

# Chehalis Basin Strategy Dam Operations Plan

---

*Technical Workshop*

*May 7, 2014*



# Operational Considerations

- Provide flood reduction in downstream areas
- Preserve geomorphic processes downstream
- Maintain slope stability in reservoir
- Keep rate of change in flows downstream within accepted limits to minimize fish stranding
- Store water during winter and release during summer for fisheries and water quality enhancement (Multi-purpose Alternative)

# Proposed Operating Rules

---



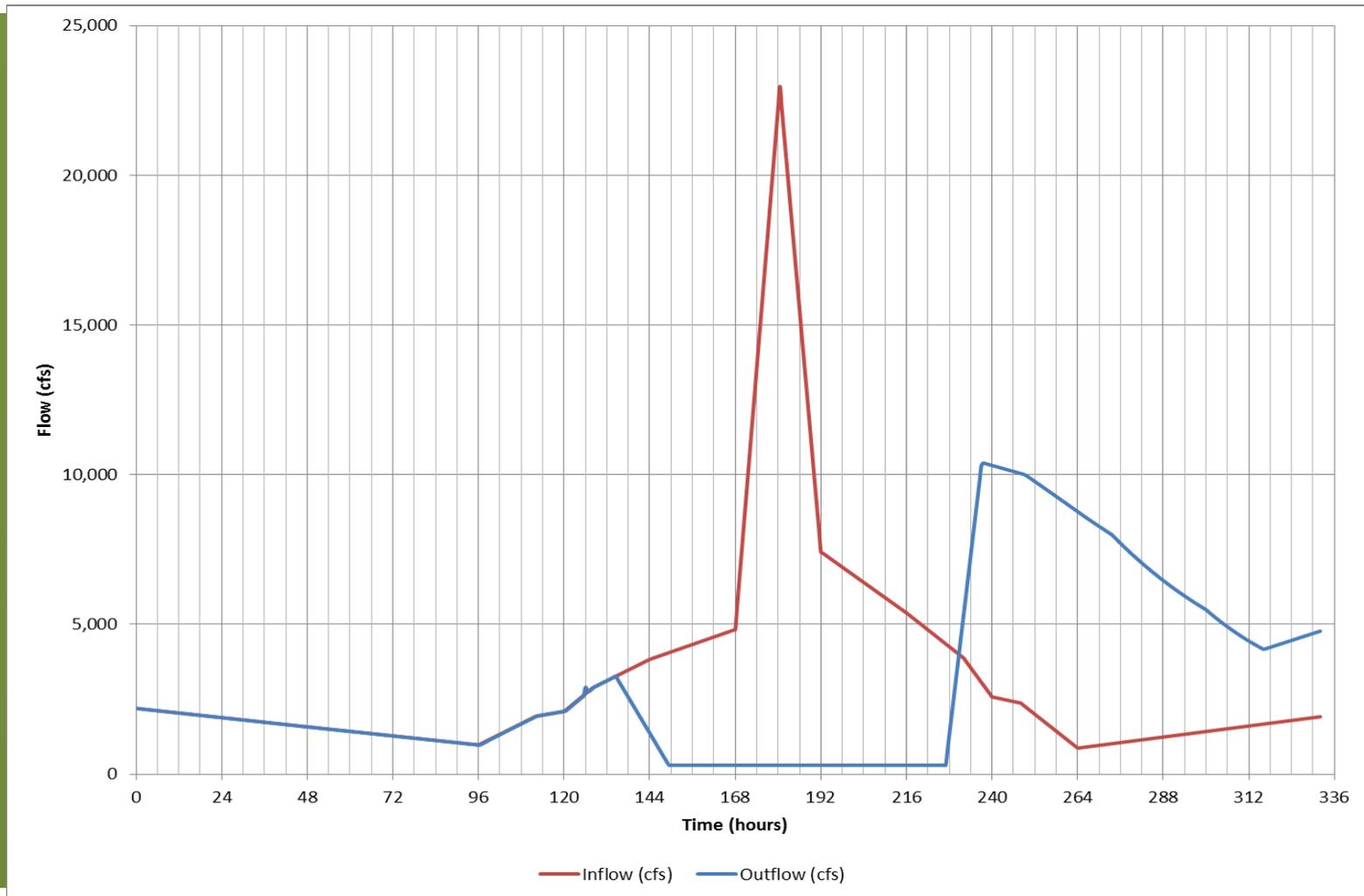
# Proposed Operating Rules – Flood Retention Only

- Available flood storage capacity = 65,000 acre-feet
- The objective is to operate the facility without impounding water except during a flood that causes damage in downstream areas
- When flows at Grand Mound gage are predicted to be above the “Major Flood” stage of 38,800 cfs within 48 hours, the reservoir starts impounding water
- The reservoir outflow is reduced at a rate of 200 cfs per hour until the reservoir outflow reaches 300 cfs.
  - The 200 cfs per hour rate was selected to reduce fish stranding in downstream areas. The 300 cfs flow is the recommended instream flow for the upper Chehalis River in winter.

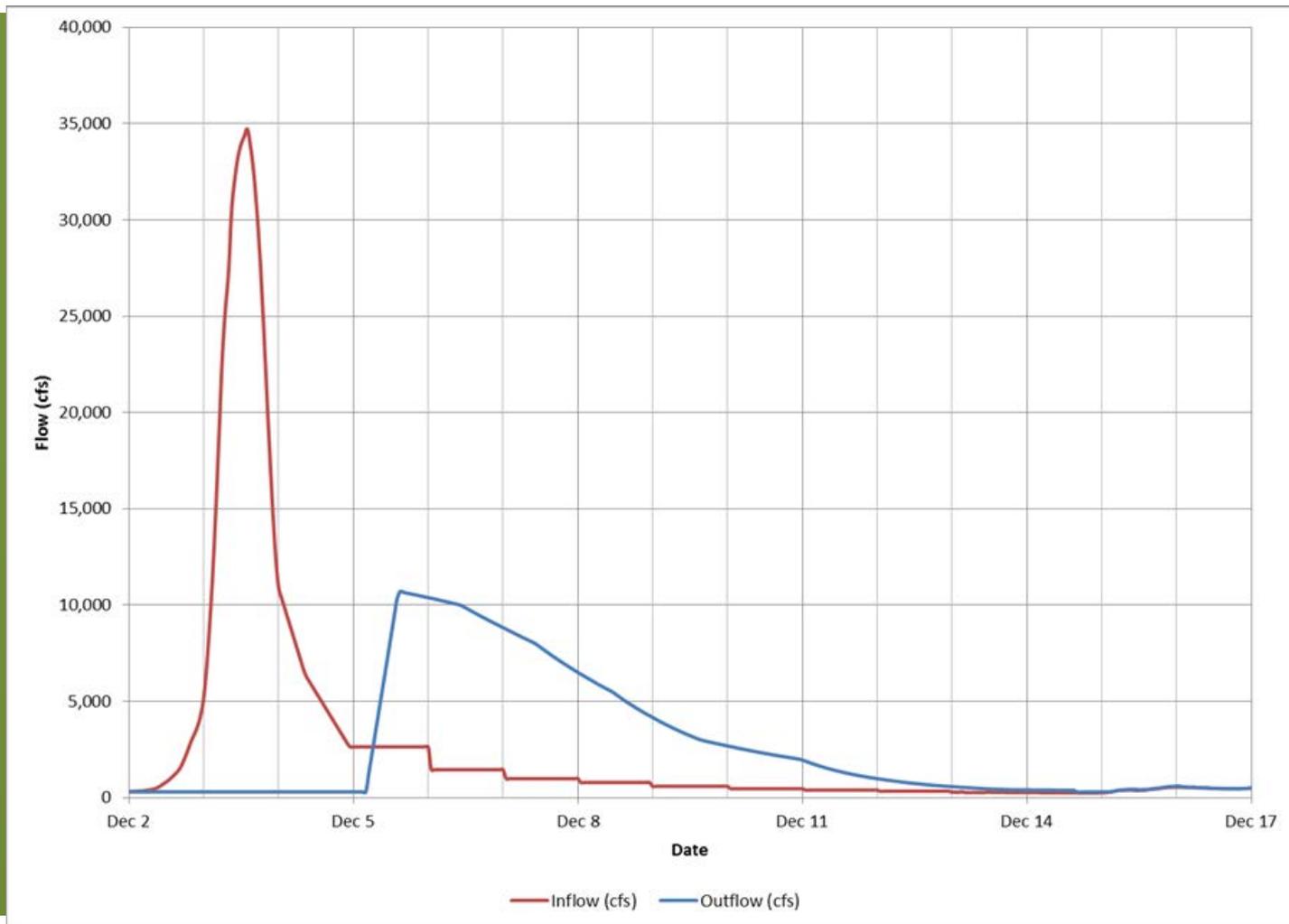
# Proposed Operating Rules – Flood Retention Only, continued

- Two days (48 hours) after Grand Mound flow drops below flood stage, the reservoir will increase its outflow at a rate of 1,000 cfs per hour to evacuate the reservoir. The maximum release rate is confined by the maximum drawdown rate recommended by geotechnical engineers to reduce the potential for landslides that could be triggered by a rapid drawdown in the reservoir. That rate is 30 feet per day. The drawdown rate may be reduced to allow for debris removal after large floods.

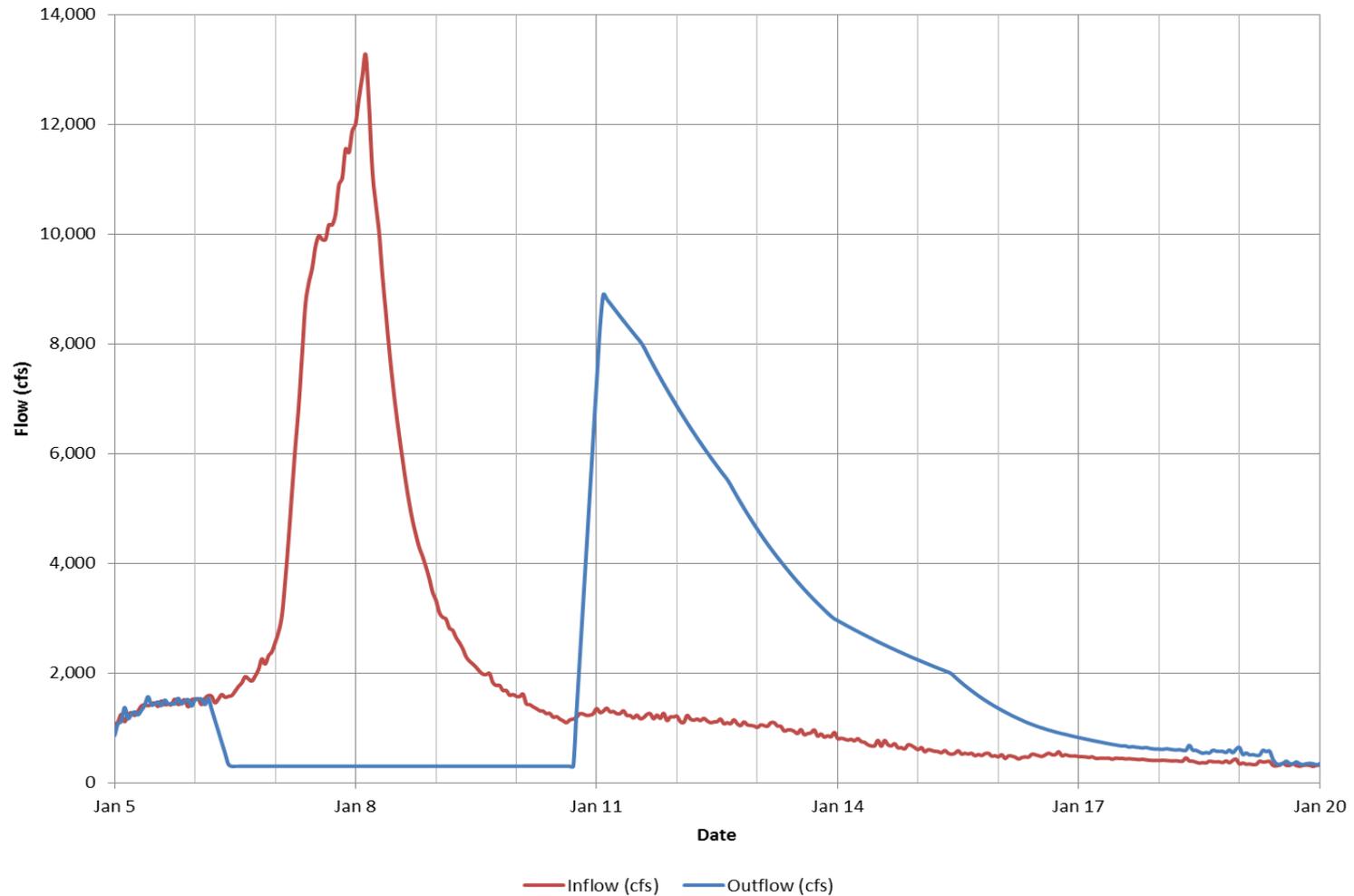
# Reservoir Inflow/Outflow during Large Flood – 100-Year Flood



# Reservoir Inflow/Outflow during 2007 Event



# Reservoir Inflow/Outflow during 2009 Event



# Reservoir Storage Used during Floods

FLOOD EVENT	VOLUME UTILIZED (AC-FT)	MAXIMUM ELEVATION (FT)
100-yr	53,830	612.3
10-yr	25,150	566.7
1996	45,020	600.7
2007	60,260	620.7
2009	34,840	584.3

# Frequency of Reservoir Usage

WATER YEAR (OCT 1 – SEPT 30)	NUMBER OF TIMES UTILIZED	NUMBER OF DAYS UTILIZED	PEAK RESERVOIR STAGE (FT)
1990	2	23	578.9
1991	2	23	569.1
1996	2	14	600.7
1997	1	1	467.9
2008	1	13	620.7
2009	1	13	584.3
<b>Total (1989 – 2012)</b>	9	87 (10 days on average or 1% of the time)	

# Downstream Flood Reduction

FLOOD EVENT	EXISTING PEAK FLOW (CFS) <sup>1</sup>	ESTIMATED RECURRENCE INTERVAL (YEARS)	PEAK FLOW WITH FLOOD RETENTION DAM (CFS)	ESTIMATED RECURRENCE INTERVAL (YEARS)	DIFFERENCE IN FLOW (%)
100-year	74,800	100	61,100	40	-18.3%
10-year	41,500	10	35,600	5	-14.2%
1996	72,100	90	61,200	40	-15.1%
2007	79,800	140	59,300	40	-25.7%
2009	57,300	35	48,600	15	-15.2%

# Downstream Flood Reduction

FLOOD EVENT	NEWAUKUM CONFLUENCE (FT)	CHEHALIS-CENTRALIA AIRPORT (FT)	MELLEN STREET (FT)	SKOOKUMCHUCK CONFLUENCE (FT)
100-year	1.2	1.5	1.8	1.4
10-year	1.4	1.6	2.1	1.7
1996	0.9	1.4	1.6	1.3
2007	1.3	2.1	2.4	2.2
2009	1.3	1.7	0.8	1.2

# Operating Rules – Multi-purpose

- The Multi-Purpose facility would have a conservation pool of 65,000 acre-feet and a flood storage pool also with 65,000 acre-foot capacity. The conservation pool would be utilized to provide instream flows during period of low flow (typically summer). The flood storage pool would capture high flows to reduce downstream flooding.

# Operating Rules – Multi-purpose

- During Large Flood Events
  - Similar to Multi-Purpose alternative except some of the flow may be retained for the conservation pool, depending on its storage volume. If the flood storage pool is being utilized during a flood, releases following the flood are increased at a rate of 1,000 cfs per hour to evacuate the flood storage pool. The peak release rate is dependent on the total storage and is as high as 11,000 cfs.
- Smaller (Non-Flood Causing) Storm Events
  - To help maintain geomorphic processes downstream of the reservoir, moderate events that occur multiple times per year on average (inflows 2,800 cfs and above) would be allowed to pass through (releases equal to inflow) as long as the flow at Grand Mound is not predicted to be in a flood condition.

# Operating Rules – Multi-purpose

- Instream Flows

- Minimum releases for instream flows are proposed

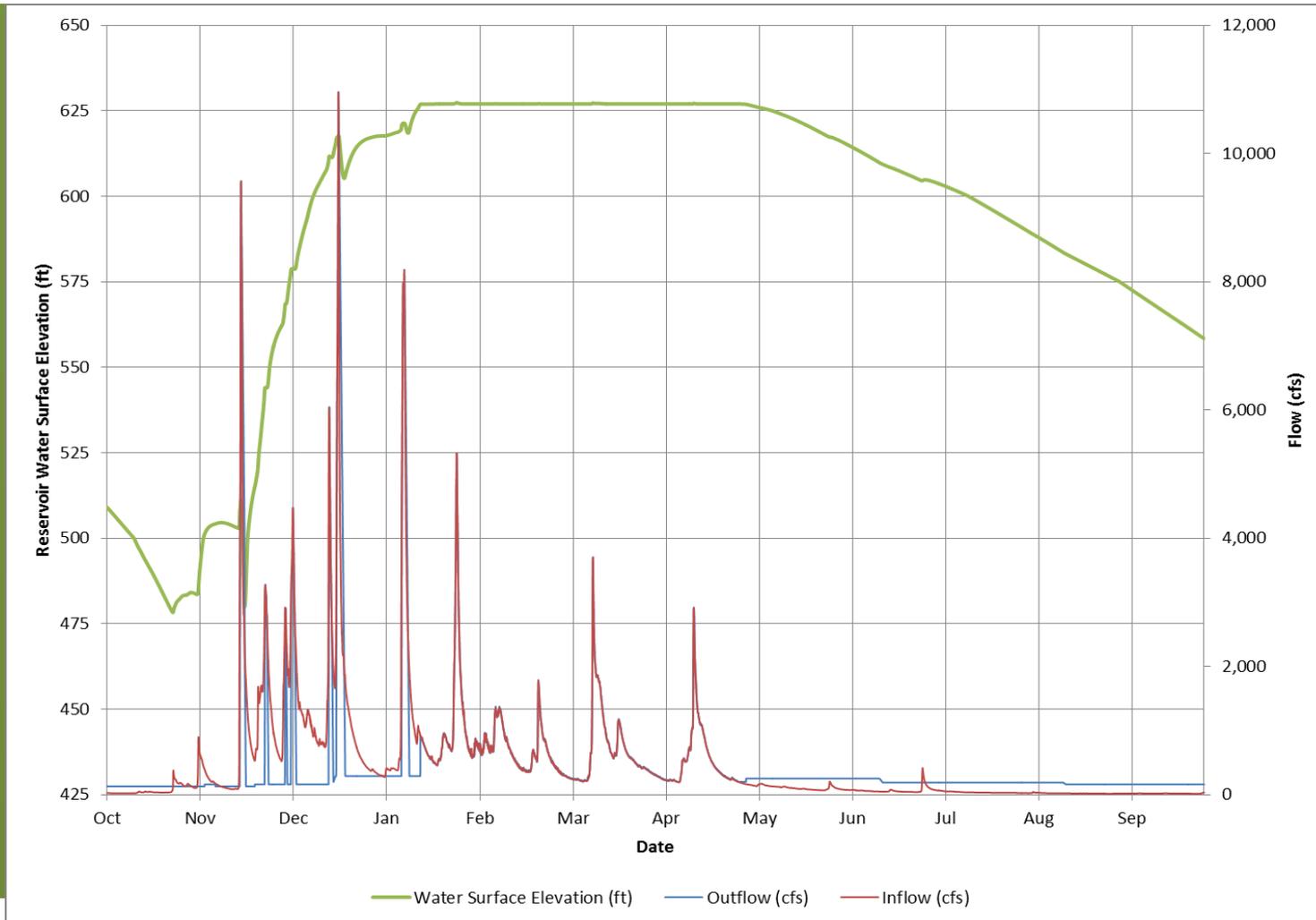
TIME PERIOD	FLOW
Jan-Feb	290 cfs
Mar-Jun 15	250 cfs
Jun 16-Aug 15	190 cfs
Aug 16-Dec 15	160 cfs
Dec 16-31	290 cfs

- During drought years, reservoir releases are reduced by 20% to prevent the reservoir from completely running out

# Flood Reduction with Multi-purpose Reservoir

- Same downstream flood reduction benefits as shown for the Flood Reduction Only Reservoir

# Example of Multi-purpose Reservoir Operations (2002)



# Reliability of Instream Flow Releases

TIME PERIOD	INSTREAM FLOW	CHEHALIS RIVER AT DAM SITE EXISTING FLOW EXCEEDANCE	MULTI-PURPOSE RESERVOIR OUTFLOW EXCEEDANCE
Jan-Feb	290 cfs	72.9%	90.1%
Mar-Jun 15	250 cfs	45.6%	87.2%
Jun 16-Aug 15	190 cfs	1.1%	94.9%
Aug 16-Dec 15	160 cfs	36.4%	98.1%
Dec 16-31	290 cfs	70.1%	94.2%

- During drought years when instream flows are not met, 80% of the instream flow is provided

# Questions