

Hood River Basin Water Use Assessment

June, 2013

Prepared for:

Hood River County
601 State Street
Hood River, OR 97031

Prepared by:

Niklas Christensen and Ed Salminen
Watershed Professionals Network LLC
701 June Street, Hood River, OR 97031
www.watershednet.com

Contents

1	Introduction	3
2	Approach	4
2.1	OWRD Data Processing	4
2.2	Quality Review	5
3	Results	6
3.1	Potable Water Use	7
3.1.1	City of Hood River	11
3.1.1.1	Water Rights.....	11
3.1.1.2	Water Use	12
3.1.1.3	Additional Information.....	14
3.1.2	Crystal Springs Water District	15
3.1.2.1	Water Rights.....	15
3.1.2.2	Water Use Reports.....	16
3.1.2.3	Additional Information.....	16
3.1.3	Ice Fountain Water District.....	18
3.1.3.1	Water Rights.....	18
3.1.3.2	Water use.....	19
3.1.3.3	Additional Information.....	19
3.1.4	Oak Grove Water Company	21
3.1.4.1	Water Rights.....	21
3.1.4.2	Water Use Reports.....	21
3.1.4.3	Additional Information.....	21
3.1.5	Odell Water Company.....	23
3.1.5.1	Water Rights.....	23
3.1.5.2	Water Use Report	23
3.1.5.3	Additional Information.....	24
3.1.6	Parkdale Water Company	26
3.1.6.1	Water Rights.....	26
3.1.6.2	Water Use Reports.....	26
3.1.6.3	Additional Information.....	26

3.1.7	Other Potable Users	28
3.1.7.1	Port of Hood River.....	28
3.1.7.2	City of The Dalles.....	28
3.1.7.3	Mt. Hood Meadows	30
3.1.7.4	Small Domestic Wells.....	30
3.2	Irrigation Water Use.....	31
3.2.1	Dee Irrigation District.....	36
3.2.1.1	Crop Types.....	36
3.2.1.2	Water Rights.....	36
3.2.1.3	Water Use Reports.....	38
3.2.1.4	Conservation Projects	43
3.2.2	East Fork Irrigation District.....	44
3.2.2.1	Crop Types.....	44
3.2.2.2	Water Rights.....	46
3.2.2.3	Water Use Reports.....	47
3.2.2.4	Conservation Projects	50
3.2.3	Farmers Irrigation District	51
3.2.3.1	Crop Types.....	51
3.2.3.2	Storage Facilities	53
3.2.3.3	Water Rights.....	56
3.2.3.4	Water Use Reports.....	58
3.2.3.5	Conservation Projects	72
3.2.4	Middle Fork Irrigation District.....	73
3.2.4.1	Crop Types.....	73
3.2.4.2	Storage Facilities	75
3.2.4.3	Water Rights.....	78
3.2.4.4	Water Use Reports.....	80
3.2.4.5	Conservation Projects	89
3.2.5	Mt. Hood Irrigation District.....	90
3.2.5.1	Crop Types.....	90
3.2.5.2	Water Rights.....	92
3.2.5.3	Water Use Reports.....	92
3.2.5.4	Conservation Projects	94

3.3	Hydropower	95
3.3.1	Farmers Irrigation District	97
3.3.1.1	Facilities, Discharge, and Production	97
3.3.1.2	Water Rights.....	100
3.3.1.3	Summary Data.....	100
3.3.2	Middle Fork Irrigation District.....	103
3.3.2.1	Facilities, Discharge, and Production	103
3.3.2.2	Water Rights.....	106
3.3.2.3	Summary Data.....	106
3.4	Instream Flow	109
3.5	Industrial.....	112
3.5.1.1	Cold Storage / Packing Houses.....	112
3.5.1.2	Lumber Mills.....	113
3.5.1.3	Other	113
3.6	Water Resource Modeling Data.....	117
3.6.1	Streamflow	117
3.6.2	Naturalized Flow	121
4	References.....	124
5	Appendices.....	125
5.1	Appendix A – Oregon Water Resource Department Water Rights Geodatabase.....	125
5.2	Appendix B - Oregon Water Resource Department Water Use Reports	125
5.3	Appendix C – Timeseries Data for Naturalizing Tucker Bridge Streamflow	125

List of Tables

Table 1. Water rights held by the City of Hood River.	11
Table 2. Water use reports filed by the City of Hood River.	13
Table 3. Water rights held by Crystal Springs Water District.	15
Table 4. Water use reports filed by Crystal Springs Water District.	17
Table 5. Water rights held by Ice Fountain Water District.	18
Table 6. Water use reports filed by Ice Fountain Water District.....	20
Table 7. Water rights held by Oak Grove Water Company.	21
Table 8. Water use estimate for Oak Grove Water Company.....	22
Table 9. Water rights held by Odell Water Company ¹	23
Table 10. Water use data obtained from Odell Water Company.	25
Table 11. Water rights held by Parkdale Water Company.	26
Table 12. Estimate of water use for Parkdale Water Company.	27
Table 13. Water rights held by Port of Hood River.	28
Table 14. Water rights held by City of The Dalles.....	28
Table 15. Water use data filed for Port of Hood River.	29
Table 16. Water use report filed by The City of The Dalles.	29
Table 17. Water rights held by the Meadows Utilities and Mount Hood Meadows.....	30
Table 18. Estimate of acreage of commonly grown crops in Dee Irrigation District.	36
Table 19. Water rights held by Dee Irrigation District.	38
Table 20. OWRD measured ¹ total diversion in Dee Irrigation District from 2000 - 2011.....	39
Table 21. Estimate ¹ of required Dee Irrigation District diversion after pipe installation in 2012. ..	39
Table 22. Water use reports filed by Dee Irrigation District for Camp Creek (WUR ID 16047).....	40
Table 23. Water use reports filed by Dee Irrigation District for Camp Creek (WUR ID 16048).....	40
Table 24. Water use reports filed by Dee Irrigation District for West Fork Hood River.	41
Table 25. Water use reports filed by Dee Irrigation District for Middle Spring/No Name Creek..	41
Table 26. Water use reports filed by Dee Irrigation District for West Fork Hood River.	42
Table 27. DID inflow, loss, and delivered water in July and September, 2008 (cfs) ¹	42
Table 28. Estimate of acreage of commonly grown crops in EFID.....	44
Table 29. Water rights held by East Fork Irrigation District.	46
Table 30. Water use report filed by East Fork Irrigation District (termed WUR).	48
Table 31. OWRD measured ¹ flow in East Fork Irrigation District’s main canal (termed OWRD). .	49
Table 32. Estimate ¹ of actual East Fork Irrigation District water use.....	49

Table 33. Estimate of acreage of commonly grown crops in Farmers Irrigation District. 51

Table 34. Acre-feet stored in Upper Greenpoint Reservoir, Lower Greenpoint Reservoir, and combined total. 55

Table 35. Water rights held by Farmers Irrigation District. 56

Table 36. Total water use cfs for Famers Irrigation District in 2011 (cfs unless otherwise noted). 60

Table 37. Water use report filed by Farmers Irrigation District for Ditch Creek/Upper Reservoir. 61

Table 38. Water use report filed by Farmers Irrigation District for Ditch Creek/Lower Reservoir Storage. 61

Table 39. Water use report filed by Farmers Irrigation District for Rainy Creek. 62

Table 40. Water use report filed by Farmers Irrigation District for Gate Creek #1. 62

Table 41. Water use report filed by Farmers Irrigation District for Gate Creek #2. 63

Table 42. Water use report filed by Farmers Irrigation District for Spring at Camp 4. 63

Table 43. Water use report filed by Farmers Irrigation District for Lower Green Point Reservoir. . 64

Table 44. Water use report filed by Farmers Irrigation District for Ditch Creek. 64

Table 45. Water use report filed by Farmers Irrigation District for Ditch Creek at Parkertown. 65

Table 46. Water use report filed by Farmers Irrigation District for Ditch Creek at Highline. 65

Table 47. Water use report filed by Farmers Irrigation District for Ditch Creek into Plant 3. 66

Table 48. Water use report filed by Farmers Irrigation District for N. Fork Greenpoint Creek. 66

Table 49. Water use report filed by Farmers Irrigation District for Greenpoint Creek. 67

Table 50. Water use report filed by Farmers Irrigation District for Deadpoint Creek (WUR ID 16098). 67

Table 51. Water use report filed by Farmers Irrigation District for Deadpoint Creek (WUR ID 16116). 68

Table 52. Water use report filed by Farmers Irrigation District for South Pine Creek. 68

Table 53. Water use report filed by Farmers Irrigation District for North Pine Creek. 69

Table 54. Water use report filed by Farmers Irrigation District for Phelps Creek. 69

Table 55. Water use report filed by Farmers Irrigation District for Hood River. 70

Table 56. Water use report filed by Farmers Irrigation District for South Pine Creek. 70

Table 57. Summary of OWRD water use reports based on data in Tables 37-56¹. 71

Table 58. Estimate of acreage of commonly grown crops in Middle Fork Irrigation District. 73

Table 59. Water rights held by Middle Fork Irrigation District. 78

Table 60. Water use report filed by Middle Fork Irrigation District for Clear Creek / Reservoir (release). 81

Table 61. Water use report filed by Middle Fork Irrigation District for Laurance Lake Reservoir (storage). 81

Table 62. Water use report filed by Middle Fork Irrigation District for Coe Creek (Coe div.)..... 82

Table 63. Water use report filed by Middle Fork Irrigation District for Eliot Creek (Eliot div.)..... 82

Table 64. Water use report filed by Middle Fork Irrigation District for Trout Creek (Sato div.)..... 83

Table 65. Water use report filed by Middle Fork Irrigation District for Trout Creek (Dykstra div.).. 83

Table 66. Water use report filed by Middle Fork Irrigation District for Rogers Creek (Rogers div.)..... 84

Table 67. Water use report filed by Middle Fork Irrigation District for Wisehart Creek (Alexander div.)..... 84

Table 68. Water use report filed by Middle Fork Irrigation District for Griswell Creek (Halliday div.)..... 85

Table 69. Water use report filed by Middle Fork Irrigation District for Evans Creek (Higgins div.)..... 85

Table 70. Water use report filed by Middle Fork Irrigation District for Evans Creek (Evans div.).. 86

Table 71. Water use report filed by Middle Fork Irrigation District for Emil Creek (Emil div.)..... 86

Table 72. Water use report filed by Middle Fork Irrigation District for Emil Creek storage..... 87

Table 73. Estimate of Middle Fork Irrigation District withdrawals, return flows, consumptive use, and hydropower based on 2008-2012 averages..... 88

Table 74. Estimate of acreage of commonly grown crops in Mt. Hood Irrigation District..... 90

Table 76. Water Use Reports Filed by Mt. Hood Irrigation District..... 93

Table 77. Location of FID penstocks and hydropower facilities..... 97

Table 78. Configuration, average discharge, and estimated annual output for Plants #2 and #3..... 97

Table 79. Water rights held by Farmers Irrigation District under use group of "Power." 100

Table 80. Total discharge through Plant #3 (CFS, from FID). 101

Table 81. Discharge through Plant #2 (CFS, from FID)..... 101

Table 82. Farmers Irrigation District combined (Plant #2 & #3) power production (MW-hr, from FID)..... 102

Table 83. Location of MFID penstocks and hydropower facilities..... 103

Table 84. Configuration, average discharge, and estimated annual output for Plant #1-#3. 104

Table 85. Hydropower water right held by MFID..... 106

Table 86. Discharge into MFID Plant #1..... 107

Table 87. Estimate of discharge through MFID Plant #2..... 107

Table 88. Discharge out of MFID Plant #3..... 107

Table 89. Combined Middle Fork Irrigation District power production (MW-hr/yr)..... 108

Table 90. Major instream water rights in the Hood River Basin..... 109

Table 91. Water rights filed under industrial, commercial, or manufacturing use groups..... 116

Table 92. Average, maximum, minimum, and monthly average discharge for 1965 -2012. 118

Table 93. Monthly average diversion values for generating naturalized USGS Tucker Bridge streamflow data. 123

List of Figures

Figure 1. Potable water districts, irrigation districts, major industrial water users, hydropower facilities, and instream flow locations in the Hood River Basin.....	6
Figure 2. Boundaries of the potable water districts in the Hood River Basin.....	7
Figure 3. Municipal points of diversion (POD) and zones of contribution (1, 2, and 3 year) for potable water districts located in the Hood River Basin.....	8
Figure 4. All domestic water rights located in the Hood River Basin.....	9
Figure 5. Annual water use for major potable water districts in the Hood River Basin.....	10
Figure 6. Average monthly water use for potable water districts in the Hood River Basin.....	10
Figure 7. Irrigation districts in Hood River County.....	31
Figure 8. Schematic of water distribution systems for irrigation districts in Hood River County with IFIM transect locations.....	32
Figure 9. All irrigation and agricultural water rights in Hood River County.....	33
Figure 10. Total water year diversion for irrigation districts in the Hood River Basin.....	34
Figure 11. Average monthly diversion for irrigation districts in the Hood River Basin.....	34
Figure 12. Average monthly irrigation plus agricultural diversion for irrigation districts in the Hood River Basin.....	35
Figure 13. Irrigation district non-hydropower water use in feet per year.....	35
Figure 14. Dee Irrigation District’s water rights ¹ and district boundary.....	37
Figure 15. East Fork Irrigation District’s water rights, district boundary, and distribution system..	45
Figure 16. Farmers Irrigation District’s water rights, district boundary, and distribution system. ..	52
Figure 17. Storage Volume in Upper and Lower Greenpoint Reservoirs as a function of elevation below spill.....	53
Figure 18. Timeseries of monthly combined reservoir storage for water year 2005-2012.....	54
Figure 19. Average monthly upper, lower and total reservoir storage based on water year 2005-2012.....	54
Figure 20. Total water use for Farmers Irrigation District in 2011.....	58
Figure 21. Irrigation water use for Farmers Irrigation District in 2011.....	59
Figure 22. Hydropower water use for Farmers Irrigation District in 2011.....	59
Figure 23. Middle Fork Irrigation District’s water rights, district boundary, and distribution system.....	74
Figure 24. Storage in Laurance Lake as a function of reservoir elevation.....	76
Figure 25. Monthly storage in Laurance Lake from water year 2001-2012.....	77
Figure 26. Average monthly storage in Laurance Lake based on water years 2008-2012.....	77
Figure 27. Middle Fork Irrigation District water use by source.....	80

Figure 28. Mt Hood Fork Irrigation District’s point of diversion and district boundary. 91

Figure 29. Hydropower water rights and major hydropower facilities in Hood River County. 95

Figure 30. All hydropower water rights in Hood River County. 96

Figure 31. Average monthly total power production (based on 2001-2011). 98

Figure 32. Annual total (Plant #2 + Plant #3) hydropower production for 2001-2011. 99

Figure 33. Average monthly flow into Plant #2 and #3 based on WY 2005-2011. 99

Figure 34. Average monthly flow into Middle Fork Irrigation District hydropower facilities (based on 2008-2012). 105

Figure 35. Average monthly power production for Middle Fork Irrigation District (based on 2001-2012). 105

Figure 36. Annual power production for Middle Fork Irrigation District. 106

Figure 37. Location of instream water rights and flow agreements in the Hood River Basin. ... 111

Figure 38. Location of all industrial waters in the Hood River Basin. 114

Figure 39. Major industrial and commercial water users in the Hood River Basin. 115

Figure 40. Average, maximum, and minimum monthly flow at USGS Tucker Bridge gauge. ... 119

Figure 41. Total water year discharge at USGS Tucker Bridge gauge. 119

Figure 42. July through September discharge at USGS Tucker Bridge gauge. 120

Figure 43. September through October discharge at USGS Tucker Bridge gauge. 120

Figure 44. Monthly values for naturalizing Tucker Bridge USGS streamflow data. 122

1 Introduction

This report is in support of the Hood River Water Planning Group's Water Supply and Storage Feasibility Study (Study). The Study is being conducted through a \$250,000 in-kind contribution from the United States Bureau of Reclamation (Reclamation) and a \$250,000 grant to Hood River County (HRC) from the Oregon Water Resource Department (OWRD). The Study is investigating the long-term reliability of the Hood River Basin (Basin) water resource system. Key focuses of the Study are water demands in the Basin, potential effects from climate change on water supply, and the ability of water conservation, groundwater use, or additional surface water storage to mitigate for any negative impacts from supply or demand changes in the future. This report documents major water rights and water use in the Basin. The data contained in this report will serve as the foundation for the overall Study; however, this document also serves as a standalone assessment of current water demands, water rights, and other water resource related data in the basin.

This report is divided into six major parts; 1) Potable Water Use, 2) Irrigation Water Use, 3) Hydropower Water Use, 4) Instream Water Use, 5) Industrial Water Use, and 6) Water Resource Modeling Data. Parts 1-5 contain general information, detailed OWRD water rights and water use information, plus a discussion of the quality of that information, and where applicable, new and better information. Part 6 (Water Resource Modeling Data) contains historic Hood River streamflow, data and results for naturalizing (i.e. removing the effects of storage and diversions) streamflow, and an analysis of the contribution from baseflow and glacial melt to streamflow. Data in part 6 will be used in the hydrologic and water resource modeling performed by Reclamation.

Quality reviewed data with summary tables, figures and discussion are provided in the body of the report, while raw data with additional fields (e.g. township/range, stream code) obtained from OWRD are contained in electronic (Microsoft Excel) appendices. Data contained in the report and appendices is also available through an interactive web map hosted on the Hood River County website at <http://www.co.hood-river.or.us/>.

2 Approach

Information contained in this report is a combination of data obtained from OWRD and data obtained directly from the entities discussed herein. The OWRD data includes information from their Water Rights Information System (WRIS)¹, Water User Reports (WUR)², and geospatial database³. Individual districts provided access to past reports, unpublished data, and information on general operations. Information contained in this report represents the best, most accurate information from the sources above.

2.1 OWRD Data Processing

The OWRD WRIS, WUR, and Geodatabase were downloaded from the webs sites referenced above. The WUR was searched for all entities reporting water use in the Hood River Basin. These data were downloaded and assembled into tables of reported use by year. The WRIS was queried to extract all non-cancelled water rights that are in the Hood River Basin (including tributaries). Geospatial data for the Hood River Basin were extracted within ArcGIS using the Basin polygon, taking care to include or exclude water rights mapped close to the basin boundaries. Data obtained from the Geodatabase were compared against the WRIS database (WRIS is the most complete and up to date source for water rights in Oregon). Data points that were not available in the Geodatabase were then plotted using the point of diversion location information from the WRIS, or from the water right documents themselves. In some cases, point-of-diversion descriptions were vague and could only be mapped at the center of the quarter-quarter-section. The Middle Fork Irrigation District (MFID) supplied a GIS layer showing the locations of all MFID diversions. The MFID layer was incorporated into the final GIS point of diversion layer. The GIS point of diversion layer was provided to HRC for incorporation into their web map server⁴.

¹ <http://www.oregon.gov/owrd/pages/wr/wris.aspx>

² http://www.oregon.gov/owrd/pages/wr/water_use_report.aspx

³ <http://www.oregon.gov/owrd/Pages/maps/index.aspx>

⁴ http://www.co.hood-river.or.us/index.asp?Type=B_BASIC&SEC={874DEC00-B8C0-4CE2-A2D9-C088E3325A16}

2.2 Quality Review

The Water Rights Information System data was joined with additional water rights data (e.g. acres) provided by the local OWRD watermaster. This information was then sorted into Microsoft Excel spreadsheets for each district that included all water rights and water use data for that district. The water use data was put into tables of water use by water year and month for each individual water use report. Summary tables and figures of average monthly water use and average annual water use were then generated from the data in each individual water use report. This information was compared against data from publically available documents (e.g. water conservation and management plans) from which potential data irregularities were identified. All data was then summarized and sent to each district along with a questionnaire about data irregularities, requests to fill data gaps, and potential changes in either operations or the way water use is recorded. At the same time, requests were made for additional data that will be required by Reclamation for performing water resource modeling of the basin (e.g. reservoir volumes).

Once replies were received or meetings were held with each district, the water rights and water use data was then updated to reflect the best available knowledge about each system. The top two rows of each water use table in this report provide an estimate of current water use by month (e.g. average current use in June). This data is included in the report to facilitate Reclamation modeling current/baseline water use in the basin. Where possible, all 2001-2012 data in the OWRD water use reports were used to compute this current demand, however, often a select shorter period was used because of either bad data or changing use patterns. For example, the OWRD water use reports for Ice Fountain Water District report 21% higher water use for 2001-2008 than for 2009-2012. In meeting with Ice Fountain Water District, it was relayed that they had an improperly calibrated water meter that got fixed in 2008, and that the 2009-2012 water use reports are the most accurate picture of their current water use. The actual years used in generating the current water use values are given in the row heading and the notes section below each table.

Irrigation districts and water companies provided feedback on items outside of just water rights and water use. This feedback varied significantly by irrigation district or water company and is captured in the general discussion of each entity. Due to the range of feedback and subsequent adjustments for each district or water company, further details on individual approaches are contained in the applicable parts of the results section.

3 Results

Data is presented in sections 3.1-3.5 for all major potable, irrigation, hydropower, instream, and industrial water uses in the Hood River Basin (Figure 1). Section 3.6 contains data required for water resource modeling, including an analysis of historic Hood River streamflow data. Complete OWRD Water Rights Information System and Water Use Reports are presented in Appendix A and B, respectively, while values used to naturalize Hood River streamflow are presented in Appendix C.

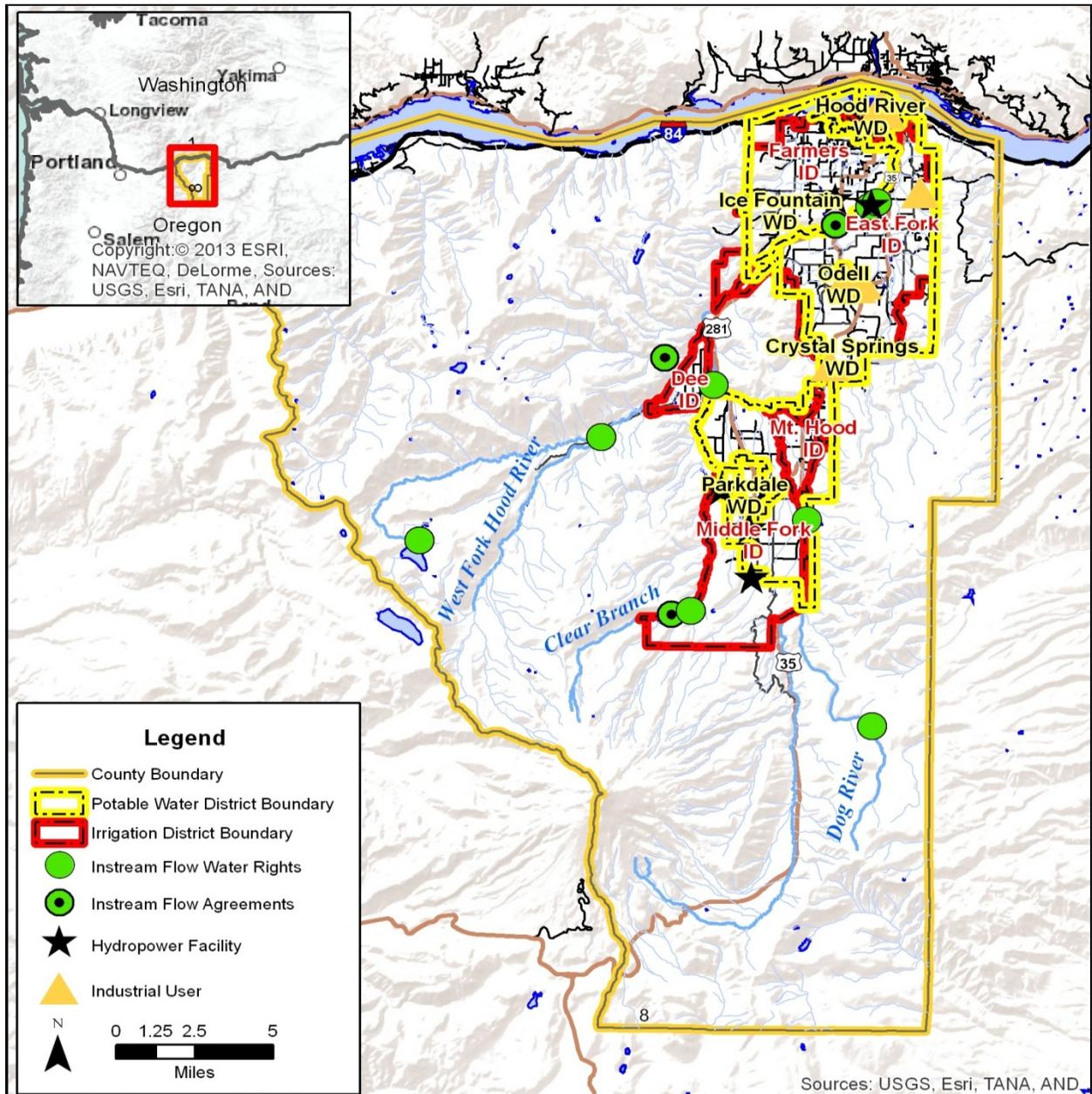


Figure 1. Potable water districts, irrigation districts, major industrial water users, hydropower facilities, and instream flow locations in the Hood River Basin.

3.1 Potable Water Use

Water rights, water use reports, along with number of patrons and other general information is presented below for The City of Hood River, Crystal Springs Water District, Ice Fountain Water District, Odell Water Company, Parkdale Water Company, Mt. Hood Meadows Resort, Oak Grove Water Company, Port of Hood River, and the City of The Dalles (Figure 2). Each district's water rights points of diversion (POD) and zones of contribution are shown on Figure 3, while annual and average monthly water use for each entity above are shown in Figures 5 and 6, respectively. This data is discussed in sections 3.1.1 through 3.1.7. Figure 4 shows all domestic water rights which are further detailed in Appendix A.

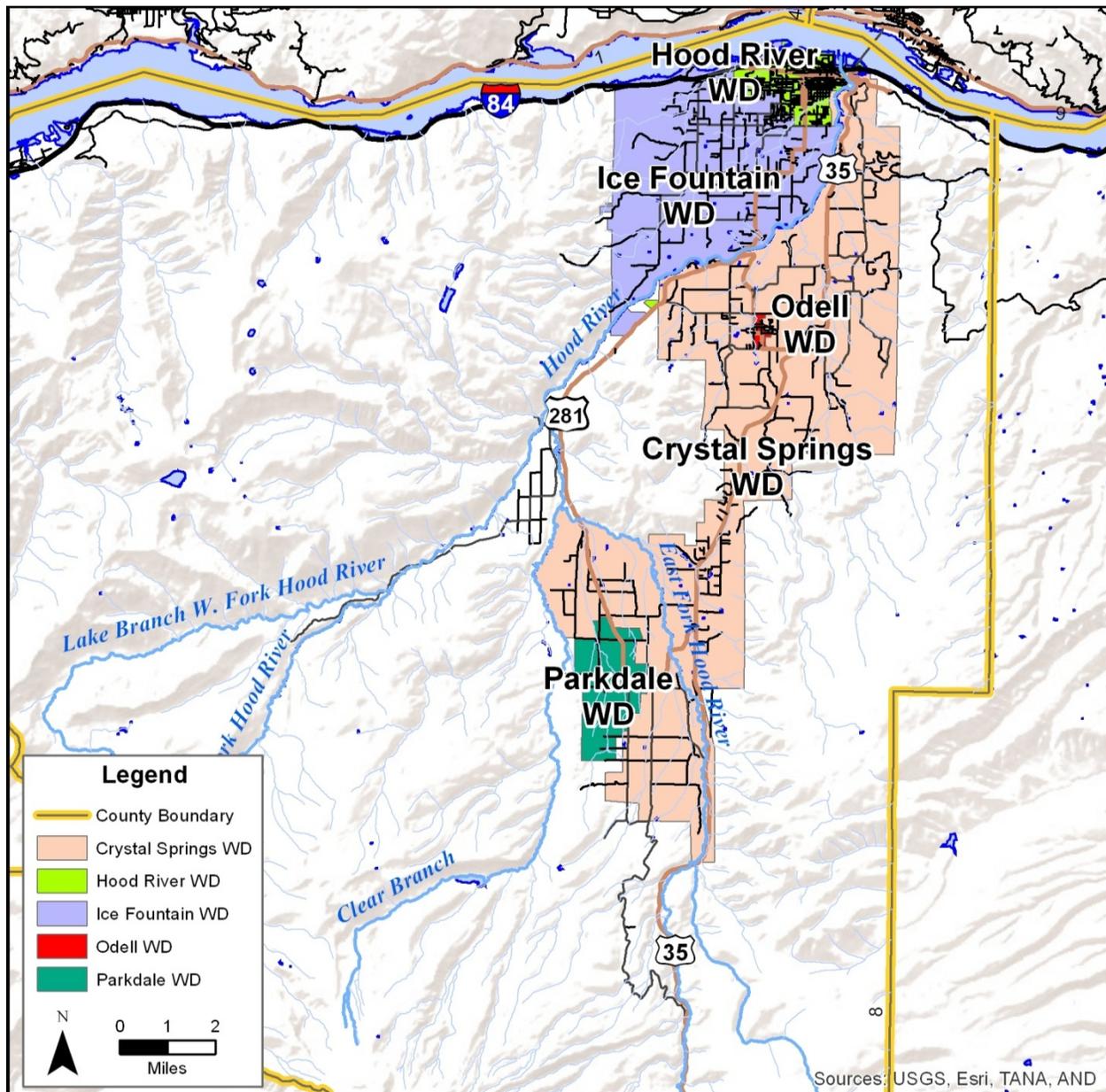


Figure 2. Boundaries of the potable water districts in the Hood River Basin. Oak Grove not shown – no GIS data available.

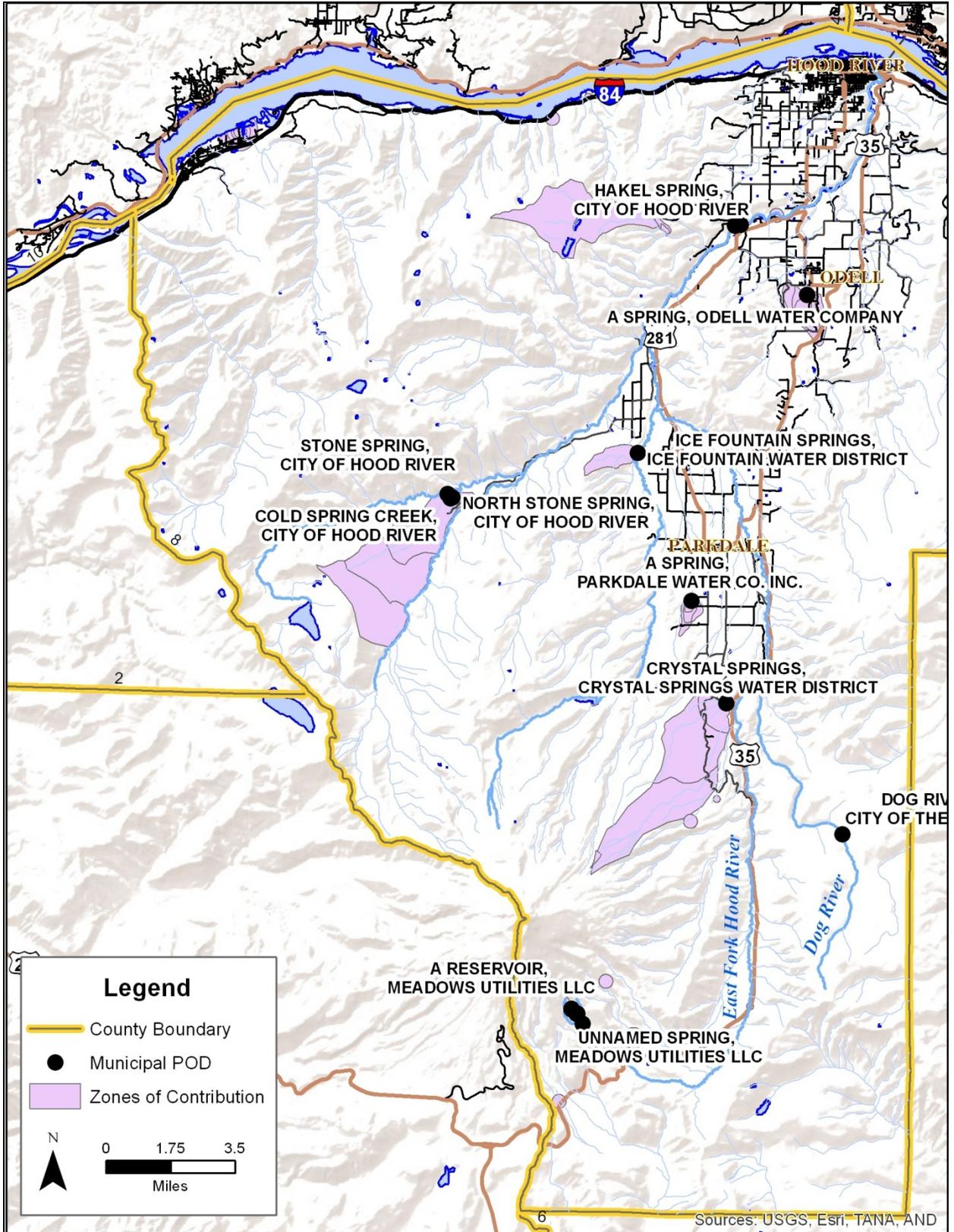


Figure 3. Municipal points of diversion (POD) and zones of contribution (1, 2, and 3 year) for potable water districts located in the Hood River Basin.

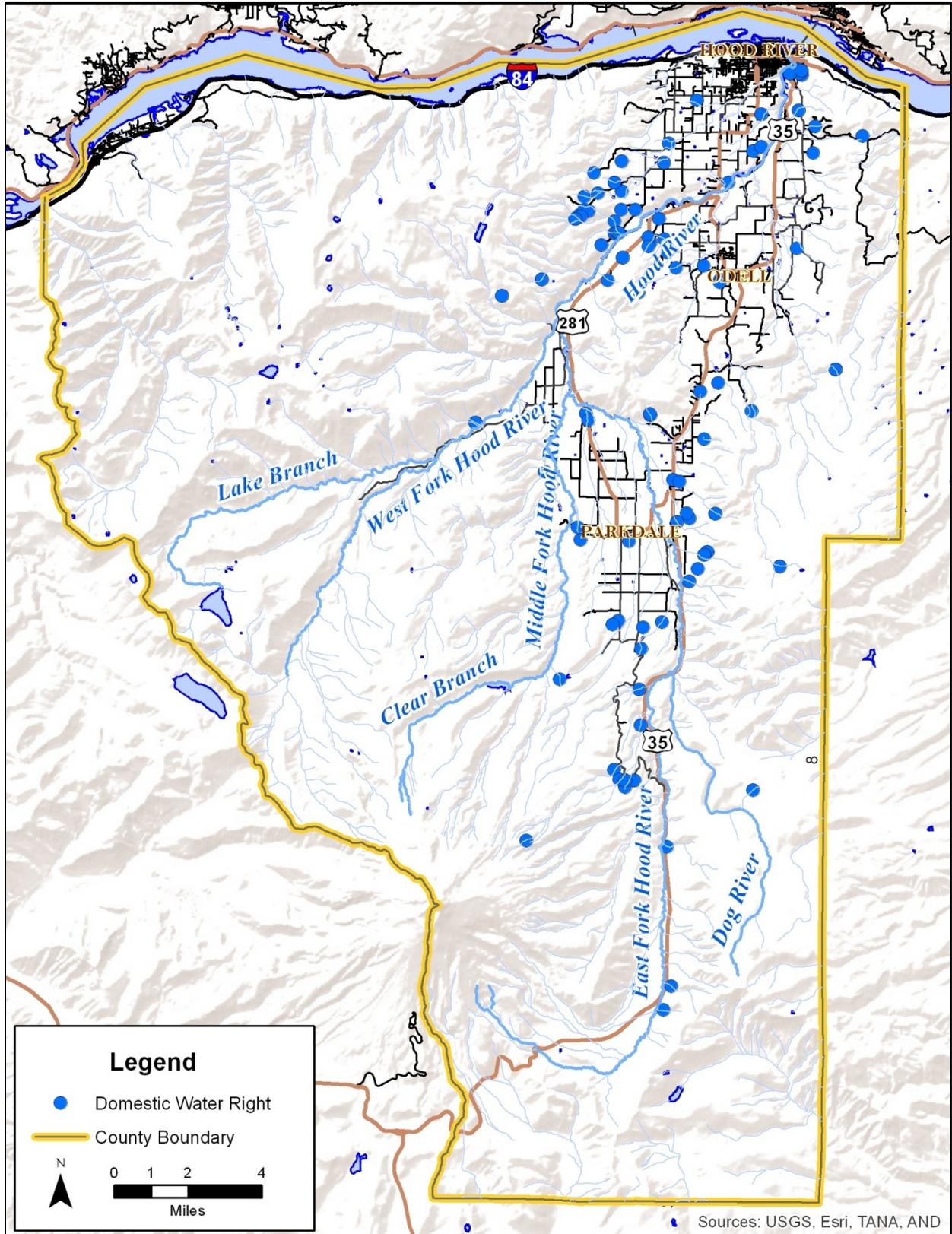


Figure 4. All domestic water rights located in the Hood River Basin.

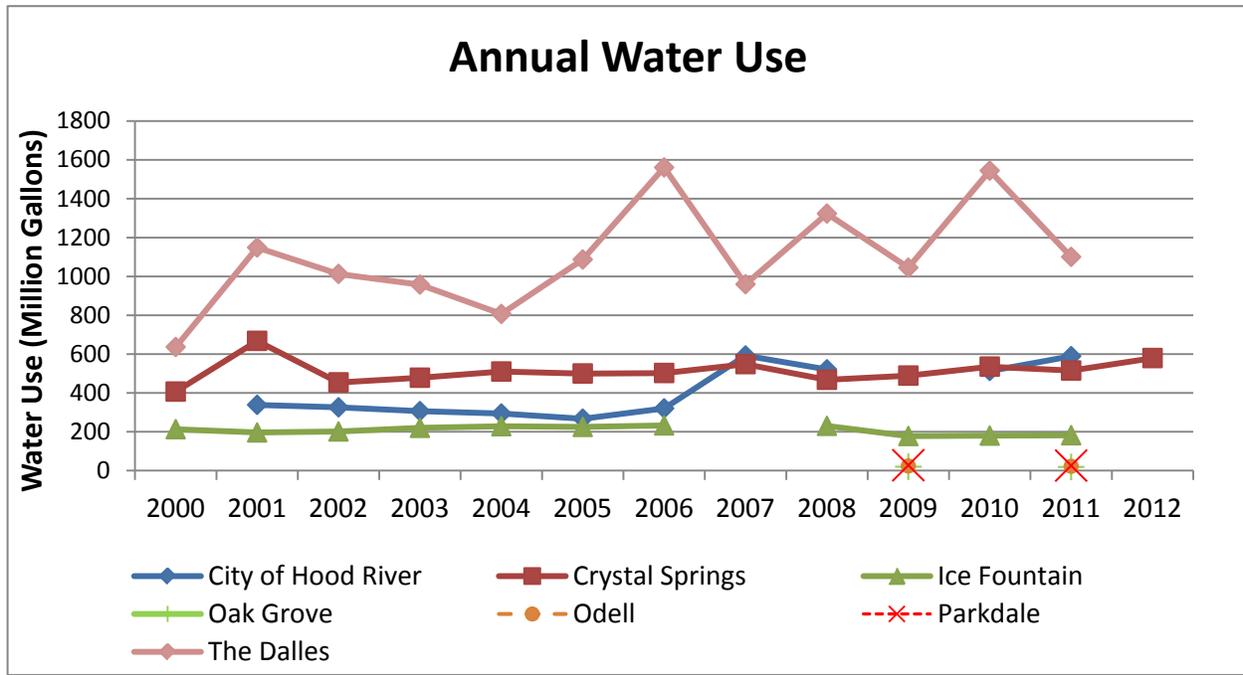


Figure 5. Annual water use for major potable water districts in the Hood River Basin. No estimate available from Mt. Hood Meadows.

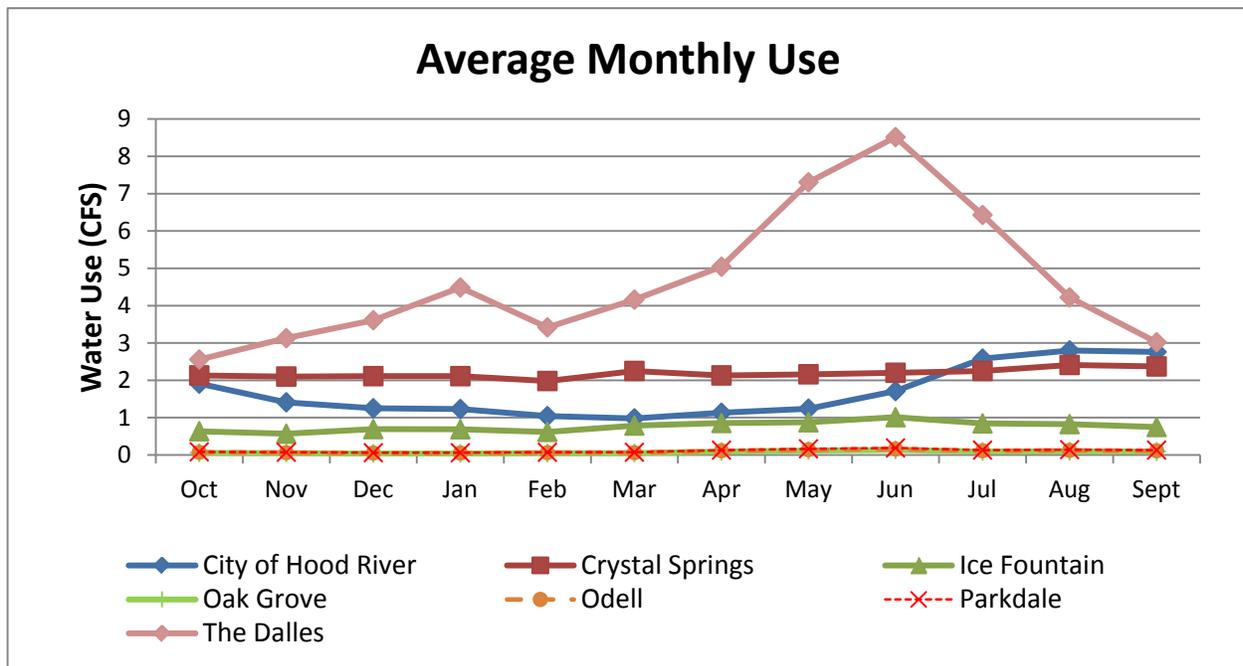


Figure 6. Average monthly water use for potable water districts in the Hood River Basin. No estimate available from Mt. Hood Meadows.

3.1.1 City of Hood River

The City of Hood River supplies water to users within City limits as well as areas along the City’s 18 mile long transmission line. In July 2011 this consisted of 7,320 people within the City plus an additional 270 people along the transmission line. The City’s sources of water are three springs located in the upper Hood River Valley below Lost Lake Butte. All three springs feed a central collection box which is gravity conveyed to a chlorine treatment station 3.8 miles away. From the treatment station, water is gravity fed to Riverdale Reservoir (5 million gallons), Wilson Reservoir (500,000 gallons), Coe Reservoir (700,000 gallons), or directly to end users. Historically, the City has diverted approximately 7.1 cfs from the springs and overflowed the amount in excess of the City’s demand at Riverdale and Coe Reservoirs. The City has recently installed 14 miles of 24” ductile iron transmission line along with electronic controls that will allow the diversion at the control box to more closely match the City’s demand, hence increasing upstream streamflow and reducing downstream overflows.

3.1.1.1 Water Rights

The City holds six water right permits ranging in priority dates from 9/11/1909 to 2/10/1978 (Table 1). Four of the permits (sources) are currently being used, and the city is evaluating the possibility of developing the other two sources for backup use. All rights have a year-round period and are for municipal use.

The sources currently used are Cold Springs, Stone Spring One, and Stone Spring Two. With improvements in 1988, the City combined South and North Stone Springs Two (Permits 15312 and 43314) into a single source now referred to as Stone Springs Two. The two sources currently not utilized by the City are Hakel and Tucker Spring, which are both located southwest of the Riverdale Reservoir on the west bank of the Hood River.

Table 1. Water rights held by the City of Hood River.

Permit/ Certificate	Priority Date	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-113/1017	9/11/1909	TUCKER SPRINGS	1/1-12/31	2.0	Municipal	11584
S-4091/2474	5/9/1919	HAKEL SPRING	1/1-12/31	0.5	Municipal	30184
S-8387/-	9/13/1923	COLD SPRING/ Laurel Creek	1/1-12/31	19	Municipal	11580
S-14288/ 14276	4/10/1940	STONE SPRING ONE	1/1-12/31	3.5	Municipal	11579
S-15312 ¹ /-	8/7/1941	S. STONE SPRINGS TWO	1/1-12/31	2.0	Municipal	11582

Notes: ¹Collection for South Stone Springs Two (permit 15312) and North Stone Springs Two (Permits 43314) have been combined into a single collection point and are often now referred to collectively as Stone Springs Two.

3.1.1.2 Water Use

The City of Hood River does not have consistent or complete long-term water use records. OWRD records indicate that water use for the active City of Hood River water rights are filed under WUR IDs of 11580, 11579, 11582, and 11583, yet these water use reports are either not filed or blank with the exception of WUR 11580 (Table 2). The Draft City of Hood River Water Management and Conservation Plan (City of Hood River, 2013) was reviewed and the City's Public Works director consulted to determine if additional data exists. The Public Works director stated that to the best of his knowledge all water use is reported under WUR ID 11580. The City's Draft Water Management and Conservation Plan contains similar data for 2000 and 2001, is missing years 2002-2009, and contains 6% lower water use for water year 2011 compared to the OWRD data. The water data for both sources is based on aggregation of the City's water meter data, though in the City's 2011 values they add on 15% to account for otherwise unaccounted system leakage.

It is difficult to draw strong conclusions due to missing water use reports, changes in accounting practices and generally suspicious data. Records show that the City has increased its use since 2000, though it is not a linear increase as one would expect with population but a significant jump in 2007 (Figure 5, Table 2). Water use data shows an 85% increase in use in 2007 from 2006, while average 2007-2011 use is 80% higher than average 2000-2006 use. One potential source of the higher water use data may be the installation of more water meters and a more accurate assessment of the City's actual use. Use throughout the year varies from an average monthly peak of 2.8 cfs in July down to 0.98 cfs in March. As shown in Figure 6, this summertime increase is significantly higher than the others districts since they are also served by a separate irrigation supply. Nonetheless, this three-fold increase during summer months is fairly typical for residential areas and can largely be attributed to lawn, garden, and park irrigation.

Table 2. Water use reports filed by the City of Hood River.

WUR ID ^{1,2}	Water Year	Unit ³	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2001-2011 AVG		CFS	1.91	1.41	1.25	1.23	1.04	0.98	1.13	1.24	1.71	2.58	2.80	2.76	n/a
		MG	38.3	27.4	25.1	24.6	18.8	19.6	21.8	24.9	33.1	51.7	56.2	53.6	395.0
11580	2011	MG	63.8	30.9	38.9	50.9	25.6	30.0	33.9	27.3	45.2	84.4	72.0	86.2	589.1
	2010 ⁴	MG													513
11580	2008	MG	37.9	32.1	27.1	27.5	27.8	29.0	43.4	37.9	48.7	65.0	75.0	70.0	521.3
11580	2007	MG	59.0	41.4	39.1	30.9	30.4	33.5	27.0	41.7	68.5	75.5	74.8	70.6	592.6
11580	2006	MG	33.0	24.9	20.1	25.3	15.3	14.5	15.4	19.2	23.0	38.7	46.8	44.0	320.1
11580	2005	MG	31.2	16.4	10.0	10.5	9.4	14.1	16.4	21.3	22.7	36.3	45.4	33.5	267.2
11580	2004	MG	33.5	21.7	15.6	21.6	17.4	12.8	14.4	19.0	21.0	35.5	44.9	36.6	293.9
11580	2003	MG	32.4	25.2	21.1	18.8	12.9	17.3	15.1	18.2	21.5	37.5	44.9	41.6	306.3
11580	2002	MG	27.1	29.2	31.1	18.3	13.1	12.9	14.3	17.5	21.3	42.9	46.9	51.2	325.8
11580	2001	MG	26.8	24.9	22.5	17.7	17.1	12.1	16.8	21.8	25.9	49.7	54.8	48.3	338.3
11580	2000	MG	25.3	29.1	33.1	34.1	29.5	17.7	21.5	27.8	32.6	59.4	67.0	58.1	435.1

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 11580 missing data from 2009 and 2010.

³ Units: MG = million gallons/month, CFS = cubic foot/second.

⁴ 2010 water use obtained from City of Hood River Draft Water Management and Conservation Plan. Monthly values not available.

3.1.1.3 Additional Information

The City is in the process of updating its potable water system. The major components of the upgrade include the new 24" transmission line, the use of telemetry to match diversions to actual demand, and an overhaul of the Riverdale Reservoir. Telemetry and the new transmission line will allow the City to divert closer to its actual demand (1-3 cfs) instead of the 7 cfs it has historically been diverting, resulting in a 4-6 cfs increase in streamflow in the West Fork Hood River and downstream.

The City is also actively pursuing high water use accounts. The account with the highest individual water use is the City of Hood River Water Treatment plant with 50.4 million gallons used in 2011. This is sevenfold increase over their 7.63 million gallons used in 1999. An investigation is underway to determine if pipes may have been damaged during major renovations in 2001. Similarly, the City is investigating the Wilson Reservoir irrigation account since it is abnormally high (11.0 million gallons used in 2011). As part of the City's water conservation efforts, it is also actively pursuing full metering of the system, water audits, leak detection, and public outreach and education with respect to water conservation. These activities, along with their potential water savings, will be documented in the Hood River Water Planning Group Water Conservation Assessment (due in June 2013).

The above activities, combined with the City's water use being significantly lower than both the source and water right, indicate that the City should not have problems meeting future demand. Earlier studies from Cold and Stone Springs indicate an average discharge of 28 cfs, from which the City has a water right of 12.5 cfs. It also has additional water rights to 2.5 cfs from Hakel and Tucker Springs that it has not yet developed. Its current water use peaks at a monthly average of 3 cfs, which is 20% of the available supply (lower of source supply and water right). Peak hourly demand is significantly higher than 3 cfs, however its 6.2 million gallons of storage provide over two days supply during peak months, and hence can adequately mitigate for diurnal fluctuations. The City's current limit on water use is the 11.1 cfs limit on the chlorination facility. Though it is unlikely this would happen, if the City increases its water use past 11.1 cfs it would need to upsize the treatment facility.

3.1.2 Crystal Springs Water District

Crystal Springs Water District (CSWD) provides potable water through 2,238 connections to approximately 6,000 customers on the eastside of Hood River County. The district’s area of 24,733 acres is a mix of farmland, forest, rural residential, as well as some medium density residential and commercial uses. It includes the Hood River Valley and the rural communities of Mt. Hood and Pine Grove. It also serves part of Odell (along with the Odell Water Company) while Parkdale is served separately by the Parkdale Water Company.

The district’s sole source of water is Crystal Springs located off the west side of Highway 35 on the northeast side of Mt. Hood. From the source, the district’s distribution system runs approximately 20 miles north to the Columbia River. The spring is at an elevation of 2,450 ft while the lowest area of the district is at 150 ft (Crystal Springs Master Plan, 2006). A chlorine water treatment facility is located directly at the springs, while the district’s two storage reservoirs are located downhill in the Hood River Valley. The first, and largest, reservoir is located at an elevation of 1,680 feet near Booth Hill and has a storage capacity of 700,000 gallons. A second downstream reservoir of 400,000 gallons is located at an elevation of 1,000 feet in the Pine Grove area. Both reservoirs have had significant continuous overflows since their construction. Reservoir modifications and the installation of pressure reducing valves in 2001 reduced the amount of these overflows but did not eliminate them.

3.1.2.1 Water Rights

The district holds three water rights from Crystal Springs (Table 3). The priority dates on the permits range from June 1930 through March 1969. All three rights are for domestic and municipal purposes and are for year-round use. The cumulative water rights are for 7.15 cfs, while average monthly spring discharge for 1997-2004 ranged from 2.6 cfs in the winter to 4.0 cfs in the early summer (Crystal Springs Master Plan, 2006).

Table 3. Water rights held by Crystal Springs Water District.

Permit/ Certificate	Priority Date	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-9831/ 10115	6/7/1930	CRYSTAL SPRINGS	1/1-12/31	1	Domestic	12538
S-29377/-	1/22/1964	CRYSTAL SPRINGS	1/1-12/31	2.65	Group Domestic	12538
S-34196/-	3/3/1969	CRYSTAL SPRINGS	1/1-12/31	3.5	Municipal	12538

3.1.2.2 Water Use Reports

All CSWD water use is measured directly at the spring and is reported under WUR ID 12538 (Table 4, Figure 5, Figure 6). Based on years 2001 to 2011, the district uses an average of 515,000 million gallons per year. The district shows an upward trend in use; however the single highest annual use was in 2001. Average monthly use varies from a low of 1.98 cfs in February to 2.41 cfs in August (Figure 6). This increase of 20% is relatively small and is attributable to large parts of the district also being served by Middle Fork and East Fork Irrigation Districts. Use is divided roughly 75% to residential and 25% to commercial. The largest single user in the district is Diamond Fruit Company with approximately 20 million gallons per year (61 acre-feet/yr).

A study performed in 2003 found that of the water diverted at Crystal Springs, 39% went to actual metered use, 25% overflowed at the Booth Hill Reservoir, 2% overflowed at the Pine Grove Reservoir, and 34% was unaccounted for. The ratio of metered use versus actual diversion is much lower than in typical systems and is a result of significant leaks in the system, inaccurate flow measurements at the spring and both reservoirs, and water loss at pressure relief valves.

3.1.2.3 Additional Information

The existing distribution system consists of 120 miles of pipe ranging from 1" to 14". Due to the significant elevation change (hence high pressures) much of the system is either ductile iron or copper, with some PVC in lower pressure areas. The majority of the district is gravity fed with a handful of residences on hillsides required to provide their own pumping.

The CSWD distribution system was modeled in WaterCAD software using projected 2025 demands to identify deficiencies in the system. The main deficiency identified was that fire flows were below recommended levels. This is a result of a considerable amount of small diameter pipe (typically 4") in the district along with the district being spread out over a large area. The district is actively prioritizing and implementing several capital improvement projects that are designed to address this issue. Although system supply is only slightly greater than demand, the same study found no potential issues with meeting its long term water supply demands due to peak spring discharge coinciding with peak water demands.

Table 4. Water use reports filed by Crystal Springs Water District.

WUR ID ¹	Water Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2001-2012 AVG ³		CFS	2.13	2.10	2.11	2.11	1.98	2.25	2.13	2.16	2.20	2.25	2.41	2.37	n/a
		MG	42.6	40.6	42.3	42.3	35.8	45.0	41.4	43.3	42.6	45.0	48.2	45.9	515.1
12538	2012	MG	36.3	48.8	47.9	40.3	41.0	52.3	49.2	46.1	45.5	53.7	60.8	57.5	579.4
12538	2011	MG	37.2	41.7	40.4	41.3	36.5	38.3	39.2	46.1	46.0	50.5	48.2	49.9	515.3
12538	2010	MG	38.5	36.7	53.7	41.9	42.3	50.0	44.4	49.0	45.6	35.9	54.2	43.0	535.1
12538	2009	MG	35.0	34.9	32.9	31.0	30.1	50.6	46.6	48.4	44.9	39.6	51.2	43.9	489.1
12538	2008	MG	43.9	47.5	39.7	63.5	21.5	40.6	33.2	34.9	35.0	34.9	32.6	40.2	467.5
12538	2007	MG	46.0	40.5	46.8	45.1	41.6	47.3	46.6	41.8	42.3	51.7	49.3	49.5	548.3
12538	2006	MG	41.8	35.9	42.9	38.6	33.8	44.0	38.0	43.9	40.0	49.0	49.1	45.4	502.4
12538	2005	MG	45.0	42.7	42.4	35.9	37.0	42.2	36.7	44.2	40.6	45.3	45.4	42.5	499.9
12538	2004	MG	38.6	42.3	36.9	46.6	38.3	43.8	43.3	38.8	46.5	45.4	45.8	43.8	510.0
12538	2003	MG	37.7	35.3	39.5	39.2	36.1	40.9	36.5	39.4	39.7	44.5	45.7	43.6	478.1
12538	2002	MG	46.9	33.9	38.5	32.4	31.6	39.5	40.6	37.1	33.2	37.9	44.7	37.9	454.1
12538	2001	MG	64.2	62.2	55.3	62.3	60.7	57.4	50.7	58.1	52.4	51.0	46.5	47.1	667.9
12538	2000	MG	36.4	37.9	28.1	32.0	29.7	32.6	29.4	33.6	32.4	38.6	38.0	38.2	406.7

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: MG = million gallons/month, CFS = cubic foot/second.

³ Averages based on water years 2001-2012.

3.1.3 Ice Fountain Water District

The Ice Fountain Water District (IFWD) was formed in 1964 through the consolidation of 15 smaller water districts. IFWD originally purchased its water from the City of Hood River, but in May 1999 switched over to its current source from the Ice Fountain Springs. The spring is adjacent to the Middle Fork Hood River, from which it is gravity conveyed 2.5 miles to a chlorination treatment system near the Dee Bridge and then another 7 miles to an 800,000 gallon storage reservoir at the base of York Hill. Roughly 98% of its water use is delivered from this lower reservoir, while the remaining two percent are served by pumping to a 120,000 gallon reservoir on top of York Hill. There are 11,000 acres of land within the service area and 1,922 connections as of February 2013.

Although Ice Fountain operates solely from their own water source, they do maintain an intertie with the City of Hood River water supply system at the intersection of Riverdale Road and Portland Drive. This intertie provides a backup if one system goes down, or for other situations such as the recent City of Hood River transmission line upgrade during which the City purchased water from IFWD. The Oak Grove Water District lies entirely within the IFWD; however, the two share no intertie.

3.1.3.1 Water Rights

IFWD has one water right with a priority date of 7/25/1984 for 3 cfs from Ice Fountain Springs (Table 5). The water right permit allows for year-round diversion for municipal use only. The IFWD boundaries match those of Farmers Irrigation District which serves the district with irrigation and agricultural water. IFWD has a no-irrigation policy which it does not strictly enforce; however, if Farmers Irrigation District were to experience delivery issues, it is likely that IFWD would need to enforce the policy to ensure adequate potable water supply to its patrons.

Table 5. Water rights held by Ice Fountain Water District.

Permit/ Certificate	Priority Date	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-48876/-	7/25/1984	ICE FOUNTAIN SPRINGS	1/1- 12/31	3	Municipal	12717

3.1.3.2 Water use

All IFWD water use is measured at the lower reservoir and is reported under WUR ID 12717 (Table 6). Water user reports for water year 2000 through 2008 are believed to overstate water use due to meter calibration error, therefore summary values in Table 6 and Figure 6 are based on water use from water years 2009-2011 only. Based on these years, IFWD uses 180,000 million gallons per year. Water use ramps up slightly during the spring before Farmers Irrigation District is delivering water to its users. The month of June shows the highest use, but that's largely due to the two-month billing cycle capturing use in April and May. The vast majority of IFWD customers are residential; with 1862 of the 1922 connections being ¾" (¾" is typical of residential connection). The biggest water users in the district are the Hood River Valley High School, Columbia Gorge Hotel, and the Westside School.

3.1.3.3 Additional Information

IFWD's average monthly water use ranges from 0.57 to 1.01 cfs, while its water right is 3 cfs, and actual spring flow is estimated at closer to 5 cfs. Repairs to the Ice Fountain Spring after the debris flow of 2006 included chemical grouting of the soil below the spring box, from which an approximately 2 cfs was realized. IFWD is currently developing a water conservation and management plan (due in July 2013) from which it may decide to pursue water rights on an additional 2 cfs from the spring. Additionally, IFWD has actively analyzed the trade-off associated with developing either Tucker Springs or Highline Springs as backup or complementary water sources. IFWD's most recent analysis of its ability to meet future demand used 2003 peak day demand and a growth rate of 2.9%, from which it concluded it would have sufficient supply, but would need to operate pumps during peak hours to overcome conveyance limitations. However, this analysis was based on year 2003 demand which was based on faulty metering, and it is unlikely that the updated plan due in July will conclude there are any potential issues with supply or conveyance during the planning horizon.

Table 6. Water use reports filed by Ice Fountain Water District.

WUR ID ¹	Water Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2009-2011 AVG ³		CFS	0.63	0.57	0.69	0.69	0.62	0.79	0.86	0.87	1.01	0.85	0.83	0.75	n/a
		MG	12.7	11.0	13.9	13.8	11.2	15.8	16.6	17.5	19.6	16.9	16.5	14.5	180.0
12717	2011 ⁴	MG	12.6	12.1	13.4	13.8	11.4	15.5	17.4	17.8	20.7	16.0	16.5	14.8	182.0
12717	2010 ⁴	MG	13.4	11.6	14.3	13.5	10.2	18.7	16.8	17.4	18.0	15.6	16.4	14.2	180.0
12717	2009 ⁴	MG	12.2	9.4	13.9	14.1	11.9	13.1	15.5	17.3	20.1	19.3	16.7	14.5	177.9
12717	2008	MG	20.3	19.7	18.8	20.1	16.2	18.9	18.9	22.8	19.5	18.3	18.9	18.1	230.3
12717	2007														
12717	2006	MG	18.0	16.8	18.3	18.9	16.0	18.5	18.8	20.9	20.2	23.5	22.5	20.2	232.5
12717	2005	MG	18.9	16.8	16.8	17.9	16.7	18.3	17.0	18.7	20.2	22.5	22.5	18.8	224.9
12717	2004	MG	17.0	15.3	16.4	19.0	14.0	19.1	18.0	20.4	21.4	25.0	23.4	19.6	228.6
12717	2003	MG	17.7	17.0	15.4	16.8	14.6	16.1	15.6	20.4	20.2	24.2	22.3	19.7	220.0
12717	2002	MG	14.0	15.2	17.4	14.8	12.4	14.6	13.9	17.2	18.6	20.9	22.8	19.6	201.4
12717	2001	MG	15.8	14.2	15.3	14.3	11.1	15.9	16.0	18.0	17.3	20.1	19.9	18.5	196.3
12717	2000	MG	18.4	16.7	14.6	17.2	16.3	17.7	16.8	16.2	18.8	20.7	22.9	17.0	213.2

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: MG = million gallons/month, CFS = cubic foot/second.

³ Averages based on water years 2009-2011. Data from 2008 and earlier is believed high due to bad meter calibration

⁴ Water Year 2009, 2010, and 2011 WURs not available from OWRD. Received copies from IFWD manager.

3.1.4 Oak Grove Water Company

Oak Grove Water Company covers a small area in the northwest part of Hood River County. From the most recent survey in 2010 it had 124 connections for 315 total customers (personal communication, Hood River County Health Department). It receives its water from a single no named spring. It has a 10,000 gallon reservoir that feeds 8 connections, a 100,000 gallon reservoir that feeds 104 connections, plus 12 connections that are fed directly from the spring (i.e. no reservoir). The water company lies within Ice Fountain Water District but does not have an intertie to their system.

3.1.4.1 Water Rights

Oak Grove Water Company has three water rights to two springs off of Kingsley Road (Table 7). The water rights range in priority from 1929 up to 1994 and cover both domestic and commercial purposes.

Table 7. Water rights held by Oak Grove Water Company.

Permit/ Certificate	Priority Date	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-9423/ 9151	11/8/1929	A SPRING	1/1 – 12/31	0.25	Domestic	
S-28649/ 57460	3/6/1963	SPRING 2	1/1 – 12/31	0.08	Group Domestic	
S-53679/-	3/2/1994	A SPRING	1/1 – 12/31	0.0896	Domestic	

3.1.4.2 Water Use Reports

Oak Grove Water Company does not file water use reports with OWRD, nor were records available from the water company itself, so water use estimates were generated based on Odell Water Company’s use (Table 8). Oak Grove Water District has 16% fewer connections so Odell Water Company’s values were scaled down by 16%. Although this method is crude it does allow an estimate to be made when no measured values exist. It should also be noted that actual use is quite small therefore does not play a significant role in the Basin’s water balance.

3.1.4.3 Additional Information

Oak Grove Water Company did not respond to requests for additional information.

Table 8. Water use estimate for Oak Grove Water Company.

WUR ID ¹	Water Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
Average ³		CFS	0.06	0.05	0.04	0.04	0.05	0.05	0.09	0.12	0.13	0.09	0.10	0.09	
		MG	1.41	1.34	1.12	0.89	1.03	1.40	1.89	2.78	2.36	1.62	1.73	1.57	19.14

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: MG = million gallons/month, CFS = cubic foot/second.

³ Estimate based on Odell Water Company 2009 and 2011 use. Values scaled down by 16% to account for difference in number of connections.

3.1.5 Odell Water Company

Odell Water Company was formed in the early 1900s to serve the few houses that existed in the local rural community. As the community grew, the water company grew with it. The water company currently has 147 connections, and typically grows by one or two connections per year. It serves an area of less than one square mile, and includes both domestic and commercial use (Odell Water Company Water Plan, 1999).

3.1.5.1 Water Rights

The water company has two domestic water rights for a total of 1.25 cfs, as well as one irrigation right for 0.66 cfs (Table 9). All three water rights are from springs that are tributaries to McGuire Creek.

Table 9. Water rights held by Odell Water Company¹.

Permit/ Certificate	Priority Date	Source ²	Period	Permitted Rate (cfs)	Use Group	WUR ID
-/14957	12/31/1882	ONE & TWO SPRINGS	4/15- 10/1	0.66	Irrigation	
8014/ 9487	3/3/1927	A SPRING	1/1- 12/31	0.25	Domestic	
9136/ 8674	5/31/1929	A SPRING	1/1- 12/31	1	Domestic	

Notes: ¹ Filed under C. Davis or Aubrey Davis.

² The spring sources for Odell Water Company are tributary to McGuire Creek.

3.1.5.2 Water Use Report

WURs have not been filed with OWRD for the Odell Water Company so water use estimates were obtained directly from the water company itself. Phil Davis (Odell Water Company Manager) provided the data presented in Table 10 and Figures 5 and 6. This data is for 2009 and 2011 only as other data is not available. This data shows the annual use of the Odell Water Company between 22 and 23.5 million gallons per year. The monthly distribution of use ranges from a low of 0.05 cfs in the winter to a maximum of 0.16 cfs in the late summer.

3.1.5.3 Additional Information

There have not been any documented studies on the flow rates from the springs; however, Mr. Davis estimates that the water company is currently using 25% of the available water. Mr. Davis stated that the water demand from customers “could not possibly increase more than 50%”, which given both the excess water right and spring discharge, indicates the water company should not have issues meeting future demand.

The water company put in a reservoir and metering system ten years ago, and has done work on source collection and upgrades for reducing contamination and maintenance needs. No major additional projects are scheduled by the company. As an Oregon Certified Operator, Mr. Davis states they meet all applicable rules, and does not foresee any external factors that are likely to impact the water company or its patrons.

Table 10. Water use data obtained from Odell Water Company.

WUR ID ¹	Year	Unit ²	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2009 & 2011 AVG		CFS	0.07	0.06	0.05	0.05	0.06	0.06	0.11	0.14	0.16	0.11	0.12	0.11	n/a
		MG	1.7	1.6	1.3	1.1	1.2	1.7	2.2	3.3	2.8	1.9	2.1	1.9	22.8
n/a	2011	MG	1.3	1.1	1.1	1.0	1.2	1.3	2.2	2.7	3.2	2.3	2.4	2.3	22.0
n/a	2009	MG	2.1	2.1	1.6	1.1	1.3	2.0	2.3	3.9	2.4	1.6	1.7	1.5	23.5

Notes: ¹No WURs available from OWRD. Data shown is obtained directly from Odell Water Company. Only 2009 and 2011 data available.

²Units: MG = million gallons/month, CFS = cubic foot/second.

3.1.6 Parkdale Water Company

Parkdale Water Company covers 3.3 square miles in downtown Parkdale. In the most recent survey performed in 2010, it had 172 connections and 455 patrons (personal communication, Hood River County Health Department). The spring is approximately one mile south of Parkdale on the west side of Clear Creek Road. It serves homes along Clear Creek Road plus a handful of residences and small business in downtown Parkdale. It does not have a traditional reservoir, however the spring box itself will hold 9,000 gallons (4' x 10' x 30').

3.1.6.1 Water Rights

The Parkdale Water Company has a single water right for a no-named spring. The water right is for year-round use of up to 1.5 cfs and has a priority date of March 1971.

Table 11. Water rights held by Parkdale Water Company.

Permit/ Certificate	Priority Date	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-42929/-	3/26/1971	A Spring	1/1 – 12/31	1.5	Quasi- Municipal	

3.1.6.2 Water Use Reports

Since Parkdale Water Company does not file water use reports with OWRD, nor were records available from the water company itself, water use estimates were generated based on Odell Water Company's use (Table 12, Figure 5, Figure 6). Parkdale Water Company has 17% more connections so Odell Water Company's values were scaled up by 17%. Similar to Oak Grove Water Company estimates, although this method is crude it does allow an estimate to be made when no measured values exist.

3.1.6.3 Additional Information

Parkdale Water Company does not have a water management and conservation plan or any other information it was able to share. In lieu of information directly from Parkdale Water Company or OWRD, zone of contribution, water system survey, and other information was obtained from the Hood River County Health Department. The distribution system has a chlorine injection system near the springbox and all patrons with the exception of one (the closest to the spring) are served by gravity. Although no actual measurements have been made, it was estimated by the Hood River County Health Department that greater than 50% of the spring's discharge is overflowed and not used for consumption.

Table 12. Estimate of water use for Parkdale Water Company.

WUR ID ¹	Year	Unit ²	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Average ³		CFS	0.08	0.07	0.06	0.06	0.07	0.07	0.13	0.16	0.19	0.13	0.14	0.13	n/a
		MG	1.97	1.87	1.55	1.24	1.43	1.95	2.63	3.87	3.28	2.26	2.41	2.19	26.66

Notes: ¹ No WURs available from OWRD. *** trying to get direct from Parkdale.

² Units: MG = million gallons/month, CFS = cubic foot/second.

³ Estimate based on Odell Water Company 2009 and 2011 use. Values scaled up by 17% to account for difference in number of connections.

3.1.7 Other Potable Users

Water rights and water use from four additional water users are documented below. These entities are documented in this section (“Other Potable Users”) because although they are not typical potable water use they still most closely fall in this category. The entities in this section are also either small water users (Port of Hood River, Mt. Hood Meadows, private and small commercial domestic rights, and exempt wells) or located outside of the Hood River Basin (City of The Dalles).

3.1.7.1 Port of Hood River

The Port of Hood River has one water right (Table 13) and files a single water use report (Table 15) with OWRD. Although water use is for irrigation (as opposed to domestic) it is shown here since the Port of Hood River is more similar to the entities in this section than the irrigation section of this report. Water is used during June through September and has a peak average monthly use of less than 0.1 cfs. Data for Port of Hood River is not shown on Figures 5 and 6 because of low water use relative to other entities discussed in this section 3.1.

Table 13. Water rights held by Port of Hood River.

Permit/ Certificate	Priority Date	Source ¹	Period	Permitted Rate (cfs)	Use Group	WUR ID
S-6495/ 74337	8/14/1924	Cedar Creek / Waste Water	1/1- 12/31	0.13	Supplemental Irrigation	50780

Notes: ¹ Water right certificate list source as “waste or seepage water, a tributary of Hood River.”

3.1.7.2 City of The Dalles

The City of The Dalles obtains its potable water from Dog River, Alder Creek, Crow Creek, and the South Fork of Mill Creek, plus three supplemental wells used during the summertime. Of these sources, only Dog River is in the Hood River watershed, from which The Dalles has two water rights (Table 14). Under its first permit The Dalles uses an average of 3.0 cfs during the winter and up to 8.5 cfs in the summer (Table 16, Figure 5, Figure 6). Water use reports filed under its second permit indicate no water use from 2003-2011.

Table 14. Water rights held by City of The Dalles.

Permit / Certificate	Priority Date	Source	Period	Permitted Rate (cfs or ac-ft)	Use Group	WUR ID
-/14954	8/1/1870	DOG RIVER	1/1- 12/31	All flow at point of diversion	Irrigation Livestock Municipal Power	12254
R-13105/- ¹	1/21/1999	MILL CREEK / DOG RIVER	1/1- 12/31	2100 ac-ft	Municipal	13785

Notes: ¹ Allows storage of the water from South Fork Mill Creek and Dog River.

Table 15. Water use data filed for Port of Hood River.

WUR ID ¹	Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2000 - 2008 Avg.		CFS	0	0	0	0	0	0	0	0	0.04	0.07	0.07	0.05	n/a
		MG	0	0	0	0	0	0	0	0	0.7	1.5	1.5	1.0	4.7
50780	2008	MG	0	0	0	0	0	0	0	0	0.0	0.1	0.1	0.1	0.2
50780	2005	MG	0	0	0	0	0	0	0	0	0.8	1.9	1.9	1.2	5.8
50780	2004	MG	0	0	0	0	0	0	0	0	1.1	2.4	2.4	1.5	7.4
50780	2003	MG	0	0	0	0	0	0	0	0	1.1	2.4	2.4	1.5	7.4
50780	2002	MG	0	0	0	0	0	0	0	0	1.1	2.4	2.4	1.5	7.4
50780	2001	MG	0	0	0	0	0	0	0	0	0.0	0.1	0.1	0.1	0.2
50780	2000	MG	0	0	0	0	0	0	0	0	1.1	2.4	2.4	1.5	7.4

Notes: ¹ No WURs available for 2006, 2007, 2009, 2010.

² Units: MG = million gallons/month, CFS = cubic foot/second.

Table 16. Water use report filed by The City of The Dalles.

WUR ID	Year	Unit ¹	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2000 - 2011 Avg		CFS	2.6	3.1	3.6	4.5	3.4	4.2	5.0	7.3	8.5	6.4	4.2	3.0	n/a
		MG	51.2	60.7	72.3	89.9	61.8	83.4	97.8	146.4	165.1	128.8	84.6	58.5	1100
12254	2011	MG	72	95	93	93	61	128	193	200	193	177	145	95	1544
12254	2010	MG	60	51	51	62	58	133	124	126	118	95	83	85	1045
12254	2009	MG	61	155	161	112	56	51	105	112	200	185	71	54	1323
12254	2008	MG	43	44	57	70	58	51	105	112	103	110	119	88	960
12254	2007	MG	50	30	39	208	159	179	135	200	221	174	119	48	1561
12254	2006	MG	35	43	98	135	41	36	40	159	197	159	88	58	1087
12254	2005	MG	43	43	57	65	56	51	117	121	109	62	47	36	806
12254	2004	MG	45	37	47	44	37	122	80	150	196	92	58	49	958
12254	2003	MG	48	42	50	135	79	71	69	137	177	97	63	44	1013
12254	2002	MG	31	40	34	43	39	78	93	245	237	162	90	57	1149
12254	2001	MG	52	51	44	49	42	40	51	118	80	47	33	30	636
12254	2000	MG	76	99	135	62	58	62	60	77	150	186	100	59	1123

Notes: ¹ Units: MG = million gallons/month, CFS = cubic foot/second.

3.1.7.3 Mt. Hood Meadows

Mt. Hood Meadows (MHM) has three water right permits (Table 17) but does not file water use reports with OWRD for any of its use. Water is used primarily through potable consumption by its patrons and by snow making equipment. MHM has a maximum capacity of 13,000 people; however it has been very proactive about installing water efficient fixtures (e.g. waterless urinals) to minimize its impacts. Snow making equipment is limited by its water right and therefore runs at a maximum rate of 0.38 cfs. While additional snowmaking is not being considered at present, MHM believes additional infrastructure and water rights may be economically beneficial to the resort and the community in the future.

Table 17. Water rights held by the Meadows Utilities and Mount Hood Meadows.

Permit / Certificate	Priority Date	Source	Period	Permitted Rate (cfs or ac-ft)	Use Group	WUR ID
S-53637/-	6/29/1989	Two Unnamed Reservoirs	11/1 – 7/31 ¹	0.27 cfs	Quasi-Municipal	
G-13388/-	5/23/1991	A WELL	8/1 – 10/31	0.11cfs	Quasi-Municipal	
R-12758/-	6/5/1991	Two Unnamed Springs and a well	11/1-7/31 ¹	2.48 ac-ft	Quasi-Municipal	

Notes: ¹ Water can legally be put into storage from 11/1-7/31; however, water from storage can be used year-round.

3.1.7.4 Small Domestic Wells

In addition to the water use listed above, domestic water is also used via; 1) private individual water rights, 2) small company owned water rights, and 3) exempt wells. The OWRD water rights database list 100 domestic water rights owned by private individuals for a total water right of 7.96 cfs. It also list 17 water rights owned by small companies (these are in addition to those listed in sections 3.1.1 – 3.1.7.3) with a total water rights of 4.81 cfs. There are also roughly 370 exempt domestic wells in the basin. These wells are allowed to pump up to 15,000 gallons per day (0.023 cfs) for single or group domestic use; however, studies have shown that household water use is typically closer to 400 gallons per day (0.00062 cfs) (American Water Works Association, 1999). Although it's just an estimate, these 370 except wells pumping at 400 gpd is equal to 0.23 cfs.

3.2 Irrigation Water Use

There are five irrigation districts in Hood River County: Dee Irrigation District (DID), East Fork Irrigation District (EFID), Farmers Irrigation District (FID), Middle Fork Irrigation District (MFID), and Mt. Hood Irrigation District (MHID) (Figures 1, 7, 8, 14, 15, 16, 22, 28). The districts range in size from 870 acres to 15,150 acres. Two of the districts (Farmers Irrigation District and Middle Fork Irrigation District) have hydroelectric facilities and operate diversions year-round, while the other three operate primarily during irrigation season from April 15 to October 1, plus some spray and frost water outside of that period. Total water year diversion, average monthly diversion, average monthly consumptive use, and average depth of use are shown in Figures 10, 11, 12, and 13. The data shown in these figures is discussed in Sections 3.2.1. - 3.2.5. Figure 9 shows all irrigation water rights in Hood River County which are further detailed in Appendix A.

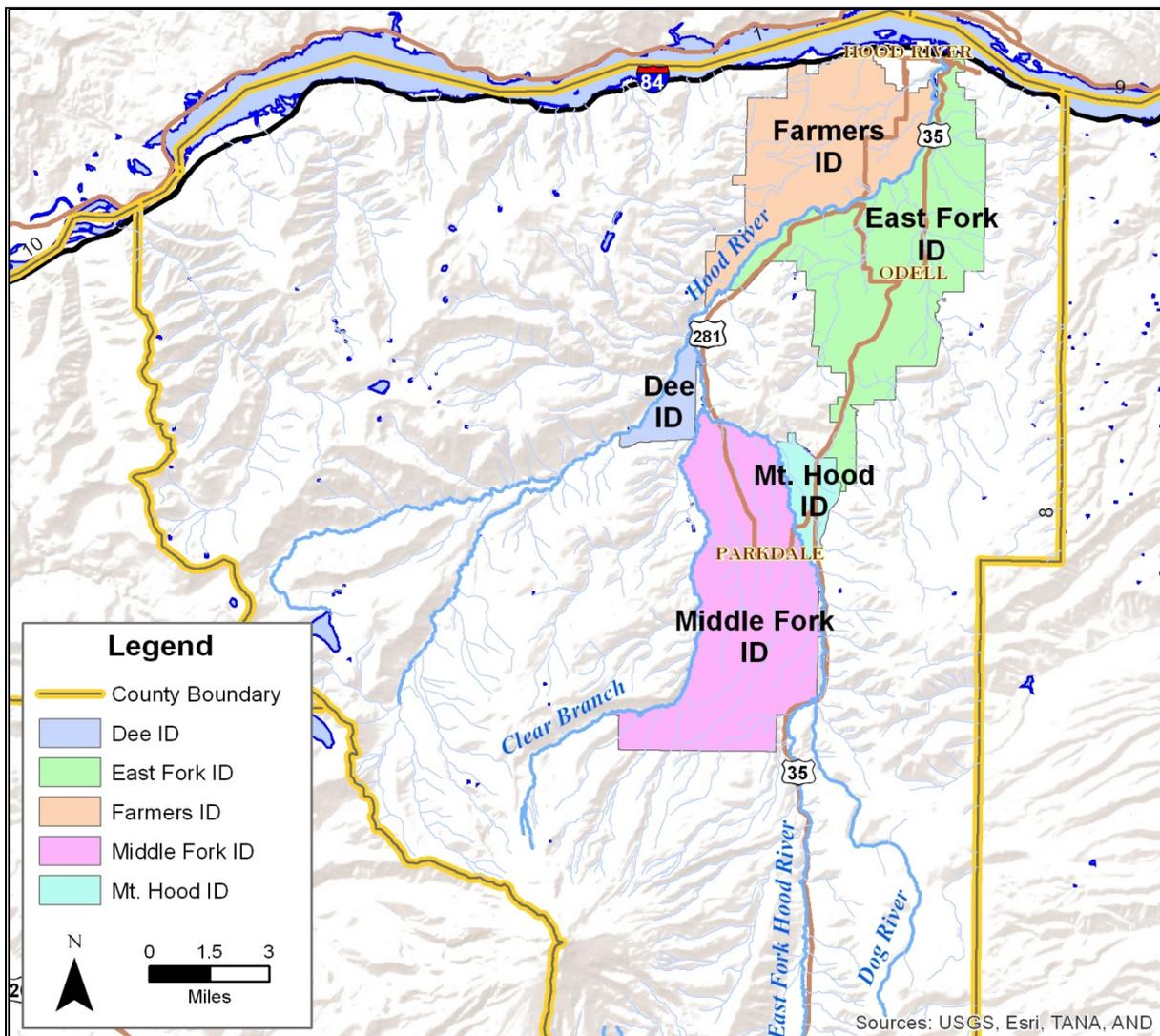


Figure 7. Irrigation districts in Hood River County.

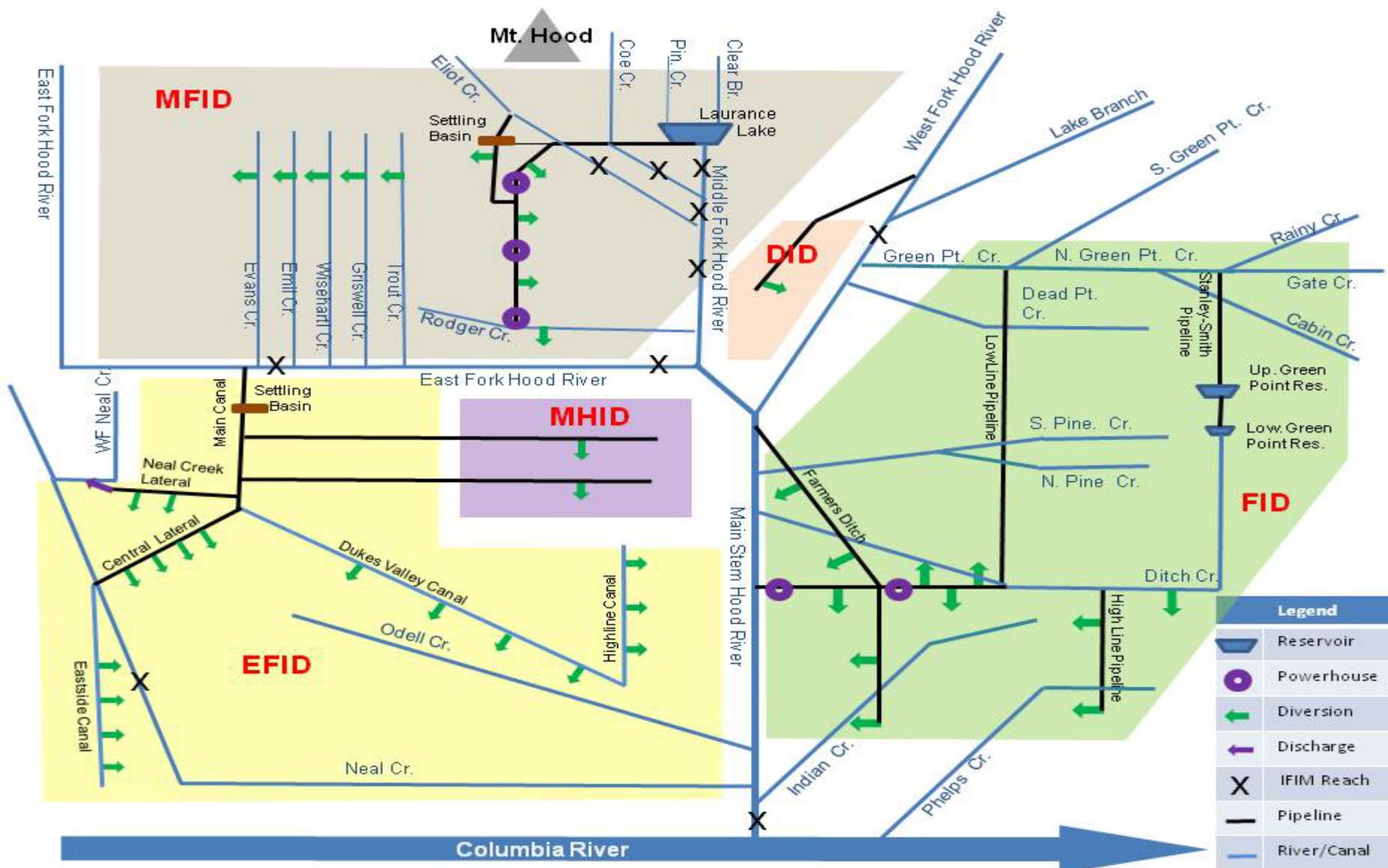


Figure 8. Schematic of water distribution systems for irrigation districts in Hood River County with IFIM transect locations.

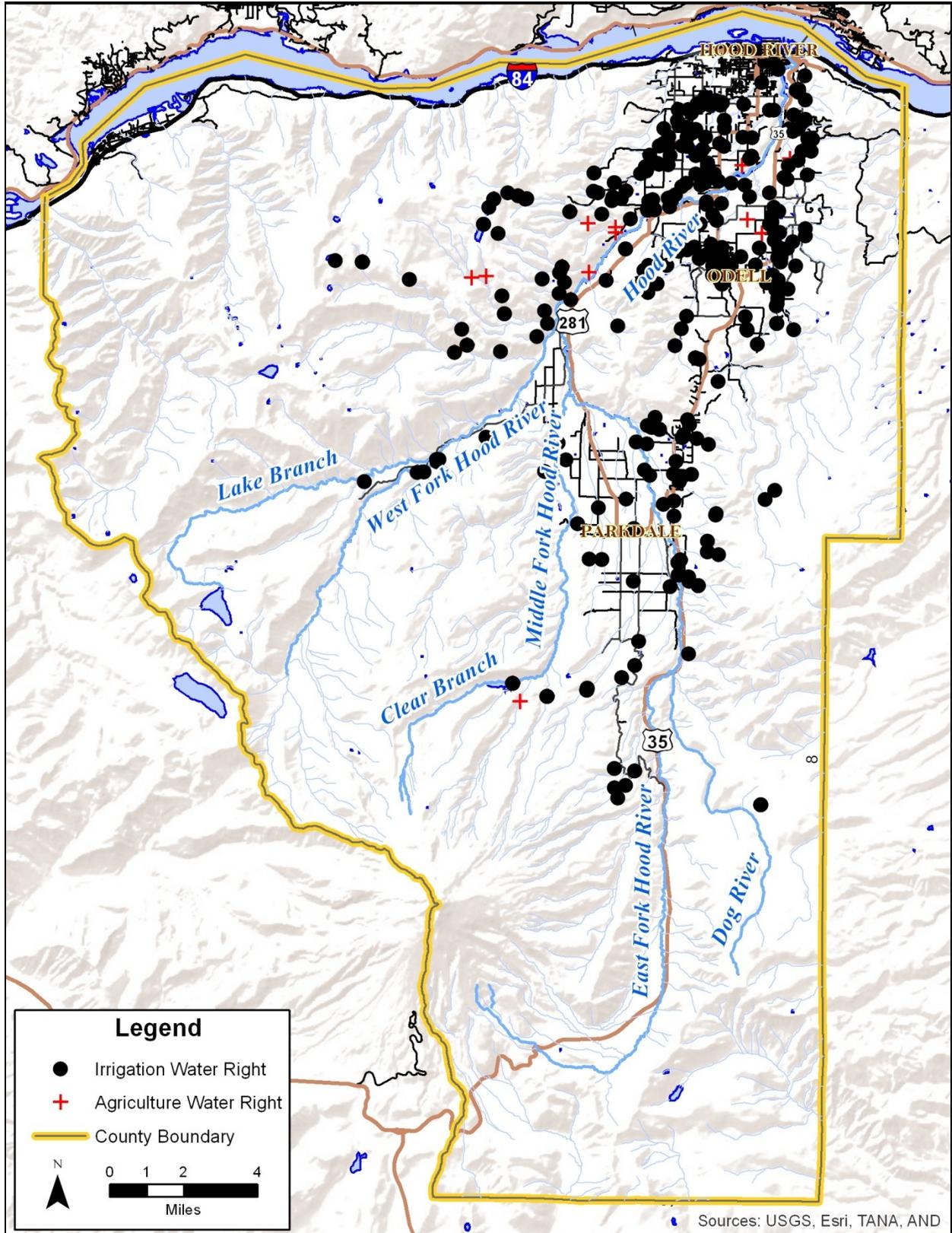


Figure 9. All irrigation and agricultural water rights in Hood River County.

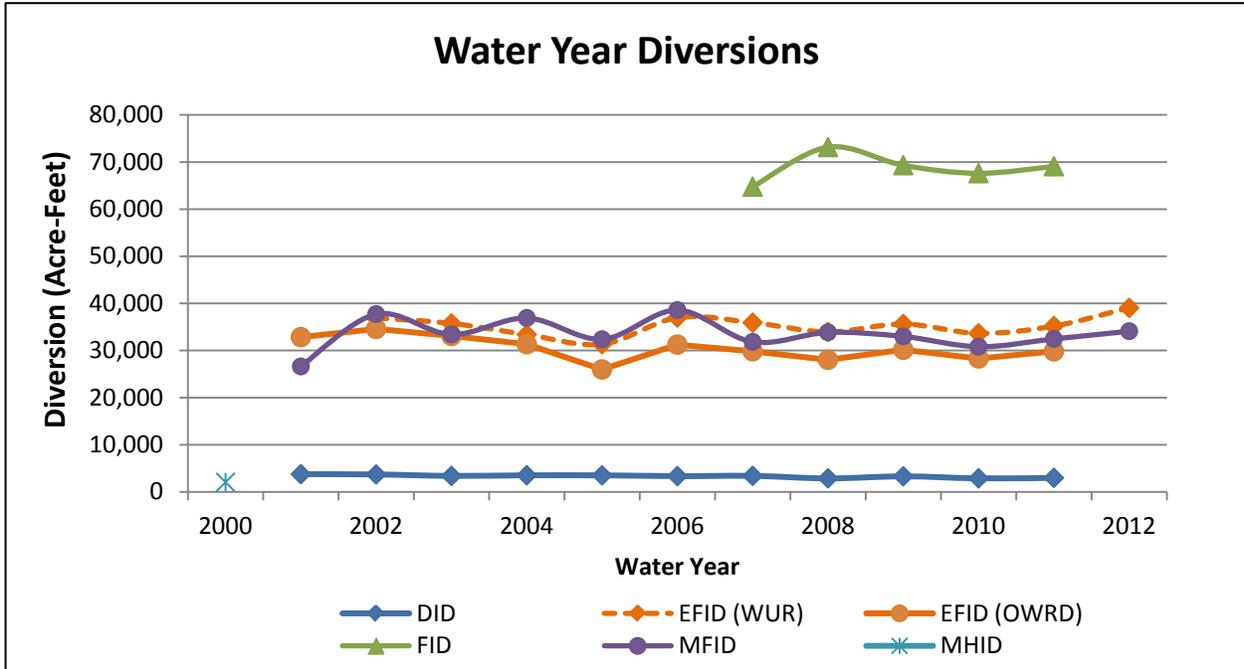


Figure 10. Total water year diversion for irrigation districts in the Hood River Basin.

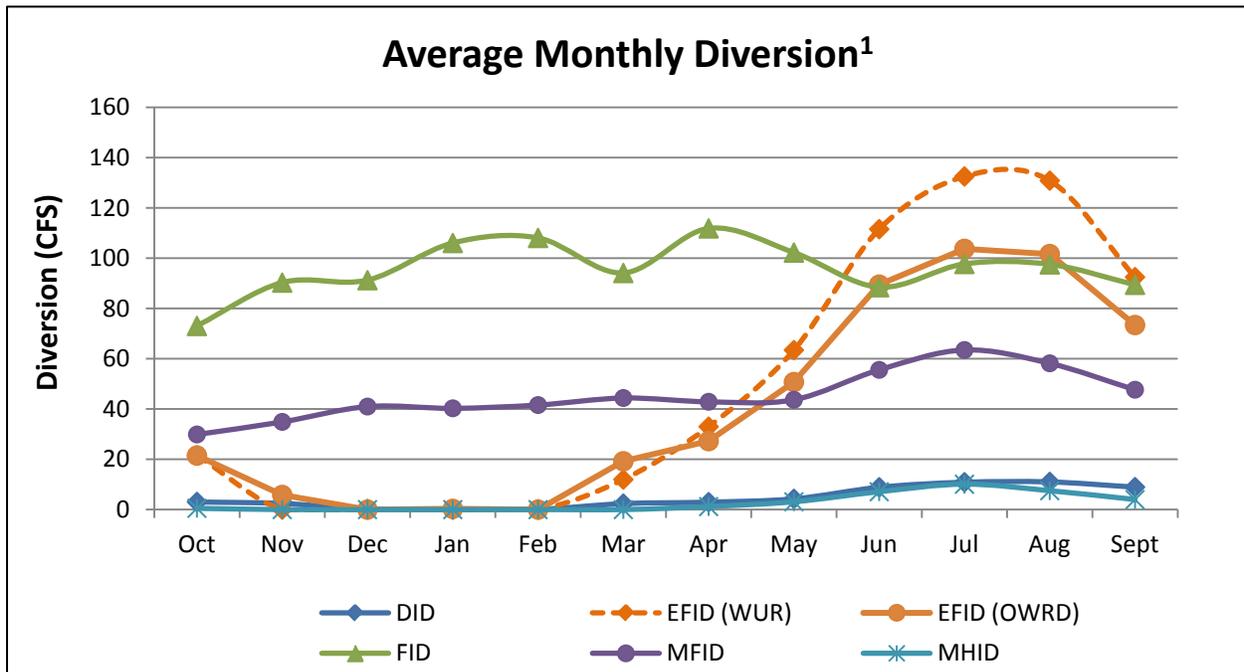


Figure 11. Average monthly diversion for irrigation districts in the Hood River Basin.

¹Includes irrigation, hydropower, and agricultural water use.

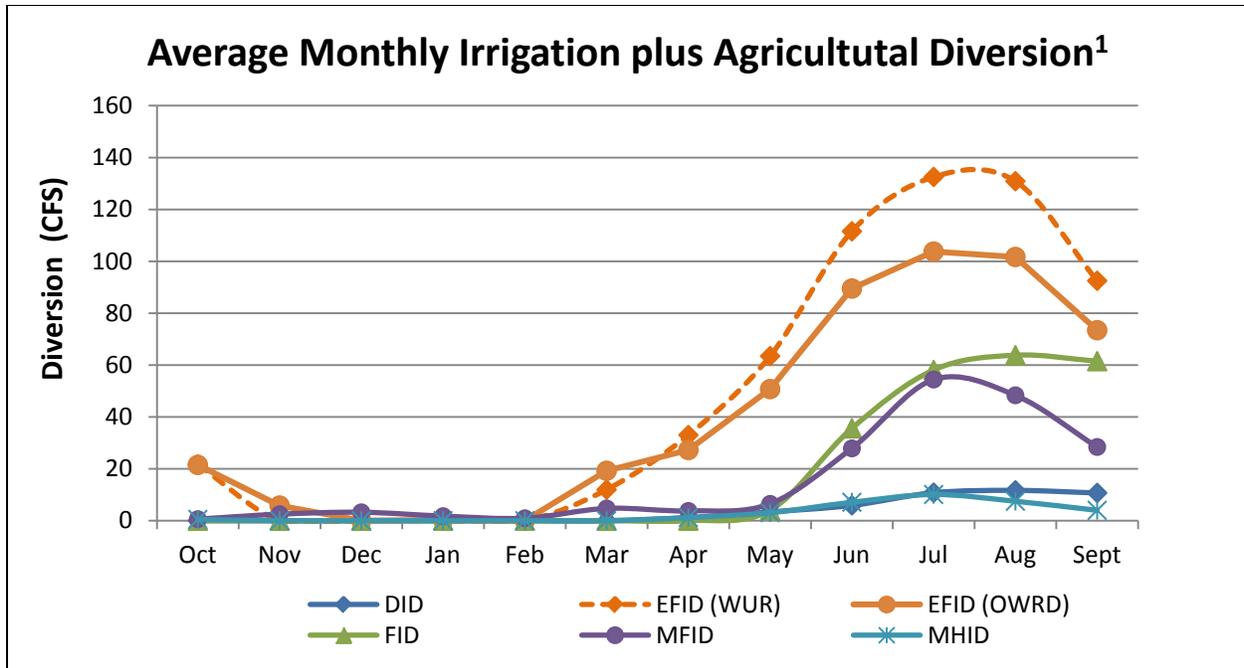


Figure 12. Average monthly irrigation plus agricultural diversion for irrigation districts in the Hood River Basin.

¹Calculated as total irrigation plus agricultural diversion minus hydropower returns.

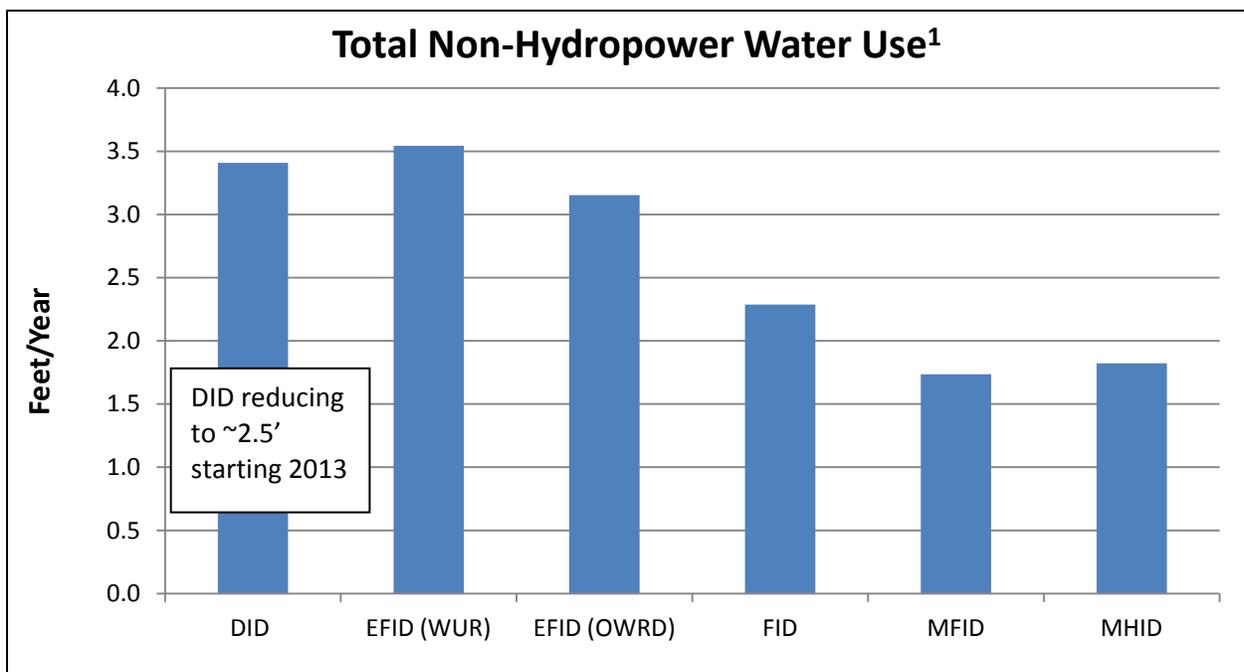


Figure 13. Irrigation district non-hydropower water use in feet per year.

¹Calculated as total irrigation plus agricultural diversion (acre-feet/year) divided by irrigated area (acres).

3.2.1 Dee Irrigation District

Dee Irrigation District is located in the area between the Middle Fork Hood River and the West Fork Hood River just south of where Lost Lake Road crosses the Hood River (Figures 1, 7, 8, 14). The District encompasses roughly six square miles, in which it services 65 patrons on 870 irrigated acres. It has water rights from the West Fork Hood River, Deer Creek, Camp Creek, and three springs (collectively called No Name Creek). In the fall of 2012, DID piped 4.5 miles of their irrigation canal and eliminated two of their five diversion points. The diversion off the West Fork Hood River saw no major changes, the No Name and Camp Creek diversions were improved, and the diversions from Alder and Deer Creek were eliminated.

3.2.1.1 Crop Types

Crop type estimates specific to DID are not available, however the OSU extension office has published general crop type patterns for the Hood River Valley that can be used to estimate acreages for DID (Table 18) (Hood River Soil and Water Conservation District, 2008). Although recent changes in crop types has not been quantified, DID manager feels there is a general shift from pears and apples to cherries and blueberries.

Table 18. Estimate of acreage of commonly grown crops in Dee Irrigation District.

Crop Type	Area (acres)¹	Area (percent)¹
Pears	592	68%
Cherries	106	12%
Apples	62	7%
Blueberries and grapes	27	3%
Hay and forage	84	10%

Notes: ¹Areas presented are based on 2011 OSU extension office survey for Hood River Valley.

3.2.1.2 Water Rights

DID has three water rights ranging in priority from 1909 up to 1978 (Table 19). DID’s main irrigation right is dated 9/13/1909 and is for 9.22 cfs from the West Fork of the Hood River. Its 1931 right is for supplemental irrigation, and is for the sources of Camp Creek, Deer Creek, and North, Middle, and South Springs. It’s most junior right, 2/10/1978, is for the West Fork Hood River and Camp Creek, and covers “agricultural”, “irrigation”, and “livestock” uses. With the water conserved from its 2012 piping project, DID is in the process of transferring some of its irrigation water right to an instream water right. This has not been finalized yet, but it is anticipated that three cfs will be transferred.

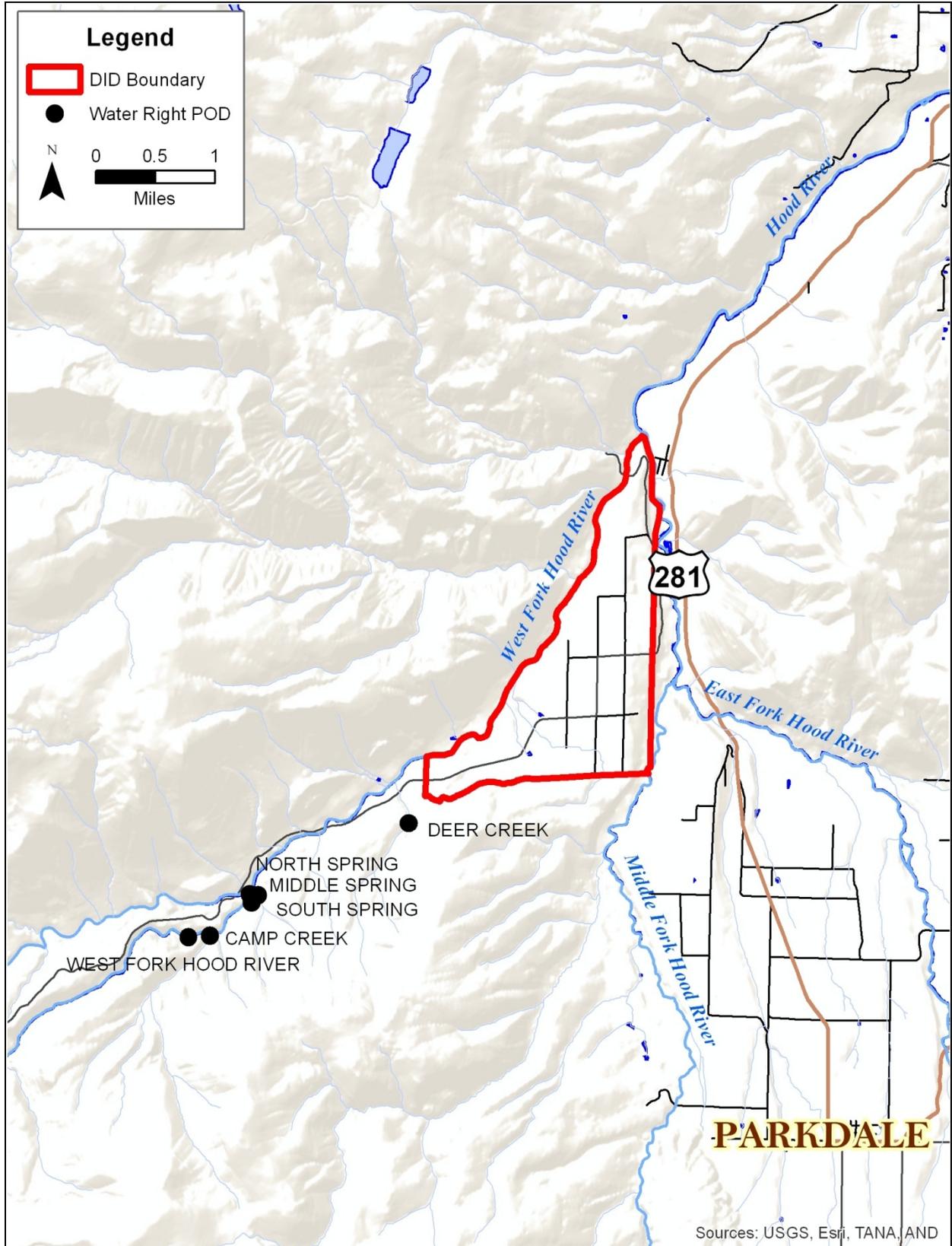


Figure 14. Dee Irrigation District's water rights¹ and district boundary.

Notes: ¹Not shown is Unnamed Creek (just downstream of Camp Creek) and No Name Creek (near Middle Springs).

Table 19. Water rights held by Dee Irrigation District.

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
S-165/ 39048	9/13/1909	West Fork Hood River	737.3	9.22	Irrig.	16057	
S-18546/ 39049	3/7/1931	Unnamed Creek Springs Deer Creek	737.3	9.22 6.00	Irrig. Suppl. Irrig.	16048 16051 16052 16056	Makes up deficiency in rate.
S-43314/ 86804	2/10/1978	Camp Creek No Name Creek West Fork Hood River	132.7 102.0	1.66 12.50 1.00 0.05	Irrig. Frost Spray Stock	16047 16050	12.5 cfs max rate
Total (irrigation only)			870.0	20.09			

3.2.1.3 Water Use Reports

Flow measurements made by the local OWRD watermaster are shown in Table 20. These measurements are made downstream of all diversions and upstream of all consumptive use, and therefore represent DID's full diversion during this period. These measurements show that peak diversion occurs in July and August and has ranged from 10.6 to 12.3 cfs from 2000-2011. DID's new pipe installed in fall of 2012 is estimated to reduce seepage by approximately 25%. Table 21 shows that DID's new peak diversion should be closer to 8.8 cfs starting in 2013 because of the reduction in seepage.

Water use reports filed by DID are also shown below in Tables 22-26. The only data available for the period 2000-2011 were years 2003 and 2004 and it is believed that the units recorded are incorrect. The original reports from OWRD stated the units as either gallons or cubic-feet, while DID suggests they are more likely to be either gallons per minute or acre-feet. In the tables below, units have been shown as acre-feet, yet it is still believed these are incorrect as the values do not seem realistic (e.g. WUR for West Fork Hood River is ~2.5 cfs, while DID states use is closer to 8 cfs). Since these tables are believed incorrect, they are presented here only for the sake of capturing the available OWRD water use data. Tables 20, 21, and 27 below reflect a more accurate assessment of water use in the District. Table 27 shows flow measurements in DID during July and September of 2008. Inflow is presented for six different locations along with total canal loss (seepage) and delivered water.

Table 20. OWRD measured¹ total diversion in Dee Irrigation District from 2000 - 2011.

Water Year	Unit ^{2,3}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total (ac-ft)
2000-2011	CFS	3.0	2.4	0.2	0.0	0.1	2.4	3.0	4.3	8.9	10.9	11.0	9.0	n/a
Average	A	187.4	145.8	14.9	0.5	5.6	146.8	177.1	263.2	529.8	670.2	678.3	532.7	3341
2011	CFS	2.8	0.8	0	0	0	0.9	2.1	3.4	5.9	10.8	11.7	10.7	2966
2010	CFS	1.6	0.4	0	0	0.2	1.9	2.5	4.0	7.0	10.3	10.0	9.5	2871
2009	CFS	2.3	0.7	0	0	0	2.8	3.9	4.4	10.5	10.9	11.3	7.7	3297
2008	CFS	1.7	0.7	0	0	0	1.3	1.8	4.0	7.8	10.7	10.8	8.6	2862
2007	CFS	2.5	1.1				1.8	2.2	5.9	11.6	11.3	10.9	8.8	3390
2006	CFS	2.8	3.6	1.2	0	0.3	1.1	2.3	4.8	9.3	11.1	10.4	8.1	3333
2005	CFS	2.5					5.4	4.4	2.9	9.3	11.4	12.3	9.8	3504
2004	CFS	4.6	3.6				1.3	2.2	6.4	10.4	11.5	11.8	6.4	3513
2003	CFS	3.3	4.8				3.2	3.0	3.7	8.1	10.8	10.8	8.2	3381
2002	CFS	6.7	3.7				3.1	4.4	4.2	8.5	9.3	10.6	10.5	3691
2001	CFS	2.9	4.9				2.7	4.2	5.2	10.1	11.5	10.9	9.6	3750
2000	CFS	n/a	n/a				3.3	2.7	2.7	8.3	11.2	10.9	9.6	n/a

Notes: ¹ Values measured by OWRD at gauge 14116200.
² Units: A = acre-feet/month, CFS = cubic foot/second.
³ Blank values missing from OWRD record and are assumed to equal zero.

Table 21. Estimate¹ of required Dee Irrigation District diversion after pipe installation in 2012.

Water Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2013 and after	CFS	2.1	0.6	0.0	0.0	0.0	0.7	1.6	2.6	4.4	8.1	8.8	8.1	n/a
	A	128.0	37.7	0.0	0.0	0.0	40.9	92.7	157.1	262.3	496.1	538.5	495.0	2248

Notes: ¹ Values based on estimates from DID and Confederated Tribes of the Warm Springs that 25% less water will be diverted relative to water year 2011.
² Units: A = acre-feet/month, CFS = cubic foot/second.

Table 22. Water use reports filed by Dee Irrigation District for Camp Creek (WUR ID 16047).

WUR ID ^{1,2}	Water Year	Unit ^{3,4}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2003-2004 AVG		CFS	0.2	0.2	0.0	0.0	0.0	0.7	0.8	0.6	0.5	0.2	0.2	0.2	n/a
		A	10	10	0	0	0	45	45	35	30	15	10	10	210
		A				Units likely incorrect, see Table 20 for estimate of water use.									
16047	2004	A	10	10	0	0	0	30	30	30	20	10	10	10	160
16047	2003	A	10	10	0	0	0	60	60	40	40	20	10	10	260

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16047 contains records for 2003 and 2004 only.

³ Units are believed incorrect, see Table 20 for estimate of water use.

⁴ Units: A = acre-feet/month, CFS = cubic foot/second.

Table 23. Water use reports filed by Dee Irrigation District for Camp Creek (WUR ID 16048).

WUR ID ^{1,2}	Water Year	Unit ^{3,4}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2003-2004 AVG		CFS	1.0	0.5	0.0	0.0	0.0	1.5	1.5	1.5	1.2	1.0	0.7	0.7	n/a
		A	60	30	0	0	0	90	90	90	70	60	40	40	570
		A				Units likely incorrect, see Table 20 for estimate of water use.									
16048	2004	A	60	30	0	0	0	90	90	90	70	60	40	40	560
16048	2003	A	60	60	0	0	0	80	80	80	60	60	40	40	580

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16047 contains records for 2003 and 2004 only.

³ Units are believed incorrect, see Table 20 for estimate of water use.

⁴ Units: A = acre-feet/month, CFS = cubic foot/second.

Table 24. Water use reports filed by Dee Irrigation District for West Fork Hood River.

WUR ID ^{1,2}	Water Year	Unit ^{3,4}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2003-2004 AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	2.6	2.4	2.4	n/a
		A	0	0	0	0	0	0	0	0	160	160	150	140	610
						Units likely incorrect, see Table 20 for estimate of water use.									
16050	2004	A	0	0	0	0	0	0	0	0	160	160	160	140	620
16050	2003	A	0	0	0	0	0	0	0	0	160	160	140	140	600

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16047 contains records for 2003 and 2004 only.

³ Units are believed incorrect, see Table 20 for estimate of water use.

⁴ Units: A = acre-feet/month, CFS = cubic foot/second.

Table 25. Water use reports filed by Dee Irrigation District for Middle Spring/No Name Creek.

WUR ID ^{1,2}	Water Year	Unit ^{3,4}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2003-2004 AVG		CFS	1.0	1.0	0.0	0.0	0.0	1.5	1.5	1.5	2.9	2.6	2.3	2.3	n/a
		A	60	60	0	0	0	90	90	90	170	160	140	135	995
						Units likely incorrect, see Table 20 for estimate of water use.									
16051	2004	A	0	0	0	0	0	0	0	0	160	160	140	140	600
16051	2003	A	120	120	0	0	0	180	180	180	180	160	140	130	1390

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16047 contains records for 2003 and 2004 only.

³ Units are believed incorrect, see Table 20 for estimate of water use.

⁴ Units: A = acre-feet/month, CFS = cubic foot/second.

Table 26. Water use reports filed by Dee Irrigation District for West Fork Hood River.

WUR ID ^{1,2}	Water Year	Unit ^{3,4}	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2003-2004 AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	n/a
		A	0	0	0	0	0	0	0	0	5	5	5	5	20
16057	2009	A				Units likely incorrect, see Table 20 for estimate of water use.									
16057	2004	A	0	0	0	0	0	0	0	0	5	5	5	5	20
16057	2003	A	0	0	0	0	0	0	0	0	5	5	5	5	20

Notes: ¹ WUR ID assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16057 contains records for 2003 and 2004 only.

³ Units are believed incorrect, see Table 20 for estimate of water use.

⁴ Units: A = acre-feet/month, CFS = cubic foot/second.

Table 27. DID inflow, loss, and delivered water in July and September, 2008 (cfs)¹.

Diversion / Type	July 31, 2008	September 17, 2008
West Fork Hood River	8.32	6.46
Camp Creek	1.23	1.03
Un-named Creek	1.2	1.48
No-named Creek	2.83	2.82
Alder Creek	0.68	0.39
Deer Creek	0.15	0
Total In-flow	14.41	12.18
Loss in canal	2.98	3.21
Delivered	11.43	8.97

Notes: ¹ Data obtained from Les Perkins, personal communication.

3.2.1.4 Conservation Projects

DID has recently completed a major conservation project and is in the preliminary planning stages of others.

Completed

Conveyance pipe installation: DID installed 4.5 miles of 36" pipe in the fall of 2012. Historic seepage losses of approximately 3 cfs will be eliminated with the new pipe.

Fish screen and diversion: Along with the pipe project above, DID installed a new diversion and Farmers Conservation Alliance fish screen on Camp Creek. The new screen will reduce the number of fish entrapped on the screen.

Proposed

Develop infrastructure: DID is in the planning stages of further developing the Dee community irrigation infrastructure. This will include installing new pipe in the whole district which will be served by a single pump station at the south end of Alder Road.

Water awareness: DID is involved in ongoing efforts to increase water use awareness, including education and outreach related to efficient on-farm irrigation practices.

3.2.2 East Fork Irrigation District

The East Fork Irrigation District encompasses 15,150 acres in the Northeast part of the Hood River Valley, on which 9611.6 acres of water rights are allocated. The district’s boundaries are roughly from its diversion point north to the Columbia River, and between the Hood River and the East Hills (Figures 1, 7, 8, 15). EFID is headquartered in Odell, and diverts water for both EFID and Mt. Hood Irrigation District. EFID delivers water for irrigation, spray, frost, and fire protection only; it does not have any hydropower facilities.

EFID has a single diversion point located south of Tollbridge Park near the community of Mt. Hood on the east bank of the East Fork Hood River. The diversion structure currently consists of a 12 feet wide by 4 ½ feet high vertical actuated headgate. Reinforced concrete wing walls extend about 8 feet beyond each side of the headgate. Local bedrock and river boulders provide the necessary water elevation control. The current diversion structure is scheduled to be replaced by an Obermeyer weir in September 2013.

3.2.2.1 Crop Types

The most recent survey of crop types was performed by EFID in 2008/2009 (Table 28). The survey was sent to district patrons with 20 acres or more of water rights (105 patrons with total of 7,375 acres of water rights). The most prevalent crop is pears with 56% of acreage, though this is down from the 63% from the previous survey in the late 1990s. Also decreasing in acreage is apples (16% in the 1990s versus 9.3% in 2009). During this same period, cherries have increased from 6% to 9%, hay and forage has increased from 6% to 15%, and suburban areas have increased from 3% to 8%. Notably, the acreage of blueberries was constant between the two survey periods, though there may be an increase in acreage in the last few years.

Table 28. Estimate of acreage of commonly grown crops in EFID.

Crop	Area (acres)¹	Area (percent)¹
Pears	5,200	54
Cherries	980	9
Apples	880	9
Blueberries and grapes	83	1
Hay and forage	1,450	15
Urban and suburban	750	8
Other	348	4

Notes: ¹ Most recent estimate from EFID is 2009 (EFID 2011).

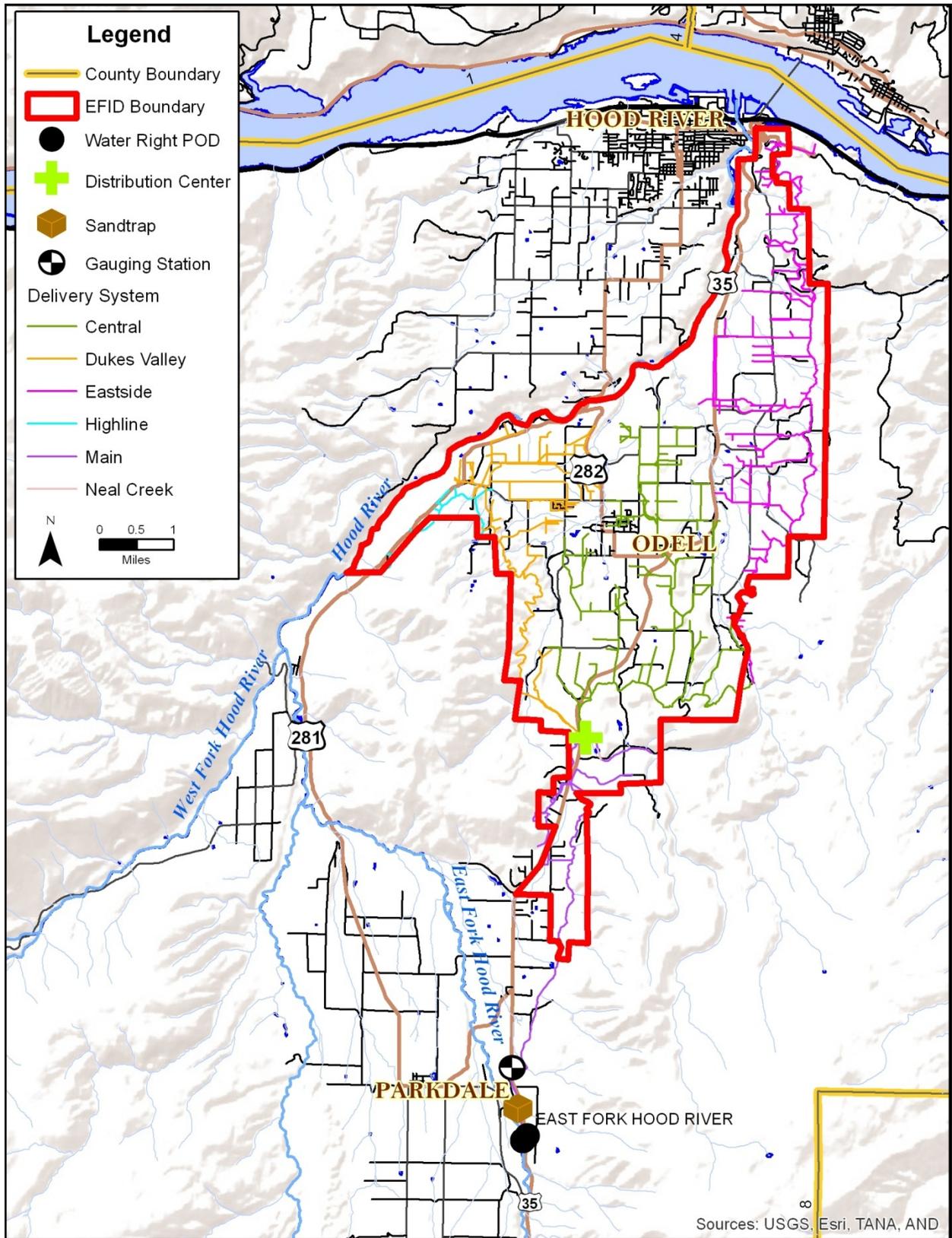


Figure 15. East Fork Irrigation District's water rights, district boundary, and distribution system.

3.2.2.2 Water Rights

EFID has eight water rights ranging in priority date from 1895 to 1982 (Table 29). Its largest single water right has a priority date of November 25, 1895 and is for 104.699 cfs (104.564 cfs for irrigation). Cumulative irrigation water rights are 117.859 cfs, which are valid from April 15 through October 1 only. Additional water rights include 37.1 cfs for spray, frost, and fire protection, 1.02 for instream, and 0.27 for commercial. Of the commercial rights, the Hanel Lumber Mill is the only patron actively using the right (10.8 acres for 0.108 cfs). The mill has applied to OWRD to transfer their additional irrigation right to industrial, plus obtain five additional acres of rights.

Table 29. Water rights held by East Fork Irrigation District.

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
-/ 81340 T-9609 T-9804 T-9129	11/25/1895	E. Fork Hood River	8526.5 3.50 5.95 10.8	104.45 0.04 0.074 0.135	Irrig. Indust.	16087	CW-53 reduced the rate of Certificate 81340 by 2.10 cfs (was 106.55 cfs).
S-29617/ 80929	3/13/1964	E. Fork Hood River	478.80	5.99	Irrig.	16087	
S-30825/ 80928	8/13/1965	E. Fork Hood River	89.00	1.10	Irrig.	16087	
S-32101/ 80927	10/26/1966	E. Fork Hood River	57.00	0.71	Irrig.	16087	
S-32685/ 80926	6/14/1967	E. Fork Hood River	25.00	0.31	Irrig.	16087	
S-43393/ -	2/23/1977 8/15/1978	E. Fork Hood River		10.00 27.00 0.10	Spray Frost Fire	16087	Rate by priority 2/23/1977 = 25.00 cfs 8/15/1978 = 12.1 cfs
S-43395/ 84803	8/8/1977 8/3/1978	E. Fork Hood River	405.00	4.45 0.61	Irrig.	16087	
S-46707/ 84802	2/3/1982	E. Fork Hood River	10.00	0.125	Irrig.	16087	
Total (irrigation only)			9600.75	117.859			

3.2.2.3 Water Use Reports

Two water use measurements exist for EFID. The first is the official water use report filed by EFID (termed “WUR”), and the second are measurements made by the local OWRD watermaster (termed “OWRD”). The OWRD watermaster measurements are likely much more accurate than the official water use reports, however results are presented here for both sets of measurements since the water use reports are the official values filed by EFID with the state.

For the EFID WUR, all water use is reported under a single water use report (Table 30). Water use reported by EFID between water year 2002 and 2012 averaged 37,300 acre-feet per year. The highest year was 2012 with a use of 41,100 acre-feet, and the lowest year was 2005 with 33,400 acre-feet. The low water use in 2005 was a result of low water supply (low snowpack and low streamflow) and not indicative of actual reduced demand during that year. Measurements made by the local watermaster show lower use than those reported by EFID (Table 31). The watermaster measurements show a range from 25,970 – 34,600 acre-feet per year between 2001 and 2012, with an average of 30,095 acre-feet per year.

It should be noted, however, that both measurements also includes approximately 50% of the MHID diversion, so actual EFID use is roughly 5% lower than shown in Tables 30 and 31. Estimates are presented in Table 32 for EFID only water use. These values are calculated by subtracting 50% of MHID water use (shown in Table 75) from the OWRD watermaster values presented in Table 31. Based on water year 2002-2012 averages for EFID only, diversions are zero in November through February. In March and April, some spray water is introduced for an average use of 12.0 and 33.0 cfs, respectively. Peak irrigation demand is in the summer with 89.5, 103.7, 101.7, and 73.4 cfs used in June through September, respectively.

Table 30. Water use report filed by East Fork Irrigation District (termed WUR).

WUR ID ^{1,2}	Water Year	Unit ³	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2002-2012 AVG ⁴		CFS	21.9	0.0	0.0	0.0	0.0	12.0	33.6	65.0	115.1	137.6	134.6	94.5	n/a
		A	1345	0	0	0	0	736	1999	3997	6850	8459	8278	5623	37286
16087	2012	A	1582	0	0	0	0	425	2084	4104	7692	9070	9191	6926	41075
16087	2011	A	1553	0	0	0	0	705	1757	2992	5378	8787	9035	7022	37230
16087	2010	A	1398	0	0	0	0	1095	2486	3399	4729	8532	8958	5086	35684
16087	2009	A	1025	0	0	0	0	468	2060	2981	7403	8791	9138	5794	37661
16087	2008	A	1586	0	0	0	0	442	1524	3387	6715	8450	7897	5984	35985
16087	2007	A	1760	0	0	0	0	473	1756	5057	7831	8312	7822	4933	37944
16087	2006	A	1559	0	0	0	0	1134	2249	5089	6808	8378	8548	5250	39015
16087	2005	A	1799	0	0	0	0	1034	2103	2834	6064	7654	7218	4668	33374
16087	2004	A	0	0	0	0	0	755	2117	5860	7081	8341	6598	4686	35438
16087	2003	A	1794	0	0	0	0	719	1894	3466	8057	8375	8262	5216	37782
16087	2002	A	732	0	0	0	0	840	1962	4795	7591	8363	8390	6283	38956
16087	2001	A	0	0	0	0	0	55	79	142	248	260	249	178	1211

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 16087 also includes approximately 50% of MHID's water diversion.

³ Units: A = acre-feet/month, CFS = cubic foot/second.

⁴ Average presented for 2002-2012 data. 2001 data believed inaccurate.

Table 31. OWRD measured¹ flow in East Fork Irrigation District’s main canal (termed OWRD).

Water Year	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total (ac-ft)
2001-2012	CFS	21.8	14.0	0.0	0.0	0.0	19.2	27.8	52.3	93.0	108.8	105.4	75.4	n/a
AVG	A	1337	831	0	0	0	1182	1657	3215	5537	6689	6482	4488	30950
2012	CFS	n/a	3		0.0	0.0	9.8	26.2	51.0	95.8	107.7	109.0	81.1	n/a
2011	CFS	19.5	0.0	0.0	3.5 ⁴	0.0	19.3	24.4	38.1	69.5	110.8	114.5	93.2	29814
2010	CFS	18.9	6.7	0.0	0.0	0.0	22.9	32.5	43.0	60.8	107.0	109.2	67.0	28311
2009	CFS	18.5					20.2	25.5	37.9	96.0	111.0	112.5	76.9	30157
2008	CFS	15.8		0.0			15.0	20.6	43.2	87.0	106.5	98.5	76.8	28026
2007	CFS	25.3			0.0	0.0	16.0	23.2	63.7	100.8	103.4	98.4	62.4	29834
2006	CFS	16.7					18.7	28.4	66.3	93.8	110.9	109.6	72.2	31253
2005	CFS	28.4					25.0	30.4	37.6	102.0	106.7	99.2	n/a	25969
2004	CFS	25.7					17.7	32.6	77.9	97.6	110.6	90.1	65.8	31336
2003	CFS	27.1	21.0				22.9	27.4	46.4	106.2	111.5	111.0	73.4	33086
2002	CFS	23.4	22.0				18.7	29.8	64.1	104.0	112.5	111.2	86.0	34575
2001	CFS	20.1	20.2				24.5	33.1	58.1	103.0	106.9	101.8	75.0	32831

- Notes: ¹ Values measured by OWRD at gauge 14114000.
² Units: A = acre-feet/month, CFS = cubic foot/second.
³ Blank values missing from OWRD record and are assumed to equal zero.
⁴ Value assumed incorrect or anomaly, not used to calculate average discharge.

Table 32. Estimate¹ of actual East Fork Irrigation District water use.

	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2001-2012	CFS	21.5	5.8	0.0	0.0	0.0	19.2	27.2	50.7	89.5	103.7	101.7	73.4	
AVERAGE	A	1322	346	0	0	0	1182	1621	3119	5325	6378	6251	4369	29915

- Notes: ¹ Values calculated by subtracting 50% of water year 2000 MHID diversion from average OWRD measured values presented in Table 31.
² Units: A = acre-feet/month, CFS = cubic foot/second.

3.2.2.4 Conservation Projects

East Fork Irrigation District has actively undertaken conservation projects, focusing primarily on replacing open canal with pipe to reduce seepage losses and end-spills (East Fork Irrigation District Water Management and Conservation Plan, 2011). To most effectively manage future conservation projects, EFID is currently working on a system optimization plan which will identify which projects should be implemented and in what order.

Completed

Central Lateral Pipeline: Completed in 2008, this \$11M multi-phase project installed approximately 4.5 miles of pipe. A Central canal Seepage study performed by OWRD estimated the savings at 2.1 cfs, of which 1.08 cfs was allocated to the State for an instream water right.

Ackerman Hill Line: In 2009, installed 1900 feet of 8" PVC.

Rasmussen Line: Between 2008 and 2010, installed 1400' 10" PVC, 1900' of 6" PVC, 400' of 4" PVC, and 1350' of 3" PVC. The installations pressured pipe, and reduced seepage and overflows.

Paasch Line: Installed 1390' of 8" PVC in 2004, and 1600' of 4" PVC in 2009, eliminating the use of pumps and water boxes.

Dominguez Silt Pond: In 2010, EFID excavated two 50' long x 18' wide x 8' deep silt pits down along the main canal near the headworks. These pits increase the silt settling area and provide cleaner water into the system.

Proposed

Replace head gate and diversion structure: EFID is scheduled to replace the existing head gate and diversion off the East Fork Hood River in fall of 2013 with an Obermeyer style push up bladder weir. This work is being funded by CTWS, OWEB, EFID, and others.

Install telemetry: EFID is working to install telemetry at multiple locations in the system. The telemetry will first be used to monitor and report system operations, but will eventually be used to automate flow rates.

Neal Creek Lateral: Install a pipeline off the Christopher Ditch to supply water to the Upper Neal Creek Road patrons currently on the Neal Creek Lateral.

Surge Pond at Central Lateral Pipeline: Install a surge pond to eliminate spill into Neal Creek Lateral and help maintain a constant water level in the Central lateral Pipeline.

Other ongoing efforts by EFID include converting open ditches to pipelines to eliminate overflows, minimizing operational spill as much as possible, and pressurization to reduce on farm pumping costs.

3.2.3 Farmers Irrigation District

Farmers Irrigation District is located in the northern part of Hood River County (Figure 1, 7, 8, and 16). It is bounded on the north by The City of Hood River and the Columbia River, on the west by the cascade Mountain range, and on the south and east by the Hood River. District elevation ranges from 180’ to 2250’ mean sea level. Total area within the district is over 12,000 acres, of which 5888.25 acres of water rights are reserved. In 2010 the district had 1851 accounts, which typically increases by a few new accounts per year.

Historically, the district maintained 34 unscreened diversions, however, as a result of various conservation projects, the district now operates only nine water diversions, each of which are fully screened and fish safe. The district operates two reservoirs, Upper Greenpoint and Lower Greenpoint, with a combined storage capacity of 918 acre-feet (Farmers Irrigation District Water Management and Conservation Plan, 2011). These reservoirs are fed by Gate Creek and Cabin Creek via the Stanely Smith pipeline. The districts largest single diversion is off of the mainstem of the Hood River from which it has a 73 cfs hydro right, 40 cfs irrigation right, and 30 cfs permitted agricultural right (e.g. orchard spraying). The district has two hydroelectric power plants which generate roughly 25,000 MW-hr/yr combined. Due to system configuration, the district is typically unable to generate hydropower with the same water it uses for irrigation, causing monthly output to vary from roughly 3,000 MW-hr/month outside of irrigation season, to down around 500 MW-hr/month during peak season.

3.2.3.1 Crop Types

The most recent assessment of crop types in FID (Table 33) is documented in FID’s 2011 Water Management and Conservation Plan. This assessment is not based on an actual survey of FID acreage, but is an extrapolation of OSU Extension Service data from the whole Hood River Valley. The FID manager reviewed the initial results from OSU and added in values for “Suburban/Residential” and “Other.”

Table 33. Estimate of acreage of commonly grown crops in Farmers Irrigation District.

Crop Type	Area (acres)¹	Area (percent)¹
Pears	2,889	49
Cherries	517	9
Apples	303	5
Blueberries and grapes	130	2
Hay and forage	410	7
Suburban / Residential	1,444	25
Other	195	3
Total	5,888	100

Notes: ¹ Most recent estimate from FID is 2011 (FID 2011).

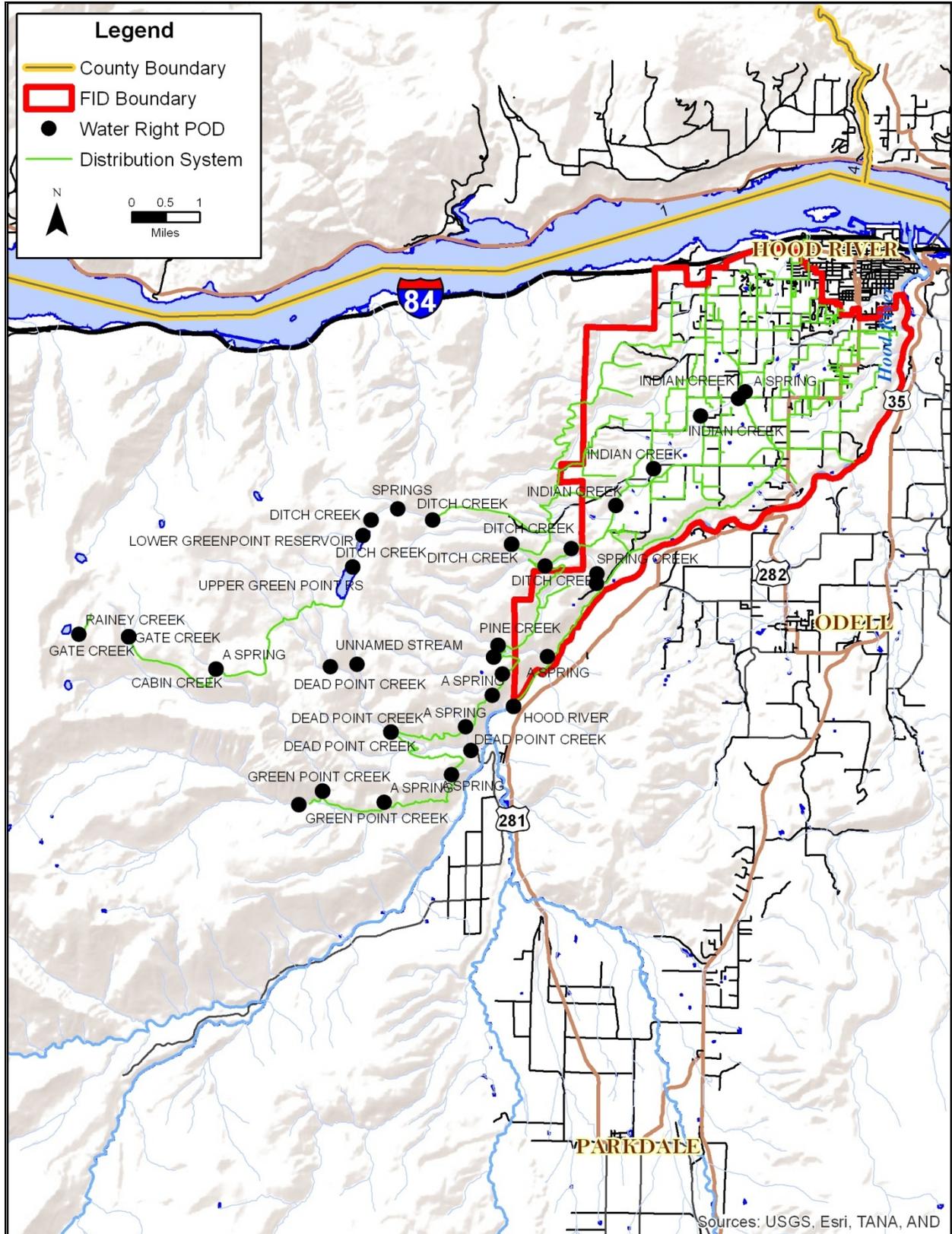


Figure 16. Farmers Irrigation District's water rights, district boundary, and distribution system.

3.2.3.2 Storage Facilities

FID's storage reservoirs were built in 1936 and 1937 and are both earthen fill. At the time of construction, the storage capacity was estimated at 715 acre-feet for the upper and 288 acre-feet for the lower, for a total of 1,003 acre-feet. The storage water rights for these (permit #698, priority date 11/22/1933) is for these volumes. A survey in 2002 (Wy' East Surveys, 2002) estimated the storage capacity at that time to be 692 acre-feet in the upper, and 246 acre-feet in the lower, for a total of 938 acre-feet (Figure 17). The same 2002 survey estimated the surface area of the upper reservoir at full pool to be 47 acres.

The water right for these reservoirs is for supplemental irrigation only, hence they are operated to fill in early spring and release during irrigation season (Figure 18, 19, Table 34). The reservoirs are small relative to their potential supply, therefore they fill each year. Any water that has not been used during irrigation season is released in October so the reservoirs sit dry over the winter. This operation is a result of the water right (i.e. not valid for hydropower) and general safety and maintenance best management practices.

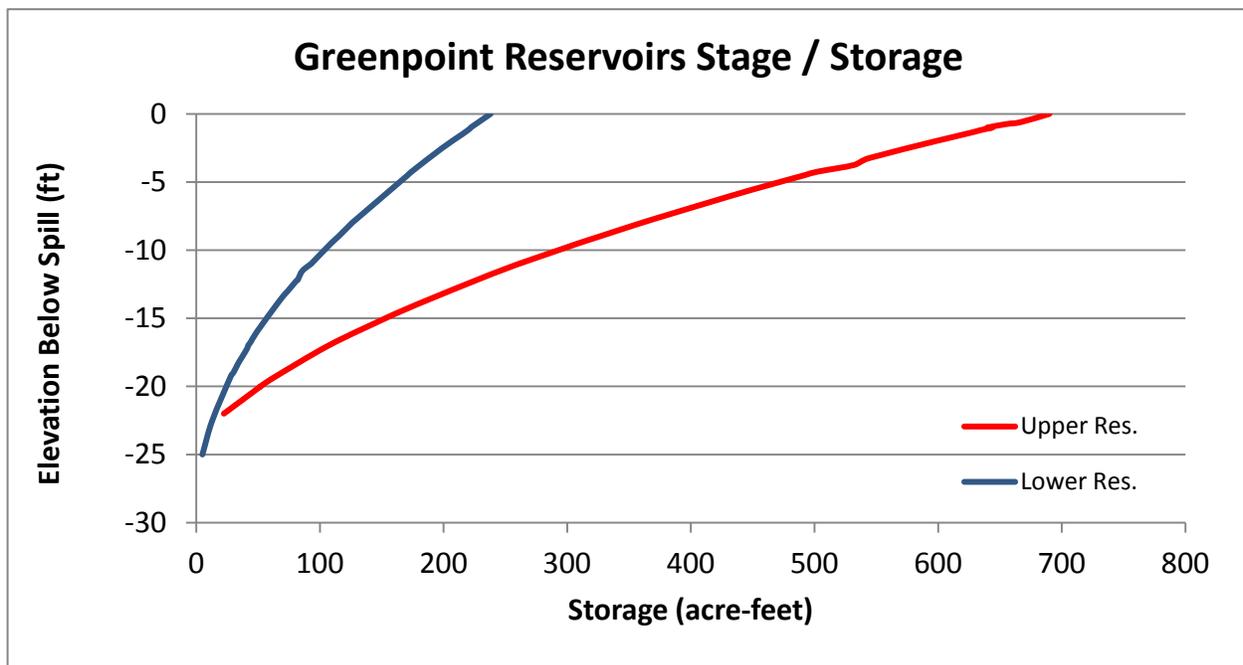


Figure 17. Storage Volume in Upper and Lower Greenpoint Reservoirs as a function of elevation below spill.

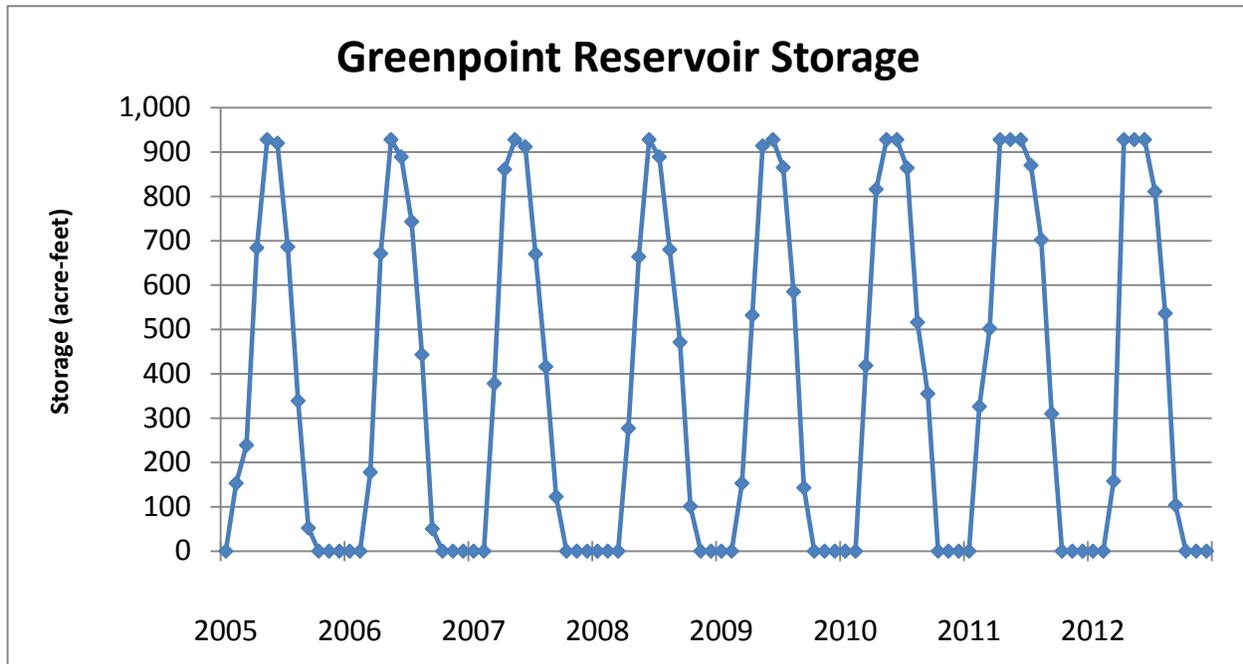


Figure 18. Timeseries of monthly combined reservoir storage for water year 2005-2012.

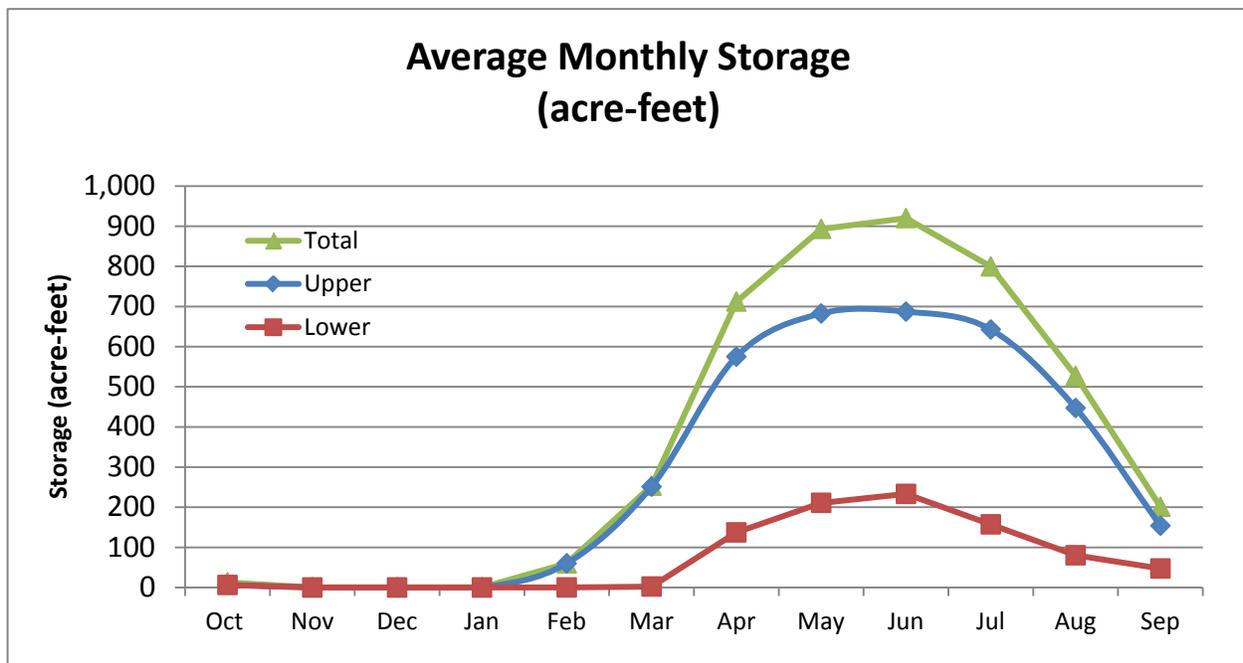


Figure 19. Average monthly upper, lower and total reservoir storage based on water year 2005-2012.

Table 34. Acre-feet stored in Upper Greenpoint Reservoir, Lower Greenpoint Reservoir, and combined total.

		Jan	Feb	March	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec
2005-2012 Average	Upper	0	60	251	575	683	687	643	447	154	7	0	0
	Lower	0	0	2	137	211	233	157	80	47	6	0	0
	Total	0	60	253	712	893	920	800	527	201	13	0	0
2012	Upper	0	0	153	690	690	690	640	462	60	0	0	0
	Lower	0	0	5	238	238	238	171	74	44	0	0	0
	Total	0	0	158	928	928	928	811	536	104	0	0	0
2011	Upper	0	326	502	690	690	690	655	621	269	0	0	0
	Lower	0	0	0	238	238	238	215	81	41	0	0	0
	Total	0	326	502	928	928	928	870	702	310	0	0	0
2010	Upper	0	0	405.5	690	690	690	690	433	290	0	0	0
	Lower	0	0	13	126	238	238	174	83	65	0	0	0
	Total	0	0	418.5	816	928	928	864	516	355	0	0	0
2009	Upper	0	0	153	532	690	690	644	492	107	0	0	0
	Lower	0	0	0	0	224	238	221	93	36	0	0	0
	Total	0	0	153	532	914	928	865	585	143	0	0	0
2008	Upper	0	0	0	277	630	690	690	598	378	52	0	0
	Lower	0	0	0	0	34	238	199	82	93	49	0	0
	Total	0	0	0	277	664	928	889	680	471	101	0	0
2007	Upper	0	0	378	690	690	690	544	301	51.8	0	0	0
	Lower	0	0	0	171	238	222	126	115	71	0	0	0
	Total	0	0	378	861	928	912	670	416	122.8	0	0	0
2006	Upper	0	0	178	433	690	667	634	360	22.3	0	0	0
	Lower	0	0	0	238	238	222	109	83	28	0	0	0
	Total	0	0	178	671	928	889	743	443	50.3	0	0	0
2005	Upper	0	153	239	598	690	690	644	309	52	0	0	0
	Lower	0	0	0	86	238	230	42	30	0	0	0	0
	Total	0	153	239	684	928	920	686	339	52	0	0	0

Notes: Data not available from OWRD. Reservoir elevations obtained from FID and converted to storage volume.

3.2.3.3 Water Rights

FID has water rights which range from 0.02 cfs (Ditch Creek for primary irrigation) up to 73 cfs (Hood River for hydroelectric generation) (Table 35). The district has rights to 83.24 cfs for irrigation, of which 81.3 cfs has a priority date preceding 1910. The districts hydro rights are from 1981 and are for 35 cfs from the upper and middle districts and 73 cfs from the lower district. The districts storage right (permit R-698, priority date 11/22/1933) is for 715 acre-feet of storage in Upper Green Point reservoir, and 288 acre-feet of storage in Lower Green Point reservoir. This storage right is specified for supplemental irrigation only.

Table 35. Water rights held by Farmers Irrigation District.

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
----/ 85974	12/31/1874 12/19/1892 10/6/1902	Ditch Cr Dead Point Cr	2260.4	5.0 15.0 10.0	Irrigation		
----/ 85975	12/31/1891	Ditch Cr Parker Springs	57.3	1.25	Irrigation		Maximum Rate = 6.25 cfs
	12/31/1899	NF Green Point Cr Spring @ Camp #4	2410.2	5.0	Suppl. Irrigation		See Finding 15 HR Decree.
----/ 77288	9/15/1904	Phelps Cr	166.6	2.08	Suppl. Irrigation		
----/ 74299	12/1/1905	NF Green Point Cr SF Green Point Cr Dead Point Cr SF Pine Cr	191.7 1745.1	10.0 15.0 10.0 2.5	Irrigation Suppl. Irrigation	16098 16103 16112 16155	Maximum Rate = 37.5 cfs
----/ 74306	5/7/1906	Hood River	3188.1	39.85	Irrigation		
----/ 74307	5/7/1906	Hood River	15.4	0.19	Irrigation		
S-6575/ 85976	2/29/1924	Capron Spring Winan Spring Dago Spring Savage Spring No Name Spring Yumibe Spring NF Pine Cr Unnamed Str Indian Cr	1935.4	6.0	Suppl. Irrigation	16079 16102 16109 16117 16118 16119 16121 16122 16123 16125 50690	
S-12362/ 74302	11/22/1933	NF Green Point Cr Upper and Lower Green Point Res.	700.0	8.75	Suppl. Irrigation	16104 16105 16114 16115	

Table 35. Water rights held by Farmers Irrigation District (continued).

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
S-34538/ 74304	7/16/1969	Hood River	1853.7	7.5	Suppl. Irrigation		
S-39822/	12/5/1974	Hood River		30.0	Orchard Spraying	16129	
S-41178/	5/17/1976	Gate Cr Dead Point Cr Ditch Cr NF Green Point Cr NF Pine Cr SF Pine Cr Indian Cr Unnamed Str		12.99	Orchard Spray & Frost Protection	16103 16106 16107 16109 16112 16114 16116 16120 16122 16123 16155	
S-44002/	7/28/1977	Hood River Pine Cr Ditch Cr Spring Br		10.0 16.0	Fertilization & Temp Control	16129 16130 16131 16132	
S-43968/ 74305	1/22/1979	Dead Point Cr	1.5	0.02	Irrigation	16098 16103	
S-45204/	1/8/1980	Ditch Cr	4.9	0.06	Irrigation	16106	
S-49871/ 67267	2/11/1981	Dead Point Cr NF Pine Cr SF Pine Cr Ditch Cr	2948 thp	20.0 5.0 5.0 20.0	Hydropower	16098 16107 16109	Plant 3 sources Max Rate = 35 cfs
S-51421/ 75809	2/11/1981	Gate Cr Cabin Cr NF Green Point Cr	2097 thp	5.0 20.0	Hydropower	16103 16114 16170	Plant 3 sources Max rate = 35 cfs
S-48576/ 67266	2/11/1981	Dead Point Cr NF Pine Cr SF Pine Cr Ditch Cr Hood River	4885 thp	20.0 5.0 5.0 20.0 73.0	Hydropower	16098 16107 16109 16112 16129	Plant 2 sources Max Rate = 108 cfs
S-51189/ 76230	4/27/1989	Rainey Cr Gate Cr Cabin Cr Ditch Cr Dead Point Cr Upper and Lower Green Point Res.	149.5	1.87	Irrigation	16104 16105 16114 16115 16159 16170 23309	
Total (irrigation only)			5868.7	83.24			

3.2.3.4 Water Use Reports

Water use reports are presented below in Tables 37-57. The reports cover all years available from OWRD between 2000 and 2012, which includes 2003, and 2006-2011. The tables show acre-feet used per month plus summary statistics on the top two rows. Due to changes in FID water use recording protocol, the statistics are not based on all data contained in the table but only on select years. FID modernized their recording methods in 2005, so most statistics are based on 2006-2011. Each period used is noted in the column heading and the notes section below the table. Water use reports that show less than 1 ac-ft/month of use (WUR IDs 16119, 16118, 16117, 16121, 16102, 16097, 16165, 16125, 16130, 16122, 16123, 50690, 13131, 13132) are not included in the body of the report but are included in Appendix B.

Table 36 and Figures 20, 21, and 22 are provided below as they capture the most up-to-date use and operations in FID. They are based on calendar year 2011 (2012 irrigation usage within 2% of 2011). Figure 20, 21, and 22 present total water (irrigation and hydropower) use, irrigation use, and hydropower use for the district in 2011, respectively. Discharge through power plants is shown on Figures 20 and 22, while change in combined reservoir volume is displayed under the name “storage” on Figures 20 and 21. For “storage”, positive values indicate reservoir drawdown and negative values indicate filling of the reservoir. Values are calculated by converting the monthly change in storage into a flow rate.

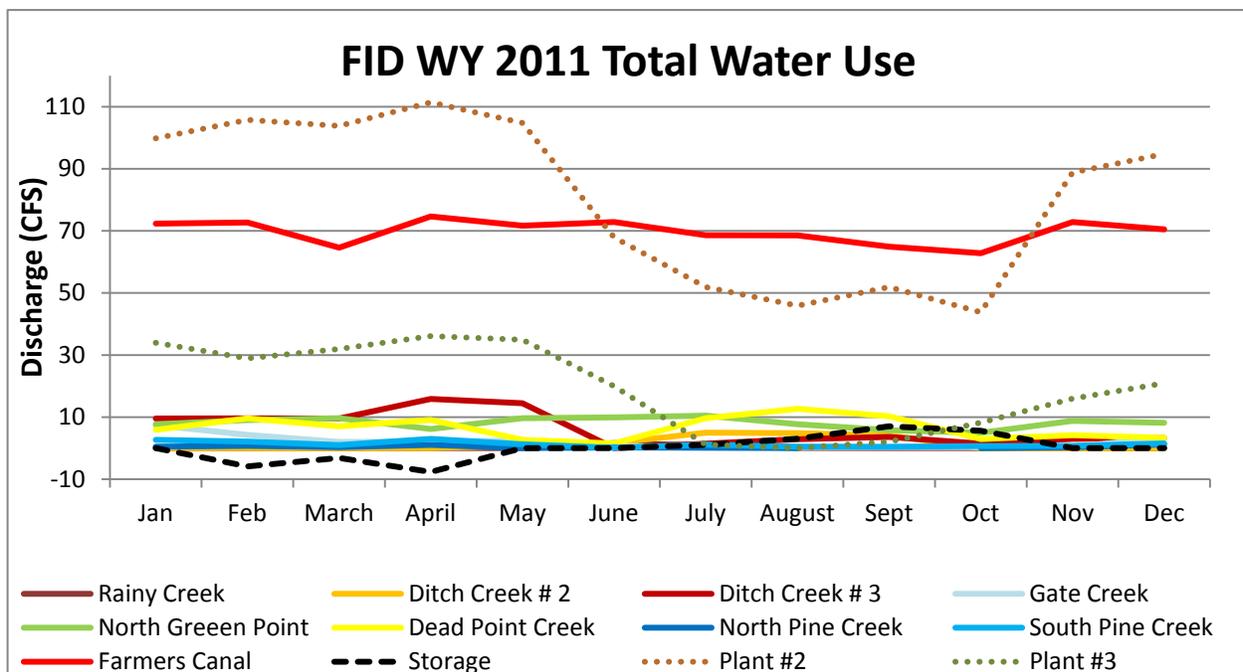


Figure 20. Total water use for Farmers Irrigation District in 2011
 Total = hydro + irrigation, negative values for storage indicate reservoir filling.

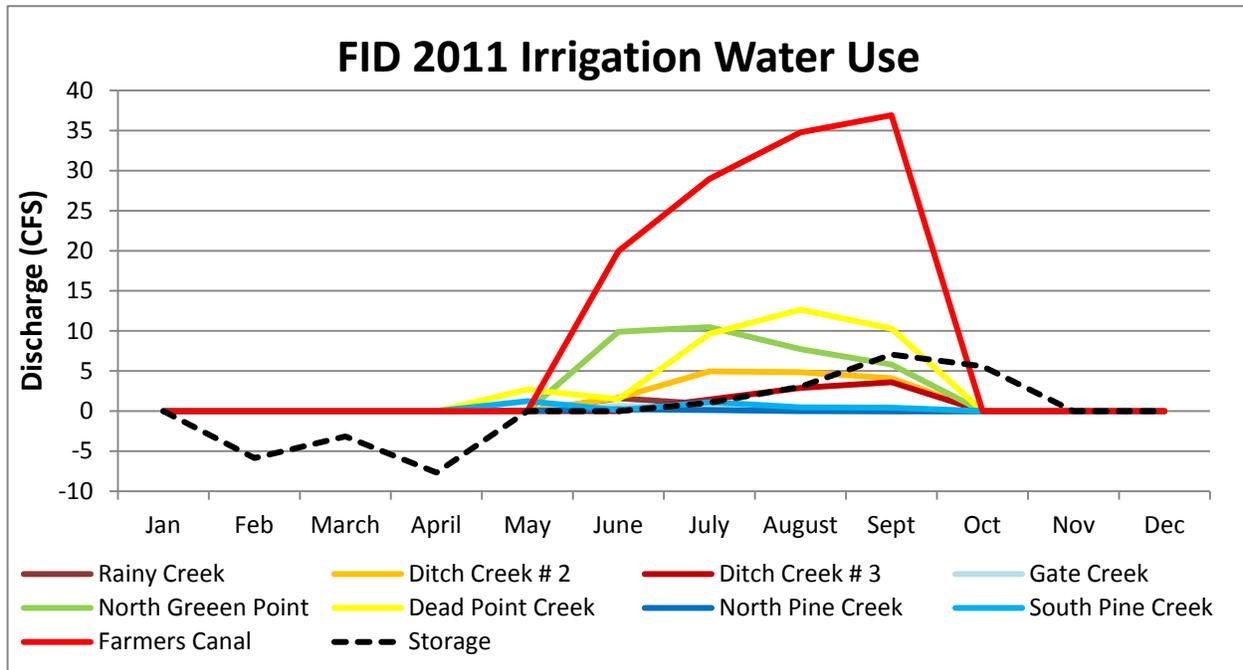


Figure 21. Irrigation water use for Farmers Irrigation District in 2011. Negative values for storage indicate reservoir filling.

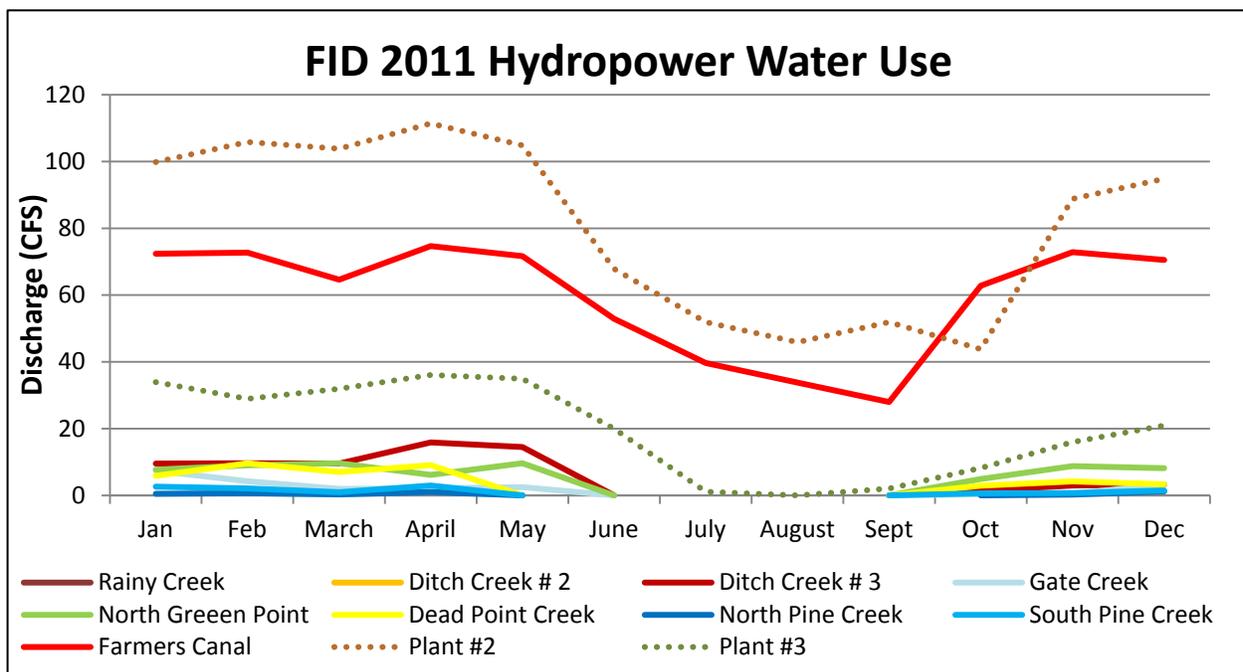


Figure 22. Hydropower water use for Farmers Irrigation District in 2011.

Table 36. Total water use cfs for Famers Irrigation District in 2011 (cfs unless otherwise noted).

District	Diversion	Use	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
Upper	Rainy Creek	Irrigation	-	-	-	-	-	1.6	0.9	0.1	-	-	-	-	
		Hydro	-	-	-	-	-	-	-	-	-	-	-	-	
		Total	-	-	-	-	-	-	1.6	0.9	0.1	-	-	-	-
	Ditch Creek # 2	Irrigation	-	-	-	-	-	-	1.7	5.0	4.8	4.1	-	-	-
		Hydro	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	-	-	-	-	-	0.8	1.7	5.0	4.8	4.1	-	-	-
	Ditch Creek # 3	Irrigation	-	-	-	-	-	-	-	1.4	2.9	3.6	-	-	-
		Hydro	9.6	9.6	9.6	15.9	14.5	-	-	-	-	-	1.4	3.0	3.2
		Total	9.6	9.6	9.6	15.9	14.5	-	-	1.4	2.9	3.6	1.4	3.0	3.2
	Gate Creek	Irrigation	-	-	-	-	-	-	0.6	0.5	0.3	0.3	-	-	-
		Hydro	7.4	4.3	2.0	2.1	2.5	-	-	-	-	-	0.3	0.5	3.3
		Total	7.4	4.3	2.0	2.1	2.5	0.6	0.5	0.3	0.3	0.3	0.3	0.5	3.3
Middle	North Green Point	Irrigation	-	-	-	-	-	9.9	10.5	7.7	5.8	-	-	-	
		Hydro	7.7	9.0	9.7	6.2	9.7	-	-	-	-	4.9	8.8	8.2	
		Total	7.7	9.0	9.7	6.2	9.7	9.9	10.5	7.7	5.8	4.9	8.8	8.2	
	Dead Point Creek	Irrigation	-	-	-	-	-	2.7	1.5	9.6	12.7	10.3	-	-	-
		Hydro	5.9	9.6	7.0	9.1	-	-	-	-	-	-	2.9	4.2	3.4
		Total	5.9	9.6	7.0	9.1	2.7	1.5	9.6	12.7	10.3	2.9	4.2	3.4	
	North Pine Creek	Irrigation	-	-	-	-	-	-	0.2	0.1	-	-	-	-	-
		Hydro	0.5	0.7	0.3	1.0	-	-	-	-	-	-	-	0.3	1.2
		Total	0.5	0.7	0.3	1.0	-	-	0.2	0.1	-	-	-	0.3	1.2
	South Pine Creek	Irrigation	-	-	-	-	-	1.2	0.1	1.1	0.5	0.4	-	-	-
		Hydro	2.7	2.1	1.0	3.0	-	-	-	-	-	-	0.7	0.7	1.5
		Total	2.7	2.1	1.0	3.0	1.2	0.1	1.1	0.5	0.4	0.7	0.7	1.5	
Lower	Farmers Canal	Irrigation	-	-	-	-	-	20.0	29.0	34.8	36.9	-	-	-	
		Hydro	72.4	72.7	64.6	74.7	71.7	52.9	39.6	33.8	28.0	62.8	72.9	70.5	
		Total	72.4	72.7	64.6	74.7	71.7	72.9	68.6	68.6	64.9	62.8	72.9	70.5	
Total	Irrigation	-	-	-	-	-	4.0	35.6	58.1	63.8	61.5	-	-	-	
	Hydro	106.1	108.1	94.1	111.9	98.3	52.9	39.6	33.8	28.0	73.1	90.3	91.3		
	Total	106.1	108.1	94.1	111.9	102.3	88.5	97.7	97.6	89.4	73.1	90.3	91.3		
Storage	Volume (ac-ft)	-	326.0	502.0	928.0	928.0	928.0	870.0	702.0	310.0	-	-	-		
	Release	-	-5.9	-3.2	-7.7	-	-	-	1.0	3.0	7.1	5.6	-	-	
Hydropower	Plant #3	33.9	28.9	31.9	36.1	34.9	20.0	1.1	-	2.1	8.2	16.0	20.9		
	Plant #2	99.8	105.8	103.8	111.4	104.8	67.9	51.9	45.9	51.9	43.8	88.8	94.8		

Notes: CFS unless otherwise notes, source FID

Table 37. Water use report filed by Farmers Irrigation District for Ditch Creek/Upper Reservoir.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2010-2011 ³ AVG		CFS													n/a
		A	0.0	0.0	0.0	0.0	23.5	312.0	400.5	378.0	0.0	0.0	0.0	0.0	0.0
16095	2011	A	0.0	0.0	0.0	0.0	0.0	238.0	475.0	356.0	0.0	0.0	0.0	0.0	1069
16095	2010	A	0.0	0.0	0.0	0.0	47.0	386.0	326.0	400.0	0.0	0.0	0.0	0.0	1159
16095	2009	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.0	118.0	276.0	224.0	679
16095	2008	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.0	237.0	225.0	224.0	804
16095	2007	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	198.0	317.0	227.0	767
16095	2006	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	155.0	307.0	246.0	741
16095	2003	A	20.7	0.0	40.1	35.5	14.1	78.8	29.6	18.9	0.0	0.0	0.0	0.0	238

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2010-2011 due to change in way values were recorded in 2010.

Table 38. Water use report filed by Farmers Irrigation District for Ditch Creek/Lower Reservoir Storage.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2010-2011 ³ AVG		CFS													n/a
		A	0.0	0.0	0.0	0.0	0.0	45.5	98.5	51.0	93.0	0.0	0.0	0.0	0.0
16096	2011	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.0	186.0	0.0	0.0	0.0	288
16096	2010	A	0.0	0.0	0.0	0.0	0.0	91.0	197.0	0.0	0.0	0.0	0.0	0.0	288
16096	2009	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	110.0	276.0	0.0	0.0	446
16096	2008	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.0	116.0	113.0	0.0	0.0	288
16096	2007	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.0	14.0	192.0	0.0	0.0	262
16096	2006	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	132.0	98.0	24.0	0.0	0.0	254
16096	2003	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2010-2011 due to change in way values were recorded in 2010.

Table 39. Water use report filed by Farmers Irrigation District for Rainy Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.9	0.2	0.0	n/a
		A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	76.7	57.0	13.5	0.0
23309	2011	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	97.0	55.0	6.0	0.0	159
23309	2010	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.0	38.0	0.0	0.0	93
23309	2009	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	80.0	61.0	18.0	0.0	171
23309	2008	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.0	71.0	20.0	0.0	180
23309	2007	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.0	101.0	37.0	0.0	244
23309	2006	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	16.0	0.0	0.0	49
23309	2003	A	0.0	0.0	0.0	0.0	0.0	0.0	58.9	51.0	12.5	6.0	0.0	0.0	128

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 40. Water use report filed by Farmers Irrigation District for Gate Creek #1.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2010-2011 ³ AVG		CFS	0.6	1.6	3.2	3.7	3.7	5.1	5.5	4.3	2.9	1.3	0.8	0.8	n/a
		A	37.7	96.8	194.5	228.5	204.3	315.5	326.5	264.0	174.5	81.2	50.7	49.3	2024
16114	2011	A	0.0	29.0	534.0	504.0	237.0	126.0	122.0	215.0	59.0	35.0	44.0	29.0	1934
16114	2010	A	59.0	89.0	100.0	249.0	475.0	386.0	386.0	681.0	356.0	74.0	14.0	7.0	2876
16114	2009	A	45.0	237.0	118.0	240.0	59.0	166.0	236.0	237.0	178.0	44.0	18.0	49.0	1627
16114	2008	A	74.0	59.0	127.0	99.0	140.0	385.0	390.0	2.0	99.0	118.0	40.0	49.0	1582
16114	2007	A	45.0	120.0	100.0	88.0	150.0	420.0	415.0	242.0	202.0	107.0	90.0	78.0	2057
16114	2006	A	3.0	47.0	188.0	191.0	165.0	410.0	410.0	207.0	153.0	109.0	98.0	84.0	2065
16114	2003	A	0.0	40.7	182.9	127.2	204.7	302.1	48.5	0.0	0.0	0.0	0.0	0.0	906

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 41. Water use report filed by Farmers Irrigation District for Gate Creek #2.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.1	0.2	0.9	1.6	1.9	3.5	5.8	2.1	2.2	0.9	1.1	1.0	n/a
		A	5.2	12.3	53.2	97.8	106.0	216.3	345.3	131.7	130.7	57.2	67.2	61.2	1284
16115	2011	A	0.0	0.0	89.0	136.0	88.0	47.0	122.0	148.0	59.0	35.0	44.0	29.0	797
16115	2010	A	0.0	0.0	0.0	0.0	80.0	170.0	392.0	144.0	140.0	7.0	4.0	8.0	945
16115	2009	A	0.0	0.0	0.0	0.0	100.0	180.0	438.0	2.0	148.0	15.0	16.0	20.0	919
16115	2008	A	28.0	0.0	20.0	118.0	98.0	242.0	318.0	150.0	144.0	88.0	105.0	100.0	1411
16115	2007	A	2.0	25.0	15.0	140.0	110.0	298.0	400.0	166.0	142.0	98.0	120.0	100.0	1616
16115	2006	A	1.0	49.0	195.0	193.0	160.0	361.0	402.0	180.0	151.0	100.0	114.0	110.0	2016

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 42. Water use report filed by Farmers Irrigation District for Spring at Camp 4.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.0	0.0	0.0	n/a
		A	0.0	3.3	3.5	12.5	16.0	26.3	32.3	1.3	3.3	2.5	2.8	0.3	104
16170	2011	A	0.0	5.0	3.0	8.0	16.0	22.0	25.0	0.0	8.0	6.0	6.0	0.0	99
16170	2010	A	0.0	3.0	0.0	10.0	12.0	19.0	21.0	0.0	6.0	5.0	5.0	0.0	81
16170	2009	A	0.0	2.0	0.0	12.0	10.0	18.0	22.0	0.0	0.0	0.0	0.0	0.0	64
16170	2008	A	0.0	2.0	0.0	12.0	19.0	27.0	38.0	0.0	0.0	0.0	0.0	0.0	98
16170	2007	A	0.0	3.0	0.0	15.0	20.0	31.0	42.0	0.0	0.0	0.0	0.0	0.0	111
16170	2006	A	0.0	5.0	18.0	18.0	19.0	41.0	46.0	8.0	6.0	4.0	6.0	2.0	173

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 43. Water use report filed by Farmers Irrigation District for Lower Green Point Reservoir.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2010-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	1.0	1.9	2.6	1.4	0.9	1.1	1.5	1.2	n/a
		A	0	0	0	0	0	0	0	0	49	201	283	221	753
16104	2011	A	0	0	0	0	0	0	0	0	0	12	290	313	615
16104	2010	A	0	0	0	0	0	0	0	0	97	389	276	128	890
16104	2009	A	0	0	0	0	0	45	149	237	237	0	0	0	668
16104	2008	A	0	0	0	0	0	267	149	297	0	0	0	0	713
16104	2007	A	0	0	0	0	170	205	310	0	0	0	0	0	685
16104	2006	A	0	0	0	0	167	198	330	0	0	0	0	0	695
16104	2003	A	244	248	248	248	217	0	321	405	198	265	337	675	3405

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2010-2011 due to change in way values were recorded in 2010.

Table 44. Water use report filed by Farmers Irrigation District for Ditch Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	0.0	1.0	1.3	1.0	0.4	0.1	0.8	0.7	n/a
		A	0	0	0	0	0	63	79	64	27	7	48	40	326
16105	2011	A	0	0	0	0	0	0	0	0	0	40	286	241	567
16105	2010	A	0	0	0	0	0	0	0	110	159	0	0	0	269
16105	2009	A	0	0	0	0	0	0	150	135	0	0	0	0	285
16105	2008	A	0	0	0	0	0	0	148	140	0	0	0	0	288
16105	2007	A	0	0	0	0	0	185	103	0	0	0	0	0	288
16105	2006	A	0	0	0	0	0	190	70	0	0	0	0	0	260
16105	2003	A	340	410	410	410	406	166	168	432	304	292	350	694	4380

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 45. Water use report filed by Farmers Irrigation District for Ditch Creek at Parkertown.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.8	1.0	1.0	n/a
		A	3	0	0	0	0	0	1	17	43	48	60	57	229
16159	2011	A	0	0	0	0	0	0	0	12	50	58	70	60	250
16159	2010	A	10	0	0	0	0	0	4	6	60	68	69	54	271
16159	2009	A	10	0	0	0	0	0	0	0	76	71	70	72	299
16159	2008	A	0	0	0	0	0	0	0	18	26	31	50	44	169
16159	2007	A	0	0	0	0	0	0	0	20	25	30	48	40	163
16159	2006	A	0	0	0	0	0	0	0	44	20	30	53	72	219
16159	2003	A	0	0	0	0	0	0	26	92	110	118	120	113	580

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 46. Water use report filed by Farmers Irrigation District for Ditch Creek at Highline.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.1	2.7	4.8	4.9	3.5	n/a
		A	0	0	0	0	0	10	30	65	162	292	302	206	1066
16106	2011	A	0	0	0	0	0	0	15	47	99	305	299	245	1010
16106	2010	A	0	0	0	0	0	14	29	120	161	358	309	179	1170
16106	2009	A	0	0	0	0	0	26	30	61	237	297	326	267	1244
16106	2008	A	0	0	0	0	0	0	44	31	151	209	272	134	841
16106	2007	A	0	0	0	0	0	0	0	32	107	182	166	56	543
16106	2006	A	0	0	0	0	0	0	0	38	32	40	45	73	228

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2011 due to change in way values were recorded in 2008.

Table 47. Water use report filed by Farmers Irrigation District for Ditch Creek into Plant 3.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	1.3	3.1	5.7	8.0	8.9	7.6	8.8	6.8	0.9	0.7	1.0	1.1	n/a
		A	81	187	352	489	494	465	524	417	54	42	61	65	3229
16107	2011	A	0	178	552	772	534	540	944	891	120	59	178	99	4867
16107	2010	A	89	237	178	338	475	267	356	594	0	0	0	0	2534
16107	2009	A	149	178	267	504	297	326	521	306	0	0	0	0	2548
16107	2008	A	99	148	450	149	356	415	217	99	0	0	0	0	1933
16107	2007	A	89	190	0	576	622	604	415	190	0	0	0	0	2686
16107	2006	A	58	190	665	595	680	640	688	420	205	190	186	290	4807
16107	2003	A	530	1136	1232	1221	828	699	491	437	515	458	489	801	8835

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 48. Water use report filed by Farmers Irrigation District for N. Fork Greenpoint Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	2.7	8.5	6.9	9.0	8.3	10.1	10.0	8.9	8.8	8.2	5.7	4.8	n/a
		A	167	503	425	553	461	623	594	547	522	503	353	284	5535
16103	2011	A	0	623	706	475	534	594	366	537	589	644	475	346	5889
16103	2010	A	1	550	299	724	716	772	596	576	583	516	429	374	6136
16103	2009	A	198	491	430	356	118	594	613	644	579	534	415	341	5313
16103	2008	A	347	267	343	475	399	510	508	599	144	309	297	287	4485
16103	2007	A	300	601	285	670	490	653	599	426	475	356	237	178	5270
16103	2006	A	156	487	488	620	510	615	880	498	760	659	266	177	6116
16103	2003	A	251	356	495	510	294	291	326	301	405	404	326	278	4239

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 49. Water use report filed by Farmers Irrigation District for Greenpoint Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
		A	0	0	0	0	0	0	0	0	0	0	1	0	1
16155	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16155	2010	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16155	2009	A	0	0	0	0	0	0	0	0	0	0	2	0	2
16155	2007	A	0	0	0	0	0	0	0	0	0	0	1	0	1
16155	2006	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16155	2003	A	801	778	2552	6476	5459	4061	4082	4704	2163	1120	853	817	33867

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 50. Water use report filed by Farmers Irrigation District for Deadpoint Creek (WUR ID 16098).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	2.3	6.9	6.4	8.5	9.8	8.5	12.0	9.1	8.9	14.0	15.3	12.0	n/a
		A	139	410	393	522	542	520	712	557	531	861	938	715	6839
16098	2011	A	0	249	207	362	534	433	545	327	556	765	779	613	5370
16098	2010	A	7	249	162	249	386	445	891	475	441	881	773	768	5727
16098	2009	A	184	398	306	534	356	326	552	546	742	1009	1069	772	6794
16098	2008	A	336	370	693	376	653	579	888	642	612	1009	1101	1069	8328
16098	2007	A	93	891	277	1010	887	859	982	589	293	755	901	525	8062
16098	2006	A	212	305	710	598	436	478	415	760	540	749	1005	544	6752

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 51. Water use report filed by Farmers Irrigation District for Deadpoint Creek (WUR ID 16116).

WUR ID1	WY	Unit2	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-20113 AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
		A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2010	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2009	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2008	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2007	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2006	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16116	2003	A	687	201	334	567	744	643	999	1150	981	1010	671	567	8554

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 52. Water use report filed by Farmers Irrigation District for South Pine Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.6	1.7	2.0	2.8	2.9	2.4	2.7	1.9	1.3	1.0	0.6	0.4	n/a
		A	36	103	122	175	162	146	160	119	80	62	35	21	1220
16112	2011	A	0	44	92	163	118	59	178	150	6	59	29	26	924
16112	2010	A	1	29	28	100	148	89	80	116	89	48	14	20	762
16112	2009	A	28	8	20	92	118	148	118	116	59	61	60	32	860
16112	2008	A	122	266	290	340	257	293	273	131	163	89	59	18	2301
16112	2007	A	47	207	172	220	198	145	140	148	122	85	26	12	1522
16112	2006	A	20	61	131	132	133	144	169	50	41	30	24	18	953
16112	2003	A	0	13	0	0	19	0	0	0	0	0	0	0	31

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 53. Water use report filed by Farmers Irrigation District for North Pine Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.1	0.5	0.7	0.9	1.2	0.9	1.0	0.7	0.4	0.1	0.0	0.0	n/a
		A	4	29	45	56	64	58	58	46	22	3	2	2	388
16109	2011	A	0	15	74	29	39	18	61	94	43	8	0	0	381
16109	2010	A	0	14	14	39	89	77	59	52	71	0	0	0	415
16109	2009	A	14	8	0	89	48	54	60	89	0	0	0	0	362
16109	2008	A	0	14	59	44	74	74	59	20	0	0	0	0	344
16109	2007	A	4	28	20	42	38	25	2	1	0	0	0	0	160
16109	2006	A	5	95	104	94	97	101	106	19	16	11	9	9	666
16109	2003	A	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 54. Water use report filed by Farmers Irrigation District for Phelps Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
		A	0	0	0	0	0	0	2	2	1	1	1	0	6
33088	2011	A	0	0	0	0	0	0	0	1	2	3	3	2	11
33088	2010	A	0	0	0	0	0	0	2	2	2	1	0	0	7
33088	2009	A	2	0	0	0	0	2	2	0	0	0	0	0	6
33088	2008	A	0	0	0	0	0	0	2	2	0	0	0	0	4
33088	2007	A	0	0	0	0	0	0	2	2	1	0	0	0	5
33088	2006	A	0	0	0	0	0	0	2	2	0	0	0	0	4

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 55. Water use report filed by Farmers Irrigation District for Hood River.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2006-2011 ³ AVG		CFS	34.1	74.0	64.2	69.0	75.1	71.2	76.3	67.9	75.0	70.6	68.6	62.1	n/a
		A	2098	4405	3946	4240	4170	4376	4542	4175	4460	4343	4219	3697	48674
16129	2011	A	60	4336	3614	4450	4039	3974	4543	4407	4511	4219	4217	3862	46232
16129	2010	A	0	4276	2772	4480	4030	4448	4329	4336	4437	4450	4173	3415	45146
16129	2009	A	1782	4276	2890	3613	4336	4480	4560	4480	4480	4480	4077	4357	47811
16129	2008	A	3217	4134	4040	4215	4050	4520	4577	4905	4475	4165	4100	3366	49764
16129	2007	A	3675	0 ⁴	0 ⁴	4444	4396	4460	4702	2750	4398	4395	4460	2768	40448
16129	2006	A	3856	5001	6415	6465 ⁴	6080 ⁴	6371 ⁴	6270 ⁴	6100 ⁴	4805 ⁴	4350	4290	4415	64418
16129	2003	A	3976	4421	4770	4635	4506	4698	4649	4594	4629	4515	4489	4542	54423

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

⁴ Values not used in computing monthly averages due to likely inaccurate values (Source: FID)

Table 56. Water use report filed by Farmers Irrigation District for South Pine Creek.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2007-2011 ³ AVG		CFS	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.7	1.9	1.7	1.3	n/a
		A	15.2	0.0	0.0	0.0	0.0	0.0	8.2	29.2	102.2	114.0	103.0	79.6	451
16120	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16120	2010	A	10	0	0	0	0	0	9	20	82	80	50	45	296
16120	2009	A	22	0	0	0	0	0	11	25	80	78	60	67	343
16120	2008	A	22	0	0	0	0	0	11	48	160	181	175	132	729
16120	2007	A	22	0	0	0	0	0	10	53	189	231	230	154	889

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2006-2011 due to change in way values were recorded in 2006.

Table 57. Summary of OWRD water use reports based on data in Tables 37-56¹.

District	Units	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Upper District	CFS	2.1	5.0	9.8	13.5	14.8	17.8	22.5	15.6	12.1	12.8	14.4	11.8
Middle District	CFS	5.6	17.6	16.0	21.2	22.1	21.9	25.6	20.6	19.4	23.3	21.6	17.2
Lower District	CFS	34.4	74.0	64.2	69.0	75.1	71.2	76.5	68.4	76.7	72.5	70.3	63.5
Total	CFS	42.1	96.6	90.0	103.7	112.0	110.9	124.6	104.7	108.2	108.6	106.4	92.4

Notes: ¹Data contained in this table is based on the periods used to calculate average values in Tables 37-56.

3.2.3.5 Conservation Projects

Since 1980 when the district began its conservation work, it has expended over 30 million dollars on system improvements. With its Low Impact Hydro Institute (LIHI) certification, almost entirely piped system, and push for patrons to use low flow application methods, FID is generally accepted as one of the most progressive irrigation districts in the Country. One impetus for FID's conservation work is that it cannot generate hydropower with water that is used for irrigation; hence, water conservation also leads to increased hydropower revenue. The following is a partial list of water conservation projects that have been completed or are proposed.

Completed

Reduced diversion points: Reduced 34 unscreened water diversions to nine fully screened diversions.

Installed pipe: Installed pipe in 95 percent of the District, greatly increasing irrigation efficiency, reducing seepage losses, eliminating end-loss, resulting in increased instream flow.

Sprinkler conversion: Converted a significant percentage of residential users to micro-sprinklers via the micro-sprinkler exchange program.

Adopted minimum flows: Adopted minimum flow targets on Green Point Creek and implemented a fish monitoring program with ODFW.

Reduce number of pumps: Eliminated 1450 individual pumps and reduced power consumption by 1.45 MW-hr per irrigation season.

Proposed

Pipe Farmers Canal: FID hopes to pipe Farmers Canal in 2014, or when funds become available. This will eliminate seepage and evaporation loss, as well as reduce the potential for sediment to enter the FID system and the Hood River if the canal fails.

Reservoir enhancement: FID plans to decommission Lower Green Point reservoir and move the volume into the Upper Reservoir. These rehabilitation plans are on the shelf and it is estimated that the project will be implemented around 2017, or when funds become available.

Rehabilitate or replace North Greenpoint pipeline: Restore or replace an old leaky pipe that carries water from the North Greenpoint diversion to the beginning of the Low Line pipeline at the Deadpoint Creek diversion. Implementation is estimated around 2019, or when funds become available.

On-farm efficiency: Continue to work with farmers to install micro-sprinkler systems, soil moisture sensors, and other sustainable on-farm practices. One example of this is the FID's sprinkler exchange program.

3.2.4 Middle Fork Irrigation District

The Middle Fork Irrigation District is in the Upper Hood River Valley, and is bounded by the Middle Fork Hood River on the west and the East Fork Hood River on the east and north (Figures 1, 7, 8, and 23). On the south the watershed for the district extends onto the northern slopes of Mt. Hood and includes Eliot, Langille and Coe Glaciers. The district itself is roughly 1 ½ miles wide (east to west) and 6 miles long (north to south). The district has 400 patrons and covers an area of 24.7 sq. mi. Water supply for the district comes from five sub-watersheds of the East Fork Hood River (Emil, Evans, Griswell, Trout, and Wisheart) and five sub-watersheds of the Middle Fork Hood River (Clear, Coe, Eliot, Pinnacle, and Rogers). The small town of Parkdale is located near the center of MFID irrigated lands.

MFID maintains 11 points of diversion, one storage reservoir, one sediment basin, one small regulating facility and three hydropower facilities. The storage reservoir, Laurance Lake, is behind Clear Branch Dam and has a capacity of 3,565 acre-feet at spillway elevation of 2978 feet msl. The surface area of the lake at full elevation is 130 acres. The dam was built in 1968; however the downstream hydropower facilities did not come online until 1986 (hydro facilities further described in Section 3.3.2). With the exception of Eliot Ditch, MFID is totally piped and delivers pressurized water to each farm turnout with sufficient head to operate sprinkler and micro irrigation systems. MFID has irrigation water rights to 6362 acres for a total of 106.2 cfs, hydropower rights from four sources for a maximum of 40 cfs at any one time, plus miscellaneous spray, stock, fire, and frost protection water rights.

3.2.4.1 Crop Types

The predominant crop type in MFID is pears, followed by cherries, and then apples (Table 58). These three crop types comprise 95% of the total acreage in production. Other crop types include hay, corn, and pasture, plus a tree nursery and a small amount of berry and vegetable production.

Table 58. Estimate of acreage of commonly grown crops in Middle Fork Irrigation District.

Crop	Area (acres)¹	Area (percent)¹
Pears	5,350	84%
Cherries	420	7%
Apples	250	4%
Hay and forage	240	4%
Nursery	75	1%
Berries	30	< 1%
Other	10	1%
Total	6375	100%

Notes: ¹ Most recent estimate from MFID is 2011 (MFID 2011).

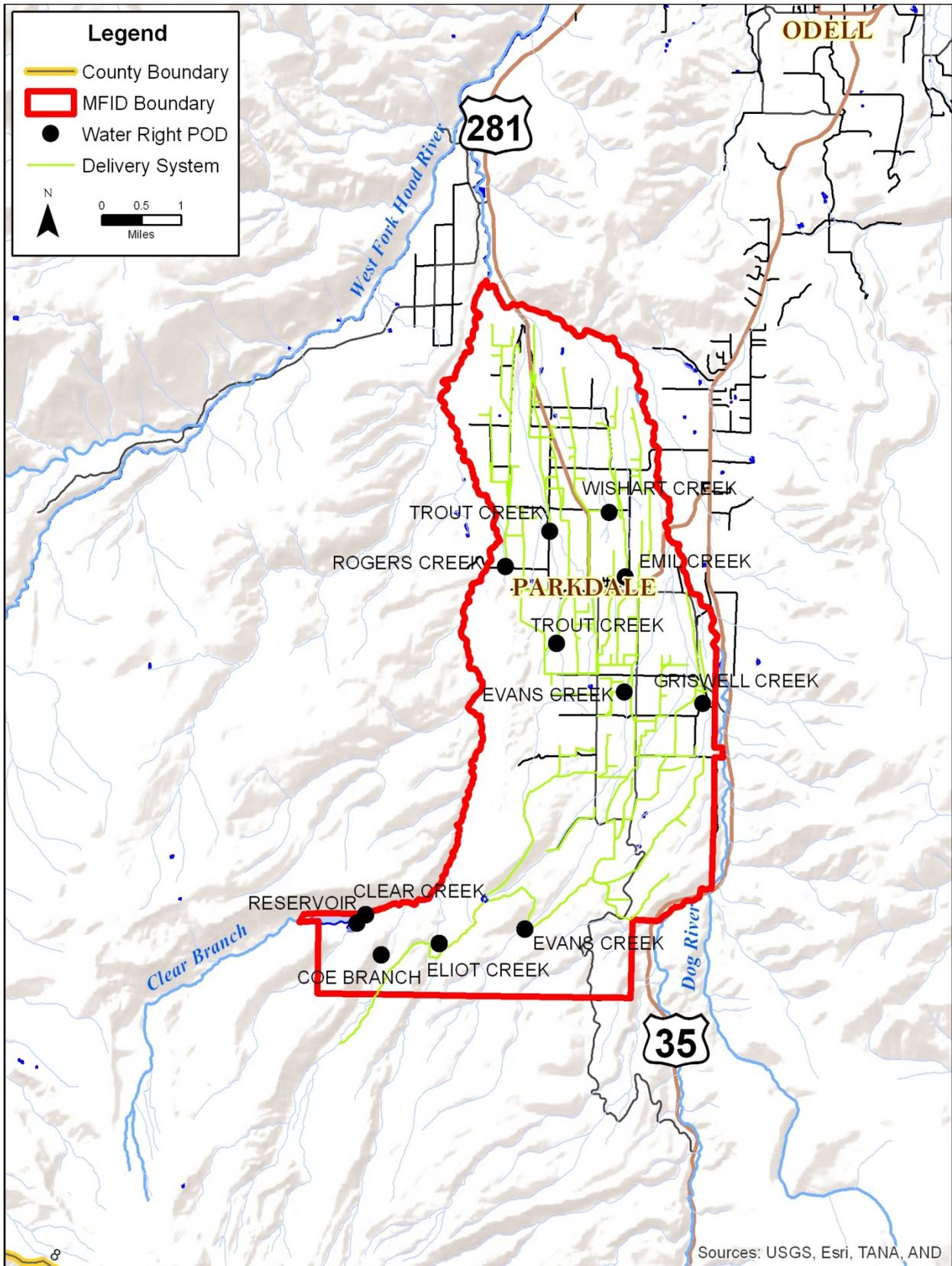


Figure 23. Middle Fork Irrigation District's water rights, district boundary, and distribution system.

3.2.4.2 Storage Facilities

Laurance Lake, created by Clear Branch Dam, is fed by Clear and Pinnacle Creek, and is the largest reservoir in the Hood River Valley at 3,565 acre-feet (Figure 24). The dam is earth and rock fill and is approximately 1350 feet long with a top width of 28 feet. The height of the dam is 106 feet, and the depth at full pool is 100 feet. The reservoir is used for irrigation supply, hydropower production, and recreation such as camping, fishing, and boating. Inflows to the reservoir, as opposed to existing storage, are used to meet downstream minimum streamflow requirements. Outflow from the reservoir is into either the Middle Fork of the Hood River (natural channel) or into a roughly two mile 42" (later decreases to 36") concrete pipe going to the sediment basin. At the sediment basin, lake water can be mixed with Coe and Eliot Creek diversions and can be distributed into the Volmer, West Evans, and Glacier pipeline for irrigation, or mixed with Coe Creek diversion and sent to Plant #1.

Laurance Lake fills every spring, except in very dry years, to roughly 3,600 acre-feet, and then, depending on water supply, gets drawn down to between 1,400 and 2,900 acre-feet by fall to meet demands (Figure 25). The reservoir generally fills again in the early winter before getting drawn down slightly in March and April before snowmelt fills it for summer (Figure 26). As can be seen in Figure 25, Laurance Lake has been drawn down to a lesser extent in recent years. This is a result of a combination of piping the last few open ditches (reducing seepage), better sediment management at Coe Creek diversion (allows longer use of Coe Creek), and new downstream flow targets adopted in 2007. The new flow targets, agreed to by MFID, Oregon Department of Fish and Wildlife, and National Marine Fisheries Service, are listed below along with general operating objectives.

Streamflow targets downstream of Laurance Lake:

1986-2006

September 1 – September 15:	Inflow up to 15 cfs
September 15 – May 1:	Inflow up to 30 cfs
May 1 – September 1:	3 cfs

2007-present

October 7 – July 1:	50% of inflow up to 20 cfs
July 1 – July 10:	Ramp down to 25% of inflow
July 10 – October 7:	3 cfs

General operational policies for Laurance Lake are as follows:

- Operated to keep as full as possible while meeting Clear Creek flow targets and maintaining space for spring snowmelt.
- No refill or storage targets exist.
- Max flow to penstock #1 is 49 cfs.
- Main outlet to Clear Creek is 14" pipe with valve at 2864' msl.

MFID also maintains two other smaller facilities that have some storage volume. The sediment basin is located at the end of the Eliot Ditch and has an approximate volume of 25 acre-feet. Its intended purpose is not to provide storage, but to trap glacial sediment from Eliot Creek before it enters the system. District staff reduce diversions from Eliot Creek during periods of high turbidity, limiting annual sediment inflow to roughly 2 acre-feet. The Emil pond is the district's other facility that has storage volume. This facility is just west of Parkdale and has 10.7 acre-feet of storage and a surface area of 2 acres when full. Water is stored in this facility for internal regulating, but it is not actively managed to the degree that Laurance Lake is regulated.

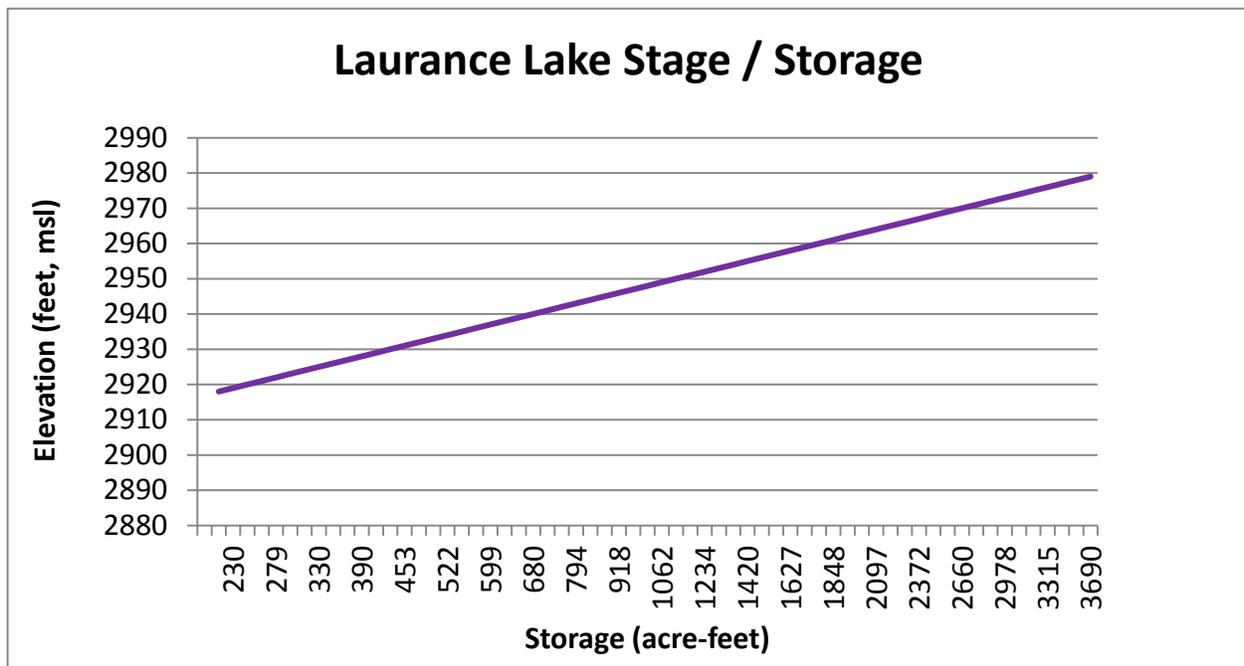


Figure 24. Storage in Laurance Lake as a function of reservoir elevation.

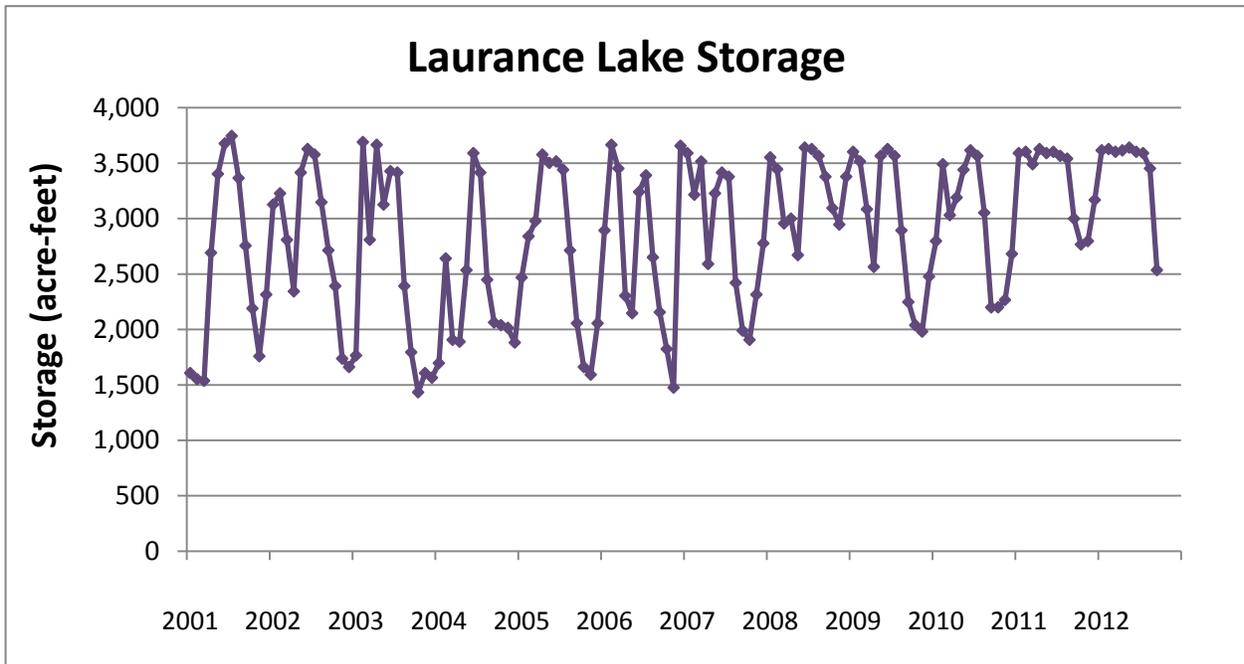


Figure 25. Monthly storage in Laurance Lake from water year 2001-2012.

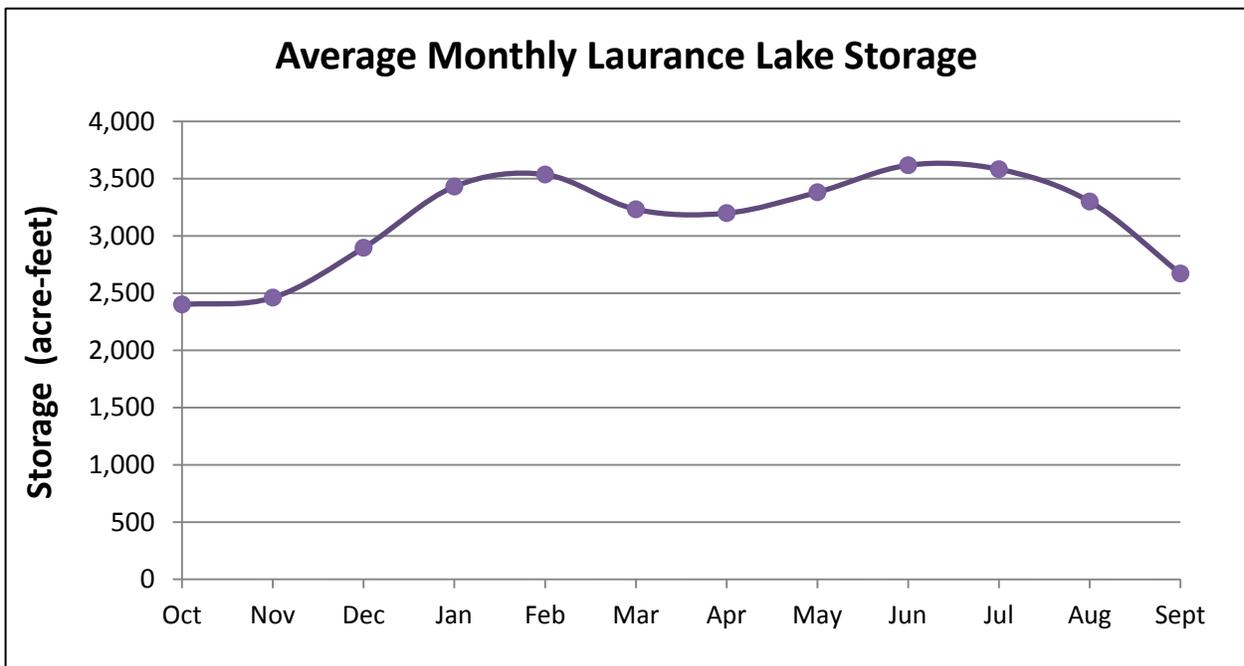


Figure 26. Average monthly storage in Laurance Lake based on water years 2008-2012.

3.2.4.3 Water Rights

MFID has 30 water rights from a total of 10 sources (Table 59). The priority dates on its rights range from 1892 through 1996, with the biggest single irrigation right having a priority date of 1962. Hydropower rights all have priority dates 1981 and 1982. Although individual hydropower rights add to greater than 40 cfs, the maximum amount of water that can be used for hydropower at any one time is 40 cfs.

Table 59. Water rights held by Middle Fork Irrigation District.

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
-/ 74253	12/31/1892	Trout Cr	17.90	0.22	Irrigation	16251	
-/ 74254	12/31/1894	Evans Cr	85.00	1.06	Irrigation	16277	
-/ 74255	12/31/1896	Evans Cr	75.90	0.95	Irrigation	16256	
-/ 74256	12/31/1896	Evans Cr	3.10	0.04	Irrigation	16256	
-/ 74258	12/31/1897	Eliot Cr	837.60	6.25	Irrigation	16258	
-/ 74257	12/31/1897	Trout Cr	12.50	0.16	Irrigation	16248	
-/ 74259	12/31/1898	Trout Cr	15.00	0.19	Irrigation	16251	
-/ 74260	12/31/1900	Evans Cr	30.00	0.38	Irrigation	16256	
-/46966	12/31/1901	Evans Cr	28.40	0.36	Irrigation		Certificate is for "Routson"
E-29/ 74261	1/19/1910	Rogers Cr	123.00	1.54	Irrigation	16244	
S-2625/ 74262	8/9/1915	Wishart Cr	80.00	1.00	Irrigation	33078	
S-15018/ 80478	6/16/1924	Griswell Cr	69.80	0.87	Irrigation	33079	
S-23660/ 74264	6/9/1955	Eliot Cr	429.30	4.163	Irrigation	16258	
S-27788/-	1/2/1962	Clear Cr	5232.0 880.0	75.00	Irrigation Suppl. Irrig.	16261	
R-4576/ 46266	4/2/1965	Emil Cr	10.7 ac-ft		Storage	16245	
S-30434/ 46267	4/2/1965	Emil Cr	44.00	0.55	Suppl. Irrigation	50765	
R-4862/-	4/6/1967	Clear Br	3550 ac-ft		Storage	16254	
S-31956/-	6/6/1967	Clear Br Reservoir	6012.0		Suppl. Irrigation	16261	
S-34104/ 46268	1/22/1969	Eliot Br Clear Cr	8.20	0.10	Irrigation	16258 26261	Eliot Cr = 0.02 Clear Cr = 0.08
S-51366/-	3/9/1970	Eliot Br	6012.0	25.00	Suppl. Irrig.	16258	

Table 59. Water rights held by Middle Fork Irrigation District (continued).

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
S-36065/-	4/9/1971	Eliot Br Clear Br	4.40	0.06	Irrigation	16258 16261	
S-43520/-	3/30/1972	Roger Cr Eliot Br, Clear Br, Reservoir Roger, Eliot, Clear	290.4 123	3.63 1.54 1.00	Irrigation Suppl. Irrig. Spray, Fire, Stock	16244 16258 16261	
S-43519/-	3/30/1972	Trout Cr Eliot Br, Clear Br Trout, Eliot, Clear	311.5 27.5	3.89 0.34 1.35	Irrigation Suppl. Irrig. Spray, Fire, Stock	16248 16258 16251 16261	
S-42645/-	9/19/1977	Evans Cr Eliot Br Clear Br	6.00	0.08	Irrigation	16256 16258 16261	
S-51367/-	5/1/1980	Eliot Br Clear Br	500 38.3	6.25 5.75 1.00	Irrigation Frost Prtc. Fire Prtc.	16258 16261	Maximum Rate = 6.25 cfs
S-49344/-	1/26/1981 1/26/1981 1/26/1981 1/26/1982 1/26/1982 1/26/1982	Clear Br Reservoir Eliot Br Coe Cr Clear Br Reservoir Eliot Br Coe Br		20.0 10.0 10.0 20.0 15.0 15.0	Hydropower	63980 16258 16275 63980 16258 16275	Maximum Rate = 40 cfs
S-51368/-	2/20/1981	Clear, Eliot Evans Cr Clear, Evans Eliot	73.30	4.375 5.468 1.00	Temp Control	16256 16258 16261	Maximum Rate = 9.843 cfs
S-51369/-	8/19/1985	Coe Cr	6012.0	29.50 0.25 0.25 10.0	Suppl. Irrig. Fire Prot. Stock Temp Contl.	16275	Maximum Rate = 30.0 cfs
S-51370/-	6/1/1987	Clear Br	365.21	20.84 15.00	Frost Prot.	16261 16275	
S-51370/-	1/2/1996	Laurence Lake	160.00	480 ac-ft	Irrigation	16261	
<i>Totals (irrigation only)</i>			8160.0	106.2			

3.2.4.4 Water Use Reports

Water use reports obtained from OWRD for MFID are contained in Tables 60-72. All reports, with the exception of Tables 61 and 72 are for acre-feet of use by month for water years 2001-2012. Table 61 and 72 are also for water years 2001 through 2012 but reflect volume in storage (acre-feet) for the months listed. The top two rows in all tables are summary statistics (e.g. average monthly use) based on consultation with MFID and the author’s professional opinion. These summary statistics are not based on all years of OWRD data presented, but typically only on water years 2008 through 2012. This period was chosen primarily to capture the reduced consumption from Eliot Creek starting in 2007, and also to be more representative of updated MFID water use reporting. Summary statistics for two sites (Emil Creek and Rodgers Creek) are based on water year 2012 only due to an update in water use reporting in 2012. In all tables, the period used to generate the statistics is listed in the row heading and the notes section below the table.

The summary data from each of the WURs is presented below in Figure 27 and Table 73. From Figure 27, it is apparent that MFID’s dominant source of water is Laurance Lake. Eliot Creek and the other smaller sources ramp up in the summer, while Coe actually gets reduced in July through August (due to sediment, see section Conservation – Proposed Projects). It should be noted here that annual use has remained fairly constant at 35,000 acre-feet since 2002 (see Figure 10). Additional data is presented in Table 73, including return flows and hydropower flows that are discussed in Section 3.3.2.

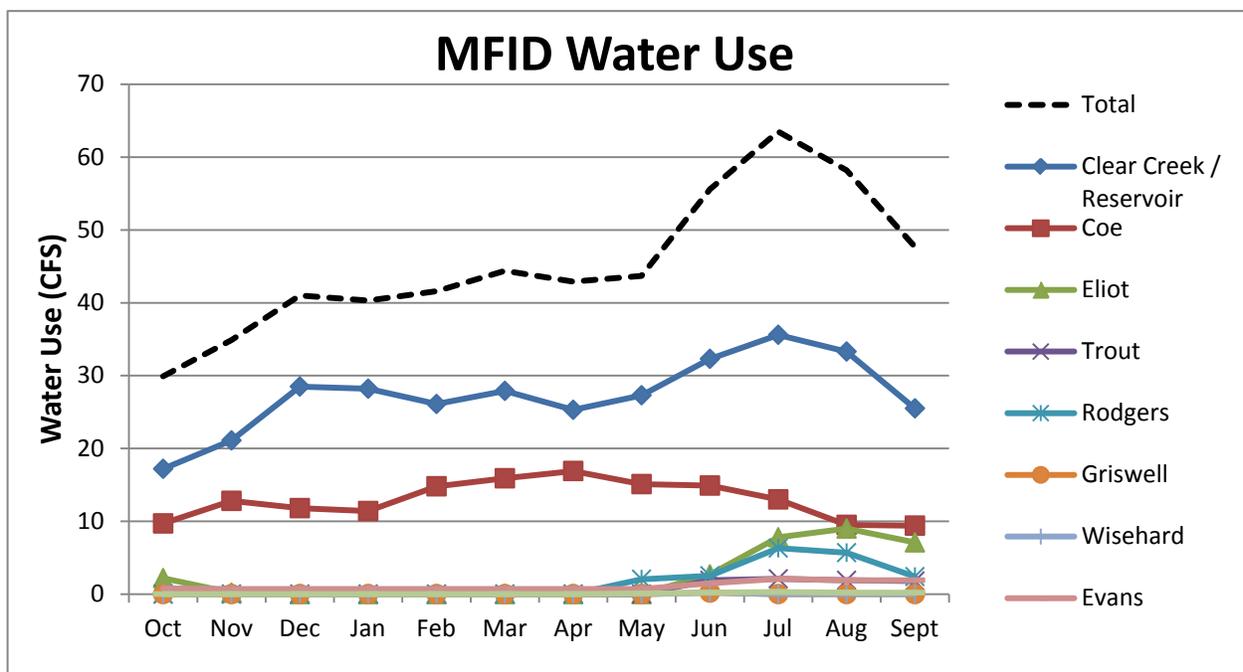


Figure 27. Middle Fork Irrigation District water use by source.

Table 60. Water use report filed by Middle Fork Irrigation District for Clear Creek / Reservoir (release).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG	CFS		17.2	21.1	28.5	28.2	26.1	27.9	25.3	27.3	32.3	35.6	33.3	25.5	n/a
	A		1057	1257	1751	1732	1452	1716	1504	1677	1923	2187	2048	1520	19826
16261	2012	A	867	1233	1850	1373	1363	1511	1358	1601	2199	2208	2303	2254	20120
16261	2011	A	903	1412	1617	1845	1335	1715	1400	1493	1689	1805	1969	1250	18433
16261	2010	A	1142	953	1710	1910	1729	1355	1405	1485	1654	2476	1596	1133	18548
16261	2009	A	1256	1424	1583	1837	1019	2172	1509	1995	1964	2277	2282	1402	20720
16261	2008	A	1119	1265	1995	1695	1813	1826	1848	1812	2111	2171	2090	1562	21307
16261	2007	A	922	401	1140	2172	1832	2164	1993	1777	2072	2255	1452	1134	19314
16261	2006	A	1017	1323	1765	2468	2050	2176	1896	1789	2387	2004	1555	797	21227
16261	2005	A	493	881	747	820	345	580	2019	2151	1496	1692	1541	914	13679
16261	2004	A	296	936	1495	1292	1757	1614	1009	1616	2307	2474	1940	684	17420
16261	2003	A	626	125	35	559	2056	1822	1769	1450	1877	2159	1740	942	15160
16261	2002	A	657	284	1139	1640	1036	1592	1670	1773	2428	2473	1642	726	17060
16261	2001	A	211	149	0	36	82	65	370	2274	1672	1409	1434	606	8308

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 61. Water use report filed by Middle Fork Irrigation District for Laurance Lake Reservoir (storage).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG	CFS					Acre-feet in storage, no CFS calculation.									
	A		2401	2461	2896	3431	3536	3232	3199	3381	3617	3582	3300	2671	n/a
16254	2012	A	2766	2797	3168	3615	3627	3602	3615	3640	3602	3590	3452	2535	n/a
16254	2011	A	2199	2266	2681	3590	3602	3490	3627	3590	3602	3565	3540	2999	n/a
16254	2010	A	2038	1980	2477	2797	3490	3031	3190	3440	3615	3565	3052	2199	n/a
16254	2009	A	3094	2946	3378	3602	3515	3084	2564	3565	3627	3565	2893	2247	n/a
16254	2008	A	1906	2314	2776	3552	3445	2956	2999	2670	3640	3627	3565	3377	n/a
16254	2007	A	1823	1475	3656	3590	3215	3515	2590	3227	3415	3377	2420	1989	n/a
16254	2006	A	1661	1592	2055	2893	3665	3452	2304	2146	3240	3390	2650	2155	n/a
16254	2005	A	2038	2014	1881	2468	2840	2978	3577	3502	3515	3440	2713	2055	n/a
16254	2004	A	1433	1606	1564	1696	2640	1906	1889	2535	3590	3415	2448	2063	n/a
16254	2003	A	2391	1737	1661	1765	3690	2808	3665	3126	3427	3415	2391	1794	n/a
16254	2002	A	2189	1758	2314	3126	3227	2808	2343	3415	3627	3577	3147	2713	n/a
16254	2001	A	1620	1530	1551	1606	1551	1537	2691	3402	3677	3745	3365	2755	n/a

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables. ² Units: A = acre-feet/month, CFS = cubic foot/second,

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 62. Water use report filed by Middle Fork Irrigation District for Coe Creek (Coe div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	9.67	12.78	11.81	11.40	14.79	15.85	16.93	15.13	14.89	12.97	9.54	9.44	n/a
		A	595	760	726	701	821	975	1007	930	886	798	587	562	9347
16275	2012	A	609	738	692	810	1031	1038	1151	965	1081	1216	836	628	10795
16275	2011	A	570	823	898	643	915	814	1030	1125	1162	887	819	609	10295
16275	2010	A	126	691	366	710	731	949	1044	1113	852	844	502	715	8643
16275	2009	A	850	558	922	641	548	1166	983	710	734	510	485	116	8223
16275	2008	A	818	991	752	701	882	906	829	737	600	532	291	741	8780
16275	2007	A	783	94	0	961	1047	1077	1079	1351	920	252	572	634	8770
16275	2006	A	724	1101	902	745	853	1018	1140	1173	653	635	883	1050	10877
16275	2005	A	785	1106	1408	1065	1098	832	1012	1067	1435	864	668	580	11920
16275	2004	A	470	960	1267	1056	1226	1528	1624	1366	814	576	453	1277	12617
16275	2003	A	1019	887	994	1165	830	1126	1256	1251	934	464	479	673	11078
16275	2002	A	907	1247	1392	1290	1235	1350	1200	1253	601	232	783	1166	12656
16275	2001	A	961	809	935	887	736	1005	1055	660	1093	702	598	1211	10652

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 63. Water use report filed by Middle Fork Irrigation District for Eliot Creek (Eliot div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	2.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.7	7.8	9.0	7.1	n/a
		A	135	15	0	0	0	0	0	0	163	482	556	422	1773
16258	2012	A	140	0	0	0	0	0	0	0	110	337	359	158	1104
16258	2011	A	191	0	0	0	0	0	0	0	0	497	608	583	1879
16258	2010	A	67	0	0	0	0	0	0	0	81	477	542	377	1544
16258	2009	A	215	73	0	0	0	0	0	0	396	527	707	540	2458
16258	2008	A	62	0	0	0	0	0	0	0	228	574	564	452	1880
16258	2007	A	229	0	0	0	0	0	0	0	285	583	724	507	2328
16258	2006	A	445	149	120	60	101	170	167	193	441	1190	1251	751	5038
16258	2005	A	436	185	305	252	198	191	198	204	548	1047	1263	613	5440
16258	2004	A	368	301	208	115	104	94	232	474	722	970	1407	782	5777
16258	2003	A	381	217	216	265	52	125	140	325	938	1206	1452	757	6074
16258	2002	A	435	441	317	294	206	214	138	230	724	1161	1363	929	6452
16258	2001	A	0	169	168	131	105	148	211	441	712	1288	1380	1042	5795

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 64. Water use report filed by Middle Fork Irrigation District for Trout Creek (Sato div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0	0	0	0	0	0	0	0.00	0.14	0.16	0.05	0.03	n/a
		A	0	0	0	0	0	0	0	0	8	10	3	2	23
16251	2012	A	0	0	0	0	0	0	0	1	9	18	16	8	52
16251	2011	A	0	0	0	0	0	0	0	0	0	15	0	0	15
16251	2010	A	0	0	0	0	0	0	0	0	30	15	0	0	45
16251	2009	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16251	2008	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16251	2007	A	0	0	0	0	0	0	0	0	0	0	0	1	1
16251	2006	A	0	0	0	0	0	0	0	0	0	0	1	0	1
16251	2005	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16251	2004	A	0	0	0	0	0	0	0	0	0	1	0	0	1
16251	2003	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16251	2002	A	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 65. Water use report filed by Middle Fork Irrigation District for Trout Creek (Dykstra div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0	0	0	0	0	0	0	0.04	1.72	1.90	1.83	1.76	n/a
		A	0	0	0	0	0	0	0	2	102	117	112	105	438
16248	2012	A	0	0	0	0	0	0	0	12	35	95	74	47	263
16248	2011	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2010	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2009	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2008	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2007	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2006	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2005	A	0	0	0	0	0	0	0	0	119	122	122	119	482
16248	2004	A	0	0	0	0	0	0	0	0	69	71	71	0	211
16248	2003	A	0	0	0	0	0	0	0	0	11	37	39	12	99
16248	2002	A	0	0	0	0	0	0	0	0	7	19	28	10	64
16248	2001	A	0	0	0	0	0	0	0	71	69	71	71	69	351

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 66. Water use report filed by Middle Fork Irrigation District for Rogers Creek (Rogers div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2012 ³ AVG		CFS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05	2.52	6.31	5.69	2.40	n/a
		A	0	0	0	0	0	0	0	0	126	150	388	350	143
16244	2012	A	0	0	0	0	0	0	0	126	150	388	350	143	1157
16244	2011	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2010	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2009	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2008	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2007	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2006	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2005	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2004	A	0	0	0	0	0	0	0	0	92	95	95	92	374
16244	2003	A	0	0	0	0	0	0	0	0	106	110	110	106	432
16244	2002	A	0	0	0	0	0	0	0	0	154	233	201	125	713
16244	2001	A	0	0	0	0	0	0	0	110	106	110	110	106	542

Notes: ¹WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

²Units: A = acre-feet/month, CFS = cubic foot/second.

³Average presented for WY 2012 only due to change in way some WUR values were recorded in 2012.

Table 67. Water use report filed by Middle Fork Irrigation District for Wisheart Creek (Alexander div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.03	0.00	0.00	n/a
		A	0	0	0	0	0	0	0	0	0	11	2	0	0
33079	2012	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33079	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33079	2010	A	0	0	0	0	0	0	0	0	52	10	0	0	62
33079	2009	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33079	2008	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33079	2007	A	0	0	0	0	0	0	0	0	0	0	0	1	1
33079	2006	A	0	0	0	0	0	0	0	0	0	0	1	0	1
33079	2005	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33079	2004	A	0	0	0	0	0	0	0	0	0	1	0	0	1
33079	2003	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33079	2002	A	0	0	0	0	0	0	0	0	32	34	34	32	132
33079	2001	A	0	0	0	0	0	0	0	27	44	43	46	38	198

Notes: ¹WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

²Units: A = acre-feet/month, CFS = cubic foot/second.

³Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 68. Water use report filed by Middle Fork Irrigation District for Griswell Creek (Halliday div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.05	0.00	0.00	n/a
		A	0	0	0	0	0	0	0	0	13	3	0	0	16
33078	2012	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33078	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33078	2010	A	0	0	0	0	0	0	0	0	60	15	0	0	75
33078	2009	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33078	2008	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33078	2007	A	0	0	0	0	0	0	0	0	0	0	1	0	1
33078	2006	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33078	2005	A	0	0	0	0	0	0	0	0	1	0	0	0	1
33078	2004	A	0	0	0	0	0	0	0	0	0	1	0	0	1
33078	2003	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33078	2002	A	0	0	0	0	0	0	0	0	0	0	0	0	0
33078	2001	A	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 69. Water use report filed by Middle Fork Irrigation District for Evans Creek (Higgins div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24	0.12	0.10	n/a
		A	0	0	0	0	0	0	0	0	14	15	78	6	43
16277	2012	A	0	0	0	0	0	0	0	0	7	45	38	31	121
16277	2011	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16277	2010	A	0	0	0	0	0	0	0	0	63	30	0	0	93
16277	2009	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16277	2008	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16277	2007	A	0	0	0	0	0	0	0	0	0	0	0	1	1
16277	2006	A	0	0	0	0	0	0	0	0	0	0	1	0	1
16277	2005	A	0	0	0	0	0	0	0	0	1	0	0	0	1
16277	2004	A	0	0	0	0	0	0	0	0	0	1	0	0	1
16277	2003	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16277	2002	A	0	0	0	0	0	0	0	0	0	0	0	0	0
16277	2001	A	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 70. Water use report filed by Middle Fork Irrigation District for Evans Creek (Evans div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG		CFS	0.83	0.74	0.70	0.68	0.70	0.68	0.69	0.74	1.25	1.90	1.80	1.84	n/a
		A	51	44	43	42	38	42	41	45	74	117	110	109	759
16256	2012	A	0	0	0	0	0	0	0	0	43	110	103	170	426
16256	2011	A	103	70	63	58	53	58	56	75	139	116	97	74	962
16256	2010	A	61	60	61	61	55	61	60	60	100	121	120	90	910
16256	2009	A	30	30	30	30	30	30	30	30	30	119	114	99	602
16256	2008	A	61	60	61	61	55	61	60	61	60	119	119	115	893
16256	2007	A	0	0	0	0	0	0	0	0	105	108	108	105	426
16256	2006	A	0	0	0	0	0	0	30	61	91	94	90	85	451
16256	2005	A	0	0	0	0	0	0	0	0	91	94	89	86	360
16256	2004	A	0	0	0	0	0	0	60	62	60	62	62	60	366
16256	2003	A	0	0	0	0	0	0	0	0	122	111	96	97	426
16256	2002	A	0	0	0	0	0	0	0	0	150	133	119	115	517
16256	2001	A	0	0	0	0	0	0	0	137	130	118	110	102	597

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 71. Water use report filed by Middle Fork Irrigation District for Emil Creek (Emil div.).

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2012 ³ AVG		CFS	0	0	0	0	0	0	0	0.09	0.17	0.32	0.15	0.18	n/a
		A	0	0	0	0	0	0	0	5.4	9.9	19.4	9.4	10.6	55
50765	2012	A	0	0	0	0	0	0	0	5.4	9.9	19.4	9.4	10.6	55
50765	2011	A	0	0	0	0	0	0	0	0	0	0	13.6	9.4	23
50765	2010	A	0	0	0	0	0	0	0	0	32	0	0	0	32
50765	2009	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2008	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2007	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2006	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2005	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2004	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2003	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2002	A	0	0	0	0	0	0	0	0	32	34	34	32	132
50765	2001	A	0	0	0	0	0	0	0	34	32	34	34	32	166

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2012 only. Method for estimating volume changed in 2012 (Source: MFID).

Table 72. Water use report filed by Middle Fork Irrigation District for Emil Creek storage.

WUR ID ¹	WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012 ³ AVG	CFS					Acre-feet in storage, no CFS calculation.									
	A	A	10.70	10.70	10.70	10.70	10.70	10.70	10.70	10.70	10.70	10.36	9.96	9.76	9.02
16245	2012	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	9	7	6	8	n/a
16245	2011	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	5	n/a
16245	2010	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2009	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2008	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2007	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2006	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2005	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2004	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2003	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2002	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a
16245	2001	A	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	n/a

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² Units: A = acre-feet/month, CFS = cubic foot/second.

³ Average presented for WY 2008-2012 due to change in way some WUR values were recorded in 2008.

Table 73. Estimate of Middle Fork Irrigation District withdrawals, return flows, consumptive use, and hydropower based on 2008-2012 averages.

(All values cfs)

TYPE / SOURCE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Notes
Withdrawals¹													
CLEAR CRK / RESERVOIR	17.2	21.1	28.5	28.2	26.1	27.9	25.3	27.3	32.3	35.6	33.3	25.5	WUR 16261
COE	9.7	12.8	11.8	11.4	14.8	15.9	16.9	15.1	14.9	13.0	9.5	9.4	WUR 16275
ELIOT	2.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2.7	7.8	9.0	7.1	WUR 16258
TROUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	2.1	1.9	1.8	WUR 16251, 16248
RODGER'S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.7	2.5	2.4	1.7	WUR 16244
GRISWELL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	WUR 33079
WISHART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	WUR 33078
EVANS	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1.5	2.1	1.9	1.9	WUR 16277, 16256
EMIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.2	WUR 50765
Total	29.9	34.9	41.0	40.3	41.6	44.4	42.9	43.7	55.6	63.5	58.2	47.7	
Return Flow²													
Plant 3	29.3	32.4	37.8	38.6	40.7	39.7	39.2	37.2	27.7	9.1	9.9	19.3	From MFID
Evans Creek	0.4	0.7	0.7	0.7	0.7	0.7	0.7	0.4	0.0	0.0	0.0	0.0	Estimated at 50% in Oct & Nov, 100% Nov-Apr, 0% in June-Sept.
Total	29.7	33.2	38.5	39.3	41.4	40.4	39.9	37.6	27.7	9.1	9.9	19.3	
Consumptive Use³													
Clear/Res + Coe + Eliot - Plant 3 returns	-0.3	1.7	2.5	1.0	0.3	4.1	3.1	5.2	22.2	47.3	42.0	22.8	Equal to mainline flow minus Plant #3 return
Trout, Rodgers, Griswell, Wishart, Evans, and Emil	0.8	0.7	0.7	0.7	0.7	0.7	0.7	1.3	5.7	7.1	6.3	5.6	Consumptive use from other than mainline
Total	0.6	2.5	3.2	1.7	0.9	4.7	3.7	6.5	27.9	54.4	48.4	28.4	
Hydropower⁴													
Plant 1	26.9	33.9	40.3	39.6	40.9	43.8	42.2	42.4	47.2	48.5	42.8	35.0	See Table 86
Plant 2	29.2	33.6	39.5	39.2	40.8	42.4	41.2	40.7	42.6	40.6	37.9	34.5	Plant #1 + Eliot – 1/3 of consumption between Plant #1 and Plant #3
Plant 3	29.3	32.4	37.8	38.6	40.7	39.7	39.2	37.2	27.7	9.1	9.9	19.3	See Table 88

Notes: ¹ Withdrawals are based on summary statistic presented in tables 60-72

² Return flow for Evans Creek based on communication from MFID manager.

³ Consumptive uses are estimates based on WURs, plant #3 returns, and communication with MFID manager.

⁴ See section "3.3.2" for discussion on hydropower data.

3.2.4.5 Conservation Projects

Middle Fork Irrigation District has implemented numerous conservation projects in the past and continues to actively identify and prioritize projects moving forward (Middle Fork Irrigation District Water Management and Conservation Plan, 2011). The District has eliminated almost all open channel conveyance (with the exception of Eliot Ditch) which has eliminated spills and significantly reduced seepage losses.

Completed

Glacier Pipeline: MFID recently completed the Glacier Pipeline, which converted older pipe and open canal to 5,400' of 18" HDPE and 5,600' of 24" HDPE.

Instream Flow Assessment: MFID recently completed an instream flow assessment on Eliot Creek, Clear Creek, Coe Creek, and the Middle Fork Hood River. This information will be used to help identify minimum flows needed for aquatic habitat.

Eliminated end-spills: MFID has installed pipe in the entire system with the exception of Eliot Ditch. This closed pipe has reduces seepage losses and eliminates end-spills. MFID has looked at the cost-benefit tradeoff of piping Eliot Ditch, but it is economically unfeasible at this time.

Clear branch dam passage feasibility study: The district completed the clear branch dam fish passage feasibility study in 2011. This study evaluated the feasibility of six different upstream and downstream fish passage scenarios.

Laurance Lake Temperature Study: In this study, water temperature, flows, bathymetric, water quality and meteorological data was collected at various sites in and around Laurance Lake. A computer model was used to evaluate reservoir management strategies and options to reduce the observed heat discharge to Clear Branch, critical habitat and threatened Bull trout.

Proposed

Pipe Coe diversion to sediment pond: MFID is in the preliminary planning process for connecting the Coe diversion structure to the existing sediment basin. Coe Creek has a very high sediment load in the summertime which causes the MFID to eliminate diversions from it and to draw down Laurance Lake to support the deficit. Connecting Coe Creek to the sediment basin will allow continued use of the Coe diversion in the summer, and in turn, allow Laurance Lake water to be utilized for other beneficial purposes.

In addition to the specific projects above, MFID continues to encourage patrons to employ irrigation scheduling tools (e.g. soil moisture sensors), advocates for patrons participating in grower organizations, and supports local groups and agencies in water conservation and management programs. MFID installs roughly two pressure reducers every year which result in lower line pressures, hence lower overall water use. All projects are designed to increase summer streamflows and reduce or eliminate water quality issues.

3.2.5 Mt. Hood Irrigation District

Mt. Hood Irrigation District is located on the east side of the East Fork Hood River between Middle Mountain and Tollbridge Park (Figures 1, 7, 8, and 28). It serves 1,110 acres through 167 accounts. MHID is unique in that it does not operate its own diversion, but receives water from the main EFID canal in two locations. Its first diversion serves acreage on the west side of highway 35 and is called the “west side diversion”. This diversion is located just west of Highway 35 and is upstream of the EFID gauging station. Its second diversion serves the east side of Highway 35 and is called the “east side diversion.” This diversion is located off of Hess Road and is approximately 3/4 miles downstream of the EIFD gauging station. Each diversion structure has three outlets: a pumped line for irrigation, a gravity line for irrigation, and an overflow outlet. The pumped lines feed the upper 15% of each “side” while the gravity line feeds the lower 85%. The overflow outlet at each diversion is always overflowing water when the other two outlets are active. The overflow outlet discharges water that is used to keep the intake screens clear, plus some amount of the difference between MHID peak usage and actual usage.

3.2.5.1 Crop Types

The distribution of crop types in MHID is significantly different than for the rest of the Hood River Valley. Because of this, the OSU Extension Service data was not used, and instead crop area estimates were obtained directly from Leonard Aubert, manager of MHID (Table 74). Hay, forage, and residential are the predominant land uses in MHID. Although residential does not typically fit with hay and forage, the reality is that many parcels are on the order of 5 acres and are residential properties that grow hay. Pear, apple, and cherry orchards make up roughly 25% of the area, while blue berries make up roughly 1%.

Table 74. Estimate of acreage of commonly grown crops in Mt. Hood Irrigation District.

Crop	Area (acres)¹	Area (percent)¹
Hay, forage, residential	821	74%
Orchard	276	25%
Berries	11	1%

Notes: ¹ Estimate from Leonard Aubert, MHID manager.

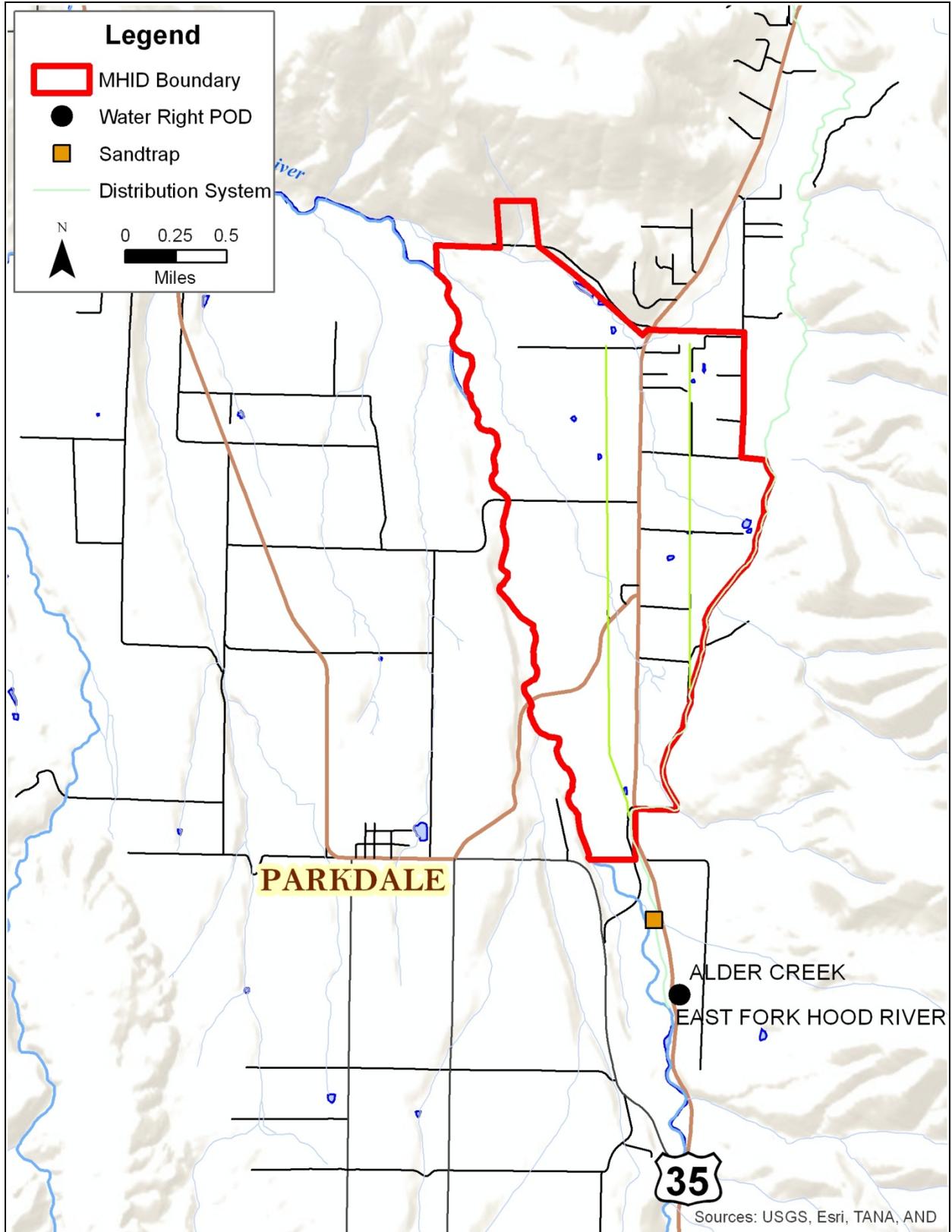


Figure 28. Mt Hood Fork Irrigation District's point of diversion and district boundary. Distribution system within MHID based on description from MHID manager and is not georeferenced.

3.2.5.2 Water Rights

MHID has four water rights from the East Fork Hood River that range in priority date from 1895 to 1977 (Table 75). The majority of the water used by MHID falls under their 1895 permit in which they have a right to 11.55 cfs.

Table 75. Water rights held by Mt. Hood Irrigation District.

Permit/ Certificate	Priority	Source	Acres	CFS	Use	WUR ID	Notes
-/ 88166	11/27/1895	East Fork Hood River	851.82	10.65	Irrigation	20937	
-/ 88167	11/27/1895	East Fork Hood River	72.38	.90	Irrigation	20937	Lands NOT involved in HB 3111 process.
S-29613/ 88168	3/2/1964	East Fork Hood River	93.70 1.00	1.10	Irrigation Suppl. Irrig.	20937	
S-43518	4/22/1977 8/8/1978	East Fork Hood River		0.50 0.05 0.05 21.66	Spray Fire Stock Frost Prot.	20937	4/22/1977 = 8.00 cfs 8/8/1978 = 14.26 cfs
Total (irrigation only)			1017.9	12.65			

3.2.5.3 Water Use Reports

The most recent water use report filed by MHID was in 2000 (Table 76). Although this water use report is over ten years old, both the MHID and EFID managers believe that the values are reflective of current use. Peak use months are June, July, and August with 7.1 cfs, 10.1 cfs, and 7.5 cfs, respectively.

MHID installed new flow meters in the district in April of 2013 and will once again file water use reports starting in water year 2013. It should also be noted that roughly half of the water that MHID uses is counted in the EFID water use reports. This occurs because MHID's second diversion is downstream of the EFID gauging station.

Table 76. Water Use Reports Filed by Mt. Hood Irrigation District.

WUR ID ¹	WY	Units ³	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2000 AVG		CFS	0.5	0.0	0.0	0.0	0.0	0.0	1.2	3.1	7.1	10.1	7.5	4.0	2.8
		A	33	0	0	0	0	0	74	188	425	623	464	237	2043
20937	2012														
20937	2011														
20937	2010														
20937	2009														
20937	2008	No water use reports filed 2001-2012.													
20937	2007														
20937	2006	New flow meters installed April 2013.													
20937	2005														
20937	2004														
20937	2003														
20937	2002														
20937	2001														
20937	2000	A	33	0	0	0	0	0	74	188	425	623	464	237	2043

Notes: ¹ WUR IDs assigned by OWRD. Report IDs also shown in last column of water rights tables.

² WUR 20937 last reported for water year 2000. MHID installing new meters and will report in 2013.

³ Units: A = acre-feet/month, CFS = cubic foot/second.

3.2.5.4 Conservation Projects

MHID is completely piped and has recently installed new flow meters. Future projects are aimed at reducing water use through pressure reducing valves and sprinkler conversions.

Completed

Pipe district: MHID replaced all open conveyance with pipe by 1990. This eliminated end-spills, reduced seepage losses, and supplied pressurized water to all patrons. The work was funded by a small energy loan that was recently fully paid off by MHID.

Install flow meters: MHID recently replaced non-functioning flow meters with four new Doppler flow sensors. The work was paid for by MHID and will allow a more accurate assessment of water use in the district.

Proposed

Install pressure reducing valves: MHID is actively identifying and installing pressure reducing valves where needed in the lower part of its district. These valves reduce water pressure and therefore reduce the amount of water used.

Sprinkler conversion: Although no formal sprinkler conversion project exists within MHID, the district encourages patrons to install water efficient application methods. Besides saving water, this will also lower operating costs in the basin by requiring less pumping.

3.3 Hydropower

Two of the five irrigation districts in Hood River County operate hydroelectric facilities (Figure 29). Farmers Irrigation District operates two facilities, while Middle Fork Irrigation District operates three facilities. One other facility, Odell Hydro, is in the process of being decommissioned and is not discussed here.

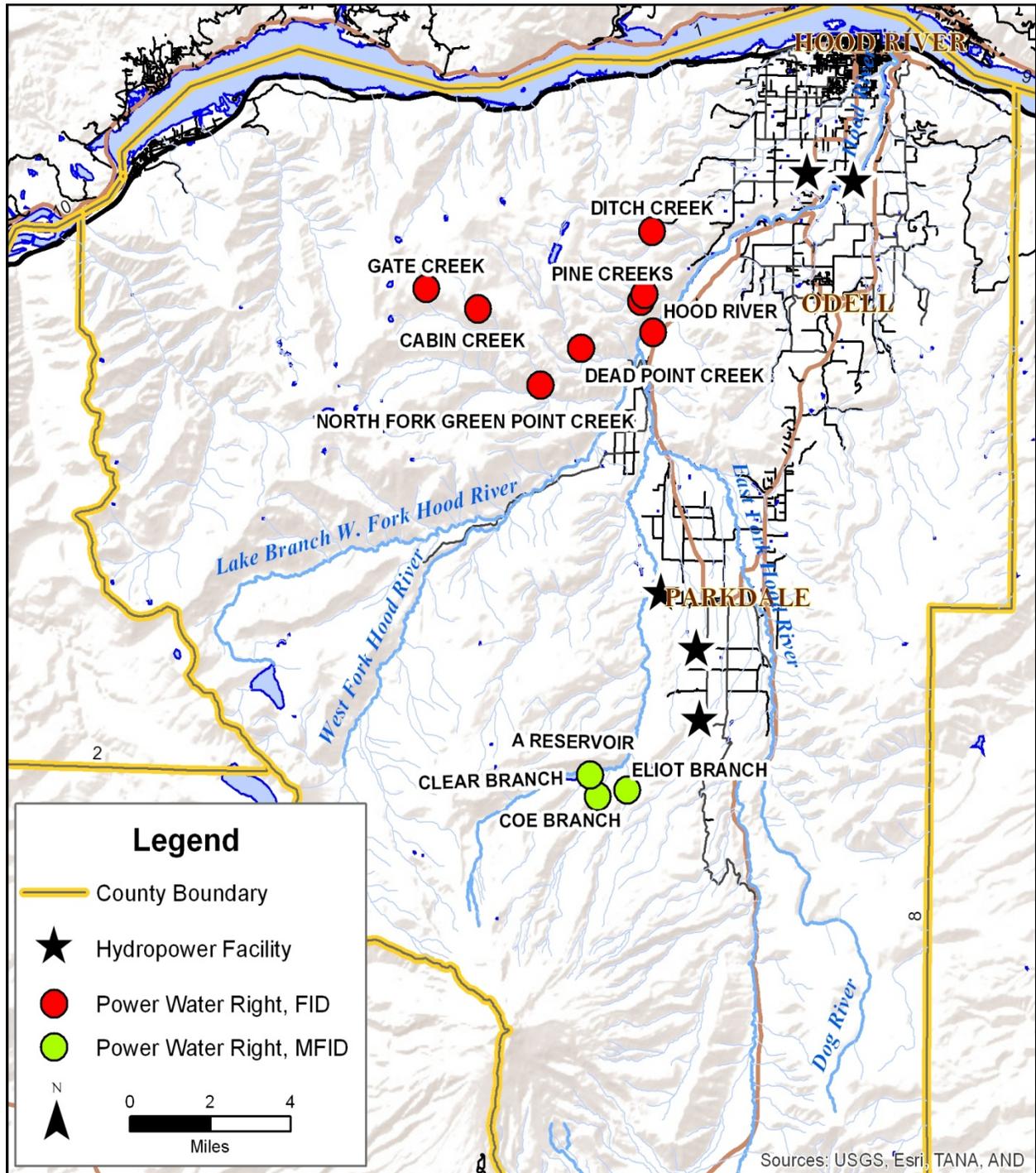


Figure 29. Hydropower water rights and major hydroelectric facilities in Hood River County.

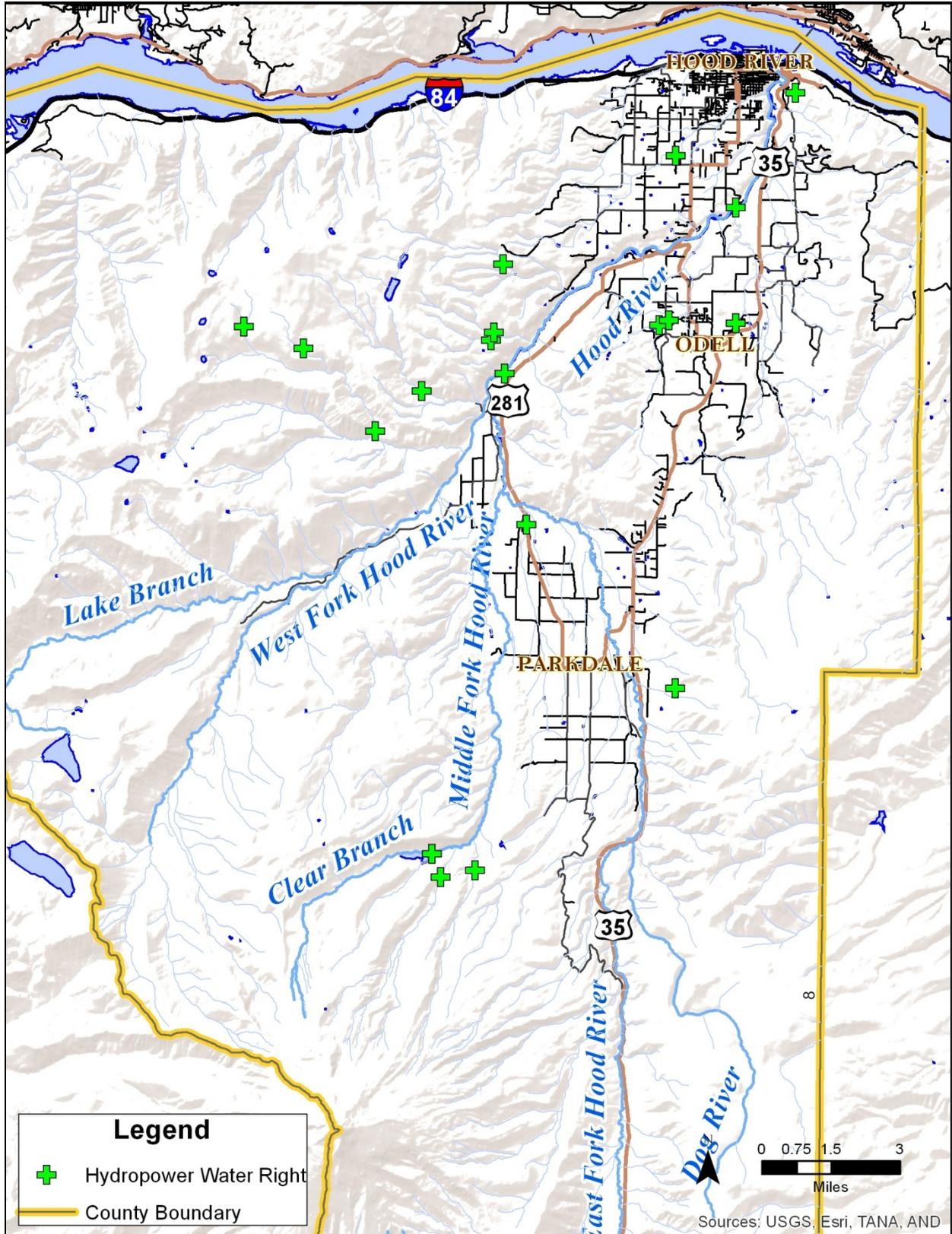


Figure 30. All hydropower water rights in Hood River County.

3.3.1 Farmers Irrigation District

Farmers Irrigation District has two hydroelectric facilities, Plant #3 located on Peter’s Drive and Plant #2 located on the Hood River near the former Copper Dam site (Table 77, Figure 30). An earlier plant, Plant #1, was located on the Farmers Canal but has since been decommissioned. Plant #3 and #2 are in series, and outside of irrigation season, water that leaves Plant #3 enters the penstock for Plant #2. With small exceptions, water used for irrigation in FID cannot be used to generate hydropower. Because of this, as irrigation season ramps up in May there is a significant decrease in the amount of water available for hydropower production (Figure 31).

3.3.1.1 Facilities, Discharge, and Production

Of FID’s two hydropower facilities, Plant #2 generates significantly more electricity (Table 78, 79-81). Plant #2 has two turbines (both Francis type) with a combined nameplate capacity of 3 MW, while Plant #3 has a single turbine (Pelton wheel type) with a nameplate capacity of 1.8 MW. Plant #3 is fed by the middle and upper district only, while Plant #2 also receives inflow from FID’s 73 cfs hydropower water right off of the mainstem of the Hood River.

Table 77. Location of FID penstocks and hydropower facilities.

Penstock / Plant	Location & Elevation	Penstock Pipe Length & Diameter
Penstock #3	Kingsley Rd, Hood River Elevation: 1438’ msl	4.4 miles of 36” Diameter
Plant #3	Peters Dr, Hood River Elevation: 689’ msl	
Penstock #2	Peters Dr, Hood River Elevation: 689’ msl	1.2 miles of 48” Diameter
Plant #2	Copper Dam Rd, Hood River Elevation: 298’ msl	

Table 78. Configuration, average discharge, and estimated annual output for Plants #2 and #3.

Item	Powerhouse #2	Powerhouse #3
Turbine type	2 x Reaction (Francis)	Impulse (Pelton)
Avail. Head	Medium	High
Rated Capacity	1000 & 2000 kW	1800 kW
Generation Voltage	4160	4160
Average Discharge	72.8 cfs	17.6 cfs
Est. Annual Output	22,050 MW-hr combined	

Annual total hydropower production has increased slightly over the period 2001 through 2011, some of which is likely attributable to increases in operation efficiencies (Figure 32). During this period, annual production ranged from 18,200 MW-hr in 2005 up to 25,700 MW-hr in 2010, with an average of 22,100 MW-hr. The low year, 2005, had the lowest July-September average Tucker Bridge streamflow from the gauged record causing Plant #2 to run at 30 cfs or below for July – October, while Plant #3 did not run at all July-September. In contrast, discharge through Plant #2 in the summer of 2010 never fell below 40 cfs (June – Sept. average of 57 cfs). As expected, monthly production (Figure 33) mirrors plant discharge (Figure 31), and drops off considerably during irrigation season. August is the lowest production month with only 500 MW-hrs produced. Most of the water supply in the District is going to meet irrigation demands, and the only available water for hydropower is 40 cfs from the 73 cfs Hood River hydropower water right.

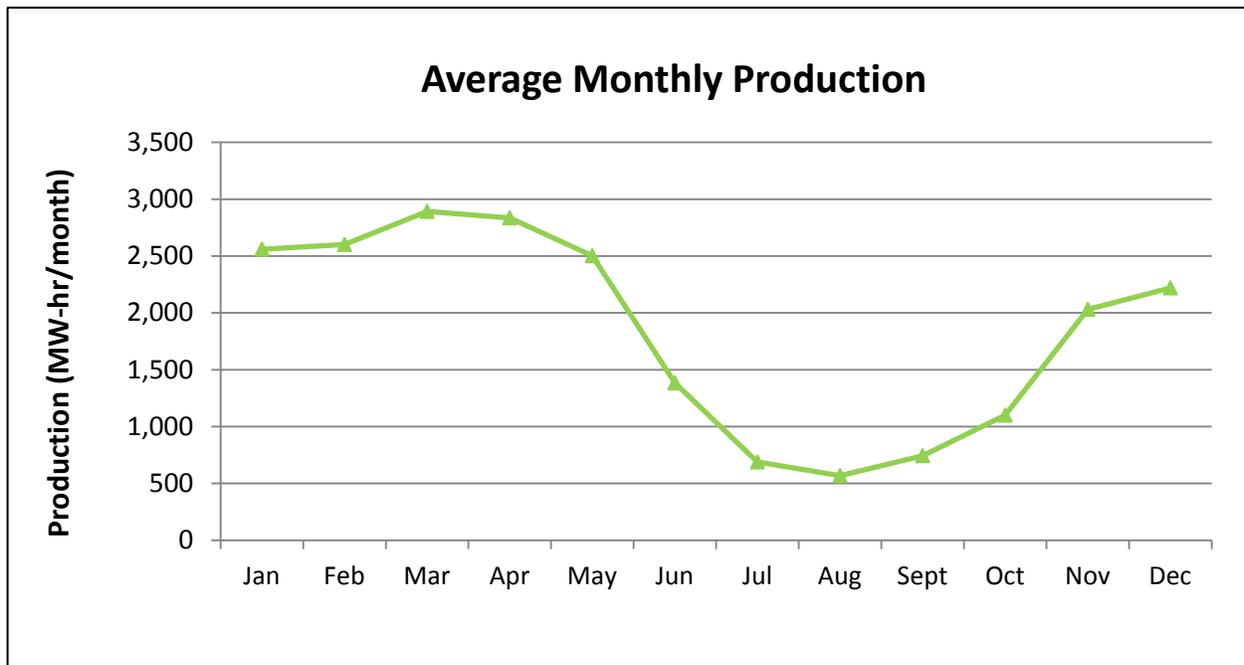


Figure 31. Average monthly total power production (based on 2001-2011).

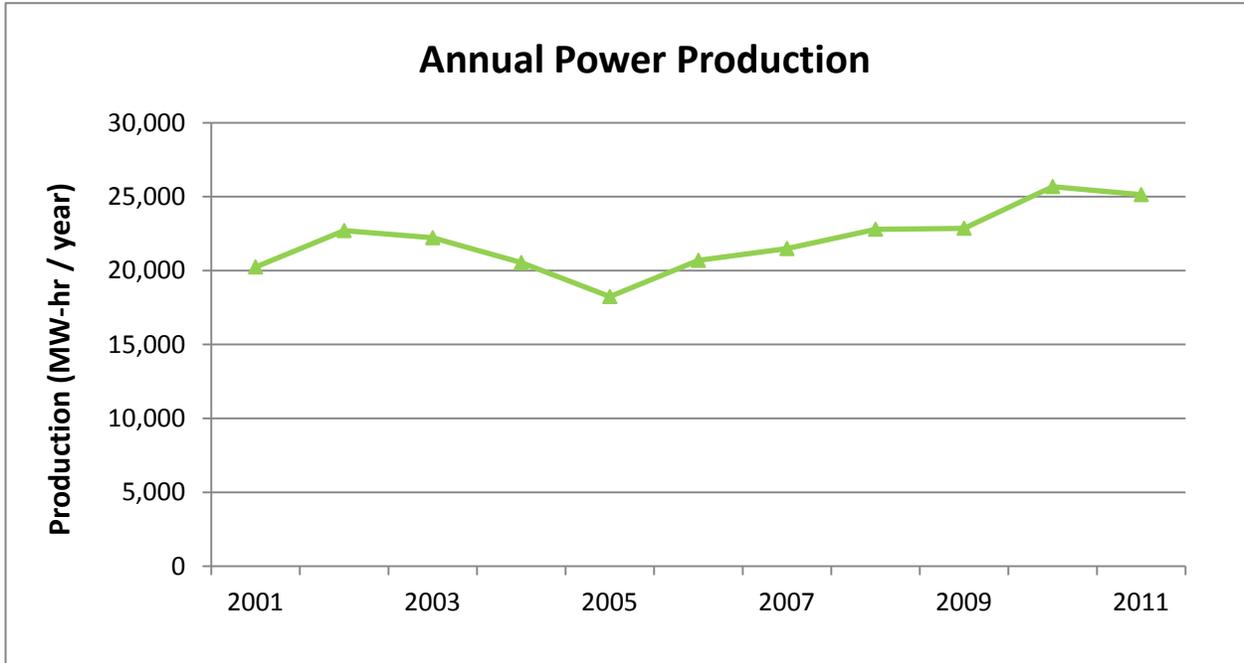


Figure 32. Annual total (Plant #2 + Plant #3) hydropower production for 2001-2011.

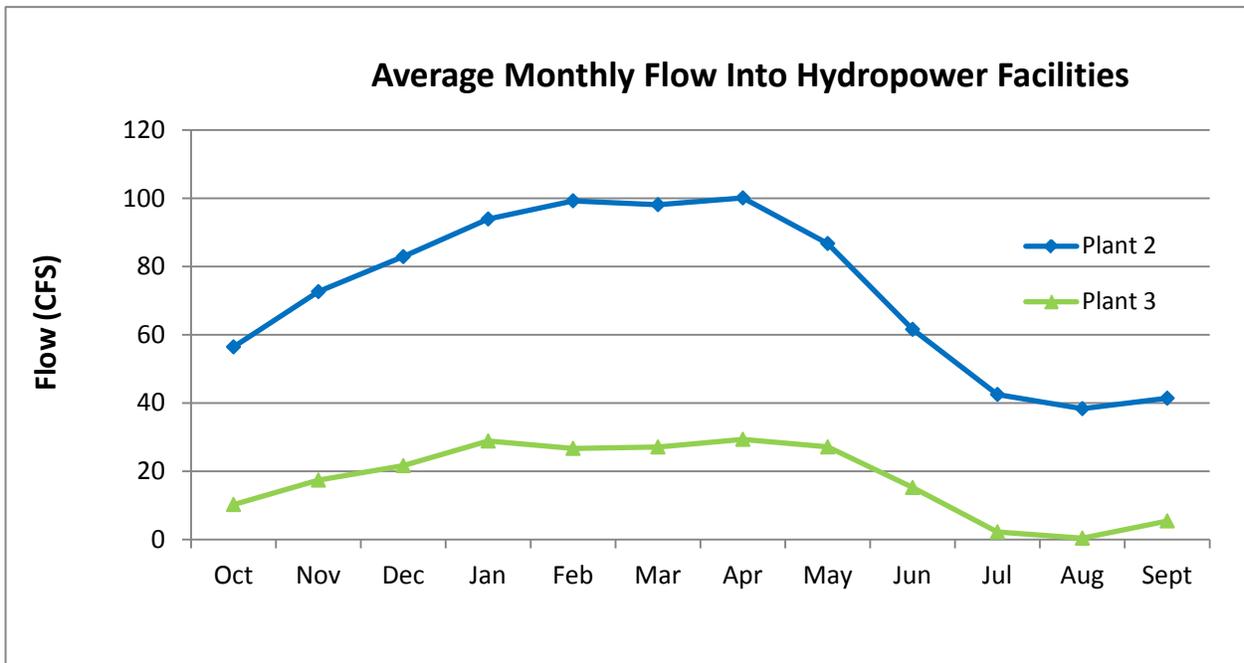


Figure 33. Average monthly flow into Plant #2 and #3 based on WY 2005-2011.

3.3.1.2 Water Rights

Farmers Irrigation District has three water rights permits for hydropower (Table 79). All permits have a priority date of February 11, 1981 and are for year-around period of use.

Table 79. Water rights held by Farmers Irrigation District under use group of “Power.”

Permit/ Certificate	Priority	Source	Power	CFS	Use	WUR ID	Notes
S-49871/ 67267	2/11/1981	Dead Point Cr NF Pine Cr SF Pine Cr Ditch Cr	2948 thp	20.0 5.0 5.0 20.0	Hydropower	16098 16107 16109	Plant 3 sources Max Rate = 35 cfs
S-51421/ 75809	2/11/1981	Gate Cr Cabin Cr NF Green Point Cr	2097 thp	5.0 20.0	Hydropower	16103 16114 16170	Plant 3 sources Max rate = 35 cfs
S-48576/ 67266	2/11/1981	Dead Point Cr NF Pine Cr SF Pine Cr Ditch Cr Hood River	4885 thp	20.0 5.0 5.0 20.0 73.0	Hydropower	16098 16107 16109 16112 16129	Plant 2 sources Max Rate = 108 cfs

3.3.1.3 Summary Data

Water use reports pertaining to FID hydropower water rights also cover other uses (e.g. irrigation), so water use for hydropower was obtained directly from FID. Tables 80 and 81 show water use at Plants #2 and #3. Table 82 shows total FID power production for 2001-2012.

Table 80. Total discharge through Plant #3 (CFS, from FID).

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total (ac-ft)
2005-2011 Avg	10.2	17.4	21.6	28.8	26.7	27.1	29.3	27.1	15.2	2.2	0.4	5.4	12775
2011	12.1	18.7	31.0	32.2	29.2	29.8	34.9	34.9	20.5	6.7	2.6	4.1	15488
2010	10.7	17.5	17.4	28.4	28.1	26.2	28.9	27.2	23.3	0	0	12.6	13309
2009	7.2	16.6	14.0	27.7	19.7	24.6	33.8	34.6	13.2	0	0	6.8	11954
2008	12.8	12.8	27.4	28.7	28.5	31.6	29.0	31.5	22.7	8.8	0	8.2	14608
2007	6.6	25.9	27.4	34.0	33.0	34.6	30.9	19.0	0	0	0	0	12759
2006	8.9	16.3	16.9	32.5	34.4	27.7	27.6	20.5	14.7	0	0	6.4	12428
2005	13.4	13.9	17.4	18.5	13.9	15.2	20.2	22.3	12.3	0	0	0	8882

Table 81. Discharge through Plant #2 (CFS, from FID).

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total (ac-ft)
2005-2011 Avg	56.4	72.7	82.9	93.9	99.3	98.1	100.1	86.7	61.6	42.5	38.3	41.4	52767
2011	81.0	88.6	104.2	104.3	95.6	106.9	108.0	105.2	81.8	54.5	48.7	49.4	62252
2010	74.2	74.6	84.0	104.2	106.0	94.0	101.3	94.6	84.6	47.7	41.4	54.3	58009
2009	63.5	83.5	87.6	95.6	91.8	104.8	107.3	101.7	62.4	44.9	45.6	59.5	57243
2008	48.1	83.4	97.0	105.4	103.4	100.8	99.6	88.9	77.8	55.3	46.3	31.0	56569
2007	61.4	48.5	37.8	60.7	107.7	105.9	96.1	59.7	36.1	37.2	38.8	36.8	43879
2006	8.9	48.2	80.9	103.3	107.8	91.7	97.2	72.6	46.2	29.1	25.5	33.9	44982
2005	58.0	81.9	88.9	84.1	82.5	83.0	88.2	84.5	42.2	28.8	22.1	25.0	46434

Table 82. Farmers Irrigation District combined (Plant #2 & #3) power production (MW-hr, from FID).

WY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total (ac-ft)
2001-2012 Avg	2559	2601	2892	2835	2502	1384	688	569	743	1099	2030	2219	22053
2012	1756	2639	3101	3093	2842	1913	939	705	735	915			
2011	3022	2635	3030	3163	2754	1924	994	855	921	1144	2236	2454	25133
2010	2963	2730	2704	2898	2842	2310	906	729	1187	1078	2421	2910	25678
2009	2327	2144	2843	3088	3059	1552	817	805	1154	1644	2199	1226	22859
2008	3043	2815	3104	2867	2799	2001	701	552	683	576	2033	1620	22794
2007	2317	2896	3181	2900	1860	632	667	647	662	921	1993	2810	21485
2006	3151	2853	2920	2806	2173	1256	558	421	622	1256	1824	850	20688
2005	2249	2052	2250	2461	2601	1169	565	299	444	251	1773	2129	18241
2004	1886	2824	3116	2906	1585	781	268	48	576	1866	2112	2570	20538
2003	2889	2866	3159	2942	2620	638	408	482	716	996	1841	2660	22218
2002	3139	2774	3044	2927	2563	1386	690	573	461	1104	1789	2252	22702
2001	1972	1983	2250	1975	2324	1047	741	706	758	1442	2115	2930	20242

3.3.2 Middle Fork Irrigation District

Middle Fork Irrigation District operates three hydropower facilities that are situated in series (Figure 30). The upstream facility is Plant #1, the middle facility is Plant #2, and the downstream facility is Plant #3.

3.3.2.1 Facilities, Discharge, and Production

Releases from Laurance Lake combine with diversions from Coe Creek and enter penstock #1 near the sediment basin. Directly downstream of Plant #1, Eliot Creek diversions join the tailwater from Plant #1 (at atmospheric pressure) and enter penstock #2. The tailwater from Plant #2 remains at pressure where it enters penstock #3. At Plant #3, water discharges into the atmosphere and is directed into Rogers Creek or used for downslope consumption. Location of penstocks and plants #1-3 are given in Table 83 while additional plant data is presented in Table 84.

During winter and spring months (i.e. outside of irrigation season) most water that travels through Plant #1 also travels through Plant #2 and #3 (Figure 34). Any difference in discharge between Plant #1 and #3 during this time of year is usually attributable to the turning out of a few cfs for frost or fire protection. During irrigation season, however, a significant portion of the discharge that travels through Plant #1 gets turned out to consumptive use before reaching Plant #3. This deficit peaks in July with an average of 48 cfs at Plant #1, but only 9 cfs at Plant #3. Discharge rates at Plant #2 are between those of Plant #1 and #3, though usually much closer to flow rates at plant #1.

Table 83. Location of MFID penstocks and hydropower facilities.

Penstock / Plant	Location	Penstock Pipe Length & Diameter ^{1,2}
Penstock #1	SW ¼ SW ¼ Section 24 T 1 S, R 9 E	8900' of 36" (plus 1000' of 42" and 9,500' of 36" for Clear Creek Dam to Sediment Basin)
Plant #1	NE ¼ SW ¼ Section 18 T 1 S, R 10 E	
Penstock #2	SW ¼ SE ¼ Section 18 T 1 S, R 10 E	8360' of 26" and 2000' of 48"
Plant #2 / Penstock #3	SW ¼ SW ¼ Section 6 T 1 S, R 10 E	4345' of 28" and 5670' of 26" (plus one pressure reducing station)
Plant #3	NE ¼ SW ¼ Section 31 T 1 N, R 9 E	

Notes: ¹ Clear Branch Dam to Sediment Basin is concrete cylinder pipe.

² Penstock #1-3 are steel and have epoxy lining.

Table 84. Configuration, average discharge, and estimated annual output for Plant #1-#3.

Item	Powerhouse #1	Powerhouse #2	Powerhouse #3
Turbine type	Impulse (Pelton)	Reaction (Francis)	Impulse (Pelton)
Avail. Head @ 40 CFS	760'	320'	268'
Rated Capacity	2050 kW	500 kW	800 kW
Generation Voltage	4160 v	480 v	480 v
Guaranteed Efficiency	85.2%	85.2%	83.14%
Average Discharge	40.3 cfs	38.5 cfs	30.1 cfs
Est. Annual Output	14.9 GW-hr	3.2 GW-hr	4.7 GW-hr

Peak power production occurs in May during snowmelt and high reservoir elevations, and before significant consumptive irrigation demands must be met. Although discharge to Plant #3 is reduced significantly during irrigation season, actual revenue decreases are much more modest due to high flow remaining at Plant #1 which has the highest rated capacity (Figure 35). Since 2001, annual power production has ranged from 18,400 MW-hr up to 26,500 MW-hr, with an average of 23,160 MW-hr (Figure 36). Although the figure shows a slight upward trend in production, that upward trend is moderated by high production numbers in 1995-1999. These years all saw above average streamflow (1996 and 1997 are the highest two years for cumulative streamflow) which in turn drove above average hydropower. In the absence of those high water years, it is likely a greater upward trend in production would be apparent.

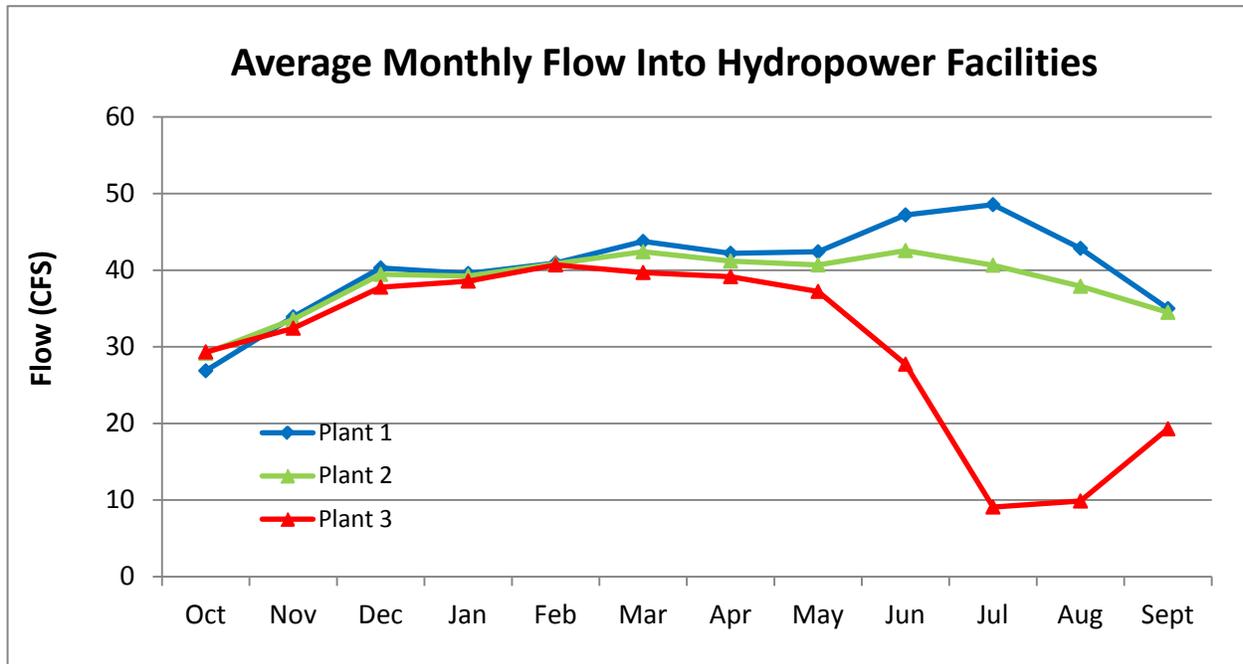


Figure 34. Average monthly flow into Middle Fork Irrigation District hydropower facilities (based on 2008-2012).

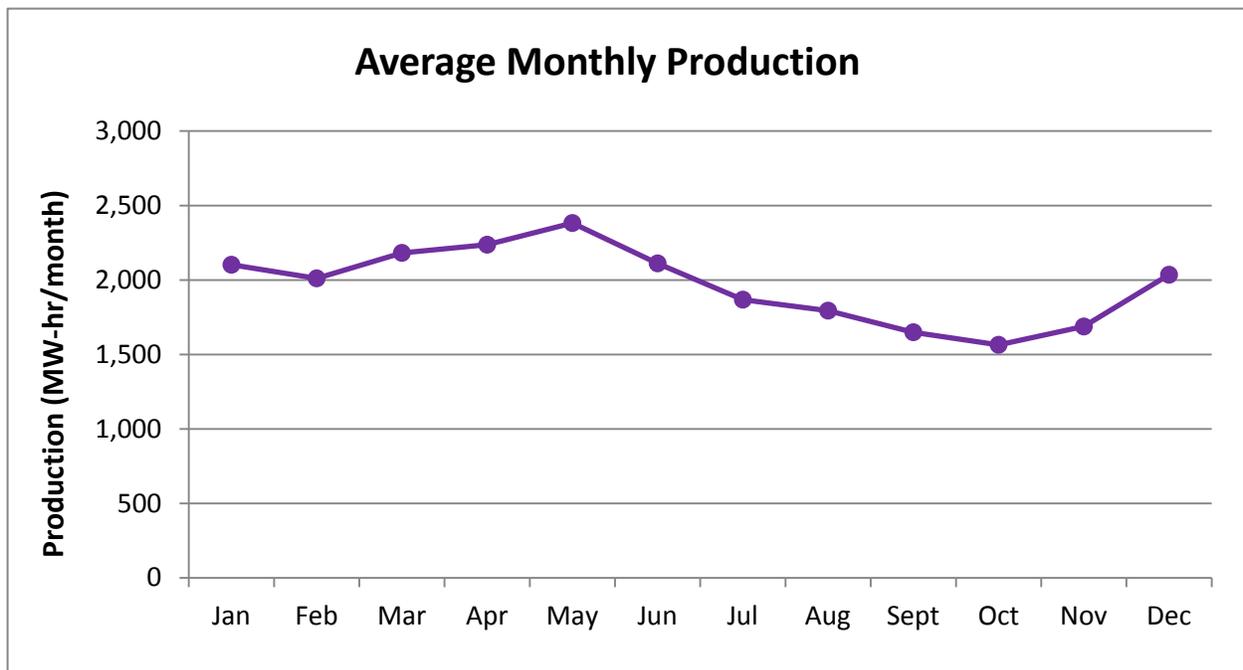


Figure 35. Average monthly power production for Middle Fork Irrigation District (based on 2001-2012).

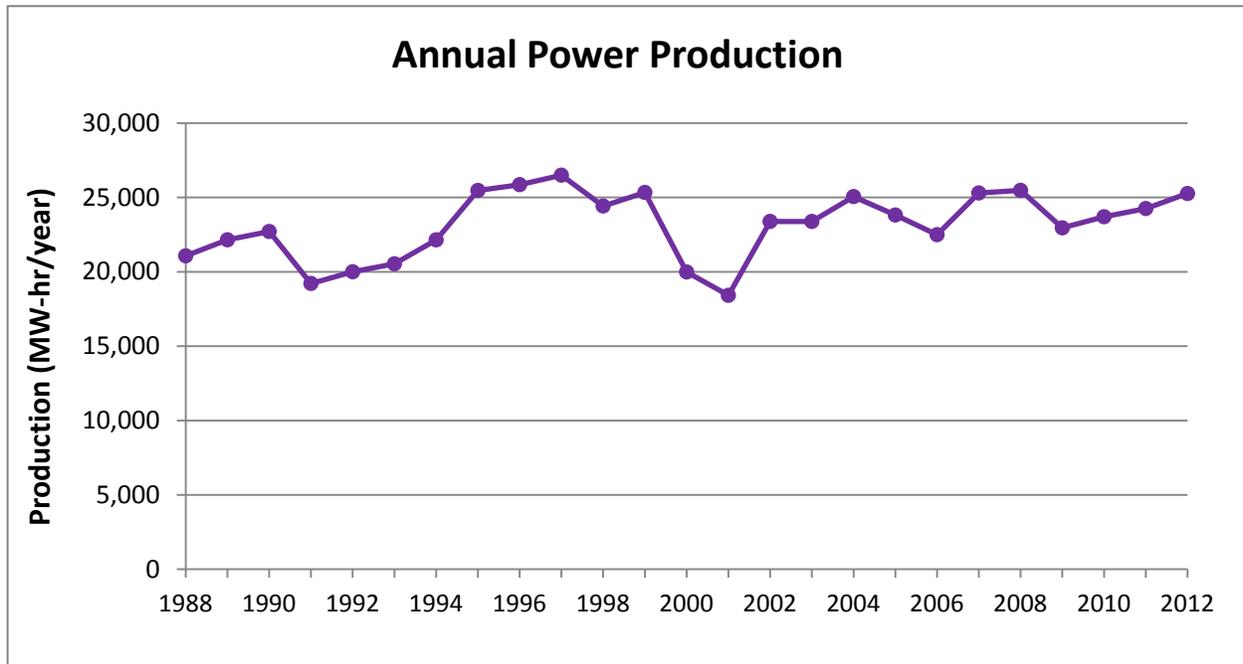


Figure 36. Annual power production for Middle Fork Irrigation District.

3.3.2.2 Water Rights

MFID’s water right for power generation is given in Table 85. This right is valid year-round, and has priority dates of 1981 and 1982.

Table 85. Hydropower water right held by MFID.

Permit/Certificate	Priority	Source	CFS	Use	WUR ID	Notes
S-49344/-	1/26/1981	Clear Br Reservoir	20.0	Hydropower	63980	Maximum Rate = 40 cfs
	1/26/1981	Eliot Br	10.0		16258	
	1/26/1981	Coe Cr	10.0		16275	
	1/26/1982	Clear Br Reservoir	20.0		63980	
	1/26/1982	Eliot Br	15.0		16258	
	1/26/1982	Coe Br	15.0		16275	

3.3.2.3 Summary Data

Water use reports pertaining to MFID hydropower water rights also cover other uses (e.g. irrigation), so water use for hydropower was obtained directly from MFID. Tables 86, 87, and 88 show water use at Plants #1-#3. Table 89 shows total MFID power production for 2001-2012.

Table 86. Discharge into MFID Plant #1.

WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012	CFS	28.0	32.7	40.4	40.2	42.7	41.2	42.4	44.3	44.5	44.4	39.7	35.6	n/a
AVG	A	1723	1946	2487	2470	2372	2532	2522	2722	2645	2731	2438	2116	28705
2013	A	1368	2310	2490										n/a
2012	A	1515	2079	2632	2307	2371	2553	2501	2801	2739	2896	2909	2616	29919
2011	A	1528	2237	2559	2554	2275	2503	2462	2626	2587	2397	2360	2003	28091
2010	A	1506	1230	1949	2652	2327	2240	2432	2617	2508	2585	2445	1869	26360
2009	A	2114	2027	2402	2475	2262	2548	2499	2747	2658	3255	1905	1695	28587
2008	A	1950	2158	2893	2364	2624	2817	2717	2817	2733	2520	2573	2401	30567

Note: Date not available from OWRD, obtained directly from MFID.

Table 87. Estimate of discharge through MFID Plant #2.

WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012	CFS	29.2	33.6	39.5	39.2	40.8	42.4	41.2	40.7	42.6	40.6	37.9	34.5	n/a
AVG	A	1792	1998	2426	2412	2269	2607	2451	2501	2532	2499	2330	2052	1792

Note: Flow through Plant #2 is estimated as Plant #1 + Eliot diversion – 1/3 of consumptive use between Plant #1 and Plant #3.

Table 88. Discharge out of MFID Plant #3.

WY	Unit ²	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
2008-2012	CFS	29.33	32.42	37.78	38.57	40.68	39.69	39.15	37.23	27.73	9.08	9.87	19.29	n/a
AVG	A	1803	1929	2323	2371	2259	2440	2329	2289	1650	558.6	606.6	1148	21709
2012	A	1568	1932	2453	2219	2300	2459	2379	2383	1450	868	795	1248	22054
2011	A	1670	2073	2461	2461	2226	2449	2377	2470	1725	701	783	1301	22697
2010	A	1558	1411	1810	2459	2221	2459	2142	2459	1946	614	400	1233	20712
2009	A	2256	2071	2431	2446	2229	2458	2370	2341	960	368	553	722	21205
2008	A	1965	2160	2460	2272	2320	2378	2380	1792	2170	242	502	1236	21877
2007	A	1645	2400	2459	2458	2126	2421	2279	2000	790	472	588	1065	20703
2006	A	2073	2400	2000	2459	2463	2459	2382	2267	1417	480	865	1327	22592
2005	A				2176	1581	1525	2499	2196	1510	527	590	1142	13746

Note: Date not available from OWRD, obtained directly from MFID.

Table 89. Combined Middle Fork Irrigation District power production (MW-hr/yr).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2001-2012 Avg	2102	2011	2182	2237	2382	2112	1868	1794	1649	1565	1688	2035	23625
2012	2067	2125	2261	2192	2316	2137	2031	2047	2041	1486	2213	2345	25262
2011	2253	2032	2234	2182	2260	2109	1885	1913	1767	1510	1844	2263	24253
2010	2329	2069	2100	2164	2250	2071	1772	1610	1609	1475	1991	2260	23700
2009	2306	2094	2310	2231	2349	2011	1868	1722	1432	1570	1290	1772	22953
2008	2058	2310	2444	2351	2418	2074	1743	1832	1984	2091	1912	2258	25475
2007	2518	2247	2503	2406	2363	1959	1830	1671	1596	1738	2074	2395	25300
2006	2513	2273	2481	2336	2355	2173	1836	1897	1558	1626	438	1008	22494
2005	1952	1507	1522	2441	2545	2219	1896	1792	1453	1935	2228	2329	23818
2004	2224	2388	2504	2238	2322	2198	2096	1883	1853	1297	1947	2107	25058
2003	1705	2351	2341	2494	2432	2123	1906	1631	1347	823	1841	2390	23385
2002	2493	2018	2521	2443	2538	2203	1980	1891	1567	1711	996	1024	23385
2001	809	718	963	1365	2441	2061	1573	1640	1582	1514	1478	2272	18416

3.4 Instream Flow

There are eight major instream water rights in the Hood River Basin held in trust for the people of Oregon by OWRD (Figure 37, Table 90). There are also two smaller (typically a few cfs) instream water rights that are the result of conserved water agreements. For example, Dee Irrigation District just installed 4.5 mile of pipe, from which it will conserve 3 cfs which is currently in the process of being transferred to an instream water right. The two districts that operate hydropower facilities (Middle Fork Irrigation District and Farmers Irrigation District) also have instream flow agreements shown below. Instream flow agreements are legally binding to the parties involved in the agreement but do not have a priority date. They are typically documented through a memorandum of understanding and may be adjusted by agreement of the two parties.

Table 90. Major instream water rights in the Hood River Basin.
(monthly values in cfs).

Cert. #	Priority	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
East Fork Hood River above confluence with Middle Fork Hood.													
68457	11/3/1983	100	100	100	150	150	150	100	100	100	150	150	150
Hood River at Powerdale Dam and maintained to the mouth.													
59679	11/3/1983	170	270	270	270	170	170	130	100	100	100	100	170
Hood River at Powerdale Dam and maintained to the mouth.													
76155	10/8/1998					250	250	250	250	250	220		
Neal Creek at the mouth.													
59681	11/3/1983	13	13	13	20	20	20	13	13	5	20	20	13
Middle Fork Hood River from Eliot Branch to the mouth.													
75230	8/12/1991	150	150	150	255	255	255	150	150	100	255	255	150
West Fork Hood River from Lake Branch the mouth.													
75619	12/6/1991	150	150	150	255	255	255	150	180	176	195	255	180
Lake Branch from Lost Lake to the mouth of the river.													
75620	12/6/1991	67	67	67	168	113	66.9	44.8	38.6	37.1	35.7	67	67
Dog River to the mouth.													
76267	12/6/1991	12	12	20	20	20	20	12	7.01	6.05	7.79	14.7	12

Farmers Irrigation District Instream Flow Agreements:

1). Agreement with ODFW at USGS Green Point Creek gauging station:

- From 1/1 - 4/4: minimum flow of 40 cfs.
- From 10/16 - 12/31: minimum flow of 20 cfs

2). For Farmers Canal diversion, measurement point at USGS Tucker Bridge Gauge. Agreement with Low Impact Hydropower institute:

- From 7/1 - 10/31: If Tucker Bridge USGS gauge mean daily drops below 250 cfs for three consecutive days, diversion into Farmers canal will not exceed 40 cfs until day Hood River at Tucker Bridge goes above 250 cfs.
- From 10/1 - 10/15: No diversion into Farmers Canal.

Middle Fork Irrigation District Instream Flow Agreements:

1). Agreement with ODFW for Clear Branch downstream of Laurance Lake:

- From 6/10 - 10/7: 3 cfs minimum
- From 10/8 - 6/10: Release 50% of inflow up to a minimum of 20 cfs.

MFID also has an agreement with ODFW that Laurance lake will not drop below 150 acre-feet of storage, plus voluntary minimum flows of 5 cfs below Coe and Eliot Diversions.

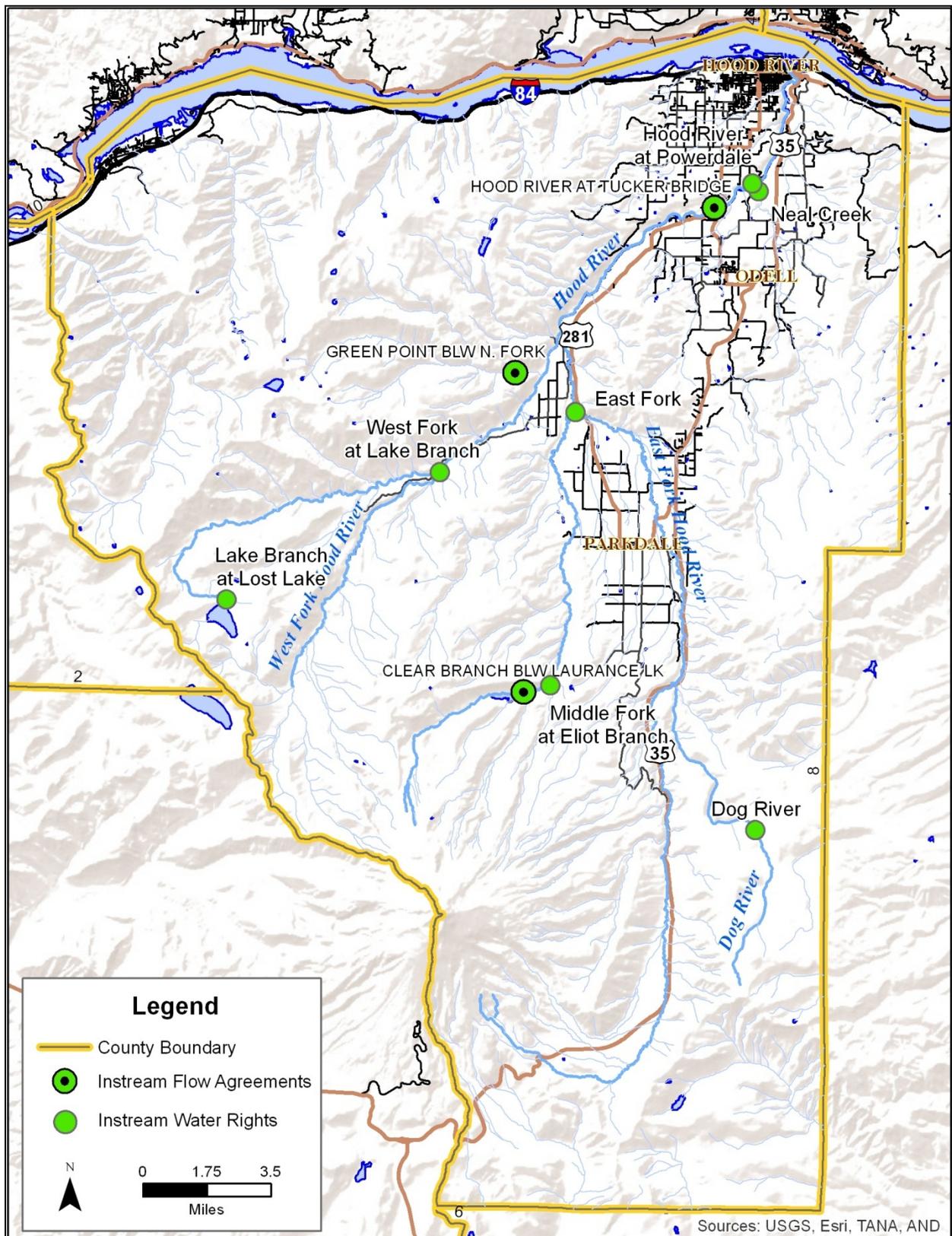


Figure 37. Location of instream water rights and flow agreements in the Hood River Basin.

3.5 Industrial

Although there are 17 water rights in the Hood River Basin that fall under the OWRD use group of “commercial”, “industrial”, or “manufacturing” (Figure 38), most industrial water use in the Basin is quite small and is often also served by other sources. Only two of the water rights in Table 91 list water use report IDs, of which one includes all EFID water use (WUR ID 16087), and the other contains zeros in water year 2003, and all other years are not available. Nonetheless, most of the industrial water rights, as well as most of the industrial use in the basin, can be categorized into; 1) cold storage/packing houses, 2) lumber mill, or 3) other/small use from which they can be analyzed. These users are discussed below and shown in Figure 39.

3.5.1.1 Cold Storage / Packing Houses

Many cold storage and packing house facilities exist in the Hood River Valley. This includes bigger ones such as Diamond Fruit Company, Duckwall-Pooley Fruit, and Stadelman Fruit in Odell, plus a handful of smaller ones near the Pine Grove area such as Bickford Orchards, Lage Orchards, Viewmont Orchards, and Moore Orchards. Since none of the packing houses file water use reports, Diamond Fruit Company and Duckwall-Pooley Fruit were contacted to get an idea of the magnitude of water use at these facilities, from which only Duckwall-Pooley Fruit provided any information.

Duckwall-Pooley Fruit obtains its water from three sources. It has water rights to a well and to Davis Creek, and also receives water from Crystal Springs Water District. The well water is used for dump tanks and rinsing fruit, and in the slow season for non-contact cooling water. In both cases it is discharged to Lenz creek (rinse water is treated with activated carbon before discharge). The Davis Creek water is used only for non-contact cooling and is also discharged to Lenz creek. The Crystal Springs water is used mainly for domestic uses like the bathroom and kitchens. This water goes to Odell Sanitary District. Crystal Springs is also used as a backup rinse water source, but in the past two years it has not been needed.

Duckwall-Pooley Fruit’s water use during 2011 and 2012 was 54% from its well, 38% from Davis Creek, and 8% from Crystal Springs Water District. Its total use was 59 acre-feet in 2011, and 70 acre-feet in 2012. Its rate of use is at a minimum in July (0.017 cfs) and at a maximum in October (0.19 cfs). Besides its low rate of use, it should also be noted that the facility does not have any appreciable storage volume and that outflow from the facility is likely greater than 75% of inflow, and therefore the facility has a relatively small impact from a water quantity perspective.

3.5.1.2 Lumber Mills

Although there are water rights for several lumber mills in the Basin, only one is currently operational. The Edward Hines Lumber Company and US Plywood Corporation were located near the Dee Bridge but both have shut down. The only remaining mill is located northeast of Parkdale and is operated by Mt. Hood Forest Products (water right is listed under EFID and Hanel in Table 91). The mill currently has 0.23 cfs of water rights, of which 0.14 cfs are for industrial purposes. With help from EFID, the mill is in the process of adding an additional 0.05 cfs of water rights, as well as converting all its rights to industrial. It is difficult to quantify actual use by the mill since its water use report includes all other EFID water use, however, the main water use on the site is log watering during which the mill captures and reuses the runoff.

3.5.1.3 Other

Through discussion with the Water Planning Group, several other potential major industrial water users have been suggested. Of those suggested the following have some amount of pseudo-industrial use, though they are typically either small or served by potable water sources. The biggest water user is the City of Hood River wastewater treatment facility which used 50.4 million gallons in 2011. However, the treatment plant is served by City of Hood River potable water, plus much of that water use is believed to be due to system leakage that is currently being investigated. Full Sail Brewery and Hood River Distillers used 13.6 and 3.3 million gallons, respectively, in 2011. For perspective, the brewery's use of 13.6 million gallons is equal to 0.058 cfs. Cardinal Glass does not manufacture glass at its Odell facility, but cuts glass to size, insets insulating gas, and presses panes together for shipment, and therefore does not use an appreciable amount of water in the manufacturing process. Hood River Organics, located by the Dee Bridge, is served by a well supplying less than 5,000 gallons per day (< 0.01 cfs).

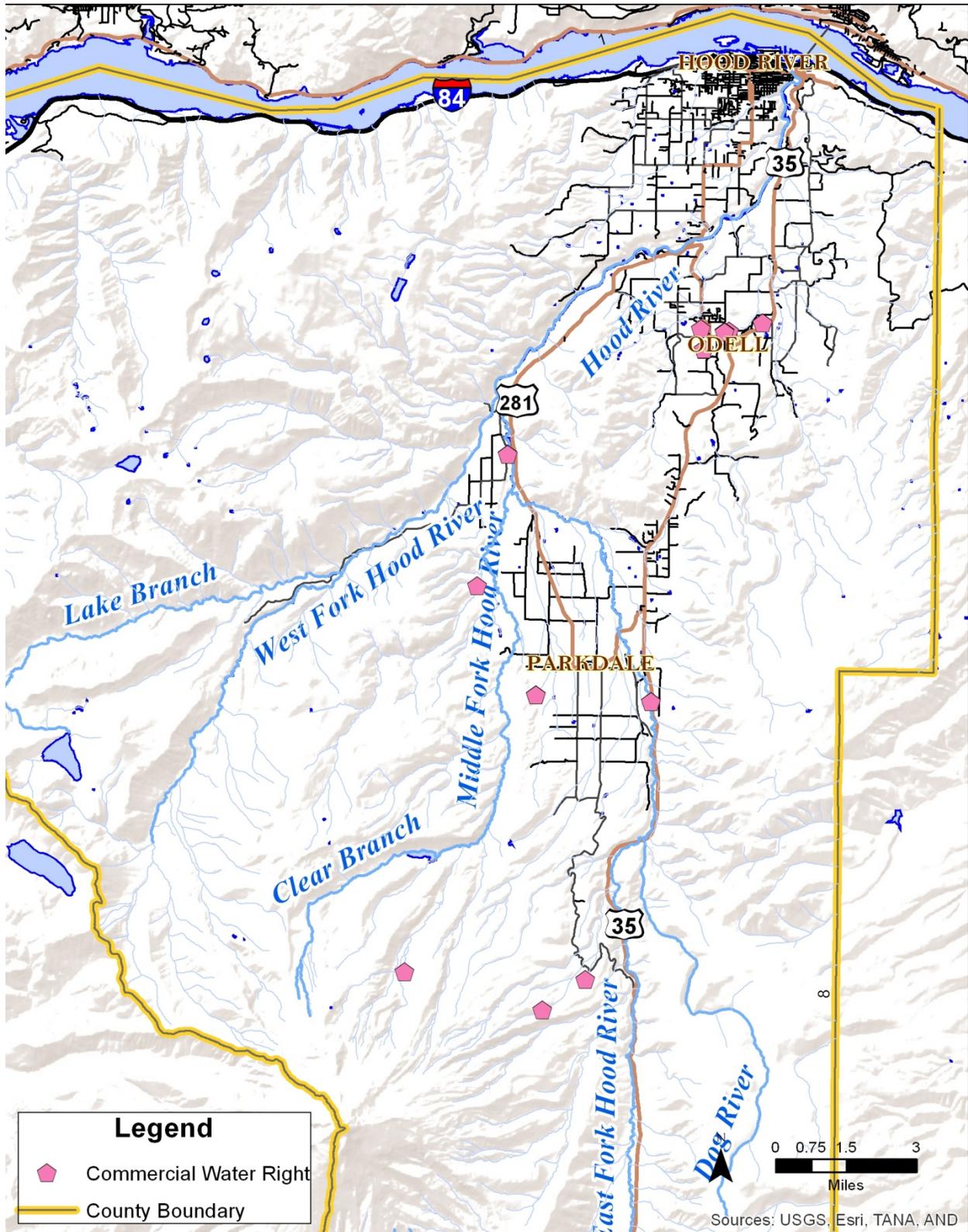


Figure 38. Location of all industrial waters in the Hood River Basin.

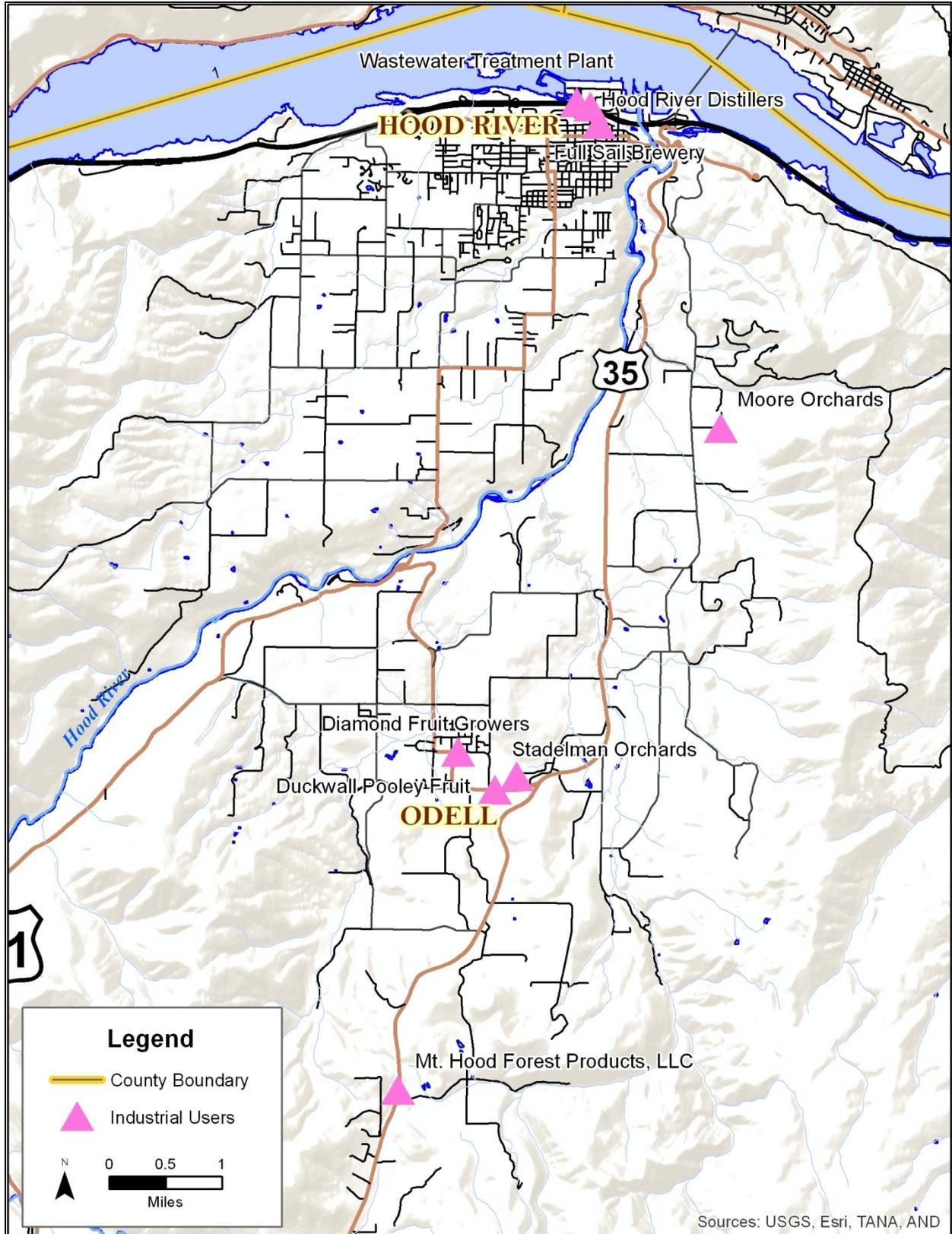


Figure 39. Major industrial and commercial water users in the Hood River Basin.

Table 91. Water rights filed under industrial, commercial, or manufacturing use groups.

Permit / Certificate	Priority	Name	Source	Period	Permitted Rate (cfs)	Use Group	WUR ID
-/82802	12/31/1882	DIAMOND FRUIT GROWERS INC.	A SPRING	4/15-10/1	0.07	Com.	
T-9129	11/25/1895	EFID	E. FORK HOOD R.	1/1-12/31	0.14	Ind.	16087
-/30440	9/30/1905	EDWARD HINES LUMBER CO.	E. FORK HOOD R.		29.3	Ind.	
S-6990/6333	10/19/1925	APPLE GROWERS ASSOCIATION	MCGUIRE CREEK		1	Com.	
G-890/56100	5/21/1958	DUCKWALL POOLEY FRUIT	A WELL		0.27	Ind.	
S-30324/39054	3/30/1965	U S PLYWOOD	TONY CR		2.5	Man.	
S-30389/41214	4/21/1965	DBA: MOORE ORCHARDS, INC.	NEAL CREEK		0.10	Com.	
S-38081/48445	2/9/1973	MT HOOD MDW DEVELOPMENT	A SPRING		0.22	Com.	
R-7782/51661	12/21/1978	HANEL LUMBER	STREAM		2 af	Ind.	
S-43829/51662	12/21/1978	HANEL LUMBER	STRM/RS		1.11	Ind.	
S-46439/54240	9/9/1980	U.S. MOUNT HOOD NF	A SPRING		0.05	Com.	105
S-48401/82174	11/9/1982	KLINDT, PAUL	A SPRING		0.07	Com.	
S-48023/55678	9/1/1983	DUCKWALL POOLEY FRUIT	DAVIS CREEK		0.79	Ind.	
S-53679/-	3/2/1994	OAK GROVE WATER CO.	A SPRING	10/1-4/15	0.0006	Com.	
G-13484/-	12/3/1997	MEADOWS UTILITIES LLC	A WELL		0.78	Com.	
Application S-86185	3/2/2005	MEADOWS UTILITIES / USFS	E. FORK HOOD R.	11/1-4/30	1.1	Com.	
Application G-16401	3/7/2005	MEADOWS UTILITIES / USFS	A WELL	11/1-3/31	0.11	Com.	
G-16258/-	7/20/2006	DUCKWALL-POOLEY FRUIT	A WELL	1/1-12/31	0.223	Com.	

3.6 Water Resource Modeling Data

Data in addition to that presented above and/or contained in the scope of work is required to support the Reclamation in hydrologic and water resource modeling. This includes an analysis of historical streamflow data, naturalizing historical streamflow data, and analyzing baseflow recession and glacial contribution to streamflow in the basin.

3.6.1 Streamflow

The USGS gauge at Tucker Bridge (# 14120000) offers the most complete and long-term discharge data in the Hood River Basin. The gauge operated intermittently between 1897-1899 and 1914-1916, and has been operating almost continuously since January 16, 1965. The gauge has a drainage area of 279 square miles and is located at latitude 45° 39' 20", longitude 121° 35' 50" and elevation 383 feet (NGVD29).

Monthly average discharge for 1965 through 2012 is presented below in Table 92. Averages, maximums, and minimums of this data are presented at the top of Table 92 and in Figure 40. Figures 41-43 present average discharge for different periods. Figure 41 is water year discharge, Figure 42 is July through September discharge, and Figure 43 is September and October discharge (discharge is shown in both average cfs and total discharge in acre-feet). The period in Figure 42 (July-September) was chosen since this a critical period for water supply, while the period in Figure 43 (September and October) was chosen since this is a critical period for low flows in the Basin.

Table 92. Average, maximum, minimum, and monthly average discharge for 1965 -2012.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg.	1605	1453	1293	1266	1189	868	513	356	331	456	969	1354
Max.	3313	4217	2915	2230	2418	2012	1078	624	517	996	2546	4109
Min.	363	430	618	704	532	278	229	194	180	218	282	438
1965	2726 ²	1831	1122	1498	1156	723	448	395	301	340	638	662
1966	1426	710	1212	1617	1243	741	499	303	286	424	881	1179
1967	1897	1283	848	713	876	668	383	276	271	753	734	1197
1968	1073	2840	1112	807	653	488	317	349	411	723	1821	1346
1969	1599	720	1223	1887	2418	1503	574	351	352	495	600	1024
1970	2878	2057	1591	1202	1144	834	472	323	336	400	1218	1023
1971	2888	1866	1418	1450	1859	1359	899	556	517	527	1105	1453
1972	2461	2455	2915	1441	1568	1125	743	484	449	403	727	1914
1973	1491	775	841	704	559	464	345	266	354	452	1687	2447
1974	3313	1794	1497	1687	1765	2012	1078	624	437	395	678	1538
1975	2543	1389	1396	898	1175	958	677	424	364	607	1193	2975
1976	2411	1403	1173	1319	1629	936	683	471	386	330	431	438
1977	452	430	681	743	619	503	256	287	411	408	1796	4109
1978	1317	1334	1157	943	879	559	387	343	398	338	484	863
1979	363	1360	1258	1005	1023	506	377	305	323	383	472	1211
1980	1322	1277	1313	1634	1150	681	445	301	309	327	759	2392
1981	1050	2264	915	1095	798	1079	422	318	329	499	679	2000
1982	1904	3367	1348	1081	1145	925	596	411	430	641	849	1479
1983	2521	1957	1977	1300	965	708	651	487	447	375	1232	990
1984	1871	1440	1607	1179	1411	1118	584	392	399	579	1561	1105
1985	663	737	823	1580	1298	1143	521	335	366	553	1001	516
1986	989	2291	2047	1133	993	669	394	285	256	301	1207	631
1987	623	1282	1307	1077	825	445	324	252	229	218	282	1229
1988	757	1069	1189	1485	1016	741	422	284	258	316	1341	954
1989	1397	718	1290	1635	1030	696	443	350	279	332	604	904
1990	1593	1249	1010	1444	960	915	474	319	268	512	1122	870
1991	1435	1400	936	1102	813	553	413	305	248	276	952	1139
1992	857	1275	711	905	532	278	229	209	268	302	807	665
1993	612	546	1626	1685	1496	897	443	313	242	285	286	641
1994	1250	695	1096	1003	654	493	338	211	188	613	993	1562
1995	1475	2671	1225	1015	927	595	475	298	298	597	2546	2467
1996	2404	4217	1527	1803	1389	817	543	375	328	643	1185	2115
1997	2527	1991	2604	2230	2070	1146	734	539	501	996	1084	960
1998	1663	1384	1294	943	1161	817	539	340	328	406	1080	2220
1999	1710	1664	1293	975	1296	1196	738	529	336	386	1410	1808
2000	1042	1374	1192	1606	1376	986	524	364	355	595	499	527
2001	485	531	780	789	997	493	307	266	215	399	737	1316
2002	1392	1012	1081	1498	1193	1103	599	319	278	329	358	511
2003	1360	1324	1706	1114	862	538	372	261	275	403	564	902
2004	1034	1052	1238	1030	923	775	424	454	471	459	530	739
2005	733	479	618	896	681	395	267	194	180	381	907	1040
2006	2527	1456	803	1096	1205	882	467	279	255	296	2261	2336
2007	1926	1343	1571	1112	859	547	422	272	247	560	707	1639
2008	1128	1058	1253	972	2330	1907	965	568	354	479	1010	804
2009	2145	777	1100	1483	2123	1085	553	359	314	431	779	808
2010	1344	948	932	1078	1046	1381	529	324	370	467	904	1816
2011	2454	1095	1439	1870	1393	1158	661	404	337	477	849	1154
2012	2031	1559	1785	1990	1565	1115	659	421	335	691	1220	1350

Note: ¹ All values CFS.

² Value presented for January 1965 based on data for January 16-31 only.

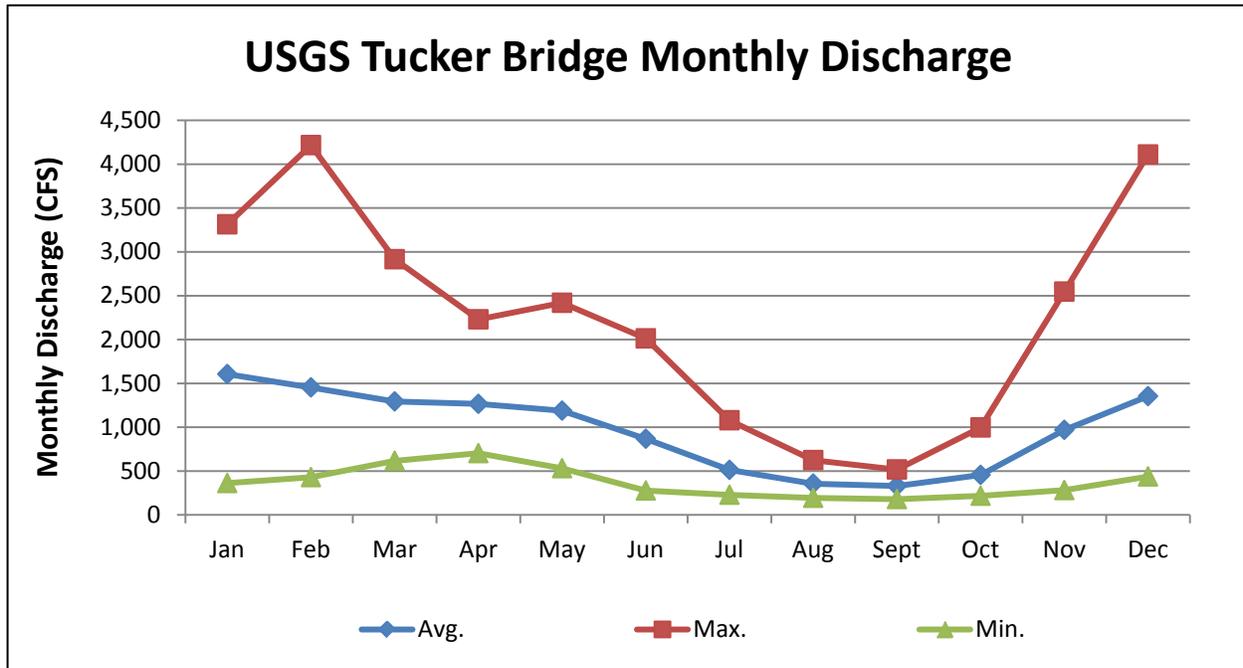


Figure 40. Average, maximum, and minimum monthly flow at USGS Tucker Bridge gauge.

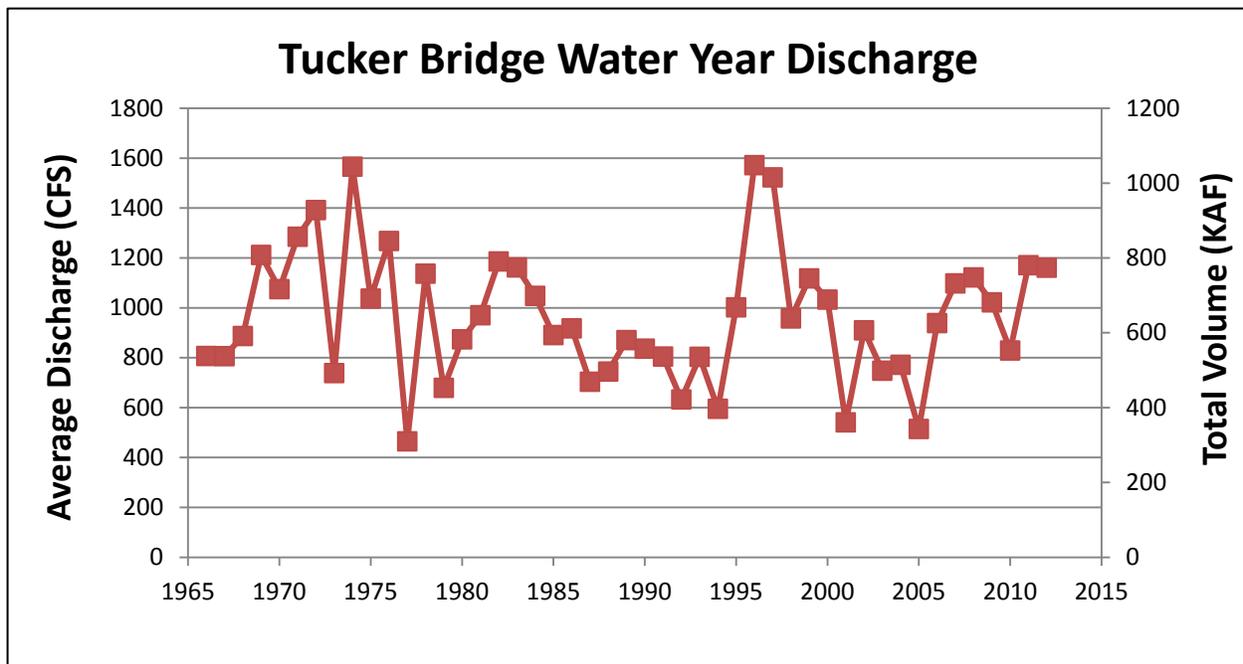


Figure 41. Total water year discharge at USGS Tucker Bridge gauge.

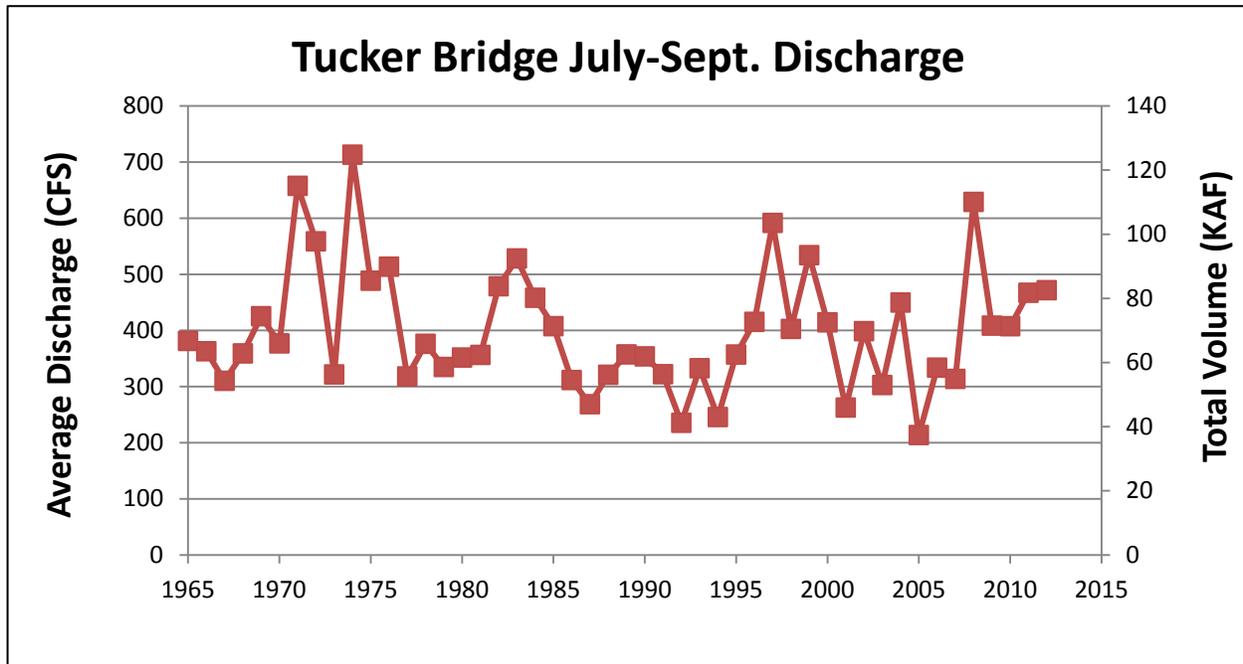


Figure 42. July through September discharge at USGS Tucker Bridge gauge.

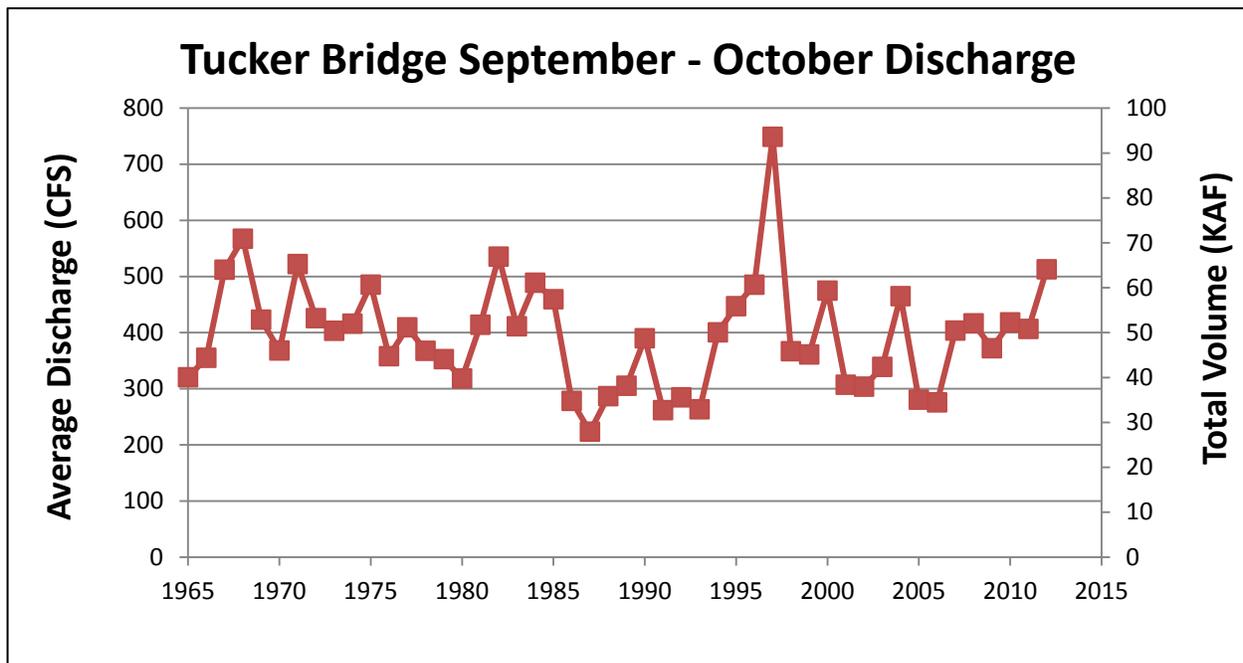


Figure 43. September through October discharge at USGS Tucker Bridge gauge.

3.6.2 Naturalized Flow

Streamflow simulated by the DHSVM model is natural (i.e. does not contain the effects of diversions or regulations) and the model therefore must be calibrated against similar natural streamflow data. The main calibration point for the DHSVM model in the basin is the USGS stream gauge at Tucker Bridge which reflects regulated flow (i.e. non-natural) since it contains the effects of withdrawals and reservoir operations. To that extent, the USGS Tucker Bridge flow data must be “naturalized” to be used in calibrating the DHSVM model.

The main effects of regulation on the USGS Tucker Bridge stream gauge come from the following sources:

1. Laurance Lake operations
2. MFID diversions
3. MFID Plant 3 return flow
4. DID diversions
5. EFID diversions
6. MHID diversions
7. Combined Greenpoint reservoirs operations
8. FID diversions (return flow not included since location is downstream of Tucker Bridge gauge)
9. Potable water diversions

To create naturalized streamflow, a timeseries was created by adding together values that reduce the natural streamflow (i. e. diversions and filling of reservoirs) and subtracting off values that supplement natural streamflow (i.e. return flows and reservoir drawdowns). This timeseries can then be added to the Tucker Bridge gauged streamflow to create Tucker Bridge naturalized streamflow.

Since some water users listed in 1-9 above do not have actual timeseries of use, but instead have estimated average monthly uses (e.g. MHID), two different methods were used to naturalize streamflows. The first method uses only average monthly values for all entities in 1-9 to create average monthly naturalizing data (Table 93). The second methods uses the same average monthly values for small users and/or those without significant inter-annual variability, but uses actual timeseries data where possible for the significant sources that may change from year to year. This includes EFID diversions (avg. peak of 113.9 cfs can vary +/- 10%), Laurance Lake operations, and Greenpoint reservoirs operations. Data for the 2001-2011 timeseries of naturalizing data is contained in Appendix C, while a comparison of the two methods is shown in Figure 44.

Figure 44 shows that the two methods produce fairly similar results. Notable points of difference include; October 2003 during which EFID did not have any diversion, summer 2005 when EFID had its lowest peak diversion, and summer 2012 when EFID had its highest peak diversion. The shorter spikes in the 2001-2012 timeseries are a result of reservoir operations. For example, the higher than average values for February 2003 and December 2006 are due to Laurance Lake increasing storage volumes by approximately 2,000 acre-feet during those months.

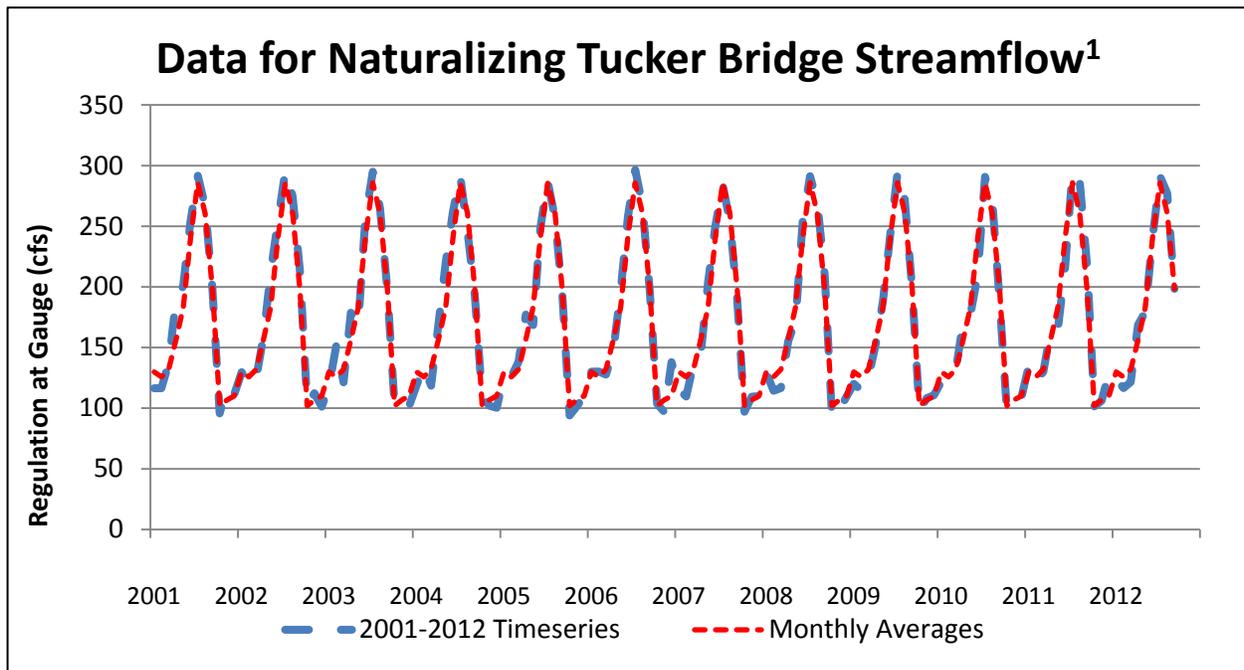


Figure 44. Monthly values for naturalizing Tucker Bridge USGS streamflow data.
 Notes: ¹ Values to be added to USGS Tucker Bridge Streamflow to create naturalized streamflow.

Table 93. Monthly average diversion values for generating naturalized USGS Tucker Bridge streamflow data.

District	Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
DID	Diversion	3.0	0.0	0.0	0.0	0.0	3.0	5.0	6.0	12.5	12.5	12.5	12.5
EFID	Diversion	21.9	0.0	0.0	0.0	0.0	12.0	33.6	65.0	115.1	137.6	134.6	94.5
FID	Diversion	73.1	90.3	91.3	106.1	108.1	94.1	111.9	102.3	88.5	97.7	97.6	89.4
	Storage	0	0	0	5.9	3.2	7.7	0	0	-1	-3	-7.1	-5.6
MFID	Diversion	29.9	34.9	41.0	40.3	41.6	44.4	42.9	43.7	55.6	63.5	58.2	47.7
	Return	-29.3	-32.4	-37.8	-38.6	-40.7	-39.7	-39.2	-37.2	-27.7	-9.1	-9.9	-19.3
	Storage	-4.2	-1.6	7.6	7.5	6.3	-4.5	-0.2	4.3	6.0	-0.4	-9.0	-9.5
MHID	Diversion	0.5	0.0	0.0	0.0	0.0	0.0	1.2	3.1	7.1	10.1	7.5	4.0
Potable	Diversion	7.44	7.39	7.81	8.66	7.23	8.36	9.49	12.00	13.92	12.44	10.62	9.23
Total		102.0	106.8	110.1	129.9	125.9	132.0	156.3	183.2	240.8	285.9	260.7	198.4

Notes: ¹ Values in table are assigned positive or negative based on whether they should be added or subtracted to create naturalized streamflow.

² Storage values are negative when reservoirs are drawn down, and positive when filling (i.e. filling counted similar to diversion).

4 References

American Water Works Association, 1999. Residential End Uses of Water, American Water Works Association Research Foundation. 1999.

City of Hood River Draft Water Management and Conservation Plan, 2013. Bell Design Company, PO Box 308, Bingen, Washington 98605. March 2013.

Crystal Springs Master Plan, 2006. Tetra Tech/KCM, 7080 SW Fir Loop, Portland, Oregon 97223. May 2006.

East Fork Irrigation District Water Management and Conservation Plan, 2011. East Fork Irrigation District, PO Box 162, Odell, Oregon 97044. March 2011.

Farmers Irrigation District Water Management and Conservation Plan, 2011. Farmers Irrigation District, 1985 Country Club Road, Hood River, Oregon 97031. January 2011

Hood River Soil and Water Conservation District, 2008. Hood River County Rural Living handbook prepared by Hood River Soil and Water Conservation District, 3007 Experiment Station Road, Hood River, Oregon 97031. February 2008.

Middle Fork Irrigation District Water Management and Conservation Plan, 2011. Middle Fork Irrigation District with assistance from H & R Engineering. PO Box 291, Parkdale, Oregon 97041. November 2011.

Wy' East Surveys, 2002. Topographic Survey by Wy' East Surveyors, 4399 Woodworth Drive, Mt. Hood, Oregon 97041. June 2002.

Odell Water Company Water Plan, 1999. Wallis Engineering, 119 East 8th Street, Vancouver, Washington 98660. September 1999.

5 Appendices

5.1 Appendix A – Oregon Water Resource Department Water Rights Geodatabase

Electronic appendix available at <http://www.co.hood-river.or.us/>

5.2 Appendix B - Oregon Water Resource Department Water Use Reports

Electronic appendix available at <http://www.co.hood-river.or.us/>

5.3 Appendix C – Timeseries Data for Naturalizing Tucker Bridge Streamflow

Electronic appendix available at <http://www.co.hood-river.or.us/>