STREAM SYSTEMS TECHNOLOGY CENTER

STREAM NOTES

To Aid in Securing Favorable Conditions of Water Flows

Rocky Mountain Research Station **January, 2001**

Position Advocacy by Scientists Risks Science Credibility

by Thomas J. Mills

The demand for science information in decisions about the management of natural resources is ever more insistent, just as the debates seem evermore contentious. Increasingly, research scientists from public agencies, such as the USDA Forest Service, are being asked to bring science information to the decision-making table. Research scientists are being asked because of their expertise and because they generally are viewed as objective and independent from interests advocating different solutions in the debate. These perceptions of credibility in turn come from the public's trust in the scientific method and science institutions.

Scientists and the science information they bring can make many valuable contributions to the decision-making process. They can contribute an understanding of the system being managed, understanding that is essential to intelligent development of management options and to the reasoned estimation of the effects of management actions. Once management goals are established by the decision-maker, or through whatever process is legitimate, scientists can contribute to development of management options that might achieve those goals.

The scientist likely will have to make professional judgments when estimating the consequences of management options, because a complete array of hard science studies on which to base the estimates probably is not available. For example, scientists may have to interpolate between points of hard science information, extrapolate results from the research study area to another area, or from one geographic scale to another. None of these science roles is easy, but they are feasible when done with careful anchoring in the scientific literature and when associated with clear communication of the degree of confidence in the results.

Accomplishing these science roles is essential to informed public decisions. Science information sometimes provides a neutral ground where people with divergent interests can assemble to better understand the systems about which they have an interest. Without the science information, the public dialogue often deteriorates into a dogmatic debate among divergent and often mutually exclusive positions driven by self-interest.

In playing these science roles in decision-making settings, it is appropriate that the scientist forcefully advocate the consideration of the relevant scientific information. Especially once science has been engaged in the debate, it is even the responsibility of the scientists to advocate for the full consideration of scientific information and to not allow others to pretend that the science was considered, if in fact it was not.

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Without the science information, the public dialogue often deteriorates into a dogmatic debate among divergent and often mutually exclusive positions driven by self-interest.

One way of implementing this is for the scientists to conduct what might be called a "science consistency check," wherein they evaluate whether the final decision fully considered, correctly interpreted, and revealed what is currently known from the available science information. This science consistency check of the decision can be a powerful tool in ensuring the full consideration of science. It is also an effective tool in helping the scientists discipline themselves to stay in a science role.

The next question, though, is whether the scientist should advocate a particular management option as the best solution, either because the scientist has strongly held personal values or because he/she thinks their science perspective gives them special insights that others lack. The most important consideration in answering this question is how position advocacy affects the vitality of the science component of the decision.

Invariably, any natural resource management decision is a value-based balance among diverse considerations, of which science information is but one component. Even though a balance among diverse values is the central stuff of decision-making, it is not the stuff of science. Science informs the choice, but it does not make the choice or direct a single solution.

This is not to say that scientists do not have personal values: They do. It also is not to say that those values do not affect the scientist's behavior: they do. Personal values affect what scientists perceive to be important to study, how they present their research findings, and how they integrate different pieces of scientific information into a larger scientific whole.

At issue, is not whether scientists have personal values. Rather, it is whether they should express those values by advocating for any particular decision outcome during a public debate in which they are being counted on to be a neutral provider of credible science information.

Position advocacy by scientists can take at least two forms. In the first form, the scientist advocates a position while pretending that the position is a science statement rather than a personal value statement. If science has any credibility in the debate, the scientists might do this to gain more attention and support for their personal position. This misrepresentation of personal values as if they were science is unethical. It is just as unethical to misrepresent personal values for science, as it is to misrepresent experimental data or the results of statistical test in a scientific paper.

The second form of position advocacy is more problematic. In the second form, the scientist carefully clarifies that they are expressing a personal value rather than science information when they advocate a position. They make it clear that they have taken off their science hat and put on their personal value hat. At best, the audience will be confused about whether the scientist is speaking science or personal values. The confusion is not helped if the scientist wraps their advocacy in scientific language. Most likely, the public will think, at least at first, that the personal value-based advocacy is really science information because, after all, the scientist gained the public platform through their scientific standing, not personal values. If this confusion occurs, the effect of the second form is the same as the first, that is, a misrepresentation, even if the intent is different.

What is the outcome, whether the misrepresentation was intended or not? Although arguably the outcome might be different from different perspectives, from at least one perspective the outcome will be erosion of the scientist's personal scientific credibility along with the credibility of the science information they brought to the dialogue. How can they be trusted to be a neutral source of science information if they entangle science with value-based advocacy, intended or not? That credibility damage might wash over onto other science information vital to the debate and perhaps even the institution of science itself.

Personal values and the advocacy of those values are vital components of any substantial natural resource management debate. They also are common components of most debates. There never seems to be a shortage of advocates for different solutions. Credible scientific information about system function, feasible management options, and inherent risks and consequences of different management options, on the other hand, is usually in short supply. Yet, it too is a vital component in reasoned public choices. Sacrificing the scarce science contribution for the more common, though no less important, expression of personal values is a poor trade. It is a poor trade for the credibility of science and it is a poor trade for the decision-making process.

Given these risks and tradeoffs, scientists should avoid position advocacy. Scientist should even avoid recommending an outcome or decision. The scientist can get to a recommendation only by doing the same value-based integration of divergent considerations as they would if they advocated a position. Therefore, a recommendation is likely to be seen as position advocacy, and reasonably so. Also, attacks on the scientist's recommendation could easily lead the scientist to defend the recommendation and thereby slide further down that slippery slope into advocacy and further lose the objectivity on which their scientific credibility is based.

This discussion has thus far focused on research scientists with public agencies. Should the same guidelines apply to scientists in other organizations, such as scientists with universities, private sector firms, and special interest groups? Similarly, should they apply to staff specialists in public agencies, like a regional hydrologist or a state fish biologist, who represent themselves as scientists? Given that interest groups and private-sector firms were formed to pursue specific agendas, perhaps different guidelines are appropriate.

The answer is a function of whether the scientists in these other organizations can credibly play two roles simultaneously: that of credible, neutral scientist and that of position advocate. The answer is that they cannot--not any more than a public research scientist can. There is nothing wrong with advocacy and there is nothing wrong with bringing science to the debate, but there is a great deal wrong with pretending that a selective use of available science to support a position or the value-based advocacy of a particular position is science or that science information somehow points to one solution. They cannot credibly change hats any more than the public agency research scientists can. Therefore, yes, the same guidelines should apply and for the same reasons.

It is good that scientists have passion for sound, science-based decisions. Their passion for good decisions should be focused on assertively communicating the rich fabric of science information into the decision process. It should not be translated into an indulgence of personal values or into thinking that their experiences give them unique insights that all others lack. Alternatively, the individual can stop playing a science role altogether and play solely an advocacy role. Play one role or the other, but not both.

An attempt by the scientist to simultaneously be a science information provider and a position advocate is an inherent conflict of interest. The development of objective science information on the one hand and the value balancing of all considerations in a final decision on the other hand are two different roles that cannot be credibly played by one person. The risk to the credibility of the science component of the decision process is too great. At best, it will further confuse already contentious and complex public debates. At worst, it is an unethical misrepresentation of personal values as if they were science information.

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Constructing Temporary Sampling Platforms for Hydrologic Studies

by Manuel Martinez & Sandra Ryan

Rocky Mountain Research Station Technical Report RMRS-GTR-64, ***Constructing Temporary Sampling Platforms for Hydrologic Studies***, presents instructions for constructing platforms that span the width of stream channels to permit the measurement of discharge and sediment over a wide range of flows. The Stream Systems Technology Center provided financial support for the publication. The platforms (see photograph on following page) provide a stable, safe, noninvasive, easily constructed, and relatively inexpensive means for collecting discharge and sediment data without wading in the flow. A primary benefit of sampling platforms is that they ensure safety in hydrologic data collection by elevating persons and equipment above the water surface, thereby limiting bodily contact with swift currents while also eliminating disturbance to the flow and the streambed from wading.

Collecting samples from vehicular bridges is one way to reduce problems introduced by wading. However, bridges are not always in desired location, particularly in mountain environments where we work. Additionally, flow conditions in the vicinity of bridges are often altered by reduced channel width or by abutments.

We have constructed about 20 of these structures on streams ranging from 15 to 70 feet in width. We suggest using cableways to deploy samplers in swift flows in streams wider than 70 feet. Jim Paradiso described construction and operation of a bank-operated cableway system in the April 2000 issue of ***Stream Notes***.

Most of our sites are within the subalpine environment of Colorado and Wyoming where flow rarely exceeds channel banks by more than a few inches during peak discharge. The structures have been used to successfully make measurements during runoff events with 2- to 5-year return frequencies. No heavy equipment is needed for assembly, thus minimizing disturbance to riparian areas. Structures may be used for a number of years and require minimal maintenance.

Platforms are fabricated from steel bar joists or TJI® joists (commonly used in housing construction), plywood, and 2 x 4s. We prefer to use TJI® joists because they are sturdy, lighter in weight and more easily handled by workers (Figure 1). Either two or three joists are used to form the primary structural component of the platform; three joists are used to construct wider platforms that are needed when a structure is longer than about 40 feet. The plywood deck and 2 x 4 cross-members provide lateral stability and a surface to walk on.

The primary consideration in selecting a site is to establish the cross-section in a location well-suited for the intended measurement. For example, the platform and cross-section should be located in a relatively straight stretch of channel for measuring bedload samples. The banks in the area should be stable, as identified by vegetative growth and the absence of cracks or raveling faces. Banks are rarely overtopped in our snowmelt streams and so they provide a suitable base for the platform.

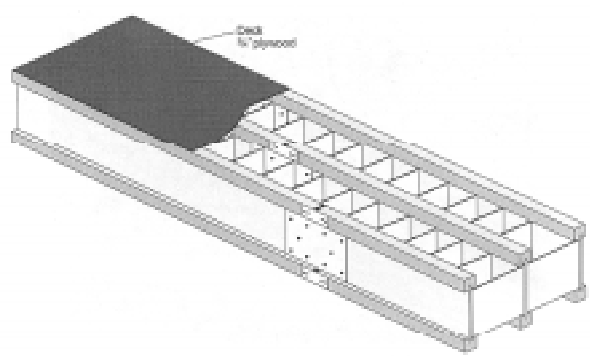
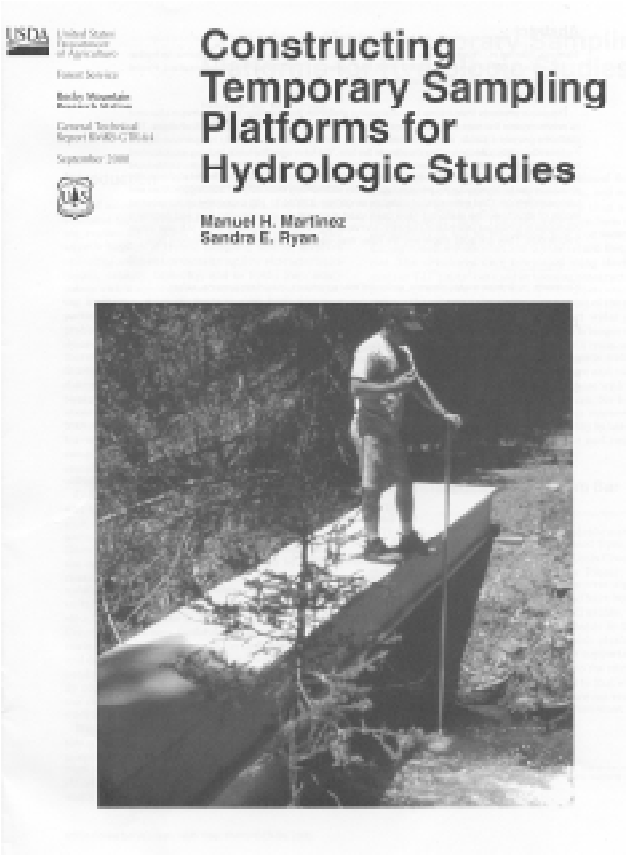


Figure 1. Schematic diagram: joists, spacers (either 2 x 4s or plywood rectangles), and plywood deck (cut away) used in constructing platform.



The structures can be constructed by persons having only rudimentary knowledge of building practices and using simple tools. A 40-foot section of joist requires only three to four people to move into place across the channel. The primary difficulty in platform construction is in hauling long sections of joists to remote sites on unpaved roads. We use a truck and flatbed trailer to haul materials to the sites, some companies will deliver to remote sites for a moderate cost. The structure is assembled over the channel during low flow, so all of the assembly work must be done using battery-powered or hand tools. The ends of the platforms are placed on wooden sills for added height and these are securely anchored into streambanks for stability.

The total cost of a platform depends on the size of the structure plus available tools on hand. Costs for materials and hardware typically ran between $500 (two joist supports) and $1,500 (three joist supports).

Our experience with these platforms has generally been limited to smaller channels that are easily waded during low flows thereby facilitating straight forward construction. These channels are generally stable, distinct, and the area of inundation is shallow and well-defined. While platforms such as these are useful under these environmental conditions, they may be unsafe in channels with less predictable flows or unstable ground. We recommend that platforms be built using estimates of the highest measurable flows for the environment in which they are constructed. This is because the platforms are unsuitable for use when flow is higher than the bottom of the joists. If it appears that flow may exceed this level, platforms must be raised using additional lumber placed under the joists at the sill contact.

We do not use handrails on our platforms mainly because they interfere with movement and placement of samplers with long handles. If handrails are preferred, they should be designed by an engineer because improperly designed handrails, which gives users a false sense of security, may fail. We recommend placing handrails only on the downstream side of platforms; the upstream side should be kept clear to prevent interference with instruments and samplers. Although in six years of use, no person has fallen from any of the platforms, crews should be outfitted with ropes and throw bags to use in the event that a person accidentally falls from the structure.

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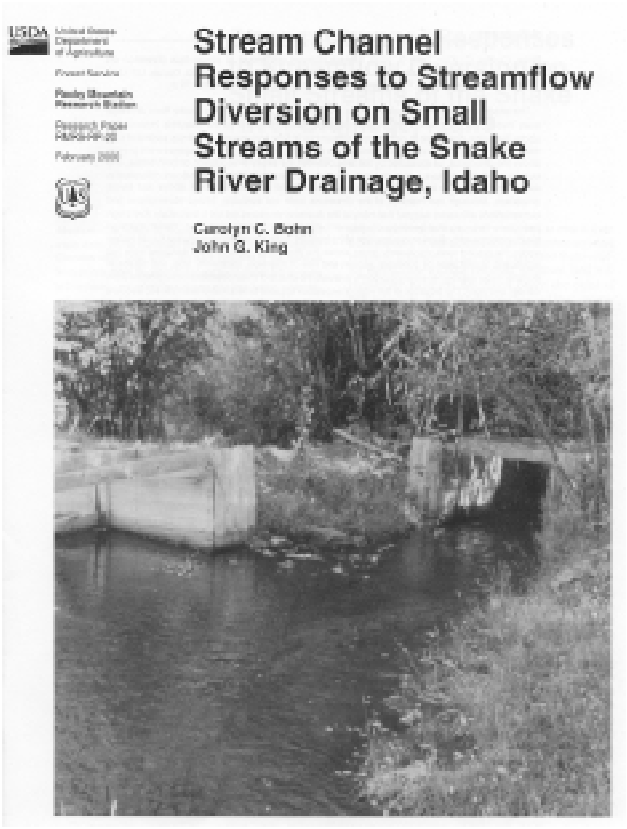
Stream Channel Responses to Streamflow Diversion on Small Streams in Idaho

by Carolyn C. Bohn and John G. King

Rocky Mountain Research Station Research Paper RP-20, ***Stream Channel Responses to Streamflow Diversion on Small Streams of the Snake River Drainage, Idaho***, reports the effects small, low-head, seasonal water diversions have on channels. Previous studies of small diversions in Wyoming and Colorado (Chavez, 1996; Ryan 1997; Wesche 1991) found some changes in channels dimensions when as much as 40 to 50 percent of flow was diverted over long periods. Most of the streams examined in our study had only a small portion of the annual hydrograph diverted all or part of the year, usually with minimal instream structures and little or no impoundment.

Alluvial channels form and change in response to the streamflow and sediment they convey. It has been suggested that reducing streamflow without reducing sediment load will necessitate sediment deposition below the point of flow reduction. It is further hypothesized that vegetation can then reestablish on previously inundated or periodically scoured surfaces, increasing the channel bed friction, and thus facilitating sediment deposition and reduced channel size. These channel adjustments may affect the channel's ability to convey the range of flows carried by the channel before flow reduction.



The 21 diversion sites selected for this study were on low-order forest streams on public lands in the Snake River drainage. Most diversions were low structures of wood, concrete, or rock and tarps. A typical diversion structure is shown on the cover of the publication. Some diversions had headgates and others appeared to be reconstructed each spring. Hydrologic records and use histories were unavailable at the study sites, but observations, conversations with irrigators, and measurements suggest a wide variation in the amount and periods of diversion. Of importance to this study is the observation that these small diversion structures failed to substantially divert high springtime flows so that passage of channel-forming flows, that is, flows generally exceeding 80 percent of bankfull discharge, probably occurred and passed down the natural stream channels in spite of the diversion.

A change in conveyance capacity, the amount of water a channel can carry, is a good indicator of channel change so we selected it as a main test criteria. If the flow is reduced and sediment deposited, channel response should be detectable by comparing the conveyance capacity in the undisturbed channel above the point of diversion to the conveyance capacity below the diversion.

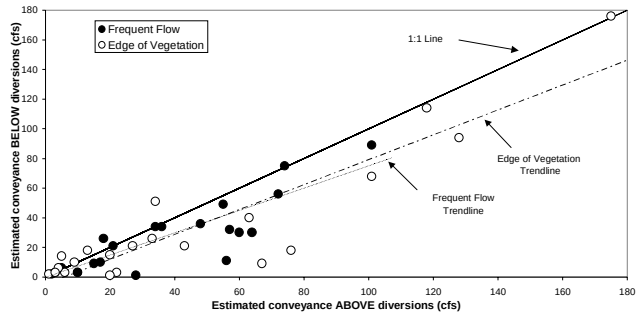
We looked at two channel features to define the stage for calculating conveyance estimates: (1) frequent flow, and (2) the edge of vegetation. The stage of frequent flow refers to a frequently occurring flow, which probably coincides with bankfull stage. It was identified using indicators similar to those used

to identify bankfull stage. The flow at the edge of vegetation refers to the average flow within the edges of vegetation. It was used because we were interested in reduced conveyance capacity due to vegetation encroachment. It is important to note that frequent flow and edge of vegetation measure fundamentally different processes. Frequent flow is defined by physical channel features; the edge of vegetation depends on the establishment and survivability of vegetation during the growing season.

Figure 1 shows the estimated conveyance discharge at the frequent-flow and edge of vegetation levels, plotting flows above and below each diversion against each other. Streamflow estimates below diversions were significantly smaller than estimates from above, indicating that flow reduction due to small diversions leaves discernable indicators in the channel. These indicators are subtle relative to channel changes found below dams, probably because channel-forming flows and sediment apparently are often allowed to pass below many of these small diversions. Channel gradient and response did not appear to be related.

Typically, flow diversion reduced both frequent flow and edge-of-vegetation conveyance. While diverted streams, by definition, have reduced flows, these findings are important because they suggest there are identifiable markers associated with reduced flows within the diverted channels that differ significantly from undiverted channel pairs. On average, the edge-of-vegetation discharge estimates decreased about 26 percent below diversions and frequent-flow estimates decreased about 29 percent.

No significant differences in substrate particle size or in channel roughness was found between channels above and below diversions. Likewise, tests of vegetation stem densities were not significant above and below diversions. We believe that past hydrographs and historical hydrologic data will be needed to fully evaluate channel and vegetation response to detect some of the subtle changes that may be taking place.



Figures 1. Frequent flow and edge of vegetation conveyance discharge above versus below diversions.

References

Chavez, Lela. 1996. Above-below diversion study: *In*: Neary, Dan; Ross, Kim; Coleman, Sandra, eds. National Hydrology Workshop Proceedings; 1992 April 27-May 1; Phoenix, AZ. Gen. Tech. Rep. RM-GTR-279, Fort Collins, CO: USDA, Forest Service, Rocky Mountain. Forest and Range Experiment. Station.

Ryan, Sandra. 1997. Morphologic response of subalpine streams to transbasin flow diversion. Journal of the American Water Resources Association, 33(4): 839-854.

Wesche, Thomas. 1991. Flushing flow requirements of mountain stream channels. WWRC-91-18. Final Report submitted to Wyoming Water Research Center, Univ. of Wyoming, Laramie, WY and the Wyoming Water Development Commission, Herschler Bldg., Cheyenne, WY, 195 p.

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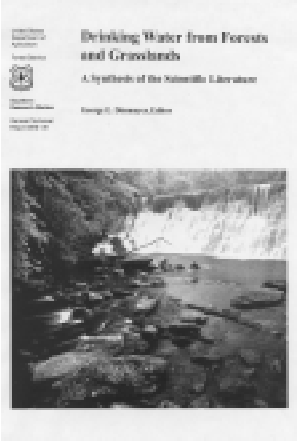
STREAM NOTES

Drinking Water from Forests and Grasslands

A synthesis of the Scientific Literature

George E. Dissmeyer, Editor



This document was written to help managers comply with the Safe Drinking Water Act by providing a review and synthesis of the current scientific literature about the effects of managing these lands on public drinking water sources. Managers of public water supplies and community groups concerned with drinking water may also find this document useful. The report's focus is restricted to potential contamination of source water associated with conventional land uses on public lands. Land uses and contamination sources covered include hydromodifications, urbanization, recreation, roads and other corridors, timber management, forest succession, fire management, pesticides, grazing, wildlife, water birds, fish and aquatic organisms, hardrock and coal mining, and oil and gas development.

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