

WATER DELIVERY ACCOUNTING
BOISE RIVER
WD-63

The purpose of this paper is to provide background information for a discussion of procedures to be used in the accounting of water deliveries on the Boise River, WD-63. The accounting process is similar to that used in WD-1, but certain unique features of Boise River require modifications from it. The accounting program was used by WD-63 during the irrigation season of 1986. Adoption of methods for computing storage accrual during the winter season is the principal subject of this paper, but other items regarding data requirements and use are also presented.

Irrigation Rights

Boise River diversion rights are contained in the Stewart and Bryan decrees and are listed in the annual reports of WD-63. These rights involve a "sliding scale" which involve successive reductions in all rights to 75 percent, then 65 percent of decreed amounts before any user is shut off. The irrigation season is not defined in the decrees but the Department's interpretation that the season is April 1 through October 31 has generally been followed. Canals in the lower valley frequently exceed their natural flow rights.

Storage Rights

In order of priority, the water rights for storage in Arrowrock, Anderson Ranch, Lucky Peak and for diversion to Lake Lowell are as follows:

<u>Priority</u>	<u>Rate (cfs)</u>	<u>Volume (acre-feet)</u>	<u>Remarks</u> ^{1/}
14 December 1903	1,354.58	--	New York Canal (BD)
13 January 1911	8,000.00	--	Arrowrock (BD)
25 June 1938	--	15,000	Arrowrock (L)
9 December 1940	--	493,161	Anderson (L)
12 April 1963	--	307,000	Lucky Peak (P)

^{1/} BD - Bryan Decree; L - License; P - Permit. All of these rights are held by the Bureau of Reclamation for the Department of the Interior.

The New York Canal right of 1,354.58 cfs is an irrigation right which can also be used to store water in Lake Lowell Reservoir during the non-irrigation season.

Arrowrock Reservoir is filled according to two rights, one for 8,000 cfs for a physical capacity of 275,000 acre-feet and another for 15,000 acre-feet with no limit on the diversion rate. However, because of siltation, the current total physical capacity is 286,600 acre-feet.

Anderson Ranch Reservoir is filled by a right for 493,161 acre-feet with no limit on diversion rate. This right is limited by dead storage of 28,980 acre-feet plus normally inactive

storage of 40,981 acre-feet to 423,200 acre-feet active space.

Lucky Peak Reservoir is filled by a right for 307,000 acre-feet, also having no limit on diversion rate. The right is limited by normally inactive storage of 28,800 acre-feet to 278,200 acre-feet of space. The Lucky Peak right is at permit stage with licensing pending.

The above-described reservoir rights are the primary diversion rights in effect during the non-irrigation season (1 November to 1 April). Prior to and subsequent to these dates when natural flow is sufficient to meet some or all of these rights, the storage rights are considered equal in stature to all other rights subject to priority date and other conditions imposed by state water law. To provide for efficiency and flexibility in reservoir operations, storage under these rights can physically occur in any of the three reservoirs without regard to the reservoir specified in the right as long as the capability of any other right to be exercised remains unaffected.

The volume stored per annum, beginning on 1 November of each year, cannot exceed the volume specified by the water right or the physical capacity of the reservoir unless all subsequent rights have been met. The volume stored (including unused storage from a previous year) cannot, on any given day, exceed the specified or physical volume of the reservoir. Previously unused storage (carryover) which is released during the non-

irrigation season for a specified beneficial use can be replaced within the constraints of the right(s) governing that space.

Accounting Procedures

This section is a summary of procedures that were used in 1986 or that are planned to be in place for 1987.

Data are collected and entered into the system in two ways. Daily river and reservoir data are all compiled in the USBR HYDROMET system and these will be transferred to the IDWR VAX. Diversion data are taken by the watermaster, who enters them into the VAX via his terminal. The watermaster operates stage recorders on _____ canals and the remainder have staff gages. Diversions are visited weekly, measured, staff gages are read and charts picked up from the recorders. The watermaster computes mean daily flows from the recorder charts. The non-recording sites are assumed to vary linearly between visits.

Both the HYDROMET data and watermaster-collected data generally use the most recent rating shifts. No attempt is made to later adjust the flows for transitions between shifts.

The 1987 accounting year will begin with a determination of carryover from 1986. Carryover determination will be in accordance with prior practice. Unused prior year storage is assigned as carryover in the following sequence: Lucky Peak,

Anderson Ranch, Arrowrock, because use is charged in the reverse order.

The accounting process determines natural flows at each reservoir and at seven valley locations. Accrual occurs by assigning the natural flows at each reservoir in order of the respective priorities. During periods of Boise Project diversions, accrual to the reservoirs is reduced because of the earlier right of the New York Canal. After April 1, irrigation diversions which have generally earlier priorities than the reservoirs, begin to affect accrual. Accrual ceases when the reservoir rights are all filled or when the natural flows are all credited to earlier irrigation rights. Allocation of the storage is then made to the respective space holders. For each reservoir, the canal accounts are set as their previous year's carryover plus their proportion of the reservoir's computed accrual. (Arrowrock carryover is redistributed ^{at the end of} each year.)

Flood control releases occur in more than seventy percent of all years. These do not affect accrual. Accrual continues in accordance with the rights in effect, but the released water is water that was stored earlier. Actual storage may continue to occur after the storage rights are all filled "on paper" as a result of the flood control releases. The second fill, called "unaccounted for storage," may, but usually does not, result in a total system fill. Any such fill deficit is assigned first to the top 73,900 acre feet in Lucky Peak, and if greater, propor-

tionally among the Lucky Peak irrigation users (111,950 ac ft), Idaho Fish and Game use (50,000 ac ft) and the remaining non-contracted space (42,350 ac ft). If the deficit were greater than the Lucky Peak capacity, the remainder would be proportionally shared by the Anderson Ranch contractors.

During the irrigation season as natural flows decline to such level that not all rights can be fully satisfied, the canal rights are progressively adjusted to 75 percent, then 60 percent in accordance with the sliding scale. If there were unsatisfied reservoir rights, they would be cut to zero if necessary to prevent sliding scale cuts to irrigation users.

Stored water use will be charged whenever a diversion exceeds the right it is entitled to exercise at that time. This includes any diversion in excess of its total rights when all rights are good, or excesses above the applicable sliding scale rights. If flood control releases occur after these stored water charges, the stored water use account will be returned to zero.

In determining natural flows at the reservoirs, evaporation will be added back, because under natural conditions, this loss would ^{not} occur. At the end of the irrigation season, the storage accounts must therefore also be adjusted for this loss.

Implications of Accounting Changes

Probably the most significant effect of the accounting change results from computation and allocation of natural flow at each reservoir. The former method allocated the total physical fill based upon the overall right sequence: Arrowrock, Anderson Ranch and Lucky Peak. This had the effect of crediting natural flow upstream. Mores Creek water was moved to Arrowrock and Anderson until they filled. After Arrowrock filled, gain below Anderson Ranch was moved into Anderson until it filled.

The new method will always result in some accrual to Lucky Peak because of its location. Following is a comparison of accounting effects on accrual using 1973 and 1977 data.

	Allocation (1000 AC FT)			
	1973		1977*	
	<u>Former</u>	<u>New</u>	<u>Former</u>	<u>New</u>
Anderson Ranch	420.6	389.7	219.0	219.0
Arrowrock	286.6	286.6	263.7	226.5
Lucky Peak	211.1	249.2	182.0	214.0

* 1977 allocation was changed due to adjustments between Lake Lowell and Arrowrock. Such adjustments were not made in other years and are not reproducible.

In most other recent years, the system approximately filled and only minor differences would result.

With the exception of 1977, Lake Lowell's storage condition has had no direct effect on accrual in the main river reservoirs.

Lake Lowell was, and will continue to be, independent of the river.

When New York Canal diversions in winter exceed the natural flow or exceed the winter diversion right (1354.58 cfs), the excess is stored water. It will be deducted from the Boise Project carryover from the previous year, and these storage withdrawals can be refilled in the period ending 31 March. Storage diversions after 31 March cannot be credited with refill because they must be treated like the other irrigation diversions. The watermaster will limit New York Canal storage diversion to the volume of prior year carryover.

Similarly, releases of fish flow water from the Idaho Fish and Game Department space and/or the USBR uncontracted space will be taken from carryover in these accounts. They, too, can refill this space in the period ending 31 March. If any releases of this type occur after 31 March, the space used after that date will not be refillable.

Inclusion of evaporation in the natural flow computation will cause an increase in natural flow, and a consequent decrease in stored water use. This will be balanced by adjusting the reservoir accounts downward, but the gainers and losers will, to some extent, be different canals. Although no comparisons have been made it is believed that impacts would be minor.

Computation of gains below Lucky Peak will result in less stored water use because of the increase in natural flow available.

When conditions are such that no natural flow need be passed at Middleton and/or Caldwell, flows of ____ cfs and ____ cfs at these locations will be designated as "operational flow" to prevent stored water from passing these points. Below these locations, the operational flow will revert to natural flow.

Stored water use can occur before peak storage is reached for the three main river reservoirs. The result will be slightly greater fill and more storage use in some years.

Possible Other Future Changes

The following items will not be addressed in 1987 accounting but may require work in the future.

(1) If it is determined that use of real time data results in substantial error, it may be appropriate to make revisions at the end of the season and run a revised final accounting.

(2) Because of its interchange with Indian Creek, there is an apparent need to gage the Riverside Canal above that stream.

(3) Consideration should be given to incorporating travel

time in the process of determining natural flow.

(4) A method should be devised for estimating river diversion by the Boise Water Corporation Ranney collectors and other non-agricultural diversions.