

BIOLOGICAL CONTROL OF PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*) AT THE GLENNVILLE WETLAND MITIGATION BANK, NEW CASTLE COUNTY, DELAWARE



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Background Glenville

- ▣ Historically, White Clay Creek & Red Clay Creek met where present confluence of Hershey Run & White Clay Creek are located
- ▣ In or prior to 1708 European colonists redirected flow of Red Clay Creek



Background Glenville

- ▣ Original confluence emergent freshwater tidal marsh
- ▣ New confluence pushed higher in watershed
- ▣ Flood storage capacity severely reduced
 - Exacerbated flood events
- ▣ Described as being on peninsula

Background Glenville

- ▣ Abandoned channel now series in-line ponds
- ▣ Large-permanently flooded wetland dominated by *Cephalanthus* (buttonbush), *Lythrum* (loosestrife), and stands of *Phragmites* (common reed grass)

Background Glenville

- Early 2000s Glenville Estates subdivision repeatedly inundated by flood events
- Approximately 140 homes severely damaged
- Mid-2000s purchased by state of Delaware





Glenville Estates Subdivision 2005

Background Glenville



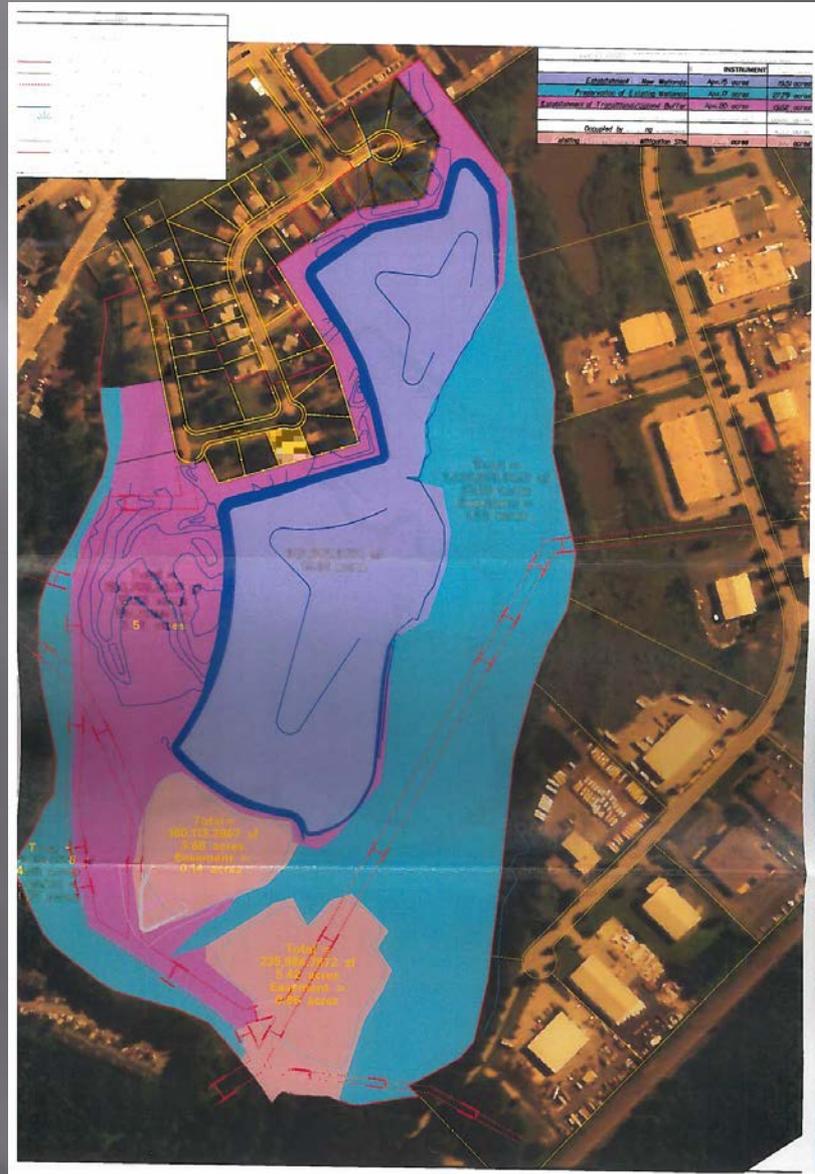
- ▣ Ideal location wetland habitat

- Creation Glenville Wetland Mitigation Bank
 - 19.6 acres creation
 - 25 acres preservation
 - 21.3 acres transitional upland buffer



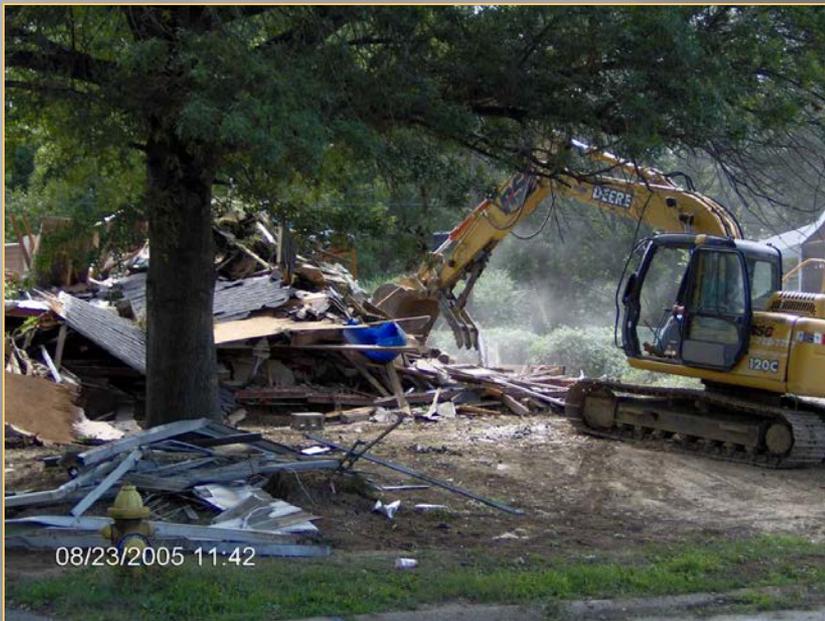
Background Glenville

WETLAND MITIGATION BANK OBJECTIVES		
	BANKING INSTRUMENT	PER PLAN
Establishment of New Wetlands	Apx.15 acres	19.51 acres
Preservation of Existing Wetlands	Apx.17 acres	27.79 acres
Establishment of Transitional/Upland Buffer	Apx.20 acres	19.62 acres
Total Conservation Area	Apx.52 acres	66.92 acres
Area Occupied by Existing Easement	0	4.33 acres
Existing 6 acres Wetland Mitigation Site	9.05 acres	9.0 acres

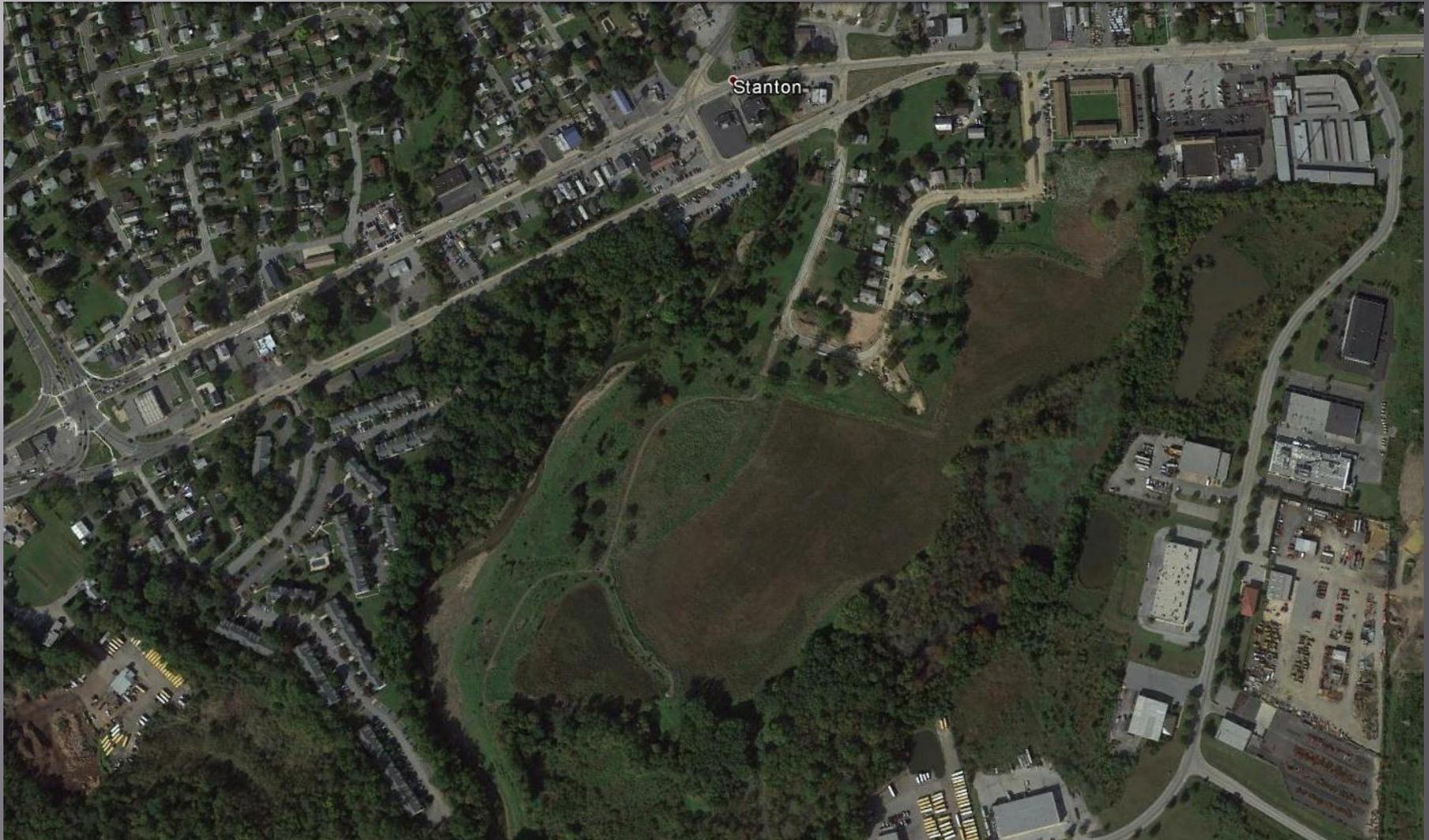


Background Glenville

- ▣ Site excavation completed Fall 2008
- ▣ Planting grasses Sept-Oct 2008
- ▣ Saplings April 2009
- ▣ Additional saplings sept 2009 & April 2013
- ▣ August 2009, June 2010, June 2011, July 2012, July 2013, July 2014, July 2015
vegetation studies



Background Glenville



Glenville Wetland Mitigation Bank 2011

Background Glenville

- ▣ By 2013, *Lythrum salicaria* colonized northern segment at moderate density
- ▣ Where colonized, tree densities excess 3000-4000 per acre
- ▣ Good ground for both trees and *Lythrum*

Lythrum salicaria

- ▣ From Europe & Asia
- ▣ Invasive perennial wetland plant
- ▣ 2-7 feet high
- ▣ Forms dense, impenetrable stands
- ▣ Unsuitable as cover, food, or nesting sites
- ▣ Wonderful for bees and wasps



Lythrum salicaria at Glenville

- ▣ Delaware does not present same problem as in Ontario or northern New York
- ▣ *Lythrum* displaces native plant material in other locations on fine texture soils, not case Glenville started clean slate bare mineral soil
- ▣ Does not form monoculture due to late leaf out in spring



Lythrum salicaria at Glenville

- ▣ Large stand dominated wetland immediately to east on old abandoned channel of red clay creek
- ▣ Floodwaters readily transfer seeds
- ▣ DeIDOT consulting DNREC merits introducing biological control



Biological Control

- ▣ Search began mid 1980s
- ▣ Testing completed in North America 1987 and 1991 at Cornell University

Biological Control

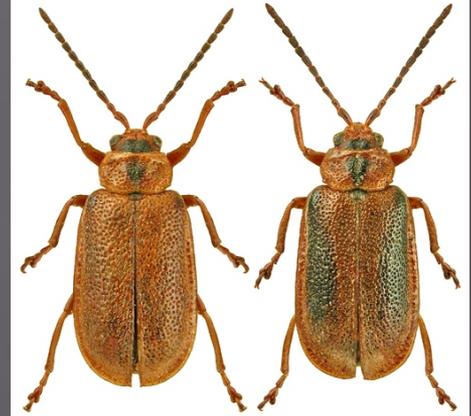
ICONOGRAPHIA COLEOPTERORUM POLONIAE
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4 species of beetles introduced to Minnesota

- 2 leaf-feeding: *Galerucella pusilla* & *G. calmariensis*

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- 1 root-boring: *Hylobius transversovittatus*

- 1 flower-feeding weevil: *Nanophyes marmoratus*

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Biological Control

- ▣ Two leaf-eating beetles
 - Look very similar, hard to differentiate in field
 - 3-6mm in length
 - Light brown or tan, sometimes w/ dark stripe on each side



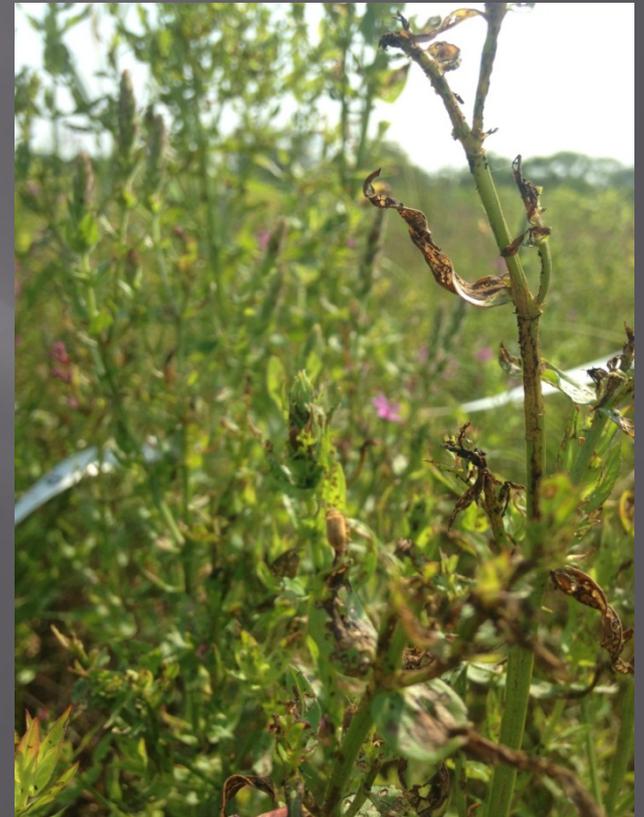
Biological Control

- ▣ Both species lay eggs only on purple loosestrife and are specific feeders as well
- ▣ Adults inflict shothole feeding pattern eating small holes through foliage
- ▣ Newly hatched larvae feed in growing shoot tips
- ▣ Larger larvae eat softer tissues in the leaves



Biological Control

- ▣ Beetles can fly between plants or plant clusters
- ▣ Both adult and larvae float



Biological Control

- ▣ Effective control reduces impact of loosestrife
- ▣ Will not be eradicated from wetlands
- ▣ Becomes a small component not a dominate one
- ▣ Minnesota: severe defoliation of population over 20% sites visited



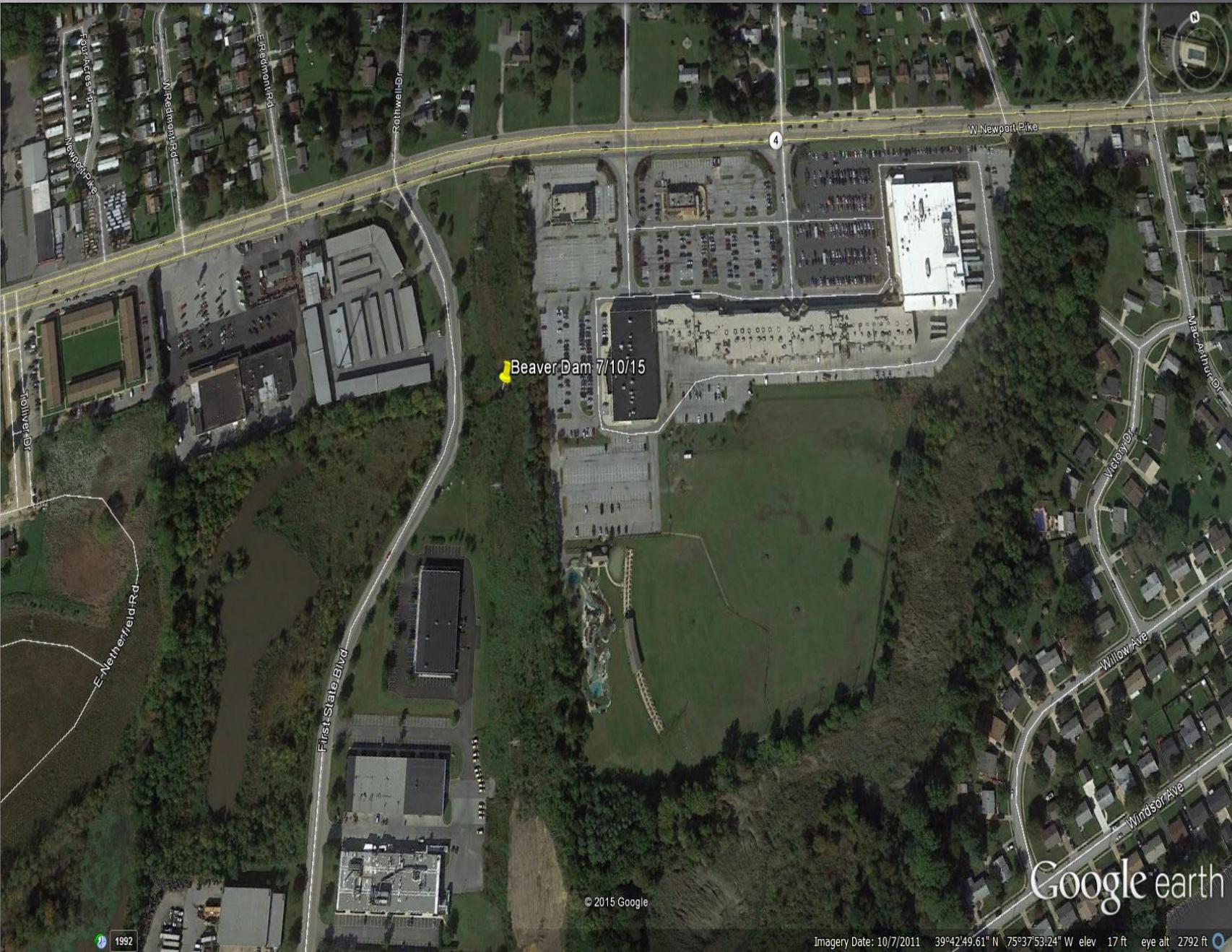
Biological Control

- ▣ The beetles find new sites on their own
- ▣ Minnesota: beetles found more than 12 miles away from release site

Vegetative Studies

- ❑ Purple Loosestrife beetles and *Lythrum salicaria* on a predator-prey cycle
- ❑ If flooding occurs, beetles will survive for a period of time
- ❑ If long inundation periods, beetles do not survive
- ❑ At Glenville in 2015 beaver dam flooded site
 - Based on monitoring data dam constructed December 2014-July 2015 (taken down)
- ❑ Expected less beetles, but the beetles survived along the slopes of the site





Beaver Dam 7/10/15

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Google earth

1992

Imagery Date: 10/7/2011 39°42'49.61" N 75°37'53.24" W elev 17 ft eye alt 2792 ft

Biological Control at Glenville

- ▣ 2014 field visit with Mark Mayer of the New Jersey Department of Agriculture
- ▣ Discuss use of biological control at Glenville
- ▣ During field visit, identified beetles already at the site and identified decrease in height and amounts of Loosestrife



Vegetative Studies

- ▣ 2014 vegetative study
 - No flowering, decreased heights and densities
- ▣ 2015 vegetative study
 - Flowering, slightly taller heights than 2014



Vegetative Studies

- ▣ 6 columns across the site
- ▣ 5 plots each column
- ▣ Total 30 sampling plots (1-square meter circular plot)

- ▣ At each plot: percent cover & quantity of saplings

Preliminary Results: *Lythrum* Heights

- ▣ 2013
 - Average height 72"
- ▣ 2014
 - Average height 22"
- ▣ 2015
 - Average height 48"



Preliminary Results-Percent Ground Coverage *Lythrum* (total vegetation cover)

- ▣ 2009
 - 6.6% (86%)
- ▣ 2010
 - 4.7% (83%)
- ▣ 2011
 - 9.1% (91.5%)
- ▣ **2012**
 - **31.4% (95.4%)**
- ▣ **2013**
 - **35.7% (94.6%)**
- ▣ **2014**
 - **12% (95.9%)**
- ▣ 2015
 - 13.5% (87.6%)

The Future

- ▣ Continue vegetative studies
- ▣ To see the best results of the biological control wait around 5-10 years
- ▣ Currently, Delaware has an established beetle population so there is no need to purchase beetles in New Castle County
- ▣ Goal is to see significant decrease in the *Lythrum salicaria* densities and an increase in the diversity of other native species

Thank You



Kenneth Dunne, DeIDOT
Environmental Studies



Mark Mayer, New Jersey
Department of Agriculture

