

EDITORIAL OPINION

# Writing for an International Audience

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## Abstract

Authors submitting to *Restoration Ecology* and other international publishing venues need to give careful thought to framing their manuscripts to maximize the relevance of their message to an international audience. I discuss five questions that all authors should reflect upon in framing their papers. Namely, authors should consider which conclusions will be most relevant to an international audience, the scope of systems to which these conclusions apply, and the amount of data supporting these conclusions. Authors

should also think about the breadth of the literature cited and the degree of replication of the study. Localized studies are critical to implementing ecological restoration, but all authors, regardless of their intended outlet, need to carefully consider their audience. To publish successfully in an international journal, such as *Restoration Ecology*, authors need to frame their results within a broad context.

**Key words:** communication, ecological restoration, restoration ecology.

## Introduction

I have served on the editorial board for *Restoration Ecology* for 8 years and I am now the associate editor of the Island Press-Society for Ecological Restoration International “Science and Practice of Ecological Restoration” book series. In these positions, I find myself writing the same comment to authors repeatedly—namely, “why would an international audience be interested in your work?”

Ecological restoration is a place-based activity. A detailed understanding of the natural history of the area to be restored is critical, and results of restoration projects and experiments are notoriously site specific. Therefore, it is of utmost importance to communicate detailed results to land managers, or better yet to collaborate with them to find out which species are most appropriate for their conditions and to identify localized obstacles to restoration. But, as with all writing and speaking one must always consider the audience. In my experience, land managers are more likely to obtain information from one-on-one meetings, regional working groups and seminars, and extension publications rather than from scientific publications. Although these modes of communication do not always count for much in academic promotion, they are critical to putting research results into application.

Likewise, when writing for an international venue, you need to think about the audience and what would interest them in your work. Below I briefly discuss five interrelated questions that I recommend every author who wants to publish in *Restoration Ecology* or another international outlet

consider when framing their message, regardless of where they conducted their work.

## Questions to Consider in Framing Papers

### What Conclusions from My Study Would be Relevant and Novel to Land Managers and Scientists Working in Other Ecosystems and Socio-Economic Contexts?

Another way to phrase this question is, “if I were reading a similar study on another continent, which of the results would be most interesting to me?” To illustrate, a few years ago I was working with a Ph.D. student who was writing up his results from a tropical dry forest restoration study in central Brazil. Specifically, the experiment had tested direct seeding, planting seedlings, and grass removal as strategies to facilitate forest recovery. We could have discussed which specific species grew best from seed and seedlings, but that information primarily would have been of interest to land managers in that region who are unlikely to read a scientific article in English. Instead, we focused on points that were more transferable to other systems. For example, the data showed that mechanical tree planting, a common restoration method, damages many naturally resprouting trees and shrubs. As a result, planting does not increase the total number of tree seedlings (Sampaio et al. 2007). This result highlights the importance of documenting natural regeneration before intervening to facilitate recovery (applicable to any system) and the potential detrimental effects of planting on resprouts (applicable to a range of ecosystems where resprouting is an important mode of regeneration).

Obviously, focusing on main points of interest to an international audience means that some details that are relevant to local practitioners will not be discussed fully. But, it is

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rarely possible to present all the results from a study within article length constraints, so picking and choosing those results most appropriate to the audience are essential regardless of the publishing venue. One way to share detailed species lists, site history information, and other carefully selected details of interest to a regional audience is to provide online Supplementary Appendices that can be accessed online, an option offered by *Restoration Ecology* and many international journals.

One topic that is unlikely to be of interest to a broad audience is localized block-specific effects within sites, unless the authors can provide a mechanistic explanation for those effects that may apply more broadly. I have reviewed many papers where authors spend extensive space comparing results from blocks A, B, and C, when those results are meaningless to readers unfamiliar with the region.

### What is the Geographic Scope of the Literature I Am Citing?

If your results are to be of interest to readers from other parts of the world, then results from those other regions and ecosystems should be referred to. For the restoration community to make more powerful recommendations about how to improve restoration efforts, it is critical to compare results across a range of systems in order to determine which results are consistent and more or less reliable, rather than merely site specific. Therefore, you should be drawing on literature from a range of systems and biogeographic regions both to frame your questions and to compare your results. These comparisons should go beyond just broad generalities (e.g. “similar studies have been conducted in other parts of the world”) to a critical analysis of similarities and differences in the applicability of theoretical principles and ecological mechanisms in different systems. Certainly, it will be necessary to draw on local references to introduce the reader to your specific system. But, if you only draw on references from your “own” system, you are in effect excluding people working in other systems from the discussion. It is also a good sign that you need to think about framing your questions and conclusions more broadly.

Clearly, access to the published literature varies a great deal among countries and institutions, and reading this literature is much more challenging for people whose first language is not English. Fortunately, the advent of publicly accessible online databases (e.g. Google scholar) and the ability to email authors directly for electronic copies of their articles has made the ability to obtain relevant literature easier. I recommend that *Restoration Ecology* consider publishing article abstracts and “implications for practice” in the language of the country in which the study was conducted, which would be consistent with the goal of making the journal more international and the information more accessible to land managers.

### To Which Ecological and Socio-Economic Systems Do My World View and Results Apply?

I recently reviewed a manuscript for an international audience in which the authors stated “Fire is an event that occurs naturally in nearly all ecosystems throughout the world.” I was

taken aback. Fire is certainly a “natural” disturbance in many ecosystems. However, fire is not a historic disturbance type in many systems, such as tropical forests, where unprovoked fires are rare and anthropogenic fires are a profound perturbation and can shift some areas of tropical forest to savannahs (Zarin et al. 2005; Nepstad et al. 2008). Moreover, fire is one of several disturbances (e.g. flooding, hurricanes, drought) that are important to the ecology and restoration in many systems. Similarly, I have read several publications on including volunteers in restoration that assume that there is an ample supply of volunteers anywhere restoration is done. Although that is often true in certain regions of developed countries, it is not likely to be true in other regions of economically developed countries, not to mention in the many other countries, where incomes are low and people struggle daily to put food on the table.

We certainly all have the tendency to spend so much time talking and thinking about our local or “favorite” ecosystems and/or socio-political systems, that we fall into the trap of thinking that the rest of the world works and thinks the same way we do. But, in asking the first and second questions mentioned above to frame messages for an international audience, it is important to consider the scope of systems to which your results do and do not apply. If you investigate restoration of deserts in the western United States, ask yourself whether your results might apply to other arid ecosystems and if so to which ones. If you study financial incentives for restoring tropical forests in Amazonia, in what other countries or ecosystems are those results relevant?

### Is My Study Sufficiently Well Replicated to Generalize My Results?

Over a quarter century ago, Hurlbert (1984) cautioned about the risk of generalizing research conclusions beyond the spatial or biophysical context of the study. Studies that have large enough experimental units to incorporate extensive spatial heterogeneity, and/or are replicated at multiple sites across a region, allow scientists to make robust generalizations about restoration. Small-scale, single-site studies, which are also valuable to inform local restoration efforts, are usually more suitable for regional than international journals. Certainly, the application of a single site study can be increased by a rigorous comparison with other studies.

To illustrate the need for multi-site replication to generalize results, over the past 5 years I have been involved in a tropical forest restoration study in southern Costa Rica that is replicated at 14 sites, all separated by at least 0.7 km (Cole et al. 2010). One of the most striking results, consistent with most multi-site studies, has been the enormous site-specific differences in almost every variable, ranging from tree growth to seed rain to bird abundances (Cole et al. 2010; Holl, Zahawi, and Lindell, unpublished data). When results are similar across such a range of heterogeneous sites, my collaborators and I feel confident in making broad generalizations, and where we find striking differences it allows us to question the mechanisms underlying the differences. In comparison, studies carried out at a single site run a great risk in misleading land managers

when conclusions are drawn about how to restore any given ecosystem type.

It is frequently time and cost-prohibitive to set up labor intensive restoration experiments at multiple sites. But, restoration projects offer an excellent potential for collaboration between scientists and land managers who can help increase spatial replication (Holl et al. 2003). Land managers often have land and some money for doing restoration, whereas scientists are more likely to have the expertise and resources to monitor the outcomes. Ideally, scientists and land managers should collaborate from the start on experimental design, but there are a range of statistical techniques, such as meta-analysis, that allow for comparisons across multiple studies (Holl et al. 2003). For example, in California, many land managers use techniques such as manual removal, mechanical removal, and burning, to remove invasive annual shrubs, such as *Genista monspessulana* (French broom) and *Cytisus scoparius* (Scotch Broom). Alexander and D'Antonio (2003) took advantage of these similar management actions to compare methods that were not replicated within sites. By synthesizing results of restoration actions across several sites, they found that the effectiveness of these treatments varied more across a coastal-inland gradient, than as a function of slope, aspect, or soil physical or chemical parameters. In other words, this study draws interesting conclusions about which management actions will be most effective depending on specific site conditions, without conducting detailed scientific experiments.

**Are My Conclusions Supported by My Data and, Conversely, Are All My Data Necessary to Support My Conclusions?**

Magnusson (1996) outlines how to “write backwards.” In a nutshell, the approach is to write down your three to six main conclusions first, then present only the results needed to support the conclusions, next write only the methods necessary to explain how the results were obtained, and finally write the introduction and discussion focusing on questions that the conclusions answer. This one-page paper transformed the way I write and provides excellent advice for anyone writing a manuscript, regardless of the intended outlet. It is particularly relevant for international journals with limited space. Most authors need to give much more thought to what conclusions can be drawn specifically from their data and, conversely, which data and analyses are most important to support those conclusions. I regularly tell graduate students to accept from the outset that they will only use 30–40% of the data they spent so much time and angst collecting, and I find that percentage is not too much higher for senior scientists. Remind yourself that by letting go of some of your data and conclusions you are much more likely to clearly communicate your most important messages and not to lose your reader.

Authors submitting to *Restoration Ecology* need to apply these rules to their “implications for practice.” They also must carefully consider which of their conclusions are likely to

inform restorationists working on the ground. The majority of papers I review for *Restoration Ecology* include “implications for practice” that are wholly unsupported by data or are so broad that they do not add to the existing body of knowledge (e.g. “It is important to compare restored sites to reference ecosystems”). Implications for practice should be conclusions that are clearly supported by research results presented in the paper and provide focused recommendations to land managers.

## Conclusions

In conclusion, I reiterate that most restoration studies have local, regional, and global implications and that studies spanning a wide range of experimental approaches and temporal and spatial scales are most valuable to inform restoration efforts. However, even those dealing with a single experiment in a single ecosystem have great potential value, depending on how they are evaluated and presented. What is critical to effectively communicate the results of any study is to consider what conclusions will be of most interest to the target audience. I am confident that if you think about the questions I have raised, you will be more likely to have your manuscripts accepted in international journals and that, more importantly, you will have a better chance of your message being heard and having a real effect.

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