



# Benthic Communities in Stormwater Retention Basins in Williamsburg, VA

Emma Wear, Illinois Wesleyan University  
Greg Capelli, William and Mary, Advisor  
Summer 2006 REU

# Introduction

- Limited information about retention pond communities
- Colonization mechanisms of many aquatic organisms not well-known
- General goal: To determine community composition of retention ponds

# Preliminary hypotheses

Older ponds will possess a more diverse assemblage of benthic macroinvertebrates.

Organisms with flighted life stages will colonize ponds more rapidly than those without obvious transportation mechanisms.



# Study sites

Colonial Heritage – Old Lock	2004	Crim Dell
Kensington Woods	2004	Lake Matoaka
Colonial Heritage – Pinebrook	2002	
Pointe at Jamestown	2002	Dog Farm
Ironbound Village	2001	
Mulberry	2001	
Monticello	2000	
Riverside Health Care Center	2000	
Route 5	1999	
Target	1998	
Greensprings Plantation	1997	
Governor's Land	1996	
Jamestown High School	1995	



PINEBROOK

OLD LOCK

MULBERRY

IRONBOUND

TARGET

MATOAKA

CRIM DELL

MONTICELLO

DOG FARM

GREENSPRINGS

RTE 5

RIVERSIDE

GOVERNORS LAND

JTHS

POINTE

KENSINGTON













# Characterization

- Structural parameters:  
Size and shape, surrounding land use, emergent and other vegetation
- Chemical parameters:  
Temperature, conductivity, dissolved oxygen, pH, suspended sediment, nitrate, ammonia, phosphate, total phosphate
- Presence/absence of fish using baited minnow traps



# Methods

- 5 sets of 4-1 m. sweeps with D-ring dip net



# Methods

- 5 sets of 4-1 m. sweeps with D-ring dip net
- Hand-picking



# Methods

- 5 sets of 4-1 m. sweeps with D-ring dip net
- Hand-picking
- Identification to lowest practical taxonomic level – usually family



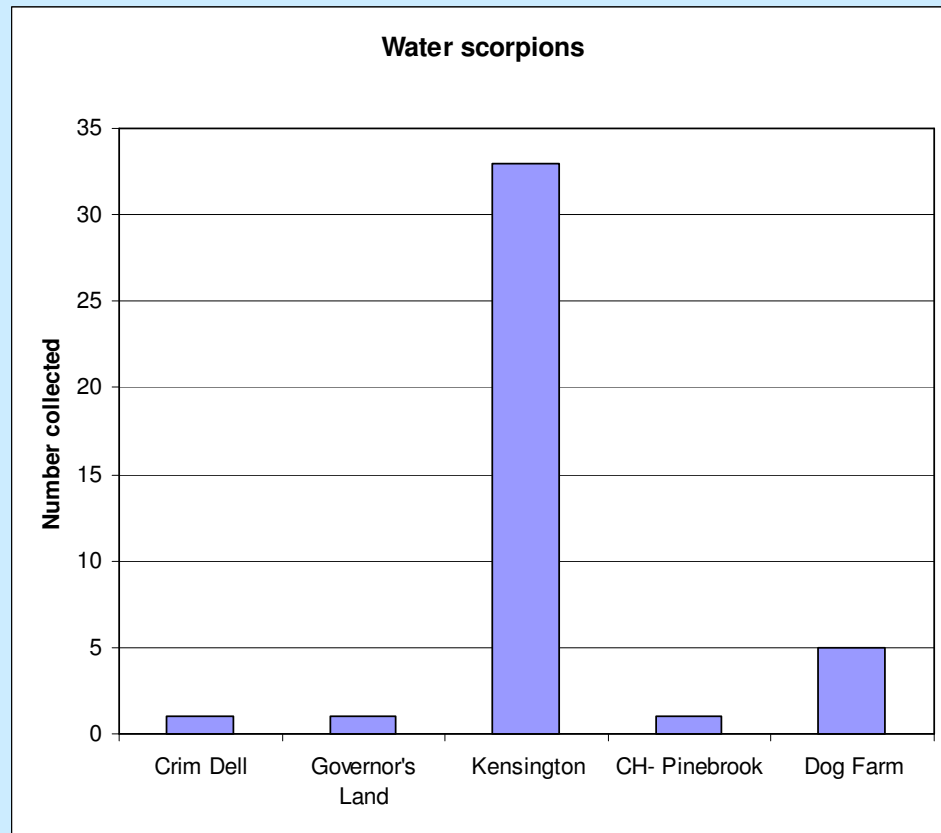


# Results

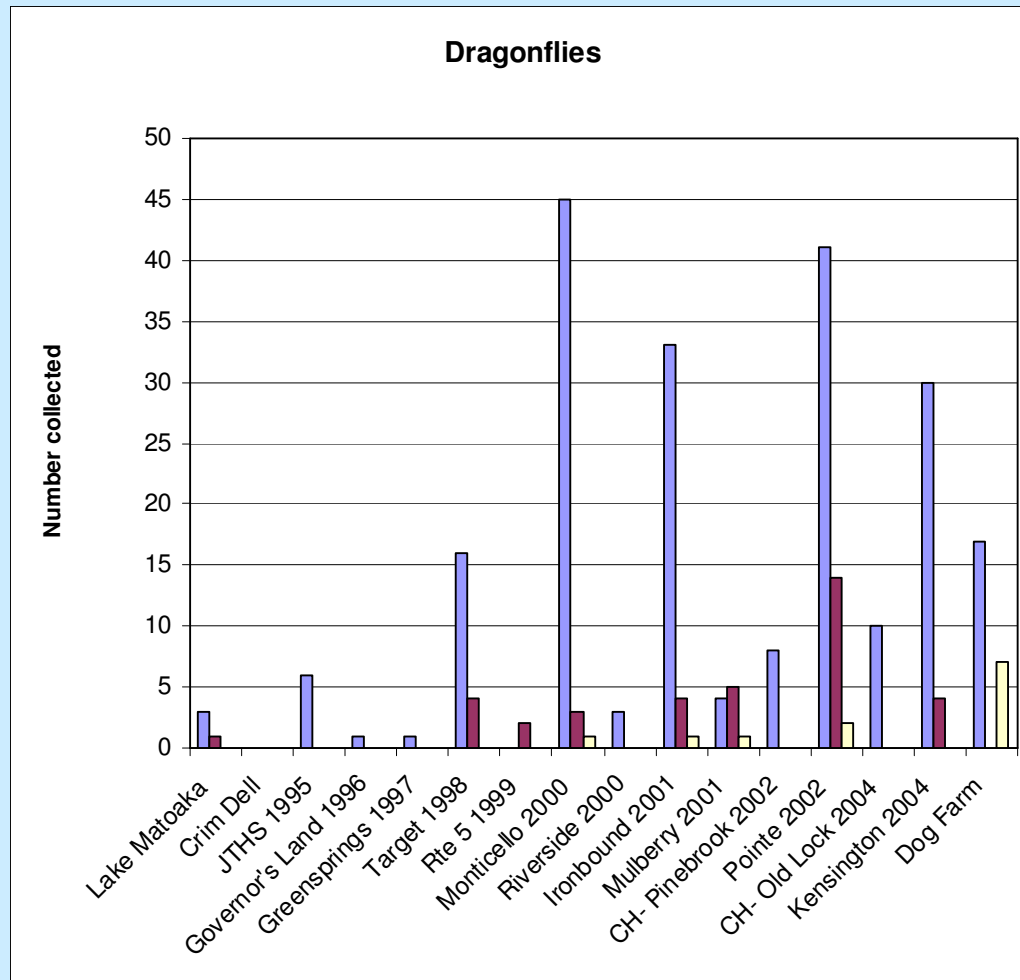
<b>Study site</b>	<b>Number of organisms in sample</b>	<b>Number of taxa in sample</b>
Lake Matoaka	201	25
Crim Dell	64	9
Retention ponds	30 - 268	8 – 19 (39 taxa overall)



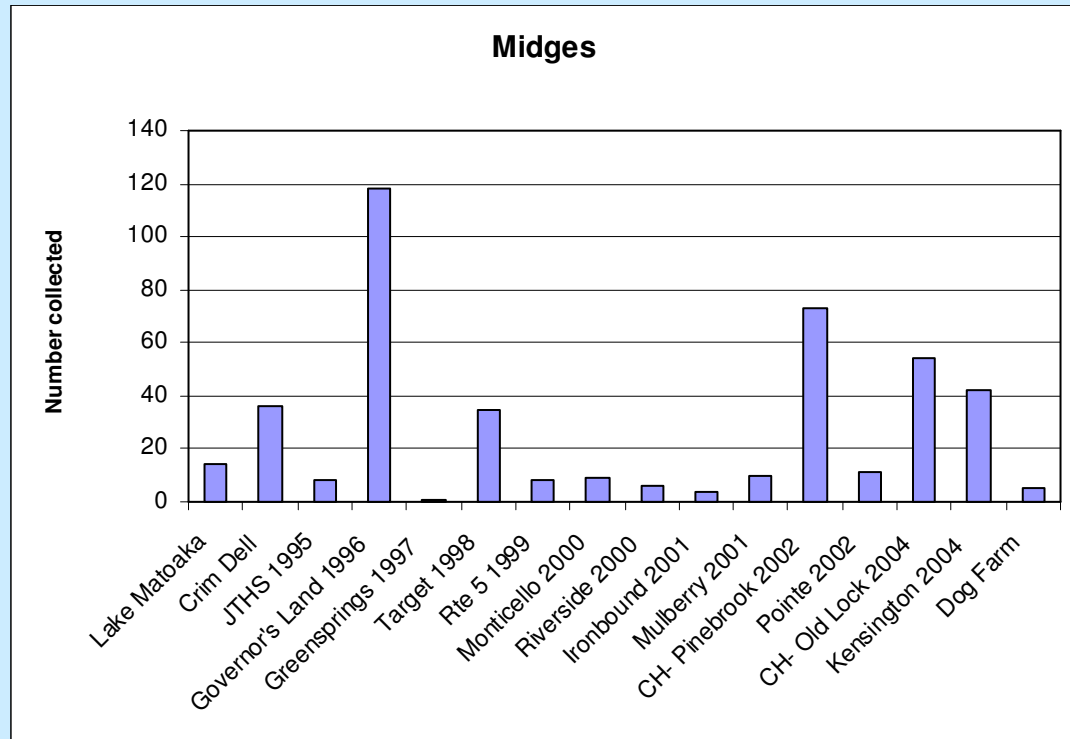
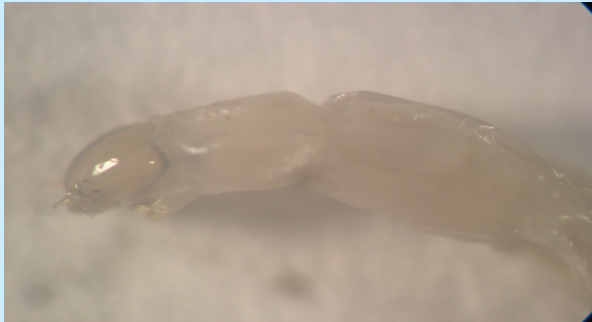
# Variation in ponds



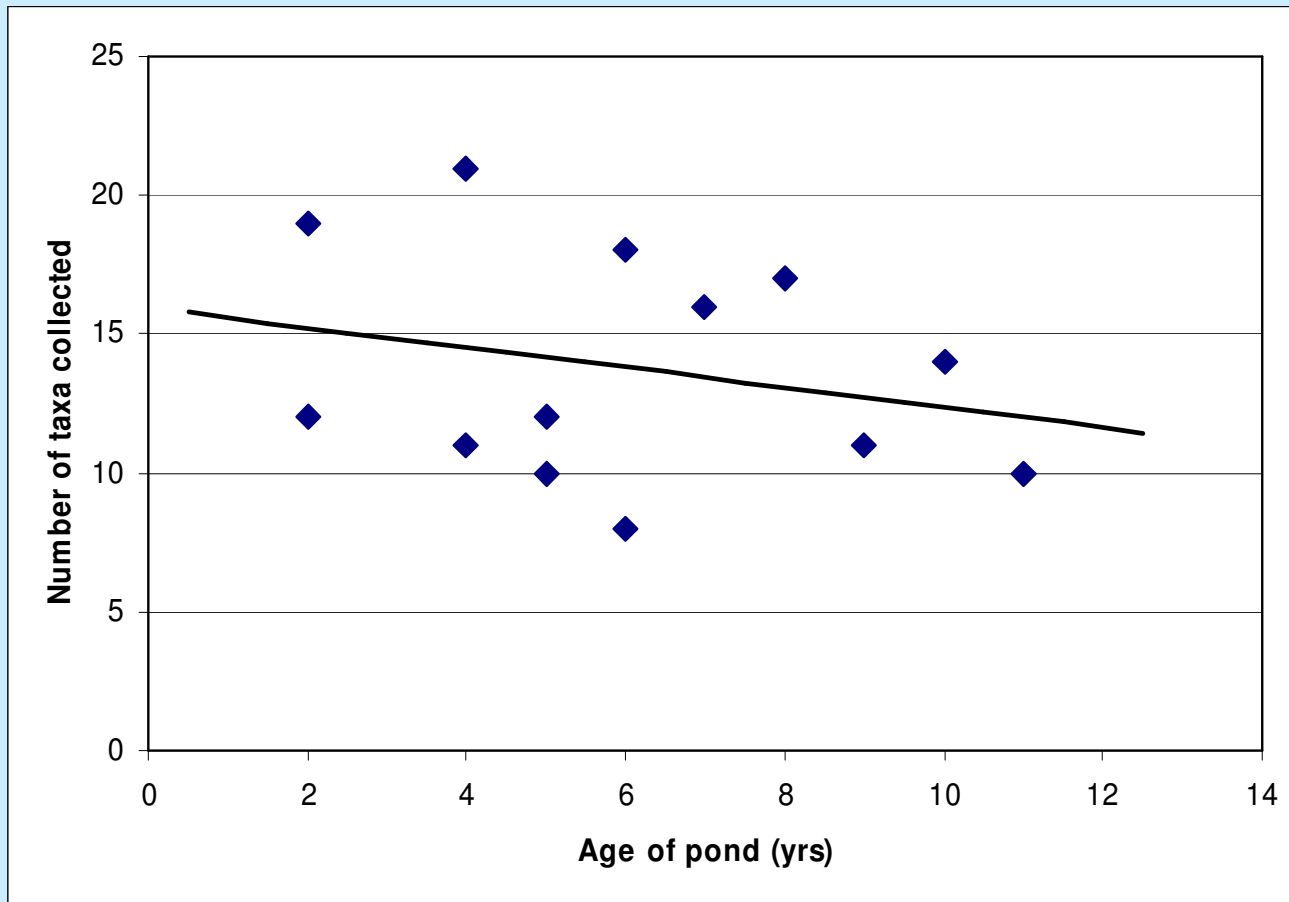
# Variation in ponds



# Variation in ponds

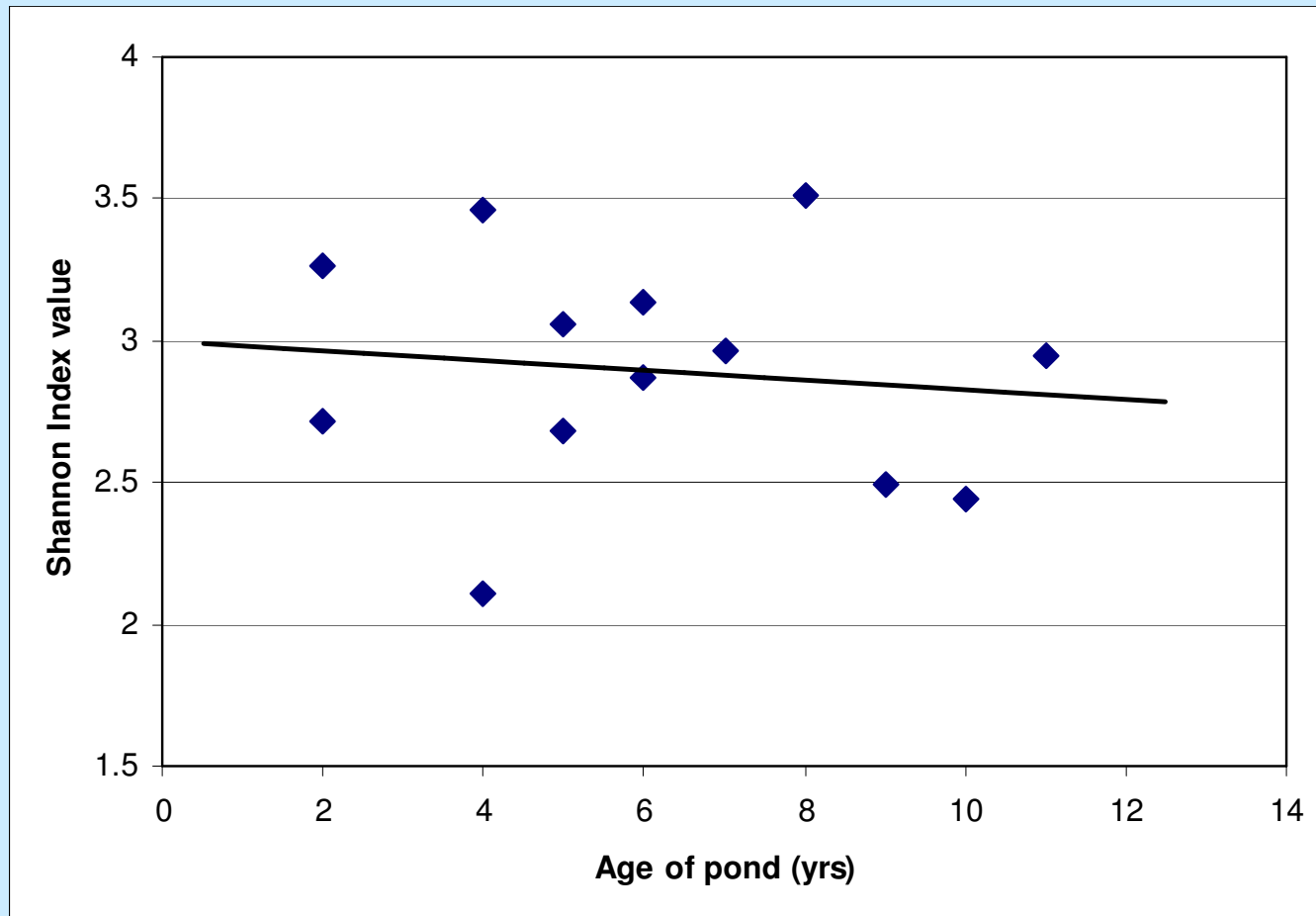


# Diversity: Taxa richness



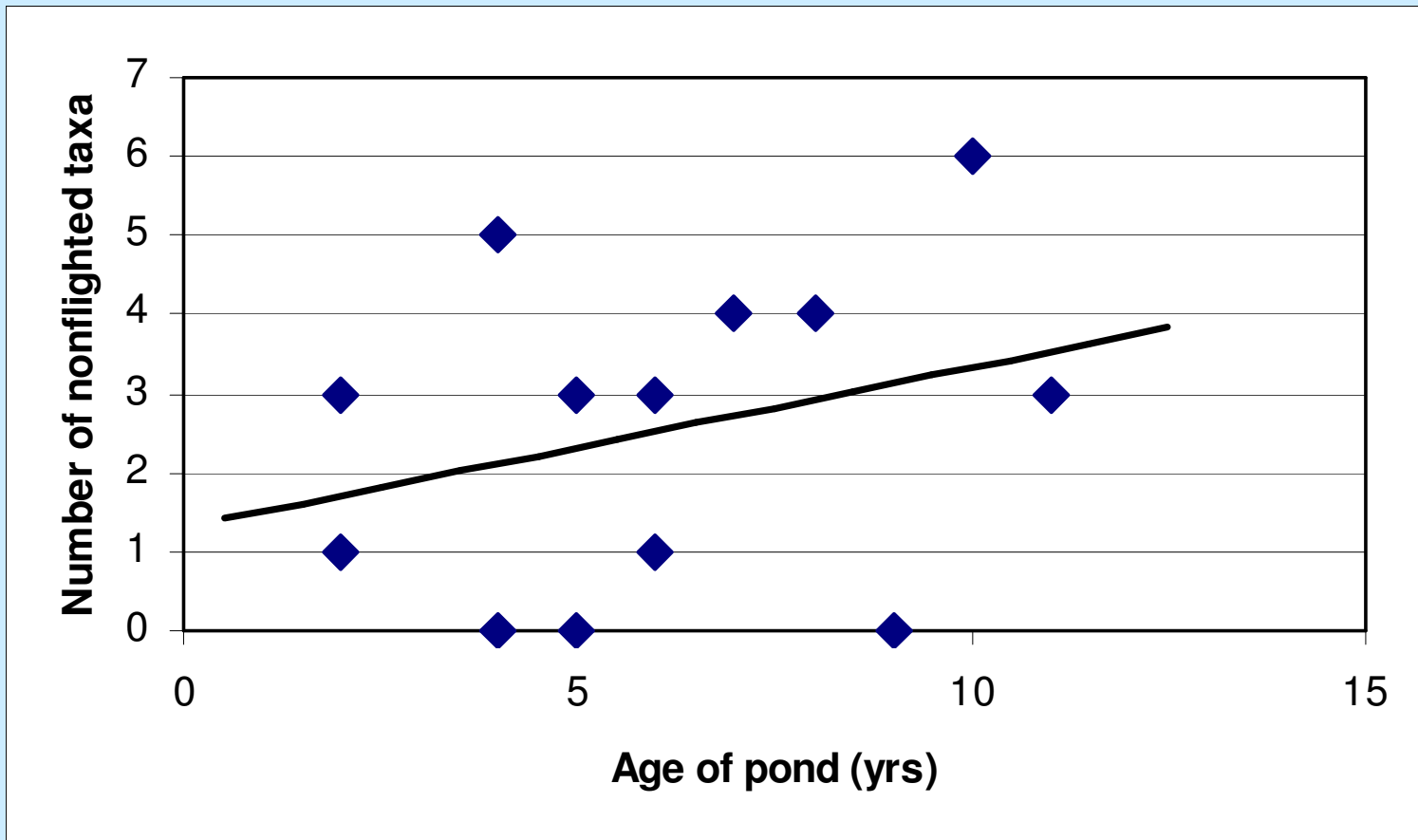
$r = -.252, p = .406, N = 13$

# Diversity: Shannon Diversity Index



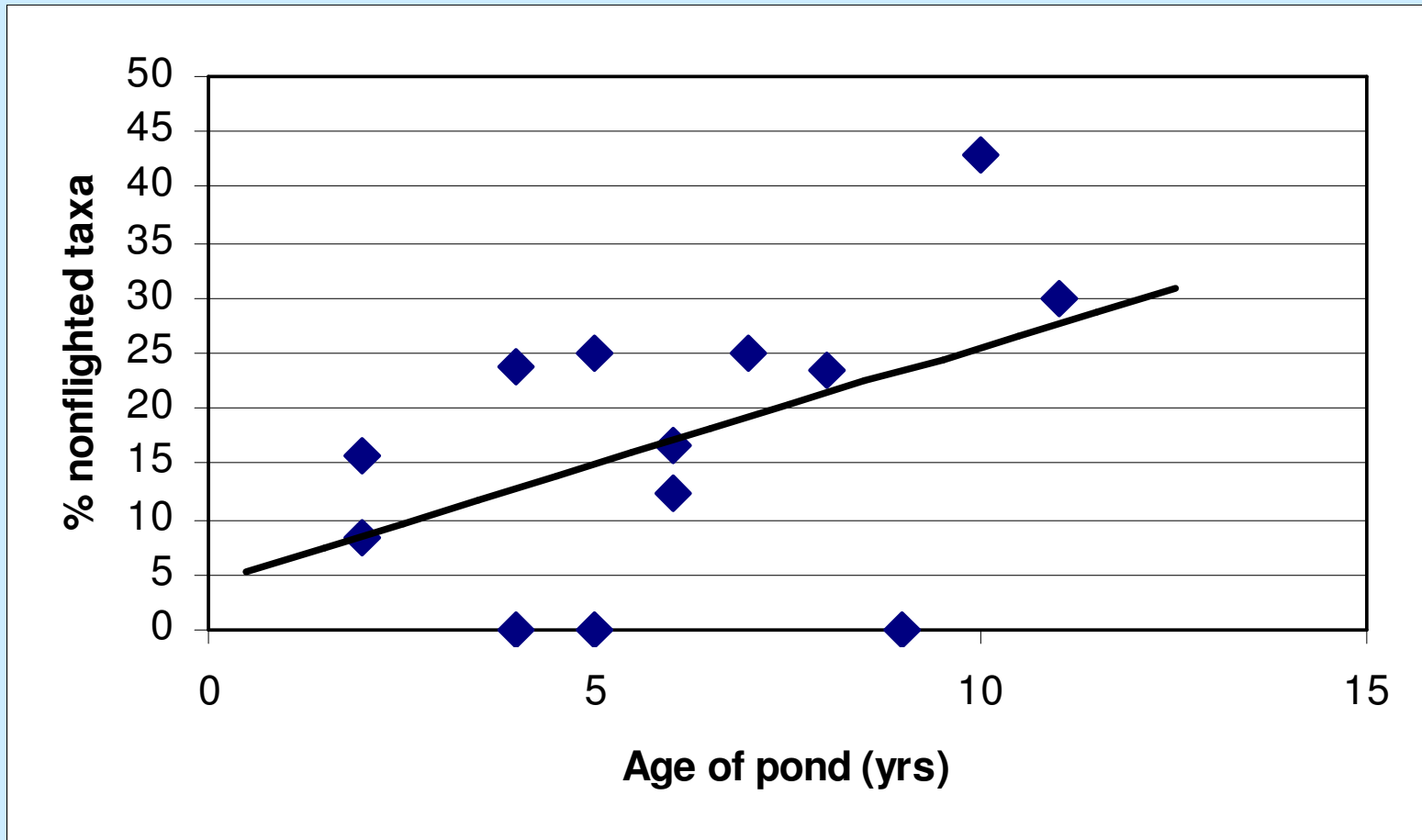
$r = -.121$   $p = .695$ ,  $N = 13$

# Nonflighted taxa and age



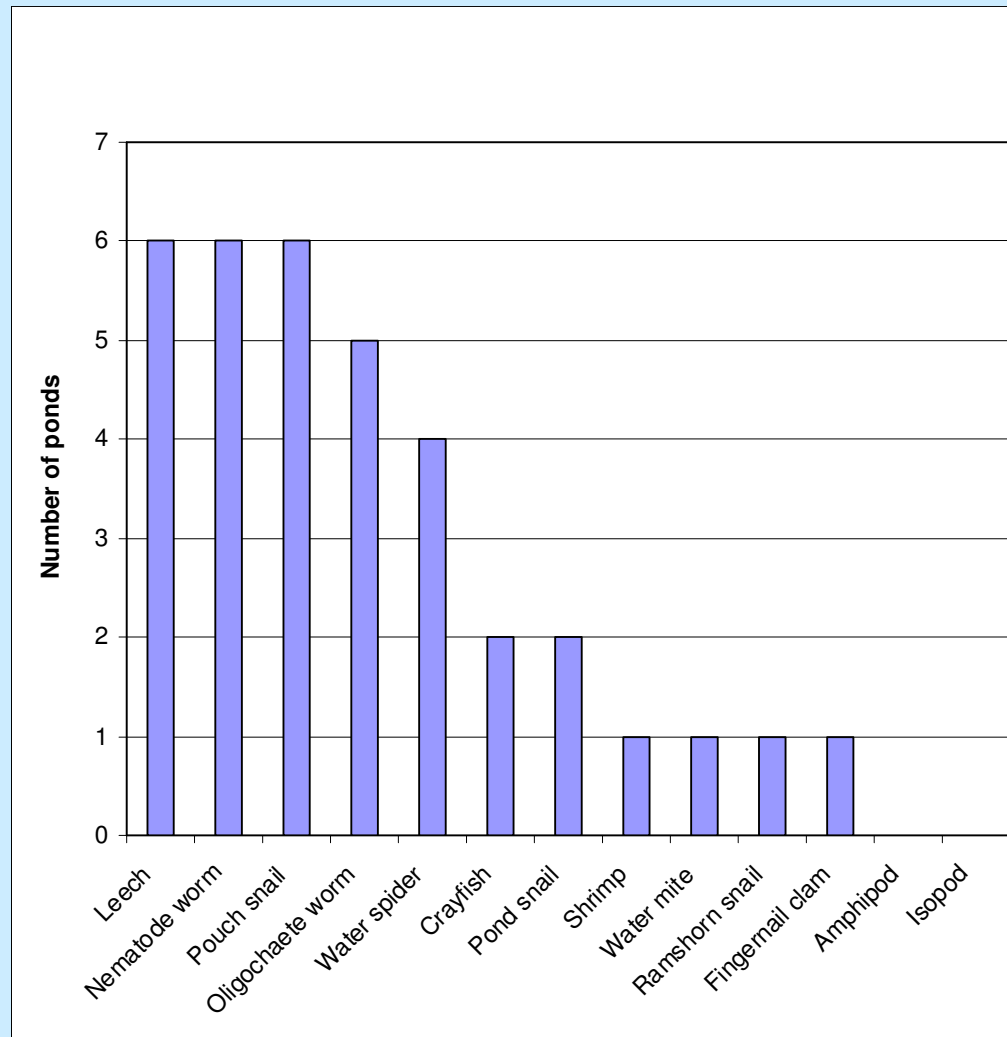
$r = .288, p = .341, N = 13$

# Percent nonflighted taxa and age



$r = .469$ ,  $p = .106$ ,  $N = 13$

# Frequency of nonflighted taxa in retention ponds

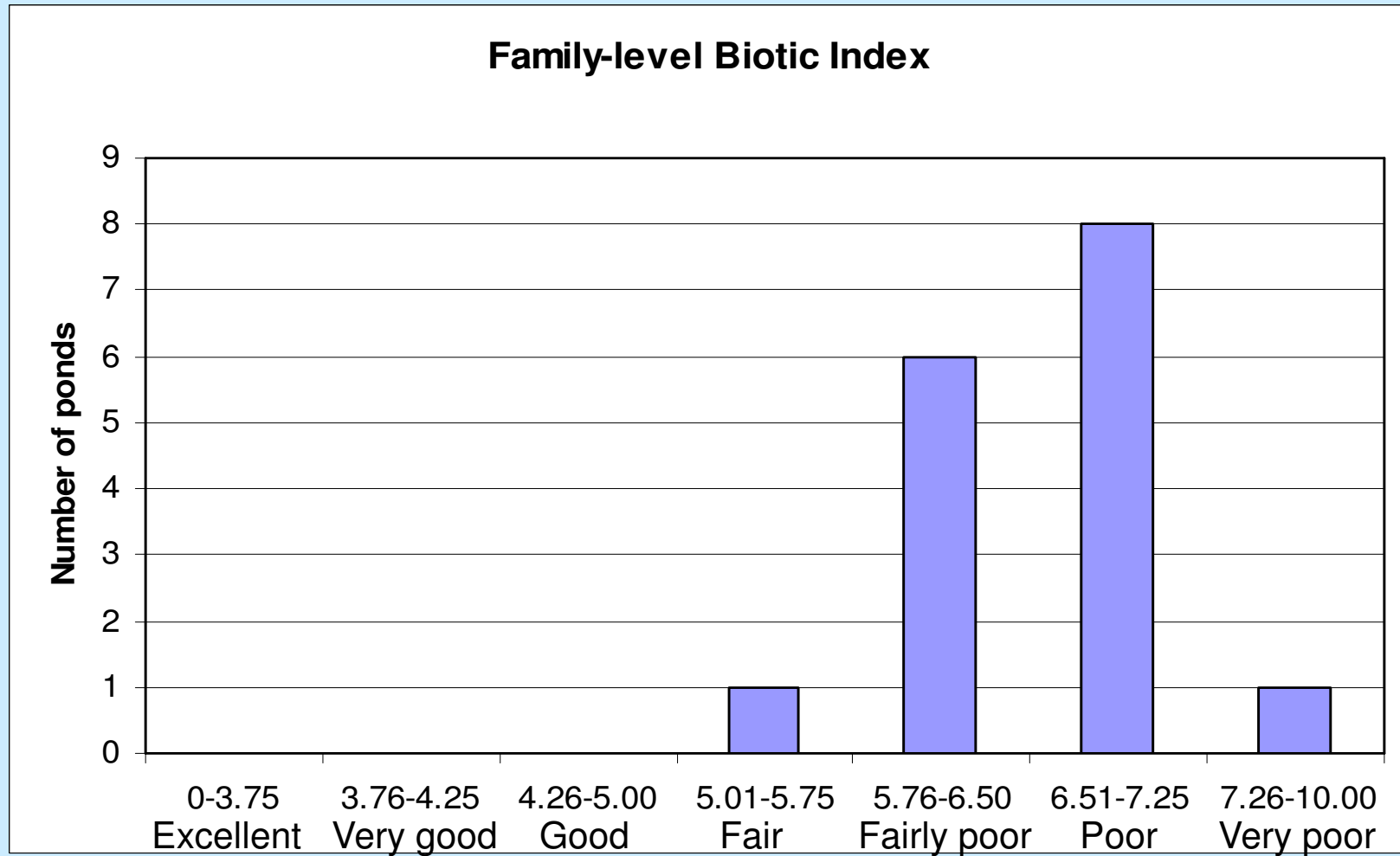




# Fish

	Fish present	Fish not present	t value	p value
Mean number of organisms	116	152	-.881	.393
Mean number of taxa	14	15	-.384	.707
Mean Shannon Diversity Index	2.924	2.898	.107	.916

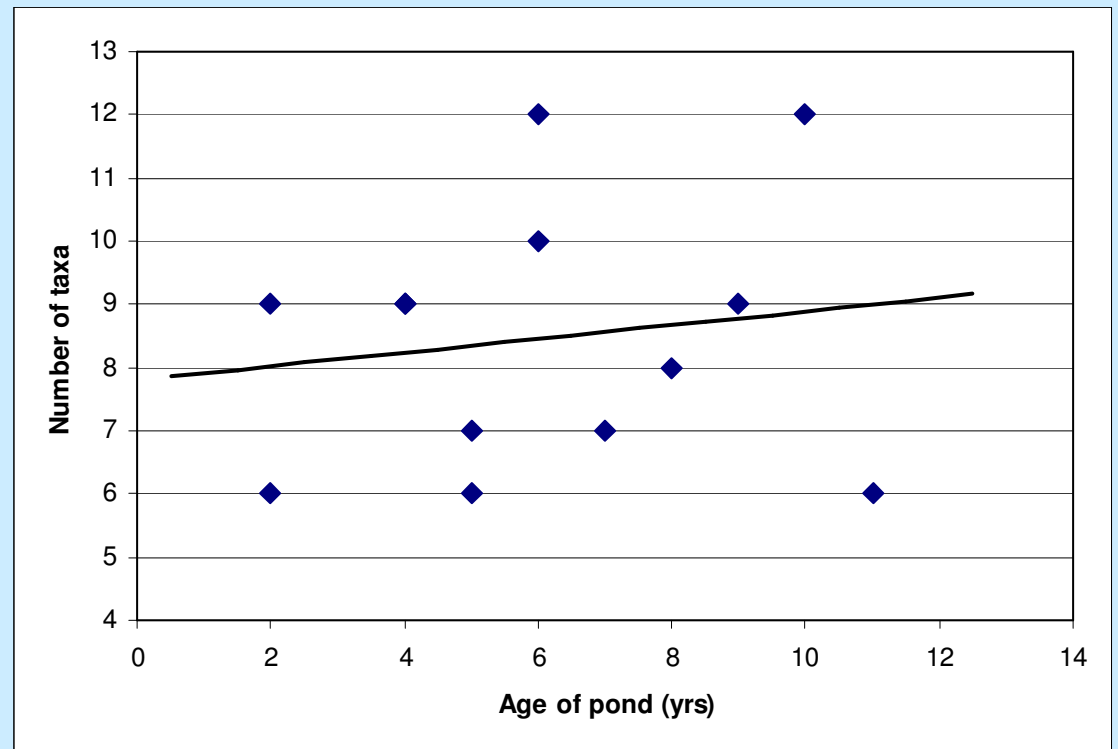
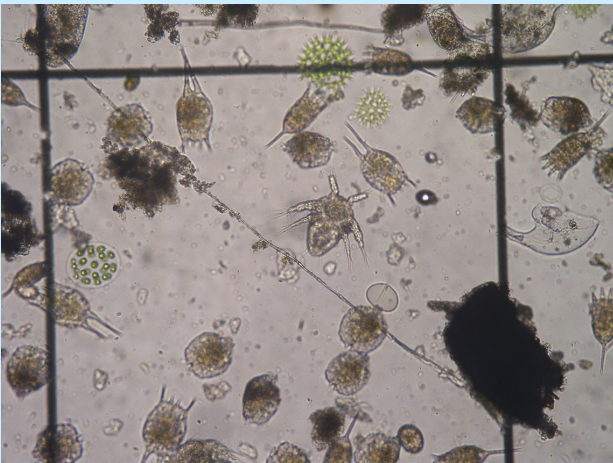
# Water quality



# Conclusions

- Age does not appear to be a significant factor in diversity of macroinvertebrates
  - Ponds relatively young
  - Trend toward higher diversity of nonflighted organisms with age
- Presence/absence of fish not a factor
- Water quality likely a key factor that merits further inquiry

# Plankton



$r = .150, p = .626, N = 13$

# Acknowledgements

- Emily Hathaway for water quality analysis
- Timothy Russell for GPS and GIS guidance