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Master of Natural Resources Capstone Report Guidance

The MNR capstone report is the formal documentation of your capstone project. It focuses on your capstone topic, describing the work you have undertaken. There are two primary purposes for your capstone report. The first is to present the findings of your study to your graduate committee, your agency or organization, and the scientific community if appropriate. The second is to demonstrate your interdisciplinary knowledge of the MNR's core learning objectives, and your ability to synthesize and apply them to a specific problem.

The capstone report also demonstrates your competency in writing and communicating ideas, as well as your ability to present information professionally. Professional writing requires authors to work through several drafts of a document to improve and refine it. We expect you to review and revise the document carefully before submitting it to your committee. *Your committee expects to see your very best, polished work, not your first draft*. You may still receive significant feedback on the report, but it is not the committee's responsibility to correct spelling errors, inconsistencies, omissions and other problems that typically occur in the first draft of a document.

> *Please Note*: The committee expects you to use the Track Changes feature in Word when making corrections so they can more efficiently review changes and revisions. The following website gives excellent instructions on how to use track changes in Word: http://shaunakelly.com/word/sharing/howtrackchangesworks.html.

Depending upon the nature of your capstone project, you have the option of taking three or six credits of NR 6600-Natural Resource Integrative Experience as part of your Program of Study. The number of capstone credits will be discussed and agreed upon during your first and second committee meetings. A three-credit capstone project addresses diverse issues associated with a natural resource problem. As mentioned above, these issues reflect core areas addressed in the MNR curriculum: human dimension effects, economic considerations, associated policies and laws, ecological issues, administrative concerns or approaches, and spatial and analytical techniques. We expect the knowledge acquired during your MNR education to be used in your characterization and analysis of the problem. A six-credit capstone report has the same elements of a three-credit report, but also includes an analysis of potential solutions to the problem.

Required Information

The exact format of your capstone report will be determined by you and your committee. The following description and example provide you with some general guidance on presenting your capstone project in a professionally written format.

Cover page: Include a cover page with your first draft to your committee of pertinent information (topic, number of credits, other committee members, etc.). **See Appendix I for the MNR cover page format**.

Abstract: Provide a concise description of the content of your report to entice readers to read the full document. See **Appendix II for abstract examples from wildlife and fisheries journals**.

Table of Contents

Glossary of Terms and Acronyms

List of Figures: Include figure numbers, titles and page numbers (e.g., graphs, maps, photos, etc.)

List of Tables: Include table numbers, titles and page numbers.

Please Note: Be clear on the distinction between figures (which includes maps) and tables. Choose a standard format for figure, table and map legends and numbering (e.g., refer to APA guidance or guidelines for a specific professional journal agreed upon by your committee) and be consistent throughout your report.

List of Appendices: Include appendix numbers and titles.

Introduction

- *Problem Statement*: This is an introductory paragraph or two that succinctly describes the problem you are addressing, why it is important, and how it will be addressed in the report**.** This is a critical element of your report, setting the stage for everything that follows. See **Appendix III for examples and more information on writing a Problem Statement**.
- *Background Information*: This section presents the history of the problem, such as what was done, when it was done, and who did it. You should also discuss theories of causation, and the long and short-term effects of the problem. Information for this section draws upon published literature, technical reports and personal communications. Make sure that all references are properly cited.
- *Goals/objectives*: Your goals are broad, general intentions of your project. Your objectives are more specific and indicate how you've achieved the goals. Objectives should be measurable or easy to assess.

  An example of a goal is: Gain a better understanding of current goshawk populations and areas of suitable habitat in the Ashley National Forest.

  Examples of objectives for this goal may be:
  1. Identify numbers of goshawk nests in the Ashley National Forest
  2. Determine hectares of suitable habitat for goshawks in the Ashley National Forest
  3. Determine the distribution of suitable habitat for goshawks in the Ashley National Forest

Methods of Analysis and Description of Study Site: If your capstone project included gathering and analyzing original data, describe the methods used for data collection and analysis. Your description should include the following information:

- Sources of data (i.e., did you collect the data or did someone else collect it?).
- Methods used to gather data (e.g., sampling, counts, surveys, interview protocols).
- Timeframe in which data was collected (i.e., specify years).

- Description of the study site, including geographical boundaries of the analysis. Include a map of the analysis area, as well as a state or regional map and show where the analysis area is located.
- Statistical approaches for analysis (e.g., models, trends, SPSS, MARK or R programs).
- Necessary permits or approvals needed to conduct the analysis (e.g., IACUC or IRB approval, landowner permission to access land).

Remember: Good science must be replicable. Have you given sufficient information about your methods to enable another investigator to replicate your data gathering and analysis?

Findings of Analysis: This section should address the findings of your research, as well as the findings and conclusions of other research related to your capstone topic for the core areas you have analyzed (human dimensions, ecology, economics, policy, and administration). Some core areas will be more relevant to your capstone topic than others, and these areas should be emphasized in this section. Discuss how core areas are interrelated. Make sure you tie your literature review into your discussion. Include studies that support AND contradict your findings, and explain any contradictory findings.

Conclusions: Use the conclusion section to emphasize the main points of your capstone analysis and findings. Summarize the relationships between the human dimensions, ecological, economic, policy, and administrative aspects of your problem to help readers see it from an integrated and "big-picture prospective."

Solutions or Recommendations **(for 6 credit capstones only):** Ideas for solutions or recommendations will likely be the result of a literature review, interviews with specialists and/or findings from your analysis. Again, show the interrelatedness of the core areas when discussing solutions, including situations where a beneficial effect in one area may result in an adverse effect in another.

References: Many students use the APA format (see http://www.apastyle.org/) for citing literature in their text and reporting their references. More important than the actual format used is you use one consistently throughout your document. Refer to published guidance for ideas on citation and bibliography styles (e.g., http://owl.english.purdue.edu/owl/resource/560/01/) or follow the guidance of a professional journal that has been agreed upon by your committee.

Appendices: Appendices should only be included if the additional information adds to a better understanding of the problem, is a useful compilation of raw material that is otherwise difficult to find or to present in the body of the report, or assists readers in interpreting or understanding your findings. Appendices may include additional maps, photographs, or other relevant data.

Writing Tips

Use online resources (e.g., http://garbl.home.comcast.net/~garbl/stylemanual/#.UugIf7Tn8sN) or obtain a standard writing manual to remind you of basic rules for good writing that you may have forgotten over the years. Having a style manual will help you to avoid common mistakes and write more clearly and concisely.

We have included at the end of this document the article *How to Write Backwards* by William E. Magnussen. Our natural tendency when we write about our projects is to include everything we did. Your capstone report, however, is not a "time and effort" report. Magnussen provides a wonderfully

logical way to assure your background, methods, and results/analysis sections are pertinent to the final conclusions of your report.

Before you start, you should develop a "road map" for your report. The road map must start with a well-conceived problem statement that will focus your literature review, analysis, and ultimately the content of your report. As discussed in the *Capstone Proposal Guidance* (found on the MNR website: https://qcnr.usu.edu/mnr/index#) your problem statement must be defined as part of your capstone proposal. It will guide you in determining how to integrate the core curriculum into your analysis and report. For additional information on developing a problem statement see appendix III of this document.

The next step in developing a "road map" for your report is developing an outline for organizing your information so it flows logically (such as the example above in "Required Information"). Having an outline ensures all important information is included, and helps to reduce repetition. The following list provides some suggestions for developing an outline:

- Write the first sentence of your problem statement at the top of your outline. It should summarize the main point of your report and help keep you focused. Identify your subtopics and how they relate to the main point of the report.
- List your primary findings and conclusions within each subtopic.
- Create a list of topic sentences for each of your findings and conclusions. This will help you determine the logic and flow of your report, and help you make certain you have the information needed to support your findings and conclusions.

Use headings, transitions, key words, and paragraph openings to provide cues to the document's organization:

- Headings help readers know they have moved into a new topic.
- Transition words help readers know you have moved into a different observation (e.g., "therefore," "in addition," "on-the-other-hand").
- Repetition of key words help readers know you are still on the same topic. For example, if the topic of the paragraph is the need for an outline when preparing a technical report, then the word "outline" should appear first in the topic sentence, and then again throughout the paragraph. It ensures consistency between sentences (see paragraph above).
- Paragraph openings, or topic sentences, help readers understand if you are on the same topic as the previous paragraph (but a new aspect of it) or if you have moved on to a new topic.

Use parallel structure throughout your report to help make it easier to follow:

- Throughout the report discuss items in the same order you introduce them.
- Use the same names for the topic in each section of the report (e.g., do not use Human Dimensions in one section and Recreation in another to discuss the same topic).

Limit paragraphs to a single topic or major idea:

- Use topic sentences to tell readers what the paragraph will be discussing.
- To create a logical and easy-to-follow flow of information, you can use the final sentence of a paragraph to transition to the next paragraph.
- Alternatively, you can use the topic sentence of the subsequent paragraph to create a linkage to the next paragraph (e.g., begin the paragraph with phrases such as "In contrast" or "Additional studies have found…").

- Use of key words within and between paragraphs will help readers stay on track and help you emphasize your most important points. For instance, do not use the word "these" or "those" without a noun behind them and do not assume the readers will automatically track what you are referring to.

Make precise and appropriate word choices. Good word choices result in more interesting reading and improved reader comprehension. Use a thesaurus to assist you in finding the best word(s) to convey your particular meaning.

Keep your sentences on topic. Do not try to cover too much information in one sentence.

Make your sentences concise, meaning "brief in form, but comprehensive in scope." Check with your committee members for their "rules of thumb" on sentence length. One suggestion is sentences should never be more than four lines in length (which is easy to see on the screen when you are writing). Another suggestion is to keep most sentences to 20 words or less. When appropriate split long sentences into two sentences. Another suggestion is to vary the length of your sentences to make your writing more interesting.

Use the active voice more often than the passive voice.

- ***Passive voice*** – The major points of the lesson were quickly learned by the class, but they were also quickly forgotten by them.
- ***Active voice*** – The class quickly learned, and then quickly forgot, the lesson's major points.

Use bullets or numbers to emphasize and list important points and to reduce long, wordy paragraphs.

Use appropriate graphics to reduce text and make your report more interesting and readable:

- Choose graphics to emphasize the primary purpose or important points of your analysis.
- Select graphics appropriate to your topic and audience.
- Introduce graphics in your text before they appear.
- Use clear and interpretive captions with your graphics. [A good rule to follow is that if someone found only the illustration and its caption lying on the floor, she would know exactly what it depicted.]

You are encouraged to be concise, which is defined by dictionary.com as "*expressing or covering much in few words; brief in form but comprehensive in scope*."

When Your Draft is Done

As noted in the introduction, we expect you to submit your very best work, not your first draft. Remember to use a spell checker and a grammar checker in your word processor. These tools do not replace the need for careful proofreading, but will catch many typos, missing words, homonyms (e.g., beach / beech) and other errors. Avoid run-on sentences or incomplete sentences. Read the report out loud, as your ear is often the best judge of a well-written sentence. Give yourself time to set the draft aside for a few days and then reread it.

MNR Capstone Review Process

Submit your report to your committee chair and program coordinator (https://qcnr.usu.edu/mnr/contact), who will record the date received. Your committee chair will review the report and either return it to you for revisions, or submit it to the other committee members for review. It is the responsibility of the committee chair to decide when your draft report is ready for review by the entire committee.

Typically, your chair and committee members will recommend edits to your report. These edits are not necessarily the only edits required before your report achieves final acceptance by your committee. Often these edits are more of a guide to let you know the types of editorial changes the committee would like to see before your report is accepted. Therefore, please review your entire edited report carefully and be sure you have addressed the committee's comments before resubmitting.

Your chair or committee members may also insert specific comments, typically asking for additional clarification or information. *Consider these comments seriously, and modify the report accordingly. If you decide not to include the information or edits requested, indicate on the next version of your report why suggested revisions were not included***.**

On average, MNR capstone reports go through two or three edits, so expect to do some revisions even if you thought you submitted a perfect report. We will try hard to return edited reports within four weeks of receiving them. However, please keep in mind this will not always be possible, especially if you send in capstones near the end of a semester. Working well in advance of semester deadlines is the best assurance of receiving prompt feedback.

Words of Wisdom from an English Teacher

… I teach writing, a process-oriented subject where progress moves slowly. The essence of good writing is strong thinking skills: the ability to generate a coherent, logical flow of information or ideas, integrating material that, at first glance, resists integration. This takes time. It requires venturing down blind alleys in pursuit of an idea, backtracking when that idea turns out to be weak, and tolerating frustration when another refuses to immediately take its place. It requires faith that blind alleys, backtracking, and frustration can lead to insights. The journey, in other words, is the thing.
(Flaherty, J. 2012. Millennial Students and Middle-aged Faculty: A Learner-centered Approach toward Bridging the Gap. *The Teaching Professor* 26.2: 1-3.

Appendix I. Sample Cover Page for MNR Capstone Report

THIS IS THE TITLE OF THE CAPSTONE REPORT IN ALL CAPS

by

Name
Date

A capstone report submitted in partial fulfillment of the requirements for the degree

of

MASTER OF NATURAL RESOURCES
and NEPA Certificate Program *(if appropriate)*

Committee Members:
Xyz, Chair
Abc
Def

UTAH STATE UNIVERSITY
Logan, Utah
2013

Appendix II. Guidance for Abstracts from Wildlife and Fisheries Journals

American Fisheries Society – N.A. Journal of Fisheries Management
The abstract should be a single paragraph that concisely states (in 300 words or fewer for an article, in 75–200 words for other papers) why you did your study, what you did, what you found, and what your results mean. Abstracts should neither list the contents (this is presented; that is discussed) nor review the methods.

Literature citations and footnotes are not allowed in abstracts. Limit the use of abbreviations. Abstracts obviate the need for formal text summaries. Because they are widely circulated by abstracting services, abstracts have much larger readerships than do full papers and should represent the texts fairly and accurately.

The Wildlife Society – Journal of Wildlife Management
The abstract includes: 1) Problem studied or hypothesis tested. Identify the problem or hypothesis and explain why it is important. Indicate new data, concepts, or interpretations directly or indirectly used to manage wildlife. 2) Pertinent methods. State methods used to achieve the results summarized in the Results (keep the methods brief unless a new, greatly improved method is reported). 3) Results. Emphasize the most important results, positive or negative. 4) Utility of results. Explain how, when, where, and by whom data or interpretations can be applied to wildlife problems or contribute to knowledge of wildlife science.

Ecological Society of America – Ecology, Ecological Applications
The abstract should explain to the general reader why the research was done and why the results should be viewed as important. It should provide a brief summary of the research, including the purpose, methods, results, and major conclusions. Do not include literature citations in the Abstract. Avoid long lists of common methods or discursive explanations of what you set out to accomplish.

The primary purpose of an abstract is to allow readers to determine quickly and easily the content and results of a paper. Abstracts should not exceed 200 words for Reports, Notes, and Communications, and 350 words for articles and for Data Papers.

Appendix III. Problem Statements

A problem statement for a report such as your MNR Capstone Report is usually a brief paragraph. The problem statement should clearly describe the issue of concern, state why it is important, and how you will address it (in your proposal) or have addressed it (in your report).

Below are the basic components of a problem statement:

State the overriding problem

- This should be a one sentence statement.

Use several sentences to define the problem:

- Why is this a problem?
- Who is affected by the problem?
- Where does the problem occur?
- When does the problem occur?

Use several sentences to describe how you will address the problem:

- What type of study will this be?
- What type of methodology will be used?
- What type of data will be collected?
- How will the results be presented?

A concluding sentence about the possible outcomes you expect (in a proposal) or the actual outcomes of the study (in a report).

Problem Statement Example (3-credits)

Strong evidence exists to indicate domestic sheep (*Ovis aries*) can infect Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) with pneumonia when herds interact (Callan 1991; Foreyt 1989, 1992, 1994; Foreyt and Lagerquist 1996; George et al 2008; Wehausen et al. 2011). Transmission of the pneumonic bacteria between the domestic and wild sheep is a result of bighorn sheep entering areas currently being grazed or that have been recently grazed by domestic sheep. Contact with the bacteria, which is carried in the mucous membranes of the domestic sheep, puts bighorn sheep at risk of contracting the bacteria, which can be fatal (Foreyt 1990; Jessup 1985; Martin et al. 1996; Monello et al. 2001; Rudolph et al. 2003). The issue is further compounded when infected bighorn sheep return to their herd, allowing the potential spread of the bacteria to other members of the herd, which can result in substantial mortality (Shackleton et al. 1999).

Throughout the western United States, the USFS and various state wildlife agencies are struggling to protect and maintain the viability of Rocky Mountain bighorn sheep populations, particularly ones coexisting with domestic sheep herds also grazing on National Forest lands. This study reviews the biological, social, economic, and legal factors associated with protecting Rocky Mountain bighorn sheep and ensuring viable populations, despite shared rangelands with domestic sheep. Much of this study focuses on the Evanston/Mt. View Ranger District (EMVRD) on the Uinta-Wasatch-Cache National Forest (UWCNF).

Problem Statement Example (6-credits)

On October 6, 1995, the U.S. Fish and Wildlife Service (Service) received a petition requesting the Service designate the lesser prairie-chicken (*Tympanuchus pallidicinctus*) (LEPC) as a threatened species and define critical habitat throughout its historic range (Service 1997). Nearly two decades have passed since the original petition was received, yet the Service has not added the species to the List of Endangered and Threatened Wildlife and Plants. Over the years, the Service has repeatedly published documents in the Federal Register supporting listing of the species but stating the agency's time, money, and energy are focused on higher priority listing actions. On November 30, 2012, the Service announced its proposal to list the species as "threatened" under the Endangered Species Act (ESA) (Service 2012).

Since the Service received the initial petition, the species' population trends have continued to decline and its habitat has become increasingly fragmented and degraded due to cropland conversion, petroleum exploration and extraction, cattle grazing, power line easements, and the generation of electricity (Hagen et al. 2011). Specifically, Taylor and Guthery (1980) found that by 1980 the population abundance of LEPC had declined 97 percent range-wide since the 1800s, reflecting a 92 percent reduction in range including a 78 percent decrease in occupied range since 1963. In 2010, the Service reviewed the status of the species and determined the species and its habitat are experiencing imminent, ongoing threats of high magnitude throughout its range. This realization resulted in a higher listing priority for the species that prompted development of the proposed listing rule. The pending final listing determination requires the Service to complete a five-factor threat analysis evaluating the status of the species now and into the future.

The goal of this research is to develop a thorough understanding of the status of the LEPC, identify the conservation challenges facing the species, and provide a basis for on-the-ground management that may serve to protect the species. Because the Service itself only manages the species on-the-ground on national wildlife refuges throughout LEPC range, the agency relies upon partnerships with non-profit organizations, state agencies, private landowners, and industry to develop plans intended to return the species to self-sustaining populations. These partnerships are integral to conserving LEPC populations because 95 percent of the species' occupied range is privately owned and the remaining 5 percent is managed by the Bureau of Land Management (BLM), U.S. Forest Service (USFS), and state agencies (*see*: Service 2010). Therefore, the research presented here may be used to provide background for future management recommendations intended to conserve the LEPC and its habitat.

HOW TO WRITE BACKWARDS

Lertzman (1995) presented many useful suggestions for writing papers and theses. Many of these appear to relate to form, but experienced writers will realize that most are intimately related to function. The paper summarized many interesting ideas that are to be found in how-to-write books, and as such may make them more accessible to beginning writers. However, in a decade of teaching scientific communication, I have found that even five pages of text, with a dozen grammatical suggestions, are too much for the beginner trying to punch out his/her first draft, especially if English is not his/her mother tongue. If the writer gets the content right, it is relatively easy to correct the draft for style using a text such as Lertzman's, or for a more experienced writer to indicate the flaws.

The following five simple rules have helped many inexperienced writers to get started, and have also helped more experienced writers, such as myself, to get out of a hope less tangle of observations and inferences.

> Rule 1: Write the conclusions to your paper. Even a large paper or the sis chapter will not have more than five or six substantial conclusions. Each conclusion must be succinct, and occupy one sentence and less than two lines. The conclusions as written here will not enter into the fi nal work so they do not need modifiers such as "however" and "that is."
>
> Rule 2: Write only the results necessary to make the conclusions you presented.
>
> Rule 3: Write only the methods necessary to understand how these results were obtained.
>
> Rule 4: Write the discussion, which should present only additional information (e.g., literature) that modifies, extends, confirms, or contradicts the conclusions based on your results.
>
> Rule 5: Write the introduction, which will have only the minimum information necessary to present the questions to which the conclusions are the answers.

When you have this, the story is told. You can go over it for stylistic errors, such as those pointed out by Lertzman (1995). If your major professor requires that you include other things such as reviews of the literature about the species/ecosystem, speculations not based on your results, etc., put them in separate chapters, sections, or appendices. After the thesis defense, these can be thrown out and the rest sent off for publication. The process is direct, the student learning to write a thesis and publish at the same time. This avoids having to unlearn all the techniques acquired during the making of the thesis so that he/she can start to learn to be a researcher and publish.

Acknowledgments
I thank all my students who, when all else failed, adopted these rules and made their theses coherent.

Literature cited
Lertzman, K. 1995. Notes on writing papers and theses. ESA Bulletin 76:86-90.

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