WPIC Technical Committee July 17, 2014

- Overview of Negotiation Process
- Basis for Incorporation of Adaptive Management
- Review of Selected technical elements in body of Water Use Agreement
- Review of Appendices to Water Use Agreement

Received from CSKT by LEPO July 17, 2014

Overview

- Parties to Negotiation – Tribes, FJBC, BIA
  - Tribes – Legal and Technical Representatives
  - FJBC – Legal and Technical Representatives

- Technical data sharing CSKT to FJBC
  - HYDROSS Models, CSKT Surface Water Supply Report, Requested HYDROSS model input files, Crop water requirement curves, several maps and spreadsheets

- Negotiations active over 2010-2013 period – CME operating FIIP during process

Selected Public Outreach related to Water Use Agreement

- May 31, 2012 – FJBC approved release of the May 18, 2012 public draft of the WUA. The Draft proposed WUA document was available to the public online shortly after May 31, 2012.
- June 21, 2012 – Public open house held in Pablo, Montana. Informational displays and maps were presented to allow irrigators and the public to understand the Draft proposed WUA.
- June 27, 2012 – A formal negotiation session was held discussing the Draft proposed WUA. Representatives at the session included staff from state and federal agencies, and the Tribes. A presentation was made describing instream flows, and a formal question and answer period was provided.
- August 20, 2012 – Evening public meeting held in Ronan, Montana. Technical presentations were made regarding instream flows and hydrology of the irrigation system. Presentations included a detailed review by DOWL HKM Engineering on the hydrological modeling of the streams and irrigation system that provided the basis of the Draft proposed WUA. Presentation also by FJBC Engineering consultant
- September 4, 2012 – Public meeting on the Draft proposed WUA. A presentation was made describing the technical basis of the new flow regime.
- September 5, 2012 – A formal negotiation session was held discussing the Draft proposed WUA. Representatives at the session included staff from state and federal agencies and the Tribes. The meeting audio is available to the public on the Reserved Water Rights Compact Commission (RWRCC) website.
- October 3, 2012 – A formal negotiation session was held discussing the Draft proposed WUA. Representatives at the session included staff from state and federal agencies and the Tribes. The meeting audio is available to the public on the RWRCC website.
- October 24, 2012 – A formal negotiation session was held discussing the Draft proposed WUA. Representatives at the session included staff from state and federal agencies and the Tribes. The meeting audio is available to the public on the RWRCC website.
- January 8-9, 2013 – A formal negotiation session was held discussing the Draft proposed WUA. Representatives at the session included staff from Tribes, FJBC, and state and federal agencies. The meeting was open to irrigators and the public. The meeting led to the final draft version of WUA produced on January 17, 2013.
- February 4-5, 2013 – The FJBC held public meetings on the proposed WUA in Arlee, St. Ignatius, Hot Springs, and Ronan Montana.
- March 2013 – A kiosk was staffed full-time and provided information regarding water rights compact issues at the state capitol building in Helena, Montana. The purpose of the kiosk was to address questions from legislators and the public on a range of issues relating to water rights.

Collectively understood negotiation points related to Water Use Agreement

- FIIP is not a full water supply irrigation system
- During dry years – shortages will be shared between instream flow and irrigation uses
- Instream flow and irrigation water allocation numbers are based on a modern and well-managed irrigation project where water rights settlement resources have targeted both operational improvements and infrastructure rehabilitation
- Irrigation target to match historic crop consumption not historic diversion
- Instream flow MEF flows target improvement in several drainages , emphasizing bull trout streams. MEF meant to be implemented with TIF flows
- Additional FJBC focus - equitable distribution of irrigation water within each of the three irrigated valleys, low cost power, R&B resource benefits to infrastructure
- Additional CSKT focus – instream flows, minimum reservoir levels, river diversion allowances, waste-ways, R&B resource benefits to fisheries
- FJBC / Project Operator focus – preserve full flexibility with water operations once water within FIIP service and distribution system
    - Ex: preserve irrigator ability to move water between tracts of land within same source of supply to prioritize fields

Common Definitions through process

- Potential Evapotranspiration (ET)
  - Consists of three components:
    - Water evaporated from the soil surface
    - Water intercepted by the plants
    - Water transpired by the plants
  - Assumes full water supply and ideal water management

- Effective Precipitation (Pe)
  - Precipitation used to offet crop water requirements

- Net Irrigation Requirement (NIR)
  - Irrigation water required to fully meet the maximum potential crop consumption (ET-Pe)

- Crop Irrigation Consumption
  - Irrigation water consumed by the crops

- Farm Turnout Allowance (FTA)
  - Irrigation water turnout volumes, reported in acre-feet per acre of land, intended to be met at individual farm turnouts. FTA's include on-farm efficiency and crop irrigation consumptions

Focus on FIIP Water Supply: Project reporting of quota and delivery for readily available years, *values in af/ac*

Little Bitterroot Valley			
Year	Quota	Reported Delivery	Source
1971	0.7	1.05	FIIP Crop Report
1972	0.9	1.45	FIIP Crop Report
1973	1.0	0.95	FIIP Crop Report
1974	1.1	1.3	FIIP Crop Report
1975	1.0	1.1	FIIP Crop Report
1976	0.9	1.0	FIIP Crop Report
1977	0.7	0.75	FIIP Crop Report
1978	0.7	0.8	FIIP Crop Report
1979	0.6	1.15	FIIP Crop Report
1980	0.6	0.5	FIIP Crop Report
1981	0.75	1.15	FIIP Crop Report
1982	0.7	1.0	FIIP Crop Report
1983	1.0	0.8	FIIP Crop Report
1984	0.7	0.9	FIIP Crop Report
1985	0.9	0.85	FIIP Crop Report
1986	0.7	1.1	FIIP Crop Report
1987	1.0	0.9	FIIP Crop Report
1988	0.7	0.6	FIIP Crop Report

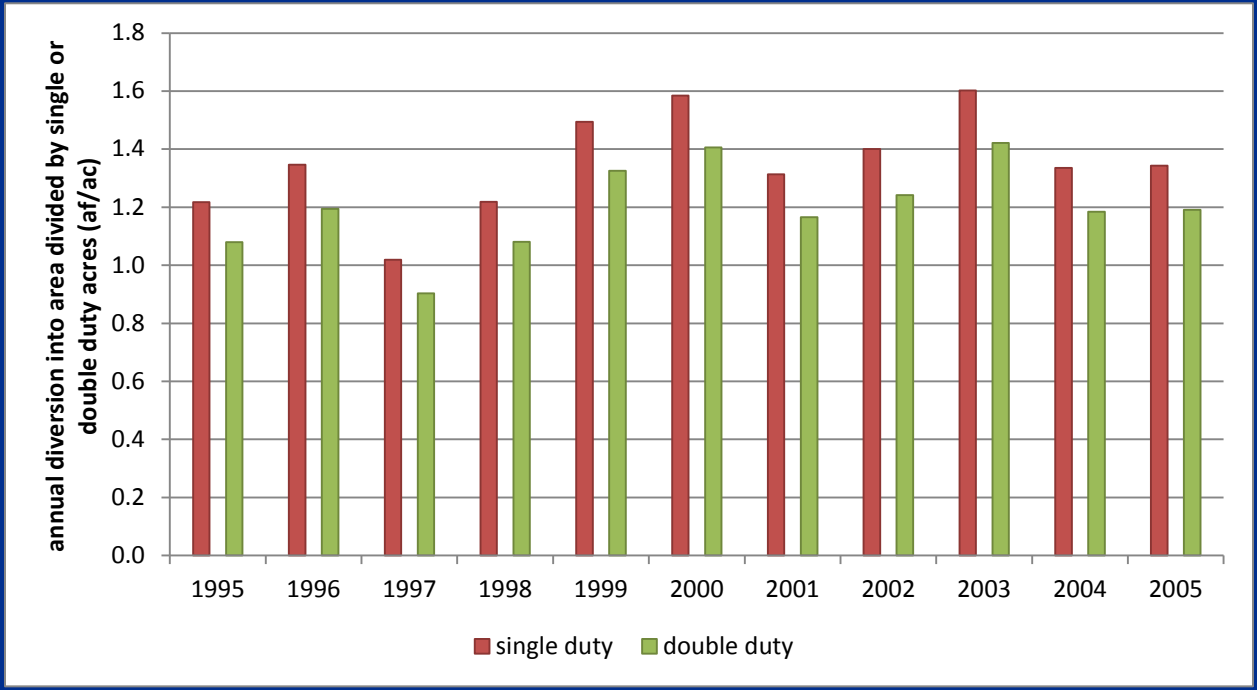
Mission Valley			
Year	Quota	Reported delivery	Source
1968	1.1	1.05	FIIP Crop Report
1969	1.0	1.3	FIIP Crop Report
1970	0.7	1.0	FIIP Crop Report
1971	0.8	1.05	FIIP Crop Report
1972	0.8	1.25	FIIP Crop Report
1973	0.8	1.05	FIIP Crop Report
1974	0.8	1.15	FIIP Crop Report
1975	1.1	0.85	FIIP Crop Report
1976	0.9	1.05	FIIP Crop Report
1977	0.8	0.85	FIIP Crop Report
1978	0.3	0.6	FIIP Crop Report
1979	0.65	1.2	FIIP Crop Report
1980	0.6	0.5	FIIP Crop Report
1981	0.7	0.65	FIIP Crop Report
1982	0.9	1.0	FIIP Crop Report
1983	0.7	0.9	FIIP Crop Report
1984	0.8	0.9	FIIP Crop Report
1985	1.0	0.85	FIIP Crop Report
1986	1.0	1.0	FIIP Crop Report
1987	0.45	0.65	FIIP Crop Report
1988	0.9	0.85	FIIP Crop Report

Focus on FIIP Water Supply: Diversion from Pablo Reservoir measured at Pablo A Canal (1995 -2005). Sole source serving North Pablo, Valley View, Round Butte

~ 37,856 single duty acres

~ 4,832 acres classified as double duty

This single figure - showing total diversion prior to conveyance and onfarm losses - illustrates water supply for just under 30 % of entire irrigation project



Diversion volumes, Pablo A Canal	1995 – 46,097 af	1998 – 46,137 af	2001 – 49,734 af	2004 – 60,568 af
	1996 – 50,955 af	1999 – 56,555 af	2002 – 52,994 af	2005 – 50,843 af
	1997 – 38,572 af	2000 – 60,000 af	2003 – 60,654 af	

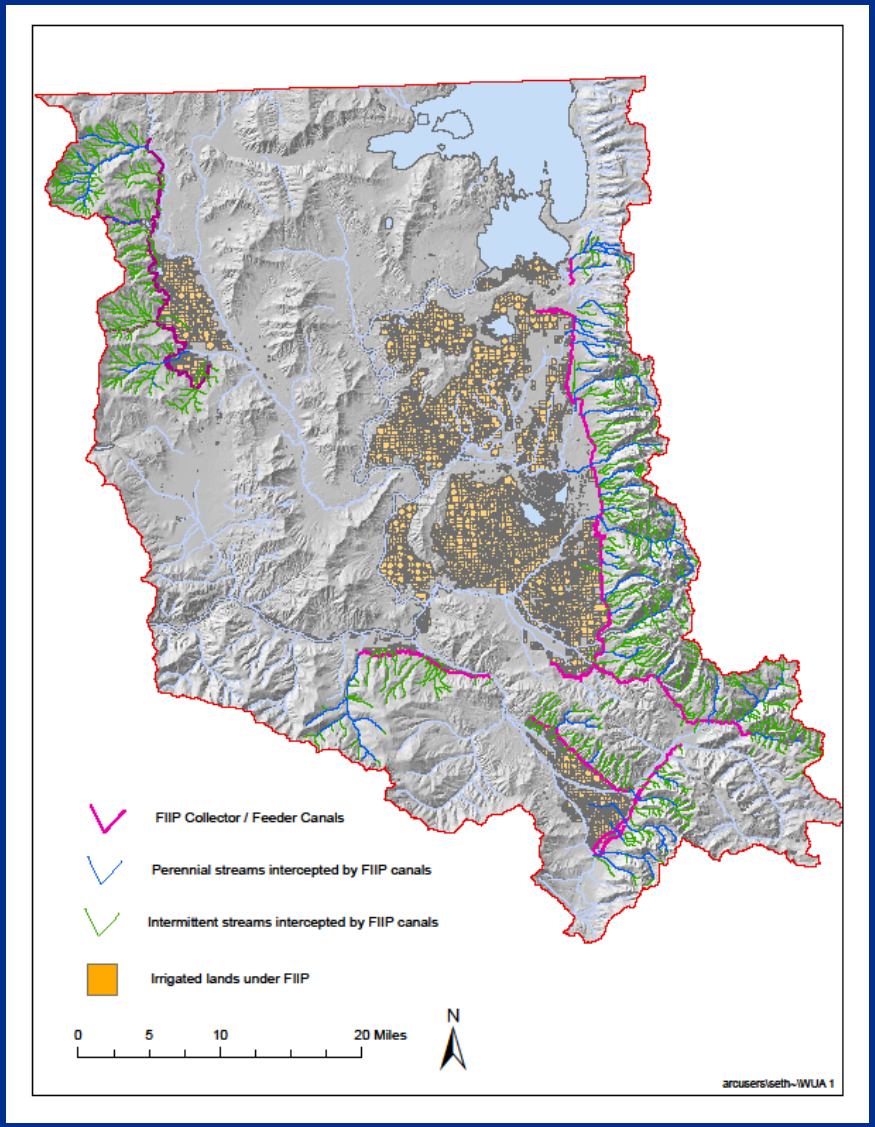
Numerous other canal examples available in August 20, 2012 presentation by DOWL HKM

Background - Adaptive Management

- Precedent – FIIP Fish / Water technical team. Operated for several years – coordination process between CSKT and Project Operator
- Motivation going forward – Shared resource management responsibilities implicated in Compact and Water Use Agreement
- Adaptive Management is a key tool to address potential uncertainty in instream flow and irrigation allocation numbers
- Adaptive management key to address basic constraints related to irrigation project and project water supply
- Water Use Agreement numbers are structured around water year types – wet through dry

Adaptive Management

Basic Constraint: Water Supply Sources



Basic Constraint: Project layout

Physical Infrastructure

- ~ 1,100 miles of open earthen ditches
- ~ 10,000 irrigation structures
- 16 irrigation reservoirs
- Water supply can vary widely based on snowpack / spring rains

Basic Constraint: Administrative

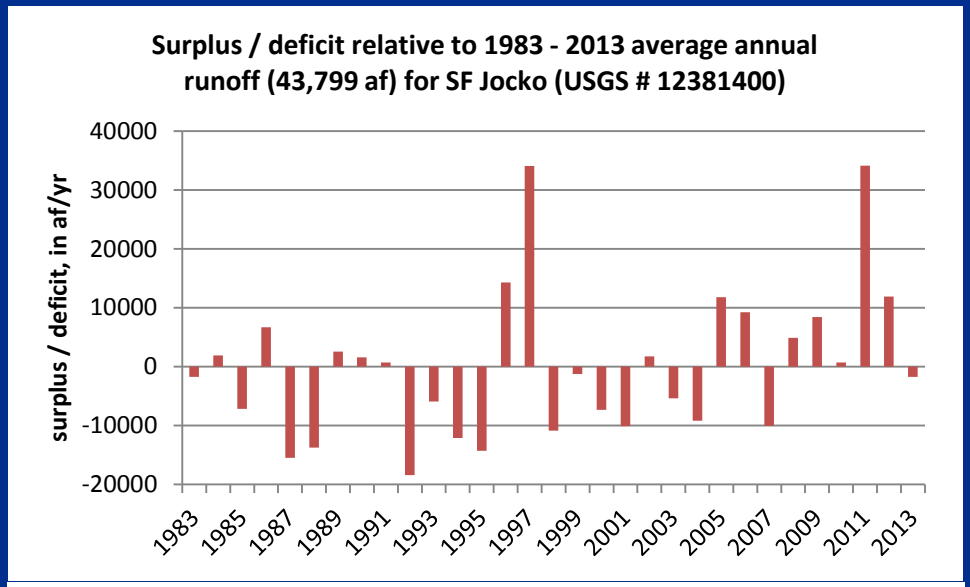
FIIP staff track / administer water to 5,025 tracts of land
40 % of tracts < 10 acres
80% of tracts < 40 acres
99% of tracts < 100 acres

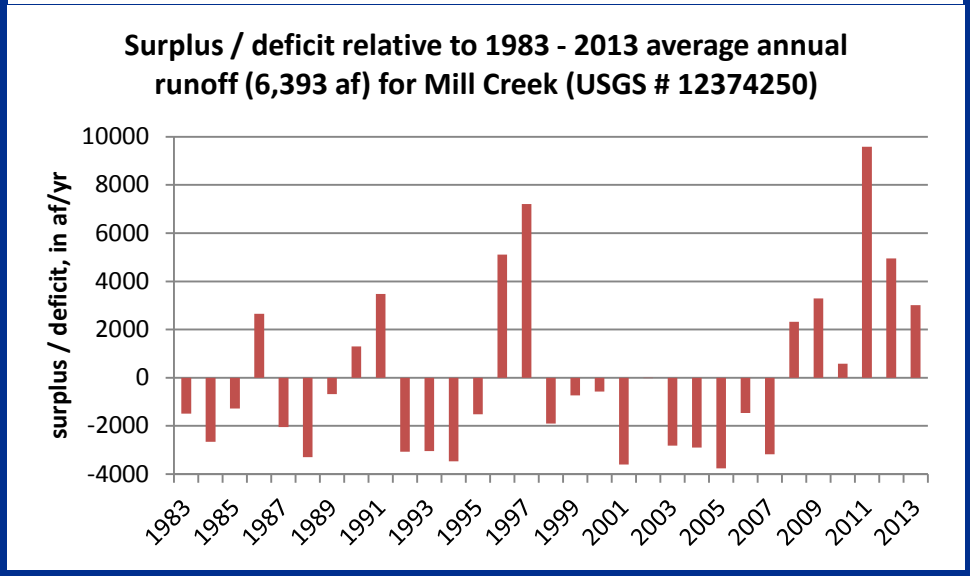
- ~ 2800 water users
- ~ 150 lawn and garden service contracts

Adaptive Management

table shows % deviation from long-term mean

Basic Constraint: Water Supply Variability – limited carry-over storage





	SF Jocko	Mill Creek
1983	-4%	-23%
1984	4%	-42%
1985	-16%	-20%
1986	15%	42%
1987	-35%	-32%
1988	-31%	-52%
1989	6%	-11%
1990	4%	20%
1991	2%	54%
1992	-42%	-48%
1993	-13%	-48%
1994	-28%	-54%
1995	-33%	-24%
1996	33%	80%
1997	78%	113%
1998	-25%	-30%
1999	-3%	-11%
2000	-17%	-9%
2001	-23%	-56%
2002	4%	0%
2003	-12%	-44%
2004	-21%	-45%
2005	27%	-59%
2006	21%	-23%
2007	-23%	-50%
2008	11%	36%
2009	19%	51%
2010	2%	9%
2011	78%	150%
2012	27%	77%
2013	-4%	47%

Adaptive Management
Structure of Water Allocation: Deferral Period

Instream Flow Deferral Process

Interim instream flows in-force until new instream flow levels applied

MEF / TIF can be deferred up to 5 years after operational improvements

MEF / TIF can be deferred up to 7 years after rehab and betterment

Irrigation Water Deferral Process

Quota and Extra Duty System in-force until farm turnout allowance applied

FTA applied after onfarm measurement and operational improvements and rehab and betterment, but not deferred greater than the 5 and 7 years noted above

Measured Water Use Allowance applicable after FTA and efficiency audit

Deferral Process and water saved through improvements implemented through adaptive management process allowing for technical process with Tribes, FJBC, Project Operator staff

Adaptive Management

Surface Water – Ground water interactions / wetlands - mitigation

CSKT Water Management Program
Summary of August 2007 discharge measurements on Jocko River
Prepared by Seth Makepeace
August 28, 2007

Overview

The enclosed summary details the results of a synoptic, surface water discharge measurement effort completed on August 21, 22, and 23 2007 on three separate reaches of the Jocko River. Also enclosed is a review of quality assurance measurements completed by the CSKT hydrographers working on the project. Assessment reaches and measurement locations are included on air photo-based maps appended to this memorandum. Primary field notes are archived with the CSKT Water Management Program.

The synoptic measurement effort was completed to understand the changes that occur in the magnitude of surface water discharge in a downstream direction under a condition of stable river flows. River flow was measured synoptically at several locations in three reaches of the Jocko River. Inflows and outflows were observed or measured concurrently.

Measured change in streamflow for this effort can be attributed to four potential factors. Measurement error is an inherent aspect of streamflow discharge gaging and is well recognized and well reviewed in Rantz S.E. and others (1982)[1]. Quality assurance results summarized below, as well as individual hydrographer ratings of their discharge measurements, define the range of potential measurement error. A second factor in potential changes in streamflow are miscellaneous surface inflows and outflows that occur within the target river reach. All larger inflows and outflows were measured, and smaller pump takeouts were identified during the field effort. These contributions or depletions are defined in the reach summaries. A third potential component that would lead to a change in flow magnitude is a change in river, or tributary flow into the reach during the synoptic measurement event. Transient or time varying flow during the measurement event may initiate a pulse of water moving through the reach that could introduce interpretive error when comparing upstream to downstream flows. Transient conditions are addressed by (1) defining the measurement reaches to exclude larger tributary inputs, (2) completing measurements during a time period when irrigation water diversion is limited, and (3) completing measurements during a period when there is either no precipitation, or inadequate antecedent precipitation to translate into a change in streamflow. The occurrence, or lack of occurrence of transient flow was monitored by tracking river stage at three CSKT continuous streamflow recording stations.

The final factor that may lead to a change in streamflow is surface water interchange with groundwater, either a gain in surface flow through groundwater discharge or a reduction in surface flow through streambed infiltration to groundwater. The objective for the synoptic sampling program is to characterize the magnitude of this process.

[1] S.E. Rantz and others, 1982. Measurement and Computation of Streamflow Volumes 1 and 2. U.S. Geological Survey WSP 2175.

Quality Assurance Measurements

Quality assurance measurements completed by hydrographers working on the project are summarized in the following table. Measurements were completed on August 19 at the CSKT gage location: Jocko River below lower J Canal (#5194.00). Each hydrographer measured discharge concurrently in the vicinity of the gage. Each hydrographer rated their measurement section as good.

Table 1.0: Summary of quality assurance discharge measurements

Hydrographer	Width	Mean velocity	Area	Discharge
1	68 ft	1.78 fps	76.1 sqft	135.8 cfs
2	67.8 ft	1.79 fps	78.8 sqft	140.9 cfs
3	68 ft	1.80 fps	77.5 sqft	139.5 cfs
Average	67.9 ft	1.79 fps	77.5 sqft	138.7 cfs
Percent difference from average for discharge (cfs)				
1	2.1 %			
2	1.6 %			
3	0.6 %			

Measurement results are well within acceptance criteria (see for example Rantz and others, 1982).

Reach 1: Jocko River below Big Knife Creek to Jocko River above HW 93

Reach One includes the river segment from downstream of Big Knife Creek and the K Canal diversion downstream to Highway 93. This reach is located upstream of the confluence with Finley Creek. There are two inflows within the reach, the Jocko Fish Hatchery discharge and a small floodplain spring channel. The hatchery maintains a passive groundwater collection system that routes through the hatchery facility and discharges into the river. The floodplain spring channel sources in a floodplain spring and discharges to the river. In the lower portions of the reach, there are some smaller open water floodplain features that discharge into the river; these features are maintained by groundwater discharge onto the floodplain surface. Measurement results for the reach are included as Table 2.0.

The CSKT streamflow gage Jocko River below K Canal (#5149.00) recorded a gage height value of 4.56 feet for nine hours preceding the synoptic measurement effort, the gage height reading was at 4.56 feet at the start of the measurement event, and the gage height reading was 4.56 feet at the end of the measurement event. This indicates a stable flow condition existed throughout the measurement event.

Reach 2: Jocko River below Finley Creek below Lower S Canal to Jocko River above Valley Creek

Reach 2 includes the river segment from the CSKT streamflow gage below lower S Canal (# 5180.00) downstream to the river above the confluence with Valley Creek. Based on field conditions during the measurement event, selected inflows/outflows were eliminated from the effort; these inflow/outflows are identified on the initial maps and measurement location summary, but not on the appended Version 2.0 maps. Reach 2 outflow 1 and

reach 2 inflow 1 were not measured because there was no utilization of the water and there should not be any net influence of river flow, as the system functions as a flow through system. Reach 2 outflow 3 and reach 2 inflow 3 were not measured because there is no utilization of the flow and the system functions as a flow through back into the river. There is a small floodplain spring that contributes to the river outflow; the magnitude of this flow is indirectly tracked as an addition between measurement stations 4 and 5 on the river. This reach of the river has one tributary inflow Jocko Spring Creek, and one primary outflow the Morin Ditch. One pump takeout was observed (see map), and was supplying 2 wheel moves. The diversion estimate for this pump takeout is 500 gpm times 1.25 for efficiency loss, or 625 gpm (1.4 cfs). Measurement results for the reach are included as Table 3.0.

The CSKT streamflow gage Jocko River below Lower S Canal (#5180.00) recorded a gage height value of 9.02 feet for 12 hours preceding the synoptic measurement effort, the gage height reading was at 9.02 feet at the start of the measurement event, and the gage height reading was 9.02 feet at the end of the measurement event. This indicates a stable flow condition existed through the measurement event.

Reach 3: Jocko River below Lower J canal to Jocko River above Mouth

This reach of the river extends from the Jocko River below Lower J Canal (CSKT gage #5194.00) downstream to the U.S. Geological Survey gage Jocko River near the Mouth at Dixon (#12388200). Three known pump takeouts occur along the reach, one pump was active during the measurement effort. This pump takeout is located to the measurement site R3-R3 and, based on a personal conversation with the pump owner, was pumping 1000 gpm (2.2 cfs) at the time of the sampling event. The only surface inflow within the reach is the Lower J Canal return flow (R3-in1). Measurement results are summarized in Table 4.0.

The CSKT streamflow gage Jocko River below Lower S Canal (#5194.00) recorded a gage height value of 5.82 feet for 12 hours preceding the synoptic measurement effort, the gage height reading was at 5.82 feet at the start of the measurement event, and the gage height reading was 5.82 feet at the end of the measurement event. This indicates a stable flow condition existed through the measurement event.

Summary

Synoptic streamflow measurement was completed on August 21, 22, and 23 on three reaches of the Jocko River. Stable streamflows existed throughout the measurement effort and changes in streamflow in a downstream direction are attributed to volumetric interchange with underlying groundwater.

Table 2.0: Measurement results for Reach One

Station	*Width*	*Mean velocity*	*Area*	*Discharge*	*Percent difference between river locations*
R1-river 1: Jocko River below Big Knife Creek	37.6 ft	.973 fps	49.8 sqft	48.4 cfs	
R1-river 2: Jocko River above Theresa Adams Bridge	36.5 ft	1.26 fps	35.2 sqft	44.3 cfs	9%
R1-river 3: Jocko River above Howlett homesite	26.4 ft	1.58 fps	20.7 sqft	32.6 cfs	30 %
R1-river 4: Jocko River above Fish Hatchery	35.0 ft	1.36 fps	32.9 sq ft	44.7 cfs	31 %
R1-river 5: Jocko River above Hatchery outfall	46.3 ft	1.70 fps	39.8 sq ft	67.5 cfs	41 %
R1-river 6: Jocko River above HW 93	39.0 ft	2.46 fps	42.0 sq ft	103 cfs	42 %
Surface Inflows to Reach					
Station	*Width*	*Mean velocity*	*Area*	*Discharge*	
R1-inflow 1: Spring creek	1.80 ft	1.02 fps	0.324 sq ft	0.332 cfs	
R1-inflow 2: Hatchery outfall	9.50 ft	1.74 fps	6.88 sq ft	12.0 cfs	

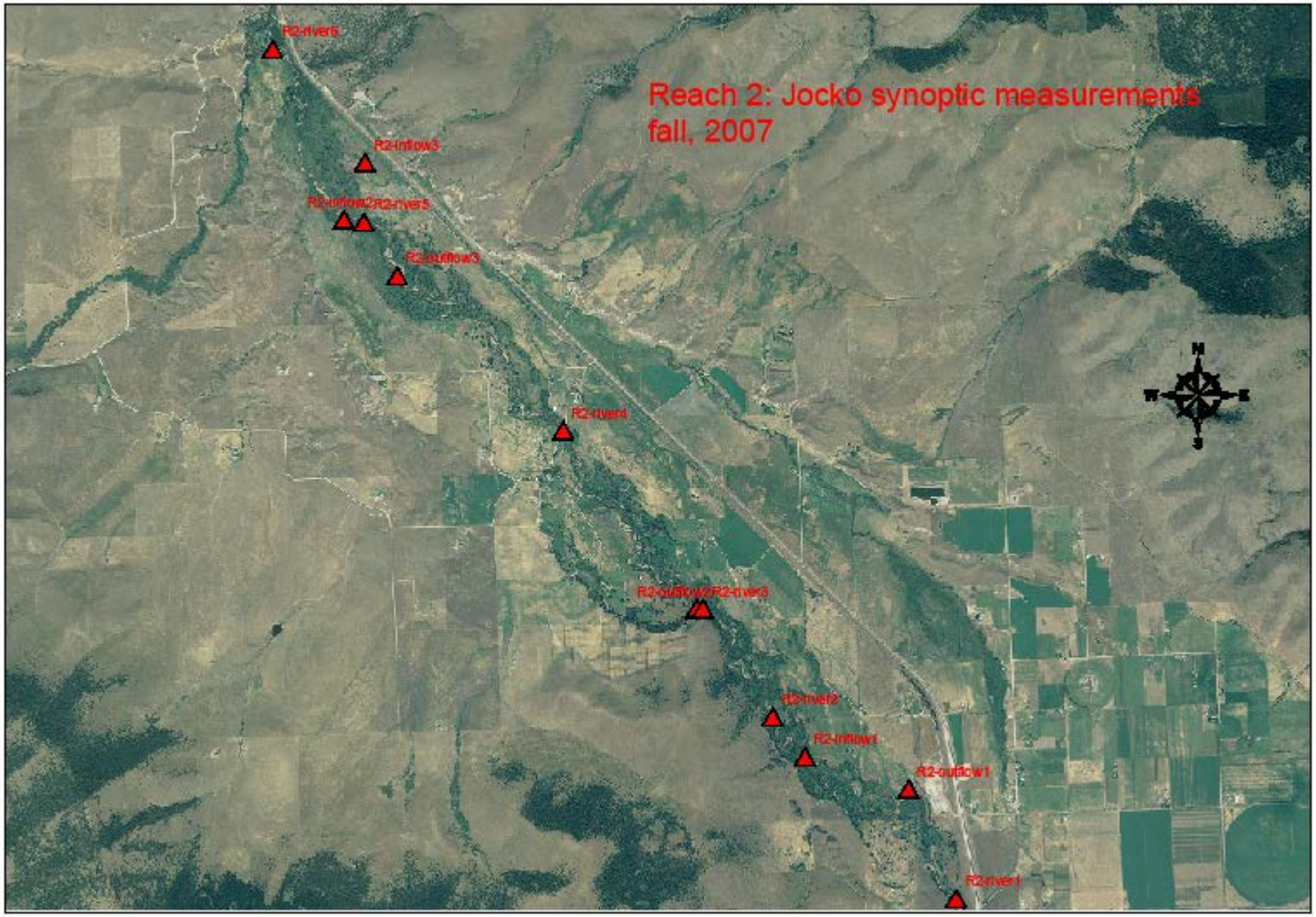
Table 3.0: Measurement results for Reach 2

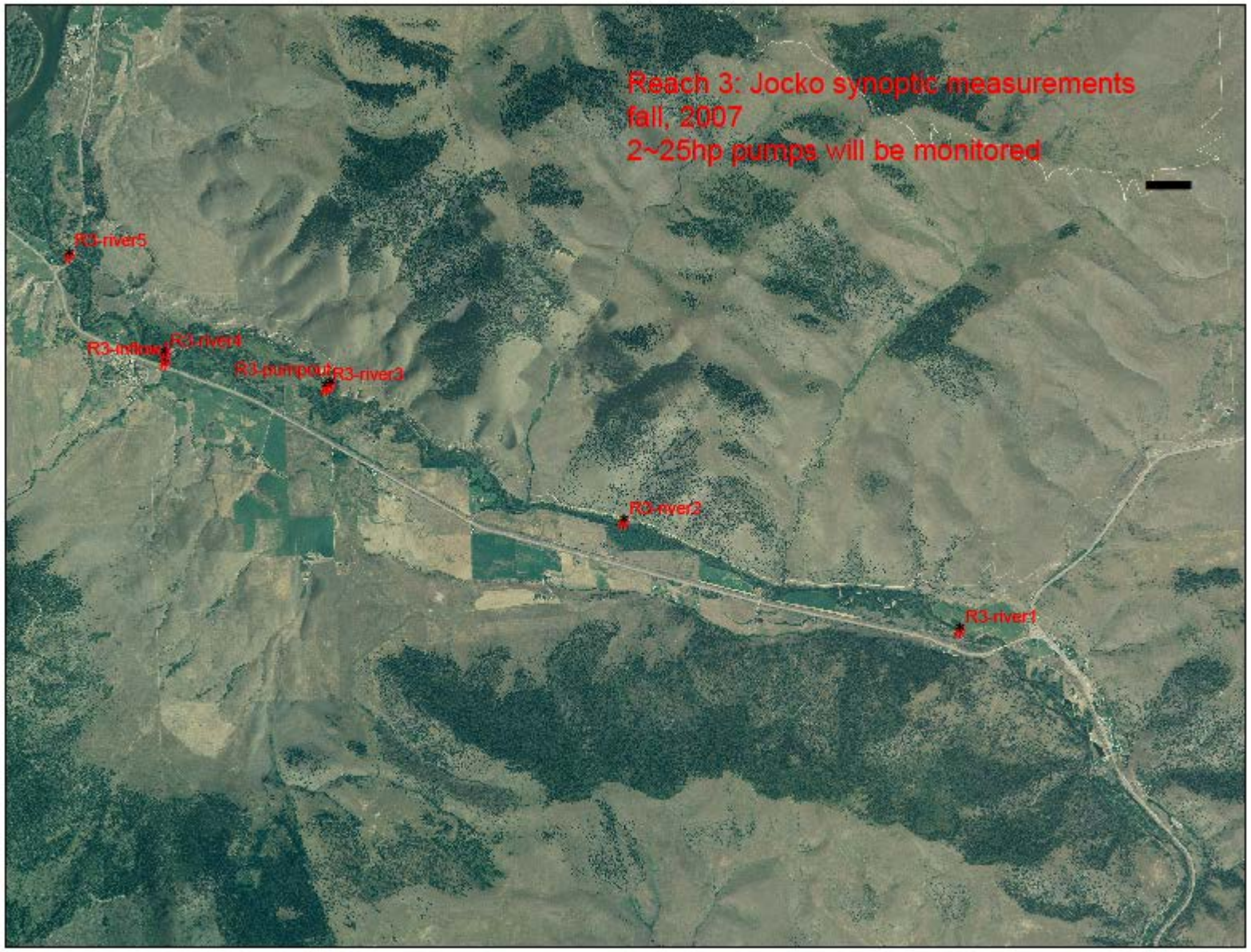
Station	*Width*	*Mean velocity*	*Area*	*Discharge*	*Percent difference between river locations*
R2-river 1: Jocko River at lower S Canal	54.8 ft	1.94 fps	54.0 sqft	105 cfs	
R2- river 2: Jocko River at Detweiler Road	44.5 ft	2.09 fps	50.1 sq ft	105 cfs	0 %
R2-river 3: Jocko River below Morin Ditch	40.0 ft	1.85 fps	60.8 sq ft	113 cfs	7 %
R2-river 4: Jocko River ab South Valley Bridge	56.1 ft	2.65 fps	44.0 sq ft	117 cfs	3 %
R2-river 5: Jocko River below Sque Sque Ditch	50.4 ft	2.72 fps	51.1 sq ft	139 cfs	17 %
R2-R6: Jocko River above Valley Creek	70.5 ft	2.15 fps	72.3 sq ft	156 cfs	12 %
Surface inflows/outflows to reach					
R2-outflow 2: Morin Ditch	11.8 ft	0.783 fps	9.56 sq ft	7.48 cfs	
R2-inflow 3: Jocko Spring Creek above Mouth	11.3 ft	2.15 fps	9.74 sq ft	21.0 cfs	

Table 4.0: Measurement results for Reach 3

Station	*Width*	*Mean velocity*	*Area*	*Discharge*	*Percent difference between river locations*
R3-river 1: Jocko River below Lower J Canal	68.4 ft	1.84 fps	76.5 sq ft	141 cfs	
R3-river 2: Jocko River at National Bison Range	65.5 ft	2.09 fps	66.8 sq ft	140 cfs	1 %
R3-river 3: Jocko River below active pump takeout	66.3 ft	2.60 fps	55.5 sq ft	144 cfs	3 %
R3-river 4: Jocko River below lower J Canal return	6.15 ft	2.65 fps	51.8 sq ft	137 cfs	-5 %
R3-river 5: Jocko River at USGS gage	55.8 ft	1.68 fps	90.5 sq ft	152 cfs	10 %
Surface inflow to reach					
R3-inflow 1: Lower J canal return flow	5.0 ft	1.67 fps	3.65 sq ft	6.10 cfs	


Reach 1: Jocko synoptic measurements
fall, 2007
R1-river6
R1-inflow2
R1-river5
R1-inflow1
R1-river4
R1-river3
R1-river2
R1-river1


Reach 2: Jocko synoptic measurements
fall, 2007
R2-river5
R2-inflow3
R2-inflow2R2-river5
R2-outflow3
R2-river4
R2-outflow2R2-river3
R2-river2
R2-inflow1
R2-outflow1
R2-river1


Reach 3: Jocko synoptic measurements
fall, 2007
2~25hp pumps will be monitored
R3-river5
R3-inflow
R3-river4
R3-pumpout
R3-river3
R3-river2
R3-river1

WUA Definitions

Adaptive Management" means a structured, iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring. In this way, decision-making aims to simultaneously maximize multiple resource objectives and, either passively or actively, accrues information needed to improve future management.

"Operational Improvement" means improved management of FIIP facilities, including the incorporation of measurement of on-farm deliveries, implementation of water management accounting, management of stock water deliveries, improved adherence to Instream Flows, dedicated efforts to reduce flows in FIIP waste ways, enhanced efficiencies, and upgraded measurement and management.

"Reallocated Water" means that portion of any given River Diversion Allowance that becomes unnecessary to deliver the FTA and any applicable MWUA to the lands served by the FIIP after the completion of Operational Improvements and Rehabilitation and Betterment. Reallocated Water shall be dedicated first to meet the CSKT Minimum Enforceable Instream Flows and Target Instream Flows, and after those are fulfilled, shall be split equally between the CSKT Instream Flows and irrigation purposes.

"Rehabilitation and Betterment" means the process by which the FIIP infrastructure undergoes major repair, replacement, upgrade and technological improvement of major structures, as referenced in Appendix C, and any project that has significant design and cost considerations that are subsequently agreed to by the Parties.

"Target Instream Flows" or "TIF" means wet and normal year instream flow hydrographs specifically identified by wet and normal years in Appendix A for select points and reaches which are desirable and achievable for Instream Flows, as determined in accordance with Appendix B, and subject to change through Adaptive Management identified in Appendix B. The Target Instream Flows are an element of the CSKT's Instream Flows and have a time immemorial priority date.

WUA Para 22 *Order of Priority*

The Project Operator shall deliver available water in a given year in the following order of priority in accordance with this Agreement and its Appendices A and B:
(a) Minimum Enforceable Instream Flows and Minimum Reservoir Pool Elevations, administered at locations and reaches identified in Appendix A;
(b) Farm Turnout Allowances and River Diversion Allowances, which vary depending on the water year and water availability conditions as identified in Appendix A;
(c) Target Instream Flows, administered at locations and reaches identified in Appendix A and as provided in Appendix B;
(d) Maximum Farm Turnout Allowance, the limit of which is as specified in Appendix A4, except in accordance with other provisions of this Agreement; and
(e) Measured Water Use Allowance for those lands where the allowance is applicable as defined in Section 25. If necessary, delivery of the MWUA may limit or delay attainment of TIF at any given Instream Flow location; the Project Operator shall meet the MWUA before full attainment of the TIF flows.

WUA Para 24 *Implement Adaptive Management*

The Parties agree to implement Adaptive Management, as identified in Appendix B, for the purposes of allocating water between Instream Flows and irrigation demands, and water made available through FIIP upgrades as identified in Appendix C.

The Measured Water Use Allowance may be delivered to farm turnouts after the deferral period described in Articles XV and XVI based on the following criteria:
(a) Water must be available in a given year after meeting the order of priority set forth in Section 22;
(b) In no instance shall the sum of the Measured Water Use Allowance and the maximum Farm Turnout Allowance exceed 2.0 acre-feet per acre;
(c) The Measured Water Use Allowance may only be applied for after a farm turnout measurement system has been installed and is operating and in no event more than five years after the end of the deferral period;
The Measured Water Use Allowance shall be available only to those irrigators who have diligently pursued on-farm irrigation system efficiency measures to meet agronomic crop water requirements and who have met the following criteria:
i. Three to five years of on-farm delivery and run-off measurement, at the discretion of the Project Operator, in consultation with the irrigator;
ii. Have met the conditions of an on-farm irrigation efficiency audit; and
iii. The Measured Water Use Allowance for any individual irrigator will be based on the average of the on-farm delivery measurements of the water delivered to that irrigator during the measurement period identified in Section 25(d)i.
(e) The on-farm efficiency audits shall be completed by the Project Operator, or a third party designee acceptable to the Project Operator and the irrigator, and shall include at a minimum the following criteria:
i. On-farm measurement system;
ii. Quantify the number of irrigated acres;
iii. Type of irrigation system;
iv. Uniformity of irrigation application;
v. On-farm surface run-off; and
vi. Soil moisture content.

WUA Para 25 *MWUA*

(f) Within 12 months of the passage of the Compact by the Montana Legislature, the Parties will define the application of criteria for the on-farm efficiency audit in Section 25(e).
i. The Parties may enter into a contract with the Natural Resources Conservation Service or the Bureau of Reclamation to develop recommendations for the application of the criteria.
ii. The Parties will review the recommendations and make a decision to adopt or revise the recommendations.
(g) If the Parties fail to agree upon the criteria in Section 25(f), the Measured Water Use Allowance shall not be implemented until such time as agreement is reached.
(h)The volume of a MWUA shall be reevaluated by the Project Operator every ten years or at some shorter time period determined by the Project Operator. Based on a reevaluation using the criteria in the on-farm efficiency audit, the Project Operator may modify the MWUA.
(i) If an irrigator fails to meet the efficiency conditions of the audit, access to the Measured Water Use Allowance shall be denied until such time as the efficiency deficiencies are met.
(j) An individual irrigator aggrieved under this Section or any Party to this Agreement may invoke the dispute resolution procedures in Article XXVI of this Agreement.

WUA Para 51, 52, 53

51. The Parties expect both Operational Improvements and Rehabilitation and Betterment, as described above in Sections 34 through 36 and in Appendix C, to result in Reallocated Water. Expansion of the existing CSKT Water Management Program and on-farm measurement activities of the Project Operator, along with other Operational Improvements, are also expected to result in Reallocated Water. The identification of increases in the enforceable levels of the CSKT Instream Flow rights, and the timing for the implementation of those increased enforceable levels are to be implemented in accordance with the deferral period identified in Article XVII above.

52. Reallocated Water resulting from construction of structures identified as Rehabilitation and Betterment projects in Appendix C is anticipated and will be identified and dedicated to increased enforceable Instream Flow levels through the FIIP water accounting process (see Appendix B). Construction of such structures and associated planning processes are subject to the appropriation of funds.

53. Once the MEFs and TIFs are met in any administrative area, saved water that becomes available for reallocation shall be split equally between irrigation and instream flows.

WUA Para 77

77. Notwithstanding any other provision of this Agreement and the Compact, ten years following the implementation of the FTAs, MEFs, and TIFs, the Parties to this Agreement agree to reevaluate and revise, in accordance with this Section, the Instream Flows and FTAs herein established. If the data show water is available or can be made available without adversely affecting the MEFs and the TIFs, additional water will be split equally between CSKT Instream Flows and irrigation purposes up to but not exceeding an amount that can be beneficially used for irrigation purposes. Subsequently the reevaluation can reoccur every ten years. When water is reallocated under this Section 77, the Parties must agree in writing to the changes and the changes shall be accounted for in the water accounting process identified in Appendix B.

WUA Appendix A

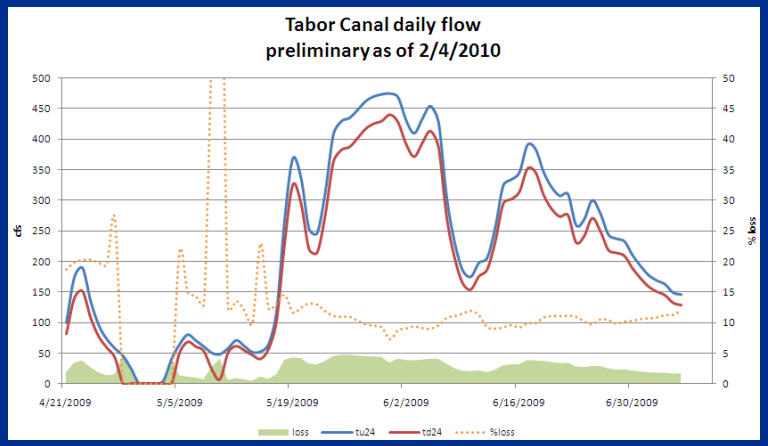
- Instream Flows – MEF, Normal Year, Wet Year, Water Right
- Minimum Reservoir Levels
- River Diversion Allowances – administered and incremental
- Farm Turnout Allowances

Basic allocation numbers are based on balanced water budgets defined over detailed service areas, aggregated to larger service areas, and then to modeled valley (Jocko 14 service areas, Little Bitterroot 6 service areas, Mission over 50 service areas)

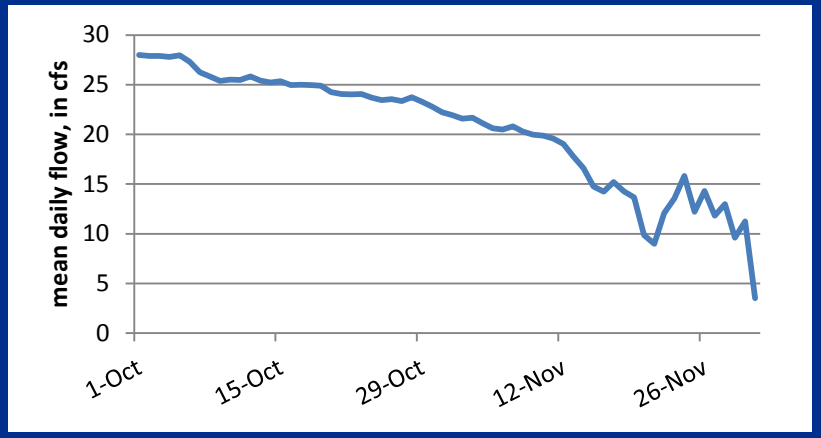
Jocko and Mission Valley water budgets used to allocate numbers incorporate a scenario with water conservation termed Operational Improvements

Little Bitterroot Valley water budget based on existing condition

WUA Appendix A: Opportunities for Operational Improvements



RWRCC data on canal losses in Tabor Feeder Canal, loss in green



Jocko K Canal diversion record – Oct- Dec average daily flow 1993-2013

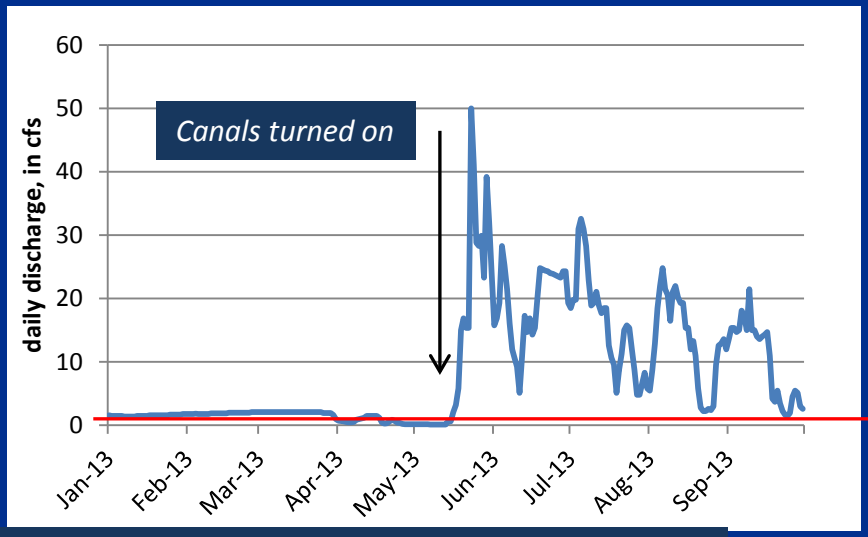
Conveyance losses Pablo A Canal

Onfarm inefficiencies Round Butte Area

WUA Appendix A: Opportunities for Operational Improvements

Percentile	Midpoint value, in cfs	Value, in af	Number of days in period	Volume over period
0th - 10th	13.5	26.78	17	455.21
10th - 30th	8.95	17.75	34	603.57
30th - 50th	5.95	11.80	34	401.26
50th - 70th	1.5	2.98	34	101.16
70th - 90th	0.40	0.79	34	26.98
90th - 100th	0.0	0.00	17	0.00

Hopkins Draw wasteway in Round Butte for 2012: Seasonal volume [April 15 – September 30] ~ 1,588 acre-feet



Coleman Coulee wasteway in Charlo. Flow at return flow site for 2013 irrigation season (blue line) Accumulated flow for season = 4,250 af

Red line BIOP upper level of allowable return flow discharge at site

Percentile	Midpoint value, in cfs	Value, in af	Number of days in period	Volume over period
0th - 10th	11.6	23.01	17	391.14
10th - 30th	7.05	13.98	34	475.44
30th - 50th	5.4	10.71	34	364.17
50th - 70th	3.45	6.84	34	232.66
70th - 90th	0.70	1.39	34	47.21
90th - 100th	0.40	0.79	17	13.49

Westphal Coulee wasteway in Valley View 2012 Seasonal volume [April 15 – September 30] ~ 1,524 acre-feet

WUA Appendix A: Operational Improvements

- Limit diversion to irrigation season, while allowing distribution and feeder canal to operate beyond irrigation season
- Reduce or Eliminate non-crop based diversion, allowing for onfarm and conveyance losses and tailwater losses
- Reduce or Eliminate off season stockwater diversions

WUA Appendix A Irrigation Basis for Allocation

- Target with Operational Improvements modeling runs maintain existing levels of crop irrigation consumption at agreed-upon geographic scale
- Operational improvements implemented with measurement and management resources and operating policy changes
- MEF set without saved water from potential rehabilitation and betterment – additional buffer to meet instream flows

WUA Appendix A Irrigation – FTA Allocation

- Crop Irrigation Consumption developed from service area water budgets and aggregated up to larger areas
- Crop Irrigation Consumption cross checked to METRIC – June 12 DOWL HKM presentation
- Final FTA numbers were agreed-upon and are consistent with FJBC interest in equitable distribution

WUA Appendix A Irrigation – Instream Flow Allocation

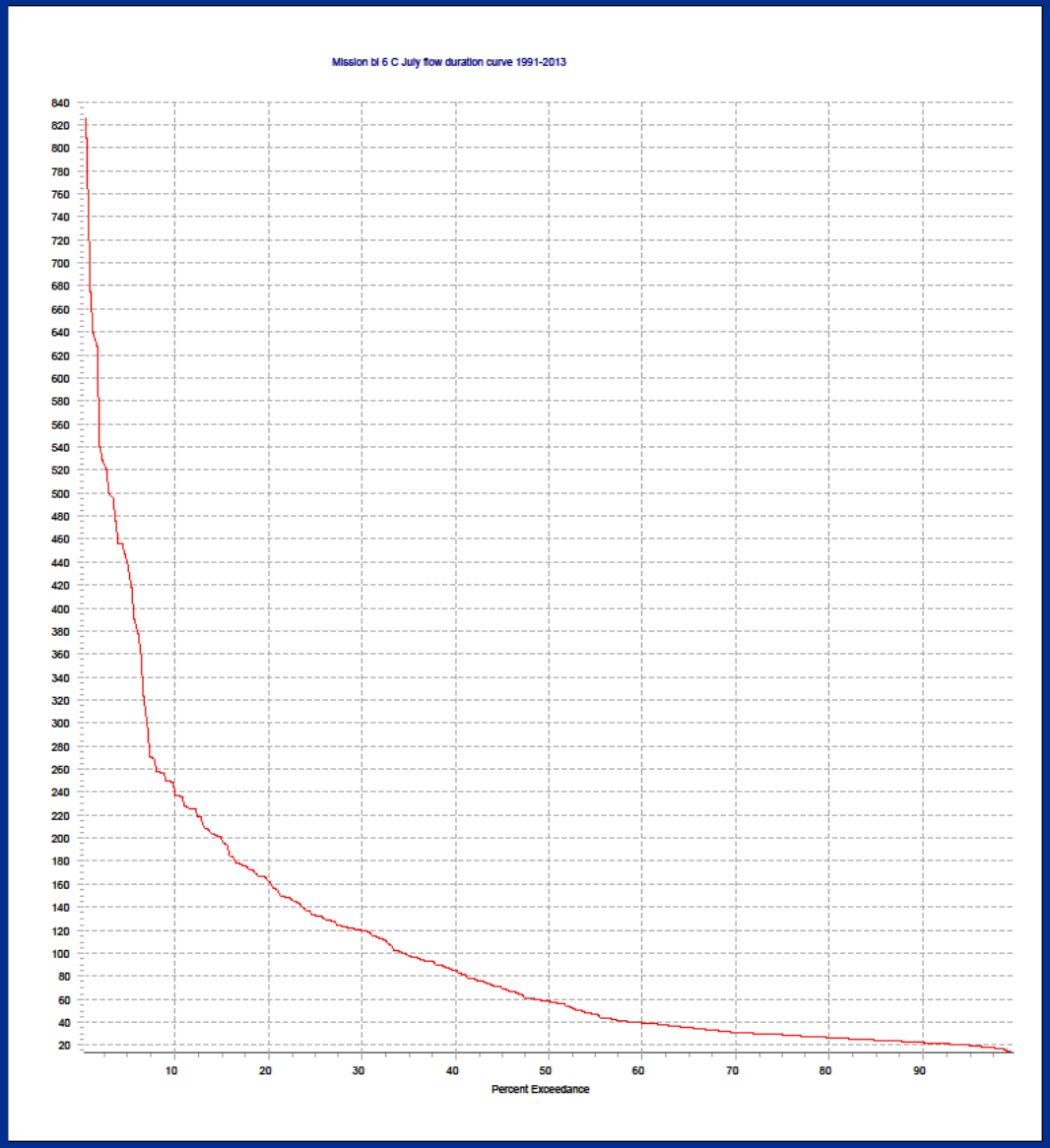
- Prioritize stream reaches by aquatic resources – bull trout for example
- North Fork Jocko River, Jocko River
- Mission and Post Creeks

MEF View: Mission Creek at HW 93

July flow duration curve – for 1991 – 2013 period

Interim instream flow = 20 cfs

MEF flow for July = 35 cfs currently exceeded ~70 percent of time

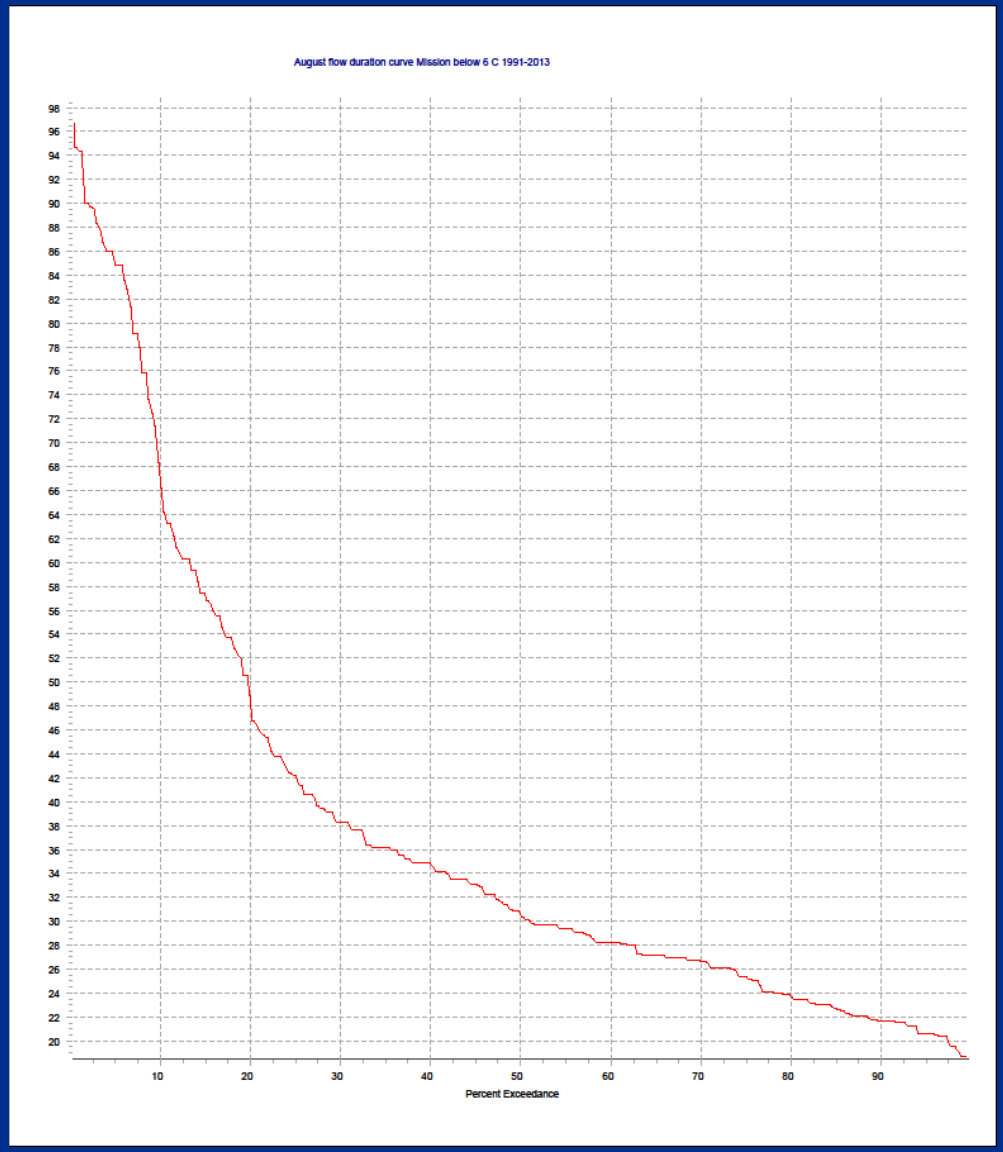


MEF View: Mission Creek at HW 93

August flow duration curve – for 1991 – 2013 period

Interim instream flow = 20 cfs

MEF flow for August = 25 cfs currently exceeded ~75 percent of time

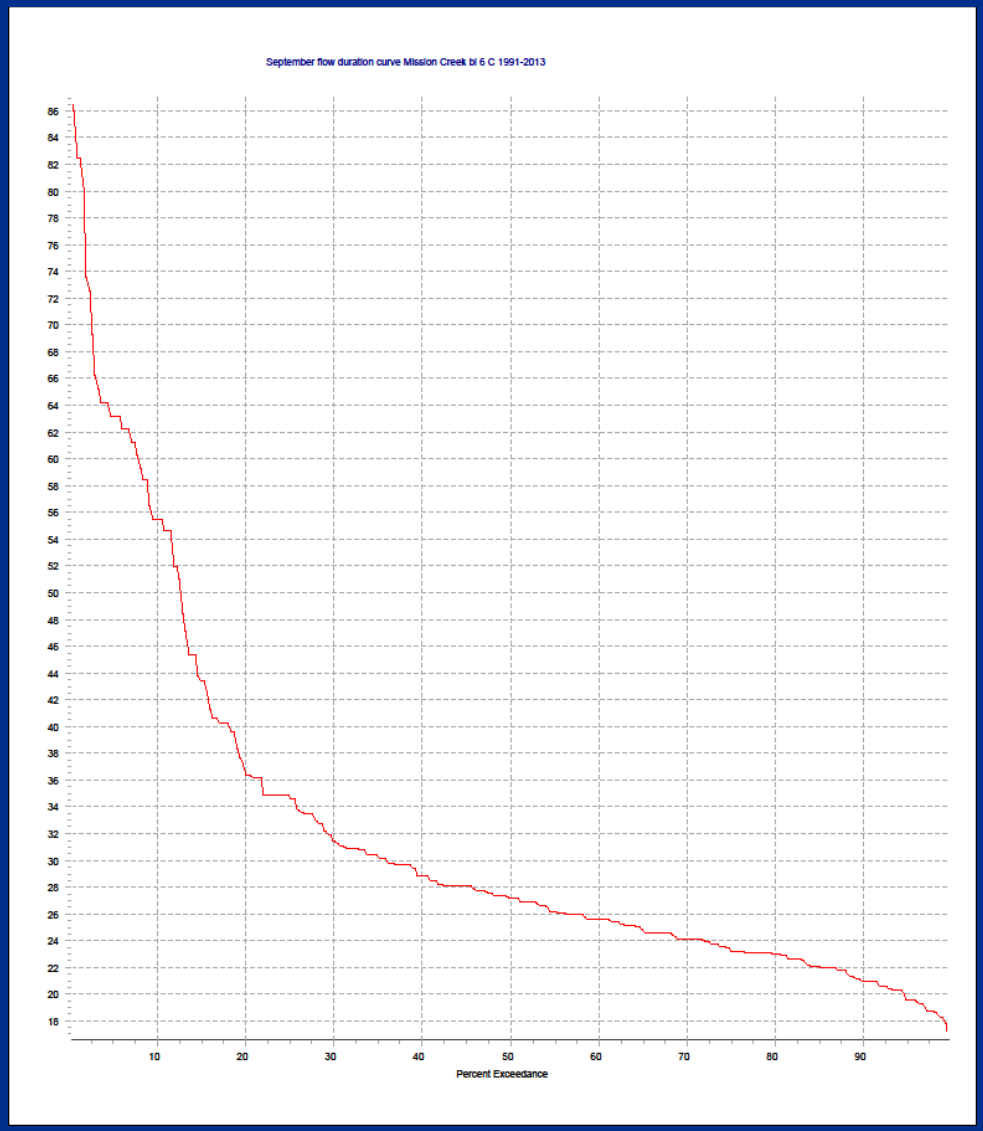


MEF View: Mission Creek at HW 93

September flow duration curve – for 1991 – 2013 period

Interim instream flow = 20 cfs

MEF flow for September = 25 cfs currently exceeded ~65 percent of time

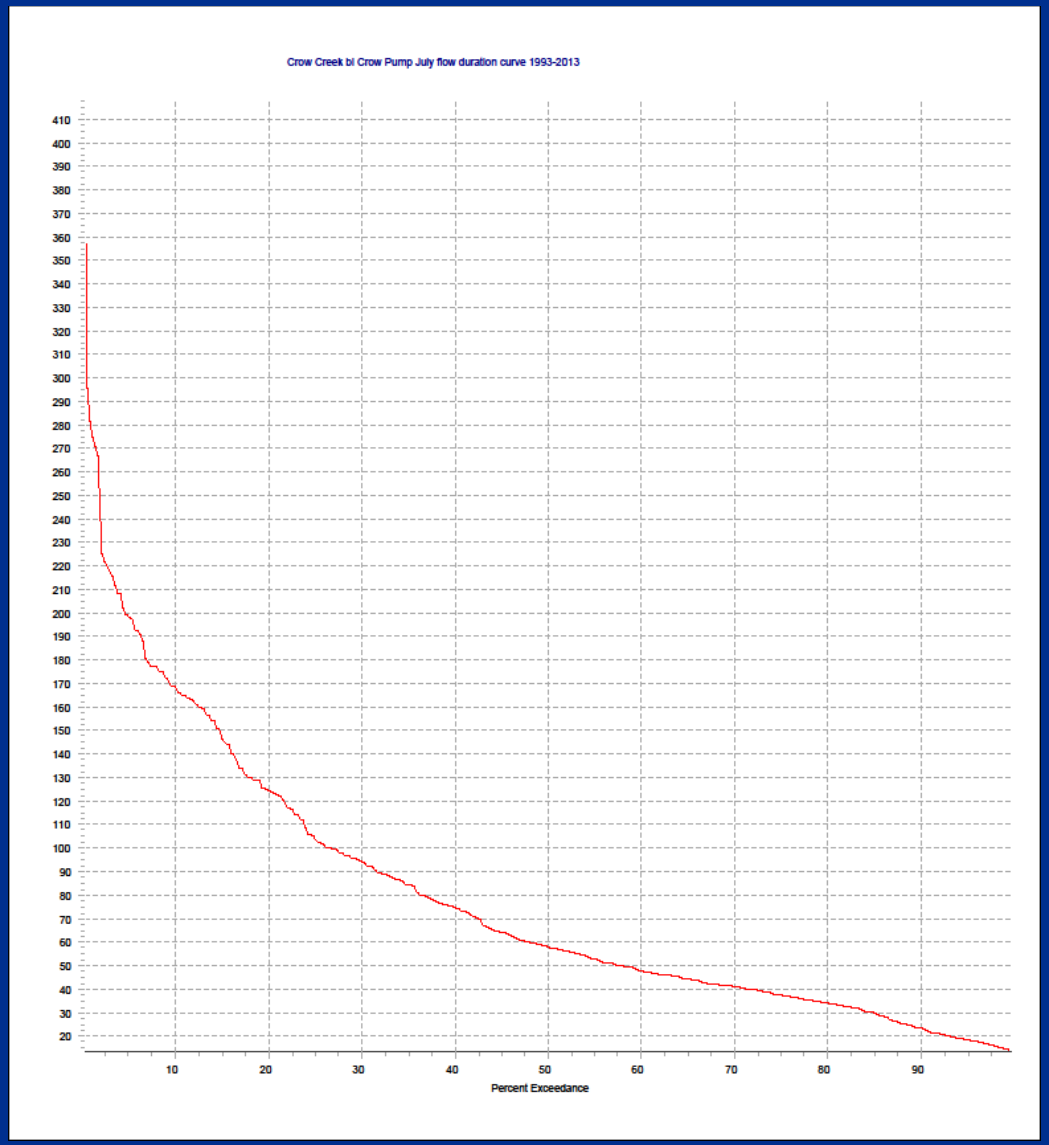


MEF View: Crow Creek at Crow Pump (above reservoir)

July flow duration curve – for 1993 – 2013 period

Interim instream flow = 17 cfs

MEF flow = 22 cfs
currently exceeded ~90 percent of time

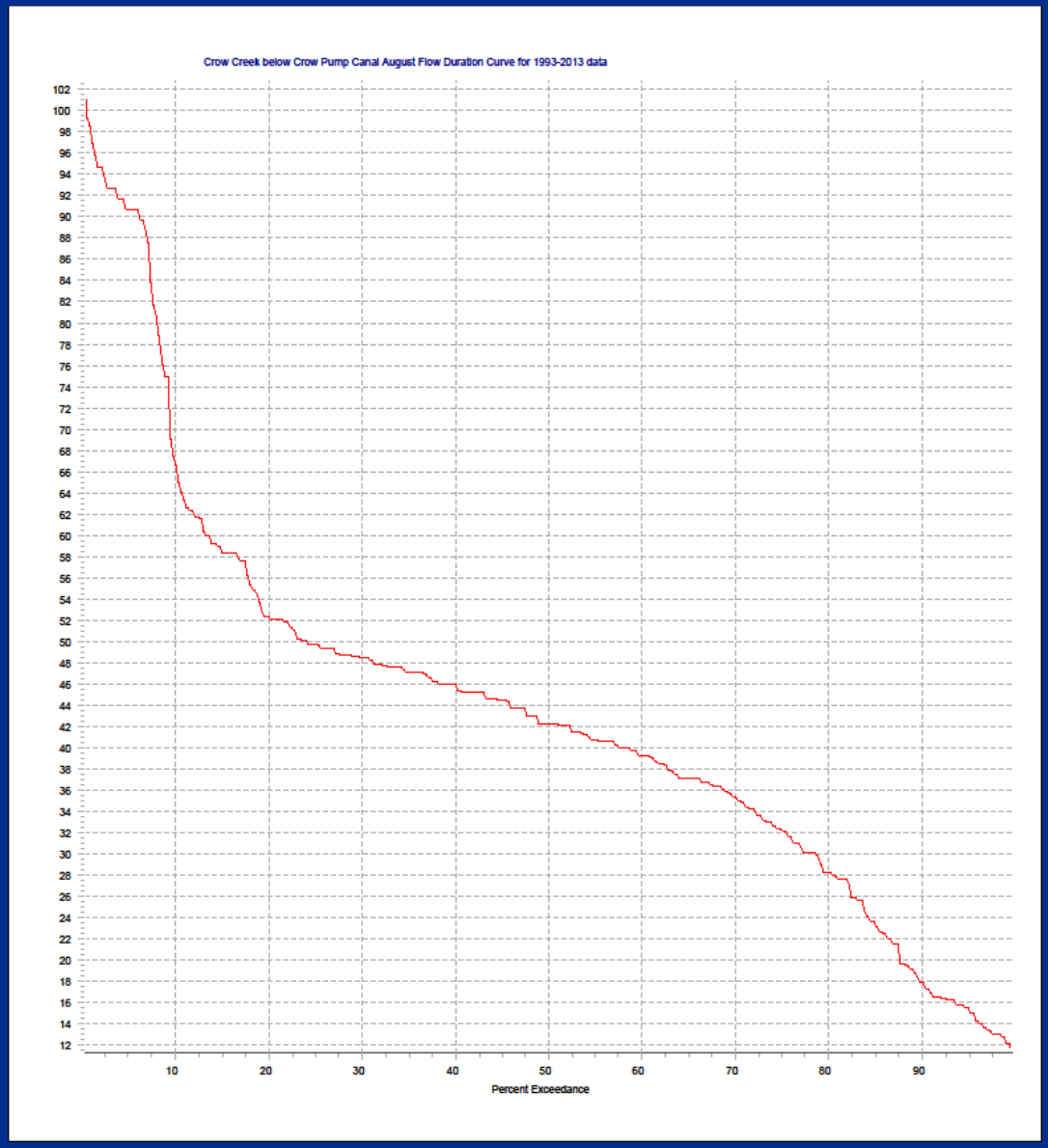


MEF View: Crow Creek at Crow Pump (above reservoir)

August flow duration curve – for 1993 – 2013 period

Interim instream flow = 17 cfs

MEF flow = 22 cfs currently exceeded ~86 percent of time

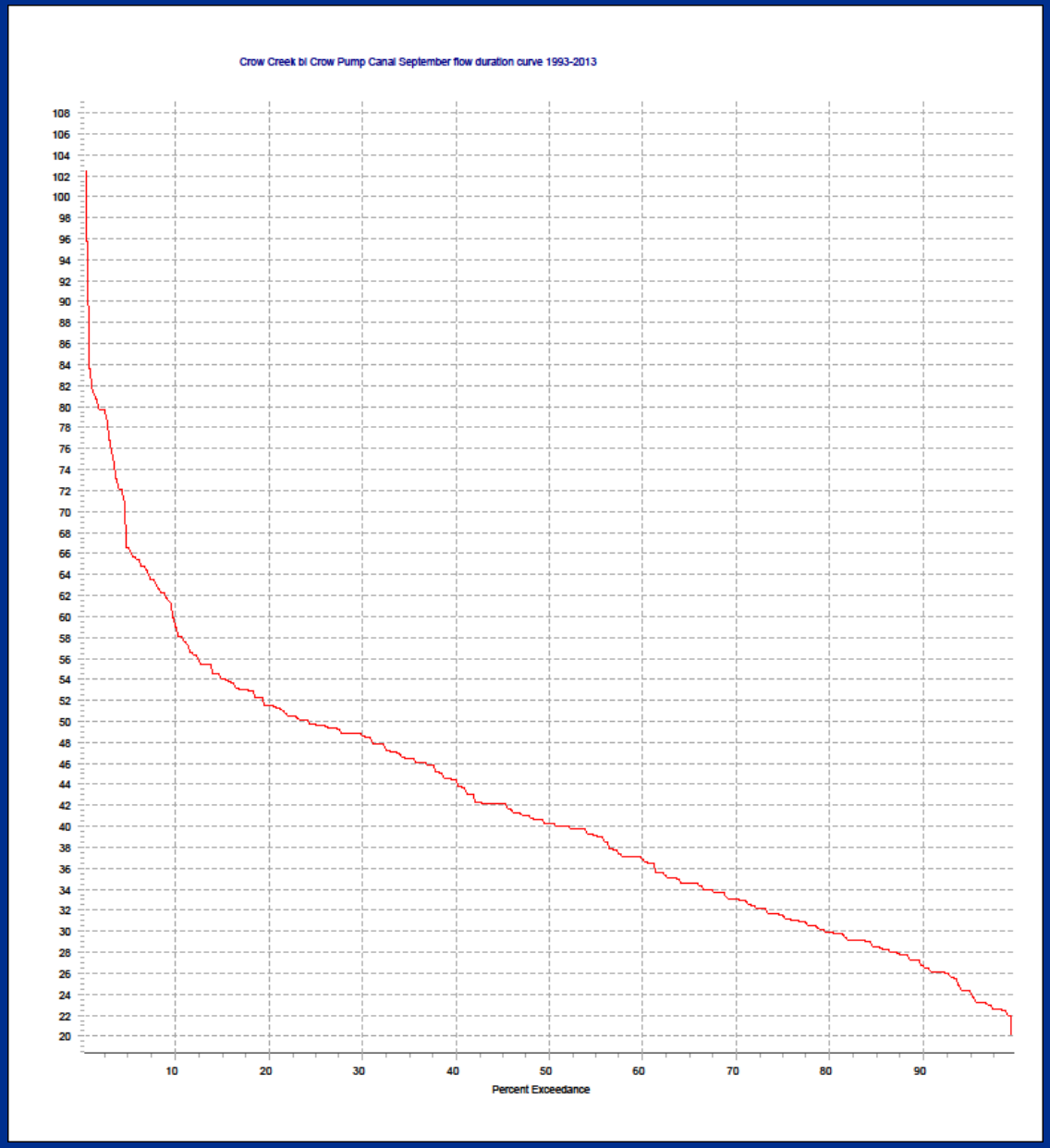


MEF View: Crow Creek at Crow Pump (above reservoir)

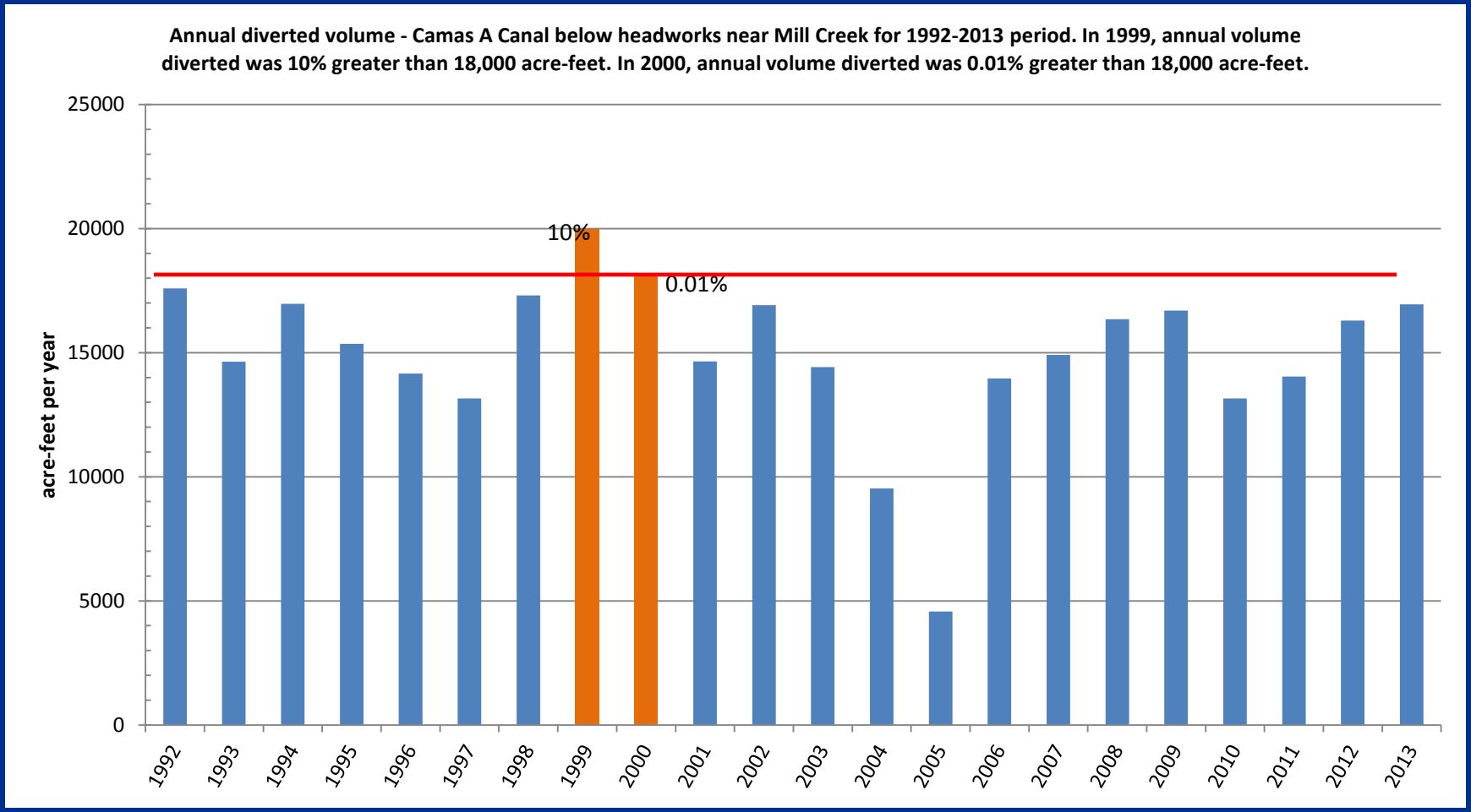
September flow duration curve – for 1993 – 2013 period

Interim instream flow = 17 cfs

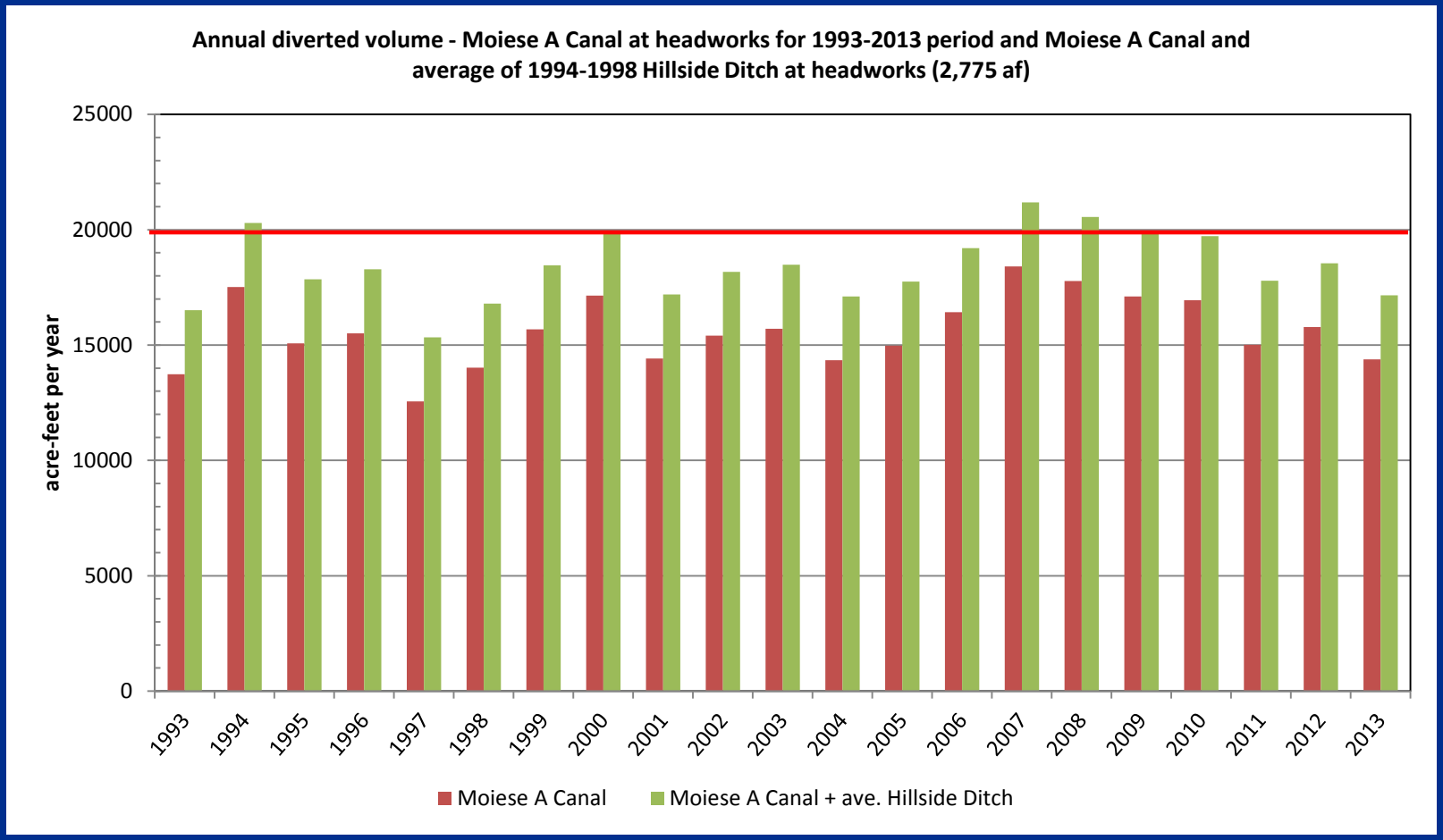
MEF flow = 25 cfs
currently exceeded ~95 percent of time



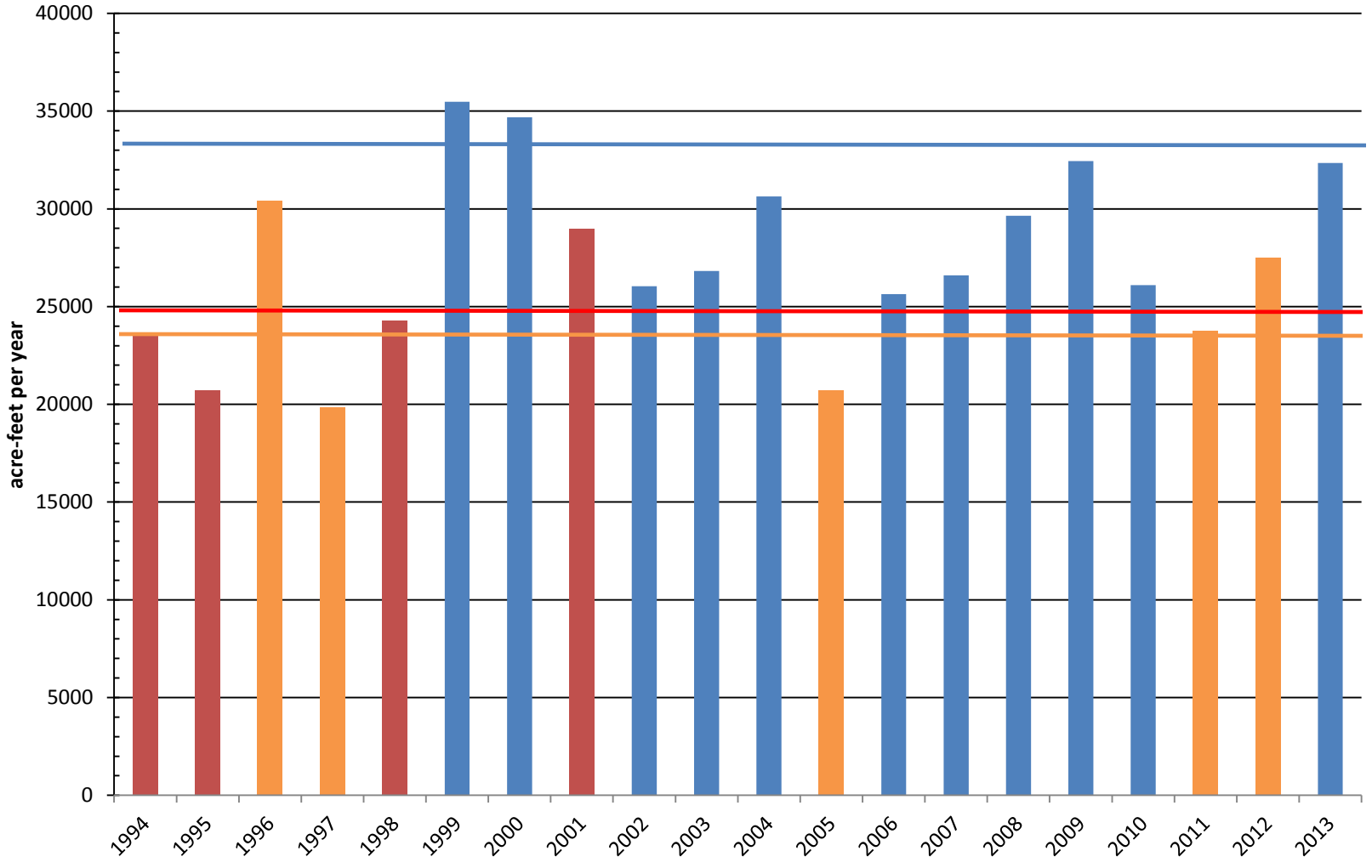
River Diversion Allowances: Little Bitterroot Valley: Measured Camas A Canal Diversion compared to River Diversion Allowance (18,000 af)



River Diversion Allowances Moiese Valley: Measured Moiese A Canal + average Hillside Ditch inflow compared to River Diversion Allowance (20,000 af)



Measured annual diverted volume - Tabor Feeder Canal below Twin Lakes for 1994-2013 period. Orange = wet years; red = dry years; blue = normal years for 1992 - 2013 measurement period



River Diversion Allowance - Tabor Feeder Canal below Twin Lakes
Wet year RDA + incremental inflow = 23,870 acre-feet; Normal year RDA + incremental inflow = 33,700 acre-feet;
Dry year RDA + incremental inflow = 24,700 acre-feet
RDA location above St. Mary's Reservoir, station includes diversion from Middle Fork and North Fork Jocko River into canal
RDA includes incremental inflow from Falls Creek, S-14 Creek, Grizzly Creek

Appendix B: Adaptive Management

- **Purpose / Intent**
  - Coordination process for within-year water management, allocation of saved water, and prioritization of projects
  - Implements several aspects of the Water Use Agreement
  - Allows flexibility to adapt to within-year water availability, and longer-term ability to adapt certain allocation targets based on monitoring
  - No mention of climate change, …, but Adaptive Management section has the ability to address this

Appendix B: Adaptive Management

- **Definitions**

- **Wet and normal year instream flow hydrographs - " These targets (wet and normal TIF's) are intended to be met, but the Parties understand that each year's snowmelt and rainfall timing will vary, leading to the need to administer wet and normal year hydrographs on an annual basis."**

- **River Diversion Allowances – " The River Diversion Allowances are set for wet through dry years, but the Parties recognize that these values shall be reviewed and, as warranted, adapted based on monitoring information."**

Appendix B: Adaptive Management

- **Objective 1**: "Until such time as the forecast procedures described in Objective 1b are useable, the parties may agree to modify Minimum Enforceable Flows for a particular year to match anticipated snowmelt runoff conditions that might occur during that year by moving the Monthly Enforceable Flows from any particular month during the irrigation season either forward in time one month or backward in time one month. **Following the development of the forecast procedures outline in Objective 1B, the parties may develop other means for modifying the timing of MEFs to match anticipated snowmelt runoff conditions to the extent possible."**

- **Objective 1a, 1b: Develop Forecast Procedures and Definition of wet through dry year types**

- **Objective 1c: Define Coordination Process, including ability to modify irrigation and instream flow allocation numbers through season**

Appendix B: Adaptive Management

- **Objective 2: Reallocate Saved water from Operational Improvements and Rehabilitation and Betterment to Instream Flows as the activities occur (stepped fashion)**

- **Objective 2a: Prioritize Operational Improvements and Rehabilitation and Betterment Projects**

- **Objectives 2b, 2c: Reallocate water based on measurement or calculation.**
  - **Define water required for resource mitigation. i.e water required to maintain wetland or groundwater resources**

- **Objective 2d: Credit saved water through a reporting procedure**

Appendix B: Adaptive Management

- **Objective 3: Monitoring and Reporting**

"the Parties understand that some uncertainty is associated with the wet and normal year instream flow targets and wet through dry year River Diversion Allowances. Uncertainty may be related to modeling and calculation procedures, and to climatic patterns that may develop in the future. Based on this, the Parties agree that an Adaptive Management process is needed to review these target flows. The minimum criteria for the process is that (a) changes to these flow targets be based on monitoring information that captures a range of wet through dry hydrologic conditions; (b) changes to these flow targets do not change the prescription for the Minimum Enforceable Instream Flows, Minimum Reservoir Pool levels, or the Farm Turnout Allowances; and (c) the changes are based on mutual written concurrence of the Parties."

Appendix C: Rehabilitation and Betterment Priority Project List

- **Key part of WUA negotiations / Rehabilitation not Operational Improvement**

Project #1: Lateral and sub-lateral rehabilitation and betterment based on the geographic priorities: 1) Mission Valley south of Crow Creek; 2) Mission Valley north of Crow Creek; 3) Jocko Valley; and 4) Little Bitterroot Valley

Project Extent: Project-wide, with a geographic prioritization for completion of lateral and sub-lateral rehabilitation and betterment starting in the Mission Valley south of Crow Creek, then the Mission Valley north of Crow Creek including the Polson Area, then the Jocko Valley, and finally the Little Bitterroot Valley

Current Condition: Condition varies, but laterals and sub-laterals, including water management structures, are generally in a deteriorated to critically deteriorated condition. Layout for lateral and sub-lateral canals based on original design of project, and does not generally meet requirements for delivery with modern standards.

Proposed Rehabilitation: Rehabilitation of canals to pipelines or efficient, and low maintenance open channel canals. Rehabilitation of water management diversion structures to improve efficiency, reduce operation and maintenance, and support water measurement.

Project Benefits: Lateral and sub-lateral rehabilitation will lead to water saving through reduced conveyance losses, improved demand-based irrigation delivery, and water measurement and structure updates. Lateral and sub-lateral rehabilitation will reduce operation and maintenance costs for FIIP and will improve demand-based delivery to farm tracts. This activity will also reduce irrigation tailwater, and detrimental effects, through improved water management and distribution.