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Voluntary Approaches to Basinwide Water Management

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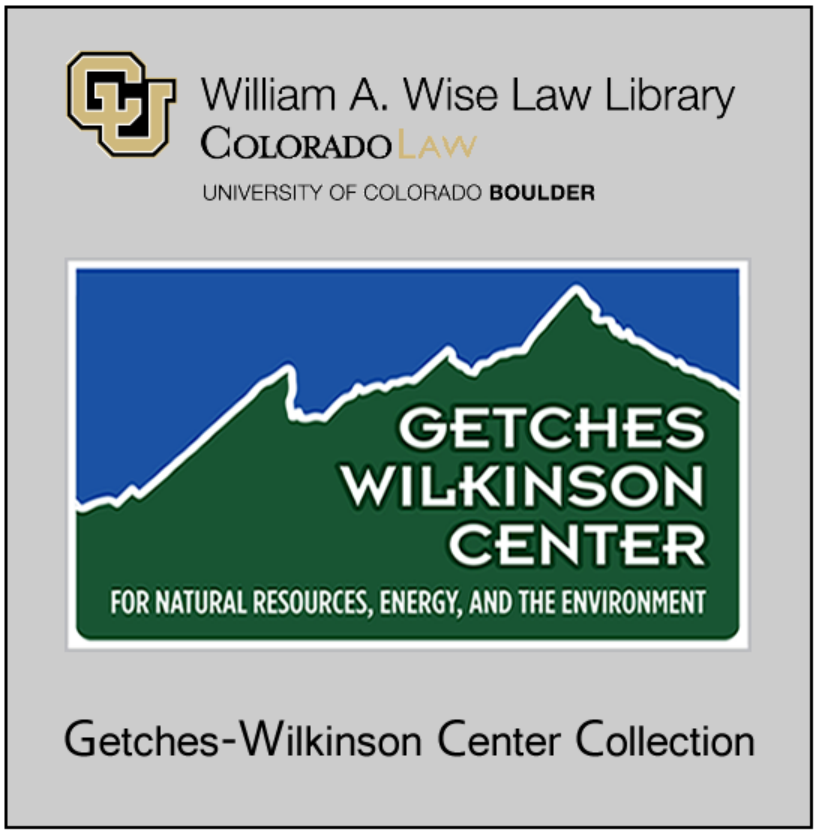

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VOLUNTARY APPROACHES TO BASINWIDE WATER MANAGEMENT

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COLORADO WATER ISSUES AND OPTIONS:
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Need for Voluntary Management

Most of the papers at this conference discuss the need to reform and improve Colorado's procedures for managing water. Some of the issues discussed relate to the following needs: new legal and institutional arrangements, changes to make the system more effective and less costly to the user, making water rights fully transferable, having greater administrative flexibility, developing innovative transfer and exchange plans and helping water users avoid the harsh realities of the prior appropriation doctrine. The purpose of this paper is to discuss one particular approach to meeting these needs, the development of a procedure for voluntary integrated water management on a basinwide basis. The basis for the approach would be to use the capabilities of computers working through new institutions to reduce conflict and increase the benefits to water users.

The ideas generated in this paper came from a research group at Colorado State University called the "South Platte Team." The group generated a draft report for the Colorado Water Resources

Research Institute (1). The ideas contained in the report and in this paper came from this draft report and a series of meetings where members of the team debated concepts that might lead to solutions to the rising conflict and heavy expenses associated with managing water rights in the South Platte Basin. The team was interdisciplinary consisting of several engineers, an economist, a political scientist and an extension specialist. Our discussions with outside groups included attorneys, state, local and water district government administrators, and consulting engineers. We do not claim, however, that our ideas have had a full hearing, since the subject is such a difficult one. If there was consensus on the ideas the reaction in the Legislature might be immediate. There are obstacles to the ideas that follow, but they consititute the best current thinking of an informed group that has given careful attention to the subject of how to improve water management in Colorado to benefit the individual water right owner.

When dealing with a subject as volatile as water rights in Colorado, it is necessary to be specific, and to define terms. By "basinwide" water management we mean that the surface and ground water in a basin is managed by considering its natural hydrologic connectivity so that the impact of diversions at one point is considered at all other points. By "voluntary" management is meant that we seek an approach that water right owners can follow of their own free will, not imposed by the

government. By "management" we do not infer that there is a czar manipulating everything, but that we seek to work together to find ways to increase benefits by joint actions.

The need for changes were seen by the team to lie in the general increase in complexity of water administration in Colorado, resulting in overburdening an administrative system that worked better in a simpler time. The team saw Colorado water law and administration to be in a period of transition where the original appropriation doctrine had to give way to more workable mechanisms that can handle the complexity of today's demands on water. In our report we present a five-stage evolution of water allocation and charging mechanisms. The symptoms that cause the need for change now include the slowness of the water courts, the pressure on the State Engineer to handle so many complex situations, the cost to make any changes in a water right and the general concern that some sort of a state "czar" will emerge to manage the whole situation.

The proposed arrangements are intended to provide an option that will alleviate but not drastically modify the existing situation. Specifically what we propose is the consideration of a voluntary association of water users that has the capability to keep records, study trends, organize exchanges and generally manage water diversions for the benefit of all water users in a basin or subbasin. We recognize that there already exists an informal procedure for doing this through water commissioners and

long-standing personal relationships. The new feature would be that computing and information management would be used to formalize the procedures currently used, and, in effect, new institution(s) would be created.

The Emerging Capabilities of Computer-Aided Management

We cannot fail to notice the increasing importance of information in managing our lives today, and information is of vast importance in managing water as well. As a result, the information explosion is really affecting water management. One obvious addition in Colorado is the satellite data system in use by the State Engineer. There are many other innovations being placed in practice, mostly in the collection and transmission of data from remote sites. Where the opportunity for advancement comes is in what is done with the data after it arrives.

There are three levels of information that are important in this discussion: data, model results, and recommendations based on the study of data and models. This represents a hierarchy of value added in the information and is familiar to water managers since there are so many modelling studies and engineering reports that are in use now. The data is simply how much water is flowing at what point and when. The models would predict the impacts on a distant point of some action such as a diversion or a change in use of water. These models are used increasingly by the government and by consulting engineers, and more sophisticated

ones are under development in the universities. The final level of information should be the most reliable: it is designed to use all other information available to make recommendations to those who have decisions to make. This last level is especially important since the use of models or raw data is not reliable unless the information has been interpreted by experienced professionals.

Computer power is increasing without a doubt, but it is the increasing capabilities and usefulness of the models and data management that creates the new opportunities. If we can be organized to use all the information and model results made available, then decisions should get better and better.

The State Engineer's office has been working on data management for a number of years now, and what I will discuss briefly here is the emerging capabilities of models themselves. Two CSU models were subjected to scrutiny by the South Platte Team: SAMSON and MODSIM. There are other models that can provide similar information, but these two have received considerable recent development and application to Colorado problems. SAMSON is a stream-aquifer model and MODSIM is a network model. Further details follow.

SAMSON is an acronym for stream-aquifer model for management by simulation and optimization. According to its developer, Professor Morel-Seytoux, it is really a system of procedures and

computer programs to make comparative studies of water allocation in a comprehensive river basin (2). The model has one set of components that simulate the behavior of the river managers in making decisions about allocating water and another set of components that predict how the river and basin will behave as a result of the management actions. The stream-aquifer feature means that you could study the effect on surface water flow of pumping a well at a certain point.

MODSIM simulates a hydrologic network of reservoirs, river reaches, canals, aquifers and wells. It has the capability of simulating and optimizing different procedures for managing the hydrologic network under study. MODSIM might be thought of as an overall model to "screen" possibilities for making management improvements in a large area, but it is more than what is called by some modellers a "screening model". It is very versatile and can be applied to situations with or without groundwater components, such as a network of surface sources for an urban water supply.

MODSIM is more general than SAMSON and might be used to simulate a larger network at lower cost to develop ideas for management strategies. It would be most effective for situations where the operating rules for a basin needed to be developed. SAMSON would be more appropriate in a situation where more detail and closer

examinations of existing management policies was needed. More attention has been given in SAMSON to the groundwater simulation component.

Either of the models discussed or others can be used to answer questions about the impact of various management actions, such as exchanges, on downstream water users. The important point would then be, how can the information be used?

How a Voluntary System Might Work for the South Platte Basin

At the present time any change in water management requires complex legal and administrative actions. Certainly there may be informal exchanges that take place within local areas, but to make any kind of major or long term change requires engineering and legal studies as well as administrative and judicial action. This is part of the development of Colorado water law and the way it is administered.

In the strict priority system of water rights administration it is difficult to make changes in point of use or diversion, and any aquisition of new water requires considerable money and, in some cases, political effort. If a small water right owner wants to make a change it may be beyond his means to pay for the engineering and legal studies and the court actions necessary. On the other hand to be guaranteed water the individual needs to own the rights, as long term leasing arrangements or transfers

are not likely without legal action. In addition, there are strong institutions on the river that dominate, such as the Denver Water Department. Some law and engineering firms are very influential and knowledgeable, and there does not exist a ready market to transfer water rights back and forth. The need is for a system for transferring water (but not water rights) to be developed to get around some of these difficulties.

In a given river basin there are a group of water right owners such as farmer, ditch companiess and cities that have a need to work together to get the most out of their water rights. In some cases transfers could be very beneficial if they can be arranged in advance so that the management entity can count on them. The arrangements could be made in advance through a voluntary association of water users with a computer modelling capability at hand. The association could take applications for water transfers at the beginning of a management season, run the models and make the analyses to check for no harm, and then obtain permission for the changes from the State Engineer's office. No plans of augmentation would be involved, only the demonstration to the administrative officials that no harm would be done to downstream water users by the changes involved.

The general principles for such an association would be that the organization would be at the grassroots level, it would protect water rights without great expense to the owners, it would be run by the water right owners themselves, and the process would be informal without legal status and authority.

The association could be made up of local groups or subbasin association which came together into a larger federation. As shown on Figure 1 a process could be developed whereby the local associations met to make proposals for exchanges which were then tested by computer models with decisions and approvals granted before the start of each year. This could result in greater water supplies for individuals with little cost. One benefit could be the assurance that supplies would be on hand to guard against drought.

Figure 1 here

The association could have a staff with the capability to run the models, and always be improving their information and modelling capability. The cost for the initial technical support would not be too large, consisting of the funds to get started with existing models and to employ a capable modeller.

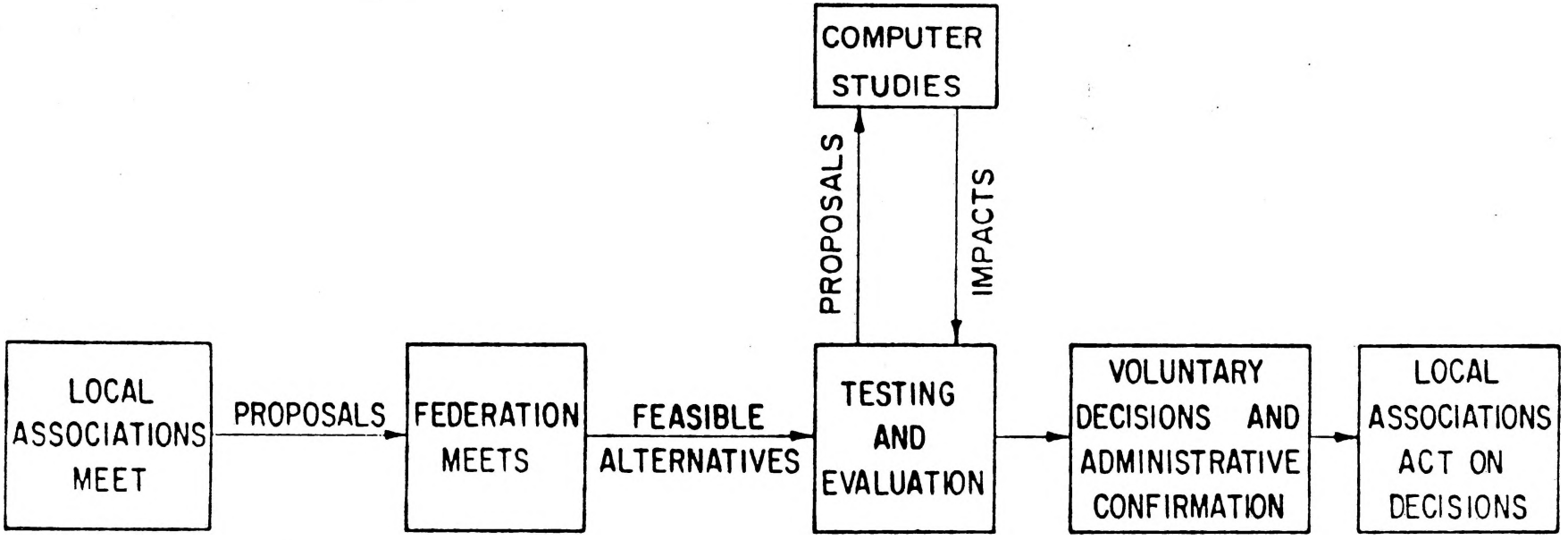

Figure 1. Sequence of Decisionmaking for a "South Platte Federation".

The system would require the sanction of the State Engineer's office. Each local water commissioner would need to participate to make sure the system worked well and was not abused. There would be a number of administrative procedures to develop.

Further Work Needed

The suggestions made above have an emphasis on modelling and information. Frankly, this is because the research team has faith that modern information technologies can provide the support needed to overcome problems in water allocation and administration. We recognize, however, that there are some in the water management business to whom models and computers have not proved their merit. One difficulty that must be overcome is in making the outputs of the models credible to water administrators and water right owners.

Another difficulty is in the inevitable lawsuits that would arise from the actions of the association. Not every water user would choose to join, and there would be suspicions about the work of the association. If this problem became too severe it could nullify the benefit of the procedure unless the economies of scale outweighed the cost of the litigation.

A very real difficulty lies in the fact that the association would represent a new institutional form in an economic arena that already has the players in place, and some would resist the new innovation. It would have to have considerable support to survive.

Finally there is the question of who would take the action to create the association? It could grow out of an existing entity, but it is not clear that it would take additional legislation. Thus the incentive structure must be in place for it to be created.

References

1. South Platte Team, Voluntary Basinwide Water Management: South Platte River Basin Colorado, Colorado Water Resources Research Institute, September 1984, draft.

2. Morel-Seytoux, Hubert, SAMSON, Colorado State University, May 16, 1985.

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