



Spring 2006 BSES Senior Research Symposium



20 April, 2006

BSES Spring Research Symposium

I welcome you to the Spring 2006 BSES Research. This event marks the gathering of students and faculty associated with the BSES degree program, a joint endeavor of the College of Arts and Sciences and the School of Public and Environmental Affairs. It is a time to showcase the accomplishments of students who have been working for the past year on a significant research project. It is also a time to remember those students who have gone before and to inspire those students who will come after.

One of the cornerstones of the BSES degree program is the opportunity for students to undertake a significant research project at the end of their undergraduate experience. The efforts of students finishing their research in May, 2004 are reported in this volume. The dedication of both the students who completed this research and the faculty members who mentored these young scientists must be applauded. All of these individuals have proven their dedication to the pursuit of scientific learning through their participation in this process. There are also a large number of additional individuals who need to be recognized including the graduate students, research scientists, and technical support personnel who play significant roles in the nurturing of these young scientists. For these contributions we are grateful; without support from the Bloomington research community, the scientific endeavors of BSES students could not be as successful as they have been.

I am proud to be a part of this process.

Dr. Bruce J. Douglas, Director

BSES Program Committee:

Debra Backhus, SPEA; Ben Brabson, Physics; Keith Clay, Biology;
Flynn Picardal, SPEA; Scott Robeson, Geography

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Griffy Lake winter drawdown simulation: how long does it take to kill *Egeria densa*.

April Arroyo Monroe

Advisor: Vicky Meretsky, SPEA

Egeria densa is an invasive aquatic plant native to South America. It was introduced into the US in 1893. It was first found in Griffy Lake in Monroe County, IN, in 2001. Griffy Lake is the only lake on public land in Indiana to contain it. Due to the species ability to reproduce vegetative through drifting fragments, it is of major management concern. One suggested method of control is winter drawdown, during which the pond or lake water is drained, drying and freezing the plants. I simulated winter drawdown by transplanting *E. densa* plants and Griffy Lake sediment to containers in an environmental chamber. I drained the containers through holes in the bottom and set the environmental chamber to 0°C. The lights were set on 10 hour days. Plants were frozen for 7, 10, or 15 days, after which they were allowed to thaw and then were transferred to a common aquarium where they rehydrated. One plant from the 7-day group survived this process; all other plants died. Clearly, winter drawdown has potential to control *E. densa* in natural settings. Expense and ecological impacts to other species may affect the decision to conduct a drawdown.

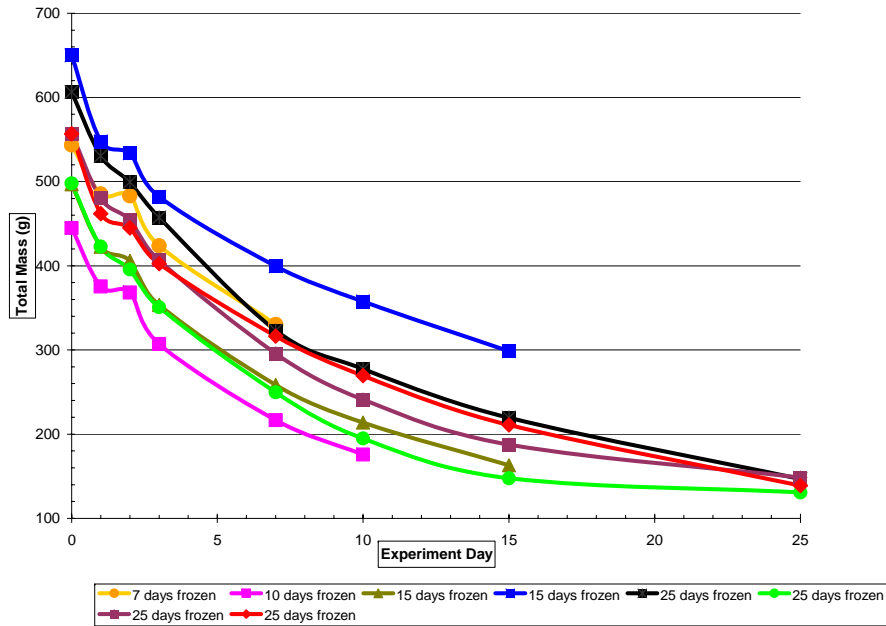


Figure: Mass (g) of experimental groups during the freezing period of the experiment.

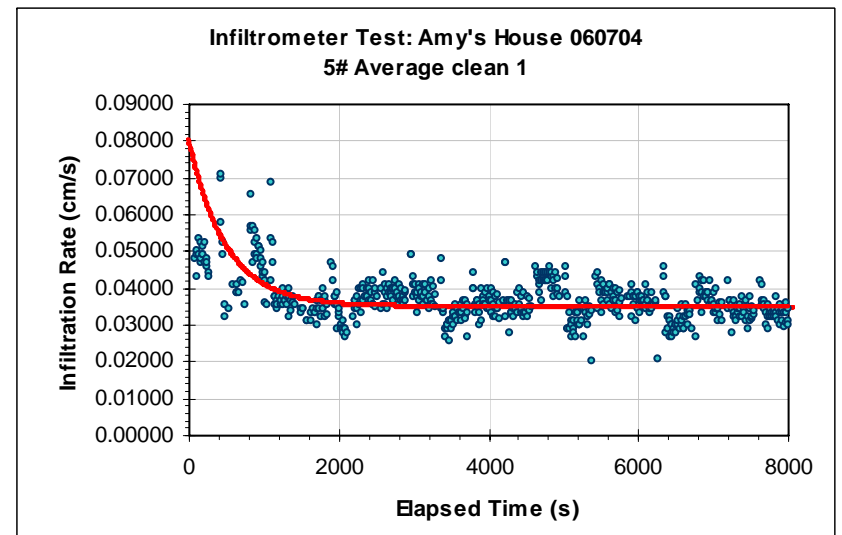
This graph shows our infiltration data collected in the field with the infiltration capacity curve fitted to the data to show a correlation.

Cicada Brood X and their influence on soil infiltration.

Ted Derheimer

Advisor: Greg Olyphant, Geological Sciences

The summer of 2004 here in Bloomington was accompanied by a mass emergence of the cicada brood X. This brood is the largest of all cicada broods, and temporarily altered our ecosystem. As the cicadas started their emergence from the ground they leave holes, or tunnels leading deep into the soil. These tunnels changed the rate of soil infiltration, and with that changed the water balance in the ecosystem. Brood X temporarily altered our ecosystem by changing infiltration capacities, ultimately changing the surface runoff and the change in soil water storage.



Effects of tidal restriction on sediment and nutrient accumulation in a tidal salt marsh.

Jillian Bertram

Advisor: Chris Craft, SPEA

I measured concentrations, accretion, and accumulation of soil organic carbon (C), nitrogen (N), and phosphorous (P) at locations upstream and downstream of a levee and bridge across the Dean Creek (GA) salt marsh to investigate the effects of historical tidal restriction on marsh accretion, sediment deposition, and nutrient retention. Four 30 cm soil cores were taken from either side of the bridge and then divided into 2 cm depth increments which were analyzed for bulk density, organic C, total N, and total P. The depth increments were also analyzed for Cs-137 and Pb-210 to obtain short and long-term accretion rates. Soils upstream of the restriction had greater bulk densities (0.55g/cm^3), more P (680 ug/g), less organic C (3.0%), and less N (0.19%) than the downstream soils (0.42g/cm^3 , 480 ug/g P, 5.5% organic C, and 0.34% N). Upstream soils also contained more sand (70%), less clay (6%), and less organic matter (8%) than the soils downstream of the restriction (64% sand, 11% clay, and 11% organic matter). Accumulation of organic carbon and nitrogen in the upstream soils ($26\text{g/m}^2/\text{yr}$ C and $1.7\text{g/m}^2/\text{yr}$ N) were half that of the downstream soils ($59\text{g/m}^2/\text{yr}$ C and $3.4\text{g/m}^2/\text{yr}$). My results suggest that historical tidal restriction has reduced the accretion rate and nutrient

accumulation in the upstream marsh over the past 40 years. Results from this study will be used to gauge the benefits of restoring tidal flow on marsh accretion and soil processes after the old culvert bridge is replaced with a spanning bridge.