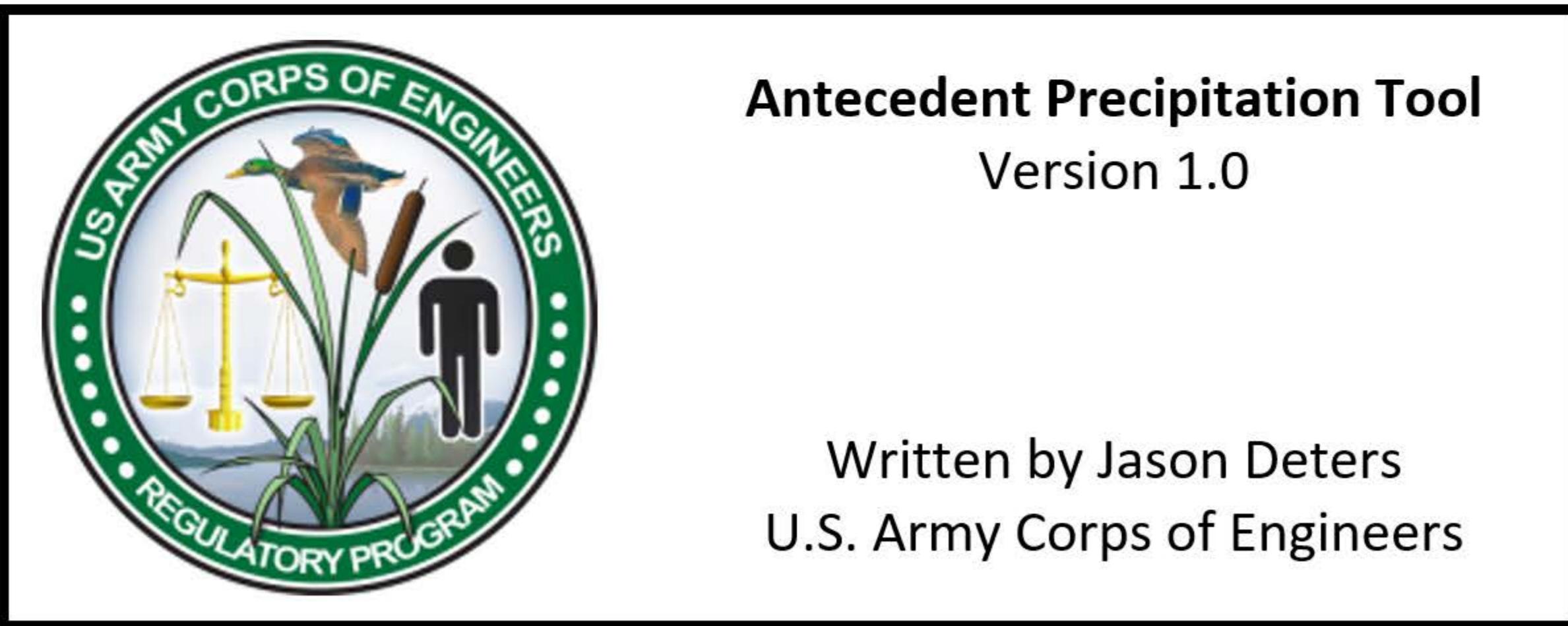


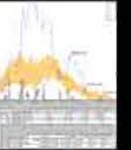
How to Generate a Single-point Analysis for a Single Date





Double-click the APT
Desktop Shortcut

Antecedent
Precipitati...



```
++++ +++ +++
hNNN +NNNy hNNm
hMMMhhMMMyMmMMN
sNMMMMMMMMMMMd
+mMMMMMMMMMMMs
dMMMm++MMMM+
dMMMm MMM+ +
dMMMs MMM+
dMMMo+MMMM
yNMMMMMMMMMMMy
yNMMMMMMMMMMMy
sMMMMMMMMMMm+
dMMMooyMMMMyyymMMh+
dMMMs MMM dMMN
dMMMs MMM+ dMMm
+dMMMs++MMMMddNMMm
hMMMMNNMMMMMMMMNm
hMMMMNNMMMMMMMMNm
yMMMMNNMMMMNNNNMMMo
```

```
+++ +++ +++
yNNN+ mNNd oNNN+
hMMMyhNMMyhMM+
sNMMMMMMMMMMMs
+dMMMMMMMMMMh
yMMMo+dMMMs
yMM+ dMMMs
yMM+ dMMMs
dMMMo+dMMMs
yMM+ dMMMs
yMM+ dMMMs
dMMMo+dMMMs
yMM+ dMMMs
yMM+ dMMMs
hMMNyMMMMhyymMMh+
NMMN NMM+ dMMMs
mMN NMM+ dMMMs
mMMddMMMMMo+dMMNh
mMMddMMMMMo+dMMNh
mMMddMMMMMo+dMMNh
mMMddMMMMMo+dMMNh
```



-Written by:
Jason C. Deters,
U.S. Army Corps of Engineers



User License Agreement - Antecedent Precipitation Tool

Please review and accept the user license agreement to proceed

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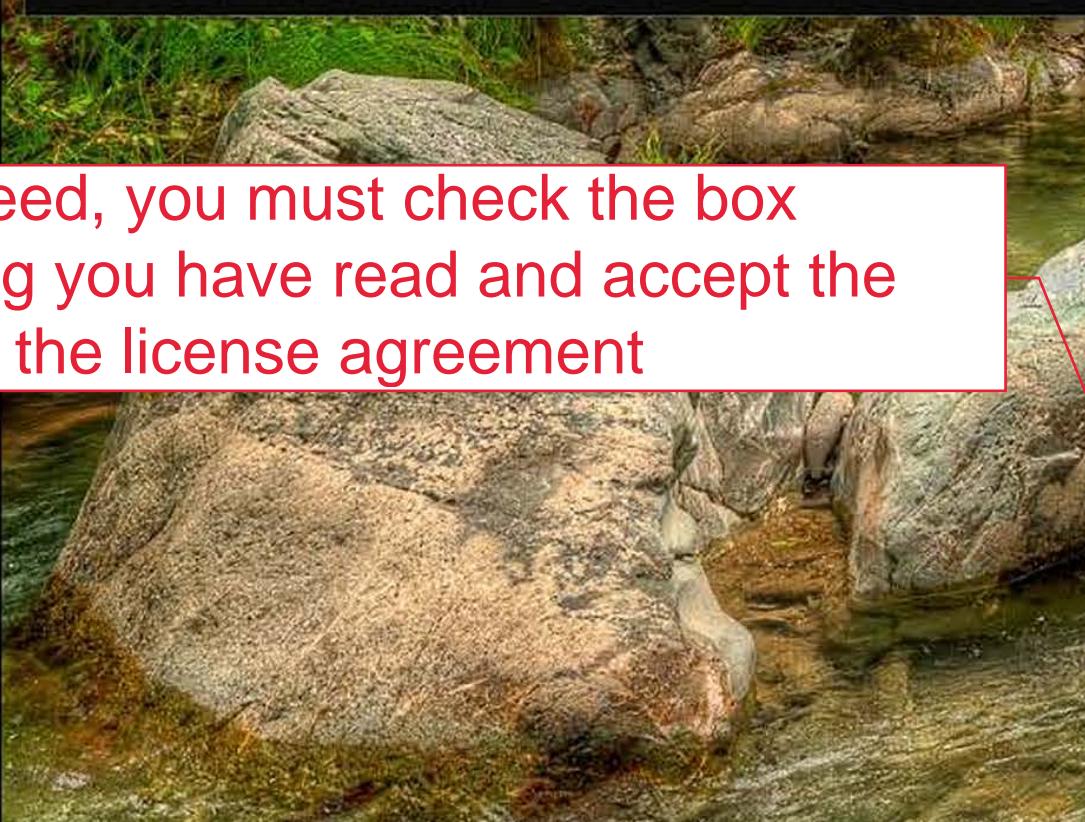
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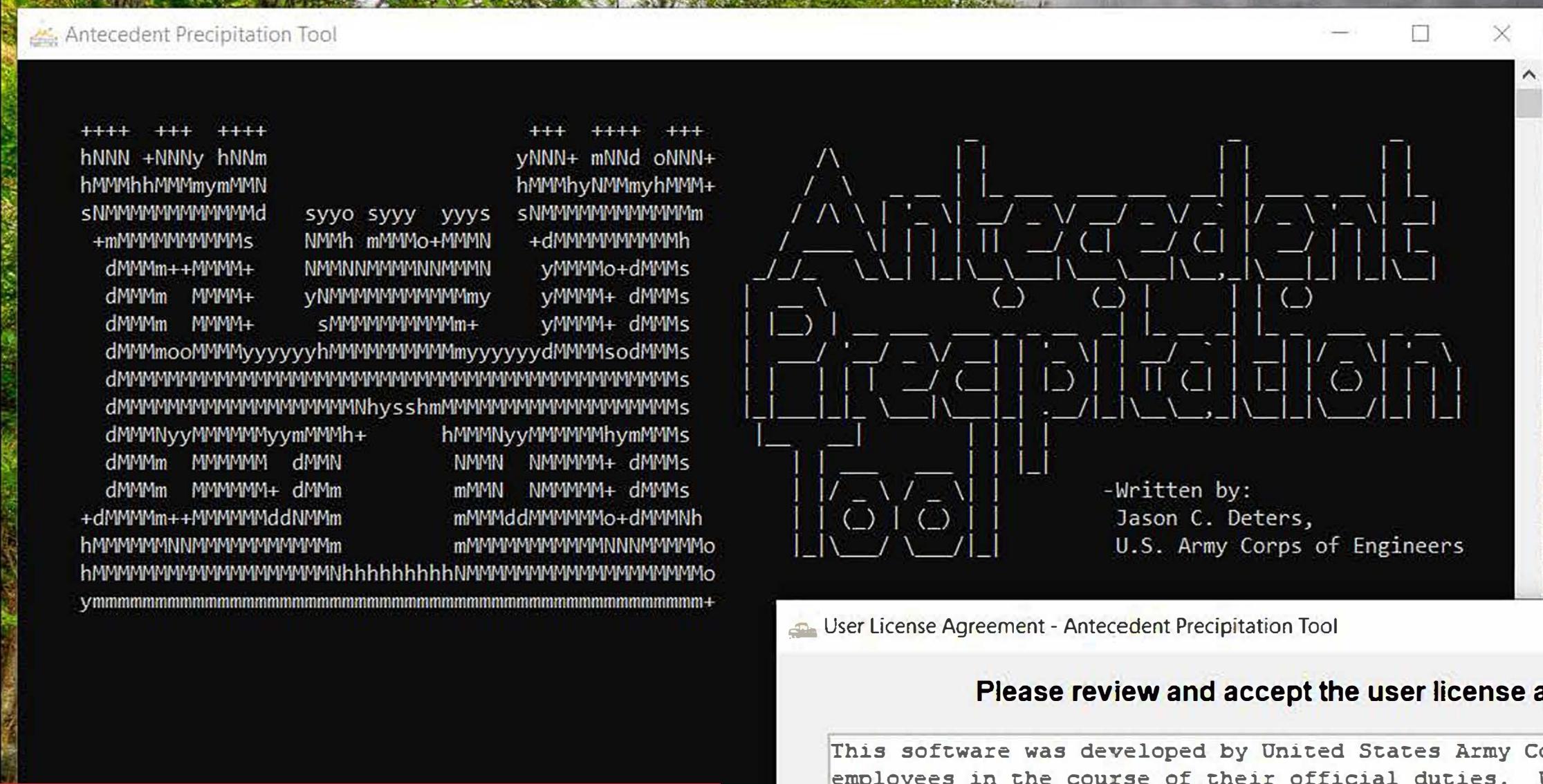
I have read and accept the terms of the license agreement

Submit

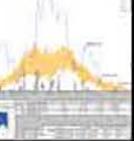
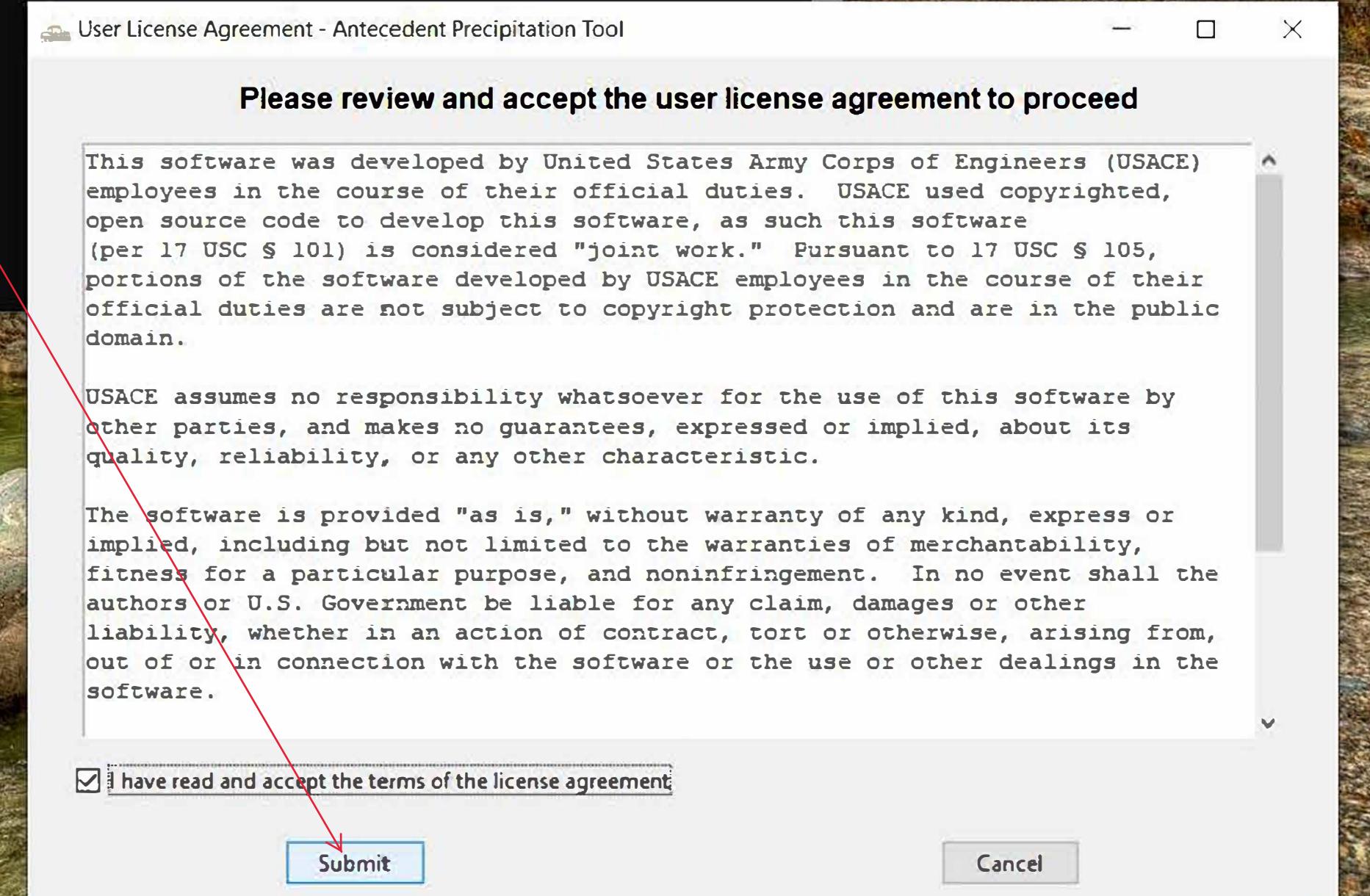
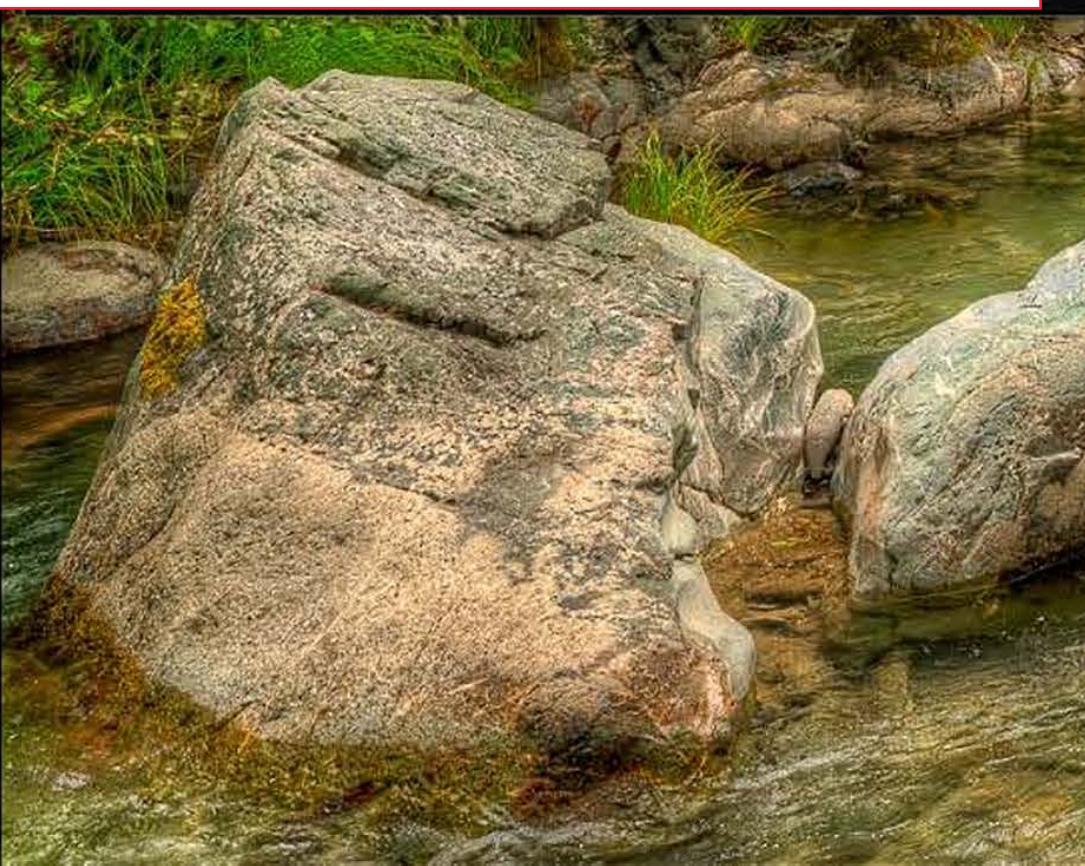
Cancel

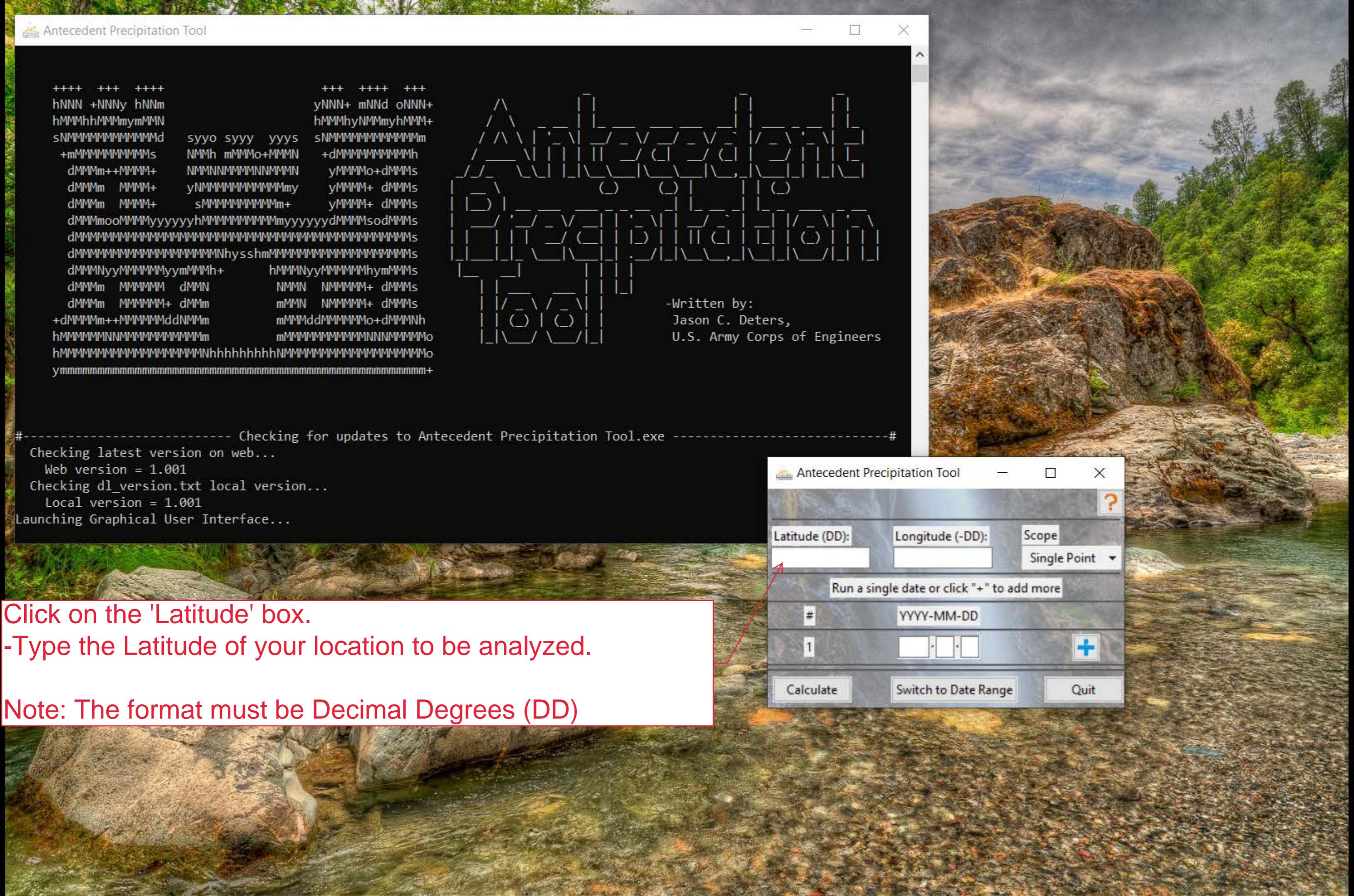
To proceed, you must check the box indicating you have read and accept the terms of the license agreement





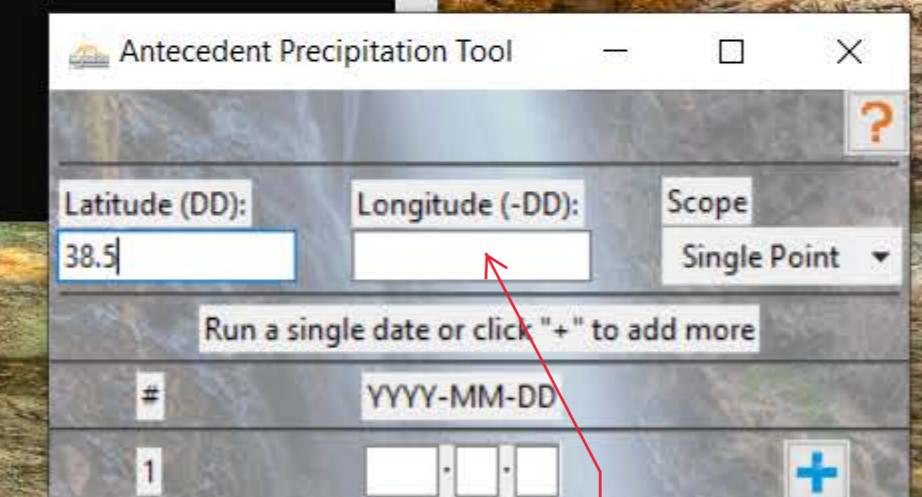
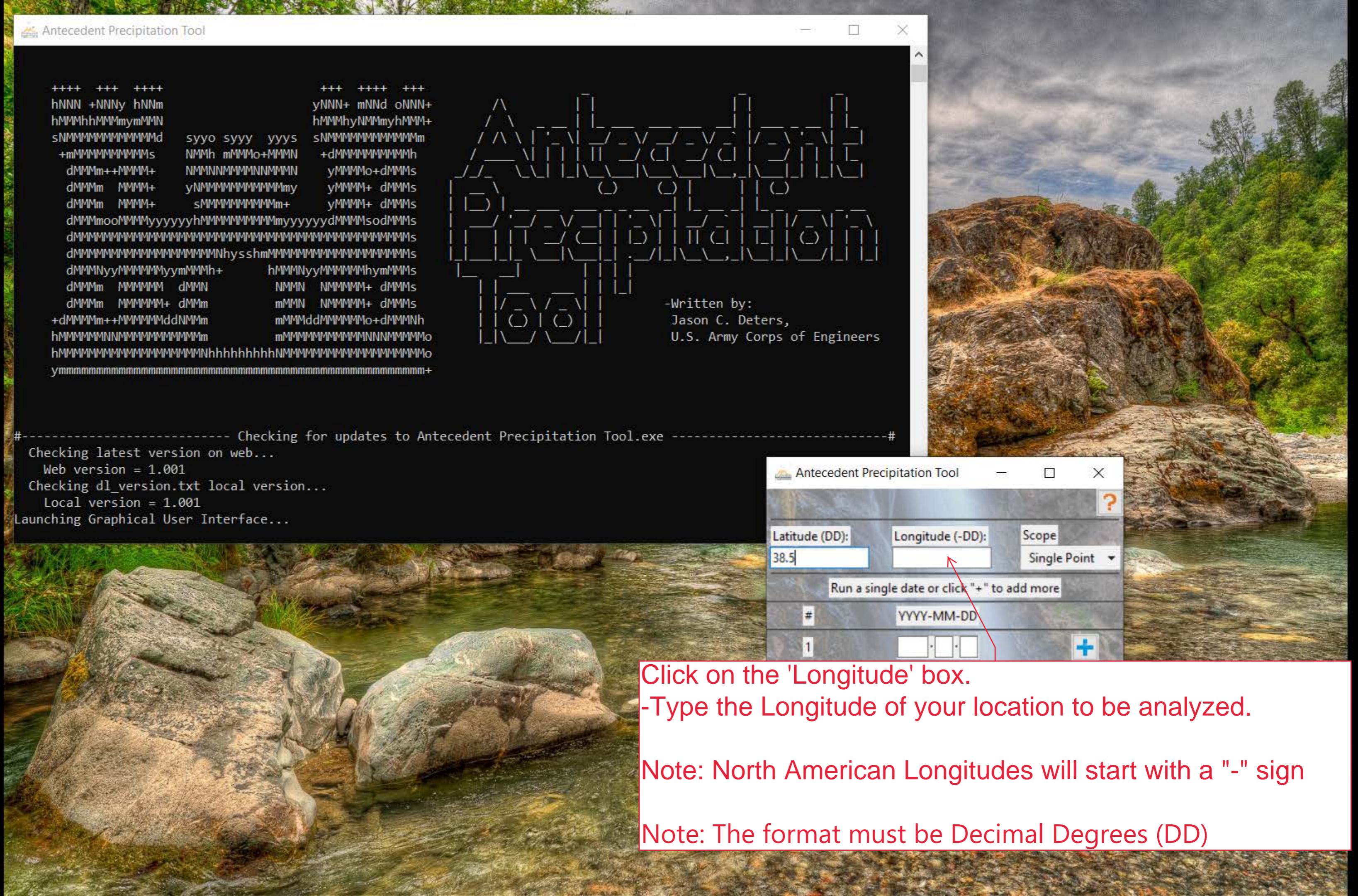
Once the agreement is checked, you can click the "Submit" button.





**Click on the 'Latitude' box.
-Type the Latitude of your location to be analyzed.**

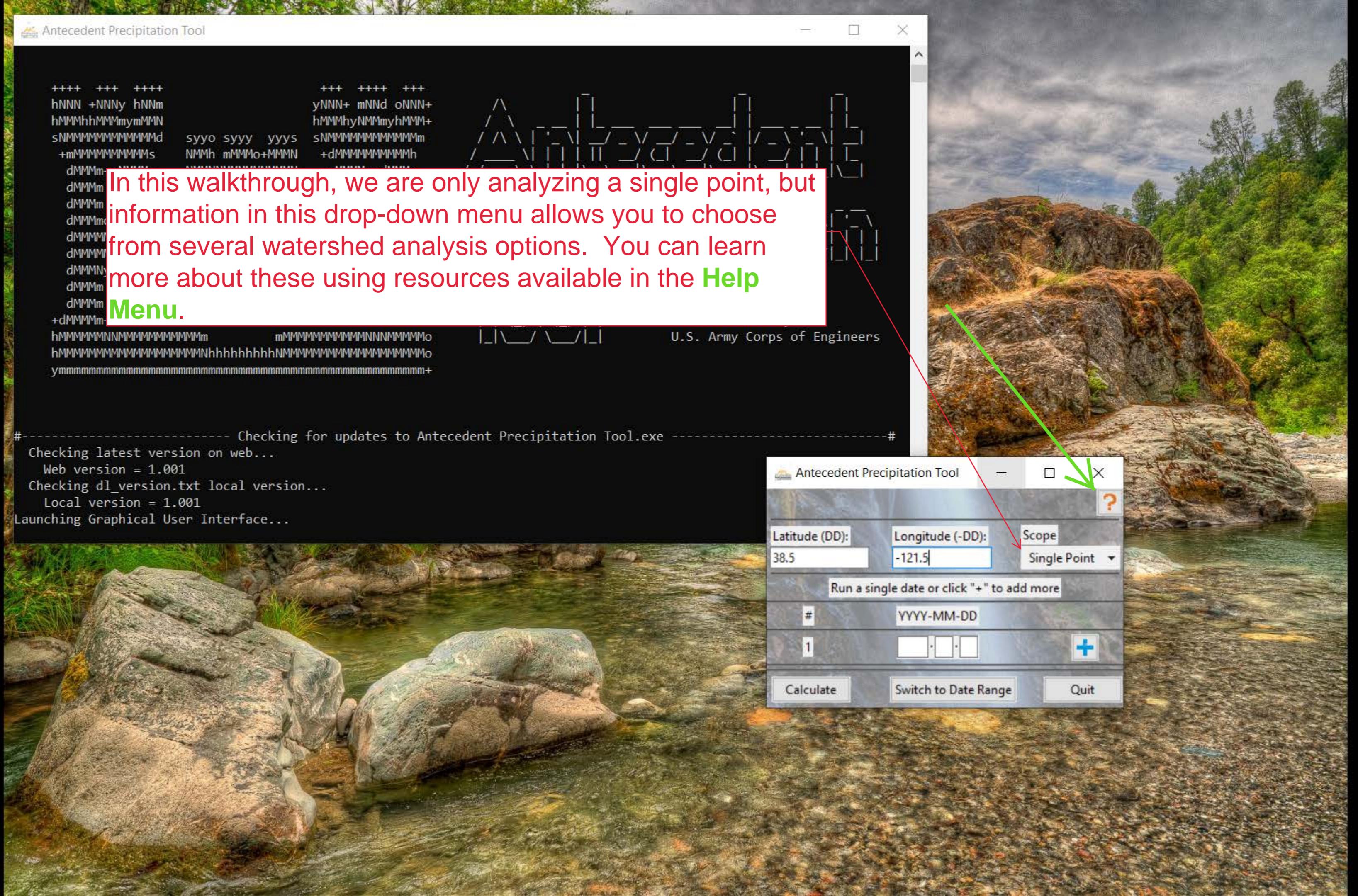
Note: The format must be Decimal Degrees (DD)

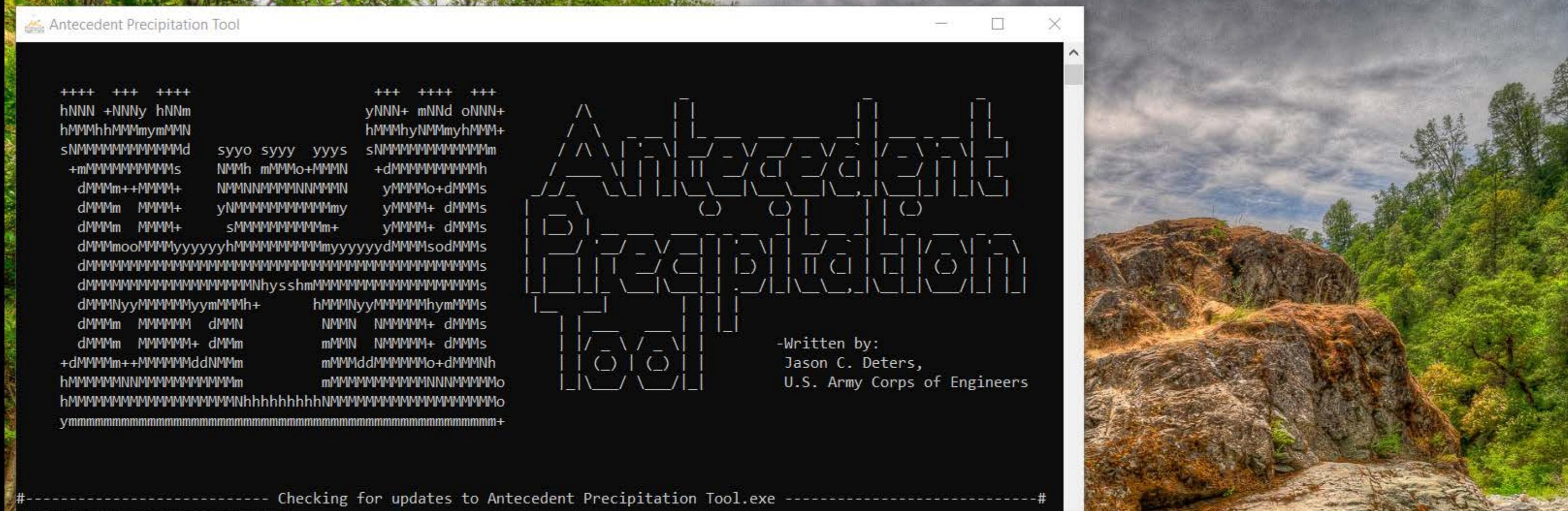


Click on the 'Longitude' box.
-Type the Longitude of your location to be analyzed.

Note: North American Longitudes will start with a "-" sign

Note: The format must be Decimal Degrees (DD)

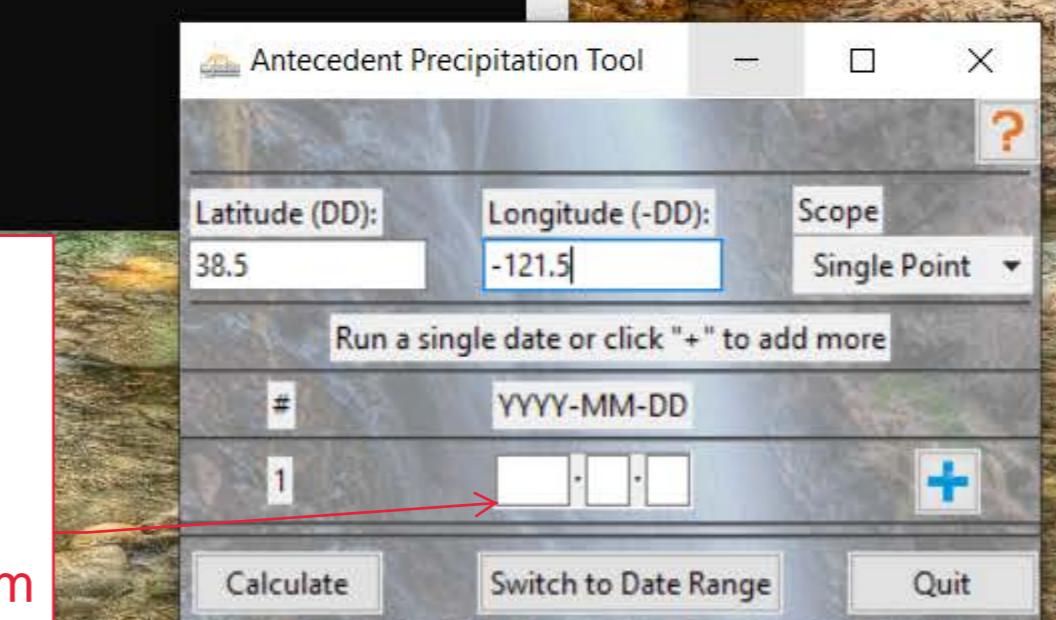


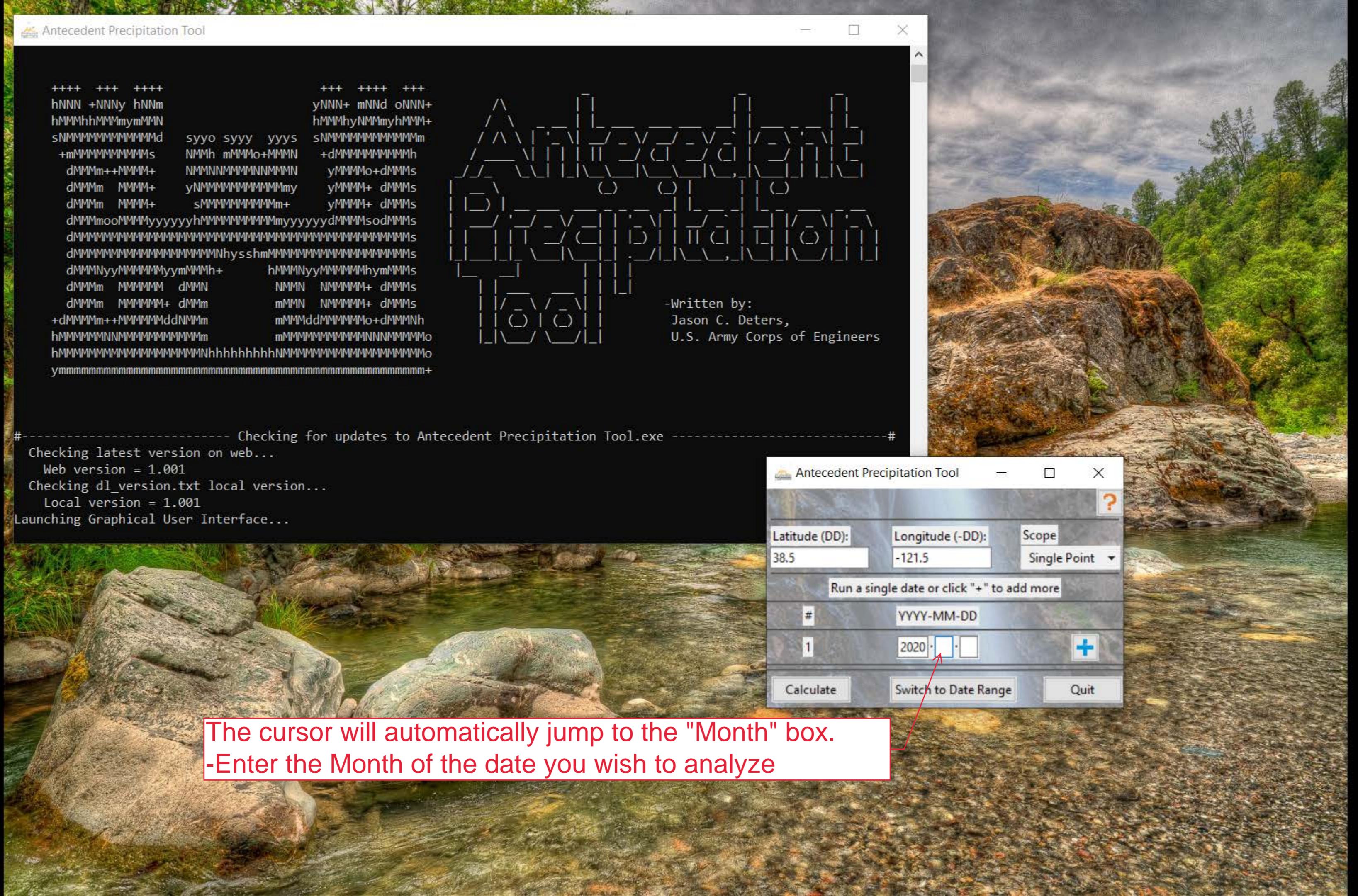


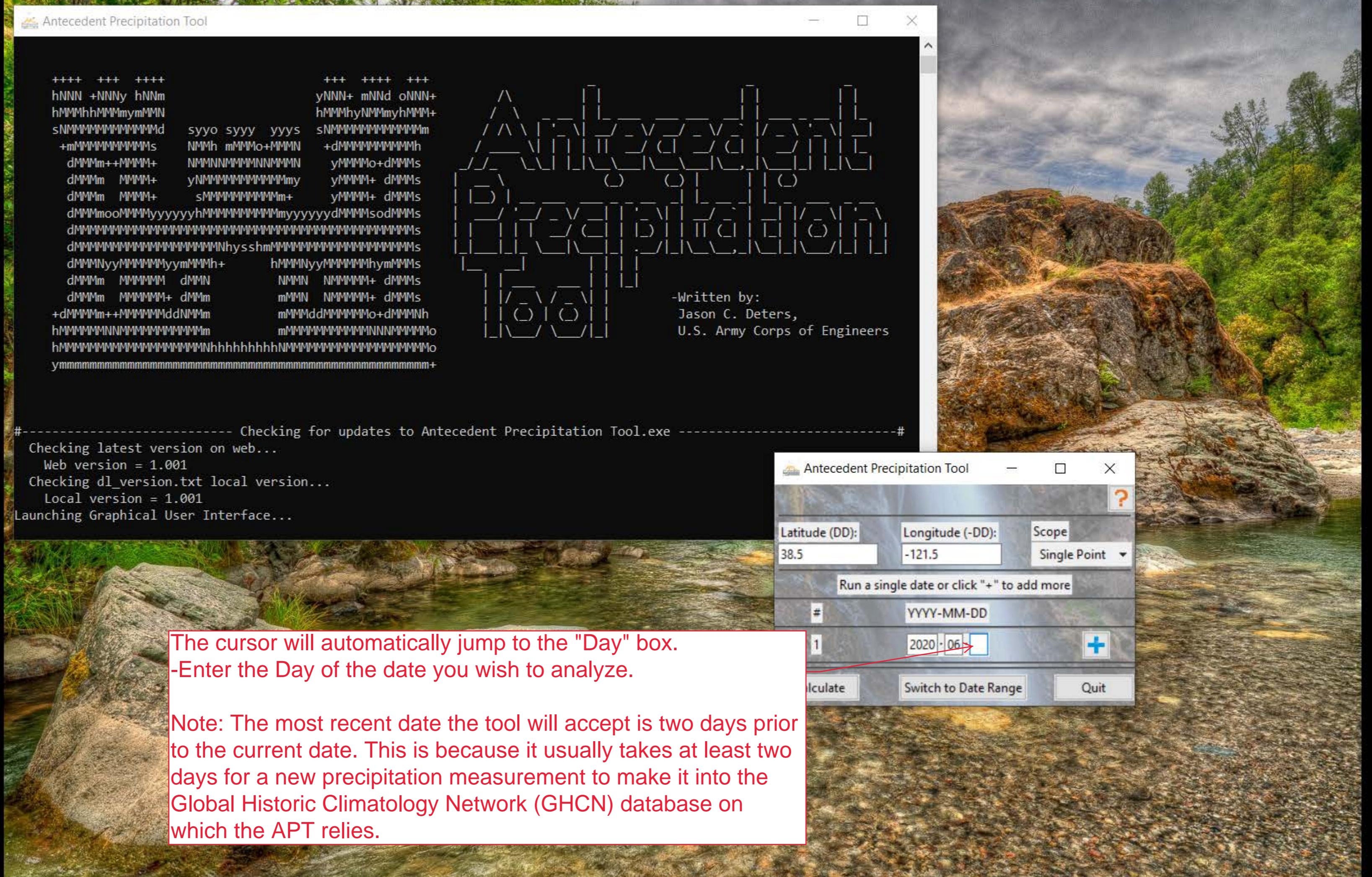
Click on the "Year" box.
-Enter the Year of the date you wish to analyze

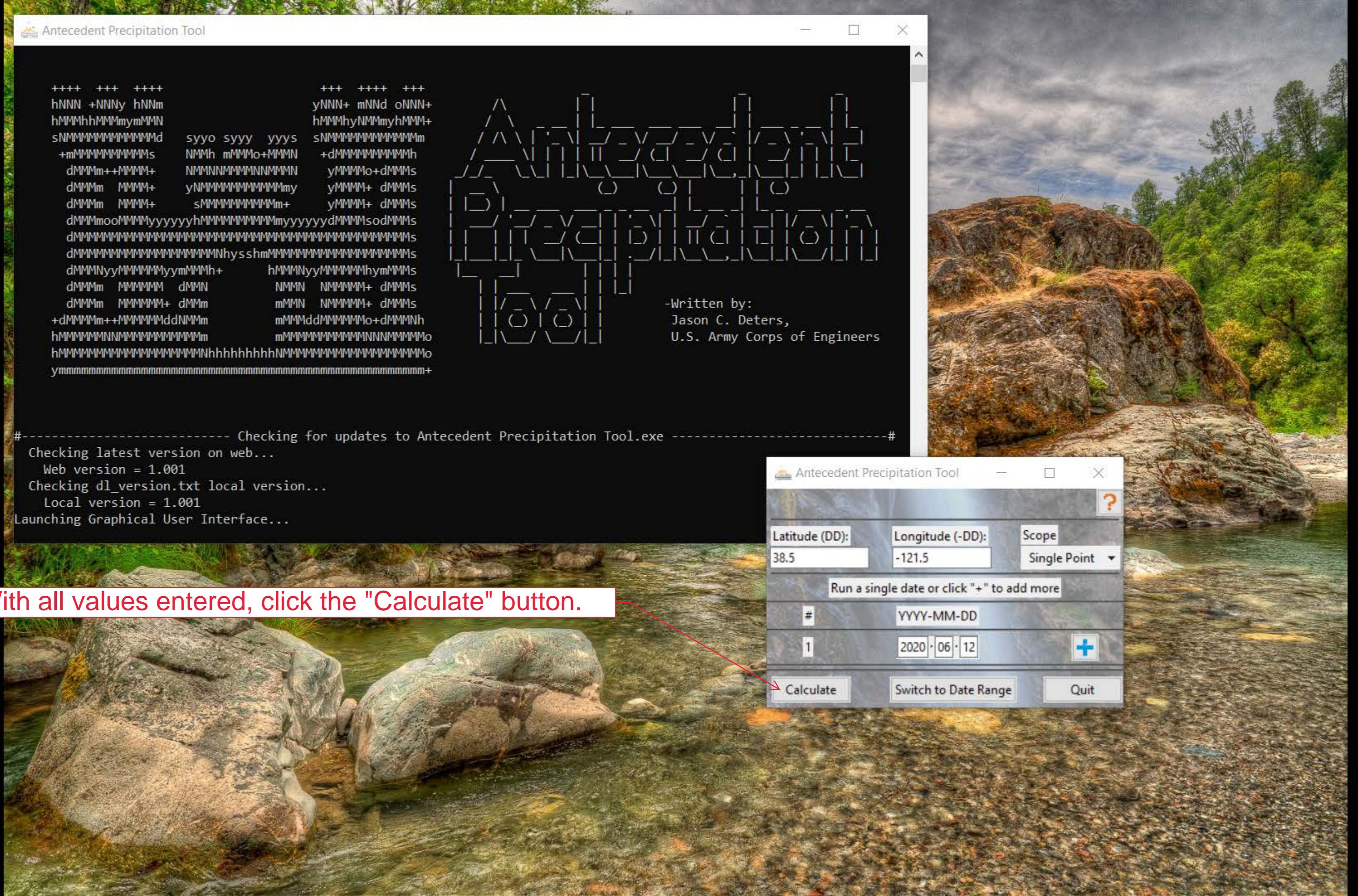
Note: The tool will not accept dates below 1910.

Calculating the Normal Range for 1910-01-01 requires data from as far back as 1878-09-01. The tool may fail to locate sufficient data to perform the analysis for such early dates (1910-1940). However, many places in the U.S. have such historic records available, which is why these years are allowed.

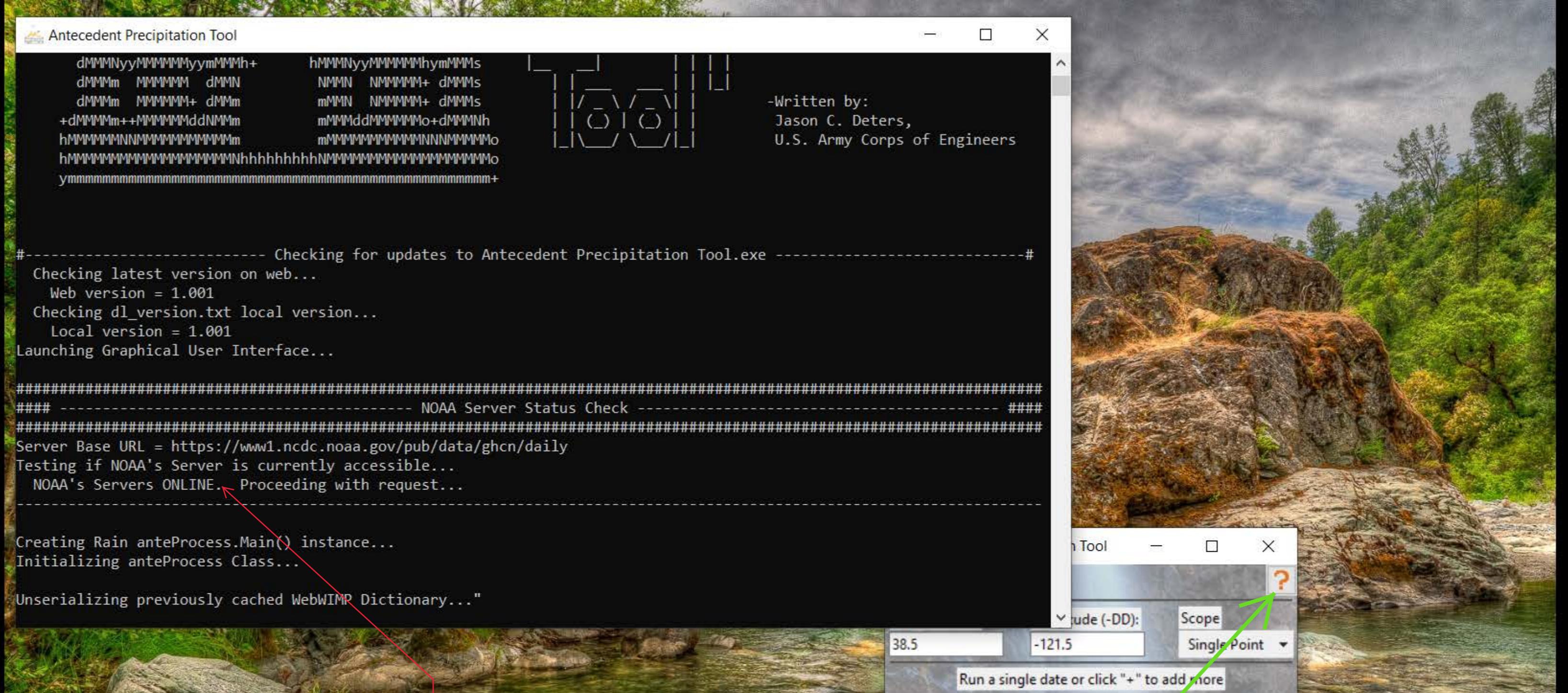






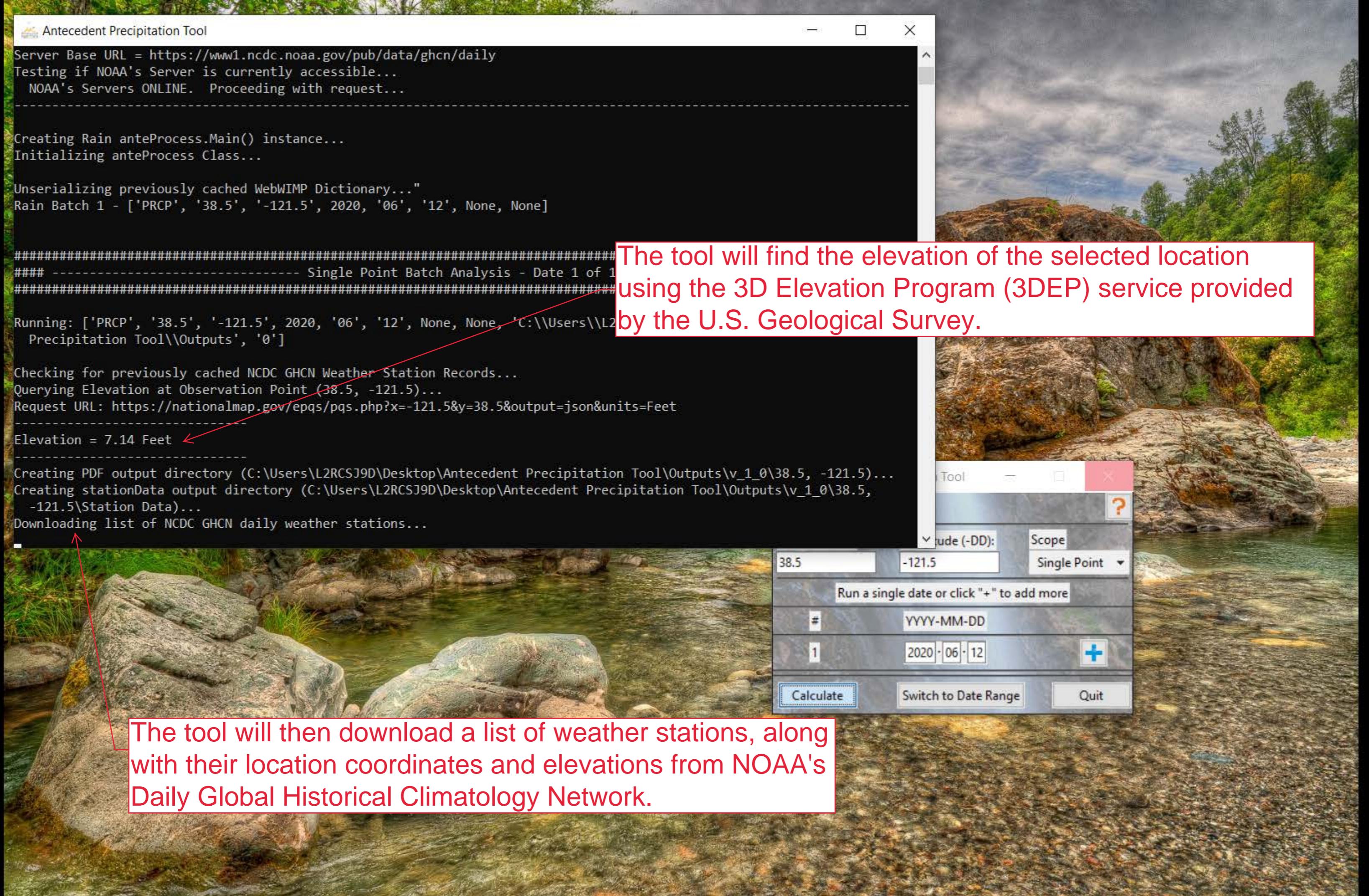


With all values entered, click the "Calculate" button.



The first thing the tool will do is check whether NOAA's servers are active. During server maintenance or special instances (for example, during certain federal government shutdowns), this resource will not be active, and the tool will inform you that it cannot continue. If this occurs, please wait and try again at a later time.

If you continue to receive messages saying the tool is offline, and you know your internet connection is working properly, open the **Help Menu** and click the **Report Issue** button to submit an alert to the APT developers.



```
Running: ['PRCP', '38.5', '-121.5', '2020', '06', '12', None, None, 'C:\\\\Users\\\\L2RCSJ9D\\\\Desktop\\\\Antecedent Precipitation Tool\\\\Outputs', '0']

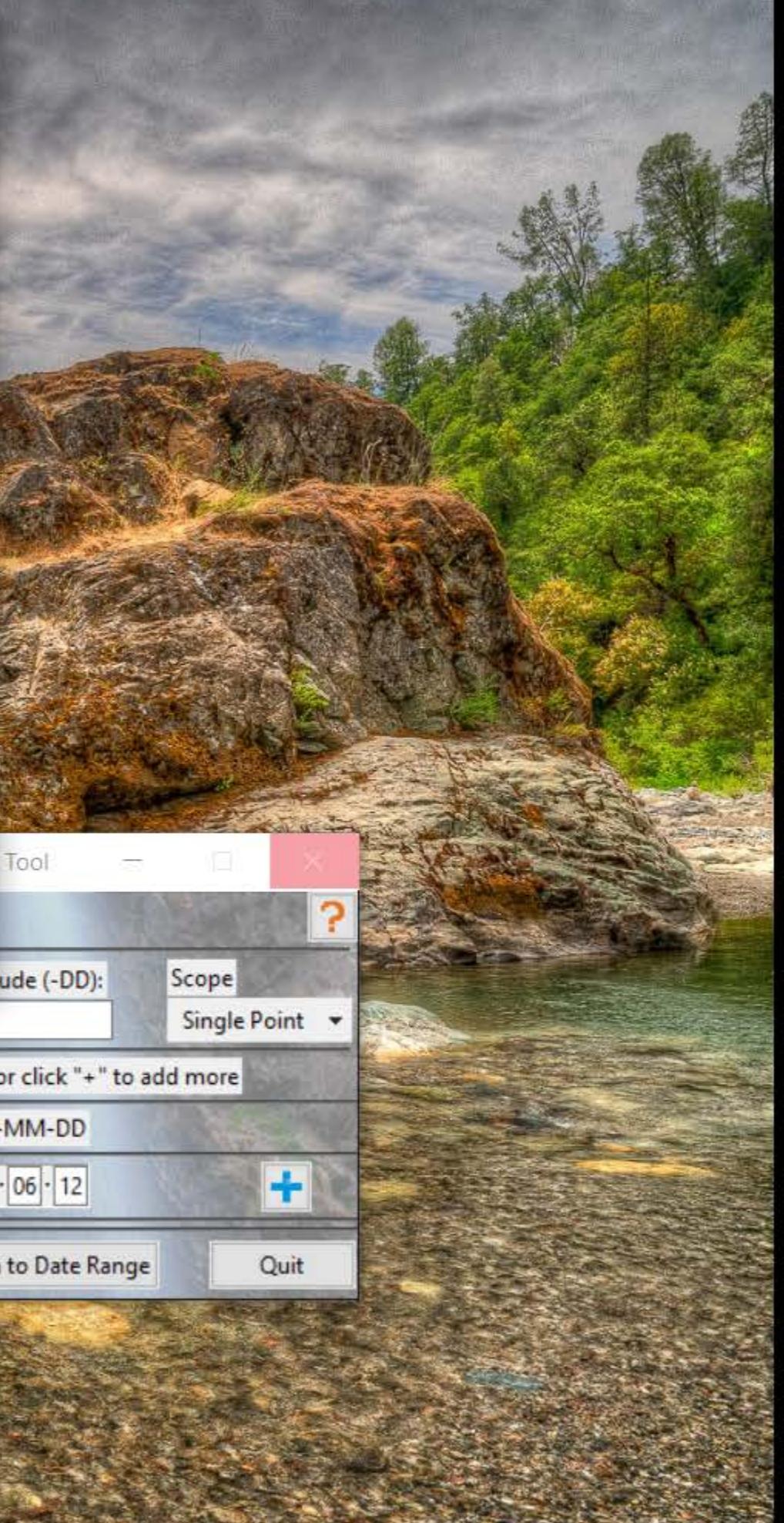
Checking for previously cached NCDC GHCN Weather Station Records...
Querying Elevation at Observation Point (38.5, -121.5)...
Request URL: https://nationalmap.gov/epqs/pqs.php?x=-121.5&y=38.5&output=json&units=Feet
-----
Elevation = 7.14 Feet
-----
Creating PDF output directory (C:\\\\Users\\\\L2RCSJ9D\\\\Desktop\\\\Antecedent Precipitation Tool\\\\Outputs\\\\v_1_0\\\\38.5, -121.5)...
Creating stationData output directory (C:\\\\Users\\\\L2RCSJ9D\\\\Desktop\\\\Antecedent Precipitation Tool\\\\Outputs\\\\v_1_0\\\\38.5, -121.5\\\\Station Data)...
Downloading list of NCDC GHCN daily weather stations...

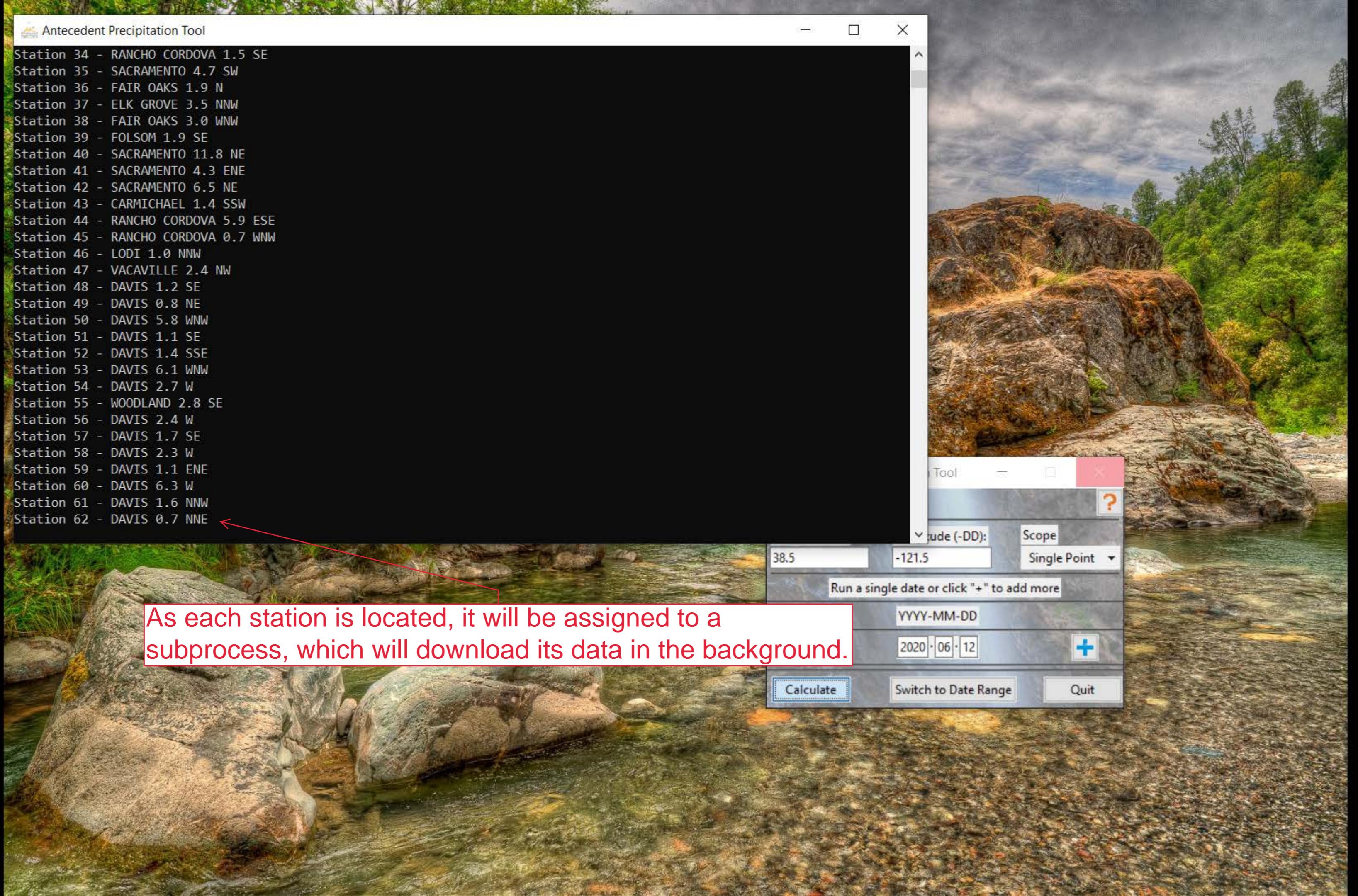
#----- MULTIPROCESSING START -----
Preparing to use sub-processes to accelerate data acquisition...
Establishing Communication Queues...
Creating 4 sub-processes...
Sub-process 1 started
Sub-process 2 started
Sub-process 3 started
Sub-process 4 started
-----
#----- ENQUEUEING STATION DATA DOWNLOADS -----
Searching for weather stations within 30 miles...
```

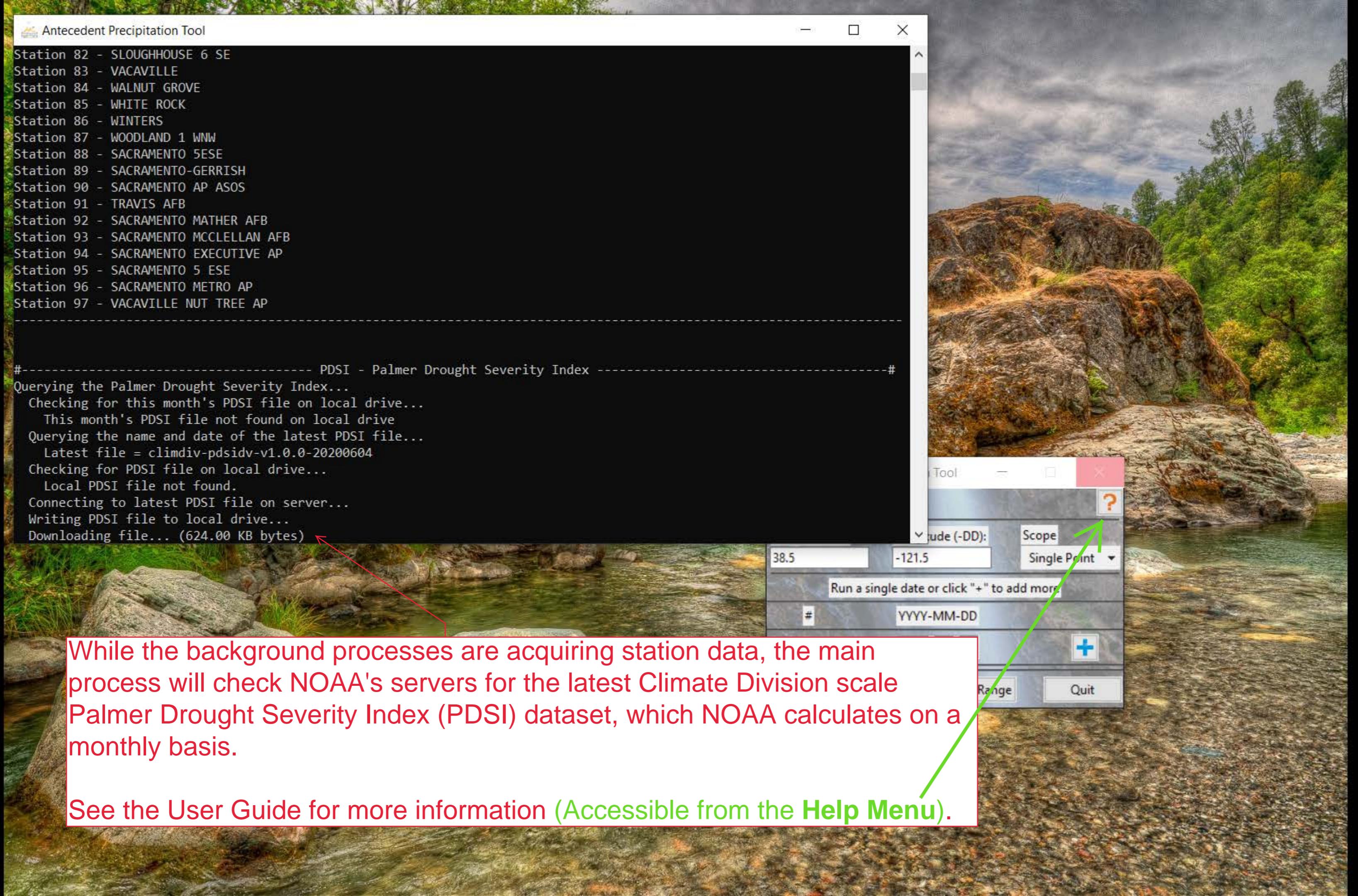
With the list downloaded, the tool will search for any weather stations within 30 miles of your location of interest.

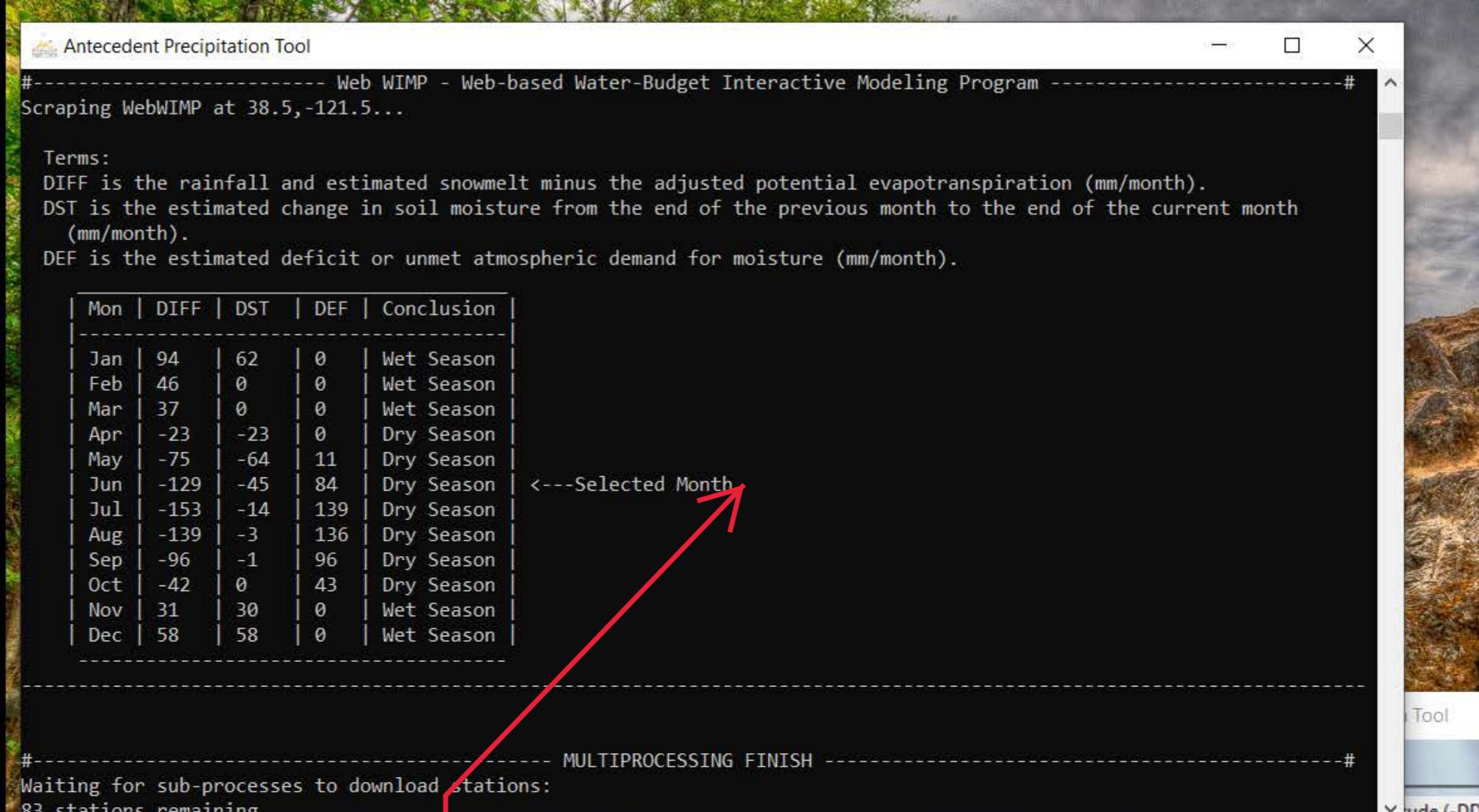
The search may be expanded up to 60 miles in rare areas with very few weather stations or where stations have incomplete records.

Note: The APT - Detailed Methodology document discusses, in detail, the Station selection method.









```
Antecedent Precipitation Tool
#----- Web WIMP - Web-based Water-Budget Interactive Modeling Program -----
Scraping WebWIMP at 38.5,-121.5...

Terms:
DIFF is the rainfall and estimated snowmelt minus the adjusted potential evapotranspiration (mm/month).
DST is the estimated change in soil moisture from the end of the previous month to the end of the current month (mm/month).
DEF is the estimated deficit or unmet atmospheric demand for moisture (mm/month).

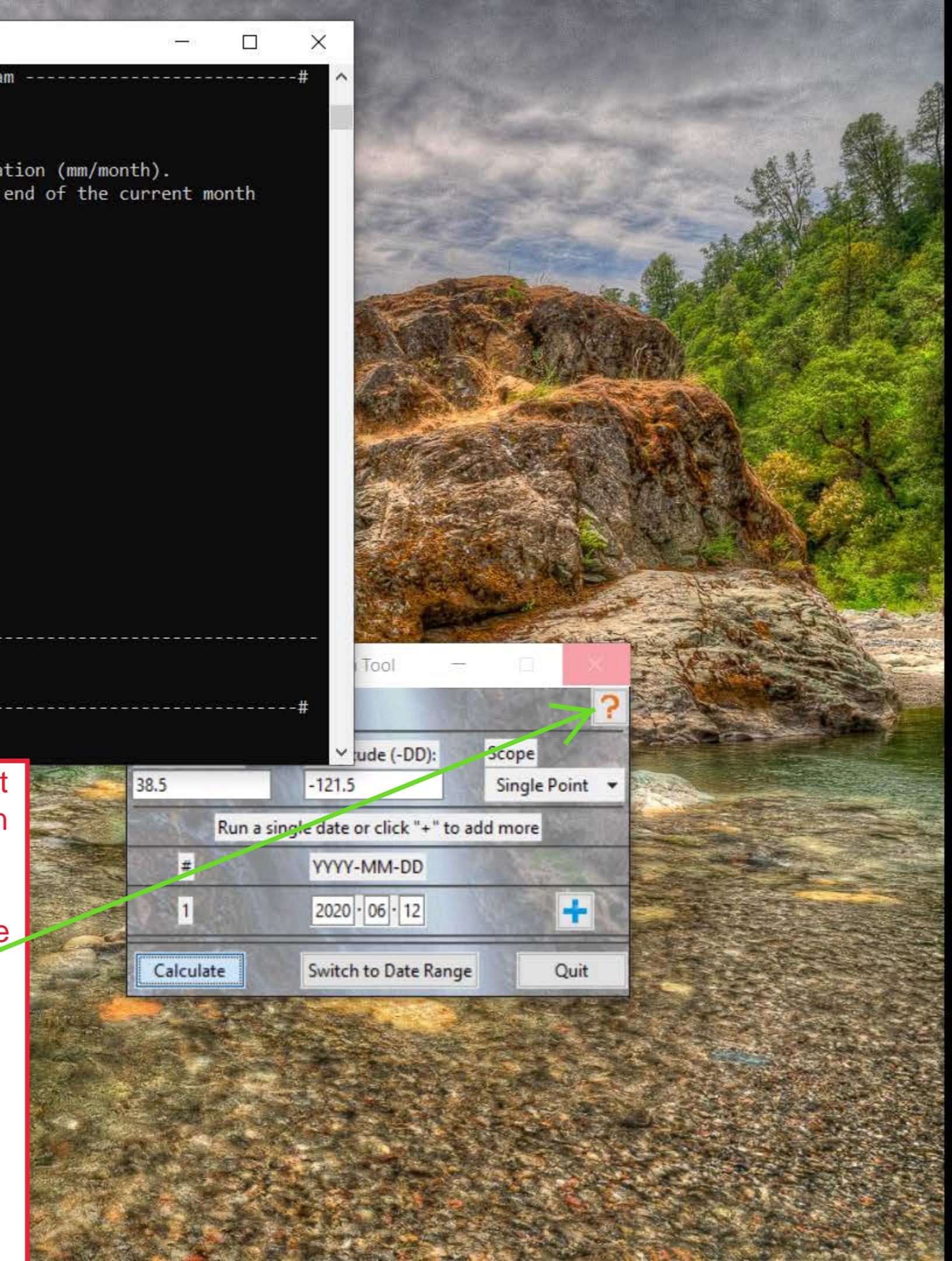
Mon | DIFF | DST | DEF | Conclusion
---|---|---|---|---
Jan | 94 | 62 | 0 | Wet Season
Feb | 46 | 0 | 0 | Wet Season
Mar | 37 | 0 | 0 | Wet Season
Apr | -23 | -23 | 0 | Dry Season
May | -75 | -64 | 11 | Dry Season
Jun | -129 | -45 | 84 | Dry Season
Jul | -153 | -14 | 139 | Dry Season
Aug | -139 | -3 | 136 | Dry Season
Sep | -96 | -1 | 96 | Dry Season
Oct | -42 | 0 | 43 | Dry Season
Nov | 31 | 30 | 0 | Wet Season
Dec | 58 | 58 | 0 | Wet Season

#----- MULTIPROCESSING FINISH -----
Waiting for sub-processes to download stations:
83 stations remaining...
```

It can take quite a while (typically less than an hour), depending on your internet connection, for the background processes to download all of the weather station data, so the main process will also use this time to collect data from the Web-Based Water-Budget Interactive Modeling Program (WebWIMP), which it uses to determine whether the selected month falls within the Dry Season or the Wet Season for selected location.

For more information, see the User Guide in the Help Menu, or the document referenced below:

U.S. Army Corps of Engineers (USACE). (2008). *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Arid West Region* (Version 2.0). <https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7627>





Antecedent Precipitation Tool

#----- Web WIMP - Web-based Water-Budget Interactive Modeling Program -----#

Scraping WebWIMP at 38.5,-121.5...

Terms:

DIFF is the rainfall and estimated snowmelt minus the adjusted potential evapotranspiration (mm/month).

DST is the estimated change in soil moisture from the end of the previous month to the end of the current month (mm/month).

DEF is the estimated deficit or unmet atmospheric demand for moisture (mm/month).

Mon	DIFF	DST	DEF	Conclusion
Jan	94	62	0	Wet Season
Feb	46	0	0	Wet Season
Mar	37	0	0	Wet Season
Apr	-23	-23	0	Dry Season
May	-75	-64	11	Dry Season
Jun	-129	-45	84	Dry Season
Jul	-153	-14	139	Dry Season
Aug	-139	-3	136	Dry Season
Sep	-96	-1	96	Dry Season
Oct	-42	0	43	Dry Season
Nov	31	30	0	Wet Season
Dec	58	58	0	Wet Season

<--Selected Month

#----- MULTIPROCESSING FINISH -----#

Waiting for sub-processes to download stations:

69 stations remaining...

Tool X

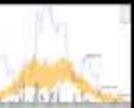
Latitude (-DD): Longitude (-DD): Scope:

Run a single date or click "+" to add more

Date: Format:

Count: Date:

It may take some time to download all the available stations, but as long as this number is decreasing occasionally, there is no reason to suspect the tool has frozen.

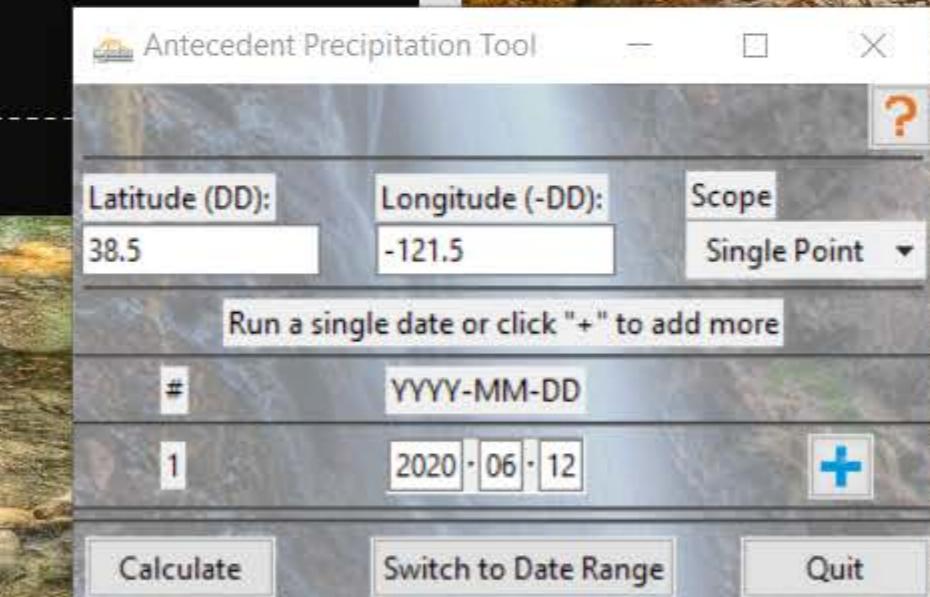


Antecedent
Precipitati...

```
Creating an empty dataframe to populate with weather station data...
11609 null values. ←
Searching for primary station...
Attempting to replace null values with values from SACRAMENTO EXECUTIVE AP...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO AP ASOS...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 4.7 SW...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 1.4 S...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 5.7 SSE...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 2.0 SE...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 0.6 ENE...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO-GERRISH...
8 null values remaining.
Attempting to replace null values with values from CLARKSBURG...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 5ESE...
8 null values remaining.
Attempting to replace null values with values from SACRAMENTO 5 ESE...
0 null values remaining.
No null values within self.finalDF
```

```
Converting PRCP values to inches...
```

The tool will create an empty dataset for the 31-year + 30-day range of dates required for the analysis, and then attempt to fill those dates with the available weather stations in order of suitability (See the User Guide for Suitability Information).

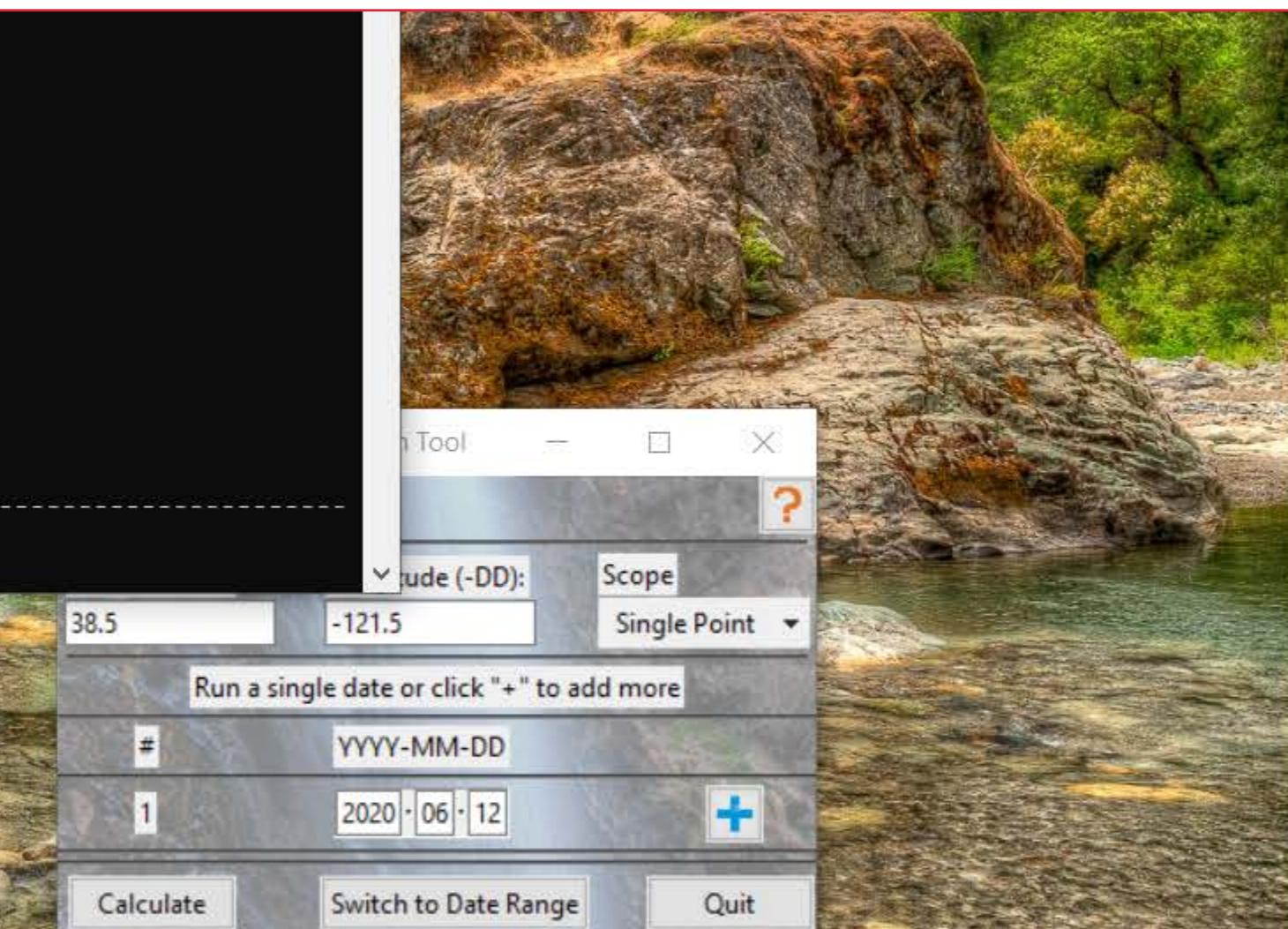


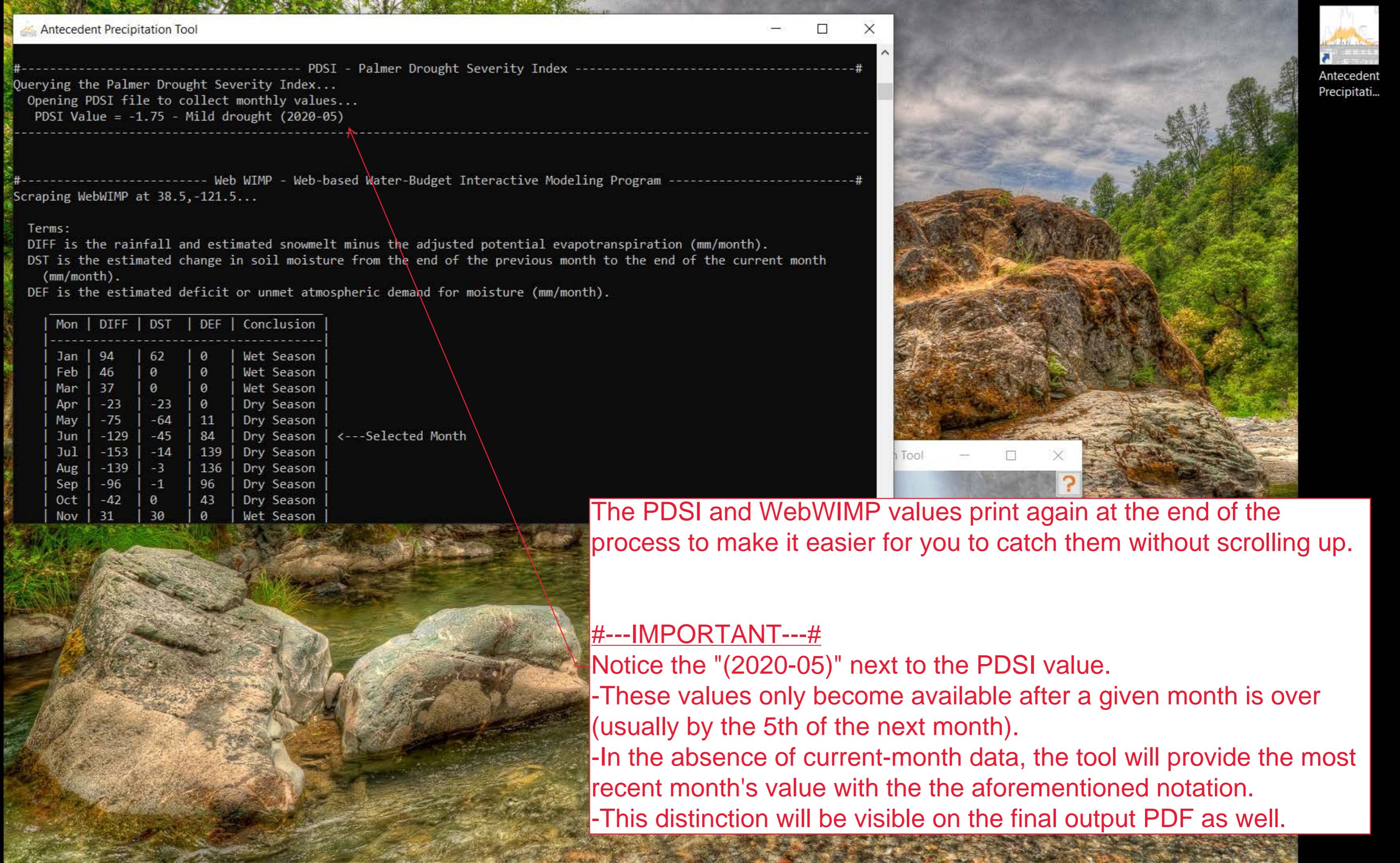


```
Antecedent Precipitation Tool  
Creating an empty dataframe to populate with weather station data...  
11609 null values.  
Searching for primary station...  
Attempting to replace null values with values from SACRAMENTO EXECUTIVE AP...  
8 null values remaining. ←  
Attempting to replace null values with values from SACRAMENTO AP ASOS...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 4.7 SW...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 1.4 S...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 5.7 SSE...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 2.0 SE...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 0.6 ENE...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO-GERRISH...  
8 null values remaining.  
Attempting to replace null values with values from CLARKSBURG...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 5ESE...  
8 null values remaining.  
Attempting to replace null values with values from SACRAMENTO 5 ESE...  
0 null values remaining. ←  
No null values within self.finalDF
```

A given station was only used if the number of null values remaining decreases after the replacement attempt.

So you can see here, and in the resulting output PDF, that only two stations actually contributed to the precipitation normalcy calculation.

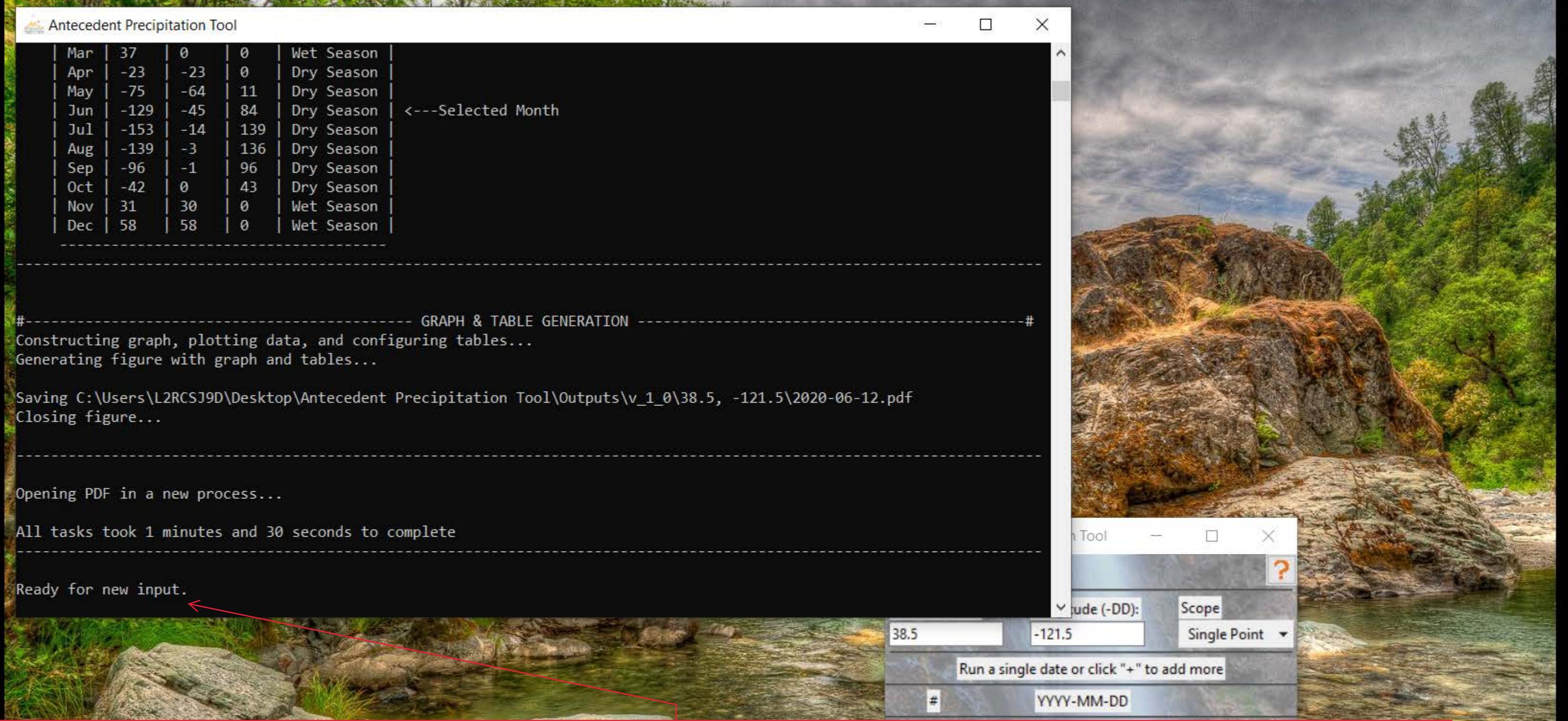




The PDSI and WebWIMP values print again at the end of the process to make it easier for you to catch them without scrolling up.

#---IMPORTANT---

- Notice the "(2020-05)" next to the PDSI value.
- These values only become available after a given month is over (usually by the 5th of the next month).
- In the absence of current-month data, the tool will provide the most recent month's value with the the aforementioned notation.
- This distinction will be visible on the final output PDF as well.



When the tool finishes running, it will report that it is "Ready for new input," but it will usually take a few seconds for the Output PDF to open.

The actual outputs are saved at:
"[Install Location]\Antecedent Precipitation Tool\Output\[LATITUDE] [LONGITUDE]"

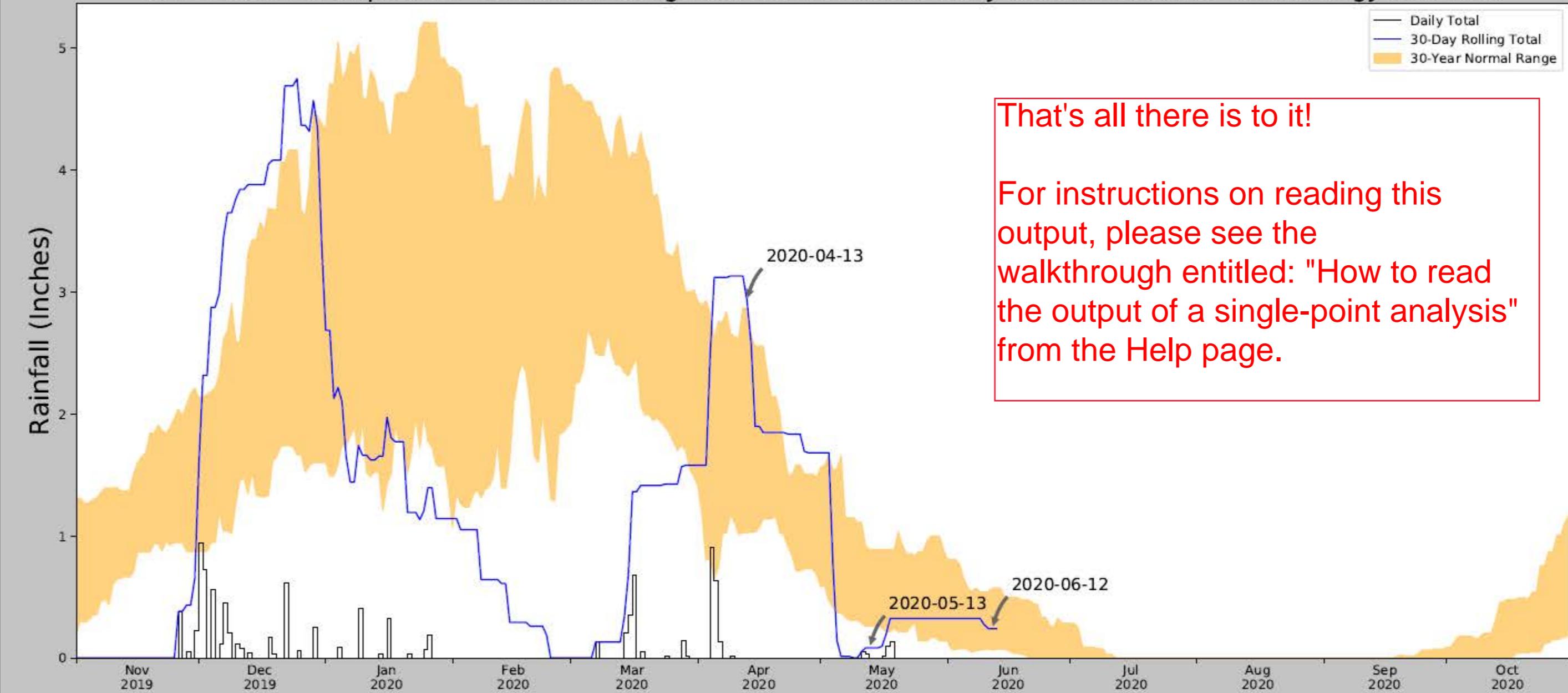


61.2%



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

Daily Total
30-Day Rolling Total
30-Year Normal Range



Coordinates	38.5, -121.5
Observation Date	2020-06-12
Elevation (ft)	7.14
Drought Index (PDSI)	Mild drought (2020-05)
WebWIMP H ₂ O Balance	Dry Season

30 Days Ending	30 th %ile (in)	70 th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2020-06-12	0.064961	0.572047	0.240157	Normal	2	3	6
2020-05-13	0.260236	0.887795	0.082677	Dry	1	2	2
2020-04-13	1.027559	2.866536	2.929134	Wet	3	1	3
Result							Normal Conditions - 11