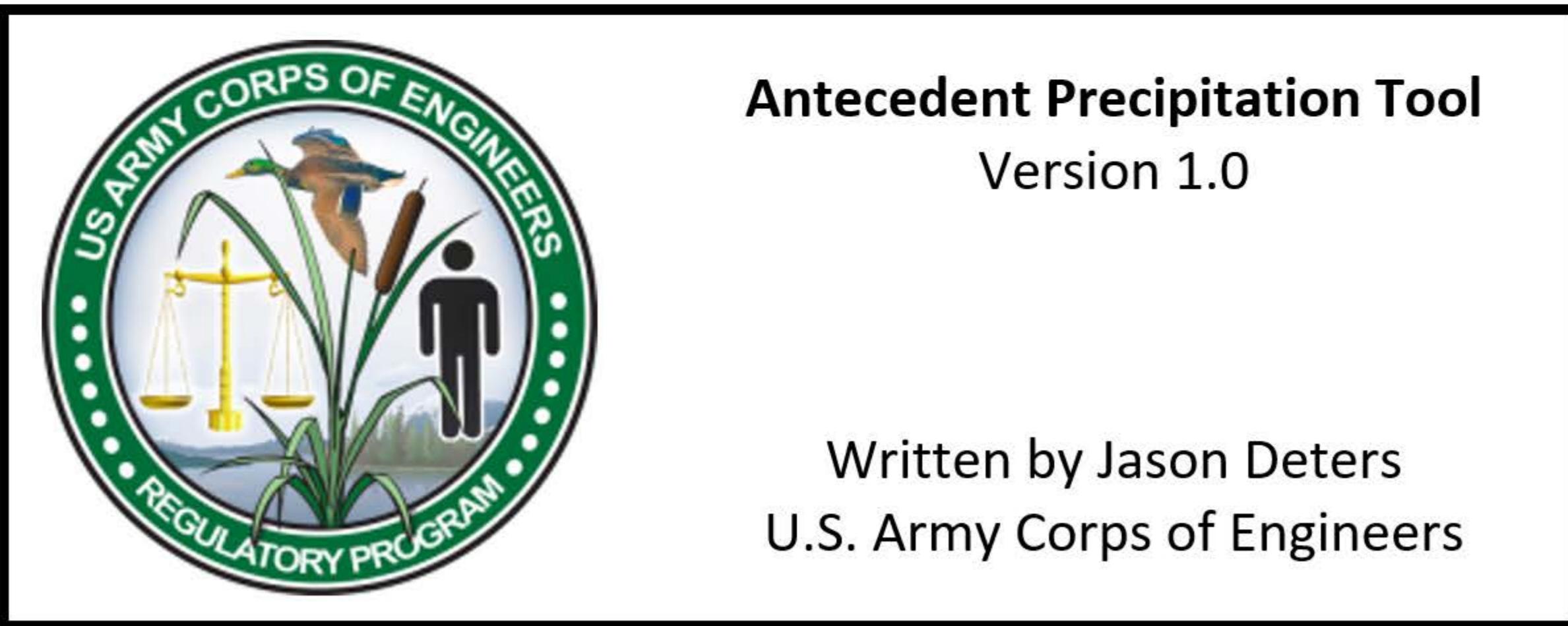


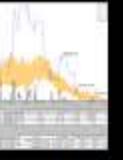
How to Generate a Single-point Analysis for a Single Date





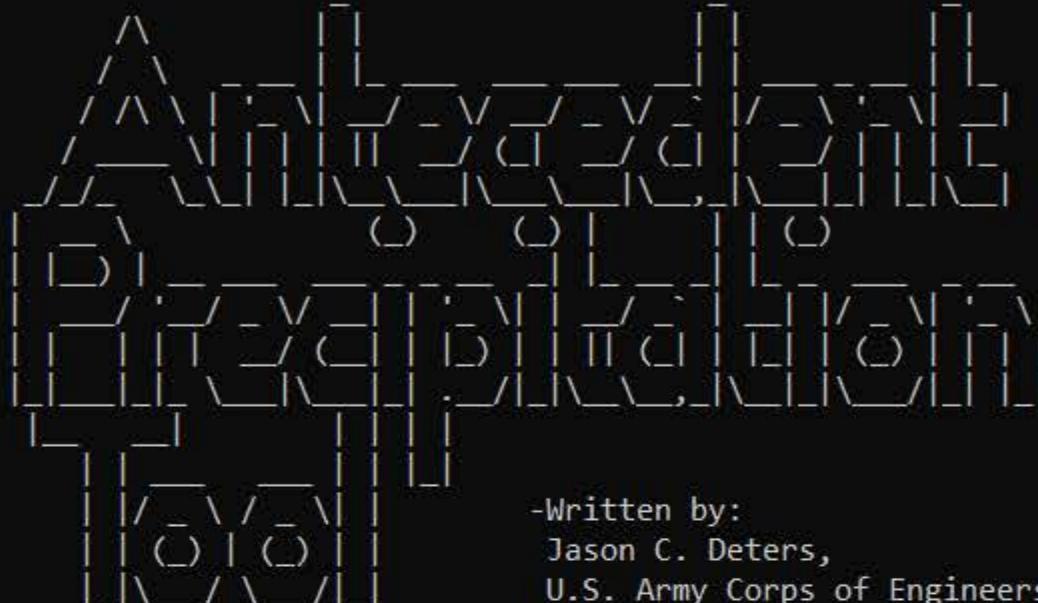
Double-click the APT
Desktop Shortcut

Antecedent
Precipitati...



++++ +++ ++++
hNNN +NNNy hNNm
hMMMhhMMMyMmMN
sNMMMMMMMMMMMd
+mMMMMMMMMMs
dMMMm++MMMM+
dMMMm MMM+
dMMMs MMM+
dMMMooyMMMyyyyyyhhMMMMMMMMMyyyyyydMMMsodMMMs
dMMMs
dMMMMMMMMMMMMMMMMhysshMmMMMMMMMMMMMMMMMMMs
dMMMNyyMMMMMyymMMh+
dMMMs MMMMM dMMN
dMMMs MMMMM+ dMMm
+dMMMs++MMMMMdNMMm
hMMMMMNMMMMMMMMMs
hMMMMMMMMMMMMMMNNhffffhffffhffffhffffhffffhffffMo
ymm+

+++ +++ +++
yNNN+ mNNd oNNN+
hMMMyhNMMyhMM+
sNMMMMMMMMMMMs
+dMMMMMMMMMs
yMMMo+dMMMs
yMMMs+dMMMs
yMMMs+dMMMs
yMMMs+dMMMs



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

 User Licence Agreement - Antecedent Precipitation Tool**Please review and accept the user licence agreement to proceed**

This software was developed by United States Army Corps of Engineers (USACE) employees in the course of their official duties. USACE used copyrighted, open source code to develop this software, as such this software (per 17 USC § 101) is considered "joint work." Pursuant to 17 USC § 105, portions of the software developed by USACE employees in the course of their official duties are not subject to copyright protection and are in the public domain.

USACE assumes no responsibility whatsoever for the use of this software by other parties, and makes no guarantees, expressed or implied, about its quality, reliability, or any other characteristic.

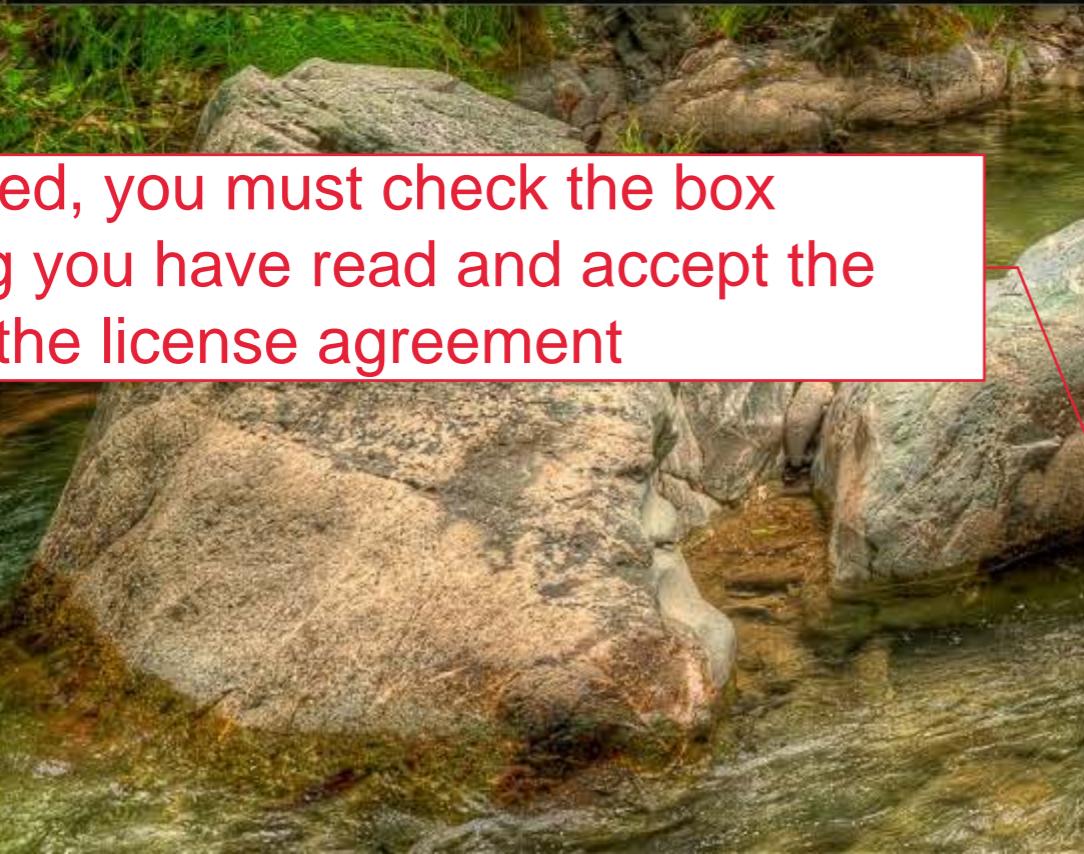
The software is provided "as is," without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose, and noninfringement. In no event shall the authors or U.S. Government be liable for any claim, damages or other liability, whether in an action of contract, tort or otherwise, arising from, out of or in connection with the software or the use or other dealings in the software.

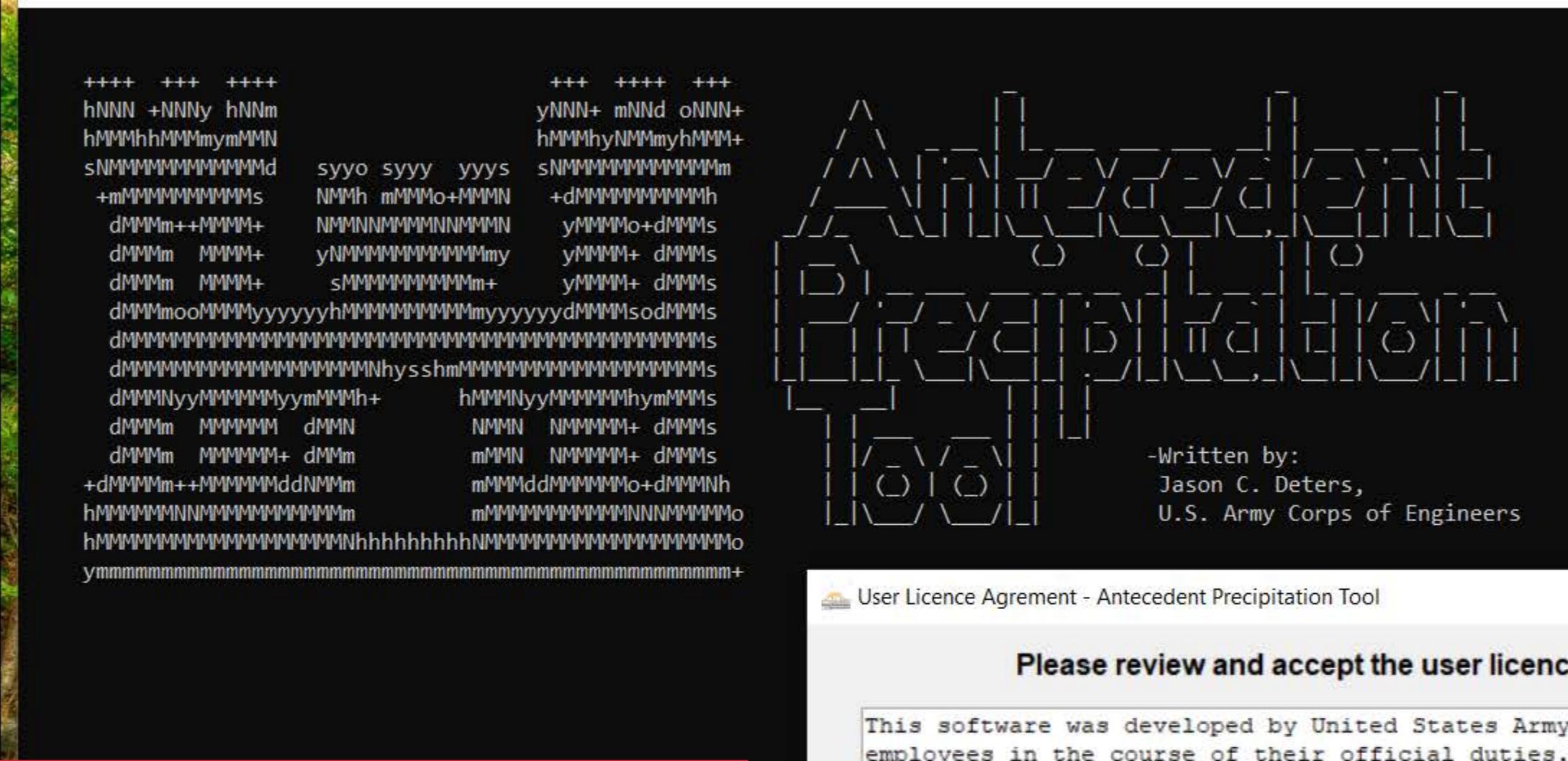
I have read and accept the terms of the license agreement

Submit

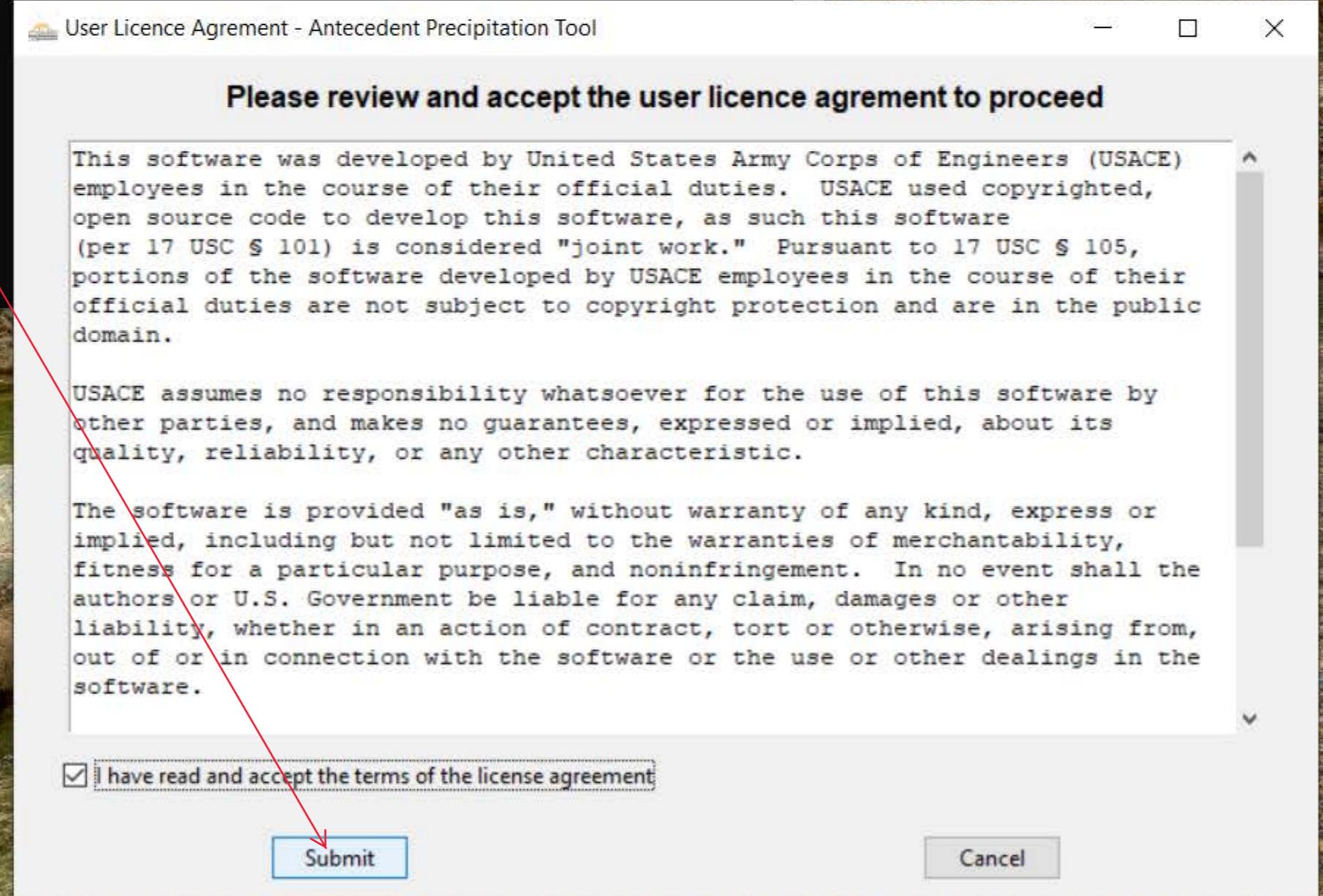
Cancel

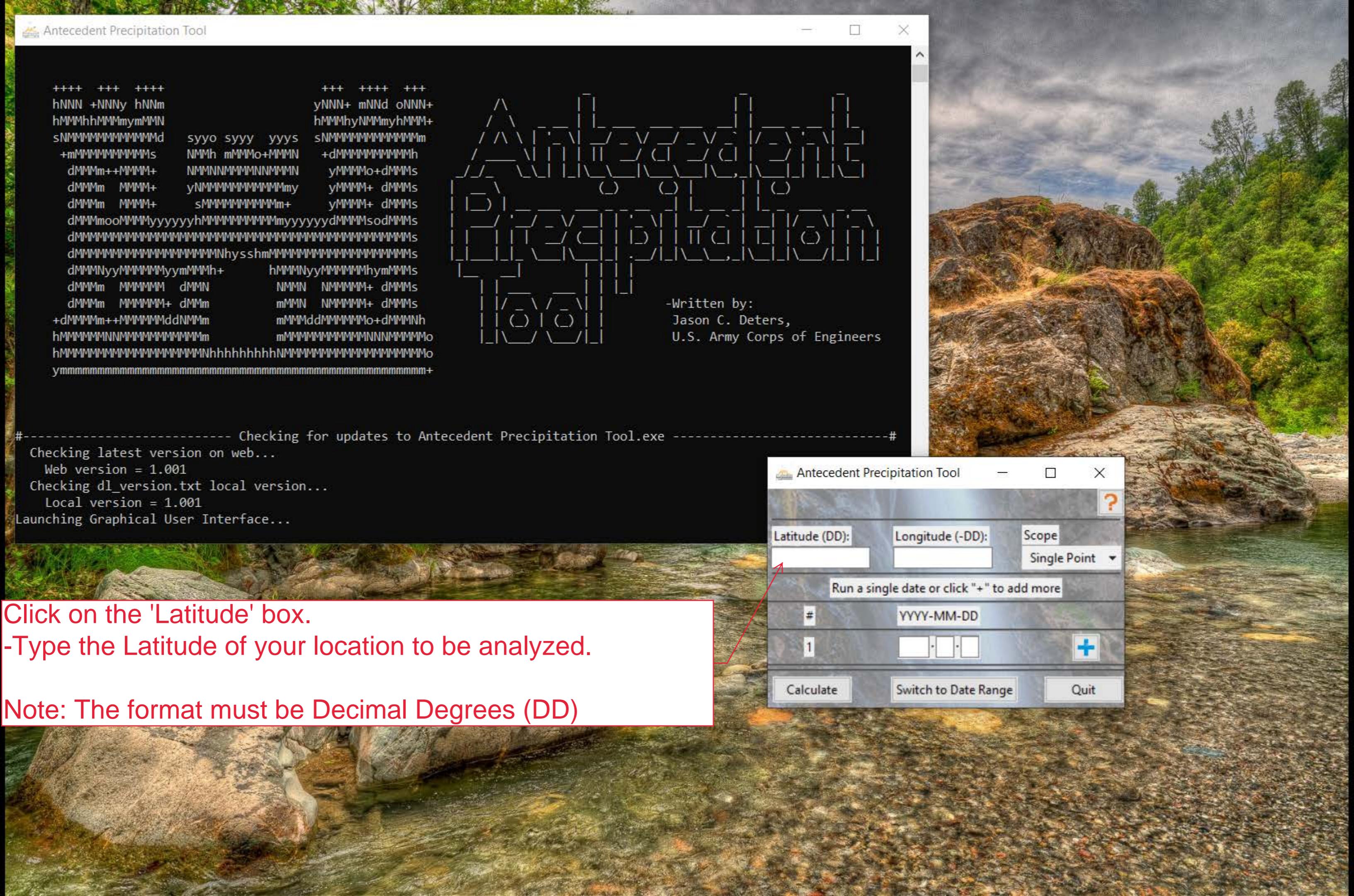
To proceed, you must check the box indicating you have read and accept the terms of the license agreement





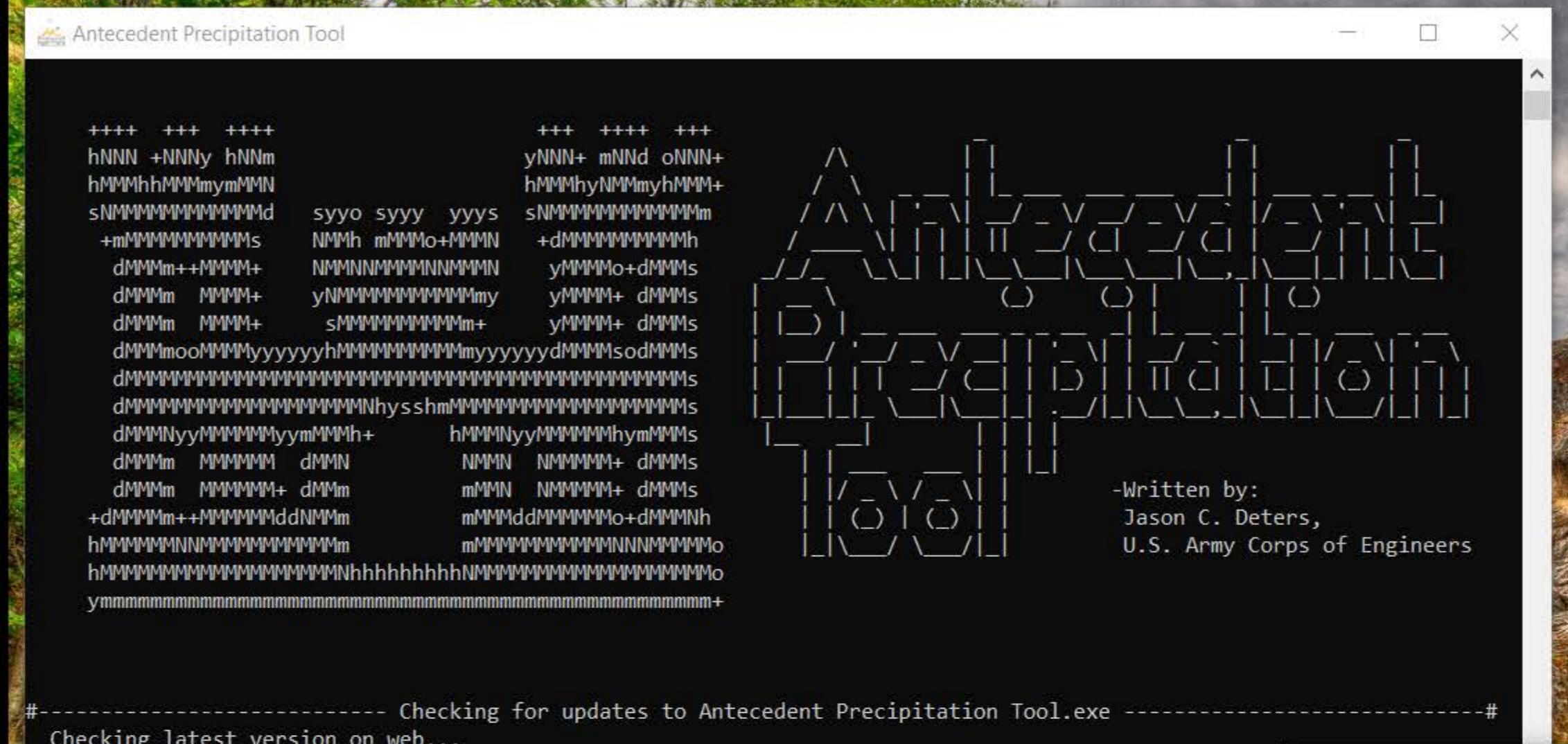
Once the agreement is checked, you can click the "Submit" button.





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

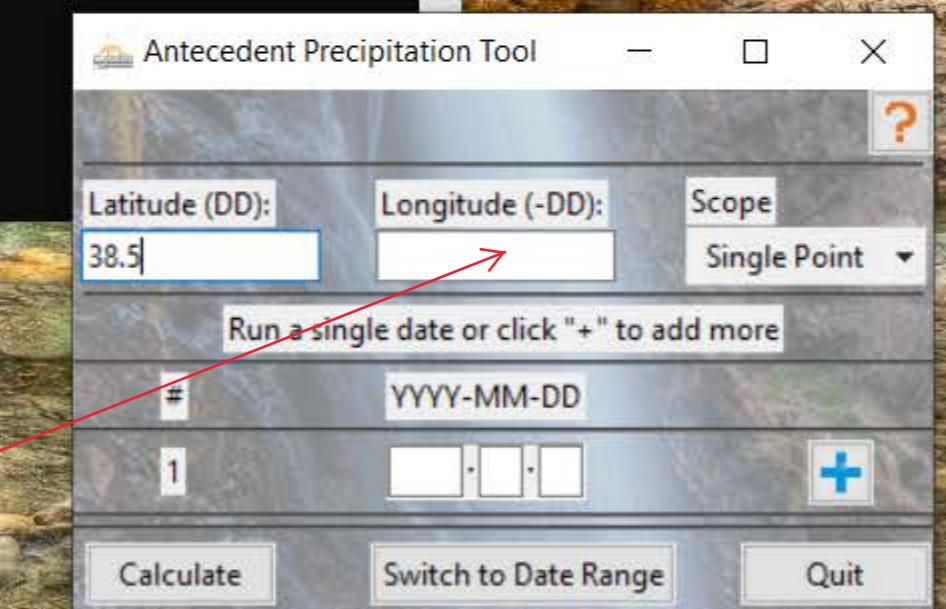
Note: The format must be Decimal Degrees (DD)

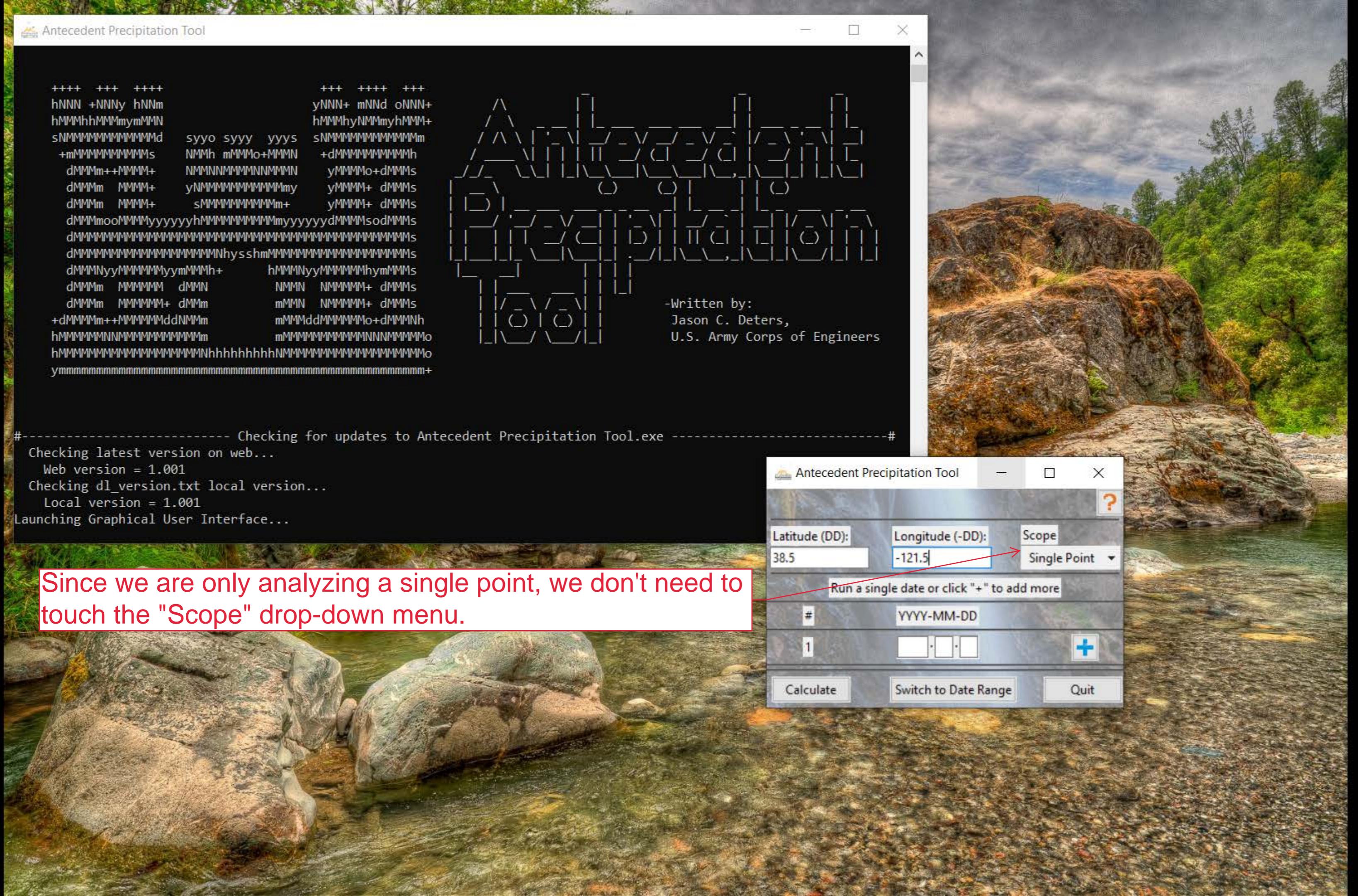


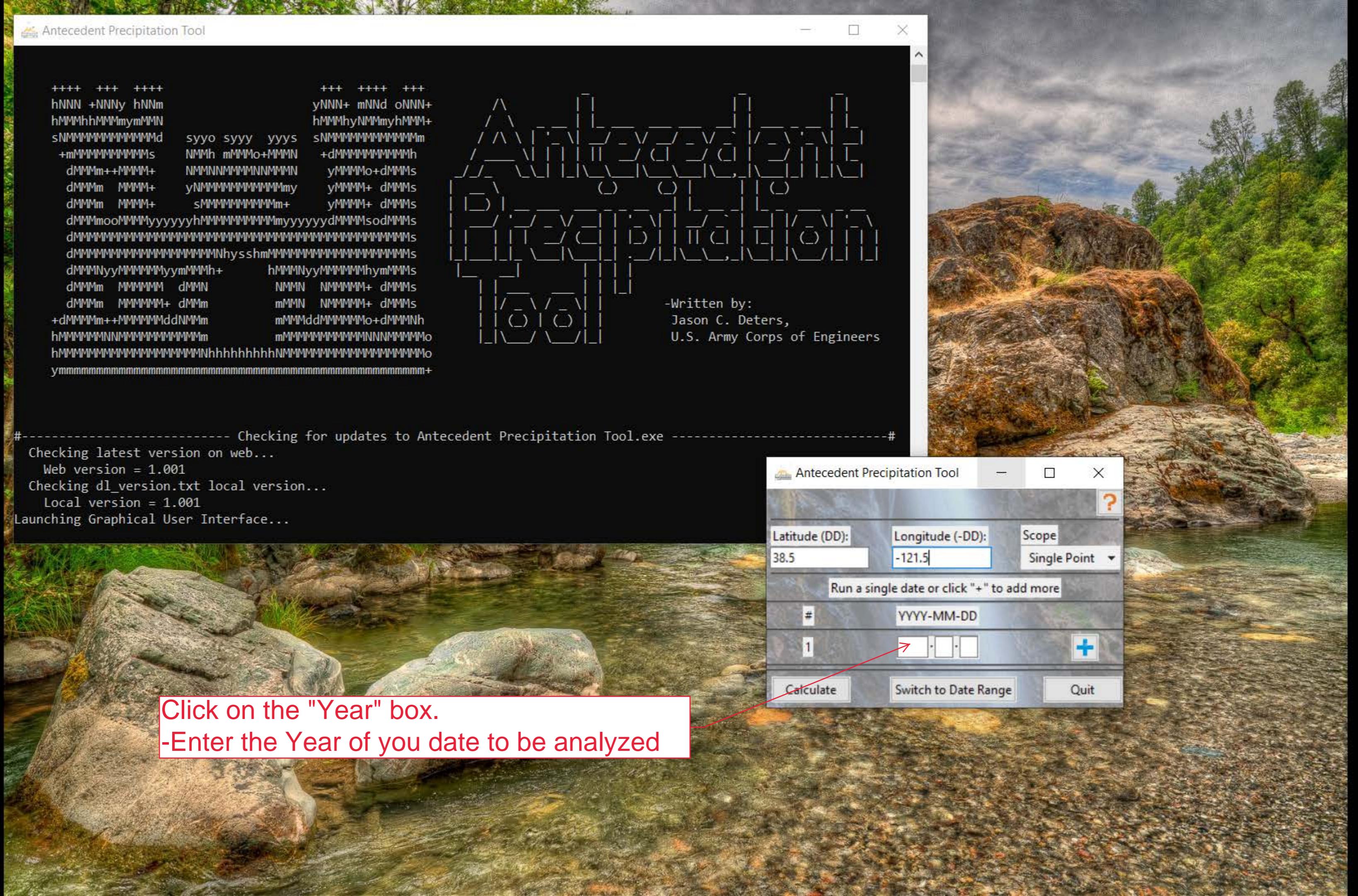
```
#----- Checking for updates to Antecedent Precipitation Tool.exe -----#
Checking latest version on web...
  Web version = 1.001
Checking dl_version.txt local version...
  Local version = 1.001
Launching Graphical User Interface...
```

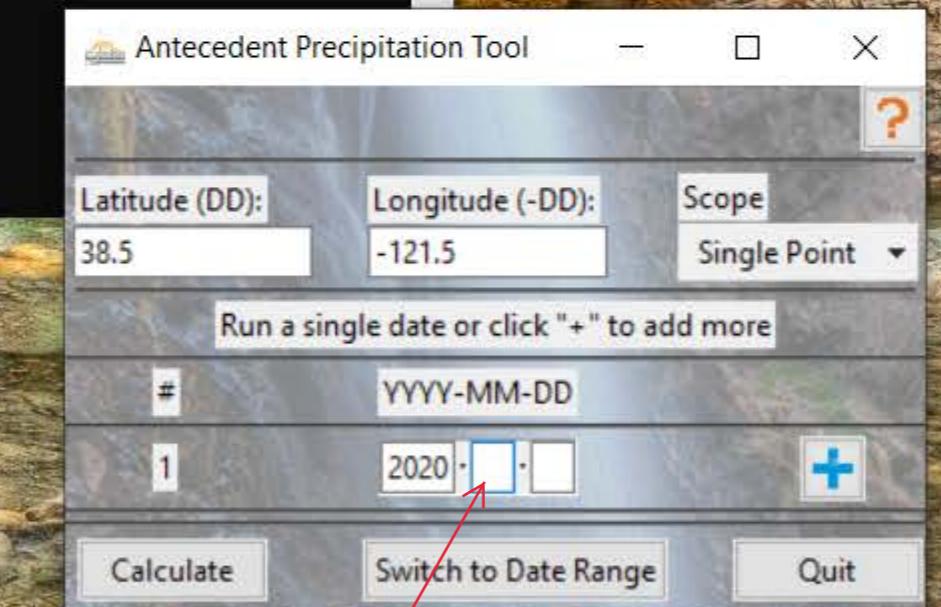
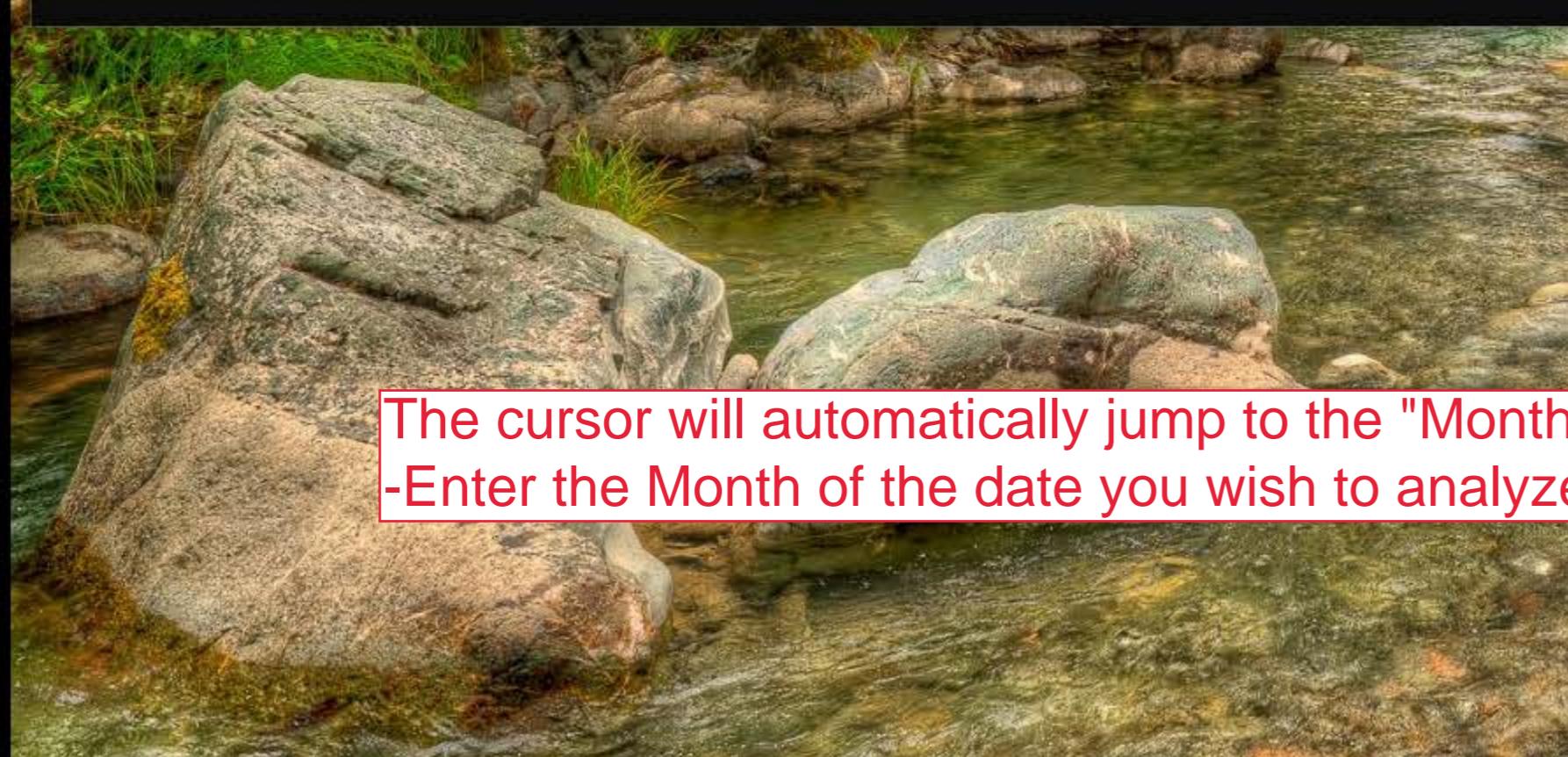
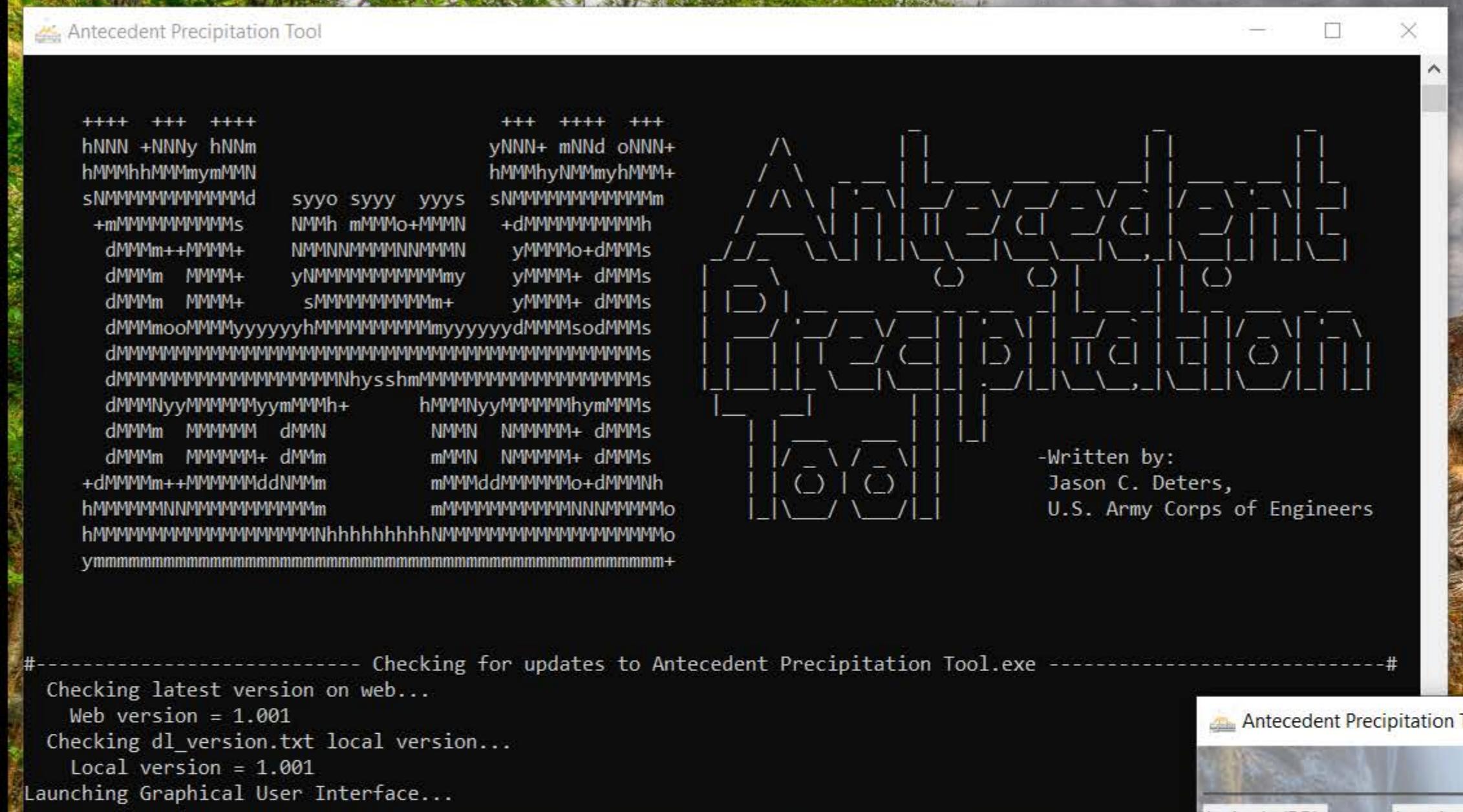
Click on the 'Longitude' box.
-Type the Longitude of your location to be analyzed.

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

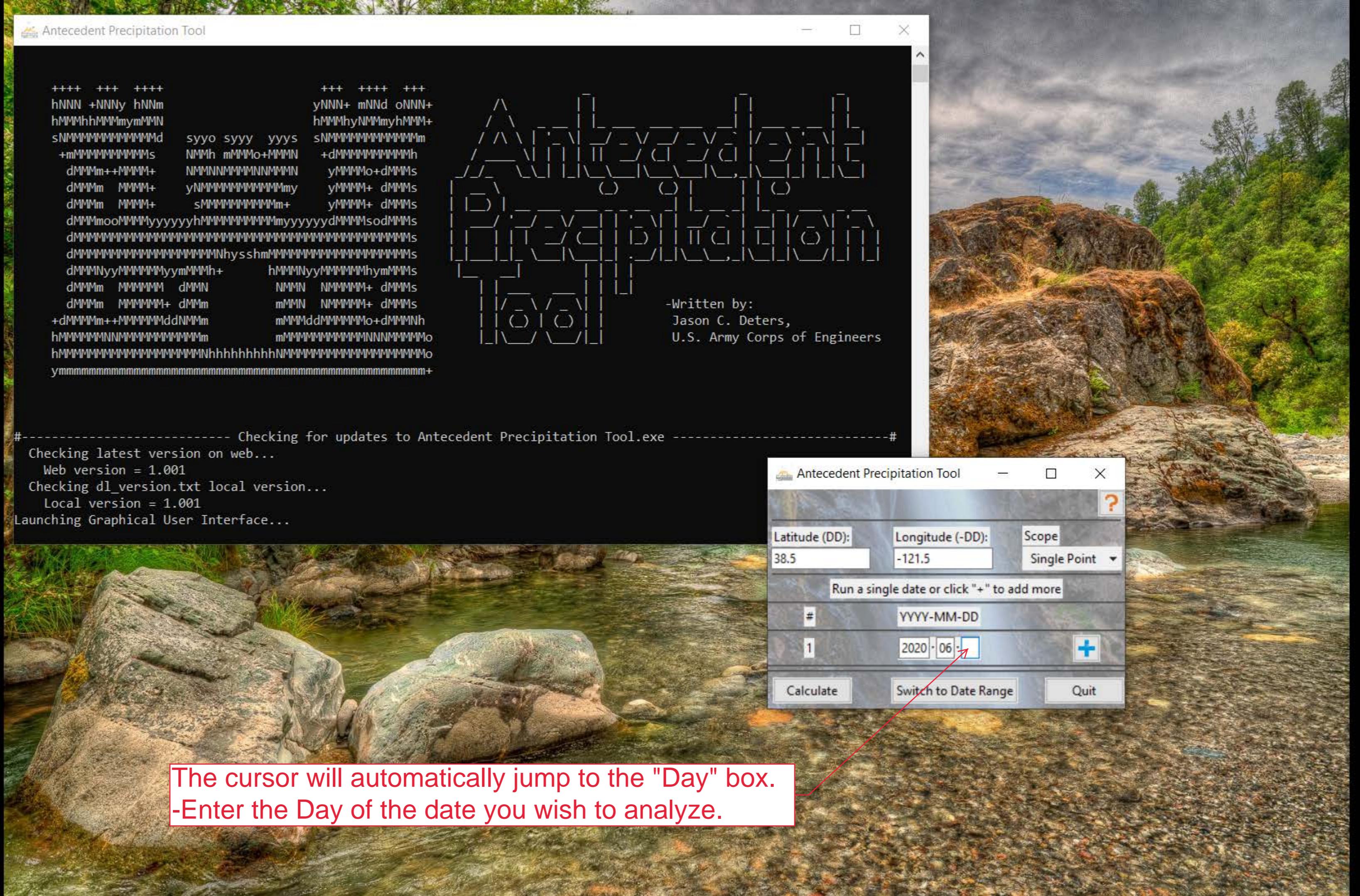


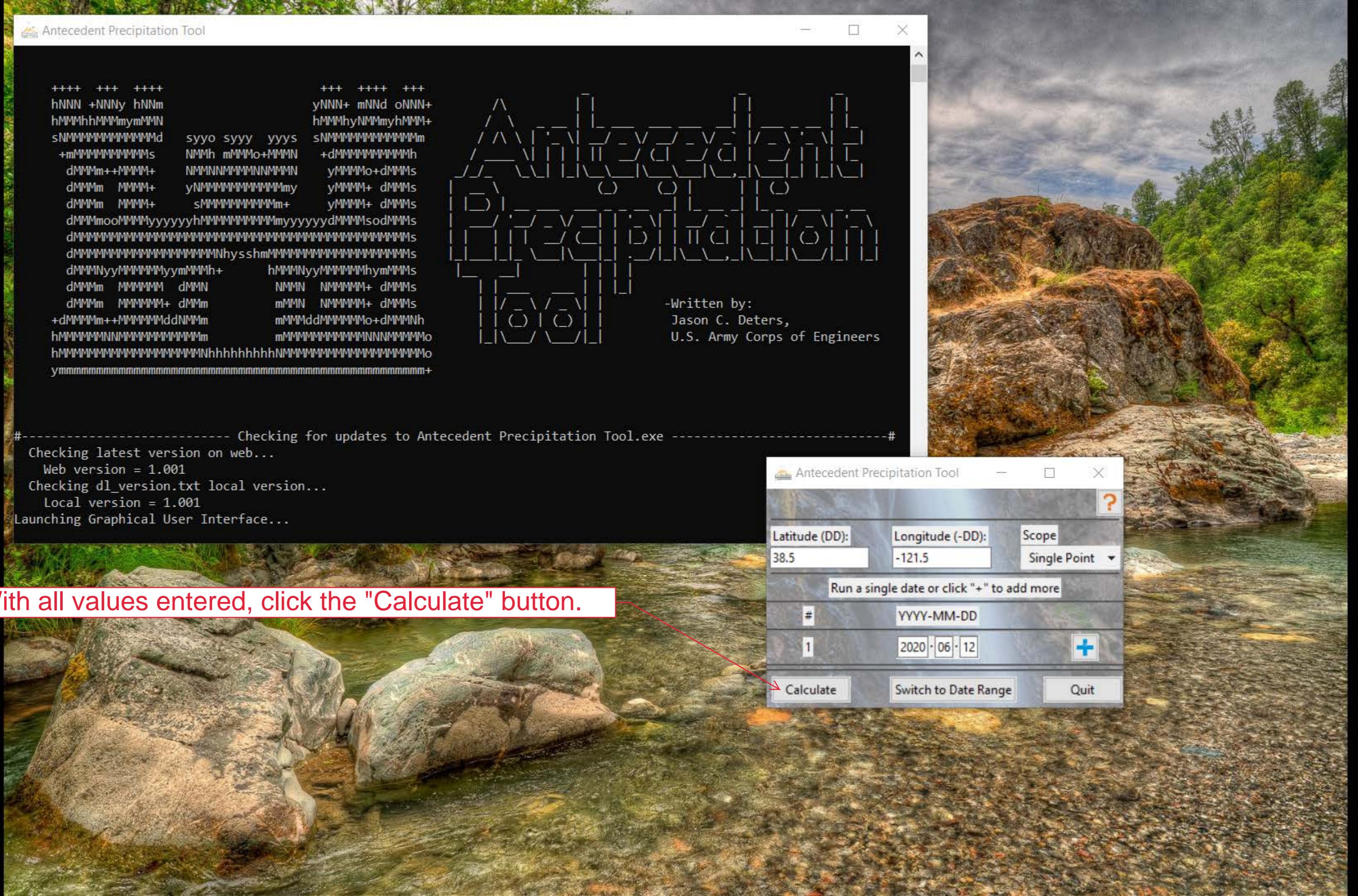




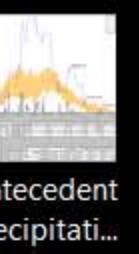
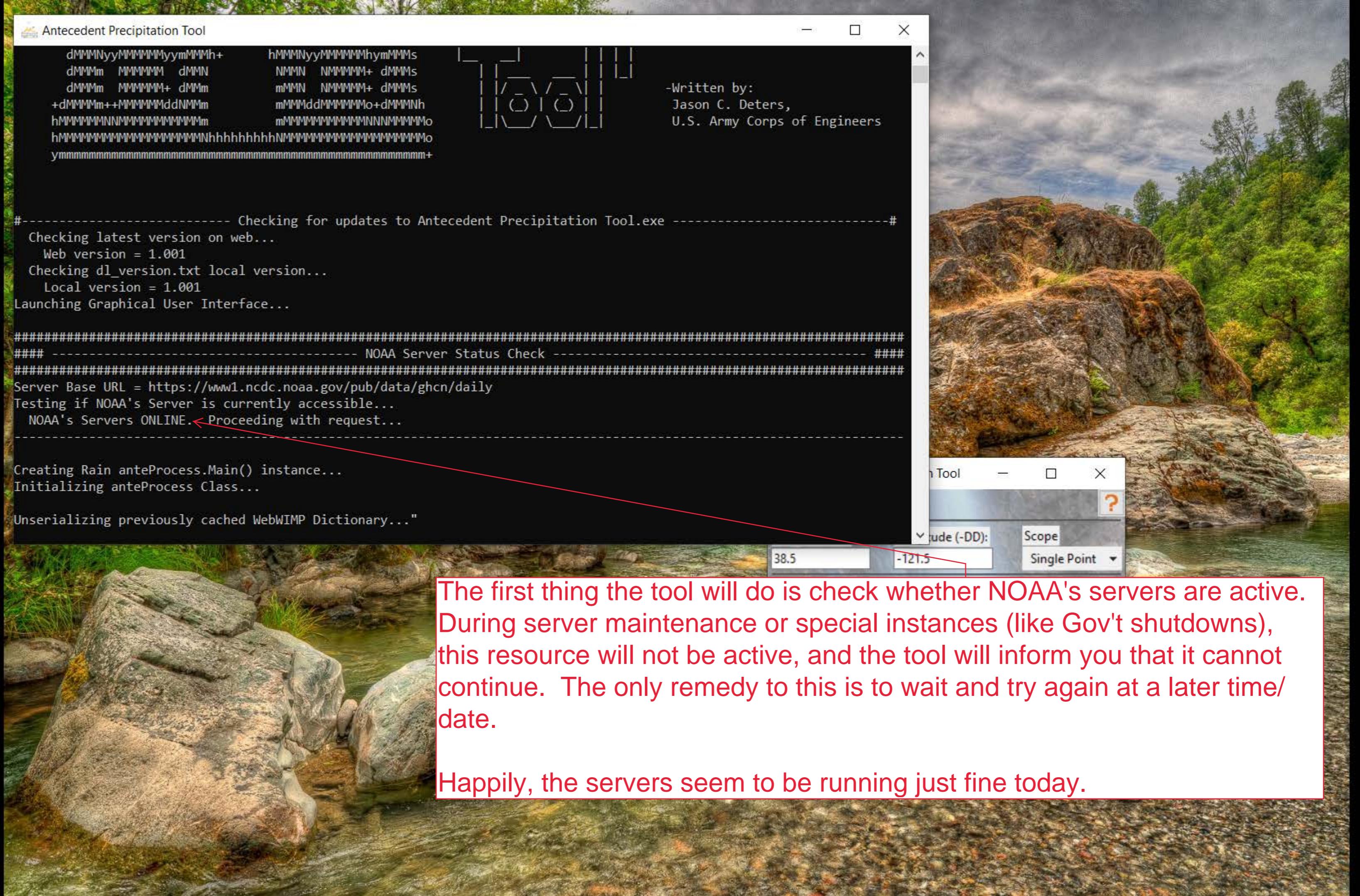


The cursor will automatically jump to the "Month" box.
-Enter the Month of the date you wish to analyze



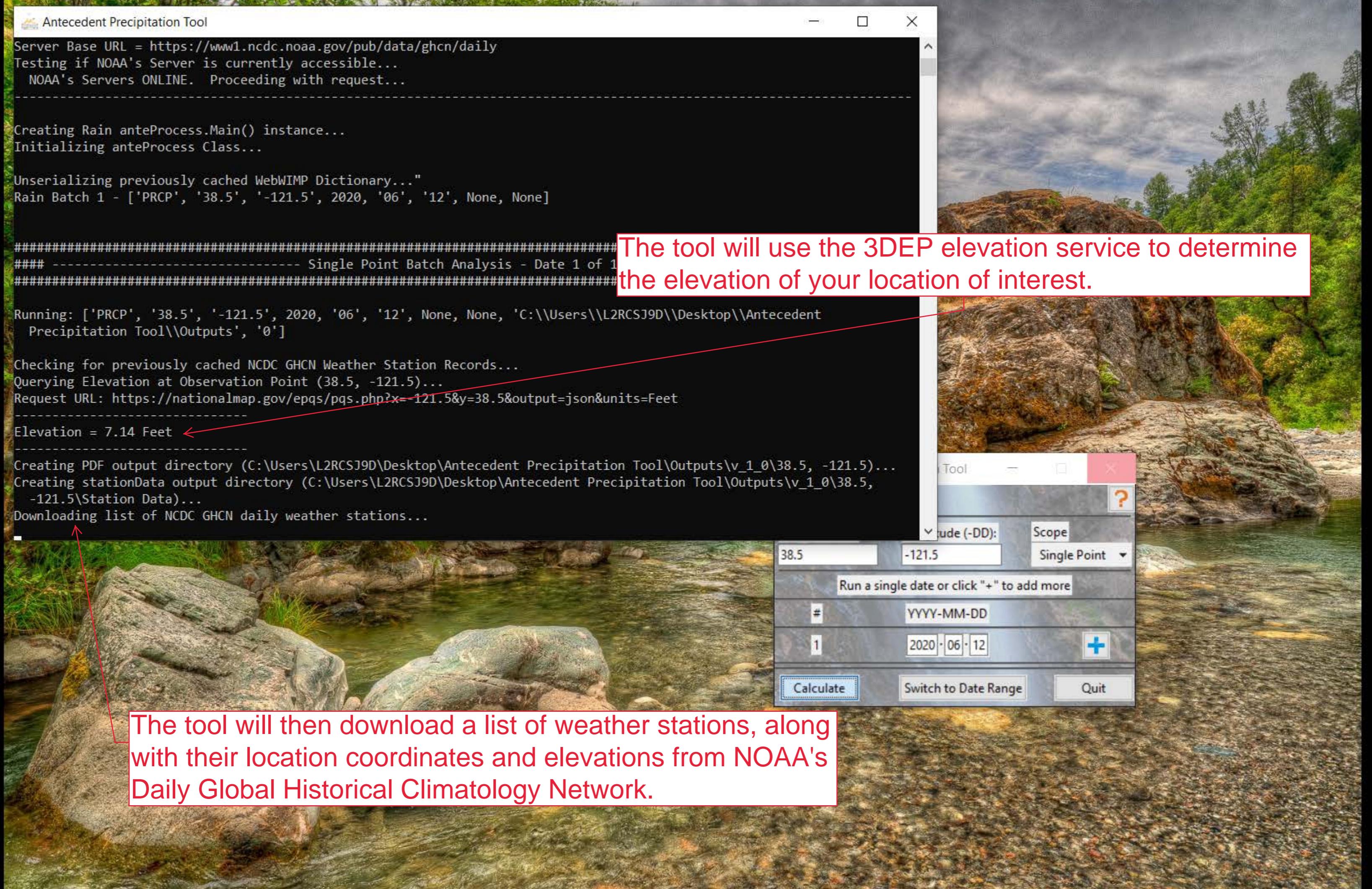


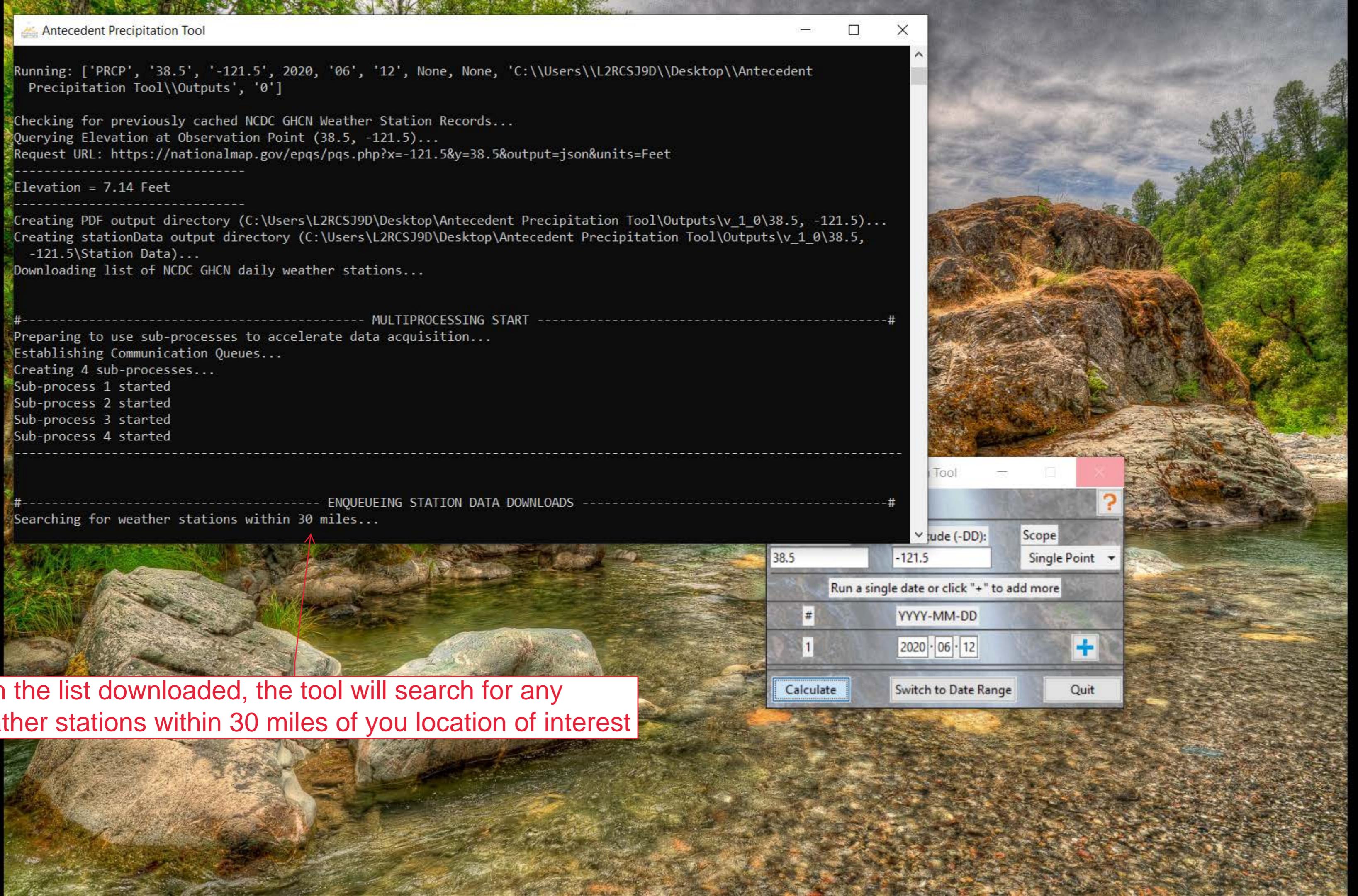
With all values entered, click the "Calculate" button.



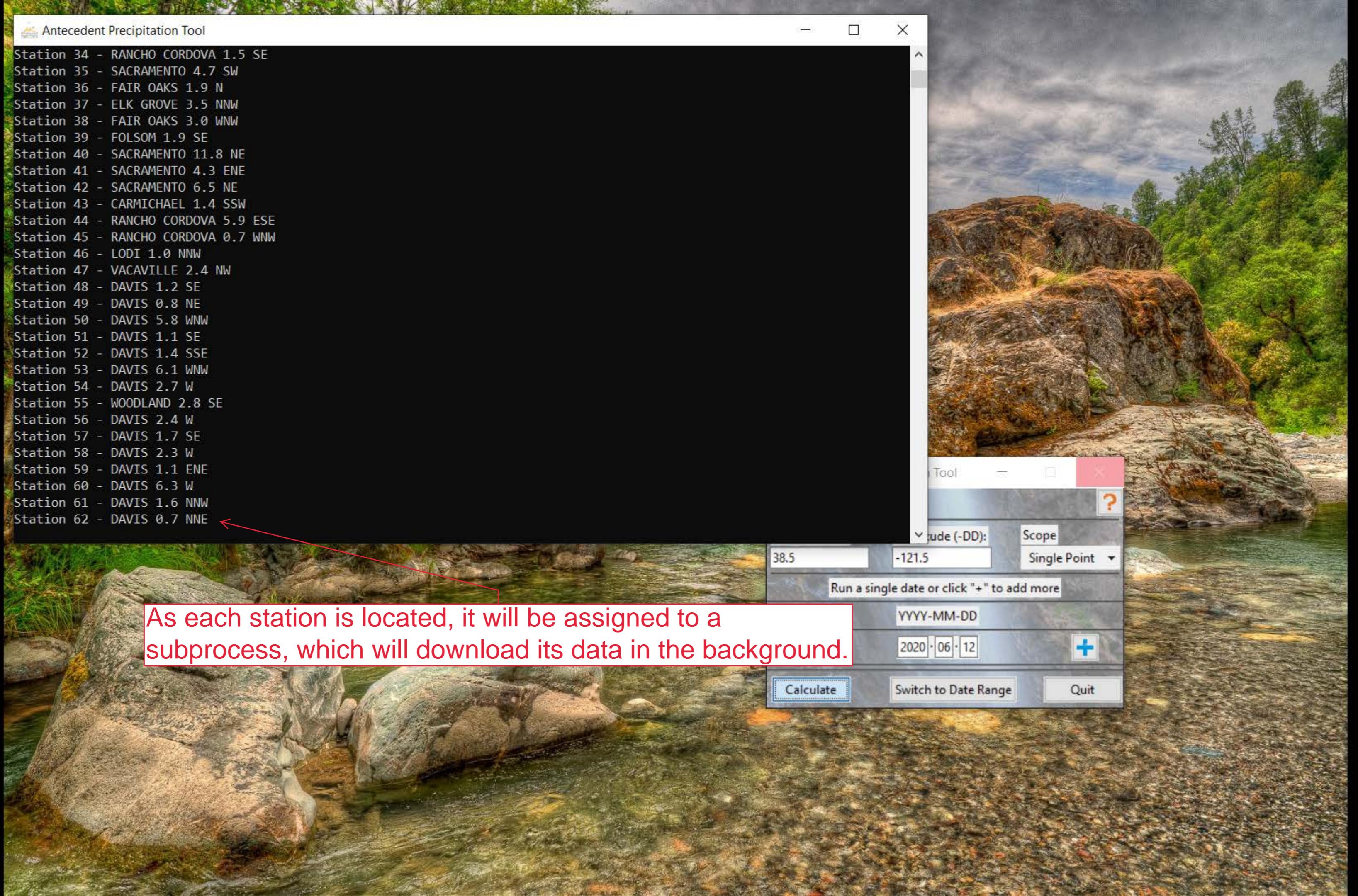
The first thing the tool will do is check whether NOAA's servers are active. During server maintenance or special instances (like Gov't shutdowns), this resource will not be active, and the tool will inform you that it cannot continue. The only remedy to this is to wait and try again at a later time/date.

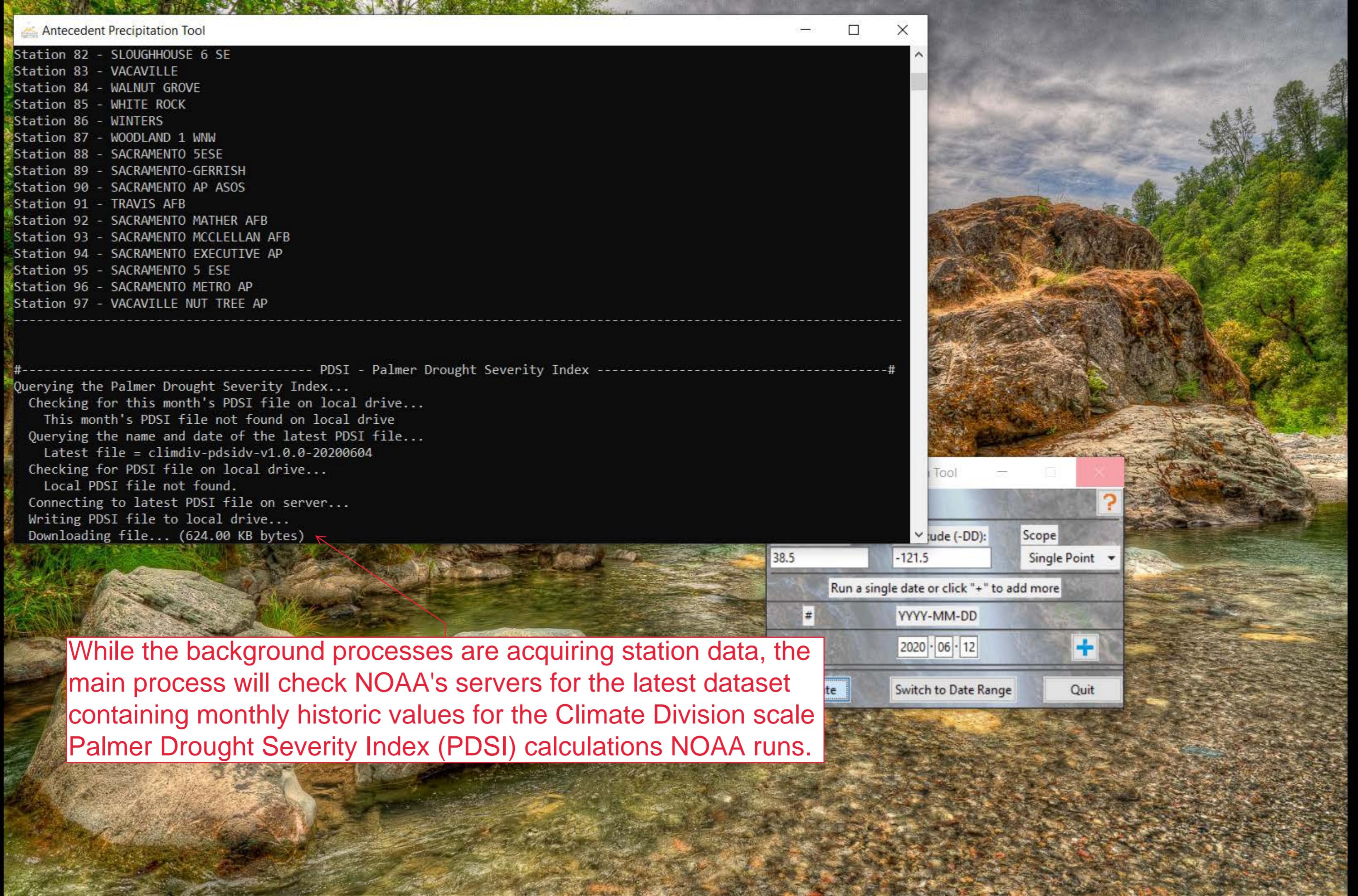
Happily, the servers seem to be running just fine today.





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





While the background processes are acquiring station data, the main process will check NOAA's servers for the latest dataset containing monthly historic values for the Climate Division scale Palmer Drought Severity Index (PDSI) calculations NOAA runs.

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...



---Selected Month

While we continue to wait for stations to download, the tool will use data from the Web-Based Water-Budget Interactive Modeling Program (WebWIMP) to determine whether the selected month falls within the Dry Season or the Wet Season for selected location.

To learn more, please see the definitions above the table and the following:

Excerpt from ERDC/EL TR-08-28

Regional Supplement to the Corps of Engineers Wetland Delineation Manual

Arid West Region (Version 2.0)

Section 5 - Difficult Wetland Situations in the Arid West

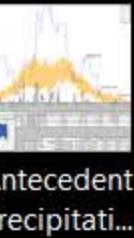
Wetlands that periodically lack indicators of wetland hydrology:

"...

3. Use one or more of the following approaches to determine whether wetland hydrology is present and the site is a wetland. In the remarks section of the data form or in the delineation report, explain the rationale for concluding that wetland hydrology is present even though indicators of wetland hydrology described in Chapter 4 were not observed.

a. Site visits during the dry season. Determine whether the site visit occurred during the normal annual dry season. The dry season, as used in this supplement, is the period of the year when soil moisture is normally being depleted and water tables are falling to low levels in response to decreased precipitation and/or increased evapotranspiration, usually during late spring and summer. It also includes the beginning of the recovery period in late summer or fall. The Web-Based Water-Budget Interactive Modeling Program (WebWIMP) is one source for approximate dates of wet and dry seasons for any terrestrial location based on average monthly precipitation and estimated evapotranspiration (<http://climate.geog.udel.edu/~wimp/>). In general, the dry season in a typical year is indicated when potential evapotranspiration exceeds precipitation (indicated by negative values of DIFF in the WebWIMP output), resulting in drawdown of soil moisture storage (negative values of DST) and/or a moisture deficit (positive values of DEF, also called the unmet atmospheric demand for moisture). Actual dates for the dry season vary by locale and year.

"





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

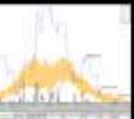
Latitude (-DD): Longitude (-DD): Scope:

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.

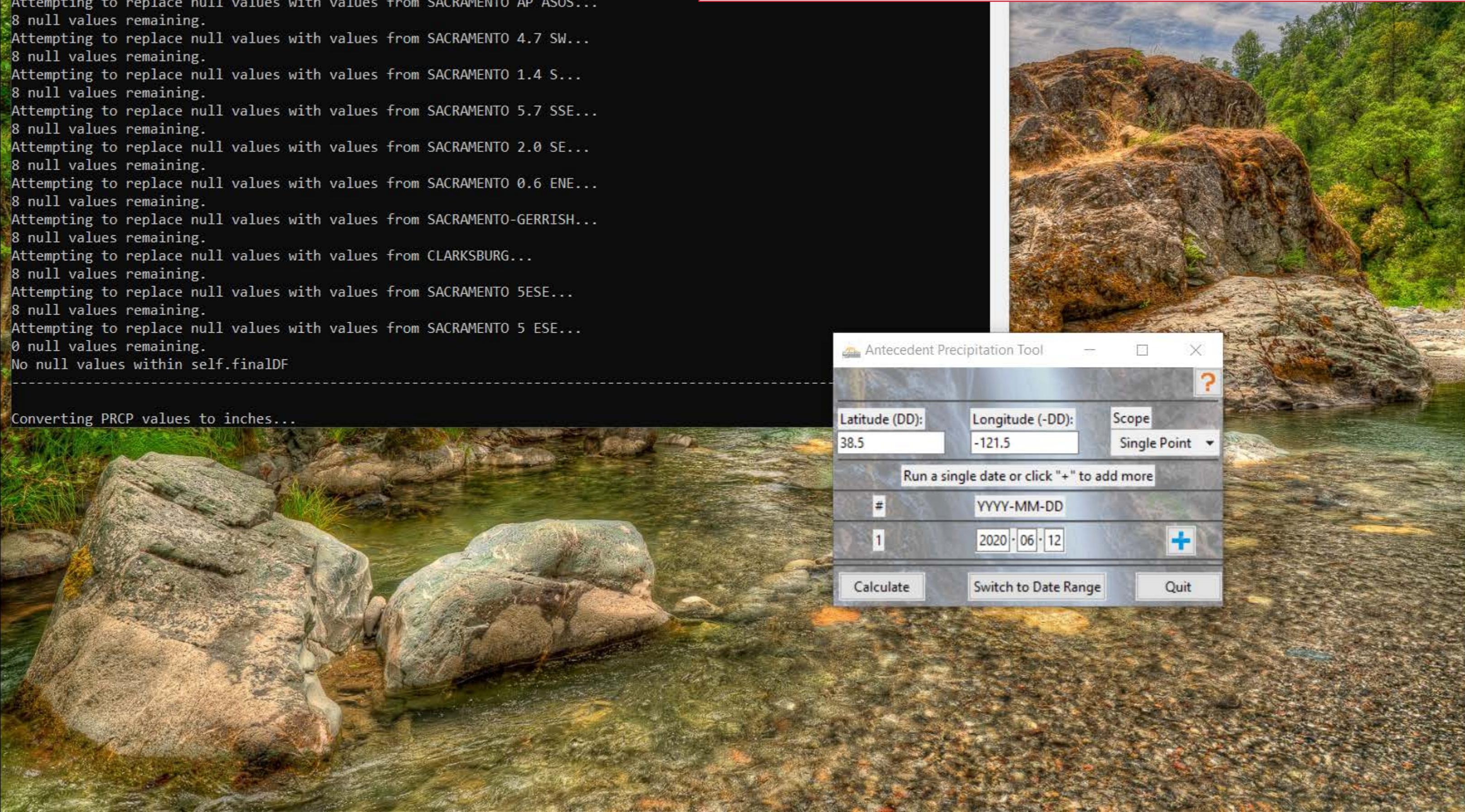
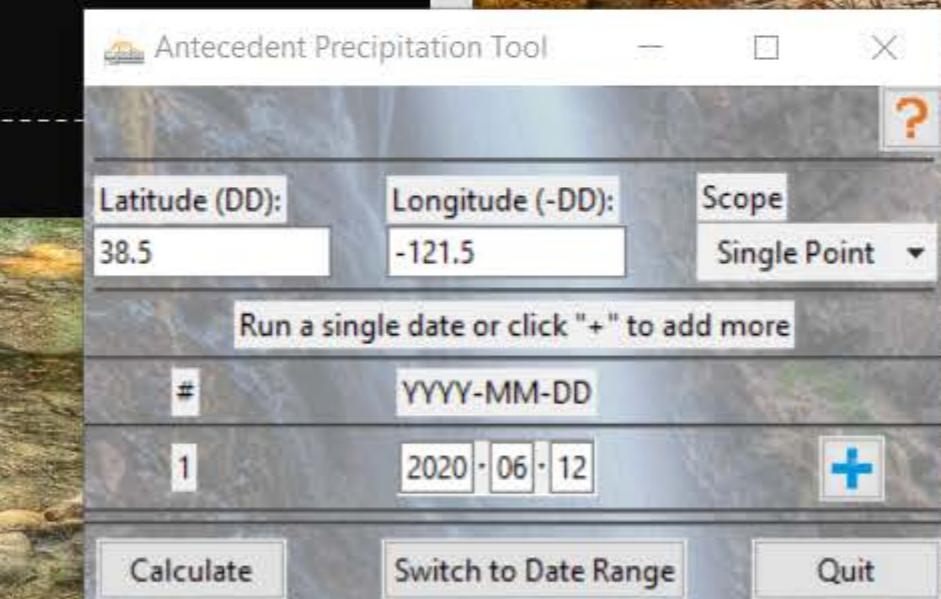


Antecedent
Precipitati...

```
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 range of dates required for the analysis, and then attempt to fill those dates with the available weather stations in order of decreasing 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
```

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

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

So you can here that only two stations actually contributed.

Tool

Latitude (-DD): 38.5 Longitude (-DD): -121.5 Scope: Single Point

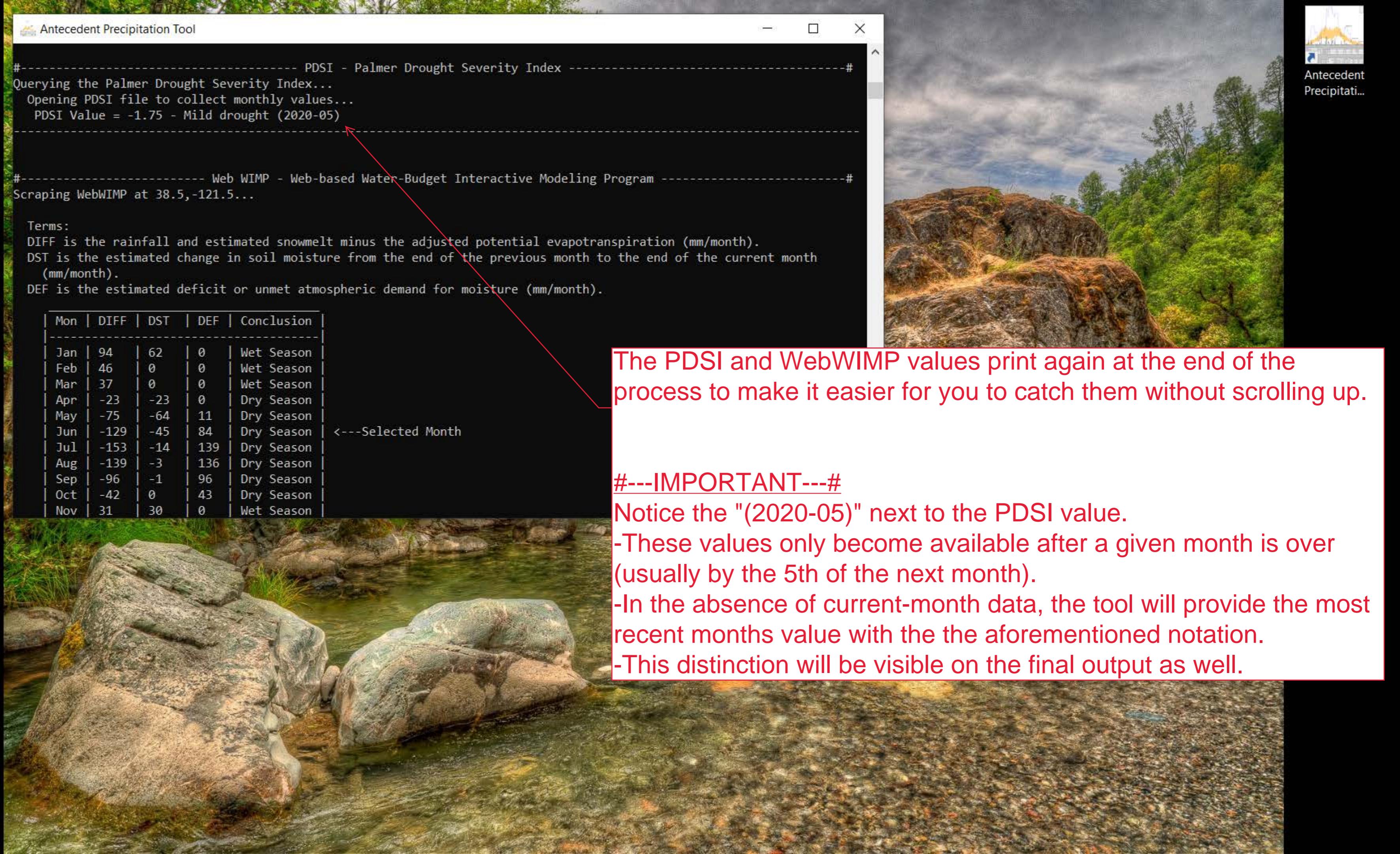
Run a single date or click "+" to add more

YYYY-MM-DD

1 2020-06-12 +

Calculate Switch to Date Range Quit





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 months value with the the aforementioned notation.
- This distinction will be visible on the final output as well.



Antecedent Precipitation Tool

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

```
#----- GRAPH & TABLE GENERATION -----#
Constructing graph, plotting data, and configuring tables...
Generating figure with graph and tables...

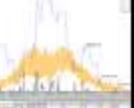
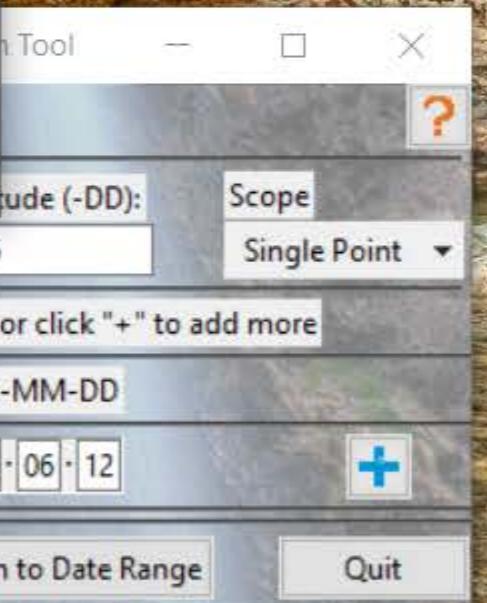
Saving C:\Users\L2RCSJ9D\Desktop\Antecedent Precipitation Tool\Outputs\v_1_0\38.5, -121.5\2020-06-12.pdf
Closing figure...

Opening PDF in a new process...
All tasks took 1 minutes and 30 seconds to complete
```

Ready for new input.



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.

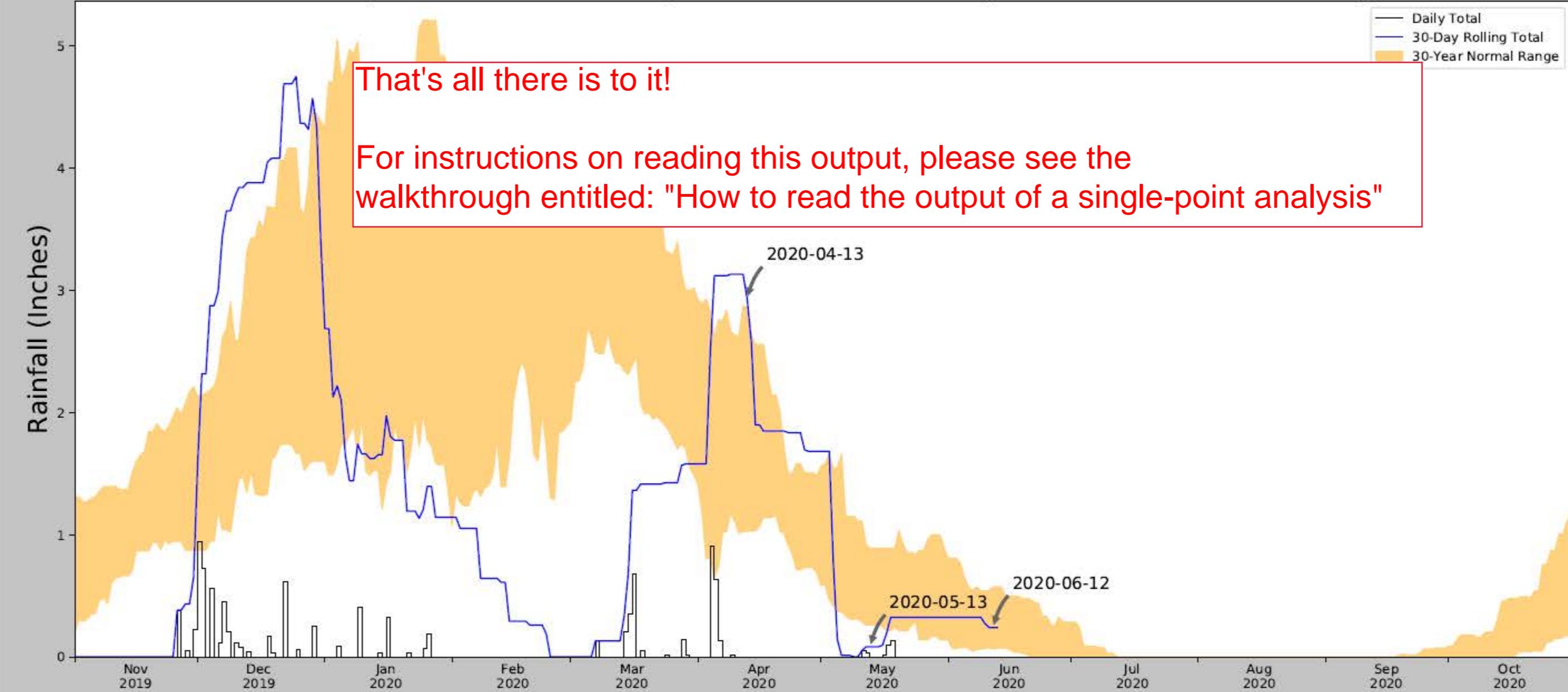
Antecedent
Precipitati...



61.2%



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



Coordinates	38.5, -121.5	30 Days Ending	30 th %ile (in)	70 th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
Observation Date	2020-06-12	2020-06-12	0.064961	0.572047	0.240157	Normal	2	3	6
Elevation (ft)	7.14	2020-05-13	0.260236	0.887795	0.082677	Dry	1	2	2
Drought Index (PDSI)	Mild drought (2020-05)	2020-04-13	1.027559	2.866536	2.929134	Wet	3	1	3
WebWIMP H ₂ O Balance	Dry Season	Result							Normal Conditions - 11