

Change in Stream Flow Tables - Modeled Impacts<sup>1</sup>

For September, 2007

To monitor the impact of new ground water permits and mitigation on scenic waterway flows and instream water right flows, the Department developed a streamflow monitoring model using historic streamflow data. The streamflow model was constructed using a base period of flows from 1966 to 1995 at selected gaging stations around the basin. This base period represents river flows during a period of time after all of the dams were constructed and before the Scenic Waterway Act was amended to include consideration of ground water impacts.

The model considers the effects of new permitted ground water use and mitigation projects on streamflows. The following tables show the monthly model results through mid-2007 for all gaging station sites most closely representing each zone of impact and areas of special interest. With only one exception, instream requirements are met or improved compared to base line conditions when averaged annually. Based on modeled results, streamflow overall has improved by as much as 27 cfs in some areas due to mitigation.

This document includes tables for the following locations:

Deschutes River at the Mouth – Station #14103000  
Deschutes River below Pelton Dam – Station #14092500  
Metolius River at Lake Billy Chinook – Station #14091500  
Deschutes River downstream of Bend – Station #14070500  
Deschutes River upstream of Bend – Station #14070500 + four canals  
Little Deschutes River at mouth – Station #14063000  
Deschutes River below Fall River – Station #14056500 and 14057500  
Deschutes River below Wickiup Dam – Station #14056500

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<sup>1</sup> R.M. Cooper, Assessing the Impact of Mitigation on Stream Flow in the Deschutes Basin. Draft not yet available. Peer review scheduled in 2008.

## Deschutes River at Mouth Gaging Station 14103000

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	93.2	93.1	-0.11	-0.12
February	90.8	90.4	-0.35	-0.39
March	95.3	95.1	-0.22	-0.23
April	99.9	99.8	-0.11	-0.11
May	99.1	99.1	0.00	0.00
June	98.0	98.7	0.67	0.68
July	91.0	92.0	1.08	1.17
August	100	100	0.00	0.00
September	98.1	98.1	0.00	0.00
October	97.4	97.3	-0.11	-0.11
November	99.9	99.9	0.00	0.00
December	91.7	91.1	-0.64	-0.71
Annual	96.2	96.2	0.02	0.02

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	6910	6900	-17.4	-0.25
February	7080	7060	-17.4	-0.25
March	7250	7230	-17.3	-0.24
April	6640	6630	-4.63	-0.07
May	5800	5820	16.6	0.28
June	5200	5220	24.6	0.47
July	4590	4610	23.3	0.50
August	4380	4400	22.6	0.51
September	4430	4450	16.9	0.38
October	4710	4710	0.29	0.01
November	5390	5380	-17.4	-0.32
December	6190	6170	-17.4	-0.28
Annual	5710	5710	1.17	0.02

\*Stream flows have been rounded to three significant figures.

## Deschutes River below Pelton Dam Gaging Station 14092500

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	64.7	64.1	-0.64	-1.01
February	63.0	62.2	-0.83	-1.33
March	67.8	66.9	-0.97	-1.45
April	71.4	71.3	-0.11	-0.16
May	58.8	62.9	4.09	6.50
June	55.6	59.1	3.56	6.02
July	41.0	42.7	1.72	4.03
August	98.2	99.0	0.86	0.87
September	66.8	67.6	0.78	1.15
October	81.1	80.3	-0.75	-0.94
November	97.2	97.2	0.00	0.00
December	66.1	65.5	-0.64	-0.99
Annual	69.3	69.9	0.59	0.85

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	5240	5230	-17.4	-0.33
February	5190	5180	-17.4	-0.34
March	5520	5500	-17.3	-0.31
April	5130	5130	-4.63	-0.09
May	4420	4440	16.6	0.37
June	4230	4250	24.6	0.58
July	4020	4040	23.3	0.58
August	3940	3960	22.6	0.57
September	3980	3990	16.9	0.42
October	4190	4190	0.290	0.01
November	4680	4670	-17.4	-0.37
December	5030	5010	-17.4	-0.35
Annual	4630	4630	1.17	0.03

\*Stream flows have been rounded to three significant figures.

## Metolius River at Lake Billy Chinook

### Gaging Station 14091500

#### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	97.7	97.7	0.00	0.00
February	99.2	99.2	0.00	0.00
March	99.8	99.8	0.00	0.00
April	100	100	0.00	0.00
May	100	100	0.00	0.00
June	100	100	0.00	0.00
July	100	100	0.00	0.00
August	100	100	0.00	0.00
September	100	100	0.00	0.00
October	100	100	0.00	0.00
November	100	100	0.00	0.00
December	100	100	0.00	0.00
Annual	99.7	99.7	0.00	0.00

#### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	1510	1510	0.00	0.00
February	1560	1560	0.00	0.00
March	1560	1560	0.00	0.00
April	1520	1520	0.00	0.00
May	1560	1560	0.00	0.00
June	1590	1590	0.00	0.00
July	1490	1490	0.00	0.00
August	1400	1400	0.00	0.00
September	1350	1350	0.00	0.00
October	1330	1330	0.00	0.00
November	1370	1370	0.00	0.00
December	1450	1450	0.00	0.00
Annual	1470	1470	0.00	0.00

\*Stream flows have been rounded to three significant figures.

## Deschutes River Downstream of Bend Gaging Station 14070500

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	60.5	58.7	-1.83	-3.11
February	63.8	62.1	-1.65	-2.66
March	68.3	67.7	-0.54	-0.79
April	23.6	23.8	0.22	0.94
May	1.29	1.40	0.11	7.69
June	2.11	3.11	1.00	32.1
July	0.11	0.54	0.43	80.0
August	0.86	1.40	0.54	38.5
September	3.67	4.11	0.44	10.8
October	13.0	13.5	0.54	3.97
November	52.2	50.4	-1.78	-3.52
December	56.3	54.5	-1.83	-3.35
Annual	28.6	28.3	-0.36	-1.26

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	683	679	-4.03	-0.59
February	705	701	-4.03	-0.57
March	714	710	-4.03	-0.57
April	299	306	7.32	2.39
May	51.2	83.1	31.9	38.4
June	50.5	88.9	38.4	43.2
July	42.6	80.9	38.4	47.4
August	46.2	84.4	38.2	45.3
September	61.0	93.5	32.5	34.8
October	222	236	14.2	6.01
November	551	547	-4.03	-0.74
December	614	610	-4.03	-0.66
Annual	335	350	15.2	4.33

\*Stream flows have been rounded to three significant figures.

## Deschutes River Upstream of Bend

### Gaging Station 14070500 + 4 Canals\*

#### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	37.3	37.3	0.00	0.00
February	40.0	40.0	0.00	0.00
March	24.8	24.8	0.00	0.00
April	33.3	33.7	0.33	0.99
May	6.45	8.92	2.47	27.7
June	17.7	24.3	6.67	27.4
July	27.1	35.2	8.06	22.9
August	4.95	12.0	7.10	58.9
September	1.78	3.78	2.00	52.9
October	15.2	16.3	1.18	7.24
November	29.0	29.0	0.00	0.00
December	35.7	35.7	0.00	0.00
Annual	22.7	25.0	2.34	9.34

#### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow**	Mitigated Stream Flow**	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	712	712	-0.118	-0.02
February	738	738	-0.118	-0.02
March	781	780	-0.118	-0.02
April	877	885	8.37	0.95
May	1180	1230	54.5	4.42
June	1360	1420	61.0	4.30
July	1440	1500	61.0	4.08
August	1290	1350	60.9	4.51
September	1090	1150	55.5	4.85
October	721	746	24.8	3.33
November	590	590	-0.118	-0.02
December	650	650	-0.118	-0.02
Annual	953	980	27.3	2.78

\* The four canals are the DCMID (14068500), the North Unit Main (14069000), the North (14069500), and the Swalley (14070000).

\*\*Stream flows have been rounded to three significant figures.

## Little Deschutes River at mouth Gaging Station 14063000

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	22.9	22.9	0.00	0.00
February	37.3	37.3	0.00	0.00
March	27.4	27.4	0.00	0.00
April	45.2	45.2	0.00	0.00
May	55.9	57.3	1.40	2.44
June	56.6	67.9	11.3	16.7
July	85.1	98	12.9	13.2
August	93.9	96.1	2.26	2.35
September	72	79.7	7.67	9.62
October	11.6	18.5	6.88	37.2
November	14.7	14.7	0.00	0.00
December	20.3	20.3	0.00	0.00
Annual	45.3	48.8	3.55	7.27

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	162	162	-0.038	-0.02
February	183	183	-0.038	-0.02
March	219	219	-0.038	-0.02
April	262	262	-0.038	-0.01
May	329	334	4.89	1.46
June	298	323	25.3	7.82
July	230	256	25.3	9.90
August	200	222	21.8	9.85
September	144	162	18.6	11.5
October	76.7	85.4	8.69	10.2
November	108	108	-0.038	-0.04
December	142	142	-0.038	-0.03
Annual	196	205	8.74	4.26

\*Stream flows have been rounded to three significant figures.

## Deschutes River below Fall River Gaging Stations 14056500 + 14057500

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	29.7	29.7	0.00	0.00
February	30.1	30.1	0.00	0.00
March	33.5	33.5	0.00	0.00
April	68.4	68.4	0.00	0.00
May	97.8	97.8	0.00	0.00
June	98.8	98.8	0.00	0.00
July	100	100	0.00	0.00
August	100	100	0.00	0.00
September	99.8	99.8	0.00	0.00
October	56.8	56.8	0.00	0.00
November	20.9	20.9	0.00	0.00
December	24.7	24.7	0.00	0.00
Annual	63.5	63.5	0.00	0.00

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	329	329	0.00	0.00
February	331	331	0.00	0.00
March	319	319	0.00	0.00
April	654	654	0.00	0.00
May	1220	1220	0.00	0.00
June	1500	1500	0.00	0.00
July	1690	1690	0.00	0.00
August	1530	1530	0.00	0.00
September	1260	1260	0.00	0.00
October	561	561	0.00	0.00
November	246	246	0.00	0.00
December	280	280	0.00	0.00
Annual	829	829	0.00	0.00

\*Stream flows have been rounded to three significant figures.



## Deschutes River below Wickiup Dam Gaging Station 14056500

### Change In Percent Of Time Instream Requirements Are Met As A Result Of Mitigated Groundwater Use

Month	Base Line Percentage	Mitigated Percentage	Change in Percentage	Percent Change
	%	%	%	%
January	26.0	26.0	0.00	0.00
February	27.6	27.6	0.00	0.00
March	22.8	22.8	0.00	0.00
April	57.3	57.3	0.00	0.00
May	95.9	95.9	0.00	0.00
June	98.2	98.2	0.00	0.00
July	99.8	99.8	0.00	0.00
August	100	100	0.00	0.00
September	99.2	99.2	0.00	0.00
October	47.0	47.0	0.00	0.00
November	10.1	10.1	0.00	0.00
December	18.6	18.6	0.00	0.00
Annual	58.7	58.7	0.00	0.00

### Change In Mean Stream Flow As A Result Of Mitigated Groundwater Use

Month	Base Line Stream Flow*	Mitigated Stream Flow*	Change in Stream Flow	Percent Change
	cfs	cfs	cfs	%
January	201	201	0.00	0.00
February	204	204	0.00	0.00
March	189	189	0.00	0.00
April	518	518	0.00	0.00
May	1080	1080	0.00	0.00
June	1360	1360	0.00	0.00
July	1550	1550	0.00	0.00
August	1400	1400	0.00	0.00
September	1130	1130	0.00	0.00
October	428	428	0.00	0.00
November	115	115	0.00	0.00
December	151	151	0.00	0.00
Annual	696	696	0.00	0.00

\*Stream flows have been rounded to three significant figures.