

2017 Water Year Report

Summary of Thurston County Precipitation, Groundwater, Stream and
Lake Data from October 2016 to September 2017

Thurston County Water Resources – Environmental Monitoring Program



April 2018

Acknowledgements:

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List of Monitoring Stations and their Basin Codes

Stream and Lake	Precipitation	Groundwater
10a: Eaton Creek @ Yelm Hwy	05u: Yelm WRF	DP1: 5013 Donnelly Dr SE
10b: Lake St. Clair	10u: Meridian Rd	DP2: 3986 Woodlawn Dr SE
<i>14a: Spurgeon Creek</i>	11u: NOAA Olympia Airport	DP3: 5535 Donnelly Dr SE
17a: Chambers Creek	11w: Rainier Transfer Station	ECY1: 5143 Windermere Dr SE
<i>17b: Chambers Ditch @ Wilderness</i>	13u: Lake Lawrence	ECY2: 5535 Donnelly Dr SE
18a: Woodland Creek @ Pleasant Glade Rd.	18u: Lacey Fire Dist. 3 Fire Station	ET1: 8538 9th Way SE
18b: Long Lake Level	18w: WARC TC	HFB-01: 628 Hidden Forest Dr SE
20a: Woodard Creek @ 36th Ave.	20u: Southbay Firestation	HFB-02: 524 Hidden Forest Dr SE
24a: McLane Creek	23u: Percival Creek, Bldg 4	HFB-03: 8836 6th Way SE
32b: Green Cove Creek @ Butler Cove FS	24u: McLane FS Wx	LRS11a: 9605 Tilley Rd S
44a: Black Lake Ditch @ Belmore Rd	27u: Boston Harbor	LRS12: 9411 SW Kimmie St
<i>45b: Black River @ 128th Ave.</i>	<i>33u: Griffin FS</i>	LRS1a: 6841 Foster Dr SW
52a: Salmon Creek @ Littlerock Rd.	<i>33x: Griffin FS 13-2</i>	LRS7a: 3804 93rd Ave SW
53a: Scott Lake Culvert	45u: Littlerock	LRS8: 8943 Walter Ct SW
<i>54a: Beaver Creek</i>	45w: Rochester Drop Box	<i>LRS8a: 8925 Walter Court SW (2017)</i>
55a: Scatter Creek @ James Rd.	55u: Tenino	LRS9: 2729 93rd Ave SW (Lathrop)
65a: Prairie Creek @ Old Highway 99	59u: Bloody Run USGS	MW1: 10415 Littlerock Rd SW
	65u: Grand Mound	MW2: 10415 Littlerock Rd SW
	69u: Summit Lake	MW3a: 3623 104TH Ave SW (Jones)
		MW5: 800 93rd Ave SE
		<i>SCMW_1: Leon St. SW</i>
		<i>SCMW_2: Pendleton and 180th</i>
		<i>SCMW_3: 201st and Old HW 99</i>
		<i>SCMW_4: Edinger Morris and Florence</i>
		<i>SCMW_5: 183rd Ave</i>
		<i>SCMW_6: Loganberry</i>
		<i>SCMW_7: Leitner and 180th</i>
		<i>SCMW_8: Old HW 99 and Violet Prairie</i>
		SLB-1: Scott Lake, Trevue Ave SW & Scott Creek Dr SW
		SLB-2: Scott Lake, 11746 Scott Creek Dr SW
		SSW1: Stuart St Well
		TWB1: Huskey Way SE & Carpenter Rd SE
		TWB10: Choker Ct & Bobcat Dr SE
		TWB11: 315 Ranger Dr SE
		TWB2: 6731 Kinwood St SE
		TWB3: 7309 Husky Way SE
		TWB4: 7653 Husky Way SE
		TWB5: 404 Choker St SE
		TWB6: Husky Way SE & Wildcat St SE
		TWB7: 454 Cougar St SE
		TWB8: 455 Bulldog St SE

Brown Italic: Site retired in WY 2017

Green Italic: Site added in WY 2017

Executive Summary- Water Year 2017

Activities

In Water Year 2017 (October 1, 2016 through September 30, 2017) the Environmental Monitoring Program (EMP) for Thurston County maintained a total of 90 monitoring stations.

Summary of Monitoring Stations

Type	Count
Weather and Atmosphere	19
Surface Water (Stream and Lake)	17
Groundwater	41
Total (2017)	77

One new weather station, three new stream stations, and eight new monitoring wells were installed. One weather station and one stream gauging location were relocated. No monitoring stations were discontinued.

In 2017 the EMP began installing telemetered stations that can relay data to a central database without the need for a physical field visit. Lake St. Clair equipment was installed and began transmitting in February 2017, and the new Deschutes Falls Park weather station was installed in late September 2017 (transmission is not yet active). Multiple new telemetered stations are anticipated in WY 2018.

A new dashboard displaying data from the centralized water database (updated hourly) was launched in mid-2017. EMP staff coordinated with King County to import millions of old records into the new central database and to create new features such as lake elevation monitoring.

Year In Review

The winter months of December 2016 through February 2017 were colder than the average year with a greater volume of snow, more days of snow, and more days where the low dropped below freezing. By contrast the summer months were somewhat warmer than average.

WY 2017 was wetter than the long term average, and nearly as wet as 2016. Rainfall was erratic, with much higher than normal volumes in October and November, followed by a drier December, a very dry January, then an increasingly wet spring culminating in March and April each with about twice the normal rainfall amount.

Streams during WY 2017 generally followed precipitation trends, with discharges increasing throughout the winter and into the spring. Discharges in late spring were notably higher than the same time in WY 2016, again due to the abnormally heavy March and April precipitation.

Groundwater levels in WY 2017 started within the range of normal elevations, owing to WY 2016 starting in drought but ending with unusually high precipitation. Like WY 2016, the groundwater elevations in WY 2017 reached their peak in mid-spring and were unusually high. Despite the elevated groundwater, there were no reports of widespread groundwater flooding in the County in WY 2017.

A notable event occurred on May 4, 2017, when a “microburst”, formed by a sudden downdraft of cold air, created intense straight-line winds and short-duration but high-intensity rainfall in a narrow swath that included parts of Lacey and Tumwater.

Background and Introduction

The Thurston County Water Resources, Environmental Monitoring Program (EMP) is responsible for installing, maintaining and collecting data from 90 fully functional monitoring stations placed throughout Thurston County to monitor atmospheric conditions, streamflow, and groundwater and lake levels. About one quarter of these monitoring stations are part of an Inter-local Monitoring Agreement (ILMA) between Thurston County and the Cities of Lacey, Tumwater, and Olympia. This report contains mostly volumetric data relating to volumes and quantities and not chemical parameters of the waters of the County. The Thurston County Environmental Health Division collects and presents chemical and biological parameter data as their major contribution to this annual report. That data is available as a supplemental report in conjunction with this document.

Monitoring under the ILMA began in the early 1990s and has provided our partnership with millions of data records since its inception. The data is used to gage the condition of our water resources in the northern part of Thurston County and within the jurisdictions of the cooperative partners. The cost of the ILMA is divided between the partners based on the number and type of equipment that is located within their respective boundaries. This data is shared between all partners and posted online for review and downloading. This data is useful not only for evaluating the general health of our systems, but also for engineering and flow modeling for basin and critical areas planning and regulatory issues.

In addition to the ILMA, Thurston County also maintains a larger program called the General Environmental Monitoring (GEM) Program. This concurrent program contains the majority of the stations that are deployed throughout Thurston County. This program has grown steadily since its founding in 2000. The purpose of the wider GEM program is to evaluate *all* aspects of the water cycle countywide to include atmospheric conditions, streamflow stages and volumes, and groundwater and lake levels. The data collected from both the ILMA and the GEM are maintained by Thurston County and provided to our partners and the public online.

This report is prepared to provide a summary of findings for the stated period of record. Thurston County has elected to include both the ILMA data and the GEM data together in this summary report to provide a complete picture of the water cycle in Thurston County from the clouds to the Sound and what the water does on its journey.

This report is a summary of WY 2017. It also contains long term records where the period of record provides a wider perspective on the subject water year. Running averages are used as comparison values for many sites to compare and contrast this water year with historic values. The data presented in this report, as well as all other, more detailed datasets, are available upon request.

In 2017, the Environmental Monitoring Program unveiled the Thurston Rainfall and Water Level Dashboard. This dashboard is intended to give the public and other interested parties quick access to all of the County's field station data. It also contains the most recent introduction of the automated telemetered groundwater, precipitation and lakes data. The telemetered sites are updated daily, while the field download sites are updated each collection cycle, approximately once per month. The dashboard is also the portal to the County's historical data. The dashboard is accessible at the following link

<http://rsh2o.co.thurston.wa.us/water-monitoring/>

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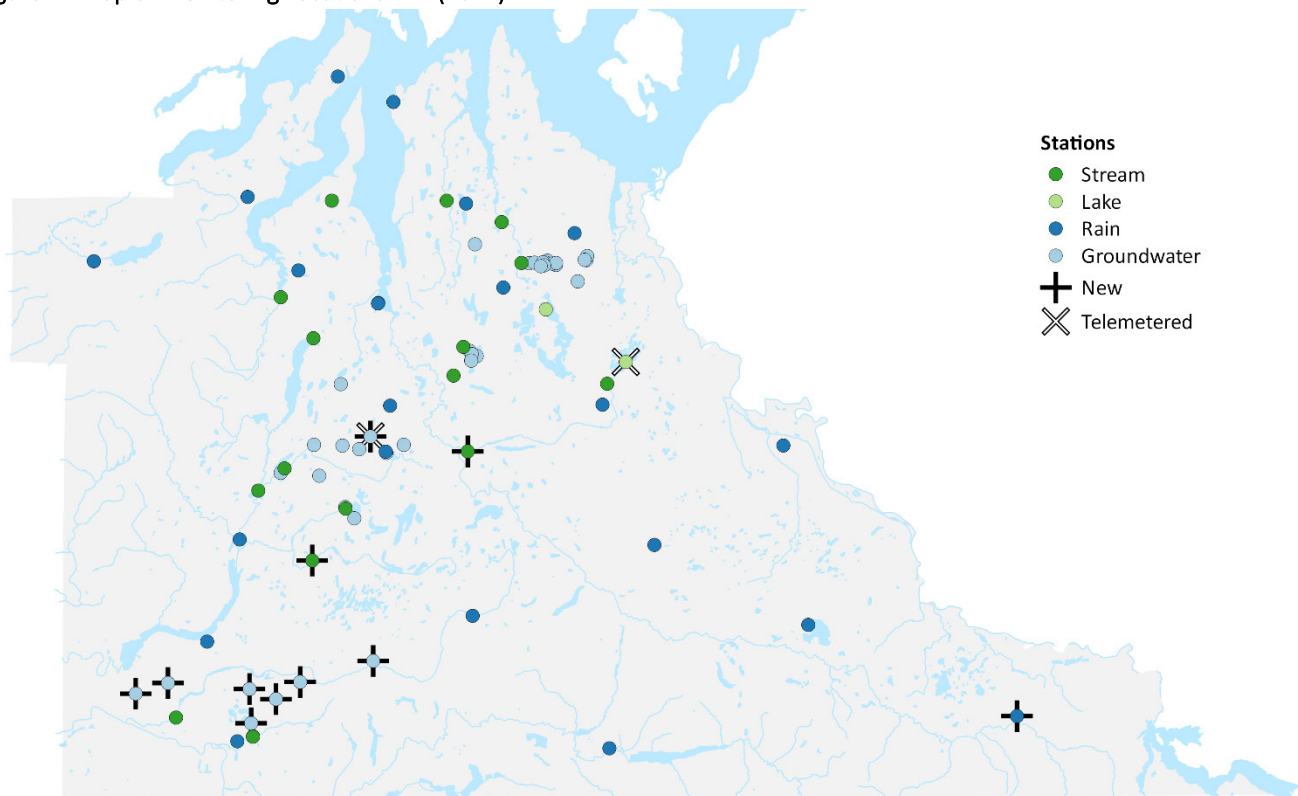
General

In WY 2017 (October 1, 2016 – September 30, 2017), the Resource Stewardship (now Community Planning and Economic Development) Department, Water Resources Division collected data from 77 monitoring sites across Thurston County. This number includes four new atmosphere and stream stations installed in 2017 as part of the general Thurston County EMP upgrade plan:

- One new atmospheric monitoring station (Deschutes Falls Park)
- Three new streamflow/ temperature stations (Beaver Creek, Spurgeon Creek and Chambers Ditch)

Below is a map of the locations and type of monitoring stations we currently have active in the field as of January 1, 2018. [Table 1](#) identifies the type and number of each station. There are additional streamflow and atmospheric sites planned for 2018 and 2019. These will be included in future reports as data becomes available.

Figure 1: Map of Monitoring Locations - All (2017)



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Table 1: Summary of Monitoring Stations

Type	Count
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Scatter Creek Basin Aquifer Project (Spring 2017)

In addition to the four new stations mentioned above, eight deep (65'-120'+) groundwater monitoring wells were installed in the Scatter Creek Basin for the purpose of tracking water levels of the highly-transmissive groundwater aquifer that supplies drinking water to several communities in south central Thurston County from Tenino to Rochester and Grand Mound. The wells were installed to monitor groundwater levels and to collect periodic water chemistry samples. Each well was equipped with Onset U20 water level sensors with integrated dataloggers to monitor groundwater levels and temperature. Groundwater data from these monitoring wells has been downloaded and processed, but only a partial year of data is available precluding it from being added to the WY 2017 report. We anticipate that the groundwater data will be included in the WY 2018 report when there are sufficient results to report.

Weather and Atmospheric Monitoring

Notable Events

Cool and Wet from October 2016 – April 2017

The summer of 2016 ended abruptly in late September and warm dry weather did not return until May of 2017. The fall and winter of 2016-2017 was the coolest on record since the 1980s.

Rainfall was equally impressive with 56 inches of rain recorded at the Olympia Airport between October 1, 2016 and April 1, 2017. These six months recorded more rainfall than is typical for the average year (51 inch average) and 16 inches higher than the same time period in WY 2016. Combined with the cool temperatures and above average rainfall, mountain snow levels were impressive and were recorded at over 180 percent higher than average for the central Cascades during the winter month of the 2017 WY. Although Thurston County has only one river, The Nisqually River, that receives direct contribution from snow melt, snow melt does contribute significantly to groundwater and baseflow in drainages coming from the Black Hills and the Cascade foothills in the spring months.

Temperature – The winter of 2016-17 was the coldest on record for the Olympia area in over 30 years. October 1, 2016 through April 30, 2017 recorded 28 days below freezing ($\leq 32^{\circ}\text{F}$) at the Olympia Regional Airport (several more days in outlying areas of Thurston County). Freezing days is just one measure of cold; the average air temperature was also persistently low. Daytime highs in October through mid-March 2017 were on average several degrees below normal.

Figure 2: Chart of Comparison of Mean Monthly Temperatures

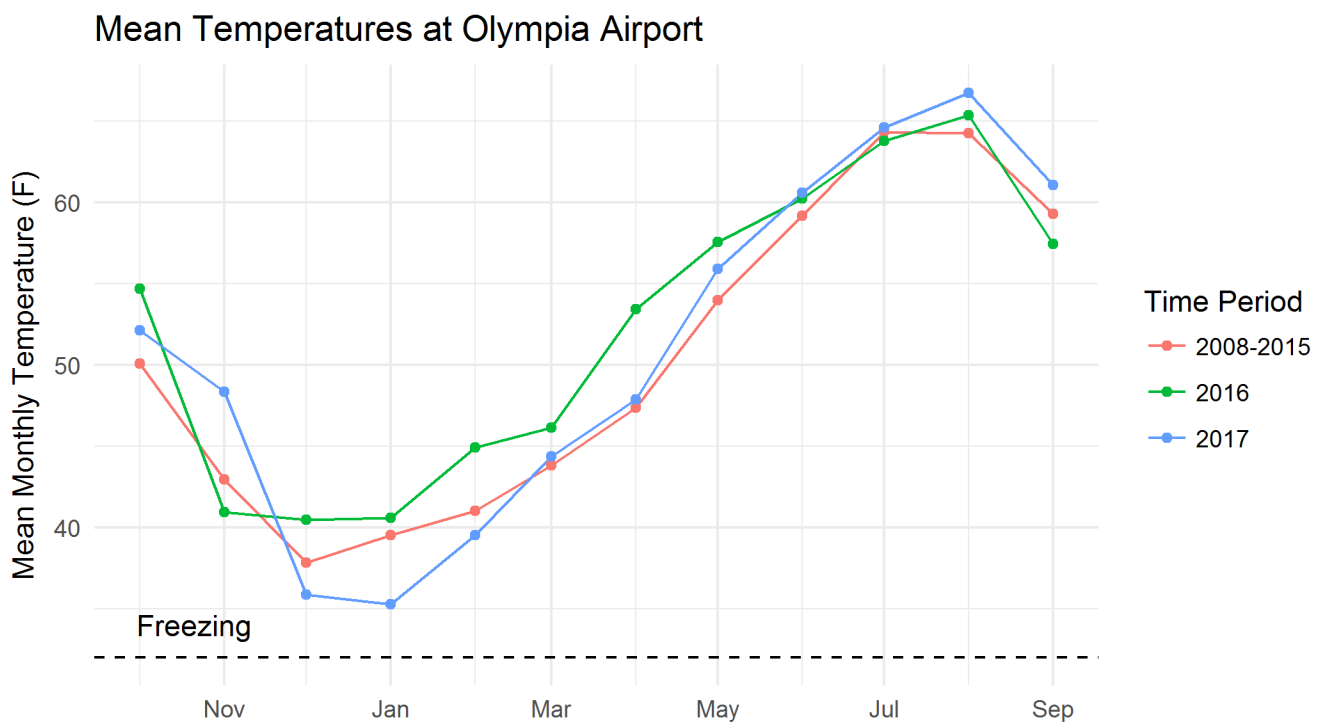
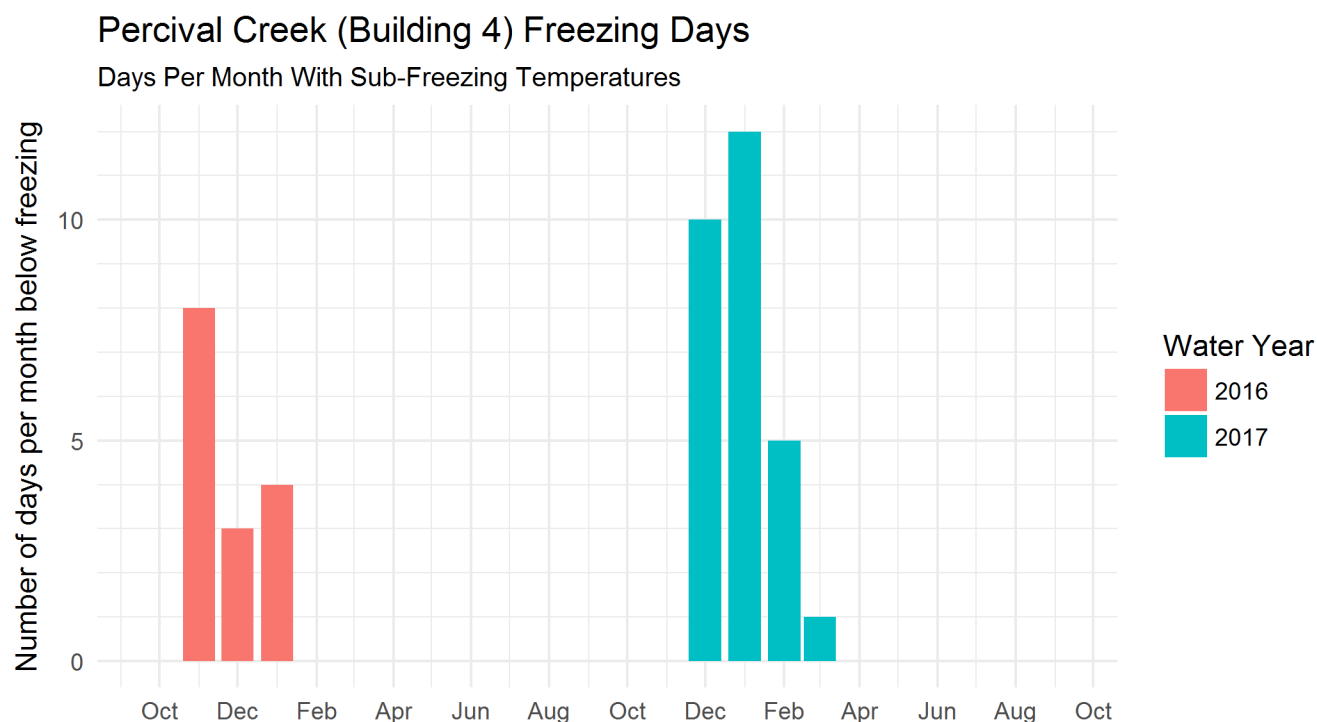


Figure 3: Number of freezing days recorded at Thurston County Build. 4 Weather Station
Coldest months of WY 2016 compared with WY 2017



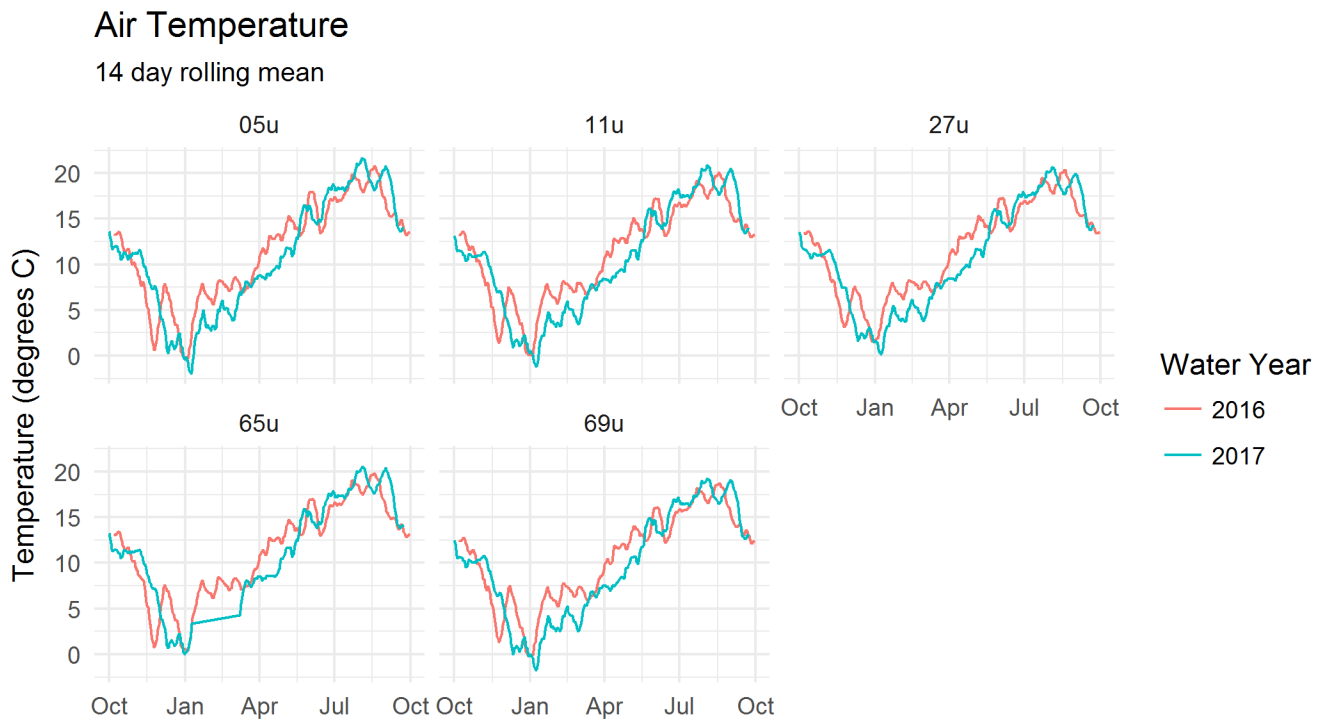
The coldest temperature recorded at the Olympia airport was 16 degrees F above zero on January 5, 2017. This temperature puts us right at the very lower limit of our USDA plant Zone 8a and likely resulted in some sensitive plant mortality.

Temperature and precipitation changed significantly beginning in July 2017. A trend into persistently warmer and drier conditions prevailed beginning in July and ending at the end of September 2017. The mid July through September rainfall records show very little precipitation and consistently hot daytime and warm night time temperatures, very similar to the drought of 2015. The graphs below illustrate the difference in average temperatures between WY 2017 and WY 2016. The below average temperatures between December through June are replaced by above average temperatures in July through September 2017.

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Figure 4: Comparison of 14-day rolling average air temperatures (C°) WY 2016 (red) & WY 2017 (blue).

WY 2017 was consistently below WY 2016 throughout the winter months. Note the transition to warmer than 2016 beginning in July 2017 (blue line crosses red line).



Rain – There was above average rainfall in October, November, February and March. January 2017 was anomalously below average by four inches. Between October 2016 and April 2017 a total of 56.3 inches of rain was recorded in Olympia. That is more than the total average (52 inches) for the year in the first six months of the 2017 WY.

Table 2: Precipitation amount (in) recorded by month vs 66-yr average
Recorded at Olympia Regional Airport for the wet months (October- April)

Precip (in)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total (in)
66 yr. Ave	4.4	8.5	8.2	8.5	5.6	4.9	3.54	43.6
WY 2016	6.4	12.0	14.5	8.5	6.5	8.6	1.70	58.2
WY 2017	12.4	9.3	6.4	3.8	9.2	11.3	6.02	58.4

No Organized Atmospheric Rivers (AR) again in WY 2017

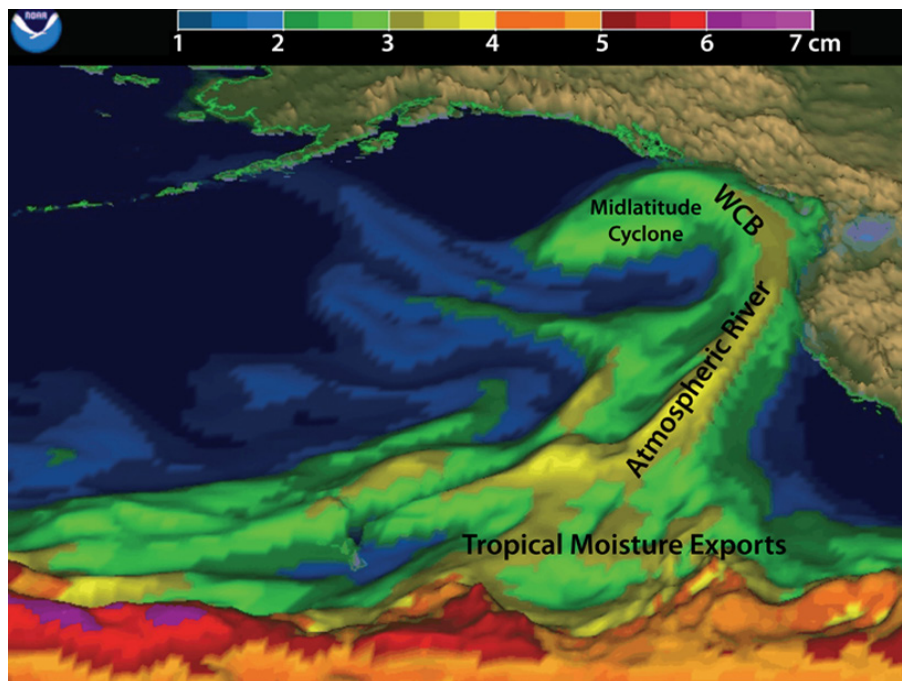
An atmospheric River is a mode of water vapor transport from the tropics into the mid and upper latitudes. They can contain several times more water than is transported by the Amazon River in a given period of time. They occur on the west coast of most continents and are responsible for a large percentage of annual rainfall in many locations. The entire west coast of North America from Southern California to Alaska is within range of AR precipitation events.

Most winter seasons in the Pacific Northwest see at least one AR event. However, the last AR that impacted Thurston County was in 2009. That event was responsible for severe river flooding equivalent to the 1% annual chance (100 year) storm event. It also caused major landslide activity in Thurston County.

In WY 2017 there was one major rain event of just under three inches on October 14, 2016. Our rainfall distribution continues to be spread out much more broadly in smaller events between October and April. Even without the input of a concentrated Atmospheric River, Thurston County received the same or greater than average amount of rainfall over the past several years with the exception of 2014.

Figure 5: Atmospheric River, 2007

Water Vapor Intensity satellite diagram showing a plume of tropical moisture directed toward the Pacific Northwest in a classic Atmospheric River event in 2007. Courtesy of NOAA



El Niño - A very strong El Niño ocean pattern (warmer-than-normal water in the Pacific Ocean off the American coast) was predominant during the winter of 2016 -2017. This scenario generally results in warmer and drier winters in the Pacific Northwest. The El Niño of 2016 did not appear to influence the winter weather pattern; it was in fact opposite of what is generally forecast for El Niño winters. The seasonal weather patterns appear to be increasingly influenced by patterns other than El Niño and La Niña. These equatorial warming and cooling

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cycles were generally used to predict the upcoming winter weather patterns for North America with some degree of accuracy. This does not seem to be the case for the past several water years and was confirmed by the National Weather Service stating it may no longer be a reliable method of long term weather forecasting in our region. A detailed explanation of El Niño and La Niña can be found at the NOAA Ocean Service website at the following address: <https://oceanservice.noaa.gov/facts/ninonina.html>

Snow and Ice – Our area experienced above average snow and freezing precipitation events in WY 2017. In fact, the winter of WY 2017 we experienced four minor snow events (4 inches or less) and one major snow event (greater than 8 inches). We typically get two minor snow events per season and one major event every four years.

May 4, 2017 Straight-line (Derecho) Micro-Burst Wind Event

A straight line wind event associated with a major thunderstorm is a very unusual event in Thurston County. The conditions that produce these events are so rare in Western Washington that there is no documented occurrence since modern records have been kept since 1951. The May 4, 2017 storm not only produced a Derecho but also a record number of lightning strikes and record breaking rainfall in a narrow band (approximately 3 miles wide) from Lewis County to the mouth of the Nisqually River.

Radar based data indicate wind speeds reached 90 miles per hour in the affected storm path. Damage from the winds was substantial and resembled tornado-like damage on trees and man-made structures. It was determined by the National Weather Service not be tornadic in nature but fit the damage pattern of a straight line microburst event. A straight line microburst occurs when cold air rapidly descends from altitudes of 50,000 feet or greater directly to the ground and spreads out in a fan shape rather than in a cyclonic pattern typical of tornadoes. Regardless of the mechanism, the event was unprecedented in Thurston County and the level of destruction was on par with a tornado.

The rainfall intensity accompanying this event was also record breaking. The intensity was estimated by Doppler radar to be greater than 14 inches per hour. The measured duration of the storm however was only 15 to 20 minutes as the parent formation moved rapidly northeast. Despite the short duration of the rainfall widespread flooding was reported.

A more detailed description of the event is posted online at the <https://stormwater.blog/2017/09/29/96/>: “May 4, A Storm System That Will Live in Infamy” Blog post original document by M. Biever- September 2017.

Status and Trends

Wet Fall and Spring; Dry Summer

The beginning months of our water years were typically stable prior to 2010. During that era, precipitation gradually increased every month from October into November and December. In WY 2017, anomalously high October and November rainfall did not continue into December as it did in the previous year. October 2016 had almost four times the normal average rainfall, and November was also slightly above average. December 2016 and January 2017 had significantly below average rainfall. The two tables below summarize the early part of WY 2017 compared to both WY 2016 and the 66-year running average.

As noted above, the general trends for all of our stations has been a distinct shift in precipitation from the middle of the wettest part of the water year, from November 1 through January 31, to earlier in the water year.

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October has been significantly higher than the mean 66 year average. The earlier onset to the wet season has been a recent trend beginning in WY 2006. Since WY 2013 the trend has become very pronounced with October (and even September) recording precipitation two to four times above historical average. The overall yearly average precipitation has also increased above the historical average in the past two water years boosted by the large increase in rainfall earlier in the water year. The implications of this temporal shift are primarily seen in elevated aquifers early in the Water Year that remain elevated throughout the wet season. If there is a higher than average rainfall year, as was seen in WY 2016 and 2017, there could be late season flooding due to increased precipitation in September/October and again in March.

The trend towards earlier onset to the rainy season can have profound impacts on aquatic species with potentially higher streamflows and sediment and pollutant transport during spawning season for salmonids.

Table 3: Precipitation Amts. for Oct, Nov & Dec from Olympia Airport Compared to Average over past 66 yrs.

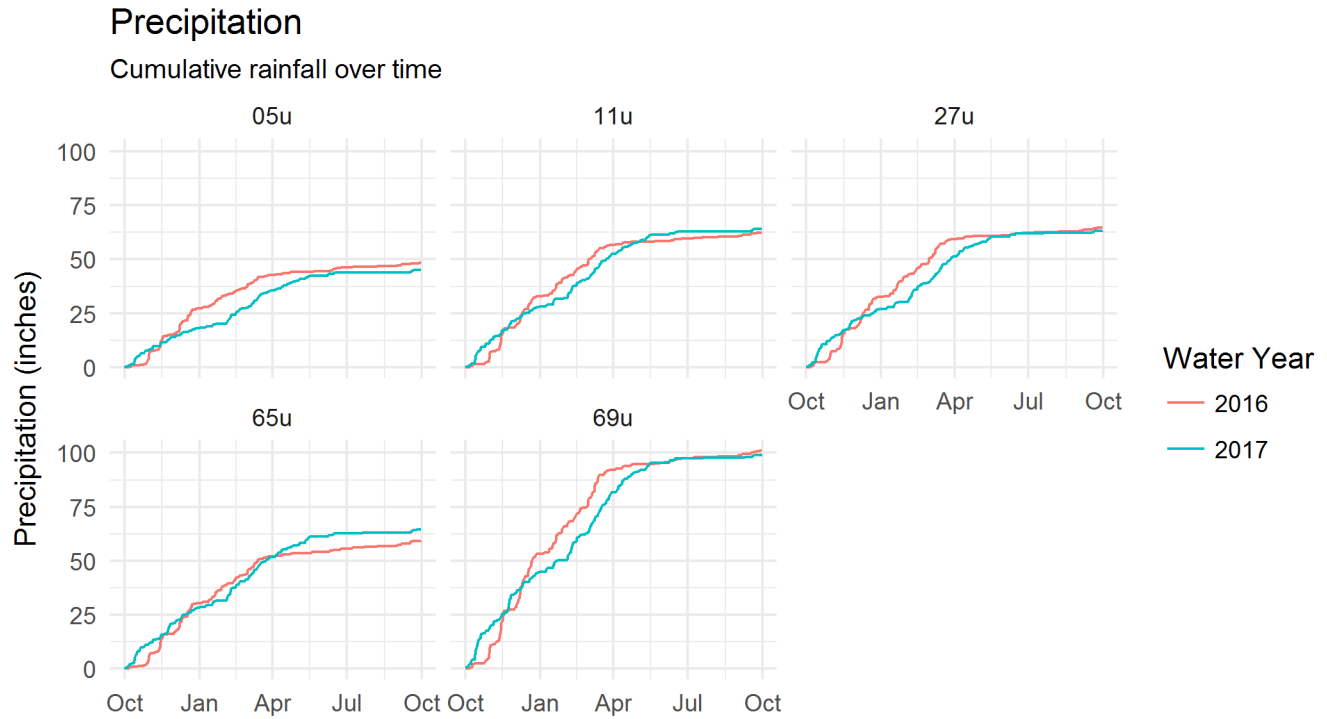
Olympia Airport	October	November	December
WY 2016	6.44	12.01	14.50
WY 2017	12.41	9.28	6.37
Average 1951 - 2017	4.63	8.65	7.47

WY 2016 on the other hand started out above average and remained so until April ending the year at 62.34 inches - ten inches above average. WY 2017 also started the year well above average but dropped below average in December 2016. The trend was soon above average rainfall again however, in February, March, April and May, finishing the water year at a **total of 65.41** for the Olympia Airport NOAA site. This total is similar to the previous water year and is 13 inches above the average of 53 inches between 1898 and 2017.

Looking at long term precipitation records going back to 1898 there is no consistent pattern between years when calculating precipitation. It is not uncommon to have one year significantly above the annual average while the following (and/or the preceding) year is significantly below the 53 inch running average. When trying to identify a consistent pattern between 2017 and 1898, there is almost no correlation or long term trend to be made. There are some decades that tend to be wetter or drier than normal but statistically correlations between individual water years are poor. The only discernable deviation that is emerging is in the temporal distribution of rainfall-both early wet season (fall) and late wet season (spring).

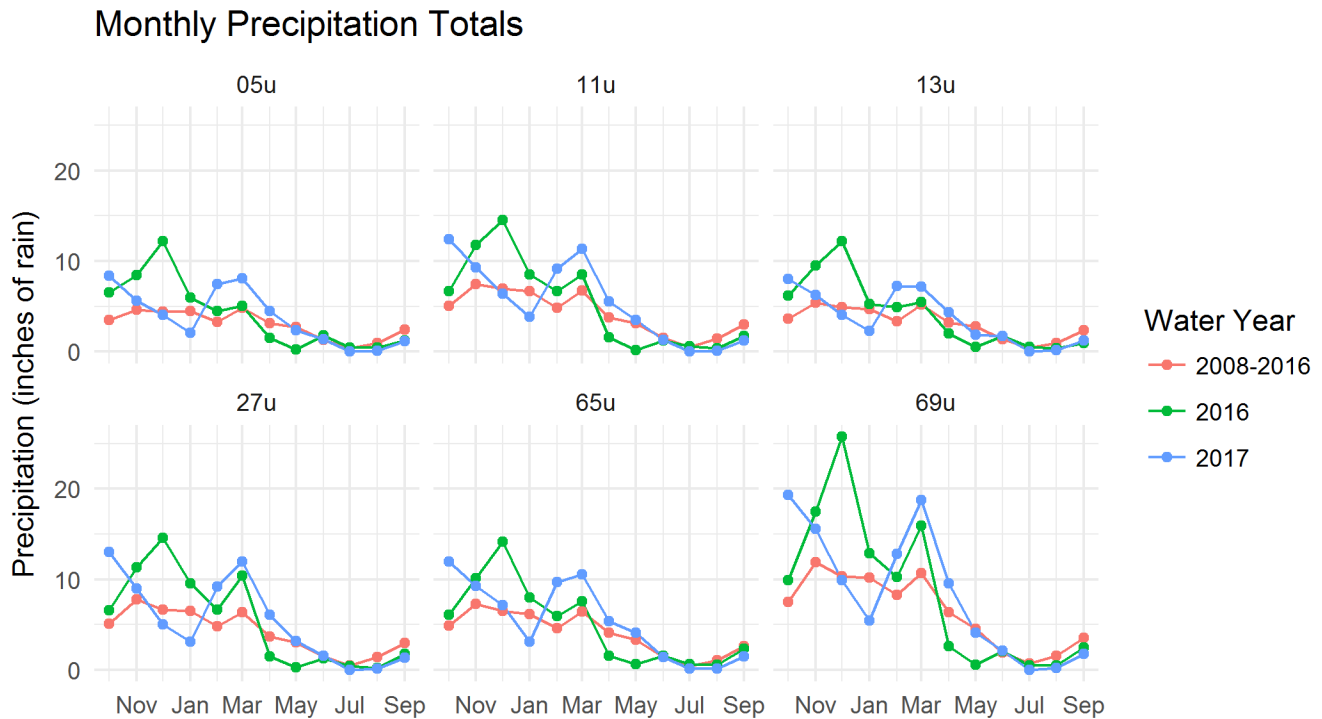
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Figure 6: Comparison of WY 2016 & WY 2017 of five selected County precipitation monitoring sites.
 5U – Yelm; 11U – NOAA Olympia; 27U – Boston Harbor; 65U – Grand Mound; 69U – Summit Lake



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Figure 7: WY 2017 was similar to WY 2016 in the overall amount of rain received. Strikingly, 69U at Summit Lake received 100 inches of rain in both water years.



Dry Summer

The wet season extended into May and June before yielding to a much drier and warmer pattern in July, August, and September. The summer months were slightly above average in temperature and below average in rainfall. By mid to late September 2017, the Pacific Northwest was approaching drought conditions. Persistent high pressure and temperatures caused dozens of major wildfires. These wildfires, sometimes hundreds of miles away, created numerous days of smoke in the Puget Sound region. There were multiple days where the air quality was listed as hazardous and unhealthy because of the smoke and falling ash. Although forest fires are not uncommon in the summer months, the persistence and severity of the wildfires during the summer of 2017 was unusual. 2017 was a record breaker for the number of acres of forests burned in the western US and Canada. 9 million acres from 66,000 wildfires was burned in 2017. It was second only to 2015 which was slightly higher at 10 million acres burned. The smoke from the 2015 wildfires did not impact our local air quality as it did in 2017. Below are some summer 2017 statistics.

Highest Temperature of WY 2017	97° F June 25, 2017	June Rain (in) 1.35
July Highest Temp	88° F July 25, 2017	July Rain (in) 0.01
August Highest Temp	95° F August 3, 2017	August Rain (in) 0.15
September Highest Temp	89° F September 2, 2017	September Rain (in) 1.36

Stations and Equipment

Thurston County monitors rainfall at 19 sites. Some sites were established as recently as 2017; others have data extending back to 1988. NOAA has maintained records at the airport since 1955. The oldest records date back to 1898 from Priest Point Park in Olympia. We employ several types of sensors to collect a multitude of atmospheric parameters. The most common type of precipitation station collects rainfall and temperature. Several locations collect multiple parameters including barometric pressure, solar radiation, wind speed and direction. Two stations also calculate and report irradiance and evapotranspiration (ET). One of the multi-parameter stations, Thurston County Building 4 West Olympia (23u), reports real time data online as part of the DavisNet worldwide weather station network.

In 2017, Thurston County began deploying automated weather stations with telemetry. This feature allows the weather stations in the field to report their data back to the central database autonomously. The first stations were deployed in 2017. A weather station was deployed in the foothills of the Cascades in September 2017 at the headwater of the Deschutes River. Additional stations were deployed early in WY 2018. Results from these locations will be included in the WY 2018 report.

The Griffin Fire Station site (33u) was moved from Griffin Fire Headquarters at Steamboat Island Road and Sunrise Beach Road to a new location (33x) at Griffin Fire Station #2 at Steamboat Island Road and 81st Ave NW. The fire station was moved for two reasons. First, tree growth around the station over the past decade was beginning to potentially influence the amount of rainfall reaching the tipping bucket. Second, occasional overspray from fire training exercises would create false “rain events”. The new site is in an open area far from training grounds, so both those issues should be mitigated.

An additional weather station was planned for the Capitol Peak area in WY 2017. Space is available for rent at the Washington DNR-owned radio tower site. Thurston County and WA DNR have not managed to come to an agreement on an appropriate annual site rental fee. Thurston County may install a weather station on Capitol Peak in the future, but for the foreseeable future the site is too expensive to monitor.

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Figure 8: Precipitation and Atmospheric Data Collection Stations



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Table 4: Precipitation Stations Location and individual Rainfall Amounts

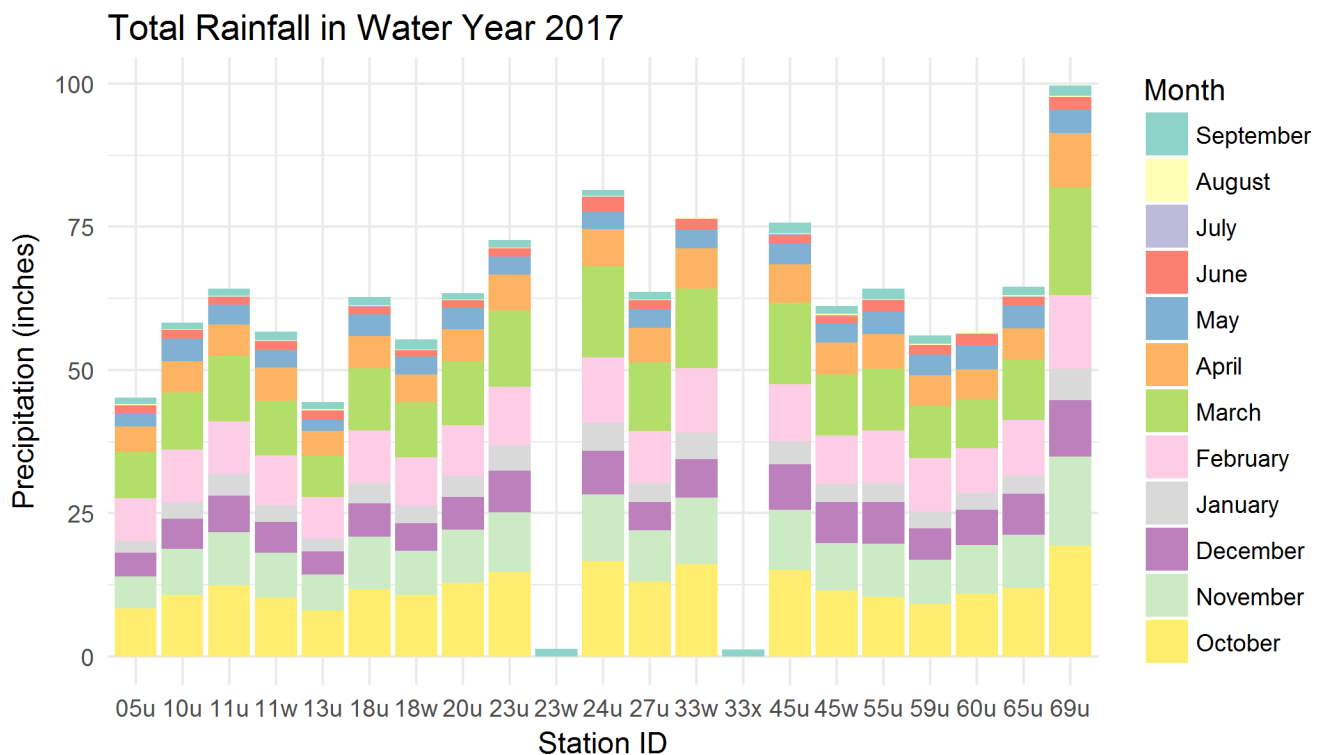
Site	First Year Recorded	Span	2016		2017		Change
			Precipitation	Days Recorded	Precipitation	Days Recorded	
05u: Yelm WRF_Rain	2007	 10.3	48.25	366	45.21	365	 -3.04
10u: Meridian Rd_Rain	1992	 26.0	59.68	366	58.32	365	 -1.36
11u: NOAA Olympia Airport	1947	 70.5	62.34	366	64.16	365	 1.82
11w: Rainier Transfer Station	2013	 4.8	58.84	366	56.73	365	 -2.11
13u: Lake Lawrence_Rain	1992	 25.3	49.72	366	44.41	365	 -5.31
18u: Lacey Fire Dist. 3 Fire Station_R	2002	 15.9	62.68	366	62.69	365	 0.01
18w: WARC TC_Rain	1993	 24.4	53.96	366	55.39	365	 1.43
20u: Southbay Firestation_Rain	2006	 12.0	59.34	366	63.4	365	 4.06
23u: Percival Creek, Bldg 4_Rain	1988	 30.0	70.01	366	72.71	365	 2.70
23w: Percival Creek, Bldg 4 Parking I	2017	 0.6		--	1.37	58	 1.37
24u: McLane FS Wx	2012	 5.5	77.37	366	81.44	365	 4.07
27u: Boston Harbor_Rain	2006	 11.9	64.73	366	63.63	365	 -1.10
33w: Griffin FS_Rain*	2008	 9.7	74.85	366	76.57	327	 1.72
33x: Griffin FS 13-2	2016	 1.4		--	1.17	365	 1.17
45u: Littlerock_Rain	1992	 26.1	80.2	366	75.73	365	 -4.47
45w: Rochester Drop Box_Rain	2009	 8.6	64.97	366	61.23	365	 -3.74
55u: Tenino_Rain	1994	 23.5	61.33	366	64.17	365	 2.84
59u: Bloody Run USGS_Rain	2009	 8.8	49.77	361	56.07	365	 6.30
60u: Bucoda USGS_Rain	2009	 8.8	55.39	366	56.54	342	 1.15
65u: Grand Mound_Rain	2006	 11.7	59.32	366	64.52	365	 5.20
69u: Summit Lake_Rain	1993	 24.3	100.92	366	99.64	365	 -1.28

* 33w was moved to 33x toward the end of the water year

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The distribution of rainfall between stations in WY 2017 was above average across all stations, with the south and east generally drier than the north and west. 69u, the Summit Lake gage, was much wetter than most other gages throughout the county (99 inches in WY 2017), demonstrating the ability of the Black Hills to extract a lot of moisture out of the air as it travels east. The Summit Lake gage has historically been the highest recorded rainfall station in the County. By the time storms arrive near Yelm (05u) and Rainier (11w), much of the water has already precipitated, leaving those areas drier than the rest of the county. Station 45u (Littlerock) has significantly more precipitation than station 45w (Rochester), despite a distance of only 5.5 miles between them, demonstrating the complexity of the precipitation patterns around the Black Hills and the Chehalis River gap on the west side of the county.

Figure 9: Rainfall Distribution Chart by Station WY 2017



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Table 5: Precipitation Station ID and Location

Site	Operator	Longitude	Latitude	Start Date	End Date
05u: Yelm WRF	TC	-122.59726	46.95176	2008-10-01	
10u: Meridian Rd	TC	-122.73863	46.97402	1995-10-01	
11u: NOAA Olympia Airport	NOAA	-122.90492	46.97374	1955 -2017	
11w: Rainier Transfer Station	TC	-122.69844	46.89890	2013-04-03	
13u: Lake Lawrence	TC	-122.57851	46.85780	1992-01-13	
18u: Lacey Fire Dist. 3 Fire Station	TC	-122.81610	47.03678	2009-01-01	
18w: WARC TC	TC	-122.76009	47.06578	2000-08-05	
20u: Southbay Fire station	TC	-122.84514	47.08173	2008-10-06	
23u: Percival Creek, Bldg. 4	TC	-122.91413	47.02865	1988-03-01	
24u: McLane/Black Lake Fire station 91	TC	-122.97679	47.04601	2012-08-27	
27u: Boston Harbor	TC	-122.90205	47.13611	2008-11-26	
32u: Kaiser Rd	TC	-122.95583	47.07019	1990-06-22	2013-01-29
33w: Griffin FS	TC	-123.01648	47.08536	2006-10-31	
35u: Steamboat Island Bridge	TC	-122.94046	47.18196	2010-05-18	2010-06-21
45u: Littlerock	TC	-123.02264	46.90223	1988-03-01	
45w: Rochester Drop Box	TC	-123.04808	46.84762	2009-07-27	
55u: Tenino	TC	-122.84066	46.86129	1994-10-01	
59u: Bloody Run USGS	USGS	-122.73417	46.79028	2008-2017	
60u: Bucoda USGS	USGS	-122.92306	46.77222	2008-2017	
65u: Grand Mound	TC	-123.02449	46.79429	2006-06-07	
69u: Summit Lake	TC	-123.13703	47.05085	1993-11-01	
PBL2: Capitol Forest Tacoma Trail Cruisers	TC	-123.08315	46.95737	1994-09-23	2000-01-08
PWD1: 12th Ave - Woodard Creek	TC	-122.86849	47.05447	1988-03-01	2008-08-06
PWL1: Woodland Creek - TC Fairgrounds	TC	-122.78604	47.02057	1988-03-01	2008-12-31

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The Table below summarizes the average monthly values for the parameters indicated as recorded at the Olympia Regional Airport between January 1, 1951 and February 1, 2017.

Table 6: Climate Averages for Olympia

Climate Olympia - Washington						°C °F
	Jan	Feb	Mar	Apr	May	Jun
Average high in °F:	46	49	54	59	65	71
Average low in °F:	34	33	35	38	43	48
Av. precipitation in inch:	7.83	5.28	5.28	3.54	2.32	1.77
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-
Average snowfall in inch:	2	5	1	0	0	0
	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	77	78	72	60	50	44
Average low in °F:	51	51	46	40	36	33
Av. precipitation in inch:	0.63	0.94	1.69	4.61	8.62	7.44
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-
Average snowfall in inch:	0	0	0	0	1	3

Taken from US Climate Data.com 2017

Streamflow

General

In general, streamflows are more reactive to seasonal rainfall than groundwater or lake water levels. The streams in Thurston County rely on baseflows from groundwater, and therefore do not see the rise in flows during the spring and summer months that are typical from snow pack fed streams. None of the streams that the County monitors have year-round reliance on snow melt.

The urbanized and sub urbanized basins that host the ILMA streams derive their flows from both baseflow (groundwater) and surface runoff from precipitation. The dominant component of these streams depend on the time of year. In general, small streams are fed predominantly by groundwater between June and early October. After the first significant rain events occur, generally in early to mid-October, a combination of groundwater and surface water combine to produce seasonally higher flows that persist during the wet months.

Many of the ILMA streams are in the more urbanized areas of north Thurston County, and in many cases they react quite quickly to urban runoff. Streams that are located in less urbanized areas of the County show a much lower propensity for sharp distribution curves and show a much more metered reaction to rainfall because of the buffering effects of pervious surface such as fields and forests.

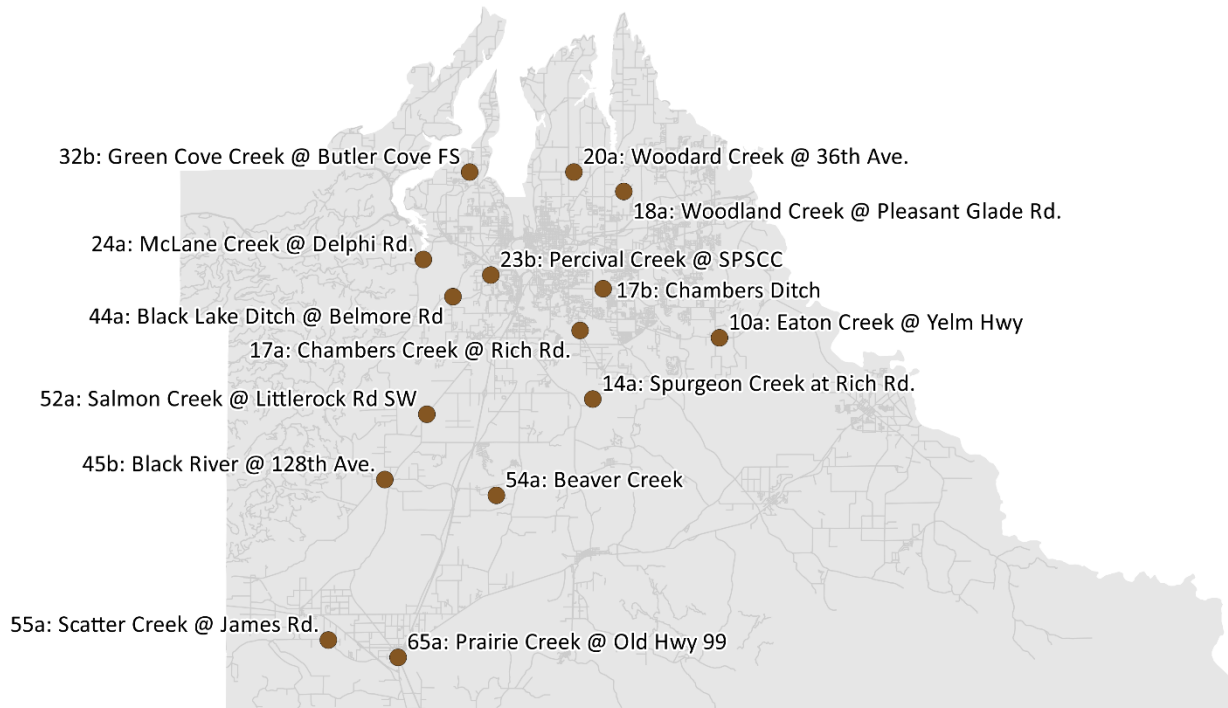
Table 7: Urban/Sub-urban Streams included in the Inter-Local Monitoring Agreement

2015 – 2018 Contributing ILMA Partners	Streamflow Station	Development Level	Comments
Tumwater/Thurston County	44a - Black Ditch outlet	Sub-urban	Nearly 15 yr record
Thurston County	17a - Chambers Creek	Sub-urban	Nearly 20 yr record
Thurston County	32b - Green Cove Creek	Sub-urban	Nearly 20 yr record
Thurston County	20a - Woodard Creek	Urban	20+ yr record
Lacey/Thurston County	18a - Woodland Creek	Urban	20+ yr record
Thurston County/Olympia	23b – Percival Creek	Urban	Removed from ILMA funding 2015

Note: Table 8 includes only the streams monitored in the ILMA during the WY 2015-2016 reporting period. Percival Creek was removed from the ILMA in 2015 and was decommissioned Dec 31, 2015.

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Figure 10: Streamflow Data Collection Stations ALL (ILMA and GEM)



Inter-Local Monitoring Agreement Streams

The 2015 – 2018 Interlocal Monitoring Agreement contains funding for five streamflow stations listed above in the Urban Streams [Table 8](#). Percival Creek was removed from the 2015 – 2018 ILMA because it was no longer included as a funding priority by the contributing agencies. The remaining streams have been monitored almost continually since the late 1980s or early 1990s as part of the ILMA and its predecessor agreements.

Water Year 2017 Observations of Streamflow

The streamflows measured between October 1, 2016 and September 30, 2017 are higher than the period of record average but slightly less than WY 2016. This period of record was dominated by early onset rains beginning in October and persisting throughout the wet season months. The summer months of WY 2017 were drier and warmer than average resulting in stream volumes returning to near normal flows. The combined above-average WYs 2016 and 2017 have led to increased baseflows that are approximately ten percent above average.

Below are some examples of the difference in streamflow between WY 2016 and WY 2017 for some selected streams in Thurston County.

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Figure 11: Discharge (cfs) statistics from selected streams:

10a - Eaton Creek; 18a – Woodland Creek; and 20a – Woodard Creek in northern Thurston County

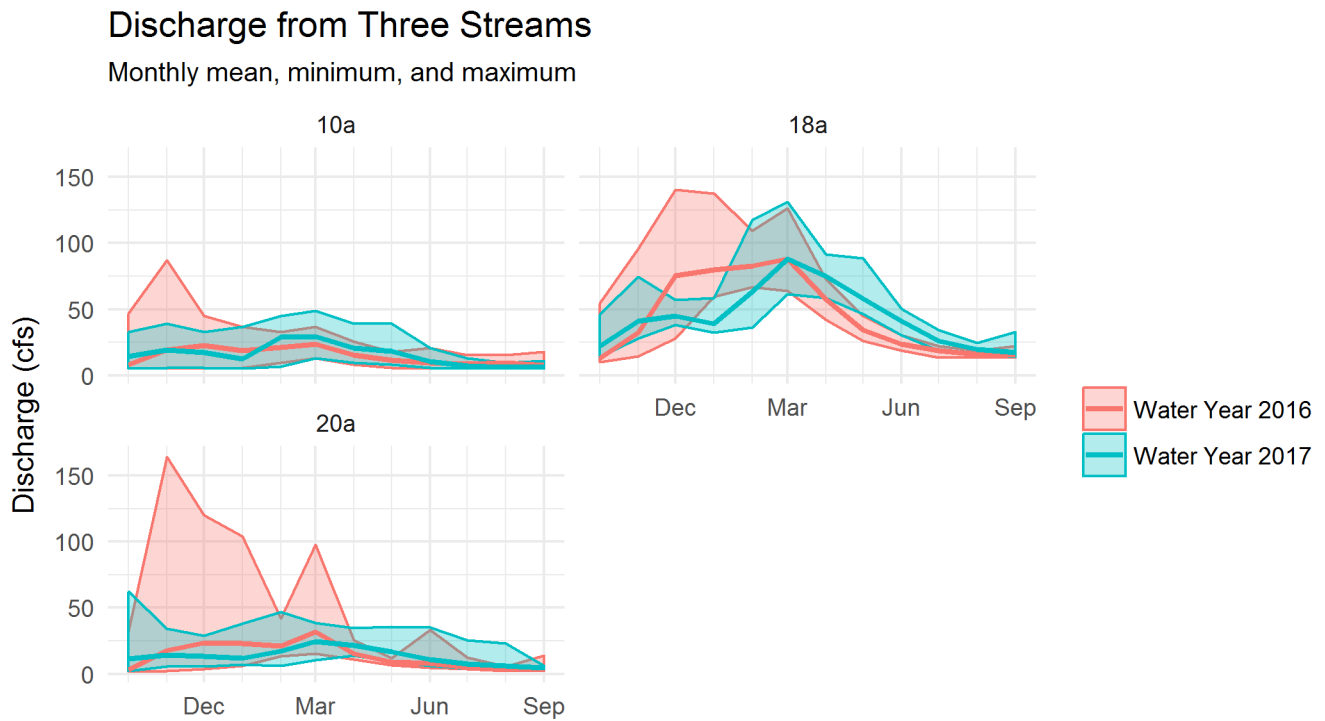


Figure 11 demonstrates the effect of above average rainfall early in the water year. The pink is data from WY 2016 while the blue is data from WY 2017. The longer period of consistent rainfall in WY 2017 appears to have extended the above-average flow volumes later into the spring months peaking in late March. Conversely, the WY 2016 data indicates the effect of high early to mid-season rainfall on flows.

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Figure 12: Daily Discharge (cfs) statistics from selected streams

10a - Eaton Creek; 18a – Woodland Creek; and 20a – Woodard Creek in northern Thurston County

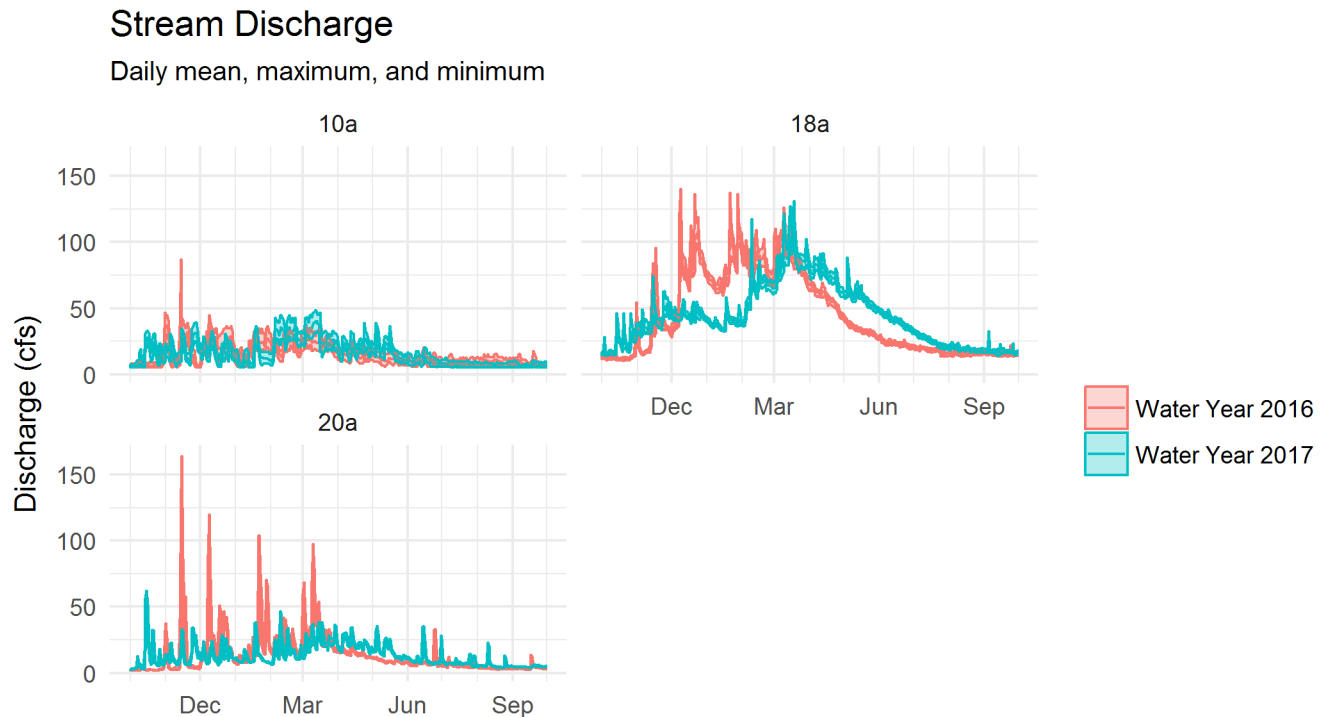


Figure 12 illustrates a similar pattern of stream discharge hydrographs using daily statistics to highlight the effect of specific periods of rainfall that drive the discharge curves left or right (earlier or later in the water year). The effect is most profound in 18a -Woodland Creek at Pleasant Glade Rd NE. Woodland Creek Basin is heavily influenced by urban and wetland/lake complexes.

Rivers

Rivers have flows greater than 100 cubic feet per second on average. The larger rivers observed or recorded by Thurston County include: The Deschutes River, the Black River, the Skookumchuck River, the Chehalis River, and the Nisqually River. These rivers generally have flows over the threshold that is safe for our field staff to monitor, and therefore we report streamflow data from the U.S. Geological Service. The Black River at Littlerock is the only exception to this case and is actively waded by field staff if safe to do so.

The Nisqually and Chehalis Rivers define the eastern and southwestern borders of the County respectively. Of these, the Nisqually River is the only one that has a consistent year round input from high Cascade Mountain snowpack, and therefore reflects snowmelt in its baseflow, especially in the summer months. The Chehalis River and its tributaries (mainly the Skookumchuck River) have generally low to medium elevation sources, and therefore groundwater or lake contributions are the primary baseflow constituents.

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Figure 13: Chehalis River Discharges

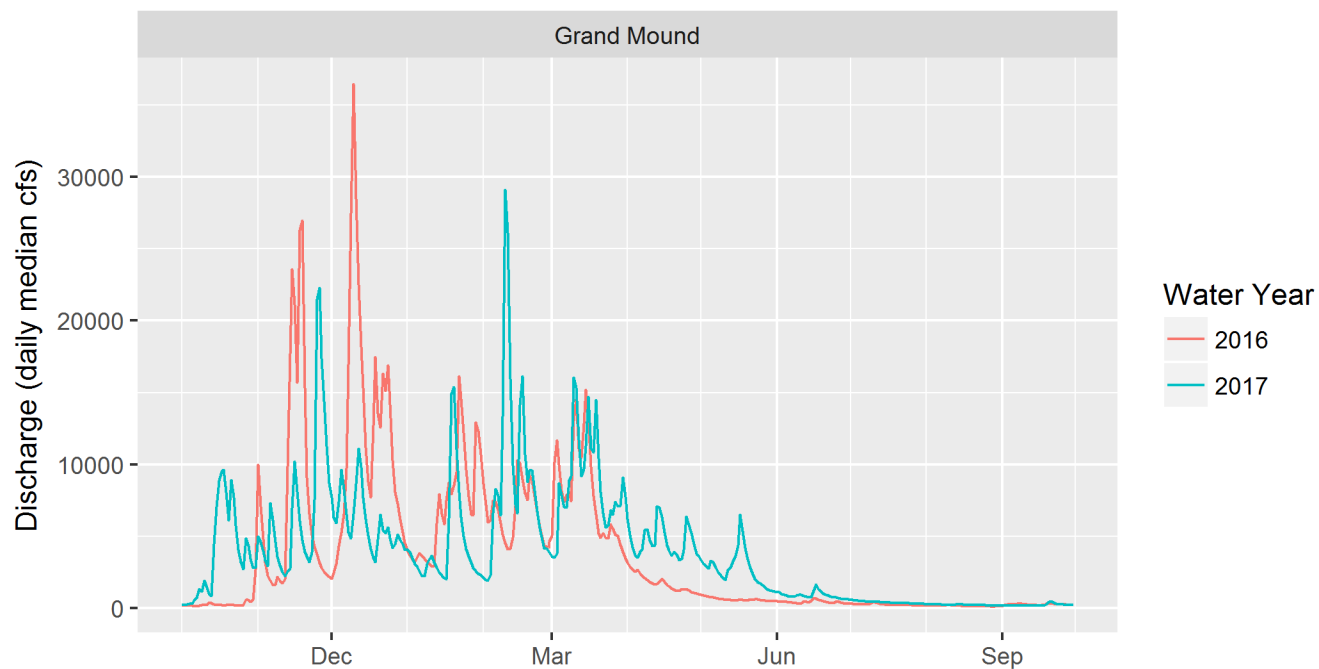
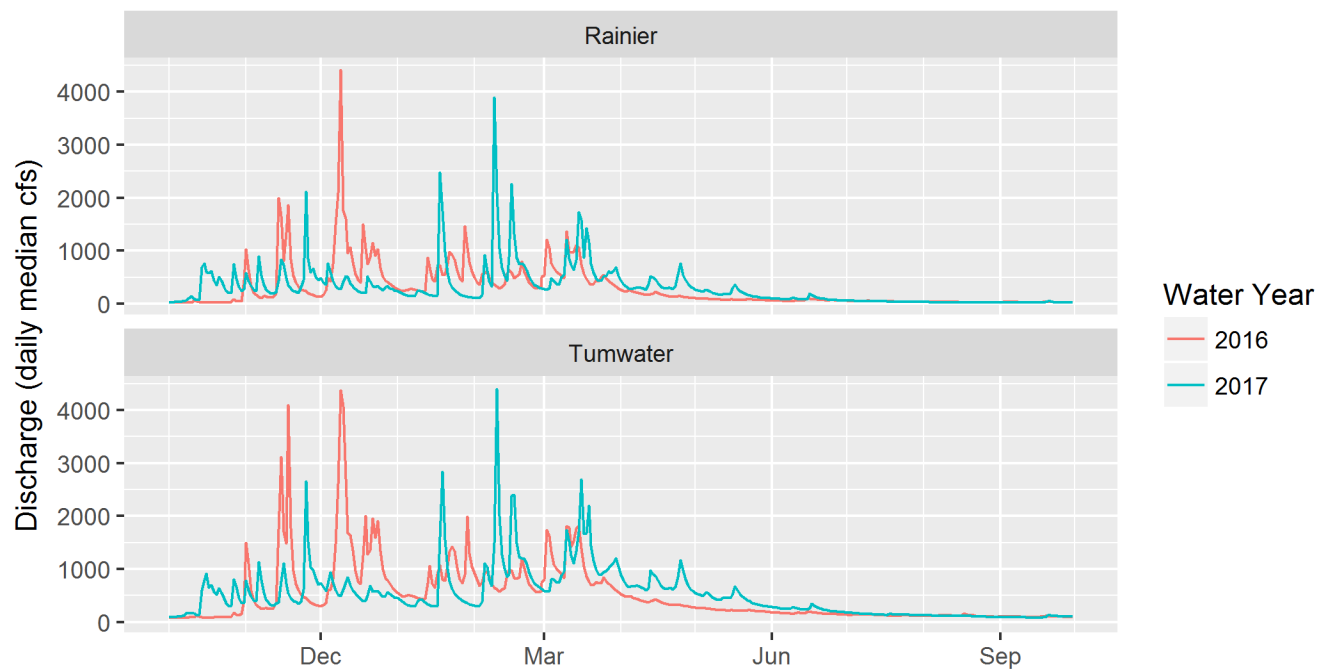


Figure 14: Deschutes River Discharges



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Figure 15: Nisqually River Discharges

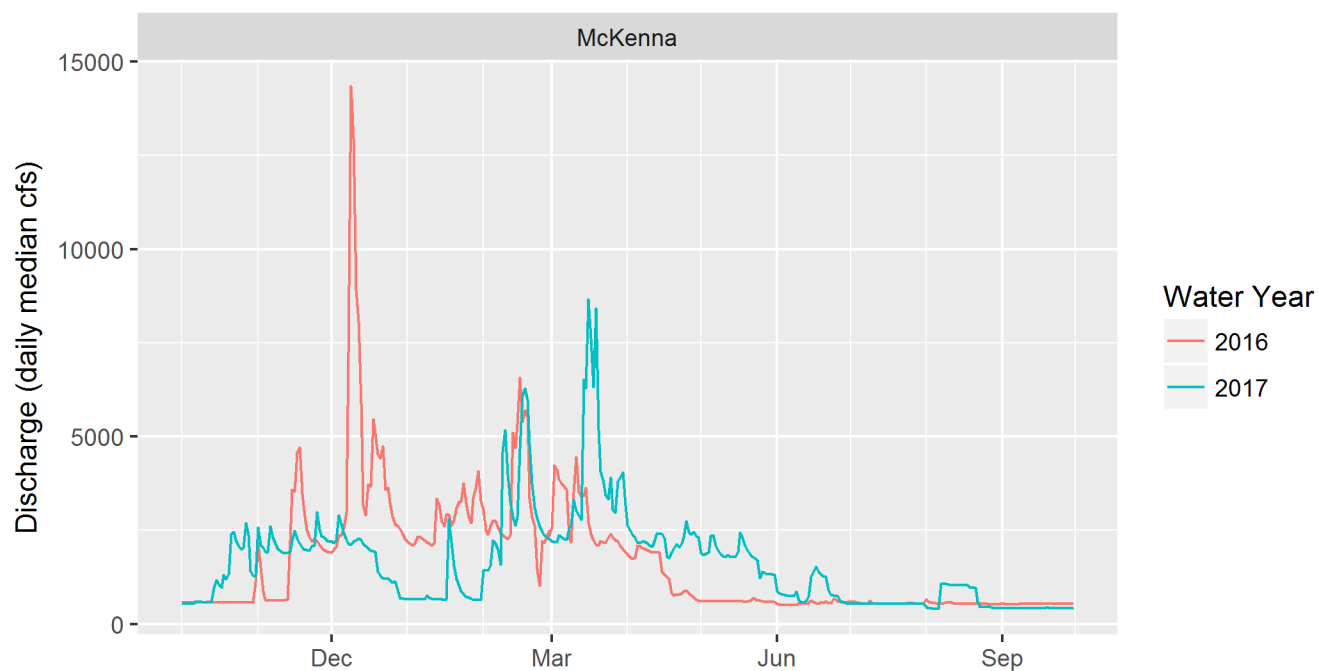
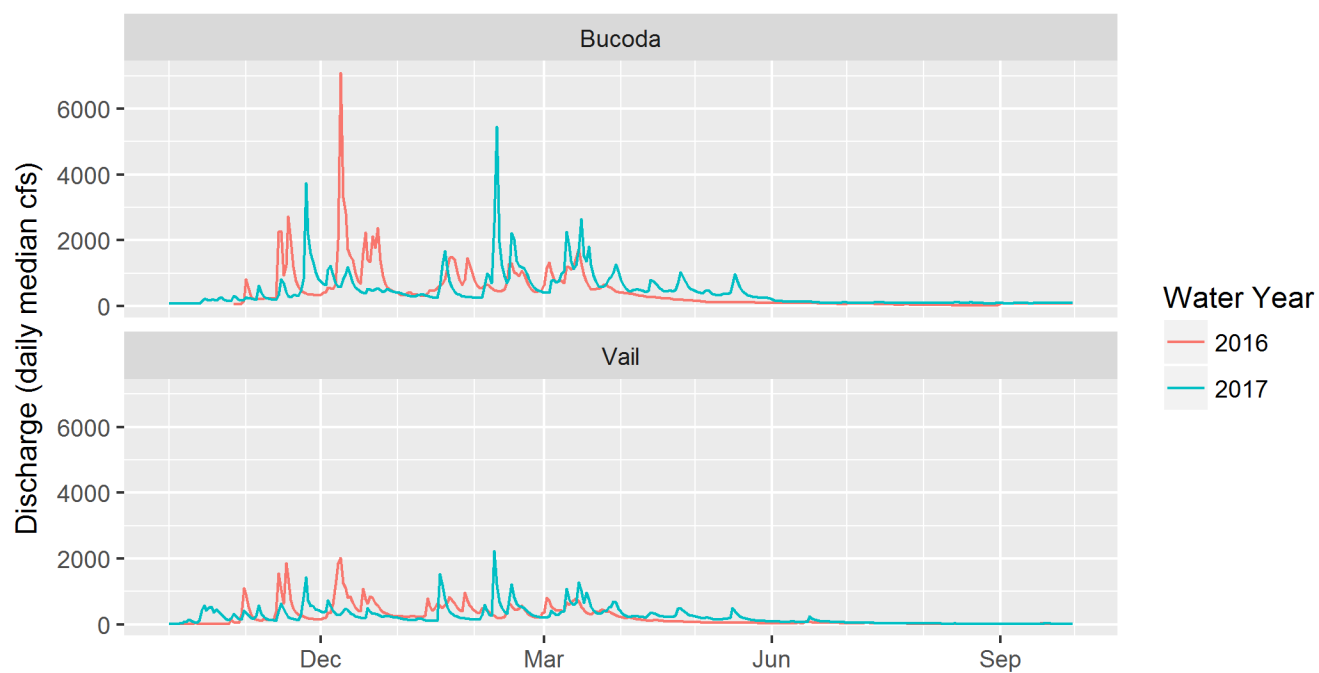


Figure 16: Skookumchuck River Discharges

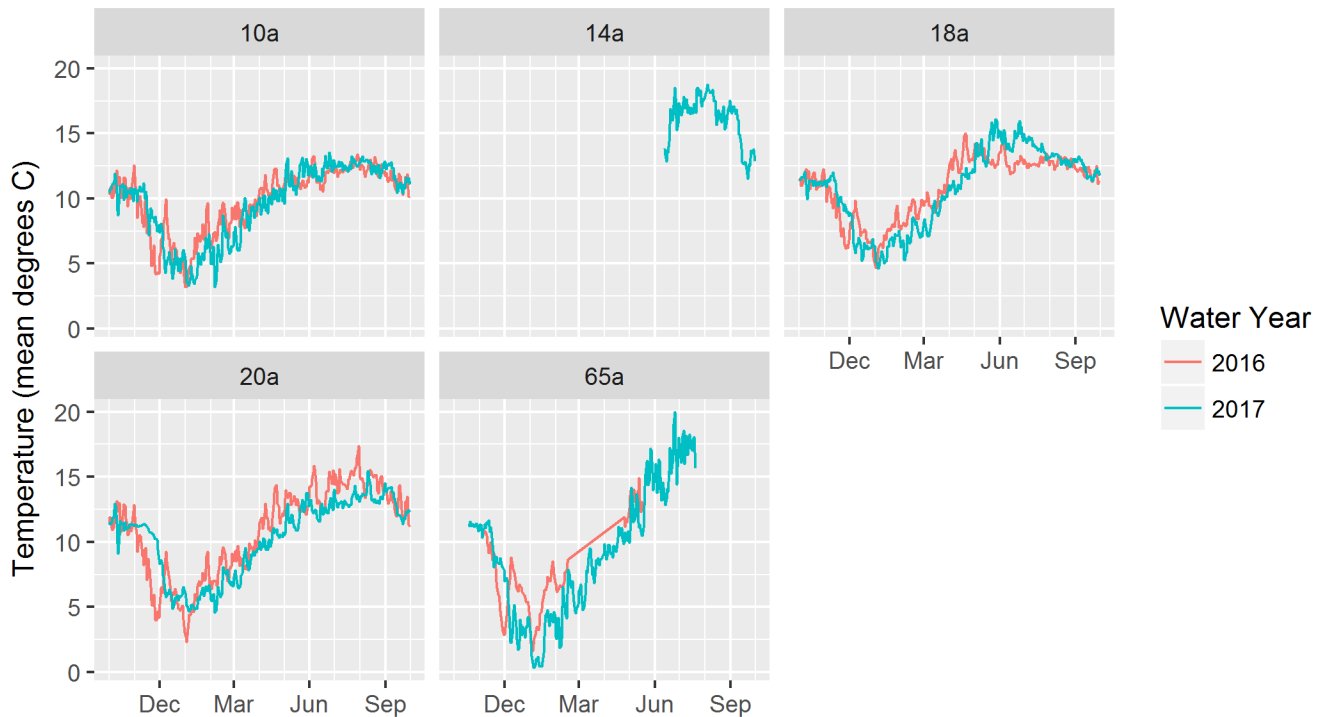


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Figure 17: Stream temperature comparison between WY 2016 and WY 2017

10a (Eaton Creek), 14a (Beaver Creek), 18a (Woodland Creek), 20a (Woodard Creek) 65a (Prairie Creek)

Water Temperature



While stream temperature profiles are similar year after year, with temperatures rising in the spring and summer and falling in the fall and winter, there are some key differences in and amongst the sites. Eaton Creek (10a) has lower summer peak temperatures than other sites; this could be due to a greater proportion of groundwater inflow from that stream, more shading along the streambank, or some combination of the two factors. Prairie Creek (65a) is the opposite, showing higher temperatures in the summer than other sites, reflecting the fact that the creek is flashy and ephemeral, drying out to zero discharge in mid- to late summer.

Stream temperatures in Eaton (10a), Woodland (18a) and Woodard (20a) were similar between WYs 2016 and 2017. One discrepancy from this trend is between July and August, when Eaton had similar temperatures between the two water years, Woodland had higher temperatures in 2017, and Woodard had lower temperatures in 2017. All streamflow data are presented in Appendix B and at <http://www.thurstoncountywa.gov/sw/Pages/monitoring-dashboard.aspx>

Groundwater

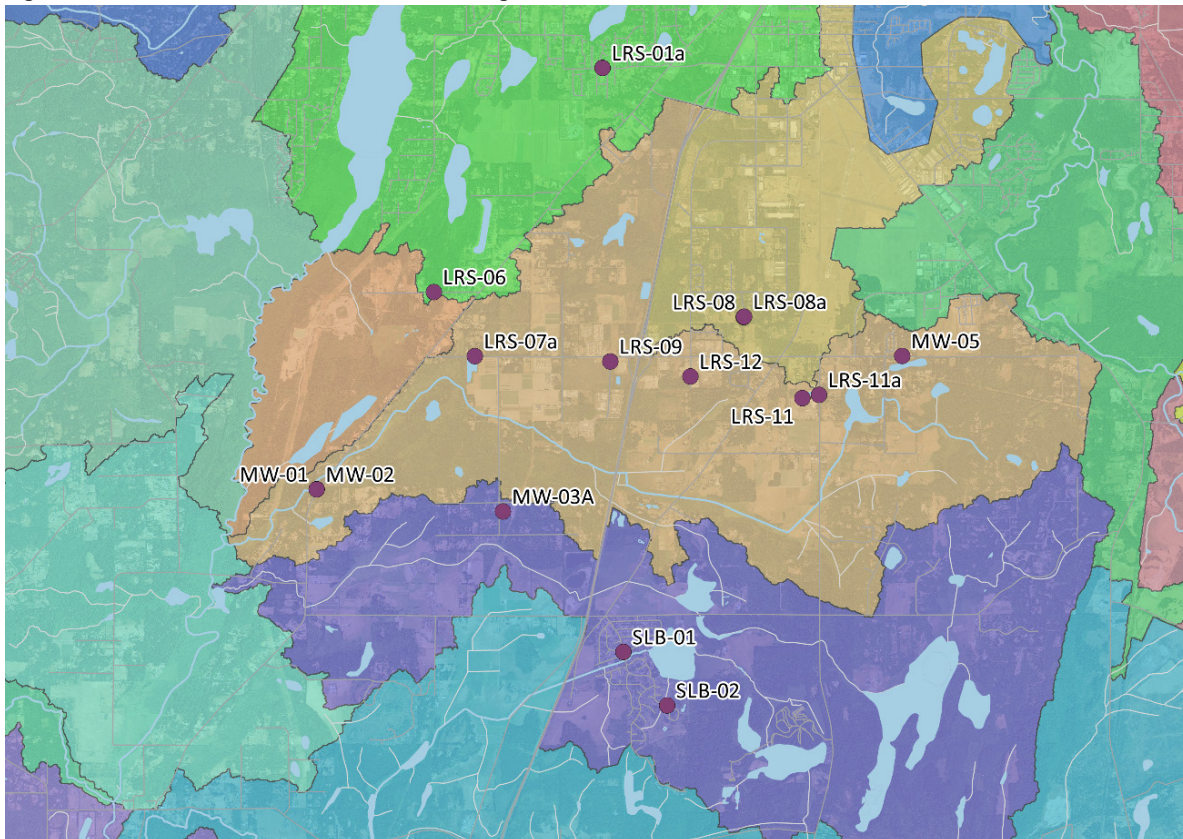
General

Groundwater is an important driver of many surface water systems, including streams and lakes and, therefore, it has value in providing an overall picture of our water cycle.

Thirteen of the forty-one actively monitored Thurston County groundwater monitoring wells are located south of Tumwater in the Salmon Creek Basin. This area is affected by high groundwater throughout the winter months in most years. There are some areas within the basin that experience flooding annually, and approximately every twenty years or so there is an increased risk of the groundwater flooding basin wide. This recurrence interval has been noted as occurring since the early 1900s in historical documents. It is of course directly reliant on precipitation, and as such, it may or may not actually occur exactly on a twenty year cycle.

The last widespread flood event occurred in March of 2009. The flood of record by which the Salmon Creek Basin Plan was implemented was based on a major flood event that occurred only ten years earlier in March 1999. Building and general development requirements within the Basin were modified in response to the 1999 flood. The groundwater data collected by Thurston County is used to calculate flood elevations on prospective parcels in relation to the 1999 flood elevations recorded at the indicator well locations. Below is a current map of the location of the groundwater wells in the Salmon Creek Basin.

Figure 18: Location of Groundwater Monitoring Wells in the Salmon Creek Basin



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There are several other areas in Thurston County where groundwater is monitored, but these are typically for project specific sites and are of durations of ten years or less. Thurston County intends to update its groundwater monitoring over a three-year period from 2018-2021. The intent of these changes is to move a more comprehensive groundwater monitoring program including high-growth areas in the County where no monitoring is currently performed.

The proposed program will use as many existing, project-specific wells as possible. Some wells in each project area will be abandoned where no longer needed or badly damaged. New wells will be drilled in high-growth parts of the county that are currently not monitored.

The result of this 3-year implementation plan will be a groundwater monitoring network that covers most of the major basins and aquifers in the County, with a special emphasis on areas of long-term import, such as areas anticipated to develop or with current high-groundwater flooding concerns.

Following field inspections over a two-year period, multiple changes to the current groundwater monitoring program were identified. In this proposed evaluation and re-configuration process, several changes are proposed:

1. Groundwater monitoring will continue at existing high-value wells;
2. Selected inactive wells will be re-activated if they are located in important parts of the County;
3. New wells will be drilled to evaluate groundwater in important growth areas that were previously un-monitored (or to replace a few important but badly-damaged wells);
4. Ineffective, unnecessary or badly damaged wells will be properly abandoned so as not to be hazardous or allow contaminant migration;
5. Repairs will be made to some damaged but important wells;
6. Inactive wells will be maintained, if they are in potentially or occasionally useful locations, or if they are neither a safety risk nor likely to cross-contaminate an aquifer.

Based on the above re-configuration, the current monitoring well network of 41 wells will be expanded to a proposed new total of 48 wells.

Monitoring protocols, monitoring frequency and specific well construction types will be defined fully after approval to re-configure.

Groundwater Levels for the 2017 Water Year (Salmon Creek Basin)

Groundwater elevations in WY 2016 started very low (due to the 2015 drought), but because WY 2016 was an abnormally wet year they ended within the normal range of groundwater elevations for October. From that more normal starting elevation, groundwater levels rose in WY 2017 to higher elevations than usual by late spring before falling again throughout the summer and fall. Peak groundwater elevations in WY 2017 were very similar to peak groundwater elevations in WY 2016, just below ground level (flooding conditions) in some locations.

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Figure 19: Maximum Water Elevations of Monitoring Wells in the Salmon Creek Basin by Water Year

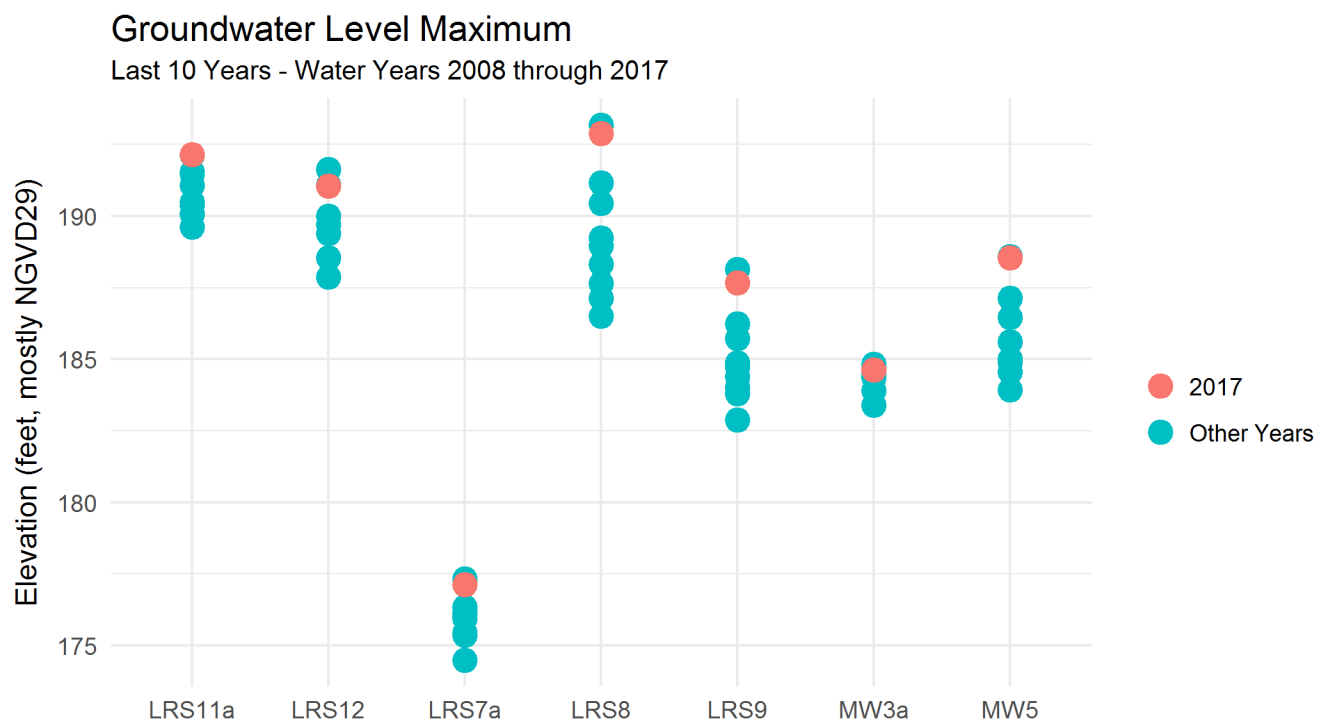
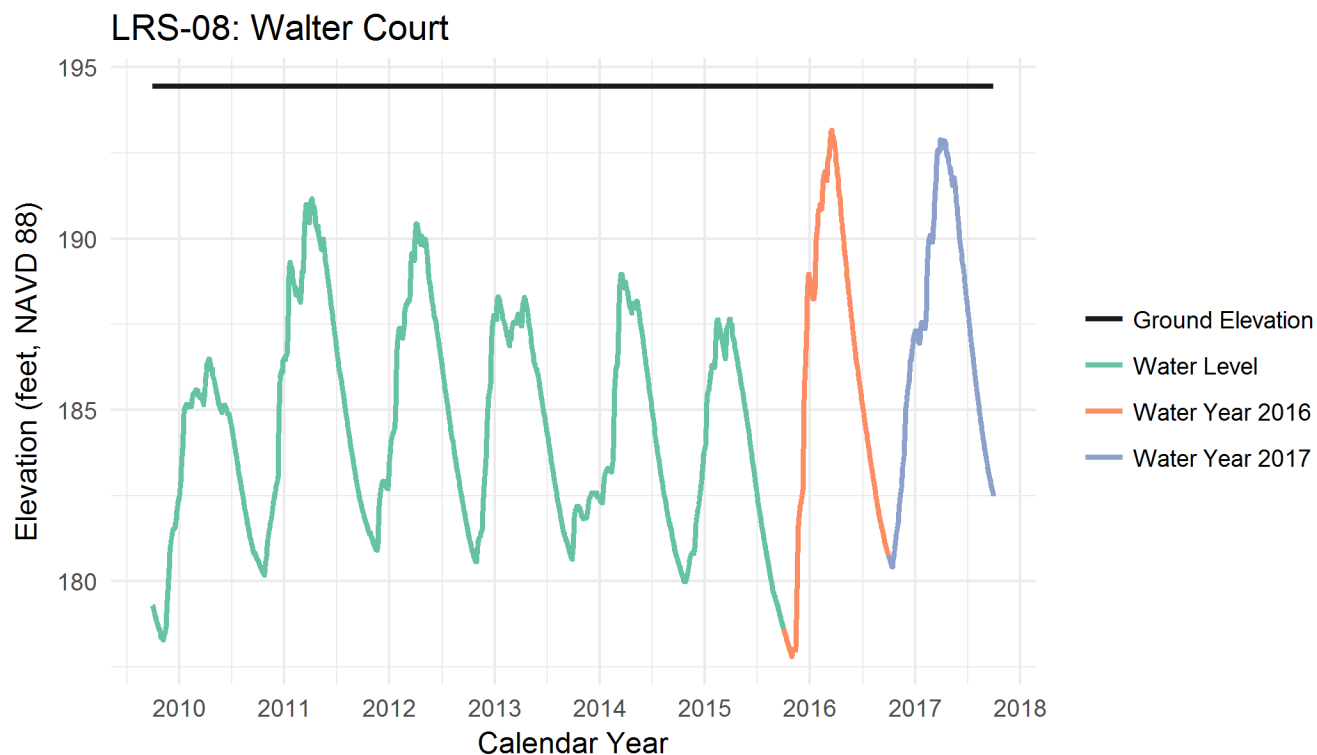


Figure 20: Groundwater well elevation data from LRS-08, Walter Court SW



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As shown in Figure 20, WY 2016 and 2017, maximum annual groundwater levels are elevated compared with levels going back to 2010, reversing a general downward trend.

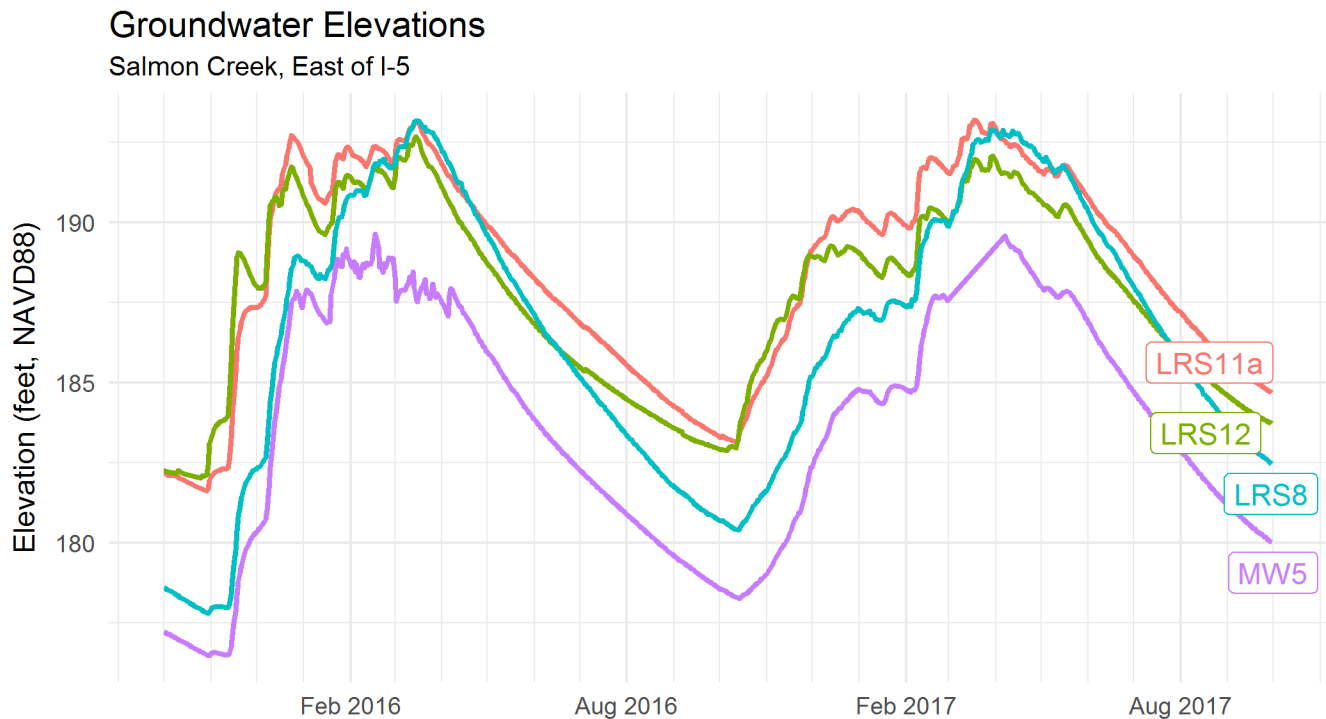
The groundwater monitoring well shown above (LRS 08) is located in the middle of the Salmon Creek Basin and is the primary indicator well for overall conditions within the shallow aquifer. It is used to indicate the probability of high groundwater hazards including potential for surface flooding caused by excessive groundwater expressing at the surface. For reference, groundwater breached the surface at this location in 1999 almost three feet above the surface, creating widespread flooding throughout the basin. LRS-08 is a primary index well that is used for the eastern half of the basin between Interstate 5 and Brooks Ln SE. In late 2017, a new well was installed at the same location (LRS 8a) and provided with telemetry to provide real-time water level monitoring.

The groundwater elevation in the western portion of the Salmon Creek Basin is markedly different than in the eastern half of the basin. The dividing line between the east and west portions is Interstate 5, which runs roughly through the middle of the basin. The principle differences between the two halves of the basin are:

- 1) Groundwater is shallower in the west basin, and
- 2) Groundwater is more reactive and rises quicker in the west basin than it does in the east basin.

The underlying cause of this difference is in the geology that controls the upper, unconfined aquifer responsible for surface flooding. The confining material is a till layer that lies beneath a medium sand. The aquifer responsible for flooding in the basin is the medium sand that fills during the wet season. The sand above the till thins to the west causing the groundwater to breach the surface quicker because it has less overburden in which to reside. This is why flooding is generally more severe west of I-5 and typically occurs earlier in the wet season. In addition, the overall groundwater gradient flows west toward the Black River ancestral channel. There is a debate as to the role Interstate 5 may play in impeding flow across the entire basin by interrupting the flow path both at the surface and extending below via its compaction prism.

Figure 21: Groundwater Elevations for the Eastern Basin Groundwater Monitoring Wells (Interstate 5 to Brooks Ln SE)



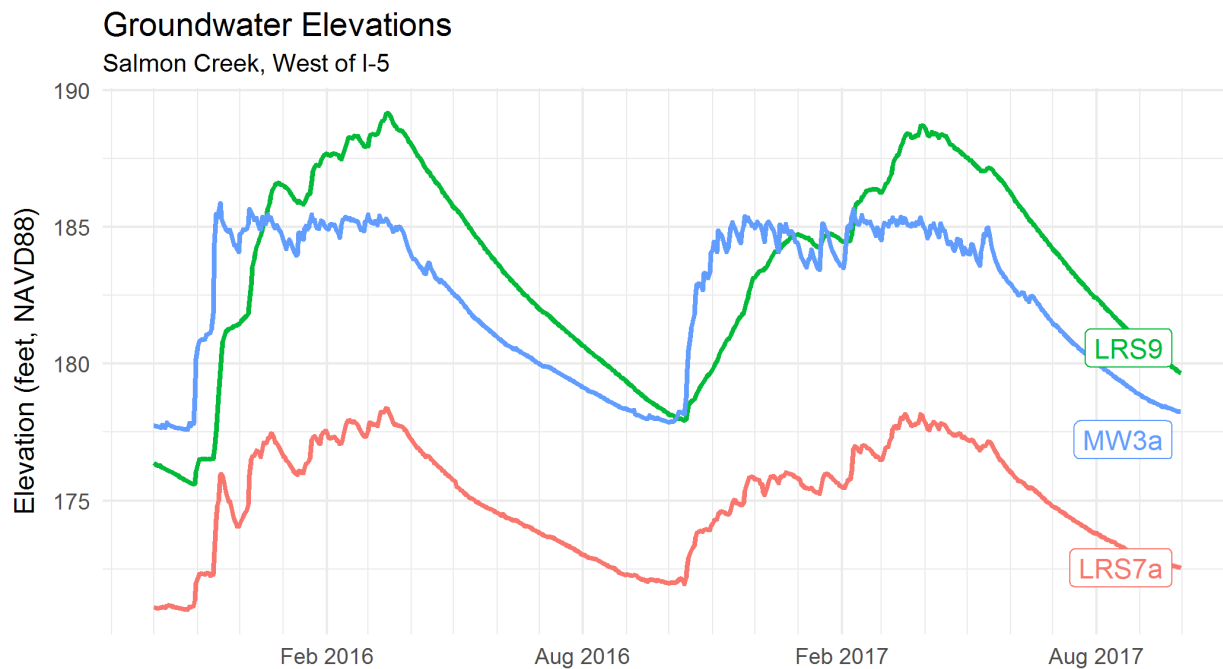
Note the dampened groundwater bulge during the dry winter months and drought in the summer of 2015 creating very low groundwater elevations. The end of the drought is marked by the rapid increase in groundwater at the beginning of the 2016 WY.

The WY 2017 hydrographs of all four continuously monitored wells east of I-5 (LRS -11a, -12, -8, and MW-5) differ in the same way from their WY 2016 hydrographs. In WY 2016, unusually low starting elevations in October 2015 were erased in November and December as major rain events over the two month period drove water levels up by over ten feet to nearly their peak by early January. From January through April of 2016 water levels maintained within a couple of feet, with the annual decline starting in mid-April.

Water levels in WY 2017, on the other hand, began rising earlier, in October 2016 rather than November. Their climb was also less precipitous, with a more gentle and consistent increase through the beginning of January, a plateau throughout January, and sharp jump of about two feet in February. The late-season water level decline is less abrupt as well, with rains and their effect on water levels tapering off around mid-May.

Despite the differences, the maximum water elevations for WY 2016 and WY 2017 were very similar for all four wells. Ending year water elevations were about two feet higher, setting up WY 2018 for increased water elevations.

Figure 22: Groundwater Elevations for the Western Basin (Interstate 5 to Littlerock Road)



Wells in the western part of the basin generally react more rapidly to high and low precipitation seasons, as seen by a jagged pattern in the hydrographs for MW3a and LRS7a in Figure 22. This is due to the direct interaction with precipitation infiltrating into the shallower sand in the western basin, and then running out again into ditches and streams.

Because their geologic setting is different from the wells in the eastern part of the basin, their hydrographs differ as well. Whereas the eastern basin wells all had a relatively gentle increase in water elevation in WY 2017 as compared to WY 2016, MW3a has almost equally sharp increases in water elevation in both water years. The hydrographs for LRS7a are somewhere between MW3a and the eastern basin, with a longer and less dramatic rise in water levels in 2017, but still more similarities between the water years than differences.

The standout well in the western basin is LRS9, which seems to function just like a well from the eastern basin. In addition to having the same difference between the shapes of the WY2016 and WY2017 hydrographs, LRS9 ends WY2017 with several more feet of water than it ended WY2016, like the eastern basin wells but *unlike* the other two western basin wells.

The Salmon Creek Basin groundwater data is included in Appendix C of this report. Data is also available online at <http://www.thurstoncountywa.gov/sw/Pages/monitoring-dashboard.aspx>.

Groundwater Levels for the 2017 Water Year (Other Basins)

The Salmon Creek Basin is not the only location where groundwater is monitored by Thurston County. It is the most extensive and has the longest, continuous record of groundwater data in the County. Other locations throughout Thurston County where groundwater data is recorded include: Tanglewilde in Lacey, Hidden Forest subdivision also in Lacey, Scott Lake south of Tumwater, and some smaller sites for project-specific groundwater data requirements.

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In 2017 eight deep groundwater monitoring wells were installed in the Scatter Creek aquifer in Southern Thurston County. Continuous monitoring of these wells began in summer 2017. Because there is no complete record for WY 2017, they were not included in this annual report. They will be included in the report for WY 2018.

Lakes – Lake St. Clair, Long Lake and Black Lake

Overview

In 2011 Thurston County Water Resources began collecting lake levels for three major lakes in Thurston County. The three lakes are:

1. **Lake St Clair** in North Eastern Thurston County between Yelm and Lacey
2. **Long Lake** in North Central Thurston County
3. **Black Lake** in North Western Thurston County

Although there are dozens of lakes in the County, these lakes were prioritized because they were the most densely populated and because they are entirely or predominantly within the County jurisdiction. Black Lake and Long Lake share boundaries with or include Urban Growth Areas for Tumwater and Lacey respectively. Lake Level data is also available in Appendix D, and online at

<http://www.thurstoncountywa.gov/sw/Pages/monitoring-dashboard.aspx>.

Each lake listed above has a separate web page for level data. Lake Level data is included in Appendix D of this report.

There is also a Lakes Home Page maintained by Thurston County Public Works which oversees the County Lakes Program at http://www.co.thurston.wa.us/tcweeds/lakes/lakes-home_nw.html. The Lakes Home Page is for those lakes with an active Lake Management District (Long and Lawrence) or Lake Special District (Black Lake).

Observations

In general, water levels in all Thurston County lakes have been higher than average over the past several years. Water levels during the 2016 and 2017 WYs have been some of the highest lake elevations in a over a decade. Although the exact cause of this is not completely understood, it is likely a combination of increased rainfall in 2016 and 2017 and probably some other mechanisms that are affecting water levels beyond merely total precipitation. Groundwater is a major factor that affects lake levels regardless of rainfall. Successive years of high groundwater can negate single water year precipitation anomalies, either high or low.

For Lake St. Clair, even during the 2015 drought, which was listed as Severe by the National Weather Service, lake levels remained high. By the end of WY2016 (Sept 30, 2016) the Lake was already at or slightly above the five mile per hour boating speed restriction elevation of 69.5 feet MSL as set by County ordinance. The summer of 2016 had the shortest period of time of the lake level being above the speed restriction level since records were available starting in 1988. In WY 2017, the lake remained closed for boating during the entire water year.

In Black and Long Lakes, both WY 2016 and WY 2017 were water years with unusually high-water elevations.

Lake St. Clair

Lake St. Clair is a unique case in Thurston County, and the following section is devoted to it. While important elements of the hydrology in the watershed are unknown at this time (specifically, groundwater), we present some general findings and data in the sections below.

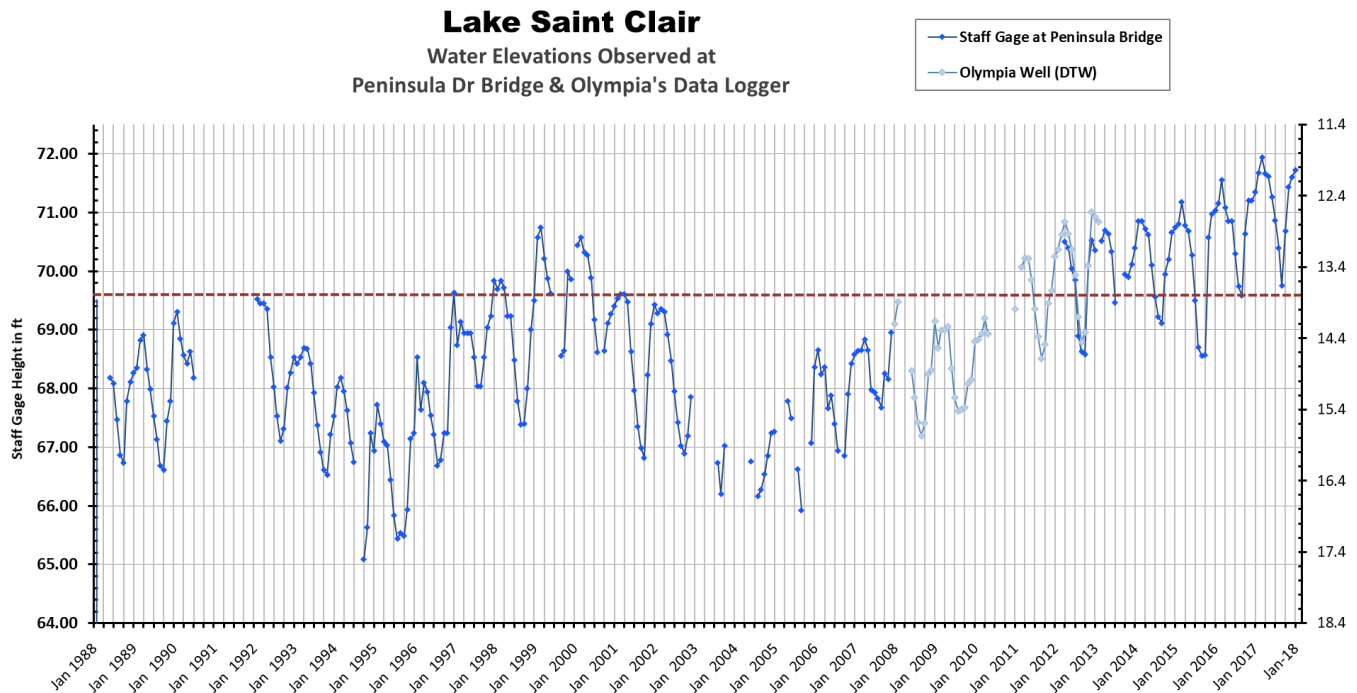
SUMMARY REPORT and ANALYSIS for WATER YEAR 2017: including Atmospheric, Streamflow, Groundwater and Lake Level Data – Thurston County Environmental Monitoring Program

Lake St. Clair is an isolated kettle lake left over from the continental ice sheet that occupied this region 13,000 years ago. It, by definition, has no natural surface outlet.

Other than evaporation, groundwater seepage is the only dominant outlet from Lake St. Clair.

Below is a chart of Lake St. Clair surface elevation data from 1988 – 2017. There are several trends visible in the data, but the most pronounced is the gradual and sustained rise in the lake level beginning in 2005 and continuing up to the present day.

Figure 23: Lake St. Clair Surface elevation Chart 1988 - 2017

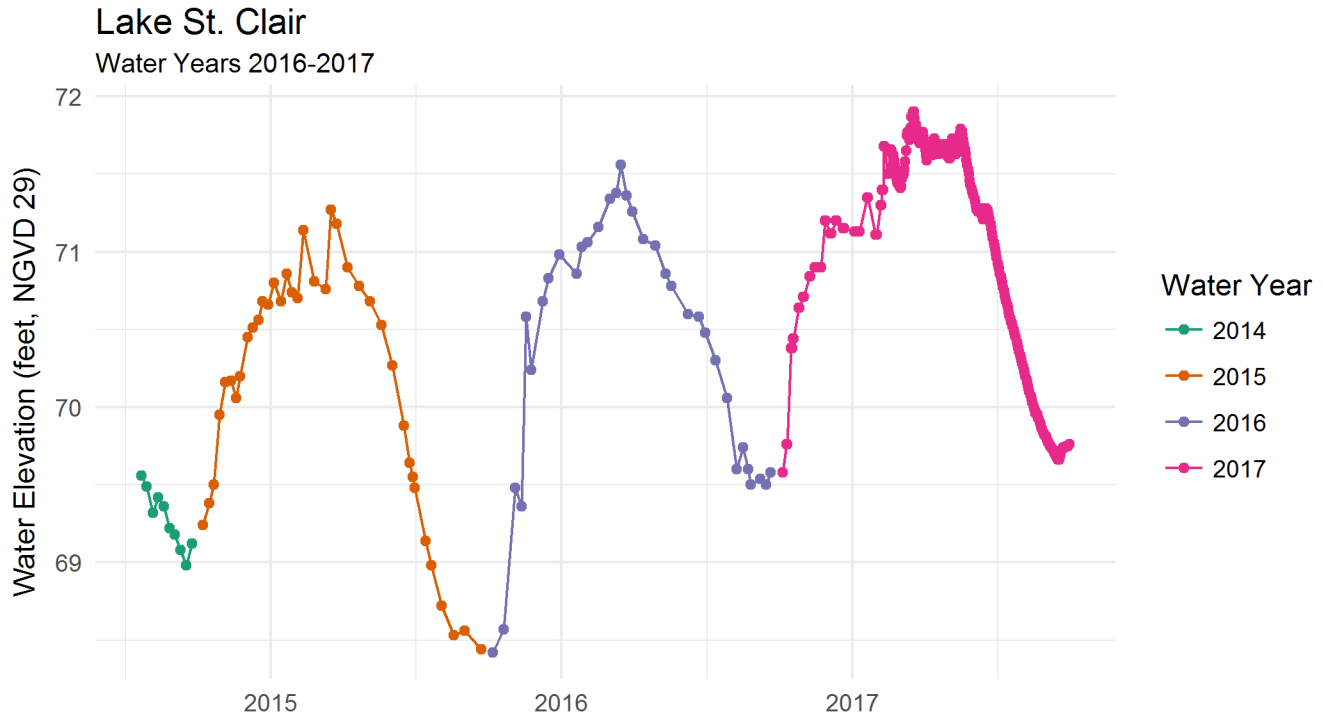


Datum: NGVD 29' converted from MSL City of Olympia Datum

The red dotted line on the plot indicates 69.5'. The water elevation at which the 5 MPH speed limit is enacted

Figure 24: Lake St. Clair Surface elevation Chart 2014-2017.

An automated telemetered level station was installed in early 2017 to provide near-real-time data

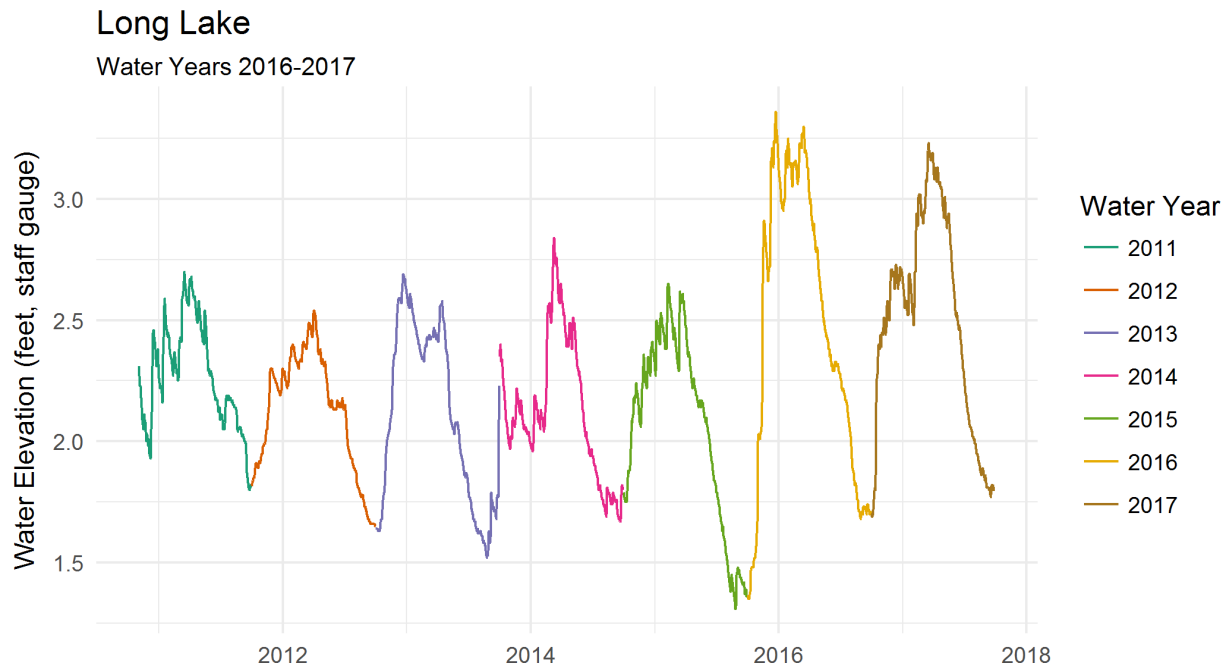


Long Lake

Long Lake is located in the southeastern Urban Growth Area of Lacey and is highly urbanized like most of the surrounding lakes. Long Lake is part of a three lake group that also includes Pattison Lake and Hicks Lake. These lakes are hydraulically connected by surface and subsurface flow ways. Unlike Lake St. Clair, Long Lake has a well-defined outlet that constitutes the headwaters of Woodland Creek.

Long Lake has also experienced higher than average seasonal lake levels during WYs 2016 and 2017. Although there is a significant portion of Long Lake that receives recharge from groundwater, unlike Lake St. Clair, the fact that it has an outlet prevents the lake level from getting excessively high. In 2016 however the County did receive many calls from residents on Long Lake reporting high lake levels and some flooding to properties. The chart below is data collected from the Holmes Island Bridge lake elevation gage that Thurston County maintains. The chart includes data from WYs 2011 through 2017 to illustrate the range of surface elevations that seasonally occur. The chart below shows that WY 2016 and 2017 lake elevations were higher and longer duration than past water years.

Figure 25: Long Lake Surface Elevation Data 2011 – early 2017



Note: The magnitude of surface elevation change is less than that of Lake St. Clair. Long Lake is on the order of 2 feet, whereas Lake St. Clair is on the order of 3+ feet in 2016.

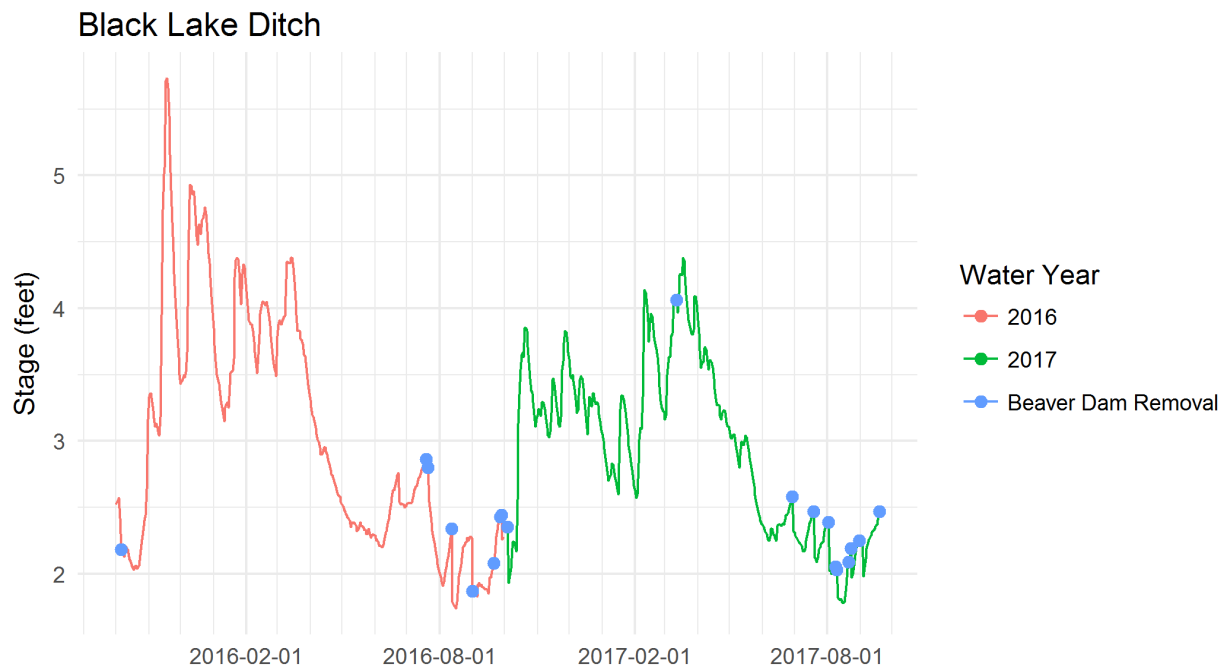
Black Lake

Black Lake also responds to variations in precipitation in predictable ways. This lake, however, responds more quickly than most lakes. The Black Lake Basin is located west of Olympia, adjacent to the Urban Growth Area for the City of Tumwater. It is situated between the Black Hills and the basalt hills of Somerset Hill in Tumwater. This basin has highly impermeable rock and glacial till underlying the surface layers. In addition, the topography is steep, and this basin receives approximately 25 percent higher precipitation than the Olympia airport only five miles to the east. As a result of this combination of factors – geology, topography, and intensified precipitation – the lake rises and falls more like a river than a lake. The figure below is a chart of WYs 2016 and 2017 plotted together.

A very active beaver population in Black Lake Ditch has a significant impact on the lake level. Sharp increases in level followed by even sharper drops are characteristic of beavers building dams and Stormwater Utility staff lowering them.

SUMMARY REPORT and ANALYSIS for WATER YEAR 2017: including Atmospheric, Streamflow, Groundwater and Lake Level Data – Thurston County Environmental Monitoring Program

Figure 26: Stage Chart for Black Lake for Water Years 2016 and 2017.



There is a noticeable difference in the lake level between the two years in magnitude, shape, and duration of the distribution curve. The repeated peaks and drops of the level in the summer months is due to very active beaver dam construction and removal from the Black Ditch Outlet.

Summary of Water Year 2017

The cooler than average temperatures and above average precipitation observed in WY 2017 resulted in higher than average streamflow, groundwater levels, and lake levels. The winter and early spring months were much cooler than average and represented a departure for the observed warming trend recorded over the previous ten years.

The overall rainfall was close to what was recorded at the Olympia Regional Airport in WY 2016 (58.4 inches in WY 2016 and 58.2 in WY 2017). There were differences in how the rainfall was distributed throughout the wet season resulting in later season (April or May) peak levels observed in streamflow, groundwater, and lake levels. This is consistent with trends observed since 2014 where the annual rainfall is distributed more widely throughout the wet season, prolonging increased water level throughout the hydrologic cycle but minimizing extreme flood events. Extreme events are generally caused by large or moderate atmospheric river events which have not occurred in our region since 2009 despite their predicted increase in frequency.

Extreme events like the microburst associated with strong thunderstorms witnessed in Thurston County in May 2017, may represent some of the more extreme possibilities that may become more frequent in a changing climate regime. The changes that have been recorded by the Thurston County's Environmental Monitoring Program represent a comprehensive assessment of the County's water budget. This report is augmented by the efforts of our partners at the Thurston County Environmental Health Division who collect, compile, and process water quality data from our streams, lakes, and groundwater.

Closing

Thurston County Water Resources, Environmental Monitoring Program has continued to collect data for our Regional Interlocal Monitoring partners and our General Environmental Monitoring program for almost twenty years. Together with the Thurston County Environmental Health Division, we collect millions of data points per year for processing and modelling. All of the data collected by our programs is available electronically at no cost to the public and other government agencies at <http://www.thurstoncountywa.gov/sw/Pages/monitoring.aspx>. The program is continuing to evolve with new technologies and analytical techniques. We will be striving to provide the highest quality data for quantifying our local water cycle and integrating it with our regional partners. We will be continuing to improve our data quality and services with new locations and using remote sensing technologies in the upcoming years. We will be providing additional services for groundwater, surface water flows and atmospheric monitoring and lake levels. We will continue to integrate our data and program elements with Thurston County Environmental Health through a shared database and other cooperative efforts. That in turn will provide a more complete picture of the health of our water resources in Thurston County.

The water cycle begins in the clouds and ends in Puget Sound or the Pacific Ocean, and we attempt to quantify it at every level from the raindrops, streams, ground, and lakes until it returns to its source.

Appendix A –Precipitation Data

05u--Yelm WRF_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.04	0.01	0.00	0.15	0.00	0.13	0.04	0.02	0.07	0.00	0.00	0.00
02	0.23	0.26	0.08	0.00	0.01	0.16	0.00	0.19	0.00	0.00	0.00	0.00
03	0.03	0.00	0.34	0.00	0.40	0.44	0.00	0.01	0.00	0.00	0.00	0.00
04	0.11	0.00	0.30	0.00	0.51	0.10	0.18	0.42	0.00	0.00	0.00	0.00
05	0.13	0.95	0.08	0.00	0.47	0.16	0.34	0.12	0.00	0.00	0.00	0.00
06	0.13	0.02	0.04	0.00	0.97	0.41	0.09	0.00	0.00	0.00	0.00	0.00
07	0.15	0.03	0.00	0.00	0.00	0.75	0.05	0.00	0.20	0.00	0.00	0.00
08	0.24	0.00	0.00	0.38	0.73	0.11	0.01	0.00	0.24	0.00	0.00	0.00
09	0.39	0.01	0.69	0.07	1.11	1.02	0.03	0.00	0.34	0.00	0.00	0.00
10	0.01	0.00	0.23	0.19	0.10	0.02	0.11	0.00	0.00	0.00	0.00	0.01
11	0.00	0.00	0.37	0.00	0.00	0.28	0.17	0.51	0.00	0.00	0.00	0.00
12	0.02	0.12	0.11	0.00	0.00	0.03	0.75	0.12	0.00	0.00	0.11	0.00
13	1.26	0.26	0.01	0.00	0.00	0.52	0.06	0.14	0.00	0.00	0.02	0.00
14	1.16	0.46	0.00	0.00	0.27	0.42	0.49	0.14	0.00	0.00	0.00	0.00
15	0.64	1.01	0.02	0.00	0.75	1.01	0.01	0.26	0.31	0.00	0.00	0.00
16	0.18	0.04	0.00	0.00	0.43	0.00	0.00	0.33	0.17	0.00	0.00	0.00
17	0.21	0.00	0.00	0.51	0.01	0.48	0.04	0.00	0.05	0.00	0.00	0.10
18	0.31	0.00	0.00	0.57	0.44	0.47	0.18	0.00	0.01	0.00	0.00	0.46
19	0.21	0.01	0.54	0.00	0.12	0.00	0.25	0.00	0.00	0.00	0.00	0.17
20	0.52	0.07	0.04	0.03	0.37	0.07	0.33	0.00	0.00	0.01	0.00	0.17
21	0.54	0.27	0.00	0.10	0.38	0.14	0.00	0.00	0.00	0.00	0.00	0.09
22	0.02	0.20	0.13	0.02	0.00	0.01	0.08	0.00	0.00	0.00	0.00	0.00
23	0.00	0.20	0.59	0.00	0.02	0.15	0.26	0.00	0.00	0.00	0.00	0.00
24	0.00	0.78	0.01	0.01	0.00	0.07	0.35	0.00	0.00	0.00	0.00	0.00
25	0.00	0.04	0.00	0.00	0.01	0.17	0.10	0.00	0.00	0.00	0.00	0.00
26	1.06	0.44	0.09	0.01	0.16	0.42	0.22	0.00	0.00	0.00	0.00	0.00
27	0.00	0.28	0.31	0.00	0.17	0.06	0.00	0.00	0.00	0.00	0.00	0.00
28	0.01	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00
29	0.04	0.03	0.05	0.01		0.39	0.34	0.00	0.00	0.00	0.00	0.04
30	0.32	0.11	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.15
31	0.45		0.04	0.01		0.00		0.08		0.00	0.00	
Total	8.41	5.60	4.07	2.06	7.43	8.10	4.48	2.34	1.39	0.01	0.13	1.19
Days	26	22	20	13	20	27	23	12	8	1	2	8

182 Precip Days

Total Rainfall for Water Year 2017: 45.21

Notes:

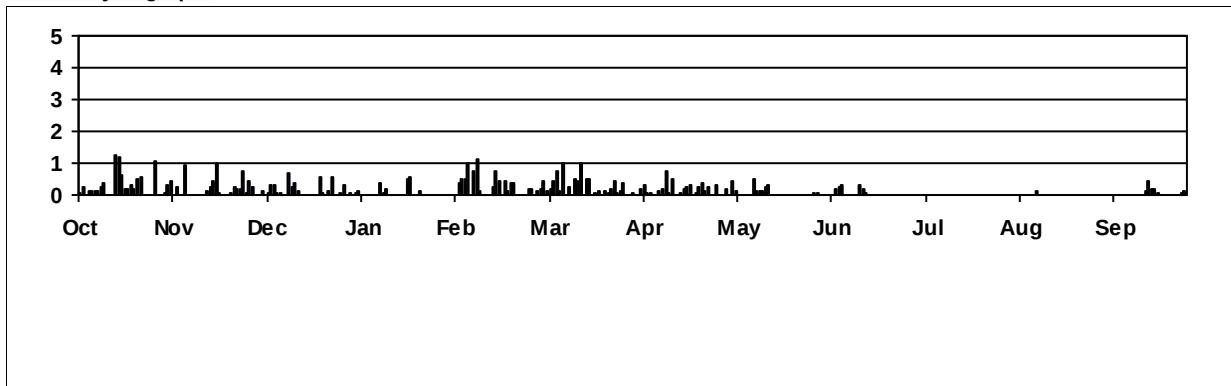
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



10u--Meridian Rd_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.04	0.06	0.01	0.16	0.00	0.23	0.07	0.04	0.02	0.00	0.00	0.00
02	0.07	0.43	0.14	0.00	0.01	0.24	0.00	0.20	0.00	0.00	0.00	0.00
03	0.04	0.01	0.46	0.00	0.50	0.57	0.00	0.02	0.00	0.00	0.00	0.00
04	0.08	0.01	0.21	0.00	0.77	0.07	0.26	1.09	0.00	0.00	0.00	0.00
05	0.12	1.32	0.11	0.00	0.58	0.19	0.43	0.09	0.00	0.00	0.00	0.00
06	0.24	0.03	0.04	0.00	0.99	0.20	0.25	0.02	0.00	0.00	0.00	0.00
07	0.23	0.05	0.00	0.00	0.00	0.76	0.37	0.00	0.13	0.00	0.00	0.00
08	0.44	0.00	0.00	0.46	0.93	0.26	0.01	0.00	0.30	0.00	0.00	0.00
09	0.31	0.05	0.71	0.02	1.37	1.19	0.09	0.00	0.24	0.00	0.00	0.03
10	0.01	0.00	0.39	0.28	0.17	0.05	0.10	0.01	0.00	0.00	0.00	0.00
11	0.00	0.00	0.41	0.00	0.01	0.31	0.16	0.79	0.00	0.00	0.00	0.00
12	0.09	0.28	0.11	0.00	0.00	0.03	1.01	0.35	0.00	0.00	0.10	0.00
13	1.53	0.38	0.00	0.00	0.00	0.48	0.07	0.21	0.00	0.00	0.01	0.00
14	1.50	0.41	0.00	0.00	0.36	0.68	0.14	0.09	0.00	0.00	0.00	0.00
15	0.81	1.13	0.03	0.01	1.27	1.00	0.00	0.49	0.73	0.00	0.00	0.00
16	0.63	0.03	0.00	0.00	0.37	0.00	0.00	0.42	0.01	0.00	0.00	0.00
17	0.27	0.00	0.00	0.85	0.00	0.57	0.05	0.00	0.12	0.00	0.00	0.12
18	0.13	0.01	0.00	0.87	0.50	0.54	0.33	0.00	0.00	0.00	0.00	0.41
19	0.29	0.03	0.86	0.04	0.17	0.00	0.37	0.00	0.00	0.00	0.00	0.19
20	0.86	0.08	0.10	0.03	0.34	0.08	0.43	0.00	0.00	0.05	0.00	0.18
21	0.70	0.19	0.00	0.12	0.24	0.22	0.00	0.00	0.00	0.00	0.00	0.03
22	0.06	0.36	0.18	0.04	0.00	0.05	0.09	0.00	0.00	0.00	0.00	0.00
23	0.00	0.43	0.71	0.00	0.19	0.30	0.22	0.00	0.00	0.00	0.00	0.00
24	0.02	1.33	0.01	0.00	0.00	0.31	0.34	0.00	0.00	0.00	0.00	0.00
25	0.01	0.07	0.00	0.00	0.00	0.07	0.17	0.00	0.00	0.00	0.00	0.01
26	1.11	0.73	0.37	0.01	0.24	0.49	0.11	0.00	0.00	0.00	0.00	0.00
27	0.01	0.37	0.28	0.00	0.20	0.24	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.04	0.08	0.00		0.51	0.38	0.00	0.00	0.00	0.00	0.04
30	0.37	0.25	0.01	0.00		0.08	0.00	0.00	0.00	0.00	0.00	0.14
31	0.68		0.06	0.00		0.01		0.11		0.00	0.00	
Total	10.66	8.08	5.28	2.89	9.21	9.96	5.45	3.93	1.55	0.05	0.11	1.15
Days	28	25	21	12	19	29	22	14	7	1	2	9

189 Precip Days

Total Rainfall for Water Year 2017: 58.32

Notes:

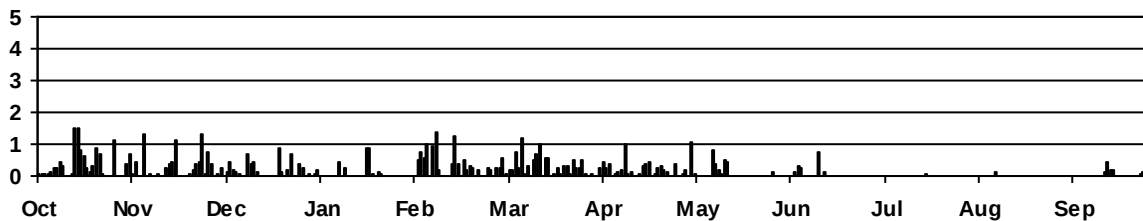
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



11u--NOAA Olympia Airport

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.09	0.15	0.00	0.13	0.00	0.20	0.01	0.09	0.04	0.00	0.00	0.00
02	0.08	0.46	0.33	0.00	0.02	0.40	0.00	0.17	0.00	0.00	0.00	0.00
03	0.02	0.00	0.42	0.00	0.46	0.82	0.00	0.05	0.00	0.00	0.00	0.00
04	0.11	0.01	0.14	0.00	1.04	0.28	0.27	0.56	0.00	0.00	0.00	0.00
05	0.15	1.18	0.15	0.00	1.02	0.25	0.64	0.08	0.00	0.00	0.00	0.00
06	0.37	0.12	0.05	0.00	0.22	0.16	0.21	0.00	0.00	0.00	0.00	0.00
07	0.21	0.09	0.00	0.00	0.00	0.86	0.55	0.00	0.01	0.00	0.00	0.00
08	0.57	0.00	0.35	0.54	1.09	0.29	0.04	0.00	0.32	0.00	0.00	0.00
09	0.25	0.10	0.62	0.06	1.51	1.19	0.05	0.00	0.32	0.00	0.00	0.04
10	0.00	0.00	0.44	0.39	0.33	0.04	0.22	0.00	0.00	0.00	0.00	0.01
11	0.00	0.01	0.68	0.01	0.01	0.35	0.13	0.82	0.00	0.00	0.00	0.00
12	0.18	0.38	0.14	0.00	0.00	0.01	0.85	0.53	0.00	0.00	0.11	0.00
13	1.61	0.60	0.01	0.00	0.00	0.48	0.07	0.21	0.00	0.00	0.00	0.00
14	2.01	0.45	0.03	0.00	0.40	0.78	0.22	0.12	0.00	0.00	0.00	0.00
15	0.72	1.18	0.01	0.00	1.16	0.80	0.00	0.47	0.58	0.00	0.00	0.00
16	0.69	0.09	0.00	0.00	0.15	0.01	0.00	0.28	0.00	0.00	0.00	0.00
17	0.34	0.00	0.00	1.14	0.02	0.84	0.05	0.00	0.05	0.00	0.00	0.17
18	0.22	0.04	0.00	1.18	0.28	0.41	0.14	0.00	0.01	0.00	0.00	0.45
19	0.50	0.08	1.07	0.09	0.23	0.00	0.40	0.00	0.00	0.00	0.00	0.19
20	0.92	0.08	0.25	0.05	0.31	0.10	0.22	0.00	0.00	0.05	0.00	0.16
21	0.44	0.15	0.00	0.15	0.13	0.20	0.00	0.00	0.00	0.00	0.00	0.00
22	0.07	0.48	0.13	0.04	0.00	0.12	0.09	0.00	0.00	0.00	0.00	0.00
23	0.00	0.49	0.82	0.00	0.11	0.38	0.36	0.00	0.00	0.00	0.00	0.00
24	0.05	1.40	0.00	0.00	0.00	0.32	0.34	0.00	0.00	0.00	0.00	0.00
25	0.01	0.15	0.00	0.02	0.01	0.08	0.24	0.00	0.00	0.00	0.00	0.03
26	1.19	0.89	0.28	0.00	0.49	0.55	0.07	0.00	0.00	0.00	0.00	0.00
27	0.04	0.39	0.22	0.00	0.13	0.21	0.02	0.00	0.00	0.00	0.00	0.00
28	0.03	0.00	0.01	0.00	0.06	0.49	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.07	0.09	0.02		0.72	0.37	0.00	0.00	0.00	0.00	0.10
30	0.42	0.24	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.09
31	1.12		0.13	0.00		0.00		0.09		0.00	0.00	
Total	12.41	9.28	6.37	3.82	9.18	11.34	5.56	3.47	1.33	0.05	0.11	1.24
Days	27	25	22	13	22	28	23	12	7	1	1	9

190 Precip Days

Total Rainfall for Water Year 2017: 64.16

Notes:

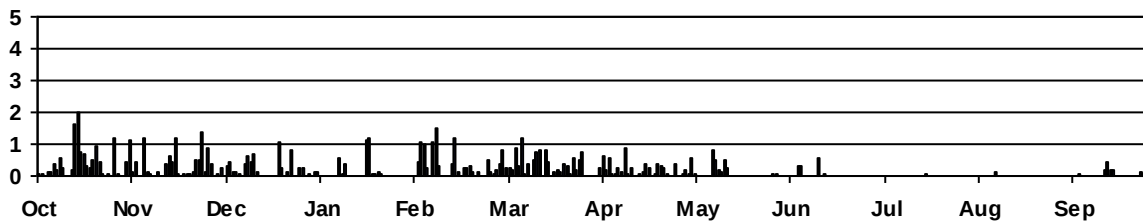
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



11w--Rainier Transfer Station

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.09	0.06	0.01	0.09	0.00	0.13	0.05	0.03	0.07	0.00	0.00	0.00
02	0.13	0.29	0.10	0.00	0.01	0.20	0.00	0.21	0.00	0.00	0.00	0.00
03	0.01	0.01	0.44	0.00	0.39	0.71	0.00	0.01	0.00	0.00	0.00	0.00
04	0.16	0.00	0.31	0.00	0.66	0.17	0.22	0.70	0.00	0.00	0.00	0.00
05	0.19	1.23	0.23	0.00	0.32	0.21	0.39	0.16	0.00	0.00	0.00	0.00
06	0.28	0.03	0.06	0.00	1.15	0.47	0.27	0.00	0.00	0.00	0.00	0.00
07	0.28	0.04	0.00	0.00	0.01	0.57	0.23	0.00	0.17	0.00	0.00	0.00
08	0.57	0.00	0.00	0.48	0.85	0.33	0.03	0.00	0.36	0.00	0.00	0.00
09	0.44	0.06	0.73	0.06	1.63	1.14	0.05	0.00	0.38	0.00	0.00	0.01
10	0.01	0.00	0.31	0.25	0.10	0.20	0.10	0.00	0.04	0.00	0.00	0.00
11	0.00	0.00	0.44	0.01	0.00	0.34	0.14	0.53	0.00	0.00	0.00	0.00
12	0.07	0.23	0.03	0.00	0.00	0.04	0.83	0.21	0.00	0.00	0.12	0.00
13	1.27	0.46	0.01	0.00	0.00	0.45	0.07	0.20	0.04	0.00	0.02	0.00
14	1.36	0.51	0.00	0.00	0.30	0.45	0.49	0.12	0.00	0.00	0.00	0.00
15	0.93	1.23	0.00	0.00	1.07	0.99	0.01	0.37	0.42	0.00	0.00	0.00
16	0.50	0.02	0.00	0.00	0.61	0.01	0.00	0.43	0.08	0.00	0.00	0.00
17	0.13	0.00	0.00	0.83	0.00	0.48	0.05	0.00	0.06	0.00	0.00	0.17
18	0.23	0.00	0.00	0.97	0.50	0.60	0.34	0.00	0.00	0.00	0.00	0.47
19	0.19	0.03	1.01	0.02	0.19	0.00	0.34	0.00	0.00	0.00	0.00	0.23
20	0.64	0.07	0.12	0.02	0.36	0.08	0.59	0.00	0.00	0.06	0.00	0.25
21	0.50	0.13	0.00	0.09	0.34	0.13	0.01	0.00	0.00	0.00	0.00	0.03
22	0.06	0.35	0.12	0.03	0.00	0.02	0.24	0.00	0.00	0.00	0.00	0.00
23	0.01	0.31	0.61	0.00	0.02	0.18	0.23	0.00	0.00	0.00	0.00	0.00
24	0.04	1.61	0.01	0.00	0.01	0.15	0.36	0.00	0.00	0.00	0.00	0.00
25	0.01	0.07	0.00	0.07	0.00	0.13	0.11	0.00	0.00	0.00	0.00	0.01
26	1.32	0.63	0.24	0.00	0.11	0.36	0.22	0.00	0.00	0.00	0.00	0.00
27	0.00	0.33	0.45	0.00	0.13	0.08	0.04	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.01	0.26	0.00	0.00	0.00	0.00	0.00	0.00
29	0.06	0.03	0.08	0.00		0.54	0.28	0.00	0.00	0.00	0.00	0.07
30	0.35	0.12	0.01	0.00		0.09	0.04	0.00	0.00	0.00	0.00	0.24
31	0.39		0.06	0.02		0.00		0.06		0.00	0.00	
Total	10.22	7.85	5.38	2.94	8.77	9.51	5.73	3.03	1.62	0.06	0.14	1.48
Days	28	23	21	13	21	29	26	12	9	1	2	9

194 Precip Days

Total Rainfall for Water Year 2017: 56.73

Notes:

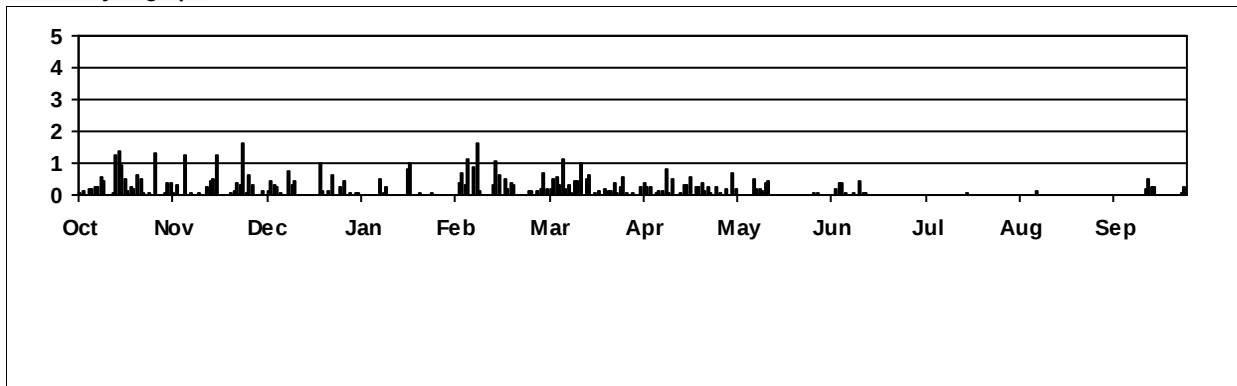
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



13u--Lake Lawrence_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.03	0.04	0.01	0.17	0.00	0.13	0.01	0.03	0.05	0.00	0.00	0.00
02	0.21	0.23	0.04	0.00	0.01	0.14	0.00	0.19	0.00	0.00	0.00	0.00
03	0.01	0.01	0.39	0.00	0.24	0.40	0.00	0.00	0.00	0.00	0.00	0.00
04	0.13	0.00	0.35	0.00	0.82	0.12	0.10	0.16	0.00	0.00	0.00	0.00
05	0.12	0.89	0.06	0.00	0.60	0.17	0.28	0.03	0.00	0.00	0.00	0.00
06	0.18	0.02	0.05	0.00	0.85	0.16	0.07	0.00	0.00	0.00	0.00	0.00
07	0.13	0.03	0.00	0.00	0.14	0.50	0.13	0.00	0.27	0.00	0.00	0.00
08	0.28	0.00	0.00	0.26	0.64	0.29	0.05	0.00	0.24	0.00	0.00	0.00
09	0.45	0.02	0.61	0.11	0.94	0.93	0.05	0.00	0.56	0.00	0.00	0.00
10	0.00	0.00	0.35	0.22	0.17	0.03	0.09	0.00	0.15	0.00	0.00	0.00
11	0.00	0.00	0.35	0.00	0.00	0.17	0.13	0.52	0.00	0.00	0.00	0.00
12	0.02	0.14	0.03	0.01	0.00	0.01	0.42	0.09	0.00	0.00	0.13	0.00
13	1.23	0.29	0.00	0.00	0.00	0.51	0.06	0.05	0.03	0.00	0.04	0.00
14	1.09	0.52	0.00	0.00	0.17	0.31	0.39	0.16	0.00	0.00	0.00	0.00
15	0.64	0.69	0.00	0.00	0.77	1.22	0.01	0.39	0.35	0.00	0.00	0.00
16	0.14	0.02	0.00	0.00	0.36	0.00	0.00	0.26	0.06	0.00	0.00	0.00
17	0.52	0.00	0.00	0.48	0.01	0.34	0.04	0.00	0.02	0.00	0.00	0.15
18	0.21	0.00	0.00	0.78	0.57	0.52	0.32	0.00	0.02	0.00	0.00	0.42
19	0.13	0.01	0.65	0.04	0.15	0.00	0.21	0.00	0.00	0.00	0.00	0.08
20	0.46	0.32	0.05	0.01	0.30	0.05	0.26	0.00	0.00	0.00	0.00	0.34
21	0.44	0.05	0.00	0.06	0.34	0.10	0.00	0.00	0.00	0.00	0.00	0.02
22	0.01	0.30	0.07	0.02	0.00	0.02	0.35	0.00	0.00	0.00	0.00	0.00
23	0.00	0.18	0.42	0.00	0.00	0.13	0.42	0.00	0.00	0.00	0.00	0.00
24	0.01	1.65	0.02	0.00	0.00	0.07	0.49	0.00	0.00	0.00	0.00	0.00
25	0.01	0.01	0.00	0.08	0.00	0.13	0.05	0.00	0.00	0.00	0.00	0.01
26	0.94	0.37	0.16	0.00	0.07	0.22	0.11	0.00	0.00	0.00	0.00	0.00
27	0.01	0.18	0.28	0.00	0.06	0.12	0.01	0.00	0.00	0.00	0.00	0.00
28	0.01	0.00	0.00	0.00	0.03	0.12	0.00	0.00	0.00	0.00	0.00	0.00
29	0.02	0.01	0.08	0.00		0.26	0.26	0.00	0.00	0.00	0.00	0.05
30	0.17	0.27	0.00	0.00		0.00	0.02	0.00	0.00	0.00	0.00	0.18
31	0.43		0.09	0.03		0.00		0.01		0.00	0.00	
Total	8.03	6.25	4.06	2.27	7.24	7.17	4.33	1.89	1.75	0.00	0.17	1.25
Days	28	23	19	13	20	27	25	11	10		2	8

186 Precip Days

Total Rainfall for Water Year 2017: 44.41

Notes:

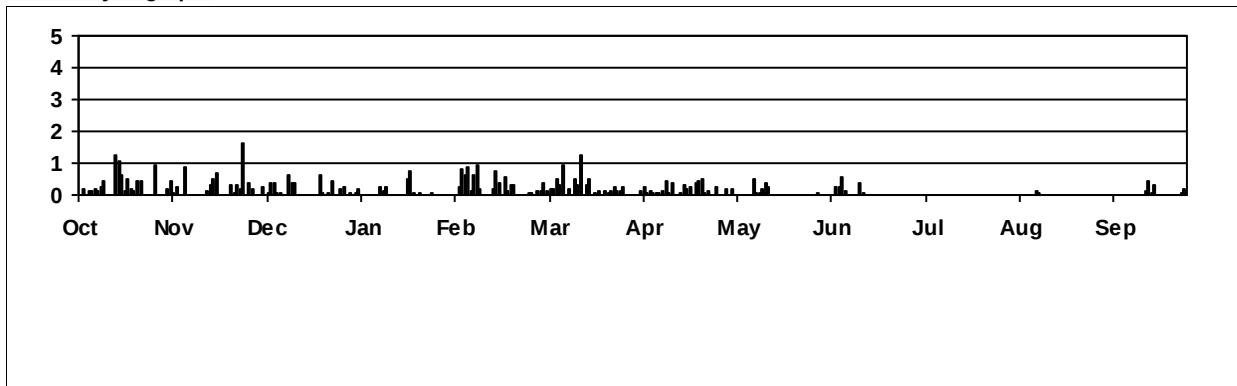
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Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



18u--Lacey Fire Dist. 3 Fire Station_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.07	0.14	0.00	0.14	0.00	0.17	0.05	0.05	0.04	0.00	0.00	0.00
02	0.04	0.46	0.30	0.00	0.02	0.28	0.00	0.16	0.00	0.00	0.00	0.00
03	0.03	0.01	0.39	0.00	0.59	0.77	0.00	0.05	0.00	0.00	0.00	0.00
04	0.09	0.00	0.13	0.00	1.02	0.15	0.29	1.27	0.00	0.00	0.00	0.00
05	0.14	1.03	0.13	0.00	0.36	0.24	0.58	0.06	0.00	0.00	0.00	0.00
06	0.29	0.07	0.08	0.00	0.86	0.19	0.27	0.00	0.00	0.00	0.00	0.00
07	0.17	0.07	0.00	0.00	0.04	0.78	0.50	0.00	0.08	0.00	0.00	0.00
08	0.51	0.00	0.00	0.54	1.00	0.28	0.11	0.00	0.30	0.00	0.00	0.00
09	0.28	0.06	0.69	0.02	1.40	1.13	0.06	0.00	0.38	0.00	0.00	0.05
10	0.01	0.00	0.53	0.28	0.28	0.04	0.19	0.00	0.01	0.00	0.00	0.02
11	0.00	0.01	0.53	0.00	0.01	0.34	0.12	0.74	0.00	0.00	0.00	0.00
12	0.10	0.39	0.07	0.00	0.00	0.01	0.85	0.56	0.00	0.00	0.12	0.00
13	1.77	0.54	0.01	0.00	0.00	0.46	0.06	0.06	0.00	0.00	0.01	0.00
14	2.14	0.45	0.00	0.00	0.35	0.99	0.41	0.11	0.00	0.00	0.00	0.00
15	0.75	1.21	0.04	0.00	1.23	0.87	0.00	0.44	0.45	0.00	0.00	0.00
16	0.62	0.23	0.00	0.00	0.25	0.00	0.00	0.24	0.01	0.00	0.00	0.00
17	0.30	0.01	0.00	1.07	0.02	0.77	0.04	0.00	0.07	0.00	0.00	0.14
18	0.19	0.03	0.00	1.06	0.36	0.44	0.16	0.00	0.02	0.00	0.00	0.38
19	0.38	0.08	0.96	0.08	0.17	0.00	0.32	0.00	0.00	0.00	0.00	0.28
20	1.06	0.03	0.20	0.03	0.33	0.12	0.34	0.00	0.00	0.04	0.00	0.16
21	0.30	0.19	0.00	0.16	0.18	0.28	0.01	0.00	0.00	0.00	0.00	0.00
22	0.06	0.45	0.17	0.05	0.00	0.09	0.08	0.00	0.00	0.00	0.00	0.00
23	0.00	0.39	0.76	0.00	0.07	0.40	0.38	0.00	0.00	0.00	0.00	0.00
24	0.04	1.59	0.00	0.01	0.00	0.25	0.30	0.00	0.00	0.00	0.00	0.00
25	0.01	0.10	0.00	0.00	0.00	0.11	0.21	0.00	0.00	0.00	0.00	0.01
26	1.24	0.84	0.47	0.01	0.55	0.45	0.03	0.00	0.00	0.00	0.00	0.00
27	0.01	0.41	0.22	0.00	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00
28	0.02	0.00	0.00	0.00	0.05	0.37	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.06	0.08	0.01		0.66	0.26	0.00	0.00	0.00	0.00	0.08
30	0.41	0.35	0.00	0.00		0.04	0.01	0.00	0.00	0.00	0.00	0.28
31	0.66		0.09	0.00		0.00		0.10		0.00	0.00	
Total	11.70	9.20	5.85	3.46	9.27	10.81	5.63	3.84	1.36	0.04	0.13	1.40
Days	29	26	19	13	22	28	24	12	9	1	2	9

194 Precip Days

Total Rainfall for Water Year 2017: 62.69

Notes:

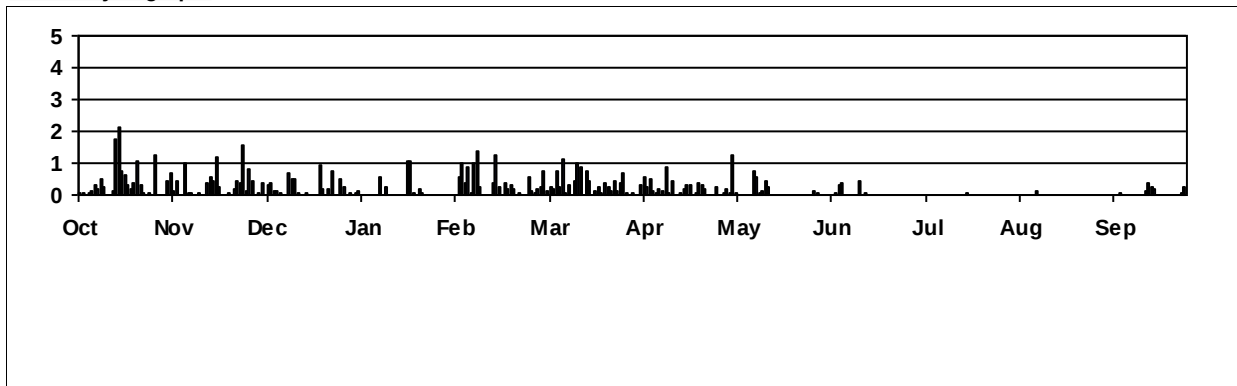
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Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



18w--WARC TC_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.05	0.08	0.01	0.06	0.00	0.12	0.03	0.03	0.02	0.00	0.00	0.00
02	0.04	0.39	0.16	0.00	0.01	0.20	0.00	0.12	0.00	0.00	0.00	0.00
03	0.03	0.01	0.36	0.00	0.59	0.57	0.00	0.04	0.00	0.00	0.00	0.00
04	0.09	0.00	0.10	0.00	1.04	0.13	0.25	0.88	0.00	0.00	0.00	0.00
05	0.11	1.01	0.09	0.00	0.39	0.13	0.51	0.05	0.00	0.00	0.00	0.00
06	0.23	0.03	0.11	0.00	0.75	0.21	0.23	0.00	0.00	0.00	0.00	0.00
07	0.16	0.07	0.00	0.00	0.00	0.70	0.32	0.00	0.10	0.00	0.00	0.00
08	0.35	0.00	0.00	0.50	0.92	0.23	0.10	0.00	0.27	0.00	0.00	0.00
09	0.31	0.05	0.54	0.02	1.26	1.11	0.07	0.00	0.25	0.00	0.00	0.03
10	0.01	0.00	0.42	0.25	0.19	0.08	0.16	0.01	0.01	0.00	0.00	0.00
11	0.00	0.00	0.43	0.00	0.00	0.32	0.10	0.58	0.00	0.00	0.00	0.00
12	0.06	0.32	0.08	0.00	0.00	0.00	0.86	0.40	0.00	0.00	0.09	0.00
13	1.60	0.39	0.00	0.00	0.00	0.47	0.03	0.15	0.00	0.00	0.01	0.00
14	2.10	0.43	0.00	0.00	0.29	0.91	0.26	0.11	0.00	0.00	0.00	0.00
15	0.70	1.22	0.03	0.00	1.14	0.85	0.00	0.43	0.33	0.00	0.00	0.00
16	0.53	0.14	0.00	0.00	0.25	0.00	0.00	0.21	0.00	0.00	0.00	0.00
17	0.29	0.01	0.00	0.94	0.02	0.69	0.06	0.00	0.09	0.00	0.00	0.12
18	0.23	0.01	0.00	0.89	0.36	0.36	0.16	0.00	0.01	0.00	0.00	0.56
19	0.33	0.06	0.74	0.07	0.16	0.00	0.24	0.00	0.00	0.00	0.00	0.12
20	1.01	0.01	0.12	0.01	0.31	0.09	0.18	0.00	0.00	0.04	0.00	0.18
21	0.30	0.21	0.00	0.19	0.14	0.25	0.00	0.00	0.00	0.00	0.00	0.01
22	0.03	0.37	0.15	0.04	0.00	0.10	0.04	0.00	0.00	0.00	0.00	0.00
23	0.01	0.31	0.73	0.00	0.13	0.39	0.45	0.00	0.00	0.00	0.00	0.00
24	0.01	1.15	0.00	0.00	0.00	0.32	0.26	0.00	0.00	0.00	0.00	0.00
25	0.00	0.06	0.00	0.00	0.00	0.14	0.15	0.00	0.00	0.00	0.00	0.01
26	1.20	0.73	0.39	0.01	0.40	0.41	0.05	0.00	0.00	0.00	0.00	0.00
27	0.00	0.37	0.19	0.00	0.13	0.08	0.02	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.02	0.23	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.06	0.06	0.01		0.56	0.26	0.00	0.00	0.00	0.00	0.05
30	0.32	0.29	0.00	0.00		0.06	0.01	0.00	0.00	0.00	0.00	0.76
31	0.56		0.07	0.00		0.00		0.09		0.00	0.00	

Total	10.67	7.78	4.78	2.99	8.50	9.71	4.80	3.10	1.08	0.04	0.10	1.84
Days	27	25	19	12	20	27	24	13	8	1	2	9

187 Precip Days

Total Rainfall for Water Year 2017: 55.39

Notes:

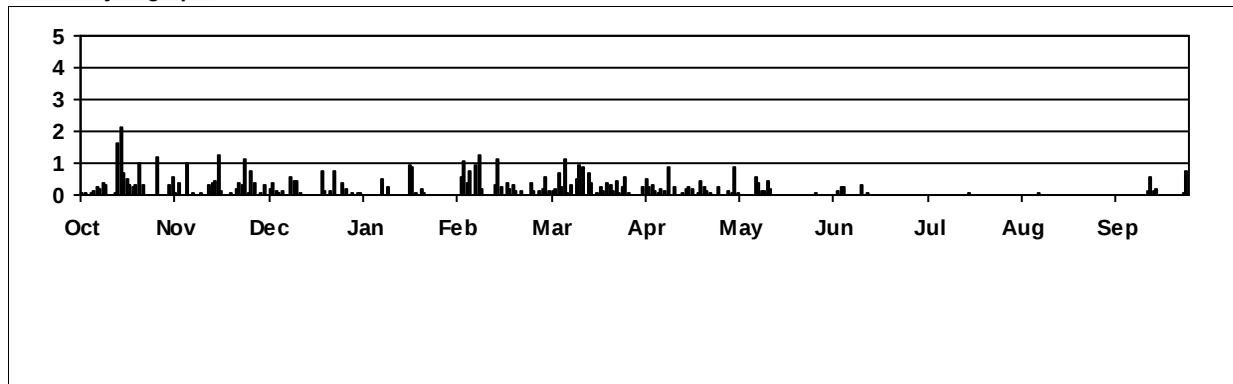
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



20u--Southbay Firestation_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.14	0.24	0.00	0.11	0.00	0.19	0.03	0.03	0.02	0.00	0.00	0.00
02	0.06	0.48	0.24	0.00	0.01	0.25	0.00	0.15	0.00	0.00	0.00	0.00
03	0.02	0.01	0.46	0.00	0.60	0.93	0.00	0.05	0.00	0.00	0.00	0.00
04	0.22	0.02	0.13	0.00	0.86	0.17	0.24	0.98	0.00	0.00	0.00	0.00
05	0.15	0.93	0.17	0.00	0.37	0.16	0.60	0.05	0.00	0.00	0.00	0.00
06	0.27	0.08	0.04	0.00	0.85	0.19	0.25	0.00	0.00	0.00	0.00	0.00
07	0.30	0.08	0.00	0.00	0.00	0.75	0.78	0.00	0.06	0.00	0.00	0.00
08	0.54	0.00	0.00	0.59	1.04	0.26	0.05	0.00	0.31	0.00	0.00	0.00
09	0.38	0.08	0.69	0.03	1.43	1.11	0.05	0.00	0.47	0.00	0.00	0.03
10	0.00	0.01	0.41	0.32	0.34	0.04	0.15	0.00	0.01	0.00	0.00	0.00
11	0.00	0.00	0.45	0.00	0.01	0.35	0.11	0.81	0.00	0.00	0.00	0.00
12	0.08	0.47	0.11	0.00	0.00	0.00	1.17	0.55	0.00	0.00	0.11	0.00
13	1.78	0.55	0.00	0.00	0.00	0.52	0.06	0.27	0.00	0.00	0.01	0.00
14	2.76	0.61	0.00	0.00	0.40	0.93	0.22	0.10	0.00	0.00	0.00	0.00
15	0.82	1.23	0.03	0.00	1.28	0.87	0.00	0.38	0.40	0.00	0.00	0.00
16	0.75	0.07	0.00	0.00	0.14	0.00	0.00	0.16	0.00	0.00	0.00	0.00
17	0.35	0.01	0.00	0.99	0.01	0.97	0.06	0.00	0.07	0.00	0.00	0.11
18	0.24	0.02	0.00	1.08	0.39	0.36	0.08	0.00	0.01	0.00	0.00	0.30
19	0.37	0.09	0.86	0.11	0.21	0.00	0.38	0.00	0.00	0.00	0.00	0.09
20	1.13	0.14	0.14	0.03	0.29	0.09	0.17	0.00	0.00	0.02	0.00	0.16
21	0.30	0.13	0.00	0.17	0.18	0.20	0.00	0.00	0.00	0.00	0.00	0.00
22	0.09	0.50	0.16	0.06	0.00	0.15	0.10	0.00	0.00	0.00	0.00	0.00
23	0.00	0.36	0.88	0.00	0.03	0.47	0.32	0.00	0.00	0.00	0.00	0.00
24	0.03	1.44	0.00	0.00	0.00	0.35	0.26	0.00	0.00	0.00	0.00	0.00
25	0.01	0.11	0.00	0.00	0.00	0.08	0.16	0.00	0.00	0.00	0.00	0.01
26	1.08	0.90	0.60	0.00	0.41	0.48	0.08	0.00	0.00	0.00	0.00	0.00
27	0.02	0.35	0.18	0.00	0.15	0.05	0.06	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.01	0.00	0.04	0.40	0.00	0.00	0.00	0.00	0.00	0.00
29	0.08	0.07	0.06	0.01		0.72	0.28	0.00	0.00	0.00	0.00	0.08
30	0.37	0.34	0.00	0.00		0.07	0.02	0.00	0.00	0.00	0.00	0.32
31	0.51		0.08	0.00		0.00		0.08		0.00	0.00	
Total	12.85	9.32	5.70	3.50	9.04	11.11	5.68	3.61	1.35	0.02	0.12	1.10
Days	27	27	19	11	21	27	24	12	8	1	2	8

187 Precip Days

Total Rainfall for Water Year 2017: 63.40

Notes:

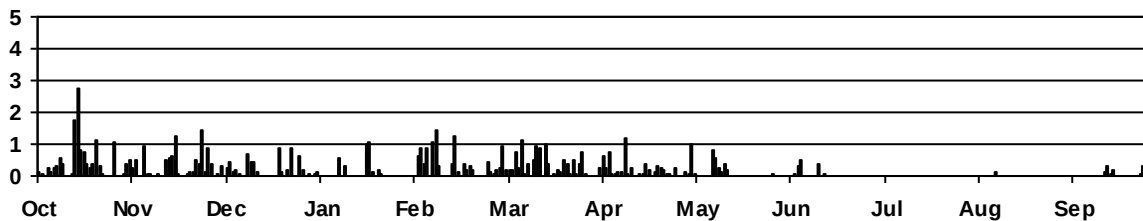
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



23u--Percival Creek, Bldg 4_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.23	0.29	0.00	0.14	0.00	0.13	0.01	0.06	0.02	0.00	0.00	0.00
02	0.10	0.55	0.43	0.00	0.02	0.50	0.00	0.18	0.00	0.00	0.00	0.00
03	0.01	0.01	0.51	0.00	0.60	1.20	0.00	0.06	0.00	0.00	0.00	0.00
04	0.19	0.02	0.14	0.00	1.01	0.34	0.31	0.48	0.00	0.00	0.00	0.00
05	0.14	1.13	0.24	0.00	0.31	0.28	0.75	0.09	0.00	0.00	0.00	0.00
06	0.41	0.14	0.01	0.00	0.97	0.19	0.24	0.00	0.00	0.00	0.00	0.00
07	0.32	0.10	0.00	0.00	0.00	1.01	0.93	0.00	0.03	0.00	0.00	0.00
08	0.71	0.00	0.00	0.66	1.19	0.27	0.10	0.00	0.37	0.00	0.00	0.00
09	0.32	0.11	0.87	0.05	1.68	1.23	0.09	0.00	0.38	0.00	0.00	0.04
10	0.00	0.00	0.63	0.37	0.42	0.05	0.17	0.00	0.01	0.00	0.00	0.00
11	0.00	0.01	0.66	0.00	0.02	0.45	0.14	0.74	0.00	0.00	0.00	0.00
12	0.15	0.52	0.11	0.00	0.00	0.00	0.96	0.67	0.00	0.00	0.14	0.00
13	1.91	0.76	0.00	0.00	0.00	0.51	0.06	0.10	0.00	0.00	0.01	0.00
14	2.99	0.63	0.00	0.00	0.51	0.93	0.21	0.10	0.00	0.00	0.00	0.00
15	0.91	1.03	0.04	0.00	1.43	0.89	0.00	0.47	0.53	0.00	0.00	0.00
16	0.92	0.10	0.00	0.00	0.14	0.01	0.00	0.12	0.00	0.00	0.00	0.00
17	0.57	0.00	0.00	1.25	0.02	1.14	0.05	0.00	0.07	0.00	0.00	0.16
18	0.22	0.03	0.00	1.37	0.38	0.43	0.09	0.00	0.01	0.00	0.00	0.56
19	0.50	0.12	1.22	0.16	0.25	0.00	0.35	0.00	0.00	0.00	0.00	0.09
20	1.39	0.08	0.33	0.05	0.32	0.08	0.32	0.00	0.00	0.00	0.00	0.15
21	0.31	0.13	0.00	0.15	0.14	0.20	0.00	0.00	0.00	0.00	0.00	0.00
22	0.10	0.49	0.15	0.05	0.00	0.21	0.08	0.00	0.00	0.00	0.00	0.00
23	0.00	0.53	0.90	0.00	0.16	0.46	0.40	0.00	0.00	0.00	0.00	0.00
24	0.05	1.60	0.00	0.01	0.01	0.48	0.31	0.00	0.00	0.00	0.00	0.00
25	0.02	0.13	0.00	0.00	0.00	0.08	0.25	0.00	0.00	0.00	0.00	0.01
26	1.10	0.95	0.67	0.01	0.53	0.59	0.08	0.00	0.00	0.00	0.00	0.00
27	0.04	0.43	0.23	0.00	0.19	0.08	0.00	0.00	0.00	0.00	0.00	0.00
28	0.03	0.00	0.00	0.00	0.05	0.71	0.00	0.00	0.00	0.00	0.00	0.00
29	0.02	0.09	0.09	0.01		0.91	0.31	0.00	0.00	0.00	0.00	0.10
30	0.42	0.36	0.00	0.00		0.00	0.02	0.00	0.00	0.00	0.00	0.22
31	0.69		0.11	0.00		0.00		0.07		0.00	0.00	
Total	14.77	10.34	7.34	4.28	10.35	13.36	6.23	3.14	1.42	0.00	0.15	1.33
Days	28	26	18	13	22	27	23	12	8		2	8

187 Precip Days

Total Rainfall for Water Year 2017: 72.71

Notes:

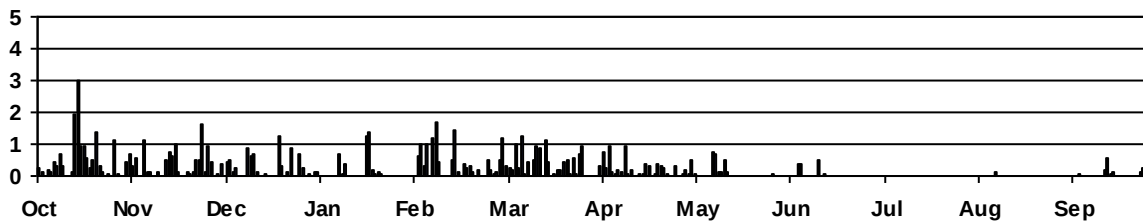
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



24u--McLane FS Wx

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.31	0.21	0.00	0.17	0.00	0.18	0.00	0.05	0.01	0.00	0.00	0.00
02	0.11	0.55	0.36	0.00	0.03	0.65	0.00	0.22	0.00	0.00	0.00	0.00
03	0.02	0.01	0.37	0.00	0.62	1.35	0.00	0.02	0.00	0.00	0.00	0.00
04	0.43	0.03	0.17	0.00	0.90	0.42	0.34	0.38	0.00	0.00	0.00	0.00
05	0.23	1.08	0.34	0.00	0.36	0.34	0.70	0.04	0.00	0.00	0.00	0.00
06	0.58	0.15	0.06	0.00	0.90	0.29	0.25	0.00	0.00	0.00	0.00	0.00
07	0.34	0.13	0.00	0.00	0.00	1.01	1.28	0.00	0.02	0.00	0.00	0.00
08	1.04	0.00	0.00	0.74	1.54	0.28	0.02	0.00	0.39	0.00	0.00	0.04
09	0.35	0.05	0.83	0.10	1.84	1.22	0.04	0.00	1.11	0.00	0.00	0.05
10	0.00	0.01	0.60	0.45	0.56	0.03	0.14	0.03	0.02	0.00	0.00	0.00
11	0.00	0.00	0.55	0.00	0.02	0.62	0.14	0.66	0.00	0.00	0.00	0.00
12	0.17	0.58	0.12	0.00	0.00	0.02	1.15	0.70	0.09	0.00	0.15	0.00
13	2.32	0.98	0.00	0.00	0.01	0.57	0.04	0.04	0.00	0.00	0.00	0.00
14	2.76	0.66	0.00	0.00	0.62	1.30	0.24	0.04	0.00	0.00	0.00	0.00
15	1.08	0.83	0.05	0.01	1.59	0.85	0.01	0.56	0.87	0.00	0.00	0.00
16	1.29	0.13	0.00	0.00	0.15	0.00	0.00	0.24	0.00	0.00	0.00	0.00
17	0.53	0.00	0.00	1.36	0.03	1.35	0.11	0.00	0.04	0.02	0.00	0.16
18	0.31	0.02	0.00	1.45	0.38	0.62	0.07	0.00	0.00	0.00	0.00	0.21
19	0.66	0.15	1.30	0.31	0.45	0.00	0.45	0.00	0.00	0.00	0.00	0.09
20	1.37	0.18	0.30	0.08	0.34	0.09	0.18	0.00	0.00	0.01	0.00	0.18
21	0.29	0.14	0.00	0.23	0.11	0.24	0.00	0.00	0.00	0.00	0.00	0.00
22	0.07	0.51	0.21	0.06	0.00	0.23	0.18	0.00	0.00	0.00	0.00	0.00
23	0.00	0.69	0.91	0.00	0.14	0.54	0.19	0.00	0.00	0.00	0.00	0.00
24	0.07	2.20	0.00	0.01	0.03	0.56	0.29	0.00	0.00	0.00	0.00	0.00
25	0.02	0.19	0.00	0.00	0.01	0.09	0.29	0.00	0.00	0.00	0.00	0.01
26	1.09	1.07	0.98	0.00	0.54	0.74	0.09	0.00	0.00	0.00	0.00	0.00
27	0.04	0.59	0.26	0.00	0.12	0.13	0.00	0.00	0.00	0.00	0.00	0.00
28	0.03	0.00	0.01	0.00	0.07	1.02	0.00	0.00	0.00	0.01	0.00	0.00
29	0.03	0.09	0.09	0.00		1.14	0.30	0.00	0.00	0.00	0.00	0.07
30	0.41	0.42	0.00	0.00		0.01	0.01	0.00	0.00	0.00	0.00	0.22
31	0.68		0.09	0.00		0.00		0.08		0.00	0.00	
Total	16.63	11.65	7.60	4.97	11.36	15.89	6.51	3.06	2.55	0.04	0.15	1.03
Days	28	26	19	12	24	28	23	13	8	3	1	9

194 Precip Days

Total Rainfall for Water Year 2017: 81.44

Notes:

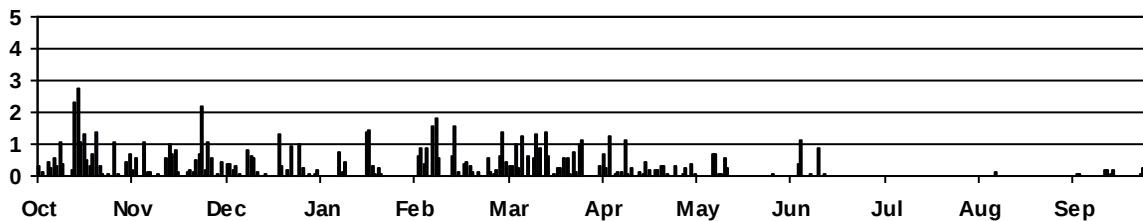
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



27u--Boston Harbor_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.15	0.22	0.00	0.07	0.00	0.18	0.03	0.04	0.02	0.00	0.00	0.00
02	0.08	0.58	0.15	0.00	0.02	0.34	0.00	0.16	0.00	0.00	0.00	0.00
03	0.05	0.01	0.39	0.00	0.52	0.80	0.00	0.04	0.00	0.00	0.00	0.00
04	0.34	0.02	0.06	0.00	0.89	0.23	0.28	0.40	0.00	0.00	0.00	0.00
05	0.16	0.84	0.13	0.00	0.48	0.16	0.70	0.02	0.00	0.00	0.00	0.00
06	0.26	0.12	0.04	0.00	0.85	0.44	0.17	0.04	0.00	0.00	0.00	0.00
07	0.16	0.09	0.00	0.00	0.11	0.60	1.09	0.00	0.06	0.00	0.00	0.00
08	0.84	0.00	0.00	0.63	1.13	0.30	0.05	0.00	0.33	0.00	0.00	0.00
09	0.30	0.12	0.58	0.03	1.29	1.05	0.06	0.00	0.46	0.00	0.00	0.05
10	0.01	0.00	0.34	0.23	0.41	0.02	0.11	0.00	0.01	0.00	0.00	0.00
11	0.00	0.01	0.33	0.00	0.01	0.46	0.08	0.66	0.00	0.00	0.00	0.00
12	0.06	0.36	0.07	0.00	0.00	0.00	1.14	0.68	0.00	0.00	0.14	0.00
13	1.63	0.46	0.00	0.00	0.00	0.57	0.05	0.22	0.00	0.00	0.00	0.00
14	1.76	0.57	0.00	0.00	0.46	0.89	0.28	0.11	0.00	0.00	0.00	0.00
15	0.89	0.68	0.00	0.00	1.19	0.81	0.01	0.56	0.55	0.00	0.00	0.00
16	0.76	0.18	0.00	0.00	0.15	0.01	0.00	0.15	0.00	0.00	0.00	0.00
17	0.70	0.02	0.00	0.82	0.02	1.05	0.05	0.00	0.09	0.00	0.00	0.13
18	0.71	0.01	0.00	0.94	0.44	0.42	0.02	0.00	0.03	0.00	0.00	0.20
19	0.40	0.12	0.61	0.14	0.25	0.00	0.41	0.00	0.00	0.00	0.00	0.02
20	1.11	0.24	0.13	0.04	0.27	0.07	0.23	0.00	0.00	0.04	0.00	0.36
21	0.32	0.06	0.00	0.17	0.12	0.23	0.00	0.00	0.00	0.00	0.00	0.00
22	0.05	0.44	0.19	0.05	0.00	0.26	0.15	0.00	0.00	0.00	0.00	0.00
23	0.00	0.35	0.92	0.00	0.05	0.54	0.22	0.00	0.00	0.00	0.00	0.00
24	0.04	1.77	0.00	0.01	0.01	0.44	0.22	0.00	0.00	0.00	0.00	0.00
25	0.01	0.13	0.00	0.00	0.00	0.13	0.14	0.00	0.00	0.00	0.00	0.04
26	1.21	0.94	0.68	0.00	0.34	0.56	0.09	0.00	0.00	0.00	0.00	0.00
27	0.01	0.23	0.16	0.00	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00
28	0.01	0.00	0.00	0.00	0.07	0.50	0.02	0.00	0.00	0.00	0.00	0.00
29	0.03	0.06	0.13	0.02		0.72	0.46	0.00	0.00	0.00	0.00	0.11
30	0.32	0.33	0.01	0.00		0.17	0.01	0.00	0.00	0.00	0.00	0.41
31	0.66		0.08	0.00		0.00		0.13		0.00	0.00	
Total	13.03	8.96	5.00	3.15	9.17	11.99	6.07	3.21	1.55	0.04	0.14	1.32
Days	29	27	18	12	23	28	25	13	8	1	1	8

193 Precip Days

Total Rainfall for Water Year 2017: 63.63

Notes:

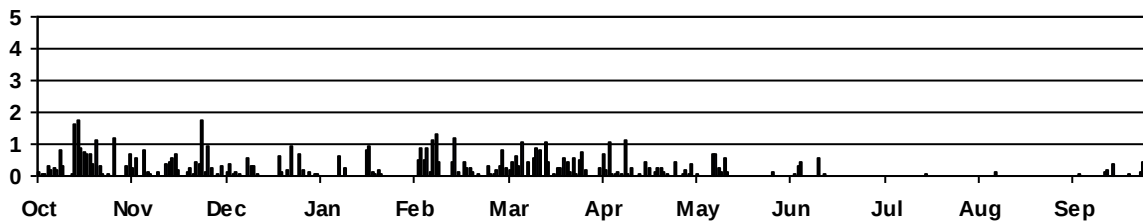
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



33w--Griffin FS_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.37	0.24	0.00	0.19	0.00	0.15	0.00	0.06	0.03	0.00	0.00	
02	0.14	0.55	0.15	0.00	0.03	0.47	0.00	0.26	0.00	0.00	0.00	
03	0.05	0.01	0.54	0.00	0.57	1.07	0.00	0.01	0.00	0.00	0.00	
04	0.29	0.06	0.14	0.00	0.91	0.48	0.32	0.19	0.00	0.00	0.00	
05	0.23	0.98	0.10	0.00	0.38	0.34	0.66	0.06	0.00	0.00	0.00	
06	0.41	0.12	0.05	0.00	0.86	0.32	0.16	0.00	0.00	0.00	0.00	
07	0.17	0.15	0.00	0.00	0.27	0.64	1.30	0.00	0.04	0.00	0.00	
08	1.10	0.00	0.00	0.80	1.69	0.28	0.02	0.00	0.37	0.00	0.00	
09	0.37	0.08	0.87	0.05	1.56	0.99	0.03	0.00	0.43	0.00	0.00	
10	0.00	0.00	0.52	0.43	0.69	0.03	0.26	0.06	0.11	0.00	0.00	
11	0.00	0.01	0.65	0.00	0.00	0.56	0.14	0.76	0.00	0.00	0.00	
12	0.13	0.38	0.22	0.00	0.00	0.02	1.27	0.83	0.00	0.00	0.22	
13	2.13	0.48	0.01	0.00	0.00	0.68	0.12	0.08	0.00	0.00	0.00	
14	2.62	0.66	0.00	0.00	0.65	0.98	0.43	0.13	0.00	0.00	0.00	
15	1.24	0.70	0.06	0.00	1.58	0.77	0.02	0.45	0.87	0.00	0.00	
16	1.21	0.12	0.00	0.00	0.16	0.01	0.00	0.19	0.01	0.00	0.00	
17	0.62	0.00	0.00	0.96	0.00	1.44	0.10	0.00	0.02	0.00	0.00	
18	0.48	0.03	0.00	1.30	0.34	0.49	0.02	0.00	0.02	0.00	0.01	
19	0.43	0.21	0.73	0.39	0.49	0.00	0.44	0.00	0.00	0.00	0.00	
20	1.35	0.30	0.18	0.08	0.31	0.10	0.22	0.00	0.00	0.00	0.00	
21	0.24	0.03	0.00	0.25	0.10	0.28	0.00	0.03	0.00	0.00	0.00	
22	0.08	0.51	0.28	0.10	0.00	0.41	0.25	0.00	0.00	0.00	0.00	
23	0.01	0.66	0.85	0.00	0.00	0.66	0.29	0.00	0.00	0.00	0.00	
24	0.07	2.81	0.01	0.00	0.03	0.58	0.28	0.00	0.00	0.00		
25	0.02	0.24	0.00	0.00	0.01	0.16	0.18	0.00	0.00	0.00		
26	1.27	1.41	0.82	0.00	0.36	0.85	0.13	0.00	0.00	0.00		
27	0.05	0.34	0.31	0.00	0.18	0.09	0.00	0.00	0.00	0.00		
28	0.00	0.00	0.00	0.00	0.09	0.48	0.00	0.00	0.00	0.00		
29	0.04	0.10	0.12	0.03		0.59	0.40	0.00	0.00	0.00		
30	0.38	0.39	0.00	0.00		0.00	0.03	0.00	0.00	0.00		
31	0.63		0.12	0.00		0.00		0.07		0.00		
Total	16.13	11.57	6.73	4.58	11.26	13.92	7.07	3.18	1.90	0.00	0.23	
Days	28	26	20	11	21	28	23	14	9		2	182 Precip Days

Total Rainfall for Water Year 2017: 76.57

Notes:

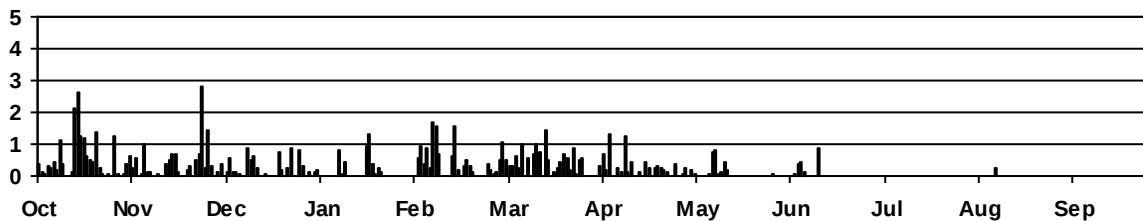
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



45u--Littlerock_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.27	0.28	0.02	0.06	0.00	0.30	0.05	0.08	0.04	0.00	0.00	0.00
02	0.09	0.43	0.43	0.00	0.05	0.67	0.00	0.23	0.00	0.00	0.00	0.00
03	0.07	0.01	0.50	0.00	0.36	1.21	0.00	0.04	0.00	0.00	0.00	0.00
04	0.20	0.02	0.14	0.00	1.21	0.51	0.41	0.40	0.00	0.00	0.00	0.00
05	0.36	1.29	0.24	0.00	0.30	0.39	0.85	0.08	0.00	0.00	0.00	0.00
06	0.49	0.20	0.01	0.00	1.17	0.27	0.20	0.00	0.00	0.00	0.00	0.00
07	0.33	0.10	0.01	0.00	0.23	0.90	1.03	0.00	0.02	0.00	0.00	0.00
08	0.81	0.00	0.00	0.62	1.24	0.40	0.04	0.00	0.37	0.00	0.00	0.00
09	0.28	0.09	1.13	0.14	1.38	1.24	0.04	0.00	0.18	0.00	0.00	0.07
10	0.00	0.01	0.50	0.50	0.49	0.08	0.13	0.01	0.00	0.00	0.00	0.01
11	0.00	0.00	0.65	0.00	0.01	0.37	0.14	0.88	0.00	0.00	0.00	0.00
12	0.18	0.48	0.31	0.00	0.00	0.05	1.04	0.48	0.00	0.00	0.12	0.00
13	1.68	0.64	0.00	0.00	0.00	0.55	0.12	0.06	0.02	0.00	0.09	0.00
14	2.21	0.56	0.00	0.00	0.45	0.72	0.17	0.23	0.00	0.00	0.00	0.00
15	1.00	1.09	0.06	0.00	1.08	0.83	0.00	0.65	0.77	0.00	0.00	0.00
16	1.11	0.02	0.00	0.00	0.11	0.01	0.00	0.44	0.01	0.00	0.00	0.00
17	0.52	0.00	0.00	0.89	0.03	0.88	0.06	0.00	0.06	0.00	0.00	0.12
18	0.37	0.03	0.00	1.21	0.34	0.44	0.10	0.00	0.05	0.00	0.00	0.52
19	0.56	0.17	1.30	0.20	0.33	0.00	0.46	0.00	0.00	0.00	0.00	0.34
20	0.97	0.20	0.37	0.10	0.47	0.12	0.11	0.00	0.00	0.12	0.00	0.27
21	0.52	0.10	0.00	0.13	0.17	0.31	0.00	0.00	0.00	0.00	0.00	0.01
22	0.05	0.54	0.20	0.06	0.00	0.21	0.11	0.00	0.00	0.00	0.00	0.00
23	0.01	0.59	0.78	0.00	0.00	0.39	0.33	0.00	0.00	0.00	0.00	0.00
24	0.10	1.75	0.00	0.00	0.00	0.48	0.39	0.00	0.00	0.00	0.00	0.00
25	0.01	0.17	0.00	0.08	0.01	0.15	0.20	0.00	0.00	0.00	0.00	0.00
26	0.92	0.94	0.36	0.00	0.40	0.65	0.10	0.00	0.00	0.00	0.00	0.00
27	0.07	0.48	0.53	0.00	0.12	0.35	0.03	0.00	0.00	0.00	0.00	0.00
28	0.07	0.00	0.01	0.00	0.05	0.80	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.05	0.12	0.02		0.81	0.56	0.00	0.00	0.00	0.00	0.17
30	0.39	0.34	0.00	0.01		0.09	0.03	0.00	0.00	0.00	0.00	0.24
31	1.39		0.25	0.00		0.00		0.11		0.00	0.00	
Total	15.04	10.58	7.92	4.02	10.00	14.18	6.70	3.69	1.52	0.12	0.21	1.75
Days	29	26	21	13	22	29	24	13	9	1	2	9

198 Precip Days

Total Rainfall for Water Year 2017: 75.73

Notes:

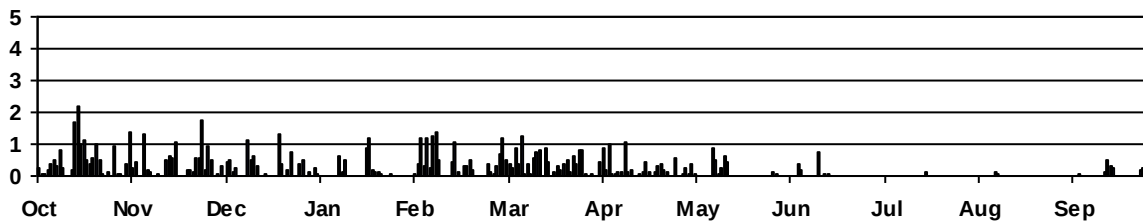
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



45w--Rochester Drop Box_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.35	0.09	0.03	0.09	0.00	0.20	0.05	0.06	0.04	0.00	0.00	0.00
02	0.10	0.31	0.26	0.00	0.04	0.25	0.00	0.23	0.00	0.00	0.00	0.00
03	0.05	0.01	0.66	0.00	0.26	0.80	0.00	0.03	0.00	0.00	0.00	0.00
04	0.20	0.01	0.19	0.00	0.98	0.29	0.27	0.50	0.00	0.00	0.00	0.00
05	0.28	1.05	0.34	0.00	0.36	0.23	0.70	0.11	0.00	0.00	0.00	0.00
06	0.31	0.15	0.04	0.00	0.73	0.34	0.17	0.00	0.00	0.00	0.00	0.00
07	0.30	0.05	0.00	0.01	0.35	0.61	0.74	0.00	0.00	0.00	0.00	0.00
08	0.52	0.00	0.00	0.59	1.07	0.36	0.08	0.00	0.36	0.00	0.00	0.00
09	0.33	0.04	0.95	0.12	1.14	0.90	0.05	0.00	0.16	0.00	0.00	0.05
10	0.00	0.01	0.35	0.36	0.39	0.02	0.11	0.03	0.00	0.00	0.00	0.01
11	0.00	0.01	0.77	0.01	0.02	0.40	0.13	0.74	0.00	0.00	0.00	0.00
12	0.14	0.29	0.31	0.00	0.00	0.02	0.96	0.38	0.00	0.00	0.14	0.00
13	1.34	0.32	0.00	0.00	0.00	0.50	0.07	0.36	0.06	0.00	0.06	0.00
14	1.36	0.52	0.00	0.00	0.35	0.56	0.17	0.13	0.00	0.00	0.00	0.00
15	0.92	0.89	0.08	0.00	0.82	0.70	0.01	0.47	0.53	0.00	0.00	0.00
16	0.88	0.04	0.00	0.00	0.09	0.01	0.00	0.23	0.00	0.00	0.00	0.00
17	0.29	0.00	0.01	0.59	0.04	0.71	0.04	0.00	0.02	0.00	0.00	0.04
18	0.58	0.04	0.00	0.92	0.31	0.46	0.08	0.00	0.07	0.00	0.00	0.46
19	0.36	0.17	0.74	0.19	0.35	0.00	0.46	0.00	0.00	0.00	0.00	0.21
20	0.80	0.14	0.24	0.12	0.43	0.12	0.13	0.00	0.00	0.18	0.00	0.37
21	0.47	0.08	0.00	0.08	0.11	0.31	0.00	0.00	0.00	0.00	0.00	0.00
22	0.04	0.40	0.21	0.06	0.00	0.26	0.08	0.00	0.00	0.00	0.00	0.01
23	0.01	0.47	0.63	0.00	0.04	0.32	0.21	0.00	0.00	0.00	0.00	0.00
24	0.08	1.47	0.01	0.00	0.02	0.44	0.41	0.00	0.00	0.00	0.00	0.00
25	0.01	0.16	0.00	0.03	0.00	0.11	0.10	0.00	0.00	0.00	0.00	0.01
26	0.80	0.79	0.36	0.00	0.49	0.50	0.16	0.00	0.00	0.00	0.00	0.00
27	0.04	0.38	0.58	0.00	0.13	0.16	0.06	0.00	0.00	0.00	0.00	0.00
28	0.06	0.00	0.02	0.00	0.02	0.37	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.03	0.15	0.02		0.58	0.34	0.00	0.00	0.00	0.00	0.17
30	0.34	0.33	0.01	0.00		0.02	0.04	0.00	0.00	0.00	0.00	0.08
31	0.56		0.19	0.00		0.00		0.13		0.00	0.00	
Total	11.52	8.25	7.13	3.19	8.54	10.55	5.62	3.40	1.24	0.18	0.20	1.41
Days	28	27	23	14	23	29	25	13	7	1	2	10

202 Precip Days

Total Rainfall for Water Year 2017: 61.23

Notes:

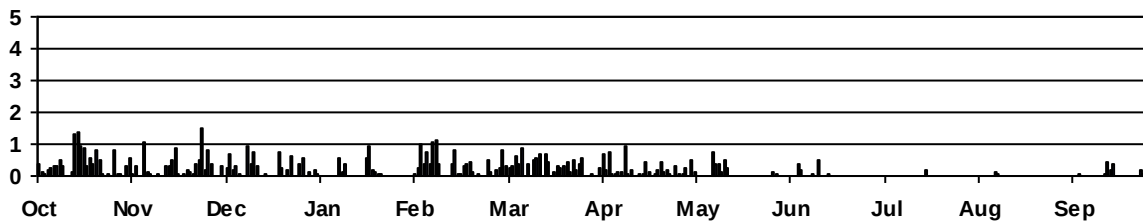
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



55u--Tenino_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.06	0.08	0.01	0.09	0.00	0.17	0.05	0.06	0.04	0.00	0.00	0.00
02	0.05	0.32	0.25	0.00	0.01	0.20	0.00	0.19	0.00	0.00	0.00	0.00
03	0.02	0.00	0.60	0.00	0.37	0.74	0.00	0.02	0.00	0.00	0.00	0.00
04	0.21	0.00	0.33	0.00	0.82	0.11	0.27	0.62	0.00	0.00	0.00	0.00
05	0.26	1.49	0.47	0.00	0.48	0.20	0.50	0.34	0.00	0.00	0.00	0.00
06	0.27	0.07	0.04	0.00	1.15	0.48	0.32	0.08	0.00	0.00	0.00	0.00
07	0.27	0.04	0.00	0.00	0.00	0.88	0.40	0.00	0.06	0.00	0.00	0.00
08	0.55	0.00	0.00	0.48	1.03	0.40	0.02	0.00	0.32	0.00	0.00	0.00
09	0.38	0.07	1.08	0.22	1.40	1.20	0.07	0.00	0.65	0.00	0.00	0.04
10	0.00	0.00	0.42	0.33	0.18	0.05	0.09	0.02	0.02	0.00	0.00	0.00
11	0.00	0.01	0.86	0.00	0.00	0.31	0.17	0.75	0.00	0.00	0.00	0.00
12	0.10	0.30	0.19	0.00	0.00	0.06	1.15	0.41	0.01	0.00	0.10	0.00
13	1.31	0.54	0.01	0.00	0.01	0.42	0.04	0.16	0.10	0.00	0.03	0.00
14	1.00	0.66	0.00	0.00	0.40	0.61	0.48	0.28	0.00	0.00	0.00	0.00
15	0.87	1.08	0.01	0.00	1.20	0.81	0.01	0.59	0.62	0.00	0.00	0.00
16	0.69	0.08	0.00	0.00	0.18	0.00	0.00	0.28	0.03	0.00	0.00	0.00
17	0.27	0.01	0.00	0.83	0.00	0.55	0.05	0.00	0.09	0.00	0.00	0.14
18	0.36	0.01	0.00	0.95	0.49	0.56	0.19	0.00	0.02	0.00	0.00	0.58
19	0.29	0.06	0.79	0.07	0.32	0.00	0.45	0.00	0.00	0.00	0.00	0.41
20	0.76	0.12	0.16	0.05	0.49	0.10	0.24	0.00	0.00	0.12	0.00	0.31
21	0.73	0.15	0.00	0.10	0.24	0.23	0.00	0.00	0.00	0.00	0.00	0.00
22	0.08	0.44	0.16	0.06	0.00	0.02	0.14	0.00	0.00	0.00	0.00	0.00
23	0.00	0.54	0.63	0.00	0.00	0.24	0.19	0.00	0.00	0.00	0.00	0.00
24	0.08	1.51	0.00	0.02	0.00	0.49	0.44	0.00	0.00	0.00	0.00	0.00
25	0.00	0.10	0.00	0.06	0.00	0.15	0.14	0.00	0.00	0.00	0.00	0.02
26	0.97	0.96	0.41	0.00	0.29	0.58	0.10	0.00	0.00	0.00	0.00	0.00
27	0.00	0.34	0.53	0.00	0.14	0.17	0.04	0.00	0.00	0.00	0.00	0.00
28	0.01	0.00	0.01	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00
29	0.02	0.04	0.11	0.00		0.63	0.40	0.00	0.00	0.00	0.00	0.13
30	0.37	0.24	0.00	0.00		0.02	0.04	0.00	0.00	0.00	0.00	0.12
31	0.44		0.22	0.01		0.00		0.17		0.00	0.00	
Total	10.42	9.26	7.29	3.27	9.20	10.81	5.99	3.97	1.96	0.12	0.13	1.75
Days	26	25	21	13	18	28	25	14	11	1	2	8

192 Precip Days

Total Rainfall for Water Year 2017: 64.17

Notes:

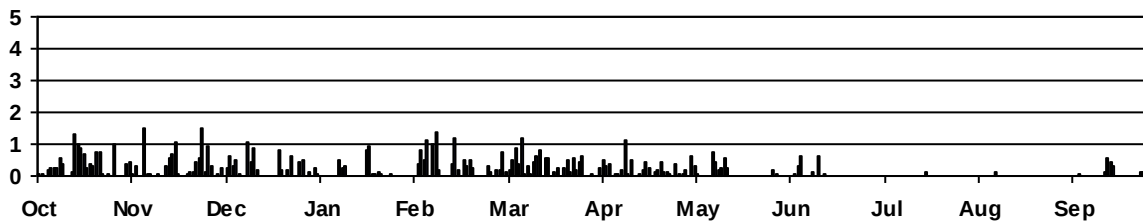
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



59u--Bloody Run USGS_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.10	0.09	0.00	0.22	0.00	0.13	0.04	0.03	0.19	0.00	0.00	0.00
02	0.04	0.22	0.12	0.00	0.02	0.14	0.00	0.31	0.00	0.00	0.00	0.00
03	0.01	0.01	0.58	0.00	0.35	0.62	0.00	0.03	0.00	0.00	0.00	0.00
04	0.20	0.00	0.38	0.00	0.78	0.06	0.17	0.62	0.00	0.00	0.00	0.00
05	0.21	1.36	0.19	0.00	1.15	0.44	0.29	0.14	0.00	0.00	0.00	0.00
06	0.19	0.01	0.02	0.00	0.70	0.36	0.16	0.00	0.00	0.00	0.00	0.00
07	0.25	0.02	0.00	0.00	0.00	0.60	0.27	0.00	0.02	0.00	0.00	0.00
08	0.27	0.00	0.09	0.47	1.07	0.53	0.03	0.00	0.35	0.00	0.00	0.00
09	0.48	0.01	0.75	0.15	1.70	1.13	0.02	0.00	0.49	0.00	0.00	0.02
10	0.01	0.00	0.37	0.23	0.08	0.02	0.21	0.00	0.02	0.00	0.00	0.00
11	0.00	0.00	0.47	0.01	0.00	0.17	0.03	0.73	0.00	0.00	0.00	0.00
12	0.01	0.16	0.18	0.00	0.00	0.01	0.56	0.18	0.00	0.00	0.02	0.00
13	1.21	0.30	0.00	0.00	0.00	0.64	0.00	0.09	0.11	0.00	0.15	0.00
14	0.96	0.72	0.00	0.00	0.27	0.37	0.14	0.46	0.00	0.00	0.00	0.00
15	1.00	0.95	0.00	0.00	1.04	1.08	0.01	0.49	0.37	0.00	0.00	0.00
16	0.41	0.01	0.00	0.00	0.48	0.01	0.00	0.41	0.02	0.00	0.00	0.00
17	0.38	0.00	0.00	0.50	0.01	0.40	0.03	0.00	0.02	0.00	0.00	0.20
18	0.49	0.00	0.00	1.07	0.53	0.61	0.44	0.00	0.02	0.00	0.00	0.54
19	0.13	0.01	0.68	0.05	0.25	0.00	0.43	0.00	0.00	0.00	0.00	0.17
20	0.59	0.13	0.12	0.02	0.40	0.03	0.29	0.00	0.00	0.07	0.00	0.31
21	0.50	0.06	0.00	0.10	0.21	0.12	0.00	0.00	0.00	0.00	0.00	0.02
22	0.04	0.42	0.05	0.02	0.07	0.02	0.52	0.00	0.00	0.00	0.00	0.00
23	0.03	0.23	0.54	0.00	0.06	0.25	0.45	0.00	0.00	0.00	0.00	0.00
24	0.04	1.66	0.04	0.00	0.00	0.14	0.67	0.00	0.00	0.00	0.00	0.00
25	0.00	0.03	0.00	0.04	0.00	0.15	0.04	0.00	0.00	0.00	0.00	0.02
26	1.02	0.76	0.27	0.00	0.15	0.33	0.11	0.00	0.00	0.00	0.00	0.00
27	0.00	0.22	0.36	0.00	0.18	0.15	0.01	0.00	0.00	0.00	0.00	0.00
28	0.01	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.01	0.14	0.00		0.30	0.37	0.00	0.00	0.00	0.00	0.17
30	0.27	0.33	0.00	0.00		0.00	0.06	0.00	0.00	0.00	0.00	0.08
31	0.28		0.12	0.00		0.00		0.09		0.00	0.00	
Total	9.14	7.72	5.47	2.88	9.50	9.05	5.35	3.58	1.61	0.07	0.17	1.53
Days	28	23	19	12	20	28	24	12	10	1	2	9

188 Precip Days

Total Rainfall for Water Year 2017: 56.07

Notes:

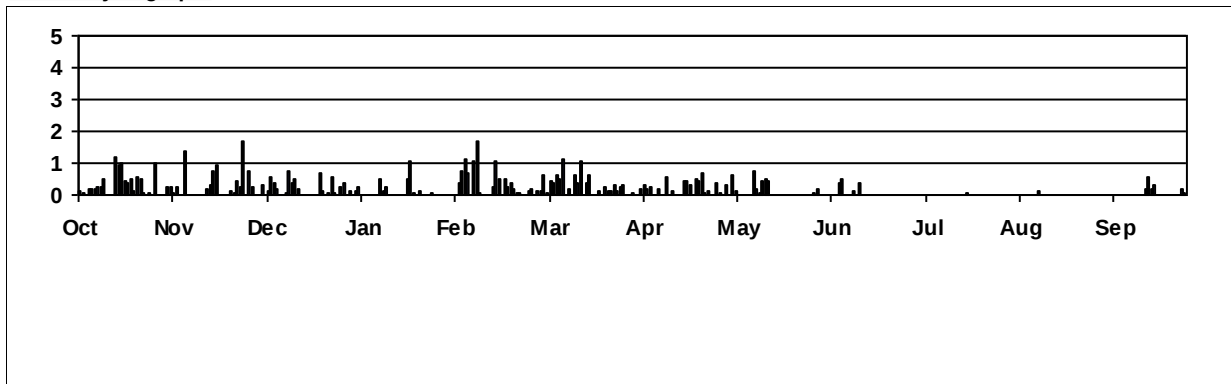
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

Visit our website at

Annual Hyetograph:



60u--Bucoda USGS_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.07	0.03	0.01	0.12	0.00	0.10	0.03	0.07	0.04	0.00	0.00	0.00
02	0.09	0.25	0.16	0.00	0.02	0.11	0.00	0.25	0.00	0.00	0.00	0.00
03	0.01	0.00	0.42	0.00	0.35	0.63	0.00	0.04	0.00	0.00	0.00	0.00
04	0.21	0.01	0.39	0.00	0.67	0.05	0.22	0.70	0.00	0.00	0.00	0.00
05	0.45	1.43	0.18	0.00	0.46	0.12	0.52	0.09	0.00	0.00	0.00	0.00
06	0.21	0.09	0.01	0.00	0.68	0.44	0.21	0.00	0.00	0.00	0.00	0.00
07	0.35	0.04	0.00	0.00	0.22	0.47	0.51	0.00	0.01	0.00	0.00	0.00
08	0.41	0.00	0.00	0.71	1.35	0.41	0.04	0.00	0.34	0.00	0.00	0.00
09	0.47	0.07	1.30	0.19	1.14	1.10	0.01	0.00	0.86	0.00	0.00	0.00
10	0.01	0.00	0.52	0.35	0.12	0.02	0.06	0.01	0.03	0.00	0.00	0.00
11	0.00	0.01	0.61	0.00	0.01	0.24	0.11	0.84	0.00	0.00	0.00	0.00
12	0.06	0.28	0.28	0.00	0.00	0.01	1.15	0.44	0.00	0.00	0.06	0.00
13	1.30	0.45	0.00	0.00	0.00	0.47	0.05	0.14	0.08	0.00	0.12	0.00
14	0.95	0.71	0.00	0.00	0.32	0.38	0.02	0.44	0.00	0.00	0.00	0.00
15	1.09	0.95	0.05	0.00	0.78	0.81	0.01	0.58	0.48	0.00	0.00	0.00
16	0.71	0.06	0.00	0.00	0.17	0.00	0.00	0.45	0.01	0.00	0.00	0.00
17	0.28	0.00	0.00	0.38	0.00	0.49	0.08	0.00	0.04	0.00	0.00	0.00
18	0.44	0.01	0.00	0.77	0.34	0.49	0.15	0.00	0.03	0.00	0.00	0.00
19	0.25	0.07	0.56	0.06	0.30	0.00	0.43	0.00	0.00	0.00	0.00	0.00
20	0.68	0.10	0.11	0.07	0.41	0.12	0.09	0.00	0.00	0.12	0.00	0.00
21	0.78	0.17	0.00	0.07	0.14	0.29	0.00	0.00	0.00	0.01	0.00	0.00
22	0.08	0.37	0.14	0.06	0.00	0.01	0.12	0.00	0.00	0.00	0.00	0.00
23	0.01	0.46	0.61	0.00	0.00	0.26	0.17	0.00	0.00	0.00	0.00	0.00
24	0.10	1.25	0.02	0.00	0.01	0.30	0.60	0.00	0.00	0.00	0.00	0.00
25	0.00	0.12	0.00	0.04	0.00	0.12	0.09	0.00	0.00	0.00	0.00	0.00
26	0.90	1.03	0.16	0.00	0.27	0.36	0.23	0.00	0.00	0.00	0.00	0.00
27	0.04	0.18	0.36	0.00	0.10	0.03	0.05	0.00	0.00	0.00	0.00	0.00
28	0.03	0.01	0.03	0.00	0.03	0.17	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.04	0.13	0.00		0.41	0.22	0.00	0.00	0.00	0.00	0.00
30	0.43	0.34	0.00	0.00		0.11	0.04	0.00	0.00	0.00	0.00	0.00
31	0.47		0.17	0.00		0.00		0.18		0.00	0.00	0.00
Total	10.89	8.53	6.22	2.82	7.89	8.52	5.21	4.23	1.92	0.13	0.18	0.00
Days	29	26	21	11	21	28	25	13	10	2	2	188 Precip Days

Total Rainfall for Water Year 2017: 56.54

Notes:

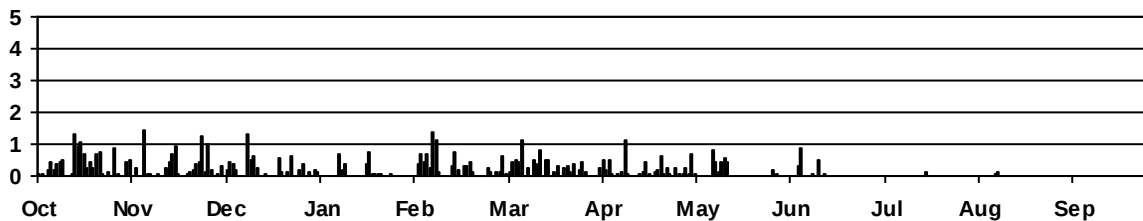
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



65u--Grand Mound_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.15	0.03	0.02	0.12	0.00	0.23	0.04	0.08	0.05	0.00	0.00	0.00
02	0.15	0.27	0.28	0.00	0.04	0.33	0.00	0.18	0.00	0.00	0.00	0.00
03	0.02	0.01	0.51	0.00	0.30	0.96	0.00	0.02	0.00	0.00	0.00	0.00
04	0.24	0.00	0.29	0.00	1.11	0.41	0.19	0.80	0.00	0.00	0.00	0.00
05	0.42	1.14	0.25	0.00	0.51	0.19	0.61	0.12	0.00	0.00	0.00	0.00
06	0.42	0.13	0.04	0.00	0.67	0.33	0.20	0.00	0.00	0.00	0.00	0.00
07	0.34	0.03	0.00	0.00	0.41	0.70	0.80	0.00	0.01	0.00	0.00	0.00
08	0.49	0.00	0.00	0.55	1.26	0.32	0.02	0.00	0.32	0.00	0.00	0.00
09	0.36	0.03	1.00	0.14	1.19	1.12	0.03	0.00	0.18	0.00	0.00	0.05
10	0.00	0.00	0.49	0.35	0.43	0.04	0.12	0.00	0.01	0.00	0.00	0.00
11	0.00	0.01	0.70	0.00	0.01	0.28	0.17	0.85	0.00	0.00	0.00	0.00
12	0.17	0.26	0.29	0.00	0.00	0.01	1.12	0.50	0.00	0.00	0.15	0.00
13	1.32	0.41	0.00	0.00	0.00	0.47	0.06	0.12	0.10	0.00	0.02	0.00
14	1.49	0.70	0.00	0.00	0.42	0.74	0.14	0.33	0.00	0.00	0.00	0.00
15	0.91	0.92	0.07	0.00	0.92	0.68	0.01	0.52	0.66	0.00	0.00	0.00
16	1.01	0.05	0.00	0.00	0.15	0.01	0.00	0.46	0.02	0.00	0.00	0.00
17	0.27	0.00	0.00	0.54	0.02	0.63	0.06	0.00	0.01	0.00	0.00	0.09
18	0.30	0.02	0.01	0.92	0.39	0.58	0.18	0.00	0.05	0.00	0.00	0.48
19	0.35	0.15	0.82	0.17	0.43	0.00	0.44	0.00	0.00	0.00	0.00	0.15
20	0.95	0.12	0.21	0.14	0.54	0.13	0.04	0.00	0.00	0.14	0.00	0.54
21	0.54	0.06	0.00	0.09	0.14	0.26	0.00	0.00	0.00	0.00	0.00	0.00
22	0.05	0.44	0.25	0.06	0.00	0.13	0.09	0.00	0.00	0.00	0.00	0.00
23	0.00	0.59	0.61	0.00	0.04	0.25	0.17	0.00	0.00	0.00	0.00	0.00
24	0.09	2.08	0.01	0.00	0.01	0.38	0.46	0.00	0.00	0.00	0.00	0.00
25	0.00	0.12	0.00	0.03	0.00	0.05	0.08	0.00	0.00	0.00	0.00	0.01
26	1.00	0.93	0.44	0.00	0.55	0.45	0.11	0.00	0.00	0.00	0.00	0.00
27	0.01	0.41	0.49	0.00	0.15	0.07	0.02	0.00	0.00	0.00	0.00	0.00
28	0.03	0.00	0.02	0.00	0.02	0.29	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.03	0.12	0.02		0.52	0.22	0.00	0.00	0.00	0.00	0.12
30	0.35	0.34	0.00	0.00		0.01	0.00	0.00	0.00	0.00	0.00	0.03
31	0.54		0.24	0.00		0.00		0.14		0.00	0.00	

Total **11.98** **9.28** **7.16** **3.13** **9.71** **10.57** **5.38** **4.12** **1.41** **0.14** **0.17** **1.47**

Days **27** **25** **22** **12** **23** **29** **24** **12** **10** **1** **2** **8** **195 Precip Days**

Total Rainfall for Water Year 2017: 64.52

Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt. Precipitation from snow is not measured accurately

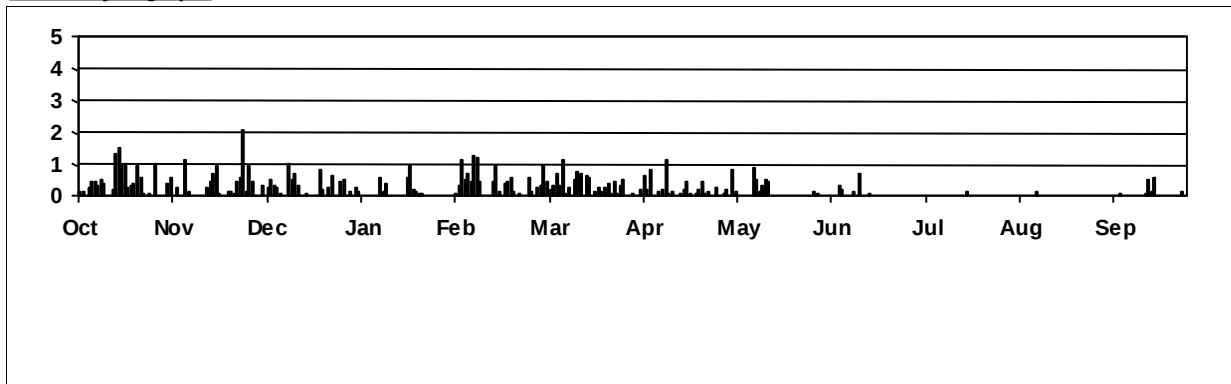
Thurston County

Notes:

Logger failure in Feb 2017.

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Annual Hyetograph:



69u--Summit Lake_Rain

Water Year: 2017

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	0.68	0.33	0.01	0.17	0.00	0.29	0.03	0.09	0.06	0.00	0.00	0.00
02	0.05	0.68	0.32	0.00	0.00	0.89	0.01	0.17	0.00	0.00	0.00	0.00
03	0.03	0.01	0.84	0.00	0.49	1.80	0.00	0.06	0.00	0.00	0.00	0.00
04	0.42	0.09	0.33	0.00	1.53	0.21	0.28	0.34	0.00	0.00	0.00	0.00
05	0.44	1.39	0.31	0.00	0.57	0.90	0.83	0.23	0.00	0.00	0.00	0.00
06	0.45	0.15	0.03	0.00	0.99	0.33	0.15	0.00	0.00	0.00	0.00	0.00
07	0.22	0.18	0.00	0.01	0.09	0.93	1.50	0.00	0.00	0.00	0.00	0.00
08	1.45	0.00	0.00	0.97	1.38	0.28	0.14	0.00	0.48	0.00	0.00	0.01
09	0.35	0.40	1.16	0.12	2.10	1.07	0.12	0.00	0.44	0.00	0.00	0.08
10	0.01	0.00	0.83	0.53	1.03	0.38	0.40	0.09	0.05	0.00	0.00	0.00
11	0.00	0.02	1.12	0.00	0.06	0.64	0.16	0.76	0.01	0.00	0.00	0.00
12	0.18	0.51	0.27	0.00	0.00	0.08	1.63	0.68	0.00	0.00	0.17	0.00
13	2.32	0.56	0.02	0.00	0.00	0.82	0.25	0.20	0.00	0.00	0.05	0.00
14	2.10	0.77	0.00	0.00	0.62	1.24	0.70	0.23	0.00	0.00	0.00	0.00
15	1.89	0.99	0.07	0.00	1.59	0.83	0.02	0.52	0.96	0.00	0.00	0.00
16	1.45	0.23	0.00	0.00	0.25	0.00	0.00	0.67	0.10	0.00	0.00	0.00
17	1.04	0.01	0.00	1.06	0.01	1.15	0.12	0.00	0.03	0.00	0.00	0.17
18	0.57	0.04	0.01	1.52	0.32	0.91	0.07	0.00	0.03	0.00	0.00	0.29
19	0.42	0.25	1.11	0.50	0.50	0.00	0.53	0.00	0.00	0.00	0.00	0.33
20	1.75	0.41	0.53	0.12	0.34	0.16	0.24	0.00	0.00	0.02	0.00	0.25
21	0.30	0.07	0.01	0.23	0.08	0.22	0.00	0.00	0.00	0.00	0.00	0.00
22	0.15	0.94	0.40	0.15	0.01	0.43	0.47	0.00	0.00	0.00	0.00	0.00
23	0.00	0.94	0.66	0.00	0.01	0.94	0.56	0.00	0.00	0.00	0.00	0.00
24	0.13	3.82	0.13	0.00	0.07	0.51	0.30	0.00	0.00	0.00	0.00	0.00
25	0.02	0.32	0.00	0.00	0.06	0.35	0.24	0.00	0.00	0.00	0.00	0.03
26	1.10	1.46	0.56	0.01	0.37	1.11	0.30	0.00	0.00	0.00	0.00	0.00
27	0.17	0.36	0.64	0.00	0.17	0.26	0.01	0.00	0.00	0.00	0.00	0.00
28	0.03	0.01	0.03	0.00	0.20	0.87	0.00	0.00	0.00	0.00	0.00	0.00
29	0.18	0.04	0.33	0.05		1.10	0.40	0.00	0.00	0.00	0.00	0.19
30	0.47	0.62	0.00	0.00		0.07	0.08	0.00	0.00	0.00	0.00	0.44
31	0.92		0.17	0.00		0.00		0.04		0.00	0.00	
Total	19.29	15.60	9.89	5.44	12.84	18.77	9.54	4.08	2.16	0.02	0.22	1.79
Days	29	28	24	13	24	28	26	13	9	1	2	9

206 Precip Days

Total Rainfall for Water Year 2017: 99.64

Notes:

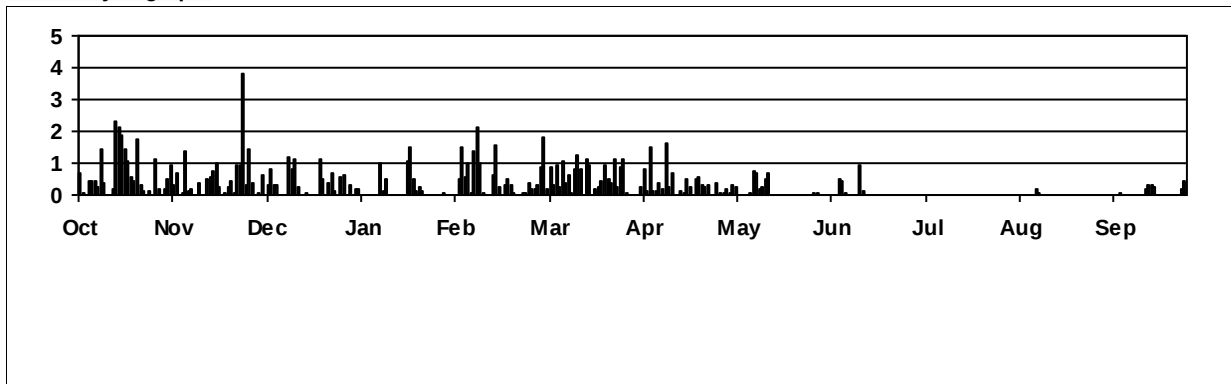
Precipitation is measured with a tipping bucket rain gauge. Ice and snow accumulations in the rain gauge are not measured until they melt.

Precipitation from snow is not measured accurately

Thurston County

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Annual Hyetograph:



Appendix B – Streamflow Data

10a--Eaton Creek @ Yelm Hwy

Water Year: 2017

Elv: #Erro

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	5.6	19	19	15	10	27	20	19	13	8.6	6.3	6.9
02	5.6	17	16	14	9.4	26	18	18	12	7.9	6.2	7.1
03	5.7	17	16	9.8	14	30	16	20	11	8.4	6.4	6.9
04	5.7	14	24	8.3	23	38	15	22	10	8.7	6.3	6.8
05	6.1	18	22	6.0	33	34	21	32	9.6	7.7	6.3	6.6
06	6.1	25	19	5.8	34	33	24	25	9.3	7.8	6.3	5.6
07	7.9	20	16	5.6	33	35	23	19	9.1	7.7	6.2	5.5
08	8.2	16	13	7.5	29	35	22	18	14	7.4	6.3	5.6
09	10	11	14	13	33	35	19	17	14	6.9	6.2	5.5
10	12	8.5	22	15	36	38	17	16	14	7.4	5.9	5.6
11	6.6	11	27	15	33	39	16	19	11	6.9	5.9	5.7
12	5.9	12	26	10	33	40	24	25	9.4	6.9	5.8	5.7
13	9.4	12	22	7.2	28	41	26	24	9.2	7.0	6.1	5.6
14	23	16	18	6.2	23	38	24	23	9.5	6.6	6.1	5.6
15	27	28	15	5.9	31	38	21	21	12	6.8	5.9	5.6
16	28	27	11	6.4	35	30	18	30	18	6.5	5.7	5.5
17	24	23	7.8	9.5	36	23	17	26	14	6.7	6.0	5.6
18	21	17	7.6	27	32	22	19	20	13	6.8	6.3	6.7
19	17	13	11	29	31	23	19	18	12	6.6	6.2	7.5
20	20	11	20	25	33	26	23	17	11	7.0	6.2	7.6
21	22	11	18	20	33	26	23	15	9.4	6.8	6.2	7.7
22	25	13	16	17	38	23	19	14	9.0	6.7	6.4	6.9
23	20	19	23	13	33	21	19	14	8.5	7.2	6.2	6.8
24	16	25	22	13	28	24	26	13	8.2	6.8	6.4	6.5
25	10	30	19	13	26	23	27	13	8.3	6.7	6.2	6.8
26	14	31	16	12	25	22	25	12	8.6	6.8	6.0	6.7
27	21	32	20	12	27	26	22	11	8.6	7.1	6.4	6.2
28	18	31	19	12	28	27	19	11	8.7	6.6	6.3	6.4
29	14	25	16	12		23	18	11	8.1	6.6	6.5	6.8
30	11	21	16	12		25	22	11	7.9	6.6	6.7	7.4
31	16		13	11		23		11		6.5	7.0	

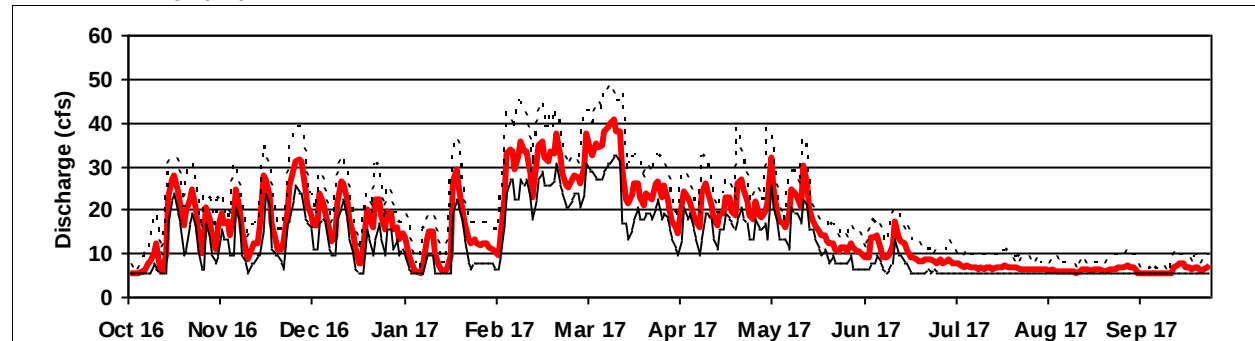
Avg Discharge	14	19	18	13	29	29	21	18	11	7.1	6.2	6.4
Max Instantaneous	33	39	33	37	45	49	39	39	21	13	9.4	11
Max Mean Daily	28	32	27	29	38	41	27	32	18	8.7	7.0	7.7

Average Discharge for Water Year 2017:		16	Low Flow (Cal Year)--7 day	5.59	09/10/17	--30 day	6.13	09/03/17	
Lowest Stage:	1.02	Discharge:	5.37	10/01/16	Metrics	High Pulse Count	18	Range	213 Days
Peak Inst Stage:	1.23	Discharge:	48.93	03/12/17	TQ Mean (Use Daily Avg)	0.45	R-B Index	0.13	
Discharge is determined by comparing continuous stage records with field flow measurements.									

Discharge is determined by comparing continuous stage records with field flow measurements.

Thurston County

Annual Discharge (cfs)-- Mean — Max ---- Min —



14a--Spurgeon Creek

Water Year: 2017

Elv: #Erro

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01						33	43	28	21	15	13	11
02						32	40	28	21	15	13	11
03						34	37	28	20	14	12	11
04						37	37	30	19	14	13	11
05						35	41	38	19	14	13	11
06						35	42	34	18	14	12	11
07						37	42	30	18	14	12	11
08						40	39	28	19	14	12	11
09						43	36	26	20	14	12	10
10						56	36	25	21	14	12	11
11						49	34	28	19	14	12	11
12						46	40	34	18	14	12	11
13						45	44	35	18	14	12	10
14						49	39	34	17	13	12	10
15						83	37	32	19	13	12	10
16						123	35	40	22	13	12	10
17						53	33	37	20	13	12	10
18						70	33	33	19	13	11	11
19						68	33	29	18	13	11	12
20						50	35	28	18	14	11	12
21						49	33	26	17	13	11	12
22						47	32	25	16	13	11	12
23					39	45	31	24	16	13	11	12
24					37	47	35	23	16	13	11	11
25					34	45	34	23	16	13	11	11
26					34	43	34	23	15	13	11	11
27					34	46	30	22	15	12	11	11
28					32	46	28	21	15	12	11	11
29						51	27	21	15	13	11	11
30						49	30	21	15	13	11	11
31						46		21		13	11	

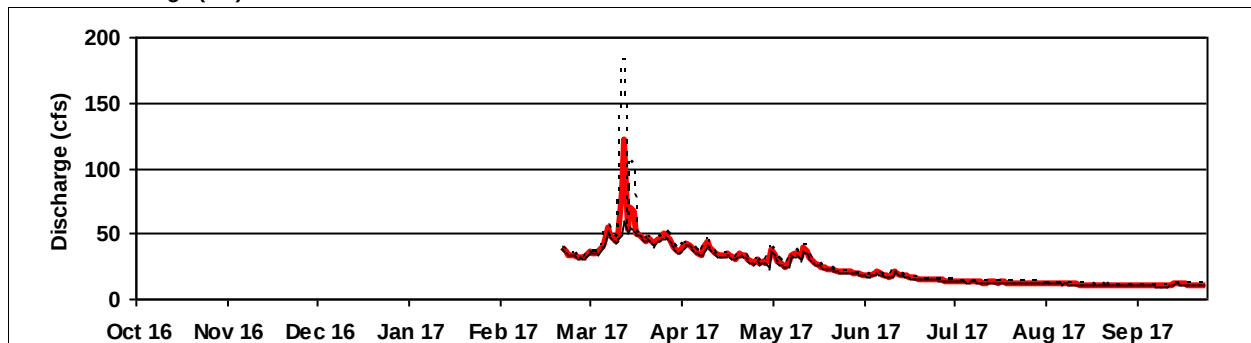
Avg Discharge					35	49	36	28	18	13	12	11
Max Instantaneous					40	185	45	41	23	15	13	12
Max Mean Daily					39	123	44	40	22	15	13	12

Average Discharge for Water Year 2017:	25	Low Flow (Cal Year)--7 day	10.4	09/14/17	--30 day	10.7	09/04/17		
Lowest Stage:	0.82	Discharge:	9.79	09/13/17	Metrics	High Pulse Count	3	Range	8 Days
Peak Inst Stage:	4.01	Discharge:	184.84	03/16/17	TQ Mean (Use Daily Avg)	0.40	R-B Index	0.08	
Discharge is determined by comparing continuous stage records with field flow measurements.									

Discharge is determined by comparing continuous stage records with field flow measurements.

Thurston County

Annual Discharge (cfs)-- Mean █ Max ---- Min ---



04/24/18 2:39:08 PM by Nat Kale

18a--Woodland Creek @ Pleasant Glade Rd.

Water Year: 2017

Elv: #Erro

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	15	34	45	42	39	65	79	60	49	33	20	18
02	15	33	44	41	38	65	77	60	48	32	20	18
03	17	34	44	39	40	72	76	60	48	32	22	18
04	15	31	47	38	48	80	76	67	46	31	22	18
05	16	39	44	37	55	75	83	70	45	30	21	20
06	15	40	44	37	55	74	84	64	45	29	20	18
07	16	35	43	37	52	81	83	61	44	29	20	17
08	16	35	43	39	56	81	83	60	46	29	21	18
09	17	35	43	39	97	92	79	58	45	29	21	18
10	16	34	46	39	74	95	78	57	44	28	19	17
11	16	32	50	37	68	90	75	61	42	28	19	17
12	15	35	50	36	66	88	84	62	42	28	19	16
13	20	34	46	35	62	89	83	65	41	27	20	16
14	33	44	44	34	60	103	78	61	41	27	20	16
15	32	60	44	34	75	114	77	60	42	27	19	16
16	26	49	44	34	78	99	76	64	41	26	20	17
17	24	43	43	37	69	103	74	60	41	25	21	17
18	20	39	41	52	69	120	73	58	41	24	21	18
19	19	39	42	47	69	104	75	57	40	24	19	17
20	34	38	48	43	70	92	74	56	40	24	18	18
21	24	38	43	41	71	86	73	55	39	24	19	17
22	21	37	42	41	68	85	73	54	38	23	19	18
23	19	42	50	41	68	82	72	54	37	22	19	17
24	19	52	47	41	67	88	77	53	36	22	18	17
25	19	51	44	41	68	85	71	53	36	22	18	17
26	31	48	45	39	67	85	65	52	36	21	18	18
27	32	53	48	39	65	85	63	51	35	21	18	17
28	30	49	46	38	65	85	63	51	35	21	18	16
29	27	45	44	42		94	62	50	34	21	18	16
30	27	50	42	40		88	62	49	33	21	19	17
31	34		42	39		83		49		21	19	

Avg Discharge	22	41	45	39	64	88	75	58	41	26	20	17
Max Instantaneous	46	74	57	59	118	131	92	88	50	34	25	33
Max Mean Daily	34	60	50	52	97	120	84	70	49	33	22	20

Average Discharge for Water Year 2017: 45 [Low Flow \(Cal Year\)--7 day](#) 16.3 09/14/17 [--30 day](#) 16.8 09/27/17

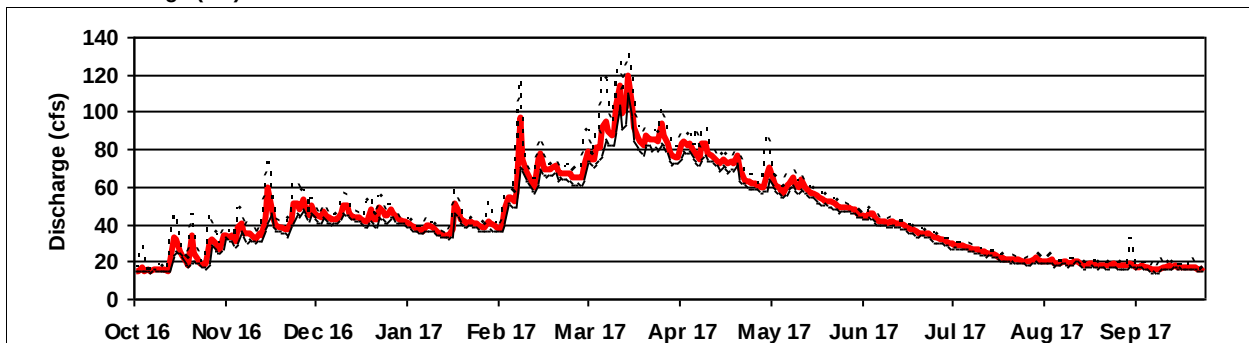
Lowest Stage: 0.55 **Discharge:** 14.14 09/14/17 **Metrics** [High Pulse Count](#) 5 [Range](#) 96 Days

Peak Inst Stage: 1.86 **Discharge:** 131.19 03/18/17 [TQ Mean \(Use Daily Avg\)](#) 0.41 [R-B Index](#) 0.05

Discharge is determined by comparing continuous stage records with field flow measurements.

Thurston County

Annual Discharge (cfs)-- Mean — Max ---- Min —



04/24/18 2:39:38 PM by Nat Kale

20a--Woodard Creek @ 36th Ave.

Water Year: 2017

Elv: #Erro

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	2.9	13	12	11	7.2	12	20	16	11	17	5.7	5.0
02	2.9	11	10	10	6.7	12	18	16	11	9.1	5.3	4.6
03	3.0	12	12	9.2	8.6	19	17	18	11	8.1	5.3	4.5
04	3.1	8.6	20	8.8	18	28	16	21	9.5	6.9	5.4	4.4
05	3.6	14	14	8.3	24	19	25	34	8.9	6.6	5.5	4.3
06	3.6	19	11	8.2	22	16	28	23	8.8	7.4	5.3	4.5
07	9.3	12	7.9	8.4	15	21	27	17	8.1	7.5	5.1	4.5
08	6.7	9.3	7.5	12	15	25	29	15	9.7	7.5	5.0	4.5
09	5.9	8.3	10	15	42	26	23	15	11	7.3	5.2	4.5
10	5.2	7.6	17	14	37	34	21	14	12	7.2	19	4.6
11	3.8	6.5	22	12	19	24	21	18	8.7	6.7	14	4.5
12	3.3	8.7	22	10.0	13	21	28	24	7.5	7.1	7.5	4.4
13	6.8	9.1	13	8.5	11	21	33	26	8.3	10	6.3	4.5
14	35	21	9.8	8.2	11	31	25	22	28	8.3	5.5	4.3
15	59	30	8.8	8.3	26	36	23	19	31	7.1	5.0	4.1
16	35	25	8.2	8.4	30	30	20	25	17	7.7	4.9	4.0
17	19	11	7.3	13	18	25	19	21	10	7.5	4.7	4.1
18	12	7.1	7.7	35	17	36	19	17	9.3	6.8	4.3	4.9
19	7.1	6.8	12	31	17	28	20	15	8.6	6.9	4.4	6.0
20	23	7.0	26	19	16	21	23	13	7.9	7.0	4.5	6.2
21	23	7.1	15	14	17	22	22	12	7.2	7.2	4.4	5.5
22	11	7.3	11	14	14	22	19	12	7.1	7.3	4.2	5.1
23	7.7	13	22	13	12	19	19	12	7.0	7.5	4.2	5.7
24	6.1	24	19	11	11	27	25	12	6.9	7.6	4.1	5.7
25	5.9	29	12	9.7	11	24	23	12	7.3	8.8	9.3	4.9
26	11	24	11	9.2	12	23	22	11	7.9	9.9	8.9	4.9
27	15	27	19	8.9	17	25	19	11	7.7	6.4	5.5	4.7
28	9.3	21	14	8.4	13	23	16	12	7.2	6.1	4.8	4.4
29	6.9	13	12	8.2		33	16	13	7.4	9.0	5.1	4.5
30	6.5	14	11	8.1		29	19	12	24	6.2	5.6	5.2
31	11		10	7.7		22		11		5.1	5.3	
Avg Discharge	12	14	13	12	17	24	22	17	11	7.8	6.1	4.8
Max Instantaneous	62	34	29	38	47	39	35	36	35	25	23	6.4
Max Mean Daily	59	30	26	35	42	36	33	34	31	17	19	6.2

Average Discharge for Water Year 2017: 13 [Low Flow \(Cal Year\)--7 day](#) 3.76 10/29/17 [--30 day](#) 4.7 10/03/17

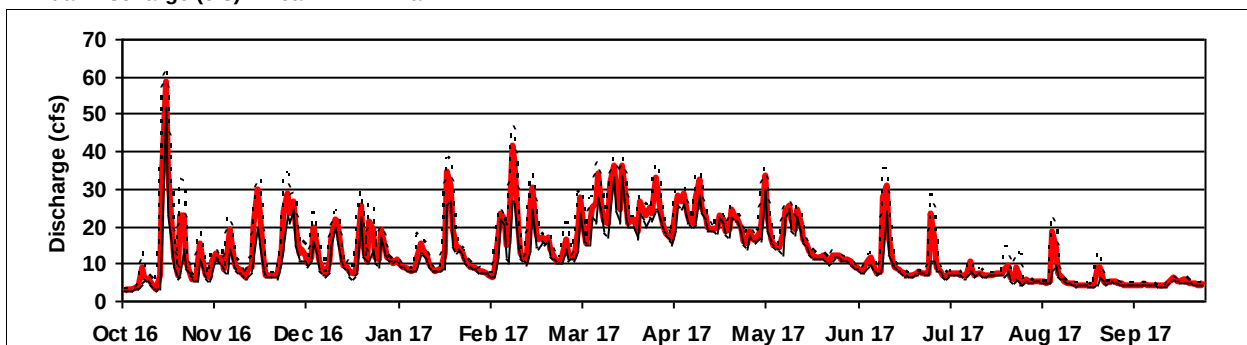
Lowest Stage: 1.01 **Discharge:** 2.54 10/01/16 **Metrics** [High Pulse Count](#) 22 [Range](#) 259 Days

Peak Inst Stage: 2.52 **Discharge:** 62.47 10/15/16 [TQ Mean \(Use Daily Avg\)](#) 0.38 [R-B Index](#) 0.23

Discharge is determined by comparing continuous stage records with field flow measurements.

Thurston County

Annual Discharge (cfs)-- Mean — Max ---- Min —



04/24/18 2:40:02 PM by Nat Kale

65a--Prairie Creek @ Old Highway 99

Water Year: 2017

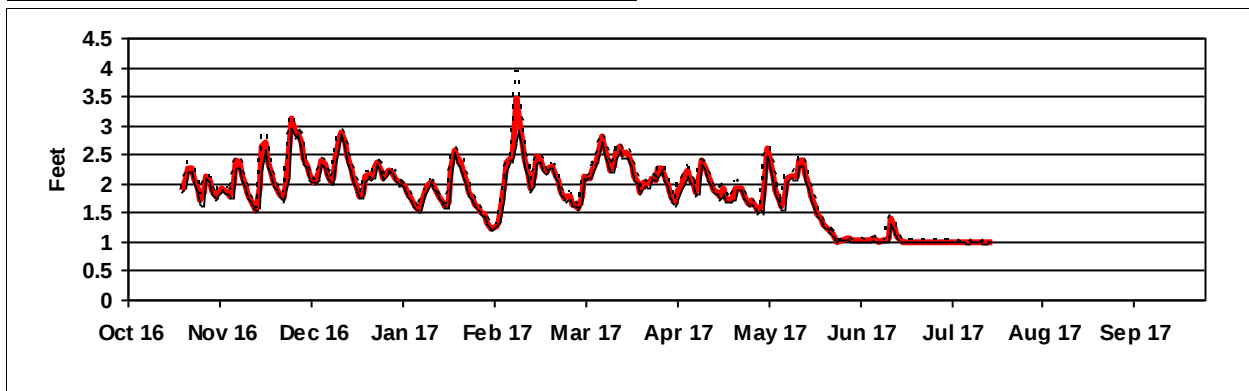
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01		1.94	2.15	2.02	1.25	1.62	2.00	1.60	1.08	1.00		
02		1.89	2.03	1.95	1.28	1.58	1.86	1.56	1.06	1.00		
03		1.87	2.01	1.85	1.34	1.77	1.75	1.61	1.03	1.00		
04		1.80	2.25	1.76	1.54	2.13	1.67	1.80	1.03	1.00		
05		1.99	2.40	1.67	2.01	2.10	1.89	2.60	1.03	1.00		
06		2.40	2.32	1.59	2.37	2.11	1.97	2.49	1.03	1.00		
07		2.38	2.17	1.53	2.45	2.24	2.12	2.13	1.02	1.00		
08		2.16	2.04	1.64	2.49	2.38	2.22	1.88	1.02	1.00		
09		1.95	2.08	1.85	3.48	2.52	2.08	1.73	1.02	1.00		
10		1.83	2.43	1.96	3.20	2.81	1.99	1.60	1.07	1.00		
11		1.68	2.78	2.03	2.72	2.66	1.86	1.82	1.02	1.00		
12		1.60	2.90	1.98	2.43	2.42	2.15	2.10	1.01	1.00		
13		1.54	2.72	1.86	2.17	2.22	2.39	2.12	1.02	1.00		
14		1.92	2.47	1.77	1.94	2.31	2.27	2.12	1.02	1.00		
15		2.65	2.27	1.69	2.13	2.57	2.17	2.14	1.08	1.00		
16		2.72	2.09	1.62	2.47	2.65	1.98	2.42	1.42	1.00		
17		2.42	1.92	1.70	2.45	2.50	1.89	2.40	1.22	0.99		
18		2.18	1.80	2.26	2.30	2.55	1.87	2.17	1.10	0.99		
19	1.88	2.03	1.81	2.59	2.20	2.52	1.78	1.96	1.03	1.00		
20	2.11	1.90	2.13	2.46	2.27	2.33	1.91	1.78	1.01	1.00		
21	2.28	1.82	2.16	2.37	2.30	2.14	1.75	1.63	1.01			
22	2.27	1.76	2.09	2.23	2.21	2.03	1.73	1.48	1.00			
23	2.10	1.96	2.29	2.02	2.05	1.87	1.71	1.40	1.00			
24	1.91	2.67	2.36	1.86	1.89	2.03	1.92	1.31	1.00			
25	1.72	3.12	2.25	1.74	1.76	2.00	1.94	1.25	1.00			
26	1.85	2.87	2.11	1.66	1.78	2.03	1.91	1.19	1.01			
27	2.12	2.88	2.20	1.59	1.77	2.11	1.81	1.13	1.00			
28	2.06	2.71	2.25	1.51	1.66	2.07	1.70	1.05	1.01			
29	1.89	2.44	2.18	1.47		2.27	1.64	1.01	1.00			
30	1.77	2.29	2.11	1.35		2.28	1.72	1.03	1.00			
31	1.85		2.01	1.24		2.15		1.03				
Avg Stage	1.99	2.18	2.22	1.83	2.14	2.22	1.92	1.73	1.04	1.00		
Max Instantaneous	2.4	3.2	2.9	2.6	4.0	2.9	2.4	2.7	1.5	1.0		
Max Mean Daily	2.3	3.1	2.9	2.6	3.5	2.8	2.4	2.6	1.4	1.0		

Average Stage for Water Year 2017: 1.83

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 786-5549 or (360) 867-2072

Annual Stage (ft)-- Mean — Max ----- Min —



Appendix C – Groundwater Data

ET1--8538 9th Way SE

Water Year: 2017 Well Water Levels are in feet

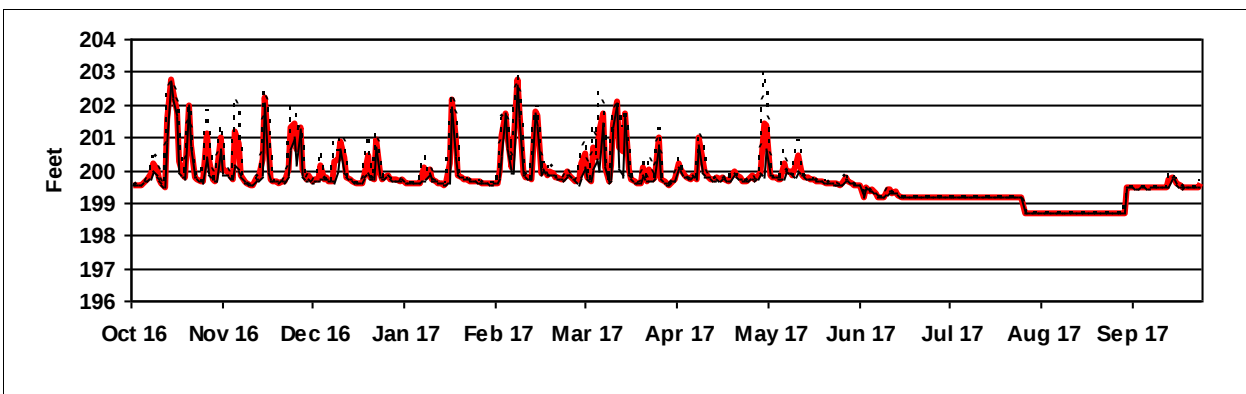
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	199.55	200.06	199.64	199.74	199.59	199.67	199.59	199.71	199.80	199.19	198.69	198.69
02	199.55	199.97	199.72	199.63	199.61	199.70	199.57	199.82	199.64	199.19	198.68	198.69
03	199.57	199.88	199.72	199.61	200.00	200.24	199.67	199.92	199.61	199.19	198.68	198.69
04	199.57	199.73	200.17	199.60	201.06	200.50	199.72	201.43	199.55	199.19	198.68	198.70
05	199.67	201.19	199.75	199.61	201.77	199.76	200.24	201.40	199.55	199.19	198.68	199.47
06	199.74	200.83	199.76	199.61	200.98	199.69	200.01	199.86	199.55	199.18	198.68	199.47
07	199.90	199.83	199.68	199.61	200.10	200.71	199.83	199.80	199.16	199.18	198.68	199.46
08	200.22	199.67	199.65	200.07	200.81	200.42	199.78	199.78	199.50	199.19	198.69	199.46
09	200.05	199.61	200.26	199.80	202.77	201.19	199.74	199.75	199.37	199.18	198.68	199.46
10	199.73	199.56	200.31	200.06	201.80	201.73	199.83	199.72	199.39	199.19	198.69	199.47
11	199.61	199.54	200.89	199.71	199.89	200.10	199.75	200.20	199.28	199.18	198.69	199.46
12	199.51	199.76	200.39	199.66	199.78	199.65	200.98	199.96	199.19	199.19	198.69	199.46
13	201.55	199.76	199.80	199.63	199.76	200.13	200.32	200.00	199.16	199.19	198.69	199.46
14	202.75	200.32	199.72	199.60	199.74	201.46	199.95	199.84	199.16	199.18	198.69	199.46
15	202.44	202.25	199.68	199.57	201.82	202.10	199.79	200.24	199.39	199.19	198.68	199.46
16	201.80	200.65	199.62	199.58	201.66	200.70	199.74	200.44	199.39	199.18	198.69	199.47
17	200.27	199.72	199.60	200.20	199.93	200.56	199.72	199.86	199.32	199.19	198.68	199.47
18	199.82	199.67	199.61	202.14	200.15	201.73	199.79	199.81	199.33	199.19	198.69	199.47
19	199.77	199.66	199.87	201.03	199.86	200.05	199.74	199.77	199.25	199.18	198.69	199.70
20	201.97	199.61	200.47	199.86	200.00	199.75	199.80	199.72	199.17	199.19	198.69	199.80
21	200.74	199.66	199.76	199.81	199.92	199.69	199.73	199.70	199.16	199.19	198.69	199.74
22	199.81	199.68	199.73	199.75	199.77	199.60	199.68	199.69	199.16	199.19	198.70	199.60
23	199.73	200.03	200.95	199.72	199.76	199.63	199.78	199.67	199.16	199.18	198.69	199.52
24	199.69	201.30	199.93	199.68	199.72	200.08	199.98	199.65	199.17	199.18	198.69	199.46
25	199.64	201.43	199.74	199.66	199.70	199.64	199.82	199.63	199.17	199.18	198.69	199.46
26	201.13	200.65	199.77	199.66	200.00	200.05	199.78	199.62	199.17	199.18	198.70	199.47
27	200.35	201.32	199.84	199.64	199.84	199.71	199.68	199.59	199.17	199.18	198.69	199.48
28	199.74	200.02	199.72	199.62	199.73	199.79	199.65	199.58	199.18	199.19	198.69	199.48
29	199.69	199.71	199.72	199.61		201.03	199.74	199.58	199.19	199.18	198.70	199.48
30	199.96	199.84	199.71	199.60		199.74	199.82	199.56	199.19	199.18	198.70	199.59
31	201.01		199.68	199.58		199.64		199.62		199.18	198.69	
Avg WL	200.28	200.16	199.90	199.83	200.34	200.27	199.84	199.90	199.32	199.19	198.69	199.40
Max WL	202.77	202.47	201	202.33	202.92	202.43	201.17	203.05	199.85	199.19	198.70	199.94
Max Day Mean	202.75	202.25	200.95	202.14	202.77	202.10	200.98	201.43	199.80	199.19	198.70	199.80

Average Well Water Level for Water Year 2017: 199.76

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



HFB-01--628 Hidden Forest Dr SE

Water Year: 2017 Well Water Levels are in feet

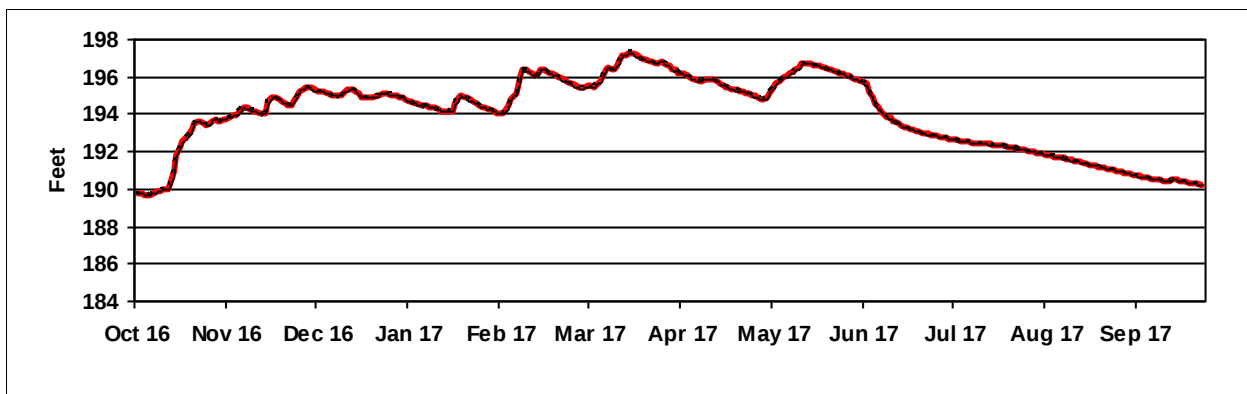
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	189.80	193.76	195.30	194.83	194.06	195.43	196.56	194.90	196.03	192.83	192.03	190.97
02	189.78	193.85	195.25	194.73	194.02	195.39	196.43	194.84	195.96	192.80	192.01	190.92
03	189.77	193.89	195.20	194.65	194.05	195.41	196.36	194.79	195.91	192.76	191.98	190.88
04	189.71	193.92	195.20	194.58	194.14	195.51	196.23	194.87	195.83	192.75	191.95	190.85
05	189.70	194.03	195.15	194.53	194.51	195.54	196.16	195.15	195.77	192.70	191.92	190.80
06	189.71	194.29	195.09	194.50	194.80	195.48	196.14	195.41	195.72	192.68	191.87	190.76
07	189.77	194.38	195.02	194.44	194.98	195.57	196.07	195.61	195.60	192.63	191.84	190.72
08	189.83	194.33	195.00	194.45	195.13	195.73	195.98	195.76	195.26	192.61	191.82	190.69
09	189.93	194.28	194.96	194.41	196.07	195.96	195.91	195.88	194.88	192.59	191.77	190.65
10	189.97	194.20	194.99	194.40	196.43	196.41	195.82	195.96	194.59	192.57	191.74	190.62
11	189.96	194.12	195.13	194.32	196.36	196.48	195.77	196.05	194.35	192.54	191.72	190.59
12	189.96	194.03	195.30	194.25	196.27	196.42	195.79	196.15	194.16	192.52	191.69	190.57
13	190.28	194.00	195.35	194.20	196.15	196.40	195.90	196.27	193.99	192.49	191.65	190.55
14	190.97	194.08	195.32	194.17	196.03	196.54	195.90	196.36	193.85	192.47	191.61	190.52
15	191.82	194.64	195.20	194.13	196.14	196.96	195.88	196.47	193.79	192.44	191.58	190.48
16	192.28	194.92	195.08	194.11	196.37	197.15	195.84	196.67	193.66	192.45	191.54	190.46
17	192.55	194.92	194.95	194.17	196.40	197.17	195.74	196.73	193.58	192.43	191.50	190.43
18	192.72	194.91	194.89	194.56	196.31	197.29	195.64	196.74	193.49	192.40	191.47	190.44
19	192.83	194.82	194.88	194.88	196.21	197.30	195.55	196.70	193.43	192.39	191.43	190.47
20	193.18	194.71	194.86	194.99	196.13	197.21	195.47	196.65	193.34	192.37	191.40	190.49
21	193.52	194.58	194.92	194.92	196.07	197.10	195.42	196.61	193.27	192.36	191.37	190.47
22	193.60	194.52	194.96	194.86	196.01	196.99	195.36	196.57	193.20	192.34	191.32	190.43
23	193.58	194.50	195.04	194.75	195.93	196.92	195.30	196.52	193.16	192.32	191.28	190.40
24	193.52	194.69	195.14	194.66	195.83	196.88	195.28	196.47	193.12	192.29	191.24	190.37
25	193.39	195.06	195.15	194.58	195.74	196.83	195.25	196.43	193.07	192.27	191.21	190.34
26	193.50	195.21	195.12	194.49	195.69	196.81	195.22	196.37	193.02	192.23	191.17	190.32
27	193.65	195.37	195.06	194.40	195.61	196.75	195.15	196.31	192.98	192.20	191.14	190.30
28	193.71	195.47	195.00	194.34	195.50	196.71	195.09	196.25	192.94	192.18	191.10	190.26
29	193.67	195.45	194.97	194.29		196.80	195.03	196.20	192.90	192.15	191.07	190.24
30	193.67	195.40	194.91	194.24		196.77	194.96	196.14	192.87	192.11	191.03	190.28
31	193.70		194.88	194.17		196.66		196.09		192.09	190.99	
Avg WL	191.74	194.54	195.07	194.48	195.61	196.47	195.71	196.06	194.12	192.45	191.53	190.54
Max WL	193.72	195.47	195	195.00	196.44	197.31	196.59	196.74	196.04	192.83	192.04	190.97
Max Day Mean	193.71	195.47	195.35	194.99	196.43	197.30	196.56	196.74	196.03	192.83	192.03	190.97

Average Well Water Level for Water Year 2017: 194.03

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



HFB-02--524 Hidden Forest Dr SE

Water Year: 2017 Well Water Levels are in feet

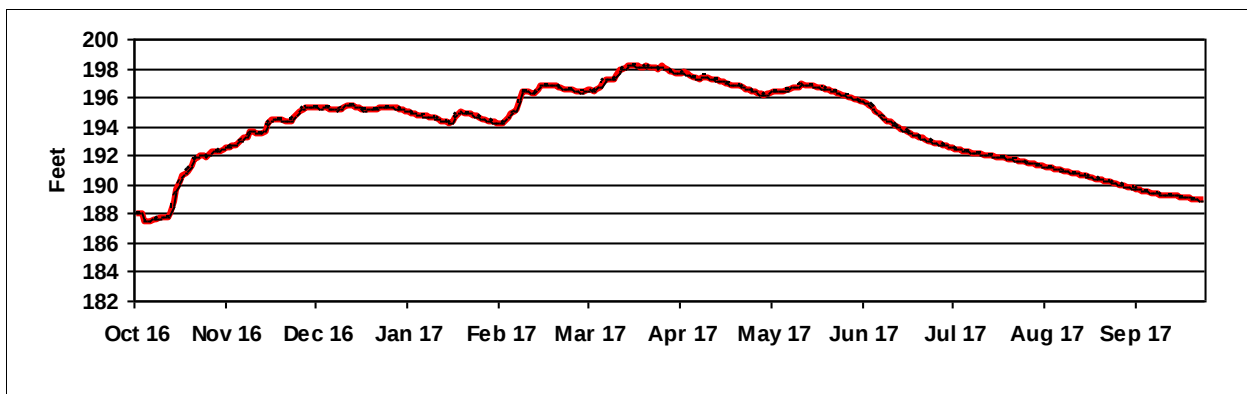
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	188.11	192.54	195.31	195.12	194.25	196.37	197.84	196.31	196.08	192.85	191.50	190.03
02	188.08	192.62	195.28	195.03	194.21	196.36	197.76	196.23	196.01	192.79	191.48	189.98
03	188.05	192.68	195.27	194.96	194.25	196.42	197.69	196.19	195.93	192.73	191.43	189.92
04	187.55	192.71	195.34	194.89	194.41	196.52	197.65	196.24	195.84	192.68	191.38	189.88
05	187.55	192.88	195.30	194.82	194.70	196.52	197.71	196.34	195.77	192.61	191.35	189.82
06	187.54	193.09	195.25	194.76	194.89	196.44	197.74	196.37	195.71	192.57	191.29	189.77
07	187.58	193.20	195.18	194.71	195.04	196.58	197.64	196.39	195.66	192.49	191.25	189.72
08	187.65	193.22	195.15	194.72	195.21	196.69	197.51	196.41	195.51	192.46	191.22	189.67
09	187.74	193.70	195.17	194.69	196.07	196.91	197.42	196.44	195.29	192.40	191.16	189.61
10	187.81	193.66	195.25	194.67	196.45	197.23	197.34	196.46	195.08	192.36	191.11	189.56
11	187.79	193.61	195.38	194.58	196.42	197.26	197.30	196.51	194.88	192.31	191.06	189.53
12	187.76	193.59	195.48	194.50	196.39	197.21	197.43	196.59	194.71	192.27	191.01	189.48
13	188.04	193.59	195.50	194.42	196.34	197.29	197.45	196.66	194.56	192.22	190.97	189.44
14	188.83	193.72	195.47	194.37	196.32	197.52	197.38	196.69	194.41	192.18	190.94	189.40
15	189.76	194.18	195.39	194.31	196.57	197.91	197.32	196.76	194.33	192.13	190.88	189.35
16	190.27	194.45	195.30	194.28	196.80	197.93	197.28	196.92	194.20	192.10	190.84	189.31
17	190.60	194.52	195.19	194.33	196.81	198.03	197.19	196.90	194.09	192.07	190.78	189.27
18	190.85	194.55	195.13	194.68	196.85	198.23	197.13	196.87	193.97	192.04	190.75	189.28
19	191.00	194.52	195.17	194.90	196.81	198.17	197.07	196.83	193.87	192.01	190.69	189.28
20	191.41	194.45	195.18	195.01	196.82	198.16	197.00	196.78	193.75	191.97	190.64	189.28
21	191.77	194.38	195.18	194.98	196.80	198.16	196.95	196.74	193.64	191.94	190.60	189.25
22	191.93	194.37	195.20	194.96	196.73	198.08	196.89	196.71	193.54	191.92	190.55	189.20
23	191.98	194.43	195.33	194.89	196.68	198.09	196.84	196.65	193.46	191.88	190.49	189.16
24	191.98	194.62	195.37	194.80	196.61	198.16	196.86	196.60	193.39	191.84	190.44	189.13
25	191.91	194.90	195.34	194.71	196.55	198.06	196.80	196.55	193.30	191.81	190.40	189.09
26	192.10	195.07	195.34	194.63	196.57	198.10	196.73	196.48	193.21	191.76	190.35	189.05
27	192.24	195.25	195.34	194.57	196.53	198.02	196.63	196.41	193.12	191.72	190.30	189.03
28	192.30	195.35	195.29	194.51	196.43	198.00	196.53	196.34	193.05	191.69	190.25	188.99
29	192.29	195.36	195.26	194.43		198.17	196.48	196.28	192.99	191.63	190.20	188.94
30	192.34	195.38	195.19	194.38		198.02	196.39	196.21	192.91	191.58	190.14	188.98
31	192.47		195.16	194.32		197.92		196.15		191.56	190.09	
Avg WL	189.91	194.02	195.28	194.68	196.02	197.50	197.20	196.52	194.41	192.15	190.82	189.41
Max WL	192.51	195.39	196	195.14	196.85	198.24	197.86	196.92	196.10	192.86	191.51	190.04
Max Day Mean	192.47	195.38	195.50	195.12	196.85	198.23	197.84	196.92	196.08	192.85	191.50	190.03

Average Well Water Level for Water Year 2017: 193.99

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



HFB-03--8836 6th Way SE

Water Year: 2017 Well Water Levels are in feet

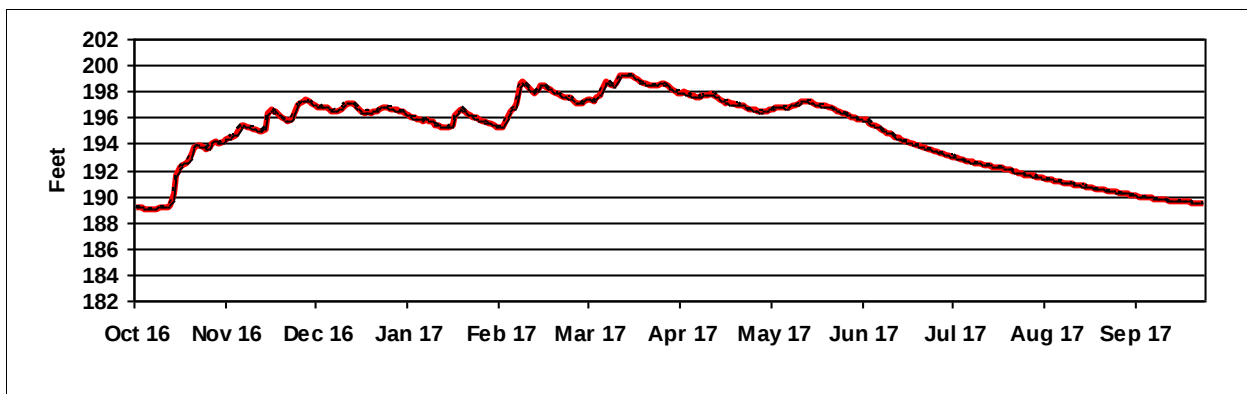
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	189.16	194.34	196.96	196.39	195.30	197.08	198.30	196.53	196.20	193.40	191.64	190.30
02	189.14	194.45	196.88	196.19	195.28	197.11	198.15	196.44	196.12	193.33	191.60	190.28
03	189.13	194.59	196.82	196.10	195.34	197.24	198.05	196.44	196.02	193.25	191.55	190.23
04	188.98	194.66	196.87	195.97	195.52	197.43	197.94	196.57	195.92	193.21	191.50	190.19
05	188.98	194.91	196.78	195.91	196.24	197.45	197.94	196.67	195.88	193.12	191.45	190.12
06	188.97	195.40	196.64	195.85	196.58	197.34	198.00	196.72	195.82	193.06	191.39	190.09
07	189.00	195.46	196.58	195.79	196.75	197.55	197.83	196.76	195.83	192.97	191.35	190.05
08	189.04	195.34	196.58	195.85	197.04	197.79	197.69	196.80	195.64	192.93	191.31	190.01
09	189.13	195.30	196.52	195.74	198.60	198.19	197.66	196.81	195.49	192.87	191.26	189.97
10	189.21	195.19	196.62	195.71	198.78	198.72	197.56	196.78	195.39	192.82	191.21	189.94
11	189.23	195.11	196.87	195.51	198.49	198.66	197.58	196.77	195.25	192.75	191.17	189.91
12	189.22	194.96	197.12	195.39	198.28	198.47	197.69	196.84	195.11	192.71	191.13	189.88
13	189.37	194.93	197.13	195.31	198.09	198.43	197.79	196.91	194.99	192.63	191.08	189.84
14	190.23	195.16	197.10	195.31	197.92	198.61	197.79	196.91	194.88	192.58	191.05	189.81
15	191.64	196.37	196.91	195.25	198.16	199.19	197.81	197.06	194.80	192.52	191.00	189.77
16	192.19	196.59	196.66	195.26	198.46	199.28	197.78	197.30	194.65	192.49	190.96	189.74
17	192.43	196.46	196.48	195.37	198.49	199.28	197.60	197.29	194.56	192.45	190.90	189.72
18	192.53	196.45	196.41	196.18	198.36	199.29	197.45	197.29	194.45	192.40	190.86	189.69
19	192.63	196.27	196.43	196.58	198.16	199.28	197.31	197.21	194.37	192.35	190.81	189.70
20	193.23	196.05	196.42	196.70	198.04	199.16	197.18	197.11	194.23	192.30	190.78	189.69
21	193.79	195.84	196.51	196.50	197.93	198.97	197.20	197.03	194.14	192.26	190.74	189.67
22	193.88	195.81	196.57	196.41	197.87	198.73	197.08	196.98	194.06	192.21	190.69	189.64
23	193.85	195.82	196.72	196.23	197.75	198.64	197.04	196.90	193.99	192.17	190.65	189.62
24	193.76	196.24	196.86	196.09	197.63	198.60	197.03	196.89	193.94	192.14	190.59	189.59
25	193.57	196.97	196.80	195.97	197.56	198.54	197.00	196.87	193.86	192.10	190.56	189.57
26	193.79	197.09	196.80	195.82	197.51	198.56	196.93	196.78	193.76	192.04	190.53	189.54
27	194.08	197.33	196.69	195.72	197.41	198.44	196.82	196.66	193.69	191.99	190.50	189.52
28	194.15	197.35	196.64	195.67	197.18	198.46	196.72	196.56	193.61	191.89	190.46	189.49
29	194.09	197.30	196.60	195.59		198.66	196.71	196.49	193.55	191.77	190.42	189.47
30	194.13	197.15	196.48	195.53		198.58	196.59	196.39	193.48	191.71	190.38	189.47
31	194.21		196.51	195.41		198.48		196.34		191.68	190.33	
Avg WL	191.51	195.83	196.71	195.85	197.45	198.39	197.47	196.81	194.79	192.52	190.96	189.82
Max WL	194.28	197.41	197	196.75	198.91	199.36	198.35	197.30	196.23	193.41	191.65	190.31
Max Day Mean	194.21	197.35	197.13	196.70	198.78	199.29	198.30	197.30	196.20	193.40	191.64	190.30

Average Well Water Level for Water Year 2017: 194.84

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



LRS7a--3804 93rd Ave SW

Water Year: 2017 Well Water Levels are in feet

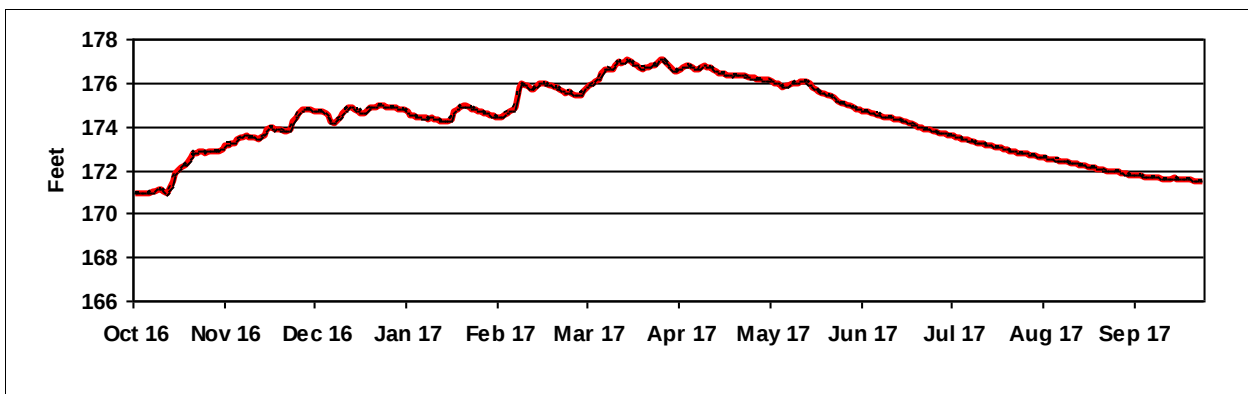
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	170.93	173.10	174.74	174.77	174.47	175.44	176.78	176.18	175.01	173.76	172.78	171.92
02	170.94	173.19	174.73	174.67	174.43	175.46	176.68	176.16	174.95	173.71	172.73	171.88
03	170.95	173.25	174.72	174.56	174.42	175.62	176.57	176.13	174.89	173.72	172.70	171.84
04	170.95	173.28	174.71	174.53	174.52	175.83	176.52	176.14	174.82	173.68	172.67	171.83
05	170.96	173.40	174.59	174.47	174.64	175.91	176.66	176.14	174.77	173.64	172.63	171.79
06	170.96	173.49	174.49	174.42	174.71	175.94	176.71	176.07	174.71	173.59	172.59	171.79
07	171.00	173.54	174.20	174.39	174.75	176.11	176.78	176.01	174.67	173.57	172.59	171.77
08	171.04	173.56	174.16	174.39	174.92	176.21	176.79	175.95	174.67	173.52	172.54	171.75
09	171.11	173.55	174.28	174.38	175.76	176.44	176.73	175.87	174.64	173.50	172.52	171.74
10	171.12	173.52	174.43	174.43	175.96	176.66	176.65	175.80	174.60	173.46	172.50	171.71
11	171.01	173.48	174.60	174.37	175.92	176.67	176.59	175.86	174.56	173.41	172.47	171.70
12	170.91	173.46	174.76	174.32	175.85	176.60	176.73	175.89	174.49	173.38	172.45	171.69
13	171.09	173.47	174.84	174.29	175.75	176.61	176.78	175.95	174.46	173.35	172.45	171.68
14	171.46	173.59	174.86	174.26	175.72	176.80	176.76	175.97	174.41	173.31	172.43	171.65
15	171.82	173.84	174.82	174.25	175.89	176.98	176.72	176.01	174.45	173.28	172.37	171.66
16	172.01	173.96	174.74	174.22	175.98	176.93	176.65	176.12	174.43	173.23	172.34	171.63
17	172.13	173.93	174.65	174.31	175.96	176.97	176.55	176.10	174.38	173.21	172.32	171.60
18	172.23	173.85	174.61	174.66	175.94	177.11	176.48	176.04	174.35	173.17	172.30	171.60
19	172.29	173.86	174.70	174.82	175.88	177.00	176.44	175.95	174.30	173.15	172.27	171.63
20	172.57	173.84	174.84	174.92	175.86	176.88	176.40	175.83	174.25	173.13	172.24	171.64
21	172.74	173.80	174.85	174.94	175.83	176.80	176.38	175.73	174.21	173.09	172.21	171.63
22	172.82	173.80	174.86	174.94	175.76	176.71	176.34	175.65	174.16	173.04	172.16	171.61
23	172.84	173.86	174.99	174.88	175.70	176.66	176.32	175.56	174.11	173.03	172.15	171.60
24	172.85	174.21	174.97	174.83	175.64	176.74	176.38	175.50	174.07	172.99	172.12	171.58
25	172.82	174.44	174.94	174.79	175.57	176.73	176.38	175.41	174.01	172.96	172.08	171.57
26	172.89	174.62	174.92	174.73	175.58	176.77	176.39	175.40	173.94	172.90	172.07	171.56
27	172.91	174.76	174.93	174.68	175.53	176.78	176.31	175.33	173.90	172.87	172.01	171.54
28	172.91	174.82	174.90	174.63	175.46	176.86	176.25	175.22	173.87	172.84	171.98	171.52
29	172.88	174.82	174.87	174.59		177.11	176.24	175.19	173.84	172.80	171.95	171.52
30	172.89	174.81	174.81	174.54		177.04	176.22	175.11	173.79	172.79	171.94	171.50
31	173.00		174.80	174.48		176.91		175.06		172.75	171.95	
Avg WL	171.90	173.84	174.72	174.56	175.44	176.56	176.54	175.78	174.39	173.25	172.34	171.67
Max WL	173.04	174.82	175	174.95	175.98	177.13	176.84	176.19	175.01	173.76	172.79	171.93
Max Day Mean	173.00	174.82	174.99	174.94	175.98	177.11	176.79	176.18	175.01	173.76	172.78	171.92

Average Well Water Level for Water Year 2017: 174.25

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



LRS8--8943 Walter Ct SW

Water Year: 2017 Well Water Levels are in feet

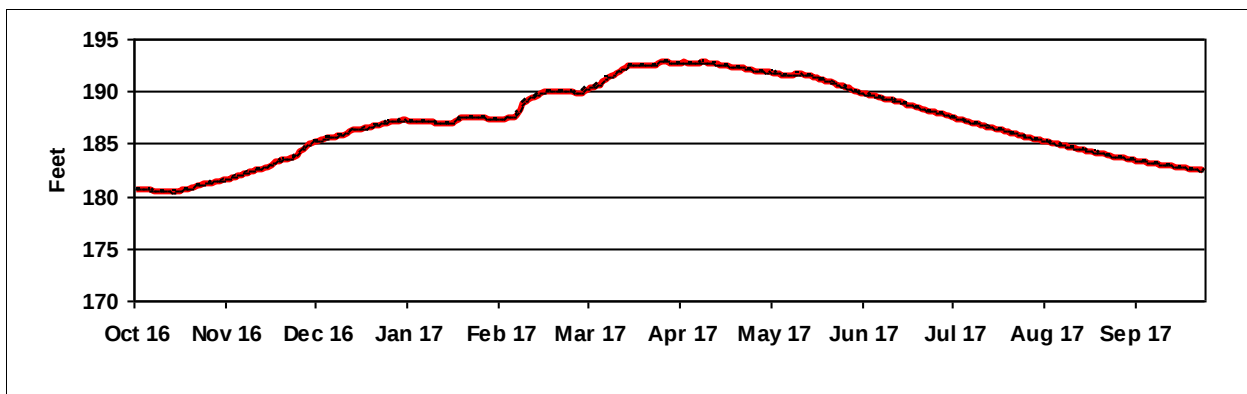
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	180.70	181.62	185.21	187.31	187.37	189.88	192.80	191.99	190.33	187.99	185.69	183.77
02	180.68	181.70	185.29	187.23	187.36	189.94	192.74	191.93	190.23	187.89	185.61	183.73
03	180.69	181.79	185.38	187.21	187.37	190.12	192.69	191.89	190.11	187.86	185.55	183.66
04	180.67	181.90	185.47	187.17	187.36	190.30	192.65	191.95	189.99	187.80	185.47	183.62
05	180.62	182.00	185.57	187.19	187.55	190.35	192.74	191.93	189.92	187.71	185.41	183.53
06	180.60	182.10	185.59	187.17	187.55	190.35	192.83	191.84	189.84	187.62	185.33	183.48
07	180.56	182.21	185.64	187.16	187.60	190.53	192.75	191.75	189.77	187.54	185.27	183.44
08	180.52	182.29	185.72	187.19	187.77	190.66	192.73	191.69	189.70	187.46	185.20	183.35
09	180.50	182.39	185.75	187.13	188.36	190.95	192.71	191.61	189.66	187.40	185.14	183.32
10	180.47	182.48	185.82	187.14	188.84	191.21	192.68	191.52	189.59	187.30	185.08	183.28
11	180.43	182.57	185.93	187.04	189.12	191.41	192.73	191.56	189.51	187.24	184.99	183.23
12	180.42	182.60	186.07	186.99	189.32	191.49	192.82	191.58	189.41	187.15	184.93	183.17
13	180.41	182.67	186.23	186.96	189.42	191.61	192.82	191.65	189.32	187.06	184.88	183.14
14	180.42	182.76	186.37	186.96	189.49	191.77	192.76	191.67	189.26	186.99	184.82	183.09
15	180.53	182.85	186.44	186.94	189.70	192.03	192.78	191.71	189.25	186.90	184.74	183.05
16	180.58	182.98	186.43	186.96	189.84	192.13	192.76	191.74	189.19	186.84	184.65	183.01
17	180.62	183.12	186.44	187.01	189.96	192.34	192.64	191.65	189.12	186.78	184.61	182.98
18	180.67	183.28	186.52	187.20	190.02	192.46	192.55	191.61	189.06	186.69	184.56	182.94
19	180.73	183.39	186.56	187.35	190.04	192.55	192.51	191.52	188.99	186.62	184.51	182.91
20	180.81	183.46	186.60	187.48	190.08	192.59	192.45	191.40	188.87	186.55	184.45	182.86
21	180.91	183.51	186.73	187.51	190.06	192.57	192.47	191.32	188.79	186.48	184.39	182.81
22	181.01	183.61	186.81	187.55	190.07	192.48	192.40	191.24	188.72	186.40	184.31	182.77
23	181.11	183.67	186.87	187.54	190.06	192.50	192.37	191.13	188.63	186.35	184.26	182.73
24	181.18	183.79	186.94	187.55	190.02	192.53	192.39	191.05	188.56	186.27	184.20	182.70
25	181.22	184.02	186.97	187.54	190.03	192.54	192.35	190.95	188.47	186.19	184.14	182.66
26	181.29	184.27	187.07	187.50	190.07	192.60	192.30	190.90	188.37	186.10	184.09	182.63
27	181.35	184.53	187.10	187.49	190.03	192.56	192.19	190.78	188.29	186.03	184.04	182.60
28	181.41	184.75	187.16	187.49	189.88	192.69	192.11	190.67	188.22	185.96	183.96	182.55
29	181.46	185.00	187.21	187.46		192.88	192.11	190.61	188.14	185.86	183.86	182.51
30	181.53	185.15	187.20	187.45		192.88	192.03	190.52	188.06	185.79	183.83	182.47
31	181.56		187.30	187.39		192.87		190.44		185.71	183.83	
Avg WL	180.83	183.08	186.34	187.27	189.08	191.73	192.56	191.41	189.18	186.86	184.70	183.07
Max WL	181.59	185.18	187	187.56	190.11	192.89	192.88	192.05	190.35	188.00	185.71	183.78
Max Day Mean	181.56	185.15	187.30	187.55	190.08	192.88	192.83	191.99	190.33	187.99	185.69	183.77

Average Well Water Level for Water Year 2017: 187.18

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



LRS9--2729 93rd Ave SW (Lathrop)

Water Year: 2017 Well Water Levels are in feet

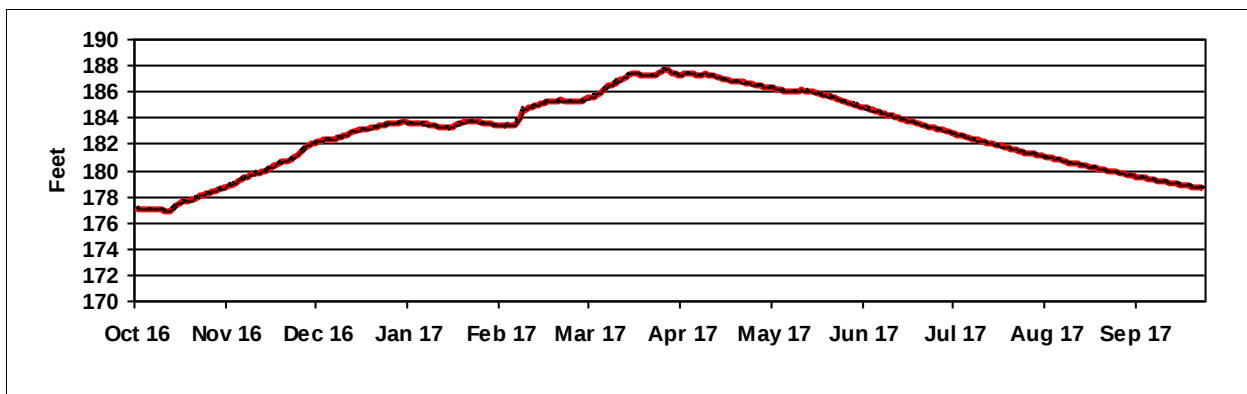
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	177.13	178.74	182.12	183.70	183.44	185.21	187.54	186.50	185.19	183.16	181.37	179.80
02	177.09	178.84	182.17	183.64	183.42	185.24	187.43	186.45	185.10	183.08	181.32	179.76
03	177.09	178.93	182.23	183.62	183.40	185.37	187.35	186.40	185.03	183.06	181.27	179.71
04	177.07	179.03	182.31	183.62	183.38	185.50	187.27	186.39	184.94	183.00	181.20	179.67
05	177.03	179.14	182.35	183.60	183.51	185.57	187.29	186.33	184.87	182.93	181.16	179.62
06	176.99	179.28	182.36	183.57	183.45	185.63	187.38	186.27	184.80	182.86	181.09	179.58
07	176.97	179.41	182.36	183.54	183.47	185.73	187.36	186.22	184.74	182.81	181.04	179.53
08	176.95	179.49	182.42	183.55	183.61	185.86	187.38	186.17	184.66	182.74	180.99	179.48
09	176.97	179.59	182.47	183.49	184.06	186.06	187.37	186.11	184.60	182.68	180.93	179.44
10	176.96	179.70	182.54	183.47	184.52	186.31	187.26	186.06	184.53	182.61	180.88	179.40
11	176.92	179.79	182.63	183.38	184.72	186.48	187.23	186.00	184.47	182.56	180.83	179.36
12	176.88	179.84	182.73	183.32	184.82	186.53	187.28	185.98	184.38	182.48	180.78	179.32
13	176.91	179.89	182.84	183.28	184.87	186.60	187.35	185.99	184.31	182.42	180.71	179.28
14	177.10	179.97	182.95	183.26	184.90	186.71	187.31	186.02	184.25	182.36	180.67	179.23
15	177.38	180.11	183.03	183.22	184.99	186.89	187.28	186.07	184.19	182.30	180.61	179.20
16	177.50	180.22	183.06	183.21	185.06	187.00	187.26	186.12	184.13	182.24	180.56	179.16
17	177.57	180.31	183.08	183.24	185.16	187.14	187.15	186.10	184.07	182.19	180.51	179.11
18	177.62	180.40	183.11	183.46	185.23	187.27	187.06	186.10	184.01	182.12	180.46	179.07
19	177.65	180.52	183.15	183.54	185.27	187.36	186.99	186.04	183.94	182.06	180.41	179.04
20	177.73	180.62	183.22	183.64	185.30	187.38	186.94	185.96	183.87	182.01	180.36	179.00
21	177.86	180.68	183.27	183.67	185.31	187.34	186.92	185.90	183.80	181.94	180.32	178.96
22	177.97	180.74	183.31	183.71	185.34	187.23	186.86	185.85	183.75	181.89	180.26	178.92
23	178.07	180.80	183.38	183.71	185.35	187.20	186.80	185.78	183.68	181.84	180.21	178.88
24	178.16	180.93	183.42	183.71	185.34	187.24	186.79	185.73	183.62	181.77	180.16	178.84
25	178.23	181.13	183.47	183.70	185.34	187.25	186.76	185.66	183.55	181.72	180.11	178.81
26	178.30	181.30	183.53	183.67	185.33	187.29	186.72	185.63	183.48	181.65	180.07	178.77
27	178.39	181.53	183.57	183.64	185.31	187.30	186.67	185.55	183.42	181.60	180.02	178.74
28	178.47	181.75	183.62	183.61	185.21	187.39	186.61	185.48	183.35	181.54	179.97	178.68
29	178.51	181.93	183.65	183.57		187.61	186.57	185.41	183.29	181.48	179.92	178.65
30	178.58	182.06	183.65	183.54		187.67	186.52	185.33	183.22	181.42	179.87	178.62
31	178.63		183.69	183.47		187.66		185.26		181.37	179.86	
Avg WL	177.57	180.22	182.96	183.53	184.61	186.68	187.09	185.96	184.17	182.25	180.58	179.19
Max WL	178.66	182.09	184	183.72	185.36	187.67	187.57	186.51	185.20	183.17	181.37	179.80
Max Day Mean	178.63	182.06	183.69	183.71	185.35	187.67	187.54	186.50	185.19	183.16	181.37	179.80

Average Well Water Level for Water Year 2017: 182.90

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



LRS11a--9605 Tilley Rd S

Water Year: 2017 Well Water Levels are in feet

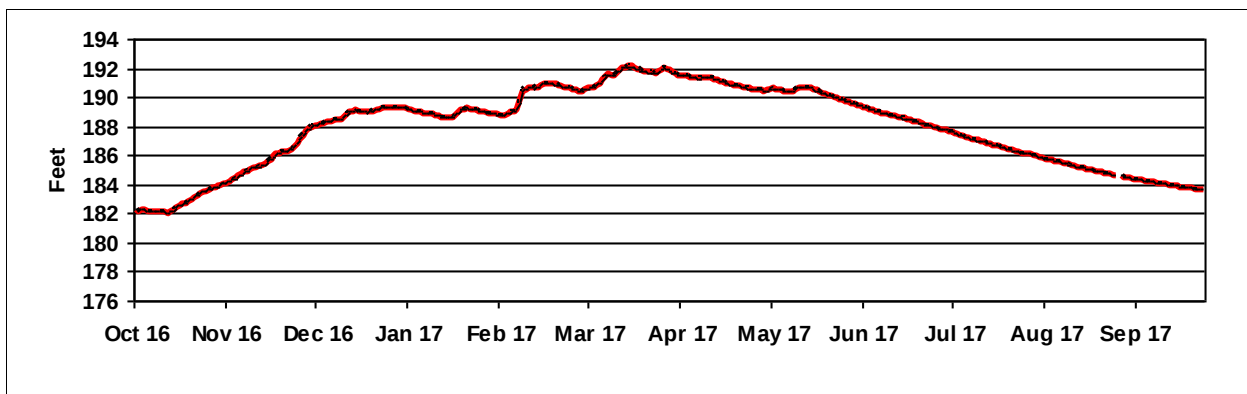
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	182.28	184.17	188.08	189.30	188.85	190.49	191.88	190.55	189.71	187.92	186.16	
02	182.25	184.26	188.15	189.22	188.80	190.48	191.76	190.51	189.63	187.85	186.10	184.61
03	182.30	184.37	188.20	189.16	188.78	190.55	191.66	190.47	189.56	187.83	186.05	184.57
04	182.26	184.48	188.28	189.10	188.79	190.67	191.57	190.51	189.48	187.78	185.99	184.53
05	182.24	184.61	188.35	189.05	188.91	190.74	191.54	190.63	189.41	187.71	185.93	184.49
06	182.21	184.76	188.40	189.00	188.99	190.75	191.55	190.64	189.34	187.63	185.87	184.45
07	182.20	184.91	188.43	188.94	189.09	190.86	191.50	190.61	189.28	187.57	185.82	184.41
08	182.18	184.98	188.46	188.93	189.23	191.02	191.44	190.57	189.21	187.51	185.76	184.37
09	182.17	185.08	188.49	188.88	189.99	191.22	191.42	190.51	189.18	187.44	185.71	184.34
10	182.15	185.17	188.56	188.85	190.48	191.53	191.35	190.44	189.12	187.38	185.68	184.30
11	182.12	185.23	188.68	188.80	190.62	191.60	191.33	190.41	189.06	187.32	185.62	184.27
12	182.10	185.28	188.90	188.74	190.68	191.57	191.36	190.42	188.98	187.25	185.57	184.23
13	182.15	185.33	189.05	188.70	190.67	191.58	191.40	190.48	188.92	187.19	185.52	184.20
14	182.28	185.42	189.12	188.65	190.64	191.68	191.37	190.61	188.87	187.13	185.46	184.16
15	182.47	185.60	189.15	188.61	190.74	191.92	191.36	190.68	188.83	187.07	185.42	184.12
16	182.58	185.82	189.09	188.59	190.90	192.01	191.32	190.74	188.79	187.01	185.36	184.09
17	182.69	185.99	189.02	188.60	190.98	192.07	191.23	190.74	188.75	186.96	185.31	184.06
18	182.77	186.13	189.00	188.80	190.99	192.15	191.15	190.73	188.70	186.90	185.25	184.03
19	182.85	186.23	189.01	189.01	190.95	192.15	191.07	190.67	188.66	186.83	185.21	184.01
20	183.00	186.28	189.06	189.19	190.94	192.09	191.02	190.58	188.59	186.78	185.17	183.97
21	183.16	186.33	189.11	189.24	190.91	192.00	190.98	190.50	188.53	186.71	185.12	183.93
22	183.31	186.37	189.16	189.27	190.86	191.88	190.92	190.42	188.47	186.66	185.07	183.90
23	183.44	186.43	189.24	189.24	190.81	191.79	190.86	190.34	188.41	186.61	185.02	183.87
24	183.53	186.59	189.29	189.20	190.75	191.77	190.84	190.26	188.36	186.55	184.98	183.84
25	183.59	186.88	189.32	189.16	190.69	191.74	190.81	190.18	188.30	186.49	184.93	183.81
26	183.69	187.18	189.34	189.10	190.66	191.74	190.77	190.16	188.22	186.43	184.89	183.77
27	183.78	187.45	189.35	189.06	190.60	191.71	190.70	190.07	188.16	186.38	184.84	183.75
28	183.86	187.70	189.35	189.02	190.52	191.75	190.65	190.00	188.10	186.32	184.81	183.71
29	183.92	187.89	189.36	188.97		191.99	190.61	189.92	188.04	186.26	184.75	183.69
30	184.00	188.02	189.33	188.93		192.05	190.57	189.85	187.98	186.21	184.71	183.65
31	184.07		189.33	188.87		192.00		189.78		186.20	184.70	
Avg WL	182.83	185.83	188.89	188.97	190.21	191.53	191.20	190.42	188.82	187.03	185.38	184.11
Max WL	184.10	188.04	189	189.31	190.99	192.16	191.91	190.75	189.73	187.92	186.16	184.61
Max Day Mean	184.07	188.02	189.36	189.30	190.99	192.15	191.88	190.74	189.71	187.92	186.16	184.61

Average Well Water Level for Water Year 2017: 187.94

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



LRS12--9411 SW Kimmie St

Water Year: 2017 Well Water Levels are in feet

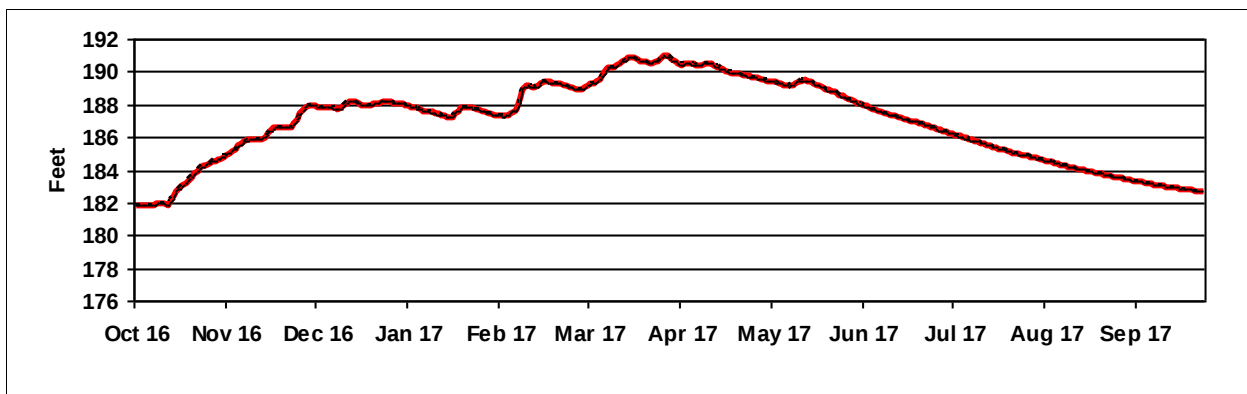
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	181.88	184.94	187.91	188.02	187.39	188.96	190.86	189.62	188.36	186.53	184.88	183.57
02	181.87	185.06	187.89	187.94	187.34	188.93	190.74	189.56	188.28	186.45	184.83	183.53
03	181.87	185.19	187.86	187.88	187.30	189.01	190.63	189.50	188.20	186.43	184.79	183.49
04	181.87	185.31	187.90	187.84	187.31	189.18	190.52	189.49	188.12	186.38	184.74	183.45
05	181.85	185.47	187.90	187.79	187.41	189.28	190.47	189.47	188.04	186.32	184.69	183.41
06	181.84	185.61	187.87	187.72	187.48	189.31	190.49	189.43	187.97	186.25	184.64	183.38
07	181.90	185.77	187.83	187.66	187.57	189.42	190.50	189.38	187.91	186.19	184.60	183.34
08	181.93	185.84	187.80	187.62	187.72	189.57	190.50	189.34	187.84	186.14	184.55	183.30
09	181.98	185.90	187.75	187.57	188.44	189.78	190.48	189.28	187.77	186.08	184.50	183.27
10	181.97	185.93	187.81	187.55	188.99	190.15	190.42	189.21	187.71	186.02	184.46	183.24
11	181.94	185.95	187.95	187.47	189.13	190.26	190.39	189.16	187.65	185.96	184.41	183.21
12	181.92	185.93	188.12	187.42	189.16	190.25	190.43	189.14	187.58	185.90	184.36	183.17
13	182.10	185.95	188.22	187.37	189.12	190.25	190.53	189.20	187.52	185.84	184.31	183.14
14	182.42	186.03	188.23	187.32	189.08	190.36	190.52	189.35	187.46	185.79	184.27	183.11
15	182.72	186.26	188.20	187.28	189.17	190.59	190.49	189.43	187.41	185.73	184.23	183.08
16	182.91	186.45	188.10	187.24	189.33	190.70	190.44	189.49	187.37	185.67	184.18	183.05
17	183.07	186.58	188.01	187.27	189.42	190.76	190.35	189.51	187.32	185.63	184.14	183.01
18	183.23	186.65	187.93	187.50	189.41	190.90	190.24	189.49	187.27	185.57	184.10	182.98
19	183.35	186.67	187.94	187.65	189.38	190.93	190.16	189.44	187.22	185.51	184.06	182.97
20	183.61	186.64	188.00	187.79	189.37	190.88	190.09	189.34	187.16	185.46	184.02	182.95
21	183.81	186.60	188.04	187.84	189.35	190.79	190.04	189.25	187.10	185.40	183.98	182.91
22	184.00	186.59	188.07	187.86	189.33	190.69	189.98	189.16	187.05	185.34	183.94	182.89
23	184.15	186.63	188.14	187.83	189.27	190.61	189.91	189.07	186.99	185.30	183.90	182.86
24	184.26	186.88	188.19	187.79	189.22	190.61	189.90	188.98	186.94	185.25	183.86	182.84
25	184.33	187.17	188.20	187.74	189.15	190.59	189.88	188.90	186.89	185.19	183.82	182.81
26	184.45	187.45	188.19	187.68	189.11	190.59	189.86	188.87	186.82	185.14	183.79	182.79
27	184.54	187.68	188.18	187.63	189.06	190.60	189.81	188.78	186.76	185.08	183.74	182.76
28	184.61	187.86	188.14	187.57	188.99	190.66	189.75	188.70	186.70	185.03	183.70	182.73
29	184.66	187.93	188.12	187.52		190.94	189.70	188.61	186.64	184.98	183.66	182.72
30	184.72	187.95	188.08	187.47		191.04	189.65	188.53	186.58	184.93	183.62	182.69
31	184.84		188.05	187.41		190.97		188.45		184.88	183.61	
Avg WL	183.05	186.36	188.02	187.62	188.68	190.24	190.26	189.20	187.42	185.69	184.21	183.09
Max WL	184.88	187.95	188	188.02	189.43	191.05	190.89	189.62	188.38	186.53	184.88	183.57
Max Day Mean	184.84	187.95	188.23	188.02	189.42	191.04	190.86	189.62	188.36	186.53	184.88	183.57

Average Well Water Level for Water Year 2017: 186.99

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



MW1--10415 Littlerock Rd SW

Water Year: 2017 Well Water Levels are in feet

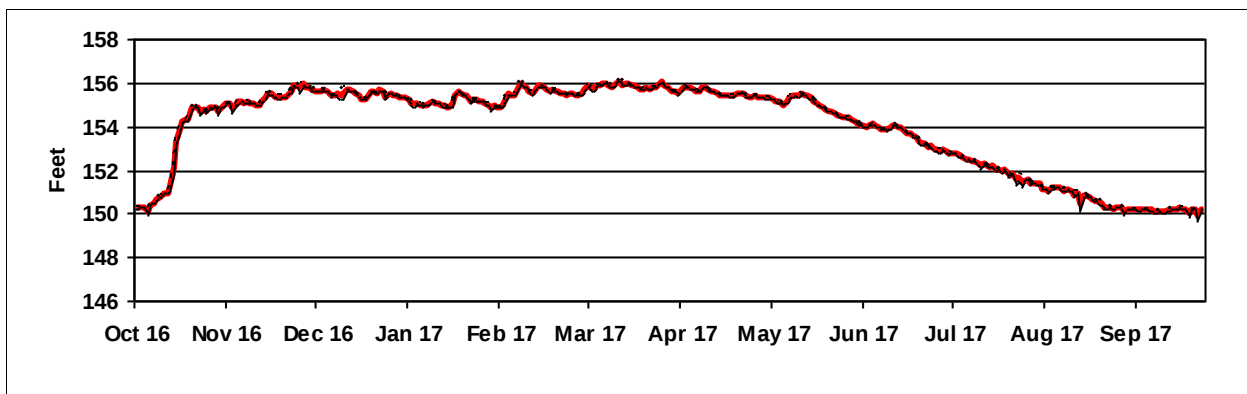
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	150.27	155.08	155.64	155.37	154.92	155.43	155.71	155.38	154.39	152.93	151.56	150.34
02	150.27	155.06	155.66	155.23	154.89	155.51	155.62	155.35	154.31	152.86	151.40	150.26
03	150.32	154.85	155.66	155.03	154.98	155.70	155.58	155.34	154.24	152.98	151.39	150.13
04	150.34	154.99	155.67	155.03	155.19	155.86	155.52	155.31	154.17	152.88	151.39	150.24
05	150.12	155.13	155.66	155.07	155.52	155.76	155.73	155.35	154.08	152.78	151.39	150.22
06	150.44	155.13	155.54	155.02	155.48	155.69	155.81	155.25	154.02	152.79	151.16	150.22
07	150.53	155.11	155.41	154.96	155.47	155.86	155.80	155.17	153.98	152.80	151.13	150.21
08	150.65	155.14	155.44	155.01	155.65	155.86	155.76	155.13	154.07	152.74	151.05	150.17
09	150.80	155.07	155.49	155.03	156.02	156.00	155.71	155.08	154.13	152.65	151.21	150.24
10	150.87	155.05	155.48	155.17	155.91	155.98	155.65	155.01	154.10	152.58	151.19	150.23
11	150.96	155.02	155.51	155.10	155.78	155.91	155.62	155.16	153.99	152.50	151.20	150.24
12	150.99	155.02	155.75	155.06	155.66	155.81	155.77	155.30	153.92	152.51	151.18	150.19
13	151.30	155.13	155.67	155.01	155.54	155.86	155.77	155.39	153.88	152.45	151.06	150.13
14	152.16	155.34	155.63	154.94	155.66	155.99	155.70	155.42	153.84	152.44	151.12	150.10
15	153.31	155.55	155.52	154.91	155.88	156.09	155.66	155.45	154.00	152.32	151.10	150.15
16	153.92	155.50	155.40	154.88	155.86	155.92	155.60	155.55	154.10	152.22	151.05	150.11
17	154.21	155.41	155.29	155.07	155.79	156.00	155.52	155.44	154.05	152.30	150.88	150.09
18	154.30	155.36	155.26	155.44	155.75	156.00	155.47	155.39	154.00	152.21	150.98	150.17
19	154.38	155.38	155.34	155.59	155.63	155.89	155.46	155.31	153.94	152.14	150.49	150.23
20	154.86	155.38	155.60	155.51	155.70	155.85	155.45	155.18	153.83	152.19	150.83	150.22
21	154.92	155.36	155.62	155.42	155.65	155.78	155.48	155.06	153.73	152.05	150.85	150.23
22	154.90	155.48	155.55	155.39	155.58	155.72	155.40	154.99	153.66	152.05	150.77	150.27
23	154.72	155.63	155.68	155.19	155.55	155.72	155.43	154.90	153.56	151.97	150.66	150.23
24	154.81	155.92	155.59	155.26	155.50	155.79	155.51	154.82	153.50	152.05	150.60	150.24
25	154.69	155.89	155.37	155.22	155.46	155.74	155.52	154.74	153.29	151.83	150.54	150.04
26	154.93	155.76	155.48	155.15	155.52	155.79	155.51	154.72	153.21	151.76	150.48	150.21
27	154.88	155.94	155.54	155.14	155.50	155.81	155.42	154.64	153.27	151.84	150.31	150.24
28	154.88	155.84	155.45	155.10	155.40	155.90	155.34	154.56	153.04	151.56	150.30	149.91
29	154.68	155.79	155.46	155.02		156.04	155.38	154.50	153.10	151.66	150.27	150.21
30	154.83	155.74	155.38	154.85		155.91	155.39	154.44	152.97	151.51	150.23	150.21
31	154.99		155.38	154.96		155.83		154.43		151.52	150.33	
Avg WL	152.85	155.37	155.52	155.13	155.55	155.84	155.58	155.09	153.81	152.29	150.91	150.19
Max WL	155.08	155.98	156	155.59	156.07	156.13	155.85	155.57	154.40	153.02	151.56	150.37
Max Day Mean	154.99	155.94	155.75	155.59	156.02	156.09	155.81	155.55	154.39	152.98	151.56	150.34

Average Well Water Level for Water Year 2017: 154.01

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



MW3a--3623 104TH Ave SW (Jones)

Water Year: 2017 Well Water Levels are in feet

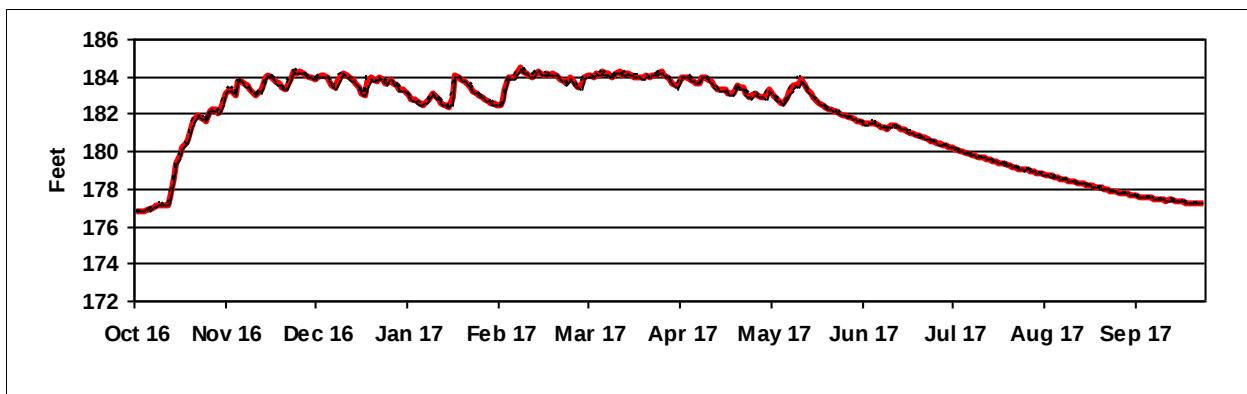
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	176.82	183.11	183.91	183.26	182.51	183.46	183.84	183.00	181.87	180.45	179.02	177.82
02	176.83	183.30	183.98	183.00	182.47	183.62	183.67	182.95	181.80	180.39	178.97	177.79
03	176.84	183.23	184.04	182.82	182.65	184.01	183.49	182.92	181.72	180.38	178.94	177.76
04	176.84	183.02	184.03	182.76	183.29	184.06	183.52	183.08	181.65	180.33	178.89	177.73
05	176.88	183.78	183.98	182.64	183.94	184.03	184.00	183.28	181.58	180.27	178.84	177.69
06	176.90	183.73	183.80	182.54	183.95	183.98	183.96	183.05	181.51	180.21	178.79	177.68
07	177.03	183.64	183.59	182.46	183.92	184.17	184.02	182.86	181.46	180.15	178.76	177.64
08	177.10	183.51	183.40	182.67	184.20	184.09	183.91	182.72	181.49	180.10	178.72	177.61
09	177.17	183.32	183.76	182.79	184.51	184.25	183.78	182.62	181.55	180.05	178.68	177.59
10	177.18	183.16	184.07	183.12	184.31	184.15	183.70	182.53	181.53	180.00	178.64	177.57
11	177.16	183.04	184.15	182.99	184.16	184.14	183.60	182.95	181.42	179.94	178.60	177.54
12	177.13	183.19	184.04	182.80	184.07	184.02	184.01	183.18	181.35	179.90	178.57	177.53
13	177.55	183.37	183.93	182.63	184.02	184.11	183.94	183.52	181.29	179.84	178.52	177.50
14	178.64	183.92	183.83	182.51	184.10	184.22	183.88	183.59	181.23	179.79	178.49	177.47
15	179.36	184.12	183.69	182.42	184.34	184.29	183.74	183.69	181.38	179.74	178.44	177.45
16	179.83	183.98	183.39	182.39	184.21	184.10	183.54	183.88	181.45	179.69	178.41	177.42
17	180.22	183.85	183.14	182.86	184.11	184.17	183.34	183.55	181.38	179.66	178.38	177.39
18	180.45	183.73	183.06	184.06	184.14	184.22	183.28	183.30	181.31	179.61	178.34	177.40
19	180.63	183.61	183.71	184.01	184.09	184.07	183.32	183.10	181.24	179.56	178.31	177.41
20	181.38	183.45	183.94	183.88	184.13	184.02	183.30	182.90	181.17	179.51	178.27	177.37
21	181.69	183.36	183.82	183.79	184.12	184.01	183.14	182.73	181.09	179.46	178.24	177.34
22	181.90	183.53	183.76	183.70	184.00	183.96	183.07	182.60	181.03	179.42	178.18	177.33
23	181.85	183.96	184.01	183.41	183.90	183.99	183.16	182.48	180.96	179.38	178.15	177.31
24	181.77	184.34	183.84	183.21	183.78	184.05	183.51	182.38	180.90	179.33	178.12	177.28
25	181.67	184.18	183.67	183.11	183.61	183.98	183.44	182.30	180.82	179.27	178.07	177.27
26	182.19	184.26	183.65	183.00	183.92	184.11	183.39	182.26	180.76	179.23	178.04	177.25
27	182.27	184.19	183.82	182.89	183.81	184.06	183.11	182.18	180.71	179.19	178.00	177.24
28	182.22	184.09	183.70	182.78	183.52	184.16	182.93	182.10	180.63	179.14	177.96	177.22
29	182.08	184.00	183.57	182.69		184.24	183.02	182.02	180.57	179.09	177.91	177.20
30	182.17	184.01	183.34	182.63		184.06	183.09	181.96	180.51	179.05	177.87	177.20
31	182.80		183.31	182.54		183.97		181.91		179.01	177.86	
Avg WL	179.50	183.67	183.74	182.98	183.85	184.06	183.52	182.83	181.25	179.71	178.42	177.47
Max WL	183.03	184.36	184	184.10	184.62	184.34	184.10	183.95	181.88	180.45	179.03	177.83
Max Day Mean	182.80	184.34	184.15	184.06	184.51	184.29	184.02	183.88	181.87	180.45	179.02	177.82

Average Well Water Level for Water Year 2017: 181.75

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



MW5--800 93rd Ave SE

Water Year: 2017 Well Water Levels are in feet

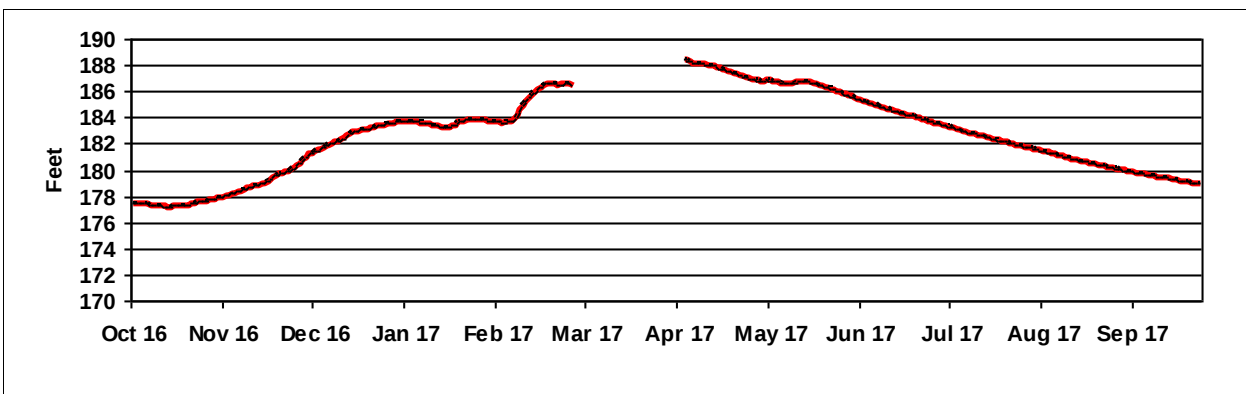
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	177.54	177.98	181.34	183.77	183.73			186.96	185.82	183.66	181.83	180.15
02	177.51	178.04	181.45	183.72	183.70			186.89	185.74	183.59	181.78	180.11
03	177.51	178.11	181.56	183.71	183.70			186.83	185.65	183.55	181.72	180.06
04	177.49	178.20	181.67	183.69	183.65			186.86	185.56	183.48	181.67	180.02
05	177.45	178.27	181.79	183.69	183.69			186.92	185.48	183.41	181.60	179.97
06	177.42	178.36	181.87	183.68	183.72			186.88	185.40	183.35	181.54	179.93
07	177.39	178.47	181.97	183.66	183.76		188.52	186.84	185.32	183.28	181.48	179.89
08	177.36	178.54	182.07	183.65	183.85		188.41	186.81	185.22	183.22	181.43	179.83
09	177.34	178.64	182.15	183.60	184.18		188.31	186.75	185.16	183.17	181.38	179.78
10	177.31	178.72	182.22	183.57	184.67		188.24	186.71	185.10	183.10	181.30	179.75
11	177.28	178.79	182.32	183.49	185.03		188.20	186.65	185.03	183.03	181.25	179.70
12	177.26	178.86	182.46	183.43	185.34		188.20	186.63	184.94	182.96	181.20	179.67
13	177.24	178.92	182.63	183.38	185.59		188.17	186.63	184.86	182.90	181.13	179.63
14	177.22	178.98	182.80	183.35	185.78		188.10	186.70	184.79	182.83	181.08	179.58
15	177.27	179.07	182.92	183.32	185.98		188.07	186.73	184.73	182.78	181.02	179.54
16	177.29	179.20	182.99	183.31	186.19		188.05	186.78	184.65	182.72	180.97	179.49
17	177.32	179.34	183.03	183.32	186.37		187.98	186.80	184.60	182.67	180.91	179.46
18	177.36	179.47	183.08	183.39	186.51		187.88	186.80	184.54	182.61	180.85	179.41
19	177.37	179.60	183.14	183.51	186.59		187.79	186.79	184.48	182.55	180.81	179.39
20	177.40	179.70	183.15	183.67	186.64		187.71	186.74	184.41	182.49	180.75	179.33
21	177.45	179.77	183.22	183.75	186.65		187.67	186.68	184.34	182.43	180.70	179.30
22	177.51	179.85	183.30	183.81	186.59 e		187.59	186.63	184.27	182.38	180.64	179.26
23	177.57	179.91	183.36	183.84	186.55 e		187.51	186.54	184.20	182.32	180.59	179.23
24	177.62	180.01	183.40	183.85	186.58 e		187.45	186.47	184.16	182.25	180.53	179.19
25	177.65	180.16	183.45	183.86	186.61 e		187.39	186.38	184.08	182.21	180.48	179.14
26	177.69	180.37	183.50	183.85	186.66		187.31	186.33	183.99	182.15	180.44	179.12
27	177.73	180.60	183.57	183.84	186.62		187.21	186.25	183.93	182.09	180.38	179.08
28	177.78	180.82	183.60	183.84	186.50		187.14	186.17	183.86	182.03	180.34	179.03
29	177.83	181.05	183.66	183.82			187.06	186.08	183.79	181.97	180.29	179.00
30	177.88	181.23	183.68	183.81			186.99	186.00	183.73	181.92	180.23	178.96
31	177.92		183.73	183.77				185.93		181.86	180.20	
Avg WL	177.48	179.30	182.74	183.64	185.41		187.79	186.62	184.73	182.74	180.98	179.53
Max WL	177.94	181.28	184	183.86	186.68		188.54	186.97	185.84	183.68	181.84	180.16
Max Day Mean	177.92	181.23	183.73	183.86	186.66		188.52	186.96	185.82	183.66	181.83	180.15

Average Well Water Level for Water Year 2017: 182.82

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



SSW1--Stuart St Well

Water Year: 2017 Well Water Levels are in feet

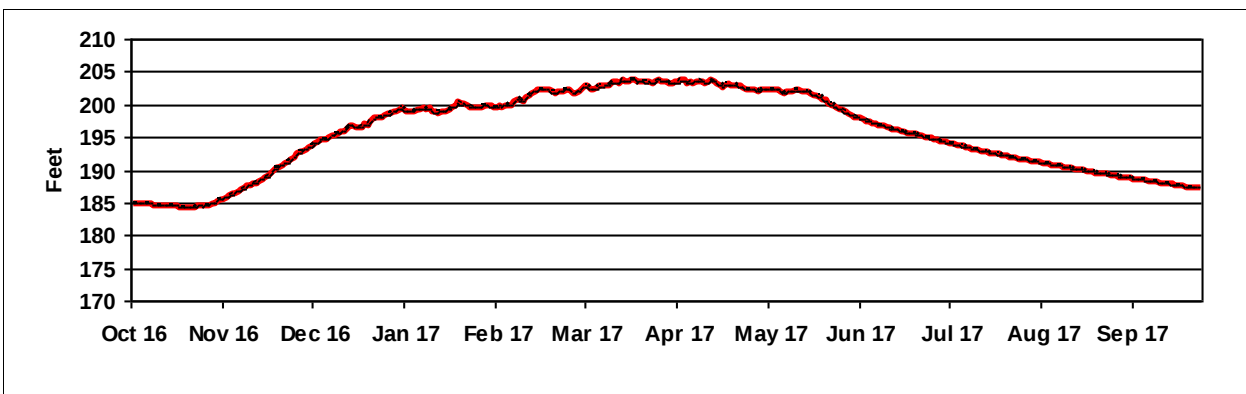
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	184.99	185.70	193.69	199.49	199.61	201.73	203.51	202.32	198.87	194.77	191.64	189.13
02	184.96	185.88	194.09	199.15	199.66	202.02	203.39	202.19	198.64	194.65	191.57	189.07
03	184.90	186.09	194.36	199.08	199.93	202.50	203.41	202.26	198.43	194.53	191.50	188.99
04	184.96	186.34	194.64	199.03	199.66	202.84	203.44	202.39	198.18	194.46	191.41	188.93
05	184.89	186.57	194.71	199.09	200.02	202.83	203.47	202.26	198.07	194.32	191.32	188.88
06	184.87	186.72	194.67	199.22	199.95	202.43	203.96	202.24	197.98	194.22	191.23	188.81
07	184.82	186.98	194.90	199.30	199.99	202.51	203.81	202.23	197.88	194.07	191.15	188.75
08	184.79	187.30	195.37	199.53	200.39	202.54	203.36	202.26	197.57	194.00	191.07	188.67
09	184.73	187.57	195.44	199.37	200.99	202.93	203.48	202.26	197.45	193.90	190.99	188.58
10	184.70	187.81	195.61	199.47	200.71	202.84	203.36	202.14	197.28	193.77	190.91	188.51
11	184.66	188.05	195.82	199.12	200.57	203.07	203.68	201.85	197.12	193.67	190.82	188.48
12	184.66	188.14	195.95	198.87	201.02	203.03	203.73	201.92	196.97	193.57	190.74	188.39
13	184.62	188.41	196.26	198.84	201.41	203.29	203.62	202.00	196.82	193.42	190.65	188.34
14	184.57	188.65	196.81	198.99	201.72	203.45	203.38	202.06	196.75	193.33	190.59	188.25
15	184.57	188.88	196.82	198.97	202.15	203.56	203.51	202.29	196.65	193.21	190.49	188.19
16	184.53	189.13	196.56	199.15	202.23	203.35	203.79	202.32	196.43	193.12	190.41	188.13
17	184.45	189.43	196.45	199.39	202.34	203.88	203.51	202.00	196.33	193.05	190.32	188.07
18	184.41	189.98	196.71	199.69	202.45	203.64	203.20	202.05	196.24	192.94	190.24	188.01
19	184.46	190.34	197.05	199.84	202.31	203.57	203.04	201.97	196.16	192.83	190.15	187.96
20	184.43	190.57	196.98	200.39	202.26	203.88	202.80	201.73	195.97	192.72	190.08	187.87
21	184.47	190.70	197.50	200.11	201.92	203.91	203.10	201.57	195.85	192.62	190.02	187.80
22	184.50	191.12	197.99	200.15	201.90	203.53	203.14	201.45	195.76	192.54	189.94	187.73
23	184.53	191.27	198.11	199.89	201.97	203.54	203.08	201.22	195.68	192.45	189.87	187.67
24	184.55	191.59	198.12	199.77	201.99	203.57	203.04	200.99	195.61	192.37	189.78	187.61
25	184.56	192.05	198.14	199.74	202.12	203.50	202.99	200.75	195.50	192.26	189.69	187.55
26	184.70	192.50	198.43	199.59	202.39	203.74	202.88	200.36	195.34	192.17	189.60	187.50
27	184.79	192.80	198.56	199.60	202.32	203.36	202.63	200.04	195.23	192.07	189.54	187.45
28	184.93	192.87	198.65	199.75	201.84	203.49	202.38	199.79	195.09	191.99	189.48	187.39
29	185.09	193.35	199.00	199.81		203.84	202.49	199.60	194.98	191.88	189.39	187.32
30	185.38	193.56	198.94	199.90		203.54	202.27	199.35	194.90	191.79	189.30	187.26
31	185.51		199.41	199.80		203.56		199.21		191.71	189.20	
Avg WL	184.74	189.35	196.64	199.49	201.28	203.21	203.25	201.52	196.66	193.17	190.42	188.18
Max WL	185.59	193.59	200	200.42	202.46	204.08	204.23	202.44	198.96	194.79	191.65	189.15
Max Day Mean	185.51	193.56	199.41	200.39	202.45	203.91	203.96	202.39	198.87	194.77	191.64	189.13

Average Well Water Level for Water Year 2017: 195.66

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Well Water Level-- Mean, Maximum, Minimum:



Appendix D – Lake Level Data

10b--Lake St. Clair

Water Year: 2017 Lake Levels are in feet

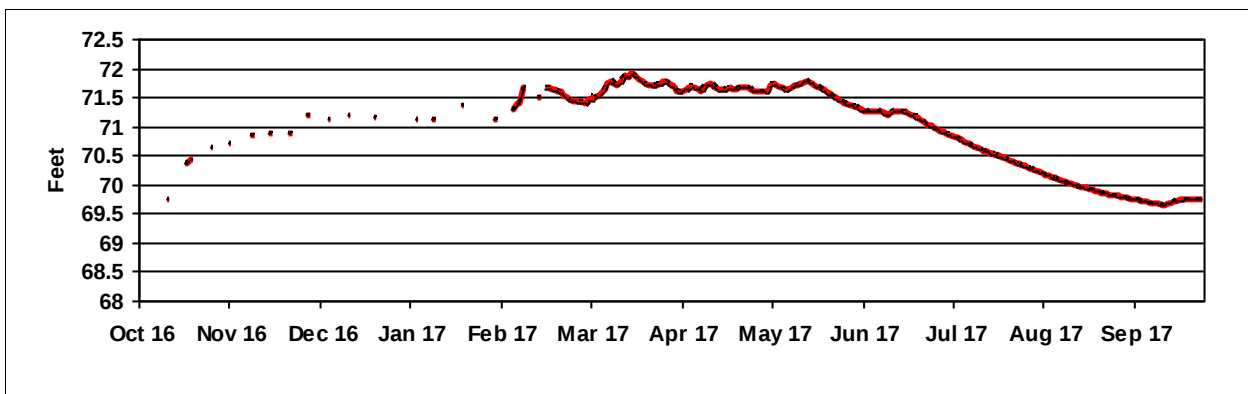
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01		70.71				71.42	71.70	71.61	71.38	70.96	70.30	69.81
02						71.41	71.66	71.60	71.36	70.93	70.28	69.79
03				71.13		71.42	71.62	71.60	71.34	70.91	70.26	69.78
04			71.12	71.13		71.47	71.59	71.61	71.32	70.89	70.24	69.77
05	69.58		71.12		71.30	71.49	71.61	71.71	71.29	70.86	70.22	69.76
06					71.30	71.50	71.65	71.73	71.27	70.84	70.20	69.75
07					71.40	71.53	71.68	71.72	71.26	70.82	70.18	69.74
08		70.84			71.40	71.58	71.68	71.69	71.27	70.80	70.16	69.74
09		70.84		71.13	71.68	71.65	71.66	71.66	71.27	70.77	70.14	69.73
10	69.76			71.13	71.68	71.75	71.65	71.63	71.28	70.75	70.12	69.72
11	69.76		71.20			71.77	71.62	71.63	71.27	70.72	70.10	69.71
12			71.20			71.75	71.66	71.68	71.25	70.70	70.08	69.70
13						71.72	71.72	71.70	71.23	70.68	70.07	69.69
14		70.90			71.50	71.74	71.73	71.72	71.21	70.66	70.05	69.68
15		70.90			71.50	71.80	71.71	71.73	71.22	70.64	70.03	69.67
16	70.38					71.87	71.68	71.76	71.28	70.61	70.01	69.66
17	70.38				71.66	71.86	71.64	71.79	71.28	70.59	69.99	69.66
18	70.44				71.66	71.90	71.63	71.78	71.28	70.57	69.98	69.68
19	70.44			71.35	71.65	71.90	71.63	71.75	71.27	70.55	69.96	69.70
20			71.15	71.35	71.63	71.86	71.64	71.72	71.25	70.54	69.96	69.72
21		70.90	71.15		71.62	71.82	71.66	71.69	71.23	70.52	69.95	69.73
22		70.90			71.59	71.79	71.65	71.66	71.21	70.50	69.93	69.74
23					71.55	71.74	71.64	71.63	71.18	70.48	69.92	69.74
24					71.51	71.72	71.66	71.59	71.15	70.46	69.90	69.74
25	70.64				71.47	71.71	71.68	71.56	71.12	70.45	69.89	69.74
26	70.64				71.45	71.70	71.69	71.53	71.09	70.42	69.87	69.75
27		71.20			71.44	71.72	71.67	71.50	71.06	70.40	69.86	69.75
28		71.20			71.43	71.73	71.64	71.46	71.04	70.38	69.84	69.75
29						71.77	71.62	71.43	71.02	70.36	69.83	69.75
30				71.11		71.77	71.62	71.41	70.99	70.34	69.82	69.76
31	70.71			71.11		71.74		71.39		70.32	69.82	
Avg WL	70.27	70.93	71.16	71.18	71.52	71.70	71.66	71.63	71.22	70.63	70.03	69.73
Max WL	70.71	71.20	71	71.35	71.68	71.93	71.75	71.80	71.40	70.97	70.31	69.81
Max Day Mean	70.71	71.20	71.20	71.35	71.68	71.90	71.73	71.79	71.38	70.96	70.30	69.81

Average Lake Level for Water Year 2017: 70.97

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Lake Level-- Mean, Maximum, Minimum:



18b--Long Lake Level

Water Year: 2017 Lake Levels are in feet

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
01	1.70	2.45	2.70	2.67	2.51	2.91	3.15	2.95	2.62	2.26	2.00	1.86
02	1.70	2.45	2.69	2.65	2.48	2.90	3.13	2.92	2.60	2.24	1.99	1.85
03	1.69	2.45	2.68	2.63	2.49	2.92	3.10	2.92	2.59	2.23	1.99	1.83
04	1.70	2.44	2.70	2.60	2.55	2.95	3.08	2.95	2.56	2.21	1.98	1.83
05	1.70	2.47	2.69	2.60	2.64	2.95	3.11	3.01	2.54	2.20	1.97	1.81
06	1.72	2.51	2.68	2.57	2.70	2.94	3.12	2.99	2.52	2.19	1.96	1.81
07	1.74	2.51	2.65	2.55	2.70	2.96	3.13	2.96	2.51	2.18	1.95	1.81
08	1.76	2.49	2.63	2.56	2.71	2.98	3.12	2.93	2.53	2.16	1.95	1.81
09	1.79	2.48	2.65	2.58	2.87	3.01	3.10	2.91	2.53	2.15	1.95	1.81
10	1.80	2.46	2.67	2.58	2.94	3.07	3.09	2.88	2.52	2.14	1.94	1.81
11	1.81	2.44	2.70	2.58	2.94	3.08	3.07	2.90	2.51	2.13	1.93	1.81
12	1.80	2.45	2.73	2.57	2.92	3.07	3.11	2.91	2.50	2.12	1.92	1.81
13	1.86	2.45	2.72	2.55	2.91	3.07	3.13	2.92	2.48	2.11	1.92	1.80
14	2.02	2.47	2.70	2.54	2.89	3.11	3.13	2.91	2.46	2.10	1.91	1.80
15	2.16	2.56	2.69	2.53	2.95	3.15	3.11	2.91	2.47	2.09	1.91	1.80
16	2.23	2.58	2.68	2.52	3.01	3.20	3.09	2.94	2.48	2.08	1.90	1.78
17	2.26	2.57	2.65	2.52	3.00	3.20	3.07	2.92	2.47	2.07	1.88	1.77
18	2.28	2.56	2.63	2.64	3.02	3.23	3.06	2.90	2.47	2.06	1.87	1.78
19	2.28	2.54	2.64	2.69	3.02	3.23	3.07	2.87	2.46	2.06	1.87	1.81
20	2.35	2.52	2.68	2.69	3.01	3.20	3.07	2.86	2.45	2.06	1.86	1.82
21	2.39	2.51	2.68	2.69	3.02	3.19	3.06	2.83	2.42	2.05	1.86	1.82
22	2.40	2.50	2.66	2.69	3.00	3.18	3.05	2.81	2.40	2.05	1.88	1.82
23	2.39	2.52	2.71	2.67	2.98	3.17	3.04	2.79	2.38	2.04	1.88	1.82
24	2.39	2.58	2.72	2.65	2.96	3.18	3.05	2.76	2.36	2.04	1.89	1.82
25	2.38	2.64	2.71	2.63	2.93	3.16	3.04	2.74	2.35	2.04	1.88	1.80
26	2.42	2.66	2.70	2.61	2.93	3.16	3.03	2.72	2.34	2.02	1.88	1.81
27	2.44	2.70	2.71	2.59	2.93	3.16	3.01	2.70	2.31	2.02	1.87	1.80
28	2.43	2.71	2.71	2.57	2.92	3.16	2.98	2.68	2.30	2.01	1.86	1.80
29	2.41	2.70	2.70	2.55		3.19	2.97	2.67	2.29	2.01	1.86	1.80
30	2.39	2.71	2.69	2.53		3.19	2.96	2.65	2.27	2.00	1.85	1.80
31	2.44		2.68	2.52		3.16		2.62		2.01	1.84	
Avg WL	2.09	2.54	2.68	2.60	2.85	3.10	3.07	2.85	2.46	2.10	1.91	1.81
Max WL	2.47	2.73	2.7	2.70	3.04	3.26	3.17	3.02	2.63	2.28	2.03	1.89
Max Day Mean	2.44	2.71	2.73	2.69	3.02	3.23	3.15	3.01	2.62	2.26	2.00	1.86

Average Lake Level for Water Year 2017: 2.51

Stage is computed from matching datum to logger records.

Thurston County Stormwater Utility (360) 754-4681

Annual Lake Level-- Mean, Maximum, Minimum:

