

**NSF Committee of Visitors Report  
Surface Earth Processes Section  
Division of Earth Sciences  
Directorate for Geosciences  
June 2-4, 2008**

**2010 UPDATE TO RESPONSE TO SPECIFIC COMMENTS IN THE COV  
REPORT**

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On June 2-4, 2008, a Committee of Visitors (COV) met at NSF to review four Programs in the Surface Earth Processes Section (SEPS) of the Division of Earth Sciences (EAR). These Programs included: *Hydrologic Sciences (HS)*, *Geobiology and Low Temperature Geochemistry (GG)*, *Geomorphology and Land Use Dynamics (GLD)*, and *Sedimentary Geology and Paleobiology (SGP)*. The review covered proposal and award actions for the Fiscal Years of 2005, 2006, and 2007. This document updates the SEPS continuing response to the COV Recommendations. It retains the initial response provided by the SEPS after submission of the COV Report, the 2009 update, and provides the 2010 update in italics text.

We acknowledge the very insightful and incisive evaluations and recommendations the COV has offered, and we specially appreciate that they appropriately put this exercise in the context of the birth and growth of the SEPS. The Preamble statements are a most important ensemble of descriptors clarifying the state of affairs at SEPS, and we take pride in the dedication of our Program Directors and support staff.

Research on the interactions between the solid Earth and atmospheric, hydrologic, biospheric and anthropogenic systems is expanding and intensifying at an unparalleled pace, and it infuses Earth Sciences much needed opportunities for demonstrating the immense societal relevance of Earth Science. This nexus of fundamental research and emergent societal issues underpins a major fraction of SEPS-supported research activities. It is therefore not surprising that **“the COV was struck by the relevance of much of the research conducted in the SEP section to societal issues, especially those related to the impact of humans on the Earth system. . . have a major impact in communicating the societal importance of the geosciences, including the prevention or adaptation to human-induced changes, including those relating to climate, land use, and the environmental health of the biosphere and hydrologic resources.”**

The following responses focus on the general and program-specific recommendations and concerns brought up in the SEPS COV Report. We retained the numbering in the original COV Report in the following response, although we attempted to group a few related concerns that have interrelated answers.

## **ACTION ITEMS:**

**1, 2, 3) Enrichment of Hydrological Sciences: HS needs to do more to encourage PIs to generate proposals that address key theoretical areas within HS, to go after fundamental challenges in the field, and to forge new frontiers of hydrological science. SEPS needs a strategy for achieving enrichment and should consider commissioning an NRC panel to examine the possibility of splitting the HS program. The COV is concerned with what will happen when the current long-serving and extremely capable HS PO retires.**

Response: EAR is committed to stepping up our efforts to solicit the scientific community's input in order to identify fundamental challenges (e.g., on-going NRC Committee on Challenges and Opportunities in Surface Earth Sciences) frontier research science, gaps and linkages in surface Earth processes through direct communication with PIs, sponsored symposia, workshops, community modeling meetings, virtual communities and town meetings. We welcome suggestions for additional strategies for achieving enrichment beyond community consultations and information programs outlined above.

We will explore the question of whether the current program organization is serving the hydrological science community well in the same manner outlined above. As a tangible response to this and other suggestions made by the SEPS COV, we have scheduled two town hall meetings at the forthcoming GSA (October, 2008) and Fall AGU (December 2008), which will also feature participation by several members of the SEPS COV.

We fully recognize the need for personnel planning for the imminent retirement of Dr. Douglas James, an issue that relates to the activities noted above. We have already made plans to conduct a search of the HS permanent PO replacement (nominations are currently being accepted), and we are very mindful of the need to accomplish the transition in a smooth and timely manner, keeping workload implications in mind.

2009 Update: The SEPS held two town hall meetings at the annual GSA meeting (October, 2008) and Fall AGU (December, 2008), with participation of directors from all of the SEPS programs and attended by the new EAR Division Director, Robert Detrick.

The National Academy of Sciences (NAS) is preparing to release the report "Challenges and Opportunities in Earth-Surface Processes" before the end of 2009. This report solicited the scientific community's input to identify fundamental challenges in Surface Earth Sciences, including the hydrologic sciences.

An award was made to the National Academy of Sciences in September 2009 for planning, organizing, and executing a two-year study entitled "Challenges and Opportunities in the Hydrologic Sciences." A prior study, "Opportunities in the Hydrologic Sciences" completed in 1991, provided a solid foundation for the research program in hydrologic sciences at NSF. This new study would look back at what has been accomplished since the prior study completed in 1991, and evaluate the needs, opportunities, and challenges for the science in the coming years in order to produce recommendations to guide the research.

To ensure a smooth transition from the leadership of Doug James to the new permanent program director for HS, EAR conducted an extensive search process, which began in early 2009 with a mix of announcements in the most widely-read outlets for the HS community, including EOS and GSA Today. Informal distribution of the job advertisement was also made through hydrologic science mail lists, Consortium of Universities for Advancement of Hydrologic Sciences (CUAHSI) web page and targeted individual email. A highly respected hydrologist, Prof. Thomas Torgersen, emerged as the top candidate and will be joining the NSF as the new permanent Program Director of Hydrologic Sciences in January 2010.

*2010 Update: Interactions with the scientific community continued during the last year. In 2010, SEPS did not hold individual town hall meetings. Instead, SEPS program directors participated in town hall meetings that EAR held at GSA and GEO held at AGU. In addition, information about SEPS was included in "EAR to the Ground" an email sent to all PIs in EAR.*

*The National Academy of Sciences (NAS) lead the project "Challenges and Opportunities in Earth-Surface Processes" and published the report "Landscapes on the Edge: New Horizons for Research in Earth Surface Processes" that includes the following nine challenges in Earth Processes: (1) What does our planet's past tell us about its future? (2) How do geopatterns on the Earth's surface arise and what do they tell us about processes? (3) How do landscapes record climate and tectonics? (4) How do biogeochemical reactions at Earth's surface respond to and shape landscapes? (5) What transport laws govern evolution of the Earth's surface? (6) How do ecosystems and landscapes co-evolve? (7) What controls landscape resilience to change? (8) How will Earth's surface evolve in the Anthropocene? (9) How can Earth surface science contribute to a sustainable earth surface? The report includes four high-priority research initiatives that group the challenges: interacting landscapes and climate, quantitative reconstruction of landscape dynamics across time scales, the coevolution of ecosystems and landscapes, and the future of landscapes in the "Anthropocene".*

*As indicated in the 2009 update, the National Academy of Sciences is leading an effort on "Challenges and Opportunities in the Hydrologic Sciences". This committee is charged with identifying the challenges and opportunities in the hydrologic sciences, including (1) a review of the current status of the hydrology and its subfields and of their coupling with related geosciences and biosciences, and (2) the identification of promising new opportunities to advance hydrologic sciences for better understanding of the water cycle that can be used to improve water resources and environmental engineering and management. The goal is to target new research directions that utilize the capabilities of new technologies and not to critique existing programs at NSF or elsewhere. The study will not make budgetary recommendations. The 4<sup>th</sup> meeting of the committee took place on September 9<sup>th</sup>, 2010. It is expected that the committee will hold two additional meetings and the final report will be published in the Fall of 2011. This report is eagerly awaited by the community, as it can become the planning document for the future of hydrology much as was the 1991 "Eagleson" Report.*

*Dr. Thomas Torgersen became the Program Director for Hydrologic Science in January 2010. He quickly took the leadership of the Hydrologic Sciences Program, became*

engaged in NSF wide programs, and joined the management team for the Water, Sustainability and Climate Solicitation, one of the Climate Research Investments (CRI). The following text is Dr. Torgersen's assessment of the activities during the last year:

*The Hydrologic Science program and its community were deeply involved in the CRI "Water Sustainability and Climate" solicitation in which \$20.5M was ultimately awarded. The projects were expected to study water systems in their entirety, to broadly integrate across the biosciences, geosciences, social sciences and engineering to enable new interdisciplinary paradigm in water research. The community demonstrated its strength and its ability to address the underlying complexity and coupling of "water" issues, as well as an ability to network the science and the collaborating communities.*

*...The naturally occurring networking of the environment's mass and energy transport that occurs via the hydrologic cycle demonstrates that the hydrologic sciences play a key role in unraveling and understanding the complexity of the coupled systems that comprise the environment. ... The Hydrologic Sciences program is positioning itself to take advantage of its strength and this natural position in the environment to advance new frontiers and collaborations where ever the water cycle can be invoked.*

**4, 5) SGP and sustaining the NCAR and Earth Time Initiatives: Now that a 'deep-time' paleoclimate liaison has been established at NCAR, mechanisms need to be explored for making this position fully accessible to the community (e.g., funds for visiting scientists, post-doctoral fellows, students to be in-residence, workshops, on-line mini-courses, etc.). The COV is also concerned that the momentum created by the EarthTime initiative may fizzle out if further plans are not put in place for both sustaining the effort and broadening its impact.**

Response: We agree that EarthTime is a key initiative that has enabled the geoscience community to ask and answer questions that it has not been able to approach in the past. A point of clarification is that EarthTime is not directly funded by SGP, but by IF. As such, it was properly a part of the IF COV review completed last year. The EarthTime community is receiving ancillary support through IF, SGP and more recently CD. SGP alone has funded at least two test-bed studies and one EarthTime-related workshop to ensure that the community is taking advantage of the momentum set forth by EarthTime. We note that plans for sustaining and utilizing EarthTime are the responsibility of the communities that need it, but we are ready to support any such community-driven undertaking. We are working closely with the IF Program and the EarthTime PI to discuss the future of EarthTime.

One of the agreed conditions at the time of the paleoclimate liaison award was that NCAR would make the position and services available to the deep time community. Funding visiting scientists, post-doctoral fellows, students to be in residence, workshops, on-line mini-courses, etc can be supported through standard grant requests, and EAR's Post-Doctoral Program is one specific vehicle now available to support Post-Doc access to the NCAR liaison. Furthermore, NCAR is currently planning a series of proposed

geologic time specific workshops in order to bring together researchers facing the same deep time geologic and modeling issues.

2009 Update: EarthTime continues to be a key initiative that has enabled the geoscience community to ask and answer questions that it has not been able to approach in the past. The facility aspects of EarthTime are funded by the IF Program. However, the EarthTime community is receiving support through SGP to make use of the facilities in scientific research projects that require high precision geochronologic data. Broader impacts are significant, including student training, postdoctoral training, and fostering further development of international collaborations. Plans for sustaining the distributed EarthTime facilities (MIT, Berkeley Geochronology Center, New Mexico Tech, Boise State University, University of Wisconsin) are the responsibility of the communities that use it. SGP is working closely with these communities and the IF Program to plan the future of EarthTime via a workshop near NSF.

The current 'deep-time' paleoclimate liaison at NCAR is Chistine Shields, who collaborates with Jeff Kiehl of NCAR. She is working with a number of university collaborators to use the CCSM3 climate model to simulate various deep time periods. Christine has provided scripts and data to users in the larger community. Jeff has given a number of presentations to the public on climate change: past, present and future. He has used results from NCAR's paleoclimate simulations to provide a context for future climate change. These results have proven very effective in conveying the magnitude and rate of climate change through Earth's history.

*2010 Update: The award that supported the 'deep-time' paleoclimate modeling liaison at NCAR is in a no-cost extension period; Dr. Jeffrey Kiehl remains in charge of the activities. In the last two years, funds have been provided to two university professors to visit NCAR to carry out climate simulations that were then compared with paleoclimate data. One graduate student from Cornell University visited NCAR to learn to use the model to simulate mid-Permian dust distributions. The Paleoclimate Working Group has discussed deep time modeling and data comparison in their annual meetings. The paleoclimate users email list provides a forum for researchers to ask questions to the deep time liaison. The award to support the deep-time liaison, co-funded with Office of Polar Programs, will expire on September 30<sup>th</sup>, 2011. This activity has made great progress and continuation of the liaison position is very desirable. However, SGP is not in financial position to carry it alone.*

**6) HS and WATERS network: We would like clarification on the relationship between HS and the newly formed WATERS network. It is unclear if/how HS will fund the WATERS network and how this may impact HS core funding.**

Response: The WATERS network has not yet been formed. At this point, it remains an alternative being considered for developing an enhanced observatory system. At present, HS funding supports CUAHSI, CUAHSI Test Beds, HIS and Synthesis Centers all of which can contribute to the development of the WATERS Science Plan. Thus, the present impact to HS core funding is minimal.

2009 Update: The WATERS writing team, drawing expertise from GEO, ENGR, and

SBE, submitted a Science Plan to NSF in April 2009. This Plan conceived a national network of watershed scale observatories to be used to gather data to build predictive understanding of water availability and quality throughout the country. This Plan was reviewed by a special panel of the Water Science and Technology Board, NRC, in June. They submitted a letter report that applauded the interdisciplinary breadth of the endeavor but concluded that the network planning was insufficient and raised doubts that immediate large capital investment in a national network was practical.

*2010 Update: The Waters program has gone on hiatus and is no longer strongly supported by the engineering Directorate whose collaboration was critical to success. The core funding of the HS program has remained stable and opportunities for the growth of the HS community have been recognized through such efforts as CZOs and CRI/WSC. It is clear that the HS program remains strong in spite of the loss of the WATERS network and that the breadth of its community is matched by the breadth of the NSF/HS program. HS features strongly in the center of numerous efforts that are being launched and/or planned under climate and sustainability (see 2010 update for 1,2,3).*

**7) Evaluation of CUAHSI: We were not asked to evaluate CUAHSI, but given its importance and apparent success, we feel it should be evaluated. However, the COV was not provided with sufficient materials to make the evaluation.**

Response: A review of CUAHSI was not in the purview of this COV because none of the awards to CUAHSI were made in the 2005-2007 timeframe. CUAHSI's funding during this period are through continuing award increments from funds that EAR designated for that specific purpose six years ago.

*2010 Update: CUAHSI will be evaluated as part of the next COV in 2011.*

**8, 37) GG (and all of SEPS) and Broader Impacts: While the justification for funding is very well documented, there was a perception in the COV that the broader impacts criterion is not always applied uniformly, and there was concern that an appropriate balance is not always achieved in the decision-making. As the GG program moves to explicitly give equal weight to the intellectual merit and broader impacts criteria, the COV was moved to question whether the intellectual merit criterion is under-weighted in comparison to the broader impacts. Discussion of this observation led the COV to raise the issue of the checks and balances that might be placed on how the criterion is applied across all of SEP.**

Response: A uniform application of the broader impact criterion is a conceptually difficult proposition, given the assortment of project scope and the diversity of broader impact vehicles available to the PIs. In addition, it should be recognized that our reviewers, panelists and Program Directors do not have uniform expertise or background to bring in to the assessment of broader impact. For this reason, Program Directors tend to include broader impact “experts” in each panel. In addition, we provide written (for reviewers) and oral (for panelists) guidelines and encourage in depth use of “scholarship” criteria for assessing broader impact plans put forward by the PI. Our Program Directors are uniformly alert on broader impact consideration by reviewers and panels, and

notations in our Review Analyses invariably address broader impact evaluations. The Section Head and Division Directors likewise review award or decline justifications to ensure sufficient and consistent consideration of the two NSF review criteria.

On the question of the weighing of the broader impact and intellectual merit, GG may have been singled out because it is trying to find a consistent way to incorporate both intellectual merit and broader impact criteria in the panel ranking. In practice, the ad hoc reviews and panel evaluation hierarchically consider the competitiveness of each proposal first on the basis of its intellectual merit, and then proceeds to assess the broader impact of each. Intellectually meritorious proposals will rank lower in panel evaluation if it has a weak broader impact, and some proposals with very strong broader impact may rise in ranking against other proposals with equally strong intellectual merit.

In response to the comment from the COV, we will craft a standard broader impact assessment “guideline” for all SEPS programs, and this guideline will be included in review solicitation and panel guidance to achieve some level of uniformity.

(Also see 18, 19)

2009 Update: GG and all SEPS programs continue to consider the competitiveness of each proposal first on the basis of its intellectual merit, and then proceed to assess the broader impact of each. The broader impacts are discussed by the panel and a statement is always included in the panel summary of each proposal.

2010 Update: *practices reported in 2009 continue to be implemented.*

**9, 38) GG (and all of SEPS) and transformative research: While we applaud the support of high-risk projects, especially in GG, we are also concerned that some high-risk projects were funded on the basis of confidence in PI capabilities, despite potentially fatal flaws revealed in mail reviews and the panel summaries (we noted one such case in GG). While the PO provided thorough rationales for these decisions, they have the potential to undermine the competitive proposal process unless a tangible metric is defined to ensure consistency. As in action item #8, discussion of this observation led the COV to raise the issue of the checks and balances that might be placed on how to best support this type of research in SEP.**

Response: We concur with the need for consistency and check/balance in the decision making process in GG and other SEPS programs. As in the broader impact consideration noted in item (8), consideration of the “potentially transformative research” (PTR) criterion as part of the intellectual merit assessment has the potential to be misunderstood by reviewers, panelists and even Program Directors. SEPS will make every effort to standardize the language in the written and oral guidance to reviewers, panelists and Program Directors with respect to consideration of PTR, while noting at the same time that the definition of PTR and metrics for identifying it are very much “work in progress” within the whole Foundation.

The specific case noted for GG by the COV is a result of the ranking of proposals by the GG panel, which in this case was consistent with the mail review scores. The PO appreciated the flaws identified by the mail reviews, but the judgment was made that

the criticisms did not warrant overturning the Panel recommendation.

There are several oversight mechanisms for ensuring checks and balances and consistency of implementation of review criteria in our current system. The concurrence by the Division Director (DD) on awards and declines signify that the DD agrees with the decision. Section Heads and DD also regularly examine program data and speak to POs, PIs and Panelists to get a global sense of consistency of PO decision process. Finally, the COV, itself, is a major component of the check and balance system employed by NSF. We welcome additional ideas on how best to implement a check and balance system that does not impinge on the decision-making ability of our Program Directors.

2009 Update: The NSF intellectual merit review criterion was updated to include potentially transformative research in January, 2008. NSF has developed documents to provide insight with respect to potentially transformative research and the application to NSF funding. SEPS programs have included a dialog on transformative science criteria at the beginning of each SEPS panel since January, 2008. SEPS panel summaries identify transformative research. Promoting and funding potentially transformative research is a high priority for NSF, so the potential for transformative research is heavily weighted in making a funding decision.

In January, 2009, NSF implemented a funding mechanism, EARly-concept Grants for Exploratory Research (EAGER), to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. This work may be considered especially "high risk-high payoff" if it involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives.

2010 Update: *practices reported in 2009 continue to be implemented.*

**10) SGP and orphaned ESH proposals: We note that excessive dwell time for 2006-07 may reflect the fate of proposals caught in the redesign of the ESH program into P2C2. Effort needs to be made to assure that this was a one-time anomaly in processing.**

Response: The COV panel analysis of what contributed to the long SGP dwell time is correct. It should not happen again because the special SEPS Paleoclimate competition lasted only one year. The addition of a new Program Director position in SGP will further ensure dwell times more in line with our 6 month target.

2009 Update: As noted in our response above, SGP had an anomalous dwell time for 2006-07. In 2008, the dwell time of SGP was close to the target.

2010 Update: *The dwell time for SGP in 2009 was higher than in 2008, but during this fiscal year dwell time was affected by the America Reinvestment and Recovery Act. In FY10, the dwell time improved significantly close to the NSF target of actions to be processed within 6 months.*

**11, 12, 21) GLD needs a permanent PO: GLD is the only program in EAR without a permanent PO, which condemns the program to constantly revisit the steepest part**

**of the learning curve with each rotator. This impedes its maturation and weakens its ability to compete for funds. NSF needs to commit to a permanent PO to the program. We note that GLD has the smallest budget, and that in its first three years it grew less than (the poorly funded) GG and SGP. This program is attracting proposals of the highest caliber from a growing cadre of young scientists. Furthermore, GLD is at the heart of the Critical Zone, now being recognized for both its richness scientifically and its essential relevance to society.**

Response: We have endeavored to negate the perceived negative impact of having a temporary PO by managing the transition between the rotators better, and by ensuring that the annual program budget allocation is based solely on EAR/GEO priorities (not on the appointment status of the PO). The fresh perspective from the research community brought in by rotators to the GLD PO position has been a major plus for this program. Whereas it would be desirable to ultimately recruit a permanent PO to the GLD program, we will continue to strive to recruit the best rotators from the community in the interim. The number of permanent positions for NSF is ultimately determined by agency budgets and overall resource allocation priorities.

Declining success rates are a concern that we share, not only for the SEP section, but for the whole Division and Foundation as well. The difficult decision on resource allocations are made by careful considerations of a number of factors including success rates, balance, and strategic areas of emphasis with guidance from the broad Earth science community such as the NRC 2001 report “Basic Research Opportunities in Earth Science” and the NRC 2008 report “Origin and Evolution of Earth: Research Questions for a Changing Planet.”

2009 Update: A position announcement for the program director of GLD has been posted. The position will be filled as a permanent appointment, a rotator, or a visiting scientist. The job announcement is being advertised in the most widely-read outlets for the GLD community, including EOS and GSA Today. We expect to fill the position by mid year 2010, when the current GLD program director will be returning to his home institution.

All SEPS programs received large percentage increases in their FY09 allocation, which together with a substantial one-time infusion of funds from the American Recovery and Reinvestment Act (ARRA) sources provided a healthy level of support for SEPS programs.

2010 Update: *Dr. Paul Cutler joined EAR in September 2010 as the first permanent program officer for GLD.*

*In fiscal year 2010, the budgets for SEPS programs increased relative to the funding level in 2008. As noted above, fiscal year 2009 was anomalous due to the ARRA funding.*

## **SEPS-wide concerns**

**13) Staff (and space) needs: It is clear that SEPS is still under-administered (whether measured by the proposal load/program officer, or by the excessive dwell time for the reporting of (mostly) declines). More staff is required.**

Response: The proposal workload of SEPS Program Officers compares reasonably with the rest of EAR, but is clearly higher than the rest of GEO. Although increasing the number of Program Management staff for SEPS to bring it up to par with the rest of GEO will certainly help alleviate work load and dwell time concerns, the two new PO positions added to SEPS in the past two years, have already set us towards recovery. The new SGP PO has brought the program near the target dwell times, and dramatic improvements in GG dwell times are also beginning to show for '08 proposals.

Support staff shortage and office/work space are perennial problems for SEPS and the whole of NSF. The space problem is presently dealt with through cooperative discussions with other 7<sup>th</sup> floor Divisions. An NSF-wide committee is looking into the serious office and panel space issues facing the Foundation. Support staff problems are being dealt with through active recruitment, “detail” arrangements and analysis of workload priorities.

2009 Update: The dwell times of SEPS programs, except HS, improved in 2008 in comparison to previous years. Dwell times for all of the SEPS programs deteriorated in 2009 due to the large number of awards as a result of extra ARRA funding.

The GEO Directorate found a partial solution to the office space problem by the relocation of three SEPS program directors to highly desirable office spaces on the 6<sup>th</sup> floor. This area of the 6<sup>th</sup> floor is intended to be shared by GEO and BIO personnel. The support staff shortage continues to be dealt with through “detail” arrangements. The hiring of one intern has been a most welcome addition to SEPS, but has not permanently resolved the problem.

*2010 Update: The only program in SEPS that met the dwell time target was GLD, and SGP was close to meeting the target. However, HS and GG dwell times continue to lag behind. The number of proposals submitted to SEPS programs (as other programs in NSF) in FY10 increased significantly. In addition in FY10, HS and GG program officers participated in the management and review of proposals related to the Climate Research Investments. No additional program officers were hired to assist with the new solicitations. Workload issues were alleviated with temporary assistance. Retired program officer Dr. James was hired as an expert, and Dr. Cuenca's appointment was extended to continue assisting HS from his home institution.*

*Several SEPS program officers occupied the offices on the 6<sup>th</sup> floor. During the first half of 2010, one permanent program officer and 3 IPAS, working in 3 different programs, had their offices on the 6<sup>th</sup> floor. This arrangement was temporary and during the second half of 2010, office space was allocated such that program officers for a given program are located near each other. Thus, the program officers for SGP, a natural partner for Biological Sciences, have moved to the 6<sup>th</sup> floor. This more permanent space allocation was facilitated by a large number of rotations of IPAs in EAR; 5 program officers returned to their home institutions.*

**14, 15) Continued recruiting of minority-involvement proposals, reviewers and panelists is warranted. While women award rates are acceptable, the absolute numbers of women PIs is not. Neither the award rates, nor absolute numbers of minority PIs is acceptable. Need for better tracking of minority groups.**

Response: For the period of the COV review, the success rates of proposals involving women are in fact higher than the overall success rates for all submissions in SEP, except for GLD. For GLD, the success rate of proposals involving women are at par with the GEO-wide average. We believe that the relatively higher success rates for women PI in SEPS will go a long way in encouraging more submissions of proposals from women PIs.

The success rates of proposals involving minority PIs are notably problematic for GG and HS. This was called to the attention of all SEPS POs, and we are taking steps to enhance minority success rates and participation. As a first step, we are aiming to have at least one minority member for each panel convened by SEP. Furthermore, the SEPS Section Head will track the success rates of proposals with minority participation in each program on an annual basis, and will discuss the observation with the relevant POs. All POs will be encouraged to closely track proposals with minority PIs for each competition.

Each program will attempt to balance requirements of supporting the most meritorious proposals and at the same time enhancing women and minority participation. Part of the problem is the lack of SEPS programs in many minority-serving institutions, but we will make every effort to encourage submissions from minority PIs and minority-serving institutions through our normal information channels.

2009 Update: The success rates of proposals involving women are higher than the overall success rates for all submissions in SEPS in 2009. All of the SEPS programs are making extra efforts to fund proposals with minority PIs. They have increased the number of minority panelists and reviewers.

*2010 Update: In general, the participation and success of women in SEPS programs is commensurate with that of men. However, the participation of other under-represented groups remains low. Efforts are being made in EAR to increase the number of PIs from under-represented backgrounds.*

**16) Tribal College involvement: While steps have been taken within SEPS to increase tribal college involvement, these efforts have not yielded tangible results. We hope that these initial efforts remain in place and will lead to tangible results.**

Response: SEPS will revisit this issue, and devise additional strategies that may be employed. This is an NSF-wide concern, and we will keep ourselves apprised of strategies developed by working groups tasked with examining this global issue. Again, part of the problem is that very few tribal colleges have program in SEPS research areas.

2009 Update: We continue to strive to increase tribal college involvement within SEPS. The most successful involvement with tribal colleges is through outreach activities to their students and teachers.

*2010 Update: In EAR, we are making progress in engaging faculty from Tribal Colleges and Universities in the research enterprise of EAR. An EAR PO participated*

*in the 2009 PI meeting for Tribal Colleges and Universities Program and made direct contact with possible institutions that have programs within the purview of EAR. There are plans for visiting some of these institutions in late 2010 or early 2011. In addition, in 2010 several supplements were made to SEPS awards to engage Native Americans in research projects. For example, NCED received a supplement to host a faculty member from Salish Kootenai College (a Tribal College), with the goal of establishing a hydrologic sciences program at the Tribal College; a PI at Purdue University received an REU supplement to engage two Native American students in his investigation.*

**17) Importance of PI's prior support: We note that, particularly in GG and HS, the POs take into consideration the PI's prior support and/or reviews of prior versions of the proposal. It would be helpful to know how this is done exactly.**

Response: There are no exact ways by which any intellectual merit, broader impacts or programmatic considerations are incorporated in the funding decision process. We instruct each panel to consider the revision of a previous submission during the panel discussion (i.e., once a resubmission is recognized). Owing to the fact that resubmissions can be from other programs, it is not straightforward to track resubmission unless the PI specifically mentions it. Responsiveness to previous reviews is a consideration, such that non-responsiveness to prior review reflects negatively on PI's ability to reconcile with the peer review process. Evaluation of the results of prior support is an NSF-wide requirement that reviewers, panelists and POs are asked to consider. Good ideas are required but not sufficient for proposal success. A good track record of productivity on past NSF support is absolutely required for more support.

Moreover, it is NSF policy that proposals which have not been revised (see page IV-2 of the NSF "Proposal and Award Policies") can be returned without review.

2009 Update: Both GG and HS ask panel members to consider the results of previously or currently funded projects. The program directors also examine the annual reports submitted on current projects. Productivity on past NSF support is required for more support. If a proposal is a resubmission, the extent to which the PI considered earlier relevant review comments is an important factor in the project's evaluation.

2010 Update: *practices reported in 2009 continue to be implemented.*

**18, 19) Satisfying the broader impacts criterion: It appears that PIs may be penalized by reviewers who pay more attention to broader impacts; therefore reviewers and panels should be made aware of the relevant statistics. POs should raise the issue at town hall meetings and in their review requests, with the specific goals of communicating the importance of the broader impacts criterion, what it includes, how much effort is expected, and how to fairly review it. Quality of panel summaries: While most of the panel summaries are thorough, some lack detail, in particular with regard to the broader impact criteria. More uniform attention is needed, especially given the lingering confusion over this merit criterion.**

Response: It is standard practice for POs to include in the letter requesting a review some instructions and a link to the NSF web site that gives examples of broader impact activities. In view of the COV assessment, we will develop new written instructions to ad

hoc reviewers and to the panels so that the review process serving the programs will all start from the same basis with respect to the broader impact criteria. Many ad hoc reviewers address broader impacts by describing the broad benefits that the research would contribute to society. Others are looking for presentation of specific educational and outreach programs. We need to deal with this difference and clarify what is expected in our new written instructions. The statement that more reviewers comment on broader impacts for declines than for awards cannot be evaluated at this time. Note that reviewers are asked to comment on the broader impact regardless of their rating or funding recommendation. Despite the lingering concerns on broader impact evaluation, we note that the increasing quality of broader impact content of proposals submitted to NSF and the scholarly level of discussions of broader impact by reviewers and panels are reasons for optimism that the science community is getting it. It is not enough that we produce good research outcomes; the science community must take part in ensuring the widest impact of the research in terms of educating the future science work force and in translating our research outcomes into public awareness (and welfare, if appropriate).

This broader impact review issue will be covered in the next SEPS Town Hall meetings (GSA, October, 2008; AGU, December, 2008). However, these issues are also regularly discussed during the opening day of every Panel in SEP.

(Also see responses to points 8, 37).

2009 Update: The broader impacts criterion was discussed during the SEPS Town Hall Meetings (GS, October 2008; AGU, December, 2008). SEPS program directors have included text in their review request letters on how to evaluate this requirement. Panels discuss the broader impacts of each proposal and, in almost every case, the panel summary indicates an evaluation of this aspect. If the proposal has sufficient scientific merit to be considered for funding, the broader impacts are taken into consideration when deciding which proposals to fund.

2010 Update: *practices reported in 2009 continue to be implemented.*

**20, 30) Success rates of re-submissions: Given the low award rates it would be helpful to understand the success rate of re-submitted proposals that respond to the prior reviews, and how the panel and PO reviews help in strengthening the proposals. These statistics also need to be explicitly communicated to the community, to help PIs decide whether or not to resubmit proposals, which may help decrease overall proposal load.**

Response: There are many types of resubmissions, ranging from hardly modified resubmission to those where there is a question on whether or not it is a resubmission (i.e., or an entirely new proposal). Furthermore, some proposals are resubmitted from another program, and this may not always be straightforward to identify. The NSF data system does not distinguish what are considered resubmissions, which would help in tracking their success rate. We recently discussed this issue at a Section meeting and concluded that success rates of resubmissions are not only tedious to track; it is unclear that this is worthwhile work, beyond the generalities that resubmitted proposals that takes full advantage of reviews and panel comments will have a greater chance of succeeding. Conversely, resubmitted proposals that are unresponsive to reviews will have practically

no chance of succeeding. Fully responsive revision does not equate to funding because every competition is unique, and funding decisions are made on the basis of relative proposal ranking – not absolute scores. Furthermore, the success also depends on other factors such as co-funding, new reviewers/panelists that brings in new perspectives/expertise, new information, etc. The SEPS POs are convinced the community is aware of these generalities, but will endeavor to clarify this to PIs at every opportunity (e.g., town meetings).

In summary, we believe that each declined/resubmitted proposal is a separate case, and we do not believe that it would be wise to prepare a general guidance to PIs beyond the generalities noted above. Should the NSF proposal tracking system eventually include resubmission statistics in its data base, we would be happy to share this with the subsequent COV.

2009 Update: There is no mechanism for tracking the success rates of resubmissions.

2010 Update: *there is no additional information to report.*

**Concerns we suspect are being attended to, but that we felt compelled to mention:**

**22) Critical Zone Observatory (CZO) sites: CZO is an important cross SEPS program that deserves more attention. The COV would like more explicit information on the selection process and progress on establishing the selected observatories, as well as future funding plans for new observatories.**

Response: The CZO awards were described during the COV presentations including the solicitation, letters of intent, review process, panel composition and eventual decision reached by SEPS (all completed within 6 months). Each CZO proposal was sent for ad hoc review to about half a dozen experts drawn from all three participating programs. A panel of experts representing the disciplines covered in the proposals was convened to review the proposals submitted for the CZO solicitation. Based on the input of the ad hoc reviewers and their collective discussion, the panel categorized the proposals and eventually chose three proposals after a thorough discussion of the panel and POs, a process that also included a video interview and Q&A involving the POs and PIs of the finalist proposals. The CZO selection process was extremely thorough. An independent national steering committee has been assembled and will provide oversight for implementation of the CZO vision.

The suggestion that more COV time be devoted to these larger projects is a welcome one, and we will consider this suggestion in planning the next COV.

2009 Update: Three new CZO projects were supported with ARRA funds in 2009. These proposals were among those received for the 2007 competition.

2010 Update: *there is no additional information to report.*

**23) Need to moderate enthusiasm for new efforts with realism: While we applaud PO efforts' to establish new large-scale community programs, the failure of the Hydrologic Observatory and Berkeley Synthesis Center highlights the importance**

**of tempering growth activities with realistic assessments of the challenges involved. Precautionary action in anticipation of difficulties is recommended (we appreciate that this may be difficult).**

Response: We will continue to work with the SEPS community to make clear that planned growth is normally a slow process. Through town meetings and smaller community meetings, we will make sure that the SEPS communities understand that some initiatives prosper, while others either fail or get transformed into refined or hybrid initiatives.

2009 Update: It can be argued that Hydrological Observatories and Critical Zone Exploration Network are precursors to CZOs, and lessons learned from the Berkeley Synthesis Centers resulted in the eventual implementation of the Hydrological Synthesis Centers in the University of New Hampshire/City University of New York and University of Illinois.

(Also see responses to points 4, 5 and 6).

2010 Update: *In the last year, EAR asked the Board of Earth Sciences and Resources from the National Academy of Sciences to convene a committee to identify research opportunities within its purview. It is expected that The New Research Opportunities in the Earth Sciences (NROES) Report will be published in 2011. The committee has representatives of the SEPS PI community. They have taken other NAS reports and workshop reports into consideration during their deliberations.*

**24) Importance of reviews that do not provide substantive comments: We recommend (if it is not already done) that POs either discount or down-weight reviews that do not provided substantive comments, and that these reviewers be asked to provide such comments. It would be helpful to have POs notate the e-jackets when reviews of this kind are received.**

Response: First, it should be noted that according to NSF policy, the reviewers cannot be asked to change (e.g., improve) their reviews (see NSF guidelines in “Proposal and Award Policies”).

Discounting non-substantive reviews is part of the Panel process, and is done routinely during Panel discussions. Furthermore, POs routinely discount reviewer ratings that do not provide substantial justifications (e.g., see PO Review Analysis). Adding a requirement of marking these reviews in ejackets as “non-substantive” will require some documentation as to why that designation is being made. We feel that this requirement will add an unnecessary burden on the part of the POs who already provide exhaustive justification for the PO recommendation in the Review Analysis, including identification of non-substantial reviews.

2009 Update: SEPS panels consider the substance of the external reviews as being more important than their scores.

2010 Update: *practices reported in 2009 continue to be implemented.*

## Recommendations for next COV:

**25) Larger-scale initiatives:** While most of the research activity within SEPS was centered on standard proposals, the COV noted that some of the most important and potentially transformative efforts center around large-scale projects, such as CUAHSI and initiatives such as EarthTime. These are also often very expensive, so they need special scrutiny for that reason to. To be most effective the COV needs to hear more explicit evaluations of these initiatives from the POs during their visit to NSF.

Response: We accept the recommendation and will take it into account in planning the next COV. The three-day review was barely sufficient even without provision for the explicit review of large projects.

2009 Update: In addition to CUAHSI, CZO, and Earthtime (part of IF COV), we note that the next SEPS COV also needs to cover Emerging Topics in Biogeochemical Cycles (ETBC) and other programs that receive contributions from multiple programs (trans-division or trans-directorate).

2010 Update: *We recognize that large investments will be part of the next COV and SEPS will take advantage of IT developments to facilitate the process (e.g. all data electronic, pre-NSF visit webinar to address logistics and objectives).*

**26) Are PIs being informed of proposal decisions in a timely fashion?** While the formal dwell time data indicates a severe crisis in PI notification, it appears that PIs are being informed of the decisions informally in a timely fashion. To be assured we need quantitative data on when PIs receive informal notification, data that is not presently readily available.

Response: NSF rules require that official decisions be relayed only through the DD-concur process and Fastlane. All SEPS POs inform PIs of their intention to award/decline ahead of the 6 month dwell time target for NSF proposals. This unofficial notification is normally sent via email (or phone call for awards), and there are variations amongst POs as to the timing of when these contacts are normally made. As noted above, the dwell time for SEPS proposals is now dramatically improving, and our plan is for this issue to be non-existent by the next COV.

2009 Update: SEPS program directors will be prepared to provide data on the timing of the unofficial notification in the next COV.

2010 Update: *there is no additional information to report.*

**27) Effects of excessive dwell times:** We need to know whether the slow data entry into the NSF system has any negative impact on both funded and unfunded PIs.

Response: POs pay attention to this closely, and PIs and POs resolve this quickly should a proposal need to be resubmitted before an official decline has been officially coursed through the DD-Concur process. Given that proposals cannot be resubmitted within one

year of decline, this situation arises infrequently, if at all. In the case of awards, POs usually have running discussions with PIs over the duration of the award process. The processes of budget revision and submitting an updated abstract that takes advantage of review comments may take a couple months, but this is seldom a source of concern.

2009 Update: The above response describes well the present practice.

2010 Update: *practice mentioned in the response continues.*

**28) Reporting bias introduced by excessive dwell times: Except for an insert with Table B, the data sheets almost always over-estimate the award rates because many of the declinations were not entered into the system (especially for 2000). If the dwell time problem is not solved by the next COV this fact should be noted explicitly on the provided data sheets.**

Response: This was and will be noted. Yellow tables in the COV binders provide the information based on proposal submitted (i.e., regardless of dwell times), and were included precisely to allay this concern. The two programs that had serious dwell time problems for the COV period are now catching up and the dwell time problems of HS and SGP resulted from temporary problems.

2009 Update: This will be noted in the next COV. The dwell time deteriorated in 2009 (see update to point 13).

2010 Update: *there is no additional information to report.*

**29) Medians versus means: We were provided with averages for award sizes, award durations, and proposal scores. However, the underlying distributions are left skewed, so medians would be more meaningful than the means. It would be helpful to either be given the median, or the underlying frequency histograms, for these metrics.**

Response: Median statistics will be reported for award sizes and duration in the next COV. Unfortunately, for proposal scores, even true median statistics cannot be generated until the EIS system is able to cope with fractional scores, which it cannot handle at present.

2009 Update: Median statistics will be reported for award sizes and duration in the next COV. The EIS system does not record fractional scores yet.

2010 Update: *there is no additional information to report.*

**31) Success of new investigators: We would like to know: 1) what proportion of successful new PI proposals were second submissions (has feedback from initially declined submissions led to successful follow-up submissions?); and, 2) how many times new PIs were funded despite a lower absolute ranking in the panel (to what extent are inexperienced PIs assisted in this way?).**

Response: Even were these factors noted, it cannot be surmised that they were

dominant in the award/decline decision.

2009 Update: Recently completed ARRA funding targeted support of early career and new PIs.

2010 Update: *there is no additional information to report.*

**32) Documenting outreach and education activities beyond the university-level:** These activities appear to be increasing in response to the broader impact criterion. If NSF desires feedback on the degree to which these ideas are implemented then annual and final reports need to be made available to the COV.

Response: We agree with this recommendation. It may be necessary for NSF to change reporting formats to require reports on broader impacts. These could cover the importance of the research to the community, the educational program, and the outreach program. In each case, it would also be valuable to obtain feedback from students and users techniques, models and data generated.

2009 Update: SEPS panels have also suggested requiring a discussion of outreach and educational activities in the results of prior NSF support.

2010 Update: *NSF is revising the award progress report template; the new template will better capture broader impacts information.*

**33) COV consultation with POs:** Finally, we recommend that future COV chairs (if not all COV members) take advantage of the time they have while “floating” to talk informally with each of the Program Officers, to get a feel for the issues that might be brewing that might not be aired in their formal reports, or in the data the COV will be provided with.

Response: This is connected to the issue of COV schedule/duration, given that it is the time constraint that may keep the COV Chair and members from taking full advantage of the PO availability during the COV visit.

2009 Update: Program Directors would like to have the opportunity to answer COV members’ questions, if time is available.

2010 Update: *the next COV panel will be encouraged to follow the recommendation.*

**NSF-wide concerns:**

**34) Errors in the reporting of the number of ad hoc reviewers and proposal scores:** We discovered that often either entire panels, or those panelists assigned to a proposal, are being counted as ad hoc reviewers. Similarly, we found that if an ad hoc reviewer did not offer a numeric score, or elected to report a split number (e.g. very good/good), neither the review, nor the score was recorded. These recording errors need to be fixed.

Response: We will continue to strongly recommend this to the EIS working group at

NSF. This must be corrected.

2009 Update: We continue to recommend this to the EIS working group at NSF.

2010 Update: *there is no additional information to report.*

**35) Alarm at pressure to reduce the number of incoming proposals: The COV was alarmed when it learned that one of NSF's management's suggestions to deal with the increased proposal pressure is for POs to try and reduce the number of proposals submitted. It is not NSF's job to try and curb the Nations scientific creative engine!**

Response: Although we believe that any program solicitation should be precise in its language so as not to attract proposals that clearly has no chance of succeeding, we agree that other measures beyond that to reduce the number of submission must be examined very carefully by NSF.

2009 Update: This is a matter for discussion within EAR/GEO.

2010 Update: *there is no additional information to report.*

**36) Education and Outreach: We feel strongly that NSF as an organization is well positioned to have major impact on education and outreach. NSF as an agency should find effective ways of publicizing the amazing range of exciting science that it funds, as well as the spectrum of innovative community outreach activities that result from NSF funded research projects.**

Response: We agree that more could be done to publicize the range of amazing science supported by NSF in general, and GEO in particular. This issue is very critical, as the public wrestles with important decisions on allocating the country's resources to a plethora of societal priorities.

Whereas NSF has numerous mechanisms in place for publicizing the important science that it funds, we agree with the COV that the present mechanisms and avenues for conveying the developments in geosciences to the public can be improved. Programs such as IGERT, GK-12, REUs, are useful in that they engender a "culture" of public accountability to scientists and students, but more direct mechanisms appear to be more sporadic rather than strategic. We therefore will recommend to our GEO leadership to consider taking a more proactive and strategic approach to promoting outreach and publicity for the science that we fund.

On our part, we will ensure that our SEP researchers continue to be major players in education and outreach programs, given the direct societal relevance of much of fundamental SEP research that we support. Indeed, the existence of an EHR program within EAR and SEPS is a clear testimony to our strong commitment to education and outreach, and we will endeavor to proactively involve this program in a GEO-wide public outreach initiative.

2009 Update: This recommendation is being implemented. We are working with the

Office of Legislative and Public Affairs to publicize the results of research, education and outreach activities of our investigators using different mechanisms to reach the public, government, and the research and education communities.

*2010 Update: the Division is regularly represented in activities that highlight scientific and education efforts to the general public. For example, research efforts supported by the Division of Earth Sciences will be highlighted in the USA Science and Engineering Festival Expo in the National Mall, October 2010.*

**CLOSING COMMENTS:**

The SEPS was pleased to receive the Report of the COV on their review of actions taken by the Geobiology and Low Temperature Geochemistry (GG), Geomorphology and Land-Use Dynamics (GLD), Hydrological Sciences (HS) and Sedimentary Geology and Paleobiology (SGP) programs during the last three fiscal years (2005-2007) and their evaluation of the products and contributions supported and overseen by the programs over the same period. We hope that our response is commensurate with the effort and thought that the COV exerted in this process. The last three years have provided unprecedented funding opportunities for SEPS PIs (e.g. ARRA funding and Climate Change Investments) and at the same time management challenges for SEPS POs. We hope that this document, with the response of SEPS to the last COV and the two updates, will provide valuable information for the next COV in the summer of 2011.

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Section