

THESIS GUIDELINES COLLEGE OF ARTS AND SCIENCES



SUL ROSS STATE UNIVERSITY

A Member of the Texas State University System

This 2nd Edition of the guide has been revised by the Arts and Sciences Committee for the Revision of Thesis Guidelines: James C. Zech, Chair (Biology); Travis Clark (Fine Arts and Communication); Sharon Hileman (Languages and Literature); Judith Parsons (Behavioral and Social Sciences); and Beverly Six (Languages and Literature).

Cover design by Kendall Craig

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GENERAL GUIDELINES FOR THESES IN GRADUATE PROGRAMS COLLEGE OF ARTS AND SCIENCES SUL ROSS STATE UNIVERSITY

A thesis is a written account based on original research or a creative project in appropriate fields presented by a candidate for a master's degree as partial fulfillment of the requirements for the degree. The thesis topic or project must be approved in advance by the student's graduate committee and the Dean of the College of Arts and Sciences. The completed thesis must meet exactly the stylistic requirements of the College of Arts and Sciences and be acceptable to the members of the student's graduate committee and the Dean of the College of Arts and Sciences in both the quality and quantity of research and the quality of the writing. The thesis must be defended by the student in a publicly announced and open defense before final acceptance of the thesis.

It is the intent of these thesis guidelines to be general and flexible enough to be adaptable to any form manual which students are required to follow in any discipline. Each form manual, however, differs somewhat from the next, and, when in doubt, the student's thesis committee chair should be consulted. In order to obtain unity among the theses of the College of Arts and Sciences, the guidelines included here must be followed and have precedent over all others, regardless of format followed. As a reminder, students must be registered while using university facilities, at the time of the defense, and during the semester or summer session of graduation.

Read this style manual in its entirety *before* beginning work on your thesis.

As you work on the thesis, consult this style manual regularly, as it contains specific instructions for thesis content and format.

Pay particular attention to the samples in Section VII and to the Thesis Checklist and templates in Section VI.

SECTION I STEPS IN WRITING THE THESIS

1. The Prospectus

The prospectus represents an important first step in developing the thesis. The written prospectus serves as a foundation upon which the thesis is constructed and may prove useful in developing grants to support the research and abstracts for submission to professional meetings. The prospectus should only be written following a thorough investigation of the subject, including an extensive literature search, and discussions with the student's committee chair and/or entire committee. Scope, time frame, and feasibility of the research or creative project are some examples of areas to be considered.

The prospectus is a summary (approximately 500 words) that describes the student's thesis topic and how the research or creative project is to be conducted and the methodology to be used. In general, the prospectus format (e.g., font, spacing, margins, etc.) should follow that of the thesis. The sequence of elements in the prospectus should be as follows:

A. Title Page (see sample in Section VII)

- This page is neither counted nor numbered.
- The title is placed at the top margin, centered within the binding margin, and in all capitals.
- If the title runs two or more lines, the lines should be divided evenly, with a preference for a shape similar to an inverted triangle.
- Margins are: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- Font style is Times New Roman, and font size is 12 point.
- The prospectus statement includes an indication of the degree (e.g., A Prospectus for the Degree Master of Science) and is centered.
- The chair of the committee is listed first, and labeled (e.g., Sharon Hileman, Ph.D., Chair).
- The remaining committee members are listed alphabetically.
- Each committee member's name should be typed in the form of his or her legal signature, located below his or her appropriate signature line.
- The Dean's name is followed by position (e.g., Jim Case, Ph.D., Dean of Arts and Sciences).
- Degrees (e.g., Ph.D., M.F.A., etc.) should be included with each committee member's name, placing a comma after the name and before the degree (e.g., Beverly Six, Ph.D.).
- Titles (e.g., Dr.) should not be included with any name.
- No committee member should sign the approval page while revisions are still being made.
- The committee chair signs first, followed by the committee members.

- At least one signature should be made in blue ink to indicate an original page (for additional signatures, any color other than blue or black is not acceptable).
- It is the student's responsibility to obtain all signatures.

Page Construction: from the top margin

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- The title is placed at the top margin, centered, double spaced, in all capitals.
- Following four single spaces, 25 underlines are used, centered.
- After two single spaces the prospectus statement is centered including an indication of the degree (e.g., A Prospectus for the Degree Master of Science).
- Following two single spaces, 25 underlines are used, centered.
- After two spaces, "by" is typed, followed by a single space and then the student's full name.

Page Construction: from the bottom margin

- The Dean's name and title are on the bottom margin and at the left margin.
- The Signature line is constructed with 40 underlines and placed at the left margin.
- "Approved:" is placed three single spaces above signature line, at the left margin.
- The final committee member name is placed two spaces above the Dean's "Approved:," with preceding committee member names and the committee "Approved:" separated by three single spaces.
- All committee signature lines are constructed with 40 underlines, ending at the right margin.
- The "A" of the committee "Approved" should align with the first letter of each committee member name.

B. Tentative Thesis Outline

- The outline may later become the TABLE OF CONTENTS in the Thesis.
- The Tentative Thesis Outline page is neither counted nor numbered.
- Each section (e.g., INTRODUCTION, DISCUSSION, etc.) should be labeled sequentially as CHAPTERS, using Roman numerals (e.g., CHAPTER I).
- Subsequent listings should be indented by a single tab (five spaces), with periods aligned, and two spaces following each period (e.g., A. Description of).

- Do not include single letter listings (e.g., A. without B., etc.).
- Do not include single number listings (e.g., 1. without 2., etc.).

C. Narrative

- This section describes the research to be conducted and the methodology to be used.
- The first page is numbered, using Arabic numbers, bottom center. All subsequent pages are numbered sequentially, using Arabic numbers, upper right.
- Text is double spaced.
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- Font style is Times New Roman, and font size is 12 point.
- All paragraphs are indented.
- All sentences must end with a period.
- Two spaces are inserted following each sentence end period.

D. Bibliography, References, or Literature Cited

- Section title varies depending upon Department preference.
- The use of general encyclopedias, including electronic encyclopedias (e.g., Wikipedia) is not acceptable.
- The chosen format must be followed, paying close attention to spacing, periods, etc.
- The bibliography, references, or literature cited must be double spaced throughout.
- Citations within the text must be included within this section and vice versa.
- Regardless of format followed, all sources (e.g., journal and book titles) must be spelled in full.
- The pages in this section are counted and numbered sequentially with Arabic numbers.

Once several revisions have been made, the prospectus is submitted, printed on white paper, to all committee members for their consideration, input, and possible further revisions. The original signed copy of the prospectus is then submitted to the Dean of Arts and Sciences for final approval. This approval must be received prior to registration for thesis hours (6302, 6040). Completed and approved forms (e.g., collecting permits; IACUC; Human Subjects) and/or paperwork (e.g., letters in support of research) must be included with the prospectus at the time of submission to the committee.

Depending on departmental recommendation, prospectus development may need to begin during the student's first semester, with completion by the second semester. The

prospectus is written, submitted, and approved while the student is enrolled in the appropriate department's 6301 thesis course.

2. The Thesis

Currently only one in twenty Sul Ross State University (SRSU) graduate students in Arts and Sciences completes the thesis in the semester the student expects to graduate. The other 19 students must request an extension in order to complete the thesis. This occurs because the student may not realize that the collaborative nature of a thesis, which involves working with at least three committee members, requires time for planning, writing, and revising material that must be submitted to and approved by the entire committee, often on a chapter-by-chapter basis.

Statistics show that SRSU graduate students in Arts and Sciences take an average of nine semesters to finish the master's degree (e.g., 5-13 within the Departments of Biology and Languages and Literature). The following timeline (Table 1) provides a 4-semester and 5-semester plan for a full-time student to complete a thesis. If a student begins early enough, he or she may be able to write a thesis and finish the 24 semester credit hours required for the degree within the specified time periods. However, failure to complete any of these requirements in the specified time frame may extend the number of semesters required to finish the degree. Students should realize that timeline specifications and preferred course sequences vary according to department and, sometimes, according to the individual thesis director. **EVERY STUDENT PLANNING TO WRITE A THESIS SHOULD CONSULT WITH HIS OR HER THESIS COMMITTEE CHAIR AS SOON AS POSSIBLE.**

Table 1. Suggested theses plans within the College of Arts and Sciences for full-time students.

Semester	4-Semester Thesis Plan (Do coursework and thesis simultaneously)	5-Semester Thesis Plan (Completed coursework before beginning thesis)
1	Interview faculty to determine likely thesis director Enroll in nine sch coursework (One of courses should be taught by proposed thesis director.) [In Biology, the student is often expected to enroll in 6301 (Prospectus) during the first semester of graduate work.]	Enroll in nine sch coursework Interview faculty to determine likely thesis director
2	Enroll in six sch coursework and 6301 (Prospectus) Work with thesis director to select a committee and convene it early in	Enroll in nine sch coursework (One of the courses should be taught by proposed thesis director.)

	<p>the semester to discuss prospectus. Submit a draft of the prospectus at mid-semester. Revise and submit prospectus to committee for approval by the end of the semester.</p>	
3	<p>Enroll in six sch coursework and 6302 (Thesis) or 6040 (Thesis Research)</p> <p>Write and revise the body of the thesis. (If thesis chapters are submitted on a monthly basis, the student should complete three chapters that have been satisfactorily revised according to all committee members' specifications. If the entire thesis is to be submitted, it should be near completion by the end of the semester) Attend thesis committee meetings throughout the semester to make progress reports and receive suggestions from committee members.</p>	<p>Enroll in six sch coursework and 6301 (Prospectus)</p> <p>Work with thesis director to select committee and convene it early in the semester to discuss prospectus. Submit a draft of the prospectus at mid-semester. Revise the prospectus and submit it to the committee for approval by the end of the semester.</p>
4	<p>Enroll in three sch of coursework and 6302 (Thesis) or 6040 (Thesis Research)</p> <p>Complete the thesis as soon as possible at the beginning of the semester. (A completed copy of the thesis is due to the committee at least nine weeks before the graduation date. This means the thesis director will probably want a completed copy at least thirteen weeks before the graduation date)</p> <p>Work with thesis director to schedule the thesis defense as soon as it is definite that the thesis will be completed during the semester.</p> <p>(Student may need to take a departmental Master's Assessment Exam)</p>	<p>Enroll in 6302 (Thesis)</p> <p>Write and revise the body of the thesis. (If thesis chapters are submitted on a monthly basis, the student should complete three chapters that have been satisfactorily revised according to all committee members' specifications. If the entire thesis is to be submitted, it should be near completion by the end of the semester.) Attend thesis committee meetings throughout the semester to make progress reports and receive suggestions from committee members.</p> <p>(Student may need to take a departmental Master's Assessment Exam)</p>

5		<p>Enroll in 6302 (Thesis)</p> <p>Complete the thesis as soon as possible at the beginning of the semester. (A completed copy of the thesis is due to the committee at least nine weeks before the graduation date. This means the thesis director will probably want a completed copy at least thirteen weeks before the graduation date). One copy of the signature page is to be submitted to the Dean's office for editing at the time that the completed thesis is given to the committee members. Work with thesis director to schedule the thesis defense as soon as it is definite that the thesis will be completed during the semester and before the defense. The thesis must be approved by all committee members before it is submitted to the office of the Dean of Arts and Sciences (no later than six weeks prior to graduation) for editing.</p>
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sch = semester credit hours.

SECTION II THESIS STYLE AND SEQUENCE

The thesis should be submitted by students pursuing the Master of Arts or Master of Science degree in accordance with the requirements set forth by their disciplines and committee chair.

1. Form and Style

Students should consult with their committee chair as to the form and style to be used. Various departments use guides particular to their own requirements (Table 2). These guides may be purchased in the campus bookstore, and reference copies are kept in the Dean's Office and the Wildenthal Memorial Library:

Table 2. Departmental thesis guides within the College of Arts and Sciences.

Department	Guide
Behavioral and Social Sciences	History: <i>A Manual for Writers of Term Papers, Theses, and Dissertations</i> , latest edition, Turabian. Political Science: <i>A Manual for Writers of Term Papers, Theses, and Dissertations</i> , latest edition, Turabian or <i>Publication Manual of the American Psychological Association (APA)</i> , latest edition. Psychology: <i>Publication Manual of the American Psychological Association (APA)</i> , latest edition.
Biology	Scientific journal format of appropriate discipline. When format is questionable, <i>Scientific Style and Format: The CBE (Council of Biology Editors) Manual for Authors, Editors, and Publishers</i> , latest edition.
Computer Science and Mathematics	No master's degree is offered at this time.
Earth and Physical Sciences	Scientific journal format of appropriate discipline. When format is questionable, <i>Scientific Style and Format: The CBE (Council of Biology Editors) Manual for Authors, Editors, and Publishers</i> , latest edition.
Fine Arts and Communication	<i>A Manual for Writers of Term Papers, Theses, and Dissertations</i> , latest edition, Turabian or <i>The Chicago Manual of Style</i> , latest edition.
Languages and Literature	<i>MLA Handbook for Writers of Research Papers</i> , latest edition or <i>MLA Style Manual and Guide to Scholarly Publishing</i> , latest edition.

2. Sequence of the Thesis

1. Title Page
2. Approval Page
3. Abstract
4. Acknowledgments
5. Table of Contents
6. List of Tables
7. List of Figures
8. Text of Thesis
9. Notes
10. Bibliography, References, or Literature Cited
11. Appendix(es)

SECTION III

THESIS FORMAT: FRONT MATTER AND APPENDIX(CES)

1. Title Page (see sample in Section VII)

- Because the title is often included within databases and information services, it should be constructed to communicate as much information as possible about the thesis, without becoming an extensive description.
- This page is counted but not numbered.

A. Page Construction: from the top margin

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- The title is placed at the top margin, centered within the binding margin, and in all capitals.
- If the title runs two or more lines, the lines should be divided evenly, with a preference for a shape similar to an inverted triangle.
- Margins are: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All text is double spaced, including the title.
- Three spaces are inserted after the title.
- On the third line following the title, 25 underlines are used, centered.
- Three spaces are inserted after the underline.
- On the fourth line, “A Thesis” is centered, followed by: one double space; “Presented to the,” centered; one double space; “College of Arts and Sciences,” centered; one double space; and “Sul Ross State University,” centered.
- Three spaces are inserted after “Sul Ross State University.”
- On the third line following “Sul Ross State University,” 25 underlines are used, centered.
- Three spaces are inserted after the underlines.
- On the fourth line, “In Partial Fulfillment” is centered, followed by: one double space; “of the Requirements for the Degree,” centered; one double space; and the title of degree (e.g., Master of Science), centered.
- Three spaces are inserted after the degree title.
- On the third line following the degree title, 25 underlines are used, centered.
- Three spaces are inserted after the underlines.
- On the fourth line, “by” is centered, followed by: one double space; the name of the student, centered; one double space; and the month and year, centered.
- The month corresponds to the month of graduation (e.g., December, May, or August).

B. Page Construction: from the bottom margin

- The number of spaces from the bottom margin to the month and year will be variable depending upon the title length.
- Page construction should begin from the top margin working down.

2. Approval Page (see sample in Section VII)

- This page is counted but not numbered.
- The chair of the committee is listed first, and labeled (e.g., Beverly Six, Ph.D., Chair)
- The remaining committee members are listed alphabetically.
- Each committee member's name should be included in the form of his or her legal signature, located a single space below the appropriate signature line.
- The Dean's name is followed by position (e.g., Jim Case, Ph.D., Dean of Arts and Sciences).
- Degrees (e.g., Ph.D., M.F.A., etc.) should be included with each committee member's name, placing a comma after the name and before the degree (e.g., Carol Fairlie, M.F.A.).
- Titles (e.g., Dr.) should not be included with any name.
- No committee member should sign the approval page until all committee level revisions are complete and the signature page has been approved by the Arts and Sciences editor.
- All final signatures are made on the required bond paper.
- The committee chair signs first, followed by the committee members.
- At least one signature should be made in blue ink to indicate an original page (for additional signatures, any color other than blue or black is not acceptable).
- It is the student's responsibility to obtain all signatures.

A. Page Construction: from the top margin

- The title is placed at the top margin, centered within binding margin, in all capitals.
- If the title runs two or more lines, the lines should be divided evenly, with a preference for a shape similar to an inverted triangle.
- Margins are: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.

B. Page Construction: from the bottom margin

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- Dean's name and title are on the bottom margin and at the left margin.
- Signature line is constructed with 40 underlines and placed at the left margin.

- “Approved:” is placed three single spaces above signature line, at the left margin.
- The final committee member name is placed two spaces above the Dean’s “Approved:,” with preceding committee member names and the committee “Approved:” separated by three single spaces.
- All signature lines are constructed with 40 underlines, placed at the right margin.
- The “A” of the committee “Approved” should align with the first letter of each committee member name.

3. Abstract

A well-prepared abstract enables readers to identify the basic contents of a document quickly and accurately, to determine the information’s relevance to their interests. It is viewed as a mini-version of the thesis and should provide a brief summary of each of the main sections. Like the title, the abstract may be included within databases and information services and, therefore, should be constructed carefully to completely reflect the entire thesis.

- While the length may vary, the abstract should be approximately 150 words.
- Abstract pages are counted in the thesis and numbered in lower-case Roman numerals (e.g., iii).

A. Abstract Page (Included in Thesis) Construction:

- The abstract page must have the title ABSTRACT.
- ABSTRACT should be written in all capitals and placed top center.
- The abstract text begins one triple space down from the title.
- A second copy of the abstract, including an abstract title page (see sample in Section VII), is required (printed on bond paper) at the time of final thesis submission. The abstract title page is not included within the thesis.

B. Abstract Title Page (Not Included in Thesis) Construction: from the top margin

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- The title is placed at the top margin, centered within the binding margin, double spaced, and in all capitals.
- Margins are: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All text is double spaced, including the title.
- Three spaces are inserted after the title.
- On the third line following the title, 25 underlines are used, centered.
- Three spaces are inserted after the underline.

- On the fourth line, “An Abstract of a Thesis” is centered, followed by: one double space; “Presented to the,” centered; one double space; “College of Arts and Sciences,” centered; one double space; and “Sul Ross State University,” centered.
- Three spaces are inserted after “Sul Ross State University.”
- On the third line following “Sul Ross State University,” 25 underlines are used, centered.
- Three spaces are inserted after the underlines.
- On the fourth line, “In Partial Fulfillment” is centered, followed by: one double space; “of the Requirements for the Degree,” centered; one double space; and the title of degree (e.g., Master of Science), centered.
- Three spaces are inserted after the degree title.
- On the third line following the degree title, 25 underlines are used, centered.
- Three spaces are inserted after the underlines.
- On the fourth line, “by” is centered, followed by: one double space; the name of the student, centered; one double space; and the month and year, centered.
- The month corresponds to the month of graduation (e.g., December, May, or August).

C. Abstract Title Page Construction: from the bottom margin

- The number of spaces from the bottom margin to the month and year will be variable depending upon the title length.
- Page construction should begin from the top margin working down.

4. Acknowledgments

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- The title is placed at the top margin, centered within the binding margin, and in all capitals.
- Three spaces are inserted after the title.
- The preferred spelling of acknowledgments does not have an "e" between the g and m.
- The acknowledgments page is counted and numbered in lower-case Roman numerals.
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- The prose format should be complete sentences throughout (e.g., Thanks go to . . .; instead of, Thanks to . . .).
- All statements of appreciation must be made in first (I wish to thank . . .) or third (Dr. Six has provided . . .) person. Third person is preferred.

- This section should be brief, only including those who have contributed to the work.
- All committee members, including the chair, should be acknowledged.
- Acknowledgments should not be stated as sweeping generalizations (e.g., I would like to thank everyone at the Smithsonian Institute).
- If funding was provided, the agency and reference number, placed in parentheses, should be included.
- Editorials are not acceptable.
- Negative statements are not acceptable.

5. Table of Contents (see sample in Section VII)

- The pages of the Table of Contents are counted and numbered in lower-case Roman numerals (e.g., v.).
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- TABLE OF CONTENTS is written in capitals and located at the top margin, centered.
- “Page” is one double space below TABLE OF CONTENTS with the “e” of Page aligned at the right margin.
- Page number digits (e.g., ones, tens, hundreds) need to be aligned, with the ones under the “e,” tens under the “g,” hundreds under the “a,” etc. of Page.
- Initial contents (e.g., Abstract, Acknowledgements, Chapter, etc.) begin one double space below “Page” (and two double spaces below TABLE OF CONTENTS) aligned at the left margin.
- Whole Table of Contents is double spaced.
- Table of Contents may contain up to three levels of divisions in the text: Chapter; first-level subtitle; and second-level headings).
- Each section (e.g., Introduction, Discussion, etc.) should be labeled sequentially as Chapters, using Roman numerals followed by a period.
- Chapter number periods must align with each other and the “p” of Chapter, followed by a single tab (five spaces).
- Subsequent listings should be indented by a single tab (five spaces), with periods aligned, and two spaces following each period (e.g., A. Description of . . .).
 - Do not include single letter listings (e.g., A. without B., etc.).
 - Do not include single number listings (e.g., 1. without 2., etc.).
 - No divisions below second-level headings should appear in the Table of Contents.
- Appendices should not be designated as Chapters with numbers within the Table of Contents. The designation should be Appendix(ces) placed at the far left margin, with first-level indentations used to designate multiple Appendices by title.
- Within the thesis, each of the multiple appendices should be preceded by a half-title page. In such cases the Appendix half-title page number is used in the Table of Contents.

- Titles of text divisions (including Appendix titles) should be shortened if they run over one line
- All titles must follow the correct capitalization for titles.
- Leader dots must be included between entry and page number with a single space following the entry. The leader dots should end and align with the “P” of Page, leaving six spaces before the ones, five spaces before the tens, four spaces before the hundreds, etc.
- Note: leader dots may be more easily inserted by using periods and spaces than with the automatic leader dot insertion function of word processing systems.
- Note: leader dots and page number alignment may be more easily inserted by using full justification for the right margin, while still maintaining the required 1.0 inch right margin.
- If the Table of Contents continues on a second page, the continuation will be acknowledged with the title TABLE OF CONTENTS, Continued on the left margin, followed by a double space and Chapter and Page as designated for the first page of the Table of Contents.

6. List of Tables (see sample in Section VII)

- Tables may or may not be included in a thesis.
- The pages of the List of Tables are counted and numbered in lower-case Roman numerals (e.g., vi).
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- LIST OF TABLES is written in capitals and located at the top margin, centered, on the first page of the list.
- “Table” is double spaced below LIST OF TABLES with the “T” of Table aligned at the left margin.
- Table number digits (e.g., ones, tens, etc.) need to be aligned with the ones under the “e,” tens under the “l,” etc. of Table, with two spaces following the period before the table title.
- “Page” is double spaced below LIST OF TABLES with the “e” of Page aligned at the right margin.
- Page number digits (e.g., ones, tens, hundreds) need to be aligned, with the ones under the “e,” tens under the “g,” hundreds under the “a,” etc. of Page.
- In List of Tables, table titles should be written as phrases, not sentences.
- If table titles are longer than a single line, an abbreviation, at an appropriate break, should be used.
- All table titles within List of Tables must follow the correct capitalization for titles.
- Leader dots must be included between table title and page number with a single space following the title, and ending with the alignment of the “P” of Page.
- Note: leader dots may be more easily inserted by using periods and spaces than with the automatic leader dot insertion function of word processing systems.

- Note: leader dots and page number alignment may be more easily inserted by using full justification for the right margin, while still maintaining the required 1.0 inch right margin.
- If the List of Tables continues on a second page, the continuation will be acknowledged with the title LIST OF TABLES, Continued on the left margin followed by a double space and Table and Page as designated for the first page of the List of Tables.

7. List of Figures (see sample in Section VII)

- Figures may or may not be included in the thesis.
- The pages of the List of Figures are counted and numbered in lower-case Roman numerals (e.g., vii).
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- LIST OF FIGURES is written in capitals and located at the top margin, centered, on the first page of the list.
- “Figure” is double spaced below LIST OF FIGURES with the “F” of Figure aligned at the left margin.
- Figure number digits (e.g., ones, tens, etc.) need to be aligned with the ones under the “e,” tens under the “r,” etc. of Figure, with two spaces following the period before the figure title.
- “Page” is double spaced below TABLE OF CONTENTS with the “e” of Page aligned at the right margin.
- Page number digits (e.g., ones, tens, hundreds) need to be aligned, with the ones under the “e,” tens under the “g,” hundreds under the “a,” etc. of Page.
- In List of Figures, figure titles should be written as phrases, not sentences.
- If figure titles are longer than a single line, an abbreviation, at an appropriate break, should be used.
- All figure titles within List of Figures must follow the correct capitalization for titles.
- Leader dots must be included between figure title and page number with a single space following the title, and ending with the alignment of the “P” of Page.
- Note: leader dots may be more easily inserted by using periods and spaces than with the automatic leader dot insertion function of word processing systems.
- Note: leader dots and page number alignment may be more easily inserted by using full justification for the right margin, while still maintaining the required 1.0 inch right margin.
- If the List of Figures continues on a second page, the continuation will be acknowledged with the title LIST OF FIGURES, Continued on the left margin followed by a double space and Figure and Page as designated for the first page of the List of Figures.

8. Appendix(ces)

- Appendices may or may not be included.
- Appendices should not be designated as Chapters with numbers within the Table of Contents. The designation should be Appendix(ces) placed at the far left margin with first-level indentations used to designate multiple Appendices by title.
- The pages in appendices are counted and numbered sequentially with Arabic numbers.
- Each Appendix must have a title written in all capitals and placed top center. If the Appendix is in the form of a figure or table printed in landscape, the Appendix title should be included within a separate half-title page preceding the landscape Appendix.
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- The appendix(ces) follows the same format as the text.
- Each appendix must have a title at the top of the page (formatted like a Chapter title, with APPENDIX centered, followed by double space and Appendix title, also centered).
- If the appendix is a full-page figure, it must be preceded by a half-title page.
- Multiple page Appendices need a title designation followed by a comma and “Continued” at the top left margin (e.g., Shakespearean Vegetation, Continued).
- In general, appendices should be double spaced. Single spacing may be used if the content or length requires it. This should be determined in a consultation between student and thesis chair. Specialized formatting should be consistent with all appendices in the thesis.

SECTION IV THESIS FORMAT: CONTENT, PAGE CONSTRUCTION, AND MECHANICS FOR TEXT

Once again, in order to obtain unity among the theses of the College of Arts and Sciences, the guidelines included here must be followed and have precedence over all others, regardless of format followed. Students must be registered while using university facilities, at the time of the defense, and during the semester or summer session of graduation.

1. Text of Thesis (see sample in Section VII)

- Each section (e.g., INTRODUCTION, DISCUSSION, etc.) should be labeled sequentially as a CHAPTER, using Roman numerals (CHAPTER I).

- Chapter headings (e.g., CHAPTER I) are centered at the top 1.0 inch margin, followed by a double space and then the centered chapter title (e.g., METHODS AND MATERIALS). A triple space follows the chapter title before the text.
- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text. Use the template provided in Section VI to check triple and double spacing (Note: Microsoft Word automatically adds a line space before and after paragraphs. This must be disabled before you begin typing your thesis.)
- The first page of each chapter is numbered, using Arabic numbers, bottom center. All subsequent pages are numbered sequentially, using Arabic numbers, upper right.
- Text is double spaced.
- Font style is Times New Roman, and font size is 12 point.
- All paragraphs are indented.
- All sentences must end with a period.
- Two spaces are inserted following each sentence end period.
- No section (i.e. Chapter) may begin with a subtitle (e.g., every Chapter should begin with one or more paragraphs of text before the first-level subtitle appears). There must be text between (before and after) subtitles as well.
- First-level subtitles and second-level headings are separated from the text by a triple space before and a double space after (Note: Be sure to use the template in Section VI to check spacing).
- Both first-level subtitles and second-level headings are placed at the left margin.
- First-level subtitles are entirely capitalized but not written in italics.
- Second-level headings are in italics with first word and proper nouns capitalized.
- While not included within the Table of Contents, third-level headings in the text are placed at the left margin, underlined, no italics, with first word and proper nouns capitalized.

2. Notes

- This section is included only if footnotes or scientific form is not used.
- The pages are counted and numbered sequentially with Arabic numbers.

3. Bibliography, References, or Literature Cited

- The title of this CHAPTER will vary depending upon department and format followed.
- The use of general encyclopedias, including electronic encyclopedias (e.g., Wikipedia), is not acceptable.
- The chosen format must be followed, paying close attention to spacing, periods, etc.
- Each entry should be complete on one page. If necessary begin the entry on the next page to avoid a split between pages.

- The bibliography, references, or literature cited entries should be double spaced.
- Citations within the text must be included within this section and vice versa.
- Regardless of format followed, all sources (e.g., journal and book titles) must be spelled in full.
- The pages in this section are counted and numbered sequentially with Arabic numbers.
- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- Bibliographic entries on Literature Cited pages should not be split between pages.
- The use of **GENERAL ENCYCLOPEDIAS**, including electronic encyclopedias (e.g., Wikipedia), **IS NOT ACCEPTABLE**.

4. Page Format

A. Margins

- All pages are to include the following margins: 1.5 inch left margin; and 1.0 inch top, bottom, and right margins.
- All required centering must be done within these margins.
- Margins will be checked by the Thesis Editor.

B. Font Style and Size

- The printing font used will be Times New Roman, size 12 point.
- First-level subtitles are not written in italics.
- Second-level headings are written in italics.

C. Page Numbering

- Both the title and approval pages are counted but not numbered. Therefore, the first typed page number will be for the Abstract (iii).
- The pages following the approval page are counted and numbered sequentially using lower-case Roman numerals (e.g., iii, iv, v, etc.) and placed bottom center (centered within the margins).
- The first page of the thesis text, CHAPTER I, begins the use of Arabic numbers (e.g., 1, 2, 3, etc.), with the entire thesis numbered sequentially.
- The first page of each CHAPTER places the page number bottom center (centered within the margins), with all subsequent pages placing the page number in the upper right.
- Page numbers are to be the same font style and size as the text (Times New Roman, 12 point).
- Page number centering should be done according to the margins, not according to the center point of the paper.

D. Page Transition

- No page may end with less than two lines of a paragraph, and no page may begin with less than two lines of a paragraph.

- No page may end or begin with a hyphenated word.
- If the thesis contains numerous tables and/or figures, no page of text should be left with more than one third to one fourth of the page blank. Multiple tables and/or figures should be grouped so that several follow a page of full text rather than having numerous short-text pages (Note: Tables and figures must still be inserted immediately following the first text citation).

E. Paragraphs

- All paragraphs must be indented.
- Single-sentence paragraphs should be avoided.

F. Spacing

- A double space leaves one line space between typed lines. A triple space leaves two line spaces between typed lines. In triple spacing, the text begins again on the third line down from the previous text, not on the fourth line down from the previous text.
- Use the template provided in Section VI to check triple and double spacing (Note: Microsoft Word automatically adds a line space before and after paragraphs. This must be disabled before you begin typing your thesis.)
- Chapter headings (e.g., CHAPTER I) are centered at the top 1.0 inch margin, followed by a double space and then the centered chapter title (e.g., METHODS AND MATERIALS). A triple space follows the chapter title before the text.
- The entire text of the thesis, including BIBLIOGRAPHY, REFERENCES, or LITERATURE CITED, should be double spaced.
- Figure and table titles should be double spaced.
- Tables in their entirety should be double spaced.
- In general, appendices should be double spaced. Single spacing may be used if the content or length requires it. This should be determined in a consultation between student and thesis chair. Specialized formatting should be consistent with all appendices in the thesis.
- First-level subtitles and second-level headings are preceded by a triple space and followed by a double space.
- Block quotations should be double spaced.

5. Grammar and Spelling

A. Person

- Acceptable person varies with discipline. Committee chair and guide followed should be consulted.
- Second person is not acceptable.

B. Punctuation

- Entries within BIBLIOGRAPHY, REFERENCES, or LITERATURE CITED should end with a period.
- All sentences, including table and figure titles, must end with a period.
- Two spaces are inserted after a period ending a sentence.
- The serial comma (a comma placed before and) should be used (e.g., red, white, and blue).
- Foreign language accents should be used (e.g., Río is written correctly. Rio is not).
- Back-to-back parentheses should be avoided.
- If necessary, parentheses are placed within brackets [()] or brackets may be placed within parenthesis ([]). [Note: specific department thesis guide format (Table 2) should be consulted.]
- The preferred sequence of use is colon followed by semi-colon followed by comma followed by period (e.g., were as follows: wind; rain, including hail; snow; and ice.).
- The colon is not used if the words “as follows” or “the following” are not included (i.e., in the previous example, no colon is used if the list appears immediately after the verb “were”).

C. Spelling and Grammar

- Two spaces are inserted following each sentence end period.
- Misspelled words are not acceptable.
- The preferred spelling of Acknowledgments does not have an "e" between the g and m.
- Data are plural. When the word data is used in a sentence, a plural verb is required. Datum is the singular form of the word.
- et al. is written correctly [et is a single word - no period, al is an abbreviation (alli) - include a period] and means “and others.”
- Within the text, Arabic numbers 1-10 should be written as words (one-ten), unless contrary to the style manual followed.
- Percentages must be spelled out when used as subjects of sentences, unless contrary to the style manual followed.
- Arabic numerals in general and years in particular must be spelled out at the beginning of a sentence.

D. Abbreviations

- Abbreviations within the text must be first introduced spelled in full followed by the abbreviation in parentheses [e.g., American Journal of Botany (AJB)]. If an abbreviation is used only once, it should be omitted.
- Starting a sentence with an abbreviation should be avoided. Restructuring the sentence is suggested.
- Journal and book titles must be spelled in full within the BIBLIOGRAPHY, REFERENCES, or LITERATURE CITED.
- State names should be spelled in full.

- The word “and” must be used instead of “&” in all CHAPTER titles.
- The words Figure and Table must be spelled in full within figure and table titles (abbreviation may be used within the text, depending on format followed, but must be consistent).
- Ph.D. is the acceptable abbreviation for Doctor of Philosophy.
- M.F.A. is the acceptable abbreviation for Master of Fine Arts.

E. Capitalization

- The prospectus and thesis titles are fully capitalized.
- All chapter headings (e.g., TABLE OF CONTENTS, LIST OF FIGURES, ABSTRACT, etc.) are capitalized in full.
- Both the chapter number (e.g., CHAPTER I) and chapter title (e.g., INTRODUCTION) should be fully capitalized.
- First-level subtitles are entirely capitalized.
- The first word and proper nouns of second-level headings are capitalized.

6. Figure and Table Formats

A. Figures

- Figures include: photographs; drawings (CAUTION: illustrations may suggest an artist’s interpretation; work closely with your illustrator!); graphs (e.g. line, bar, pie, etc.); diagrams (using symbols); and maps.
- Figures are numbered sequentially throughout the thesis (NOT by chapter) and given an Arabic number. Figures included within an appendix are designated A1, A2, A3, etc.
- Figures are cited parenthetically within the text. Do not include specific figure reference sentences (e.g., See figure 3. or These data are shown in Figure 3.).
- Figures should be included on separate pages, inserted immediately following the first citation.
- Figures should be centered, vertically and horizontally, within the margins.
- Each figure must have a figure title. The title is located below the figure and should include all information necessary for interpreting the figure (in general, figures and titles stand independent of the text). Depending on the departmental thesis guide used (Table 2), this title may or may not be a sentence.
- All figure titles must follow the correct capitalization for titles.
- A single space is inserted between the Figure and title.
- Figure titles are double spaced.
- If the figure is too large for the inclusion of the figure title on the same page, the figure title is to be included on the preceding page, centered both vertically and horizontally within the margins.

- Figure titles are the same font style and size as the text (Times New Roman, 12 point).
- Although text within figures should be the same font style (Times New Roman), size may vary, but not unreasonably so (e.g., too small to read).
- If multiple images are included within a single figure, each must be labeled separately (e.g., a, b, c, etc.) and explained within the figure title.
- Symbols must be explained within the figure title.
- If the figure is being used with permission, a credit line (e.g., photo by Carol Fairlie) or citation should be included within parentheses at the end of the figure title.
- All figure titles must end with a period.

B. Tables

- Tables are used to present numerical data and/or short parallel descriptions (e.g., voucher information) that otherwise would have to be listed in the text.
- Tables are numbered sequentially and given an Arabic number. Tables included within an appendix are designated A1, A2, A3, etc.
- Tables are cited parenthetically within the text. Do not include specific table reference sentences (e.g., These data are shown in Table 3. or See Table 3.).
- Tables are embedded within the text, positioned as close as possible to the first citation after finishing the paragraph that includes the citation.
- Triple spacing occurs above and below the table to slightly separate it from the text.
- The table and title are double spaced.
- Each table must include a title. The table title is located at the top of the table, at the left table margin, and should include all information necessary for interpreting the table (in general tables and titles stand independent of the text). Depending on the departmental thesis guide used (Table 2), this title may or may not be a sentence.
- All table titles must follow the correct capitalization for titles.
- A single line space is inserted between the table and title.
- If the table is too large for a single page, it may be reoriented in a landscape position or extended over additional pages. For each additional page, the table title should be repeated followed by “continued.” Column headings should be repeated on each subsequent page.
- Table title and content are the same font style and size as the text (Times New Roman, 12 point).
- All table titles must end with a period.
- Table entries should be consistently aligned. For example, each numerical digit (ones, tens, hundreds, etc.) and decimal points should align with the inclusion of a zero before if no number is available (e.g., 0.17).

- Symbols and/or abbreviations must be explained within the table title or below the table.
- A single line, the bottom rule, is placed at the end of the table, with additional information (e.g., explanation of abbreviations) located below the bottom rule.

7. Quotations

- Block quotations should be set apart from the text by one double space above and below, and adjusted left (2.0 inches) and right (1.5 inches) margins.
- The block quote font style and size remains the same as the text (Times New Roman, 12 point).
- Block quotations should be double spaced and indented 0.5 inches from both right and left margins.
- The American Style should be followed for quotation mark placement and use. Double quotation marks (“”) are used for a primary quotation and single quotation marks (‘’) for a quotation within a quote. The closing quotation mark should be placed after a comma or period, even if the punctuation mark is not part of the quotation, before a semicolon or colon, and after any other punctuation mark (e.g., !, ?, etc.) if it is part of the quotation.
- Quotations cited within the text should include the page number of the quote [e.g., Smith 2005: 346 (where 346 equals the page number)].

8. Departmental Specifics

- Scientific names are spelled in full at the beginning of a sentence and may or may not be abbreviated within the text.
- The first letter of a genus name is capitalized; the specific epithet is not. Both the genus and specific epithet are typed in italics or underlined.

SECTION V SUBMISSION, REVISION, AND COPY REQUIREMENTS

1. Submission, Revision, and Copy Requirements

- After extensive revision by the thesis committee chair, the completed thesis is to be submitted, printed on white paper, to the departmental committee at least **nine** weeks prior to graduation. The student then has **three** weeks to successfully defend the thesis, make necessary corrections, and obtain committee signatures.
 - The thesis should **not** be defended until completed.
 - The completed thesis should be given to thesis committee members a minimum of two weeks prior to the date of the defense.

- **One copy of the signature page must be submitted to the Dean's Office when the completed thesis is given to the thesis committee. After the signature page is checked by the thesis editor, it should be picked up from the Dean's Office, corrected, if necessary, and provided for signatures at the thesis defense.**
- For all steps during the revision process, a separate statement of the guide followed is required. When a journal style is followed, a copy of the format guide and **two** sample papers should be included at the time the thesis is submitted. Deliberate deviations from the style manual or journal must be noted with justification.
- The thesis should **not** be submitted to the Dean's office until the defense has been completed and the student has passed.
- The original copy of the thesis, a completed Checklist for Theses (see Section VI), and a minimum of four copies of the thesis approval page individually signed by the committee members must be in the Dean's Office no later than **six** weeks prior to the date of graduation.
 - Failure to make the deadline of **six** weeks prior to graduation may result in a postponement of graduation.
 - All signature pages should be made on required white bond paper, with at least one signature in blue ink.
 - The original copy of the thesis and a minimum of four copies of the thesis approval page, all printed on white paper, need to be submitted within a labeled manila envelope.
 - Original signature pages will remain in the student's file until finished theses are returned to the Dean's Office.
 - A completed Checklist for Theses must be turned into the Dean's Office along with the original copy of the thesis and a minimum of four copies of the thesis approval page individually signed by the committee members.
- For all steps during the revision process, a separate statement of the guide followed is required. When a journal style is followed, a copy of the format guide and sample paper should be included at the time the thesis is submitted. Deliberate deviations from the style manual or journal must be noted with justification.
- The Dean's Office will forward the thesis to the College of Arts and Sciences' Thesis Editor. When edited, the thesis will be returned to the Dean's Office and then to the student.
 - The student should discuss all changes with the thesis committee chair.
 - Any disagreement concerning corrections should be conducted through the Dean's Office.
- When corrections are made, the thesis is submitted for final approval by the Dean.

- Following corrections indicated by the Dean, the final thesis and all copies, a separate copy of the thesis abstract, and an Abstract Title Page, all printed on required white bond paper, are returned to the Dean's Office.
 - A minimum of **four** copies of the thesis is required: two copies for the Wildenthal Memorial Library, including one for the archives; one copy for the department; and one copy for the student.
 - While not required, additional copies may be purchased for family, thesis committee chair, etc. Check with the Dean's Office for current binding and shipping costs.
 - When the completed thesis is turned into the Dean's Office, the signature pages will be inserted within each copy.
 - The student will be given, requested to complete, and asked to return to the Dean's Office a required Master's Thesis publication agreement form.
 - The required receipt for binding is also turned into the Dean's Office at this time. Please check with the Dean's Office for current costs.
- One week prior to graduation the thesis shall be submitted by the Dean's Office to the Provost. After binding, the original and one copy are sent to the Wildenthal Memorial Library, one copy is sent to the student's department, and a minimum of one copy may be picked up by the student.
 - The Provost's Office will contact the student once the theses have been returned from the bindery.
 - The Provost's Office will distribute the theses to the Wildenthal Memorial Library and department.
 - It is the student's responsibility to pick up or make alternative arrangements for personal and/or all additional copies. If sent via United States mail, United Parcel Service, etc., all extra expenses must be paid before shipping.

2. Legibility

- The original must be created with a word processing program on a computer and must be printed on a "letter quality" setting of the printer.
- "Draft" level printed texts of the thesis are unacceptable.
- If copies are generated using a computer and printer, they, too, must be printed at a "letter quality" level.
- Copies may also be made using a photocopy machine, such as those found in the Wildenthal Memorial Library.
- The student is responsible for insuring that all text pages of the original and the required four copies are legible and correctly aligned.

3. Corrections

- Corrections must be made on a computer.
- Corrections made by hand (e.g., liquid correction fluid, tape, etc.) are not acceptable.

4. Binding and Fees

- Check with the Dean's Office for current binding and shipping costs.
- Complete the required Master's Thesis publication agreement form available in the Dean's Office.

5. Paper

- Paper size is 8.5 X 11.0 inches.
- Paper must be at least twenty-weight bond.
- Paper color must be white.

SECTION VI
COLLEGE OF ARTS AND SCIENCES CHECKLIST FOR THESIS
AND EDITING TEMPLATES

Before turning in your thesis to the Dean of Arts and Sciences, edit your work and check off each of the following to indicate that these requirements have been met. Theses will not be accepted until these guidelines are met. **Turn in this checklist with your thesis.**

FOR ALL THESES: Be sure that

- all pages have the following margins: 1.5" on left, 1" at top, right, and bottom. (Tip: Check each page with a hand-drawn, margin template. Use the sample on page 35 of the *Thesis Guidelines* as a guide.)
- all of the References or Literature Cited pages are double-spaced, with a single, blank, line space between each typed line of each entry and between entries.
- all chapter titles are centered (in all capitals) immediately below the top 1" margin. Be sure that all sub-titles for chapters are centered, all caps, one double space below the word CHAPTER (one blank line space between). See the spacing sample below.
- all initial chapter text begins one triple space below the chapter sub-title. A triple space leaves two, blank lines between lines of text. See the spacing sample below.
- spacing is correct both before and after all first-level subtitles and all second-level headings. (See *Thesis Guidelines*, p. 22). These constructions are preceded by a triple space (two blank line spaces) and followed by a double space (one blank line space).
- first-level subtitles are entirely capitalized (no italics) and begin on the left margin.
- second-level headings begin on the left margin, are in *italics*, and follow the capitalization rules for titles generally (See *Thesis Guidelines*, p. 22).
- all font is Times New Roman, 12 pt. (the type style and size in this checklist).

FOR SCIENCE THESES: Be sure that

- your thesis packet includes the thesis, a copy of the style-manual instructions from your chosen journal, and copies of two sample articles from the chosen journal.

BEGIN TEXT HERE. EVERYTHING FOLLOWING SHOULD BE DOUBLE-

SPACED. XXX

XX

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FIRST-LEVEL SUBTITLE

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Second-level Heading

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XXXXXXX

The Thesis Editor for the College of Arts and Sciences
will use a template similar to this one to check
the margins in your thesis.

Before turning in your thesis, you should check the margins
to be sure that you have followed the guidelines
and that the pages of your thesis did not become misaligned in printing.

Using a ruler and a black marker, make a template similar
to this one, with the correct margins marked
(left margin 1.5" and 1" all other margins).

Do not photocopy this example to use as your template; draw your own.

Check to see that the margins on each page
of your thesis are correct by placing
this template behind each page.

SECTION VII SAMPLE PAGES

1. Order of Sample Pages

- Prospectus Title Page
- Thesis Title Page
- Thesis Approval Page
- TABLE OF CONTENTS
- LIST OF TABLES
- LIST OF FIGURES
- CHAPTER I INTRODUCTION
- Abstract Title Page

NOTE: The pages of the guide are numbered sequentially. While the page numbers of the following sample page are in the correct position, specific numbers and kind (e.g., Roman numerals vs. Arabic numbers) will vary within the thesis.

PCR-BASED IDENTIFICATION OF *ESCHERICHIA COLI* O157:H7,
LISTERIA MONOCYTOGENES, AND METHICILLIN-RESISTANT
STAPHYLOCOCCUS AUREUS IN ENVIRONMENTAL SAMPLES

A Prospectus for the Degree Master of Science

by
Ryan T. Welsh

Approved:

Keith L. Sternes, Ph.D., Chair

Bonnie Warnock, Ph.D.

James C. Zech, Ph.D.

Approved:

Jim Case, Ph.D., Dean of Arts and Sciences

PCR-BASED IDENTIFICATION OF *ESCHERICHIA COLI* O157:H7,
LISTERIA MONOCYTOGENES, AND METHICILLIN-RESISTANT
STAPHYLOCOCCUS AUREUS IN ENVIRONMENTAL SAMPLES

A Thesis

Presented to the
College of Arts and Sciences
Sul Ross State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by

Ryan T. Welsh

May 2007

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Approved:

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CHAPTER I

INTRODUCTION

The risk of illness from water-associated recreation and use of a fresh or marine water source has been largely overlooked (31). Special circumstances, such as waste water reclamation and contamination, promote the growth of pathogenic bacteria which can lead to infections of humans who use the water source (19). Many of these pathogens are introduced into the Río Grande via sewage-treatment outflows and sources such as human and animal waste. Past studies have shown that the highest pathogen presence has been observed below human population centers, with inflows of untreated waste water, and below agricultural irrigation (18).

There is a need for better methods for detecting pathogenic bacteria in the water and sediments of watersheds. The detection by culturing of these pathogens in aquatic environments is expensive and time-consuming, making culturing impractical on a regular basis (31). Polymerase chain reaction (PCR) is a rapid method that has successfully detected bacteria in water, sediments, and soils (25). In this study, PCR testing was used on target Deoxyribonucleic acid (DNA) sequences to directly detect the pathogens of interest from the water and sediment of the Río Grande.

Generally, recovery of pathogens by culturing is not effective because many bacteria undergo a physiological and morphological change in aquatic environments (31). Bacteria in the environment endure a variety of biological, chemical, and physical stresses which include competition, predation, starvation, extremes of temperature and pH, radiation, and presence of antibiotics, algal toxins, and heavy metals (25). Under these stresses, pathogens persist into a nonculturable but viable (NCBV) stage, making

REASSESSING A LIZARD SURVEY IN BIG BEND NATIONAL PARK,
BREWSTER COUNTY, TEXAS

An Abstract of a Thesis
Presented to the
College of Arts and Sciences
Sul Ross State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
