Biological Control – Alligatorweed & Flea Beetle Annual Collection

Angie Huebner

Biologist

Invasive Species Management Branch
Jacksonville District

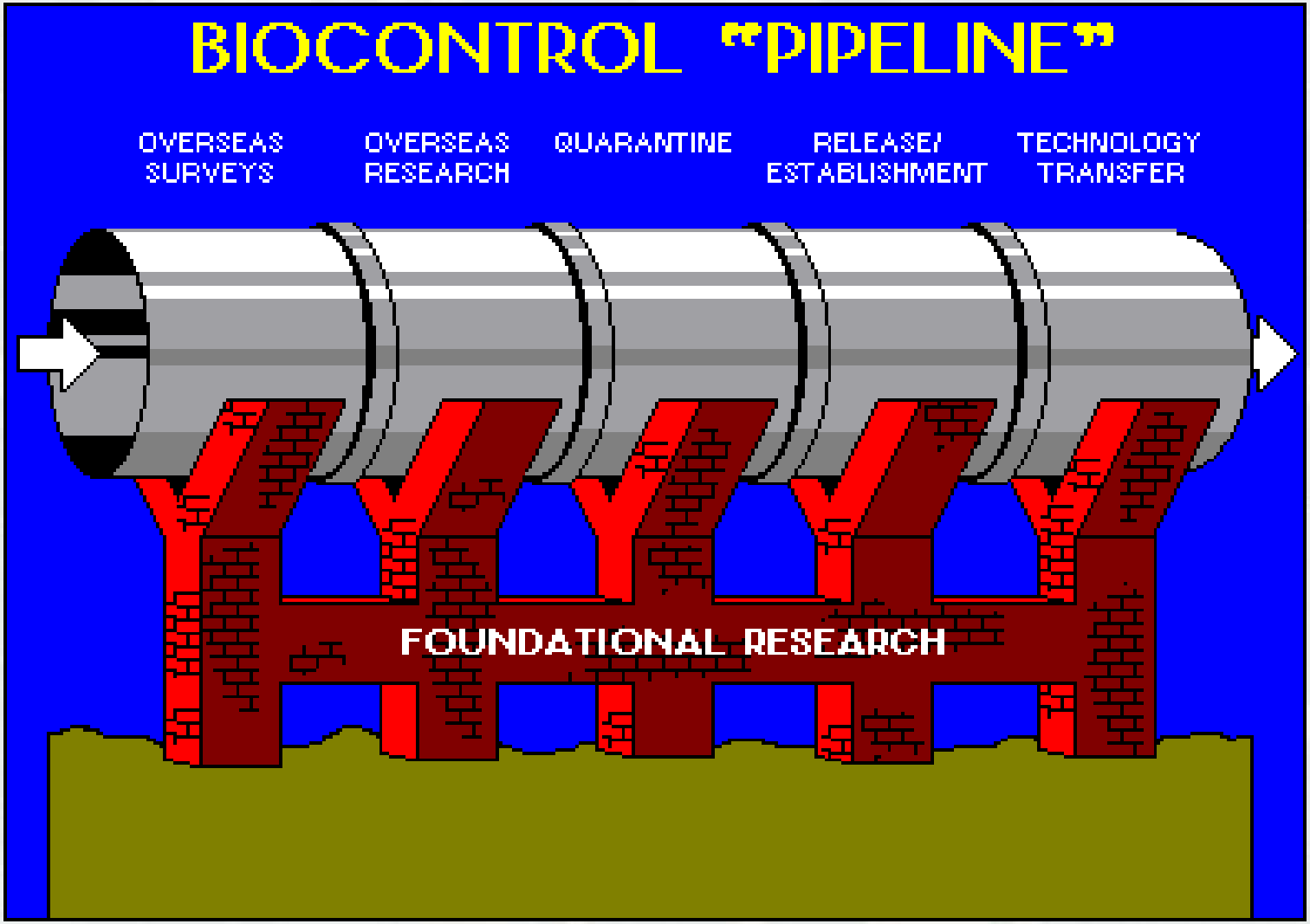
18 June 2014

US Army Corps of Engineers
BUILDING STRONG®

Biological Control

- Purposeful introduction of parasites, predators, and/or pathogenic microorganisms
- Reduce or suppress populations of plant or animal pests

BIOCONTROL "PIPELINE"



Biological Control

Benefits:

- Reduced or minimal use of chemicals
- Species colonization will control target species long term
- Low maintenance cost once naturalized

Disadvantages:

- Lengthy process to test and receive approval
- May be impacted by pesticides, predators, parasites, or weather conditions
- Bio-controls may not colonize area

Alligatorweed

Alligatorweed

- Native to South America
- Federal noxious weed
- Prohibited or noxious in AZ, CA, FL, SC
- Roots along banks and grows across water surface
- Forms thick mats
  - ► inhibits water flow
  - ► Breaks away – creates obstructions
  - ► Increases mosquito habitat

Distribution

General Information	
Symbol:	ALPH
Group:	Dicot
Family:	Amaranthaceae
Duration:	Perennial
Growth Habit:	Forb/herb
Native Status:	PR I L48 I
Characteristics	
Data Source and Documentation	

View Native Status

Present Absent/Unreported

See U.S. county distributions (when available) by clicking on the map or the linked states below:

USA (AL, AR, CA, FL, GA, IL, KY, LA, MS, NC, OK, SC, TN, TX, VA), **USA+** (PR)

Alligatorweed

- Displaces native plants
- Disrupts water flow and causes sedimentation
- Shades submersed plants – reduces oxygen levels below the mats
- Poses threats to navigation & recreation

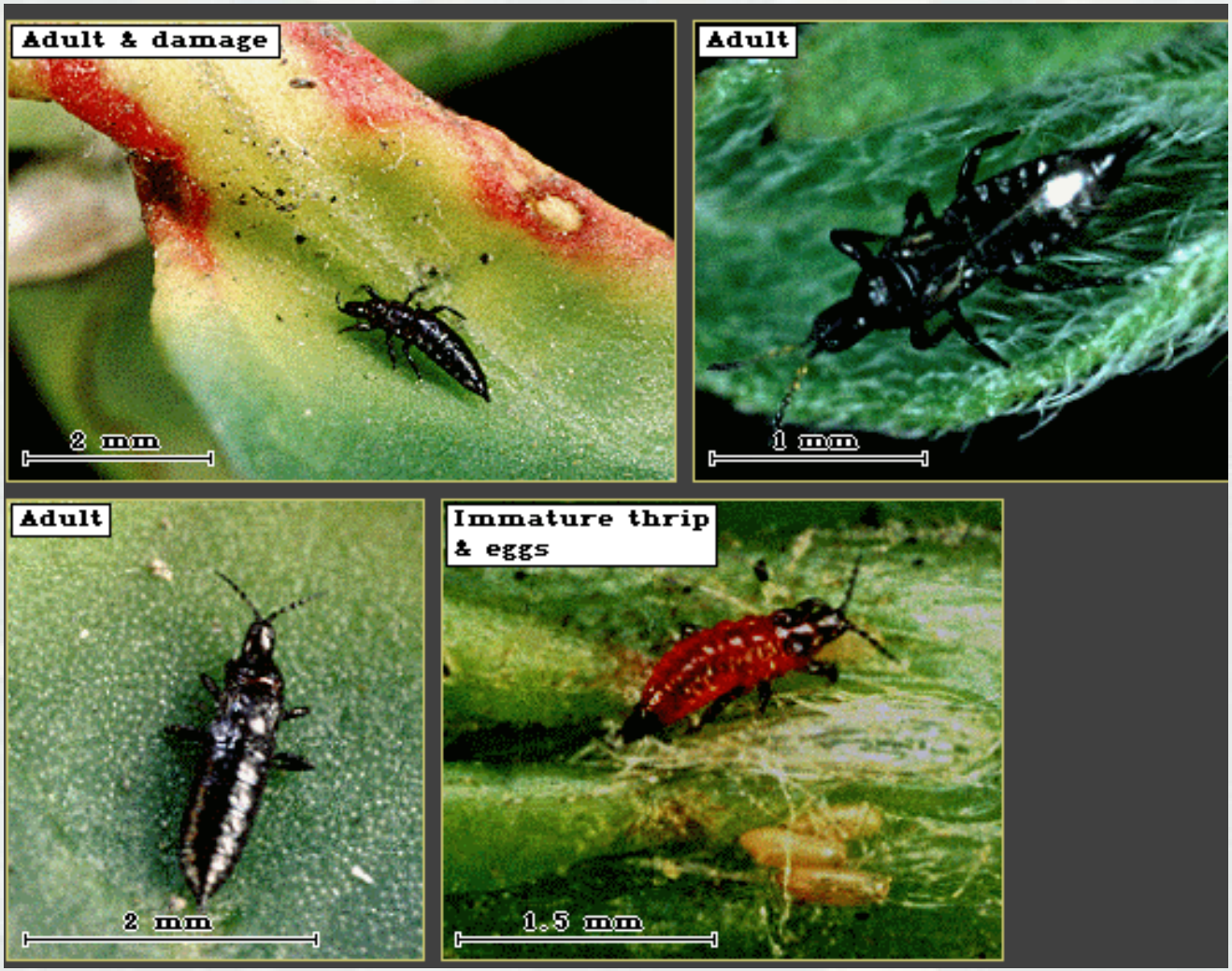
Biological Control & USACE

- Began in 1959
- US Army Corps of Engineers requested US Department of Agriculture to evaluate potential biological controls
- Aquatic Plant Control Research Program
- Alligatorweed

Biological Control Agents

- Annual surveys conducted in South America from 1960 – 1962; additional surveys conducted in southeastern US
- 40 insects species recorded on alligatorweed
- 5 were considered to suppress alligatorweed
- 4 insects tested in host range – Argentina and Uruguay & quarantine in Albany, CA
- 3 were approved for release: flea beetle, thrip and stem borer

Aligatorweed Thrip



Alligatorweed Thrip

- Adults small, 2mm in length, black elongate with fringed wings
- Pre-oviposition period – 4 days
- Life cycle – average 28 days
- Deposit approximately 200 eggs – on hairs of nodes of apical leaves
- Eggs are elongated oval and amber colored
- Larval development – 13 days
- 2 larval stages; resting pupal stage on plant

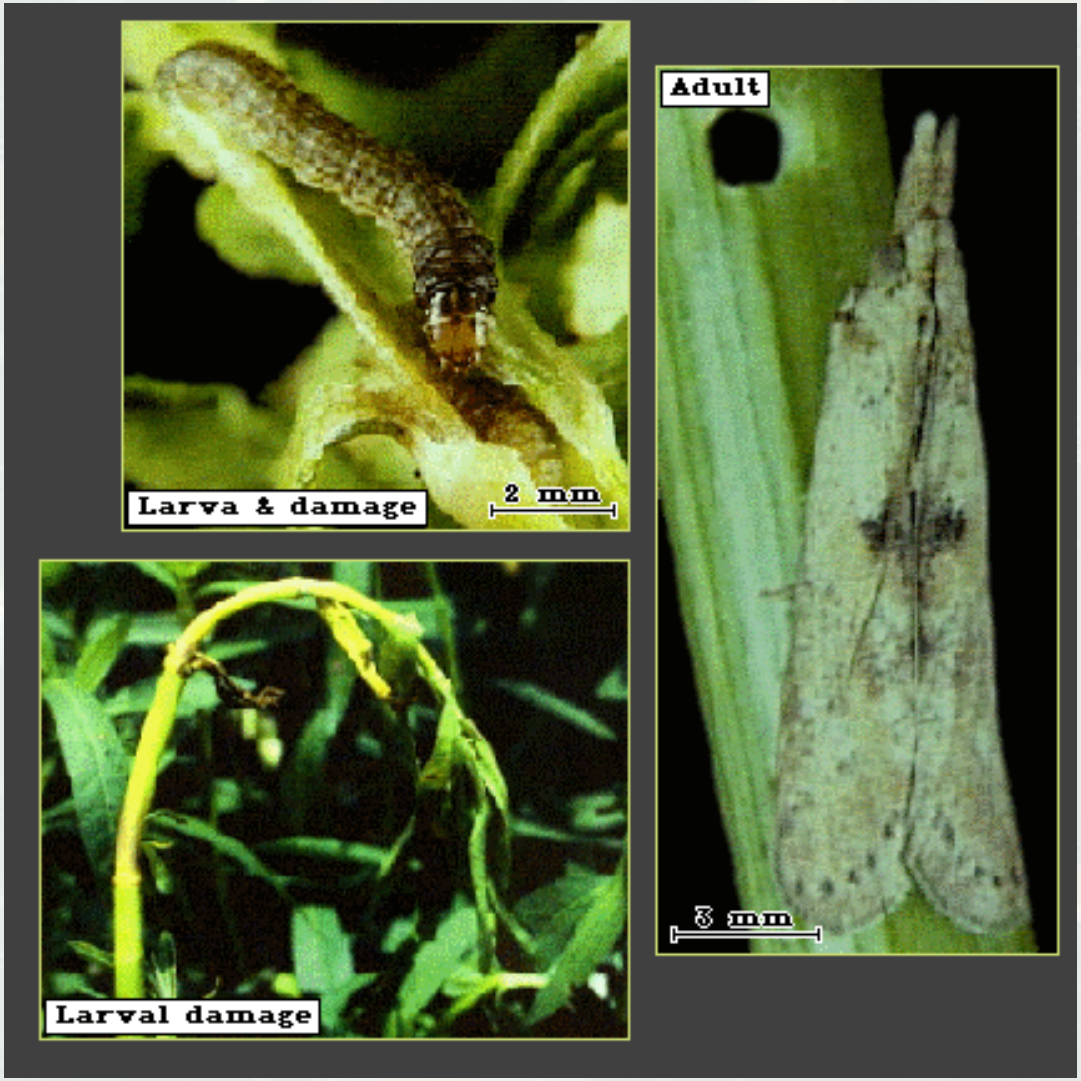
Alligatorweed Thrip

- Adults and larvae feed in tips of stems – causes leaf deformation and stunting of the plant
- Edges of leaves often curl inward – provides shelter
- Feed on aquatic and terrestrial plants

Alligatorweed Thrip

- Quarantine colony from Argentina released (1968 – AL, TX & MS) and (1967 – CA, FL, GA & SC)

Aligatorweed Stem Borer



Alligatorweed Stem Borer

- Adults – light tan moth; 20mm wing span
- Life cycle – approximately 39 days
- Females deposit single white egg on underside of leaves
- Pre-oviposition period – less than 24 hours
- Average – 267 eggs over 6 to 8 days
- Eggs hatch 3 to 4 days

Alligatorweed Stem Borer

- Larvae – whitish with wavy tan longitudinal stripes
- Larvae tunnel into tips of stems and bore downward
- As mature – exit stems & utilize silken threads to access other stems to bore
- Mature larvae bore through nodes/seal holes
- Larvae chew exit holes to outside epidermis for emerging moths

Alligatorweed Stem Borer

- Feeds on both aquatic and terrestrial alligatorweed
- Damaged tips wilt quickly; heavily damaged stems collapse, turn yellow and die
- Leaves remain on damaged stems – distinguishes damage from flea beetle

Alligatorweed Stem Borer

- Eggs/larvae collected in Argentina – released in FL & GA in 1971
- Eggs collected in Necochea, Argentina – released in GA & SC (cold tolerant populations)
- Quarantine/greenhouse colonies started with eggs from Necochea released in NC in 1971 and AL in 1972

Aligatorweed Flea Beetle

- Brought to US in 1964
- Extensive quarantine testing
- Host specific – not reported on other hosts – 40 yrs
- Most feeding/oviposition on aquatic alligatorweed

Alligatorweed Flea Beetle

- Black with yellow stripes
- Well developed wings and capable of flying
- Adults move from one area to another for available food
- Jump when disturbed
- Life span 48 days

Alligatorweed Flea Beetle

- Life cycle is approximately 25-30 days
- Pre-mating & pre-oviposition period – 6 days
- Eggs deposited in clusters of 12-54 - two contiguous rows on underside of leaves
- One egg cluster per day – average 1,127 eggs

Alligatorweed Flea Beetle

- Eggs yellow in color; hatch approx. 4 days
- Instars develop approx 8 days; pupal period – 5 days
- Larvae feed on underside of leaves
- When mature – bore into hollow stem and develop into adult beetles – 1 to 2 days

Alligatorweed Flea Beetle

- Field-collected from Argentina - released in 1964 in CA & SC; 1965 in FL
- Field-collected from Uruguay - released in 1965 in SC
- Mixed quarantine colony from Argentina and Uruguay released in MS in 1965
- Beetles collected at release sites mostly in FL were redistributed (1966 – GA),(1967 – AL, NC, TX), (1968 – TN), (1969 – AR) and (1970 – LA)

1965 Biological Control Release

1966 Biological Control Post Release – 1 Year

Flea Beetle Damage

- Release site in Arkansas

Flea Beetle Damage

Collection & Distribution

- Plant is more cold tolerant than insects
- Populations reduced or eliminated over time for various reasons
- Yearly distribution to northern states
- Survives multiple years in southern states

Required Permit

- USDA – Animal and Plant Health Inspection Service
- PPQ 526 - Application and Permit to Move Live Plant Pests or Noxious Weeds

Current Permit - Virginia

APHIS Animal and Plant Health Inspection Service

PPQ Plant Protection & Quarantine

United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road
Riverdale, MD 20737

Permit to Move Live Plant Pests, Noxious Weeds, and Soil

Interstate Movement

Regulated by 7 CFR 330

This permit was generated electronically via the ePermits system

PERMITTEE NAME:	Angie Huebner	**PERMIT NUMBER:**	P526P-12-00962
ORGANIZATION:	U.S. Army Corps of Engineers	**APPLICATION NUMBER:**	P526-110527-004
ADDRESS:	Invasive Species Management Branch 701 San Marco Blvd Jacksonville, FL 32207	**FACILITY NUMBER:**	N/A
MAILING ADDRESS:	701 San Marco Blvd Jacksonville, FL 32207	**HAND CARRY:**	Yes
		DATE ISSUED:	03/15/2012
PHONE:	(904) 894-3648		
FAX:		**EXPIRES:**	**03/15/2015**
DESTINATION:	VA		
RELEASE:	mutiple locations within the state of VA, VA		

Under the conditions specified, this permit authorizes the following:

Article Category: Invertebrate Pests - Insects; Biocontrol Organisms - Invertebrate Herbivores of Weeds

Regulated Article	Life Stage(s)	Intended Use	Shipment Origins	Originally Collected	Culture Designation
Agasicles hygrophila	Adult, Egg, Larvae, Pest-infected plant material	Release - Biocontrol	FL	Originally Collected from Foreign Locations	field collected St. Johns River, FL
Amynothrips andersoni	Adult, Egg, Larvae, Pest-infected plant material	Release - Biocontrol	FL	Originally Collected from Foreign Locations	field collected St. Johns River, FL
Arcola malloi	Adult, Egg, Larvae, Pest-infected plant material	Release - Biocontrol	FL	Originally Collected from Foreign Locations	field collected St. Johns River, FL

State Permits

BIOLOGICAL CONTROL AGENTS
ALLIGATORWEED
(*Alternanthera philoxeroides*)

Species of insects

Agasicles hygrophila (Alligatorweed flea beetle)
Amynothrips andersoni (Alligatorweed thrip)
Vogtia malloi (Alligatorweed stem borer)

State	Date Issued	Expiration	Permit Number
Arkansas	2 May 2012	2 May 2015	P526P-12-01865
Alabama	2 May 2012	2 May 2015	P526P-12-01867
Georgia	24 April 2012	24 April 2015	P526P-12-01664
Louisiana	2 May 2012	2 May 2015	P526P-12-01866
Mississippi	17 January 2014	17 January 2017	P526P-14-00209
N. Carolina	15 March 2012	15 March 2015	P526P-12-00960
Oklahoma	15 March 2012	15 March 2015	P526P-12-00961
S. Carolina	24 April 2012	24 April 2015	P526P-12-01667
Tennessee	23 January 2014	23 January 2017	P526P-14-00290
Texas	7 March 2014	7 March 2017	P526P-14-00970
Virginia	15 March 2012	15 March 2015	P526P-12-00962

Updated 6/16/2014

Field Collection – Flea Beetles

Field Collection – Flea Beetles

Storage & Sorting

- Stored overnight in coolers on ice
- Sorted/cleaned following day
- If possible – shipped the same day

Packing

- Shipped in containers
- Ice
- Cooler/box
- Double containment

Handling Instructions

- Instructions and recommendations for release
- Site selection
- Number per acre
- Address for returning supplies and forms

HANDLING, SITE SELECTION AND RELEASE PROCEDURES
FOR ALLIGATORWEED FLEA BEETLES

HANDLING

1. Keep beetles in the Styrofoam shipping containers. Replace the ice as needed to maintain cool conditions for the beetles until release. Remove any water which may have leaked into the cups.

2. Beetles should be released on the same day or the day after receipt. Only under extreme circumstances should the flea beetles be stored for several days as this will increase mortality. Under these conditions, the beetles need to be kept cool and supplied with moist fresh alligatorweed.

SITE SELECTION

1. Select a site with a healthy alligatorweed mat that is located in standing water. These mats will provide the hollow stems which are necessary for the pupae stage of the beetle.

2. Make releases away from sites where insecticides are applied.

RELEASING

1. Each cup contains approximately 300 adult beetles. One to two cups per site provide optimum establishment results.

2. When releasing adult beetles, leave the cup sitting in the mat until the adult beetles emerge. The cups and lids and non-propagative plant material should be properly contained and placed in the garbage.

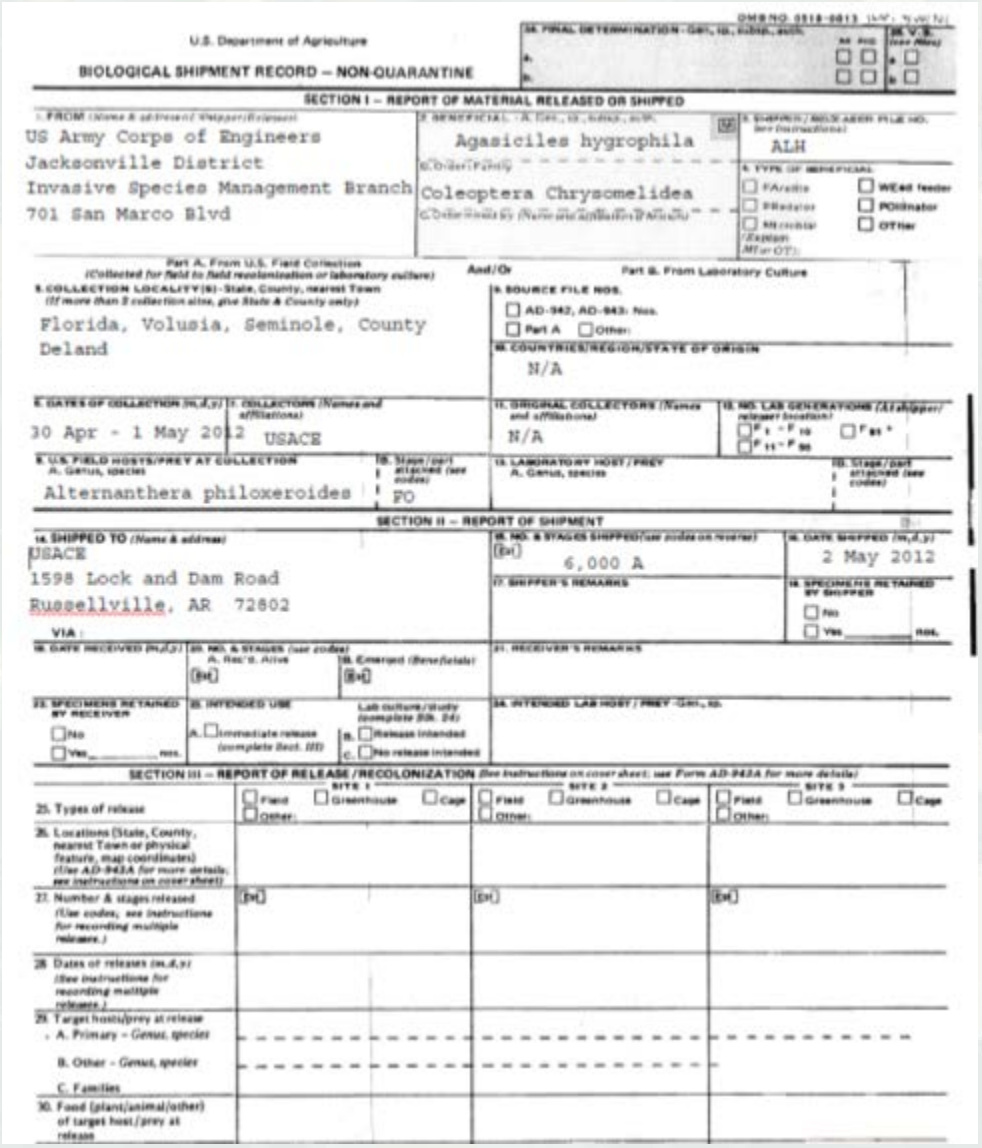
3. After releasing the beetles complete the enclosed Biological Shipment Record – Non Quarantine, Form 943, blocks 19 through 33.

4. Return completed forms to the address below:
U.S. Army Corps of Engineers
Jacksonville District
Invasive Species Management Branch
701 San Marco Blvd
Jacksonville, FL 32207

5. Return shipping containers to the address below:
U.S. Army Corps of Engineers
602 North Palm Avenue
Palatka, FL 32177

For Additional information call Angie Huebner at (904)894-3648.

USDA – Biological Shipment Record



U.S. Department of Agriculture

BIOLOGICAL SHIPMENT RECORD – NON-QUARANTINE

SECTION I – REPORT OF MATERIAL RELEASED OR SHIPPED

1. FROM
US Army Corps of Engineers
Jacksonville District
Invasive Species Management Branch
701 San Marco Blvd

2. BENEFICIAL
Agasiciles hygrophila
Coleoptera Chrysomelidea

3. SHIPPER'S / RELEASER'S FILE NO.
ALH

4. TYPE OF BENEFICIAL
☐ PArodite ☐ PRedator ☐ PMicrobial (Explain in OTher)
☐ WEed feeder ☐ POllinator ☐ OTher

Part A. From U.S. Field Collection (Collected for field to field recolonization or laboratory culture)

5. COLLECTION LOCALITY(S) - State, County, nearest Town (If more than 2 collection sites, give State & County only)
Florida, Volusia, Seminole, County
Deland

6. DATES OF COLLECTION (m,d,y)
30 Apr - 1 May 2012

7. COLLECTORS (Names and affiliations)
USACE

8. U.S. FIELD HOSTS/PREY AT COLLECTION
A. Genus, species
Alternanthera philoxeroides

8B. Stage/part attacked (see codes)
FO

And/Or

Part B. From Laboratory Culture

9. SOURCE FILE NOS.
☐ AD-942, AD-943: Nos.
☐ Part A ☐ Other:

10. COUNTRIES/REGION/STATE OF ORIGIN
N/A

11. ORIGINAL COLLECTORS (Names and affiliations)
N/A

12. NO. LAB GENERATIONS (At shipper/release location)
☐ F1 - F10 ☐ F11 - F99 ☐ F99 +

13. LABORATORY HOST / PREY
A. Genus, species

13B. Stage/part attacked (see codes)

SECTION II – REPORT OF SHIPMENT

14. SHIPPED TO (Name & address)
USACE
1598 Lock and Dam Road
Russellville, AR 72802

VIA:

15. NO. & STAGES SHIPPED (see codes on reverse)
[EH] 6,000 A

16. DATE SHIPPED (m,d,y)
2 May 2012

17. SHIPPER'S REMARKS

18. SPECIMENS RETAINED BY SHIPPER
☐ No
☐ Yes _____ nos.

19. DATE RECEIVED (m,d,y)

20. NO. & STAGES (see codes)
A. Rec'd. Alive [EH]
B. Emerged (Beneficials) [EH]

21. RECEIVER'S REMARKS

22. SPECIMENS RETAINED BY RECEIVER
☐ No
☐ Yes _____ nos.

23. INTENDED USE
A. ☐ Immediate release (complete Sect. III)
Lab culture/study (complete 23B, 24)
B. ☐ Release intended
C. ☐ No release intended

24. INTENDED LAB HOST / PREY (Gen., sp.

SECTION III – REPORT OF RELEASE / RECOLONIZATION (See instructions on cover sheet; use Form AD-943A for more details)

	SITE 1	SITE 2	SITE 3
25. Types of release	☐ Field ☐ Greenhouse ☐ Cage ☐ Other:	☐ Field ☐ Greenhouse ☐ Cage ☐ Other:	☐ Field ☐ Greenhouse ☐ Cage ☐ Other:
26. Locations (State, County, nearest Town or physical feature, map coordinates) (Use AD-943A for more details, see instructions on cover sheet)			
27. Number & stages released (Use codes, see instructions for recording multiple releases.)	[EH]	[EH]	[EH]
28. Dates of releases (m,d,y) (See instructions for recording multiple releases.)			
29. Target hosts/prey at release A. Primary – Genus, species			
B. Other – Genus, species			
C. Families			
30. Food (plant/animal/other) of target host/prey at release			

U.S.ARMY

BUILDING STRONG®

Shipping

- Shipped overnight via FedEx
- Request for receiver to return box and cooler for future use

Information Required & How to Obtain Flea Beetles

- Name, physical mailing address, email, cell phone number, acreage present

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

Questions