



## State of Idaho

# DEPARTMENT OF WATER RESOURCES

322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098

Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: [www.idwr.idaho.gov](http://www.idwr.idaho.gov)

C.L. "BUTCH" OTTER  
Governor

GARY SPACKMAN  
Director

### MEMO

#### Magic Reservoir Water Supply

To: Tim Luke  
From: David Hoekema

Date: July 10, 2013

#### Introduction—Camas Creek and Big Wood River

Magic Reservoir receives surface water inflow mainly from Camas Creek and the Big Wood River. Camas Creek flows eastward down the Camas Valley into Magic Reservoir which is located at the valley outlet. The only major surface water storage reservoir in Camas Valley is the 19,280 acre-foot Mormon Reservoir owned by the Twin Lakes Reservoir & Irrigation Company. The Twin Lakes Dam was built in 1908<sup>1</sup>. The Twin Lakes Reservoir & Irrigation Company stores water from McKinney Creek and provides irrigation to 6,463 acres along Camas Creek in the southeastern side of the valley.

A USGS report (Young, 1982)<sup>2</sup> also indicates that there are two aquifer systems in the Camas Valley. An aquifer composed of valley fill deposits is located at the center of the valley, and an aquifer composed of basalt from the Bruneau Formation is located at the western end of the basin near Magic Reservoir. The deeper artesian system receives an average annual recharge of 37,000 acre-feet (Young, 1982) and was estimated to provide 20,000 acre-feet (Walton, 1962)<sup>3</sup> of percolation or upward leakage to the overlying unconfined aquifer. Young (1982) estimated that 7,500 acre-feet (ac-ft) of base flow is provided to Magic Reservoir annually due to upward leakage from the artesian aquifer. He also noted that Camas Creek drains the basalt aquifer on the western side of the valley before the creek enters the reservoir.

The upward leakage from the artesian aquifer that percolates into the shallow unconfined aquifer is used by farmers to sub-irrigate a hay crop that was estimated at 82,490 acres in 2012 (NASS, 2013)<sup>4</sup>. Other major crops in 2012 include barley (12,070 acres), spring wheat (2,690 acres), and oats (600 acres). Deep wells tapping the artesian aquifer also provide water for irrigation. In the extremely dry year of 1977, Young (1982) estimated that 9,500 acre-ft were pumped from the aquifers. The IDWR water rights database indicates that groundwater can provide irrigation to about 13,500 acres. Assuming that mature crops can make use of the sub-irrigation provided by the underlying unconfined aquifer, it may be that groundwater irrigation is a supplemental supply. As was done by Young (1982), power usage by pumps could be used to determine pumping rates in the basin for an updated analysis of aquifer withdrawals. The Big Wood River enters Magic Reservoir from the east, after crossing the Bellevue fan. Water is diverted from the Big Wood River as it crosses the Bellevue fan to irrigate about 25,000 to 26,000 acres of land. Much of the irrigated land appears to rely on

<sup>1</sup> Downloaded from: [http://en.wikipedia.org/wiki/List\\_of\\_dams\\_and\\_reservoirs\\_in\\_Idaho](http://en.wikipedia.org/wiki/List_of_dams_and_reservoirs_in_Idaho), on 4/5/2013.

<sup>2</sup> H.W. Young (1982?). Water Resources of the Camas Prairie, South-Central Idaho, USGS Water-Resources Investigation 78-82 Open-file Report.

<sup>3</sup> W. C. Walton (1962). Ground-water resources of the Camas Prairie, Camas and Elmore Counties, Idaho: U.S. Geological Survey Water-Supply Paper 1609.

<sup>4</sup> (NASS, 2013) Data was extracted from GIS data provided by the United States Department of Agriculture's National Agricultural Statistics Service: <http://nassgeodata.gmu.edu/CropScape/>.

supplemental groundwater pumping in addition to the diversions from the Big Wood River. Groundwater recharge from these diversions enhances the spring fed streams of Willow Creek and Silver Creek. Willow Creek flows back to the Big Wood River, while Silver Creek flows to the Little Wood River. Groundwater recharge flowing out the Silver Creek drainage bypasses Magic Reservoir.

### Gage History and Record

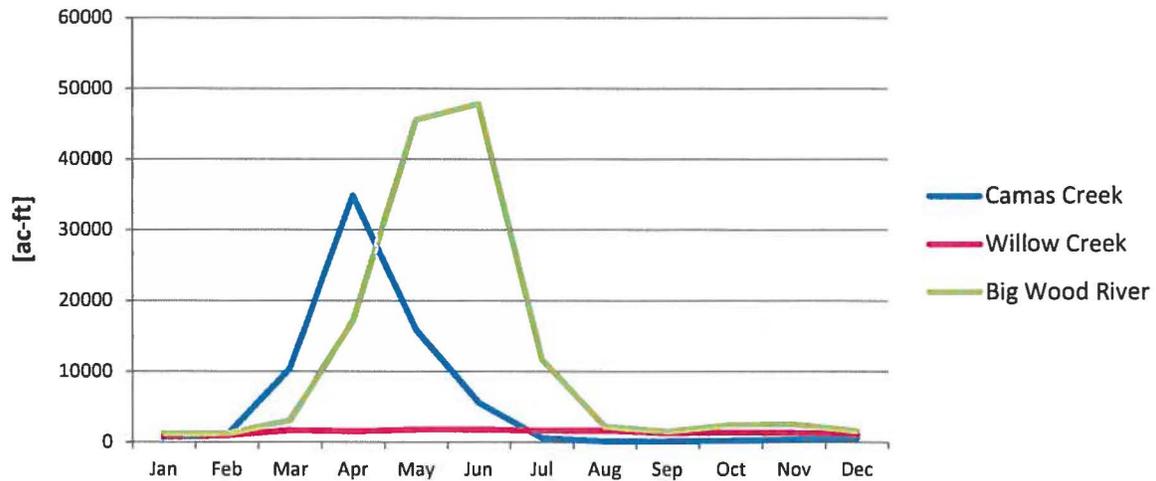
Four gages have been maintained by which surface water supply to the Magic Reservoir may be estimated: the Stanton Crossing gage on the Big Wood River (#13140800, full annual record available from 1997-2012, located 2.8 miles upstream of Magic Reservoir), the Big Wood River near Bellevue (#13141000, full annual record available from 1944-1995, located 1.5 miles above Magic Reservoir), the Willow Creek gage (#13140900, full annual record 2001-2006 and 2008-2012, located 0.6 miles upstream of the creek’s mouth on the Big Wood River), and the Camas Creek gage (#13141500, full annual record from 1945-2012, located 2.6 miles upstream of Magic Reservoir). When the Big Wood River gage near Bellevue was moved upstream 1.3 miles to its current location at Stanton Crossing the USGS did not include an overlapping measurement period by which the gages could be correlated. The new site was located above Willow Creek, while the old site included flow from Willow Creek. Idaho Power Company has maintained the gage at Willow Creek since 2000.

Table 1 shows the total acre-feet and percent contribution of the surface water supply entering Magic Reservoir from Camas Creek, Willow Creek, and the Big Wood River from 2001 to 2012. Figure 1 shows the average monthly volume of water contributed from the three surface water sources included in Figure 1. Table 2 provides a record of the decadal average contribution of the Big Wood and Camas Creek basins for the 1950s, 1960s, 1970s, and 1980. The 1990s are not included in Table 2 because of the gage relocation on the Big Wood. It should be noted that the contribution of runoff to Magic Reservoir is based on a *two-fill system*. The first fill comes from Camas Creek where peak runoff typically occurs in April, while the second fill comes from the Big Wood River which peaks in May or June. A mass balance performed to calculate reach gains in the Magic Reservoir indicates that on average from 1950 to 1989 the reservoir gained an additional 22,000 ac-ft per year from ungaged sources. The average annual ungaged contribution from 2002-2012 was 32,000 ac-ft. A different set of gages was used for calculating reach gains in these two periods, which might explain part of the discrepancy in values.

**Table 1.** Average volume (ac-ft) and percent contribution of water supply to Magic Reservoir

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Camas Creek	16882	50323	36085	30049	53020	223189	27812	54140	59596	49031	129663	115907	70475
Willow Creek	11828	12363	12465	13272	14285	17891	24650	12448	15242	17950	23417	18901	16226
Big Wood River	30486	72018	141006	48389	143758	400046	41439	100539	163732	118344	226877	174158	138399
Camas Creek	29%	37%	19%	33%	25%	35%	30%	32%	25%	26%	34%	38%	31%
Willow Creek	20%	9%	7%	14%	7%	3%	26%	7%	6%	10%	6%	6%	7%
Big Wood River	51%	53%	74%	53%	68%	62%	44%	60%	69%	64%	60%	56%	61%

### Average Monthly Flow Contribution to Magic Reservoir 2001-2012



**Figure 1.** The average monthly flow contribution of Camas Creek, Willow Creek, and the Big Wood River during the period from 2001-2012

**Table 2.** Decadal comparison of the contribution in acre-feet of the Big Wood and Camas basins to fill in Magic Reservoir from the 1950s, 1960s, 1970s, and 1980s

	1950s		1960s		1970s		1980s	
	Camas Creek	Big Wood						
Jan	1831	4763	2681	4517	1713	4584	1665	4970
Feb	3166	4179	9837	4595	2843	4665	3923	5067
Mar	12324	5857	10044	6301	23893	9494	24658	10373
Apr	81707	28235	60247	28774	62236	22228	63353	30027
May	34269	69677	21840	51657	31610	55538	32833	67786
Jun	10003	61145	10716	65311	9766	67356	12396	76427
Jul	1698	21308	2050	25378	2312	27568	2588	30228
Aug	449	6825	475	7552	426	6574	510	8675
Sep	362	5274	444	6381	418	5921	492	7836
Oct	574	6056	683	6169	759	6793	974	7874
Nov	943	6318	1059	6320	1495	7110	1607	7945
Dec	1846	6104	3797	5775	1668	5542	1548	5905
<b>Total</b>	<b>149173</b>	<b>225740</b>	<b>123872</b>	<b>218730</b>	<b>139139</b>	<b>223374</b>	<b>146547</b>	<b>263114</b>
<b>Percent</b>	<b>40%</b>	<b>60%</b>	<b>36%</b>	<b>64%</b>	<b>38%</b>	<b>62%</b>	<b>36%</b>	<b>64%</b>

\*\* Willow Creek is included in the Big Wood flows described above.