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Grant-Making Criteria for Developing Useful and Usable Marine Science: A Philanthropic Perspective

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Decades of scholarship and practice highlight the need for scientific research that informs individuals on the front lines of decision-making. Funding organizations can play an important role in supporting useful and usable research by discussing the criteria and processes they use to guide the development and review of funded projects. However, practical examples of how funders can engage with grantees on the design of research efforts are not widely available. In this article, we respond to calls for more information in this area by presenting one example of evaluation criteria and guidance questions used by a philanthropic grant-making program that is focused on user-driven research. We describe this process through the lens of a funded research project that was designed to inform improvements in coastal habitat restoration. We hope that a closer look at an example of how to evaluate project ideas for their potential to provide critical information to decision-makers can be useful for other funders and researchers trying to produce useful and usable science.

Keywords: science funding, science policy, marine science, research utilization, science-practice interaction, coastal management, boundary organizations, boundary spanning

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INTRODUCTION

Research funders play a crucial role in supporting scientific evidence that can inform decision-making (Lyall et al., 2013; Trueblood et al., 2019; Arnott et al., 2020a; Cvitanovic et al., 2021; Gruby et al., 2021). In the last few decades, multiple groups from regulatory and scientific circles (Funtowicz and Ravetz, 1993; Lubchenco, 1998; Gibbons, 1999; Hart and Yohannes, 2019) to practitioners in conservation-related fields (Palmer, 2009; Akerlof et al., 2021; Society for Ecological Restoration[1]) have emphasized the critical need to fund useful and "usable" science, defined as "science that meets the changing needs of decision-makers" (SPARC Usable Science Handbook[2]). Public and private funding institutions that focus on collaborative research can be particularly effective in both providing research dollars and sharing their expertise about how to design projects that have a high likelihood of use in the decision-making process (Bednarek et al., 2015, 2018; Cvitanovic et al., 2021). However, few institutions share the approaches and criteria they

[1]https://www.ser.org/page/about

[2]https://sciencepolicy.colorado.edu/research_areas/sparc/outreach/sparc_handbook/index.html

use to identify, develop, and support useful and usable research projects (Arnott et al., 2020b). In response to the call for funders to share their approaches, in this article, we outline a grant-making tool used by a marine science philanthropy program to guide the development and evaluation of research projects intended to inform decision-makers, managers and practitioners.

Guidance on how to develop research that is useful and usable is not new (Clark and Majone, 1985; Jasanoff et al., 1998; Sarewitz and Pielke, 1999; Beier et al., 2017), and funders can encourage this engagement through their grant-making (Matso and Becker, 2015; Arnott et al., 2020a,b). For example, in a review of past projects supported by the United States National Estuarine Research Reserve System (NERRS), the participating researchers found that "escalating funding requirements for collaboration with users changes research practice and strengthens connections between research outcomes and knowledge use" (Matso and Becker, 2015; Arnott et al., 2020b). However, supporting usable science requires a non-traditional approach to grant-making that allows for flexibility and iterative engagement between program officers, grant applicants, and information users such as managers and practitioners (Cvitanovic et al., 2021).

Because they often sit at the intersection of science, management, and policy, funders of usable science are well positioned to help scientists consider how their research projects are designed and implemented. Informally, program officers can help cultivate audiences for a project and connect the scientists with new contacts. They may also serve as conveners of one-on-one dialogues, structured meetings, or workshops. These types of actions enable scientists to better understand how their research can inform decisions that address pressing societal issues and set the stage for continued relationships. Formally, funding organizations can use grant-making tools such as solicitations, application questions, grant criteria, evaluation metrics, or review panel compositions to encourage collaborative proposals from researchers and practitioners (Matso and Becker, 2015; Arnott et al., 2020a) or design competitive grant opportunities (Matso and Becker, 2014; Meadow et al., 2015; Bremer and Meisch, 2017; Arnott et al., 2020b). Furthermore, they may also use 1-year "planning exercises" to encourage engagement and the co-design of research projects (RESTORE FFO, 2021[3]; NOAA Regional Integrated Sciences and Assessments Program[4]; National Science Foundation Convergence Accelerator[5]).

However, practical examples of the types of approaches used by philanthropic organizations are not widely reported, particularly in the fields of environmental and sustainability science (Arnott et al., 2020b). One reason is that engaging in interactive, collaborative dialogues to frame the scope and structure of scientific research is not intuitive or straightforward, and the role of funders in this dialogue is often absent or unacknowledged (Dilling and Lemos, 2011; Goodrich et al., 2020). While Arnott et al. (2020a) highlights that the solicitation process and grant criteria could be used as an initial incentive to urge grantees to propose useful and usable research, there is little guidance given to research funders about tools they can use (Cvitanovic et al., 2021).

Below, we present grant criteria and guidance questions from the Lenfest Ocean Program (LOP), a grant-making project of The Pew Charitable Trusts, as a demonstration of how these tools can be used to collaborate with potential grantees to design useful and usable research projects. A recent review of the Program's activities outlines additional actions that research funders should consider to enhance the impact of marine science on policy and practice (Cvitanovic et al., 2021).

GRANT CRITERIA FOR FUNDING USABLE SCIENCE

The program developed grant criteria (**Table 1**) to evaluate whether projects seeking support are (1) addressing decision-makers' priorities in the relevant management arena and/or jurisdiction; (2) asking the appropriate research questions to address the key information gaps that inform an issue or challenge of societal importance; and (3) incorporating the necessary activities and feedback loops with decision-makers and stakeholders to maximize the potential to produce useful and usable science. These criteria frame the internal review of the proposal, help to determine whether a project is a good fit for funding, and identify proposals' weaknesses and areas where project usability could be strengthened. Furthermore, the guidance highlights key elements for grantees to consider in research design, promotes consistency in proposal evaluation, and serves as a guide for providing feedback and structuring discussions between program officers and potential grantees as the project is being developed. By posting the criteria publicly online and sharing them openly with potential grantees and partners, we ensure that grantees have a clear understanding of the questions that are used to evaluate proposals.

As outlined in **Table 1**, program officers ask grantees to consider general questions in six categories: (1) topical relevance; (2) usable science; (3) project team qualifications, (4) research approach and methods; (5) project engagement; and (6) budget. This helps grantees to consider their projects through a management or policy lens. Within each category, the guidance questions underscore how the researcher's proposal considers the information needs of practitioners and stakeholders. While we use **Table 1** to guide our grant-making through iterative conversations with potential grantees, these questions could also be incorporated into open requests for proposals, Federal funding opportunities, or other types of grant-making processes.

Below we present how program officers used each of the grant criteria to guide the development of an environmental research project on coastal habitat restoration. These self-reported observations illustrate how we apply our guidance questions to potential grantees and audiences operating in different locations and at local, regional, and national scales of decision-making. Finally, while the example is drawn from marine science, these guidance questions can be employed by grantees and funders across different disciplines.

[3]https://restoreactscienceprogram.noaa.gov/funding-opportunities/ffo-2021

[4]https://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA/About-RISA

[5]https://www.nsf.gov/od/oia/convergence-accelerator/

TABLE 1 | Lenfest Ocean Program's general evaluation criteria and guidance questions used to develop useful and usable research projects followed by targeted questions and implications as they were applied to a funded project aimed at improving coastal habitat restoration by integrating ecological concepts into coastal restoration.

General criteria	General questions to guide discussion	Targeted questions to develop example project	Implications for example project's structure/design
Topical relevance	*Understanding the scientific and management context*: • What is the scientific and management context for the proposed research? • Does the project topic align with the priorities of LOP and the needs of the issue area? *Identifying specific information needs*: • Does the project address an existing problem or fill a knowledge gap?	*Understanding the scientific and management context*: • What information needs do coastal restoration managers and practitioners face? • What research would be positioned to fill those needs and ultimately improve restoration practice and success? *Identifying specific information needs*: • How aware are practitioners of the potential benefits of integrating positive species interactions into their restoration efforts? Is it a new concept to them?	Conversations between the grantee, LOP staff, and restoration managers and practitioners during the project design phase revealed that: • Past restoration projects had experienced mixed results, including costly failures; • These failures could be attributed, in part, to major gaps in local ecological knowledge about how interactions between species would contribute to restoration success or failure; • The grantee's proposed research would meet these needs by investigating the utility of integrating positive species interactions at relevant spatial and temporal scales in collaboration with partners overseeing ongoing restoration efforts.
Usable science	*Determining the scale of the proposed research:* • Will the proposed research produce information that can be used at appropriate geographic and governance scales for the intended users? • Can new information be provided in time for a decision-making window? *Strengthening relationships with managers, practitioners, and stakeholders:* • How were users involved in the formulation of the project idea? • Have the users/primary decision-makers participated in the development of the project or research questions? • Is it clear how new information is intended to be used to inform decision-making? • Do the research questions address specific needs of identified users/audiences? • Based on the decision-making landscape, what is the potential for the new information to be accepted by targeted users and integrated into decisions?	*Determining the scale of the proposed research:* • What locations do you plan to use as experimental sites, and what makes them ideal candidates for investigating the incorporation of positive species interactions into restoration efforts? • How would the research results be positioned to inform timely restoration decisions at those sites? *Strengthening relationships with managers, practitioners, and stakeholders:* • Who are the relevant restoration managers and/or practitioners that could use the research results to inform restoration efforts at the individual experimental sites, and how would they use this information? • Do you currently have relationships with individuals in charge of restoring habitats in all proposed areas, and have you discussed this project in the context of how it might address their information gaps? • How do you plan to use the collective results from all the experimental sites to inform other geographies faced with different ecological, logistical, and/or economic contexts and challenges?	Conversations between the grantee, LOP staff, and restoration managers and practitioners during the project design phase led to: • The identification and development of key strategic relationships between the grantee and at least one local researcher and one restoration practitioner in each case study region to encourage uptake of research results into decision-making; • Additional engagement opportunities between the grantee and other scientists and managers/decision-makers that could help the grantee share the results with the broader restoration community; • The selection of four experimental sites that had the potential to meet the expressed information needs at those sites, as well as the potential for the collective results to derive generalizable conclusions that could be transferred elsewhere.
Project team/ qualifications	Is the research team positioned for success given its collective technical expertise and ability to connect with relevant stakeholders involved in decision-making? • Does the team have credibility with the relevant audiences and stakeholders? • Have the researchers developed relationships with those involved in decision-making, and if not, are they willing to develop these connections? *Has the research team demonstrated the following:* • Skill sets needed to address the research questions? • Expertise/experience/willingness to learn engagement approaches? • Credibility with the relevant audiences (scientists/decision-makers/stakeholders)? • Productive relationships with proposed partners, target audiences, and/or intended users of the information users, or do they have a plan to develop them? *If an interdisciplinary approach or working group is proposed:* • Is the research team capable of leading a group and integrating knowledge across disciplines? • Do they detail why this approach is needed and what skill sets, geographic regions, or other factors will need to be considered when inviting group members?	What research have you previously completed in this field, and how might that research and your experiences be leveraged to complete this project? • What past experiences have you had in applying research results to inform decision-making concerning coastal restoration?	Conversations between the grantee, LOP staff, and other external experts during the project design phase confirmed that: • The grantee had the technical skills to complete the field experiments given their previously published work; • The grantee showed a willingness to work with LOP staff and restoration managers and practitioners in the field to ensure that the research project was aligned to meet their needs.

(Continued)

TABLE 1 | (Continued)

General criteria	General questions to guide discussion	Targeted questions to develop example project	Implications for example project's structure/design
Research approach and methods	Are the research approach and methods feasible and appropriate given the identified information needs facing key stakeholders? • Are the research approach and methods sufficient to fill the identified knowledge gaps and to inform decision-making on a timely basis and in a scientifically rigorous way? • Are the research methods feasible given available data and other factors?	Are the research questions focused and appropriate for the scale of the project, both in terms of the science and the needs of the restoration managers at individual sites? • How were these research questions identified and which individuals or groups were involved in developing them? • What research methods offer the best approach to investigate the potential benefits of integrating positive species interactions in restoration at the individual sites and across all four sites? • Will the proposed research methods and approach provide relevant and timely information that can be easily understood and used to inform restoration activities at each site?	Conversations between the grantee, LOP staff, and restoration managers and practitioners during the project design phase led to: • Early engagement between the grantee and restoration managers and practitioners at each experimental site to ensure the project's research questions were framed to address local information needs; • Planned field experiments that were positioned to produce real-world results in a time frame commensurate with the restoration work being executed at the individual experimental sites; • Integration of monitoring into the research plan to investigate the long-term benefits of incorporating positive interactions.
Project engagement	How will stakeholders be involved in the project once it's funded? • Are individuals who can influence the use of information engaged in the project as it is underway? Or is there an effort to include them? • Are engagement activities described in the proposal (e.g., workshops, calls or meetings with stakeholders, or collaboration on data)? Is the approach sound, practical, and appropriate? • Have potential challenges to engagement been identified and/or discussed?	How do you plan to engage with restoration managers and/or practitioners during the implementation of the research project so that its results are integrated into restoration design and execution? • What types of activities would be most useful for communicating results with stakeholders at the individual site level and the broader restoration community?	Conversations between the grantee, LOP staff, and restoration managers and practitioners during the project design phase resulted in: • Planned direct and consistent communication between the grantee and researchers and practitioner partners in each experimental study location to coordinate and adjust field work to meet practitioners' changing information needs through the life of the project; • Continued conversations with other regional, national, and international managers and practitioners who were positioned to amplify the reach of the research results to broader audiences within the restoration community; • Planned LOP support to identify and connect the grantee with key stakeholders interested in the project and its results, which included hosting a public webinar to introduce the project to broader audiences across the restoration, coastal zone management, and industry sectors.
Budget	Is the budget appropriate for the scale and scope of the project? • Does the budget include funds for engagement (team meetings/stakeholder briefings)? • Has the research team budgeted time to participate in engagement events? • Does the budget include funds to compensate users for their participation in the project, when appropriate?	Have you budgeted time and funds that facilitate engagement with your research and restoration practitioner partners at each experimental site? • Have you budgeted time and funds to facilitate interaction with stakeholders that have access to broader audiences of restoration managers and practitioners? • Do you plan to publish in open access journals, and have you budgeted for these publication costs?	Conversations between the grantee, LOP staff, and restoration managers and practitioners during the project design phase resulted in: • Building both time and travel into the budget to ensure active engagement between the grantee and both the research and restoration practitioner partners in each of the experimental sites; • Selecting experimental sites where existing restoration projects were underway to leverage existing support and stretch the project budget to include more case study sites; • Budgeting for open access fees for published work stemming from the field research to ensure broad communication of published results.

EXAMPLE PROJECT: INCREASING COASTAL HABITAT RESTORATION SUCCESS THROUGH ECOLOGICAL RESEARCH

Coastal restoration – or the planting of marsh grasses, oysters, and other ecologically important species – is pursued throughout the world to help mitigate the impacts of development, sea level rise, altered river flows, and other human caused stressors. In 2018, the LOP awarded a grant to Dr. Brian Silliman (Duke University) to lead a team of researchers to test whether enhancing natural partnerships between organisms can significantly increase restoration yields at four coastal restoration sites. As a practical example, in the sections below we examine the development of the project's research questions, structure, approach, and linkages to relevant audiences, through the lens of our grant criteria.

Topical Relevance

Understanding the Scientific and Management Context

Project development begins with an assessment of a proposed idea's relevance regarding its alignment with both the program's priorities as well as the information needs facing decision-makers. The management context was initially scoped by reviewing the existing literature and speaking with multiple scientific and management experts to understand the challenges around coastal habitat restoration. Through our independent investigations coupled with conversations with Dr. Silliman, we learned that (1) coastal habitats have continued to decline due to multiple threats (Gedan et al., 2009; Waycott et al., 2009; He and Silliman, 2019; Ostrowski et al., 2020), (2) marine coastal restoration projects designed to rebuild damaged or degraded habitats have had mixed results, including costly failures (Bayraktarov et al., 2016; Narayan et al., 2016), and (3) greater understanding of how habitats and species interact could potentially improve restoration efforts (Zhang et al., 2018). Furthermore, we discovered that the restoration community would be interested in scientific research positioned to improve restoration design and its outcomes.

Identifying Specific Information Needs

A growing body of published research showed that positive species interactions could enhance recovery of disturbed ecosystems (Halpern et al., 2007; Silliman et al., 2015; Renzi et al., 2019). Positive species interactions occur when species benefit from living near one another, as opposed to facing negative impacts, such as through competition for resources. Through further conversations, Dr. Silliman revealed that restoration practitioners consistently reported that they had not been integrating positive species interactions in practice despite their potential benefits. In essence, the field needed to bridge the divide between academic study and restoration practice.

Restoration practitioners must weigh the financial risks and the likelihood of restoration project failure when considering new information. With high costs and limited funding, they need to be confident that adopting a new approach will increase restoration success. Through informal informational conversations with national level managers and restoration practitioners, Dr. Silliman collaborated with us to identify and articulate the practitioners' key needs: (1) integrate results from small-scale experiments (i.e., 1 m^2) on positive interactions into larger restoration sites (i.e., 10'–100's m^2); (2) identify conditions under which positive species interactions should be considered in restoration design; and (3) synthesize the long-term impacts of integrating positive species interactions into restoration design. These concepts helped frame the design of the research project, which is discussed in the following sections.

Usable Science

Determining Scale of the Proposed Research

The grantee proposed four research locations - North Carolina, California, Netherlands, and China – where restoration projects were planned or currently underway (**Table 2**). Selecting specific restoration sites helped narrow the potential individuals and groups that should be consulted during project design as well as the management scale where decisions were being made. LOP staff encouraged the potential grantee to work directly with these local practitioners to tailor the design and implementation of the planned field experiments to meet their region-specific needs, which resulted in inclusive engagement with local partners in the proposed regions. Furthermore, we discussed how the collective research results from the candidate sites could be leveraged to inform restoration practices in other locations and environmental contexts.

Strengthening Relationships With Managers, Practitioners, and Stakeholders

Early engagement with stakeholders involved in the decision-making process represents a critical component for successful coastal restoration efforts (Bernhardt et al., 2007; Suding, 2011; Brown et al., 2014; Bayraktarov et al., 2016). Building on the collaborative relationships that were developed in each location (**Table 2**), the grantee invited at least one researcher and one practitioner partner in each location to collaborate on the design and execution of the field experiments. Formalizing these partnerships was essential given the different management systems and ecological considerations across the case study regions.

Research Approach and Methods

Tailoring the research approach to align with management processes and decision-making can be challenging given that scientists, managers, and practitioners naturally hold different objectives (CSPO, 2007; McNie, 2007; Bednarek et al., 2015; Bieluch et al., 2017). The guidance questions help grantees explore how research approaches can be adjusted to produce results that are feasible, timely, and usable in a management context.

As guided by the questions in **Table 1**, we encouraged Dr. Silliman to develop research questions and propose experiments through the lens of the practitioners' specific restoration objectives, needs, and timelines. By directly engaging with in-field partners, he prioritized research questions that focused on locally specific habitat types and organisms (e.g., endemic salt marsh plants and oyster beds) and restoration practitioner needs. Dr. Silliman also worked with his research and practitioner partners to ensure that results from field experiments could be scaled up to the size of the restoration area. Through these conversations, they determined the spatial dimensions of experimental plots that would be sufficient to demonstrate the potential benefits of positive species interactions. To the extent feasible, they chose sites that represented different ecological conditions – from salt marshes to estuarine environments and river deltas – to gain a sense of how positive species interactions fare in a variety of settings. Finally, if the experiments were not monitored over a sufficient period of time, practitioners might not have enough information to assess the potential utility of integrating positive species interactions over the long-term. Thus, the LOP suggested that the grantee discuss this aspect of the project with research

TABLE 2 | Site locations, restoration context, and partners identified through project scoping and development for integrating positive species interactions at four coastal restoration sites.

Site location	Restoration context	Stakeholder types	Stakeholders identified
North Carolina	The Coastal Federation was overseeing a coastal restoration project as part of their Living Shorelines Program to restore 5,000 linear meters of fringing salt marsh and oyster habitat.	Restoration practitioner partners: Science/research partners: Other key stakeholders:	The Coastal Federation Duke University NOAA Restoration Center
California	The Elkhorn Slough NERRS site was in the process of executing a restoration plan to add sediment to the salt marshes and were interested in integrating positive species interactions to help improve that restoration effort.	Restoration practitioner partners: Science/research partners: Other key stakeholders:	California Conservation Commission; NERRS NERRS; Sonoma State University NOAA Restoration Center
Netherlands	A 4-year restoration project called MERCES (Marine Ecosystem Restoration in Changing Seas) had just started and was focused on restoring over 300 acres of wetland and oyster reef habitat while also integrating innovative planting techniques into restoration efforts.	Restoration practitioner partners: Science/research partners: Other key stakeholders:	Netherlands Coastal Defense Commission; The Dutch Nature Conservancy; The Croatian Conservation Department; Norway's Coastal Planning Commission University of Groningen; Netherlands Institute of Ecology; the Deltares Engineering Firm The World Bank
China	Researchers from Beijing Normal University and Fudan University had started to develop coastal habitat restoration techniques that would be included in planned salt marsh restoration projects in Northern China.	Restoration practitioner partners: Science/research partners: Other key stakeholders:	Management Bureau of the Yellow River Delta National Nature Reserve; Management Committee of Liao River Delta National Nature Reserve Beijing Normal University and Fudan University China Oceanic Administration; China Forestry Administration

and practitioner partners, which led to a commitment to monitor the field experiments for a 10-year period.

Project Engagement

Sustained engagement between researchers, practitioners, and stakeholders is often critical to a project's success because it helps position researchers to (1) identify and connect with new potential audiences; (2) adapt the research approach if unforeseen challenges or opportunities arise, or if the decision landscape shifts over time (e.g., management staff turnover and evolving management priorities, etc.); and (3) translate results in ways that align with management processes and resonate with diverse stakeholders. Planning for this two-way dialogue can be accomplished through various channels, such as workshops, meetings, public webinars, communications materials (e.g., fact sheets and policy briefs), as well as one-on-one conversations with key authorities and staff (e.g., state or federal agencies, local community leaders, and NGOs). In other situations, advisory bodies are formed (Turner and Jordan, 2018), or stakeholder workshops are planned to provide input and support on the research and its usability for decision-making. In this project, we encouraged the grantee to plan for continued coordination and collaboration with researcher and restoration practitioner partners in each study location while also considering approaches to engage with individuals who could help identify other restoration efforts (e.g., the NERRS, NOAA Restoration Center, and World Bank).

While planning for engagement is important, executing those activities can require additional support. While not the focus of this paper, the LOP has an outreach and communications team that helps grantees carry out planned engagement and other communication tactics during project execution. For example, once this project was funded the LOP hosted a public webinar where Dr. Silliman introduced the project to broad audiences and resulted in several follow-up requests from managers and practitioners on how they could apply this type of research to restoration activities in their regions.

Budget

Project budgets are central to research design, yet they are often overlooked or underappreciated when considering how to support usable science. Engagement with relevant stakeholders, in particular, is often excluded from project budgets, signaling that it is less important than the technical research. However, we consider budgeting for engagement activities as crucial to the success of projects, and thus we hold dedicated discussions with grantees about their needs for potential engagement costs when developing projects.

Lenfest Ocean Program staff inquire how structured engagement with managers, practitioners, and/or other stakeholders is reflected in the proposed budget by evaluating explicit line items for the grantee's time, travel, or meeting costs outside those required to complete the technical work. Compensation for individuals outside of the project team, but who play a significant role as advisors or stakeholders is also emphasized. Additionally, LOP encourages researchers to budget for open access peer-reviewed journal fees to ensure research results can be shared widely. For this project, LOP staff encouraged the grantee to include time and travel in the budget to ensure active engagement with both the research and restoration practitioner partners in each of the experimental sites. The grantee also budgeted for open access fees for published work stemming from the field research.

DISCUSSION

Funders play an important role in shaping the field of useful and usable science, not only financially but also through the various

grant-making processes they use to identify, develop, and support research projects. While there are numerous philanthropic efforts that encourage the creation of useful and usable science, the field would benefit from more examples of how funders use grant-making criteria, processes, and tools to select and support individual research projects, which is rarely documented and communicated publicly. By sharing our grant criteria and walking through an example, we hope we have pulled back the curtain on one example of a grant-making process, and we encourage other funders to contribute similarly so that insights from the collective group can be used to compare the effectiveness of different grant-making approaches.

We find that having clear criteria and guidance questions provides a structure and consistency to the project development process regardless of topical focus, geography, or management context, and increases the likelihood that the research results are used in management. In this example project, our guidance questions prompted dialogue between researchers and practitioners, setting a foundation for shared learning and discovery of the practitioner's goals, information needs, and constraints, and the capabilities and limitations of the grantee's planned research. Establishing key relationships between the grantee and local research and practitioner partners supported the grantee to: (1) execute research that is currently being integrated into restoration efforts; (2) adjust to unanticipated changes in field conditions and management contexts, and (3) expand the dissemination of research information to managers and practitioners in other locations. These relationships ensured the usefulness and relevance of the research to address specific practitioner information needs at the individual restoration sites.

Our grant criteria have been informed by over a decade's worth of information stemming from external and internal evaluations of the "impact" of funded projects (Bednarek et al., 2015; Cvitanovic et al., 2021), and lessons learned from the published literature and ongoing discussions with colleagues about factors that ensure the greatest likelihood for knowledge creation and use in decision-making. Over this period, we developed a process for tracking the impact of our funding that helps us to examine how each project's design and execution contributed to the production and use of new knowledge by practitioners and stakeholders. We use this process to assess project-level successes and failures, but over time these insights have also helped us to refine our grant-making criteria and practices at the program-level. Through this feedback, our criteria and guidance questions embody the critical factors that require consideration when developing impactful useful and usable science.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

JPL, CGH, SLC, and EK conceived the idea and wrote the manuscript. VB, KR, and R-MP contributed critical feedback and helped shape the manuscript. All authors contributed to the article and approved the submitted version.

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