



**Sustaining a Green Collar Workforce:
An Interdisciplinary Approach**



Green Application Projects (GreenApps)

Title: Exploring Waste and Recycling

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Interdisciplinary Classification (Subject, Level?): This project was developed for use in a Physical Geology course, but would also be very appropriate for Environmental Geology or Environmental Science. Due to the variety of activities, it could also be easily adapted for a wide variety of other courses, by emphasizing or expanding on some of the specific aspects (e.g. could be more writing-intensive, focus more on documenting with photography, etc.). It was designed for college students but would work in modified form for younger students

Prerequisite Skills: basic math, reasoning, and writing skills

Materials Required: calculator, periodic table, scale (household/bathroom type is fine), digital camera (or other electronic device that takes .jpg pictures), access to a computer and transportation (carpooling encouraged)

Estimated Time:

In Class: 1 hour for Part 1; 30 minutes to introduce Part 2 and 15 minutes to wrap it up on the due date; full 2.75 hour class period for Part 3 (field trip), although this could also be scheduled outside of regular class time

Outside of Class: 3 hours for Part 2 (recycling project); 1 hour for Part 3 (write-up)

Description of Project: In a traditional Physical Geology class, minerals and rocks are major course topics, but sustainability issues related to mining, pollution, depletion of resources, and waste are rarely examined. Even in an Environmental Geology class, where these subjects are more integral to the course, it is hard to convey the information in a personal way that truly impacts the students. The goal of this GreenApp is to get students to think critically about which earth materials are used to make the things we use, what it takes to get geologic resources out of the ground, and where all the waste from both mining and consumption ends

up. The benefits of recycling will be examined in a hands-on way. Learning about limits to resource availability, the amount of waste we create, and potential environmental harm caused by our “disposable” society can be eye-opening for students.

Part 1: Ore Minerals and Mining

Work on this GreenApp most logically should begin about $\frac{1}{4}$ of the way through the semester, after some of the basic geology of minerals and rocks has already been taught. The first part of the project (see attached student worksheet) is a teacher-guided in-class brainstorming activity, where students work in assigned groups of 3 to answer some questions about resource extraction and mining waste. Among other things, this activity involves looking up atomic masses on the periodic table (students learn how to do that previously in the semester) and figuring out how to perform simple calculations to determine the mass of a desirable element in an ore deposit vs. the amount of waste material. (The idea for the calculations came from the Georgia Southern University Environmental Geology Laboratory Manual.) Following the students' completion of this worksheet, a teacher-guided class discussion on mining waste issues and the long-term sustainability (or the lack thereof) of mining for our resources takes place.

Part 2: Waste Reduction Trial

Statistics about the amount of trash Americans produce (about 4.6 pounds per person per day, according to the EPA) are used to get students thinking about what can be done with all of this waste. This is followed by a discussion about ways to generate less waste and recycle - including the benefits and possible impediments/limitations of doing so, and possibilities in the local area. The key part of the entire GreenApp is an at-home project (see attached assignment instructions and data sheet), in which students try to “reduce, re-use, and recycle” for 2 weeks, record data on their efforts and results, take appropriate items to a recycling center, document their experience with a couple of photos, and write a paragraph reflecting on the project. Their photos are shared with classmates in a wrap-up discussion of the project, and may possibly be posted in the Science hallway and/or on the college website along with selections from their writing. In a similar but less-involved activity offered for a little extra credit at a former institution, I found that once students get over their initial reluctance to recycle (few did so prior to the project) and realize how easy it actually is, this experience can alter attitudes and behavior for life. Several students even told me that it was more meaningful to them than any other college project they had done. The first semester (Spring 2010) that this GreenApp was implemented at RRCC, I had similar positive responses from many students, but a few others felt that recycling is a “political issue”, complained vociferously, and refused to do the assignment (to the detriment of their grade in the course). Since then, I have briefly described the project expectations on the first day of the semester, so that students would know in

advance that it is a required portion of the class. That reduced the griping somewhat in Fall 2010 and more students completed the work, but there were still some complaints.

Part 3: Field Trip

The final component of this GreenApp is a class field trip to a recycling or waste management facility. This can be done before, during, or after Part 2. During the Spring 2010 semester, I took my classes to either the Denver Arapahoe Disposal Site (DADS) to learn about landfills and methane recovery or to Rooney Road Recycling to learn about hazardous and organic waste recycling in Jefferson County. The former was great but rather far away, and the latter was disappointing in that there really wasn't much to see. During the Fall 2010 semester, I took my classes to the Altogether Recycling facility in Commerce City. Seeing the sorting work involved in single-stream sorting of recyclables, and the bales of material quickly accumulating, made an impact on some students, but not others. Several expressed the opinion that visiting a company that actually takes recycled materials and produces something with them would be more interesting, but I have been unable to arrange such a site visit. This semester I am taking my classes back to DADS. After their field trip, students write a one-page essay describing some of the highlights of what they learned and what they thought of the experience. This write-up counts as a lab grade for the course.

Outcomes: By the end of this project, students will: (1) have a better understanding of the amount of waste generated by mining activities and consumption by individuals; (2) be more aware of what happens to this waste and what environmental problems it can cause; (3) realize that current usage patterns are not sustainable over the long term due to the limited supply of earth resources and land availability; and (4) know firsthand what individual waste reduction and recycling involves and be able to estimate how much material can be prevented from ending up in landfills as a result. The latter is expected to be the most powerful part of this experience. They will also have the chance to think and act creatively in solving simple math problems, coming up with numerous ways to “reduce, re-use, and recycle”, taking photos, and writing reflective statements on their experiences.

Assessment: Questions related to Part 1 are included in a course examination. Part 2 is a 25-point graded assignment (see attachment for details). Part 3 counts as a 10-point lab-exercise grade. The overall GreenApp experience is assessed with the use of the official GreenApp student evaluation form.

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