TIPS ON WRITING A REVIEW OF THE LITERATURE
(such as a term paper or a thesis review)

Peer-Reviewed Sources
The management of wildlife and fish populations is often a controversial and expensive endeavor. Legal decisions on endangered species can often result in the expenditure of millions of dollars and the implementation of numerous regulations to conserve these populations. Decisions regarding creel limits on fish can affect public opinion about game agencies because of limits on recreational fishing opportunities or overfishing of a public resource. Many management strategies, such as timber harvesting or planting crops, can be very expensive when conducted over large scales. Thus, management decisions must be based on the best scientific knowledge available.

To acquire this knowledge, scientists conduct extensive research. Scientists follow the scientific method and they must take extreme care in identifying the study question, designing the study, collecting the data, and in their analysis and interpretation of the results. If they fail in any of these steps, they may come to erroneous conclusions that could negatively impact fish and wildlife populations and cost the public substantial sums of money (as well as lose their job!).

To minimize the publication of erroneous results, scientific journals and some books use a process called "peer-review". When scientists complete a study, they develop a manuscript that details the importance of the study, their objectives, the methods of data collection and analysis, and their interpretation of the results and their conclusions. This manuscript is submitted to a professional journal. The editor of the journal sends the manuscript out to 2-3 anonymous reviewers that have expertise in the subject matter. The reviewers are supposed to be very critical of the paper and suggest whether the paper can be accepted for publication as currently written (very seldom), accepted with revisions (common), or rejected (also common). They base their decision on study design, data collection and analysis, and their interpretation of the results. Different journals also have different success rates. Some of the "high-order" or more prestigious journals often reject 80% or more of the manuscripts that they receive! The entire process can take several months to a year or more.

Understanding peer review is important because magazine articles are not peer-reviewed. Many proceedings and technical reports are also not peer-reviewed. Thus, these articles should be read with caution. Many of these articles are written to persuade their audience on a particular issue. Essential details may be overlooked or data can be used selectively. Peer-review improves the probability of the article focusing on sound science and not opinion. Although articles that are not peer-reviewed must be read with caution, this does not mean that they should be dismissed as irrelevant or inaccurate. They often contain very important information and the studies are often well designed, but you should not base your conclusions on a topic without sufficient review of peer-reviewed articles. In this class, at least 8 of the 10 articles must be peer-reviewed.

Primary Sources
Primary sources are the original descriptions of experiments, observations, or theory. This material is most often found in journal articles, but may also be found in proceedings of symposia and the technical bulletins of various agencies. Secondary sources (review articles, texts) are useful in familiarizing yourself with the field and as an aid in finding the original
material. Do not, however, take another reviewer's conclusions on the primary sources as the last word; your interpretations may be different. Cite another reviewer's conclusions in your own paper if you wish, but don't cite a finding of a primary source unless you have reviewed the source yourself. Also, when evaluating a primary source don't rely solely on the abstract: check the results and see if you agree with the author's conclusions. Be critical, it is your job to examine the area of your review in a new light.

One of the best ways to begin locating the primary sources in the area of your review are the databases available over the Library network for both Wildlife and Fish but don't rely on these alone, they are not omniscient! Once you have found several recent papers in the area, start looking up their references, then check the references in those papers, and so on; soon you will have a good feeling for the people, the pattern of research, and the work to date in the field.

Examples of Peer-Reviewed Primary Sources

- Journal of Wildlife Management
- Transactions of the America Fisheries Society
- Wildlife Society Bulletin
- North American Journal of Fisheries Management
- Journal of Mammalogy
- Copeia
- Auk
- Canadian Journal of Fisheries and Aquatic Sciences
- Condor
- Limnology and Oceanography
- Wilson Bulletin
- Journal of Aquaculture
- Journal of Field Ornithology
- Journal of Fish Biology
- Ecology
- Proceedings of the Southern Association of Fish and Wildlife Agencies

Examples of literature that is not peer-reviewed (or to a lower level than most high-order journals)

- National Wildlife
- Most websites
- Tennessee Wildlife
- US Forest Service General Technical Reports
- Proceedings of Conferences

Narrow Your Topic

Many failures in term papers come from trying to review too much. A good, thorough review of primary sources takes time. Choosing too broad a topic will result in an unfinished or superficially treated project. For example, don't try to write a complete, primary review of the "Hormones of Fishes" in ten pages; a more suitable topic would be "Gonadotropins of Teleosts". This does not mean you should neglect the supporting material, you need a knowledge of that to write a good review, but you can rely on secondary sources for the peripheral information. Thesis reviews, of course, tend to be more inclusive than term papers, but the general approach is the same: rely on secondary sources for the base and then narrow in on the primary sources of direct concern to your research.

Integrate and Synthesize

Too many inexperienced reviewers simply paraphrase the finding of each primary source one at a time and leave it at that. The result is a list of summaries, not a review. Point out similarities, conflicts, and unanswered
questions among the primary sources. What are the trends? What research needs to be done next? Do not be afraid to speculate, but substantiate your speculation and label it as such.

BAD EXAMPLE:

Bluegills taken from a number of habitats throughout North America were found to have green blood; all samples were obtained by a syringe (Lepomis et al. 1982) Pomoxis and Centrarchid (1991) sampled adult white crappie form a number of southern ponds using a syringe and reported all to have black blood. Micropterus(1967) used a meatgrinder to take blood samples from largemouth bass and found no blood of any color. Black blood was reported form largemouth bass in a Wisconsin lake when a syringe was employed (Salmoides 1977).

GOOD EXAMPLE:

There is variation in blood color within the sunfish family. While crappies and largemouth bass have black blood (Salmoides 1977, Pomoxis and Centrarchid 1991) bluegill blood is green (Lepomis et al. 1982). An early report of an absence of blood in black bass (Micropterus 1967) is probably attributable to the use of a meatgrinder as a sampling tool. Later work on demonstrating black blood in bass was confined to a single lake (Salmoides 1977) and is yet to be confirmed in other habitats, though no geographically based differences in blood color have been found in other members of the sunfish family.

Use Proper Citation Form
You must attribute information to a source whenever you state information that you did not discover on you own or that is not common knowledge (e.g., "... since the sky is blue"). The source in most cases is the primary literature. Most journals in our field cite the author and date in the text (see examples above) and a complete citation in the Literature Cited section, which is found at the end of the paper.

The Literature Cited section is just that, do not put references in the Literature Cited that are not cited in the text. Also, be sure that all citations in the text are represented in the Literature Cited.

Citation Examples

Different journals use slightly different citation styles (e.g., some abbreviate journal titles others spell the titles out). The following are examples of acceptable styles:

Journal, Article


Technical Chapter in Edited Book


Published proceedings

Thesis


EXAMPLE OF A GOOD REVIEW PAPER

Effects of Cattle Grazing on Elk Ecology

One of the major land use problems of the western United States is competition for food resources between game species and livestock. The relationship between elk (Cervus canadensis) and cattle (Bovus spp.) provide a good example. The dietary overlap between elk and cattle in southern Colorado ranges from 30.4% to 50.9% (Hansen and Reid 1975). This is higher than the dietary overlap of deer and cattle or deer and elk. In general, cattle and elk compete indirectly, with cattle grazing in the summer where elk will forage in the winter. Direct competition for food resources can also occur, usually in the spring and fall (Mackie 1970).

Grazing at the level of 3.7 ha/AUM did not harm the chemical composition of the elk's major forage species, bluebunch wheatgrass (Agropyron spicatum), rough fescue (Festuca scabrella), and Idaho fescue (Festuca idahoensis), (Dragt and Havstad 1987). Dragt and Havstad (1987) also suggested that the primary winter forage management concern should be quantity rather than quality. Introduction of cattle into areas with existing elk populations can cause noticeable changes in elk activity. There are significantly fewer elk seen on pastures grazed by cattle that on pastures not grazed by cattle (Wallace and Krausman 1987). Additionally, the habitat use of elk shifts from open, mesic and silviculturally-disturbed areas to a more closed forest type (Wallace and Krausman 1987). This may indicate that cattle can displace elk from optimal habitat.

Mixed results were achieved in previous attempts to manage elk with cattle grazing. In southeastern Washington, the concept that summer cattle grazing would promote regrowth, enhance winter forage and increase elk use was not supported. In fact, areas with cattle stocked at a 1.1 ha/AUM actually showed a decrease in winter elk use when compared to ungrazed areas (Skovlin et al. 1983). Forage quality was not measured. Another study in northeastern Oregon produced very different results. Grazing was used, with other management tools, in an attempt to increase winter forage quality and attract elk use. In this study, the elk population grew from 320 to 1,190 over the 10 year period (Anderson and Scherzingher 1975). It is impossible to determine how much of the increase can be attributed solely to cattle grazing, but the author claims that the success of the project is primarily attributed to improved quality of winter forage.

The question as to whether managed cattle grazing can increase elk winter
forage is still undecided. It does appear that both species can coexist if cattle are not grazed in high densities and if deleterious effects on elk winter forage areas are minimized.

Literature Cited


