Urban Ecology: Redesign on the Fly

Nathan Rycroft* and Angela M. Seliga, PhD

Department of Biology, Boston University, Boston MA

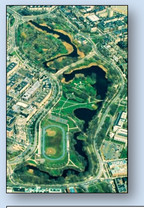
*nrycroft@bu.edu

What is BIOBUGS?

- Biology Inquiry and Outreach with Boston University Graduate Students (BIOBUGS) is an outreach program to encourage local high school (HS) students to become excited about science by:
  1) exposing them to sophisticated scientific equipment
  2) providing interaction with graduate students who utilize that equipment in their research, and
  3) introduce them to a university campus and laboratory environments.
- Since Fall 2006, BIOBUGS has 5 modules designed by GK-12 Fellows.
  1) One module, Outbreak, is a major workshop at ABLE this year.
  2) For more information about the program, see our website: http://www.bu.edu/lernet/biobugs/.
- Participation in BIOBUGS aids in the training of our graduate students to become better teaching fellows (TFs) by:
  1) Teaching in a classroom with a demographically unfamiliar and diverse audience, which allows exploration of new teaching techniques modification of previously used methods.
  2) Presenting material that is novel or unfamiliar as the modules are outside of research or coursework backgrounds.
  3) Affording the opportunity to refine methods in a lower risk, lower pressure environment.

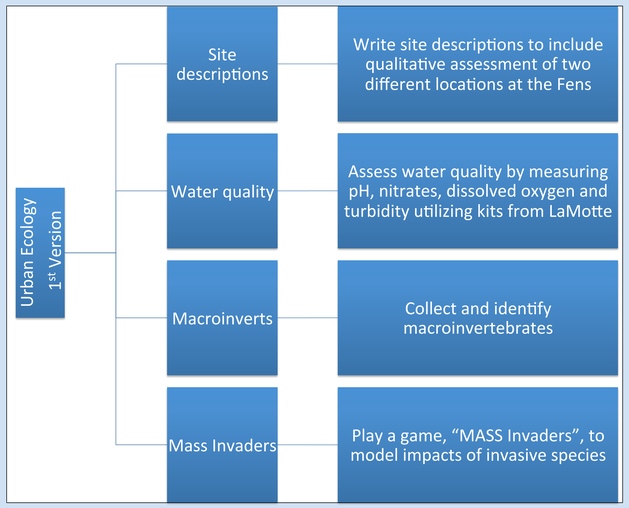
Urban Ecology – 1st Version

Developed in Spring 2010, this BIOBUGS module allowed HS students to experience ecology from a new perspective.



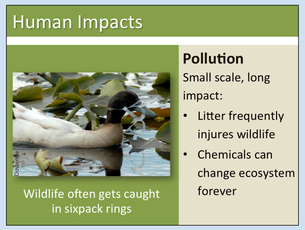
The module was based around the Fens (left panel), a city park within easy walking distance from our science building. HS students assessed the ecosystem of this managed and thus very disturbed site (right panel).

For all versions of Urban Ecology, the design of the modules are found in the flow charts organized as follows: 1st columns indicate the version, 2nd columns are activity titles, and 3rd columns briefly describe the purpose and procedure. For additional information, please contact the authors for detailed Preparation Notes for teaching and support staff, Student Worksheets, PowerPoint presentations, and Evaluation Forms.



Urban Ecology – 2nd Version

- The 1st version was functional, but disjointed, and did not meet the objectives of the BIOBUGS program.
- In Spring 2012, a Task Force of eight biology graduate students and staff with various teaching and research backgrounds determined four major needs of the 2nd version described below.



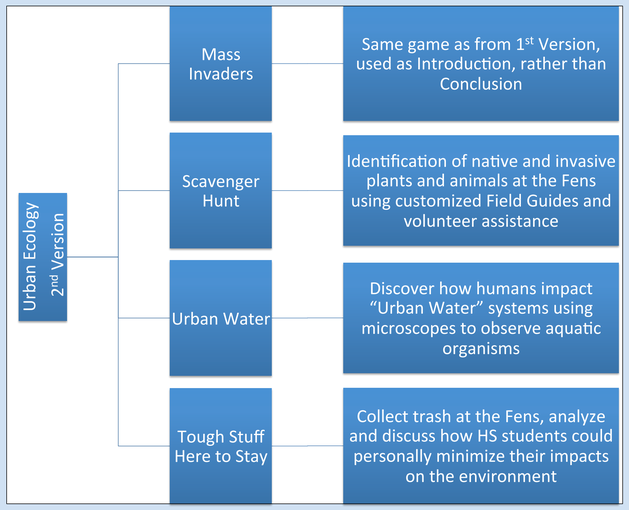
1) A clearly defined purpose: how humans impact the urban ecosystem

2) An indoor contingency: utilize BU's museum of prepared specimens and photographic slideshows to recreate the field site within a classroom

3) Less reliance on the BU teacher and more responsibilities for the BU volunteers: create small group activities lead by BU volunteers with customized Personal Cards

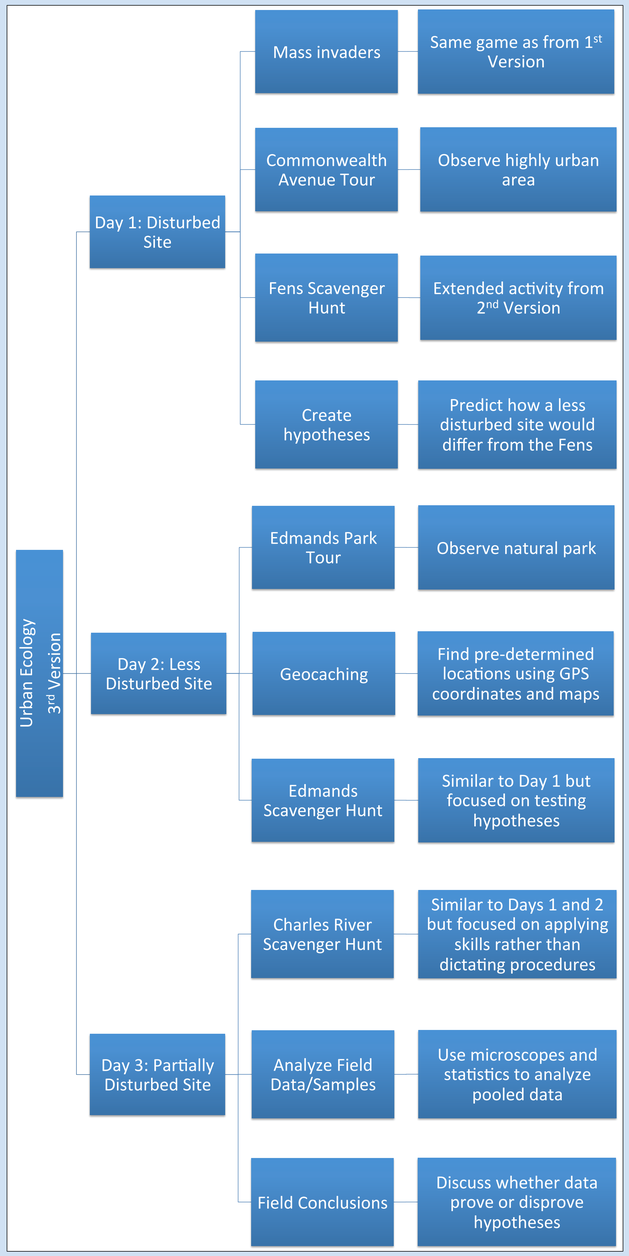
4) Greater use of BU graduate student expertise and equipment that the HS teachers and students do not have access to in their own classrooms: develop customized Field Guides and guided inquiry-based questions BU volunteers could ask HS students

Samples of the teaching materials created for this version (Personal Cards and Field Guides) are provided as visual aids. The indoor slideshows can be viewed during the poster session.



Urban Ecology – 3rd Version

- Our department also participates in the Upward Bound Math Science (UBMS) program, which has similar objectives as the BIOBUGS program. For more information about the program, see the website: http://www.bu.edu/ubms/
- In the past, BIOBUGS modules were extended from 3 hours to 6 hours, but this summer, with a Task Force, the 3-hour Urban Ecology module 2nd Version will be extended to a total of 18 hours over 3 days. The major design objectives are as follows:
  1) Explore the on-campus ecosystem
  2) Increase the time allotted at the Fens
  3) Add a second, less disturbed field site for a second day
  4) Apply skills to a third, partially disturbed field site for a third day
  5) Enable students to create and test hypotheses, and make conclusions about all the field sites visited



Urban Ecology – 4th Version

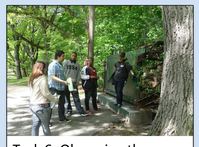
- In Spring 2013 for BIOBUGS and Summer 2013 for UBMS, if funds can be acquired, this module will be modified again by:
  1) Upgrading GPS technology through the purchase of new GPS handheld units for data collection at each site
  2) Advancing abilities to quantitatively test environmental health through the purchase of a portable computerized air and water multi-sensor system

Effective design strategies

- Clearly defined goals/targets for each activity
- Finding proper field sites which illustrate the overall theme of the lab and provide sufficient locations for unique tasks
- Hierarchical system of graduate student and staff designers, each with specific assignments
- Increased use of discussion groups led by BU volunteers
- Use of "Personal Cards" for volunteers which provide (see binder for 2nd Version):
  - Individual duties for each task
  - Stock questions and answers for BU volunteers to ask HS students
  - Answers for each question on Student Worksheet to be answered at that volunteer's assigned task
- Design more tasks than could be completed by HS students in the time allotted for guided-inquiry activities
- Creation of a viable indoor contingency that enabled students to experience the field site in the event of inclement weather
- Proper training of BU teachers and volunteers
- Thorough run-throughs, with and without HS students, to discover and troubleshoot any inherent problems

Task Force: Planning tasks at the Fens one month prior to module

Task 3: Discussing the impacts of tree removal with BU Volunteer



Task 6: Observing the impacts of a rusty bridge with BU Volunteer

Task 1: Learning how to identify plants with BU Volunteer and Field Guides

Task 4: Identification of plants without BU Volunteer

Tough Stuff: Sorting trash collected with BU Volunteer

Acknowledgments

- Funding for the BIOBUGS program is through the Learning Resource Network's (LERNet) and the UBMS program is through the federally-funded TRIO program. Travel to ABLE was possible through BU's Center for Excellence and Innovation in Teaching.
- This module would not exist without the GK-12 Fellows, Brianna Brown and Casey Olson, who designed most of the 1st version. The 2nd and 3rd versions were designed by graduate students: Kim Cohen, Kellie Cotter, Ashley Jennings, Tristan Lubinski, and Derek Stefanik, and post-doctoral fellow: Martina Boerner (see Task Force photo). The design and future teaching of the UBMS program in July includes Liz McCarthy and Alex Helfand. The task force is also grateful for the field assistance from Joseph Wooters, the unofficial groundskeeper of Edmands Park, the Day 2 site in the 3rd version.
- The BIOBUGS program is due to the efforts from numerous BU faculty, staff and students. In particular, Cynthia Brossman, the LERNet director, and the Spring 2012 BIOBUGS Coordinators, Ysabel Milton and Liz McCarthy.
- The BU Teachers and Volunteers are indebted to the numerous HS teachers and students for affording them the opportunity to practice teaching.