



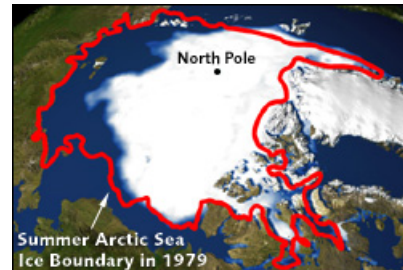
GLOBAL WARMING – The Real Environmental Issue by Lester W. Reed, Jr., PhD

Environmental issues abound. Issues such as loss of habitat, diminishing potable water, alteration of the environment by human activity, over-harvesting of resources, diminishing species, etc., all compete for attention. However, there is a growing consensus that global warming is the condition that is having and will have the greatest impact on our planet. The issue is no longer based on speculation but is based on hard scientific information. The National Climatic Data Center's (NCDC) website provides a detailed summary of data that verify the global warming trend. These data, however, are not uniform and there are anomalies which suggest analysis requires a "global perspective". See: <http://www.ncdc.noaa.gov/oa/climate/globalwarming.html>

Predictions of the impact of global warming include changing patterns in ocean currents, species extinction, increasing number and strength of tropical storms. Perhaps the most significant prediction is the destruction of the Arctic ice fields and the melting of areas of permafrost in the Arctic region. Support for change in the Arctic region is well established. The Arctic Climate Impact Assessment report concludes that the northern ice cap is warming at twice the global rate and that this will lead to serious consequences for the planet. See: <http://www.newscientist.com/article.ns?id=dn6615>

The National Resource Defense Council reports: "Average temperatures in the Arctic region are rising twice as fast as they are elsewhere in the world. Arctic ice is getting thinner, melting and rupturing. For example, the largest single block of ice in the Arctic, the Ward Hunt Ice Shelf, had been around for 3,000 years before it started cracking in 2000. Within two years it had split all the way through and is now breaking into pieces. The polar ice cap as a whole is shrinking. Images from NASA satellites show that the area of permanent ice cover is contracting at a rate of 9 percent each decade. If this trend continues, summers in the Arctic could become ice-free by the end of the century." See: www.nrdc.org/globalWarming/qthinice.asp

The impact of warming and the loss of the ice packs have already altered migratory and feeding patterns of wildlife and the ability of native populations to hunt for their primary



food. Rising temperatures are affecting Alaska, where the spruce bark beetle is breeding faster in the warmer weather. These pests now sneak in an extra generation each year. From 1993 to 2003, they chewed up 3.4 million acres of Alaskan forest. Loss of the "icebox effect" as the Arctic warms has potential ominous consequences for the world's food supply. For example wheat farming in Kansas would be profoundly affected. According to a NASA Goddard Institute of Space Studies computer model, Kansas would be 4 degrees warmer in the winter without Arctic ice. Warmer winters are bad news for wheat farmers, who need freezing temperatures to grow winter wheat. And in summer, warmer days would rob Kansas soil of 10 percent of its moisture, drying out valuable cropland.

The accelerated warming trend is also evident in the Antarctic. However, the intense cold of the southern reaches of the continent has forestalled the dramatic effects observed in the Arctic. For more details on the impact of warming in the Antarctic see www.climatehotmap.org/antarctica.html.

Global warming exists – so why? There is debate about the issue, but much of the debate is not based on scientific fact. There may be compounding factors; however, one scientific factor that is at the heart of the problem is the buildup of greenhouse gasses that trap heat in the lower atmosphere. The Environmental Protection Agency (EPA) reports, "Since the beginning of the industrial revolution, atmospheric concentrations of carbon dioxide have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15%. These increases have enhanced the heat-trapping capability of the earth's atmosphere."

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NEW CURRICULUM MODULES

NCSR FINALIZING FOUR NATURAL RESOURCE MODULES

An Evaluation of Seedling Mortality: A field-based laboratory that evaluates seedling growth and mortality. This is a long-term project that requires students to apply skills that are commonly used in forest management. Each class contributes new information and evaluates accumulated data. The activity also incorporates an understanding of basic ecological principles such as ecological succession, range of tolerance, shade tolerance, nutrient cycling and competition and engages students in an authentic data interpretation activity.

Stream Activities: In this laboratory students are engaged in a watershed study that examines the impact of adjacent land use on water quality. The activity consists of two parts. The first is a preparatory classroom/laboratory portion in which students use remote sensing and Internet sources to gain a greater understanding of the watershed under study. The second component is a field experience in which students observe watershed characteristics and measure various water quality parameters. In contrast to most river-based curriculum which measures water quality values at a single location accessed from shore, this activity will place students "on the river" where they are better able to appreciate its dynamic and interconnected nature.

Evaluation of Human Impacts: This laboratory builds on an existing laboratory that used aerial photography to evaluate land use change at a local level over a time frame of approximately 50 years. This new activity will use additional resources to expand the scale of time and space to place this activity into a broader context. Students will examine and evaluate these new resources. They will calculate their own "ecological footprint" and evaluate land use changes and other human impacts using satellite images.

Town Meeting, an Approach to Exploring Environmental Issues: This activity introduces the "town meeting" format as a new teaching method for evaluation of a complex environmental issue. The case study that is used to illustrate the method is the Klamath Basin, Oregon situation where dwindling water supplies, drought and endangered species management have resulted in impacts on the local agricultural community. Any local, regional or international issue could be examined in the same manner. Various stakeholders in the issue are identified and students are asked to represent the viewpoints of their chosen stakeholder at a "town meeting" that is moderated by the instructor.

Each module provides faculty with a detailed instructional material designed to facilitate adaptation to a variety of natural resource/environmental science offerings.

Modules will be available at the Center's website (www.ncsr.org) or in hard copy by contacting the Center at ncsradm@chemeketa.edu or by mail at:

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C404 – Smarter Than the Average Bear – I mean Sea Lion by Lester W. Reed, Jr., PhD

The Columbia River hydroelectric system has been a boon to the Pacific Northwest. It has produced cheap electricity to power the economy of the region without excessive carbon emissions from fossil fuel plants. During its development it was hailed as a shining example of man's ability to harness nature and even today would seem to be a great addition to man's effective use of the environment. But there is a problem; salmon who have migrated up the Columbia to spawn for centuries find their progress blocked by the dams. The Bonneville Dam, more than 140 miles from the Pacific Ocean, is a major case in point. The 1,450 foot dam maintains the upriver reservoir 60 feet above the river on the downstream side - obviously a formidable barrier for salmon seeking their spawning grounds.

As a solution, the dam has been equipped with fish ladders to allow the salmon to negotiate the dam (and the others on the Columbia and Snake Rivers). The ladders at Bonneville are the first ones salmon encounter and during migration from the sea and they queue to access the ladders.

Enter the sea lions. The California Sea Lion is a protected species and their populations have been increasing. As the population grows it, plus other factors, is putting pressures on their normal feeding areas and so they are venturing into new areas. A lucrative area has turned out to be the Columbia River. As the sea lions move farther upstream in search for a food source they have encountered what must

seem to them as providential gift – the salmon queuing to enter the Bonneville fish ladders. The U.S. Army Corps of Engineers has tried all sorts of non-lethal harassment – firecrackers, rubber bullets, a million dollar set of restrictive grates, rockets, and sonar devices. So far, the sea lions are winning. Some of the sea lions appear so comfortable that they sun on the concrete ramps of the dam's spillway. One particular sea lion - named “C404” because of a brand applied by a state and federal program - is in a class by himself. Definitely smarter than the average sea lion he has figured out how to get into fish ladders and salmon become his easy prey. C404 (dubbed “Cecil” by the media) has been seen at the fish viewing window leisurely rolling over to give a clear view of his brand before flipping a flipper to the frustrated officials and swimming off.

As the sea lions impact on an already depleted salmon run the Columbia River, managers are planning to turn to the option of last resort – lethal removal.

Faculty can use the issue of the dams, sea lions and salmon as a point of departure for a discussion of unintended consequences of human activities on the environment. Students can readily gather data on the issue by searching on topics such as Bonneville Dam, Snake River Dams, or Bonneville Dam Sea Lions. Another useful exercise is to have students develop a plan for dealing with C404 and his kin or evaluating the possible bias in media coverage of the issue.

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Why the rise? EPA reports, “what has changed in the last few hundred years is the additional release of carbon dioxide by human activities. Fossil fuels burned to run cars and trucks, heat homes and businesses, and power factories are responsible for about 98% of U.S. carbon dioxide emissions, 24% of methane emissions, and 18% of nitrous oxide emissions. Increased agriculture, deforestation, landfills, industrial production, and mining also contribute a significant share of emissions.” For EPA data see: <http://yosemite.epa.gov/OAR/globalwarming.nsf/content/Climate.html>

Recent polls show that nearly 80% of Americans believe global warming is a trend but nearly half of those surveyed believe that there is not a strong consensus among scientists supporting global warming. For more information on recent polls results see: http://www.americans-world.org/digest/global_issues/global_warming/gw1.cfm

It seems essential that the issue of global warming, its cause and potential impact be addressed by natural resource/environmental science faculty. One approach is to have students research the scientific evidence and socioeconomic issues surrounding global warming's cause and potential consequences and to draw their conclusions on the merit of arguments pro and con. There are abundant resources both print and on the Internet to support such student research.

Field Experiences in Natural Resources Curriculum by Wynn W. Cudmore, PhD

With recent emphasis on the use of technology in education providing distance learning experiences for students, the importance of field experiences as educational tools may seem somewhat old-fashioned. While distance learning may improve access to education for some students, it may not provide the breadth of educational opportunities provided by well-designed field experiences. This is particularly true in natural resources education where students are likely to be expected to work proficiently and comfortably in a field setting.

For the purposes of this article, field experiences are defined as any "out-of-the-classroom" learning experience. Field experiences may assume a number of different forms. Some are simply visits with experts (e.g., "lecture in the woods") who share their expertise with students on a particular curriculum topic. Others introduce students to the use of a particular technology in a field setting such as a measuring or mapping device (Global Positioning Systems, dissolved oxygen meters, surveying tools). Often, these instruments are also used in the workplace. The field may also be used to illustrate a new concept such as wetland mitigation or forest thinning. In this type of experience the field setting is used as a visual by the instructor.

While there is value to all of these experiences, *investigative* field experiences probably provide the greatest opportunity for developing a broad range of skills in students. In these experiences, students often begin with a question and apply a scientific approach to answering it. The answer to the question is not known at the outset and the *process* of answering the question is probably more important than the answer itself. Students are often involved in

experimental design and certainly in measurement, analysis and evaluation components of the activity. Questions or problems investigated in this manner may be "authentic"; that is, they represent a real issue facing a land management agency or other public entity. Thus, a greater good is served by the completion of the activity, particularly when the results are reported back to the agency. These activities provide students with opportunities to become proficient with the tools of their trade including both measurement (e.g., digital anemometers, dissolved oxygen meters) and analysis (e.g., GIS, spreadsheets) tools. Also, students are often engaged in activities that are applicable to the workplace.

Despite the benefits of field experiences in natural resources curriculum, the challenges to providing meaningful field experiences for students may discourage their development and implementation. Transportation costs, access to field sites, liability issues and development time are among those cited most often by faculty who attend NCSR institutes. The result is often increased demands of time, money and energy to both the college and the faculty member. For the most part however, faculty who place a high value on this type of learning have found ways to address these challenges. Some faculty, for example, have developed partnerships with public agencies who are willing to open up their lands to education uses.

NCSR curriculum includes several examples of investigative of field experience and we encourage you to seek these out and try them in the courses that you teach.

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This project was supported, in part, by the
National Science Foundation
Opinions expressed are those of the authors
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