Alligatorweed biological control in the U.S.

Nathan E. Harms
U.S. Army Engineer Research and Development Center, Aquatic Ecology and Invasive Species Branch
Vicksburg, MS

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The USACE and weed control...
Alligatorweed  
*(Alternanthera philoxeroides)*

- Perennial aquatic amaranth
- Roots in shallow water or on bank and creeps across water
  - Hollow stems
  - Adventitious roots at nodes
  - Also grows terrestrially
- Vegetative reproduction
- Native to Parana River region, South America
- Present in US for >100 yrs
Two genotypes in US

Narrow-stemmed type (NSA)
- Northern distribution*
- Denser stems
- Shorter, rounder leaves
- Slower-growing
- Better defended against herbivores?*
- More susceptible to herbicides? (Kay 1992)

Broad-stemmed type (BSA)
- Southern distribution*
- Hollow stems
- Longer, narrower leaves
- Faster-growing
- Less defended?*
- More resistant to herbicides? (Kay 1992)
Distribution

- Southeastern US and California
  - Not common in northern areas
- Also introduced into China, Australia, New Zealand

Winston et al. (2017)
Impacts
Impacts

• Obstructs navigation
• Impacts water delivery
• Increases sedimentation
• Reduces oxygen levels below mats
• Impact native diversity
Brief history of alligatorweed biological control

• USACE and USDA foreign surveys 1960 – 1962
• 40 insect species
  – 5 damaging
• 4 insects tested in host range – Argentina and Uruguay & quarantine in Albany, CA
• 3 approved for release
• Later, fungal pathogen discovered
**Alternaria alternantherae**
(Alligatorweed leaf spot pathogen)

- First discovered near Baton Rouge, LA
  - 1976
  - Produces purple lesions on leaves, leads to abscission
- Can be very damaging
- May have non-target effects
- Possible use with other agents
Amynothrips andersonii
(Alligatorweed thrips)

• Argentina population released (1968 – AL, TX & MS) and (1967 – CA, FL, GA & SC)
• Common and widespread
  – Abundance varies
• Red larvae, black adults
• Life cycle – average 28 days
• Deposit eggs on hairs of nodes of apical leaves
**Amynothrips andersonii** (Alligatorweed thrips)

- Larval development – 13 days
- 2 larval stages; resting pupal stage on plant
- Feed in growing tips
  - Deformed leaves, stunting of the plant
- Edges of leaves often curl inward – provides shelter
- Feed on aquatic and terrestrial plants
Amynothrips andersonii
(Alligatorweed thrips)
**Arcola malloii (=Vogtia malloii)** (Alligatorweed stem borer)

- Tan moth
- Life cycle – approximately 39 days
- Females deposit single white egg on underside of leaves
- Pale white caterpillar with wavy stripes
- Caterpillars tunnel into tips of stems
- Larvae chew exit holes for emerging moths
Arcola malloi (=Vogtia malloi) (Alligatorweed stem borer)

- Argentina – released in FL & GA in 1971
- Argentina – released in GA & SC (cold tolerant)
- Argentina - released in NC in 1971 and AL in 1972
Arcola malloii
(Alligatorweed stem borer)
Agasicles hygrophila
(Alligatorweed flea beetle)

- Brought to US in 1964
- Distinct yellow and black stripes
- Well-developed wings and capable of flying
  - Strong dispersers
- Jump when disturbed
- Life span ~48 days
- Limited to areas where winter temperatures above 11.1ºC
Agasicles hygrophila (Alligatorweed flea beetle)

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**Agasicles hygrophila**  
(Alligatorweed flea beetle)

- Yellow eggs deposited in clusters on underside of leaves
- One egg cluster per day – average 1,127 eggs per female!
**Agasicles hygrophila**
(Alligatorweed flea beetle)

- Larvae feed on underside of leaves
- When mature – bore into hollow stem and pupate
- ~2 weeks from hatch to adult emergence
Agasicles hygrophila
(Alligatorweed flea beetle)

- Argentina - released in 1964 in CA & SC; 1965 in FL
- Uruguay - released in 1965 in SC
Control can be rapid!

1965

1966

Ortega River, Jacksonville, FL

Photos courtesy of USACE ISMB
Control can be rapid!
Challenges

- Winter severity tied to northern range limits of agents
Challenges

Succession of other undesirable species

Simultaneous restoration may mitigate additional problems
Current/ future research

- Distribution of plant genotypes in US
- Combination of biocontrol and plant competition
- Document seasonal patterns of control related to climate
  - Importance of seasonal attack on plant suppression
- Interaction between insect and pathogen agents
- New agents?
Availability of agents

- *Agasicles hygrophila* only agent currently available
- Funded by **USACE APCRP**
- Supplied by SAJ Invasive Species Management Branch
- ~42,000 per year from 1981-2004
Availability of agents

- Permits to ship:
  - AR, AL, GA, LA, MS, NC, OK, SC, TN, TX, VA

- Collections made in spring each year
Instructions included for handling/release
Site selection, number per acre
Return shipping
Who is eligible to receive agents?

- Local, state and federal organizations

- Provide: name, physical mailing address, email, cell phone number, acreage present

- Contact Angie Huebner – USACE Jacksonville District
  
  - Via email: angie.l.huebner@usace.army.mil
  - Via cell phone: 904-894-3648