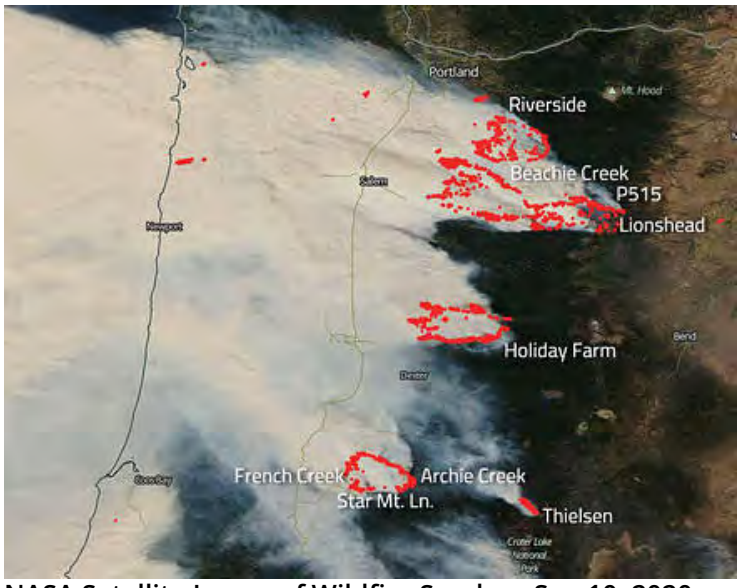
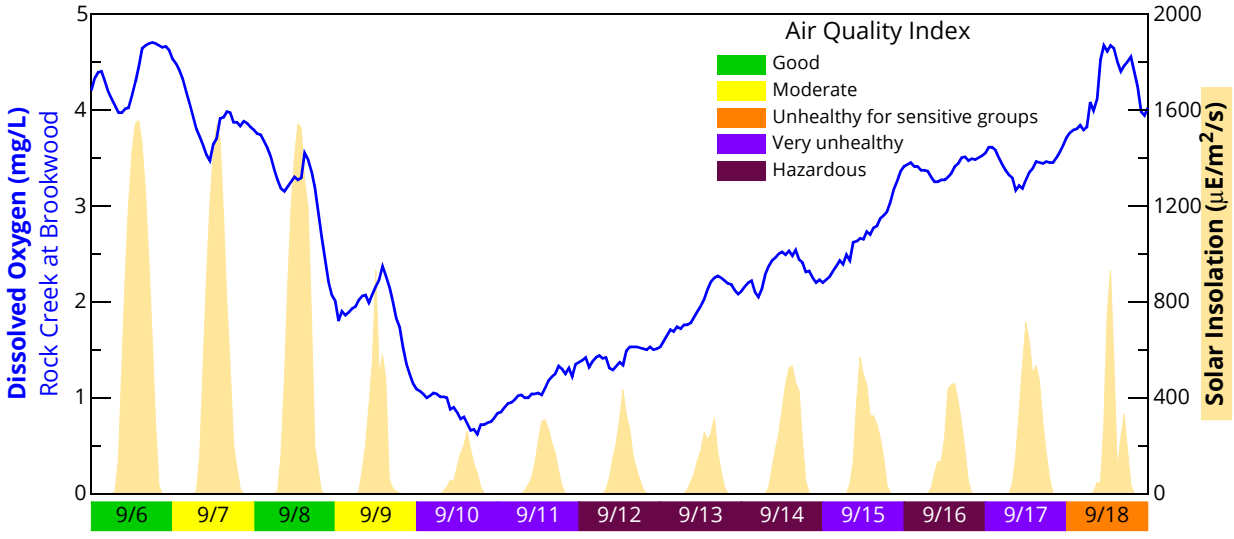
TUALATIN RIVER FLOW MANAGEMENT TECHNICAL COMMITTEE



NASA Satellite Image of Wildfire Smoke – Sep 10, 2020

September Wildfire Effects

Strong east winds on September 7-8 downed power lines and fanned wildfires in western Oregon, including a fire near Hagg Lake. By September 10, thick smoke from large fires in the Cascade foothills blanketed the Willamette Valley, blocking sunlight and causing hazardous air quality. With little sunlight, air and stream temperatures dropped and photosynthesis by aquatic plants all but ceased. In small, low flow streams such as Beaverton and Rock Creeks, plant respiration drove dissolved oxygen levels below 1 mg/L. Conditions improved on September 18 when more than an inch of rain fell.



2020 Annual Report

prepared by
Bernie Bonn for
Clean Water Services

Cover photo: NASA
https://www.nasa.gov/image-feature/goddard/2020/nasas-aqua-satellite-captures-devastating-wildfires-in-oregon

Data for Graph:
USGS: Dissolved oxygen at Rock Creek at Brookwood, Solar insolation at Durham WWTF
Multnomah County: Air Quality Index

Tualatin River Flow Management Technical Committee

2020 Annual Report

Prepared by: Bernie Bonn *For:* Clean Water Services

FLOW MANAGEMENT TECHNICAL COMMITTEE MEMBERS

Kristel Griffith, Chair	*City of Hillsboro Water Department*
John Goans	*Tualatin Valley Irrigation District*
Jake Constans	*Oregon Water Resources Department*
Raj Kapur	*Clean Water Services*
Laura Porter	*Clean Water Services*
Chris Walsh	*Washington County — Emergency Management System*
Mark Rosenkranz	*Lake Oswego Corporation*
Brian Dixon	*City of Forest Grove*

ACRONYMS USED IN THIS REPORT

Full Name	Acronym
Facilities	
Spring Hill Pumping Plant	SHPP
Wastewater Treatment Facility	WWTF
Organization	
Barney Reservoir Joint Ownership Commission	BRJOC
Clean Water Services	CWS
Joint Water Commission	JWC
Lake Oswego Corporation	LOC
Oregon Department of Environmental Quality	ODEQ
Oregon Department of Fish and Wildlife	ODFW
Oregon Department of Forestry	ODF
Oregon Water Resources Department	OWRD
National Marine Fisheries Service	NMFS
Tualatin Valley Irrigation District	TVID
Tualatin Valley Water District	TVWD
Bureau of Reclamation	BOR
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS

Full Name	Acronym
Units of Measurement	
Acre-Feet	ac-ft
Cubic Feet per Second	cfs
Micrograms per liter	µg/L
Milligrams per Liter	mg/L
Million Gallons per Day	MGD
Pounds	lbs
River Mile	RM
Water Year	WY
Water Quality Parameters	
Biochemical Oxygen Demand	BOD
Dissolved Oxygen	DO
Sediment Oxygen Demand	SOD
Other	
Biological Opinion	BiOp
Total Maximum Daily Load	TMDL
Wasteload Allocation	WLA

Disclaimer

This report and the data presented herein are provided without any warranty, explicit or implied. The data presented in this report were supplied by the members of the committee. Although every effort was made to faithfully reproduce the data as provided, the data are not warranted to be accurate, appropriate for interpretation, merchantable, or suitable for any particular purpose.

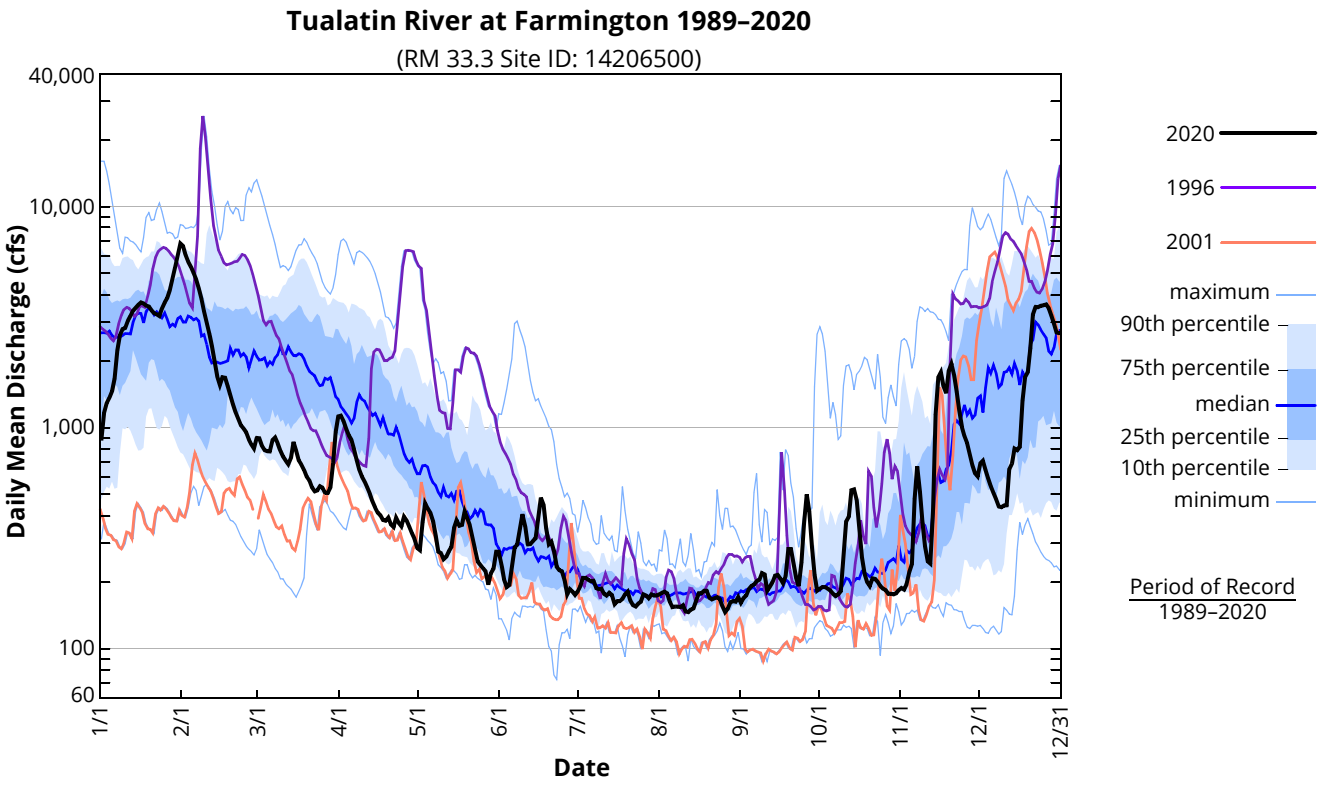
TABLE OF CONTENTS

2020 SUMMARY

This is the thirtieth year that the Tualatin River Flow Management Technical Committee has prepared an annual report documenting the flow management of the Tualatin River. Members of the committee include Clean Water Services (CWS), Tualatin Valley Irrigation District (TVID), Joint Water Commission (JWC), Lake Oswego Corporation (LOC) and Oregon Water Resources Department (OWRD).

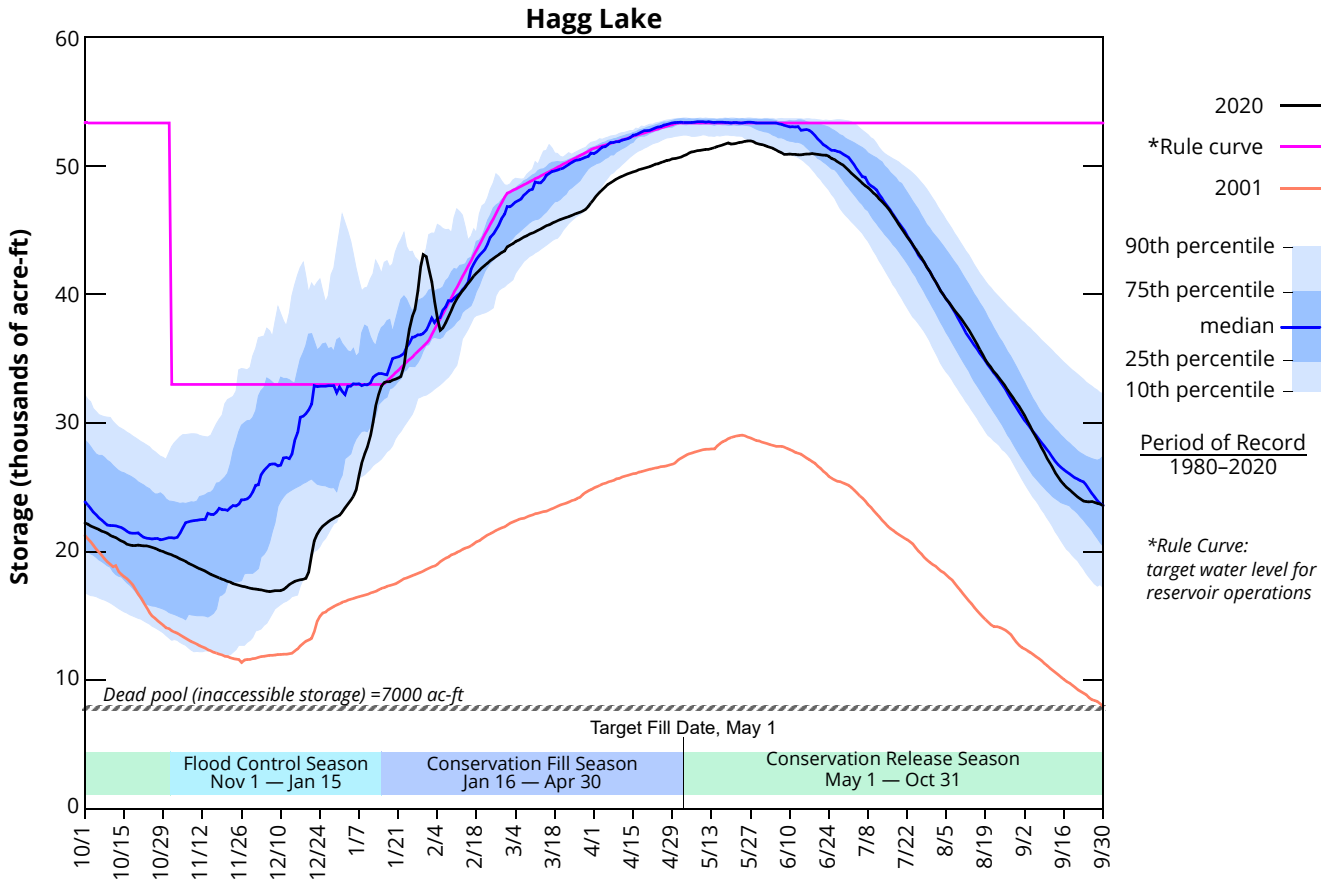
HIGHLIGHTS

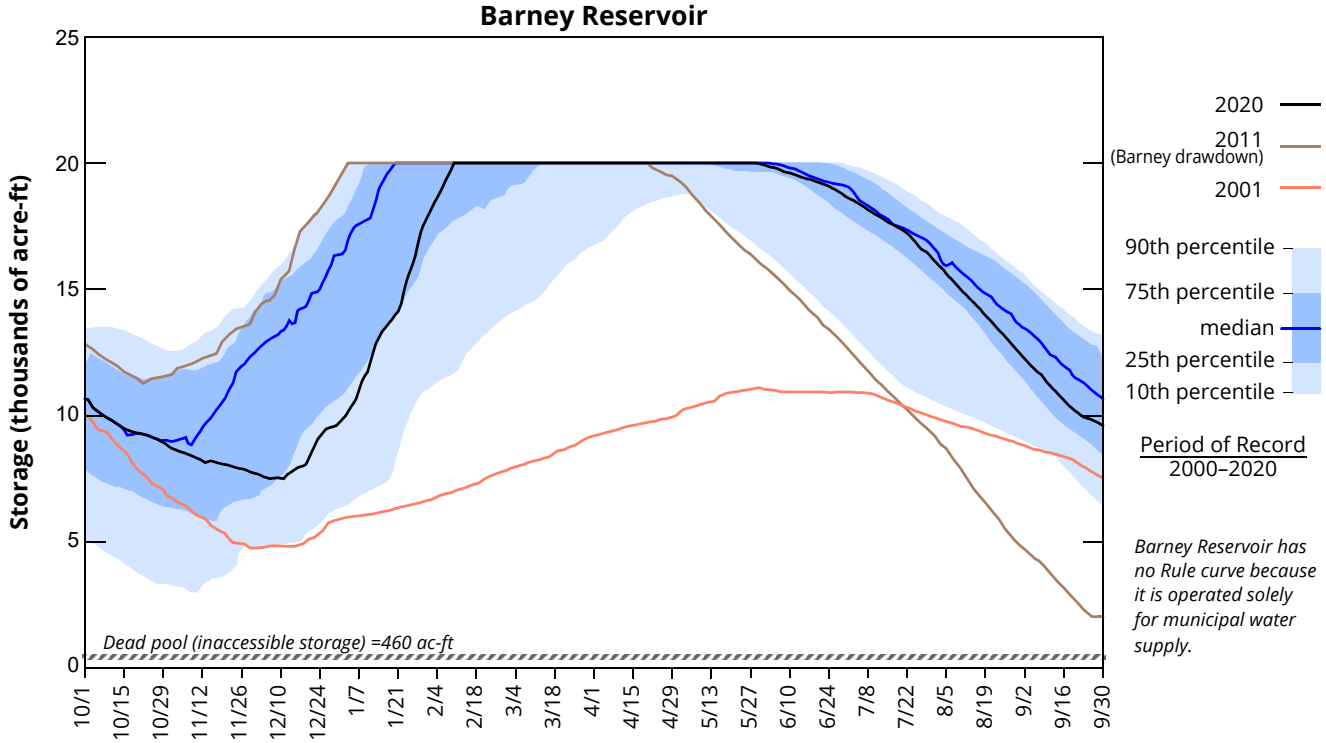
- Hagg Lake reached 97% full pool. Barney Reservoir filled. The fill curves are on the following page.
- Regulation of river water began on May 28 and continued through November 16, 173 days total.
- Wildfires flared in western Oregon during the second week of September, including a fire in the Scoggins Basin which caused power outages for JWC. Heavy wildfire smoke blanketed the area, resulting in hazardous air quality and blocking sunlight, The lack of light all but stopped photosynthesis. In several tributaries the lack of oxygen production by aquatic plants and algae coupled with oxygen consumption from respiration and SOD drove the dissolved oxygen levels to less than 1 mg/L.
- Clean Water Services tested a new biological method of phosphorus removal that does not add alum in the tertiary process, thereby reducing aluminum levels in the discharge. The new method resulted in higher concentrations of phosphorus in the Tualatin River. A few small algal blooms occurred and chlorophyll-a concentrations were higher than in recent years, Chlorophyll-a remained below the action level and there were no pH violations. Higher phosphorus concentrations in the Tualatin River may be a concern for Oswego Lake which receives water diverted from the Tualatin River.
- Weather highlights:
  - —Total rainfall for the 2020 water year was 8-10 inches lower than the period of record median at every site except South Saddle Mountain where the difference was less.
  - —Rainfall in November 2019 (WY 2020) was especially low and set records at many sites. February through April were drier than usual. Records for low monthly rainfall were set at several sites in April.
- Health restrictions related to the COVID-19 epidemic changed how business was conducted in 2020. The Tualatin River Flow Management Technical Committee held its regular meetings by video conference. Many of the committee representatives worked remotely.



Reservoir Status

Hagg Lake reached 51,956 ac-ft (97% of full pool) on May 27, 2020. Barney Reservoir reached full pool on February 10, 2020. The reservoir levels for WY 2020 and the filling histories are shown below.





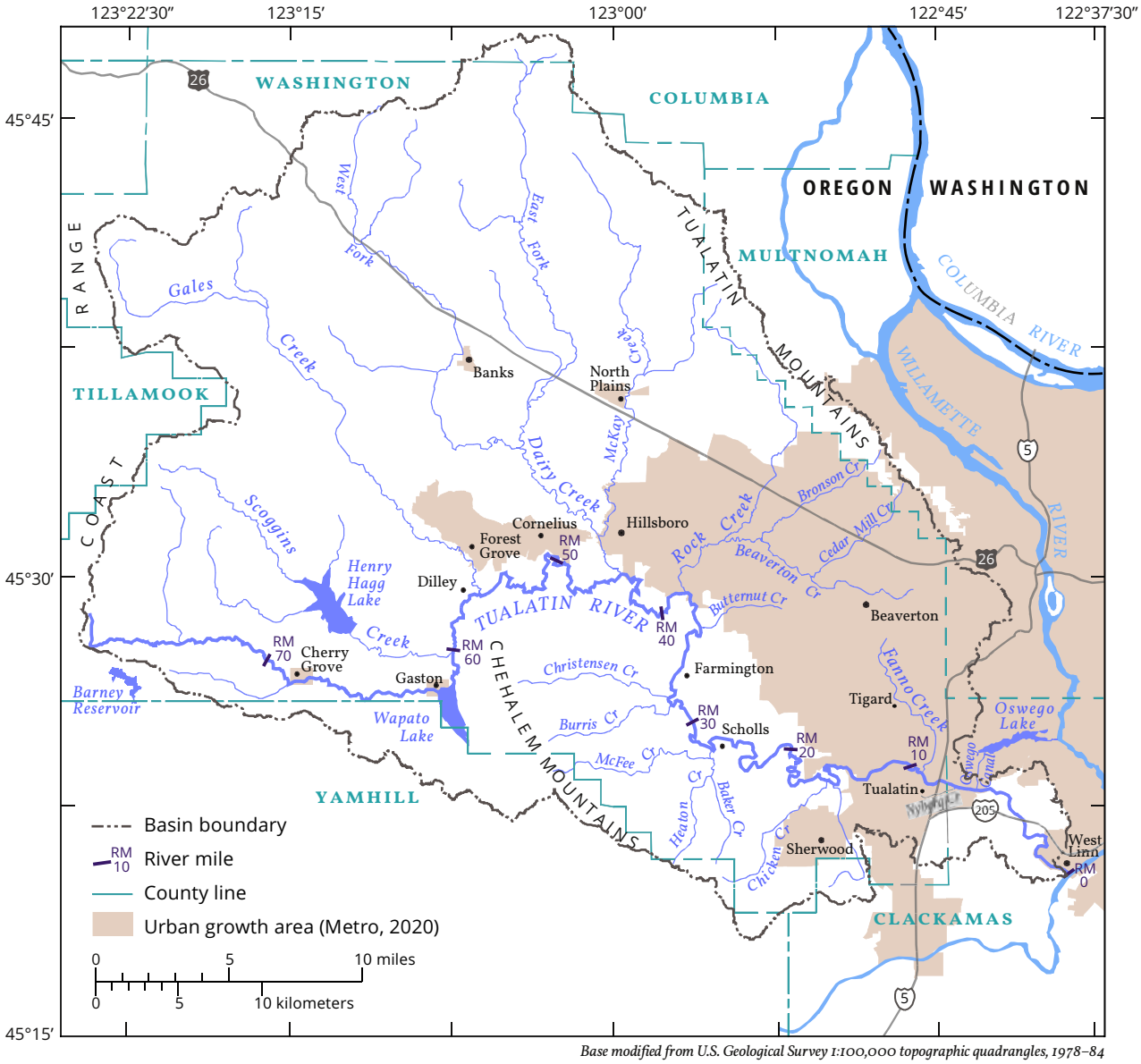
BACKGROUND

Basin Description

The Tualatin River Basin consists of 712 square miles in the northwest corner of Oregon and is a subbasin of the Willamette River. The basin lies almost entirely in Washington County. (See map below.)

The Tualatin River flows in a generally easterly direction from its headwaters in the Coast Range to its confluence with the Willamette River just upstream of Willamette Falls near West Linn. It can be divided into 4 different reaches.

Reach	Location	Width	Average Slope	Characteristics
Headwater	> RM 55	about 15 ft	74 ft/mi	fast moving, steep terrain
Meander	RM 55–33	about 20–50 ft	1.3 ft/mi	slow moving, meandering on valley bottom
Reservoir	RM 33–3.4	wide, up to 150 ft	0.08 ft/mi	slow moving, lake-like with deep pools
Riffle	RM 3.4–0	variable	10 ft/mi	short reservoir section to a narrow gorge



Base modified from U.S. Geological Survey 1:100,000 topographic quadrangles, 1978–84

Water sources to the Tualatin River

Precipitation: Seasonal rainfall accounts for most of the natural flow in the Tualatin Basin; streamflow from snowmelt is minimal. The amount of rainfall ranges from 110 inches on the eastern slopes of the Coast Range to 37 inches in the southeastern area of the drainage basin. Peak months for rainfall are November through February while the driest months are normally June through October. The peak streamflow month is usually February and the lowest streamflow month is August. Precipitation records can be found in Appendix G.

Barney Reservoir: Barney Reservoir is located behind Eldon Mills Dam on the Middle Fork of the North Fork of the Trask River (outside of the Tualatin Basin). A trans-basin aqueduct carries water over a low Coast Range divide to a pipeline that discharges into the Tualatin River at RM 78. Barney Reservoir has a capacity of 20,000 acre-feet and stores water for the Joint Water Commission (Cities of Hillsboro, Forest Grove and Beaverton, and the Tualatin Valley Water District) and Clean Water Services. The Barney Reservoir Joint Ownership Commission owns, operates and manages Barney Reservoir. Reservoir content is monitored through calibrated reservoir elevations; water releases are monitored using a stream gage located in the outlet flume. Water is released during the summer low-flow season to supplement shortages in natural flow. The water is used for municipal supply and for instream water quality. Storage in Barney Reservoir is also allocated to the Oregon Department of Fish and Wildlife. Those flows, to the Trask River, are measured using an instream weir. Reports on Barney Reservoir operation can be found in Appendix D.

Hagg Lake: In the early 1970s the Bureau of Reclamation built an earthen dam on Scoggins Creek (RM 5.1). Releases from Henry Hagg Lake (the reservoir behind Scoggins Dam) flow down Scoggins Creek and enter the Tualatin River at RM 60.0. Hagg Lake has an active storage capacity of 53,323 acre-feet. Its water is used for irrigation, municipal and industrial supply, and water quality enhancement.

Scoggins Dam is operated and maintained by the Tualatin Valley Irrigation District under contract with the Bureau of Reclamation. Flow into Scoggins Creek (RM 4.8) is monitored by a Bureau of Reclamation stream gage; Oregon Water Resources Department maintains the rating curve for this site. Reports on Scoggins Dam operation can be found in Appendix C.

Clean Water Services: Clean Water Services provides wastewater treatment, stormwater management, and watershed management services primarily in urban areas of Washington County. A watershed-based NPDES permit allows Clean Water Services to discharge treated wastewater into the Tualatin River from four wastewater treatment facilities (WWTFs). The Rock Creek and Durham WWTFs (RM 38.1 and 9.3, respectively) are the largest. The Forest Grove and Hillsboro WWTFs (RM 55.2 and 43.8, respectively) are much smaller and prior to 2017 did not discharge during the dry season (generally May–October). In 2017, Clean Water Services began treating wastewater from the Forest Grove and Hillsboro service areas during the dry season at the Forest Grove WWTF and then directing it through a 95-acre natural treatment system (NTS) at Forest Grove prior to discharge into the Tualatin River at RM 55.2. WWTF flow rates are continuously monitored at each WWTF. Clean Water Services also releases storage water from Hagg Lake and Barney Reservoir for flow augmentation during the summer and early fall. (River mile locations given here are based on USGS topographic maps and may be slightly different from those used in Clean Water Services' watershed-based NPDES permit which are from a different source.)

Water sources to the tributaries

Clean Water Services: Clean Water Services partners with the Tualatin Valley Irrigation District to deliver water to several tributaries for flow restoration in the summer. Approximately 1 to 2.5 cfs of water has been added to McKay Creek every year since 2005. Similar measures have been implemented for Gales Creek (2009), East Fork Dairy Creek (2010), and West Fork Dairy Creek (2011). The goal of the program is to increase base flows in the tributaries, thereby improving water quality— specifically increasing the dissolved oxygen concentration and decreasing stream temperature. The flow augmentation water for the tributaries is from Clean Water Services' allocation in Hagg Lake and is delivered by TVID transmission lines.

Water diversions from the Tualatin River

Cherry Grove Intake (RM 73.2): The City of Hillsboro diverts water for municipal and industrial uses at the Cherry Grove Intake. This water is delivered to the rural residents of the Dilley and Cherry Grove areas (served by the City of Hillsboro), as well as the City of Gaston and the LA Water Cooperative (as Hillsboro wholesale customers). The diversion is less than 3 cfs and is monitored via metered flows.

Spring Hill Pumping Plant (RM 56.3): The Spring Hill Pumping Plant is the largest diversion facility on the river. It is owned by the Bureau of Reclamation (BOR) and operated jointly by the Tualatin Valley Irrigation District (TVID) and the Joint Water Commission (JWC). TVID, with a pumping capacity of approximately 90 MGD (140 cfs), delivers water to about 12,000 acres of irrigated cropland via a pressure pipeline. JWC, with a pumping capacity of approximately 86 MGD (133 cfs), delivers water to the Cities of Hillsboro, Forest Grove and Beaverton, to the Tualatin Valley Water District, and to the wholesale customers of these entities. Both TVID and JWC have natural flow water rights. When natural flow is not adequate, the Washington County Watermaster (part of the Oregon Water Resources Department) curtails some water rights. At that time, TVID and JWC release contracted stored water from Hagg Lake and Barney Reservoir to augment the low natural flow. Pumping rates are monitored by TVID and JWC using telemetry-equipped flow meters. Additional monitoring is provided by real-time stream gages on the Tualatin River located above and below the pumping plant and on Gales Creek.

Wapato Canal Diversion: Historically, TVID diverted water from the Tualatin River at the Wapato Canal Diversion (near RM 62), to the Wapato Improvement District and to surrounding TVID customers. The Wapato Improvement District drained Wapato Lake each year and its members farmed the lake bed. From 2007–2013, ownership of Wapato Lake transitioned to the US Fish and Wildlife Service who now manages it as the Wapato Lake National Wildlife Refuge. The duties of the now defunct Wapato Improvement District have been split between USFWS (to maintain the dike and levee system), and TVID (to operate and maintain the irrigation water delivery system). At this time flow in the Wapato Canal Diversion is not monitored.

Irrigation Withdrawals: Water is obtained directly from the Tualatin River for irrigation purposes by members of the TVID and by irrigators with natural flow water rights. About 5,000 acres of cropland served by TVID is irrigated with water obtained directly from the Tualatin River. Some of the discharge from the Rock Creek WWTF (RM 38.1) is contracted to TVID to be used by downstream irrigators.

Patton Valley Pump Plant: Tualatin Valley Irrigation District pumps water from Scoggins Creek (RM 1.71) into a low-pressure pipeline that serves customers along Patton Valley Road. Historically, this pipeline also diverted water into the upper Tualatin River (at RM 63.1 and RM 64.3) to supplement low flows in this reach, but this has not been needed in recent years due to releases from Barney Reservoir.

Oswego Lake Canal Diversion: The Lake Oswego Corporation (LOC) diverts a portion of the Tualatin flow into the Oswego Lake Canal at RM 6.7. A headwork structure regulates the flow into this mile long canal that feeds into Oswego Lake. The Lake Oswego Corporation has several natural flow water rights, including rights for hydropower generation, irrigation, and lake level maintenance. At RM 3.4, a combination diversion dam/fish ladder structure is used during low flow periods to elevate the Tualatin River enough to divert the flow into the canal. During most of the year, river elevation is adequate to allow diversion of the LOC water right. Historically, flash boards were installed to increase the water level during the summer, but they have not been used since 2003. The dam plus several natural basalt sills cause the water to pool in the reservoir reach. Flow in Oswego Lake Canal was monitored during the summer by a gaging station operated by the Oregon Water Resources Department, but that site was discontinued partway through 2011 and is not currently monitored.

Water diversions from the tributaries

Irrigation withdrawals: Water is obtained directly from some tributaries for irrigation by irrigators with natural flow water rights.

Forest Grove withdrawal: The City of Forest Grove owns part of the Clear Creek watershed in the Gales Creek basin. The city diverts water for municipal use at several locations in that watershed.

Tualatin River Water Management

Tualatin River Flow Management Technical Committee: The Tualatin River Flow Management Technical Committee provides a mechanism for the coordination and management of flow in the Tualatin River. The members of the committee are technical staff with detailed knowledge of the specific characteristics of flow in this river. The committee meets monthly from April through November. Meetings focus on the current status of the reservoirs. In addition, a variety of other water issues and any problems are discussed. Each member updates the committee on changes that could impact the flow management of the Tualatin. The communication, coordination and cooperation among the partner agencies has proven invaluable in managing the resource.

Data collection system: Water in the Tualatin Basin is monitored by gages on streams and flow meters on major diversions and wastewater treatment facility discharges. Stream gages are present along the mainstem Tualatin and all major tributaries that affect water distribution. Various water quality parameters are monitored at several sites. Many of these monitors have telemetry, making the data available in real-time. Throughout the season, daily operations can be monitored by Clean Water Services (CWS), Joint Water Commission (JWC), Tualatin Valley Irrigation District (TVID), and the Lake Oswego Corporation (LOC). A map showing monitoring locations is shown on the next page. Selected data are in the appendices of this report.

A coordinated information system was developed to provide flow information to all members of the committee. Flow conditions and a summary of daily releases are reported via daily email by the superintendent of Scoggins Dam. The JWC provides a daily email containing information about the rate of intake at the Spring Hill Pump Plant, releases from Scoggins and Barney Reservoirs, and available natural flow. Because use or release of water by any one of the entities can impact the other users, coordination of flow information is an important aspect of the committee's work.

The monitoring effort makes it possible to proactively manage storage, instream flows, and diversions so that minimum instream flow requirements and general compliance with water rights and storage agreements are met. Flow data are also required to calculate pollutant loads, which are necessary for the Total Maximum Daily Load (TMDL) program. Monitoring includes temperature as well as flow at some sites. As water quality issues have come to the forefront, the monitoring system has provided information vital to understanding the Tualatin Basin, helped guide basin management, and been an excellent example of interagency cooperation. The members of the Flow Management Committee appreciate the efforts of all those who provide data.

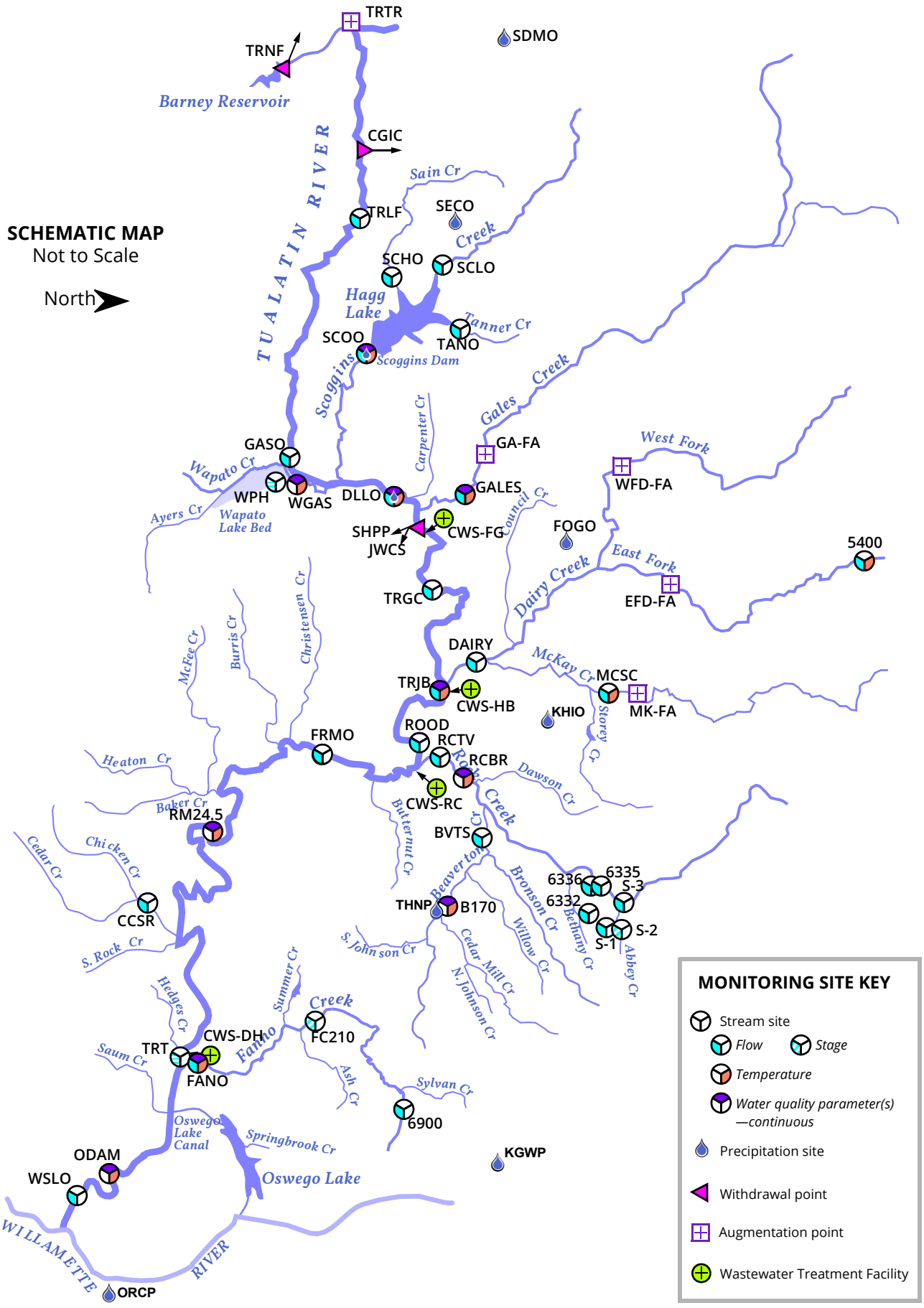
Some of the monitoring data for the Tualatin Basin can be accessed at the following web sites:

- Bureau of Reclamation data:
  `https://www.usbr.gov/pn/hydromet/tuatea.html`
- Oregon Water Resources Department data:
  `https://apps.wrd.state.or.us/apps/sw/hydro_near_real_time/`
- USGS data:
  `https://or.water.usgs.gov/tualatin/monitors/`

Annual Tualatin Basin Flow Management Report: This report is published annually and describes water management, accounting, storage, stream gaging, diversions, and effluent discharge for the Tualatin Basin. Annual reports dating from 1992 are available at:

https://www.co.washington.or.us/Watermaster/SurfaceWater/tualatin-river-flow-technical-committee-annual-report.cfm

Tualatin Basin Monitoring Sites



2020 MONITORING SITES — ALPHABETICAL LISTING BY SITE CODE

Location in Report

Main: Water Quality | Appendix A | Appendix B | Appendix F | Appendix G | Monitored, but not in report

Code	Site Name	Flow	Precipitation	Continuous Monitors: Temp	DO	pH	Cond	Turb	Chl-*a*	fDOM
Stream monitoring sites										
5400	East Fork Dairy Creek near Meacham Corner, OR									
6332	Bethany Creek at NW Springville Rd at Bethany, OR									
6335	Rock Creek at NW 185th Ave near Hillsboro, OR									
6336	Rock Creek Ditch at NW 185th Ave near Hillsboro, OR									
6900	Fanno Creek at 56th Avenue									
B170	Beaverton Creek at 170th Ave, Beaverton, OR									
BVTS	Beaverton Creek at Cornelius Pass Road (near Orenco)									
CCSR	Chicken Creek at Roy Rogers Rd near Sherwood, OR									
DAIRY	Dairy Creek at Hwy 8 near Hillsboro, Oregon									
DLLO	Tualatin River at Dilley, Oregon									
FANO	Fanno Creek at Durham Road near Tigard, Oregon									
FC210	Fanno Creek at Hwy210 at Beaverton, OR	Stage								
FOGO	Forest Grove, Oregon AgriMet Weather Station (Verboort)									
FRMO	Tualatin River at Farmington, Oregon									
GALES	Gales Creek at Old Hwy 47 near Forest Grove, Oregon									
GASO	Tualatin River at Gaston, Oregon									
KGWP	KGW-TV Weather Station									
KHIO	Hillsboro Airport Weather Station									
MCSC	McKay Ck at Scotch Church Rd abv Waible Ck nr North Plains									
ODAM	Tualatin River at Oswego Dam near West Linn, Oregon									
ORCP	Oregon City Precipitation Station									
RCBR	Rock Creek at Brookwood Avenue, Hillsboro, Oregon									
RCTV	Rock Creek at Hwy 8 near Hillsboro, Oregon									
RM24.5	Tualatin River at RM 24.5 near Scholls, Oregon									
ROOD	Tualatin River at Rood Bridge Road near Hillsboro, Oregon									
SCHO	Sain Creek above Henry Hagg Lake near Gaston, Oregon									
S-2	Rock Creek at NW Germantown Rd at Bethany, OR									
S-3	Abbey Creek at NW Kaiser Rd at Bethany	Stage								
SCLO	Scoggins Creek above Henry Hagg Lake near Gaston, Oregon									
SCOO	Scoggins Creek below Henry Hagg Lake near Gaston, Oregon									
SDMO	Saddle Mountain Precipitation Station (SNOTEL #726)									
SECO	Sain Creek Precipitation Station (SNOTEL #743)									
TANO	Tanner Creek above Henry Hagg Lake near Gaston, Oregon									
THNP	Tualatin Hills Nature Park Precipitation Station									
TRGC	Tualatin River at Golf Course Road near Cornelius, Oregon									
TRJB	Tualatin River at Hwy 219 Bridge									
TRLF	Tualatin River below Lee Falls near Cherry Grove, Oregon									
TRT	Tualatin River at Tualatin, Oregon	Stage								
WGAS	Wapato Creek at Gaston Road at Gaston, Oregon									
WPH	Wapato Canal at Pumphouse at Gaston, Oregon	Stage								
WSLO	Tualatin River at West Linn									
Monitored withdrawals and releases										
CGIC	City of Hillsboro Withdrawal at Cherry Grove									
CWS-DH	CWS Durham WWTF Discharge									
CWS-FG	CWS Forest Grove WWTF Discharge (with Fernhill NTS)									
CWS-HB	CWS Hillsboro WWTF Discharge									
CWS-RC	CWS Rock Creek WWTF Discharge									
EFD-FA	CWS East Fork Dairy Flow Augmentation with TVID									
GA-FA	CWS Gales Creek Flow Augmentation with TVID									
JWCS	Joint Water Commission Withdrawal at Spring Hill Pump Plant									
MK-FA	CWS McKay Creek Flow Augmentation with TVID									
SHPP	TVID–Withdrawal at Spring Hill Pump Plant									
TRNF	Barney Reservoir Measured Flow to North Fork Trask River									
TRTR	Barney Reservoir (Trask River) Release to Tualatin River									
WFD-FA	CWS West Fork Dairy Flow Augmentation with TVID									

Abbreviations: Temp=water temperature, DO=dissolved oxygen, Cond=conductance, Turb=turbidity, chl-*a*= =chlorophyll-*a*, fDOM=fluorescent dissolved organic matter;

CLEAN WATER SERVICES

by Raj Kapur, Water Resources Program Manager, Clean Water Services

Introduction

Clean Water Services (the District) provides wastewater treatment, stormwater management, and watershed management services to more than 600,000 customers primarily in the urban areas of Washington County. The District implements these programs in cooperation with twelve cities (Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin) and Washington County.

Wastewater treatment: The District owns and operates four wastewater treatment facilities (WWTFs) at sites in Forest Grove, Hillsboro, and Tigard. The Rock Creek and Durham WWTFs are the larger facilities and discharge directly to the Tualatin River year-round.

Rock Creek Wastewater Treatment Facility

The Forest Grove and Hillsboro WWTFs are considerably smaller than the other two facilities and discharge to the Tualatin River through their respective outfalls during the wet season. Since 2017, dry season wastewater from the Hillsboro and Forest Grove service areas is treated at the Forest Grove WWTF and then directed through a 95-acre natural treatment system (NTS) at Forest Grove before discharge to the Tualatin River at RM 55.2.

Durham Wastewater Treatment Facility

Stormwater management: Clean Water Services also implements the municipal separate storm sewer system (MS4) program in the urban parts of the Tualatin River watershed.

Watershed management: Activities occur across the entire Tualatin watershed and include streamflow enhancement in the mainstem Tualatin River and tributaries, and riparian and stream restoration.

Permits: The four WWTFs and the MS4 program are permitted by the Oregon Department of Environmental Quality (ODEQ) under a watershed-based National Pollutant Discharge Elimination System (NPDES) permit.

Flow augmentation program

During the summer low-flow season, Clean Water Services releases stored water to the Tualatin River and several tributaries. The District has rights to 24% of the water in Hagg Lake, which equates to 12,618 ac-ft. The District also owns 10% of the water in Barney Reservoir, which equates to 1,654 ac-ft after accounting for dead pool and required Oregon Department of Fish and Wildlife (ODFW) releases to the Trask River. In all, the District has 14,272 ac-ft of stored water available for use. The stored water releases serve multiple purposes including the following:

Offset thermal load from the District's WWTFs: The watershed-based permit provides Clean Water Services with a mechanism to offset a portion of the thermal load discharged from the Rock Creek, Durham and Forest Grove facilities by releasing stored water from Hagg Lake and Barney Reservoir. Stored water releases in July and August form the basis of the flow augmentation credit. The District offsets the remainder of its thermal load by planting riparian areas in the Tualatin River basin to increase shading of the stream channel.

Maintain minimum stream flows: The District's NPDES Permit is based on maintaining minimum stream flows in the Tualatin River above each WWTF. The District uses its stored water releases to maintain minimum stream flows during the summer and fall low-flow period.

Provide sustainable base flows in the upper Tualatin River: During the dry season, Clean Water Services' releases from Hagg Lake and Barney Reservoir can account for more than half of the flow in the Tualatin River in the 15-mile stretch between the Spring Hill Pump Plant (where water is withdrawn for municipal and irrigation uses) and Highway 219, where Dairy Creek enters the Tualatin River. The stored water releases provide sustainable base flows that support habitat for aquatic life and result in cooler river temperatures and higher dissolved oxygen levels.

Improve dissolved oxygen levels and enhance overall water quality in the lower Tualatin River: During the low flow season (summer and early fall) oxygen levels in the lower Tualatin River are heavily influenced by sediment oxygen demand. Sediment oxygen demand is consumption of oxygen by decaying substances in river sediment. When days are long and sunny, photosynthetic production of oxygen by algae tends to offset the oxygen consumed by sediment oxygen demand. However, when days grow short (September-October), or when it is cloudy, photosynthetic production of oxygen does not keep up with consumption of oxygen by sediment oxygen demand, causing oxygen levels to decrease. Clean Water Services' stored water releases from Hagg Lake and Barney Reservoir decrease the effect of sediment oxygen demand, thereby limiting the declines in dissolved oxygen levels in the lower Tualatin River that usually occur during the late summer/early fall period when photosynthetic oxygen production wanes.

Maintaining adequate dissolved oxygen is important for aquatic life and the general health of the river. In addition, dissolved oxygen levels measured downstream of the WWTFs are used to calculate the ammonia limits specified in the watershed-based NPDES permit.

Restore stream flows in Tualatin River tributaries: Clean Water Services uses Tualatin Valley Irrigation District transmission lines to deliver stored water to select tributaries to restore flow and improve water quality. In 2020, Clean Water Services released stored water into Gales Creek, West Fork Dairy Creek, East Fork Dairy Creek, and McKay Creek. Details are in Appendix B.

2020 Wastewater discharges

A watershed-based NPDES permit allows Clean Water Services to discharge treated wastewater into the Tualatin River from its WWTFs. A summary of the discharges is shown below. Details are in Appendix B.

WASTEWATER TREATMENT FACILITY DISCHARGES 2020

Rock Creek WWTF annual average	Durham WWTF annual average	Forest Grove WWTF and NTS* annual average	Hillsboro WWTF wet season average**
46.6 cfs [30.1 MGD]	31.3 cfs [20.2 MGD]	5.02 cfs [3.25 MGD]	6.82 cfs [4.41 MGD]

*Discharge may be through WWTF outfall, the NTS, or a combination of the two, except during the dry season (generally May–October), when it is only through the NTS.
**Wet season is generally January–April plus November and December; dry season is generally May–October.

2020 Water releases for flow augmentation

Clean Water Services released flow augmentation water for 155 days in 2020. The total average daily release (for days with releases) was 39.3 cfs. In all, 12,096 acre-feet were released. This is 85% of the District's allocation. The amount of water available to and released by Clean Water Services during 2020 is summarized below.

CLEAN WATER SERVICES WATER AVAILABILITY AND USE — 2020

Reservoir		Maximum Available (acre-ft)	Available (acre-ft)	Total CWS Release (acre-ft)
Hagg Lake	Storage	12,618	12,618	10,458
	Natural flow credit	4,282	0	—
Barney Reservoir	Storage	2,000	1,654	1,639
	Summer storage*	—	0	—
Total		**18,900**	**14,272**	**12,096**
Percent of available				**85.0%**

*Summer storage is water from rain that is stored in Barney Reservoir after releases have begun for the season. Summer storage (when it occurs) is allocated among the members of the Barney Partnership.

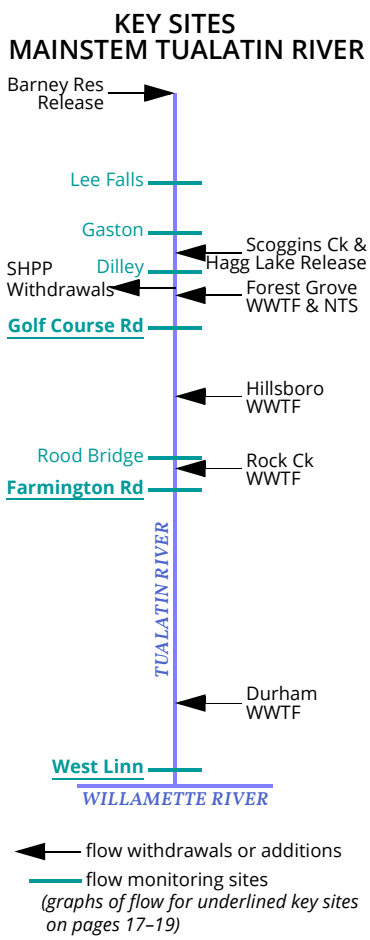
Details by month and reservoir: The District released stored water intermittently from Hagg Lake in May and June to maintain minimum stream flows in the Tualatin River. Thereafter, stored water was continuously released from Hagg Lake from June 24 to November 14. The District continued to release stored water from Hagg Lake into November until the onset of fall rains. The District initiated stored water releases from Barney Reservoir on September 1 and ended on October 29. Details of releases by month are shown below.

CLEAN WATER SERVICES WATER RELEASE SUMMARY — 2020

	Units	May	June	July	Aug	Sept	Oct	Nov	Total
Hagg Lake Release	acre-ft	139	278	2,123	2,916	2,313	1,984	704	10,458
	days	7	12	31	31	30	31	13	155
Barney Release	acre-ft	0	0	0	0	833	806	0	1,639
	days	0	0	0	0	30	29	0	59
Total Release	acre-ft	139	278	2,123	2,916	3,147	2,790	704	12,096
Daily Average Release (for days with releases)	cfs	10.0	11.7	34.5	47.4	52.9	45.4	27.3	39.3

Flow augmentation effects on Tualatin River flow— 2020

Flow is monitored in the upper, middle and lower reaches of the river and informs the management of stored water releases. The figure at the right illustrates the locations of several significant additions and withdrawals along with several key monitoring sites.



Flow targets in the Tualatin River have evolved as the understanding of the river has changed and new objectives were added. The District began managing stored water releases in 1987 with a goal of preventing the large nuisance algal blooms that were then common during the summer. In the early 1990s, work by the US Geological Survey showed that releasing water in the late summer could improve low oxygen conditions by lessening the expression of sediment oxygen demand and the District increased late season flow targets. Flow targets changed again in 2004 when stored water releases were allowed to offset some of the thermal loads from the WWTFs. New mixing zone studies have also affected flow targets as have effluent load limits which are calculated from river flows. The current flow targets are used at three key sites and are applied for the entire dry season (May–October).

FLOW TARGETS AND MEASURED FLOWS AT KEY SITES — 2020

	Golf Course Rd	Rood Bridge Rd	Farmington Rd
Flow target	60 cfs	110 cfs	160 cfs
Daily mean flow (May–October)			
minimum	61 cfs	93 cfs	147 cfs
average	119 cfs	163 cfs	236 cfs

Low flow period: For the purposes of discharges from the WWTFs, the low flow period is defined as beginning on the first day after April 30 when the 7-day consecutive median flow in the Tualatin River at Farmington is less than 250 cfs or July 1, whichever is earlier. Similarly, the low flow period ends on the first day after September 30 when the 7-day consecutive median flow in the Tualatin River at Farmington is at least 350 cfs or November 15, whichever is earlier. The low flow period for the WWTFs was from May 28 through October 15 in 2020.

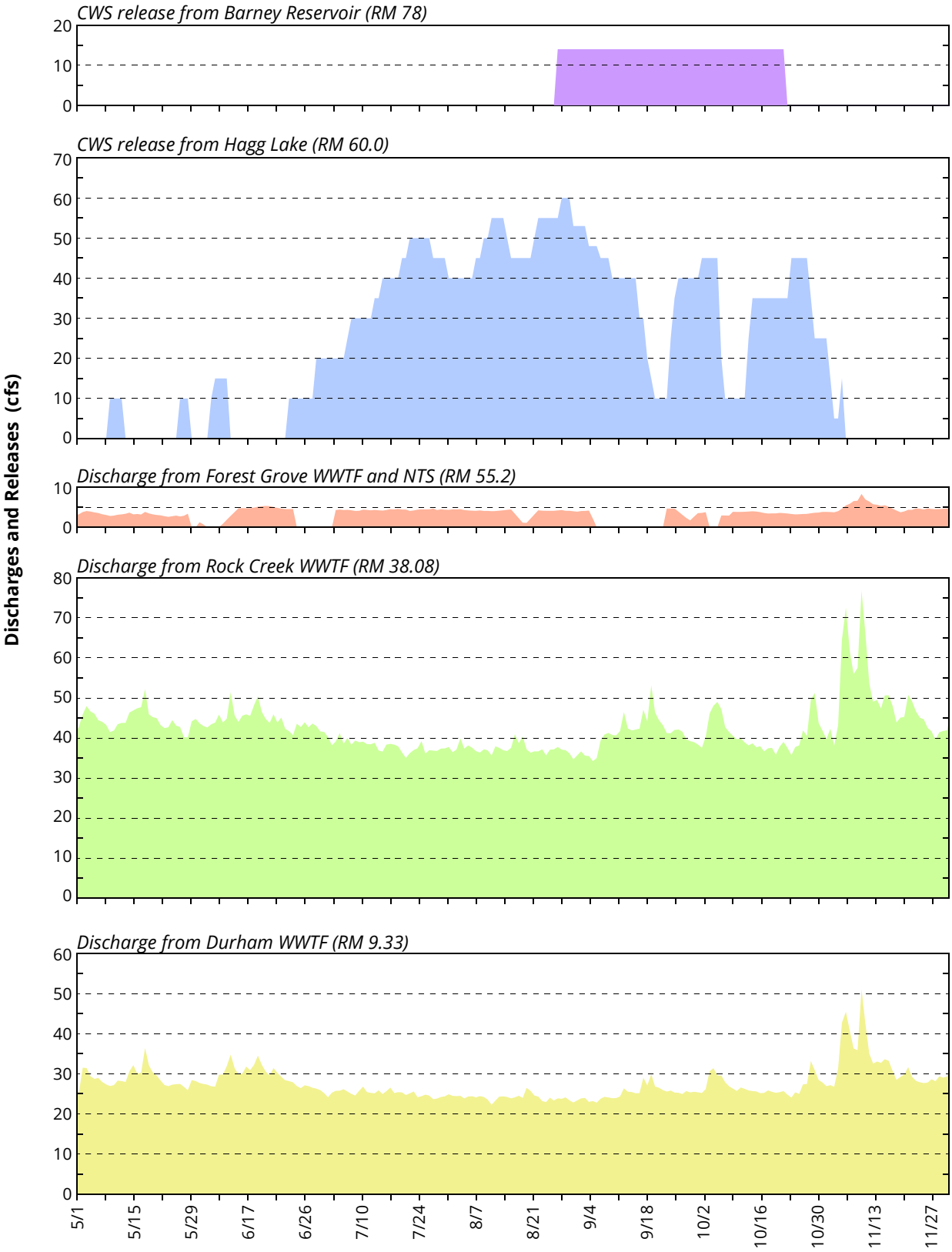
Rainfall was not sufficient to sustain higher flows through the entire remainder of 2020. The 7-day consecutive median flow at Farmington dropped below 250 cfs on October 22 and did not exceed 350 cfs until November 10. It remained above 350 cfs for the rest of 2020. Although low flow periods after the high flow trigger do not alter the regulatory low flow period for the WWTFs, they affect decisions regarding flow augmentation for water quality management. Releases from Hagg Lake continued through November 13.

With its releases of stored water and discharge from the WWTFs, the District generally was able to maintain minimum stream flows, offset thermal loads from the WWTFs, provide sustainable base flows in the upper Tualatin River and key tributaries and improve overall water quality. Flow management will continue to be vital as the population in Washington County increases.

Releases and discharges: The graph on the following page shows Clean Water Services' flow augmentation from Barney Reservoir and Hagg Lake, and discharges from the WWTFs and NTS for May through November 2020. Graphs on pages 17, 18 and 19 illustrate the importance of the District's contributions to total flow at three key sites:

- Golf Course Road (RM 51.5) is located downstream of major withdrawals by JWC and TVID at the Spring Hill Pump Plant (RM 56.3) and small discharges from the Fernhill NTS and Forest Grove WWTF (RM 55.2).
- Farmington Road (RM 33.3) is located downstream of the Rock Creek WWTF (RM 38.08) and includes flows from Dairy and Rock Creeks and their tributaries.
- West Linn (RM 1.75) is located downstream of the Durham WWTF (RM 9.33). Several small tributaries also enter the Tualatin River between Farmington and West Linn.

Clean Water Services Releases and Discharges to Tualatin River — 2020

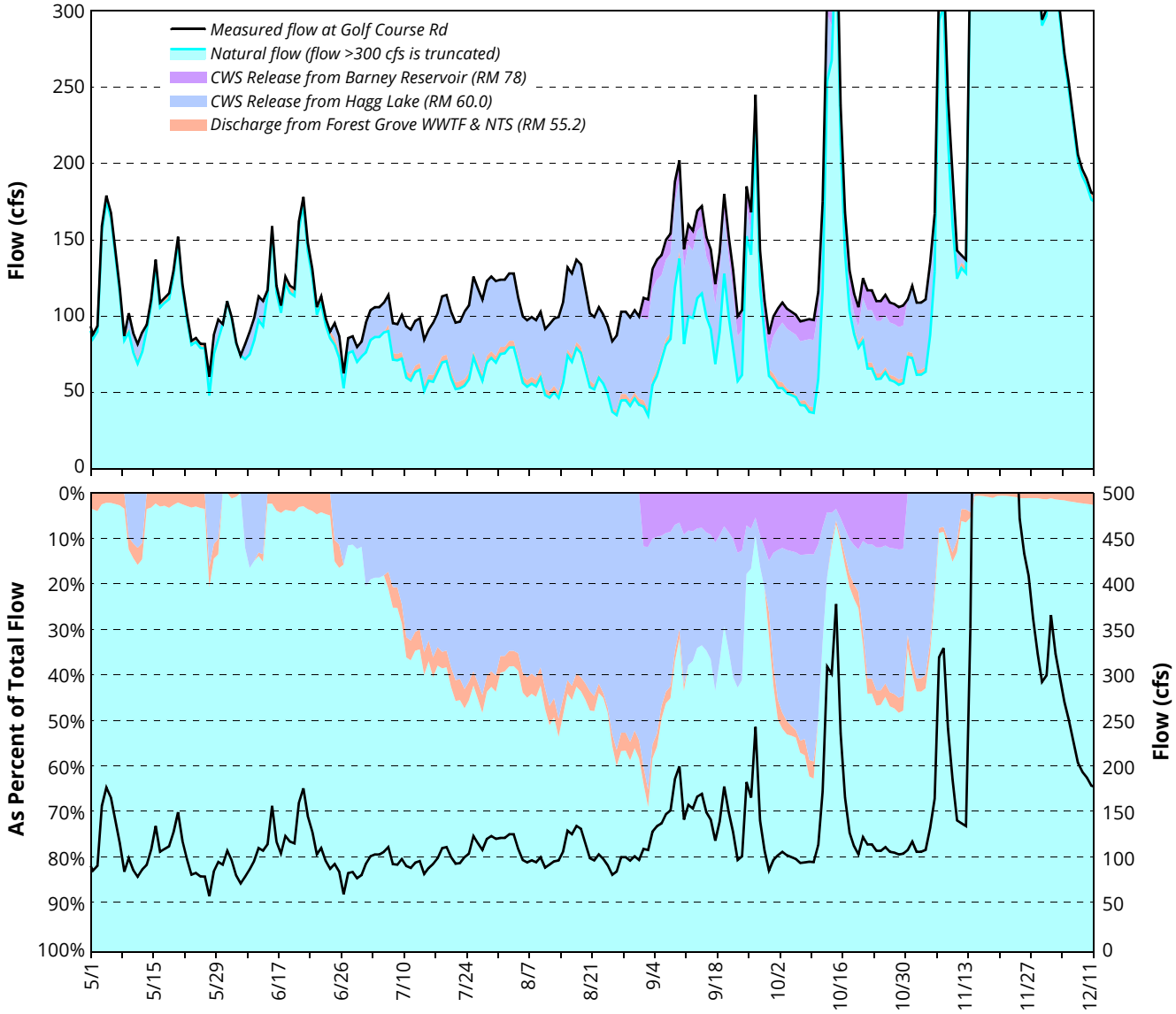


Upper Tualatin River — Golf Course Road site: The graph below shows flow at the Golf Course Rd site (RM 51.5). Flow at this site includes natural flow from the Tualatin River headwaters and Gales Creek plus storage water from Barney Reservoir and Hagg Lake that was not withdrawn at SHPP. The Forest Grove WWTF and Fernhill NTS (both RM 55.2) are upstream of this site. In 2020, the NTS discharged periodically from May 1 through October 31. The District tries to maintain a minimum stream flow target of 60 cfs at this site. The site is unaffected by discharges from the District's two large WWTFs (they are downstream).

During the dry periods between July and October, the District's stored water releases accounted for about 50% of the total flow in the upper Tualatin River. Without these releases, flow in the upper Tualatin downstream of SHPP would have dropped below 50 cfs, making the river considerably slower and warmer.

Note that flow at this site shows a wavy pattern with high flows and low flows repeating approximately every week. This pattern is due to decreased withdrawals by TVID from the SHPP that occur on Sundays, when the demand for irrigation water is generally lower than other days. Releases from Hagg Lake and Barney Reservoir are mostly influenced by weather conditions and do not exhibit a weekly cycle.

Calculated* Clean Water Services Releases in Tualatin River at Golf Course Rd (RM 51.5) — 2020



*The following formula was used to calculate flows in this figure, assuming constant travel time and a uniform evaporative loss (0.25% per mile).

Natural Flow at Golf Course w/o CWS releases =
+ Measured flow at Golf Course (OWRD data)
– Calculated flow from Fernhill NTS or Forest Grove WWTF (= 0.978 x discharge from the same day)
– Calculated flow from Hagg Lake (= 0.979 x CWS Hagg Lake release from the same day)
– Calculated flow from Barney Reservoir (= 0.934 x CWS Barney Reservoir release from the same day)

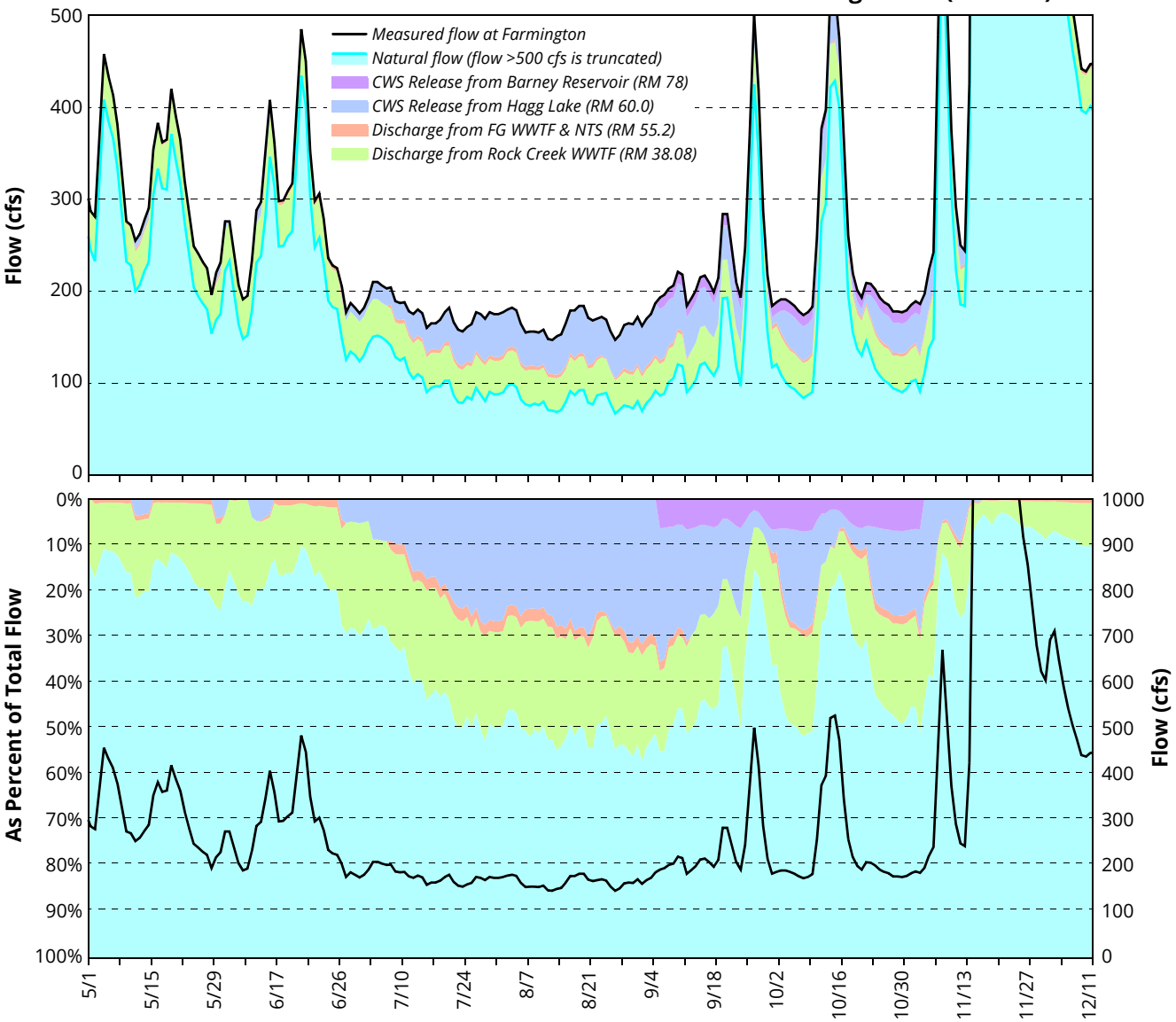
Middle Tualatin River — Farmington Road site: The graph below shows flows at the Farmington Road site (RM 33.3). Flow at this site affects water quality in the middle and lower parts of the river. Keeping Farmington flow from becoming very low (below 120 cfs) can mostly prevent the large scale algal blooms that were a recurring problem in the lower river in the 1990s.

Stream flow measurements at this site are also used to define ammonia limits at the treatment facilities, as well as when dry and wet season limits apply at the District's treatment facilities.

During the summer low flow period, the District's stored water releases plus the Rock Creek WWTF discharge accounted for about 50% of the flow at the Farmington Road site. Without this additional water, flow in the Tualatin River at this site would average less than 100 cfs during the July-August period. In 2020, flows during several weeks in October and November would also have been less than 100 cfs without Clean Water Services releases. Flows this low would almost certainly be associated with significant water quality problems down river, such as those that were common in the 1990s and before.

Note that the weekly cyclical signature of decreased irrigation withdrawals on Sundays is still clearly evident at this site.

Calculated* Clean Water Services Releases in Tualatin River at Farmington Rd (RM 33.3) — 2020



*The following formula was used to calculate flows in this figure, assuming constant travel time and a uniform evaporative loss (0.25% per mile).

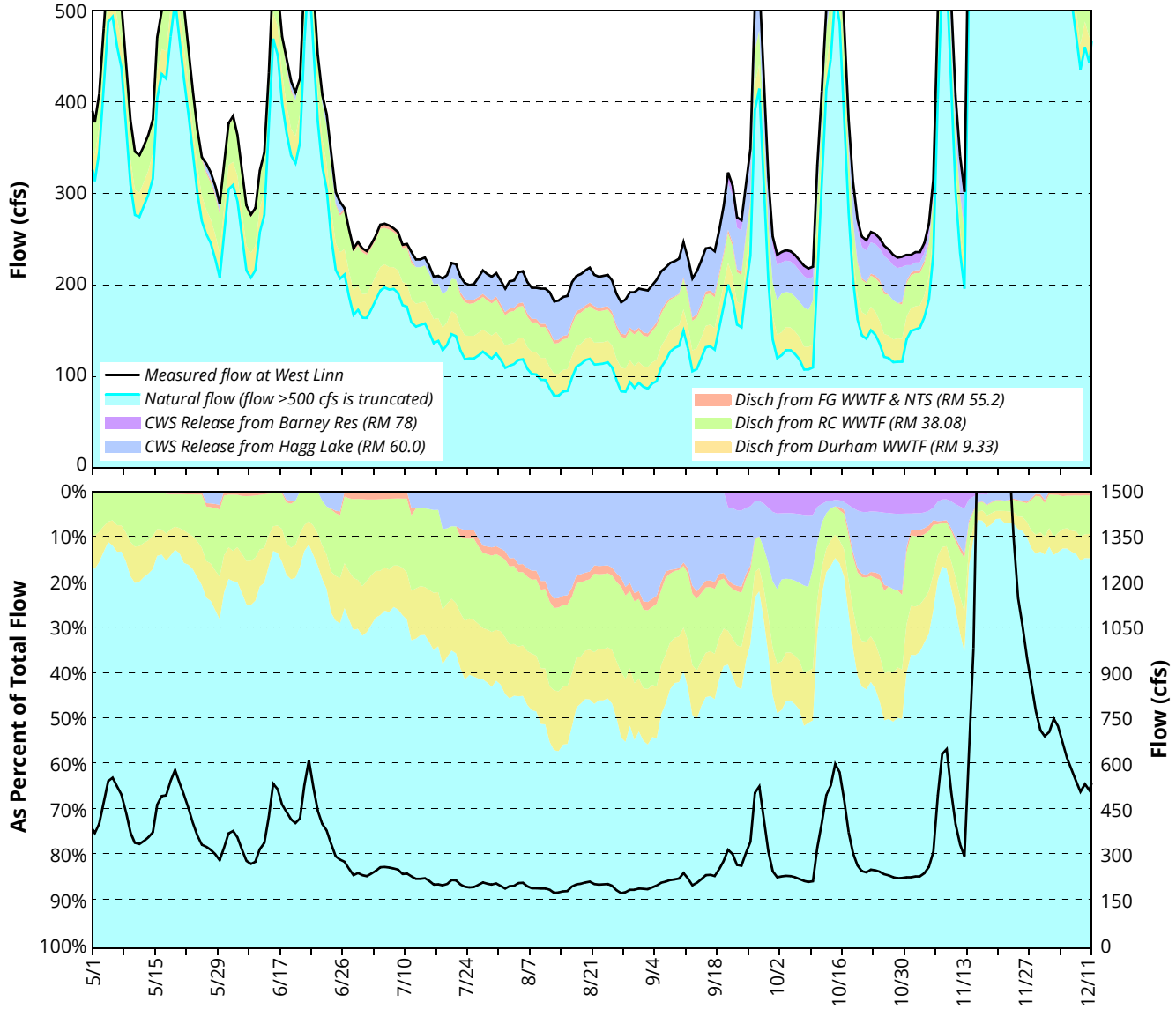
Natural Flow at Farmington w/o CWS releases =
+ Measured flow at Farmington (OWRD data)
– Calculated flow from Rock Creek WWTF (= 0.988 x Rock Creek WWTF discharge from the same day)
– Calculated flow from Fernhill NTS and Forest Grove WWTF (= 0.933 x discharge from 1 day before)
– Calculated flow from Hagg Lake (= 0.933 x CWS Hagg Lake release from 2 days before)
– Calculated flow from Barney Reservoir (= 0.888 x CWS Barney Reservoir release from 4 days before)

Lower Tualatin River — West Linn site: Flows at the West Linn site (RM 1.75) are shown below. Flow at this site during July–August averaged about 40 cfs higher than those at Farmington; about 60% of that increase is discharge from the Durham WWTF.

The District's stored water releases account for more than 20% of the flow during the low flow season. When discharges from the WWTFs are included, Clean Water Services' contributions account for 40-60% of the flow. Without this additional water, at times flows at the West Linn site would drop below 100 cfs during the summer. Flows this low would be associated with significant water quality problems such as:

- high temperatures,
- severe algal blooms that would likely increase the pH to levels that exceed the criterion for aquatic health, and
- very low dissolved oxygen concentrations caused by an increased expression of sediment oxygen demand, especially during cloudy days when photosynthetic production of oxygen is decreased.

Calculated* Clean Water Services Releases in Tualatin River at West Linn (RM 1.75) — 2020



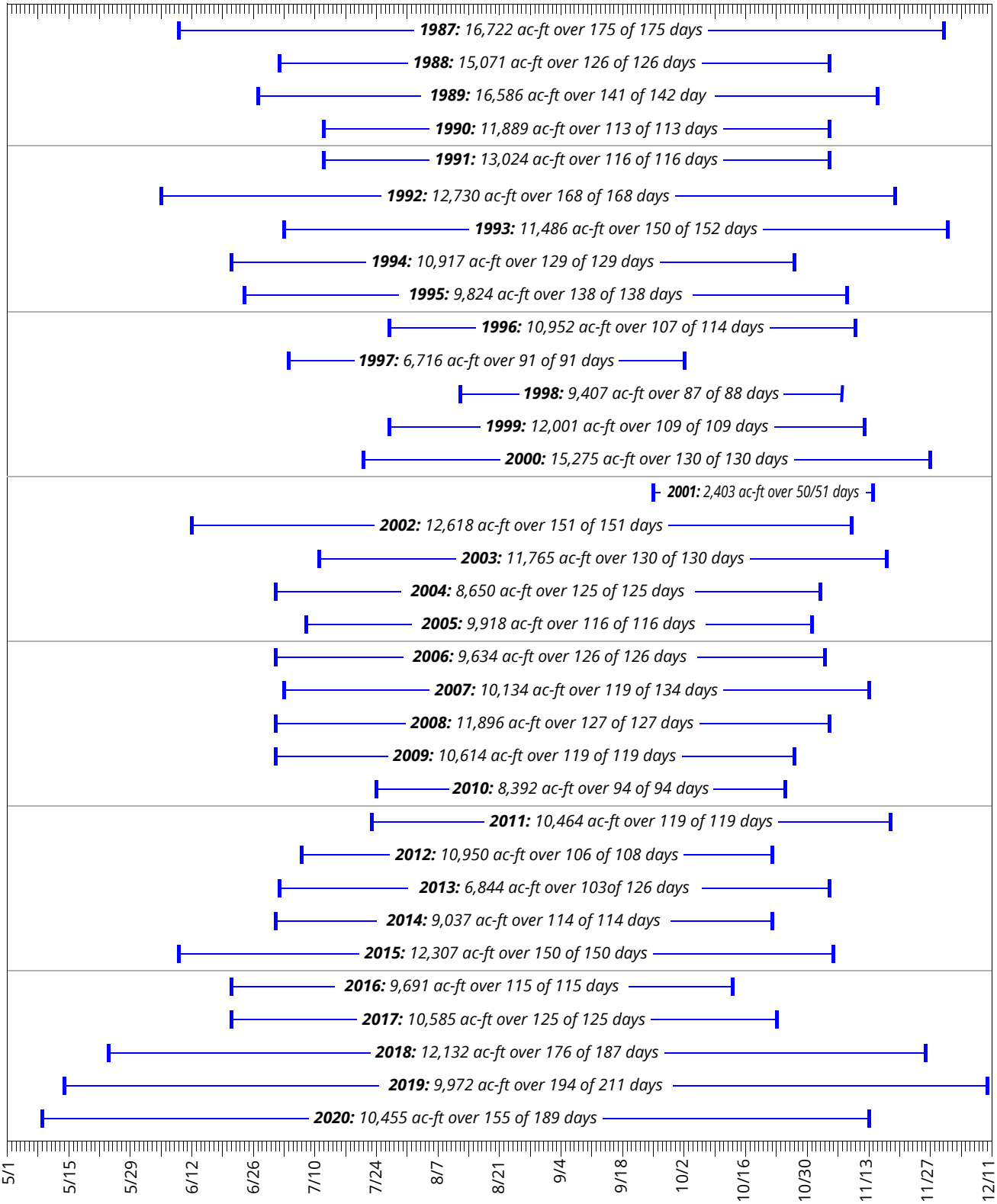
*The following formula was used to calculate flows in this figure, assuming constant travel time and a uniform evaporative loss (0.25% per mile).

Natural Flow at West Linn without CWS releases =
+ Measured flow at West Linn (USGS data)
– Calculated flow from Durham WWTF (= 0.981 x Durham WWTF discharge from 3 days before)
– Calculated flow from Rock Creek WWTF (= 0.909 x Rock Creek WWTF discharge from 14 days before)
– Calculated flow from Fernhill NTS and Forest Grove WWTF (= 0.854 x discharge from 16 days before)
– Calculated flow from Hagg Lake (= 0.854 x CWS Hagg Lake release from 17 days before)
– Calculated flow from Barney Reservoir (= 0.809 x CWS Barney Reservoir release from 19 days before)

Historical record of stored water releases

Hagg Lake: Water releases from Hagg Lake begin when natural flow decreases in late spring and continue until high natural flow resumes. Release rates are adjusted as needed to meet the applicable flow targets. In recent years, releases have begun earlier in the season

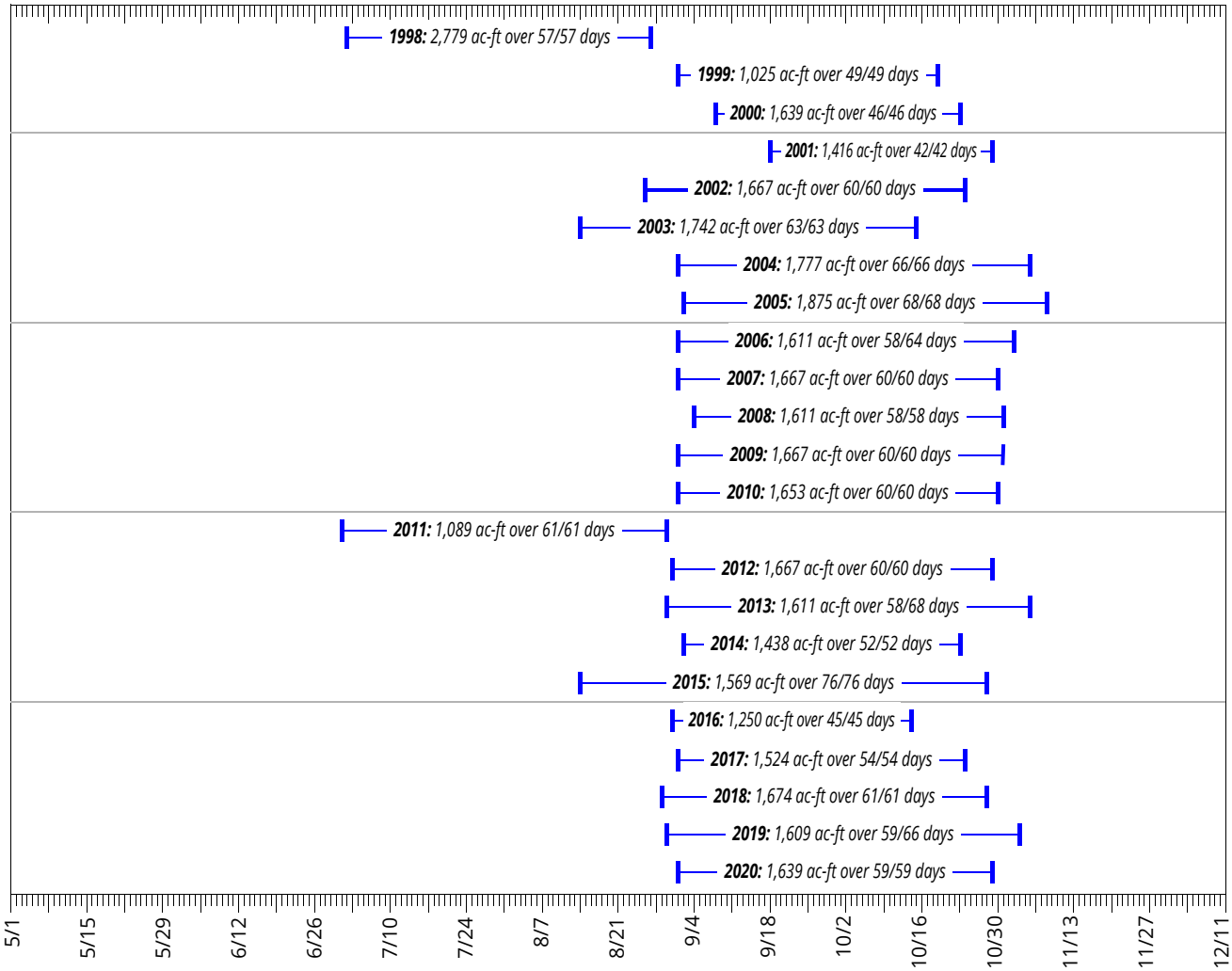
HISTORY OF CLEAN WATER SERVICES RELEASES OF WATER FROM HAGG LAKE



Water allocation depends on whether Hagg Lake filled. When Hagg Lake reaches full pool, Clean Water Services allocation is 12,618 ac-ft. In 1987–1989, Bureau of Reclamation allowed Clean Water Services to release its stored allocation plus natural flow. In 2000, Clean Water Services purchased additional water because low flow conditions persisted until late November. In 2001 allocations were severely decreased because Hagg Lake did not fill.

Barney Reservoir: Water usually is released from Barney Reservoir during the late summer. Accounting for dead pool volume and the 15% allocation to the Oregon Department of Fish and Wildlife, Clean Water Services has 1,654 ac-ft available at full pool. The allocation is adjusted if the reservoir does not fill.

HISTORY OF CLEAN WATER SERVICES RELEASES OF WATER FROM BARNEY RESERVOIR



In 2001, the allocation was much reduced because the reservoir did not fill; Clean Water Services purchased 1000 ac-ft more water than its allocation that year. Reservoir drawdown in 2011 led to a reduced allocation. With minor variations, releases from Barney Reservoir are on the order of 14 cfs. Once begun, suspension of releases is infrequent.

Natural Flow Credit

When Scoggins Dam was constructed, Clean Water Services was granted a natural flow credit of up to 4,282 acre-ft. The credit applies only in May, June, October and November, and only if the monthly mean daily natural flow in the Tualatin River measured at West Linn is less than the flow targets specified for each month. Natural flow is calculated as the monthly mean daily flow measured at West Linn minus Clean Water Services' mean daily release of stored water. Clean Water Services was not entitled to a natural flow credit in 2020 because the natural flow exceeded the target flow for months in question (see table below). Clean Water Services last received a natural flow credit in 1994.

BUREAU OF RECLAMATION NATURAL FLOW CREDIT 2020

Month	Mean Daily Measured Flow at West Linn (cfs)	Mean Daily CWS Release (cfs)	Calculated Natural Flow at West Linn (cfs)	Target Natural Flow at West Linn (cfs)	Maximum Possible CWS Natural Flow Credit (cfs)	*[acre-ft]*	CWS Natural Flow Credit (cfs)
May	427	10	417	85	13		0
June	380	11.7	368	140	21	*[1,250]*	0
October	303	45	258	95	16	*[984]*	0
November	947	27	919	110	21	*[1,250]*	0

JOINT WATER COMMISSION

by Kristel Griffith, Water Resources Program Coordinator, Joint Water Commission/City of Hillsboro

Introduction

Over 400,000 people in Washington County receive at least a portion of their drinking water from the Joint Water Commission (JWC). The JWC provides water to its member agencies: the Cities of Hillsboro (the managing and operating agency), Forest Grove, Beaverton, and the Tualatin Valley Water District. JWC also provides wholesale service directly to the City of North Plains, and to Cornelius, Gaston, and the LA Water Cooperative as wholesale customers of Hillsboro.

JWC's water treatment plant (WTP) is supplied with water from the nearby Tualatin River. An intake facility at Spring Hill constructed by the Bureau of Reclamation, and shared with the Tualatin Valley Irrigation District (TVID), pumps river water to the JWC WTP.

Flows in the Tualatin River are supplemented during the summer with water from two impoundments—Hagg Lake and Barney Reservoir. Hagg Lake is located on Scoggins Creek behind Scoggins Dam. Scoggins Dam is owned by the Bureau of Reclamation (BOR) and operated by TVID under contract to the BOR. Barney Reservoir is located on the upper Trask River behind the Eldon S. Mills Dam. The reservoir and dam are owned and operated by the Barney Reservoir Joint Ownership Commission (BRJOC). The BRJOC includes the Cities of Hillsboro (the managing and operating agency), Forest Grove, and Beaverton, the Tualatin Valley Water District, and Clean Water Services.

The JWC WTP uses conventional dual media filtration plus disinfection to produce high quality potable water. Treated water is pumped from the plant to the member agencies either directly through finished water pipelines or via the Fern Hill Reservoirs. The Fern Hill Reservoirs are located about one-third mile to the east of the treatment plant and can store up to 40 million gallons of finished water (in two 20 million gallon covered concrete tanks). The JWC finished water pipelines include flow meters and pressure reducing stations at the connection points to the member agencies.

2020 Operations

Production and demands: In 2020 the JWC WTP produced an average of 31.1 million gallons per day (MGD) of finished water. A maximum day production of 57.7 MG occurred on September 4, which is less than the 2019 maximum day production of 62.6 MG. A minimum day production of 16.6 MG occurred on June 9 due to a maintenance shutdown.

2020 Stored water releases: The amount of stored water released by JWC for 2020 is summarized in the tables below. In all, 64% of the total allocation was released (63% for Hagg Lake and 65% for Barney Reservoir). Typical average use is 40–60% of allocation, although higher usage has occurred in the recent past.

Stored water was released from Hagg Lake on May 20 and 21, before regulation was imposed. OWRD imposed regulation of natural flow on May 28, about a week earlier than average. Regulation continued until being lifted on November 16th.

STORED WATER RELEASE FROM EACH RESERVOIR — 2020

Description	Beginning Balance (acre-ft)	Amount Released (acre-ft)	Ending Balance (acre-ft)	Days of Release	Average Release	
					acre-ft/day	cfs
Barney (M&I)	14,886	9,638	5,248	172	56.0	28.3
Scoggins	13,500	8,501	4,999	175	48.6	24.5
Total	**28,386**	**18,139**	**10,247**	**175**	**103.7**	**52.3**

COMPARISON OF STORED WATER RELEASES— 10-YEAR RECORD

Year	Dates of Stored Water Use			Stored Water Release (acre-ft)			Average Release (acre-ft/day)
	First Day*	Last Day*	Days**	Barney	Scoggins	Total	
2020	5/20	11/16	175	9,638	8,501	18,139	104
2019	5/30	12/12	196	9,963	9,964	19,927	102
2018	5/26	11/28	187	12,159	9,513	21,672	116
2017	6/22	10/24	125	7,819	6,425	14,244	114
2016	5/11	10/12	153	7,476	9,465	16,941	111
2015	5/8	10/29	173	11,730	9,904	21,633	124
2014	6/5	10/24	142	6,548	9,090	15,638	110
2013	5/4	10/1	141	6,387	7,490	13,877	98
2012	6/23	10/30	129	6,557	7,016	13,573	105
2011	6/28	11/7	132	8,848	3,945	12,794	97
10-yr average	**5/30**	**11/2**	**156**	**8,712**	**8,131**	**16,844**	**108**

*First and last day of Stored Water Use may include days when regulation was not in effect. These dates may lag OWRD regulation dates by 1 day because releases are adjusted the day after OWRD imposed or lifted regulation.
**Days of Stored Water Use does not equal the elapsed days between the start and end dates for regulation if regulation was temporarily suspended during the period.

STORED WATER RELEASE TO EACH AGENCY — 2020

Description	Beginning Storage (acre-ft)	Amount Released (acre-ft)			Ending Balance (acre-ft)	Average Release (acre-ft/day)
		from Barney	from Scoggins	Total		
Hillsboro	10,127	3,976	3,714	7,690	2,437	43.9
Forest Grove	4,914	—	1,267	1,267	3,647	7.2
Beaverton	7,556	2,172	3,520	5,692	1,864	32.5
TVWD	5,789	3,490	—	3,490	2,299	19.9
Total	28,386	**9,638**	**8,501**	**18,139**	**10,247**	**103.7**

North Plains and Tigard: usage is reflected in the values for JWC partners.
Values in this table reflect internal leases between JWC partner agencies.

Efficiency: JWC maximizes the capture of released water by coordination with partner agencies to anticipate and track system demands, and by leveraging finished water storage at the Fern Hill Reservoirs. During the peak season, the JWC and Cherry Grove pump station (at the City of Hillsboro's slow sand filter plant) recovered an average of 102% of the water available for municipal use from natural flow rights and releases from impounded supplies.

ESTIMATED WATER CAPTURE RATES – 2020

Water Available		Raw Water Pumped			Finished Water Produced			
					Total		Average Daily	Peak Day
Source	(acre-ft)	Facility	(acre-ft)	(MG)	(acre-ft)	(MG)	(MGD)	(MGD)
Reservoir releases	18,139	JWC WTP* (Spring Hill)	22,100	7,199	23,648	7,703	34.1	57.7
Natural flow	3,945	Slow Sand Filter Plant* (Cherry Grove)	449	146	538	175	0.8	1.1
Total	22,084		22,550	7,345	24,187	7,879	34.9	58.8
		Capture rate	102%		110%			

*The values shown here were measured and reported by JWC.

Fire and loss of power events

From September 7-9, 2020, the JWC Water Treatment Plant (WTP) experienced intermittent power loss. On September 7, communications with Fern Hill Reservoir were lost, due to a power surge. On September 8, wind and fire on Fernhill Road contributed to a power loss at the JWC WTP. The backup power generators came on and produced enough power to operate the WTP until the following day when grid power was fully restored. PGE delivered fuel to keep the generators operating. During the event, the WTP was able to produce enough water to meet partner demands, with the addition of a small amount of stored water in Fernhill Reservoir.

Fire burning near Fernhill

Conditions at JWC WTP

The City of Portland, in response to fires in the Clackamas area, requested that Tualatin Valley Water District (TVWD) shift water supply from Portland Water Bureau to Joint Water Commission from September 11th to 18th.

Key Facts about the Emergency Event:

•Backup generators, installed in 2016, were designed to produce 38 MGD, but successfully produced 51 MGD.

•In total, 53 MG of water was produced on generator power.

•7,140 gallons of fuel were used to power backup generators during outage.

•Finished water quality was not affected by the use of backup generator power.

Regulatory matters

Water Right Activity: In 2018, the Joint Water Commission applied for a water right to withdraw 44.0 cfs at the Spring Hill Pump Plant (application S-88506). Withdrawal under the new permit will be in combination with the usage under permit S-54737, meaning the total combined usage will not exceed 75 cfs. Permit S-54737 is authorized for use between October 1 and May 31.

OWRD's initial review of application S-88506 indicated that water was not available for withdrawal in October, November, and May. In 2019, JWC modified the application to limit the requested time period of use to December 1 through April 30. The application was placed on hold in July 2020, when Oregon Department of Environmental Quality (DEQ) asked Oregon Water Resources Department (OWRD) to condition use of the permit in the month of April to when flow in the Tualatin River at the Farmington gage is greater than 904 cfs. JWC accepted this condition

OWRD issued a proposed final order (PFO) in April 2021 approving the application with conditions and a draft permit. The PFO is currently under review.

Water Management and Conservation Plan (WMCP): A statewide rule on Conservation and Efficient Water Use requires major water users and suppliers to prepare a Water Management and Conservation Plan (WMCP) in order to gain access to undeveloped portions of their existing water right permits. These rules ensure the efficient use of the state's water resources, and facilitate water supply planning consistent with water provider capabilities.

WMCPs document available water rights, historical water demands, projections of future water needs, curtailment plans, and water conservation and efficiency efforts. They also establish conservation performance benchmarks to achieve over the next 10 years.

JWC submitted a final draft to OWRD on September 11, 2020. No comments were received in a 30-day public comment period. OWRD staff provided feedback November 24, 2020, and JWC will submit revisions in January 2021. After OWRD accepts the changes, the WMCP will be open to a 60-day public comment period, before being accepted as final.

Fish screening exemption agreement and Bateman Creek mitigation

Background: The JWC holds multiple water rights that require the use of a withdrawal facility meeting current ODFW fish screening standards. However, the Spring Hill Pumping Plant (SHPP), which is the facility the JWC uses to make its withdrawals, is owned by the Bureau of Reclamation (BOR) and does not meet those current standards.

Compliance through infrastructure improvements would require replacing the intake screens and lowering the approach velocities to the screens. The JWC cannot directly make improvements because it does not own the SHPP facility, and BOR is not compelled to make the upgrades. Compliance with approach velocities would require significant redesign of the entire intake facility or channel, or construction of a new intake facility.

Because of the compliance and ownership issues, JWC began working towards ODFW approval of a fish screening exemption in 2016. The first task was to monitor fish presence in the Tualatin River near the Spring Hill Pumping Plant and then to estimate JWC's entrainment impacts. Fish monitoring was done in 2018 with the final report completed in 2019. The report was used to inform the development of a mitigation project to offset detrimental impacts.

Fish screening exemption agreement: JWC proposed to mitigate for fish screen and entrainment impacts by restoring fish passage at two road culverts on Bateman Creek, a tributary to Gales Creek. ODFW has also required a large woody debris habitat project at the site to be included as part of the mitigation. This site is an ODFW priority and the project is estimated to produce more than enough salmonid fry to meet JWC's required mitigation to receive the screening exemption. Within the SHPP, the JWC operates four raw water pumps. The nine pumps operated by TVID are not a part of the analysis or requested exemption.

Culvert sites on Bateman Creek identified for fish passage restoration

On June 5, 2020, the Oregon Fish Screening Task Force recommended approval of a Fish Screening Exemption Agreement to the Oregon Fish Commission. The Oregon Fish Commission approved the agreement on August 7, 2020. The Joint Water Commission approved the agreement on October 9, 2020. The exemption includes the following:

- Identifies the two water rights (S-54737 and S-55219) and one pending application (S-88506) that require compliance with State of Oregon fish screening rules.
- Identifies the mitigation project that will provide a net benefit to the fish populations of the Tualatin River basin. This includes replacing two failing roadway crossings and installing large wood instream.
- Identifies future monitoring, reporting, and maintenance requirements.
- Allows for the agreement to end if the JWC begins using an intake that fully complies with fish screening criteria.

Landowner agreement: The mitigation site is located on private, non-industrial timber property. A landowner agreement and permanent easement will be necessary to protect JWC's compliance with the Fish Screening Exemption Agreement. Negotiations with the land owner have been positive and are ongoing. The landowner agreement and easement are scheduled for review and approval by the Joint Water Commission in January 2021.

Design and construction: Engineering design began in July 2020 with 100% plans to be completed in early 2021. Construction will occur in summer of 2021 or 2022.

Facility expansion

To meet increased water demand, the JWC increased the peak capacity of its WTP from 75 to 85 MGD in 2019. The WTP was upgraded with new filter capacity, enhanced flocculation/sedimentation features, new pumps, mechanical systems, increased solids handling capacity, and enhanced chemical feed systems. Production tests successfully produced a treatment capacity of 85 MGD.

Raw water pumps: Four new vertical turbine pumps and motors were installed in 2019 to increase raw water (RW) pumping capacity. After installation, RW pumps 1 and 2 experienced significant vibration issues. RW 1 was removed from service in 2020 for manufacturer investigation of the couplings and the pump shaft. RW pump 1 is expected to be reinstalled in the beginning of 2021, then RW pump 2 will be removed and investigated.

Corrosion protection: At the completion of the WTP Expansion Project, concerns were acknowledged regarding the potential for pipe corrosion. In 2020, three pipe penetrations were excavated and inspected for structural deficiencies. For added protection, cathodic protection was recommended to protect the pipe penetrations against possible future corrosion. An anode bed was installed to provide protection for both the SW and filter effluent lines.

2020 Maintenance

Electrical: Breaker and Arc Flash Testing occurred in June 2020 and will be completed in Spring 2021.

Finished water pumps: Replacement of the motor control centers for finished water (FW) pumps # 7, 8 and 9 started in late 2020 and is slated to be completed in January 2021. FW pumps 1, 2, 4 and 6 were slated to be replaced in 2020, but work was rescheduled for October of 2021.

Fernhill Reservoir: Fernhill Reservoir 1 was drained on February 10th and remained offline until April 28th. An inspection of both Fern Hill Reservoirs, conducted in November 2017, determined that modifications and repairs were required to improve the exterior and interior concrete and prevent potential water intrusion and further degradation of the concrete. The engineering design, completed in December 2019, also included safety improvements for both reservoirs to improve access and to comply with OSHA Standards.

Fernhill Reservoir #1, drained and off line.

Protective coating being added to the roof of Fernhill Reservoir #1.

Acknowledgements

The Joint Water Commission appreciates the efforts of the Watermaster and our partners on the Tualatin River Flow Management Technical Committee. We extend our thanks for their involvement and cooperation. The communication and coordination among the committee members is invaluable.

MILLS DAM/BARNEY RESERVOIR

by Kristel Griffith, Water Resources Program Coordinator, Joint Water Commission/City of Hillsboro

OVERVIEW

Mills Dam/Barney Reservoir is a rock and earth impoundment on the Middle Fork of the North Fork of the Trask River. The original structure, known as the Trask Dam, was built in 1970 by the Cities of Hillsboro and Forest Grove; the reservoir held 4,000 ac-ft of water. In 1999, the dam height was raised to accommodate 20,000 ac-ft of storage and renamed the Mills Dam. Barney Reservoir is named for J.W. Barney and Mills Dam is named for Eldon S. Mills, both former Hillsboro City Managers and key leaders in the original dam construction and its later expansion.

Water stored in Barney Reservoir is released to both the Trask and Tualatin Rivers. Flows to the Trask River include all storage overflows and 15% of the stored water, which is allocated to Oregon Department of Fish and Wildlife (ODFW). A gravity flow diversion pipeline conveys water from the Trask River to the headwaters of the Tualatin River. The additional flow in the Tualatin River is used for municipal purposes and flow augmentation to improve water quality.

Release from Barney Reservoir to the Trask River through a Howell-Bunger Valve

The current owners of Barney Reservoir are the Cities of Hillsboro, Forest Grove, Beaverton, the Tualatin Valley Water District (the same entities that form the Joint Water Commission) and Clean Water Services. Collectively they form the Barney Reservoir Joint Ownership Commission (BRJOC). As with the Joint Water Commission, the City of Hillsboro serves as the managing and operating agency for the BRJOC.

RESERVOIR OWNERSHIP AND WATER ALLOCATION FOR BARNEY RESERVOIR

		Water Allocation (percent)	Storage at Full Capacity (acre-ft)	Reservoir Ownership (percent)
Reserved	Dead pool	2.3%	460	—
	Oregon Department of Fish and Wildlife (ODFW)	15.0%	3,000	0.0%
BRJOC Partners	Clean Water Services	8.3%	1,654	10.0%
	JWC Partners	74.4%	14,886	90.0%
	City of Hillsboro	*25.6%*	*5,127*	*31.0%*
	City of Forest Grove	*2.1%*	*414*	*2.5%*
	City of Beaverton	*17.8%*	*3,556*	*21.5%*
	Tualatin Valley Water District (TVWD)	*28.9%*	*5,789*	*35.0%*
	TOTAL	100.0%	20,000	100.0%

2020 Operations

Barney Reservoir filled on February 10, 2020. Storage volume at full pool is 20,000 ac-ft. By the end of the release season, 71% of the total allocated water was released.

Releases to the Tualatin River: The majority of the JWC's natural flow rights were regulated off on May 28, 2020 and releases from Barney Reservoir to the Tualatin River began that day. JWC releases from Barney Reservoir continued uninterrupted for a for a total of 172 release days until natural flow rights were restored on November 16. The JWC partners used 65% of their allocation.

Releases to the Trask River: Releases from Barney Reservoir to the Trask River for ODFW began on June 3 and continued through December 2 for a total of 183 release days. Almost all of the stored water for ODFW was released to the Trask River.

STORED WATER ALLOCATION AND RELEASES FOR BARNEY RESERVOIR — 2020

	Total Storage	Oregon Dept of Fish and Wildlife	BRJOC Partners					
			Clean Water Services	JWC Total	JWC Partners			
					City of Hillsboro	*City of Forest Grove*	*City of Beaverton*	*TVWD*
Water allocation (acre-ft)	20,000	3,000	1,654	14,886	*5,127*	*414*	*3,556*	*5,789*
Water released (acre-ft)	14,243	2,967	1,638	9,638	*3,976*	*0*	*2,172*	*3,490*
Percent allocation used	71%	99%	99%	65%	*78%*	*0%*	*61%*	*60%*
First day of release		Jun-3	Sep-1	May-28				
Last day of release		Dec-2	Oct-29	Nov-15				
Number of Days with Releases		183	59	172				
Average Daily Release (cfs)		8.1	14	28.3				

Maintenance

Dam inspection: Mills Dam was not inspected in 2020. An inspection by OWRD and valve exercise is scheduled for Fall/Winter 2021.

Flow transmitter installation: Ultrasonic transmitters were installed in the Tualatin flume to accurately measure the amount of water being released from the reservoir and improve the real-time communications. The Tualatin flume level is now transmitted back via radio communications to Barney Reservoir to easily and more precisely adjust flow.

Fence repairs: Construction began in April 2019 on a chain link fence replacement project along the Mills Dam spillway structure. It was completed during the summer of 2020. Approximately 1,600 feet of galvanized chain link fence was replaced using custom fabricated fence post brackets mounted to the side of the concrete spillway. These improvements were recommended in previous dam inspections to improve security and reduce concrete deterioration.

Oregon Department of Forestry (ODF) Trask Flats timber sale

JWC staff are working on a list of specifications to be included in ODF's pre-bid materials. The specifications include contractor requirements for logging work within the BRJOC Trask River Pipeline Easement. One of the primary requirements will be that all logging activity be limited to the non-release season, in order to avoid any potential conflicts with water supply deliveries to the partners.

Trask Flats timber sale area

LAKE OSWEGO CORPORATION

by Mark Rosenkranz, Water Resource Specialist, Lake Oswego Corporation

Introduction

The Lake Oswego Corporation (LOC), a non-profit organization, owns and manages Oswego Lake, a 163-hectare (403 acre) reservoir located 10 miles south of Portland, Oregon. LOC was formed in 1942 when the Oregon Iron and Steel Company, then owner of the land around the Lake, deeded to LOC the land, three dam structures, and all water rights. The original dam was constructed in 1871 and later upgraded in 1921. Oswego Lake is a private water body whose primary water right is hydropower generation. Secondary uses include irrigation, aesthetic viewing, contact recreation, fishing, and boating.

Oswego Lake and watershed morphology

The original natural lake, called Waluga, was formed 10,000 years ago by the Missoula glacial floods which altered the old Tualatin River channel. Today, the Lake has three basins: West Bay, the Main Lake, and Lakewood Bay. There are also two shallow, man-made canals, Blue Heron Canal and Oswego Canal. Oswego Canal is the 2.4-km conduit from the Tualatin River (RM 6.7). Total lake surface area and volume is 1.63 km^2 (403 acres) and 12.7 x 10^6 m^3 (10,300 acre-feet). Shoreline length, including bays and canals, is 18.62 km (11.56 mi). Oswego Lake has a 5.08-km (3.15-mi) fetch and a narrow 0.56-km width (0.34-mi). The hydraulic residence time is 390 days.

Oswego Lake's two watersheds include the natural, 7.5-mi^2 urban basin around the Lake (10:1 watershed to lake-area ratio) and the larger 700-mi^2 Tualatin River basin (1,000:1 ratio) when the LOC Headgate is open. Major inflows from the watershed include Springbrook Creek, Lostdog Creek, Blue Heron Creek, and 70-plus storm drains from the City of Lake Oswego.

Aerial view of the West Bay of Oswego Lake looking to the East

LOC water rights and contracts

Hydropower Generation: The primary hydropower water right is 57.5 cubic feet per second (cfs) obtained in 1906 that allows year-round diversion. To guarantee this flow during the dry season, LOC owns and operates a diversion dam located downstream of the Oswego Canal (RM 3.4). Flaps are erected on an "as needed" basis. No flaps have been used since 2004.

Irrigation: A contract between LOC and the Bureau of Reclamation (Oct 20, 1972) provides for up to 500 acre-feet from Hagg Lake for irrigation use during March through November. The largest irrigator on the Lake is the Lake Oswego Country Club (approximately 175 acre-feet).

Maintenance/Evaporation: LOC also has a maintenance/evaporation water right of 3.36 cfs dating from 1985. This water can be diverted between September 16th and July 30th.

Oswego Lake watershed management plan

Water quality improvements and safety are the top priorities for LOC. For many years, Oswego Lake has had issues with overgrowth of cyanobacteria that can impair lake aesthetics. Under extreme conditions cyanobacteria also can be harmful to health. The goal of the annual LOC Water Quality Management Plan is to reduce cyanobacteria productivity and maximize the aesthetic value of the lake. In order to accomplish this goal and provide long-term water quality solutions, LOC conducts a variety of watershed activities as part of the management plan.

Conditions that favor cyanobacteria: All algae require sunlight and nutrients (nitrogen and phosphorus) in order to grow. Because cyanobacteria are capable of fixing nitrogen, they can outcompete other algal species when nitrogen is limited. Cyanobacteria grow better than other freshwater algae because they are adapted to higher temperatures and can adjust their buoyancy to optimize nutrient uptake. Cyanobacteria are present in Oswego Lake every year and without phosphorus control the lake would experience severe blooms. Nutrient control may become even more important in the future because warmer conditions caused by climate change favor cyanobacteria.

Role of phosphorus: A healthy lake includes moderate plant and algae growth to support aquatic life. Excessive phosphorus can cause rampant proliferation of plants or algae, and in many instances cyanobacteria. To maintain a healthy level of plants and algae and limit cyanobacteria in Oswego Lake, LOC has focused its efforts on reducing the availability of phosphorus. The LOC has targeted 20 µg/L as the maximum phosphorus concentration in the lake that would substantially limit cyanobacteria growth. They use several strategies and have successfully decreased phosphorus concentrations in the lake, although not always to the target level of 20 µg/L. The strategies include:

- *Reduce phosphorus loading to the lake from the Tualatin River*— Oswego Lake is fed in part by water from the Tualatin River that is conveyed via the Oswego Canal. Flow into the lake from the Oswego Canal is regulated by a headgate. In recent years, LOC has tried to minimize or eliminate flow from the Tualatin River into the lake because the phosphorus concentrations in the Tualatin River exceed LOC's target level for the lake. The regulated level of phosphorus in the river is 100 µg/L, five times the target for Oswego Lake.

  The Tualatin River receives phosphorus from several sources. The highest total phosphorus concentrations often occur near the beginning of storms when high flow causes spikes in particulate phosphorus. High flow resuspends bed sediment and transports particles entrained in stormwater. Groundwater that is naturally high in phosphorus is a source of dissolved phosphorus that is particularly important during low flow. In addition, Clean Water Services (CWS) facilities discharge treated wastewater into the river. During the dry season, CWS employs strict phosphorus control at its wastewater treatment facilities (WWTFs) and their discharges have lower phosphate concentrations than the river at that time.

- *Reduce phosphorus loading to the lake from stormwater runoff*— Stormwater runoff contributes phosphorus directly to the lake. LOC discourages the use of phosphorus-containing fertilizers in the local area.

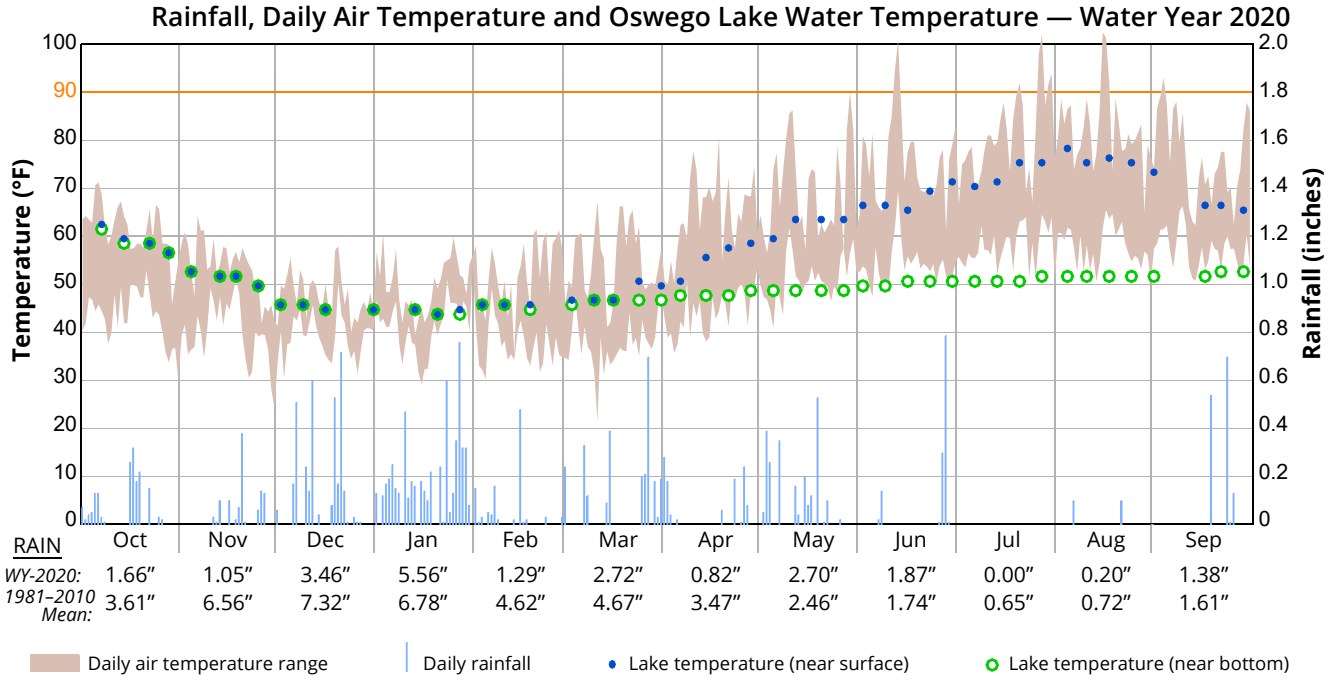
- *Decrease phosphorus release from sediment*— Sediment at the bottom of Oswego Lake contains phosphorus that is chemically bound to various mineral surfaces. When the oxygen level at the bottom of the lake (hypolimnion) is very low or zero, the minerals dissolve and the phosphorus is released. LOC has used hypolimnetic aeration to maintain oxygen levels, thereby reducing phosphorus release.

  Warm temperatures increase the rate of oxygen consumption by biological activity, including sediment oxygen demand at the sediment/water interface. The result is a rapid loss of oxygen in the hypolimnion and subsequent release of phosphorus. Although hypolimnetic aeration helps to counter this effect, it is not always able maintain dissolved oxygen concentrations high enough to prevent phosphorus release.

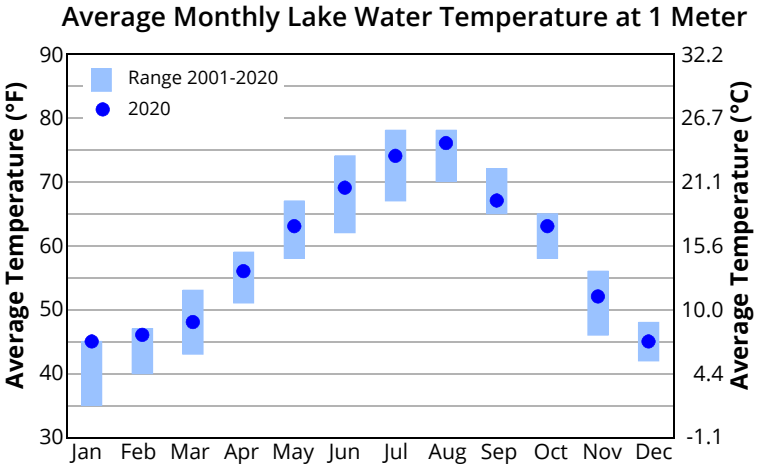
- *Reduce bioavailability of dissolved phosphorus*— Despite implementation of the strategies just described, dissolved phosphorus is still present in the water of Oswego Lake. The dissolved forms of phosphorus are highly bioavailable to algae and aquatic plants and can lead to significant algal blooms. LOC adds alum (aluminum sulfate) to the lake to decrease dissolved phosphorus. Alum forms tiny particles of aluminum hydroxide in the water. These particles bind to the dissolved phosphorus making it biologically unavailable and eventually causing it to sink to the bottom of the lake.

Conditions in 2020

Weather: Weather was mild with below-average rainfall from October through April. Most of June was dry until the 27th when about an inch of much needed rain fell. The late June rainfall delayed opening the headgate until July 10. Summer 2020 had 14 days where the daily high was above 90 degrees.



May–August average water temperatures were similar to those of 2019 and within the middle 50% of the 2001–2020 range. The September average was four degrees cooler than that in 2019, and the second lowest in the past 20 years. Low September water temperatures were due to increased evaporative cooling caused by strong east wind and decreased solar input caused by wildfire smoke, conditions that occurred during the second week of the month. The unusual conditions in September 2020 are discussed on the next page.



AVERAGE LAKE TEMPERATURE (°F)

	May	Jun	Jul	Aug	Sep
2001	63	68	73	74	70
2002	60	69	75	74	69
2003	61	70	75	75	69
2004	65	68	76	76	68
2005	62	67	74	75	68
2006	64	69	76	74	69
2007	62	67		72	69
2008	62	65	75	74	68
2009	61	70	75	76	70
2010	60	65	72	73	
2011	59	65	71	73	69
2012	58	62	67	70	65
2013	64	69	76	76	72
2014	65	70	76	78	71
2015	64	74	78	75	69
2016	67	71	72	74	70
2017	62	70	75	77	72
2018	65	68	76	77	70
2019	65	69	74	75	71
2020	63	69	74	76	67

lowest value for each month
less than 25th percentile for each month
25th–75th, inclusive percentile for each month
greater than 75th percentile for each month
highest value for each month

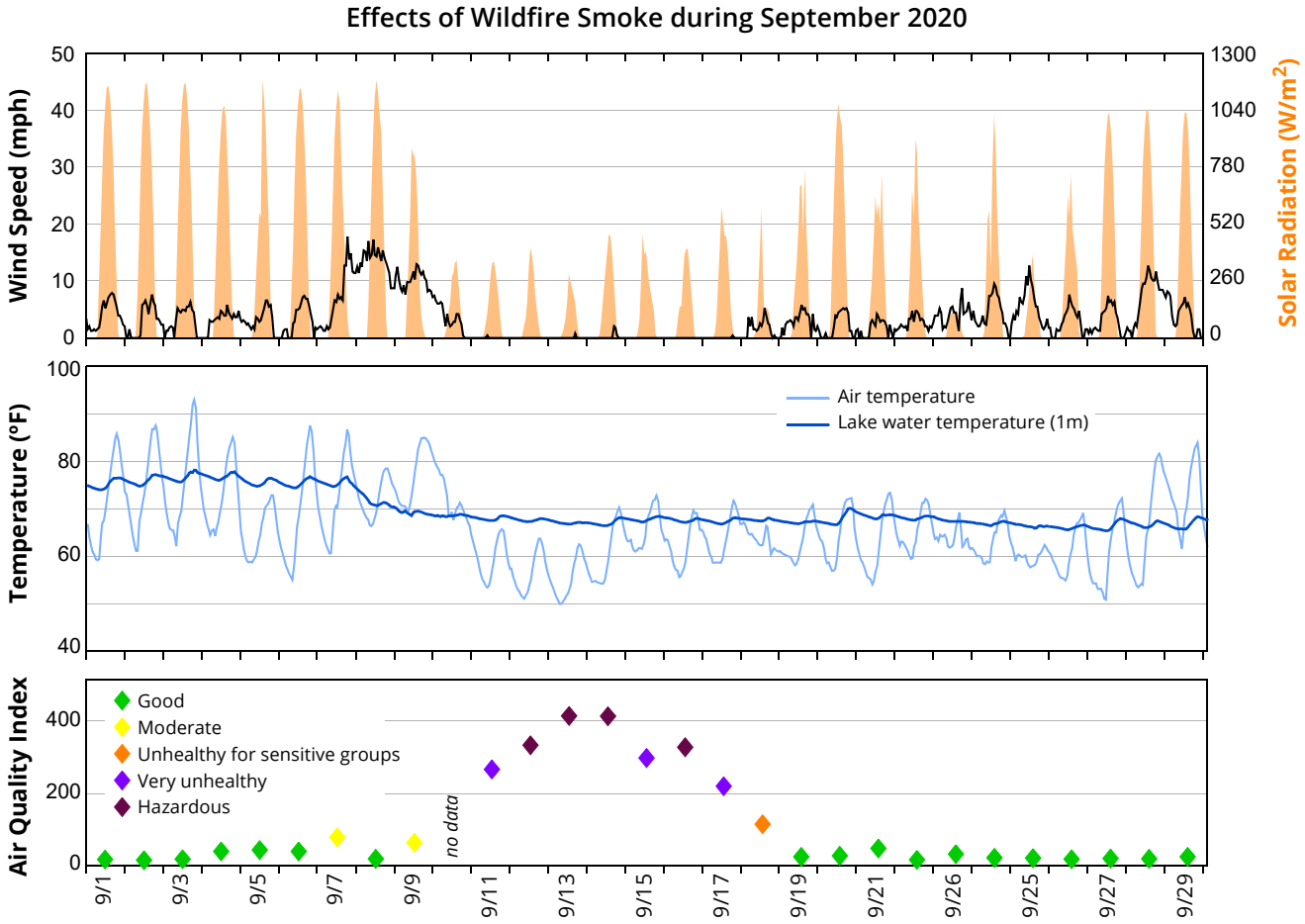
September wildfire smoke: September was profoundly affected by wildfire smoke. Weather during the first week was typical—daytime high temperatures into the 80s and nighttime lows in the 60s. The lake water temperature was mid to high 70s, with small diurnal fluctuations related to solar input and air temperature.

Strong east winds began late on September 8th with gusts of nearly 20 mph at the west end of the lake. As usual for east wind events, the humidity dropped to below 20%, increasing evaporative cooling of the lake during the three windy days. By September 10th, smoke from several large wildfires had blown into the Willamette valley.

The next eight days had almost no wind. Wildfire smoke caused hazardous air quality and blocked nearly two-thirds of the expected daily peak solar radiation. Daily high air temperatures decreased by about 20 °F and the lake cooled further.

Advancing front of wildfire smoke as seen from Oswego Lake

Upper level winds began dispersing some smoke by September 15th, but there was still no wind at the lake surface. Moderate winds at lake level resumed by September 18th and normal late September conditions (cool nights, intermittent cloudy days, occasional rainfall) soon returned.



2020 Lake Management

Maintaining a healthy lake depends on controlling phosphorus to limit overgrowth of algae and particularly cyanobacteria. The goal is to keep the phosphorus level in Oswego Lake below 20 µg/L during summer when long days and sunshine create conditions favorable to algal growth.

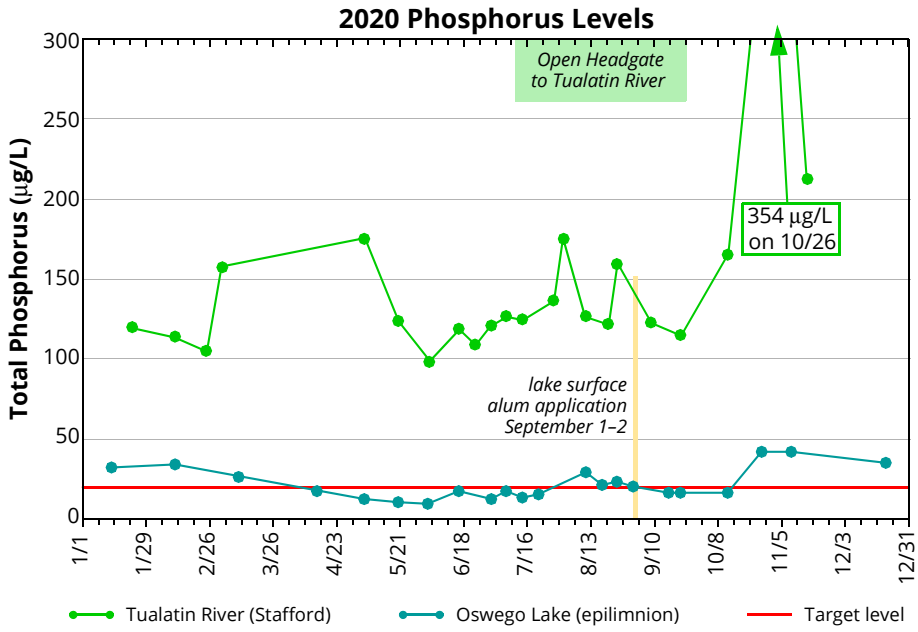
Inflow from Tualatin River: Clean Water Services has used alum to remove phosphorus from effluent before discharging it into the Tualatin River. That method may not be practicable in the future because of expected new regulations for aluminum discharge. During 2020, Clean Water Services obtained permission from the Oregon Department of Environmental Quality (ODEQ) to test a new biological treatment system for phosphorus removal that does not use alum. The biological removal system results in higher instream phosphorus concentrations, especially soluble phosphorus, than the alum treatment system. Further information about the results of biological phosphorus treatment tests are in the Water Quality section (p. 46).

New instream phosphorus limits are expected to be included in the next TMDL. The previous limit was 100µg/L total phosphorus.

Higher concentrations of soluble phosphorus have consequences for Oswego Lake because, unlike total phosphorus, all of the soluble form of phosphorus is immediately available to feed algae blooms.

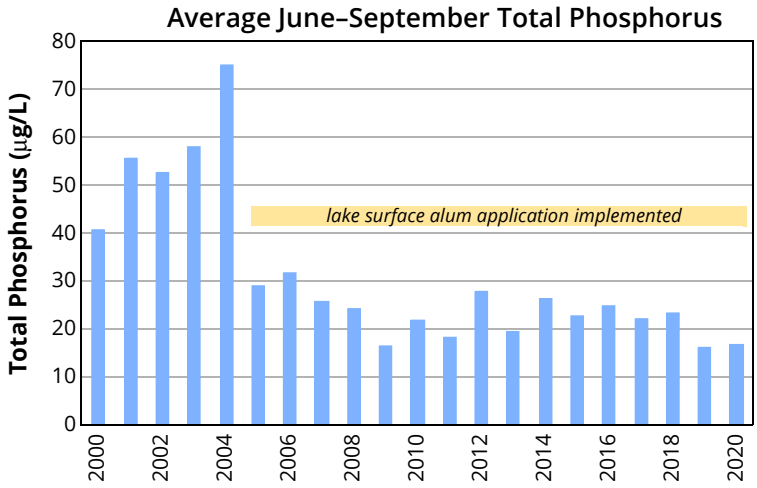
Opening the lake headgate was later than usual in 2020 because 0.79" of rain fell on June 27th. The headgate was opened on July 10th. July, August and early September were mostly dry and the headgate remained open through September 23. It is important for us to reduce the amount of water coming from the river during summer because the concentration of phosphorus from that source is several times higher than what we want in the lake.

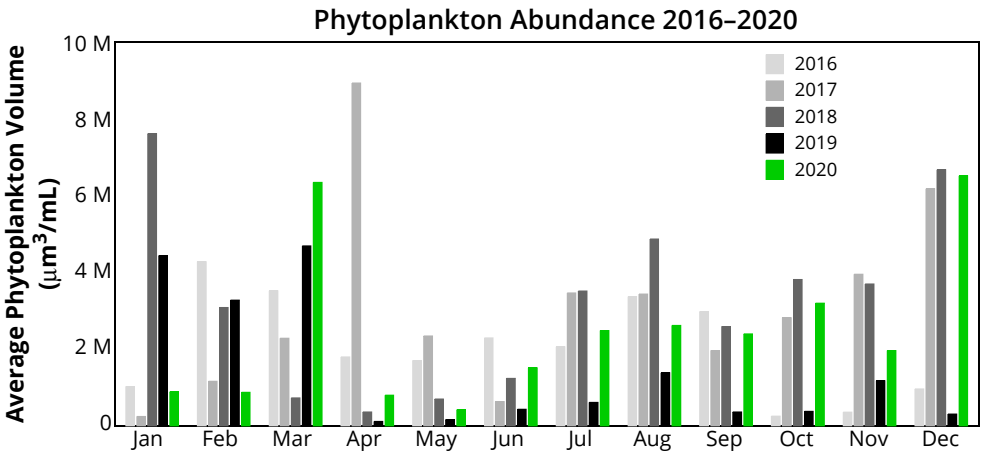
Alum treatment: Alum was applied September 1–2.



2020 Lake Water Quality

Lake water quality was good, with our target phosphorus concentration being met in all summer months except for a brief excursion above the target in early August (see graph above). The average concentration of 17 µg/L was nearly as low as in 2019, which was the lowest in 20 years. Phosphorus was much higher in the years before alum use was initiated in 2005.





The graph at the left shows average monthly phytoplankton volume from 2016 to 2020 in μm^3/mL. Compared to 2019, overall volume in 2020 is much higher. However, it is similar to phytoplankton volumes from other years. Phytoplankton growth was low in 2019 because that summer had many partly cloudy days.

Data for nutrient concentrations in the lake and lake clarity are shown in the table below.

2020 OSWEGO LAKE WATER QUALITY — MEASUREMENT AVERAGES

	Location	Chlorophyll-*a* (µg/L)	Total P (µg/L)	SRP (µg/L)	Total N (µg/L)	Secchi (m)	Turbidity (NTU)
Summer	Lakewood Bay (depth 3.2 m)	69	54	1	674	0.85	9.1
	Main Lake (depth 16 m)	27	17	1	401	2.7	2.4
	West Bay (depth 1.4 m)	20	117	3	849	0.48	19
	Oswego Canal (depth 1.2 m)	9	133	37	4980	0.81	3.9
	Blue Heron Canal (depth 1.3 m)	25	92	1	1033	0.84	8.8
	Outlet (depth 6 m)	16	25	1	454	2.2	2.7
Annual	Lakewood Bay (depth 3.2 m)	34	43	2	554	1,69	5.8
	Main Lake (depth 16 m)	27	22	2	489	2,5	3.1
	West Bay (depth 1.4 m)	16	97	6	1908	0.62	15
	Oswego Canal (depth 1.2 m)	10	145	40	4588	0.81	3.7
	Blue Heron Canal (depth 1.3 m)	25	93	4	2298	0.93	3.9
	Outlet (depth 6 m)	12	23	5	2952	2.7	2.5

Boxed cell = highest average during summer; Shaded cell = lowest average during summer; Summer=June–September
Abbreviations: Total P = Total Phosphorus, SRP = Soluble Reactive Phosphorus, Total N = Total Nitrogen, Secchi = Secchi depth, µg/L = micrograms per liter, m = meters, NTU = nephelometric turbidity units

OREGON WATER RESOURCES DEPARTMENT

by Jake Constans, Watermaster, District 18

INTRODUCTION

The District 18 Watermaster's Office is a field office of the Oregon Water Resources Department (OWRD) (`https://www.oregon.gov/OWRD`) in cooperation with Washington County (`https://www.co.washington.or.us`), and is responsible for water distribution management within the Tualatin, Oswego Lake, and Lower Willamette Drainage Basins in northwestern Oregon. District 18 covers approximately 1,111 square miles and serves the majority of the population in Washington and Columbia counties, as well as parts of Clackamas, Multnomah, and Yamhill counties. There are 2,806 total surface water rights in the district which cover 58,602 acres of land. As part of the surface water rights within the Tualatin River Basin, the following streams have instream water rights: Tualatin River, Gales Creek, Scoggins Creek, Rock Creek, West Fork Dairy Creek, and Fanno Creek. To assist in monitoring surface water in the basin we currently utilize 17 total gaging stations, 10 of which are on real time data.

WATERMASTER DISTRICT 18 GAGING STATIONS FOR 2020

STATION NUMBER	STREAM	STREAM MILE	LATITUDE	LONGITUDE	TYPE
14206200	Dairy Creek at Hwy 8 near Hillsboro, OR	2.06	45°30'38"N	123°06'56"W	*Logger
14205480	E. Fk. Dairy Creek at Dairy Creek Rd near Mountaindale, OR	12.33	45°40'32"N	123°03'54"W	Staff
14205000	W. Fk. Dairy Creek @ Banks, OR	7.7	45°37'26"N	123°06'59"W	Staff
14205160	W. Fk. Dairy Creek @ Evers Rd near Roy, OR	1.96	45°34'34"N	123°05'34"W	Staff
14204530	Gales Creek @ Old Hwy 47 near Forest Grove, OR	2.36	45°30'39"N	123°06'56"W	*Logger
14204540	Gales Creek @ Clapshaw Hill Rd near Gales Creek, OR	12.36	45°35'39"N	123°12'38"W	Staff
14202920	Sain Creek above Hagg Lake near Gaston, OR	1.6	45°28'50"N	123°14'40"W	*Logger
14202850	Scoggins Creek above Hagg Lake near Gaston, OR	8.0	45°30'06"N	123°15'06"W	Logger
14202980	Scoggins Creek below Hagg Lake near Gaston, OR	4.8	45°28'10"N	123°11'56"W	*Logger
14202860	Tanner Creek above Hagg Lake near Gaston, OR	1.6	45°30'21"N	123°13'10"W	Staff
14206500	Tualatin River @ Farmington, OR	33.3	45°26'58"N	122°57'02"W	*Logger
14202510	Tualatin River @ Gaston, OR	62.3	45°26'21"N	123°07'85"W	*Logger
14204800	Tualatin River @ Golf Course Rd near Cornelius, OR	51.5	45°30'08"N	123°03'22"W	*Logger
14202450	Tualatin River below Lee Falls near Cherry Grove, OR	70.7	45°30'21"N	123°13'06"W	*Logger
14206295	Tualatin River @ Rood Bridge Rd near Hillsboro, OR	38.4	45°29'24"N	122°57'06"W	*Logger
14206956	Tualatin River @ Tualatin (stage only) (station number formerly 14206960)	8.9	45°23'14"N	122°45'46"W	*Logger
WAPO	Wapato Canal near Gaston, OR (from Tualatin River)	61.9	45°26'29"N	123°07'17"W	Staff

*Telemetry

Water Rights

All water in Oregon, by law, is publicly owned. With a few exceptions, a person or organization (such as a city, business, or other entity) must obtain an authorization from the state before they are allowed to divert water from its natural source, whether that water is from a stream, a lake or underground. This authorization is called a water right and they have been required for surface water since 1909. The Oregon Water Resources Department (OWRD) is responsible for issuing and managing water rights in Oregon.

Water right characteristics:

- Every water right establishes the following conditions:
  - —the location where the water is being diverted,
  - —how much water is being diverted,
  - —where the water will be used,
  - —and what the water will be used for.

  The use must be considered "beneficial" by the state and the water must be used in a way that is not considered wasteful. Changing any of these conditions requires legally changing the water right.
- Every water right has a "priority date" which is the date when it was issued.
- Water rights are usually associated with the land cited in the water right and when that land is sold, the water right usually goes with it. This is called "appurtenancy" which is a legal term for rights or restrictions that go with a property (an easement is a common example). It is possible, however, to sell or transfer a water right independent of the land. In such a case, a water right transfer must be applied for and granted by OWRD. Note that mere ownership of land does not confer the right to the water adjacent to or under that land; the land owner must own a water right.
- An instream water right is designed to retain a specified amount of flow in the stream for fish and wildlife, water quality or recreation. The Departments of Fish and Wildlife, Environmental Quality and Parks and Recreation may apply for instream water rights. An instream water right has a priority date and is not treated differently than other water rights.
- A water right remains in perpetuity as long as it is used at least once every 5 years. If it has not been used for 5 years, it may be forfeited or cancelled, but this is not automatic.

Prior Appropriation: In Oregon and throughout the western U.S., water is managed by a a system called "Prior Appropriation." Prior Appropriation is most simply explained as first come, first served, where "first" to "last" is in order of priority date.

A water source may not always be adequate to meet all of the water rights that have been issued for it. Because summers in the western U.S. are typically dry, surface water shortages in the summer are not uncommon. If a water source cannot meet all of the water rights associated with it, the entity with the oldest (most senior) priority date is entitled to all of the water documented in their water right. If water is still available after that water right has been fulfilled, then the entity with the next oldest priority date is entitled to water. This process continues on in order of priority date. The entities with more recent (junior) priority dates may exercise their water rights only after the more senior rights have been met.

The Oregon Water Resources Department monitors the availability of water throughout the season. Based upon flow, location and priority date, OWRD determines which, if any, water rights holders in the basin will be restricted from exercising their water rights. Note that the eventual use of the water (for example, irrigation, municipal supply, etc.) is taken into consideration only if two water rights have the same priority date or if a drought has been officially declared by the Governor.

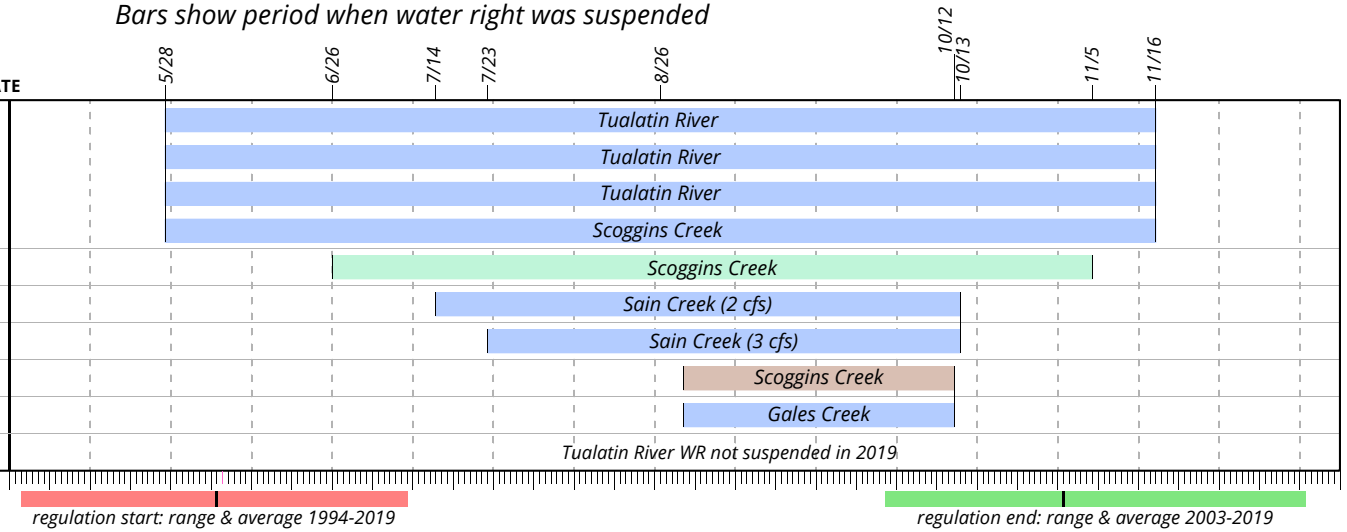
Regulatory Overview 2020

Regulation in 2020 began on May 28; the last day was November 16. Regulation was not suspended during the season. The 2020 regulation season was shorter than that of 2019 (196 days, the longest on record) and similar to that of 2018 (180 days). The 2020 regulation season is shown on the following page. A history of regulation for non-irrigation use is shown on page 38.

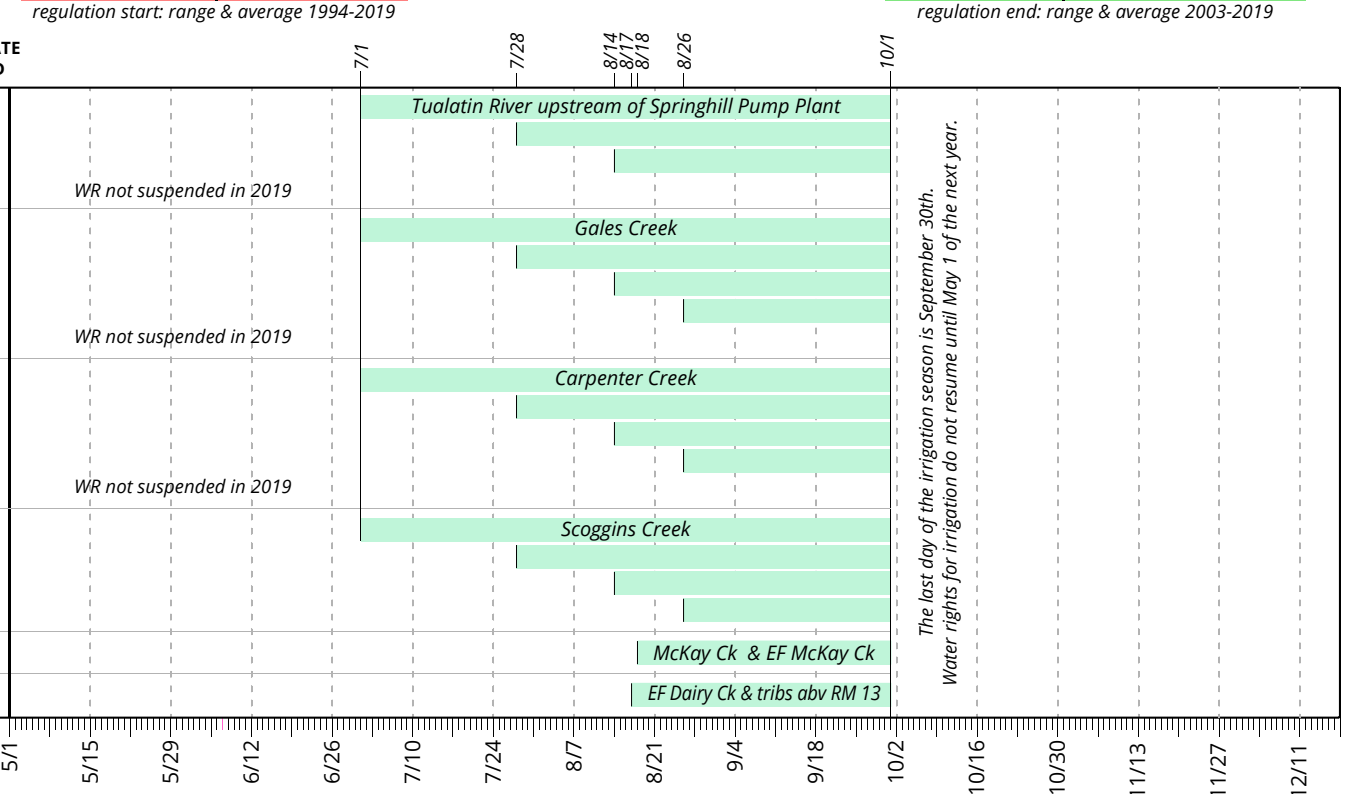
REGULATION OF WATER RIGHTS IN THE TUALATIN BASIN — 2020

Bars show period when water right was suspended

Entity	WR Permit	Priority Date
City of Beaverton	P-45455	7-15-1980
City of Forest Grove	P-40615	4-28-1976
City of Hillsboro	P-46423	2-6-1974
City of Hillsboro	P-50879	6-9-1988
TVID	P-35792	2-20-1963
City of Hillsboro	P-2443	5-1-1915
City of Hillsboro	P-1136	1-22-1912
Stimson Lumber Co	P-10633	4-1-1932
City of Forest Grove	P-12034	4-16-1935
City of Hillsboro	P-10408	1-22-1912



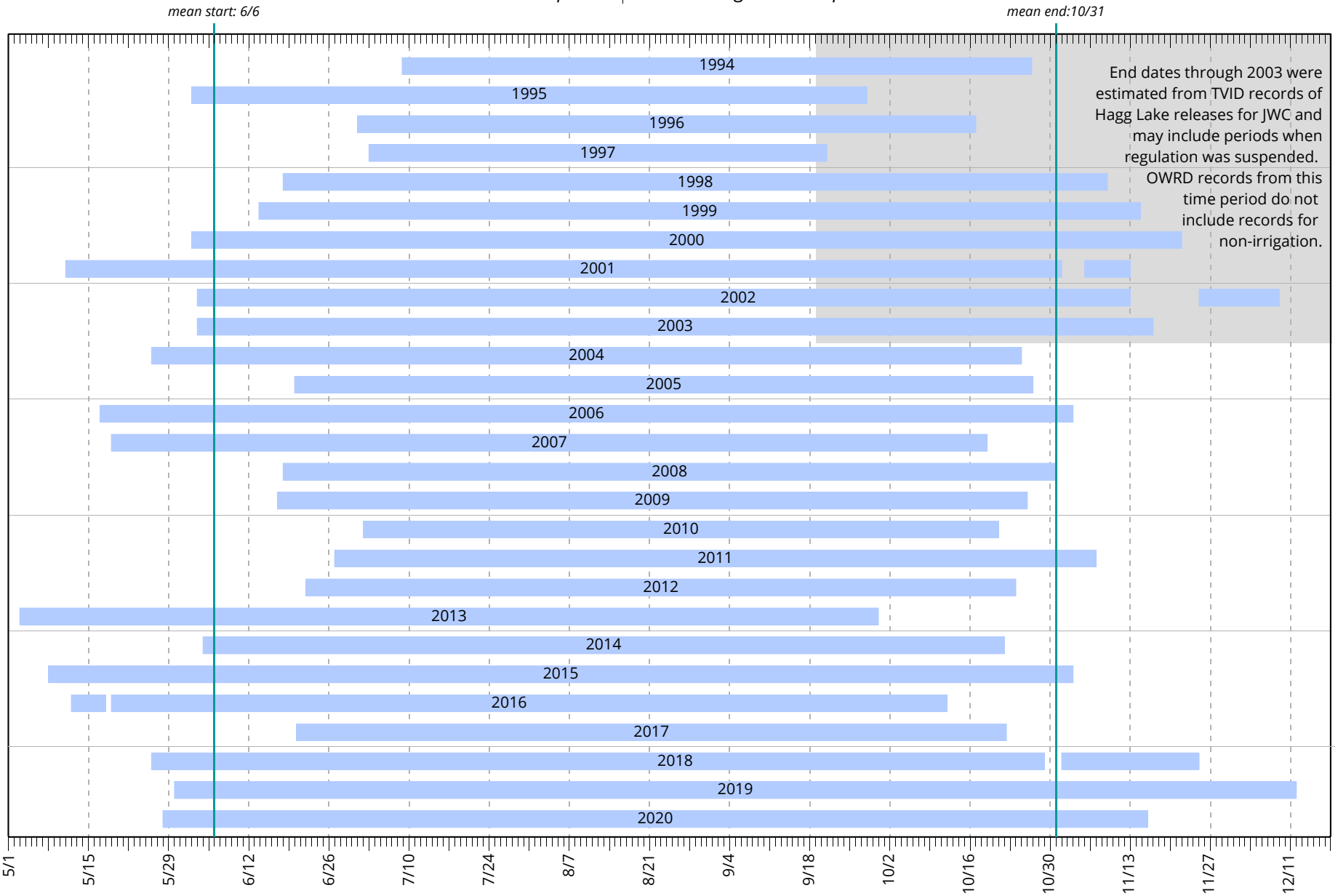
Location of Irrigation WRs	# of WRs Regulated Off	Earliest Priority Date Regulated
Tualatin R upstream of SHPP	11	2-20-1963
	18	4-14-1949
	23	3-18-1936
	3	8-26-1919
Gales Ck	62	9-24-1963
	38	4-18-1949
	26	6-25-1935
	5	9-6-1932
	7	1-23-1923
Carpenter Ck	4	7-10-1967
	5	8-22-1949
	6	12-14-1936
	1	3-25-1935
	1	10-21-1924
Scoggins Ck	3	7-28-1975
	5	4-15-1955
	7	4-24-1939
	1	4-1-1932
McKay Ck & tribs abv Northrup Rd	8	8-8-1966
EF Dairy Ck & tribs abv RM 13	12	3-6-1967



Water Use Municipal, Irrigation, Industrial-manufacturing

HISTORY OF REGULATION OF WATER RIGHTS FOR NON-IRRIGATION USE IN THE TUALATIN BASIN

Bars show period when water right was suspended



SCOGGINS DAM/HENRY HAGG LAKE

By John Goans, Reservoir Superintendent, TVID; Wally Otto, retired, TVID; Bernie Bonn

INTRODUCTION

Scoggins Dam/Henry Hagg Lake is located on Scoggins Creek in the upper part of the Tualatin Basin. Scoggins Dam is an earthfill dam constructed during 1972–75 to store water during the winter for summer and fall use. The dam is owned by the Bureau of Reclamation (BOR) and managed by the Tualatin Valley Irrigation District (TVID). Stored water from Hagg Lake is used for irrigation, municipal and industrial use, and flow augmentation in the Tualatin Basin to support water quality and protect fish and wildlife.

Scoggins Dam and Hagg Lake

Three tributaries flow into Hagg Lake—Sain, Scoggins and Tanner Creeks. Flows in Sain and Scoggins Creeks are monitored by Oregon Water Resources Department gages; flow in Tanner Creek is monitored by daily readings of a staff plate by TVID personnel. Outflow is measured by a BOR stream gage in Scoggins Creek at RM 4.8. Oregon Water Resources Department maintains the rating curves for these sites.

Scoggins Dam stores 53,323 acre-feet of water in Henry Hagg Lake as active storage—the amount of water that can be moved in or out of the reservoir between the intake structure and the top of the spillway gates. Another 7,000 acre-feet of stored water that is not engineered to be removed exists below the intake structure. It is reserved for the protection of fish if the lake were to be drafted down completely to the intake structure.

ALLOCATION OF WATER FROM HAGG LAKE

CONTRACTED TO	WATER USE	AVAILABLE VOLUME	
		ac-ft	AS PERCENT
Tualatin Valley Irrigation District	Irrigation (up to 17,000 acres)	26,705	50%
Joint Water Commission	Municipal and industrial	13,500	25%
City of Beaverton		4,000	
City of Forest Grove		4,500	
City of Hillsboro		5,000	
Clean Water Services	Instream water quality	12,618	24%
Lake Oswego Corporation	Irrigation	500	1%
Total		***53,323**	**100%**

*The active storage in Hagg Lake was revised in 2011.

Scoggins Dam is authorized by the U.S. Congress to provide flood risk management for communities located downstream, including Gaston, Cornelius and Forest Grove. The dam controls runoff from a 39 square mile watershed (about 5% of the Tualatin Basin). From November 1st to January 15th, 20,000 acre-feet are designated for storage for flood risk management. The dam does not generate electricity.

During the summer, recreation is a major activity at Hagg Lake and the surrounding area. Washington County maintains and operates the 2,851 acre Scoggins Valley Park/Henry Hagg Lake recreational facility. In addition to the 1,100 acre lake, the park includes picnic areas, hiking trails, two boat launching facilities, and observation decks for bird and wildlife watching. The lake is stocked for fishing. Most of the park's facilities were designed to be accessible for disabled visitors. The park is open all year for day-use only.

http://www.co.washington.or.us/Support_Services/Facilities/Parks/Hagglake/index.cfm

2020 Water Use

Water year 2020 marks the 46th year since Scoggins Dam began storing and releasing water for downstream beneficial use. A total of 34,881 acre-feet were delivered in 2020 (calendar year) bringing the total delivery from the Project to more than 1.3 million acre-feet.

2020 flow regulation began on May 28th for the Joint Water Commission and June 27th for TVID. With the exception of TVID's extended season irrigators, all users were permitted to return to natural flow use in the Tualatin River on November 16, 2020. Outside of the regulation period, water was released for JWC on May 20th for testing purposes and for Clean Water Services on May 9–12. In addition, TVID delivered small amounts of storage water primarily to nurseries and greenhouses beginning in March and continuing until the end of November as permitted by the Oregon Water Resources Department.

2020 WATER DELIVERIES FROM HAGG LAKE

Delivered to	Volume (ac-ft)
Tualatin Valley Irrigation District	14,749
Clean Water Services	10,455
Municipal Use (Cities of Beaverton, Forest Grove and Hillsboro)	8,501
Lake Oswego Corporation	500
Other (includes two golf courses, from TVID allocation)	676
Total	**34,881**

Events in 2020

Recreation: In 2020 there were 1,000,000 users recorded at Scoggins Valley Park/Henry Hagg Lake.

Coho Salmon: Eight Coho were spotted in Scoggins Creek below the dam in December.

Lake Fish Habitat: Over the previous years, the Oregon Panfish Club anchored a total of 350 fish habitat structures (8' diameter) in the upper reaches of Henry Hagg Lake. These have caused no problems in terms of operation and maintenance of Scoggins Dam. They have remained in place weighted down with concrete anchors.

Elk Mitigation: Roughly 50% of the fir trees planted in February 2012 remain standing and continue to form a visual barrier for the elk along the side of the Control House entry road. The field remains off limits to all trespassers including dogs. On numerous occasions, elk were observed grazing in the pasture.

Endangered species: As part of the consultation, BOR committed to avoid or minimize impacts to Fender's Blue Butterfly (FBB) and Kincaid's lupine. The Master Trail that traversed prairie patches containing FBB and Kincaid's lupine was relocated and trail maintenance practices modified to support these species. Reclamation has also committed to work with partner agencies to study and control invasive weeds.

Scoggins Dam Security

Department of Homeland Security Alert Levels: The Project follows the Department of Homeland Security (DHS) alert levels as required by BOR. No incidences of heightened security level occurred at Scoggins Dam in 2020 due to any specific terrorist alerts.

Scoggins Dam Safety

At Scoggins Dam, earthquake activity, weather including temperature and precipitation, river stage levels, and water surface elevation are reported and recorded electronically. In addition, key dam behavioral instruments report electronically over BOR's Hydromet system. The data are collected, stored and transmitted via satellite to BOR's Pacific Northwest Regional office in Boise, and are available on the Internet through both secure and non-secure channels. Many of these electronic reporting stations have alarms to alert operators if sudden or unusual conditions develop including earthquakes and flooding. While operators are not on site 24/7, the Project is monitored 24/7, both by BOR and TVID personnel.

Spills and Water Quality: No spills or accidents that jeopardized the water quality in Henry Hagg Lake occurred in 2020 and the BOR on-site Response Trailer was not needed for emergency response. No containment booms were deployed to contain any contaminant spills during 2020.

Earthquakes: No earthquakes were recorded near the dam in 2020.

Future of the Project

Tualatin Basin Water Supply: In 2001, the water resource agencies in the Tualatin Basin (except TVID) began to explore and compare alternatives for providing the additional water needed to meet future needs. TVID was not part of this group because it is limited to serving 17,000 acres of irrigated land and the current supply is adequate. After studying many different options as well as seismic issues, the municipal and industrial water providers decided to focus on the Willamette River for future water supply. Clean Water Services continues to collaborate with BOR as a Project Partner because additional water would help Clean Water Services meet its regulatory requirements and contribute to the long-term needs of the basin.

Three options are under review for the Tualatin Basin Dam Safety and Water Supply Joint Project:

- Modify the existing dam (BOR is leading the review);
- Modify and raise the existing dam (BOR is leading the review);
- Construct a new concrete dam downstream of Stimson Mill (Clean Water Services is leading the review).

In February 2020, the Project Partners met to review feasibility designs for the three options. Estimated costs ranged from $750 million for dam modifications alone to $1.2 billion for a new downstream dam. All three options were deemed technically feasible, but not financially feasible. Consequently, CWS and Reclamation did not select an option to move forward. Rather, they have been pursuing additional information about risks, costs and other funding to advance the project.

The partners are evaluating the project in the context of meeting regional needs and financial carrying capacity along with federal financial obligations. BOR's dam safety investments represent a generational opportunity to expand the facility to support regional needs including the Endangered Species Act, hydroelectric power, climate resiliency, wildfires, recreation and other benefits.

The issue of high cost remains. Various Federal loans and grants are being investigated. Clean Water Services has commissioned an economic study by ECONorthwest to provide a valuation of water for various beneficiaries and to help identify additional project purposes and potential partners. When these activities are complete, BOR will evaluate all options and determine how to proceed. The project schedule is based on BOR's Safety of Dams program funding and identified financing options available. Construction of the selected option is not likely to begin before 2028 and is estimated to last six to eight years.

More information about the Tualatin Basin Water Supply Project and updates can be found at:
http://www.tualatinbasinwatersupply.org

TUALATIN VALLEY IRRIGATION DISTRICT

by Wally Otto, retired, TVID; updated by John Goans, Reservoir Superintendent, TVID

Tualatin Valley Irrigation District Overview

The Tualatin Valley Irrigation District (TVID), located in Forest Grove, Oregon, is the agricultural water service agency in the Tualatin Basin. In the early twentieth century, relatively little agricultural land was irrigated in Washington County: about 15 acres in 1915 and about 130 acres in 1933. By 1951, however, 18,455 acres had water rights registered in the county. When the TVID was formed in 1962, the total had grown to 33,885 acres. TVID was formed to assist in the delivery of irrigation water to about half of those acres (17,000) in the Tualatin Basin. The water was supplied from natural flow and return flows, and was extremely limited due to early summer withdrawals from the Tualatin River and increasing demands for water for irrigation and municipal use and for maintaining instream water quality and fish. The only storage at this time was Barney Reservoir which stored 4000 acre-feet for municipal use. Beginning in 1975, additional stored water became available behind the newly completed Bureau of Reclamation Project, Scoggins Dam. Approximately half of the water stored in Hagg Lake (Henry Hagg Lake) is allocated to TVID.

Most of the water supplied by TVID is pumped from the Tualatin River at the Spring Hill Pump Plant and delivered to TVID patrons via approximately 120 miles of pressurized pipeline. Additionally, water in both Scoggins Creek and the Tualatin River is withdrawn by irrigators for use on land abutting the river. They are known as “river users” and pay for their own pumping costs because they are not associated with the pressure pipeline or the Spring Hill Pumping Plant. When natural flow no longer meets demand, the District 18 Watermaster begins regulating water users with “junior” (or more recent) water rights off, starting with users with the most recent water right. The TVID storage right is dated 1963, so TVID patrons with water rights after that date must stop withdrawing natural and return flow water, and all water withdrawals must be supplied from storage. Storage water is discharged from Hagg Lake to either augment the river flow or supply the entire need of the TVID patrons, both the pump plant/pressure pipeline users and the river users. Water for some of the TVID members on the lower Tualatin River is supplied by water discharged from Clean Water Services’ Rock Creek Wastewater Treatment Facility. Crops irrigated with TVID water range from row crops including blueberries, blackcaps, corn, pumpkins and other vegetables to nursery stock.

TVID is allowed to use storage water early and late in the year because of an extended season for irrigation made possible by an agreement with the Oregon Water Resources Department. The early season begins March 1 and the extended season ends November 30. All water used outside the normal irrigation season (May through September) must come from TVID's annual contracted *storage* allotment of 26,705 acre-feet. TVID's total contracted amount with Reclamation is 37,000 acre-feet with the additional coming from natural and return flows in the Tualatin River and its tributaries.

The extension of the irrigation season for the Tualatin Valley Irrigation District has made growing specialty crops within the District much more appealing. During the extended spring season, the water is used primarily for berries and nurseries; during the extended fall season, water is primarily used for the nurseries. A more diverse nursery stock is now possible, including flowers which are raised well into November when protected by greenhouses. Water availability and moderate temperatures make the Tualatin Valley Irrigation District home to many small specialty nurseries along with several large operations.

2020 TVID Water Use

For the 2020 irrigation season (March through the end of November), TVID took delivery of 14,749 acre-feet of water from storage in Henry Hagg Lake—about 966 ac-ft less than usage in 2019. The least amount was 8,333 ac-ft in 1993; the largest seasonal delivery was 25,852 ac-ft in 2015. TVID 2020 peak use from storage was 107 cfs on August 9.

WEATHER STATISTICS AT SCOGGINS DAM 2020

Month	Description	Precipitation		Average Temperature		Other
		2020	[average]*	Low	High	
January	wet	13.5″	[7.93″]	39°F	48°F	some precipitation all days
February	dry, mild	2.22″	[6.17″]	34°F	51°F	13 days with no precipitation
March	dry, mild	2.59″	[5.640″]	34°F	53°F	15 days with no precipitation 8 days ≥60°F
April	dry	1.15″	[3.48″]	39°F	63°F	no precipitation 6th–24th
May	warm	2.92″	[2.14″]	47°F	67°F	5 days ≥80°F; 1 day = 90°F
June	average; dry periods	2.07″	[1.44″]	50°F	72°F	16 days with no rain
July	dry	0.02″	[0.41″]	52°F	79°F	only 1 day with rain (8th)
August	dry	0.10″	[0.63″]	52°F	83°F	22 days ≥80°F, 4 days >90°F
September	mostly dry; 2 wet periods	3.41″	[1.55″]	53°F	77°F	no rain 1st –17th 1.2″ 18th–19th; 2.16″ 24th–27th
October	mostly dry; one wet period	2.21″	[3.73″]	45°F	66°F	2.10″ (95% of total) 10th – 14th
November	average	7.76″	[7.88″]	38°F	51°F	1.64″ on 13th; 1.17″ on 15th
December	dry early one very wet day	8.18″	[9.23″]	36°F	49°F	only 0.12″ on 1st–8th; 2.11″ on 20th

*average based on 1970–current year

2020 TVID Operation and Maintenance

The year was uneventful from an operations standpoint. A "moratorium" remains in place regarding new turn-out deliveries. No new deliveries were added to the delivery system during 2020.

Pipeline Maintenance: TVID delivers irrigation water by high pressure pipeline to customers from Gaston to North Plains and from west of Forest Grove to Highway 219 south of Hillsboro. The water is withdrawn from the Tualatin River at the Spring Hill Pump Plant and lifted by pumps to a water regulating tank off Winter's Road. From there it flows under gravity pressure to all points of delivery through 120 miles of pipeline. Preventative maintenance continues to keep service delivery as dependable as possible. Several minor disruptions of service occurred during the year, but were quickly isolated and repaired. Service was restored in minutes in some cases or in up to a day if conditions did not allow quick access. There were no long term disruptions of service to District patrons.

Tributary Flow Restoration Projects: TVID and Clean Water Services continue their cooperative effort using the TVID water distribution network to supply water to West Fork Dairy Creek, Gales Creek, East Fork Dairy Creek, and McKay Creek. Each site consists of a metered pipeline with a diffuser at the outlet. All sites are located near delivery lines for the Irrigation District. Flow augmentation occurs during the summer and fall. The water not only adds to streamflow, but it cools the stream as well. The partnership between the Tualatin Valley Irrigation District and Clean Water Services is a novel way to improve the water quality of these streams at minimal cost.

WAPATO LAKE

by Kristel Griffith, Water Resources Program Coordinator, JWC; John Goans, Reservoir Superintendent, TVID

The former Wapato Lake bed, located southeast of Gaston, Oregon, is a 780 acre wetland that was once the winter residence of indigenous people. Landowners formed the Wapato Improvement District (WID) in the 1930s. The WID constructed a levee and pump system to drain the lake bed during spring so that the land could be farmed in summer. The levee protects the former lake bed from severe flooding during the winter, thereby allowing easier drainage in spring.

In 2002, the US Fish and Wildlife Service (USFWS) began considering parts of the area for inclusion in the Tualatin River National Wildlife Refuge. USFWS began purchasing land and by 2012 USFWS was the majority land-owner and the WID was dissolved. The Wapato Lake National Wildlife Refuge was established in 2013.

Levee, pump and drainage issues

A levee failure in December 2007 caused the lake bed to flood. By spring 2008, the lake was supporting a substantial population of algae and zooplankton. When the impounded water was discharged in June 2008, it created many water quality problems in the Tualatin River which affected drinking water treatment, agricultural irrigation, fish and wildlife, and recreational use. The State of Oregon issued a Public Health Advisory for recreational contact with the Tualatin River due to high levels of toxic algae. Detailed descriptions of these events can be found in USGS Report 2015-5178, "Upstream Factors Affecting Tualatin River Algae-Tracking the 2008 Anabaena Algae Bloom to Wapato Lake, Oregon."

The primary pump failed in 2010 and in 2016. In both cases, the water and natural resource managers in the Tualatin Basin (including CWS, JWC and USFWS) worked together to obtain temporary pumps and facilitate emergency repairs. These actions averted the sort of water quality problems that occurred in 2008.

In order to protect water quality in the Tualatin River, drainage from Wapato Lake was included in the 2012 Total Maximum Daily Load (TMDL). The TMDL stipulates that only limited pumping from the lakebed is allowed after April 30th each year. This time frame avoids draining the area when river conditions are favorable for algal blooms (low flow and high temperature) which can cause water quality problems.

Pumping operations in 2020

Both pumps were turned on March 3rd when the lake water level was 167.2 ft. The large pump had intermittent outages until March 26th when it was turned off. The small pump operated until May 30th.

2020 PUMPING CAPACITY AND DATES OF OPERATION

Pump	Nominal Capacity (gpm)	Operation Period
USFWS Primary (not allowed after April 30)	~10,000	3/3 – 3/26
USFWS Secondary (allowed after April 30)	~3,000	3/3 – 5/30

Replacement pumps

USFWS commissioned a pump station rehabilitation because the pumps had reached the end of their useful life and the pump houses were no longer safe. Washington County removed two bridges in the Refuge: the Gaston Feed Store Bridge in the northwest corner and the Pump House Bridge in the northeast which was replaced with a nearby bridge. Pump station construction occurred from June through December and included demolition of the existing pump house, use of cofferdams, removing and replacing historic pumps, gate removals, and constructing a new pump house. The new pump house includes telemetry communications. Construction of the new pump station was completed in December 2020 and the new pumps were successfully tested on January 21, 2021. The two new pumps' rated capacities are 3,625 and 9,650 gpm, which are similar to the old pumps.

Monitoring updates

In May 2020, USGS in partnership with JWC installed a water quality monitor at Wapato Creek downstream of the pumps. In 2020, at the urging of TVID, the Tualatin Soil and Water Conservation District agreed to partner with USGS to monitor flow in Wapato Creek at the water quality monitoring site. The flow gage will be installed in 2021. Data from these monitors can be found at:

`https://or.water.usgs.gov/tualatin/monitors/wapato_all_7.html`

Water level at Wapato Lake continues to be monitored by USGS as it has been since September 2011.

WATER QUALITY

by Bernie Bonn

Concern about water quality in the Tualatin River is longstanding. Until the formation of Clean Water Services (formerly the Unified Sewerage Agency of Washington County), numerous small towns and cities discharged minimally treated sewage into the river and its tributaries. Water use by agricultural activities in the basin depleted river flow in the summer and contributed nutrients and sediment. By the 1960s, the local newspaper documented the poor water quality in the Tualatin River. In 1984, the Oregon Department of Environmental Quality (ODEQ) included sections of the Tualatin River on the 303d list as being water quality limited. Water quality issues in the Tualatin Basin have included elevated pH and nuisance algae, low dissolved oxygen, high temperatures, and excess bacteria. Many groups have worked to improve water quality in the Tualatin Basin, including Clean Water Services, the Tualatin River Watershed Council, the Tualatin Riverkeepers and others. Part of the reason for the formation of the Flow Committee is to manage river flow to improve and preserve water quality.

HISTORICAL WATER QUALITY CONCERNS

Algae and high pH: In the reservoir section (about RM 3.4-30), the Tualatin River is wide and slow moving. Because the river is so broad, streamside vegetation cannot adequately shade the full width and consequently much of the water surface is in exposed to the sun. Nutrients, both naturally occurring and anthropogenic, are ample. These conditions—slow movement, sunlight, and ample nutrients— are ideal for algal growth during summer. Most of the algae in the Tualatin River are phytoplankton that float in the upper few feet of the water. During the day, photosynthesis by algae converts carbon dioxide dissolved in the water into biomass. As the concentration of dissolved carbon dioxide decreases, the pH of the water increases. High pH values can negatively affect aquatic resources.

In the 1980s the lower section of the Tualatin River was listed by the ODEQ for elevated pH (>8.5) and degraded aesthetics due to nuisance algal growth. To address these water quality problems, the ODEQ developed a TMDL for phosphorus to limit nutrient availability. Target levels for instream total phosphorus concentrations have been established for the Tualatin River at various locations.

Some Tualatin tributaries also have had problems with algal growth, usually periphyton.

Dissolved oxygen: The amount of oxygen dissolved in water is the net result of processes that contribute oxygen and processes that consume oxygen. In the lower Tualatin River the primary sources of oxygen are:

—photosynthesis by algae during the daytime, and
—inflow of oxygen rich water.

The processes that consume oxygen are:

—biochemical oxygen demand (including organic substances that decompose and ammonia),
—sediment oxygen demand (from substances at the river bottom that decompose), and
—respiration by algae.

Because the lower section of the river moves slowly and is not turbulent, oxygen exchange with the atmosphere is slow. If dissolved oxygen becomes depleted, it cannot be quickly replenished from the air. Similarly, if dissolved oxygen is in excess, the river water stays supersaturated for a prolonged period of time.

In the 1980s the lower section of the Tualatin River was listed by the ODEQ for low dissolved oxygen that could impair fish health.The water quality criteria for this section of the river, which is considered 'Cool Water Habitat,' are:

- Grab samples: dissolved oxygen > 6.5 mg/L
- Continuous Monitoring:
  —30-day average of daily mean dissolved oxygen > 6.5 mg/L (no credit for supersaturation)
  —7-day average of daily minimum dissolved oxygen > 5.0 mg/L (no credit for supersaturation)
  —Daily minimum dissolved oxygen > 4.0 mg/L

ODEQ also developed a TMDL for ammonia which reacts with oxygen to form nitrate.

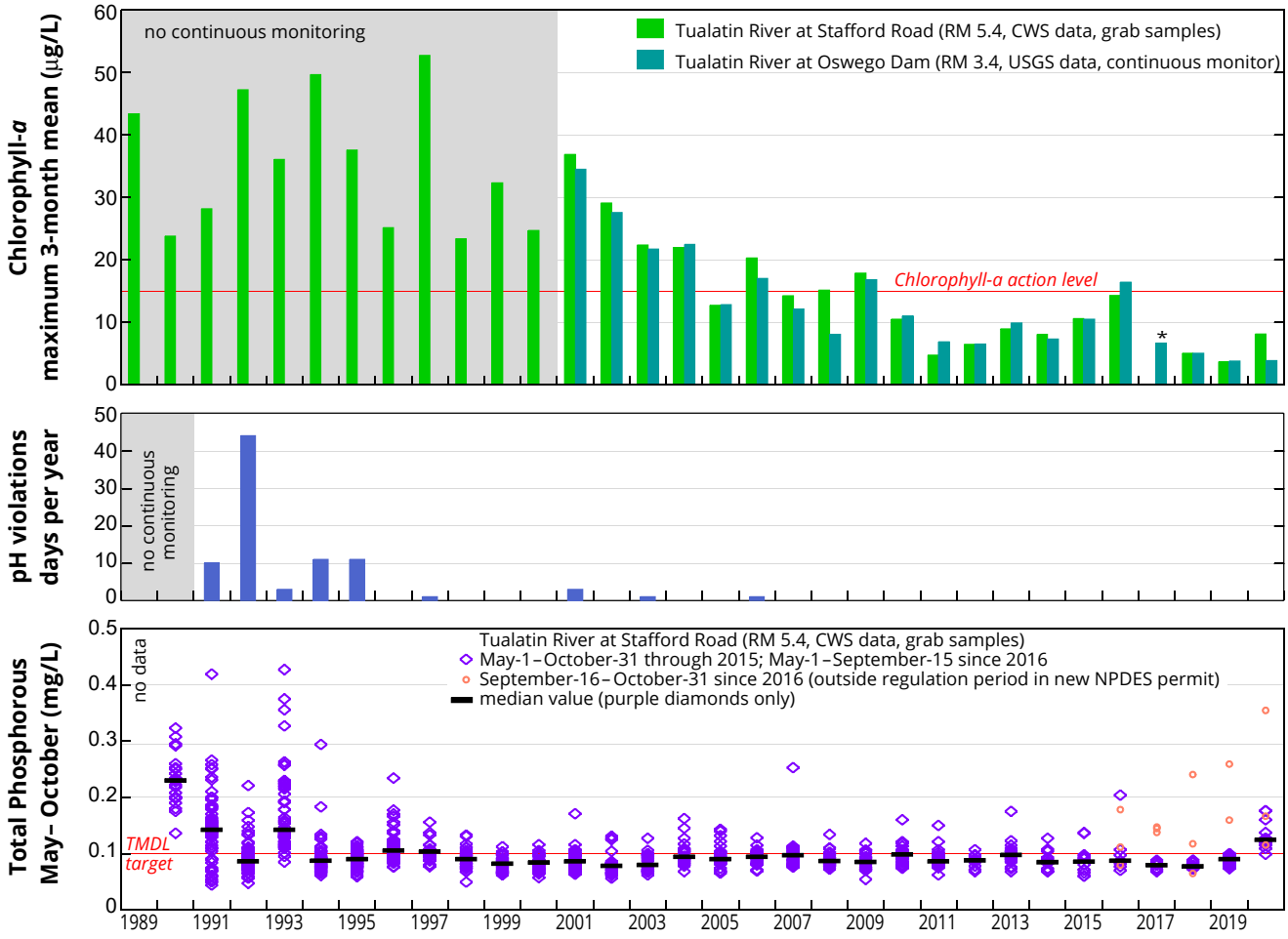
Algae and pH — 2020 and the past 30 years

In 1988 when the first Tualatin TMDL was imposed, the primary strategy to prevent algal overgrowth and high pH was to strictly limit phosphorus. Limiting ammonia decreased the potential for toxicity at high pH. Clean Water Services implemented advanced wastewater treatment at its Rock Creek and Durham WWTFs which greatly decreased the amounts of these nutrients discharged to the river during summer low flow.

Since the TMDL: The TMDL limits had the intended effect. From 1998 through 2019, median total phosphorus concentrations during May through October in the Tualatin River at Stafford Road did not exceed the TMDL target level (0.10 mg/L). Algal populations as measured by chlorophyll-*a* concentrations decreased substantially since the 1990s and the high pH values in the lower Tualatin River that were problematic in the early 1990s no longer occur. (See the figure at the bottom of the page.)

2020: In 2020, the mean May–October phosphorus concentration in the Tualatin River at Stafford Road was greater than in recent years (0.125 mg/L). This was because Clean Water Services was testing a new biological phosphorus removal process at the Rock Creek and Durham WWTFs. Recently, USEPA proposed limits for aluminum in freshwater that will make the existing alum method of phosphorus removal impractical. The new biological process decreases alum use, but does not eliminate it. Because the biological treatment process removes less phosphorus than the old alum method, Clean Water Services entered into a Mutual Agreement and Order with DEQ to temporarily increase phosphorus limits from the WWTFs. Despite greater stream phosphorus concentrations in 2020, chlorophyll-*a* concentrations remained low (maximum 3-month mean of 3.9 µg/L, USGS continuous monitoring data) suggesting that a moderate increase in phosphorus concentration would not result in a sustained large algal bloom in the lower river. The maximum pH for May–October 2020 was 7.46, well below the 8.5 pH criterion. Although a moderate increase in phosphorus may not cause algal overgrowth in the Tualatin River, it may affect Oswego Lake when river water is diverted to the lake. More details about the river response to higher phosphorus concentrations can be found in the Tualatin River Phosphorus Study Report by Clean Water Services (December 2020).

CHLOROPHYLL-*a*, pH & PHOSPHORUS — LOWER TUALATIN RIVER — MAY–OCTOBER



Dissolved oxygen — 2020 and the past 30 years

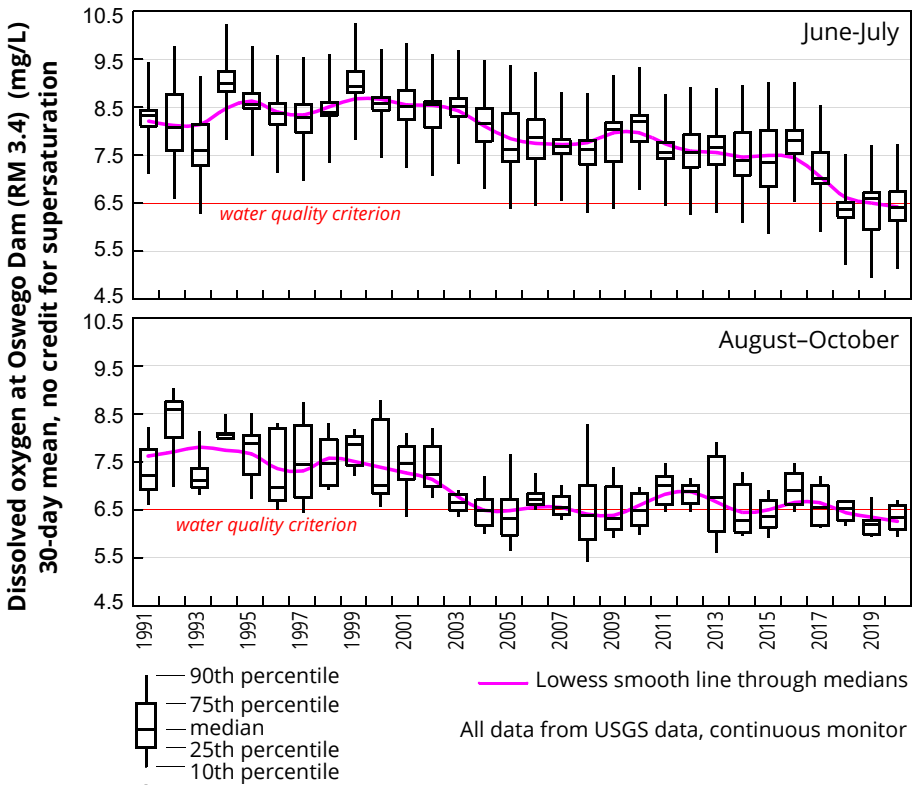
Since the TMDL: When the TMDL was implemented, episodes of low dissolved oxygen in the Tualatin River were thought to result from decomposition of ammonia (from the WWTFs) and of algae when a large algal bloom crashed. Very low streamflow exacerbated the oxygen losses.

Since that time, ammonia discharges are much decreased and large algal blooms are now rare. Streamflow in the Tualatin River during the summer has increased and very low flow occurs infrequently.

Despite these improvements, the graphs at the right show that low dissolved oxygen is an issue in the lower Tualatin River—in August–October (since 2004), and during early summer (since 2018). Studies in the past 30 years have shown that sediment oxygen demand (SOD) is an important and continual consumer of oxygen.

The figure at the lower right shows that not meeting the 30-day dissolved oxygen criterion is more frequent when chlorophyll-*a* concentrations are low (< 5 µg/L). This suggests that photosynthetic production of oxygen by algae is needed to offset oxygen consumption by sediment oxygen demand.

The changes over time may be related to Increased river flow which affects both SOD and algal population. Higher flow decreases contact time between river water and sediment which limits oxygen consumption. Higher flow also lessens the time that algal populations have to grow and fewer algae produce less oxygen. In addition, much of the increased flow originated from Hagg Lake, Barney Reservoir and WWTFs, source waters that have little indigenous algae.



Number of Days below 30-day DO Criterion and Chlorophyll-a

	June	July	August	September	October
1991	0	0	0	0	0
1992	0	0	0	0	1
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	9	0
1997	0	0	0	11	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	6
2001	0	0	0	0	14
2002	0	0	0	0	0
2003	0	0	13	3	10
2004	0	0	13	26	8
2005	0	0	6	30	31
2006	0	0	2	0	7
2007	0	0	20	22	0
2008	0	0	4	30	19
2009	0	0	10	30	12
2010	0	0	0	21	25
2011	0	0	0	3	13
2012	0	0	0	14	0
2013	0	0	2	30	6
2014	0	0	0	24	29
2015	0	0	7	22	31
2016	0	0	0	11	3
2017	0	0	2	30	12
2018	25	17	15	28	0
2019	0	27	31	30	13
2020	3	31	31	7	28

Chlorophyll-*a* monthly mean
- <5 µg/L
- 5 – <10 µg/L
- 10 – 20 µg/L
- > 20 µg/L

Days below 30-day DO criterion
- none
- <20%
- 20 – <50%
- 50 – <80%
- 80 – <100%
- all

Chlorophyll-*a* data
1991–2000: CWS at Stafford Rd grab samples
2001–2020: USGS at Oswego Dam continuous monitor

Dissolved oxygen data
1991–2020: USGS at Oswego Dam continuous monitor

The table below shows the number of days per month when any applicable dissolved oxygen criteria were not met in the Tualatin River at Oswego Dam since the continuous DO monitor was installed. In general, August and September are the most critical months with respect to all three DO criteria.

The daily minimum and the 7-day mean minimum criteria are usually met. When either of these criteria are not met, it is generally only for a few days. The rare occasions when several days in a month failed to meet the 7-day criterion can often be attributed to a specific event. For example, in August 2008 the failures coincided with the arrival of a plume of drainage from Wapato Lake at Oswego Dam. The number of days that fail to meet the daily or 7-day criteria does not appear to be changing over time.

The number of days when the 30-day mean criterion is not met has been increasing, especially since 2003. Not meeting the 30-day mean criterion has also been occurring earlier in the year (June and July) which was not the case before 2018. As described on the previous page, the increase in days not meeting the 30-day criterion is associated with a decrease in chlorophyll-*a* concentrations. Water temperature may also be a contributing factor. Water temperature in July through September at Oswego Dam has shown a statistically significant increase since 1991 (see Appendix F). Higher temperatures increase the rate of oxygen consumption by sediment oxygen demand and photosynthetic oxygen production by a small algal population cannot keep up.

NUMBER OF DAYS WHEN DISSOLVED OXYGEN CRITERIA WERE NOT MET AT OSWEGO DAM

	Daily Minimum Value (≤4 mg/L)						7-day Mean Minimum (≤5 mg/L)						30-day Mean no Credit for Super Sat (≤6.5 mg/L)					
	J	J	A	S	O	N	J	J	A	S	O	N	J	J	A	S	O	N
1991	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	1	0	3	0	0	0	2	0	0	0	0	1	28
1993	0	0	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	4	0	0	0	0	0	3	4	0	0	0	0	0	9	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	15
2001	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	14	4
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	1	0	0	0	0	0	0	0	0	0	0	0	13	3	10	7
2004	0	0	0	0	0	0	0	0	1	0	0	0	0	0	13	26	8	0
2005	0	0	0	0	0	0	0	0	0	2	0	0	0	0	6	30	31	5
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	0
2007	0	0	0	0	0	0	0	3	0	0	0	0	0	0	20	22	0	0
2008	0	0	2	0	0	0	0	0	12	3	0	0	0	0	4	30	19	0
2009	0	0	2	0	0	0	0	0	7	0	0	0	0	0	10	30	12	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	25	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0
2013	0	0	0	0	0	0	0	0	0	7	0	0	0	0	2	30	6	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	29	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	22	31	9
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	3	0
2017	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	30	12	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	25	17	15	28	0	11
2019	0	0	0	0	0	0	0	2	0	0	0	0	0	27	31	30	13	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	3	31	31	7	28	1

% Days below Criterion

- none
- <20%
- 20 – <50%
- 50 – <80%
- 80 – <100%
- all

all data from USGS continuous monitor

The 7-day and 30-day criteria are backward looking, meaning that they reflect conditions in the previous 6 or 29 days plus the date to which the statistic is assigned.

2020: Dissolved oxygen conditions in the Tualatin River in 2020 at Oswego Dam continued to be an issue. The 30-day criterion (30-day mean with no credit for supersaturation) was not met from June 28 through September 17, and from October 4 through November 1— in all, 101 days. The 7-day criterion and the daily minimum criterion were met during the entire dry season. As is typical, all criteria for DO were met throughout the dry season at RM 24.5

NUMBER OF DAYS THAT DID NOT MEET DISSOLVED OXYGEN CRITERIA IN 2020

Criterion	May	June	July	Aug	Sept	Oct	May–October Percentage	Nov
Tualatin River at RM 24.5								
30 day	0	0	0	0	0	0	0%	0
7 day	0	0	0	0	0	0	0%	0
Daily	0	0	0	0	0	0	0%	0
Tualatin River at Oswego Dam (RM 3.4)								
30 day	0	3	31	31	7	28	54%	1
7 day	0	0	2	0	0	0	0%	0
Daily	0	0	0	0	0	0	0%	0

Low dissolved oxygen at Oswego Dam in late summer and early fall are common. Although two algal blooms were evident in 2020, they were not sufficient to offset sediment oxygen demand in July and August when the river was at its warmest.

As in 2018 and 2019, the failure to meet the 30-day criterion began early in the season (June 28, 2020). Before 2018, the 30-day criterion had been met every day in June and July since continuous monitoring at Oswego Dam began in 1991. The lowest DO at Oswego Dam during the entire 2020 low flow season was 4.97 mg/L on October 9.

Water Quality Monitoring

Clean Water Services obtains grab samples at numerous sites throughout the basin, including several on the Tualatin River as well as tributaries. Field parameters (dissolved oxygen, water temperature and pH) are measured in the stream at the time of sample collection. Other constituents, including chlorophyll-*a*, phosphorus, nitrate and ammonia, are analyzed in the laboratory.

Continuous water quality monitors have been deployed throughout the basin. Most are operated by USGS. The Tualatin River at Hwy 219 monitor was operated by personnel at Jackson Bottom Wetlands Preserve through June 30 and by Clean Water Services thereafter. Since October 2015, the Beaverton Creek at 170th monitor has been operated by Clean Water Services personnel, although the data are still reviewed by USGS. All monitors record data at least half-hourly. The table below lists the currently operating continuous monitors that are not part of any special study.

LONG TERM CONTINUOUS WATER QUALITY MONITORS

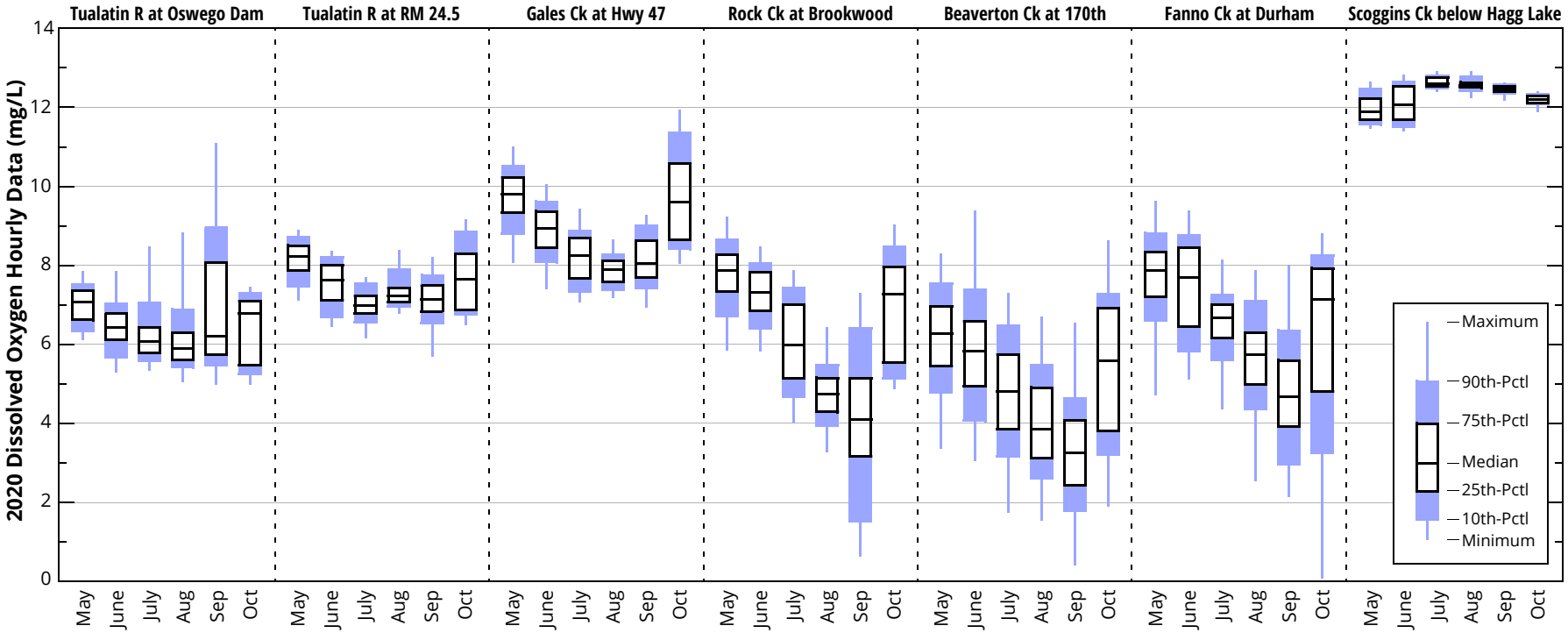
Site	River Mile	Parameters*								Notes
		DO	pH	WT	SC	Tbdy	Chl	Phyc	fDOM	
Tualatin River at Oswego Dam	3.4	●	●	●	●	●	●	●		most parameters since 1991
Tualatin River at RM 24.5	24.5	●	●	●	●		●	●		most since 1997, summer only
Tualatin River at Hwy 219	44.4	●	●	●	●	●	●	●		most parameters since 2004
Tualatin River at Dilley	58.8	●	●	●	●	●	●	●	●	most parameters since 2016
Fanno Creek at Durham		●	●	●	●	●				since 2003
Beaverton Creek at 170th		●	●	●	●	●				most parameters since 2001
Rock Creek at Brookwood		●	●	●	●	●				since 2004
Gales Creek at Old Hwy 47		●	●	●	●	●			●	most parameters since 2001
Scoggins Creek below Hagg Lake		●	●	●	●	●				most parameters since 2002

*Parameter abbreviations: DO=dissolved oxygen, WT=water temperature, SC=specific conductance, Tbdy=turbidity, Chl=chlorophyll-*a*, Phyc=phycocyanin (indicator of cyanobacteria), fDOM=fluorescent dissolved organic matter

Dissolved oxygen throughout the Tualatin Basin

As previously discussed, low dissolved oxygen (DO) concentrations have been an ongoing problem in the lower Tualatin River. Some of the tributaries in the Tualatin Basin also have had low DO levels. In general, the slow moving valley bottom streams are more likely to have low DO than faster moving headwaters streams. It is thought that sediment oxygen demand is largely responsible for the low DO levels in the tributaries. Transport of material from the landscape and re-suspension of sediment are also thought to be important sources of biochemical oxygen demands to the tributaries. Continuous monitoring can provide insight into the processes that affect DO concentrations. A statistical summary of the data is shown below. More detailed descriptions for each site are provided on the following pages. Data are available at:
`https://or.water.usgs.gov/cgi-bin/grapher/table_setup.pl?basin_id=tualatin`

DISSOLVED OXYGEN LEVELS IN THE TUALATIN RIVER AND SELECTED TRIBUTARIES DURING LOW-FLOW SEASON — 2020

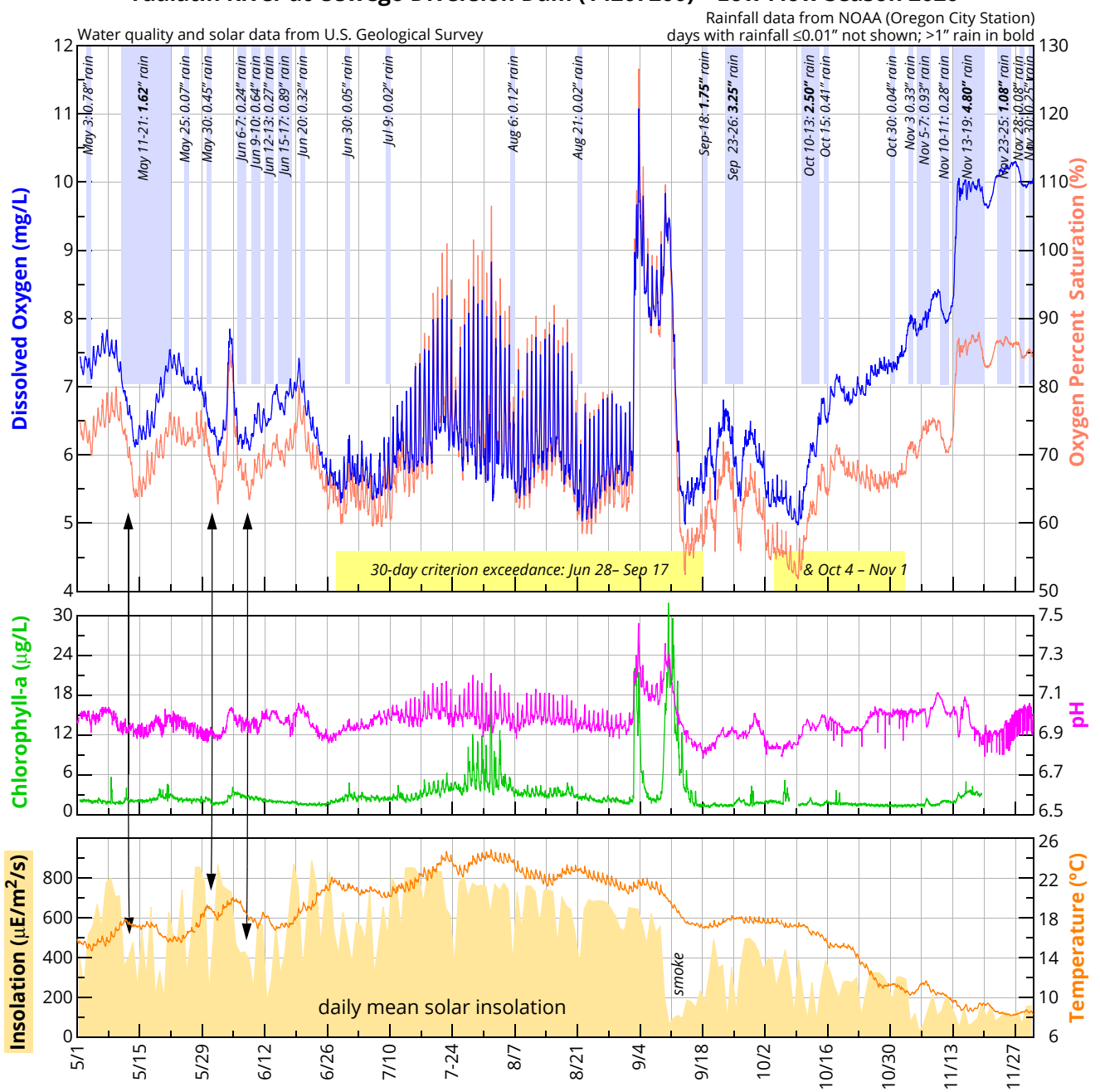


- In 2020, DO concentrations in Rock, Beaverton, and Fanno Creeks were exceptionally low in September. The very low DO occurred when wildfire smoke blanketed the region, blocking most sunlight. Photosynthetic oxygen production was mostly eliminated while respiration by aquatic plants and algae continued to consume oxygen as did SOD. Low flow at the time exacerbated the oxygen loss.
- Although Gales Creek, Scoggins Creek and the Tualatin River sites were also affected by wildfire smoke, they have higher flow and greater depth than the other tributaries which lessens the net effects of SOD and aquatic plants and algae.
- Because of releases from Hagg Lake, DO concentrations in Scoggins Creek are greater and show a different pattern than other sites.

Tualatin River – Oswego Dam

- Algal blooms strongly affect DO at the Oswego Dam site. Blooms can be identified by high chlorophyll concentrations, large daily DO ranges and DO concentrations greater than 100% saturation. Algal blooms have been rare and small in recent years, but were clearly evident in 2020 (late July and early September). Increased phosphorus concentrations in the river (from Clean Water Services testing of new phosphorus treatment at its WWTFs) likely promoted algal growth. No problematic high pH values occurred.
- DO was less than 70% saturation on cloudy days in May (see arrows) and most of May–October, except during algal blooms. The 30-day criterion was not met from Jun-28–Sep-17 and Oct-4–Nov-1.
- The abrupt end of the September algal bloom coincided with thick wildfire smoke which blocked most sunlight and severely limited photosynthesis.
- The low DO in late September and early October may have been associated with two heavy rain events that transported oxygen demand (suspended sediment and stormwater) from the tributaries to the Tualatin River. Later rains were sustained and flow increased enough to offset oxygen demands.

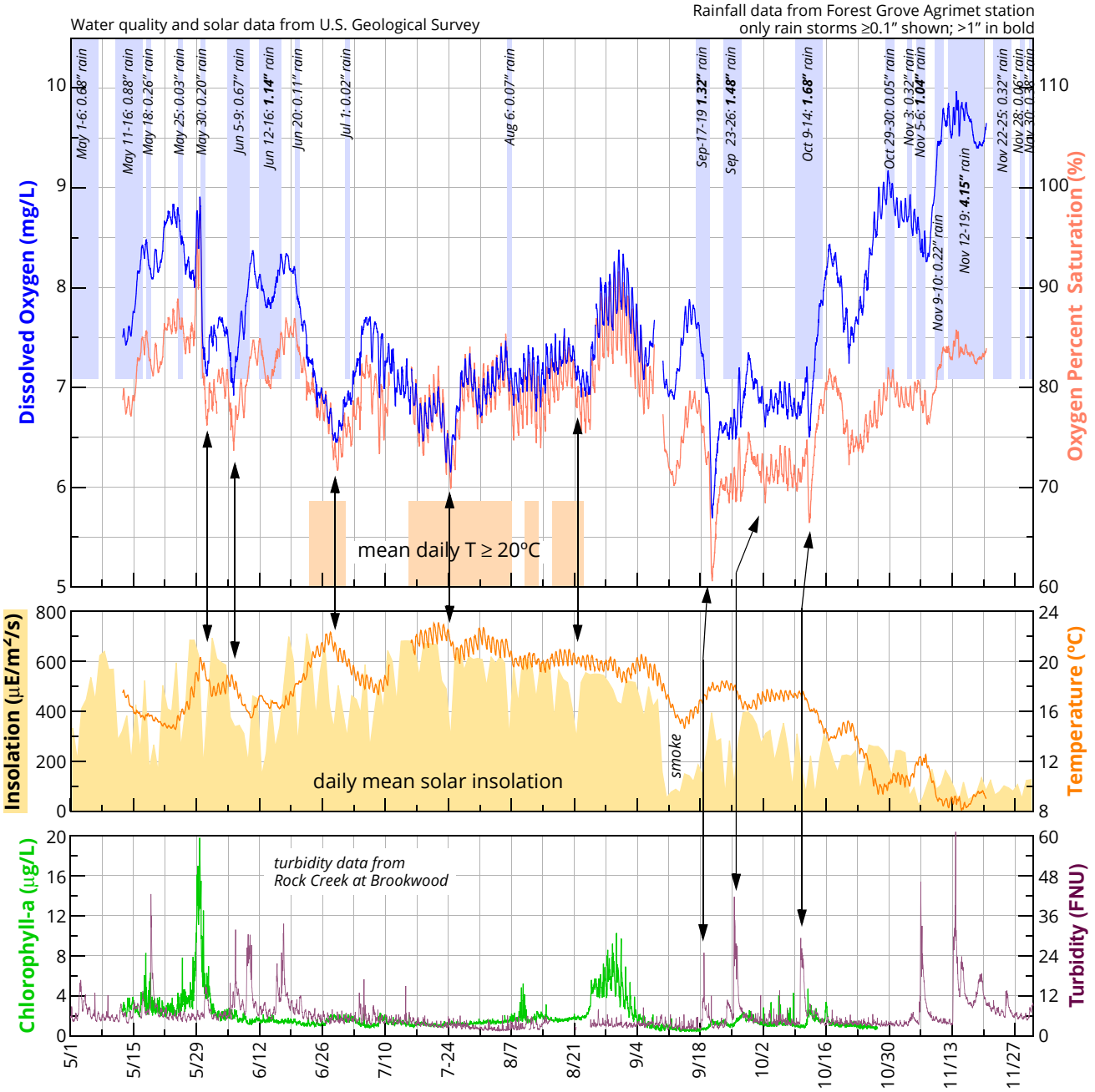
Tualatin River at Oswego Diversion Dam (14207200) – Low Flow Season 2020



Tualatin River – RM 24.5

- DO concentrations at RM 24.5 were about 75-80% saturation for most of the summer.
- The lowest DO concentrations in June through August coincided with high temperatures and cloudy days (see arrows), conditions than increase oxygen consumption by SOD and limit photosynthetic oxygen production, respectively.
- Large algal blooms are rare at this site. A small, short-lived bloom in May was likely related to pumping from Wapato Lake. A small bloom from August through early September was probably promoted by increased phosphorus concentrations related to the testing of a new method of phosphorus removal at the RC-WWTF. That bloom ended when wildfire smoke blocked sunlight limiting photosynthesis.
- The lowest DO was likely related to intense rain on September 17–19 which increased turbidity in Rock Creek and other tributaries (see arrows). Turbidity is associated with an increase in oxygen demanding substances—from resuspension of sediment and from stormwater inflows. Low DO from September 18–October 9 suggests that Rock Creek and other tributaries with different travel times continued to contribute oxygen demand to the RM 24.5 site with subsequent rainfall.

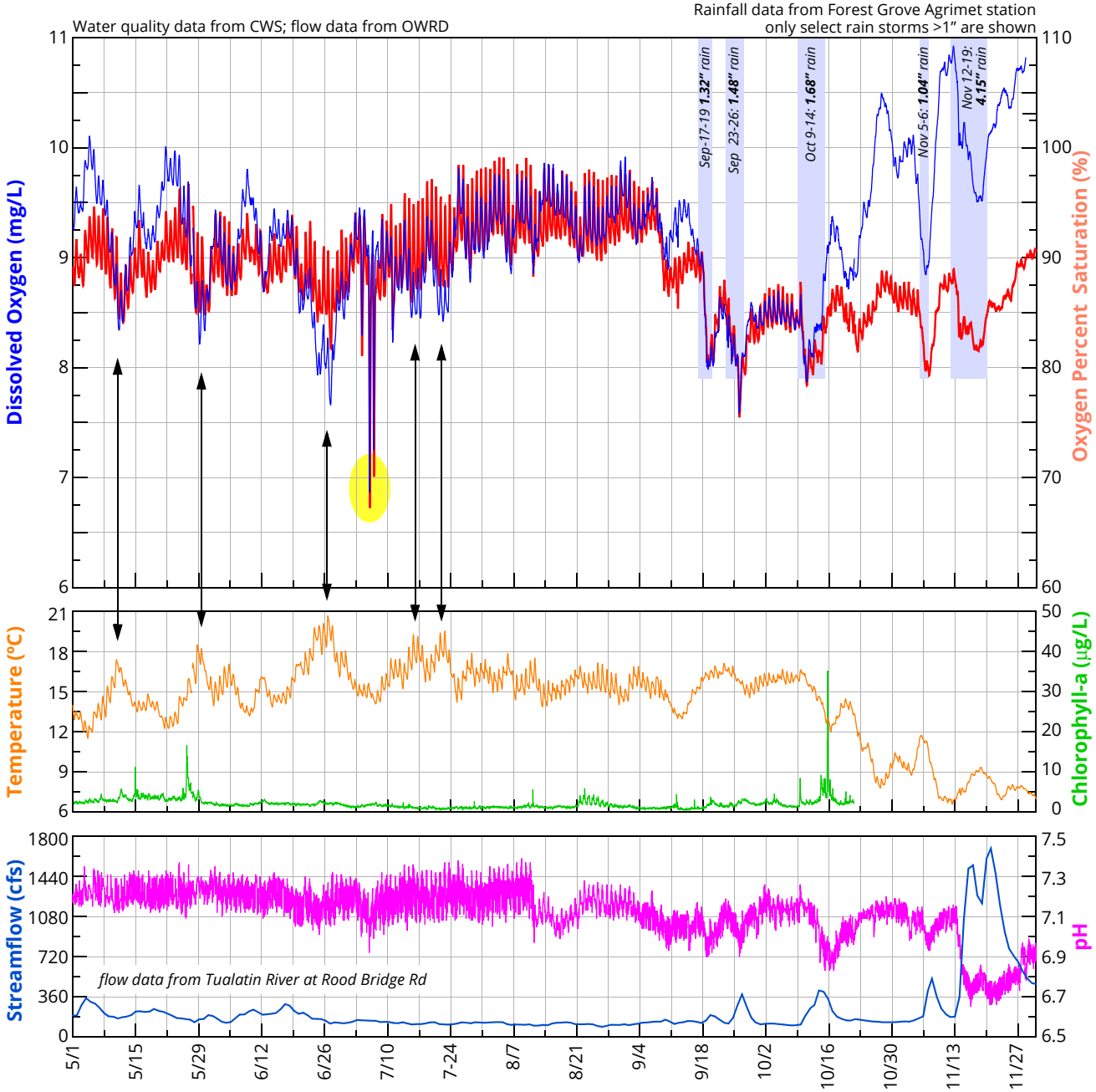
Tualatin River at RM 24.5 (14206694) – Low Flow Season 2020



Tualatin River – Hwy 219

- DO concentrations at Hwy 219 were 85-95% saturation May through mid-September and about 5% lower thereafter through November. Lower %-saturation in the fall is likely due to a combination of factors, including less oxygen production from photosynthesis and inputs of BOD from higher flows in tributaries.
- The lowest DO concentrations in May through August coincided with high temperatures (see arrows) which increase oxygen consumption by SOD.
- Several instances of low DO in September through November coincided with heavy rain which likely increased suspended sediment and, therefore, oxygen demand. High rainfall was also associated with lower pH values. Decreases in pH occur when rain makes up a greater fraction of streamflow compared to groundwater. The pH of rainfall is 5.6. Groundwater has a higher pH.
- Two small pulses of chlorophyll-*a* were observed, but neither was associated with much photosynthetic oxygen production as evidenced by small daily variations in both DO and pH. The first pulse was probably related to the pumping of Wapato Lake. The origin of the second pulse is unknown.
- The lowest DO value (near 7 mg/L on July 5) was one of 3 sharp minima from July 4-7 (yellow shading). These minima were observed at RM 24.5 three days later. The cause is unknown.

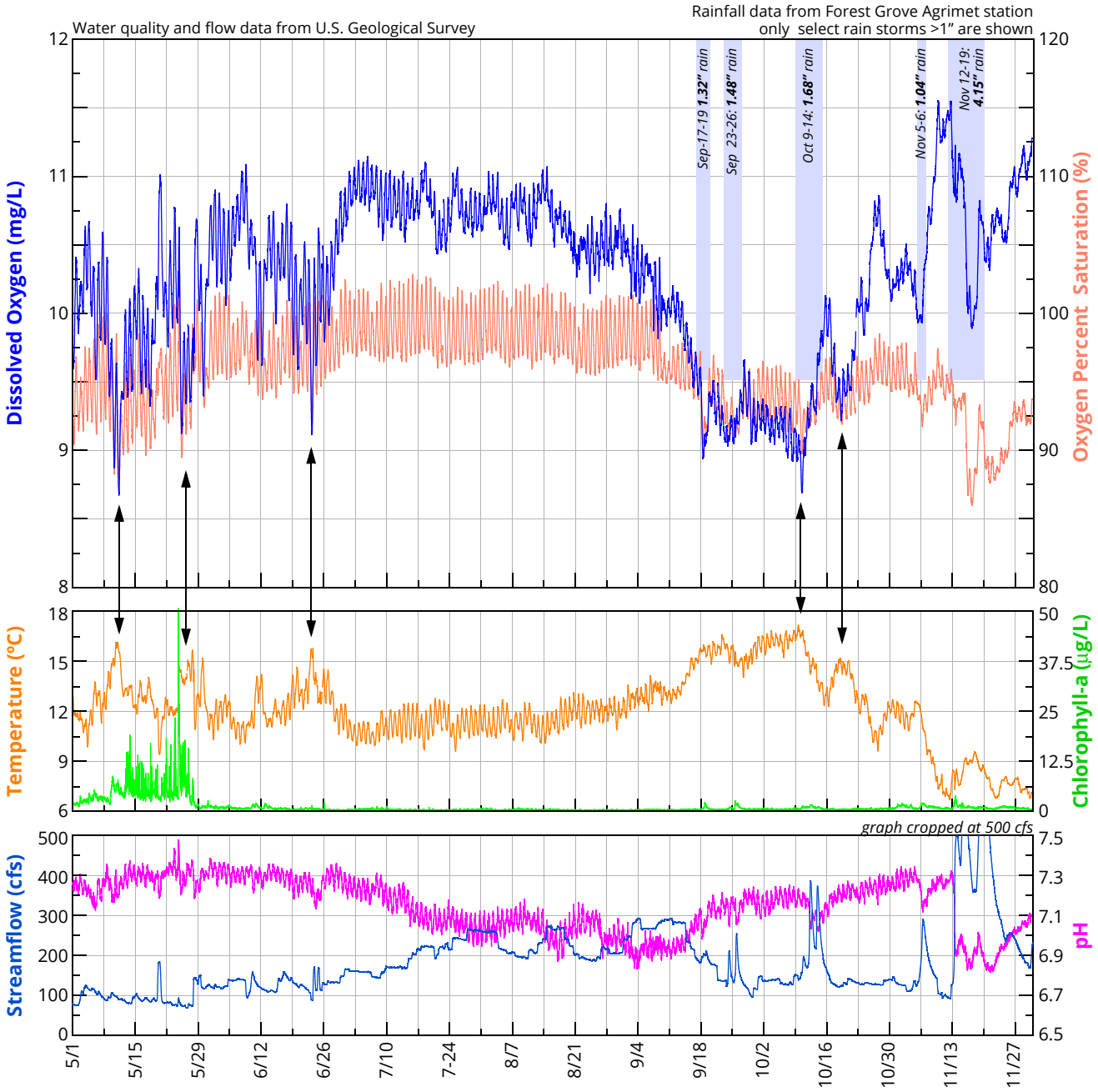
Tualatin River at Hwy 219 (14206241) – Low Flow Season 2020



Tualatin River – Dilley

- DO concentrations at Dilley were generally greater than 90% saturation.
- Lower DO concentrations at Dilley coincided with higher temperature (see arrows). When temperatures were greater than 15ºC, oxygen saturation was often than 90%. Oxygen consumption by SOD is greater at higher temperatures.
- Low DO in September and October coincide with heavy rain which likely caused an increase in oxygen demand through suspended sediment. Toward the end of large storms, DO increased as flows increased, diluting the oxygen demand.
- Chlorophyll-*a* levels were less than 3 µg/L except during May. The higher concentrations of chlorophyll-*a* in May were probably related to the pumping of Wapato Lake. Since neither DO nor pH showed much daily variation, little photosynthetic oxygen production occurred, possibly due to riparian shade.
- Decreases in pH were often associated with higher flow. Increased streamflow at this site is due to releases from Hagg Lake or heavy rainfall, both of which have a lower pH than baseflow groundwater.

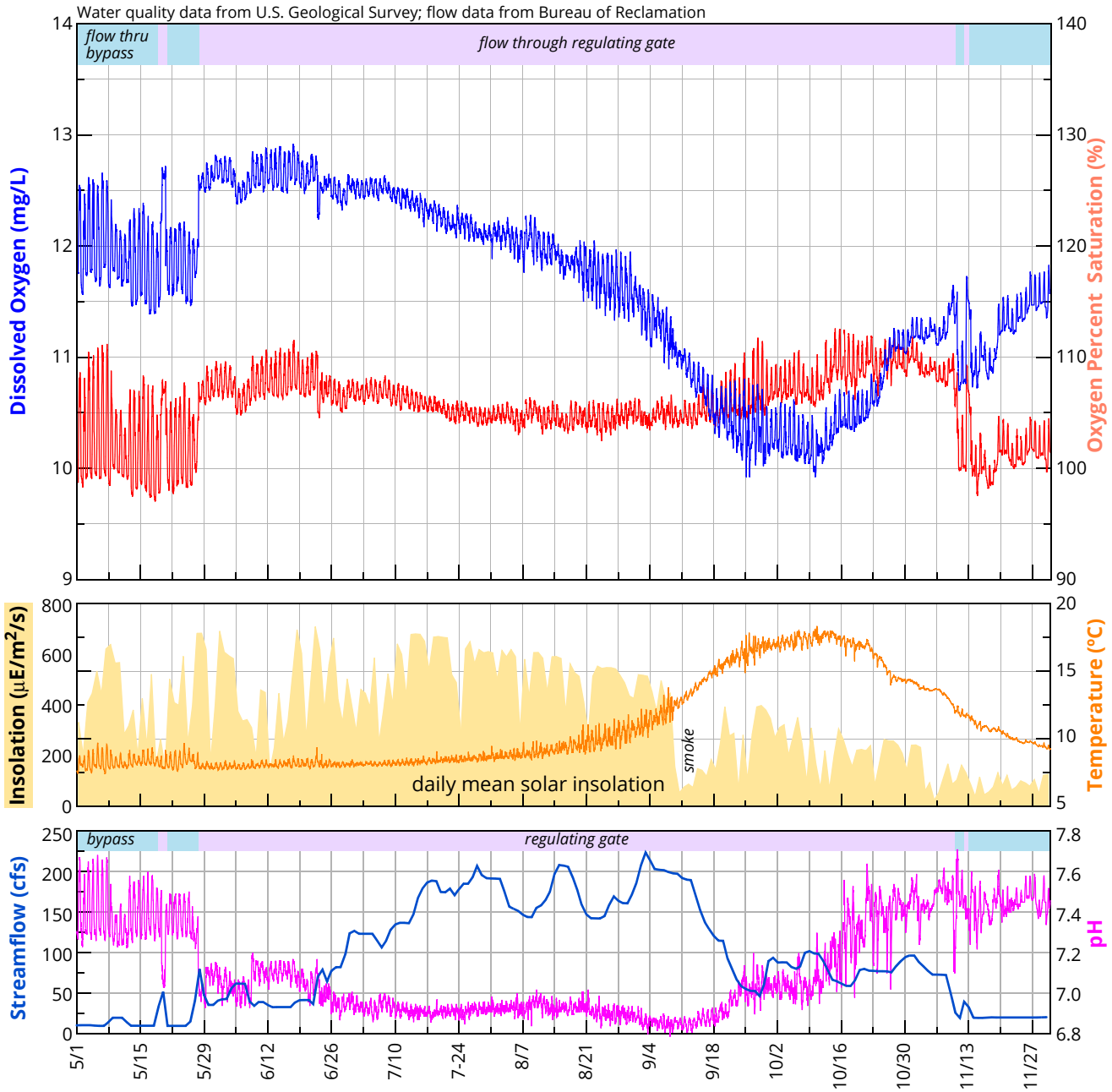
Tualatin River at Dilley (14206241) – Low Flow Season 2020



Scoggins Creek below Hagg Lake

- The DO pattern through the low flow season at Scoggins Creek is very different from the other sites because streamflow at this site begins as releases from Scoggins Dam.
- Temperatures at this site are colder in summer and warm through fall. As the reservoir is drawn down, more of the warmer water from the upper layers reaches the release inlet. Although the absolute DO concentration decreases, the percent saturation usually stays relatively constant.
- Flow rate affects travel time between the dam outlet and the monitoring site. Longer times allow resident macrophytes to impose the typical daily pattern associated with photosynthesis and increase oxygen saturation. Daily temperature patterns are also stronger when flow is low. The exception during September 11–18 was when wildfire smoke blocked sunlight suppressing photosynthesis and shading the creek.
- Flow rates affect dam operation which in turn affects DO. When releases are at least 35 cfs, the regulating gate is used. Entrained air results in DO saturation of about 105% and increases dissolved CO_2, lowering the pH. Water is diverted through the bypass when releases are less than 35 cfs, decreasing the turbulence and making travel time between the outlet and the monitoring site longer.

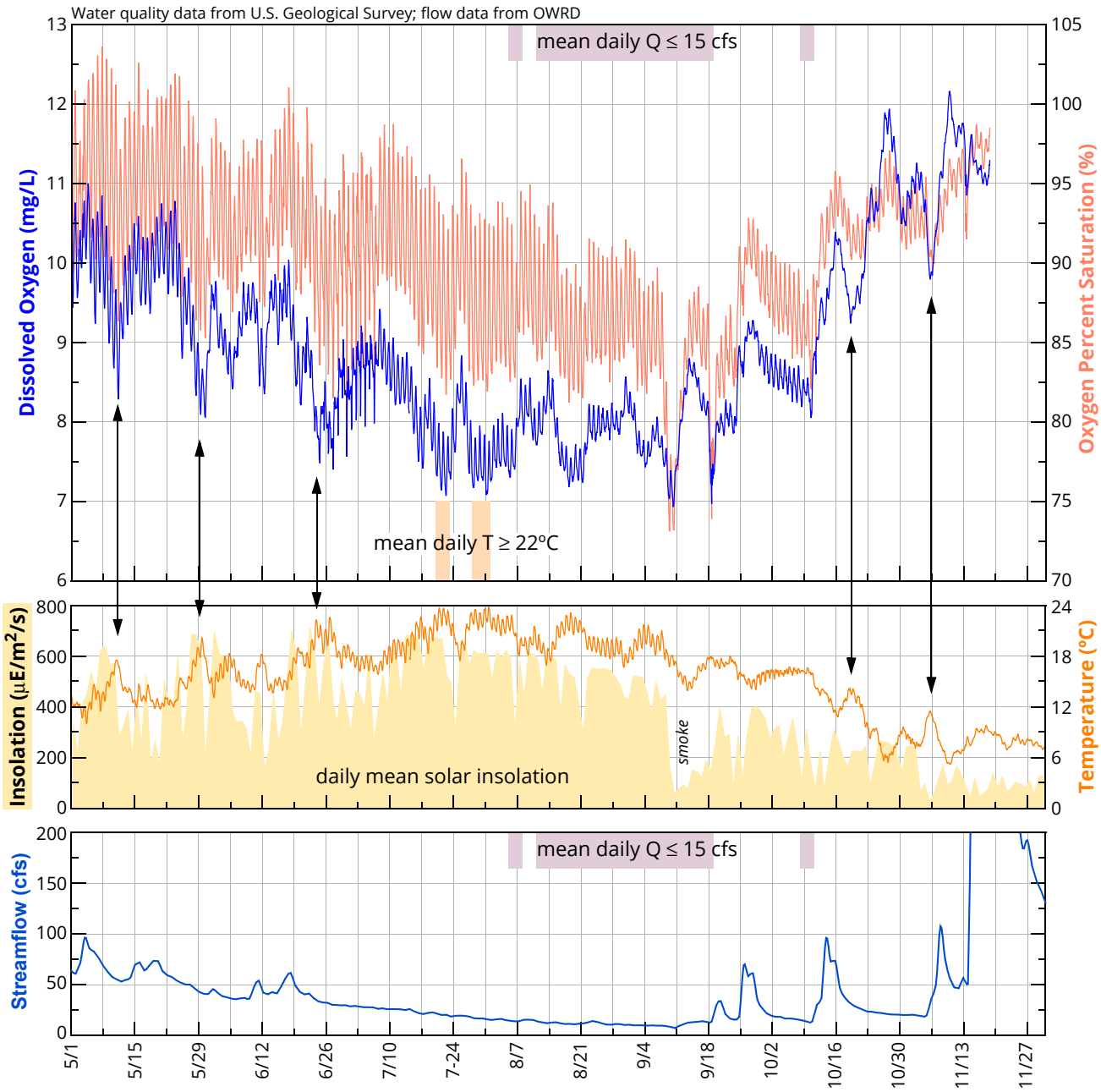
Scoggins Creek below Hagg Lake (14202980) – Low Flow Season 2020



Gales Creek at Old Hwy 47

- Algal activity at Gales Creek was evident by the daily DO range of about 0.5–1 mg/L. Saturation concentrations rarely exceeded 100%.
- From May through September daily average DO saturation decreased steadily in response to increasing temperature and decreasing flow. Arrows show specific instances when low DO was associated with high temperature. Oxygen consumption by SOD is greater at higher temperatures. DO fell below 90% saturation shortly after flow dropped below 15 cfs. DO saturation rebounded once rainfall increased streamflow, but the effects of temperature were still evident. Low flow exacerbates oxygen loss from sediment oxygen demand because a smaller volume of water is in contact with the sediment for a longer time.
- The lowest DO occurred on September 9–10 (~7 mg/L and 73% saturation) when thick wildfire smoke blocked most sunlight, severely limiting photosynthesis. The abrupt decrease in oxygen associated with lack of photosynthetic oxygen production shows that while the algae population may be small, it is important to the oxygen budget in Gales Creek.

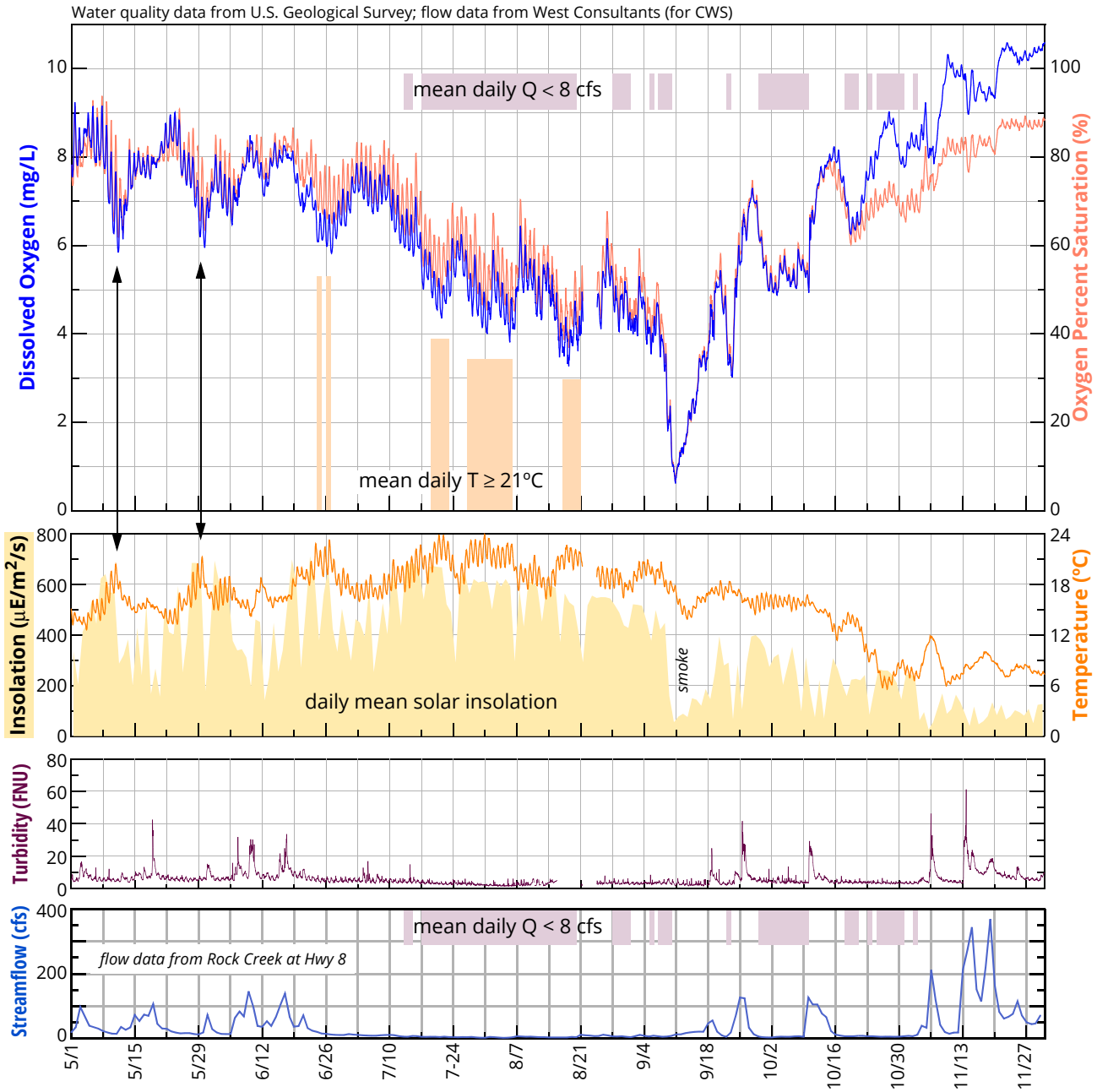
Gales Creek at Old Hwy 47 (453040123065201) – Low Flow Season 2020



Rock Creek at Brookwood

- Dissolved oxygen in Rock Creek was lower overall than all other sites except Beaverton Creek. Like Beaverton Creek, Rock Creek is a valley bottom stream with high sediment oxygen demand and little reaeration. Algal activity in Rock Creek was present (daily DO range 0.5–1.5 mg/L), but not enough to offset SOD.
- The large oxygen sag during the second week of September coincided with thick wildfire smoke which blocked most sunlight. The lowest DO (0.22 mg/L) of the year occurred early on September 12 when lack of photosynthesis coupled with algal respiration drove the DO to almost zero.
- Temperature strongly affects DO in Rock Creek. SOD consumes oxygen faster at higher temperature. All episodes of low DO from May–August coincided with high temperatures. See arrows and orange bars.
- From mid-September–November, DO generally correlated with flow. Higher flow decreases oxygen consumption by SOD by minimizing the contact time between stream water and sediment.
- Intense rainfall can produce turbidity spikes from resuspended sediment and stormwater inflow that are associated with oxygen demand. Turbidity spikes in 2020 were small (<60 FNU) and did not appear to affect DO at this site, possibly because higher flows contained well-oxygenated rain water. The oxygen demand related to turbidity spikes at this site likely did contribute to decreased oxygen at RM 24.5.

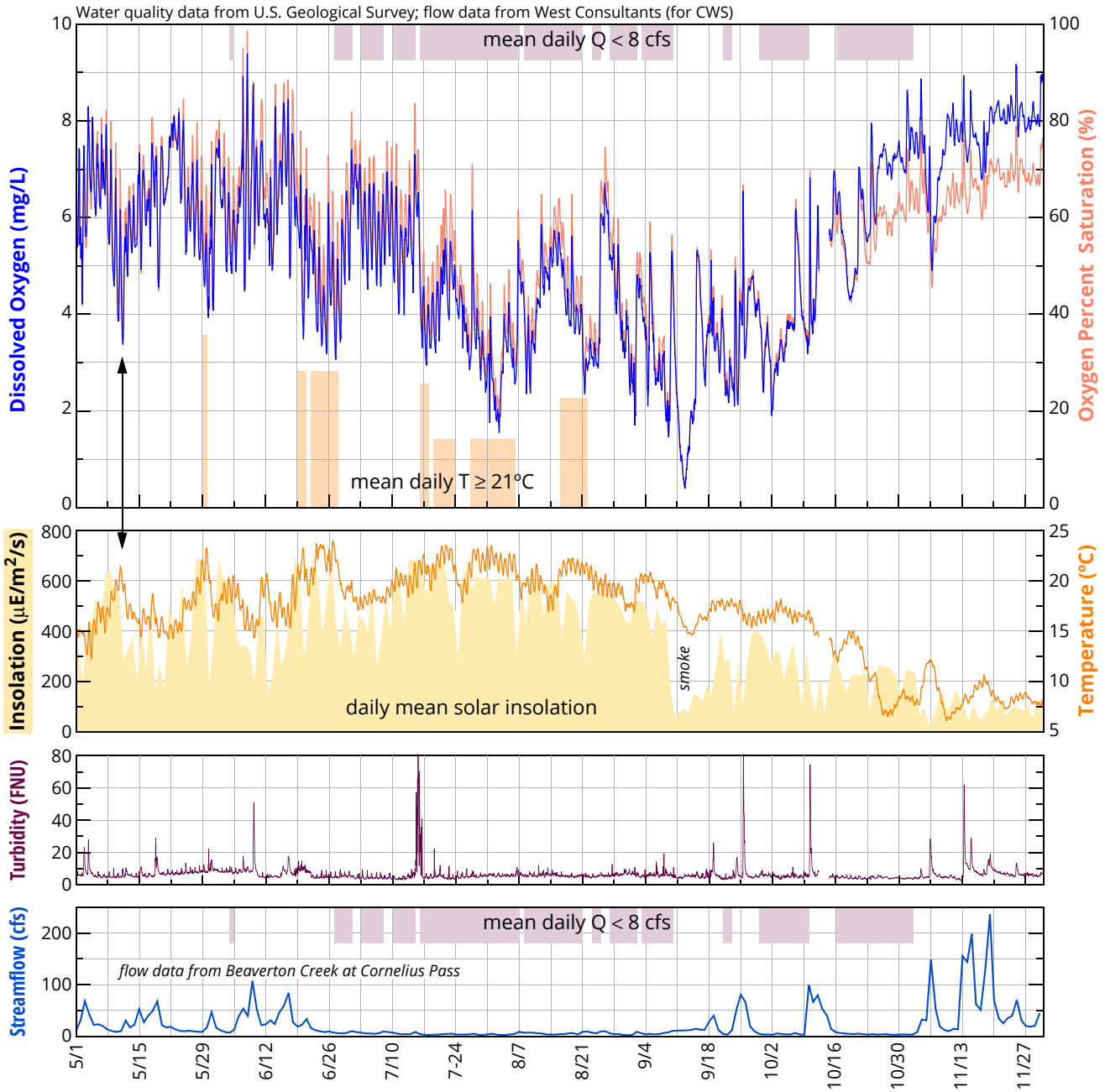
Rock Creek at Brookwood (453030122560101) – Low Flow Season 2020



Beaverton Creek at 170th

- The Beaverton Creek site has very low DO levels—often less than 6 mg/L. DO concentrations of 4 mg/L are not uncommon. The organic-rich, silty bottom and low flow of Beaverton Creek result in high sediment oxygen demand and little reaeration. Although algal activity was clearly present (daily DO range 1–3 mg/L), photosynthetic oxygen production was not sufficient to offset sediment oxygen demand.
- DO minima generally correlated with higher stream temperatures that increase the rate of oxygen consumption by SOD (see arrow and orange bars). Very low flow at this site exacerbates oxygen losses.
- The lowest DO of the year (0.4 mg/L) occurred on September 12 when thick wildfire smoke blocked most sunlight. Lack of photosynthesis coupled with algal respiration drove the DO to almost zero.
- Turbidity spikes caused by rainstorms that resuspend sediment and increase stormwater inflow are associated with oxygen demand. In 2020, such turbidity spikes did not clearly affect DO at this site, possibly because heavy rain caused high flows that contained well-oxygenated rain water. An unusual set of turbidity spikes on July 15–16 were not associated with rainfall or an increase in flow. They coincided with a decrease in DO, but so did high temperature. The source of the July 15–16 turbidity is unknown.

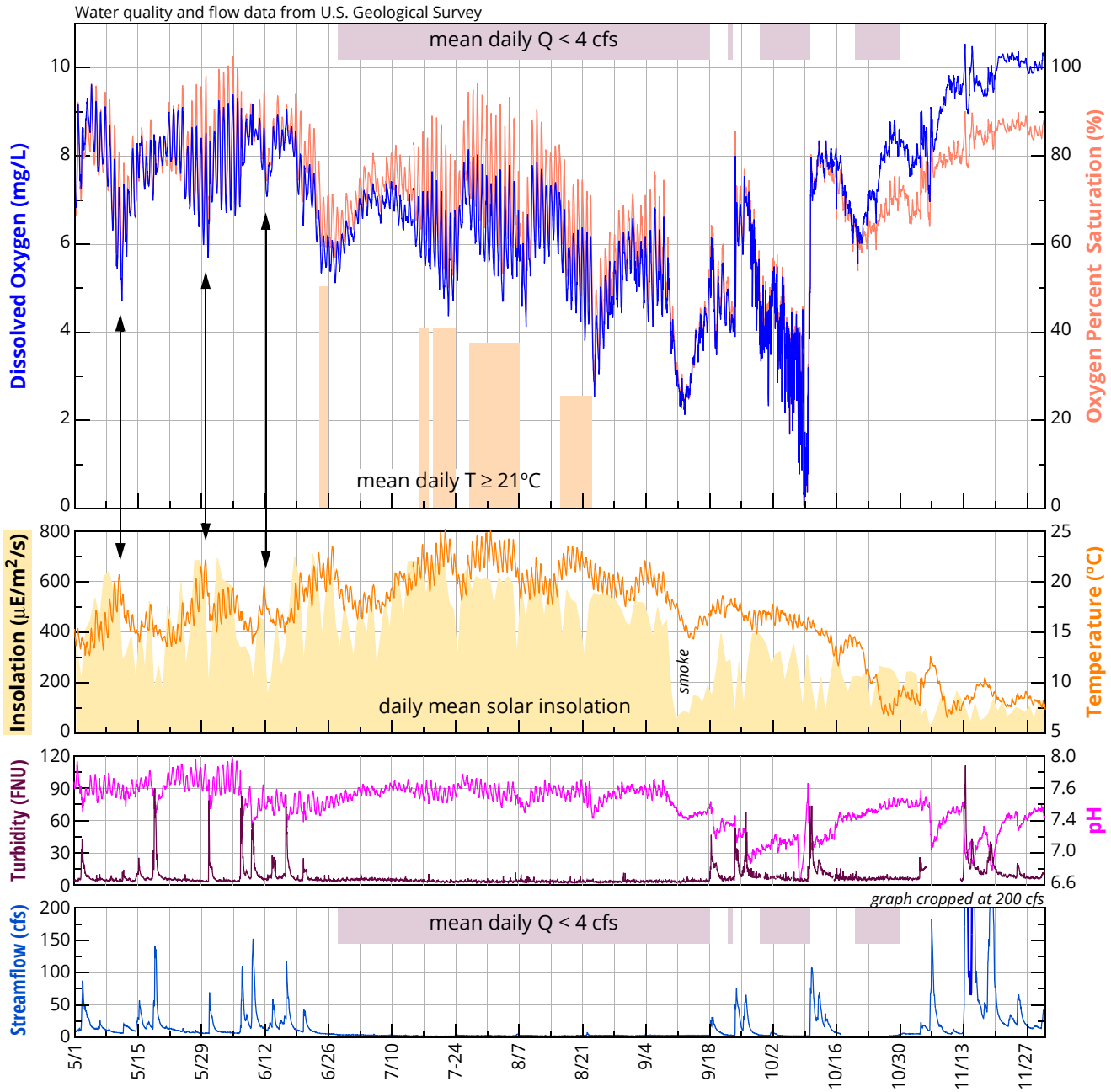
Beaverton Creek at 170th (453004122510301) – Low Flow Season 2020



Fanno Creek at Durham

- Algal activity in Fanno Creek, specifically *Cladophora sp*. is common. In 2020, algal activity was clear, but variable. Daily DO ranges were as low as 0.6 mg/L on cloudy days and up to 2.6 mg/L when it was sunny.
- From May–early June, DO averaged about 8 mg/L (80% saturation) with the lowest DO coinciding with high temperatures (see arrows). By late June flows were below 4 cfs and DO slowly declined through August, although with considerable variability that correlated with temperature (see orange bars).
- The sharp decline in DO beginning on September 9 coincided with thick wildfire smoke that blocked sunlight and limited photosynthetic oxygen production. Respiration by algae drove the DO to 2.1 mg/L.
- The decrease in DO in early October ending in a DO of 0 mg/L is unexplained and somewhat suspect. The DO data are noisy, masking the normal daily pattern. Unusual low pH values occurred at the same time. These anomalies suggest instrument fouling, however an unknown source cannot be ruled out.
- Turbidity spikes at this site often do not cause a DO sag because they occur during high flows that contain well-oxygenated rainwater as evidenced by a lower pH. In such cases, DO increases.

Fanno Creek at Durham (14206950) – Low Flow Season 2020



APPENDIX A
STREAMFLOW

SCOPE

This appendix shows data for streamflow at selected sites in the Tualatin River and its tributaries. It is intended to be a comprehensive listing of sites where daily data were collected in 2020. Historical streamflow data exist for other sites. Most of the data represent daily mean flows and have been subject to quality assurance tests by the collecting entity.

The following data and analyses are included for each site. A more detailed explanation of the analyses and graphics begins on page A-4:

- Table of 2020 data with summary statistics by month.
- Graph of 2020 data superimposed on percentile statistics for the period of record for the site.
- Color-coded chart of the distribution of streamflow by month for the period of record.
- Table of monthly median streamflows by year for the period of record.
- Graphs showing low-flow trends over the period of record, including the first day of sustained low flow and the distribution of streamflow during select low flow periods.
- Graphs showing high-flow trends over the period of record, including the first day of sustained high flow and the distribution of streamflow during December–January.
- A brief discussion of the graphs and tables.

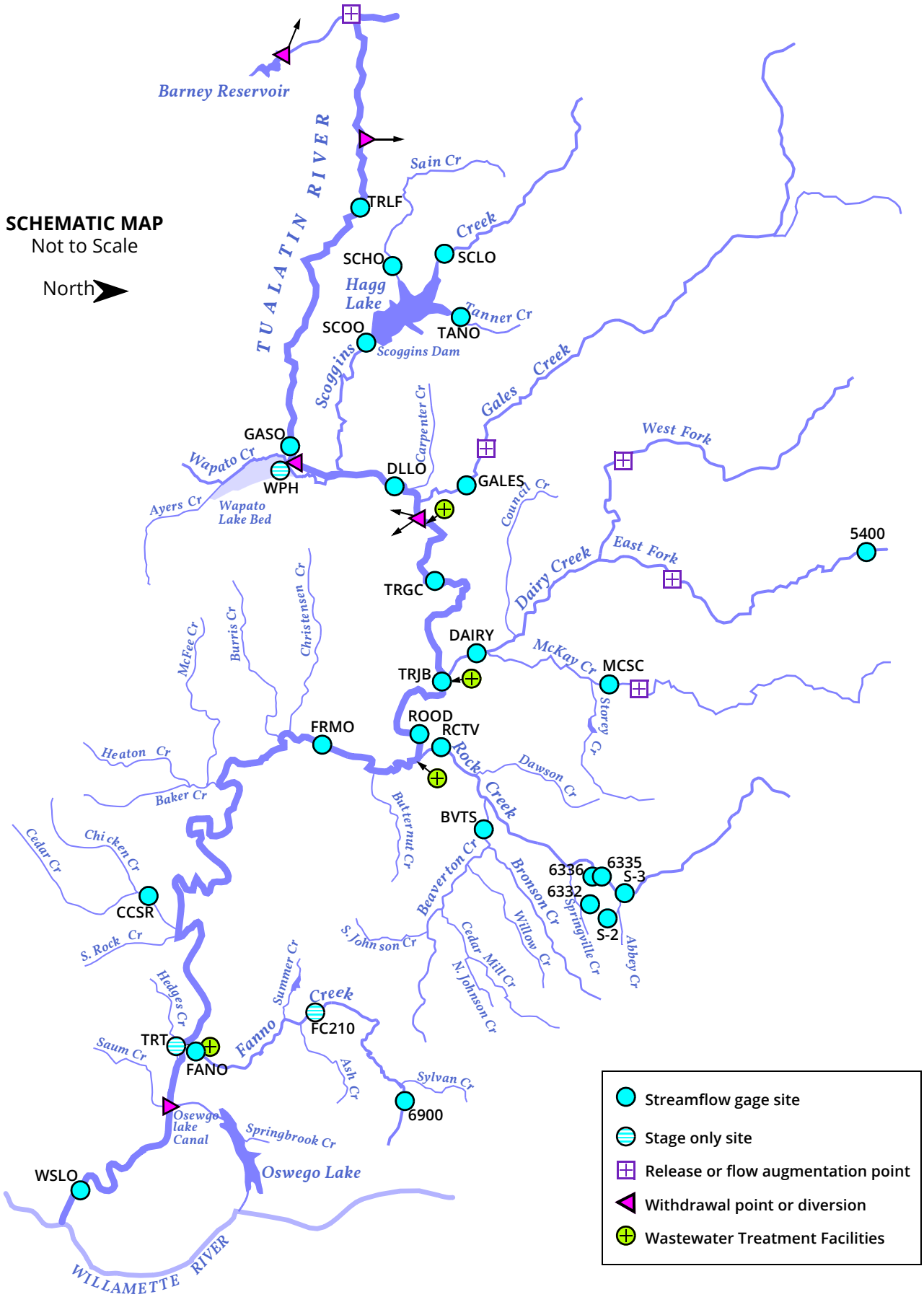
2020 HIGHLIGHTS

- All sites had high flow in January with many setting records. Beginning in mid-February, rainfall was infrequent and flows through May were mostly below period of record medians. Many sites set records for low flow in March and especially April.
- Fall storms were intense and short-lived resulting in widely spaced high flow episodes. Dry periods of up to 2 weeks occurred between storms leading to low flow records in October and November being set at many sites.
- Baseflows in 2020 were well below their respective period of record medians for all of the tributaries. Record low flows were set for numerous days at many sites. Flows that exceeded median levels occurred only during periods of rainfall which were usually short-lived and followed by prolonged dry periods.

TRENDS OF NOTE

- Flows in Scoggins Creek below Hagg Lake and in the Tualatin River at Dilley increased from 1975 through the early 1990s, mostly as a result of larger releases of stored Hagg Lake water by Joint Water Commission. Since the mid-1990s, any increases in flow have been small and difficult to discern from year-to-year variation.
- Flow in the Tualatin River at West Linn increased sharply around 1995 when water diversion through the Oswego Canal was decreased. Since then, trends in flow are small and difficult to isolate from year-to-year variation. The onset of low flow (defined as 7-day median streamflow < 250 cfs), is occurring later in the summer at West Linn; again the data from recent years is noisy. Reasons for the delay include earlier releases of flow augmentation water by Clean Water Services and increases in the fraction of total flow that is from wastewater treatment facilities which does not decrease as quickly as natural baseflow in early summer.
- Flow in Fanno Creek, especially baseflow, is decreasing over the period of record (1991–present). The trend is clearer at the 56th Avenue site, but also evident at the Durham Road site. The reason is unknown. Onset of low flow is occurring earlier in the year at both sites.

STREAMFLOW GAGE SITES



STREAMFLOW GAGE SITES — ALPHABETICAL LISTING BY SITE CODE

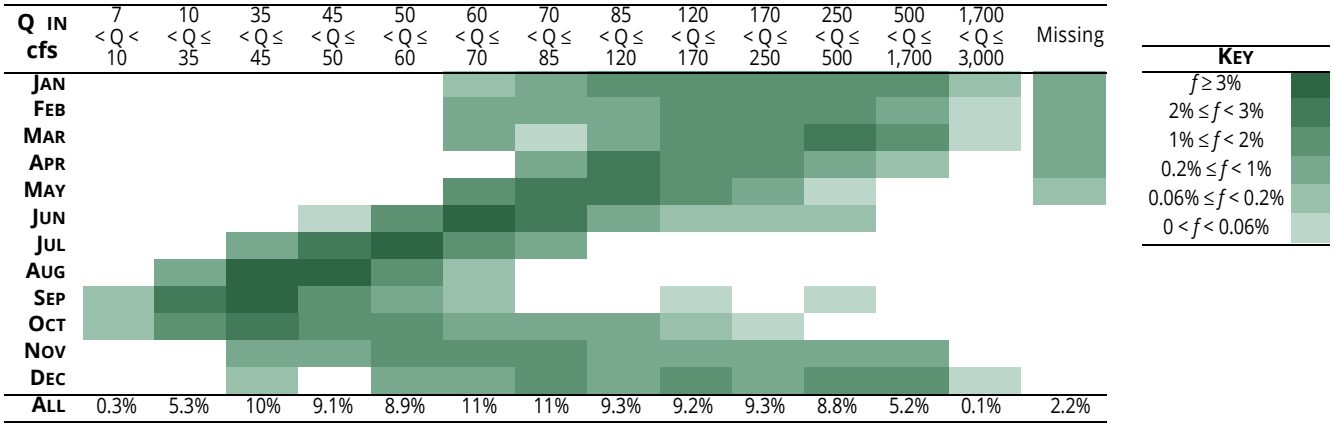
SITE CODE	SITE NAME	RIVER MILE	STATION ID	PAGE
5400	East Fork Dairy Creek near Meacham Corner, OR	12.4	14205400	A–44
6332	Bethany Creek at NW Springville Rd at Bethany, OR	—	14206332	A–57
6335	Rock Creek at NW 185th Ave near Hillsboro, OR	—	14206335	A–55
6336	Rock Creek Ditch at NW 185th Ave near Hillsboro, OR	—	14206336	A–56
6900	Fanno Creek at 56th Avenue	11.9	14206900	A–67
BVTS	Beaverton Creek at Cornelius Pass Road	1.2	14206435	A–58
CCSR	Chicken Creek at Roy Rogers Rd near Sherwood, OR	2.3	14206750	A-64
DAIRY	Dairy Creek at Hwy 8 near Hillsboro, Oregon	2.06	14206200	A–50
DLLO	Tualatin River near Dilley, Oregon	58.8	14203500	A–15
FANO	Fanno Creek at Durham Road near Tigard, Oregon	1.2	14206950	A–70
FC210	Fanno Creek at Hwy 210 at Beaverton, OR	—	—	A–76
FRMO	Tualatin River at Farmington, Oregon	33.3	14206500	A–27
GALES	Gales Creek at Old Hwy 47 near Forest Grove, Oregon	2.36	14204530	A–41
GASO	Tualatin River at Gaston, Oregon	62.3	14202510	A–9
MCSC	McKay Creek at Scotch Church Rd above Waible Ck near North Plains, Oregon	6.3	14206070	A–47
RCTV	Rock Creek at Hwy 8 near Hillsboro, Oregon	1.2	14206451	A–61
ROOD	Tualatin River at Rood Bridge Road near Hillsboro, Oregon	38.4	14206295	A–24
S-2	South Fork Abbey Creek Downstream of NW Kaiser Rd at Bethany, OR	—	—	A–53
S-3	Rock Creek at NW Germantown Rd at Bethany, OR	—	—	A–54
SCHO	Sain Creek above Henry Hagg Lake near Gaston, Oregon	1.6	14202920	A–36
SCLO	Scoggins Creek above Henry Hagg Lake near Gaston, Oregon	9.3	14202850	A–36
SCOO	Scoggins Creek below Henry Hagg Lake near Gaston, Oregon	4.80	14202980	A–12
TANO	Tanner Creek above Henry Hagg Lake near Gaston, Oregon	1.6	14202860	A–39
TRGC	Tualatin River at Golf Course Road near Cornelius, Oregon	51.5	14204800	A–18
TRJB	Tualatin River at Hwy 219 Bridge	44.4	14206241	A–21
TRLF	Tualatin River below Lee Falls near Cherry Grove, Oregon	70.7	14202450	A–6
TRT	Tualatin River at Tualatin, Oregon	8.9	14206956	A–77
WPH	Wapato Canal at Pumphouse at Gaston, Oregon	—	14202630	A–73
WSLO	Tualatin River at West Linn	1.75	14207500	A–30

EXPLANATION OF FIGURES AND TABLES IN THIS APPENDIX — PAGES 1-2

Page 1–current year data and graph: A table of mean daily streamflow for the current year is at the top of page 1. A graph at the bottom of the page shows the current year's data superimposed on shaded percentile ranges for the period of record, providing historical context. A legend, located to the right of the graph, includes the period of record for the site and definitions of lines and shading. If the period of record is too short to accurately calculate some percentiles, the appropriate shaded areas are omitted.

Page 2–Frequency Chart: A Frequency Chart for the site is at the top of page 2. This graphic can be used to determine the ranges of flow for each month, the percent of the time flow is within a particular range, and the importance of missing values. An example is shown below.

FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH FOR PERIOD OF RECORD



- *The top row* shows the ranges of streamflows (bins) corresponding to each column. The streamflow ranges do not change from year-to-year in the Flow Report. They were determined as follows:
  - —round numbers were used for simplicity,
  - —the first and last bins capture the extreme highs and lows (<0.5% of the distribution),
  - —the second and second to last bins capture the highest and lowest 5% of the distribution,
  - —the other rows each capture approximately 10% of the distribution,
  - —a column for missing data is included if needed.
- *The first column* shows the months corresponding to each row.
- *The bottom row* shows the actual fraction of the distribution in the bin. Because the bins use round numbers and do not vary from year-to-year, the distribution totals will only approximate 5% and 10% as designed. The total distribution may not add to 100% due to round-off error.
- *Each cell is color coded* based on the fraction of the overall distribution of streamflow in the corresponding bin and month. A Key to the color code is at the right of the chart. All sites use the same color code.
- *Information that can be obtained* from the example chart above includes:
  - —The all-time lowest flows at this site are 7–10 cfs, and occurred in September and October.
  - —Although extremely low flows have occurred in October, flows as high as 250 cfs have also occurred.
  - —Streamflow was less than 45 cfs about 15% of the time.
  - —Streamflow in December has been highly variable, ranging from 35 to 3,000 cfs.
  - —About 2% of the data were missing, all of which occurred in January–May. High flow occurs during several of these months, suggesting that some data may be missing because flow exceeded the rating curve. If this is the case, the highest flows may be over 3,000 cfs and the distribution fractions may be skewed with the fraction at low flow actually smaller and the fraction at high flow greater.

Page 2–color-coded table of monthly medians: A table of monthly medians of daily mean streamflow by year follows the Frequency Chart on page 2. Entries in this table are color-coded by percentiles calculated from the daily mean streamflow for the period of record. Two Keys are provided to the right of the table. The upper Key contains the values corresponding to the percentiles shown in the lower Key. Medians are not shown if more than 20% of the data are missing.

Explanation of Figures and Tables in this Appendix — page 3

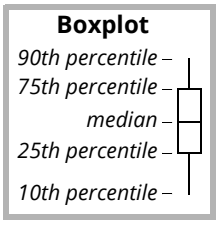
Page 3–discussion of graphs: The left side of the page contains a discussion of findings based on the graphs for each site. The narrative is divided into three sections:

- *Current year* describes the streamflow for the current year in the context of the historical record.
- *Low flow and Rainy season flow* describe the low flow and rainy season flow regimes, respectively, including when they occur and any trends over time.

Page 3–low flow season onset: The uppermost graph on the right side shows the first day of sustained low flow for each year. The plot is arranged so that earlier dates are toward the bottom of the y-axis and later dates are toward the top. Although defining the onset of low flow is necessarily somewhat arbitrary, such a definition serves as a benchmark for comparing low flow conditions over time.

- *For mainstem sites,* low flow is defined as the first day after March 31 when the 7-day median streamflow in the Tualatin River at Farmington is less than 200 cfs. Correlations between each site and Farmington for the period of record through 2017 were used to obtain site-specific values. Flow at Farmington often has been used as a benchmark for low flow.
- *For tributary sites,* low flow is defined as a rounded number near the 25th percentile of mean daily flow.

Page 3–trends in low flow over time: Boxplots plotted versus year for selected low-flow periods show changes in flow magnitude over time. A boxplot is a graphical representation of the data distribution and is illustrated at the right.



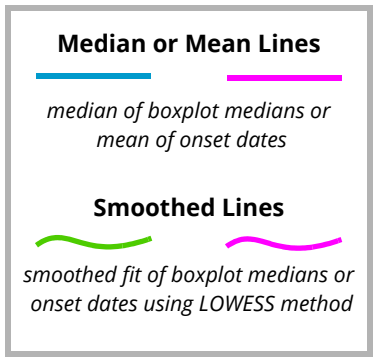
For most mainstem sites, two plots are shown: July/August and September. For a few mainstem sites, June data were shown if June had lower streamflow than July/August. For tributary sites, a plot of August/September is usually shown.

Page 3–rainy season onset: The second graph from the bottom is the high flow analog to the uppermost graph for low flow onset. The term "high flow" was not used because reservoir releases and short summer rainstorms can increase flow at mainstem and tributary sites, respectively, but do not signal the annual seasonal shift to rainy weather.

- *For mainstem sites,* rainy season flow is defined as the first day after August 31 when the 7-day median streamflow at Farmington is at least 350 cfs and remains so for the next 7 days. To help ensure that the rainy season was not a short-term increase, the difference between the daily mean maximum and daily mean minimum flows within the 7-day median period was required to be at least 50% of their average. Correlations between each site and Farmington for the period of record through 2017 were used to obtain site-specific values. A Farmington flow of 350 cfs was used by ODEQ in the TMDL as a criterion for high flow.
- *For tributary sites,* rainy season flow is defined as a rounded number near the 75th percentile.

Page 3–trends in high flow over time: The graph at the bottom right shows boxplots plotted versus year for the December/January (by water year), which is typically high flow.

Page 3–how trends are assessed: All of the graphs on page 3 show one or more lines that indicate trends and central tendencies of the data. The types of lines used vary with the graph and are shown at the right:



- *Median lines* were used for streamflow; *mean lines* for onset dates.
- *Smoothed lines* were calculated using the LOWESS method (LOcally WEighted Scatterplot Smoothing). LOWESS is a non-parametric method that fits a curve to data giving more weight to points closer to the point being fitted. LOWESS can be used to help visualize trends in data.
- *Statistically significant differences* were tested using non-parametric methods (Kendall's tau for trends, Mood medians test for 2 groups). Magenta lines are used to show statistically significant results ($p \leq 0.01$).

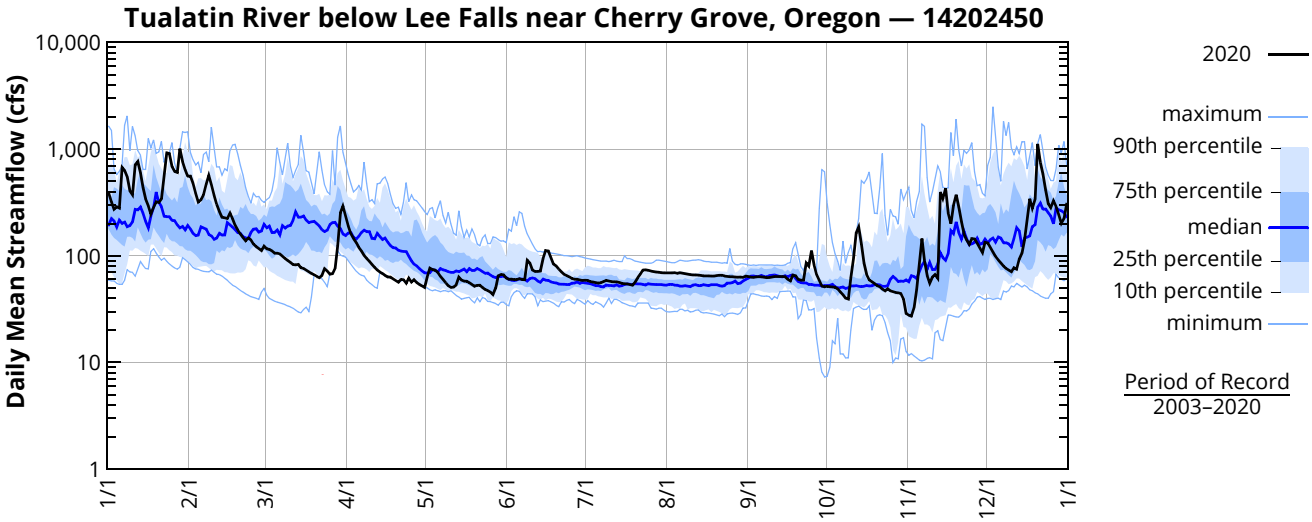
TRLF – Tualatin River below Lee Falls near Cherry Grove, Oregon – 14202450

Data source: Oregon Water Resources Department
River mile: 70.7 *Latitude:* 45 30 21 *Longitude:* 123 13 06

2020 — MEAN STREAMFLOW† (cfs) — TRLF

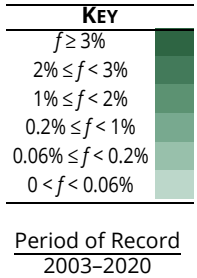
DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	386	560	123	236	50.4	61.9	59.0	69.2	63.9	51.8	27.7	132
2	320	481	116	191	63.1	60.2	58.9	69.2	63.1	51.2	27.1	120
3	273	385	115	160	76.7	60.4	57.3	69.3	62.8	51.0	32.6	108
4	288	320	111	145	74.3	59.9	56.8	69.5	63.4	50.7	48.3	98.5
5	280	335	106	133	73.3	59.8	56.1	68.6	63.7	49.0	85.1	91.1
6	673	374	106	120	70.2	60.9	55.5	69.4	63.4	45.9	145	85.6
7	632	471	104	111	64.1	59.9	55.9	68.8	63.0	43.1	89.6	80.1
8	551	570	99.1	101	60.1	59.7	57.2	68.0	62.3	40.1	65.3	76.0
9	406	466	94.2	94.4	55.9	90.9	58.8	67.3	62.7	39.3	55.2	73.3
10	374	369	90.3	88.6	52.4	85.3	58.0	66.6	63.3	62.5	63.2	70.8
11	715	304	86.6	83.0	50.6	73.6	57.2	66.1	63.9	95.7	66.7	77.4
12	767	261	82.8	77.9	50.9	71.4	57.0	66.2	63.9	163	61.6	75.0
13	598	230	82.2	73.6	53.3	71.3	57.0	66.0	64.0	186	396	92.7
14	434	227	83.1	70.3	63.1	71.8	56.2	65.4	64.0	128	342	106
15	341	223	77.3	68.3	59.2	94.2	55.1	64.7	63.6	85.4	428	141
16	294	252	76.0	65.5	57.9	112	54.7	64.7	60.0	66.3	252	220
17	246	223	73.5	63.2	57.8	111	54.5	64.7	58.0	59.2	200	342
18	285	194	70.7	63.2	56.0	96.2	53.8	64.5	66.0	57.0	296	278
19	321	174	68.5	60.6	53.7	83.7	53.1	64.5	65.0	54.9	373	338
20	315	160	66.3	58.6	51.7	80.2	56.6	65.2	60.0	52.5	287	1120
21	341	148	64.1	56.4	52.8	75.3	62.3	65.7	59.0	51.2	209	745
22	559	138	62.3	60.1	53.0	70.6	67.4	65.6	59.0	48.7	160	584
23	923	147	65.4	59.7	50.4	67.0	73.7	64.6	85.6	46.9	141	411
24	911	141	75.8	55.3	48.3	65.3	73.8	64.1	79.9	49.2	128	309
25	686	129	71.9	61.9	47.2	63.5	73.2	63.7	112	46.8	145	282
26	619	122	67.3	56.6	45.7	61.2	71.8	63.6	82.3	46.0	144	328
27	604	117	67.9	59.7	43.3	60.3	71.1	63.3	66.6	45.3	131	290
28	1010	112	76.4	56.0	49.8	60.2	70.5	63.1	58.6	44.9	118	243
29	762	132	125	54.0	65.1	59.3	70.2	63.2	51.9	44.3	107	202
30	643	—	253	52.2	66.8	58.8	69.4	62.9	51.0	39.3	134	225
31	558	—	292	—	66.5	—	69.2	64.6	—	28.8	—	306
Mean	520	268	98.5	87.9	57.5	72.2	61.3	65.9	65.5	62.1	159	247
Max	1010	570	292	236	76.7	112	73.8	70.5	112	186	428	1120
Min	246	112	62.3	52.2	43.3	58.8	53.1	62.9	51.0	28.8	27.1	70.8
Ac-Ft	31964	15402	6055	5229	3537	4296	3771	4051	3899	3816	9438	15175

†All 2020 data are provisional—subject to revision



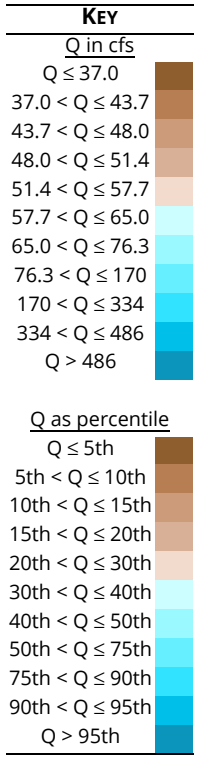
FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — TRLF

Q IN cfs	7 < Q < 10	10 < Q ≤ 35	35 < Q ≤ 45	45 < Q ≤ 50	50 < Q ≤ 60	60 < Q ≤ 70	70 < Q ≤ 85	85 < Q ≤ 120	120 < Q ≤ 170	170 < Q ≤ 250	250 < Q ≤ 500	500 < Q ≤ 1,700	1,700 < Q ≤ 3,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.1%	3.7%	7.5%	6.4%	15%	12%	9.1%	10.3%	10.5%	9.3%	11.2%	4.5%	0.09%



MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — TRLF

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2003	206	177	350	165	45.8	48.5	51.1	67.2	55.9	39.2	38.0	182
2004	247	214	118	76.0	46.1	57.7	57.9	50.2	45.3	44.6	42.4	75.1
2005	88.2	60.4	40.0	134	62.6	44.3	41.1	50.1	65.4	51.4	119	116
2006	532	148	161	120	52.2	50.0	43.3	31.8	65.9	68.5	377	292
2007	169	144	206	91.6	47.4	40.7	40.7	29.9	45.7	40.5	47.1	306
2008	270	182	216	178	97.0	47.5	36.0	40.0	48.0	46.0	82.0	76.0
2009	251	80	181	119	102	47.0	50.0	43.0	52.0	43.0	211	116
2010	389	161	139	228	98.0	83.5	63.0	58.0	64.0	54.0	125	346
2011	207	110	359	306	150	107	89.0	87.0	74.0	26.0	39.5	58.0
2012	279	206	298	169	93.0	57.5	57.0	63.0	68.5	60.0	202	397
2013	164	152	138	107	80.0	64.5	50.0	53.0	59.0	56.0	76.5	81.0
2014	100	234	287	151	105	56.5	54.0	51.0	62.0	54.0	112	244
2015	171	145	97.0	74.0	72.0	65.0	62.0	58.0	79.0	51	108	523
2016	368	265	316	83.5	59.0	65.5	53.0	50.0	64.0	156	200	289
2017	165	398	401	203	106.0	53.0	68.0	62.0	79.0	50.0	246	139
2018	255	140	175	182	62.9	58.2	51.9	64.1	67.6	52.4	34.5	169
2019	178	143	123	126	50.1	58.1	53.9	39.2	54.7	54.9	35.8	98.8
2020	551	229	82.8	66.9	55.9	66.2	57.3	65.4	63.4	50.7	133	202
median	225	167	188	130	68.3	58.0	54.0	53.0	60.0	52.2	102	185



2020

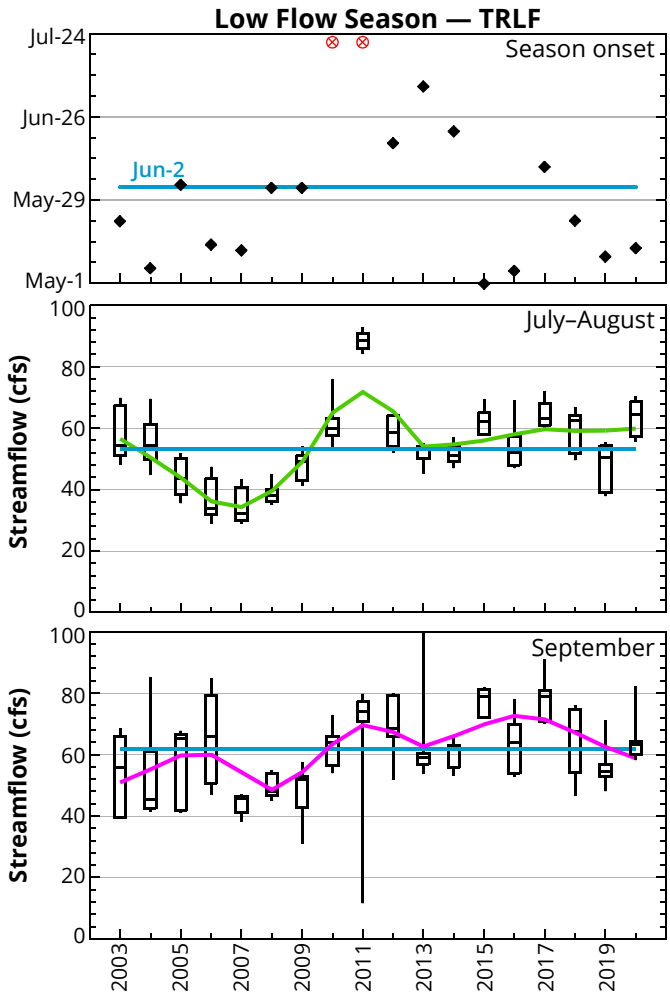
- Except for summer, 2020 was characterized by intermittent high flow and extended periods of low flow. Spring was particularly dry and record low flow occurred in the last halves of March and April—a total of 22 days.
- Flows in June–August were higher than the long-term median. During September–December flow alternated between high and low in response to intermittent heavy rainstorms.

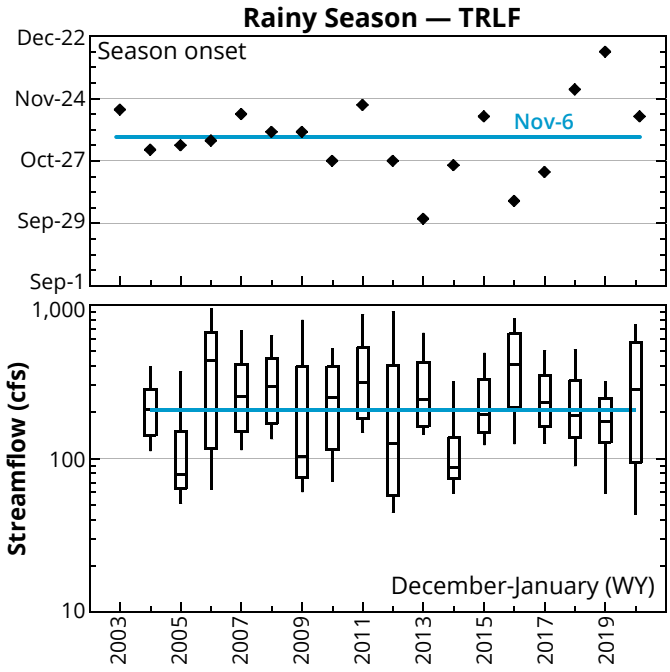
LOW FLOW SEASON

- The lowest flow months are July, August and October. Flow during this time is mostly controlled by releases from Barney Reservoir. Most of the released water is withdrawn downstream for municipal use.
- Higher flow during September (compared to July–August is mostly due to Clean Water Services' releases from Barney Reservoir.
- Low flow criterion is: 7d-Q ≤ 55 cfs (~27th pctl)
- Low flow did not occur in 2010 which had a relatively rainy and cool summer.
- Higher than normal releases from Barney Reservoir occurred from mid-April through late-September 2011 so that repairs of Eldon Mills Dam could be done. Releases were temporarily discontinued in late September. The atypical release regime in 2011 was responsible for
  - —high flows in July-August
  - —the low-flow criterion not being met until 9/30
  - —some very low flows in September
- Flow during July—September appears to be slightly greater in recent years. The trend for September is statistically significant, but weak. Flows during this time depend on releases from Barney Reservoir which may have changed.

RAINY SEASON

- The highest flow months are December through March due to normal patterns in rainfall.
- Rainy season criterion: 7d-Q ≥ 80 cfs (~50th pctl)
- Onset of the rainy season has been more variable in recent years than in the early 2000s.
- No trends are evident for the magnitude of December–January rainy season flow.





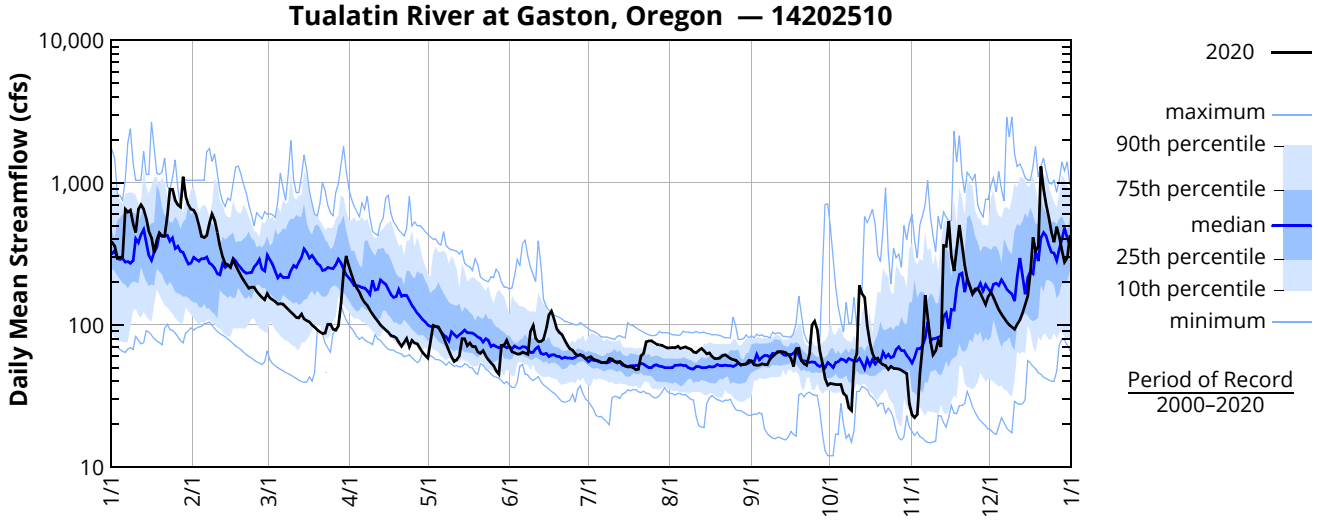
GASO — TUALATIN RIVER AT GASTON, OREGON — 14202510

Data source: Oregon Water Resources Department
River mile: 62.3 *Latitude:* 45 26 21 *Longitude:* 123 07 85

2020 — MEAN STREAMFLOW† (cfs) — GASO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	381	641	166	260	58.5	70.0	58.8	69.0	55.8	38.7	23.3	169
2	358	594	155	228	74.6	64.7	59.7	69.3	52.5	38.4	22.3	156
3	295	504	150	200	99.1	63.7	57.3	69.0	52.0	38.1	23.5	141
4	299	419	146	182	97.3	62.4	56.4	70.9	52.1	38.0	45.0	128
5	299	411	140	170	96.9	62.3	55.6	68.2	53.3	38.1	71.1	119
6	650e	425	141	154	89.1	64.3	54.4	69.1	52.5	33.0	162	112
7	620e	521	140	144	81.7	63.3	54.3	70.0	52.5	31.6	110	105
8	640e	602	134	137	73.4	62.0	54.5	68.4	57.2	26.1	77.1	99.9
9	515	547	128	127	66.1	89.9	58.0	67.4	60.2	25.0	61.4	96.7
10	447	445	123	119	59.5	98.9	57.6	64.5	62.4	54.9	65.7	93.1
11	650e	358	118	112	55.3	80.6	55.2	63.9	64.8	62.2	78.0	101
12	700e	302	113	106	56.8	76.4	55.0	66.2	64.9	190	70.0	108
13	650e	270	112	100	60.4	76.6	55.2	68.3	64.6	166	361	120
14	564	264	119	95.6	80.0	79.1	53.4	65.7	63.9	156	357	139
15	456	254	110	92.3	80.0	93.7	51.2	62.6	61.6	99.2	536	159
16	409	287	107	88.7	71.4	117	50.7	63.5	58.1	74.8	301	237
17	323	261	105	83.8	74.5	125	50.7	60.2	50.9	63.0	239	412
18	393	240	99.6	83.1	70.3	110	50.3	57.8	67.7	57.4	344	331
19	443	221	96.3	80.8	70.5	93.6	48.4	58.0	68.5	58.3	503	356
20	421	206	92.2	75.4	64.6	88.3	48.7	58.5	56.1	54.2	376	1300e
21	421	193	89.1	70.6	63.0	85.6	60.8	60.7	53.2	52.4	263	900e
22	590e	181	86.9	75.2	65.8	78.1	62.8	61.6	51.9	51.7	211	700e
23	900e	184	87.5	80.3	60.6	72.2	75.9	59.8	61.7	48.6	188	567
24	900e	184	101	70.0	56.9	68.0	77.1	58.0	99.6	51.1	165	449
25	750e	172	101	77.7	54.1	66.5	77.4	57.0	106	49.5	179	381
26	700e	163	93.3	74.3	51.8	62.7	74.9	56.5	93.1	49.3	180	491
27	675e	156	91.7	73.7	47.5	60.9	73.1	54.3	65.3	49.0	167	418
28	1100e	150	98.4	68.4	45.0	61.7	72.2	52.1	53.4	48.0	152	332
29	800e	171	139	64.1	71.8	60.0	71.9	52.8	42.0	46.6	139	276
30	700e	—	235	61.0	72.1	57.9	70.3	53.0	37.6	45.6	158	296
31	650e	—	305	—	78.0	—	68.8	56.3	—	28.0	—	420
Mean	571	322	127	112	69.2	77.2	60.3	62.3	61.2	60.1	188	313
Max	1100	641	305	260	99.1	125	77.4	70.9	106	190	536	1300
Min	295	150	86.9	61.0	45.0	57.9	48.4	52.1	37.6	25.0	22.3	93.1
Ac-Ft	35105	18498	7781	6653	4257	4592	3710	3833	3640	3695	11164	19265

†All 2020 data are provisional—subject to revision; e=estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — GASO

Q IN cfs	10 < Q < 15	15 < Q ≤ 30	30 < Q ≤ 45	45 < Q ≤ 55	55 < Q ≤ 65	65 < Q ≤ 75	75 < Q ≤ 100	100 < Q ≤ 160	160 < Q ≤ 250	250 < Q ≤ 400	400 < Q ≤ 700	700 < Q ≤ 2,000	2,000 < Q ≤ 5,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.109	2.3%	8.3%	12.4%	12.1%	8.4%	10.7%	10.5%	11.2%	10.3%	9.5%	3.9%	0.09%

KEY

- $f \geq 3\%$
- $2\% \leq f < 3\%$
- $1\% \leq f < 2\%$
- $0.2\% \leq f < 1\%$
- $0.06\% \leq f < 0.2\%$
- $0 < f < 0.06\%$

Period of Record
2000–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — GASO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2000	442	310	278	86.0	69.7	75.0	62.4	50.6	67.5	65.3	57.2	72.0
2001	78.2	103	81.2	71.5	68.0	38.3	31.7	30.0	23.5	35.6	95.3	571
2002	479	391	286	172	61.4	51.3	48.2	51.6	55.7	45.2	35.3	229
2003	353	315	545	307	97.6	57.4	54.1	72.5	64.9	41.5	47.0	320
2004	372	357	179	114	70.8	69.7	64.3	54.7	51.9	63.1	67.1	113
2005	123	78.0	51.5	179	99.2	57.3	44.5	51.9	71.5	84.7	184	235
2006	855	216	240	175	69.5	57.7	39.4	31.6	62.4	69.0	452	446
2007	256	189	300	120	56.5	41.9	40.2	34.6	48.3	55.3	76.7	426
2008	366	303	276	217	111	57.5	41.0	40.0	44.5	50.0	102	86.0
2009	379	102	248	155	126	62.0	50.0	40.0	48.0	47.0	284	199
2010	587	270	238	325	119	123	66.0	58.0	62.0	65.0	167	507
2011	385	296	583	482	260	123	87.0	85.0	68.5	24.0	41.5	64.0
2012	359	271	454	242	113	68.0	61.0	65.0	68.0	64.0	294	671
2013	224	181	180	126	83.0	72.0	49.0	50.0	58.5	61.0	103	102
2014	134	382	427	231	138	68.0	52.0	48.0	59.0	52.0	123	399
2015	255	231	152	101	72.0	62.0	58.0	54.0	76.5	47.0	149	840
2016	615	499	583	117	67.0	64.5	48.0	44.0	60.0	194	262	386
2017	248	538	511	300	150	63.0	63.0	55.0	78.0	55.0	348	197
2018	376	201	253	263	70.1	61.5	51.7	62.4	72.6	53.2	36.5	204
2019	244	227	177	178	56.7	58.0	52.2	35.3	55.0	62.3	31.5	111
2020	590	267	113	90.5	70.3	71.1	57.3	62.6	57.7	49.3	164	237
median	343	264	255	166	83.6	62.9	53.0	51.2	58.2	56.7	111	266

KEY

Q in cfs

- $Q \leq 35.6$
- $35.6 < Q \leq 44.0$
- $44.0 < Q \leq 49.1$
- $49.1 < Q \leq 52.6$
- $52.6 < Q \leq 59.9$
- $59.9 < Q \leq 69.5$
- $69.5 < Q \leq 86.0$
- $86.0 < Q \leq 239$
- $239 < Q \leq 475$
- $475 < Q \leq 640$
- $Q > 640$

Q as percentile

- $Q \leq 5\text{th}$
- $5\text{th} < Q \leq 10\text{th}$
- $10\text{th} < Q \leq 15\text{th}$
- $15\text{th} < Q \leq 20\text{th}$
- $20\text{th} < Q \leq 30\text{th}$
- $30\text{th} < Q \leq 40\text{th}$
- $40\text{th} < Q \leq 50\text{th}$
- $50\text{th} < Q \leq 75\text{th}$
- $75\text{th} < Q \leq 90\text{th}$
- $90\text{th} < Q \leq 95\text{th}$
- $Q > 95\text{th}$

2020

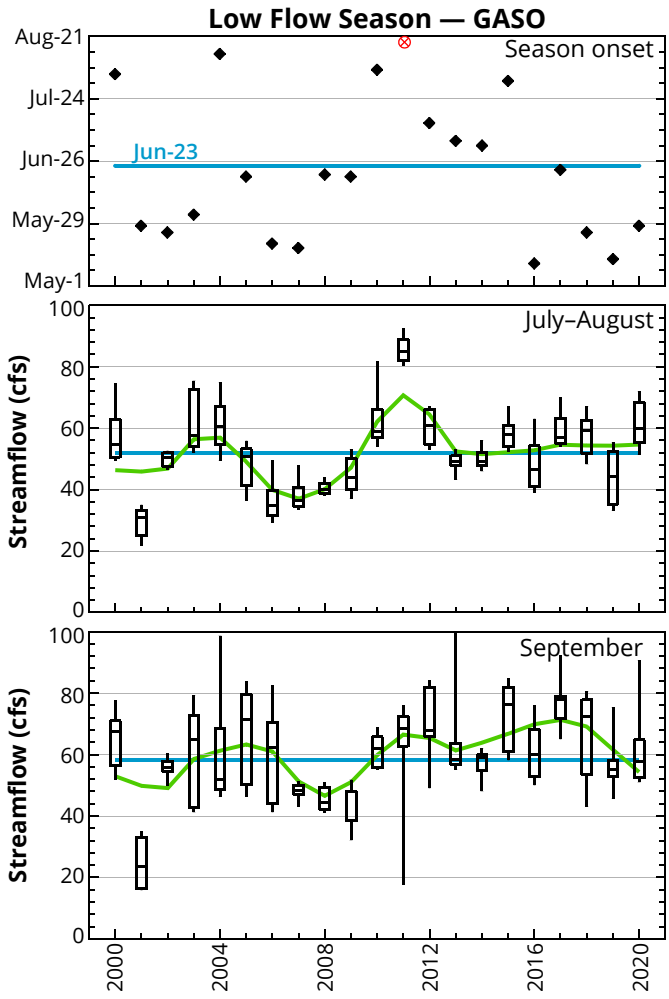
- Winter and spring flows in 2020 alternated between higher and lower flows due to intermittent storms. Prolonged dry spells led to record low flows in late March and late April. In all, 9 days had record low flow. June–August flows were near or higher than the long-term median. September–December flows alternated between near record high flows and near record low flows.

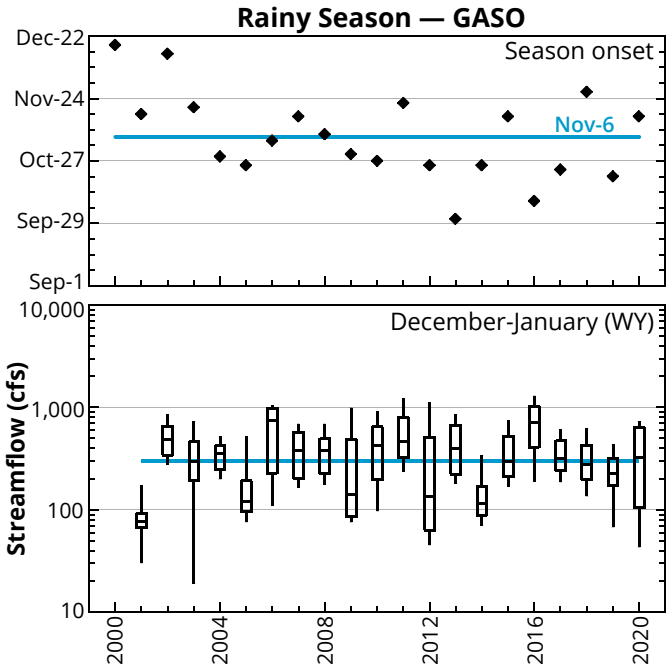
LOW FLOW SEASON

- The lowest flow months are July, August and October. Flow during this time is mostly controlled by releases from Barney Reservoir. Most of the released water is withdrawn downstream for municipal use.
- Higher flow during September (compared to July-August) is mostly due to Clean Water Services' releases from Barney Reservoir.
- Low flow criterion is: 7d-Q ≤ 55 cfs (~23rd pctl)
- Higher than normal releases from Barney Reservoir occurred from mid-April through late-September 2011 so that repairs of Eldon Mills Dam could be done. Releases were temporarily discontinued in late September. The atypical release regime in 2011 was responsible for
  - —high flows in July-August
  - —the low-flow criterion not being met until 9/30
  - —some very low flows in September
- Flows during the dry season may be slightly greater in recent years, but the trends are not statistically significant. Flows during this time depend on releases from Barney Reservoir which may have changed.

RAINY SEASON

- The highest flow months are December and January due to normal patterns in rainfall. Although low flows are less common during these months, they do occur, especially in December.
- Rainy season criterion: 7d-Q ≥ 85 cfs (~48th pctl)
- In 2020, rainy season onset was on November 16, although it was preceded by 4 days of high flow in mid-October that did not persist.
- No trends are evident for the magnitude of December–January rainy season flow.





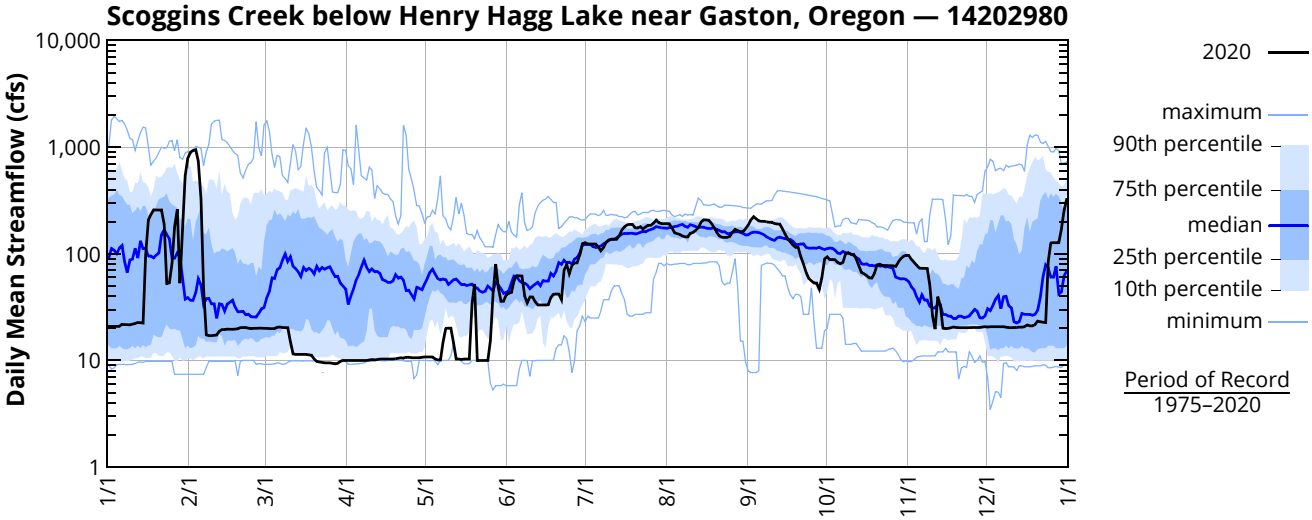
SCOO – Scoggins Creek below Henry Hagg Lake near Gaston, Oregon – 14202980

Data source: Bureau of Reclamation (in cooperation with District 18 Watermaster)
River mile: 4.8 *Latitude:* 45 28 10 *Longitude:* 123 11 56

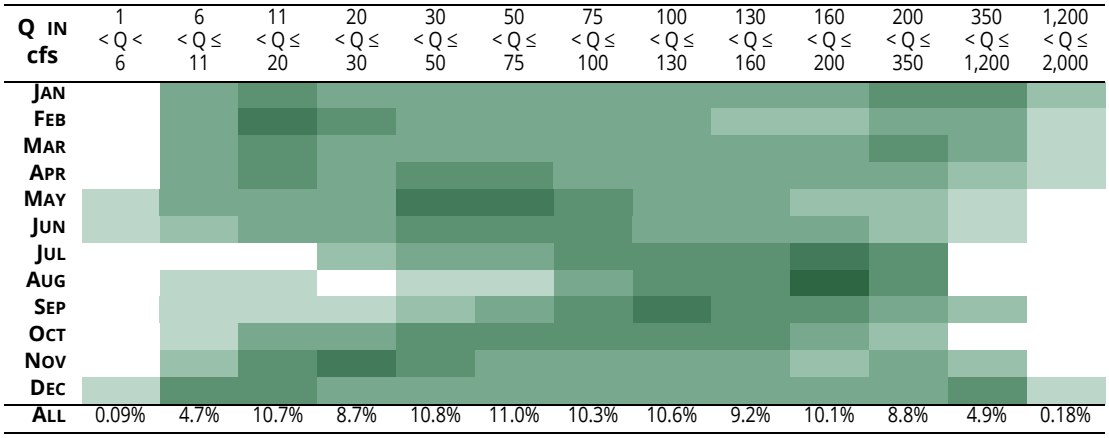
2020 — MEAN STREAMFLOW[†] (cfs) — SCOO

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	20.9	893	20.0	9.99	10.8	41.0	127	192	186	93.7	96.7	20.6
2	20.9	930	20.0	9.97	10.8	42.7	123	191	208	88.0	88.6	20.7
3	20.9	945	19.9	10.0	10.8	43.2	124	175	223	88.3	83.2	20.7
4	20.9	736	19.9	10.0	10.8	56.1	124	157	213	88.0	78.0	20.7
5	20.9	324	19.9	10.0	10.3	62.3	123	154	203	82.5	73.3	20.7
6	21.8	47.5	20.5	10.0	10.1	62.1	115	152	202	80.5	73.2	20.7
7	21.7	17.3	20.6	10.0	10.1	62.0	107	147	202	83.2	73.1	20.7
8	21.7	17.1	20.4	10.0	14.8	40.2	115	144	199	99.9	72.8	20.5
9	21.5	17.1	20.3	10.0	20.0	34.7	128	144	198	102	50.8	20.3
10	21.9	17.2	20.3	10.1	20.1	39.4	135	155	198	99.1	26.2	20.3
11	22.2	17.3	14.8	10.2	20.1	39.4	137	159	192	98.9	19.7	20.4
12	22.7	18.8	11.5	10.1	14.5	35.7	137	165	190	90.1	39.7	20.4
13	22.6	19.5	11.4	10.2	10.3	33.2	136	176	190	78.2	32.9	20.6
14	22.4	19.5	11.4	10.3	10.3	33.2	148	197	171	66.8	20.1	20.5
15	97.8	19.7	11.4	10.3	10.2	33.2	168	208	152	65.1	19.9	20.7
16	206	19.6	11.4	10.3	10.3	33.2	179	207	138	62.3	20.0	21.5
17	233	19.6	11.4	10.3	10.3	33.3	187	206	129	59.4	20.2	21.1
18	258	19.7	11.3	10.3	10.3	38.8	189	193	121	59.2	20.6	21.1
19	258	19.8	11.2	10.3	33.9	41.8	188	177	115	66.0	20.4	21.7
20	258	20.3	10.3	10.4	52.2	41.9	175	159	115	78.6	20.3	23.4
21	258	20.4	9.84	10.5	9.98	41.9	175	147	93.5	80.1	20.3	23.1
22	189	20.4	9.74	10.6	9.98	37.0	179	143	80.2	77.9	20.3	22.8
23	52.5	20.1	9.57	10.5	9.99	70.3	171	142	66.9	77.7	20.3	22.7
24	53.3	19.9	9.52	10.7	9.99	79.3	178	142	58.8	77.5	20.3	84.9
25	81.7	20.0	9.47	10.7	9.99	64.8	185	145	55.6	77.4	20.4	127
26	179	20.0	9.45	10.6	15.4	77.8	185	159	53.3	77.3	20.4	127
27	262	20.1	9.36	10.6	41.3	82.2	193	170	53.2	75.9	20.4	127
28	53.1	20.1	9.31	10.6	80.0	82.2	207	164	46.7	83.3	20.4	127
29	175	20.1	9.37	10.6	48.5	98.1	196	161	60.1	89.6	20.6	170
30	537	—	9.82	10.7	35.9	124	192	161	89.6	94.6	20.7	257
31	782	—	9.98	—	35.9	—	192	172	—	96.7	—	322
Mean	137	149	13.7	10.3	19.9	53.5	159	167	140	81.9	38.5	59.0
Max	782	945	20.6	10.7	80.0	124	207	208	223	102	96.7	322
Min	20.9	17.1	9.31	9.97	9.98	33.2	107	142	46.7	59.2	19.7	20.3
Ac-Ft	8399	8567	840	613	1225	3183	9755	10247	8336	5033	2288	3625

[†]All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — SCOO



MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — SCOO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975	98.0	93.0	166	34.0	65.0	50.5	154	271	348	35.0	37.0	31.0
1976	86.0	24.0	124	85.0	45.0	31.0	95.0	94.0	171	140	23.0	14.0
1977	13.0	10.0	11.0	10.5	21.0	10.0	82.0	82.0	81.5	13.3	76.7	374
1978	181	41.7	28.6	60.3	76.7	33.3	84.8	122	215	173	16.0	14.0
1979	14.0	14.0	45.0	21.0	49.0	33.0	92.0	121	141	142	31.5	150
1980	205	22.0	135	74.0	35.0	29.0	80.0	117	123	84.0	78.5	123
1981	21.0	32.5	47.0	55.0	35.0	50.0	78.0	176	104	130	129	353
1982	228	217	199	142	74.0	73.0	82.0	107	103	150	131	341
1983	333	76.0	343	97.5	55.0	67.4	49.1	104	155	175	119	348
1984	65.1	66.1	59.1	60.0	76.0	68.7	108	157	107	112	212	126
1985	21.0	17.9	12.0	12.0	90.6	99.9	178	142	66.7	31.0	22.0	50.0
1986	11.0	51.0	98.1	13.0	45.9	91.8	149	158	88.4	27.0	19.0	9.0
1987	27.0	13.5	194	36.0	34.0	54.5	173	162	91.0	45.0	16.0	13.0
1988	15.0	13.0	14.0	41.0	52.0	47.5	143	166	136	90.0	27.0	27.0
1989	120	18.0	175	36.0	26.0	72.0	144	158	152	116	31.5	13.0
1990	12.0	63.5	150	15.0	33.0	54.0	188	177	114	98.0	19.0	9.9
1991	10.0	10.0	69.0	107	37.0	23.0	148	192	152	135	17.0	9.1
1992	9.9	11.0	11.0	10.5	30.0	105	164	175	102	66.0	22.0	11.0
1993	12.0	11.0	12.0	135	82.0	32.0	44.0	118	179	102	107	13.0
1994	14.0	12.0	76.0	36.0	30.0	30.0	201	188	132	83.0	22.0	17.0
1995	585	145	177	62.0	47.0	57.0	134	181	128	54.0	21.0	569
1996	334	609	32.0	202	116	38.5	181	204	93.0	75.0	24.0	57.0
1997	365	78.0	221	10.0	74.0	46.5	129	209	192	61.0	38.0	372
1998	211	172	193	35.5	59.0	50.0	133	149	199	104	39.0	121
1999	409	582	158	52.5	53.0	111	167	183	170	112	26.5	73.0
2000	191	25.0	94.0	15.5	37.0	89.0	133	173	135	113	51.0	10.0
2001	9.8	9.8	10.0	9.9	10.0	68.5	105	99.0	79.5	43.4	14.3	16.7
2002	230	54.6	92.0	80.8	46.9	122	154	160	169	134	29.5	9.7
2003	13.3	104	199	127	63.6	108	162	177	154	116	90.5	10.7
2004	10.7	117	50.5	51.0	39.7	90.6	158	204	103	95.0	20.8	10.7
2005	10.4	10.6	9.9	10.5	81.0	51.3	168	197	155	105	21.2	10.8
2006	688	75.1	33.7	66.1	45.0	60.4	176	205	156	79.2	20.8	201
2007	193	25.4	99.4	39.8	52.3	145	182	202	180	49.0	21.2	23.4
2008	289	107	33.2	96.0	73.6	50.2	186	178	174	105	22.3	19.6
2009	58.2	15.9	16.6	57.0	110	58.0	180	183	154	74.4	21.7	90.0
2010	207	99.1	68.6	169	87.4	154	139	174	98.9	79.0	27.2	318
2011	222	28.4	290	174	97.5	51.8	99.4	134	149	92.0	50.5	56.0
2012	309	82.5	249	113	100	55.0	158	187	167	63.0	113	386
2013	124	27.5	25.0	14.0	36.0	67.0	184	182	97.5	32.0	33.0	91.0
2014	47.0	48.5	299	98.0	111	89.5	178	198	164	82.0	26.0	24.0
2015	152	85.5	47.0	20.5	67.0	170	225	214	115	85.0	21.0	205
2016	288	102	284	56.5	35.0	110	155	197	118	31.4	27.0	402
2017	165	280	314	162	75.8	41.6	158	180	140	79.4	42.7	98.1
2018	232	34.9	26.9	157	59.3	111	203	177	147	79.1	42.2	13.0
2019	16.9	16.6	16.1	61.1	43.6	136	136	186	64.0	53.9	58.3	20.5
2020	53.1	19.9	11.4	10.3	10.8	41.9	171	161	145	80.5	20.5	21.1
median	93.0	30.8	66.5	55.4	52.3	62.0	147	169	134	86.0	31.0	35.7

KEY

Q in cfs
- Q ≤ 11.0
- 11.0 < Q ≤ 13.7
- 13.7 < Q ≤ 19.0
- 19.0 < Q ≤ 23.0
- 23.0< Q ≤ 39.1
- 39.1 < Q ≤ 60.0
- 60.0 < Q ≤ 83.5
- 83.5 < Q ≤ 156
- 156 < Q ≤ 223
- 223 < Q ≤ 352
- Q > 352

Q as percentile
- Q ≤ 5th
- 5th < Q ≤ 10th
- 10th < Q ≤ 15th
- 15th < Q ≤ 20th
- 20th < Q ≤ 30th
- 30th < Q ≤ 40th
- 40th < Q ≤ 50th
- 50th < Q ≤ 75th
- 75th < Q ≤ 90th
- 90th < Q ≤ 95th
- Q > 95th

2020

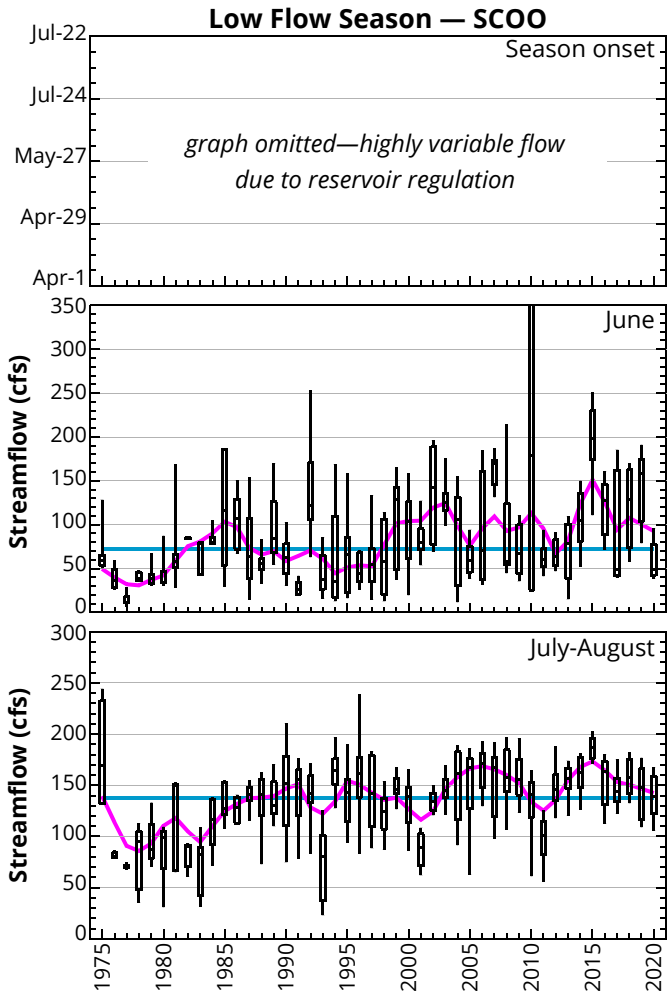
- After near record flow at the beginning of February 2020, flow was near the 10 cfs minimum requirement for the remainder of February through April. Required 10 cfs releases persisted into May, resulting in 6 days with record low flow during that month. Spring of 2020 was unusually dry and Hagg Lake was still filling.
- Flows from June through December were near the long-term medians.

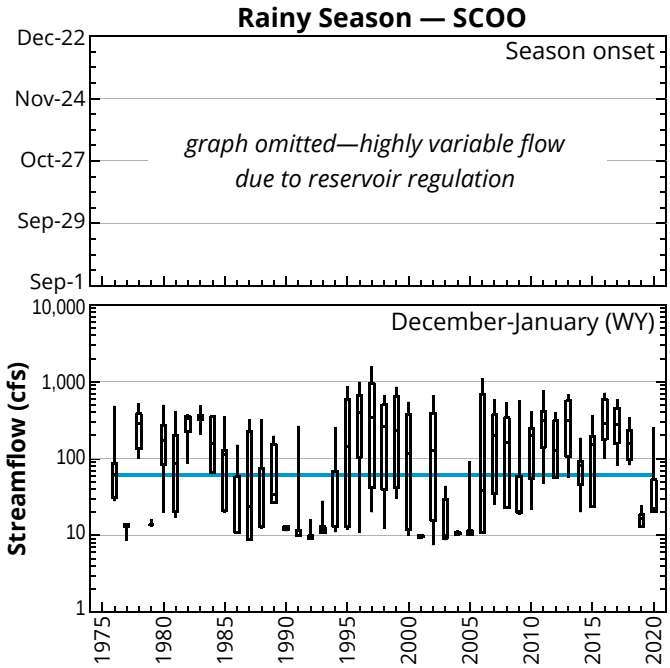
RESERVOIR EFFECTS

- Flow at this site is mostly controlled by the operation of Scoggins Dam and reservoir releases. Weather is secondary.
  - —Seasonal, sustained low or high flow regimes driven by weather generally do not occur.
  - —Both the lowest and highest flow extremes occur December through April and depend on whether on not Hagg Lake is filling.
  - —The month with the lowest average flow is November when releases for municipal use or irrigation are low and the reservoir is filling.
  - —Winter releases must be at least 10 cfs for the benefit of fish.

RELEASE SEASON

- Releases for irrigation and municipal use can begin in May and extend into November.
- The months with the highest average flow are July and August when releases are greatest due to high water demand.
- Flow during the release season varies substantially year-to-year depending on weather and other factors.
  - —1993: Spring was very wet. Flow regulation did not start until July and releases in early July were low. Flow augmentation water was also being saved for use later in the year.
  - —2001: The reservoir did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.
  - —2010: June was extremely wet.
  - —2011: Joint Water Commission was releasing more water than usual from Barney Reservoir and therefore decreased their releases from Hagg Lake.
- Despite the variability, mid-summer flow has increased over the period of record. The trend is statistically significant for June through August.





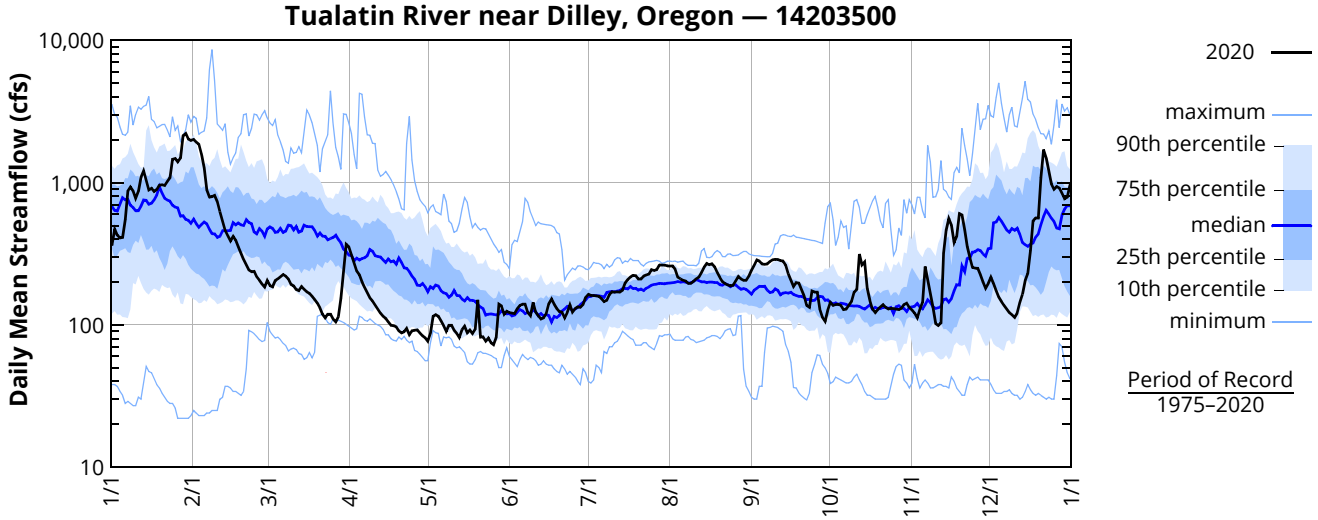
DLLO — TUALATIN RIVER NEAR DILLEY, OREG. — 14203500

Data source: U.S. Geological Survey, Oregon Water Science Center
River Mile: 58.8 *Latitude:* 45 28 30 *Longitude:* 123 07 23 *Drainage area:* 125.00 sq mile *Datum:* 147.57 ft

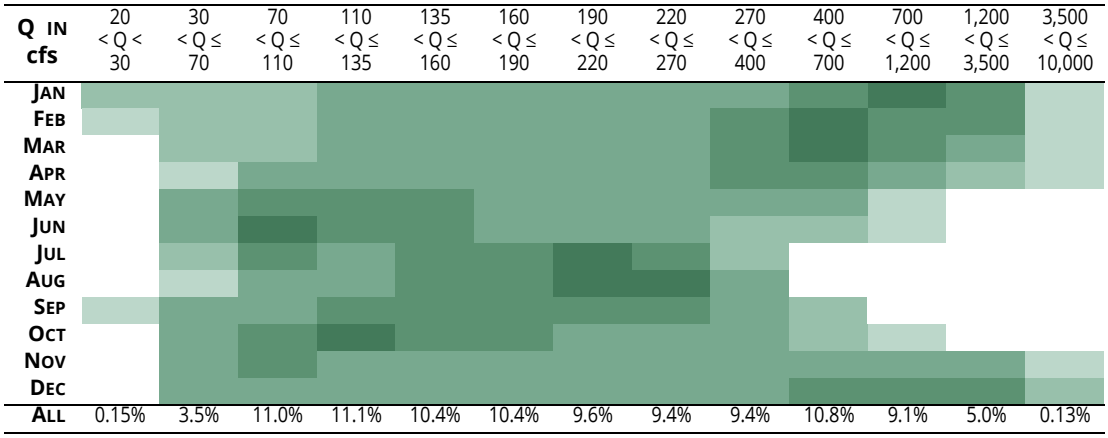
2020 — MEAN STREAMFLOW† (cfs) — DLLO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	368	2010	205	354	76.8	122	164	259	242	144	127	216
2	472	1930	189	310	86.9	121	161	260	261	137	121	196
3	427	1860	185	271	115	120	161	247	286	139	112	174
4	409	1590	205	239	118	130	160	216	281	140	128	157
5	412	1270	211	225	115	137	159	211	268	137	144	146
6	552	892	218	201	107	140	153	206	267	128	257	137
7	873	791	226	183	98.6	140	146	203	268	129	208	129
8	932	799	220	168	90.2	122	149	196	279	137	164	122
9	873	814	210	155	99.5	116	163	196	287	146	133	118
10	776	737	193	147	99.3	144	171	202	289	169	102	113
11	869	628	188	138	91.7	123	170	211	288	177	98.9	121
12	1090	539	177	129	87.1	116	171	216	283	315	103	144
13	1210	462	174	121	81.5	110	170	234	282	264	319	164
14	1040	422	186	115	92.5	112	175	254	263	277	462	205
15	891	389	178	111	98.0	120	197	270	229	181	559	229
16	914	420	171	105	88.0	141	208	265	206	148	504	333
17	867	394	167	99.3	91.9	152	217	269	186	129	379	538
18	894	355	159	98.6	86.9	140	223	256	198	122	419	566
19	963	319	151	97.0	93.2	130	222	234	197	128	606	564
20	967	288	142	90.7	150	124	210	215	178	134	594	1080
21	955	264	132	87.9	82.1	123	210	201	160	139	467	1710
22	1020	243	119	89.3	82.5	112	220	195	137	133	356	1500
23	1080	236	112	94.5	77.0	122	224	191	133	129	299	1200
24	1460	238	119	85.4	80.8	138	227	188	173	131	253	977
25	1480	218	119	90.9	74.8	123	244	190	170	130	251	896
26	1400	206	110	91.8	72.4	130	241	203	170	129	250	940
27	1490	194	105	92.3	81.2	134	244	219	129	128	226	918
28	2140	184	114	87.5	140	133	264	211	113	131	200	843
29	2220	206	154	83.7	136	139	263	206	106	139	181	771
30	2030	—	251	81.0	119	156	263	206	127	142	195	792
31	1980	—	369	—	125	—	260	220	—	133	—	952
Mean	1066	652	176	141	98.0	129	200	221	215	153	274	547
Max	2220	2010	369	354	150	156	264	270	289	315	606	1710
Min	368	184	105	81.0	72.4	110	146	188	106	122	98.9	113
Ac-Ft	65562	37484	10828	8414	6026	7676	12317	13587	12805	9412	16300	33622

† Data after Dec 21, 2020 are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — DLLO



KEY

- $f \geq 3\%$
- $2\% \leq f < 3\%$
- $1\% \leq f < 2\%$
- $0.2\% \leq f < 1\%$
- $0.06\% \leq f < 0.2\%$
- $0 < f < 0.06\%$

Period of Record
1975–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — DLLO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975	833	637	688	212	189	83.5	151	302	382	65.0	316	702
1976	1010	310	546	311	111	68.5	93.0	111	199	195	42.0	35.0
1977	30.0	33.5	247	85.0	74.0	58.0	90.0	83.0	102	49.0	307	1120
1978	885	617	245	284	233	90.0	103	141	275	222	77.5	232
1979	183	745	305	146	147	62.0	99.0	134	160	170	143	632
1980	963	452	475	336	109	67.0	102	134	145	111	175	660
1981	260	431	222	297	132	138	125	198	174	191	611	1210
1982	877	1081	725	597	157	103	90.5	123	123	206	307	1070
1983	913	1415	1010	440	139	103	88.6	119	202	210	785	748
1984	516	595	460	303	280	169	143	187	126	166	761	588
1985	194	291	196	222	150	184	196	151	71.5	62.9	144	158
1986	474	568	452	117	138	105	153	162	107	66.0	117	373
1987	604	536	943	180	79.0	79.0	180	168	111	83.0	41.5	254
1988	541	264	161	193	156	92.0	148	171	153	114	190	259
1989	569	288	616	219	81.0	106	171	174	163	140	116	96.0
1990	368	1053	494	128	90.0	111	170	174	124	123	132	203
1991	327	386	354	394	149	68.0	159	192	163	136	84.0	187
1992	248	377	153	177	94.0	132	150	152	109	83.0	86.0	328
1993	278	160	310	458	207	120	89.0	120	190	135	123	150
1994	494	188	356	179	84.0	73.5	193	185	145	100	293	1050
1995	1450	1050	611	282	160	115	149	178	140	93.0	332	1970
1996	1290	1210	350	597	437	145	184	205	127	114	162	1440
1997	976	537	887	261	187	112	162	266	277	280	359	723
1998	1320	1014	673	229	171	142	184	235	241	139	150	1280
1999	1450	2285	696	344	181	156	209	224	226	173	259	902
2000	856	463	495	124	123	189	211	238	218	205	128	130
2001	112	140	116	103	108	109	131	136	98.5	95.0	153	1270
2002	1310	571	461	300	116	179	202	207	224	177	110	317
2003	536	508	1020	480	153	159	201	225	195	151	153	340
2004	572	613	293	194	120	157	205	240	154	133	66.8	139
2005	195	122	81.8	266	203	123	196	232	188	146	244	326
2006	2430	491	481	307	124	128	211	226	206	165	659	1100
2007	571	252	521	196	128	165	197	209	198	105	142	755
2008	1050	663	455	393	231	137	255	202	212	135	125	108
2009	931	151	318	271	252	105	213	200	162	117	310	411
2010	920	466	440	585	248	441	181	193	141	150	238	1110
2011	823	323	807	654	325	162	176	216	194	114	130	162
2012	719	465	809	500	237	129	193	217	217	137	389	1260
2013	416	280	267	167	161	126	198	204	151	121	154	187
2014	187	822	882	468	259	134	199	206	186	130	162	537
2015	513	408	360	159	142	202	254	238	153	124	219	1570
2016	1190	732	986	240	93.9	159	189	241	182	305	483	964
2017	644	1125	890	639	317	126	222	231	208	137	641	454
2018	774	287	429	571	132	154	245	221	191	138	87.0	290
2019	353	361	251	291	111	178	175	226	133	130	99.3	134
2020	955	421	177	108	91.9	127	208	211	218	137	238	333
median	703	485	442	266	146	124	177	197	164	135	166	497

KEY

Q in cfs

- $Q \leq 78.0$
- $78.0 < Q \leq 95.9$
- $95.9 < Q \leq 110$
- $110 < Q \leq 122$
- $122 < Q \leq 144$
- $144 < Q \leq 169$
- $169 < Q \leq 199$
- $199 < Q \leq 399$
- $399 < Q \leq 877$
- $877 < Q \leq 1210$
- $Q > 1210$

Q as percentile

- $Q \leq 5th$
- $5th < Q \leq 10th$
- $10th < Q \leq 15th$
- $15th < Q \leq 20th$
- $20th < Q \leq 30th$
- $30th < Q \leq 40th$
- $40th < Q \leq 50th$
- $50th < Q \leq 75th$
- $75th < Q \leq 90th$
- $90th < Q \leq 95th$
- $Q > 95th$

2020

- Although January had high flow, flows were below the long term median from mid-February through May. Three days in March had record low flows. Flows in June–October were at or above the long-term median.

RESERVOIR EFFECTS

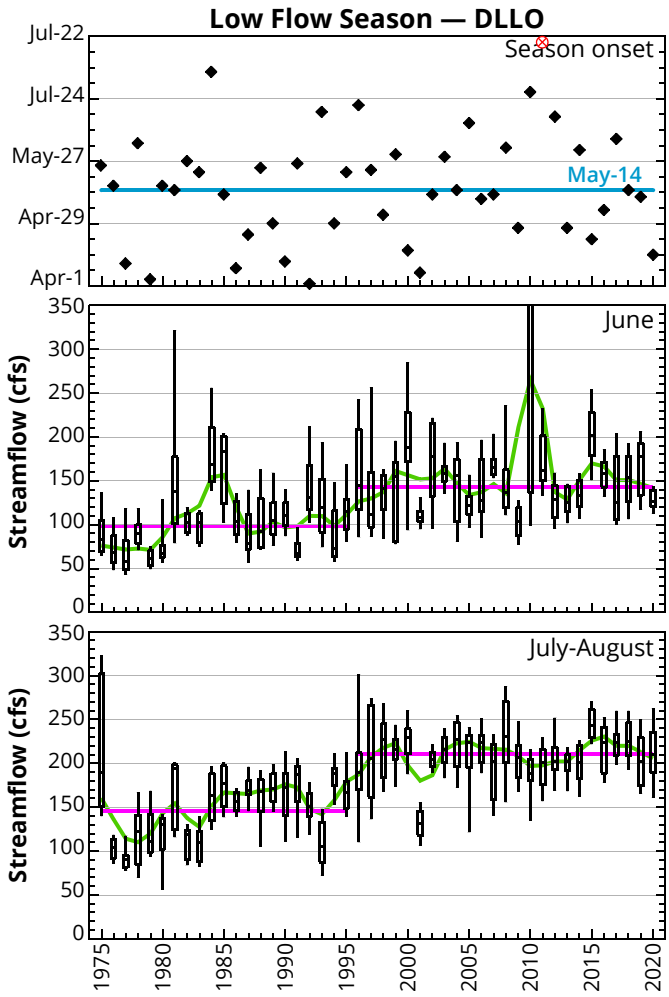
- Flow at this site is highly influenced by releases from Hagg Lake and Barney Reservoir.
  - —Releases for irrigation and municipal use can begin in May and extend into November.
  - —Onset of seasonal, sustained low or high flow regimes is highly variable.
  - —The frequency chart shows a weaker relationship between flow and season than most sites.

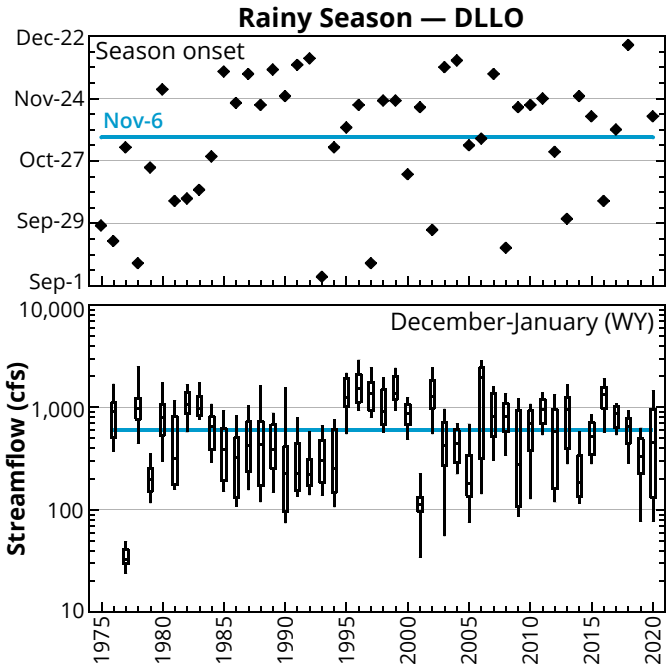
LOW FLOW

- The lowest average flows occur in May, June and October when reservoir releases are smaller than in mid-summer and rain is not prevalent.
- From 1975 through 1995, June–August flow increased markedly. The trend is statistically significant. Since 1995, no trend is evident. Several factors could contribute to the increase.
  - —Municipal water use increased due to population growth.
  - —Both the timing and amount of flow augmentation water released by Clean Water Services changed over time.
  - —Cooperation among water users and careful management of water resources increased.
- Low flow varies substantially year-to-year depending on weather and other factors.
  - —1993: Spring was very wet. Reservoir releases in early July were low.
  - —2001: The reservoir did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.
  - —2010: June was extremely wet.
- Low flow criterion is: 7d-Q ≤ 130 cfs (~23rd pctl)

RAINY SEASON FLOW

- December through March are the months with the highest flows.
- High flow criterion is: 7d-Q ≥ 200 cfs (~50th pctl)





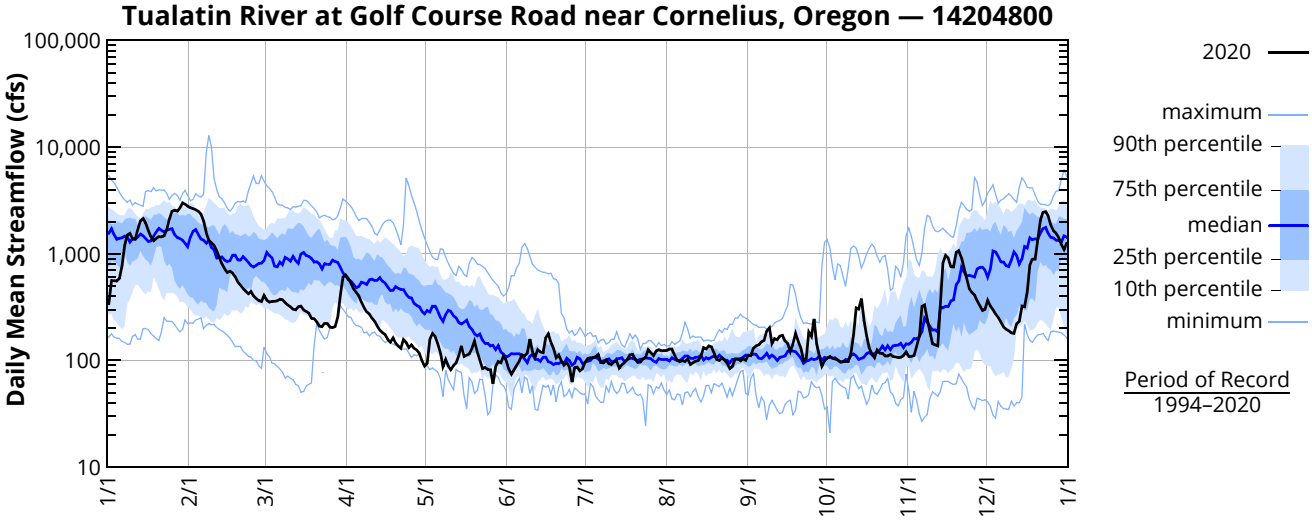
TRGC – Tualatin River at Golf Course Road near Cornelius, Oregon – 14204800

Data source: Oregon Water Resources Department
River mile: 51.5 *Latitude:* 45 30 08 *Longitude:* 123 03 22

2020 — MEAN STREAMFLOW[†] (cfs) — TRGC

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	341	2700	406	633	88.3	99.5	95.9	124	112	105	109	367
2	561	2650	368	589	93.6	82.9	104	128	111	109	109	325
3	560	2590	351	526	159	74.4	106	128	131	105	111	299
4	554	2510	358	468	179	81.7	106	112	137	103	135	272
5	587	2360	359	434	168	89.8	109	100	140	101	167	252
6	779	2040	362	403	144	98.7	114	97.4	150	96.7	321	229
7	1200	1580	376	353	118	113	95.5	99.5	154	97.4	331	206
8	1500	1340	371	313	87.2	110	94.9	97.5	188	98.1	243	196
9	1550	1270	348	286	102	117	101	103	202	97.6	188	190
10	1380	1200	330	272	89.0	159	93.4	91.7	144	116	143	181
11	1370	1070	318	250	81.8	120	91.3	94.9	160	175	140	179
12	1680	923	302	232	89.5	107	97.0	98.5	156	311	137	221
13	2040	803	298	210	94.6	126	98.7	99.5	169	303	352	232
14	2140	721	319	192	111	120	84.7	109	172	379	818	324
15	1950	669	324	182	137	118	91.3	132	152	238	965	318
16	1650	686	298	175	109	162	95.7	128	144	168	916	443
17	1450	660	289	157	112	178	102	137	121	130	753	780
18	1330	610	277	148	115	148	113	134	142	115	751	892
19	1390	543	248	163	130	131	114	118	180	106	1030	891
20	1450	508	246	145	152	106	103	102	152	125	1070	1310
21	1440	471	231	136	121	113	95.9	99.5	130	117	918	2060
22	1470	446	210	130	101	98.7	96.6	106	100	117	733	2440
23	1680	422	207	157e	83.9	90.2	103	101	104	110	590	2480
24	2100	443	223	147e	85.8	95.5	107	94.1	185	110	472	2260
25	2500	403	222	132	82.0	87.1	126	83.7	168	114	434	1860
26	2560	381	206	140	81.9	62.7	118	87.4	245	109	410	1640
27	2510	364	203	130	60.5	85.7	111	103	143	108	363	1560
28	2690	357	207	125	87.9	86.9	123	103	110	106	325	1420
29	3000	382	252	117	97.8	80.0	126	99.2	88.4	107	294	1220
30	2920	—	414	99.0	94.9	83.5	123	104	100	111	301	1090
31	2790	—	604	—	110	—	124	99.9	—	120	—	1250
Mean	1649	1072	307	248	109	108	105	107	146	139	454	883
Max	3000	2700	604	633	179	178	126	137	245	379	1070	2480
Min	341	357	203	99.0	60.5	62.7	84.7	83.7	88.4	96.7	109	179
Ac-Ft	101399	61690	18897	14765	6678	6397	6474	6575	8708	8544	27033	54321

[†]All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — TRGC

Q IN cfs	20 < Q < 30	30 < Q ≤ 65	65 < Q ≤ 90	90 < Q ≤ 110	110 < Q ≤ 125	125 < Q ≤ 160	160 < Q ≤ 250	250 < Q ≤ 450	450 < Q ≤ 750	750 < Q ≤ 1,400	1,400 < Q ≤ 2,300	2,300 < Q ≤ 5,000	5,000 < Q ≤ 15,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.06%	3.5%	10.9%	12.6%	8.1%	9.0%	8.9%	10.5%	10.1%	11.6%	9.6%	4.9%	0.12%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1994–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — TRGC

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1994	773	461	796	405	125	76.5	120	110	91.5	75.0	623	1780
1995	2051	1766	1550	591	240	94.3	77.3	117	96.0	88.4	616	2273
1996	2036	2709	613	1005	663	152	85.6	117	82.6	125	262	2922
1997	1905	963	1843	469	251	124	87.1	134	223	452	805	1174
1998	2431	1951	1188	469	278	128	114	106	131	135	248	2198
1999	2318	3448	1290	639	303	139	120	128	146	163	526	1410
2000	1637	846	835	244	181	149	110	142	170	184	147	231
2001	183	276	199	154	123	78.6	55.3	52.7	43.4	60.8	354	2256
2002	1693	1122	854	535	125	80.9	78.8	77.3	127	124	98.6	715
2003	1073	1042	1629	806	216	78.1	69.2	117	107	130	159	755
2004	1038	1168	546	316	127	68.3	83.4	116	84.9	131	91.4	247
2005	371	176	93.7	475	298	102	99.6	89.8	76.1	126	418	620
2006	2478	1183	864	530	140	102	103	99.9	111	93.1	1603	2058
2007	1172	382	998	328	112	100	107	109	113	83.3	145	1756
2008	1800	1435	790	647	244	123	133	106	126	125	192	175
2009	1810	286	597	454	427	68.5	117	116	112	104	575	646
2010	2070	845	799	994	376	621	110	102	105	119	468	2420
2011	1840	560	1990	1210	454	186	115	112	105	82.0	138	274
2012	1480	851	1490	740	313	139	111	101	113	113	656	2510
2013	748	487	531	326	154	127	105	97.0	106	143	244	271
2014	319	1545	1560	796	381	108	102	97.0	98.0	120	264	1170
2015	862	782	603	261	96.0	94.0	98.0	100	85.5	77.0	386	2770
2016	2270	1300	1860	332	82.0	75.0	92.0	99.0	113	501	762	1470
2017	1010	1960	1600	1115	457	111	105	96.0	110	100	1057	703
2018	1450	551	765	1010	149	89.3	107	103	106	96.5	66.1	549
2019	678	734	418	446	108	90.0	98.7	100	93.3	91.5	87.3	211
2020	1500	704	302	179	101	103	103	102	144	110	342	443
median	1452	933	855	492	200	101	102	104	109	117	311	1170

KEY

Q in cfs

$Q \leq 69.1$
$69.1 < Q \leq 82.0$
$82.0 < Q \leq 90.7$
$90.7 < Q \leq 98.9$
$98.8 < Q \leq 115$
$115 < Q \leq 139$
$139 < Q \leq 209$
$209 < Q \leq 798$
$798 < Q \leq 1770$
$1770 < Q \leq 2300$
$Q > 2300$

Q as percentile

$Q \leq 5$th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

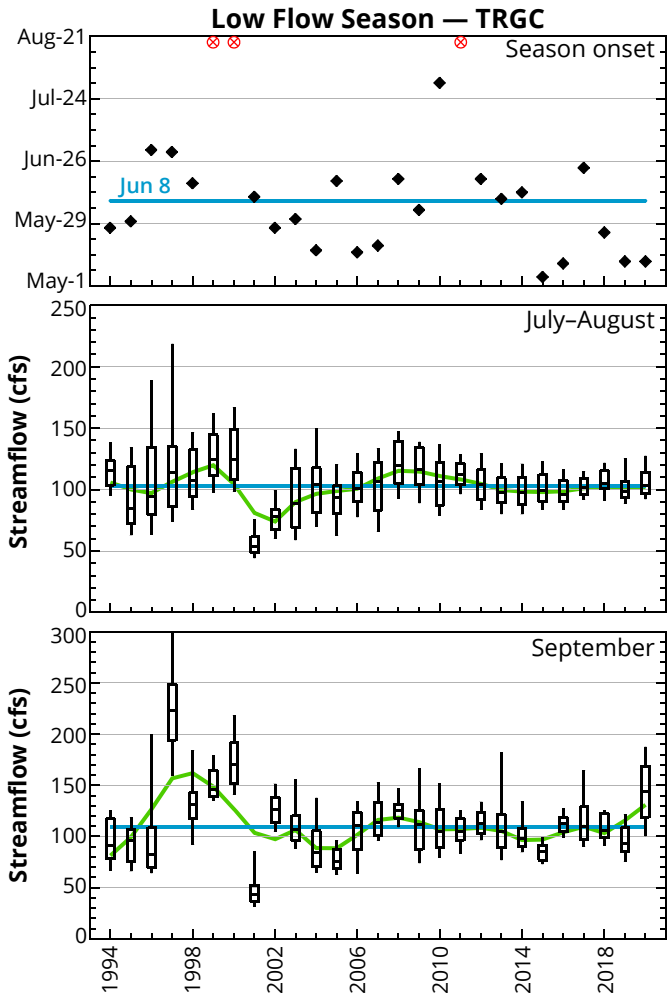
- Flows were below the long term median from mid-February through May. In all, low flow records were set on seven days. Flows in June–October were at or above the long-term median. Flows from September through December alternated between moderately high and moderately low flow in response to rainfall.

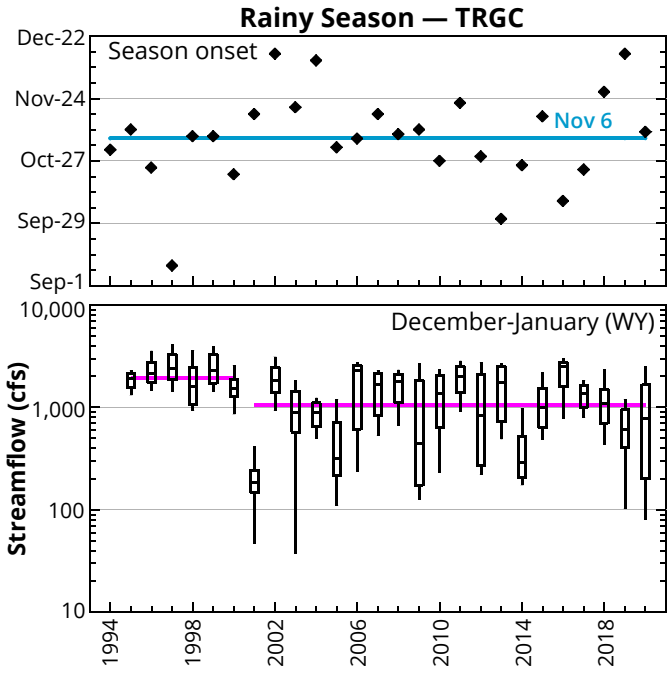
LOW FLOW

- June through September are the months with the lowest average flow.
- Because flow at this site is highly influenced by releases from Hagg Lake and Barney Reservoir and withdrawals at Spring Hill Pump Plant, the frequency chart shows a weaker relationship between flow and season than most sites.
- Very low daily flows can occur anytime from early summer through December depending on weather and Scoggins Dam operations.
- Low flow criterion is: 7d-Q ≤ 95 cfs (~17th pctl)
- Low flow did not occur in 1999 and 2000.
- In 2011, low flow was delayed until 9/6 because Joint Water Commission was releasing more water than usual from Barney Reservoir so that repairs could be done on Eldon Mills Dam.
- No trends are evident in flow magnitude over time for July–September.
- A few years had higher or lower flow than usual due to weather or other factors.
  - —1997: September rainfall was higher than usual.
  - —2001: Hagg Lake did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.

RAINY SEASON FLOW

- December and January are the months with the highest average flow, although very high daily flows can occur from November through April. This pattern is consistent with normal rainfall.
- High flow criterion is: 7d-Q ≥ 170 cfs (~44th pctl)
- Daily mean flows for December–January 1994–2000 were consistently greater than 1000 cfs. Since 2001, they have been more variable and generally lower than before. The difference is statistically significant. The cause is unknown.





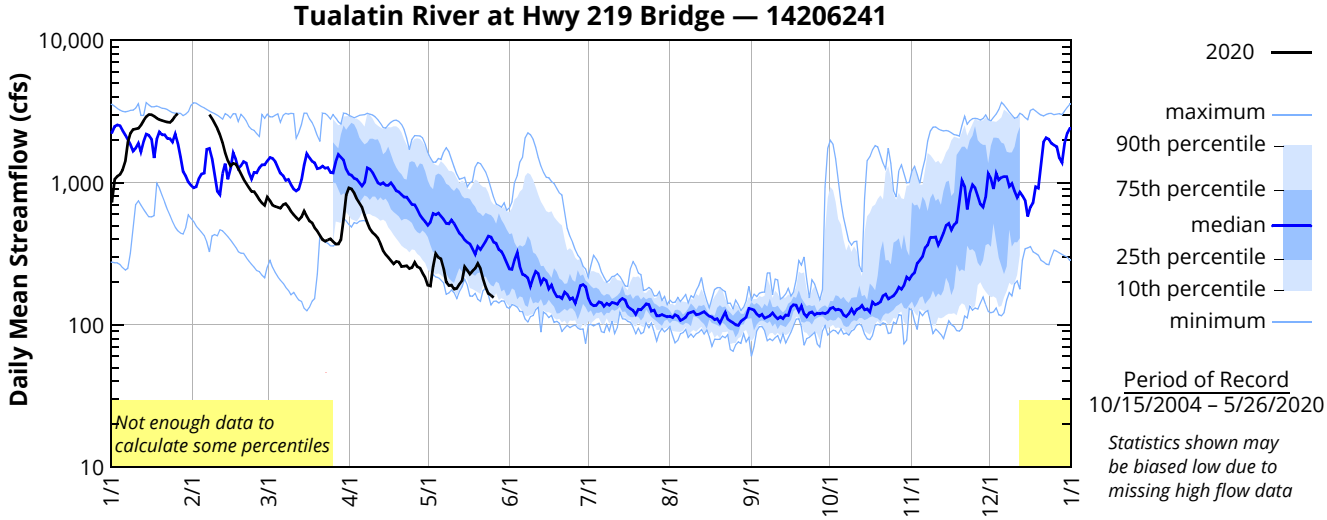
TRJB — Tualatin River at Hwy 219 Bridge — 14206241

Data source: Jackson Bottom Wetland Education Center
River mile: 44.4 *Latitude:* 45 30 01 *Longitude:* 122 59 24

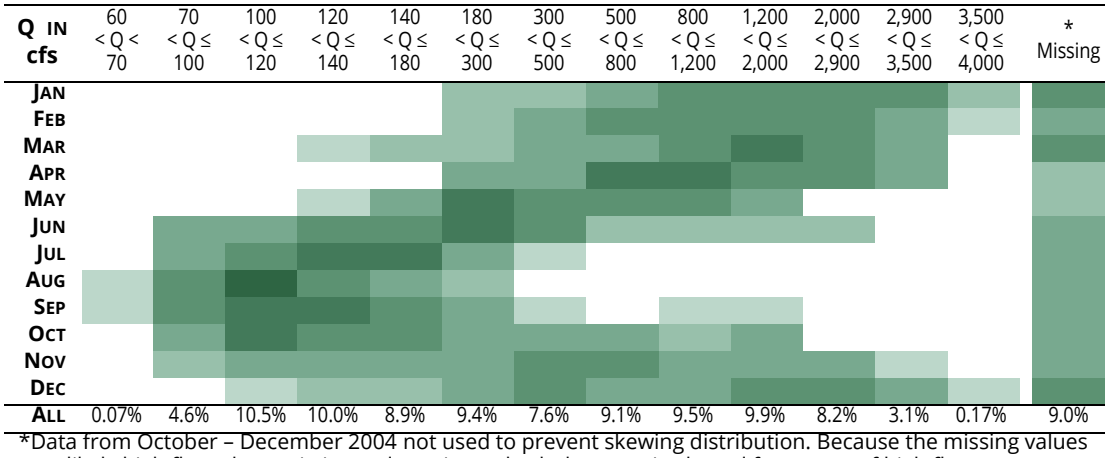
2020 — MEAN STREAMFLOW† (cfs) — TRJB

DAY	JAN*	FEB*	MAR	APR	MAY*	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	740		793	919	190							
2	1059		746	903	187							
3	1110		696	848	257							
4	1140		680	772	317							
5	1226		671	720	298							
6	1411		661	672	292							
7	1922	3015	700	591	248							
8	2219	2825	712	523	200							
9	2360	2611	675	475	190							
10	2386	2404	629	445	191							
11	2410	2183	595	430	178							
12	2542	1911	568	408	180							
13	2740	1627	547	372	193							
14	2914	1427	572	332	204							
15	3014	1312	630	313	256							
16	3009	1365	579	298	242							
17	2938	1355	538	282	228							
18	2840	1256	522	269	239							
19	2773	1149	482	280	250							
20	2735	1059	456	277	270							
21	2700	987	426	257	249							
22	2667	924	397	259	211							
23	2655	868	387	260	183							
24	2751	865	395	248	166							
25	2936	816	402	253	162							
26	3062	758	385	275	156							
27		720	370	257								
28		692	371	251								
29		693	398	231								
30		—	559	215								
31		—	815	—		—			—		—	
Mean	2318		560	421	221							
Max	3062		815	919	317							
Min	740		370	215	156							
Ac-Ft	119523		34430	25057	11384							

†All values should be considered estimates because the rating curve is not updated; *Incomplete record; Equipment failure May 26, 2020



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — TRJB



Q in cfs	60 < Q < 70	70 < Q ≤ 100	100 < Q ≤ 120	120 < Q ≤ 140	140 < Q ≤ 180	180 < Q ≤ 300	300 < Q ≤ 500	500 < Q ≤ 800	800 < Q ≤ 1,200	1,200 < Q ≤ 2,000	2,000 < Q ≤ 2,900	2,900 < Q ≤ 3,500	3,500 < Q ≤ 4,000	* Missing
Jan														
Feb														
Mar														
Apr														
May														
Jun														
Jul														
Aug														
Sep														
Oct														
Nov														
Dec														
All	0.07%	4.6%	10.5%	10.0%	8.9%	9.4%	7.6%	9.1%	9.5%	9.9%	8.2%	3.1%	0.17%	9.0%

Key

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
10/15/2004 – 5/26/2020

*Data from October – December 2004 not used to prevent skewing distribution. Because the missing values are likely high flow, the statistics underestimate both the magnitude and frequency of high flow.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — TRJB

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004											176	451
2005	722	407	228	1003	802	232	127	92	88.9	154.5	780	1284
2006	3264	2395	1404	954	332	212	128	98	107	124	2264	2865
2007	2394	710	1604	638	235	152	124	118	123	118	275	2533
2008		2493	1380	1214	460	204	169	124	139	144	353	333
2009		527	1109	817	694	146	125	115	115	124	841	1088
2010		1678	1415	2081	667	995	187	120	128	127	676	
2011		1213		1901	808	316	176	135	119	117	182	415
2012		1507			597	294	157	119	121	159		
2013	1126	831	965	589	248	220	124	106	131	203	409	421
2014	563			1485	669	193	138	107	105	148	512	1721
2015	1517		1205	596	215	128	113	101	102	96	576	
2016		2254		650	193	127	117	114	132	812	1231	
2017				2019	926	247	151	117	132	139	1685	1305
2018	2307	1001	1480	1883	301	148	134	116	127	127	114	721
2019	1248	1515	852	834	241	130	119	111	124	121	131	456
2020	2661	1284	568	305	208							
median	1917	1230	1278	947	409	191	135	114	121	139	476	1227

Key

Q in cfs

Q ≤ 100
100 < Q ≤ 110
110 < Q ≤ 118
118 < Q ≤ 126
126< Q ≤ 147
147< Q ≤ 199
199 < Q ≤ 347
347 < Q ≤ 1109
1109 < Q ≤ 2217
2217 < Q ≤ 2759
Q > 2759

Q as percentile

Q ≤ 5th
5th < Q ≤ 10th
10th < Q ≤ 15th
15th < Q ≤ 20th
20th < Q ≤ 30th
30th < Q ≤ 40th
40th < Q ≤ 50th
50th < Q ≤ 75th
75th < Q ≤ 90th
90th < Q ≤ 95th
Q > 95th

2020

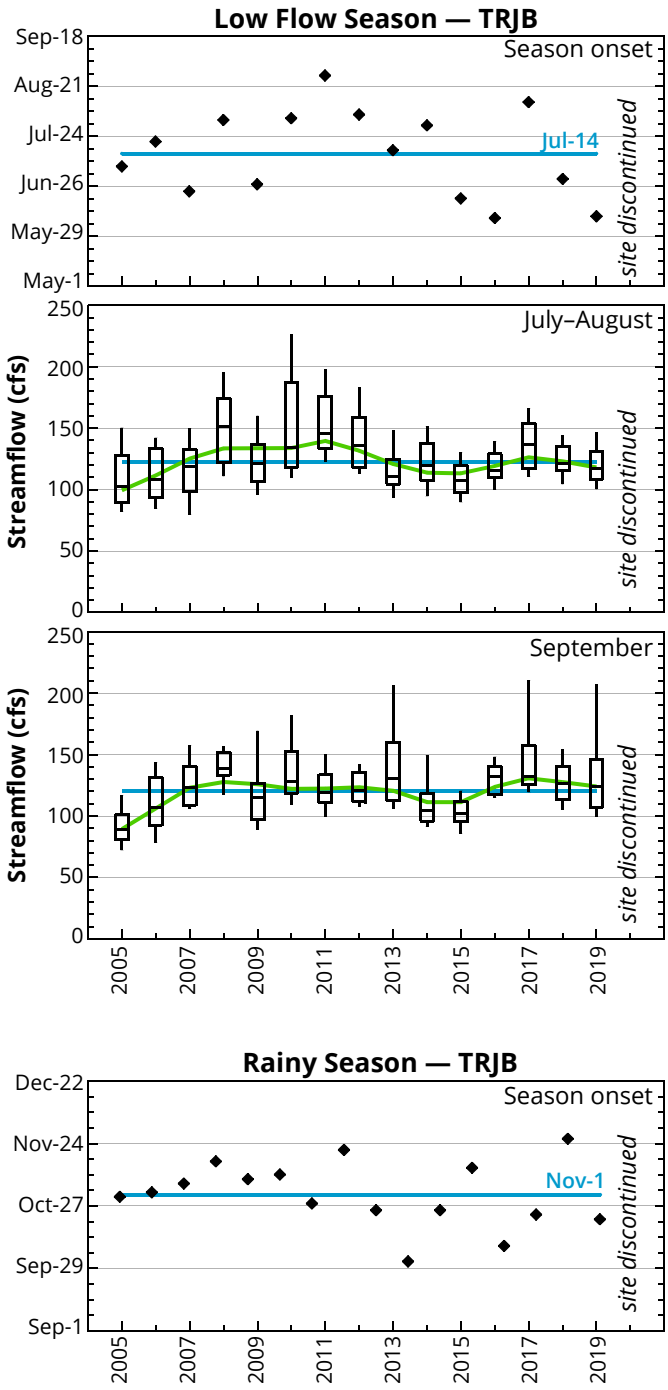
- High flow that occurred at the end of January likely broke a record for this site, but was not estimated because it exceeded the rating curve. Flows from mid-February through May were below the period of record median. In all, low flow records were set on 31 days in this time period, mostly in April.
- The pressure transducer at this site failed on May 26, 2020. Flow measurements at this site will resume sometime in 2021 when a new pressure transducer is installed. At that time maintenance of the site will be assumed by USGS.

Low flow

- August and September are the months with the lowest average flow and the lowest daily flows.
- Low flow criterion is: 7d-Q ≤ 125 cfs (~19th pctl)
- No trends are evident in the magnitude of flow over time for July–September.

Rainy season flow

- December and January are the months with the highest average flow, although very high daily flows can occur from November through April. This pattern is consistent with normal rainfall.
- High flow criterion is: 7d-Q ≥ 200 cfs (~39th pctl)
- Much of the high flow data is missing because the rating curve has an upper limit. The frequencies and percentiles in tables on the previous page are therefore skewed with low values overrepresented.
- Boxplots were not shown for the December–January rainy season because too many data are missing.



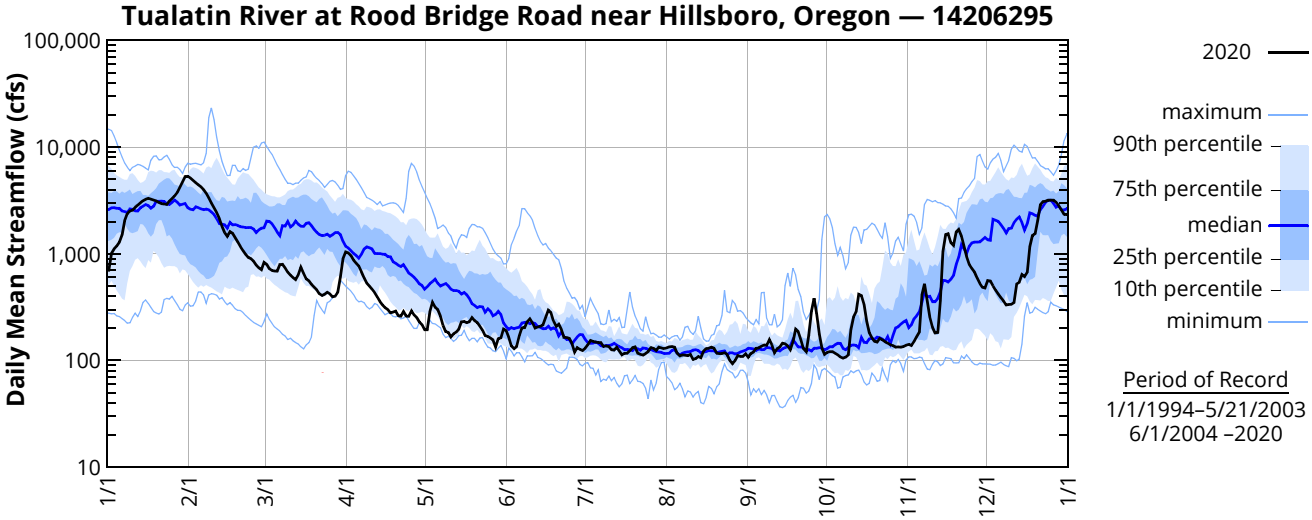
ROOD – TUALATIN RIVER AT ROOD BRIDGE ROAD NEAR HILLSBORO, OREGON – 14206295

Data source: Oregon Water Resources Department
River mile: 38.4 *Latitude:* 45 29 24 *Longitude:* 122 57 06

2020 — MEAN STREAMFLOW[†] (cfs) — ROOD

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	702	5130	830	1040	194	190	130	131	107	119	141	561
2	1010	4880	793	1020	194	165	140	134	116	121	138	556
3	1110	4640	724	959	287	137	154	135	120	121	151	500
4	1180	4430	697	871	350	129	151	133	130	117	167	457
5	1280	4240	689	813	315	135	149	117	131	113	185	419
6	1500	4000	687	767	301	171	147	110	136	108	412	388
7	2040	3680	791	680	261	202	147	113	140	105	523	361
8	2370	3330	798	595	214	203	135	112	139	107	367	332
9	2520	2980	736	533	186	231	137	111	157	113	256	335
10	2550	2690	672	498	183	246	135	114	140	194	205	336
11	2720	2430	631	467	166	225	126	102	118	257	181	348
12	2860	2140	598	432	178	201	125	104	129	287	183	521
13	3010	1820	572	395	184	206	133	109	133	418	363	539
14	3140	1580	637	357	197	209	123	106	145	406	1050	639
15	3240	1460	749	332	230	216	113	122	143	338	1510	611
16	3310	1610	655	313	232	251	117	129	137	232	1540	670
17	3250	1560	583	300	226	296	117	130	126	182	1270	1170
18	3180	1420	559	280	230	282	123	133	148	162	1200	1480
19	3130	1290	518	284	252	235	132	130	197	151	1600	1540
20	3020	1170	486	290	236	209	134	117	187	148	1690	2050
21	2950	1070	460	262	227	219	117	116	156	161	1470	2890
22	2930	986	422	260	210	195	114	116	129	156	1180	3090
23	2890	920	407	288	192	165	112	118	121	150	943	3110
24	3110	901	416	260	171	164	116	114	173	145	794	3190
25	3290	854	436	259	168	161	121	100	291	140	728	3180
26	3480	783	420	293	162	144	132	93.3	383	138	673	3190
27	3760	740	394	268	156	120	130	100	275	133	592	3040
28	4200	708	400	252	133	132	124	111	176	134	527	2820
29	4740	711	434	230	160	127	133	109	131	133	484	2590
30	5290	—	609	216	163	124	131	109	114	135	477	2340
31	5320	—	896	—	197	—	129	115	—	139	—	2330
Mean	2874	2212	603	460	211	190	130	116	158	173	700	1470
Max	5320	5130	896	1040	350	296	154	135	383	418	1690	3190
Min	702	708	394	216	133	120	112	93.3	107	105	138	332
Ac-Ft	176691	127246	37089	27400	13002	11286	7987	7127	9378	10637	41653	90413

[†]All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — ROOD

Q IN cfs	10 < Q < 45	45 < Q ≤ 100	100 < Q ≤ 120	120 < Q ≤ 140	140 < Q ≤ 180	180 < Q ≤ 280	280 < Q ≤ 500	500 < Q ≤ 900	900 < Q ≤ 1,600	1,600 < Q ≤ 2,800	2,800 < Q ≤ 4,500	4,500 < Q ≤ 12,000	12,000 < Q ≤ 25,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.12%	4.7%	8.43%	10.9	10.5%	9.8%	9.9%	10.5%	10.8%	10.3%	9.2%	4.8%	0.08%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1/1/1994–5/21/2003
6/1/2004 –2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — ROOD

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1994	1310	762	1480	656	205	123	107.0	96.0	91.5	82	1095	3590
1995	3903	4086	2810	1104	478	207	111.0	115.8	106.8	140.5	972	5587
1996	2880	4720	1123	1705	1421	317	145	147	138	257	523	4549
1997	3934	1931	3518	815	412	322	128	135	236	610	1748	2470
1998	4637	3079	2163	798	496	300	152	121	131	179	367	4046
1999	5027	6820	2665	1129	457	207		134	128	142	695	2582
2000	2626	1670	1584	412	297	200	120	124	155	196	144	375
2001	293	429	326	282	194	111	66	57	49	84	544	3823
2002	2941	2476	1516	701	239	134	111	99	123	122	121	1037
2003	2683	3123	3382	1777	424							
2004						134	105	122	114	196	212	468
2005	721	387	222	1067	905	256	124	91	85	156	899	1497
2006	5846	3111	1569	1017	332	202	139	117	122	118	2850	4187
2007	2928	815	1739	622	235	148	129	126	135	146	254	3230
2008	3560	2905	1410	1205	461	184	154	118	129	120	361	304
2009	3280	523	1140	865	768	163	126	126	130	152	1047	1110
2010	3230	1775	1530	2265	801	1100	197	136	166	169	886	3750
2011	3370	1375	3380	2090	916	342	190	146	133	133	256	418
2012	2940	1690	2900	1495	679	344	169	130	134	236	1175	4130
2013	1330	859	1020	622	264	257	138	121	175	215	434	420
2014	609	2735	2810	1680	739	201	144	114	114	181	612	2240
2015	1610	2250	1360	638	219	127	116	113	115	81	580	5570
2016	3800	2440	2860	646	188	129	114	97	115	964	1425	3240
2017	2290	5140	3570	2100	864	247	159	128	139	165	1770	1370
2018	2710	1280	1620	2140	304	143	136	129	139	135	135	798
2019	1340	1995	856	902	251	134	128	124	149	144	132	458
2020	3010	1595	609	323	197	198	130	114	138	140	525	670
median	2288	1920	1661	913	387	198	132	121	129	152	545	2290

KEY

Q in cfs

$Q \leq 100$
$100 < Q \leq 114$
$114 < Q \leq 123$
$123 < Q \leq 131$
$131 < Q \leq 157$
$157 < Q \leq 225$
$225 < Q \leq 379$
$379 < Q \leq 1540$
$1540 < Q \leq 3310$
$3310 < Q \leq 4461$
$Q > 4461$

Q as percentile

$Q \leq 5$th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

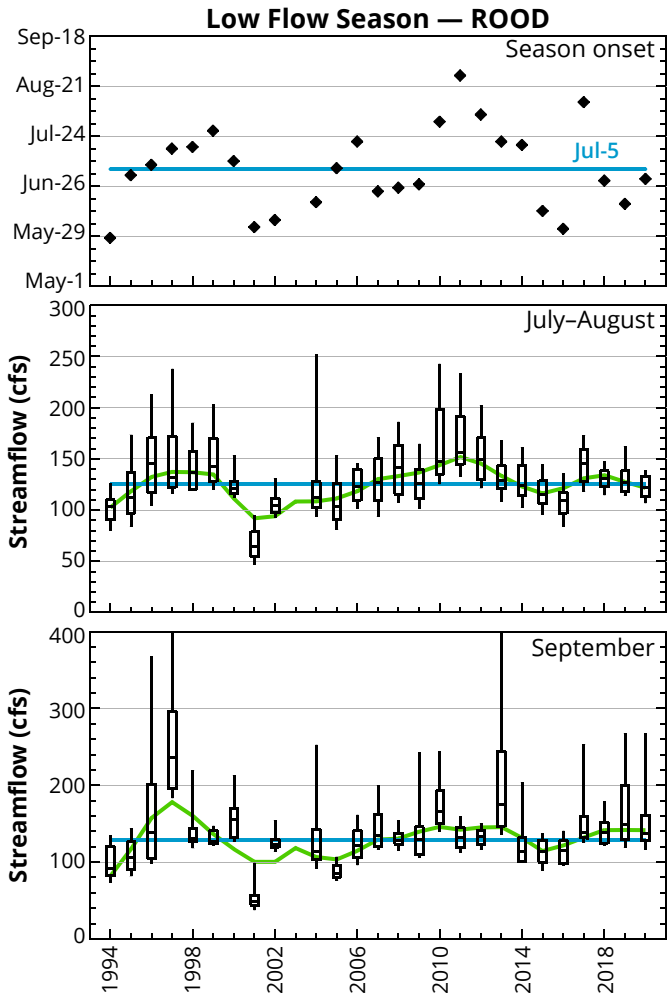
- After moderately high flow at the end of January, flows from mid-February through May were below the long-term median. In all, seven new records for low flow were set, mostly in April.
- Flows in June–September were near the long-term median. A high flow record was set on September 26, but the previous record for that date was low relative to other nearby dates.
- Flows from September through December alternated between moderately high and moderately low flow in response to rainfall.

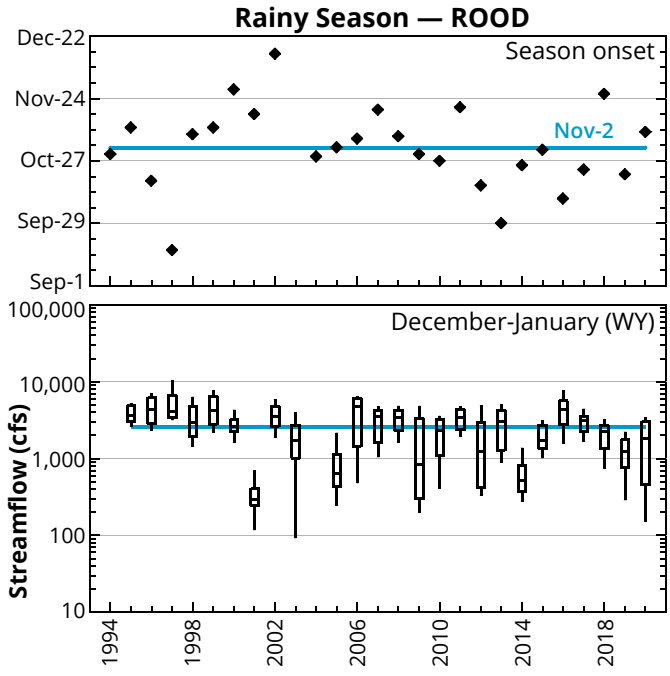
LOW FLOW

- July through September are the months with the lowest average flow and the lowest daily flows.
- Low flow criterion is: 7d-Q ≤ 123 cfs (~21st pctl)
- In 2011, low flow was delayed until 8/27 because Joint Water Commission was releasing more water than usual from Barney Reservoir so that repairs could be done on Eldon Mills Dam.
- No trends are evident in the magnitude of flow over time for July–September.
- A few years had higher or lower flow than usual due to weather or other factors.
  - —1997: September rainfall was higher than usual.
  - —2001: Hagg Lake did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.
  - —2003–4: All data are missing from June-2003 through May-2004 because the bridge was being rebuilt.

RAINY SEASON FLOW

- December and January are the months with the highest average flow and the highest daily flows.
- Rainy season criterion: 7d-Q ≥ 240 cfs (~40th pctl)
- In 2020, rainy season onset was on November 9, although it was preceded by 5 days of high flow in mid-October that did not persist.
- No trends are evident for the magnitude of the December–January rainy season flow.





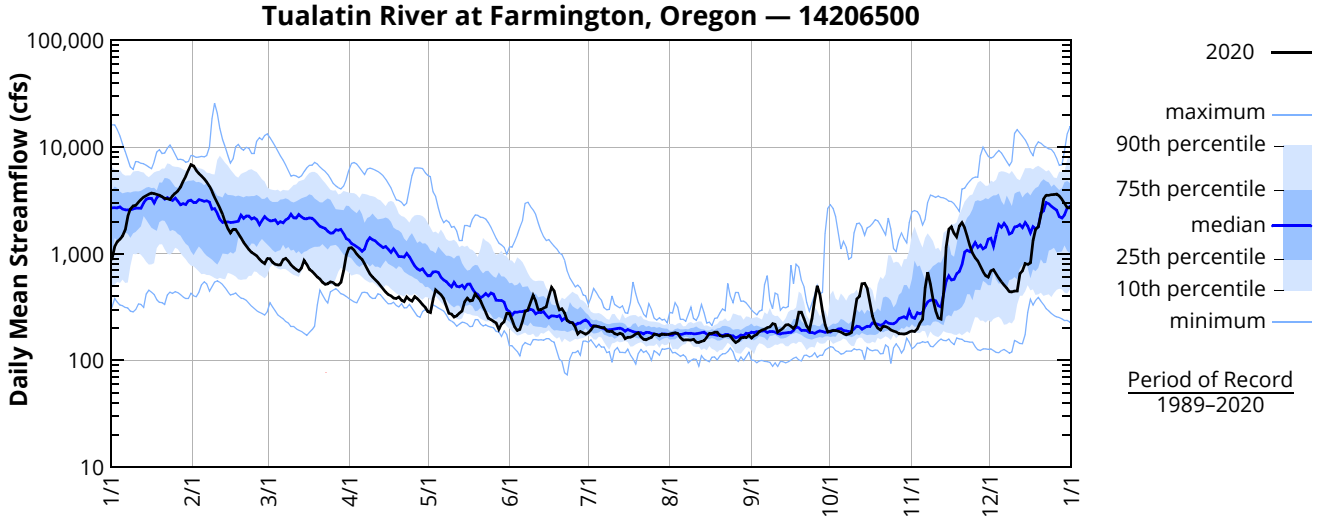
FRMO — TUALATIN RIVER AT FARMINGTON, OREGON — 14206500

Data source: Oregon Water Resources Department
River mile: 33.3 *Latitude:* 45 26 58 *Longitude:* 122 57 02

2020 — MEAN STREAMFLOW† (cfs) — FRMO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	897	6670	904	1130	287	276	182	177	162	188	189	693
2	1170	6060	901	1140	281	242	193	180	170	191	186	712
3	1300	5660	831	1080	375	207	210	182	175	191	197	648
4	1370	5370	796	993	458	191	210	179	187	188	223	592
5	1470	5050	787	930	434	195	206	164	193	184	242	546
6	1680	4710	785	886	414	233	203	155	196	178	479	508
7	2250	4300	882	804	381	288	204	156	203	174	671	477
8	2630	3850	906	716	327	297	189	156	206	177	518	442
9	2810	3380	854	647	276	347	187	155	221	183	375	439
10	2840	2990	790	605	272	408	188	158	218	258	292	447
11	3050	2680	745	573	255	361	178	148	184	377	250	448
12	3220	2350	713	540	262	298	175	147	192	397	244	651
13	3400	1990	687	504	277	299	180	151	201	523	426	690
14	3510	1720	735	466	290	309	176	153	215	528	1150	808
15	3620	1570	866	437	354	317	160	165	217	475	1700	795
16	3710	1700	793	415	383	396	165	179	209	346	1790	821
17	3670	1690	714	403	362	485	165	179	199	260	1550	1330
18	3590	1550	684	384	365	450	169	184	214	220	1440	1700
19	3550	1410	646	381	420	352	177	184	284	201	1820	1790
20	3420	1280	604	394	391	298	182	171	284	193	1960	2310
21	3310	1180	580	367	365	306	166	168	245	209	1750	3260
22	3280	1100	540	357	320	279	158	170	210	208	1460	3540
23	3220	1030	518	394	283	236	156	172	193	202	1200	3530
24	3480	996	523	372	249	228	161	169	247	193	1010	3580
25	3700	958	546	360	241	225	164	156	370	188	918	3600
26	3880	889	538	397	232	206	177	147	502	185	857	3630
27	4200	843	510	381	225	177	175	152	419	178	764	3490
28	4770	808	509	358	196	187	170	163	288	178	681	3240
29	5330	804	538	334	220	182	177	165	217	177	624	2970
30	6090	—	695	315	231	176	175	164	184	179	605	2710
31	6850	—	960	—	276	—	175	172	—	185	—	2690
Mean	3267	2572	712	569	313	282	179	165	234	242	852	1712
Max	6850	6670	960	1140	458	485	210	184	502	528	1960	3630
Min	897	804	509	315	196	176	156	147	162	174	186	439
Ac-Ft	200860	147943	43795	33844	19244	16762	11014	10157	13894	14904	50719	105296

†All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — FRMO

Q IN cfs	10 < Q < 100	100 < Q ≤ 150	150 < Q ≤ 180	180 < Q ≤ 200	200 < Q ≤ 250	250 < Q ≤ 350	350 < Q ≤ 600	600 < Q ≤ 1,000	1,000 < Q ≤ 1800	1,800 < Q ≤ 3,000	3,000 < Q ≤ 5,000	5,000 < Q ≤ 13,000	13,000 < Q ≤ 30,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.21%	4.5%	10.8%	8.6%	11.9%	8.7%	10.2%	10.0%	11.6%	9.6%	9.2%	4.6%	0.11%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1989–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — FRMO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1989	3026	1135	3117	1154	332	157	169	186	149	185	223	390
1990	2923	5460	2514	552	406	417	203	174	164	224	419	968
1991	1349	2031	1940	2464	620	283	197	192	178	180	343	1020
1992	1184	3089	774	720	306	152	141	133	137	150	288	1763
1993	1618	723	1651	2111	938	450	200	155	202	193	217	799
1994	1797	969	1802	852	327	173	152	136	138	133	1349	3782
1995	3978	4361	2952	1296	590	264	186	180	170	215	1137	5537
1996	3520	5746	1421	2046	1794	379	200	200	196	299	600	5701
1997	4071	2127	3652	991	492	394	193	190	283	695	2069	2701
1998	5248	3584	2539	949	584	378	206	172	187	228	418	5136
1999	6113	8123	2929	1356	553	265	198	178	184	197	851	2802
2000	3002	1998	1870	503	370	252	172	172	205	255	207	375
2001	380	515	410	356	261	170	125	113	100	135	610	4827
2002	3552	2708	1803	850	299	186	148	130	166	170	172	1238
2003	2530	2870	3050	1790	535	207	148	169	170	219	219	1350
2004	2430	2555	1150	644	321	200	172	193	184	266	286	543
2005	920	505	286	1340	1180	344	180	145	144	239	1155	1910
2006	6010	3400	1800	1190	421	301	207	168	170	187	3100	4000
2007	3500	966	2120	823	339	219	190	180	190	223	397	3350
2008	4200	3360	1600	1400	587	263	223	193	204	210	430	361
2009	3830	630	1300	934	898	215	176	176	189	221	1170	1280
2010	3880	2020	1740	2590	930	1220	265	208	224	214	914	4500
2011	4110	1555	4140	2525	1060	450	257	212	193	190	299	497
2012	3560	2000	3720	1840	825	426	239	203	204	331	1455	5200
2013	1690	1105	1300	827	375	353	203	190	252	288	554	538
2014	731	3385	3550	1965	898	297	219	187	187	277	759	2670
2015	1910	2805	1660	777	307	202	178	173	183	169	793	8310
2016	4760	3020	3490	777	280	206	182	170	199	1170	1725	4060
2017	2860	7270	4550	2655	1070	334	198	167	182	222	2115	1610
2018	2960	1390	1710	2375	376	213	188	171	186	186	172	899
2019	1500	2185	978	1045	342	200	185	168	196	203	203	589
2020	3400	1710	714	426	287	284	177	165	210	191	676	821
median	2923	2245	1880	1061	466	255	191	176	186	210	554	2010

KEY

Q in cfs

$Q \leq 151$
$151 < Q \leq 167$
$167 < Q \leq 179$
$179 < Q \leq 190$
$190 < Q \leq 219$
$219 < Q \leq 286$
$286 < Q \leq 457$
$457 < Q \leq 1670$
$1670 < Q \leq 3560$
$3560 < Q \leq 4852$
$Q > 4852$

Q as percentile

$Q \leq$ 5th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

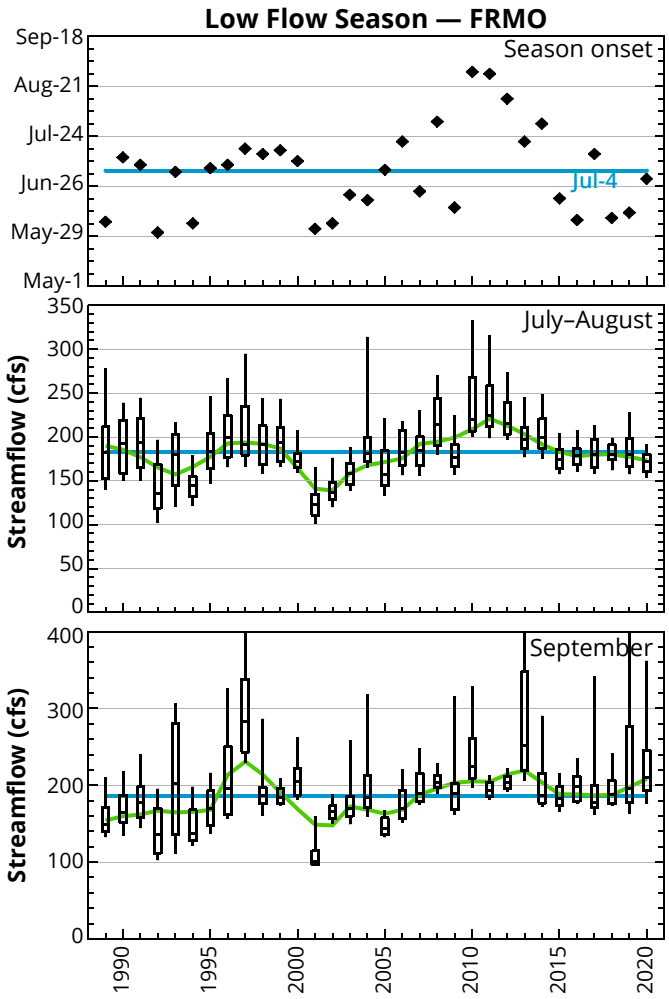
- After high flow that was not record setting at the end of January, flows from mid-February through May were below the long-term median. Low flow records were set on May 1–2.
- Flows in June–September were near the long-term median. High flow records was set on September 26–27, but the previous records were low relative to other nearby dates.
- Flows from September through December alternated between moderately high and moderately low flow in response to rainfall.

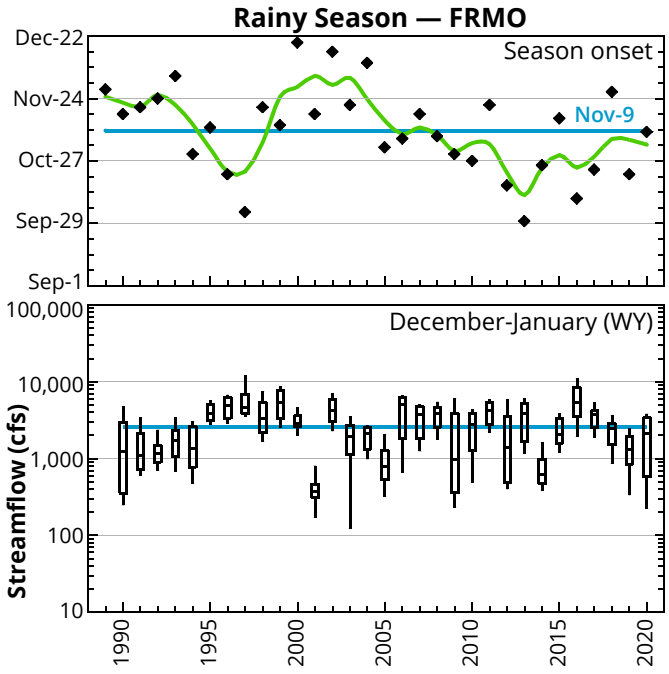
LOW FLOW

- July through September are the months with the lowest average flow. The lowest daily flow can occur June through October.
- Low flow criterion is: 7d-Q ≤ 200 cfs (~24th pctl)
- In 2011, low flow was delayed until 8/27 because Joint Water Commission was releasing more water than usual from Barney Reservoir so that repairs could be done on Eldon Mills Dam.
- No trends are evident in the magnitude over time for July–September.
- A few years had higher or lower flow than usual that can be explained by weather or other factors.
  - —1997: September rainfall was higher than usual.
  - —2001: Hagg Lake did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.

RAINY SEASON FLOW

- December through March are the months with the highest average and the highest daily flows.
- Rainy season criterion: 7d-Q ≥ 350 cfs (~44th pctl)
- The onset of rainy season may be occurring earlier. The trend is highly variable and not statistically significant. Rainy season onset should be interpreted with caution. In 2020, rainy season onset was on November 9, but it was preceded by 5 days of high flow in mid-October that did not persist.
- No trends are evident for the magnitude of the December–January rainy season flow.





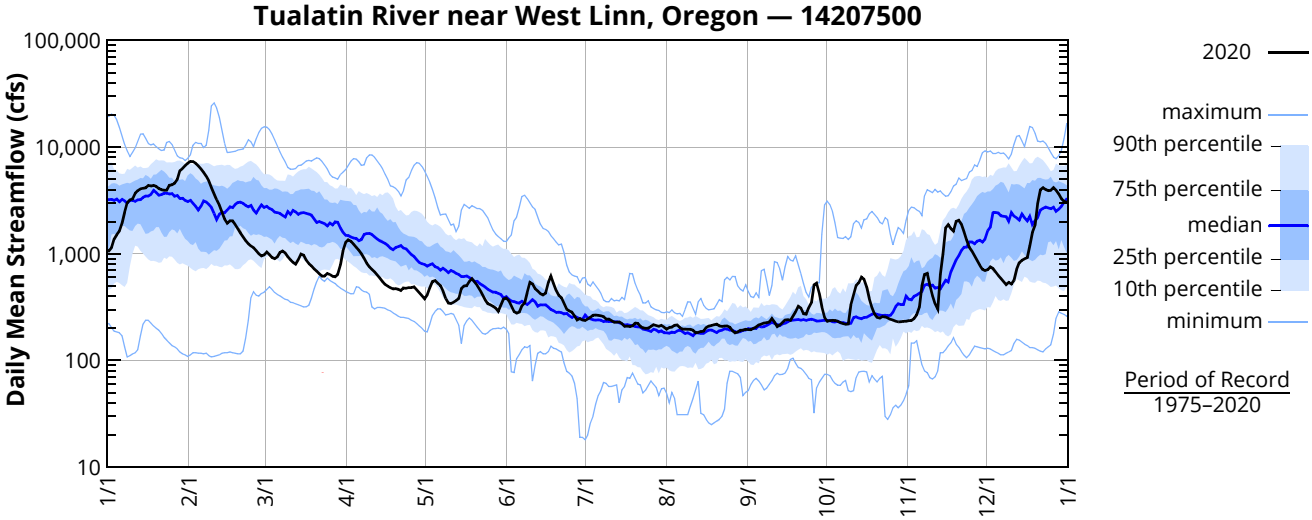
WSLO — TUALATIN RIVER AT WEST LINN, OREG. — 14207500

Data source: U.S. Geological Survey, Oregon Water Science Center
River Mile: 1.75 *Latitude:* 45 21 03 *Longitude:* 122 04 30 *Drainage area:* 706.00 sq mile *Datum:* 85.61 ft

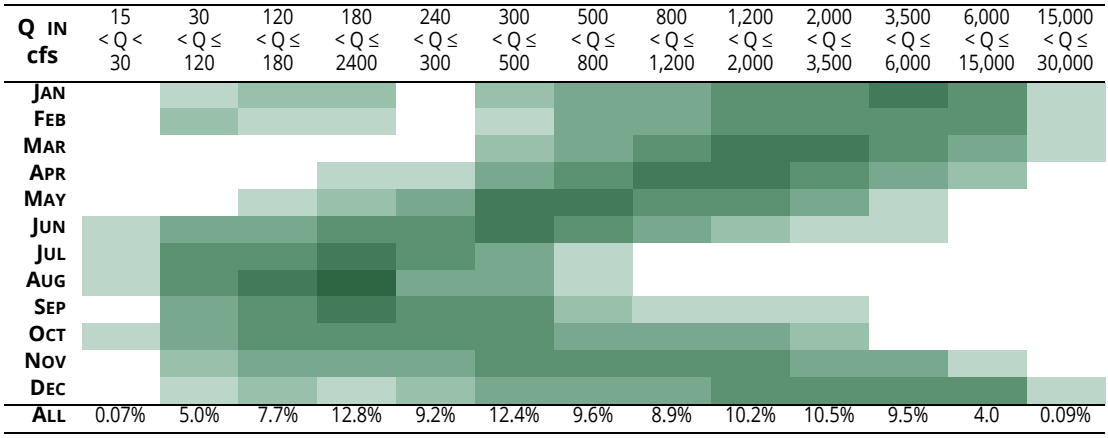
2020 — MEAN STREAMFLOW† (cfs) — WSLO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1060	7340	975	1280	378	385	237	196e	195	233	236	710
2	1140	7320	1040	1350	409	364	245	204e	194	236	236	753
3	1370	7050	984	1310	481	324	254	205e	200	238	246	728
4	1510	6670	923	1230	549	287	266	214e	206	237	267	675
5	1630	6250	900	1150	560	277	267	215	215	233	315	625
6	1940	5800	930	1080	531	284	265	203	219	227	501	588
7	2450	5320	1030	1000	504	325e	262	197	224	221	638	549
8	3000	4820	1060	905	447	345e	258	197	226	218	654	514
9	3200	4190	1020	817	380e	432e	244	196	229	220	513	539
10	3260	3640	942	754	346e	540e	245	196	247	331	407	519
11	3690	3210	878	713	342e	522e	236	192	229	412	341	562
12	3910	2850	830	676	352	472e	228	182	207	503	302	715
13	4060	2460	801	633	364	448e	228	183	215	534	640	826
14	4110	2110	885	590	381	423e	230	187	227	605	986	870
15	4160	1940	993	548	471	411e	221	188	240	578	1750	897
16	4370	2040	971	515	500	426e	209	203	241	488	1880	918
17	4320	2040	873	497	502	536e	210	210	237	381	1720	1190
18	4380	1890	809	482	549	617e	207	212	260	313	1630	1580
19	4280	1720	770	469	585	528	211	216	287	272	2010	1850
20	4090	1570	721	472	544	452	224	219	323	253	2060	2970
21	3980	1440	686	465	504	408	223	211	309	249	1890	3990
22	3940	1330	650	452	460	387	209	209	274	258	1610	4170
23	3940	1240	618	478	412	343	202	210	271	256	1350	4000
24	4390	1180	617	474	370	302	200	211	313	251	1150	3900
25	4440	1140	652	481	340	291	201	205	349	243	1060	3930
26	4580	1070	639	481	333	284	208	190	510	239	954	4170
27	4970	1000	616	490	323	261	216	181	531	233	862	3950
28	6020	955	609	459	309	240	212	184	425	230	778	3630
29	6310	932	639	431	289	247	209	192	318	231	716	3290
30	6700	—	784	403	330	240	213e	192	253	233	696	3100
31	7050	—	1060	—	377	—	205e	196	—	233	—	3040
Mean	3815	3121	836	703	427	380	227	200	272	303	947	1927
Max	7050	7340	1060	1350	585	617	267	219	531	605	2060	4170
Min	1060	932	609	403	289	240	200	181	194	218	236	514
Ac-Ft	234545	179538	51382	41821	26225	22614	13974	12290	16213	18623	56327	118508

† Data after October 7, 2021 are provisional—subject to revision; e=estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — WSLO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1975–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — WSLO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975	5390	4570	3560	946	737	235	213	298	387	232	1070	3330
1976	4920	1585	3090	1255	441	247	161	176	232	213	144	132
1977	164	118	1000	306	219	161	61	37	172	150	850	4240
1978	4470	3470	1300	1035	959	347	142	128	376	268	197	905
1979	852	4435	2040	695	600	142	89	117	191	238	622	2820
1980	4450	2740	2600	1950	483	318	125	89	220	163	588	3220
1981	1390	2035	1120	1465	557	510	153	184	195	382	1785	6660
1982	4250	4765	3400	3005	598	193	99	124	184	264	780	5260
1983	4070	6610	5470	2045	609	282	254	128	267	272	3040	3380
1984	2510	3375	2440	1620	1210	757	259	133	182	333	2710	2470
1985	964	1575	964	895	345	323	128	142	143	100	431	666
1986	2080	2980	2250	618	640	182	159	78	89	100	335	1540
1987	3630	3525	5000	840	329	183	178	111	79	72	138	1830
1988	2900	1245	866	1235	735	389	147	122	117	118	688	1150
1989	3060	1235	3540	1325	441	229	135	160	117	189	228	432
1990	3320	6530	2580	582	389	411	174	135	130	203	460	1220
1991	1620	2170	2080	3055	676	339	244	147	131	139	377	1140
1992	1350	3765	882	821	330	143	110	84	96	110	306	2230
1993	2010	917	2010	2495	1200	580	235	141	177	172	196	932
1994	2010	1015	1960	966	337	205	135	126	124	113	1560	4200
1995	5030	5410	3390	1550	769	302	177	151	155	265	1365	6620
1996	4320	6930	1750	2395	2280	443	264	233	257	474	799	6440
1997	5060	2445	4680	1305	682	549	235	226	374	867	2340	3250
1998	6170	4375	3100	1150	798	569	280	212	251	340	673	5890
1999	6790	8685	3740	1745	805	416	262	230	240	261	1085	3470
2000	3910	2525	2300	758	590	385	221	212	268	367	285	596
2001	543	709	603	564	425	250	150	130	128	201	934	5430
2002	4770	3715	2440	1150	511	296	234	158	204	225	264	1610
2003	3250	3960	4140	2385	766	311	173	188	215	285	288	1740
2004	3020	3165	1350	840	432	263	178	198	228	363	358	712
2005	1030	706	436	1520	1380	485	234	171	188	282	1330	1910
2006	8630	4175	2150	1505	578	389	235	195	219	239	3500	5410
2007	3980	1140	2440	1005	454	282	235	237	248	319	482	4380
2008	4930	3855	1880	1550	692	351	261	225	242	260	603	537
2009	4380	742	1490	1110	1050	292	216	215	222	249	1230	1470
2010	4680	2300	2050	3115	1120	1490	326	245	290	289	1028	5510
2011	4930	1915	5200	2925	1320	573	341	249	254	284	439	618
2012	3890	2210	4390	2205	1020	511	278	228	237	451	1425	5990
2013	1650	1070	1250	853	436	459	245	208	293	330	626	554
2014	798	3945	4040	2280	985	347	255	199	209	329	897	2690
2015	2000	3085	1840	930	362	218	202	188	218	213	907	8020
2016	5350	3290	3880	1065	433	280	228	208	257	1210	1820	4480
2017	2980	7800	5090	2760	1230	450	242	212	238	310	2190	1810
2018	3310	1675	2070	2985	476	282	222	195	221	247	272	1020
2019	1740	2740	1270	1320	453	273	230	190	267	250	305	875
2020	4060	2075	873	532	408	375	223	197	241	243	747	918
median	3340	3730	2200	1220	596	318	213	188	222	258	660	2390

KEY

Q in cfs

$Q \leq 119$
$119 < Q \leq 158$
$158 < Q \leq 192$
$192 < Q \leq 214$
$214 < Q \leq 264$
$264 < Q \leq 361$
$361 < Q \leq 570$
$570 < Q \leq 1890$
$1890 < Q \leq 4190$
$4190 < Q \leq 5640$
$Q > 5640$

Q as percentile

$Q \leq 5$th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

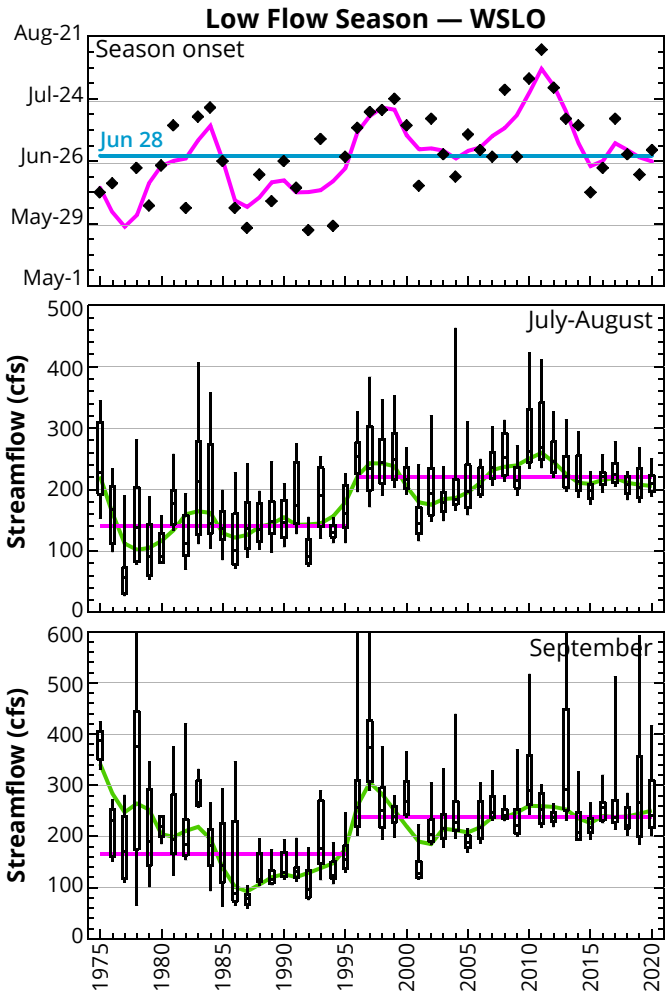
- After moderately high flow at the end of January, flows from mid-February through May were below the long-term median.
- Flows in June–September were near or slightly above the long-term median. High flow records was set on September 26–27, but the previous records were low relative to other nearby dates.
- Flows from September through December alternated between moderately high and moderately low flow in response to rainfall.

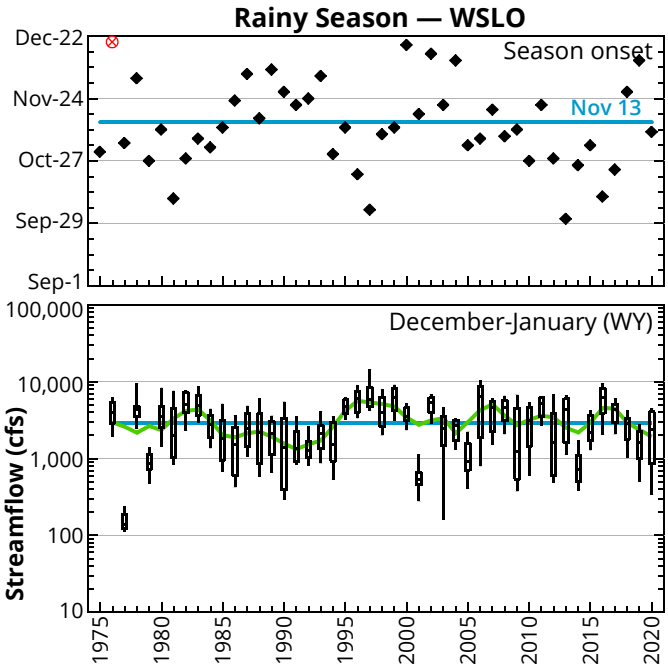
LOW FLOW

- July through September are the months with the lowest average flow. The lowest daily flows can occur June through October.
- Low flow criterion is: 7d-Q ≤ 250 cfs (~28th pctl)
- The onset of low flow has become later over the POR. The trend is statistically significant. Delayed low flow is likely due to earlier flow augmentation and increased flow from WWTFs.
- Flows in July-August and September are higher since 1995 compared to 1995 and before. The difference is statistically significant despite year-to-year variability. The difference is likely due to a reduction of about 40 cfs in the diversion of water into the Oswego Canal that occurred at that time.
- A few years had higher or lower flow than usual that can be explained by weather or other factors.
  - —1997: September rainfall was higher than usual.
  - —2001: Hagg Lake did not fill and water allocations were severely curtailed. The water users cooperated to conserve water.

RAINY SEASON FLOW

- December through March are the months with the highest average flow and the highest daily flows.
- Rainy season criterion: 7d-Q ≥ 500 cfs (~47th pctl)
- The onset of rainy season flow for 1976 did not occur until the following March (3/3/1977).
- No trends are evident in the magnitude of the flow in the December–January rainy season.
- Water year 1977 was a drought year which accounts for the low December-January flow.





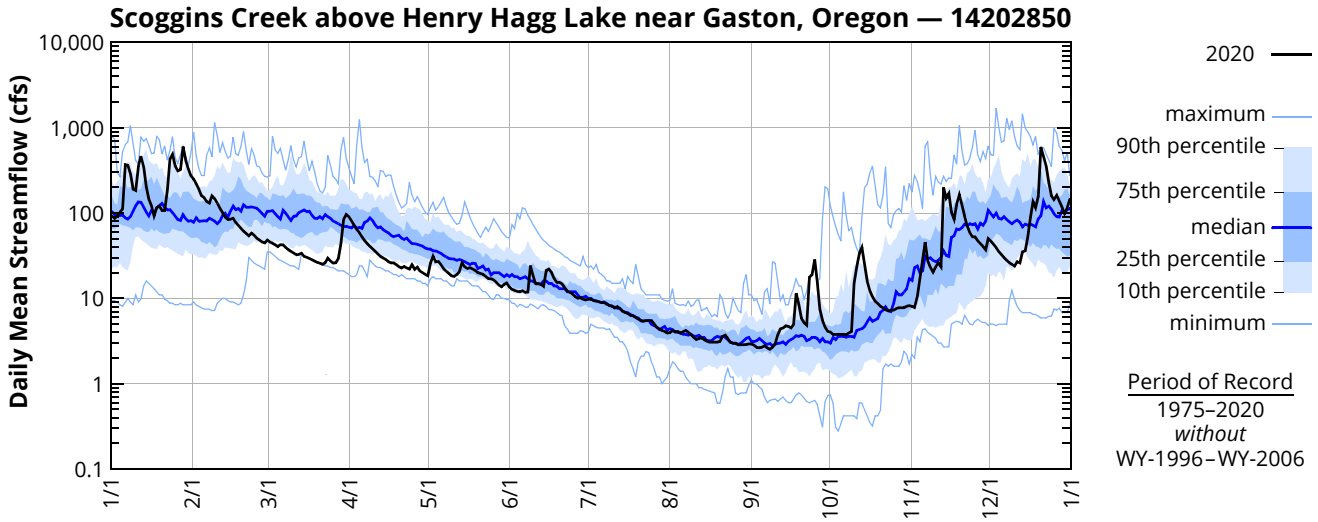
SCLO – SCOGGINS CREEK ABOVE HENRY HAGG LAKE NEAR GASTON, OREGON – 14202850

Data source: Oregon Water Resources Department
River Mile: 9.3 *Latitude:* 45 30 06 *Longitude:* 123 15 60

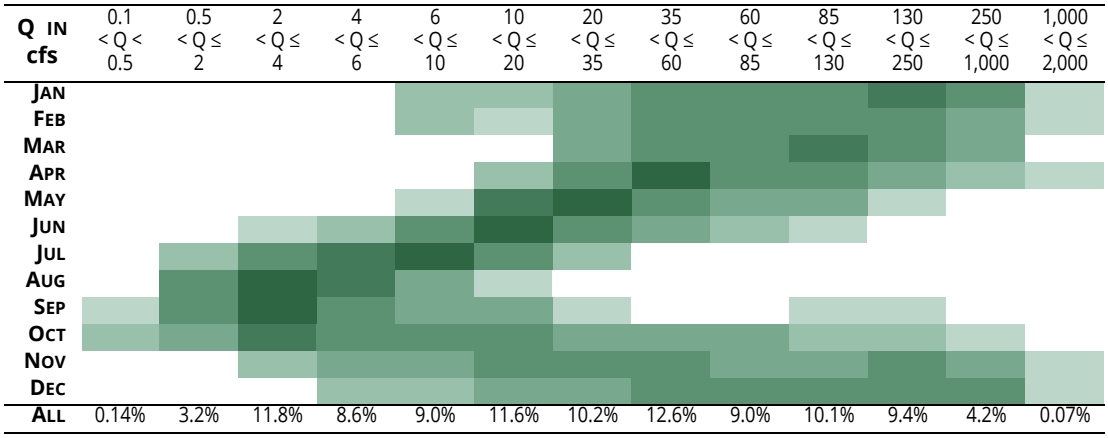
2020 — MEAN STREAMFLOW[†] (cfs) — SCLO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	92.5	251	48.4	90.8	18.5	13.6	9.8	4.0	2.9	4.0	8.1	46.9
2	86.7	220	45.7	81.5	25.7	12.8	9.8	4.2	2.8	3.8	7.8	43.3
3	92.5	190	44.3	71.5	31.2	12.4	9.5	4.1	2.7	3.8	10.5	39.4
4	103	160	42.5	64.7	26.8	12.1	9.3	4.1	2.6	3.8	16.7	35.5
5	112	152	40.5	59.1	27.1	12.0	9.1	3.9	2.7	3.8	28.2	32.6
6	370	136	42.7	52.7	24.9	12.3	9.0	4.1	2.8	3.8	45.7	30.1
7	365	131	42.4	47.6	22.3	11.8	8.9	4.2	2.6	3.7	27.7	28.0
8	291	159	39.6	43.8	20.8	11.9	8.5	4.0	2.5	3.9	23.1	26.3
9	191	148	37.3	40.9	19.6	24.2	8.3	3.8	2.7	4.1	20.3	25.1
10	184	130	35.6	38.2	18.4	18.5	8.1	3.5	2.9	15.1	23.4	23.9
11	354	114	34.0	35.8	18.0	14.8	7.7	3.3	3.7	23.7	26.2	27.0
12	465	101	32.6	33.3	19.1	14.9	8.0	3.4	4.4	33.6	23.5	26.1
13	348	89.8	32.9	31.1	20.5	14.6	7.6	3.5	4.5	39.5	200	35.2
14	203	83.9	33.8	29.8	26.2	13.9	7.1	3.3	4.8	24.9	150	36.0
15	146	84.9	31.1	28.7	23.5	21.3	6.9	3.2	4.7	16.0	170	52.3
16	122	87.1	30.3	27.1	22.4	22.1	6.7	3.1	4.5	12.3	103	89.7
17	92.6	77.6	29.5	26.1	23.0	20.2	6.3	3.1	4.9	10.5	84.6	136
18	116	71.8	28.5	26.2	22.2	17.2	6.3	3.1	11.5	9.3	127	116
19	121	66.3	27.4	24.9	21.4	15.4	6.0	3.1	8.4	8.8	164	158
20	107	61.4	26.4	23.6	20.0	15.5	5.7	3.1	5.9	8.1	125	595
21	107	57.6	25.8	22.7	19.7	14.9	5.5	3.6	5.2	7.8	91.1	462
22	188	54.2	25.0	23.7	19.2	13.4	5.5	3.7	4.9	7.4	71.0	359
23	430	58.2	26.2	22.8	18.1	12.2	5.5	3.4	17.7	7.1	59.3	225
24	490	55.0	29.7	22.0	17.1	11.8	5.5	3.1	18.9	7.3	52.8	160
25	356	51.0	27.5	24.9	17.0	11.3	5.5	3.0	28.6	7.3	52.8	144
26	312	48.4	26.0	22.0	16.5	10.5	5.0	3.0	15.6	7.6	47.4	162
27	323	46.0	26.2	23.3	15.5	10.1	4.6	2.9	7.5	7.8	43.9	139
28	602	44.7	29.5	20.9	14.4	10.2	4.4	2.9	5.5	7.8	40.6	118
29	412	53.6	43.9	20.0	13.7	9.8	4.2	2.9	4.6	7.8	37.2	99.1
30	331	—	84.3	19.1	14.7	9.6	4.1	2.9	4.1	8.1	50.3	116
31	274	—	96.7	—	15.2	—	3.9	2.9	—	8.2	—	145
Mean	251	103	37.6	36.6	20.4	14.2	6.8	3.4	6.6	10.3	64.4	120
Max	602	251	96.7	90.8	31.2	24.2	9.8	4.2	28.6	39.5	200	595
Min	86.7	44.7	25.0	19.1	13.7	9.6	3.9	2.9	2.5	3.7	7.8	23.9
Ac-Ft	15446	5918	2313	2179	1255	843	421	210	391	636	3830	7401

[†]All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — SCLO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1975–2020
without
WY-1996–WY-2006

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — SCLO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975	179	133	123	53	33	11	5.4	3.0	1.9	4.9	79	147
1976	164	92	129	60	21	12	5.7	3.8	2.4	2.2	5.9	6.8
1977	9.1	9.1	59	21	16	12	4.5	1.5	4.5	6.2	72	144
1978	163	122	55	51	46	17	5.7	1.6	3.8	1.8	6.7	45
1979	31	190	68	37	29	11	4.0	3.0	2.8	4.0	24	127
1980	151	125	93	67	21	15	6.2	3.4	3.2	2.2	40	117
1981	59	106	51	69	26	24	8.4	3.6	2.2	20	96	215
1982	147	202	131	110	33	14	7.9	4.1	3.8	11	50	211
1983	158	304	160	74	29	12	11	3.3	5.9	5.3	154	96
1984	102	132	102	66	68	31	12	6.3	5.2	11	135	94
1985	44	79	69	67	24	19	7.4	3.7	4.4	8.4	29	47
1986	124	138	93	39	35	13	9.1	2.3	4.4	5.5	34	65
1987	117	114	154	43	19	9.7	5.8	2.3	2.1	4.7	15	75
1988	98	72	43	50	26	16	7.8	2.9	1.8	3.5	53	54
1989	121	51	136	53	19	8.4	3.7	1.8	0.7	0.6	11	17
1990	80	172	109	35	22	19	5.1	3.0	3.0	4.6	21	41
1991	68	102	82	78	30	15	9.1	4.3	2.2	1.2	11	46
1992	70	91	32	40	16	8.1	2.4	1.1	1.7	3.1	16	80
1993	67	45	71	94	44	25	9.8	5.1	2.8	3.5	5.0	37
1994	71	63	74	44	20	12	5.5	2.4	1.5	2.3	77	183
1995	153	121	120	57	26	13	7.4	3.5	3.9			
1996–2005												
2006										2.5	187	150
2007	86	64	104	44	21	10	5.1	3.2	2.9	10	29	178
2008	139	112	107	85	39	19	7.2	4.6	3.4	6.2	40	39
2009	129	40	92	54	52	17	6.6	4.4	3.7	9.8	104	90
2010	202	90	81	99	41	41	12	6.1	7.5	9.7	81	189
2011	105	69	175	118	45	24	13	6.6	4.1	8.3	24	39
2012	125	90	150	78	44	22	9.6	4.9	3.3	7.0	94	200
2013	75	69	64	44	21	18	6.9	4.8	4.7	19	33	27
2014	35	111	136	75	50	16	7.5	3.9	2.9	8.2	60	126
2015	84	73	50	32	16	7.8	4.2	2.6	3.0	3.8	52	331
2016	177	137	165	44	17	11	5.4	2.9	3.0	80	110	130
2017	76	225	210	104	44	19	6.9	3.7	3.2	4.4	129	64
2018	147	64	87	90	22	12	4.6	2.7	2.8	3.2	7.0	74
2019	93	83	58	58	21	8.8	6.4	3.5	4.8	6.0	5.3	38
2020	203	86	33	28	20	13	6.7	3.3	4.6	7.8	47	90
median	100	97	90	57	27	14	6.7	3.5	3.2	5.3	42	90

KEY

Q in cfs

$Q \leq 2.3$
$2.3 < Q \leq 3.1$
$3.1 < Q \leq 3.9$
$3.9 < Q \leq 5.0$
$5.0\ Q \leq 8.5$
$8.5 < Q \leq 16$
$16 < Q \leq 27$
$27 < Q \leq 81$
$81 < Q \leq 161$
$161 < Q \leq 234$
$Q > 234$

Q as percentile

$Q \leq$ 5th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

- After two instances of high flow in January (the second of which set high flow records on 3 days), flows were below the median almost entirely from mid-February through May. Record low flows were set on 5 days in March.
- June–August flow was near the POR median.
- Flow in the fall was characterized by several instances of high flow caused by heavy rain. Between high flow events, flows often dropped to below the POR median.

DATA GAP

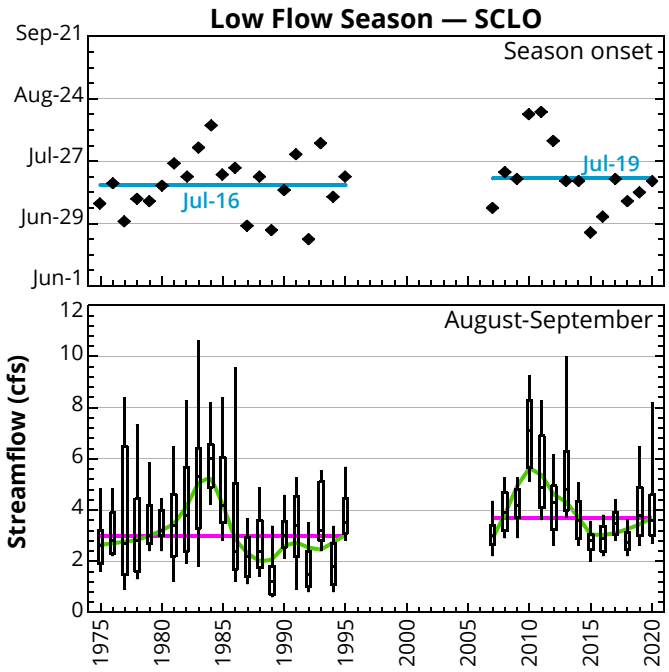
- Data from October-1995 through September-2006 are missing due to issues with OWRD data processing.
- Flows before and after the data gap have a statistically significant difference. Flows from the later period are about 1.25 times those in the earlier period. The factor is the same for both the August–September period and the December–January period.
- The difference may or may not indicate true changes in the flow regime. In particular, the later period may not have adequate representation of dry periods that were better captured by the longer early record.

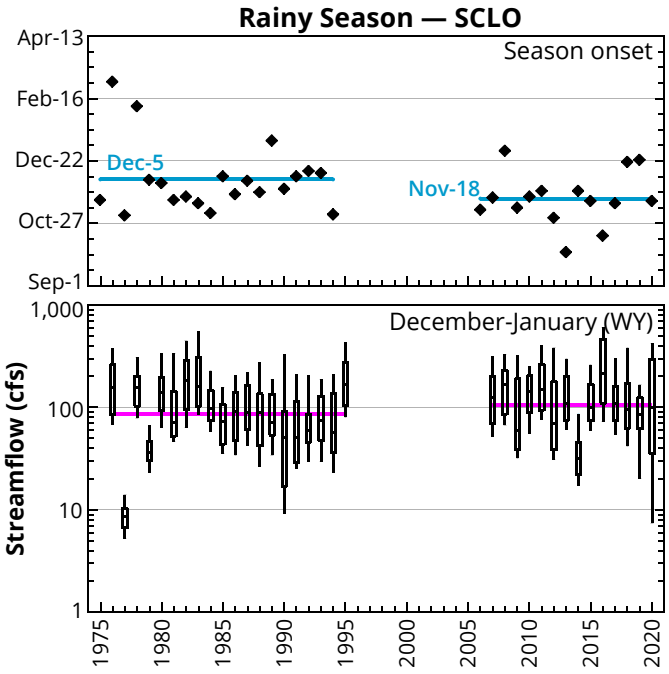
LOW FLOW

- August and September are the months with the lowest average flows. The lowest daily flows occur in September and October.
- Low flow criterion: 7d-Q ≤ 7 cfs (~26th pctl)
- The difference between low flow onset before and after the data gap (1996-2006) is not statistically significant.

RAINY SEASON FLOW

- December through February are the months with the highest average flow.
- Rainy season criterion: 7d-Q ≥ 80 cfs (~70th pctl)
- The difference between high flow onset before and after the data gap (1996-2006) is not statistically significant.
- Water year 1977 was a drought year which accounts for the low December-1976 to January-1977 flow.





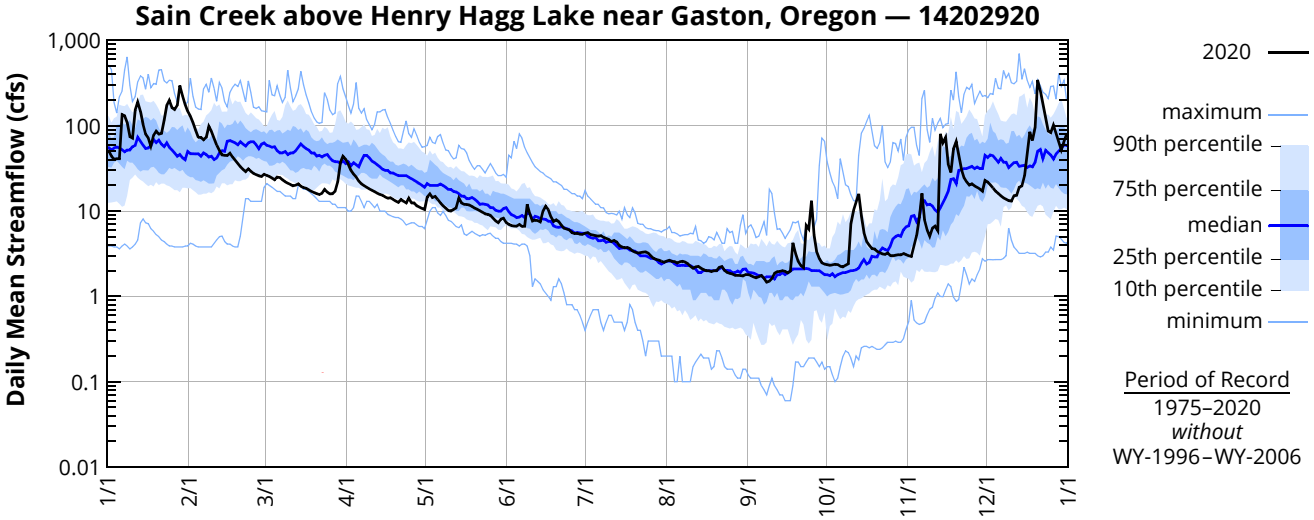
SCHO – Sain Creek above Henry Hagg Lake near Gaston, Oregon – 14202920

Data source: Oregon Water Resources Department
River Mile: 1.6 *Latitude:* 45 28 50 *Longitude:* 123 14 40

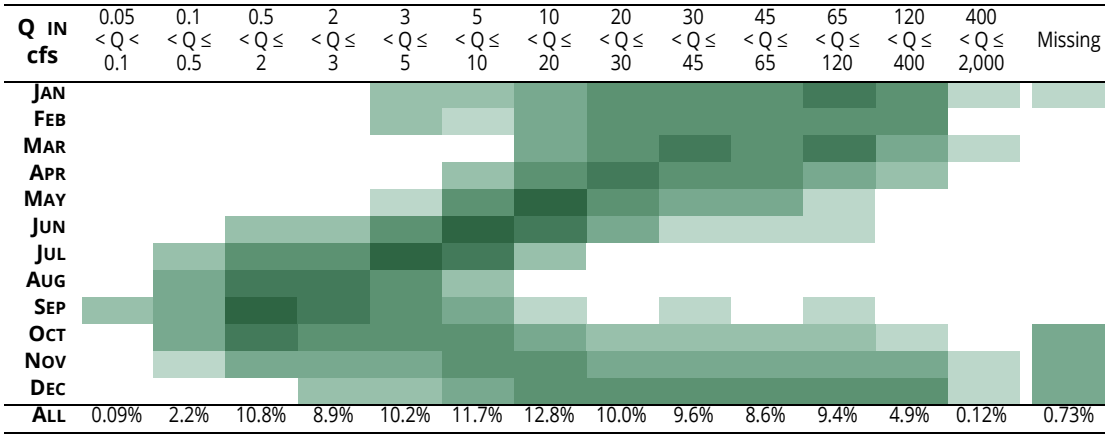
2020 — MEAN STREAMFLOW[†] (cfs) — SCHO

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	50.6	129	27.1	40.4	10.5	7.4	5.5	2.6	1.8	2.4	3.0	21.9
2	43.9	109	26.2	35.5	14.6	7.0	5.6	2.7	1.8	2.3	2.9	20.4
3	40.5	88.4	25.5	30.0	16.0	6.8	5.3	2.6	1.7	2.3	3.9	18.7
4	41.1	73.4	24.4	27.2	14.4	6.7	5.3	2.6	1.7	2.4	5.2	17.1
5	41.1	73.2	23.3	25.0	14.9	6.7	5.2	2.5	1.7	2.4	8.5	16.1
6	135	68.4	25.0	22.5	13.7	7.0	5.1	2.6	1.8	2.3	16.1	15.1
7	131	73.3	24.7	20.9	12.4	6.6	5.2	2.6	1.6	2.2	7.9	14.3
8	109	98.4	23.3	19.9	11.6	6.7	4.9	2.5	1.5	2.3	6.0	13.8
9	74.8	86.3	22.1	19.0	10.8	12.0	4.8	2.4	1.5	2.4	5.1	13.3
10	71.8	71.2	21.2	18.2	10.2	9.3	4.7	2.3	1.6	7.1	6.3	13.1
11	153	59.5	20.5	17.6	10.0	7.6	4.4	2.1	1.9	10.2	6.7	15.2
12	191	51.4	19.8	16.9	10.5	7.9	4.5	2.2	2.0	12.8	5.9	15.3
13	148	45.7	20.1	16.2	10.9	7.8	4.4	2.3	2.0	15.9	80.4	19.0
14	104	45.0	20.9	15.7	14.3	7.5	4.0	2.2	2.0	8.7	63.2	19.8
15	80.1	44.8	19.6	15.3	12.5	10.0	3.8	2.1	2.0	5.6	73.0	25.8
16	71.9	48.0	18.9	14.7	12.0	11.4	3.7	2.0	1.9	4.4	35.7	49.6
17	57.6	43.1	18.5	14.2	12.0	10.4	3.8	2.0	2.0	4.0	28.4	85.1
18	77.2	39.7	17.8	14.4	11.8	8.6	3.6	2.0	4.3	3.6	53.4	67.4
19	86.6	36.1	17.1	13.7	11.4	7.6	3.4	2.0	3.2	3.6	65.0	95.9
20	79.8	33.2	16.5	13.2	10.8	7.9	3.3	2.0	2.6	3.4	45.3	345
21	81.1	30.8	16.0	12.7	10.5	7.5	3.2	2.2	2.3	3.3	31.0	257
22	117	29.1	15.7	13.7	10.1	6.8	3.3	2.2	2.2	3.2	24.7	181
23	173	31.3	16.2	13.1	9.7	6.3	3.3	2.0	6.8	3.1	22.1	122
24	199	29.2	18.0	12.5	9.3	6.2	3.3	1.9	6.2	3.2	20.2	86.4
25	163	27.7	16.7	14.1	9.2	6.0	3.2	1.9	13.2	3.0	20.9	82.9
26	155	26.7	15.9	12.4	8.9	5.6	3.0	1.8	5.3	3.0	19.8	102
27	174	25.9	16.0	12.5	8.3	5.5	2.8	1.8	3.4	3.1	19.0	81.7
28	296	25.5	17.0	11.5	7.7	5.5	2.7	1.8	2.8	3.1	18.1	64.7
29	225	29.6	21.9	11.2	7.3	5.4	2.7	1.8	2.5	3.1	17.1	52.0
30	178	—	37.1	10.8	8.0	5.3	2.6	1.7	2.4	3.2	22.9	65.5
31	148	—	43.9	—	8.3	—	2.5	1.8	—	3.1	—	79.2
Mean	119	54.2	21.5	17.8	11.0	7.4	4.0	2.2	2.9	4.3	24.6	67.0
Max	296	129	43.9	40.4	16.0	12.0	5.6	2.7	13.2	15.9	80.4	345
Min	40.5	25.5	15.7	10.8	7.3	5.3	2.5	1.7	1.5	2.2	2.9	13.1
Ac-Ft	7333	3120	1322	1061	679	442	244	133	173	267	1463	4118

[†]All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — SCHO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1975–2020
without
WY-1996–WY-2006

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — SCHO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1975	115	86	78	27	16	5.1	1.9	0.80	0.19	2.3	26	70
1976	81	39	65	31	11	6.0	2.8	2.2	1.4	1.6	3.0	3.2
1977	3.9	4.2	30	10	6.9	1.4	0.50	0.60	2.0	2.7	20	70
1978	92	67	38	27	25	13	4.1	1.1	4.1	2.7	2.6	19
1979	17	87	35	19	15	6.4	3.6	2.7	2.4	2.6	10	62
1980	75	57	46	25	8.9	3.9	2.2	1.8	1.7	1.8	14	39
1981	27	55	26	34	12	9.5	2.2	0.19	0.11	10	43	89
1982	83	107	71	66	16	6.5	3.0	1.1	1.2	3.1	17	93
1983	77	157	89	45	17	11	6.5	3.0	4.1	3.0	73	53
1984	52	67	57	36	32	16	6.4	3.7	3.0	5.4	56	51
1985	26	43	29	29	11	7.7	2.4	1.7	1.9	1.9	9.3	20
1986	57	69	44	19	17	6.5	3.0	0.45	0.72	2.2	7.4	28
1987	59	60	81	19	7.4	5.1	3.3	0.51	0.25	0.25	1.3	30
1988	51	38	25	30	16	12	4.7	1.5	0.88	1.7	23	23
1989	68	27	68	34	11	5.7	2.5	1.1	0.61	1.1	3.7	7.1
1990	53	91	57	19	11	9.5	2.0	1.2	1.1	2.1	9.0	24
1991	35	49	43	35	15	7.1	3.5	2.1	1.1	1.1	7.2	23
1992	28	44	18	24	8.9	4.3	1.2	0.76	0.78	1.2	7.5	45
1993	35	21	33	44	21	11	5.2	3.0	1.6	1.2	1.4	16
1994	32	27	35	22	10	5.8	1.7	0.63	0.43	0.29	33	90
1995	82	68	63	31	15	7.8	4.7	4.2	4.1			
1996–2005												
2006										2.1	72	67
2007	51	39	57	29	14	6.7	4.1	2.6	1.9			
2008	72	63	53	50	17	9.7	3.6	2.3	2.0	3.6	21	22
2009	68	21	41	26	30	11	4.8	3.0	2.4	3.5	52	36
2010	119	54	52	62	30	26	8.1	4.3	4.5	4.2	33	125
2011	64	35	117	61	27	13	7.4	3.9	2.6	3.8	7.2	14
2012	85	52	88	40	24	12	5.6	3.2	2.1	2.9	52	118
2013	36	30	31	22	11	8.2	3.9	2.8	2.4	6.6	15	16
2014	20	83	90	51	28	9.5	4.3	2.4	1.8	3.0	18	67
2015	45	49	30	22	8.8	4.5	2.5	1.6	2.0	1.8	23	206
2016	109	83	91	24	10	6.3	3.8	2.1	2.2	39	55	81
2017	51	129	115	68	26	12	5.3	3.0	2.4	3.4	68	37
2018	79	39	51	54	15	7.8	3.4	2.2	2.0	2.2	3.4	30
2019	40	50	30	30	11	5.0	3.3	2.0	2.0	2.4	2.4	17
2020	109	45	20	15	11	7.0	3.8	2.1	2.0	3.1	19	50
median	55	54	48	30	14	7.6	3.7	2.2	1.9	2.7	16	41

KEY

Q in cfs

Q ≤ 0.90
0.90 < Q ≤ 1.7
1.7 < Q ≤ 2.1
2.1 < Q ≤ 2.7
2.7< Q ≤ 4.3
4.2< Q ≤ 7.7
7.8 < Q ≤ 14
14 < Q ≤ 41
41 < Q ≤ 83
83 < Q ≤ 120
Q > 120

Q as percentile

Q ≤ 5th
5th < Q ≤ 10th
10th < Q ≤ 15th
15th < Q ≤ 20th
20th < Q ≤ 30th
30th < Q ≤ 40th
40th < Q ≤ 50th
50th < Q ≤ 75th
75th < Q ≤ 90th
90th < Q ≤ 95th
Q > 95th

2020

- After high flow in January in which high flow records were set on 3 days, flows were below the median almost entirely from mid-February through May.
- June–August flow was similar to recent years.
- Flow in the fall was characterized by several instances of high flow caused by heavy rain. Between high flow events, flows often dropped to below the POR median. In all, 4 records for high flow were set in September and December.

DATA GAP

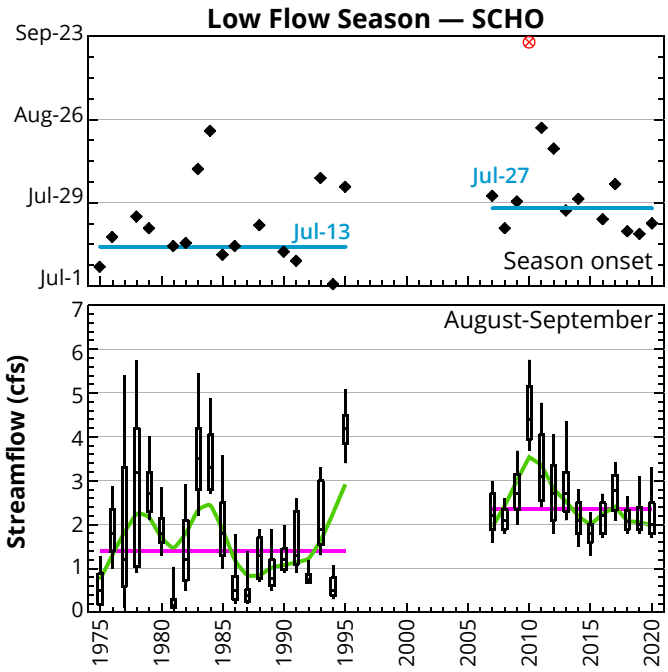
- Data from October-1995 through September-2006 are missing due to issues with OWRD data processing.
- Flows before and after the data gap have a statistically significant difference. Flows from the later period are about 1.7 (August-September) and 1.3 (December – January) times those in the earlier period.
- The difference may or may not indicate true changes in the flow regime. In particular, the later period may not have adequate representation of dry periods that were better captured by the longer early record.

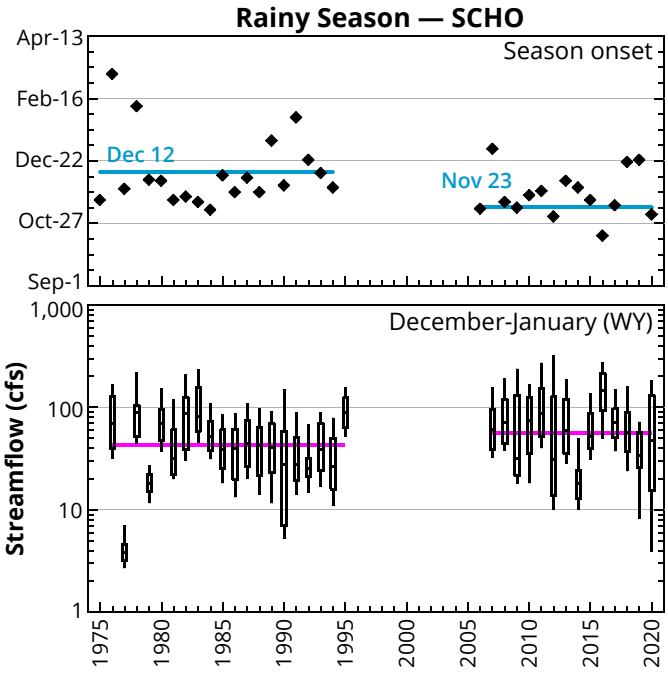
LOW FLOW

- August and September are the months with the lowest average flows.
- Low flow criterion: 7d-Q ≤ 3.5 cfs (~25th pctl)
- Low flow onset after the data gap is later than before, which is consistent with higher flows in the more recent period. The difference is not statistically significant.
- Low flow did not occur in 2010.

RAINY SEASON FLOW

- December through February are the months with the highest average flow.
- Rainy season criterion: 7d-Q ≥ 40 cfs (~73rd pctl)
- Onset of the rainy season after the data gap is earlier, which is consistent with higher flows in the more recent period. The difference is not statistically significant.
- Water year 1977 was a drought year which accounts for the low December–January flow.





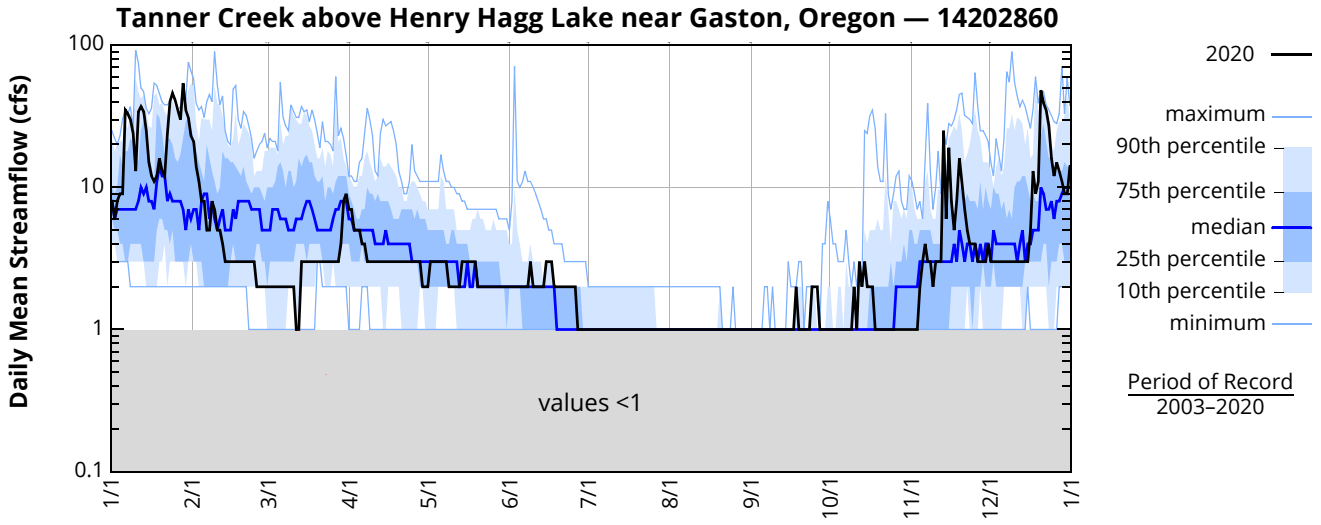
TANO – TANNER CREEK ABOVE HENRY HAGG LAKE NEAR GASTON, OREGON – 14202860

Data source: Oregon Water Resources Department
River mile: 1.6 *Latitude:* 45 30 21 *Longitude:* 123 13 10

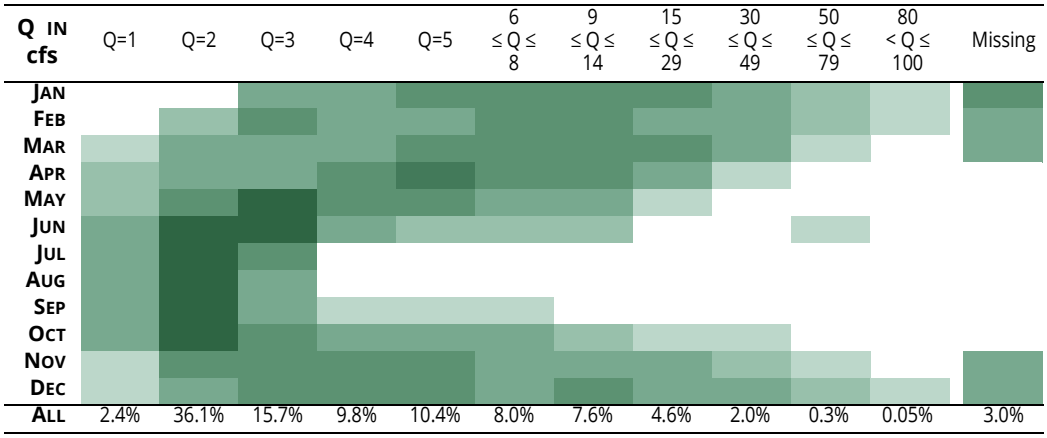
2020 — MEAN STREAMFLOW* (cfs) — TANO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8	21	2	7	2	2	1	1	1	1	1	3
2	6	14	2	7	3	2	1	1	1	1	1	3
3	8	11	2	5	3	2	1	1	1	1	1	3
4	9	8	2	5	3	2	1	1	1	1	2	3
5	9	8	2	5	3	2	1	1	1	1	3	3
6	35	5	2	4	3	2	1	1	1	1	4	3
7	33	5	2	4	3	2	1	1	1	1	3	3
8	30	8	2	3	3	2	1	1	1	1	3	3
9	24	7	2	3	2	3	1	1	1	1	2	3
10	13	5	2	3	2	2	1	1	1	2	3	3
11	34	5	2	3	2	2	1	1	1	1	3	3
12	37	4	1	3	2	2	1	1	1	3	3	3
13	34	3	1	3	2	2	1	1	1	2	25	3
14	25	3	3	3	3	2	1	1	1	3	6	3
15	15	3	3	3	3	3	1	1	1	2	19	3
16	12	3	3	3	3	3	1	1	1	2	8	5
17	11	3	3	3	3	3	1	1	1	2	5	13
18	12	3	3	3	3	2	1	1	2	1	8	9
19	16	3	3	3	3	2	1	1	1	1	16	11
20	13	3	3	3	2	2	1	1	1	1	11	48
21	12	3	3	3	2	2	1	1	1	1	7	39
22	24	3	3	3	2	2	1	1	1	1	5	35
23	40	3	3	3	2	2	1	1	1	1	4	27
24	46	3	3	3	2	2	1	1	2	1	4	16
25	41	2	3	3	2	2	1	1	2	1	4	12
26	35	2	3	3	2	2	1	1	2	1	3	15
27	30	2	3	3	2	1	1	1	1	1	3	13
28	54	2	3	3	2	1	1	1	1	1	3	11
29	35	3	4	2	2	1	1	1	1	1	3	9
30	31	—	8	2	2	1	1	1	1	1	4	9
31	23	—	9	—	2	—	1	1	—	1	—	14
Mean	24	5	3	3	2	2	1	1	1	1	6	11
Max	54	21	9	7	3	3	1	1	2	3	25	48
Min	6	2	1	2	2	1	1	1	1	1	1	3
Ac-Ft	1498	294	179	206	149	119	61	61	67	79	331	657

*Values are read from a staff plate. Values may be daily readings taken at about 8:00 a.m. or averages over several days.



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — TANO



MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — TANO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2003	9	8	11	6	2	1	1	1	1	1	2	7
2004	10	8	4	3	2	1	1	0	1	1	2	2
2005	4	2	1	4	3	1	1	1	1	1	3	6
2006	25	5	3	2	1	1	1	1	0	1	10	9
2007	6	4	5	2	1	1	1	1	1	1	1	
2008	10	12	8	7	4	2	1	1	1	1	2	2
2009		2	5	1	1	0	1	1	1	1	3	2
2010				10	5	5	2	2	1	1		
2011		11	17	11	7	2	1	1	1	1	1	1
2012	5	4		4	2	2	2	1	1	1	6	5
2013	2	2	2	3	2	2	1	1	1	2	4	3
2014	4	6	6	5	4	1	1	1	1	1	4	9
2015	5	7	4	3	2	1	1	1	1	1	5	32
2016	27	19	19	4	2	1	1	1	1	7	9	12
2017	5	23	22	8	3	2	1	1	1	1	12	5
2018	13	5	7	9	3	2	1	1	1	1	1	5
2019	7	7	4	4	3	1	1	1	1	1	1	3
2020	24	3	3	3	2	2	1	1	1	1	4	5
median	8	7	6	4	2	1	1	1	1	1	3	5

KEY

Q in cfs

Q = 0
Q = 1
1 < Q ≤ 2
2 < Q ≤ 5
5< Q ≤ 12
12< Q ≤ 20
Q > 20

Q as percentile

Q ≤ 3rd
3rd < Q ≤ 40th
40th < Q ≤ 56th
56th < Q ≤ 75th
75th < Q ≤ 90th
90th < Q ≤ 95th
Q > 95th

2020

- Two periods of high flow occurred in January. From mid-February through March, flows were lower than usual due to lack of rainfall. September—December was characterized by one high flow event in each month in response to intermittent instances of heavy rain followed by dry periods.

Low flow

- June through October are the months with the lowest average flows; however, low flow can occur almost any time of year. Tanner Creek drains a small watershed and therefore flows tend to be very low overall.
- Low flow measurements have only one significant digit and cannot be distinguished from one another.

Rainy Season flow

- December through March are the months with the highest average flows. Because some data from these months are missing, the distribution likely under-represents the frequency and range of high flows.

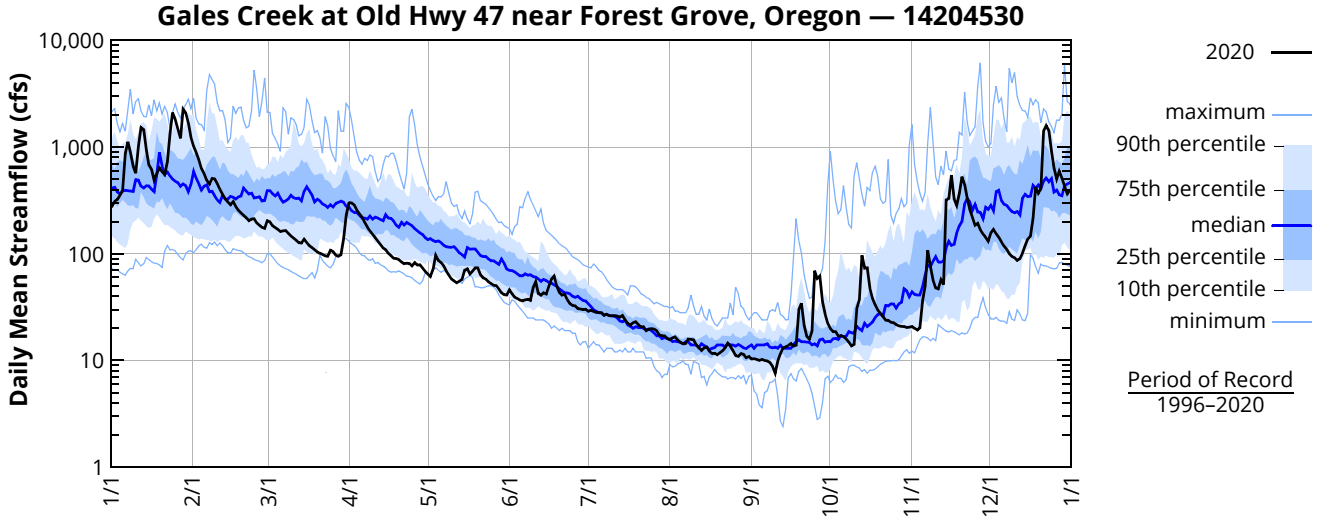
GALES – GALES CREEK AT OLD HWY 47 NEAR FOREST GROVE, OREGON – 14204530

Data source: Oregon Water Resources Department
River Mile: 2.36 *Latitude:* 45 30 39 *Longitude:* 123 06 56

2020 — MEAN STREAMFLOW† (cfs) — GALES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	278	1020	199	300	61.1	42.4	29.5	16.3	10.4	18.6	20.0	169
2	310	891	183	287	71.7	39.2	28.8	16.6	10.2	18.6	19.3	154
3	322	757	176	258	96.8	38.1	28.2	15.5	10.0	16.9	20.2	143
4	354	629	169	237	86.3	36.8	28.2	14.8	10.2	17.1	36.4	129
5	392	562	162	221	83.1	36.1	28.0	14.3	10.0	16.7	50.0	118
6	872	489	164	198	76.9	37.0	26.5	14.4	9.9	15.9	108	110
7	1120	451	165	178	69.1	37.4	27.1	15.9	9.6	14.9	75.9	100
8	893	509	155	164	63.0	36.5	26.3	15.8	8.8	13.7	57.1	94.5
9	664	505	147	152	58.1	48.2	26.2	15.6	7.6	14.1	47.8	91.8
10	569	453	140	142	55.6	54.5	26.3	14.0	9.8	30.5	46.8	86.6
11	1020	401	134	131	53.4	42.5	26.1	13.2	11.6	37.0	57.1	89.9
12	1530	360	127	122	55.3	40.8	25.4	12.4	13.1	96.6	51.4	101
13	1460	326	126	113	57.4	43.1	26.4	13.1	13.4	73.3	321	119
14	953	306	137	109	70.1	41.9	24.0	13.3	13.8	74.0	330	137
15	684	288	127	101	72.3	49.3	22.3	12.2	14.4	47.5	545	147
16	618	309	119	96.0	64.5	58.0	21.4	11.6	13.6	38.3	327	215
17	488	277	114	91.0	68.7	62.0	22.5	11.7	13.9	33.1	284	421
18	567	256	109	90.3	74.0	49.7	23.1	11.3	30.0	29.7	371	370
19	638	242	104	88.2	73.8	43.4	21.7	11.8	34.3	27.6	530	408
20	588	229	101	83.8	63.7	40.9	20.6	12.3	21.3	25.8	445	1420
21	553	218	98.6	80.5	59.7	41.6	20.7	13.2	16.9	23.9	331	1590
22	733	205	95.8	81.8	58.0	37.1	19.0	14.5	15.8	23.7	260	1430
23	1320	212	94.7	81.1	54.7	34.1	19.7	13.6	18.7	22.8	219	923
24	2110	213	108	77.0	52.4	32.8	19.9	12.3	69.5	22.6	185	637
25	1830	195	105	82.8	50.7	32.5	19.7	11.1	58.7	21.7	193	500
26	1500	185	97.2	78.3	50.4	30.6	19.0	10.9	61.7	21.1	168	596
27	1210	177	94.9	78.9	46.7	30.4	17.3	11.6	35.3	20.9	153	511
28	2270	173	97.7	73.6	43.1	30.0	17.0	11.4	27.3	20.8	143	433
29	2090	204	139	68.2	41.3	30.2	17.0	10.6	22.2	20.4	131	365
30	1690	—	229	64.5	41.1	28.9	16.1	10.9	19.9	20.5	157	393
31	1240	—	301	—	46.0	—	15.6	10.3	—	20.8	—	597
Mean	996	381	139	131	61.9	40.1	22.9	13.1	20.7	29.0	189	406
Max	2270	1020	301	300	96.8	62.0	29.5	16.6	69.5	96.6	545	1590
Min	278	173	94.7	64.5	41.1	28.9	15.6	10.3	7.6	13.7	19.3	86.6
Ac-Ft	61222	21901	8567	7793	3806	2392	1407	806	1234	1783	11272	24989

†All 2020 data are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — GALES

MONTH	2 < Q < 6	6 < Q ≤ 10	10 < Q ≤ 15	15 < Q ≤ 20	20 < Q ≤ 35	35 < Q ≤ 70	70 < Q ≤ 120	120 < Q ≤ 200	200 < Q ≤ 300	300 < Q ≤ 500	500 < Q ≤ 1,000	1,000 < Q ≤ 4,000	4,000 < Q ≤ 10,000
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.21%	2.8%	9.8%	8.7%	11.8%	10.4%	10.3%	11.1%	9.9%	10.8%	9.1%	4.7%	0.10%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1996–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — GALES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1996	634	751	256	336	231	70.1	26.2	12.6	18.1	32.9	87.7	1034
1997	645	356	725	195	97.1	71.5	28.9	15.5	26.3	146	342	314
1998	805	599	403	203	104	55.2	30.4	13.8	15.2	26.0	85.7	742
1999	628	1255	438	246	119	48.3	23.7	18.7	14.4	18.8	175	581
2000	527	337	310		88.3	61.9	26.0	14.2	11.1	15.2	30.7	101
2001	86.1	136	88.9	71.7	75.6	30.5	17.3	15.0	12.9	22.5	140	743
2002	648	474	298	185	78.2	40.3	15.0	7.7	7.6	9.5	67.9	239
2003	385	330	545	282	122	38.2	19.7	11.7	12.1	23.8	43.2	294
2004	431	429	255	168	87.0	45.0	20.6	13.5	20.4	28.5	88.0	141
2005	211	117	80.6	235	133	72.7	26.1	16.7	13.5	28.3	169	281
2006	986	279	279	215	99.1	60.1	21.5	10.0	8.7	10.7	538	512
2007	307	169	344	143	71.4	29.0	17.5	12.7	7.2	22.4	65.9	722
2008	581	465	333	274	119	38.0	15.0	13.0	11.0	15.0	76.5	82.0
2009	403	140	272	182	143	59.5	22.0	13.0	18.0	30.0	243	243
2010	745	321	285	349	146	145	41.0	25.0	28.5	29.0	190	758
2011	459	315	753	401	172	79.0	40.0	21.0	17.0	19.0	49.5	107
2012	461	376	566	275	141	65.5	27.0	16.0	12.0	21.0	271	1040
2013	291	226	233	142	86.0	54.5	20.0	15.0	15.0	65.0	113	116
2014	155	447	430	277	182	57.5	23.0	16.0	13.0	20.0	123	392
2015	283	283	207	150	62.0	22.5	13.0	13.0	14.0	16.0	167	1290
2016	732	518	656	132	60.0	28.0	19.0	10.0	10.0	194	309	578
2017	367	975	750	376	167	61.4	30.0	15.3	13.0	20.7	429	250
2018	485	228	304	328	82.5	39.9	17.4	13.1	15.2	14.2	27.8	211
2019	291	350	202	170	64.4	32.4	19.9	11.7	15.9	16.6	26.5	105
2020	872	308	127	105	61.1	40.0	23.1	13.2	13.7	21.7	148	169
median	460	350	313	205	106	49.1	22.0	14.0	14.0	22.5	119	367

KEY

Q in cfs

$Q \leq 11.0$
$11.0 < Q \leq 13.7$
$13.7 < Q \leq 15.8$
$15.8 < Q \leq 18.8$
$18.8 < Q \leq 29.0$
$29.0 < Q \leq 55.0$
$55.0 < Q \leq 95$
$95 < Q \leq 296$
$296 < Q \leq 622$
$622 < Q \leq 967$
$Q > 967$

Q as percentile

$Q \leq$ 5th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

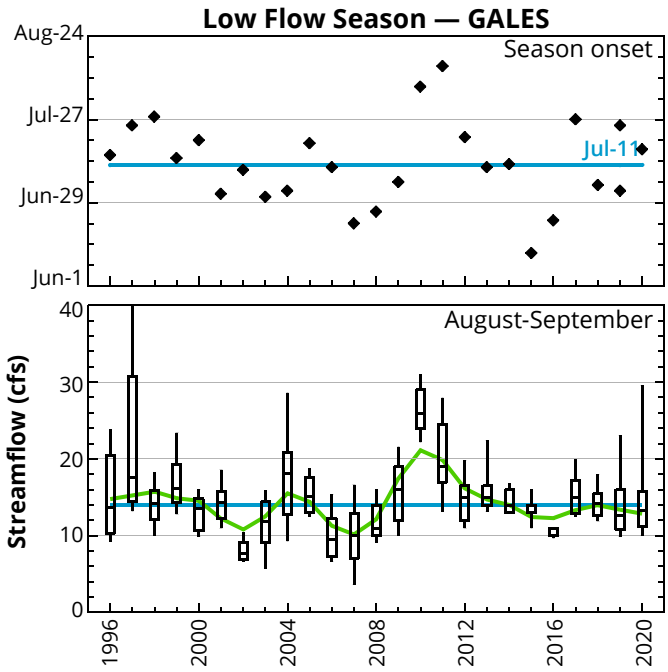
- Two episodes of high flow occurred in January, the second of which set high flow records on 28–30. From mid-February through May, flows were below the median almost every day. Record low flows were set on 3 days in March and 7 days in May.
- June–August flow was near the POR median.
- Flow in the fall was characterized by several episodes of high flow caused by heavy rain. Between high flow events, flows often dropped well below the POR median, sometimes for more than 2 weeks.

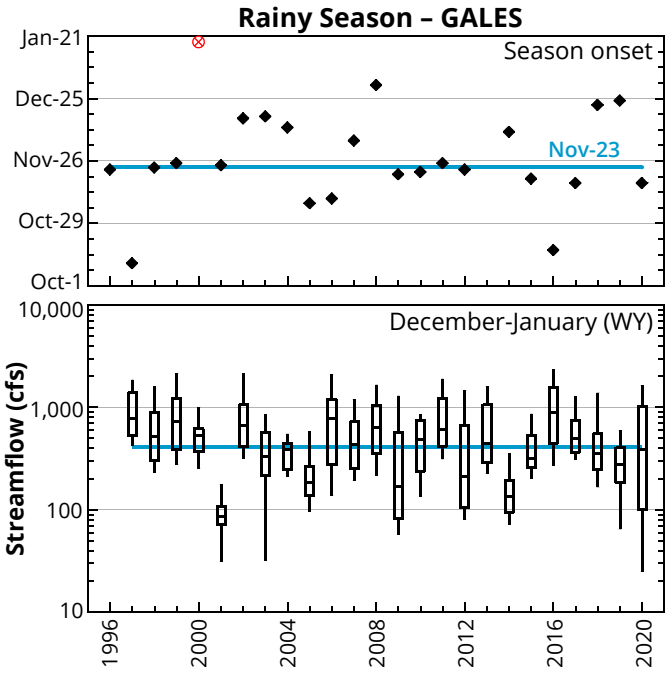
LOW FLOW

- August and September are the months with the lowest average flow and the lowest daily flows.
- Low flow criterion: 7d-Q ≤ 25 cfs (~26th pctl)
- No trends are evident in the magnitude of the flow for August–September.
- Various rates of flow augmentation have supplemented streamflow in Gales Creek during July–October since 2009. The augmentation point is about 2.6 miles upstream of this site. The average flow augmentation rate in 2020 was 1.7 cfs, which is similar to flow augmentation rates in recent years (1.7 cfs in 2018 and 1.8 cfs in 2019).
- Spring rainfall in both 2010 and 2011 was high, resulting in higher flows that persisted into summer.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 300 cfs (~74th pctl)
- No trend is evident in the magnitude of the flow for December–January.
- The fall/winter of 2000-2001 was very dry.
  - —The rainy season criterion was not met in 2000.
  - — Winter flows were low for WY 2001.





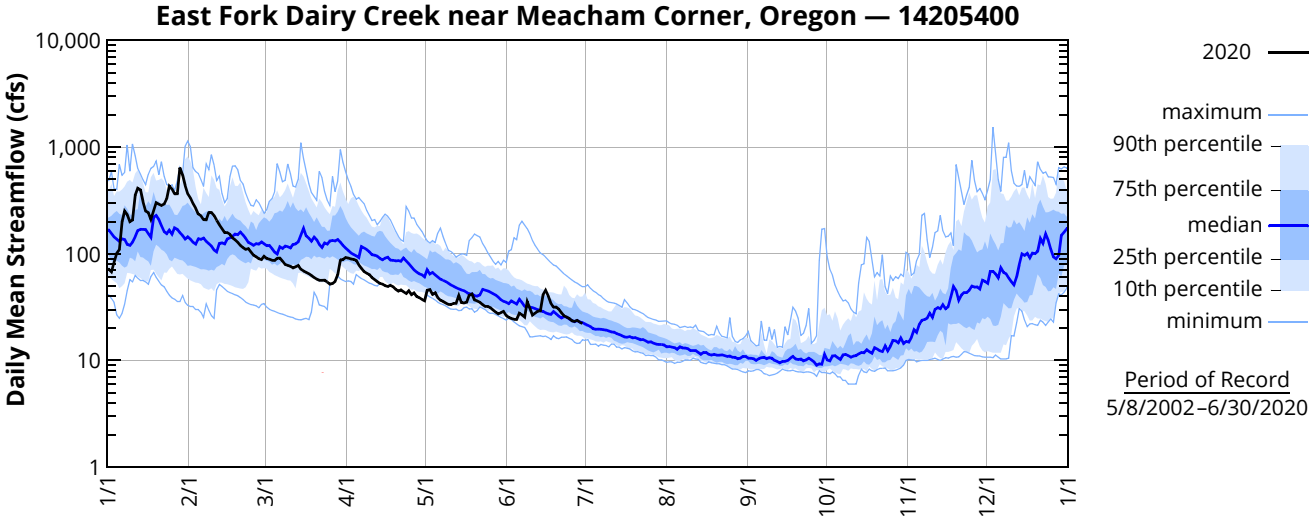
5400 – East Fork Dairy Creek near Meacham Corner, Oregon – 14205400

Data source: U.S. Geological Survey, Oregon Water Science Center
River Mile: 12.4 *Latitude:* 45 40 51 *Longitude:* 123 04 12 *Drainage area:* 32.92 sq mile *Datum:* 29.0 ft

2020 — MEAN STREAMFLOW† (cfs) — 5400

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	71.5	334	94.9	92.3	36.3	26.4						
2	67.5	296	90.2	91.3e	45.5	25.3						
3	83.0	267	89.1	89.3e	46.2	24.7						
4	101	236	86.9	88.8e	41.6	24.3						
5	109	227	86.5	86.6e	43.1	24.2						
6	200	209	90.9	78.6e	38.9	27.7						
7	252	208	91.3	73.0e	36.7	26.8						
8	233	245	85.3	68.0e	35.8	25.5						
9	200e	244	79.1	65.6e	34.5	35.6						
10	207	228	77.8	63.8	33.6	30.8						
11	353	206	76.3	59.9e	33.4	26.6						
12	411	187	73.6	57.2e	34.3	27.7						
13	397	172	75.4	54.8e	34.3	29.1						
14	308	158	77.7	52.7e	40.6	29.2						
15	252	158	71.7	51.9	34.9	41.4						
16	243	152	68.9	50.2	34.5	45.6						
17	210	141	67.1	49.3	35.0	40.1						
18	253	135	65.0	50.7	40.9	34.4						
19	301	128	62.5	49.1	42.0	31.6						
20	292	120	59.8	46.5	36.9	31.7						
21	284	114	57.9	44.6	36.1	30.3						
22	293	110	56.5	45.9	35.1	28.0						
23	330	112	56.4	44.0	33.4	26.2						
24	432	104	56.6	42.3	32.1	25.5						
25	404	97.0	54.4	45.1	32.1	24.8						
26	365	93.6	52.0	41.3	31.3	23.5						
27	366	89.8	52.6	43.0	29.8	23.2						
28	642	88.2	55.0	39.7	28.4	23.7						
29	549	104	63.5	38.7	27.3	22.8						
30	438	—	87.7	37.3	28.1	22.2						
31	367	—	88.1	—	28.9	—			—		—	
Mean	291	171	72.6	58.1	35.5	28.6						
Max	642	334	94.9	92.3	46.2	45.6						
Min	67.5	88.2	52.0	37.3	27.3	22.2						
Ac-Ft	17879	9845	4464	3454	2185	1704						

†Site discontinued July 1, 2020; e=estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — 5400

Q IN cfs	5 < Q < 7.5	7.5 < Q ≤ 9.5	9.5 < Q ≤ 12	12 < Q ≤ 15.5	15.5 < Q ≤ 22	22 < Q ≤ 35	35 < Q ≤ 55	55 < Q ≤ 80	80 < Q ≤ 110	110 < Q ≤ 170	170 < Q ≤ 300	300 < Q ≤ 1,000	1,000 < Q ≤ 2,000	* Missing
JAN														
FEB														
MAR														
APR														
MAY														
JUN														
JUL														
AUG														
SEP														
OCT														
NOV														
DEC														
ALL	0.22%	5.4%	10.3%	8.8%	8.6%	11.1%	10.5%	9.1%	9.1%	9.6%	8.3%	4.7%	0.12%	4.5%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2002–2020

*The missing values date from January–May, 2002 before the gage was installed and from July–December 2020 after the gage was discontinued. These data represent almost a complete year.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — 5400

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002					39.0	25.6	16.3	11.6	9.7	8.5	12.8	43.6
2003	98.7	142	201	126	59.5	28.4	17.8	12.8	9.9	11.1	15.2	69.3
2004	166	155	90.5	61.2	36.1	25.4	14.0	11.1	11.4	16.7	22.4	52.1
2005	65.6	45.7	29.4	93.5	93.3	39.9	22.1	10.8	10.5	12.5	38.2	82.0
2006	418	131	111	84.2	45.8	35.5	18.4	11.9	9.3	9.8	152	181
2007	148	85.6	126	69.0	38.3	22.5	15.5	10.6	7.9	12.0	19.5	239
2008	228	176	129	102	45.6	27.8	14.3	11.7	8.7	9.0	22.5	22.4
2009	161	56.1	86.7	75.8	64.4	27.6	17.0	11.8	9.0	9.3	45.6	50.6
2010	203	125	123	154	78.5	90.3	31.0	16.8	14.4	13.0	49.1	272
2011	181	109	303	156	85.8	45.8	28.9	17.8	12.9	14.3	26.4	33.0
2012	98.6	160	280	135	67.6	44.2	23.2	13.6	10.3	15.0	61.3	395
2013	120	77.9	89.1	68.1	35.2	31.2	14.8	11.4	10.6	21.7	37.3	44.5
2014	44.5	152	226	131	79.2	33.1	19.5	12.5	9.2	13.6	42.3	142
2015	108	121	93.4	66.4	35.5	16.7	13.0	10.0	10.3	8.7	29.9	260
2016	255	212	218	66.5	32.2	21.1	15.3	10.2	9.8	50.2	86.3	206
2017	146	302	238	150	80.9	40.4	21.0	13.6	10.6	12.6	83.1	82.5
2018	164	101	135	127	44.9	26.1	15.2	9.9	9.2	9.7	12.2	43.6
2019	90.6	142	86.8	88.2	40.1	19.6	14.0	9.6	10.9	13.9	12.4	40.3
2020	292	158	73.6	51.3	34.9	26.7						
median	152	131	128	91.7	47.2	29.2	17.0	11.7	10.2	12.0	32.0	93.2

KEY

Q in cfs

$Q \leq 9.3$
$9.3 < Q \leq 10.4$
$10.4 < Q \leq 11.5$
$11.5 < Q \leq 13.0$
$13.0 < Q \leq 18.2$
$18.2 < Q \leq 26.9$
$26.9 < Q \leq 40.1$
$40.1 < Q \leq 103$
$103 < Q \leq 214$
$214 < Q \leq 301$
$Q > 301$

Q as percentile

$Q \leq$ 5th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

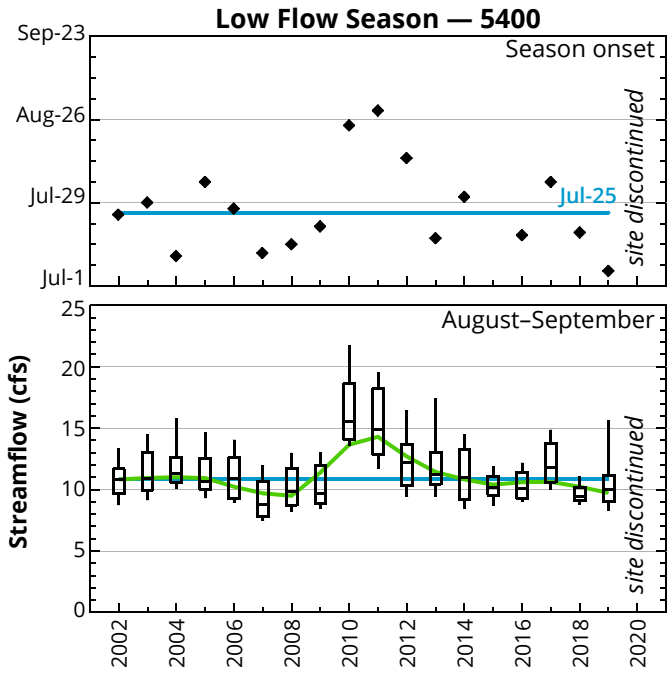
- January flows were high, setting records for 3 days. From mid-February through early June, flows were below the POR median due to prolonged dry weather.
- Flow monitoring at this site was discontinued at the end of June 2020.

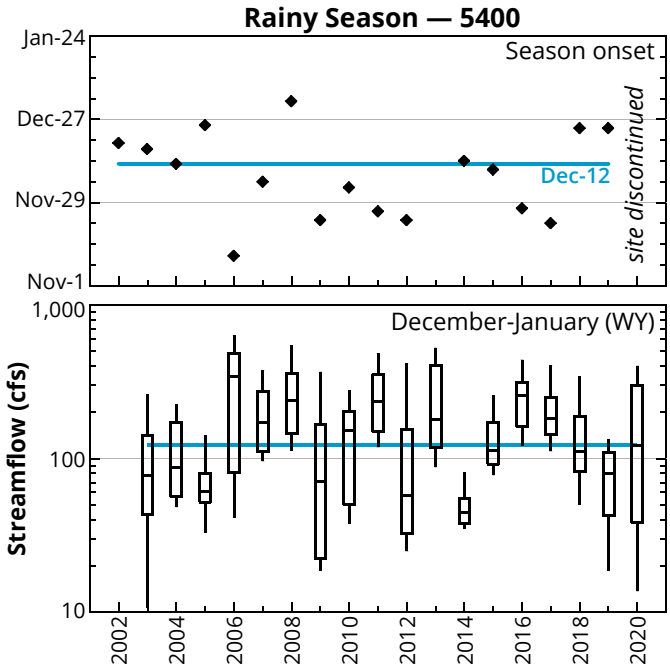
LOW FLOW

- August through October are the months with the lowest average flow and the lowest daily flows.
- Low flow criterion: 7d-Q ≤ 16 cfs (~26th pctl)
- No trends are evident in the magnitude of the flow for August–September.
- Spring rainfall in both 2010 and 2011 was high, resulting in later onset of low flow and higher flows that persisted into summer.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 100 cfs (~74th pctl)
- No trend is evident in the magnitude of the flow for December–January.



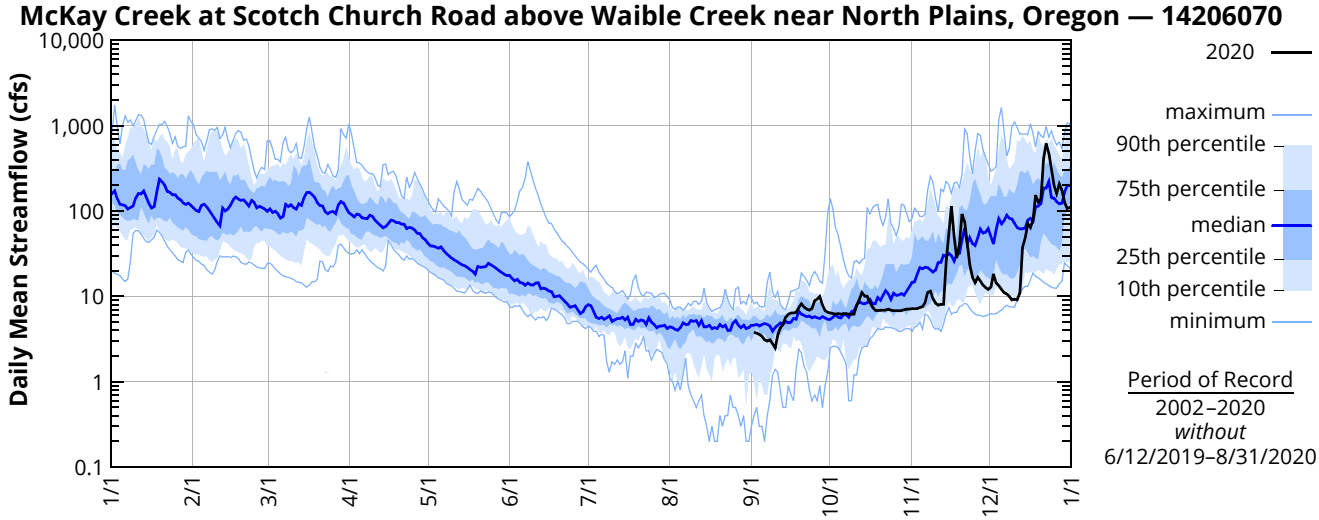


Data source: WEST Consultants for Clean Water Services
River Mile: 6.3 *Latitude:* 45 57 21 *Longitude:* 122 99 18

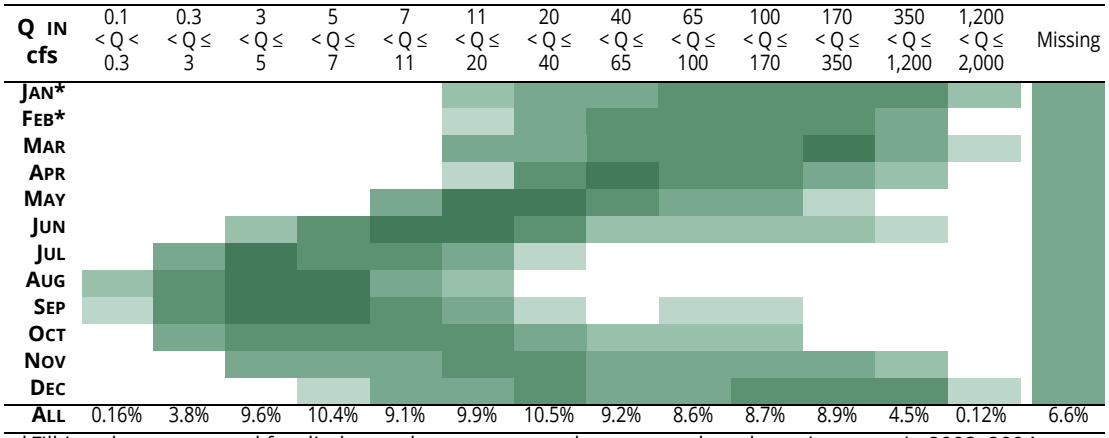
2020 — MEAN STREAMFLOW (cfs) — MCSC

DAY	JAN*	FEB*	MAR*	APR*	MAY*	JUN*	JUL*	AUG*	SEP	OCT	NOV	DEC
1									3.84e	6.31	7.19e	18.4
2									3.74	6.22e	7.15e	14.4
3									3.62	6.26e	7.42	13.4
4									3.37	6.23e	7.63	12.1
5									3.05	6.28e	8.50	11.1
6									2.95	6.26e	11.2	10.7
7									3.12	6.20e	11.6	10.0
8									2.79e	6.23e	9.37	9.07
9									2.53e	6.22e	8.27	9.25
10									3.50e	7.93	7.93	9.07
11									4.27	9.20	8.12	11.0e
12									4.65	11.1	8.14	37.1e
13									5.65	10.1	25.2	48.4e
14									6.20	10.1	55.6	71.4e
15									6.42	8.49	114	63.9e
16									6.42	7.48	50.2	78.5e
17									6.51	6.91	28.2	154e
18									7.40	6.82e	40.4	127e
19									8.22	6.91e	92.3	138e
20									7.45	6.86e	75.0	417e
21									7.05	6.85e	41.4	621e
22									6.87	7.13e	23.3	476e
23									7.18	6.87e	16.7	303e
24									8.86	6.75e	14.5	202e
25									9.34	6.76e	16.7	160e
26									10.0	6.83e	15.2	208e
27									7.88	6.83e	13.6	175e
28									6.83	6.95e	12.7	127e
29									6.49	7.08e	12.1	107e
30		—							6.39	7.13e	12.9	110e
31		—		—		—			—	7.15e	—	188e
Mean									5.75	7.24	25.4	127
Max									10.0	11.1	114	621
Min									2.53	6.20	7.15	9.07
Ac-Ft									342	445	1512	7816

*Measurements were discontinued June 12, 2019 – August 31, 2020 because of bridge reconstruction; e=estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — MCSC



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2002–2020

*Fill-in values were used for discharge that was reported as greater than the rating curve in 2002–2004.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — MCSC

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002		130	91.8	46.1	17.0	9.18	3.18	0.45	0.69	4.15	7.67	52.7
2003	170	123	153	115	34.5	9.52	3.85	2.25	5.50	11.2	23.3	82.4
2004			86.9	41.4	14.9	8.67	4.30	3.45	5.40	10.6	16.5	31.4
2005	59.0	41.2	19.5	94.2	91.3	20.5	8.80	2.84	4.98	13.4	47.8	124
2006	573	82.4	94.8	72.9	26.5	18.2	6.24	5.49	5.35	29.8	140	
2007	95.9	65.9	94.4	53.3	21.6	9.63	5.37	4.61	7.93	5.61	11.0	230
2008	359	253	126	78.4	22.3	10.2	4.95	5.24	4.89	6.50	21.8	19.8
2009	109	29.4	61.3	43.9	35.3	12.4	5.20	3.62	4.19	5.86	39.1	29.6
2010	274	117	97.0	115	62.4	77.7	8.54	4.76	8.78	10.7	53.3	246
2011	149	88.3	311	117	54.3	20.4	8.86	5.62	3.60	4.49	9.20	22.0
2012	160	105	238	92.5	43.9	22.5	8.89	6.64	5.57	9.92	48.3	364
2013	75.4	57.7	75.7	39.6	15.2	18.7	7.10	6.44	9.52	10.1	33.6	25.8
2014	35.1	149	127	94.0	43.8	12.0	6.86	5.20	4.85	9.05	46.0	156
2015	87.3	96.3	82.5	45.7	13.7	6.35	5.12	5.32	6.62	5.51	19.2	540
2016	232	153	171	37.7	11.9	6.58	4.27	3.77	4.78	62.4	121	204
2017	146	447	278	145	67.1	11.5	4.51	4.20	4.93	10.4	104	122
2018	173	70.1	124	100	17.8	10.2	4.54	2.88	2.56	5.11	7.12	38.8
2019	96.1	153	68.8	79.3	19							
2020									6.42	6.85	13.2	71.4
median	145	110	112	72.3	26.4	11.8	5.34	4.41	5.24	7.76	30.2	103

KEY

Q in cfs

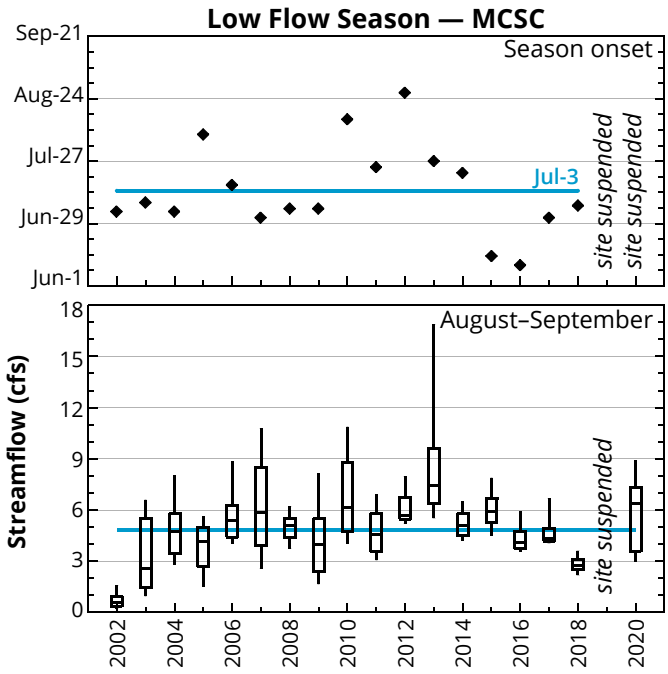
$Q \leq 3.35$
$3.35 < Q \leq 4.33$
$4.33 < Q \leq 5.08$
$5.08 < Q \leq 5.85$
$5.85 < Q \leq 8.34$
$8.34 < Q \leq 14.1$
$14.1 < Q \leq 25.8$
$25.8 < Q \leq 93.7$
$93.7 < Q \leq 227$
$227 < Q \leq 345$
$Q > 345$

Q as percentile

$Q \leq 5$th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

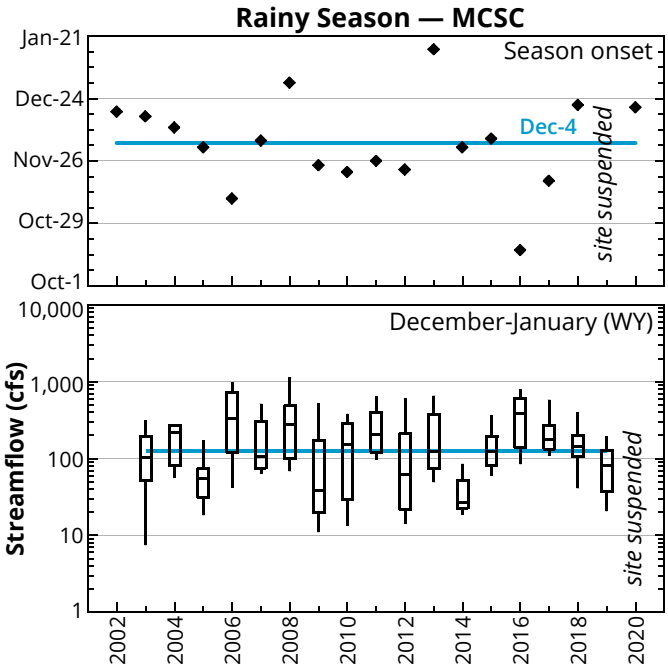
2020

- Flow measurements at this site resumed in September 2020 after being discontinued since June 12, 2019 for bridge reconstruction.
- Although two small increases in flow were observable in September, most flows were near the POR median.
- Two episodes of high flow occurred during November–December. Between these episodes, flows were low, sometimes for more than 2 weeks.
- Compared to the POR, the high flows during September 23–25 were fairly small. Flows at that time at many other sites in the basin set high flow records. Similarly, the high flow episodes in November and December at this site were small relative to the POR. It is possible that the flow measurements before bridge construction may be different than those after.



Low flow

- July through September are the months with the lowest average flow. The lowest daily flows occur in August and September.
- Low flow criterion: 7d-Q ≤ 7 cfs (~25th pctl)
- July–August flows have been variable over the period of record. Understanding any trends at this site is complicated by:
  - —The presence of intermittent and variable backwater from Rock Creek.
  - —Streamflow monitoring changed from OWRD (2002–2007) to West Consultants (2008–present). The same method was used by both.
  - —Various rates of flow augmentation have supplemented streamflow in McKay Creek during July–October since 2005. The augmentation point is about a mile upstream of this site. The flow augmentation rate in 2020 was 1.7 cfs, which is similar to that in recent years.



Rainy season flow

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 90 cfs (~74th pctl)
- No trend is evident in the magnitude of the flow for December–January.

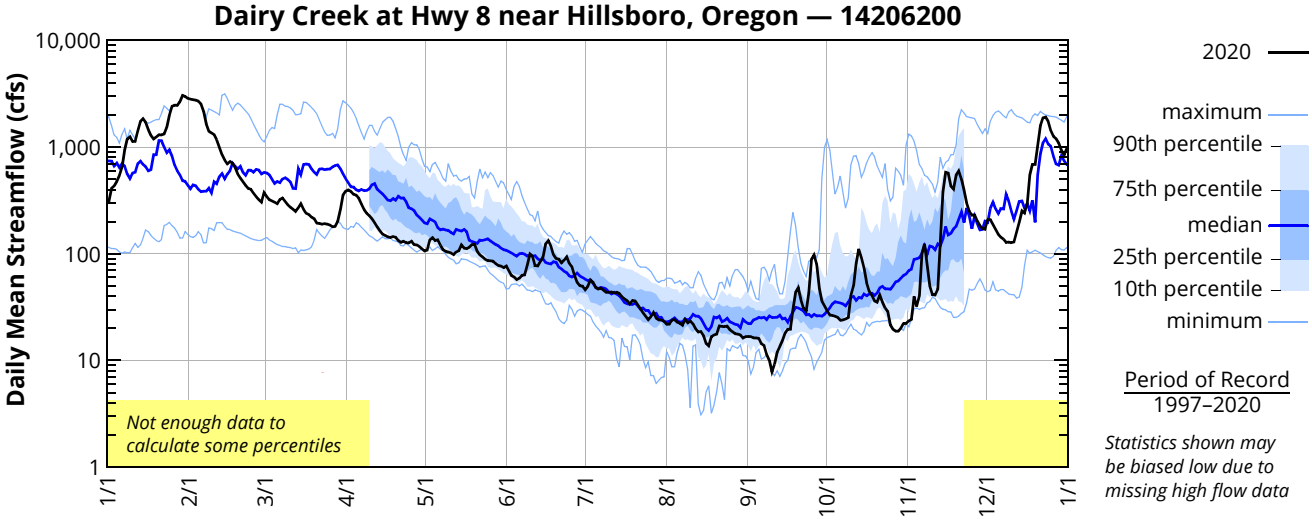
DAIRY – DAIRY CREEK AT HWY 8 NEAR HILLSBORO, OREGON – 14206200

Data source: Oregon Water Resources Department
River Mile: 2.06 *Latitude:* 45 30 38 *Longitude:* 123 06 56

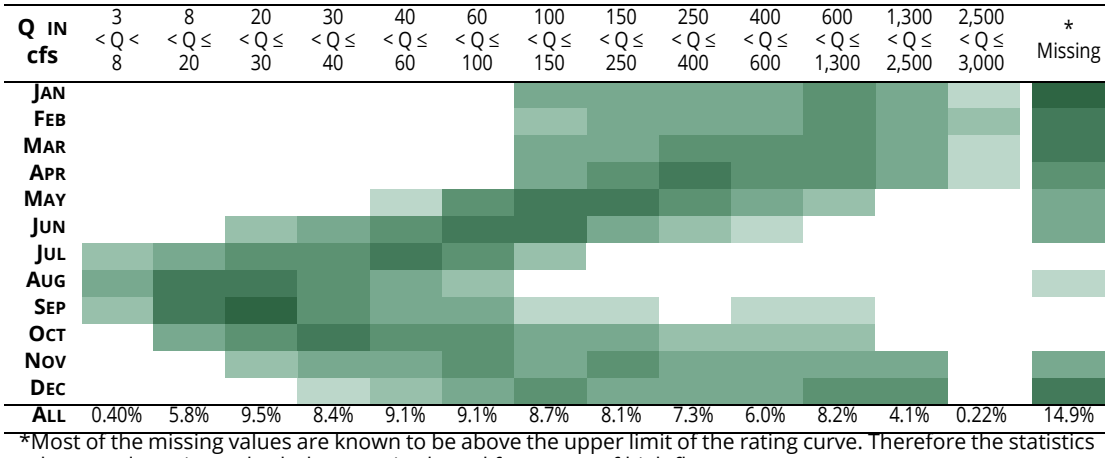
2020 — MEAN STREAMFLOW† (cfs) — DAIRY

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	308	2820e	374	386	106	76.7	46.0	21.8	16.8	29.2	23.5	210
2	410	2790e	344	397	108	69.2	49.4	21.9	16.7	26.7	24.2	209
3	431	2760e	321	384	135	62.7	56.8	24.0	16.3	26.4	39.8	187
4	477	2700e	313	361	142	60.7	54.1	24.1	16.3	25.9	32.0	169
5	540e	2540e	304	354	133	57.4	48.2	22.8	16.1	25.3	40.1	152
6	650e	2170e	294	332	135	59.0	46.6	22.3	14.3	23.8	99.5	143
7	938e	1650e	323	293	120	62.8	47.6	21.4	13.8	24.0	124	137
8	1190e	1410e	333	260	109	63.5	45.5	24.2	11.4	24.5	79.2	128
9	1250e	1360e	309	240	105	77.5	43.6	22.4	10.0	25.2	50.0	129
10	1130e	1310e	288	227	104	99.8	43.5	23.4	7.8	40.5	41.3	127
11	1130e	1170e	273	213	102	95.0	43.9	22.0	9.2	50.2	41.0	129
12	1410e	992e	262	196	98.2	77.5	42.8	19.8	12.0	81.3	46.6	161
13	1740e	851e	249	179	104	77.1	43.6	18.4	13.5	111	127	197
14	1850e	757e	270	164	107	84.9	42.5	18.7	15.4	92.2	378	253
15	1710e	698e	295	153	121	93.7	39.6	17.1	18.0	74.2	580e	241
16	1460e	732e	261	149	113	124	37.7	14.4	19.6	53.3	570e	296
17	1290e	707e	240	144	112	133	36.3	13.7	19.6	44.4	430	550e
18	1190e	646e	233	142	115	118	33.8	16.7	30.1	40.5	404	687e
19	1240e	560e	221	145	122	98.2	36.5	17.3	43.7	36.1	550e	687e
20	1310e	513	213	143	123	89.8	36.1	17.6	47.9	35.2	600e	1010e
21	1300e	472	194	133	105	89.3	33.3	21.1	37.0	41.0	500e	1590e
22	1327e	437	193	128	97.6	82.1	30.6	20.9	30.9	35.4	394	1880e
23	1530e	408	189	131	93.3	86.8	28.1	20.7	29.2	31.0	301	1910e
24	1970e	403	192	127	89.1	93.6	25.9	21.0	43.0	28.9	251	1740e
25	2410e	370	190	126	86.2	81.2	24.1	19.4	88.6	21.5	230	1430e
26	2480e	342	186	131	86.0	75.2	25.8	18.6	97.7	19.6	232	1260e
27	2460e	322	179	122	85.5	62.5	28.2	17.8	80.5	18.8	204	1200e
28	2660e	305	181	121	80.8	53.9	24.9	17.7	47.4	18.8	184	1090e
29	3050e	313	201	117	77.9	50.1	24.0	17.3	35.9	20.0	172	940e
30	2990e	—	261	111	76.7	49.8	24.0	16.2	32.2	22.3	169	840e
31	2870e	—	354	—	74.1	—	23.3	16.7	—	22.2	—	963e
Mean	1506	1121	259	204	105	80.2	37.6	19.7	29.7	37.7	231	666
Max	3050	2820	374	397	142	133	56.8	24.2	97.7	111	600	1910
Min	308	305	179	111	74.1	49.8	23.3	13.7	7.8	18.8	23.5	127
Ac-Ft	92630	64479	15947	12117	6479	4770	2313	1213	1767	2319	13720	40949

†All 2020 data are provisional—subject to revision; e-estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — DAIRY



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1997–2020

*Most of the missing values are known to be above the upper limit of the rating curve. Therefore the statistics above underestimate both the magnitude and frequency of high flow.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — DAIRY

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1997				383	200	167	61.7	38.4	52.4	224		
1998				400	224	155	58.7	31.7	28.5	59.7	156	
1999				622	203	97.2	48.9	34.7	26.4	36.8	270	
2000				198	111	58.4	24.8	17.7	19.0	30.2	31.5	114
2001	140	207	157	142	92.7	45.5	16.4	13.9	16.3	44.2		
2002				388	115	54.9	27.0	19.3	19.0	36.3	64.6	
2003					171	70.9	30.7	16.5	27.3	52.0	62.7	
2004				210	90.7	57.9	21.0	13.0	26.2	46.8	69.2	114
2005		182	122			86.2	45.1	18.4	20.5	36.4	255	
2006				488	165	123	41.9	23.7	19.5	20.7		
2007				285	114	58.2	26.0	18.9	15.9	43.4	82.1	
2008				505	156	93.0	33.0	29.0	18.5	34.0	99.5	103
2009		198		300	216	82.5	34.0	27.0	30.0	60.0		
2010							85.0	39.0	53.5	47.0		
2011					309	130	71.0	40.0	34.0	38.0	70.5	136
2012	994	672	1240	620	254	137	54.0	34.0	27.0	55.0	388	1850
2013	552	367	460	255	116	103	35.0	30.0	41.5	76.0	149	136
2014	203	1245	1430	703	264	106	46.0	26.0	25.5	55.0	218	885
2015	697	740	603	266	103	44.0	23.0	17.0	25.0	26.0	157	1790
2016	1700	1010	1470	245	99.0	51.5	32.0	18.0	24.0	381	555	1080
2017	750	1475	1220	849	330	116	42.0	26.0	24.0	34.0	650	550
2018	950	536	675	825	128	65.7	30.4	19.0	20.3	25.8	51.2	263
2019	550	832	363	373	118	49.0	31.0	19.1	44.3	41.5	45.7	205
2020	1310	745	261	151	105	77.5	37.7	19.8	18.8	28.9	178	296
median	660	540	563	351	150	80.8	37.7	23.6	26.0	41.0	128	454

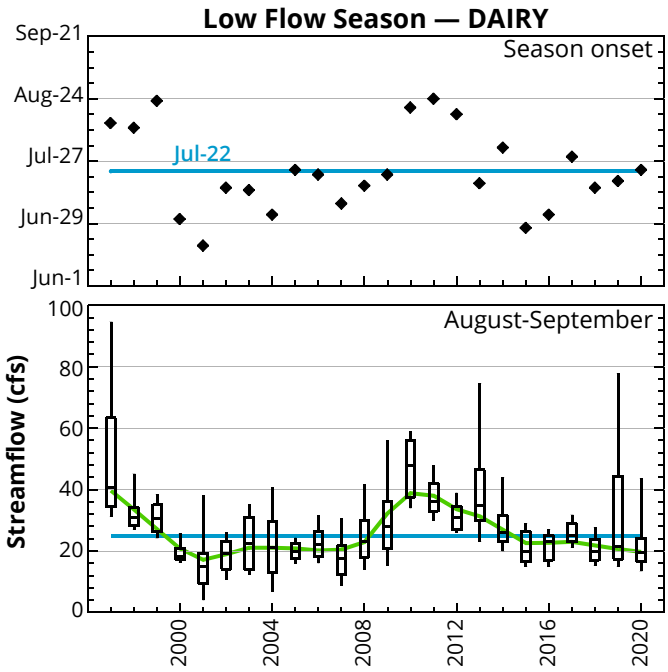
KEY

Q in cfs
$Q \leq 17.7$
$17.7 < Q \leq 22.2$
$22.2 < Q \leq 26.6$
$26.6 < Q \leq 31.0$
$31.0 < Q \leq 42.0$
$42.0 < Q \leq 62.1$
$62.1 < Q \leq 101$
$101 < Q \leq 344$
$344 < Q \leq 842$
$842 < Q \leq 1301$
$Q > 1301$

Q as percentile
$Q \leq 5th$
$5th < Q \leq 10th$
$10th < Q \leq 15th$
$15th < Q \leq 20th$
$20th < Q \leq 30th$
$30th < Q \leq 40th$
$40th < Q \leq 50th$
$50th < Q \leq 75th$
$75th < Q \leq 90th$
$90th < Q \leq 95th$
$Q > 95th$

2020

- High flow occurred in mid and late January, 2020. By mid-February, flows had decreased below the POR median and remained so through May.
- Flow was near the POR median through June and then slowly decreased through mid-September.
- Heavy rain near the end of September resulted in high flow. Widely spaced high flow episodes in October–December were interspersed with periods of low flow sometimes as long as 2 weeks.

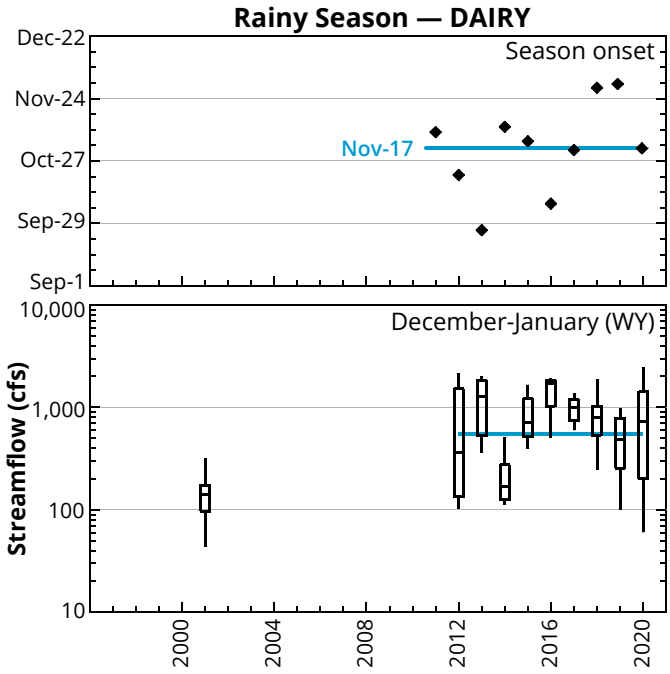


LOW FLOW

- August and September are the months with the lowest average flow and the lowest daily flows.
- Low flow criterion: 7d-Q ≤ 35 cfs (~24th pctl)
- Various rates of flow augmentation have supplemented streamflow in several tributaries of Dairy Creek during July–October. Flow augmentation rates varied from year-to-year.
  - —McKay Ck at RM 7.0, since 2005, 0.5–3 cfs
  - —EF Dairy Ck at RM 4.9, since 2010, 0.5–1.6 cfs
  - —WF Dairy Ck at RM 5.2, since 2011, 0.4–1 cfs
- Spring rainfall in both 2010 and 2011 was high, resulting in later onset of low flow and higher flows that persisted into summer.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- A large portion of high flow data are missing for this site. Most of these data are known to be above the upper limit of the rating curve. These missing values will result in the under-representation of high flows in the frequency distribution as well as skewing the magnitude of high flow data.
- Too few high flow data are available to assess trends. No trends are evident in the onset of the rainy season or in the magnitude of the flow for December–January.
- Rainy season criterion: 7d-Q ≥ 350 cfs (~76th pctl)



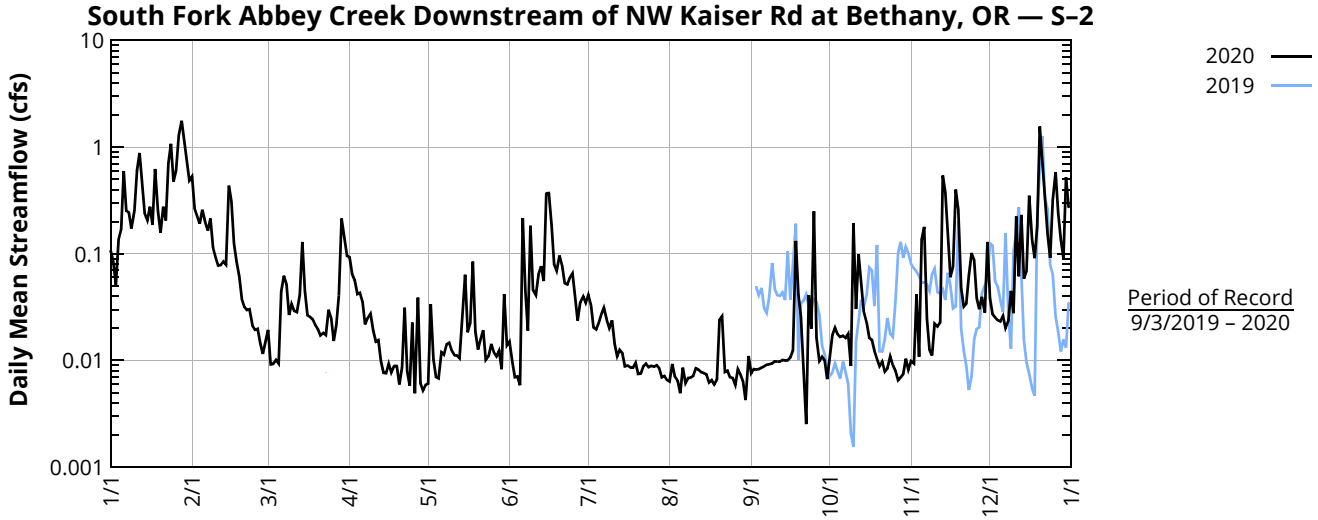
S-2 – South Fork Abbey Creek Downstream of NW Kaiser Rd at Bethany, OR

Data source: WEST Consultants for Clean Water Services

2020 — MEAN STREAMFLOW (cfs) — S-2

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.11e	0.53	0.019e	0.093e	0.006e	0.015e	0.041e	0.006e	0.008e	0.011e	0.010e	0.038e
2	0.08e	0.27	0.009e	0.065e	0.034e	0.010e	0.033e	0.009e	0.008e	0.017e	0.009e	0.027e
3	0.05e	0.23	0.009e	0.057e	0.010e	0.007e	0.020e	0.007e	0.008e	0.020e	0.042e	0.025e
4	0.14e	0.19	0.010e	0.042e	0.007e	0.007e	0.020e	0.006e	0.008e	0.018e	0.011e	0.024e
5	0.17e	0.26	0.009e	0.043e	0.007e	0.006e	0.022e	0.005e	0.009e	0.017e	0.14e	0.023e
6	0.60	0.20	0.044e	0.036e	0.012e	0.22e	0.027e	0.009e	0.009e	0.017e	0.18e	0.026e
7	0.25	0.17	0.062e	0.022e	0.011e	0.046e	0.031e	0.006e	0.009e	0.016e	0.025e	0.020e
8	0.24	0.21	0.052e	0.025e	0.014e	0.019e	0.024e	0.007e	0.009e	0.018e	0.013e	0.023e
9	0.17	0.11e	0.027e	0.027e	0.015e	0.18e	0.020e	0.007e	0.009e	0.009e	0.011e	0.045e
10	0.25e	0.093e	0.034e	0.019e	0.012e	0.046e	0.024e	0.007e	0.010e	0.19e	0.022e	0.028e
11	0.60	0.078e	0.029e	0.015e	0.011e	0.041e	0.014e	0.008e	0.010e	0.030e	0.021e	0.22e
12	0.88	0.078e	0.028e	0.016e	0.011e	0.064e	0.011e	0.008e	0.010e	0.099e	0.023e	0.062e
13	0.45	0.085e	0.041e	0.010e	0.011e	0.076e	0.013e	0.008e	0.010e	0.057e	0.54	0.23e
14	0.24	0.079e	0.13e	0.008e	0.023e	0.055e	0.012e	0.008e	0.010e	0.029e	0.38e	0.058e
15	0.21	0.44e	0.045e	0.008e	0.064e	0.37	0.009e	0.007e	0.010e	0.023e	0.17e	0.068e
16	0.28	0.31	0.026e	0.009e	0.018e	0.37	0.009e	0.006e	0.011e	0.016e	0.060e	0.35e
17	0.19	0.12e	0.026e	0.008e	0.022e	0.19	0.009e	0.007e	0.012e	0.016e	0.075e	0.14
18	0.62	0.084e	0.024e	0.009e	0.084e	0.079e	0.009e	0.006e	0.13e	0.012e	0.40e	0.091e
19	0.25	0.061e	0.022e	0.009e	0.019e	0.069e	0.009e	0.007e	0.042e	0.010e	0.26e	0.18
20	0.16	0.038e	0.020e	0.006e	0.013e	0.097e	0.007e	0.024e	0.025e	0.009e	0.048e	1.56
21	0.28	0.032e	0.017e	0.009e	0.016e	0.078e	0.008e	0.026e	0.007e	0.010e	0.032e	0.80
22	0.21	0.030e	0.018e	0.031e	0.019e	0.053e	0.009e	0.008e	0.003e	0.008e	0.034e	0.33
23	0.70	0.030e	0.017e	0.008e	0.010e	0.051e	0.009e	0.008e	0.041e	0.008e	0.063e	0.15
24	1.07	0.021e	0.030e	0.006e	0.011e	0.060e	0.009e	0.007e	0.020e	0.011e	0.10e	0.092e
25	0.47	0.019e	0.025e	0.023e	0.014e	0.066e	0.009e	0.007e	0.25e	0.009e	0.087e	0.32e
26	0.61	0.020e	0.015e	0.005e	0.012e	0.040e	0.009e	0.006e	0.016e	0.008e	0.038e	0.58
27	1.29	0.015e	0.021e	0.039e	0.011e	0.024e	0.009e	0.008e	0.010e	0.007e	0.030e	0.24
28	1.77	0.012e	0.041e	0.006e	0.012e	0.035e	0.008e	0.007e	0.011e	0.007e	0.040e	0.13
29	1.15	0.067e	0.21e	0.005e	0.008e	0.040e	0.007e	0.006e	0.010e	0.007e	0.028e	0.091
30	0.73	—	0.15	0.006e	0.042e	0.035e	0.007e	0.004e	0.007e	0.010e	0.13e	0.52
31	0.48	—	0.096e	—	0.014e	—	0.007e	0.011e	—	0.008e	—	0.28
Mean	0.474	0.136	0.042	0.022	0.018	0.081	0.015	0.008	0.024	0.024	0.100	0.219
Max	1.770	0.528	0.214	0.093	0.084	0.371	0.041	0.026	0.249	0.194	0.542	1.560
Min	0.051	0.012	0.009	0.005	0.006	0.006	0.007	0.004	0.003	0.007	0.009	0.020
Ac-Ft	0.940	0.269	0.084	0.044	0.037	0.161	0.029	0.016	0.048	0.047	0.199	0.434

e-estimated or poor data quality



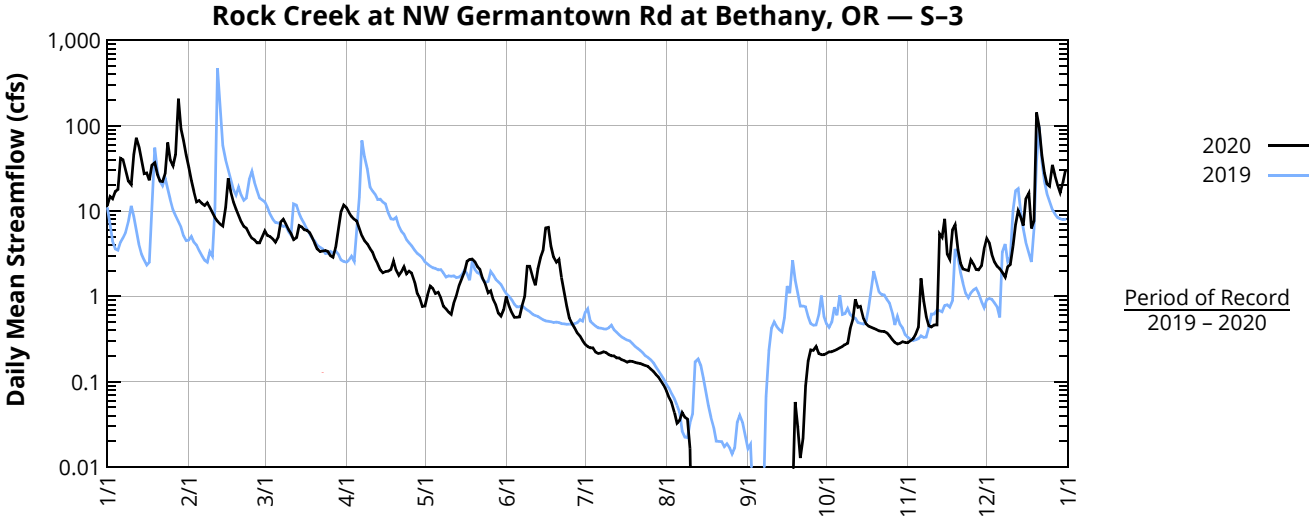
S-3 – Rock Creek at NW Germantown Rd at Bethany, OR

Data source: WEST Consultants for Clean Water Services

2020 — MEAN STREAMFLOW (cfs) — S-3

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	11.8	32.4	5.81	11.0	0.77	1.00	0.27	0.08e	no flow	0.22e	0.29	4.77
2	14.8	22.7	5.17	9.72	1.05	0.77	0.26e	0.07e	no flow	0.22e	0.30	4.22
3	13.9	16.9	5.03	8.63	1.32	0.65	0.25e	0.06e	no flow	0.22e	0.32	3.09
4	17.0	12.8	4.71	7.99	1.25	0.57	0.25e	0.04e	no flow	0.23e	0.36	2.53
5	17.8	13.3	4.32	7.63	1.08	0.57	0.22e	0.03e	no flow	0.24e	0.43	2.25
6	41.7	12.3	4.93	6.32	1.12	0.57	0.22e	0.04e	no flow	0.25e	1.62	2.12
7	40.2	11.6	7.44	5.17	0.96	0.78	0.22e	0.04e	no flow	0.26e	0.88	1.92
8	30.4	12.5	7.98	4.49	0.77	0.99	0.22e	0.04e	no flow	0.27e	0.58	1.68
9	22.5	11.0	7.09	4.10	0.71	2.26	0.22e	0.04e	no flow	0.28	0.45	2.23
10	20.4	9.66	6.14	3.64	0.66	2.26	0.21e	0.02e	no flow	0.42	0.44	2.36
11	46.1	8.38	5.49	3.27	0.62	1.67	0.20e	no flow	no flow	0.53	0.46	3.91
12	72.1	7.59	4.63	2.74	0.83	1.35	0.20e	no flow	no flow	0.92	0.46	6.98
13	57.6	7.04	4.87	2.40	1.01	2.10	0.19e	no flow	no flow	0.75	5.44	10.1
14	39.5	6.68	6.76	2.04	1.33	2.84	0.19e	no flow	no flow	0.77	4.94	8.54
15	27.4	11.1	6.53	1.89	1.63	3.44	0.18e	no flow	no flow	0.55	8.10	6.78
16	28.1	24.2	6.05	1.96	1.93	6.37	0.18e	no flow	no flow	0.48	3.13	13.9
17	23.0	16.8	5.96	1.97	2.58	6.46	0.17e	no flow	no flow	0.45	2.73	16.2
18	34.5	12.7	5.63	2.08	2.70	3.90	0.18e	no flow	no flow	0.43	6.05	6.24
19	36.9	10.6	4.92	2.60	2.74	2.91	0.17e	no flow	0.06e	0.42	6.93	7.59
20	26.8	8.91	4.22	2.03	2.55	2.52	0.17e	no flow	0.03e	0.41	3.52	143
21	22.4	7.48	3.59	1.76	2.23	2.73	0.17e	no flow	0.01e	0.40	2.44	97.3
22	22.1	6.61	3.35	1.94	2.08	1.66	0.16e	no flow	0.02e	0.39	2.09	45.4
23	27.4	6.29	3.39	2.22	1.64	1.12	0.16e	no flow	0.09e	0.39	2.05	28.1
24	63.7	5.35	3.45	1.84	1.39	0.77	0.15e	no flow	0.17e	0.37	2.00	20.8
25	39.5	4.79	3.35	1.97	1.10	0.55	0.15e	no flow	0.24e	0.35	2.69	19.6
26	33.7	4.59	2.98	1.87	1.17	0.48	0.14e	no flow	0.23e	0.32	2.39	34.7
27	46.0	4.25	2.87	1.47	0.92	0.43	0.13e	no flow	0.26e	0.29	2.08	26.1
28	207e	4.24	3.70	1.08	0.79	0.38	0.12e	no flow	0.21e	0.28	2.04	20.1
29	91.6	32.40	5.98	0.95	0.64	0.34	0.11e	no flow	0.21e	0.28	2.27	16.4
30	66.8	—	9.68	0.77	0.59	0.30	0.10e	no flow	0.21e	0.29	3.64	21.3
31	45.6	—	11.8	—	0.70	—	0.09e	no flow	—	0.29	—	29.6
Mean	41.6	11.2	5.41	3.58	1.32	1.76	0.18	0.01	0.06	0.39	2.37	19.7
Max	207	32.4	11.8	11.0	2.74	6.46	0.27	0.08	0.26	0.92	8.10	143
Min	11.8	4.24	2.87	0.77	0.59	0.30	0.09	0.00	0.00	0.22	0.29	1.68
Ac-Ft	82.4	22.2	10.7	7.11	2.61	3.49	0.36	0.03	0.12	0.76	4.70	39.0

e-estimated or poor data quality



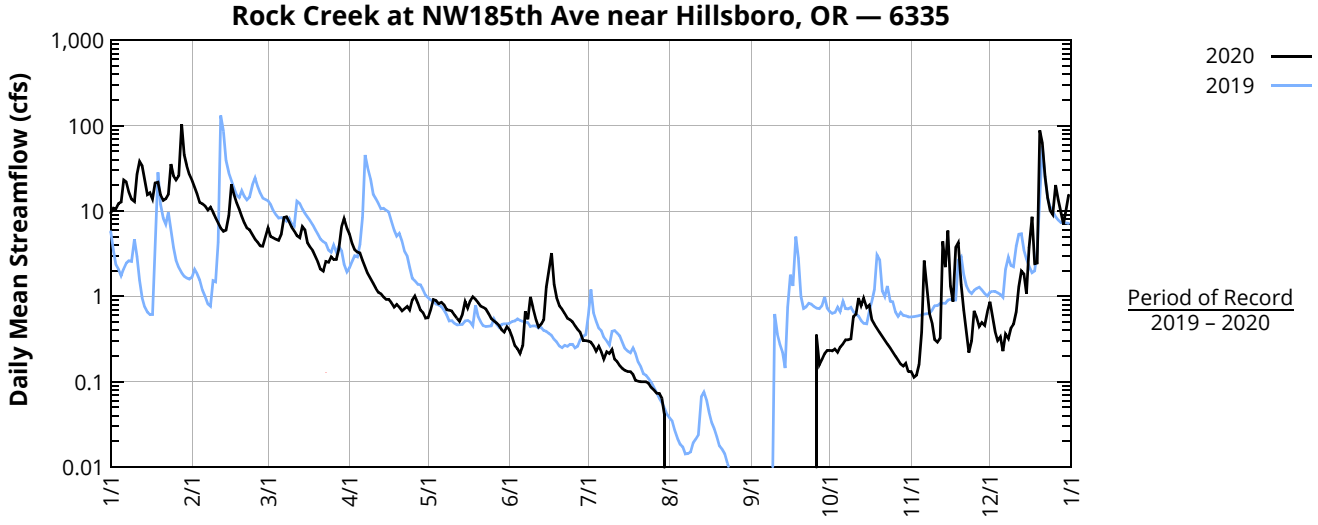
6335 – Rock Creek at NW 185th Ave near Hillsboro, OR – 14206335

Data source: WEST Consultants for Clean Water Services

2020 — MEAN STREAMFLOW (cfs) — 6335

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9.46	23.0e	6.35e	5.38e	0.56e	0.40	0.30	no flow	no flow	0.23	0.13	0.87
2	10.8	19.1e	5.05e	4.18e	0.70e	0.33	0.29	no flow	no flow	0.23	0.11	0.57
3	10.6	15.8e	4.88e	3.53	0.92e	0.26	0.26	no flow	no flow	0.24	0.12	0.39
4	12.3	12.6e	4.68e	3.30	0.90e	0.24	0.23	no flow	no flow	0.22	0.16	0.30
5	12.7	12.2e	4.54e	3.23	0.82e	0.21	0.26	no flow	no flow	0.25	0.38	0.34
6	23.1	11.4e	5.29e	2.64	0.85e	0.26	0.23	no flow	no flow	0.28	2.62	0.23
7	22.0	10.3e	8.42e	2.23	0.80e	0.67	0.18	no flow	no flow	0.31	1.21	0.36
8	16.7	11.1e	8.59e	1.86	0.70e	0.54	0.22	no flow	no flow	0.31	0.64	0.32
9	13.8	9.76e	7.55e	1.61	0.69e	0.98	0.21	no flow	no flow	0.32	0.49	0.42
10	12.9	8.35e	6.48e	1.42	0.67e	0.74	0.24	no flow	no flow	0.58	0.31	0.47
11	27.1	7.25e	5.85e	1.25	0.61e	0.54	0.18	no flow	no flow	0.62	0.29	0.66
12	38.1e	6.31e	5.17e	1.12	0.55e	0.44	0.17	no flow	no flow	0.95	0.32	1.30
13	34.0e	5.78e	4.87	1.07	0.51	0.47	0.15	no flow	no flow	0.77	4.39	1.99
14	23.3	5.94e	6.59	0.99	0.60	0.53	0.14	no flow	no flow	0.95	2.19	1.83
15	15.6	8.96e	6.06e	0.93	0.87	1.28	0.14	no flow	no flow	0.74	5.89	1.07
16	16.4	20.6e	4.25e	0.92	0.73	2.01	0.13	no flow	no flow	0.79	1.32	3.71
17	13.9	15.7e	3.78e	0.85	0.89	3.22	0.13	no flow	no flow	0.53e	0.87	8.60
18	21.4e	12.5e	3.46e	0.75	0.99	1.39	0.12	no flow	no flow	0.47e	3.77	2.41
19	21.8e	10.5e	2.94e	0.81	0.93	0.96	0.10	no flow	no flow	0.42e	4.26	2.44
20	15.5e	8.66e	2.53e	0.75	0.85	0.77	0.10	no flow	no flow	0.38e	1.37	88.1
21	13.3e	7.20e	2.09e	0.68	0.77	0.71	0.10	no flow	no flow	0.34e	0.69	62.4
22	13.9e	6.30e	1.97e	0.72	0.74	0.63	0.10	no flow	no flow	0.31e	0.40	25.6
23	15.7e	6.02e	2.55e	0.76	0.71	0.56	0.10	no flow	no flow	0.28e	0.22	14.4
24	35.5e	5.26e	2.49e	0.69e	0.63	0.53	0.10	no flow	no flow	0.25e	0.30	10.1
25	25.9e	4.68e	2.91e	0.91e	0.55	0.51	0.09	no flow	no flow	0.22e	0.68	9.06
26	23.1e	4.30e	2.71e	1.01e	0.52	0.45	0.08	no flow	0.35e	0.20e	0.57	20.1
27	25.9e	3.91e	2.70e	0.84e	0.49	0.41	0.07	no flow	0.16	0.18e	0.44	13.7
28	104e	3.88e	3.61e	0.69e	0.46	0.38	0.07	no flow	0.18	0.16	0.49	9.62
29	45.7e	23.0	6.50e	0.65e	0.41	0.30	0.06	no flow	0.21	0.15	0.46	7.00
30	34.0e	—	8.14e	0.56e	0.38	0.30	0.04	no flow	0.23	0.17	0.66	10.3
31	26.9e	—	6.29e	—	0.44	—	no flow	no flow	—	0.13	—	15.4
Mean	23.7	9.91	4.82	1.54	0.68	0.70	0.15	0.00	0.04	0.39	1.19	10.1
Max	104	23.0	8.59	5.38	0.99	3.22	0.30	0.00	0.35	0.95	5.89	88.1
Min	9.46	3.88	1.97	0.56	0.38	0.21	0.00	0.00	0.00	0.13	0.11	0.23
Ac-Ft	47.1	19.7	9.55	3.06	1.36	1.39	0.30	0.00	0.08	0.77	2.36	20.1

e-estimated or poor data quality



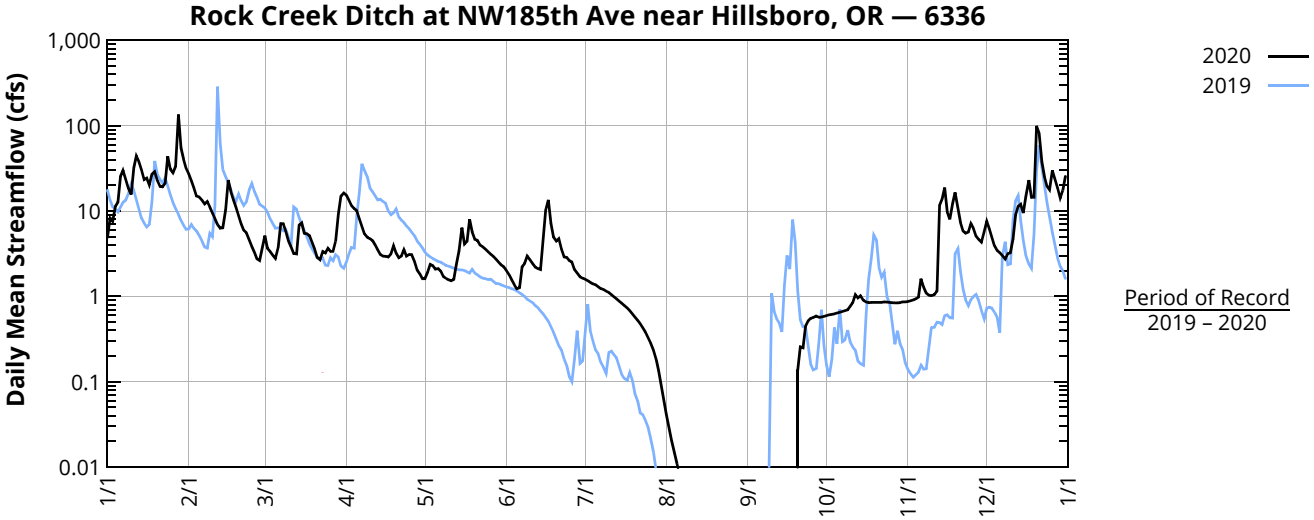
6336 – Rock Creek Ditch at NW 185th Ave near Hillsboro, OR – 14206336

Data source: WEST Consultants for Clean Water Services

2020 — MEAN STREAMFLOW (cfs) — 6336

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.99	27.3	5.19	15.5	1.63e	2.04e	1.60e	0.04e	no flow	0.60e	0.88e	7.66
2	8.36	22.7	3.67	13.5	1.93e	1.81e	1.54e	0.03e	no flow	0.61e	0.90e	6.26
3	7.59	18.8	3.39	11.7	2.39e	1.58e	1.47e	0.02e	no flow	0.62e	0.91e	4.98
4	11.4	15.0	3.05	10.7	2.31e	1.39e	1.41e	0.01e	no flow	0.63e	0.94e	3.96
5	12.8	14.7	2.80	10.2	2.10e	1.24e	1.38e	0.01e	no flow	0.64e	0.99e	3.47
6	25.5	13.5	3.73	8.21	2.13e	1.27e	1.31e	0.008e	no flow	0.66e	1.62e	3.28
7	30.1	12.2	7.15	6.73	1.98e	2.24e	1.25e	0.006e	no flow	0.67e	1.29e	3.03
8	24.0	13.0	7.15	5.45	1.71e	2.44e	1.21e	0.005e	no flow	0.69e	1.10e	2.76
9	18.8	11.3	5.82	4.93	1.64e	3.00e	1.16e	0.004e	no flow	0.70e	1.04e	3.18
10	15.7	9.59	4.52	4.75	1.58e	2.73e	1.12e	0.003e	no flow	0.77e	1.03e	3.25
11	32.2	8.20	3.87	4.54	1.53e	2.42e	1.06e	0.002e	no flow	0.85e	1.05e	4.73
12	44.4	7.03	3.21	4.05	1.59e	2.21e	1.00e	0.002e	no flow	1.06e	1.16e	9.04
13	38.3	6.37	3.16	3.53	2.38	2.13e	0.95e	0.001e	no flow	0.97e	11.7e	11.4
14	30.7	6.39	6.90	3.12	3.44	2.08e	0.89e	0.001e	no flow	1.03e	13.9	12.1
15	23.5	10.5	7.35	2.99	6.44	4.86e	0.84e	no flow	no flow	0.90e	18.9	9.55
16	24.5	23.1	5.53	2.96	4.12	10.2e	0.79e	no flow	no flow	0.87e	9.82	14.9
17	20.5	17.2	5.45	2.90	4.45	13.6	0.74e	no flow	no flow	0.85e	8.02	23.1
18	27.0	13.6	5.20	3.17e	8.04	7.20	0.69e	no flow	no flow	0.86e	12.2	14.6
19	29.0	11.1	4.35	3.95e	5.76	5.01	0.63e	no flow	no flow	0.86e	16.6	14.6
20	22.8	8.91	3.63	3.23e	4.71	4.48	0.58e	no flow	0.14e	0.86e	10.7	99.5
21	19.6	7.14	2.89	2.86e	4.55	4.75	0.53e	no flow	0.26e	0.86e	7.39	82.2
22	19.3	6.01	2.70	2.99e	4.02e	3.63	0.48e	no flow	0.25e	0.86e	5.85	38.2
23	21.2	5.62	3.37	3.55e	3.83e	2.93	0.44e	no flow	0.45e	0.87e	5.55	25.7
24	44.1	4.59	3.25	2.98e	3.59e	2.89	0.39e	no flow	0.52e	0.87e	5.69	19.7
25	31.2	3.86	3.69	3.12e	3.35e	2.64	0.34e	no flow	0.56e	0.86e	7.19	17.8
26	28.3	3.30	3.41	3.11e	3.15e	2.56	0.29e	no flow	0.57e	0.85e	6.29	30.1
27	33.3	2.77	3.39	2.55e	2.96e	2.09e	0.24e	no flow	0.59e	0.84e	5.13	23.9
28	136	2.65	4.44	2.05e	2.76e	1.90e	0.19e	no flow	0.58e	0.84e	4.71	18.6
29	55.0	27.3	9.24	1.85e	2.55e	1.71e	0.14e	no flow	0.58e	0.85e	4.34	14.3
30	40.6	—	15.0	1.63e	2.36e	1.65e	0.09e	no flow	0.59e	0.87e	5.74	17.6
31	31.8	—	16.4	—	2.24e	—	0.06e	no flow	—	0.87e	—	25.5
Mean	29.4	10.9	5.25	5.09	3.14	3.36	0.80	0.00	0.17	0.81	5.75	18.45
Max	136	27.3	16.4	15.5	8.04	13.6	1.60	0.04	0.59	1.06	18.9	99.5
Min	4.99	2.65	2.70	1.63	1.53	1.24	0.06	0.00	0.00	0.60	0.88	2.76
Ac-Ft	58.4	21.7	10.4	10.1	6.22	6.66	1.58	0.01	0.34	1.61	11.4	36.4

e-estimated data or poor data quality



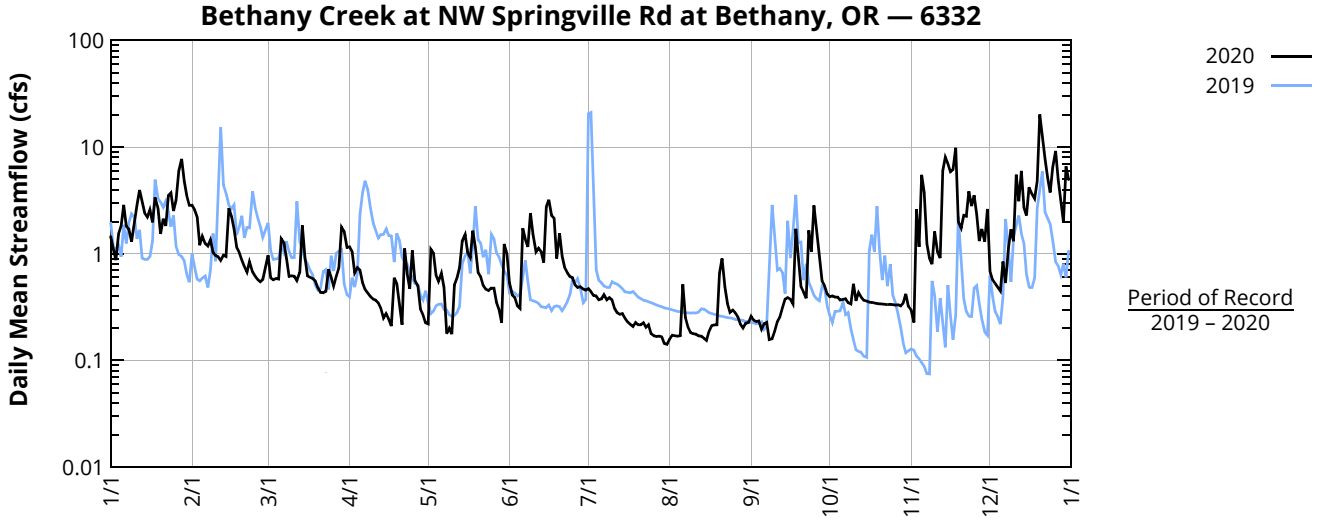
6332 – Bethany Creek at NW Springville Rd at Bethany, OR – 14206332

Data source: WEST Consultants for Clean Water Services

2020 — MEAN STREAMFLOW (cfs) — 6332

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.45	2.85	0.97	1.16	0.22	0.53	0.47	0.16	0.26	0.40	0.30e	0.69e
2	1.11	2.59	0.60	1.05	1.11	0.41	0.44	0.17	0.24	0.40	0.23e	0.57e
3	0.87	2.22	0.57	0.66	1.02	0.39	0.41	0.17	0.23	0.39	2.61e	0.53e
4	1.54	1.20	0.59	0.74	0.63	0.33	0.40	0.17	0.23	0.39	1.16e	0.49e
5	1.83	1.46	0.58	0.70	0.55	0.31	0.37	0.17	0.20	0.37	5.50e	0.45e
6	2.88	1.25	1.39	0.54	0.66	1.74	0.38	0.52	0.22	0.37	3.77e	0.85e
7	1.82	1.18	1.27	0.46	0.48	1.37	0.42	0.25	0.23	0.38	1.24e	0.53e
8	1.71	1.35	0.91	0.43	0.18	1.16	0.37	0.21	0.16	0.35	0.91e	1.12e
9	1.30	1.03	0.61	0.40	0.20	2.41	0.39	0.18	0.16	0.34e	0.80e	1.70e
10	1.96	0.96	0.62	0.38	0.18	1.52	0.37	0.18	0.19	0.52e	1.62e	1.31e
11	2.88	0.94	0.62	0.37	0.51	1.04	0.31	0.18	0.23	0.36e	1.05e	5.53e
12	3.96	0.87	0.56	0.35	0.59	1.13	0.28	0.17	0.26	0.43e	0.91e	3.12e
13	3.10	0.98	0.67	0.31	0.74	1.05	0.27	0.17	0.31	0.39e	6.02e	5.98e
14	2.42	0.95	1.85	0.25	1.32	0.83	0.28	0.16	0.38	0.37e	8.06e	2.73e
15	2.21	2.69	0.94	0.28	1.51	2.74	0.25	0.15	0.39	0.36e	7.05e	2.29e
16	2.58	2.27	0.62	0.24	1.02	3.21	0.23	0.19	0.38	0.35e	5.87e	4.19e
17	1.97	1.73	0.60	0.21	0.92	2.28	0.22	0.21	0.34	0.35e	6.15e	3.62e
18	3.37	1.15	0.59	0.60	1.65	2.16	0.21	0.22	1.72	0.35e	9.86e	3.29e
19	2.70	1.03	0.56	0.53	1.15	0.90	0.23	0.22	0.91	0.34e	2.00e	4.78e
20	1.54	0.88	0.48	0.34	0.67	1.56	0.22	0.66	0.49	0.34e	1.75e	20.2e
21	2.13	0.76	0.44	0.22	0.61	0.95	0.22	0.91	0.44	0.34e	2.30e	13.0e
22	1.83	0.68	0.43	1.12	0.51	0.74	0.23	0.49	0.38	0.34e	2.25e	7.74e
23	3.51	0.85	0.45	0.65	0.47	0.66	0.20	0.34	1.66	0.34e	3.84e	5.20e
24	3.73	0.68	0.72	0.47	0.45	0.61	0.22	0.28	1.05	0.34e	2.81e	3.77e
25	2.52	0.62	0.61	1.08	0.48	0.60	0.18	0.30	2.84	0.33e	3.54e	6.47e
26	3.18	0.57	0.50	0.56	0.48	0.51	0.17	0.28	1.78	0.33e	2.34e	9.23e
27	5.95	0.55	0.62	0.50	0.35	0.48	0.17	0.26	0.96	0.33e	1.32e	4.98e
28	7.73	0.58	0.73	0.30	0.30	0.49	0.17	0.22	0.55	0.33e	1.71e	3.13e
29	4.81	2.85	1.79	0.27	0.23	0.47	0.17	0.20	0.50	0.35e	1.30e	1.98e
30	3.51	—	1.63	0.23	1.24	0.46	0.14	0.22	0.42	0.42e	2.63e	6.65e
31	2.85	—	1.15	—	1.01	—	0.14	0.23	—	0.32e	—	4.97e
Mean	2.74	1.24	0.79	0.51	0.69	1.10	0.27	0.27	0.60	0.37	3.03	4.23
Max	7.73	2.85	1.85	1.16	1.65	3.21	0.47	0.91	2.84	0.52	9.86	20.2
Min	0.87	0.55	0.43	0.21	0.18	0.31	0.14	0.15	0.16	0.32	0.23	0.45
Ac-Ft	5.44	2.47	1.58	1.02	1.37	2.18	0.54	0.53	1.20	0.72	6.01	8.39

e-estimated or poor data quality



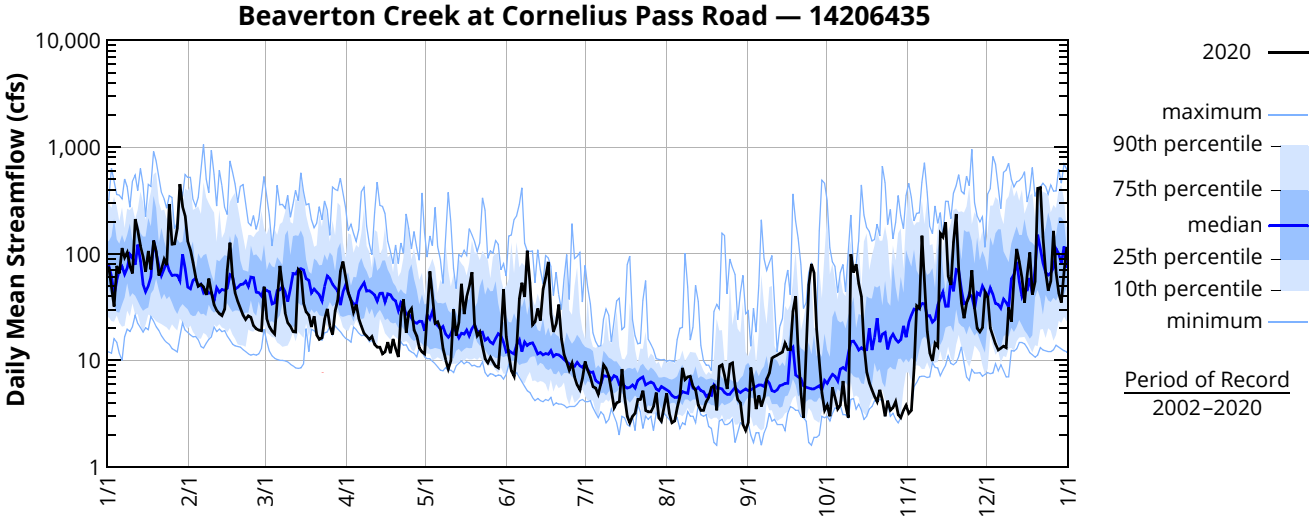
BVTS – Beaverton Creek at Cornelius Pass Road – 14206435

Data source: WEST Consultants for Clean Water Services
River Mile: 1.2 *Latitude:* 45 31 15 *Longitude:* 122 53 59

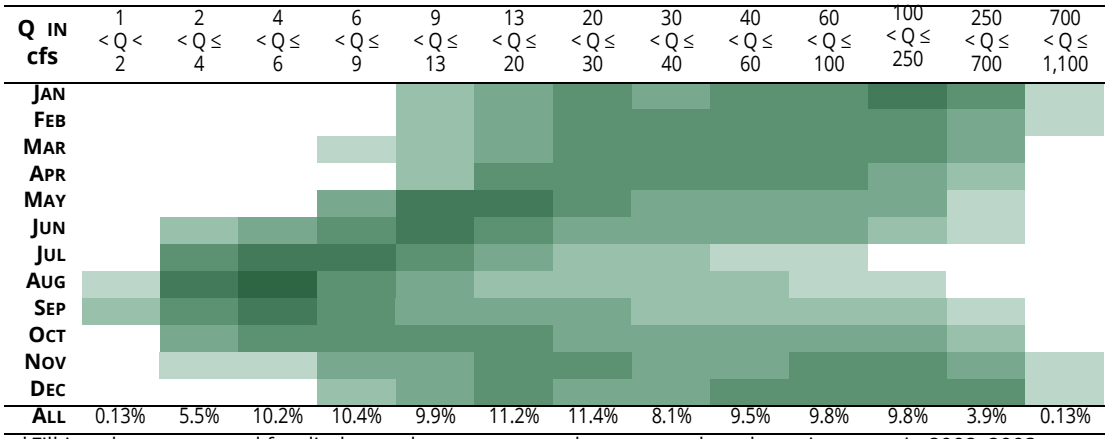
2020 — MEAN STREAMFLOW (cfs) — BVTS

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	74.1	109	49.2	60.5	11.5	16.8	9.82	4.94	2.64	3.77e	3.23e	39.4
2	47.5	83.0	24.7	43.3	29.3	11.3	8.12	3.18	8.64	2.95e	3.40e	20.2
3	32.0	60.2	20.8	36.5	68.5	8.01	6.98	2.57	5.94	5.58e	8.47e	16.8
4	76.9	49.6	18.8	28.2	41.1	7.10	5.72	2.66	3.47	4.49e	32.6	14.2
5	65.4	51.7	17.7	33.4	22.3	13.1	5.46	3.58	4.74	3.48e	30.8	12.5
6	113	49.0	34.6	24.8	23.1	37.9	4.77	4.57	3.70	3.75e	148	13.0
7	92.2	41.2	76.9	21.0	19.6	53.5	5.98	8.51	4.50	6.36e	52.7	13.6
8	103	58.7	49.4	17.9	12.9	39.4	9.11	6.63	6.61	3.76e	18.8	13.2
9	77.0	43.2	27.9	16.9	10.1	107	8.40	7.02	7.55	2.94e	11.8	31.5
10	65.5	33.1	22.6	15.8	8.28	53.3	7.07	7.10	10.5	99.1e	9.87	23.1
11	211	29.5	20.9	16.8	9.93	21.6	5.19	5.68	10.9	66.6	14.5	59.1
12	165	27.4	18.6	14.1	30.2	23.1	3.61	5.27	11.2	79.6	13.5	111
13	118	26.3	18.5	13.3	17.1	30.7	4.01	3.75	11.6	52.7	155	84.1
14	94.7	30.2	71.4	13.3	22.7	23.6	4.07	3.39	12.0	39.7	144	59.3
15	67.7	70.4	67.6	11.5	52.3	46.3	8.34	3.41	14.5	13.9	198	34.8
16	106	127	34.5	12.0	27.2	59.6	4.60	4.06	12.7	7.75	61.9	64.4
17	71.2	61.4	28.5	14.8	39.4	84.0	2.98	4.50	12.6	6.17	51.1	103
18	133	43.2	26.7	11.7	49.1	27.3	2.60	5.63	28.8	5.26e	128	41.5
19	105	35.8	20.6	15.9	67.4	18.5	2.99	5.81	39.9	4.63e	236	55.1
20	62.4	31.0	25.9	13.0	21.8	22.0	3.15	3.39	12.1	4.12e	69.0	410
21	71.6	26.6	17.3	10.8	17.0	33.4	4.26	8.75	4.94	5.26e	34.7	417
22	89.1	24.2	15.8	26.6	18.5	15.9	4.31	9.13	2.92	4.17e	24.9	144
23	78.4	26.2	16.3	37.6	13.4	11.4	5.15	7.19	11.6	3.03e	34.7	66.8
24	292	25.4	24.3	18.2	10.4	9.67	3.37	5.43	50.9	4.17e	39.7	45.1
25	123	21.2	30.4	28.1	9.47	8.07	3.34	9.18	80.2	3.39e	70.1	54.9
26	124	19.8	21.1	30.5	10.7	9.42	3.33	9.53	66.8	3.63e	30.6	164
27	174	19.3	17.5	19.4	9.72	7.01	3.67	5.78	19.6	4.10e	20.0	66.6
28	450	19.0	29.1	17.0	8.78	5.89	4.97	4.29	9.54	3.05e	18.5	42.8
29	277	36.2	36.7	13.1	8.46	5.30	2.88	3.97	4.95e	2.91e	20.2	34.8
30	228	—	68.4	12.0	17.6	6.80	2.72	2.50	3.40e	3.35e	43.7	68.5
31	132	—	84.4	—	46.6	—	3.68	2.21	—	3.75e	—	113
Mean	126	44.1	33.5	21.6	24.3	27.2	4.99	5.28	16.0	14.8	57.6	78.6
Max	450	127	84.4	60.5	68.5	107	9.82	9.53	80.2	99.1	236	417
Min	32.0	19.0	15.8	10.8	8.28	5.30	2.60	2.21	2.64	2.91	3.23	12.5
Ac-Ft	7775	2536	2057	1285	1496	1620	307	325	951	907	3427	4834

e-estimated data or poor data quality



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — BVTS



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2002–2020

*Fill-in values were used for discharge that was reported as greater than the rating curve in 2002–2003.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — BVTS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002		61.9	52.9	25.8	12.8	8.77	5.97	4.24	4.56	9.48	15.5	
2003	77.1	48.3	82.9	74.1	24.0	10.5	7.43	6.78	5.87	13.8	20.6	93.3
2004	115	80.7	35.5	19.3	13.1	10.1	7.52	7.46	9.08	29.1	25.0	37.6
2005	31.4	17.8	15.1	44.6	45.0	25.4	10.7	6.85	6.14	23.4	57.2	79.8
2006	272	42.7	49.5	38.5	21.3	14.0	8.24	6.22	7.69	10.8	130	88.6
2007	53.5	60.0	51.7	35.3	16.9	10.8	6.23	5.00	4.52	19.3	22.6	126
2008	145	44.9	46.7	30.1	15.8	9.33	5.02	5.93	4.64	4.61	27.4	21.9
2009	32.1	18.6	30.1	21.5	25.9	9.54	4.32	4.67	4.22	13.3	77.9	25.8
2010	101	60.7	44.0	51.0	35.1	39.8	9.57	7.97	12.9	14.4	54.5	143
2011	65.4	50.8	114	57.2	33.6	18.7	14.3	8.81	5.23	7.60	43.7	16.7
2012	74.5	46.9	102	65.9	30.5	22.4	7.12	5.90	5.23	29.9	86.2	154
2013	36.5	29.3	23.0	20.2	16.3	13.8	5.58	4.74	17.1	13.2	24.7	14.6
2014	19.1	67.9	66.0	53.4	28.4	11.3	6.08	3.95	3.24	25.7	34.3	59.6
2015	26.5	35.2	28.5	23.3	10.2	4.33	4.07	3.24	5.06	6.06	27.5	269
2016	149	67.1	85.2	25.6	12.8	8.39	5.60	3.81	5.04	70.6	59.2	63.5
2017	58.7	265	136	49.8	19.0	11.4	5.20	4.44	6.00	14.8	94.1	36.4
2018	92.6	36.3	32.6	30.9	9.96	7.52	2.99	2.78	3.88	6.08	11.9	51.3
2019	30.3	43.0	25.5	32.6	13.7	7.87	5.06	3.72	12.8	8.73	9.44	28.2
2020	103	34.5	25.9	17.0	18.5	20.1	4.31	4.94	10.7	4.17	33.7	54.9
median	71.2	47.2	48.6	36.1	18.5	11.4	6.43	5.13	5.99	12.8	34.8	58.9

KEY

Q in cfs

$Q \leq 3.84$
$3.84 < Q \leq 4.77$
$4.77 < Q \leq 5.82$
$5.82 < Q \leq 7.04$
$7.04 < Q \leq 10.3$
$10.3 < Q \leq 15.0$
$15.0 < Q \leq 21.9$
$21.9 < Q \leq 56.6$
$56.6 < Q \leq 133$
$133 < Q \leq 221$
$Q > 221$

Q as percentile

$Q \leq$ 5th
5th $< Q \leq$ 10th
10th $< Q \leq$ 15th
15th $< Q \leq$ 20th
20th $< Q \leq$ 30th
30th $< Q \leq$ 40th
40th $< Q \leq$ 50th
50th $< Q \leq$ 75th
75th $< Q \leq$ 90th
90th $< Q \leq$ 95th
$Q >$ 95th

2020

- Except during periods of rainfall, flow in 2020 was well below the median. Record low flows were set for 36 days in all. Low flow records were set in every month from March–November except May and September.
- Intermittent storms throughout the year caused high flows; record high flows were recorded in January, June, September, October, November and December. The high flows were short-lived which is typical for this site.

CHANGE IN MEASUREMENT

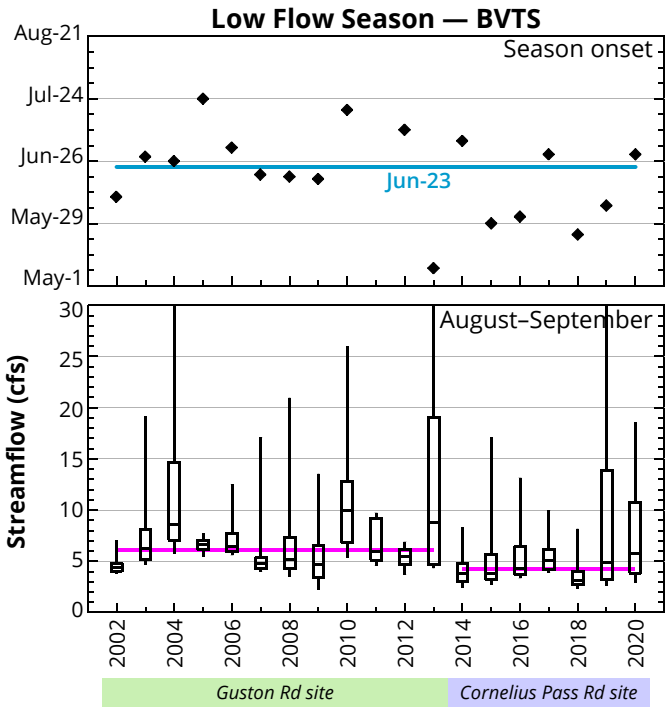
- OWRD monitored flow at this site from 2002 through 2007. Beginning in 2008, monitoring was done by WEST Consultants.
- In June 2014, the site was relocated from Guston Rd to Cornelius Pass Rd which is about 900 ft downstream. The site was relocated because the Guston Rd site had issues with backwater.
- Measured low flows at the Guston Rd site were higher than those at the Cornelius Pass Rd site. Despite considerable variability, the difference is statistically significant. High flows do not show any difference between the site locations.
- Reasons for the low flow difference include:
  - —Backwater issues may have artifically increased low flow measurements at the Guston Rd site.
  - —The flow regime truly may have changed.

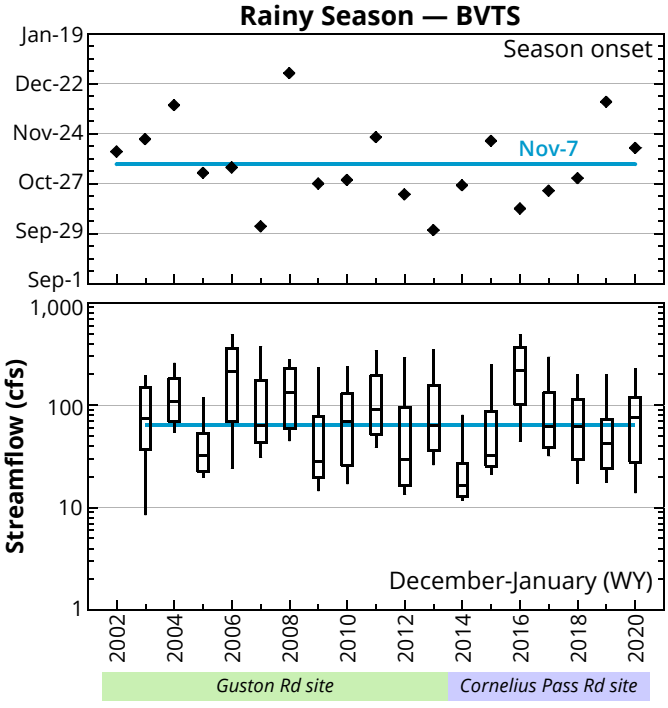
LOW FLOW

- July through September are the months with the lowest average flow and the lowest daily flows.
- Although the August–September median flows are low, higher flows in these months are not uncommon. This pattern is typical of flashy urban streams such as Beaverton Creek.
- Low flow criterion: 7d-Q ≤ 9 cfs (~25th pctl)

RAINY SEASON FLOW

- December and January are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 60 cfs (~75th pctl)





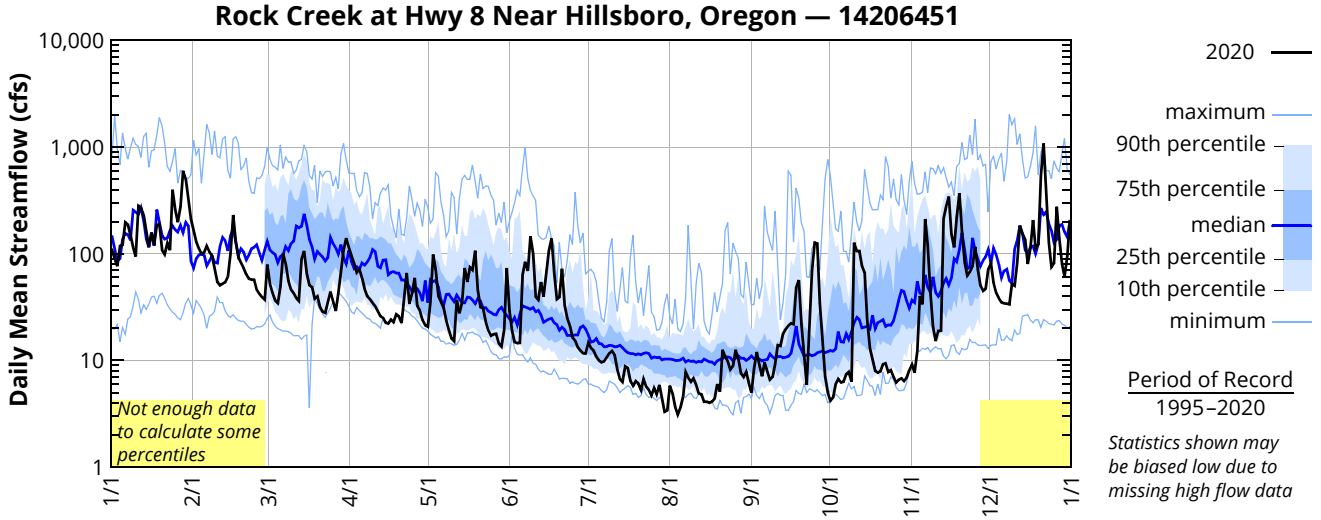
RCTV – Rock Creek at Hwy 8 near Hillsboro, Oregon – 14206451**

Data source: WEST Consultants for Clean Water Services
River Mile: 1.2 *Latitude:* 45 30 08 *Longitude:* 122 56 52

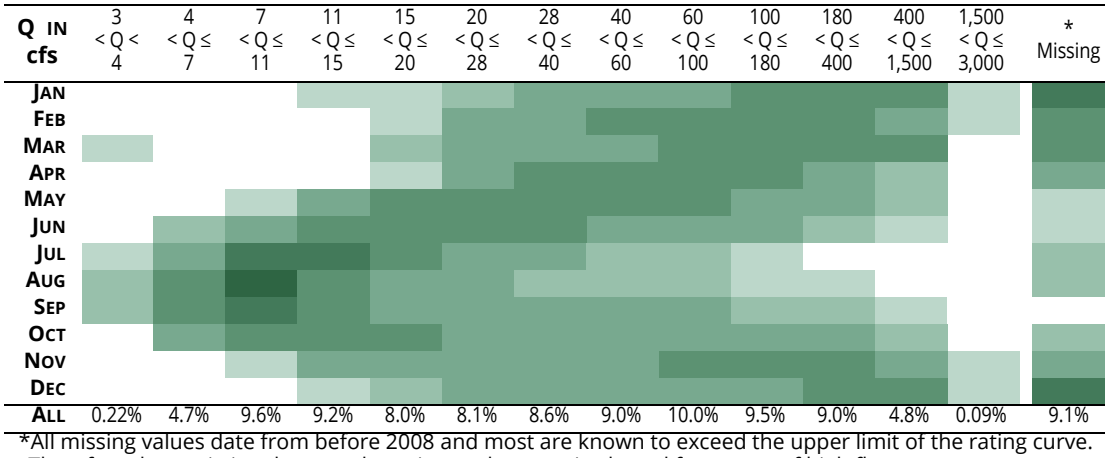
2020 — MEAN STREAMFLOW (cfs) — RCTV

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	109	166	79.2	115	20.7	29.3	14.6	5.83	5.03	4.23	9.22	81.4
2	89.8	130	52.2	96.8	35.0	19.0	13.1	4.86	8.43	4.46	7.68	53.8
3	76.6	112	43.1	81.3	98.3	14.9	12.4	3.67	12.0	5.98	12.2	43.0
4	118	99.9	36.4	66.9	70.8	14.5	10.9	3.12	9.09	6.71	40.2	38.5
5	121	103	34.4	71.6	40.1	14.6	10.0	3.59	7.09	6.20	33.6	35.0
6	197	118	48.9	59.7	35.5	63.6	9.64	4.64	9.57	6.31	212	34.3
7	188	104	101	46.9	31.2	84.1	9.80	7.84	7.92	7.44	120	34.1
8	150	95.7	81.0	39.9	23.8	69.3	10.7	6.90	6.56	7.80	43.1	33.5
9	115	72.2	55.9	37.7	19.3	146	11.7	6.27	7.02	6.32	20.7	52.0
10	94.4	54.6	46.4	34.7	16.1	100	12.3	6.83	9.34	127	15.2	50.2
11	281	50.7	42.7	32.3	15.2	39.6	11.3	5.86	13.9	106	18.9	82.3
12	270	52.5	38.4	28.9	37.0	37.0	8.22	4.85	13.7	106	19.0	184
13	230	54.1	36.1	25.9	27.6	54.3	6.69	4.81	17.8	77.4	213	155
14	162	61.1	88.8	25.0	35.0	39.7	6.29	4.13	19.7	66.7	276	136
15	116	99.3	106	22.5	73.5	66.5	8.81	4.10	21.1	23.8	344	80.3
16	158	231	64.8	22.1	54.6	106	8.51	3.99	22.3	13.0	153	114
17	121	130	50.9	24.1	74.6	139	6.38	4.10	21.8	10.2	115	207
18	185	94.0	48.7	22.8	70.6	67.5	5.82	4.43	47.8	7.95	219	112
19	190	82.3	38.0	27.0	107	37.5	6.41	6.03	56.7	7.69	369	123
20	108	73.5	40.0	25.9	45.8	39.2	6.13	5.14	21.8	7.94	162	538
21	98.9	64.1	31.7	22.4	31.6	72.3	5.33	12.6	10.5	9.20	82.8	1080
22	126	58.2	28.7	38.0	30.9	32.8	6.74	10.9	5.89	9.41	62.3	418
23	108	57.3	27.9	66.2	23.1	25.0	5.74	9.84	19.9	7.76	67.6	126
24	398	57.2	34.9	33.9	19.2	21.1	5.31	8.24	69.3	8.09	76.8	75.1
25	259	46.2	44.1	41.9	17.0	16.4	4.71	8.94	127	6.98	116	81.3
26	198	42.1	36.0	59.5	17.6	15.3	5.51	12.6	125	6.22	71.5	276
27	277	39.2	29.1	32.5	17.8	13.3	4.81	10.4	34.3	6.63	50.5	141
28	600	37.1	43.0	29.2	14.4	12.4	5.92	7.62	14.1	6.83	44.9	80.2
29	501	55.5	69.2	23.9	13.5	11.7	4.35	6.97	7.12	6.38	47.0	61.3
30	327	—	109	21.4	19.4	11.6	3.30	7.75	4.98	6.86	71.5	95.2
31	212	—	140	—	73.7	—	3.44	6.10	—	8.11	—	202
Mean	200	84.2	55.7	42.5	39.0	47.1	7.90	6.55	25.2	22.3	103	156
Max	600	231	140	115	107	146	14.6	12.6	127	127	369	1080
Min	76.6	37.1	27.9	21.4	13.5	11.6	3.30	3.12	4.98	4.23	7.68	33.5
Ac-Ft	12267	4841	3424	2531	2400	2804	486	403	1501	1372	6136	9567

**Site moved 120 feet downstream in 2012, previous ID was 14206450



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — RCTV



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1995–2020

*All missing values date from before 2008 and most are known to exceed the upper limit of the rating curve. Therefore the statistics above underestimate the magnitude and frequency of high flow.

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — RCTV

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1995				102	40.2	22.2	12.3	10.2	9.5	24.9		
1996					161	30.0	15.8	10.2	15.9	50.8		
1997				81.0	41.8	38.4	16.5	11.3	15.1			
1998				53.3	153	35.4	18.3	14.3	13.7	26.9		
1999				60.8	39.6	22.0	15.8	14.9	12.0	14.3		
2000		206	149	37.2	30.0	17.9		11.7	12.9	26.6	20.1	61.2
2001	37.5	41.1	35.9	38.1	17.9	16.0	9.8	9.5	8.6	13.7	83.6	
2002			125	41.1	22.8	16.8	13.2	10.0	9.4	17.7	27.0	133
2003			368	155	37.8	17.3	12.5	12.0	11.1	23.3	30.6	178
2004	288		61.6	30.4	18.8	16.2	11.5	11.3	14.0	31.4	30.6	50.5
2005	52.2	30.4	21.6	81.0	82.4	32.7	16.4	13.0	10.7	31.1	104	
2006			118	70.9	28.4	26.7	11.1	10.8	11.9	15.8	447	
2007		147	182	53.5	22.5	19.2	10.7		17.4	26.3	35.4	
2008	334	127	121	68.0	33.7	16.5	8.7	9.0	6.1	7.8	44.7	31.3
2009	102	45.1	71.3	49.7	54.7	28.1	7.6	7.0	8.0	25.2	177	59.9
2010	377	217	151	176	67.0	85.3	19.8	15.8	20.7	19.9	122	352
2011	231	103	265	118	64.8	29.9	19.5	9.0	6.8	18.6	43.8	30.0
2012	104	96.7	291	118	66.0	37.6	14.0	9.8	8.2	49.1	126	434
2013	91.1	70.7	56.0	41.5	24.2	32.4	9.6	7.3	28.2	19.8	42.2	26.8
2014	43.6	132	135	122	47.7	19.6	12.6	5.9	5.2	50.4	61.8	143
2015	54.0	53.4	53.7	55.5	18.2	7.8	5.8	4.5	8.1	10.5	68.4	433
2016	357	181	226	53.6	21.9	15.3	10.3	5.8	9.5	108	111	196
2017	147	404	295	137	62.5	20.8	8.2	7.2	8.1	24.2	146	92.0
2018	182	93.1	96.5	79.2	20.1	12.4	6.1	5.6	5.9	8.5	19.8	131
2019	89.0	92.8	57.6	69.2	25.8	15.3	13.2	7.2	24.3	16.6	18.9	63.5
2020	162	72.9	44.1	33.2	31.2	37.3	6.7	6.0	13.8	7.8	69.6	82.3
median	156	103	113	67.8	35.4	22.8	12.1	10.1	11.4	21.8	65.7	123

KEY

Q in cfs
Q ≤ 6.8
6.8 < Q ≤ 8.9
8.9 < Q ≤ 11.0
11.0 < Q ≤ 12.0
12.0< Q ≤ 17.0
17.0< Q ≤ 24.0
24.0 < Q ≤ 35.0
35.0 < Q ≤ 103
103 < Q ≤ 261
261 < Q ≤ 410
Q > 410

Q as percentile
Q ≤ 5th
5th < Q ≤ 10th
10th < Q ≤ 15th
15th < Q ≤ 20th
20th < Q ≤ 30th
30th < Q ≤ 40th
40th < Q ≤ 50th
50th < Q ≤ 75th
75th < Q ≤ 90th
90th < Q ≤ 95th
Q > 95th

2020

- Baseflows in 2020 were well below the median. Record low flows were set for 31 days in months spaced throughout the year (March, April, June, July, August, October and November).
- Storms scattered throughout most of the year (except late June–August) caused the highest flows, including record high flows on 7 days. High flows were short-lived as is typical for this site.

CHANGE IN MEASUREMENT

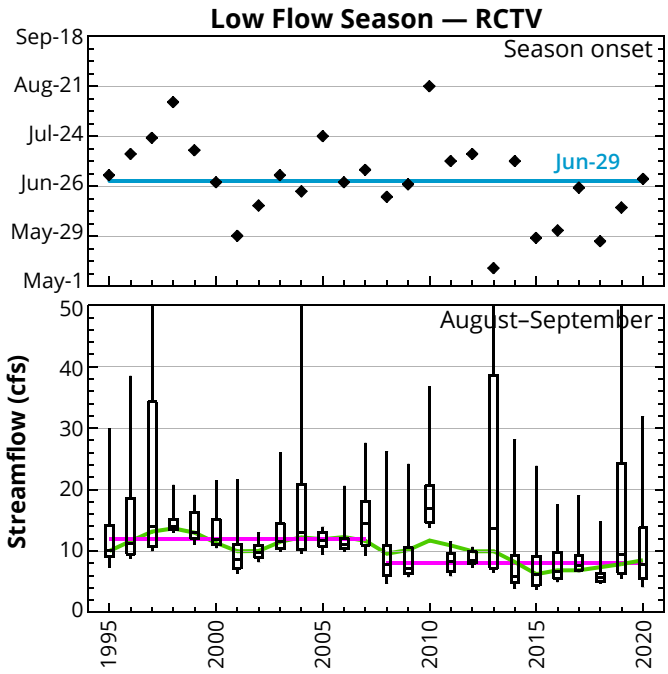
- OWRD monitored flow at this site from 1995 through 2007 using the stage-discharge method. Beginning in 2008, monitoring was done by WEST Consultants who switched to the index velocity method because of backwater issues at this site.
- Flows during the August–September period from 2007 and before (OWRD) are higher than those from 2008 to present (WEST Consultants). Despite considerable variability, the difference is statistically significant. These differences are probably due to differences in monitoring methods. Backwater issues that may affected the rating curve theregby artifically increasing low flow data before 2008. The new method would not be similarly affected by backwater. True changes in the flow regime are also possible.

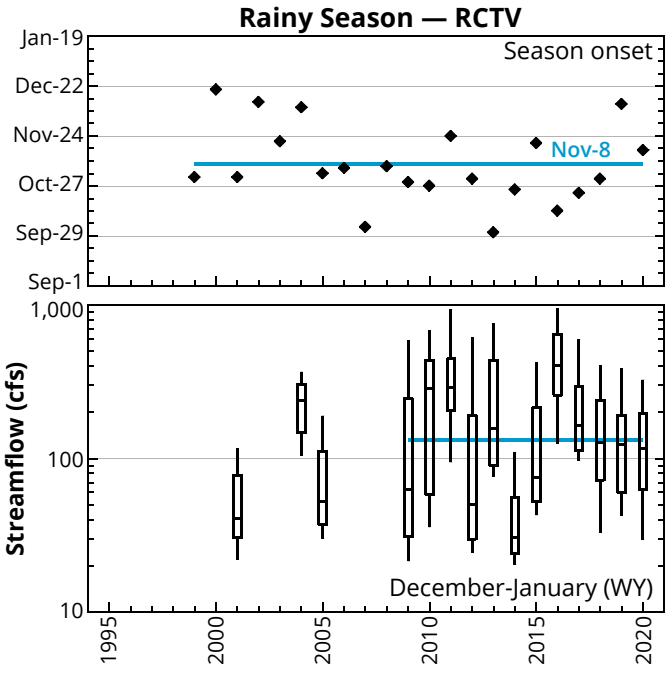
LOW FLOW

- July through September are the months with the lowest average flow and the lowest daily flows.
- Although the August–September median flows are low, higher flows in these months are not uncommon. This pattern is typical of flashy urban streams such as Rock Creek.
- Low flow criterion: 7d-Q ≤ 15 cfs (~25th pctl)
- Low flow appears to be occurring earlier in recent years. Since 2013 only two years have had low flow onset after the POR median and one of those was just a day later. The trend is not statistically significant at this time.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 100 cfs (~74th pctl)
- Boxplots and onset of rainy season flow are not shown for years with too much missing data.



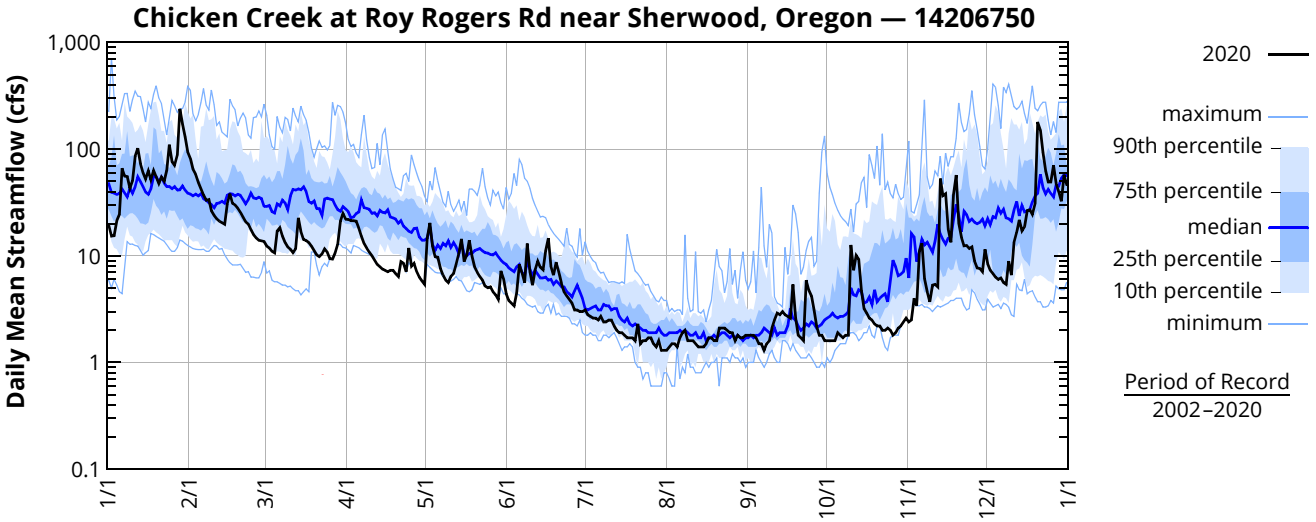


CCSR — Chicken Creek at Roy Rogers Rd near Sherwood, Oregon — 14206750

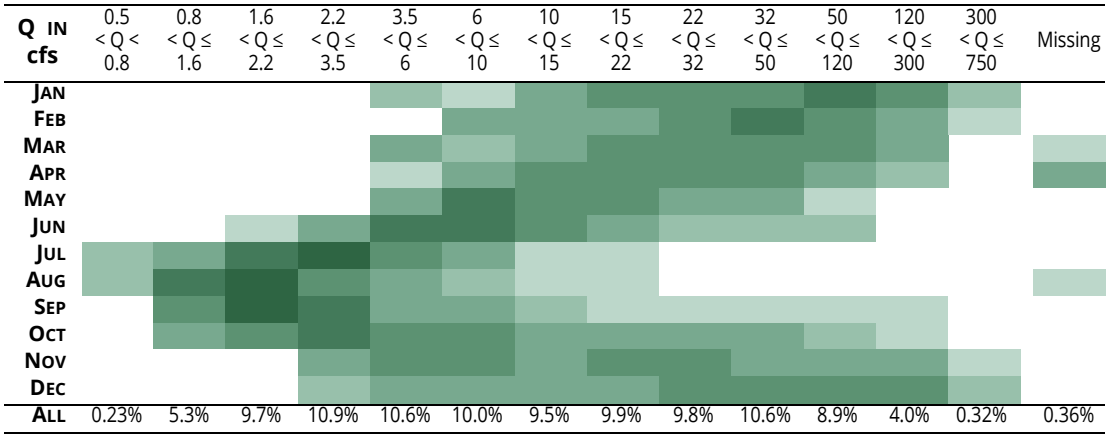
Data source: WEST Consultants for Clean Water Services
River Mile: 2.3 *Latitude:* 45 22 31 *Longitude:* 122 51 24

2020 — MEAN STREAMFLOW (cfs) — CCSR

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19.4	81.5	13.6	22.0	5.42	4.38	3.09	1.25	1.79	1.57	2.44	8.43
2	15.3	64.7	12.3	21.9	14.6	3.83	2.76	1.39	1.80	1.59	2.47	7.31
3	15.4	57.9	11.8	21.3	20.3	3.57	2.69	1.46	1.75	1.61	3.97	6.76
4	21.3	49.1	11.0	21.3	12.3	3.38	2.61	1.52	1.68	1.63	3.37	6.31
5	24.3	42.6	10.6	21.1	9.77	4.46	2.58	1.44	1.53	1.91	11.0	6.03
6	66.3	37.1	17.1	18.2	9.74	8.28	2.48	1.66	1.46	1.77	13.1	6.20
7	55.9	33.1	18.4	15.3	7.59	7.03	2.70	1.88	1.32	1.73	6.12	5.55
8	55.4	33.7	15.3	13.0	6.60	5.55	2.43	2.01	1.54	1.76	4.55	5.39
9	42.8	26.4	13.3	11.8	5.92	13.0	2.36	1.57	1.64	1.76	3.72	8.94
10	50.2	23.9	12.1	10.8	5.62	7.09	2.47	1.55	2.14	12.6	5.28	6.60
11	86.2	22.2	11.5	10.0	6.36	5.33	2.48	1.56	2.52	7.25	5.38	13.3
12	102	21.1	10.7	9.12	6.80	7.28	2.22	1.46	2.89	10.1	5.12	16.6
13	73.0	20.5	11.6	8.30	8.32	8.94	2.02	1.42	2.82	9.32	52.9	21.7
14	60.1	19.8	22.7	7.89	10.5	7.76	1.91	1.44	2.97	4.68	36.6	17.1
15	52.3	30.6	16.9	7.50	14.4	7.37	1.88	1.43	2.81	3.24	38.1	18.7
16	62.6	38.2	14.2	7.27	8.77	11.1	1.82	1.52	2.69	2.94	17.8	26.5
17	51.4	31.0	13.9	7.05	10.1	14.6	1.71	1.66	2.60	2.55	13.4	27.0
18	63.1	29.9	13.3	7.30	14.0	7.98	1.70	1.69	5.43	2.48	37.5	24.3
19	55.2	27.9	12.3	7.25	9.89	6.58	1.72	1.57	2.63	2.32	57.1	30.7
20	47.5	25.6	11.2	6.75	7.91	8.71	1.63	1.62	1.76	2.24	20.2	180
21	54.6	22.9	10.2	6.38	6.96	7.09	2.28	2.14	1.73	2.15	14.9	151
22	50.0	20.8	9.77	8.76	6.44	5.49	1.52	2.13	1.60	1.98	12.4	93.4
23	63.4	19.8	10.4	8.49	5.91	4.60	1.59	2.10	5.85	2.03	12.5	62.4
24	110	17.6	11.6	7.12	5.24	4.23	1.58	1.97	4.76	2.11	11.7	49.2
25	76.2	15.8	10.8	11.8	5.04	3.93	1.67	1.93	4.19	1.95	12.1	49.2
26	70.4	14.7	9.43	7.99	5.08	3.64	1.66	1.89	3.10	1.83	8.86	70.6
27	87.5	14.0	9.34	8.52	4.55	3.11	1.50	1.64	2.17	1.92	7.73	48.1
28	239	13.8	10.6	7.11	4.25	3.06	1.41	1.80	1.83	2.06	7.60	39.8
29	170	15.5	12.8	6.32	3.91	3.02	1.59	1.72	1.80	2.20	7.11	32.4
30	130	—	21.1	5.80	7.21	2.96	1.28	1.73	1.61	2.40	11.5	57.4
31	94.1	—	24.9	—	6.10	—	1.27	1.79	—	2.64	—	46.7
Mean	69.8	30.1	13.4	11.1	8.25	6.25	2.02	1.68	2.48	3.17	14.9	36.9
Max	239	81.5	24.9	22.0	20.3	14.6	3.09	2.14	5.85	12.6	57.1	180
Min	15.3	13.8	9.34	5.80	3.91	2.96	1.27	1.25	1.32	1.57	2.44	5.39
Ac-Ft	4294	1729	823	661	507	372	124	103	148	195	886	2268



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — CCSR



MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — CCSR

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002	65.0	48.5	46.5		9.80	5.00	2.20	1.70	1.70	2.70	6.95	30.0
2003	33.0	39.1	47.9	36.3	14.6	6.08	2.49	1.52	1.98	4.31	7.26	37.0
2004	45.2	43.2	21.7	12.8	6.82	4.22	1.50	1.27	1.93	4.47	5.68	14.7
2005	15.1	9.74	6.59	23.7	23.0	6.80	2.17	1.04	1.29	3.16	18.1	32.8
2006	180	31.2	30.2	20.8	9.49	5.37	2.33	1.47	1.26	2.50	54.0	62.4
2007	37.7	37.7	33.7	26.5	11.2	4.79	2.22	1.91	3.06	20.4	30.8	62.1
2008	61.1	44.9	41.9	27.2	14.4	7.23	2.92	3.16	3.51	4.37	7.97	8.68
2009	20.5	11.7	19.5	13.1	16.8	6.88	2.43	1.48	2.03	4.20	21.3	16.8
2010	66.6	36.7	36.5	28.0	16.4	21.2	4.05	1.82	2.83	4.29	27.7	77.3
2011	51.6	33.6	76.5	39.7	18.7	10.3	5.59	1.93	2.12	4.51	9.08	5.94
2012	40.5	34.8	67.7	43.0	22.9	11.9	5.59	2.33	1.83	10.1	25.7	102
2013	19.4	16.7	16.7	14.1	7.74	11.5	3.49	1.95	4.04	14.1	21.4	8.12
2014	15.5	42.0	43.2	30.1	14.9	6.04	3.38	2.15	2.18	4.02	15.7	39.3
2015	19.1	29.5	25.0	17.6	7.10	3.35	1.87	1.78	1.80	2.17	15.1	167
2016	74.0	43.5	49.1	15.3	7.34	4.52	2.57	1.84	2.12	26.5	32.9	53.2
2017	42.4	141	88.1	34.3	19.2	9.64	4.07	2.39	3.20	4.36	41.0	30.0
2018	55.4	27.5	32.7	33.2	8.39	5.50	1.68	1.49	1.47	3.00	3.86	23.0
2019	24.3	35.0	20.6	23.8	8.85	4.17	2.25	1.60	2.63	2.98	3.64	11.1
2020	60.1	26.0	12.1	8.5	8.51	6.96	1.88	1.64	1.99	2.11	11.3	24.3
median	44.4	4.132	32.7	23.1	11.2	6.11	2.55	1.78	2.09	4.10	16.2	33.0

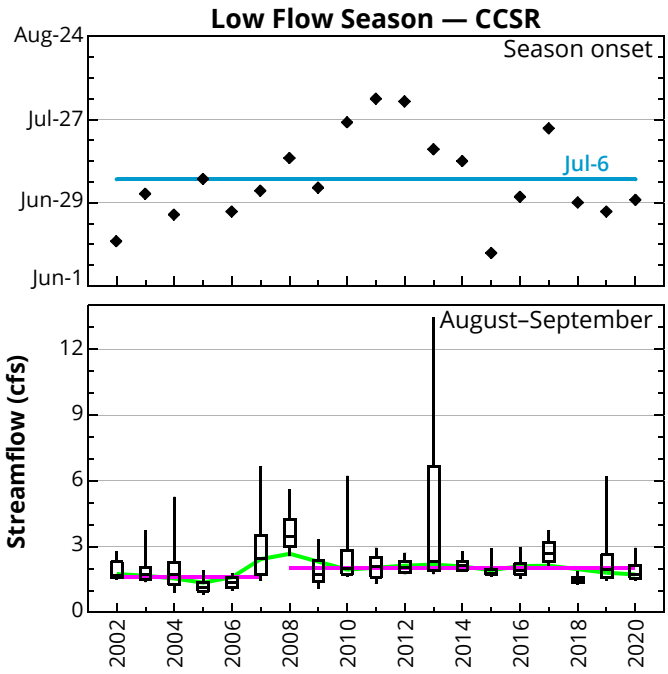
KEY

Q in cfs
- Q ≤ 1.56
- 1.56 < Q ≤ 1.82
- 1.82 < Q ≤ 2.17
- 2.17 < Q ≤ 2.65
- 2.65< Q ≤ 4.26
- 4.26< Q ≤ 6.92
- 6.92 < Q ≤ 11.4
- 11.4 < Q ≤ 30.6
- 30.6 < Q ≤ 61.1
- 61.1 < Q ≤ 107
- Q > 107

Q as percentile
- Q ≤ 5th
- 5th < Q ≤ 10th
- 10th < Q ≤ 15th
- 15th < Q ≤ 20th
- 20th < Q ≤ 30th
- 30th < Q ≤ 40th
- 40th < Q ≤ 50th
- 50th < Q ≤ 75th
- 75th < Q ≤ 90th
- 90th < Q ≤ 95th
- Q > 95th

2020

- High flow in late January declined quickly and remained well below the POR median from mid-February through the first week of June. During this time, low flow records were set on 36 days.
- Flow was near the POR median through June and then slowly decreased through mid-September.
- Intermittent storms from late September through December resulted in high flow. These high flow episodes were widely space and interspersed with periods of low flow sometimes as long as 2 weeks. Eight low flow records occurred during October through the first week of November.



CHANGE IN MEASUREMENT

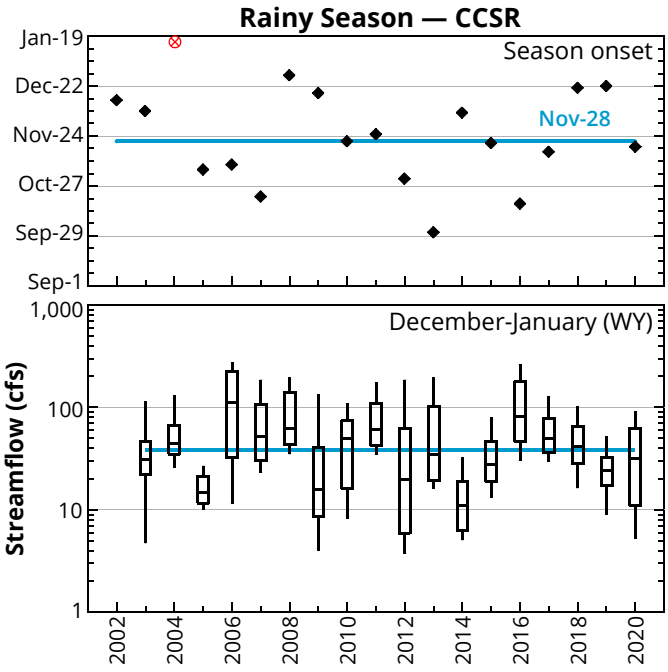
- OWRD monitored flow at this site from 2002 through 2007. Beginning in 2008, monitoring was done by WEST Consultants. Both used the same monitoring method.
- Flows during the August–September period from 2007 and before (OWRD) are lower than those from 2008 to present (WEST Consultants). Despite considerable variability, the difference is statistically significant.
- This difference is most likely due to differences in rating curves and monitoring, although true changes in the flow regime are possible.

LOW FLOW

- July through September are the months with the lowest average flows, with August consistently having the lowest of the three. The lowest daily flows occur in July and August.
- September often has very low flow, but early fall rains may cause high flows as was the case in 2013 and 2019.
- Low flow criterion: 7d-Q ≤ 3.5cfs (~25th pctl)

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 30 cfs (~73th pctl)
- Rainy season flow for 2004 did not occur until the following March (3/30/2005)



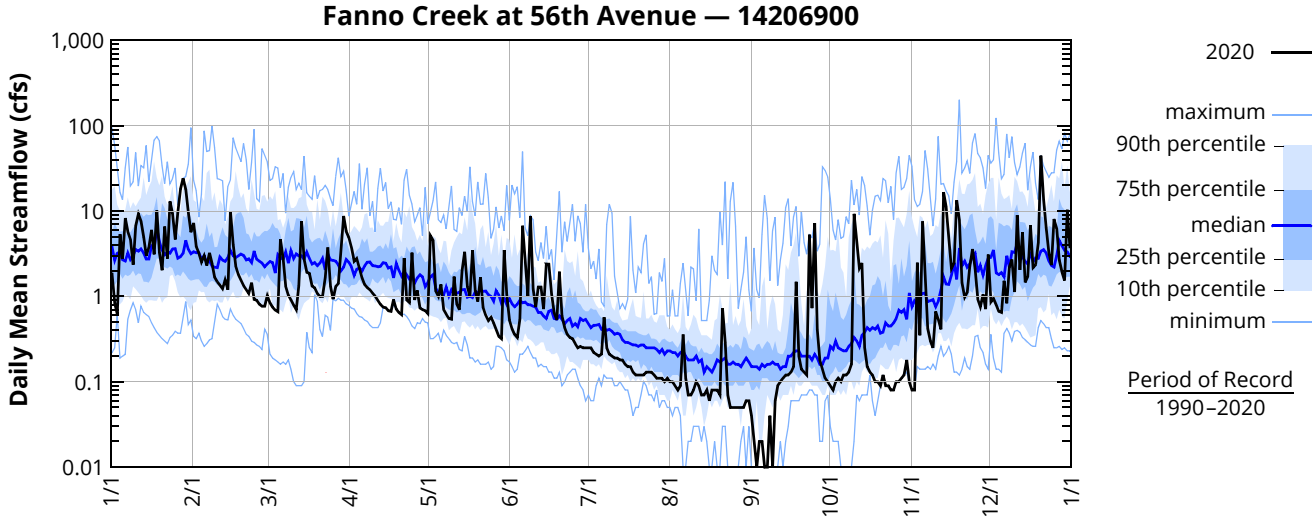
6900 – Fanno Creek at 56th Avenue – 14206900

Data source: U.S. Geological Survey, Oregon Water Science Center
River Mile: 12.6 *Latitude:* 45 29 17 *Longitude:* 122 44 01 *Drainage area:* 2.37 sq mile

2020 — MEAN STREAMFLOW† (cfs) — 6900

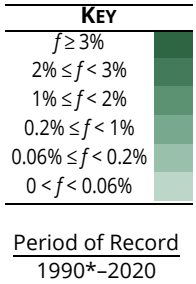
DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.84	7.25	1.02	4.90	0.63	0.53	0.25	0.10	0.04	0.09	0.08	0.86
2	0.83	3.87	0.84	3.76	5.16	0.42	0.25	0.10	0.02	0.08	0.08	0.95
3	0.62	3.22	0.75	2.58	4.54	0.36	0.22	0.09	0.01	0.10	2.49	0.80
4	5.37	2.53	0.69	2.79	1.16	0.33	0.21	0.08	0.02	0.11	0.35	0.67
5	2.77	3.01	0.66	2.13	1.00	0.54	0.20	0.09	0.02	0.10	7.60	0.65
6	8.31	2.30	4.70	1.66	1.38	6.75	0.21	0.36	0.01	0.12	2.30	1.53
7	5.75	3.24	2.77	1.38	0.70	2.50	0.57	0.11	0.01	0.12	0.42	0.83
8	4.70	2.42	1.32	1.27	0.62	1.00	0.25	0.07	0.04	0.13	0.30	2.19
9	2.35	1.68	1.03	1.20	0.55	8.77	0.21	0.07	0.01	0.16	0.25	2.71
10	6.71	1.48	0.91	1.09	0.54	1.22	0.20	0.08	0.06	9.29	0.67	1.13
11	9.29	1.36	0.79	1.01	1.71	0.75	0.19	0.10	0.09	4.53	0.54	8.95
12	7.68	1.23	0.70	0.90	0.81	1.29	0.19	0.09	0.10	2.14	0.41	2.05
13	4.94	1.57	1.34	0.81	0.70	1.29	0.18	0.07	0.11	2.47	16.7	5.64
14	3.00	1.20	7.63	0.75	2.01	0.71	0.18	0.07	0.12	0.25	11.2	1.46
15	3.73	9.80	2.73	0.74	3.33	2.40	0.16	0.08	0.12	0.15	4.53	1.71
16	6.02	4.07	1.92	0.68	1.30	2.39	0.15	0.06	0.13	0.13	2.12	6.86
17	3.11	2.27	1.86	0.67	1.01	1.07	0.15	0.08	0.15	0.12	2.48	2.18
18	10.2	1.82	1.32	0.92	3.47	0.65	0.13	0.08	1.49	0.10	13.4	2.35
19	3.27	1.55	1.26	0.71	1.18	0.53	0.12	0.08	0.20	0.10	7.84	4.26
20	2.03	1.34	1.08	0.65	0.87	1.95	0.12	0.07	0.14	0.09	1.45	44.7
21	6.59	1.20	1.00	0.61	1.68	0.59	0.12	0.73	0.13	0.12	0.98	13.7
22	2.78	1.08	1.00	2.82	0.75	0.43	0.12	0.29	0.12	0.09	1.12	6.37
23	13.0	1.45	1.66	0.91	0.60	0.36	0.13	0.07	5.29	0.09	2.26	3.24
24	9.35	0.92	3.77	0.85	0.52	0.33	0.13	0.05	0.73	0.08	3.59	2.33
25	4.65	0.90	1.31	3.26	0.57	0.32	0.13	0.05	7.23	0.08	2.11	8.09
26	9.64	0.81	0.93	0.91	0.49	0.28	0.12	0.05	0.41	0.10	0.93	6.28
27	18.2	0.77	1.31	1.18	0.41	0.25	0.11	0.05	0.18	0.10	0.76	2.67
28	24.2	0.77	1.42	0.73	0.34	0.26	0.11	0.05	0.14	0.11	1.06	1.93
29	17.8	3.05	3.54	0.70	0.32	0.25	0.11	0.05	0.11	0.12	0.71	1.54
30	9.56	—	8.76	0.68	3.50	0.25	0.10	0.06	0.10	0.18	3.10	10.4
31	5.65	—	5.82	—	1.05	—	0.11	0.06	—	0.10	—	3.82
Mean	6.90	2.35	2.12	1.44	1.38	1.29	0.18	0.11	0.58	0.70	3.06	4.93
Max	24.2	9.80	8.76	4.90	5.16	8.77	0.57	0.73	7.23	9.29	16.7	44.7
Min	0.62	0.77	0.66	0.61	0.32	0.25	0.10	0.05	0.01	0.08	0.08	0.65
Ac-Ft	424	135	131	85.8	85.1	76.9	10.8	6.82	34.4	42.7	182	303

† Data after Dec 9, 2020 are provisional—subject to revision



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — 6900

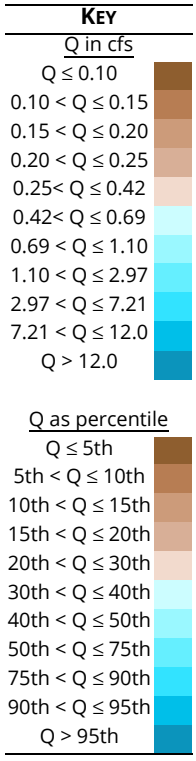
Q IN cfs	0.01 < Q < 0.02	0.02 < Q ≤ 0.1	0.1 < Q ≤ 0.2	0.2 < Q ≤ 0.3	0.3 < Q ≤ 0.5	0.5 < Q ≤ 0.8	0.8 < Q ≤ 1.3	1.3 < Q ≤ 2	2 < Q ≤ 3	3 < Q ≤ 5	5 < Q ≤ 12	12 < Q ≤ 80	80 < Q ≤ 300
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.26%	4.2%	10.2%	8.0%	10.5%	9.7%	10.7%	11.1%	10.3%	9.8%	9.9%	5.2%	0.09%



*Data from October – December 1990 not used to prevent skewing distribution.

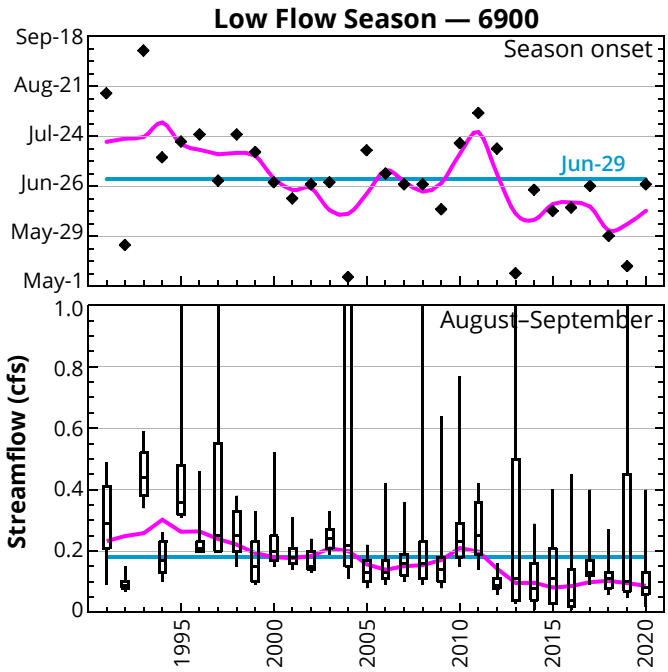
MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — 6900

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1990										0.46	1.50	2.10
1991	2.20	3.45	2.60	1.95	1.30	0.92	0.65	0.39	0.21	0.16	2.35	2.60
1992	2.50	2.95	1.50	1.70	0.50	0.26	0.14	0.09	0.08	0.19	0.85	1.60
1993	1.90	1.25	2.90	3.80	2.10	0.97	0.62	0.52	0.38	0.49	0.55	0.71
1994	1.30	1.50	1.40	1.60	0.70	0.49	0.34	0.19	0.13	0.15	2.05	5.30
1995	4.20	3.40	3.20	2.65	1.20	0.93	0.41	0.36	0.33	0.56	2.85	5.30
1996	6.40	9.55	2.20	2.75	2.30	0.75	0.43	0.22	0.20	1.70	4.10	12.0
1997	4.00	1.85	5.90	2.00	0.80	0.68	0.30	0.25	0.33	0.74	2.00	2.10
1998	6.50	4.85	3.30	1.20	2.80	1.00	0.44	0.27	0.21	0.41	4.85	7.30
1999	6.30	9.60	4.30	1.80	1.10	0.59	0.34	0.22	0.10	0.16	2.25	2.20
2000	4.80	3.35	2.70	1.05	1.00	0.50	0.28	0.20	0.20	0.37	0.60	1.00
2001	0.73	0.81	1.30	1.20	0.65	0.46	0.26	0.20	0.16	0.22	2.08	5.11
2002	4.71	3.21	2.76	1.24	0.65	0.46	0.20	0.14	0.19	0.21	0.40	2.92
2003	3.60	2.49	2.95	3.79	1.57	0.69	0.30	0.25	0.22	0.28	1.19	5.63
2004	6.56	3.93	1.67	0.69	0.27	0.20	0.13	0.16	0.24	0.44	0.90	2.35
2005	2.02	0.73	0.25	2.53	2.85	1.17	0.30	0.16	0.12	0.46	0.78	1.46
2006	8.45	2.41	2.47	1.99	1.03	0.78	0.30	0.14	0.12	0.24	6.16	3.46
2007	2.71	3.32	3.14	1.76	0.75	0.48	0.27	0.16	0.16	0.65	1.07	5.60
2008	5.28	3.16	3.42	1.84	0.79	0.57	0.19	0.21	0.11	0.16	1.44	1.56
2009	2.91	1.78	1.48	1.00	1.14	0.40	0.25	0.12	0.17	0.33	2.84	1.65
2010	5.31	2.58	1.93	2.60	2.01	2.05	0.42	0.21	0.27	0.43	2.53	4.60
2011	2.97	2.50	6.27	3.55	1.95	0.86	0.54	0.32	0.19	0.35	1.60	0.57
2012	2.70	1.95	6.18	3.60	1.89	1.17	0.38	0.11	0.08	0.53	2.03	5.63
2013	1.83	1.40	1.22	1.05	0.51	0.75	0.22	0.05	0.31	0.47	0.48	0.42
2014	0.43	1.96	3.27	3.45	2.08	0.74	0.54	0.09	0.07	0.40	1.42	3.15
2015	1.47	3.44	4.12	2.66	0.88	0.40	0.19	0.03	0.20	0.48	1.68	11.5
2016	6.76	5.53	5.12	1.50	1.03	0.37	0.09	0.03	0.12	3.12	2.24	3.00
2017	2.96	7.22	6.58	3.22	1.58	0.55	0.22	0.12	0.16	0.49	2.41	1.09
2018	3.48	1.87	1.90	2.76	0.49	0.30	0.11	0.08	0.13	0.21	0.32	2.23
2019	1.12	3.19	1.47	2.00	0.56	0.20	0.13	0.08	0.35	0.26	0.20	0.63
2020	5.65	1.56	1.31	0.92	0.87	0.57	0.15	0.08	0.12	0.11	1.29	2.33
median	3.30	2.70	2060	2.10	1.10	0.64	0.30	0.18	0.17	0.38	1.50	2.80



2020

- After high flow in late January declined, a succession of small storms caused intermittent flows that exceeded the POR median from mid-February through the first week of June. Baseflow during this time was well below the POR median and low flow records were set on 8 days.
- Flow was far below POR median for most of mid-June through August.
- Intermittent storms from late September through December resulted in high flow. These high flow episodes were widely space and interspersed with periods of low flow sometimes as long as 2 weeks. Flows were particularly low during late October through early November when 13 new records for low flow were set.

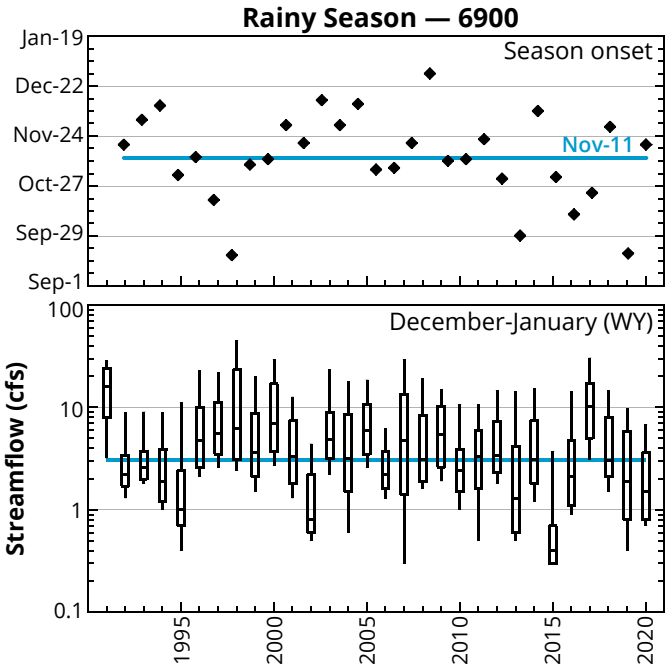


LOW FLOW

- August and September are the months with the lowest average flow and the lowest daily flows.
- August–September flows show a statistically significant decreasing trend. The reason for the decrease is unknown. Monitoring protocols have not changed at this site.
- Low flow criterion: 7d-Q ≤ 0.4 cfs (~27th pctl)
- Low flow onset is occurring earlier in the year. The trend is statistically significant. Low flow began before June 29 in every one of the past 8 years. Before then, low flow began that early in 11 of 22 years (50%).
- Spring rainfall in both 2010 and 2011 was high, resulting in later onset of low flow and higher flows that persisted into summer.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- No trends are evident in the magnitude of the flow for December–January.
- Rainy season criterion: 7d-Q ≥ 3.0 cfs (~74th pctl)
- Rainfall in the fall of 2014 was low compared to most years, resulting in low WY 2015 December–January flow.



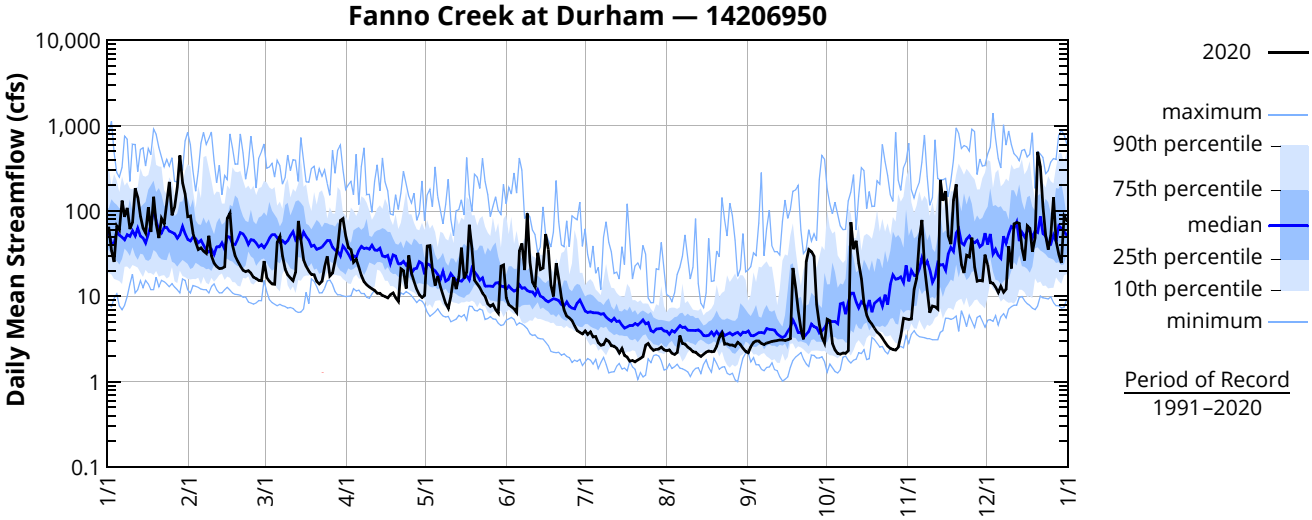
FANO – FANNO CREEK AT DURHAM – 14206950

Data source: U.S. Geological Survey, Oregon Water Science Center
River Mile: 1.2 *Latitude:* 45 24 13 *Longitude:* 122 45 13 *Drainage area:* 31.50 sq mile

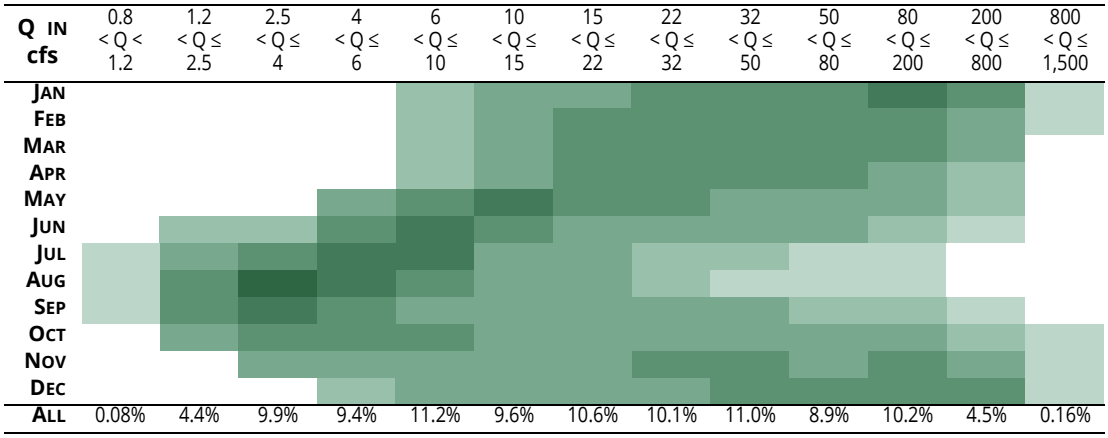
2020 — MEAN STREAMFLOW† (cfs) — FANO

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	63.4	87.7	26.0	51.2	10.2	9.69	3.95	2.30	2.19	5.42	5.37	23.4
2	34.3	55.2	16.7	37.5	39.0	8.00	3.58	2.36	2.58	5.21	5.43	14.5
3	25.4	43.3	15.1	35.4	39.4	7.57	3.83	2.16	2.89	2.81	12.1	14.3
4	67.5	35.5	14.0	25.2	20.3	7.14	3.36	2.09	3.01	2.36	16.3	12.9
5	60.2	37.1	13.9	27.4	13.4	6.50	3.40	2.20	3.01	2.14	47.2	11.1
6	133	33.9	43.2	22.2	17.3	34.1	2.87	3.49	2.81	2.10	78.9	13.1
7	86.0	31.9	50.6	17.7	13.0	41.8	2.68	2.81	2.73e	2.18	22.1	11.2
8	109	51.4	29.9	14.9	10.5	20.4	2.73	2.77	2.85e	2.15	11.5	12.2
9	61.5	30.1	20.9	13.7	8.27	93.9	3.13	2.54	2.89e	2.30	6.45	38.8
10	73.3	24.6	17.9	12.9	7.25	25.3	2.97	2.43	2.97e	74.1	7.71	21.3
11	185	22.4	16.4	12.3	10.1	14.6	2.65	2.24	3.01e	35.7	7.60	70.9
12	146	21.2	15.3	11.8	16.8	12.9	2.61	2.23	3.04e	45.0	7.12	73.6
13	86.7	21.4	19.1	10.9	12.2	32.5	2.47	2.08	3.09e	24.5	232	72.0
14	62.9	22.2	76.9	10.9	16.9	20.7	2.18	1.98	3.09e	16.1	132	36.9
15	55.0	82.3	47.5	10.2	37.3	21.5	2.46	2.10	3.04e	8.25	171	26.4
16	111	95.0	26.9	10.0	16.3	53.8	2.03	2.23	3.10e	6.05e	51.6	67.5
17	57.0	39.7	22.5	9.63	19.2	35.6	1.95	2.29	3.20e	5.17e	41.1	62.9
18	147	29.9	19.8	10.5	69.2	13.5	1.74	2.24	21.6e	4.74e	135	33.3
19	70.8	25.7	18.1	11.0	35.7	10.0	1.78	2.26	12.7	4.23e	206	48.8
20	48.3	22.7	18.0	9.68	15.5	24.6	1.71	2.61	6.85	3.81e	44.6	496
21	82.1	20.3	15.0	8.74	14.0	16.1	1.80	3.29	4.13	3.58e	23.6	331
22	70.9	19.5	14.0	21.1	12.7	9.55	1.87	3.74	3.15	3.26e	18.9	112
23	122	20.0	15.0	20.0	10.9	7.00	1.96	2.76	25.5	2.89e	30.3	51.7
24	220	18.8	22.0	12.4	10.0	5.88	2.68	2.78	35.4	2.62e	28.9	35.4
25	89.2	16.8	29.5	30.3	8.16	5.60	2.81	2.69	33.5	2.46e	48.8	52.3
26	111	16.2	17.4	18.9	7.65	5.21	2.50	2.70	29.5	2.38e	22.2	145
27	192	15.4	18.9	15.1	8.06	4.52	2.33	2.60	8.06	2.35e	15.1	44.5
28	448	15.3	26.4	12.1	7.00	3.97	2.40	2.90	4.70	2.54	15.4	31.3
29	214	18.6	37.6	10.5	6.39	3.78	2.42	2.74	3.35	3.44	15.2	24.8
30	158	—	77.3	9.69	22.6	3.64	2.54	2.47	2.85	5.56	30.9	87.9
31	85.8	—	81.5	—	23.4	—	2.36	2.26	—	5.46	—	78.1
Mean	112	33.6	28.5	17.5	18.0	18.6	2.57	2.53	8.03	9.38	49.7	69.5
Max	448	95.0	81.5	51.2	69.2	93.9	3.95	3.74	35.4	74.1	232	496
Min	25.4	15.3	13.9	8.74	6.39	3.64	1.71	1.98	2.19	2.10	5.37	11.1
Ac-Ft	6895	1932	1752	1039	1108	1109	158	155	478	577	2956	4275

† Data after Dec 9, 2020 are provisional—subject to revision; e=estimated



FREQUENCY OF MEAN DAILY STREAMFLOW BY MONTH — FANO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1991–2020

MEDIAN OF DAILY MEAN STREAMFLOW BY MONTH AND YEAR — FANO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1991	28	44	33	25	17	12	7.5	4.8	3.3	3.1	34	40
1992	42	50	22	33	12	5.2	3.4	2.8	2.9	3.7	20	56
1993	44	21	56	73	38	17	8.7	4.7	3.5	3.8	5.8	26
1994	41	37	34	25	12	8.7	3.8	3.8	3.4	3.6	49	68
1995	62	59	59	39	19	15	9.8	6.7	5.5	15	50	71
1996	95	124	25	37	25	7.8	6.6	5.9	7.5	19	80	221
1997	74	41	110	34	21	20	8.9	6.5	9.3	31	39	39
1998	100	73	58	21	54	18	9.2	7.8	24	34	70	100
1999	90	155	71	30	20	11	6.8	6.3	4.5	6.3	53	48
2000	61	68	52	17	17	7.5	5.6	3.9	3.8	12	8.9	21
2001	13	17	21	22	11	10	5.5	5.4	4.4	7.1	39	99
2002	86	54	44	19	11	7.9	5.5	3.8	4.0	4.1	8.5	66
2003	58	41	71	63	20	9.2	5.6	4.5	3.7	12	17	78
2004	100	64	25	12	9.1	6.7	3.8	5.2	6.5	17	15	25
2005	22	13	11	33	33	14	5.4	4.9	3.5	14	39	64
2006	195	32	42	33	15	9.5	4.3	3.0	2.7	4.4	117	65
2007	38	47	44	28	11	6.5	4.0	3.0	3.3	15	18	105
2008	109	34	54	29	16	9.0	4.5	4.6	3.4	4.9	19	17
2009	26	16	27	21	23	8.2	3.3	3.2	3.4	7.3	48	18
2010	86	41	31	36	21	28	6.0	3.5	6.5	5.6	46	96
2011	51	32	101	50	26	13	9.5	4.0	2.4	8.3	28	13
2012	50	35	81	46	23	15	5.5	2.7	2.0	21	49	137
2013	27	23	18	17	11	9.2	2.4	3.0	13	7.3	12	8.9
2014	20	50	67	48	21	7.6	4.8	2.2	2.2	17	26	53
2015	23	31	28	21	7.1	3.0	1.8	1.4	2.4	2.8	28	183
2016	84	55	67	16	11	6.9	3.5	1.7	3.6	58	48	55
2017	47	160	104	35	20	10	3.8	2.6	3.9	11	66	33
2018	72	36	33	35	7.7	5.3	2.0	3.0	3.2	4.7	14	42
2019	26	36	21	26	9.8	6.0	4.0	3.0	12	8.6	5.4	26
2020	86	25	20	13	13	11	2.5	2.4	3.1	3.6	23	39
median	55	42	42	29	17	10	5.0	3.8	3.9	8.9	29	52

KEY

Q in cfs

Q ≤ 2.6
2.6 < Q ≤ 3.3
3.3 < Q ≤ 4.1
4.1 < Q ≤ 5.1
5.1< Q ≤ 8.0
8.0< Q ≤ 12
12 < Q ≤ 18
18 < Q ≤ 47
47 < Q ≤ 114
114 < Q ≤ 190
Q > 190

Q as percentile

Q ≤ 5th
5th < Q ≤ 10th
10th < Q ≤ 15th
15th < Q ≤ 20th
20th < Q ≤ 30th
30th < Q ≤ 40th
40th < Q ≤ 50th
50th < Q ≤ 75th
75th < Q ≤ 90th
90th < Q ≤ 95th
Q > 95th

2020

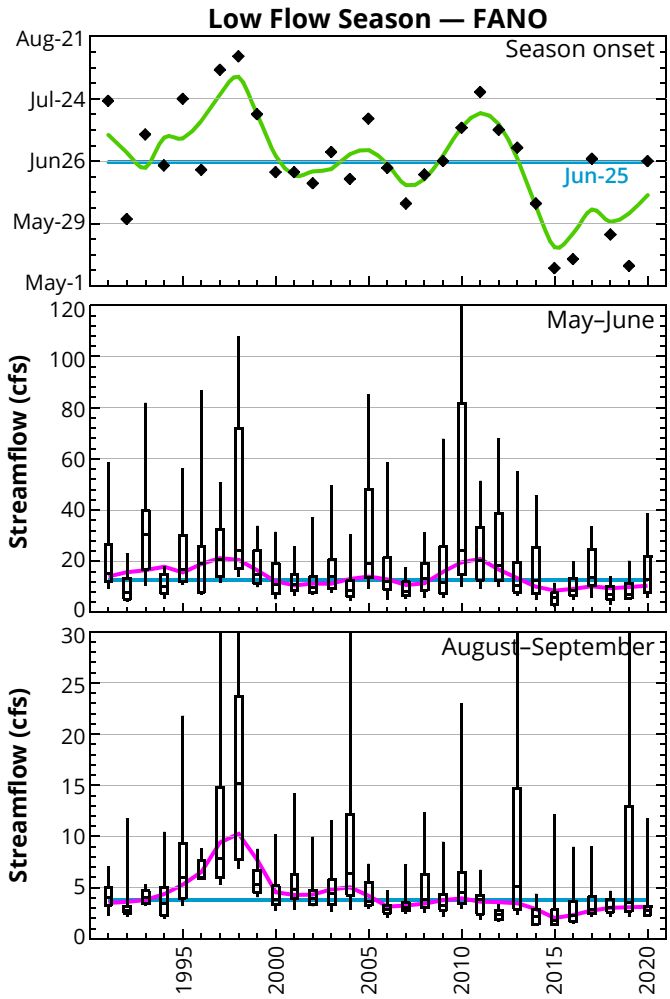
- After high flow in late January declined, a succession of small storms caused intermittent flows that exceeded the POR median from mid-February through the first week of June. Baseflow during this time was well below the POR median and low flow records were set on 10 days in April.
- Flow was far below POR median for most of mid-June through August.
- From late September through December, intermittent storms resulted in short periods of high flow which were interspersed with periods of low flow that were sometimes as long as 2 weeks.

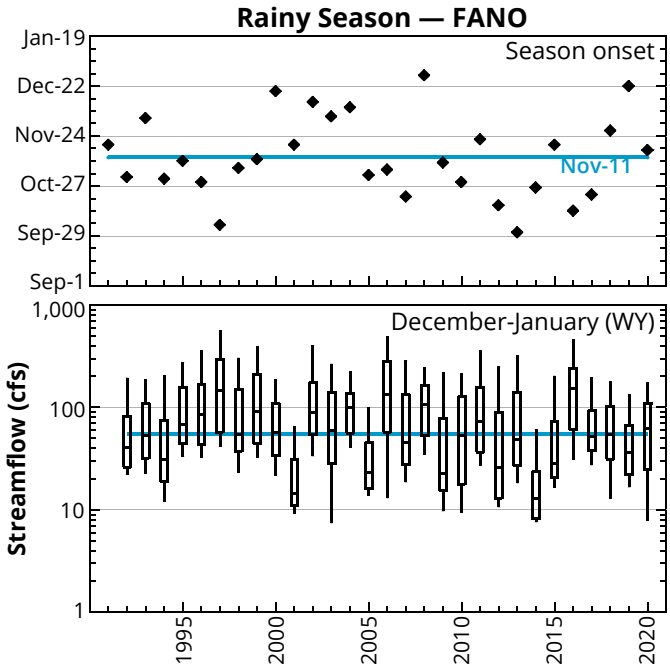
LOW FLOW

- July through September are the months with the lowest average flow and the lowest daily flows.
- Although median flows usually are low during the July through September period, flows that are much higher are not uncommon. The August–September boxplots show this variability. This pattern is typical of flashy urban streams such as Fanno Creek.
- May–June and August–September flows show a statistically significant decreasing trend, despite considerable variability. The reason is unknown.
- Low flow criterion: 7d-Q ≤ 7 cfs (~26th pctl)
- Low flow onset may be trending toward earlier in the year, but the trend is noisy and not statistically significant. Onset of low flow in July or later has not occurred in the past seven years.

RAINY SEASON FLOW

- December through March are the months with the highest average flows.
- Rainy season criterion: 7d-Q ≥ 50 cfs (~75th pctl)
- No trends are evident in the magnitude of the flow for December–January.
- Rainfall in the fall of 2004 was low compared to most years, resulting in low WY-2005 December–January flows.
- The winter of 2000–2001 was very dry as evident in the boxplots.





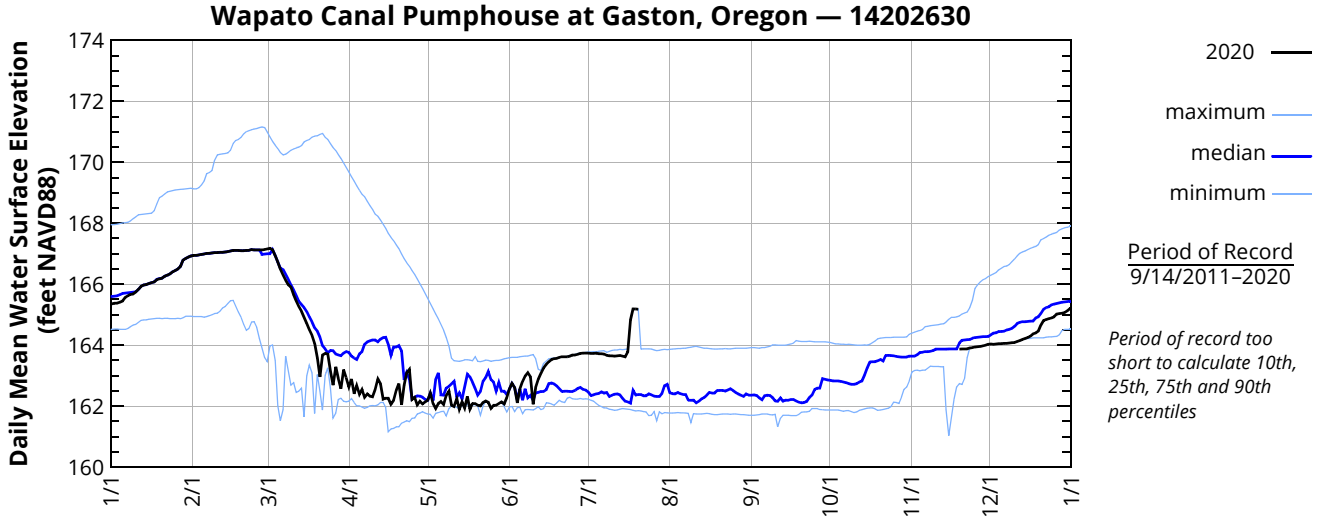
WPH – WAPATO CANAL PUMPHOUSE AT GASTON, OREG. – 14202630

Data source: U.S. Geological Survey, Oregon Water Science Center
Latitude: 45 26 25 *Longitude:* 123 07 31

2020 — MEAN WATER SURFACE ELEVATION ABOVE NAVD88 (feet)† — WPH

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL*	AUG*	SEP*	OCT*	NOV*	DEC
1	165.36	166.95	167.16	162.63	162.19	162.56	163.74					164.04
2	165.38	166.95	167.18	162.89	162.43	162.75	163.73					164.03
3	165.38	166.96	167.14	162.41	162.08	162.62	163.73					164.04
4	165.41	166.98	166.94	162.68	161.92	162.11	163.74					164.05
5	165.45	166.99	166.73	162.39	162.09	162.56	163.72					164.05
6	165.57	167.01	166.49	162.55	162.15	162.81	163.72					164.06
7	165.62	167.02	166.30	162.29	162.05	162.99	163.71					164.06
8	165.67	167.03	166.13	162.40	162.35	163.10	163.67					164.07
9	165.68	167.04	165.98	162.33	162.49	162.97	163.65					164.08
10	165.74	167.04	165.91	162.31	162.03	162.06	163.65					164.09
11	165.83	167.05	165.65	162.54	161.99	162.62	163.64					164.12
12	165.93	167.05	165.45	162.89	162.24	162.88	163.65					164.15
13	165.98	167.06	165.27	162.74	161.89	163.08	163.66					164.19
14	165.99	167.07	165.11	162.23	162.14	163.25	163.64					164.22
15	166.02	167.09	164.92	162.26	161.94	163.37	163.62					164.25
16	166.05	167.11	164.71	162.26	162.32	163.46	163.78					164.30
17	166.07	167.11	164.51	162.06	161.90	163.53	164.83					164.37
18	166.15	167.11	164.32	162.18	162.09	163.56	165.19					164.40
19	166.18	167.10	164.06	162.52	162.08	163.57	165.19				163.87	164.46
20	166.20	167.10	163.58	162.74	162.03	163.60	165.18				163.88	164.66
21	166.26	167.11	162.96	162.04	162.01	163.62					163.88	164.81
22	166.30	167.11	163.68	162.69	162.12	163.62					163.88	164.84
23	166.34	167.14	163.73	163.10	162.17	163.62					163.91	164.87
24	166.41	167.13	163.71	163.21	162.13	163.64					163.92	164.89
25	166.45	167.13	163.14	162.22	161.93	163.68					163.94	164.93
26	166.50	167.13	162.69	162.29	162.03	163.68					163.95	165.02
27	166.58	167.13	163.29	162.04	162.03	163.70					163.96	165.04
28	166.79	167.14	162.90	162.16	162.09	163.73					163.98	165.05
29	166.85	167.16	162.57	162.07	162.14	163.74					164.00	165.07
30	166.89	—	163.2	162.14	162.07	163.74					164.03	165.13
31	166.93	—	162.94	—	162.27	—			—		—	165.2
Mean	166.06	167.07	164.79	162.44	162.11	163.21						164.47
Max	166.93	167.16	167.18	163.21	162.49	163.74						165.20
Min	165.36	166.95	162.57	162.04	161.89	162.06						164.03

† Data after July 20, 2020 are provisional—subject to revision; *incomplete record, no data available for July 21–November 18, 2020.



FREQUENCY OF DAILY MEAN WATER SURFACE ELEVATION BY MONTH — WPH

ELEV IN FT	161.0 < EL < 161.3	161.3 < EL ≤ 161.8	161.8 < EL ≤ 162.0	162.0 < EL ≤ 162.2	162.2 < EL ≤ 162.4	162.4 < EL ≤ 162.8	162.8 < EL ≤ 163.5	163.5 < EL ≤ 1164.5	164.5 < EL ≤ 165.5	165.5 < EL ≤ 166.5	166.5 < EL ≤ 169.0	169.0 < EL ≤ 171.0	171.0 < EL ≤ 171.2
JAN													
FEB													
MAR													
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
ALL	0.09%	2.8%	6.1%	8.9%	6.9%	7.0%	9.9%	22.2%	9.8%	8.5%	10.0%	3.6%	0.24%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
9/14/2011–2020

MEDIAN OF DAILY MEAN WATER SURFACE ELEVATION BY MONTH AND YEAR — WPH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2011									163.66	163.43	163.33	164.25
2012	165.06	166.32	164.45	161.89	162.23	162.24	161.90	161.74	161.73	161.95	163.58	166.04
2013	167.47	165.73	162.59	162.12	162.59	162.20	162.14	162.46	162.36	163.94	164.21	164.48
2014	164.86	165.42	166.23	164.54	162.13	162.14	162.07	162.18	161.91	162.03	163.82	164.84
2015	165.89	167.33	165.24	162.47	162.15	162.29	162.75	162.37	161.97	161.94	163.58	166.18
2016	168.31	169.40	169.29	166.37	163.49	163.00	162.37	162.21	161.94	163.51	164.88	167.18
2017	168.33	170.36	170.55	167.75	162.74	162.35	162.24	162.95	162.81	162.85	164.22	165.35
2018	166.35	167.29	165.10	163.75	163.38	163.54	163.52	163.60	163.52	163.64	163.88	164.68
2019	165.52	166.59	164.56	163.92	163.10	163.55	163.85	163.90	164.03	164.08	164.32	164.74
2020	166.05	167.08	164.71	162.36	162.09	163.42	163.72				163.93	164.30
median	166.21	167.06	165.41	163.63	162.60	162.54	162.37	162.40	162.28	163.41	164.06	165.05

KEY

EL in feet

EL ≤ 161.88
161.88 < EL ≤ 162.02
161.02 < EL ≤ 162.13
162.13 < EL ≤ 162.24
162.24< EL ≤ 162.62
162.62< EL ≤ 163.35
163.35< EL ≤ 163.67
163.67 < EL ≤ 165.21
162.21 < EL ≤ 167.15
167.15 < EL ≤ 168.29
EL > 168.29

EL as percentile

EL ≤ 5th
5th < EL ≤ 10th
10th < EL ≤ 15th
15th < EL ≤ 20th
20th < EL ≤ 30th
30th < EL ≤ 40th
40th < EL ≤ 50th
50th < EL ≤ 75th
75th < EL ≤ 90th
90th < EL ≤ 95th
EL > 95th

2020

- Water levels from January through early June were similar to the POR median. Beginning in early June, water levels were higher than those in 2011–2018, but similar to those in 2019. The reason for the higher water levels in June in the past 2 years is unknown.
- An equipment malfunction resulted in lost data during July 21–November 18.

General

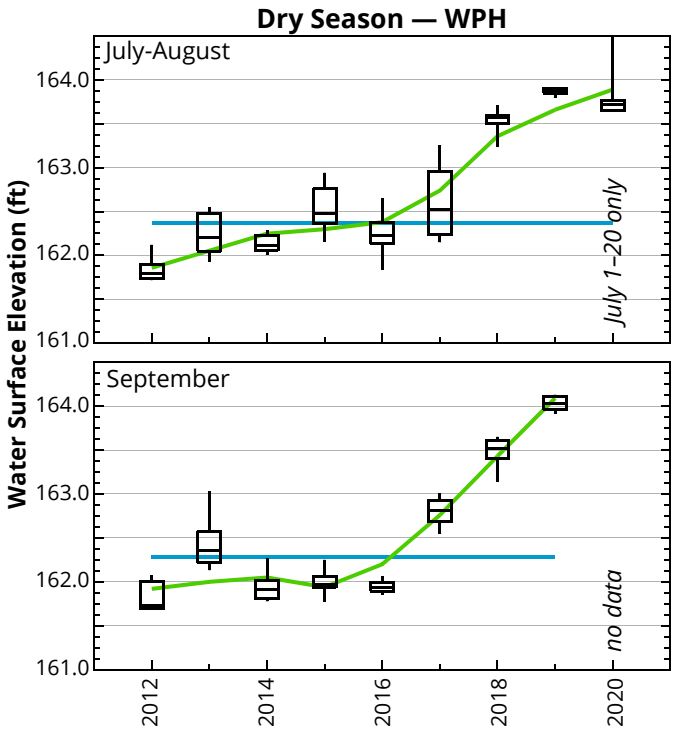
- Wapato Canal Pumphouse is located at Wapato Lake. Water surface elevation reflects lake level.
- During the rainy season, water accumulates in the lake from rainfall and groundwater seepage.
- During March and April, water is pumped out of the lake, lowering the surface elevation. Pumping has continued into May some years.
- Historically the lake was managed by the Wapato Improvement District who pumped enough water out of the lake to allow farming on the lake bed during the summer.
- From 2007–2013, ownership of Wapato Lake transitioned to the US Fish and Wildlife Service who now manages it as the Wapato Lake National Wildlife Refuge. Pumping and some farming still occur, but the management priorities are different than in the past and are evolving.

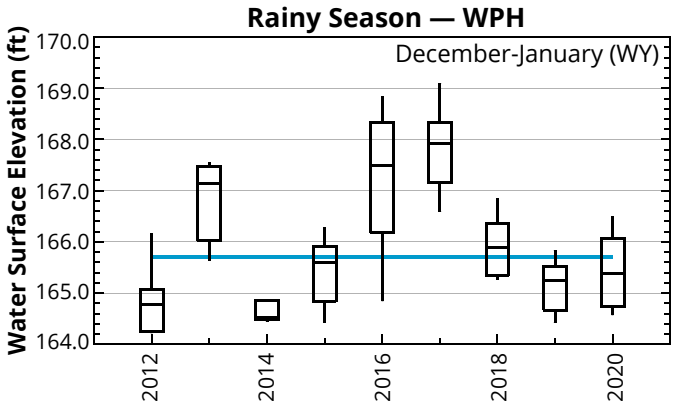
Dry season

- June through October are the months with the lowest average water levels.
- Water levels during the summer were markedly higher in 2019 than in previous years. Water levels in June and July 2020 suggest that the increase applied in to the summer of 2020 as well, but data from mid-July through September are not available.

Rainy season

- January through March are the months with the highest average water levels.





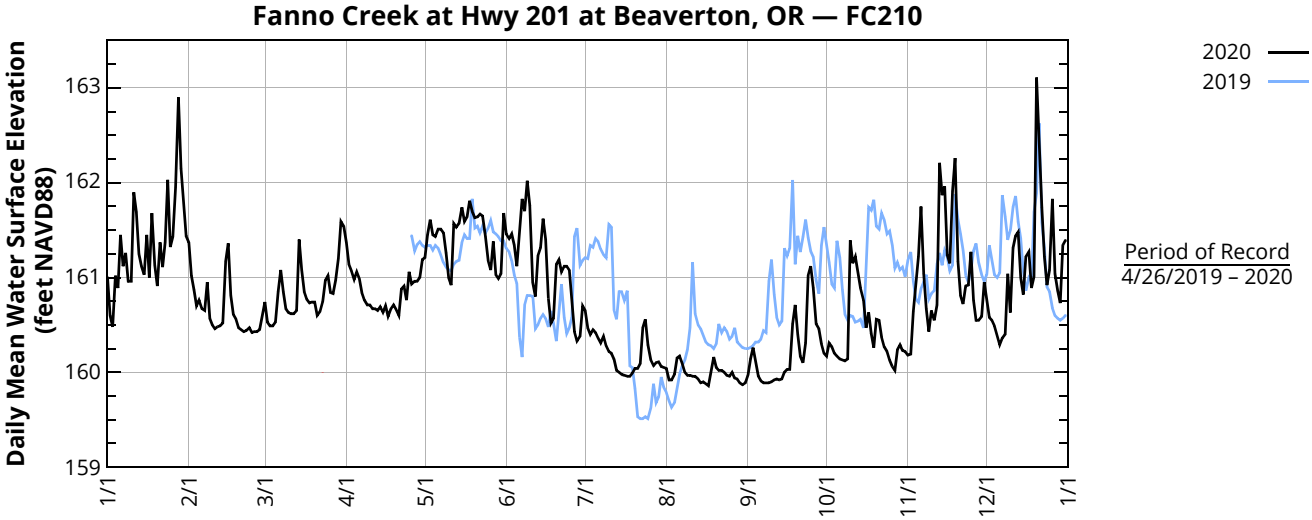
FC210 – Fanno Creek at Hwy 210 at Beaverton, OR

Data source: WEST Consultants for Clean Water Services

2020 — MEAN WATER SURFACE ELEVATION ABOVE NAVD88 (feet) — FC210

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	161.00	161.37	160.74	161.37	161.21	161.46	160.65	160.04	159.97	160.17	160.18	160.77
2	160.60	161.02	160.53	161.14	161.45	161.41	160.47	159.92	160.14	160.31	160.19	160.58
3	160.48	160.87	160.49	161.07	161.61	161.46	160.40	159.92	160.26	160.27	160.64	160.55
4	161.02	160.70	160.49	160.98	161.45	161.34	160.45	159.98	160.12	160.20	160.95	160.49
5	160.89	160.76	160.53	161.06	161.43	161.12	160.42	160.15	159.96	160.17	161.22	160.39
6	161.45	160.67	160.85	160.99	161.51	161.49	160.36	160.17	159.91	160.14	161.75	160.29
7	161.12	160.65	161.08	160.84	161.51	161.83	160.31	160.09	159.89	160.13	161.04	160.36
8	161.26e	160.95	160.85	160.76	161.47	161.70	160.38	160.00	159.89	160.12	160.67	160.40
9	160.96e	160.57	160.67	160.71	161.26	162.02	160.28	159.97	159.89	160.14	160.43	161.04
10	160.96e	160.50	160.63	160.71	161.00	161.76	160.22	159.97	159.90	161.39	160.65	160.63
11	161.90e	160.46	160.62	160.67	160.92	160.95	160.20	159.96	159.92	161.15	160.55	161.31
12	161.69e	160.48	160.62	160.67	161.57	160.80	160.14	159.96	159.93	161.22	160.71	161.44
13	161.25e	160.49	160.65	160.65	161.53	161.23	160.02	159.93	159.92	161.05	162.21	161.48
14	161.12	160.52	161.40	160.69	161.57	161.31	160.00	159.89	159.93	160.89	161.87	161.00
15	161.03	161.17	161.08	160.63	161.74	161.62	159.98	159.90	160.00	160.76	161.96	160.82
16	161.45	161.36	160.85	160.70	161.59	161.40	159.97	159.88	160.03	160.47	161.24	161.22
17	161.00	160.81	160.77	160.59	161.64	160.78	159.96	159.86	160.03	160.63	161.15	161.27
18	161.68	160.61	160.73	160.67	161.81	160.52	159.96	160.00	160.51	160.41	161.91	160.89
19	161.13	160.56	160.74	160.71	161.70	160.57	159.99	160.16	160.71	160.26	162.26	161.01
20	160.91	160.47	160.74	160.66	161.63	161.14	160.04	160.05	160.40	160.56	161.17	163.11
21	161.37	160.45	160.60	160.60	161.64	161.19	160.04	160.02	160.17	160.55	160.81	162.58
22	161.11	160.43	160.64	160.88	161.67	161.06	160.09	160.02	160.10	160.37	160.72	161.74
23	161.37	160.44	160.74	160.91	161.65	161.12	160.47	160.00	160.31	160.27	160.91	161.22
24	162.03	160.47	160.97	160.76	161.43	161.12	160.56	159.97	161.02	160.22	160.92	160.92
25	161.32	160.42	161.02	161.06	161.18	161.08	160.29	159.96	161.12	160.13	161.27	161.08
26	161.43	160.43	160.84	160.93	161.08	160.77	160.13	160.00	160.89	160.06	160.76	161.83
27	161.95	160.43	160.83	160.96	161.38	160.43	160.07	159.94	160.51	160.02	160.55	161.04
28	162.90	160.45	160.97	160.96	161.03	160.33	160.10	159.93	160.46	160.24	160.55	160.86
29	162.15	160.56	161.20	161.00	160.99	160.38	160.11	159.89	160.30	160.29	160.59	160.73
30	161.83	—	161.59	161.19	161.04	160.70	160.06	159.87	160.20	160.23	160.95	161.34
31	161.44	—	161.54	—	161.68	—	160.05	159.89	—	160.22	—	161.39
Mean	161.35	160.66	160.84	160.85	161.43	161.14	160.20	159.98	160.21	160.42	161.03	161.09
Max	162.90	161.37	161.59	161.37	161.81	162.02	160.65	160.17	161.12	161.39	162.26	163.11
Min	160.48	160.42	160.49	160.59	160.92	160.33	159.96	159.86	159.89	160.02	160.18	160.29

e=estimated

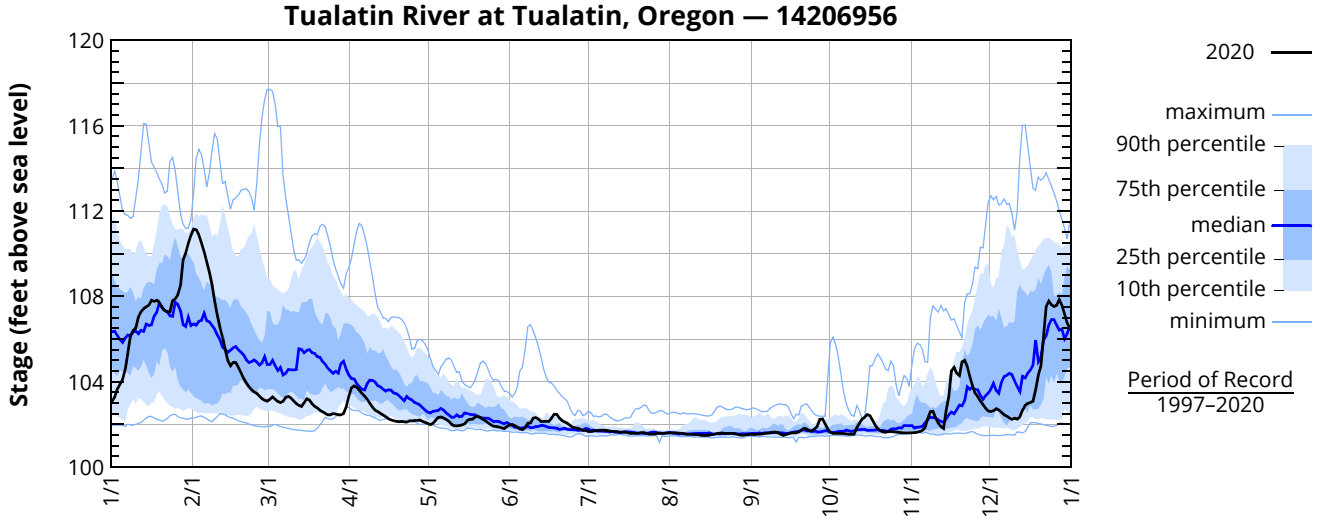


TRT – TUALATIN RIVER AT TUALATIN, OREGON – 14206956 (FORMERLY 14206960)

Data source: Oregon Water Resources Department
River mile: 8.9 *Latitude:* 45 23 14 *Longitude:* 122 45 46

2020 — MEAN WATER SURFACE ELEVATION (feet) — TRT

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	103.08	111.16	103.18	103.71	101.99	102.00	101.67	101.60	101.53	101.58	101.62	102.64
2	103.28	111.13	103.29	103.81	102.06	101.95	101.69	101.61	101.54	101.59	101.63	102.74
3	103.65	110.88	103.18	103.75	102.20	101.87	101.71	101.60	101.54	101.58	101.66	102.68
4	103.89	110.51	103.07	103.59	102.33	101.79	101.73	101.59	101.56	101.58	101.72	102.57
5	104.10	110.09	103.03	103.45	102.35	101.76	101.73	101.58	101.58	101.57	101.85	102.46
6	104.59	109.63	103.09	103.33	102.30	101.86	101.73	101.55	101.59	101.56	102.27	102.39
7	105.39	109.11	103.27	103.18	102.24	102.06	101.72	101.54	101.61	101.54	102.60	102.31
8	106.15	108.54	103.31	102.99	102.14	102.07	101.70	101.54	101.64	101.54	102.62	102.24
9	106.41	107.79	103.24	102.80	102.01	102.29	101.67	101.53	101.64	101.54	102.30	102.29
10	106.51	107.11	103.10	102.67	101.94	102.32	101.67	101.53	101.63	101.84	102.06	102.25
11	107.04	106.56	102.98	102.60	101.93	102.26	101.66	101.52	101.54	102.05	101.90	102.35
12	107.29	106.07	102.89	102.52	101.95	102.14	101.64	101.49	101.49	102.24	101.81	102.66
13	107.43	105.51	102.84	102.44	101.98	102.14	101.64	101.48	101.52	102.33	102.65	102.89
14	107.51	104.98	103.01	102.36	102.02	102.15	101.64	101.49	101.56	102.46	103.33	102.98
15	107.59	104.75	103.21	102.28	102.19	102.14	101.61	101.49	101.60	102.41	104.51	103.03
16	107.82	104.91	103.15	102.21	102.25	102.29	101.58	101.53	101.61	102.20	104.68	103.09
17	107.77	104.90	102.97	102.17	102.25	102.48	101.59	101.54	101.60	101.96	104.41	103.62
18	107.83	104.68	102.85	102.15	102.35	102.48	101.58	101.57	101.65	101.80	104.29	104.31
19	107.70	104.42	102.77	102.13	102.39	102.30	101.59	101.59	101.73	101.70	104.93	104.72
20	107.48	104.16	102.67	102.14	102.32	102.19	101.62	101.60	101.82	101.65	105.01	106.16
21	107.33	103.95	102.60	102.13	102.24	102.11	101.62	101.57	101.79	101.64	104.73	107.53
22	107.28	103.78	102.52	102.11	102.16	102.06	101.58	101.58	101.70	101.67	104.26	107.79
23	107.28	103.63	102.45	102.17	102.07	101.96	101.55	101.58	101.69	101.67	103.82	107.61
24	107.80	103.52	102.45	102.17	101.98	101.87	101.55	101.58	101.79	101.66	103.46	107.53
25	107.88	103.46	102.51	102.19	101.92	101.84	101.55	101.56	101.90	101.64	103.30	107.58
26	108.07	103.33	102.49	102.19	101.91	101.82	101.57	101.52	102.24	101.63	103.10	107.85
27	108.52	103.21	102.45	102.21	101.88	101.77	101.59	101.50	102.26	101.61	102.93	107.58
28	109.70	103.13	102.45	102.14	101.84	101.72	101.59	101.50	102.02	101.61	102.76	107.19
29	110.04	103.09	102.51	102.09	101.80	101.72	101.59	101.52	101.78	101.60	102.63	106.75
30	110.49	—	102.81	102.04	101.90	101.67	101.60	101.53	101.63	101.61	102.61	106.50
31	110.86	—	103.32	—	101.98	—	101.60	101.54	—	101.61	—	106.41
Mean	107.02	106.14	102.89	102.59	102.09	102.04	101.63	101.55	101.69	101.76	103.05	104.54
Max	110.86	111.16	103.32	103.81	102.39	102.48	101.73	101.61	102.26	102.46	105.01	107.85
Min	103.08	103.09	102.45	102.04	101.80	101.67	101.55	101.48	101.49	101.54	101.62	102.24



FREQUENCY OF MEAN WATER SURFACE ELEVATION BY MONTH — TRT

ELEV IN FT	101.0 < EL < 101.3	101.3 < EL ≤ 101.5	101.5 < EL ≤ 101.6	101.6 < EL ≤ 101.7	101.7 < EL ≤ 101.9	101.9 < EL ≤ 102.1	102.1 < EL ≤ 102.6	102.6 < EL ≤ 103.3	103.3 < EL ≤ 104.5	104.5 < EL ≤ 106.5	106.5 < EL ≤ 110.0	110.0 < EL ≤ 116.0	116.0 < EL ≤ 120	Missing
JAN														
FEB														
MAR														
APR														
MAY														
JUN														
JUL														
AUG														
SEP														
OCT														
NOV														
DEC														
ALL	0.02%	4.0%	10.3%	9.9%	12.1%	9.4%	9.2%	9.3%	10.4%	10.2%	10.8%	3.6%	0.11%	0.65%

KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
1997–2020

MEDIAN OF DAILY MEAN WATER SURFACE ELEVATION BY MONTH AND YEAR — TRT

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1997											104.87	106.60
1998	109.86	108.00	106.40	103.50	102.61	102.27	102.47	102.56	102.67	102.03	102.26	109.61
1999	110.47	112.37	107.42	104.50	102.61	101.77	101.67	101.66	101.90	101.79	103.16	106.84
2000	107.35	105.61	105.25	102.36	102.20	101.86	101.61	101.78	102.11	101.92	101.71	102.34
2001	102.25	102.53	102.33	102.29	102.03	101.64	101.56	101.47	101.42	101.62	102.67	109.24
2002	108.39	107.15	105.46	103.33	102.09	101.79	101.73	102.23	102.05	101.78	101.71	103.82
2003	106.19	107.07	107.24	105.17	102.61	101.85	101.64	102.23	101.99	101.95	101.65	104.18
2004	106.17	106.45	103.86	102.78	101.99	101.70	101.53	101.60	101.64	101.88	101.89	102.49
2005	103.05	102.39	101.91	103.92	103.66	102.06	101.70	101.47	101.46	101.77	103.45	104.39
2006	112.57	107.80	104.88	103.90	102.27	101.87	101.65	101.54	101.57	101.67	106.92	
2007	107.89	103.45	105.51	103.21	102.07	101.79	101.70	101.69	101.72	101.91	102.14	108.04
2008		107.23	104.42	104.01	102.54	101.89	101.77	101.61	101.64	101.62	102.29	102.20
2009	107.77	102.47	103.79	103.20	103.06	101.73	101.57	101.54	101.54	101.62	103.31	103.78
2010	107.71	104.99	104.66	106.44	103.18	103.68	101.81	101.65	101.72	101.67	102.89	108.91
2011	108.30	104.35	108.52	105.78	103.55	102.17	101.74	101.62	101.59	101.59	101.85	102.21
2012	106.94	104.92	107.55	105.31	102.99	102.19	101.70	101.59	101.59	101.88	103.71	109.58
2013	104.18	103.18	103.62	102.82	101.97	102.01	101.58	101.51	101.72	101.83	102.30	102.30
2014	102.71	107.14	107.29	104.94	103.08	101.83	101.65	101.47	101.58	101.78	102.85	105.62
2015	104.73	106.34	104.58	103.02	101.88	101.59	101.54	101.48	101.55	101.53	102.93	112.01
2016	109.12	106.49	107.28	102.98	101.85	101.64	101.47	101.46	101.52	103.35	104.13	
2017	106.16	111.59	108.95	105.87	103.43	101.99	101.59	101.52	101.57	101.77	104.22	
2018	106.56	103.97	104.65	105.97	102.15	101.72	101.55	101.46	101.55	101.63	101.64	102.93
2019	104.32	105.69	103.47	103.49	102.10	101.65	101.62	101.53	101.77	101.75	101.83	102.91
2020	107.43	104.95	102.97	102.32	102.06	102.06	101.62	101.540	101.62	101.64	102.71	103.03
median	103.09	102.57	102.59	102.36	101.82	101.61	101.52	101.45	101.48	101.54	101.67	102.08

KEY

EL in feet

EL ≤ 101.51
101.51 < EL ≤ 101.56
101.56 < EL ≤ 101.60
101.60 < EL ≤ 101.65
101.65< EL ≤ 101.78
101.78< EL ≤ 102.00
102.00 < EL ≤ 102.34
102.34 < EL ≤ 104.52
104.52 < EL ≤ 107.67
107.67 < EL ≤ 109.44
EL > 109.44

EL as percentile

EL ≤ 5th
5th < EL ≤ 10th
10th < EL ≤ 15th
15th < EL ≤ 20th
20th < EL ≤ 30th
30th < EL ≤ 40th
40th < EL ≤ 50th
50th < EL ≤ 75th
75th < EL ≤ 90th
90th < EL ≤ 95th
EL > 95th

2020

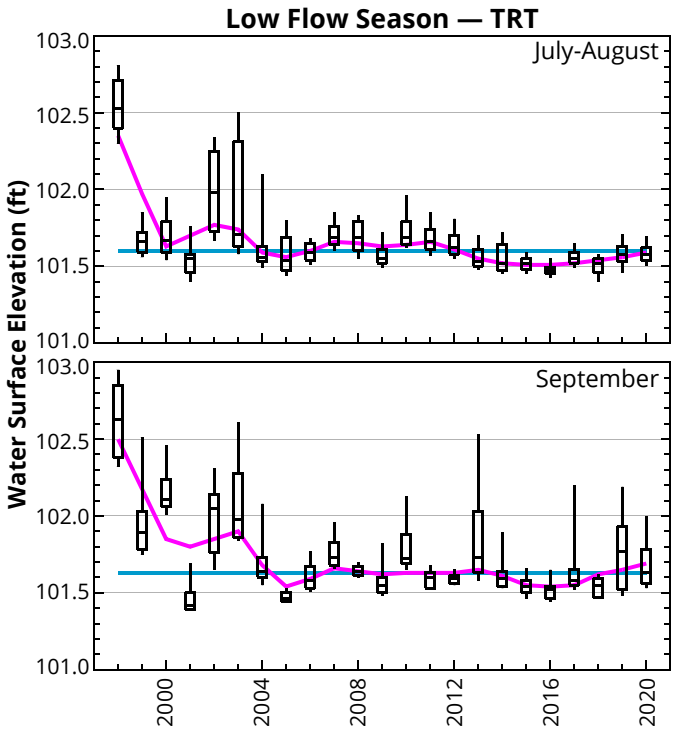
- Water surface elevations in late January and early February were higher than usual. Beginning in mid-February, water surface elevation decreased and was lower than the POR median through May.
- Water surface elevations were near the POR median during June–September.
- From mid-November through the end of December, water surface elevation alternated between being considerably above the POR median to being considerably below the POR median. Fall of 2020 was characterized by periods of intense rainfall followed by prolonged dry periods.

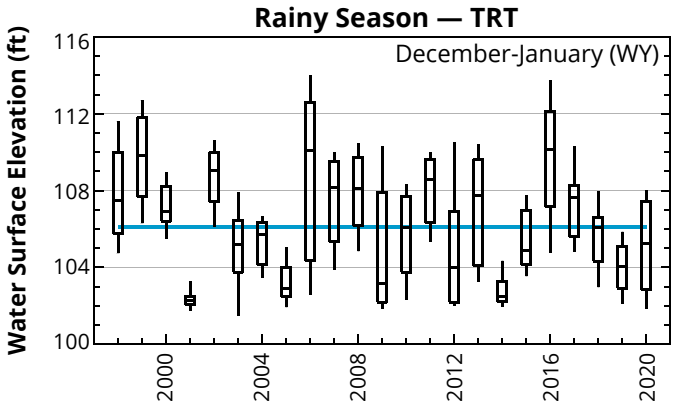
LOW FLOW

- July through September are the months with the lowest average water levels.
- July–August water levels show a statistically significant decreasing trend. The past eight years all have median stage less than the period of record median.
- Water levels in September show a similar decreasing trend that is also statistically significant, although with more variability than the July–August trend.
- The higher water levels in the late 1990s and early 2000s were likely due to the use of flash boards at the Oswego Dam, a practice which has been discontinued.

RAINY SEASON

- January through April are the months with the highest average water levels.





HISTORICAL DATA SOURCES

Data were obtained from several sources. If more than one source had a value for the same date, the values were compared and the one judged as the best quality was used. In some cases, quality could not be determined and none were used. Because data collection changed (for example, different agencies, new rating curves), the measurements may not have been consistent over the period of record.

DATA SOURCES

SITEID	SITE NAME	START DATE	SOURCES OF DATA FOR DISTRIBUTION
14202450	Tualatin River below Lee Falls near Cherry Grove, Oregon	1/1/2003	previous Flow Reports: 2003–2007 OWRD database: 2008–present
14202510	Tualatin River at Gaston, Oregon	1/1/2000	CWS data warehouse: 2000–2007 (origin: OWRD Dist 18) OWRD database: 2008–present
14202630	Wapato Canal at Pumphouse at Gaston, Oregon	9/14/2011	USGS database: all
14202850	Scoggins Creek above Henry Hagg Lake near Gaston, Oregon	1/1/1975	OWRD database: all (no data WY-1997–WY-2006)
14202860	Tanner Creek above Henry Hagg Lake near Gaston, Oregon	1/12003	Wally Otto, TVID, pers. comm.: 2003 previous Flow Reports: 2004–present (Scoggins Dam Ops tables)
14202920	Sain Creek above Henry Hagg Lake near Gaston, Oregon	1/1/1975	OWRD database: all (no data WY-1997–WY-2006)
14202980	Scoggins Creek below Henry Hagg Lake near Gaston, Oregon	1/1/1975	USGS database: 1975–WY-2006 BOR: WY-2007–present (BOR has data back to 1941)
14203500	Tualatin River at Dilley, Oregon	1/1/1975	USGS database: 1975–present (USGS has data back to 1939)
14204530	Gales Creek at Old Hwy 47 near Forest Grove, Oregon	1/1/1996	CWS data warehouse: 1996–2007 (origin: ORWD Dist 18) OWRD database: 2008–present
14204800	Tualatin River at Golf Course Road near Cornelius, Oregon	1/1/1994	previous Flow Report: 1994 CWS data warehouse: 1995–2007 (origin: ORWD Dist 18) OWRD database: 2008–present
14205400	East Fork Dairy Creek near Meacham Corner, OR	5/8/2002	USGS database: all
14206070	McKay Creek at Scotch Church Rd above Waible Ck near North Plains, Oregon	1/1/2002	previous Flow Reports: all
14206200	Dairy Creek at Hwy 8 near Hillsboro, Oregon	1/1/1997	CWS data warehouse: 1997–2007 (origin: OWRD Dist 18) OWRD database: 2008–present
14206241	Tualatin River at Hwy 219 Bridge	10/15/2004	Stewart Rounds, USGS pers. comm.: all (origin: Jackson Bottom Wetland Education Center)
14206295 (old id= 14206440)	Tualatin River at Rood Bridge Road near Hillsboro, Oregon (new siteid in 2002)	1/1/1994	previous Flow Report: 1994 CWS data warehouse: 1995–2007 (origin: OWRD Dist 18) OWRD database: 2008–present
14206435	Beaverton Creek at NE Guston Court near Orenco, Oregon	1/1/2002	previous Flow Reports: all
14206450 14206451	Rock Creek at Hwy 8 near Hillsboro, Oregon (site moved 120 ft downstream in 2002)	1/1/1995	CWS data warehouse: 1995–2007 previous Flow Reports: 2008–present
14206500	Tualatin River at Farmington, Oregon	1/1/1989	CWS data warehouse: 1989–2002 (origin: OWRD Dist 18) previous Flow Reports: 2003–WY-2005 OWRD database: WY-2006–present
14206900	Fanno Creek at 56th Avenue	10/1/1990	USGS database: all
14206950	Fanno Creek at Durham, Oregon	1/1/1991	Stewart Rounds, USGS pers. comm.: 1991-WY-1993, 2/4/1996-WY-2000 USGS database: WY-1994-2/5/1996, WY-2001–present
14206956	Tualatin River at Tualatin, Oregon	10/22/1997	previous Flow Reports: 1997-1999 & 2002-2005 Stewart Rounds, USGS pers. comm.: 2000-2001 OWRD database: 2006–present
14207500	Tualatin River at West Linn, OR	1/1/1975	USGS database: all (USGS has data back to 1928)

Abbreviations: BOR=Bureau of Reclamation; CWS=Clean Water Services; OWRD=Oregon Water Resources Department; TVID=Tualatin Valley Irrigation District; USGS=United States Geological Survey; WY=water year

APPENDIX B
SELECTED RELEASES AND WITHDRAWALS

SCOPE

This appendix shows data for selected water releases to and withdrawals from the Tualatin River and its tributaries. It is not a comprehensive listing of releases and withdrawals. Some of the data represent daily mean flows and some represent instantaneous measurements.

Streamflow measurements are in Appendix A.

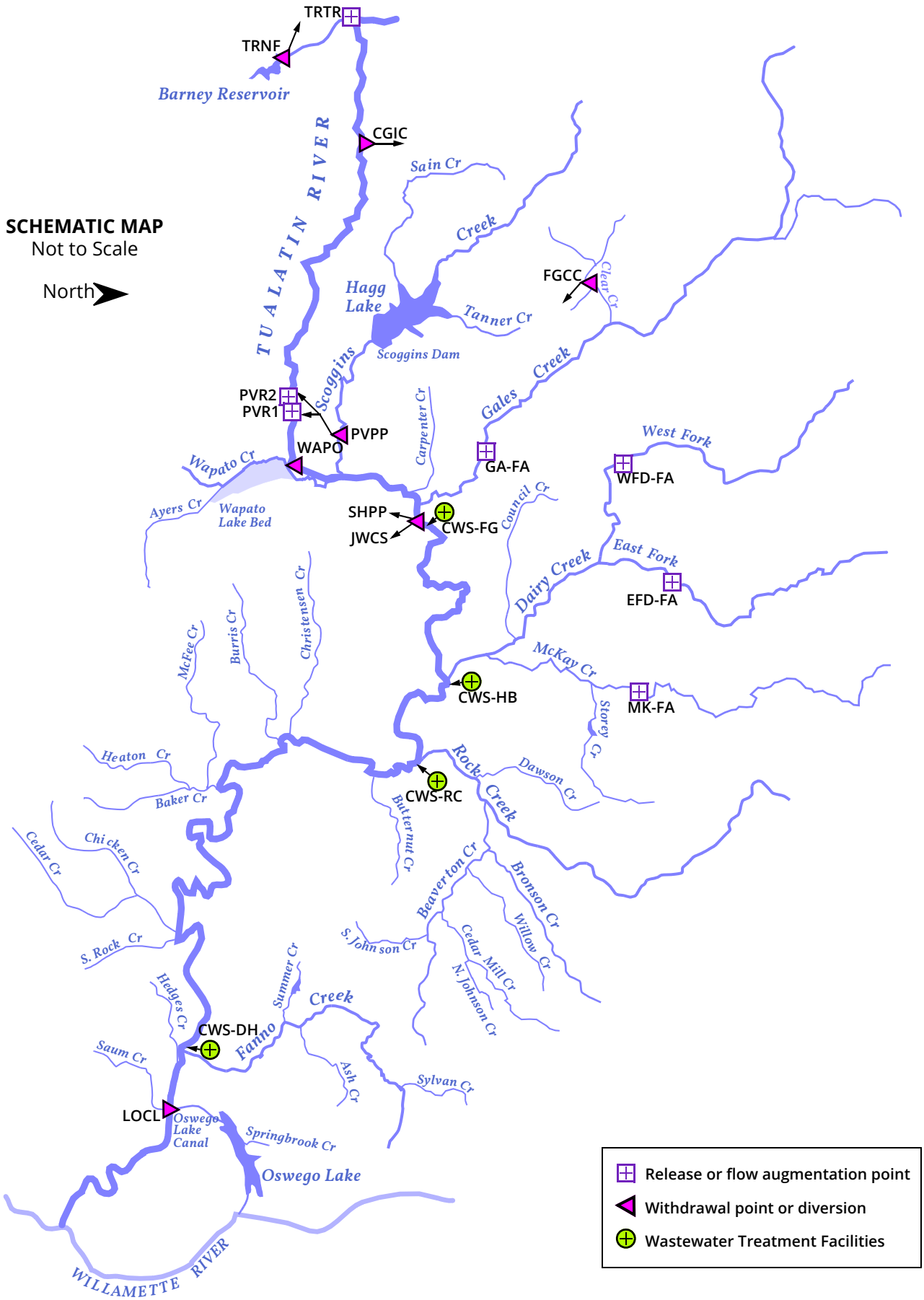
HIGHLIGHTS

- Withdrawals by Tualatin Valley Irrigation District (TVID) at Spring Hill Pump Plant (SHPP) in March–April were much larger than the period of record median. The was especially true for April, when the median withdrawal was 5.6 times the period of record median and 1.5 times the previous largest median April withdrawal. Withdrawals by Joint Water Commission (JWC) at SHPP during this time were not unusually large. Unseasonably dry and warm weather in March–May increased the need for irrigation water by farmers and nurseries.
- Clean Water Services' Fernhill Natural Treatment System (NTS) operated from May–October, although flow to the Tualatin River was intermittently suspended. During May–October, all effluent from the FG-WWTF was discharged either to the NTS or transferred to the RC-WWTF. Outside May–October, discharge from the FG-WWTF may be directly to the Tualatin River or routed through the NTS based on the operational needs of the WWTF.
- Clean Water Services continued its summer flow augmentation program to selected tributaries in cooperation with Tualatin Valley Irrigation District.

TRENDS OF NOTE

- Withdrawals in July-August by Joint Water Commission at the Spring Hill Pump Plant increased almost linearly from 1991 through about 2003. Similarly, July-August discharges from Clean Water Services' Rock Creek WWTF increased almost linearly from to 1991 to about 2003. Both JWC withdrawals and RC-WWTF discharges have been relatively constant since 2004, with only minor year-to-year variation.
- Withdrawals in July-August by Tualatin Valley Irrigation District at the Spring Hill Pump Plant have remained relatively constant over the period of record 1991–2020.

Selected Release and Withdrawal Sites



SELECTED RELEASE AND WITHDRAWAL SITES — ALPHABETICAL LISTING BY SITE CODE

SITE CODE	SITE NAME	RIVER MILE	PAGE
CGIC	City of Hillsboro Withdrawal at Cherry Grove	73.3	B-8
CWS-DH	CWS Durham WWTF Discharge	9.33	B-20
CWS-FG	CWS Forest Grove WWTF Discharge (with Fernhill NTS)	55.2	B-14
CWS-HB	CWS Hillsboro WWTF Discharge	43.8	B-16
CWS-RC	CWS Rock Creek WWTF Discharge	38.08	B-18
EFD-FA	CWS East Fork Dairy Creek Flow Augmentation with TVID	4.9	B-22
FGCC	City of Forest Grove Withdrawals in Clear Creek Watershed	—	*
GA-FA	CWS Gales Creek Flow Augmentation with TVID	5.0	B-22
JWCS	Joint Water Commission Withdrawal at Spring Hill Pump Plant	56.1	B-12
LOCL	Lake Oswego Corp. Canal Diversion	6.7	**
MK-FA	CWS McKay Creek Flow Augmentation with TVID	7.0	B-22
PVPP	TVID Withdrawal at Patton Valley Pump Plant	1.71	***
PVR1	TVID—Patton Valley River Turnout #1 Release	63.13	***
PVR2	TVID—Patton Valley River Turnout #2 Release	64.26	***
SHPP	TVID–Withdrawal at Spring Hill Pump Plant	56.1	B-10
TRNF	Barney Reservoir Measured Flow to North Fork Trask River	—	B-4
TRTR	Barney Reservoir (Trask River) Release to Tualatin River	78.0	B-6
WAPO	Wapato Canal Diversion	62.0	***
WFD-FA	CWS West Fork Dairy Creek Flow Augmentation with TVID	5.2	B-22

*The City of Forest Grove withdraws water at several locations in the Clear Creek watershed. The data are not included in this report.
**Monitoring of the Lake Oswego Canal Diversion was discontinued 8/23/2012.
***Withdrawals and releases at Patton Valley Pump Plant, Patton Valley River turnouts and Wapato Canal Diversion were not measured in 2020.

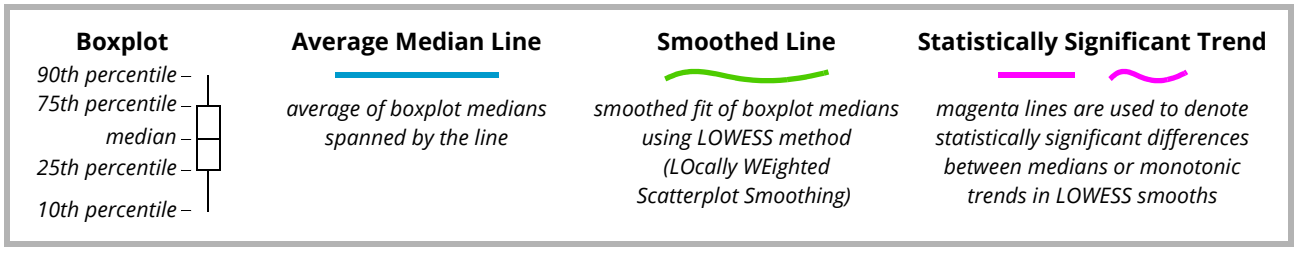
Explanation of Figures and Tables in this Appendix

Two pages of tables and graphs are included for every site.

Page 1–current year: Page 1 includes tabled data for daily releases or withdrawals plus a graph showing data for the current year compared to that of the previous year.

Page 2–statistical summary: A brief summary for the site is at the top of the page. The summary is followed by:

- a *color-coded table of the monthly medians* of daily mean releases or withdrawals for the period of record. The color-code is based on percentiles and is keyed to both cubic feet per second (cfs) and the equivalent percentile.
- a *graph showing boxplots for July-August* of daily releases or withdrawals by year for the period of record. July-August was chosen because it is typically a critical time for water management. An explanation of the features of these graphs is below.

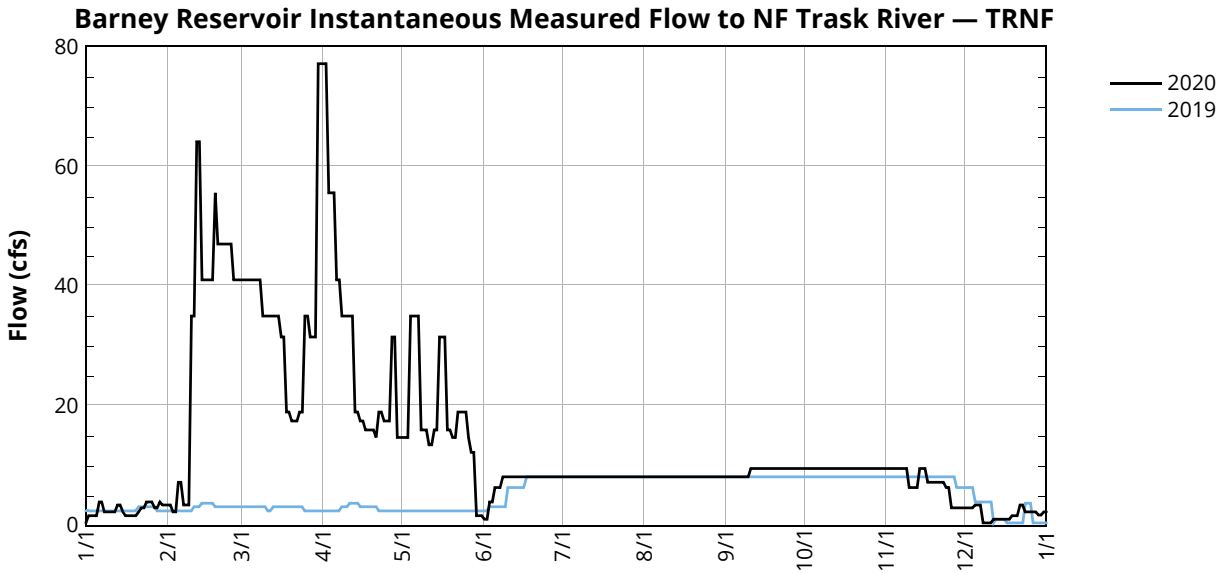


TRNF – Barney Reservoir Measured Flow to North Fork Trask River

Data source: Barney Reservoir Joint Ownership Commission

2020 — INSTANTANEOUS MEASURED FLOW (cfs) — TRNF

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				77.0	14.8	1.1	8.2					
2	1.7		41.0							9.6	9.6	3.0
3		2.4		55.5		4.0	8.2	8.2	8.2			
4			41.0		35.0			8.2	8.2		9.6	3.5
5		7.3				6.4		8.2		9.6		
6	4.0		41.0	41.0	35.0		8.2				9.6	
7		3.5						8.2	8.2	9.6		0.5
8	2.4			35.0	16.0	8.2	8.2		8.2			
9			35.0							9.6	6.4	0.5
10	2.4	35.0		35.0		8.2	8.2	8.2	9.6			
11			35.0		13.5						6.4	1.1
12		64.0				8.2		8.2		9.6		
13	3.5		35.0	19.0	16.0		8.2				9.6	
14		41.0						8.2	9.6	9.6		1.1
15	2.4			17.5	31.5	8.2	8.2					
16	1.7		31.5						9.6	9.6	7.3	1.1
17				16.0		8.2	8.2	8.2				
18			19.0		16.0				9.6		7.3	1.7
19		55.5				8.2		8.2		9.6		
20		47.0	17.5		14.8		8.2				7.3	
21	2.4			14.8				8.2	9.6	9.6		3.5
22	3.0			19.0	19.0	8.2	8.2					
23			19.0						9.6	9.6	6.4	2.4
24	4.0	47.0		17.5		8.2	8.2	8.2				
25			35.0						9.6		3.0	
26		41.0			14.8	8.2		8.2		9.6		
27	3.0		31.5	31.5	12.3		8.2				3.0	
28		41.0			12.3			8.2	9.6	9.6		1.8
29	4.0			14.8	1.7	8.2	8.2					
30	3.5	—	77.0						9.6	9.6	3.0	2.4
31		—		—		—	8.2	8.2	—		—	



TRNF – Barney Reservoir measured flow to North Fork Trask River

Data source: Barney Reservoir Joint Ownership Commission

Summary

- Winter and spring releases from Barney Reservoir to the NF Trask River depend on inflow and whether or not the reservoir is filling. No trends are evident for 2011–2020.
- Winter and spring releases in 2020 (January through mid-June) were similar to those in recent years, except 2019 which was particularly low.
- Summer releases from Barney Reservoir to the North Fork Trask River have generally been constant (about 8.4 cfs). Releases were slightly lower in 2019 and 2020 (8.2 cfs).

MEDIAN OF INSTANTANEOUS MEASURED FLOW — TRNF

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	47.0	38.0	79.6	55.5	35.0	16.5	8.4	8.4	9.5	9.5	7.3	6.2
2012	7.3	4.0	4.0	47.0	35.0	14.8	8.4	8.4	8.4	8.4	9.0	6.2
2013	47.0	47.0	41.0	35.0	8.4	8.4	8.4	8.4	8.4	8.4	8.4	0.5
2014	0.5	2.3	79.6	41.0	35.0	8.4	8.4	8.4	8.4	8.4	6.2	1.1
2015	1.1	51.3	35.0	27.6	7.3	8.4	8.4	8.4	8.4	8.4	6.2	2.8
2016	2.3	64.0	79.6	33.2	6.2	8.4	8.4	8.4	8.4	8.4	8.4	1.7
2017	4.0	0.0	110.8	79.6	47.0	20.2	8.4	12.3	12.3	9.6	9.6	2.3
2018	2.3	22.9	31.0	31.0	12.3	6.4	9.8	9.8	9.8	9.8	4.9	3.2
2019	2.5	3.2	3.2	2.5	2.5	6.4	8.2	8.2	8.2	8.2	8.2	1.1
2020	2.4	41.0	35.0	19.0	16.0	8.2	8.2	8.2	9.6	9.6	7.3	1.8
median	2.5	30.5	38.0	34.1	14.2	8.4	8.4	8.4	8.4	8.4	7.8	2.1

Key

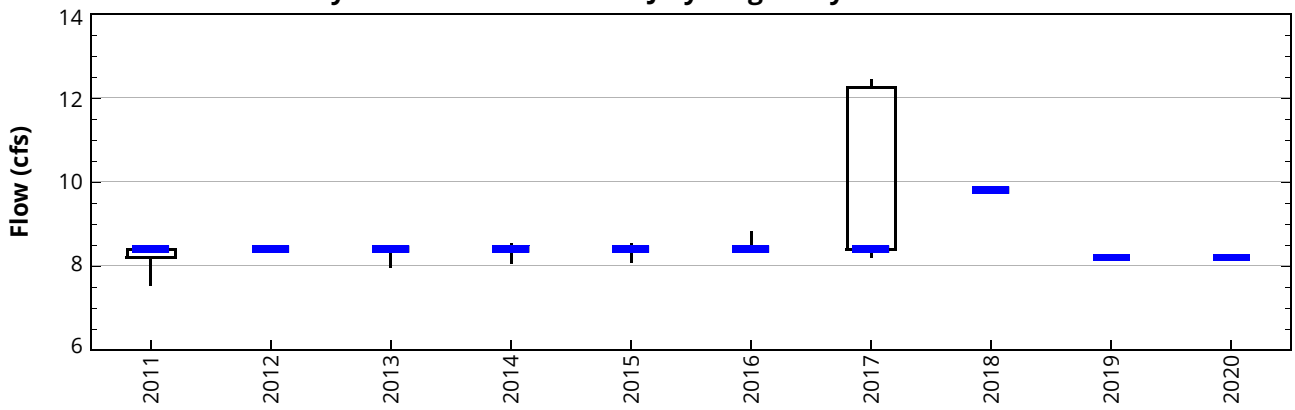
Q in cfs

- 0. < Q ≤ 2.5
- 2.5 < Q ≤ 7.3
- 7.3 < Q ≤ 23
- 23 < Q ≤ 47
- Q > 47

Q as percentile

- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Daily Flow Distributions for July–August by Year — TRNF



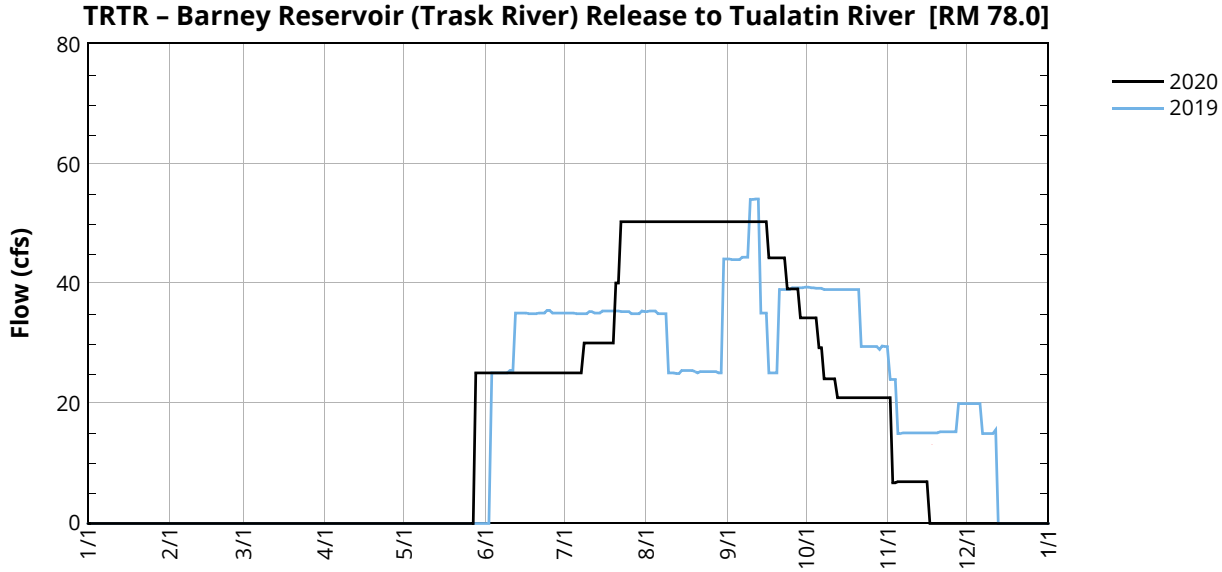
Note: Releases to the North Fork Trask River in the July–August period are often constant. Because the data vary little, the quartile boxes and whiskers are sometimes small or zero. Blue dashes are used to identify the median value.

TRTR — Barney Reservoir (Trask River) Release to Tualatin River [RM 78.0]

Data source: Barney Reservoir Joint Ownership Commission

2020 — INSTANTANEOUS MEASURED FLOW (cfs) — TRTR

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1				0.0	0.0	25.1	25.1					
2	0.0		0.0							34.3	6.8	0.0
3		0.0		0.0		25.1	25.1	50.3	50.3			
4			0.0		0.0			50.3	50.3		7.0	0.0
5		0.0				25.1		50.3		29.3		
6	0.0		0.0	0.0	0.0		25.1				7.0	
7		0.0						50.3	50.3	24.1		0.0
8	0.0			0.0	0.0	25.1	30.1		50.3			
9			0.0							24.1	7.0	0.0
10	0.0	0.0		0.0		25.1	30.1	50.3	50.3			
11			0.0		0.0						7.0	0.0
12		0.0				25.1		50.3		21.0		
13	0.0		0.0	0.0	0.0		30.1				7.0	
14		0.0						50.3	50.3	21.0		0.0
15	0.0			0.0	0.0	25.1	30.1					
16	0.0		0.0						44.3	21.0	0.0	0.0
17				0.0		25.1	30.1	50.3				
18			0.0		0.0				44.3		0.0	0.0
19		0.0				25.1		50.3		21.0		
20		0.0	0.0		0.0		40.1				0.0	
21	0.0			0.0				50.3	44.3	21.0		0.0
22	0.0			0.0	0.0	25.1	50.3					
23			0.0						39.1	21.0	0.0	0.0
24	0.0	0.0		0.0		25.1	50.3	50.3				
25			0.0						39.1		0.0	
26		0.0			0.0	25.1		50.3		21.0		
27	0.0		0.0	0.0	0.0		50.3				0.0	
28		0.0			25.1			50.3	34.3	21.0		0.0
29	0.0			0.0	25.1	25.1	50.3					
30	0.0	—	0.0						34.3	21.0	0.0	0.0
31		—		—		—	50.3	50.3	—		—	



SUMMARY

- July–September are the peak months for water releases from Barney Reservoir to the Tualatin River.
- Releases in 2020 began May 28 and continued through November 15.
- The capacity of Barney Reservoir increased when the dam was raised in 1999. Water releases before the dam raise were smaller. Since the dam raise, releases have varied year-to-year, but have no overall trend. Releases in 2020 were similar to recent years except 2019.

MEDIAN OF INSTANTANEOUS FLOW — TRTR

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1991	0	0	0	0	0	6	6	6	6	6	0	0
1992	0	0	0	0	0	0	1	8	8	8	0	0
1993	0	0	0	0	0	6	14	19	19	3	2	2
1994	0	0	0	0	0	2	12	18	18	2	0	0
1995	0	0	0	0	2	16	8	5	5	5	5	0
1996	0	0	0	10	0	0	10	20	30	7	0	0
1997	0	0	0	0	0	0	3	10	5	0	0	0
1998	0	0	0	0	0	0	60	68	5	0	0	0
1999	0	0	0	0	0	10	20	20	30	35	0	0
2000	0	0	0	0	0	20	39	39	57	57	39	0
2001	0	0	0	0	0	5	20	20	15	19	0	0
2002	0	0	0	0	0	24	36	48	54	39	0	0
2003	0	0	0	0	0	26	40	66	44	12	0	0
2004	0	0	0	0	0	23	38	34	24	14	0	0
2005	0	0	0	0	0	0	22	36	50	31	0	0
2006	0	0	0	0	0	21	20	20	40	49	0	0
2007	0	0	0	0	0	12	20	20	39	19	0	0
2008	0	0	0	0	0	0	18	24	30	24	0	0
2009	0	0	0	0	0	0	20	24	34	20	0	0
2010	0	0	0	0	0	0	26	34	40	30	0	0
2011	0	0	0	20	50	49	49	60	49	10	0	0
2012	0	0	0	0	0	0	30	40	30	18	0	0
2013	0	0	0	0	15	20	20	32	38	14	0	0
2014	0	0	0	0	0	15	30	30	44	30	0	0
2015	0	0	0	0	25	30	40	40	50	30	0	0
2016	0	0	0	0	20	30	30	35	49	19	0	0
2017	0	0	0	0	0	0	40	40	56	20	0	0
2018	0	0	0	0	0	30	40	50	55	40	15	0
2019	0	0	0	0	0	35	35	25	39	39	15	0
2020	0	0	0	0	0	25	35	50	47	21	3	0
median	0	0	0	0	0	11	24	31	38	19	0	0

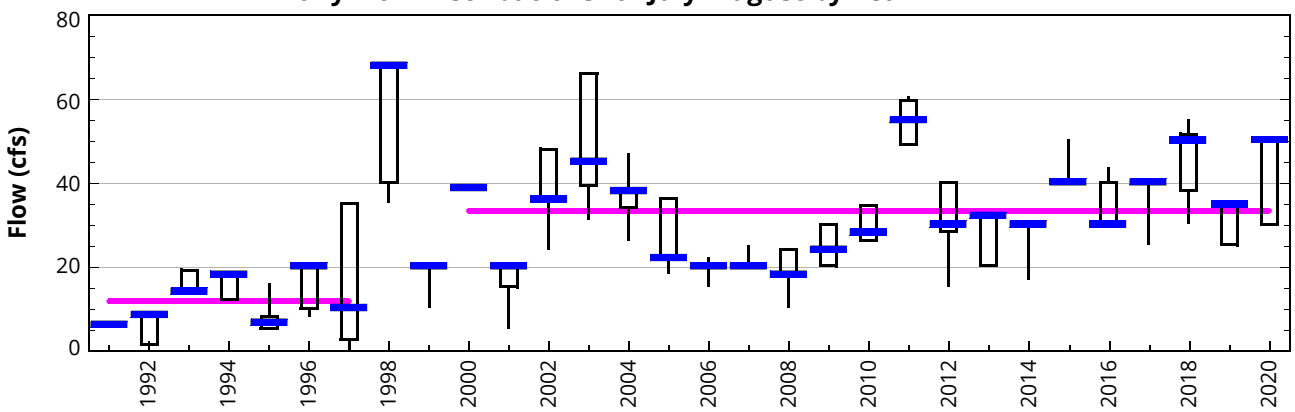
KEY

Q in cfs
- 0 < Q ≤ 6
- 6 < Q ≤ 15
- 15 < Q ≤ 39
- 39 < Q ≤ 50
- Q > 50

Q as percentile
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Only days with water releases were used to calculate percentiles

Daily Flow Distributions for July–August by Year — TRTR



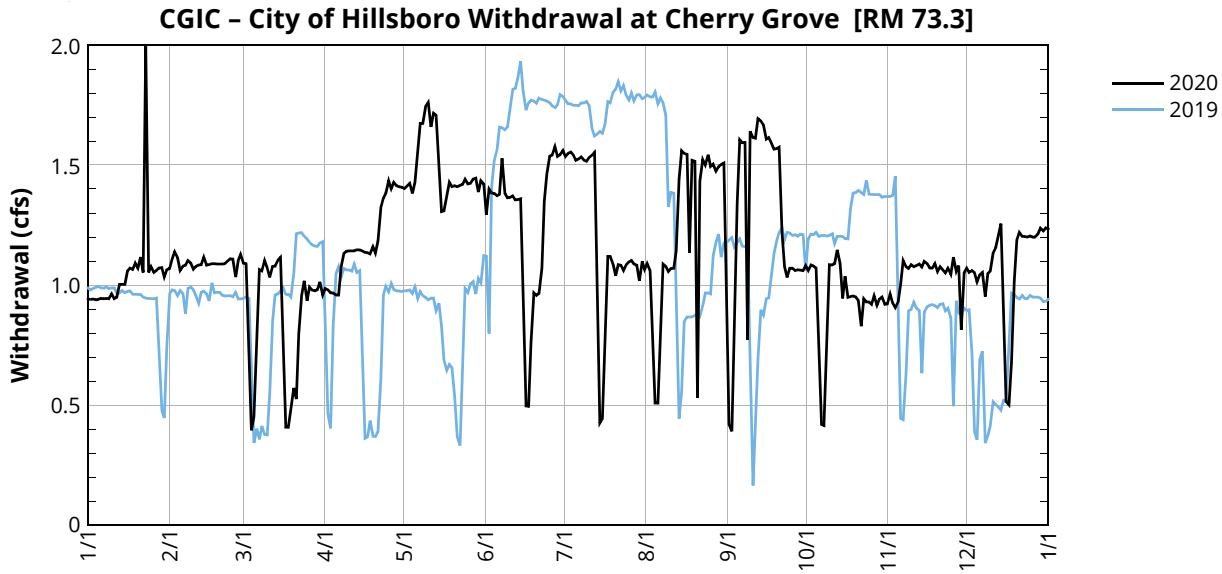
Note: Blue dashes are used to identify median values because quartile boxes and whiskers are sometimes small.

CGIC — City of Hillsboro Withdrawal at Cherry Grove [RM 73.3]

Data source: City of Hillsboro

2020 — MEAN WITHDRAWAL (cfs) — CGIC

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.94	1.07	1.09	0.99	1.40	1.30	1.54	1.09	0.42	1.06	0.97	1.06
2	0.94	1.11	1.09	0.98	1.41	1.40	1.55	1.06	0.39	1.09	0.93	1.06
3	0.94	1.14	0.73	0.97	1.43	1.39	1.56	0.84	0.75	1.08	0.91	1.05
4	0.94	1.12	0.40	0.97	1.38	1.38	1.54	0.51	1.34	1.07	0.93	1.01
5	0.94	1.06	0.45	0.96	1.43	1.38	1.52	0.51	1.61	0.71	1.00	1.04
6	0.95	1.08	0.81	0.96	1.56	1.38	1.53	0.83	1.60	0.42	1.10	1.06
7	0.95	1.08	1.07	1.08	1.68	1.53	1.54	1.09	1.60	0.42	1.08	0.95
8	0.95	1.10	1.06	1.13	1.68	1.38	1.52	1.08	0.77	0.72	1.07	1.05
9	0.95	1.09	1.10	1.14	1.75	1.37	1.52	1.06	1.64	1.09	1.09	1.06
10	0.97	1.07	1.08	1.14	1.76	1.37	1.53	1.07	1.62	1.09	1.08	1.14
11	0.95	1.08	1.03	1.14	1.66	1.37	1.54	1.07	1.61	1.09	1.08	1.16
12	0.95	1.09	1.08	1.14	1.72	1.36	1.55	1.14	1.70	1.15	1.09	1.21
13	1.01	1.09	1.08	1.15	1.71	1.36	0.97	1.44	1.69	1.09	1.08	1.26
14	1.01	1.12	1.11	1.15	1.53	1.36	0.43	1.56	1.67	0.95	1.10	0.82
15	1.01	1.08	1.12	1.14	1.31	0.85	0.45	1.55	1.61	1.04	1.09	0.52
16	1.06	1.09	0.71	1.14	1.31	0.50	0.82	1.55	1.62	0.95	1.07	0.50
17	1.07	1.09	0.41	1.14	1.37	0.50	1.12	1.14	1.60	0.95	1.07	0.68
18	1.07	1.09	0.41	1.13	1.43	0.76	1.12	1.52	1.57	0.96	1.09	1.02
19	1.09	1.09	0.49	1.16	1.41	0.97	1.09	1.52	1.57	0.95	1.06	1.19
20	1.07	1.09	0.57	1.14	1.42	0.96	1.04	0.53	1.58	0.94	1.08	1.22
21	1.12	1.09	0.53	1.19	1.41	0.97	1.09	1.44	1.22	0.83	1.06	1.21
22	1.06	1.09	0.80	1.32	1.42	1.07	1.08	1.53	1.08	0.95	1.05	1.20
23	2.01	1.10	0.96	1.36	1.42	1.35	1.06	1.50	1.03	0.93	1.07	1.20
24	1.06	1.11	1.02	1.38	1.44	1.47	1.09	1.55	1.07	0.93	1.05	1.21
25	1.08	1.11	0.94	1.44	1.42	1.54	1.10	1.50	1.07	0.92	1.12	1.20
26	1.06	1.04	0.99	1.40	1.43	1.54	1.10	1.51	1.06	0.96	1.06	1.20
27	1.06	1.10	0.98	1.43	1.44	1.58	1.09	1.48	1.07	0.92	1.08	1.21
28	1.07	1.13	0.98	1.42	1.45	1.54	1.08	1.50	1.06	0.94	0.82	1.24
29	1.08	1.06	0.98	1.41	1.39	1.55	1.02	1.50	1.06	0.95	1.05	1.23
30	1.04	—	1.01	1.41	1.44	1.56	1.10	1.51	1.08	0.92	1.07	1.24
31	1.07	—	0.96	—	1.42	—	1.07	0.82	—	0.92	—	1.24



CGIC — City of Hillsboro Withdrawal at Cherry Grove [RM 73.3]

Data source: City of Hillsboro

Summary

- Withdrawals at Cherry Grove in 2020 were similar to those in 2019.
- May, August and September had the highest withdrawal rates in 2020. Rates were lower in July, although not as low as they were in July 2017.
- The median withdrawal rate for July-August for the period of record was 1.46 cfs.
- Withdrawal rates at Cherry Grove are operational decisions by Joint Water Commission.

MEDIAN OF DAILY MEAN WITHDRAWAL — CGIC

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	0.91	1.14	1.17	1.28	1.35	1.59	1.42	1.74	1.47	1.35	1.24	1.34
2012	1.00	1.30	1.26	1.34	1.33	1.37	1.60	1.47	1.27	0.98	0.86	0.97
2013	1.12	1.15	1.10	1.12	1.48	1.45	1.45	1.73	1.09	1.00	1.11	0.93
2014	0.84	0.80	0.32	0.49	0.00	0.37	1.22	0.89	0.82	0.74	0.32	0.88
2015	0.99	1.11	1.29	0.88	1.34	1.21	1.49	1.34	1.26	0.82	0.55	0.54
2016	0.54	0.59	0.58	0.83	0.74	0.57	1.14	0.50	0.94	0.60	0.82	0.72
2017	0.69	0.40	0.39	0.37	0.36	0.65	0.66	0.59	0.56	0.57	0.57	0.57
2018	0.42	0.95	0.93	1.07	0.98	1.26	1.38	1.56	1.16	1.26	1.25	0.97
2019	0.97	0.97	0.96	0.98	0.95	1.76	1.77	1.12	1.17	1.22	0.91	0.90
2020	1.04	1.09	0.98	1.14	1.43	1.37	1.10	1.44	1.46	0.95	1.07	1.16
median	0.94	1.03	0.97	1.03	1.16	1.32	1.40	1.39	1.17	0.97	0.89	0.92

Key

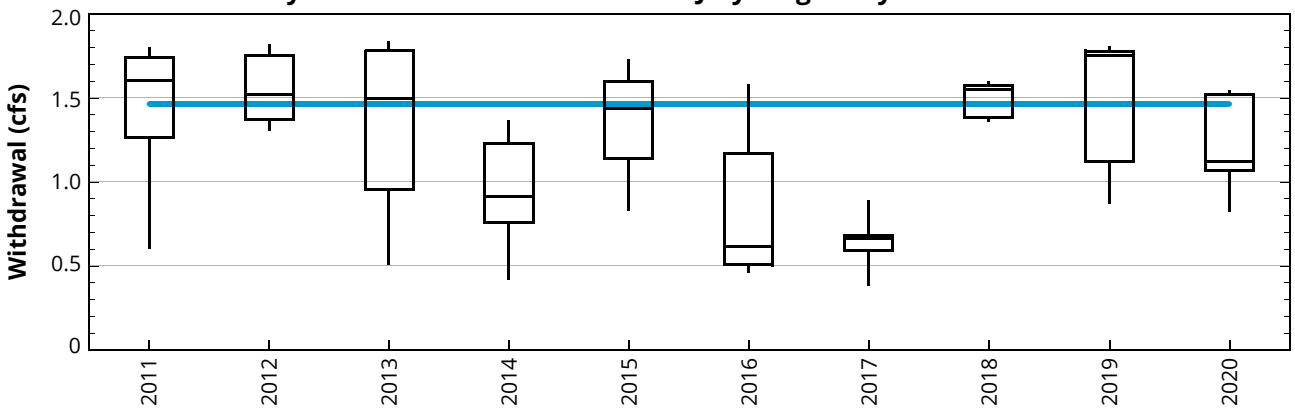
Q in cfs

- 0 < Q ≤ 0.43
- 0.43 < Q ≤ 0.64
- 0.64 < Q ≤ 1.29
- 1.29 < Q ≤ 1.51
- Q > 1.51

Q as percentile

- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Daily Withdrawal Distributions for July–August by Year — CGIC

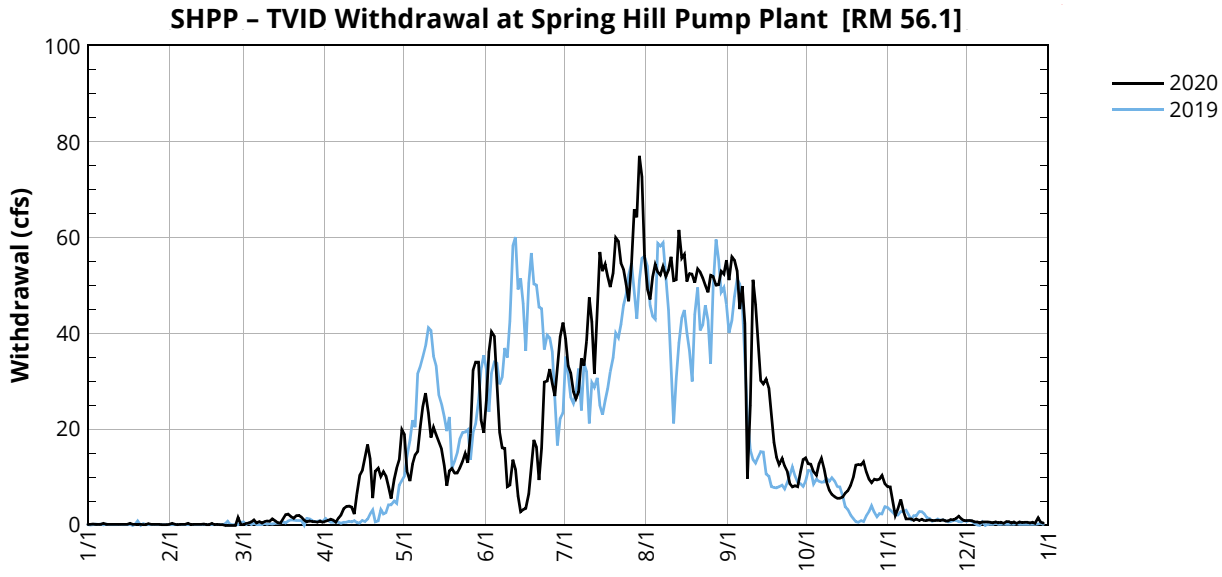


SHPP – TVID Withdrawal at Spring Hill Pump Plant [RM 56.1]

Data source: US Geological Survey, Oregon Water Science Center

2020 — MEAN WITHDRAWAL (cfs) — SHPP

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.24	0.28	0.22	0.87	19.0	26.1	38.9	49.2	51.1	12.9	8.03	1.07
2	0.24	0.48	0.43	1.09	11.4	36.1	33.3	47.1	56.0	12.8	5.14	1.02
3	0.30	0.25	0.49	1.30	9.32	40.4	31.8	51.8	55.3	11.2	2.06	0.74
4	0.24	0.19	0.76	1.14	12.8	39.5	27.9	54.4	53.0	10.5	3.42	0.74
5	0.24	0.25	1.17	0.68	14.7	30.9	26.4	52.8	45.1	12.8	5.43	0.51
6	0.24	0.25	0.57	1.60	15.4	19.4	27.8	52.2	49.9	14.0	3.03	0.74
7	0.47	0.25	0.81	2.17	20.5	16.2	34.8	54.0	42.1	11.9	1.41	0.74
8	0.24	0.44	0.49	3.57	24.8	16.1	33.3	51.9	9.76	9.12	1.36	0.76
9	0.24	0.19	0.81	3.97	27.6	8.12	38.4	53.2	25.0	7.35	1.41	0.71
10	0.24	0.25	0.98	4.07	23.4	8.42	47.5	56.0	51.2	6.52	1.07	0.59
11	0.24	0.25	0.87	3.82	18.3	13.7	42.4	51.0	46.0	6.02	1.36	0.77
12	0.24	0.25	1.36	2.39	20.5	11.8	31.6	51.2	38.7	5.67	1.07	0.59
13	0.24	0.25	0.92	6.58	19.0	6.16	45.2	61.6	30.2	5.67	1.30	0.71
14	0.24	0.30	0.57	10.5	17.5	2.88	57.0	55.7	29.5	5.90	1.02	0.47
15	0.24	0.22	0.52	11.5	16.1	3.34	53.0	56.5	30.5	6.73	1.07	0.83
16	0.24	0.22	1.38	14.2	12.5	3.54	54.4	50.8	28.7	7.26	1.22	0.83
17	0.47	0.43	2.28	16.9	8.32	6.60	51.9	52.5	22.9	8.35	1.10	0.53
18	0.24	0.22	2.36	13.9	11.4	12.4	49.7	52.4	17.3	9.99	1.07	0.77
19	0.24	0.27	1.85	5.74	11.9	17.8	52.6	50.6	14.2	12.6	1.13	0.47
20	0.24	0.22	1.52	11.3	10.9	16.4	60.0	53.5	12.7	12.7	1.02	0.77
21	0.24	0.22	2.06	12.0	11.0	9.48	59.2	52.8	14.0	12.6	1.22	0.62
22	0.18	0.00	2.14	10.2	12.0	16.1	54.7	51.6	12.4	13.3	0.96	0.68
23	0.19	0.00	1.76	11.2	13.4	29.9	53.4	50.1	11.3	11.3	0.96	0.71
24	0.41	0.00	1.14	10.3	15.0	30.1	50.3	48.6	8.74	9.68	1.27	0.53
25	0.28	0.00	0.76	8.03	13.1	32.6	46.7	52.1	8.06	8.91	1.19	0.71
26	0.25	0.00	0.98	5.63	19.2	29.6	54.6	51.9	8.32	9.68	1.53	0.47
27	0.25	1.68	0.81	9.58	32.3	27.0	65.9	50.1	8.12	9.45	1.92	1.65
28	0.25	0.22	0.81	12.0	34.1	32.6	64.2	50.2	11.2	9.66	1.41	0.71
29	0.19	0.49	0.68	13.7	34.1	39.3	77.0	53.0	13.7	10.5	1.02	0.53
30	0.19	—	0.95	20.0	22.0	42.3	72.6	52.4	14.1	8.71	1.07	0.77
31	0.19	—	0.71	—	19.3	—	56.2	55.3	—	8.09	—	0.47



SHPP – TVID Withdrawal at Spring Hill Pump Plant [RM 56.1]

Data source: US Geological Survey, Oregon Water Science Center

Summary

- TVID withdraws water at SHPP for irrigation. Peak season is usually July–August.
- Withdrawals during the winter and summer 2020 seasons were similar to other years. Withdrawals in March–April were much larger the POR median. The median April withdrawal was 5.6 times the POR median and 1.5 times the previous largest median April withdrawal. The median October withdrawal was larger than the POR median, but smaller than those of several other years (1991, 1999, 2006 and 2015). Unseasonably dry and warm weather in March–May and early October necessitated more irrigation.
- Historically, withdrawal rates in the winter were zero, but are now low volumes used to supply nurseries.

MEDIAN OF DAILY MEAN WITHDRAWAL — SHPP

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	0	0	0	0	1.1	10.5	49.0	45.0	25.5	12.0	0.1	0
1992	0	0	0	0	18.0	40.0	50.0	49.0	18.0	4.8	0	0
1993	0	0	0	0.6	1.8	4.4	28.0	43.0	28.5	8.8	0.8	0
1994	0	0	0	0	13.0	21.5	58.0	50.0	24.0	6.8	0.2	0
1995	0	0	0	0	6.0	13.2	44.5	46.2	20.1	3.1	0	0
1996	0	0	0	0	0	25.2	62.0	54.0	9.1	2.1	0	0
1997	0	0	0	1.8	10.0	11.5	51.0	56.0	11.5	3.0	0.3	0
1998	0	0	0	1.5	1.9	14.5	49.0	52.0	28.5	4.2	0.6	0.3
1999	0	0	0.1	2.1	6.6	27.5	56.0	47.0	35.0	10.0	0.4	0.3
2000	0.3	0.3	0.3	4.8	5.9	20.5	49.0	45.0	21.5	0.0	0	0
2001	0	0	0	0	9.6	29.5	42.0	36.0	24.5	3.5	0.8	0
2002	0	0	0	0	15.0	37.0	50.0	51.0	30.0	8.6	1.7	0.3
2003	0.5	0	0	0.9	3.3	52.3	64.4	45.3	24.7	3.3	0	0
2004	0	0	0	0	13.2	41.8	57.9	46.3	4.1	3.1	1.1	0.2
2005	0.3	0.3	1.8	1.3	1.7	15.2	43.7	59.3	30.7	5.1	0.8	0.3
2006	0.2	0.3	0.6	1.6	17.7	24.3	56.7	55.7	29.9	10.7	1.0	0.3
2007	0.3	0.3	0.5	2.3	18.8	45.7	51.3	42.7	29.7	3.4	2.2	0.3
2008	0.3	0.4	0.9	1.9	17.0	32.0	54.0	39.0	32.5	5.1	2.7	0.3
2009	0.3	0.3	0.9	2.9	3.9	39.1	62.0	43.5	23.3	3.7	1.7	1.0
2010	1.0	1.1	1.4	2.5	3.4	3.1	53.0	56.0	20.5	3.6	1.3	0.3
2011	0.32	0.34	0.71	1.25	2.75	17.1	40.6	51.1	27.2	4.74	2.82	0.41
2012	0.40	0.40	0.45	1.55	6.20	16.5	42.0	53.0	37.5	6.00	1.40	0.41
2013							54.0	48.0	19.5	0	0	0
2014	0	0.23	0.43	1.45	11.0	39.0	53.0	54.0	38.0	5.10	0.73	0.22
2015	0.23	0.23	0.81	2.10	36.0	59.5	63.0	52.0	25.0	12.0	0.99	0.22
2016	0.22	0.23	0.51	4.82	25.6	43.1	51.5	56.8	24.1	1.98	1.03	0
2017	0.22	0.22	0.53	0.92	3.85	27.9	56.2	49.6	21.1	6.37	0.71	0.45
2018	0.45	0.45	0.71	0.98	25.8	41.9	53.0	47.0	21.7	9.40	1.73	0.22
2019	0.22	0.22	0.54	1.03	21.9	36.9	32.7	44.9	11.5	3.93	1.44	0.24
2020	0.24	0.25	0.87	7.31	16.1	17.1	50.3	52.2	24.0	9.68	1.25	0.71
median	0.22	0.22	0.43	1.30	9.60	27.5	51.4	49.3	24.3	4.77	0.78	0.22

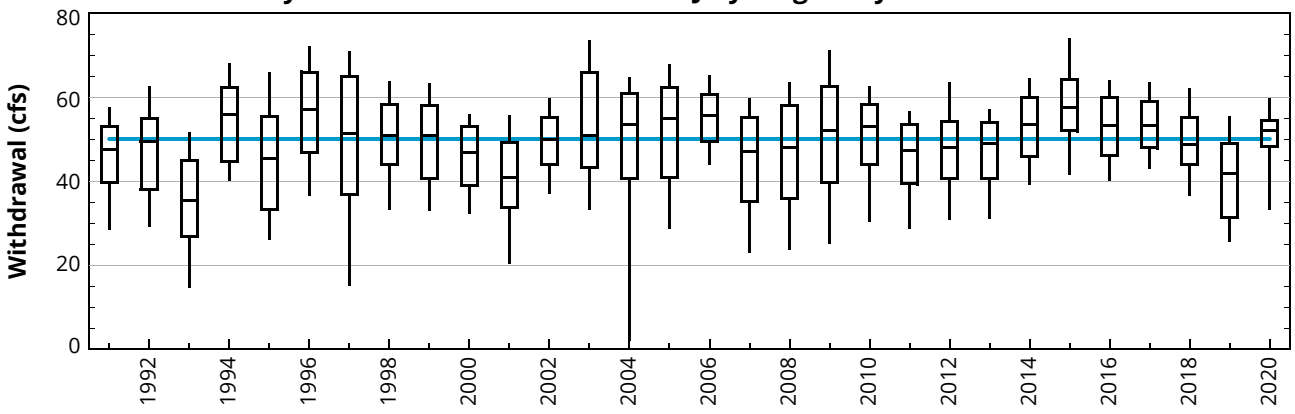
Key

Q in cfs
- Q=0
- 0 < Q ≤ 0.30
- 0.30 < Q ≤ 0.90
- 0.90 < Q ≤ 35.0
- 35.0 < Q ≤ 52.8
- Q > 52.8

Q as percentile*
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Only days with withdrawals >0 were used to calculate percentiles

Daily Withdrawal Distributions for July–August by Year — SHPP

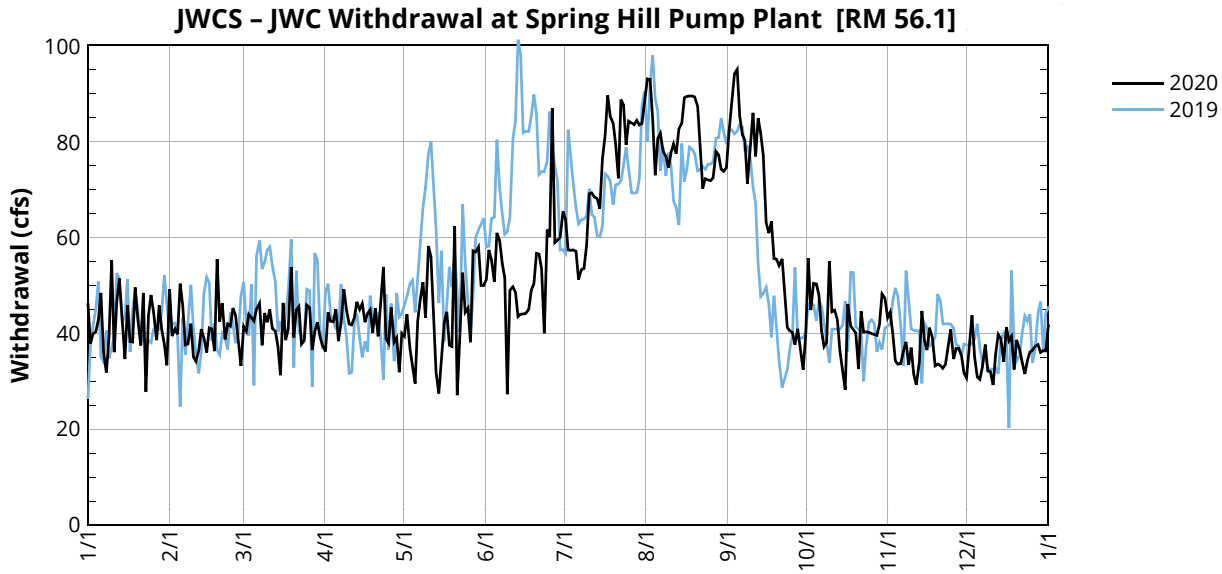


JWCS – JWC Withdrawal at Spring Hill Pump Plant [RM 56.1]

Data source: Joint Water Commission

2020 — MEAN WITHDRAWAL (cfs) — JWCS

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	46.2	49.2	41.5	36.2	39.4	51.2	63.8	93.0	82.0	55.7	44.5	37.8
2	37.8	39.5	40.5	44.4	44.0	57.4	57.4	92.9	87.9	44.9	40.0	43.8
3	39.9	40.9	44.0	42.6	36.7	55.4	57.4	84.7	94.1	50.5	34.3	35.2
4	40.4	39.8	43.4	42.5	33.2	50.8	57.4	73.0	95.0	50.3	33.6	31.0
5	42.8	50.4	42.7	45.1	29.6	60.9	57.2	80.6	85.3	47.9	33.7	30.4
6	48.5	45.9	45.1	38.4	42.5	59.4	51.3	81.7	81.5	40.6	36.3	33.0
7	36.3	37.6	46.3	42.1	47.1	54.7	53.3	78.0	80.3	37.3	38.2	37.7
8	31.9	37.8	37.6	49.3	50.7	51.6	53.5	76.9	71.2	38.1	33.4	32.2
9	39.4	42.0	44.3	45.0	43.3	27.3	58.3	74.5	78.1	55.1	37.0	32.1
10	55.3	35.2	42.4	42.0	58.2	49.0	69.1	77.7	86.0	44.5	31.5	29.3
11	36.1	34.2	45.0	41.8	56.0	49.8	69.3	79.5	76.9	44.8	29.3	35.8
12	46.6	36.3	41.0	43.2	41.7	48.6	68.5	77.5	84.9	42.9	34.0	39.9
13	51.4	40.9	40.5	46.6	31.9	43.5	68.1	82.7	81.7	36.3	44.7	39.0
14	42.6	39.2	37.3	45.0	27.6	44.0	66.0	83.7	77.1	32.3	38.6	34.2
15	34.7	36.1	31.3	46.2	33.7	44.1	76.3	89.1	63.1	28.3	36.6	41.3
16	45.9	41.2	46.4	42.3	42.3	44.1	81.3	89.4	60.9	46.1	41.2	38.5
17	38.4	40.9	38.6	44.1	44.5	45.0	89.6	89.5	63.4	41.6	39.3	39.4
18	38.2	36.3	40.9	44.9	37.6	49.1	85.2	89.5	55.6	40.8	33.3	32.5
19	49.6	55.5	53.8	40.1	37.3	50.3	83.9	89.3	55.5	40.1	33.6	38.7
20	43.2	42.5	39.2	45.3	62.3	56.8	79.4	87.4	54.2	32.7	33.4	36.8
21	37.5	46.3	44.9	39.4	27.2	56.5	72.3	78.3	55.6	44.6	32.8	33.9
22	48.4	38.8	45.6	47.0	41.6	53.5	88.7	70.2	48.8	40.3	33.5	31.5
23	27.8	42.0	37.8	53.9	52.7	40.1	87.6	72.2	41.3	40.3	37.5	34.3
24	43.7	41.6	38.5	38.9	44.4	61.6	79.3	72.0	40.5	40.2	40.8	36.1
25	48.0	45.3	46.0	38.0	45.3	60.1	84.3	71.9	40.3	40.0	34.7	36.5
26	44.4	43.8	45.4	45.4	38.2	86.9	83.9	72.5	37.7	39.8	36.9	37.4
27	38.6	38.9	36.5	38.2	57.3	58.9	83.5	77.9	41.0	39.6	37.0	37.7
28	45.8	33.3	40.3	39.1	57.0	59.4	84.4	77.2	36.6	41.9	35.4	36.1
29	40.9	36.5	42.4	31.9	58.0	60.0	83.5	74.2	32.4	48.3	31.8	36.4
30	37.8	—	39.4	40.0	50.0	65.5	83.8	73.8	39.5	47.4	30.8	36.4
31	33.4	—	37.5	—	50.0	—	88.4	74.6	—	43.3	—	41.7



JWCS – JWC Withdrawal at Spring Hill Pump Plant [RM 56.1]

Data source: Joint Water Commission

Summary

- JWC withdraws water at SHPP for municipal use. Peak season is July–August.
- Withdrawals in 2020 July–August were similar to those in recent years.
- Withdrawal rates in July–August increased from 1991 to the early-2000s. Withdrawal rates also increased for other months. Since 2003, no trend is evident. The median July-August withdrawal since 2003 is 73 cfs.

MEDIAN OF DAILY MEAN WITHDRAWAL — JWCS

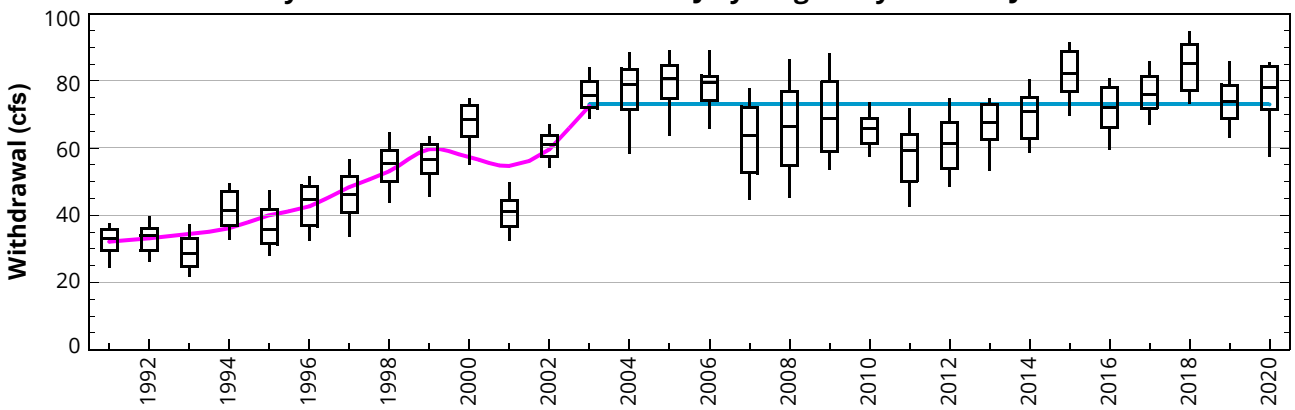
	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	19.5	19.2	18.6	19.3	16.8	21.0	33.1	33.6	28.6	22.9	19.6	15.9
1992	17.9	17.9	18.0	19.8	28.3	37.1	32.7	34.6	27.7	22.2	17.8	16.5
1993	17.0	16.0	16.6	16.1	20.4	24.8	25.4	32.9	32.3	19.1	17.1	18.4
1994	17.7	15.7	15.6	16.4	24.3	27.6	42.8	40.6	33.1	23.9	16.0	20.7
1995	20.9	20.9	22.5	20.8	24.4	30.2	37.8	35.4	32.9	24.0	24.2	23.4
1996	23.0	29.6	27.6	27.8	25.5	34.5	46.4	42.6	27.3	23.5	24.8	25.1
1997	23.9	23.4	28.5	25.7	43.2	39.5	48.1	44.7	33.3	25.7	24.6	26.7
1998	28.2	29.3	29.2	30.3	31.9	42.2	56.9	55.0	52.7	33.9	32.2	33.1
1999	32.6	29.8	31.2	30.1	38.4	45.8	56.1	57.6	54.1	40.8	34.5	42.0
2000	34.7	33.1	32.8	36.0	41.7	59.0	67.6	69.2	53.2	44.0	42.4	42.7
2001	43.1	42.9	45.1	38.8	36.7	33.0	38.2	42.9	38.8	28.8	35.5	37.0
2002	38.2	38.9	42.2	43.5	44.0	52.8	60.2	62.9	55.1	47.8	44.4	45.7
2003	47.1	47.6	48.5	50.1	53.4	65.9	79.1	73.0	58.0	49.5	46.8	49.2
2004	52.5	37.8	51.7	56.6	61.6	67.5	80.1	78.8	57.9	52.9	47.9	46.0
2005	48.4	49.2	53.7	53.6	49.8	58.9	75.3	83.9	77.6	49.3	47.4	46.4
2006	50.0	50.8	49.2	53.8	57.4	61.0	79.4	79.4	70.2	52.5	48.8	40.8
2007	44.7	43.6	43.9	42.2	50.7	56.9	62.6	65.1	64.9	38.8	43.9	46.8
2008	48.3	47.0	43.7	38.2	43.7	46.9	68.2	63.4	60.3	42.0	36.4	42.4
2009	44.0	43.7	42.2	40.0	43.2	56.1	72.6	65.7	53.9	38.8	32.4	38.0
2010	41.5	42.6	39.3	33.7	33.8	36.1	64.3	67.0	43.3	38.9	32.2	33.0
2011	35.4	38.0	35.4	34.9	32.1	41.1	50.2	61.8	61.4	36.5	30.6	31.4
2012	32.2	33.2	35.7	37.0	42.4	41.7	57.5	67.5	65.8	39.4	32.6	35.2
2013	37.6	37.3	33.0	29.7	45.5	44.2	62.6	72.0	45.8	44.4	42.8	34.4
2014	38.2	39.5	39.7	38.1	45.0	55.2	67.1	72.7	66.2	45.9	39.9	46.6
2015	46.9	38.6	37.3	45.3	53.8	71.9	85.5	78.2	56.2	42.2	39.5	36.3
2016	38.6	40.5	40.4	44.8	54.1	68.4	66.7	76.9	56.8	39.2	39.6	38.5
2017	40.7	37.6	38.7	40.2	43.7	57.4	73.0	77.3	66.2	36.9	34.6	28.8
2018	27.9	33.9	33.7	34.3	55.5	71.8	86.7	83.2	72.4	44.8	38.4	38.9
2019	40.8	39.9	48.9	42.2	53.8	74.2	70.1	77.3	48.1	41.4	41.1	37.5
2020	40.9	40.9	41.5	42.5	43.3	52.6	76.3	78.0	63.3	41.6	35.1	36.4
median	38.2	37.9	38.0	37.6	43.3	49.8	63.5	66.4	54.6	39.3	35.3	36.7

Key

Q in cfs
- 0 < Q ≤ 22.4
- 22.4 < Q ≤ 31.4
- 31.4 < Q ≤ 52.1
- 52.1 < Q ≤ 68.0
- Q > 68.0

Q as percentile
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Daily Withdrawal Distributions for July–August by Year — JWCS



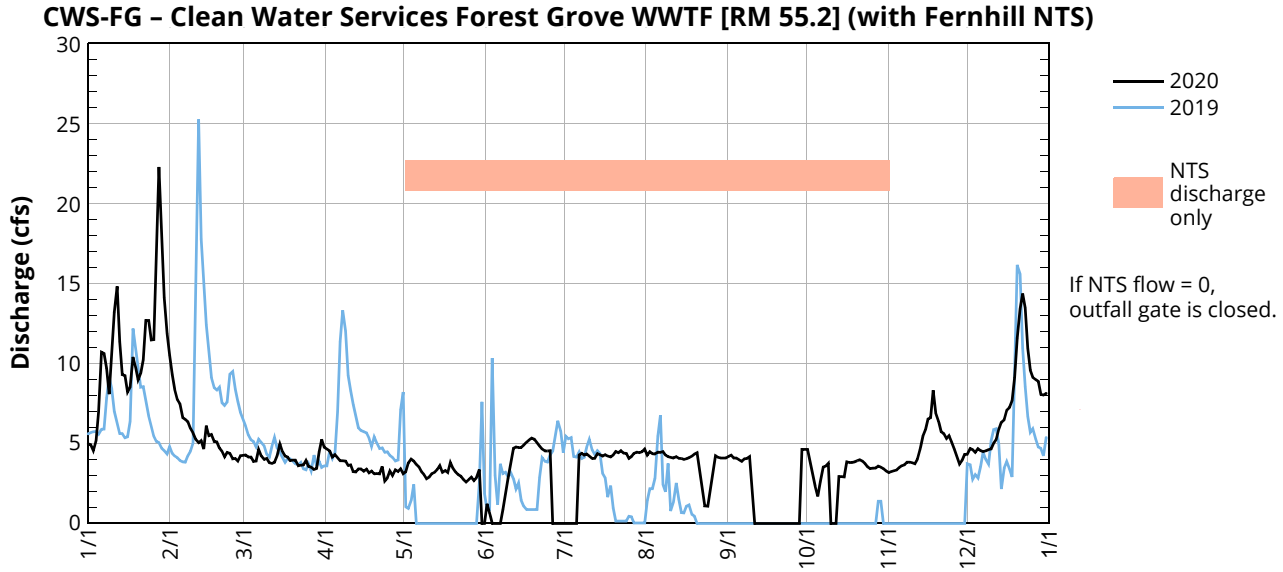
CWS-FG – Clean Water Services Forest Grove WWTF Discharge [RM 55.2] with Fernhill NTS

Data source: Clean Water Services

2020 — MEAN DISCHARGE (cfs) — CWS-FG

DAY	Jan	Feb	Mar	Apr	May*	Jun*	Jul*	Aug*	Sep*	Oct*	Nov	Dec
1	4.97	10.5	4.29	4.66	3.22	1.25	closed	4.27	4.20	4.64	3.19	4.33
2	4.93	9.31	4.16	4.53	3.77	0.67	closed	4.47	4.27	3.87	3.23	4.68
3	4.56	8.37	4.15	4.16	4.02	closed	closed	4.37	4.10	3.09	3.31	4.61
4	5.15	7.77	3.88	4.30	3.91	closed	closed	4.34	4.10	2.32	3.34	4.45
5	6.99	7.49	3.90	4.12	3.70	closed	closed	4.47	3.98	1.70	3.50	4.67
6	10.7	6.61	4.64	3.93	3.54	closed	4.29	4.44	3.89	2.61	3.61	4.56
7	10.6	6.50	4.24	3.93	3.25	0.88	4.39	4.49	4.05	3.52	3.67	4.49
8	9.70	6.37	4.01	3.90	3.06	1.86	4.27	4.27	4.07	3.58	3.82	4.54
9	8.08	5.94	4.05	3.62	2.80	2.83	4.35	4.18	4.17	3.75	3.83	4.61
10	10.8	5.66	3.79	3.67	2.91	3.78	4.21	4.13	2.15	closed	3.79	4.65
11	13.2	5.26	3.76	3.23	3.12	4.70	4.05	4.10	closed	closed	3.74	5.01
12	14.8	5.04	3.82	3.22	3.20	4.78	4.08	4.18	closed	closed	4.01	5.24
13	11.4	5.18	4.21	3.42	3.37	4.74	4.36	4.08	closed	2.94	4.61	5.87
14	9.30	4.66	4.98	3.40	3.62	4.75	4.30	4.06	closed	2.94	5.45	6.32
15	9.25	6.13	4.50	3.26	3.20	4.90	4.21	4.00	closed	2.91	5.85	6.47
16	8.21	5.49	4.21	3.39	3.31	5.10	4.30	4.05	closed	3.85	6.53	7.07
17	8.52	5.57	4.15	3.16	3.19	5.23	4.21	4.13	closed	3.81	6.61	7.25
18	10.4	5.12	3.93	3.28	3.82	5.33	4.16	4.22	closed	3.81	8.32	7.66
19	9.79	5.11	3.96	3.11	3.45	5.27	4.27	4.35	closed	3.85	6.92	9.16
20	8.97	4.72	3.96	3.12	3.22	5.05	4.50	4.42	closed	3.93	6.39	11.6
21	9.37	4.52	3.60	3.11	3.06	4.84	4.42	3.35	closed	3.98	5.74	13.4
22	10.2	4.18	3.64	3.56	2.95	4.66	4.56	2.23	closed	3.90	5.62	14.4
23	12.7	4.44	3.67	2.65	2.74	4.53	4.41	1.11	closed	3.76	5.32	13.5
24	12.7	4.39	3.94	2.83	2.58	4.54	4.39	1.09	closed	3.54	5.49	10.9
25	11.5	4.04	3.56	3.28	2.75	4.55	4.05	2.13	closed	3.43	5.10	9.59
26	11.5	4.05	3.53	3.00	2.89	closed	4.18	3.18	closed	3.46	4.63	9.14
27	17.1	3.91	3.37	3.36	2.69	closed	4.38	4.23	closed	3.47	4.17	8.99
28	22.3	4.22	3.43	3.23	2.86	closed	4.46	4.13	closed	3.58	3.72	8.88
29	17.6	4.70	4.47	3.40	3.37	closed	4.42	4.11	4.64	3.53	3.94	8.06
30	14.1	—	5.26	3.11	closed	closed	4.47	4.10	4.64	3.42	4.33	8.02
31	11.9	—	4.76	—	closed	—	4.66	4.10	—	3.29	—	8.13

*Discharge from the NTS. Effluent from the Forest Grove WWTF was not discharged directly to the Tualatin River at that time. It was either routed to the NTS or transferred to the Rock Creek WWTF depending on operational needs.



Summary

- Beginning in 1995, the Forest Grove WWTF discontinued discharges to the Tualatin River during the low-flow season (May/June – October/November, depending on river flow). Effluent was transferred to the Rock Creek WWTF during the entire low-flow season until 2017.
- In 2017, the Forest Grove Natural Treatment System (NTS) at Fernhill Wetlands began trial operation during the low-flow season. Since then, the Forest Grove WWTF either discharges into the NTS or transfers effluent to the Rock Creek WWTF during the low-flow season. The choice of destination is an operational decision and may change day-to-day. The WWTF does not discharge directly to the Tualatin River during the low-flow season.
- Outside of the low flow season, the WWTF may discharge effluent directly to the Tualatin River through the outfall, route effluent to the NTS or use a combination of the two.
- In 2020, the NTS discharged intermittently from May through October. Discharges to the Tualatin River during November and December were either from the NTS, which continued intermittent operation through December, or directly from the Forest Grove WWTF.

MEDIAN OF DAILY MEAN DISCHARGE — CWS-FG

	Jan	Feb	Mar	April	May*	Jun*	Jul*	Aug*	Sep*	Oct*	Nov	Dec
1991	7.8	9.8	8.8	8.2	6.3	5.0	4.1	3.0	3.1	2.6	4.8	6.4
1992	7.1	7.7	5.4	5.7	3.9	2.9	2.6	2.4	2.5	2.9	4.3	7.8
1993	7.8	6.2	7.7	7.7	5.7	4.2	2.9	2.7	2.6	2.7	2.8	4.8
1994	6.4	5.8	5.2	3.1	2.2	1.2	1.1	1.0	1.0	1.4	2.8	5.6
1995	4.7	5.3	5.7	5.4	3.9	0	0	0	0	0	5.0	9.1
1996	8.5	9.8	4.9	5.4	5.0	0	0	0	0	0	2.9	10.0
1997	9.0	4.5	8.3	3.4	0	0	0	0	0	0	0	5.4
1998	10.7	8.9	6.6	1.9	0	2.0	0	0	0	0	0	10.5
1999	8.4	16.4	9.7	3.7	0	0	0	0	0	0	5.2	7.8
2000	9.5	6.9	6.1	0	0	0	0	0	0	0	0	4.0
2001	3.6	3.8	2.8	2.7	0	0	0	0	0	0	0	8.7
2002	7.3	5.5	4.6	0	0	0	0	0	0	0	0	0
2003	7.8	6.8	8.2	0	0	0	0	0	0	0	0	6.0
2004	7.3	7.7	5.0	0	0	0	0	0	0	0	0	0
2005	4.7	3.4	3.3	5.8	0	0	0	0	0	0	0	8.3
2006	12.8	6.0	6.4	5.6	0	0	0	0	0	0	8.1	10.9
2007	6.6	6.9	6.3	4.9	0	0	0	0	0	0	0	8.4
2008	8.8	5.1	5.6	4.6	3.2	0	0	0	0	0	3.5	4.2
2009	5.7	3.9	5.6	0	0	0	0	0	0	0	5.4	4.7
2010	9.2	7.1	5.9	5.3	0	0	0	0	0	0	0	11.1
2011	7.5	6.5	10.1	11.3	9.7	6.1	0	0	0	0	1.3	3.7
2012	8.3	6.4	10.2	6.3	5.6	0	0	0	0	0	5.8	12.3
2013	4.6	4.3	5.0	4.2	0	0	0	0	0	0	3.5	3.4
2014	4.2	8.1	8.3	6.1	4.0	0	0	0	0	0	4.1	8.8
2015	5.6	7.1	6.1	4.4	0	0	0	0	0	0	3.5	15.4
2016	11.0	8.5	10.0	4.4	0	0	0	0	0	0	0	9.3
2017	8.0	13.8	11.0	7.0	4.5	2.9	3.9	0	0	0	8.0	5.9
2018	8.7	5.7	6.3	5.7	3.1	5.4	4.6	3.7	0.9	0.9	3.2	5.5
2019	5.9	7.6	4.1	5.4	0	3.0	2.8	0.7	0	0	0	4.7
2020	6.7	3.4	2.6	2.2	2.1	2.7	2.8	2.7	0	2.3	2.7	4.6
median	7.7	6.7	6.1	4.8							2.8	6.2

Key

Q in cfs
- 0 < Q ≤ 2.6
- 2.6 < Q ≤ 3.6
- 3.6 < Q ≤ 7.9
- 7.9 < Q ≤ 11.0
- Q > 11.0

Q as percentile
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Only days with discharges were used to calculate percentiles

*Since June 2017, discharges from May through October are from the NTS (provided that river flow is low). During this time treated wastewater from the Forest Grove WWTF is either routed to the NTS or transferred to the Rock Creek WWTF depending on operational needs.

No July-August boxplots graph produced because direct discharge to the Tualatin River from the Forest Grove WWTF does not occur in July-August.
Since 2017, the FG-WWTF may discharge through the Fernhill NTS during this time.

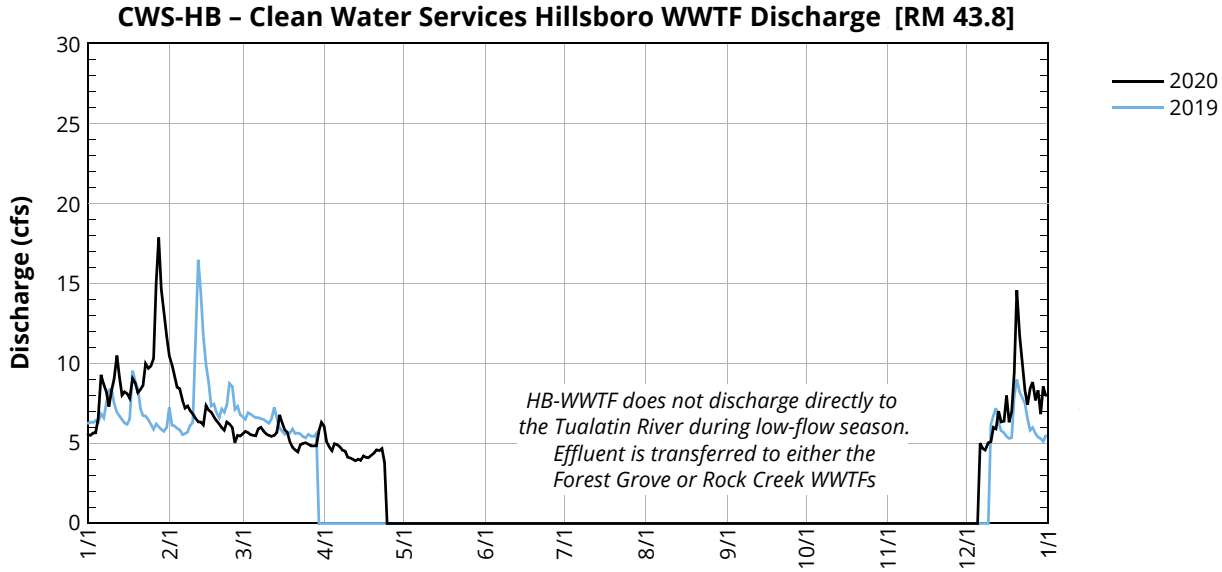
CWS-HB – Clean Water Services Hillsboro WWTF Discharge [RM 43.8]

Data source: Clean Water Services

2020 — MEAN DISCHARGE (cfs) — CWS-HB

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5.6	10.5	5.8	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	5.5	9.9	5.7	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	5.6	9.2	5.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	5.7	8.5	5.5	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	6.6	8.4	5.5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	9.3	7.7	5.9	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
7	8.7	7.2	6.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7
8	8.2	7.3	5.7	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6
9	7.3	7.0	5.6	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
10	8.3	6.9	5.5	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
11	9.0	6.6	5.4	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
12	10.5	6.4	5.5	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
13	9.1	6.3	5.7	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
14	8.0	6.2	6.8	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
15	8.2	7.4	6.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4
16	8.1	7.1	5.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
17	7.8	7.0	5.7	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
18	9.0	6.6	5.1	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
19	8.8	6.4	4.8	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4
20	8.2	6.2	4.6	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6
21	8.4	6.0	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7
22	8.6	5.8	4.9	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9
23	10.0	6.3	5.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
24	9.7	6.2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4
25	9.8	6.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.4
26	10.3	5.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8
27	15.0	5.5	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
28	17.9	5.5	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
29	14.7	6.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
30	13.3	—	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6
31	11.7	—	6.1	—	0.0	—	0.0	0.0	—	0.0	—	8.0

During the low-flow season the Hillsboro WWTF does not discharge directly to the Tualatin River. Effluent is transferred to either the Forest Grove or Rock Creek WWTFs depending on operational needs.



Summary

- Beginning in 1995, the Hillsboro WWTF discontinued discharges to the Tualatin River during the low-flow season (May/June – October/November, depending on river flow). Effluent was transferred to the Rock Creek WWTF during the entire low-flow season until 2017.
- Since 2018, during the low flow season effluent was transferred from the Hillsboro WWTF to either the Forest Grove or Rock Creek WWTFs. Once at the Forest Grove WWTF, it was either discharged into the Natural Treatment System (NTS) at Fernhill Wetlands or transferred to the Rock Creek WWTF.

MEDIAN OF DAILY MEAN DISCHARGE — CWS-HB

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	4.2	4.8	4.3	4.5	3.8	3.5	3.1	3.8	3.7	4.4	5.0	6.6
1992	6.8	7.7	6.2	6.4	5.4	5.0	4.6	4.5	4.6	4.5	5.1	7.4
1993	7.3	6.0	6.9	7.7	6.4	6.1	4.7	4.4	4.6	3.9	4.2	5.7
1994	7.2	6.5	5.4	4.1	3.3	3.3	1.9	2.0	2.1	2.2	5.1	10.3
1995	8.3	7.6	7.4	5.6	4.5	0	0	0	0	0	5.2	9.2
1996	11.2	12.6	6.0	6.8	6.3	0	0	0	0	0	5.2	15.5
1997	9.9	6.8	9.9	5.1	4.4	0	0	0	0	0	2.4	6.2
1998	11.7	9.5	7.6	5.9	7.1	5.4	0	0	0	0	5.7	12.7
1999	11.3	15.5	9.6	7.1	0	0	0	0	0	0	6.9	8.7
2000	9.8	7.9	7.8	5.8	0	0	0	0	0	0	0	5.6
2001	5.8	5.8	5.6	5.4	0	0	0	0	0	0	0	10.9
2002	10.5	7.5	7.5	7.2	0	0	0	0	0	0	0	7.5
2003	9.4	10.3	10.5	9.3	0	0	0	0	0	0	0	7.9
2004	10.1	9.5	7.6	6.7	0	0	0	0	0	0	0	0
2005	7.1	6.9	0	6.9	7.8	0	0	0	0	0	7.2	8.7
2006	16.3	7.6	7.5	6.7	0	0	0	0	0	0	8.6	10.6
2007	7.2	7.1	6.2	5.5	0	0	0	0	0	0	0	10.6
2008	10.5	6.8	7.1	6.3	0	0	0	0	0	0	4.6	5.0
2009	6.4	5.1	6.0	3.8	4.9	0	0	0	0	0	6.0	5.8
2010	11.2	8.0	6.5	7.0	5.3	5.6	0	0	0	0	0	6.0
2011	8.7	6.9	10.4	0	0	0	0	0	0	0	0	4.9
2012	7.9	7.2	11.7	0	0	0	0	0	0	0	6.0	13.4
2013	5.8	5.5	5.8	0	0	0	0	0	0	0	4.7	4.4
2014	4.8	8.6	8.2	6.4	4.0	0	0	0	0	0	4.4	7.7
2015	5.8	7.1	6.8	5.6	0	0	0	0	0	0	0	17.1
2016	12.3	8.8	10.1	5.6	0	0	0	0	0	0	6.9	9.5
2017	8.6	15.3	11.7	8.1	5.9	0	0	0	0	0	6.9	5.8
2018	7.8	6.8	7.3	6.9	0	0	0	0	0	0	0	0
2019	6.5	7.1	5.8	0	0	0	0	0	0	0	0	5.5
2020	5.6	4.3	3.6	2.7	0	0	0	0	0	0	0	4.4
median	8.1	7.2	7.2	5.9	0.0	0.0	0.0	0.0	0.0	0.0	4.5	7.5

Key

Q in cfs
- Q ≤ 4.2
- 4.2 < Q ≤ 5.2
- 5.2 < Q ≤ 8.7
- 8.7 < Q ≤ 12.3
- Q > 12.3

Q as percentile
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Only days with discharges were used to calculate percentiles

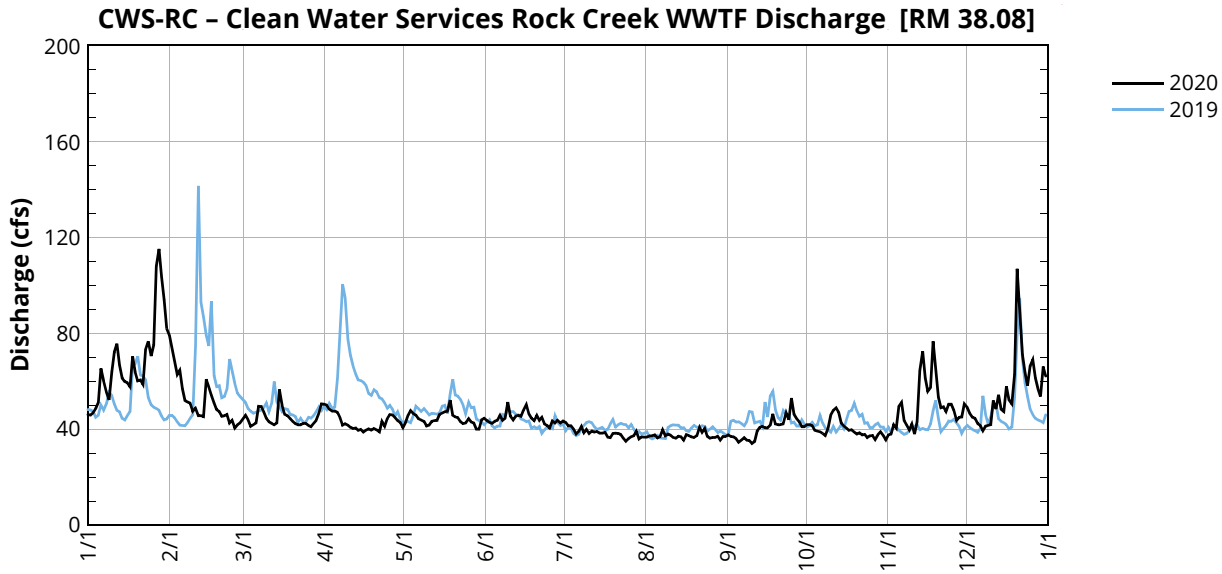
No July-August boxplots graph produced because direct discharge to the Tualatin River from the Hillsboro WWTF does not occur in July-August.

CWS-RC – Clean Water Services Rock Creek WWTF Discharge [RM 38.08]

Data source: Clean Water Services

2020 — MEAN DISCHARGE (cfs) — CWS-RC

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	46.2	79.3	45.9	50.2	42.8	43.7	43.0	36.8	37.7	42.0	37.7	49.1
2	45.9	73.8	43.9	48.4	45.9	43.0	41.6	37.4	37.1	42.1	38.1	46.6
3	47.1	68.6	41.3	47.6	47.9	42.6	41.5	37.4	37.0	41.6	41.9	45.0
4	48.8	62.9	42.1	47.8	46.6	43.4	40.2	37.8	36.2	39.6	40.5	44.7
5	51.2	64.7	42.7	47.1	46.1	43.8	38.2	36.4	34.7	39.2	49.6	42.5
6	65.5	57.1	49.6	45.0	44.4	45.8	39.1	37.1	35.7	39.0	51.2	41.7
7	60.2	52.1	49.6	41.9	44.0	43.9	41.2	39.9	36.6	38.4	43.7	39.6
8	55.5	51.5	47.2	42.4	43.3	44.8	38.6	37.3	35.6	37.5	41.8	41.4
9	52.3	50.9	44.6	41.8	41.5	51.4	40.0	38.1	35.5	40.3	39.7	41.7
10	63.9	47.6	43.2	40.9	41.8	45.6	38.3	37.6	34.2	46.1	42.3	41.9
11	72.3	48.9	42.5	40.5	43.4	44.0	39.4	36.7	35.0	48.0	38.1	52.0
12	75.7	45.8	42.0	40.7	43.7	45.6	38.9	36.4	39.4	49.0	43.2	48.5
13	66.9	45.8	42.7	39.6	43.8	45.9	39.1	37.2	40.9	47.2	64.5	54.5
14	61.4	45.3	56.7	40.0	46.3	45.5	38.5	36.9	41.3	42.7	72.5	48.4
15	60.0	60.9	50.1	38.9	46.9	48.2	38.4	35.6	40.7	41.5	61.6	47.6
16	59.4	57.9	46.4	39.8	47.4	50.4	38.8	37.9	40.7	40.5	55.9	58.0
17	57.9	54.3	45.7	40.3	47.7	46.5	36.9	37.5	41.8	39.6	57.5	52.3
18	70.5	51.1	44.5	39.8	52.2	44.8	36.6	36.9	46.5	39.9	76.7	50.7
19	64.0	48.3	43.3	40.5	45.9	43.7	38.4	36.7	42.4	38.9	66.2	62.9
20	60.3	47.5	42.5	40.0	45.2	45.9	38.5	37.5	41.9	38.1	53.6	107.0
21	60.7	45.5	41.9	39.0	44.9	43.8	38.3	40.9	42.1	38.7	49.0	91.5
22	58.8	45.8	42.0	43.3	43.2	45.1	37.9	38.7	42.3	37.7	49.5	71.3
23	73.3	46.2	42.6	41.3	42.5	42.3	36.4	40.4	47.1	37.9	47.4	63.9
24	76.8	42.8	42.6	44.4	42.7	41.7	35.0	37.1	44.1	36.6	50.6	58.2
25	70.6	43.8	41.6	46.3	44.5	40.7	36.2	36.4	53.2	37.4	50.6	66.4
26	75.2	40.7	41.2	46.1	43.1	43.6	37.0	36.7	46.4	37.5	48.0	69.0
27	108.1	41.9	42.5	45.0	42.7	42.7	37.4	36.7	44.4	35.8	43.9	61.5
28	115.3	42.7	43.8	43.7	40.2	43.9	39.2	37.2	43.2	37.8	45.1	57.1
29	103.5	45.6	46.8	42.9	40.2	42.7	36.1	35.6	41.2	39.0	45.2	53.8
30	94.0	—	50.7	40.8	44.1	43.6	37.0	37.1	41.2	37.5	50.7	66.2
31	82.1	—	50.6	—	44.8	—	36.8	37.1	—	35.7	—	62.2



Summary

- Discharges from the Rock Creek WWTF in 2020 from February–May and July–August were somewhat lower than those in recent years. Compared to the other WWTFs, the RC WWTF receives more inflow from commercial and industrial facilities, many of which were operating at a lower capacity due to the COVID pandemic.
- Discharges in July–August steadily increased from1991 to the early-2000s. Discharges also increased for other months during this time period.
- From 2003–2017 discharges show no trend. Beginning in 2018, discharges have been slightly lower.

MEDIAN OF DAILY MEAN DISCHARGE — CWS-RC

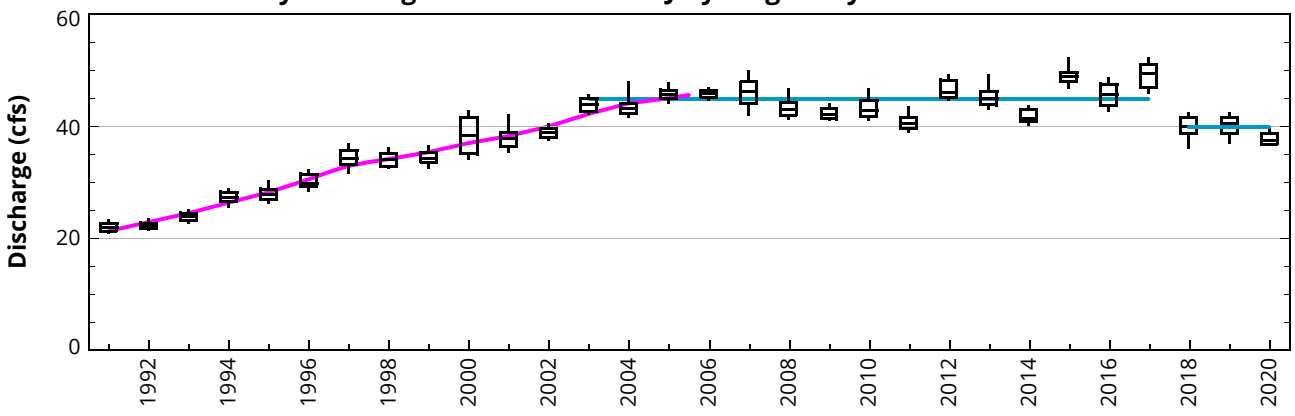
	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	26.9	32.7	33.8	30.0	28.5	23.9	21.3	22.3	21.3	21.4	28.3	30.0
1992	31.7	36.4	28.6	29.5	24.6	22.9	22.3	21.8	21.6	22.3	25.4	35.3
1993	38.1	31.4	36.9	40.4	28.7	27.4	24.2	23.4	22.2	22.2	21.1	27.1
1994	32.4	29.0	33.0	30.5	28.7	27.7	26.9	27.4	26.4	25.2	37.7	48.9
1995	55.3	51.0	52.8	37.0	33.0	28.7	28.2	27.3	27.2	28.6	34.0	71.3
1996	56.8	68.0	37.6	41.6	40.3	32.9	31.2	29.3	28.6	30.0	36.8	97.3
1997	63.0	38.2	60.8	34.8	34.7	36.8	34.8	33.5	33.8	38.7	48.3	39.6
1998	67.9	56.2	47.7	37.7	42.0	38.6	34.2	33.2	35.2	35.6	40.2	75.5
1999	73.0	89.3	55.9	39.5	39.2	38.0	33.9	34.4	32.1	30.5	44.6	51.2
2000	63.5	59.0	58.5	43.7	48.6	44.3	41.5	35.0	38.4	40.9	34.2	39.6
2001	38.2	39.5	39.4	39.4	38.3	36.7	37.5	37.7	38.9	41.5	47.8	71.3
2002	72.1	56.6	52.3	44.4	42.4	40.8	39.0	38.5	39.6	38.8	40.8	50.3
2003	59.3	57.8	63.4	63.4	47.3	45.6	43.9	43.8	40.5	40.7	39.6	51.5
2004	67.2	58.2	42.8	40.5	41.4	44.7	42.8	43.3	44.5	46.6	48.1	46.9
2005	45.3	41.8	38.4	49.3	57.3	48.3	46.0	45.6	45.8	48.4	50.1	58.0
2006	100.9	51.2	50.9	48.0	45.8	45.5	46.0	45.6	41.8	41.9	65.7	137.7
2007	55.6	55.8	52.0	48.4	48.0	44.2	46.1	46.4	42.3	47.4	47.1	73.8
2008	72.0	53.1	51.9	46.0	42.8	43.1	42.4	43.5	43.9	42.8	43.1	42.6
2009	49.8	41.3	47.0	46.2	49.6	46.5	41.7	42.7	43.0	44.5	50.6	46.2
2010	68.6	56.2	52.7	54.0	51.4	57.3	44.4	41.9	43.8	42.5	56.7	87.5
2011	62.0	51.3	73.4	59.8	45.5	41.0	41.2	39.6	39.9	42.3	45.6	37.9
2012	50.9	49.1	67.7	57.3	53.6	51.5	48.2	45.2	45.2	49.4	53.2	79.8
2013	48.0	45.1	43.4	46.8	47.2	49.0	44.2	45.7	50.5	49.9	45.7	43.4
2014	43.2	64.3	62.9	53.7	46.3	45.7	42.6	41.1	41.2	46.3	47.8	58.4
2015	48.8	58.4	59.1	52.2	51.9	50.3	49.0	48.7	51.2	51.8	59.4	100.4
2016	83.8	70.2	72.6	50.1	52.2	48.7	47.0	44.9	48.4	70.3	68.9	70.9
2017	67.0	99.3	82.4	65.9	53.5	52.0	47.0	50.7	51.5	55.6	69.8	64.6
2018	75.3	63.4	60.6	54.0	45.8	43.1	39.9	40.1	37.5	39.9	40.9	50.9
2019	48.3	56.0	47.7	54.6	47.4	42.7	40.7	40.1	43.5	41.9	40.7	44.5
2020	63.9	48.3	43.3	41.8	44.1	43.9	38.4	37.1	41.0	39.0	48.5	52.3
median	58.1	54.5	52.0	46.1	45.7	43.5	41.4	40.1	40.8	41.7	45.7	51.4

Key

Q in cfs
- 0 < Q ≤ 29.0
- 29.0 < Q ≤ 38.4
- 38.4 < Q ≤ 52.5
- 52.5 < Q ≤ 69.3
- Q > 69.3

Q as percentile
- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Daily Discharge Distributions for July–August by Year — CWS-RC

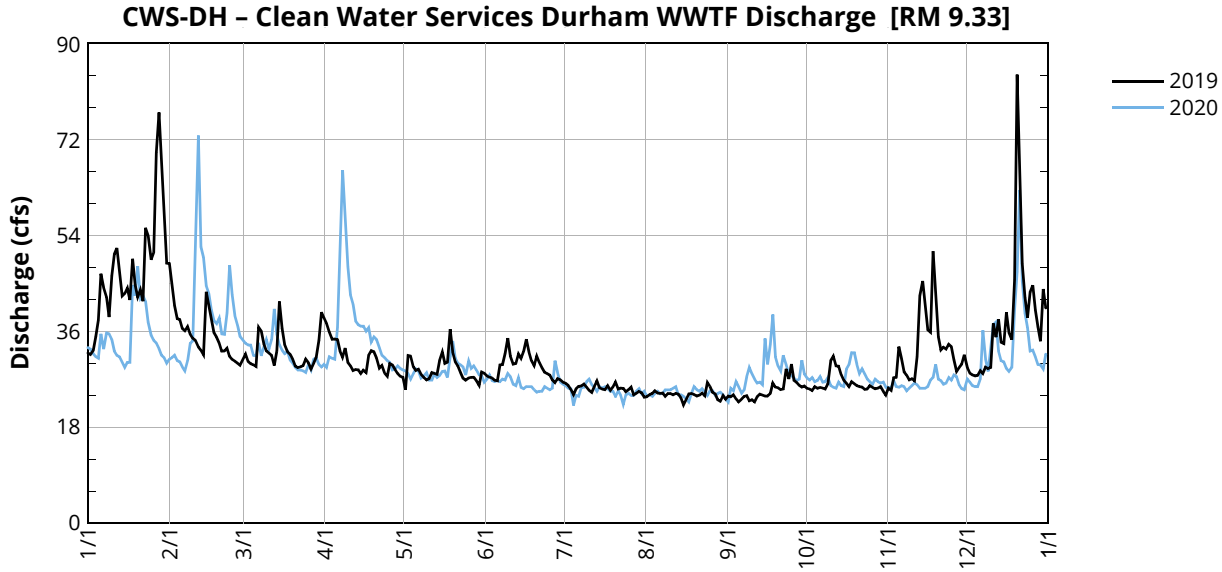


CWS-DH – Clean Water Services Durham WWTF Discharge [RM 9.33]

Data source: Clean Water Services

2020 — MEAN DISCHARGE (cfs) — CWS-DH

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	31.9	48.7	31.8	37.5	25.1	27.7	26.3	23.8	23.9	25.3	25.4	29.2
2	31.7	44.6	30.4	35.9	31.5	27.5	25.9	24.2	23.7	25.2	25.0	28.2
3	32.4	40.9	30.0	34.5	31.4	27.3	25.2	24.4	24.1	24.9	27.3	27.9
4	35.0	38.4	29.7	34.6	29.4	26.9	24.1	24.9	23.4	25.7	27.4	27.7
5	38.1	38.3	29.4	34.5	28.7	26.8	25.3	24.5	22.8	25.3	33.1	27.8
6	46.9	36.5	36.8	32.3	29.0	29.7	25.7	24.4	23.3	25.5	30.9	28.6
7	44.3	36.1	36.1	31.2	28.0	29.8	25.8	24.5	23.9	25.4	28.4	28.1
8	42.5	36.9	33.7	32.9	27.3	31.9	26.1	23.8	24.0	25.2	27.8	29.3
9	38.7	35.5	32.4	30.2	26.9	34.8	25.6	24.3	23.0	26.2	26.9	29.0
10	46.4	34.7	32.0	29.5	27.2	31.4	25.0	24.4	23.2	30.6	27.1	29.3
11	50.5	34.4	31.5	28.6	28.3	29.8	24.6	24.1	22.8	31.4	26.7	37.5
12	51.6	33.1	29.6	28.9	28.2	30.0	25.7	24.4	23.8	29.6	31.3	34.9
13	46.9	32.5	32.3	28.8	28.0	31.8	26.8	24.2	24.2	29.5	42.7	38.3
14	42.6	31.6	41.6	28.2	30.6	30.9	25.4	23.5	24.1	27.9	45.4	34.0
15	43.1	43.5	36.6	28.7	32.1	32.2	25.2	22.3	23.9	26.9	40.7	33.7
16	44.2	40.9	33.6	28.3	30.0	34.5	25.1	23.3	23.9	26.3	36.3	39.5
17	41.9	38.4	32.2	31.6	30.2	32.2	25.9	24.3	24.4	25.7	35.9	35.8
18	49.6	35.8	31.7	32.4	36.4	30.5	24.9	24.4	26.3	26.6	51.0	34.5
19	44.7	34.9	30.8	32.2	32.1	29.6	25.6	24.2	25.5	26.2	42.6	45.7
20	42.4	33.8	29.5	31.0	30.3	31.4	26.5	23.9	25.4	25.8	35.0	84.2
21	43.8	32.3	29.2	29.1	29.6	30.2	25.2	24.1	25.1	25.7	32.5	63.1
22	41.7	32.4	29.4	29.6	28.3	29.2	25.4	24.5	25.2	25.6	33.1	48.7
23	55.5	32.9	29.6	28.2	27.2	28.4	25.3	24.0	29.0	25.1	32.7	42.4
24	54.0	31.3	30.8	27.6	26.9	28.2	24.7	26.5	27.1	25.2	33.6	38.6
25	49.5	30.8	30.1	30.0	27.3	27.9	25.1	25.7	29.9	25.8	33.2	43.3
26	50.8	30.4	29.0	29.7	27.4	26.9	25.6	24.6	26.8	25.5	30.7	44.6
27	69.5	30.1	30.0	28.9	27.5	26.4	24.1	24.3	26.5	25.2	28.5	40.0
28	77.1	29.7	31.2	28.1	26.7	27.1	24.4	23.2	25.9	25.4	29.2	36.9
29	65.5	32.2	34.4	27.6	25.9	26.9	24.8	22.9	25.6	25.7	29.8	34.2
30	56.4	—	39.6	27.4	28.4	26.5	24.6	24.0	25.8	24.8	31.6	44.0
31	48.9	—	38.6	—	28.2	—	23.6	23.3	—	24.1	—	40.4



CWS-DH – Clean Water Services Durham WWTF Discharge [RM 9.33]

Data source: Clean Water Services

Summary

- Discharges from the Durham WWTF from the past 3 years were slightly lower than the median period of record discharges.
- Discharges before 1995 were lower than those after.
- Since 1995, discharges show no trend. Periods of lower and higher discharge repeatedly occur. The average discharge in July-August 1995–2020 was 25.6 cfs.

MEDIAN OF DAILY MEAN DISCHARGE — CWS-DH

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	28.9	32.8	29.4	30.7	28.2	25.4	22.3	22.0	21.5	21.5	27.0	28.1
1992	29.6	34.4	26.6	27.9	23.7	22.1	19.9	18.5	21.0	20.9	24.9	33.4
1993	33.0	26.7	30.9	39.1	31.4	24.9	24.9	24.6	23.5	24.5	21.1	27.7
1994	31.2	30.7	32.1	28.9	24.6	23.8	22.7	23.1	23.9	23.7	36.2	40.5
1995	40.3	41.7	41.3	35.6	31.5	28.2	25.9	26.1	26.0	28.8	37.4	44.4
1996	49.0	56.4	40.2	40.7	36.4	27.9	25.6	24.8	26.5	31.0	38.7	69.8
1997	60.9	36.5	51.4	34.9	30.0	30.1	26.4	25.8	28.0	30.4	34.9	33.1
1998	49.2	45.3	41.7	33.1	35.9	30.3	26.3	25.8	26.7	29.4	37.9	51.0
1999	54.7	63.1	47.4	36.9	31.1	28.5	26.7	26.8	26.2	26.8	36.7	39.8
2000	42.1	42.5	39.7	32.0	31.4	28.7	27.2	24.9	25.6	26.5	26.7	30.0
2001	28.2	28.0	28.4	28.8	25.9	25.4	24.1	24.3	24.5	25.0	30.2	42.9
2002	41.9	38.4	36.8	31.7	26.6	25.8	24.6	23.5	24.1	23.7	25.2	34.0
2003	38.2	37.1	42.5	39.3	30.9	25.5	23.5	23.8	23.6	25.2	27.2	39.0
2004	43.9	39.8	32.3	28.5	26.1	24.5	23.4	24.4	25.1	27.7	27.5	30.0
2005	30.2	27.0	25.8	33.7	34.5	28.6	24.6	23.4	23.7	28.2	34.3	40.7
2006	64.0	41.5	38.8	35.5	30.0	27.8	25.1	25.2	25.3	24.6	46.2	47.8
2007	38.7	36.1	37.0	34.3	28.6	25.8	24.4	25.5	24.1	27.4	29.8	48.6
2008	48.4	35.9	41.8	37.9	30.8	28.8	28.0	26.8	25.2	27.1	31.0	30.0
2009	37.3	33.1	36.8	34.2	33.0	29.8	28.3	28.5	29.0	29.5	38.3	35.3
2010	52.4	41.2	39.4	41.8	35.7	40.9	30.8	29.2	30.2	30.5	41.1	57.9
2011	46.4	40.2	54.3	44.9	33.7	29.9	27.2	28.0	28.2	26.3	30.6	30.2
2012	39.6	36.2	48.1	38.6	33.1	30.3	28.6	27.7	28.2	33.1	44.4	66.5
2013	39.0	36.5	35.4	35.1	31.9	32.7	28.5	25.7	29.2	28.2	30.9	29.2
2014	31.2	43.9	42.9	38.3	31.1	27.7	26.7	25.3	25.2	28.2	31.3	39.4
2015	32.2	37.3	34.5	31.7	26.9	25.4	24.0	24.3	25.7	26.0	31.3	61.4
2016	52.6	43.6	45.9	31.7	29.4	27.4	25.5	25.1	26.1	40.8	38.5	42.9
2017	40.8	64.4	52.3	41.0	34.5	30.2	26.6	26.1	27.1	28.0	39.0	36.0
2018	45.6	37.7	36.7	36.7	28.8	26.5	25.1	24.1	25.4	25.5	26.5	33.4
2019	32.8	37.4	31.4	34.3	28.3	26.1	24.8	24.4	27.6	26.8	25.9	30.8
2020	44.7	34.7	31.5	29.7	28.3	29.7	25.3	24.2	24.2	25.7	31.4	35.8
median	40.5	37.3	37.9	34.6	30.9	27.9	25.4	25.0	25.5	26.9	31.3	37.5

Key

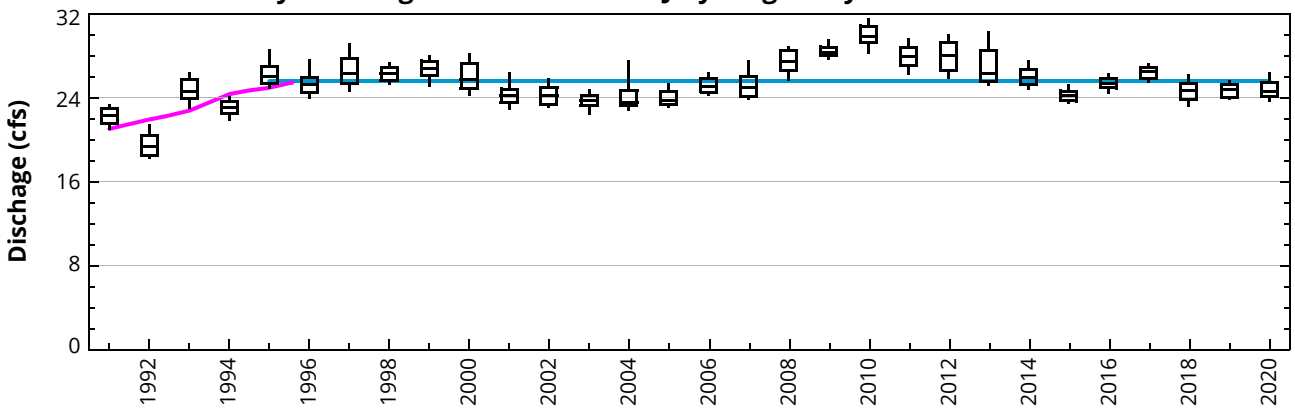
Q in cfs

- 0 < Q ≤ 24.1
- 24,1 < Q ≤ 26.1
- 26.1 < Q ≤ 29.9
- 29.9 < Q ≤ 48.0
- Q > 48.0

Q as percentile

- Q ≤ 10th
- 10th < Q ≤ 25th
- 25th < Q ≤ 75th
- 75th < Q ≤ 90th
- Q > 90th

Daily Discharge Distributions for July–August by Year — CWS-DH



Clean Water Services Tributary Flow Augmentation

Summary

- Since 2011, Clean Water Services has partnered with TVID to use the TVID pipeline to deliver flow augmentation water to selected tributaries that have conveniently located TVID release points. (A pilot program started at McKay Creek in 2005.)
- Typical rates of tributary flow augmentation range from 0.5 cfs to 2 cfs.
- Tributary flow augmentation usually begins sometime in July and ends sometime in October.

2020 RELEASES FOR TRIBUTARY FLOW AUGMENTATION

Site Name	River Mile	Start Date	End Date	Average Flow (cfs)	Average Daily Release (ac-ft)	Total Release (ac-ft)
McKay Creek	7.0			1.69	3.36	356
East Fork Dairy Creek	4.9	same start/end for all sites		0.92	1.82	193
West Fork Dairy Creek	5.2	7/9/2020	10/22/2020	0.90	1.79	190
Gales Creek	5.0			1.68	3.33	353

HISTORY OF TRIBUTARY FLOW RESTORATION

Year	Dates	McKay Creek #1 (RM 7.0)		EF Dairy Creek #2 (RM 4.9)		WF Dairy Creek #3 (RM 5.2)		Gales Creek #4 (RM 5.0)	
		Mean cfs	Total ac-ft	Mean cfs	Total ac-ft	Mean cfs	Total ac-ft	Mean cfs	Total ac-ft
2011	7/11 – 9/30	0.4	67	0.6	96	0.4	72	1.5	240
2012	7/20 – 10/16	2.2	388	0.7	118	0.8	146	na	177
2013	7/9 – 9/1	3.0	444	0.9	125	0.8	118	2.0	287
2014	7/11 – 10/21	1.6	319	1.0	205	0.7	151	1.9	384
2015	6/30 – 10/30	2.1	512	1.6	395	0.7	158	1.3	315
2016	7/16 – 10/13	2.0	348	1.5	274	0.7	122	1.7	303
2017	7/7 – 10/18	1.0	202	0.5	95	1.0	193	0.5	104
2018	7/18 – 10/29	1.7	355	0.8	167	0.9	188	1.7	342
2019	7/23 – 10/14	2.2	361	0.7	113	0.8	132	1.8	300
2020	7/9 – 10/22	1.7	356	0.9	193	0.9	190	1.7	353

Releases at sites that have been discontinued:
McKay Creek (RM (6.5): 2011 (118 ac-ft) 2012 (140 ac-ft)
WF Dairy Creek (RM7.5): 2011 (106 ac-ft) 2012 (175 ac-ft)
Blackjack Creek: 2013(144 ac-ft) 2014 (168 ac-ft) 2015 (234 ac-ft)

APPENDIX C
SCOGGINS DAM OPERATIONS — MONTHLY REPORTS

2020 SUMMARY

- Maximum Hagg Lake storage: 51,956 ac-ft on May 27 (97.4%)
- First day of allocated releases: March 1
- Last day of allocated releases: November 30
- Days with allocated releases: 244
- Maximum daily allocated release: 221 cfs on September 4
- Minimum Hagg Lake storage: 18,382 ac-ft on November 10 (34.5% of full pool)

RELEASE SEASON — 2020

Details of releases for each month follow in this appendix.

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RELEASE SEASON
Number of days of with allocated releases											
TVID	23	27	0	4	31	31	30	29	27	0	202
CWS	0	0	7	12	31	31	30	31	13	0	155
LO	0	0	0	0	21	31	30	2	0	0	84
JWC	0	0	6	30	31	31	30	31	16	0	175
Other	0	14	0	4	30	31	30	22	0	0	131
TOTAL	**23**	**27**	**11**	**30**	**31**	**31**	**30**	**31**	**30**	**0**	**244**
Allocation releases in acre-feet											
TVID	56	389	0	286	4687	5044	3465	676	147	0	14749
CWS	0	0.0	139	278	2122	2916	2313	1984	704	0	10455
LO	0	0.0	0	0	125	184	179	12	0	0	500
JWC	0	0.0	303	1152	1815	1480	1690	1444	617	0	8501
Other	0	28	0	16	202	198	167	65	0	0	676
TOTAL	**56**	**417**	**442**	**1732**	**8951**	**9822**	**7813**	**4181**	**1468**	**0**	**34,881**

Abbreviations: TVID=Tualatin Valley Irrigation District; CWS=Clean Water Services; LO=Lake Oswego Corporation; JWC=Joint Water Commission

SCOGGINS DAM RESERVOIR OPERATIONS — JANUARY 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	RELEASE (cfs) [8]	COMP INFLOW (cfs) [9]	GASO (cfs) [10]	DLLO (cfs) [11]	GOLF (cfs) [12]	ROOD (cfs) [13]	FRMO (cfs) [14]	WSLO (cfs) [15]	PREC (in) [16]	MAX TEMP (°F) [17]	MIN TEMP (°F) [18]	TVID (cfs) [19]	CWS (cfs) [20]	LO (cfs) [21]	JWC (cfs) [22]	OTHER (cfs) [23]
1	82	94	8	184	272.01	23070	249	126	21	147	396	345	373	636	784	994	0.70	51	43	0	0	0	0	0
2	66	77	6	149	272.41	23392	322	162	21	183	371	494	711	966	1050	1020	0.17	53	40	0	0	0	0	0
3	58	93	8	159	272.75	23668	276	139	21	160	303	447	712	1090	1210	1270	0.09	49	40	0	0	0	0	0
4	63	103	9	175	273.14	23985	317	160	21	181	314	416	693	1140	1250	1420	0.17	48	36	0	0	0	0	0
5	54	105	9	168	273.53	24305	320	161	21	182	288	419	730	1260	1370	1530	0.20	46	38	0	0	0	0	0
6	235	397	35	667	274.13	24799	494	249	23	272	467	485	800	1370	1480	1710	1.07	48	41	0	0	0	0	0
7	211	363	33	607	275.50	25941	1142	576	22	598	na	886	1210	1980	2110	2270	0.37	49	45	0	0	0	0	0
8	182	311	30	523	276.62	26889	948	478	22	500	664	961	na	2320	2530	2890	0.48	50	38	0	0	0	0	0
9	123	201	24	348	277.45	27600	711	358	22	380	539	898	1790	2500	2810	3110	0.02	43	31	0	0	0	0	0
10	88	154	13	255	278.06	28127	527	266	22	288	403	784	1640	2540	2840	3130	0.05	40	32	0	0	0	0	0
11	270	374	34	678	279.02	28964	837	422	22	444	na	843	1550	2690	3020	3590	1.26	47	40	0	0	0	0	0
12	303	446	37	786	280.27	30067	1103	556	23	579	na	1034	1840	2810	3190	3810	0.82	44	39	0	0	0	0	0
13	242	380	34	656	281.67	31321	1254	632	23	655	na	1210	na	3000	3390	3950	0.42	45	35	0	0	0	0	0
14	171	232	25	428	282.68	32238	917	462	23	485	585	1046	2350	3110	3510	4030	0.15	39	33	0	0	0	0	0
15	123	161	15	299	283.36	32860	622	314	18	332	464	870	2210	3230	3620	4050	0.01	40	30	0	0	0	0	0
16	113	146	12	271	283.67	33145	285	144	207	351	433	889	1900	3310	3710	4300	0.41	41	32	0	0	0	0	0
17	91	118	11	220	283.76	33228	83	42	205	247	330	838	1690	3270	3710	4270	0.05	42	31	0	0	0	0	0
18	116	144	12	272	283.75	33219	-9	-5	258	253	360	832	1300	3160	3590	4300	0.57	42	33	0	0	0	0	0
19	136	164	16	316	283.90	33358	139	70	258	328	440	895	1330	3150	3590	4220	0.31	43	42	0	0	0	0	0
20	128	151	13	292	283.96	33413	55	28	258	286	433	898	1390	3030	3450	4050	0.02	53	39	0	0	0	0	0
21	116	149	12	277	284.04	33487	74	37	257	294	397	875	1370	2940	3340	3890	0.18	47	41	0	0	0	0	0
22	158	211	24	393	284.19	33626	139	70	258	328	538	908	1350	2930	3310	3880	0.53	47	43	0	0	0	0	0
23	238	494	40	772	285.06	34435	809	408	52	460	na	915	1510	2870	3250	3740	0.39	52	45	0	0	0	0	0
24	312	670	46	1028	286.66	35943	1508	760	53	813	na	1171	1890	3050	3450	4340	0.76	54	49	0	0	0	0	0
25	277	520	41	838	288.04	37262	1319	665	53	718	na	1206	2360	3270	3710	4350	0.35	53	46	0	0	0	0	0
26	254	403	35	692	289.09	38278	1016	512	102	614	na	1116	2430	3430	3850	4500	0.40	54	45	0	0	0	0	0
27	205	306	30	541	289.62	38795	517	261	270	531	648	1150	2360	3710	4160	4780	0.25	53	39	0	0	0	0	0
28	426	772	54	1252	291.17	40322	1527	770	195	965	na	1503	2430	4100	4680	5900	2.39	51	41	0	0	0	0	0
29	335	403	35	773	292.99	42144	1822	919	53	972	na	1764	2880	4620	5230	6110	0.28	52	46	0	0	0	0	0
30	288	316	31	635	293.95	43118	974	491	284	775	na	1940	2780	5260	5890	6630	0.49	48	45	0	0	0	0	0
31	146	204	23	373	293.79	42955	-163	-82	651	569	659	1910	2630	5350	6820	7010	0.14	53	45	0	0	0	0	0
TOTALS																	13.50 inches							
cfs	5610	8662	755	15027	—	—	10151	3739	13890	9032	29948	48209	88092	99904	115044	MAX	54	49	0	0	0	0	0	
ac-ft	11127	17181	1498	29806	—	—	20134	7416	27551	17915	59402	95623	174730	198160	228190	MIN	39	30	0	0	0	0	0	

Reservoir Storage Status on Jan-31

Comparison to fill curve: 6.88 ft
6771 ac-ft
Percent of full reservoir: 80.6%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Jan-31

	SECO	SDMO
precip to date:	38.5″	57.0″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Jan-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	0	
CWS	0	12,615
LO	0	500
JWC	0	13,500
Other	0	

SCOGGINS DAM RESERVOIR OPERATIONS — FEBRUARY 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	135	192	21	348	292.84	41992	-963	-486	902	416	633	1940	2530	5160	6760	7270	0.18	58	52	0	0	0	0	0
2	110	156	14	280	291.79	40939	-1053	-531	847	316	607	1866	2470	4920	6150	7370	0.01	53	32	0	0	0	0	0
3	90	122	11	223	290.29	39452	-1487	-750	1040	290	517	1808	2410	4670	5710	7070	0.11	45	33	0	0	0	0	0
4	74	95	8	177	288.93	38123	-1329	-670	854	184	430	1568	2340	4460	5420	6730	0.00	46	29	0	0	0	0	0
5	77	97	8	182	287.97	37195	-928	-468	682	214	389	1324	2200	4270	5110	6320	0.17	42	31	0	0	0	0	0
6	68	75	5	148	288.17	37388	193	97	169	266	406	923	1860	4040	4790	5860	0.02	50	42	0	0	0	0	0
7	72	70	5	147	288.62	37822	434	219	17	236	522	800	1420	3720	4400	5400	0.03	57	48	0	0	0	0	0
8	102	99	8	209	289.11	38298	476	240	17	257	607	807	1150	3360	3950	4910	0.37	54	39	0	0	0	0	0
9	88	85	7	180	289.63	38808	510	257	17	274	564	849	1100	3010	3500	4300	0.02	48	30	0	0	0	0	0
10	71	74	5	150	290.09	39256	448	226	17	243	459	789	1050	2700	3090	3720	0.00	48	31	0	0	0	0	0
11	60	61	5	126	290.48	39639	383	193	17	210	368	674	935	2440	2780	3300	0.00	52	31	0	0	0	0	0
12	51	52	4	107	290.83	39985	346	174	20	194	307	580	781	2160	2470	2930	0.01	41	34	0	0	0	0	0
13	45	45	3	93	291.14	40292	307	155	20	175	274	502	662	1830	2040	2560	0.00	51	31	0	0	0	0	0
14	45	42	3	90	291.43	40580	288	145	20	165	274	456	564	1570	1740	2190	0.24	44	35	0	0	0	0	0
15	38	35	3	76	291.69	40839	259	131	20	151	246	420	519	1410	1560	1930	0.02	49	37	0	0	0	0	0
16	46	43	3	92	292.00	41148	309	156	20	176	294	463	532	1560	1670	2080	0.34	46	36	0	0	0	0	0
17	42	37	3	82	292.27	41419	271	137	20	157	266	443	514	1550	1700	2090	0.00	49	33	0	0	0	0	0
18	38	33	3	74	292.50	41650	231	116	20	136	243	405	457	1400	1560	1960	0.04	48	29	0	0	0	0	0
19	34	30	3	67	292.73	41881	231	116	20	136	225	371	395	1270	1420	1800	0.00	51	31	0	0	0	0	0
20	32	26	3	61	292.93	42083	202	102	20	122	210	340	361	1130	1280	1640	0.00	56	34	0	0	0	0	0
21	29	24	3	56	293.11	42265	182	92	21	113	197	318	326	1040	1190	1500	0.00	58	29	0	0	0	0	0
22	27	22	3	52	293.29	42447	182	92	21	113	185	297	308	947	1090	1400	0.00	58	30	0	0	0	0	0
23	27	22	3	52	293.46	42620	173	87	20	107	176	279	265	873	1010	1300	0.08	56	32	0	0	0	0	0
24	27	22	3	52	293.64	42802	182	92	20	112	189	295	306	850	972	1230	0.12	47	35	0	0	0	0	0
25	25	20	2	47	293.78	42945	143	72	20	92	176	272	260	819	949	1200	0.00	49	31	0	0	0	0	0
26	24	19	2	45	293.95	43118	173	87	20	107	168	208	235	743	876	1140	0.00	56	34	0	0	0	0	0
27	24	17	2	43	294.08	43251	133	67	20	87	159	195	219	699	827	1060	0.00	57	32	0	0	0	0	0
28	23	16	2	41	294.22	43394	143	72	20	92	152	186	213	661	786	1020	0.00	63	34	0	0	0	0	0
29	29	24	3	56	294.37	43547	153	77	20	97	166	194	213	642	766	987	0.46	54	37					
TOTALS																	2.22 inches							
cfs	1553	1655	148	3356	—	—	298	4941	5239		9409	19572	26595	63904	75566	92267	**MAX:**	63	52	0	0	0	0	0
ac-ft	3080	3283	294	6657	—	—	592	9800	10392		18663	38821	52751	126754	149885	183012	**MIN:**	41	29	0	0	0	0	0

Reservoir Storage Status on Feb-28		
Comparison to fill curve:	-3.98	ft
	-4158	ac-ft
Percent of full reservoir:	81.7%	

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Feb-29		
	SECO	SDMO
precip to date:	42.6″	66.9″
snow depth:	1″	0
water content:	0.9″	0

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Feb-28		
	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	0	
CWS	0	12,615
LO	0	500
JWC	0	13,500
Other	0	

SCOGGINS DAM RESERVOIR OPERATIONS — MARCH 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	RELEASE (cfs) [8]	COMP INFLOW (cfs) [9]	GASO (cfs) [10]	DLLO (cfs) [11]	GOLF (cfs) [12]	ROOD (cfs) [13]	FRMO (cfs) [14]	WSLO (cfs) [15]	PREC (in) [16]	MAX TEMP (°F) [17]	MIN TEMP (°F) [18]	TVID (cfs) [19]	CWS (cfs) [20]	LO (cfs) [21]	JWC (cfs) [22]	OTHER (cfs) [23]
1	24	19	2	45	294.52	43701	154	78	20	98	171	209	260	768	858	1010	0.01	47	31	1	0	0	0	0
2	24	17	2	43	294.65	43835	134	68	20	88	159	190	227	751	883	1100	0.00	48	34	0	0	0	0	0
3	23	16	2	41	294.78	43968	133	67	20	87	154	183	350	678	808	1050	0.01	49	41	1	0	0	0	0
4	22	16	2	40	294.91	44102	134	68	20	88	150	206	359	639	763	981	0.01	58	36	0	0	0	0	0
5	21	14	2	37	295.02	44215	113	57	20	77	144	210	359	638	754	955	0.00	55	32	1	0	0	0	0
6	22	15	2	39	295.15	44349	134	68	20	88	139	212	353	620	740	949	0.14	57	38	0	0	0	0	0
7	22	15	2	39	295.27	44473	124	63	21	84	141	226	376	726	832	1080	0.19	44	36	1	0	0	0	0
8	21	14	2	37	295.37	44577	104	52	20	72	139	223	370	742	871	1120	0.06	48	31	0	0	0	0	0
9	21	13	2	36	295.47	44680	103	52	21	73	132	212	347	695	825	1080	0.00	50	28	1	0	0	0	0
10	21	11	2	34	295.57	44784	104	52	21	73	126	192	326	674	756	1010	0.00	56	29	0	0	0	0	0
11	21	11	2	34	295.67	44887	103	52	20	72	121	193	315	630	705	943	0.00	60	32	1	0	0	0	0
12	20	10	1	31	295.77	44991	104	52	12	64	115	178	300	596	672	887	0.00	56	27	1	0	0	0	0
13	20	10	1	31	295.87	45095	104	52	11	63	112	173	293	566	639	851	0.00	56	29	1	0	0	0	0
14	21	34	3	58	296.00	45230	135	68	11	79	123	187	300	585	645	887	0.39	40	33	0	0	0	0	0
15	20	31	3	54	296.11	45345	115	58	12	70	113	182	322	757	824	1040	0.09	38	33	1	0	0	0	0
16	19	31	3	53	296.19	45428	83	42	11	53	109	173	295	661	757	1050	0.00	46	32	1	0	0	0	0
17	19	30	3	52	296.29	45533	105	53	11	64	107	169	282	577	669	943	0.00	60	29	2	0	0	0	0
18	18	29	3	50	296.39	45637	104	52	11	63	100	161	276	555	632	863	0.00	62	31	2	0	0	0	0
19	17	28	3	48	296.47	45721	84	42	11	53	97	154	239	519	598	828	0.00	58	31	1	0	0	0	0
20	17	27	3	47	296.56	45815	94	47	10	57	93	145	236	475	551	776	0.00	63	34	2	0	0	0	0
21	16	26	3	45	296.64	45899	84	42	10	52	90	134	227	455	582	743	0.00	66	32	2	0	0	0	0
22	16	25	3	44	296.71	45972	73	37	10	47	87	122	197	415	542	705	0.00	60	31	2	0	0	0	0
23	16	26	3	45	296.79	46056	84	42	10	52	85	112	192	400	517	667	0.00	62	34	1	0	0	0	0
24	18	30	3	51	296.89	46161	105	53	10	63	100	119	203	403	513	651	0.20	51	38	1	0	0	0	0
25	17	28	3	48	296.97	46245	84	42	10	52	104	123	214	428	542	705	0.08	47	35	1	0	0	0	0
26	16	26	3	45	297.04	46318	73	37	10	47	94	111	196	416	539	689	0.02	51	30	1	0	0	0	0
27	16	26	3	45	297.11	46392	74	37	10	47	90	105	189	388	508	667	0.05	49	33	0	0	0	0	0
28	17	27	3	47	297.20	46487	95	48	9	57	95	110	194	386	500	657	0.08	48	41	1	0	0	0	0
29	25	47	4	76	297.33	46624	137	69	9	78	119	126	209	406	521	678	0.25	52	44	1	0	0	0	0
30	48	93	8	149	297.53	46835	211	106	9	115	191	189	337	579	657	782	0.64	57	42	0	0	0	0	0
31	52	101	9	162	297.82	47141	306	154	10	164	315	343	566	865	933	1090	0.37	49	38	1	0	0	0	0
TOTALS																	2.59 inches							
cfs	670	846	90	1606	—	—	1812	430	2242	3915	5372	8909	17993	21136	27437	**MAX:**	66	44	28	0	0	0	0	
ac-ft	1329	1678	179	3186	—	—	3594	853	4447	7765	10655	17671	35689	41923	54421	**MIN:**	38	27	56	0	0	0	0	

Reservoir Storage Status on Mar-31

Comparison to fill curve:	-3.81 ft
	-4107 ac-ft
Percent of full reservoir:	88.4%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Mar-31

	SECO	SDMO
precip to date:	46.8'	73.9"
snow depth:	0"	2"
water content:	0"	1"

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Mar-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	56	
CWS	0	12,615
LO	0	500
JWC	0	13,500
Other	0	

SCOGGINS DAM RESERVOIR OPERATIONS — APRIL 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	45	87	7	139	298.09	47428	287	145	10	155	268	343	620	1050	1150	1310	0.10	49	37	0	0	0	0	0
2	43	83	7	133	298.35	47704	276	139	10	149	234	300	576	1040	1170	1430	0.07	48	34	1	0	0	0	0
3	37	72	5	114	298.57	47939	235	118	10	128	204	258	510	984	1120	1400	0.01	51	30	0	0	0	0	0
4	32	64	5	101	298.76	48142	203	102	10	112	183	222	454	892	1030	1300	0.00	48	34	1	0	0	0	0
5	30	61	5	96	298.96	48356	214	108	10	118	173	212	420	825	961	1230	0.15	51	37	0	0	0	0	0
6	27	53	4	84	299.14	48548	192	97	10	107	156	187	395	788	923	1160	0.00	61	38	1	0	0	0	0
7	25	48	4	77	299.27	48688	140	71	10	81	144	169	348	706	845	1080	0.00	61	34	1	0	0	0	0
8	23	44	3	70	299.41	48838	150	76	10	86	140	155	304	615	755	981	0.00	62	35	2	0	0	0	0
9	21	40	3	64	299.53	48968	130	66	10	76	128	141	274	548	682	887	0.00	73	38	3	0	0	0	0
10	21	38	3	62	299.65	49097	129	65	10	75	121	134	284	494	634	810	0.00	76	39	3	0	0	0	0
11	19	35	3	57	299.74	49194	97	49	10	59	113	124	262	463	604	771	0.00	71	38	4	0	0	0	0
12	18	33	3	54	299.83	49291	97	49	10	59	107	116	240	429	569	732	0.00	63	34	3	0	0	0	0
13	18	31	3	52	299.90	49367	76	38	10	48	102	109	220	397	531	689	0.00	64	32	2	0	0	0	0
14	16	30	3	49	299.98	49453	86	43	10	53	97	119	200	357	491	641	0.00	67	33	6	0	0	0	0
15	15	29	3	47	300.06	49540	87	44	10	54	92	113	188	334	462	600	0.00	68	40	10	0	0	0	0
16	15	27	3	45	300.13	49615	75	38	10	48	89	107	186	310	438	568	0.00	67	37	11	0	0	0	0
17	14	26	3	43	300.19	49680	65	33	10	43	85	101	168	302	426	542	0.00	69	35	13	0	0	0	1
18	14	25	3	42	300.26	49756	76	38	10	48	80	96	163	277	404	522	0.03	75	44	17	0	0	0	1
19	14	24	3	41	300.33	49832	76	38	10	48	81	100	179	271	394	512	0.13	54	41	14	0	0	0	1
20	13	23	3	39	300.39	49897	65	33	10	43	76	92	165	295	418	507	0.00	61	37	5	0	0	0	1
21	13	22	3	38	300.45	49962	65	33	11	44	71	90	152	265	392	517	0.01	70	42	11	0	0	0	1
22	13	22	3	38	300.51	50028	66	33	11	44	68	87	141	251	368	482	0.02	61	45	12	0	0	0	1
23	13	23	3	39	300.60	50126	98	49	10	59	83	98	138	295	417	517	0.27	57	46	10	0	0	0	1
24	13	22	3	38	300.65	50180	54	27	11	38	69	86	140	266	395	522	0.01	61	48	10	0	0	0	1
25	14	24	3	41	300.72	50256	76	38	11	49	68	85	139	253	374	487	0.19	62	48	10	0	0	0	1
26	13	23	3	39	300.80	50343	87	44	11	55	75	92	162	297	415	522	0.06	62	37	8	0	0	0	1
27	13	25	3	41	300.86	50409	66	33	11	44	69	89	148	276	408	532	0.08	63	45	5	0	0	0	1
28	12	21	3	36	300.91	50463	54	27	11	38	69	88	152	259	379	507	0.02	64	40	9	0	0	0	1
29	12	20	2	34	300.98	50540	77	39	11	50	64	84	140	236	360	473	0.00	69	47	11	0	0	0	1
30	11	20	2	33	301.02	50583	43	22	11	33	60	81	120	225	341	445	0.00	70	49	13	0	0	0	1
TOTALS																	1.15 inches							
cfs	587	1095	104	1786	—	—	1735	309	2044	3369	4078	7588	14000	17856	22676	**MAX:**	76	49	196	0	0	0	14	
ac-ft	1164	2172	206	3543	—	—	3442	613	4055	6682	8089	15051	27769	35417	44978	**MIN:**	48	30	389	0	0	0	28	

Reservoir Storage Status on Apr-30	
Comparison to fill curve:	-2.44 ft
	-2696 ac-ft
Percent of full reservoir:	94.9%

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Apr-30	SECO	SDMO
precip to date:	48.8″	76.8″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Apr-30	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	444	
CWS	0	12,615
LO	0	500
JWC	0	13,500
Other	28	

SCOGGINS DAM RESERVOIR OPERATIONS — MAY 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	CHANGE STORAGE (cfs) [8]	RELEASE (cfs) [9]	COMP INFLOW (cfs) [10]	GASO (cfs) [11]	DLLO (cfs) [12]	GOLF (cfs) [13]	ROOD (cfs) [14]	FRMO (cfs) [15]	WSLO (cfs) [16]	PREC (in) [17]	MAX TEMP (°F) [18]	MIN TEMP (°F) [19]	TVID (cfs) [20]	CWS (cfs) [21]	LO (cfs) [22]	JWC (cfs) [23]	OTHER (cfs) [24]
1	11	19	2	32	301.04	50605	22	11	11	22	58	77	107	204	289	414	0.00	62	36	0	0	0	0	0
2	12	21	3	36	301.11	50682	77	39	11	50	61	77	102	199	272	397	0.11	60	45	0	0	0	0	0
3	17	32	3	52	301.20	50780	98	49	11	60	90	106	177	274	351	502	0.62	58	41	0	0	0	0	0
4	14	27	3	44	301.29	50878	98	49	11	60	99	119	207	358	455	584	0.16	59	38	0	0	0	0	0
5	16	29	3	48	301.39	50988	110	55	11	66	104	117	189	325	440	615	0.17	66	46	0	0	0	0	0
6	14	27	3	44	301.47	51076	88	44	10	54	86	105	176	311	415	578	0.07	70	44	0	0	0	0	0
7	13	23	3	39	301.52	51130	54	27	10	37	83	101	143	277	390	563	0.04	62	38	0	0	0	0	0
8	12	21	3	36	301.58	51196	66	33	10	43	74	89	105	235	341	497	0.00	72	51	0	0	0	0	0
9	11	20	2	33	301.61	51229	33	17	20	37	66	94	134	191	275	418	0.00	79	58	0	10	0	0	0
10	11	20	2	33	301.64	51262	33	17	20	37	59	100	109	193	275	317	0.00	84	53	0	10	0	0	0
11	10	18	2	30	301.66	51284	22	11	21	32	53	91	96	179	258	296	0.00	85	52	0	10	0	0	0
12	11	19	2	32	301.66	51284	0	0	20	20	55	88	97	187	256	384	0.10	66	48	0	10	0	0	0
13	11	20	2	33	301.70	51328	44	22	10	32	59	81	99	196	282	397	0.17	59	49	0	0	0	0	0
14	14	26	3	43	301.77	51405	77	39	10	49	82	89	98	207	287	397	0.22	60	49	0	0	0	0	0
15	13	25	3	41	301.85	51493	88	44	10	54	83	102	142	257	341	507	0.39	55	49	0	0	0	0	0
16	12	21	3	36	301.92	51570	77	39	10	49	70	86	110	287	399	537	0.03	66	51	0	0	0	0	0
17	13	24	3	40	301.98	51636	66	33	10	43	79	95	111	259	366	552	0.19	66	50	0	0	0	0	0
18	11	21	3	35	302.04	51702	66	33	10	43	67	84	119	254	361	542	0.01	65	51	0	0	0	0	0
19	12	22	3	37	302.11	51779	77	39	10	49	72	89	144	326	434	636	0.37	58	44	0	0	0	0	0
20	11	20	2	33	302.04	51702	-77	-39	63	24	64	184	181	286	405	600	0.00	62	44	0	0	0	53	0
21	11	20	2	33	302.06	51724	22	11	18	29	62	81	119	274	379	552	0.00	61	48	0	0	0	8	0
22	11	20	2	33	302.10	51768	44	22	10	32	67	82	103	229	334	512	0.00	57	41	0	0	0	0	0
23	10	19	2	31	302.13	51802	34	17	10	27	61	77	84	205	298	459	0.02	60	39	0	0	0	0	0
24	10	18	2	30	302.17	51846	44	22	10	32	58	74	87	178	260	410	0.00	62	46	0	0	0	0	0
25	10	17	2	29	302.22	51901	55	28	10	38	53	74	82	176	249	372	0.00	73	49	0	0	0	0	0
26	9	17	2	28	302.26	51945	44	22	10	32	52	70	86	142	241	368	0.02	69	56	0	0	0	0	0
27	9	16	2	27	302.27	51956	11	6	20	26	49	75	67	140	238	352	0.00	73	45	0	10	0	0	0
28	8	15	2	25	302.20	51879	-77	-39	65	26	44	145	95	113	211	344	0.00	84	51	0	10	0	30	0
29	8	15	2	25	302.09	51757	-122	-62	70	8	76	150	100	142	230	306	0.00	90	52	0	10	0	38	0
30	8	14	2	24	302.04	51702	-55	-28	36	8	70	117	96	140	241	333	0.00	83	54	0	0	0	12	0
31	9	16	2	27	301.99	51647	-55	-28	36	8	82	128	107	180	277	410	0.23	61	47	0	0	0	12	0
TOTALS																	2.92 inches							
cfs	352	642	75	1069	—	—		536	594	1130	2138	3047	3672	6924	9850	14151	**MAX:**	90	58	0	70	0	153	0
ac-ft	698	1273	149	2120	—	—		1064	1178	2242	4241	6044	7283	13734	19537	28069	**MIN:**	55	36	0	139	0	303	0

Reservoir Storage Status on May-31	
Comparison to fill curve:	-1.51 ft
	-1676 ac-ft
Percent of full reservoir:	96.9%

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on May-31	SECO	SDMO
precip to date:	52.7″	81.9″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on May-31	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	444	
CWS	139	12,476
LO	0	500
JWC	303	13,197
Other	28	

SCOGGINS DAM RESERVOIR OPERATIONS — JUNE 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	8	14	2	24	301.93	51581	-66	-33	36	3	72	120	103	179	291	418	0.00	62	39	0	0	0	12	0
2	7	13	2	22	301.86	51515	-66	-33	44	11	65	123	89	152	258	401	0.00	72	43	0	0	0	20	0
3	7	13	2	22	301.81	51449	-66	-33	42	9	63	118	77	123	208	364	0.00	76	48	0	0	0	20	0
4	7	13	2	22	301.73	51361	-88	-44	44	0	63	124	85	108	184	321	0.00	75	49	0	10	0	12	0
5	7	12	2	21	301.63	51251	-110	-55	62	7	63	139	90	113	189	303	0.00	71	52	0	15	0	25	0
6	7	13	2	22	301.52	51130	-121	-61	62	1	63	138	94	142	213	296	0.08	69	47	0	15	0	25	0
7	7	12	2	21	301.41	51010	-120	-61	62	1	64	141	111	186	275	333	0.02	59	44	0	15	0	25	0
8	7	12	2	21	301.31	50900	-110	-55	62	7	61	139	107	194	291	317	0.00	61	49	0	15	0	25	0
9	12	21	3	36	301.31	50900	0	0	34	34	73	104	87	227	300	423	0.54	63	48	0	0	0	6	0
10	10	20	2	32	301.33	50922	22	11	39	50	105	152	168	294	414	459	0.08	63	53	0	0	0	12	0
11	8	16	2	26	301.32	50911	-11	-6	39	33	83	134	122	251	369	450	0.01	76	54	0	0	0	12	0
12	8	14	2	24	301.30	50889	-22	-11	40	29	73	124	102	187	295	376	0.06	75	54	0	0	0	12	0
13	8	15	2	25	301.29	50878	-11	-6	33	27	76	120	126	192	290	348	0.27	59	47	0	0	0	7	0
14	8	15	2	25	301.28	50867	-11	-6	33	27	82	123	113	203	305	380	0.23	60	47	0	0	0	7	0
15	11	21	3	35	301.31	50900	33	17	33	50	77	117	107	203	300	376	0.25	66	51	0	0	0	7	0
16	11	21	3	35	301.33	50922	22	11	33	44	111	146	162	278	379	380	0.16	62	51	0	0	0	7	0
17	12	21	3	36	301.35	50944	22	11	33	44	129	168	186	391	471	432	0.08	66	46	0	0	0	7	0
18	9	18	2	29	301.36	50955	11	6	33	39	111	148	157	340	464	478	0.00	72	47	0	0	0	12	0
19	8	16	2	26	301.34	50933	-22	-11	42	31	89	141	144	236	359	605	0.00	81	51	0	0	0	12	0
20	7	15	2	24	301.31	50900	-33	-17	42	25	78	131	113	133	297	445	0.02	84	60	0	0	0	20	0
21	8	16	2	26	301.29	50878	-22	-11	42	31	80	135	117	149	301	427	0.26	68	50	0	0	0	20	0
22	7	14	2	23	301.24	50824	-54	-27	42	15	72	126	112	185	284	405	0.01	76	49	0	0	0	20	0
23	7	13	2	22	301.24	50824	0	0	31	31	65	97	91	96	244	360	0.00	86	56	0	0	0	7	0
24	6	12	2	20	301.15	50725	-99	-50	82	32	60	123	76	98	229	314	0.00	93	56	0	10	0	45	0
25	6	11	2	19	301.03	50594	-131	-66	82	16	60	123	69	102	229	303	0.00	79	51	0	10	0	50	0
26	6	11	2	19	300.92	50474	-120	-61	73	12	56	139	67	83	206	296	0.00	84	53	0	10	0	60	0
27	6	10	1	17	300.79	50332	-142	-72	82	10	53	144	92	101	177	278	0.00	86	54	31	10	0	22	2
28	6	10	1	17	300.67	50202	-130	-66	82	16	54	144	92	121	185	246	0.00	70	52	31	10	0	22	2
29	6	10	1	17	300.54	50060	-142	-72	80	8	54	143	87	117	183	252	0.00	69	48	29	10	0	22	2
30	6	10	1	17	300.37	49876	-184	-93	110	17	50	161	91	112	171	249	0.00	74	56	53	10	0	28	2
TOTALS																	2.07 inches							
cfs	233	432	60	725	—	—	-893	1554	661	2205	3985	3237	5296	8361	11035	**MAX:**	93	60	144	140	0	581	8
ac-ft	462	857	119	1438	—	—	1771	3082	1311	4374	7904	6421	10505	16584	21888	**MIN:**	59	39	286	278	0	1152	16

Reservoir Storage Status on Jun-30	
Comparison to fill curve:	-3.13 ft
	-3447 ac-ft
Percent of full reservoir:	93.5%

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Jun-30	SECO	SDMO
precip to date:	55.7″	86.2″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Jun-30	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	730	
CWS	417	12198
LO	0	500
JWC	1456	12044
Other	44	

SCOGGINS DAM RESERVOIR OPERATIONS — JULY 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	6	10	1	17	300.17	49659	-217	-109	132	23	51	179	101	115	175	242	0.00	65	53	65	20	0	28	2
2	6	10	1	17	299.97	49442	-217	-109	124	15	53	173	111	128	191	249	0.00	63	53	63	20	0	22	2
3	6	10	1	17	299.79	49248	-194	-98	124	26	51	173	115	143	206	258	0.00	70	50	62	20	0	22	3
4	5	9	1	15	299.61	49054	-194	-98	123	25	49	172	112	139	210	275	0.00	70	54	63	20	0	22	3
5	5	9	1	15	299.43	48860	-194	-98	124	26	48	172	112	139	206	275	0.00	71	49	64	20	0	22	3
6	5	9	1	15	299.24	48656	-204	-103	123	20	47	171	124	137	203	275	0.00	73	50	63	20	0	22	3
7	5	9	1	15	299.07	48473	-183	-92	111	19	47	159	105	139	206	268	0.00	66	53	56	20	0	17	3
8	5	9	1	15	298.90	48291	-182	-92	104	12	47	156	101	123	186	268	0.02	67	50	49	20	0	17	3
9	5	9	1	15	298.74	48120	-171	-86	120	34	50	171	113	124	182	252	0.00	74	53	60	25	0	17	3
10	5	8	1	14	298.53	47896	-224	-113	133	20	50	184	103	126	189	249	0.00	76	53	59	30	0	27	3
11	4	8	1	13	298.34	47694	-202	-102	137	35	49	184	96	115	176	242	0.00	79	51	61	30	3	27	3
12	4	8	1	13	298.12	47460	-234	-118	137	19	47	184	98	113	169	233	0.00	73	57	61	30	3	27	3
13	4	8	1	13	297.90	47226	-234	-118	137	19	48	184	111	121	176	233	0.00	76	46	61	30	3	27	3
14	4	7	1	12	297.70	47014	-212	-107	135	28	47	181	94	117	176	236	0.00	78	48	65	30	3	22	3
15	4	7	1	12	297.44	46740	-274	-138	160	22	45	206	103	97	156	230	0.00	84	54	77	30	3	35	3
16	3	7	1	11	297.17	46455	-285	-144	172	28	44	222	106	105	159	213	0.00	87	54	80	35	3	40	3
17	4	6	1	11	296.87	46140	-315	-159	183	24	44	235	112	103	161	215	0.00	83	55	80	35	3	50	4
18	3	6	1	10	296.53	45783	-357	-180	190	10	44	227	117	109	164	213	0.00	70	47	83	40	3	50	4
19	3	6	1	10	296.21	45449	-334	-168	190	22	41	227	117	117	169	215	0.00	84	60	83	40	3	50	4
20	3	6	1	10	295.89	45116	-333	-168	188	20	41	226	116	124	179	230	0.00	89	56	81	40	3	50	4
21	3	6	1	10	295.61	44825	-291	-147	165	18	53	209	103	109	165	230	0.00	92	57	83	40	3	25	4
22	3	5	1	9	295.30	44504	-321	-162	182	20	53	227	106	99	153	218	0.00	88	58	86	40	3	40	4
23	3	5	1	9	294.99	44184	-320	-161	178	17	68	235	117	99	153	207	0.00	82	51	82	45	3	35	4
24	3	6	1	10	294.70	43886	-298	-150	166	16	68	227	114	104	158	204	0.00	75	54	82	45	3	27	4
25	3	6	1	10	294.36	43537	-349	-176	185	9	70	256	131	104	157	204	0.00	69	45	91	50	3	27	4
26	3	5	1	9	294.04	43210	-327	-165	185	20	68	256	125	120	175	210	0.00	81	52	92	50	3	27	4
27	3	5	1	9	293.74	42904	-306	-154	185	31	65	252	137	116	171	221	0.00	97	58	92	50	3	27	4
28	2	4	1	7	293.39	42548	-356	-179	206	27	64	278	138	105	168	218	0.00	97	57	115	50	3	27	4
29	2	4	1	7	293.00	42154	-394	-199	192	-7	64	276	144	119	172	210	0.00	88	52	101	50	3	27	4
30	2	4	1	7	292.64	41791	-363	-183	192	9	63	277	141	115	172	218	0.00	94	57	101	50	3	27	4
31	2	4	1	7	292.27	41417	-374	-189	192	3	62	275	141	115	172	172	0.00	96	58	102	45	3	32	0
TOTALS																	0.02 inches							
cfs	118	215	31	364	—	—	-4265	4875	610	1641	6554	3564	3639	5455	7183	**MAX:**	97	60	2363	1070	63	915	102
ac-ft	234	426	61	722	—	—	-8459	9670	1210	3255	13000	7069	7218	10820	14247	**MIN:**	63	45	4687	2122	125	1815	202

Reservoir Storage Status on Jul-31

Comparison to fill curve: -11.23 ft
-11,906 ac-ft
Percent of full reservoir: 77.7%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Jul-31

	SECO	SDMO
precip to date:	55.7″	86.6″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Jul-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	5417	
CWS	2539	10,076
LO	125	375
JWC	3271	10,209
Other	246	

SCOGGINS DAM RESERVOIR OPERATIONS — AUGUST 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	RELEASE (cfs) [8]	COMP INFLOW (cfs) [9]	GASO (cfs) [10]	DLLO (cfs) [11]	GOLF (cfs) [12]	ROOD (cfs) [13]	FRMO (cfs) [14]	WSLO (cfs) [15]	PREC (in) [16]	MAX TEMP (°F) [17]	MIN TEMP (°F) [18]	TVID (cfs) [19]	CWS (cfs) [20]	LO (cfs) [21]	JWC (cfs) [22]	OTHER (cfs) [23]
1	2	4	1	7	291.89	41038	-379	-191	191	0	62	273	131	116	172	132	0.00	86	54	96	45	3	37	3
2	2	4	1	7	291.51	40659	-379	-191	191	0	63	276	139	120	176	146	0.00	82	55	96	45	3	37	3
3	2	4	1	7	291.12	40272	-387	-195	191	-4	63	274	140	123	178	124	0.00	86	53	96	45	3	37	3
4	2	4	1	7	290.81	39965	-307	-155	157	2	67	233	129	126	176	148	0.00	82	55	89	40	3	15	3
5	2	4	1	7	290.50	39659	-306	-154	157	3	71	230	114	111	164	224	0.00	86	55	79	40	3	25	3
6	2	4	1	7	290.19	39354	-305	-154	152	-2	71	221	106	104	151	210	0.03	83	54	74	40	3	25	3
7	2	4	1	7	289.89	39059	-295	-149	151	2	74	224	110	103	149	204	0.01	83	49	73	40	3	25	3
8	2	4	1	7	289.60	38776	-283	-143	145	2	72	212	107	104	153	204	0.00	78	55	71	40	3	20	3
9	2	4	1	7	289.31	38493	-283	-143	144	1	73	213	111	101	151	201	0.00	76	46	71	40	3	20	3
10	2	4	1	7	289.04	38230	-263	-133	144	11	69	210	106	109	154	201	0.00	82	56	71	40	3	20	3
11	2	3	1	6	288.71	37909	-321	-162	162	0	70	232	103	93	147	196	0.00	91	44	80	45	3	25	3
12	2	3	1	6	288.39	37600	-309	-156	156	0	70	225	107	99	142	188	0.00	80	52	79	45	3	20	3
13	2	4	1	7	288.02	37243	-357	-180	171	-9	74	252	115	103	146	188	0.00	71	43	82	50	3	26	3
14	2	3	1	6	287.66	36897	-346	-174	180	6	73	266	120	98	148	190	0.00	78	47	91	50	3	26	4
15	2	3	1	6	287.25	36505	-392	-198	206	8	69	293	154	111	154	190	0.00	87	56	105	55	3	33	4
16	2	3	1	6	286.83	36104	-401	-202	205	3	68	285	143	121	172	204	0.00	100	59	105	55	3	33	4
17	2	3	1	6	286.42	35715	-389	-196	205	9	68	292	158	124	172	218	0.00	94	58	104	55	3	33	4
18	2	3	1	6	285.99	35309	-406	-205	206	1	65	290	152	132	179	215	0.00	93	58	105	55	3	33	4
19	2	3	1	6	285.60	34941	-368	-186	185	-1	65	264	137	133	183	221	0.00	85	55	89	50	3	33	4
20	2	3	1	6	285.24	34604	-337	-170	171	1	66	246	116	119	168	227	0.00	85	58	80	45	3	33	4
21	2	4	1	7	284.93	34314	-290	-146	150	4	69	224	107	115	161	218	0.05	81	62	69	45	3	15	3
22	2	4	1	7	284.62	34025	-289	-146	143	-3	70	217	119	115	166	215	0.01	75	50	70	45	3	15	3
23	2	4	1	7	284.32	33746	-279	-141	142	1	69	214	113	118	169	215	0.00	78	49	69	45	3	15	3
24	2	3	1	6	284.03	33478	-268	-135	143	8	68	210	117	116	166	215	0.00	83	48	71	45	3	15	3
25	2	3	1	6	283.72	33191	-287	-145	142	-3	67	212	98	103	155	213	0.00	79	49	70	45	3	15	3
26	2	3	1	6	283.41	32906	-285	-144	148	4	67	217	100	96	146	196	0.00	81	49	71	50	3	15	3
27	2	3	1	6	283.06	32585	-321	-162	170	8	67	246	118	99	146	185	0.00	81	48	80	55	3	23	3
28	2	3	1	6	282.69	32247	-338	-170	168	-2	63	243	120	115	159	185	0.00	83	49	78	55	3	23	3
29	2	3	1	6	282.35	31937	-310	-156	161	5	64	231	109	109	163	196	0.00	84	50	76	55	3	18	3
30	2	3	1	6	281.99	31610	-327	-165	161	-4	64	231	116	110	158	193	0.00	76	43	76	55	3	18	3
31	2	3	1	6	281.65	31303	-307	-155	161	6	65	233	120	117	165	201	0.00	77	49	77	55	3	18	3
TOTALS																	0.10 inches							
cfs	62	107	31	200	—	—	-5099	5159	60	2106	7489	3735	3463	4989	6063	**MAX:**	100	62	2543	1470	93	746	100
ac-ft	123	212	61	397	—	—	-10114	10233	119	4177	14854	7408	6869	9896	12026	**MIN:**	71	43	5044	2916	184	1480	198

Reservoir Storage Status on Aug-31

Comparison to fill curve: -21.85 ft
-22020 ac-ft
Percent of full reservoir: 58.7%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Aug-31

	SECO	SDMO
precip to date:	55.8″	87.0″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Aug-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	10,461	
CWS	5,455	7,160
LO	309	191
JWC	4,750	8,750
Other	444	

SCOGGINS DAM RESERVOIR OPERATIONS — SEPTEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	RELEASE (cfs) [8]	COMP INFLOW (cfs) [9]	GASO (cfs) [10]	DLLO (cfs) [11]	GOLF (cfs) [12]	ROOD (cfs) [13]	FRMO (cfs) [14]	WSLO (cfs) [15]	PREC (in) [16]	MAX TEMP (°F) [17]	MIN TEMP (°F) [18]	TVID (cfs) [19]	CWS (cfs) [20]	LO (cfs) [21]	JWC (cfs) [22]	OTHER (cfs) [23]
1	2	3	1	6	281.28	30970	-332	-167	179	12	70	268	117	99	150	204	0.00	76	52	87	55	3	25	3
2	2	3	1	6	280.87	30602	-368	-186	190	4	66	276	117	113	161	199	0.00	89	56	88	60	3	30	3
3	2	3	1	6	280.40	30183	-419	-211	219	8	65	311	140	114	164	201	0.00	92	55	97	60	3	50	3
4	2	3	1	6	279.89	29730	-453	-228	227	-1	65	292	149	126	175	210	0.00	96	54	99	60	3	55	4
5	2	3	1	6	279.42	29315	-415	-209	202	-7	67	267	142	129	183	218	0.00	86	55	94	53	3	42	4
6	2	3	1	6	278.96	28911	-404	-204	202	-2	65	267	155	134	183	224	0.00	77	53	94	53	3	42	4
7	2	3	1	6	278.52	28527	-384	-194	201	7	67	267	155	137	190	233	0.00	90	56	93	53	3	42	4
8	2	2	1	5	278.05	28118	-409	-206	201	-5	73	278	156	139	193	233	0.00	88	61	93	53	3	42	4
9	2	3	1	6	277.58	27712	-406	-205	198	-7	76	286	224	157	203	236	0.00	80	66	85	48	3	42	4
10	2	3	1	6	277.10	27300	-412	-208	198	-10	78	290	157	148	217	246	0.00	86	64	90	48	3	47	4
11	2	4	1	7	276.62	26906	-394	-199	197	-2	81	293	168	115	173	242	0.00	74	49	88	48	3	47	4
12	2	4	1	7	276.19	26524	-382	-193	191	-2	82	284	163	128	175	213	0.00	68	47	84	45	3	45	4
13	2	4	1	7	275.76	26160	-364	-184	190	6	81	282	167	127	184	221	0.00	68	47	84	45	3	45	4
14	2	5	1	8	275.33	25798	-362	-183	190	7	81	282	179	145	199	230	0.00	70	48	83	45	3	45	4
15	2	5	1	8	274.97	25497	-301	-152	158	6	79	236	155	146	205	249	0.00	72	53	75	40	3	28	4
16	2	4	1	7	274.65	25230	-267	-135	147	12	76	215	159	138	195	249	0.00	80	53	70	40	3	23	4
17	2	5	1	8	274.37	24997	-233	-117	132	15	67	189	127	130	189	246	0.00	74	54	54	40	3	23	4
18	6	12	2	20	274.15	24815	-182	-92	128	36	78	196	134	130	185	258	0.86	76	57	35	40	3	28	2
19	3	9	1	13	273.94	24642	-173	-87	115	28	89	206	188	193	260	285	0.34	67	55	35	40	3	22	2
20	3	6	1	10	273.70	24444	-198	-100	115	15	57	178	156	193	275	329	0.01	70	52	38	40	3	22	2
21	2	5	1	8	273.45	24239	-205	-103	115	12	54	174	139	161	233	325	0.00	74	52	40	40	3	22	2
22	2	5	1	8	273.26	24083	-156	-79	81	2	53	137	102	124	202	289	0.00	73	54	26	30	3	12	2
23	2	5	1	8	273.08	23936	-147	-74	81	7	52	137	108	106	173	255	0.04	72	57	26	30	3	12	2
24	6	20	2	28	273.05	23912	-24	-12	59	47	120	209	152	156	222	329	0.72	65	54	5	20	3	6	1
25	7	11	2	20	272.99	23863	-49	-25	60	35	64	132	157	237	324	317	0.38	70	54	10	15	3	11	1
26	6	20	2	28	273.04	23904	41	21	54	75	100	178	298	380	503	502	0.74	64	51	1	10	3	11	1
27	3	10	1	14	272.95	23831	-73	-37	54	17	70	133	154	286	439	568	0.32	66	40	15	10	3	11	1
28	3	7	1	11	272.85	23749	-82	-41	53	12	56	118	123	176	296	468	0.00	73	49	17	10	3	11	1
29	3	6	1	10	272.79	23700	-49	-25	43	18	44	97	90	130	220	344	0.00	85	54	16	10	3	3	1
30	2	5	1	8	272.63	23570	-130	-66	70	4	39	116	102	105	178	272	0.00	82	50	25	25	3	8	1
TOTALS																	3.41 inches							
cfs	82	181	34	297	—	—	-3898	4250	352	2115	6594	4533	4602	6649	8395	**MAX:**	96	66	1747	1166	90	852	84	
ac-ft	163	359	67	589	—	—	-7732	8430	698	4195	13079	8991	9128	13188	16651	**MIN:**	64	40	3465	2313	179	1690	167	

Reservoir Storage Status on Sep-30	
Comparison to fill curve:	-30.87 ft
	-29753 ac-ft
Percent of full reservoir:	44.2%

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2020 on Sep-30	SECO	SDMO
precip to date:	60.7″	93.5″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Sep-30	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	13,926	
CWS	7,767	4,848
LO	488	12
JWC	6,440	7,060
Other	611	

SCOGGINS DAM RESERVOIR OPERATIONS — OCTOBER 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	2	5	1	8	272.40	23384	-186	-94	102	8	39	148	107	111	182	239	0.00	82	51	25	35	3	30	1
2	2	5	1	8	272.20	23223	-161	-81	87	6	40	137	113	113	185	242	0.00	78	49	18	40	3	16	2
3	2	5	1	8	270.00	23061	-162	-82	88	6	39	138	108	112	184	230	0.00	81	52	15	40	0	23	2
4	2	5	1	8	271.78	22885	-176	-89	88	-1	39	139	104	109	184	230	0.01	77	54	15	40	0	23	2
5	2	5	1	8	271.57	22716	-169	-85	88	3	39	142	106	107	179	227	0.00	70	51	15	40	0	23	2
6	2	5	1	8	271.37	22557	-159	-80	80	0	34	128	101	101	173	218	0.00	76	48	15	40	0	15	2
7	2	4	1	7	271.18	22405	-152	-77	80	3	33	126	98	97	168	215	0.00	83	50	16	40	0	15	2
8	2	4	1	7	271.03	22285	-120	-61	86	25	27	127	103	99	170	210	0.00	74	52	17	45	0	15	2
9	2	4	1	7	270.74	22055	-230	-116	109	-7	26	150	104	104	176	213	0.00	64	55	15	45	0	40	2
10	10	18	2	30	270.57	21920	-135	-68	100	32	35	154	112	145	203	299	0.76	71	55	0	45	0	29	2
11	5	10	1	16	270.39	21777	-143	-72	99	27	57	176	196	251	379	376	0.24	62	48	7	45	0	29	2
12	14	39	3	56	270.32	21721	-56	-28	99	71	249	371	226	255	374	517	0.66	60	52	0	45	0	29	2
13	9	22	2	33	270.20	21626	-95	-48	85	37	98	223	308	412	520	478	0.14	64	53	7	20	0	24	1
14	9	27	3	39	270.22	21642	16	8	74	82	160	308	436	386	515	605	0.30	63	48	5	10	0	19	1
15	6	17	2	25	270.11	21555	-87	-44	62	18	95	187	256	353	499	584	0.03	63	40	7	10	0	30	1
16	4	13	2	19	270.01	21476	-79	-40	68	28	68	154	181	230	365	507	0.00	65	40	8	10	0	22	1
17	4	11	2	17	269.92	21405	-71	-36	60	24	55	130	142	169	277	393	0.00	67	44	10	10	0	22	1
18	4	9	1	14	269.79	21302	-103	-52	59	7	49	122	126	142	232	314	0.00	68	52	12	10	0	22	1
19	4	9	1	14	269.69	21223	-79	-40	59	19	51	126	114	130	212	272	0.00	68	52	12	10	0	22	1
20	3	8	1	12	269.52	21089	-134	-68	69	1	46	129	124	126	204	249	0.00	66	45	9	25	0	22	1
21	3	8	1	12	269.29	20909	-180	-91	84	-7	44	141	123	141	218	239	0.01	63	44	9	35	0	27	1
22	3	7	1	11	269.10	20760	-149	-75	77	2	44	134	126	133	219	252	0.00	57	34	8	35	0	22	1
23	3	7	1	11	268.92	20619	-141	-71	78	7	41	129	118	130	213	249	0.00	57	35	10	35	0	22	0
24	3	7	1	11	268.73	20470	-149	-75	78	3	44	131	117	121	202	246	0.00	56	37	10	35	0	22	0
25	3	7	1	11	268.55	20330	-140	-71	78	7	42	130	121	117	198	239	0.01	51	37	10	35	0	22	0
26	3	7	1	11	268.35	20175	-155	-78	77	-1	42	129	118	115	195	233	0.00	46	27	9	35	0	22	0
27	3	8	1	12	268.16	20027	-148	-75	77	2	42	128	115	111	190	227	0.00	56	31	8	35	0	22	0
28	3	8	1	12	267.98	19888	-139	-70	77	7	41	126	108	111	189	224	0.00	60	35	8	35	0	22	0
29	3	8	1	12	267.80	19749	-139	-70	88	18	40	137	108	109	187	224	0.00	67	41	12	35	0	29	0
30	3	8	1	12	267.60	19595	-154	-78	90	12	39	140	109	111	187	224	0.02	64	43	14	35	0	24	0
31	3	8	1	12	267.38	19426	-169	-85	96	11	24	133	129	113	192	224	0.03	59	35	15	45	0	24	0
TOTALS																	2.21 inches							
cfs	123	308	40	471	—	—	-2089	2542	453	1722	4773	4457	4864	7571	9199	**MAX:**	83	55	341	1000	6	728	33
ac-ft	244	611	79	934	—	—	-4144	5042	898	3416	9467	8840	9648	15017	18246	**MIN:**	46	27	676	1984	12	1444	65

Reservoir Storage Status on Oct-31

Comparison to fill curve: -36.12 ft
-33897 ac-ft
Percent of full reservoir: 36.4%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2021 on Oct-31

	SECO	SDMO
precip to date:	5.1″	7.7″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Oct-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	14,603	
CWS	9,751	2,864
LO	500	0
JWC	7,884	5,616
Other	676	

SCOGGINS DAM RESERVOIR OPERATIONS — NOVEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO (cfs) [1]	SCLO (cfs) [2]	TANO (cfs) [3]	TOTAL INFLOW (cfs) [4]	W.S. ELEV (ft) [5]	STORAGE CONTENT (ac-ft) [6]	CHANGE STORAGE (ac-ft) [7]	RELEASE (cfs) [8]	COMP INFLOW (cfs) [9]	GASO (cfs) [10]	DLLO (cfs) [11]	GOLF (cfs) [12]	ROOD (cfs) [13]	FRMO (cfs) [14]	WSLO (cfs) [15]	PREC (in) [16]	MAX TEMP (°F) [17]	MIN TEMP (°F) [18]	TVID (cfs) [19]	CWS (cfs) [20]	LO (cfs) [21]	JWC (cfs) [22]	OTHER (cfs) [23]
1	3	8	1	12	267.10	19211	-215	-108	96	-12	18	128	110	115	198	227	0.00	61	36	15	45	0	24	0
2	3	8	1	12	266.86	19027	-184	-93	96	3	17	126	110	112	195	230	0.00	66	34	15	45	0	24	0
3	3	8	1	12	266.67	18883	-144	-73	83	10	17	111	112	134	180	227	0.01	65	39	11	45	0	15	0
4	5	16	2	23	266.54	18784	-99	-50	84	34	43	131	118	154	209	258	0.39	59	45	1	45	0	15	0
5	6	22	3	31	266.41	18685	-99	-50	74	24	49	133	154	162	223	268	0.09	65	54	2	35	0	15	0
6	18	49	4	71	266.45	18715	30	15	73	88	181	274	263	336	391	492	0.90	55	47	2	25	0	22	0
7	8	28	3	39	266.32	18617	-98	-49	73	24	108	217	351	523	637	605	0.03	48	33	2	25	0	22	0
8	6	23	3	32	266.20	18526	-91	-46	73	27	73	168	256	366	509	672	0.01	49	38	2	25	0	22	0
9	5	20	2	27	266.04	18405	-121	-61	73	12	55	146	192	251	372	532	0.00	48	26	2	25	0	22	0
10	6	22	3	31	266.01	18382	-23	-12	38	26	49	103	146	200	290	414	0.18	42	30	2	15	0	15	0
11	7	27	3	37	266.02	18390	8	4	20	24	80	102	136	172	246	344	0.07	52	36	2	5	0	10	0
12	6	23	3	32	266.04	18405	15	8	20	28	71	93	140	175	236	296	0.00	49	33	2	5	0	10	0
13	182	290	25	497	266.24	18556	151	76	54	130	125	162	159	236	295	610	1.64	47	38	2	15	0	35	0
14	30	77	6	113	266.81	18989	433	218	20	238	348	477	848	965	934	822	0.22	52	38	0	0	0	20	0
15	79	175	19	273	267.58	19579	590	297	20	317	605	547	969	1450	1510	1740	1.17	50	41	0	0	0	20	0
16	36	101	8	145	268.08	19965	386	195	20	215	296	529	944	1570	1690	1870	0.30	54	44	0	0	0	20	0
17	26	74	5	105	268.40	20214	249	126	20	146	225	384	784	1300	1450	1740	0.11	50	44	1	0	0	0	0
18	40	99	8	147	268.77	20502	288	145	20	165	244	365	712	1120	1250	1570	0.92	55	45	1	0	0	0	0
19	69	164	16	249	269.42	21011	509	257	21	278	517	601	996	1540	1630	2010	0.82	47	42	1	0	0	0	0
20	50	125	11	186	269.96	21436	425	214	20	234	397	612	1090	1710	1850	2070	0.10	50	40	1	0	0	0	0
21	31	89	7	127	270.32	21721	285	144	20	164	265	488	954	1500	1660	1920	0.00	44	33	1	0	0	0	0
22	24	69	5	98	270.59	21935	214	108	20	128	205	370	763	1210	1360	1650	0.00	41	32	1	0	0	0	0
23	21	58	4	83	270.84	22134	199	100	20	120	174	305	617	947	1100	1380	0.15	43	34	1	0	0	0	0
24	19	47	4	70	271.03	22285	151	76	20	96	153	260	503	793	937	1160	0.04	50	42	1	0	0	0	0
25	20	51	4	75	271.22	22437	152	77	21	98	162	253	448	707	839	1080	0.16	48	38	1	0	0	0	0
26	19	44	3	66	271.37	22557	120	61	21	82	168	255	435	657	792	962	0.04	48	40	1	0	0	0	0
27	18	40	3	61	271.52	22676	119	60	20	80	155	231	390	575	714	875	0.03	46	40	1	0	0	0	0
28	17	38	3	58	271.66	22789	113	57	20	77	141	204	353	508	633	782	0.02	47	37	1	0	0	0	0
29	16	34	3	53	271.77	22877	88	44	21	65	127	181	319	464	581	721	0.01	43	37	1	0	0	0	0
30	23	51	4	78	271.92	22997	120	61	21	82	124	171	302	439	551	689	0.35	53	36	1	0	0	0	0
TOTALS																	7.76 inches							
cfs	796	1880	167	2843	—	—	1800	1202	3002	5192	8127	13674	20391	23462	28216	**MAX:**	66	54	74	355	0	311	0
ac-ft	1579	3729	331	5639	—	—	3571	2384	5955	10298	16120	27122	40446	46537	55966	**MIN:**	41	26	147	704	0	617	0

Reservoir Storage Status on Nov-30	
Comparison to fill curve:	-11.58 ft
	-9992 ac-ft
Percent of full reservoir:	43.1%

Minimum Required Discharges	
Dec-Sept: 10 cfs	Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2021 on Nov-30	SECO	SDMO
precip to date:	23.2″	16.0″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Nov-30		
	ALLOCATION (ac-ft)	
	USED	REMAINING
TVID	14,749	
CWS	10,455	2,160
LO	500	0
JWC	8,501	4,999
Other	676	

SCOGGINS DAM RESERVOIR OPERATIONS — DECEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.]

Source: Tualatin Valley Irrigation District

	INFLOW				HENRY HAGG LAKE					TUALATIN RIVER						WEATHER			WATER DELIVERIES				
DAY	SCHO	SCLO	TANO	TOTAL INFLOW	W.S. ELEV	STORAGE CONTENT	CHANGE STORAGE	RELEASE	COMP INFLOW	GASO	DLLO	GOLF	ROOD	FRMO	WSLO	PREC	MAX TEMP	MIN TEMP	TVID	CWS	LO	JWC	OTHER
	(cfs) [1]	(cfs) [2]	(cfs) [3]	(cfs) [4]	(ft) [5]	(ac-ft) [6]	(ac-ft) [7]	(cfs) [8]	(cfs) [9]	(cfs) [10]	(cfs) [11]	(cfs) [12]	(cfs) [13]	(cfs) [14]	(cfs) [15]	(cfs) [16]	(in) [17]	(°F) [18]	(°F) [19]	(cfs) [20]	(cfs) [21]	(cfs) [22]	(cfs) [23]	(cfs) [24]
1	21	44	3	68	272.09	23134	137	69	21	90	157	220	403	523	619	694	0.08	51	31	0	0	0	0	0
2	19	40	3	62	272.25	23263	129	65	21	86	145	199	353	541	664	748	0.00	50	32	0	0	0	0	0
3	18	37	3	58	272.37	23360	97	49	21	70	130	177	326	481	603	732	0.00	55	34	0	0	0	0	0
4	16	33	3	52	272.49	23457	97	49	21	70	116	159	300	441	558	672	0.00	48	31	0	0	0	0	0
5	15	30	3	48	272.58	23530	73	37	21	58	107	148	279	403	518	625	0.00	55	31	0	0	0	0	0
6	14	28	3	45	272.68	23611	81	41	21	62	100	139	254	370	480	589	0.03	52	38	0	0	0	0	0
7	13	26	3	42	272.75	23668	57	29	21	50	93	130	230	347	454	547	0.01	47	38	0	0	0	0	0
8	12	25	3	40	272.83	23733	65	33	21	54	88	123	197	316	422	517	0.00	49	38	0	0	0	0	0
9	12	23	3	38	272.91	23798	65	33	20	53	86	119	191	312	410	547	0.09	54	38	0	0	0	0	0
10	12	22	3	37	272.98	23855	57	29	20	49	80	112	183	320	423	512	0.01	51	34	0	0	0	0	0
11	12	22	3	37	273.04	23904	49	25	20	45	83	115	177	305	407	517	0.16	41	38	0	0	0	0	0
12	14	28	3	45	273.17	24010	106	53	20	73	98	145	232	505	593	705	0.45	40	36	0	0	0	0	0
13	18	37	3	58	273.27	24092	82	41	21	62	96	139	209	475	599	810	0.38	44	39	0	0	0	0	0
14	19	38	3	60	273.41	24206	114	57	20	77	123	190	327	609	730	869	0.08	43	40	0	0	0	0	0
15	20	44	3	67	273.54	24313	107	54	21	75	127	192	308	593	735	899	0.19	44	39	0	0	0	0	0
16	30	67	5	102	273.79	24518	205	103	21	124	205	288	428	575	702	869	0.09	49	43	0	0	0	0	0
17	93	149	13	255	274.32	24956	438	221	21	242	408	482	769	1050	1110	1130	0.94	49	41	0	0	0	0	0
18	66	118	9	193	274.83	25380	424	214	21	235	340	533	920	1460	1540	1530	0.02	51	38	0	0	0	0	0
19	67	125	11	203	275.32	25790	410	207	22	229	345	511	909	1520	1650	1860	0.38	50	42	0	0	0	0	0
20	388	670	48	1106	276.74	26992	1202	606	23	629	na	734	1190	1850	1940	2870	2.11	53	45	0	0	0	0	0
21	265	482	39	786	278.59	28588	1596	805	23	828	na	1350	1970	2840	3090	3950	0.88	54	46	0	0	0	0	0
22	194	391	35	620	279.95	29783	1195	602	23	625	na	1479	2440	3090	3460	4200	0.28	56	35	0	0	0	0	0
23	127	252	27	406	280.91	30638	855	431	23	454	584	1201	2520	3090	3430	4030	0.01	49	32	0	0	0	0	0
24	90	172	16	278	281.59	31249	611	308	23	331	463	961	2360	3190	3480	3910	0.00	48	29	0	0	0	0	0
25	69	134	12	215	281.87	31502	253	128	126	254	351	881	1950	3200	3650	3910	0.00	47	30	0	0	0	0	0
26	104	169	15	288	282.35	31937	435	219	127	346	496	913	1690	3210	3700	4240	0.95	48	37	0	0	0	0	0
27	87	151	13	251	282.72	32274	337	170	127	297	430	906	1610	3090	3590	4030	0.15	49	41	0	0	0	0	0
28	66	129	11	206	282.98	32512	238	120	127	247	337	837	1490	2870	3330	3700	0.00	51	31	0	0	0	0	0
29	54	108	9	171	283.13	32649	137	69	128	197	273	756	1300	2640	3070	3370	0.00	48	29	0	0	0	0	0
30	49	101	9	159	283.12	32640	-9	-5	202	197	247	745	1110	2370	2770	3040	0.15	37	29	0	0	0	0	0
31	84	156	14	254	283.15	32667	27	14	299	313	423	913	1260	2340	2740	3100	0.74	47	37	0	0	0	0	0
TOTALS																	8.18 inches							
cfs	2068	3851	331	6250	—	—	4875	1646	6521	6531	15797	27885	44926	51467	59722		**MAX:**	56	46	0	0	0	0	0
ac-ft	4102	7638	657	12397	—	—	9670	3265	12935	12954	31333	55310	89111	102085	118459		**MIN:**	37	29	0	0	0	0	0

Reservoir Storage Status on Dec-31

Comparison to fill curve:	-0.35 ft
	-322 ac-ft
Percent of full reservoir:	61.3%

Minimum Required Discharges

Dec-Sept: 10 cfs Oct-Nov: 20 cfs

SNOWTEL Summary for WY 2021 on Dec-31

	SECO	SDMO
precip to date:	27.8″	39.2″
snow depth:	0″	0″
water content:	0″	0″

The allocations (used & remaining) shown in this table are provisional.

Reservoir Delivery Status on Dec-31

	ALLOCATION (ac-ft) USED	REMAINING
TVID	14,749	
CWS	10,455	2,160
LO	500	0
JWC	8,501	4,999
Other	676	

this page intentionally blank

APPENDIX D
BARNEY RESERVOIR OPERATIONS — MONTHLY REPORTS

2020 SUMMARY

- Maximum Barney Reservoir storage: 20,000 ac-ft on February 10 (full pool)
- First day of allocated releases: May 28
- Last day of allocated releases: December 2
- Days with allocated releases: 189
- Maximum daily allocated release: 72 cfs on September 1
- Minimum Barney Reservoir storage: 8,233 ac-ft on November 2 (41.2% of full pool)

RELEASE SEASON — 2020

Details of releases for each month follow in this appendix.

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RELEASE SEASON
Number of days of with allocated releases									
JWC	4	30	31	31	30	31	15	0	172
CWS	0	0	0	0	30	29	0	0	59
ODFW (Trask)	0	28	31	31	30	31	30	2	183
TOTAL	**4**	**30**	**31**	**31**	**30**	**31**	**30**	**2**	**189**
Allocated releases in acre-feet									
JWC	198	1,488	2,192	3,074	1,882	595	208	0	9,638
CWS	0	0	0	0	833	805	0	0	1,638
ODFW (Trask)	0	434	504	504	549	590	373	12	2,967
TOTAL	**198**	**1922**	**2696**	**3579**	**3264**	**1991**	**581**	**12**	**14,243**

Abbreviations: JWC=Joint Water Commission; CWS=Clean Water Services; ODFW=Oregon Department of Fish and Wildlife; Trask=Trask River

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF JANUARY 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP		TRASK	TUALATIN			CWS		MUNICIPAL	
					min	max								
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									0	0	0	0	0	0
2	1613.9	9,975	375	3.48	37	47	1.7	0.0	0	0	0	0	0	0
3									0	0	0	0	0	0
4									0	0	0	0	0	0
5									0	0	0	0	0	0
6	1616.0	10,666	691	3.94	33	43	4.0	0.0	0	0	0	0	0	0
7									0	0	0	0	0	0
8	1618.1	11,366	700	1.94	36	44	2.4	0.0	0	0	0	0	0	0
9									0	0	0	0	0	0
10	1619.2	11,733	367	0.66	30	36	2.4	0.0	0	0	0	0	0	0
11									0	0	0	0	0	0
12									0	0	0	0	0	0
13	1622.3	12,863	1130	5.38	31	36	3.5	0.0	0	0	0	0	0	0
14									0	0	0	0	0	0
15	1623.4	13,275	412	0.77	25	30	2.4	0.0	0	0	0	0	0	0
16	1623.8	13,425	150	1.66	30	32	1.7	0.0	0	0	0	0	0	0
17									0	0	0	0	0	0
18									0	0	0	0	0	0
19									0	0	0	0	0	0
20									0	0	0	0	0	0
21	1625.7	14,138	713	1.56	29	38	2.4	0.0	0	0	0	0	0	0
22	1624.4	14,400	262	1.21	35	37	3.0	0.0	0	0	0	0	0	0
23									0	0	0	0	0	0
24	1628.9	15,338	938	3.06	40	45	4.0	0.0	0	0	0	0	0	0
25									0	0	0	0	0	0
26									0	0	0	0	0	0
27	1631.4	16,275	937	2.15	34	44	3.0	0.0	0	0	0	0	0	0
28									0	0	0	0	0	0
29	1634.0	17,250	975	3.70	41	45	4.0	0.0	0	0	0	0	0	0
30	1634.8	17,550	300	0.50	39	41	3.5	0.0	0	0	0	0	0	0
31									0	0	0	0	0	0
Monthly Totals			7,950	30.01						0		0		0
Year to Date Totals			7,950	30.01						0		0		0

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF FEBRUARY 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									0	0	0	0	0	0
2									0	0	0	0	0	0
3	1636.9	18,450	900	1.49	31	48	2.4	0.0	0	0	0	0	0	0
4									0	0	0	0	0	0
5	1637.7	18,850	400	0.89	28	56	7.3	0.0	0	0	0	0	0	0
6									0	0	0	0	0	0
7	1638.8	19,320	470	2.32	41	44	3.5	0.0	0	0	0	0	0	0
8									0	0	0	0	0	0
9									0	0	0	0	0	0
10	1640.6	20,000	680	1.51	30	43	35.0	0.0	0	0	0	0	0	0
11									0	0	0	0	0	0
12	1640.9	20,000	0	0.05	32	40	64.0	0.0	0	0	0	0	0	0
13									0	0	0	0	0	0
14	1640.8	20,000	0	0.56	38	46	41.0	0.0	0	0	0	0	0	0
15									0	0	0	0	0	0
16									0	0	0	0	0	0
17									0	0	0	0	0	0
18									0	0	0	0	0	0
19	1640.7	20,000	0	1.18	32	37	55.5	0.0	0	0	0	0	0	0
20	1640.7	20,000	0	0.00	33	38	47.0	0.0	0	0	0	0	0	0
21									0	0	0	0	0	0
22									0	0	0	0	0	0
23									0	0	0	0	0	0
24	1640.9	20,000	0	1.02	32	43	47.0	0.0	0	0	0	0	0	0
25									0	0	0	0	0	0
26	1640.7	20,000	0	0.02	32	42	41.0	0.0	0	0	0	0	0	0
27									0	0	0	0	0	0
28	1640.7	20,000	0	0.00	34	44	41.0	0.0	0	0	0	0	0	0
29									0	0	0	0	0	0
Monthly Totals			2,450	9.04						0		0		0
Year to Date Totals			10,400	39.05						0		0		0

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF MARCH 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP		TRASK	TUALATIN			CWS		MUNICIPAL	
					min	max								
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									0	0	0	0	0	0
2	1640.7	20,000	0	1.07	30	39	41.0	0.0	0	0	0	0	0	0
3									0	0	0	0	0	0
4	1640.7	20,000	0	0.08	35	44	41.0	0.0	0	0	0	0	0	0
5									0	0	0	0	0	0
6	1640.7	20,000	0	0.24	32	43	41.0	0.0	0	0	0	0	0	0
7									0	0	0	0	0	0
8									0	0	0	0	0	0
9	1640.6	20,000	0	0.34	30	36	35.0	0.0	0	0	0	0	0	0
10									0	0	0	0	0	0
11	1640.6	20,000	0	0.01	31	45	35.0	0.0	0	0	0	0	0	0
12									0	0	0	0	0	0
13	1640.6	20,000	0	0.05	30	42	35.0	0.0	0	0	0	0	0	0
14									0	0	0	0	0	0
15									0	0	0	0	0	0
16	1640.6	20,000	0	0.20	26	37	31.5	0.0	0	0	0	0	0	0
17									0	0	0	0	0	0
18	1640.6	20,000	0	0.01	32	35	19.0	0.0	0	0	0	0	0	0
19									0	0	0	0	0	0
20	1640.6	20,000	0	0.00	32	46	17.5	0.0	0	0	0	0	0	0
21									0	0	0	0	0	0
22									0	0	0	0	0	0
23	1640.6	20,000	0	0.24	32	50	19.0	0.0	0	0	0	0	0	0
24									0	0	0	0	0	0
25	1640.6	20,000	0	1.09	32	42	35.0	0.0	0	0	0	0	0	0
26									0	0	0	0	0	0
27	1640.6	20,000	0	0.16	32	38	31.5	0.0	0	0	0	0	0	0
28									0	0	0	0	0	0
29									0	0	0	0	0	0
30	1640.8	20,000	0	2.40	35	43	77.0	0.0	0	0	0	0	0	0
31									0	0	0	0	0	0
Monthly Totals			0	5.89						0		0		0
Year to Date Totals			10,400	44.94						0		0		0

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF APRIL 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1	1640.7	20,000	0	1.79	32	37	77.00	0.0	0	0	0	0	0	0
2									0	0	0	0	0	0
3	1640.7	20,000	0	0.04	32	37	55.5	0.0	0	0	0	0	0	0
4									0	0	0	0	0	0
5									0	0	0	0	0	0
6	1640.7	20,000	0	0.28	32	46	41.0	0.0	0	0	0	0	0	0
7									0	0	0	0	0	0
8	1640.6	20,000	0	0.00	34	48	35.0	0.0	0	0	0	0	0	0
9									0	0	0	0	0	0
10	1640.6	20,000	0	0.00	40	62	35.0	0.0	0	0	0	0	0	0
11									0	0	0	0	0	0
12									0	0	0	0	0	0
13	1640.6	20,000	0	0.00	35	58	19.0	0.0	0	0	0	0	0	0
14									0	0	0	0	0	0
15	1640.6	20,000	0	0.00	35	53	17.5	0.0	0	0	0	0	0	0
16									0	0	0	0	0	0
17	1640.6	20,000	0	0.00	40	54	16.0	0.0	0	0	0	0	0	0
18									0	0	0	0	0	0
19									0	0	0	0	0	0
20									0	0	0	0	0	0
21	1640.6	20,000	0	0.15	38	60	14.8	0.0	0	0	0	0	0	0
22	1640.6	20,000	0	0.21	38	48	19.0	0.0	0	0	0	0	0	0
23									0	0	0	0	0	0
24	1640.6	20,000	0	0.56	40	46	17.5	0.0	0	0	0	0	0	0
25									0	0	0	0	0	0
26									0	0	0	0	0	0
27	1640.6	20,000	0	0.85	40	51	31.5	0.0	0	0	0	0	0	0
28									0	0	0	0	0	0
29	1640.6	20,000	0	0.00	40	56	14.8	0.0	0	0	0	0	0	0
30									0	0	0	0	0	0
Monthly Totals			0	3.88					0	0	0	0	0	0
Year to Date Totals			10,400	48.82						0		0		0

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF MAY 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL*	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1	1640.6	20,000	0	0.11	39	58	14.75	0.0	0	0	0	0	0	0
2									0	0	0	0	0	0
3									0	0	0	0	0	0
4	1640.6	20,000	0	1.49	38	46	35.0	0.0	0	0	0	0	0	0
5									0	0	0	0	0	0
6	1640.6	20,000	0	0.58	38	44	35.0	0.0	0	0	0	0	0	0
7									0	0	0	0	0	0
8	1640.6	20,000	0	0.00	38	58	16.0	0.0	0	0	0	0	0	0
9									0	0	0	0	0	0
10									0	0	0	0	0	0
11	1640.6	20,000	0	0.01	43	67	13.5	0.0	0	0	0	0	0	0
12									0	0	0	0	0	0
13	1640.6	20,000	0	0.38	44	51	16.0	0.0	0	0	0	0	0	0
14									0	0	0	0	0	0
15	1640.6	20,000	0	0.86	42	46	31.5	0.0	0	0	0	0	0	0
16									0	0	0	0	0	0
17									0	0	0	0	0	0
18	1640.6	20,000	0	0.36	36	44	16.0	0.0	0	0	0	0	0	0
19									0	0	0	0	0	0
20	1640.6	20,000	0	0.16	44	56	14.8	0.0	0	0	0	0	0	0
21									0	0	0	0	0	0
22	1640.6	20,000	0	0.69	40	46	19.0	0.0	0	0	0	0	0	0
23									0	0	0	0	0	0
24									0	0	0	0	0	0
25									0	0	0	0	0	0
26	1640.6	20,000	0	0.03	36	57	14.8	0.0	0	0	0	0	0	0
27	1640.6	20,000	0	0.00	46	59	12.3	0.0	0	0	0	0	0	0
28	FIRST DAY OF STORED WATER RELEASE FOR MUNICIPAL USE													
	1640.6	20,000	0	0.00	54	67	12.3	25.1	0	0	0	0	25	50
29	1640.5	20,000	0	0.00	54	73	1.7	25.1	0	0	0	0	25	50
30									0	0	0	0	25	50
31									0	0	0	0	25	50
Monthly Totals			0	4.67						0		0		198
Year to Date Totals			10,400	53.49						0		0		198

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF JUNE 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL*	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1	1640.3	19,920	-80	0.42	40	64	1.10	25.1	0	0	0	0	25	50
2									0	0	0	0	25	50
3	FIRST DAY OF STORED WATER RELEASE TO TRASK RIVER FOR FISH USE													
	1640.1	19,840	-80	0.00	40	66	4.0	25.1	3	6	0	0	25	50
4									6	13	0	0	25	50
5	1640.0	19,800	-40	0.00	46	64	6.4	25.1	6	13	0	0	25	50
6									6	13	0	0	25	50
7									8	16	0	0	25	50
8	1639.6	19,640	-160	0.24	41	58	8.2	25.1	8	16	0	0	25	50
9									8	16	0	0	25	50
10	1639.5	19,600	-40	1.08	45	52	8.2	25.1	8	16	0	0	25	50
11									8	16	0	0	25	50
12	1639.3	19,520	-80	0.29	48	57	8.2	25.1	8	16	0	0	25	50
13									8	16	0	0	25	50
14									8	16	0	0	25	50
15	1639.0	19,400	-120	1.10	43	54	8.2	25.1	8	16	0	0	25	50
16									8	16	0	0	25	50
17	1638.9	19,360	-40	0.58	43	48	8.2	25.1	8	16	0	0	25	50
18									8	16	0	0	25	50
19	1638.7	19,280	-80	0.00	46	64	8.2	25.1	8	16	0	0	25	50
20									8	16	0	0	25	50
21									8	16	0	0	25	50
22	1638.4	19,160	-120	0.25	39	66	8.2	25.1	8	16	0	0	25	50
23									8	16	0	0	25	50
24	1638.2	19,080	-80	0.00	54	74	8.2	25.1	8	16	0	0	25	50
25									8	16	0	0	25	50
26	1638.9	18,950	-130	0.00	50	66	8.2	25.1	8	16	0	0	25	50
27									8	16	0	0	25	50
28									8	16	0	0	25	50
29	1637.5	18,750	-200	0.03	48	68	8.2	25.1	8	16	0	0	25	50
30									8	16	0	0	25	50
Monthly Totals			-1,250	3.99						434		0		1,488
Year to Date Totals			9,150	57.48						434		0		1,686

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF JULY 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL*	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1	1637.2	18,600	-150	0.05	47	58	8.2	25.1	8.2	16	0	0	25	50
2									8.2	16	0	0	25	50
3	1637.0	18,500	-100	0.06	48	52	8.2	25.1	8.2	16	0	0	25	50
4									8.2	16	0	0	25	50
5									8.2	16	0	0	25	50
6	1636.6	18,300	-200	0.00	50	56	8.2	25.1	8.2	16	0	0	25	50
7									8.2	16	0	0	25	50
8	1636.3	18,150	-150	0.07	48	53	8.2	30.1	8.2	16	0	0	30	60
9									8.2	16	0	0	30	60
10	1636.0	18,000	-150	0.00	49	59	8.2	30.1	8.2	16	0	0	30	60
11									8.2	16	0	0	30	60
12									8.2	16	0	0	30	60
13	1635.5	17,813	-187	0.02	46	60	8.2	30.1	8.2	16	0	0	30	60
14									8.2	16	0	0	30	60
15	1635.1	17,663	-150	0.00	48	65	8.2	30.1	8.2	16	0	0	30	60
16									8.2	16	0	0	30	60
17	1634.8	17,550	-113	0.00	52	64	8.2	30.1	8.2	16	0	0	30	60
18									8.2	16	0	0	30	60
19									8.2	16	0	0	30	60
20	1634.3	17,363	-187	0.00	50	72	8.2	40.1	8.2	16	0	0	40	79
21									8.2	16	0	0	40	79
22	1633.9	17,213	-150	0.00	50	64	8.2	50.3	8.2	16	0	0	40	79
23									8.2	16	0	0	50	99
24	1633.3	16,988	-225	0.00	46	65	8.2	50.3	8.2	16	0	0	50	99
25									8.2	16	0	0	50	99
26									8.2	16	0	0	50	99
27	1632.2	16,575	-413	0.00	46	73	8.2	50.3	8.2	16	0	0	50	99
28									8.2	16	0	0	50	99
29	1631.8	16,475	-100	0.00	55	74	8.2	50.3	8.2	16	0	0	50	99
30									8.2	16	0	0	50	99
31	1631.2	16,200	-275	0.00	58	74	8.2	50.3	8.2	16	0	0	50	99
Monthly Totals			-2,550	0.20						504		0		2,192
Year to Date Totals			6,600	57.68						939		0		3,878

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF AUGUST 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL*	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									8.2	16	0	0	50	99
2									8.2	16	0	0	50	99
3	1630.3	15,863	-337	0.00	54	66	8.2	50.3	8.2	16	0	0	50	99
4	1630.0	15,750	-113	0.00	64	65	8.2	50.3	8.2	16	0	0	50	99
5	1629.6	15,600	-150	0.00	65	67	8.2	50.3	8.2	16	0	0	50	99
6									8.2	16	0	0	50	99
7	1629.0	15,375	-225	0.00	47	65	8.2	50.3	8.2	16	0	0	50	99
8									8.2	16	0	0	50	99
9									8.2	16	0	0	50	99
10	1628.0	15,000	-375	0.00	47	65	8.2	50.3	8.2	16	0	0	50	99
11									8.2	16	0	0	50	99
12	1627.4	14,775	-225	0.00	48	73	8.2	50.3	8.2	16	0	0	50	99
13									8.2	16	0	0	50	99
14	1626.8	14,550	-225	0.00	46	60	8.2	50.3	8.2	16	0	0	50	99
15									8.2	16	0	0	50	99
16									8.2	16	0	0	50	99
17	1625.9	14,213	-337	0.00	56	75	8.2	50.3	8.2	16	0	0	50	99
18									8.2	16	0	0	50	99
19	1625.2	13,950	-263	0.00	56	72	8.2	50.3	8.2	16	0	0	50	99
20									8.2	16	0	0	50	99
21	1624.6	13,725	-225	0.09	56	67	8.2	50.3	8.2	16	0	0	50	99
22									8.2	16	0	0	50	99
23									8.2	16	0	0	50	99
24	1623.6	13,350	-375	0.05	51	65	8.2	50.3	8.2	16	0	0	50	99
25									8.2	16	0	0	50	99
26	1623.0	13,125	-225	0.00	49	64	8.2	50.3	8.2	16	0	0	50	99
27									8.2	16	0	0	50	99
28	1622.3	12,863	-262	0.00	50	66	8.2	50.3	8.2	16	0	0	50	99
29									8.2	16	0	0	50	99
30									8.2	16	0	0	50	99
31	1621.3	12,489	-374	0.01	45	66	8.2	50.3	8.2	16	0	0	50	99
Monthly Totals			-3,711	0.15						504		0		3,074
Year to Date Totals			2,889	57.83						1,443		0		6,952

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF SEPTEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP		TRASK	TUALATIN			CWS		MUNICIPAL*	
					min	max								
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1	FIRST DAY OF STORED WATER RELEASE FOR TUALATIN RIVER WATER QUALITY													
									8.2	16	14	28	50	99
2									8.2	16	14	28	36	71
3	1620.3	12,113	-376	0.00	54	62	8.2	50.3	8.2	16	14	28	36	71
4	1620.0	12,000	-113	0.00	56	74	8.2	50.3	8.2	16	14	28	36	71
5									8.2	16	14	28	36	71
6									8.2	16	14	28	36	71
7	1619.0	11,666	-334	0.00	50	75	8.2	50.3	8.2	16	14	28	36	71
8	1618.8	11,600	-66	0.00	58	72	8.2	50.3	8.2	16	14	28	36	71
9									9.6	19	14	28	36	71
10	1617.9	11,300	-300	0.00	61	67	9.6	50.3	9.6	19	14	28	36	71
11									9.6	19	14	28	36	71
12									9.6	19	14	28	36	71
13									9.6	19	14	28	36	71
14	1616.5	10,833	-467	0.00	50	60	9.6	50.3	9.6	19	14	28	36	71
15									9.6	19	14	28	36	71
16	1615.8	10,600	-233	0.00	65	66	9.6	44.3	9.6	19	14	28	30	60
17									9.6	19	14	28	30	60
18	1615.1	10,366	-234	0.67	56	63	9.6	44.3	9.6	19	14	28	30	60
19									9.6	19	14	28	30	60
20									9.6	19	14	28	30	60
21	1614.3	10,100	-266	0.73	51	54	9.6	44.3	9.6	19	14	28	30	60
22									9.6	19	14	28	30	60
23	1613.7	9,925	-175	0.39	57	64	9.6	39.1	9.6	19	14	28	25	50
24									9.6	19	14	28	25	50
25	1613.5	9,875	-50	3.48	52	56	9.6	39.1	9.6	19	14	28	25	50
26									9.6	19	14	28	25	50
27									9.6	19	14	28	25	50
28	1612.9	9,725	-150	0.50	48	59	9.6	34.3	9.6	19	14	28	20	40
29									9.6	19	14	28	20	40
30	1612.4	9,600	-125	0.00	54	60	9.6	34.3	9.6	19	14	28	20	40
Monthly Totals			-2,889	5.77						549		833		1,882
Year to Date Totals			0	63.60						1,992		833		8,835

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF OCTOBER 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL*	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									9.6	19	14	28	20	40
2	1611.9	9,479	-121	0.02	53	60	9.6	34.3	9.6	19	14	28	20	40
3									9.6	19	14	28	20	40
4									9.6	19	14	28	20	40
5	1611.1	9,250	-229	0.01	50	59	9.6	29.3	9.6	19	14	28	15	30
6									9.6	19	14	28	15	30
7	1610.7	9,175	-75	0.01	54	59	9.6	24.1	9.6	19	14	28	10	20
8									9.6	19	14	28	10	20
9	1610.4	9,100	-75	0.00	52	58	9.6	24.1	9.6	19	14	28	10	20
10									9.6	19	14	28	10	20
11									9.6	19	14	28	10	20
12	1610.2	9,050	-50	3.31	48	56	9.6	21.0	9.6	19	14	28	7	14
13									9.6	19	14	28	7	14
14	1610.2	9,050	0	1.15	48	51	9.6	21.0	9.6	19	14	28	7	14
15									9.6	19	14	28	7	14
16	1610.1	9,000	-50	0.09	39	45	9.6	21.0	9.6	19	14	28	7	14
17									9.6	19	14	28	7	14
18									9.6	19	14	28	7	14
19	1609.8	8,933	-67	0.46	44	52	9.6	21.0	9.6	19	14	28	7	14
20									9.6	19	14	28	7	14
21	1609.5	8,833	-100	0.03	43	46	9.6	21.0	9.6	19	14	28	7	14
22									9.6	19	14	28	7	14
23	1609.1	8,700	-133	0.05	36	42	9.6	21.0	9.6	19	14	28	7	14
24									9.6	19	14	28	7	14
25									9.6	19	14	28	7	14
26	1608.7	8,566	-134	0.03	31	44	9.6	21.0	9.6	19	14	28	7	14
27									9.6	19	14	28	7	14
28	1608.2	8,400	-166	0.00	37	44	9.6	21.0	9.6	19	14	28	7	14
29									9.6	19	14	28	7	14
	LAST DAY OF STORED WATER RELEASE FOR TUALATIN RIVER WATER QUALITY													
30	1607.9	8,300	-100	0.19	45	51	9.6	21.0	9.6	19	0	0	7	14
31									9.6	19	0	0	7	14
Monthly Totals			-1,300	5.35						590		805		595
Year to Date Totals			-1,300	68.95						2,582		1,638		9,430

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF NOVEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP		TRASK	TUALATIN			CWS		MUNICIPAL*	
					min	max								
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									9.6	19	0	0	7	14
2	1607.7	8,233	-67	0.03	38	46	9.6	6.8	9.6	19	0	0	7	14
3									9.6	19	0	0	7	14
4	1607.7	8,233	0	0.96	41	51	9.6	7.0	9.6	19	0	0	7	14
5									9.6	19	0	0	7	14
6	1607.9	8,300	67	1.53	42	50	9.6	7.0	9.6	19	0	0	7	14
7									9.6	19	0	0	7	14
8									9.6	19	0	0	7	14
9	1607.9	8,300	0	0.18	29	41	6.4	7.0	6.0	12	0	0	7	14
10									6.0	12	0	0	7	14
11	1608.1	8,366	66	1.00	27	37	6.4	7.0	6.0	12	0	0	7	14
12									6.0	12	0	0	7	14
13	1608.7	8,566	200	2.84	34	38	9.6	7.0	6.0	12	0	0	7	14
14									6.0	12	0	0	7	14
15									6.0	12	0	0	7	14
	LAST DAY OF STORED WATER RELEASE FOR MUNICIPAL USE													
16	1610.8	9,200	634	3.16	40	42	7.3	0.0	6.0	12	0	0	0	0
17									6.0	12	0	0	0	0
18	1610.5	9,125	-75	1.64	38	44	7.3	0.0	6.0	12	0	0	0	0
19									6.0	12	0	0	0	0
20	1612.5	9,625	500	1.42	36	40	7.3	0.0	6.0	12	0	0	0	0
21									6.0	12	0	0	0	0
22									6.0	12	0	0	0	0
23	1613.3	9,825	200	0.49	33	43	6.4	0.0	6.0	12	0	0	0	0
24									3.0	6	0	0	0	0
25	1613.7	9,925	100	0.88	38	38	3.0	0.0	3.0	6	0	0	0	0
26									3.0	6	0	0	0	0
27	1614.1	10,033	108	0.43	34	38	3.0	0.0	3.0	6	0	0	0	0
28									3.0	6	0	0	0	0
29									3.0	6	0	0	0	0
30	1614.7	10,233	200	0.84	36	38	3.0	0.0	3.0	6	0	0	0	0
Monthly Totals			1,933	15.40						373		0		208
Year to Date Totals			633	84.35						2,955		1,638		9,638

*In this table (Reservoir Operations), the amount of water released is recorded on the day it was released from the reservoir. In the Municipal Use tables (Appendix E), the released water is recorded on the day that it was available for use which is one day later.

BARNEY RESERVOIR OPERATIONS FOR THE MONTH OF DECEMBER 2020

[See Appendix E for breakdown of municipal use by water provider.] Source: Barney Reservoir Joint Ownership Commission

DAY	SURFACE ELEVATION	STORAGE	CHANGE IN STORAGE	WEATHER @ BARNEY			MEASURED FLOW TO		STORAGE RELEASED TO TRASK—ODFW		ALLOCATED STORAGE RELEASED TO TUALATIN			
				RAIN	TEMP						CWS		MUNICIPAL	
					min	max	TRASK	TUALATIN						
	feet	ac-ft	ac-ft	in.	°F	°F	cfs	cfs	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft
1									3.0	6.0	0	0	0	0
2	1615.0	10,333	100	0.14	32	37	3.0	0.0	3.0	6.0	0	0	0	0
	LAST DAY OF STORED WATER RELEASE TO TRASK RIVER FOR FISH USE													
3									0	0	0	0	0	0
4	1615.4	10,466	133	0.00	36	38	3.5	0.0	0	0	0	0	0	0
5									0	0	0	0	0	0
6									0	0	0	0	0	0
7	1615.6	10,533	67	0.12	39	41	0.5	0.0	0	0	0	0	0	0
8									0	0	0	0	0	0
9	1615.9	10,633	100	0.14	41	46	0.5	0.0	0	0	0	0	0	0
10									0	0	0	0	0	0
11	1616.1	10,700	67	0.52	34	40	1.1	0.0	0	0	0	0	0	0
12									0	0	0	0	0	0
13									0	0	0	0	0	0
14	1616.6	10,866	166	1.12	32	37	1.1	0.0	0	0	0	0	0	0
15									0	0	0	0	0	0
16	1617.0	11,000	134	0.63	36	38	1.1	0.0	0	0	0	0	0	0
17									0	0	0	0	0	0
18	1617.8	11,266	266	1.76	38	38	1.7	0.0	0	0	0	0	0	0
19									0	0	0	0	0	0
20									0	0	0	0	0	0
21	1620.9	12,338	1072	5.45	41	44	3.5	0.0	0	0	0	0	0	0
22									0	0	0	0	0	0
23	1622.5	12,938	600	0.94	32	45	2.4	0.0	0	0	0	0	0	0
24									0	0	0	0	0	0
25									0	0	0	0	0	0
26									0	0	0	0	0	0
27									0	0	0	0	0	0
28	1624.5	13,688	750	1.62	32	37	1.8	0.0	0	0	0	0	0	0
29									0	0	0	0	0	0
30	1625.1	13,913	225	0.58	32	34	2.4	0.0	0	0	0	0	0	0
31									0	0	0	0	0	0
Monthly Totals			3,680	13.02						12		0		0
Year to Date Totals			4,313	97.37						2,967		1,638		9,638

this page intentionally blank

APPENDIX E
MUNICIPAL WATER USE ALLOCATIONS — MONTHLY REPORTS

2020 SUMMARY

- Length of release season: 175 days
- First day of stored water delivery for municipal use: 105 acre-feet (34.3 MG) on May 20
- Last day of stored water delivery for municipal use: 53.6 acre-feet (17.4 MG) on November 16
- Mean daily used allocation of stored water: 104 acre-feet per day (33.8 MGD)
- Maximum daily used allocation of stored water: 180 acre-feet per day (58.8 MGD) on September 4

2020 MUNICIPAL WATER USE ALLOCATIONS

Details of releases for each month follow in this appendix.

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RELEASE SEASON*
Barney Reservoir (acre-feet)									
Hillsboro	40	586	797	1391	865	262	35	0	3976
Forest Grove	0	0	0	0	0	0	0	0	0
Beaverton	53	510	436	687	251	138	97	0	2172
TVWD	56	391	909	996	826	221	90	0	3490
TOTAL	**149**	**1488**	**2142**	**3074**	**1942**	**621**	**222**	**0**	**9638**
Hagg Lake (acre-feet)									
Hillsboro	172	619	794	512	644	693	280	0	3714
Forest Grove**	6	49	239	371	336	188	78	0	1267
Beaverton	126	485	781	596	710	563	259	0	3520
TOTAL	**303**	**1152**	**1815**	**1480**	**1690**	**1444**	**617**	**0**	**8501**

*The Release Season total may not equal the sum of the Monthly Allocations because of round-off error.
Abbreviations: TVWD=Tualatin Valley Water District
**Releases from Hagg Lake allocated to Forest Grove may include water that was leased to TVWD. Details about allocation leases from Forest Grove to TVWD can be obtained from the JWC.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF MAY 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18				FIRST DAY OF MUNICIPAL USE OF STORED WATER						
19				Barney Reservoir: May 29 (released May 28)			Hagg Lake: May 20			
20	53	0	53	-3.7	35	0.0	0.9	0.0	17	3.7
21	8	0	8	-0.7	4.5	0.0	0.2	0.0	3.3	0.7
22	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	30	0	30	-4.4	14.7	0.0	1.4	0.0	13.9	4.4
29	63	25	38	8.2	20.4	0.0	0.2	7.0	17.4	9.8
30	37	25	12	9.6	5.9	0.0	0.1	9.8	6.0	5.6
31	37	25	12	11.0	6.3	0.0	0.1	9.9	5.7	4.2
Monthly Summary (May)										
Mean daily cfs	38.0	25.0	25.5	6.7	14.4	0.0	0.5	8.9	10.6	9.4
Total ac-ft	452	149	303	40	172	0	6	53	126	56
Stored Water Use Summary to Date (May 28–May 31)										
Mean daily cfs	38.0	25.0	25.5	6.7	14.4	0.0	0.5	8.9	10.6	9.4
Total ac-ft	452	149	303	40	172	0	6	53	126	56

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF JUNE 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	37	25	12	11.9	6.2	0.0	0.1	10.8	5.7	2.3
2	45	25	20	11.8	10.1	0.0	1.5	9.8	8.4	3.4
3	45	25	20	9.8	11.5	0.0	0.3	7.0	8.2	8.2
4	37	25	12	7.0	5.1	0.0	1.1	8.1	5.9	9.9
5	50	25	25	6.6	12.3	0.0	0.8	6.3	11.9	12.0
6	50	25	25	8.0	13.7	0.0	0.1	6.5	11.1	10.5
7	50	25	25	8.2	13.9	0.0	0.1	6.5	11.0	10.3
8	50	25	25	11.3	14.4	0.0	0.2	8.1	10.3	5.6
9	31	25	6	12.0	3.0	0.0	0.1	11.9	2.9	1.1
10	37	25	12	12.2	6.2	0.0	0.2	11.1	5.6	1.6
11	37	25	12	12.2	6.1	0.0	0.4	10.9	5.5	1.8
12	37	25	12	11.9	5.9	0.0	0.6	11.2	5.5	1.9
13	32	25	7	11.9	3.5	0.0	0.1	11.4	3.4	1.7
14	32	25	7	11.9	3.6	0.0	0.1	11.4	3.4	1.7
15	32	25	7	11.8	3.5	0.0	0.1	11.5	3.4	1.7
16	32	25	7	11.9	3.4	0.0	0.3	11.4	3.3	1.7
17	32	25	7	11.7	3.4	0.0	0.2	11.6	3.4	1.7
18	37	25	12	11.7	5.8	0.0	0.9	10.9	5.3	2.4
19	37	25	12	9.7	4.7	0.0	2.4	10.0	4.9	5.3
20	45	25	20	8.0	10.5	0.0	0.1	7.2	9.4	9.8
21	45	25	20	10.3	11.2	0.0	0.1	8.0	8.7	6.7
22	45	25	20	12.4	11.6	0.0	1.2	7.8	7.3	4.8
23	32	25	7	9.4	2.6	0.0	1.5	10.1	2.9	5.5
24	70	25	45	5.6	24.5	0.0	1.2	4.4	19.4	15.0
25	75	25	50	5.3	27.8	0.0	1.0	4.0	21.1	15.7
26	85	25	60	3.6	37.1	0.0	3.0	1.9	19.9	19.5
27	47	25	22	9.5	11.8	0.0	1.6	6.9	8.6	8.6
28	47	25	22	9.1	11.6	0.0	1.5	7.0	8.9	8.9
29	47	25	22	9.1	11.2	0.0	2.1	7.1	8.8	8.8
30	53	25	28	9.6	15.8	0.0	2.0	6.3	10.3	9.1
Monthly Summary (June)										
Mean daily cfs	44.4	25.0	19.4	9.8	10.4	0.0	0.8	8.6	8.1	6.6
Total ac-ft	2,640	1,488	1,152	586	619	0.0	49	510	485	391
Stored Water Use Summary to Date (May 28–June 30)										
Mean daily cfs	43.3	25.0	20.4	9.6	11.1	0.0	0.8	8.6	8.6	6.8
Total ac-ft	3,092	1,636	1,456	626	791	0.0	54	563	611	448

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF JULY 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	53	25	28	9.0	13.7	0.0	4.3	6.6	10.1	9.4
2	47	25	22	8.9	10.6	0.0	2.1	7.8	9.3	8.3
3	47	25	22	9.3	11.6	0.0	1.5	7.1	8.9	8.6
4	47	25	22	7.9	10.7	0.0	1.6	7.1	9.7	10.0
5	47	25	22	8.7	10.7	0.0	1.7	7.8	9.6	8.5
6	47	25	22	9.4	10.3	0.0	2.5	8.4	9.2	7.2
7	42	25	17	10.4	8.3	0.0	1.9	8.4	6.8	6.2
8	42	25	17	10.2	8.0	0.0	2.5	8.4	6.5	6.4
9	47	30	17	11.9	8.0	0.0	2.5	9.5	6.4	8.6
10	57	30	27	10.0	12.9	0.0	3.6	8.2	10.5	11.8
11	57	30	27	8.9	13.1	0.0	2.5	7.7	11.3	13.4
12	57	30	27	9.9	14.0	0.0	2.5	7.5	10.5	12.6
13	57	30	27	8.7	12.3	0.0	3.5	7.9	11.2	13.3
14	52	30	22	10.4	10.5	0.0	3.3	8.1	8.2	11.5
15	65	30	35	8.3	17.9	0.0	3.6	6.2	13.4	15.5
16	70	30	40	7.6	21.4	0.0	4.2	5.1	14.4	17.2
17	80	30	50	4.6	26.8	0.0	4.2	3.3	19.0	22.1
18	80	30	50	5.9	26.7	0.0	4.3	4.2	19.0	19.9
19	80	30	50	5.8	26.4	0.0	4.4	4.2	19.1	20.0
20	80	30	50	5.8	25.9	0.0	5.1	4.3	19.0	19.9
21	65	40	25	17.9	5.3	0.0	4.0	4.5	15.6	17.7
22	80	40	40	9.6	19.7	0.0	4.6	7.6	15.7	22.8
23	75	40	35	14.9	10.2	0.0	5.2	3.7	19.6	21.3
24	77	50	27	25.6	5.1	0.0	4.9	6.4	17.0	18.0
25	77	50	27	26.4	5.0	0.0	4.9	6.6	17.1	17.0
26	77	50	27	26.5	4.8	0.0	5.6	6.6	16.6	16.8
27	77	50	27	18.1	11.9	0.0	5.8	14.3	9.4	17.6
28	77	50	27	16.5	11.5	0.0	6.1	13.5	9.4	20.0
29	77	50	27	23.4	8.2	0.0	5.2	5.9	13.6	20.7
30	77	50	27	25.9	7.2	0.0	6.4	6.5	13.4	17.6
31	82	50	32	25.3	11.5	0.0	6.2	6.3	14.4	18.4
Monthly Summary (July)										
Mean daily cfs	64.4	34.8	29.5	13.0	12.9	0.0	3.9	7.1	12.7	14.8
Total ac-ft	3,957	2,142	1,815	797	794	0	239	436	781	909
Stored Water Use Summary to Date (May 28–July 31)										
Mean daily cfs	53.0	29.8	24.6	11.2	11.9	0.0	2.2	7.9	10.5	10.7
Total ac-ft	7,049	3,779	3,271	1,423	1,585	0.0	294	999	1,392	1,357

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF AUGUST 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	87	50	37	25.2	15.3	0.0	5.6	6.3	16.1	18.5
2	87	50	37	25.8	14.3	0.0	6.0	6.4	16.7	17.8
3	87	50	37	26.2	15.1	0.0	5.7	6.5	16.1	17.3
4	65	50	15	20.7	5.5	0.0	5.4	15.0	4.0	14.3
5	75	50	25	28.2	4.4	0.0	6.2	7.0	14.5	14.8
6	75	50	25	28.0	5.5	0.0	4.8	7.0	14.8	15.0
7	75	50	25	26.2	6.1	0.0	5.1	6.6	13.8	17.2
8	70	50	20	19.6	8.7	0.0	5.1	14.0	6.2	16.4
9	70	50	20	20.3	8.8	0.0	5.1	14.2	6.1	15.6
10	70	50	20	20.0	8.2	0.0	5.8	14.5	6.0	15.5
11	75	50	25	20.6	12.0	0.0	5.4	13.1	7.6	16.3
12	70	50	20	19.8	9.2	0.0	4.7	13.2	6.1	17.1
13	76	50	26	25.4	5.8	0.0	6.1	6.3	14.1	18.3
14	76	50	26	25.2	5.3	0.0	6.4	6.3	14.4	18.5
15	83	50	33	24.1	9.9	0.0	6.8	6.0	16.3	19.9
16	83	50	33	23.9	10.4	0.0	6.0	6.0	16.6	20.1
17	83	50	33	23.6	9.9	0.0	6.5	5.9	16.6	20.5
18	83	50	33	22.7	8.8	0.0	6.9	5.7	17.3	21.6
19	83	50	33	18.5	15.5	0.0	7.0	12.5	10.5	18.9
20	83	50	33	20.0	16.4	0.0	6.8	12.0	9.8	17.9
21	65	50	15	21.6	5.7	0.0	5.5	14.8	3.9	13.6
22	65	50	15	20.8	5.1	0.0	6.0	16.1	3.9	13.1
23	65	50	15	20.3	5.0	0.0	6.1	15.8	3.9	13.9
24	65	50	15	19.9	5.2	0.0	5.6	16.1	4.2	14.0
25	65	50	15	19.8	4.6	0.0	6.5	16.4	3.8	13.8
26	65	50	15	21.1	5.0	0.0	6.2	15.7	3.8	13.3
27	73	50	23	21.8	9.4	0.0	7.4	14.3	6.2	13.9
28	73	50	23	29.0	3.1	0.0	7.1	7.3	12.9	13.7
29	68	50	18	21.4	6.8	0.0	6.5	15.1	4.8	13.5
30	68	50	18	21.0	6.8	0.0	6.3	15.2	4.9	13.7
31	68	50	18	20.6	6.6	0.0	6.6	15.2	4.9	14.2
Monthly Summary (August)										
Mean daily cfs	74.1	50.0	24.1	22.6	8.3	0.0	6.0	11.2	9.7	16.2
Total ac-ft	4,554	3,074	1,480	1,391	512	0	371	687	596	996
Stored Water Use Summary to Date (May 28–August 31)										
Mean daily cfs	59.7	36.4	24.4	14.9	10.8	0.0	3.4	8.9	10.2	12.5
Total ac-ft	11,603	6,853	4,750	2,814	2,097	0.0	665	1,686	1,988	2,353

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF SEPTEMBER 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	75	50	25	26.6	5.0	0.0	7.4	6.6	12.6	16.8
2	80	50	30	25.9	8.4	0.0	7.7	6.5	13.9	17.6
3	86	36	50	13.5	23.6	0.0	7.9	3.4	18.5	19.2
4	91	36	55	10.7	26.4	0.0	8.3	2.7	20.4	22.6
5	78	36	42	13.3	17.9	0.0	6.6	3.3	17.5	19.4
6	78	36	42	14.5	18.2	0.0	6.5	3.6	17.3	17.9
7	78	36	42	13.9	18.1	0.0	6.9	3.5	17.0	18.7
8	78	36	42	12.8	17.9	0.0	6.4	3.2	17.7	19.9
9	78	36	42	13.9	18.2	0.0	7.6	3.5	16.1	18.7
10	83	36	47	12.5	19.2	0.0	7.9	3.1	20.0	20.4
11	83	36	47	10.8	21.2	0.0	6.3	2.7	19.5	22.5
12	81	36	45	9.2	20.9	0.0	6.3	2.3	17.8	24.5
13	81	36	45	9.8	20.8	0.0	6.1	2.5	18.1	23.7
14	81	36	45	9.7	19.3	0.0	6.6	2.4	19.1	23.9
15	64	36	28	17.9	7.9	0.0	5.7	4.5	14.4	13.7
16	59	36	23	18.1	5.0	0.0	5.9	4.5	12.1	13.4
17	53	30	23	14.3	6.7	0.0	5.2	3.6	11.1	12.1
18	58	30	28	13.4	11.4	0.0	5.1	3.3	11.6	13.3
19	52	30	22	17.2	8.6	0.0	4.3	4.3	9.1	8.5
20	52	30	22	17.2	9.1	0.0	3.9	4.3	9.1	8.5
21	52	30	22	17.7	7.9	0.0	5.1	4.4	9.0	7.9
22	42	30	12	19.9	0.8	0.0	4.2	5.0	7.1	5.2
23	42	30	12	19.6	0.8	0.0	4.1	4.9	7.2	5.5
24	31	25	6	12.4	1.3	0.0	4.0	7.7	0.8	4.9
25	36	25	11	11.8	3.7	0.0	5.0	7.2	2.3	6.0
26	36	25	11	15.2	1.1	0.0	4.2	3.8	5.6	6.0
27	36	25	11	15.4	1.7	0.0	4.1	3.9	5.2	5.7
28	36	25	11	15.3	1.2	0.0	4.5	3.8	5.3	5.9
29	23	20	3	7.0	0.3	0.0	2.4	6.5	0.3	6.5
30	28	20	8	6.8	2.6	0.0	3.2	5.6	2.2	7.6
Monthly Summary (September)										
Mean daily cfs	61.0	32.6	28.4	14.5	10.8	0.0	5.6	4.2	11.9	13.9
Total ac-ft	3,632	1,942	1,690	865	644	0	336	251	710	826
Stored Water Use Summary to Date (May 28–September 30)										
Mean daily cfs	60.0	35.5	25.4	14.8	10.8	0.0	3.9	7.8	10.6	12.8
Total ac-ft	15,235	8,795	6,440	3,679	2,741	0.0	1,001	1,937	2,698	3,178

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF OCTOBER 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	50	20	30	8.4	13.4	0.0	5.2	2.1	11.4	9.4
2	36	20	16	14.0	4.5	0.0	4.7	3.5	6.8	2.4
3	43	20	23	13.7	10.8	0.0	4.2	3.4	8.0	2.9
4	43	20	23	13.5	11.6	0.0	3.6	3.4	7.8	3.1
5	43	20	23	11.5	12.3	0.0	4.8	5.4	5.8	3.1
6	30	15	15	8.3	7.7	0.0	3.3	4.4	4.0	2.3
7	30	15	15	8.2	7.5	0.0	3.3	4.5	4.2	2.3
8	25	10	15	5.2	7.9	0.0	2.7	2.9	4.4	1.9
9	50	10	40	4.2	23.0	0.0	5.5	2.1	11.5	3.7
10	39	10	29	4.3	17.3	0.0	2.5	2.3	9.2	3.4
11	39	10	29	4.2	16.1	0.0	4.1	2.3	8.8	3.5
12	39	10	29	4.0	16.5	0.0	3.4	2.2	9.1	3.8
13	31	7	24	2.3	13.5	0.0	2.5	1.4	8.0	3.3
14	26	7	19	2.4	10.2	0.0	2.2	1.6	6.7	3.0
15	37	7	30	1.6	15.9	0.0	3.5	1.0	10.6	4.4
16	29	7	22	1.8	10.7	0.0	2.8	1.4	8.5	3.8
17	29	7	22	1.4	10.2	0.0	2.3	1.3	9.6	4.2
18	29	7	22	1.4	9.7	0.0	2.7	1.3	9.6	4.3
19	29	7	22	1.4	10.0	0.0	2.3	1.4	9.6	4.2
20	29	7	22	1.5	8.5	0.0	3.5	1.8	10.0	3.8
21	34	7	27	1.4	11.2	0.0	2.6	1.7	13.3	3.8
22	29	7	22	1.8	9.4	0.0	2.4	1.9	10.2	3.3
23	29	7	22	1.8	9.5	0.0	2.3	2.0	10.2	3.2
24	29	7	22	1.7	10.1	0.0	1.5	1.8	10.4	3.5
25	29	7	22	1.6	10.0	0.0	1.9	1.6	10.1	3.8
26	29	7	22	1.6	9.1	0.0	2.8	1.8	10.2	3.6
27	29	7	22	1.6	9.1	0.0	2.8	1.7	10.2	3.7
28	29	7	22	1.6	9.3	0.0	2.0	1.8	10.7	3.6
29	36	7	29	1.4	12.5	0.0	2.6	1.6	13.8	4.0
30	31	7	24	1.9	11.1	0.0	2.3	1.8	10.6	3.3
31	31	7	24	2.0	11.2	0.0	2.2	2.0	10.7	3.0
Monthly Summary (October)										
Mean daily cfs	33.6	10.1	23.5	4.3	11.3	0.0	3.1	2.2	9.2	3.6
Total ac-ft	2,065	621	1,444	262	693	0.0	188	138	563	221
Stored Water Use Summary to Date (May 28–October 31)										
Mean daily cfs	54.9	30.4	25.0	12.7	10.9	0.0	3.8	6.7	10.3	11.0
Total ac-ft	17,300	9,416	7,884	3,941	3,434	0.0	1,189	2,075	3,261	3,400

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

MUNICIPAL ALLOCATIONS FOR THE MONTH OF NOVEMBER 2020

Source: Joint Water Commission

DAY	TOTAL MUNICIPAL USE	MUNICIPAL USE BY RESERVOIR		BREAKDOWN OF MUNCIPAL USE BY WATER PROVIDER†						
				HILLSBORO		FOREST GROVE		BEAVERTON		TVWD
		Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney	Hagg Lake	Barney
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	31	7	24	1.7	8.9	0.0	2.7	2.4	12.4	2.9
2	31	7	24	0.0	13.5	0.0	2.0	4.0	8.6	3.0
3	22	7	15	0.0	7.2	0.0	1.5	4.4	6.3	2.6
4	22	7	15	0.0	5.6	0.0	3.3	4.4	6.1	2.6
5	22	7	15	0.0	6.2	0.0	1.4	4.0	7.4	3.0
6	29	7	22	0.0	8.2	0.0	3.3	3.7	10.5	3.3
7	29	7	22	0.0	13.4	0.0	1.3	4.5	7.3	2.5
8	29	7	22	0.0	11.6	0.0	2.4	3.7	8.0	3.3
9	29	7	22	2.3	11.0	0.0	2.0	1.9	9.0	2.9
10	22	7	15	1.8	5.2	0.0	2.8	2.5	7.0	2.7
11	17	7	10	1.8	3.5	0.0	0.7	3.0	5.8	2.2
12	17	7	10	1.7	2.9	0.0	1.8	3.1	5.3	2.1
13	42	7	35	1.7	17.2	0.0	4.8	1.3	13.0	3.9
14	27	7	20	2.0	8.2	0.0	3.8	2.0	8.0	3.0
15	27	7	20	2.3	9.0	0.0	3.5	1.9	7.5	2.8
16	27	7	20	2.3	9.6	0.0	2.2	2.0	8.3	2.7
17	LAST DAY OF MUNICIPAL USE OF STORED WATER									
18	Barney Reservoir: November 16 (released November 15) Hagg Lake: November 16									
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
Monthly Summary (November)										
Mean daily cfs	26.4	7.0	19.4	1.1	8.8	0.0	2.5	3.0	8.2	2.8
Total ac-ft	839	222	617	35	280	0.0	78	97	259	90
Stored Water Use Summary to Date (May 28–November 16)										
Mean daily cfs	52.3	28.3	24.5	11.7	10.7	0.0	3.7	6.4	10.1	10.2
Total ac-ft	18,139	9,638	8,501	3,976	3,714	0.0	1,267	2,172	3,520	3,490

†In this table (Municipal Use), the amount of water allocated to each provider is recorded on the day that it was available. In the Barney Reservoir Operations table (Appendix D), the amount of water released is recorded on the day it was released from the reservoir, which is one day earlier than its availability.

APPENDIX F
STREAM TEMPERATURE

SCOPE

This appendix shows data for stream temperature at selected sites in the Tualatin River and its tributaries. Most of the data were obtained by continuous monitoring at a resolution of 15 minutes to 1 hour. Resolution may have changed over time for an individual site. The data have been subject to quality assurance tests by the collecting entity.

The following data and analyses are included for each site. A more detailed explanation of the analyses and graphics begins on page F-4:

- Table of 2020 data with summary statistics by month.
- Graph of 2020 data superimposed on percentile statistics for the period of record for the site.
- Color-coded chart of the distribution of stream temperature by month for the period of record.
- Table of monthly median stream temperatures by year for the period of record.
- Graphs showing trends in stream temperature for selected summer months over the period of record.
- Graphs showing the number of days that the State of Oregon rearing and migration temperature standard was exceeded over the period of record and the period when that exceedance occurred. The spawning standard may apply at some sites, but data were not evaluated relative to that standard in this report.
- Not all statistics and graphs are shown for sites where monitoring was begun recently or where monitoring was intermittent over the period of record.
- A brief discussion of the graphs and tables.

2020 HIGHLIGHTS

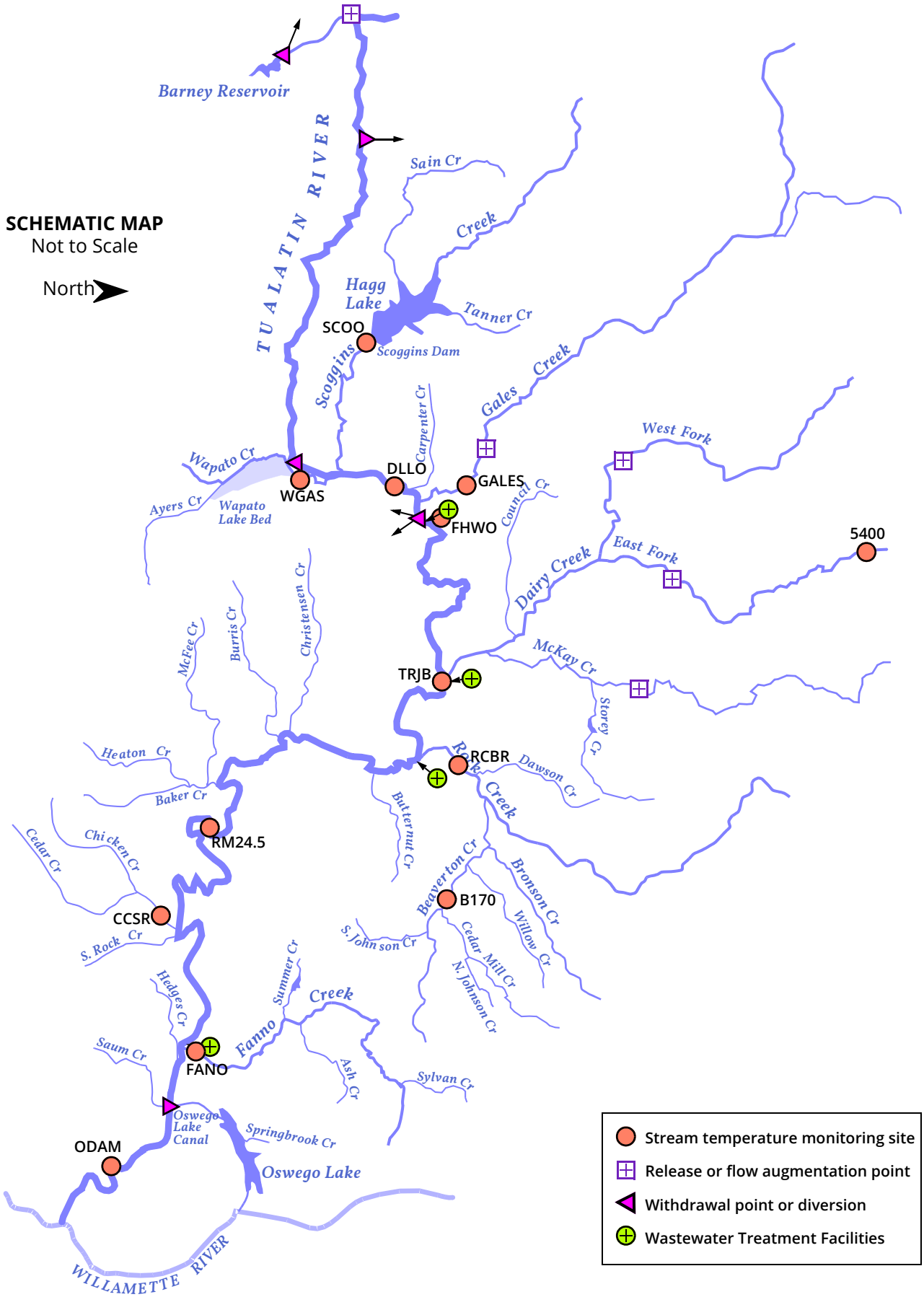
- Although temperatures in 2020 were above average intermittently at most sites during May through August, relatively few record high mean daily temperatures were set. Generally, temperatures during these months were similar to long-term medians.
- January, April and early October had prolonged periods when daily mean temperatures exceeded long-term medians.
- Statistically significant increases in summer water temperatures in recent years appear to have occurred in the Tualatin River at Hwy 219 and at Oswego Dam and in Fanno Creek at Durham. The cause is unknown.

EXCEEDANCES OF OREGON REARING AND MIGRATION TEMPERATURE STANDARD

SITE	NUMBER OF DAYS		DATE RANGE OF EXCEEDANCES*		PERCENT OF YEARS WITH EXCEEDANCES
	2020	MEDIAN	2020	AVERAGE (MEAN)	
Mainstem Tualatin River and Scoggins Creek sites					
Scoggins Creek below Hagg Lake	0	9	did not occur	Sep-22 – Oct-6	42%
Tualatin River at Hwy 219 Bridge	18	13	June-24 – July-20	Jun-23 – Jul-29	75%
Tualatin River at RM 24.5	95	96	May-31 – Sep-26	Jun-7 – Sep-18	100%
Tualatin River at Oswego Dam	111	111	May-31 – Oct-4	Jun-3 – Sep-25	100%
Tributary sites					
Gales Creek at Old Hwy 47	81	87	Jun-23 – Sep-12	Jun-17– Sep-16	100%
Beaverton Creek at 170th	118	117	May-10– Sep-25	May-15 – Sep-19	100%
Rock Creek at Brookwood Ave	96	95	May-11 – Sep-12	May-27 – Sep-13	100%
Fanno Creek at Durham Road	105	106	May-11 – Sep-15	May-25 – Sep-15	100%

*Date range may include days when the standard was not exceeded (7-day average daily maximum ≤ 18 °C).

STREAM TEMPERATURE MONITORING SITES



STREAM TEMPERATURE MONITORING SITES — ALPHABETICAL LISTING BY SITE CODE

SITE CODE	SITE NAME	RIVER MILE	STATION ID	PAGE
5400	East Fork Dairy Creek near Meacham Corner, OR	12.4	14205400	F-28
B170	Beaverton Creek at 170th	4.9	453004122510301	F-31
CCSR	Chicken Creek at Roy Rogers Road	2.3	452230122512201	F-38
DLLO	Tualatin River near Dilley, Oregon	58.8	14203500	F-10
FANO	Fanno Creek at Durham Road near Tigard, Oregon	1.2	14206950	F-40
FHWO	Fernhill Wetlands Outfall	51.2	453016123052400	F-26
GALES	Gales Creek at Old Hwy 47 near Forest Grove, Oregon	2.36	453040123065201 OWRD#: 14204530	F-22
ODAM	Tualatin River at Oswego Dam near West Linn, Oregon	3.4	14207200	F-18
RCBR	Rock Creek at Brookwood Avenue, Hillsboro, Oregon	2.4	453030122560101	F-34
RM24.5	Tualatin River at RM 24.5 near Scholls, Oregon	24.5	14206694	F-15
SCOO	Scoggins Creek below Henry Hagg Lake near Gaston, Oregon	4.80	14202980	F-6
TRJB	Tualatin River at Hwy 219 Bridge	44.4	14206241	F-12
WGAS	Wapato Creek at Gaston Road at Gaston, Oregon	1.9	14202650	F-21

Explanation of Figures and Tables in this Appendix — pages 1-2

Page 1–current year data and graph: A table of mean daily stream temperature for the current year is at the top of page 1. A graph at the bottom of the page shows the current year's data superimposed on shaded percentile ranges for the period of record, providing historical context. A legend, located to the right of the graph, includes the period of record for the site and definitions of lines and shading. If the period of record is too short to accurately calculate some percentiles, the appropriate shaded areas are omitted.

Page 2–Frequency Chart: A Frequency Chart for the site is at the top of page 2. This graphic can be used to determine the temperature ranges for each month, the percent of the time stream temperature is within a particular range, and the importance of missing values. An example is shown below.

FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH

Temp (°C)	0 < T < 6.0	6.0 < T ≤ 7.5	7.5 < T ≤ 9.0	9.0 < T ≤ 11	11 < T ≤ 13	13 < T ≤ 16	16 < T ≤ 18	18 < T ≤ 19	19 < T ≤ 20	20 < T ≤ 21	21 < T ≤ 22	22 < T ≤ 23	23 < T ≤ 26	Missing
Jan														
Feb														
Mar														
Apr														
May														
Jun														
Jul														
Aug														
Sep														
Oct														
Nov														
Dec														
All	7.2%	10%	11%	11%	9.2%	11%	9.3%	5.7%	4.7%	5.1%	5.1%	4.3%	2.8%	3.1%

Key	
$f \geq 3\%$	
$2\% \leq f < 3\%$	
$1\% \leq f < 2\%$	
$0.2\% \leq f < 1\%$	
$0.06\% \leq f < 0.2\%$	
$0 < f < 0.06\%$	

- *The top row* shows the ranges of stream temperatures (bins) corresponding to each column. The temperature ranges do not change from year-to-year in the Flow Report. They were determined as follows:
  - —round numbers were used for simplicity,
  - —the last bin captures the extreme high temperatures,
  - —the first half of the bins capture the low temperatures, about 5-10% of the distribution per bin,
  - —the other bins capture the higher temperatures, approximately 5% of the distribution per bin,
  - —a column for missing data is included if needed.
- *The first column* shows the months corresponding to each row.
- *The bottom row* shows the actual fraction of the distribution in the bin. Because the bins use round numbers and do not from vary year-to-year, the distribution totals will only approximate 5% and 10% as designed. The total distribution may not add to 100% due to round-off error.
- *Each cell is color coded* based on the fraction of the overall distribution of temperature in the corresponding bin and month. A Key to the color code is at the right of the chart. All sites use the same color code.
- *Information that can be obtained* from the example chart above includes:
  - —The all-time highest temperatures at this site are 23-26°C, and occurred in June, July and August.
  - —Temperature was above 18°C about 27.7% of the time.
  - —Mean daily temperature in August at this site has exceeded 18°C every day for the period of record.
  - —About 3% of the data were missing, most of which occurred in January–April, a time when temperatures would be low. Consequently, the percentages for the low temperature bins are likely too small.

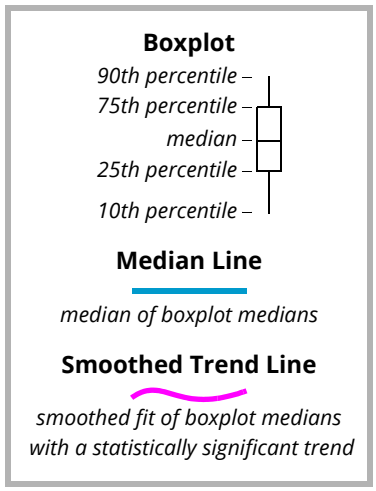
Page 2–color-coded table of monthly medians: A table of monthly medians of daily mean stream temperature by year follows the Frequency Chart on page 2. Entries in this table are color-coded by percentiles calculated from the daily mean temperature for the period of record. Two Keys are provided to the right of the table. The upper Key contains the values corresponding to the percentiles shown in the lower Key. Medians are not shown if more than 20% of the data are missing.

EXPLANATION OF FIGURES AND TABLES IN THIS APPENDIX — PAGE 3

Page 3–discussion of graphs: The left side of the page contains a discussion of findings based on the graphs for each site. The narrative is divided into three or four sections:

- *Distribution and Current year* describes stream temperatures for the current year in the context of the historical record, when the highest and lowest temperatures occur, and data shortcomings.
- *Reservoir effects* is included if stream temperature is influenced by an upstream reservoir.
- *Trends* describes any trends in stream temperature over time.
- *Oregon water temperature standard* describes the frequency and timing of exceedances of the standard.

Page 3–temperature trends: The top three graphs on the right side show changes in stream temperature over time for the warmest times of the year. Boxplots of daily mean temperature are plotted versus year for June, July/August and September. A boxplot is a graphical representation of the data distribution and is illustrated at the right.



These graphs include one or more lines that indicate trends and central tendencies of the data over time. The types of line used vary with the graph and are shown at the right,

Smoothed lines were calculated using the LOWESS method (LOcally WEighted Scatterplot Smoothing). LOWESS is a non-parametric method that fits a curve to data giving more weight to points closer to the point being fitted. LOWESS can be used to help visualize trends in data.

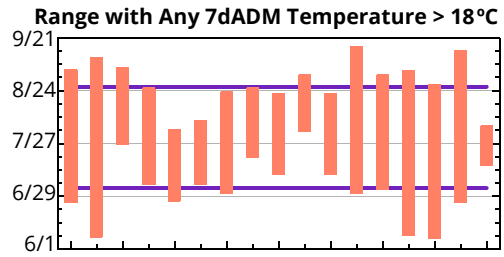
Statistically significant differences were tested using non-parametric methods (Kendall's tau). Magenta lines are used to show trends that are statistically significant. Note that a statistically significant trend may or may not indicate a meaningful environmental trend. Temperature is influenced by long-term weather patterns, such as the El Niño Southern Oscillation and the Pacific Decadal Oscillation. Especially for sites with short periods of record, an apparent trend may be statistically significant, but disappear over a longer period of record.

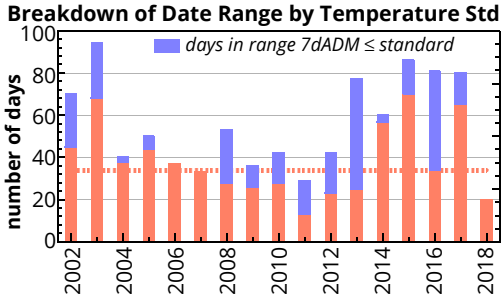
Page 3–Oregon temperature standard: The two lower graphs on page 3 assess each site with regard to the State of Oregon water-quality standard for temperature. The Oregon standard for salmonid rearing and migration applies in the Tualatin Basin. The standard is:

The seven day average of the daily maximum temperature (7dADM) is not to exceed 18°C.

Daily maximum temperature and the 7dADM were computed for sites with data of at least hourly frequency.

Example graphs pertaining to the temperature standard are shown at the right.





The upper graph shows a bar for each year that begins on the first day of the year when the 7dADM exceeded 18°C and ends on the last day that the 7dADM exceeded 18°C. Some of the 7dADM within this date range may be less than 18°C. Purple lines, if present, show the mean date range for exceedance of the temperature standard for the period of record.

The bottom graph shows the number of days in the date range from the upper graph when the standard was exceeded (orange), and the number of days it was not (blue). Missing values, if they occurred within the date range, are shown in grey. A dotted orange line, if present, shows the median number of days that the standard is exceeded in a year (including years when it was not exceeded).

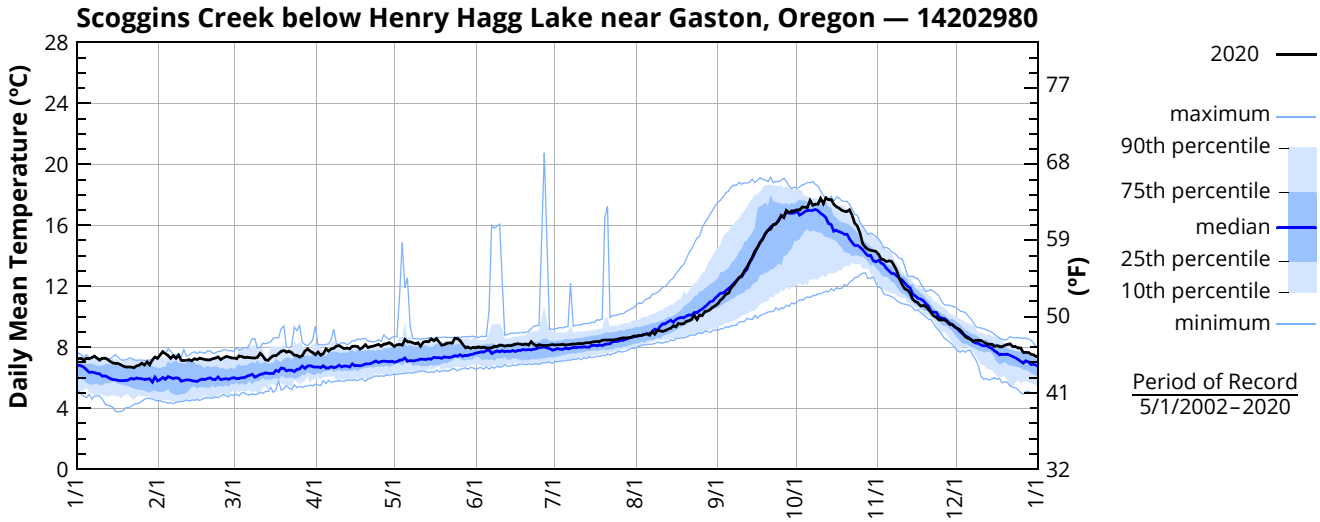
A trend is shown in magenta as a smoothed trend line (LOWESS) if it is statistically significant.

SCOO – Scoggins Creek below Henry Hagg Lake near Gaston, Oregon – 14202980

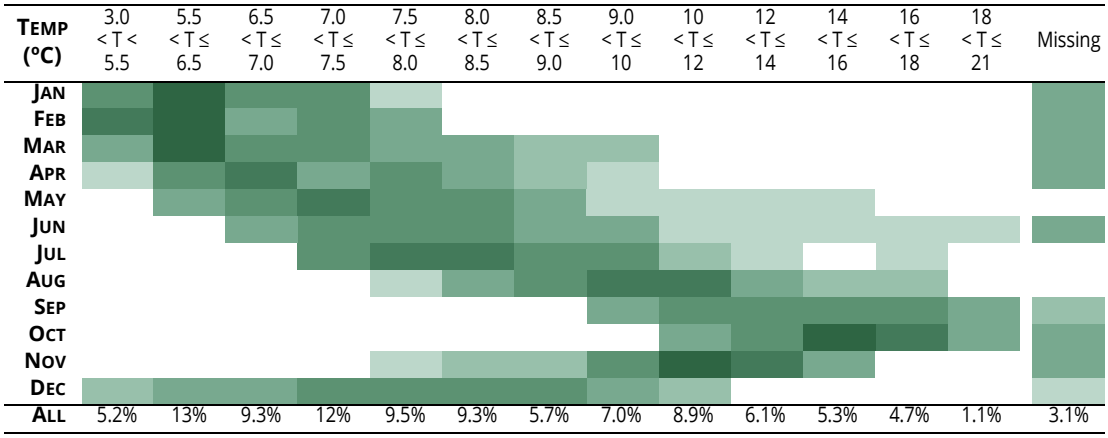
Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 4.80 *Latitude:* 45 28 10 *Longitude:* 123 15 61

2020 — DAILY MEAN WATER TEMPERATURE (°C) — SCOO

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7.25	7.48	7.29	7.50	8.04	7.95	8.14	8.72	10.85	17.02	14.10	9.24
2	7.27	7.70	7.24	7.68	8.15	8.02	8.16	8.77	11.10	17.01	13.78	9.13
3	7.14	7.57	7.43	7.47	8.19	7.95	8.17	8.76	11.25	17.21	13.74	8.94
4	7.27	7.47	7.39	7.57	8.13	8.01	8.19	8.84	11.47	17.19	13.61	8.69
5	7.24	7.26	7.31	7.89	8.51	7.94	8.14	8.88	11.55	17.16	13.67	8.58
6	7.31	7.44	7.35	7.74	8.35	7.95	8.16	8.78	11.89	17.63	13.63	8.52
7	7.42	7.27	7.31	7.89	8.35	7.95	8.19	9.02	12.08	17.31	13.34	8.39
8	7.28	7.48	7.30	7.93	8.29	8.06	8.22	8.85	12.31	17.40	13.01	8.45
9	7.15	7.14	7.28	8.08	8.22	8.03	8.20	9.10	12.57	17.39	12.47	8.46
10	7.27	7.13	7.34	8.10	8.29	8.14	8.25	9.08	12.69	17.76	12.10	8.44
11	7.28	7.14	7.60	8.00	8.06	8.12	8.23	9.04	13.00	17.42	11.84	8.33
12	7.21	7.18	7.43	7.90	8.33	8.06	8.25	9.09	13.25	17.81	11.75	8.22
13	7.06	7.10	7.17	7.94	8.38	8.11	8.29	9.18	13.58	17.68	11.56	8.20
14	6.97	7.24	7.13	7.89	8.36	8.10	8.29	9.24	13.90	17.69	11.14	8.20
15	6.94	7.19	7.30	8.06	8.55	8.13	8.32	9.40	14.29	17.38	10.99	8.06
16	6.94	7.28	7.44	8.07	8.43	8.21	8.36	9.33	14.54	17.22	10.92	8.10
17	6.85	7.23	7.44	8.05	8.56	8.23	8.38	9.56	14.87	17.13	10.70	8.03
18	6.76	7.19	7.59	7.87	8.35	8.19	8.38	9.52	15.08	16.99	10.74	8.03
19	6.70	7.17	7.73	7.99	8.12	8.16	8.46	9.55	15.44	16.92	10.66	8.12
20	6.71	7.17	7.78	8.16	8.16	8.21	8.48	9.71	15.67	16.90	10.48	8.19
21	6.69	7.25	7.67	7.98	8.27	8.13	8.47	9.73	15.75	17.02	10.25	8.22
22	6.64	7.28	7.75	8.04	8.28	8.36	8.48	9.84	16.04	16.66	10.05	8.04
23	6.77	7.37	7.64	8.07	8.27	8.19	8.47	10.10	16.09	16.12	9.97	8.05
24	6.81	7.19	7.47	8.12	8.60	8.07	8.50	9.81	16.27	15.95	9.78	7.95
25	6.96	7.29	7.47	8.19	8.56	8.17	8.53	10.12	16.64	15.47	9.79	7.95
26	6.83	7.39	7.35	8.06	8.43	8.13	8.59	10.07	16.51	14.80	9.79	7.65
27	7.04	7.37	7.44	8.21	8.19	8.10	8.62	10.34	16.98	14.55	9.69	7.66
28	6.84	7.29	7.74	8.22	7.96	8.12	8.61	10.37	16.82	14.42	9.50	7.65
29	7.16	7.20	7.89	8.30	8.02	8.13	8.63	10.46	16.94	14.36	9.49	7.54
30	7.36	—	7.75	8.20	7.92	8.18	8.65	10.62	16.94	14.33	9.33	7.49
31	7.26	—	7.65	—	7.99	—	8.74	10.73	—	14.29	—	7.37
Mean	7.04	7.29	7.47	7.97	8.27	8.10	8.37	9.50	14.21	16.59	11.40	8.19
Max	7.42	7.70	7.89	8.30	8.60	8.36	8.74	10.73	16.98	17.81	14.10	9.24
Min	6.64	7.10	7.13	7.47	7.92	7.94	8.14	8.72	10.85	14.29	9.33	7.37



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — SCOO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2002–2020

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — SCOO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002					7.1	7.4	8.0	9.5	14.6	16.2	10.6	8.0
2003	6.9	7.1	7.4	7.9	8.2	8.5	9.1	11.0	18.2	18.5	10.3	7.5
2004	4.9	5.6	6.3	6.7	7.1		7.8	10.2	14.9	16.9	11.7	8.4
2005	5.8	5.9	6.4	7.1	7.5	7.9	8.2	9.3	11.8	15.5	10.7	6.3
2006	7.1	6.8	6.3	6.7	7.2	7.5	8.0	10.2	17.0	16.3	10.9	7.5
2007	5.6	5.2	5.9	6.3	6.8	7.1	8.0	10.1	17.0	15.0	10.9	7.0
2008	5.6	4.6	5.2	5.8	6.6	6.9	7.5	9.2	14.3	15.6	11.9	7.0
2009	5.1	4.6	5.4	6.4	6.8	7.1	7.5	9.1	12.4	15.0	10.7	6.1
2010	5.7	6.3	7.0	7.8	8.2	9.0	9.1	9.9	11.4	13.1	12.0	8.2
2011	6.2	6.1	6.7	6.7	7.3	7.8	8.1	8.6	10.0	11.8	11.7	7.3
2012	6.0	5.9	6.5	7.0	7.2	7.5	7.8	8.6	10.5	14.5	11.7	8.7
2013	5.7	5.5	6.2	6.8	6.8	7.2	7.6	9.1	12.4	14.2	12.1	6.5
2014	5.6	5.0	5.9	6.7	7.2	7.8	8.5	9.8	13.3	17.2	11.1	8.6
2015	7.2	7.6	8.0	8.4	8.6	8.9	9.6	12.8	18.8	17.3	11.9	8.0
2016	6.0	6.3	7.5	7.8	8.2	8.3	8.9	11.0	18.0	14.8	12.5	7.7
2017	4.5	5.2	6.1	6.8	7.7	8.3	8.7	10.0	13.6	15.8	11.3	7.7
2018	6.8	7.1	6.9	7.4	7.8	8.1	8.8	10.2	15.6	15.9	11.7	7.6
2019	6.6	5.6	5.7	6.0	6.4	6.8	7.4	9.1	15.1	15.0	11.2	7.8
2020	7.1	7.3	7.4	8.0	8.3	8.1	8.4	9.4	14.4	17.0	11.0	8.2
median	6.1	5.9	6.4	6.9	7.3	7.8	8.2	9.7	13.9	15.5	11.3	7.8

KEY

T in °C

$T \leq 5.5$
$5.5 < T \leq 5.9$
$5.9 < T \leq 6.2$
$6.2 < T \leq 6.6$
$6.6 < T \leq 7.1$
$7.1 < T \leq 7.5$
$7.5 < T \leq 8.0$
$8.0 < T \leq 10.4$
$10.4 < T \leq 14.5$
$14.5 < T \leq 16.4$
$T > 16.4$

T as percentile

$T \leq$ 5th
5th $< T \leq$ 10th
10th $< T \leq$ 15th
15th $< T \leq$ 20th
20th $< T \leq$ 30th
30th $< T \leq$ 40th
40th $< T \leq$ 50th
50th $< T \leq$ 75th
75th $< T \leq$ 90th
90th $< T \leq$ 95th
$T >$ 95th

DISTRIBUTION AND 2020

- Water temperatures averaged more than 1ºC higher than POR medians throughout much of 2020, including January–June and October. Record highs were set in January, February and October.
- Water temperatures from June–September 2020 were near long-term median values.
- The highest temperatures occur in September and October which is after the warmest months and due to the influence of Hagg Lake releases.

RESERVOIR EFFECTS

- Hagg Lake is thermally stratified in the summer. During most of the summer, water is released from the lower, cooler, level of the reservoir. As the reservoir is drawn down, eventually the water from the upper, warmer level reaches the outlet and is released. The overall effect is to trap heat in the lake during the summer and release it at the end of summer through fall.
- Exactly when warm water reaches the outlet depends on the depth of the warm water layer and how much water has been released during the season. In a cool summer (such as 2011), the upper layer is thinner, less water is released for irrigation and municipal use, and water from the upper warm layer may not be released at all. The opposite occurs for a hot summer such as 2015. This process accounts for the wide variability in the September temperatures.
- Temperatures at this site sometimes spike for a day or so in the spring and early summer. These spikes mark the occasional times when water is released over the spillway.

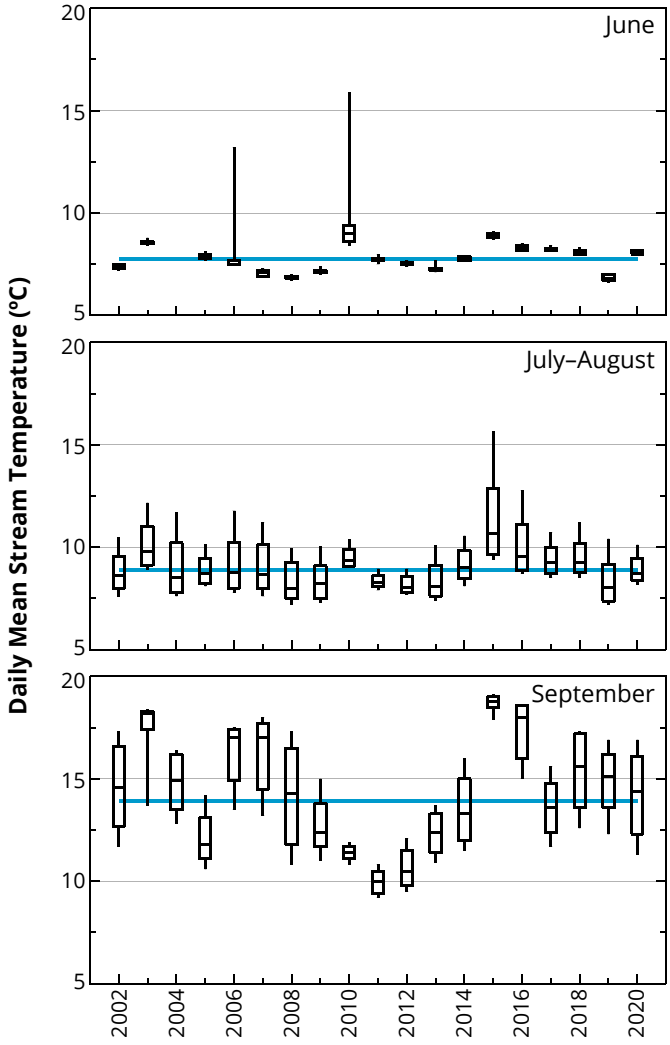
TRENDS

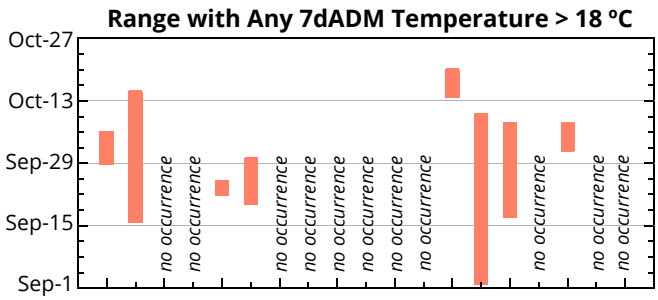
- Water temperatures in July through September do not show any trend.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

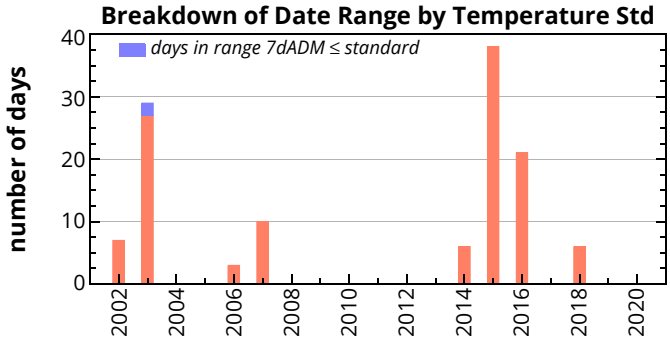
OREGON WATER TEMPERATURE STANDARD

- Exceedances of the water temperature standard occurred in less than half of the years. None occurred in 2020.

fraction of years with any exceedance	42%
median days/year exceeding standard	0
average first day of exceedance (if it occurred)	Sep-22
average last day of exceedance (if it occurred)	Oct-6





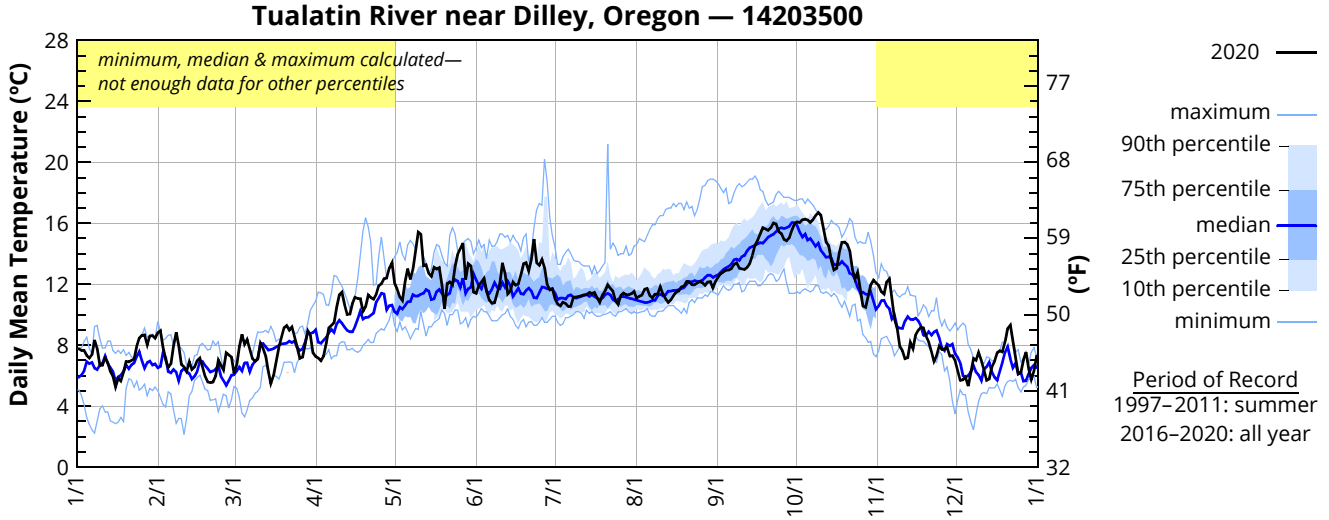


DLLO – Tualatin River near Dilley, Oregon – 14203500

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 58.8 *Latitude:* 45 28 30 *Longitude:* 123 07 23

2020 — DAILY MEAN WATER TEMPERATURE (°C) — DLLO

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7.77	8.94	6.16	7.26	12.09	11.40	11.02	11.10	12.47	16.09	11.92	6.34
2	7.65	7.87	6.70	7.17	11.69	11.90	10.70	11.21	12.70	16.05	11.51	5.70
3	7.66	7.05	7.87	6.98	11.17	12.14	10.58	11.28	12.81	16.23	11.36	5.73
4	7.33	6.55	8.71	7.27	10.94	12.38	10.82	11.67	12.93	16.27	12.15	5.91
5	7.16	6.78	8.06	8.12	12.19	11.55	10.74	11.73	12.93	16.22	12.35	5.32
6	7.39	7.95	8.37	9.13	13.03	10.96	10.54	11.25	13.02	16.05	11.10	6.23
7	8.34	8.85	7.74	9.29	12.31	10.76	10.55	11.11	13.30	16.23	9.74	7.13
8	7.80	7.94	7.13	9.47	12.99	10.79	11.16	11.35	13.40	16.50	9.11	7.01
9	6.67	6.74	6.95	10.48	14.27	11.39	11.16	11.35	13.05	16.71	7.93	7.54
10	6.68	6.58	7.08	11.31	15.42	12.07	11.20	11.83	13.01	16.54	7.64	7.00
11	7.15	6.26	8.13	11.47	15.28	13.40	11.24	11.35	12.96	15.63	7.11	6.40
12	6.87	6.92	7.81	10.65	13.22	12.73	11.30	11.05	13.10	14.77	7.18	5.70
13	6.26	6.40	7.29	10.02	13.28	11.37	11.30	10.80	13.35	14.54	8.20	5.78
14	5.95	6.57	6.30	10.04	12.71	11.57	11.46	10.97	13.90	13.55	7.79	6.59
15	5.25	6.98	5.48	10.74	12.51	12.15	11.39	11.25	14.57	12.94	8.67	6.93
16	5.82	7.16	6.01	11.15	13.11	11.94	11.46	11.48	14.90	13.05	8.97	7.50
17	5.65	6.59	6.92	11.06	13.00	12.01	11.10	11.56	15.32	14.04	9.17	7.63
18	6.22	5.97	7.85	11.05	13.09	12.60	10.80	11.82	15.72	14.75	9.14	7.56
19	6.94	5.58	8.47	10.23	11.95	13.34	11.29	11.87	15.63	14.77	8.59	8.21
20	6.91	5.54	9.15	10.53	10.39	13.42	11.55	12.19	15.54	14.62	8.22	9.09
21	7.00	5.58	9.29	11.29	12.04	12.88	11.96	12.16	15.70	14.19	7.60	9.32
22	7.09	5.97	8.98	11.13	12.16	13.65	11.74	11.97	16.02	13.00	6.94	8.29
23	7.92	7.02	9.20	11.02	11.96	14.96	11.56	11.97	15.96	12.35	7.29	7.13
24	8.46	6.68	8.57	11.33	13.16	13.41	10.92	12.08	15.45	12.78	7.94	6.12
25	8.65	6.37	7.85	11.89	13.99	13.25	10.67	12.18	15.32	11.62	7.72	6.22
26	8.68	7.50	7.14	12.03	14.34	13.64	11.26	12.10	14.95	10.57	7.72	7.04
27	8.02	7.37	7.21	12.37	14.70	13.10	11.42	11.92	14.85	10.49	7.88	7.55
28	8.62	7.22	8.02	12.41	12.31	12.00	11.30	12.14	15.04	11.22	7.28	6.43
29	8.63	7.20	8.94	13.05	13.35	11.63	11.30	12.18	15.54	11.97	7.31	5.74
30	8.46	—	8.65	13.41	13.21	11.71	11.38	11.76	15.97	12.27	6.99	6.32
31	8.82	—	7.50	—	11.48	—	11.53	12.20	—	12.09	—	7.28
Mean	7.35	6.90	7.73	10.45	12.82	12.34	11.17	11.64	14.31	14.13	8.75	6.86
Max	8.82	8.94	9.29	13.41	15.42	14.96	11.96	12.20	16.02	16.71	12.35	9.32
Min	5.25	5.54	5.48	6.98	10.39	10.76	10.54	10.80	12.47	10.49	6.94	5.32



DLLO – Tualatin River near Dilley, Oregon – 14203500

Data source: U.S. Geological Survey, Oregon Water Science Center

FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — DLLO

Temp (°C)	5 < T < 10	10 < T ≤ 10.5	10.5 < T ≤ 11.0	11.0 < T ≤ 11.5	11.5 < T ≤ 12.0	12.0 < T ≤ 12.5	12.5 < T ≤ 13.0	13.0 < T ≤ 13.5	13.5 < T ≤ 14.0	14 < T ≤ 15	15 < T ≤ 16	16 < T ≤ 18	18 < T ≤ 22	Missing
Jan														
Feb														
Mar														
Apr														
May														
Jun														
Jul														
Aug														
Sep														
Oct														
Nov														
Dec														
All	4.2%	6.8%	11%	11%	11%	11%	7.6%	6.6%	4.5%	8.9%	5.1%	4.9%	0.7%	6.6%

Key

- $f \geq 3\%$
- $2\% \leq f < 3\%$
- $1\% \leq f < 2\%$
- $0.2\% \leq f < 1\%$
- $0.06\% \leq f < 0.2\%$
- $0 < f < 0.06\%$

Period of Record
1997–2011
2016–2020

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — DLLO

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997					12.9	13.2	10.6	10.8	14.1			
1998					10.4	13.8	12.0	12.5	13.7	15.3		
1999					12.0	10.8	10.5	11.5	15.9	15.0		
2000					12.2	11.5	10.7	10.8	14.8	14.5		
2001				9.2	12.0	11.6	13.2	17.0	18.1	12.9		
2002	6.3	6.0	6.8	8.8	10.6	10.8	10.9	11.3	14.6	14.3	9.1	
2003	7.4	7.1	8.6	9.5	11.1	11.6	11.5	12.3	15.6	15.1	10.1	
2004								12.0	14.4	15.1		
2005						12.4	11.1	11.3	12.2	14.0		
2006					11.0	12.3	10.3	11.3	14.7	13.6		
2007					10.9	9.8	10.4	11.6	15.7	12.1		
2008					11.2	11.3	11.3	11.3	14.4	12.9		
2009					10.8	14.0	10.4	11.1	13.4	13.3		
2010					11.2	12.3	12.6	12.1	12.7	11.5		
2011					10.0	12.2	12.4	12.4	12.3	11.6		
2012												
2013												
2014												
2015												
2016			8.8	11.6	12.9	11.5	11.5	12.7	16.4	11.7	10.5	5.9
2017	4.1	6.0	8.3	9.2	12.4	12.2	11.7	12.1	13.9	13.0	8.8	5.8
2018	7.2	6.3	7.7	9.1	11.3	11.1	11.1	11.9	14.7	13.7	8.6	6.6
2019	6.5	5.4	7.4	9.6	11.8	10.4	10.3	11.1	14.8	12.1	9.1	6.5
2020	7.3	6.8	7.9	10.9	13.0	12.1	11.3	11.7	14.7	14.5	8.1	6.9
median	6.7	6.1	7.8	9.6	11.4	11.7	11.2	11.7	14.5	13.4	9.2	6.4

Key

T in °C

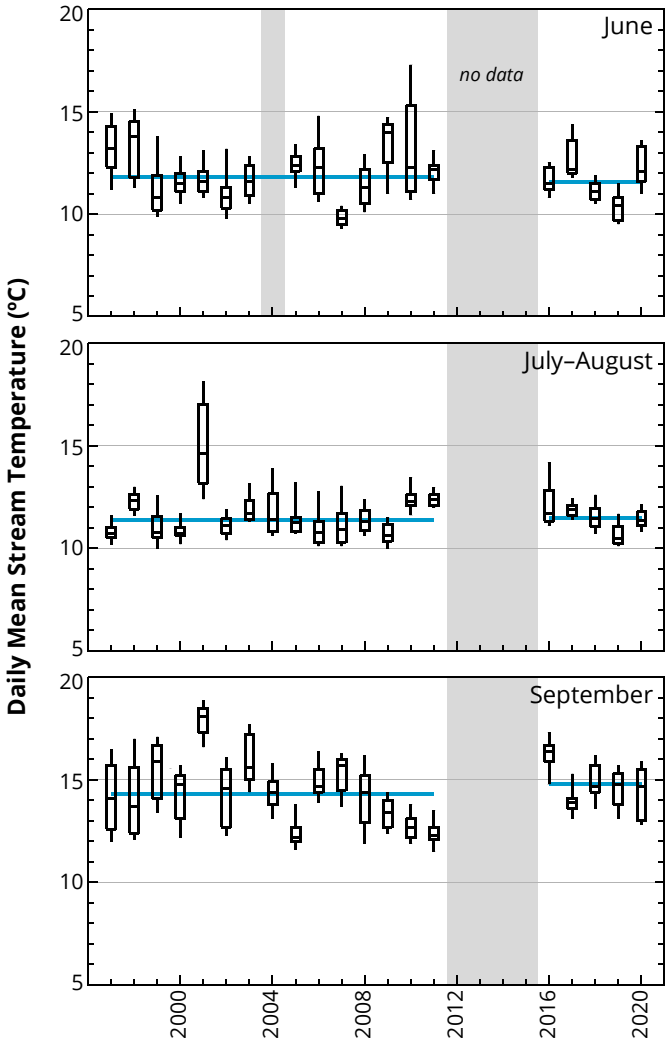
- $T \leq 6.0$
- $6.0 < T \leq 7.2$
- $7.2 < T \leq 8.2$
- $8.2 < T \leq 9.2$
- $9.2 < T \leq 10.4$
- $10.4 < T \leq 10.9$
- $10.9 < T \leq 11.4$
- $11.4 < T \leq 13.0$
- $13.0 < T \leq 14.8$
- $14.8 < T \leq 15.8$
- $T > 15.8$

T as percentile

- $T \leq$ 5th
- 5th $< T \leq$ 10th
- 10th $< T \leq$ 15th
- 15th $< T \leq$ 20th
- 20th $< T \leq$ 30th
- 30th $< T \leq$ 40th
- 40th $< T \leq$ 50th
- 50th $< T \leq$ 75th
- 75th $< T \leq$ 90th
- 90th $< T \leq$ 95th
- $T >$ 95th

Distribution and 2020

- Water temperatures July–September 2020 were near the POR median values. No records were set from June through September.
- May and June had episodes when temperatures were warmer than POR medians. These occurred during very sunny periods. Record highs were set on 6 days in May.
- Temperatures were warmer than POR medians in October. Record highs were set on 3 days.
- Because of the influence of reservoir releases, the highest average temperatures occur in September and October.
- Individual days with high temperatures have occurred in June through October.
- Few data are available outside of the summer season. No temperature data were collected in 2012–2015.



Reservoir effects

- During the summer season, a substantial fraction of the water at Dilley originates in Hagg Lake. Reservoir releases account for warm temperatures in September and October. The reservoir traps heat in the upper warm layer during the summer and releases it at the end of summer through fall.
- Hagg Lake did not fill in 2001 and less cold water was available in the lower layer of the lake. By July/August, the upper warmer lake water was being released and is responsible for the high water temperatures at Dilley in 2001.
- Reservoir release is also responsible for occasional temperature spikes at this site. The spikes occur when warm water from the upper layer of the lake is released over the spillway.

Trends

- Water temperatures in June through September do not show any trend.

Oregon water temperature standard

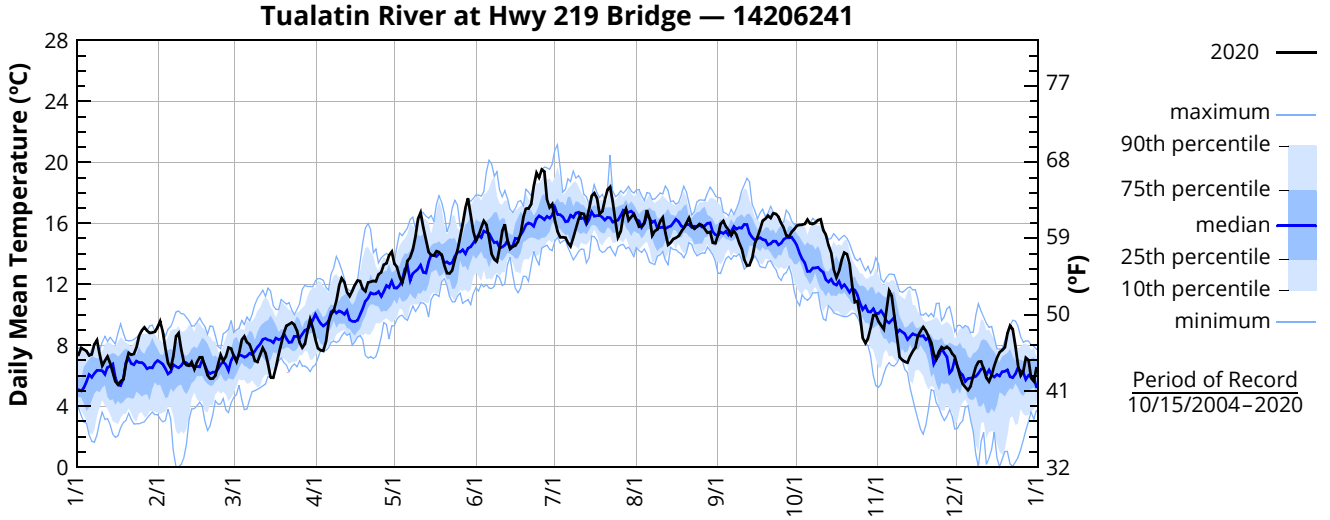
- Exceedance of the water temperature standard can be assessed only for 2016–2020 because those are the only years when daily maximum temperatures are available.
- The water temperature standard was not exceeded during 2016–2020.

TRJB – Tualatin River at Hwy 219 Bridge – 14206241

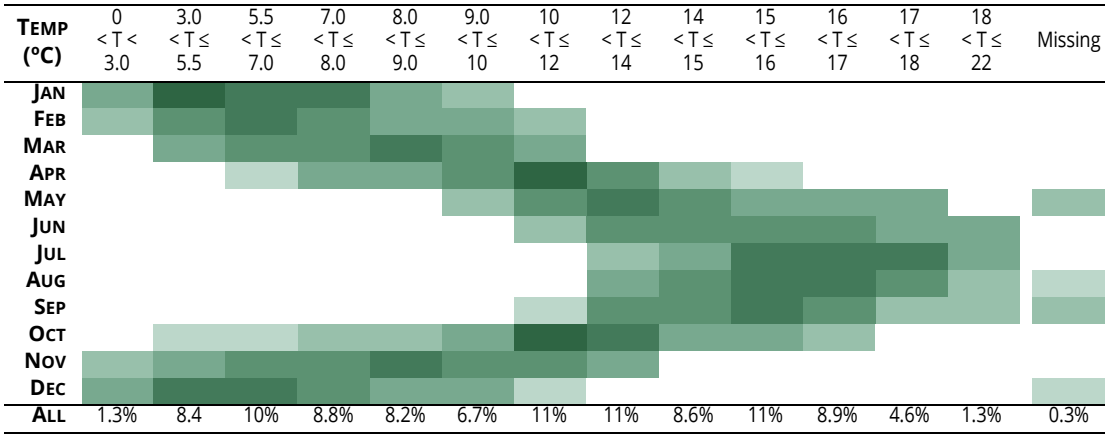
Data source: Jackson Bottom Wetlands Education Center
River mile: 44.4 *Latitude:* 45 30 01 *Longitude:* 123 59 24

2020 — DAILY MEAN WATER TEMPERATURE (°C) — TRJB

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	7.37	9.57	7.28	8.38	13.35	14.85	16.19	16.23	15.22	15.84	9.55	6.60
2	7.82	8.91	6.90	7.80	13.14	15.19	15.48	15.78	15.96	15.89	9.31	5.97
3	7.72	7.76	7.48	7.66	12.50	15.72	15.08	15.83	16.16	15.90	9.05	5.46
4	7.61	6.82	8.35	7.62	12.08	16.16	15.08	16.05	15.79	15.96	10.32	5.25
5	7.33	6.51	8.57	8.23	12.71	15.91	15.06	16.87	15.56	16.25	11.57	5.05
6	7.39	7.27	8.20	9.46	13.54	15.01	14.72	16.32	15.21	16.00	11.24	5.29
7	8.06	8.58	8.05	10.01	13.76	13.96	14.49	15.20	15.52	15.96	9.84	5.99
8	8.33	8.80	7.58	10.28	14.25	13.63	15.05	15.49	15.26	16.03	8.49	6.59
9	7.39	7.75	6.97	10.92	15.15	13.49	15.64	15.60	14.73	16.21	7.23	6.92
10	6.65	6.88	6.89	11.90	16.28	14.39	16.26	16.10	14.34	16.26	7.03	6.94
11	6.99	6.70	7.38	12.39	16.69	15.47	16.66	16.37	13.62	15.54	6.92	6.44
12	7.26	6.65	7.82	12.13	15.71	15.92	16.62	15.39	13.23	15.24	6.85	5.86
13	6.81	6.90	7.47	11.49	14.96	14.86	16.17	14.59	13.25	14.58	7.27	5.61
14	6.23	6.42	6.75	11.22	14.12	14.32	16.97	14.73	13.74	14.08	7.60	6.03
15	5.62	6.88	5.88	11.56	13.91	14.48	17.79	14.97	14.65	12.98	7.83	6.64
16	5.41	7.21	5.87	11.95	13.89	14.53	17.97	15.04	15.10	12.43	8.63	7.17
17	5.62	7.21	6.53	12.25	14.17	14.79	17.65	15.15	15.60	12.85	8.93	7.53
18	5.75	6.65	7.39	12.21	14.11	15.33	16.61	15.44	16.16	13.59	9.19	7.66
19	6.78	6.03	8.08	11.69	13.92	16.39	16.78	15.68	16.29	14.08	8.94	7.86
20	7.49	5.80	8.80	11.54	13.26	16.98	17.52	16.02	16.50	13.98	8.59	8.76
21	7.37	5.81	9.28	12.11	12.73	16.97	18.20	16.36	16.34	13.35	8.19	9.28
22	7.42	6.01	9.37	12.16	12.71	17.27	18.38	15.83	16.66	11.94	7.42	9.06
23	7.85	6.75	9.49	12.22	12.92	18.45	17.43	15.64	16.62	10.82	7.08	7.93
24	8.61	7.37	9.35	12.19	13.59	19.31	16.11	15.79	16.43	10.90	7.60	6.69
25	8.96	6.97	8.95	12.64	14.26	18.99	15.08	15.96	16.00	9.87	7.87	6.00
26	9.17	7.25	8.18	12.78	15.10	19.53	15.46	15.87	15.69	8.47	7.78	6.28
27	8.95	7.84	7.83	13.28	15.97	19.40	16.50	15.62	15.20	8.13	7.89	7.18
28	8.81	7.78	8.07	13.37	17.01	17.59	16.93	15.38	15.13	8.43	7.76	7.02
29	8.83	7.74	8.98	13.89	17.64	17.05	16.20	15.43	15.43	9.10	7.44	5.84
30	8.88	—	9.71	14.13	16.51	17.26	16.42	14.73	15.61	9.97	7.25	5.63
31	9.18	—	9.16	—	15.49	—	16.61	14.70	—	10.00	—	6.50
Mean	7.54	7.20	7.96	11.32	14.37	16.11	16.36	15.62	15.37	13.25	8.36	6.68
Max	9.18	9.57	9.71	14.13	17.64	19.53	18.38	16.87	16.66	16.26	11.57	9.28
Min	5.41	5.80	5.87	7.62	12.08	13.49	14.49	14.59	13.23	8.13	6.85	5.05



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — TRJB



Key

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2005–2020
(Oct-Dec 2004 omitted)

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — TRJB

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004										11.8	7.7	5.8
2005	5.0	5.4	9.0	10.3	13.1	14.6	17.1	15.5	13.6	13.2	7.3	5.6
2006	7.5	6.6	7.6	10.7	13.2	15.6	16.3	14.9	15.4	12.4	8.7	6.1
2007	4.7	7.2	9.0	10.0	13.5	14.3	15.8	14.9	15.4	11.6	8.3	5.9
2008	4.9	6.1	7.1	8.3	12.7	14.8	15.0	15.1	14.8	11.5	8.9	4.3
2009	4.6	4.7	7.0	10.1	12.0	16.5	16.5	14.8	14.8	12.3	8.2	3.9
2010	7.4	8.1	8.8	10.6	11.8	13.2	17.0	16.3	14.6	11.2	8.6	7.1
2011	6.7	5.6	8.0	9.1	11.2	14.1	16.1	16.3	15.0	12.1	7.8	4.7
2012	6.0	6.7	7.1	10.6	12.3	14.9	16.6	16.0	13.6	11.6	8.8	6.7
2013	4.6	6.6	8.2	11.0	13.2	15.5	16.4	16.2	15.9	10.5	9.0	4.0
2014	4.8	6.3	9.3	10.9	13.7	15.9	17.4	16.6	15.5	14.4	8.8	8.1
2015	7.2	9.1	10.4	10.9	14.2	16.9	17.1	17.3	16.1	14.5	8.9	7.4
2016	7.3	8.4	9.4	12.2	14.6	16.4	16.0	16.4	16.0	12.1	11.1	5.3
2017	3.6	6.5	9.1	10.2	13.5	16.0	17.3	16.7	15.7	11.6	8.8	5.2
2018	7.5	6.6	7.9	10.4	14.8	15.6	16.6	15.9	15.1	12.6	7.3	6.7
2019	6.3	5.5	7.9	10.7	14.6	16.2	15.7	15.5	15.9	11.0	7.1	6.6
2020	7.4	6.9	8.1	11.9	14.1	15.8	16.4	15.6	15.5	14.0	7.9	6.6
median	6.2	6.6	8.2	10.4	13.5	15.4	16.4	15.9	15.2	12.1	8.4	6.0

Key

T in °C

$T \leq 4.5$
$4.5 < T \leq 5.5$
$5.5 < T \leq 6.3$
$6.0 < T \leq 7.0$
$7.0 < T \leq 8.1$
$8.1 < T \leq 9.4$
$9.4 < T \leq 11.2$
$11.2 < T \leq 15.1$
$15.1 < T \leq 16.5$
$16.5 < T \leq 17.1$
$T > 17.1$

T as percentile

$T \leq$ 5th
5th $< T \leq$ 10th
10th $< T \leq$ 15th
15th $< T \leq$ 20th
20th $< T \leq$ 30th
30th $< T \leq$ 40th
40th $< T \leq$ 50th
50th $< T \leq$ 75th
75th $< T \leq$ 90th
90th $< T \leq$ 95th
$T >$ 95th

Distribution and 2020

- Temperatures in 2020 were well above average in late January, most of April and periods in May, June, September, early October and December. New record high daily mean temperatures were set during all of these months.
- July and August temperatures were near the long-term medians.
- The highest average temperatures occur in July and August, but individual days with high temperatures can occur from June through September.
- The lowest average temperatures occur in December and January.

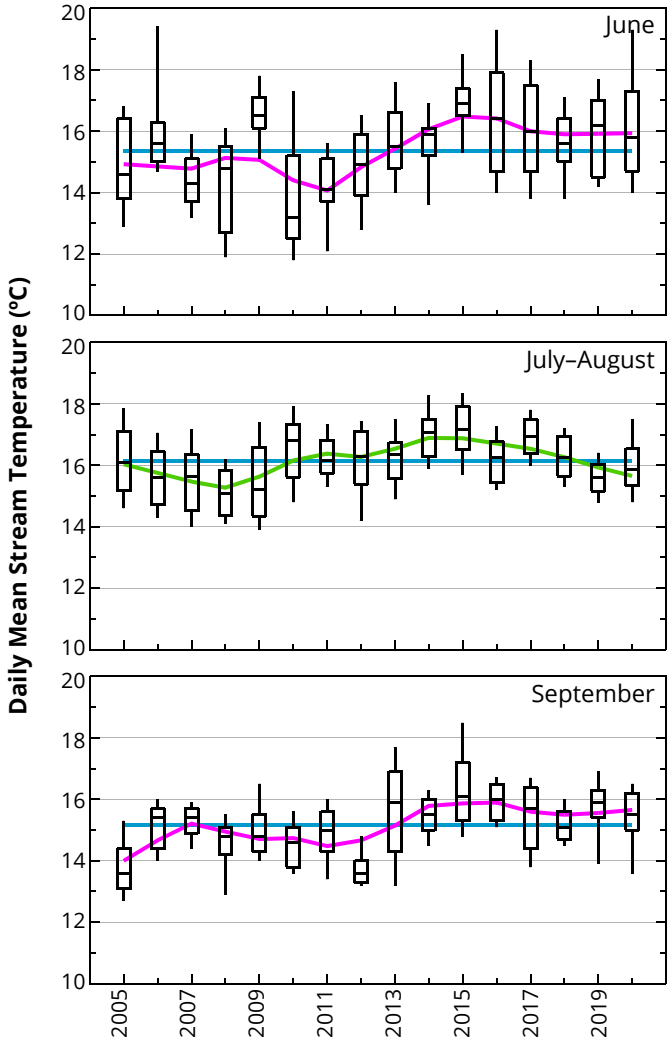
Trends

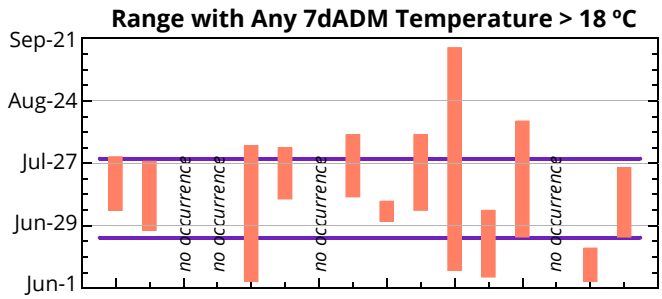
- Water temperatures showed increasing trends in June and September that were statistically significant. Because the period of record is short, the trend may be related to long-term weather patterns such as the Pacific Decadal Oscillation and the El-Niño Southern Oscillation. More years will be required to know if this trend persists.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

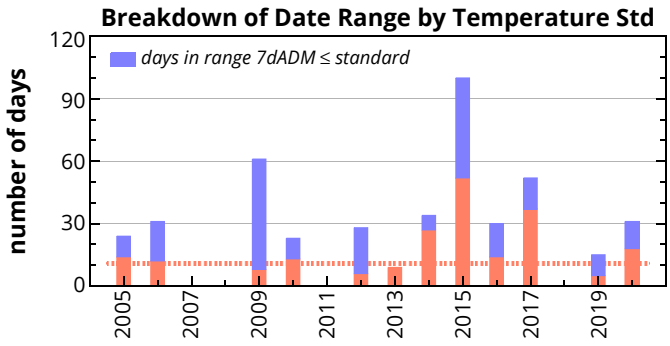
Oregon water temperature standard

- Exceedances of the water temperature standard occurred in about three-quarters of the years.
- The temperature standard was exceeded for 18 days in 2020— a nine day period in late June and another nine day period in mid-July.
- Days when the 7dADM did not exceed the standard were common within the date range of exceedances.

fraction of years with any exceedance	75%
median days/year exceeding standard	11
average first day of exceedance (if it occurred)	Jun-23
average last day of exceedance (if it occurred)	Jul-29







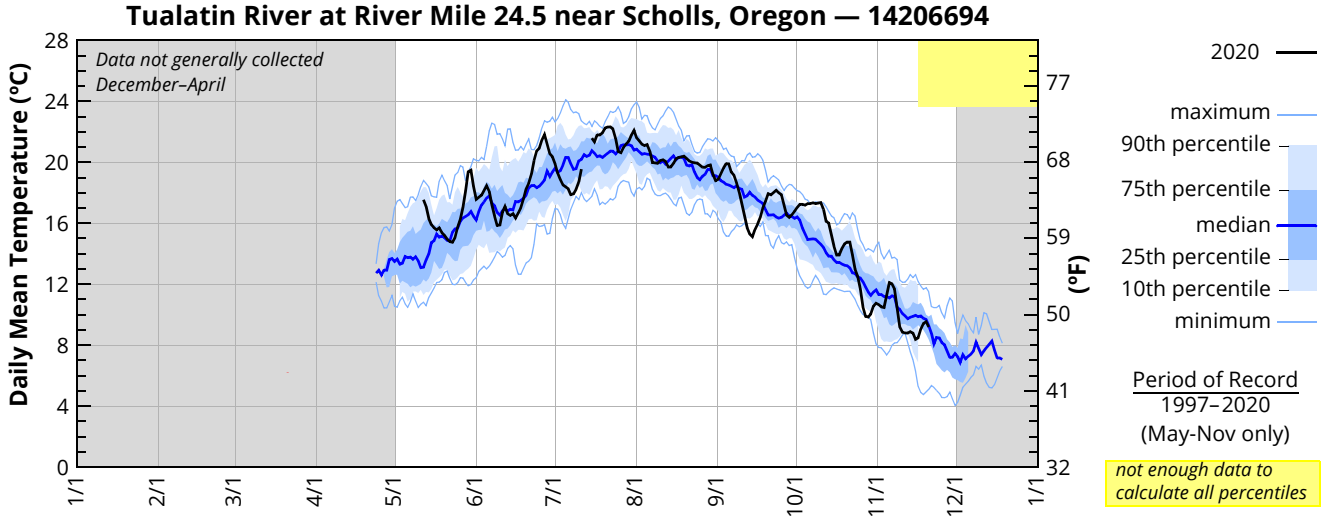
RM24.5 – Tualatin River at River Mile 24.5 nr Scholls, Oregon – 14206694

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 24.5 *Latitude:* 45 24 06 *Longitude:* 122 53 38

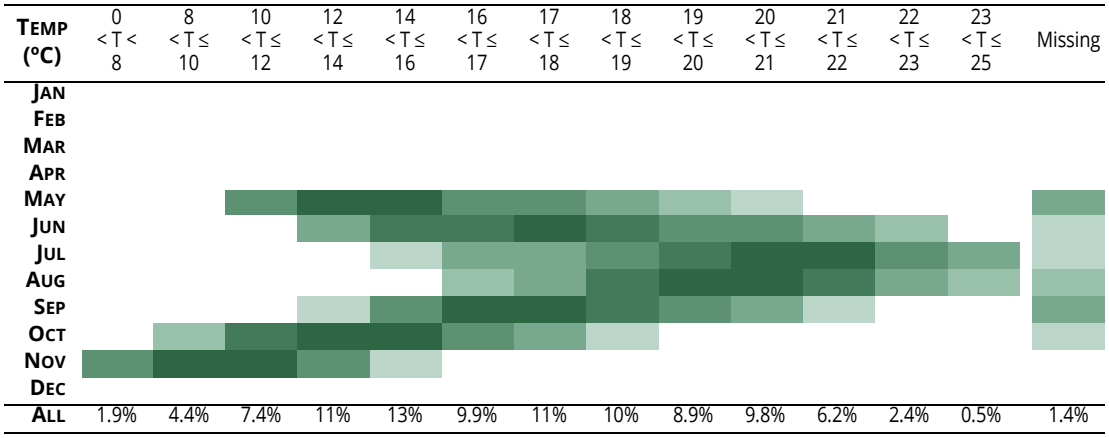
2020 — DAILY MEAN WATER TEMPERATURE (°C) — RM24.5

DAY	JAN	FEB	MAR	APR	MAY*	JUN	JUL*	AUG	SEP	OCT	NOV*	DEC
1						17.57	19.90	21.62	18.89	17.04	10.66	
2						17.71	19.31	21.41	19.24	17.25	10.52	
3						17.84	18.87	21.20	19.63	17.25	10.48	
4						18.15	18.52	21.10	19.92	17.19	11.27	
5						18.47	18.39	21.16	19.90	17.29	12.10	
6						18.08	18.27	20.72	19.36	17.29	12.03	
7						17.21	17.88	19.99	19.15	17.34	11.69	
8						16.47	17.93	19.97	18.66	17.29	10.47	
9						15.86	18.22	19.94	18.01	17.33	9.19	
10						15.89	18.71	20.12	17.24	17.36	8.85	
11						16.72	19.56	20.17	16.49	16.91	8.81	
12					17.54	17.10		20.06	15.71	16.12	8.79	
13					17.11	16.62		19.69	15.29	16.02	8.89	
14					16.31	16.51		19.70	15.12	15.25	8.80	
15					15.91	16.63	21.58	19.94	15.60	14.51	8.39	
16					15.71	16.34	21.34	20.24	15.97	13.92	8.48	
17					15.57	16.68	21.81	20.33	16.39	13.92	9.07	
18					15.69	17.03	21.80	20.36	17.00	14.35	9.42	
19					15.38	17.62	21.94	20.41	17.45	14.64	9.54	
20					15.21	18.27	22.25	20.25	17.94	14.77	9.19	
21					14.96	18.62	22.32	20.09	17.87	14.77		
22					14.80	19.22	22.33	20.01	18.01	13.95		
23					14.76	20.09	22.20	19.97	18.17	12.99		
24					15.06	20.75	21.57	19.96	18.00	12.53		
25					15.77	20.91	20.71	19.82	17.88	11.68		
26					16.27	21.48	20.63	19.68	17.23	10.53		
27					17.04	21.84	20.98	19.67	16.53	9.89		
28					18.15	21.23	21.21	19.78	16.39	9.85		
29					19.38	20.57	21.38	19.83	16.56	10.04		
30		—			19.49	20.38	21.80	19.23	16.79	10.57		
31		—		—	18.43	—	22.10	18.80	—	10.76	—	
Mean						18.26	20.48	20.17	17.55	14.54		
Max						21.84	22.33	21.62	19.92	17.36		
Min						15.86	17.88	18.80	15.12	9.85		

*Incomplete record



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — RM24.5



MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — RM24.5

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997					16.0	16.9	20.1	20.0	16.8	12.0		
1998					12.9	17.2	20.4	19.4	17.2	13.4	10.4	
1999					12.4	16.2	18.8	19.2	16.9	12.8	10.5	
2000					14.6	17.6	19.8	18.0	16.2	14.0	7.1	
2001					15.1	17.6	21.1	21.0	19.1	13.7	9.9	
2002					14.5	17.9	21.1	19.7	16.9	14.0	10.0	7.0
2003					13.6	18.4	21.8	19.5	17.6	15.0	8.6	8.0
2004					15.7	18.8	21.6	20.1	17.7	15.0	9.4	
2005			9.8	10.7	14.0	16.1	20.5	20.4	16.8	14.5		
2006					14.4	17.3	20.2	19.2	17.2	13.6	9.1	
2007					15.2	17.5	20.5	18.9	17.5	13.4	9.8	6.6
2008					14.5	16.5	19.3	18.6	17.1	12.8	10.2	
2009					13.2	18.9	21.3	18.7	17.3	13.4	9.4	
2010					13.0	14.1	19.6	19.8	16.8	12.8	10.5	
2011					12.1	15.6	18.8	19.9	17.9	13.9	9.3	
2012					13.5	16.7	19.9	20.2	16.8	13.3	9.5	8.3
2013					14.8	17.6	20.7	20.2	18.6	11.9	10.1	
2014					15.2	18.2	21.3	21.1	18.4	16.1	9.6	8.1
2015					16.1	20.7	21.6	21.1	17.9	16.0	10.4	
2016					16.4	18.9	20.1	20.4	17.5	12.9	12.1	
2017					14.3	17.8	20.9	21.0	18.3	12.8	9.9	
2018					16.8	18.6	21.1	20.5	17.1	14.2	11.3	
2019					16.3	19.3	20.5	19.9	17.9	12.4	9.1	
2020					15.8	17.8	21.1	20.0	17.7	14.8	9.3	
median					14.8	17.7	20.5	20.0	17.3	13.7	9.8	

Key

T in °C
- T ≤ 8.5
- 8.5 < T ≤ 10.2
- 10.2 < T ≤ 11.5
- 11.5 < T ≤ 12.4
- 12.4 < T ≤ 14.1
- 14.1 < T ≤ 15.7
- 15.7 < T ≤ 16.8
- 16.8< T ≤ 19.3
- 19.3 < T ≤ 20.9
- 20.9 < T ≤ 21.5
- T > 21.5

T as percentile
- T ≤ 5th
- 5th < T ≤ 10th
- 10th < T ≤ 15th
- 15th < T ≤ 20th
- 20th < T ≤ 30th
- 30th < T ≤ 40th
- 40th < T ≤ 50th
- 50th < T ≤ 75th
- 75th < T ≤ 90th
- 90th < T ≤ 95th
- T > 95th

Distribution and 2019

- Temperatures in 2020 were above average for periods in May, June and early October. New record high daily mean temperatures were set on May 29 and October 6, 7, and 10.
- Temperatures in July and August were near the long term median.
- The highest temperatures occur in July and August.
- Temperature is not routinely measured at this site during high flow which is when low temperatures would occur. Consequently, the percentiles are skewed and under-represent low temperatures.

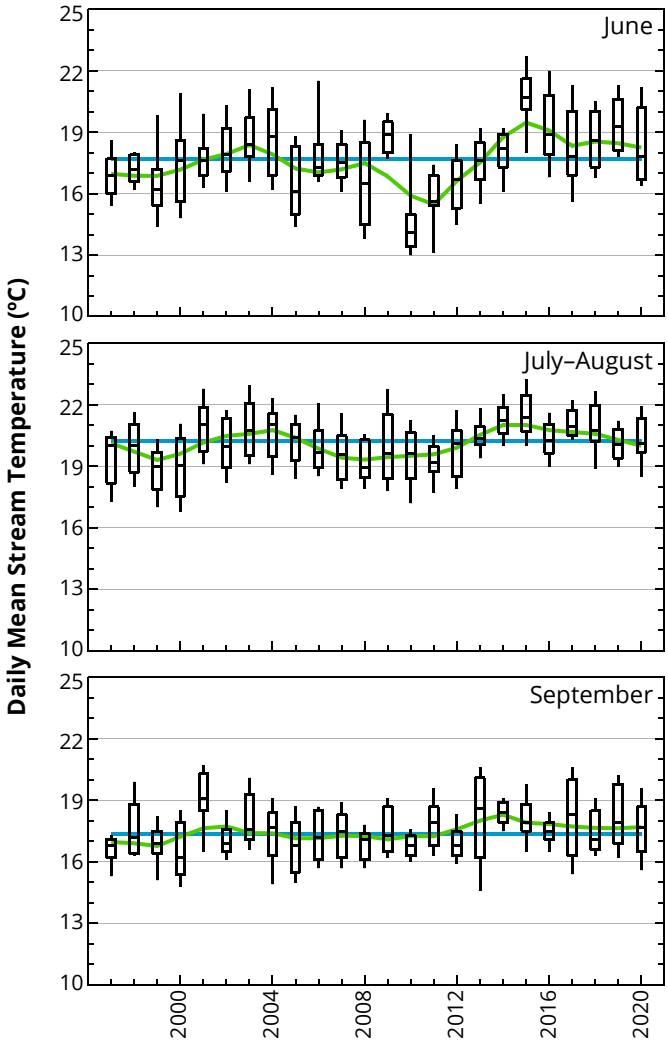
Trends

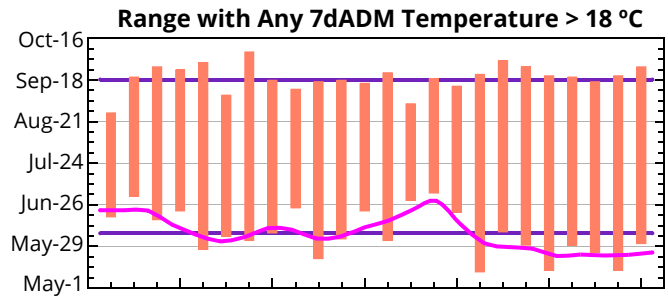
- Water temperatures in June through September do not show any statistically significant trends. The year-to-year variability is considerable and appears somewhat cyclical.
- The first day when the temperature standard is exceeded has become earlier over the period of record. The trend is statistically significant.
- The number of days exceeding the temperature standard shows an overall increasing trend that is statistically significant, although considerable variability exists year-to-year.

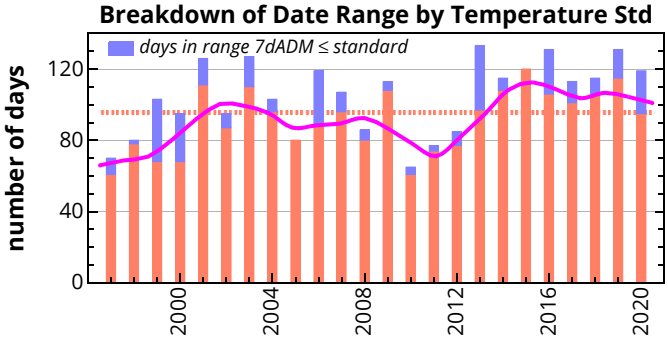
Oregon water temperature standard

- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard usually occurred within the date range of exceedances, but were a minor fraction.

fraction of years with any exceedance	100%
median days/year exceeding standard	96
average first day of exceedance (if it occurred)	Jun-7
average last day of exceedance (if it occurred)	Sep-18





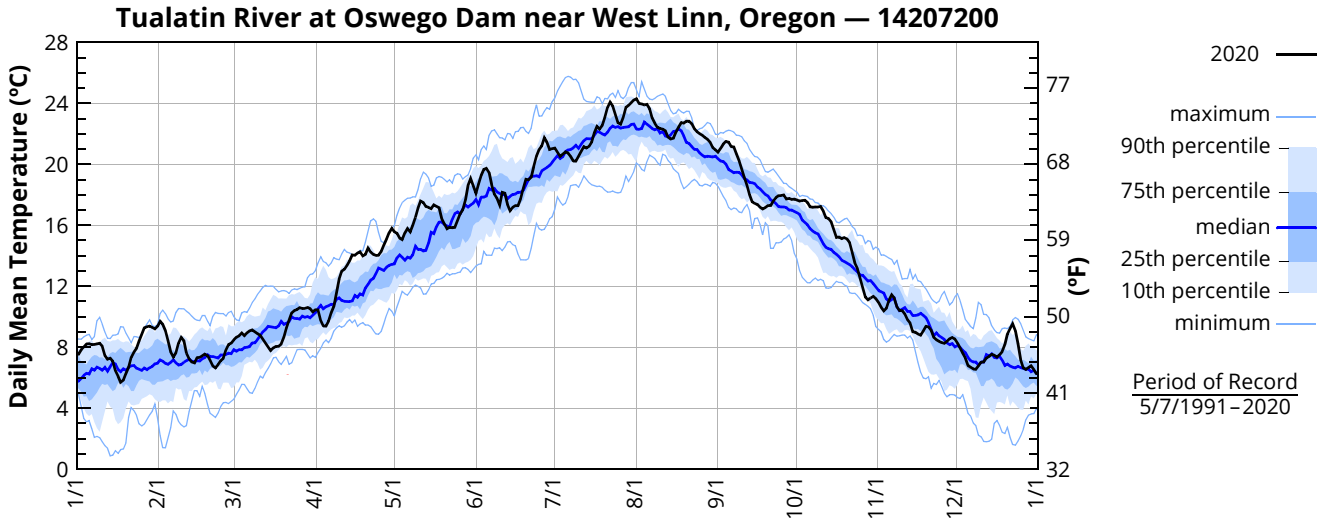


ODAM – Tualatin River at Oswego Dam near West Linn, Oregon – 14207200

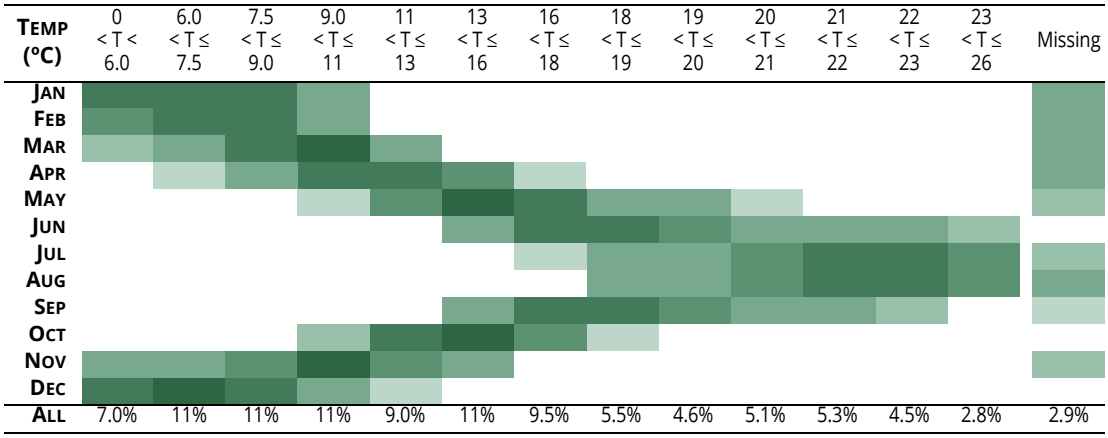
Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 3.4 *Latitude:* 45 21 24 *Longitude:* 122 41 02

2020 — DAILY MEAN WATER TEMPERATURE (°C) — ODAM

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	7.55	9.70	8.48	10.45	15.58	18.10	21.07	24.31	20.80	17.66	10.94	8.28
2	7.84	9.51	8.66	10.45	15.48	18.70	20.81	23.99	21.04	17.58	10.62	7.96
3	8.02	9.09	8.74	9.75	15.16	19.29	20.52	23.97	21.33	17.63	10.38	7.60
4	8.22	8.44	8.93	9.39	15.06	19.66	20.67	23.90	21.50	17.65	10.55	7.29
5	8.23	7.67	8.75	9.38	15.50	19.74	20.82	23.94	21.46	17.50	11.11	6.80
6	8.16	7.36	8.93	9.71	15.79	19.46	20.75	23.64	21.16	17.22	11.44	6.68
7	8.19	7.65	9.07	10.24	15.56	18.67	20.52	23.03	21.14	17.19	11.23	6.57
8	8.22	8.28	9.13	10.68	15.99	18.05	20.22	22.70	20.69	17.21	10.65	6.55
9	8.26	8.65	9.01	11.54	16.52	17.78	20.21	22.43	20.24	17.20	10.40	6.77
10	8.07	8.43	8.89	12.47	17.12	17.33	20.54	22.35	19.71	17.24	10.40	7.02
11	7.45	7.61	8.78	12.98	17.59	18.16	20.85	22.31	19.17	16.93	10.18	7.03
12	7.21	7.23	8.54	13.11	17.50	18.11	21.17	22.20	18.63	16.50	9.80	7.28
13	7.27	7.03	8.28	13.36	17.24	17.36	21.07	21.80	18.01	16.45	9.59	7.39
14	7.08	6.97	8.03	13.68	17.18	16.95	21.19	21.66	17.53	16.23	9.02	7.54
15	6.46	7.31	7.78	14.06	17.09	17.19	21.46	21.71	17.43	15.75	8.98	7.47
16	6.10	7.34	7.95	14.04	17.34	17.29	22.06	22.11	17.36	15.21	8.87	7.35
17	5.70	7.43	8.05	14.18	17.25	17.29	22.49	22.44	17.19	15.23	8.78	7.50
18	5.83	7.55	8.06	14.27	17.16	17.73	22.31	22.74	17.07	15.13	9.06	7.70
19	6.26	7.45	8.21	13.99	16.43	18.43	22.55	22.70	17.16	15.19	9.37	8.17
20	6.68	7.14	8.66	14.09	16.09	19.02	23.08	22.83	17.29	15.11	9.33	8.87
21	7.33	6.77	9.27	14.51	15.77	18.98	23.74	22.83	17.30	14.88	9.11	9.24
22	7.67	6.64	9.76	14.24	15.87	19.15	24.10	22.67	17.58	14.25	8.65	9.54
23	7.91	6.86	10.26	14.09	15.84	19.86	23.84	22.34	17.82	13.52	8.49	9.08
24	8.39	7.11	10.40	14.02	15.86	20.53	23.27	22.14	17.94	13.16	8.39	8.24
25	8.84	7.26	10.46	14.04	16.32	20.96	22.74	22.02	17.95	12.53	8.30	7.18
26	9.27	7.83	10.59	14.28	16.74	21.21	22.64	21.92	17.99	11.93	8.25	6.65
27	9.34	8.18	10.54	14.69	17.01	21.74	23.08	21.76	17.73	11.28	8.37	6.54
28	9.38	8.27	10.55	15.09	17.65	21.46	23.74	21.65	17.76	11.11	8.55	6.66
29	9.30	8.33	10.60	15.50	18.60	20.98	23.86	21.45	17.70	11.22	8.64	6.78
30	9.19	—	10.53	15.80	19.06	21.03	24.04	21.10	17.72	11.34	8.54	6.54
31	9.37	—	10.32	—	18.59	—	24.22	20.96	—	11.19	—	6.27
Mean	7.83	7.76	9.17	12.94	16.64	19.01	22.05	22.50	18.78	15.10	9.53	7.44
Max	9.38	9.70	10.60	15.80	19.06	21.74	24.22	24.31	21.50	17.66	11.44	9.54
Min	5.70	6.64	7.78	9.38	15.06	16.95	20.21	20.96	17.07	11.11	8.25	6.27



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — ODAM



MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — ODAM

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991					13.0	16.1	21.5	21.8	18.5	14.8	9.8	6.9
1992	6.4	8.5	11.2	12.5	16.6	20.8	21.4	21.1	17.5	14.1	10.5	5.6
1993	4.0	5.9	8.3	10.0	16.3	16.7	18.9	20.6	16.5	14.7	8.3	6.9
1994	7.5	5.6	9.3	11.6	16.3	17.8	21.7		18.6	13.5	7.0	7.6
1995	6.7	9.5			14.7	18.5	22.1	20.1	18.7	14.1	11.0	7.9
1996	8.0				13.6	18.1	21.2	20.8	16.9	14.5	9.6	7.1
1997		7.5	8.7	11.3	17.4	18.1	20.8	22.4	17.6	12.4	9.9	6.8
1998	7.1	8.6	9.9	11.1	13.5	18.4	21.8	22.0	19.6	14.0	10.8	7.1
1999	7.0	7.1	8.6	11.2	12.9	17.5	20.1	21.1	18.1	13.7	10.6	8.2
2000	6.0	7.5			15.2	18.1	21.1	20.6	17.6	14.4	8.2	6.7
2001	6.5	6.6	9.8	10.8	15.8	18.6	21.0	21.1	19.5	14.3	10.8	7.2
2002	6.6	6.7	7.5	11.7	15.3	19.3	22.4	21.3	18.6	14.0	9.7	7.5
2003	7.6	8.1	9.8	11.5	13.8	20.0	22.9	21.4	18.4	15.3	9.2	7.8
2004	6.0	7.3	10.6	12.5	16.5	18.7	23.0	23.1	18.6	15.6	9.5	7.8
2005	6.0	6.7			14.9	17.0	21.2	22.5	18.5	15.0	8.8	6.0
2006	7.8	7.0	8.1	11.5	15.4	18.2	22.3	21.3	18.2	14.1	9.3	6.1
2007	5.3	7.6	9.9	11.1	15.7	18.9	21.6	20.6	18.8	13.8	10.2	6.5
2008	5.3	6.6	8.4	9.5	15.3	16.6	21.7	20.8	18.6	13.6	11.3	4.9
2009	5.0	5.6	7.7	11.0	13.3	19.6	21.8	20.8	18.9	14.0	9.0	4.8
2010	7.6	8.3	9.4	11.8	13.3	14.5	21.0	21.6	17.8	14.3	10.2	7.3
2011	7.0	6.7			12.9	16.7	19.7	21.4	19.4	14.4	9.5	5.5
2012	6.3	7.2	7.5	11.5	14.5	17.2	21.3	22.2	18.4	13.8	10.1	7.5
2013	4.7	7.4	8.8	12.3	16.5	18.7	22.4	22.0	20.0	12.2	10.5	5.6
2014	5.8	6.6	9.9	12.3	15.4	18.8	22.7	23.0	19.5	16.5	9.8	8.6
2015	7.5	9.5	11.2	12.3	16.7	21.9	24.1	22.6	18.9	16.2	10.7	7.7
2016	7.5	8.7	10.0	13.7	17.2	19.6	21.5	22.3	18.4	13.8	12.1	5.7
2017	4.1	7.2	9.6	10.8	14.7	18.9	22.5	22.4	19.9	12.9	9.8	6.1
2018	7.9	7.4	8.6	10.9	17.7	18.9	23.3	23.0	18.4	13.9	10.1	7.6
2019	7.2	6.1	8.5	12.0	17.0	20.4	22.0	21.9	19.1	12.9	9.3	7.3
2020	8.0	7.5	8.9	14.0	16.5	18.8	22.1	22.4	17.9	15.2	9.2	7.3
median	6.6	7.2	9.1	11.6	15.5	18.6	21.8	21.7	18.5	14.2	9.9	6.9

Key

T in °C
- T ≤ 5.5
- 5.5< T ≤ 6.5
- 6.5 < T ≤ 7.1
- 7.1 < T ≤ 7.7
- 7.7 < T ≤ 9.1
- 9.1 < T ≤ 10.8
- 10.8 < T ≤ 12.9
- 12.9 < T ≤ 18.7
- 18.7 < T ≤ 21.6
- 21.6 < T ≤ 22.4
- T > 22.4

T as percentile
- T ≤ 5th
- 5th < T ≤ 10th
- 10th < T ≤ 15th
- 15th < T ≤ 20th
- 20th < T ≤ 30th
- 30th < T ≤ 40th
- 40th < T ≤ 50th
- 50th < T ≤ 75th
- 75th < T ≤ 90th
- 90th < T ≤ 95th
- T > 95th

DISTRIBUTION AND 2020

- Temperatures in 2020 were higher than the POR median for all months except March and November. January, April and early October had particularly high temperatures, averaging about 0.2ºC more than their respective monthly 75th percentiles. New record high daily mean temperatures were set on two days in January and six in April.
- The highest temperatures occur in July and August. The lowest temperatures occur in December and January.

TRENDS

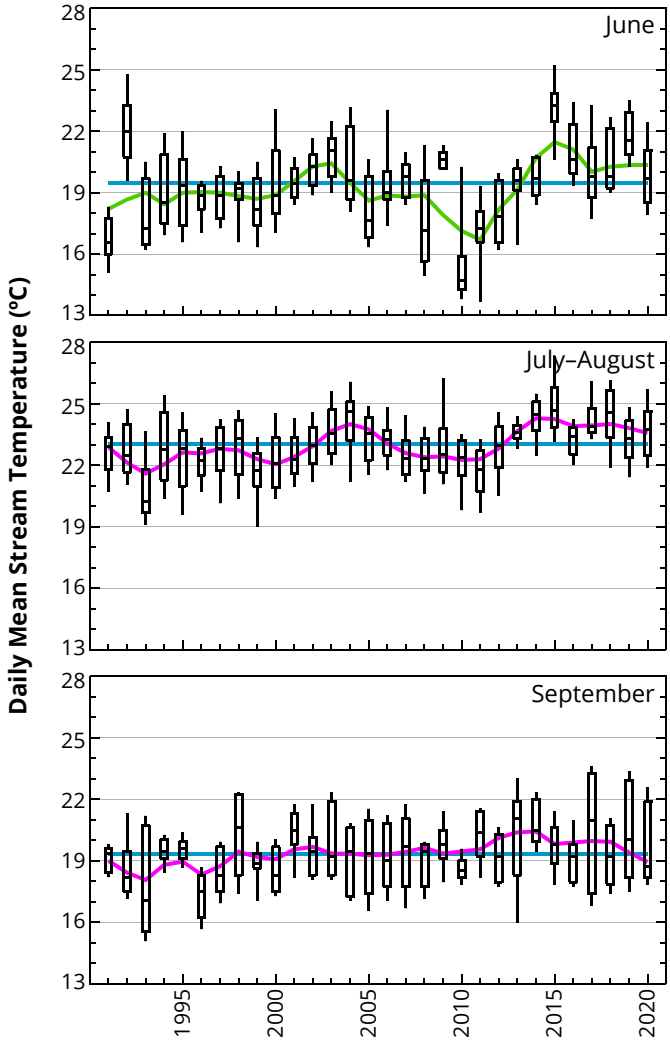
- June median water temperatures from 2013–2020 were greater than the period of record median for June. June temperatures were variable over time, but this 8-year streak is the longest.
- Water temperatures in July–August and September show an increasing trend. The trend is statistically significant even though the increase is small.
- The year-to-year variability in June and July–August is considerable and appears to be somewhat cyclical. Year-to-year variability is less in September than in the earlier summer months.
- This site illustrates the importance of a long period of record, especially when long-term patterns such as the Pacific Decadal Oscillation and the El Niño Southern Oscillation may be active.
- No trend was evident in the timing of temperature standard exceedances. The number of days with exceedances had a increasing trend that was statistically significant.

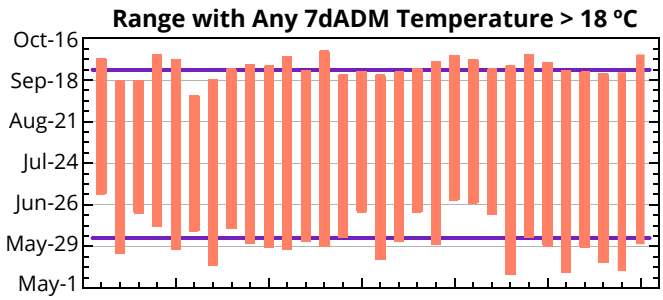
OREGON WATER TEMPERATURE STANDARD

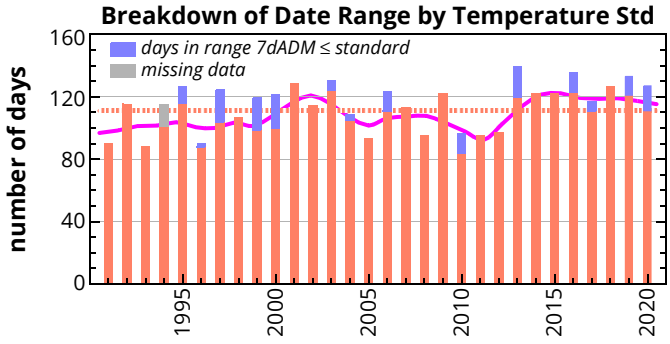
- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard occurred sporadically within the date range of exceedances. When they occurred, they were a minor fraction of the range.

fraction of years with any exceedance	100%
median days/year exceeding standard	111
average first day of exceedance (if it occurred)	Jun-3
average last day of exceedance (if it occurred)	Sep-25

- In 1994, 14 days in August did not have temperature data. The 7dADMs exceeded 20ºC on days before and after the data gap.







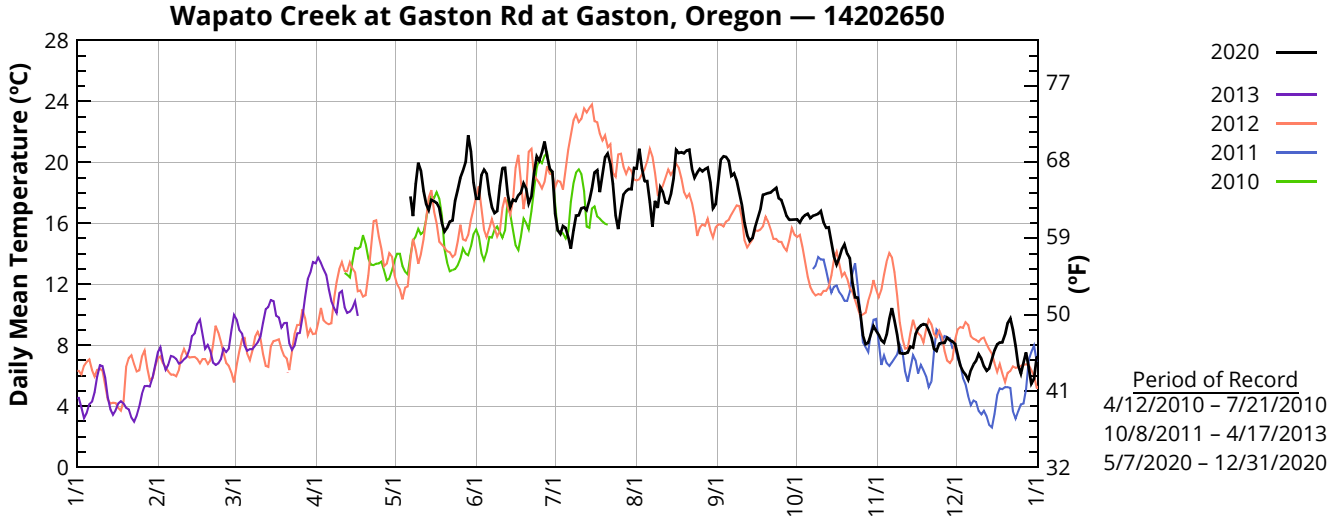
WGAS – Wapato Creek at Gaston Rd at Gaston, Oregon – 14202650

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 1.9 *Latitude:* 45 26 26 *Longitude:* 123 07 30

2020 — DAILY MEAN WATER TEMPERATURE (°C) — WGAS

DAY	JAN	FEB	MAR	APR	MAY*	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1						17.62	16.64	19.59	18.66	16.26	8.69	7.37
2						17.62	15.56	20.89	20.18	16.05	8.32	6.67
3						19.18	15.30	19.62	20.40	16.36	8.15	6.29
4						19.53	15.82	18.76	20.36	16.53	8.68	6.08
5						19.28	15.69	18.77	20.10	16.63	9.72	5.72
6						17.93	15.12	17.37	19.11	16.35	10.43	6.35
7					17.76	17.07	14.34	15.78	19.28	16.49	9.62	6.74
8					16.47	16.67	15.55	17.47	18.82	16.54	8.68	6.97
9					18.57	16.80	16.50	17.01	18.00	16.62	7.49	7.41
10					19.98	18.47	16.52	18.36	17.20	16.80	7.45	7.11
11					19.49	19.63	16.99	18.04	16.04	16.06	7.45	6.62
12					18.13	19.64	17.04	17.37	15.23	15.70	7.51	6.33
13					17.29	17.89	16.86	17.31	14.84	15.74	7.90	6.47
14					16.87	17.08	17.49	17.88	15.03	14.72	7.84	7.09
15					17.54	17.55	18.29	18.94	15.73	13.82	8.72	7.65
16					17.45	17.47	19.34	20.82	16.32	13.29	9.10	8.05
17					17.33	17.85	19.48	20.61	16.89	13.71	9.30	8.18
18					17.02	17.99	18.05	20.66	17.87	14.31	9.38	8.19
19					16.02	18.62	19.21	20.59	17.92	14.62	9.34	8.69
20					15.45	18.28	20.32	20.78	17.98	14.00	8.98	9.45
21					15.70	17.29	20.58	20.83	18.03	13.71	8.51	9.75
22					16.10	17.76	19.92	19.59	18.18	12.13	7.75	9.02
23					16.18	19.28	18.57	18.99	18.33	11.15	7.62	7.94
24					17.47	20.39	16.51	19.33	17.65	11.13	8.10	6.69
25					18.21	20.10	15.62	19.57	17.52	10.09	8.15	6.14
26					18.98	20.66	16.89	19.41	17.03	8.66	8.15	6.85
27					19.43	21.36	17.89	19.56	16.49	8.07	8.49	7.52
28					20.01	20.42	18.12	19.65	16.23	8.15	8.32	6.54
29					21.77	19.57	18.26	18.69	16.24	8.68	8.25	5.47
30		—			20.71	19.39	18.24	16.98	16.25	9.25	8.08	5.79
31		—		—	18.69	—	19.63	17.25	—	8.96	—	7.17
Mean					17.94	18.61	17.43	18.92	17.60	13.57	8.47	7.17
Max					21.77	21.36	20.58	20.89	20.40	16.80	10.43	9.75
Min					15.45	16.67	14.34	15.78	14.84	8.07	7.45	5.47

* Incomplete record, temperature monitoring at this site resumed on May 7, 2020 after being discontinued in April 2013.



DISTRIBUTION AND 2020

- The highest mean daily temperature on an individual day in 2020 occurred on May 29th (21.77°C), not during July or August.
- The highest temperatures overall occur in July and August.
- The lowest temperatures occur in December and January.

COMPARISON TO HISTORICAL RECORD

- Because relatively few historical data exist, comparisons of 2020 temperatures to those in previous years are not generally meaningful.

OREGON WATER TEMPERATURE STANDARD

- Exceedances of the water temperature standard occurred in all years for which adequate data are available.
- Monitoring during some years did not coincide with the time period in which high temperatures would be expected. During other years time periods of temperature standard exceedance could only be approximated because temperature monitoring started after or ended while temperature exceedances were occurring. Periods of temperature standard exceedances are shown below.

TEMPERATURE STANDARD EXCEEDANCES

YEAR	TIME PERIOD	DAYS	PERCENT OF TIME PERIOD	NOTES
2010	5/14 – after 7/17	≥24	37%	monitoring ended while standard was exceeded
2011	—	—	—	monitoring began October 7th, after water cooled
2012	5/15 - 8/24	86	84%	
2013	—	—	—	monitoring ended April 17, before water warmed
2020	before 5/7 – 9/27	≥125	87%	monitoring began after standard was exceeded

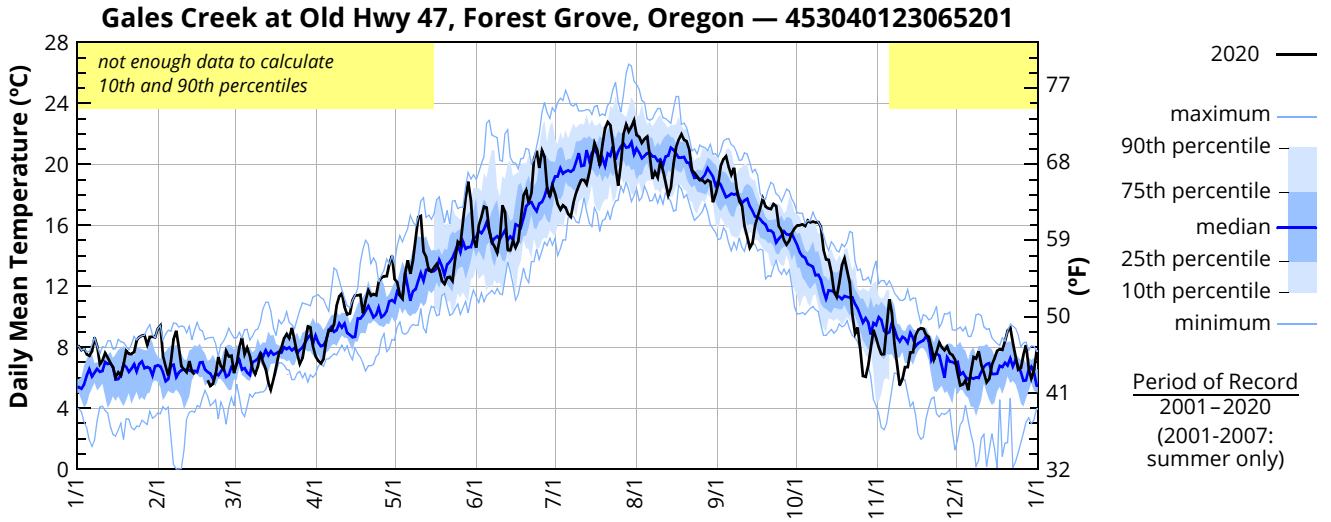
GALES – GALES CREEK AT OLD HWY 47, FOREST GROVE, OREGON – 453040123065201

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 2.36 *Latitude:* 45 28 40 *Longitude:* 123 06 52

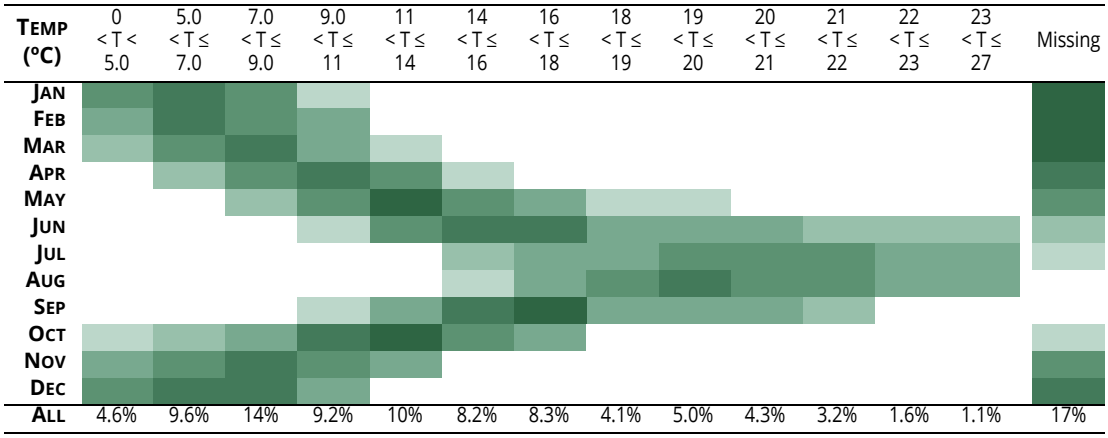
2020 — DAILY MEAN WATER TEMPERATURE (°C) — GALES

DAY	JAN	FEB*	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8.07	9.42	6.30	7.40	12.47	14.53	18.09	21.92	18.74	15.99	8.01	6.28
2	7.81	7.45	6.91	7.11	12.27	15.97	17.39	21.79	19.89	16.00	7.54	5.49
3	7.92	6.75	7.99	6.94	11.42	16.56	17.03	21.41	20.35	16.06	7.55	5.55
4	7.54	6.15	8.62	7.22	11.20	17.22	17.31	21.68	20.53	15.96	9.34	5.84
5	7.44	7.08	7.53	8.45	12.86	17.16	17.16	21.83	19.82	16.31	11.15	5.17
6	7.75	8.51	7.97	9.12	13.70	15.62	16.73	20.51	19.32	16.19	10.25	6.34
7	8.65	9.08	7.44	9.08	12.82	14.90	16.55	19.04	19.77	16.24	8.22	7.35
8	8.08	8.01	6.59	9.50	13.71	14.60	17.49	19.50	18.43	16.19	6.87	7.24
9	6.87	6.75	6.22	10.73	15.12	14.21	18.11	19.13	17.57	16.21	5.49	7.73
10	7.11	6.54	6.68	11.35	16.53	15.16	18.59	20.22	17.31	15.91	5.91	6.83
11	7.61	6.36	7.63	11.54	16.61	17.31	18.99	19.60	15.97	14.40	6.70	6.34
12	7.31	7.08	7.02	10.62	14.27	16.88	18.98	18.83	15.26	13.76	6.69	5.69
13	6.96	6.39	6.59	10.15	13.93	14.37	18.70	17.96	14.53	13.73	7.65	5.91
14	6.71	6.21	5.72	10.20	13.04	14.36	19.48	18.46	14.83	12.91	7.67	6.83
15	6.03		5.19	11.07	12.96	14.98	20.43	20.05	15.97	11.68	8.77	7.25
16	6.35		5.90	11.41	13.23	14.54	21.41	21.12	16.59	11.30	9.14	7.77
17	6.14		6.67	11.40	13.45	14.95	20.94	21.62	17.13	12.21	9.25	7.87
18	6.86		7.56	11.44	13.08	16.40	19.92	21.98	17.76	13.37	9.22	7.82
19	7.77	5.83	7.97	10.22	12.34	17.97	21.32	21.62	17.23	13.81	8.81	8.40
20	7.57	5.46	8.59	11.03	12.15	18.30	22.35	21.52	17.11	12.99	8.68	9.08
21	7.55	5.59	8.86	11.73	12.56	17.47	22.77	20.99	17.06	12.20	7.95	9.26
22	7.68	6.20	8.58	11.39	12.62	18.10	22.57	19.61	17.40	10.12	7.19	8.28
23	8.44	7.38	9.27	11.49	12.35	20.33	21.36	19.44	17.26	8.89	7.67	7.36
24	8.66	6.77	8.44	11.41	13.75	20.89	19.77	19.20	15.96	9.29	8.29	6.52
25	8.76	6.55	7.57	12.29	14.92	19.77	18.60	18.97	15.66	7.81	7.99	6.63
26	8.79	7.74	6.90	12.57	14.72	20.90	20.03	18.97	15.02	6.11	7.80	7.51
27	8.15	7.40	7.29	12.66	16.11	20.49	21.96	18.78	14.73	6.05	8.04	8.13
28	8.67	7.44	8.31	12.66	17.82	18.46	22.61	18.96	14.98	6.78	7.60	6.61
29	8.69	7.30	9.36	13.45	18.87	17.85	22.16	18.85	15.48	7.99	7.48	5.94
30	8.64	—	9.30	14.00	17.62	18.60	22.47	17.51	15.80	9.14	7.17	6.46
31	9.22	—	8.07	—	15.16	—	22.88	18.03	—	8.64	—	7.75
Mean	7.74	7.02	7.52	10.65	13.99	16.96	19.81	19.97	17.12	12.39	8.00	7.01
Max	9.22	9.42	9.36	14.00	18.87	20.90	22.88	21.98	20.53	16.31	11.15	9.26
Min	6.03	5.46	5.19	6.94	11.20	14.21	16.55	17.51	14.53	6.05	5.49	5.17

* Incomplete record



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — GALES



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2001–2020
(2001-2007: summer only)

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — GALES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2001					13.9	15.8	19.9	20.0	17.1	10.8		
2002					12.2	17.1	21.2	19.6	16.3	11.5	7.9	5.9
2003					14.4	16.8	21.0	20.3	17.4	13.7		
2004					14.9	17.3	21.9	21.3	16.6	12.7		
2005						14.7	20.1	20.3	15.4	12.6		
2006					13.3	15.8	20.8	19.3	15.9	11.3	8.7	
2007					14.3	16.8	20.8	19.1	16.3	10.9	7.6	6.2
2008	5.5		6.8	7.8	12.9	15.4	20.0	19.5	16.7	10.7	8.7	4.8
2009	4.6	4.6	6.6	9.3	12.0	16.7	21.6	19.5	16.5	11.3	8.2	4.3
2010	7.5	7.8	8.0	9.7	11.1	12.5	19.1	19.1	16.4	10.9	8.1	7.4
2011	6.6	5.6	7.2	8.1	10.6	14.5	17.8	19.3	17.1	12.1	6.9	4.7
2012	6.1	6.4	7.0	9.4	12.0	14.8	19.6	20.0	16.3	11.1	8.9	7.2
2013	4.7	6.4	7.7	10.1	13.3	16.2	20.5	19.9	18.1	10.3	8.6	3.9
2014	5.1	6.3	8.2	10.0	12.6	16.7	21.2	20.7	17.5	13.9	8.5	8.1
2015	7.3	8.7	9.6	10.1	14.4	20.1	22.0	20.3	16.0	13.9	8.4	8.0
2016	7.4	8.2	8.7	11.3	14.6	18.1	19.4	20.0	16.4	11.6	10.2	6.1
2017	4.1	6.3	7.9	8.9	12.8	16.2	20.2	20.9	16.7	10.6	8.5	5.4
2018	7.5	6.1	7.2	9.0	14.5	16.6	21.8	20.6	15.9	11.9	6.9	7.1
2019	6.7	5.6	7.2	10.1	14.6	17.8	20.1	20.1	17.1	10.2	6.3	6.8
2020	7.8	6.8	7.6	11.2	13.5	17.0	19.8	19.6	17.1	13.0	7.9	6.8
median	6.4	6.4	7.6	9.6	13.2	16.3	20.3	20.0	16.6	11.6	8.2	6.4

KEY

T in °C

T ≤ 4.9
4.9 < T ≤ 6.0
6.0 < T ≤ 6.7
6.7 < T ≤ 7.3
7.3 < T ≤ 8.5
8.5 < T ≤ 10.1
10.1 < T ≤ 12.2
12.2 < T ≤ 17.7
17.7 < T ≤ 20.4
20.4 < T ≤ 21.5
T > 21.5

T as percentile

T ≤ 5th
5th < T ≤ 10th
10th < T ≤ 15th
15th < T ≤ 20th
20th < T ≤ 30th
30th < T ≤ 40th
40th < T ≤ 50th
50th < T ≤ 75th
75th < T ≤ 90th
90th < T ≤ 95th
T > 95th

DISTRIBUTION 2020

- Temperatures in 2020 were well above average during most of January and April, and early October. Record setting high mean temperatures occurred several times in each of these months (January: 10 days, April: 5 days, October: 3 days).
- Above average temperatures occurred intermittently during May through September 2020, but generally temperatures during these months were near their long-term medians.
- The highest temperatures occur in July and August.
- Before 2008, temperature was not measured at this site during high flow which is when low temperatures would occur. Consequently, the percentiles are skewed and under-represent low temperatures.

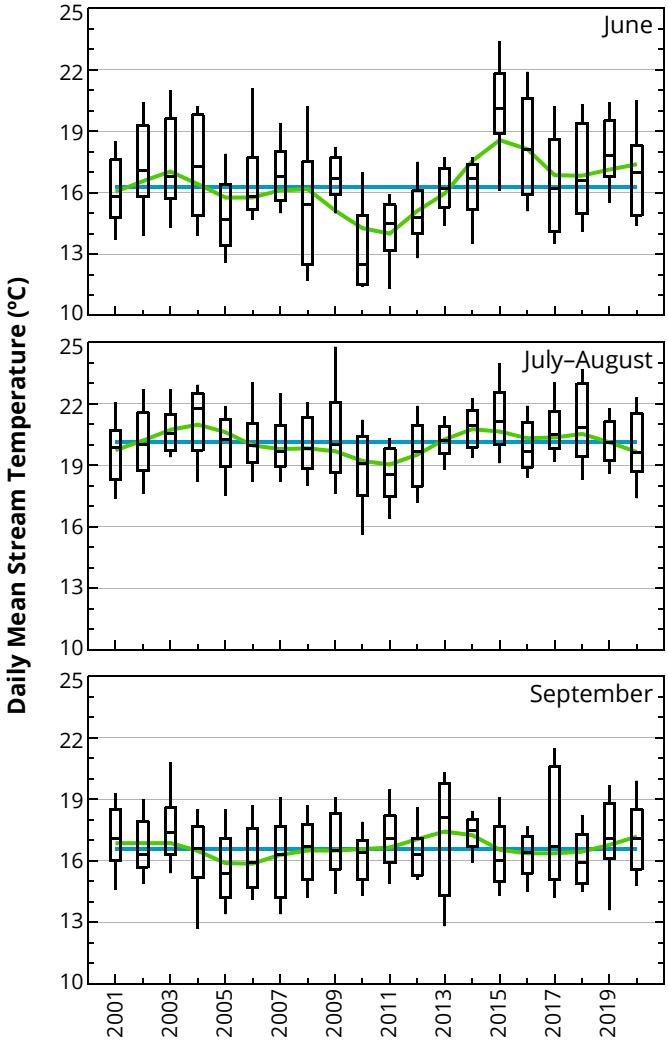
TRENDS

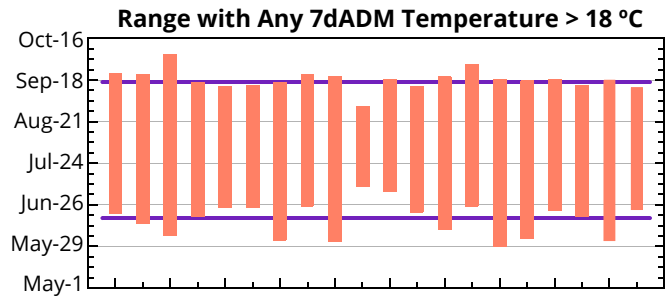
- Water temperatures in June, July–August and September do not show any statistically significant trends.
- The year-to-year variability is considerable, especially in June and appears somewhat cyclical. Year-to-year variability is less in September than in early summer.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

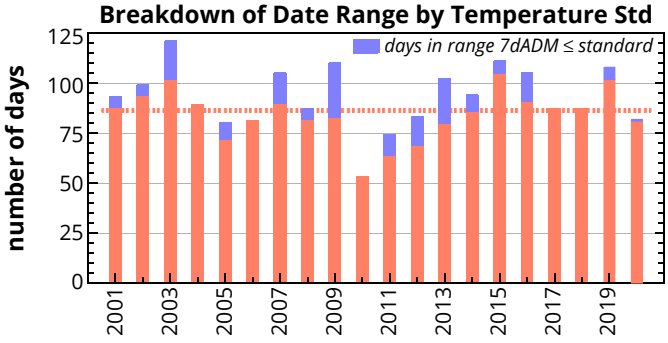
OREGON WATER TEMPERATURE STANDARD

- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard frequently occurred within the date range of exceedances, but were a minor fraction.

fraction of years with any exceedance	100%
median days/year exceeding standard	87
average first day of exceedance (if it occurred)	Jun-17
average last day of exceedance (if it occurred)	Sep-16







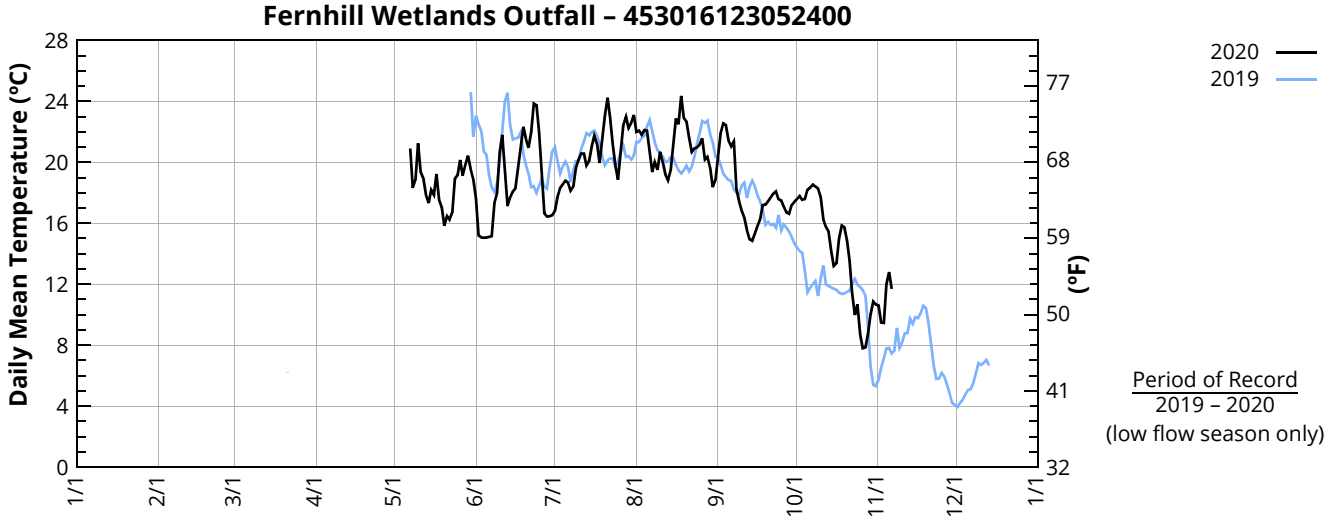
FHWO – Fernhill Wetlands Outfall – 453016123052400

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 55.2 *Latitude:* 45 30 16 *Longitude:* 123 05 24

2020 — DAILY MEAN WATER TEMPERATURE (°C) — FHWO

DAY	JAN	FEB	MAR	APR	MAY*	JUN	JUL	AUG	SEP	OCT	NOV*	DEC
1						17.59	16.81	22.01	20.47	17.58	10.61	
2						15.21	17.71	22.09	21.89	17.79	9.50	
3						15.07	18.32	21.82	22.55	17.54	9.47	
4						15.05	18.55	22.12	22.45	17.59	12.00	
5						15.06	18.79	22.09	21.42	18.20	12.80	
6						15.11	18.68	20.62	21.05	18.34	11.69	
7					20.91	15.15	18.14	19.36	21.38	18.54		
8					18.33	17.31	18.41	20.02	18.23	18.41		
9					18.87	17.93	19.61	19.51	17.44	18.29		
10					21.25	20.66	20.18	20.69	16.84	17.75		
11					19.39	21.81	20.58	20.01	16.39	16.27		
12					18.96	19.46	20.58	19.22	15.55	15.77		
13					17.90	17.13	19.80	18.82	14.96	15.47		
14					17.33	17.70	20.10	19.45	14.85	14.18		
15					18.18	18.09	21.04	21.28	15.31	13.19		
16					17.86	18.29	21.75	22.88	15.82	13.37		
17					19.23	19.67	21.23	22.50	16.25	15.00		
18					17.56	20.99	19.96	24.36	17.20	15.85		
19					17.06	22.33	21.62	22.92	17.23	15.75		
20					15.84	21.54	23.06	22.68	17.43	14.86		
21					16.47	20.95	24.24	21.64	17.69	13.53		
22					16.24	22.00	22.91	20.68	17.94	11.39		
23					16.71	23.85	21.21	20.90	18.10	9.98		
24					18.92	23.75	19.78	20.98	17.58	10.67		
25					19.16	21.99	18.87	21.15	17.50	8.71		
26					20.16	19.26	20.62	21.57	17.09	7.80		
27					19.13	16.66	22.42	20.18	16.72	7.85		
28					19.84	16.45	22.98	20.36	16.63	8.75		
29					20.44	16.46	22.26	19.64	17.19	10.02		
30		—			19.55	16.52	22.59	18.37	17.41	10.86		
31		—		—	18.90	—	23.11	18.83	—	10.66	—	
Mean					18.57	18.63	20.51	20.93	17.95	14.19		
Max					21.25	23.85	24.24	24.36	22.55	18.54		
Min					15.84	15.05	16.81	18.37	14.85	7.80		

*Incomplete record, temperature monitoring at this site is low flow season only.



Distribution and 2020

- Temperatures in 2020 were similar to those in 2019 during most of the summer.
- Temperatures in early October 2020 averaged about 4ºC higher than those in 2019.
- Mean daily temperatures exceeded 22ºC 15 and 22 times in 2019 and 2020, respectively. They exceeded 23ºC 4 and 6 times in 2019 and 2020, respectively.

Oregon water temperature standard

- Exceedances of the water temperature standard occurred in both 2019 and 2020. For both years, temperatures above the water temperature standard likely began sometime in May before monitoring had begun for the season.

TEMPERATURE STANDARD EXCEEDANCES

Year	Time Period	Days	Percent of Time Period	Notes
2019	before 5/30 - 9/19	≥125	100%	monitoring began after standard was exceeded
2020	before 5/7 – 10/13	≥137	86%	monitoring began after standard was exceeded

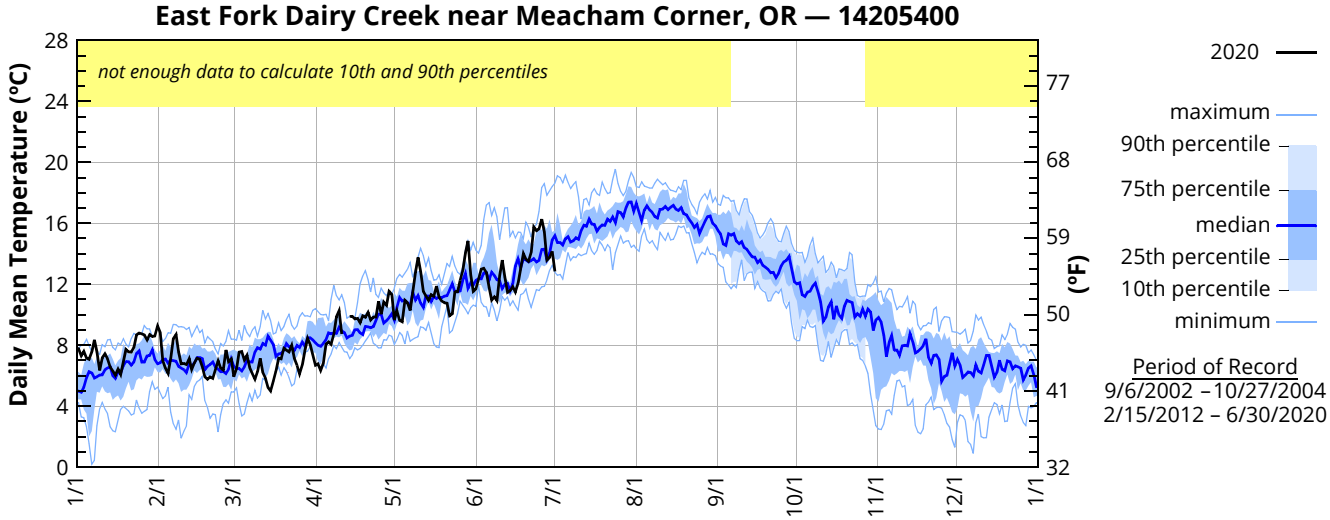
5400 – East Fork Dairy Creek near Meacham Corner, OR – 14205400

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 12.4 *Latitude:* 45 30 40 *Longitude:* 123 06 52

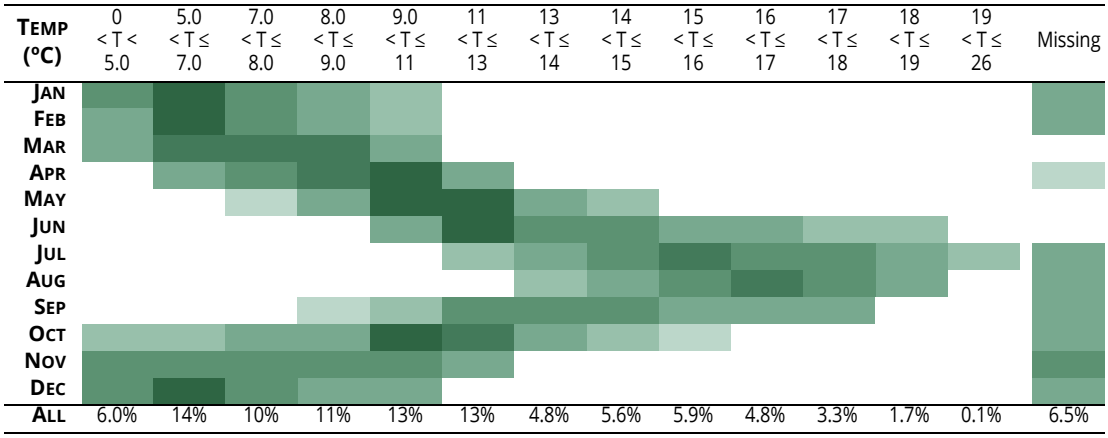
2020 — DAILY MEAN WATER TEMPERATURE (°C)† — 5400

DAY	JAN	FEB	MAR	APR*	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	7.78	8.85	5.93	6.68	9.65	11.69						
2	7.30	7.00	6.45	6.78	10.26	12.31						
3	7.60	6.48	7.55	6.34	9.63	12.98						
4	7.16	6.15	7.59	6.80	9.54	13.05						
5	7.07	7.15	7.03	8.08	10.95	12.77						
6	7.56	8.43	7.34	8.22	10.79	11.79						
7	8.34	8.70	6.55	8.05	10.28	10.96						
8	7.55	7.55	6.15	8.72	11.47	11.18						
9	6.35	6.78	5.76	9.85	12.79	10.93						
10	7.17	6.80	6.25	10.25	13.76	12.57						
11	7.43	6.73	7.14	8.73	12.85	13.58						
12	7.11	7.11	6.21		11.52	12.48						
13	6.57	6.40	5.83		11.23	11.46						
14	6.32	6.84	5.22	9.89	10.94	11.57						
15	6.03	7.15	4.99	9.90	11.31	11.84						
16	6.43	7.08	5.63	9.73	11.21	11.48						
17	6.07	6.60	6.29	9.76	11.87	12.07						
18	6.95	5.93	7.15	9.47	11.16	13.06						
19	7.72	5.76	7.09	9.93	10.90	14.02						
20	7.56	5.92	7.80	9.83	10.79	13.65						
21	7.54	5.82	7.67	10.16	10.76	13.50						
22	7.86	6.40	7.56	9.66	9.93	14.09						
23	8.67	6.98	7.99	9.86	10.05	15.77						
24	8.79	6.49	7.15	9.84	11.51	15.51						
25	8.74	6.37	6.68	10.88	11.50	15.63						
26	8.67	7.68	6.12	10.03	12.25	16.27						
27	8.34	6.92	6.70	10.83	12.87	15.43						
28	8.70	7.09	7.64	10.62	14.04	13.57						
29	8.57	6.49	8.46	11.54	14.84	13.75						
30	8.61	—	8.05	11.34	12.63	14.16						
31	9.27	—	7.37	—	11.52	—						
Mean	7.61	6.88	6.82	9.35	11.45	13.10						
Max	9.27	8.85	8.46	11.54	14.84	16.27						
Min	6.03	5.76	4.99	6.34	9.54	10.93						

†Site discontinued on July 1, 2020; *Incomplete record



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — 5400



Key

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
9/2002–10/2004
2012–2020

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — 5400

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002									13.5	9.6	7.2	6.2
2003	7.0	6.6	7.9	8.7	9.8	12.9	15.7	15.7	14.3	11.4	5.7	6.5
2004	5.7	7.0	8.4	9.5	11.2	13.6	16.8	16.7	13.9	12.1		
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012		6.1	6.6	8.8	10.3	11.8	15.0	15.9	13.6	9.7	8.1	7.2
2013	4.9	6.2	7.4	9.2	11.0	12.9	15.6	16.3	15.2	9.3	6.0	3.8
2014	4.7	6.4	7.9	9.0	11.0	12.6	16.2	17.2	14.8	12.2	7.9	7.9
2015	6.9	8.4	8.9	8.8	11.7	15.1	17.4	16.7	13.3	12.1	8.2	7.7
2016	7.4	8.1	8.4	10.0	11.7	13.6	15.1	16.6	13.5	11.0	9.8	5.8
2017	4.6	6.5	7.8	8.5	11.0	12.7	15.0	17.0	14.0	9.8	8.0	5.3
2018	7.4	5.5	6.8	8.6	11.9	12.8	17.2	16.6	13.1	10.2	6.7	6.5
2019	6.4	5.4	6.7	9.2	11.7	13.4	15.8	16.5	14.2	9.2	6.2	6.4
2020	7.6	6.8	7.0	9.8	11.2	13.0						
median	6.5	6.7	7.7	9.0	11.3	13.0	15.7	16.5	13.8	10.5	7.7	6.5

Key

T in °C

$T \leq 4.6$
$4.6 < T \leq 5.8$
$5.8 < T \leq 6.4$
$6.4 < T \leq 6.9$
$6.9 < T \leq 7.8$
$7.8 < T \leq 8.7$
$8.7 < T \leq 9.8$
$9.8 < T \leq 13.6$
$13.6 < T \leq 16.1$
$16.1 < T \leq 17.1$
$T > 17.1$

T as percentile

$T \leq$ 5th
5th $< T \leq$ 10th
10th $< T \leq$ 15th
15th $< T \leq$ 20th
20th $< T \leq$ 30th
30th $< T \leq$ 40th
40th $< T \leq$ 50th
50th $< T \leq$ 75th
75th $< T \leq$ 90th
90th $< T \leq$ 95th
$T >$ 95th

Distribution and 2020

- Temperatures in 2020 were above average during much of January.
- Temperatures in May and June were intermittently high compared to the long-term record, but overall near long-term medians for these months.
- Temperature monitoring at this site was discontinued on July 1, 2020.
- The highest temperatures generally occur in July and August.
- Temperature was not monitored at this site from November 2004 through January 2012.

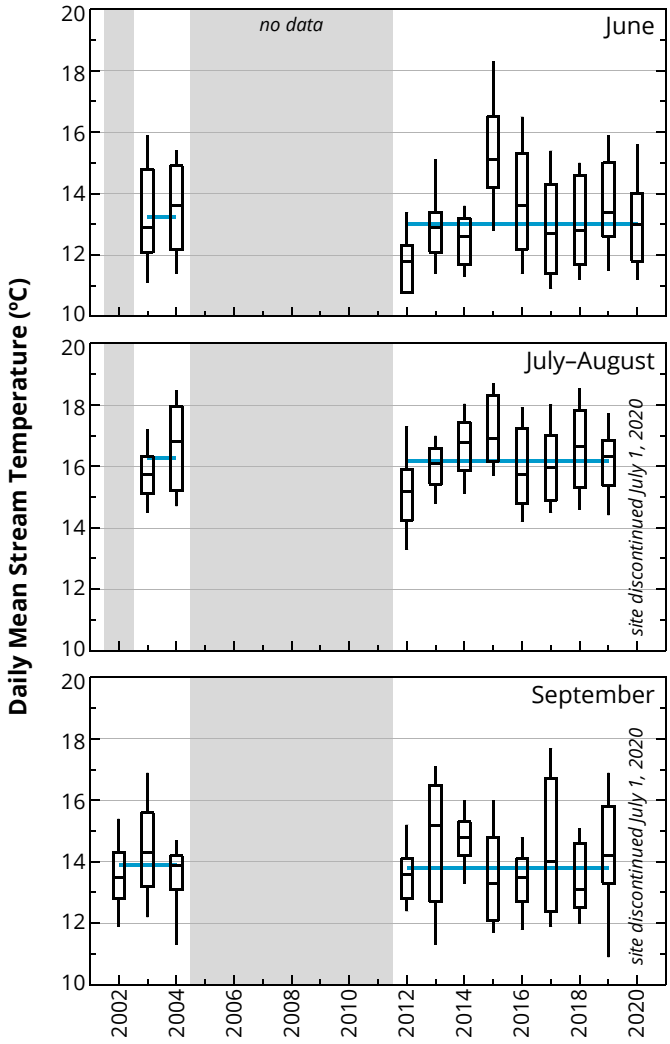
Trends

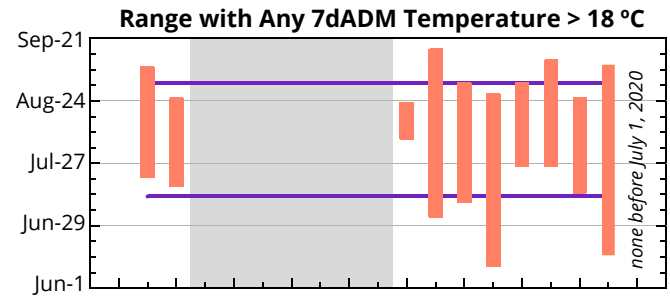
- Water temperatures in June, July–August and September do not show any statistically significant trends.
- The year-to-year variability is considerable, especially in June. Year-to-year variability is less in September than in the earlier summer months.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

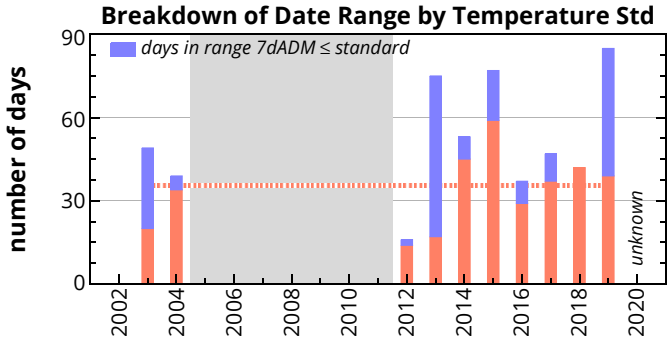
Oregon water temperature standard

- Exceedances of the water temperature standard occurred in all years for which data were available.
- Exceedances of the water temperature standard could not be assessed in 2020 because temperature monitoring was discontinued before any exceedance occurred.
- Days when the 7dADM did not exceed the standard frequently occurred within the date range of exceedances. Days that did not exceed the standard but occurred within the range when exceedances occurred varied from none (2018) to more than half the range, as in 2019.

fraction of years with any exceedance	100%
median days/year exceeding standard	34
average first day of exceedance (if it occurred)	Jul-12
average last day of exceedance (if it occurred)	Sep-1







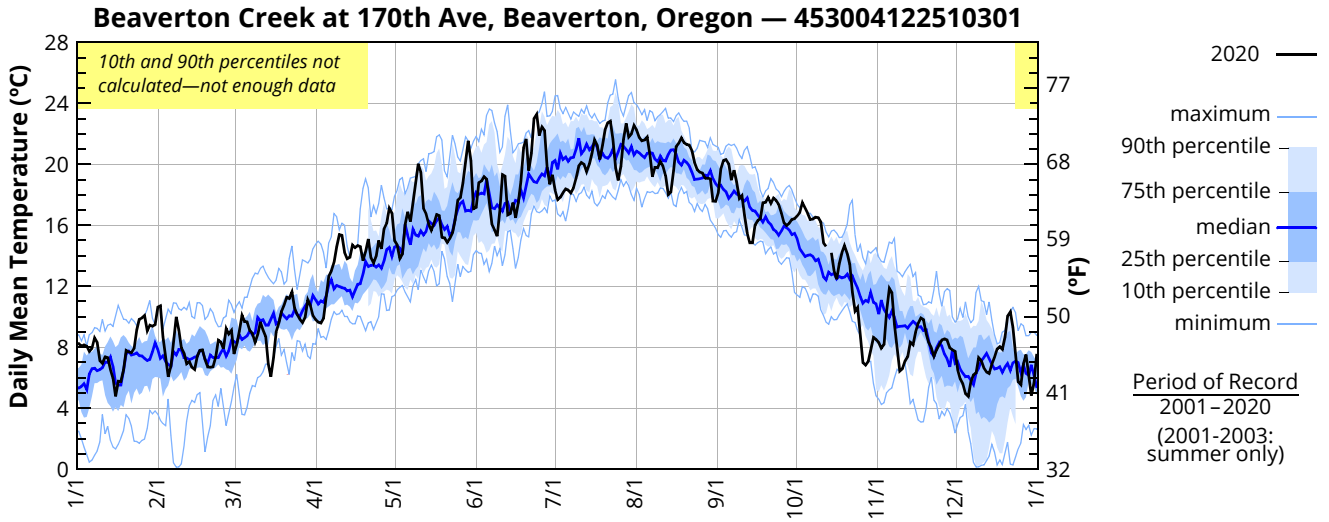
B170 – Beaverton Creek at 170th Ave, Beaverton, OR – 453004122510301

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 4.9 *Latitude:* 45 28 04 *Longitude:* 122 51 03

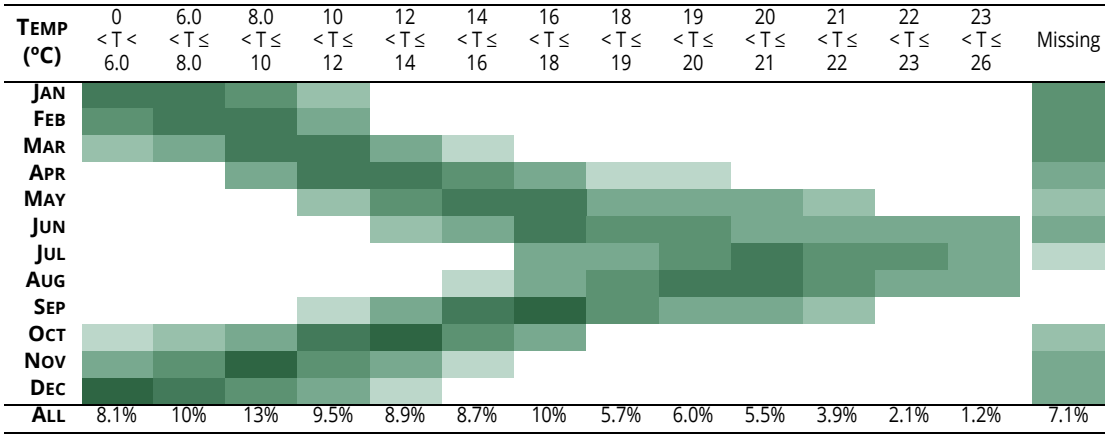
2020 — DAILY MEAN WATER TEMPERATURE (°C) — B170

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov	Dec
1	8.24	10.72	7.56	9.81	15.00	17.18	18.31	22.26	18.11	16.61	8.31	6.53
2	8.06	8.67	8.16	9.65	14.72	18.79	17.69	21.76	19.67	16.84	7.93	5.92
3	8.15	7.38	9.05	9.58	13.81	18.91	17.85	21.54	20.25	17.49	8.18	5.58
4	8.07	6.05	10.10	9.89	14.11	19.19	18.13	21.60	20.31	17.12	10.37	4.95
5	7.72	6.75	9.69	11.36	16.05	19.03	18.38	21.80	20.03	16.79	11.86	4.77
6	7.93	8.40	9.67	12.66	16.89	17.55	18.31	20.65	18.96	16.39	11.58	5.71
7	8.61	9.99	9.09	13.00	16.24	16.07	18.12	19.18	19.61	16.41	9.48	6.18
8	8.31	9.13	8.91	13.57	17.54	15.69	18.46	19.80	18.83	16.53	7.91	6.31
9	7.11	7.95	8.32	14.57	18.87	15.28	19.08	19.78	17.76	16.50	6.43	7.31
10	6.94	7.60	8.82	15.39	20.04	17.01	19.89	20.19	17.95	16.22	6.59	7.12
11	7.37	6.92	9.67	15.35	19.51	19.33	20.11	19.88	16.67	14.84	7.09	6.64
12	7.31	7.06	9.14	14.21	17.10	19.23	20.00	19.27	15.51	14.61	7.39	6.37
13	6.54	6.68	8.70	13.80	16.75	16.68	19.52	18.01	14.85		8.32	6.28
14	5.97	6.54	6.91	13.90	16.06	16.76	20.01	18.17	14.85	14.19	8.15	6.88
15	4.77	7.39	6.07	14.71	15.67	17.49	20.71	19.58	16.01	13.06	8.98	7.32
16	5.77	7.80	7.32	14.53	16.15	16.49	21.61	21.15	16.31	12.47	9.56	7.89
17	5.75	7.83	8.99	14.67	16.70	17.49	21.25	21.37	16.43	13.47	9.92	8.04
18	6.52	7.19	9.57	14.60	16.64	18.87	20.32	21.73	17.48	14.20	9.81	7.86
19	7.79	6.71	10.32	13.68	15.19	21.08	21.25	21.43	17.51	14.66	8.90	8.68
20	7.68	6.68	10.76	14.27	15.18	21.67	22.26	21.30	17.83	14.15	8.30	10.04
21	7.64	6.72	11.26	15.10	14.87	19.59	22.73	21.27	17.44	13.42	7.95	10.32
22	7.92	7.33	11.19	13.88	15.13	20.75	22.83	20.89	17.79	11.62	7.40	9.31
23	9.12	8.46	11.62	13.52	15.50	23.00	21.65	20.13	17.64	10.36	7.82	7.55
24	9.84	8.33	10.59	13.96	16.34	23.29	19.77	19.65	17.37	10.60	8.17	5.74
25	9.92	7.90	10.14	15.01	17.65	21.89	18.95	19.49	16.81	8.75	8.47	5.54
26	10.08	9.23	9.84	14.45	17.81	22.46	19.87	19.43	16.17	6.99	8.54	6.89
27	9.08	8.86	9.61	15.77	18.78	22.23	21.64	19.09	15.99	6.82	8.47	7.51
28	9.45	9.10	9.95	16.15	20.21	19.80	22.69	19.10	16.14	7.05	7.95	6.15
29	9.37	8.89	11.13	17.12	21.54	18.69	21.79	19.04	16.38	7.81	7.83	4.83
30	9.48	—	10.75	16.79	20.22	19.32	22.01	17.60	16.43	8.64	7.73	5.67
31	10.63	—	10.09	—	17.09	—	22.55	17.57	—	8.51	—	7.48
Mean	7.97	7.87	9.45	13.83	16.88	19.03	20.25	20.12	17.44	13.10	8.51	6.88
Max	10.63	10.72	11.62	17.12	21.54	23.29	22.83	22.26	20.31	17.49	11.86	10.32
Min	4.77	6.05	6.07	9.58	13.81	15.28	17.69	17.57	14.85	6.82	6.43	4.77

*Incomplete record



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — B170



Key

- $f \geq 3\%$
- $2\% \leq f < 3\%$
- $1\% \leq f < 2\%$
- $0.2\% \leq f < 1\%$
- $0.06\% \leq f < 0.2\%$
- $0 < f < 0.06\%$

Period of Record
2001–2020

(2001-2003: summer only)

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — B170

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001					17.6		20.4	20.4	17.9	12.6		
2002					15.2	18.7	21.6	19.7	17.1	12.7	9.3	
2003					14.5	20.0	21.8	20.4	17.4	14.3	7.3	
2004		8.2	11.3	13.2	16.3	19.0	22.4	22.1	17.7	14.3	9.0	6.9
2005	5.7	6.9	10.3	11.7	15.7	17.1	21.1	20.6	16.1	13.9	8.1	5.7
2006	8.3	7.3	8.7	12.6	15.8	18.3	21.6	19.5	16.4	12.3	9.4	6.3
2007	5.1	7.8	10.6	12.0	16.3	18.3	20.9	18.9	16.6	12.1	8.4	6.2
2008	5.3	7.1	8.8	10.4	14.9	16.8	19.8	19.1	16.5	11.4	9.5	5.5
2009	4.7	5.8	8.2	12.0	15.0	18.8	20.7	19.0	17.1	11.7	8.7	3.5
2010	8.1	8.9	9.9	12.4	13.9	15.5	19.7	19.2	16.6	12.2	9.5	7.6
2011	7.4	6.4	9.0	10.5	13.4	17.2	19.2	20.0	17.3	12.9	8.5	4.3
2012	6.4	7.5	8.5	12.3	15.2	17.0	20.4	20.2	16.5	12.7	9.6	7.3
2013	4.6	7.6	9.5	12.3	15.7	18.2	20.6	20.2	18.1	11.4	10.0	4.5
2014	5.5	7.1	10.2	12.5	16.8	18.3	21.8	20.8	17.8	14.7	9.8	8.3
2015	7.5	9.9	11.5	12.5	16.6	19.9	21.3	19.7	15.9	13.9	9.6	8.0
2016	8.0	9.5	10.9	14.6	16.8	18.8	19.5	19.6	16.2	13.5	11.9	5.9
2017	3.6	7.2	10.1	11.9	17.3	19.4	21.2	20.2	16.9	12.3	9.5	5.0
2018	8.1	7.1	9.6	12.6	17.8	18.6	21.1	20.2	16.0	12.5	7.9	7.4
2019	6.5	5.9	10.2	13.7	17.7	19.4	20.5	20.6	17.8	11.5	7.4	7.0
2020	7.9	7.7	9.7	14.2	16.6	19.0	20.0	19.9	17.5	14.2	8.2	6.6
median	6.8	7.5	9.7	12.4	15.9	18.3	20.8	20.0	16.9	12.8	9.0	6.6

Key

T in °C

- $T \leq 4.9$
- $4.9 < T \leq 6.3$
- $6.3 < T \leq 7.3$
- $7.3 < T \leq 8.0$
- $8.0 < T \leq 9.4$
- $9.4 < T \leq 11.3$
- $11.3 < T \leq 13.3$
- $13.3 < T \leq 18.2$
- $18.2 < T \leq 20.6$
- $20.6 < T \leq 21.6$
- $T > 21.6$

T as percentile

- $T \leq$ 5th
- 5th $< T \leq$ 10th
- 10th $< T \leq$ 15th
- 15th $< T \leq$ 20th
- 20th $< T \leq$ 30th
- 30th $< T \leq$ 40th
- 40th $< T \leq$ 50th
- 50th $< T \leq$ 75th
- 75th $< T \leq$ 90th
- 90th $< T \leq$ 95th
- $T >$ 95th

Distribution and 2020

- Temperatures were well above average during much of January and April, and early October. Record setting high mean temperatures occurred several times in each of these months (January: 7 days, April: 4 days, October: 6 days).
- Temperatures in 2020 were above average for periods in May and June. New record high daily mean temperatures were set on May 10 & 29 and June 23–24.
- The mean daily temperatures on June 23 and 24 were 23.0ºC and 23.3ºC, respectively.
- The highest temperatures during the year can occur in June, July or August.

Trends

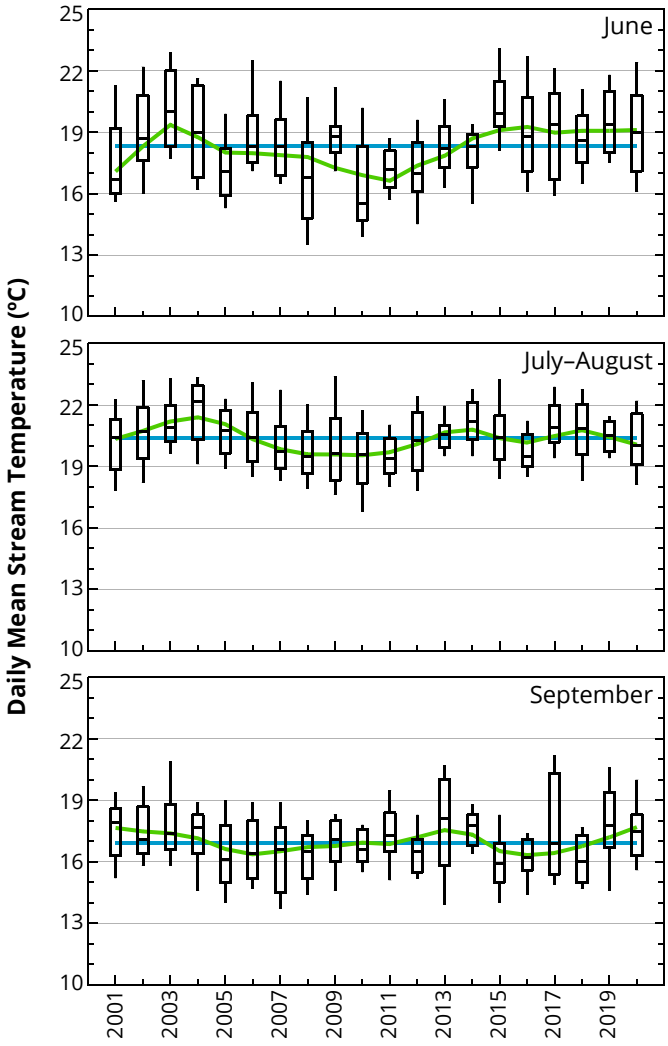
- Water temperatures in June, July–August and September do not show any statistically significant trends.
- The year-to-year variability is considerable, especially in June.
- The first day when the temperature standard is exceeded appears to be occurring earlier. The trend is statistically significant. In the past 5 years, the first day of the temperature standard exceedance was on May 10 or earlier.
- No trend was evident in number of days with temperature standard exceedances.

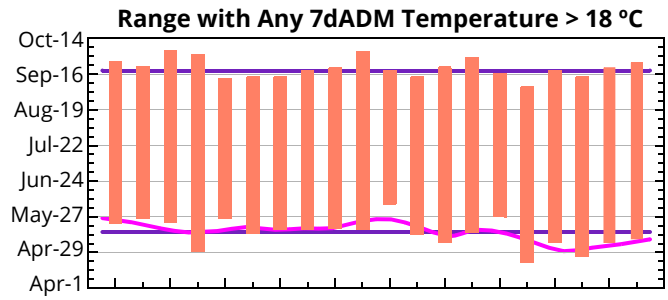
Oregon Water Temperature Standard

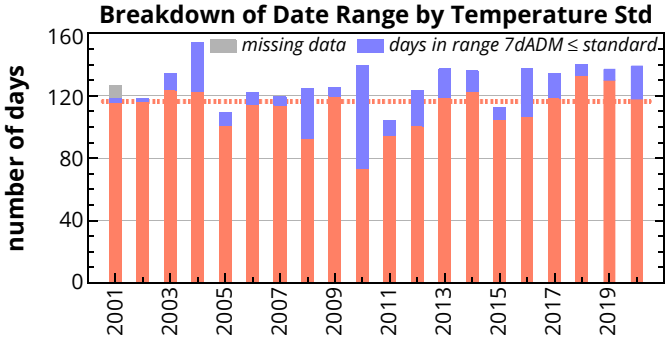
- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard always occurred within the date range of exceedances, but in most years were a minor fraction.

fraction of years with any exceedance	100%
median days/year exceeding standard	117
average first day of exceedance (if it occurred)	May-15
average last day of exceedance (if it occurred)	Sep-19

- In 2001, 7dADM could not be computed for 8 days in June because of gaps in the temperature data. Based on data from the surrounding days, most of these days likely had 7dADMs that exceeded the temperature standard.







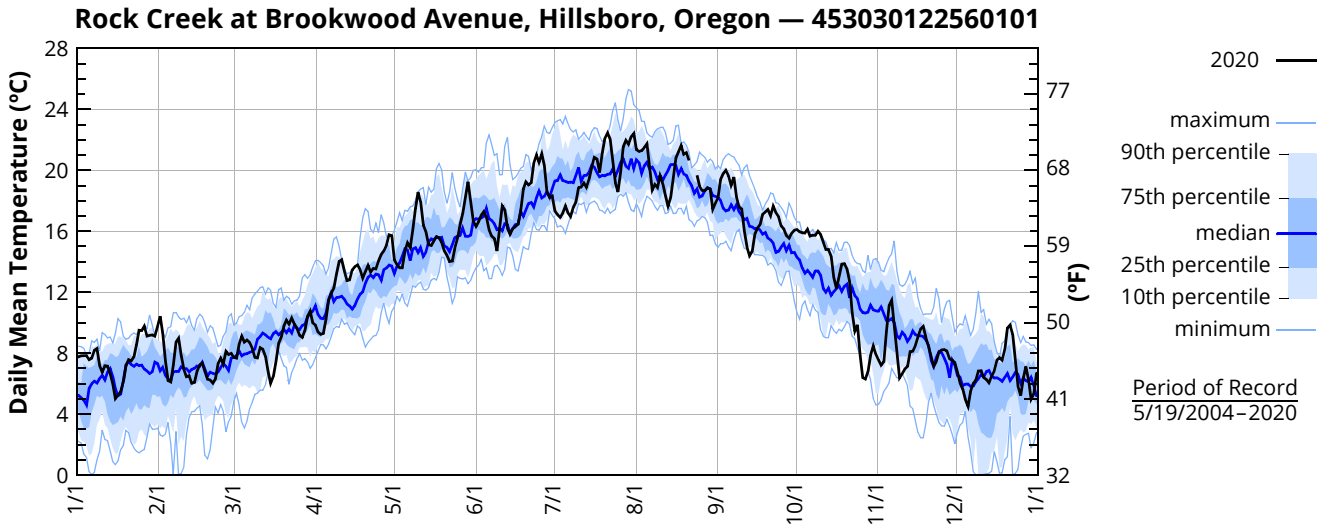
RCBR – Rock Creek at Brookwood Avenue, Hillsboro, OR – 453030122560101

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 2.4 *Latitude:* 45 30 30 *Longitude:* 122 56 01

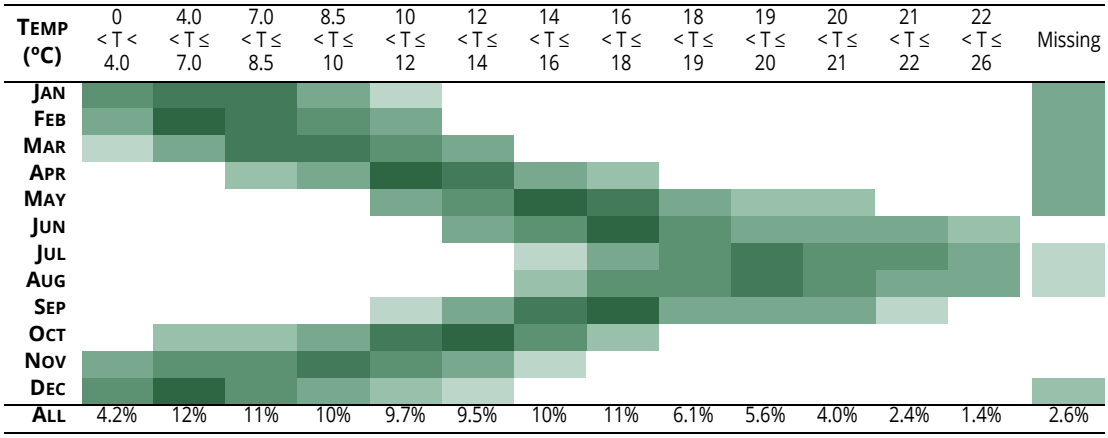
2020 — DAILY MEAN WATER TEMPERATURE (°C) — RCBR

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug*	Sep	Oct	Nov	Dec
1	7.76	10.42	7.72	9.84	14.12	16.31	17.33	21.36	18.20	16.11	7.55	6.78
2	7.83	9.30	7.67	9.39	13.81	16.62	17.10	21.24	19.39	15.97	7.21	6.05
3	7.84	7.47	8.57	9.24	13.60	17.05	16.91	21.29	19.80	15.90	7.44	5.65
4	7.84	6.21	9.12	9.29	13.60	17.29	17.19	21.50	20.01	15.88	9.41	4.97
5	7.58	6.12	8.73	10.23	14.69	16.94	17.66	21.73	19.63	16.13	11.14	4.51
6	7.68	7.21	8.87	11.45	15.24	16.09	17.22	20.11	19.01	15.68	11.47	5.50
7	8.19	8.73	8.70	11.91	14.92	15.68	16.96	18.71	19.56	15.75	9.87	6.02
8	8.30	8.98	8.33	12.27	16.08	15.53	17.57	19.08	18.29	15.74	8.05	6.23
9	7.18	7.87	7.72	13.17	17.51	14.71	17.91	18.87	17.58	16.00	6.37	6.83
10	6.76	6.95	7.68	14.01	18.57	16.21	18.89	19.66	17.47	15.80	6.65	6.85
11	7.18	6.45	8.36	14.13	17.95	17.68	18.90	19.13	16.05	15.29	6.96	6.40
12	7.16	6.53	8.27	13.38	16.42	17.42	19.17	18.36	14.98	14.81	7.13	6.27
13	6.64	6.02	7.79	12.77	15.98	16.20	18.89	17.64	14.40	14.81	8.10	6.05
14	5.98	6.08	6.81	12.82	15.12	15.81	19.43	18.19	14.71	14.36	8.13	6.49
15	5.01	6.80	6.01	13.47	15.06	16.19	20.20	19.53	15.80	12.97	8.50	6.84
16	5.26	7.23	6.47	13.68	15.37	16.29	20.85	20.81	16.21	12.24	9.06	7.54
17	5.47	7.36	7.43	13.79	15.64	16.47	20.75	21.21	16.44	13.03	9.58	7.70
18	6.12	6.82	8.64	13.49	15.58	17.31	19.86	21.63	17.12	13.85	9.75	7.53
19	7.17	6.29	9.04	12.92	15.27	18.77	21.15	21.05	17.27	13.88	9.01	8.24
20	7.57	6.24	9.78	13.35	14.72	19.24	22.10	21.16	17.43	13.52	8.48	9.66
21	7.49	6.03	10.17	13.76	14.41	19.04	22.47	20.65	17.02	12.71	7.78	9.85
22	7.76	6.32	9.91	13.32	14.02	19.18	22.07		17.66	10.66	7.14	9.25
23	8.55	7.34	10.31	13.56	14.05	20.46	20.71		17.23	9.43	7.45	7.57
24	9.51	7.68	9.93	13.53	14.90	21.01	19.18	19.67	16.97	9.85	8.08	5.84
25	9.49	7.29	9.62	14.04	15.55	20.52	18.58	18.95	16.35	7.85	8.22	5.22
26	9.78	8.12	9.17	14.48	16.46	21.08	19.94	18.68	16.17	6.40	8.24	6.33
27	9.12	7.91	9.04	14.71	17.16	20.31	21.54	18.67	15.72	6.31	8.15	7.12
28	9.17	8.00	9.48	15.10	18.21	18.60	21.97	18.85	15.55	6.78	7.63	6.25
29	9.20	8.20	10.43	15.77	19.25	18.22	21.71	18.78	15.87	7.85	7.54	4.97
30	9.12	—	10.76	15.71	17.92	18.32	22.21	17.44	16.07	8.48	7.39	5.33
31	9.76	—	9.99	—	16.68	—	22.42	17.86	—	7.93	—	6.64
Mean	7.72	7.31	8.73	12.95	15.74	17.69	19.64	19.72	17.13	12.64	8.25	6.66
Max	9.78	10.42	10.76	15.77	19.25	21.08	22.47	21.73	20.01	16.13	11.47	9.85
Min	5.01	6.02	6.01	9.24	13.60	14.71	16.91	17.44	14.40	6.31	6.37	4.51

*Incomplete record



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — RCBR



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2004–2020

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — RCBR

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2004						18.4	21.3	20.5	16.5	13.7	8.5	6.4
2005	5.4	6.1	9.8	11.3	15.3	16.4	20.0	19.8	15.1	13.4	7.6	5.7
2006	8.1	6.6	8.3	12.4	15.0	17.6	20.3	18.4	15.7	11.5	9.2	6.0
2007	4.3	7.6	9.9	11.4	14.9	16.8	19.8	18.3	16.0	11.8	8.0	6.3
2008	4.4	6.5	8.3	9.9	14.7	15.6	19.0	18.8	15.9	10.5	9.4	4.9
2009	4.3	4.8	7.9	11.6	14.6	18.0	20.4	19.0	16.6	11.4	8.6	3.2
2010	7.9	8.6	9.3	11.9	13.6	15.0	18.6	18.3	16.3	11.5	9.3	7.3
2011	7.1	6.0	8.6	10.1	12.9	16.2	18.1	18.9	16.8	12.8	8.0	3.9
2012	6.0	7.1	7.9	11.6	14.4	16.4	19.5	19.5	15.7	12.1	9.2	7.1
2013	4.0	7.0	9.2	12.1	15.0	17.4	19.5	19.9	18.1	10.6	9.6	3.9
2014	4.9	6.9	9.7	12.3	16.1	17.4	20.9	20.4	17.4	14.6	9.5	8.2
2015	7.1	9.4	11.2	12.0	15.5	19.1	21.0	19.7	15.4	13.4	9.5	7.6
2016	7.7	8.8	10.4	13.7	15.8	17.7	18.9	19.1	15.8	13.4	11.9	5.5
2017	3.0	6.8	9.7	11.3	16.0	18.2	20.0	20.0	16.3	11.7	9.1	4.7
2018	7.9	6.7	9.2	12.0	16.7	17.1	20.9	19.9	15.3	11.9	7.5	7.1
2019	6.3	5.6	9.1	12.7	16.2	17.7	19.7	19.8	17.2	10.8	6.5	6.7
2020	7.8	7.2	8.7	13.4	15.4	17.3	19.4	19.5	17.1	13.9	8.1	6.4
median	6.4	6.9	9.2	11.9	15.1	17.3	19.8	19.5	16.3	12.3	8.8	6.3

KEY

T in °C

T ≤ 4.3
4.3 < T ≤ 5.8
5.8 < T ≤ 6.7
6.7 < T ≤ 7.5
7.5 < T ≤ 8.8
8.8 < T ≤ 10.4
10.4 < T ≤ 12.4
12.4 < T ≤ 17.2
17.2 < T ≤ 19.7
19.7 < T ≤ 20.7
T > 20.7

T as percentile

T ≤ 5th
5th < T ≤ 10th
10th < T ≤ 15th
15th < T ≤ 20th
20th < T ≤ 30th
30th < T ≤ 40th
40th < T ≤ 50th
50th < T ≤ 75th
75th < T ≤ 90th
90th < T ≤ 95th
T > 95th

DISTRIBUTION AND 2019

- Although temperatures in 2020 were above average for periods in May, June and July, periods of high temperature were fleeting and overall temperatures were near long-term medians. New record high daily mean temperatures were set on May 10, June 23–24 and July 20–21.
- Temperatures were well above average during much of January and April, and early October. Record setting high mean temperatures occurred six times in each of these months.
- The highest temperatures occur in July and August.
- The lowest temperatures occur in December and January.

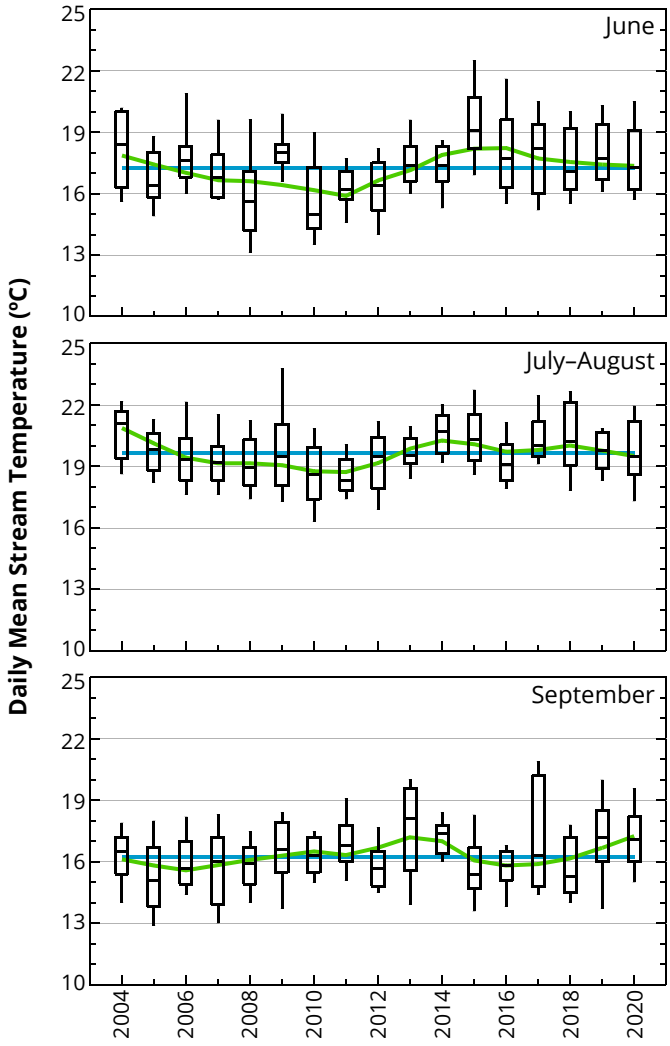
TRENDS

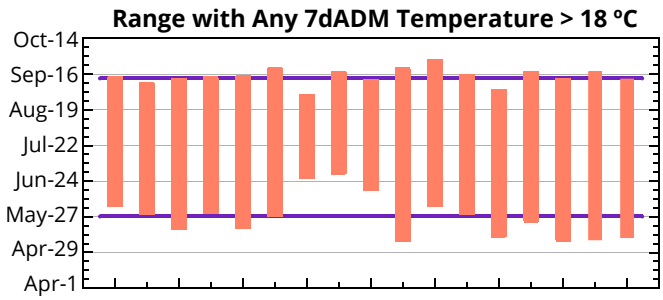
- Water temperatures in June, July–August and September do not show any statistically significant trends.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

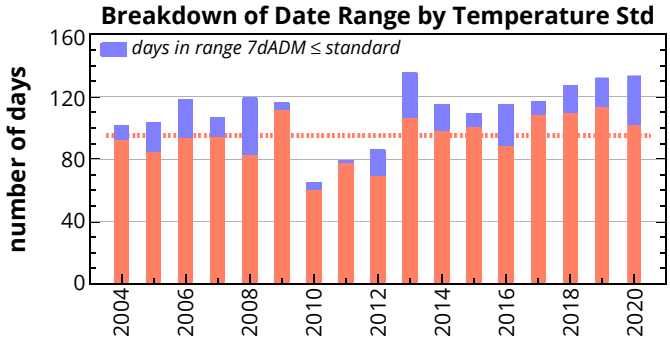
OREGON WATER TEMPERATURE STANDARD

- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard frequently occurred within the date range of exceedances, but were a minor fraction.

fraction of years with any exceedance	100%
median days/year exceeding standard	95
average first day of exceedance (if it occurred)	May-27
average last day of exceedance (if it occurred)	Sep-13





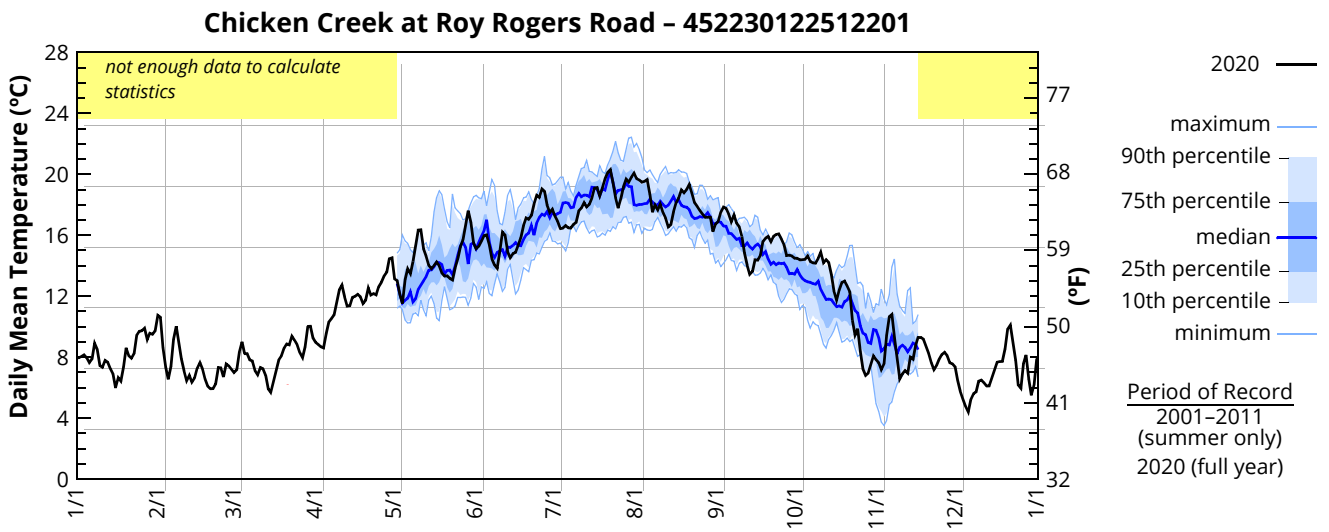


CCSR – Chicken Creek at Roy Rogers Road – 452230122512201

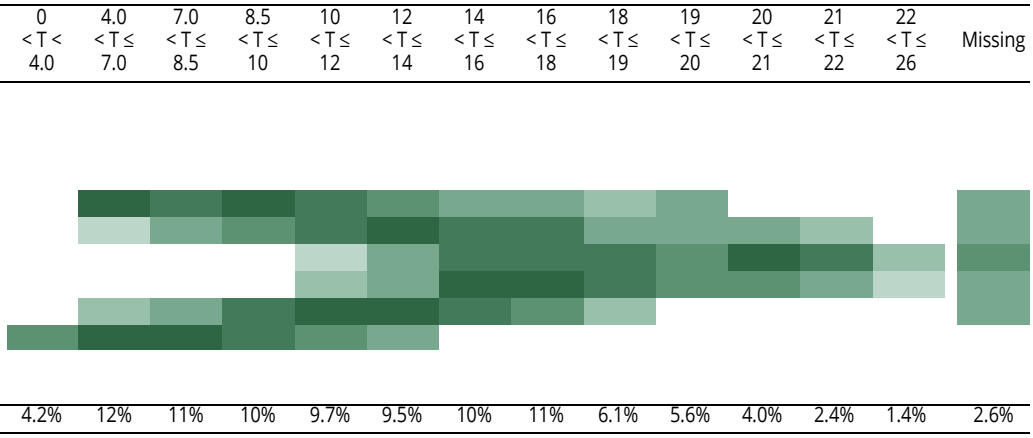
Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 2.3 *Latitude:* 45 22 30 *Longitude:* 122 51 22

2020 — DAILY MEAN WATER TEMPERATURE (°C) — CCSR

DAY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7.97	10.62	6.99	8.97	13.13	15.12	17.24	19.72	16.90	14.50	7.64	6.46
2	8.05	8.63	7.17	8.84	13.03	15.27	16.91	19.63	17.51	14.38	7.19	5.77
3	8.15	7.35	8.31	8.68	12.12	15.62	16.44	19.49	17.86	14.40	7.58	5.25
4	7.95	6.55	9.00	8.61	11.52	15.98	16.47	19.54	17.77	14.42	9.43	4.78
5	7.64	7.41	8.23	9.55	13.10	16.03	16.64	19.65	17.38	14.64	10.66	4.40
6	7.88	9.17	8.24	10.30	13.80	15.38	16.49	18.70	16.88	14.29	10.81	5.22
7	8.92	10.03	7.82	10.52	13.48	14.46	16.47	17.51	17.33	14.19	9.30	5.60
8	8.53	8.98	7.74	10.77	14.28	14.05	16.71	17.98	16.80	14.17	7.99	5.72
9	7.45	7.89	7.10	11.58	15.37	13.84	16.84	17.66	16.55	14.49	6.57	6.42
10	7.33	7.09	6.84	12.43	16.34	14.98	17.60	18.05	15.93	14.90	6.92	6.49
11	7.79	6.45	7.31	12.73	16.37	16.21	17.78	17.50	14.83	14.20	7.12	6.33
12	7.67	6.81	7.24	11.96	15.12	16.02	18.14	17.14	14.03	14.40	6.95	6.11
13	7.23	6.36	6.80	11.36	14.64	14.91	17.86	16.55	13.44	14.22	8.01	6.12
14	6.89	6.64	5.92	11.38	14.02	14.53	18.02	16.70	13.63	13.42	7.87	6.66
15	5.98	7.27	5.69	11.92	13.81	14.80	18.43	17.55	14.39	12.34	8.76	7.16
16	6.65	7.65	6.40	11.99	14.01	14.87	19.10	18.14	14.37	11.74	9.30	7.67
17	6.43	7.24	7.07	12.12	14.24	15.36	19.14	18.45	14.68	12.40	9.30	7.71
18	7.38	6.58	7.83	11.98	14.00	15.84	18.58	18.98	15.59	12.90	9.18	7.72
19	8.62	6.10	8.08	11.52	13.52	16.65	19.13	18.79	15.81	12.99	8.69	8.55
20	8.09	5.93	8.59	11.74	13.32	17.14	19.71	19.01	15.93	12.66	8.25	9.83
21	7.93	5.94	8.87	12.54	13.34	17.05	20.12	19.34	15.58	12.29	7.63	10.11
22	8.25	6.24	8.80	12.08	13.17	17.30	20.30	18.76	15.92	10.43	7.18	8.98
23	9.44	7.32	9.38	12.18	13.07	18.04	19.49	18.15	16.05	9.45	7.45	7.81
24	9.70	7.30	9.12	12.09	13.84	18.62	18.46	17.90	16.09	9.87	7.88	6.18
25	9.74	6.70	8.81	12.63	14.44	18.49	17.78	17.64	15.75	8.36	8.17	5.96
26	9.90	7.56	8.30	12.92	15.23	19.04	18.41	17.41	15.38	7.24	8.32	7.58
27	9.15	7.43	7.96	13.31	15.68	18.89	19.18	17.18	14.68	6.81	8.11	8.14
28	9.57	7.20	8.68	13.57	16.71	17.98	19.68	17.19	14.70	6.96	7.63	6.58
29	9.50	7.57	10.02	14.45	17.62	17.49	19.49	17.20	14.64	7.51	7.57	5.50
30	9.72	—	10.03	14.52	16.83	17.71	19.82	16.24	14.50	8.08	7.37	6.15
31	10.75	—	9.27	—	15.52	—	20.08	16.75	—	7.84	—	7.83
Mean	8.27	7.38	7.99	11.64	14.34	16.26	18.27	18.08	15.70	11.95	8.16	6.80
Max	10.75	10.62	10.03	14.52	17.62	19.04	20.30	19.72	17.86	14.90	10.81	10.11
Min	5.98	5.93	5.69	8.61	11.52	13.84	16.44	16.24	13.44	6.81	6.57	4.40



FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — CCSR



Key

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2001–2011, 2020
(May–Oct only)

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — CCSR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001					15.4	15.5	18.1	17.9	15.4	10.7		
2002					13.5	17.0	19.2	17.5	14.5	10.9	8.2	5.8
2003					12.7	16.7	19.0	18.4	15.4	13.1	6.6	7.8
2004	6.2				14.4	17.2	20.0	19.4	15.5	12.9	8.3	
2005				11.8	14.6	15.5	19.3	18.9	14.4	12.7	9.2	
2006					14.0	16.4	19.1	17.5	14.2	10.5	9.7	
2007					13.7	15.4	18.5	17.0	14.8	11.3		
2008				9.3	13.8	14.8	18.0	17.4	14.8	10.4	8.7	
2009					13.5	16.9	18.9	17.8	15.4	10.7	8.4	
2010				11.2	12.5	13.8	17.5	17.5	15.0	10.8	9.1	
2011				9.7	11.9	14.6	16.6	17.6	15.7	12.3	8.0	
2012												
2013												
2014												
2015												
2016												
2017												
2018												
2019												6.8
2020	8.1	7.3	8.1	12.0	14.0	16.0	18.4	18.0	15.8	12.9	7.9	6.5
median	7.6	7.3	8.1	11.0	13.6	16.0	18.5	17.8	15.1	11.7	8.3	6.9

Key

T in °C

T ≤ 6.7
6.7 < T ≤ 7.9
7.9 < T ≤ 8.7
8.7 < T ≤ 9.8
9.8 < T ≤ 11.7
11.7 < T ≤ 13.1
13.1 < T ≤ 14.4
14.4 < T ≤ 17.1
17.1 < T ≤ 18.7
18.7 < T ≤ 19.5
T > 19.5

T as percentile

T ≤ 5th
5th < T ≤ 10th
10th < T ≤ 15th
15th < T ≤ 20th
20th < T ≤ 30th
30th < T ≤ 40th
40th < T ≤ 50th
50th < T ≤ 75th
75th < T ≤ 90th
90th < T ≤ 95th
T > 95th

Distribution and 2020

- Temperatures in 2020 from May through September were similar to those in 2001–2011.
- Temperatures from mid-September through mid-October were higher than those measured in 2001—2011.
- The highest temperatures occur in July and August.

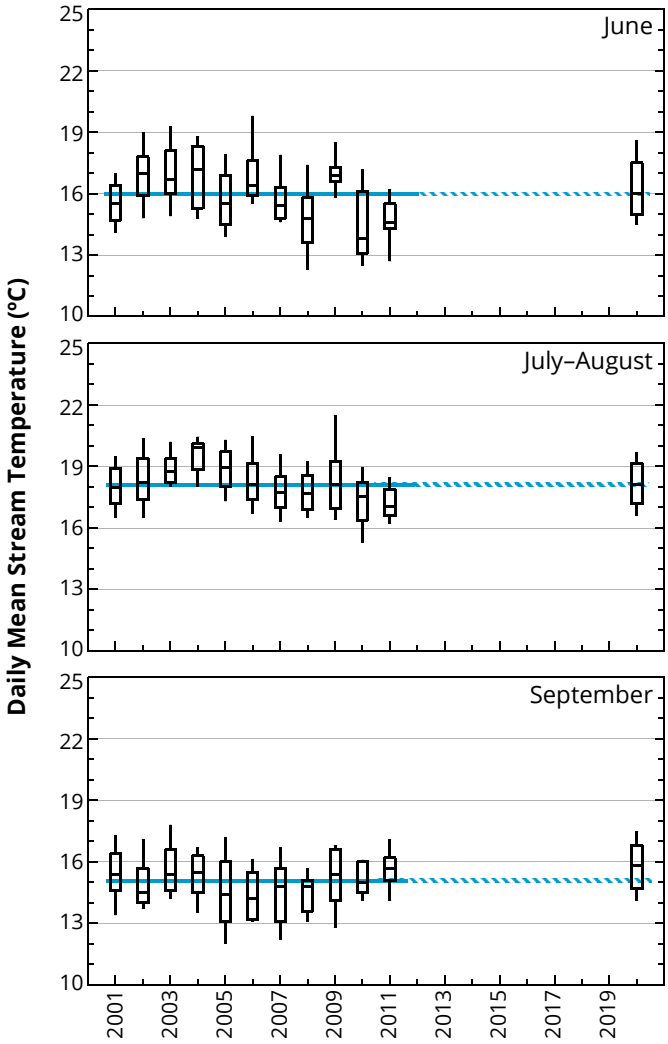
Trends

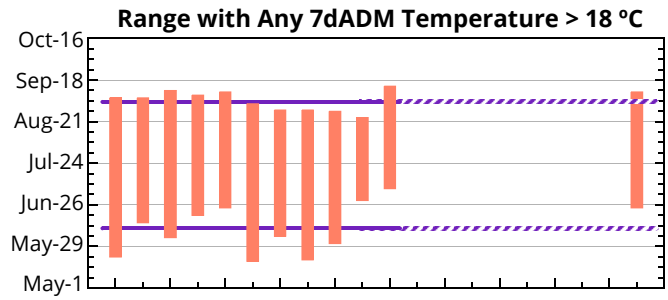
- Water temperatures in June, July–August and September do not show any statistically significant trends.
- No trend was evident in the timing of or number of days with temperature standard exceedances.

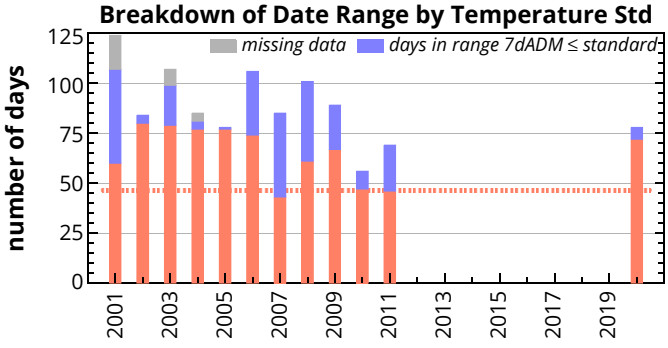
Oregon water temperature standard

- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard frequently occurred within the date range of exceedances, and varied from a few days to more than half of the range.

fraction of years with any exceedance	100%
median days/year exceeding standard	47
average first day of exceedance (if it occurred)	Jun-10
average last day of exceedance (if it occurred)	Sep-3





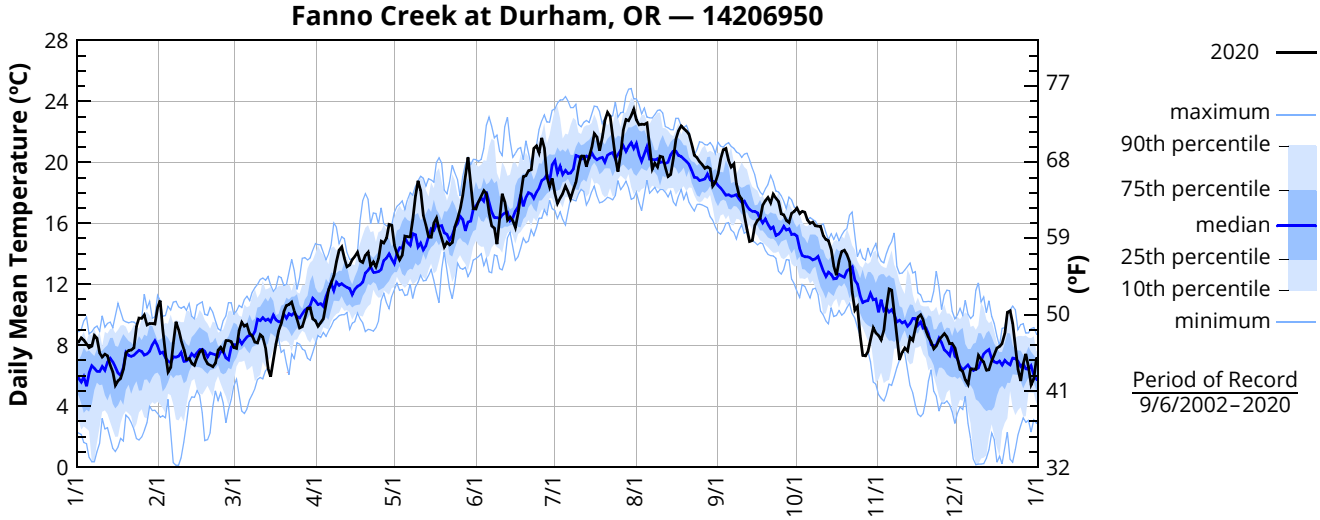


FANO – FANNO CREEK AT DURHAM, OR – 14206950

Data source: U.S. Geological Survey, Oregon Water Science Center
River mile: 1.2 *Latitude:* 45 24 13 *Longitude:* 122 45 13

2020 — DAILY MEAN WATER TEMPERATURE (°C) — FANO

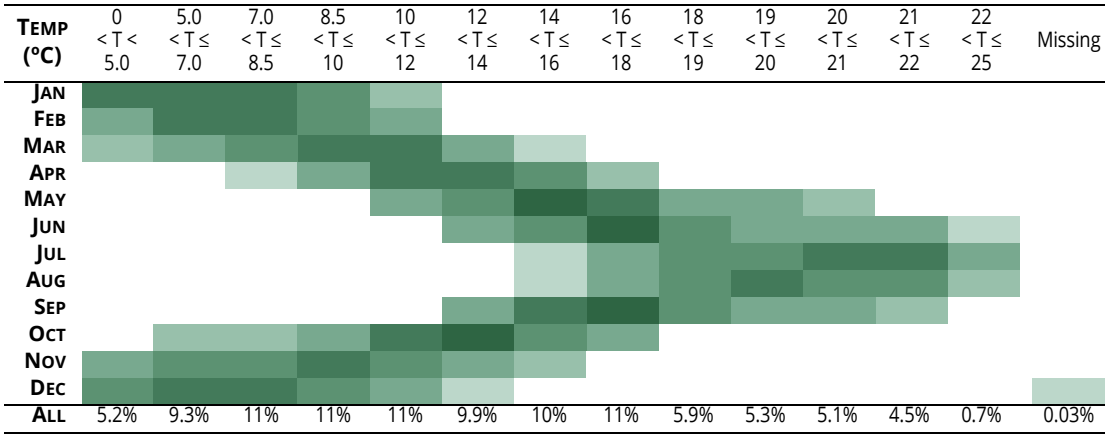
DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8.21	10.93	7.85	9.60	14.58	16.94	17.96	22.78	19.22	17.00	8.64	7.12
2	8.48	9.03	7.79	9.24	14.02	17.43	17.30	22.46	20.19	16.64	8.34	6.41
3	8.33	7.43	8.96	9.48	13.60	17.81	17.67	22.51	20.83	16.79	8.96	6.29
4	8.09	6.24	9.51	9.72	13.90	18.15	17.95	22.49	20.91	16.72	10.48	5.74
5	7.84	6.55	9.25	10.68	15.16	17.94	18.43	22.58	20.14	16.22	11.68	5.44
6	7.93	8.12	9.35	11.63	15.13	16.68	18.08	21.05	19.70	16.00	11.61	6.45
7	8.64	9.54	8.76	12.06	15.11	15.83	17.62	19.56	19.91	16.08	10.05	6.44
8	8.46	9.04	8.63	12.55	16.24	15.68	18.19	19.94	18.58	15.84	8.41	6.42
9	7.49	8.32	8.20	13.48	17.80	14.63	18.68	19.70	17.82	15.81	7.03	7.35
10	7.22	7.74	8.14	14.25	18.79	16.23	19.70	20.40	17.61	15.81	7.53	7.07
11	7.41	7.05	8.69	14.45	18.18	17.94	20.42	20.35	16.54	15.19	7.82	6.91
12	7.30	7.14	8.54	13.70	16.52	17.43	20.41	19.67	15.60	14.94	7.62	6.36
13	6.69	6.81	7.84	13.14	15.89	16.21	19.72	19.06	14.80	14.86	8.51	6.39
14	6.25	6.67	6.50	13.26	15.10	16.41	20.36	19.19	14.86	14.30	8.31	6.97
15	5.37	7.16	5.94	13.63	15.09	16.18	20.96	20.26	15.86	13.22	9.10	7.37
16	5.68	7.56	7.07	13.82	16.02	15.73	21.89	21.51	16.20	12.60	9.82	7.82
17	5.81	7.68	8.07	14.11	16.35	16.66	21.66	22.07	16.31	13.53	9.99	7.91
18	6.39	7.12	8.93	13.53	15.61	17.76	20.78	22.39	17.17	14.15	9.66	8.11
19	7.50	6.78	9.39	13.43	15.03	19.06	21.64	22.22	17.49	14.23	8.95	8.76
20	7.66	6.69	10.20	13.90	14.44	19.12	22.72	22.06	17.70	13.94	8.52	10.16
21	7.68	6.58	10.61	14.11	14.76	19.45	23.29	21.85	17.33	13.48	8.21	10.25
22	7.83	6.81	10.66	13.19	14.59	19.51	23.03	21.20	17.92	11.50	7.77	9.43
23	9.23	7.68	10.83	13.46	14.74	20.90	21.79	20.46	17.65	10.29	7.96	7.95
24	9.78	7.87	10.26	13.13	15.77	21.08	20.29	20.31	17.44	10.53	8.33	6.42
25	9.76	7.60	9.72	13.68	16.29	20.63	19.39	20.04	16.62	8.64	8.55	5.66
26	9.98	8.30	9.13	14.82	16.91	21.61	20.58	19.86	16.56	7.34	8.76	6.77
27	9.33	8.30	9.21	14.71	17.82	20.97	22.09	19.61	16.19	7.30	8.55	7.43
28	9.43	8.24	9.76	15.02	19.12	19.06	22.80	19.71	16.05	7.59	8.10	6.54
29	9.42	8.44	10.42	15.92	20.32	18.38	22.73	19.59	16.66	8.38	8.12	5.39
30	9.39	—	10.45	15.87	18.46	18.95	23.07	18.44	16.78	9.14	7.84	5.79
31	10.46	—	9.73	—	16.96	—	23.47	18.69	—	8.81	—	7.11
Mean	8.03	7.70	8.98	13.12	16.07	18.01	20.47	20.71	17.55	13.12	8.77	7.10
Max	10.46	10.93	10.83	15.92	20.32	21.61	23.47	22.78	20.91	17.00	11.68	10.25
Min	5.37	6.24	5.94	9.24	13.60	14.63	17.30	18.44	14.80	7.30	7.03	5.39



FANO – FANNO CREEK AT DURHAM, OR – 14206950

Data source: U.S. Geological Survey, Oregon Water Science Center

FREQUENCY OF DAILY MEAN TEMPERATURE BY MONTH — FANO



KEY

$f \geq 3\%$
$2\% \leq f < 3\%$
$1\% \leq f < 2\%$
$0.2\% \leq f < 1\%$
$0.06\% \leq f < 0.2\%$
$0 < f < 0.06\%$

Period of Record
2003–2020

MEDIAN OF DAILY MEAN TEMPERATURE BY MONTH AND YEAR — FANO

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2002									15.7	12.0	9.1	7.1
2003	7.8	7.8	10.0	11.9	14.0	17.8	20.3	19.5	16.5	14.1	7.1	7.6
2004	6.3	7.9	11.0	12.5	15.5	18.1	21.1	20.8	16.7	13.8	9.0	6.9
2005	5.6	6.7	10.0	11.5	15.4	16.3	20.0	19.7	15.6	13.7	8.0	5.9
2006	8.3	7.0	8.6	12.3	15.1	17.4	20.3	18.6	15.8	11.8	9.6	6.4
2007	5.0	7.6	10.3	11.6	14.8	16.9	20.0	18.6	16.6	12.1	8.8	6.6
2008	5.6	7.2	8.5	9.8	14.5	15.8	19.4	18.9	16.1	11.2	9.9	5.6
2009	4.9	5.8	8.0	11.7	14.9	18.0	20.8	19.1	17.0	11.8	8.9	4.1
2010	8.1	8.8	9.7	12.0	13.7	15.0	19.1	19.0	16.4	12.1	9.6	7.4
2011	7.6	6.2	8.8	10.4	13.1	16.2	18.1	19.5	17.1	13.2	8.6	4.5
2012	6.6	7.5	8.2	12.2	14.8	16.6	19.7	19.6	16.4	12.6	9.8	7.4
2013	4.2	7.5	9.4	12.3	15.2	17.8	20.0	20.3	18.2	11.4	9.9	4.9
2014	5.8	7.0	10.0	12.6	16.5	17.7	21.4	21.0	17.9	14.7	9.8	8.2
2015	7.4	9.8	11.7	12.5	15.7	20.0	21.8	20.4	16.2	14.2	9.6	8.0
2016	7.9	9.4	10.6	14.1	16.2	18.4	19.3	20.3	16.6	13.5	11.9	6.0
2017	3.2	7.0	9.9	11.6	15.9	18.4	20.5	20.5	17.0	12.4	9.6	5.4
2018	8.1	7.1	9.3	12.1	17.0	17.9	21.7	20.8	16.0	12.6	8.5	7.6
2019	6.6	6.0	9.6	13.1	16.5	18.8	20.8	20.6	17.6	11.5	7.9	7.1
2020	7.9	7.6	9.1	13.5	15.8	17.9	20.4	20.4	17.4	14.2	8.5	6.9
median	6.8	7.4	9.6	12.1	15.3	17.6	20.3	19.9	16.6	12.8	9.1	6.8

KEY

T in °C

$T \leq 4.9$
$4.9 < T \leq 6.2$
$6.2 < T \leq 7.1$
$7.1 < T \leq 7.8$
$7.8 < T \leq 9.1$
$9.1 < T \leq 10.5$
$10.5 < T \leq 12.5$
$12.5 < T \leq 17.4$
$17.4 < T \leq 20.0$
$20.0 < T \leq 21.0$
$T > 21.0$

T as percentile

$T \leq 5$th
5th $< T \leq$ 10th
10th $< T \leq$ 15th
15th $< T \leq$ 20th
20th $< T \leq$ 30th
30th $< T \leq$ 40th
40th $< T \leq$ 50th
50th $< T \leq$ 75th
75th $< T \leq$ 90th
90th $< T \leq$ 95th
$T >$ 95th

Distribution and 2020

- Although temperatures in 2020 were above average for periods in May–August, periods of high temperature were fleeting and overall temperatures were near long-term medians. New record high daily mean temperatures were set twice in each of these months.
- Temperatures were above average during much of January and April, and early October 2020. Record setting high mean temperatures occurred several times in each of these months (January: 2 days, April: 5 days, October: 6 days.

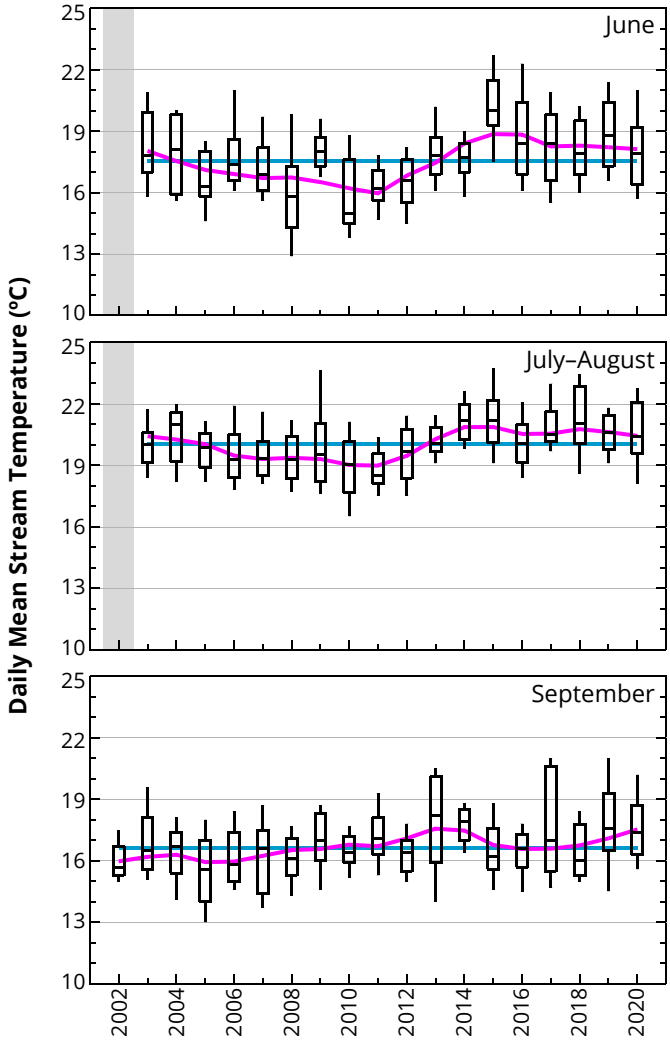
Trends

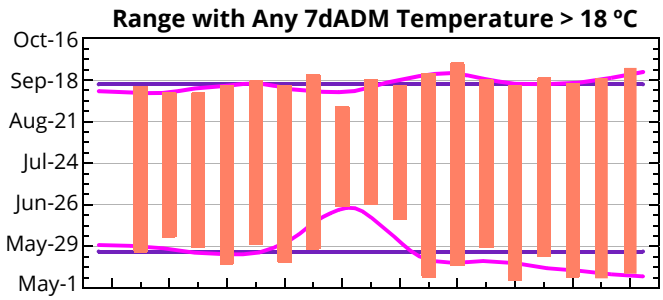
- Water temperatures in June, July–August and September all show an increasing trend, especially comparing 2013-onward with previous years. The period of record is relatively short. More years will be required to know if this trend persists or if it is part of a cyclical pattern.
- Both the timing of and number of days with temperature standard exceedances show statistically significant trends, but whether they will persist is unknown.
- Since 2013, the first day of temperature standard exceedance was earlier than the long-term average (7 of 8 years). Before 2013, the first day of standard exceedance occurred earlier than the long-term average in only 2 of 11 years. Similar comparisons can be made for the last day.
- The number of days when the temperature standard is exceeded also increased. In every year since 2013 the temperature standard was exceeded on at least 105 days. From 2003 to 2012, the standard was exceeded on more than 100 days only twice (107 days in 2003 and 114 days in 2009).

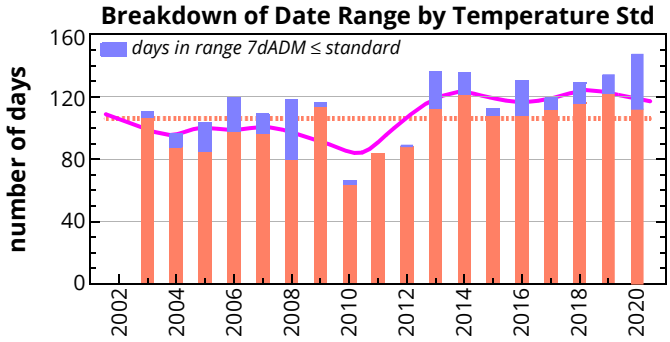
Oregon water temperature standard

- Exceedances of the water temperature standard occurred in all years.
- Days when the 7dADM did not exceed the standard frequently occurred within the date range of exceedances, but were a minor fraction.

fraction of years with any exceedance	100%
median days/year exceeding standard	106
average first day of exceedance (if it occurred)	May-25
average last day of exceedance (if it occurred)	Sep-15







DATA SOURCES

Data for the statistical distributions were obtained from the USGS database and from previous Tualatin River Flow Management Reports. For some sites, the data were collected by different organizations over the period of record; it is not known if these data are fully comparable with one another.

DATA SOURCES

SITE ID	SITE NAME	START DATE	SOURCES OF DATA FOR DISTRIBUTION
Mainstem Tualatin River and Scoggins Creek sites			
14202980	Scoggins Creek below Henry Hagg Lake near Gaston, Oregon	4/30/2002	USGS database: all (data collected by USGS)
14203500	Tualatin River at Dilley, Oregon	5/16/1997	USGS database: 2016–present; previous Flow Reports: 1997–2000 (data collected by OWRD) Flow Report source files 2001–2013 (Bernie Bonn) (data collected by: OWRD 2001–2007, consultant 2008–2011)
14206241	Tualatin River at Hwy 219 Bridge	10/15/2004	Stewart Rounds, USGS pers. comm.: all (data collected by: Jackson Bottom Wetland Education Center)
14206694	Tualatin River at RM 24.5 near Scholls, Oregon	5/31/1997	USGS database: all (data collected by USGS; no data collection in winter)
14207200	Tualatin River at Oswego Dam near West Linn, Oregon	5/7/1991	USGS database: all (data collected by USGS)
Tributary sites			
14202650	Wapato Creek at Gaston Road at Gaston, Oregon	4/12/2010	USGS database: all (data collected by USGS)
453040123065201 OWRD#: 14204530	Gales Creek at Old Hwy 47 near Forest Grove, Oregon	5/9/2001	USGS database: all (data collected by USGS)
4530161230525400	Fernhill Wetlands Outfall	5/30/2019	USGS database: all (data collected by USGS)
14205400	East Fork Dairy Creek near Meacham Corner, OR	9/6/2002	USGS database: all (data collected by USGS) (no data from 10/28/2004–2/15/2012)
453004122510301	Beaverton Creek at 170th, Beaverton, Oregon	5/11/2001	USGS database: all (data collected by: USGS 2001–WY2015, CWS WY2016–present)
453030122560101	Rock Creek at Brookwood Ave, Hillsboro, Oregon	5/19/2004	USGS database: all (data collected by USGS)
4522301225012201	Chicken Creek at Roy Rogers Road	5/11/2001	USGS database: all (data collected by USGS) (no data from 12/13/2011–12/2/2019)
14206950	Fanno Creek at Durham Road near Tigard, Oregon	9/6/2002	USGS database: all (data collected by USGS)

Abbreviations: CWS=Clean Water Services; OWRD=Oregon Water Resources Department; USGS=United States Geological Survey; WY=water year

this page intentionally blank

APPENDIX G
PRECIPITATION

SCOPE

This appendix shows precipitation data for selected sites the Tualatin River Basin. Because relatively few active precipitation monitoring stations with an adequate period of record are located in the basin, three sites are located just outside the basin boundaries. Precipitation may be monitored at other sites in the basin that are not included in the Appendix. Streamflow measurements are in Appendix A.

2020 HIGHLIGHTS

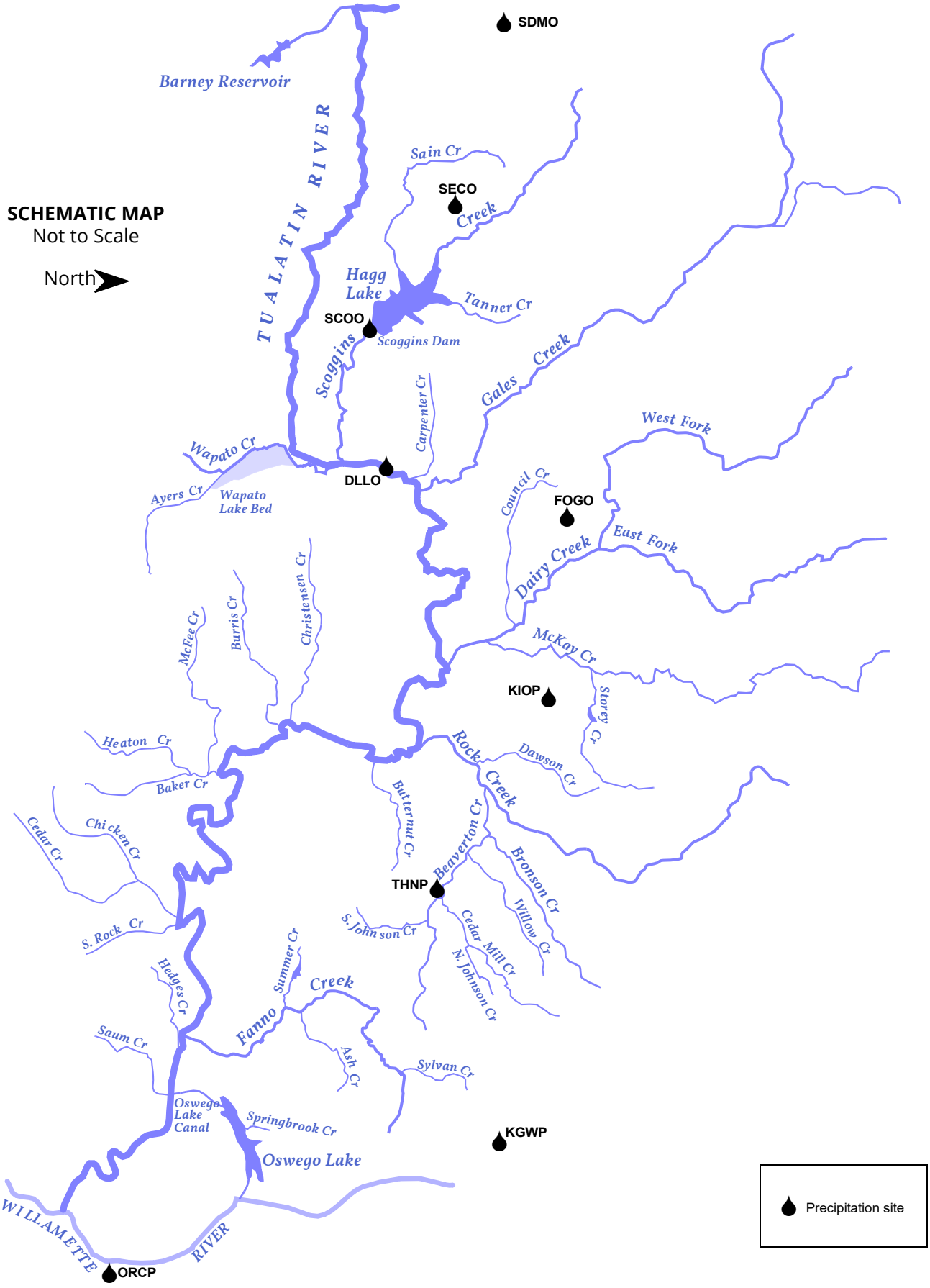
- The beginning of water year 2020 was dry. November 2019 set records for low rainfall, even at the Dilley precipitation site which has records dating back to 1944.
- January 2020 was wet, with light to medium rainfall on most days in the month. Particularly heavy rainfall occurred near the end of the month with more than 2 inches of rainfall over 2-3 days.
- February through April were on the dry side, April particularly so. The low spring rainfall delayed the filling of Hagg Lake which led to unusually low flows in the upper Tualatin River during much of the spring.
- June was wetter than average. July–August were typical to slightly dry, but typical is only a few hundreths of an inch of rain.
- Although September was wetter than average, almost all of the rain fell on a few days between the 17th and 26th.
- Rainfall in the first three months of water year 2021 was typical of the period of record.

COMPARISON OF 2020 WITH PERIOD OF RECORD BY MONTH

Precipitation Sites	First Record	Water Year 2020												WY 2021		
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
South Saddle Mountain	Oct-1980		R													
Sain Creek	Oct-1981		R					R								
Scoggins Ck below Hagg Lake	Dec-1970		R													
Tualatin River at Dilley	Dec-1944		R													
Forest Grove Agrimet	Oct-1992		R					R								
Hillsboro Airport	Nov-1999		R					R								
Tualatin Nature Park	Oct-2008		R			R		R	no data May– Nov 2020							
KGW-TV	Aug-1973															
Oregon City	Feb-1948															

R Record for month was set or tied
<10th percentile for month
10th – <25th percentile
25th – 75th percentile
>75th – 90th percentile
>90th percentile

SELECTED PRECIPITATION MONITORING SITES



SELECTED PRECIPITATION MONITORING SITES — ALPHABETICAL LISTING BY SITE CODE

SITE CODE	SITE NAME	ELEVATION (FT)	PAGE
DLLO	Dilley Precipitation Station (COOP ID#352325)	170	G-10
FOGO	Forest Grove, Oregon AgriMet Weather Station (Verboort)	180	G13
KHIO	Hillsboro Airport Weather Station (WBAN ID#94261)	204	G-15
KGWP	*KGW-TV Weather Station – Portland (COOP ID#356749)	159	G-19
ORCP	*Oregon City (COOP ID#356334)	167	G-21
SCOO	Scoggins Creek below Henry Hagg Lake	215	G-8
SDMO	*South Saddle Mountain Precipitation Station (SNOTEL #726)	3250	G-4
SECO	Sain Creek Precipitation Station (SNOTEL #743)	2000	G-6
THNP	Tualatin Hills Nature Park (COOP ID#355945)	185	G-17

*Stations that are not within the Tualatin Basin boundary.

SITES OUTSIDE OF TUALATIN BASIN

- South Saddle Mountain is located in the Coast Range and indicative of conditions in the headwaters and Barney Reservoir area. Because this site is at a higher elevation and on the western side of the Coast Range divide, it will receive greater rainfall than most areas in the basin.
- KGW-TV is located in downtown Portland and indicative of conditions in the northeastern part of the basin. Because this site is in the rain shadow of the Tualatin Mountains (east side), it likely receives less rain than locations in the basin which are on the west side.
- Oregon City is directly across the Willamette River from West Linn. This site is representative of the far southeastern part of the basin.

EXPLANATION OF FIGURES AND TABLES IN THIS APPENDIX

One table and two graphs are included for every site. Water year, rather than calendar year, is used for precipitation data.

Page 1 (-2) –historical record: Tabled data for precipitation by month and year for the period of record.

- The monthly total was not reported if more than 3 days of data were missing.
- Data for October–December of the next water year are included to provide compatibility with the other parts of the flow report that use calendar year. This row is shaded in gray and these data were not used to compute any statistics in this appendix.
- A statistical summary for each month is at the bottom of the table. Data in the gray shaded row were not used to compute these statistics.
- In some cases this table continues on a second page.

Page 2 (3) –graphical summary: Two graphs showing the distribution of precipitation by month and year:

- *A graph of expanded boxplots of monthly total precipitation* for the period of record is at the top of the page. An explanation of the features of this graph is shown next to the graph on the right side.
- *A graph of total precipitation for each water year* for the period of record is at the bottom of the page.
  - —Bars shown in blue have up to 3 days of missing data per month.
  - —Gray bars have more than 3 days of missing data in at least one month and up to 36 days in a year.
  - —The extent to which the gray bars underestimate the total annual precipitation is unknown. If the missing data occurred during the rainy season, the bar could be significantly less than the true total. If the missing data occurred during the dry months (July–August), the bar is likely a close estimate of the total.

SDMO – South Saddle Mountain Precipitation Station

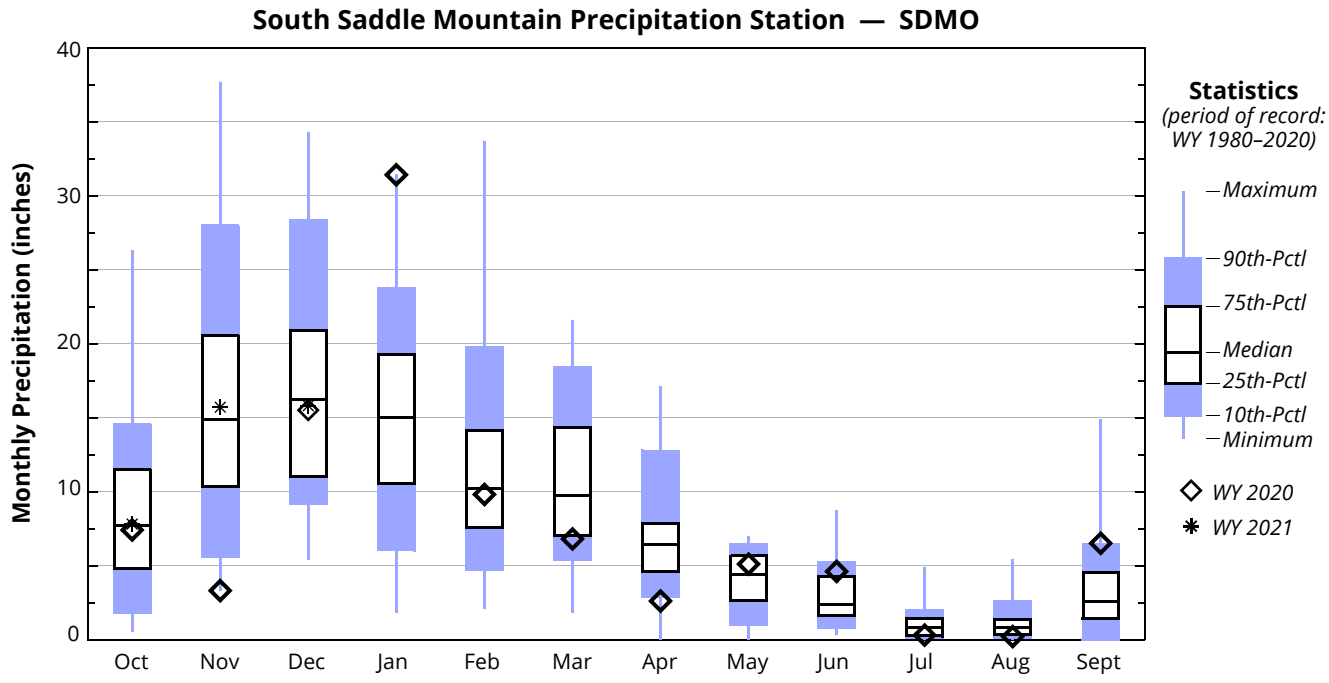
Data source: Natural Resources Conservation Service (SNOTEL #726)
https://wcc.sc.egov.usda.gov/nwcc/rgrpt?report=precsnotelmon&state=OR

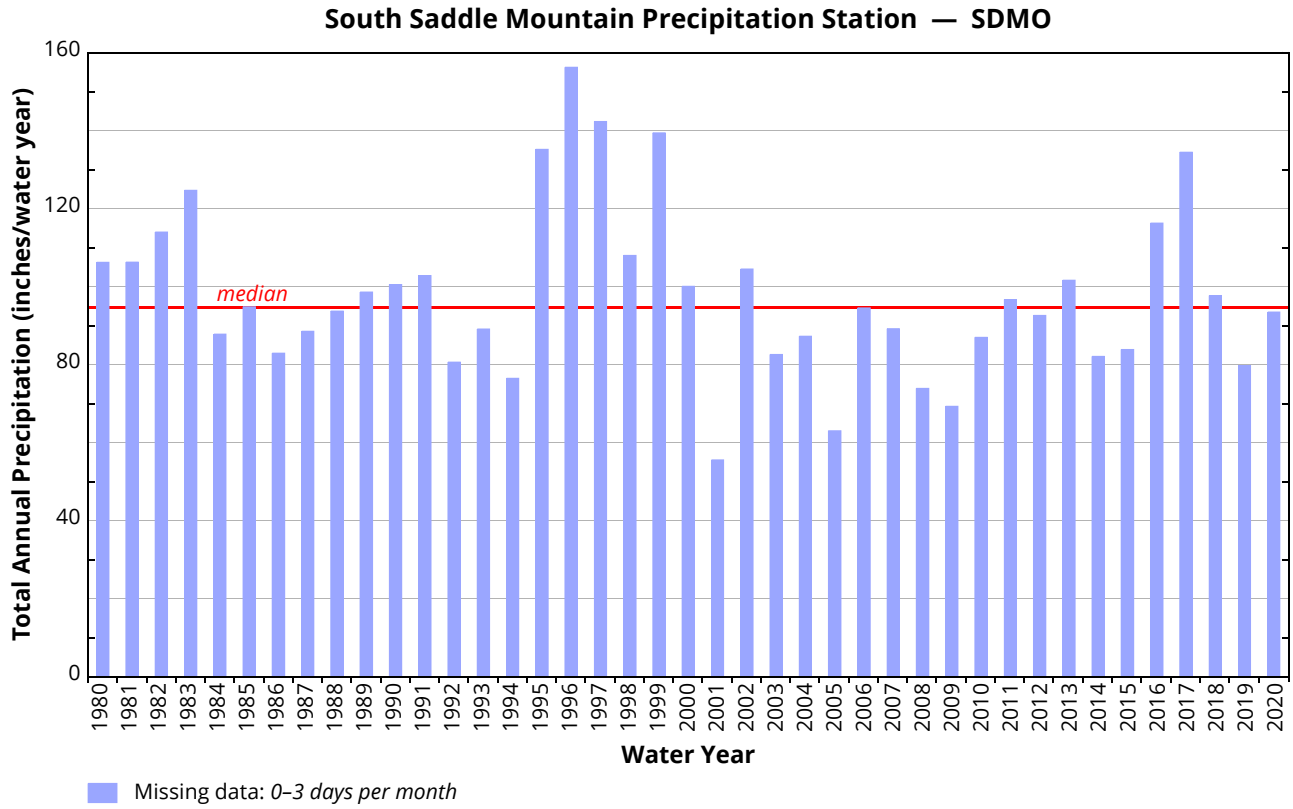
Elevation: 3250 ft Latitude: 45 31 48 Longitude: 123 22 12

MONTHLY TOTAL PRECIPITATION (inches) — SDMO

Water Year*	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1980	10.8	7.5	19.2	19.3	11.2	10.1	6.5	6.4	8.7	1.0	0.6	4.9
1981	4.2	19.3	26.8	5.2	18.6	7.5	7.9	4.1	7.2	0.4	0.7	4.4
1982	13.0	14.9	26.6	19.3	17.2	7.5	7.2	0.0	2.0	1.1	1.9	3.3
1983	13.4	16.7	21.5	17.3	15.2	11.5	7.1	4.3	4.7	4.9	3.4	4.7
1984	1.7	23.3	11.8	8.3	12.6	8.1	6.3	6.4	3.8	0.6	1.1	3.8
1985	11.4	28.6	12.9	1.8	10.2	11.8	4.8	1.5	4.3	0.2	1.4	5.9
1986	12.2	11.1	5.4	15.8	13.4	7.2	5.7	3.2	1.1	1.4	0.2	6.2
1987	5.3	20.2	11.1	17.1	7.7	16.0	2.3	4.9	1.1	1.7	0.2	0.9
1988	0.7	10.8	22.2	14.1	9.6	15.0	7.8	6.1	2.4	2.0	0.3	2.7
1989	2.5	28.5	11.4	14.9	10.2	17.4	5.3	2.8	1.7	1.9	2.0	0.0
1990	5.8	9.6	8.6	31.4	20.8	7.0	6.4	3.3	4.9	0.4	0.8	1.5
1991	11.4	18.7	10.0	12.7	12.7	12.1	15.3	4.4	2.7	1.0	1.2	0.6
1992	2.8	14.4	11.8	19.1	8.8	1.8	10.5	2.4	1.2	1.4	1.1	5.3
1993	6.8	13.8	16.2	10.8	3.3	12.4	13.7	6.4	3.2	1.6	0.9	0.0
1994	2.7	3.3	18.8	11.0	15.2	9.3	5.5	3.6	4.2	0.9	0.5	1.5
1995	14.7	20.9	31.0	19.7	13.5	14.8	6.8	1.5	4.3	3.0	1.3	3.7
1996	8.5	34.8	21.7	21.2	32.6	6.0	17.1	6.4	2.0	1.2	1.0	3.7
1997	11.6	16.9	34.3	17.2	7.3	20.1	8.3	5.9	5.3	2.1	2.6	10.7
1998	19.8	15.3	9.3	24.2	14.7	10.4	3.3	6.1	1.6	0.2	0.4	2.7
1999	7.7	25.9	28.7	20.3	33.7	12.9	2.8	5.0	0.9	0.2	1.3	0.0
2000	6.1	23.6	18.6	17.7	10.1	6.3	2.9	4.9	6.0	0.1	0.6	3.2
2001	4.3	5.6	9.2	5.5	4.8	6.2	6.1	5.2	3.3	1.4	3.1	0.8
2002	6.6	23.0	20.3	21.7	7.5	10.7	7.6	2.9	3.6	0.2	0.3	0.1
2003	0.5	5.8	17.2	21.5	5.4	19.5	7.5	2.3	0.3	0.3	0.4	1.9
2004	9.4	12.1	13.5	15.0	8.7	5.4	4.4	4.9	2.7	0.1	5.4	5.7
2005	7.4	5.0	10.9	9.3	2.1	11.0	6.5	5.8	2.2	1.0	0.4	1.4
2006	9.4	12.4	18.2	29.8	6.1	7.3	3.4	3.1	2.0	0.7	0.0	2.1
2007	1.9	37.7	15.1	9.0	10.3	4.9	3.7	0.5	2.0	0.9	1.1	2.1
2008	7.7	9.5	21.9	11.5	4.7	7.6	4.9	1.1	2.3	0.3	2.4	0.0
2009	6.6	11.9	10.7	11.6	4.4	7.1	4.8	7.0	0.8	0.5	1.3	2.6
2010	7.8	15.5	9.2	14.5	8.5	9.7	7.2	4.8	5.0	0.5	0.5	3.8
2011	9.1	14.1	19.1	12.3	8.2	13.8	10.0	5.1	1.7	1.4	0.1	1.8
2012	5.8	14.6	12.2	17.3	9.6	18.0	5.9	5.0	3.7	0.2	0.0	0.3
2013	14.8	19.4	19.4	4.8	5.9	5.6	6.1	6.5	2.0	0.3	1.9	14.9
2014	1.8	9.9	6.6	9.5	15.3	18.5	9.1	5.5	1.8	0.8	0.8	2.5
2015	13.5	12.1	18.4	8.8	11.4	8.3	3.7	2.5	0.6	0.2	2.0	2.4
2016	11.1	17.5	34.2	15.7	12.1	15.3	3.1	1.0	2.5	0.9	0.5	2.4
2017	26.3	18.0	14.4	11.1	20.0	21.6	11.7	4.2	3.1	0.0	0.2	3.9
2018	13.8	21.9	10.9	18.9	7.8	7.6	13.0	0.1	1.2	0.1	0.1	2.3
2019	6.6	9.9	17.0	10.3	12.8	3.0	7.7	3.2	0.5	1.2	0.8	6.7
2020	7.4	3.3	15.5	31.4	9.8	6.8	2.6	5.1	4.6	0.3	0.2	6.5
2021	7.8	15.7	15.8	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.5	3.3	5.4	1.8	2.1	1.8	2.3	0.0	0.3	0.0	0.0	0.0
MAX	26.3	37.7	34.3	31.4	33.7	21.6	17.1	7.0	8.7	4.9	5.4	14.9
MEDIAN	7.7	14.9	16.2	15.0	10.2	9.7	6.4	4.4	2.4	0.8	0.8	2.6
MEAN	8.41	16.03	16.87	15.31	11.56	10.56	6.89	4.03	2.91	0.94	1.10	3.27

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


South Saddle Mountain Precipitation Station — SDMO
Monthly Precipitation (inches)
0
10
20
30
40
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: WY 1980–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


South Saddle Mountain Precipitation Station — SDMO
Total Annual Precipitation (inches/water year)
0
40
80
120
160
median
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Water Year
Missing data: 0–3 days per month

SECO – SAIN CREEK PRECIPITATION STATION

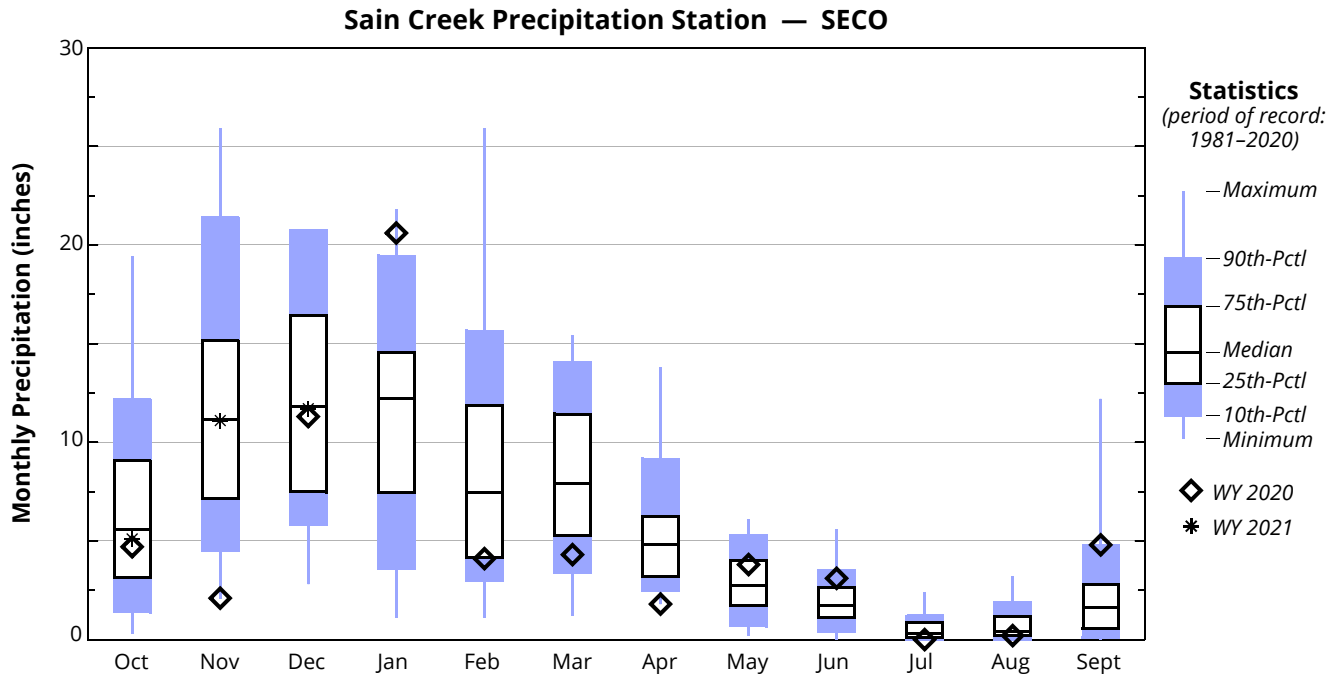
Data source: Natural Resources Conservation Service (SNOTEL #743)
https://wcc.sc.egov.usda.gov/nwcc/rgrpt?report=precsnotelmon&state=OR

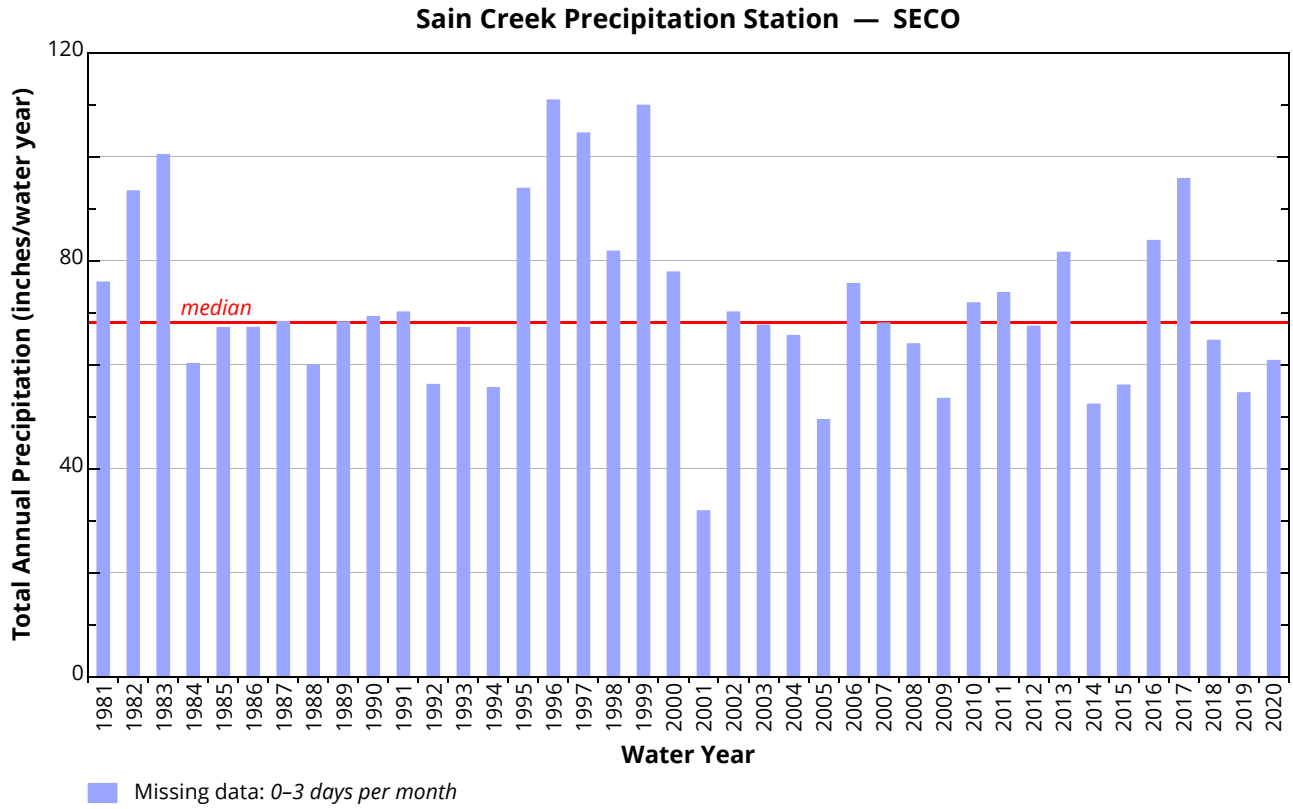
Elevation: 2000 ft Latitude: 45 31 12 Longitude: 123 16 48

MONTHLY TOTAL PRECIPITATION (inches) — SECO

WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1981	2.3	13.5	17.8	5.8	12.8	5.3	6.0	3.6	5.6	0.0	0.2	3.0
1982	10.3	11.8	20.8	13.2	14.9	7.9	6.4	0.7	2.0	1.1	1.9	2.4
1983	11.1	11.4	17.0	15.5	17.3	14.5	6.3	2.5	3.1	1.6	0.0	0.1
1984	1.4	16.7	3.5	3.5	12.1	9.1	2.5	5.3	3.3	0.0	0.0	2.8
1985	10.4	22.6	7.0	1.1	4.0	7.9	4.3	1.4	3.5	0.1	1.6	3.2
1986	9.3	4.9	2.8	13.2	15.1	2.9	5.2	6.1	0.2	1.0	0.2	6.3
1987	4.5	15.3	8.4	12.4	6.4	12.3	3.6	3.3	0.4	1.2	0.2	0.3
1988	0.7	6.8	15.8	12.2	2.8	9.1	4.4	4.0	2.0	0.7	0.0	1.4
1989	1.3	21.5	7.4	9.1	7.3	11.6	3.7	1.7	1.9	0.9	1.7	0.1
1990	4.5	6.2	5.8	21.8	14.5	6.4	3.2	2.6	2.5	0.3	0.7	0.8
1991	8.4	10.9	6.1	7.4	9.1	8.3	12.9	2.8	2.1	0.8	0.8	0.5
1992	2.5	9.7	8.4	12.2	6.7	1.2	9.2	1.1	1.1	0.6	0.4	3.1
1993	5.0	9.3	11.9	8.9	2.0	8.8	9.9	5.7	2.7	2.4	0.5	0.0
1994	1.7	4.5	12.7	8.5	10.7	5.9	4.2	3.1	2.4	0.1	0.2	1.6
1995	13.0	13.4	16.6	16.0	9.3	11.2	5.2	1.9	2.9	1.1	0.8	2.5
1996	6.6	24.6	15.7	15.3	21.9	3.4	13.8	4.8	1.4	0.4	0.4	2.6
1997	8.4	12.7	27.6	13.3	4.7	13.7	5.6	4.8	3.4	0.4	1.9	8.1
1998	13.0	12.0	6.4	19.8	12.0	8.5	2.5	5.1	0.8	0.0	0.2	1.5
1999	5.6	20.5	22.3	16.1	25.9	11.1	2.0	4.0	1.0	0.2	1.2	0.0
2000	4.6	18.3	15.4	13.5	8.5	5.3	2.6	3.8	4.0	0.0	0.2	1.6
2001	2.9	3.7	6.4	3.2	3.1	3.7	3.7	2.4	1.1	0.3	1.2	0.2
2002	3.8	16.7	13.3	14.9	5.1	6.6	5.1	2.0	2.0	0.1	0.0	0.5
2003	0.3	7.8	16.5	15.8	4.3	14.1	5.9	1.4	0.0	0.0	0.0	1.5
2004	5.8	7.3	12.0	12.2	7.6	3.9	4.7	2.3	2.0	0.2	3.2	4.4
2005	5.6	3.2	8.3	8.4	1.1	8.5	4.9	5.3	2.5	0.4	0.2	1.0
2006	9.1	10.4	14.7	21.8	3.7	6.9	3.0	3.2	1.5	0.2	0.0	1.1
2007	1.8	25.9	12.0	6.1	9.5	4.0	3.2	0.4	1.1	1.2	0.9	1.9
2008	4.7	7.5	20.0	11.2	5.0	7.5	4.5	0.5	0.6	0.6	1.9	0.0
2009	5.8	7.4	11.3	7.9	3.0	5.9	2.9	5.3	0.8	0.0	1.3	1.9
2010	6.2	12.5	7.7	13.0	7.2	8.2	6.7	3.3	4.1	0.1	0.2	2.7
2011	7.0	10.1	16.1	7.3	6.6	12.3	7.7	2.7	1.4	1.4	0.0	1.3
2012	4.8	10.2	7.7	13.4	6.5	15.4	4.0	2.7	2.0	0.0	0.4	0.3
2013	12.3	16.8	16.6	2.1	4.0	3.5	5.3	5.9	1.2	0.2	1.5	12.2
2014	1.4	6.1	2.9	4.7	11.4	13.0	5.8	3.1	1.4	0.6	0.4	1.6
2015	9.0	7.1	11.7	6.0	8.9	6.3	2.1	1.3	0.9	0.2	1.1	1.5
2016	6.2	11.9	25.0	12.9	8.5	11.5	2.5	0.7	1.6	0.9	0.6	1.6
2017	19.4	12.7	10.2	8.7	15.7	15.1	7.7	2.1	1.3	0.3	0.1	2.5
2018	9.1	14.7	7.3	12.9	3.8	5.4	8.7	0.2	1.1	0.0	0.1	1.4
2019	4.6	6.6	10.8	7.5	9.5	2.3	5.5	2.6	0.2	0.7	0.6	3.7
2020	4.7	2.1	11.3	20.6	4.1	4.3	1.8	3.8	3.1	0.0	0.2	4.8
2021	5.1	11.1	11.7	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.3	2.1	2.8	1.1	1.1	1.2	1.8	0.2	0.0	0.0	0.0	0.0
MAX	19.4	25.9	27.6	21.8	25.9	15.4	13.8	6.1	5.6	2.4	3.2	12.2
MEDIAN	5.6	11.2	11.8	12.2	7.5	7.9	4.8	2.8	1.8	0.3	0.4	1.6
MEAN	6.23	11.68	12.28	11.24	8.67	8.07	5.23	2.99	1.91	0.51	0.68	2.20

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


Sain Creek Precipitation Station — SECO
Monthly Precipitation (inches)
30
20
10
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 1981–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


Sain Creek Precipitation Station — SECO
Total Annual Precipitation (inches/water year)
120
80
40
0
median
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Water Year
Missing data: 0–3 days per month

SCOO – SCOGGINS CREEK BELOW HENRY HAGG LAKE PRECIPITATION STATION

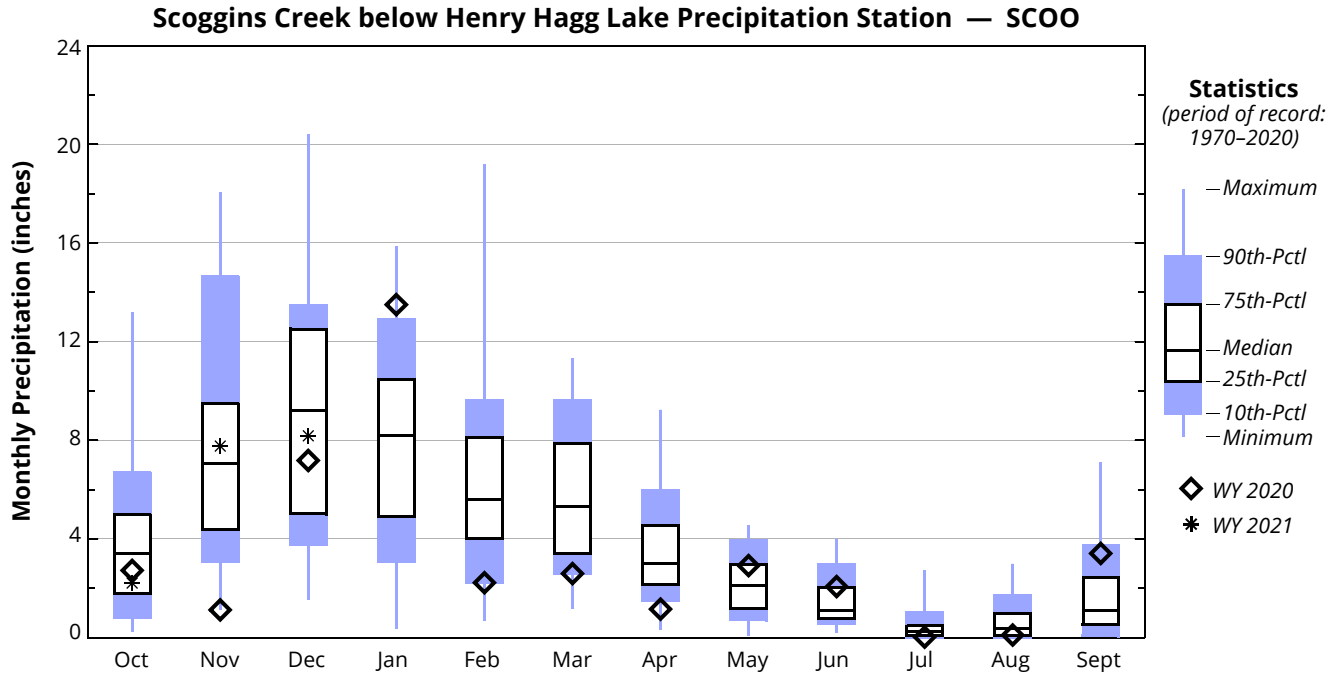
Data source: Tualatin Valley Irrigation District
data not available online

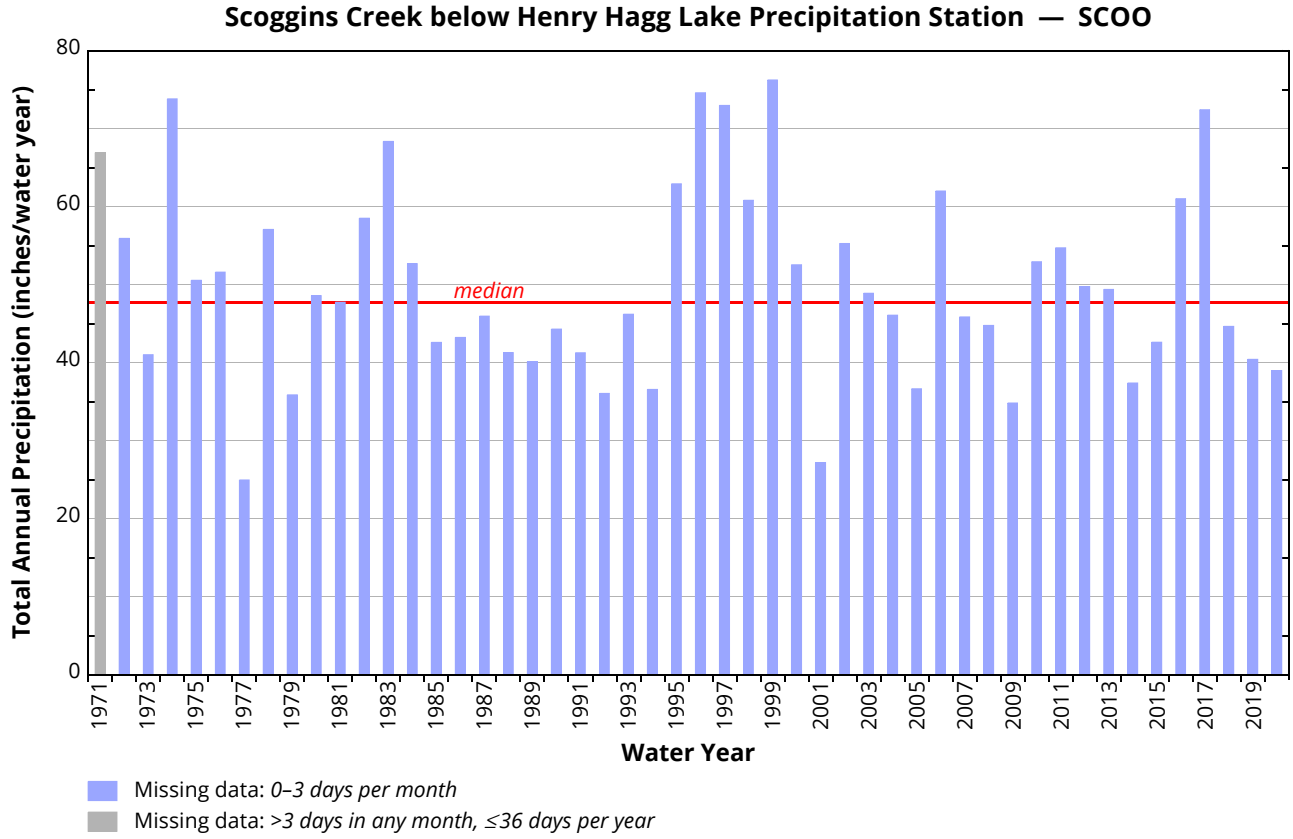
Elevation: 187.5 ft Latitude: 45 28 10 Longitude: 123 11 56

MONTHLY TOTAL PRECIPITATION (inches) — SCOO

WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970			8.53	15.85	6.30	3.47	3.49	1.27	0.77	0.01	0.00	1.10
1971	4.40	6.86	16.85	10.82	5.60	10.30	3.96	1.54	2.03	0.14	0.52	3.92
1972	4.02	8.68	12.12	10.20	5.05	6.79	3.92	0.92	0.58	0.28	0.25	3.12
1973	0.72	6.31	12.28	6.44	2.36	3.75	2.15	1.19	1.37	0.04	0.86	3.54
1974	3.82	18.05	14.64	12.46	7.92	9.31	3.98	1.31	0.86	1.38	0.02	0.06
1975	1.33	8.02	9.94	10.45	8.11	5.71	2.00	2.12	0.67	0.47	1.72	0.03
1976	6.69	6.38	9.50	7.68	8.25	5.98	1.81	1.63	0.48	0.70	1.80	0.69
1977	1.26	1.65	1.54	1.05	3.37	5.33	0.32	2.50	1.11	0.41	2.99	3.42
1978	2.76	8.11	13.47	7.92	6.66	2.47	5.04	2.95	1.00	0.65	2.11	3.94
1979	0.81	4.29	3.77	3.16	9.75	3.30	2.83	2.99	0.68	0.15	1.71	2.42
1980	6.69	4.25	9.21	8.30	7.13	4.09	4.38	1.10	1.81	0.22	0.05	1.37
1981	1.76	8.71	11.80	3.60	6.07	3.22	2.88	2.67	3.14	0.08	0.06	3.77
1982	5.55	6.77	13.00	7.21	8.43	4.85	6.45	0.51	1.41	0.37	1.46	2.49
1983	5.82	6.90	13.00	8.13	13.46	9.93	2.88	1.54	2.10	2.73	1.19	0.67
1984	1.34	15.16	7.91	3.09	7.92	4.81	4.05	3.95	3.34	0.00	0.00	1.13
1985	5.16	14.86	4.88	0.37	4.03	5.22	1.50	0.73	2.58	0.41	0.68	2.17
1986	4.48	4.55	2.93	9.23	8.42	4.13	2.57	2.65	0.59	1.07	0.00	2.60
1987	3.43	7.85	5.96	8.19	6.67	8.51	1.80	2.10	0.31	0.79	0.11	0.23
1988	0.23	3.09	12.51	9.46	1.67	4.50	3.32	2.78	2.59	0.15	0.09	0.89
1989	0.27	12.19	4.64	4.61	4.59	8.21	1.26	1.63	0.89	0.48	0.83	0.55
1990	2.74	4.39	3.52	13.00	8.87	2.60	2.20	3.01	2.02	0.26	1.18	0.49
1991	4.35	4.49	3.87	4.69	4.72	5.38	9.03	2.29	1.44	0.22	0.54	0.23
1992	1.80	6.31	5.74	7.72	4.66	1.16	5.63	0.09	0.71	0.42	0.35	1.47
1993	2.84	5.94	8.85	6.25	1.21	5.40	6.71	3.95	2.26	2.59	0.17	0.04
1994	1.21	1.92	9.97	6.47	7.71	3.41	2.49	0.96	1.30	0.00	0.13	0.98
1995	4.94	9.30	11.54	12.00	5.36	7.88	4.53	1.47	2.44	0.58	1.01	1.89
1996	3.70	12.24	12.17	11.53	13.61	2.81	9.23	4.49	1.59	0.58	0.34	2.32
1997	5.44	8.73	20.40	10.71	2.98	9.22	3.38	2.68	3.34	0.29	1.28	4.52
1998	8.57	9.32	4.41	14.18	9.08	6.26	2.31	4.56	0.96	0.24	0.00	0.91
1999	4.51	15.20	13.27	11.84	19.20	6.25	1.77	2.15	0.93	0.08	0.96	0.06
2000	3.13	12.68	9.50	9.02	6.51	4.08	1.40	2.94	2.26	0.03	0.19	0.81
2001	3.24	3.08	5.11	2.30	2.36	3.05	2.19	2.20	1.79	0.23	1.12	0.52
2002	3.28	12.10	11.86	11.36	4.11	5.84	2.79	1.58	1.46	0.13	0.19	0.57
2003	0.73	4.37	13.26	9.33	4.20	9.29	5.17	0.86	0.20	0.01	0.62	0.86
2004	3.34	5.26	9.92	8.84	5.96	3.11	3.12	1.63	0.90	0.00	2.01	2.00
2005	4.60	2.75	4.95	4.92	0.70	7.73	3.34	4.52	1.99	0.38	0.39	0.38
2006	5.54	8.57	12.92	15.72	4.10	6.13	3.63	2.96	1.53	0.15	0.00	0.75
2007	0.83	17.64	7.76	4.37	6.42	2.79	2.15	0.90	0.76	0.69	0.58	0.99
2008	3.91	4.68	13.42	8.69	3.30	5.03	2.50	0.92	1.25	0.02	0.98	0.09
2009	2.89	6.29	4.58	6.36	2.20	4.13	1.99	3.95	0.76	0.21	0.66	0.82
2010	3.73	8.95	5.11	10.29	5.16	5.72	5.79	3.20	3.04	0.36	0.05	1.54
2011	4.53	7.24	12.96	4.99	4.78	9.67	5.35	2.96	0.78	1.11	0.00	0.35
2012	2.29	8.12	3.93	9.33	4.53	11.32	2.99	2.94	3.98	0.25	0.02	0.04
2013	6.95	9.95	11.78	1.19	2.35	2.61	1.93	3.79	0.94	0.00	0.79	7.10
2014	1.04	3.33	2.06	3.28	8.96	9.39	4.56	2.01	0.94	0.33	0.10	1.37
2015	7.15	3.75	9.16	4.36	7.79	5.42	1.49	0.54	0.65	0.23	0.77	1.33
2016	3.35	8.38	19.38	10.36	4.97	9.21	2.39	0.72	0.97	0.29	0.29	0.71
2017	13.19	10.43	7.82	6.41	14.24	9.75	5.99	1.85	0.86	0.00	0.15	1.74
2018	6.05	10.21	5.02	8.37	2.51	4.75	5.70	0.10	0.78	0.01	0.02	1.13
2019	3.28	3.75	7.72	5.05	8.30	1.73	4.21	2.00	0.24	0.45	0.54	3.15
2020	2.72	1.12	7.18	13.50	2.22	2.59	1.15	2.92	2.07	0.02	0.10	3.41
2021	2.21	7.76	8.18	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.23	1.12	1.54	0.37	0.70	1.16	0.32	0.09	0.20	0.00	0.00	0.03
MAX	13.19	18.05	20.40	15.85	19.20	11.32	9.23	4.56	3.98	2.73	2.99	7.10
MEDIAN	3.39	7.07	9.21	8.19	5.60	5.33	2.99	2.10	1.11	0.25	0.39	1.10
MEAN	3.73	7.66	9.17	7.93	6.17	5.64	3.48	2.14	1.44	0.41	0.63	1.58

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


Scoggins Creek below Henry Hagg Lake Precipitation Station — SCOO
Monthly Precipitation (inches)
0
4
8
12
16
20
24
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 1970–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


Scoggins Creek below Henry Hagg Lake Precipitation Station — SCOO
Total Annual Precipitation (inches/water year)
0
20
40
60
80
median
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
Water Year
Missing data: 0–3 days per month
Missing data: >3 days in any month, ≤36 days per year

DLLO – DILLEY PRECIPITATION STATION

Data source: National Weather Service COOP Program (COOP ID#352325)
http://scacis.rcc-acis.org

Elevation: 170 ft Latitude: 45 27 48 Longitude: 123 06 49

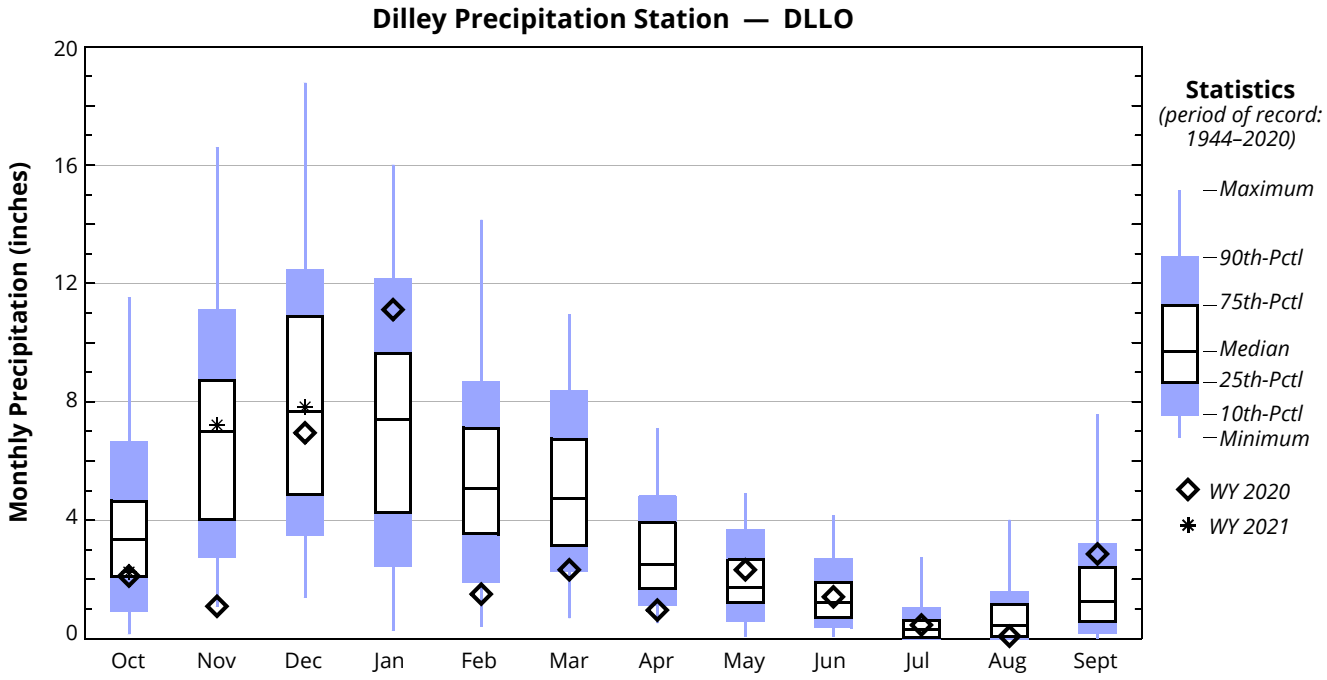
MONTHLY TOTAL PRECIPITATION (inches) — DLLO

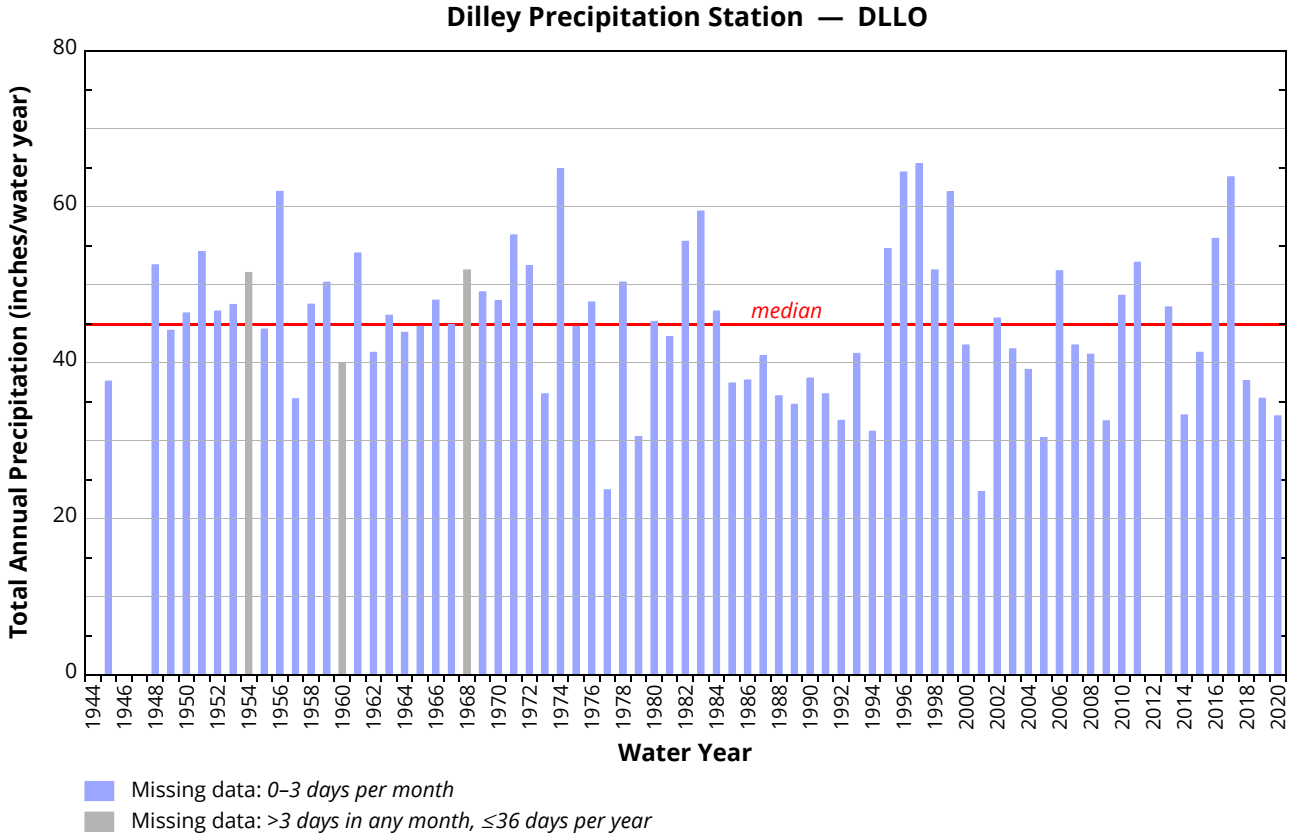
WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1944			4.08		3.98	3.22	3.93	0.94	0.74	1.06	0.20	2.80
1945	1.56	5.50	2.74	4.13	6.99	7.18	2.09	3.71	0.22	0.20	0.13	3.17
1946	1.45	11.82	7.56	7.21	7.61	6.09	1.41	1.51	1.74			
1947			5.38	5.47	4.46	4.69	1.30	0.09	3.12	0.86	0.50	1.28
1948	9.68	4.08	4.99	7.28	7.52	4.55	3.97	4.92	0.90	0.59	1.35	2.72
1949	2.52	8.67	10.59	2.06	11.83	2.99	0.55	2.98	0.55	0.82	0.03	0.58
1950	2.48	7.55	5.93	10.43	6.58	6.77	1.46	0.48	2.19	0.54	0.84	1.13
1951	9.62	9.55	8.93	11.03	5.01	4.74	0.88	1.67	0.15	0.11	0.15	2.38
1952	6.96	7.89	9.70	7.08	5.65	4.20	1.35	0.77	2.62	0.00	0.03	0.38
1953	0.61	2.29	9.28	14.98	4.86	5.36	2.74	2.87	1.25	0.10	1.51	1.60
1954	3.55	7.37	7.40	13.80	7.32	2.95	3.26	1.33	2.06	0.56		1.97
1955	3.92	7.61	7.66	4.36	4.36	5.23	4.56	0.77	1.78	1.41	0.00	2.65
1956	6.97	10.49	12.90	13.36	4.43	7.27	0.64	1.42	1.29	0.03	1.32	1.84
1957	4.83	1.98	4.55	3.02	5.77	7.09	2.09	3.03	1.52	0.27	0.47	0.75
1958	3.55	3.77	10.90	9.29	8.50	2.62	4.24	1.05	2.96	0.02	0.00	0.59
1959	2.34	8.74	6.90	12.18	5.10	4.42	1.76	2.55	2.57	0.92	0.08	2.75
1960	2.71	4.44	4.86	6.56	6.94		4.65	4.37	4.16	0.00	0.74	0.53
1961	4.24	10.95	3.64	7.05	11.15	10.02	2.94	2.36	0.24	0.48	0.52	0.46
1962	5.98	4.95	7.67	1.61	4.14	5.78	4.79	2.43	0.44	0.00	1.43	2.08
1963	4.57	11.23	3.48	1.91	5.39	6.65	4.03	2.82	1.94	1.01	1.64	1.42
1964	3.68	7.10	5.24	16.01	1.47	5.23	1.34	0.85	1.53	0.66	0.54	0.23
1965	1.87	9.80	14.38	9.04	2.72	0.69	2.21	1.14	0.91	1.02	0.87	0.00
1966	1.92	8.73	9.87	9.62	2.67	8.47	0.66	1.28	1.84	1.10	0.46	1.39
1967	3.62	6.98	11.57	10.14	1.83	6.07	2.63	0.64	0.76	0.00	0.00	0.65
1968	6.35	3.28	7.17	7.94	9.00	5.53	1.41	3.01	2.10		4.01	2.08
1969	5.45	7.48	12.91	9.61	4.33	1.21	2.19	1.72	2.01	0.02	0.00	2.14
1970	4.64	3.26	11.18	14.21	5.81	3.12	2.64	1.26	0.57	0.01	0.00	1.26
1971	4.01	5.89	14.28	8.96	4.74	8.29	3.68	1.22	1.61	0.13	0.36	3.19
1972	3.21	8.35	10.45	8.19	4.90	7.32	4.41	1.39	0.56	0.28	0.25	3.12
1973	0.61	4.78	11.33	5.37	2.18	3.40	1.57	1.40	1.27	0.05	0.76	3.30
1974	3.36	16.59	12.01	11.25	6.75	8.51	2.96	1.46	0.65	1.25	0.00	0.07
1975	1.32	7.50	8.64	8.99	7.00	4.86	1.75	1.94	0.62	0.44	1.60	0.00
1976	6.42	5.16	8.59	6.85	7.20	5.54	2.31	1.30	0.39	0.82	2.41	0.79
1977	1.30	1.32	1.60	1.05	2.98	4.46	0.51	2.50	1.12	0.60	3.07	3.18
1978	2.94	7.21	11.39	7.37	5.92	2.27	3.70	2.67	0.99	0.99	1.65	3.23
1979	0.71	3.85	3.77	3.06	8.00	2.49	2.41	2.07	0.58	0.13	0.94	2.54
1980	6.67	3.93	7.50	8.14	6.25	4.02	3.70	1.21	2.24	0.22	0.06	1.36
1981	1.63	8.35	11.43	2.65	5.17	2.98	2.17	1.96	3.00	0.15	0.05	3.83
1982	5.90	5.89	12.15	9.42	7.75	3.89	4.83	0.44	1.31	0.36	1.24	2.40
1983	4.87	5.36	11.16	7.40	12.20	8.23	2.49	1.40	1.65	2.74	1.38	0.54
1984	1.32	13.07	6.87	2.70	5.95	4.29	3.95	3.36	3.88	0.00	0.00	1.21
1985	4.63	12.83	3.87	0.27	3.18	4.56	1.20	0.36	2.94	0.45	1.45	1.63
1986	3.97	3.95	2.77	8.38	7.35	3.81	1.59	1.99	0.37	0.85	0.00	2.74
1987	3.31	6.52	5.47	8.00	5.18	7.47	1.72	1.85	0.19	0.85	0.15	0.20
1988	0.20	3.66	10.41	8.14	1.16	3.67	2.60	2.23	2.27	0.07	0.17	1.16
1989	0.14	10.98	3.81	4.14	3.51	7.05	0.81	1.62	0.78	0.36	0.93	0.51
1990	2.47	4.02	3.47	10.42	7.14	2.08	1.71	2.98	1.82	0.27	0.93	0.72
1991	4.14	4.15	3.36	3.97	4.46	5.07	6.36	2.19	1.39	0.29	0.39	0.24
1992	1.91	6.26	4.91	6.62	3.97	1.19	4.79	0.07	0.80	0.31	0.51	1.28
1993	2.79	5.44	7.42	5.39	0.78	5.00	6.76	3.79	1.95	1.76	0.08	0.00

MONTHLY TOTAL PRECIPITATION (inches) — DLLO (continued)

WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1994	1.26	1.49	9.12	5.67	6.45	3.14	1.41	0.89	0.95	0.00	0.24	0.58
1995	4.64	8.12	10.29	10.56	5.02	6.53	3.74	1.29	1.76	0.45	0.49	1.74
1996	3.41	9.78	10.09	9.69	12.68	2.46	7.09	4.84	1.12	0.60	0.26	2.43
1997	5.37	8.05	18.46	9.63	2.51	8.29	2.98	2.65	2.38	0.47	1.38	3.33
1998	6.58	8.36	3.54	12.10	7.66	5.20	1.76	4.82	1.05	0.09	0.00	0.73
1999	3.24	13.00	10.81	10.29	14.15	4.85	1.90	1.71	0.76	0.02	1.14	0.04
2000	2.55	10.10	7.10	7.81	5.46	3.25	1.52	2.15	1.21	0.00	0.22	0.89
2001	3.09	2.46	4.20	2.17	1.98	2.25	1.72	1.60	1.84	0.32	1.27	0.54
2002	2.91	10.26	10.66	9.00	3.61	4.04	1.93	1.14	1.32	0.19	0.07	0.57
2003	0.59	3.35	12.22	8.61	3.69	7.41	4.24	0.46	0.07	0.01	0.32	0.79
2004	2.87	4.10	9.01	7.70	5.21	2.32	2.24	1.25	1.21	0.00	1.66	1.56
2005	3.80	2.53	3.89	4.25	0.41	5.97	2.79	4.26	1.84	0.29	0.13	0.24
2006	4.16	7.58	11.79	14.09	3.38	4.21	2.58	2.26	0.92	0.17	0.00	0.63
2007	1.01	15.05	8.03	4.03	4.62	2.48	2.32	1.22	0.83	0.82	0.63	1.21
2008	3.80	4.35	10.41	7.03	2.93	4.66	2.91	2.72	0.97	0.00	0.96	0.32
2009	2.42	6.01	4.85	5.53	2.04	3.43	1.72	3.53	0.23	0.17	1.29	1.32
2010	3.67	8.41	4.48	8.95	4.91	5.26	4.82	3.36	3.03	0.16	0.08	1.50
2011	4.00	7.00	13.55	5.63	4.36	8.93	4.62	2.47	0.84	0.98	0.07	0.42
2012	2.56	8.00				10.95	2.54	2.30	2.52	0.37	0.07	0.04
2013	5.86	8.87	11.29	1.96	2.17	2.38	1.66	3.66	1.17	0.00	0.54	7.57
2014	0.85	2.92	1.37	2.87	7.64	8.69	3.98	1.80	1.05	0.37	0.54	1.23
2015	7.66	3.21	8.18	3.91	7.90	4.87	1.96	0.87	0.59	0.43	0.66	1.09
2016	2.71	6.52	18.77	10.09	4.22	7.54	3.22	0.71	0.69	0.35	0.27	0.82
2017	11.53	9.66	5.97	5.91	12.83	8.70	4.53	1.99	1.18	0.00	0.09	1.42
2018	5.15	8.42	4.70	7.24	1.86	3.79	4.91	0.06	0.62	0.00	0.05	0.92
2019	3.15	3.47	6.68	4.23	6.48	1.07	3.73	1.49	0.69	0.51	1.17	2.78
2020	2.11	1.09	6.95	11.11	1.50	2.32	0.96	2.32	1.41	0.46	0.08	2.86
2021	2.24	7.21	7.82	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.14	1.09	1.37	0.27	0.41	0.69	0.51	0.06	0.07	0.00	0.00	0.00
MAX	11.53	16.59	18.77	16.01	14.15	10.95	7.09	4.92	4.16	2.74	4.01	7.57
MEDIAN	3.36	7.00	7.67	7.40	5.06	4.72	2.49	1.72	1.21	0.31	0.46	1.25
MEAN	3.65	6.84	8.09	7.42	5.46	4.97	2.77	1.96	1.39	0.43	0.65	1.50

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


Dilley Precipitation Station — DLLO
Monthly Precipitation (inches)
0
4
8
12
16
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 1944–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


Dilley Precipitation Station — DLLO
Total Annual Precipitation (inches/water year)
0
20
40
60
80
median
1944
1946
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Water Year
Missing data: 0–3 days per month
Missing data: >3 days in any month, ≤36 days per year

FOGO – FOREST GROVE PRECIPITATION STATION (VERBOORT)

Data source: Bureau of Reclamation – AgriMet
https://www.usbr.gov/pn/agrimet/webarcread.html

Elevation: 180 ft Latitude: 45 33 11 Longitude: 123 05 01

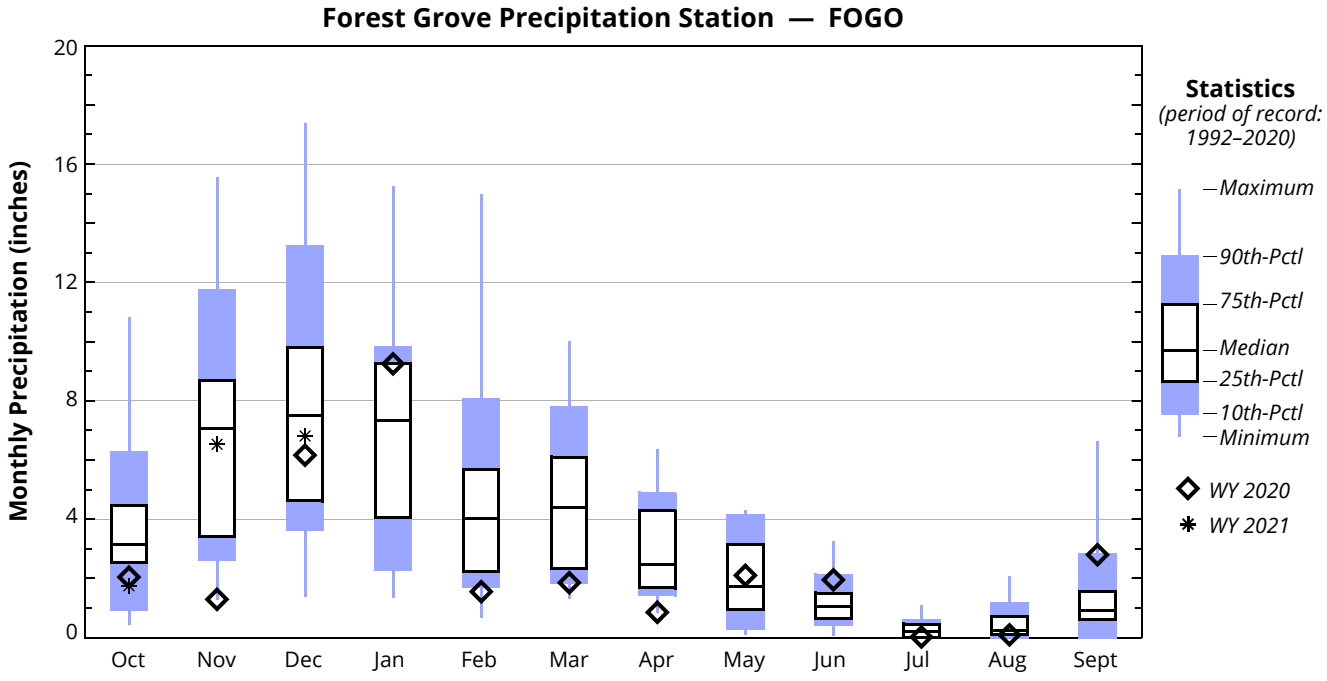
MONTHLY TOTAL PRECIPITATION (inches) — FOGO

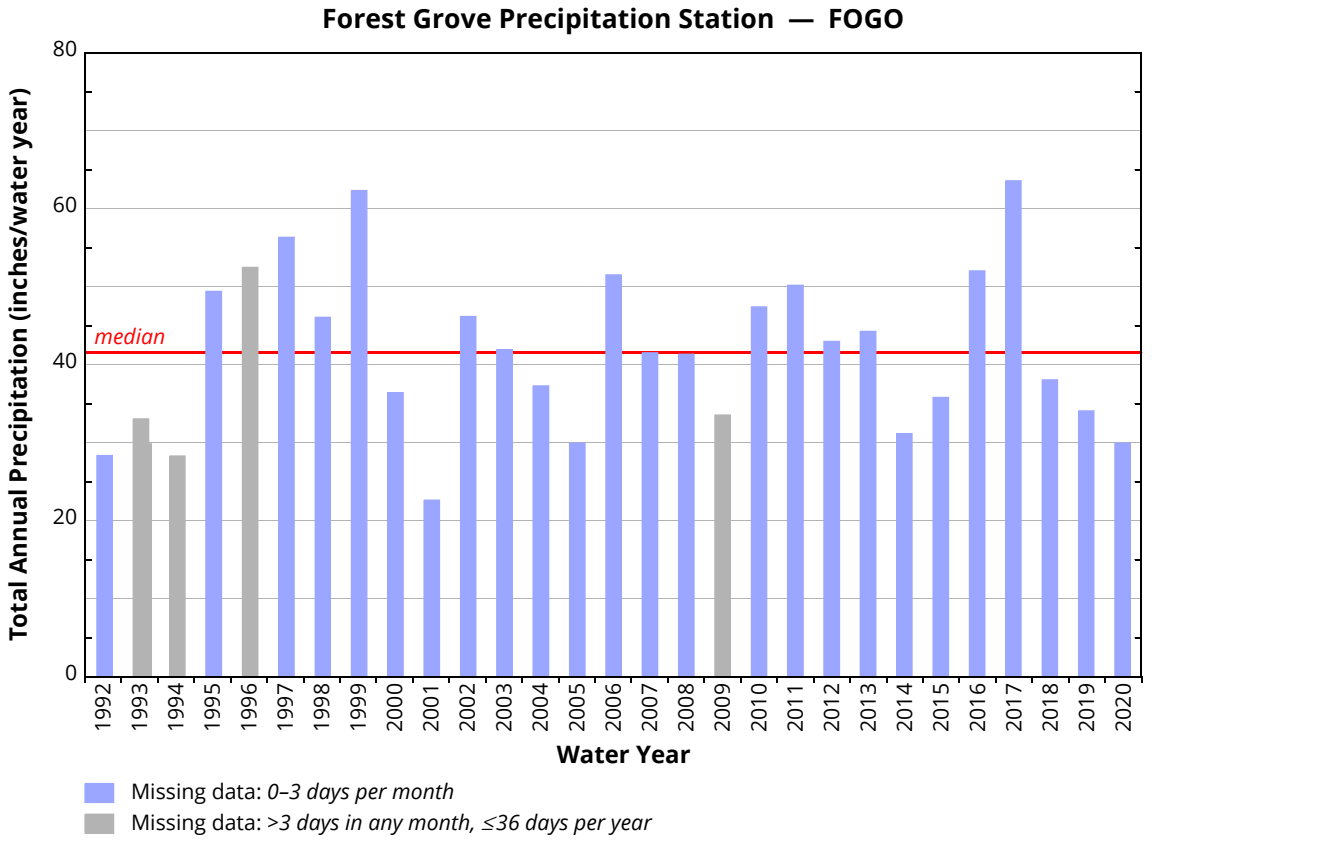
WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1992	1.50	5.10	3.68	5.93	3.56	1.56	4.35	0.10	0.94	0.26	0.28	1.08
1993	2.41	4.17	6.00		2.22	4.15	4.88	4.22	0.57	1.09	0.14	0.00
1994	1.08	1.68	7.61		5.75	2.34	1.49	1.31	1.04	0.02	0.23	0.77
1995	6.26	7.51	7.56	9.72	4.05	5.78	3.09	1.57	1.23	0.53	0.50	1.62
1996	3.08	11.72	8.55	9.06		2.33	6.37	4.14	0.85	0.48	0.26	1.99
1997	4.53	7.99	14.96	7.64	1.78	7.76	3.27	1.83	1.80	0.18	1.32	3.25
1998	6.99	7.08	3.47	9.12	7.20	4.57	1.44	4.28	1.06	0.07	0.00	0.80
1999	3.44	13.67	9.83	9.65	14.97	5.39	1.69	1.68	0.98	0.35	0.66	0.02
2000	2.78	7.84	5.89	7.72	3.99	2.37	1.05	2.06	1.58	0.09	0.13	0.92
2001	3.08	2.63	4.30	1.66	1.74	2.13	1.68	1.07	2.11	0.44	1.15	0.63
2002	2.79	11.22	9.74	9.30	3.45	4.60	1.61	1.16	1.20	0.20	0.03	0.90
2003	0.43	3.02	12.24	10.06	3.18	6.19	5.13	0.55	0.07	0.00	0.35	0.73
2004	3.49	4.62	7.87	6.09	5.23	1.93	2.55	1.10	0.81	0.00	2.08	1.50
2005	3.80	2.78	4.38	2.47	0.67	6.00	2.60	4.08	1.56	0.21	0.11	1.28
2006	4.32	7.44	11.35	15.24	2.15	4.38	2.19	2.91	0.69	0.20	0.07	0.58
2007	0.95	15.55	8.57	3.88	4.24	2.45	2.12	0.78	0.59	0.57	0.50	1.32
2008	3.14	4.51	13.02	8.81	2.70	4.13	2.46	0.71	0.78	0.01	0.97	0.11
2009	2.66	5.69		6.06	1.91	3.69	1.77	3.43	1.17	0.13	1.06	1.22
2010	3.78	7.70	5.34	7.44	4.78	5.28	4.24	3.37	3.23	0.51	0.23	1.52
2011	4.39	7.42	11.53	5.08	5.52	7.35	4.38	2.37	0.62	1.05	0.00	0.48
2012	2.75	8.28	3.82	7.25	4.17	10.00	2.16	2.15	2.22	0.08	0.08	0.02
2013	6.25	9.20	9.56	1.36	2.24	2.08	1.67	3.36	1.44	0.00	0.78	6.33
2014	0.68	2.96	1.39	2.98	7.57	7.73	3.70	1.30	0.87	0.29	0.10	1.55
2015	6.13	3.19	7.45	3.61	5.90	4.67	1.48	0.80	0.44	0.28	1.02	0.84
2016	4.12	5.50	17.40	9.42	4.58	7.09	1.97	0.31	0.46	0.24	0.32	0.61
2017	10.82	9.09	6.96	6.15	12.26	8.37	4.49	1.74	1.41	0.00	0.11	2.16
2018	4.90	9.19	4.08	7.35	2.53	3.31	4.70	0.11	1.11	0.02	0.00	0.75
2019	2.99	3.62	5.76	4.07	7.31	1.31	3.37	1.73	0.50	0.55	0.21	2.67
2020	2.04	1.29	6.16	9.25	1.55	1.85	0.85	2.10	1.95	0.02	0.09	2.80
2021	1.75	6.53	6.81	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.43	1.29	1.39	1.36	0.67	1.31	0.85	0.10	0.07	0.00	0.00	0.00
MAX	10.82	15.55	17.40	15.24	14.97	10.00	6.37	4.28	3.23	1.09	2.08	6.63
MEDIAN	3.14	7.08	7.51	7.35	4.02	4.38	2.46	1.73	1.04	0.20	0.23	0.92
MEAN	3.64	6.61	7.80	6.90	4.54	4.51	2.85	1.94	1.15	0.27	0.44	1.33

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.

FOGO – Forest Grove Precipitation Station (Verboort)

Data source: Bureau of Reclamation – AgriMet





KHIO – Hillsboro Airport Precipitation Station

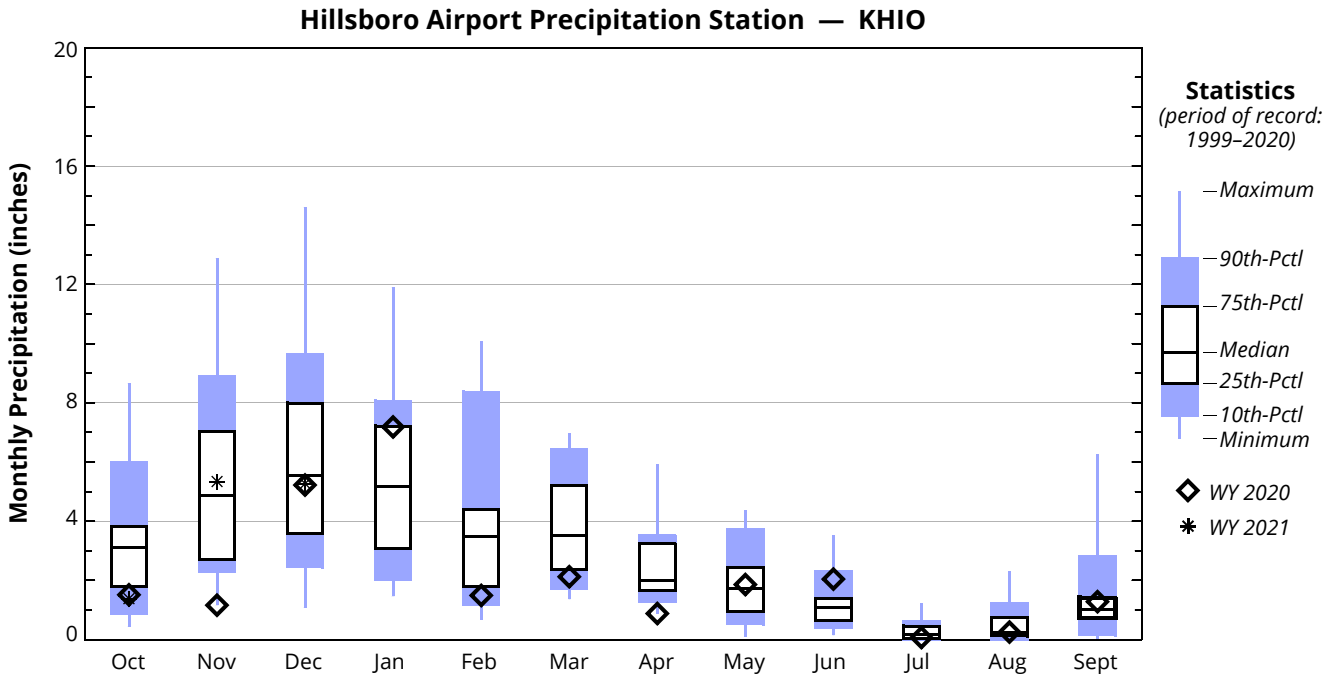
Data source: National Weather Service COOP Program (WBAN ID#94261)
http://scacis.rcc-acis.org

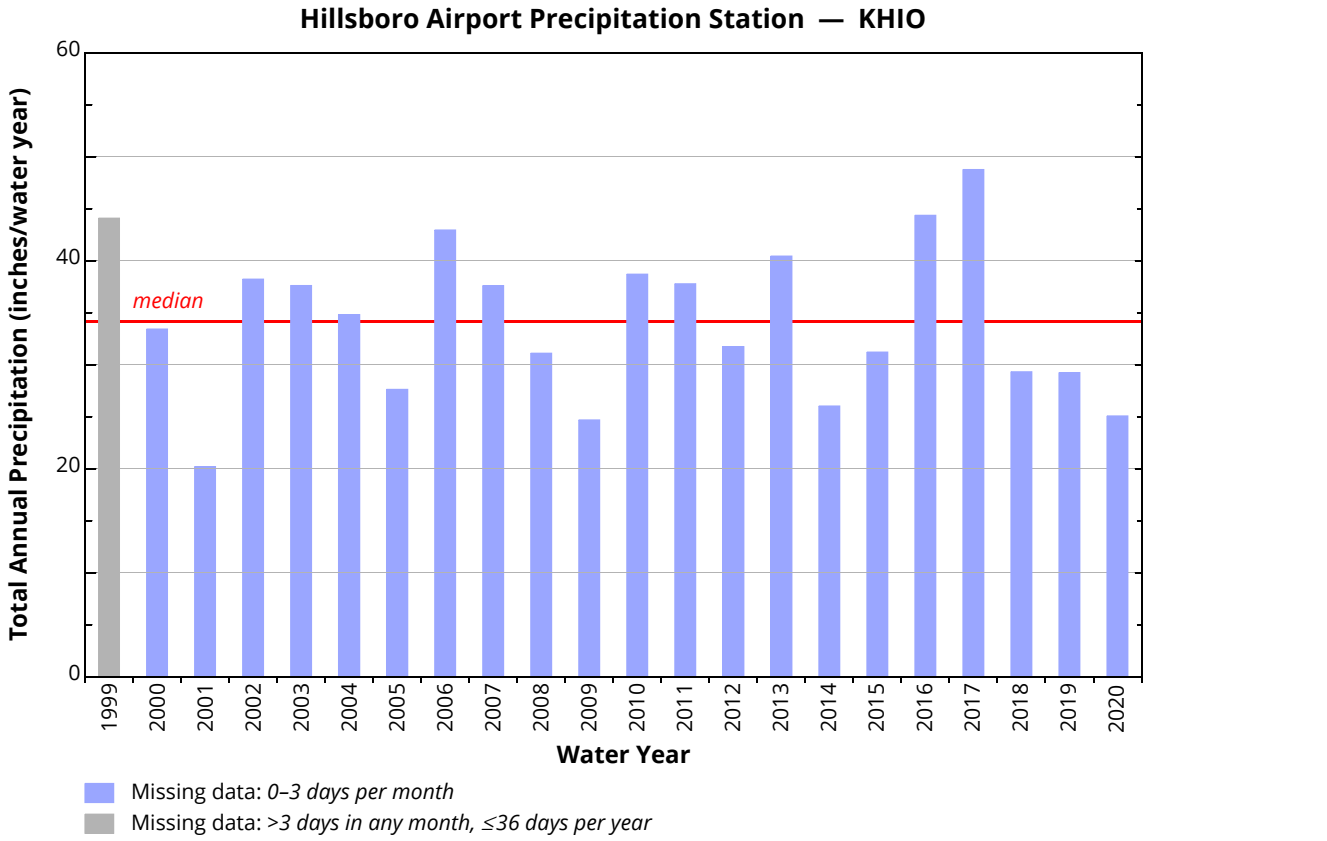
Elevation: 204 ft Latitude: 45 32 26 Longitude: 122 56 55

MONTHLY TOTAL PRECIPITATION (inches) — KHIO

Water Year*	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1999		9.03	7.07	7.48	9.78	4.29	1.50	1.74	1.55	0.66	0.84	0.14
2000	2.49	6.91	3.91	6.92	4.35	3.02	1.36	1.91	1.04	0.08	0.15	1.27
2001	3.00	2.16	3.24	1.94	1.58	2.33	1.86	0.85	1.20	0.45	0.79	0.79
2002	3.13	8.54	6.98	7.31	3.13	3.49	1.71	1.44	1.30	0.32	0.05	0.83
2003	0.43	2.61	9.88	8.29	2.93	5.16	5.91	0.75	0.15	0.00	0.55	0.94
2004	3.07	4.43	7.93	5.90	4.27	1.68	1.79	1.24	0.82	0.00	2.31	1.37
2005	3.55	2.61	3.72	2.27	0.68	4.42	2.56	4.35	1.55	0.24	0.32	1.36
2006	3.68	6.09	9.09	11.90	1.99	3.57	2.02	2.70	1.08	0.14	0.08	0.59
2007	0.90	12.88	7.49	3.24	3.80	2.39	1.96	1.29	0.97	0.40	0.53	1.73
2008	3.12	3.90	8.94	5.38	1.49	3.31	1.94	0.97	0.36	0.09	1.37	0.22
2009	1.69	4.51	2.77	4.36	1.08	2.40	1.24	2.92	1.34	0.13	0.72	1.51
2010	3.32	5.72	3.96	5.14	4.06	3.76	3.22	3.16	3.52	0.45	0.17	2.21
2011	3.98	5.23	8.16	3.59	3.83	5.39	3.42	2.10	0.59	1.23	0.00	0.26
2012	1.88	5.38	2.33	5.79	2.48	6.59	2.38	2.34	2.42	0.09	0.02	0.04
2013	5.45	7.59	7.50	1.47	1.87	1.81	2.33	3.98	1.31	0.00	0.85	6.27
2014	0.87	2.73	1.08	2.41	5.06	6.07	3.42	1.70	0.92	0.52	0.14	1.10
2015	6.12	2.83	5.88	3.01	4.57	4.68	1.41	0.44	0.54	0.32	0.55	0.86
2016	3.42	4.00	14.60	7.53	3.96	5.31	1.88	0.80	1.33	0.33	0.25	0.93
2017	8.66	6.25	4.77	4.11	10.06	6.96	3.56	1.82	1.05	0.00	0.13	1.39
2018	4.04	7.38	2.92	5.17	2.15	2.79	3.32	0.11	0.65	0.00	0.00	0.79
2019	3.33	2.61	4.74	3.12	4.96	1.36	3.23	1.45	0.64	0.49	0.21	3.08
2020	1.51	1.16	5.22	7.18	1.49	2.12	0.88	1.86	2.04	0.07	0.25	1.28
2021	1.38	5.34	5.27	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.43	1.16	1.08	1.47	0.68	1.36	0.88	0.11	0.15	0.00	0.00	0.04
MAX	8.66	12.88	14.60	11.90	10.06	6.96	5.91	4.35	3.52	1.23	2.31	6.27
MEDIAN	3.13	4.87	5.55	5.16	3.47	3.53	1.99	1.72	1.07	0.19	0.25	1.02
MEAN	3.22	5.21	6.01	5.16	3.62	3.77	2.40	1.81	1.20	0.27	0.47	1.32

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


Hillsboro Airport Precipitation Station — KHIO
Monthly Precipitation (inches)
0
4
8
12
16
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 1999–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


Hillsboro Airport Precipitation Station — KHIO
Total Annual Precipitation (inches/water year)
0
20
40
60
median
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Water Year
Missing data: 0–3 days per month
Missing data: >3 days in any month, ≤36 days per year

THNP – Tualatin Hills Nature Park Precipitation Station

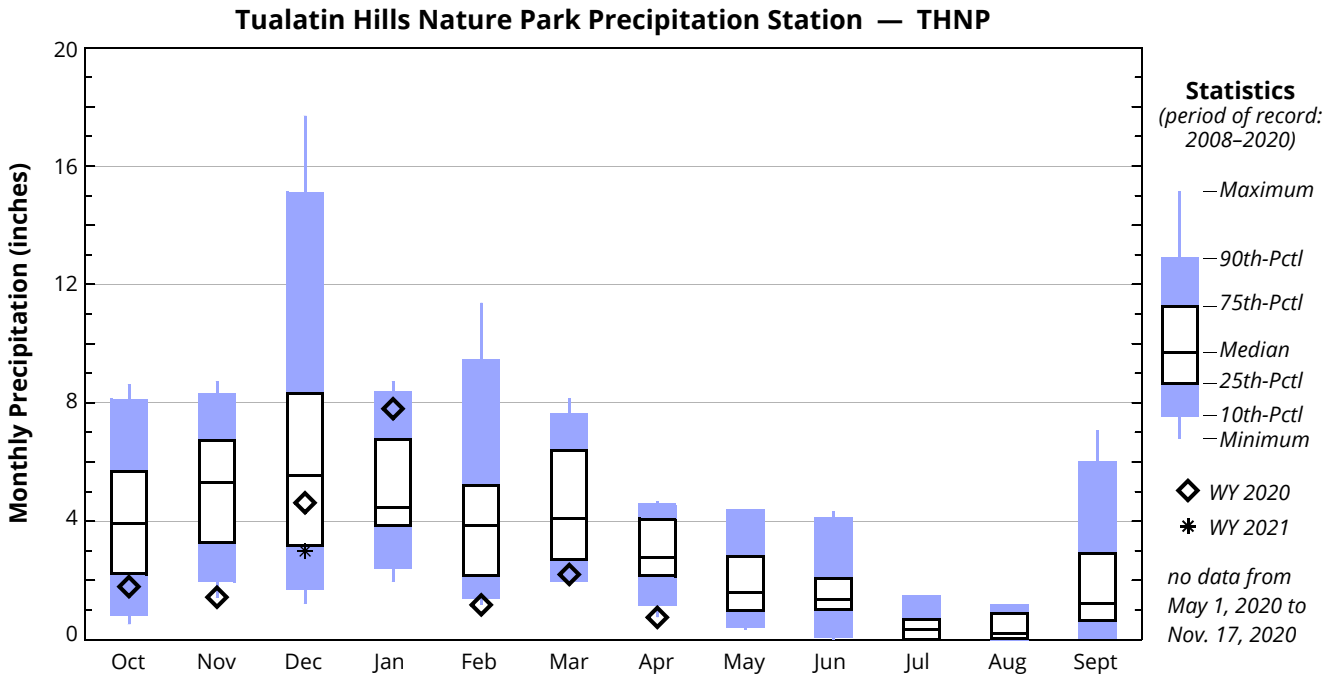
Data source: National Weather Service COOP Program (COOP ID#355945)
http://scacis.rcc-acis.org

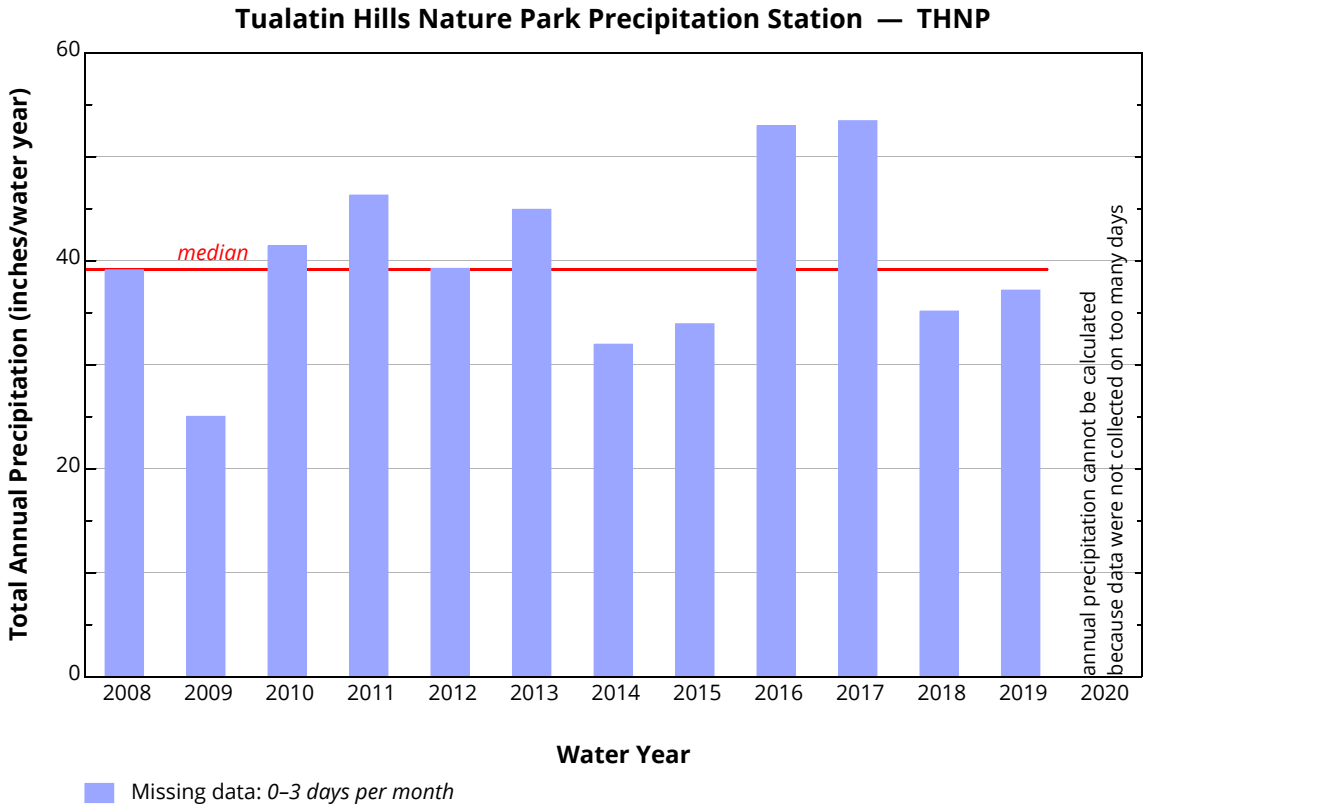
Elevation: 185 ft Latitude: 45 29 53 Longitude: 122 50 22

MONTHLY TOTAL PRECIPITATION (inches) — THNP

Water Year*	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2008	3.92	4.43	11.17	6.38	2.18	3.98	2.18	1.30	0.99	1.50	0.94	0.13
2009	1.38	4.65	3.26	4.46	2.31	3.16	2.73	0.90	0.00	0.00	0.70	1.45
2010	3.62	6.41	3.08	5.22	3.87	4.07	2.76	4.26	4.33	0.42	0.01	3.39
2011	4.86	6.60	8.38	4.28	5.45	6.08	4.41	2.83	1.40	1.37	0.03	0.60
2012	2.65	5.46	2.50	7.08	3.36	8.15	3.60	2.70	3.52	0.19	0.00	0.04
2013	6.51	8.71	8.22	1.96	1.76	1.87	2.11	4.41	1.21	0.00	1.11	7.07
2014	0.52	3.21	1.23	3.12	6.51	6.77	4.65	2.47	1.53	0.72	0.12	1.09
2015	7.32	3.37	5.56	3.52	4.03	4.48	1.85	0.70	0.33	0.26	1.17	1.34
2016	4.23	5.32	17.69	8.72	4.21	5.81	2.42	1.37	1.74	0.53	0.19	0.76
2017	8.61	7.60	6.29	4.25	11.37	6.69	3.92	1.80	1.34	0.01	0.24	1.33
2018	3.93	6.86	3.93	6.41	2.14	4.09	4.21	0.34	2.18	0.00	0.03	1.01
2019	4.71	2.81	7.94	4.18	4.96	2.25	3.66	1.17	1.08	0.40	0.50	3.50
2020**	1.79	1.43	4.62	7.80	1.17	2.20	0.75					
2021**			2.99	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.52	1.43	1.23	1.96	1.17	1.87	0.75	0.34	0.00	0.00	0.00	0.04
MAX	8.61	8.71	17.69	8.72	11.37	8.15	4.65	4.41	4.33	1.50	1.17	7.07
MEDIAN	3.93	5.32	5.56	4.46	3.87	4.09	2.76	1.585	1.37	0.33	0.215	1.21
MEAN	4.16	5.14	6.45	5.18	4.10	4.58	3.02	2.02	1.64	0.45	0.42	1.81

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.
**No data collected May 1, 2020 – November 17, 2020.


Tualatin Hills Nature Park Precipitation Station — THNP
Monthly Precipitation (inches)
0
4
8
12
16
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 2008–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021
no data from May 1, 2020 to Nov. 17, 2020


Tualatin Hills Nature Park Precipitation Station — THNP
Total Annual Precipitation (inches/water year)
0
20
40
60
median
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
annual precipitation cannot be calculated because data were not collected on too many days
Water Year
Missing data: 0–3 days per month

KGWP – KGW-TV PRECIPITATION STATION

Data source: National Weather Service COOP Program (COOP ID#356749)
http://scacis.rcc-acis.org

Elevation: 159 ft Latitude: 45 31 05 Longitude: 122 41 22

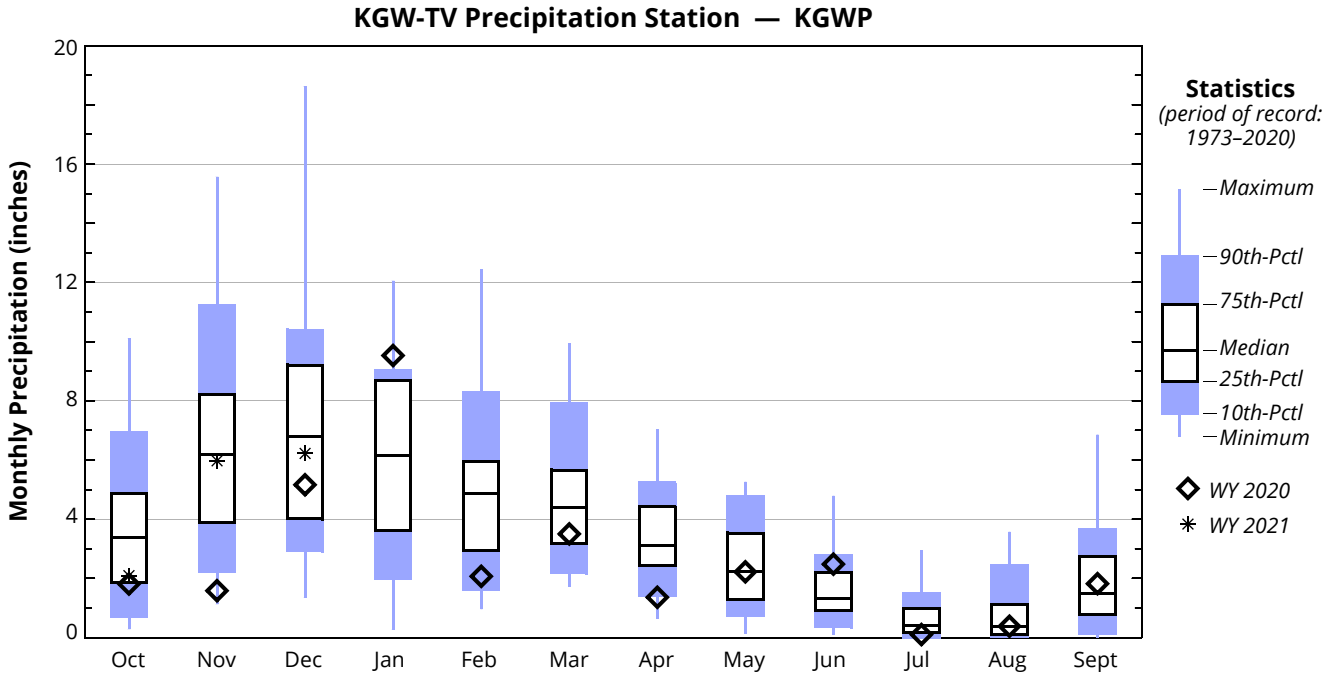
MONTHLY TOTAL PRECIPITATION (inches) — KGWP

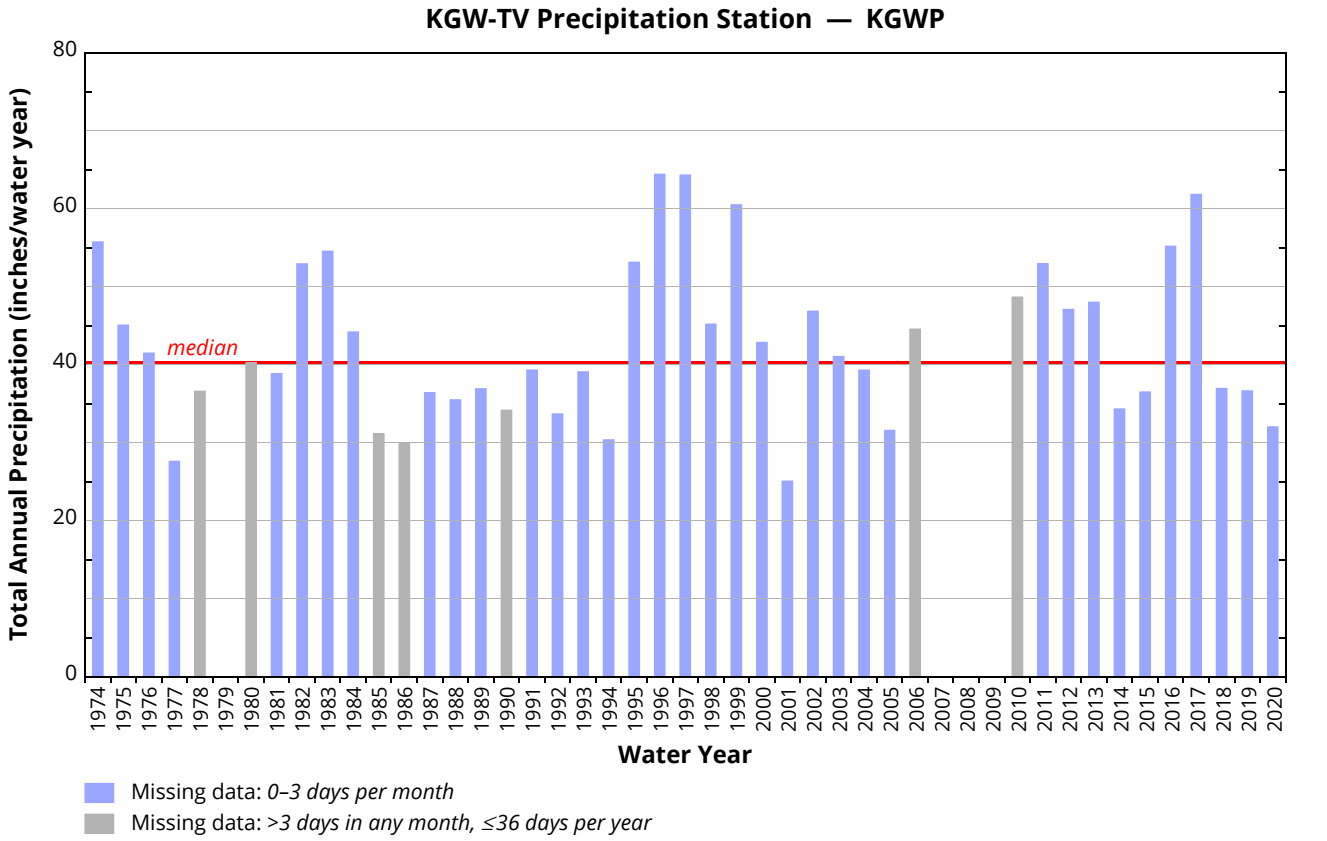
WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1973											1.66	3.76
1974	3.81	13.46	9.88	9.07	4.85	6.43	2.64	2.17	0.86	2.27	0.14	0.15
1975	2.22	7.13	6.93	8.83	6.03	5.02	2.48	1.97	1.22	0.41	2.84	0.00
1976	5.67	4.71	6.74	6.07	5.41	3.41	2.63	1.74	0.92	0.75	2.50	0.93
1977	1.73	1.13	1.36	1.26	2.71	4.10	0.63	4.39	0.99	1.05	3.57	4.69
1978	3.51	5.87		5.93	3.81	1.73	3.53	3.70	1.41	1.17	2.36	3.58
1979	0.48	4.08	2.85	3.04	7.00	2.58	2.83	2.18	0.39	0.25		
1980		4.58	7.35	8.88	4.51	4.45	3.11	2.16	2.77	0.18	0.21	2.06
1981	1.25	7.09	10.27	1.67	3.84	2.74	3.11	1.81	4.03	0.21	0.04	2.76
1982	4.57	5.99	10.34	8.76	7.10	3.61	4.89	0.59	0.99	0.83	1.92	3.33
1983	4.96	3.84	9.40	7.71	9.05	7.31	2.44	2.38	2.04	2.94	2.01	0.47
1984	1.92	10.73	5.78	2.38	4.05	4.32	4.38	4.09	4.48	0.00	0.08	1.99
1985	4.60	10.69	3.38	0.27		4.06	1.14	0.88	2.28	0.12	0.99	2.71
1986	3.05		2.20	5.87	7.15	2.78	1.32	2.33	0.32	1.86	0.04	2.96
1987	2.09	6.36	4.23	7.33	2.99	6.50	2.45	1.88	0.20	1.56	0.46	0.36
1988	0.28	1.97	9.19	6.31	1.38	4.08	5.08	2.97	2.20	0.26	0.11	1.66
1989	0.33	8.34	3.04	4.43	2.64	8.74	1.63	3.53	0.97	1.01	1.11	1.13
1990	1.68	4.46	3.82	8.51	5.44	2.68	3.01		1.89	1.10	1.04	0.52
1991	5.87	4.88	3.74	3.66	4.92	4.52	4.02	4.13	2.43	0.12	0.93	0.10
1992	2.17	7.44	4.88	5.04	4.58	1.78	5.06	0.13	0.56	0.45	0.25	1.33
1993	3.17	5.45	6.84	3.60	0.96	5.20	6.31	4.02	1.94	1.42	0.18	0.00
1994	1.44	1.79	6.86	4.95	6.11	2.72	2.31	1.23	1.10	0.07	0.14	1.63
1995	9.02	7.49	6.53	7.44	5.22	5.02	4.19	1.13	2.29	0.98	1.69	2.14
1996	4.35	11.71	7.84	8.56	12.43	4.46	5.95	4.84	0.09	0.49	0.50	3.22
1997	6.17	9.72	16.28	8.86	2.14	8.24	3.78	2.46	1.62	0.64	1.55	2.84
1998	7.58	5.19	4.01	7.76	6.80	4.21	1.49	5.18	1.61	0.34	0.00	1.02
1999	3.57	13.36	9.21	8.97	11.39	5.67	1.61	2.59	2.45	0.38	1.12	0.19
2000	2.89	7.67	7.67	8.08	4.96	3.62	2.39	2.51	0.90	0.25	0.15	1.76
2001	3.19	2.91	3.85	1.99	1.79	3.73	3.09	1.12	1.40	0.46	0.87	0.66
2002	4.37	7.44	7.83	8.03	4.92	5.40	3.60	1.57	2.19	0.19	0.01	1.31
2003	0.32	2.49	10.48	9.14	3.17	5.16	7.03	1.60	0.11	0.00	0.06	1.50
2004	2.30	5.38	10.43	5.02	4.86	2.01	2.16	1.17	1.03	0.00	3.20	1.76
2005	3.27	2.46	4.58	2.02	0.99	4.73	4.44	5.06	2.03	0.39	0.22	1.37
2006	4.26	6.54	10.20	12.05	2.38	3.63	2.52		1.12	0.19	0.07	1.12
2007	1.83	15.56										
2008								1.22				
2009												1.63
2010	3.54	7.21	4.99	6.68	3.96	5.62	3.99	4.63	4.79	0.30		2.94
2011	5.16	7.39	10.23	5.13	5.79	7.59	5.37	3.25	0.87	1.36	0.10	0.70
2012	2.64	8.32	3.37	8.74	3.71	9.95	3.85	3.21	2.78	0.51	0.00	0.01
2013	6.59	8.53	9.14	3.11	1.51	2.37	2.59	5.26	1.43	0.00	0.63	6.85
2014	0.93	3.52	1.77	3.34	5.95	7.58	4.51	2.79	1.84	0.92	0.13	1.05
2015	7.26	3.58	6.78	3.69	4.11	5.12	2.61	0.64	0.44	0.60	0.78	0.87
2016	4.39	5.61	18.61	8.93	4.87	5.71	2.46	1.30	1.11	0.75	0.16	1.26
2017	10.11	8.74	6.12	5.65	12.18	8.40	4.63	2.25	1.12	0.00	0.09	2.53
2018	5.19	7.90	4.23	6.21	2.93	3.11	5.08	0.29	1.06	0.00	0.03	0.90
2019	3.75	3.65	6.84	3.55	5.58	2.00	3.53	1.83	0.65	0.26	0.59	4.40
2020	1.81	1.58	5.16	9.53	2.07	3.50	1.36	2.22	2.48	0.10	0.38	1.82
2021	2.09	5.97	6.22	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.28	1.13	1.36	0.27	0.96	1.73	0.63	0.13	0.09	0.00	0.00	0.00
MAX	10.11	15.56	18.61	12.05	12.43	9.95	7.03	5.26	4.79	2.94	3.57	6.85
MEDIAN	3.39	6.18	6.78	6.14	4.85	4.39	3.10	2.22	1.31	0.40	0.38	1.50
MEAN	3.62	6.45	6.87	6.05	4.84	4.67	3.35	2.47	1.58	0.62	0.81	1.78

*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.

KGWP – KGW-TV Precipitation Station

Data source: National Weather Service COOP Program (COOP ID#356749)





ORCP – Oregon City Precipitation Station

Data source: National Weather Service COOP Program (COOP ID#356334)
http://scacis.rcc-acis.org

Elevation: 167 ft Latitude: 45 21 21 Longitude: 122 36 17

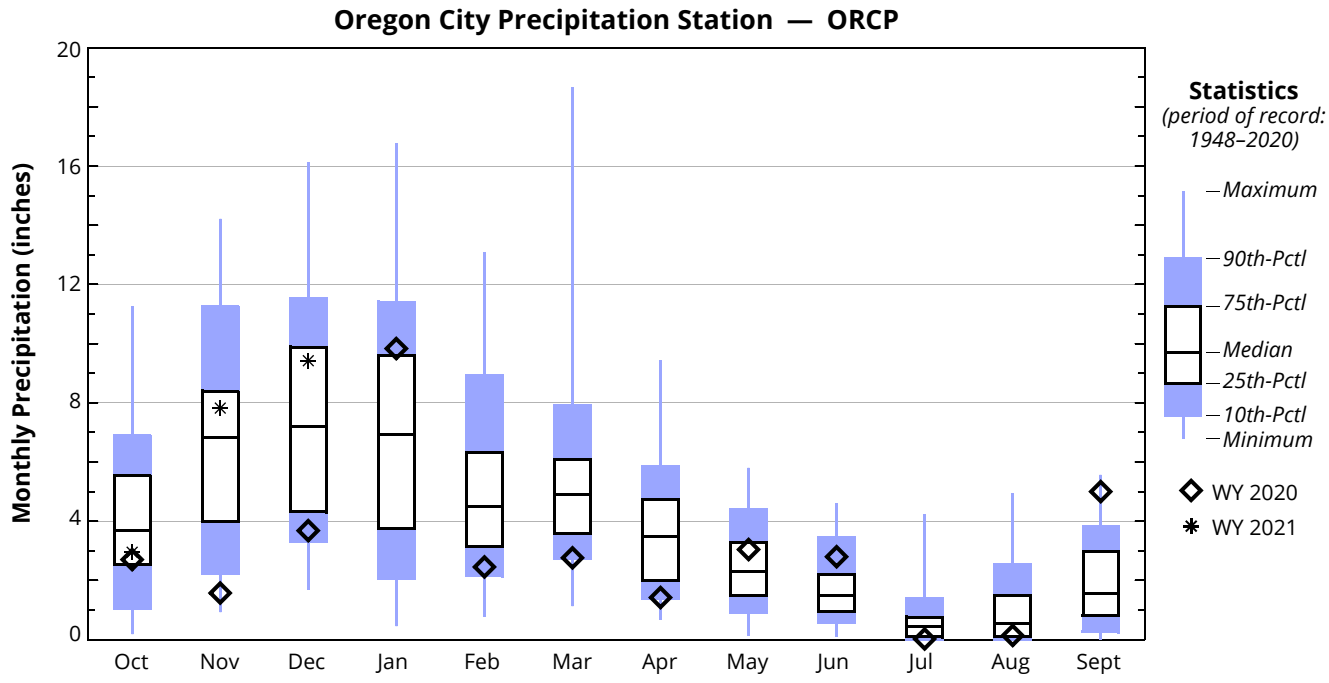
MONTHLY TOTAL PRECIPITATION (inches) — ORCP

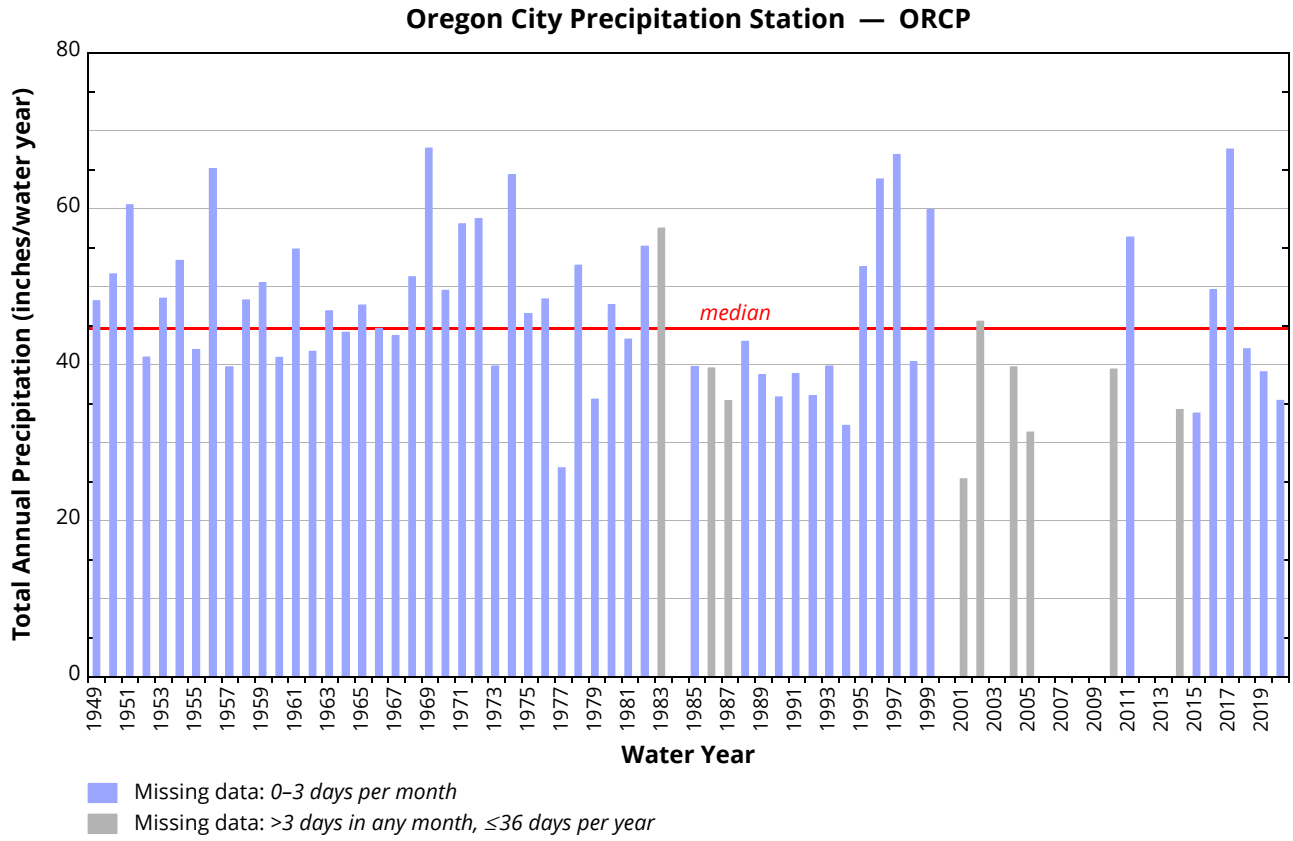
Water Year*	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1948					7.57	4.70	4.27	4.73	1.15	0.91	2.07	3.46
1949	2.70	8.46	10.26	1.48	13.09	3.34	1.16	2.69	1.25	0.94	0.22	2.60
1950	3.17	6.92	6.50	11.44	6.97	6.29	3.13	1.09	2.05	1.35	0.45	2.26
1951	10.34	12.70	7.48	10.50	5.93	5.63	1.06	2.58	0.09	0.16	0.34	3.71
1952	5.55	6.25	7.29	6.20	4.72	4.51	1.75	0.89	3.30	0.00	0.09	0.42
1953	0.87	1.32	7.70	16.77	4.76	4.96	2.52	4.15	1.50	0.04	2.53	1.40
1954	3.39	7.46	9.04	11.25	5.06	3.46	3.88	2.17	3.76	0.69	2.18	1.01
1955	3.91	5.61	6.49	3.02	3.62	5.32	6.30	1.45	1.37	1.39	0.00	3.46
1956	7.68	9.71	11.20	14.25	4.44	7.61	0.68	2.30	1.99	0.02	3.57	1.67
1957	7.69	1.81	4.53	3.26	4.81	9.43	1.66	3.10	1.95	0.43	0.37	0.68
1958	3.97	4.02	10.60	9.43	6.93	2.67	5.38	0.61	3.26	0.00	0.04	1.40
1959	1.73	8.21	7.12	10.41	5.75	5.07	1.65	3.76	2.00	0.83	0.17	3.81
1960	4.17	3.34	3.86	4.91	4.94	6.64	4.09	5.80	0.64	0.00	1.33	1.20
1961	3.49	12.68	4.18	5.22	11.74	7.01	3.47	4.14	0.60	0.57	0.85	0.84
1962	4.04	6.01	6.65	2.13	4.33	5.88	4.05	3.62	1.15	0.06	1.37	2.43
1963	4.36	11.78	3.00	1.96	4.99	6.33	5.06	4.36	1.74	1.30	0.54	1.46
1964	3.68	7.73	4.22	13.64	1.22	4.43	1.85	1.07	2.90	0.76	0.95	1.72
1965	1.22	9.65	14.78	10.67	1.99	1.47	3.42	1.91	0.75	0.24	1.50	0.03
1966	2.54	7.28	8.87	9.75	2.19	6.43	1.29	1.31	1.67	1.26	0.31	1.72
1967	3.32	6.60	8.29	8.65	2.76	6.08	3.54	2.52	1.17	0.00	0.00	0.81
1968	6.36	2.74	6.24	5.53	8.87	3.60	1.95	3.23	3.44	0.50	4.95	3.83
1969	7.09	7.89	14.56	10.47	3.92	2.99	9.44	2.23	4.48	0.09	0.11	4.50
1970	5.00	3.77	9.15	14.05	6.03	3.01	3.76	1.81	0.69	0.09	0.00	2.15
1971	3.59	8.69	9.36	10.08	4.50	6.27	4.33	2.41	3.16	0.37	1.50	3.79
1972	4.37	7.66	10.25	9.17	6.71	6.53	4.81	2.87	0.73	0.50	0.71	4.41
1973	1.04	6.47	9.79	5.90	2.34	4.00	1.79	1.62	2.23	0.08	1.40	3.18
1974	4.00	14.21	11.93	9.57	6.70	8.04	2.81	2.63	1.18	2.82	0.06	0.40
1975	2.44	7.21	6.87	8.28	5.51	5.67	2.44	1.93	2.12	0.73	3.31	0.00
1976	6.25	5.53	7.79	6.33	8.11	3.64	3.55	2.12	0.67	0.87	2.30	1.25
1977	1.20	0.93	1.69	1.65	3.52	4.20	0.77	4.31	1.41	0.68	3.01	3.41
1978	2.92	7.17	11.49	5.96	4.53	1.88	5.84	4.45	1.71	1.53	2.36	2.88
1979	0.61	4.73	3.27	2.90	8.99	3.30	3.94	2.49	0.70	0.52	0.98	3.14
1980	5.70	3.75	7.73	11.38	4.38	3.71	3.91	1.30	3.79	0.18	0.22	1.65
1981	1.56	7.60	12.61	1.84	4.51	3.13	2.55	1.83	4.52	0.28	0.00	2.84
1982	4.79	5.49	11.42	7.76	8.22	5.18	4.37	1.66	1.05	0.22	1.27	3.76
1983	4.25	5.42	10.39	8.70	8.93	7.87	2.50	2.11		4.24	2.57	0.53
1984	2.16	9.82	6.78	3.29	5.53		3.82	5.19	4.60	0.00	0.03	
1985	6.24	12.34	4.27	0.46	3.64	4.39	1.38	0.93	2.51	0.43	0.52	2.65
1986	3.59	6.47	3.05	6.56	7.99	3.19	2.40	2.89	0.57	1.92		
1987	2.08	6.93		7.92	4.44	6.00	2.71	2.11	0.49	1.62	0.23	0.84
1988	0.29	2.25	10.77	9.17	2.04	4.91	5.85	3.58	1.94	0.59	0.08	1.51
1989	0.18	11.24	3.43	5.18	3.18	7.08	2.02	2.23	1.05	0.58	1.45	1.10
1990	2.25	3.69	3.98	9.65	4.58	2.78	2.59	1.92	2.46	0.48	1.00	0.47
1991	5.94	4.94	3.31	3.50	4.26	3.71	4.63	4.40	2.32	0.06	1.61	0.15
1992	2.98	7.65	5.99	5.24	4.48	1.12	5.10	0.16	0.41	0.26	0.76	1.86
1993	4.19	4.46	6.51	3.74	1.11	5.24	6.15	4.24	1.73	2.23	0.23	0.00
1994	1.43	1.91	6.48	5.38	6.33	4.12	2.14	1.71	1.53	0.08	0.00	1.10
1995	7.22	8.74	6.62	7.61	5.44	4.23	3.88	1.54	1.97	0.76	1.62	2.93
1996	4.82	11.00	8.36	9.17	12.05	3.86	5.63	5.00	0.91	0.63	0.11	2.25
1997	5.33	9.96	16.13	8.45	2.20	8.63	4.91	2.37	2.38	1.01	1.54	4.02

MONTHLY TOTAL PRECIPITATION (inches) — ORCP (continued)

WATER YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1998	5.70	3.97	3.47	8.91	4.86	4.68	1.19	4.99	1.03	0.43	0.02	1.13
1999	4.21	11.32	9.74	9.14	10.01	5.60	3.43	3.41	1.78	0.20	0.84	0.19
2000	2.70		5.01		6.29	3.08	2.26		1.41	0.46	0.02	0.48
2001	3.88		2.98		1.33	5.02		1.60		0.73	1.05	0.80
2002	2.85	6.52	9.54		3.96	5.55	3.58	1.50	2.09	0.37	0.29	
2003	0.47	2.81	10.18		3.86		5.58	0.52	0.70	0.00		1.02
2004	3.02	6.20	9.30	5.98	3.33		1.74	2.38	2.15	0.15	3.20	2.27
2005	5.62	1.89	4.35	2.15	0.78	5.43	2.88		2.06	0.57		1.58
2006	3.19	6.73	9.91	13.20	2.60	3.70	6.28		1.01	0.08	0.00	1.25
2007				1.01	2.13		1.39	0.61		0.32	0.00	0.32
2008					3.08				0.40		1.53	0.25
2009		7.13		6.86	3.06	4.88	1.38	0.98	1.05	0.17	0.69	1.60
2010	2.74	6.35	5.05	5.39	3.65	5.06		2.85		0.22	0.17	2.24
2011	5.73	7.91	11.43	5.35	5.17	8.25	5.58	3.32	1.48	1.10	0.00	1.04
2012		9.14	4.30	9.24	3.11		4.84	3.16	3.54			0.09
2013		9.00	9.74	3.56	2.48	1.95		2.69	0.12	0.00		5.56
2014	1.05	3.94	2.08		3.83	9.02	3.93	2.59	1.33	0.91	0.77	1.56
2015	6.86	3.39	5.08	3.28	3.99	5.52	2.35	1.00	0.32	0.26	0.80	0.96
2016	4.31	7.50	14.15	7.35	3.43	5.47	3.45	1.12	1.49	0.43	0.10	0.82
2017	11.24	7.56	5.98	3.75	9.17	18.65	5.16	1.29	1.38	0.00	0.23	3.22
2018	6.51	7.72	4.18	6.98	2.85	4.32	7.08	0.12	1.73	0.00	0.05	0.52
2019	2.85	3.99	7.26	4.43	8.12	2.03	4.67	1.19	0.80	0.23	0.46	3.07
2020	2.70	1.57	3.68	9.83	2.45	2.76	1.42	3.04	2.80	0.02	0.14	5.00
2021	2.95	7.82	9.42	*Data in this row are not included in statistics because water year is incomplete.*								
MIN	0.18	0.93	1.69	0.46	0.78	1.12	0.68	0.12	0.09	0.00	0.00	0.00
MAX	11.24	14.21	16.13	16.77	13.09	18.65	9.44	5.80	4.60	4.24	4.95	5.56
MEDIAN	3.68	6.83	7.19	6.92	4.50	4.91	3.47	2.30	1.50	0.43	0.53	1.57
MEAN	3.93	6.66	7.50	7.06	4.99	5.08	3.48	2.46	1.73	0.59	0.93	1.88

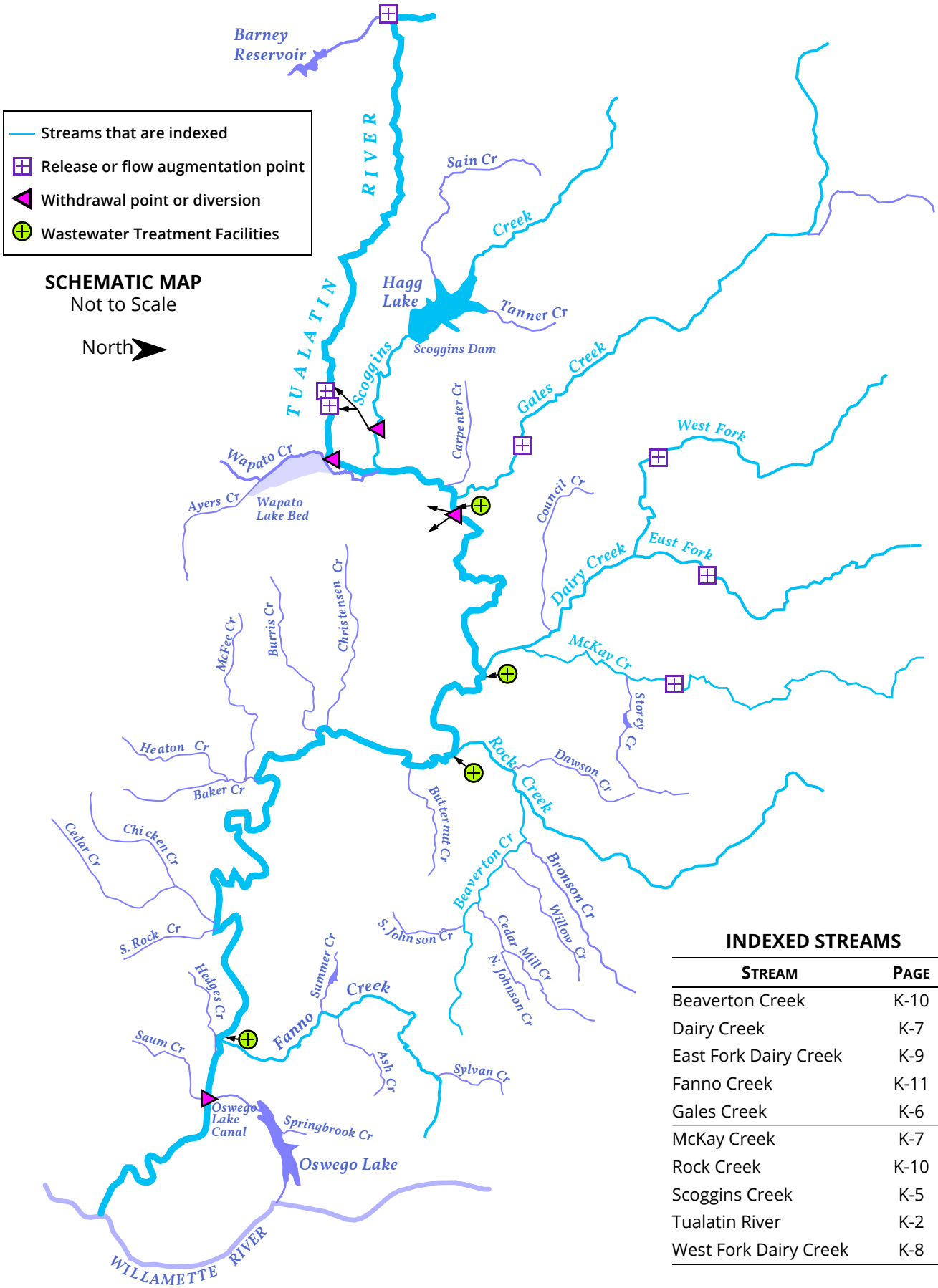
*Water Year (WY) begins October 1st of the previous calendar year and ends September 30th of current year.


Oregon City Precipitation Station — ORCP
Monthly Precipitation (inches)
0
4
8
12
16
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Statistics
(period of record: 1948–2020)
Maximum
90th-Pctl
75th-Pctl
Median
25th-Pctl
10th-Pctl
Minimum
WY 2020
WY 2021


Oregon City Precipitation Station — ORCP
Total Annual Precipitation (inches/water year)
0
20
40
60
80
median
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
Water Year
Missing data: 0–3 days per month
Missing data: >3 days in any month, ≤36 days per year

this page intentionally blank

APPENDIX H
River Mile Indices



INDEXED STREAMS

TUALATIN RIVER – RIVER MILE INDEX

[Abbreviations: RB= right bank, LB= left bank]

RIVER MILE	BANK	DESCRIPTION	DRAINAGE AREA (square miles)	ELEVATION (feet)
0.00		Mouth of Tualatin River at Willamette River (LB of Willamette River @ River Mile 28.5)	712	
0.20		Weiss Bridge – Petes Mtn Rd.		
1.60	RB	Fields Creek		
1.69		State Hwy 212 Bridge (Fields Bridge)		
1.75	LB	USGS Gage #14207500: Tualatin River at West Linn	706	85.61
2.40	LB	Tate Creek		
3.45		Lake Oswego Corp. Diversion Dam		
4.25		Interstate 205 Bridge		
4.56	LB	Wilson Creek		
5.34	LB	Boat Launch		
5.36	LB	Shipley Creek		
5.38		Shipley Bridge– Stafford Rd NWS Wire Weight Gage		
5.62	LB	Pecan Creek		
6.02	RB	Athey Creek		
6.70	RB	Saum Creek		
6.70	LB	Oswego Canal Diversion River Elevation Recording Gage #14206990 Headgate and Canal Recording Gage #14207000		
7.36	LB	Boat Launch – Dogwood Drive		
7.67	RB	Browns Ferry Park Canoe Launch		
7.83		Clackamas County – Washington County Boundary (Underground Cable Crossing Sign)		
8.18		Interstate 5 Bridge		
8.60		Boones Ferry Road Bridge		
8.64	RB	Hedges Creek		
8.90	RB	Tualatin Park Boat Launch		
8.91	RB	Southern Pacific RR Bridge Tualatin River at Tualatin Elevation Recording Station #14206956 (formerly #14206960)		
9.32	LB	Fanno Creek *[Index on page I-13]*	26.8	
9.33	LB	Durham Wastewater Treatment Plant Outfall (9.2 on NPDES permit)		
9.34		Oregon Electric RR Bridge		
9.80	LB	Cook Park Boat Launch		
11.50	LB	US Hwy. 99W Bridge (Pacific Highway) Canoe Launch(access from southeast of bridge)		
12.68		Overhead BPA Transmission Line; Vancouver–Eugene		
12.80	LB	Rivermeade Boat Launch (Private)		
15.20	RB	Rock Creek–South	13.7	
15.50	RB	Chicken Creek		
16.09	RB	Chicken Creek Drainage Ditch		
16.22	RB	Shamberg Bridge (Elsner Road) Rated Staff Gage for Stream Flow		

TUALATIN RIVER – RIVER MILE INDEX

[Abbreviations: RB= right bank, LB= left bank]

RIVER MILE	BANK	DESCRIPTION	DRAINAGE AREA (square miles)	ELEVATION (feet)
21.12		Overhead BPA Transmission Line; Big Eddy–Keeler		
26.90		State Hwy. 210 bridge (Scholls)		
28.20	RB	McFee Creek		
30.76	LB	Unnamed Stream (Jacktown)		
31.62	RB	Burris Creek		
31.92	RB	Christensen Creek		
33.30	LB	Harris Bridge (State Highway 208) Farmington Recording Stream Gage #14206500	568	100.42
35.68	LB	Butternut Creek		
37.38	LB	Gordon Creek		
38.08	LB	Rock Creek Wastewater Treatment Plant Outfall (37.7 on NPDES permit)		
38.09	LB	Rock Creek Beaverton Creek	74.6 36	
38.44	LB LB	Rood Bridge Small Watercraft Launch Rood Bridge Road Bridge Recording Stream Gage #14206295		105.16
40.44	RB	Davis Creek		
41.64		Minter Bridge Road Bridge		
43.88	LB LB	Jackson Slough Jackson Bottom Wetlands Hillsboro Wastewater Treatment Plant Effluent Outfall (42.9 and 43.3 on NPDES permit)		
44.40	RB	State Highway 219 Bridge Recording Stream Gage #14206241		
44.73	LB	Dairy Creek *[Index on page I-9]* McKay Creek (LB) *[Index on page I-10]* East Fork Dairy Creek *[Index on page I-11]* West Fork Dairy Creek *[Index on page I-12]*	226 63.4	
51.54	RB	Golf Course Road Bridge Golf Course Recording Stream Gage #14204800		
53.74		LaFollett Road (Bridge removed)		
55.24	LB	Forest Grove Wastewater Treatment Plant Outfall (53.8 on NPDES permit) Fern Hill Wetlands and CWS Natural Treatment System		
55.32		Fernhill Road Bridge		
56.10		Springhill Pump Plant Intake		
56.80	LB	Gales Creek *[Index on page I-8]*	78.6	
57.38	LB	Carpenter Creek		
57.84	LB	Dilley Creek		
58.04	LB	Johnson Creek		
58.82	LB	Springhill Road Bridge USGS Gage #14203500: Tualatin River at Dilley	125	147.57
59.02	LB	O'Neil Creek		
60.00	LB	Scoggins Creek *[Index on page I-7]*		
60.80	RB	Wapato Creek Wapato Creek Improvement District Return Flow		

TUALATIN RIVER – RIVER MILE INDEX

[Abbreviations: RB= right bank, LB= left bank]

RIVER MILE	BANK	DESCRIPTION	DRAINAGE AREA (square miles)	ELEVATION (feet)
62.00	RB	Wapato Improvement District Headgate)		
62.24		Southern Pacific RR Bridge		
62.25		State Highway 47 Bridge (Gaston) New Tualatin River at Gaston Recording Stream Gage #14202510		
62.30		Bates Road Bridge		
62.80	LB	Black Jack Creek		
62.90		Overhead BPA Transmission Line; Forest Grove–McMinnville		
63.13		TVID Patten Valley Pump Station Outfall #1		
63.87	RB	Discontinued Tualatin River at Gaston Recording Stream Gage	48.5	
64.26		TVID Patten Valley Pump Station Outfall #2		
65.34	RB	Williams Canyon		
65.90		Mt. Richmond Road Bridge		
67.30	LB	Hering Creek		
67.83		South Road Bridge (Cherry Grove)		
68.44	RB	Roaring Creek		
69.42		Little Lee Falls		
70.70	LB	Raines Bridge– Tualatin River below Lee Falls Rated Staff Gage for Stream Flow		
71.07		Lee Falls		
73.28		Haines Falls		
73.30	LB	City of Hillsboro Haines Falls Intake		
74.00	LB	Lee Creek		
74.05	RB	Patten Creek		
75.70	LB	Sunday Creek		
76.60	LB	Maple Creek		
76.95		Ki–A–Cut Falls		
78.00	RB	Barney Reservoir Aqueduct Outfall		
79.3+		Headwaters of Tualatin River		

SCOGGINS CREEK — STREAM MILE INDEX

[Abbreviations: RB= right bank, LB= left bank]

RIVER MILE	BANK	DESCRIPTION
0.00		Confluence with Tualatin River @ River Mile 60.00
0.94		RR Bridge
1.00		State Highway 47 Bridge
1.70		Old State Highway 47 Bridge
1.71		USGS Gage #14203000: Scoggins Creek near Gaston, OR (10/1940 – 9/1974) Drainage Area = 43.3 square miles
4.80		USGS Gage #14202980: Scoggins Creek below Henry Hagg Lake, near Gaston, OR (1/1975 –present) Drainage Area = 38.8 square miles
5.10		Scoggins Dam
7.00	RB	Sain Creek
7.62	LB	Tanner Creek
8.40	LB	Wall Creek
9.70		Lake Loop Road Bridge
9.30		Scoggins Creek above Henry Hagg, near Gaston, OR – Gage #14202850 (10/1972 – present) Drainage Area = 15.9 square miles
10.52	LB	Parson Creek
15.50	LB	Fisher Creek
15.5+		Headwaters

GALES CREEK — STREAM MILE INDEX

[Abbreviations: RB= right bank, LB= left bank, ISWR= Instream Water Right]

RIVER MILE	BANK	DESCRIPTION
0.00	RB	Confluence with Tualatin River@ River Mile 56.80 ***ISWR:*** C–59523 5/25/66
1.63		Southern Pacific RR Bridge
1.75		Forest Grove Bypass Bridge – State Highway 47 to State Highway 8
2.36		State Highway 47 Bridge Gales Creek Recording Stream Gage #14204530
3.66		Ritchey Road Bridge (County Road 461)
6.53	RB	Prickett Creek
6.98		Stringtown Road Bridge (County Road A–176)
7.70	RB	Roderick Creek
8.56		Roderick Road Bridge (County Road 395) USGS Gage #14204500: Gales Creek near Forest Grove Oregon (10/1940–9/1956, 10/1970–9/1981)
8.94	RB	Godfrey Creek
9.22	LB	Kelly Creek
10.68	RB	Clear Creek
11.44	RB	Iler Creek
11.46		NW Gales Creek Road (County Road 1312) Community of Gales Creek
11.47	RB	Fir Creek
12.00		***ISWR:*** C–59509 5/25/66 above this point
12.36		Clapshaw Hill Road Bridge (County Road 2037) Rated Staff Gage for Stream Flow
12.40	LB	Little Beaver Creek ***ISWR:*** C–59512 5/25/66
12.92		Parson Road Bridge
14.44	RB	White Creek
14.68		NW Wilson River Highway Bridge (State Highway 6)
15.74	RB	Lyda Creek
16.26	RB	Bateman Creek
17.50		USGS Gage #1420400: Gales Creek near Gales Creek, OR – (10/1935–9/1945 & 10/1963–9/1970)
18.00	LB	Beaver CreekCommunity of Glenwood ***ISWR:*** C–59524 5/25/66
18.45		NW Timber Road Bridge (County Road 374)
18.65		Wilson River Highway Bridge (State Highway 6)
19.70		Wilson River Highway Bridge (State Highway 6)
19.88	LB	Coffee Creek
20.07	LB	Finger Creek
20.70	RB	South Fork Gales Creek ***ISWR:*** C–59514 5/25/66
21.60	LB	North Fork Gales Creek ***ISWR:*** C–59513 5/25/66
22.76	RB	Low Divide Creek
		Gales Creek Forest Park
23.20		USGS Gage #14203750: Gales Creek near Glenwood, OR (7/94 – present)
23.2+		Headwaters

Dairy Creek — Stream mile index

[Abbreviations: RB= right bank, LB= left bank]

River Mile	Bank	Description
0.00		Confluence with Tualatin River @ River Mile 44.73
1.65		Southern Pacific RR Bridge
2.06		State Highway 8 Bridge USGS Gage #14206200: Dairy Creek at TV Hwy
2.20		Oregon Electric RR Bridge
2.26	LB	McKay Creek
3.53	RB	Council Creek
6.02		Susbauer Road Bridge (County Road 196)
7.39		BPA Power Line Crossing
8.51		Cornelius–Schefflin Road Bridge (County Road 2161) Rated Staff Gage for Stream Flow
10.55		Confluence of East Fork Dairy Ck & West Fork Dairy Ck

McKay Creek — Stream mile index

[Abbreviations: RB= right bank, LB= left bank]

River Mile	Bank	Description
0.00		Confluence with Dairy Creek @ River Mile 2.26
1.31		Padgett Road Bridge (County Road 2245)
2.25		Hornecker Road Bridge (County Road 2393) Rated Staff Gage for Stream Flow
2.30		Southern Pacific RR Crossing
4.32		Glencoe Road Bridge (County Road A–146½) Rated Staff Gage for Stream Flow
4.46		BPA Transmission Line Crossing
5.34	LB	Waible Creek
6.30		NW Old Scotch Church Road Bridge (County Road A–66)
8.00		US Hwy 26 Bridge – Sunset Highway
9.36		NW West Union Road Bridge (County Road 2496) City of North Plains to West
9.38		Southern Pacific RR Crossing
10.94	LB	Jackson Creek
12.80		NW Shadybrook Road Bridge (County Road A–110)
15.56		NW Collins Road Bridge (County Road 1889) Rated Staff Gage for Stream Flow
16.56	RB	Brunswick Canyon
16.66	LB	East Fork McKay Creek
24.0+		Headwaters

West Fork Dairy Creek — Stream mile index

[Abbreviations: RB= right bank, LB= left bank]

River Mile	Bank	Description
0.00		Confluence with East Fork Dairy Creek @ River Mile 10.56 of Dairy Creek
1.96		Evers Road Bridge (County Road A–187) Rated Staff Gage for Stream Flow
2.09	RB	Lousignant Canal
2.82		State Highway 47 Bridge
5.28		Greenville Road Bridge (County Road A–159)
6.20		State Highway 6 Bridge
6.22	RB	Cedar Canyon Creek
7.53		Cedar Canyon Road Bridge (County Road 1938) City of Banks to SE
7.70		State Hwy 47 Bridge – Rated Staff Gage for Stream Flow USGS Gage #14205000: West Fork Dairy Creek at Banks, OR (10/1940 – 9/1943) Drainage Area = 47.5 square miles
7.72		Port of Tillamook Bay RR Bridge
9.30		US Highway 26 Bridge
10.60		NW Green Mountain Road Bridge (County Road 127)
11.02	LB	Garrigus Creek
12.19		NW Turk Road Bridge (County Road 233)
12.36	RB	Kuder Creek
12.90		NW Pihl Road Bridge (County Road 1045) Community of Manning
13.33		Port of Tillamook Bay RR Bridge
13.48		Port of Tillamook Bay RR Bridge
13.58	LB	Witcher Creek
14.37		Port of Tillamook Bay RR Bridge
14.50		US Highway 26 Bridge
15.00		NW Fisher Road Bridge (County Road 394)
15.11	LB	Mendenhall Creek
15.58	RB	Burgholzer Creek
15.60		US Highway 26 Bridge
16.00		Community of Buxton – ½ mile east
17.02	LB	Williams Creek
17.98	RB	Cummings Creek
18.10		State Highway 47 Bridge
18.85		Port of Tillamook Bay RR Bridge
22.0+		Headwaters

EAST FORK DAIRY CREEK — STREAM MILE INDEX

[Abbreviations: RB= right bank, LB= left bank, ISWR= Instream Water Right]

RIVER MILE	BANK	DESCRIPTION
0.00		Confluence with West Fork Dairy Creek @ River Mile 10.56 of Dairy Creek
1.24		Roy Road Bridge (County Road A–159) Rated Staff Gage for Stream Flow
2.34		Port of Tillamook Bay RR Bridge
3.04	RB	Bledsoe Creek
3.20		Harrington Road Bridge (County Road 1989)
4.80		SP&S RR Bridge
5.56		US Highway 26 Bridges
6.91		Mountaindale Road Bridge (County Road 12)
6.97	LB	Baker Creek
8.44		Dairy Creek Road Bridge (County Road 2067) Rated Staff Gage for Stream Flow
8.55		USGS Gage #14205500: East Fork Dairy Creek at Mountaindale, OR – (10/1940–9/1951) Drainage Area = 43.0 square miles
9.62		NW Uebel Road Bridge (County Road 304)
12.50		Murphy Lane Bridge (Private) Rated Staff Gage for Stream Flow
12.82	RB	Big Canyon
13.00		***ISWR:*** C–59525 5/25/66
13.95	RB	Murtaugh Creek
14.04	LB	Meadow Brook Creek
14.17		Meacham Road Bridge (County Road 742)
15.55	LB	Plentywater Creek ***ISWR:*** C–59527 5/25/66
16.52	RB	Denny Creek ***ISWR:*** C–59526 5/25/66
16.56		Bacona Road Bridge (County Road 422) Snooseville Corner
17.21		Greener Road Bridge (County Road 1990)
17.34	LB	Rock Creek
17.50		Little Bend Park
17.60		Fern Flat Road Crossing (County Road 241)
18.15	LB	Panther Creek
18.31		Fern Flat Road Crossing (County Road 241)
18.84	RB	Roundy Creek
19.10	RB	Campbell Creek
21.30		Washington County – Columbia County Boundary
21.48		BPA Power Line Crossing
22.0+		Headwaters

Rock Creek — Stream mile index

[Abbreviations: RB= right bank, LB= left bank

River Mile	Bank	Description
0.8		River Road Bridge
1.2		Southern Pacific RR Bridge
1.2+		State Highway 8 Bridge – Rated Staff Gage for Stream Flow
2.4		SW Brookwood Avenue Bridge
3.1	RB	Dawson Creek
4.4	LB	Beaverton Creek
4.5		Baseline Road Bridge
4.9		NW Quatama Road Bridge – Rated Staff Gage for Stream Flow
5.5		Oregon Electric RR Bridge
5.7		NW 216th Avenue Bridge
6.7		NW Cornell Road Bridge
7.8		US Highway 26 Bridge
9.0		West Union Road Bridge – Rated Staff Gage for Stream Flow
9.3	RB	Holcomb Creek
10.0		NW 185th Avenue Bridge
10.9	LB	Abbey Creek
11.0		Germantown Road Bridge
11.9		Cornelius Pass Road Bridge
13.0		Old Cornelius Pass Road Bridge
14.1		Burlington Northern RR Bridge
15.1		Rated Staff Gage for Stream Flow
16.4		Rock Creek Road Bridge
16.5		Van Raden Reservoir
19.1		Headwaters

Beaverton Creek — Stream mile index

[Abbreviations: RB= right bank, LB= left bank

River Mile	Bank	Description
0.00		Confluence with Rock Creek @ River Mile 4.3
0.40		Southwest Baseline Road
1.16		Southwest 216th Avenue Road Bridge– Rated Staff Gage for Stream Flow
2.20	RB	Bronson Creek
3.32	RB	Willow Creek
4.90		Southwest 170th Avenue Road Bridge– Rated Staff Gage for Stream Flow
5.47	LB	Unnamed Stream
6.06	LB	Johnson Creek
6.30	LB	Unnamed Stream
6.66		Oregon Electric Railroad
7.45		Cedar Hills Boulevard
7.90	RB	Reasoners Creek
8.75+		Headwaters

FANNO CREEK – RIVER MILE INDEX

[Abbreviations: RB= right bank, LB= left bank]

RIVER MILE	BANK	DESCRIPTION
0.00		Confluence with the Tualatin River at River Mile 9.32
0.86		Oregon Electric RR Bridge
1.19		Durham Road Bridge USGS Gage #14206950: Fanno Creek at Durham
2.00	LB	Ball Creek
2.12		Bonita Street Bridge – Rated Staff Gage
3.28		SW Hall Blvd Bridge
3.95		SW Ash Avenue Bridge
4.28		SW Main St Bridge
4.30		State Hwy 99W Bridge
4.49		SW Grant Ave Bridge
5.07		SW Tiederman Ave. Bridge
5.08	RB	Summer Creek Rated Staff Gage at Fowler School
5.32		SW Tigard Ave Bridge
5.53		SW North Dakota St Bridge
5.54	LB	Ash Creek Rated Staff Gage at Greenburg Road
6.38		Scholls Ferry Road Bridge
7.30		Tuckerwood – Rated Staff Gage
7.66		SW Hall Blvd Bridge
8.40		SW Denny Rd Bridge
8.60		Oregon Electric RR Bridge
8.70		State Hwy 217 Bridge
9.42		Scholls Ferry Road Bridge Rated Staff Gage
9.66		SW 92nd Ave Bridge
9.90		SW Bohmann Parkway Bridge
10.16		SW 86th Ave Bridge
10.78		SW Nicol Road Bridge
11.76		Olson Road Bridge
11.96	RB	Sylvan Creek
11.98		SW Beaverton–Hillsdale Hwy (State Hwy 10)
12.10		Washington County – Multnomah County Line
12.58		SW 56th Ave Bridge USGS Gage #14206900: Fanno Creek at 56th
12.81		SW Shattuck Road Bridge
13.22		SW 45th Ave Bridge
13.23	RB	Ivey Creek
13.32		SW 43rd Ave Bridge
13.38		SW 42nd Ave Bridge
13.48		SW 39th Ave Bridge
13.98		SW Beaverton–Hillsdale Hwy (State Hwy 10)
14.10		SW 30th Ave Bridge
14.1+		Headwaters