

**FY 2023 REPORT FOR NSF
COMMITTEES OF VISITORS (COVs)**

Tables 1 and 2 completed by NSF program staff.

Table 1 - Summary Information

Summary Information
Date of COV: June 7-9, 2023
Program/Cluster/Section: All DEB Programs
Division: Division of Environmental Biology
Directorate: Directorate for Biological Sciences
Number of actions reviewed: 215 Awards: 68 Declinations: 144 Other: 3 (Invited)
Total number of actions within Program/Cluster/Division during period under review: Awards: 1273 Declinations: 2939 Other: 27 (Invited)
Manner in which reviewed actions were selected: <p>The full list of DEB proposal actions from FY2019 to FY2022 was downloaded from the NSF Enterprise Information System. Non-lead collaborative jackets were removed from consideration because they duplicate documentation of the lead jackets, leaving a pool of 4239 unique actions during the period. Five percent of the jackets were selected for the sample by numbering each jacket using a random number generator function in Excel, sorting the numbers from lowest to highest and then selecting the first 215 jackets.</p> <p>This sample was checked for inclusion of all DEB programs, proposal types, award types, and action types. The sample was also compared to the full proposal list for geographic, institutional, and PI demographic representation but no additional proposals were added in these categories.</p>

COV Membership

Table 2 - COV Membership

Role	Name	Affiliation
COV Chair:	Dr. Anne Yoder	Duke University
COV Members:	Dr. Brian Allan Dr. Henry Bart (BIO AC Liaison) Dr. Creagh Breuner Dr. Keith Crandall Dr. Theresa Culley Dr. Linda Deegan Dr. Joseph Graber Dr. Kent Holsinger Dr. Jennifer Kovacs Dr. Kristina Schierenbeck Dr. Kathleen Treseder Dr. Jessica Ware	University of Illinois Urbana-Champaign Tulane University University of Montana George Washington University University of Cincinnati Woodwell Climate Research Center Department of Energy University of Connecticut Agnes Scott College California State University-Chico University of California-Irvine American Museum of Natural History

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them. Also included is a description of some examples of broader impacts, provided by the National Science Board

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities. These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([PAPPG Chapter II.C.2.d](#) contains additional information for use by proposers in development of the Project Description section of the

proposal.) Reviewers are strongly encouraged to review the criteria, including [PAPPG Chapter II.C.2.d](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

7. What is the potential for the proposed activity to:
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
8. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
9. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
10. How well qualified is the individual, team, or organization to conduct the proposed activities?
11. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.¹ "These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples."

¹ [NSB-MR-11-22](#)

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

Table 3 - Quality and Effectiveness of the Merit Review Process

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Commentary: The entire Committee of Visitors (COV) evaluated 384 jackets which resulted in reviews of 215 unique grants (given co-PI/Collaborative jackets). The vast majority were full research proposals, including both ad hoc and panelist reviews, with panel summaries and review analyses. Proposals had between 3 and 9 reviews (where noted by committee member). Most proposals were collaborative, multi-institution, and multi-investigator.</p> <p>We find the review process to be thorough and appropriate with substantial thought given to the representation of ad hoc and panel reviews.</p> <p>Emerging Issues: As a nation, we are only recently emerging from the COVID-19 pandemic. Along with the rest of the national workforce, the NSF was abruptly forced to take on new protocols across proposal evaluation, general working conditions, and work/life balance for both investigators and for NSF personnel. Given that we are the first COV charged with evaluating DEB's response and productivity during this time, we are uniquely placed to comment on which of these protocols we believe can best serve DEB moving forward. In Section I-7 we detail issues for consideration and provide recommendations on virtual vs in-person panels.</p> <p>As an overarching statement, the COV has been deeply and positively impressed by DEB's response to this global crisis with many on the Committee noting that there was virtually no diminishment in proposals evaluated and grants distributed, nor in the quality of the review process. We unanimously commend the NSF generally, and DEB specifically, for their immediate and effective response to what was a global crisis. In the words of many on the COV, "NSF-DEB was a</p>	<p>YES</p>

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>lifeline for the scientific community during the global pandemic."</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 6</p>	
<p>2. Are both merit review criteria addressed:</p> <p>a) In individual reviews? Broader Impacts were missing in one of 202 jackets reviewed per 2023 Self-Study, Table 3.</p> <p>b) In panel summaries? Yes, per 2023 Self-Study, Table 4.</p> <p>c) In Program Officer review analyses? Yes, per 2023 Self-Study, Table 5.</p> <p>Commentary: Both merit review criteria, Intellectual Merit (IM) and Broader Impacts (BI), are virtually always addressed in panel and ad hoc reviews. Both criteria are consistently addressed in panel summaries and review analyses. Panel summaries and review analyses are structured the same way, specifically addressing both IM and BI criteria strengths and weaknesses for each section of these documents.</p> <p>We note noticeable improvement in understanding of the BI criterion among investigators, page space devoted to BIs in proposals, and critical review and appreciation of BI plans by reviewers. Reviewers often point out weaknesses in BI plans and recommend that resources be requested for broader impacts activities. There are still sizable differences in the amount of page space devoted to articulating IM and BI, with typically much more space devoted to IM than BI.</p> <p>Commentary: We note the potential for inequity for researchers working from institutions with less ORSP (office of research and sponsored projects) infrastructure. Many larger institutions have offices dedicated to BI development at a level that is not possible at smaller institutions (even for those with high research focus). We note that these smaller institutions (sometimes Minority Serving Institutions (MSIs) or small colleges) often serve underrepresented students.</p> <p>Recommendation: We recommend greater clarity from the NSF regarding the importance of BI as communicated to the community; particularly as regards how BIs are assessed relative to IM in making funding decisions. Further, we recommend that DEB enhance its communication to PIs as how best to incorporate costs of BI activities in proposal budgets. We think this is especially important for newer investigators and/or PIs that have not served on review panels.</p> <p>Data Source: Jackets</p>	<p>YES</p>

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Commentary: Reviews can differ considerably in substance from non-substantive (and least helpful) to highly substantive and detailed (generally the most helpful). Some of the more substantive reviews were critical of the proposal and the advice may have thus been difficult for the investigator to read. The most common cases of this kind of reviewer criticism involved proposal concepts or study designs and aims that were not clearly articulated by the investigator. As long as the reviewer was clear about what they found questionable or confusing about the proposal the feedback is considered by the COV to be useful.</p> <p>In cases of special solicitations, with solicitation-specific requirements that proposers must address, there are other criteria that reviewers are asked to evaluate and these are reflected in Panel Summaries, making the feedback to proposers more detailed. It would be helpful to investigators if all program solicitations specified more items that proposers should address and also include these items in the review criteria. To the extent that criteria like these can be added to regular program solicitations, such information should improve reviewer and investigator feedback.</p> <p>In a conversation the COV had with DEB Program Officers, it was mentioned that some DEB programs offer panel reviewer training, generally in advance of panels, but do not offer training for ad hoc reviewers.</p> <p>Recommendation: Ad hoc reviewer training (e.g., office hours, a recorded webinar) could potentially benefit DEB programs and should be offered to the extent practical. The feedback that Principal Investigators (PIs) receive from more evaluative and substantive reviews and Panel Summaries will benefit both the scientific community and the NSF staff by making the review process and subsequent funding decisions more transparent. The COV believes that one relatively easy way to accomplish this would be to consistently provide detailed reviewer guidelines within review templates.</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Commentary: Panel Summaries in our sample of jackets provided an informative consensus overview of the strengths and weaknesses of key elements of a proposal and details of the panel discussion that led to the consensus opinion, if a consensus was reached. In rare cases, a panel summary was not provided, though this only occurs when a proposal is "triaged" as a consequence of three or more reviews judging the proposal to be without merit. In such cases, the proposal is not brought to the panel for evaluation. The</p>	<p>YES</p>

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>recommendations given in Panel Summaries do not always agree with program funding decisions, with the latter made by program staff (below, see comments and recommendation under subheading #6).</p> <p>Data Source: Jackets</p>	
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>Commentary: Collectively, the documentation in the jackets provides a narrative that communicates the rationale for award decisions. The individual reviews and Panel Summary, which are made available to the PI on the proposal, convey the range of perspectives and deliberations by the reviewers. When a proposal is reviewed by multiple panels, reviews and Panel Summaries from both panels are provided to the PI. The program officer (PO) Review Analysis provides a detailed consideration of the individual reviews and Panel Summary, any additional factors that may have influenced a funding decision, and how the totality of information was used to make a final decision to fund/decline an award. The Review Analysis is particularly insightful for communicating the rationale for funding decisions that may not align fully with panel recommendations. We emphasize that this disparity appears to occur relatively rarely, and the decision is well-documented in the Review Analysis document. In combination, these documents paint a transparent picture of how award decisions are made and the various factors that are considered in making decisions to fund/decline an award. Special panels may have additional program-specific criteria that reviewers must address, resulting in additional beneficial feedback to the PI.</p> <p>Data Source: Jackets</p>	YES
<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>Commentary: In most cases, the documentation provided to the PI offers a clear rationale for the award/decline decision. As per the 2019 COV for DEB, we observed some instances when the panel recommendation and the funding decision did not align. In those cases, a rationale was provided in the Review Analysis document but was not always articulated clearly in the Panel Summary provided to the PI. Particularly in instances when the panel provides a strong recommendation to fund, but the proposal is declined for funding, some additional explanation from the PO is warranted. PIs are provided with a context statement that conveys the number of proposals reviewed by panels, the funding priority recommendations, and the number of proposals intended to be funded. This information may be provided at too high a level to help individual PIs interpret funding decisions for a specific panel. When awards are recommended for funding by review panels but then declined for funding, the COV believes that it will be helpful to the PI if POs can provide more specific</p>	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>data in explaining award decisions.</p> <p>The COV observed that Review Analyses generally provided much better rationale for funding decisions, including explanations of strengths and weaknesses of proposals, but also the program's decision on funding. Some of the information is confidential, such as why favorable (but outlying) reviews weren't weighed into the funding decision.</p> <p>Our conversation with DEB POs revealed various mechanisms by which information about program decisions not included in Panel Summaries is communicated to PIs. POs welcome conversations with PIs via phone (at pre-scheduled meeting times). Another mechanism mentioned for communicating funding decisions is via "PO comment" (referred to as PO Comment in the e-jacket). These comments take some of the information from a Review Analysis (RA), and share this with the PI in addition to the standard decision letter. PO Comments are routinely used for non-peer reviewed proposals like RAPID, EAGER, and Conference requests, where PIs have no other feedback on what went into an award or decline decision. PO comments have been used sparingly for full proposals even though they potentially provide feedback on proposals that were close to being funded but were nonetheless declined. They also provide an opportunity to provide a more personal offer for the applicant to call the PO for a fuller conversation.</p> <p>Recommendation: To the extent that information within the Review Analysis can be shared with proposers via a PO Comment, this can serve as a mechanism for alleviating concerns when proposals are declined and could ultimately provide investigators with information that may be important for improving and resubmitting a declined proposal. The COV encourages POs to consider using the PO comment as a mechanism for increased transparency on how proposals are evaluated, and consequent funding decisions are made. It would be helpful to PIs if NSF could provide additional guidance for how to interpret panel feedback when awards are declined for funding. By providing this information in a standardized and transparent fashion, such a mechanism can improve communication between POs and PIs.</p> <p>Data Source: Jackets</p>	
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>Emerging Issue: The COVID-19 pandemic forced NSF to take on new protocols for merit review by moving rapidly and efficiently to a remote workforce and virtual review panels held via Zoom. The COV unanimously commends DEB for making this transition smoothly and effectively. Indeed, numerous members of the COV remarked that there was virtually no discernable change in the "raw data" provided in the e-Jacket system. In other words, even despite the global disruption of the pandemic, DEB continued to</p>	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>evaluate and fund proposals at normal levels. This is a remarkable achievement, and the staff and Program Officers of DEB are to be vigorously commended for their creative and positive response to historic challenges.</p> <p>Commentary: Given the timing of our review, the 2023 COV is well placed to evaluate which of the review protocols taken on by necessity (i.e., remote work and virtual panels) may or may not continue to serve NSF in proposal review and other operations moving forward.</p> <p>Panels: While the choice of panel modality can be determined locally (within each division or program), the COV had the impression that most DEB program officers are considering a combination of in-person and virtual-panel formats as desirable going forward. POs from outside DEB, however, expressed a strong preference for virtual panels. The analysis below of benefits and drawbacks of panel modality largely reflects the COV's interpretation of what we heard directly from NSF staff and leadership.</p> <p><u>Virtual Panels:</u></p> <p><u>Benefits:</u></p> <ul style="list-style-type: none"> - Greater panel diversity is afforded as a far wider range of individuals across economic and career-stage categories are able to participate (e.g., early career stage, single parents, people with disabilities, etc.). - A considerably lower carbon footprint is a consequence of virtual work and is a notable concern given the realities of a changing climate. - There are distinct cost savings associated with no travel, leaving more funding for science and broader impacts. - Panelists typically review fewer proposals per panel, with the impression given by some POs that, as a consequence, reviews are more thoughtfully prepared. - Zoom has been shown to provide a more even "playing field" where strong personalities are less likely to sway general opinion. - Some POs outside of DEB remarked that break-out room exchanges between POs and panelists offer an intimacy of interaction that is not afforded by an in-person setting. <p><u>Drawbacks:</u></p> <ul style="list-style-type: none"> - Personal interactions among panelists and between POs and panelists are limited, thus hindering career-benefiting networking interactions and social bonding. - There is no caucusing with virtual panels, which may limit the opportunity for panelists to reach consensus prior to broader discussion of proposal merits. - Interpersonal engagement during the panel tends to be lower in the virtual setting (though we heard reports to the contrary from several non-DEB POs). - Virtual panelists may be less engaged during discussions, both in individual discussions and the panel as a whole, given that there is more opportunity to multi-task and be distracted by other obligations. This is rarely a factor with in-person panels. 	

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p><u>In-Person Panels:</u> Note: The consensus among POs suggested that even when in-person panels are convened, there will likely be several participants who, for a variety of reasons, will need to be remote.</p> <p><u>Benefits:</u> -In-person panels can evaluate more proposals within the allotted days. It was suggested 2- to 3-fold more proposals can be covered in the same number of days as compared to virtual panels. It is unclear whether this is because virtual panels days are shorter (usually 10am to 5 pm for virtual compared to 8 – 5 pm for in person) or because virtual panels do not utilize caucusing for reaching consensus, with the result that more time is devoted to the full panel discussion of each proposal. - Dynamics such as networking and more active engagement among panelists is a distinct benefit. We note that this benefit is especially important for early-career panelists. - With in-person interaction it is more natural for people not assigned as reviewers to lend an ear to especially passionate discussions. This potentially results in a more evaluative process with more detailed panel summaries produced.</p> <p><u>Drawbacks:</u> - In-person participation favors panelists with either geographic proximity to the NSF headquarters and/or those without teaching, care-giving or other considerations that limit their ability to travel. - Infrastructure for in-person meetings has not yet returned to pre-COVID protocols and resources. This has resulted in increased workloads for staff as they work to provide the smoothest panel experience possible.</p> <p><u>Hybrid Panels:</u> We here define hybrid as panels that are designed to have a nearly equal representation of in-person and virtual panelists. We note that while this format allows for many of the benefits of in-person or virtual (depending on the format that panelist is using), it also comes with the associated drawbacks.</p> <p><u>Benefits:</u> - Progress in technology allows for greater interaction for virtual panelists during an in-person meeting.</p> <p><u>Drawbacks:</u> - DEB staff reported that workloads for hybrid panels are nearly double those for fully virtual or fully in-person panels.</p> <p><u>Recommendations:</u> 1. We recommend DEB continue its serious evaluation of the benefits of in-person meetings versus the cost of workload to staff and cost (in dollars)</p>	

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>of hosting in-person panels and other events. The COV was not provided with a cost analysis per se but the budgetary implications of in-person versus virtual appear obvious.</p> <ol style="list-style-type: none"> 2. NSF should carefully consider impacts to staff operations (many of whom are still working remotely) as in-person events are rolled out. 3. We recommend a thoughtful balance of virtual and in-person panels allowing for more efficient proposal processing and network-building (in-person) while also increasing accessibility of panel service (virtual). <p>Data Source: This evaluation of in-person vs virtual panels is based on 1) discussions within the COV (which as a group represent many decades of proposal review and panel service both in person and virtual, as well as recent hybrid panel experience), 2) NSF DEB staff, 3) NSF DEB and non-DEB Program Officers, and 4) the BIO Division Assistant Director.</p>	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

Table 4 - Selection of Reviewers

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Commentary: DEB reviewers were well chosen and had the qualifications and disciplinary expertise appropriate to evaluate the proposals. DEB POs work carefully to identify appropriate experts to review proposals – both ad hoc reviewers and panelists – as detailed in the 2023 Self-Study Report. NSF standards are to have at least 3 reviews for each submitted proposal, and DEB consistently meets this goal with a deliberate attempt to obtain ad hoc reviews, especially for core programs. In particular, DEB has done an excellent job with recruiting reviewers who have the ability to identify outstanding research from a diversity of institution types and geographic representation. However, the COV was unable to identify whether reviewers are sufficiently diverse across race, gender and ethnicity, given limitations of the available demographic information (see below).</p> <p>DEB is to be commended for its efforts to include ad hoc experts in the review process for many of its programs (with the exception of special programs which may not utilize ad hoc reviewers). These efforts far exceed what is accomplished NSF-wide, as detailed in the 2023 Self-Study provided to the COV. The COV recognizes that inclusion of a greater diversity of ad hoc reviewers with disciplinary breadth and depth strengthens the DEB review process. Furthermore, established processes are being followed to ensure that ad hoc reviews are included in panel considerations thus addressing a concern raised in the 2019 COV report.</p> <p>It is also commendable that DEB has a high positive response rate to ad hoc invitations. This rate of acceptance for ad hoc review far exceeds that of most peer-reviewed journals which often struggle to find peer-reviewers. Nonetheless, some members of the COV expressed concern that in the absence of effective demographic data for ad hoc reviewers, ad hoc reviewers may not represent the diversity of proposal PIs.</p> <p>The COV also observed that for special programs that did not use ad hoc reviewers, the number of reviews often just met the NSF minimum (3) but was below the average number of reviews for DEB. In some cases, the individual panelist reviews did not provide the substantive level of review expected. But in other cases, panelist reviews were more detailed, possibly due to program specific solicitation requirements and more focused directions given to</p>	<p>YES</p>

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>reviewers. Ad hoc reviews or assigning more panelists to review the proposal would provide more information for the panel's decision and more feedback to the submitter.</p> <p>There were a number of jackets in which co-review occurred, and the COV was interested in how this might affect the disciplinary spread and the diversity of expertise in the reviewer pool. Given that the last review of the effectiveness of the co-review process within DEB was over a decade ago (in 2012; Inouye et al. 2013) and was focused primarily on funding success, a new review is warranted. Though we were informed by both DEB and non-DEB POs that co-review leads to higher funding rates, a critical review of the process could provide better data for COV evaluation.</p> <p>Recommendation: The COV recommends an updated analysis of how the co-review process affects the selection of reviewers – both ad hoc and on the panel. Specifically, the COV suggests that more transparency in illustrating the decision-making process to co-review (as well as the co-review process itself) is warranted. An evaluation of the process could address questions such as: Is it more difficult to find reviewers for co-reviews, especially when the content of a given proposal bridges across different fields and/or disciplines? Are co-reviewed proposals more likely to be positively assessed, and if so, are they more likely to be funded?</p> <p>Commentary: The COV noted the inclusion of international reviewers on panels and as ad hoc experts in some jackets. This was viewed as an advantage in both incorporating more expertise and in expanding demographic and cultural diversity. However, the quality of international reviews was highly variable – ranging from very thorough responses to extremely cursory comments. This variation may reflect differences in proposal standards and processes in other countries, such that the expertise of the international scientific community is not sufficiently captured. The COV hopes that the small percentage of international reviewers can increase in the future, especially if experts continue to participate remotely (i.e., in virtual panels) and as researchers continue to broaden their collaborative networks.</p> <p>Recommendation: The COV recommends that DEB (and more broadly NSF) develop specific guidance to support international reviewers so they are better equipped to understand the NSF review process and meet those expectations. This will strengthen the quality and diversity of ad hoc reviews. We also suggest that DEB consider such questions as: What is the distribution of international reviewers within programs, especially within the pool of ad hoc reviewers for a given panel? Does the proportion of international reviewers differ between ad hoc experts and panelists? How can international reviewers be better supported? Science is an international endeavor, and the NSF review process should reflect this.</p>	

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p><i>Reference:</i> Inouye R, Gholz H, Kane M, Chandra S, Deegan L (2013) Outcomes of Co-Review in the National Science Foundation's Ecosystem Studies Program. Bulletin of the Ecological Society of American 94(2):165-169.</p> <p>Data Source: Jackets</p>	
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Commentary: DEB has a robust, multilayered approach to identifying conflicts of interest (COI) that abides by the clear NSF-wide rule for COIs. DEB clearly communicates these rules to submitters, reviewers, and panelists throughout the entire process from submission to final review at panel. Any identified COIs are clearly indicated in the Review Record, Diary Notes (post-2021 per NSF guidance), and/or Review Analysis (pre-2021) for each jacket.</p> <p>The required submission of both the required NSF individual COI and the DEB combined proposal Collaborators and Other Affiliation's (COA) spreadsheet is an excellent example of the extra effort and attention that DEB pays to COIs. These documents, combined with other resources (individual websites, bibliographic information, etc.), are used to identify conflicts with potential ad hoc reviewers and panelists. In cases in which a reviewer submits a review, and subsequently, either the reviewer points out a conflict or the PO later identifies a conflict, the review is marked as conflicted (Form 7) and is not provided to the panel nor is taken into account during the final determination.</p> <p>To identify conflicts in a panel, all Panelists are sent the names and institutions of submitted proposals and asked to self-identify conflicts, which are then entered into the NSF system. Panelists are denied access to those proposals and must leave the panel room when proposals are discussed with which they have a conflict. POs complete the same process as Panelists and leave the panel during discussion and do not participate in further NSF discussions in the evaluation and funding decision process. Based on a review of the assigned jackets, the COV confirmed that both of these processes are being followed within the panels.</p> <p>DEB is to be commended for developing clear and multilayered procedures that effectively identify COIs and for documenting these COIs carefully in the review record.</p> <p>Recommendation: To further streamline the process, the COV recommends that DEB ensure that the COA worksheet is in the same format as the NSF individual COI so it is not burdensome for submitters to create the DEB-specific COA worksheet.</p> <p>Data Source: Jackets</p>	<p>YES</p>

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>3. Additional comments on reviewer selection:</p> <p>Commentary: DEB strives to ensure reviewer diversity drawing from a variety of considerations, including geographic location, institution type, reviewer career stage, race, ethnicity, etc. Much of the demographic information is difficult to assess, however, as these data are self-reported and often reviewers choose not to report such data. Unfortunately, no data were provided in the 2023 Self-Study with respect to this lack of reporting. The COV requested such data from the program staff and found a significant difference between demographics (in this case just race and ethnicity) reported by PIs than by Reviewers. Notably, reviewers are much less likely to self-identify race/ethnicity than are PIs in general. This seems to be due, in part, to the NSF's having two different information tracking systems for (a) ad hoc reviewers and (b) PIs and panel members. We understand that the NSF is in the process of merging these two systems into one NSF wide data system for all reviewers and PIs, regardless of panel membership or ad hoc functions. If the PI/Panel data are retained, this will improve the overall demographic data availability of reviewers. The COV applauds this effort by NSF to unify its information tracking systems.</p> <p>Recommendation: The COV recommends that DEB explore ways of increasing participation by gathering demographic data from reviewers (both ad hoc and panel) to better allow DEB to assess reviewer diversity. Panelists could be reminded of the importance of this information and to update their information as part of the "Meeting Sign In." Reviewers could also be required to opt-out of reporting their demographic information (rather than opt-in), an approach successfully used with PIs to increase their contribution of demographic data.</p> <p>Recommendation: The DEB might consider a post-panel process to review the diversity of ad hoc reviewers. NSF could work with the Office of Management and Budget (OMB) to broaden the concept of 'gender' with options beyond "Male or Female" on the personnel information sheet in FastLane.</p> <p>Reference: https://www.scientificamerican.com/article/nonbinary-scientists-want-funding-agencies-to-change-how-they-collect-gender-data/#:~:text=The%20surveys%20are%20used%20to,do%20not%20wish%20to%20disclose.%E2%80%9D</p> <p>Commentary: The 2023 Self-Study did assess institution type and geographic location of reviewers, showing a good spread of institution types represented in the review process as well as a geographic spread. However, the geographic spread analysis showed raw counts of all reviewers (ad hoc and panelists combined) and does not normalize with respect to number of proposals submitted by state. Likewise, the institutional type data are not normalized by submissions from these institutional types, and reviewer counts are not broken down by panel versus ad hoc. Thus, it is difficult to assess the degree of success for reaching the DEB goal to 'represent the full diversity of the applicant</p>	<p>YES</p>

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>community' in terms of reviewer demographics.</p> <p>Recommendation: The COV recommends that DEB perform additional analyses on reviewer selection data that normalize reviewer participation by grants submitted (geographically, institution type) and partition between ad hoc and panel reviewers.</p> <p>Emerging Issues: The COVID-19 pandemic has significantly impacted DEB in a number of ways, one of which was undoubtedly reviewer selection and participation. The 2023 Self-Study was silent on the impact of COVID-19 on reviewer selection as review panels moved to a virtual platform. The COV feels that this is a missed opportunity for DEB to reflect on lessons learned through the pandemic and adjust practices to improve reviewer selection moving forward. Questions worth considering are: Will virtual panels continue? Are hybrid panels successful? What are the advantages, disadvantages to such approaches? Did the option to join remotely allow more scientists to participate in the review process who otherwise might be unable to attend an in-person panel? In the discussion with DEB POs, it was clear they find that a larger number of grant proposals can be reviewed within a given timeframe with a predominantly in-person panel.</p> <p>Recommendation: The COV recommends that DEB track data on recruitment and diversity of reviewers in virtual, hybrid, or in-person review panels across core and specialty programs to determine the impact of these different review panel mechanisms on reviewer participation and diversity, especially in terms of whether it represents the applicant community.</p> <p>Data Source: NSF Staff + Jackets</p>	

III. Questions concerning the management of the program under review. Please comment on the following:

Table 5 - Management of the Program Under Review

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<p>1. Management of the program.</p> <p>Commentary: The COV found DEB to be well-organized, and the overall management of the division appears to be effective, adaptable, and forward-looking. The written materials, program data, and discussions with DEB and other NSF staff members show a program that is supporting critical research under DEB's core objectives while maintaining sufficient flexibility to address evolving science priorities and broader societal needs.</p> <p>Commentary: The period reviewed by the 2023 COV covers the transition to no-deadline submissions for proposals within certain DEB program elements. Commentary from DEB staff and Program Officers was largely positive as relates to the no-deadline impacts. Though all acknowledged that this has led to changes in work processes and distribution of effort over the course of the year, POs highlighted the lower number and generally higher quality of proposals received, and staff members noted reductions in the administrative processing workload. These responses, coupled with program data available to the COV, suggest that the no-deadline system has had an overall positive impact on both process and outcomes and that the application of this approach may be worth considering for a wider set of DEB program elements. That said, the available data made it difficult to assess whether all types of institutions and members of the DEB science community are benefitting equally from the shift to no-deadline proposals. This is an area that DEB should monitor moving forward.</p> <p>Recommendation: Continue to assess the impacts of the transition to no-deadline proposal submissions — including determination of any differential effects across the diversity of DEB's science community at both the institutional and individual levels — while considering expansion of this practice to other DEB funding elements.</p> <p>Commentary: The COVID-19 pandemic had major impacts on DEB, and the effects of necessary shifts in all the division's operational processes continue to be felt. The COV was highly impressed with the speed and flexibility displayed by DEB staff in their response to the pandemic. The abrupt shift to remote work and virtual panels did not seem to have diminished DEB's productivity, and there was little detectable change in the solicitation, review, and funding of proposals. DEB also made good use of the EAGER and RAPID funding mechanisms to support science relevant to the pandemic response, and the deployment of supplemental funding to address effects of the pandemic on early-career scientists is noted as a positive use of resources. <u>DEB's management, program officers, and staff all deserve a great deal of credit for continuing to successfully execute critical tasks under extremely difficult circumstances.</u></p> <p>Emerging Issue: The lingering effects of the pandemic was a major topic of discussion during the COV, and there was significant confusion and no small measure of anxiety evident among the program officers and staff regarding the path forward for DEB operations. The introduction of hybrid virtual/in-person review panels, along with the loss of key elements of logistical support (for example, availability of catering for panels), has resulted in increased workloads for existing staff.</p>

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The COV heard conflicting information regarding the NSF's plans for virtual versus in-person work for staff and for panels going forward. DEB staff are struggling under this uncertainty. While the COV acknowledges that many of these factors are beyond DEB's (or even NSF's) control, it is necessary to acknowledge the disproportionate impacts that shifts in operations have had on some members of the staff.

Recommendation: To whatever degree possible, greater consistency is needed in NSF's communication with staff about future plans regarding panel formats, remote work, and other issues that impact future planning of critical day-to-day operations. This may include reassessing the balance of in-person, virtual, and hybrid panels until there is greater clarity on the "new normal" for NSF operations and broader logistical support has been re-established within the headquarters building. DEB should be aware that the loss of catering services places a considerable burden on staff when panels are either hybrid or in-person and this should be taken into consideration when weighing the advantages and disadvantages of panel meeting modalities.

Commentary: DEB operates within a continuum of NSF divisions organized under BIO and other NSF directorates (GEO etc.). The areas of research that DEB supports frequently cross organizational boundaries within NSF (particularly in the case of multidisciplinary efforts), and this requires coordination and collaboration between DEB and other NSF divisions. The materials provided to the COV demonstrate that these efforts are ongoing and seem to be effective overall. Communications among programs and with other divisions within and outside the BIO directorate are used effectively to align solicitations and portfolio decisions both with NSF-wide and community priorities. Collaborative review, selection, and funding of programs between divisions is one obvious manifestation of these coordination activities (the mechanics of the processes involved are discussed in Section 2 of this report). NEON-related science is cooperatively managed by DEB, BIO's Division of Biological Infrastructure, and other NSF directorates. Numerous cross-NSF initiatives were highlighted during the review, including several that address emerging research priorities addressing global climate change, understanding the ecology of infectious diseases, and other areas in which DEB plays a critical role. Program officers from other divisions within BIO and other NSF directorates cited positive interactions and long-standing relationships with DEB.

Commentary: In addition to core programs (Ecosystem Science, Population and Community Ecology, Evolutionary Processes, and Systematics and Biodiversity Science), DEB manages or participates in a large number of other funding programs, notably the Mid-Career Advancement program (which began in DEB as a Mid-Career Synthesis Track within the Opportunities for Promoting Understanding through Synthesis program), the Macrosystems & Early NEON Science program, the Evolution and Ecology of Infectious Diseases program, the Long-Term Ecological Research program, the Long-Term Research in Environmental Biology program, the Biodiversity on a Changing Planet program, and the Dynamics of Integrated Socio-Environmental Systems program. DEB's participation in this broad range of activities demonstrates the central importance of DEB research to the health of a wide range of life science disciplines at scales from the molecule to the biosphere.

Emerging Issue: In the 2023 Self-Study report, the COV noted that the amount of DEB's funding directed towards co-funding other BIO divisions has significantly *increased* over the period under review in this COV. Over the same period, funding moving into DEB from other

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divisions has *decreased*. Although the amounts in question represent a small fraction of DEB's total budget, continued trends in this direction could begin to compromise DEB's ability to address core science objectives, especially if specific program elements were disproportionately impacted

Recommendation: The COV recommends that DEB carefully monitor the money flow into other BIO divisions with an eye towards maintaining parity.

Commentary: The 2019 COV extensively discussed the effectiveness and importance of the Best Practices Group. The self-study we reviewed contained little information about the Best Practices Group, but our conversations with staff revealed that it still plays an important role. Meetings are now bi-weekly rather than weekly, but policies and procedures developed by the DEB Best Practices Group are often shared with other divisions at NSF leading to improved practices not only within DEB, but throughout NSF.

Recommendation: The COV recommends that the Best Practices Group continues to improve processes and procedures within DEB and share these developments with other NSF programs as appropriate.

2. Responsiveness of the program to emerging research and education opportunities.

Commentary: DEB is attentive to emerging research and education opportunities and has developed a range of approaches to incorporate new science into its research programs. DEB receives guidance on their strategic priorities in research and education from a variety of sources including the Office of Science and Technology Policy, Congress, and the National Science Board. Input from the science community is gathered through NSF's various advisory bodies, strategic planning workshops organized by DEB (one was conducted during the period under review), and funding support for community-driven science meetings. It was not entirely clear how DEB balances among these varying inputs, arrives at ranked priorities, and determines how resources will be allocated among the various new program tracks. This wasn't explicitly addressed during the review, and it would likely be useful to future COV panels if more time was allotted to discuss the process by which these decisions are reached.

Commentary: A specific example of DEB's response to an emerging research opportunity is the increased incorporation of research addressing global climate change impacts. Development of the new Biodiversity of a Changing Planet special program is consistent with these objectives, and this element logically builds upon the discontinued Dimensions of Biodiversity special program. Consideration of climate change impacts are also apparent in DEB's involvement in cross-NSF initiatives such as the long-running Long Term Ecological Research (LTER) program, where recommendations from the recent decadal review emphasized an expanded focus on solution-driven research on human impacts to the life-supporting properties of ecosystems. DEB's scientific competencies will be crucial to better understand the impacts of global climate change on the biosphere and facilitate the transition of knowledge gained to adaptation and mitigation strategies in collaboration with other NSF program elements such as the Technology Innovation and Partnerships directorate (TIP) (see question 3).

Emerging Issue: Although DEB's increased emphasis on science that addresses climate change and other solution-driven priorities is considered to be a positive development, it does come with

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some risk to DEB's (and NSF's) long-standing emphasis on discovery-driven research. DEB leadership will need to carefully consider the balance between these differing modes of research and maintain complementarity within the overall funding portfolio.

Recommendation: With the recent increase in special programs and special program funding, it is important that DEB review how monetary and time budgets are divided between core and special programs. It would be good for the next COV to have a clearer understanding of how special programs are created and funded, which is a potential mechanism for their assessment in the future. We recommend that the division consistently and thoughtfully assess the balance between special programs and core programs, taking into account pressing societal, scientific, and community needs as well as the impacts of inflation on the costs of doing science. DEB should be vigilant in maintaining a strong focus on basic discovery-driven scientific priorities.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Commentary: Data provided to the COV show that the total proportion of DEB funding devoted to core programs declined in 2022, while funding for other programs increased more than 50%. This change in emphasis may be appropriate, but the self-study did not discuss how much of the change was driven by internal assessments of priorities for research in environmental biology versus opportunities for new funding resulting from priorities at higher levels within NSF (e.g., new opportunities for collaboration with other government agencies), nor did it discuss the process by which decisions about allocations were made. The COV found it difficult to determine the extent to which new solicitations arise from program officer and community initiatives within DEB versus initiatives that arise at other levels of NSF, nor could we assess the criteria used to determine whether DEB would participate in new solicitations.

Recommendation: When self-studies are prepared for future COVs, DEB should explain the reasons for any change in relative funding allocations to core programs and describe the process by which the decision was made. In particular, future self-studies should address how DEB balances its commitment to ensuring that clusters do not become sub-disciplinary silos with its commitment to supporting strong disciplinary communities that are often identified with one of the research clusters.

Emerging issue: NSF identifies diversity and inclusion as one of its five core values. The COV notes that advancing this value faces a challenge that may not have been fully recognized. The vast majority of persons from first-generation, low-income, and other underserved communities who complete college degrees graduate from regional public universities, MSIs, and HBCUs, not R1s or elite liberal arts colleges. Many of these institutions do not offer PhD programs, and most lack the research infrastructure common at R1s. Ensuring that students from all backgrounds have the opportunity to develop research skills that will prepare them for PhD study and scientific careers may require investments in research and education targeted at regional public universities (analogous to the Research in Undergraduate Institution funding already available). Our understanding is that CHIPS funding may be available to support additional activities at regional public universities. The COV noted that a December 2022 [Dear Colleague Letter](#) called for proposals to hold conferences or workshops addressing the challenges of enhancing research at emerging research and minority-serving institutions and the BRC-BIO program supports pre-tenured faculty in biology at institutions that do not traditionally receive large amounts of NSF funding.

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Recommendation: DEB should develop an approach to enhance research in environmental biology at regional public universities, MSIs, and HBCUs, including participation in GRANTED and BRC-BIO consistent with NSF's commitment to scientific leadership and excellence. DEB should also ensure that it takes full advantage of any funding available through CHIPS to enhance support for research in environmental biology at regional public universities.

Emerging issues: The new Directorate for Technology, Innovations, and Partnerships (TIP) promises substantial new opportunities for NSF as a whole and for DEB in particular. To the extent that funding available through TIP helps DEB researchers increase the impact of their work, these opportunities may help DEB and DEB-funded scientists demonstrate the relevance of discovery science in core programs to grand challenges like those posed by climate change and the biodiversity crisis. At the same time, an increased emphasis on translational science, even if it is translation to societal impact rather than to technological application, may further shift the balance of DEB leadership, program officer, and staff effort to activities outside the core programs.

Recommendation: DEB should think strategically about ways in which collaboration and cooperation with TIP can enhance the quality and impact of DEB science and can contribute to NSF-wide strategic goals. In doing so, DEB should carefully consider the impact on science supported by existing DEB programs associated with any reallocation of effort or funding.

4. Responsiveness of program to previous COV comments and recommendations.

Commentary: The COV commends DEB for its thorough and effective response to nearly all recommendations in the 2019 COV report. The COV was particularly pleased to see that DEB successfully encouraged more serious consideration of ad hoc reviews during panel deliberations.

In its response to the 2019 COV report, DEB noted that it is difficult to define "innovative" or "transformative" in a way that could be used in text mining to identify innovative or transformative research to facilitate analysis of factors associated with such research, e.g., EAGER vs. RAPID vs. core programs vs. special programs. DEB also noted that its publication repository was new.

Recommendation: The NSF publication repository may not yet be extensive enough for identifying innovative or transformative research, and the text mining tools may not yet be sophisticated enough to support analyses of the type envisioned in the 2019 COV report. Nonetheless, DEB should monitor the status of both the repository and the text mining tools and use them to explore the factors associated with innovative or transformative funded proposals when the data and tools are. The explosive advances in generative AI may make the difficult problem of recognizing "innovation" or "transformation" substantially less difficult in the near future.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

Table 6 - Resulting Portfolio of Awards

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Commentary: Funding rates and the number of competitive awards are well-balanced and relatively consistent among years across the four clusters of DEB. There is more variation in funding rates among the current special programs in DEB, though this is likely due to the smaller total number of awards within these special programs and co-management between divisions.</p> <p>In 2022, while funding to the core programs remained essentially at the same level as the previous year, funding to special programs showed a marked increase. This tension between special programs and core programs, both in monetary and human resources, has been felt across the BIO directorate, not just DEB.</p> <p>Emerging Issues: There was concern that the continued addition of special programs could skew the overall budget allotment for core programs and the overall portfolio balance across disciplines and subdisciplines. However, we appreciate DEB's efforts to create, maintain, and transition special programs and the vital role these programs play in supporting the broad evolutionary and ecological interests of the scientific community DEB serves. Additionally, research efforts in the core areas continue to see increases in expenses (personnel, supplies, novel equipment, inflation).</p> <p>Recommendation: We recommend that DEB continue to fund work that bridges cultural and societal needs in special programs while building upon discovery science that is the heart of the DEB core, particularly in the areas of biodiversity and responses to and perceptions of climate change. This is consistent with OMB recommendations for addressing societal needs, the biodiversity crisis, and building a diverse future workforce in the sciences.</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 8</p>	<p>Appropriate</p>

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Commentary: DEB is to be commended in its continued support of the community through the size of awards. Generally, PIs get the monetary amount requested in their budgets, with only ~5% of awarded PIs receiving less than requested in their proposal. This is an exemplary track-record. This suggests that, overall, the funds are appropriate for the size and scope of the awarded projects. The average duration of projects has stayed relatively steady over the four study years, while award amounts have steadily increased (with the notable exception of 2020). This is likely due to post-pandemic supply chain issues, inflation, and increases in personnel and travel costs.</p> <p>Emerging Issues: As noted in the self-study, one of the reasons for increased budgets over the past four years has been increased personnel costs. Even so, stipends for post-docs and graduate students in grants funded by DEB do not appear to be on par with other programs, even within the BIO directorate. While we understand that DEB and NSF do not directly control these amounts, we hope that broader discussions of pay and pay equity can be discussed within the division at all levels, including undergraduate stipends, to address higher inflation and cost of living expenses.</p> <p>In the coming years, it will be important for DEB to find ways of addressing pay disparities between divisions and among institutions, particularly for undergraduates, graduates, and post-docs supported through NSF awards, without compromising the quality of the funded science and strive for support levels towards that of NSF Fellowship stipend levels.</p> <p>Recommendation: Maintain awareness of postdoctoral salary and graduate student stipend equity in DEB relative to other NSF programs and divisions.</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 4</p>	<p>Appropriate</p>
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Commentary: The DEB portfolio demonstrates strong and continued support of basic science that is in-line with national priorities. This is demonstrated by the large spike in the funding of EAGERS and RAPIDs in 2020 in response to the COVID-19 pandemic. Additionally, DEB is to be commended for being central to the development and deployment of special programs and solicitations that explicitly require the incorporation of expertise from a variety of scientific backgrounds, including but not limited to Dynamics of Integrated Socio-Environmental Systems (DISES) and EEID.</p>	<p>Appropriate</p>

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>There is often concern that panels may be reluctant to fund high risk/ high reward research proposals. During their review of selected jackets, however, the COV found little evidence for this perception. Additionally, the committee found that in several cases, POs went against panel recommendations for funding due to the transformative potential of the proposed work. This is a clear example of how POs can ultimately shape the innovative and transformative nature of the overall DEB portfolio.</p> <p>Emerging Issues: The new Technology, Innovation, and Partnerships (TIP) directorate is anticipated to provide innovative research directions for the coming years. Although its core programs have not yet been fully developed, the new directorate has the potential to support innovative connections with DEB core programs. Ideally, the TIP directorate, through both co-review and internal programs, will enable PIs to cross disciplinary and agency boundaries that have previously been difficult to achieve. Special programs allow the growth and development of partnerships and this may gain importance as TIP evolves. Increased partnerships will provide opportunities to broaden the impacts of DEB programs, consequently broadening participation and the transfer of ideas. TIP may allow PIs to develop more broad perspectives of what is defined as innovative and transformative as well as to include interdisciplinary and sociological contexts.</p> <p>Recommendation: DEB should pay close attention to developing programs in other directorates and institutions to look for synergies and co-funding opportunities. The rollout of TIP appears to offer a particularly promising environment for synergies between DEB's core strengths in discovery-driven science with potential societal benefits in mind.</p> <p>Data Source: Jackets</p>	
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Commentary: Over the four review years, DEB has increased the number of secondary co-reviews it provides for proposals not managed by DEB. There has also been an overall increase in primary co-reviewed proposals, though there is more fluctuation in the total number between years. Within BIO, the largest increase and the largest proportion of co-reviewed proposals and awards outside of DEB were with IOS. The largest increase (between 2019 and 2022) and the largest proportion of co-reviewed proposals and awards outside of BIO were with GEO (LTER & DISES) and particularly EAR. Additionally, not only has there been a relatively steady increase in the number of co-reviewed proposals, but there has also been a corresponding increase in the number of co-reviewed awards in roughly equal proportions.</p> <p>Through conversations with POs from across BIO, the COV gleaned that</p>	Appropriate

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>there is the general feeling that co-reviewed proposals are not at any disadvantage during the review and award process. Indeed, the converse appears to be true in that co-reviewed proposals tend to have higher funding rates. This same trend of increased co-review and awards of co-reviewed proposals is evident in co-reviews across non-BIO divisions, BIO divisions, and clusters within DEB, suggesting that DEB has increased its efforts to solicit and support co-reviewed grant proposals. DEB should be commended for the marked increase in both co-reviewed proposals and awards within and outside DEB. The POs are doing a good job of selecting reviewers with diverse expertise and making funding decisions for split decisions between panels.</p> <p>During conversations with POs outside of DEB, it was noted that there is strong collaboration and seamless integration across BIO. It was noted that, overall, DEB maintains strong working relationships with many programs, and that these programs enjoy working with DEB and its staff. Non-DEB POs also noted that the ease and flexibility of assigning and co-reviewing proposals with DEB benefits the community which they serve.</p> <p>Recommendation: DEB should continue the outstanding job it is doing in seeking and supporting opportunities to co-review and co-manage proposals across the diverse portfolio of the NSF.</p> <p>Data Source: If co-funding is a desired proxy for measuring inter- and multi- disciplinary projects, the Co-Funding from Contributing Orgs and Co-Funding Contributed to Recipient Orgs reports can be obtained using Enterprise Reporting, COV Dashboard, Question 7</p>	
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Commentary: Overall, there is a rough correlation between the proportion of grants submitted by PIs in a particular state and the proportion of awards in that state for all 50 states. Most proposals from PIs in non-EPSCoR states had a stable success rate for funding across the four years under review, while the award rate for EPSCoR states showed more fluctuation between years.</p> <p>Emerging Issues: EPSCoR proposals submissions are consistent across the four years of the 2023 COV charge. However, there is considerable variation in the percent of DEB awards from EPSCoR states, with some years having disproportionately more than expected awards to EPSCoR states and others disproportionately less, with no apparent pattern associated with these more/less years. Over the four years, awards that went to researchers in EPSCoR states were in direct proportion to the number of proposals received from those states.</p>	Appropriate

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>Recommendation: Continue to fund grants from states traditionally underrepresented in research and maintain current strong relationships with EPSCoR program officers and programs to find ways to co-review and co-fund projects from these states. Explore ways to further support the PIs and institutions within these states to create cultures of research and support increased grant submissions from institutions traditionally underrepresented among NSF proposal submissions, including mechanisms such as the GRANTED solicitation.</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 2</p>	
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Commentary: For most of the institution types characterized (2-year, 4-year, non-traditional, masters, Ph.D., top 100, and MSIs), DEB's 4-year funding rate is generally proportional with the overall submission rate by PIs at these institution types.</p> <p>There were several notable items within the analysis:</p> <p>1) The proportion of proposals submitted by PIs at MSIs has shown a steady increase since 2020, when there was a steep drop in the total number of proposals submitted. This is an exciting finding and suggests that outreach efforts on the part of DEB to increase submissions from MSIs have been effective. However, according to the Department of Education in 2020 ~20% of higher institutions qualified for MSI funding, while fewer than 20% of DEB submissions come from PIs at MSI, suggesting that there is still work to be done in this area.</p> <p>2) Analyses of institution type by year revealed that non-traditional institutions (museums, botanical gardens, etc.) and top 100 R1s tend to be over-represented to a small degree within the award portfolio. By contrast, master's and Ph.D. institutions which are not classified as top 100 R1s or non-traditional institutions tend to be under-represented, though at a relatively low rate.</p> <p>DEB is to be commended for maintaining an overall, well-balanced portfolio in which a large variety of institutions appear to be proportionately represented among the awards.</p> <p>Emerging Issues: Recent federal funding priorities and the most recent appropriation budget (CHIPS) have recommended increased funding priorities for R2 institutions and institutions in EPSCoR states, suggesting that increased outreach and capacity building at these institutions will become a near-term priority.</p>	Appropriate

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>Recommendation: DEB is encouraged to work with institutions and PIs at institutions currently under-represented in the DEB portfolio, particularly at MSIs, to help develop recommendations on topics such as teaching release time, infrastructure, budget development, and post-award support for grant applications and awards. DEB has the potential to help create a culture of NSF proposal submissions and research at these institutions and should take all sensible measures for achieving this goal.</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 3</p>	
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p>Commentary: New PIs were funded at disproportionately lower rates than the overall DEB award rate over years 2019 - 2021). Though this rate fluctuated between study years, it is consistently lower than the rate expected by the representation of new PIs among the general pool of DEB Proposals The difference between the expected funding rate based on the proportion of submitted proposals and the actual funding rate for this group varied between 5% and 10% depending on the year. Overall, Early Career PIs are funded at about 2% less than what would be expected by their proportion of proposals submitted to the general DEB pool. This is in line with the self-study finding, which suggests that while Early Career PIs and New PIs may have overlapping definitions, they are in fact two distinct groups that may require different types of outreach and guidance from DEB personnel.</p> <p>Recommendation: Continue to encourage emerging PIs to consult Program Officers throughout the development of proposals and to discuss the review process and any resulting reviews.</p> <p>Data Source: Information on new PIs available via Enterprise Reporting, COV Dashboard, Question 6</p>	Appropriate
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Commentary: A number of special calls incorporate educational components, including RUI, CAREER, REU, RAHSS, RET, and ROA programs. RUIs retained an award rate higher than the DEB average award rate in 2020, but decreased well below average in 2021, perhaps as a consequence of the COVID-19 pandemic. The RUI award rate then rebounded in 2022. Supplements remain as the main source of funding for educational components.</p>	Appropriate

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>Recommendation: We recommend increased training around the inclusion of traditional supplemental funding opportunities in original proposals, perhaps in workshops or DEB office hours. A particular focus of this training should emphasize to PIs at R1s that they can maximize their Broader Impacts by being inclusive of K-14 and regional public institutions. PIs should be encouraged to increase the educational component in all grants, not just those specialized in teaching.</p> <p>Data Source: Jackets</p>	
<p>9. Does the program portfolio have appropriate participation of underrepresented groups²?</p> <p>Commentary: The number of minority-led and minority women-led proposals increased over the study years with the notable exception of 2020, which saw a disproportionate decrease in both the number of minority-led and minority women-led proposals submitted and the number of minority-led and minority women-led proposals awarded as compared to the overall pool of proposals and awards submitted in that year. However, in the two study years following 2020, proposals submitted by minority and minority women PIs and co-PIs rebounded and even surpassed the number in 2019.</p> <p>Additionally, in 2021 and 2022, award percentages for minorities and minority women-led proposals have fallen into line with the overall representation of proposal submissions to DEB. These increases in the last two years have resulted in an overall 4-year funding rate that is slightly lower than that expected by the overall representation of minority-led and minority women-led proposals in the general DEB proposal pool.</p> <p>Overall, when compared to 2019 and 2020, there have been increases in minority and minority women-led applications, and funding rates for these two groups are in line with their representation among the general DEB pool of proposals.</p> <p>Women were awarded at a percentage similar to that expected by their representation within the general pool of proposals submitted to DEB. This trend of proportionate funding holds in all four of the study years despite the large decrease in the total number of proposals submitted by women in 2020,</p>	

² NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>which was disproportionate for women-led proposals compared to the overall number of proposals submitted to DEB in 2020. In fact, in 2022, a larger overall percentage of proposals were women-led than in pre-pandemic 2019, suggesting that the marked increase in women-led proposals noted by the 2019 COV has continued in post-pandemic years. Over the four years, the percentage of awards to women slightly exceed the percentage of proposals submitted by women.</p> <p>Emerging Issues: Overall, this suggests that DEB has been successful and should be commended for increasing the representation of women and/or minority-led and co-led proposals in their proposal pool. The 4-year demographics of the proposal pool women and/or minority PIs and co-PIs are very similar to that of the broader field of potential PIs in the biological and life sciences at universities and 4-year colleges (2017 NCSSES numbers-- 49% for women and 11% for minorities [non-White, non-Asian]). Additionally, women-led proposals have been funded proportionally to their submission rate in all study years and, in some years, have been slightly over-represented among the award pool. After being disproportionately underfunded in 2019 and 2020, minority and minority women-led awards were proportionally funded to their submission rates in 2021 & 2022, a trend that DEB will hopefully continue to work towards in the coming years. Again, we commend the minoritized PIs for this increase in submission rate, and encourage DEB is to continue their efforts to support such gains in the overall proposal submission rates for women, minority, and minority women PIs and co-PIs, especially in light of the significant drop in proposals from these groups in 2020. Additionally, the proportional representation of women and/or minority-led proposals among awarded proposals suggests that the significant work that DEB has done to address issues of bias during the review process has been successful and that there is no evidence of bias in the portfolio awards, which is outstanding.</p> <p>Recommendation: The COV recommends that rates of proposal submission and award be calculated as a percentage of all proposals submitted or awarded respectively. This approach provides a clearer view of whether women and/or minority-led proposal are being funded at rates proportional to their representation among DEB proposals submitted.</p> <p>Data Source: Enterprise Reporting, COV Dashboard, Question 5</p>	

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Commentary: NSF has done a commendable job of responding to national priorities, developing a skilled workforce, and increasing the representation of women and/or minorities in STEM. These goals have been achieved while still retaining focus on the core values of DEB through basic and innovative research. DEB has continued to support early stage and basic research as outlined in the 2019 OMB-OSTP report. Particularly, DEB developed the EEID program to respond to national priorities to "develop infectious disease modeling, prediction, and forecasting." DEB has provided and utilized state-of-the-art infrastructure by providing data products through the NEON program. Additionally, DEB continues to respond to urgent national research priorities through the RAPID and EAGER grant programs. In response to COVID-19, they developed a special program in EEID. The EEID program responded to national priorities through the understanding of human disease and interagency coordination.</p> <p>Emerging Issues: The Office of Management and Budget (OMB) has identified global and societal issues that are especially in-line with DEB strengths and priorities, primarily the biodiversity crisis and training a scientifically literate workforce. If NSF's goal is to respond to workforce needs, more effort needs to be given to training scientists at Minority Serving Institutions (MSIs) as the US is estimated to be a White minority by the year 2045.</p> <p>Recommendation: Maintaining "state of the art infrastructure" and training the future workforce is difficult when universities that primarily serve underrepresented populations are increasingly faced with economic challenges. Thus, the COV recommends that DEB continue its course of prioritizing funding to MSIs. This is an investment that will pay dividends in both scientific and societal gains.</p> <p>Data Source: Jackets</p>	<p>Appropriate</p>
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>The committee would like to commend everyone at DEB for their outstanding accomplishment in assembling and maintaining a diverse and well-balanced portfolio through the tumultuous and unpredictable years of the COVID-19 global pandemic. There is repeated evidence of DEB's continued and exemplary support of the scientific community throughout this unprecedented time of uncertainty and societal upheaval.</p>	<p>Appropriate</p>

OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

Comments/Discussion: The programs covered by the NSF directorate seem to cover the breadth of knowledge and work in Biological Sciences as a discipline. However, there are concerning trends visible in data from the COV review period which suggest that as special programs are created, the amount of core funding decreases proportionally; all four core programs had funding lows in 2022. More specifically, we note that core funding has remained flat, but given inflation and other economic variation, this results in a "real dollar" decline. We recognize that special programs can also benefit individual core programs but wish to point out that not all PIs or PI teams are interested in or able to apply to specific program calls. Thus, core programs remain vital for maintaining excellence in DEB's mission.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

Comments/Discussion: The COV was of the strong opinion that the former Doctoral Dissertation Improvement Grant (DDIG) program was beneficial for graduate students and thus the future of the DEB-supported scientific community. We gained a detailed understanding of the demands that were placed on the program by the misbegotten sense of faculty advisors that the DDIG was primarily an exercise for fostering graduate student grant-writing skills. We are fully apprised of the unsustainable workload that this placed on DEB staff and Program Officers. Yet, we mourn the collapse of a vital funding mechanism for promoting the scientific development and independence of graduate students in DEB core research areas.

Recommendation: We suggest the development of alternative award mechanisms that will allow graduate students to apply for funds without the disproportionate administrative burden entailed by the DDIG program. Possibilities include competitively funding block grants to institutions or to professional societies rather than individual graduate students, starting a program akin to REUs but for graduate students, or using abbreviated panel evaluations similar to those for the NSF GRFP. We urge DEB to consider that the disappearance of the single NSF funding mechanism for independent graduate student research has been a tremendous loss to the next generation of DEB scientists.

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

Comments/Discussion: In a time when science is called upon by a vocal group to dismantle DEI efforts (see articles such as "merit in science"), we applaud NSF for continuing to address historically based inequities across the Biological Sciences. The continued use of broader impacts benefits the community in terms of capacity building but also broadens perspectives and ideas within the research itself.

Recommendation: The COV notes that there is often a burden on under-represented groups who are called on often due to historically based low numbers in efforts to diversify reviewer pools and panels. As efforts to diversify reviewer pools continue, and this burden persists, we recommend paying ad hoc reviewers as well as panelists to compensate for this issue (and to help recruit reviewers in general).

4. Please provide comments on any other issues the COV feels are relevant.

We use this section to raise issues not raised above and to reiterate discussions that we consider to be of particular import.

Comments/Discussion: In our conversation with DEB program officers, the COV learned that at least some of them felt that they had little input into the self-study that the COV reviewed. The COV recognizes that the template for the self-study is set by NSF-wide policy and that many of the questions require answers to descriptive questions that DEB staff are best situated to answer. However, some of the questions, especially in Sections III and IV would benefit from evaluative responses to the data by DEB leaders and program officers, e.g., "Are awards appropriate in size and duration for the scope of the project?" This approach would help the COV learn if DEB leadership and program officers are working toward particular goals and priorities. For instance, is it a priority to distribute grant awards among demographic groups in the same proportion as the proposals are submitted?

Recommendation: The COV recommends that DEB ensure that leaders and program officers provide substantive, evaluative responses to questions in sections III and IV using summary data provided by DEB staff.

Emerging issue: Impacts of the COVID-19 pandemic and recovery

The COV commends DEB's exemplary performance during the COVID-19 pandemic. There was little to no evidence for declines in numbers of external reviews, ad hoc review requests, numbers of reviews per jacket, dwell times, number of awards, number of proposals co-reviewed, supplements awarded, and minority or women PIs/Co-PIs in 2020 and 2021 compared with other years. The staff and leadership of NSF should be commended for their dedication and tenacity. This was noted earlier in responses to Section I-7, Section III-1.

Recommendation: The COV recommends that NSF study the merits of virtual versus hybrid or in-person panels (described in detail in Section I-7), especially with an eye toward maximizing diversity, equity, and inclusion of participants while also considering the economic and collegial aspects of panel modalities. We anticipate that some mix of the two panel settings will ultimately serve the DEB best as it moves towards a "new normal" post-pandemic.

Comments/Discussion: As NSF readjusts after the COVID-19 shutdown, requiring staff members to return to in-person work, either permanently or on a day-to-day basis, this could present new challenges for employees. For example, some employees have moved farther away from NSF, requiring longer commute times. Others struggle to find childcare for days that they are required to staff panels, etc. There are potential equity issues if certain staff members are required to return to in-person while others are allowed to work from home. These seem to be top concerns for NSF staff.

Recommendation: We recommend that NSF provide as much advance notice as possible of any intention to require staff members to return to in-person work, either for particular events or long-term. In addition, we encourage the NSF administration to work with local representatives of the American Federation of Governmental Employees and any other relevant bargaining units to ensure work practices that protect staff members' welfare.

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

Comments/Discussion: We thank the NSF for their efforts and work to prepare this COV. The amount of human-power required to develop the teams and execute the logistics for this meeting seemed to be large, and we commend the planning team. In addition, we found the COV to be insightful in highlighting success at DEB in terms of award granting and DEI. After reviewing the awards and submissions, it is clear that while there are no specific targets used by NSF to determine award distribution, factors like anti-bias training appear to have been successful; we found the numbers of awards going to different members of the applicant demographic pool to be proportional to rates of submission by researchers from said groups.

With that said, the COV felt that the process could be improved if the chair and other members were given more direction earlier in the process. We acknowledge that much in the way of institutional knowledge has been lost due to the confluence of remote work and turnover of DEB staff and leadership. The chair, in particular, found it difficult to navigate the emails from numerous sources and without informative subject headings. And though efforts were made well in advance of the meeting to assign writing groups, the assigned categories were missed by several committee members. A better-informed chair would no doubt yield a better-informed committee in advance of the COV meeting. And though the meeting itself was remarkably efficient and productive, and inordinate time was spent by the chair and other members of the committee with formatting this final-report document. We suspect that these problems reflect a combination of incompatibilities between the SharePoint document and local MS Word versions on individual computers.

Recommendation: We recommend that the pre-meeting orientation focus on operational topics in addition to Conflicts of Interest (COIs). Though COIs are critical to the NSF's high standards of unbiased assessment, the orientation could also provide more explicit directions about the purpose of reading the jackets, any expectations for collecting and sharing information from them, how writing section assignments will be communicated to the panelists, and other operational details directly relevant to the report structure. This could be accomplished via a longer orientation session and/or additional meetings. It might also be productive to choose a member of the current COV (2023, in this case) to chair the subsequent COV (2027, presumably).

Recommendation: We also recommend a different structure and timing for meeting with DEB program officers. There was a surprisingly large number of DEB POs present, and while the COV appreciated the sense of involvement and investment that this enthusiastic representation communicated, the committee nonetheless found it difficult to attempt a group conversation with such a large group within a one-hour timeframe and in a virtual setting. If future COVs will also be held virtually, we recommend smaller breakout groups with a few POs (perhaps from different programs) with a few COV members (from different fields). Regarding timing, it would be more productive to meet with DEB program officers later in the COV – perhaps the afternoon of Day 2 when the COV has a better sense of emerging issues and questions. We also suggest that COV meetings might be more productive in an in-person setting which could entail more flexible movement and communication among section groups.

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SIGNATURE BLOCK:

A handwritten signature in black ink that reads "Anne D. Yoder". The signature is written in a cursive style with a large initial "A" and "D".

For the NSF-Division of Environmental Biology 2023 Committee of Visitors
Anne D. Yoder
Chair



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C231648

June 7th – 9th, 2023

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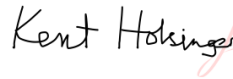
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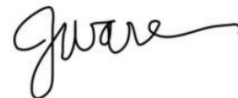
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