

Natural Resource Science/Research for Parks Workshop

October 17, 2005 • Yellowstone National Park

Background

The National Park Service (NPS) entered a new era of scientific accountability with the passage of the National Park Omnibus Act in 1998, specifically Section 202, wherein “*The Secretary (of Interior) is authorized and directed to assure that management of units of the National Park System is enhanced by the availability and utilization of a broad program of the highest quality science and information.*” Although the importance of research in the national parks has long been acknowledged, multiple authors have challenged that there has been little progress in linking science with park management and ecosystem processes (Leopold et al. 1963, Allen and Leopold 1977, Castleberry 1987, NPCA 1988, NRC 1992, NPS 1992, Keiter and Boyce 1991, Wright 1992, Wright 1999, Pritchard 1999). The National Research Council (1992) recommended that research in the national parks should 1) determine what resources are present in order to protect them, manage them, and detect changes in them; 2) understand the natural dynamics and processes of populations, ecosystems, and other park resources; and 3) assess the effects of specific threats and devise and evaluate management responses. While there is evidence that the NPS is striving to make the parks more attractive places for scientists to work (Parsons 2004), there remains an important gap in how to conceptualize and prioritize park-based science so that parks and park networks can develop integrated long-term science programs to achieve these broad objectives. Soukup (2004) further suggests that there remains an important “intellectual backlog” in understanding the resources the National Park Service manages and wide variability among park managers in prioritized investments in science. The basic foundations of successful long-term science in national parks needs to include transparent and deliberate science agendas that offer structure for the interest, creativity, and productivity of individual scientists, working alone and together. Indeed, national parks inherently possess the capacity to work with partners to critically address these needs and find creative ways to support both internal and external research.

This one day workshop served as an opportunity for NPS staff to meet with invited experts to initiate a multi-park dialogue and consider case studies of different approaches being utilized by parks to identify science needs and develop short- and long-term science agendas. We reviewed and identified different types of strategic park science needs, and identified best practices that have the highest probability of meeting these needs. This workshop will help identify key concepts and practices for park science planning that can be further researched and developed for a multi-authored journal article and a full session at the George Wright Society meeting in Minneapolis, 2007.

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Participants:

Glenn Plumb, Tom Olliff, Christie Hendrix – Yellowstone NP
 Bob Moon – NPS Intermountain Region
 Cathie Jean – NPS- Greater Yellowstone Inventory and Monitoring Network
 Terry Terrell – Rocky Mountain NP [now retired]
 Leigh Welling, Jack Potter, Sallie Hejl – Glacier NP
 Sue Consolo-Murphy – Grand Teton NP
 Regina Rochefort – North Cascades NP
 Lisa Graumlich – Montana State University
 Hank Harlow – University of Wyoming
 Cormack Gates – University of Calgary
 Mark Williams - University of Colorado, Boulder
 Paul Cross - USGS Northern Rockies Science Center
 Bob Crabtree - Yellowstone Ecological Research Center
 Mary Maj - Greater Yellowstone Coordinating Committee
 Jim Cheatham – Devils Tower NM
 Christina Miller – University of Colorado at Denver, Recorder

Final Agenda:

- 8:00 – 8:20 Welcome, Review Agenda – Kathy Tonnessen and Glenn Plumb
- 8:20 – 9:30 **Topic: Science Agendas: what have parks tried already and how did these strategies work?**
- [e.g., Research catalogs, research needs lists, ecosystem models, short-term tactical needs for resource management, serving via web sites, through RLCs and via CESUs]
- 10 minute case studies by Terry Terrell, Leigh Welling, Regina Rochefort, Glenn Plumb
- 30 minute open discussion
- 9:30 – 10:00 **Topic: How does a LTER program develop research strategies/models?**
- 20 minute presentation by Mark Williams, 10 minutes Q&A
- 10:00 - 10:15 Break
- 10:15 – 11:00 **Topic: How do parks facilitate research priorities?**
- [E.g. How to decide on permits to issue, to encourage outside researchers to get major grants, to develop cooperative proposals for internal and external funding]
- 10 minute case studies by Christie Hendrix, Hank Harlow, Jim Cheatham
- 15 minute open discussion
- 11:00 - 12:00 **Topic: How can these larger research/science strategies be integrated with ongoing NPS programs, e.g. Inventory and Monitoring**
- Open discussion facilitated by Cathie Jean
- 12:00 – 1:00 Catered lunch at HRC
- 1:00 -3:00 **Topic: What are next steps? E.g. Identify key in-depth case studies, develop comparative review article, and recommendations for 2007 GWS meeting.**
- 1st half discussion facilitated by Kathy Tonnessen
- 2nd half discussion facilitated by Glenn Plumb

NOTES

I : Science Agendas and Research Catalogs- what have parks tried already and how did these strategies work?

Terry Terrell, Rocky Mountain NP, (ROMO): [Terry retired from the NPS in Jan 2006]

Research-what kind and how do we set limits?

Running into limits on what research ROMO staff can facilitate and support.

Sources for research needs information:

- Resource management documents.
- I&M network materials.
- Solicit information from staff (permanent, seasonal, volunteers).
- Rangers, maintenance, law enforcement and interpreters ask for studies/contribute research ideas.
- Researchers from academia, NGOs and agencies also contribute ideas for research.

Determining research needs:

- Picking the researchable questions, eliminating non-science suggestions.
- ROMO makes 2 lists; one gets posted on the webpage (Research Needs) and the other is a solicitation list that goes out with a letter to park staff and partners (see handouts); Research Coordinator for the park sends out a shorter list of items that will more than likely get funded. The list includes projects ROMO is interested in, does not mean the money exists to fund the research
- Research Needs lists are provided so that CESUs, students, and other research scientists to look at, pick a project, and *they* can then get funding to perform the research.
- Most research at ROMO is carried out with funds that agency and university scientists procure themselves.
- Can articulate a management need/reason for every research project done in ROMO.

Limits:

- Logistical limitations (e.g. there are only so many campsites and dorm rooms available for researchers).
- ROMO does have some base funding for research – the park funds maybe 6 projects a year, based on their call for preproposals.
- Most projects are funded by standard scientific funding sources/programs.
- There are research activities that require additional scrutiny – for example, some park staff have concerns about collaring of experimental animals. This requires additional evaluation before permits are issued.
- Half of the projects that are funded aren't needs on the ROMO list. Scientists may come up with interesting research questions that are not necessarily related to a current management concern/issue.
- Intellectual property issues come up when ROMO asks for research needs ideas and then adds those ideas to the list. If other researchers see the topic and develop proposals based on it, then there can be conflict.

Handouts:

- Email to park staff soliciting research needs.
- Sample letter to partners.
- Printout of Research Needs webpage.
- Unedited or “Full” list of ROMO research needs.

Q&A and other comments:

Bob Crabtree:

- Are the parks consistent in terms of what they require for NEPA compliance during the permit review phase? The answer is “no”.

Cormack Gates:

- He suggested that the NPS might look at Canadian methods for Environmental management systems, that would include flow diagrams for the steps between research proposals and final reporting.

Bob Moon:

- Parks in the Intermountain Region are “all over the map” when it comes to the level of NEPA compliance required before a permit for research is issued. Some parks do no compliance; others do an EIS every time they want to put a collar on an animal. Need some form of consistency when we look at research permitting.

Leigh Welling , Glacier NP (GLAC) and Director of the Crown of the Continent RLC [now the coordinator of the NPS Research Learning Centers]:

We have a list of needs that reads like a laundry list.

How do you make these into researchable questions?

What is the prioritization process?

What do you mean by research?

Consider language and drivers to get better and more focused research in parks.

What’s driving the question between science (research) and management? Science is driven by inquiry or curiosity and management is driven by immediate needs and is often in crisis mode.

- Mismatch between the two.
- Funding is an issue for both, but criteria are different; resource management funding sources require a solution to a crisis level problem at a given location (application based) while research funding sources require testable hypotheses and additions to the broader knowledge of a field.
- Perspectives about, and needs for, information are different.
- Need to get prioritization process/mechanism that will tell you where these two realms overlap in a given park.
- Management want to protect from change rather than monitor change; Scientists see parks as the last area we can understand natural systems – areas that can give a baseline.
- Who is driving the research questions pursued in the parks? This is a huge issue because managers often resent science groups that drive a research agenda that they feel does not

address their top level concern. Scientists often believe the managers don't really have the expertise to set a research agenda at all. There is lack of communication on this issue.

Comprehensive approach:

- Up until now most parks that have research needs lists have not looked at their research needs from an ecosystem perspective. The lists read like shopping lists rather than a comprehensive plan or assessment of gaps in knowledge about a system.
- The Inventory and Monitoring program has undertaken a conceptual modeling process to look at the major ecosystems and indicators in the parks. This is the basis for vital signs selection. This process could be used to develop a more comprehensive look at research needs as well as identifying the major areas of management concern.
- What is the system you're looking at? What are the main drivers? Be able to conceptualize and compartmentalize. This is a useful exercise, however, there are no priorities put on the important ecosystem drivers and stressors.
- Parks should consider research projects that integrate research, education, and management issues; i.e. what are the issues we are facing that 1) scientists want to know more about, 2) managers need information on, and 3) the public doesn't understand very well, or is misinformed about?.
- Strictly top-down and/or bottom-up approaches do not allow for prioritization that meets both science and management criteria.
- In creating list of research needs – first step is to determine what is known, what isn't known, and where the gaps are in our scientific knowledge.
- What Glacier did (through the Crown of the Continent RLC): Invited the research community, education specialists, and resources management people into a round table discussion – asked them to come up with issues that were pertinent to them and then the RLC looked for the intersection of those. Looked for topics that were active science areas, those that needed to be, what the public didn't understand well, areas that didn't have a lot of information or needed more information, or where managers needed answers in the short term.
- Focus on taking information to managers and/or to the public.
- Just cataloging isn't prioritizing – need a more comprehensive approach.

Handouts:

- CCRLC (Crown of the Continent) approach for GLAC.
- Research needs list for the parks.

Regina Rochefort, Science Advisor, North Cascades NP (NOCA):

Sources for research information:

- The Pacific West Region of the NPS has 10-12 science advisors, all in different disciplines, which is unique in the NPS.
- NOCA has a Web-based research catalog that lists all possible research needs and is not management driven.
- NOCA research catalog is not prioritized.

- Everything she does with research needs lists and catalogs needs to be extended to the network level, all the parks in the North Coast and Cascades I&M network.
- Concerned they won't get funding for research that doesn't serve management needs.

When the RLC was first developed:

- The RLC staff were advised not to develop a hard copy of the research catalog because no researcher would look at it.
- A web-based catalog is considered superior to hard copy – it's at the researcher's fingertips and it can be constantly updated. However, there have been problems keeping it up-to-date because of limited staff time.
- Research flyers go out to NGOs, researchers, and educators/students in region instead of having paper copy of catalog. The flyer directs them to the web-based catalog.
- Problem with the web-based version: the research catalog is buried in URLs.

Research/Permitting:

- NOCA has a smaller number of research permits than parks like Yellowstone and Rocky Mountain.
- They generally do not turn any researcher requests for permits down.
- Wrote to all the resource managers and asked for ideas on research.
- Funding issues and logistics – work with each park in area on housing, permits, supplying previous research reports, etc.
- Funding research for management issues is certainly important, will tend to get money for research if it pertains to management issues, but is not always the main criterion.
- Not sure what they're missing, so it's hard to come up with a management need or purpose for unknown research projects.
- The research catalog appeals to graduate students who are looking for a two-year Masters project. They also request funding and ask Regina to be on their thesis committees. This is a lot of work.
- The Elwha River Consortium on ecosystem recovery is a way to get a number of researchers to perform work on collaborative projects in an ecosystem that is being restored– see handout.
- NOCA does compliance on all permit requests.
- Wilderness is one of the major considerations in NOCA when considering research permit requests.

Handouts:

- Research opportunities packet.
- CESU-Cooperative Ventures newsletter that includes the call to researchers to participate in the Elwha River Research Consortium.

Glenn Plumb, Supervisory Wildlife Biologist, Yellowstone NP (YELL):

Yellowstone science:

- Is largely reactive because they have an adequate scale to be reactive.
- Resource Management issues operate at a large scale (10,000 km² scale).

- Large scale phenomenon and exciting projects (wolf reintroduction for example) attract money.
- Smaller issues fall out because they are not as charismatic or operating on as large a scale (ex: trumpeter swans, pronghorn, mountain goats, beavers). Articulating the importance of these “smaller issues” is difficult.

Research Agenda Development:

(See Handout: “A Comprehensive Rapid-assessment Approach for Research Agenda Development: Elk (*Cervus elaphus*) at Yellowstone National Park”)

- Park scientists, with researchers at University of Kentucky, reviewed existing literature on elk; filtered out good and bad information/approaches and then developed models. Came up with the 7-level process of determining quality of literature. Graded complete library of elk research/science in YELL and then came up with a way of filtering the quality of the science against the pathways imbedded in the conceptual model to come up with the gaps in the system.
- Created urgency value (input from local level – managers, park staff); plotted this value (see last page of handout). Plotted research priorities on an elk-centric system. Plotted what we don’t know against urgency of the problem.
- This model is good because if new science comes in, you can plug it into the model and re-run it.
- Can get into a trap of continuing long-term investigations – need to figure out when enough information is enough. When does a resource management issue stop being a priority for the park?
- This approach could work for research topics operating at moderate scales, not sure about efficacy at very large scales: Concept is good, but is it practical? This elk model is certainly a tool and can change as information is added.
- How quickly do the research projects need to be revised/revisited? Need to adjust focus as issues come about – such as possible extinctions.
- This model approach to research question formulation is not usually practiced at Yellowstone because the park is very reactive.

Q&A and other comments:

Terry Terrell:

- If this process identified studying trumpeter swans instead of wolves or bison would the money still be available? Money is often available only for a specific thing and can’t be moved to something else.

Glenn Plumb:

- Depends on who is allotting the money and if they have identified what the money will/should go toward. If it is general funding – they may ask if we received this money what would we put it toward? NPS funds tend to go toward “short term” research questions that can be resolved with management actions. Other funding may allow for exploratory research on topics that are not major management issues now.

Mark Williams:

- Long-term data are very valuable. Need to reevaluate and collect more data every 5-10 years.

Glenn Plumb:

- There are issues with long term research in YELL because of the large number of studies. We are reaching the point where large animal research running up against social tolerance by staff and visitors.

Hank Harlow:

- Presented the idea of taking important projects that aren't "sexy" and tying them in with another project that is in order to get funding.
- Too many people want projects with quick turnaround of info, data, and findings.

Cormack Gates:

- Major drivers of environmental planning: Environmental assessments, environmental management planning, political opportunities/pressures, litigation, public stakeholder (community feedback), independent research interests, internal interests/science.
- National interests tend to focus on short-term studies.
- Resource Management programs in National Parks have as underlying support systems: GIS, long-term data sets, previous reports, permitting system, personnel.
- Critical drivers: land use management, visitors, infrastructure, operations, management of conditions.

II: How does a Long Term Ecological Research (LTER) program develop research strategies/models.

Mark Williams, Professor, University of Colorado at Boulder (CU-Boulder) and Coordinator of the Niwot Ridge LTER in Colorado:

(PowerPoint Presentation)

LTER info:

- The National Science Foundation has funded the Long Term Ecological Research [LTER] sites for many years. There are no NPS sites in the LTER network. How can parks develop long-term programs that emulate LTERs?
- There are 26 LTER sites around the US (including 2 in Antarctica and 2 in Alaska).
- Represent unique ecosystems.

Shares characteristics with parks:

- Each has a unique identity.
- Decentralized governance.
- Unique resources/problems at each site.

How do you conduct synthesis and long-term research without over-prescribing the monitoring program?

Long-term research is required to reveal:

- Slow processes or transients.
- Episodic or infrequent events.

- Trends.
- Multi-factor responses.
- Processes with major time lags.

More on long-term research:

- The more long-term research you have, the easier it is to bring scientists in because they can use your long-term data (saves time, money, and effort). Long-term research data attract research scientists.
- The ratio of all observational experimental studies, 80% of the scientific literature is based on studies of less than 3 years – because of a lack of long-term research. Nature doesn't work in nice 3-year increments.
- A major portion of the LTER funding goes into long-term measurements.
- Duration of all observational and experimental studies (most ecological projects are less than 3 years).

Network Management:

- Every LTER site is required to invest a percentage of their funding in data management.
- The LTER network does have specific requirements for data management and data collection, e.g. climate data. Also, the network of sites is required to invest in education, publications, synthesis, international collaborations and graduate student education.

Overarching question:

- How do you prioritize your research agenda?
- How do changes in human population density and behavior interact with climate variation, altered biodiversity?

Conceptual Model:

- Broken down into human and non-human components – integrated, interrelated, and interacting – the components can be drivers and/or responders.
- Human: Ecosystem services; Human behavior (society, policy, economics)
- Non-Human: Biotic structure; Ecosystem functioning; Long-term “press” (happens unidirectionally over time) – short-term “pulse” (short duration, high magnitude event).
- See diagram and graph in PowerPoint presentation. The more natural the ecosystem is, the higher the environmental quality.
- Parks provide the baseline for restoration.
- All ecosystems are managed ecosystems in some way.
- What are the normal/natural variants and what will the ecosystem look like in the future from human impacts, climate change, etc.? – This is what park managers are facing.
- Every park's research and management agenda changes with each new superintendent. The parks need to come up with an administrative structure that outlasts the park staff changes.

Other info/comments:

- Parks can collaborate with LTER sites to allow for comparable data sets (e.g. Rocky Mountain NP and Niwot Ridge LTER).

- NSF's initiative - NEON (National Ecological Observatory Network) is different from LTER because NEON will provide environmental technology infrastructure whereas LTER funds site specific research.
- Technology should assist in lessening the research "footprint", allowing for fewer people in the field.
- Parks need to carefully consider the issue of installation of long term technology and hardware sensors that might be in conflict with wilderness designations and visitor enjoyment.

III. How do parks facilitate research priorities?

Christie Hendrix, Permit Coordinator, Yellowstone NP (YELL):
(PowerPoint presentation)

Research permitting in parks:

- Permitting Requirements
 - Permits can be issued if the research does not adversely impact public health or safety, environmental or scenic values, natural or cultural resources.
 - The permit review system allows for the implementation of management responsibilities, proper allocation and use of facilities, and visitor use activities.
 - Scientific research permits issued only to investigators if they are affiliated with universities, research organizations, private organizations, or other government agencies.
 - Researcher must agree to all permit and reporting requirements.
 - Investigators must submit to the park copies of the final research report or any journal articles.
- Who is required to have a permit? Scientists, park employees conducting studies, and inter-agency employees.
- Facilitation of park research priorities:
 - When a project's results are of value to the park, we provide: Letters of support, assistance with housing, support staff to aid with collection, equipment (vehicles, computers, office space).
- Communication of research results
 - Try to keep track of all the projects in the park each year.
 - Try to go into the field with researchers and share information.
 - Provide reports and publications to the researchers when staff are available.
 - Hard to set up forums for people (no time); hard to get scientists to talk at a level that the public will understand.
- Limitations of NPS permitting systems:
 - Can take 90 days to get a permit.
 - Have to have everything in writing for NEPA.
 - Need 2 peer-reviews for each permitted research project at YELL.
 - Asking scientists to provide complete research proposals leads to resistance.

NPS doesn't require employees to get permits, but YELL does it anyway – practice of going through the process. A park can set individual research permitting policy for “in-house” research.

Common problems in Yellowstone:

- Researchers fail to report research results.
- Few researchers seem interested in what they can do to help the park.

Suggestions:

- Park managers should consider developing written science agendas.
- Work closely with CESUs and I&M staff.
- Parks should have research permitting policy and is posted on the web site.
- Set more rigorous reporting requirements on researchers.
- Research permit coordinators need to work closely with NPS staff (RPRS administrators).

New Product:

- Yellowstone just issued a brochure, co-sponsored by the Thermal Biology Institute at Montana State University, titled “Performing environmentally sensitive field research in Yellowstone NP”. The web site is <http://www.nps.gov/yell/technical/researchpermits/>, then scroll down to the listing for “Brochure”.

Hank Harlow, Professor, University of Wyoming, and Director, UW/NPS Research Center
(PowerPoint presentation)

How do we facilitate research?

- At the AMK Ranch facility on Jackson Lake in Grand Teton NP, they provide housing (58 beds at full capacity) and some lab facilities for visiting summer researchers.
 - Have to become more exclusive because of capacity issue.
 - Women in science issue (some want to bring their families).
- Hold weekly conferences and seminars open to the public (every Thursday) – brings in anywhere from 80 to 100 people – scientists, park employees, and local community.
- Dinner (colleagues come together).
- Off-Campus library for field researchers (Uses UW website access; not NPS computers). This access can provide immediate turn-around on the data – easier for parks to get access to the reports created by researchers when all the equipment is right there.

How do we obtain and prioritize projects?

- Newsletters and Annual Reports of research projects
- Call for small grant proposals.
- Each year they list the priority research topics for GRTE and YELL
- Seek out researchers to address the science questions of greatest concern.
- Four criteria for determining proposals: Merit, how well-defined the objectives are, how well-defined the methods are, and what is the resource management implication.

- Proposals geared for starting new project, when the grant terminates the project is dead in the water – however, this is where the small grant program comes into play – it can cover the remainder of the original proposal so the project doesn't just end if it is not complete.
- Steering committee ranks proposals.

Proposals:

- Purpose to initiate new projects and ongoing projects in need of support.
- Enhance external funding by providing letter to agencies pledging support (lodging, labs, and logistics).

Case studies:

- Large return on small investment.
- Topics funded in the past: fire ecology, amphibian populations, montane meadows as indicators of global climate change, Teton fault, Yellowstone supervolcano.

Other info:

- Annual report is put out
- Budget getting tighter
- GRTE and YELL can leverage their NPS funds with UWYoming funds through the small grants proposals.

Jim Cheatham, Chief of Resource Management, Devils Tower NM (DETO):

Sources for research info:

- DETO is a member of the Northern Great Plains I&M network.
- Also a member of the Rocky Mountain Cluster of parks, with access to assistance from the Rocky Mountains CESU
- Look for research needs within management documents.
- Some natural resource “needs” lists have been developed as part of I&M vital signs planning.

Research needs/addressed:

- Once research needs have been identified, will announce them on the RPRS (Research Permitting and Reporting System), RM-CESU site, and the Northern Great Plains I&M website.
- Get cold calls; I&M program, contractors call in and look for support, universities, etc. – funding is an issue.
- Questions addressed: Has the research been done before? What is the need? Is it consistent with their compliance improvement management system (environmental management system)? What are the environmental impacts? - consult with the management team in the park before issuing a permit.
- Runs proposal through PEPC (Planning, Environmental, and Public Comment) system; puts RPRS and PEPC together to start project.
- Puts bulleted research information on CESU websites.
- DETO is a small park, so it's hard to be competitive with NPS-WASO funds.

Funding sources:

- I&M Network
- RM-CESU
- CCI (DOI's Cooperative Conservation Initiative) included restoration funding for NPS projects for two years. Then the program was cancelled.

Issues with managing researchers:

- Getting appropriate documentation and cataloging in museum (which is based in Mt. Rushmore as of 2001).
- See handout: "Curatorial Requirements for Collectors of Natural History Specimens". Walks the researchers through what to do with collections before, during, and after collecting.

Other info:

- Need to include the small park perspective in research needs/catalogues – difficulty in being competitive with funding sources.
- Remind researchers that specimen belong to the NPS – though ownership can be transferred – this cuts down the work of curators and makes specimens more accessible because they are not being kept at the park if ownership is transferred.
- Specimen ownership can be transferred directly to the Smithsonian for easier accessibility and to reduce workload on individual parks keeping track of where the specimens are and the shape they're in.
- You can also give specimen to a regional location, however, the park will have to check on them on an annual basis.

IV: How can these larger research/science strategies be integrated with ongoing NPS programs, e.g. Inventory and Monitoring ; (Open Discussion – facilitated by Cathie Jean, Program Manager, Greater Yellowstone Inventory and Monitoring network)

Clarifying how the NPS is using the Inventory and Monitoring program:

- Rather than "just another program", I&M should represent a new way of doing business for the National Park Service.
- I&M has as a centerpiece, good data management and metadata documentation.
- I&M should help to integrate all elements of park natural resource and education programs.

Integration with on-going NPS programs:

- Who is our audience, who is interested in this monitoring information and how can we build a broad base of support to develop research that supports selection of monitoring indicators?
- I&M could assist with making research results collectively more informative than the parts, particularly through timely synthesis of data sets (e.g. stressor/response data).
- I&M could assist parks and other land managers with economies of scale in monitoring across political boundaries, collaborating, etc. – who has time to do this prior to embarking on projects.

- There are inter-network. RLC and CESU collaborations going on – we have developed workshops, and collaborated with other NPS regions (e.g. alpine monitoring workshop included networks in IMR, PWR, AK) or with similar parks or networks.

Ideas on how to integrate I&M data with other science data sets:

- Broaden research definition – how important is research to conservation?
- I&M results can tie into social science and cultural resource managements, e.g. with work on Cultural Landscape and environmental history.
- How much science is used in park or regional decision-making?
- How do you link science to management?
- Good science and reliable knowledge might depend on the relationship between the scientist and the park staff (who listens to whom and who trusts whom?). What is the relationship between the park manager and the science advisor?
- Idea of paring down expensive and timely research into 30 words and trying to help managers make decisions based on this type of summary.

Issues:

- Bob Moon: Science advisors need to communicate with managers by citing literature – this would help to convince managers of the value of the scientific research (e.g. Cormack Gates, University of Calgary, compilation of bison research in Yellowstone NP). Some aspect of the science needs to help a superintendent make better decisions. It is often the case that key personalities with credibility help to make the science relevant for managers.
- Jack Potter: Managers need to keep in mind the issue of “uncertainty” – science doesn’t necessarily have all the answers.
- Bob Moon: NPS is about tourism and people (managing visitors and scenery), not about science – science is often low on the list of NPS priorities.
- Need to do the basic research before we can plan for long-term monitoring of ecological indicators.

(Break for Lunch)

Continue IV. How can these larger research/science strategies be integrated with ongoing NPS programs, e.g. Inventory and Monitoring (Open Discussion – facilitated by Cathie Jean)

Is there any information about thresholds that might feed into I&M or other NPS program?

We need to have scientists help us to define the stressor thresholds that might trigger management actions, especially with respect to environmental change:

- Lower (below acceptable), middle (a limit of acceptable change), and upper (beyond acceptable) threshold limits.
- Historic range of variability not necessarily applicable
- Human impact range of variability.

- The appropriate range of variability is important.
- Expected range of variability – role of science and research in predicting what is outside the “normal range” that should concern the resource manager.

We have the challenge of taking the best science available and shrinking it down into one sound bite to share with managers/decision-makers.

Prioritization on research issues is important. Managers and park resource management staff have a long menu of issues that need science support. The challenge is to choose research that is important to preserving park resources, rather than what’s hot at the moment.

We need to have the flexibility to do research on “emerging issues” that could be important in the future, e.g. wildlife disease, Africanized bee invasion and invasive aquatic organisms. This will allow managers to have needed information ready to make the appropriate decision.

V: What are the next steps? E.g. Identify key in-depth case studies, develop comparative review article, and recommendations for 2007 GWS meeting. (facilitated by Kathy Tonnessen, RM-CESU and Glenn Plumb, Yellowstone NP)

Based on this discussion of Research/science needs in park, what is the next step? Where do we go from here?

Re-cap of points made:

- The group heard about some examples of how to create research needs lists.
- There were also suggestions made on how to publicize these lists to the science community.
- It is important for parks to communicate with the scientific community to get science done or focus on the hotspots.
- Communication – sharing and translating science to the policy and decision makers is an important step that is often overlooked.
- There are examples out there on how to frame science questions and communicate with the public, e.g. LTER data sets..
- It will always be a struggle for small parks to be able to frame their science needs and get researchers to pay attention. This issue has been taken up by the CESUs, I&M networks and the PWR Science advisors.

What questions can the NPS pursue in the near-term?

- How do we put together better research lists and formulate better researchable questions – and make the questions attractive to researchers?
- How can we help smaller parks that might be overwhelmed and unable to put effort in research catalogs or outreach to the research community?
- If we assume that NPS wants to get as much science in the parks as possible – is there such a thing as too much science?

- Are there internal park issues that determine how much science can take place in the parks?
- Amount of research and science depends on what the parks can accommodate.
- We should consider the “research permit” as a valuable commodity. Therefore, we should be able to ask more of the researchers in presenting data/findings.
- NPS does not have to find and fund all of their own research. Since parks can’t afford to hire their own scientists, we need to be more welcoming to agency, university and NGO researchers who are willing to help. NPS should consider the types of consortia that would help to advance research in parks, e.g. NEON, LTER, FHM, etc.
- Parks also need to look into the future for “emerging issues”. We need outside scientists to help us think about questions that are going to problems in 3-5 years. Then we’ll have the results when we need them rather than 5 years after we need them - to make informed decisions.
- Difficult to get park staff to focus on possible future needs because they are too focused on current issues – trying to mitigate current problems.
- Some of our emerging threats involve trans-boundary processes and issues – air pollution, roaming bison and elk, etc.
- We need to become more adept at integrating with larger scale efforts, in collaboration with other institutions and agencies.
- We need to consider NPS’ continued need for science advisory committees, at the park, region, I&M or national level. It is useful to managers to get outside review, as long as the input is not based on adversarial science.
- Do we need to prioritize research in parks?
 - We haven’t prioritized because we don’t have sufficient funding to be selective about what projects get done in parks.
 - Some parks might not want to put priority numbers on research; this might limit what work is done in parks by scientists with their own funding.
 - If parks set research priorities, then does that restrict who gets a research permit?
 - Might there be conflict between researchers and the visiting public in using the parks as places for scientific inquiry? (e.g. the last campsite dilemma)

Items on white board [items that would require additional discussion]:

- 1) Researchable questions:
 - Emerging issues (proactive research)
 - Integrating into larger scale initiatives
 - Priorities (for research, for park support)
 - Matrix
- 2) Science Advisory Committee:
 - Priorities (for research, for park support)
 - Trans-boundary issues
- 3) Internal NPS Issues:
 - How to weigh the importance of the research
 - Staff concerns about wilderness issues, collars on wildlife

- Limits on research activities
- 4) Research Consortia:
- Models
 - Strategies for getting research done
 - Trans-boundary issues
 - Baseline data collection
- Many parks do not treat science opportunities/prioritization on an opportunity-cost basis, e.g. if there's a cost for the park (YELL) to facilitate a research project, then will that permit application be rejected?
 - Are there opportunities to bring non-traditional partners into partnerships to get research done? For example, can we interest other agencies (NSF, EPA) in using parks as research sites?
 - Which ideas from today can we pick to work on that would be productive?
 - Are there already efforts in parks/regions to come up with innovative programs/processes to get some of these questions answered?

Questions:

- Compliance – how parks can effectively do the environmental review for research projects
- Permit review process – how to make it less time consuming
- When is there too much science (too many permits, too many researchers in the field)?
- Wilderness vs. Science – how to keep both wilderness managers and science staff together
- “Implementation Gap” – how to link science to park management
- Is there a role for an “outside” science advisory committee?

Common Threads:

- Funding – lack of same
- NPS managers vs. scientists
- Seeing parks as part of the ecoregion when it comes to research

Other Information from meeting:

- Book recommendation (Leigh Welling): “Science and the National Parks” By the National Research Council (ISBN: 0309047811) – lays out the history of research in the National Parks.
- Support from NPS-WASO on this issue – there is no funding for science planning. Should we bring this up with the Natural Resource Advisory Group, meeting with Mike Soukup in March 2006?
- Jack Potter and Jim Cheatham will present some of this information on research agendas for parks at the Rocky Mountain cluster meeting, scheduled for February 27-28, 2006 in Lakewood, CO

Follow up/Next Steps:

- **Jack Potter (GLAC) and Jim Cheatham (DETO) will present these ideas at the Rocky Mountain Cluster meeting, Feb 27-28, 2006**
- **Is there interest in developing a “white paper” on this topic?**
- **Should we organize further discussion at George Wright Society meetings in spring 2007? After the meeting there were three volunteers: Leigh Welling (GLAC), Kathy Tonnessen (RM-CESU) and Glenn Plumb (YELL).**

- **Other Recommendations for a “white paper/article”:**
 - **Draw on case histories as to what has worked – what has driven the decision process? – this type of case study could then allow the development of a framework (or road map) for defining a science agenda for parks.**
 - **Can we develop a policy-supportive science agenda for a park.**
 - **This effort will require 2 or 3 key individuals to get something moving.**