

Suggestions for new and aspiring graduate students in wildlife science

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The transition from an undergraduate to a graduate program can be a difficult experience for students. Many undergraduates are unfamiliar with the process of preparing for graduate school, especially the search for a graduate program. Once in graduate school, they may be unfamiliar with requirements (both written and unwritten) and expectations, and they may also lack the necessary knowledge or skills to complete a graduate program successfully. For students in wildlife science graduate programs, these problems can become major issues, especially for students with undergraduate degrees in fields other than wildlife science (e.g., biology programs).

Although several authors have provided advice to graduate students (Stearns 1987, Huey 1987, Witz 1994), their suggestions either did not provide sufficient information for undergraduate students, or did not apply to graduate students in wildlife science. We provide information for undergraduates and new graduate students in wildlife science that is often unavailable prior to and during the initial phases of a graduate program. Our objectives are: (1) to provide advice on how to prepare for graduate school; (2) to provide an approach to locating, evaluating, and selecting potential graduate schools and a graduate advisor; (3) to describe the fundamentals of graduate school; and (4) to familiarize students with available tools and techniques to enhance a graduate program. We hope that university professors will provide this paper to undergraduates to aid those interested in attending graduate school. In addition, graduate advisors may wish to provide this paper to new graduate students as they begin their programs.

Preparing for graduate school

Preliminary steps

Have you wondered about what you really want to do upon completion of your undergraduate degree? If so, you are not alone. Undergraduates (and graduate students, too!) commonly feel uncertain about career plans. One approach to resolve this problem is to seek a variety of employment and educational opportunities such as paid or volunteer assistance, independent study for course credit, or cooperative education ("co-op") programs and internships.

Salaried or hourly wage jobs are often necessary to fulfill financial obligations; however, when feasible, volunteer work (e.g., assisting professors and graduate students with research projects) can frequently provide a greater diversity of experiences because you are not limited to projects with "extra" funding. If your school does not have a wildlife biology or similar program, you might volunteer your time with state and federal agencies (e.g., at wildlife management areas, national wildlife refuges, federal research centers) or private organizations (e.g., private ranches, timber companies, environmental organizations, consulting firms, Student Conserv. Assoc. [New Hampshire Conservation, P.O. Box 550, Charlestown, NH 03603]). This will usually require contacting an agency and following an established procedure for volunteer work; because of liability concerns, it may not be possible to "walk on" and do volunteer work with a government agency. You can also contact professors at nearby schools with natural resource or ecology programs to learn about other opportunities. Additional paid and volunteer employment opportunities can be found in publications and newsletters of

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various professional societies (Table 1) or on the internet (e.g., listservers, webpages).

Some universities offer cooperative education or internship opportunities. These programs allow you to integrate training with practical work experience, typically by alternating school semesters with co-op or internship semesters. You will spend a specified period of time under the supervision of a practicing wildlife professional in industry, business, educational institutions, nonprofit organizations, or government agencies. Check with your university for availability of these programs.

A position in the natural resources field can provide you with invaluable experience in problem solving and teamwork, give you exposure to a variety of research topics, test your career goals and assist you in selecting a career path that is most suited to your interests, and, if it is a paid position, even defray the costs of college education. Undergraduates should understand that these positions are an important commitment; the success of your assigned project is dependent on the quality of assistance that you provide. You should leave a positive impression of your work ethic and professionalism on the employer, including professors and graduate students, because they may be excellent sources for letters of recommendation. Work experience is a major criterion in the graduate student selection process for many graduate advisors (Harper 1995). Faculty want to know that prospective students can tolerate the physical and mental demands of field work.

Club and organization activity

Seek membership in student chapters of national organizations such as The Wildlife Society, American Fisheries Society, Society of American Foresters, and others. These organizations can enhance your prospects for acceptance into graduate school. Membership can broaden your perspective about career choices through interaction with other students, faculty, and guest speakers. Student chapters often travel to conclaves to compete with other university chapters in tests of professional knowledge and technical skills of the participants. These activities are very rewarding because they are a great learning experience and allow you the opportunity to interact with other wildlife professionals and students. Professional clubs are also a great place to learn of new jobs, graduate positions, or volunteer activities. Students also can enhance their leadership skills by serving as elected officers or committee chairpersons.

Grade point average

Your grade point average (GPA) is a major, but not exclusively important, component of your ap-

plication package. Most graduate schools and advisors require a minimum of a 3.0 GPA on a 4.0 scale for entrance (Harper 1995). You should also realize, however, that entrance into a graduate program does not ensure you of the most desirable projects. Competition for graduate research projects is often intense, and GPA is an important component in the selection process. GPAs well above the minimum entrance requirement may be necessary to secure a given project. You should not, however, be discouraged from contacting graduate advisors simply because your GPA does not meet a 3.0 standard. Work experience, Graduate Record Exam (GRE) scores, and other factors all interact with your GPA to determine your qualifications. Also consider that often the final 60 hours of your undergraduate program are more heavily weighed than the initial phases because they are generally "core" curriculum courses, and you have had time to mature and adjust to college.

Graduate Record Exam

The Graduate Record Exam is a standardized test that is required by most graduate programs in natural resource fields. Each department typically sets a minimum allowable score (typically ≥ 1000 combined verbal and quantitative scores, but highly variable among programs) or combination of acceptable GRE and GPA scores for entrance; these scores may be higher than the scores set for general admission into the university's graduate school. Some departments will accept a student with a lower-than-minimum GRE score into their program if the student has other credentials that indicates he or she is capable of graduate studies (e.g., grades, extensive experience, publications). Nevertheless, GRE scores are an essential component of the graduate student application package. In addition to the general exam, some schools require applicants to complete the biology subject test part of the GRE.

The GRE is expensive; \$96 general test, and \$96 subject test as of 19 December 1997. It is wise, therefore, to be prepared for the exam the first time you take it. Electronic and bound study guides are available at a moderate cost from some libraries, most bookstores, or on the Educational Testing Service web page (<http://www.ets.org>). These manuals contain a review of relevant material, a description of test conditions, and official GRE tests from previous years or practice tests. A computer version of the general test is also offered several times per month (also \$96), whereas the paper version is offered about quarterly.

Students are encouraged to take the GRE late in their junior year or early in their senior year because

Table 1. List of national and international professional societies and their respective publications that may contain advertisements of employment and graduate school opportunities.

Professional society	Publications with job/graduate school opportunities	Peer-review journal(s)
American Ornithologist's Union Cooper Ornithological Society Association of Field Ornithologists Wilson Ornithological Society	<i>Ornithological Newsletter</i> (Published by all 4 societies)	<i>Auk</i> <i>Condor</i> <i>Journal of Field Ornithology</i> <i>Wilson Bulletin</i>
American Society of Mammalogists American Fisheries Society Ecological Society of America	<i>Bulletin of the Ecological Society of America</i>	<i>Journal of Mammalogy</i> <i>Fisheries</i> <i>Ecology</i> , <i>Ecological Applications</i> , <i>Ecological Monographs</i>
Society of American Foresters Society of Wetland Scientists The Wildlife Society	<i>Journal of Forestry</i> <i>SWS Bulletin</i> <i>The Wildlifer</i>	<i>Journal of Forestry, Forest Science</i> <i>Wetlands</i> <i>The Wildlife Society Bulletin</i> <i>The Journal of Wildlife Management</i> <i>Wildlife Monographs</i>
Society for Range Management Wildlife Disease Association	<i>Rangelands, Trailboss</i> <i>Newsletter</i>	<i>Journal of Range Management</i> <i>Journal of Wildlife Diseases</i>

it takes approximately 6 weeks to receive test scores. In addition, an early test date will allow you to retake the exam if you are dissatisfied with your scores. If you are 1 of several potential candidates for a particular graduate research project, having your GRE scores early may help you secure the position. In some instances, professors may not be willing to commit funds to students until they know their GRE scores.

Letters of recommendation

Most schools will require letters of recommendation or a list of references in the application package. Prospective advisors often will contact ≥ 1 of these individuals to assess your suitability for the graduate position. You should, therefore, select your references carefully. Primary references should: (1) have knowledge of your academic and professional capabilities; (2) be familiar with relevant personal traits (e.g., ability to work with others, reliability, motivation, trustworthiness), and (3) have known you for a sufficient length of time to formulate an opinion. Appropriate references might be former supervisors or professors of courses in which you have excelled. Potential advisors usually are most interested in academic references that indicate your academic potential. When possible, attempt to maintain a strong relationship with faculty through coursework, volunteer work, and casual conversations. References outside of academia (e.g., state and federal agency personnel) may be useful in verifying your ability to do fieldwork. Before listing an individual as a reference, ask whether they would be willing to provide a reference or letter of recommendation. It is also a

good idea to forewarn them of positions for which you have applied, so that they will have time to critically evaluate your suitability for a given project and to formulate their response before being contacted by your prospective advisor.

Resume

The resume (or curriculum vitae) is an extremely important document that can make or break you during the early stages of application. You should examine copies of resumes prepared by professors and other students when developing your own to make sure that essential information is included. However, your resume should be considered an extension of yourself and should always be tailored to emphasize your strong points. The document must be crisp, clean, to-the-point, and error free; 1 misspelling or awkward statement may be all that it takes to eliminate you from a group of applicants. Therefore, ask several persons to critically evaluate draft copies before printing the final copy. It is a good idea to print copies on high-quality white bond paper, using either a laser or inkjet printer; under no circumstances should you submit a resume that has been printed on a dot-matrix printer or poorly reproduced on an inadequate copy machine. Length of the document is also very important. We recommend that entry-level resumes be concise and no longer than 2–3 pages.

Choosing a graduate program

Locating prospective graduate schools

Locating a graduate school that meets both your academic expectations and personal needs and de-

sires (e.g., a particular region of the country, research interests) and has available funding can be very frustrating and stressful for potential graduate students. Funded graduate-research studies often are advertised in professional periodicals (Table 1), professional meetings, or other information resources (Table 2). Although choosing an advertised research project often saves time and money over other search methods (if you are indeed selected for the project), you should still thoroughly evaluate the program, project, and professor before making a commitment to a program.

There are several other effective methods of locating potential graduate programs, especially when used in combination: (1) browse a book with a listing of university graduate programs in your area of interest (e.g., Anonymous 1994, Doughty 1994, Gordon 1995); (2) ask professors within your department for assistance; (3) contact local, state, or federal wildlife biologists and ask about potential schools; (4) browse journals of the respective professional societies within your chosen field (Table 1), noting authors and affiliations; and (5) use the World Wide Web to explore homepages of various wildlife departments. If you currently are attending a school that does not have a wildlife curriculum, the university librarian may be able to help you in locating information about potential graduate schools. If your library does not have a strong journal collection, then try to visit libraries at other universities.

Once you have a list of potential graduate schools, write a short letter to each department requesting additional information on requirements and deadlines for admission and general information on interests of professors in the department. This type of information is also often on the World Wide Web (Table 2). When you locate a professor with appealing interests, the next step is to contact him or her in writing. Professors generally prefer letters to telephone calls. We suggest that you avoid e-mail for your initial contact so that the ma-

terials you are presenting will appear as professional as possible.

Critical components of your initial correspondence are a cover letter and a current resume. In your letter, note that you will follow up with a telephone call at a later date. Also, state what research topics you are interested in (without being too specific or too general), your GPA and GRE scores, and the date you expect to be available. Do not be overly concerned if you are unsure what area of research you would like to pursue or if you feel you have an inadequate background in wildlife science. Students with undergraduate degrees in subjects other than wildlife are common in wildlife graduate programs; these students can bring different perspectives and experiences to a multidisciplinary field that are valuable in the development of new approaches and ideas. Most professors will respond within 3-6 weeks; others may not respond at all. Responses may include: (1) funding is not available, (2) no additional graduate students are currently being accepted, (3) funding is probable at a later date, or (4) funding is available.

Speaking with the advisor

If you have not heard from professors within 6 weeks of your initial contact, give them a telephone call. First, however, keep in mind that professors are very busy and the timing of your call could overlap with meetings or classes, so do not be alarmed if they must return your call later. Be prepared for your conversation; write down questions on a sheet of paper beforehand and leave some room for answers. We suggest asking, but not limiting yourself to, the following questions:

What projects are available? Often professors will have funded projects as well as ideas for additional projects. Ask them to describe these projects or their ideas. Several questions will likely develop from this conversation.

What types of funding would be associated with these projects? You should be aware of the

types of funding available and the responsibilities associated with each. Generally, funding comes in 3 forms: (1) fellowships, (2) teaching assistantships, and (3) research assistantships. However, there may be hourly wage jobs available for persons with particular field or laboratory skills.

Fellowships may be awarded by the university or department to outstanding students based

Table 2. Information resources for employment and graduate school opportunities.

Source	Description
<i>Job Seeker</i>	Provides a detailed listing of many graduate research projects and employment opportunities in wildlife science.
University Job Boards	Many wildlife departments have a specific area reserved for graduate student position and employment announcements.
Internet	A variety of sources of information can be found on the World Wide Web via various web-browser applications (e.g., Netscape). Also, subscribing to a "LISTSERV" on the internet allows you timely announcements of job and graduate positions, and access to a discussion forum for many wildlife issues.

upon grades, research accomplishments, or other qualifications. In addition, you can compete for fellowships through various private and public fellowship programs. Ask your prospective advisor and the financial aid office at the school about fellowships and scholarships available to graduate students.

Teaching assistantships are awarded to graduate students to assist in teaching labs or lecture courses within their major department or related departments. Teaching is rewarding as well as an essential experience for students entertaining thoughts of an academic career. However, teaching is time consuming and can affect the number of hours available for coursework, data collection, and data analysis. Many departments prefer to award teaching assistantships to Ph.D. students rather than M.S. students.

Research assistantships provide funds for graduate students to conduct some part of their own research. However, the graduate student may be required to collect data for other studies that specifically satisfy the requirements of the funding agency. Funding for both teaching and research assistantships is generally either 1/3 or 1/2 time, meaning that you are paid for 1/3 or 1/2 of a 40-hour week specifically for working on your research project. You will soon realize, however, that quality research requires considerably more hours of work than the hours for which you are actually paid. Graduate students typically work 60+ hours per week in order to excel at coursework and carry out their research. Although this may be difficult, you must think of graduate school as an investment in your future.

Is funding 100% secured? It is a common practice for some professors to accept graduate students without secured funding. At the Ph.D. level, it is sometimes the student's responsibility to secure all or part of their funding. At the M.S. level, however, be cautious of unfunded opportunities. The potential advantage of starting a graduate program without research funding (and a project) is that it can provide time to complete coursework before field work begins, thereby allowing time to concentrate solely on field work once funding is secured. The major disadvantage, however, is that funding may never be secured, or, if funding is secured, the research may not be what you had envisioned. In addition, if you are a nonresident student and unfunded, you will be required to pay out-of-state fees. Students on graduate research or teaching assistantships typically have nonresident fees waived. Discuss this with the professor prior to committing to a graduate program.

How much travel and research time away from home will the project require? Field work

can be located in remote locations for extended periods of time. These projects may be interesting, but they are not for everyone. Family commitments (e.g., marriage, children) can affect the suitability of a given project. In addition, find out what type of living conditions are expected during field work. These can range from tents to hotels to nice (or not-so-nice) homes; make sure you (and, if applicable, your family) would be satisfied with these conditions.

What is the average time most students need to complete degree requirements within their department? Generally speaking, 2-3 years is common for an M.S. program and 3-5 years for a Ph.D. If a professor notes that his or her students take longer, be sure to pursue the reasons why at a later date. This may simply mean that his or her students put forth a greater effort and study more complex problems, but it could also mean that the advisor is overly demanding or does a poor job of advising students. Be extremely cautious if the professor speaks poorly of his or her students, or blames them for their longer period of stay.

We add an additional word of caution if you are offered the opportunity to pursue a Ph.D. without first completing a Master's program. Although this is a flattering offer, it may not be in your best interest. The major advantage of this approach is that you may finish graduate school sooner than the average student. However, several disadvantages may also exist. During a Master's program, students are expected to learn about the research process but, inevitably, mistakes are made. Graduate advisors, committee members, and future employers are generally more forgiving of mistakes during this program. Doctoral students are expected to apply their research skills to develop and test new or existing theories. The room for error is small; thus research expertise is a prerequisite. The second potential disadvantage has to do with publications. The current job market for Ph.Ds is highly competitive; number of publications may be a major criterion of consideration for many jobs. The Master's program can provide you with the opportunity for additional publications, as well as opportunities to increase the breadth of your research experience.

What jobs have this department's recent graduates received? How many M.S. students went on for doctorates? The ultimate goal of any graduate student should be to secure a satisfying job. Are the types of jobs available to their students the kind that would satisfy you? If not, ask if anyone from their department has recently been employed doing the kind of work you would like to pursue. If you are interested in eventually pursuing a Ph.D., inquire

about the number of students who have located and successfully entered or completed Ph.D. programs.

Can you schedule a visit? If so, can you meet with additional faculty and graduate students?

You may be spending 3 years or more at the school you ultimately choose, and these individuals will help shape the future of your career; therefore, a visit is highly recommended. Interviews between prospective advisors and graduate students are also common at professional meetings. Scheduling an interview at a professional meeting may be 1 option to reduce your travel costs.

You must continue to be proactive with faculty. During your phone conversation, ask for specific information about when you will hear from them; do not hang up until you understand what the next step is in the application process. If the faculty member does not want to give a next step, then tell him or her that you will call back in 2 weeks to check again—and then do it.

Visiting the school

During your visit to the school, make sure that you discuss the projects you are considering with your potential advisor. Are there any new developments? Rehash your notes with him or her and make sure that nothing has changed, particularly in regard to the availability and types of funding. Also, ask the professor about graduate student facilities (e.g., office space, computers).

An essential component in evaluating any graduate program is visiting with the graduate students. Graduate students generally will be honest with you about the department; however, not everyone will have the same opinion, so talk with as many students as possible (including students with other advisors) to gain insight about the professor and the department. Ask the students if funding is adequate and stable and if they would choose the same department again if given the chance. Also, ask them about your potential advisor. Is he or she easy to work with and well respected by the other faculty? Does he or she encourage or provide funding for students to attend scientific meetings?

During the visit, see as much of the entire school and town as you can. Would you and your family like this area? Obtain and review the classified section of the local newspaper, or other real estate guides, to determine if housing is affordable. Also, go by the bookstore or graduate school and peruse a graduate catalog.

Making the decision

The decision to attend a particular school or to work with a particular professor is a personal one.

Regardless of the quality of the department, some people will like it and others will not. Carefully consider all the advantages and disadvantages of a given program before making your final decision. Graduate school is stressful enough in a place you enjoy; an unenjoyable place can make the situation unbearable.

Inform the professor in writing if you plan to attend the school. If you decide to accept a position, make sure your application has been accepted by the graduate school. Notify any other potential graduate advisors that are interested in you that you have made a decision to attend another school. They will appreciate the courtesy and can remove you from their list of candidates. Be sure to get the details of an offer in writing, including funding, work requirements, and insurance. Understand the costs of attending the institution, including tuition, books, and insurance; these vary greatly from school to school. For example, some universities waive all tuition and fees if a student is on an assistantship; others waive only out-of-state tuition. Some universities offer health insurance; this may be critical for a student with a family. Additionally, inquire about the research funding to determine if it will last the duration of your tenure as a student, or you may have to seek a job while finishing your thesis. Finally, know the requirements for completion of the degree, including passing a qualifying exam and defending a thesis.

Graduate school

Once you begin graduate school, you will find that there is a progression of key steps that you must follow to complete your program. These steps include establishing a funded research program (with a graduate advisor), selecting a graduate committee, choosing a course curriculum (plan of study), developing a research proposal, executing coursework and research, and writing and defending a thesis or dissertation. These topics are discussed below.

Graduate committees

The graduate committee typically consists of 3–5 faculty members, including your advisor, who serve as a steering committee for your program. Major duties of this committee include reviews of your proposed coursework, research proposal, and thesis or dissertation. It is your task to determine the faculty members who will provide the most benefit to you in the development and execution of your program.

Faculty members often are very busy; some may be too busy or already obligated to too many other graduate committees to be helpful to you. Discuss the positive and negative aspects of potential com-

mittee members with your advisor and other graduate students. Do not hesitate to meet informally with potential committee members to discuss your research and then determine their interest and likely input. After all, this committee will ultimately decide your fate!

Once you have chosen a committee, you should plan at least 1 committee meeting during your first or second semester to discuss proposed coursework and to review your research proposal. During committee meetings, be prepared to review the general scope and direction of your research. This will keep your committee updated on your progress. Additionally, Keppie (1990) suggested that graduate students may ask the committee what criteria they will use to assess success. Look for experts in your field, other than committee members, who may be able to give you additional help with your research. If possible, plan on taking at least 1 course under each of your committee members; of course, you should plan on performing well in these courses.

Finally, personality conflicts, differences in opinion, and a variable level of involvement are inevitable among committee members. You can minimize problems by talking with other graduate students and identifying faculty members who may have personality conflicts with you or with other committee members. During committee meetings, do not get directly involved in disputes between committee members; let your advisor intervene when necessary. For more information on the kind of guidance and support you might expect from your graduate advisor, see Stock (1985) and Binkley (1988).

Coursework

Coursework does not end when you enter graduate school. A graduate degree in wildlife science requires that you be both a good student and field researcher, often concurrently. You must schedule and complete a certain number of hours for each graduate degree. Although your department or university will have its own requirements, do not feel constrained by the courses offered in your department when proposing a course list. Examine other departments or colleges at your university for courses that will help diversify your knowledge and training in the natural sciences (e.g., agronomy, range sciences, ecology) as well as other important disciplines (e.g., economics, public speaking, geography, computer science, statistics). A course in college teaching is beneficial to any aspiring college professor.

Several professional societies (e.g., The Wildlife Society, Society of Wetland Scientists) offer certifi-

cation programs for professionals. These programs have minimum coursework and experience requirements that must be fulfilled prior to certification. If interested, review the qualifications of these societies during the development of your course curriculum.

Research proposals

The research proposal is the foundation of a graduate research program and is the blueprint for the execution of research that will ultimately be your thesis. In consultation with your advisor, you should be prepared to start work on your research proposal shortly after beginning your graduate program; some departments require a completed proposal during the first or second quarter or semester. The typical research proposal clearly explains why your research is necessary (Introduction and Justification), where and when the work will occur (Study Area), and how data will be collected and statistically analyzed (Methods). Your advisor often has provided groundwork for the study by obtaining funding, conducting a preliminary literature review, and constructing a brief scope of work. Be sure that there is opportunity for you to either develop, modify, or expand the research scope. A completely structured and unchangeable research project may stifle your creativity and ability to think critically.

Writing a research proposal is also 1 of the most stressful undertakings of your graduate program. Be prepared to read and synthesize a large amount of literature while in the process of taking classes. Students often choose to take most of their classes early in their program in order to have more time for data analysis and thesis preparation near the completion of their program. However, course availability and the demand for field research may make this difficult to arrange.

The quality of graduate research is related to the study design developed in the research proposal. Poorly designed research typically leads to poor-quality results. Prior to conducting research, some wildlife departments require you to present a seminar to the graduate faculty and students in which you outline your research proposal. This gives you an opportunity to receive feedback on your study design and methods. Ratti and Garton (1994) provided an excellent review of the steps that should be considered in the development of a research project, including experimental design, hypothesis formulation and testing, and data analysis. Anyone involved in designing or executing a research project should read this chapter thoroughly. For appropriate methodology for wildlife data collection, helpful ref-

erences include The Wildlife Society's publication *Research and Management Techniques for Wildlife and Habitats* (Bookhout 1994) or recent journal articles dealing with similar types of research.

An M.S. student often is not expected to go beyond the scope of the groundwork established by the advisor; however, Ph.D. students are expected to take the next step and develop ideas for original research. Keppie (1990:456) suggested that the difference between M.S. and Ph.D. students is only a "matter of emphasis" in their guidance and encouragement. The caliber of M.S. research projects varies from identification of simple life-history traits to ingenious hypothesis testing that approaches the "why" questions. Although the former type of study is necessary and important in some situations, be wary of projects designed to study simple life-history traits of common species in a limited portion of their range. Hunter (1989) described this as the "Arcadia Principle." You should look for projects that will allow you to test hypotheses that will lead to meaningful contributions to wildlife science (Keppie 1990).

Field research

Field research often sets wildlife and other natural resources disciplines apart from other graduate disciplines. Many graduate research projects in wildlife science require extensive time away from the university, long work periods (60–80 hr/week or more are common), and sometimes in remote locations with few amenities or modern conveniences. Field research can be rigorous, lonely, and frustrating, yet very rewarding. Physical and mental preparation may be needed before entering the field. Moreover, extended field research may be difficult for married students. Carefully consider this when selecting a graduate research project that may require long periods away from home. Consult with your advisor about the availability of funding to hire ≥ 1 technician. Technicians will help you complete your primary objectives so that you will have time to address additional research questions. You will also gain some supervisory experience.

While conducting your research, do not feel confined by the objectives defined in your research proposal. Ideas and opportunities often arise in the field. A little insight can lead to data that may provide you with a stronger thesis or an additional publication. However, your initial objectives are your priority and these objectives should be satisfied before you take on additional work. Moreover, additional research should be discussed with your advisor.

If you have ≥ 2 nonconsecutive field seasons, spend time between seasons analyzing your results

and evaluating your approach to your research; you may develop new ideas at this time. You should present your preliminary results and your new ideas to your graduate committee or at a professional meeting. You may receive helpful suggestions and new insights that will be valuable in developing and testing new hypotheses and refining current techniques.

Volunteer on research projects of other professors or graduate students. You can learn new techniques, share ideas, or just enjoy a change of pace from your own research. However, remember to fulfill your own research objectives and requirements before offering extensive assistance to others.

Finally, research often follows Murphy's Law; it is rarely as straightforward as journal articles may lead you to believe. Don't be discouraged if things don't go quite as planned; learn, be willing to adapt, and persevere. Look for ways to improve existing techniques; journal articles occasionally develop from techniques that solve problems in the field.

Writing, publishing, and professional meetings

We begin this section with the thesis because this document is "published." Writing a thesis is time consuming; it requires a work-area free of distractions. Your advisor, department, or university may have a limited space and computer facilities. Students often choose to purchase a personal computer to complete this phase of their program. Although computers are expensive, many campus bookstores offer an educational discount for computers and software.

Becoming a good writer takes time, experience, and practice. Your ability to write effectively may be critical to your success as a graduate student. Your thesis is reviewed by your committee and then shelved at your university library where it can be retrieved by others. You do not want to leave a shabby thesis behind for others to read. Seek good writers to review your writing and help you to improve it. Your advisor should be an experienced scientific writer; ask for a critical review of your proposal and thesis and talk about ways to improve your writing. Pay close attention to editorial comments. Good starting points for improving your technical writing skills include the *CBE Style Manual* (CBE Style Manual Committee 1983), Mack (1986), Day (1995), and Lertzman (1995).

The final step in the scientific method is to make results of research available to others. You should strive to publish results of your research in peer-reviewed journals, agency publications, or presentations and proceedings at scientific meetings (Ratti and Garton 1994). Whenever possible, attend pro-

professional meetings and plan to present at least 1 paper during each level of your graduate career (i.e., M.S., Ph.D.). Too many students graduate with poorly developed public speaking and written communication skills. Attendance at meetings also will allow you to interact with other scientists whose interests and research is similar to your own. Meetings also provide opportunities to meet potential employers. Travel funds may be available for professional meetings; check first with your graduate advisor, then with the society or organization sponsoring the meeting, and finally with your university's student government or graduate student organizations. Also, student papers are judged at some meetings and there are sometimes cash awards for best papers.

We believe that the best way to prepare a thesis is to write separate chapters for each topic covered in your research. Thesis chapters may then be submitted as separate manuscripts for publication in a peer-reviewed journal. However, you should consult the thesis guidelines for your graduate school; some universities may not allow this format. Most manuscripts submitted for publication are reviewed and criticized far more thoroughly than thesis or dissertation chapters. To improve your manuscript's likelihood of acceptance by a journal, have it reviewed by several other professionals prior to submission. This critical step may identify problem areas that can be remedied before journal reviewers begin to evaluate your manuscript.

Manuscripts are submitted to an editor or associate editor, who then distributes copies to qualified natural resource scientists and professionals for review. The peer-review process determines the suitability of your manuscript for publication in that journal. The review process for most journals takes at least 3–4 months. Subsequently, your manuscript is returned to the editor or associate editor with a recommendation to accept with minor revisions, accept with major revisions, or reject as unsuitable. The journal editor will then return your manuscript as unsuitable for publication or with specific instructions for revision. Do not be discouraged by harsh criticism of your research and writing, or by outright rejection; this is a common and important component of the professional development process. You may be inclined to blame the reviewers for misinterpreting your writing or providing a poor review. Carefully consider their comments; if they did not understand something that appears clear to you, it is likely that many other readers will have the same problems. You may improve the manuscript by incorporating suggestions provided by reviewers and be able to resubmit the revision to the same or another journal. The Wildlife So-

ciety is taking steps to educate students in this process by providing workshops designed to familiarize students with the editorial process (Thompson et al. 1994).

There are certain ethical guidelines for authorship that should be followed when publishing manuscripts from a thesis or dissertation. To prevent misunderstandings, authorship should be discussed with your advisor early in your program. Typically, the student is first author (i.e., senior author) and the graduate advisor is co-author. Other co-authors might be persons who actively supervised field research, were involved directly in obtaining funding for the study, conducted extensive field research, or provided extensive statistical analyses (Dickson et al. 1978, Galindo-Leal 1996).

Other recommendations

There are a few other considerations that we would like to mention. First, you do not need to eliminate your social life to be successful in graduate school. This may be a time to foster friendships that will last a lifetime.

Second, networking can be very beneficial to you in the future. Getting a job involves not only what you know, but often who you know. Employers are more likely to hire someone they know they can enjoyably work with on a daily basis. To demonstrate your ability to work with others and for others to become familiar with you and your work, volunteer on student committees at school or with professional societies, participate in student functions or social events at professional meetings, and present papers or posters at these meeting. Do not hesitate to introduce yourself to others; you might be surprised where it leads.

Finally, we would like to reiterate that graduate school is an investment in your future. As with any investment, success is a result of wise decisions, learning from your mistakes, and the amount of time and effort you put forth. Dedication and perseverance are 2 traits that characterize virtually all successful graduate students.

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