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An Evaluation of Media Coverage of Wildfire Issues

NCSR Fire Ecology and Management Series

Northwest Center for Sustainable Resources (NCSR)
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Fire Ecology and Management Series

This six-module series is designed to address both the general role of fire in ecosystems as well as specific wildfire management issues in forest ecosystems. The series includes the following modules:

- Ecological Role of Fire
- Historical Fire Regimes and their Application to Forest Management
- Anatomy of a Wildfire - the B&B Complex Fires
- Pre-Fire Intervention - Thinning and Prescribed Burning
- Post-Wildfire (Salvage) Logging – the Controversy
- An Evaluation of Media Coverage of Wildfire Issues

The *Ecological Role of Fire* introduces the role of wildfire to students in a broad range of disciplines. This introductory module forms the foundation for the next four modules in the series, each of which addresses a different aspect of wildfire management. *An Evaluation of Media Coverage of Wildfire Issues* is an adaptation of a previous NCSR module designed to provide students with the skills to objectively evaluate articles about wildfire-related issues. It can be used as a stand-alone module in a variety of natural resource offerings.

Please feel free to comment or provide input.

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NCSR curriculum modules are designed as comprehensive instructions for students and supporting materials for faculty. The student instructions are designed to facilitate adaptation in a variety of settings. In addition to the instructional materials for students, the modules contain separate supporting information in the "Notes to Instructors" section. The modules also contain other sections which contain additional supporting information such as a "Glossary" and "Suggested Resources."

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An Evaluation of Media Coverage of Wildfire Issues

Module Description

This module is the sixth in the *Fire Ecology and Management Series*. This module is an adaptation of a previous NCSR module and is designed to provide students with the skills to objectively evaluate articles published on wildfire-related issues such as salvage logging, wildfire impacts and thinning as a tool for reducing the probability of catastrophic wildfire. The module includes a brief *PowerPoint* presentation that provides some context for the activity, a detailed procedure and citations for suggested articles for review. The module should be used in conjunction with the NCSR module: *Evaluation of Media Coverage of an Environmental Issue* (see Addendum A included in this module).

An Evaluation of Media Coverage of Wildfire Issues

Introduction

The “Information Age” has brought with it access to a tremendous volume of accounts that address environmental issues. These accounts appear routinely in the popular and scientific media. Newspapers, magazines, books, web sites, radio and TV broadcasts all attempt to present information, which the public generally accepts as objective and factual. However, reports are frequently sensationalized or exaggerated and there is often reason to suspect bias. Students in natural resource and environmental science programs, in particular, should learn to critically evaluate these reports and to use them to enhance their understanding of these issues. This activity is designed to provide the opportunity to develop and practice those skills required to evaluate claims made in written accounts relating to environmental issues.

In general, students will gain the most useful information from published reports by:

- Reading critically and expecting logical thought processes
- Consulting a number of sources on the same issue rather than relying on a single source
- Recognizing bias and hidden agendas
- Making decisions that are consistent with their own set of values after an evaluation of the report(s)

Objectives

Upon successful completion of this module, students should be able to:

1. Critically evaluate an article on a wildfire-related issue
2. Recognize some common types of bias in an article

Procedure

1. Select some aspect of the wildfire issue as a topic for evaluation. Topics that are contentious, well-publicized and for which there is a legitimate degree of scientific uncertainty seem to work best for this activity (e.g., Healthy Forests Restoration Act, salvage logging, pre-fire thinning, prescribed fire).
2. Present the *PowerPoint* associated with this module, *An Evaluation of Media Coverage of Forest Fires*, to introduce the topic and to describe the types of bias students may encounter in their articles. Early in this presentation, students should be asked to express their own opinions about wildfire. This can be done simply by asking for their “views on wildfire”, but more likely this will take some prompting. The presentation includes some ideas for soliciting responses from students. It is important that the instructor not bias students’ opinions by phrasing leading questions or inserting their own opinions at this point. Student views should be recorded and displayed as they are given.
3. Video segments from news broadcasts, if available, may also be used to supplement main points in the presentation. I sometimes use the forest fire scene from the 1942 Walt Disney classic, *Bambi*, to stimulate student thinking on how wildfire is portrayed to the general public.
4. Direct students towards resources for articles. Internet and/or print sources such as environmental organizations, government agencies, and journals should be identified that are likely sources for information on the assigned topic. Alternatively, the instructor may select the articles for review and hand these out to students.
5. Establish criteria for student articles. Articles of sufficient length (two or more pages) are required. Shorter articles generally lack sufficient detail to evaluate. Articles with a particular viewpoint seem to work best, rather than those that attempt to take a balanced approach.
6. Allow students approximately one week to find and evaluate their article by responding to the questions included with the *Evaluation of Media Coverage of an Environmental Issue* module (see addendum A for details).
7. Students meet in small groups (3-4 students) to discuss their evaluations (approximately one hour).
8. Instructor leads group in sharing key issues of their evaluations.

Please refer to Excerpt of Media Coverage Module (addendum A), for a complete description of the activity including detailed procedure, student handout, student assessment, and notes to instructors.

* Additional text or titles may be added to the *PowerPoint* slides to match your particular instructional style.

Assessment

Please refer to Addendum A: Excerpt of Media Coverage Module - Assessment.

PowerPoint Slides with Instructor's Notes

An Evaluation of Media Coverage of Wildfire Issues



This project supported in part by the National Science Foundation. Opinions expressed are those of the authors and not necessarily those of the Foundation.



Reports of forest fires throughout the U.S. commonly appear in the national media. In the past several years sensational accounts of fires in Arizona, California, Colorado, Florida, Minnesota and Oregon have been widely publicized in the popular media. Newspapers, magazines, books, web sites, radio and TV broadcasts all attempt to present information, which the public generally accepts as objective and factual. However, reports are frequently sensationalized or exaggerated and there is often reason to suspect bias. Students in natural resource and environmental science programs, in particular, should learn to critically evaluate these reports and to use them to enhance their understanding of these issues. This module is designed to provide students the opportunity to develop and practice those skills required to evaluate claims made in published accounts relating to wildfire.

Student views on wildfire

A major wildfire has just occurred on a national forest in the western United States during a particularly dry, warm period in the summer. Despite a major fire fighting effort by the Forest Service, the fire burned for several weeks consuming thousands of acres of forests and endangering human structures and lives.

Do you consider wildfires like this a “completely natural event” or something else?

What short-term impacts do you expect the wildfire to have on soils, wildlife, and streams? What about long-term impacts?

Should wildfires that do not endanger any human structures be allowed to “burn themselves out” or should we actively fight them with all available resources?

What should be done to restore the forest after the fire?

The first objective is to get students to express their preconceptions about wildfire before they have been exposed to any material from the course. This can be done simply by asking for their “views on wildfire”, but more likely this will take some prompting. This slide is intended to stimulate some discussion. It is important that the instructor not bias students opinions by phrasing leading questions or inserting their own opinions at this point. Student views should be recorded and displayed as they are given.



Student Preconceptions Concerning Wildfire

1. All fire is inherently “bad” and should be suppressed.
2. Catastrophic fires are the result of too much fuel.
3. The ecological role of fire is mimicked by logging.
4. Large fires can be stopped.
5. Fire destroys forests and wildlife.
6. Fire sterilizes the land.
7. Salvage logging after a fire is necessary to restore forests.
8. Prescribed burning is an adequate substitute for wildfire.

These are some common preconceptions frequently held by students and the general public concerning wildfire (adapted from Wuerthner 2006). Note that they are “preconceptions”, not necessarily misconceptions. Like most statements concerning fire, there is some truth in many of these statements, although almost all require some clarification, qualification and modification. The information included in the NCSR fire module series sheds some light on most of these statements.

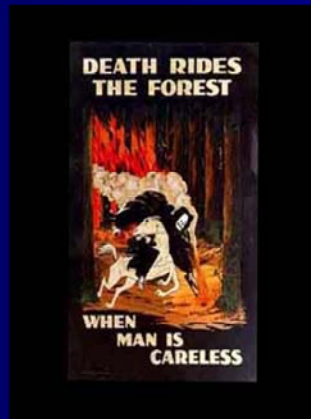
Student input received as a result of the previous slide may be added to this list.

The purpose of this activity however, is not to address the science behind each of these statements, but rather to explore how these preconceptions come about in the first place and particularly, the role of the media in developing these views.

Adapted from:

Wuerthner, G. (ed.). 2006. Wild fire: A century of failed forest policy. Foundation for Deep Ecology, Sausalito, CA 322 pp.

An Evaluation of Media Coverage of Forest Fires



USDA Forest Service
Public Service Message
1940

The media frequently report results of forest fires as catastrophic events. Detail on role of fire, variation in patterns of burning, proportion of area that survives fire and post-fire landscape over time is usually lacking.

1940 (pre-Smokey Bear image) used as a public service message by Forest Service. Image of fire as a destructive force to be feared is apparent.

See *NCSR Evaluation of Media Coverage* module for details. Today we will use this module to evaluate some media accounts related to wildfire.

The Evolution of Smokey Bear



1950



1960



1973



2001



USDA Forest Service

Smokey Bear campaign compelling people to prevent forest fires. Themes of “complete devastation”, “harm to wildlife” and the impression that fire is “universally bad” are at least underlying themes.

Wildfire is natural.

**Catastrophic
Wildfire**



is not natural.

All across this country, severely overcrowded forests sit like ticking time bombs, waiting to explode into catastrophic wildfires like those that are burning in the West right now. Decades of misguided forest policy are to blame for this unnatural condition of too many trees growing too tightly together. But we can work to eliminate the risk of catastrophic wildfire by using scientifically sound forest management techniques such as tree thinning and prescribed burning to return our forests to good health and give them sustainable futures.

Thinning trees around homes is NOT ENOUGH and will not protect forests, wildlife habitat, or water quality from fire. Trees must be cut in high risk areas in order to restore balance to American forests.

Sponsored by Lewis & Clark, WA Chambers of Commerce, PISC/Pulp and Paperworkers Resource Council, Intermountain Forest Association, American Forest Resource Council, Montana Wood Products Association, California Forestry Association, and Montana Logging Association
www.ppsc.com | www.usconservation.org

Chambers of commerce
Pulp and paper industry
Wood products association
Loggers association

US Conservation

Let's examine some of the ways that wildfire is portrayed in the media.

The first is a statement in support of thinning and prescribed burning as a method for reducing the probability of catastrophic wildfire. There appears to be the recognition of the natural role of fire in ecosystems ("Wildfire is natural"), but the message portrayed by the photo along with the large font ("Catastrophic wildfire is not natural") is that wildfire is something to be feared. In addition, the cause of catastrophic fire is explained:

"....severely overcrowded forests sit like ticking time bombs waiting to explode into catastrophic wildfires."

This advertisement was sponsored by:

- Chambers of commerce
- Pulp and paper industry
- Wood products association
- Loggers association

Why would these groups take this position on the wildfire issue?



This advertisement presents a different view. As seen in the previous slide, the message appears to promote thinning as a method for reducing the probability of wildfire. However, it is promoting the protection of people from fire by emphasizing thinning around communities. The assumption is that more remote areas away from communities should not be thinned.

This message is sponsored by several environmental groups:

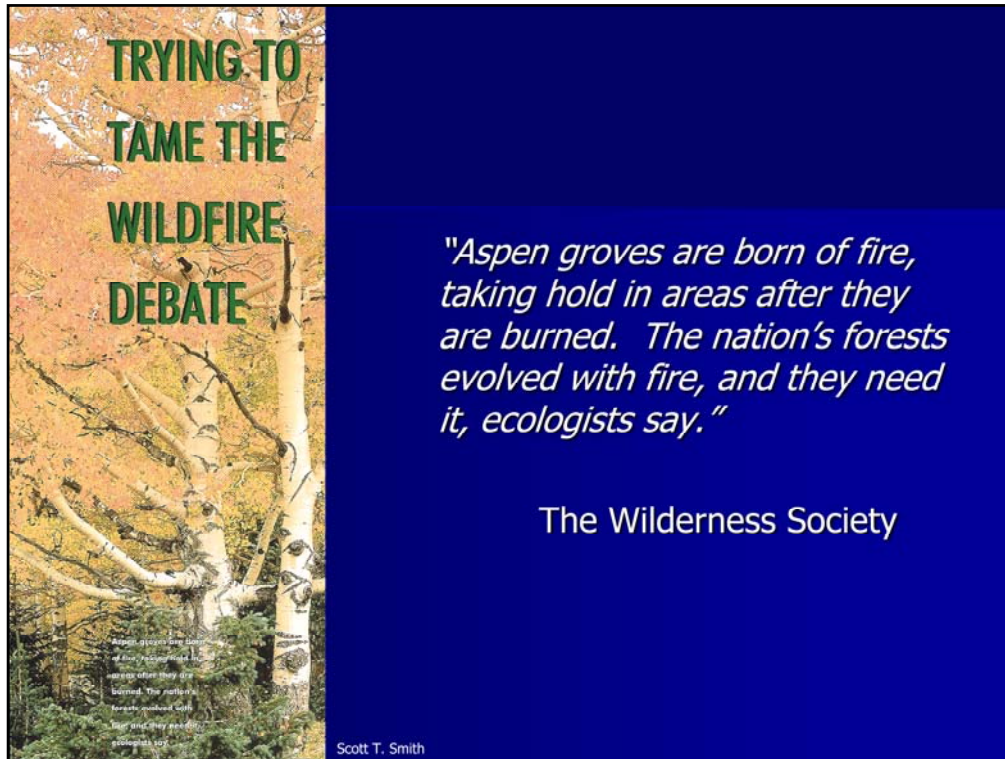
Sierra Club

Wilderness Society

National Environmental Trust

Oregon Natural Resources Council

Why would these groups promote this message?



**TRYING TO
TAME THE
WILDFIRE
DEBATE**

"Aspen groves are born of fire, taking hold in areas after they are burned. The nation's forests evolved with fire, and they need it, ecologists say."

The Wilderness Society

Scott T. Smith

Environmental groups are more likely to emphasize the positive aspects of wildfire and the important role that wildfires play in forest ecosystems, while de-emphasizing the destructive nature of wildfire.



Cartoons usually provide good opportunities for evaluating how the media portrays wildfire issues. This one, for example, was published during debates concerning the Healthy Forest Initiative, a Bush Administration proposal that promoted forest thinning. The cartoon exaggerates the extent of thinning and is obviously critical of the proposal.

Fire Headlines

Flames and smoke scar the state

“It’ s like fighting a horrible beast”

Wildfires raging across the West, abetted by dry storms, lightning inferno

Fires ravaging West

Giants facing blaze’ s wrath

Nearly 20,000 acres scorched by 2 blazes

Headlines of articles published in newspapers and magazines are used to capture the reader’s attention. Here is a sample of headlines from a number of recent articles that reported on wildfires in the western United States. Note the words and phrases that are chosen to describe wildfire in these headlines (“scar”, “horrible beast”, “raging”, “inferno”, “ravaging”, “blaze’s wrath”, “scorched”). These choices clearly portray fire as something to be feared and are probably consistent with the image that most people in the general public have of wildfire. The potential positive aspects of wildfire in forest ecosystems receive little attention in articles that follow these headlines.



Images (photographs, diagrams, video) can also be used to portray wildfire and often accompany articles in newspapers, magazines and on-line. Fire images such as this one have tremendous “curb appeal” and are used to attract the reader. The images that are most often chosen are those that show crown fires or.....



.....the impact that fires have on human structures, such as these photos that were taken during and after the Angora Fire near Lake Tahoe, California in the summer of 2007.



Another popular image used in the media is the application of fire retardant by large aircraft. War-like imagery like this builds on the assumption that “wildfire is the enemy” and we are using sophisticated technology to wage war against it.

The public perception of wildfire develops as a result of a number of influences such as personal experiences, scientific publications, print, web and broadcast media accounts. Among these, media accounts probably have the most widespread influence on the general public. As land managers attempt to incorporate the most recent scientific thinking into wildfire management decisions (pre-fire-thinning, post-fire salvage, prescribed burns, etc.), public support and understanding of these decisions will be essential. Media accounts of wildfire that present a biased, exaggerated or sensationalized slant will be counterproductive to this effort. It is therefore important that students learn to critically evaluate these reports and develop the ability to separate the “factual” from the “emotional.” Only then will they be able to gain a complete understanding of these issues.

What should we accept as evidence?

1. Consider the source
 - Get as close to the original source as possible
 - The Internet as a resource
2. Consider the type of information used to prepare the report
 - Opinion
 - Single anecdote
 - Collection of anecdotes
 - Single peer-reviewed scientific study
 - Collection of independent peer-reviewed scientific studies
3. Consider the logic used to connect the claims to the evidence
4. Beware of bias and hidden agendas

See Addendum A: *Evaluation of Media Coverage of an Environmental Issue* – Notes to Instructors, pages 28-33 for detailed instructor notes for this slide.

Bias and Hidden Agendas

Bias

- A mental leaning or inclination, partiality, prejudice
- Drawing conclusions based on pre-conceived notions

An example:

"Hunting and trapping regulations on cougar and bear should be relaxed because these predators pose a threat to humans, livestock and game animals."

See Addendum A: *Evaluation of Media Coverage of an Environmental Issue – Notes to Instructors*, pages 28-33 for detailed instructor notes for this slide.

Two Different Viewpoints

Partnership for the Ethical Treatment of Animals (PETA)

"NO!" – This organization supports:

- Animal rights
- Vegetarianism
- Anti-hunting and trapping legislation

National Rifle Association (NRA)

"YES!" – This organization supports:

- Right to bear arms
- Hunter education
- Pro-hunting legislation

See Addendum A: *Evaluation of Media Coverage of an Environmental Issue* – Notes to Instructors, pages 28-33 for detailed instructor notes for this slide.

Sources of Articles for Media Activity

- American Lands Alliance
- Capital Press (regional agricultural weekly)
- Chambers of Commerce
- Chronicle, Lance Iverson
- Environmental News Service
- Loggers Association
- National Park Service
- NET
- New York Times
- ONRC
- Pulp and Paper Industry
- Sierra Club
- Statesman Journal (Salem, Oregon)
- USDA Forest Service
- Wall Street Journal
- Wilderness Society
- Wood Products Association

These are sources of articles I have used for this activity. They represent a broad range of viewpoints on wildfire issues.

Photo Credits

- Chronicle, Lance Iverson
- National Park Service www.nps.gov
- NCSR
- Scott T. Smith
- Sierra Club
- Statesman Journal
- US Conservation
- USDA Forest Service
- USDA Forest Service, Tahoe National Forest

Resources

Print and Web-based Resources

Most environmental science texts now include a chapter or portion of a chapter that discusses critical thinking on environmental issues. Instructors may also find the following useful.

Agee, J.K. 1993. *Fire Ecology of Pacific Northwest Fires*. Island Press, Washington D.C. 493 pp.

Chapter 3 of this comprehensive fire ecology text provides an interesting cultural history of the human-fire relationship.

Botkin, D. and E. Keller. 2007. *Environmental Science: Earth as a Living Planet*. 6th ed. John Wiley and Sons, Inc. New York. 668 pp.

Bykoff, J. and M. Bykoff. 2004. Journalistic balance as global warming bias.
www.fair.org

Fairness and Accuracy in Reporting (FAIR) is a national media watch group that advocates for greater diversity in the press and fights media bias and censorship. Their web site includes an archive of interesting articles on media coverage that are categorized by subject area including the environment. This article uses the global warming issue to illustrate how the attempt to present opposing viewpoints in journalism can result in bias.

Chiras, D. D. 1992. Teaching critical thinking skills in the biology and environmental science classrooms. *Am. Bio. Teacher*. 54(8):464-468.

Etkina, E. and D. Ehrenfeld. 2000. Helping ecology students to read: The use of reading reports. *BioScience* 50(7):602-608.

Ford, R. 1998. Critically evaluating scientific claims in the popular press. *The American Biology Teacher* 60(3):174-180.

The Week Daily
www.theweekdaily.com

“The Week” publishes reviews of the most important news stories as well as coverage of the arts, business, health and science. The magazine attempts to present both sides of an issue and cites their sources. Articles and cartoons are available on-line.

Wuerthner, G. (ed.). 2006. *Wild fire: A century of failed forest policy*. Foundation for Deep Ecology, Sausalito, CA 322 pp.

Video Resource

Bambi. 1942. Walt Disney Classics. The Walt Disney Company. Distributed by Buena Vista Home Video, Burbank, California. VHS #942. 69 min.

Addendum A: Excerpt of Media Coverage Module

Evaluation of Media Coverage of Forest Fires

Background

The following pages provide a detailed description of this activity using the issue of forest fires and the Healthy Forest Restoration Act as a case study. I have chosen this topic for the following reasons:

- A number of different “camps” have become established, each with its own vested interest in how forests and forest fires are managed.
- The science of forest fire ecology is complex and an active area of research.
- There is no scientific consensus on pre- and post-fire manipulations.
- The issue has regional importance and students probably have at least a casual familiarity with the issue.

Introduction

Reports of forest fires in western U.S. commonly appeared in the national media during the summers of 2002 and 2003. Sensational accounts of fires in Colorado, Arizona and Oregon were widely publicized. Some blamed the fires on federal forest policy, others on environmental protection. Spirited debates have ensued that relate to forest management, the role of fire in ecosystems, challenges to forest management activities by environmental groups and environmental law. The White House proposed a "Healthy Forests Initiative" to address the issue which later became law as the "Healthy Forests Restoration Act."

Student Handout

Procedure

- A. Find a published report that offers an opinion on the management of forest fires, the "Healthy Forests Restoration Act" or the debates that followed its passage. **Articles from sources that would be expected to have a certain viewpoint on the issue will be the most useful for this activity** (as opposed to sources that attempt to present a balanced approach).

Each of the following, for example, have stated opinions on the forest fires or the "Healthy Forests Restoration Act":

Oregon Natural Resources Council	American Forest Resource Council
Sierra Club	American Forest and Paper Association
<i>Capital Press</i> , a regional agricultural newspaper	The Wilderness Society
Oregon Forest Resources Institute	Western Wood Products Association
USDA Forest Service	Society of American Foresters

- B. Bring your article along with the following completed analysis to class.
- C. Prior to class, evaluate your article using the guidelines that follow:
1. Different media carry with them different degrees of credibility. A scientific journal article, for example, is likely to be more credible than a newspaper report which is likely to have higher credibility than a tabloid article or a blog. In what **type of publication** does your report appear?
 2. Is the **author** of the report given? Who is it? Is it an "individual" or an "organization"?
 3. If an organization has produced the report, determine the **mission** of the organization. If an individual has produced the report, what credentials or affiliations does he/she have?

4. Does the report attempt to **persuade**, **advocate** or **inform**? Explain.
5. What **information** was used to prepare the report? Circle those that were used and add others if necessary.
- a. Some possibilities include:
- observation of actual occurrences
 - consultation with experts
 - discussion with non-experts
 - reports in scientific journals
 - reports or findings from a particular organization (scientific or other)
 - sources are not stated in article
- b. Is this information **properly referenced** so that you could check it out if you wanted to?
6. What is the date of publication? Is the information in the report (or the report itself) reasonably up-to-date? The importance of having recent information will vary with the topic under consideration.

7. **Claims** are positions or conclusions that are stated in the article. They should be supported by some kind of **evidence** - specific observations or data that are used to support a given claim. For example, the claim that a fish kill was caused by a spill of sulfuric acid into a river might be supported by the following evidence:

- an accident involving a tanker truck containing 1000 gallons of sulfuric acid occurred upstream of the fish kill
- 500 dead fish were counted downstream from the accident site by a fisheries biologist the day after the accident
- no dead fish were found upstream of the accident
- water samples taken downstream from the accident by the biologist indicated a pH measurement of 4.0
- previous studies have found that pH measurements of less than 4.5 are toxic to most fish

What claims are made in your article? What evidence is used to support those claims? List the claims and the specific evidence supporting them in the space below:

Claim	Evidence

Do the claims in the report follow logically from the evidence given or are "leaps in logic" required to reach the same conclusions as the authors? Could alternative claims be made from the same evidence?

8. Is there a basis for suspecting bias on the part of the sources, the author of the report, or yourself? If so, circle those that you detect from the list of common biases below:

- the author or source has a clear stake in the issue and will benefit in some way from the claims that are being made
- only selected information is being reported (Are you aware of other information that would refute the claims being made?)
- you reject the claims of the article because you disagree with them or you accept them because the claim happens to agree with your opinion
- the publication has a well-known or suspected position on the issue

For each of the biases you have detected, explain where in the article it appears.

9. Does the report appear to be objective or does there appear to be a particular agenda being promoted? Explain.

10. Is there anything in the article that you consider to be "unnecessarily sensationalized" to make a point or to stimulate some emotion. Examples may include misleading or exaggerated titles, phrases that are meant to appeal to our emotions or accompanying photographs.

- D. Discuss your evaluation with your group. Keep in mind that other members of the group have probably not read your article.

I suggest the following format for your discussion:

- What is the title of the report?
- Where and when was the report published?
- Briefly describe the content of the report.
- Critically evaluate the report using items #1-10 on this handout as a guide

- E. Staple your evaluation to the front of your article and turn them both in at the conclusion of class.

Assessment

Student assessment for this activity is based on the completion of questions #1 – 10 used to evaluate their article. Although students will discuss the evaluation of their articles in small groups, responding to questions is an individual effort. For simplicity, I award a single point per question, although some instructors may wish to assign different weights to different questions. Acceptable responses will vary tremendously depending upon the characteristics of the article a student selects for evaluation. It is therefore important that the instructor evaluate the adequacy of answers relative to the article that the student has selected.

Students can severely limit themselves in this activity by choosing an article that is too brief, too bland or off topic. For this reason, it is important to establish some guidelines for article selection when this activity is introduced (see “Procedure”).

Notes to Instructors

The critical evaluation of natural resource and environmental issues is a common learning outcome for courses in these disciplines. This activity is designed to fine tune some skills that students should already have. For courses that emphasize the scientific basis of natural resource issues, the activity is probably most appropriate early in the term where it could be used to complement lectures that introduce "science as a way of knowing."

The activity can be introduced by directing a discussion around the following questions and considerations in this critical evaluation:

1. Consider the source. Where was the article published?

Try to get as close to the original source of information as possible. Although there are many pathways for environmental information to reach the general public, a common sequence looks like this:

- Scientific study appears in a peer-reviewed science journal (e.g., *Science*, *Nature*). This information is usually reliable but often inaccessible to the general reader due to the technical nature of the writing.
- Summary of scientific study (or studies) is prepared by a science writer and appears in a journal designed for a more general reader (e.g., *Science News*, *Discover*, *Environment*, *Scientific American*). This information is usually reliable but less detailed and is usually more accessible to the average reader.
- Newspaper or popular magazine (e.g., *Time*, *Newsweek*, *New York Times*) account of a scientific finding. The author may or may not have any particular expertise on the topic and each author places his/her own particular interpretation of the findings into their work. Also, space limitations often necessitate shortening and perhaps over-simplification of the findings. As a result, reliability may be somewhat diminished.
- Newspaper or magazine accounts of scientific findings may be used as a source for a radio talk show broadcast, internet web site, or another written article. For all of the reasons indicated above, reliability may be further compromised.
- Selected information from any of the above is used to produce an article that supports a particular agenda or viewpoint. Only information that supports that view is reported and conflicting information is omitted or discredited. This report may take the form of an editorial, promotional brochure or a tabloid article.

Note that the reliability of information fades as one gets further and further from the original source.

Students should also be aware that journalists in the popular media (unlike scientists) are trained to present both sides of a contentious issue. The viewpoints of individuals or groups that represent these sides are generally described in an effort to present a “fair and balanced” account. This may be done, even when the preponderance of scientific evidence supports one viewpoint over another. However, viewpoints rather than evidence are emphasized and the uninformed reader may be left with the understanding that there is a legitimate debate when, in fact, none exists. This “false dichotomy” is frequently seen in reports on environmental issues and students should be aware of its existence especially when resources in the popular media are consulted. See Bykoff and Bykoff, 2004 for a detailed discussion of how this has played out in the global warming issue.

2. What advantages and disadvantages does the Internet present as a source of information?

While most traditional sources of information such as books or journal articles have to run through some filters before publication, this may not be the case for much of what students encounter on-line. With an increasing reliance on the Internet as a source of information, students’ ability to critically evaluate reports becomes even more important. Reliable sources are frequently intermingled with those that are less reliable and students need to learn to be able to tell the difference.

Although there is no fool-proof method to assure that students are accessing the best information on-line here are some suggestions:

- Domain names (the suffix of the URL) give some indication of the source of information and the motive for posting the information. Educational (.edu) and governmental (.gov) sites, for example, generally provide more reliable information than commercial (.com) sites, which may have a motivation other than providing useful information. Web sites sponsored by organizations (.org) are a mixed bag. Many are excellent sources of unbiased information while others clearly have a particular agenda.
- To be sure that you are not getting outdated information, examine the “last updated or modified” note at the bottom of the first page.
- The appearance of poor grammar, misspellings, and other errors should be seen as an indication of lack of editorial control. Thus, any sites that exhibit these characteristics should be looked upon with suspicion.
- There is strength in numbers. If several different sites have the same information, its credibility should probably be elevated.

3. What type of information was used to prepare the report? What should we accept as “evidence”?

Expect complete information to be used in the preparation of the report. If only selected information that supports a particular point of view is presented, the claims should be looked upon with suspicion. Also, be aware of the manner in which the information is presented. A common strategy is to present data by reporting only the extremes. Phrases such as, “as many as”, or “as few as” should serve as red flags indicating that the author is reporting extreme values to make a point. A more credible report would report numbers as a mean with some indication of variation around that mean (i.e., range, standard deviation or confidence interval).

Different types of evidence carry with them different levels of credibility. Consider the following hierarchy, ranked in increasing order of credibility:

- opinion
- single anecdote
- collection of anecdotes
- single scientific study
- group of independent studies

Beware of anecdotal information. Single accounts of isolated incidents are inherently unreliable. Many people rely solely on anecdotal information to formulate opinions. For example:

- At the height of the "spotted owl controversy" in the Pacific Northwest a Northern spotted owl was seen roosting on a grocery store sign in Roseburg, Oregon (a single anecdote). This observation received much media attention and was frequently cited as evidence that the species could live anywhere and certainly did not require old growth forest habitat. The results of numerous scientific studies that examined spotted owl habitat use suggested otherwise.
- The summer of 2001 was dubbed by the media as the "Summer of the Shark" as several high profile attacks occurred along the East Coast (a collection of anecdotes). The public interpreted these accounts as an unusually high rate of attacks when in reality those who keep shark attack statistics confirmed that it was a rather average year.

A **peer-reviewed** (or “refereed”) article is one that has been scrutinized by experts in the field prior to publication. As a result, such articles carry more weight than one that is not peer-reviewed. However, not all scientific studies carry the same degree of reliability. For example, the results from a “preliminary observational study” may not be as reliable as a “controlled experimental study”, even though both are published in peer-reviewed journals. Reliability is also influenced by factors such as sample size, length of the study and even researcher bias.

A claim gains credibility when it is confirmed by several independent studies, particularly when different methods are used by each study.

4. Do the conclusions or claims follow logically from the evidence or does the author appear to be “shooting from the hip”?

Expect the connection between "the evidence" and "the conclusions" (or "claims") to be logical and straight-forward. If the connection is convoluted or illogical, less credence should be bestowed upon the claims.

5. Beware of bias and hidden (or sometimes not so hidden) agendas (including your own!)

Bias is defined as a mental leaning or inclination, partiality or prejudice. When we exhibit bias, conclusions are based on preconceived notions rather than a critical evaluation of the evidence.

Consider the following statement:

Hunting and trapping regulations on cougar and bear should be relaxed because these predators pose a threat to humans and livestock.

Suppose that while deciding whether you agree or disagree with this statement, you consult the following sources:

- Partnership for the Ethical Treatment of Animals (PETA)
- National Rifle Association (NRA)
- U.S. Fish and Wildlife Service (USFWS)

The first two sources clearly would present a biased view of this issue. The first promotes animal rights, vegetarianism and supports anti-hunting and anti-trapping legislation. The second promotes the right to bear arms, hunter education and pro-hunting legislation. Although it might be interesting to see how each of these groups approaches the issue, neither should be used as the sole source of information. The U.S. Fish and Wildlife Service is a federal agency responsible for wildlife management on national wildlife refuges and endangered species management. The agency employs professional wildlife biologists and other scientists who conduct scientific studies of wildlife populations and evaluate the results of studies conducted by others. Although individuals within the agency may exhibit biases, the agency itself (ideally, at least) draws conclusions, establishes policy and takes action based on an objective evaluation of the information at hand. As a result, the agency is a less biased source of information on this particular issue.

Mathematical bias may be added during data collection by using improper sampling techniques, small sample sizes or equipment that is not working properly.