

## Supplementary material

### Appendix 1

Mean catch per unit effort (biomass  $\times$  dipnet  $\text{min}^{-1}$ ) for snail species collected on E. S. George Reserve and Pinckney State Recreation Area sites. All species except of *Helisoma campanulata* and *Gyraulus crista* reach their peak abundance in May or June.

Species	May	June	July
<i>Ferrissia</i> sp.	0.023	0.097	0.017
<i>Laevapex fuscus</i>	0.043	0.045	0.017
<i>Amnicola limosus</i>	0.408	0.793	0.121
<i>Amnicola walkeri</i>	0.321	0.872	0.079
<i>Pyrgulopsis lustrica</i>	0.075	0.279	0.024
<i>Fossaria obrussa</i>	0.325	0.192	0.041
<i>Fossaria parva</i>	0.105	0.126	0.025
<i>Pseudosuccinea columella</i>	0.166	0.098	0.134
<i>Stagnicola elodes</i>	0.590	0.359	0.209
<i>Aplexa elongata</i>	0.863	1.474	0.670
<i>Physa</i> sp.	0.328	0.916	0.326
<i>Gyraulus circumstriatus</i>	0.394	0.229	0.051
<i>Gyraulus crista</i>		0.017	0.025
<i>Gyraulus deflectus</i>	0.160	0.100	0.102
<i>Gyraulus parvus</i>	0.576	0.489	0.098
<i>Helisoma anceps</i>	0.171	0.205	0.097
<i>Planorbella campanulata</i>	0.269	0.368	0.463
<i>Planorbella trivolvis</i>	0.163	1.068	0.660
<i>Planorbula armigera</i>	0.175	0.552	0.181
<i>Promenetus exacuouus</i>	0.339	0.807	0.241
<i>Promenetus umbilicatellus</i>	0.763	0.259	0.170
<i>Valvata tricarinata</i>	0.135	0.089	0.058
<i>Cipangopaludina chinensis malleata</i>	0.090	0.067	0.075
<i>Viviparus georgianus</i>	0.017		0.017

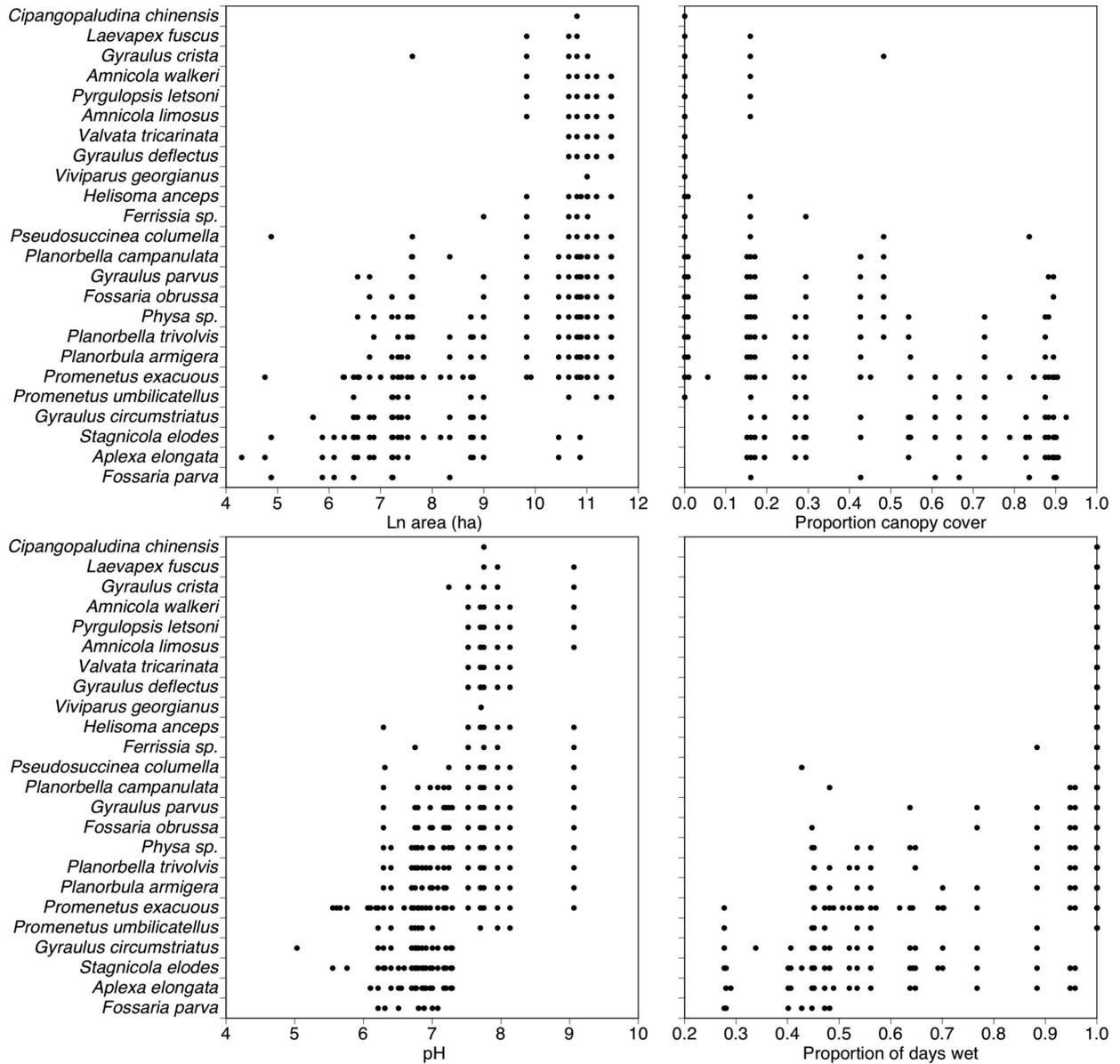
## Appendix 2

### Sampling efficiency of the E. S. George Reserve and Pinckney State Recreation Area ponds for freshwater snails

We computed 95% detection threshold curves as a function of snail density. To calculate these curves, we first needed an estimate of our total sampling effort at each site, which consisted of both pipe and dipnet sampling. We constrained this analysis to sites on the E. S. George Reserve in which we had conducted both pipe and dipnet sampling. Using cases in which snail species were collected in the pipe and dipnet samples, we regressed pipe density estimates against individuals captured per person-minute of dipnetting. Pooling all snail species, the slope of the regression was 1.66 ( $R^2 = 0.558$ ,  $p < 0.001$ ) indicating that we collected 1.66× more snails in a minute of dipnetting than with a single pipe sample. Since our protocol equalized the number of pipe samples taken to the person-minutes of dipnetting, our total sampling effort (i.e., pipe equivalents) at each site was 2.66× the number of pipes. Assuming that snails are randomly distributed in a pond, we used the Poisson distribution to calculate a 95% detection threshold for snails. For our analyses of detection probabilities, we calculated the mean sampling effort (i.e. pipe equivalents) in two ways: first by averaging effort across ponds within a year and then across years (2001–2007) and second, by summing the total sampling effort within a pond across 2001 to 2007 and then averaging across ponds. Based on the average yearly effort across ponds (165 pipe equivalents/site), our 95% detection threshold for a species occurred at a density of 0.30 snails  $m^{-2}$  (SE = 0.04 snails  $m^{-2}$ , range = 0.08–1.14 snails  $m^{-2}$ ). Based on the average cumulative effort (i.e. summed effort across years) across ponds (886 pipe equivalents site<sup>-1</sup>), our 95% detection threshold for a species occurred at a density of 0.05 snails  $m^{-2}$  (SE = 0.006 snails  $m^{-2}$ , range = 0.02–0.17 snails  $m^{-2}$ ). Together, these results provide strong evidence that we are sampling effectively for snail presences and absences even for low-density populations.

# Appendix 3

Snail species distributions as a function of pond area, canopy cover, pH, and hydroperiod.



## Appendix 4

Incidence matrix for the E. S. George Reserve non-permanent pond sites. The incidence matrix was ordinated using reciprocal averaging implemented by the program of Leibold and Mikkelson (2002). Solid areas indicate that a species was present in that habitat at least once over the survey duration.

Pond	Species													
	<i>Pseudosuccinea columella</i>	<i>Promenetus exacucous</i>	<i>Fossaria parva</i>	<i>Stagnicola elodes</i>	<i>Aplexa elongata</i>	<i>Gyraulus circumstriatus</i>	<i>Planorbella campanulata</i>	<i>Promenetus umbilicatellus</i>	<i>Planorbula armigera</i>	<i>Planorbella trivolvis</i>	<i>Physa sp.</i>	<i>Fossaria obrussa</i>	<i>Gyraulus parvus</i>	<i>Ferrissia sp.</i>
Uzzell's #1	■	■	■	■										
Buck Hollow		■												
Cassandra Pond East		■												
Star Pond		■												
Uzzell's #4		■												
Cassandra Bog West		■		■										
Dreadful Hollow		■												
West Woods Big		■												
Cattail Marsh		■		■										
West Woods Little		■		■										
Red Maple Swamp		■												
North Fence Pond		■	■											
North Fence Swamp		■	■											
Gravel Pit Pond		■	■			■		■						
Ilex Pond		■	■		■			■	■					
Aspen Grove Pond		■	■		■			■			■			
Crescent Pond		■	■		■			■	■					
Spring Pond South		■	■		■			■						
Willow Pond		■	■	■		■		■						
Buffer Zone Marsh		■	■	■		■		■	■					
Spring Pond North		■	■			■		■		■		■		
Southwest Woods		■	■			■		■	■		■	■		
West Marsh # 06		■	■			■		■	■		■	■		
West Marsh # 10		■	■			■		■	■		■	■		
West Marsh # 11		■	■			■		■	■		■	■		
Gravel Pit Marsh		■	■			■		■	■		■	■		
Fishhook Marsh		■	■			■		■	■		■	■		
Dreadful Swamp		■	■			■		■	■		■	■		
West Marsh Dam		■	■			■		■	■		■	■		