Combined BS/MS in Environmental Science & Ecology

The College at Brockport, College Senate
SUNY BROCKPORT
College Senate
State University of New York
College at Brockport
350 New Campus Drive
Brockport, NY 14420-2923
(585) 395-2586 (fax) 395-2246

TO: Dr. John B. Clark, Interim College President
FROM: The Faculty Senate Meeting on: May 2, 2005
RE: 
   I. Formal Resolution (Act of Determination)
   II. Recommendation (Voting the Fitness of)
   III. Other, For Your Information (Notice, Request, Report, etc.)

SUBJ: Combined BS/MS Program in Environmental Science and Biology
       (with GMSC designation)

Signed: Dawn M Jones Date: May 6, 2005
(Dr. Dawn M. Jones, 2004-2005 College Senate President)

Please fill out the bottom portion and return document to the College Senate Office.

TO: The College Senate
FROM: Dr. John B. Clark, Interim College President

RE: 
   I. Decision and Action Taken on Formal Resolution (circle choice)
      a. Accepted. Effective Date: __/__/2005
      b. Deferred for discussion with the College Senate on __/__/2005
      c. Unacceptable for the reasons contained in the attached explanation

II. III. Response to Recommendation or Other/FYI
      a. Received and acknowledged __/__/2005
      b. Comment:

DISTRIBUTED BY PRESIDENT'S OFFICE TO: Executive Council
DISTRIBUTED BY PROVOST'S OFFICE TO: Dean's Council
DISTRIBUTED ALSO TO: Originator, Academic Advisement, Registrar (as appropriate)

Signed:  Date: __/__/2005
(Dr. John B. Clark, Interim College President, SUNY College at Brockport)
DEADLINE FOR SUBMISSIONS: MARCH 1 - Proposals received after March 1 may not be reviewed until next semester.
Submit all proposals to the Faculty Senate President electronically or on a disk with a hard copy.
Please provide cover page information requested.
facprez@brockport.edu, senate@brockport.edu
Faculty Senate Office, 426 Allen Building

1. PROPOSAL TITLE:
Please be somewhat descriptive, for example, Graduate Probation/Dismissal Proposal rather than Graduate Proposal.
Combined BS/MS Program in Environmental Science and Biology –

2. BRIEF DESCRIPTION OF PROPOSAL:
This is a proposal for a combined BS/MS degree in Environmental Science and Biology

3. SUBMISSION & REVISION DATES: PLEASE DATE ALL UPDATED DOCUMENTS and resubmit to the
Senate Office electronically prior to Senate review and vote at fsenate@brockport.edu.

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<td>April 4, 2005</td>
<td>April 11, 2005</td>
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4. SUBMITTED BY: (contact person)

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<tr>
<th>Name</th>
<th>Department</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Joseph Makarewicz</td>
<td>Environmental Science and Biology</td>
<td>395-5747</td>
<td><a href="mailto:jmakarew@brockport.edu">jmakarew@brockport.edu</a></td>
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5. COMMITTEES TO COPY: (Senate office use only)

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Proposal for
a. Combined BS/MS in Environmental Science and Biology

Programs to be combined – BS in Environmental Science HEGIS 0420 (SED 23535) and MS in Environmental Science and Biology HEGIS 0420

The Vision
The proposed combined BS/MS Program in Environmental Science and Biology would attract and improve retention of high parameter undergraduate students majoring in the Department of Environmental Science and Biology by offering them an efficient, time-shortened degree program and a rich portfolio of courses. The goal of the proposed combined BS/MS in Environmental Science and Biology is to develop in its students an advanced understanding of ecosystem structure and function, and how environmental stressors affect them. Graduates of SUNY Brockport’s combined BS/MS in Environmental Science and Biology will be trained in a variety of modern scientific methods in environmental chemistry and toxicology, ecological genetics, statistical and computational analysis, and field biology. The interdisciplinary nature of our program will facilitate interaction among students and faculty with different areas of expertise, both within SUNY Brockport and across a broad range of academic, governmental and non-governmental institutions. Our program will encourage students to design and conduct innovative graduate research projects, and to develop strong written and oral communication skills through presentations at professional meetings and submission of manuscripts to peer-reviewed journals.

Graduates of the combined BS/MS Program in Environmental Science and Biology will be “well rounded specialists” in Environmental Science. They will have solid science backgrounds with an undergraduate specialty in either Environmental Chemistry, Earth Science, Aquatic Ecology or Terrestrial Ecology. Courses included in this curriculum will ensure high levels of oral and written communication skills and technical expertise, will help students acquire up-to-date knowledge on environmental issues and politics and develop the strong scientific and analytical skills essential for solving tomorrow’s vexing environmental problems.

The proposed combined BS/MS program in Environmental Science and Biology will provide a solid background in the natural sciences. Students participating in the graduate portion of the program will take a minimum of 30 credit hours by faculty advisement. Graduate courses could be taken in at least two of the college’s Schools – Letters and Sciences and Professions. For example, Environmental Law is offered in the School of Professions. However, we expect that most course offerings would be from the School of Letters and Sciences. The program contains courses that integrate the expertise of faculty in several departments, such as Biological Sciences, Chemistry and Earth Sciences. Thus, the course sequence selected by the student, in collaboration with the Thesis Advisory Committee, may include courses from other disciplines and draw on environmental experts from the larger community. This unique approach reflects the interdisciplinary nature of the program.

Graduate students are also important to our ability to attract research funds and develop the quality of the undergraduate program in Environmental Science and Biology. Graduate students
are an integral part of the vigorous research programs directed by faculty in the Department of Environmental Science and Biology. Since 1995, our graduate students in the MS program in Biological Sciences with interests in ecology and environmental science have produced 32 theses based on original research (Appendix A). Since 1995 research by Drs. Haynes, Norment and Makarewicz have generated approximately $4.8 million in external funding, much of which has gone to support graduate student research. During the same period externally-funded research by faculty with expertise in environmental science and biology has resulted in at least 30 peer-reviewed publications, including 15 with graduate student coauthors. Ongoing research by Department of Environmental Science and Biology faculty in areas such as toxic chemical levels in Great Lakes biota, water quality problems in the Finger Lakes and Lake Ontario, phytoplankton and zooplankton dynamics in the Great Lakes, fisheries ecology in Lake Ontario and the Finger Lakes, stressed stream analyses of watersheds, impacts of zebra mussels, spiny and fishhook water fleas and other exotic species on Lake Ontario, wildlife use of wetlands; migration ecology of songbirds; and the breeding biology and habitat selection of grassland birds has brought SUNY Brockport a regional and, in some areas, national and international reputation for ecological research.

**Evidence of Need**

It is difficult to talk in general terms about “Environmental” employment. Whereas industries like biotechnology, auto manufacturing, and software design have a clear set of specific employers with relatively similar job titles and descriptions, the environmental job market is dispersed over thousands of public, private and nonprofit employers. Some of these employers are identifiable as “environmental,” while other employers include environmental functions within an apparently unrelated business. Thus an important aspect of environmental employment is the fact that jobs are widely dispersed across thousands of small units, rather than being largely centralized in relatively few, well-known places.

The “Environmental Trends Report: 2002” of the Environmental Careers Organization (ECO) identified the following important, emerging multidisciplinary eco-careers:

1. Pollution prevention/Waste reduction specialist
2. Conservation biologist/ecosystems manager
3. Environmental information technology/GIS
4. Environmental manager
5. Global climate researcher
6. Renewable energy and energy management
7. "Smart Growth" urban planner
8. Policy integration specialist
9. Community organizer
10. Fundraiser
11. Environmental economist
12. Environmental health specialist

In 2000, 64,000 jobs were identified as available under the category of Environmental Scientist by the ECO (Environmental Career Trends: 2002). By 2010, ECO projects a 14,000 increase in the number of Environmental Scientists - a 22.3% increase in jobs (Table 1). Other occupations, such as Conservation Scientist, Forest Conservation Scientist, Geoscientist, Hydrologist and Environmental Technician, for which students with an MS in Environmental Science would qualify, show an increase of another 18,000 positions by 2010. Thus, a minimum increase of 32,000 jobs related to Environmental Science are projected by 2010.
Projected national job trends indicate that a national and local need exists for trained scientists with a M.S. in Environmental Science and Biology. The *Occupational Outlook Handbook*, published by the U. S. Department of Labor, forecasts that employment of environmental scientists is “expected to grow faster than the average for all occupations through 2010”, due to the “continuing need for companies and organizations to comply with environmental laws and regulations”. The projected increase in jobs for environmental scientists through 2010 is expected to be between 21 to 35 percent. The *Occupational Outlook Handbook* also predicts a growth of jobs as conservation scientists, another occupation that many graduates of a M.S. program in Environmental Science and Biology would be qualified of between 3 to 9 percent. Kevin Doyle, Director of Career Education for the Environmental Careers Organization, also predicts that the need for Environmental Scientists will increase by over 20% in the coming decade with the need for conservation scientists increasing by over 8% (Table 1). At the regional level, continuing concern about environmental issues in the Great Lakes Basin, protection of air and water quality, conservation of wetlands and the environmental needs of companies such as Xerox and Kodak should ensure a steady demand for environmental scientist professionals with graduate degrees. For example, a 1998 survey by the Environmental Careers Organization of 40 employers in the private sector and government agencies asked, “When hiring non-seasonal, entry level environmental professionals, what level of education/training do you prefer?” Forty percent responded that the undergraduate degree was preferred followed closely (29%) by the Master’s degree1.

Locally, the consistently high number of graduate students supervised by Drs. Haynes, Norment and Makarewicz in their former department, the Department of Biological Sciences, provides an indication of current and future demand for a M.S. program in Environmental Science and Biology at SUNY Brockport (Appendix A). Perhaps of greater importance in illustrating the existence of a local and national job market in environmental science is the placement record of our M.S. students (Appendix A). Some have gone on to Ph.D. programs at major research universities, but the majority has entered the job market. Our former M.S. students are working for the U.S. Environmental Protection Agency, New York Sea Grant, U.S. Fish and Wildlife Service, New York State Department of Environmental Conservation, Monroe County Health Department, Orleans County Soil and Water, Monroe County Pure Waters, Ecology and Environment, Inc., Battelle Laboratories, Mote Marine Laboratory and Paul Smith’s College, to name but a few.

1 The Environmental Careers Organization (ECO) has been serving the needs of environmental employers, students and aspiring professionals for 25 years. ECO, 179 South Street, Fifth Floor, Boston MA 02210

Table 1. Projected employment by occupation in fields related to Environmental Science. Data from The Environmental Careers Organization1.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment (in 1000s)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2010</td>
</tr>
<tr>
<td>Environmental Scientists</td>
<td>64</td>
<td>78</td>
</tr>
<tr>
<td>Conservation Biologists</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Forest Conservationist</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Geoscientists</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Hydrologist</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Env. Protection Techs</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>Total Environmental</td>
<td>160</td>
<td>192</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Economists</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Chemists</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>Biological Scientists</td>
<td>73</td>
<td>88</td>
</tr>
<tr>
<td>Other Life Scientists</td>
<td>28</td>
<td>33</td>
</tr>
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</table>

**Faculty**

The proposed graduate program will be delivered by innovative faculty, all of whom hold a PhD and who have extensive research experience, professional achievements, and a record of collaboration with other researchers in academia, industry and government (Appendix D). Environmental Science faculty are members of the Department of Environmental Science and Biology and have directed over 57 M.S. degrees in their former department, Biological Sciences (Appendix A). This faculty has attracted over $4.8 million in external funds from NOAA, EPA, Sea Grant, Army Corps of Engineers, Biological Research Institute, U.S. Fish and Wildlife Service, and the New York State Department of Environmental Conservation, and they have published in peer-reviewed journals such as Science, Bioscience, Ecological Monographs, Journal of Great Lakes Research, Environmental Science and Technology, Auk, Condor and Canadian Journal of Zoology. The vigorous, externally-funded research programs of the faculty has meant that funding of graduate stipends and research supplies often has been augmented by external funding sources.

We envision the graduate program as reflecting the interdisciplinary approach of the undergraduate major in Environmental Science and Biology. Thus, graduate faculty with supervisory privileges will also include “Associate Faculty” (Appendix D) from departments other than Environmental Science and Biology who teach courses in the undergraduate B.S. program in Environmental Science or who, by petition to the Chairperson of the Department of Environmental Science and Biology, request to be “Associate Faculty”. Currently, “Associate Faculty” reside in the Departments of Earth Sciences, Psychology, and Chemistry (e.g. See Appendix D). Appointment of additional Associate Faculty from other departments is possible in the future. Associate Faculty in the Departments of Chemistry, Earth Sciences and Psychology with expertise in areas such as geographic information systems, wetland systems, animal behavior, green chemistry, surficial geomorphology, and environmental chemistry will be able to supervise graduate students.

1 The Environmental Careers Organization (ECO) has been serving the needs of environmental employers, students and aspiring professionals for 25 years. ECO, 179 South Street, Fifth Floor, Boston MA 02210

With the combined expertise of faculty from the Department of Environmental Science and Biology and Associate Faculty from other departments, the graduate teaching and research program in Environmental Science and Biology at SUNY Brockport would become even stronger with opportunities for students to pursue advanced study in a much wider range of subjects.

**Library Resources:** Journals available to graduate students through Drake Memorial Library are listed in Appendix E.

**Resources:** No new fiscal or faculty resources are required for this proposal.
**Computer Facilities:** Lennon Hall houses a satellite “PC Center” with 24 Gateway PCs and a SUN equipped center (10 machines) for computer modeling.

**Laboratory and Field Facilities:**
There is a wide range of well-equipped laboratories and field research equipment available for environmental research at SUNY Brockport. The Lennon Hall facility, where the Department of Environmental Science and Biology and the Department of Earth Sciences are housed, was recently renovated with funds from the National Science Foundation and the New York State Construction Fund. The ~$13 million renovation provides state-of-the-art facilities, with new equipment ranging from radio-telemetry gear for tracking birds and fish, a Geographic Information Systems lab, a new $38,000 fish-electroshocking vessel; a 25-foot lake-going vessel for Lake Ontario equipped with GPS, marine radio, fathometer, SeaBird CTD, gas powered winch; three Bran-Luebbe chemical autoanalysers, Perkin Elmer atomic absorption (flame and graphite) spectrophotometer, HP G1800C Quadrupole GC/MS, Agilent 6890N Network Gas Chromatograph System, and assorted spectrophotometers, fluorometers and microscopes. Additional facilities under departmental direction include an aquaculture facility, aquaculture ponds, diluter room for toxicity testing, a greenhouse, a NELAC (National Environmental Laboratory Accreditation Consortium) certified analytical laboratory, herbarium, and a large walk-in environmental chamber. Nearby field sites used on a regular basis for teaching and research include Iroquois National Wildlife Refuge and Braddock Bay Bird Observatory.

**The Combined Bachelor of Science and Master of Science Program**

**General:** Students pursuing the BS/MS degree would be required to complete a minimum of 138 semester hours. Of these 138 credits, 30 credits would be at the graduate level and 108 credits would be at the undergraduate level (see Requirements for the BS/MS in Environmental Science for details). At the graduate level, thirteen hours of core courses that include a defended thesis based upon original research would be required. Students would also have to pass an oral comprehensive exam administered by their “Thesis Advisory Committee”. Students pursuing a BS/MS in Environmental Science and Biology would be supervised by faculty members in the Department of Environmental Science and Biology, and by qualified “Associate Faculty” from the Departments of Earth Science, Psychology and Chemistry, which currently collaborate with the Department of Environmental Science and Biology on the B.S. program in Environmental Science.

**Admission:** Students must apply for admission to the combined degree by the middle of the second semester of their junior year. Admission to the combined program is selective, restricted to students with exceptional records and to availability of a faculty member to serve as a thesis advisor. Students must have a cumulative GPA of 3.4 or better through the end of the junior year to be accepted into the program. Transfer students could be considered for the BS/MS program after taking 30 credits of course work at SUNY Brockport. Qualified applicants will be interviewed by the Department of Environmental Science and Biology as a whole, which will make the final decision on admissions. Achievement of the minimum standards for admission does not guarantee acceptance. Since the Combined Program will be limited to 10 students per year, the academic burden on faculty should be manageable.
Major Advisor and Thesis Advisory Committee: Upon admission to the BS/MS program in Environmental Science and Biology, the candidate will be assigned a Major Advisor by the Department of Environmental Science and Biology. This decision will consider the student’s area of specialization and the willingness of the faculty member to accept the responsibility of serving as the Major Advisor. The Major Advisor will monitor the student’s academic progress and be responsible for direction of the Thesis Proposal, Oral Comprehensive Exam and the Thesis Defense.

The candidate, with the advice of the Major Advisor, will select two other members who, together with the Major Advisor, will constitute the candidate’s Thesis Advisory Committee. One member may be a scientist not from the Brockport campus. The Thesis Advisory Committee will:

1. With the candidate develop a Plan of Graduate Study (see below);
2. Act in an advisory capacity concerning thesis research;
3. Administer and evaluate the candidate’s Oral Comprehensive Exam;
4. Evaluate the candidate’s written thesis (ENV 704);
5. Administer and evaluate the Thesis Defense; and,
6. Terminate the student’s participation in the graduate program if the student does not make reasonable progress towards completion of the M.S. degree, or does not maintain a 3.0 GPA. Reasonable progress is defined by the following:
   a. The maintenance of a GPA of 3.0 in courses listed in the Plan of Graduate Study; and
   b. The development of a Thesis Proposal and Plan of Graduate Study in a timely manner.

Graduate Dismissal Policy: Students in the Combined BS/MS with a GPA below 3.0 in courses listed on the Plan of Graduate Study will have one semester to bring the GPA to 3.0. Failure to bring the GPA to 3.0 will result in the student’s dismissal from the program. Students with a GPA below 3.0 may not enroll in Thesis (ENV 704).

Duration and Time Limit: Table 2 shows a five-year, full-time course of study for completion of the Combined Program. The first three years are spent taking undergraduate courses, while in the 4th year (>90 undergraduate credits), students may take four (up to 12 credits) graduate courses, with a fifth year for the remaining graduate courses and research. Due to the vagaries of experimental and field-related research, completion of a defended thesis may not occur by

Table 2. A suggested five-year course schedule for a BS/MS student in Environmental Science and Biology.

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<th>Freshmen - Fall Cr</th>
<th>Freshmen - Spring Cr</th>
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<tr>
<td>Environmental Science</td>
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<td>Principles of Biology</td>
</tr>
<tr>
<td>College Chemistry I</td>
<td>4</td>
<td>College Chemistry II</td>
</tr>
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<td>General Education Courses</td>
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<td>General Education Courses</td>
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<td>Elective</td>
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<td><strong>SubTotal</strong></td>
<td><strong>15</strong></td>
<td><strong>SubTotal</strong></td>
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<tr>
<td>Sophomore - Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecology</td>
<td>4</td>
<td>Intro Meteorology</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>4</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>General Education/College Electives</td>
<td>4</td>
<td>General Education/College Electives</td>
</tr>
<tr>
<td>Environmental Law</td>
<td>3</td>
<td>Statistics or Calculus I</td>
</tr>
<tr>
<td><strong>SubTotal</strong></td>
<td><strong>15</strong></td>
<td><strong>SubTotal</strong></td>
</tr>
<tr>
<td>Junior- Fall</td>
<td></td>
<td></td>
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<tr>
<td>Physical Geology</td>
<td>4</td>
<td>General Education/College Electives</td>
</tr>
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<td>11</td>
<td>Track Electives</td>
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the end of the 5th year. It should be emphasized that a student in the combined BS/MS program may require more time to complete thesis requirements. Students must complete the BS/MS program in seven years.

Progression and Fallback Position: Students must have a cumulative 3.4 GPA through the end of their junior year to be admitted to the combined Program and a continuing GPA of 3.0 or better to remain in the program. Students admitted to the Combined Program who fail to meet this academic standard will have a fallback position, which is to complete all requirements for the BS degree in Environmental Science. After completing the combined program, students will earn a BS and an MS in Environmental Science and Biology.

Full-Time Students: Students enrolled in ENV 704 are considered to be full-time students even though they may have less than 12 credit hours of courses.

Independent Study: Independent study allows students to explore unique areas of interest not addressed by currently offered courses or to explore to greater depth a topic covered in an existing course. A student is limited to three credits of Independent Study credit.

Thesis Proposal: A thesis proposal must be written by the candidate and be approved by the Thesis Advisory Committee prior to beginning thesis research.

Tuition Rate: The tuition rate is subject to college policies when students progress into graduate courses.

**Plan of Graduate Study/The Curriculum**

Thirty credits or more are required for the M.S. portion of the BS/MS in Environmental Science and Biology. Of these 30 credits, 15 credits or more are to be at the 600/700 level. The remainder may be at the 700, 600 or 500 level as determined by the Thesis Advisory Committee in consultation with the candidate prior to the end of the seventh semester (normally the fall semester of the senior year). Thirteen credits of core courses are required as follows: Graduate Research Seminar (ENV 705), Thesis (ENV 705), Experimental Design (ENV 614). The Plan of Graduate Study may include supervised independent study which will not exceed three credits. The Plan of Graduate Study will reflect the student’s expressed desire to concentrate in some area of Environmental Science and Biology. That is, courses selected will reflect the expertise required for their thesis, enabling them to help solve important environmental problems while providing a fully integrated, interdisciplinary approach to environmental science and biology. This educational outcome should provide our graduates with the background demanded in the marketplace. To accomplish this, the program will use strengths of the School of Letters and Sciences to provide a strong scientific education at the graduate level. Furthermore, several courses and internships open to Environmental Science students include extensive problem-
solving exercises provided by members of the environmental community (government, non-government organizations, and industry). Members of the environmental community have indicated a willingness to participate as mentors to students in these problem-solving exercises (e.g., Brockport’s paid intern program with NYSDEC).

The courses making up the Plan of Study are to be listed on the Plan of Study Form and approved by all members of the Thesis Advisory Committee and the Department Chair. Courses may be from any department on campus, as long as they contribute to a coherent program of study (See Appendix B for a list of potential courses). Any changes in the Plan of Graduate Study must be approved by the Thesis Advisory Committee.

**Level of Expectation of Students**

The M.S. in Environmental Science and Biology is a rigorous, demanding thesis-based experience. The comprehensive exam, thesis defense and schedule of courses are designed to challenge students to think critically, independently and creatively, while providing the intellectual depth and breadth necessary to support the research formally developed in the thesis proposal.

The oral comprehensive exam is a 2 to 3-hour formal question and answer period required of every student. Exam questions from each faculty member are unannounced and may cover any aspect of environmental science and biology deemed important by the Thesis Advisory Committee.

The written thesis is reviewed by the Thesis Advisory Committee and revised by the candidate until deemed acceptable for the Thesis Defense by the Committee. The written thesis (ENV 704 – six credits) will be formally defended before the Thesis Advisory Committee. The defense, which takes place over a 2 to 3-hour period, concentrates on aspects of the thesis. That is, the students must be able to satisfactorily answer questions dealing with experimental design, methodology, hypotheses, conclusions, etc. developed in the thesis.

The Graduate Research Seminar (ENV 705), required of all students, is designed as four, one-credit seminars offered in successive semesters (total of four credits). Each seminar will critically review selected literature (one or two papers per week) on a topic determined by the faculty member. Over a two-year period, four different faculty will teach the course, providing students with breadth and depth on a series of topics.

Experimental Design (ENV 614 – 3 credits) is required of all students. We believe all students need to have a strong background in design of experiments to be successful. Parametric and non-parametric statistics as well as regression and ANOVA are covered. See Appendix F for the syllabus.

Syllabi of other 600 and 500-level elective courses are provided in Appendix F. 500-level courses are offered to graduate students and to selected undergraduate students who have taken prerequisite courses. In 500-level courses, graduate students face a significantly higher level of expectation than undergraduates. This is accomplished by one or more techniques including enhanced reading lists, extra papers or projects, presentations before the class, and often a more rigorous exam. For example, in Limnology (ENV 519) a total of 22 journal articles are read both by undergraduate and graduate students. In addition, graduate students must read five extra chapters (218 pages), write an additional term paper on some aspect of their thesis research and
Requirements for the BS/MS in Environmental Science

1. Completion of the core requirements (38 credit hours) for the BS in Environmental Science (Appendix C).
2. Completion of General Education requirements of SUNY Brockport.
3. Completion of the Plan of Graduate Study as determined by the Thesis Advisory Committee in consultation with the candidate by the end of the first semester.
4. Successful completion of an oral comprehensive exam administered by the Advisory Committee by the beginning of the eighth semester of matriculation (normally the last semester of the senior year). The result of this exam may be used by the advisory committee to adjust the candidate’s Plan of Graduate Study. In case of failure of this exam, ONE oral reexamination may be granted by the committee prior to the start of the fourth semester.
5. Required Core Courses (13 credits)
   a) Graduate Research Seminar (ENV 705 – 4 credits, one one-credit course per semester).
   b) Thesis (ENV 704 – 6 credits)
   c) Experimental Design (ENV 614 – 3 credits)
6. A minimum of 15 semester hours at the 600/700 level.
7. A minimum of 30 semester hours of credit with a cumulative GPA of 3.0 or higher in the courses listed in the Plan of Graduate Study:
9. Submission of five copies of the defended thesis to the department secretary.
10. A minimum of 120 credits are required for graduation.

Quality of the Program: This is an ambitious program for a student. Nevertheless, quality will be maintained throughout the program. Admission to and continuation in the Combined Program is dependent on maintaining high academic standards – A GPA greater than 3.4 for the initial six semesters and greater than 3.0 for the graduate courses listed in the Plan of Graduate Study. Students in the “Combined BS/MS Program” must meet the same graduate course requirements as all other students in the “Traditional MS” program.

Transfer Credit: Up to six credits of graduate course work with a grade of “B” or better may be transferred from other institutions with the approval of the student’s Thesis Advisory committee.

Program Requirements and Side by Side Comparison. A student enrolled in the “Traditional BS plus MS” program requires a minimum of 150 credits to graduate, while a candidate in the “Combined BS/MS” program is required to take 138 credits (Table 3). Note that the BS in Environmental Science has a set of “Core” courses required of all majors, but varying co-requisites and electives in its four areas of concentration. The concentration areas, or tracks, are Terrestrial Ecology, Aquatic Ecology, Earth Science and Environmental Chemistry.
Table 3. Side by side comparison of the “Traditional BS+MS” program and the “Combined BS/MS” program. *=Required Courses.

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| SUBTotal for a Track | 4 | 23 | SUBTotal for a Track | 4 | 23 |

| Electives | | Environmental Chemistry Track | | Total | | 12 | 0 |
|-----------|-------------------------------|-------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Aquatic and Terrestrial Track | 20 | Aquatic and Terrestrial Track | 12 | Aquatic and Terrestrial Track | 20 | Aquatic and Terrestrial Track | 12 | Aquatic and Terrestrial Track |
| Earth Science Track | 20 | Earth Science Track | 12 | Earth Science Track | 20 | Earth Science Track | 12 | Earth Science Track |
| Environmental Chemistry Track | 2-4 | Environmental Chemistry Track | 2-4 | Environmental Chemistry Track | 2-4 | Environmental Chemistry Track | 2-4 | Environmental Chemistry Track |

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| SUBTotal | 57-59 | 54 | 45 |

| Total | 120 | 12 | 0 |
| Total | 108 | 108-110 |

A) Master’s Degree

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Appendix A. Current (or last known) job placement, thesis title and advisor of MS students advised by Norment, Haynes and Makarewicz in their former department.

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Title of Thesis</th>
<th>Major Advisor</th>
<th>Position</th>
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<tr>
<td>Insalaco, Samual</td>
<td>1979</td>
<td>Routine determination of mirex and photomirex in fish tissue in the presence of polychlorinated hydrocarbons.</td>
<td>Makarewicz</td>
<td>V.P. for European Affairs, OH Materials, Findlay, Oio</td>
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<tr>
<td>McCormack, Charles</td>
<td>1980</td>
<td>Stamina and feeding responses of rainbow trout fitted with dummy biotelemetry devices.</td>
<td>Haynes</td>
<td>Unknown</td>
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<tr>
<td>Calaban, Michael</td>
<td>1981</td>
<td>The effect of temperature and density on the amplitude of vertical migration of <em>Daphnia magna</em>.</td>
<td>Makarewicz</td>
<td>Water Quality Specialist, NY Dept Environmental Conservation</td>
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<tr>
<td>McKellar, Dorothy</td>
<td>1982</td>
<td>Growth response of <em>Anacystis nidulans</em> to sodium, phosphate and potassium.</td>
<td>Makarewicz</td>
<td>Technical Assistant, Stone and Webster, Boston, MA</td>
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<tr>
<td>Mellas, Ernest</td>
<td>1982</td>
<td>Effect of dummy telemetry transmitter attachments on swimming performance and behavior of rainbow trout and white perch.</td>
<td>Haynes</td>
<td>Professor of Biology, Monroe Community College, Rochester, NY</td>
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<tr>
<td>Leupold, Maureen</td>
<td>1983</td>
<td>Blue-green algal mats from acidified lakes: Mat structure and pH response of algal isolates.</td>
<td>Makarewicz</td>
<td>Assistant Professor, Genesee Community College</td>
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<td>Nettles, David</td>
<td>1983</td>
<td>Ecology of Lake Ontario brown trout. Assistant Professor, Paul Smith’s College.</td>
<td>Haynes</td>
<td>NYSDEC, Atlantic salmon recovery coordinator for Lake Champlain, Raybrook, NY</td>
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<tr>
<td>Kent, Brian</td>
<td>1984</td>
<td>Mirex and its metabolites: Trends in levels of Lake Ontario coho and chinook salmon.</td>
<td>Makarewicz</td>
<td>Director, Quality Assurance Program, General Electric, Syracuse, NY</td>
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<tr>
<td>Poulin, Kathleen</td>
<td>1985</td>
<td>A review and evaluation of regulatory, design and environmental impact considerations for Great Lakes recreation development.</td>
<td>Haynes</td>
<td>Environmental regulations specialist, Architectural and Engineering firms, Providence RI.</td>
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<td>Firstencel, Heidi</td>
<td>1987</td>
<td>The Black Tern: Breeding ecology in upstate New York and results of pesticide residue analyses</td>
<td>Makarewicz</td>
<td>Research Associate, Cornell Ornithology Lab, Ithaca, NY</td>
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<tr>
<td>Lewis, Theodore</td>
<td>1987</td>
<td>Exchange of mirex between Lake Ontario and its tributaries.</td>
<td>Makarewicz</td>
<td>Research Associate, Research Foundation of SUNY</td>
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<tr>
<td>Gerber, Glen</td>
<td>1987</td>
<td>Movements and behavior of smallmouth bass and rock bass in southcentral Lake Ontario and two</td>
<td>Haynes</td>
<td>Endangered Species Coordinator, San Diego Zoo.</td>
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<tr>
<td>Name</td>
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<td>Advisor</td>
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<td>Shea, Mary</td>
<td>1987</td>
<td>Mysis relicta: Production, vertical migration and life history of the Lake Ontario population.</td>
<td>Makarewicz</td>
<td>Water Treatment Plant Operator, Batavia, NY</td>
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<td>Koapaha, Joujje</td>
<td>1989</td>
<td>Leptodora kindti: Seasonal population abundance and food web interactions in Lake Ontario.</td>
<td>Makarewicz</td>
<td>Unknown, Returned to Indonesia</td>
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<tr>
<td>Fry, Barry</td>
<td>1989</td>
<td>Alpha and Pmax as functional indicators of aquatic ecosystems</td>
<td>Makarewicz</td>
<td>Director of Sales Columbia Analytical, Rochester, NY</td>
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<tr>
<td>Teal, Gregory</td>
<td>1989</td>
<td>Nutrient loadings into Conesus Lake</td>
<td>Makarewicz</td>
<td>Lab Director, Columbia Analytical, Rochester, NY</td>
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<tr>
<td>Puckett, Norma</td>
<td>1989</td>
<td>Trophic interactions and alewife predation in Conesus Lake</td>
<td>Makarewicz</td>
<td>Lab Director (retired), Van Lare STP</td>
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<tr>
<td>Letson, Michael</td>
<td>1991</td>
<td>An experimental test of the crayfish as a control mechanism for submerged aquatic macrophytes.</td>
<td>Makarewicz</td>
<td>CH2 Hill Consultants, Florida</td>
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<td>Murray, Michael</td>
<td>1991</td>
<td>Residues of mirex and photomirex in eggs and fillets of Lake Ontario coho and chinook salmon.</td>
<td>Makarewicz</td>
<td>Analytical Lab, Buffalo, NY</td>
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<td>Desormeaux, Eileen</td>
<td>1992</td>
<td>Trophic interactions: The relative importance of Dreisena filtration and Daphnia grazing on phytoplankton abundance and water clarity.</td>
<td>Makarewicz</td>
<td>School teacher, Chili High School</td>
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<td>Aultman, Dana</td>
<td>1992</td>
<td>Spring thermal fronts and salmonine distributions in Lake Ontario.</td>
<td>Haynes</td>
<td>Statistician, Eastman Kodak Company</td>
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<td>Brown, Gary</td>
<td>1993</td>
<td>Investigation of generalized watershed loading functions predictions on Sodus East Creek watershed</td>
<td>Makarewicz</td>
<td>Co-Director, Monroe Co. Environmental Health Dept</td>
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<td>Crego, Gregory</td>
<td>1994</td>
<td>Effects of alewife predation on zooplankton community structure in Honeoye and Conesus Lakes</td>
<td>Makarewicz</td>
<td>Ph.D program, Mississippi</td>
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<td>Stewart, Timothy</td>
<td>1993</td>
<td>Benthic macroinvertebrate community changes following zebra mussel colonization of southwestern Lake Ontario</td>
<td>Haynes</td>
<td>Assistant Professor, Dept. Natural Resources, Iowa State University</td>
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<td>Miller, Steven</td>
<td>1994</td>
<td>An analysis of factors potentially limiting the abundance of the zebra mussel in Salmon Creek, Monroe County, New York.</td>
<td>Haynes</td>
<td>Regulatory analyst/fishery technician, NYSDEC, Avon, NY.</td>
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<td>Verna, Tony</td>
<td>1995</td>
<td>The paleolimnology of Irondequoit Bay: Trophic history inferred from sedimentary diatom assemblages</td>
<td>Makarewicz</td>
<td>General Motors, Rochester, NY</td>
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<td>Cloen, Carol</td>
<td>1996</td>
<td>Ultraviolet-B penetration in the water column and its effect on the American toad, Bufo americanus</td>
<td>Makarewicz</td>
<td>Natural Resource Adm., WA Dept of Natural Resources</td>
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<td>Nale, Helen</td>
<td>1996</td>
<td>Benthic macroinvertebrates of Sandy Creek: Characterization and use in water quality analysis</td>
<td>Makarewicz</td>
<td>High school teacher, Penfield, NY</td>
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<td>Name</td>
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<td>Cady, Bruce</td>
<td>1996</td>
<td>The effects of zooplankton grazing and nutrients on the phytoplankton of Conesus Lake, NY</td>
<td>Makarewicz</td>
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<td>Tangorra, Philip</td>
<td>1996</td>
<td>Sediment chemistry of Irondequoit, NY</td>
<td>Makarewicz</td>
<td>Lab Analyst, Hudson Valley Health Department</td>
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<td>Roberts, Chris</td>
<td>1996</td>
<td>Effects of Forest Fragmentation on the Reproductive Biology of Scarlet Tanagers (Piranga olivacea)</td>
<td>Norment</td>
<td>Ecologist, Nature Conservancy Rochester, NY</td>
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<td>Lampman, Gregory</td>
<td>1997</td>
<td>Trophic interactions in Lake Ontario: The zooplankton- phytoplankton link</td>
<td>Makarewicz</td>
<td>Associate Project Manager, NYSERDA</td>
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<td>Jones, Gregory</td>
<td>1997</td>
<td>Stopover Ecology of neotropical migrants on the south shore of Lake Ontario during spring migration</td>
<td>Norment</td>
<td>Ph.D. program, Univ. Florida</td>
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<td>Terninko, John</td>
<td>1998</td>
<td>Watershed management plan for Wayne County</td>
<td>Makarewicz</td>
<td>Associate Director, Center for Environmental Information, Rochester, NY</td>
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<td>Cook, George</td>
<td>1998</td>
<td>Chironomids as indicators of water quality in Irondequoit Creek.</td>
<td>Haynes</td>
<td>Aquatic ecology consultant, Rochester, NY</td>
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<td>Weaver, Ken</td>
<td>1987</td>
<td>Alpha and betadiversity in zooplankton communities.</td>
<td>Makarewicz</td>
<td>Everglades Park, Florida</td>
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<td>Arnold, Mary</td>
<td>2001</td>
<td>Paleolimnological analysis of Sodus Bay</td>
<td>Makarewicz</td>
<td>Private Consultant, Diatom Analysis</td>
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<td>Robinson, Judy</td>
<td>2000</td>
<td>Follow-up vegetational and avifaunal surveys on wetlands restored through the U.S. Fish and Wildlife Service</td>
<td>Norment</td>
<td>Environmental Specialist, Dept. of Env. Quality, Virginia</td>
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<td>Bland, Stephen</td>
<td>2002</td>
<td>Causes of moss distribution in Alleghany primary order streams</td>
<td>Makarewicz</td>
<td>Analyst, VanLage STP, Rochester, NY</td>
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<td>Burke, Brian</td>
<td>2000</td>
<td>Habitat suitability comparisons for creek and horneyhead chubs.</td>
<td>Haynes</td>
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<td>Ward, Roger</td>
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<td>Makarewicz</td>
<td>Regulatory Affairs Officer, NYSDEC</td>
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<td>2001</td>
<td>Nocturnal energy levels and stopover behavior of spring neotropical migrants along the southern Lake Ontario shoreline</td>
<td>Norment</td>
<td>Ph.D. program, U. Rhode Island</td>
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<td>Bailey-Billhardt, Nichelle</td>
<td>2001</td>
<td>Ecological indicators of water quality in Irondequoit Creek.</td>
<td>Haynes</td>
<td>Director, Orleans C. Soil and Water Conservation District, Albion, NY</td>
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<td>Damaske, Bestsy</td>
<td>2001</td>
<td>Long-term changes mirex levels in Lake Ontario salmon</td>
<td>Makarewicz</td>
<td>GC analyst, Battelle labs, Columbus, OH</td>
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<td>Parnell, Nicholas</td>
<td>2002</td>
<td>Developing an Index of Biotic Integrity based on fish assemblages in small lakes in central and western New</td>
<td>Haynes</td>
<td>Senior Fisheries Scientist, Mote Marine Laboratory,</td>
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<td>Laxson, Corey</td>
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<td>Cercopagis pengoi distribution in Lake Ontario</td>
<td>Makarewicz, Assistant Professor, Paul Smiths College, NY</td>
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<td>Rhyne, Randall</td>
<td>2002</td>
<td>Sampling and statistical considerations for steam invertebrate indices</td>
<td>Haynes, High School teacher, Fayetteville, NC</td>
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<td>Hughes, Thomas</td>
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<td>Lake sturgeon ecology in the Niagara River</td>
<td>Haynes, Biologist, NYSDEC, Stony Brook, NY</td>
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<td>D’Auito, Peter</td>
<td>2003</td>
<td>Factors controlling metaphyton in Conesus Lake</td>
<td>Makarewicz, Everglades Project, USGS, Florida</td>
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**Appendix B.** List of graduate electives available to candidates for the BS/MS of Science degree in Environmental Science and Biology. *Required Course. ¹Syllabi in Appendix F.

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<td>*ENV 705</td>
<td>Graduate Research Seminar (1)</td>
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<td>LST 722</td>
<td>Great Lakes Issues (3)</td>
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<td><strong>600 LEVEL Courses</strong></td>
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<td>¹ENV 614</td>
<td>Experimental Design (3)</td>
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<td>¹ENV 621</td>
<td>Water Chemistry (4)</td>
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<td>ENV 692</td>
<td>Graduate Internship (3)</td>
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<td>ENV 699</td>
<td>Independent Study (3)</td>
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<td>ESC 636</td>
<td>Water Resources Topics (3)</td>
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<td>NAS 663</td>
<td>Field Natural History (3)</td>
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<td>Grant Writing and Management (1)</td>
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<td>PAD 680</td>
<td>Public Policy (3)</td>
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<td>¹ENV 513</td>
<td>Topics in Plant Biology (3)</td>
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<td>Limnology (3)</td>
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<td>Population Biology (3)</td>
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<td>Pollution Biology (3)</td>
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<td>Ornithology (4)</td>
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<td>Herpetology (4)</td>
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<td>Field Ecology (3)</td>
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<td>Mammalogy (4)</td>
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<td>¹ENV 583</td>
<td>Aquatic Invertebrates (4)</td>
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<td>¹ENV 584</td>
<td>Fish Ecology (3)</td>
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<td>¹ENV 588</td>
<td>Environmental Impact Analysis (3)</td>
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<td>¹ENV 590</td>
<td>Fishery Techniques (2)</td>
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<td>ENV 595</td>
<td>Plant Ecology (4)</td>
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<td>¹ESC 511</td>
<td>Hydrology Lab (1)</td>
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<td>¹ESC 512</td>
<td>Hydrology (3)</td>
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<td>ESC 516</td>
<td>Landform Analysis Lab (3)</td>
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<td>¹ESC 518</td>
<td>Watershed Sciences (3)</td>
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<td>ESC 521</td>
<td>Air Pollution Meteorology (3)</td>
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<td>ESC 555</td>
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<td>ESC 530</td>
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</tr>
<tr>
<td>¹ESC 557</td>
<td>Geochemistry (3)</td>
</tr>
<tr>
<td>¹ESC 562</td>
<td>Groundwater (4)</td>
</tr>
<tr>
<td>GEL 511</td>
<td>Stratigraphy and Sedimentology (3)</td>
</tr>
<tr>
<td>CRJ 540</td>
<td>Environmental Law (3)</td>
</tr>
<tr>
<td>BIO 526</td>
<td>Recombinant DNA (3)</td>
</tr>
<tr>
<td>BIO 567</td>
<td>Biochemistry I (4)</td>
</tr>
<tr>
<td>BIO 568</td>
<td>Biochemistry II (4)</td>
</tr>
<tr>
<td>BIO 515</td>
<td>Molecular Biology (3)</td>
</tr>
</tbody>
</table>
Appendix C

The Major in Environmental Science

Department of Environmental Science and Biology

Summary of Requirements

Core Courses (38 Credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV 202</td>
<td>Environmental Science</td>
</tr>
<tr>
<td>ENV 111</td>
<td>Principles of Biology</td>
</tr>
<tr>
<td>ENV 303</td>
<td>Ecology</td>
</tr>
<tr>
<td>CHM 205</td>
<td>College Chemistry I</td>
</tr>
<tr>
<td>CHM 303</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>CRJ 440</td>
<td>Environmental Law</td>
</tr>
<tr>
<td>ESC 211</td>
<td>Intro. to Meteorol.</td>
</tr>
<tr>
<td>GEL 201</td>
<td>Intro. Phys. Geol.</td>
</tr>
<tr>
<td>MTH 201</td>
<td>Calculus I or</td>
</tr>
<tr>
<td>ENV 437(B)</td>
<td>(Bio. Invest./Data Interp.)</td>
</tr>
<tr>
<td>ESC 350</td>
<td>(Comp. Methods)</td>
</tr>
</tbody>
</table>

**Concentration in Aquatic Ecology (24 credits)**
- 15 elective credits chosen by advisement
- 3 co-requisite courses
  - CHM 305 Organic Chemistry I, ENV 419 Limnology, ENV 421 Limnology Laboratory

**Concentration in Terrestrial Ecology (24 Credits)**
- 20 elective credits chosen by advisement
- 1 co-requisite course
  - (CHM 305 Organic Chemistry I)

**Concentration in the Earth Sciences (24 Credits)**
- 20 elective credits chosen by advisement
- 1 co-requisite courses
  - (PHS 115 General Physics with Lab or PHS 201 College Physics with Lab or CHM 305 Organic Chemistry)

**Concentration in Environmental Chemistry (35-37 Credits)**

<table>
<thead>
<tr>
<th>Required Courses (19 cr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 301 Chemical Safety</td>
</tr>
<tr>
<td>CHM 305 Organic Chemistry I</td>
</tr>
<tr>
<td>CHM 306 Organic Chemistry II</td>
</tr>
<tr>
<td>CHM 400 Chemistry Seminar</td>
</tr>
<tr>
<td>CHM 401 Chemistry Seminar</td>
</tr>
<tr>
<td>CHM 405 Physical Chemistry I</td>
</tr>
<tr>
<td>CHM 406 Physical Chemistry II</td>
</tr>
<tr>
<td>CHM 457 Environmental Geochemistry</td>
</tr>
</tbody>
</table>

**Co-requisite Courses (14 cr)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 202</td>
<td>Calculus II (F,S)</td>
</tr>
<tr>
<td>MTH 203</td>
<td>Calculus III (F,S)</td>
</tr>
<tr>
<td>PHS 201</td>
<td>College Physics I (F)</td>
</tr>
<tr>
<td>PHS 202</td>
<td>College Physics II (S)</td>
</tr>
</tbody>
</table>

**Electives (2-4 credits)**
Appendix D. Vitae of Environmental Science and Biology Faculty and Associate Faculty.

JOSEPH C. MAKAREWICZ

CURRENT POSITION: Distinguished Professor and Chairman, Department of Environmental Science and Biology, State University of New York at Brockport, Brockport, New York 14420 (716-395-5747), e-mail: Jmakarew@brockport.edu

EDUCATION:

1969  B.S. (Marine Biology, minor in Chemistry) University of Massachusetts - Dartmouth
1974  Ph.D. (Limnology, Water Resources) Cornell University

PROFESSIONAL EXPERIENCE:

1968  Research Assistant, Univ. of Georgia Marine Institute, Sapelo Island, Georgia. Salt marsh hydrology.
1969-1971  Graduate Teaching Assistant, Cornell University, Ithaca, NY
1971-1972  Instructor in Environmental Sciences, Bristol Community College, Fall River, Massachusetts.
1971-1972  Instructor in Biology, Southeastern Massachusetts Univ., North Dartmouth, Massachusetts
1975-1976  Research Fellow, Edmund Niles Huyck Preserve, Rensselaerville, New York
1974-present  Assistant Professor of Biology, SUNY at Brockport, NY
1974-present  Designed, equipped and maintained a fully equipped (A.A., G.C., Autoanalyser, phase scopes, etc.) certified (ELAP, NELAC) water quality laboratory: 1975-present. Directed 31 graduate students and over 50 undergraduate research projects; employ and supervise 2-3 technicians per year.
1980  Summer course, (taught "Structure and Function of Marine Plankton Ecosystems"), Univ. of Massachusetts, Nantucket Field Station
1978-1984  Associate Professor of Biology, SUNY at Brockport, NY
1984-1998  Professor of Biology, SUNY at Brockport, NY
1989-1990 Senior Fulbright Research Fellow, Max Planck Institute fur Limnologie, Germany
1992-present  Research Fellow: CILER (Cooperative Institute for Limnology and Ecosystems Research)
1991-1997  Chairman, Dept. of Biological Sciences, SUNY at Brockport
1998-2000  Coordinator - Environmental Science major
1998-present  Distinguished Professor of Biological Sciences, SUNY Brockport, Brockport, NY
2000-2002  Director – Environmental Science Program
2000-present  Chairman – Department of Environmental Science and Biology

ADMINISTRATIVE:

Coordinator, Director and now Chair of the Department of Environmental Science and Biology (1998- present). SUNY College at Brockport.

Implemented and developed the curriculum and major and minor in Environmental Science and Biology.

Set-up a new department from “ground zero” into a functioning department with
four faculty and 3 staff.
Set-up web site, newsletter, space, budget, etc.
In the process of developing an MS degree in Environmental Science

Chairman: Lake Ontario Facilities Development. As Chair, we have developed a campus-wide consensus report that has been approved by the President of the college to initiate the development of a research/education facility on the shores of Lake Ontario. At present, ~$100,000 in funding has been received for preliminary drawings. Activities completed include negotiations with NYS Parks and Recreation on siting of the facility at a State Park, development of brochures, and initiatives for funding through federal and state sources. This included meetings and presentations with appropriate state and federal congressional representatives. Preliminary architectural drawings are now underway with Bergmann Associates, Inc.

Chairman, Department of Biological Sciences (1991-1997), SUNY College at Brockport.
14 faculty, 2 research associates, 4 service personnel, 300+ undergraduate majors, 30 graduate students.
Developed and instituted an undergraduate assessment procedure.
Developed and published a departmental newsletter.
Doubled enrollments in the undergraduate major in Biological Sciences through a multifaceted program that included sending the newsletter to community colleges instructors, letter writing and a phone campaign to students.
Implemented the major in Medical Technology
Lead the development and passage through administrative channels of the interdisciplinary major (Earth Science, Biology and Chemistry) in Environmental Sciences.
Received funding from the college to set up a 24 station computer facility for the sciences.
Initiated the renovation of the Lennon Hall Science building through a National Science Foundation Infrastructure grant with matching funding from the SUNY Construction Fund. Total amount of funds attracted for renovation was $13 million.
Hired five new faculty and developed and hired a new position titled instructional support assistant.

Responsible for Brockport's interest in developing a research consortium of colleges for research on the Great Lakes. Brockport and SUNY Oswego received two development grants for this project. As of 1986 the Consortium was officially formed and received funding from the New York State Assembly and has an annual budget of $150,000.

Chairman, Articulation & Recruitment Committee (1982-1984), SUNY Brockport.
Responsible for developing articulation programs with community colleges for the Department of Biological Sciences. This necessitated working with administrators at various colleges while negotiating 10 successful agreements. The strategy developed has served as a model for other programs and increased enrollment by approximately 20% within the department within two years.

Principal Investigator of contracts and grant.
Administered and managed 73 grants and contracts ($4,400,000+).

RESEARCH AGENDA:

Applied aspects of environmental science, lake and watershed resource management, including such topics as watershed and ecosystem approaches to determining point and non-point sources of nutrients in urban and rural watersheds, hydrologic and nutrient budgets, indicators of successful remediation, strategies and demonstrations projects for reducing nutrient and organic hydrocarbon from watersheds, atmospheric deposition rates on ecosystems, uptake dynamics of chlorinated hydrocarbons in aquatic food-webs, top-down and bottom-up effects on
plankton community structure, environmental education, environmental impact statements, plankton as indicators of success of the phosphorus reduction program in the Great Lakes and methods of reducing pesticide levels in fish grown in polluted waters. Because of my former association with the Hubbard Brook Ecosystem Study in New Hampshire, I also have continuing interest in acid precipitation and analysis using the small watershed approach.

GRANTSMANSHIP: Administered and managed over 73 grants and contracts ($4,400,000+).


West Valley Nuclear Services Company. Biological sampling. $7,500.


Environmental Protection Agency. Summer, 1993-94. Limnology Practicum: Graduate training course on Lake Huron aboard the R.V. Lake Guardian. Topics: Coring, sediment and water analysis, plankton and chlorophyll analysis, etc. Project Leader. $6,331.


Livingston County Planning Department. 1990-1993. Land use as a determinant of watershed chemistry, Conesus Lake. P.I. $33,969.


Great Lakes Research Consortium. 1989. Equipment (G.C) and student support. $13,500.


New York Sea Grant Institute. 1990-91. Trophic interactions: relative importance of Dreissena and Daphnia grazing on phytoplankton abundance and water clarity. $6,050.

Great Lakes Research Consortium. 1990. Concentration and metabolism of pesticides at the air-water interface in Lake Ontario. $20,000.


New York Sea Grant Institute. 1987. Macrophyte development on Wautoma Shoals. $7,000.


NYS Department of Agriculture and Markets. 1988. Uptake and retention of contaminants by fish cultured on prepared diets in waters of Lake Ontario. $37,500.


Monroe County Health Department. 1987. Urban runoff: a watershed approach. $32,000.


Research Foundation of the State of New York, 1983. Grant to develop a Lake Ontario Research Consortium. Project Leader. $20,000.

Department of Transportation, 1983. Fishery survey of the Champlain Section of the NYS Barge Canal. Project Director. $42,840.


Department of Transportation, 1982. Evaluation of dredging in the NYS Barge Canal (Erie Canal). Principal Investigator. $1,000.


Research Incentive Fund Award, 1981. SUNY Brockport. Principal Investigator. $800.


Army Corps of Engineers, 1976. Impact of opening Irondequoit Bay by dredging to
Lake Ontario. Coinvestigator. $13,865.


RESEARCH/CONSULTING:

Have provided expertise to lawyers (e.g., Kehoe & Kehoe). Engineering firms (e.g., Malcolm-Pirnie, Beak, Ebasco, Halfmoon Generation, Saiki, Larsen, Ecology and Environment) and private associations (e.g., Port Bay Association, Black Lake Association).

PUBLICATIONS - JOURNALS AND BOOKS:

Protection Alliance. 33pp.


**PUBLICATIONS - TECHNICAL REPORTS:**


Makarewicz, J.C., and T.W. Lewis. 2002. Segment analysis of Sheldon Creek, the location of pollution sources, part of the Lake Neatahwanta watershed. Technical Report to the Oswego County Soil and Water Conservation District. Fulton, NY.


Makarewicz, J.C., and T.W. Lewis. 2002. Eighteenmile Creek remedial action plan: area of concern plankton community study; Olcott Harbor at Eighteenmile Creek, New


Makarewicz, J.C., and T.W. Lewis. 2001. Segment analysis of Johnson Creek, the location of sources of pollution. Technical report to the Niagara County Soil and Water Conservation District, Albion, NY.


Makarewicz, J.C., and T.W. Lewis. 2001. Segment analysis of Marsh Creek, the location of sources of pollution. Part of the Lake Ontario watershed located in Orleans County, NY. Technical report to the Orleans County Soil and Water Conservation District, Albion, NY.


Makarewicz, J.C., and T.W. Lewis. 2000. Nutrient and sediment loss from the

Makarewicz, J.C., and T.W. Lewis 2000. Nutrient and sediment loss from a Niagara County watershed, the East branch of Twelvemile Creek. Technical report to the Niagara County Soil and Water Conservation District, Lockport, NY.

Makarewicz, J.C., and T.W. Lewis 2000. Segment analysis of Johnson Creek, the location of sources of pollution. Technical report to the Orleans County Soil and Water Conservation District, Albion, NY.


Makarewicz, J.C., and T.W. Lewis 1999. Soil and nutrient loss from sub-watersheds in the Southwest quadrant of Conesus Lake. Technical report to the Livingston County Health Department and the Livingston County Planning Department, Mount Morris, NY.


Lake. Livingston County Planning Department. 17pp.
Bay. Wayne County Soil and Water Conservation District.
Pollution in Conesus Lake. Livingston County Planning Department.
Makarewicz, J.C. and T. Lewis. 1995. Sources of pollutants in the Kendig Creel
watershed. Seneca County Soil and Water Conservation District.
Makarewicz, J.C and T. Lewis. 1992. Sources of pollutants in the Glenmark and
Wolcott Creek watersheds. Oswego Soil and Water Conservation District.
Makarewicz, J.C. 1990. Chemical analysis and nutrient loading of Salmon and Black
Creek. Monroe County Health Department.
Monroe County Health Department.
Makarewicz, J.C. 1990. Chemical analysis and nutrient loading of streams entering
Conesus Lake. Livingston County Planning Department.
Makarewicz, J.C. 1990. Chemical analysis and nutrient loading of streams entering
Sodus Bay. Wayne County Soil and Water Conservation District.
County Soil and Water Conservation District.
Makarewicz, J.C. 1989. Water Chemistry of Buttonwood, Larkin, Northrup and
Round Pond Creek, Monroe County. Monroe County Health Department. 86 pp.
and Geneseo and the Town of Livonia. Livingston County Health Department. 122 p.
Makarewicz, J.C. 1983. Fisheries Survey of Regions 5, 6 and 7 of Erie Section of
the New York State Barge Canal. New York State Department of Transportation.
74 p.
Makarewicz, J.C. 1983. Fisheries Survey of the Champlain Canal and Upper
Hudson River. New York State Department of Transportation. 242 p.
Survey - Buffalo River and Outer Harbor of Buffalo, New York. Army Corps of
Engineers. Vol. 1 (126 p.); Vol. 2 (168 p.).
Makarewicz, J.C., J.M. Haynes and R.C. Dilcher. 1979. Environmental impact of
dredging Oak Orchard Harbor, Lake Ontario, New York. Environmental Impact
Statement to the Army Corps of Engineers. 53 p.
dredging Cape Vincent Harbor, Lake Ontario, New York. Environmental Impact
Statement to the Army Corps of Engineers. 50 p.
Statement to the Army Corps of Engineers. With R. Ellis and T. Haines. 61 p.
Haines, T., J.C. Makarewicz and R.H. Ellis. 1977. Spring movement and spawning
activity of fish in the vicinity of the proposed dredging operations, Irondequoit Bay,
Makarewicz, J.C. 1977. Environmental impact of opening the mouth of Irondequoit
Bay, Lake Ontario, New York. Environmental Impact Statement to the Army Corps
Pond, New York. Research Report to the Biological Research Station of the
Edmund Niles Huyck. Preserve. 18 p.
Makarewicz, J.C. 1976. An ecological study of the Rochester-Lockport section of the
New York State Barge Canal. New York State Department of Parks and
Ninth Annual Report of the State University College at Oneonta Biological Field
Station, Cooperstown, New York. 12 p.

SEMINARS AND INVITED PRESENTATIONS including keynote speaker

Available on request.

AWARDS
Among 38 scientists honored by the Chancellor of the SUNY system for outstanding scholarship and grantmanship. 2002

Named a member of the “Environmental 25”. In celebration of the Rochester Center for Environmental Studies 25th Anniversary, 25 people from New York State were named “Environmentalist” of the quarter century. 1999.

New York State Conservation Districts Special Award. In recognition of his desire to educate and advance Soil and Water Conservation Districts in their understanding of water resources management.
Phi Beta Delta College International Scholar's Award. 1995.
SUNY Chancellor's Award for Excellence in Teaching. 1994.
Senior Fulbright Research Fellow. 1989/90. Max Planck Institute for Limnologie, Germany.
Fellow of CILER. Elected member of the Cooperative Institute for Lake Experimental Research.
Wayne County Soil and Water Conservation District. Acknowledgment and Appreciation for assistance and excellence in the development of the District's water quality monitoring program.
Researcher of the Month Award (1984) - SUNY Researcher
Faculty Research Award (1983) - Society of Sigma Xi at Brockport
New York State Scholar Incentive Award (1974)
Commonwealth of Massachusetts Scholarship (1968)

COURSES TAUGHT:

PROFESSIONAL SERVICE
Member of Board of Representatives, Great Lakes Consortium (1985-present)
Chairman, Search Committee for Director of Sponsored Research
Scientific Advisory Committee, New York Sea Grant and Federation of Lake Associations
Reviewer for NSF (24 grants)
Member of Board of Representatives, Great Lakes Consortium (1985-present)
Chairman, Search Committee for Director of Sponsored Research
Reviewer for EPA (8 grants)
Reviewer for New York Sea Grant (16 grants)
Reviewer for USDA (2 grants)
Individual and panel reviewer for the Great Lakes Research Consortium (>50 grants)
Reviewer for the Great Lakes Protection Fund (4 grants)
Reviewer for Ohio Sea Grant (3 grants)
Reviewer for Michigan Sea Grant (one grant)
Reviewer for Louisiana Sea Grant (one grant)
Reviewer for ERDA (one grant)
Reviewer for Hydrobiologica
Reviewer for International Association for Great Lakes Research
Reviewer for Ohio Journal of Sciences.
Reviewer for the Canadian Journal of Aquatic Biology and Fisheries
Reviewer for Ecology
Reviewer for Physiology and Behavior
Reviewer for Limnology and Oceanography
Reviewer for Canadian Journal of Aquatic and Fish Biology
Reviewer for Journal of Freshwater Ecology
Session Convener (Ecology), Annual Meeting of the Rochester Academy of Sciences (1976, 1980)
Liaison Officer. Rochester Meeting of the International Association of Great Lakes Research.
Program Committee. Oswego Meeting of the International Association of Great Lakes Research.
Session Chair - Lake Ontario Fishery. 1983. Symposium on Lake Ontario. Center for Environmental Information. This is an International Symposium on the status of Lake Ontario held in Rochester, N.Y.
Great Lakes Initiative Development Committee. 1987. Formed cooperatively by Sea Grant and the National Marine Fishery Service to develop collaborative research on the Great Lakes.
JAMES M. HAYNES

CURRENT POSITION: Professor, Department of Environmental Science and Biology, State University of New York, Brockport, New York 14420 jhaynes@brockport.edu

EDUCATION:
Carleton College, Northfield, MN - B.A., Biology, 1973
University of Minnesota - M.S., Fisheries, 1975
University of Minnesota - Ph.D., Ecology, 1978

PROFESSIONAL EXPERIENCE

Professor (1991 to present), Associate Professor (1984-1990) and Assistant Professor (1978-83) of Environmental Science and Biology, SUNY College at Brockport. Teach undergraduate and graduate courses in Environmental Impact Analysis, Fisheries Science/Management, Fish Biology/Ecology, Fishery Techniques/Fish Identification, Pollution Biology, and Marine Biology/Geology-Bahamas, plus undergraduate courses in Environmental Science, Eco-Citizenship, Biological Oceanography, Evolution, and laboratories for General Biology. Lead instructor or project director for nine National Science Foundation Undergraduate Faculty Enhancement and National Dissemination programs: Summer Practicum for Applied Environmental Problem-Solving (Great Lakes Research Consortium) and Stressed Stream Analysis (Center for Applied Aquatic Science & Aquaculture).

RESEARCH


Principal or Co-Principal Investigator for 30+ grants and contracts for fisheries and aquatic ecology research and education in the lower Great Lakes region totaling $2.7 million since 1978, including impacts of zebra mussels on native benthic invertebrate communities; invertebrates and fish as indicators of aquatic system health; radiotelemetry/netting studies of movements, habitats and diets of fishes in Lake Ontario; impacts of thermal discharges, dredging and recreation development on coastal ecology and fishes in Lakes Ontario/Erie and the St. Lawrence River; photographic and illustrated guides to Great Lakes, Hudson River, and Bahamas fishes; and development of aquaculture ponds and a wet laboratory for aquatic organism culture at SUNY Brockport. Sabbatical leave research in 1988 with the NOAA/NMFS SE Fisheries Center Mississippi Laboratories explored techniques for determining the distribution and abundance of aquatic animals along environmental fronts and reefs in the Gulf.
of Mexico and SW Atlantic Ocean. Used radio telemetry to study movements and habitats of chinook salmon and white sturgeon in relation to hydroelectric dams and gas super-saturation in the Snake and Columbia Rivers with Battelle Pacific Northwest Laboratories, 1975-78. These research and related teaching efforts have resulted in 25+ refereed publications, 20+ major technical reports, a book, and over 60 professional presentations since 1976.

PUBLICATIONS


* student author

Books and Media


Proceedings


Technical Reports


External Funding


Haynes, J.M. 1994. Survey of Buttonwood Creek, Monroe County, NY to determine habitat availability for and relative abundance of a species of special concern, the pirate perch (Aphredoderus sayanus). Monroe County Dept. of Transportation.


Army Corps of Engineers.
Haynes, J.M. 1987-88. Attraction of fishes to the thermal plume at Somerset Station under two-pump operating conditions. Stone and Webster Engineering Corp.
Haynes, J.M. 1986-87. Activity and survival of winter-impinged fish at Somerset Station. NY State Electric and Gas Corp.
Haynes, J.M. 1983. Recreation facility design and environmental impacts on the Great Lakes. NY Sea Grant/NOAA.
Haynes, J.M. 1983. Photographic and illustrated key of selected NY fishes. Faculty Grant for the Improvement of Undergraduate Instruction. SUNY.
CHRISTOPHER NORMENT

CURRENT POSITION: Associate Professor, State University College at Brockport, Department of Environmental Science and Biology, Brockport, New York
(585) 395-5748 cnorment@brockport.edu

EDUCATION

1992 PhD, Systematics and Ecology, University of Kansas, Lawrence, KS.
1982 M.S., Zoology, Washington State University, Pullman, WA.
1975 B.S., Biology, Southern Oregon State College, Ashland, OR.

PROFESSIONAL EXPERIENCE

1998-present Associate Professor (tenured), Department of Environmental Science and Biology, State University of New York, College at Brockport, Brockport, NY. Instruct courses in Mammalogy, Animal Behavior, Conservation Biology, Ornithology, Herpetology, Wildlife Ecology, General Ecology
1993-1998 Assistant Professor, Department of Biological Sciences, State University of New York, College at Brockport, Brockport, NY.
1990-1993 Lecturer, School of Basic Life Sciences, University of Missouri, Kansas City, MO. Instruct courses in Introductory Biology, Comparative Vertebrate Anatomy. Data Manager, Kansas Biological Survey, University of Kansas, Lawrence, KS.
1990-1994 1992-1993 Adjunct Curator, Museum of Natural History, University of Kansas, Lawrence, KS.
1988-1992 Graduate teaching assistant, Division of Biological Sciences, University of Kansas, Lawrence, KS.
1979-1982 Graduate teaching assistant, Department of Zoology, Washington State University, Pullman, WA.
1975-1976 Biologist, United States National Park Service, University of Nevada, Las Vegas, NV.

RESEARCH

Current Avian community structure, breeding biology, and conservation biology in northeastern grasslands; population biology of Frasera speciosa (Gentianacea); reproductive ecology of Zonotrichia sparrows; breeding biology of Australian Pipits (Anthus spinolletta) spring stopover ecology of Neotropical migrant songbirds; wildlife use of created and natural wetlands. 1989-1991 Comparative breeding ecology of Harris’ Sparrows and White-crowned Sparrows in the Northwest Territories, Canada.

Additional Teaching Experience
1983-1988 Director, Outdoor Program, Westover School, Middlebury, CT.
1979-1983 Instructor and Chief Instructor, Pacific Crest Outward Bound School.
1979-1984 Portland, OR.
1974 Environmental Education Specialist, Youth Conservation Corps, Ashland, OR

External Funding (recent)
2003-4 New York State Biodiversity Research Institute ($18,983 for research on...
grassland birds in the St. Lawrence River Valley)

2003 Fish and Wildlife Service ($15,000 for grassland bird research)
2002 Fish and Wildlife Service ($19,000 for grassland bird research)
2000-2003 Biological Study of Irondequoit Bay. (J. M. Haynes, Principal Investigator, $50,000).
2001 Fish and Wildlife Service ($4,800 for grassland bird research)
2001 New York State Department of Environmental Conservation ($4,900 for wetlands research).
2000 Bergen Swamp Preservation Society ($1,600 for small mammal study in Bergen Swamp)
1999 Department of Environmental Conservation ($3,600 for study on Grasshopper Sparrows)
1999 New York State Office of Parks, Recreation and Historic Preservation ($46,000 for biological inventory of Yanty Creek Marsh, J. Makarewicz, principal investigator).
1998-1999 Great Lakes Research Consortium ($20,000 for stopover ecology research with Dr. T. Donovan of SUNY ESF).
1998 Department of Defense, Fort Drum, NY. ($40,000 for study on breeding biology of Henslow's Sparrow)
1997 National Science Foundation Grant: Stressed Stream Analysis: Addressing Real Environmental Problems to Stimulate Undergraduate Science Faculty and Students (J. M. Haynes, Principal Investigator, $120,000).
1997-1998 United States Fish and Wildlife Service Challenge Grants ($15,500 for grassland bird research)
1997-1998 United States Fish and Wildlife Service Challenge Grant ($14,700 for wetlands research).
1994 - 1996 United States Fish and Wildlife Service Challenge Grants ($24,200 for grassland bird research)
1995 - 1998 Department of Environmental Conservation, New York State, ($2,700 for grassland bird research)
1996 Bergen Swamp Preservation Society ($1,100 for assessment of bog turtle populations)
1994 National Science Foundation Grant: Stressed Stream Analysis: Addressing Real Environmental Problems to Stimulate Undergraduate Science Faculty and Students (J. M. Haynes, Principal Investigator, $113,593).

PUBLICATIONS


  (Invited presentation)
GEOFFREY C. GARDNER

CURRENT POSITION:

Assistant Professor, Department of Environmental Science and Biology, State University of New York, Brockport, New York 14420 ggardner@brockport.edu

EDUCATION

The State University of New York at Albany December 2002
Ph.D. Ecology, Evolution and Behavior program
Dissertation: Persistence and Spread of Cryptococcus fagisuga, the initiating agent in Beech Bark Disease
Advisor: Dr. George Robinson

The State University of New York at Albany May 2002
Graduate Certificate in Geographic Information Systems And Spatial Analysis

Union College June 1995
Bachelor of Science in Biology, magna cum laude

PROFESSIONAL EXPERIENCE

SUNY College at Brockport August 2002 to Present
Qualified Academic Rank, Lecturer
ENV 303 Ecology
ENV 495/595 Plant Ecology
ENV 499 Independent Study: Evolution and Impact of Angiosperms,
ENV 437/614 Biological Investigation and Data Analysis

The State University of New York at Albany September 1995 to August 2002
Instructor
Biology 320 Ecology

Teaching Assistant
Biology 110 Introduction to Biology I,
Biology 111 Introduction to Biology II
Biology 455/555 Plant Ecology,
Biology 497/601 Restoration Ecology
Study Group Facilitator Biology 110

RESEARCH

New York State Department of Environmental Conservation September 2000 – June 2002
Division of Water. Bureau of Flood Protection. Water GIS section Internship

The State University of New York at Albany May 1996 to August 1998
Research Assistant
Field assistant in survey of E.N. Huyck Preserve.
Computer work in study of epidemics using TEMPEST computer program.

Union College Summer 1994
Research Assistant
Field assistant in study of eutrophication of an Adirondack lake.

PUBLICATIONS


Examples of Associate Faculty

Mark R. Noll, Ph.D.

EDUCATION
Ph.D. University of Delaware, Newark, Delaware, May 1989 in Soil Physical Chemistry.
M.S. New Mexico Institute of Mining and Technology, Socorro, New Mexico, May 1985 in Geology.

EXPERIENCE
Associate Professor, State University of New York College at Brockport, Department of The Earth Sciences, Sept. 2003 to present, Asst. Prof. Aug. 1997 to Aug. 2003. Responsible for courses in Physical Geology (majors and non-majors), Mineralogy, Geochemistry, Groundwater.
R&D Geochemist, DuPont Chemicals R&D, Environmental Resources Group, Jackson Lab, Deepwater, NJ, April 1991 to March 1994
Adjunct Faculty, Delaware County Community College, Media, PA, September 1992 to March 1994.
Geologist, DuPont Environmental Remediation Services, Wilm., DE, March 1990 to April 1991
Science Teacher, Tower Hill School, Wilmington, De., February 1988 to June 1988. I was responsible for teaching 2 sections of ninth grade physical science and 3 sections of eighth grade earth science.

GRANTS AND CONTRACTS AT BROCKPORT
Principal Investigator

Co-Principal Investigator


Collaborator

PUBLICATIONS AT BROCKPORT
(* denotes undergraduate student co-author)

Journal Articles


Other Peer Reviewed Documents


Conference Abstracts


Other Reports


**PUBLICATION PRIOR TO BROCKPORT**

**Patents**


**Journal Articles**


**Chapter in Edited Volume**


**Conference Proceedings Papers**


Invited Conference Proceeding Paper


Conference Abstracts


GRADUATE STUDENT COMMITTEES

Roger J. Ward
Daniel J. White
Hillary Richardson

HONORS, AWARDS, AND FELLOWSHIPS

- Special Recognition Award, USEPA Region III, 1996
• Rice University Consortium ECRS Advisory Committee, 1994.
• DuPont Chemicals R&D, Oscar Award for Achievement, 1992 and 1993.
• Distinguished Alumni Fellow, Millersville University, 1990.
• Outstanding Teaching Award, University of Delaware, 1987.
• New Mexico Governor's Commission on Higher Education, 1984.
• Sigma Gamma Epsilon, National Earth Science Honor Society, May 1982.

PROFESSIONAL MEMBERSHIPS
Geological Society of America
Soil Science Society of America
National Association of Geoscience Teachers
Markus M. Hoffmann

CURRENT POSITION: Assistant Professor, Department of Chemistry, State University of New York at Brockport, Brockport, New York 14420 mhoffman@brockport.edu

EDUCATION

“Vordiplom” 1991, Chemistry, Darmstady University of Technology, Germany
M.A. 1996, Physical Chemistry, Washington University, St. Louis, MO
Ph.D. 1997, Physical Chemistry, Washington University, St. Louis, MO

PROFESSIONAL EXPERIENCE

1999-2000 Adjunct, Columbia Basin College, Department of Math and Science, Pasco, WA
1999-2000 Post Doctoral Associate, Pacific Northwest National Laboratory, Supercritical Fluids Groups, Richmond, WA
1994-1997 Graduate Assistant, Washington University, Department of Physics, St. Louis, MO
1993-1994 Teaching Assistant, Washington University, Department of Physics, St. Louis, MO
1992-1993 Teaching Assistant, Florida State University, Department of Chemistry, Tallahassee, FL

GRANTSMANSHIP

2003 Petroleum Research Fund Award from the American Chemical Society
2003 Workshop Project Associate Program Starter Grant for Team Learning
2000 Camille and Henry Dreyfus Faculty Start-up Grant for Undergraduate Institutes.
2001 Recipient of an educational grant from the Quadrille Ball of the Germanistic Society of America in 1995.

PUBLICATIONS

A Classroom Exercise Aiming at the Development of an Intuitive Understanding of P-V-T Phase Behavior of Fluids. Hoffmann, M.M. Journal of Chemical Education in press.


CURRICULUM VITAE

David Allen Holtzman

Personal
Department of Psychology
135 Holmes Hall
SUNY Brockport
Brockport, NY 14420

Education and Positions Held

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Department</th>
<th>Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-Present</td>
<td>Assistant Professor</td>
<td>Department of Psychology</td>
<td>SUNY Brockport</td>
<td>Brockport, NY</td>
</tr>
<tr>
<td>1997-2001</td>
<td>Assistant Professor</td>
<td>Department of Brain &amp; Cognitive Sci.</td>
<td>University of Rochester</td>
<td>Rochester, NY</td>
</tr>
<tr>
<td>1992-1997</td>
<td>Assistant Professor</td>
<td>Neuroscience Program</td>
<td>Oberlin College</td>
<td>Oberlin, OH</td>
</tr>
<tr>
<td>1990-1992</td>
<td>Postdoctoral Fellow</td>
<td>Laboratory of Neurobiology &amp; Behavior</td>
<td>The Rockefeller University</td>
<td>New York, NY</td>
</tr>
<tr>
<td>1984-1990</td>
<td>Ph.D., Program in Neural and Behavioral Sciences</td>
<td>State University of New York Health</td>
<td>Science Center at Brooklyn</td>
<td>Brooklyn, NY</td>
</tr>
<tr>
<td>1980-1984</td>
<td>B.S., Anatomy and Physiology</td>
<td></td>
<td>Cornell University</td>
<td>Ithaca, NY</td>
</tr>
</tbody>
</table>

Research Interests
Spatial ecology, memory, and learning in reptiles and amphibians
Development of sensory systems and their use in naturally-occurring behaviors
Chemical senses in reptiles and amphibians
Comparative neuroanatomy

Refereed Publications
Holtzman, D.A., Stosic, C.S., and J. Wyatt (In review) Movement of resident and displaced boa constrictors (Boa constrictor imperator) on Ometepe Island, Nicaragua. Herpetologica.


**Non-refereed Publications**


**External support**


$334,000 (direct costs) - NIH FIRST (R29) Award entitled, “Neurogenesis in the Olfactory and Vomeronasal Systems” (1994-1999)

$100,000 (direct costs) - NIH Shannon Award for expanding on ideas described in a R01 grant application entitled, “Neurogenesis in the Olfactory and Vomeronasal Systems” (1992-1994)

NIH Postdoctoral Fellowship: "Effects of steroids on axial muscle reflexes" (1990-1991); "Interactions of steroids and noxious stimulation on opiate expression in the ventromedial hypothalamus and spinal cord" (1992)

**Honors and Awards**
1999-2003 NSF Award – “Learning-Dependent Neurogenesis”

1994 W.M. Keck Foundation Fellowship in the Natural Sciences

1993 Excellence in Teaching Award from the Faculty for Undergraduate Neuroscience
1993-1998 NIH FIRST Award (R-29)

1992 NIH Shannon Award

1990-1992 NIH Postdoctoral Fellowships

1983 Cornell Tradition Summer Fellowship

1981-1984 Greene Scholarship

1980-1984 New York State Regents Scholarship

Research and Professional Experience

1992-Present Independent research focusing on spatial learning and memory and embryonic and postnatal neurogenesis in the vomeronasal and olfactory systems and hippocampus; orientation behavior/spatial ecology in snakes

1990-1992 Postdoctoral research with Drs. S. Schwartz-Giblin and D.W. Pfaff at the Rockefeller University studying the interactions of steroid hormones with dorsal horn neurons of the spinal cord

1984-1990 Graduate study with Dr. Mimi Halpern at SUNY Health Science Center at Brooklyn examining the neuroanatomical development of the vomeronasal and olfactory systems in garter snakes

1983, 1984 Independent research at Cornell University studying the competitive interactions of two species of darters in an artificial stream

1983 Research assistant with L. Greenberg studying the interactions between various species of benthic stream fishes in the Little River, TN

1980-1984 Curatorial assistant in the Cornell Herpetological and Ichthyological Museum Collections

Teaching Experience

1999-Present Ometepe, Nicaragua and La Suerte, Costa Rica Field Stations: Tropical Animal Behavior and Tropical Herpetology
1997-2001  Assistant Professor, Univ. of Rochester: Neuroethology, Introductory Neuroscience Lab and Lecture, Biomedical Research Ethics, Learning and Memory, Developmental Neurobiology

1992-1997  Assistant Professor, Oberlin College: Introductory Neuroscience Lab and Lecture, Developmental Neurobiology, and Animal Behavior

1990, 1991  Instructor, Nassau County Community College: Human Anatomy and Physiology

1988, 1989  Lecturer, SUNY Health Science Center at Brooklyn: Medical Neuroscience

1986, 1987  Graduate Teaching Assistant, SUNY Health Science Center at Brooklyn: Medical Neuroanatomy

1983  Undergraduate Teaching Assistant, Cornell University: Comparative Vertebrate Anatomy

**Scientific Organization Memberships**
Cornell University Herpetological Society
International Brain Research Organization
Sigma Xi
Society for Neuroscience
Society for the Study of Reptiles and Amphibians

**Journal and Professional Reviews**
American Naturalist
Behavioral Neuroscience
Brain, Behavior and Evolution
Brain Research
Chemical Senses
Copeia
Herpetologica
Journal of Chemical Ecology
Journal of Comparative Neurology
Journal of Comparative Psychology
Journal of Herpetology

Study section for Small Grants for National Institute of Deafness and Communication Disorders
Ad hoc reviewer for National Science Foundation-Ecological and Evolutionary Physiology, Sensory Systems, and Developmental Neuroscience Programs
Appendix E. List of periodic journals held by Drake Library in the areas of Environmental Science and Biology, Earth Science and Chemistry.

ENVIRONMENTAL SCIENCE AND BIOLOGY
List of periodical titles held by Drake Memorial Library, SUNY Brockport. Holdings were last updated in July, 2001. Items which are currently received in print or microform are indicated by an *. Titles which are available in an electronic version are indicated by the words --available online-- after the title.

- AIBS bulletin v.1-13, 1951-1963 Cont by: BioScience
- AIBS education review v.1-7, 1972-1978 Conts: CUEBS news
- Ambio v.11, 1982 (Mic-1); v.26, 1997-date
- American bee journal v.120, 1980; v.122, 1982; v.124, 1984-date
- American biology teacher v.18, 1956-date
- American fern journal v.1-66, 1910-1976
- American forests --available online-- v.46-90, 1940-1984; v.92-103, 1986-1998; v.105, 1999/00
- American naturalist --available online-- v.94, 1960-date
- American scientist --available online-- v.30-33, 1942-1945; v.35-87, 1947-1999
- Animal behaviour v.6, 1958-date, Conts: British journal of animal behaviour
- Animal learning & behavior v.1, 1973-date
- Annals of the Entomological Society of America v.1, 1908-date
- Annals of the Missouri Botanical Garden v.30-33, 1943-1946; v.35-70, 1948-1983 (scattered issues missing)
- Apicultural abstracts v.13-47, 1962-1996 (scattered issues missing)
- Apidologie v.20-26, 1989-1995
- Applied & environmental microbiology --available online-- v.31-42, 1976-1981; v.62, 1996-date
- Aquacultural engineering --available online-- v.15-23, 1996-2000
- Aquaculture digest v.10-14, 1985-1989
- Aquaculture magazine v.15, 1989-date (scattered issues missing)
- Atlantic naturalist v.23-24, 1968-1969
- Audubon --available online-- v.43-101, 1941-1999
- Auk --available online-- v.1-77, 1884-1960 (Mic-1); v.78-112, 1961-1995; v.116, 1999-date (scattered issues missing)
- Australian journal of marine & freshwater research v.11-36, 1960-1985 (scattered issues missing)
- Bee culture v.121, 1993-date Conts: Gleanings in bee culture
- Bee world v.33-77, 1952-1996
- Behavior genetics v.1, 1970-date
- Behavioral ecology & sociobiology --available online-- v.1-2, 1976-1977; v.34, 1994-date
- Behavioral neuroscience v.97, 1983-
• * Behaviour --available online-- v.20-23, 1963-1964; v.26, 1966-
• * Biogeochimistry v.36, 1997-date
• Biological conservation --available online-- v.1-14, 1968- v.32-43, 1966-
• Biometrics v.7-53, 1951-1997
• Botanica marina v.12-17, 1969-1974
• Botanical gazette v.121-144, 1959-1983
  Conts: Journal of the Linnean Society of London. Botany
• Botanical review --available online-- v.1-50, 1935-1984
• British journal of animal behaviour v.1-5, 1953-1957 Cont by: Animal
• Bulletin (American Association of Botanical Gardens & Arboreta) v.8-19, 1974-
  1985 (scattered issues missing) Conts: Arboretum & botanical garden bulletin.
  Cont by: Public
• Bulletin of environmental contamination & toxicology v.1-21, 1966-1979
• * Bulletin of marine science v.15, 1965-date Conts: Bulletin of marine science of the Gulf & Caribbean
  Cont by: Bulletin of marine science
• Bulletin of the Ecological Society of America v.49-71, 1968-1990 (scattered issues missing)
  (scattered issues missing) Cont by: Sea frontiers
• Bulletin of the Torrey Botanical Club v.73-123, 1946-1996 Cont by: Journal of
  the Torrey Botanical
• Canadian entomologist v.52, 1920; v.70-80, 1938-1948; v.83, 1951; v.90-116, 1958-1984
• * Canadian field naturalist v.65, 1951; v.79, 1965-date
• Canadian fish culturist no.32-40, 1964-1969
• Canadian journal of animal science v.48-54, 1968-1974
• Canadian journal of botany v.29-63, 1951-1985 Conts: Canadian journal of
  research. Section C: Botanical sciences
• * Canadian journal of fisheries & aquatic sciences --available online-- v.37, 1980-date (scattered issues missing)
  Conts: Journal of the Fisheries Research Board of Canada
• * Conservation biology v.8, 1994-date
• Conservation Foundation letter 1973-1974 Conts: CF letter
• * Copeia 1913-date
• * Cornell focus v.3, 1994-date (scattered issues missing
• Curtis's botanical magazine v.175-183, 1967-
• EHP: Environmental health perspectives no.2-100, 1972-1993
  Cont by: Environmental health perspectives, and Environmental health perspectives supplements
• * Ecological applications v.4-5, 1994-1995; v.7, 1997-date
• * Ecological monographs --available online-- v.1, 1931-date
• Ecology (Akademiia nauk SSSR) 1970 Cont by: Soviet journal of ecology
• * Ecology (Ecological Society of America) --available online-- v.1, 1920-date
• Ecology of western North America v.2, 1969/70
• Journal of economic entomology v.1-93, 1908-
• Journal of environmental education --available online-- v.2-29, 1970-1998
  Conts: Environmental education
• * Journal of experimental botany --available online-- v.1, 1950-date
• * Journal of field ornithology v.51, 1980-date Conts: Bird-banding
• * Journal of fish biology v.7, 1975-date
• * Journal of freshwater ecology v.2, 1983-date
• * Journal of Great Lakes research v.1, 1975-date
• Journal of herpetology v.1-19, 1968-
• Journal of insect pathology v.1-6, 1959-
• Journal of insect physiology --available online-- v.1-43, 1957-1997
• Journal of invertebrate pathology v.7-38, 1965-
• * Journal of mammalogy --available online-- v.21, 1940-date
• * Journal of mollusc studies --available online-- v.60, 1994-date
• * Journal of phycology v.1, 1965-date
• * Journal of soil & water conservation --available online-- v.22, 1967-date
• * Journal of the American Water Resources Association v.33, 1997-date
  Conts: Water resources bulletin
• Journal of the Fisheries Research Board of Canada v.18-36, 1961-1979
  Cont by: Canadian journal of fisheries & aquatic
• * Journal of the New York Entomological Society v.76, 1968-date
• * Journal of the Torrey Botanical Society v.124, 1997-date Conts: Bulletin of the Torrey Botanical
• * Journal of wildlife management v.15, 1951-
• * Limnology & oceanography v.1, 1956-date
• * Living museum v.16-21, 1954-1960; v.29, 1967-date
  Michigan entomologist v.1-4, 1966-1971
• National parks --available online-- v.55-71, 1981-1997
  Conts: National parks & conservation magazine
• Natural history --available online-- v.54-108, 1945-1999
• Naturalist 1968-1985
• * Nature v.6, 1872; v.53-98, 1895-1916; v.151-152, 1943; v.155, 1945-date
• * Nature Canada v.1, 1972-date Nature magazine v.25-52, 1935-
• New York State conservationist v.3-14, 1948-1960
• * New York State conservationist (1995) --available online-- v.50, 1995-date
• * North American journal of aquaculture v.61, 1999-date Conts: Progressive fish-culturist
• * North American journal of fisheries management v.1, 1981-date
  Oceans v.17-22, 1984-1989
• * Oceanus --available online-- v.11, 1964-date (scattered issues missing)
• * Oecologia --available online-- v.1, 1968-date
• * Oikos v.16, 1965-date
• * Phycologia v.3-24, 1963-1985 (scattered issues missing)
• * Proceedings of the National Academy of Sciences ... --available online-- v.1-21, 1915-1935; v.23-26, 1937-1940; v.28, 1942-date
• * Proceedings of the Rochester Academy of Science        v.1, 1889-
• Progressive fish-culturist        v.41-60, 1979-1998 Cont by: North American journal of
• Research journal of the Water Pollution Control Federation        v.61-63, 1989-1991
  Conts in part: Journal (Water Pollution Control Federation). Cont by: Water environment research
• Russian journal of ecology        v.24-31, 1993-2000 (scattered issues missing)
  Conts: Soviet journal of ecology
• * Science --available online--        v.1-22, 1883-1894; new ser., v.1-7, 1895-1898;
  v.13, 1901-date (scattered issues missing) Science (Washington, D.C.)
• * Scientific American --available online--        v.2-14, 1846-1859; new ser., v.1-93,
  1859-1905 (Mic-55 LAC 31486-593); v.76, 1897-date
• Sea frontiers (1988) --available online--        v.34-42, 1988-
• Smithsonian --available online--        v.1-32, 1970-2001 (scattered issues missing)
• Snowy egret        v.37-46, 1974-1983; v.48, 1985 (scattered issues missing)
  nauk SSSR). Cont by: Russian journal of ecology
• * Transactions of the American Entomological Society (1890)        v.94, 1968-date
• * Transactions of the American Fisheries Society        v.1-75, 1872-1945 (Mic-1);
  v.75, 1945-date
• Transactions of the American Microscopical Society        v.84-113, 1965-1994
• * Trends in ecology & evolution --available online--        v.9, 1994-date
• * Water environment research        v.64, 1992-date Conts: Research journal of
  the Water Pollution Control Federation Water research --available online-
• Water resources bulletin        v.5-32, 1969-1996 Cont by: Journal of the
  American Water Resources Association
• * Water resources research        v.1, 1965-date (scattered issues missing)
• Watsonia        v.6-14, 1964-1983
• Wilderness --available online--        v.46-59, 1982-1995 (scattered issues missing)
• * Wildlife monographs        no.4, 1960-date (scattered issues missing)
• * Wildlife Society bulletin        v.1, 1973-date (scattered issues missing)
• Wilson bulletin (Wilson Ornithological Society) --available online--        v.33-35,

EARTH SCIENCES
• List of periodical titles held by Drake Memorial Library, SUNY Brockport. Holdings were last
  updated in August, 2001. Items which are currently received in print or microform are indicated
  by an *. Titles which are available in an electronic version are indicated by the words --available
  online-- after the title. Please check the library's web catalog for access information.
• * AAPG bulletin        v.58, 1974-date
• Acta crystallographica. Section A: Crystal physics, diffraction, theoretical & general
  crystallography        v.25-30, 1969-1974
  Acta crystallographica. Section B: Structural crystallography & crystal chemistry
  v.25-30, 1969-1974
• Agricultural & forest meteorology --available online
• Agricultural meteorology        v.1-30, 1964-
• American Association of Petroleum Geologists bulletin        v.51-57, 1967-1973
• * American journal of science        v.246, 1948-date
• American meteorological journal        v.6-12, 1889-1896
• * American mineralogist        v.1-27, 1916-1942 (Mic-1); v.26, 1941-date
• American paleontologist  v.4, 1996-date (scattered issues missing)
• Antarctic journal of the United States  --available online--  v.19-32, 1984-1997  
• Antipode  v.1-15, 1969-1983  
• Applied geochemistry  --available online--  v.13, 1998-date  
• Arctic & alpine research  v.3-30, 1971-1998  
• Arctic, antarctic & alpine research  v.31, 1999-  
• Atlantic geology  v.25, 1989-date  
• Atmosphere-ocean  --available online--  v.16, 1978-date  
• Beitrage zur mineralogie und petrographie  v.6-11, 1957-1965  
• Conts: Heidelberger beitrage zur mineralogie und petrography  
• Limnology & oceanography  --available online--  v.1, 1966-date  
• Lithos  --available online--  v.1, 1968-date  
• Marine geology  --available online--  v.1-114, 1964-1993  
• Marine geophysical researches  v.1-3, 1970-1978  
• Marine georesources & geotechnology  --available online  
• Maritime sediments  v.1-32, 1965-1980  
• Micropaleontology  v.11, 1965; v.14-46, 1968-2000  
• Mineral information service  v.1-23, 1948-1970  Cont by: California geology  
• Mineralium deposita  v.1-32, 1966-1997 (scattered issues missing)  
• Mineralogical journal  --available online--  v.6, 1970-date (scattered issues missing)  
• Mineralogical magazine  --available online--  
• Mineralogical magazine & journal of the Mineralogical  
• Minerals science & engineering  v.1-8, 1969-1976 (scattered issues missing)  
• Mines magazine  v.59-87, 1969-1997  
• Mining engineering  v.21-49, 1969-1997  
• Mining journal  --available online  
• Mining magazine  --available online--  v.120-177, 1969-1997  
• Monthly weather review  1875-1876; 1878-1882: v.11-92, 1883-1964; v.94, 1966-date (scattered issues missing)  
• National weather digest  v.8, 1983-date  
• Nordic hydrology  v.2-5, 1971-1974  
• Norsk geologisk tidsskrift  v.49-65, 1969-1985  
• Northeastern environmental science  v.1-3, 1982-1984  
• Northeastern geology  v.1-16, 1979-  
• Northeastern geology & environmental sciences  v.17, 1995-  
• Oceans  v.17-22, 1984-1989  
• Oceanus  --available online--  v.11, 1964-date (scattered issues missing)  
• Oil & gas journal  --available online--  v.67-97, 1969-1999  
• Palaeogeography, palaeoclimatology, palaeoecology  --available online  
• Palaeontology  --available online--  v.12, 1969; v.16, 1973-date  
• Palaios  v.1-4, 1986-1989  
• Paleobiology  v.8, 1982-date  
• Physics & chemistry of minerals  v.4-24, 1979-1997  
• Precambrian research  --available online--  v.1-7, 1974-1978  
• Proceedings of the Geological Society of America  
• Pure & applied geophysics  v.122-127, 1984-1988  
• Quarterly journal of the Royal Meteorological Society  v.35, 1909-date  
• Quarterly of the Colorado School of Mines  v.60-72, 1965-1977  
• Cont by: Journal of the Geological Society  
• * Quarterly journal of the Royal Meteorological Society  v.35, 1909-date  
• Quarterly School of Mines  v.60-72, 1965-1977  
• Cont by: Colorado School of Mines quarterly  
• * Quaternary research  v.1, 1970-date  
• Reviews of geophysics  v.5-7, 1967-  
• Reviews of geophysics & space physics  v.8-21, 1970-
CHEMISTRY

List of periodical titles held by Drake Memorial Library, SUNY Brockport. Holdings were last updated in February, 2002. Items which are currently received are indicated by an *. Titles which are available in an electronic version are indicated by the words --available online-- after the title. Please check the library's web catalog or the list of electronic full text titles for access information. SUNY Brockport online catalog Full text electronic journal list *

- Accounts of chemical research v.1, 1968-date
- Analytica chimica acta --available online— v.29-428, 1963-2001; v.337, 1997-date (online)
  Analytical biochemistry v.1-215, 1960-1993
  * Analytical chemistry v.19, 1947-date
    Conts: Industrial & engineering chemistry. Analytical edition
  * Applied spectroscopy --available online—
  Berichte der Deutschen Chemischen Gesellschaft v.1-77, 1868-1944
  Biochemical & biophysical research communications v.1-126, 1959-1985
  * Biochemical journal --available online— v.74, 1960-date
  Biochemical medicine v.1-11, 1967-1974
  * Biochemical Society transactions v.1, 1973-date
  * Biochemistry (American Chemical Society) v.1, 1962-date
- * Journal of organic chemistry  v.1, 1936-date
- * Journal of organometallic chemistry  -- v.527, 1997-date (online)
- Journal of physical chemistry  v.1-100, 1896-1996
- * Journal of physical chemistry A  v.101-102, 1997-1998; v.104, 2000-date
- * Journal of physical chemistry B  v.101-102, 1997-1998; v.104, 2000-date
- * Journal of research of the National Institute of Standards & Technology  -- available online--  v.94-104, 1989-1999; v.100, 1995-date (online)
- * Journal of the American Chemical Society  v.1, 1879-date
- Journal of the Chemical Society (1926)  1935-
- Journal of the Chemical Society. Faraday transactions 2  v.68-83, 1972-
- * Nature  1945-date
- New scientist  --available online--
- * Phytochemistry  --available online--  v.3-7, 1964-1968; v.9-20, 1969-1981; v.44, 1997-date (online)
- * Polyhedron  --available online--  v.16, 1997-date (online)
- Proceedings of the American Chemical Society  v.1-2, 1876-1878
- * Proceedings of the National Academy of Sciences  --available online
- Record of chemical progress  v.32, 1971
- * Review of scientific instruments  --available online--  v.1, 1930-date
- * Science  --available online--  v.1-22, 1883-1894; new ser., v.13, 1901-date
- Science news  --available online--  v.89-154, 1966-1998 (Mic-1
- * Scientific American  --available online--  v.2-14, 1846-1859; new ser. v.1-93, 1859-1905 (Mic-55 LAC 31486-593); v.76, 1897-date
- Scientific monthly  v.1-85, 1915-1957
- SciQuest  v.52-55, 1979-1982  Conts: Chemistry
- Spectrochimica acta. Part A: Molecular spectroscopy  --available online--  v.53,
- * Spectrochimica acta. Part A: Molecular & biomolecular spectroscopy  --available online--  v.53, 1997-date (online)  Conts: Spectrochimica acta. Part A: Molecular spectroscopy
- * Spectrochimica acta. Part B: Atomic spectroscopy  --available online--  v.52, 1997-date (online)
- * Synthesis  1969-date
- * Tetrahedron  --available online--  v.53, 1997-date (online)
- * Tetrahedron: Asymmetry  --available online--  v.8, 1997-date (online)
- * Tetrahedron letters  --available online--  v.1-41, 1959-2000; v.38, 1997-date (online)
- * Trends in analytical chemistry: TrAC  --available online--  v.1-4, 1981-1985; v.16, 1997-date (online)
- * Trends in biochemical sciences  --available online--  v.16, 1991-date
- * Vibrational spectroscopy  --available online--  v.1-9, 1990-1995; v.13, 1997-date (online)
Appendix F. Syllabi of selected graduate courses in Environmental Science and Biology.

ENV 614
Experimental Design

Fall 2003

Dr. Geoffrey Gardner
ggardner@brockport.edu

Hours: M W 5:30 – 7:00
Office: Lennon 117
Room: 218 Lennon
Phone: 395-5743

Office Hours: T-TH 11:30 – 12:30, Wed 12-1 or by appointment

Required Text:

Readings:


Calculator:
You will need a calculator for this class. On quizzes and exams you may NOT share calculators so it’s important that every student has access to their own calculator.

Objective: This course provides the basic knowledge of introductory statistics. Students will learn the importance of statistics in biological research. They will be exposed to the underlying concepts of statistics as well as computations for various statistical tests.

Course Requirements:
Competence will be evaluated by 7 homework assignments, 4 quizzes, and 3 exams. All quizzes and exams will be a combination of multiple choice questions and short answer questions based on lectures and the text. Please bring two pencils with erasers and a calculator to each quiz and exam.

Homework assignments: Homework will be made up of problem sets assigned approximately every two weeks and will be collected. Each assignment will be worth 20 points for a total of 140 points. Problem set assignments will be collected at the beginning of the class on the day they are due. 1 point will be deducted for every day that an assignment is late. (For example, if due Monday and you hand it in Wednesday, 2 points will be deducted from that assignment). Assignments will not be accepted for a given week once that assignment has been graded and returned to the class. You will be assigned 7 problem sets over the course of the semester. It is in your best interest to do every homework.

While I encourage you to work in groups on homework assignments be aware that directly copying someone else’s work will not help you learn the material. The purpose of homework assignments is for you to actively learn statistics through practice. This practice will be of value for quizzes and exams.
Quizzes: It is important in a statistics class to keep up with the material. Quizzes will be given periodically to ensure that everyone is understanding the material. Four quizzes will be given throughout the semester however, you may drop your lowest quiz grade. Each quiz will be worth 50 points for a total of 150 points. Make-up quizzes will NOT be given. You should take all 4 of the quizzes as this information will also be tested on the exams.

Exams: All exams will be comprehensive in nature. In a statistics course information builds on itself. What you learn earlier in the course will be needed to understand the material later in the course. Exams will be worth 100 points each for a total of 300 points. Tentative exam dates are noted on the syllabus. Make-up exams will only be given in cases where you can provide documentation for your absence.

Computer Lab: We will spend a portion of some class periods working in the Computer Lab. Three assignments will be collected and graded, each worth 10 points, for a total of 30 Computer Lab points.

Angel: Course materials and course information will be placed online. Students should enroll in the course to access materials. I will also place updated class announcements, reminders and review material on Angel.

Grading:
Final course grades will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>3 x 50</td>
<td>150 pts</td>
</tr>
<tr>
<td>Exams and Final</td>
<td>3 x 100</td>
<td>300 pts</td>
</tr>
<tr>
<td>Problem Sets</td>
<td>7 x 20</td>
<td>140 pts</td>
</tr>
<tr>
<td>Computer Lab</td>
<td>3 x 10</td>
<td>30 pts</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>620 pts</td>
</tr>
</tbody>
</table>

Final grades will be determined by adding the scores on your three highest quizzes, your three exam grades and problem set assignments. Final letter grades will be determined based upon the following scale:

- A  93% and above
- A- 90 - 92%
- B+ 87 - 89%
- B  83 - 86%
- B- 80 - 82%
- C  73 - 76%
- C- 70 - 72%
- D+ 67 - 69%
- D  63 - 66%
- D- 60 - 62%
- E Below 60%

Attendance: Regular class attendance is expected and is the responsibility of each student. I will periodically take attendance in class. You will be responsible for all materials covered in class. If you miss class for some reason it is your responsibility to get the notes from another student in class. Lecture notes will not be available from the instructor.

Class Conduct and Punctuality: It is my goal to develop a relationship with students based on mutual respect and courtesy. To create an environment conducive to learning we all must exercise discipline and self-restraint. Behaviors that are disruptive and insulting to me or to other students in the class will not be tolerated. Examples of these behaviors include arriving
late to class, leaving class early, and talking during the lecture or any other actions that would be distracting to other students in the class.

**Academic Integrity**: SUNY Brockport has a firm policy concerning academic dishonesty. Please familiarize yourself with definitions and college policies regarding academic honesty in the College Student Handbook.

**One final note**: Statistics is generally thought of as a hard class. The key to this class is keeping up on the material, attending class and doing homework assignments. If you find that you are having a problem understanding the material or keeping up with the class do not hesitate in coming to talk to me.

**Tentative Course Schedule**

<table>
<thead>
<tr>
<th>Date (week of)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/25</td>
<td>Introduction - Measurements and Graphs</td>
<td>Ch 1, Ch 2</td>
</tr>
<tr>
<td>9/1- NO CLASS - Labor Day</td>
<td></td>
<td></td>
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<tr>
<td>9/3</td>
<td>Measures of central tendency and variability</td>
<td>Ch 3-4</td>
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<tr>
<td>9/8 - 9/10</td>
<td>Probability - Computer Lab I (9/10)</td>
<td>Ch 5, 24.1</td>
</tr>
<tr>
<td>9/15* – 9/17</td>
<td>Standard scores, Normal Distribution, Distributions of Means</td>
<td>Ch 6 – 6.3</td>
</tr>
<tr>
<td>9/22 – 9/24</td>
<td>Hypothesis testing: Introduction - One- Sample test</td>
<td>Ch 6.4, Ch 7.0-7.2</td>
</tr>
<tr>
<td>Wen 9/24</td>
<td>EXAM 1 Chapters 1-6</td>
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<tr>
<td>9/29- 10/1</td>
<td>Research design - Confidence Intervals</td>
<td>Ch 7.3 – 7.5 Hurlbert, Heffner et al.</td>
</tr>
<tr>
<td>10/6 – 10/8*</td>
<td>Two Sample hypotheses: Independent groups t test</td>
<td>Ch 8.0 – 8.3, 8.5</td>
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<tr>
<td>10/15</td>
<td>Non- Parametric Test</td>
<td>Ch 8.9-8.10</td>
</tr>
<tr>
<td>10/20 - 10/22</td>
<td>Correlated groups t test - Computer Lab II (10/22)</td>
<td>Ch 9.0 – 9.5</td>
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<tr>
<td>10/27 – 10/29</td>
<td>Goodness of Fit</td>
<td>Ch 22.0-22.6</td>
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<tr>
<td>10/29 - EXAM 2 Chapters 7-9</td>
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<tr>
<td>11/3 – 11/5</td>
<td>One way between subjects ANOVA</td>
<td>Ch 10.0-10.1</td>
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<tr>
<td>11/10 – 11/12*</td>
<td>Nonparametric Test - Multiple comparisons</td>
<td>Ch 10.4, Ch 11.0 11.2 - 11.6</td>
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<tr>
<td>11/17 - 11/19</td>
<td>Two – Factor ANOVA, Repeated measures ANOVA</td>
<td>Ch 12.1-2.2,12.5</td>
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<tr>
<td>11/24 – 11/26</td>
<td>Computer Lab III (9/24)</td>
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<tr>
<td>11/26 - NO CLASS - Thanksgiving Break</td>
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<tr>
<td>12/1* – 12/3</td>
<td>Regression - Correlation</td>
<td>Ch 17.1 – 17.3,</td>
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</tbody>
</table>
TO BE ANNOUNCED  ** FINAL EXAM **

**QUIZ DATES**
Monday 9/15  Quiz 1

**Wednesday 9/25: EXAM 1 Chapters 1-6**

Wednesday 10/8: Quiz 2

**Wednesday 10/29: EXAM 2 Chapters 7-9**

Monday 11/12:  Quiz 3

Monday 12/1: Quiz 4
BIO 621  
Water Chemistry  
Instructor: J. Makarewicz, 125 Lennon Hall

SPRING 2004

READING LIST: Articles are available on the World Wide Web. Titles of reading are in bold. To access the reading you will need to have Acrobat installed on your computer and have capability to reach the World Wide Web. Our password will be “mercury”. Acrobat is available "free of charge" at Http://www.Adobe.com/proindx/acrobat/readstep.htm

Optional TEXT: Standard Methods for the Examination of Water and Wastewater, 20th Edition

SM = Standard Methods   HO= Handout  UN= Unknown  RC= Regression Curve, QC= Quality Control

<table>
<thead>
<tr>
<th>WEEK OF</th>
<th>LECTURE</th>
<th>READING</th>
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<tbody>
<tr>
<td>1/28</td>
<td>Background, Lab Orientation</td>
<td>SM:1-25 to 56, HO (Background 1,2,3,4)</td>
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<tr>
<td>2/4</td>
<td>Background, Safety in the LAB, Standards</td>
<td>HO, UN</td>
</tr>
<tr>
<td>2/11</td>
<td>pH, Alkalinity, and Conductivity</td>
<td>…SM: 2-26 to 2-29,2-44 to2-47,4-86 to 4-91</td>
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<tr>
<td>2/18</td>
<td>Sulfate (Turbidimetric)</td>
<td>SM: 4-176 to 4-181, UN, RC</td>
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<tr>
<td>2/25</td>
<td>Nitrate (Cadmium Column)  (Wash)</td>
<td>SM: 4-114 to 4-122, UN, RC</td>
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<tr>
<td>3/3</td>
<td>Nitrate (Cadmium-automated)</td>
<td>SM: 4-114 to 4-122, HO, UN, RC</td>
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<tr>
<td>3/10</td>
<td>EXAM</td>
<td></td>
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<tr>
<td>3/17</td>
<td>VACATION WEEK</td>
<td></td>
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<tr>
<td>3/24</td>
<td>Phosphate (Ascorbic-automated)</td>
<td>SM:4-139 to 4-153, HO, UN, RC</td>
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<tr>
<td>3/31</td>
<td>Metals and Introduction to Procedures  (Na - Atomic Absorption)</td>
<td>SM:1-1 to 1-24; 3-1 to 3-6; 3-13 to 3-18  780, Video # QD96.A8 A76 1992</td>
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<tr>
<td>4/7</td>
<td>Calcium and Sodium</td>
<td>&quot;A.A. Book&quot;, Video, HO, UN, RC, QC, Video#</td>
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<td>4/14</td>
<td>Lead (Graphite Furnace)</td>
<td>SM: 3-24 to 3-31, HO, UN, RC, Video #875</td>
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<tr>
<td>4/21</td>
<td>Pesticides (Gas Chromatography)</td>
<td>SM:6-1 to 6-7, 6-91 to 6-104, HO, Video #3439</td>
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<tr>
<td>4/28</td>
<td>Organochlorine Pesticides</td>
<td>(Extraction FiltersHO, Filmstrip</td>
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<tr>
<td>5/5</td>
<td>Review</td>
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<tr>
<td>5/14</td>
<td>FINALS WEEK</td>
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</table>
WATER QUALITY ANALYSIS                                      SPRING, 2004

EXAMS: Two Exams - 26 March 2004, Final on assigned day

QUIZZES: Several (unannounced)

UNKNOWNs: Many! Students are to work on their own. Each student is responsible for knowing how to operate the equipment. For each unknown, you will have to provide a regression curve, the correlation coefficient and a short paragraph. Each week this paragraph will address a question about the quality of the water in your unknown.

PAPERS: NONE

MAKE-UP POLICY: There will be no make-up exams or quizzes. Unknowns are due by 2:30 PM the day they are assigned. After 2:30 PM, 10 points per day will be deducted for lateness.

ATTENDANCE: The college policy states that you must attend all classes. If you have any special needs or requirements, please see me after class.

GRADING: Two Exams 60%
Unknowns 30%
Quizzes 10%
Total 100%

Optional TEXT: Standards Methods for Examination of Water and Wastewater, 20th edition

LABORATORY RULES:
1. No smoking ever!
2. The Laboratory will be open during the (8:30 AM to 5 PM) for your use. Please keep in mind that the lab. will close promptly at 5PM. Enter this factor into your planning.
3. Keep the laboratory clean. Other people doing research use this laboratory continuously.
4. Safety classes and lab coats must be worn in the lab at all times.
5. Answers to unknowns will be due the following laboratory.
6. Report on broken equipment to Dr. Makarewicz immediately. Excessive and continuous damage to equipment by one student will be charged to the student. A GRADE WILL NOT BE GIVEN UNTIL BROKAGE FEES HAVE BEEN PAID.
7. Each student will have a mutually agreeable time slot to perform the laboratory. These times are from 8:30 AM to 12:30 and 12:30 PM to 4:30PM.
BIOL 406/506 – WILDLIFE ECOLOGY – FALL 2002

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites: Introductory Biology, Ecology (ENV 303)

Instructor: Dr. Chris Norment
Office: 119 Lennon
Office hours: T R 2:55-3:55 p.m., F 9:00-11:00 a.m., or by Appt.
Phone: 395-5748 (office)
637-0252 (home; before 9:00 p.m.)
E-Mail: cnorment@brockport.edu

General Course Objectives:
1. Introduce basic concepts of wildlife ecology.
2. Develop an understanding of the basic principles necessary to successfully manage wildlife populations.
3. Develop the ability to think critically about issues related to the ecology and management of wildlife populations.
4. To improve students’ written and spoken communication skills.

Class Meets: T R 9:45-11:15 a.m., B0006 Holmes; F 1:15-5:15.

A large three-ring binder also will be valuable.

Course Structure: The course format will include lectures, discussions, cooperative learning exercises, laboratory and field work.

Grading: Grades will be assigned based upon the following scheme:
- Lecture tests - 2 at 100 points each 200
- Final exam - 1 at 125 points 125
- Papers 150
- Problem sets and other written assignments 150
- Quizzes 60
- Total points 685(approximate)

(Graduate students (BIO 506): Graduate students are expected to develop a deeper and broader understanding of wildlife ecology than is the case for undergraduates enrolled in ENV 406. Requirements for BIO 506 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. During the term I will take attendance; if you are not present and do not have a valid excuse (doctor's note, etc.), 7 points (about 1% of your grade) will be deducted from your point total. If you miss a scheduled lab without a valid excuse, 3% of the total points will be deducted. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes from a classmate. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to drop the course is September 24. Withdrawal policies are described in Your Right to Know & Academic Policies Handbook. Unless prior arrangements have been made, late work will be discounted at the rate of 5%/school day. Tests will be based primarily on material discussed during lectures and study group
sessions. **However**, approximately 10% of the points on each test may be based on material covered in your text, but not in class.

**Surviving BIOL 427/527:**

1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after the lecture.
6. "Don't worry, be happy." (Mehr Babba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-11, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, "Your Right to Know & Academic Policies Handbook, 2000-2001". The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class, or in a previous class. (In order to account for this last, unfortunate possibility, I keep a random subset of major papers from previous classes on file.) A wise policy might be to discuss freely, but write with complete independence. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment or the course.** If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 506. In addition to the requirements for ENV 406, graduate students in BIO 506 will:
1. Develop more in-depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a habitat management plan for either a wetland or upland habitat at Iroquois National Wildlife Refuge. The habitat management plan will include recommendations for management based on previous experiences at the refuge and relevant literature.
3. Complete additional technical readings from the following source: *Journal of Wildlife Management*: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings.)

**SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 27</td>
<td>Introduction</td>
<td>Chapters 1,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Er: Educational needs</em></td>
</tr>
<tr>
<td>Aug 29</td>
<td>Some successes in wildlife mgmt</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Aug 30</td>
<td>No lab (I'll make it up to you later!)</td>
<td></td>
</tr>
</tbody>
</table>
Week 2
Sept 3  Guest lecture: History of attitudes towards nature (Ralph Black, English Dept.)  Handouts  JWM assignment due
Sept 5  An overview of management issues  Quiz: Heart and Blood, Chapter 1  JWM assignment due
Sept 6  Field trip: Irondequoit  Er: Selecting deer management options

Week 3
Sept 10  Field work: set mammal traps
Sept 12  Field work: telemetry
Sept 13  Discussion: Irondequoit deer mgmt  Spreadsheet hints and Tips (do on your own)

Week 4
Sept 17  Population ecology I  Chap 5 (pp. 48-57)
Sept 19  Population ecology II  Chap 5 (pp. 57-69)
Sept 20  Quiz: NY game species  Chap 12

Week 5
Sept 24  Census techniques  Review pp. 61-65
Sept 26  Movements  Chapter 6 (pp. 74-77, 81-91)
Sept 27  Lab: white-footed mouse data analysis  Soils lab write-up due

Week 6
Oct 1  Food and cover  Chapter 7
Oct 3  Test 1 (covers material from August 27-Oct1)
Oct 4  Field trip: Iroquois NWR, Oak Orchard and Tonawanda WMAs

Week 7
Oct 8  Habitat management: grasslands  Chaps 13-14 (pp. 265-270, 298-313)
Oct 10  Habitat management: forests  Chapter 15  Iroquois assignment due
Oct 11  Computer lab: population estimation  Discussion: Iroquois field trip

Week 8
Oct 15  NO CLASS!
Oct 17  Wildlife diseases  Chapter 8  Wfm assignment due
Oct 18  Computer lab: geometric population models

SCHEDULE
Date  Topic  Readings*
Week 9  Oct 22  Exotic species  Chapter 18  pp. 321-322, 521
Oct 24  Hunting and trapping, animal rights  Chapter 10 (pp. 178-183)
   Extension quest due

Oct 25  Computer lab: logistic population models

Week 10
Oct 29  Predators  Chapter 9
Oct 31  Harvesting effects  pp. 183-192
Nov 1   Computer lab: harvest models

Week 11
Nov 5   Nongame issues  Chapter 19
Nov 7   Lab: deer dentition  Harvest model
Nov 8   Computer lab: life tables  questions due

Introduction: wolves and ungulates

Week 12
Nov 12  Test 2 (covers material from Oct 4-Nov 8)
Nov 14  Conservation Biology  Chapter 21
       Er: Conservation biology trailblazers
Nov 15  Population analysis problem: wolves  er: 6 papers
       and ungulates

Week 13
Nov 19  Case study: caribou  er: Watchful world
Nov 21  HEP/HSI
Nov 22  Lab: HEP/HSI

Week 14
Nov 26  Economics  Chapter 20
Nov 28  NO CLASS

Week 15
Dec 3   Wildlife and the public  Chapter 22
Dec 5   Wrap-up: discussion  Irondequoit deer
       paper due

Week 16
Thursday, Dec 10 (8:00 – 10:00)  Final exam (Includes H& B)

*Unless otherwise noted, all readings refer to those in Bolen and Robinson.
Note: I assume that students in BIO 406/506 are familiar with the basic concepts in Chapter 4
(Ecosystems and Natural Communities).
Note: (Instructions for graduate students are indicated in parentheses)

ENV BIO 419/519                        Limnology                        FALL
2003

Prerequisite – ENV 303 (Ecology), CHM 205, 206 (College Chemistry preferred)
Dr. Makarewicz  395-5747
E-Mail Jmakarew@brockport.edu

Recommended Text: - See attached reading list

Date       Lecture (Tentative)
Aug. 26    Properties of Water, The Late Great Lakes
Sep. 2     Origins of Lake Basins
Sep. 9     Solar Radiation
Sep. 16    Water Currents
Sep. 23    Carbonate cycle, Acid ppt., Acid Precipitation
Sep. 30    Exam 1
Oct. 7     Dissolved oxygen, Primary production
Oct. 14    No Class: Mid-semester break
Oct. 21    Phytoplankton "TERM PAPER DUE"
           Limiting Nutrient Controversy
Oct. 28    Zooplankton/Top-down vs Bottom-up, Zebra
           Mussels, Lake Ontario Ecosystem Structure
Nov. 4     Exam 2, Lotic Environment
Nov. 11    Stressed Stream Analysis,
Nov. 18    Effects of Clear Cutting
Nov. 25    Thanksgiving recess begins at 10 PM
           Palaeolimnology
Dec. 2     Wetlands System, Lake Ontogeny
Dec. 9     Final Exam: 6 to 8pm

Graduate Students (ENV 519): A deeper and broader understanding of Limnology is expected of graduate students; that is, the expectation level for graduate students are significantly different from undergraduates. These include an extra term paper, extra readings and more rigorous grading of exams. Items in parentheses represent graduate student requirements.

Attendance Policy: The college policy allows excused absences for documented illnesses, official representation of the college, death of a close relative, religious holiday and other circumstances beyond the control of the student. Students whose unexcused absences exceed 15% of the scheduled classes and laboratories may receive a lowered grade or failure at the instructor's discretion.

Make-up Policy - There are no make-ups for exams.

Term Paper - Ten points will be deducted for each day the paper is late. (Graduate students will complete two term papers). All students will do a critical review of a paper from the Journal of Great Lakes Research. The second graduate student term paper will focus on some aspect of your research.

Disability - If anyone has a special need due to a disability, please see me after class.

Grading -

<table>
<thead>
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<th></th>
<th>UG</th>
<th>Grad</th>
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<tr>
<td>Exam 1</td>
<td>25%</td>
<td>(20%)</td>
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<tr>
<td>Exam 2</td>
<td>25%</td>
<td>(20%)</td>
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</tbody>
</table>

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2004-2005-27.res.doc
Drop Policy: You may drop up to 1 December with no penalty. After this date, you need the permission of the department chairperson. Withdrawals are given only for illness or unusual circumstances.

READING LIST: Journal articles are available on the World Wide Web. To access the reading, you will need to have Acrobat installed on your computer and have capability to reach the World Wide Web. Acrobat is available "free of charge" at Http://www.Adobe.com/proindx/acrobat/readstep.htm

Undergraduates: Chapter numbers in the first column refer to Wetzel’s “Limnology: Lake and River Ecosystems. “THIRD EDITION”. This is not required for undergraduates! Recommended only!!

Graduates: Chapter’s listed in the third column are from either Mackie’s Applied Aquatic Ecosystem Concepts (“Second Edition) or Wetzel's Limnology. (Extra graduate student readings are in parentheses!!!!)

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<tr>
<th>Week of</th>
<th>Author</th>
<th>Title</th>
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<tr>
<td>Date</td>
<td>Author(s)</td>
<td>Title</td>
<td>Source/Issue/Volume/Publication Details</td>
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<td>Chap. 8</td>
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<td></td>
<td>Spencer et al. (1991)</td>
<td></td>
<td>Bioscience 41:14</td>
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<td>11 Nov.</td>
<td>Bormann, F.H. et al. (1968)</td>
<td>Nutrient loss accelerated by clear-cutting of a forest ecosystem</td>
<td>Science - 159:882</td>
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<tr>
<td></td>
<td>Smith, S.H.</td>
<td>Early changes in the fish community of Lake Ontario</td>
<td>Great Lakes Fishery Commision. Tech. Rep. 60</td>
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<td>(Mackie’s Applied Aquatic Ecosystem)</td>
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<td>Chap. 25</td>
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</table>
Environmental Science 422/522  
Population Biology  
(Prerequisite: Ecology, ENV 303)  

Note: (Instructions for graduate students are indicated in parentheses)

Spring 2004  
Dr. Geoffrey Gardner  
ggardner@brockport.edu  
Office: Lennon 117  
Phone: 395-5743  
Office Hours: M + T 11:30-12:30 or by appointment

Hours: Tuesday, Thursday 5:30 – 7:00  
Room: 136 Lennon

Required Text:  

Supplemental articles will be available on ANGLE.

Calculator:
You will need a calculator for this class. On exams you may NOT share calculators so it’s important that every student has access to their own calculator.

Objective: This course considers the evolution and function of populations. It combines population genetics with population ecology.

Course Requirements:
Competence will be evaluated by homework assignments and exams. All exams will be a combination of multiple choice questions and short answer questions based on lectures, the text and readings. A topic paper will also be required.

(Graduate Students (ENV 522): Graduate students will be expected to have a broader and deeper understanding of Population Biology, therefore, the expectation level for graduate students are significantly higher than for undergraduates. Graduate students will be expected to complete an extensive research paper and are subject to a more rigorous grading of problem sets and exams. In addition, graduate students will be responsible for leading class discussions on current topics in population biology.)

Homework assignments: Homework will be made up of problem sets. Each assignment will be worth 50 points for a total of 150 points. Problem set assignments will be collected at the beginning of the class on the day they are due. 1 point will be deducted for every day that an assignment is late. (For example, if due Tuesday and you hand it in Thursday, 2 points will be deducted from that assignment). Assignments will not be accepted for a given week once that assignment has been graded and returned to the class. You will be assigned 3 problem sets over the course of the semester.

While I encourage you to work in groups on homework assignments, be aware that directly copying someone else’s work will not help you learn the material. The purpose of homework assignments is for you to actively learn through practice. This practice will be of value for exams.
Exams: Exams will be worth 100 points each for a total of 300 points. Tentative exam dates are noted on the syllabus. Make-up exams will only be given in cases where you can provide documentation for your absence.

Paper: This will be a term paper reviewing research on one particular topic of population biology, using reference material and primary literature. Choose a topic early in the semester. The topic is your choice, and this is a solo project. A topic must be submitted by the scheduled deadline. The format will be as follows:

- 5-10 pages, double-spaced, including references. (Graduate students papers should be 10-15 pages).
- begin with a title, your name, course number and date
- pages must be numbered
- use subheadings to organize your writing
- state the underlying scientific question clearly, and describe how it arose.
- describe research methods used to probe the question, and their results.
- draw your own conclusions, and suggest further research.
- use the Latin binomial to introduce a species. Common names can be used thereafter.
- minimum of 10 references, primary scientific papers.
- cite last names of authors and dates in parentheses; don't use numbers or footnotes.
- for the bibliography, list references in same format as in your textbook.
- do not use direct quotations; use your own words
- grammar and spelling will be checked.

Participation
You are expected to attend every class. Periodically we will have class discussions on various papers/topics/issues. (Graduate students will be assigned to a date to lead a discussion on a current issue in population biology. Graduate students will select the paper for the topic, which will be assigned to the class. A written review of the paper is also expected)

Angel: Course materials and course information will be placed online. Students should enroll in the course to access materials. I will also place updated class announcements, reminders and review material on Angel.

Grading:
Final course grades will be determined as follows:
Exams and Final 3 x 100 = 300 pts
Problem Sets 3 x 50 = 150 pts

\[
\text{Paper} = 100 \text{ pts} \quad \text{(Paper review [graduate only] = 25 pts)}
\]

Total 550 pts (575 pts)

Final grades will be determined by adding the scores on your three exam grades, problem set assignments and paper.

Attendance: Regular class attendance is expected and is the responsibility of each student. I will periodically take attendance in class. You will be responsible for all materials covered in class. If you miss class for some reason it is your responsibility to get the notes from another student in class. Lecture notes will not be available from the instructor.
**Class Conduct and Punctuality:** It is my goal to develop a relationship with students based on mutual respect and courtesy. To create an environment conducive to learning we all must exercise discipline and self-restraint. Behaviors that are disruptive and insulting to me or to other students in the class will not be tolerated. Examples of these behaviors include arriving late to class, leaving class early, and talking during the lecture or any other actions that would be distracting to other students in the class.

**Academic Integrity:** SUNY Brockport has a firm policy concerning academic dishonesty. Please familiarize yourself with definitions and college policies regarding academic honesty in the College Student Handbook.

### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Date (week of)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/27 – 1/29</td>
<td>Introduction - Species Concept</td>
<td>Birch, Hay</td>
</tr>
<tr>
<td>2/3 – 2/5</td>
<td>Geographical Variation and Speciation</td>
<td>Lack, Grant, Brown,</td>
</tr>
<tr>
<td>2/10 - 2/12</td>
<td>Genetic Variability, Hardy Weinberg law</td>
<td>Bishop and Cook,</td>
</tr>
<tr>
<td>2/17 – 2/19</td>
<td>Population Genetics</td>
<td>King and Lawson</td>
</tr>
<tr>
<td>2/24 – 2/26</td>
<td>Genetics con’t</td>
<td>Elena et al</td>
</tr>
</tbody>
</table>

**Thurs** 2/26 - **EXAM 1**

<table>
<thead>
<tr>
<th>Date (week of)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/2 - 3/4</td>
<td>Estimating population density, Distribution of Species population</td>
<td>Mills</td>
</tr>
<tr>
<td>3/9 – 3/11</td>
<td>Life Tables</td>
<td>BMT Ch 1 Luckinbill, Reznick Topics due</td>
</tr>
</tbody>
</table>

**3/16 – 3/18 - NO CLASS – SPRING BREAK**

<table>
<thead>
<tr>
<th>Date (week of)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/23 – 3/25</td>
<td>Models of population Growth</td>
<td>BMT ch 3</td>
</tr>
<tr>
<td>3/30 – 4/1</td>
<td>Competition</td>
<td>Brown and Davidson, BMT ch 4</td>
</tr>
<tr>
<td>4/6 – 4/8</td>
<td>Competition cont</td>
<td>Goldberg and Barton</td>
</tr>
</tbody>
</table>

**4/8 - EXAM 2**

<table>
<thead>
<tr>
<th>Date (week of)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/20 – 4/22</td>
<td>Parasites and Parasitoids and Disease</td>
<td>BMT ch 5</td>
</tr>
<tr>
<td>4/27 - 4/29</td>
<td>Population Regulation</td>
<td>BMT ch 6 Murdoch</td>
</tr>
</tbody>
</table>
Additional Readings. – you will need Acrobat installed to view articles. These should be available on Angel. Some are available through library e-reserves in addition.


Bishop and Cook 1975 Moths, melanism and clean air. Scientific American 231(1) 90-99


Non-required texts.- these may be helpful, but are not required. Can be used as reference.


**BIO 423/523  "BIOLOGY OF POLLUTION"

Note: (Instructions for graduate students are indicated in parentheses)

**Prerequisites**

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

**Course Information**

**Meetings**

- Semester: Spring 2003
- Time: 3:45 - 5:15 pm; Monday and Friday
- Place: 215 Holmes Hall

**Office**

- Hours: J. Haynes. 3:00 - 4:30, Tuesday; 9:30 - 12:00 Thursday; or by appointment
- Place: 121 Lennon Hall
- Telephone: 395-5783
- E-Mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you briefly after class meetings, during scheduled office hours, or by appointment. You should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

**Syllabus**

<table>
<thead>
<tr>
<th>Week/Date</th>
<th>Topics</th>
<th>Reading Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/27</td>
<td>Introduction and History</td>
<td>WHSP: xi, xiii-xvi, 3-22; LY: 1-19</td>
</tr>
<tr>
<td>1/31</td>
<td>Ecological Foundations</td>
<td>This Guide; WHSP: 23-45; 195-219</td>
</tr>
<tr>
<td>2 2/3</td>
<td>Adaptation and Tolerance</td>
<td>WHSP: 220-237; LY: 111-130</td>
</tr>
<tr>
<td>2/7</td>
<td>Bioassay Procedures</td>
<td>WHSP: 93-98, 107-118; LY: 21-37</td>
</tr>
<tr>
<td>3 2/10</td>
<td>Bioassay Analysis 1: Median Survival</td>
<td>LY: 55-92; <strong>Topic/10 References due</strong></td>
</tr>
<tr>
<td></td>
<td>Times, Asymptotic LC50's, Latent Period</td>
<td></td>
</tr>
<tr>
<td>4 2/17</td>
<td>Good Laboratory Practices</td>
<td>RR #1</td>
</tr>
<tr>
<td>2/21</td>
<td><strong>EXAM 1</strong></td>
<td></td>
</tr>
<tr>
<td>5 2/24</td>
<td>Temperature</td>
<td>RR# 2</td>
</tr>
<tr>
<td>2/28</td>
<td>Hypoxia</td>
<td>LY: 131-133, 140-151; RR# 5</td>
</tr>
<tr>
<td>6 3/3</td>
<td>Acute Gill Effects</td>
<td>WHSP: 46-58; <strong>3 Annotations due</strong></td>
</tr>
<tr>
<td>3/7</td>
<td>Inorganics: Metals, pH, Ammonia</td>
<td>LY: 177-190; RR# 6</td>
</tr>
<tr>
<td>7 3/10</td>
<td>Organics 1: Sewage, Eutrophication</td>
<td>RR# 10, 15</td>
</tr>
<tr>
<td>3/14</td>
<td>Organics 2: Detergents, Pulp Mills, Oils</td>
<td>RR# 13, 14, 16</td>
</tr>
<tr>
<td>8 3/15-23</td>
<td><strong>SPRING BREAK!</strong></td>
<td></td>
</tr>
<tr>
<td>9 3/24</td>
<td>Chronic Effects: Physiology</td>
<td>WHSP: 119-139; LY: 93-104</td>
</tr>
<tr>
<td>3/28</td>
<td><strong>EXAM 2</strong></td>
<td></td>
</tr>
<tr>
<td>10 3/31</td>
<td>Chronic Effects: Behavior and Integration</td>
<td>WHSP: 139-152; RR# 19</td>
</tr>
<tr>
<td>11 4/7</td>
<td>Pesticides and Bioconcentration</td>
<td>LY: 104-111; RR# 20, 21</td>
</tr>
<tr>
<td>4/11</td>
<td>Biotransformation and Excretion</td>
<td>WHSP: 58-89; LY: 191-224</td>
</tr>
</tbody>
</table>

**Page 87 of 124**

2004-2005-27.res.doc
Graduate students are expected to develop and demonstrate a broader and deeper understanding of pollution biology than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in pollution biology.

1. Additional readings, and testing on them, to develop understandings of concepts more broadly and deeply (see study questions).

2. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?

3. Additional project, beyond the annotated bibliography and short presentation required of all students, and presentation. Small teams of graduate students (2-4) will work with me to identify pollution biology topics of interest that are not covered in depth in the course. Each team will prepare a 10 - 15 page paper on the topic and will make a 45 min presentation to the class. Both parts of the project will be graded according to the expectation of the Department of Environmental Science and Biology that its MS graduates are prepared to teach introductory biology at a community college. Alternatively, a team may choose to design, conduct and report on a toxicity test conducted in my laboratory.

4. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students’ final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

Texts


Library Readings

Because my notes and lectures may not always be clear to you, below I list a source (on reserve in Drake Library) from which I have taken information for lectures during weeks 6-10.


Assigned readings from other references, placed on electronic or paper reserve in Drake Library, are listed below; they should be completed before coming to class. Reserve readings come from a variety of books, journals and other sources. The volume of reading is high in this course, especially for graduate students. Guided by the study questions that follow, you should read these articles to get a sense of the breadth and depth of pollution biology. Reserve readings
(RR) are listed in numerical order as indicated on the syllabus. Ignore non-consecutive numbering. (Items in **bold** below are required for graduate students only.)


ENV 439/BIO 539 - CONSERVATION BIOLOGY - SPRING 2004

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: M: 10:40 - 11:40; W: 2:30 - 3:30; F: 10:45-1:00 or by Appt.
Phone: 395-5748 (Office); 637-0252 (Home; before 9:00 p.m.)
e-mail: cnorment@brockport.edu

Course Objectives:
1. To describe patterns of biological diversity, and to investigate factors which affect this diversity and vulnerability to extinction.
2. To characterize genetic and demographic characteristics of endangered populations.
3. To discuss design and protection of natural areas.
4. To introduce important research and management methods.
5. To think about the implications of ecology and evolution for conservation biology, the implications of conservation biology for society, and the relationship between values, science, and conservation.

Class Meets: 9:30-10:30, MW, 127 Hartwell


Course Structure: The course format will emphasize lectures, with supplemental discussions, guest presentations, and student projects.

Grading: Grades will be assigned based upon the following:

Lecture tests - 2 at 100 points each  200
Quizzes - 1                  40
Final exam                  100
Short papers                100
"Issues" assignment - presentation  120
Homework assignments (approximate pts)  80
Total points                680

(GRADUATE STUDENTS (BIO 539): Graduate students are expected to develop a deeper and broader understanding of conservation biology than is the case for undergraduates enrolled in ENV 439. Requirements for BIO 539 are given on page 2 of the syllabus.)

Attendance: Attendance is required; please come prepared for class. During the term I will take attendance at the start of every class; if you are not present and do not have a valid excuse (doctor's note), 7 points (ca. 1% of the total) will be deducted from your total points for the term. If you do miss a class, it is your responsibility to talk to me about why you missed and what material was missed, and to obtain notes from a classmate. I reserve the right to give unannounced quizzes that cannot be made up.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: ≥ 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Late assignments are penalized 5% per class day (MTWRF). Last day to withdraw from the course with departmental approval is April 30th.

Surviving BIOL 439/539:
1. Come to class and be prepared.
2. If you must miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after each class.
6. "Don't worry, be happy."

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to the discussion on pp. 9-12 of Your Right to Know: Academic Policies Handbook, 2003-2004, which is published by the Division of Student Affairs. The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence, unless clearly instructed to collaborate. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment.** If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 539. In addition to the requirements for ENV 439, graduate students in BIO 539 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete an additional group research project on Habitat Conservation Plans (HCPs). This additional project will require an in-depth analysis of an HCP of the students' choosing. The graduate student group will then make an hour-long oral presentation on HCPs to the class.
3. Complete additional technical readings from the following source: Conservation Biology: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings. Students will complete a written critical review of one of the papers.)

SCHEDULE - CONSERVATION BIOLOGY, 2004

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIT 1 - Introduction, history, values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan 26</td>
<td>Introduction</td>
<td>3-7</td>
</tr>
<tr>
<td>Jan 28</td>
<td>Biodiversity - description/patterns,</td>
<td>Chap 2 (pp. 27-43)</td>
</tr>
<tr>
<td>Jan 30</td>
<td>Biodiversity</td>
<td>Chap 3 (pp. 62-82)</td>
</tr>
<tr>
<td>Feb 2</td>
<td>History of Conservation - North America</td>
<td>pp. 11-24</td>
</tr>
<tr>
<td>Feb 4</td>
<td>History of Conservation - North America</td>
<td>Internet assignment due</td>
</tr>
<tr>
<td>Feb 6</td>
<td>Value of Biodiversity</td>
<td></td>
</tr>
<tr>
<td>Feb 9</td>
<td>Endangered Species Act</td>
<td></td>
</tr>
<tr>
<td>Feb 11</td>
<td>Film: Varmints</td>
<td></td>
</tr>
<tr>
<td>Feb 13</td>
<td>Discussion - value of biodiversity Return of the wolf</td>
<td></td>
</tr>
<tr>
<td>Feb 16</td>
<td>Quiz: Unit 1; catch-up</td>
<td></td>
</tr>
</tbody>
</table>

Date
**Unit 2 - Loss of biodiversity: patterns and causes**

Feb 16 Quiz: Unit 1; catch-up
Feb 18  | Lecture: Extinctions       | Chap 7
Feb 20  | Lecture: Extinctions       | Chap 7
Feb 23  | Discussion: Primack, Chapter 7 | Complete question set # 1
Feb 25  | Vulnerability to extinction | Chap 8
Feb 27  | Lecture: Habitat fragmentation | Chap 9 (pp. 197-229)
Mar 1   | Global change              | Chap 9 (pp. 252-260)
Mar 3   | Lecture: Introduced species | Chapter 10 (pp. 276-292)
Mar 5   | Discussion: Lomborg        | Complete question set # 2
Mar 8   | Discussion # 3: Synthesis   | Complete question set # 3
Mar 10  | Test # 1 (Units 1 and 2)   | Essay # 1 due
Mar 12  | Habitat Conservation Plans (grad students) pp. 562-565

**Unit 3 - Biology of small populations**
Mar 13-21 | SPRING BREAK – NO CLASS!! |
Mar 22    | Population genetics I      | Chap 11 (pp. 297-320)
Mar 24    | Population genetics II     |
Mar 26    | Demographic/environmental variation | Chap 11 (pp. 32-327)
Mar 29    | Discussion: Return of the Wolf (pp 105-210) | Pop. gen. assign due
Mar 31    | Metapopulations; PVA       | Chap 12 (pp. 348-348)
Apr 2     | In-class PVA project using RAMAS/metapop (computer lab) |
Apr 5     | In-class PVA project, continued |

**Unit 4 - Management issues and methods**
Apr 7     | Design of protected areas  | Chapter 16, 15 (pp. 427-444)
Apr 9     | Review PVA project         |
Apr 12    | Managing protected areas   | Chap 12 (329-344)
Apr 14    | Scholar’s Day (no class)   |
Apr 16    | International issues       | Asquith²
Apr 19    | Test 2 (Units 3, 4)        |
Apr 21    | Ex situ strategies/Reintroductions | Chap 13
Apr 23, 26| Group I presentations      |
Apr 28, 30| Group II presentations     |
May 3, 5  | Group III presentations    |
May 7     | Consensus (Groups I, II, III) |

**Final exam:**  Friday, May 14, 8-10 am

¹All readings refer to material in Primack unless otherwise noted.
²These papers are on electronic reserve in Drake, where they are listed by title. I list them by author to save space. The authors/titles for those papers listed in the syllabus are given below.
³Thomas McNamee, *The Return of the Wolf to Yellowstone*

**Electronic reserve readings from syllabus (by date)**
Rohlf: Six biological reasons why the Endangered Species Act doesn’t work and what to do about it
O’Connell: Response to “Six biological reasons why….”
Blaine: Basic science
Christian: Fraud discovered in endangered species studies
PEER (Public Employees for Environmental Responsibility): Lynx “biofraud” myth
BIO 440/540 - HERPETOLOGY - SPRING 2003

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: M: 10:40 - 11:40; W: 2:30-3:30; F: 10:45-1:00, or by appointment.
Phone: 395-5748 (office)
637-0252 (home; before 9:00 p.m. only; weekends okay)
e-mail: cnorment@brockport.edu

Course Objectives:
1. To develop an appreciation for the diversity of form and function in amphibians and reptiles.
2. To understand the evolutionary history of reptiles and amphibians.
3. To expose students to some basic techniques used in studying amphibians and reptiles in the field.
4. To develop the ability to think critically and ask questions about herps.
5. To investigate conservation issues related to reptiles and amphibians.

Class Meets: MWF 1:15 - 2:15 p.m., 033 Hartwell; F 2:15 - 5:15 p.m., 110 Lennon.

You will also need a 3-ringed field notebook that takes either 6"X9" or 8 1/2"X5 1/2" paper.

Course Structure: The course format will emphasize lecture, field exercises, and laboratory work.

Grading: Grades will be assigned based upon the following scheme (point totals are approximate):

- Lecture tests - 2 at 100 points each: 200
- Quizzes: 150
- Final exam - 1 at 100 points: 100
- Lab tests - 1, plus 2 quizzes: 150
- Field notebook: 75
- Misc. homework assignments: 175
- Lab reports: 150
- Total points: 1,000(approximate)

GRADUATE STUDENTS (BIO 540): Graduate students are expected to develop a deeper and broader understanding of herpetology than is the case for undergraduates enrolled in ENV 440. Requirements for BIO 540 are given on page 2 of the syllabus.

Attendance: Attendance is expected; please come prepared for class. During the term I sometimes will take attendance; if you are not present and do not have a valid excuse (doctor's note), 10 points (ca. 1%
of the total) will be deducted from your total points. It is particularly important that all lab sessions be attended, as they may be difficult to make up; an unexcused absence from a lab will result in a deduction of 3% from your grade! If an unannounced quiz is missed, it may not be made up. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes from a classmate.

Grading and Test policy: Lecture and lab tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to drop the course is February 24. Unless prior arrangements have been made, late work will be discounted at the rate of 5%/class day (MTWRF).

Surviving BIOL 440/540:
1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor; this includes the need for extensions on assignments.
5. Be aggressive in your approach to studying; for example, review and think about class notes after class.
6. "Don't worry, be happy."

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need which may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to the discussion in "Your Right to Know, 2002-2003" (pp. 9-12), which is published by the Division of Student Affairs. The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence. Failure to adhere to the standard of independent written work may result in a 0 on the assignment. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 540. In addition to the requirements for ENV 440, graduate students in BIO 540 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a research term paper on any area of herpetology, subject to approval by the instructor.
3. Complete two additional technical readings from recent volumes of the primary journals in the field. These readings will be discussed with the instructor during two out-of-class meetings. One of the readings will be analyzed in a short review/analysis article.)

SCHEDULE - BIO 440/540 Note: (L) = lab/field day; lectures occur prior to lab/field exercises

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
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</tr>
<tr>
<td>Jan 27</td>
<td>Characters and taxa of amphibians</td>
<td>Pp.1-8, Chapter 3 (skim)</td>
</tr>
<tr>
<td>Jan 29</td>
<td>Characters and taxa of reptiles</td>
<td>Pp. 8-20, Chapter 4 (skim)</td>
</tr>
<tr>
<td>Jan 31(L)</td>
<td>Systematics</td>
<td>Pp 21-25; Fig. 2-1</td>
</tr>
<tr>
<td>Feb 3</td>
<td>Evolution - Amphibia</td>
<td>Pp. 25-36</td>
</tr>
<tr>
<td>Feb 5</td>
<td>Evolution - Reptilia</td>
<td>Pp. 36-40</td>
</tr>
<tr>
<td>Feb 7(L)</td>
<td><strong>Quiz</strong> (basic taxonomy, characters)</td>
<td><strong>Phylogenetics worksheet due</strong></td>
</tr>
<tr>
<td>Feb 10</td>
<td>Homeostasis biology (a diversion!)</td>
<td>Pp. 171-190</td>
</tr>
<tr>
<td>Feb 12</td>
<td>Homeostasis - temperature regulation</td>
<td>Pp. 159-170, 190-195</td>
</tr>
<tr>
<td></td>
<td><strong>Bibliography due</strong></td>
<td></td>
</tr>
</tbody>
</table>
Feb 14(L) Homeostasis - finish
Feb 17 Energetics Chapter 6 (skim)
Feb 19 Catch-up day
Feb 21(L) No lecture; lab only
Feb 24 **Test # 1** (Lecture material from Jan 27-Feb 19)
Feb 26 Spacing and movements Pp. 335-352
Feb 28(L) Orientation (guest lecture, Dr. Dave Holtzman)
**Lab quiz** (see next page)
Mar 3 Feeding/diet Chapter 9 (skim 292-325)
Mar 5 Venomous/toxic herps Pp. 325-332
Mar 7(L) Reproduction I Chapter 7 (pp. 228-243)
Mar 10 Reproduction II Chapter 7 (pp. 243-259)
Mar 12 Reproduction III
Mar 14 No lecture; **lab exam** (see next page)
Mar 17-21 Spring break (down)
Mar 24 Mating Systems I Chapter 12 (pp. 398-413)
Mar 26 Mating Systems II Chapter 12 (pp. 413-430)
**UV lab report due** (tentative)
Mar 28(L) Mating Systems III
Mar 31 **Test 2** (Lecture material from Feb 26-Mar 28)
Apr 2 No class: Scholar’s Day
Apr 4(L) No lecture: field trip to zoo
Apr 7 Population biology I
Apr 9 Population Biology II **Zoo assignment due**
Apr 11(L) No lecture; **quiz**, field trip
Apr 14 Census methods **Hand in field notebooks**
Apr 16 Foraging ecology/interactions Chapter 13
**Population biology worksheet due**
Apr 18(L) No lecture; field trip
Apr 21 Community ecology I Chapter 14
**Habitat selection lab due** (tentative)
Apr 23 Community ecology II
Apr 25(L) No lecture; field trip to Iroquois NWR
Apr 28 Biogeography and evolution
Apr 30 Conservation Biology I Chapter 15
May 2 No class
May 5 No class
May 7 Conservation Biology II **Iroquois NWR assignment due**
May 9 (L) Finish up; field work
**Final exam: Wednesday, May 14, 10:30-12:30**
*All readings, unless otherwise indicated, are from Pough et al.*

**Lab Schedule**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
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<tbody>
<tr>
<td>Jan 31</td>
<td>Anatomy I (Integument/External Anatomy)</td>
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<tr>
<td>Feb 7</td>
<td>Set up UV lab</td>
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<td></td>
<td><strong>Note:</strong> a formal lab writeup will be required; due date depends upon how quickly larval development proceeds</td>
</tr>
<tr>
<td>Feb 14</td>
<td>Anatomy II (Skeleton)</td>
</tr>
<tr>
<td>Feb 21</td>
<td>Anatomy III (Digestion/Respiration/Circulation)</td>
</tr>
<tr>
<td>Feb 28</td>
<td><strong>Lab quiz</strong> (Anatomy 1 and 2); Habitat selection lab</td>
</tr>
<tr>
<td>Mar 7</td>
<td>Anatomy IV (Excretion/Reproduction/Sensory systems); Review</td>
</tr>
<tr>
<td>Mar 14</td>
<td><strong>Lab Test (Labs I - IV)</strong></td>
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<tr>
<td>Mar 28</td>
<td>Taxonomy: local reptiles and amphibians</td>
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<tr>
<td></td>
<td><strong>UV lab report due</strong></td>
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<tr>
<td>Apr 4</td>
<td>Field trip - Buffalo Zoo: taxonomy</td>
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<tr>
<td>Apr 11</td>
<td>Field trip; <strong>Quiz</strong> – local taxonomy</td>
</tr>
<tr>
<td>Apr 18</td>
<td>Field trip - Ossian State Forest; <strong>late return</strong></td>
</tr>
<tr>
<td>Apr 25</td>
<td>Field trip – Iroquois National Wildlife Refuge</td>
</tr>
</tbody>
</table>
May 2       No class
May 9       Field trip
May 12      Field notebooks due.

**Note 1:** Beginning after spring break, I will be leading evening (± 1.5 hr) field trips about once/week (weather permitting). **Each student must participate in at least one evening outing.**

**Note 2:** “Taxon” quizzes (n = 8) will be given every Friday, unless otherwise noted.
BIOL 427/527 - ANIMAL BEHAVIOR – FALL 2003

Note: (Instructions for graduate students are indicated in parentheses)

Instructor: Dr. Chris Norment
Office: 119 Lennon
Office hours: T R 2:55-3:55 p.m., F 9:00-11:00 a.m., or by Appt.
Phone: 395-5748 (office)
       637-0252 (home; before 9:00 p.m.)
E-Mail: cnorment@brockport.edu

General Course Objectives are to:
1. Describe the diversity of animal behavior.
2. Understand the influence of genes, developmental pathways, and anatomy on behavior.
3. Examine patterns of behavior in an evolutionary context.
4. Develop the ability to think critically and ask testable questions about behavior.
5. Develop improved scientific writing skills.

Class Meets: T R 1:15-2:45 p.m., 030 Hartwell

     A large three-ring binder also will be valuable.

Electronic reserves password: raptor

Course Structure: The course format will include lectures, discussions, and cooperative learning exercises. Although no formal lab time is scheduled, several field and lab exercises will be conducted during the term.

Grading: Grades will be assigned based upon the following scheme:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture tests - 2 at 100 points each</td>
<td>200</td>
</tr>
<tr>
<td>Final exam - 1 at 125 points</td>
<td>125</td>
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<tr>
<td>Lab reports</td>
<td>225</td>
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<tr>
<td>Problem sets and other written assignments</td>
<td>155</td>
</tr>
<tr>
<td>Unannounced quizzes (possible)</td>
<td>30</td>
</tr>
<tr>
<td>Total points</td>
<td>705(approximate)</td>
</tr>
</tbody>
</table>

(GRADUATE STUDENTS (BIO 527): Graduate students are expected to develop a deeper and broader understanding of animal behavior than is the case for undergraduates enrolled in ENV 427. Requirements for BIO 527 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. During the term I will take attendance; if you are not present and do not have a valid excuse (doctor's note, etc.), 7 points (about 1% of your grade) will be deducted from your grade. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes from a classmate. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up. See p. 8 of Your Right to Know & Academic Policies Handbook for an explanation of the college’s policy on attendance.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to withdraw from the course is December 1. Withdrawal policies are described in Your Right to Know & Academic Policies Handbook. Unless prior arrangements have been made, late work will be discounted at the rate of 5%/school day. Tests will be based primarily on material discussed during lectures and study group sessions. However, tests will be based substantially on material covered in your text, but not in class.

Surviving BIOL 427/527:
1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after the lecture.
6. "Don't worry, be happy." (Mehr Babba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need which may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-11, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, *Your Right to Know & Academic Policies Handbook, 2000-2001*. The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class, or in a previous class. (In order to account for this last, unfortunate possibility, I keep a random subset of major papers from previous classes on file.) A wise policy might be to discuss freely, but write with complete independence. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment or the course.** If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 527. In addition to the requirements for ENV 427, graduate students in BIO 527 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a research term paper that involves analysis of a current, controversial topic in animal behavior. The paper will require comparison of opposing viewpoints, analysis, and defense of the student’s position on the controversy.
3. Complete additional technical readings from the following sources:
- Animal Behaviour: Two current papers from the most recent volume of the primary journal in the field.
These readings will be discussed with the instructor during two out-of-class meetings. )

**SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings*</th>
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</thead>
</table>

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Week 1
Aug 26  Introduction, Squirrel Assignment I  pp. 1-9  Aug 29
Aug 28  Methods of studying behavior  Clotfelter (e-reserves)

Week 2
Sept 2  Lab time (honeybee orientation)  Lopez essay due
Sept 4  Statistics and hypothesis testing
        Scientific writing

Week 3
Sept 9  Evolution and Natural Selection  pp. 9-18
Sept 10 Evolution of behavior: geographical variation
        Squirrel assignment I due

Week 4
Sept 16 Discussion: methods/Lopez essay
        Development of behavior: genes and environment I  Chapter 3
Sept 18 Development of behavior: genes and environment II  Chapter 4

Week 5
Sept 23 Finish development;  Bee report
draft and review due
Sept 25 Neural systems and behavior  Chapter 5 (115-142)
        Continue neural systems
        Discussion: Ravens in Winter, pp. 11-104

Week 6
Sept 30 Test 1 (Aug 26 – Sept 225; includes Ravens in Winter, pp. 11-104)
Oct 2  Guest lecture: Dr. Dave Holtzman,
        Nasal chemical senses

Week 7
Oct 7  Lab: Vomeronasal use in snakes
Oct 9  Endocrine systems and behavior  Pp. 78-79, Chapter 6

Week 8
Oct 14 NO CLASS!
Oct 16 Discussion of vomeronasal lab/
        Foraging behavior  Final draft of bee report due
        Chapter 8

Week 9
Oct 21 Film/Foraging behavior  Chapter 11
Oct 23 Male and female tactics I

Week 10
Oct 28 Male and female tactics II  Optimality model problem set
due
Oct 30 Mating systems  Chapter 12

Week 11
Nov 4  Mating systems, continued
        Discussion: R/W, pp. 105-207
Nov 6  Test II (Covers material from Oct 2 - Nov 4; includes R/W, pp. 105-207)
        Mating tactics problems due

Week 12
Nov 11 Social systems  Chapter 14 (422-445)
Nov 13 Social systems  Chapter 14 (445-455)
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
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<tbody>
<tr>
<td>Nov 18</td>
<td>Behavior of domestic animals</td>
<td>Vomeronasal lab due</td>
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<tr>
<td>Nov 20</td>
<td>Animal intelligence</td>
<td>Discussion questions due</td>
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<td></td>
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<td>Cheney &amp; Seyfarth (e-reserves)</td>
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<tr>
<td>Week 14</td>
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<tr>
<td>Nov 25</td>
<td>Animal intelligence/discussion</td>
<td></td>
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<tr>
<td>Nov 27</td>
<td>No class; give Thanks!</td>
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<tr>
<td>Week 15</td>
<td></td>
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<tr>
<td>Dec 2</td>
<td>Evolution of human behavior</td>
<td>Chapter 15</td>
</tr>
<tr>
<td>Dec 4</td>
<td>Discussion: human behavior</td>
<td>Discussion questions due</td>
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<tr>
<td></td>
<td>*RIW, pp. 208-301</td>
<td></td>
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<tr>
<td>Week 16</td>
<td></td>
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<tr>
<td>Thursday,</td>
<td></td>
<td>Final exam (Includes <em>RIW</em>, pp.</td>
</tr>
<tr>
<td>Dec 9</td>
<td>(10:30-12:30)</td>
<td>208-301)</td>
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<td></td>
<td></td>
<td>*Unless otherwise noted, all</td>
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<tr>
<td></td>
<td></td>
<td>readings are from Alcock.</td>
</tr>
</tbody>
</table>
BIO 459/559 - MAMMALOGY - FALL 2003

Note: (Instructions for graduate students are indicated in parentheses)

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: T R 2:50-3:50 p.m., F 9:00-11:00 a.m., or by appointment.
Phone: 395-5748 (office)
637-0252 (home; before 9:00 p.m.)
E-mail: cnorment@brockport.edu

Course Objectives:
1. To develop an appreciation for the diversity of mammalian form and function, in anatomical, physiological, and ecological contexts.
2. To understand the evolutionary relationships among mammals, and the relationship of mammals to other vertebrates.
3. To expose students to some basic techniques used in studying mammals in the field.
4. To develop the ability to think critically and ask questions about mammals.

Class Meets: T R 9:45-11.15 a.m., 121 Smith, F 1:15-5:00 p.m., 110 Lennon

Texts and Materials:
A large, 3-ringed binder will also help in organizing course materials.

Electronic reserves password: rhino

Course Structure: The course format will emphasize lecture, field exercises, and laboratory work.

Grading: Grades will be assigned based upon the following scheme:
- Lecture tests and quizzes 250
- Final exam - 1 at 125 points 125
- Lab tests - 2 at ± 75 points each 150
- Peromyscus research paper/lab report 100
- Annotated Bibliography 50
- Problem sets 50
- Taxon quizzes (8 @ 15 pts. ea) 120
- Total points 845 (approximate)

(Graduate students (BIO 559): Graduate students are expected to develop a deeper and broader understanding of mammalogy than is the case for undergraduates enrolled in ENV 459. Requirements for BIO 559 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. If you do miss a class, it is your responsibility to talk to the instructor about what material was missed, and to obtain notes from a classmate. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up. I will take attendance before each lecture class; if you are absent and do not have a legitimate excuse, your grade will be lowered 9 points (about 1% of the total possible); an unexcused absence from a lab class will result in the loss of 27 points (about 3% of your grade). See p. 8 of “Your Right to Know & Academic Policies Handbook” for an explanation of the college’s policy on attendance.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 70-79% = C range; 55-69% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to withdraw from the course is December 1. Unless prior arrangements have been made, late work will be discounted.
at the rate of 5%/ school day.

Surviving BIOL 459/559:
1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after class.
6. "Don't worry, be happy." (Mehr Baba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-12, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, "Your Right to Know & Academic Policies Handbook". The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence. Failure to adhere to the standard of independent written work may result in a 0 on the assignment, or an E grade in the course. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 559. In addition to the requirements for ENV 459, graduate students in BIO 559 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete an additional research project associated with the Peromyscus leucopus lab report that all students complete. This additional project will require an in-depth analysis of data in the 11-year database for Peromyscus populations in the Brockport woods. The statistical analysis and write-up, with relevant literature, will be presented as an addendum to the regular Peromyscus leucopus lab report.
3. Complete additional technical readings from the following source: *Journal of Mammalogy: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings.*

SCHEDULE - BIO 459/559 - Fall 2003

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings*</th>
</tr>
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<tbody>
<tr>
<td>Week 1</td>
<td></td>
<td></td>
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<tr>
<td>Aug 26</td>
<td>Introduction/Characteristics</td>
<td>Chap 2 (pp. 8-27)</td>
</tr>
<tr>
<td>Aug 28</td>
<td>Classification/origin of mammals I</td>
<td>Chap 1 (pp. 2-6)</td>
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<tr>
<td>Aug 29</td>
<td>Bats: lecture (1:15-2:15)</td>
<td>pp. 138-149, 404-411</td>
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<td></td>
<td><strong>Field trip: bats (7-10 pm)</strong></td>
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<tr>
<td>Week 2</td>
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<tr>
<td>Sept 2</td>
<td>Classification/Origin of mammals II</td>
<td>Chap 3</td>
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<td><strong>Quiz - mammalian orders</strong></td>
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<tr>
<td>Sept 4</td>
<td>Distribution of mammals I</td>
<td>476-482</td>
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<tr>
<td>Sept 5 (L)</td>
<td>Mammal trapping (lecture)</td>
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<td></td>
<td>Set mammal traps</td>
<td>Phylogeny problems due</td>
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<tr>
<td>Week 3</td>
<td>Distribution of mammals II</td>
<td>Chap 25 (esp. pp. 528-540)</td>
</tr>
<tr>
<td>Sept 9</td>
<td>Group problem</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Readings*</td>
</tr>
<tr>
<td>Sept 11</td>
<td>Mammalian communities I - patterns</td>
<td>pp. 483-505</td>
</tr>
<tr>
<td>Sept 12 (L)</td>
<td><strong>Quiz - characteristics, classification, origins</strong></td>
<td>Field work: Woodchuck observations</td>
</tr>
</tbody>
</table>
Week 4
Sept 16  Mammalian communities II - processes Bring diskette to class
Sept 18  Catch-up, group problem
Sept 19(L) Analysis of Peromyscus data

Week 5
Sept 23  Population dynamics I pp. 506-526
Sept 25  Population dynamics II Peromyscus bibliography due
Sept 26(L) Buffalo Zoo field trip

Week 6
Sept 30  Reproduction I pp. 334-346, 352-363
Oct 2  Test 1 - material from Aug 26 – Sept 25
Oct 3(L) Rat dissection
Group problem (populations)

Week 7
Oct 7  Reproduction II pp. 346-352
Oct 9  Reproduction III
Oct 10(L) Dentition lab Group problem (reproduction)

Week 8
Oct 14  No class - Fall Break
Oct 16  Metabolism and temperature regulation I pp. 364-378
Oct 17(L) Skeleton lab

Week 9
Oct 21  Metabolism and temp reg II pp. 380-388, 394-403
Peromyscus paper due (draft), with peer review
Oct 23  Metabolism and temp reg III/ Group problem
Oct 24(L) Lab practical 1

Week 10
Oct 28  Feeding/digestive specializations I pp. 272-273
Oct 30  Film - Monotremes and marsupials
Oct 31(L) Noneutherians, Insectivora/Chiroptera

Week 11
Nov 4  Feeding/digestive specializations II pp. 433-436
Group problem
Nov 6  Catch-up
Nov 7(L) Carnivora

Week 12
Nov 11 Test 2 - from Sept 30 - Nov 6
Nov 13  Sexual selection and mating systems pp. 450-456
Nov 14(L) Rodents

Week 13
Nov 18  Social systems I pp. 456-475
Peromyscus lab report due
Nov 20  Social systems II/Group problem
Nov 21(L) Subungulates/Artiodactyla/Perissodactyla

Week 14
Nov 25  Social systems III
Nov 27&28 No class: Give Thanks!

Week 15
Dec 2  Conservation of mammals Chap 26
Dec 4  Review for lab test
Dec 5(L) Lab practical II
Dec 11 Final exam: 10:30-12:30
*Unless otherwise indicated, all readings are from Vaughn et al.; M = Martin et al.

LABS: From September 19th on, bring both Vaughn et al. and Martin et al. to lab!!!

Note: Once we get going there will be a cumulative “taxon quiz” every Friday for eight weeks
ENV 488/588: Environmental Impact Analysis

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one college-level ecology course or some background in general science before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

Semester: Summer 2004, Session I, May 17 - 28
Time: 9:00 am - 5:00 pm; Monday through Friday
Place: 118 Lennon Hall

Office

J. Haynes. Hours: During regular class time
Place: 121 Lennon Hall
Telephone: 716-395-5783
E-Mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you during class meetings. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course.

Text


Syllabus

Mon, May 17
am: Introductions: Course, Participants, Environmental Analysis/NEPA
pm: Tour Project Area; Preliminary Scoping
Assignment: SEQRA/Permit Materials; Bregman--Chapters. 1, 2

Tue, May 18
am: EIA/EIS Procedures
pm: Organize and Work on Team Special Projects
Assignment: SEQRA/Permit Materials; Bregman--Chapter 3

Wed, May 19
am: Teams Identify and Summarize Laws and Regulations Relevant to the Project
pm: Regulatory Perspective: SEQRA, Permits, Scoping the Class Project
(Mr. Albert Butkas, NYSDEC, retired)
Assignment: This Guide, p. 1-15; Bregman--Chapter 6

Thu, May 20
am: Assessing Environmental Impacts
pm: Work on Team Special Projects
Assignment: Bregman--Chapter 7

Fri, May 21
am: EIA/EIS Methodologies; Teams Prepare Environmental Impact Assessment (EIA)
pm: Teams Complete EIA; Make Positive or Negative Declaration; Quiz #1

Mon, May 24
am: Complete Team Special Projects
pm: Teams Organize and Tabulate Information for EIS; Develop EIS Outline

Tue, May 25
am: Citizen Participation in EIA; Present Special Projects to Class
pm: Teams Begin Drafting EISs

Assignment: Bregman--Chapter 4

Wed, May 26
am/pm: Teams Continue Drafting EISs

Thu, May 27
am: Quiz #2; Graduate Student Presentations
pm: Permit Hearing Preparation; Continue Drafting EISs

Fri, May 28
am: Complete and Turn In Team EISs
pm: Permit Hearing (Mr. Albert Butkas, NYSDEC);

(Additional Expectations for Graduate Students in ENV 588)

Graduate students are expected to develop and demonstrate a deeper understanding of environmental impact analysis than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in environmental impact analysis.

5. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?

6. Additional project, beyond the assignments required of all students, and presentation. Small teams of graduate students (2-4) will review an existing EIS, then prepare a 10-15 page critique of the EIS. Writing style and mechanics will be graded according to the expectation of the Department of Environmental Science and Biology for MS thesis-quality writing.

7. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students’ final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).
Prerequisites

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Semester: Spring 2004
Time: 3:45 - 5:15 pm; Monday and Friday

Place: 218 Lennon Hall

Office Hours: J. Haynes, 2:30 - 3:30, MF; 9:30 - 12:00, W; or by appointment
Place: 121 Lennon Hall
Telephone: 395-5783
E-mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance briefly after class meetings, during scheduled office hours, or by appointment. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

Texts to Purchase


Library Reserve Texts


Reading assignments for each class meeting are listed in the Syllabus below and should be completed before coming to class. The reading can be heavy going at times, but your text and library readings provide valuable reinforcement and complementary material for topics covered in lecture. The abbreviations for assigned readings, shown on the syllabus below, are coded as follows: B = Bond, D = Diana, J = Jobling, and KH = Kohler and Hubert.

Week/Date       Topics                Readings
1 1/26          Introduction/Basics    D:xiii-iv, 1-11; B:3-16; this Guide
                1/30                     J:251-273, 286-295; D:294-311
2 2/2           Movement              D:12-57
                2/6                     J:114-136, 211-249
3 2/9           Gas Bladder: Buoyancy  J:273-286
                2/13                    J:11-45
4 2/16          Senses/Reproduction   D:313-321, 331-344; Topic/References Due
                2/20                    D:345-365
5 2/23          Exam 1

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2/27  Life History  D:321-330, 270-293
6 3/1  Behavior  D: 201-223, 224-243
3/5  Adaptations/Relationships  D:175-200, 244-269
7 3/8  Trout Ecology  D:399-413; KH:481-504
3/12  Environ./Pop. Interactions  D:134-146
**Spring Break!**
8 3/22  Recruitment  D:147-174; J:391-403
3/26  Recruitment/Growth  D:59-80; **Paper Outline Due**
9 3/31  Growth  D:81-108; KH:151-155

8 3/31  Growth  D:81-108; KH:151-155

4/2  **Exam 2**
10 4/5  Mortality  KH:140-150
4/9  Models 1  KH:127-140
11 4/12  Models 2  KH:155-163
4/16  Management 1  KH:3-30
12 4/19  Management 2  KH:31-59, 455-457
4/23  Management 3  KH:403-430, 249-284; **Paper Draft to Peer Reviewer**
13 4/26  Graduate Student Presentations  
13 4/30  **Exam 3**
14 5/3  Great Lakes Fisheries  KH:623-664; D:377-398; **Paper Due**
( 5/7  Biodiversity  KH:431-454; D:477-490)

(Additional Expectations for Graduate Students in ENV 584)
Graduate students are expected to develop and demonstrate a deeper understanding of fish ecology than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in fish ecology.

a. Additional readings, and testing on them, to develop understandings of concepts more deeply and mathematically (see study questions).

b. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?

c. Additional project, beyond the fish life history paper required of all students, and presentation. Small teams of graduate students (2-4) will work with me to identify fish ecology topics of interest that are not covered in depth in the course. Each team will prepare a 10 - 15 page paper on the topic and will make a 45 min presentation to the class. Both parts of the project will be graded according to the expectation of the Department of Environmental Science and Biology that its MS graduates are prepared to teach introductory biology at a community college.

d. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students’ final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).
ENV 490/590 "FISHERY TECHNIQUES

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

IDENTIFICATION"
Semester: Fall 2003
Time: 12:00 - 5:00 pm; Tuesday
Place: 118 Lennon Hall

Office

J. Haynes. Hours: 2:30 - 3:30 pm, MW; 9:30 - 11:00 am TW; or by appointment
Place: 121 Lennon Hall
Telephone: 585-395-5783
E-mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you during class meetings and scheduled office hours, or by appointment. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

Texts


Reading assignments for each week's meeting are listed in the syllabus below and should be completed before coming to class. There are no formal lectures in this course, but you are responsible for mastering material in your texts and other handouts. Study questions at the end of this Course Guide will guide your reading. Be sure to bring Smith's fish key to each of the fish identification lab periods listed on the syllabus and to Exam 2.

Syllabus

<table>
<thead>
<tr>
<th>Week/Date</th>
<th>Topics</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 8/26</td>
<td>Introduction/References (R)</td>
<td>This Guide: 1-17; MW:1-15, 63-81</td>
</tr>
<tr>
<td>2 9/2</td>
<td>Backpack Electrofish/Seines</td>
<td>MW:221-253, 121-155</td>
</tr>
<tr>
<td>3 9/9</td>
<td>Gill/Trawl Nets/Pop Estimate (R)</td>
<td>MW:157-192, 433-446</td>
</tr>
<tr>
<td>4 9/16</td>
<td>Trap Nets/Boat Electrofish</td>
<td>MW:193-220, 303-333</td>
</tr>
<tr>
<td>5 9/23</td>
<td>Community Spreadsheets (R)</td>
<td>MW:353-383</td>
</tr>
<tr>
<td>6 9/30</td>
<td><strong>Exam 1/Fish Identification 1</strong></td>
<td>S:1-24 (plus pages in this Guide)</td>
</tr>
<tr>
<td>7 10/4</td>
<td>Fish Identification 2</td>
<td>MW:255-302, 555-590</td>
</tr>
<tr>
<td>8 10/14</td>
<td>No Class: Mid-semester Break</td>
<td></td>
</tr>
<tr>
<td>9 10/21</td>
<td>Fish Identification 3</td>
<td>MW:385-432, 533-554</td>
</tr>
<tr>
<td>10 10/28</td>
<td>Fish Anatomy (R)</td>
<td>Lagler Chp.3 (pages in this Guide)</td>
</tr>
<tr>
<td>11 11/4</td>
<td><strong>Exam 2/Food Habits (R)</strong></td>
<td>MW:513-532</td>
</tr>
</tbody>
</table>
Graduate students are expected to develop and demonstrate a deeper understanding of fishery techniques and fish identification than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in fishery techniques and fish identification.

8. Additional readings, and testing on them, to develop understandings of concepts more deeply and mathematically (see study questions).

9. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?

10. Additional projects beyond the oral presentation on a fishery technique required of all students. Each graduate student will also write a 6 – 8 page paper on the fishery technique that he or she chooses to speak about. The paper will be graded according to the expectation of the Department of Environmental Science and Biology for MS thesis-quality writing, and the presentation will be graded according to standards for presentation at a professional society meeting. Collectively, the graduate students will work together to improve the fish museum at SUNY Brockport by collecting fish in the field and properly identifying, preserving and cataloging specimens.

11. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students’ final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

**Laboratories**

We will begin each 5 h class period with a brief introduction to the day's activities at 12:00 sharp, then leave for field work or begin lab exercises. There are no formal lectures, but you must be familiar with information from assigned readings and the laboratory exercises to successfully complete this course. Our emphasis is hands-on experience with fishery techniques and fish identification. Following a few general guidelines will make laboratory/field sessions and lab report writing more enjoyable and beneficial for you and other students.
Plant Ecology  ENV 495/595  Spring 2003
Prerequisite - Ecology, ENV 303
(Graduate Requirements are in parentheses and are highlighted)
Class meets: Monday, Wednesday, and Friday, 12:00 – 1:00 PM,
Lab meets:

Instructor: Geoffrey Gardner, Ph.D.
Office: Lennon 117
Phone: 395-5743
Email: ggardner@brockport.edu
Office Hours: Tues+Thurs 11:30-12:30; Wed 1:30-2:30

Supplemental readings: any supplemental readings necessary will be available on reserve.

Grading: 100 total points
Two exams (2 best scores from 3 exams given, including the final): 30 pts each
Topic Paper: 20 pts
Lab: 15 pts
Participation: 5 pts

Tentative schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>1/27</td>
<td>Course Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>1/29</td>
<td>Consequences of being a Plant</td>
<td>Ch 1</td>
<td>No Lab</td>
</tr>
<tr>
<td>F</td>
<td>1/31</td>
<td>Photosynthesis + Light</td>
<td>Ch 2</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2/3</td>
<td>Photosynthesis + Gas exchange</td>
<td>Ch 2</td>
<td>Competition Lab I</td>
</tr>
<tr>
<td>W</td>
<td>2/5</td>
<td>Photosynthesis</td>
<td>Ch 2</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2/7</td>
<td>Water Relations</td>
<td>Ch 3</td>
<td>Competition Lab II</td>
</tr>
<tr>
<td>M</td>
<td>2/10</td>
<td>Water Relations</td>
<td>Ch 3</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>2/12</td>
<td>Life Below Ground: Soil</td>
<td>Ch 4</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2/14</td>
<td>Soil</td>
<td>Ch 4</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2/17</td>
<td>Ecological effects of Global change</td>
<td>Ch 22</td>
<td>Winter Botany</td>
</tr>
<tr>
<td>W</td>
<td>2/19</td>
<td>Evolution – Processes</td>
<td>Ch 5</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2/21</td>
<td>Evolution – Outcomes</td>
<td>Ch 6</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2/24</td>
<td>Discussion</td>
<td></td>
<td>Photosynthesis Lab</td>
</tr>
<tr>
<td>W</td>
<td>2/26</td>
<td>Exam #1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2/28</td>
<td>Plant population dynamics</td>
<td>Ch 7</td>
<td>Dendrochronology</td>
</tr>
<tr>
<td>M</td>
<td>3/3</td>
<td>Plant population dynamics</td>
<td>Ch 7</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>3/5</td>
<td>Plant reproduction – dispersal</td>
<td>Ch 8</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3/7</td>
<td>Plant reproduction – pollination</td>
<td>Ch 8</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3/10</td>
<td>Plant Life history</td>
<td>Ch 9</td>
<td></td>
</tr>
</tbody>
</table>
Examinations and Assignments

(Graduate Students (ENV 595): Graduate students will be expected to have a broader and deeper understanding of Plant Ecology. Therefore, the expectation level for graduate students is significantly higher than for undergraduates. Graduate students will be expected to complete an extensive research paper and are subject to a more rigorous grading of labs and exams. In addition, graduate students will be responsible for leading class discussion on current topics in plant ecology. )

1. Exams (60 pts.)
The two midterm exams and the final will be the same length and carry equal weight. Each will cover 1/3 of the course material. All three will have the following format:

- half the exam will consist of short answers and definitions; half will consist of extended essay questions, which will be distributed before the exam.
- one week in advance of each exam, you will be give a list of 4-5 essay questions taken from material covered in lecture and lab in the previous 1/3 of the course.
- from this list, 2 questions will be chosen for the exam, exactly as written.
- you are encouraged to discuss these questions with classmates, and draw from your text and any available literature. Your instructor may be consulted for clarification only.
- preparing for the two essay questions will also help you prepare for the rest of the exam.
- during each exam, you will be on your own, with no notes allowed.

Your two best scores from the three exams will be counted. Make-up exams will not be given. If you miss either of the first two exams, you must take the third.

2. Topic Paper (20 pts.)
This will be a term paper reviewing research on one particular topic of plant ecology, using reference material and primary literature. Choose a topic early in the semester. The topic is your choice, and this is a solo project. A topic must be submitted by the scheduled deadline, followed by an outline. The format will be as follows:

- 5-10 pages, double-spaced, including references. (Graduate students papers should be 10-15 pages).
- pages must be numbered
- use subheadings to organize your writing
- state the underlying scientific question clearly, and describe how it arose.
- describe research methods used to probe the question, and their results.
- draw your own conclusions, and suggest further research.
- use the Latin binomial to introduce a species. Common names can be used thereafter.
- minimum of 10 references, mostly primary scientific papers.
- cite last names of authors and dates in parentheses; don't use numbers or footnotes.
- for the bibliography, list references in same format as in your textbook.
- do not use direct quotations; use your own words
- emphasize content over appearance (fancy binders get you NO extra credit. In fact, they make a paper hard to read. We will not be pleased.
- grammar and spelling will be checked.

3. Participation (5 pts.)
You are expected to attend every class and participate in all Tuesday laboratories. Periodically we will have class discussions on various papers/topics/issues.
(Graduate students will be assigned to a date to lead a discussion on a current issue in plant ecology. Graduate students will select the paper for the topic, which will be assigned to the class. A written review of the paper is also expected).

4. Lab (15 pts)
Lab assignments will account for 15 pts of your grade.

GEL462 - GROUNDWATER
Department of the Earth Sciences
SUNY College at Brockport

Instructor: Dr. Mark R. Noll
Office: 327 Lennon Hall
Phone: 395-5717
e-mail: mnoll@weather.brockport.edu

Semester: Class Time:
            3 hours lecture
            3 hours lab

Office Hours:

Course Description:

This course will investigate the fundamental aspects of the hydrologic cycle with emphasis on the subsurface. Relationships between the physics of fluid flow and the physical properties of rocks, sediments, and soils will provide a basis for examination of the management and environmental aspects of groundwater hydrogeology.

Rationale:

Water is essential to life on Earth, and approximately 50% of our water resources come from subsurface sources. As man imposes more pressures on this resource in terms of beneficial uses and past detrimental impacts, groundwater hydrogeology has increased in significance for earth science professionals. This course will look to answer some basic questions that are needed to solve current and future problems:

- What is an aquifer
- What are its geologic and hydrologic properties
- Where does the water come from, which way does it flow and where does it go
- What if the hydraulic gradient
- What is the quality of the water, is it contaminated

Learning Outcomes:

Lecture
1. Define the major components of the hydrologic cycle
2. Identify the principle components of subsurface hydrogeologic systems
3. Formulate models that describe the hydrogeologic system under study
4. Solve common mathematical expressions and equations that elucidate the physical and hydraulic properties of groundwater systems
5. Quantitatively analyze hydraulic data to evaluate groundwater systems in terms of resource management, quality and quantity
6. Evaluate the impact of anthropogenic activities on natural systems

Laboratory
1. Acquire skills in the basic field and laboratory procedures applied to investigating groundwater systems
2. Design experiments that test a specific property
3. Operate laboratory and field equipment so as to produce accurate and precise data
4. Interpret hydraulic data in the context of the system under study
5. Evaluate the quality of experimental data in both a qualitative and quantitative manner
6. Prepare written reports that detail experimental procedures, results, and interpretations

Assessment:

Formal assessment in this course will evaluate the following:

- The basic knowledge and facts of hydrogeology
- Comprehension, use and quantitative solutions to common hydrogeologic expressions and equations
- Application of hydrogeologic principles to solving new problems
• Analysis of groundwater systems
• Synthesis of hydrogeologic principles into a model or hypothesis of a natural groundwater system, and how it works
• Qualitative and quantitative evaluation of the quality and relevance of hydrogeologic data and literature

Formal assessment will be quantified using the following grading scheme:

Tests (3) @ 100 pts each    300 pts
Final Exam                    100 pts
Homework                     100 pts
Laboratory project reports (2) 100 pts
Term Paper                   100 pts
Projects                     100 pts
Total                        800 pts

Tests will be given three times during the semester as outlined on the course schedule. You will be given 1 hour to complete each test. Each test will consist of short answer questions and quantitative problem solving exercises. Tests serve as a measure of what you have learned to date, and as a means of identifying subject matter that you need to review again.

The Final Exam is cumulative and will cover all material covered over the course of the semester. Everyone must take the final exam. The exam will focus on your ability to connect various aspects of the course in answering more comprehensive questions, by synthesizing information from various sources.

Homework problems will be distributed approximately weekly over the course of the semester. Completed problems are due at the beginning of class on the day assigned when the homework is distributed in class. Late homework will be penalized according to the late assignments policy below with the exception of an excused absence. Questions on these assignments will be similar to the questions on tests.

Laboratory reports will be required for both laboratory projects. These reports should follow the standard format for laboratory reports. If you are not familiar with the proper format, please see me. As these projects are multi-week efforts and involve collaboration with others in the class, interim data summaries will be assigned to ensure that you are on the right track and that everyone has a complete data set. Final reports will be due on the date assigned for each project. Late laboratory reports will be penalized according to the late assignments policy below with the exception of an excused absence.

A Term Paper is required. The term paper may be either a survey of the literature on a specific topic or you have the option of designing and completing a field and/or laboratory investigation and writing a formal laboratory report. The general topic for a literature survey paper is groundwater remediation technologies. The term paper is due at the beginning of class on Monday April 28th. Late papers will be penalized according to the late assignments policy below with the exception of an excused absence.

Short Projects will be assigned throughout the semester. These will typically involve some independent or group review of literature or data to answer a specific question or solve a
problem. For group assignments, a single group product may be submitted. Late projects will be penalized according to the late assignments policy below with the exception of an excused absence.

**Late assignments** will be penalized at the rate of 10% of the total number of points per day, weekends and holidays included.

**Extra credit** will not be offered in this course. The reasoning for this policy is that the assessment plan has been developed as an integrated part of the learning outcomes for the course. Extra credit opportunities may or may not meet the designed learning outcomes. Furthermore, it is inherently unfair to allow some individuals extra credit opportunities and not others.
GEL562 - GROUNDWATER

Additional Requirements

In addition to the requirements stated above for GEL 462, students taking GEL 562 will be required to complete the following work.

2nd Term Paper 100 pts
Critical Reviews 100 pts

Total Points 1000 pts

A second term paper will be required for students taking GEL 562 in the area of contaminant hydrogeology. The term paper will consist of a review of the current literature on a specific technology used for groundwater remediation. The paper must focus on a current state-of-the-art technology, in what applications is the technology used, how the technology is applied, the limitations of the technology and the critical groundwater parameters used in system design.

A selection of journal articles will be available for your reading. These articles will be integrated with topics covered in lecture. Over the course of the semester, you must complete a critical review on 3 of these articles. Please note, in addition to the critical reviews, a targeted test questions will be included on your version of each test.
GEL/CHM 457 - GEOCHEMISTRY
Department of the Earth Sciences
SUNY College at Brockport

Instructor: Dr. Mark R. Noll  Semester: 
Office: 327 Lennon Hall  Class Times: 
Phone: 395-5717  3 hours lecture
E-mail: mnoll@esc.brockport.edu  3 hours lab
Office Hours:

Text: Environmental Geochemistry, Eby (2004)

Course Description:
This course will apply basic chemical principles such as thermodynamics, kinetics, and
equilibrium to the investigation of common low-temperature and environmental geochemical
problems.

Rationale:
The Earth is a complex structure of interrelated systems through and within which energy and
matter are transferred. An understanding of the chemical reactions that take place in these
natural systems is fundamental to developing models of how these systems work and relate to
other systems.

Learning Outcomes:

Lecture
7. Identify the physical and chemical characteristic of a system
8. Formulate models that describe the geochemical system under study
9. Observe and identify the signs of and products of geochemical reactions within a system
10. Solve common expressions and equations describing geochemical systems
11. Interpret the significance of geochemical reactions in the context of describing the systems
    workings
12. Evaluate the impact of anthropogenic activities on natural systems

Laboratory
7. Acquire skills in the basic laboratory and analytical procedures applied to investigating
    geochemical phenomena
8. Design experiments that test a specific hypothesis
9. Operate laboratory equipment so as to produce accurate and precise data
10. Interpret geochemical data in the context of the system under study
11. Evaluate the quality of experimental data in both a qualitative and quantitative manner
12. Prepare written reports and presentations that detail experimental procedures, results, and
    interpretations

Assessment:
Formal assessment in this course will evaluate the following:

- The basic knowledge and facts of low temperature and environmental geochemistry
- Comprehension and solution of common geochemical expressions and equations
- Application of geochemical principles to solving new problems
- Analysis of geochemical systems as a complex blend of interdependent reactions
- Synthesis of geochemical principles into a model or hypothesis of a natural geochemical system
- Qualitative and quantitative evaluation of the quality and relevance of geochemical data and literature

Formal assessment will be quantified using the following grading scheme:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests (3) @ 100 pts each</td>
<td>300</td>
</tr>
<tr>
<td>Homework projects</td>
<td>100</td>
</tr>
<tr>
<td>Term paper</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory project</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>600</strong></td>
</tr>
</tbody>
</table>

**Laboratory reports** will be required for all laboratory experiments. These reports should follow the format in the attached document on laboratory reports. Reports will be due at the beginning of the next lab period unless otherwise noted. Late laboratory reports will be penalized according to the late assignments policy below with the exception of an excused absence.

A **laboratory project** will be required from each student. This project will consist of a study proposal and experimental design, field and/or laboratory data collection and analysis, and a formal project report. The written project report (80% of grade) will be due the last day of lab, an oral presentation (20% of grade) of your results using Powerpoint will be due during the final exam time slot. A goal of this portion of the course is to complete a project that would be acceptable for presentation at a professional conference, and you will be encouraged to do such. Details on the project will be discussed during the first laboratory session. Late laboratory project written reports will be penalized according to the late assignments policy below with the exception of an excused absence. Late oral presentations will not be accepted with the exception of an excused absence.

**Tests** will be given three times during the semester as outlined on the course schedule. You will be given **1 hour** to complete each test. Each test will consist of short answer questions and quantitative problem solving exercises. Tests serve as a measure of what you have learned to date, and as a means of identifying subject matter that you need to review again. As the material all interrelated, and the structure of the course will require you to use skills developed early in the course at later dates, all tests are cumulative in nature.

**Homework projects** will be assigned approximately weekly during the semester. These will consist of quantitative problems, critical reading of journal articles, or short research reports. Assignments will typically be due on Fridays. Late assignments will be penalized according to the late assignments policy below with the exception of an excused absence.
A term paper will be required. The paper will cover the geochemistry of a single element of your choice with approval. The element selected and an annotated bibliography are due Feb 13th. A draft report is due March 5th with the final paper due March 26th. In addition to the written paper (90% of grade), a brief 5-10 minute oral report using Powerpoint is required. The oral presentations will be given on April 2nd, but the Powerpoint file must be submitted by April 1st.

Late assignments will be penalized at the rate of 10% of the original total number of points per day, weekends and holidays included.

Lab Safety Policy – Lab safety is an important aspect of this course. The lab safety guidelines, including housekeeping requirements are included. It is your responsibility to be aware of safety requirements, to properly clean any materials you use, and to help maintain equipment in good operating condition. Failure to do so will result in the following penalties. 1st offense – warning
2nd offense – 10% reduction in grade for that lab assignment
3rd offense – 10% reduction in course grade
Their will be an additional 20% reduction in course grade for each offense after the third.

Extra credit will not be offered in this course. The reasoning for this policy it that the assessment plan has been developed as an integrated part of the learning outcomes for the course. Extra credit opportunities may or may not meet the designed learning outcomes. Furthermore, it is inherently unfair to allow some individuals extra credit opportunities and not others.
GEL/CHM 557 – GEOCHEMISTRY

Additional Requirements

In addition to the requirements stated above for GEL/CHM 457, students taking GEL/CHM 557 will be required to complete the following work.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Proposal</td>
<td>100 pts</td>
</tr>
<tr>
<td>Journal Manuscript Review</td>
<td>100 pts</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>800 pts</strong></td>
</tr>
</tbody>
</table>

You will be required to develop a research proposal for a mutually agreed upon topic. The topic must focus on some aspect of geochemistry. It may be related to your thesis work, but not identical to it. The proposal will be prepared following the NSF guidelines for a standard research proposal. Your grade will be based on the quality of writing (20%), the depth of background research (30%), and the quality of your experimental design (50%). Proposal guidelines may be found at [www.nsf.gov](http://www.nsf.gov).

You will be asked to complete two manuscript reviews that might be submitted to a journal for consideration for publication. The manuscripts will be supplied to you with guidelines to reviews as used by the Journal of Environmental Quality. Your review should cover the following items, 1) scientific merit, 2) quality of results, 3) quality of writing, and 4) adherence to journal guidelines. Your review will address these items and your grade will be based on the overall quality of your review.
Course Outline

Introduction to the course. The Earth as a geochemical system.
Reading assignment – Eby, CH 1

Week 1

Review of thermodynamics, kinetics and equilibrium.
Reading assignment – Eby, CH 2

Week 2

Acid-base reactions and the carbonate system
Reading assignment – Eby, CH 3

Week 3

Oxidation and reduction reactions. Fe and S geochemistry
Reading assignment – Eby, CH 4

Week 4

Test #1, Monday 2/23
Stable and radiogenic isotopes.
Reading assignment – Eby, CH 6

Week 5

Clay mineralogy. Reactions at mineral surfaces.
Reading assignment - Eby, CH 7

Week 6

Atmospheric chemistry. Rain water chemistry. Global climate change.
Reading assignment - Eby, CH 8

Week 7

Marine chemistry. Seawater chemistry. Geochemical reactions in sediments
Reading assignment - Eby, CH 10

Week 8

Test #2, Monday 3/29
Continental environments 1. Weathering and soils development. Reading assignment - Eby, CH 9

Week 9

Continental environments 2. Surface and groundwater chemistry
Reading assignment - Eby, CH 9

Week 10

Continental environments 3. Trace metals in terrestrial systems.
Reading assignment - Eby, CH 9

Week 11

Carbon chemistry and cycles.
Reading assignment - Eby, CH 5

Week 12
Elemental Cycling.
Reading assignment - Handouts

Test #3, Thursday, 5/6
Elemental Cycling.
Reading assignment - Handouts