

## Proposal tips from a recent grant panel

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Recently, I had the pleasure of serving as panel manager for the USDA NIFA AFRI ‘Controlling Weedy and Invasive Plants’ competitive grants program. The panel was comprised of top scientists at various career stages, with balanced institutional, geographic and gender representation. We were able to recommend some very good and innovative research proposals for funding. However, we also reviewed some proposals that contained interesting ideas but had serious limitations that eliminated them from further consideration. I thought it might be useful to share the insights that we gained with those wishing to hone proposals for submission to future competitions. Although this advice is motivated by this particular program, it is broadly relevant to all proposal development. We hope you find it helpful.

**1. Be responsive to the RFA.** Competitive grant programs exist to help funding agencies accomplish their mission. When reading the request for application (RFA), pay close attention to the funding body’s goals and the criteria for relevance. For example, the very short description for the FY 2013 AFRI Weedy and Invasive Plants program reads:

‘This priority area supports projects that focus on compelling scientific questions underlying current issues in weed and invasive plant management in crops, managed forests and rangeland including:

- Ecological processes related to integrated pest management;
- The evolution, spread and mitigation of herbicide resistance based on an understanding of ecological fitness and gene flow; or
- Other ecological or evolutionary studies that would inform weed management strategies, including links between agronomic practices and weed problems.’

The core message is that this program supports projects that advance the scientific basis for management of weedy and invasive plants. Proposals should feature compelling science, current and/or emerging issues, and strong links to weedy and invasive plant management in arable, forested, rangeland and wildland systems. The suggested research areas are intentionally broad and inclusive, but there are limits. Your proposal may be brilliant, but if it does not fit the program it will not be funded. If you have questions about an RFA, call the program leader well in advance of submitting a pre-proposal. Clarifying the RFA is an important part of a program leader’s responsibilities.

Having a letter of intent accepted doesn’t guarantee that your project will be a perfect fit with the RFA. It is up to you to remain aware of this when writing the full proposal, and to explain clearly how your research will advance the program goals.

**2. State your hypotheses and objectives.** Your proposal should be built on clearly articulated hypotheses to be tested or questions to be asked, and these should be stated early in the narrative. ‘Fishing expeditions’ in which data will be collected without a clear, compelling hypothesis guiding the work will provoke negative reactions in reviewers. For example, a proposal asking

for support for a massive sequencing effort of a particular weed species, with no justification for what the team is looking for or how the results will be used, is unlikely to succeed. Explain how different experiments are linked to each other and to the overarching research question or hypothesis, and don't tack on an unrelated research activity simply because it is currently fashionable or is a pet project of one of the investigators.

Avoid contingent hypotheses and experiments, in which the latter in a series become irrelevant or unattainable if the first or second are falsified as the project proceeds. We all know that experiments don't always turn out as we expect them to. For this reason too, a well-written 'Pitfalls and Limitations' section helps satisfy reviewers that you know your system: acknowledge what can go wrong, discuss the limitations for inferences made from the data, and develop credible, well-supported contingency plans for responding to such issues.

**3. Support your claims.** The various sections of a proposal consist of series of assertions. Some of these claims relate to current knowledge gaps and are stated as hypotheses, whereas others are statements of why the project is needed (rationale) or what you intend to do (approach). In each case, your claims need to be supported by the best available information. This can take the form of a concise but thorough review of the literature establishing the scientific context for the problem. Make sure that the problem is novel and that your research questions have not already been addressed by other groups. Preliminary data collected by the proposal authors that point to the need for the project will greatly strengthen your proposal. Such preliminary results are best presented as tables or figures, although a brief statement of the key results is acceptable if you cite work that has already been published. Avoid citing papers 'in prep' or 'in review' – the reviewer has no way of accessing these to confirm your results, or even the existence of the paper – and remember that unsubstantiated or exaggerated claims (aka 'baloney') will rapidly undermine your proposal and reduce the credibility of its authors in the minds of the reviewers.

**4. Choose the right tools for the job and explain them fully.** Many proposals don't achieve their full potential due to inappropriate, or more often inadequately explained, experimental methods. When selecting a particular experimental approach to address an objective, three important considerations are scale, precision and feasibility of measurements. Natural phenomena occur at many levels of scale along different dimensions, such as space, time and taxonomy. Tools should be chosen that have adequate precision at the required scale. For example, using genetic markers that only provide taxonomic resolution at the family or genus level, while attempting to address an objective aimed at the intraspecific level, simply won't work. If you claim that a particular tool will do the job, support this claim with appropriate references, and provide sufficient detail when describing your methods that the panel can assess their validity. Don't forget this also applies to your proposed statistical analyses, which should be clearly explained and justified. If you are unsure whether a tool or approach is appropriate, seek input from an outside expert, either as an advisor or as a collaborator.

Reviewers will also assess whether your experimental approach is feasible within your specified time frame and budget. Don't be tempted to propose huge multifactorial designs that defy meaningful analysis or experiments with so many replicates that data collection would be impossible with the available resources. Equally, it may be ideal to perform an experiment at different scales, but the cost or logistics may be prohibitive. If you plan a scaled-back version, it can be beneficial to explain your rationale for doing so.

**5. Make it easy for reviewers.** Grant proposal reviewers are your peers, but not all those who read your proposal are experts in your particular sub-field. Reviewers are also volunteering their time on top of their regular jobs. They get tired and cranky after reading several lengthy proposals late at night, so make it as easy as possible for them to understand and like your proposal. An effective way to do this is to remember that a research proposal (or a scientific paper, for that matter) is simply *telling a story with data*. The best stories keep the reviewer nodding appreciatively from the first line all the way to the end. There should be a strong narrative flow through the proposal, starting with an informative title and a gripping (but not exaggerated) summary section. To make these first sections compelling, it is critical to spend time honing your sales pitch. Can you explain to a colleague in your department who is not a specialist in your field, in no more than two minutes, why your project is exciting? If you can't, reconsider what is the core of your project, and refocus around this until you can.

The remaining sections of the proposal need to flow in a clear, organized way from the pitch that is made on the first page of the introduction. This pitch should contain a clear central question supported by a strong rationale and tightly linked to three to four main objectives. Use figures when appropriate to illustrate your main points, and make it easy for reviewers to identify these points through judicious use of formatting (e.g. italicizing a key phrase). Sometimes a photo of your system could be useful - remember that the panel comes from all over the US but may not have visited or have a full appreciation of all other regions and systems. Preferences for organizational structure vary among writers, but many of the reviewers on my panel preferred to see proposals organized by objective, so that all the related information (experimental design and methods, statistical analyses, anticipated results etc.) was close by and easy to find.

An important point that is often overlooked: take time to proof-read your proposal carefully. Typos may be good for a laugh (e.g. 'flatuation' instead of fluctuation), however they will not do your proposal any favors. Errors in spelling and grammar, incorrectly cited references, or missing proposal sections make you look unprofessional and raise doubts among the reviewers as to whether your research is equally sloppy.

**6. Be persistent and hone your proposal writing skills.** Think ahead, and build a strong case over time for testing a particular hypothesis by collecting preliminary data and assembling a fact-pattern that points to your proposed work as the next step. Test out your big picture ideas on colleagues and graduate students as part of local group meetings. If you submit a proposal that is not funded, don't give up. Read reviewer comments carefully to determine where the problem lies, and address their suggestions for improvement in a new submission.

Another good way to become familiar with the criteria for success in a given program is to ask colleagues who have been recently successful to let you read their funded proposals. Finally, you might consider volunteering as a panel member so that you'll have the opportunity to review proposals. Participants in the panel that I managed, especially early-career scientists, found it a useful, informative and fun experience that greatly increased their understanding of what it takes to get a proposal funded by this program.