



Stream Restoration Workshop held at NCED

The National Center for Earth-surface Dynamics (NCED) Stream Restoration Partners Group (see box below for who these groups are) met in February 2005 to: (1) examine the current state of stream restoration science and practice, and identify knowledge gaps; (2) evaluate the current methods and models and identify needs; (3) examine the current status of restoration training; and (4) evaluate stream restoration decision-making issues and processes.

More on this meeting's discussion, along with other stream restoration information and links, can be found on NCED's stream restoration portal:

www.streamrestoration.net

Stream Restoration Assessment

Although participants discussed a range of specific issues (see accompanying article on the web) in restoration science and practice, most of the discussion focused on knowledge gaps at the "what approach do we take" level. Five issues that came up consistently were:

(1) Advances in science and engineering are slow to make it into practice, with time lags of as much as decades.

(2) The practice of restoration is too often seen as a single-discipline problem – a problem in geomorphology, for example, or hydro-engineering, or ecological restoration. The geomorphic consequences of ecological engineering, and the ecological consequences of physical engineering, are all too rarely considered in a consistent and balanced fashion.



NCED Stream Restoration Partners Group meeting attendees

(3) The science of stream restoration is usually limited to reach-scale considerations. Many participants identified the need to take a "watershed perspective" or "corridor management" mindset that would both place the project in context and permit the evaluation of up-stream and down-stream impacts.

(4) Restoration practice has typically used a "template" or "reference reach" approach even though disturbed streams have often responded to changes in external drivers for which no template exists. But a competing approach based on specifying changes in watershed fluxes faces large uncertainties in determining past and future conditions.

(5) The restoration community needs to more consistently incorporate post-design monitoring and reporting into all restoration projects. The current paucity of restoration forensics and reporting insures that the gaps between knowledge and practice grow wider with time.

Tools and Methods

A wide range of existing, proposed,

or needed methods and models were discussed, ranging from small scale computational models to channel-change scenarios to river corridor management plans (see the web for more details on these). Some common themes included the need to integrate biology/ecology into tools that for the most part deal only with the physical side of restoration; tools that better translate current academic research into a form accessible and usable by practitioners; tools that incorporate uncertainty in quantifiable ways; tools that guide practitioners in adopting appropriate post-design monitoring; and a tool to help practitioners/stakeholders decide whether to intervene at all. Gary Parker of NCED presented an outline of a Stream Restoration Toolbox that NCED researchers are developing for web dissemination, and invited all participants to contribute to it (Tool 1 is available on the web).

Training

Several participants described the training programs and curricula currently available at their respective organizations. In addition, NCED presented a plan for developing a graduate program in applied stream restoration.

Despite the quantity and variety of training resources available, most participants felt there were still major unanswered questions: **What** specifically needs to be taught? **Who** needs to be taught? **What level** of training is required for

NCED: The National Center for Earth-surface Dynamics is an NSF-funded Science and Technology Center based at the St. Anthony Falls Laboratory of the University of Minnesota. Its mission is to develop integrated interdisciplinary models of channels and channel networks, and its major application area is stream restoration.

See www.nced.umn.edu for more information on NCED.

NCED Stream Restoration Partners Group: Organizations (federal agencies, private consulting firms, and research institutions) with an active interest in stream restoration and who have officially partnered with NCED.

See www.nced.umn.edu/partners_portal.html for more information on NCED partners.

Stream Restoration Workshop (continued)

different tasks and should different level(s) of training be available depending on the trainee's background? Should practitioners be **certified**, and if so by whom? And **who should decide** the answer to these questions?

There was general agreement that an organized, community-wide discussion of training levels, requirements, and content was needed; and that proactive coordination (possibly by NCED) of training opportunities is desirable. Representatives of the government agencies at the meeting expressed a willingness to share training materials/methods and one of the first tasks of NCED's Stream Restoration

website will be to list available training courses and materials, followed by posting of available teaching materials as they are contributed.

There was also agreement that the same gaps identified above for stream restoration practice (lack of interdisciplinary approach, reach-scale thinking, etc.) are clearly present in the training as well.

Decision-making

There were frequent references during the above discussions to the social/societal aspects of successful stream restoration. Ultimately, the general public pays most of the costs and has a primary stakeholder role (often voiced by government agencies) in determining what makes a project a success. In this final formal segment of the meeting, the process of setting objectives, evaluating tradeoffs, and measuring successes for restoration projects was discussed. A questionnaire covering these issues was completed by participants, and a summary of results was presented by NCED's PIs focused on environmental economics and policy. Major conclusions were:

(1) Many decision-making issues (who's involved, to what extent are alternative solutions considered, criteria for "success") are dependent on the project's size, motivation, and location;

(2) The uncertainties inherent in project design are rarely calculated or communicated, and are certainly not handled in any uniform way; and

(3) Decision-making would be greatly helped by the ability to quantify or monetize non-economic outcomes.

Potential NCED Roles

Participants identified several ways in which NCED, as an NSF-supported Science and Technology Center focused on channel systems science, could contribute to the stream restoration community:

(1) Research – NCED is already doing much basic research



Mike Ellis (NSF), Jeff Marr (NCED SR Project Manager), and Bruce Orr (Stillwater Sciences)

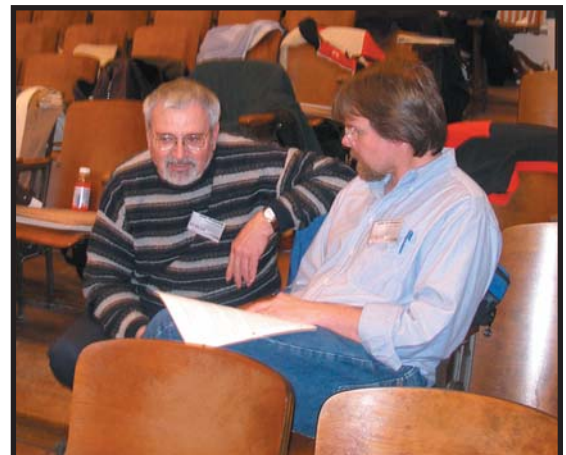
germane to the field, and is committed to transferring that knowledge to the practitioner community. In addition, NCED could sponsor "working groups" that address specific and difficult restoration science issues, and bring practitioners and scientists together to set a restoration research agenda.

(2) Community building – NCED announced plans to foster communications between all elements of the restoration community through development of a community web space and publication of a newsletter (this one - go to the web site to subscribe); and

(3) Training – NCED could provide a valuable service by coordinating the development of training curricula and standards, and helping to insure that these curricula and standards are frequently updated as advances are made in restoration science.

For more detail on this day-and-a-half conversation, please visit NCED's Stream Restoration web portal at:

www.streamrestoration.net



John Potyondy and John Buffington of the USFS

The Stream Restoration Networker

Published quarterly by the National Center for Earth-surface Dynamics and distributed free of charge to members of the stream restoration community.

More information and a subscription form can be found on NCED's Stream Restoration web site:

www.streamrestoration.net

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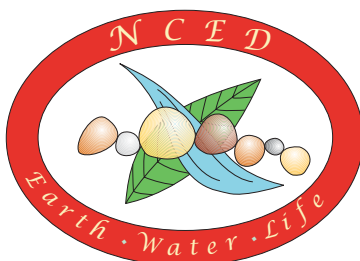
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Stream restoration needs a community effort

By Peter Wilcock

We now know that annual expenditures on stream restoration projects exceed \$1 billion per year (<http://www.nrrss.umd.edu>) and that number *excludes* the mega-projects that draw much of the public's attention. The economic reality alone makes a compelling case for improving the science and engineering basis of restoration and getting this information out into practice.

NCED, which exists to better understand the channel systems that shape our planet's surface, has made stream restoration one of three overarching projects that organize the Center's activities. This effort includes a variety of research studies intended to improve our understanding of channel dynamics, which in turn can lead to improved channel design. To be useful, this work can't be done in isolation but in collaboration with practitioners and regulators who deal with restoration issues on a daily basis. Together, we need to look at the restoration business, its scope, its details, and its missing links, so that we can define the most relevant research and the best ways of getting the latest information to those who use it.

At the heart of NCED's stream restoration efforts is the Stream Restoration Partners Group (SRPG), whose goal is to improve stream restoration practice by identifying research needs and by facilitating and coordinating method development and training. On February 23-25, an exceptionally enthusiastic group of 41 practitioners, researchers, and educators convened a SRPG meeting in balmy Minneapolis. The meeting is described more fully in our lead article, and more information on the meeting can be found on NCED's Stream Restoration web portal (www.streamrestoration.net).

Here, I would like to highlight what I thought were some of the key issues that came up during the meeting:

(1) There is a need to better define linkages between geomorphic design and ecological outcomes. This is an ongoing challenge that will probably never be fully addressed. It is at the heart of many NCED projects, which have the goal of developing a truly integrated and predictive

understanding of physical and biological processes in stream channels. A specific issue of applied importance that emerged was the need to identify fast biologic indicators that can be used to monitor project success on management timescales, rather than the often longer timescales of ecological recovery.

(2) There is a need to get latest science and methods to practitioners. Some ideas are timeless, others have been replaced or updated. The time lag between knowledge development and application is often long and needs to shrink. One effort intended to address this problem is the NCED Stream Restoration Toolbox, which will contain open source methods and models with accompanying instructions for their use. But having the latest model does not ensure the best restoration decision or design. Another essential need is a clear definition of both the methods and the training required for different tasks. This issue is at the heart of what an effective research/training/practice collaboration, such as the SRPG, can do.

(3) What is the effect of vegetation on bank erosion and channel stability? This is an active field of research both in and out of NCED, and a significant expansion of this research is proposed in the near future. There is still a long way to go before there is a predictive and general approach.

(4) Institutional and social barriers to restoration practice are as important as knowledge barriers. NCED has added two investigators in the environmental economics and policy area, Nick Flores of the University of Colorado and Ben Hobbs of Johns Hopkins University. Nick and Ben will be looking at the social drivers of setting objectives, evaluating outcome tradeoffs, and other decision-making issues associated with stream restoration.

This problem may be one that NCED and its partners are well positioned to address, because the center environment can foster clear and direct communication and coordination without the constraints that can be introduced by agency or commercial priorities.

(5) There is a pressing need for more and more effective project



Peter Wilcock, Lead PI, Stream Restoration Project.

evaluation. The recent completion of the first phase of the National River Restoration Science Synthesis (Bernhardt et al., *Science*, 308:636-637, 29 April 2005) provides context and a starting point for a rational approach to project evaluation. It is time to start learning from the large-scale experiment being conducted in our streams!

NCED and its partners will be addressing these and other issues, with the goal of improving stream restoration practice. We have no agenda other than to develop and promote the most useful and relevant methods and models, which means that NCED may be able to clearly state problems, propose solutions, and provide continuity and coordination without the constraints that can restrict commercial, environmental, or governmental organizations. Anyone interested in improving restoration practice can get involved and we welcome any input, comments, and contributions you might wish to provide.

**Only in fetters is liberty.
Without its banks,
Can a river be?
-Louis Ginsberg**

Welcome to the Stream Restoration Networker!

What is it? A quarterly newsletter dedicated to the advancement of stream restoration.

Who's it for? If you have an interest in stream restoration, it's not only FOR you, it's YOUR newsletter – contributions and suggestions are welcome at all times.

Only four pages?? Read this newsletter to see what's new – there will be more in-depth coverage and additional resources on the Stream Restoration Networker's web site: go to www.streamrestoration.net and click on the Newsletter link.

How can I get my copy? You can email the editor (editor@streamrestoration.net) or visit the web site and sign up there.

More on the web: www.streamrestoration.net

Annotated Bibliography - Selected readings in stream restoration science, practice, and policy, with comments

Conferences and Workshops – Where to get together in real-space

Forums – Where to get together in cyber-space

Links – Other stream restoration online resources

Newsletter - Downloadable version of this publication

Photo Gallery - A visual tour of the stream restoration world

Research - Highlights of research results

Restoration Projects - Links to current project web sites

Toolbox - A suite of restoration tools - the first is available now

Training - A compilation of curricula, programs, materials and events

Note: the web site is a work in progress. Your patience AND YOUR INPUT will be much appreciated while we build it into a premier online stream restoration resource!



Summer 2005 Issue

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