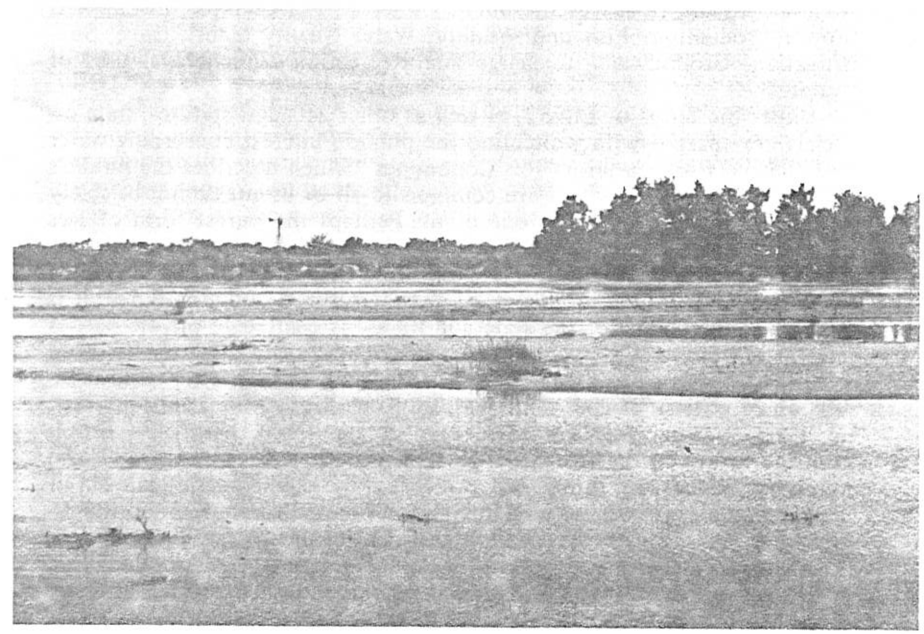
Reprinted from: Prairie/Plains Journal (4) 1982. pp. 26-30.

Instream Flows: The Next Step Toward Protection

by John G. VanDerwalker



Platte River

Bill Whitney

Man has many uses for the water that flows in our streams and rivers. These can be divided into two general categories: out-of-channel use, primarily for domestic, industrial and irrigation purposes, and instream use, for navigation, aesthetics, fisheries, wildlife, recreation, water quality maintenance, groundwater recharge, conveyance and hydropower.

There are two principal and significant differences between these categories of use. Out-of-channel uses generally serve the interests of private individuals or groups of individuals and result in the consumption of large quantities of water.

The instream uses of water are primarily those which are enjoyed by everyone but can never be exclusively acquired by an individual. Consumption of water through instream use is relatively small compared to consumption through out-of-channel use.

In the West, interest in water has focused almost exclusively on out-of-channel use. Until recently, instream uses of water have been given little attention. Some western states, including California, Colorado, Idaho, Montana, Oregon and Washington have taken legislative action to protect their instream flows. Nebraska, however, has no statutes specifically aimed at protecting instream use of water.

There are, in various Nebraska laws and regulations, however, references to the instream flows for the public's interest. For example, LB252 lists Power Production, Fish and Wildlife, Water Quality Maintenance, Sub-irrigation, Groundwater Recharge and Recreation as beneficial uses of water.

Under the terms of LB252, as well as other acts and statutes, state officials are charged with protecting the public's interest concerning water use. Lawyers have a term "Res Communes" which describes the public's interest as those values that are common to all of us but cannot be solely owned or possessed by any one of us. Perhaps the purest form of Res Communes is sunlight and air, but certainly instream use of water fits this description of public values.

It should be noted at this point that water is a public resource; it is owned by the people of the state and its use is granted to private parties insofar as it serves the public interest. State ownership of water has been confirmed by many court decisions. In theory, present state law allows diversion of water if it does not significantly jeopardize the public interest.

If this is true, why has there been no significant affirmative action taken to protect instream values in Nebraska? Is it because the instream values are, in fact, not threatened, or because the public doesn't care about these values? Is it because westerners have focused for so long on the diversion of water that we have simply lost sight of the instream values?

All of the above may be contributing factors, but I believe our failure to understand the dynamics of stream systems and the quantities of water required to maintain particular uses is the primary reason we have not acted.

This lack of quantification of water needs associated with fisheries, recreation, groundwater recharge and all the other uses creates problems for everyone involved. Those who wish to maintain instream uses are forced to fight for all of the present flow because they know what that provides and they don't know what the impact associated with even a minor depletion might be. Those whose needs and interests are served by diversion respond to this assumption by fighting any effort, legislative or otherwise, to protect instream values because they assume all the remaining water in the stream will be kept there if such efforts are successful.

State officials who for decades have routinely approved applications for diversion are in a weak position to deny an application because they have not developed the scientific and engineering data needed to defend such a radical change from the norm.

Until we quantify the water needs associated with instream values in specific areas, the positions discussed above are not likely to change.

Let's examine these conditions. Does the maintenance of instream values require that all the water in a stream or river remain there? This perception of reality is held by both the antagonists and protagonists of instream flows. It is, nevertheless, a myth. Except for the goal of maintaining a "natural condition," all of the individual instream uses of water can be improved by changing either the timing or the quantity of instream flows. In the case of rivers like the Platte, a "natural" condition hasn't existed for decades so this is not a reasonable goal. It is a managed river and it needs to be better managed for instream as well as out-of-stream uses. Another myth is the concept of minimum streamflow, that magic flow, with the emphasis on minimum, that will maintain fish, wildlife, recreation, conveyance, etc. This is a non-existent figure; all instream uses have an extinction point, a minimum flow below which the use no longer exists. Most uses also have a flood point – a maximum flow which extinguishes the use when it is exceeded. Somewhere between these two extremes is the optimum point. As will be seen later, this optimum point for a particular use may vary depending on the time of day or time of year. It should be clear that the maximum, minimum and optimum flows for various instream uses are different. Therefore, when we are managing streamflows, we necessarily make trade-offs, not only between out-of-stream and instream uses but also between the various instream uses.

Figure 1 illustrates some of the points made above. Hypothetical flow requirements for several instream uses are shown. Most of these flow regimes are based on actual data but the differences in such things as stream gradient, sediment sizes and regional ecology makes it impossible to consider these curves as practical flows for any system.

The recreation curve was based on the flows required to support canoe travel for spring, summer and early fall. Waste assimilation or water quality maintenance was based on the level of biological activity during the year and the increased loads expected in spring and summer. Fisheries' flows were based on the need for high spring flows to flood backwater spawning areas, moderate flows in summer to maintain a covered riverbed for maximum food production for young fish and minimum streamflows in the winter for adult maintenance during the period of minimum activity.

The sediment transport curve was based on a high spring flushing flow and a lower year-round flow to maintain an unvegetated active channel. The wildlife curve was based on the needs for migratory birds to use the river for roosting in the fall and early spring and moderate flows in early summer to sub-irrigate the wet meadow ecosystem which provides the food base for the birds.

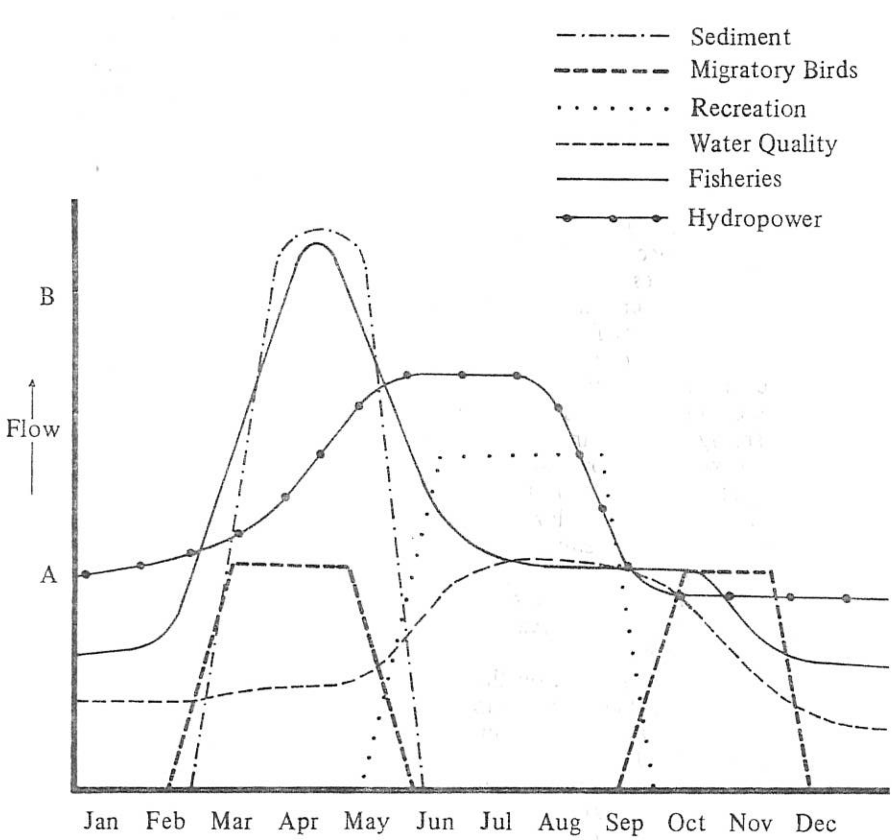
The hydroelectric curve was based on a year-round demand for peaking power six hours each day and a general increase in demand during the summer irrigation and air conditioning season. The conveyance curve was based on the need for diversions downstream from the reach of the river being considered. The groundwater recharge curve was based on the amount of flow required to keep a significant portion of the channel width covered with water.

It should be emphasized at this point that the above criteria are hypothetical criteria and not based on any particular stream reach. For purposes of this discussion, these curves are considered optimum curves for each use.

Theoretically, we can plot an extinction curve and a flood curve for each of these uses. The recreation curve provides a simple example of this concept. If the flow falls to A, the general depth of water falls below two feet, making paddling difficult and 25 percent of the channel is less than 3

Figure 1

Hypothetical Flows for Six Instream Uses of Water



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inches making passage impossible. At this point, canoeing is not recreation. At point B water velocity exceeds 10 feet per second and rips and rapids become impassable for a canoe, thus eliminating this form of recreation. In between these points, canoeing provides varying degrees of recreation.

It is important to recognize that although there are optimum flows for each of these uses, significant benefits accrue from flows that deviate from these optimum figures. Lower flows for recreation may lower the quality

of the experience but recreation is still possible. Lower flows may reduce the quantity of power produced but not affect the more important potential for producing peak load power.

There are also ways to maintain various uses by substituting money and energy for water.

Good examples of these are waste assimilation and fisheries maintenance. There are many point sources of pollution such as feed lots and domestic sewage systems that dump wastes into rivers and streams. Streams can assimilate a given amount of such wastes. Reducing the flow reduces the assimilative capacity of the stream. This reduction in capacity can be offset by waste treatment before delivering the effluent to the stream.

In the case of fishery flows, the high spring flows are required for spawning and hatching the eggs. Once the eggs are hatched, lower flows can support the juvenile and adult fish. If these high flows are to be eliminated, the fishery can be maintained by producing fish up to the juvenile stage in a fish hatchery and then planting them in the river.

There are techniques to mitigate the adverse impacts of reduced stream flows on practically all instream uses. There are, however, physical, biological and economic limits to the application of these techniques.

Webster defines a river as a stream of water of considerable volume. If the public's interest in fish, wildlife, recreation, waste assimilation, groundwater recharge, hydroelectric and other instream uses is to be protected, water must continue to flow in our rivers and streams. How much that is needed to protect these interests must be established. Since these uses are the public's interest, it seems logical that state agencies should be responsible for defining the various instream values for each stream reach and quantifying the flows required to maintain them. With this information available to them, the people of Nebraska will be able to weigh the values of instream versus out-of-stream uses and choose how much of each they wish to have. Without such information the public's interest in instream flows cannot be effectively protected.

John VanDerwalker is Executive Director of the Platte River Whooping Crane Habitat Maintenance Trust in Grand Island, Nebraska. See also his "Water Allocation: Why are we Failing?" in *Prairie/Plains Journal* No. 3 (Winter-Spring, 1982), pp. 18-20.