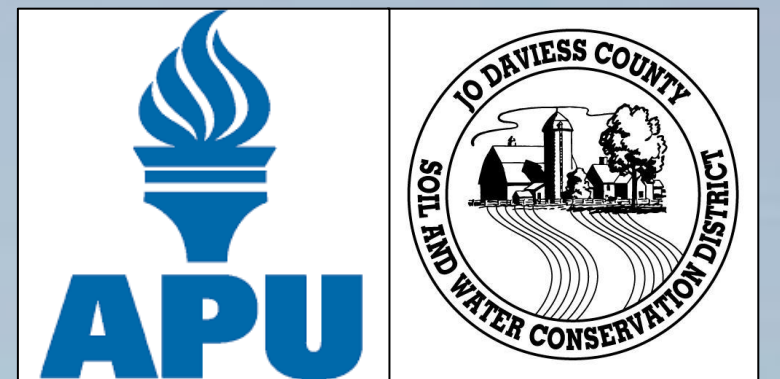
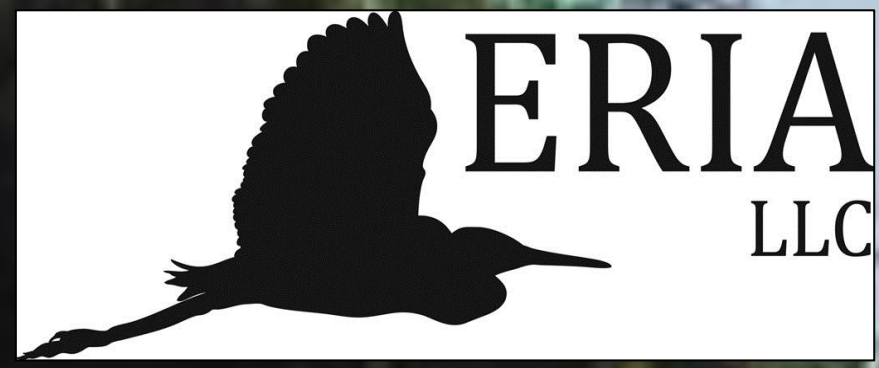


Mussel Community Habitat Preferences in the Upper Mississippi River, Pool 12 (Frentress Lake Area)

Daniel Call¹ and Michael Malon²

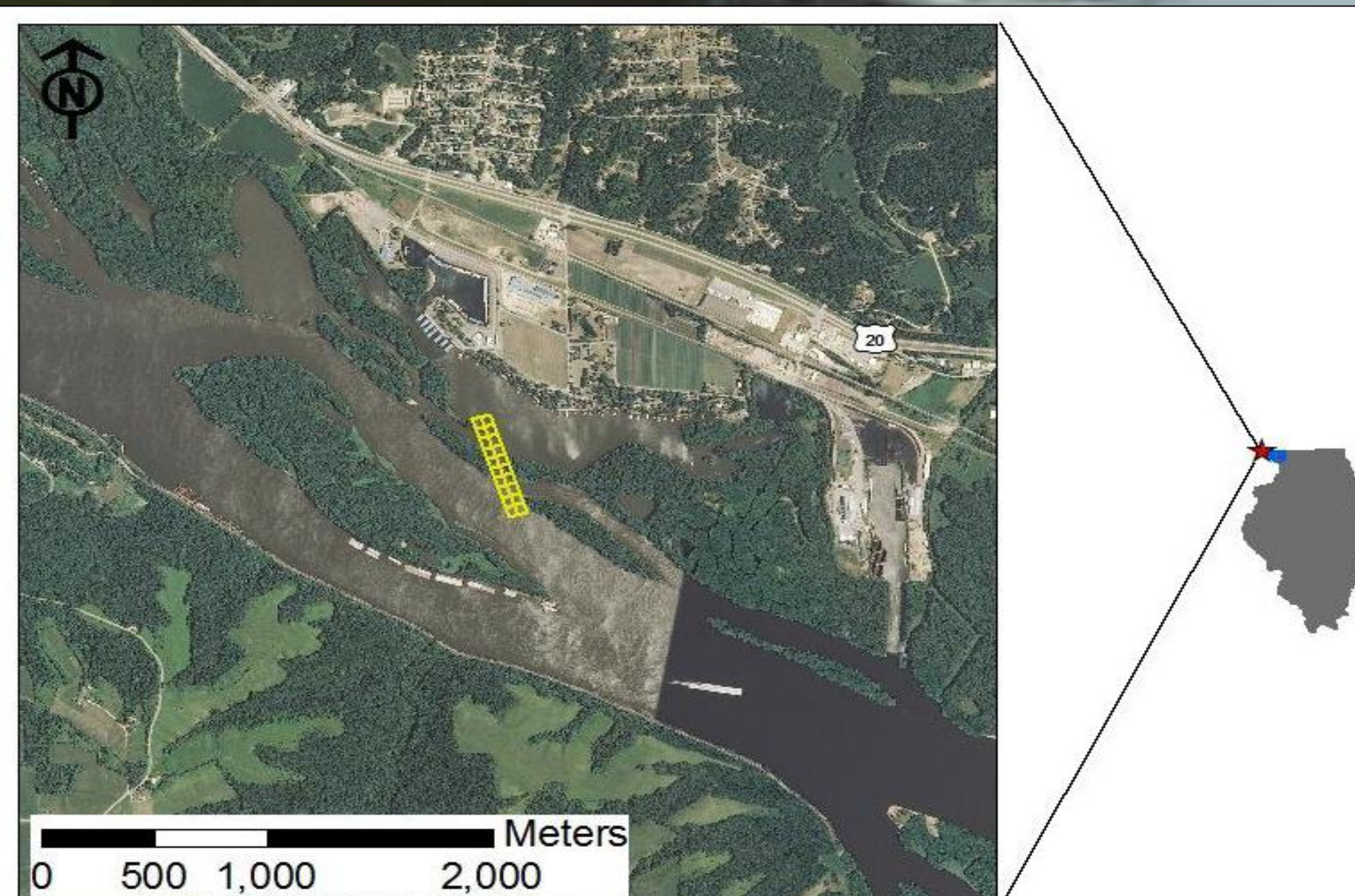
¹Environmental Research & Information, Analysts, LLC, Dubuque, IA

²American Public University, Charlestown, WV; Jo Daviess County SWCD, Elizabeth, IL



ABSTRACT

A Level I survey of the mussel community was performed in September, 2013, in side channel habitat of the Upper Mississippi River (Pool 12) near Frentress Lake, East Dubuque, IL (River Mile 575.7-576.1) as a permitting requirement for a proposed dredging project. The survey area was divided into 20 plots of 2,000 m² each, and 20-minute collection dives were made starting within each plot. A sediment core sample was collected at each site for characterization of particle size and organic matter, and measurements were made of current velocity, temperature, dissolved oxygen and pH near the sediment-water interface. Data from pairwise plot-by-plot comparisons of species composition (presence or absence) and the Sorensen-Dice coefficient of similarity were used to help characterize the nature of the mussel community and habitat variability. Results from this survey were used to develop a conservation plan approved by the Illinois Department of Natural Resources to relocate any threatened or endangered mussels and provide follow-up monitoring and research over the next ten years.



SITE DESCRIPTION

This site is a backwater channel used to access Frentress Lake, an approximately 130 acre backwater lake of the Mississippi River, near East Dubuque, IL. Maintenance dredging in the access channel required a permit from the US Army Corps of Engineers and US Fish and Wildlife Service.

METHODS

- The survey area was divided into 20 plots of 2,000 m² each, and 20-minute collection dives were made starting within each plot.
- A sediment core sample was collected at each site for characterization of particle size and organic matter.
- Particle size fractions from the plots were characterized as medium sand (< 2.0 mm - > 425 μm), fine sand (< 425 - > 75 μm) or silt plus clay (< 75 μm).
- Measurements were made of current velocity, temperature, dissolved oxygen and pH near the sediment-water interface.
- Associations were analyzed between species number by plot, as well as for distribution relative to habitat characteristics.
- Data from pairwise plot-by-plot comparisons of species composition (presence or absence) and the Sorensen-Dice coefficient of similarity were used to help characterize the nature of the mussel community and habitat variability.

RESULTS

Species	No.	Rel. Abund.
<i>Amblema plicata</i>	588	62.4%
<i>Obliquaria reflexa</i>	146	15.5
<i>Fusconaia flava</i>	68	7.2
<i>Quadrula pustulosa</i>	42	4.5
<i>Obovaria olivaria</i>	25	2.6
<i>Lampsilis cardium</i>	20	2.1
<i>Quadrula quadrula</i>	18	1.9
<i>Pyganodon grandis</i>	13	1.4
<i>Quadrula nodulata</i>	8	0.8
<i>Leptodea fragilis</i>	3	0.3
<i>Megaloniais nervosa</i>	3	0.3
<i>Lasmigona complanata</i>	2	0.2
<i>Toxolasma parvum</i>	2	0.2
<i>Ligumia recta</i>	1	0.1
<i>Potamilus ohioensis</i>	1	0.1
<i>Truncilla donaciformis</i>	1	0.1
<i>Utterbackia imbecillus</i>	1	0.1

Table 1: Results showing total numbers and relative abundances of live unionid mussels.

Results from Plot 8 Level II Survey

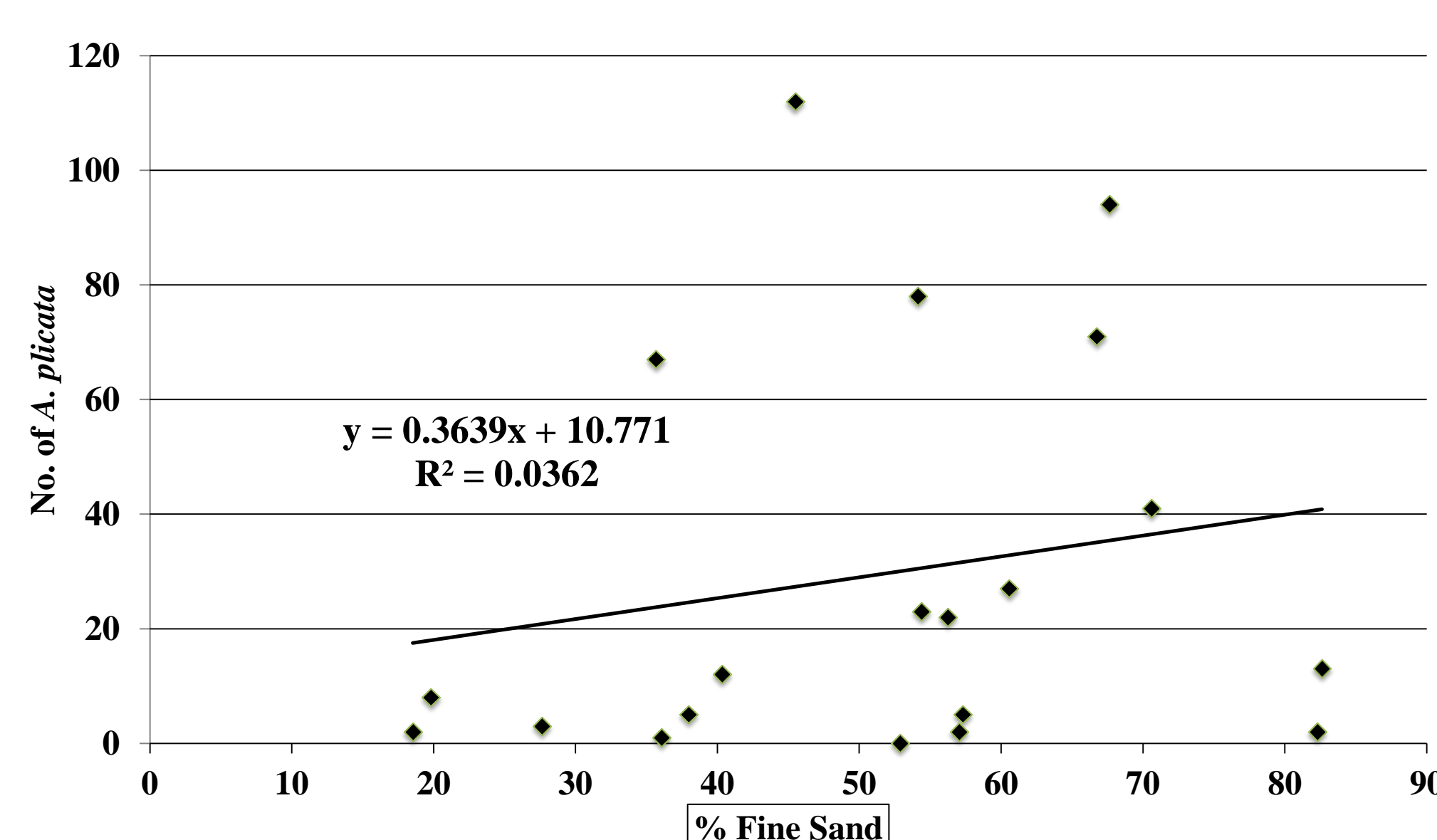
Mean Unionid density = 20.8 ± 9.6/m²

- A low-density mussel bed
- Species richness = 6 for live unionids
- Shannon-Weaver Index (H') = 1.37
- Simpson's Index of Diversity (1-D) = 0.68

Mean *Dreissena polymorpha* (zebra mussel) density in substrate = 116 ± 45.2/m²

Mean *Corbicula fluminea* (Asian clam) density in substrate = 10.0 ± 7.6/m²

% Fine Sand vs. *A. plicata*



Habitat Correlations

Significant Positive Correlations (p ≤ 0.05)

- Current velocity & particle size > 0.425 mm
- Dissolved oxygen & pH
- Pyganodon grandis* & < 0.075 mm particle size
- Obovaria olivaria* count & current velocity
- Quadrula quadrula* count & depth

Significant Negative Correlations (p ≤ 0.05)

- Current velocity & particle size < 0.075 mm
- Large particle size & small particle size
- Amblema plicata* & > 0.425 mm particle size
- Pyganodon grandis* & > 0.425 mm particle size
- Obovaria olivaria* & < 0.075 mm particle

Species Correlations

Significant Positive Associations (p < 0.05)

- Amblema plicata* & *Fusconaia flava*
- Amblema plicata* & *Obliquaria reflexa*
- Amblema plicata* & *Quadrula pustulosa*
- Obliquaria reflexa* & *Quadrula pustulosa*
- Obliquaria reflexa* & *Fusconaia flava*

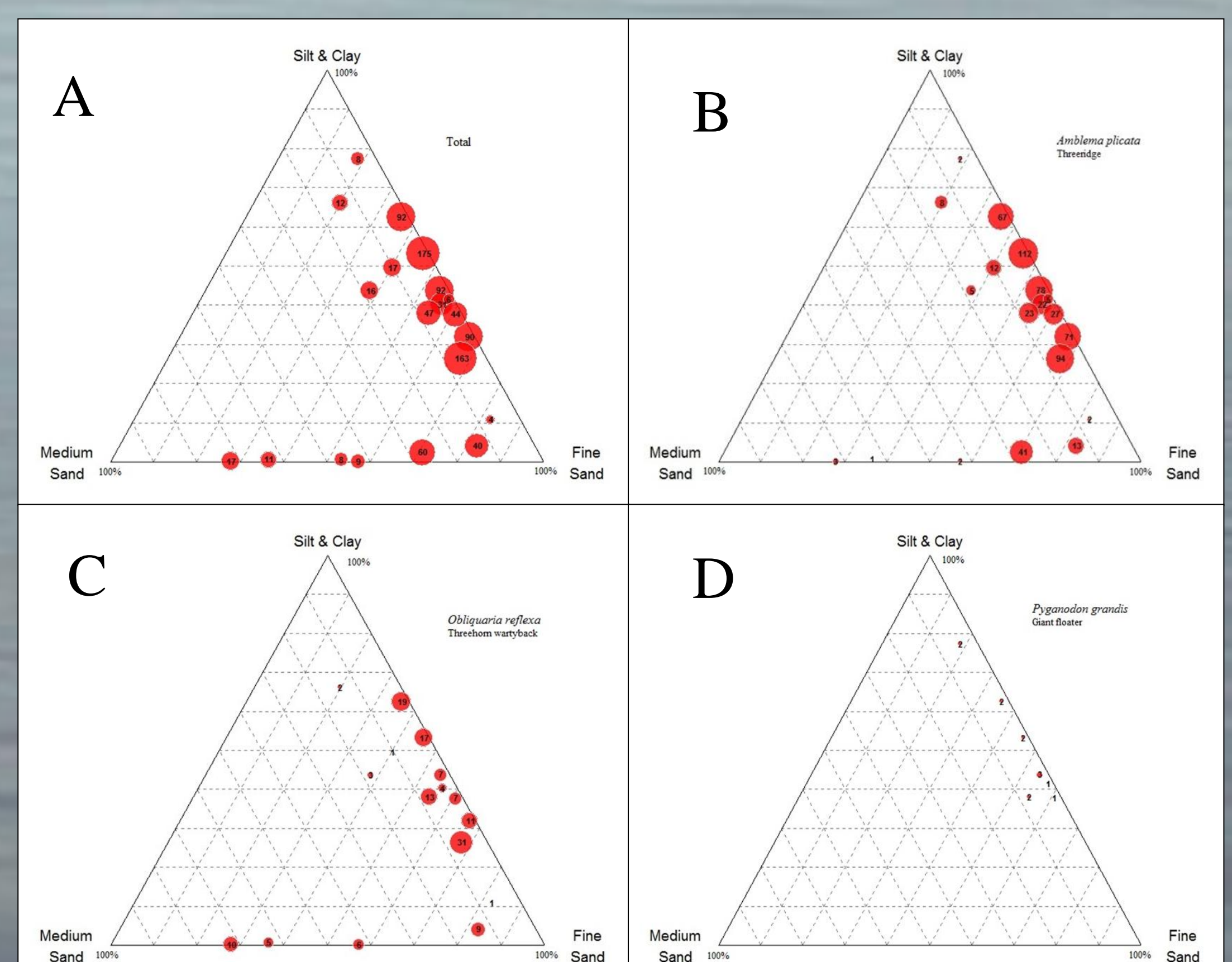


Figure 1: Ternary-bubble plot showing mussel community distribution relative to substrate particle size for: (A) the total community, (B) *Amblema plicata*, (C) *Obliquaria reflexa*, and (D) *Pyganodon grandis*.

DISCUSSION

- This preliminary study has become part of a conservation plan approved by the Illinois Department of Natural Resources addressing the state threatened black sandshell (*Ligumia recta*) and butterfly (*Ellipsaria lineolata*).
- For species that were not represented by many individuals, their preferred sediment substrate appeared to be somewhat different from the more common species.
- The single butterfly mussel, *Ellipsaria lineolata*, was collected in site 18, a site with a relatively high percentage (18.3%) of medium-high sand grains.
- Quantitative information on the preferred habitat characteristics of mussel species, such as this, may be valuable to identify where species may be found and determine sites for successful relocation of threatened and endangered mussels.