Surveys of the Mainstem Flint River 2011-2014

Unionid Survey History

300+ sites surveyed in the Flint River Basin

- Mostly in the lower portion of basin

110 total sites in Flint River

- 70% of sites sample prior to 1993
- 21% of sites sampled prior to 1900

Amblema neislerii:

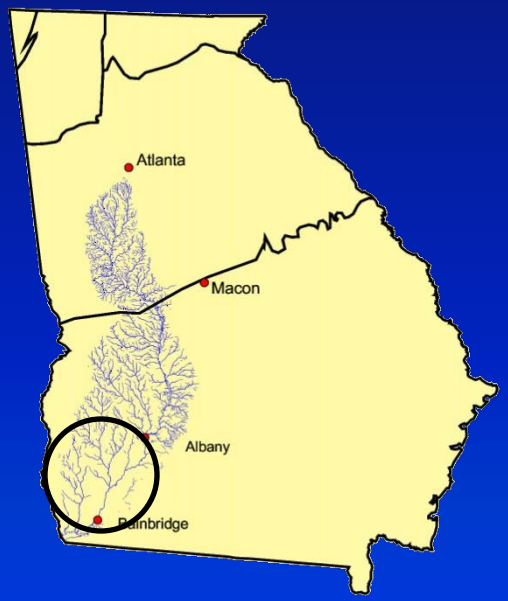
- Described from Flint River near Montezuma
- Presumed extirpated until 2006

Elliptio nigella:

- Presumed extinct until 2008

More occupied sites found in recent years

Study Area



Study conducted in 2011

~119 km between Albany Dam and Lake Seminole

Sites located at ~2.5 km intervals

Covariate Measurements

Transect Level

Depth

Velocity

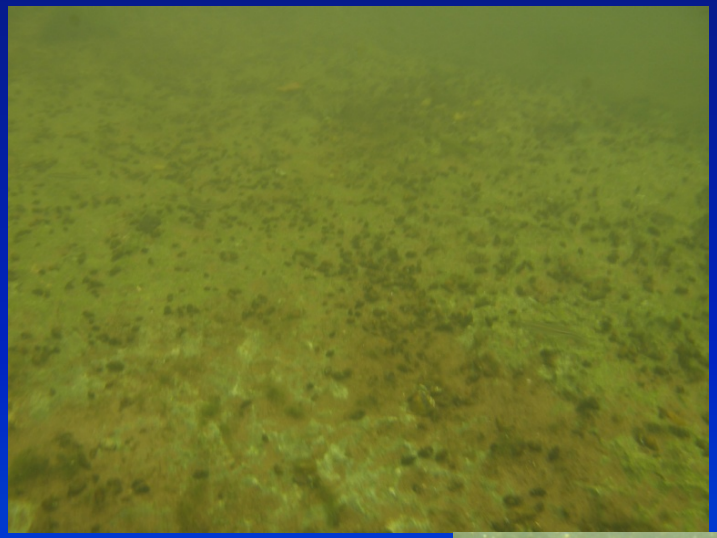
Substrate roughness

Effort

Experience

Substrate (% of transect)

Clay	<0.004 mm (slick)
Silt	<0.006 mm
Sand	0.006 – 2 mm
Gravel	2-64 mm
Cobble	64-256 mm
Boulder	> 256 mm
Bedrock	



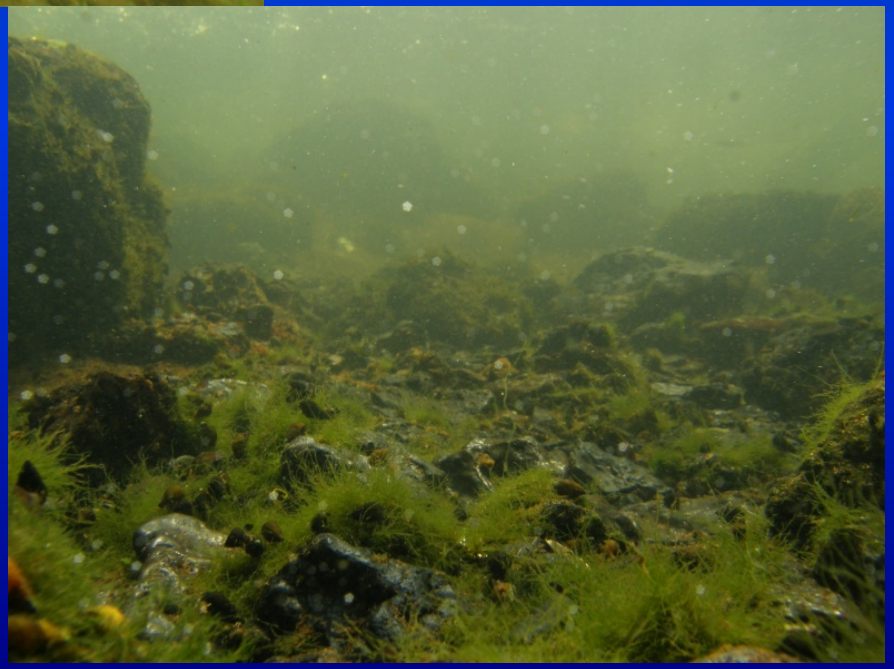
Site Level

Slackwater vs. Swiftwater

Distance from Albany Dam

Woody debris

Substrate (% of site)



Results

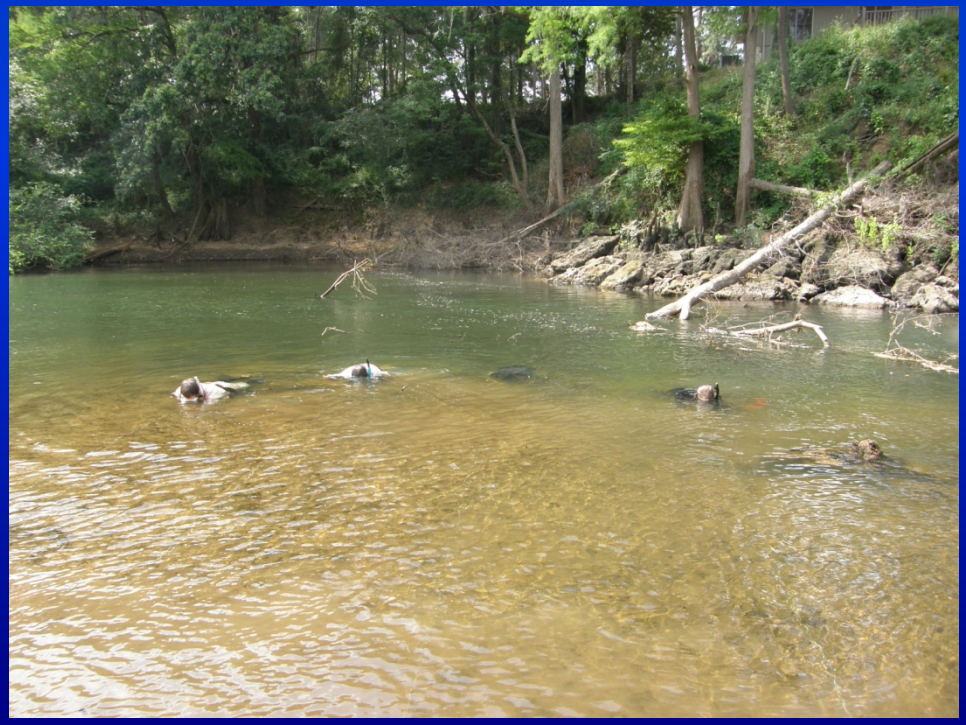
Unionids found at 38 of 39 total sites

20 total species collected

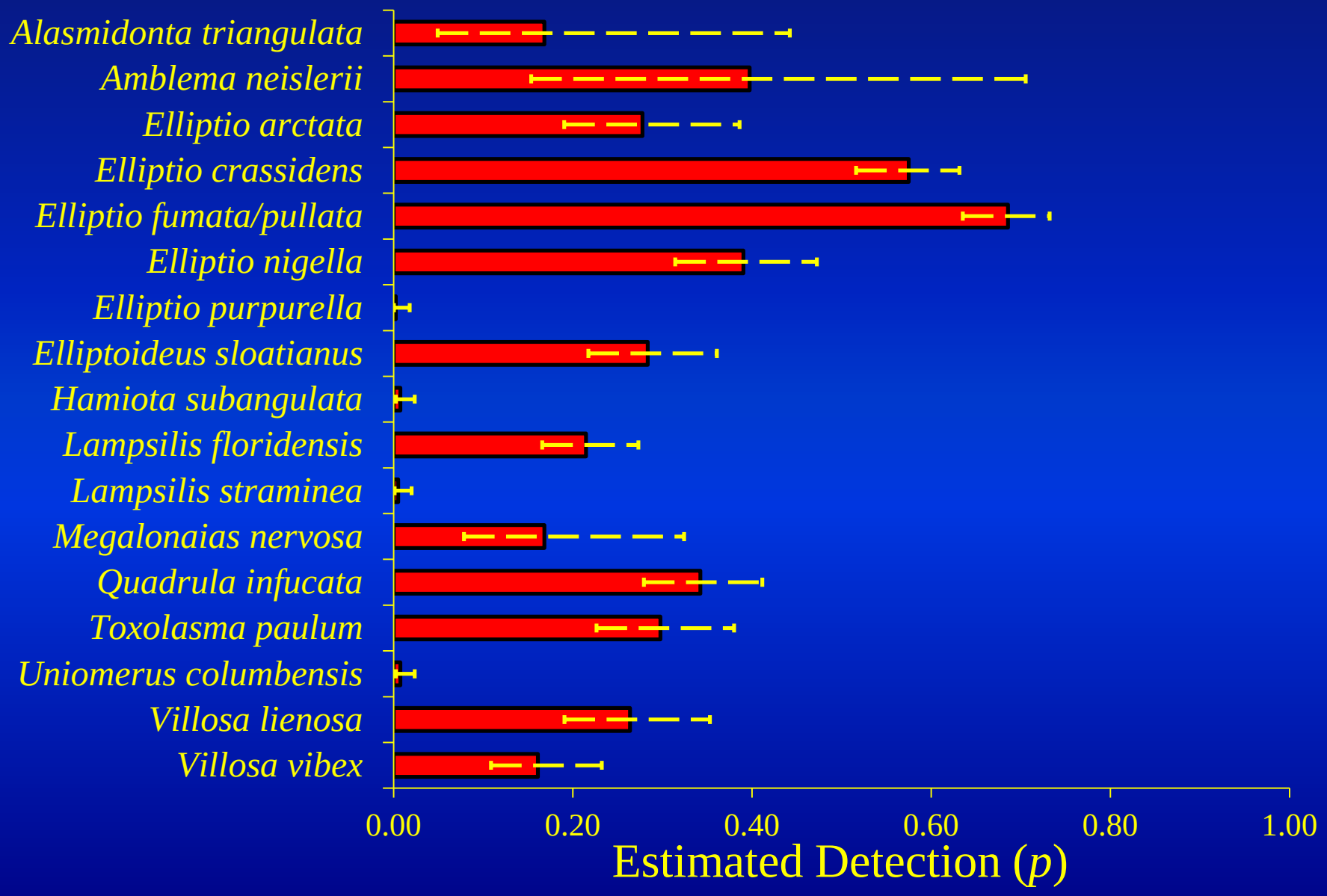
- Ranged from 1-12 species /site

7,404 total individuals collected

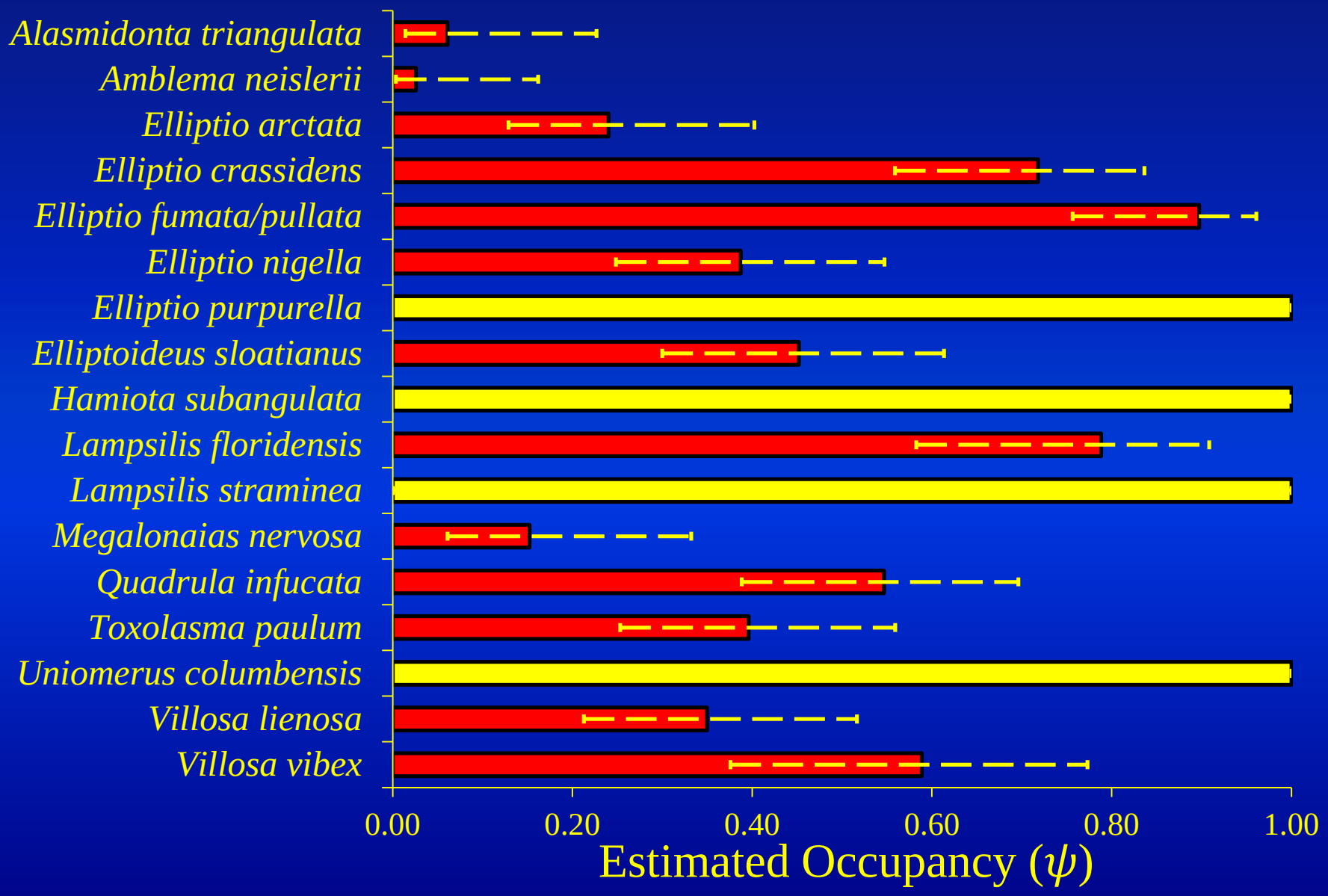
- 2,120 individuals collected at 1 site
- 48% of total survey catch collected from 2 sites



Detection


Alasmidonta triangulata
Amblema neislerii
Elliptio arctata
Elliptio crassidens
Elliptio fumata/pullata
Elliptio nigella
Elliptio purpurella
Elliptoideus sloatianus
Hamiota subangulata
Lampsilis floridensis
Lampsilis straminea
Megalonaias nervosa
Quadrula infucata
Toxolasma paulum
Uniomerus columbensis
Villosa lienosa
Villosa vibex
0.00
0.20
0.40
0.60
0.80
1.00
Estimated Detection (p)

Occupancy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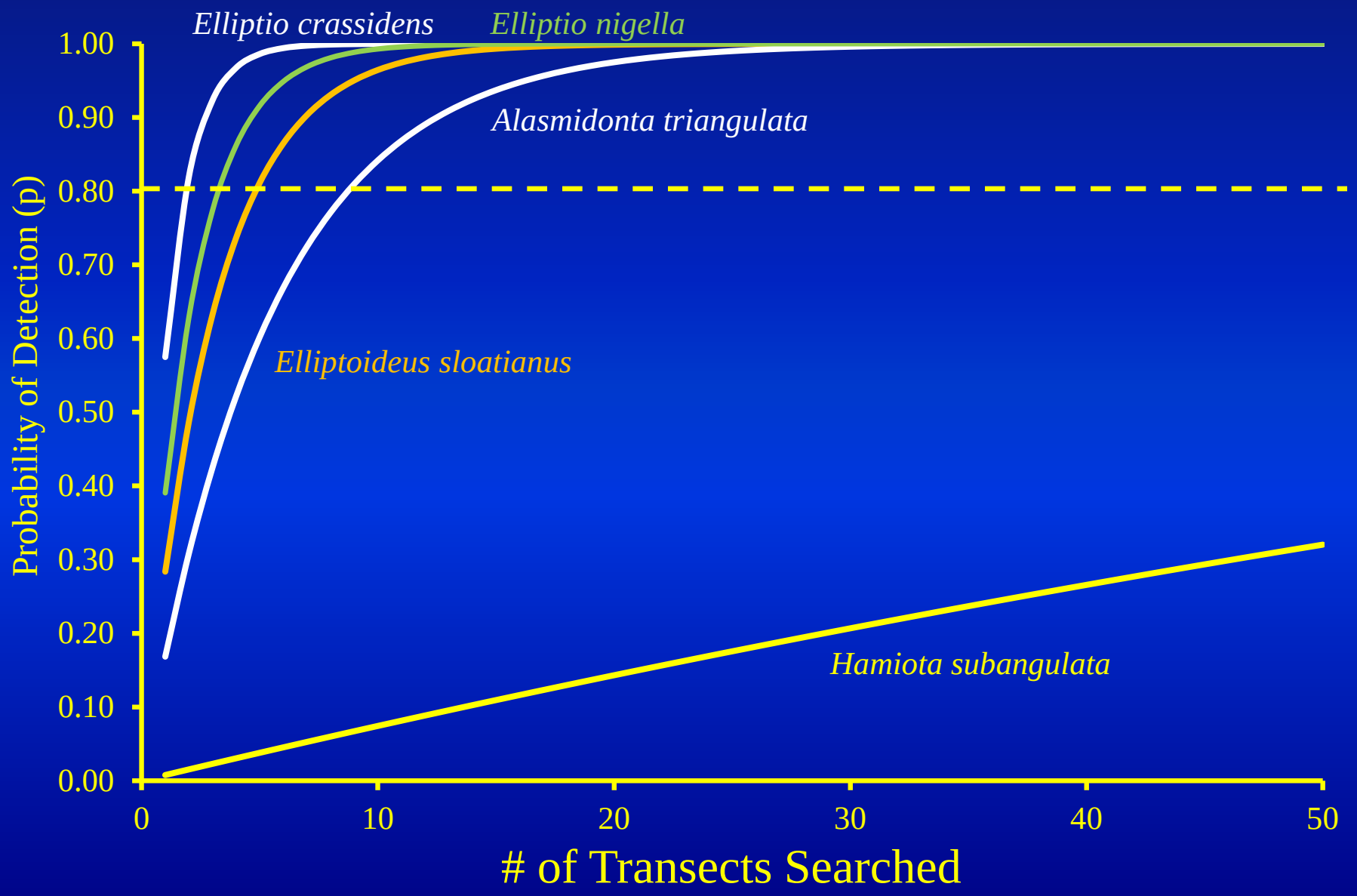
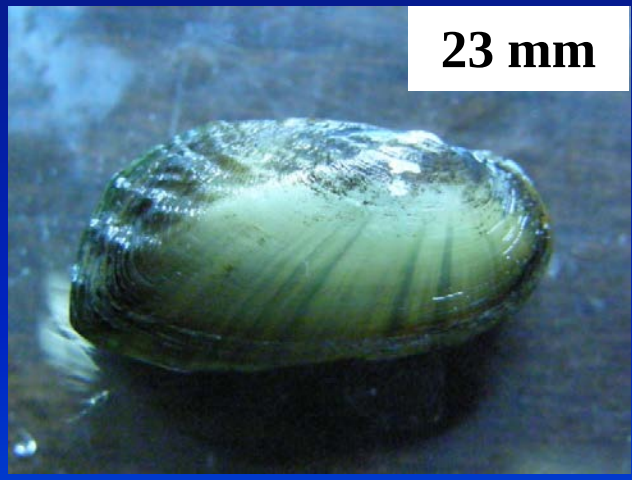
0.00
0.20
0.40
0.60
0.80
1.00
Estimated Occupancy (ψ)

Site-Level Detection



Conclusions

Occupancy modeling was a useful approach to meet a variety of common goals associated with unionid sampling



Objective 1: Inventory extant species

20 total species collected during our study

- 15 species collected by Brim Box and Williams in the early 1990's
- 7 additional species collected from current study
- 2 species collected by BB&W but not current study

Objective 2: Assess status and distribution of unionids in Lower Flint River

Quantitative estimates of detection and occupancy for all species

Should provide a nice baseline for status trajectories in the future

Mean naïve occupancy was 26% lower than mean estimated occupancy incorporating detection

10 species with evidence of recent reproduction (≤30 mm)

Conclusions

Objective 3: Estimate site-level detection

Site-level detection of a species was 0.80 or higher for 70% of the species collected during the study

Provides a useful tool to management agencies in developing standardized sampling protocols for unionid surveys

Objective 4: Investigate factors affecting occupancy and detection

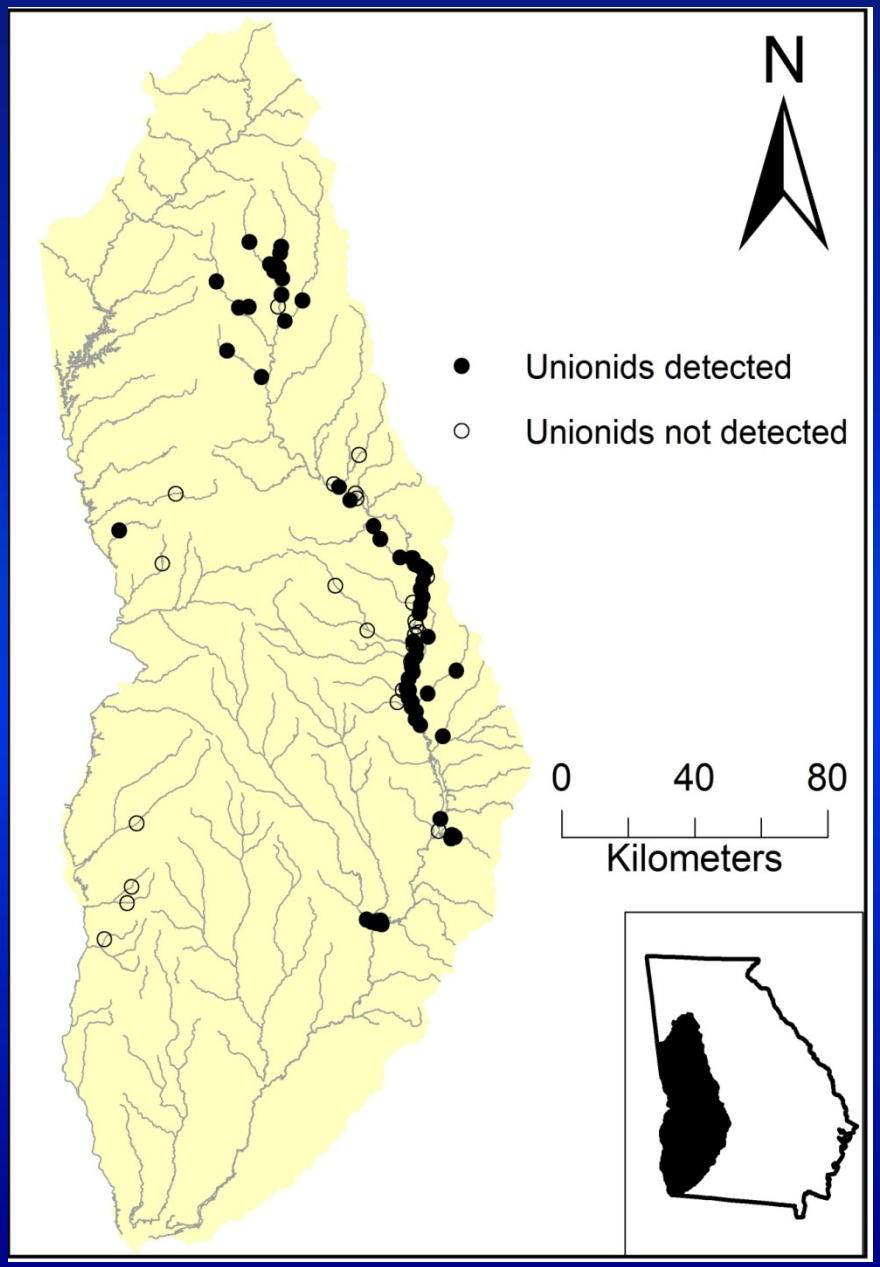
Occupancy influenced positively influenced by swiftwater habitat and % gravel substrate

Detection influenced positively by water velocity and searcher experience but negatively influenced by water depth

Highlight of entire survey

Largest collection of *Alasmidonta triangulata* in at least the past 16 years

40-50 collected since



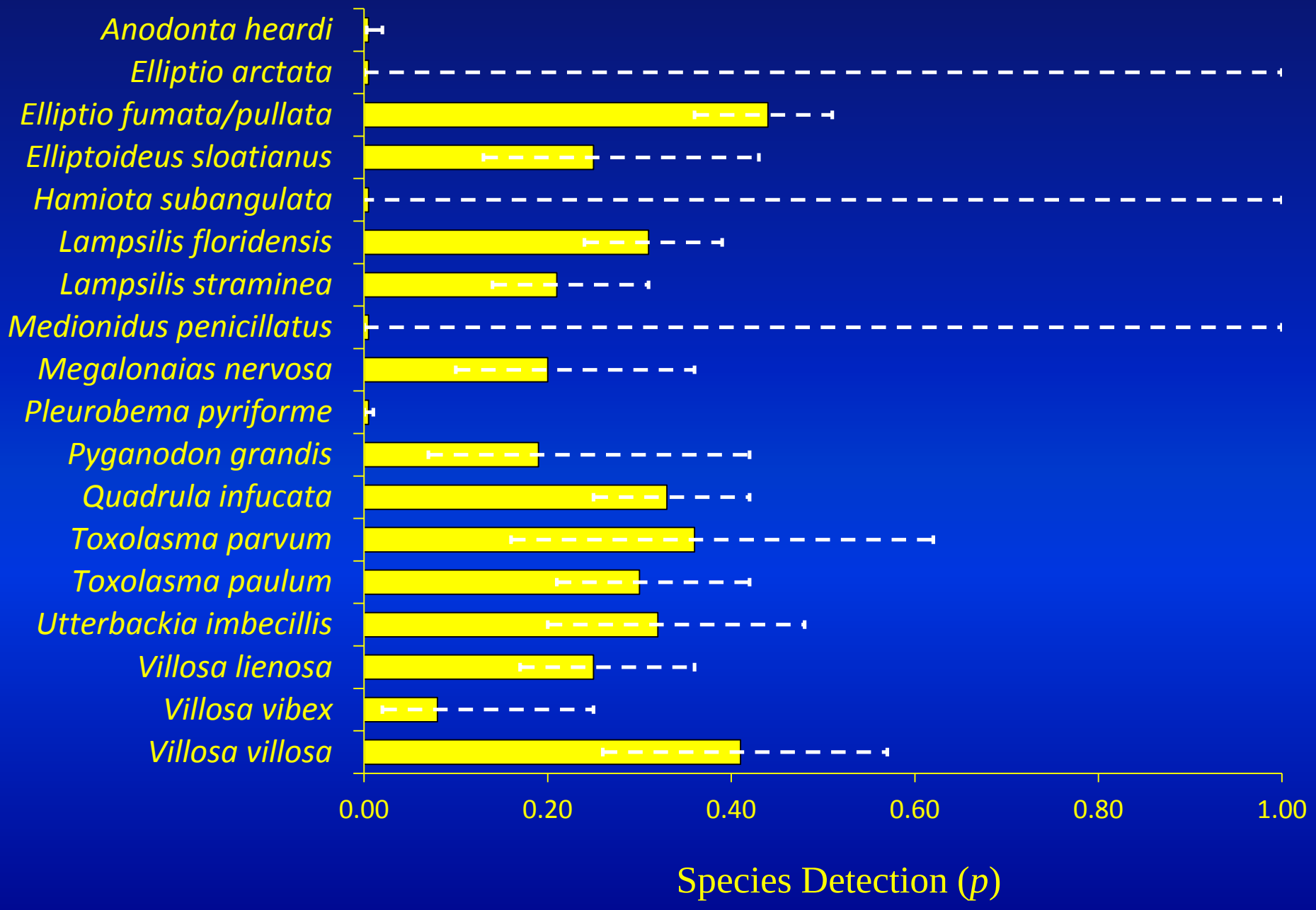
97 sites sampled in 2014

21 tributary sites
76 mainstem Flint sites

Unionids found at 65 sites

17 native species
1 introduced species

856 live unionids found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Hamiota subangulata
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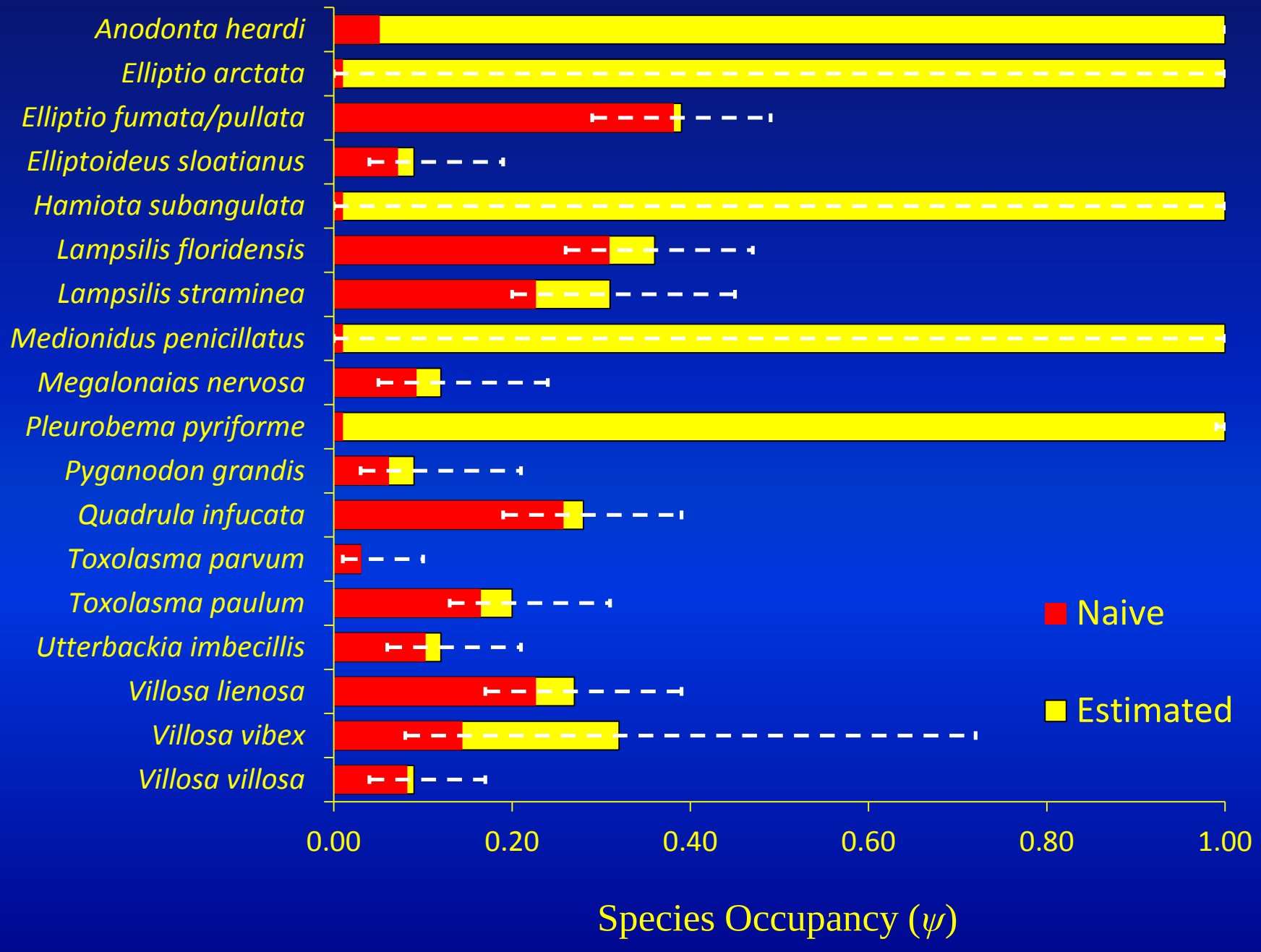
Lampsilis straminea
Medionidus penicillatus
Megalonaias nervosa
Pleurobema pyriforme
Pyganodon grandis
Quadrula infucata
Toxolasma parvum
Toxolasma paulum
Utterbackia imbecillis
Villosa lienosa
Villosa vibex
Villosa villosa
0.00
0.20
0.40
0.60
0.80
1.00
Species Detection (p)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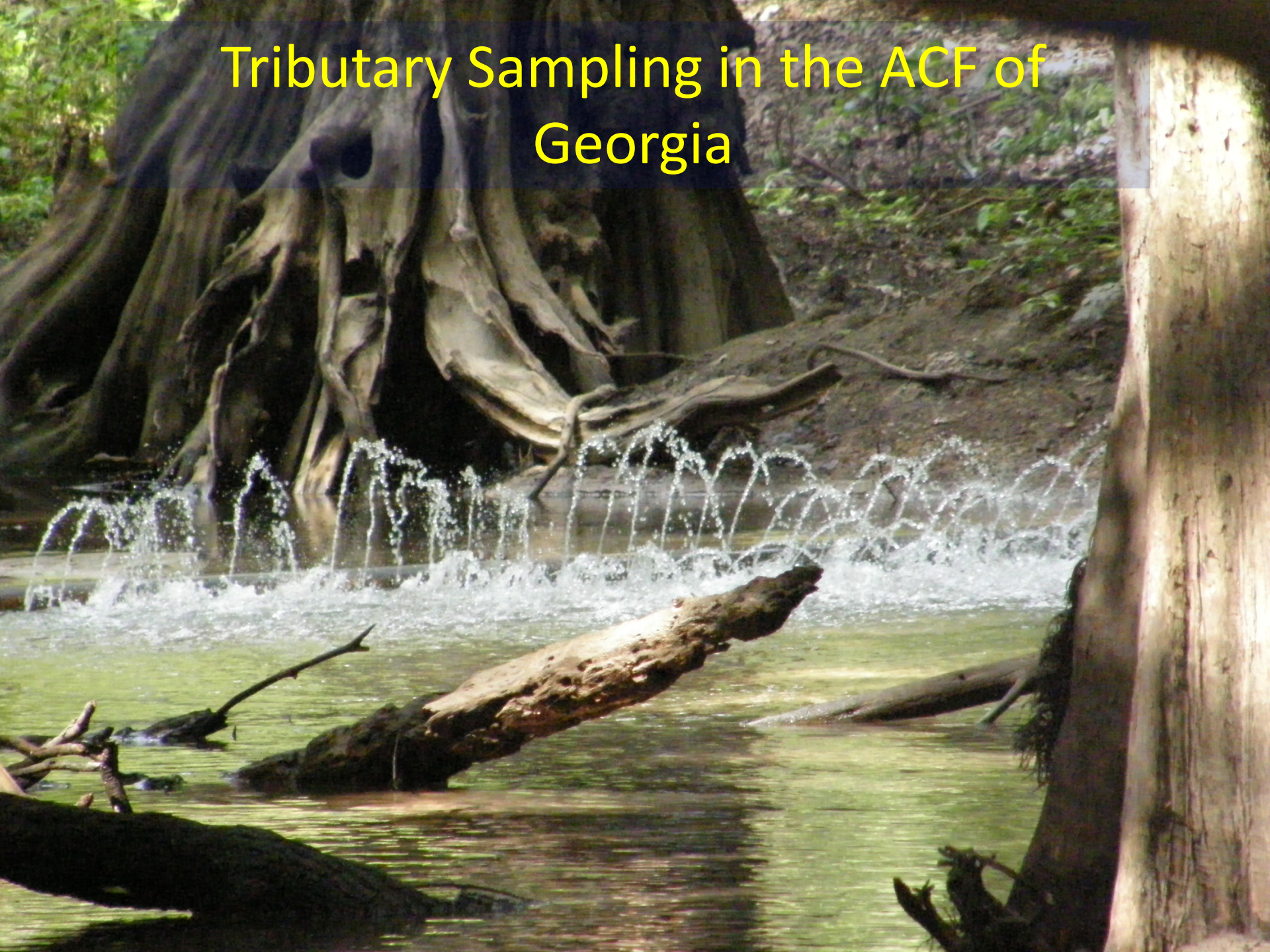
Villosa vibex
Villosa villosa
Naive
Estimated
0.00
0.20
0.40
0.60
0.80
1.00
Species Occupancy (ψ)

Tributary Sampling in the ACF of Georgia

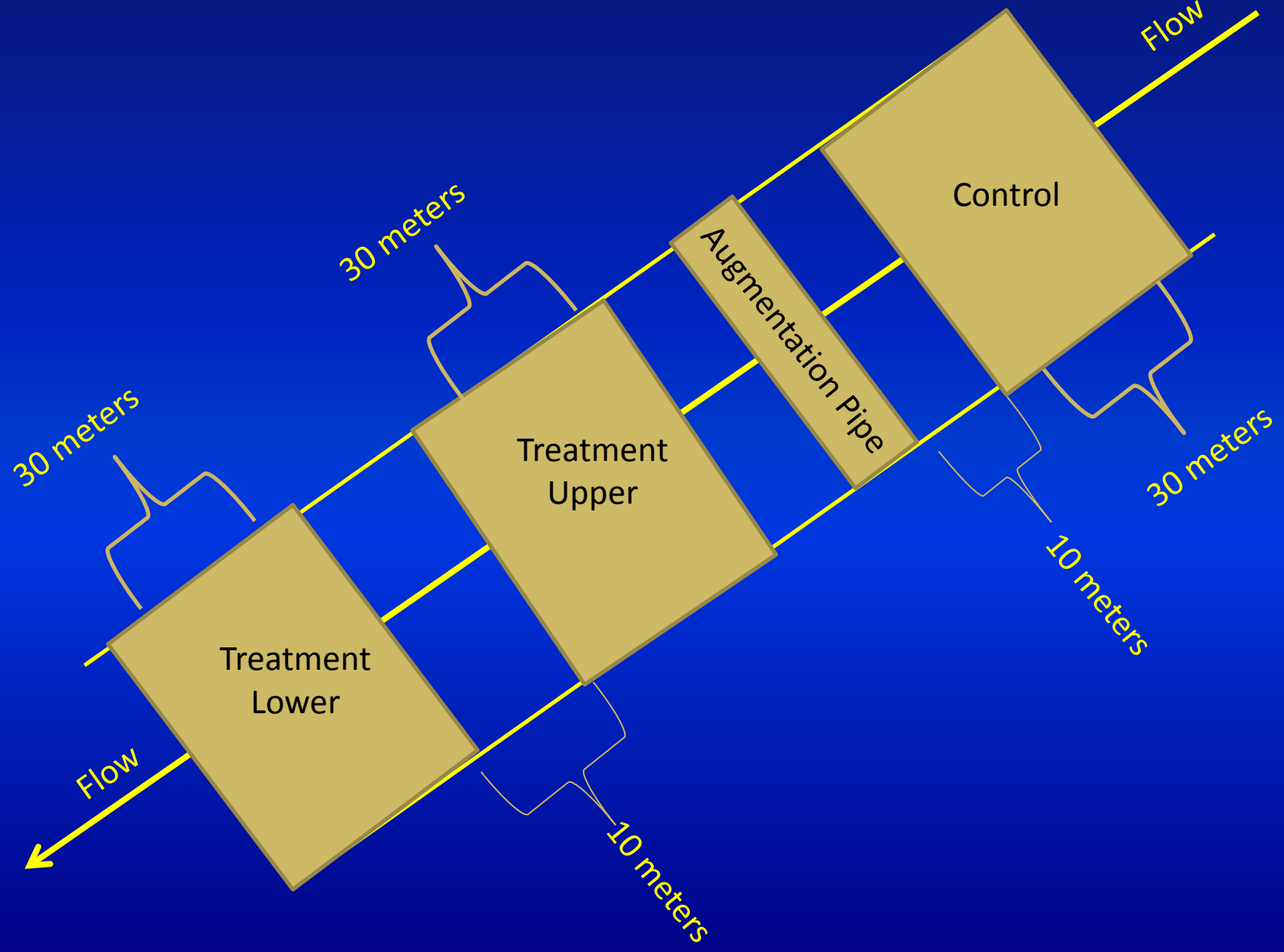


Sensitive to Drought

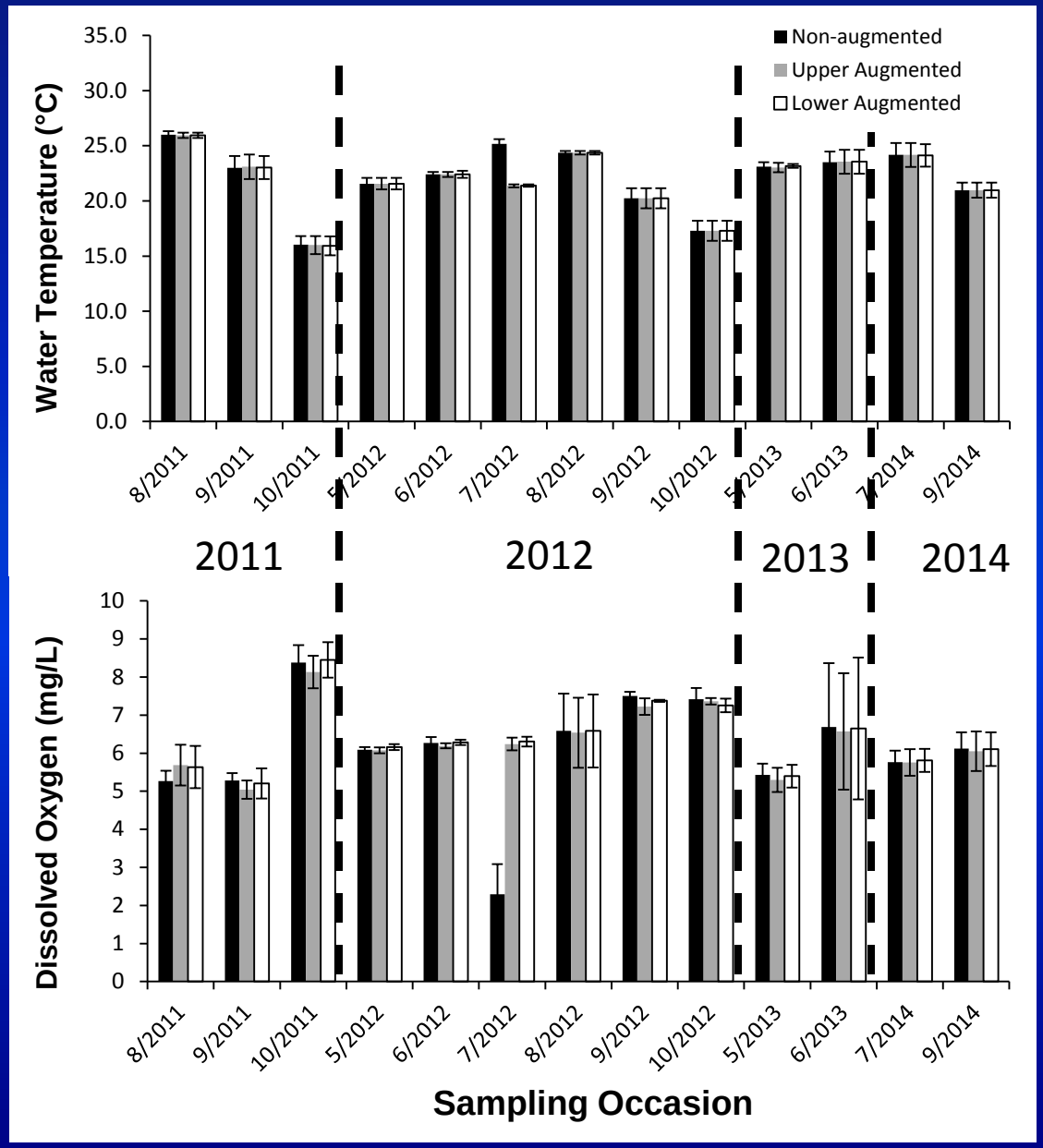
2 – 450 gpm electric pumps (~2 cfs)

Diffused through 10” perforated PVC

Study Design



Water Quality



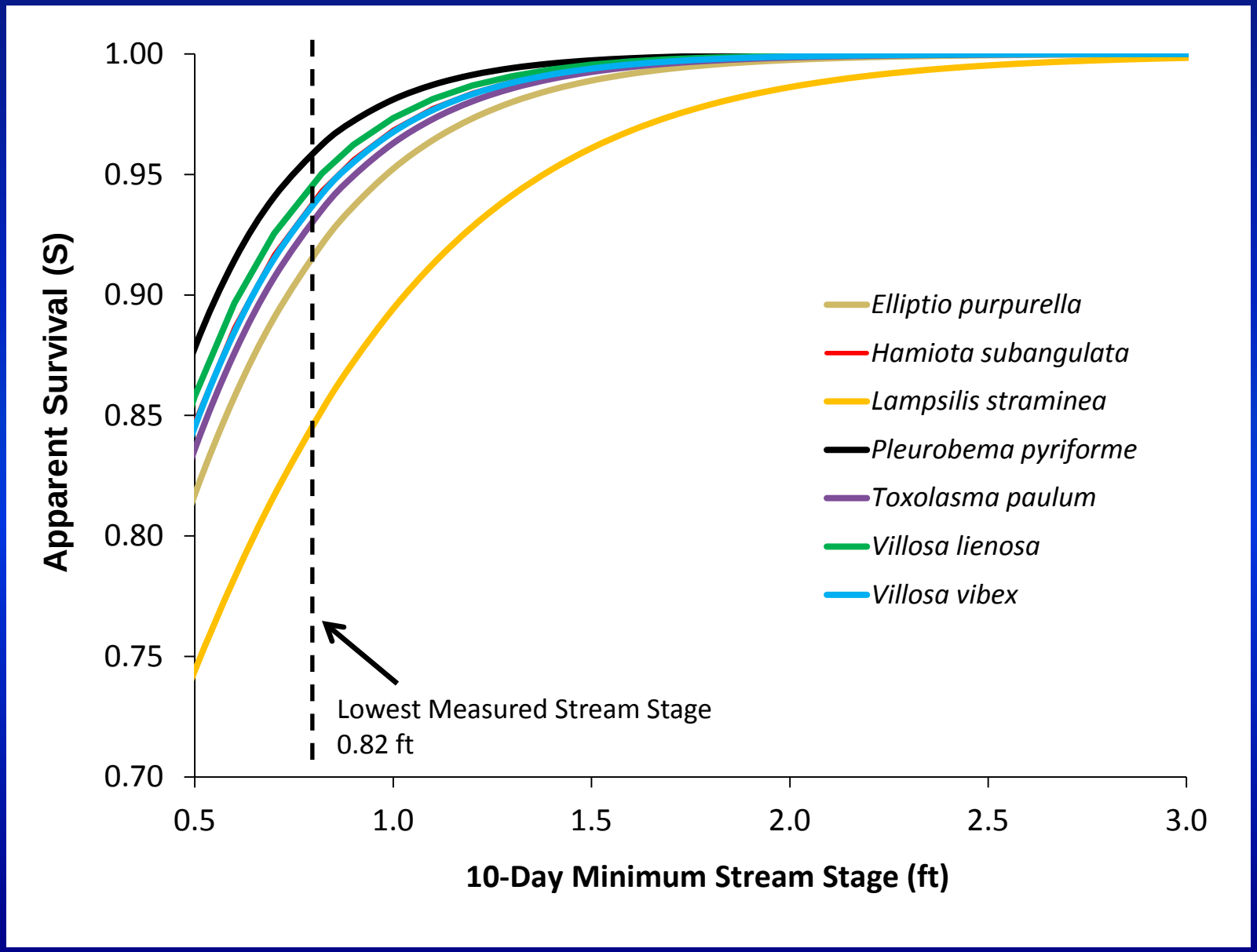
2011 – 3 primary occasions
2012 – 6 primary occasions
2013 – 2 primary occasions
2014 – 2 primary occasions
2015 – 1 primary occasions
2016 – 2 primary occasions

16 primary occasions X 3 secondary samples = 48 samples

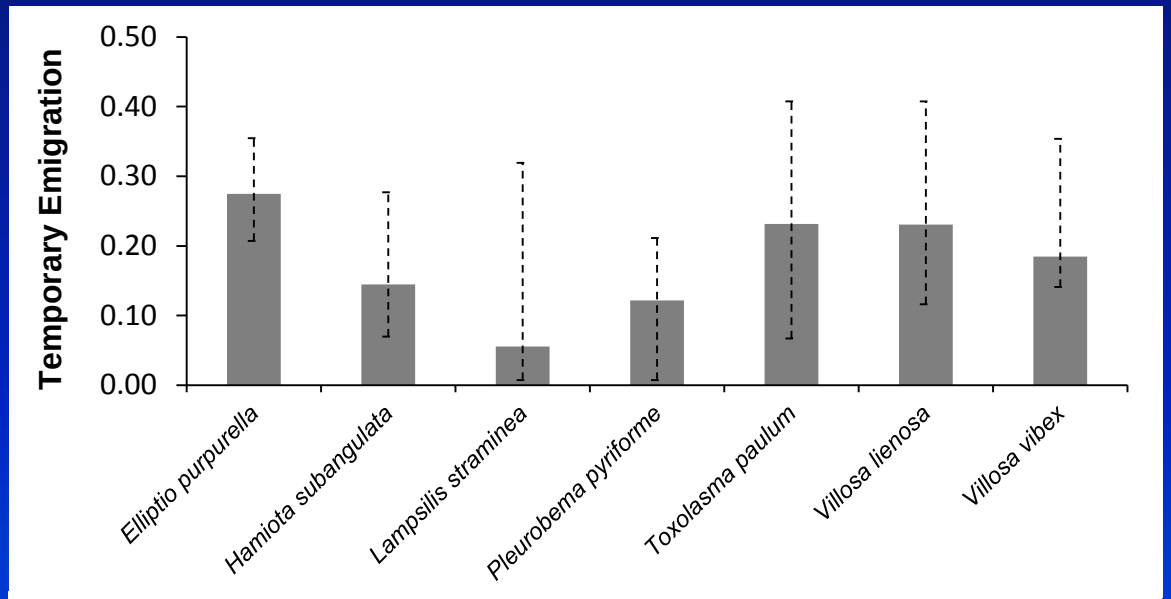
4,898 total animals tagged
359 *Pleurobema pyriforme*
232 *Hamiota subangulata*

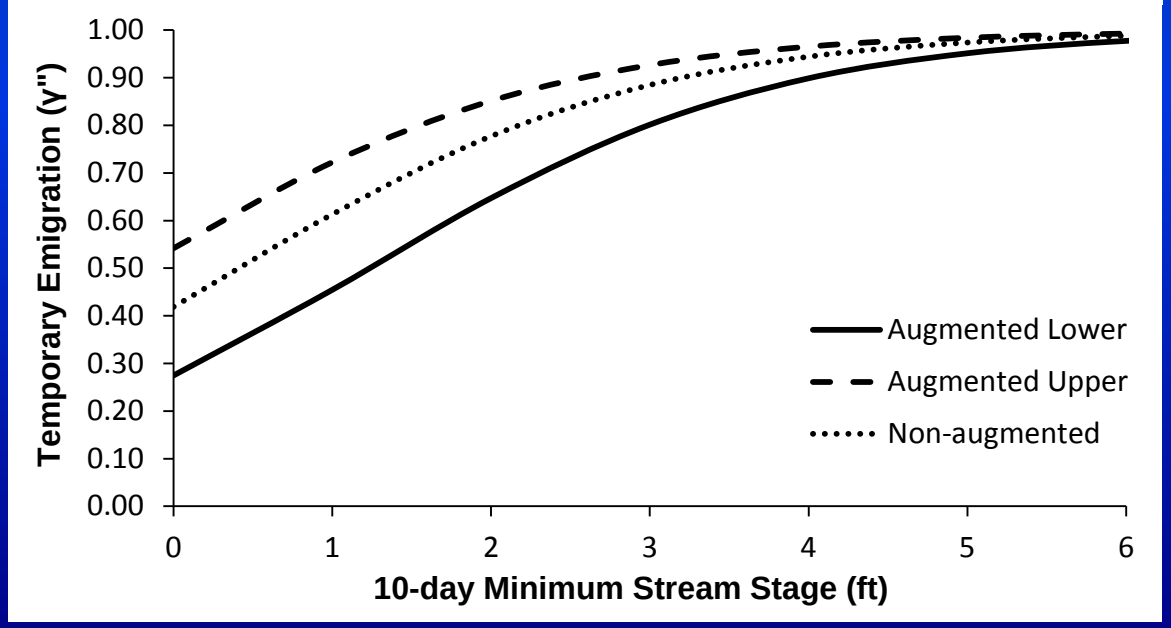
6 additional species

Apparent Survival



Temporary Emigration





Conclusions

Water augmentation appeared to benefit water quality

- DO higher in augmented reaches
- Temperature lower in augmented reaches

Temporary emigration was not benefitted by augmentation

Apparent survival was high but negatively related to stage

- Did not differ among treatment units
- Exceeded 89% for all species

Similar CMR Studies in the ACF of GA

Sawhatchee Creek

Sampled annually since 2005 (12 years)

1,132 tagged

Hamiota subangulata - 83
Medionidus penicillatus - 672
Pleurobema pyriforme - 377

Ichawaynochaway Creek (2,191 total, 7 species)
Chokee Creek (1,776 total, 9 species)
Limestone Creek (1,480 total, 6 species)

Sampled annually since 2008 (9 years)

Models

We are using Pradel Reverse Time CMR models to estimate 2 primary parameters

Apparent Survival
Per Capita Recruitment

Flow metrics are fit for each parameter to estimate the influence of flows on each

Apparent Survival + Recruitment = Population growth

Population decreasing if population growth <1.1
Population stable if population growth =1.1
Population increasing if population growth >1.1

Questions?