

## New Water Right Accounting Procedure

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**Abstract.** Water is valuable in Idaho. After the extremely dry year of 1977, Robert Sutter used FORTRAN to develop his water right accounting program and run on main frame computer VAX to replace simplified hand calculation methods forty years. The natural (unregulated) flow is computed and storage water supplies are figured out after streamflow, reservoir and canal data are transmitted daily to Idaho Department of Water Resources state office from remote gage sites and regional terminals. Since then, a limited amount of water supply of multiple reservoir river systems, Upper Snake River, Boise River and Payette River in Idaho, is managed efficiently. Natural flow is delivered legally among users and various uses based on established water rights under the western prior appropriation doctrine, i.e. “first in time is first in right.” Water users need to pay USBR with reservoir space contracts for their storage water or pay storage water sellers for their bought storage water. Storage water is allocated and monitored daily to better manage reservoir storage water to meet the demand during an irrigation season.

The key of the accounting procedure is to account for and distribute natural flow and storage water. First the whole river system is divided into some reaches. Sutter has used the following formula to calculate the water gained in each reach:  $\text{Reach gain} = \text{reach outflow} - \text{reach inflow} + \text{sum of reach diversions in the reach} + \text{reservoir change in storage} + \text{reservoir evaporation}$ . Then he has summed these gains accumulated in downstream order from the headwaters to the end of each reach to make natural flow available to distribute according to water right priorities. Finally, he identified and delivered the amounts of natural flow and stored water. The sum of diverted stored water is made to help manage the reservoir stored water to meet water demand for the whole irrigation season. The actual diversion rate is the sum of natural flow rate and storage flow rate. The new procedure is presented here to achieve the same goal of water right accounting. Instead of calculation of natural flow, the diversion of storage water is figured out first. The sum of diverted storage water should be equal to the amount of storage water released from the system of reservoirs. After the storage flow is known, the difference between actual diversion rate and storage flow rate is natural flow rate. The simplified accounting example used in Sutter’s paper is adopted to show how the new procedure works. The new procedure is more accurate.

The advantage of this new procedure can be seen especially when several “special cases” in water distribution and water rights unique to the systems of Upper Snake River and Payette River required to incorporate modifications and additions to the general program. It is known that surface water and ground water is hydrologically connected. The new procedure is suitable to the water right accounting with the involvement of groundwater.