

Guidelines for Technical Writing

The Proposal

Introduction

Writing proposals is a common task in environmental management. You might write a proposal to an research funding agency, to a foundation that supports nonprofits, or to your boss in an internal competition for institutional support. The details will vary accordingly, but the critical elements are essentially the same in every case.

Proposal Outline

The narrative structure of a proposal should lead the reader—a reviewer—logically from problem statement to problem solution. In this case, a reviewer will want to know: *What is the issue at stake here? What do you propose to do about it? and How are you going to accomplish this?* The proposal itself will demonstrate that you have marshalled the conceptual understanding and technical tools to do what you have proposed.

More generally, writing a proposal is a two-level competition with other people who are also submitting proposals to the same agency or funder. At one level, you are selling apples and you need to convince the reviewers that they should invest in apples rather than oranges or bananas. Once past that challenge, you must win at another level: you must convince the reviewers that they should invest in *your* apples instead of somebody else's apples. You lose if you fail at either level; to win, you must win twice.

Much of the success of a proposal depends on it sounding natural and logical—it must *make sense*—and much of this depends on its structural arrangement. This is a narrative device that you can modify to your own needs. Begin with the outline below, and modify it as appropriate for your system or perspective.

Introduction

Tell the reviewer about the system, in a narrative overview. *Why is it interesting?* This is the apples-versus-oranges-or-bananas competition, and you must win this case.

Focus on only one especially compelling issue. This defines the *scope* of the problem to be addressed in your proposal. Tell the reviewer what you propose to do about this—in general terms, without the technical details. This is the overall *goal* of your proposal. In a real proposal, you need to convince the client or funding agency that the work you propose to do *needs to be done*, and that *you can do it*. To convince the reviewer that the work needs to be done is your main task in the Introduction; your ability to do it will be demonstrated in the Introduction and especially Methods section.

There will be a tendency to load a lot of background information into the Introduction. This can work, but often this gets distracting—and you cannot afford to let the reviewer get distracted! It probably will be more useful and make for a better narrative flow if you embed your background information in various places where it is most appropriate to the specific discussion at hand. In the Introduction, relevant background should include a brief review or references to authoritative works on the same subject. By citing the key references you are telling the reviewer two things:

(1) that other people also think this is an important subject, and (2) that you are familiar with this body of work. The first part sells the subject, the second sells you (if you fail to cite the important papers by people working in this area, you will have little credibility). Other background information will fit better elsewhere in the proposal, as indicated below.

Objectives

Focus from the broad issues presented in the Introduction, to a specific issue that you plan to resolve. Restate your goal succinctly, and itemize a few specific objectives that you will meet. Remember, the hallmarks of objectives (as compared to goals) are that objectives are specific, quantifiable, their successful completion can be gauged (i.e., you can tell when you're done, and whether you've succeeded), and they have a fixed time-line (a target date). As a narrative device, your Objectives can be phrased as objectives, research questions, or hypotheses—whatever feels most natural to you. Your itemized Objectives should map closely onto a set of specific Research Tasks to be described below.

Study Area

What is the study system? Why is this a good place to address the question you have raised in the Introduction? This is partly a matching game, wherein you pose a compelling question (above) and then present a study system that will provide the logistical or other leverage to answer that compelling question. This section also begins the translation from “this issue is important” to “I can do this” (because this is *your* study area).

This is another spot where background information and key references can fit naturally, especially if you have selected this study area specifically to build upon previous work there. If you are working at a place because it is an especially good exemplar of a more broadly distributed system, then add some background on the general system *before* zooming in to your study area, and then explain why it will be a good case study. For example, you might talk generally about longleaf pine savannas before introducing the Sandhills; or you might describe coral reefs before introducing your study island; or you might delineate a focal study area within a larger mountain range. How you choose your local study area should follow naturally from your goals and should lead naturally to your Methods.

Methods

Your methods section has all the details that the reviewer should need to fully understand what you propose and to gauge whether you are likely to succeed. Depending on your project, the Methods might include several subsections (Approach, Data Collection, Analysis). But at some level, this section needs to focus on specific Tasks that correspond to your specific objectives itemized in the Introduction. These tasks should make it clear how you will meet each of the objectives and so achieve your overall goal.

Approach

Provide an outline or overview of your approach to the specific questions raised as objectives. Is this a GIS-based analysis? Are you going to develop a model? Is it mostly a field study? Will you survey or interview stakeholders? What key relationships would you need to demonstrate? Is what you're doing different from how others have approached the problem

previously?

Whatever your approach, this section might include a few key references that identify this general approach (i.e., the leading proponents, or a seminal study). If you are proposing a new approach to an old problem, you must include more background here because you must convince the reviewer that your way is likely to work better than the old way.

Data Collection

What data are critical to these analyses? What data are already available? How will you collect any new data that you need? What sampling design will you use? It sometimes is convenient to summarize or itemize the data in a table (it saves space). Use citations to refer to existing datasets or to specific sampling designs. This section must pass a feasibility test by reviewers; if you propose something that is logistically crazy, you lose.

Analyses

What will you do with the data? How will your analyses be conducted? What technique(s) will you use—ANOVA? partial regression? Classification tree analysis?

While you needn't be perfectly explicit about your analyses at this point (after all, you don't have your data yet), you do need to convince the reader that you know what you're doing and you'll do the analyses appropriately. Key references to similar analyses will help sell this.

Alternative arrangements

The structure of your Methods section should be modified to present the work as clearly as possible. Your proposal probably will include several analyses, corresponding to your specific objectives as itemized previously. If these analyses all use the same data, then itemize your Research Tasks under the Analyses section. If each Task requires its own data, then itemize separate Data and Analysis sections under each Task. Similarly, if your project will develop or use a simulation model, then you need to include a Model Development section in the Methods in which you describe the model and how you'll use it.

Schedule

In most proposals it is helpful to include a short section in which you schedule your research tasks, as a flowchart of how the project will unfold. This might be a time-line in which you itemize which field tasks or analyses will be done in each season (e.g., summer vs. fall/winter/spring) during each year of the project. This section should also itemize any benchmarks you plan to meet along the way.

Anticipated Results and Products

What results do you anticipate, and how would you interpret or respond to various alternative findings? For example, are you looking for the partials from a regression analysis as a means of inferring the relative importance of various explanatory variables? Are you seeking specific effects in an ANOVA? How will these results answer the specific questions you raised as objectives?

Finally, what product(s) will you provide when finished? How will your project meet your objectives and help resolve the issue(s) you raised in your Introduction? You should end by reiterating your initial goal (echo the Introduction) and make it clear why you should do this project. In short, why will it be a wonderful thing that you have done this project?

Technical Details

Style

Follow a standard scientific style such as those used in the journal articles you've been reading in your discipline. This is a technical document, so although writing engagingly in the first person is appropriate (and encouraged!), an overly casual or informal style is not. Strive to be clear and concise, but without omitting crucial information.

References

Cite those articles and books you've used to support your points or to document methods as needed. Use references judiciously. Remember, the reason you provide a citation is to justify a decision you've made (e.g., a particular analysis method) or to guide the reader to a source of additional information as needed. In either case, the more specific the reference, the better. You should be aware that the way you cite references will cue the reader (reviewer!) whether you actually know the literature or are merely arm-waving.

Cite references in a consistent style such as that used in your discipline. Personal communications are acceptable when necessary (e.g., personal communication of unpublished data). The format for referencing these is "Blah blah blah (H.L. Schwarz, Wisconsin Department of Natural Resources, *pers. comm.*)" or "I used field data collected as part of the Park's monitoring program (J. Blow, Yosemite National Park Research Office, *unpublished data*)."

In general, only quality-checked information that is archival and generally accessible is citable in scientific documents. Websites that are maintained in archival fashion are citable. Cite these in the text by source and date (USGS 1999) and in the References section by author, date ("last updated" date on the webpage), the name of the site or webpage, and its URL. Websites that contain information that is not peer reviewed or subject to scientific quality assurance protocols should not be cited as primary references. For this reason, on-line lecture notes or other course materials are not citable. Websites with an agenda (e.g., advocacy groups) should be avoided or cited as *public communications*.

Structure

Use sections and subsections as necessary to guide the flow of your paper. Some of these (Introduction, Methods) are clearly needed; others will depend on your own needs. Use figures and tables as necessary to emphasize points or reduce verbiage. Remember that your goal is to make the paper as concise and as clear as possible to readers who probably do not share your expertise.

One easy check on the logical flow of a paper (proposal or otherwise) is to outline the paper in simple phrases or sentence fragments, no more than one per line. Then simply trace through the outline, line by line, and ensure that each line follows directly from the previous line and leads naturally to the next line. If this doesn't scan easily, rearrange the lines.

When you expand the outline into prose, a similar litmus test will help you enforce the logical structure of your paragraphs. Try to write sentences that pick up an idea from the previous sentence and carry it forward to the next sentence. If the bits of information in your paragraph can be represented by letters of the alphabet, then you might strive for a sentence flow that runs something like: *A -> B. B -> C. C -> D.* and so on. You cannot do this for all sentences, of course (the result would be boring), but if you stray too far from this structure you risk losing your reader.

Page limits

Almost all programs that invite proposals also dictate page limits and (often) other details about the proposal. Clearly, you must adhere to these guidelines. Less clearly, you should adhere *closely* to these guidelines. If the limit is 15 pages and you submit a 6-page proposal, you are sending a clear message (and one that does not bode well for you). Almost always, you will have to much stuff for the page limits; how you condense material and focus on particular ideas or analytic details is hugely important. This is because these decisions demonstrate how well you understand the context of your proposed project, and how well you appreciate the unique contribution of your project to this larger body of work.