

Boulder River Watershed

Irrigation Efficiencies and Water Supply Study 2003-2006



Montana Department of Natural Resources and Conservation and Boulder River
Watershed Association

DNRC Report: WR 2.D.7a BRW Boulder River Watershed

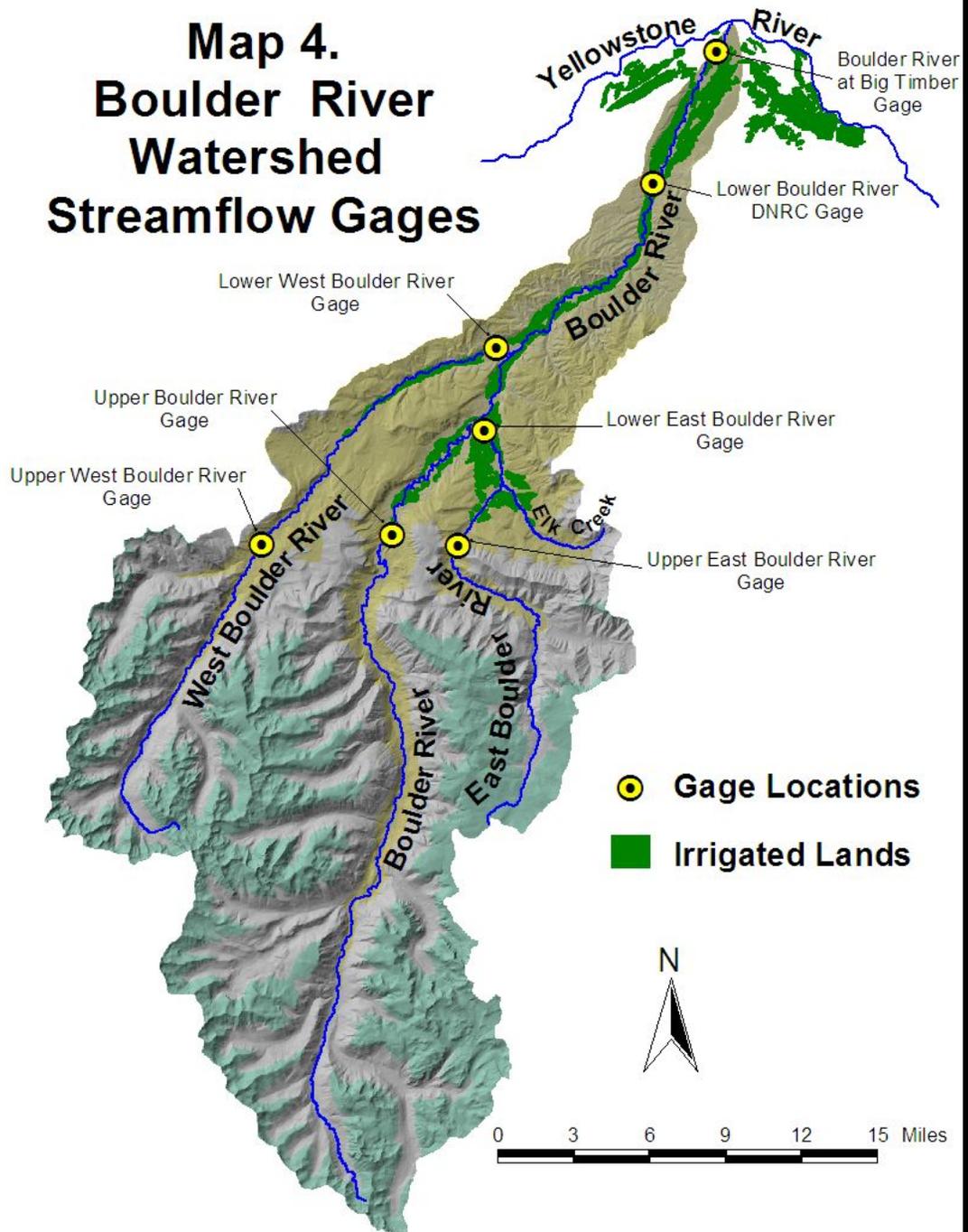
Helena, Montana

January, 2008

Project Tasks

- Irrigated Lands Inventory
- Streamflow Monitoring
- Ditch and Field Efficiencies Assessment

Map 4. Boulder River Watershed Streamflow Gages

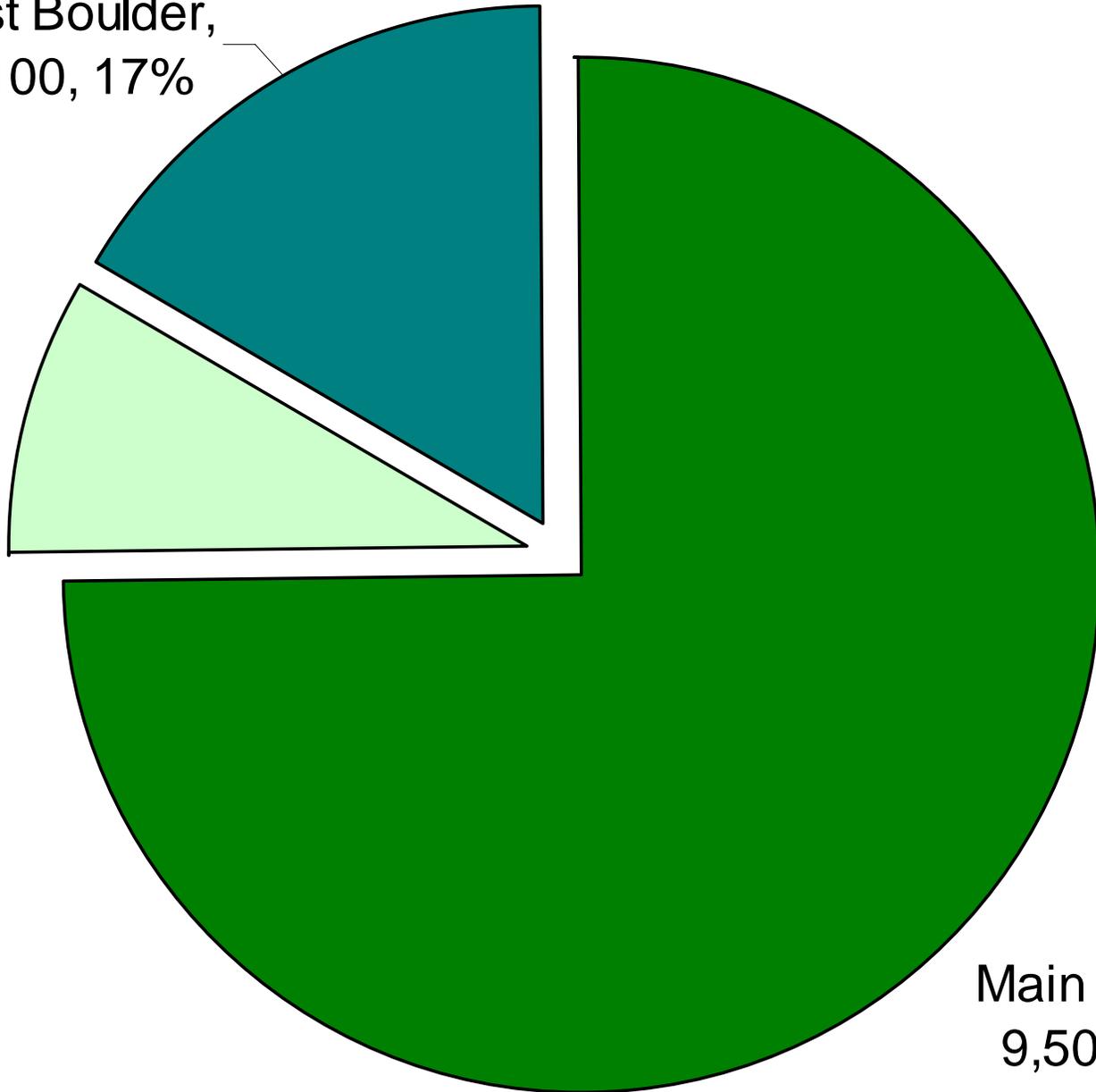


Boulder River Acres Irrigated by Tributary

East Boulder,
2,100, 17%

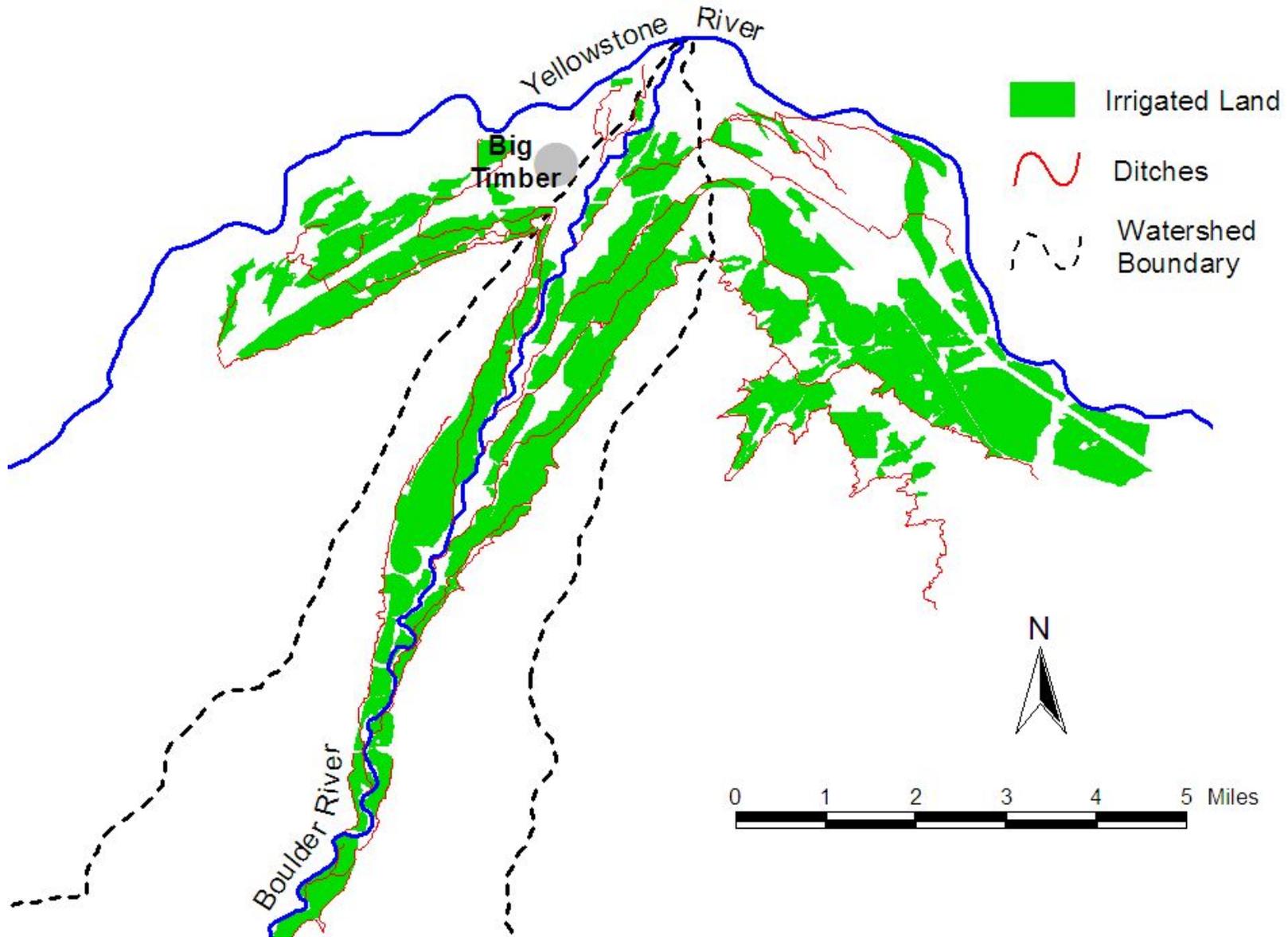
West Boulder,
1,100, 9%

Main Boulder,
9,500, 74%



Map 2.

Lower Boulder River Irrigation



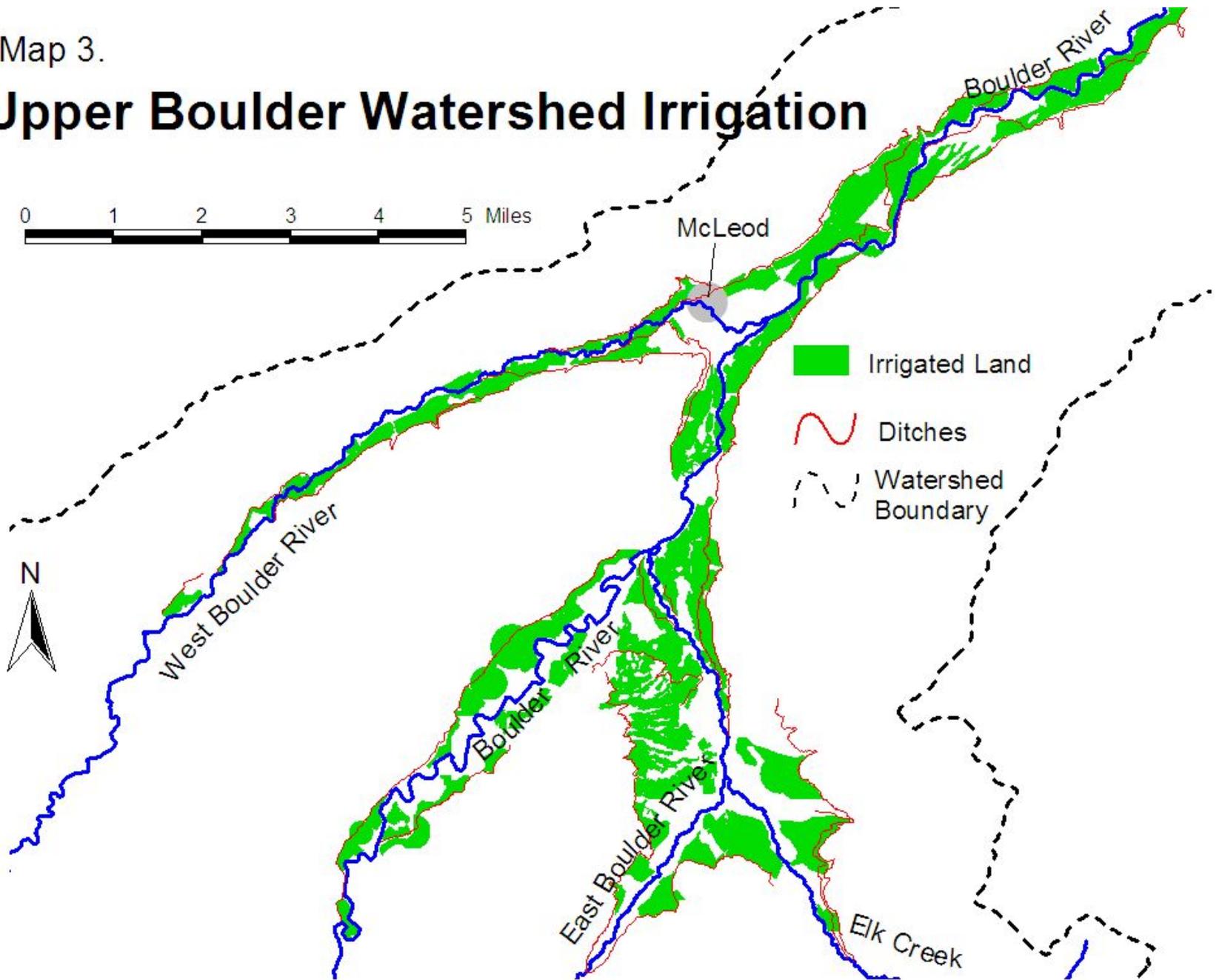
Map 3.

Upper Boulder Watershed Irrigation

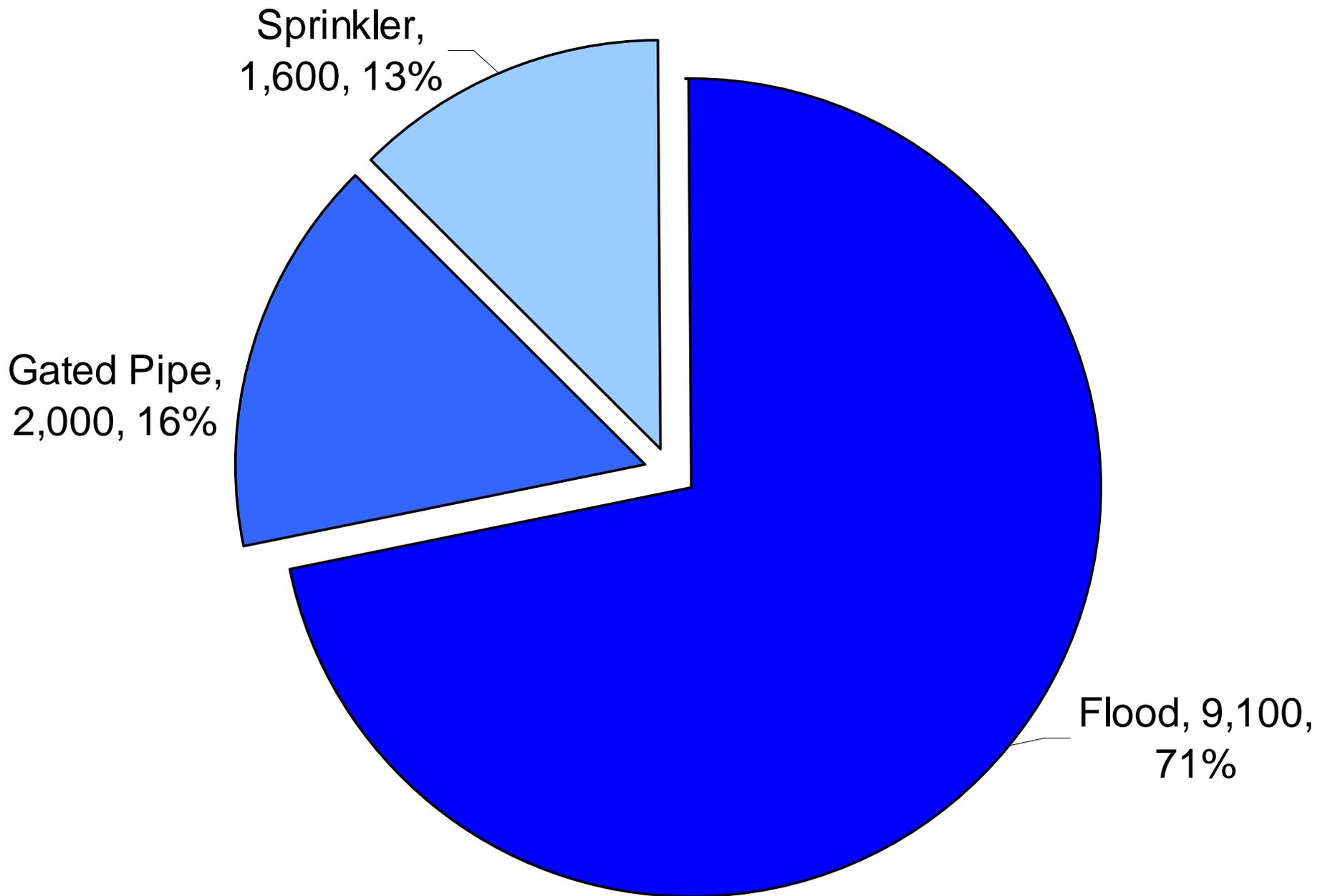


McLeod

-  Irrigated Land
-  Ditches
-  Watershed Boundary



Boulder River Watershed Acres Irrigated by System





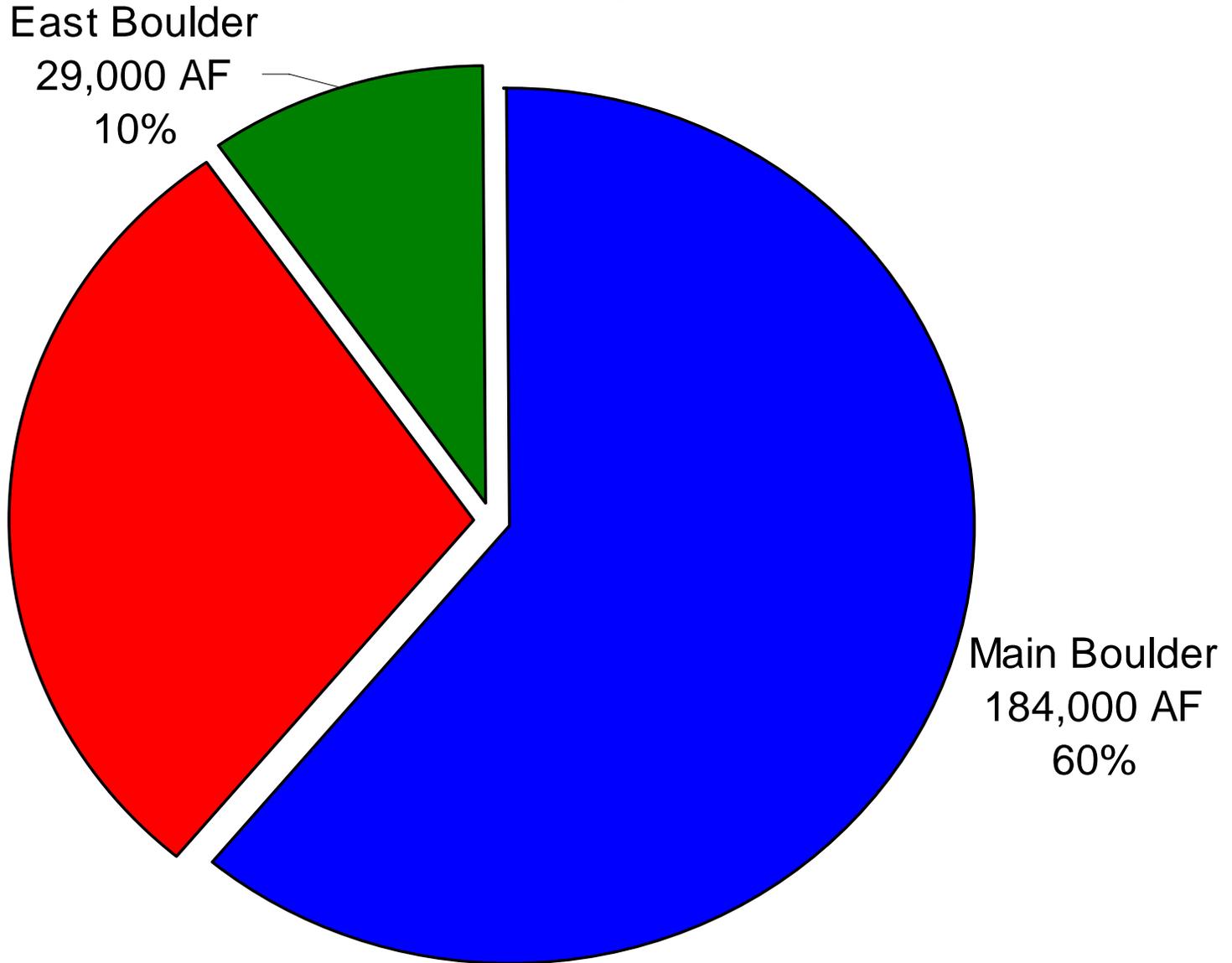
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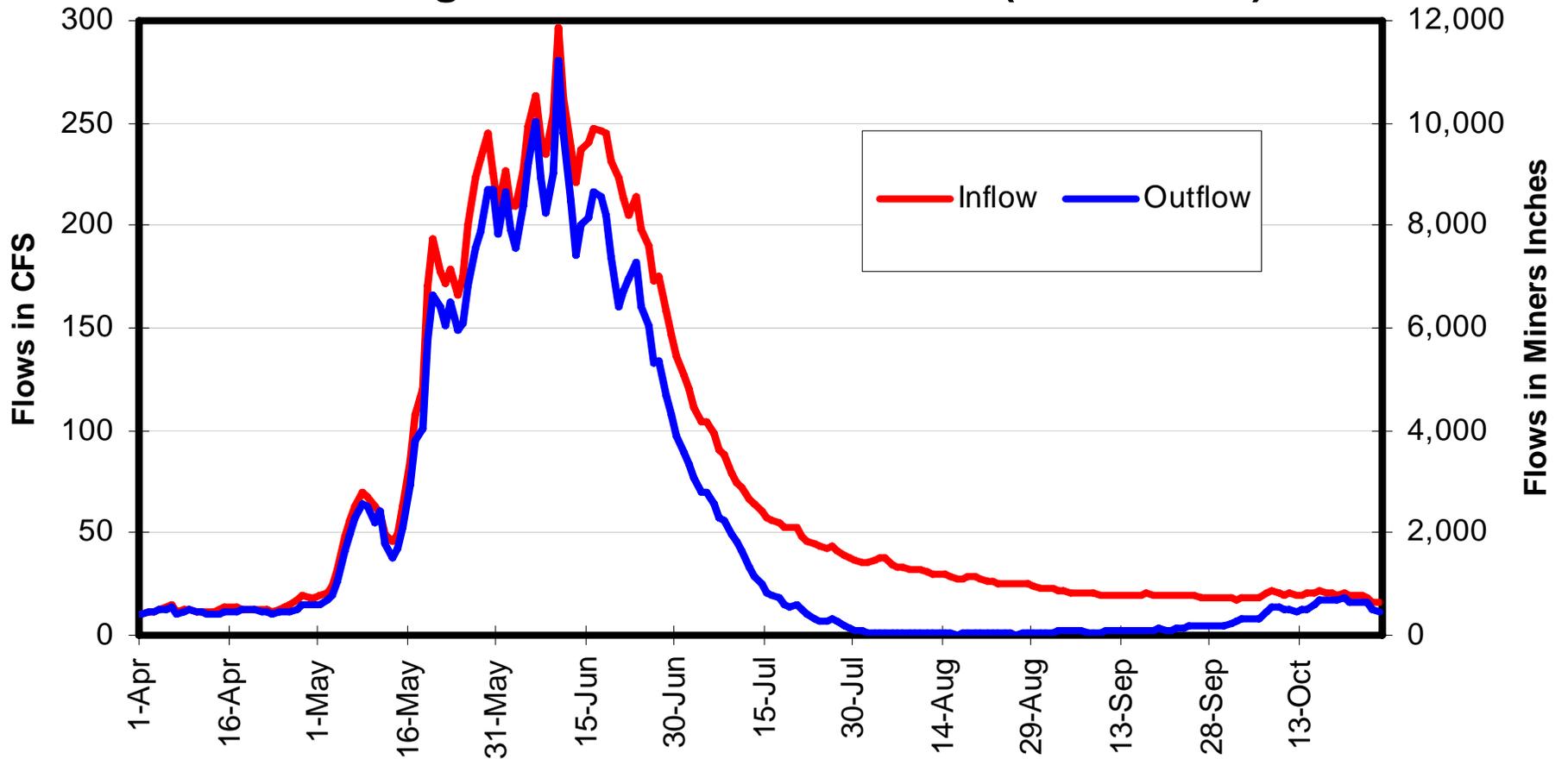


29 3:16 PM

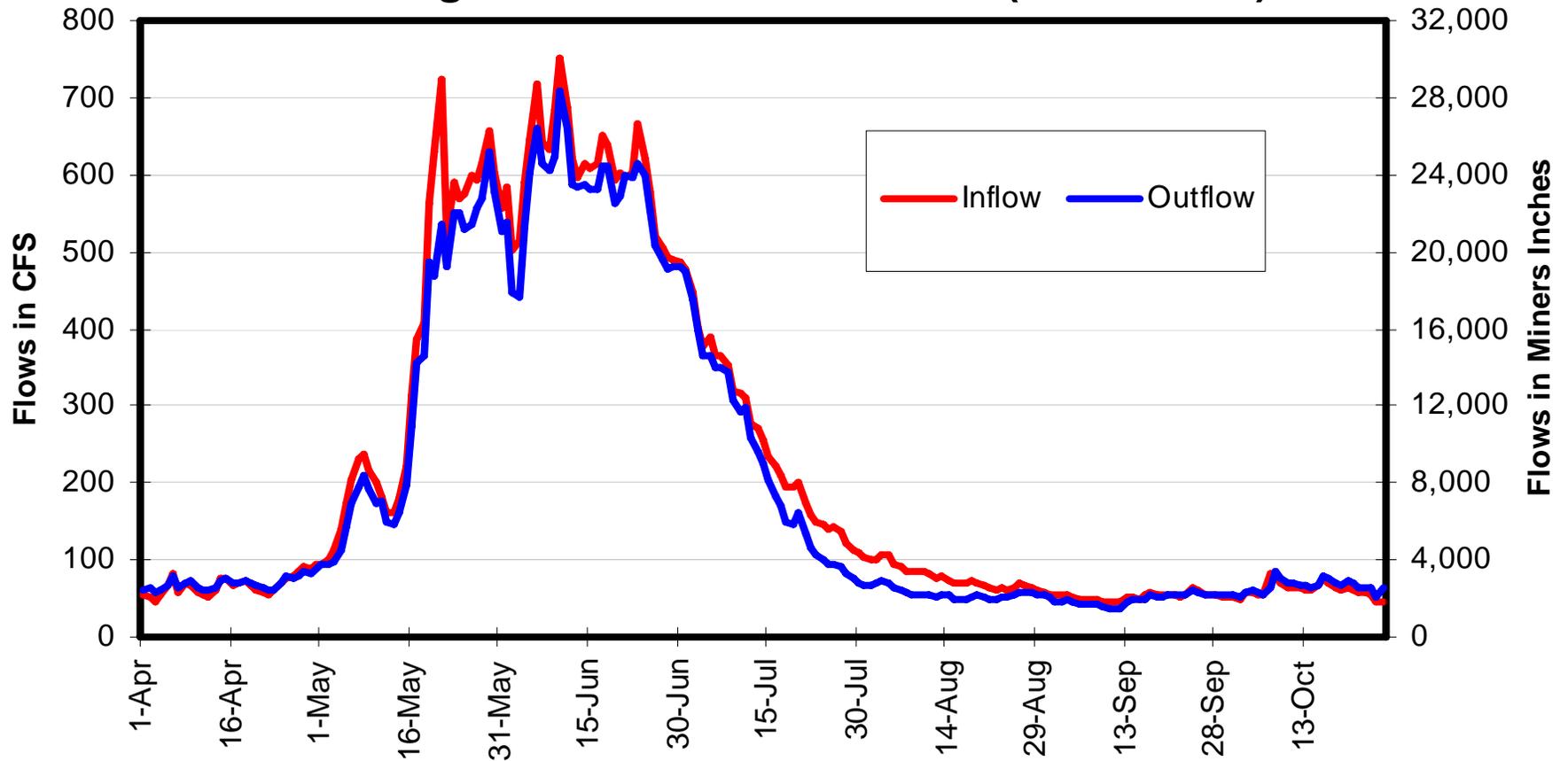
Boulder River Water Yield by Tributary in Acre-Feet and by Percent of Total (2003-2006 Average)



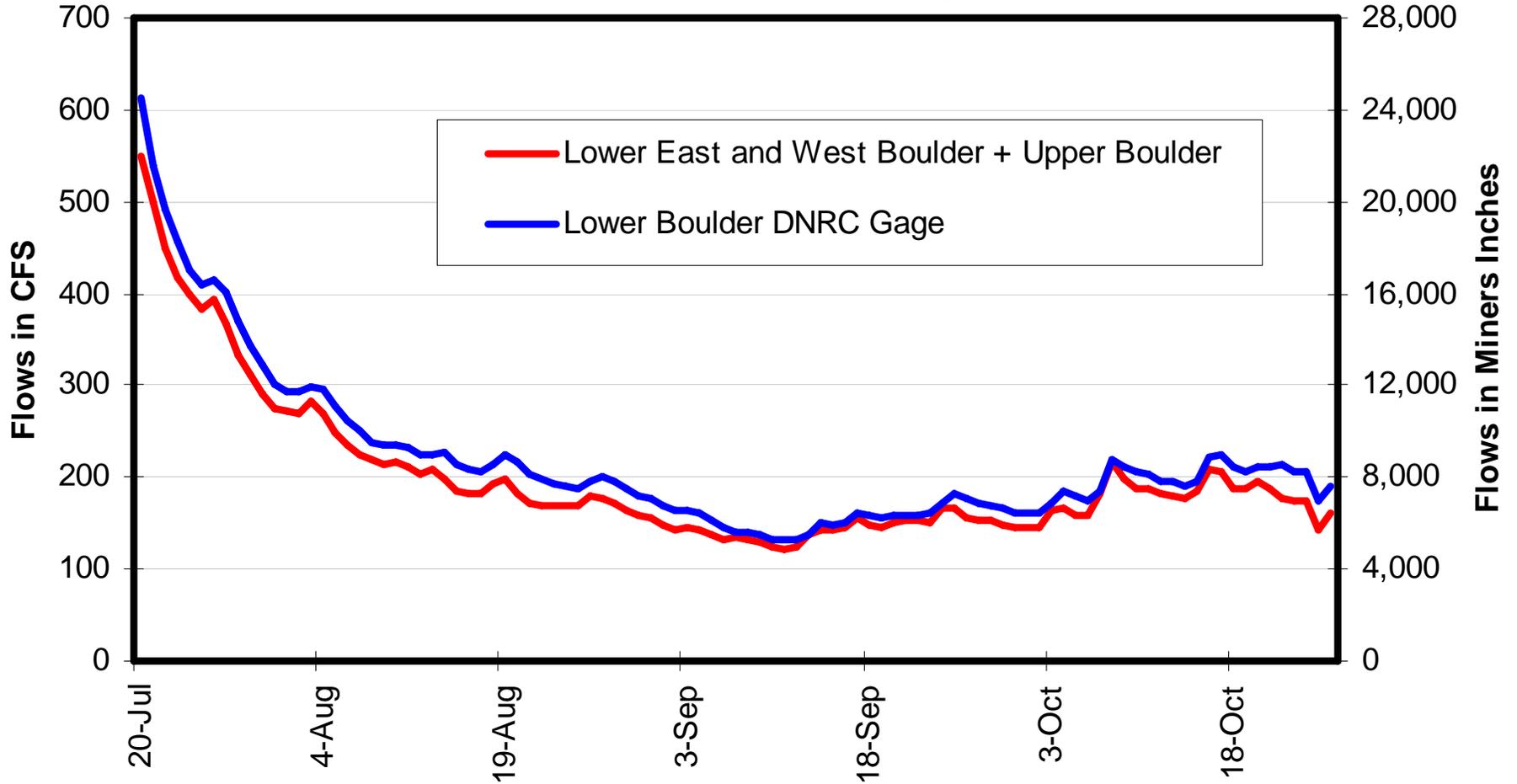
East Boulder River Average Inflows and Outflows (2003-2006)



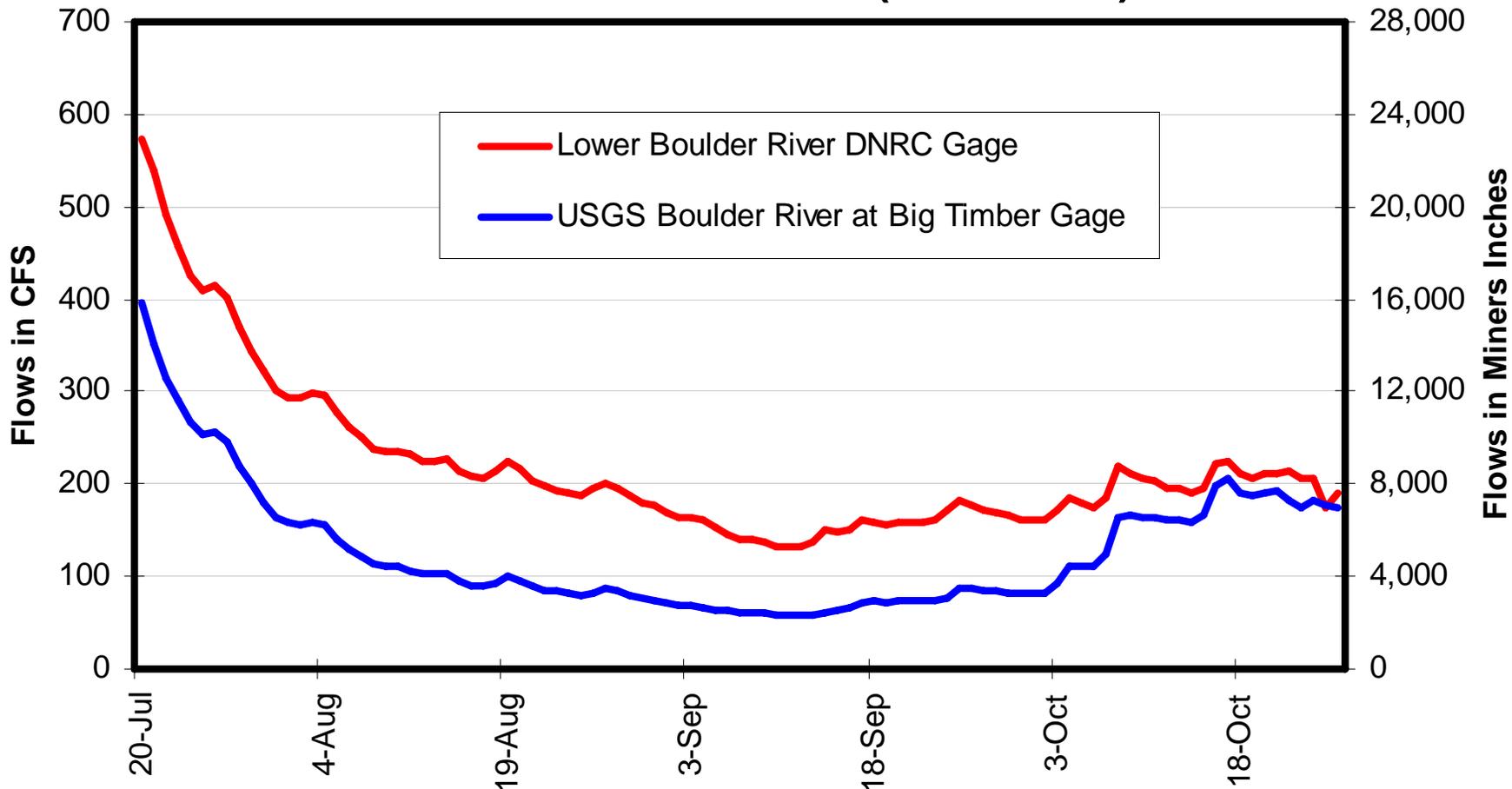
West Boulder River Average Inflows and Outflows (2003-2006)



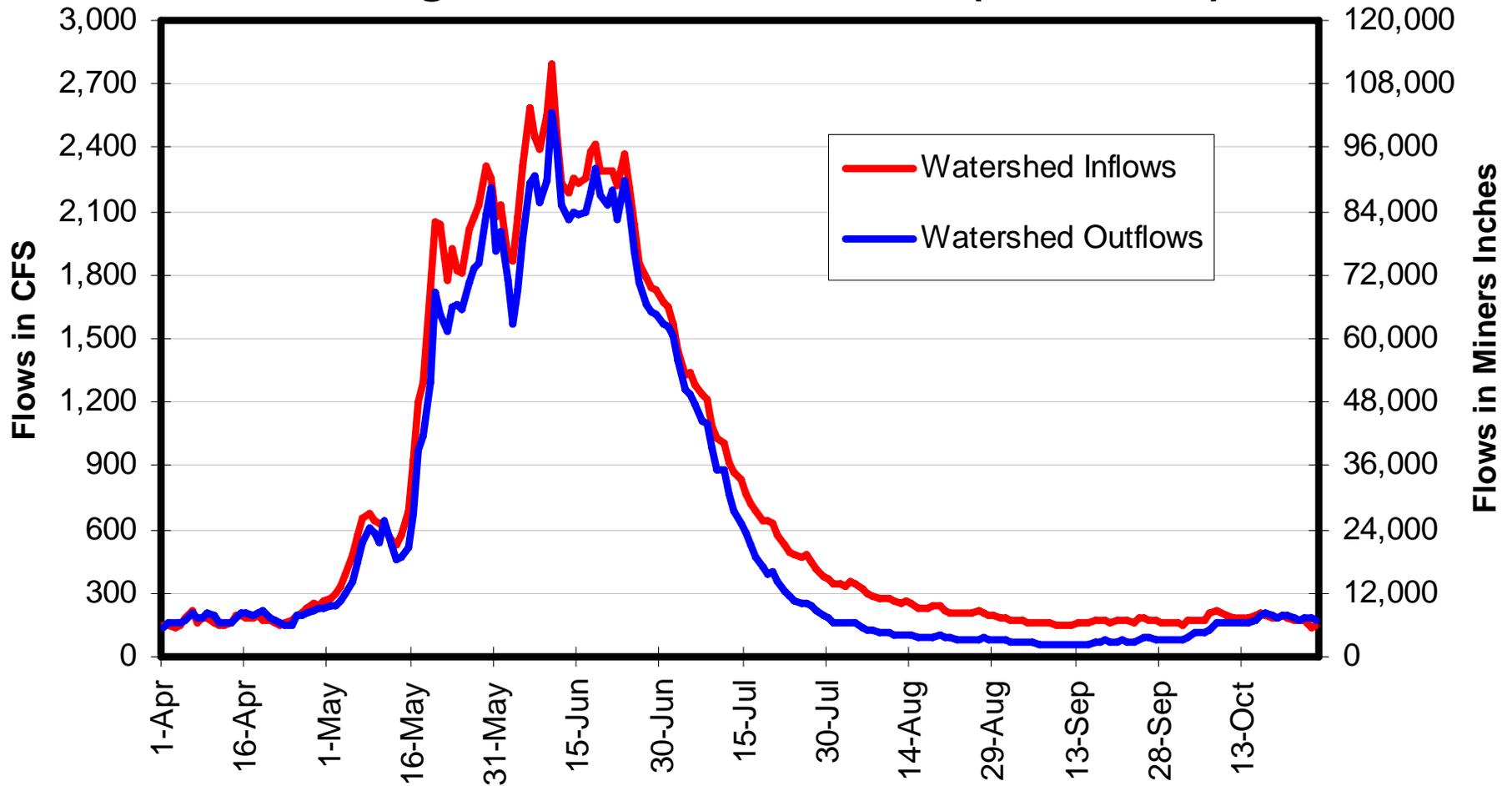
Boulder River Average Flow Gains Forks Area to Lower DNRC Gage (2003-2006)



Lower Boulder River Watershed Inflows and Outflows (2003-2006)



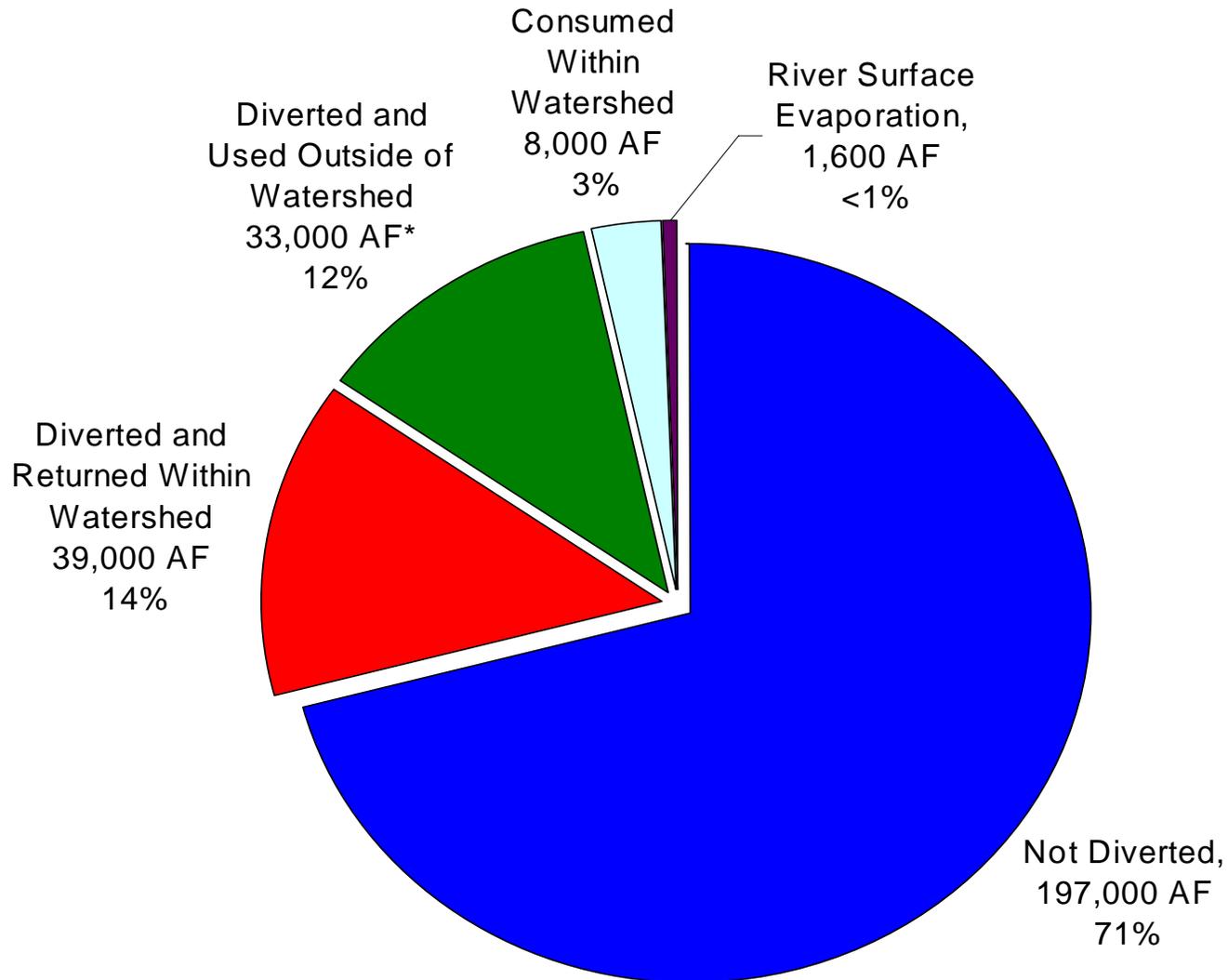
Boulder River Watershed Average Inflows and Outflows (2003-2006)



Boulder Watershed Irrigation Season Average Flow Volumes

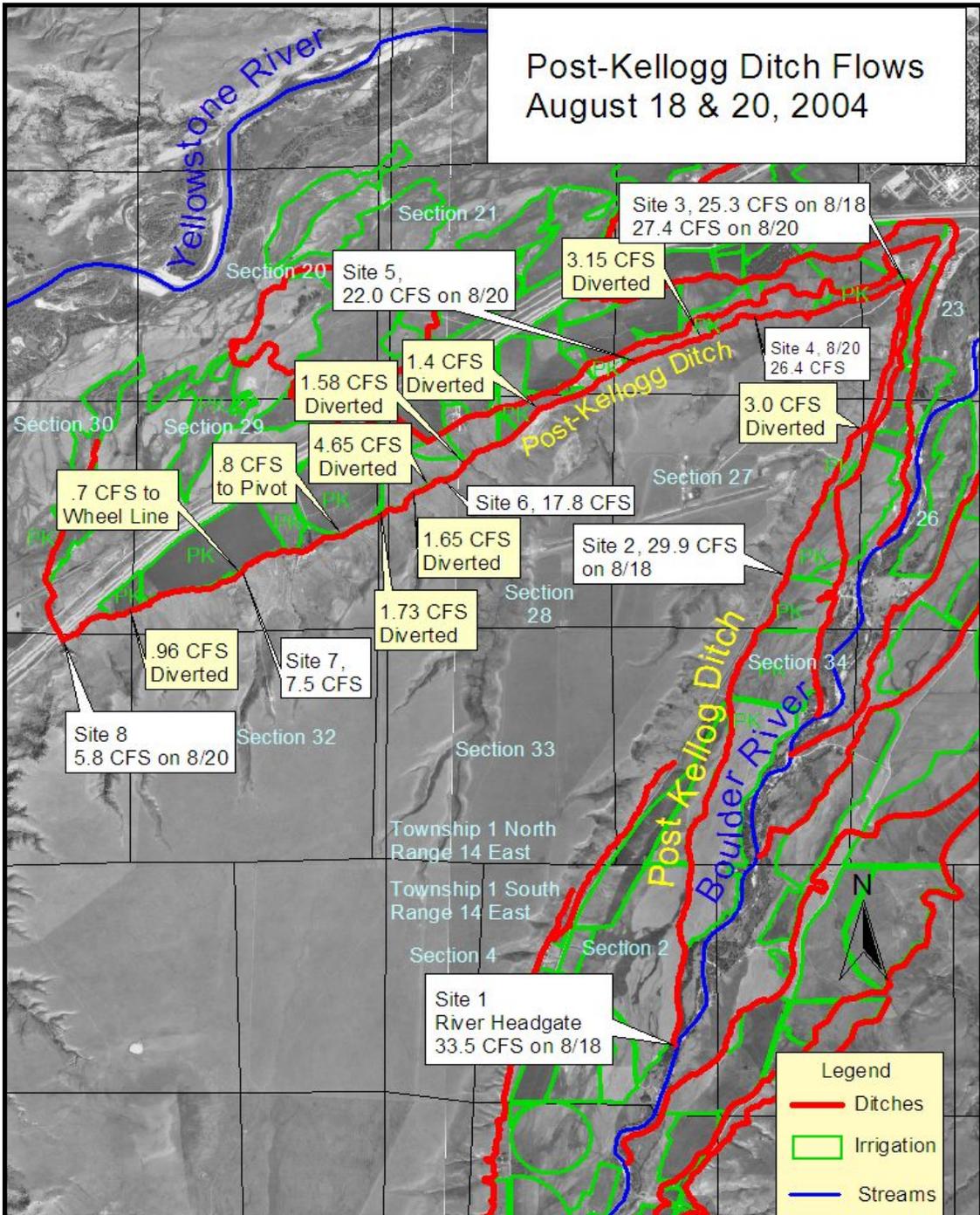
	Watershed Inflows	Water Outflows (acre-feet)	Difference (acre-feet)
East Boulder	29,300	19,750	9,550
West Boulder	79,700	72,900	6,800
Entire Boulder Watershed	278,200	236,300	41,900

Boulder River Watershed May-September Irrigation Water Budget (2003-2006 Average)

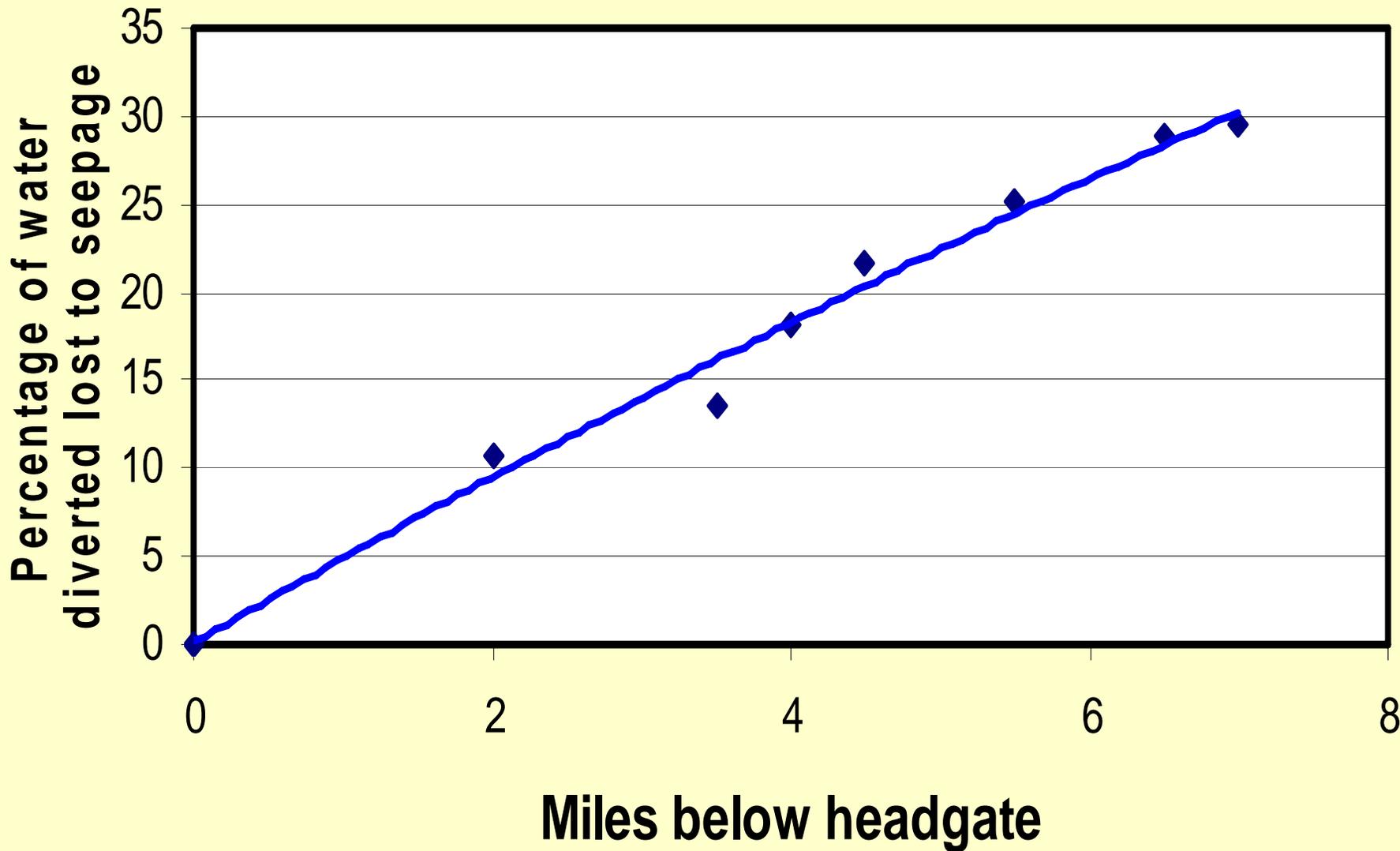




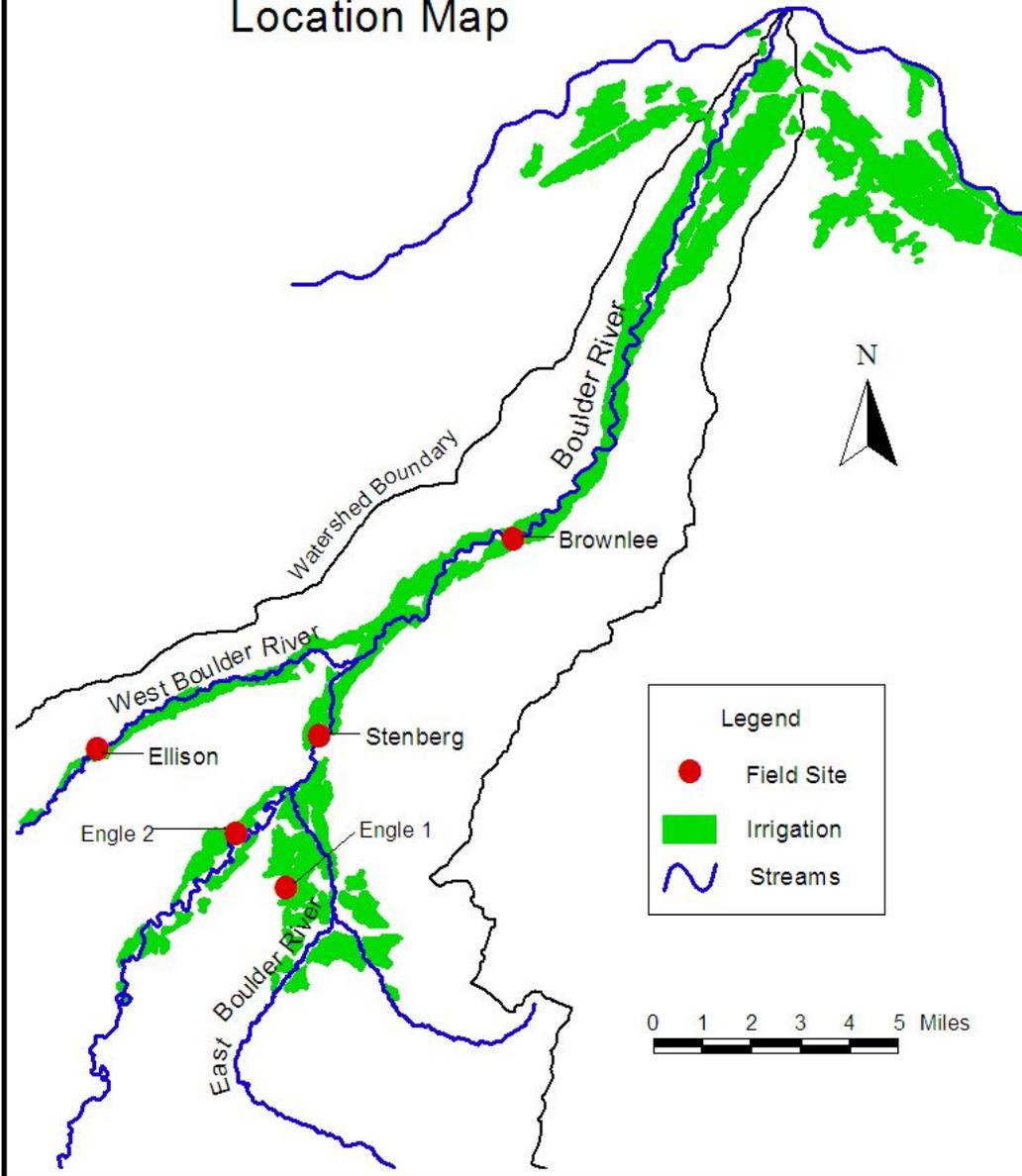
Post-Kellogg Ditch Flows August 18 & 20, 2004



Boulder River Watershed Ditch Seepage Example



Boulder River Watershed Irrigation Efficiency Assessment Location Map





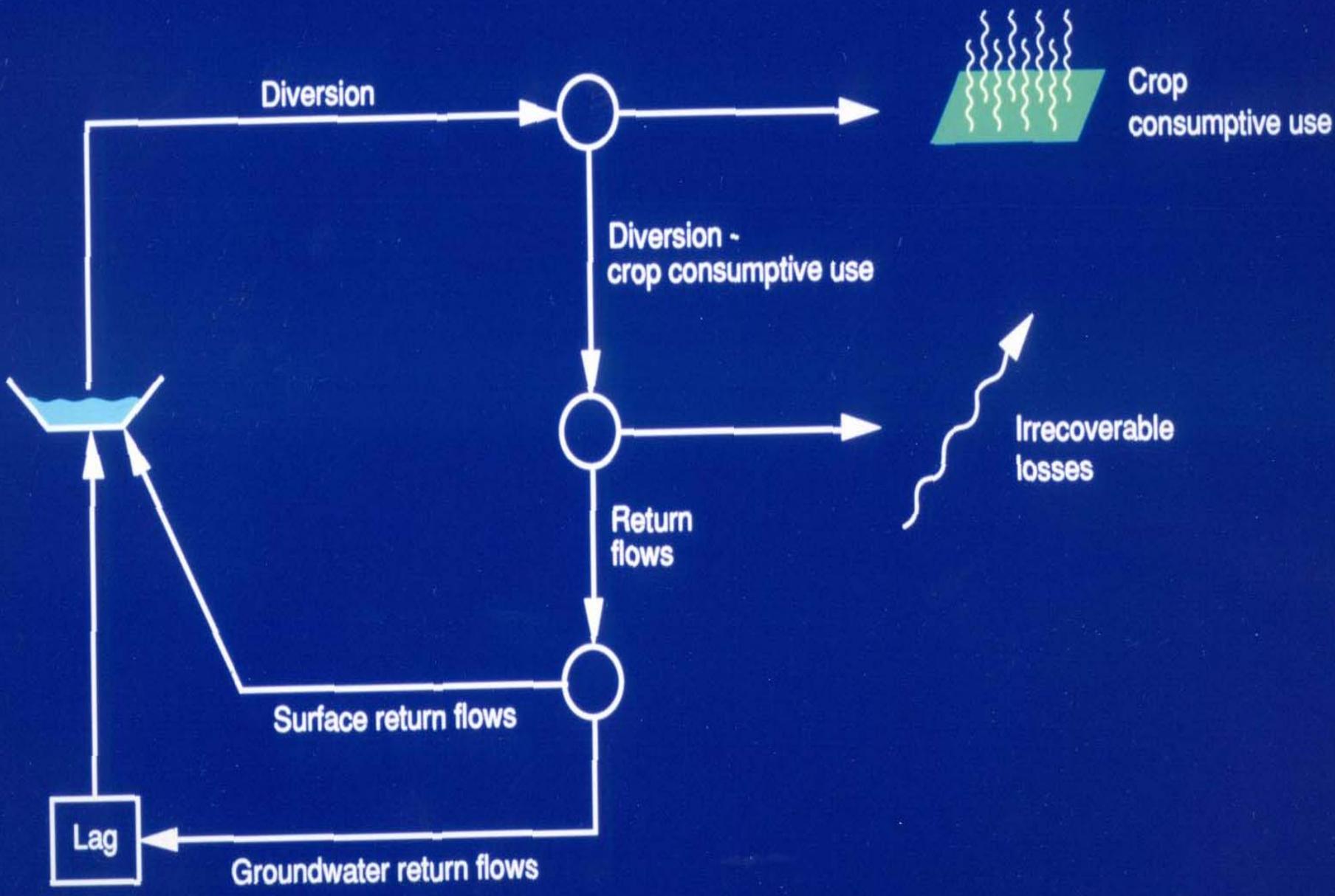




AUG 19 2004







Average Flood Irrigation Field Efficiency

- To Crop – 20 %
- Tailwater Loss – 20%
- Deep Percolation – 60%
- Total Water applied: 20 inches

Big Timber Average Municipal Diversions

Month	CFS	Inches
April	0.5	20
May	0.8	33
June	0.9	36
July	1.4	56
August	1.3	52
September	1	40
October	0.4	16

Conclusions

- Irrigation efficiencies are low overall: Perhaps about 17 percent
- For every acre-foot used by the crop about 6 inches of water is applied
- About 6.5 acre-feet of irrigation water is diverted and about 13 inches of irrigation water is consumed per acre irrigated

East Boulder River

- Ditch and field efficiency improvements could improve the water supply for junior users
- Seepage losses on the Craft Ditch are high and could be reduced through ditch repair and lining
- Efficiency improvements alone probably would not be enough to keep the stream from being dewatered
- Efficiency improvements might be most effective where East Boulder water is used to irrigate land adjacent to the Boulder River

West Boulder River

- Reducing ditch losses could provide for more effective irrigation and reduce diversion requirements
- Improvements to ditch systems that supply West Boulder River water to lands adjacent to the Boulder River would be most effective at improving flows in the lower West Boulder River

Boulder River

- There is still a substantial land base where efficiency improvements could be made
- Reducing ditch losses and increasing field efficiencies could reduce diversions requirements on the lower Boulder River and thereby improve flows

Other Recommendations

- Measuring devices and improved headgates at some sites would allow for better water management
- Marginal fields might be retired and water rights changed
- Small off-stream storage might have some potential





JUN 28 2005



JUL 22 2005



JUN 28 2005





JUN 26 2003



