Determining the Feasibility of Biological Control of a Weed Target

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Invasive plants

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Biological Control

Positive

- Safe (Host specific)
- Self perpetuating
- Spreads to new areas
- Environmentally friendly
- High return on investment

Negative

- High up front cost
- Slow
- Will not eradicate pest
- Doesn’t always “stick”




However…..

- Not all weeds are amenable to biocontrol
- Several challenges…..
  - Closely related (or chemically similar) to
    - economically important species
    - threatened/ endangered species
      - Difficult to find host-specific agents
  - Conflicts of interest
    - Beekeepers
    - Nurseries/Horticulture
    - Culturally significant

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Feasibility studies.....

- Biocontrol is expensive on the front end
  - Difficulty in finding host-specific biocontrol agents
  - Potential conflicts of interest
- Prudent to do a feasibility study before start of biocontrol program
  - Cost-effective
  - Can uncover hidden challenges before the initiation of a BC program
  - Assist in determining likelihood of success

Feasibility study

- Nature of damage (ecological/economic)
- Origin/ geographic distribution
- Taxonomy/ closely related plants (molecular/traditional)
  - Potential risks to native plants
- Secondary plant chemistry (relevance to herbivory)
- Recommended species test list
- Conflicts of interest
- Recommendations

Earleaf acacia

- Native to Northern Australia, Papua New Guinea, and Indonesia
- Introduced into US intentionally ornamental
  - Hawaii- 1920s
  - Florida- 1930s

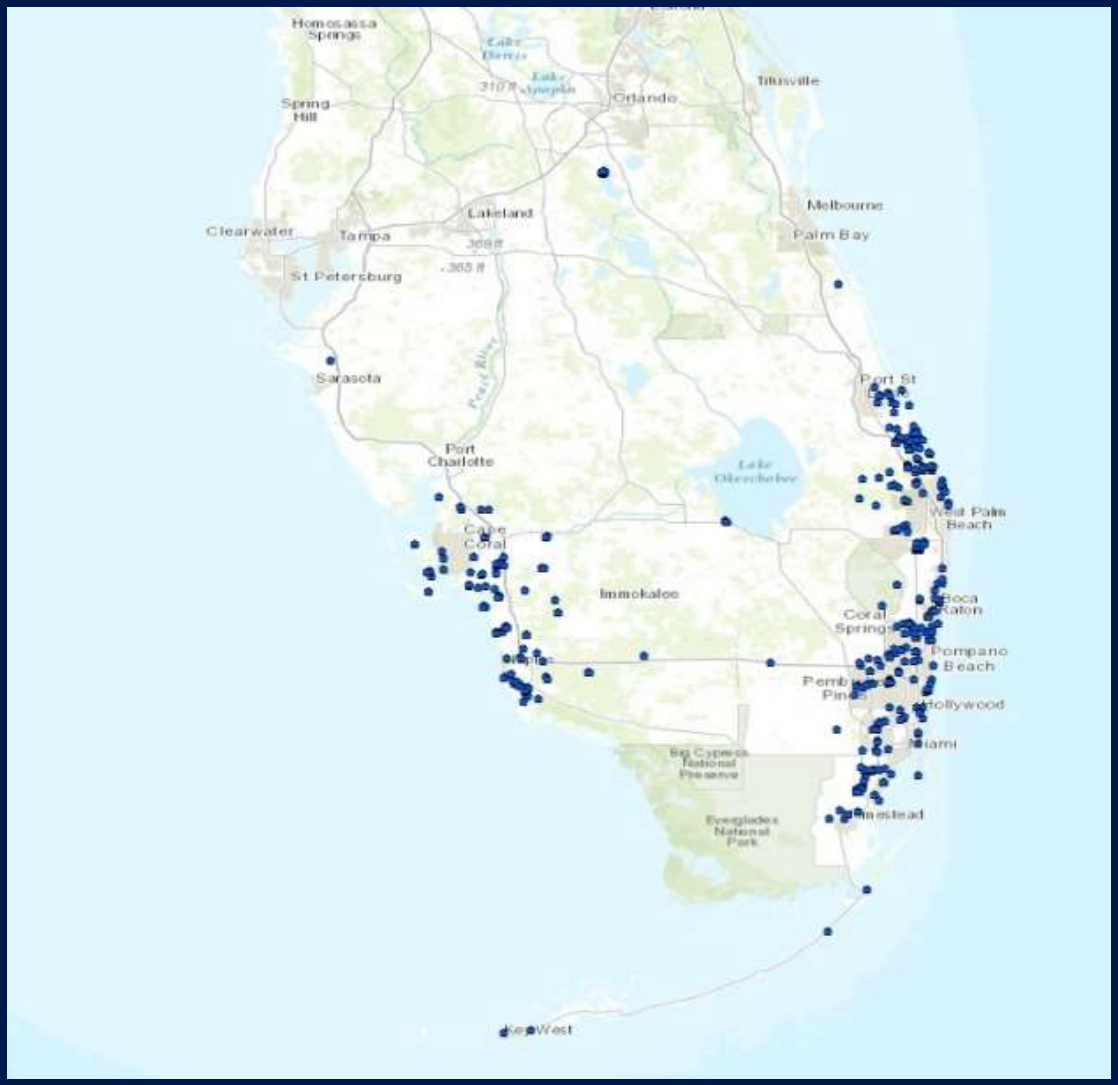
Nature of damage (ecological/economic)

- Allelopathic
- Host for the lobate lac scale
- Brittle wood paired with weak branch crotches
  - badly damaged during wind storms/hurricanes
- Allergenic (pollen)

Origin/ geographic distribution

- Native to Northern Australia, Papua New Guinea, and Indonesia

Origin/ geographic distribution



EDDMapS, 2016

Taxonomy

- Molecular phylogeny
  - extracted DNA from subfamilies Mimosoideae, Caesalpinioideae, and Papilionoideae
    - emphasis on the native Mimosoideae taxa (most closely related to earleaf acacia)
  - rbcL gene
  - Sequences from 335 taxa (extracted and GenBank)
- Identify potential risks to closely related native plants

Recommended species test list

- Based on molecular phylogeny,
- Threatened and endangered plants,
  - Fabaceae and closely related families
- Economically important species
- Plants with similar secondary plant chemistry

Conflicts of Interest

- Used as an ornamental (not recommended)
- Medicinal (potential)
  - antifilarial (Ghosh et al. 1993), an anticestodal (Ghosh et al. 1996), and an antifungal (Mandal et al. 2005)
- Supplemental food source for big cypress fox squirrels (endangered)

Preliminary foreign surveys

- Leaf feeders (5)
- Stem/leaf gallers (3)
- Leaf miners (1)
- Seed feeders (2)
- Sap suckers (1)

Recommendation for earleaf acacia

- No evidence to abandon pursuing a BC program
- Potential for success in finding host specific agent
- Next steps….
  - Continue with foreign surveys
  - Begin preliminary host range testing of candidate agents (in native range)

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