

Panel Review Report
United States Geological Survey
Biological Resources Discipline
Wildlife: Terrestrial and Endangered Resources Program

Panel Members:

Steven M. Chambers, Ph.D.
Senior Scientist
Ecological Services
U.S. Fish and Wildlife Service

Thomas H. Eason, Ph.D.
Deputy Director, Planning and Policy Development
Division of Habitat and Species Conservation
Florida Fish and Wildlife Conservation Commission

Herbert Frost, Ph.D.
Associate Director
Natural Resource Stewardship and Science
U. S. National Park Service

Peter P. Marra, Ph.D.
Research Scientist
Smithsonian Migratory Bird Center, National Zoological Park
Smithsonian Institution

Gary C. White, Ph.D.
Professor Emeritus
Department of Fish, Wildlife, and Conservation Biology
Colorado State University

EXECUTIVE SUMMARY OF PANEL RECOMMENDATIONS

Organization of Programs

- Look across all the program areas within the Biological Resource Discipline (BRD) and, where appropriate, combine programs to reduce duplication in staffing, administration, and reporting. The Panel realizes that this recommendation goes beyond the scope of what they were asked to address, but believe it is critical to the long-term benefit and sustainability of the Wildlife: Terrestrial and Endangered Species (WTER) Program as well as BRD. The Panel also recognizes that this would take support and concurrence from senior United States Geological Survey (USGS), Department of the Interior (DOI), and Congressional staff to achieve.
- Review the regional structure of the USGS BRD and modify as appropriate to reduce the agency's monetary overhead and remove barriers to productivity of USGS scientists. The Panel recommends special attention be given to the REX-Regional Director aspects. The Panel observed little benefit of the current structure, and believes authority for the management of USGS BRD scientists should be at the Center Director level.

Funding

- Use WTER Program funds to support research projects only, as opposed to the current model of funding permanent salaries, overhead, and administrative support functions. This may require Science Centers (Centers) to become base funded.
- Include Headquarters level staff in setting research priorities to ensure national level issues are being addressed.
- Develop mechanisms to minimize the work needed to compete in national requests for proposals (RFPs) that have small pots of money.
- Determine the optimal level of reimbursable funding using a structured decision process, with the objective of maximizing the research productivity of scientists. The Panel does not suggest that no reimbursable money be taken by BRD scientists, but rather that there is some optimal level beyond which, the goal of the research project becomes the pursuit of funding rather than sound science.
- Create a Projects of Special Significance program to fund long-term critical research.
- Streamline the cyclical budget process to ensure the efficient use of the scientists' time.
- Create centers of expertise where specialized equipment is purchased, but would be available to all USGS clients desiring its use.
- Invest substantially, with appropriated funds, in the research areas and Centers for which USGS is clearly the world leader.

- Create an exploratory committee to assess the feasibility of a "Friends" group as well as the development of other funding mechanisms to help support the financial needs of USGS researchers.

Planning Process

- Be sensitive about over planning. Instead of six element plans within the Biological Research and Monitoring (BRM) Program, the Panel recommends one combined plan that identifies objectives and priorities across all six areas. Specific funding and resources should be allocated to these priorities; funding for Projects of Special Significance and the centers of expertise proposed under Funding above, and streamlining of the cyclical budget process should be part of this planning process.
- Develop one set of goals that capture both the scientific practitioner and oversight reporting needs when working on future plans.
- Use the WTER Program Plan to set strategic direction and drive research project selection at the program field level instead of just to summarize and organize the broad scope of USGS efforts funded by the Program.
- Include scientists in future planning efforts (as appropriate) while balancing the need for scientific staff involvement with their priority duty of implementing scientific projects.
- Ensure that Program plans define clear objectives, priorities and actions for activities and programs. The Panel did not review any of the activity-level plans, but our recommendation is that within BRD, the three activities should be the focus for specific priority planning. Nested within and/or drawing from these activity plans would be the Regional and Center planning efforts which should focus on specific priorities and actions.
- Include Cooperative Research Unit (CRU) scientists in WTER Program planning efforts. These plans should identify specific strategies and actions for how CRUs can help fulfill Program goals and objectives.

Science Management

- Conduct a survey of USGS scientists to gauge the effectiveness of the Budget and Science Information System (BASIS Plus) as a way to manage and query scientific products. Follow up actions could include modifying BASIS Plus or using another database system.
- Amend the Fundamental Science Practices (FSP) for the internal review and approval of abstracts for meetings, PowerPoint presentations, and manuscripts prior to submission to peer-reviewed publication to include only the immediate supervisor.
- Eliminate limitations on the number of USGS scientists traveling to domestic and international meetings assuming proper scientific justification is in place. The approval of travel should occur at the level of the supervisor or the Center Director.

Availability of BRD Products

- Create or enhance systems for long-term archiving of physical material and electronic records to capture their scientific value for future research. Produce an archive of oral histories or develop publication outlets for retired or senior scientists to record their broad views of important scientific efforts.
- Link BRD postings to a single, searchable, user-friendly database that connects to specific sites where queried information is posted. Electronic files of the actual publications should be available whenever consistent with copyright laws. The link to this database should be prominently displayed on the BRD home page.
- Add an explicit statement on peer review and publication status to each publication that is posted.

PREAMBLE

The Panel recognizes the impressive group of scientists in the United States Geological Survey (USGS) Biological Resources Discipline (BRD). BRD scientists are leaders the wildlife research field, and produce immensely influential work.

The Panel’s goal is to improve the impact of USGS science by:

- Increasing the productivity of scientists, specifically peer-reviewed journal articles;
- Improving the quality of science;
- Improving the efficiency with which science is produced; and
- Increasing the effectiveness of application of USGS science.

The Panel advocates a structured decision process where decisions are evaluated based on whether the results will meet or exceed the goals listed above.

INTRODUCTION

The Panel identified five areas that could be improved to better meet the goals of Biological Resource Discipline (BRD) of producing the quality and quantity of biological science that the agency desires:

- Organization of programs/Management layers;
- Funding;
- Planning process;
- Science management; and
- Availability of BRD products.

The charge to the Panel included, “. . . answer questions about the quality of the science and the effectiveness and efficiency of the Wildlife: Terrestrial and Endangered Resources (WTER) Program in meeting goals set out in its five-year plan. . . .” The five-year plan included program, goals, objectives, products, outcomes, and measures. The Panel could not fulfill the charge to evaluate effectiveness and efficiency of the WTER in meeting goals of the five-year plan because of a lack of information on the specific, quantifiable outcomes identified in the plan for measuring achievement of program goals. If BRD intends to continue to use such strategy documents and plans to guide activities, the Panel recommends that they track the achievement of the quantifiable outcomes identified in the plans and provide this information to future reviewers.

ORGANIZATION OF PROGRAMS WITHIN THE BIOLOGICAL RESOURCE MANAGEMENT PROGRAM/MANAGEMENT LAYERS

The WTER Program is part of the USGS BRD. Many of the programs within BRD are similar in program scope, subject matter areas, and types of projects that are ultimately funded in the Science Centers (Centers), resulting in added bureaucracy, increased overhead and administrative staff, and multiple planning efforts. This ultimately appears to lead to overlap

between many of the programs both in terms of administration and addressing the various types of subject matter expertise.

Panel Recommendation:

- Look across all the program areas within BRD and, where appropriate, combine programs to reduce duplication in staffing, administration, and reporting. The Panel realizes that this recommendation goes beyond the scope of what they were asked to address, but believe it is critical to the long-term benefit and sustainability of the WTER Program as well as BRD. The Panel also recognizes that this would take support and concurrence from senior USGS, Department of the Interior (DOI), and congressional staff to achieve.

Management Layers

As described to the Panel, the organization of BRD consists of lines of supervision running from Headquarters, through Regional Directors, to Regional Executives (REXs), and then to the Center Directors. The fundamental scientific units of BRD are the Science Centers. The Center Directors and the branch chiefs or other line supervisors that report to the Center Directors are the managers most familiar with the work of Center scientists and those best able to make the necessary decisions affecting the impact of USGS science.

Crossing the lines of supervision is direction from each of the programs in Headquarters to the Centers. The Panel supports line authority without the crossing lines of program authority. The Panel understands that program categories may be necessary for communicating with Congress and partner agencies, but believes that any program needs and accounting related to program areas should be transmitted up and down through the lines of authority between the Associate Director for Biology and the Center Directors.

Adherence to these strict lines of authority should not and need not lead to insularization of the Centers. Communication and coordination among centers should be encouraged at all times, and Center directors should be held accountable for cooperation among Centers to enhance the quality and value of scientific products of BRD as a whole.

The current organization creates excessive overhead and sets up unnecessary filters of scientific information generated by Center scientists, thus affecting the impact of USGS science. REX control over Centers is not an effective mechanism for integrating and communicating scientific information produced or gathered by Center scientists. Effective communication of the science of the USGS disciplines is challenging for any single individual, especially when they are not in immediate contact with the scientists who produce the information. Because of closer contact with USGS scientists and their projects, the Center Directors are much more qualified to effectively communicate the science generated by scientists from the USGS disciplines.

Even if REX control over the Centers could be justified, their existence questions the purpose of and need for Regional Directors. In the materials that the Panel reviewed, only passing mention of the Regional Director was found, which raises further questions about the function of the

Regional Director, especially relative to REXs. The appearance and reality is of high-level supervisors supervising other high-level supervisors.

Further, REXs are expected to communicate the science of the Centers outside their discipline, e.g., a geologists speaking for biologists, or vice versa. This is troublesome as partners quickly perceive the lack of background and hence credibility of a REX trained in geology trying to promote a biological project. Thus, the Panel does not see the benefit of REXs to the Centers that are outside their area of expertise. As suggested elsewhere in this report, the Panel believes the money could be put to better use as base funding of centers.

Finally, integration of the USGS disciplines at the region level (top down) will not result in scientists working together. Rather, other approaches to integration from the bottom-up are necessary. The Center Directors, in cooperation with line supervisors, are in a much better position to identify and enforce appropriate integration of efforts to produce interdisciplinary research that enhances the quality and utility of science products.

Because the Region structure in USGS is not resulting in increased scientific productivity, the Panel recommends removing this structure and making the savings available to the Centers for science. This savings would include both salary costs and contingency funds now held by the Regional Directors and REXs. Elements from the Regional Director and REXs layers that remain should have quantifiable measures of their value in terms of such outcomes as fund raising for science, improving science quality, or efficiencies achieved through coordination efforts.

Panel Recommendation:

- Review the regional structure of the USGS BRD and modify as appropriate to reduce the agency's monetary overhead and remove barriers to productivity of USGS scientists. The Panel recommends special attention be given to the REX-Regional Director aspects. The Panel observed little benefit of the current structure, and believes authority for the management of USGS BRD scientists should be at the Center Director level.

FUNDING

Allocation of Funding

The WTER Program has the largest budget (\$45 million in 2009) of the programs within BRD. Because of the overlap in goals and objectives among BRD programs, different program funds are often mixed at the project level making accounting for funds and reporting difficult.

Funds come to the WTER Program at the Washington level through a line-item allocation in the annual Department of the Interior (DOI) budget request. The allocations are ultimately determined by Congress during its annual budget process and remain as a separate line-item when they get to DOI and USGS. The USGS allocates funds to the different disciplines, one of which is BRD, and BRD allocates funds to its programs, including WTER.

The current funding allocation is a result of a long and diverse history. Over the years many of the existing BRD programs came from other Bureaus or program areas. As a result, the current configuration is composed of remnants of those former programs.

Most of the WTER Program funds go to the Centers; however, a small amount is retained in Washington to support national level program staff and provide money for special initiatives. The WTER Programs funds should be allocated to the Centers based on strategic goals, emerging issues, hot topics, and long-term research agendas. The reality is that each Center gets approximately the same amount of money each year, which essentially turns into base funding for the Centers. As the Panel understands it, the Centers receive little or no base funding and rely entirely on WTER, other program funds, and external funding sources to maintain their operations, pay permanent staff, and conduct necessary research.

The Centers allocate funds to various research projects based on ongoing research, Center priorities, and researcher's interest. Additional funds are acquired through other targeted opportunities that are subject specific (e.g., West Nile Virus, Avian Influenza, etc). These funds, like the Program funds, are also required to pay for overhead, salaries, and administrative costs. In addition, at the Center level, funds from the WTER program are often co-mingled with funds from other BRD program areas. While projects are often crosscutting and the mixing of funds is appropriate, the lines between the program areas become blurred making it difficult to report on specific program funds. It is also not unusual for funds from one program area to be used to cover shortages in projects in other program areas. National program managers may be aware that this practice occurs on a routine basis, but are not consulted when it does. This gives very little programmatic oversight to the national program leads, which is problematic since they are the ones ultimately responsible for how the money was spent.

Some of the consequences of the current funding model are:

- Reduced funds for research because program funds are paying for salaries, overhead, and administrative support.
- Minimal ability to address national level issues as they arise unexpectedly. For example, when White-nose Syndrome became a national issue, funds had to be redirected or pulled from ongoing projects in order to meet emerging needs.
- Minimal input and oversight from Washington level staff into how funding is allocated. While research may be addressing regional issues, it is difficult to address national issues both on a short-term or long-term basis.
- Funds that are available for national requests for proposals (RFPs) are usually minimal yet still require a large amount work by the individual researcher to compete for them.

The advantages to current funding model are:

- Relative ease in reporting on how WTER Program funds are spent. This does become more difficult if funds from different programs are mixed at the Center level. This is important as Congress and other interested parties often request this type of information.
- Less administrative burden on Headquarters staff to track funds. The majority of the oversight is done at the Center level.

Panel Recommendations:

- Use WTER Program funds to support research projects only, as opposed to the current model of funding permanent funding salaries, overhead, and administrative support functions. This may require the Centers to become base funded.
- Include headquarters level staff in setting research priorities to ensure national level issues are being addressed.
- Develop mechanisms to minimize the work needed to compete in national RFPs that have small pots of money.

Erosion of Base Funding

The most insidious problem with funding in BRD has been the gradual erosion of the base budget to support science in the research centers. This erosion has come about from several causes, most notably the reduction in congressional appropriations, but also from more dollars being taken from the budget prior to allocation for science to support the regional management structure and Headquarters staff in Reston, VA.

The reduction in the base budget has caused a lack of flexibility to manage science in the Centers because almost all of the allocated money is required for staff and scientist salaries. For example, scientists at the Fort Collins Science Center are expected to acquire outside research funding to support 20% of their own salaries (funding identified as “reimbursable” in material provided to the Panel). Although other Centers may not be quite this extreme, either because of stronger base funding or because of dedicated money from other federal agencies (e.g., US Army Corps of Engineers, Bureau of Reclamation), the downward creep of the base budget requires a serious response.

The gradual increase in dependence on reimbursable money means that the science program is unable to follow the intent of strategic plans developed at all levels within BRD. Rather, scientists are chasing available dollars to meet budget needs, regardless of whether the research fits within the BRD mission. This strategy will decrease the quality of work produced, and puts the agency in direct competition with academic researchers. BRD scientists cannot compete as effectively for these monies as academic researchers because they are more constrained by the bureau policies, have less flexibility to negotiate overhead rates, have less available peripheral expertise like that provided to wildlife researchers at a major research university, and do not have the low-cost, reliable research capacity of a lab of graduate students. Further, the time required to produce proposals reduces the time available to produce science funded by the base budget.

In addition, reimbursable money should not be driving the research priorities of Centers, but rather should supplement existing research priorities. As described below, WTER should be striving to develop centers of excellence. Reimbursable money should be taken to develop these centers of excellence, not detract from them. Too much reimbursable money results in unfocused, undirected research and research focused on short-term, client-driven projects that seldom lead to stable, long-term productive fields of investigation.

The Panel believes that BRD missed a prime opportunity to increase its base funding with the new DOI focus on Landscape Conservation Cooperatives and National Climate Change and

Wildlife Science Centers. Some or all of this money could have been used to increase base funding in one or more of the Centers.

Panel Recommendation:

- Determine the optimal level of reimbursable funding using a structured decision process, with the objective of maximizing the research productivity of scientists. The Panel does not suggest that no reimbursable money be taken by BRD scientists, but rather that there is some optimal level beyond which, the goal of the research project becomes the pursuit of funding rather than sound science.

Long-term Research

BRD scientists should be performing long-term research, the benefits of which are numerous and well documented (Likens 1989). This type of research is difficult for the academic community to conduct because only short-term funding is available. Most importantly for the WTER Program is the need to provide data strings that allow the evaluation and estimation of temporal process variation in population or ecosystem dynamics. Climate change is generally predicted to increase temporal process variation (Walther et al. 2002), and given that increased temporal process variation leads to increased extinction rates (White 2000), long-term research monitoring population dynamics of endangered species or their surrogates is needed.

Prior to the review, the Panel believed that BRD was conducting these types of long-term projects. However, the presentations to the Panel clearly described the issues investigators attempting to conduct such research have faced. Most notably, peaks and troughs in funding resulted in years with missing observations when no money was available to collect data. This greatly weakens the consistency and value of long-term data. No amount of statistical manipulation can replace missing information.

To resolve the lack of emphasis on long-term research, the Panel suggests that a funding mechanism be developed at the program coordinator level to provide consistent, stable funding to projects that are generating data of long-term significance. For this report, the Panel is terming these projects as Projects of Special Significance (PSS).

Criteria to determine PSS might include research that generates extended time series of biological and environmental data that address ecological and population dynamics processes aimed at resolving important issues in wildlife biology. Researchers would have to have collected at least six years of previous data to qualify for PSS funding. (The National Science Foundation (NSF) also requires six years of data prior to requesting support for Long Term Research in Environmental Biology funding.) The PSS proposal would also need to present a rationale and framework for ten years of additional research. That is, these projects would not just be doing more of the same year after year, but rather, would continue to produce publications about the biological processes while simultaneously developing a long-term data string. Questions or hypotheses to be tested should be outlined for the initial five-year period, including expected science products, as well as a subsequent, abbreviated proposal of work for the second five-year period. The PSS proposal would thus constitute a decade-long research plan that would address critical and unique long-term questions in wildlife biology. As part of the

requirements for funding, projects should be required to show how data collected will be shared broadly with the scientific community and the interested public and how the questions fit into the five-year strategic plan of the WTER Program.

Money would be ear-marked by the WTER Program as going to the PSS Principle Investigator, thus increasing the base funding of the researcher's home center. The salaries of scientists and critical technicians on the project should both be covered, as long-term work cannot be performed without the support of skilled technicians that understand the procurement system and are able to get the job done in the field. These technicians are the integral ingredient in the logistics of long-term work.

Panel Recommendation:

- Create a Projects of Special Significance program to fund long-term critical research.

Overhead Rates

Although scientists complained of a high overhead rate, the overhead rate seems to vary by center, and the values reported did not seem exceptionally high given the range of rates experienced by academics, even within the same university. Although the indirect cost rate USGS charges to their DOI sister bureaus is reasonable (~15%), the business model of charging additional fees to help cover the costs of salaries, facilities, and other administrative support is problematic for most agencies and other customers. As stated numerous times in Customer Satisfaction Surveys of the USGS Wildlife Program, the overhead is too high and inconsistent between centers, which results in less money going toward research and fueling customer resentment that their money is not being spent on the research they need.

Cyclical Budgets

Another result of the eroded base budget is the lack of flexible funding for scientists to pursue emerging issues. The cyclical budget is too small to develop major new initiatives, and scientists often put a lot of time into proposals that do not have a high probability of funding.

Panel Recommendation:

- Streamline the cyclical budget process to ensure the efficient use of the scientists' time.

Centers of Excellence

Scientific professionals outside of USGS are, for the most part, aware of the USGS scientists and their expertise, especially if they are working on similar topics. In addition, there is name recognition for certain Centers, including the Patuxent Wildlife Research Center for biometrics, the Wildlife Health Center for animal disease, and Northern Prairie Research Center for research on waterfowl. These three Centers have developed areas of expertise unequalled within the United States and internationally. The Panel does not perceive that most of the fifteen Centers have this type of name recognition.

To increase the name recognition of the Centers, each Center should have a focal area in which it excels. Resources should be invested in this area of excellence allowing the center to pursue a substantial body of research, thus, in time, creating center of excellence. The Panel recognizes that many Centers have been designated as specializing in specific research topics, but, for most Centers, these designations have yet to result in nationally recognized programs with a supporting body of scientific work published in the open literature.

In our interviews with Center Directors, they suggested that these centers of excellence should be established through direct appropriations to the Center's base budget as new sources of money become available. Although this process would result in funds not being distributed equitably in a particular year, the Center Directors felt that over time, fairness would result. Further, there would be less needless effort for Centers to compete for RFP funds. The Panel also notes that designated funds are required to produce the body of scientific work needed to create a center of excellence.

The Panel recognizes that most centers have obligations to regional partners. The centers of excellence strategy cannot exclude these regional partners and must fulfill the stated mission of BRD research. A balance must be maintained.

Panel Recommendation:

- Invest substantially with appropriated funds, in the research areas and Centers for which USGS is clearly the world leader. The Patuxent Wildlife Research Center (PWRC) for biometrics would be an example. Building capacity in these areas would pay huge dividends for scientific advancement and productivity. As an example, the Panel suggests that a center of excellence in biostatistics at the PWRC be created and could include the following improvements:

Internal Capacity

- 1 Research Grade Equivalent (RGE) to build more research capacity
- 1 RGE to build outreach capacity (potentially a consulting statistician)
- 2 Full Time Equivalents (FTEs) for computer programmers
- 1 FTE for administrative support

Professional Training

Postdoctoral Fellowships in Biostatistics: These could be developed as an annual competitive proposal process.

Graduate Training: A formal relationship with a local university (e.g. the University of Maryland) that provides fellowships for MS and PhD students and more formal mentoring opportunities for USGS scientists should be pursued.

Rapid Response Funding for Emerging Threats

Recent history suggests that a mechanism is needed within the WTER Program to provide a rapid response to emerging issues and threats, e.g., avian influenza, white-nosed bat syndrome, and West Nile virus. BRD has been able to meet this need by pulling funds from Headquarters,

Centers, and Regions. However, the Panel suggests a more structured approach is needed, as these kinds of threats will continue to emerge.

The most plausible approach seems to be to hold some funds at Headquarters for a portion of the fiscal year to allow for the opportunity to respond to emerging threats. If the money has not been appropriated by a designated date, then the Panel suggests that it be spent on equipment, as discussed in the next section.

Equipment Funding

The Panel recognizes that not all Centers can have the most up-to-date and proficient equipment in all research areas. The example discussed during the review was gene sequencers – expensive equipment that is required if BRD is to maintain a presence in this area. However, not all Centers should have such equipment. The Panel recommends that one Center be identified as the primary genomics center, and the appropriate equipment be maintained in this Center. Other Centers would have access to the equipment, through both a system of sample processing, or by temporary transfer of personnel to the equipment Center.

The notion of one Center being the primary genomics Center fits into our recommendation above that each Center develop some area of expertise for which they are nationally recognized. Further, state-of-the-art equipment at this Center will provide BRD with the necessary expertise to maintain research leadership in the area.

Panel Recommendation:

- Create centers of expertise where specialized equipment is purchased, but would be available to all USGS clients desiring its use.

Novel Funding Mechanisms

Depending entirely on appropriated funds to cover the increasing costs of salaries, operations and research is a losing strategy. Appropriations do not typically compensate agencies for mandatory cost of living increases. In addition, federal employees and agencies are not allowed to apply for research funds from institutes such as the National Institutes of Health and the National Science Foundation. This funding situation puts federally funded agencies (including USGS) at a disadvantage in supporting research efforts.

Novel funding mechanisms are needed at the Headquarters and Center levels to compensate for funding deficiencies. Several federal agencies have Friends Groups or other non-profit partners that raise funds through memberships, events and traditional developments approaches. Examples include the Friends of the National Zoo, the National Park Foundation, and the National Forest Foundation (NFF). The NFF, chartered by Congress, engages Americans in community-based and national programs that promote the health and public enjoyment of the 193-million-acre National Forest System, and administers private gifts of funds and land for the benefit of the National Forests. Each year NFF raises millions of dollars, offers volunteer and stewardship opportunities for the public on Nation Forest lands and provides effective communication and outreach opportunities for the USFS and their mission objectives.

Panel Recommendation:

- Create an exploratory committee to assess the feasibility of a "Friends" group as well as the development of other funding mechanisms to help support the financial needs of USGS researchers.

PLANNING PROCESSES

Planning and Implementation

The WTER Program 5-Year Plan (Plan) covers 2005–2009 and was developed through a well-structured process. Eight wildlife advisory teams were created and included internal USGS staff from multiple levels and disciplines and external partners at the state, federal, tribal, and NGO levels. These teams created the Plan contents and were intended to serve as ongoing resources throughout the Plan period. The Plan identified five program goals and eight thematic goals. Both sets of goals had several objectives and numerous strategies established to meet each of them. The thematic goals were created by the teams and were then synthesized and combined to form the overarching program goals. The program goals were intended for future reviews and audits, while the thematic goals were intended for more local use by USGS scientists and partners. While these two sets of goals (thematic versus program) encompassed WTER Program efforts, they also added complexity and confusion.

The teams were heavily weighted toward USGS staff and were not used as ongoing advisory resources. In the future, the planning process should include more partners and the teams should be kept active throughout the five-year Plan horizon. In this capacity, the teams could provide continual review, feedback, and coordination.

Panel Recommendation:

- Develop one set of goals that capture both the scientific practitioner and oversight reporting needs when working on future plans.

Five year plan does not set priorities

Many hundreds of USGS scientists are distributed among dozens of Centers and field stations across nine areas and three regions. This vast network of facilities and staffs is decentralized and research agendas are predominantly set and advanced at the individual scientist or local level. The Plan summarized and organized this broad scope of WTER Program efforts into a coherent structure. This structure appears effective at demonstrating WTER Program value to external oversight entities like OMB and Congress, as evidenced by stable to increasing budgets and program support. However, it is not effective at setting and coordinating WTER Program priorities across the distributed USGS system. Based on the numerous presentations, interviews, and discussions the Panel conducted with USGS scientists, Center Directors, and program staff, the Plan did not drive specific research direction or implementation. There was no evidence that individual scientists used the Plan to set priorities or determine project focus. Further, many scientists did not know that the Plan existed. Some of the more savvy scientists were aware of the Plan and used it to justify research agendas that they already were pursuing.

Overall, the Plan was effective at summarizing and organizing the broad scope of USGS efforts funded by the WTER Program; however, it did not serve as a driver of specific priorities or projects.

Panel Recommendation:

- Use the WTER Program Plan to set strategic direction and drive research project selection at the program field level instead of just to summarize and organize the broad scope of USGS efforts funded by the Program.

Involving scientists in planning

The Plan development process included many USGS scientists. The result was a product that accurately reflected scientific work under WTER Program funding. However, this Plan is only one of many planning efforts within USGS that requires using scientific staff's time on planning instead of on conducting science.

Panel Recommendation:

- Include scientists in future planning efforts, as appropriate, while balancing the need for scientific staff involvement with their priority duty of implementing scientific projects.

Too many plans/Too much planning

Planning is done at a variety of levels within USGS, which affects both the WTER Program and the Centers where most of the research is conducted. It appears that not all plans relate to other plans, while some are redundant. Currently, there are at least five levels of planning that are either completed or ongoing. These include the DOI Strategic Plan, the USGS Science Strategy, the WTER Program Strategy, Center specific Strategic Plans, and Regional or Theme related plans (e.g. sagebrush, megaprojects).

This level of planning is admirable in its comprehensive nature, but is so complex and confusing that it becomes unworkable at the individual scientist level. In addition, this planning requires staff time to be spent on scoping and writing plans, time which could perhaps be better spent on doing additional research. It is also unclear as to which plan has priority, how individual research fits into each of the plans, and whether it really matters if the research being conducted is congruent with any of plans. This ultimately leads to minimal support at the field level.

In addition, the Biological Research and Monitoring (BRM) Program activity does not have its own plan. Rather, it has six plans – one for each of its elements. The Panel recommends that these six plans be combined into one BRM plan that would address the six elements as core elements of an overall, synthesized, BRM plan. This synthesis would accomplish the following: first, it would reduce the number of plans that scientific and program staffs have to develop and use; and second, it would facilitate the combination of objectives and priorities across the six programs, which based on our information and assessment, do not have clear lines of separation and function. To be most effective given the distributed nature of BRD, the combined plan should focus on cross-cutting objectives and priorities and link specific resources with those

priorities. Then, based on these priorities and their own needs, each Science Center could determine research themes, priorities, and actions.

A fundamental strength of BRD is its science capacity and expertise driven by local research agendas set by individual scientists. This distributed model results in high-quality, issue-based research and scientific advancement fueled by individual scientific creativity and priority assessment. A challenge of this organic system is that it can be difficult to focus on emerging or programmatic issues that do not easily lend themselves to individual scientific pursuit. This challenge is where the combined BRM programs plan should have positive effect. By identifying emerging and programmatic issues and by providing the incentive of resources, the combined plan could drive collaboration and scientific inquiry around priority issues without compromising the basic strength of the distributed system. The combined plan would bring value both to the scientist performing research and to program staff who have to coordinate priority issues and report accomplishments.

Panel Recommendation:

- Be sensitive about over planning. Instead of six element plans within the Biological Research and Monitoring (BRM) Program, the Panel recommends one combined plan that identifies objectives and priorities across all six areas. Specific funding and resources should be allocated to these priorities.

Need for a nested hierarchical planning process

Ideally, plans within the USGS should be linked via nested visions, goals, objectives, priorities and actions and minimized in number. Plans at the higher organizational levels should focus on broad vision and goal setting. At the BRD level and below, plans should begin defining specific objectives, priorities, and actions. The current BRD Strategic Plan is under development and not fully formed to set higher objectives or priorities for the activities and programs. Even so, the DOI, USGS, and partially formed BRD plans provide basic guidance regarding high-level direction setting.

Panel Recommendation:

- Ensure that Program plans define clear objectives, priorities and actions for activities and programs. The Panel did not review any of the activity-level plans, but our recommendation is that within BRD, the three activities should be the focus for specific priority planning. Nested within and/or drawing from these activity plans would be the Regional and Center planning efforts which should focus on specific priorities and actions.

Cooperation with CRUs

The USGS Cooperative Research Units (CRUs) function well and have established relationships and science delivery mechanisms with universities and partners across the country. These relationships should be utilized in fulfilling WTER (and other) Program objectives. WTER Program and Center staffs should build on current relationships and collaborations with CRU scientists and coordinate closely with the CRUs.

Panel Recommendation:

- Include CRU scientists in WTER Program planning efforts. These plans should identify specific strategies and actions for how CRUs can help fulfill Program goals and objectives.

SCIENCE MANAGEMENT

USGS scientists within the WTER Program conduct first rate applied and fundamental scientific investigations involving wildlife. These scientists are fortunate to have the freedom to focus almost entirely on research unlike many of their peers in academia who also have teaching responsibilities. In many cases, USGS scientists are provided with financial research support and most USGS scientists have full 12 month federal salaries, although others are expected to raise funds for research purposes. There are, however, several practices within USGS that hinder scientific productivity, academic freedom and scientific advancement (see *Funding, Erosion of Base Funds* above).

Budget and Science Information System (BASIS Plus)

All USGS financial accounting and scientific products are managed using a Budget and Science Information System (BASIS Plus). USGS scientists and support staff report that BASIS works as an accounting tool but does not work as a database for cataloguing and querying scientific products such as grant reports, abstracts or scientific citations. Specifically, scientists and database managers report that BASIS is cumbersome, ineffective, and has many problems; however, the USGS accounting program appears to be moving into a new system leaving BASIS Plus only for the science management. BASIS Plus needs an urgent and detailed review so that scientists are provided with a manageable database system for their science products. An example of a system currently in use by another organization is *Fastlane* at the National Science Foundation.

Panel Recommendation:

- Conduct a survey of USGS scientists to gauge the effectiveness of the Budget and Science Information System as a way to manage and query scientific products. Follow up actions could include modifying BASIS Plus or using another database system.

Fundamental Science Practices (FSP)

Scientific peer review refers to the scrutiny of work or ideas by peers who are sufficiently well qualified, without conflict of interest, and who are not associated with the work being performed. Peer review is an essential part of any scientific practice that validates and ensures the quality and integrity of a scientific paper. Peer review within the USGS is required for all information products, whether published and disseminated by the USGS or by an outside entity, regardless of media (print, digital, audiovisual, or Web) or if the work was funded, in whole or in part, by the

USGS, and if USGS affiliation is identified with the authorship. The current policy consistent with the USGS Fundamental Science Practices includes:

- An informal peer review by at least two qualified scientists who have no stake in the outcome of the review, who are not associated with the work being performed, and who are without conflict of interest. The USGS author is required to oversee this process by acquiring the reviews and developing the reconciliation document dealing with the concerns raised in this process.
- Approval by the Center Director of the manuscript and the reconciliation document that indicates how review comments were addressed.
- Approval by the Official for Bureau Approval of the manuscript and the reconciliation document that indicates how review comments were addressed.

Standard scientific journals already adhere to a rigorous independent review process that includes the professional assessment of a scientific paper from usually a minimum of two scientists. Scientists asked to provide peer reviews are usually experts in the subject area of the paper under consideration and do not have any conflicts of interest with any of the authors on the paper. The USGS policy on peer review of papers authored by their scientists unnecessarily involves several additional layers of internal review, including review by non-scientists and others who are not experts in the relevant field. Such additional steps are unnecessary and can result in several unfortunate consequences including:

- Publication delays of important scientific material;
- Unnecessary use of USGS time; and
- Removal of USGS personnel as authors on publications. When non-USGS personnel are the lead authors of manuscripts including USGS as secondary authors – papers can be delayed because of the FSP process. USGS personnel have been known to remove their names from manuscripts so as not to delay the publication process.

Panel Recommendation:

- Amend the Fundamental Science Practices (FSP) for the internal review and approval of abstracts for meetings, PowerPoint presentations, and manuscripts prior to submission to peer-reviewed publications to include only the immediate supervisor.

Travel authority and regulation

Domestic and international travel, for the purpose of attending conferences to give presentations and interact with colleagues, is essential to conducting first rate science and for professional development of scientists. Currently, there are limitations in terms of the number of USGS scientists that can attend both domestic (30) and international (5) meetings. Furthermore approval for travel is often delayed which leads to additional complications.

Panel Recommendation:

- Eliminate limitations on the number of USGS scientists traveling to domestic and international meetings assuming proper scientific justification is in place. The approval of travel should occur at the level of the supervisor or the Center Director.

AVAILABILITY OF USGS PRODUCTS

Internal systems for archiving long-term data and samples

USGS is no different from other agencies in having an aging workforce. Some highly regarded scientists have recently retired, and others are eligible for retirement. USGS faces difficult decisions on whether to fill the positions opened by retirement with scientists from the same discipline, or to recognized new priorities by filling from another discipline. All these factors underline the importance of preserving the samples, data, and institutional memory of USGS scientists. Especially important are data and samples collected over long periods that may someday serve as reference points for future efforts to understand environmental change.

Panel Recommendation:

- Create or enhance systems for long-term archiving of physical material and electronic records to capture their scientific value for future research. Produce an archive of oral histories or develop publication outlets for retired or senior scientists to record their broad views of important scientific efforts.

One-stop shopping for USGS products for Partners and other users

USGS produces numerous reports and publications describing scientific efforts and results, and many are posted on USGS websites making them available to the public and federal and state agencies. Some products are easier to find than others. For example, someone interested in polar bear publications could navigate from the BRD webpage to the page for the Alaska Science Center, which has a link to polar bears, which provides a link for publications and products. However, for most subjects (e.g. grassland birds), there is no obvious single place to go for information. In addition, it is not always clear whether official reports posted on BRD websites represent peer-reviewed publications or should be considered gray literature.

Panel Recommendations:

- Link BRD postings to a single, searchable, user-friendly database that connects to specific sites where queried information is posted. Electronic files of the actual publications should be available whenever consistent with copyright laws. The link to this database should be prominently displayed on the BRD home page.
- Add an explicit statement regarding peer review and publication status to each publication that is posted.

LITERATURE CITED

Likens, G. E. 1989. Long-Term Studies in Ecology: Approaches and Alternatives. Springer-Verlag, New York, New York, USA.

Walther, G. R., E. Post, P. Convey, A. Menzel, C. Parmesan, T. J. C. Beebee, J. M. Fromentin, O. Hoegh-Guldberg, and F. Bairlein. 2002. Ecological responses to recent climate change. *Nature* 416:389–395.

White, G. C. 2000. Population viability analysis: data requirements and essential analyses. Pages 288–331 *in* L. Boitani, and T. K. Fuller, editors. Research techniques in animal ecology: controversies and consequences. Columbia University Press, New York, New York, USA.