

## GeoScience Service Learning Resource Sheet

---

### Table of Contents:

**I. Syllabi and General Information (p. 1)**

**II. Model Programs (p. 4)**

**III. Undergrad Service Learning with K-12 Students and Teachers (p. 5)**

**IV. Partnering Institutions and Grant Resources (p. 5)**

**IV. Recommended Journal Articles & Books (p. 8)**

---

**\*\*Please See the Environmental Studies Resource Sheet: many of the resources listed there will also be useful to the Geoscience Dept.**

### I. Syllabi and General Information

**1) May 2006 Journal of Geoscience Education: The Symphony of the Spheres- Recent Advances in Earth System Science Education**

<http://esse21.usra.edu/designguide/JGEabstractsandlinks.htm>

This website summarizes a wide plethora of service learning and inquiry-based GeoScience courses and programs, and provides the full text journal articles regarding each GeoScience program from the issue (54(3)) of the Journal of Geoscience Education.

**2) Hydrology Service-Learning @ University of Vermont**

<http://www.uvm.edu/cosmolab/?Page=projects/urbanhydro/urbanhydro.html>

OR [http://serc.carleton.edu/introgeo/service/examples/uvm\\_hydro.html](http://serc.carleton.edu/introgeo/service/examples/uvm_hydro.html)

Two students, from a Geomorphology class, used historical maps and aerial photographs of the university campus to document the dramatic increase in impermeable surfaces on campus from 4% of the land area in 1869 to 42% in 1999. In GeoHydrology, student teams used aerial photography, field mapping, and door-to-door surveys to document green space losses of 40 to 50% over the past 20 years in neighborhoods inhabited predominantly by students, despite zoning controls enacted in 1973.

**3) Service Learning and Community Service in Earth Science Courses**

Summaries of GeoScience service learning classes.

[http://gsa.confex.com/gsa/2006AM/finalprogram/session\\_18155.htm](http://gsa.confex.com/gsa/2006AM/finalprogram/session_18155.htm)

**4) Physical Geology Lab @ Tulane University**

<http://tulane.edu/cps/students/upload/Fall-08-Courses.pdf>

The purpose of this class is for the students to gain an understanding of the physical foundation of the world by focusing on fundamental concepts from mineralogy, geomorphology, glaciology, and biogeochemistry. Participants in this class will observe natural processes to learn how to read landscape and decide about environmental issues. The Service Learning students will monitor the restoration activities, erosion of the barrier island (Grand Island State Park), and document threats to the island's survival.

**5) GeoScience Service Learning @ Wesleyan University (CT)**

[http://gsa.confex.com/gsa/2006AM/finalprogram/abstract\\_114794.htm](http://gsa.confex.com/gsa/2006AM/finalprogram/abstract_114794.htm)

“ 1) E&ES 322, Introduction to GIS, has been taught twice as a service-learning course, beginning in spring 2005. The instructor solicited GIS projects from local towns and community groups.. 2) E&ES 280, Environmental Geochemistry, was taught as a service-learning course for the first time during the fall of 2005. The course focused on evaluating the potential of using methane from a landfill site as a source of energy. 3) E&ES 331, Complexities of Community-Based Conservation: Environmental Decision Making, is under development and will be offered fall of 2007. These courses help students to develop skills, provide information to the community, and increase awareness of the importance of earth science.”

**6) GeoScience in Upper Division GeoScience Courses @ University of Connecticut**

<http://nsdl.org/resource/2200/20080625122404429T>

“Upper-division earth science courses taught in the Department of Geology and Geophysics at the University of Connecticut used a service-learning approach. The emphasis was on providing sound and useful scientific expertise through a project for the local community. Two projects, Imaging the Interior of the Nathan Hale Monument and Hydrogeophysical Investigation of the University Well Field, are described.”

\*See Liu, Philpotts, & Gray (2004) as cited below.

**7) The Pinellas County Project: Project –Based GeoScience & Public Speaking**

By Brey, J., and Runge, K.

[proceedings.esri.com/library/userconf/educ05/papers/pap2062.pdf](http://proceedings.esri.com/library/userconf/educ05/papers/pap2062.pdf)

“This paper will describe a project-based science activity in which students use GIS to explore data and then create a scenario for future land use. This capstone small group project is the culmination of a unique interdisciplinary course in environmental geology and public speaking developed as a learning community at the UW Fox Valley.”

**8) Austin College Weather Station (ACWX) Service Learning Project**

<http://weather.austincollege.edu/>

“As part of a long-term Environmental Physics Research Program, the Austin College Weather Station project contains three phases. Establishment of the Austin College Weather Station constituted Phase I. Undergraduate physics students constructed the Austin College Weather Station in Spring 2001 for a senior-level extended study course. The first measurements were taken on April 27, 2001. Phase II of the project includes data quality assurance and control. Student projects provide essential verification and calibration of instruments in this phase. Public release of weather and climate data comprises Phase III of the project. Phases II and III are ongoing portions of the ACWX project.”

\*\*Please see: Baker, R.D. (2006). Project-based learning, surface energy balance, and establishment of a new undergraduate weather station. *Journal of Geoscience Education*, 54, 320-328.

**9) CRed: Community Carbon Reduction Project at UNC-Chapel Hill**

<http://www.ie.unc.edu/content/research/cred/models.html>

\*\*Free carbon calculation system provided to the public by a UNC student 2005 Capstone Web Site Project

“Mathematical models can be used to predict the impact of a particular policy on atmospheric carbon. Models such as those used by the Intergovernmental Panel on Climate Change (IPCC) have been developed to simulate the emissions of greenhouse gases, their dynamics in the earth system, resulting concentrations in the atmosphere, and the effect on temperature and climate. The analyses performed on this web site use a simpler, reduced-scale model of the carbon cycle that is significantly easier to operate (and hence are useful in education and in policy analyses) and yet mimics the predictions of the more complex models within the range of uncertainty inherent in all such models. It was produced during an NSF sponsored project: Visualization Technology in Environmental Curricula, and the full model and associated materials can be obtained from that web site.”

**\*\*Please see** Crawford-Brown, D., LaRocca, S. (2006). Teaching systems principles and policy applications using a reduced-scale carbon cycle model for global warming. *Journal of Geoscience Education*, 54, 301-311.

<<http://www.nagt.org/nagt/jge/abstracts/may06.html#v54p301>>

**10) International Service Learning in Water, Sanitation, and Hygiene @ N. Illinois U. Rockford**

[http://gsa.confex.com/gsa/2009NC/finalprogram/abstract\\_156219.htm](http://gsa.confex.com/gsa/2009NC/finalprogram/abstract_156219.htm)

“In the fall, Hydrogeology students review topics of hydrogeology, water resources, well drilling, well protection, water treatment, health and sanitation, and learn to site and drill a well. Each student develops advanced learning in one related topic for sharing in Guatemala. Students also take a course in Cross-Cultural Service to study community development, cross-cultural communication, personal assessments, and characteristics of the host country.”

**11) In Depth Description of Academic Coursework in a Wide Variety of Disciplines @ Bates College (contains many courses in geology (see pp.22):**

<http://www.bates.edu/Prebuilt/07-08YESElectronicFinal.pdf>

More than a third of our faculty has included a service component in its courses and more than half of the student body has engaged in a service-learning project. Faculty across all disciplines engage their students in service-learning. Approximately 70 current faculty members have incorporated service-learning into their courses.

**12) Descriptions of commonly Offered Environmental Studies and Geology Service Learning Courses @ Carleton College**

<http://apps.carleton.edu/collab/civic/courses/past/commonlyoffered/>

**13) Geoscientists Without Borders**

[http://www.seg.org/SEGportalWEBproject/portals/SEG\\_Online.portal?\\_nfpb=true&\\_pageLabel=pg\\_gen\\_content&Doc\\_Url=prod/SEG-Foundation/Foundation-Geoscientists-Without-Borders/Geoscientists-Without-Borders.htm](http://www.seg.org/SEGportalWEBproject/portals/SEG_Online.portal?_nfpb=true&_pageLabel=pg_gen_content&Doc_Url=prod/SEG-Foundation/Foundation-Geoscientists-Without-Borders/Geoscientists-Without-Borders.htm)

Connect universities and industries with communities in need through projects using applied geophysics to benefit people and the environment around the world.

## II. Model Programs

### 1) Center for Earth and Environmental Science at Indiana University- Purdue University

<http://www.cees.iupui.edu/index.htm>

CEES is a research center working to solve complex environmental problems. Our programs seek to translate environmental issues and solutions to legislators, environmental professionals, students, and citizens.

CEES does environmental undergraduate service learning work in three main areas: research, environmental science education, and public service.

\*\*This website has a plethora of resources about all of the various outreach activities conducted by service learning students as well as community based research. It also includes many GeoScience projects.

### 2) School of GeoSciences Outreach Programs @ University of Texas at Austin

[http://www.jsge.utexas.edu/outreach/educational\\_programs.html](http://www.jsge.utexas.edu/outreach/educational_programs.html)

UTA GeoScience programs provide outreach programs for K-12 students, public research facilities, and other public services.

#### A) 18 outreach programs for K-12 students & teachers, including:

1) **“The Texas Coastal Monitoring Program:** High school students, teachers, and scientists work together to gain a better understanding of dune and beach dynamics on the Texas coast. Scientists from The University of Texas at Austin provide the tools and training needed for scientific investigation. Students and teachers learn how to measure the topography, map the vegetation line and shoreline, and observe weather and wave conditions.”

<http://coastal.beg.utexas.edu/thscmp/>

#### 2) GeoFORCE Texas

<http://www.jsge.utexas.edu/geoforce/>

Summary of partnership with the schools:

<http://www.jsge.utexas.edu/news/rels/011608.html>

#### 3) Online Modules to Assist in K-12 GeoScience instruction:

[http://www.beg.utexas.edu/education/nw\\_online-mod.htm](http://www.beg.utexas.edu/education/nw_online-mod.htm)

B) **Public research facilities include:** a Core Research Center, a Geophysical Log Facility, and more.

C) **Public service programs include:** Earth quake monitoring, public lectures, and more.

#### D) Shell Oil, Texas Regional Collaboratives, & University of Texas at Austin Partnership

Summary article: <http://www.utexas.edu/news/2005/02/02/education/>

Summary power-point: [thetrc.org/trc/doc/shell/Shell-TRC\\_3-1-05.ppt](http://thetrc.org/trc/doc/shell/Shell-TRC_3-1-05.ppt)

### 3) GeoScience Outreach Programs @ Virginia Tech

<http://www.outreach.geos.vt.edu/programs/programs.html>

Programs include multiple school-based GeoScience programs, courses, internships, and research experiences.

### 4) School of Earth, Society, and Environment @ University of Illinois at Urbana-Champaign

<http://www.earth.uiuc.edu/>

“Understand the environmental and social issues that face the earth - and do something about them - with a Bachelor Degree in Earth Systems, Environment, and Society.... ESES will help you get – and

give you academic credit for – a real-world capstone experience, with choices that span local environmental research projects and global internships.”

**\*\*Please see:** Wuebbles, D.J., et al. (2006). Earth systems, environment and society: A new interdisciplinary undergraduate major at the University of Illinois. *Journal of Geoscience Education*, 54, 230-239.

### **III. Undergrad Service Learning with K-12 Students and Teachers**

#### **1) Interpreting the History, Geology, and Ecology of Monterey Bay**

[http://www.lessonplanet.com/search?grade=all&keywords=%22marine+GeoScience%22&rating=3&search\\_type=narrow](http://www.lessonplanet.com/search?grade=all&keywords=%22marine+GeoScience%22&rating=3&search_type=narrow)

Students explore what they know about Monterey Bay in the special topics course and share their information with K-12 grade children at local schools by participating in the Virtual Canyon Project. Students in this service learning class team up with students in another service learning class ("Tech Tutors") and work with children to create a fun and informative web-pages that become part of the Virtual Canyon web site

#### **2) Northern Illinois University Rockford Mexico GeoScience Trips for Teachers**

<http://www.niu.edu/PubAffairs/RELEASES/2008/jan/fieldtrip.shtml>

“Over the next five years, Northern Illinois University will take about 45 middle and high school science teachers on geologic field trips to Mexico, aiming to bring back culturally relevant and exciting lessons for Hispanic students.”

### **IV. Partnering Institutions and Grant Resources**

#### **A) Ohio Resources**

##### **1) Alford Center for Service Learning at Denison University**

<http://www.denison.edu/campuslife/servicelearning/>

##### **2) Ohio Campus Compact:** Supports Academic Service Learning in all disciplines.

<http://www.ohiocampuscompact.org/>

##### **3) Ohio Environmental Education Fund**

[http://www.epa.state.oh.us/oeef/about\\_oeef.htm](http://www.epa.state.oh.us/oeef/about_oeef.htm)

The Ohio EPA Office of Environmental Education administers the Ohio Environmental Education Fund (OEEF), which awards approximately \$1 million annually in grants for education projects targeting pre-school to university students and teachers, the general public, and the regulated community. OEEF funds projects to enhance the public’s awareness and understanding of issues affecting environmental quality in Ohio.

##### **4) Great Lakes Directory: Environmental Grant-making Organizations**

<http://www.greatlakesdirectory.org/grants.htm>

##### **5) Environmental Education Council of Ohio (EECO)**

<http://www.eeco-online.org/index.html>

At EECO it is our mission to be a leader in the promotion and facilitation of Environmental Education (EE), and to nurture knowledge, attitudes and behaviors. We want a healthy and sustainable environment, and the key to this is education. Through EECO, individuals and groups are not only educated, but also develop partnerships with other individuals and organizations. These partnerships

strengthen EE in Ohio, leading to a more environmentally literate population and a healthier environment. You are welcome to become a partner and friend.

## **B) National Resources**

### **1) American Geological Institute Foundation (AGIF)**

<http://www.agifoundation.org/>

The AGI Foundation supports educational, scientific, and charitable activities of benefit to the entire GeoScience community and the member societies affiliated with the Institute. The Foundation is the principal source of U.S. tax-deductible endowment and programmatic contributions to the American Geological Institute from industry as well as private foundations and individual donors.

\*\*AGI position statement: Valuing Professional Contributions to GeoScience Public Policy and Education

[www.geosociety.org/positions/pos2\\_proContrib.pdf](http://www.geosociety.org/positions/pos2_proContrib.pdf)

### **2) Association for Women Geoscientists Foundation**

<http://www.awg.org/AWGFoundation/index.html>

“The mission of the AWG Foundation is to achieve equality of opportunity in the GeoSciences for women. We fund high impact programs working towards that equality, from precollege through graduate levels.”

\*\*Check out their partnership programs with the Girls Scouts.

### **3) National Science Foundation: GeoScience Ed. Grant Program**

[http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5505](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5505)The goals of the

GeoScience Education (GeoEd) Program are to:

- \* improve the quality of GeoScience education at all educational levels;
- \* increase the number and competency of Earth and Space Science teachers at K-12 levels;
- \* demonstrate the relevance of the GeoSciences by identifying and promoting traditional and non-traditional career opportunities in the field;
- \* increase the number of students enrolling in GeoScience courses and degree programs at all educational levels;
- \* increase the number of students drawn from groups underrepresented in science, technology, engineering and mathematics (STEM) fields in GeoScience courses and degree programs; and
- \* increase the public’s understanding of GeoScience-related issues.

### **4) Government Departments Offering GeoScience Grant Support: As Suggested by the American Geological Institute**

<http://www.agiweb.org/legis105/geoedu.html>

### **5) EPA Environmental Education Grants**

<http://www.epa.gov/Education/grants.html>

### **6) Environmental Community Service Projects (EPA)**

[http://servicelearning.org/instant\\_info/links\\_collection/index.php?popup\\_id=588](http://servicelearning.org/instant_info/links_collection/index.php?popup_id=588)

From the EPA's Environmental Education Center, this page lists ideas for environmental community service projects as well as a listing of events in your local area.

**7) North American Association for Environmental Education (NAAEE)**

[http://servicelearning.org/instant\\_info/links\\_collection/index.php?popup\\_id=1725](http://servicelearning.org/instant_info/links_collection/index.php?popup_id=1725)

NAAEE is the professional association for environmental education. Their members promote professional excellence in non-formal organizations, K-12 classrooms, universities (both instructors and students), government agencies, and corporate settings throughout North America and in over 55 other countries.

**EELink: Higher Education Environmental Education Curriculum design:**

[http://servicelearning.org/instant\\_info/links\\_collection/index.php?popup\\_id=1925](http://servicelearning.org/instant_info/links_collection/index.php?popup_id=1925)

**8) Earth System Science Education in the 21st Century**

<http://esse21.usra.edu/ESSE21/>

“Sponsored by NASA through the Universities Space Research Association, ESSE 21 is a collaborative undergraduate/graduate education program offering small grants to colleges and universities to engage a diverse interdisciplinary community of faculty and scientists in the development of courses, curricula and degree programs and sharing of learning resources focused on the fundamental understanding and application of Earth system principles for the classroom and laboratory.”

**9) Earth System Science Education Alliance**

<http://essea.strategies.org/>

ESSEA would be a good partner for reaching out to middle and high school GeoScience teachers. “ESSEA delivers a student-centered teaching model for GeoScience education to university faculty, as well as pre-service and in-service middle-high school teachers.

**10) Society of Exploration Geophysicist**

[http://www.seg.org/SEGportalWEBproject/portals/SEG\\_Online.portal?\\_nfpb=true&\\_pageLabel=pg\\_gen\\_content&Doc\\_Url=prod/SEG-Foundation/Foundation-Overview/foundation-overview.htm](http://www.seg.org/SEGportalWEBproject/portals/SEG_Online.portal?_nfpb=true&_pageLabel=pg_gen_content&Doc_Url=prod/SEG-Foundation/Foundation-Overview/foundation-overview.htm)

“The SEG Foundation supports cutting-edge programs that benefit SEG members, the corporations for which they work and the communities in which they live. Together with SEG, the SEG Foundation has developed a bold response to two of the most pressing challenges facing the GeoScience community—a growing demand for innovative technology and the need for visionary young talent.”

**11) Volunteer in National Parks, National Park Service**

<http://www.nps.gov/volunteer/>

**12) Earthwatch Institute**

[http://servicelearning.org/instant\\_info/links\\_collection/index.php?popup\\_id=1097](http://servicelearning.org/instant_info/links_collection/index.php?popup_id=1097)

The Earthwatch Institute's mission is research, conservation, and education "to promote the understanding and action necessary for a sustainable environment." Site offers educational and funding resources for educators and students.

\*\*Great organization for students to find volunteer work and internships in environmental studies field work.

## V. Recommended Journal Articles & Books

### Best Resource:

Rankey, E.C., & Ruzek, M. (2006). Symphony of the spheres: Perspectives on earth system science education[Special issue]. *Journal of Geoscience Education*, 54(3).

\*\*This special issue of the *Journal of Geoscience Education* highlights a wide plethora of service learning and problem based Geosciences courses and programs.

\*\*For a summary of each article in the edition please see:

<<http://esse21.usra.edu/designguide/JGEabstractsandlinks.htm>>

### Other Great Resources:

Apedoe, X. S., Walker, S. E., & Reeves, T. C. (2006). Integrating inquiry-based learning into undergraduate geology. *Journal of Geoscience Education*, 54(3), 414-421.

Full text: <[www.nagt.org/files/nagt/jge/abstracts/apedoev54p414.pdf](http://www.nagt.org/files/nagt/jge/abstracts/apedoev54p414.pdf)>

Domack, C. W. (2000). A service-learning component in a paleontology course as a model for community outreach by geology students. *Journal of Geoscience Education*, 48(5), 658-661.

Guebert, M.D., & Rosenberger, D. (2009). *Environmental GeoScience In international development: Service-learning in water, sanitation and hygiene*. Paper presented at the North-Central Section Annual Meeting of The Geological Society of America, Illinois, 41 (4), 20.

Guertin, L.A., 2005. *Student reactions to required service learning*. The National Teaching and Learning Forum, 14(5), 1-3.

Guertin, L.A., Cao, E.T., Craig, K.A., George, A.E., Goldson, S.T., Makatche, S.P., et al. (2004). *Bringing dinosaur science to the Junior Girl Scouts through a college service learning project*. *Journal of Science Education and Technology*, 13(4), 523-531.

Guertin, L., & Nguyen, C. (2003). Combining a historical geology project with a campus student organization's fundraising efforts. *Journal of Geoscience Education*, 51(4), 378-380.

Guertin, L.A., Rufo, J.L., 2004. *A positive science and technology experience for Junior Girl Scouts through a college service learning project*. *Journal of Women and Minorities in Science and Engineering*, 10(1), 79-88.

Guertin, L.A., Zappe, S.E., Kim, H., *Service learning at the introductory level: bringing dinosaur science to children in hospitals*. *International Journal of Teaching and Learning in Higher Education*. (in preparation, to be submitted December 2007).

Harbor, J.M. (2000). A capstone course in environmental Geosciences. *Journal of Geosciences Education*, 48(5), 617-23.

Liu, L., Philpotts, A. R., & Gray, N. H. (2004). Service-learning practice in upper division GeoSciences courses: Bridging undergraduate learning, teaching, and research. *Journal of Geoscience Education*, 52(2), 172-177.

<[http://www.nagt.org/files/nagt/jge/abstracts/Liu\\_v52n2p172.pdf](http://www.nagt.org/files/nagt/jge/abstracts/Liu_v52n2p172.pdf)>

Nickols, K.K., Bierman, P.R., Lyman, P., Bosley, A., Melillo, P., & Kurfis, J. (2003). Quantifying urban land use and runoff changes through service-learning hydrology projects. *Journal of Geoscience Education*, 51, 365-372.

Download pdf @ Kyle Nichols' website:

<<http://www.uvm.edu/cosmolab/?Page=people/nichols/nichols.html>>

Nyquist, J.E. (2008) Can service learning be a component of the GeoSciences PhD?. Paper presented at the meeting of the American Geophysical Union.

Semken, S. (2005). Sense of place and place-based introductory GeoSciences teaching for American Indian and Alaska Native undergraduates. *Journal of Geoscience Education*, 53(2), 149-157. <[http://www.promiseofplace.org/why\\_pbe\\_matters/documents/SemkenPlacebasedGeoScienceforAmeriIndian.pdf](http://www.promiseofplace.org/why_pbe_matters/documents/SemkenPlacebasedGeoScienceforAmeriIndian.pdf)>

\*\*Development of a theory of place-based GeoScience to reach native populations.

Tewksbury, B.J. (2008). More than just a workforce issue: Teaching GeoScience for the future. *The Leading Edge*, 27(10), 1372-1375.

<<http://tle.GeoScienceworld.org/cgi/content/abstract/27/10/1372>>

Tedesco, L. P., and Salazar, K. A. (2006). Using environmental service learning in an urban environment to address water quality issues. *Journal of Geoscience Education*, 54(2), 123-132.

Thomas, R. C. (2001) Learning geologic time in the field. *Journal of Geoscience Education*, 49(1), 18-21.

Thompson, K., Bickmore, B. R., Graham, C.R., & Yanchar, S.C. (2007). Earth science mini-lessons: A service-learning strategy for improving attitudes toward science of preservice elementary teachers. *Journal of Geoscience Education*, 55(2), 218-221.