

**Deschutes Basin
HABITAT CONSERVATION PLAN**

STUDY REPORT

**Study 13 – Phase 2: Estimation of
Unregulated Flows in the Lower
Crooked River Basin for Application to
the DBHCP**

Prepared for:

**Deschutes Basin Board of Control, and
City of Prineville, Oregon**

Prepared by:

**R2 Resource Consultants, Inc.
And
Biota Pacific Environmental Sciences, Inc.**

June 2014

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List of Acronyms, Symbols and Abbreviations

Acronym, Symbol, Abbreviation	Definition
@	At
Ac-Ft	Acre-feet
AID	Arnold Irrigation District
Alt	Alternative
App.	Appendix/Appendices
Approx.	Approximate
AV	Approach Velocity (fps)
Bdg	Bridge
BFW	Bank Full Width
BiOP	Biological Opinion
BLM	United States Bureau of Land Management
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BPA	Bonneville Power Administration
°C	Degrees Celsius
CCI	Construction Cost Index
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm	Centimeter
COCO	Central Oregon Cities Organization
COIC	Central Oregon Intergovernmental Council
COID	Central Oregon Irrigation District
Cr	Creek
CRK	Crooked River
CREP	Conservation Reserve Enhancement Program
CRSO	Crooked River at Smith Rocks; Hydromet Gauge #14087300 code
CRWC	Crooked River Watershed Council
CTWS	Confederated Tribes of Warm Springs
Cu Ft	Cubic Feet
CWA	Clean Water Act
D	Drain
DBBC	Deschutes Basin Board of Control
DBHCP	Deschutes Basin Habitat Conservation Plan
DEQ	Oregon Department of Environmental Quality
DES	Deschutes River
DO	Dissolved oxygen
DRC	Deschutes River Conservancy
DWA	Deschutes Water Alliance
\$	Dollar
DN	Downstream Passage Alternative
d/s	Downstream
Ecology	Washington State Department of Ecology
eds.	Editors
EF	East Fork
e.g.	exempli gratia; For Example

Acronym, Symbol, Abbreviation	Definition
EL.	Elevation
ENR	Engineering News Record
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
et al.	And others
etc.	et cetera; and so on
Eval.	Evaluation
Exceedance Flow (50%; 80%)	Monthly Flow Level Exceeded 50% or 80% of the time; respectively.
°F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
f/m ²	Fish per square meter
FERC	Federal Energy Regulatory Agency
FS	Forest Service
FSC	Floating Surface Collector
'	Foot
ft	Feet
Ft ²	Square Feet
FTE	Full Time Equivalent
fps	Feet per second
gal	Gallon
GIS	Geographic Information Systems
GBD	Gas Bubble Disease
GBT	Gas Bubble Trauma
gpm	Gallons per minute
>	Greater than
≥	Greater than or equal to:
GW	Groundwater
HDQrs	Headquarters
HCP	Habitat Conservation Plan
HEC-RAS	Hydrologic Engineering Center-River Analysis System
Hwy	Highway
his	Habitat Suitability Index
"	Inch
in.	Inch
I.D.	Inside Diameter
IFIM	Instream Flow Incremental Methodology
IHA	Indicators of Hydrologic Alteration
ITP	Incidental Take Permit
kg	Kilogram
kWh	Kilowatt-hour
LASAR	Laboratory Analytical Storage and Retrieval Database
Lb	Pound
LiDAR	Light Detection And Ranging
LYT	Lytle Creek
<	Less than
≤	Less than or equal to:
M	Meter
M ²	Square Meter

Acronym, Symbol, Abbreviation	Definition
mm	Millimeter
max	Maximum
MCK	McKay Creek
Mg	Milligram
mg/L	Milligrams/liter
min	Minimum
MLCO	Mill Creek nr Schoolhouse; Hydromet Gauge #14083400 code
MP	Mile Post
mpg	Miles per gallon
MSL	Mean Sea Level
#	Number
N	North
No.	Number
NA	Not Applicable
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination System
Nr	Near
NRCS	Natural Resources Conservation Service
NUID	North Unit Irrigation District
O & M	Operation and Maintenance
0+ age	Juvenile fish – less than a year in age
OAR	Oregon Administrative Rule
OCH	Ochoco Creek
OCRO	Ochoco Creek blw Marks Creek; Hydromet Gauge #14082550 code
OCHO	Ochoco Creek blw Reservoir; Hydromet Gauge #14085300 code
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OID	Ochoco Irrigation District
OR	Oregon
OSU	Oregon State University
OWEB	Oregon Watershed Enhancement Board
OWRD	Oregon Department of Water Resources
%	Percent
P	Probability
p.	Page/pages
Pers. Comm.	Personal Communication
PGE	Portland General Electric
PHABSIM	Physical Habitat Simulation
POD	Point-of-Diversion
PROC.	Proceedings
PSE	Puget Sound Energy
Q	Discharge (cfs)
R.	River
R ²	Coefficient of Determination; Square of the Correlation Coefficient

Acronym, Symbol, Abbreviation	Definition
r^2	Coefficient of Determination; Square of the Correlation Coefficient
r	Correlation Coefficient
R2	R2 Resource Consultants, Inc.
RBT	Rainbow Trout
Rd	Road
Reclamation	United State Bureau of Reclamation
Res.	Reservoir
RM	River Mile
§	Section
SA	Surface Area (ft ²)
SA _e	Effective Surface Area (ft ²)
SC	Screen Contact
SID	Swalley Irrigation District
SOP	Standard Operating Procedure
STH	Steelhead Trout
SWCD	Soil and Water Conservation District
SWW	Selective Water Withdrawal
3D	Three Dimensional
TDG	Total Dissolved Gas
TID	Tumalo Irrigation District
TMDL	Total Maximum Daily Load
TR	Transect
TSID	Three Sisters Irrigation District
TSS	Total Suspended Solids
UCM	Unit Characteristic Method
UDLAC	Upper Deschutes Local Advisory Committee
UDWC	Upper Deschutes Watershed Council
ug	Microgram
UGB	Urban Growth Boundary
UP	Upstream Passage Alternative
US	United States
USACOE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USBR	United State Bureau of Reclamation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
u/s	Upstream
VAF	Velocity Adjustment Factor
Vol.	Volume
vs.	Versus
VSP	Viable Spawning Population
w/	With
WF	West Fork
WHY	Whychus Creek
WP	Wetted Perimeter
WPN	Watershed Professional Network
WSE	Water Surface Elevation

Acronym, Symbol, Abbreviation	Definition
WUA	Weighted Useable Area
Ww	Wetted Width
WWTP	Wastewater Treatment Plant
XS	Cross Section
Yr	Year
Z	Depth

1.0 Introduction

1.1. Background

Seven central Oregon irrigation districts (Arnold, Central Oregon, North Unit, Ochoco, Swalley, Three Sisters, and Tumalo) and the City of Prineville, Oregon (City) are seeking Federal Endangered Species Act (ESA) incidental take permits for the bull trout (*Salvelinus confluentus*), Middle Columbia River steelhead (*Oncorhynchus mykiss*), Middle Columbia River spring Chinook salmon (*O. tshawytscha*), Deschutes River summer/fall Chinook salmon, Sockeye salmon (*O. nerka*) (collectively referred to as the covered fish species), and up to 10 other unlisted species inhabiting the Deschutes River basin. As required by Section 10 of the ESA, the City and the irrigation districts (collectively the Applicants) are preparing the Deschutes Basin Multi-species Habitat Conservation Plan (DBHCP) to minimize and mitigate the effects of the proposed incidental take on the covered species. The DBHCP is being prepared in cooperation with a multi-stakeholder Working Group representing the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Bureau of Reclamation (Reclamation), U.S. Bureau of Land Management (BLM), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Environmental Quality (ODEQ), Oregon Water Resources Department (OWRD), the Confederated Tribes of the Warm Springs, Crook County, and several non-governmental entities.

This study has been completed to support development of the DBHCP. This report does not necessarily represent the consensus view of the Working Group. Rather, it is intended to serve as a reference document for the members of the group as they collaboratively develop plans for additional studies and conduct analyses of the effects of the covered activities and the benefits of various minimization and mitigation options.

1.2. Purpose, Scope, and Methods

The purpose of this study is to compile and evaluate existing flow data that may be used to support the evaluation of potential impacts and conservation measures related to the storage, release and diversion of irrigation water covered by the DBHCP on instream flows and habitats for covered fish species in the Lower Crooked River Basin. Not all of the irrigation activities in the basin are proposed for coverage under the DBHCP. The purpose of this study is to estimate the unregulated flow regime in the Crooked River and various tributary waters in the absence of the effects of irrigation upstream of DBHCP covered activities.

Monthly unregulated flows were synthesized for 69 water years extending from October, 1941 to September, 2010. Unregulated flows were derived for the following five locations:

1. Crooked River, inflow to t Prineville Reservoir.
2. Ochoco Creek, inflow for Ochoco Reservoir
3. Ochoco Creek, at mouth
4. McKay Creek, at mouth
5. Lytle Creek, at mouth.

Data and methods used to develop the unregulated flows are described within this report. The methodology used for each location was selected based on the data available for each location. A common element of each location was the use of monthly 50 and 80 percent exceedance flows derived by the Oregon Department of Water Resources for unregulated flow conditions. These flows were obtained from the Water Availability Reporting System (WARS, http://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/MainMenu1.aspx).

Monthly unregulated flows from October, 1941 to September, 2010 are reported in Appendix A for each of the five locations. These unregulated flows were used to derive monthly flow duration curves for each location, and these curves are included in this report.

2.0 Inflows to Prineville Reservoir

Monthly inflows to Prineville Reservoir were obtained from Bob Main, a consultant working for the Ochoco Irrigation District (e-mail transmission from Ochoco Irrigation District to R2 Resource Consultants, Inc., July 9, 2012). These flows covered the 69-year period from Water Years 1942 through 2010 (October 1941 to September 2010) and they included the effects of irrigation upstream from Prineville Reservoir.

In this analysis, the monthly flows were adjusted to remove the effects of irrigation upstream from Prineville Reservoir. Irrigation upstream from Prineville Reservoir is not a DBHCP covered activity. Monthly flow adjustments were performed to match monthly natural flow estimates of 50 percent and 80 percent exceedance flows developed from data obtained from the Oregon Department of Water Resources (OWRD) Water Availability Reporting System, http://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/MainMenu1.aspx.

The Oregon Department of Water Resources developed 50 percent exceedance flows for the following two sub-basins of the Crooked River upstream from Bowman Dam:

Crooked River above Sand Creek – Watershed ID 70353, drainage area = 2,170 mi².

Bear Creek at the mouth – Watershed ID 70606, drainage area = 203 mi².

Bowman Dam is located downstream from these two sub-basins within Watershed ID 30530507 (Crooked River above Dry River, drainage area = 3,130 mi²). The Crooked River accumulates about 79 mi² of additional drainage area downstream from the two sub-basins listed above. Monthly 50 percent exceedance flows for the Crooked River at Bowman Dam were estimated by adding the corresponding flows in the Crooked River above Sand Creek, Bear Creek at the mouth, and the portion of additional inflow from the downstream drainage. Results of these calculations are shown in Table 2-1.

A similar process was used to derive monthly 80 percent exceedance flows for the Crooked River at Bowman Dam. Results of these calculations are shown in Table 2-2. It should be noted there is apparently a discrepancy between drainage areas reported by the Oregon Department of Water Resources and the US Geological Survey. From the data reported by the Oregon Department of Water Resources, the drainage area of the Crooked River at Bowman Dam is estimated to be 2,450 mi². The US Geological Survey reports a drainage area of 2,700 mi² for the Crooked River near Prineville (Gage No. 14080500, located just downstream from Bowman Dam).

Table 2-1 Monthly 50 percent exceedance flows for the Crooked River at Bowman Dam derived from 50 percent exceedance flows reported by the Oregon Department of Water Resources.

Watershed ID	70353	70606		70611	70595	30530507	Watershed 30530507 minus sum of Watersheds 70353, 70606, 70611, and 70595	Incremental drainage between Bowman Dam and Watersheds 70353 and 70606	Crooked River at Bowman Dam
Stream Name	CROOKED R > DESCHUTES R - AB SAND CR	BEAR CR > CROOKED R - AT MOUTH	Sum of Watersheds 70353 and 70606	OCHOCO CR > CROOKED R - AT MOUTH	MCKAY CR > CROOKED R - AT MOUTH	CROOKED R > DESCHUTES R - AB DRY R			
JAN	192	4	196	44	11	287	36	9	206
FEB	392	9	401	102	28	607	76	20	421
MAR	741	21	762	186	34	1,060	79	21	782
APR	960	20	980	183	34	1,280	83	22	1,002
MAY	622	12	634	109	21	792	28	7	641
JUN	321	6	327	51	6	389	4	1	328
JUL	93	2	95	15	1	112	1	0	95
AUG	48	1	49	6	0	56	0	0	49
SEP	56	1	57	7	0	64	0	0	57
OCT	66	1	67	7	1	75	1	0	67
NOV	81	1	82	9	2	96	4	1	83
DEC	134	2	136	25	6	185	17	4	141
Drainage Area (mi ²)	2,170	203	2,370	358	99	3,130	303	79	2,450

Table 2-2 Monthly 80 percent exceedance flows for the Crooked River at Bowman Dam derived from 80 percent exceedance flows reported by the Oregon Department of Water Resources.

Watershed ID	70353	70606		70611	70595	30530507	Watershed 30530507 minus sum of Watersheds 70353, 70606, 70611, and 70595	Incremental drainage between Bowman Dam and Watersheds 70353 and 70606	Crooked River at Bowman Dam
Stream Name	CROOKED R > DESCHUTES R - AB SAND CR	BEAR CR > CROOKED R - AT MOUTH	Sum of Watersheds 70353 and 70606	OCHOCO CR > CROOKED R - AT MOUTH	MCKAY CR > CROOKED R - AT MOUTH	CROOKED R > DESCHUTES R - AB DRY R			
JAN	79	1	80	15	4	107	8	2	82
FEB	175	2	177	35	9	257	35	9	186
MAR	337	4	341	71	14	473	46	12	353
APR	598	6	604	97	20	755	35	9	613
MAY	404	4	408	62	9	491	11	3	411
JUN	261	3	264	43	3	313	3	1	265
JUL	80	1	81	13	1	95	1	0	81
AUG	39	0	39	6	0	46	0	0	39
SEP	45	1	46	6	0	52	0	0	46
OCT	47	0	48	3	0	51	0	0	48
NOV	61	0	61	5	1	67	1	0	61
DEC	77	1	77	11	3	93	3	1	78
Drainage Area (mi ²)	2,170	203	2,370	358	99	3,130	303	79	2,450

Estimates of monthly upstream consumptive irrigation losses were obtained from the Oregon Department of Water Resources. Estimated monthly irrigation losses in the Crooked River above Sand Creek and Bear Creek at the mouth are listed in Table 2-3. Initially, the monthly irrigation losses from these two sub-basins were combined and then added to the 61 years of monthly inflow to Prineville Reservoir obtained from Bob Main. Monthly flow duration analyses were performed and the resultant monthly 50 percent and 80 percent exceedance flows were compared with the corresponding flows in Tables 2-1 and 2-2, derived from data reported by the Oregon Department of Water Resources.

The monthly 50 percent and 80 percent exceedance flows derived by adding estimates of consumptive irrigations losses to monthly inflows to Prineville Reservoir were greater than the corresponding flows reported in Tables 1 and 2. This result it not surprising because the monthly estimates of consumptive irrigation losses were derived based on the assumption that upstream irrigation fully utilized the water rights for irrigation withdrawal.

Through trial and error, good results were obtained when the estimates of upstream irrigation were reduced by 47.3 percent. Good agreement was found between the monthly 50 percent and 80 percent flow estimates obtained by adding the consumptive irrigation losses to the monthly inflows to Prineville Reservoir and the natural flows reported by the Oregon Department of Water Resources. These comparisons are shown in Figures 2-1 and 2-2 for the 50 percent and 80 percent exceedance flows, respectively.

Table 2-3 OWRD estimates of monthly consumptive irrigation losses in the Crooked River upstream from Prineville Reservoir.

Monthly Consumptive Irrigation Losses (cfs)				
Watershed ID	70353	70606	Sum of Watersheds 70353 and 70606	Sum of Watersheds 70353 and 70606 reduced by 47.3%
Stream Name	CROOKED R > DESCHUTES R - AB SAND CR	BEAR CR > CROOKED R - AT MOUTH		
JAN	0	0	0	0
FEB	0	0	0	0
MAR	31	1	32	17
APR	126	5	131	69
MAY	345	13	358	189
JUN	283	10	293	155
JUL	81	3	84	44
AUG	41	2	43	22
SEP	42	2	44	23
OCT	20	1	21	11
NOV	0	0	0	0
DEC	0	0	0	0

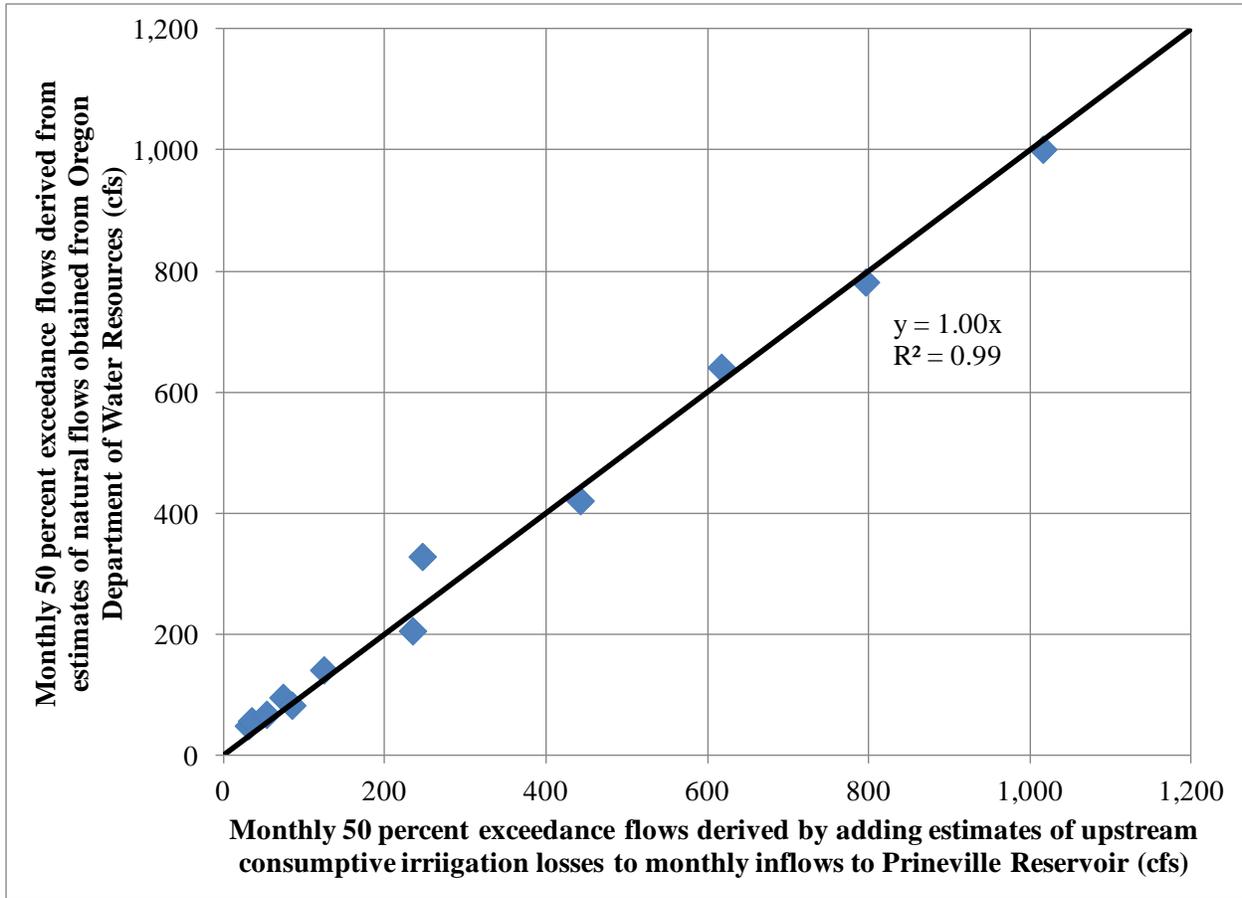


Figure 2-1 Comparison of monthly 50 percent exceedance flows derived by adding estimates of upstream consumptive irrigation losses to monthly inflows to Prineville Reservoir with monthly 50 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

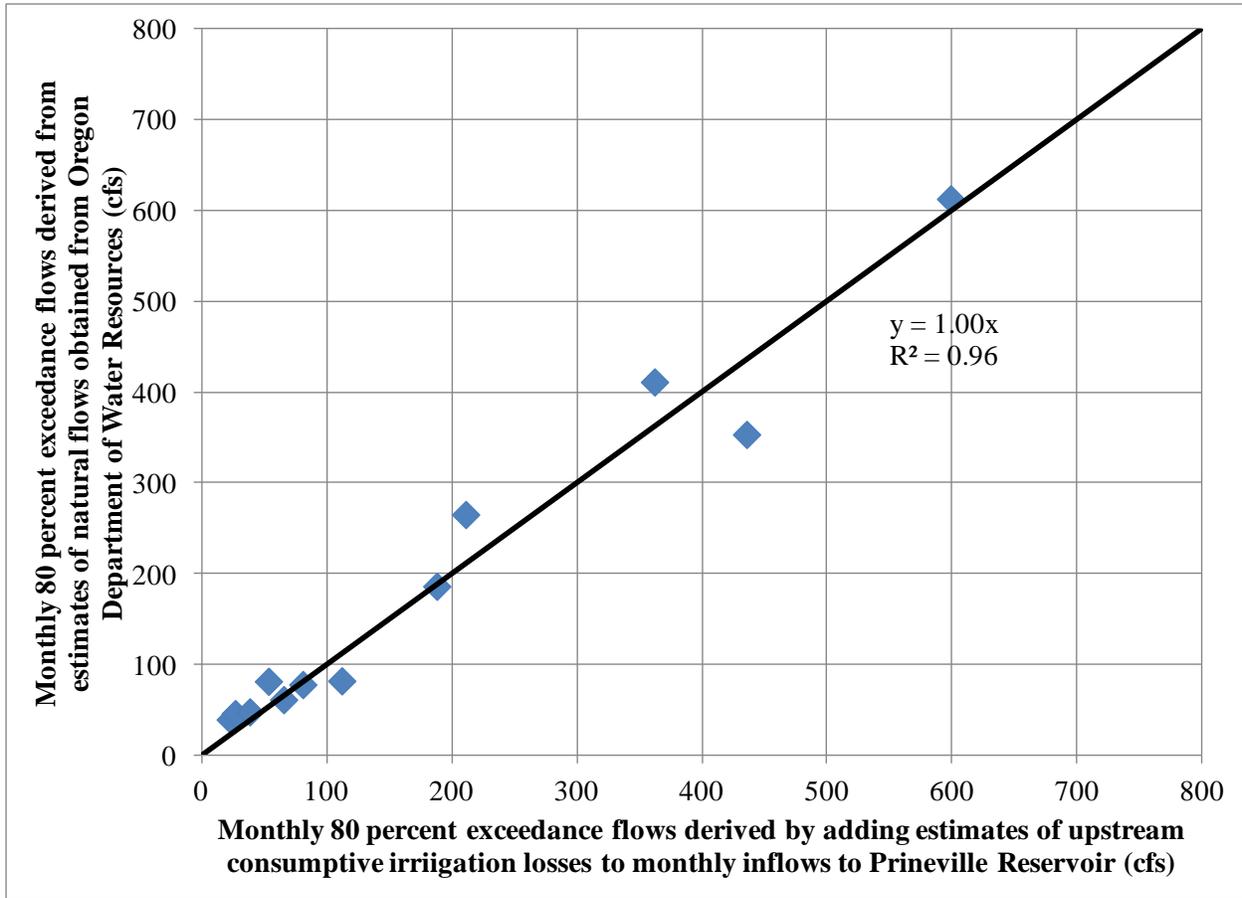


Figure 2-2 Comparison of monthly 80 percent exceedance flows derived by adding estimates of upstream consumptive irrigation losses to monthly inflows to Prineville Reservoir with monthly 80 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

The 61 years of monthly inflows to Prineville Reservoir, adjusted to remove the effects of upstream irrigation were analyzed to develop monthly flow duration curves. Monthly flow duration curves for the months of April through August are shown in Figure 2-3, while monthly flow duration curves for the months of August through April are shown in Figure 2-4.

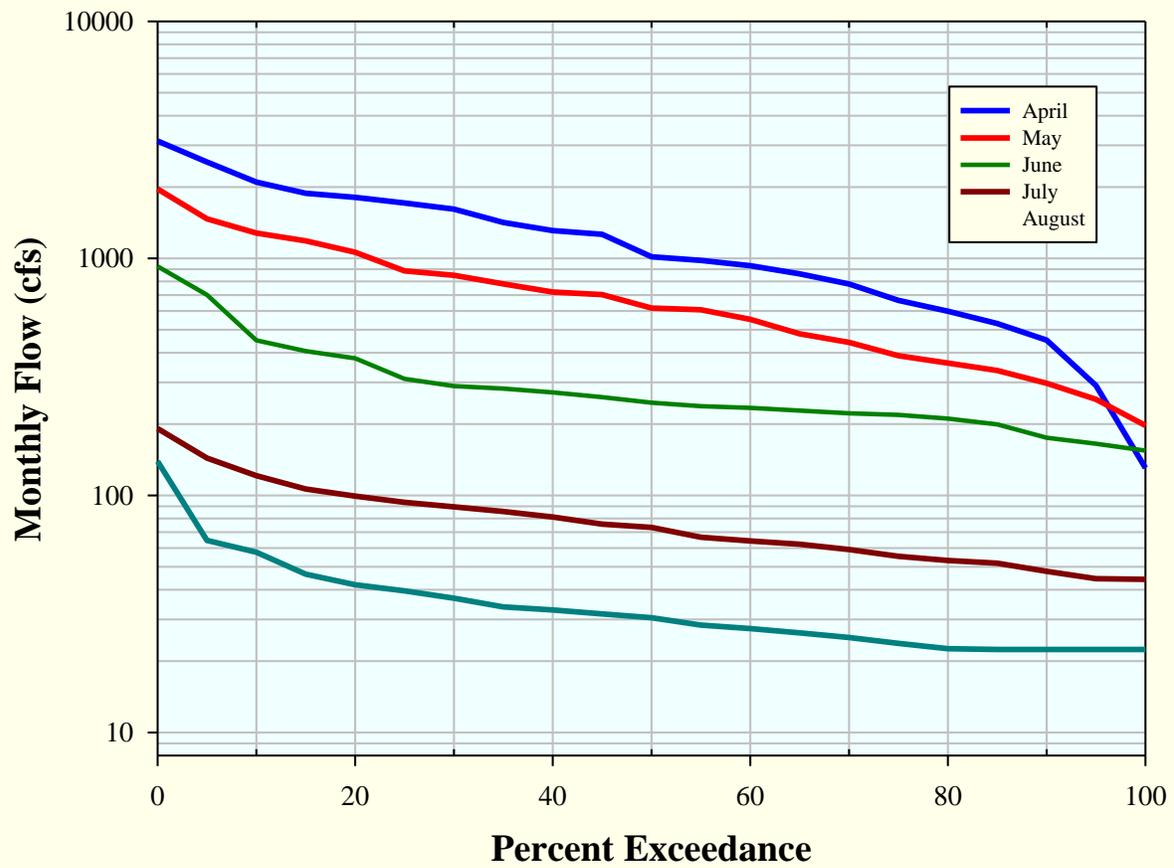


Figure 2-3 Monthly flow duration curves for inflow to Prineville Reservoir, adjusted to remove the effects of upstream irrigation, April through August.

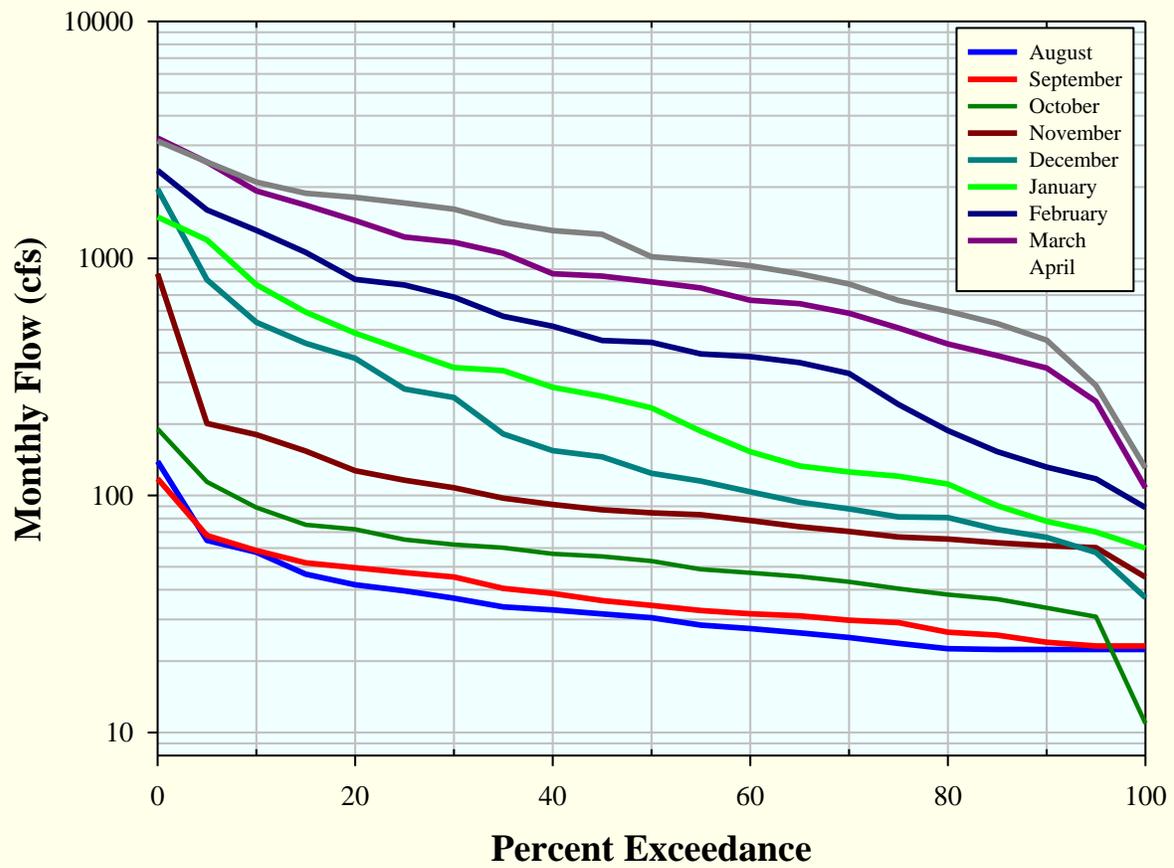


Figure 2-4 Monthly flow duration curves for inflow to Prineville Reservoir, adjusted to remove the effects of upstream irrigation, August through April.

3.0 Inflows to Ochoco Reservoir

Monthly inflows to Ochoco Reservoir were synthesized for the 69-year period from Water Years 1942 through 2010 (October 1941 to September 2010). Flow records for the Ochoco Creek Basin were obtained from the US Bureau of Reclamation (<http://www.usbr.gov/pn/hydromet/destea.html>) for the following gages:

- OCHO - Ochoco Creek below Ochoco Reservoir, OR, Latitude = 44°17'56", Longitude = 120°43'40", Elevation = 3,100 feet
- OCRO - Ochoco Creek above Reservoir near Prineville, OR, Latitude = 44°20'00", Longitude = 120°34'58", Elevation = 3,300 feet
- MLCO - Mill Creek near Prineville, OR, Latitude = 44°24'26", Longitude = 120°38'23", Elevation = 3,480 feet

Records from the OCHO gage included estimates of daily unregulated flow. These estimates were apparently based on measured flows at that location that were corrected to account for upstream storage and evaporation losses. The daily flow estimates included days when negative flows were reported. These daily flow estimates were converted to monthly average flows. Negative flows persisted even with the monthly average flows. Records from this gage were not used to synthesize inflows to Ochoco Reservoir.

Daily flow records from the OCRO and MLCO gages, located upstream from Ochoco Reservoir were combined. Monthly averages of these combined flows were determined from the period from January 2000 through September 2010. These combined monthly flows were compared with the corresponding monthly inflows to Prineville Reservoir adjusted to remove the effects of upstream irrigation (Section 2.0). The two sets of flows were found to be well-correlated ($R^2 = 0.91$), as shown in Figure 3-1. The regression equation shown in Figure 3-1 was used to synthesize the combined monthly flows for OCRO and MLCO gages from the monthly inflows to Prineville Reservoir.

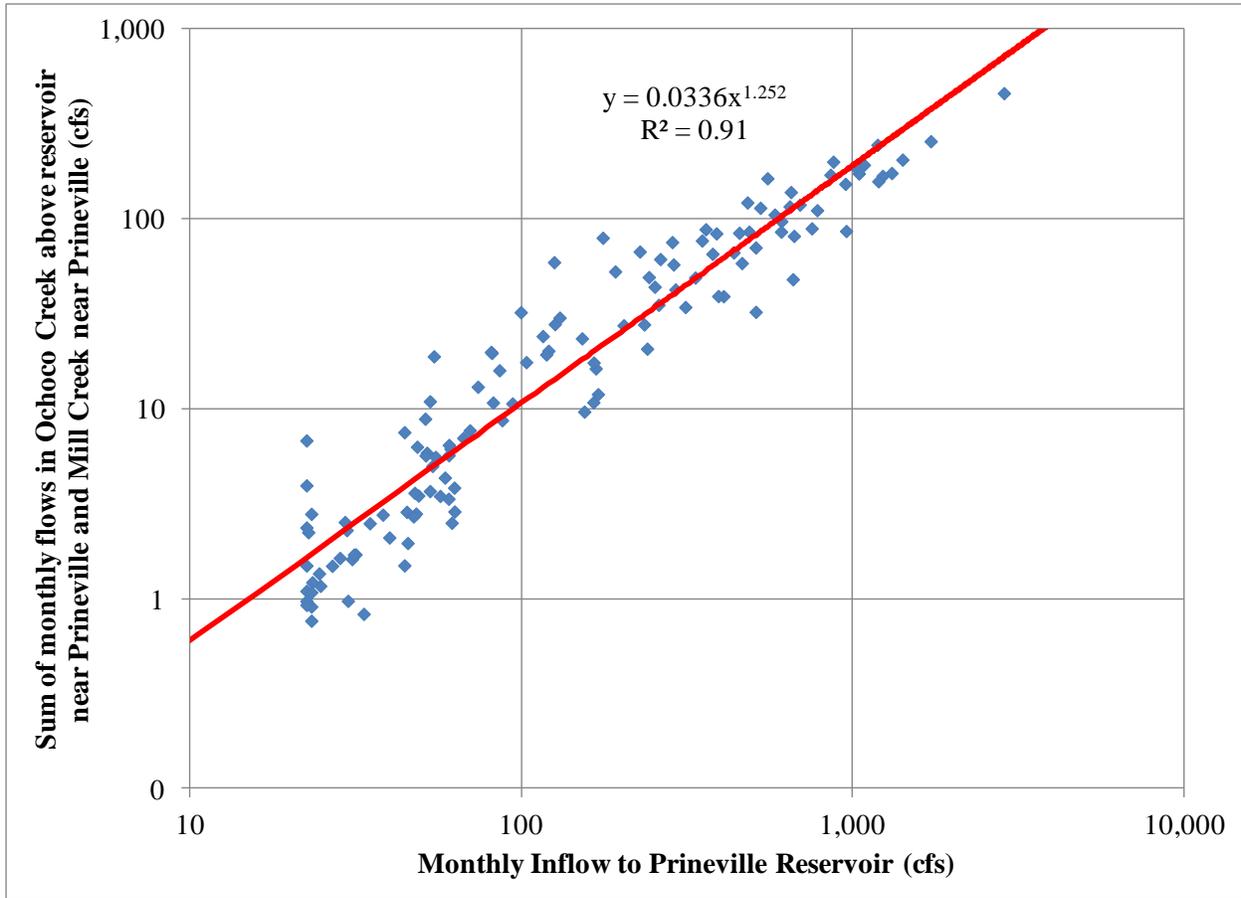


Figure 3-1 Relationship between the monthly inflow to Prineville Reservoir and the combined monthly flows in Ochocho Creek above Ochocho Reservoir and Mill Creek near Prineville.

Monthly 50 and 80 percent exceedance flows were obtained from the Oregon Department of Water Resources for Ochoco Creek at the mouth. These monthly flows are summarized in Table 3-1.

Table 3-1 OWRD monthly 50 and 80 percent exceedance flows in Ochoco Creek at the mouth.

Watershed ID	70611	
Stream Name	OCHOCO CR > CROOKED R - AT MOUTH	
	50 percent exceedance	80 percent exceedance
JAN	44	15
FEB	102	35
MAR	186	71
APR	183	97
MAY	109	62
JUN	51	43
JUL	15	13
AUG	6	6
SEP	7	6
OCT	7	3
NOV	9	5
DEC	25	11

The combined monthly flows in Ochoco Creek above Ochoco Reservoir and in Mill Creek near Prineville were adjusted upwards to estimate natural flows in Ochoco Creek at the Mouth. Through trial and error, an increase of 9.9 percent was found to provide good agreement between the synthesized flows and natural flows estimated by the Oregon Department of Water Resources for 50 percent exceedance (Figure 3-2) and 80 percent exceedance (Figure 3-3).

By applying a simple drainage area ratio adjustment, natural inflows to Ochoco Reservoir were estimated by adjusting the combined monthly flows in Ochoco Creek above Ochoco Reservoir and in Mill Creek near Prineville upwards by 5.8 percent. The 69 years of monthly inflows to Ochoco Reservoir were analyzed to develop monthly flow duration curves. Monthly flow duration curves for the months of April through August are shown in Figure 3-4, while monthly flow duration curves for the months of August through April are shown in Figure 3-5.

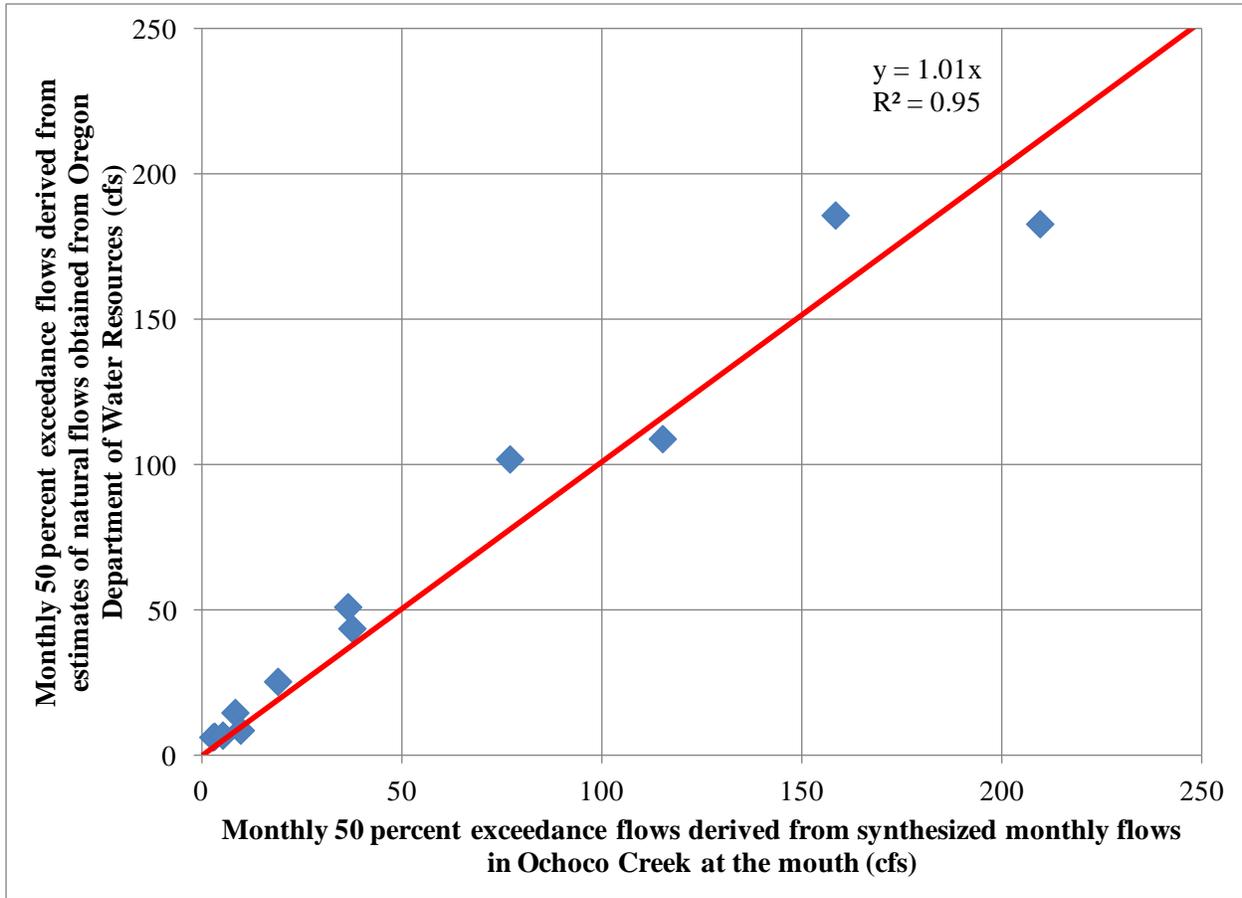


Figure 3-2 Comparison of monthly 50 percent exceedance flows derived from synthesized monthly flows in Ochoco Creek at the mouth with monthly 50 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

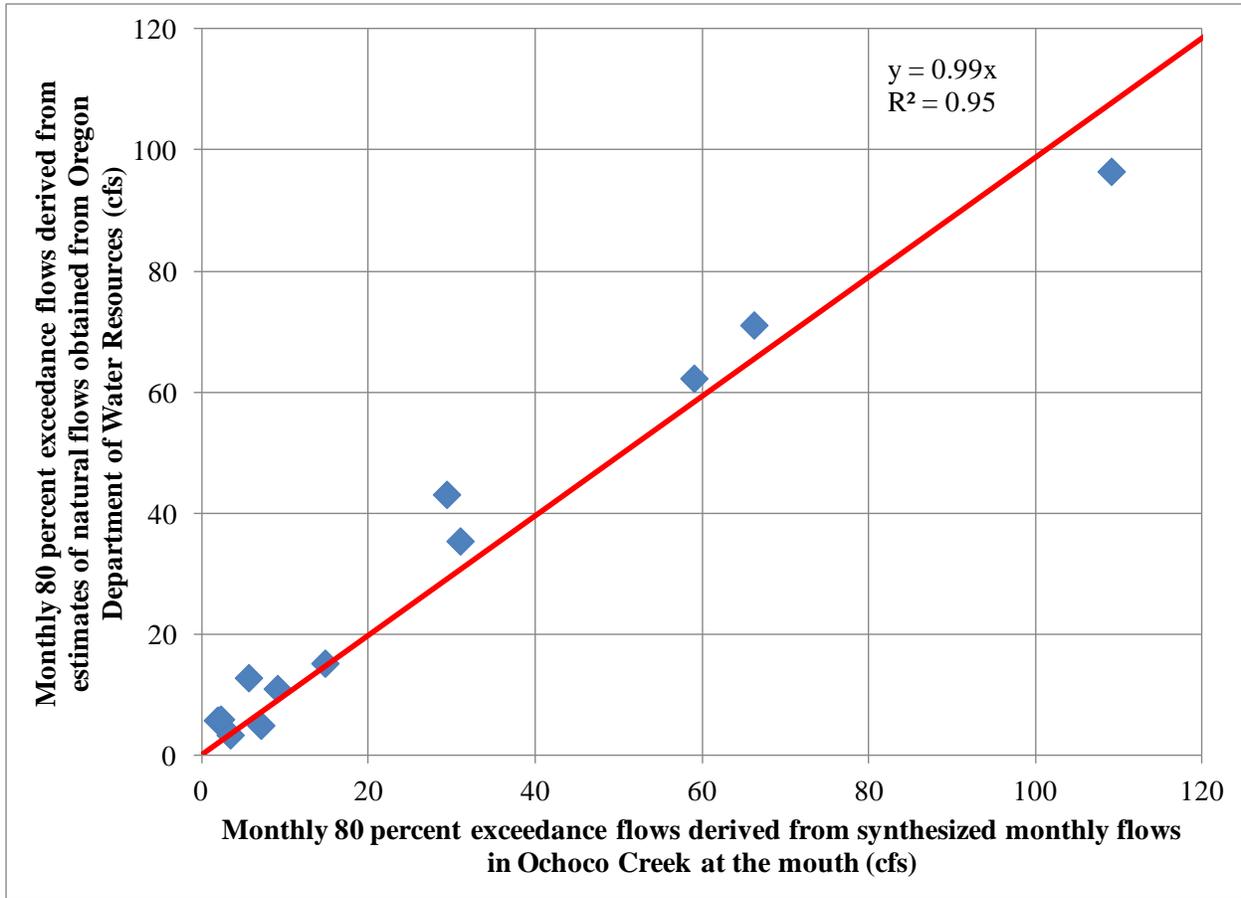


Figure 3-3 Comparison of monthly 80 percent exceedance flows derived from synthesized monthly flows in Ochoco Creek at the mouth with monthly 80 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

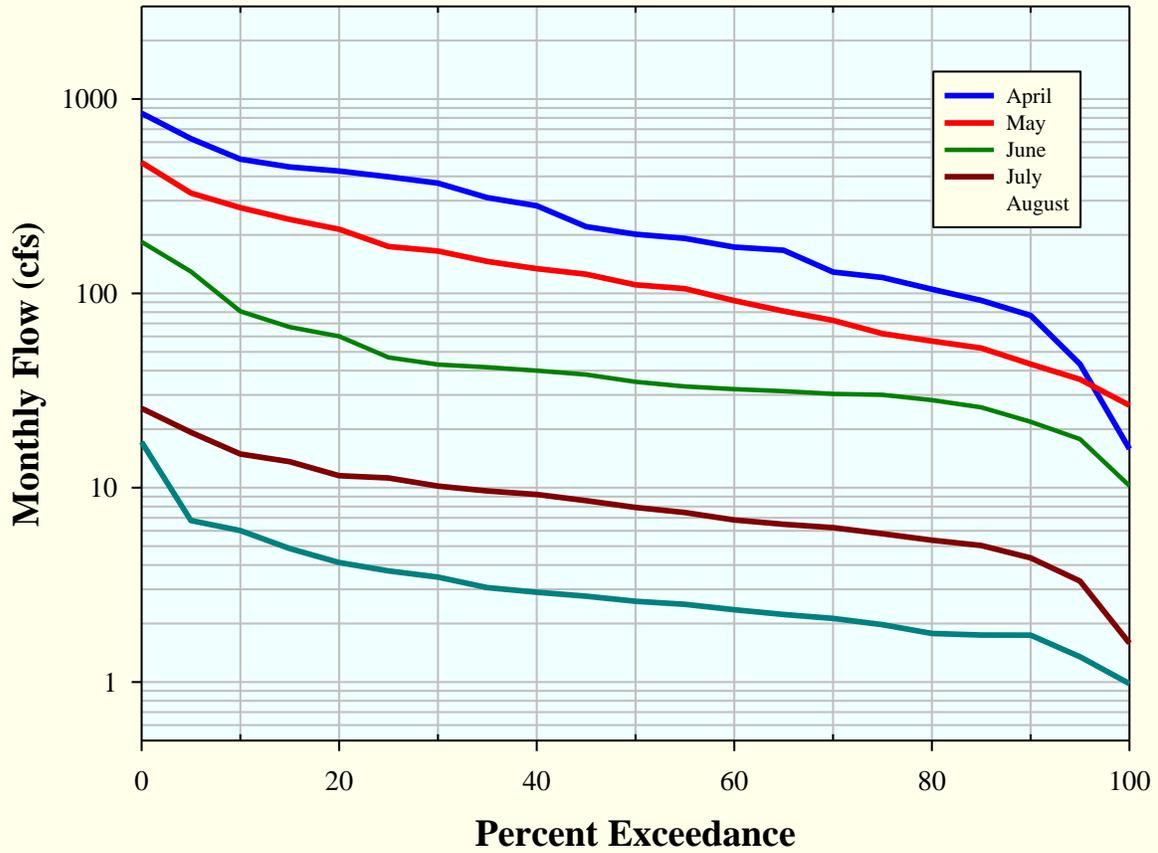


Figure 3-4 Monthly flow duration curves for inflow to Ochoco Reservoir, April through August.

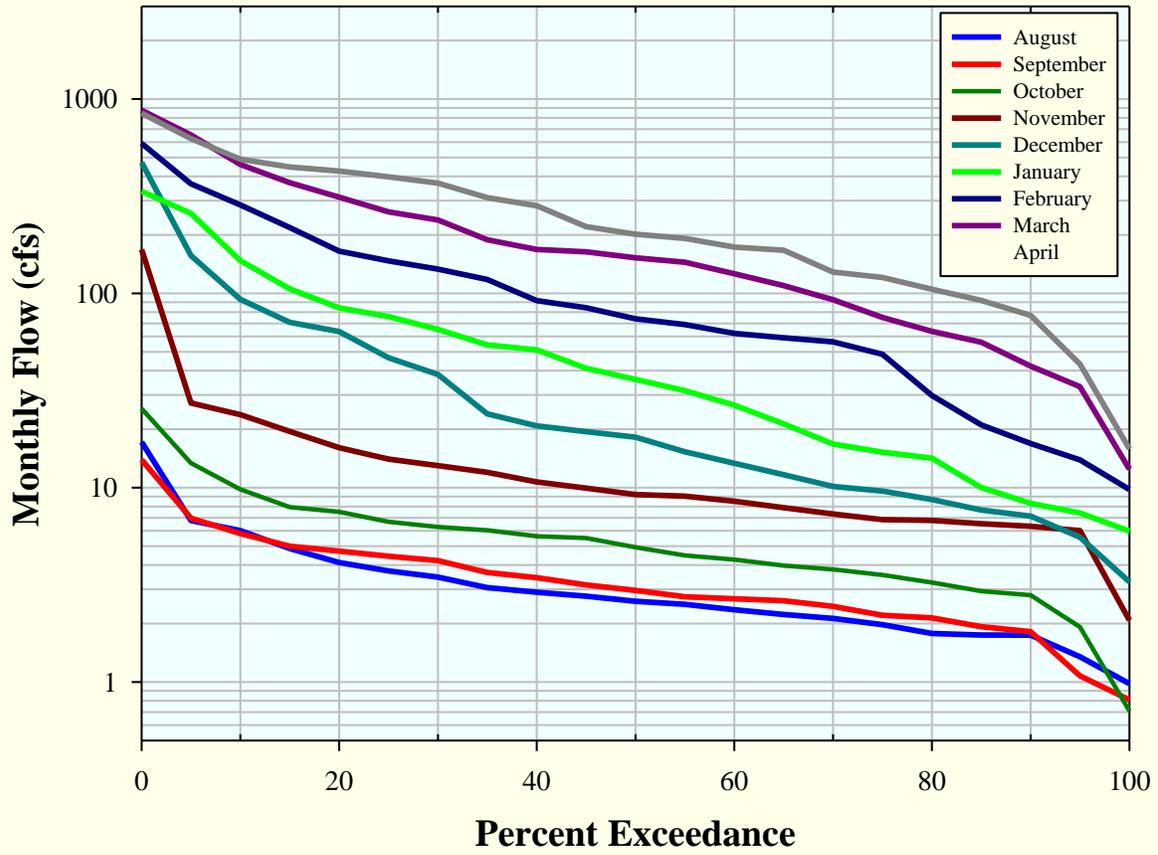


Figure 3-5 Monthly flow duration curves for inflow to Ochoco Reservoir, August through April.

4.0 Flows in McKay Creek

Monthly flows in McKay Creek were synthesized for the 69-year period from Water Years 1942 through 2010 (October 1941 to September 2010). Flow records for McKay Creek were obtained from the Oregon Department of Water Resources for the following location:

- 14085700 - McKay Creek above Poppy Creek near Prineville, OR, Latitude = 44°27'03", Longitude = 120°44'41", Elevation = 3,100 feet

Monthly averages from this gage were determined from the period from October 2009 through September 2010. These monthly flows were compared with the corresponding monthly inflows to Prineville Reservoir which were adjusted to remove the effects of upstream irrigation (Section 2.0). Both flow datasets were found to be well-correlated ($R^2 = 0.90$), as shown in Figure 4-1. The regression equation shown in Figure 4-1 was used to synthesize the monthly flows for McKay Creek above Poppy Creek from the monthly inflows to Prineville Reservoir.

Monthly 50 and 80 percent exceedance flows were obtained from the Oregon Department of Water Resources for McKay Creek at the mouth. These monthly flows are summarized in Table 4-1.

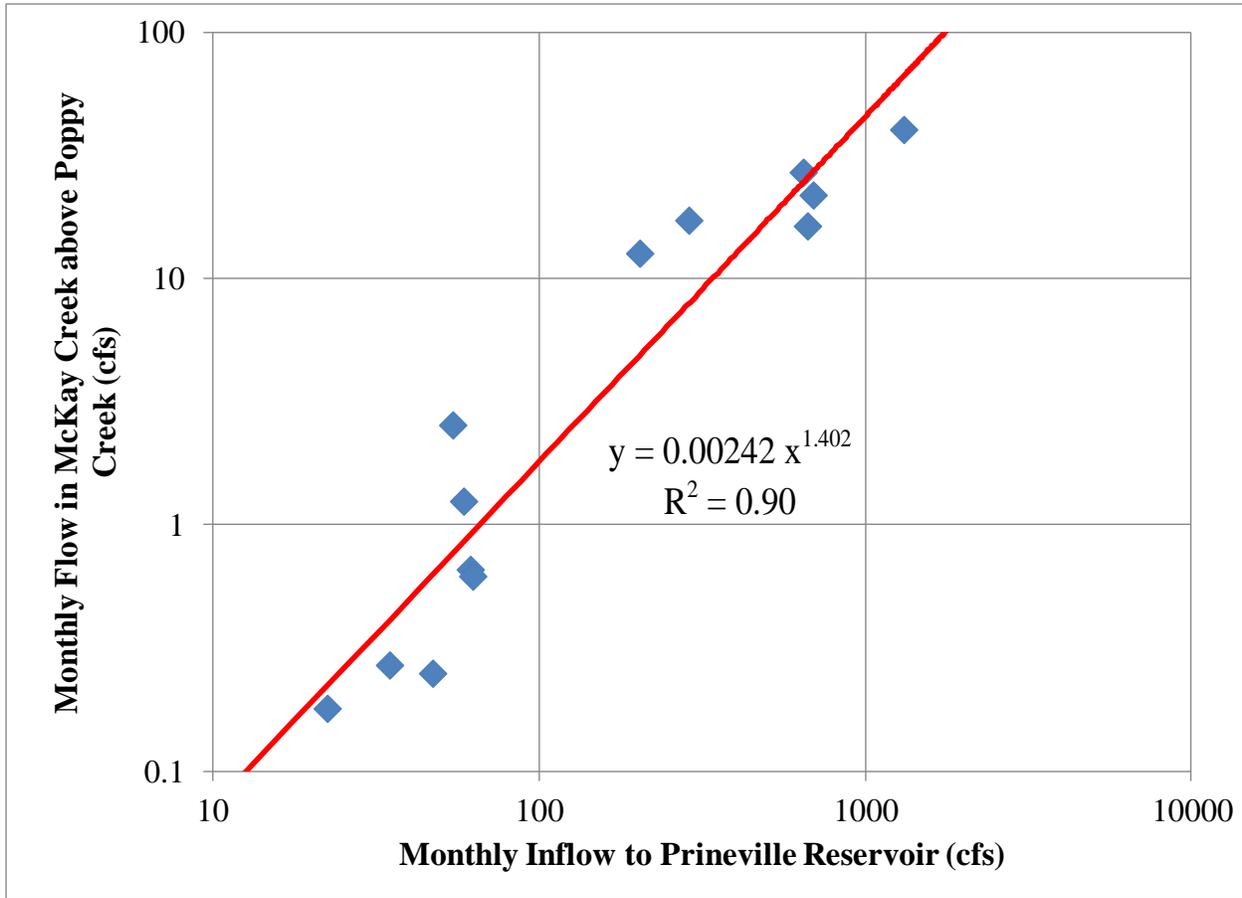


Figure 4-5 Relationship between the monthly inflow to Prineville Reservoir and the monthly flow in McKay Creek above Poppy Creek near Prineville.

Table 4-1 OWRD monthly 50 and 80 percent exceedance flows in McKay Creek at the mouth.

Watershed ID	70595	
Stream Name	MCKAY CR > CROOKED R - AT MOUTH	
	50 percent exceedance	80 percent exceedance
JAN	11.0	3.8
FEB	28.4	9.3
MAR	33.7	14.3
APR	34.4	19.6
MAY	21.2	9.1
JUN	6.4	2.8
JUL	1.2	0.6
AUG	0.4	0.2
SEP	0.4	0.2
OCT	0.5	0.1
NOV	1.6	0.5
DEC	6.2	2.7

The synthesized monthly flows in McKay Creek above Poppy Creek were adjusted to estimate unregulated flows in McKay Creek at the Mouth. Through trial and error, a reduction of 6.6 percent was found to provide good agreement between the synthesized flows and natural flows estimated by the Oregon Department of Water Resources (OWRD Water Availability Reporting System, http://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/MainMenu1.aspx) for 50 percent exceedance (Figure 4-2) and 80 percent exceedance (Figure 4-3).

The 69 years of monthly flows in McKay Creek at the mouth were analyzed to develop monthly flow duration curves. Monthly flow duration curves for the months of April through August are shown in Figure 4-4, while monthly flow duration curves for the months of August through April are shown in Figure 4-5.

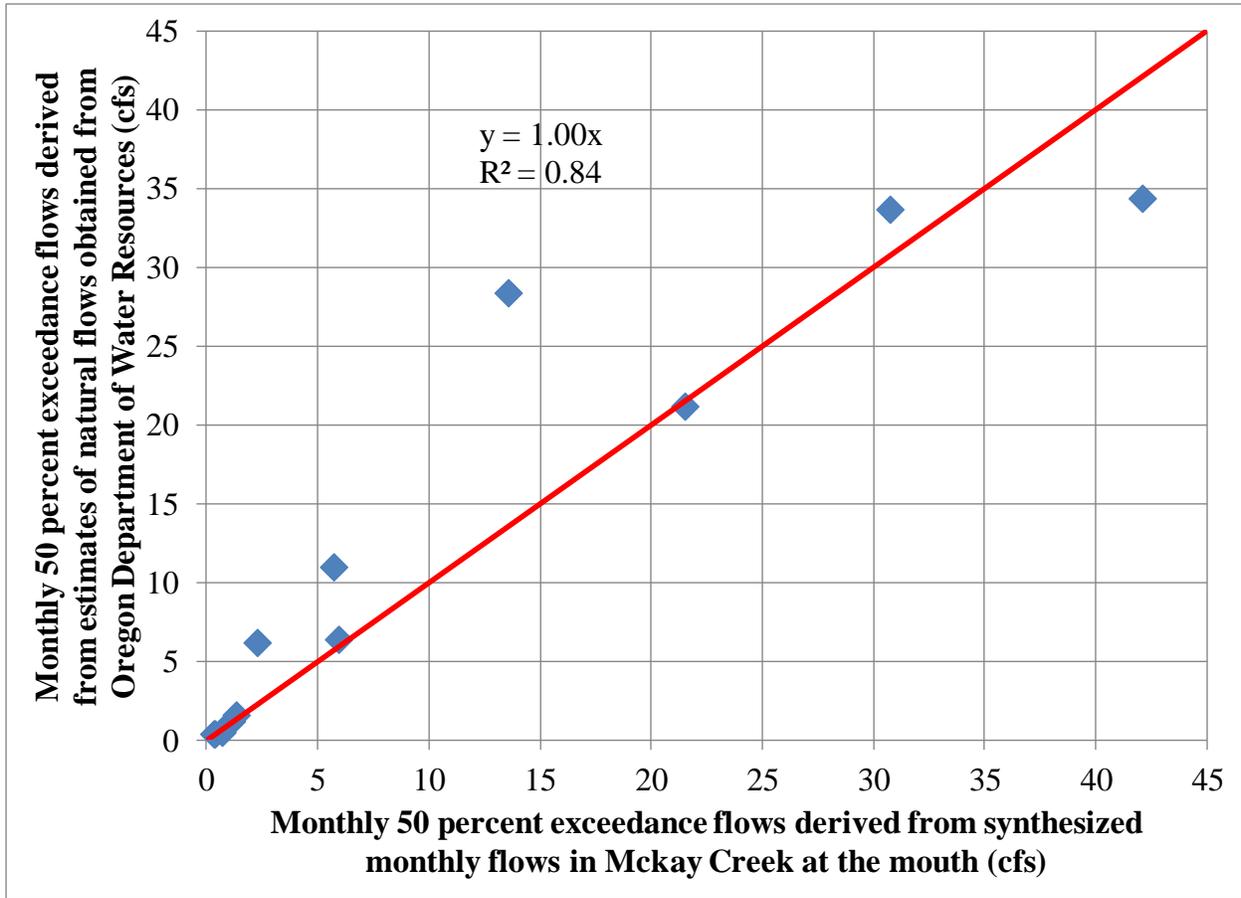


Figure 4-2 Comparison of monthly 50 percent exceedance flows derived from synthesized monthly flows in McKay Creek at the mouth with monthly 50 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

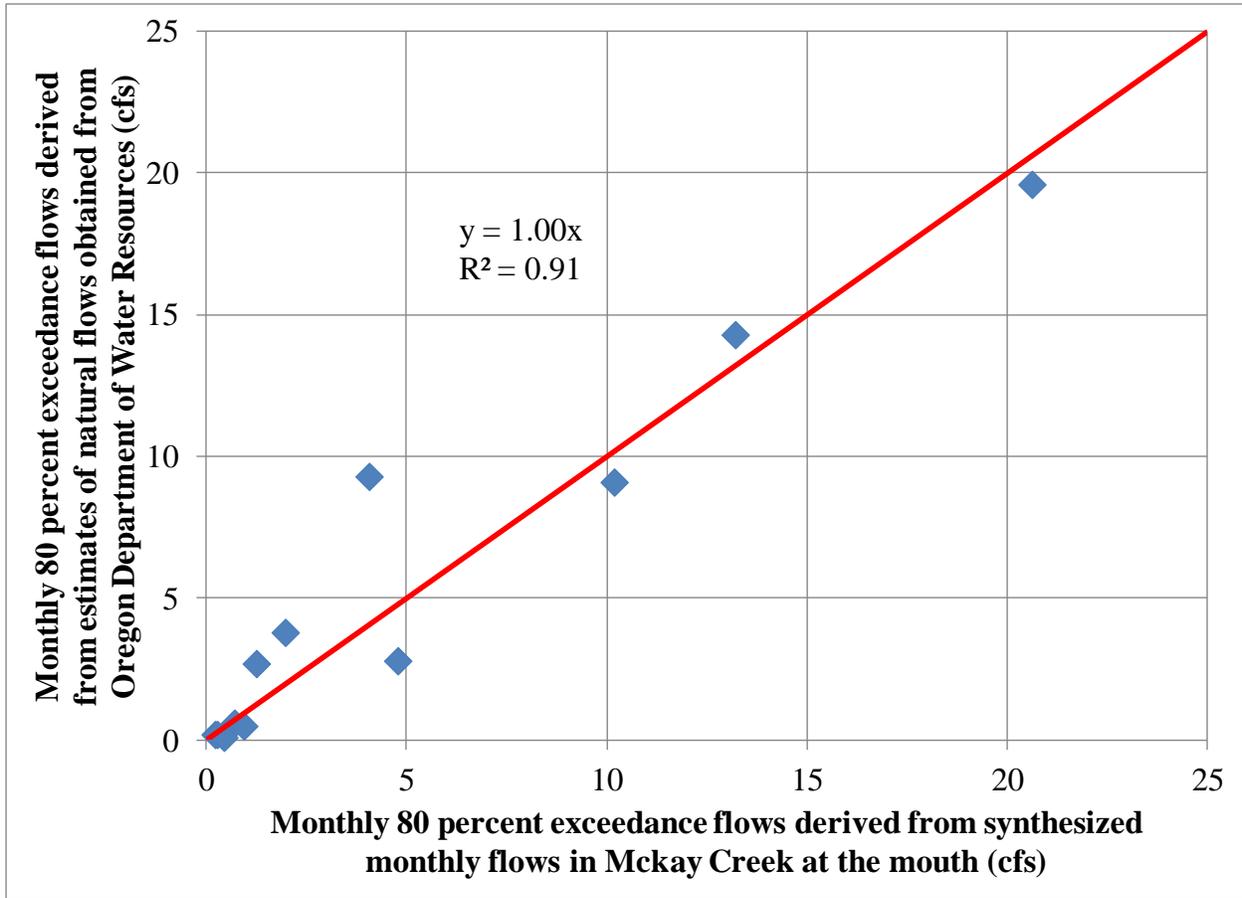


Figure 4-3 Comparison of monthly 80 percent exceedance flows derived from synthesized monthly flows in McKay Creek at the mouth with monthly 80 percent exceedance flows reported by the Oregon Department of Water Resources for natural conditions.

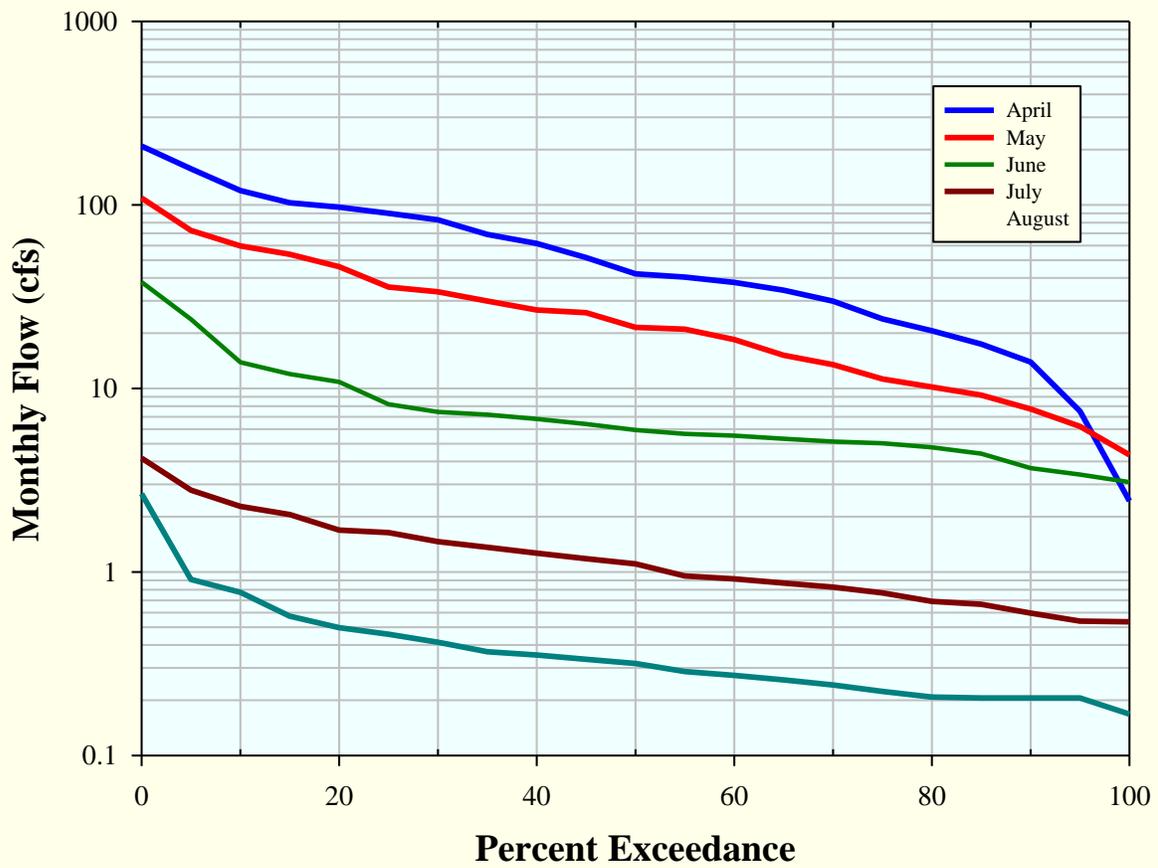


Figure 4-4 Monthly flow duration curves for McKay Creek at the mouth, April through August.

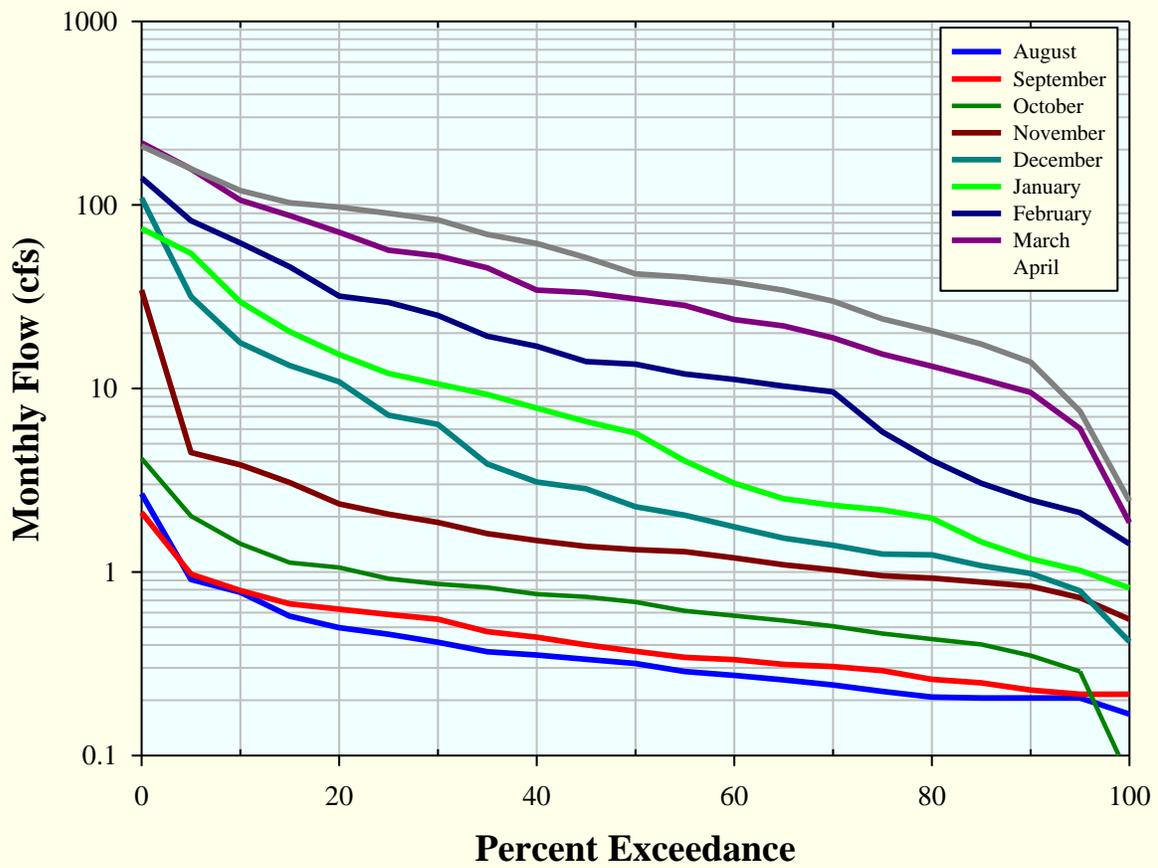


Figure 4-5 Monthly flow duration curves for McKay Creek at the mouth, August through April.

5.0 Flows in Lytle Creek

No flow records are available for Lytle Creek. Monthly flows in Lytle Creek were synthesized for the 69-year period from Water Years 1942 through 2010 (October 1941 to September 2010).

Monthly flows records for Lytle Creek were estimated by applying a drainage area ratio to the monthly flows synthesized for nearby McKay Creek (Section 4.0). Monthly flows for Lytle Creek at the mouth were estimated by reducing monthly flows in McKay Creek at the mouth by 59.2 percent based on differences in drainage area between the two basins.

The 69 years of monthly flows in Lytle Creek at the mouth were analyzed to develop monthly flow duration curves. Monthly flow duration curves for the months of April through August are shown in Figure 5-1, while monthly flow duration curves for the months of August through April are shown in Figure 5-2.

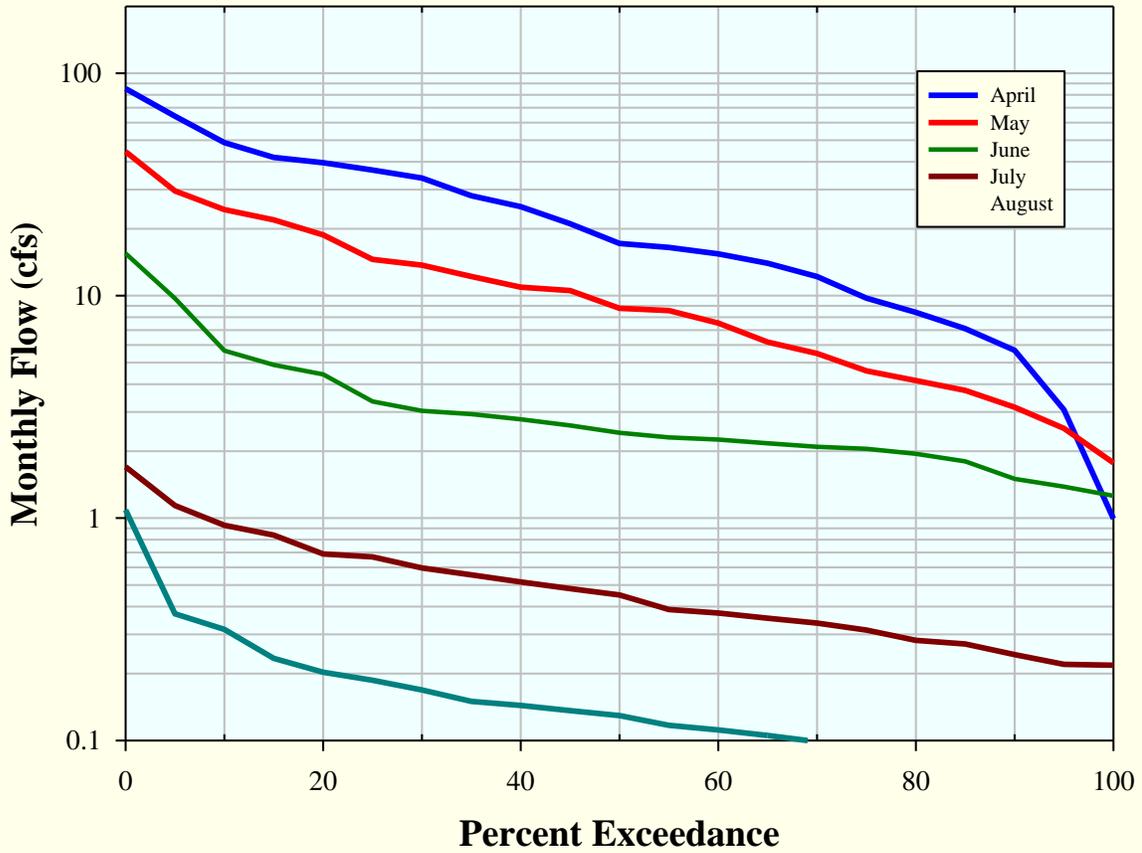


Figure 5-1 Monthly flow duration curves for Lytle Creek at the mouth, April through August.

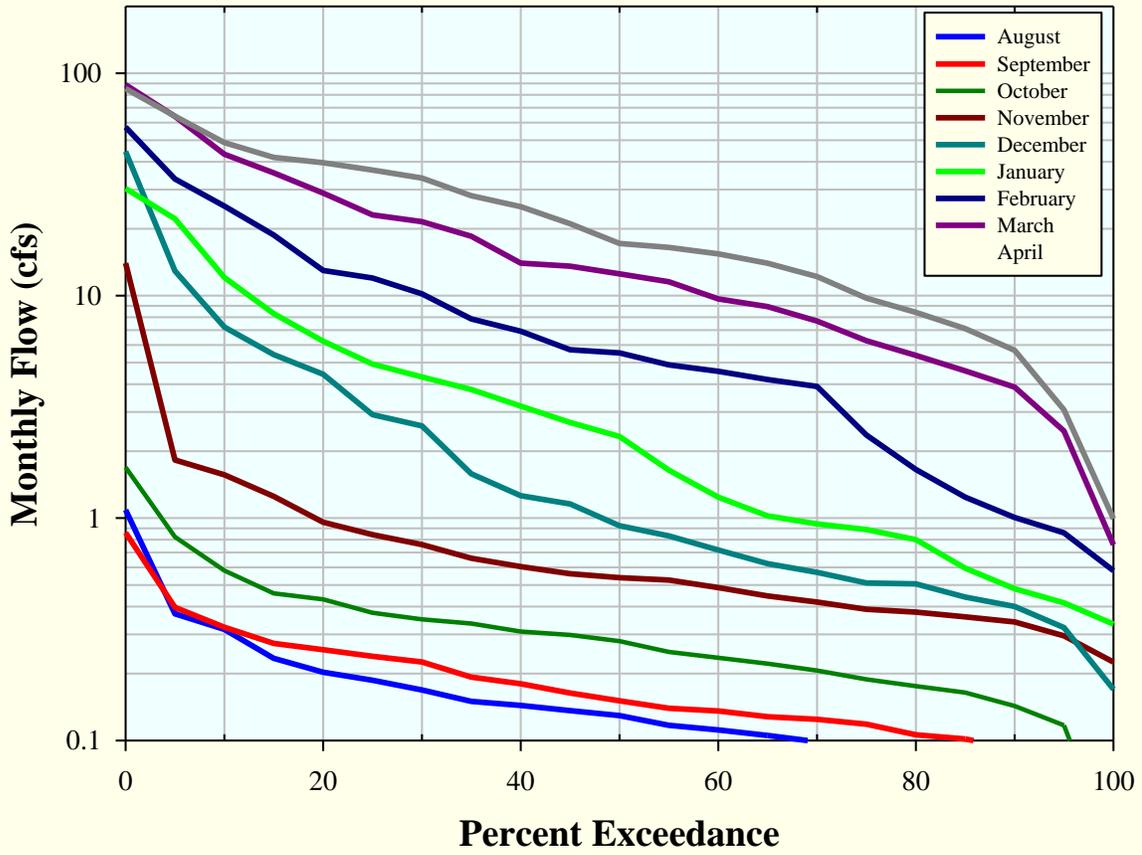


Figure 5-2 Monthly flow duration curves for Lytle Creek at the mouth, August through April.

6.0 References

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Accessed August, 2012.

Appendix A

Monthly Unregulated Flows at Various Locations in the Crooked River Basin, October, 1941 to September, 2010

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
OCT	1941	57	6	6	0.8	0.3
NOV	1941	151	19	20	3.0	1.2
DEC	1941	278	41	42	7.0	2.9
JAN	1942	234	33	34	5.5	2.3
FEB	1942	447	74	77	13.7	5.6
MAR	1942	833	161	168	32.8	13.4
APR	1942	1952	468	486	108.0	44.1
MAY	1942	746	141	146	28.1	11.5
JUN	1942	408	66	68	12.0	4.9
JUL	1942	99	11	12	1.7	0.7
AUG	1942	33	3	3	0.4	0.1
SEP	1942	39	3	4	0.4	0.2
OCT	1942	36	3	3	0.4	0.2
NOV	1942	207	28	29	4.6	1.9
DEC	1942	530	91	95	17.4	7.1
JAN	1943	761	144	150	28.9	11.8
FEB	1943	853	166	173	33.9	13.8
MAR	1943	1896	452	469	103.8	42.3
APR	1943	2580	664	690	159.8	65.2
MAY	1943	922	183	190	37.7	15.4
JUN	1943	377	60	62	10.8	4.4
JUL	1943	98	11	12	1.6	0.7
AUG	1943	35	3	3	0.4	0.2
SEP	1943	34	3	3	0.4	0.2
OCT	1943	57	6	6	0.8	0.3
NOV	1943	83	9	9	1.3	0.5
DEC	1943	85	9	10	1.3	0.5
JAN	1944	65	7	7	0.9	0.4
FEB	1944	159	20	21	3.2	1.3
MAR	1944	484	82	85	15.3	6.2

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
APR	1944	611	109	114	21.2	8.6
MAY	1944	299	45	46	7.8	3.2
JUN	1944	223	31	32	5.1	2.1
JUL	1944	73	8	8	1.1	0.4
AUG	1944	34	3	3	0.4	0.2
SEP	1944	31	3	3	0.3	0.1
OCT	1944	38	3	4	0.4	0.2
NOV	1944	69	7	7	1.0	0.4
DEC	1944	102	12	12	1.7	0.7
JAN	1945	302	45	47	7.9	3.2
FEB	1945	641	116	121	22.7	9.3
MAR	1945	410	66	69	12.1	4.9
APR	1945	1442	320	333	70.7	28.8
MAY	1945	1053	216	225	45.5	18.6
JUN	1945	403	65	67	11.8	4.8
JUL	1945	62	6	7	0.9	0.4
AUG	1945	28	2	2	0.3	0.1
SEP	1945	35	3	3	0.4	0.2
OCT	1945	45	4	4	0.5	0.2
NOV	1945	126	15	16	2.3	0.9
DEC	1945	569	100	104	19.2	7.8
JAN	1946	523	90	93	17.0	6.9
FEB	1946	455	76	79	14.0	5.7
MAR	1946	1486	333	346	73.7	30.1
APR	1946	2230	553	575	130.2	53.1
MAY	1946	719	134	139	26.6	10.9
JUN	1946	239	34	35	5.7	2.3
JUL	1946	77	8	8	1.2	0.5
AUG	1946	31	3	3	0.3	0.1
SEP	1946	51	5	5	0.7	0.3
OCT	1946	65	7	7	0.9	0.4
NOV	1946	179	24	24	3.8	1.5
DEC	1946	255	37	38	6.2	2.5
JAN	1947	122	15	15	2.2	0.9
FEB	1947	444	73	76	13.6	5.5
MAR	1947	616	110	115	21.4	8.7
APR	1947	523	90	94	17.1	7.0
MAY	1947	260	38	39	6.4	2.6

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
JUN	1947	259	37	39	6.4	2.6
JUL	1947	57	6	6	0.8	0.3
AUG	1947	30	3	3	0.3	0.1
SEP	1947	40	4	4	0.5	0.2
OCT	1947	51	5	5	0.7	0.3
NOV	1947	108	12	13	1.9	0.8
DEC	1947	147	18	19	2.9	1.2
JAN	1948	411	67	69	12.2	5.0
FEB	1948	385	61	64	11.1	4.5
MAR	1948	381	60	63	10.9	4.5
APR	1948	1528	345	358	76.7	31.3
MAY	1948	1649	379	394	85.3	34.8
JUN	1948	925	184	191	38.0	15.5
JUL	1948	146	18	19	2.8	1.2
AUG	1948	60	6	6	0.8	0.3
SEP	1948	54	5	5	0.7	0.3
OCT	1948	72	8	8	1.1	0.4
NOV	1948	96	11	11	1.6	0.6
DEC	1948	88	10	10	1.4	0.6
JAN	1949	65	7	7	0.9	0.4
FEB	1949	700	130	135	25.6	10.5
MAR	1949	1251	268	279	57.9	23.6
APR	1949	1708	396	412	89.6	36.5
MAY	1949	673	124	128	24.3	9.9
JUN	1949	202	27	28	4.5	1.8
JUL	1949	52	5	5	0.7	0.3
AUG	1949	26	2	2	0.3	0.1
SEP	1949	30	3	3	0.3	0.1
OCT	1949	40	4	4	0.5	0.2
NOV	1949	67	7	7	1.0	0.4
DEC	1949	73	8	8	1.1	0.4
JAN	1950	84	9	10	1.3	0.5
FEB	1950	397	64	66	11.6	4.7
MAR	1950	752	142	147	28.3	11.6
APR	1950	1713	398	413	90.0	36.7
MAY	1950	782	149	155	30.0	12.2
JUN	1950	497	85	88	15.9	6.5
JUL	1950	81	9	9	1.3	0.5

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
AUG	1950	32	3	3	0.3	0.1
SEP	1950	29	2	3	0.3	0.1
OCT	1950	67	7	7	1.0	0.4
NOV	1950	128	16	16	2.4	1.0
DEC	1950	611	109	114	21.2	8.7
JAN	1951	339	52	54	9.3	3.8
FEB	1951	1305	283	294	61.4	25.1
MAR	1951	1024	209	217	43.8	17.9
APR	1951	1778	417	433	94.8	38.7
MAY	1951	854	166	173	33.9	13.8
JUN	1951	227	32	33	5.3	2.2
JUL	1951	60	6	6	0.8	0.3
AUG	1951	26	2	2	0.3	0.1
SEP	1951	26	2	2	0.3	0.1
OCT	1951	61	6	6	0.8	0.3
NOV	1951	76	8	8	1.1	0.5
DEC	1951	169	22	23	3.5	1.4
JAN	1952	133	16	17	2.5	1.0
FEB	1952	532	92	96	17.5	7.1
MAR	1952	1393	307	319	67.4	27.5
APR	1952	3127	845	878	209.2	85.3
MAY	1952	815	157	163	31.8	13.0
JUN	1952	278	41	42	7.0	2.9
JUL	1952	99	11	12	1.7	0.7
AUG	1952	39	4	4	0.5	0.2
SEP	1952	40	4	4	0.5	0.2
OCT	1952	40	4	4	0.5	0.2
NOV	1952	63	6	7	0.9	0.4
DEC	1952	81	9	9	1.2	0.5
JAN	1953	616	110	115	21.4	8.7
FEB	1953	909	180	187	37.0	15.1
MAR	1953	842	164	170	33.3	13.6
APR	1953	1856	440	457	100.7	41.1
MAY	1953	1115	232	241	49.3	20.1
JUN	1953	708	132	137	26.1	10.6
JUL	1953	107	12	13	1.9	0.8
AUG	1953	52	5	5	0.7	0.3
SEP	1953	60	6	6	0.8	0.3

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
OCT	1953	70	7	8	1.0	0.4
NOV	1953	186	25	26	4.0	1.6
DEC	1953	426	70	72	12.8	5.2
JAN	1954	240	34	35	5.7	2.3
FEB	1954	726	136	141	27.0	11.0
MAR	1954	843	164	170	33.3	13.6
APR	1954	996	202	210	42.1	17.2
MAY	1954	396	64	66	11.6	4.7
JUN	1954	282	42	43	7.2	2.9
JUL	1954	63	6	7	0.9	0.4
AUG	1954	26	2	2	0.3	0.1
SEP	1954	34	3	3	0.4	0.2
OCT	1954	62	6	6	0.9	0.4
NOV	1954	70	7	8	1.0	0.4
DEC	1954	69	7	7	1.0	0.4
JAN	1955	78	8	9	1.2	0.5
FEB	1955	98	11	11	1.6	0.7
MAR	1955	213	29	30	4.8	2.0
APR	1955	622	112	116	21.8	8.9
MAY	1955	886	174	181	35.7	14.6
JUN	1955	229	32	33	5.4	2.2
JUL	1955	75	8	8	1.1	0.5
AUG	1955	25	2	2	0.2	0.1
SEP	1955	26	2	2	0.2	0.1
OCT	1955	42	4	4	0.5	0.2
NOV	1955	87	9	10	1.4	0.6
DEC	1955	768	146	151	29.2	11.9
JAN	1956	830	160	167	32.6	13.3
FEB	1956	430	70	73	13.0	5.3
MAR	1956	1772	415	431	94.3	38.5
APR	1956	1858	440	457	100.8	41.1
MAY	1956	1318	286	298	62.3	25.4
JUN	1956	358	56	58	10.0	4.1
JUL	1956	126	15	16	2.3	1.0
AUG	1956	42	4	4	0.5	0.2
SEP	1956	51	5	5	0.7	0.3
OCT	1956	75	8	8	1.1	0.5
NOV	1956	109	13	13	1.9	0.8

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
DEC	1956	155	20	20	3.1	1.3
JAN	1957	76	8	8	1.1	0.5
FEB	1957	668	122	127	24.0	9.8
MAR	1957	1173	248	257	52.9	21.6
APR	1957	1246	267	277	57.6	23.5
MAY	1957	767	145	151	29.1	11.9
JUN	1957	236	33	35	5.6	2.3
JUL	1957	67	7	7	0.9	0.4
AUG	1957	27	2	2	0.3	0.1
SEP	1957	41	4	4	0.5	0.2
OCT	1957	98	11	11	1.6	0.7
NOV	1957	90	10	10	1.4	0.6
DEC	1957	174	23	24	3.7	1.5
JAN	1958	322	49	51	8.6	3.5
FEB	1958	2352	591	614	140.3	57.2
MAR	1958	857	167	174	34.1	13.9
APR	1958	2065	503	522	117.0	47.7
MAY	1958	1277	275	286	59.6	24.3
JUN	1958	382	61	63	11.0	4.5
JUL	1958	118	14	14	2.1	0.9
AUG	1958	33	3	3	0.4	0.1
SEP	1958	47	4	5	0.6	0.2
OCT	1958	62	6	6	0.9	0.4
NOV	1958	90	10	10	1.5	0.6
DEC	1958	105	12	13	1.8	0.7
JAN	1959	274	40	42	6.9	2.8
FEB	1959	197	27	28	4.3	1.8
MAR	1959	287	42	44	7.3	3.0
APR	1959	562	99	102	18.9	7.7
MAY	1959	346	54	56	9.6	3.9
JUN	1959	188	25	26	4.1	1.7
JUL	1959	55	5	6	0.7	0.3
AUG	1959	24	2	2	0.2	0.1
SEP	1959	29	2	2	0.3	0.1
OCT	1959	54	5	5	0.7	0.3
NOV	1959	63	6	7	0.9	0.4
DEC	1959	61	6	6	0.8	0.3
JAN	1960	71	7	8	1.0	0.4

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
FEB	1960	132	16	17	2.5	1.0
MAR	1960	809	156	162	31.5	12.8
APR	1960	1033	211	219	44.3	18.1
MAY	1960	505	86	89	16.2	6.6
JUN	1960	228	32	33	5.3	2.2
JUL	1960	47	4	5	0.6	0.2
AUG	1960	24	2	2	0.2	0.1
SEP	1960	27	2	2	0.3	0.1
OCT	1960	37	3	3	0.4	0.2
NOV	1960	71	7	8	1.0	0.4
DEC	1960	37	3	3	0.4	0.2
JAN	1961	72	8	8	1.1	0.4
FEB	1961	528	91	95	17.3	7.0
MAR	1961	550	96	100	18.3	7.5
APR	1961	661	121	125	23.7	9.7
MAY	1961	450	75	78	13.8	5.6
JUN	1961	222	31	32	5.1	2.1
JUL	1961	54	5	5	0.7	0.3
AUG	1961	41	4	4	0.5	0.2
SEP	1961	32	3	3	0.3	0.1
OCT	1961	48	5	5	0.6	0.2
NOV	1961	70	7	7	1.0	0.4
DEC	1961	102	12	12	1.7	0.7
JAN	1962	163	21	22	3.3	1.4
FEB	1962	442	73	76	13.5	5.5
MAR	1962	579	102	106	19.7	8.0
APR	1962	1932	462	480	106.5	43.5
MAY	1962	511	88	91	16.5	6.7
JUN	1962	218	30	31	5.0	2.0
JUL	1962	64	7	7	0.9	0.4
AUG	1962	74	8	8	1.1	0.4
SEP	1962	30	2	3	0.3	0.1
OCT	1962	130	16	16	2.4	1.0
NOV	1962	193	26	27	4.2	1.7
DEC	1962	360	56	59	10.1	4.1
JAN	1963	89	10	10	1.4	0.6
FEB	1963	1361	298	310	65.2	26.6
MAR	1963	313	47	49	8.3	3.4

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
APR	1963	861	168	175	34.3	14.0
MAY	1963	874	171	178	35.0	14.3
JUN	1963	226	31	33	5.3	2.1
JUL	1963	91	10	11	1.5	0.6
AUG	1963	22	2	2	0.2	0.1
SEP	1963	31	3	3	0.3	0.1
OCT	1963	33	3	3	0.4	0.1
NOV	1963	83	9	9	1.3	0.5
DEC	1963	88	10	10	1.4	0.6
JAN	1964	120	14	15	2.2	0.9
FEB	1964	128	15	16	2.4	1.0
MAR	1964	277	41	42	7.0	2.9
APR	1964	983	198	206	41.3	16.9
MAY	1964	371	59	61	10.5	4.3
JUN	1964	235	33	34	5.5	2.3
JUL	1964	66	7	7	0.9	0.4
AUG	1964	22	2	2	0.2	0.1
SEP	1964	26	2	2	0.3	0.1
OCT	1964	34	3	3	0.4	0.2
NOV	1964	71	7	8	1.0	0.4
DEC	1964	1964	472	490	109.0	44.5
JAN	1965	1202	255	265	54.8	22.3
FEB	1965	1348	295	306	64.3	26.2
MAR	1965	794	152	158	30.6	12.5
APR	1965	1399	309	321	67.8	27.6
MAY	1965	570	100	104	19.2	7.8
JUN	1965	250	36	37	6.1	2.5
JUL	1965	102	12	12	1.7	0.7
AUG	1965	64	6	7	0.9	0.4
SEP	1965	59	6	6	0.8	0.3
OCT	1965	79	8	9	1.2	0.5
NOV	1965	93	10	11	1.5	0.6
DEC	1965	89	10	10	1.4	0.6
JAN	1966	120	14	15	2.2	0.9
FEB	1966	148	19	19	2.9	1.2
MAR	1966	750	141	147	28.2	11.5
APR	1966	861	168	175	34.3	14.0
MAY	1966	237	33	35	5.6	2.3

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
JUN	1966	310	47	49	8.2	3.3
JUL	1966	44	4	4	0.5	0.2
AUG	1966	30	2	3	0.3	0.1
SEP	1966	32	3	3	0.3	0.1
OCT	1966	47	4	5	0.6	0.2
NOV	1966	97	11	11	1.6	0.7
DEC	1966	408	66	69	12.1	4.9
JAN	1967	386	62	64	11.1	4.5
FEB	1967	388	62	64	11.2	4.6
MAR	1967	627	113	118	22.0	9.0
APR	1967	694	128	133	25.4	10.3
MAY	1967	1270	273	284	59.1	24.1
JUN	1967	307	46	48	8.1	3.3
JUL	1967	82	9	9	1.3	0.5
AUG	1967	37	3	3	0.4	0.2
SEP	1967	23	2	2	0.2	0.1
OCT	1967	43	4	4	0.5	0.2
NOV	1967	60	6	6	0.8	0.3
DEC	1967	72	7	8	1.1	0.4
JAN	1968	97	11	11	1.6	0.7
FEB	1968	448	74	77	13.7	5.6
MAR	1968	231	32	34	5.4	2.2
APR	1968	131	16	16	2.4	1.0
MAY	1968	219	30	31	5.0	2.1
JUN	1968	176	23	24	3.7	1.5
JUL	1968	47	4	5	0.6	0.2
AUG	1968	31	3	3	0.3	0.1
SEP	1968	36	3	3	0.4	0.2
OCT	1968	36	3	3	0.4	0.2
NOV	1968	165	21	22	3.4	1.4
DEC	1968	146	18	19	2.8	1.2
JAN	1969	336	52	54	9.2	3.7
FEB	1969	252	36	37	6.1	2.5
MAR	1969	739	139	144	27.7	11.3
APR	1969	1881	447	465	102.6	41.9
MAY	1969	607	108	113	21.0	8.6
JUN	1969	415	67	70	12.3	5.0
JUL	1969	99	11	12	1.7	0.7

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
AUG	1969	22	2	2	0.2	0.1
SEP	1969	26	2	2	0.3	0.1
OCT	1969	43	4	4	0.5	0.2
NOV	1969	65	7	7	0.9	0.4
DEC	1969	116	14	14	2.1	0.8
JAN	1970	1495	335	348	74.3	30.3
FEB	1970	772	147	152	29.4	12.0
MAR	1970	844	164	170	33.3	13.6
APR	1970	681	125	130	24.7	10.1
MAY	1970	719	134	139	26.6	10.9
JUN	1970	267	39	40	6.6	2.7
JUL	1970	86	9	10	1.4	0.6
AUG	1970	31	3	3	0.3	0.1
SEP	1970	32	3	3	0.3	0.1
OCT	1970	47	4	5	0.6	0.2
NOV	1970	273	40	41	6.8	2.8
DEC	1970	261	38	39	6.5	2.6
JAN	1971	1349	295	306	64.4	26.3
FEB	1971	645	117	122	22.9	9.3
MAR	1971	785	150	156	30.1	12.3
APR	1971	1307	283	294	61.6	25.1
MAY	1971	718	134	139	26.6	10.8
JUN	1971	271	40	41	6.8	2.8
JUL	1971	92	10	11	1.5	0.6
AUG	1971	28	2	2	0.3	0.1
SEP	1971	49	5	5	0.6	0.2
OCT	1971	46	4	4	0.6	0.2
NOV	1971	87	9	10	1.4	0.6
DEC	1971	152	19	20	3.0	1.2
JAN	1972	405	65	68	11.9	4.9
FEB	1972	755	143	148	28.5	11.6
MAR	1972	2621	677	704	163.4	66.6
APR	1972	874	171	178	35.0	14.3
MAY	1972	612	110	114	21.2	8.7
JUN	1972	246	35	36	5.9	2.4
JUL	1972	103	12	12	1.7	0.7
AUG	1972	37	3	3	0.4	0.2
SEP	1972	36	3	3	0.4	0.2

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
OCT	1972	53	5	5	0.7	0.3
NOV	1972	82	9	9	1.3	0.5
DEC	1972	211	29	30	4.8	1.9
JAN	1973	211	29	30	4.8	1.9
FEB	1973	139	17	18	2.7	1.1
MAR	1973	380	60	63	10.9	4.5
APR	1973	527	91	94	17.2	7.0
MAY	1973	350	54	57	9.7	4.0
JUN	1973	166	21	22	3.4	1.4
JUL	1973	52	5	5	0.7	0.3
AUG	1973	30	3	3	0.3	0.1
SEP	1973	38	3	4	0.4	0.2
OCT	1973	47	4	5	0.6	0.2
NOV	1973	404	65	68	11.9	4.8
DEC	1973	999	202	210	42.3	17.2
JAN	1974	909	180	187	37.0	15.1
FEB	1974	362	57	59	10.2	4.2
MAR	1974	1448	322	335	71.1	29.0
APR	1974	1651	380	395	85.5	34.9
MAY	1974	989	200	208	41.7	17.0
JUN	1974	272	40	41	6.8	2.8
JUL	1974	62	6	7	0.9	0.4
AUG	1974	33	3	3	0.4	0.1
SEP	1974	24	2	2	0.2	0.1
OCT	1974	49	5	5	0.6	0.3
NOV	1974	84	9	10	1.3	0.5
DEC	1974	81	9	9	1.2	0.5
JAN	1975	124	15	15	2.3	0.9
FEB	1975	242	34	36	5.8	2.4
MAR	1975	648	118	122	23.1	9.4
APR	1975	1292	279	290	60.6	24.7
MAY	1975	1510	339	353	75.4	30.7
JUN	1975	290	43	45	7.4	3.0
JUL	1975	121	14	15	2.2	0.9
AUG	1975	52	5	5	0.7	0.3
SEP	1975	58	6	6	0.8	0.3
OCT	1975	83	9	9	1.3	0.5
NOV	1975	104	12	12	1.8	0.7

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
DEC	1975	145	18	19	2.8	1.2
JAN	1976	262	38	39	6.5	2.6
FEB	1976	376	59	62	10.7	4.4
MAR	1976	598	107	111	20.6	8.4
APR	1976	1560	354	367	78.9	32.2
MAY	1976	617	111	115	21.5	8.8
JUN	1976	218	30	31	5.0	2.0
JUL	1976	87	10	10	1.4	0.6
AUG	1976	139	17	18	2.7	1.1
SEP	1976	76	8	8	1.1	0.5
OCT	1976	87	10	10	1.4	0.6
NOV	1976	84	9	9	1.3	0.5
DEC	1976	75	8	8	1.1	0.5
JAN	1977	60	6	6	0.8	0.3
FEB	1977	89	10	10	1.4	0.6
MAR	1977	108	12	13	1.9	0.8
APR	1977	187	25	26	4.0	1.6
MAY	1977	389	62	65	11.2	4.6
JUN	1977	192	26	27	4.2	1.7
JUL	1977	58	6	6	0.8	0.3
AUG	1977	41	4	4	0.5	0.2
SEP	1977	52	5	5	0.7	0.3
OCT	1977	62	6	7	0.9	0.4
NOV	1977	92	10	11	1.5	0.6
DEC	1977	442	73	76	13.4	5.5
JAN	1978	728	136	142	27.1	11.1
FEB	1978	796	152	158	30.8	12.5
MAR	1978	1684	389	404	87.9	35.8
APR	1978	1308	284	295	61.7	25.2
MAY	1978	722	135	140	26.8	10.9
JUN	1978	274	40	42	6.9	2.8
JUL	1978	118	14	15	2.1	0.9
AUG	1978	47	4	5	0.6	0.2
SEP	1978	50	5	5	0.6	0.3
OCT	1978	60	6	6	0.8	0.3
NOV	1978	78	8	9	1.2	0.5
DEC	1978	95	11	11	1.6	0.6
JAN	1979	289	43	44	7.4	3.0

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
FEB	1979	1281	276	287	59.9	24.4
MAR	1979	2041	495	515	115.1	46.9
APR	1979	1356	297	308	64.8	26.4
MAY	1979	1291	279	290	60.5	24.7
JUN	1979	245	35	36	5.9	2.4
JUL	1979	67	7	7	1.0	0.4
AUG	1979	32	3	3	0.3	0.1
SEP	1979	32	3	3	0.3	0.1
OCT	1979	65	7	7	0.9	0.4
NOV	1979	108	12	13	1.9	0.8
DEC	1979	161	21	21	3.3	1.3
JAN	1980	611	109	114	21.2	8.6
FEB	1980	1097	228	237	48.2	19.7
MAR	1980	863	168	175	34.4	14.0
APR	1980	996	202	209	42.0	17.2
MAY	1980	474	80	83	14.9	6.1
JUN	1980	332	51	53	9.0	3.7
JUL	1980	90	10	10	1.4	0.6
AUG	1980	22	2	2	0.2	0.1
SEP	1980	38	3	3	0.4	0.2
OCT	1980	57	6	6	0.8	0.3
NOV	1980	80	9	9	1.2	0.5
DEC	1980	309	47	48	8.2	3.3
JAN	1981	173	23	23	3.6	1.5
FEB	1981	774	147	153	29.5	12.1
MAR	1981	671	123	128	24.2	9.9
APR	1981	666	122	126	23.9	9.8
MAY	1981	481	81	84	15.2	6.2
JUN	1981	290	43	45	7.5	3.0
JUL	1981	65	7	7	0.9	0.4
AUG	1981	22	2	2	0.2	0.1
SEP	1981	30	2	3	0.3	0.1
OCT	1981	75	8	8	1.1	0.5
NOV	1981	119	14	15	2.1	0.9
DEC	1981	843	164	170	33.3	13.6
JAN	1982	457	76	79	14.1	5.8
FEB	1982	2046	497	516	115.4	47.1
MAR	1982	1225	261	271	56.2	22.9

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
APR	1982	1713	398	413	90.0	36.7
MAY	1982	1153	242	252	51.7	21.1
JUN	1982	440	72	75	13.4	5.5
JUL	1982	192	26	27	4.2	1.7
AUG	1982	34	3	3	0.4	0.1
SEP	1982	50	5	5	0.6	0.3
OCT	1982	106	12	13	1.8	0.7
NOV	1982	122	15	15	2.2	0.9
DEC	1982	266	39	40	6.6	2.7
JAN	1983	476	80	83	15.0	6.1
FEB	1983	1406	310	323	68.2	27.8
MAR	1983	2644	685	711	165.4	67.5
APR	1983	1882	447	465	102.6	41.9
MAY	1983	1943	466	484	107.4	43.8
JUN	1983	558	98	102	18.7	7.6
JUL	1983	172	22	23	3.6	1.5
AUG	1983	65	7	7	0.9	0.4
SEP	1983	71	7	8	1.0	0.4
OCT	1983	119	14	15	2.2	0.9
NOV	1983	189	25	26	4.1	1.7
DEC	1983	498	85	88	15.9	6.5
JAN	1984	496	84	88	15.8	6.5
FEB	1984	788	150	156	30.3	12.4
MAR	1984	3006	804	835	197.9	80.7
APR	1984	3046	818	850	201.7	82.3
MAY	1984	1963	472	490	108.9	44.4
JUN	1984	770	146	152	29.3	12.0
JUL	1984	166	21	22	3.4	1.4
AUG	1984	67	7	7	1.0	0.4
SEP	1984	118	14	14	2.1	0.9
OCT	1984	191	25	26	4.1	1.7
NOV	1984	862	168	175	34.3	14.0
DEC	1984	408	66	69	12.0	4.9
JAN	1985	271	39	41	6.8	2.8
FEB	1985	365	57	60	10.3	4.2
MAR	1985	1166	246	255	52.5	21.4
APR	1985	2385	602	625	143.1	58.4
MAY	1985	549	96	99	18.3	7.5

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
JUN	1985	289	43	45	7.4	3.0
JUL	1985	89	10	10	1.4	0.6
AUG	1985	62	6	6	0.9	0.3
SEP	1985	80	9	9	1.2	0.5
OCT	1985	120	14	15	2.2	0.9
NOV	1985	116	14	14	2.1	0.8
DEC	1985	129	16	16	2.4	1.0
JAN	1986	339	52	54	9.3	3.8
FEB	1986	1732	403	419	91.4	37.3
MAR	1986	2435	618	642	147.3	60.1
APR	1986	873	171	178	35.0	14.3
MAY	1986	480	81	84	15.1	6.2
JUN	1986	210	29	30	4.8	1.9
JUL	1986	86	9	10	1.3	0.5
AUG	1986	42	4	4	0.5	0.2
SEP	1986	63	6	7	0.9	0.4
OCT	1986	101	11	12	1.7	0.7
NOV	1986	139	17	18	2.7	1.1
DEC	1986	124	15	15	2.3	0.9
JAN	1987	194	26	27	4.2	1.7
FEB	1987	413	67	70	12.3	5.0
MAR	1987	1230	263	273	56.6	23.1
APR	1987	976	197	204	40.9	16.7
MAY	1987	370	58	61	10.5	4.3
JUN	1987	220	30	32	5.1	2.1
JUL	1987	141	17	18	2.7	1.1
AUG	1987	44	4	4	0.5	0.2
SEP	1987	53	5	5	0.7	0.3
OCT	1987	72	8	8	1.1	0.4
NOV	1987	80	9	9	1.2	0.5
DEC	1987	113	13	14	2.0	0.8
JAN	1988	150	19	20	3.0	1.2
FEB	1988	364	57	59	10.2	4.2
MAR	1988	453	75	78	13.9	5.7
APR	1988	471	79	82	14.7	6.0
MAY	1988	346	54	56	9.6	3.9
JUN	1988	230	32	34	5.4	2.2
JUL	1988	81	9	9	1.2	0.5

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
AUG	1988	45	4	4	0.5	0.2
SEP	1988	44	4	4	0.5	0.2
OCT	1988	34	3	3	0.4	0.1
NOV	1988	113	13	14	2.0	0.8
DEC	1988	138	17	18	2.6	1.1
JAN	1989	138	17	18	2.6	1.1
FEB	1989	483	81	85	15.2	6.2
MAR	1989	2144	527	547	123.3	50.3
APR	1989	1735	404	420	91.6	37.4
MAY	1989	842	163	170	33.2	13.6
JUN	1989	201	27	28	4.5	1.8
JUL	1989	61	6	6	0.8	0.3
AUG	1989	34	3	3	0.4	0.1
SEP	1989	49	5	5	0.6	0.3
OCT	1989	60	6	6	0.8	0.3
NOV	1989	75	8	8	1.1	0.5
DEC	1989	81	9	9	1.2	0.5
JAN	1990	135	17	17	2.6	1.0
FEB	1990	112	13	14	2.0	0.8
MAR	1990	405	65	68	11.9	4.9
APR	1990	264	38	40	6.5	2.7
MAY	1990	251	36	37	6.1	2.5
JUN	1990	211	29	30	4.8	2.0
JUL	1990	52	5	5	0.7	0.3
AUG	1990	26	2	2	0.3	0.1
SEP	1990	46	4	5	0.6	0.2
OCT	1990	26	2	2	0.3	0.1
NOV	1990	65	7	7	0.9	0.4
DEC	1990	54	5	5	0.7	0.3
JAN	1991	106	12	13	1.8	0.7
FEB	1991	157	20	21	3.1	1.3
MAR	1991	190	25	26	4.1	1.7
APR	1991	332	51	53	9.0	3.7
MAY	1991	434	71	74	13.1	5.4
JUN	1991	219	30	31	5.0	2.1
JUL	1991	80	9	9	1.2	0.5
AUG	1991	22	2	2	0.2	0.1
SEP	1991	26	2	2	0.3	0.1

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
OCT	1991	38	3	3	0.4	0.2
NOV	1991	99	11	12	1.7	0.7
DEC	1991	124	15	15	2.3	0.9
JAN	1992	83	9	9	1.3	0.5
FEB	1992	320	49	51	8.6	3.5
MAR	1992	353	55	57	9.8	4.0
APR	1992	208	28	29	4.7	1.9
MAY	1992	197	27	28	4.3	1.8
JUN	1992	155	20	20	3.1	1.3
JUL	1992	58	6	6	0.8	0.3
AUG	1992	28	2	2	0.3	0.1
SEP	1992	25	2	2	0.2	0.1
OCT	1992	50	5	5	0.6	0.3
NOV	1992	67	7	7	1.0	0.4
DEC	1992	88	10	10	1.4	0.6
JAN	1993	133	16	17	2.5	1.0
FEB	1993	182	24	25	3.9	1.6
MAR	1993	3217	875	909	217.7	88.8
APR	1993	2507	641	666	153.5	62.6
MAY	1993	1242	266	276	57.3	23.4
JUN	1993	419	68	71	12.5	5.1
JUL	1993	94	10	11	1.5	0.6
AUG	1993	57	6	6	0.8	0.3
SEP	1993	43	4	4	0.5	0.2
OCT	1993	73	8	8	1.1	0.4
NOV	1993	66	7	7	0.9	0.4
DEC	1993	113	13	14	2.0	0.8
JAN	1994	127	15	16	2.3	1.0
FEB	1994	126	15	16	2.3	0.9
MAR	1994	385	61	64	11.1	4.5
APR	1994	360	56	59	10.1	4.1
MAY	1994	306	46	48	8.0	3.3
JUN	1994	199	27	28	4.4	1.8
JUL	1994	44	4	4	0.5	0.2
AUG	1994	27	2	2	0.3	0.1
SEP	1994	23	2	2	0.2	0.1
OCT	1994	31	3	3	0.3	0.1
NOV	1994	63	6	7	0.9	0.4

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
DEC	1994	69	7	7	1.0	0.4
JAN	1995	409	66	69	12.1	4.9
FEB	1995	1177	249	258	53.2	21.7
MAR	1995	796	152	158	30.7	12.5
APR	1995	549	96	99	18.3	7.4
MAY	1995	603	108	112	20.8	8.5
JUN	1995	262	38	39	6.5	2.6
JUL	1995	75	8	8	1.1	0.5
AUG	1995	22	2	2	0.2	0.1
SEP	1995	24	2	2	0.2	0.1
OCT	1995	43	4	4	0.5	0.2
NOV	1995	64	7	7	0.9	0.4
DEC	1995	345	53	56	9.5	3.9
JAN	1996	500	85	88	16.0	6.5
FEB	1996	1777	416	433	94.7	38.6
MAR	1996	930	185	192	38.2	15.6
APR	1996	823	159	165	32.2	13.1
MAY	1996	694	128	133	25.4	10.4
JUN	1996	234	33	34	5.5	2.3
JUL	1996	74	8	8	1.1	0.5
AUG	1996	27	2	2	0.3	0.1
SEP	1996	47	4	5	0.6	0.2
OCT	1996	56	5	6	0.7	0.3
NOV	1996	155	20	20	3.1	1.3
DEC	1996	868	170	176	34.7	14.2
JAN	1997	1219	260	270	55.9	22.8
FEB	1997	845	164	171	33.4	13.6
MAR	1997	1099	228	237	48.3	19.7
APR	1997	927	184	191	38.0	15.5
MAY	1997	384	61	64	11.1	4.5
JUN	1997	219	30	31	5.0	2.0
JUL	1997	67	7	7	0.9	0.4
AUG	1997	23	2	2	0.2	0.1
SEP	1997	46	4	5	0.6	0.2
OCT	1997	57	6	6	0.8	0.3
NOV	1997	67	7	7	0.9	0.4
DEC	1997	66	7	7	0.9	0.4
JAN	1998	252	36	37	6.1	2.5

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
FEB	1998	338	52	54	9.2	3.8
MAR	1998	1444	321	334	70.8	28.9
APR	1998	1089	225	234	47.7	19.4
MAY	1998	1407	311	323	68.3	27.9
JUN	1998	714	133	138	26.4	10.8
JUL	1998	124	15	15	2.3	0.9
AUG	1998	38	3	3	0.4	0.2
SEP	1998	33	3	3	0.4	0.1
OCT	1998	41	4	4	0.5	0.2
NOV	1998	163	21	22	3.3	1.4
DEC	1998	281	41	43	7.1	2.9
JAN	1999	340	52	55	9.3	3.8
FEB	1999	394	63	66	11.5	4.7
MAR	1999	1654	380	395	85.7	34.9
APR	1999	1707	396	411	89.5	36.5
MAY	1999	1073	221	230	46.7	19.1
JUN	1999	285	42	44	7.3	3.0
JUL	1999	69	7	7	1.0	0.4
AUG	1999	40	4	4	0.5	0.2
SEP	1999	40	4	4	0.5	0.2
OCT	1999	11	1	1	0.1	0.0
NOV	1999	74	8	8	1.1	0.4
DEC	1999	82	9	9	1.3	0.5
JAN	2000	120	21	22	2.2	0.9
FEB	2000	387	89	92	11.2	4.6
MAR	2000	1043	184	191	44.9	18.3
APR	2000	1413	217	226	68.7	28.0
MAY	2000	334	52	54	9.1	3.7
JUN	2000	167	17	18	3.5	1.4
JUL	2000	49	4	4	0.6	0.2
AUG	2000	22	1	1	0.2	0.1
SEP	2000	32	2	2	0.3	0.1
OCT	2000	53	4	4	0.7	0.3
NOV	2000	61	7	7	0.8	0.3
DEC	2000	67	7	8	1.0	0.4
JAN	2001	70	8	8	1.0	0.4
FEB	2001	94	11	12	1.5	0.6
MAR	2001	407	41	43	12.0	4.9

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
APR	2001	377	69	72	10.8	4.4
MAY	2001	291	45	47	7.5	3.1
JUN	2001	170	13	13	3.5	1.4
JUL	2001	54	5	5	0.7	0.3
AUG	2001	22	2	2	0.2	0.1
SEP	2001	23	1	1	0.2	0.1
OCT	2001	31	2	2	0.3	0.1
NOV	2001	60	6	6	0.8	0.3
DEC	2001	119	20	21	2.1	0.9
JAN	2002	350	82	85	9.7	4.0
FEB	2002	192	56	58	4.2	1.7
MAR	2002	486	91	94	15.4	6.3
APR	2002	856	181	188	34.0	13.9
MAY	2002	259	37	39	6.4	2.6
JUN	2002	165	11	12	3.4	1.4
JUL	2002	45	3	3	0.5	0.2
AUG	2002	24	1	1	0.2	0.1
SEP	2002	25	1	1	0.2	0.1
OCT	2002	31	2	2	0.3	0.1
NOV	2002	45	2	2	0.6	0.2
DEC	2002	57	4	4	0.8	0.3
JAN	2003	262	65	68	6.5	2.6
FEB	2003	360	93	97	10.1	4.1
MAR	2003	509	75	78	16.4	6.7
APR	2003	480	129	134	15.1	6.2
MAY	2003	437	70	73	13.2	5.4
JUN	2003	165	19	19	3.4	1.4
JUL	2003	48	3	3	0.6	0.2
AUG	2003	23	1	1	0.2	0.1
SEP	2003	30	1	1	0.3	0.1
OCT	2003	27	2	2	0.3	0.1
NOV	2003	48	4	4	0.6	0.2
DEC	2003	81	21	22	1.3	0.5
JAN	2004	125	63	65	2.3	0.9
FEB	2004	526	121	126	17.2	7.0
MAR	2004	1719	272	282	90.5	36.9
APR	2004	950	162	168	39.4	16.1
MAY	2004	609	103	107	21.1	8.6

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
JUN	2004	252	47	48	6.1	2.5
JUL	2004	51	9	10	0.7	0.3
AUG	2004	22	4	4	0.2	0.1
SEP	2004	23	3	3	0.2	0.1
OCT	2004	55	6	6	0.7	0.3
NOV	2004	60	7	7	0.8	0.3
DEC	2004	103	19	19	1.8	0.7
JAN	2005	126	30	31	2.3	0.9
FEB	2005	130	32	33	2.4	1.0
MAR	2005	659	51	53	23.6	9.6
APR	2005	752	94	98	28.4	11.6
MAY	2005	780	118	122	29.9	12.2
JUN	2005	234	29	31	5.5	2.3
JUL	2005	52	6	6	0.7	0.3
AUG	2005	22	1	1	0.2	0.1
SEP	2005	23	1	1	0.2	0.1
OCT	2005	40	2	2	0.5	0.2
NOV	2005	87	9	10	1.4	0.6
DEC	2005	462	62	64	14.3	5.9
JAN	2006	1187	260	270	53.8	22.0
FEB	2006	552	173	180	18.4	7.5
MAR	2006	1230	178	185	56.6	23.1
APR	2006	2861	487	506	184.7	75.4
MAY	2006	1195	167	174	54.3	22.1
JUN	2006	393	42	43	11.4	4.7
JUL	2006	82	11	12	1.3	0.5
AUG	2006	23	2	2	0.2	0.1
SEP	2006	30	2	3	0.3	0.1
OCT	2006	60	4	4	0.8	0.3
NOV	2006	86	17	18	1.3	0.6
DEC	2006	227	71	74	5.3	2.2
JAN	2007	176	84	88	3.7	1.5
FEB	2007	454	89	93	14.0	5.7
MAR	2007	1081	204	212	47.2	19.2
APR	2007	581	112	116	19.8	8.1
MAY	2007	312	36	38	8.3	3.4
JUN	2007	155	10	11	3.1	1.3
JUL	2007	44	2	2	0.5	0.2

Month	Year	Average Monthly Flow (cfs)				
		Crooked River, Inflow to Prineville Reservoir	Ochoco Creek, Inflow to Ochoco Reservoir	Ochoco Creek at Mouth	McKay Creek at Mouth	Lytle Creek at Mouth
AUG	2007	22	1	1	0.2	0.1
SEP	2007	23	1	1	0.2	0.1
OCT	2007	48	7	7	0.6	0.2
NOV	2007	74	14	14	1.1	0.4
DEC	2007	81	21	22	1.2	0.5
JAN	2008	99	34	35	1.7	0.7
FEB	2008	242	52	54	5.8	2.4
MAR	2008	650	147	152	23.1	9.4
APR	2008	1016	199	206	43.3	17.6
MAY	2008	873	212	220	35.0	14.3
JUN	2008	285	80	83	7.3	3.0
JUL	2008	44	8	8	0.5	0.2
AUG	2008	22	3	3	0.2	0.1
SEP	2008	29	3	3	0.3	0.1
OCT	2008	38	3	3	0.4	0.2
NOV	2008	51	6	6	0.7	0.3
DEC	2008	53	12	12	0.7	0.3
JAN	2009	116	26	27	2.1	0.8
FEB	2009	152	25	26	3.0	1.2
MAR	2009	509	34	36	16.4	6.7
APR	2009	955	91	95	39.7	16.2
MAY	2009	608	91	94	21.0	8.6
JUN	2009	239	22	23	5.7	2.3
JUL	2009	63	3	3	0.9	0.4
AUG	2009	28	2	2	0.3	0.1
SEP	2009	33	1	1	0.4	0.1
OCT	2009	47	3	3	0.2	0.1
NOV	2009	62	3	3	0.6	0.3
DEC	2009	59	5	5	1.2	0.5
JAN	2010	203	29	30	11.9	4.8
FEB	2010	287	61	63	16.2	6.6
MAR	2010	664	86	89	15.3	6.2
APR	2010	1310	185	192	37.7	15.4
MAY	2010	645	123	128	25.3	10.3
JUN	2010	692	126	131	20.4	8.3
JUL	2010	54	20	21	2.4	1.0
AUG	2010	22	7	7	0.2	0.1
SEP	2010	35	3	3	0.3	0.1