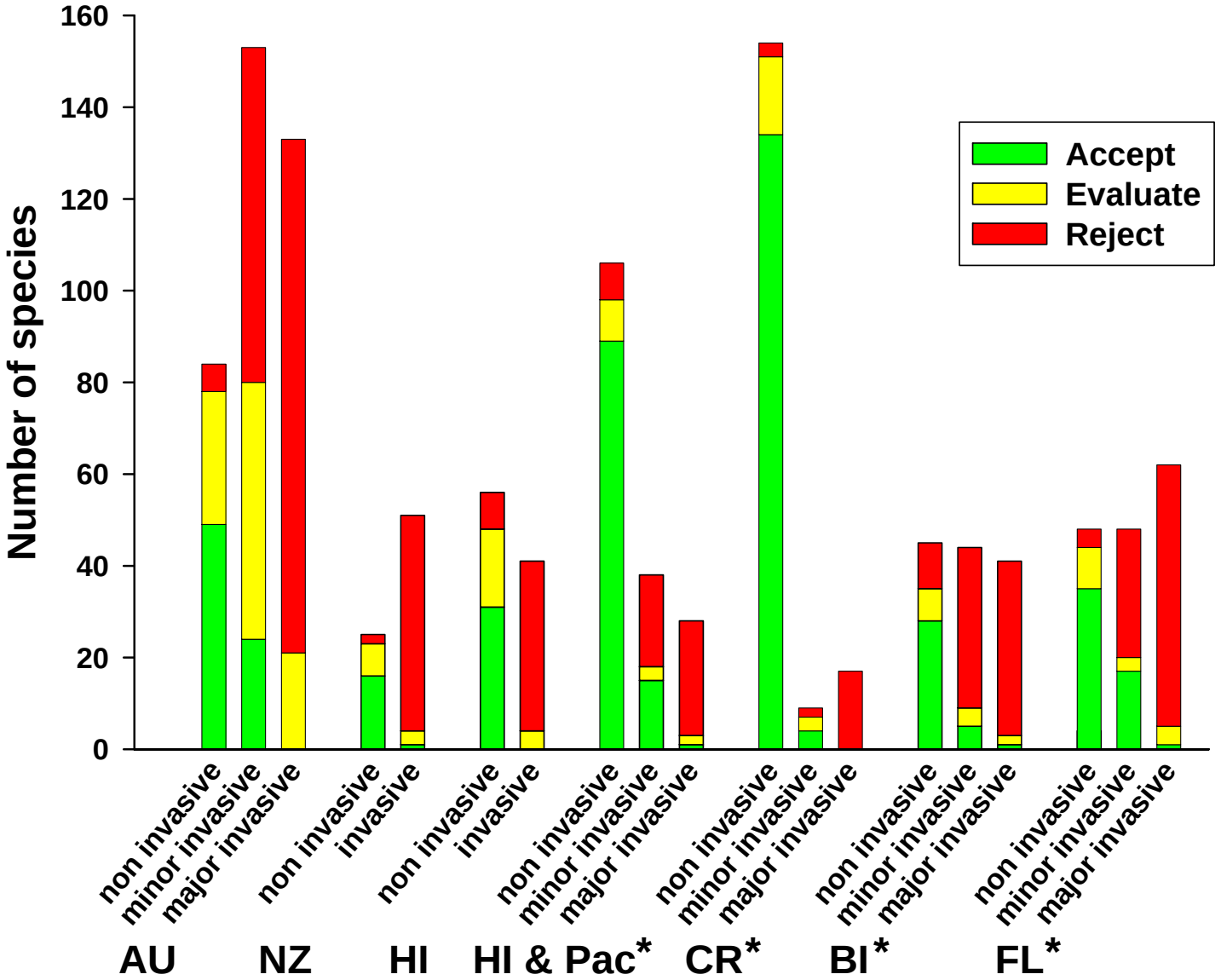
- Curve area = 0.91




- Area not significantly different than when Minor and Non-invaders are combined (0.89)
- When Score = 3:
  - 90% correct rejects
  - 70% correct accepts

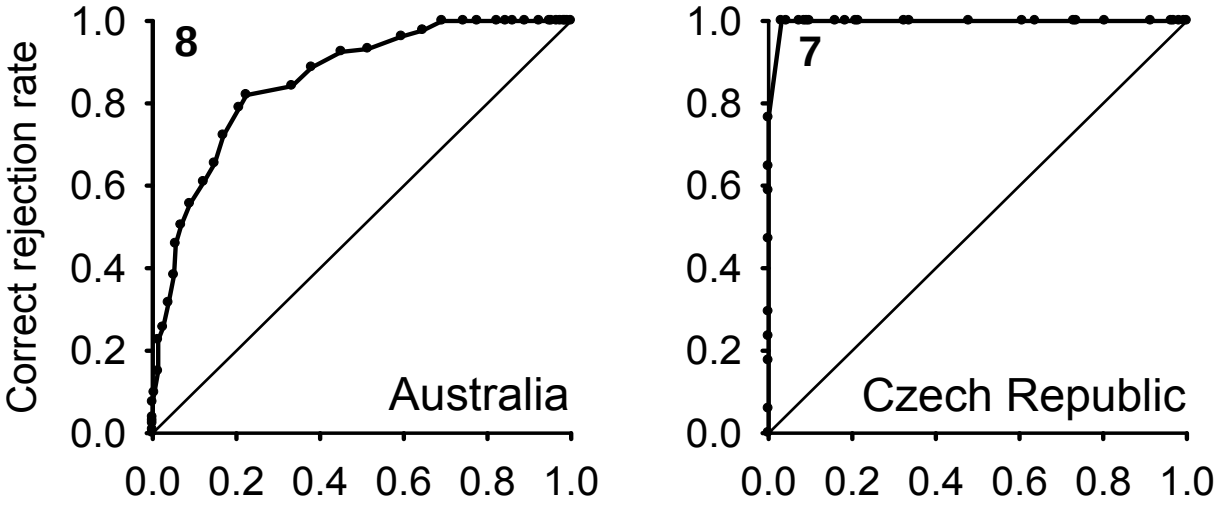
# Comparison to tests elsewhere




- 82 - 100% Major Invaders rejected - NS
- 56 - 87% Non-invaders accepted
  CR > AU, HI, BI
  H & P > AU, HI
- 22 - 80% Minor invaders rejected
  BI > AU, CR
- 13 – 29%
  *8 – 11%
  Eval further

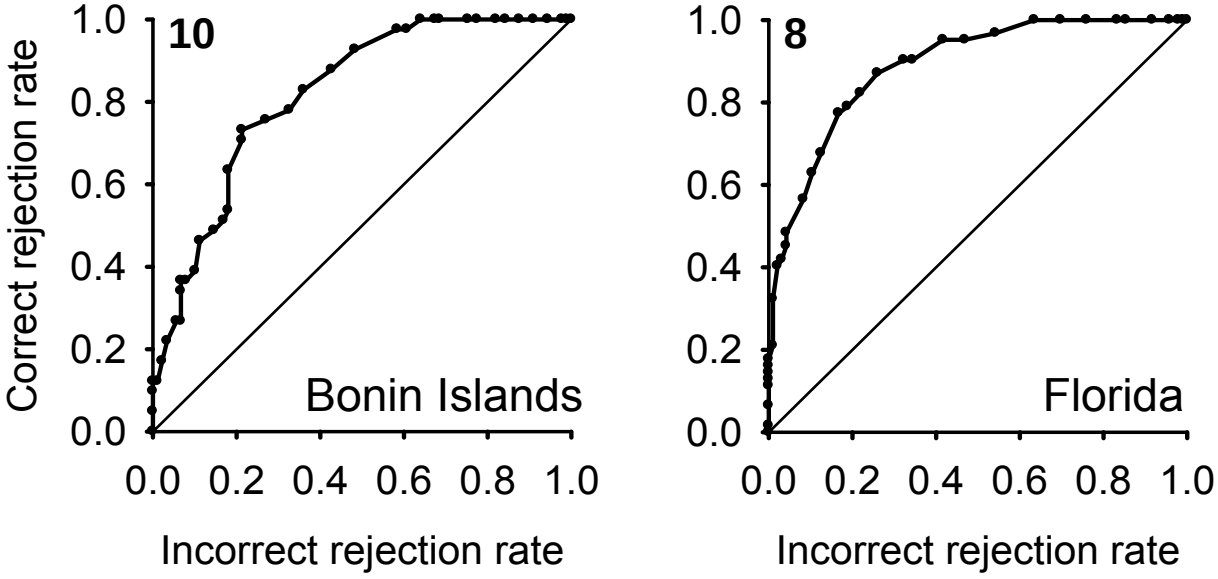
* Used 2º screen (Daehler et al. 2004)

# ROC Curves – Minor + Non













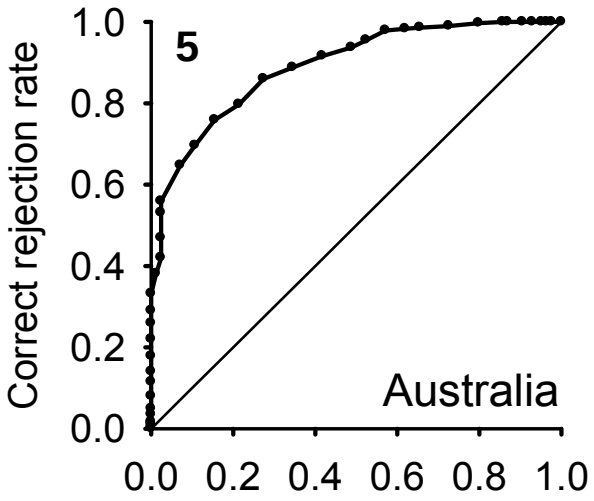
CR area > all others

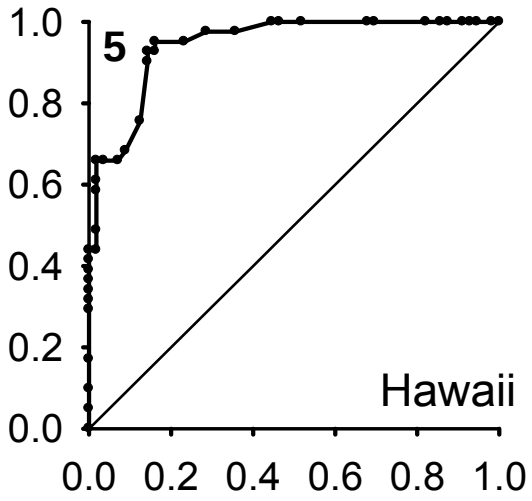
Pheloung et al. 1999

Křivánek & Pyšek 2006

Kato et al. 2006

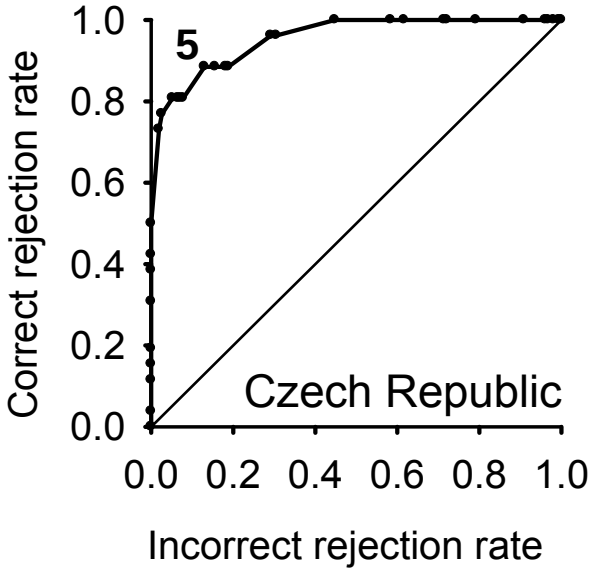
# ROC Curves –Minor + Major

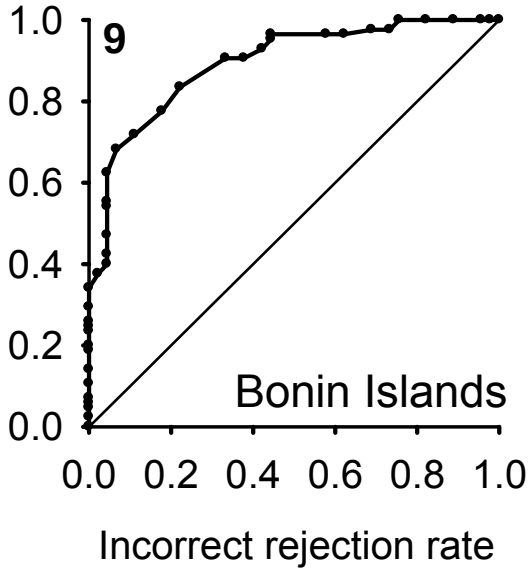


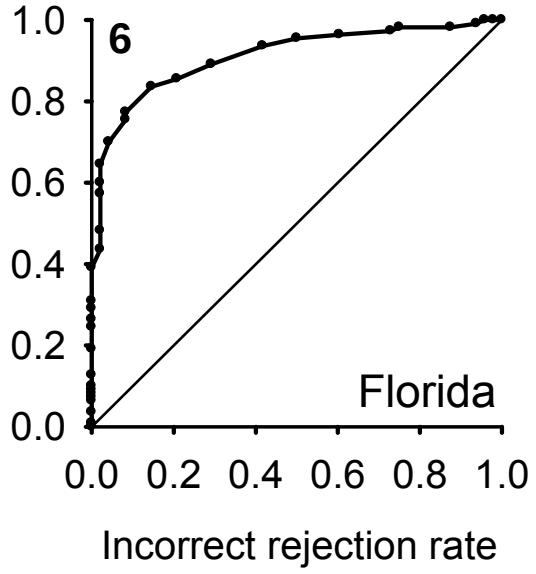




All curve areas equivalent

Pheloung et al. 1999
Daehler & Carino 2000
Křivánek & Pyšek 2006
Kato et al. 2006



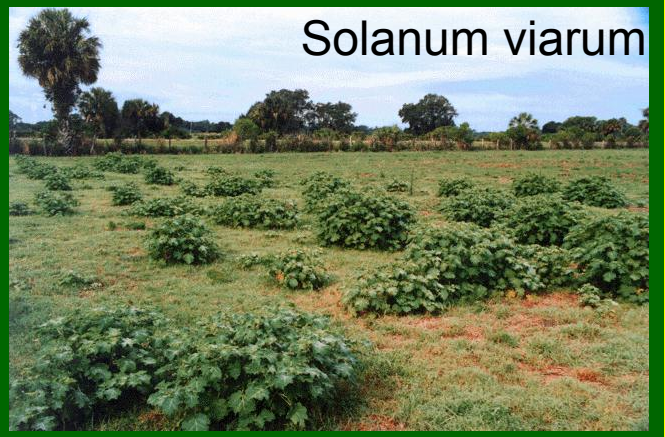



# Conclusions

- The WRA amended for conditions in Florida and with the secondary screen developed by Daehler et al. (2004) meets the three hypothesized accuracy standards:
  - > 90% of invaders correctly rejected
  - > 75% of non-invaders correctly accepted
  - < 15% of species require further evaluation

- Results not significantly affected by:
  - Natural areas vs. agricultural weeds
  - Families, life-form, life-history


Solanum viarum

- The WRA approach appears useful across variable geographies.