Soundview Consultants LLC
Environmental Assessment • Planning • Land Use Solutions

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Technical Memorandum

To: **Chris Beale, City of Puyallup** **Project Number: 1273.0009**

From: **Jon Pickett, Soundview Consultants LLC** **Date: February 21, 2024**

Re: **Response to Third Party Review Comments**
2007 Shaw Road, Puyallup, Washington 98327

Dear Chris,

Soundview Consultants LLC (SVC) has been supporting RM Homes (Applicant) with a wetland and fish and wildlife habitat assessment for proposed residential development of an approximately 28.2-acre property located at 2007 Shaw Road in the City of Puyallup, Washington. The subject property consists of one parcel situated in the Southeast ¼ of Section 35, Township 20 North, Range 04 East, W.M. (Pierce County Tax Parcel Number 0420354039). The City's third-party reviewer, Confluence Environmental Company ("Confluence") reviewed the *Wetland and Fish and Wildlife Habitat Assessment Report* (SVC, 2022) submitted to the City. Confluence completed a site investigation on July 5, 2022, to review the findings detailed in the submitted documents, and provided comments in response to their site investigations in a letter entitle *Normandy Heights Plat Wetland and Fish and Wildlife Habitat Assessment Report – Third Party Review* dated July 18, 2022 (Confluence, 2022).

This Technical Memorandum has been prepared in response to Confluence's comments (Confluence, 2022). This memorandum supersedes any inconsistencies that may remain between the memorandum and the report. Below are Confluence's critical area comments (italicized) that require addressing followed by SVC's responses.

General Comments

1) *Update the critical areas report to include a discussion about the stormwater management or submit a sperate stormwater management report.*

   The project engineer will submit a stormwater management report.

2) *Revise the wetland determination data forms in Appendix E to correct the vegetation indicator statuses.*

   The vegetation indicator statuses have been revised. Vine maple (*Acer circinatum)*, piggy-back plant (*Tolmeia mensiezii)*, and field horsetail (*Equisetum arvense)* were changed to FAC status. According to the most recent USACE National Wetland Plant List (NWPL) Version 3.5, Scotch broom is considered an upland, or UPL, species, and has been revised to reflect this change. As noted by

Confluence, this does not change any of the outcomes for the hydrophytic vegetation criteria on either DP-1U or DP-2W.

3) *Reassess and revise the delineation of Wetland A to include the wetland area to the northeast of the stream and update the field-flagging to extend to the site boundary and wetland boundary flag attached to the fence. Update the report and appendices C, D, and E accordingly.*

SVC investigated these areas during the site visits completed on November 16, 2021, and January 5, 2022. Conditions during the November 2021 site investigation were significantly above normal for the prior 30 days and water year (209 percent of normal and 178 percent of normal, respectively), indicating likely exaggerated hydrologic conditions. SVC dug a test pit to 16 inches in approximately the same location as noted by Confluence (south of and between flags Z-5 and Z-6) during the November 2021 site investigation and no evidence of groundwater was observed. Given the time of year (wet season) and wetter than normal conditions, groundwater would have been expected to be present in this area if wetland conditions were met.

Table 1. Precipitation Summary[1]

Date	Day of	Day Before	1 Week Prior	2 Weeks Prior	30 Days Prior (Observed/Normal)	Year to Date (Observed/ Normal)[2]	Percent of Normal[3]
11/16/2021	0.00	0.20	4.67	6.95	11.68/5.60	12.85/7.22	209/178
1/5/2022	0.33	0.22	1.96	3.30	5.33/5.73	21.93/16.90	93/130
7/5/2022	0.02	0.00	0.12	0.16	2.31/1.35	45.11/36.29	171/124

Notes:

1. Precipitation levels provided in inches. Data obtained from NOAA (http://w2.weather.gov/climate/xmacis.php?wfo=sew) for SeaTac International Airport. Precipitation data is missing for the following dates and may skew calculations for percent of normal: 12/18, 12/28, and 12/30.
2. Year-to-date precipitation is for the 2021/2022 water year from October 1 to the onsite dates.
3. Percent of normal is shown for the last 30 days and water year to date.

Confluence completed their site visit on July 5, 2022. Precipitation levels during this time were above normal for the prior 30 days (171 percent of statistical normal), and within the normal range for the 2021/2022 water year (124 percent of statistical normal). It should be noted that that water year typically tapers off in late May or June, however, due to an abnormally wet June, the water year appears to have lasted longer than normal. Review of the USACE Antecedent Precipitation Tool (APT) indicates that conditions were wetter than normal onsite when considering the onsite conditions as well as the three months leading up to Confluence's site visit. This area failed to exhibit wetland hydrology during above normal conditions in the winter, but exhibited wetland hydrology during Confluence's site investigation. Therefore, the hydrology observed by Confluence during the July site investigation may have been a result of abnormally high precipitation levels that were maintained throughout the winter and into the early summer months, and are likely not representative of normal conditions. Given these abnormally high precipitation levels combined previous lack of wetland hydrology and unconfirmed hydric soils, this area does not appear to meet wetland criteria.

4) *Update the Appendix F – wetland rating form sections H1.1 H1.2 and H1.4 for Wetland A as described above. Please note that this is may also result in an increase in wetland buffer widths.*

The wetland rating form has been updated to include a forested Cowardin classification, permanently flowing hydroperiod, and increased interspersion. This increased the overall habitat score from 4 to 5, which is still considered low, and did not change the wetland rating. As such, there is no change to the buffer width.

Regarding H1.4 – Per the steps provided in the guidance, we would not start the steps over again to pick up the additional undisturbed; that total was already tallied in step two and also the undisturbed at that point would no longer be contiguous with the wetland boundary and is separated by human disturbance (low and moderate land uses). Per the manual:

To calculate the accessible habitat around the wetland unit you are rating, follow these steps:

1. Highlight all polygons of relatively undisturbed land uses on your map that are contiguous with the wetland boundary and not separated from the wetland by some human disturbance.

2. Estimate the relative area of all such polygons as a percent of the total area within the larger 1 km Polygon. You do not need to measure actual acreages, just the percent of the total areas within the larger polygon (Figure 48). Include this number on the rating form.

3. Highlight all polygons of moderate or low intensity land uses that are contiguous with the wetland boundary or to the relatively undisturbed areas mapped in #1 above.

4. Estimate the relative area of the polygons categorized as moderate or low intensity as a percent of the total area within the larger 1 km Polygon. Divide this result by 2 and add it to the percent of accessible, undisturbed, habitat calculated in steps #1 and #2 above.

Human disturbance is defined in many ways in the manual. Accessible habitat is defined as the amount of habitat that can be reached from the wetland without crossing a human land use (e.g., roads, fields, and development). In the rationale for what a "regular disturbance" is, that would deem a parcel not relatively undisturbed, they define it with a list that contain both high and low/moderate uses. Below are the regular disturbances (mixed high and low):

- Tilling and cropping
- Residential and urban development
- Grazing
- Paved roads or frequently used gravel roads (both)
- Mowing
- Pets
- Boating and fishing

According to this method, roads can be high or they can be low or even undisturbed if used less than once or twice a week. If it is used daily it is considered "disturbed" (not high or low in the manual but "disturbed"). Fields can also be high or low. Fields that are tilled annually or are home to livestock are considered high. Hay fields, orchards, and pastures are low and moderate intensity but are still a human disturbance by their definition. The example in the manual and the reviewers comment states "development" as a human land use. The rating manual breaks development into residential and urban categories both are considered a human disturbance. Residential is considered low and moderate unless it is a multi-unit property or a property less than 1 acre in

size. Urban development is considered high and would consist of commercial and industrial uses (as well as those less than 1-acre parcels already mentioned).

Utilizing this approach, the site itself is considered moderate intensity due to the land use as a lower density single family residence. The land use of the site was determined based on Table 3 in the rating manual, which assigns residential land uses with 1 unit or less per acre as moderate. This land use intensity applies to the parcel as a whole; and does not isolate the single-family residence land use from other undeveloped portions of the site. If the single-family residential area was isolated from the remainder of the undeveloped portion of the property, this would likely change the land use intensity of the single family home to "high" as it would decrease the overall acreage being considered, increasing the home to acreage ratio and ultimately the land use intensity. The calculations were completed following the guidance in the rating manual by identifying any potential undisturbed habitat directly abutting the wetland unit first, then identifying low and moderate habitats abutting the wetland boundary or contiguous with the undisturbed area, such as the site, which is a moderate land use intensity due to the presence of the single-family residence, and these areas were calculated. According to the wetland rating question, the accessible habitat should directly abut the wetland unit itself. The guidance does not indicate the inclusion of additional undisturbed habitat discontinuous from the wetland boundary but touching low or moderate intensity land uses. As such, no changes to the habitat calculations are necessary.

5) *Update the report to provide data on OHWM widths and clarify if the buffer was measured from the centerline or the OHWM. Please include photos showing the OHWM.*

As noted in Section 5.2 of the report (SVC, 2022), the stream exhibits OHWM of 2 feet or less on average, with areas of pooling approximately 5 feet wide. As the stream flows offsite to the north, flows spread out into braided channels that are typically 2 feet wide or less.

The buffer shown on the existing conditions map is projected from the centerline of the stream. As no impacts are anticipated for this project, the delineated features were not surveyed and instead were collected with a handheld GNSS device which typically exhibits accuracy of 10 feet or less, depending on the canopy cover and atmospheric conditions. Centerline delineation is typically reserved for narrow channels of 6 feet or less when collecting the OHWM may result in conflicting data due to accuracy, such as OHWM that crisscross. Given the relatively narrow width of the channel and moderate accuracy range, trying to account for an additional 1 to 2 feet on either side of the channel is typically not very effective or accurate. Furthermore, in this particular case, the wetland projects a larger buffer than the stream, and therefore the stream buffer is generally contained within the wetland buffer.

6) *Update the report and change the stream typing from Type III to Type II.*

While portions of the onsite stream channel do exceed the 2-foot width requirement for Type F water, downgradient portions of the watercourse do not meet Type F criteria, precluding fish from accessing this reach of the channel. Downgradient portions of the channel offsite to the north were noted to be braided and less than 2 feet wide. According to the WDFW Fish Passage Barrier Map several natural slope barriers (in combination with manmade water surface drop and debris barriers) are present downgradient of the site, preventing fish from accessing the onsite portion of the stream. Review of Pierce County contours shows several portions of the channel northwest of the site, and west of Shaw Road, exhibit natural slopes in excess of 20 percent grades. According

to DNR stream typing, channels with gradients exceeding 20 percent are generally considered non-passable for fish. This determination is corroborated by DNR Stream Typing and WDFW and NWIFC SWIFD mapping which both indicate downgradient portions of the stream as Type N (non-fish habitat).

In addition, Confluence references WAC 222-16-031 in their stream typing determination which was an interim stream typing classification system that has since been replaced by WAC 222-16-030. However, the City does not reference either of these stream typing systems in their code. Rather, the City identifies their own criteria that generally aligns with the outdated WAC 222-16-031 but varies slightly. According to PMC 21.06.1010(3)(a), Type II streams are identified as "*either perennial or intermittent, and have known or potential use by anadromous or resident fish species, significant recreational value, or significant wildlife habitat functions. Potential use shall be determined based upon species life cycle requirements, habitat suitability, presence or lack of natural barriers, and a reasoned evaluation of current, historic, and future fish use by a qualified professional*", whereas Type III waters are identified as "*streams with perennial or intermittent flow and are not used by anadromous fish*".

While Deer Creek is listed as a Type II within the City, no known anadromous fish use has been documented in any portions of the channel upgradient of the Puyallup River. However, a reach between the Puyallup River and the intersection of Shaw Road and 16th Avenue Southeast is identified as gradient accessible to several anadromous species. The gradient accessibility terminates approximately 1,900 feet downgradient to the north where several water surface drops, slopes, and velocity barriers are identified. It appears that Deer Creek likely transitions from a Type II water to a Type III at this location, which would result in the onsite portion of the channel being considered a Type III water. Given that the onsite channel is not gradient accessible to anadromous fish, it appears to meet the City's definition of a Type III water as perennial flows are present and anadromous fish use is neither documented nor is it likely.

Furthermore, Habitat Technologies identified the onsite stream as a Type III water in their *Wetland and Drainage Corridor Evaluation and Delineation Report* dated November 27, 2006, which was reviewed and confirmed by the City's third-party review ESA Adolfson (May 4, 2007). The City approved these findings through a Hearing Examiner's Decision and a Mitigated Determination of Non-Significance (MDNS) dated November 27, 2007. As such, the Type III determination is in line with the prior local approvals for the same site and site reach of the channel.

7) *Update site plans to depict changes in wetland size, wetland category, stream type, and associated buffers.*

No change to wetland rating or buffers are necessary.

I trust these responses address the City's third-party review comments. Revisions to our Wetland and Fish and Wildlife Habitat Assessment Report and associated maps and plans will be completed in response to these comments. Please do not hesitate to contact me with any questions or concerns you may have.

Sincerely,

Jon Pickett
Principal
Office 253.514.8952
jon@soundviewconsultants.com

References

Confluence Environmental Company (Confluence). 2022. *Normandy Heights Plat Wetland and Fish and Wildlife Habitat Assessment Report—Third Party Review*. July 18, 2022. Tacoma, Washington.

Soundview Consultants LLC (SVC). 2022. *Wetland and Fish and Wildlife Habitat Assessment Report – Deer Creek*. February 24, 2022. Gig Harbor, Washington.

Antecedent Precipitation Tool (APT)

Antecedent Precipitation Tool v1.0 - Watershed Sampling Summary

Generated on 2023-05-23

User Inputs

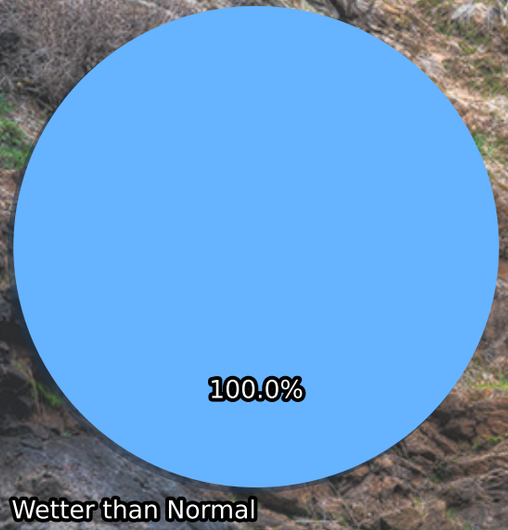
Coordinates	47.170783, -122.25237
Date	2021-11-16
Geographic Scope	HUC12

Intermediate Data

Hydrologic Unit Code	171100140502
Watershed Size	49.71 mi^2
# Random Sampling Points	6

Preliminary Result

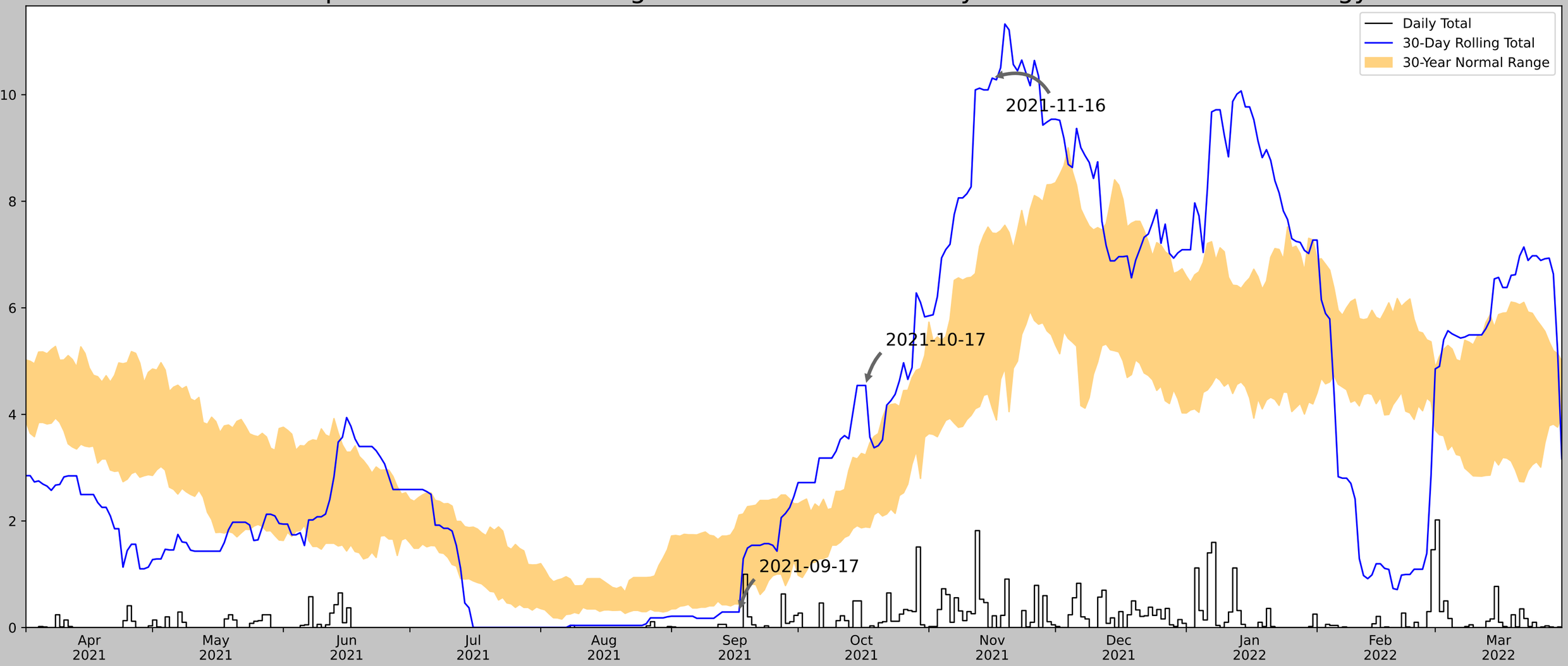
Average Antecedent Precipitation Score	15.67
Preliminary Determination	Wetter than Normal



Sampling Point Breakdown

Antecedent Precipitation Score	Antecedent Precipitation Condition	WebWIMP H_2O Balance	Drought Index (PDSI)	# of Points
16	Wetter than Normal	Wet Season	Moderate wetness	4
15	Wetter than Normal	Wet Season	Moderate wetness	2

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.170783, -122.25236993
Observation Date	2021-11-16
Elevation (ft)	429.755347
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

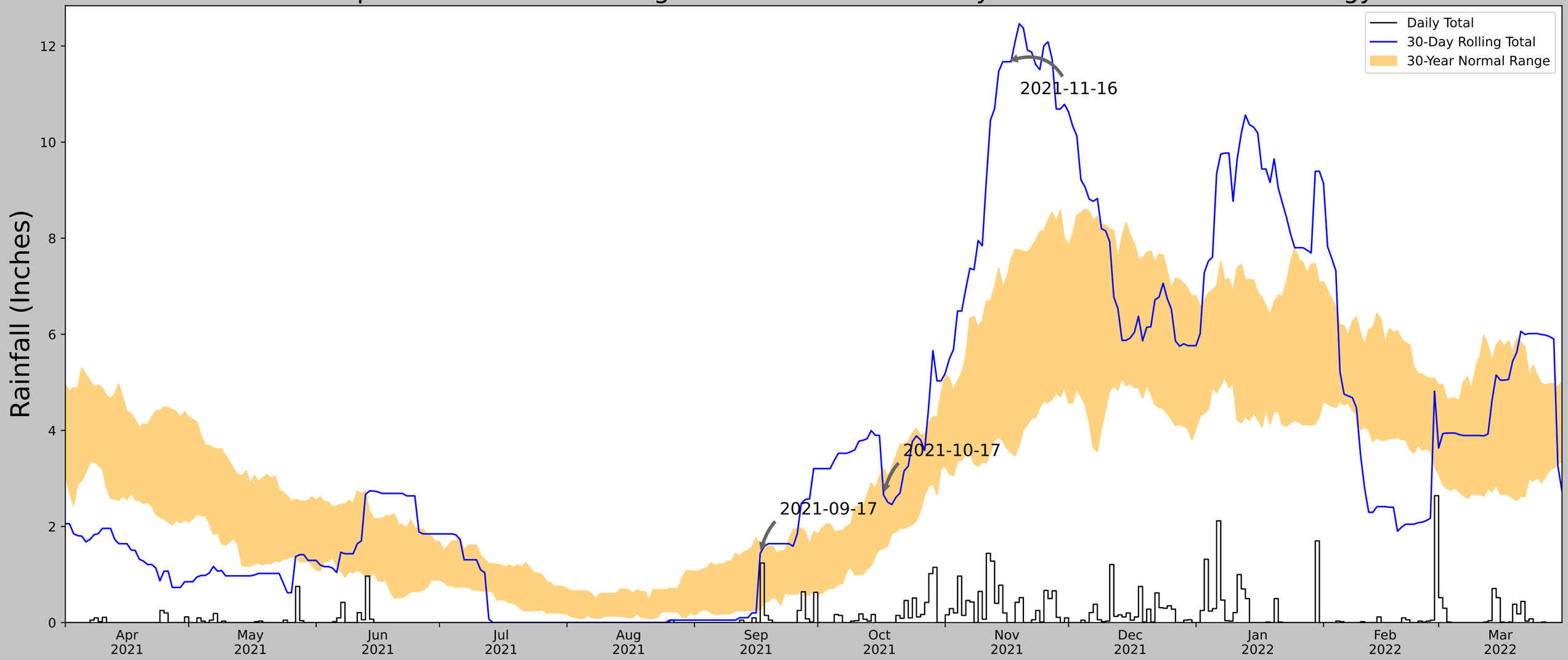
30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	4.120079	7.403544	10.311024	Wet	3	3	9
2021-10-17	1.888583	3.23937	4.543307	Wet	3	2	6
2021-09-17	0.440551	2.112598	0.291339	Dry	1	1	1
Result							Wetter than Normal - 16

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	2.437	140.127	1.438	9686	48
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	26
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	7
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	8
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.200026, -122.415656
Observation Date	2021-11-16
Elevation (ft)	426.011437
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

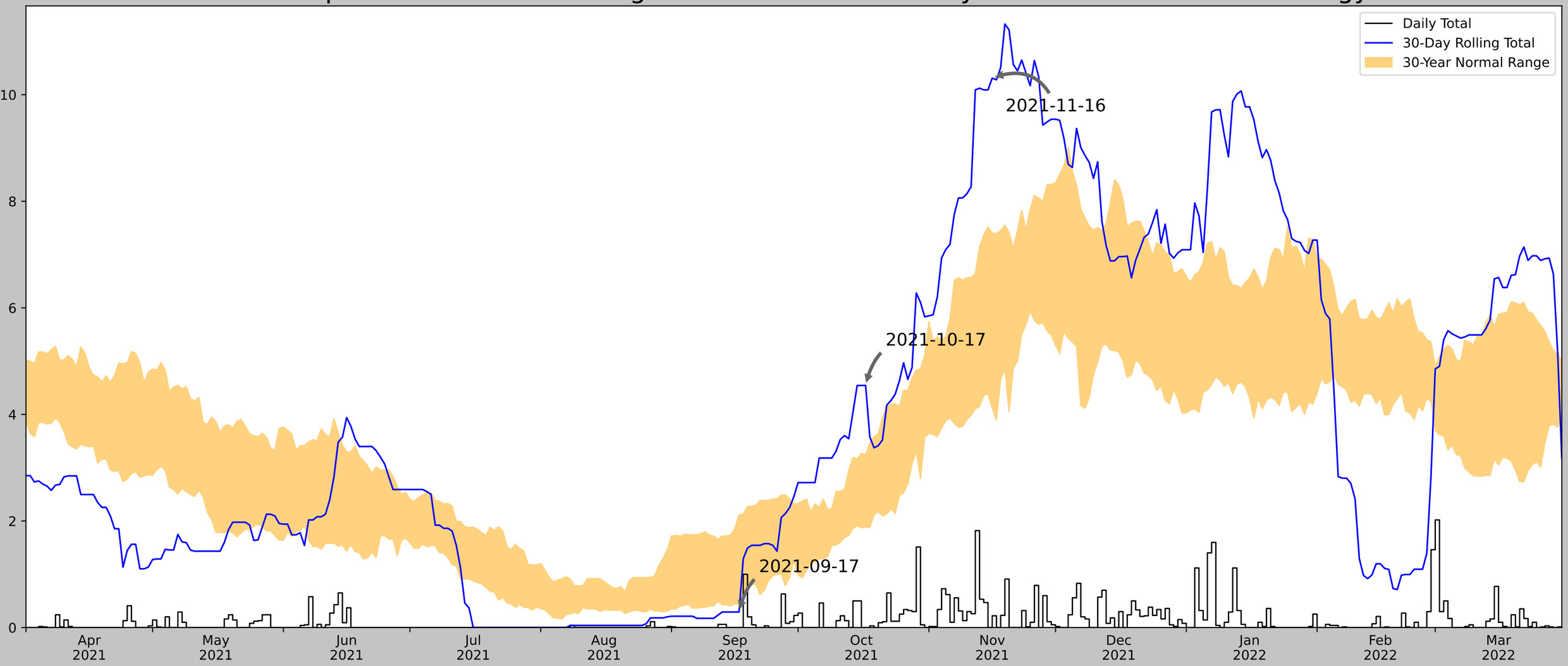
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	3.624016	7.187796	11.673229	Wet	3	3	9
2021-10-17	1.543701	3.200788	2.65748	Normal	2	2	4
2021-09-17	0.265748	1.620472	1.440945	Normal	2	1	2
Result							Wetter than Normal - 15

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	3.263	401.077	2.777	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.147206, -122.266295
Observation Date	2021-11-16
Elevation (ft)	489.360895
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	4.120079	7.403544	10.311024	Wet	3	3	9
2021-10-17	1.888583	3.23937	4.543307	Wet	3	2	6
2021-09-17	0.440551	2.112598	0.291339	Dry	1	1	1
Result							Wetter than Normal - 16

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	0.934	80.521	0.496	9686	48
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	26
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	7
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	8
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
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PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

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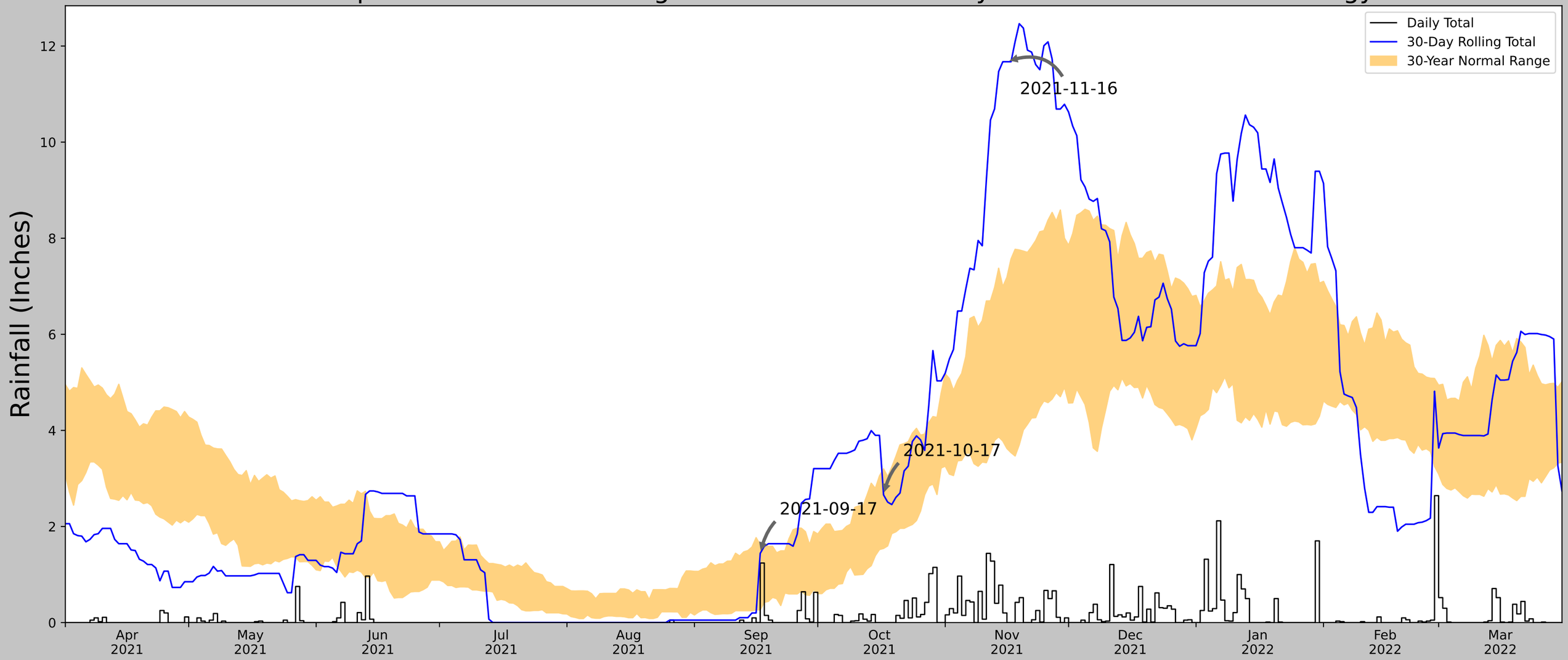

Coordinates	47.200366, -122.30978
Observation Date	2021-11-16
Elevation (ft)	39.165068
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	3.624016	7.187796	11.673229	Wet	3	3	9
2021-10-17	1.543701	3.200788	2.65748	Normal	2	2	4
2021-09-17	0.265748	1.620472	1.440945	Normal	2	1	2
Result							Wetter than Normal - 15

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

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U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	5.794	14.231	2.69	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
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TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

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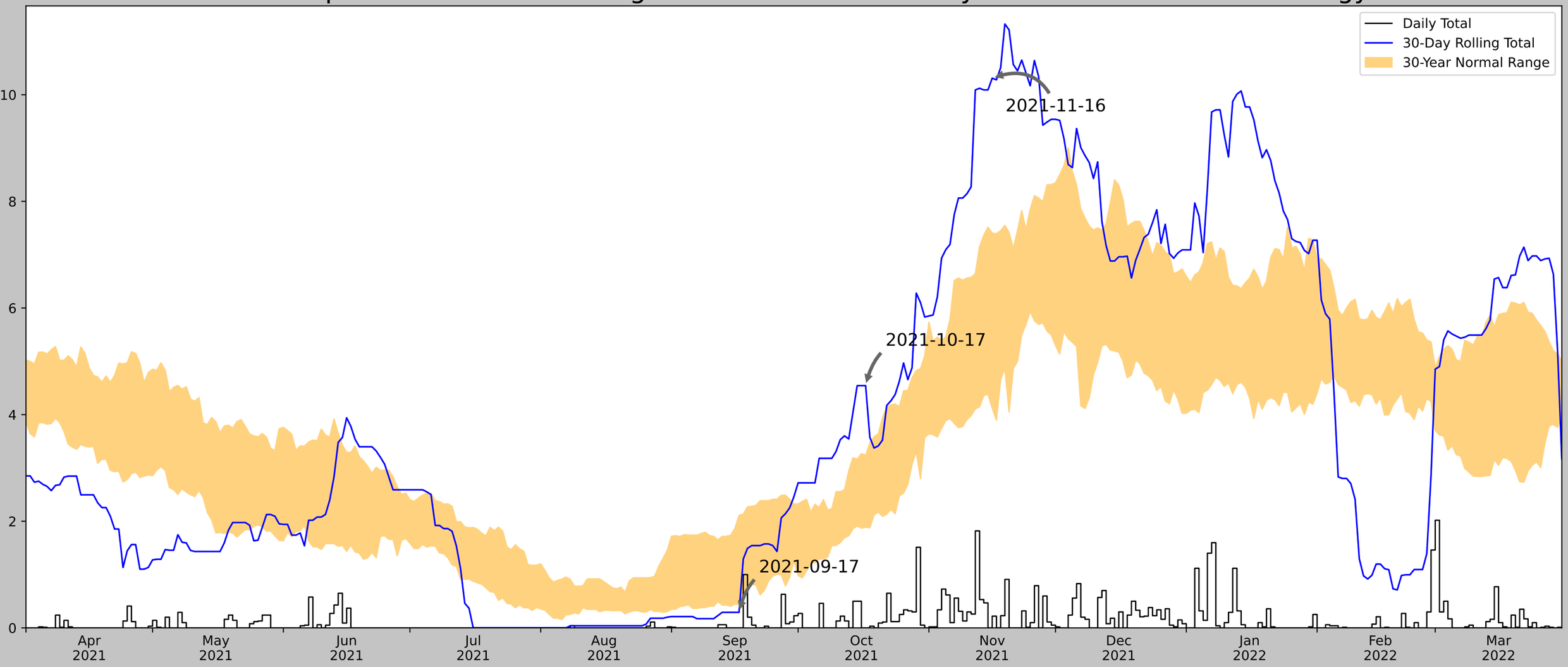

Coordinates	47.104434, -122.314906
Observation Date	2021-11-16
Elevation (ft)	506.368438
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	4.120079	7.403544	10.311024	Wet	3	3	9
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2021-09-17	0.440551	2.112598	0.291339	Dry	1	1	1
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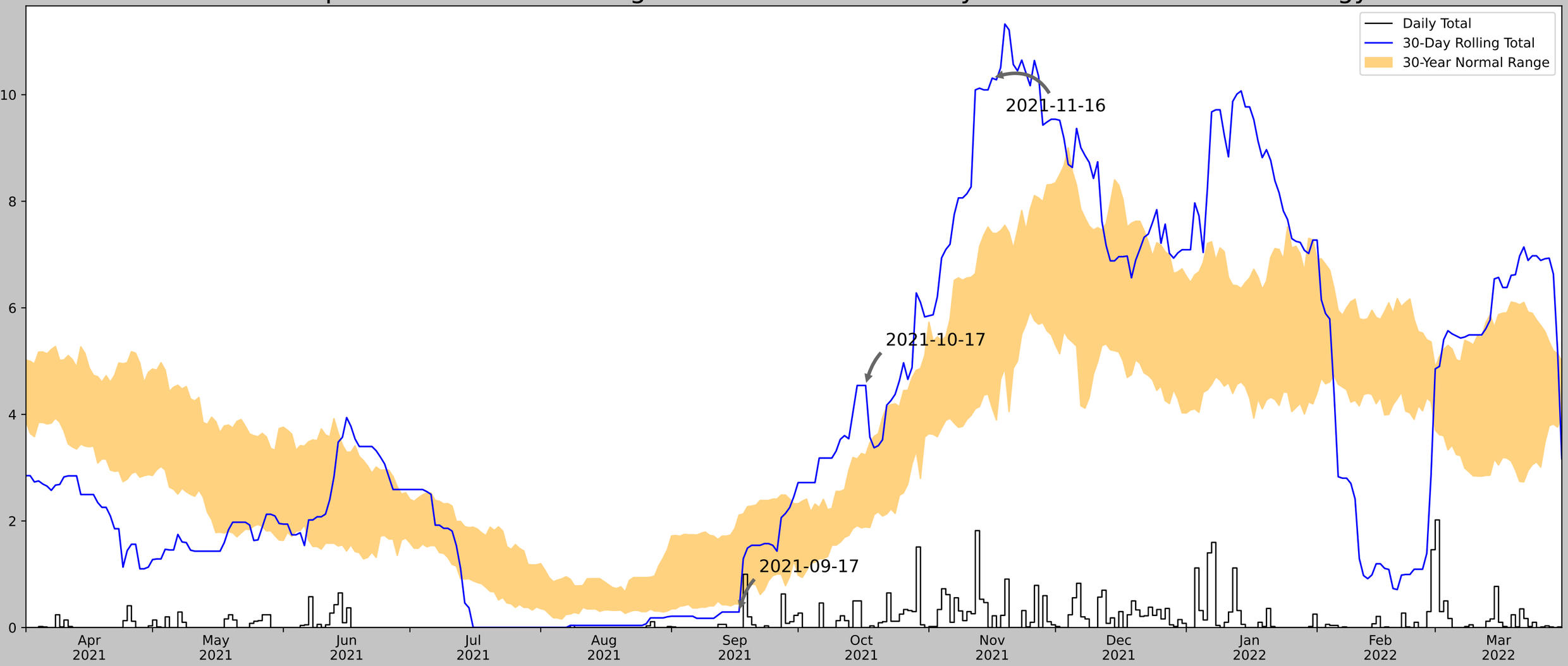
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	3.504	63.514	1.799	9686	48
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	26
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	7
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	8
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.154922, -122.352967
Observation Date	2021-11-16
Elevation (ft)	438.987616
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-16	4.120079	7.403544	10.311024	Wet	3	3	9
2021-10-17	1.888583	3.23937	4.543307	Wet	3	2	6
2021-09-17	0.440551	2.112598	0.291339	Dry	1	1	1
Result							Wetter than Normal - 16

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	4.744	130.894	2.756	9686	48
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	26
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	7
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	8
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation Tool v1.0 - Watershed Sampling Summary

Generated on 2023-05-23

User Inputs

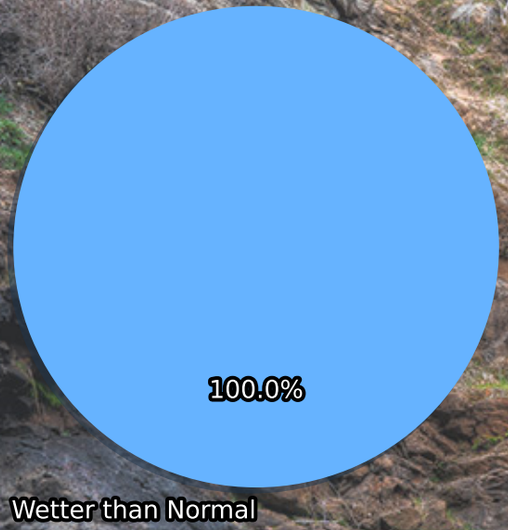
Coordinates	47.170783, -122.25237
Date	2022-01-05
Geographic Scope	HUC12

Intermediate Data

Hydrologic Unit Code	171100140502
Watershed Size	49.71 mi^2
# Random Sampling Points	5

Preliminary Result

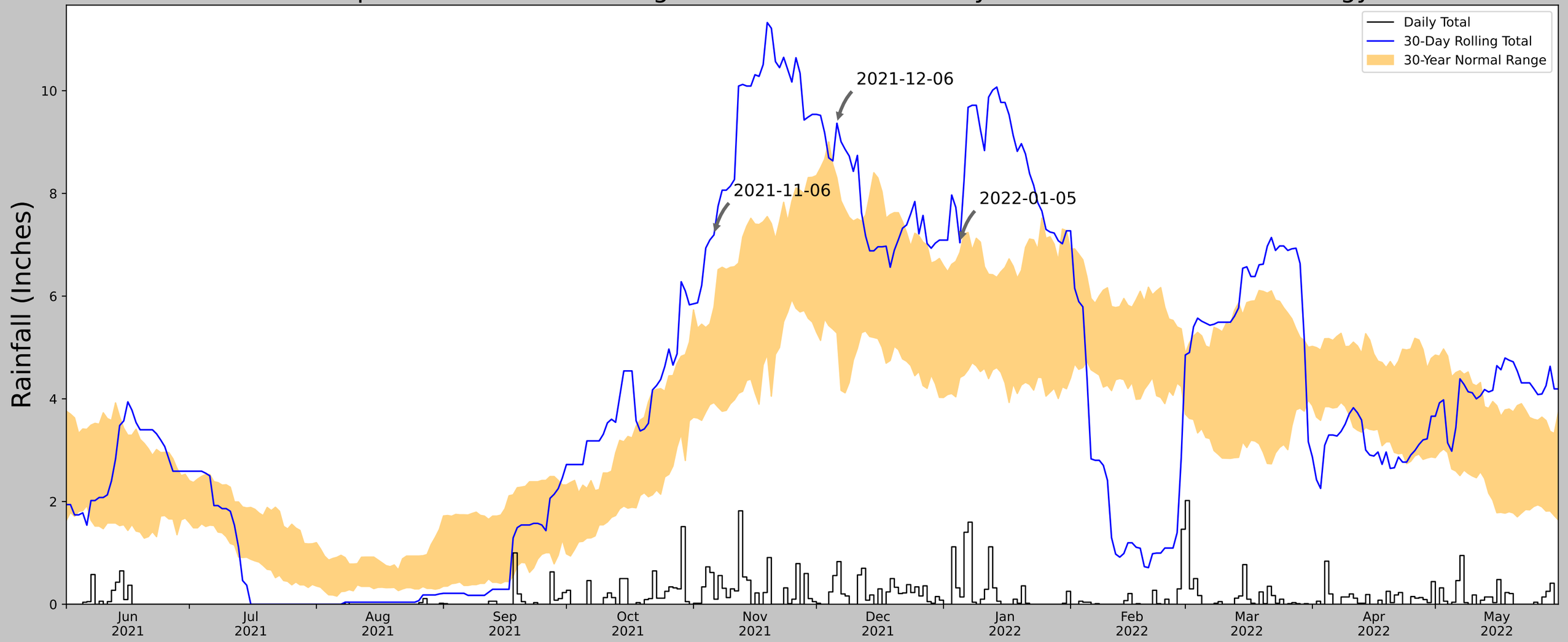
Average Antecedent Precipitation Score	18.0
Preliminary Determination	Wetter than Normal



Sampling Point Breakdown

Antecedent Precipitation Score	Antecedent Precipitation Condition	WebWIMP H_2O Balance	Drought Index (PDSI)	# of Points
18	Wetter than Normal	Wet Season	Moderate wetness	5

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.170783, -122.25236993
Observation Date	2022-01-05
Elevation (ft)	438.987616
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

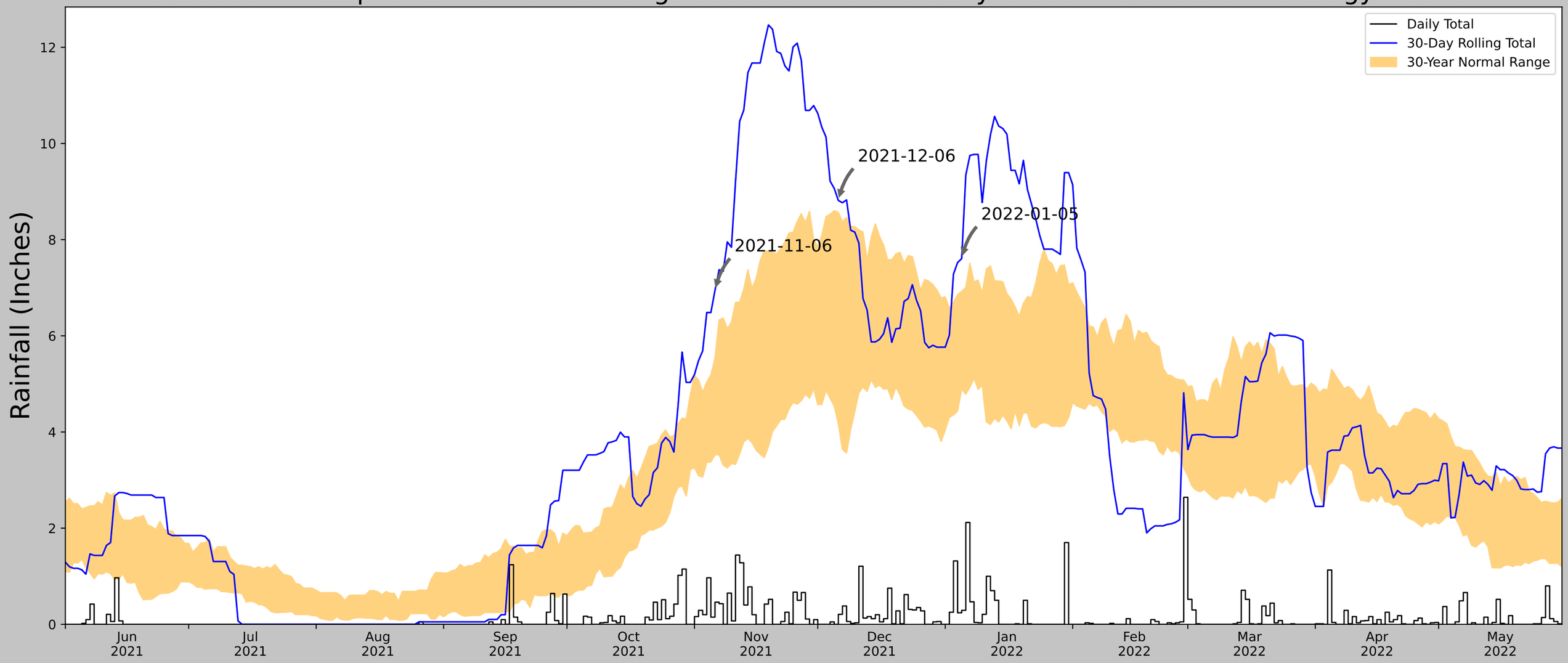
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-01-05	4.414567	6.851969	7.03937	Wet	3	3	9
2021-12-06	5.279921	8.301969	9.366142	Wet	3	2	6
2021-11-06	3.926772	5.787402	7.192914	Wet	3	1	3
Result							Wetter than Normal - 18

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	2.437	130.894	1.416	9686	45
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	23
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	8
TEHALEH 0.2 SW	47.1275, -122.1801	721.129	3.616	151.247	2.174	0	6
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	7
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.214205, -122.366421
Observation Date	2022-01-05
Elevation (ft)	77.718846
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-01-05	4.894095	6.923622	7.606299	Wet	3	3	9
2021-12-06	4.171654	8.566536	8.814961	Wet	3	2	6
2021-11-06	3.52441	5.540945	6.944882	Wet	3	1	3
Result							Wetter than Normal - 18

Figure and tables made by the
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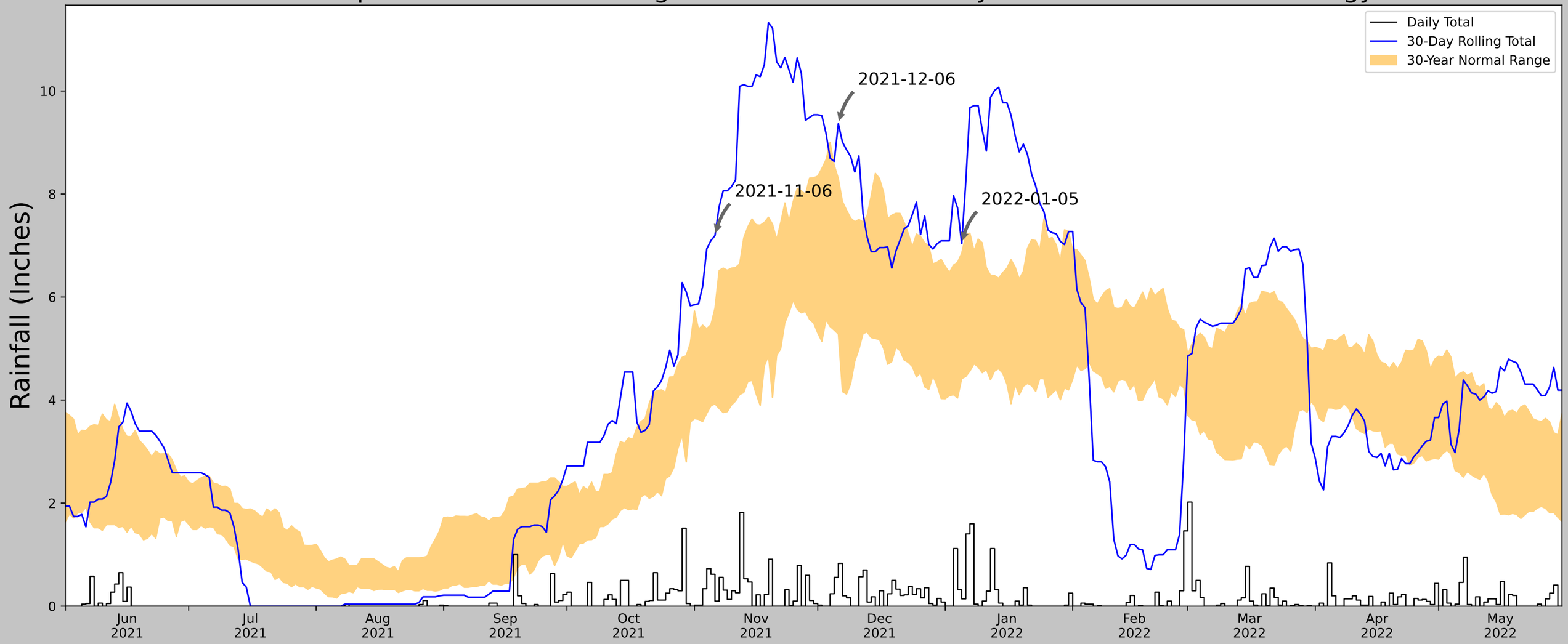
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	3.132	52.785	1.575	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.147855, -122.30756
Observation Date	2022-01-05
Elevation (ft)	429.074659
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-01-05	4.414567	6.851969	7.03937	Wet	3	3	9
2021-12-06	5.279921	8.301969	9.366142	Wet	3	2	6
2021-11-06	3.926772	5.787402	7.192914	Wet	3	1	3
Result							Wetter than Normal - 18

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

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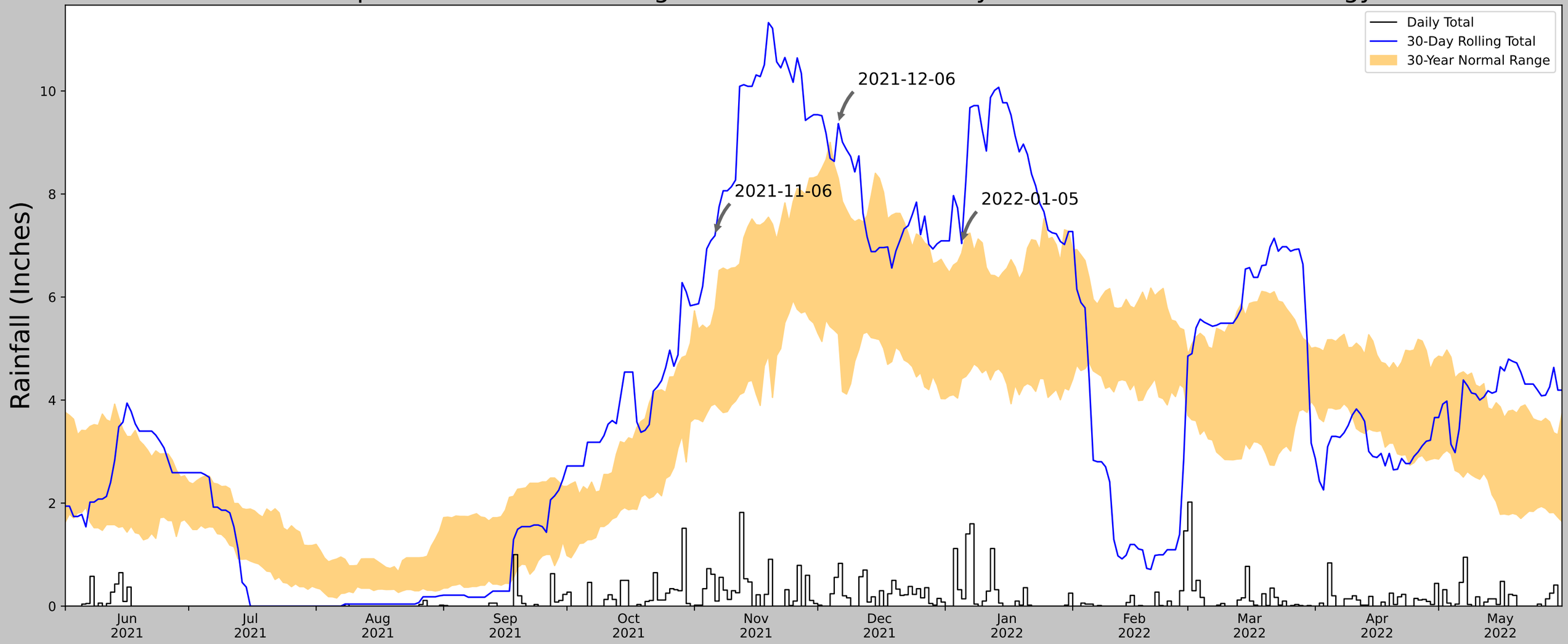
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	2.562	140.807	1.514	9686	45
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	23
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	8
TEHALEH 0.2 SW	47.1275, -122.1801	721.129	3.616	151.247	2.174	0	6
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	7
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.214341, -122.274519
Observation Date	2022-01-05
Elevation (ft)	435.747326
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

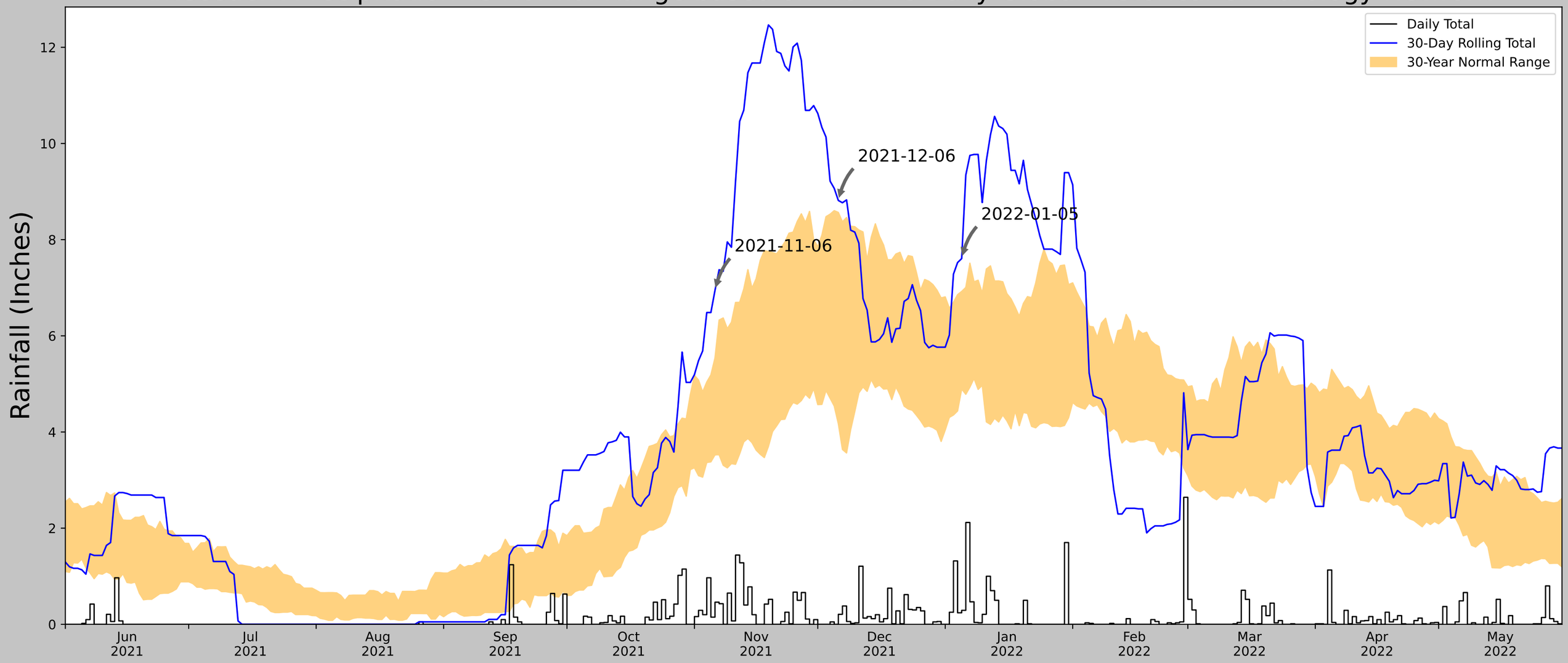
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-01-05	4.414567	6.851969	7.03937	Wet	3	3	9
2021-12-06	5.279921	8.301969	9.366142	Wet	3	2	6
2021-11-06	3.926772	5.787402	7.192914	Wet	3	1	3
Result							Wetter than Normal - 18

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
MCMILLIN RSVR	47.1356, -122.2561	569.882	5.509	134.135	3.218	9686	45
PUYALLUP 2.1 ESE	47.1683, -122.244	411.089	2.33	158.793	1.418	1057	23
SOUTH HILL 3.3 WSW	47.1303, -122.3367	473.097	3.806	96.785	2.081	274	8
TEHALEH 0.2 SW	47.1275, -122.1801	721.129	3.616	151.247	2.174	0	6
SUMMIT 1.1 WSW	47.1653, -122.3783	466.864	6.098	103.018	3.372	132	0
SPANAWAY 5.4 ESE	47.0655, -122.3289	444.882	5.932	125.0	3.411	86	7
EDGEWOOD 2.5 SE	47.211, -122.256	355.971	5.21	213.911	3.459	34	0
PARKLAND 0.9 NE	47.1473, -122.4169	387.139	7.6	182.743	4.809	12	1
GRAHAM 2.7 SW	47.017, -122.314	735.892	8.636	166.01	5.32	2	0
PUYALLUP 2 W EXP STN	47.2, -122.3333	49.869	5.74	520.013	5.568	1	0
BUCKLEY 1 NE	47.1694, -122.0036	685.039	12.092	115.157	6.834	67	0
LANDSBURG	47.3767, -121.9614	535.105	21.645	34.777	10.493	2	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.167585, -122.402134
Observation Date	2022-01-05
Elevation (ft)	419.759564
Drought Index (PDSI)	Moderate wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-01-05	4.894095	6.923622	7.606299	Wet	3	3	9
2021-12-06	4.171654	8.566536	8.814961	Wet	3	2	6
2021-11-06	3.52441	5.540945	6.944882	Wet	3	1	3
Result							Wetter than Normal - 18

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	5.521	394.826	4.664	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation Tool v1.0 - Watershed Sampling Summary

Generated on 2023-05-23

User Inputs

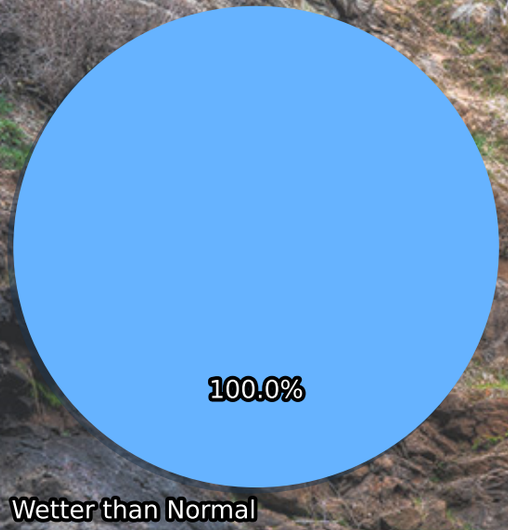
Coordinates	47.170783, -122.25237
Date	2022-07-05
Geographic Scope	HUC12

Intermediate Data

Hydrologic Unit Code	171100140502
Watershed Size	49.71 mi^2
# Random Sampling Points	5

Preliminary Result

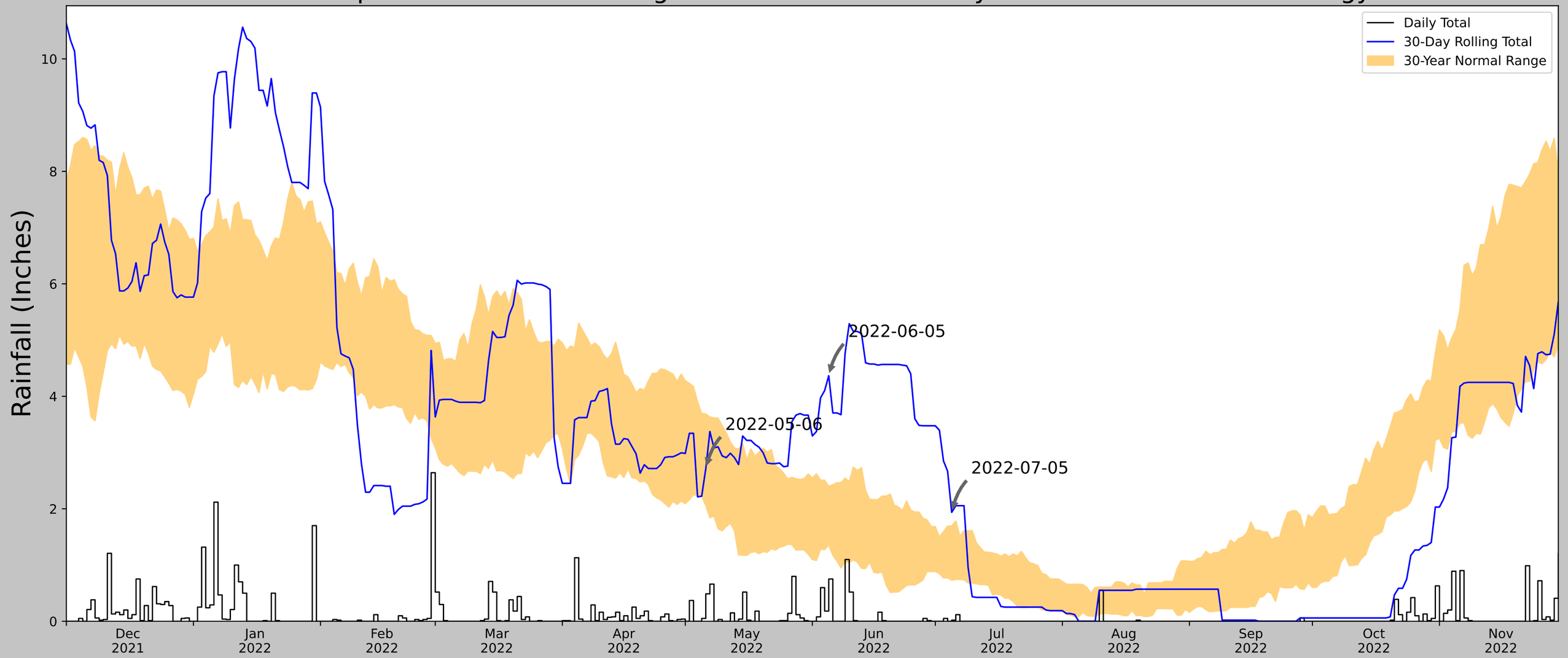
Average Antecedent Precipitation Score	17.0
Preliminary Determination	Wetter than Normal



Sampling Point Breakdown

Antecedent Precipitation Score	Antecedent Precipitation Condition	WebWIMP H_2O Balance	Drought Index (PDSI)	# of Points
17	Wetter than Normal	Dry Season	Normal	5

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.170783, -122.25236993
Observation Date	2022-07-05
Elevation (ft)	323.877
Drought Index (PDSI)	Normal
WebWIMP H_2O Balance	Dry Season

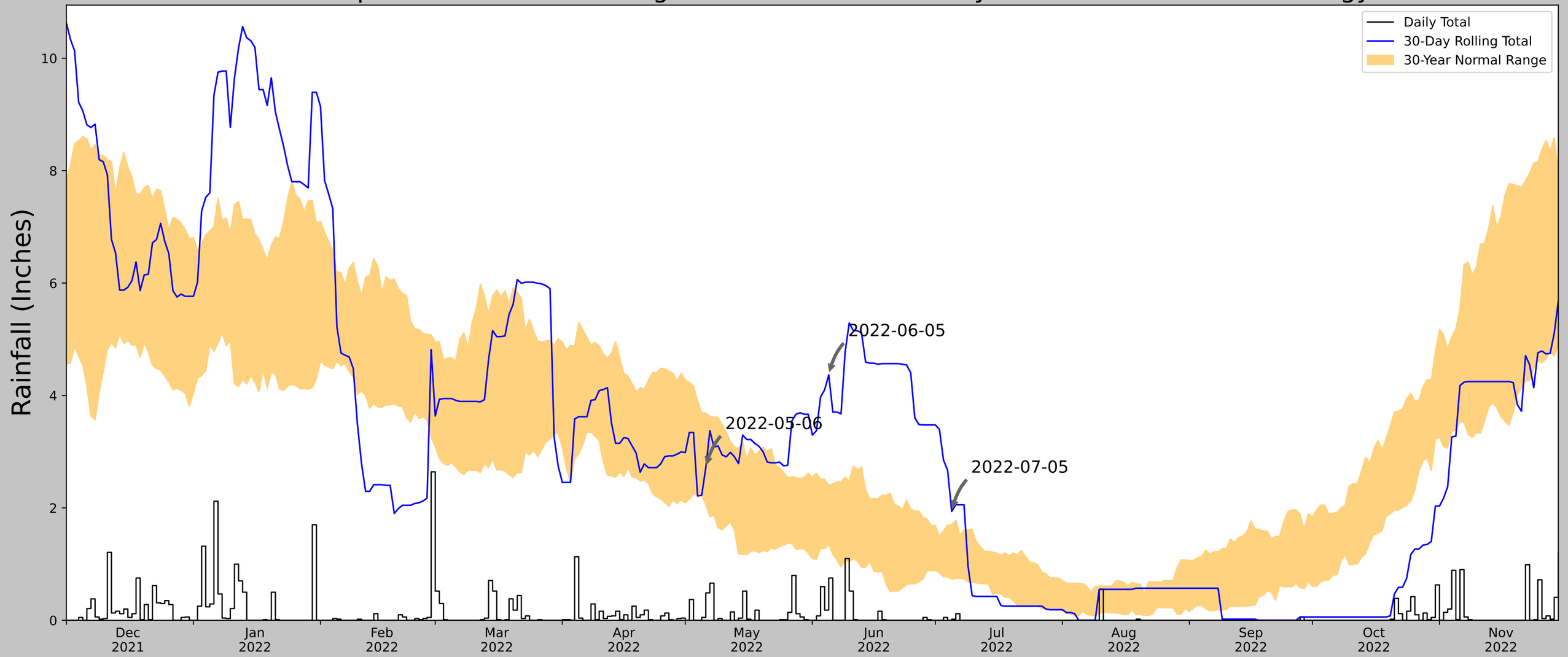
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-07-05	0.730709	1.696063	1.937008	Wet	3	3	9
2022-06-05	1.357087	2.400394	4.366142	Wet	3	2	6
2022-05-06	2.061024	3.685827	2.712599	Normal	2	1	2
Result							Wetter than Normal - 17

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	9.174	298.943	6.871	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.134304, -122.273692
Observation Date	2022-07-05
Elevation (ft)	323.877
Drought Index (PDSI)	Normal
WebWIMP H_2O Balance	Dry Season

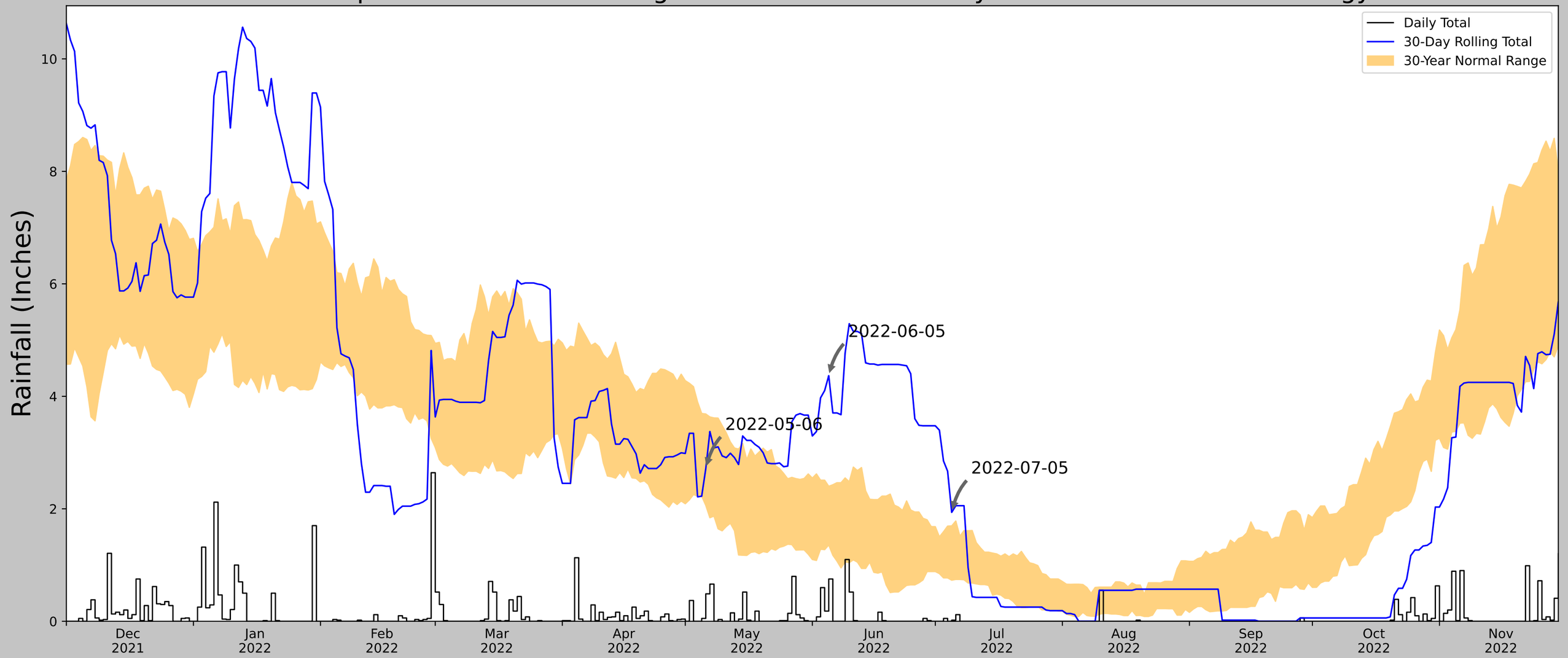
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-07-05	0.730709	1.696063	1.937008	Wet	3	3	9
2022-06-05	1.357087	2.400394	4.366142	Wet	3	2	6
2022-05-06	2.061024	3.685827	2.712599	Normal	2	1	2
Result							Wetter than Normal - 17

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	10.156	298.943	7.606	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.225477, -122.373128
Observation Date	2022-07-05
Elevation (ft)	15.468895
Drought Index (PDSI)	Normal
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-07-05	0.730709	1.696063	1.937008	Wet	3	3	9
2022-06-05	1.357087	2.400394	4.366142	Wet	3	2	6
2022-05-06	2.061024	3.685827	2.712599	Normal	2	1	2
Result							Wetter than Normal - 17

Figure and tables made by the
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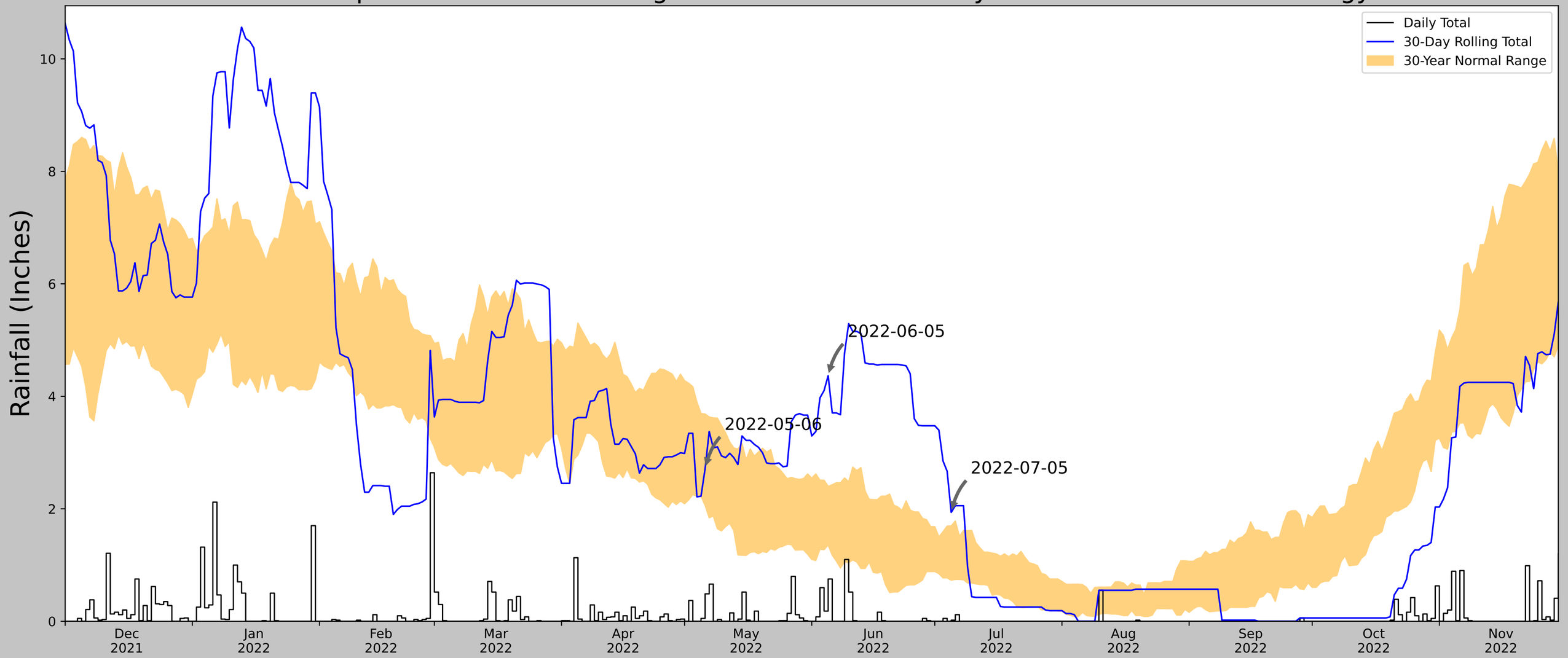
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	2.369	9.465	1.088	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.171793, -122.388794
Observation Date	2022-07-05
Elevation (ft)	443.714286
Drought Index (PDSI)	Normal
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-07-05	0.730709	1.696063	1.937008	Wet	3	3	9
2022-06-05	1.357087	2.400394	4.366142	Wet	3	2	6
2022-05-06	2.061024	3.685827	2.712599	Normal	2	1	2
Result							Wetter than Normal - 17

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

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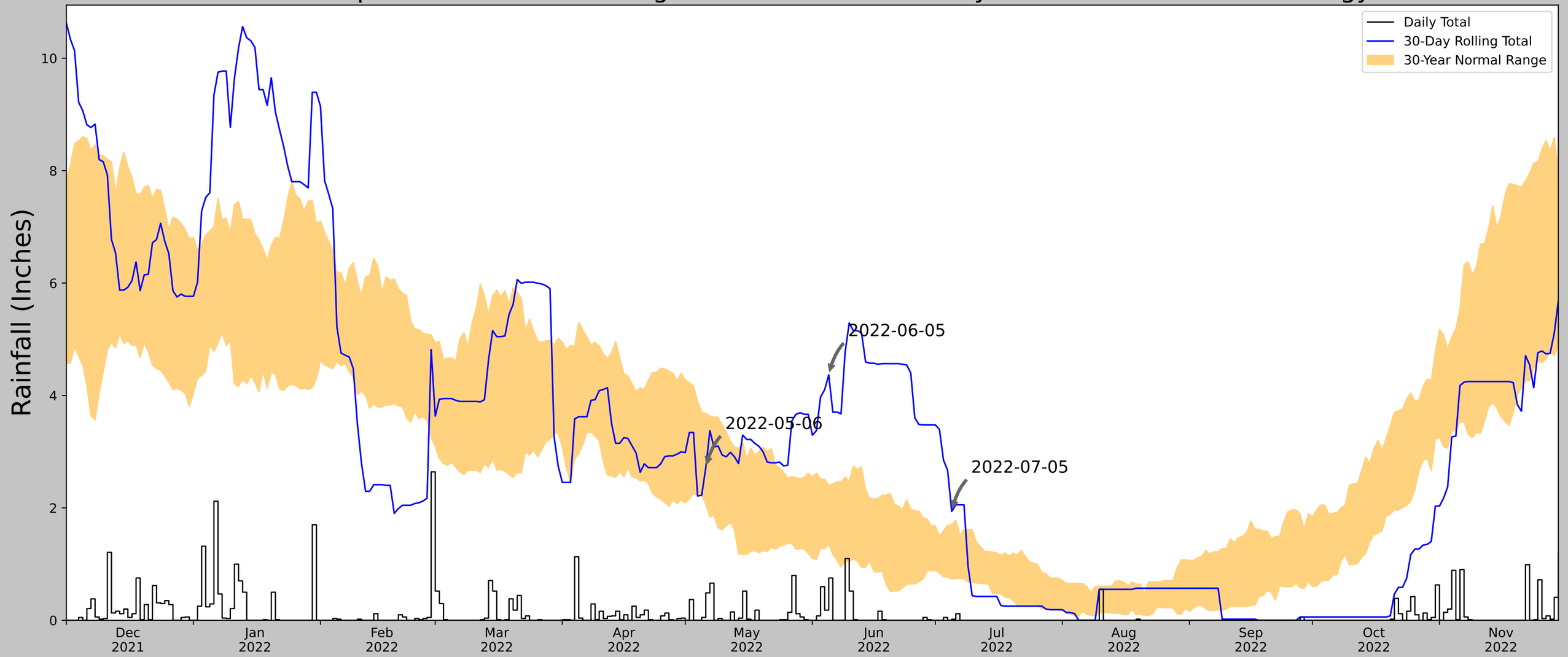
Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	5.325	418.78	4.626	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.21621, -122.274256
Observation Date	2022-07-05
Elevation (ft)	429.755347
Drought Index (PDSI)	Normal
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-07-05	0.730709	1.696063	1.937008	Wet	3	3	9
2022-06-05	1.357087	2.400394	4.366142	Wet	3	2	6
2022-05-06	2.061024	3.685827	2.712599	Normal	2	1	2
Result							Wetter than Normal - 17

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

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U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
TACOMA #1	47.2472, -122.4122	24.934	6.817	404.821	5.827	10871	90
TACOMA 0.9 NW	47.26, -122.4751	342.848	3.08	317.914	2.365	44	0
TACOMA 1.1 NW	47.2618, -122.4772	337.927	3.211	312.993	2.45	15	0
PUYALLUP 2.1 NW	47.1997, -122.32	32.152	5.43	7.218	2.483	4	0
PUYALLUP 1.1 NNW	47.1954, -122.2955	46.916	6.542	21.982	3.088	93	0
TACOMA 2.9 NNW	47.2876, -122.4941	293.963	4.747	269.029	3.413	6	0
TACOMA 3.1 NW	47.2867, -122.5025	270.997	5.037	246.063	3.506	7	0
TACOMA NARROWS AP	47.2675, -122.5761	290.026	7.813	265.092	5.587	160	0
KENT	47.4172, -122.2433	28.871	14.161	3.937	6.428	150	0
WAUNA 3 W	47.3725, -122.7028	17.06	16.133	7.874	7.387	3	0