

## CAPSTONE 2011

By: The Faculty of Natural Science  
Editors: K.L. Lavalli, R. Schoch, & S. K. Sommers Smith

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### About the Capstone Project

The Capstone represents the culmination of the student experience at CGS. It was conceived and is designed as an interdisciplinary experience because our College's pedagogical mission centers on the Liberal Arts, which is, by definition, interdisciplinary. Thus, the Capstone is project that includes all of the disciplines you have encountered at the College and is not the province of any one division at the College. You may view it as the final course that caps two years of study and that ties all of your educational experiences at CGS together.

In this year's syllabus you will find that every question is interdisciplinary in nature, enabling students to use the insights garnered from all disciplines, and enabling faculty of all divisions to participate equally in the process. "Science" *per se* is not the focus, and as a result no discipline is sidestepped or relegated to a few specialized questions. In this syllabus, you will find that all questions combine science and/or technology, ethics, community, local governance, and local politics.

As you begin this project, keep three thoughts in mind. First, the construction of a building is not an individual effort, but the culmination of labor undertaken by an organized group. You are expected to work together, to share ideas, and to collaborate for the success of your group. Second, successful Capstone projects address relatively narrow topics and devise local solutions to global problems. Finally, the Capstone paper is not a fifty-page term paper. Instead it should be a synthesis, combining separate elements to form a coherent whole. Research is indispensable; but beyond research, your group is expected to analyze, synthesize, make proposals, and justify your conclusions. The most effective Capstone projects provide meaningful solutions to well-documented problems. In your written product, your group will present a logical argument based on evidence, sound rhetorical practice, and well-documented sources of information.

## Think Globally, Act Locally

Change is a natural aspect of any ecosystem, but rapid change has been documented to cause unforeseen and often unwanted effects. Just as the production of oxygen by the first photosynthetic organisms changed the Earth, the activities of humans have the potential to modify the biosphere. Today, human-induced environmental change is a more powerful force than ever before. For example, early human societies began the deforestation of Mediterranean and other regions from Neolithic times onward. Humans continue to destroy forests with potentially catastrophic results, but our technological ability to extract and burn forests is greater than ever before. Another example is the large-scale movement of human populations. Historically, this occurred through migration due to warfare, or to escape famine or poverty. Increasing global travel and commerce may permit many potentially harmful species to be introduced into ecosystems. These introductions can have devastating effects on endemic populations and significant economic impacts on local regions.

There is strong evidence that human activity is accelerating global climate change, shifting temperature and rainfall patterns with tremendous consequences for coastal regions, regional agriculture, and the spread of disease. Human populations also create great amounts of waste (both biological and artificial), over-utilize water resources, and place enormous stresses on ecosystems as a result. In addition, we may tamper with nature and the evolutionary process. Animal and plant domestication (artificial selection) are at least 10,000 years old. However, we now enter a new phase in our manipulation of evolution, not only by artificial selection, but we also transplant genes between species to create genetically modified organisms.

All of these issues are not just concerns for one country or one region of the world, but are truly global in nature. However, national responses and global responses to the problems facing our planet today are slow in coming and rarely combine to create effective change. Many argue that real solutions will come about through change at the local level that forms a model for adoption in other similar regions. Hence, this Capstone requires that you examine local solutions to global problems by focusing on the New England region of the United States (Maine, Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island). This region is an excellent model for developing local solutions to many problems because with the exception of one state (Vermont), all other states have a coastline, and all states in the region have urban, suburban, and rural areas with lakes, rivers, watersheds, and a variety of soils that may be greatly influenced by human activities.

## Mechanics of the Capstone Project

### Groups

The Capstone Project is a group project. You will be a member of the group during the entire project and each group will need to decide some form of division of labor and responsibility. Each member of the group will be responsible not only to herself or himself, but to the other members as well. We encourage you to use Google Documents, DropBox, Google Wave, or other group projects tools as a way to easily add to, edit, and co-edit your Capstone paper. We also encourage students to document specific contributions using e-Portfolio. Each student should create a specific Capstone tab for his or her work in e-Portfolio.

### Project Grades

You will receive one grade for the Project as a whole. This grade will make up 25% of your semester grade in Natural Science, Social Science, and Humanities. There are three components to the Capstone grade: the paper itself, the oral defense, and peer evaluation of your participation in the activities of the group. You will be evaluated as a group on the written report (in other words, each member of the group will receive the same paper grade), but as individuals on the oral defense and participation. Your final Capstone grade will be a combination of these three components, and is determined by your three professors. Your professors take this process seriously and discuss each student's performance at the conclusion of the oral defense. Faculty teams also consider grades again at the end of the entire process of oral examinations before finally settling on a recorded grade.

Understand from the outset that our teaching and learning endeavor at CGS is a process, and the Capstone project is simply a part of that process. Faculty and students should come to the oral examination prepared to engage in discussion about both the capstone process and the finished product. Rather than a "checklist" of strong and not-so-strong points about the finished product, faculty will use this opportunity to engage with you one more time. Faculty will "share the floor" so that students may participate fully and so that each faculty examiner has an equal opportunity for engagement with students. The evaluation rubric that we present here addresses the evaluation process in greater detail, in order to provide guidelines for everyone's participation in the oral examinations

### Reporting of Grades

No Capstone grades will be released until all oral exams are completed. This is necessary because team faculty do not assign Capstone grades until all oral

examinations are finished. Your faculty will discuss the mechanics of reporting grades to you. Note that you will receive only **your individual Capstone grade**, as this is what constitutes 25% of your semester grade in each course.

### **The Written Report**

The length of the Capstone paper should be no more than 50 pages typed, double-spaced. This does not include preliminary pages (table of contents, etc.), endnotes, bibliography, or appendices. Copies of the Capstone paper must be provided for each faculty member and also each member of the group in order to prepare for the oral defense. Your Professors may ask for electronic copies of your paper on a Flashdrive rather than copied and bound submissions.

### **The Oral Defense**

After the final report has been submitted to the faculty, your group will meet at an appointed time to defend its work before your team faculty. The oral defense can last up to two hours. Each group member should have his or her own copy of the Capstone Project and should be prepared to answer questions on all aspects of the report.

### **Statement on Plagiarism**

To plagiarize is "to take (ideas, writings, etc.) from another and pass them off as one's own" (Webster's New World Dictionary, 3rd College Edition, New York: Simon and Schuster, 1988, p. 1031). You are expected to indicate sources using approved techniques. Since students are often confused about the use of quotation marks, the faculty has established the general rule that whenever five words are copied consecutively from another author, the material must be put in quotation marks; failure to do this is plagiarism. Students should note that the sources of ideas and thoughts, even though paraphrased in one's own words and expressed in what is commonly called an indirect quotation, must be credited, and properly cited (see "Referencing Your Project" below).

### **Use of the Internet**

The Internet can be a valuable resource for you during this project, but most information available on the Internet is not checked or regulated, and therefore is not necessarily accurate. However, you can find authentic research sources through the Internet by carefully reading a web site, and by checking the authenticity of the authors of the web site. Often, a helpful bibliography is posted at the end of a web site. You should consult with your faculty regarding the type of information that they consider acceptable for use in the Capstone Project. For guidance in proper methods of citing Internet sources, please see "Referencing Your Project" below.

## Capstone Format

### The Group's Identity

Each Capstone group is charged with the task of formulating a policy recommendation on an issue that is related to the theme of **Thinking Globally, Acting Locally**. For that purpose, each group will constitute itself as a panel of experts that has been charged with the responsibility of surveying the history and scope of a particular problem within New England. The group must consider many possible solutions before recommending what it determines to be the best solution for the local area. The group may be a special commission of inquiry, bureaucrats in a government agency, or an independent panel of scientists, scholars or citizens. The group will consider the ethical, philosophical, sociological, political, scientific, and technological implications of the chosen problem and of the policy. The research necessary to formulate such policy recommendations should reflect data-driven research rather than opinion. Primary data collection, which can supplement opinions of other experts in the field, is a recommended means of involving group members in the real issues of their chosen topic. Your faculty team can guide you on what kinds of primary data collection may be appropriate for your project.

### Format for the Written Report

Your group will develop a recommendation that is presented to a government agency or international group.

Through your investigation you will develop a realistic recommendation as a solution to the problem. Your recommendation will be presented to a government agency, organization, or even a private research group. Your paper should follow these general guidelines:

**A. Background:** You will include an introduction that puts your topic into a context that is understandable to general readers. Clearly state the problem you are investigating, why it is important to investigate this problem, and to whom you will be presenting your recommendation. Your work on this section will be evaluated for clarity, brevity, and how effectively you describe the topic. *This section should occupy approximately 10% of your final written work.*

**B. Discussion and Development of the Problem:** Here you will pinpoint an issue from your background section. The problem you identify will be a contemporary issue, so you will use contemporary sources (newspapers, etc.) to shape this section of your work. By using contemporary sources you will be able to uncover the

“experts” or other crucial players who hold opinions, provide ideas, act on, consult, legislate, oppose, etc. the problem you identify. It is these people and their work that you will want to research more to shape your solution. Your work on this section will be evaluated for its clarity, focus, and connection with a real contemporary problem. *This section should occupy approximately 30% of your final written work.*

**C. The Recommended Solution:** Your recommendation should be a logical outcome of the data and background you presented in sections A and B. You will propose a solution to the problem you have identified. You may draw from many sources for this section but it is logical that you will want to rely heavily on the work of key players you identified in the problem section. In order for your solution to be effective you **must** have the following components. (1) The group must have a persona: who are you and to whom are you presenting your solution? (2) Your solutions must consider opposing viewpoints, potential opposition, and barriers. “Magic bullet” solutions are not acceptable for this project. (3) You should base your solution on the background you provided and the problem you identified. Your project must represent a unified, logical idea. Your work on this section will be evaluated based on the points above as well as clarity, accuracy, focus, and effective writing. *This section should occupy approximately 60% of your final written work.*

**D. Citations:** Citations occur within the text and are done in an author/year format. Unlike Humanities or Social Sciences, page numbers are not normally included in the citation unless you are using a direct quote. However, direct quotes are RARELY used in scientific writings, so learn to properly paraphrase the information being presented by the authors of works you are using. Also be aware that if you mention specific species, you MUST properly format the species name – the genus name is capitalized and both the genus and species name are italicized (e.g., *Homo sapiens*). The following citation example should help you understand how you appropriately cite using the Council of Biological Editors format.

Made naturally, antibiotics are designed to interfere with or kill other microorganisms (Ambile-Cuevas et al., Ludgar, 1995; Levy, 1998). Microbes that make the antibiotics have devised ways to protect themselves from their self-manufactured toxins (Ambile-Cuevas et al., 1995). This resistance can also be passed on to other bacteria, even those of different species. When a population of bacteria is exposed to an antibiotic (which occurs, for example, when we take antibiotics), those bacteria NOT resistant to the drug die first. The resistant ones are left behind to produce more resistant bacteria (Ambile-Cuevas et al., 1995; Levy, 1998). Some bacteria acquire the DNA of other bacteria, and therefore gain antibiotic resistance genes more readily than others (Grady, 1996). This has produced particularly pathogenic strains of

some food borne bacteria, such as *E. coli* and *Salmonella*, which no longer respond to antibiotic treatment (Holmberg et al., 1987).

## Deadlines

The Capstone Project begins immediately after final exams of your CGS courses. Your Team faculty will do all scheduling of meetings and your oral defense. Below is an outline of the expected progress of your Capstone.

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Dates	Capstone Progress
April 1st	Capstone Kickoff with Team Faculty during regularly-scheduled Humanities lecture time. MANDATORY ATTENDANCE
April 4th – April 15th	Attend scheduled meetings with faculty, Capstone group meetings, and conduct lots of research
April 18th – April 22nd	Additional conferences with faculty if needed, complete research, and write the paper
April 25th – April 28th	Edit, reproduce, and bind the written report
<b>April 29th</b>	<b>All sophomores are required to be present in Jacob Sleeper Auditorium FRIDAY APRIL 29<sup>TH</sup>, at 12pm at which time all Capstone Projects will be collected by faculty teams.</b> <b>THERE WILL BE NO EXTENSIONS</b>
May 2nd – May 13th	Capstone Oral Defenses
The Week After May 13th	Final grades will be posted

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## Your Meetings With Professors

Your group will meet with your team of professors three times during the Capstone project. More meetings will be scheduled if necessary. **All written work must be typewritten in 12-point Times Roman font, paginated at the lower right hand side of the page, and presented immediately at the time of the meeting.** Here is a model of what your team might require of you at each meeting. Team requirements for submissions at these meetings may differ.

**Meeting 1:** During this meeting you will report on:

1. Your topic
2. Your group coordinator(s)
3. Any questions you have

**Meeting 2:** During this meeting you will discuss progress on your topic. Your professors will help you focus or narrow your topic as needed. You must bring:

1. Three copies of a 1-2 page outline of the work you propose based on the “Background, Problem, Solution” format. *Your outline must be in formal outline style.*
2. Three copies of a 1-2 page bibliography in CBE (Council of Biology Editors) style. *All of your citations throughout the project must be done in this style—no exceptions and no other styles accepted (**failure to comply with this will result in a lowering of your grade for your Capstone project**).*

**Meeting 3:** This is the last formal meeting with your professors before you deliver the project to your professors. During this meeting, your professors will comment on your final outline and the status of your project. Your group will be assigned a final meeting time (oral examination) at this meeting. You must bring:

1. Three copies of a 4-5 page outline of your project. You should be ready to write the whole of the final Capstone Project from this outline. You must include your persona and your audience persona in this outline. *The outline must be in formal outline style.*
2. Three copies of an expanded bibliography **in the appropriate citation style.**
3. A list of all group members’ final exam times.



## The Oral Examination

Your professors will have read your written work and agreed on a provisional grade for the work. The oral examination then takes the form of a discussion between you and your professors. It will be in two parts.

1. Your group will be invited to engage in discussion about the Capstone process and your approach to the final project.
2. Your professors will ask general and specific questions about your final project. Your answers will help the professors understand your work on the project and it will help them evaluate the work based on the criteria outlined above.

At the end of the oral examination, which will take approximately two hours, you will be asked to evaluate your own performance as well as that of your fellow team members on the Capstone project. Your evaluations will be strictly confidential.

## Rubric for Success

The most successful Capstone projects will take into account the following.

### Written Portion:

1. Did your background section sufficiently introduce the contemporary issues with which the Capstone was concerned and identify appropriate stakeholders and players?
2. Was your research of the issue sufficient in scope and detail to provide the reader with a good working knowledge of the extent of the problem at hand? Did you use appropriate examples and infer from those examples the kinds of solutions that had been tried in other local areas? Did you assess the success or failure of similar solutions elsewhere and analyze the reasons for those successes or failures? Did you extrapolate how solutions would work in the region or locality on which you focused your attention in New England?
3. Did you provide data (tabular, graphical) demonstrating why this topic is an important issue facing the New England region?
4. Did you locate appropriate local resources (via interviews, visits, etc.) that would help you better understand the problem, current local responses, and potential solutions (and/or previously attempted solutions)?
5. Did you account for how local implementation of your solutions would occur (what were the responsible agencies, councils, governmental bodies that would be

6. Is your solution based on logic and driven by available data?
7. Is the writing clear, concise, clean, and well-organized? Did you use evidence, rather than assertion, to advance your argument?

### **Oral Portion:**

1. Could each of you, individually, define the problem on which you focused?
2. Could each of you, individually, describe to the faculty the background of the problem and the solution you propose?
3. Could each of you, individually, defend your entire position?

## **Referencing Your Project**

One of the most challenging aspects of researching a topic is finding appropriate published materials and then documenting the use of the sources in your paper. Each discipline has a slightly different approach to citing sources within a paper and then formatting the citations in the bibliography or works cited section. While the styles may seem very different, they are all designed to allow the reader to find the original source (or other form of information) to which the writer is referring. In the humanities the usual format is the MLA Style, in history it is the Chicago Style, and in some of the sciences it is the CBE Style. In this project you will use the Council of Biological Editors style only—no other style is acceptable. Examples of how you format your sources follow.

### **Book by a Single Author**

Sagan C. 1996. The demon-haunted world: science as a candle in the dark. New York: Random House; 457p.

### **Book by Two or More Authors**

Ferrini AF, Ferrini RL.1993. Health in the later years. 2nd ed. Dubuque (IA): Brown & Benchmark; 470 p.

### **Book with Editors**

Gilman AG, Rall TW, Nies AS, Taylor P, editors. 1990. The pharmacological basis of therapeutics. 8th ed. New York: Pergamon; 1811 p.

### **Book with Author, Editor, Translator, and Note**

Luzikov VN. 1985. Mitochondrial biogenesis and breakdown. Galkin AV, translator; Roodyn DB, editor. New York: Consultants Bureau; 362 p. Translation of: Regulatsiia formirovaniia Mitokhondrii.

### **Book Published in a New Edition**

Bauman MG. 1998. Ideas and details: a guide to college writing. 3rd ed. Fort Worth (TX): Harcourt Brace College Publishers; 434 p.

### **Book Published in Several Volumes**

Geigy Scientific Tables. 1991-1993. 8th ed. 6 volumes. West Caldwell (NJ): CIBA-Geigy.

### **Article in an Encyclopedia**

Ellis AJ. 1992. Geothermo power. McGraw-Hill Encyclopedia of Science and Technology. 7th ed. 20 volumes. New York: McGraw-Hill; 8: 83-87.

### **Article in a Scholarly Journal**

Holmberg S, Osterholm M, Sanger K, Cohen M. 1997. Drug-resistant *Salmonella* from animals fed antimicrobials. New England Journal of Medicine 311: 617-622.

### **Article in a Monthly Periodical**

Jarrell KF, Bayley DP, Correia JD, Thomas NA. 1999 July. Recent excitement about the archaea. BioScience ; 49 (7): 530-541.

### **Article in a Newspaper**

Glaberson W. 1999 June 7. The courts vs. scientific certainty. New York Times; Sect 4; 5 (col 3).

### **Article Without an Author**

[Anonymous]. 1990 Aug 24. Gene data may help fight colon cancer. Los Angeles Times; Sect A: 4.

### **Letter to the Editor**

Dandelions free, abundant, tasty. To the Editor. Carey P. 1999 Aug 1. Rochester Democrat and Chronicle; Sect A: 21 (col 1).

### **Editorial**

A health-care divide. Editorial. 1999 Aug 1. Rochester Democrat and Chronicle; Sect A: 20 (col 1).

### **Personal Communication (Interview)**

Krueger B. 1999 July 15. Research documentation style in biology classes.

### **Video Recording**

Aids in Africa: living with a time bomb [videocassette] 1991. Princeton: Films for the Humanities and Sciences; 33min, sound, color, ½ in.

## **ELECTRONIC SOURCES**

### **Book**

MARTINDALE ONLINE [book online]. London: Pharmaceutical Society of Great Britain; 1989 [updated 1989 Dec]. Available from: Dialog Information Services, Palo Alto, CA www.dialog.com Related to the publication Martindale, The Extra Pharmacopoeia. Accessed 1990 Jan 10.

### **Article in a Journal**

Halbert M. The challenge of multimedia networking. Public Access Comput Syst Rev [serial online] 1993; 4 (1): 18-23. Avail from: FTP: lib.ncsu.edu. Accessed 1995 Feb 28.

### **CD-ROM, Tape, or Diskette (Unchangeable Databases)**

Jones, E, editor. Developing client/server applications with Microsoft Access. [CD-ROM] New York: McGraw-Hill; 1997. 327p.

### Database

Carr JA. Information literacy and teacher education. ERIC Digest. Washington DC: ERIC Clearing House on Teaching and Teacher Education; 1998. (ERIC Accession NO. ED 42423).

### E-mail

Callan S. scallan@monroecc.edu 1999 Aug 7. The Mayan Calendar.

### Internet

Derian JD. Cyber-deterrance. Wired [Online] 2 (9). Avail from: <http://www.wired.com/Etext/index.html>  
File: Cyber-deterrance: The US army fights tomorrow's war today [1997 Oct 15]

### Online Posting

Holland N. Overcoming depression. Online posting. 1997 Mar 19. Psyart. 1997 Mar 21  
<http://web.clas.ufl.edu/ipsa/psyart.htm>.

## List of Topics

### 1. The Effect of Global Warming on New England Forests

Much of New England has been covered with forest for centuries. A distinctly North American species, the sugar maple (*Acer saccharum*) is of the most common and economically important trees in the Northeast. For example, the production of maple syrup from the sugar maple has been a significant activity especially in Vermont, but the recent increase in average temperatures in New England may have a deleterious effect on these forests. How is global climate change affecting the forests of New England? Can its impacts be ameliorated in any way? What does the future hold for these forests, the sugar maple, and the industries that rely on such species?

### 2. Future Sources of New England Electrical Power: Nuclear Power Plants vs. Cape Wind

At the present time, the Pilgrim Power Plant is the only licensed nuclear power plant operating in Massachusetts. One nuclear reactor at Seabrook, NH has been operating for years, but another planned reactor was not completed because of vigorous local opposition. A very different proposal for an electrical power source, the Cape Wind project, has been delayed for years because of the hostility of residents of Cape Cod and the nearby islands and their concern about the project's environmental impact and its effect on the aesthetics of Nantucket Sound. How should New England respond to its energy needs? How should we respond to the needs of the many for power while taking into consideration the concerns of the few who will be affected by whatever structures are built?

### 3. Cost Effectiveness of Expanding the MBTA

The MBTA (Massachusetts Bay Transportation Authority) oversees the operation of a large system of commuter rail trains, subway trains, buses, and even ferries. Some recent proposals for expansion of the MBTA have included an extension of the Green Line and the replacement of the Silver Line bus with a rail line. The Green Line already is regarded as the slowest of the subway lines, and some have suggested that the costs associated with the construction of a Silver Line rail will be excessive. What should New England states do to improve the regional public transportation system? Should there be a state-by-state approach to the problem, or should there be a regional approach to enhancing public transportation and reducing congestion on major thoroughfares/interstate highways?

### 4. A Need for Control of Wildlife in New England?

The past two decades have witnessed significant increases in the populations of some wildlife species in New England including Canada Geese, deer, coyote, and squirrels. These increases have been accompanied by some undesirable effects: growth of the deer population on Nantucket has been associated with an upsurge in Lyme disease, and coyotes have become urban populations. Also, the year-round presence of large flocks of Canada Geese may soon pose a hazard to air travel. Should controlled hunting of these species by humans be permitted in state parks, state reservations, and even in areas populated by humans? Should predators be reintroduced to help control these wildlife populations? Should our current *laissez faire* policy be continued?

### 5. Saving the Back Bay

The Back Bay, built on landfill over swamp land by the Charles River, was one of the greatest urban engineering and social experiments of the 19<sup>th</sup> century. Today the Back Bay is sinking. Why? What has been done to ameliorate this problem, and how can urban planners address it in the future?

### 6. Noise Pollution? Or Tidy Lawns?

Leaf blowers are a prominent feature in urban landscape maintenance. Some communities have banned them because they cause air and noise pollution. How have Boston-region communities dealt with this problem and how can we address the issues of leaf blowers while protecting citizens' rights to maintain their lawns and gardens? What models in an urban region could be exported to the more suburban areas of the major cities of New England?

## 7. Maintaining the Charles River or the Blackstone River

The landscape of the Charles and Blackstone Rivers is dynamic. From a tidal swamp to a polluted industrial and transportation locus, to today's mixed-use capabilities, the Charles River reflects the communities that surround it. Likewise, the Blackstone River historically provided a transport pathway for manufacturing from Worcester, MA to Providence, RI. How can we preserve these rivers, and in particular, how can we rebuild the natural plant and animal communities that they once hosted?

## 8. Dealing with the Electronic Trash Stream

Boston is one of the most "wired" cities on the planet. Many of our current endeavors revolve around computer use, with the result that we have developed new environmental threats. Discarded electronics and enormous electrical consumption are two of the by-products of our computer culture. Currently we take our used electronics to a recycling center that then sends the material to places in Africa, India, China, and Pakistan for dismantling and recovery of metals – we do this because these countries have no environmental protection measures in place for the hazardous materials in used electronics and have a cheap workforce that has none of the protections afforded to U.S. workers. How can we ameliorate these problems as responsible 21<sup>st</sup> century communities?

## 9. Paving Paradise, Continued

Do we need to keep building roads? The core of Boston was built centuries before cars were invented. Roadways in the metropolitan area increase congestion, environmental degradation, and our unsustainable dependence on fossil fuels. How have communities around Boston addressed this problem and what can we do about it?

## 10. Wildlife in the City

What are the costs and benefits of encouraging urban wildlife? One cost of urbanization is the reduction of living closely with wild animals. While some species cope well with urbanization and make a city a living zoo (eastern gray squirrels, rats, mice, raccoons, and many species of birds including hawks) others may pose threats to human well-being (white-tailed deer, skunks, eastern coyotes, red and gray foxes). Is it possible for humans to reap the environmental, economic and esthetic benefits of living close to wildlife, and at the same time minimize potential risks?

### 11. Urban Transportation

Can or should the City of Boston (or Providence, RI or Portland, ME) work towards becoming a model city for public transportation? What is being done and what can be done to make these cities efficient multimodal urban transportation models? A focused problem for this topic could be making Boston or Providence or Portland a truly bicycle centered and usable city. What has been done in other more bicycle friendly cities like Portland, Oregon and can it be done in New England cities? Should bicycle use be encouraged and what can be done to make it safe for all?

### 12. The Green University

Is Boston University a “green” community? Examine the use of resources by the university and evaluate it as a model sustainable ecological community. There are current projects set up to calculate energy use and the carbon footprint of the university and this topic will allow you to research and analyze how one institution can make a difference.

### 13. The Local Politics of the Environment

Develop an analysis of how the city of Boston (or some other local community) approaches the environment and environmental issues as policy. Is the environment an important component of city politics? Should it be? How do environmental issues at a local level relate to other urban problems?

### 14. Emerging Disease and the University Community

Is Boston University a crucible for emerging diseases? One aspect of increasing human population density is the emergence of density dependent diseases. What is the history of campus diseases and what can and is being done to respond to disease issues on our campus?

### 15. Urban Gardens and Food Pantries

Should Boston University advocate the use of locally grown and raised food for use in the dining commons? The “slow food” movement is a real force in many communities. Could BU become more environmentally friendly if it actively embraced this movement? Could BU be sustainable if they relied on locally grown and raised foods? Should BU invest in local farms in providing food for students?

## 16. Getting Off the Grid

Should Boston University go “off the grid?” Boston University could be a model for energy independence by initiating programs to supply all its own energy. Other institutions of higher learning in MA have included wind turbines to decrease their energy dependence on the grid (e.g., Massachusetts Maritime Academy in Buzzards Bay). Does this make ecological and environmental sense?

## 17. Recycling – Green As We Suppose?

What is the reality behind recycling? Boston University has initiated major programs to have its community recycle as much materials as is possible. What happens to our recycled materials? Follow the recycle stream from BU building to processing. What is the cost of recycling? Is recycling an environmentally sound and sustainable practice?

## 18. How Clean Is Your Water?

Where does your wastewater go? Follow the waste water stream from BU. Can Boston University initiate policies that mitigate water use and advance waste water treatment? What would the costs/benefits be for BU to become more proactive in water use and wastewater treatment? Alternatively, consider the water resources of the city of Boston. What concerns are there about how we deal with the water usage patterns of the city, the waste products, and the dumping of millions of gallons of treated water into Massachusetts Bay? Are we creating “dead zones” in our coastal regions? How could the city ameliorate the amount of treated water released by the reuse of grey water from businesses? Can green architecture in new construction and in rehabilitating established buildings work in a highly urban setting?

## 19. Green Roofs – Practical or Just Pretty?

Design The Boston (or Boston University) Green Roof initiative. Green roofs have always been a part of human habitations. Yet, in many urban areas roofs are sterile wastelands. What would the environmental impact be if every roof in Boston became a green roof? Could Boston University be the model for the city in this regard? What are the positive aspects of green roofs and what are the limitations?



## 20. Raising Awareness About Environmental Problems – Does It Work?

Do students really care about the environment? All current Boston University students have grown up during the period of “Reduce, Reuse, Recycle.” It is socially unacceptable to not be environmentally aware. However, do students really care? What is being done and what can and should be done to make all BU students environmental citizens?

## 21. Green Profits

Can the local environment be the “business of local business?” The environment movement and business (economic growth) are often viewed as polar opposites. Can Boston as an economic zone or region bridge the gap between sound economic practices and sound ecology? What is the connection between economic growth at the local level and environmental sustainability?

## 22. Marine Protected Areas/Fishery Closures

As coastal fish stocks are depleted and some species are pushed into commercial extinction, the idea of permanent or temporary fishery closures in particular regions of the ocean becomes more and more appealing to regulators in charge of ensuring the sustainability of fish stocks over the long term. Generally, these closures are proposed over a coastal region (e.g., the coastal waters off Newfoundland for cod fishing, or the Southern New England coastal region for lobster fishing) or a particular area of the ocean is closed to all fishing (e.g., George’s Bank). New England historically has been considered a rich fishing region for a number of species of fish and crustaceans. With an ever-increasing demand by consumers for seafood, more and more species of fish are overexploited. How do we solve the problem of supplying seafood products for consumer demand while, at the same time, ensuring that the wild fish and crustacean stocks remain sustainable populations? Are fishery closures effective? Are marine protected areas effective? Should more such closures or protected areas be established? This Capstone should investigate the scientific data on the efficacy of such closures or protected areas, should consider any unintended consequences arising from their establishment, and should determine if these are effective fisheries management tools that could be implemented more broadly along the New England coast.

### 23. How Should We Respond to Increased Exposure to Endocrine Disruptors?

An endocrine disruptor is a substance that is not produced in the body but acts by mimicking or antagonizing natural hormones. It is thought that endocrine disruptors may be responsible for some reproductive problems in both women and men as well as for the increases in the frequency of certain types of cancer. Endocrine disruptors have also been linked to developmental deficiencies and learning disabilities in children. Because hormone receptor systems are similar in humans and animals, effects observed in wildlife species raise concerns of potential human health effects. Exposure to endocrine disruptors can occur through direct contact with pesticides and other chemicals or through ingestion of contaminated water, food, or air. Chemicals suspected of acting as endocrine disruptors are found in insecticides, herbicides, fumigants and fungicides that are used in agriculture as well as in the home. Industrial workers can be exposed to chemicals such as detergents, resins, and plasticizers with endocrine disrupting properties. Endocrine disruptors enter the air or water as a byproduct of many chemical and manufacturing processes and when plastics and other materials are burned. Endocrine disruptors can also leach out of plastics, including the type of plastic used to make hospital intravenous bags. Many endocrine disruptors are persistent in the environment and accumulate in fat, so the greatest exposures come from eating fatty foods and fish from contaminated water. How can we ensure that our water supplies are adequately treated for these chemicals and how can we reduce our use of plastic containers that leach these compounds?

### 24. Natural Gas: the Solution to Dwindling Oil Supplies, but at What Cost?

Natural gas has become a more popular fuel source for heating our homes because it is generally cheaper than oil and burns more cleanly. Over 2 million metric tons of liquefied natural gas (LNG) entered through Boston port in 2009, a 5% increase from the previous year and estimates are that this amount will steadily increase to supply the needs of the residents of Boston and surrounding cities and towns. This liquefied gas is transported through Boston harbor to a terminal in Everett on the Mystic River, a pathway that travels offshore of downtown Boston. With the increased threats of terrorist attacks on U.S. soil, some have proposed constructing an offshore LNG facility in Massachusetts Bay; similar proposals have been made for constructing offshore, floating LNG terminal projects in Mt. Hope Bay near Fall River to increase current shipments that pass through Mt. Hope Bay, Narragansett Bay, and Providence harbor supplying southern Massachusetts and Rhode Island. Likewise, proposals to build a facility in Passamaquoddy Bay in Maine are also pending and this facility would connect to a pipeline to Nova Scotia to supply Maine residents with natural gas. Many proponents of the offshore LNG terminals argue that these facilities should not be

located near major urban areas given their potential to destroy everything within a 2-km radius if an explosion were to occur; instead they should be located in rural areas or offshore. Opponents of offshore facilities argue that such facilities would be more easily targeted by terrorists and could be exposed to dangerous oceanic conditions; in addition, they argue that fisheries and aquaculture in these offshore regions will be destroyed. How do we deal with our need to use cleaner fuels in highly populated areas, yet at the same time ensure that such populated areas are protected from the hazards posed by such fuels? Do we sacrifice the habitats of our offshore waters to quench our thirst for clean energy and more regional jobs?

#### 25. Biotechnology and Bioterrorism

Boston University's biotechnology laboratories serve both as training facilities for future generations of scientists and as research and development portals for organisms and techniques that might be categorized as biowarfare or bioterrorism. What impact does such a laboratory have on the surrounding community? Is this an appropriate use of University resources? What might be done to better protect the community or to ensure that knowledge from such laboratories be used for peaceful purposes?

#### 26. Combating Hunger in Boston

In June 2009, the Food and Agriculture Organization, an agency of the United Nations, estimated that hunger now affects one billion people -- about one-sixth of the world's population. If the current crisis continues unabated, chronic malnutrition will stunt the neurological development of more and more children under the age of five all over the world. It can be argued that there is a moral imperative for countries with abundant food resources like the U.S. to respond to this hunger crisis, yet designing and implementing a workable solution from a foreign policy standpoint will not be easy. Can Hunger in Boston be used as a model for the whole globe? What is the incidence of hunger in Boston? Malnutrition? Neurological disorders due to hunger? Can interventions be designed here to reduce the problem?

#### 27. Gene Therapy Research in Boston University

There is huge promise in the ability to treat human disease with gene therapy, esp. for genetic diseases that have been historically extremely difficult to treat. There have been successes in the development of new technology for gene therapy: Mouse studies have successfully delivered genetic material to the brain in a study looking at key proteins in depression. But the ethics of modifying the human genome are controversial. From the National Institutes of Health:

The ethical questions surrounding gene therapy include:

- How can “good” and “bad” uses of gene therapy be distinguished?
- Who decides which traits are normal and which constitute a disability or disorder?
- Will the high costs of gene therapy make it available only to the wealthy?
- Could the widespread use of gene therapy make society less accepting of people who are different?
- Should people be allowed to use gene therapy to enhance basic human traits such as height, intelligence, or athletic ability?

What experiments are being done in Boston to better understand and improve gene therapy research? Can it be safe? Is it ethically sound? Interviewing local stakeholders in this field would form better local and potentially federal policy.

## 28. Personal Genomics

People can sequence and map their own DNA by submitting tissue samples to commercial companies (see 23andme.com, et al.). This information allows people to see which version of various SNPs (single nucleotide polymorphisms) they have in their own genome. The variants of human SNPs have been correlated with various traits, and more and more people are interested in their own genetic predispositions. What are the potential pitfalls of learning more about your own genetics? What are the benefits? Understanding local initiatives, interviewing local scientists, and researching various positions about the benefits and costs of Personal Genomics may help determine local and federal policy.

## 29. Rising Seas: A Threat to Boston?

All of New England's major cities are port cities (Boston, Providence, Portsmouth, Portland) and all face serious consequences if sea levels change dramatically, not only from the rising level of water, but also from major storms that bring tidal surges into coastal regions. How best can we learn about this threat? What should cities like Boston do about this problem? How might public policy to address this issue be designed?