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

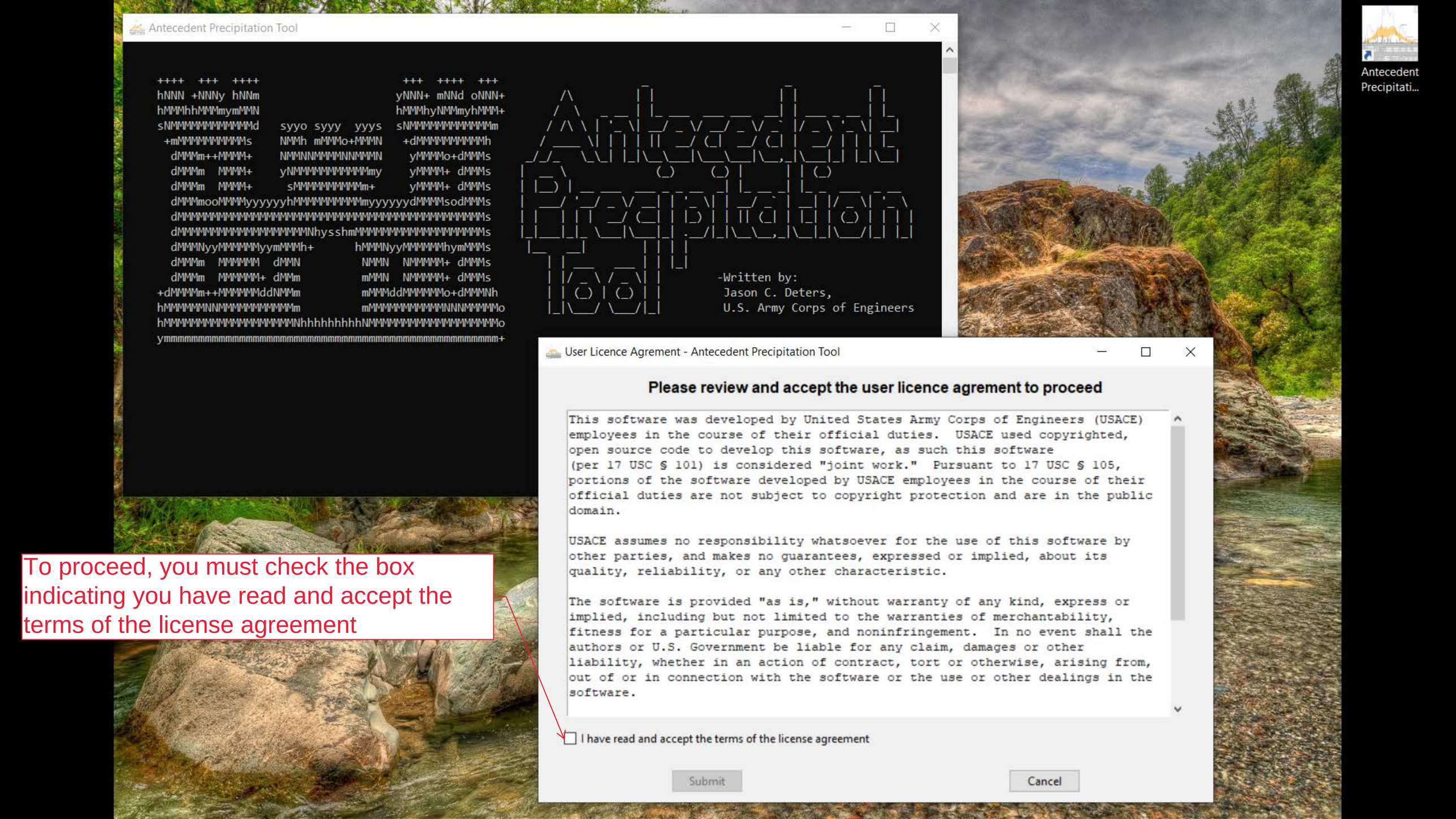
Antecedent Precipitation Tool

Version 1.0

Written by Jason Deters

U.S. Army Corps of Engineers


Double-click the APT
Desktop Shortcut
Antecedent
Precipitati...


Antecedent Precipitation Tool
-Written by:
Jason C. Deters,
U.S. Army Corps of Engineers
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Submit
Cancel
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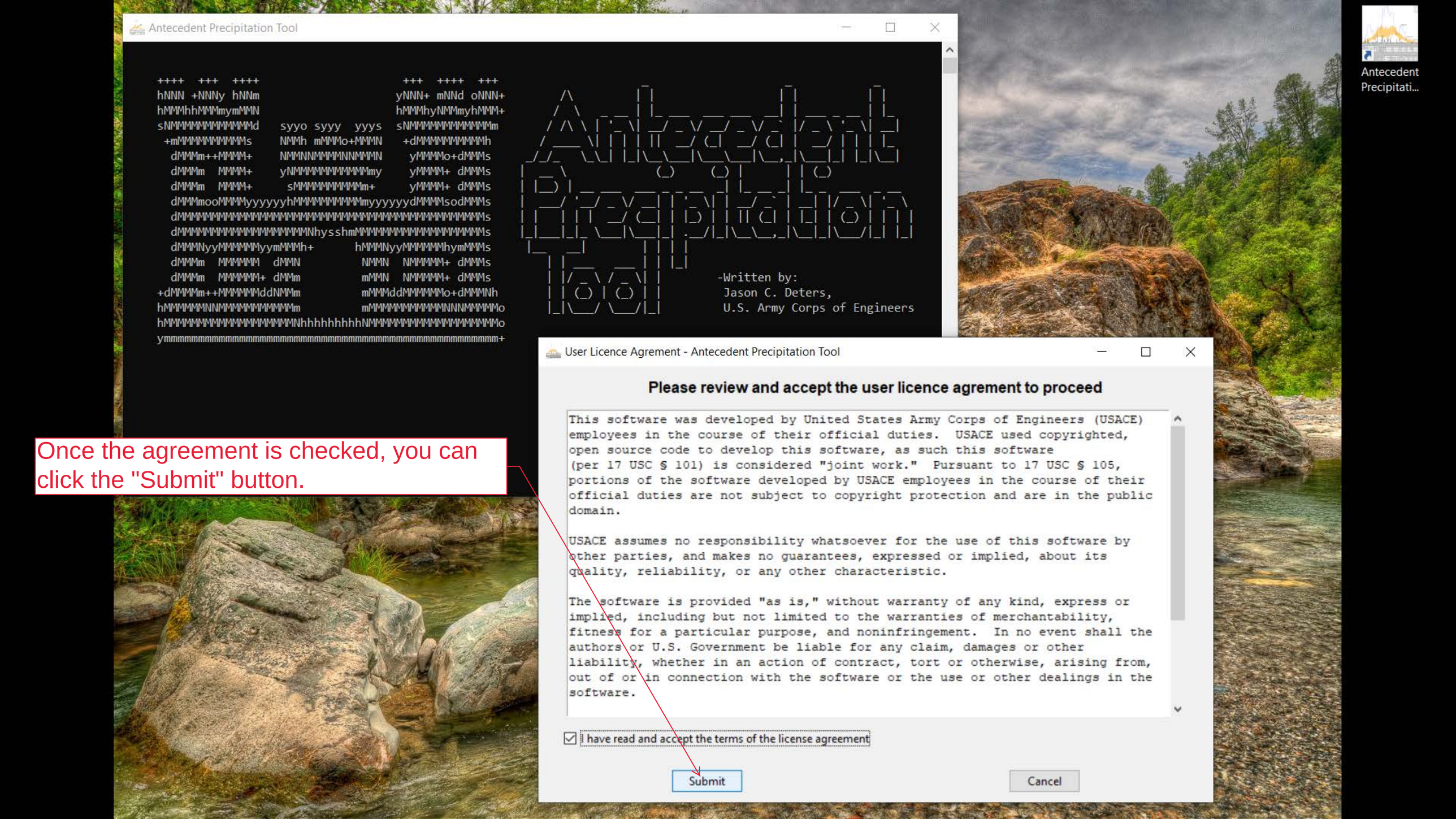
Antecedent Precipitati...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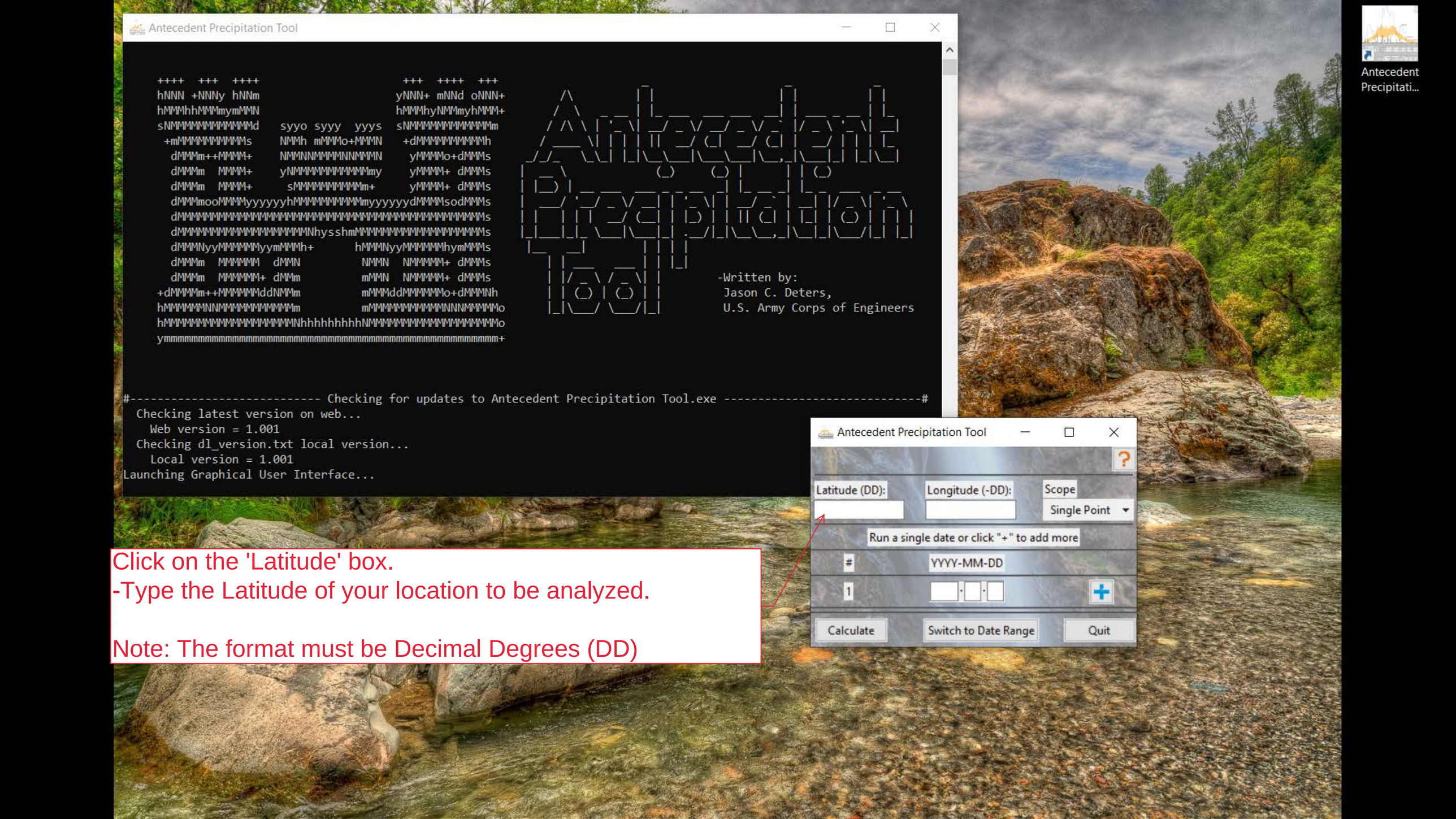
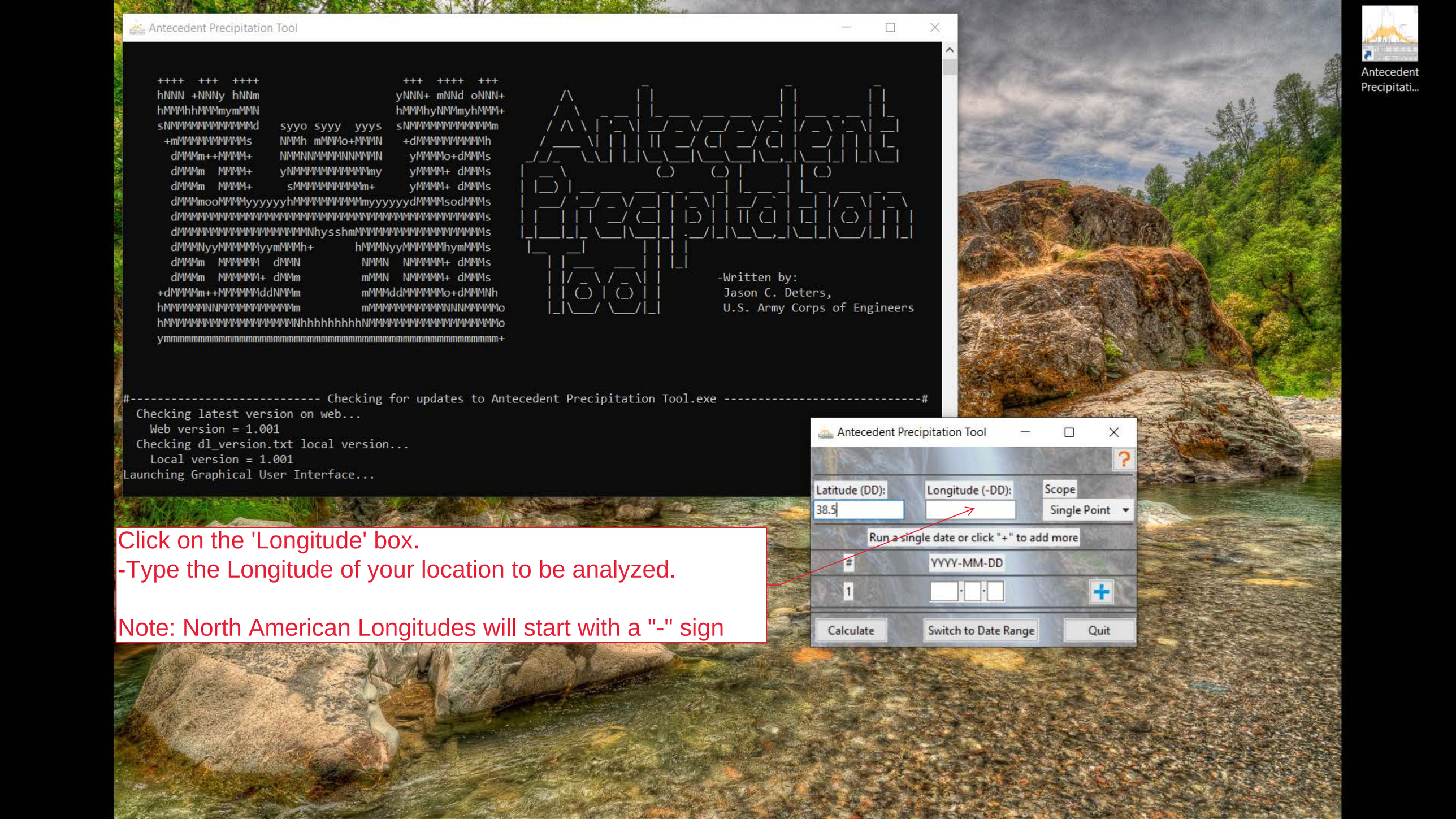
I have read and accept the terms of the license agreement
Submit
Cancel
Once the agreement is checked, you can click the "Submit" button.
Antecedent Precipitati...


Antecedent Precipitation Tool
-Written by:
Jason C. Deters,
U.S. Army Corps of Engineers
#---------- 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...
Antecedent Precipitation Tool
Latitude (DD):
Longitude (-DD):
Scope
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
Calculate
Switch to Date Range
Quit
Click on the 'Latitude' box.
-Type the Latitude of your location to be analyzed.
Note: The format must be Decimal Degrees (DD)
Antecedent Precipitati...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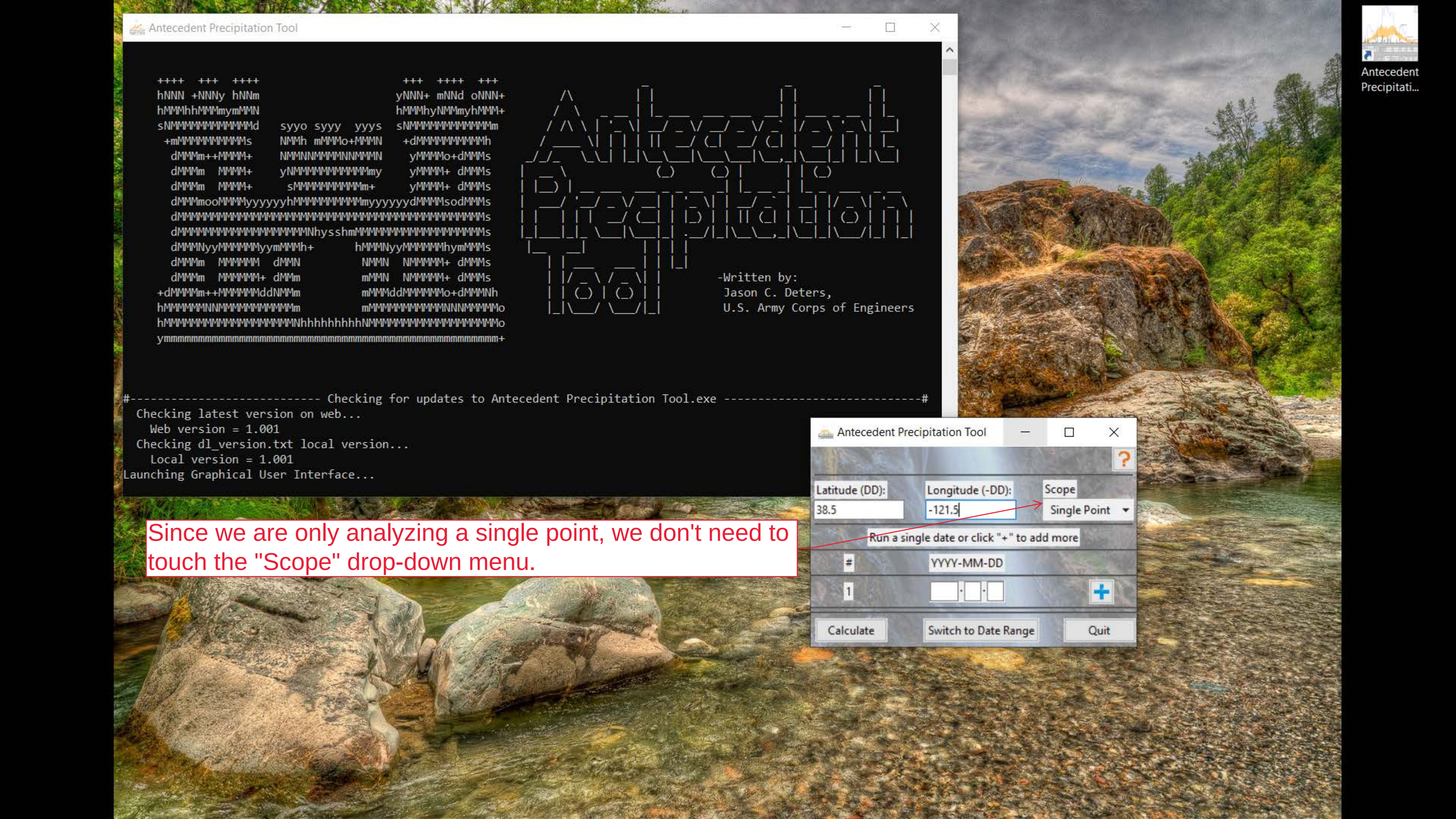
#---------- Checking for updates to Antecedent Precipitation Tool.exe ----------#
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
Longitude (-DD):
Scope
38.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
Calculate
Switch to Date Range
Quit
Click on the 'Longitude' box.
-Type the Longitude of your location to be analyzed.
Note: North American Longitudes will start with a "-" sign
Antecedent Precipitati...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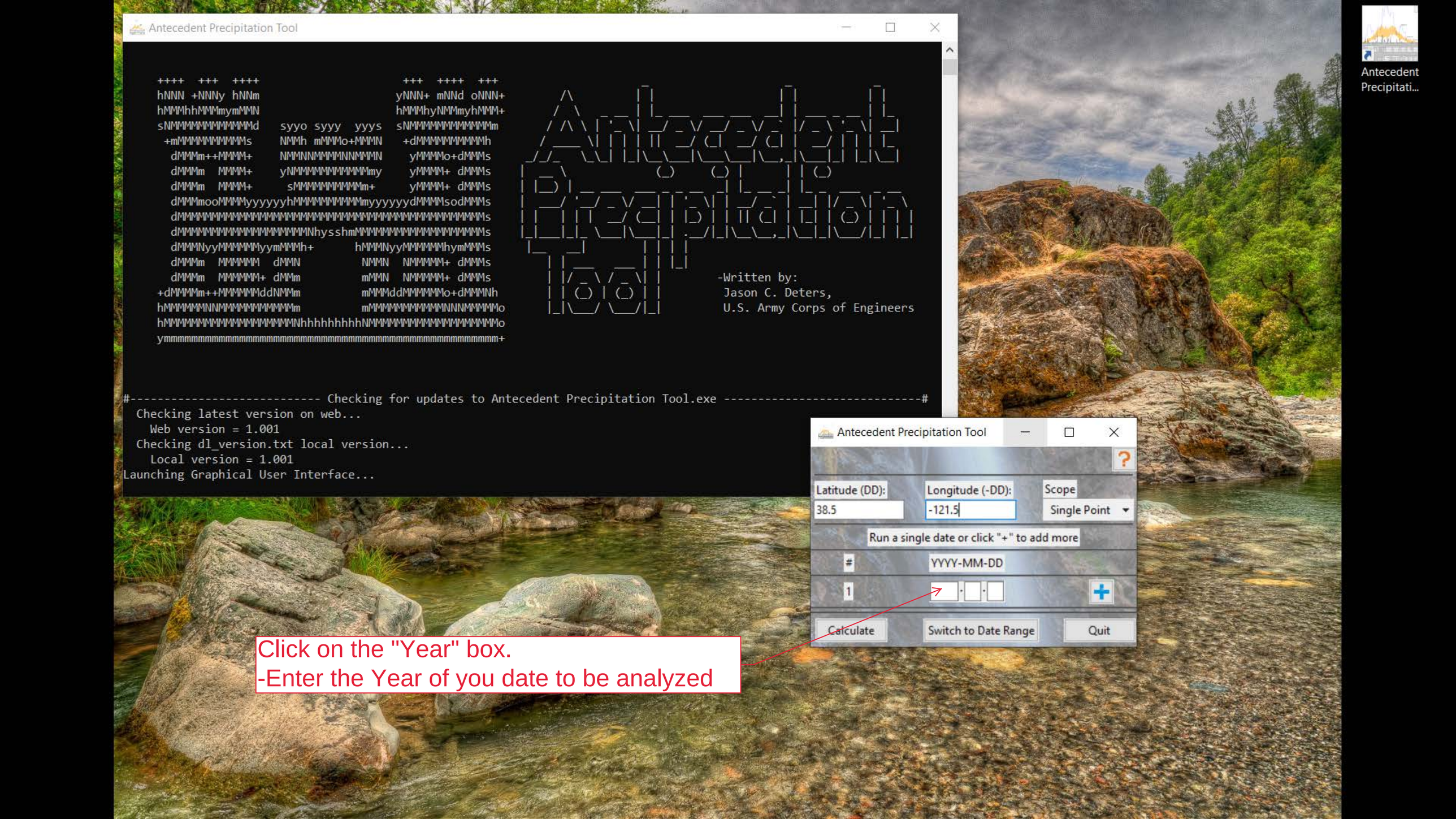
#---------- Checking for updates to Antecedent Precipitation Tool.exe ----------#
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
Longitude (-DD):
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
Calculate
Switch to Date Range
Quit
Since we are only analyzing a single point, we don't need to touch the "Scope" drop-down menu.
Antecedent Precipitati...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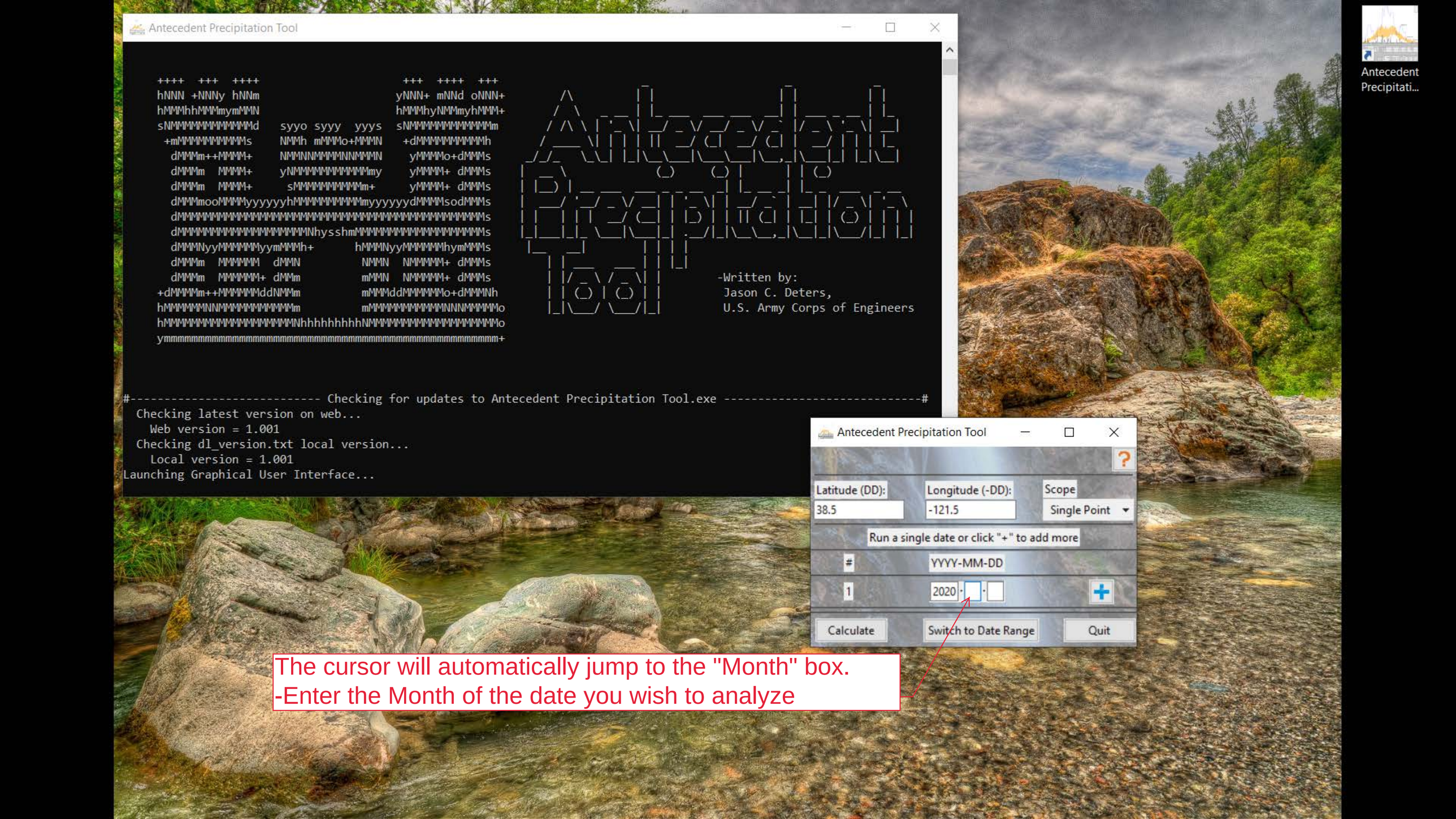
#---------- Checking for updates to Antecedent Precipitation Tool.exe ----------#
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
Longitude (-DD):
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
Calculate
Switch to Date Range
Quit
Click on the "Year" box.
-Enter the Year of you date to be analyzed
Antecedent Precipitati...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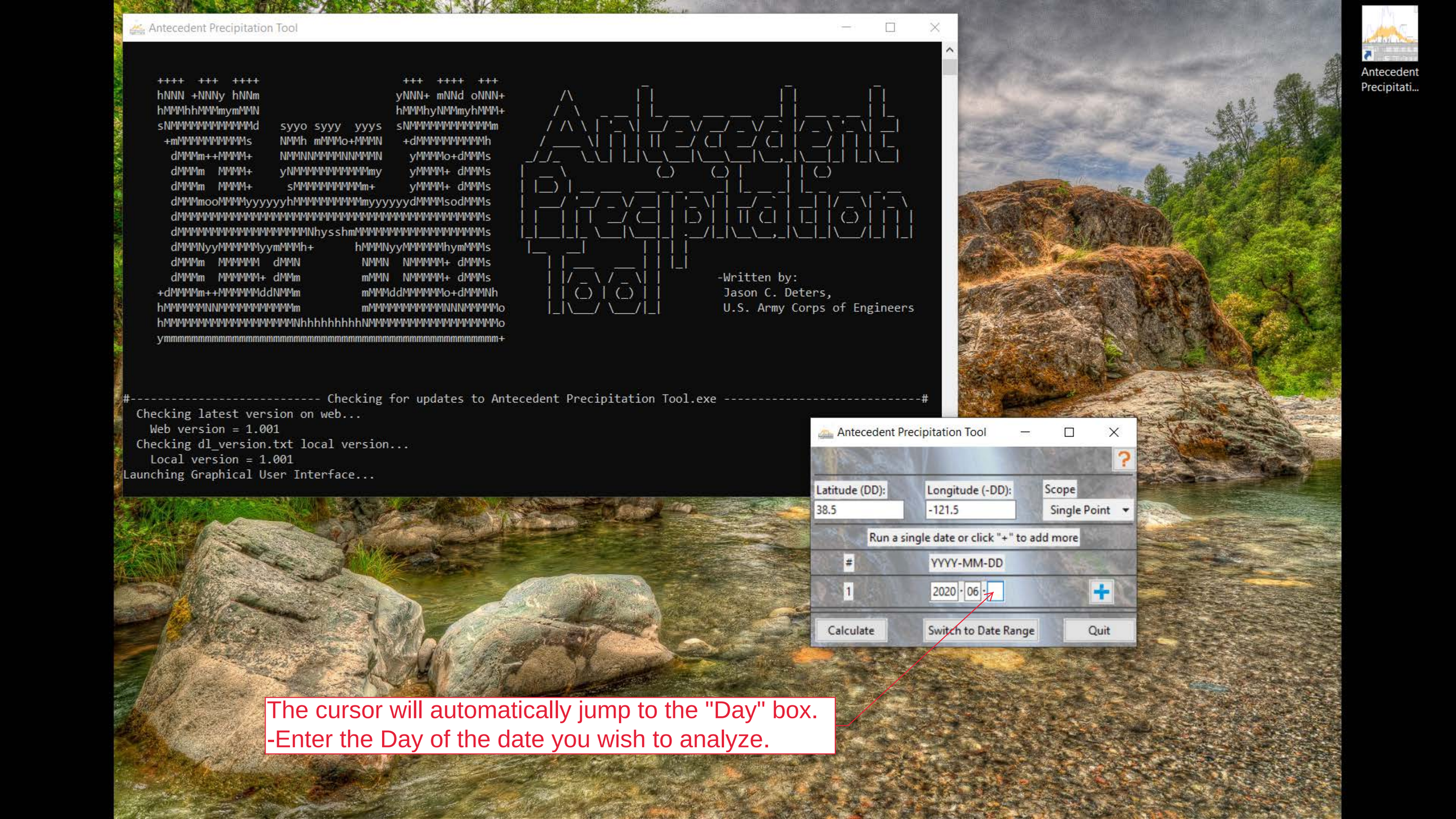
#---------- Checking for updates to Antecedent Precipitation Tool.exe ----------#
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
38.5
Longitude (-DD):
-121.5
Scope
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
2020
Calculate
Switch to Date Range
Quit
The cursor will automatically jump to the "Month" box.
-Enter the Month of the date you wish to analyze
Antecedent Precipitati...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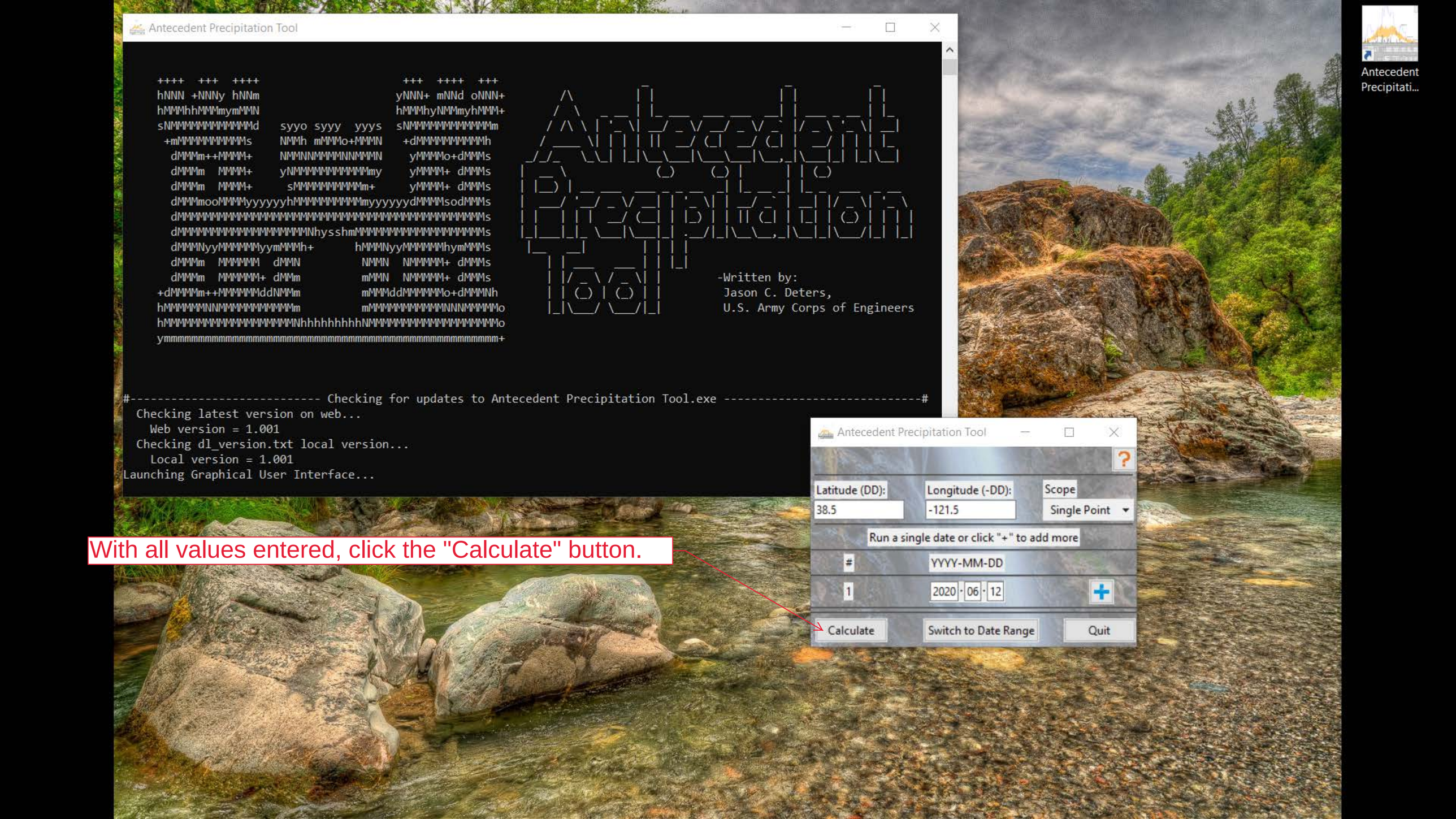
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
38.5
Longitude (-DD):
-121.5
Scope
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
2020 - 06 -
Calculate
Switch to Date Range
Quit
The cursor will automatically jump to the "Day" box.
-Enter the Day of the date you wish to analyze.
Antecedent Precipitati...


Antecedent Precipitation Tool
-Written by:
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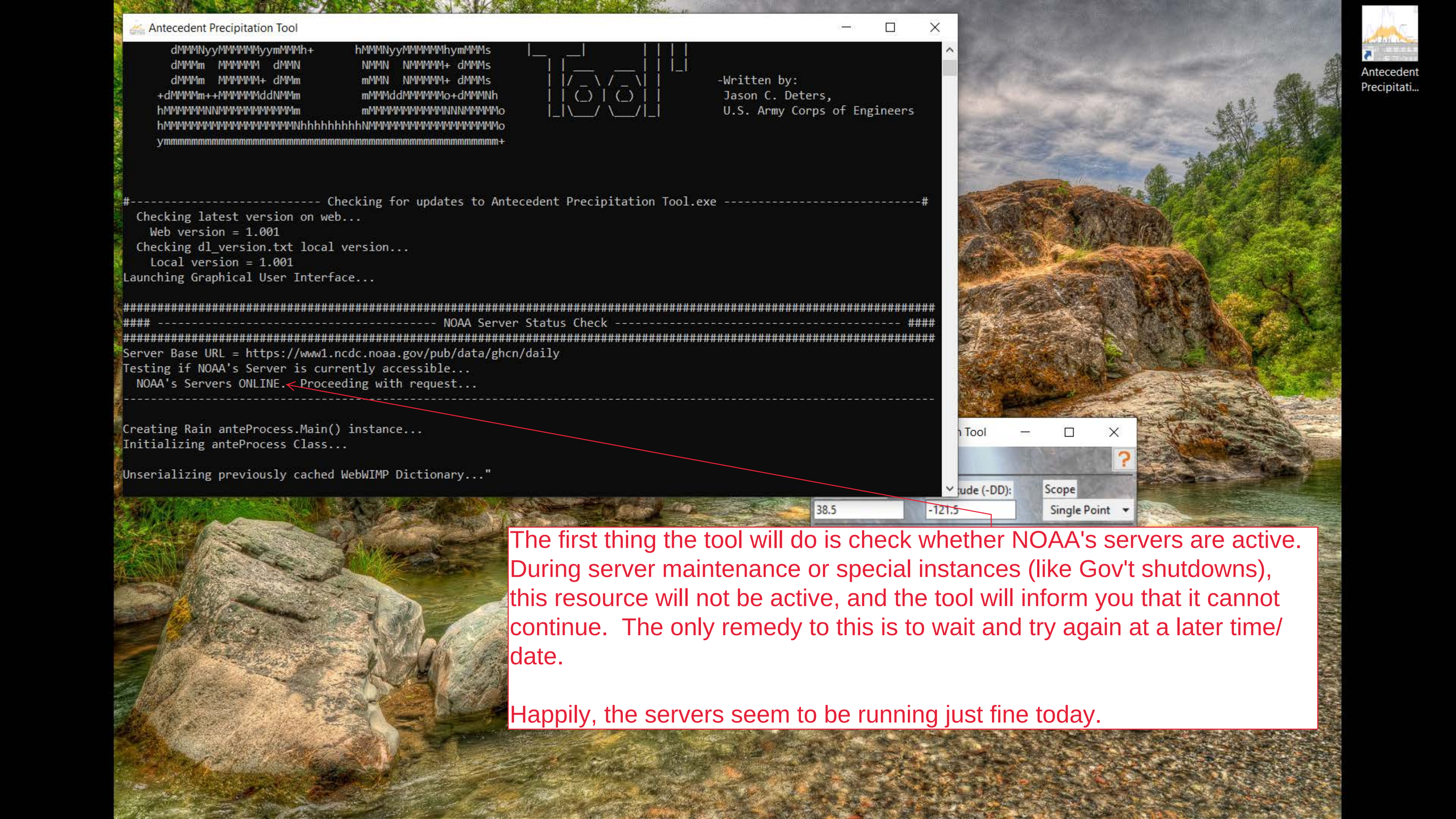
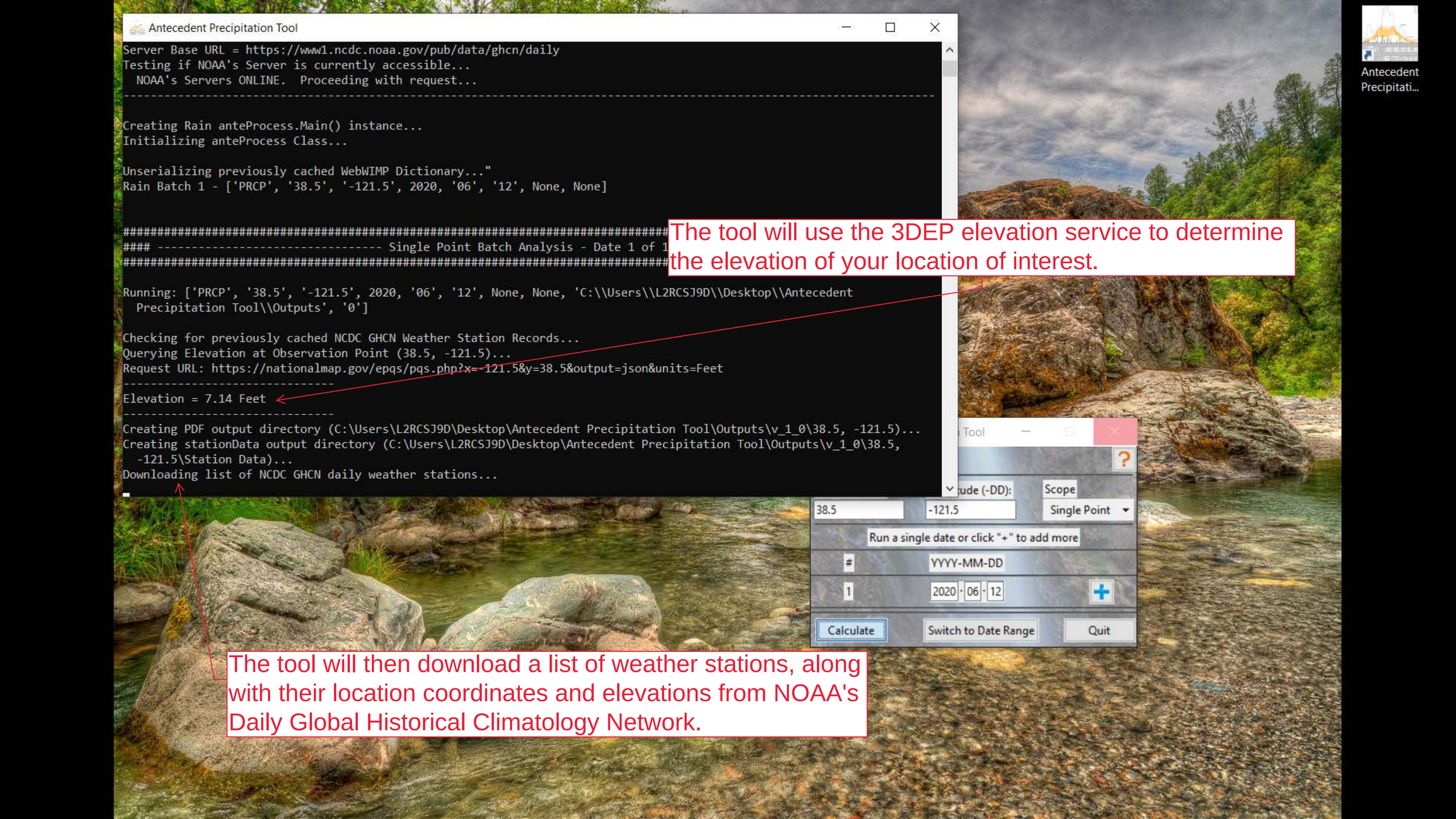
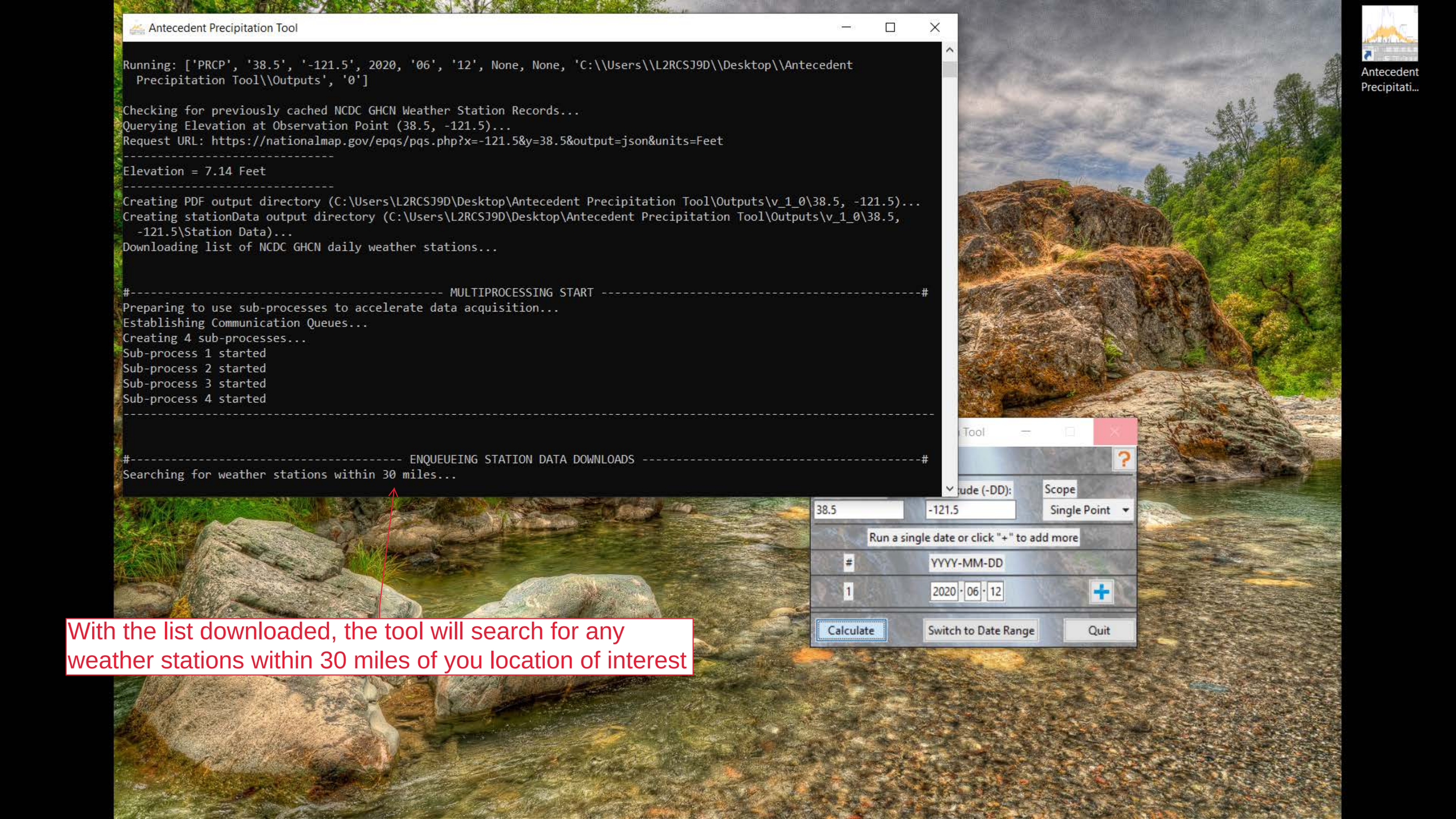
#---------- Checking for updates to Antecedent Precipitation Tool.exe ----------#
Checking latest version on web...
Web version = 1.001
Checking dl_version.txt local version...
Local version = 1.001
Launching Graphical User Interface...
Antecedent Precipitation Tool
Latitude (DD):
38.5
Longitude (-DD):
-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
With all values entered, click the "Calculate" button.
Antecedent Precipitati...

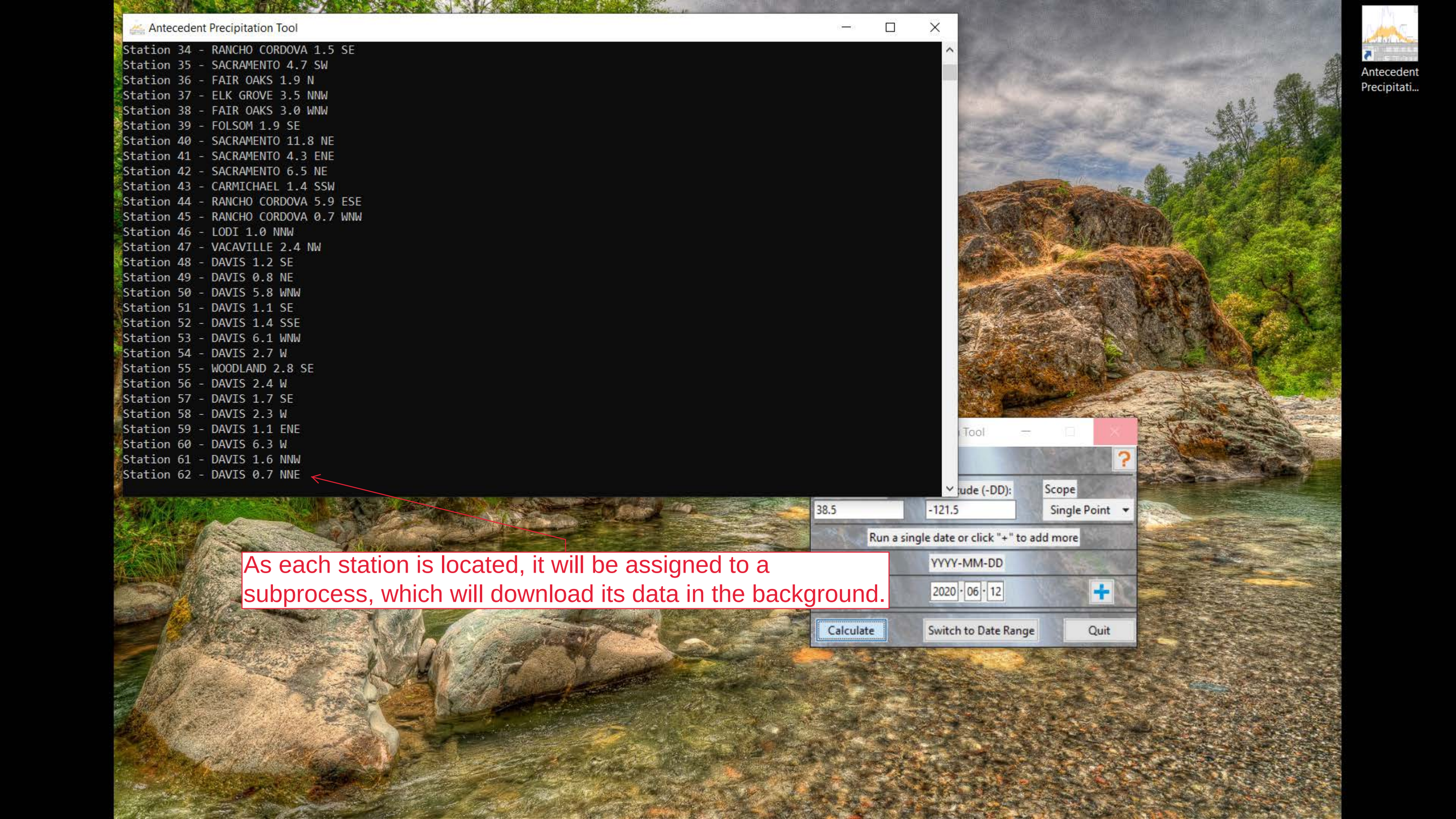


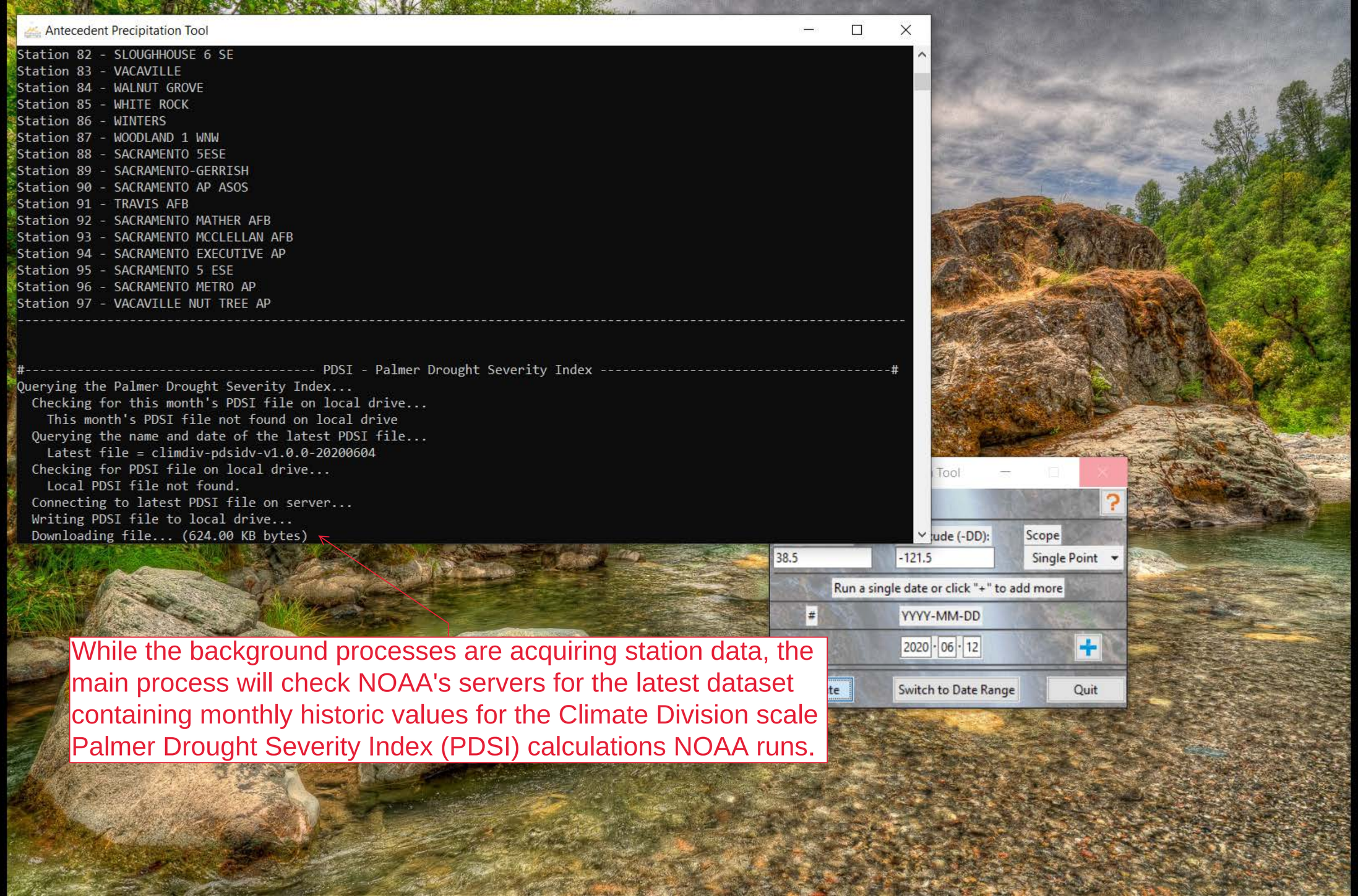
The first thing the tool will do is check whether NOAA's servers are active. During server maintenance or special instances (like Gov't shutdowns), this resource will not be active, and the tool will inform you that it cannot continue. The only remedy to this is to wait and try again at a later time/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

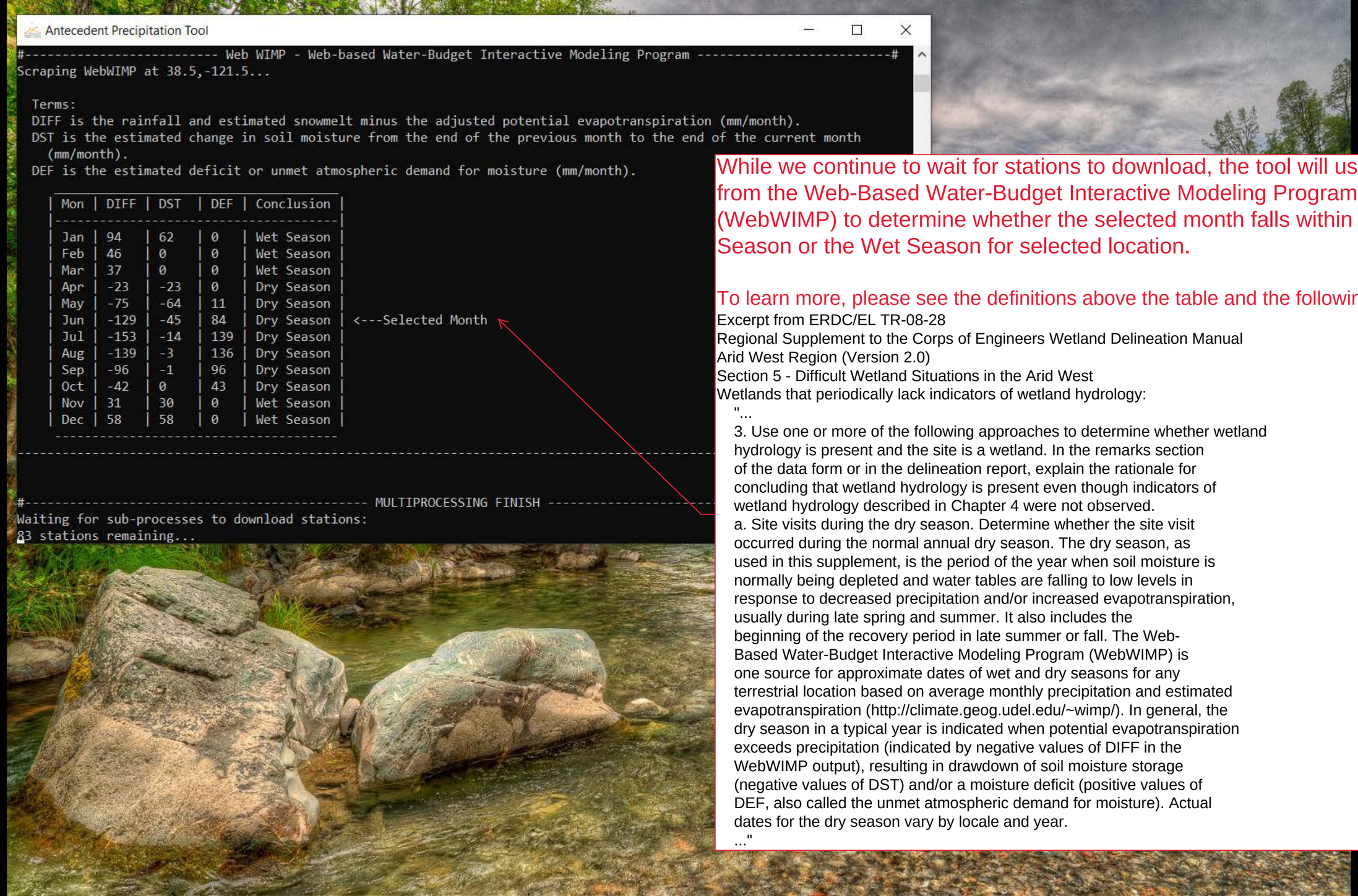
Happily, the servers seem to be running just fine today.


Antecedent Precipitation Tool
Server Base URL = https://www1.ncdc.noaa.gov/pub/data/ghcn/daily
Testing if NOAA's Server is currently accessible...
NOAA's Servers ONLINE. Proceeding with request...
Creating Rain anteProcess.Main() instance...
Initializing anteProcess Class...
Unserializing previously cached WebWIMP Dictionary..."
Rain Batch 1 - ['PRCP', '38.5', '-121.5', 2020, '06', '12', None, None]
Single Point Batch Analysis - Date 1 of 1
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...
The tool will use the 3DEP elevation service to determine the elevation of your location of interest.
Tool
ude (-DD):
Scope
38.5
-121.5
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 tool will then download a list of weather stations, along with their location coordinates and elevations from NOAA's Daily Global Historical Climatology Network.
Antecedent Precipitati...


Antecedent Precipitation Tool
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...
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
2020 · 06 · 12
Calculate
Switch to Date Range
Quit
With the list downloaded, the tool will search for any weather stations within 30 miles of you location of interest
Antecedent Precipitati...


Antecedent Precipitation Tool
Station 34 - RANCHO CORDOVA 1.5 SE
Station 35 - SACRAMENTO 4.7 SW
Station 36 - FAIR OAKS 1.9 N
Station 37 - ELK GROVE 3.5 NNW
Station 38 - FAIR OAKS 3.0 WNW
Station 39 - FOLSOM 1.9 SE
Station 40 - SACRAMENTO 11.8 NE
Station 41 - SACRAMENTO 4.3 ENE
Station 42 - SACRAMENTO 6.5 NE
Station 43 - CARMICHAEL 1.4 SSW
Station 44 - RANCHO CORDOVA 5.9 ESE
Station 45 - RANCHO CORDOVA 0.7 WNW
Station 46 - LODI 1.0 NNW
Station 47 - VACAVILLE 2.4 NW
Station 48 - DAVIS 1.2 SE
Station 49 - DAVIS 0.8 NE
Station 50 - DAVIS 5.8 WNW
Station 51 - DAVIS 1.1 SE
Station 52 - DAVIS 1.4 SSE
Station 53 - DAVIS 6.1 WNW
Station 54 - DAVIS 2.7 W
Station 55 - WOODLAND 2.8 SE
Station 56 - DAVIS 2.4 W
Station 57 - DAVIS 1.7 SE
Station 58 - DAVIS 2.3 W
Station 59 - DAVIS 1.1 ENE
Station 60 - DAVIS 6.3 W
Station 61 - DAVIS 1.6 NNW
Station 62 - DAVIS 0.7 NNE
Tool
ude (-DD):
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
YYYY-MM-DD
2020 · 06 · 12
Calculate
Switch to Date Range
Quit
As each station is located, it will be assigned to a subprocess, which will download its data in the background.
Antecedent Precipitati...


Antecedent Precipitation Tool
Station 82 - SLOUGHHOUSE 6 SE
Station 83 - VACAVILLE
Station 84 - WALNUT GROVE
Station 85 - WHITE ROCK
Station 86 - WINTERS
Station 87 - WOODLAND 1 WNW
Station 88 - SACRAMENTO 5ESE
Station 89 - SACRAMENTO-GERRISH
Station 90 - SACRAMENTO AP ASOS
Station 91 - TRAVIS AFB
Station 92 - SACRAMENTO MATHER AFB
Station 93 - SACRAMENTO MCCLELLAN AFB
Station 94 - SACRAMENTO EXECUTIVE AP
Station 95 - SACRAMENTO 5 ESE
Station 96 - SACRAMENTO METRO AP
Station 97 - VACAVILLE NUT TREE AP
#-------------------------------------- PDSI - Palmer Drought Severity Index --------------------------------------#
Querying the Palmer Drought Severity Index...
Checking for this month's PDSI file on local drive...
This month's PDSI file not found on local drive
Querying the name and date of the latest PDSI file...
Latest file = climdiv-pdsidv-v1.0.0-20200604
Checking for PDSI file on local drive...
Local PDSI file not found.
Connecting to latest PDSI file on server...
Writing PDSI file to local drive...
Downloading file... (624.00 KB bytes)
Tool
ude (-DD):
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
2020 · 06 · 12
Switch to Date Range
Quit
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 Precipitati...

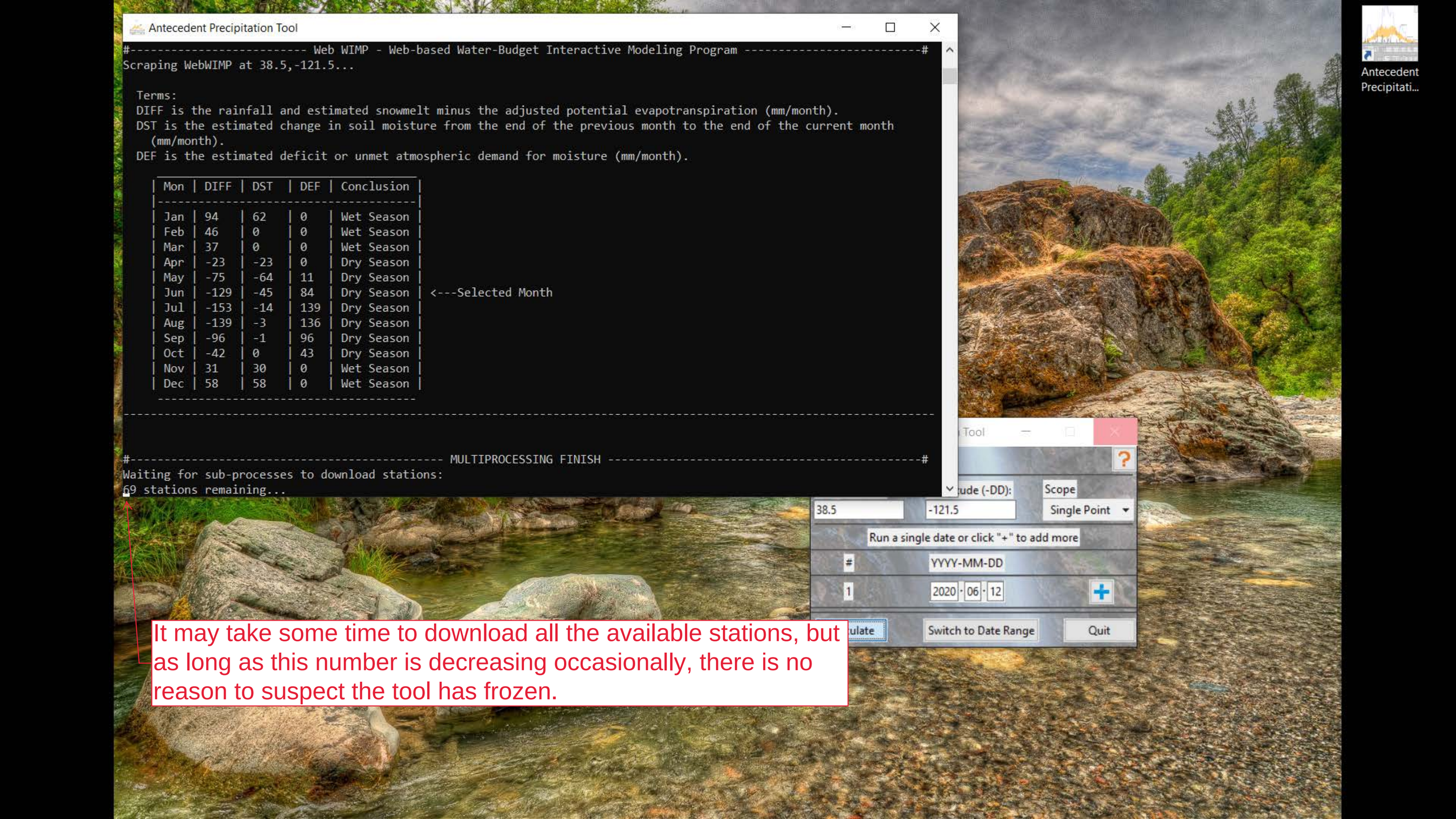


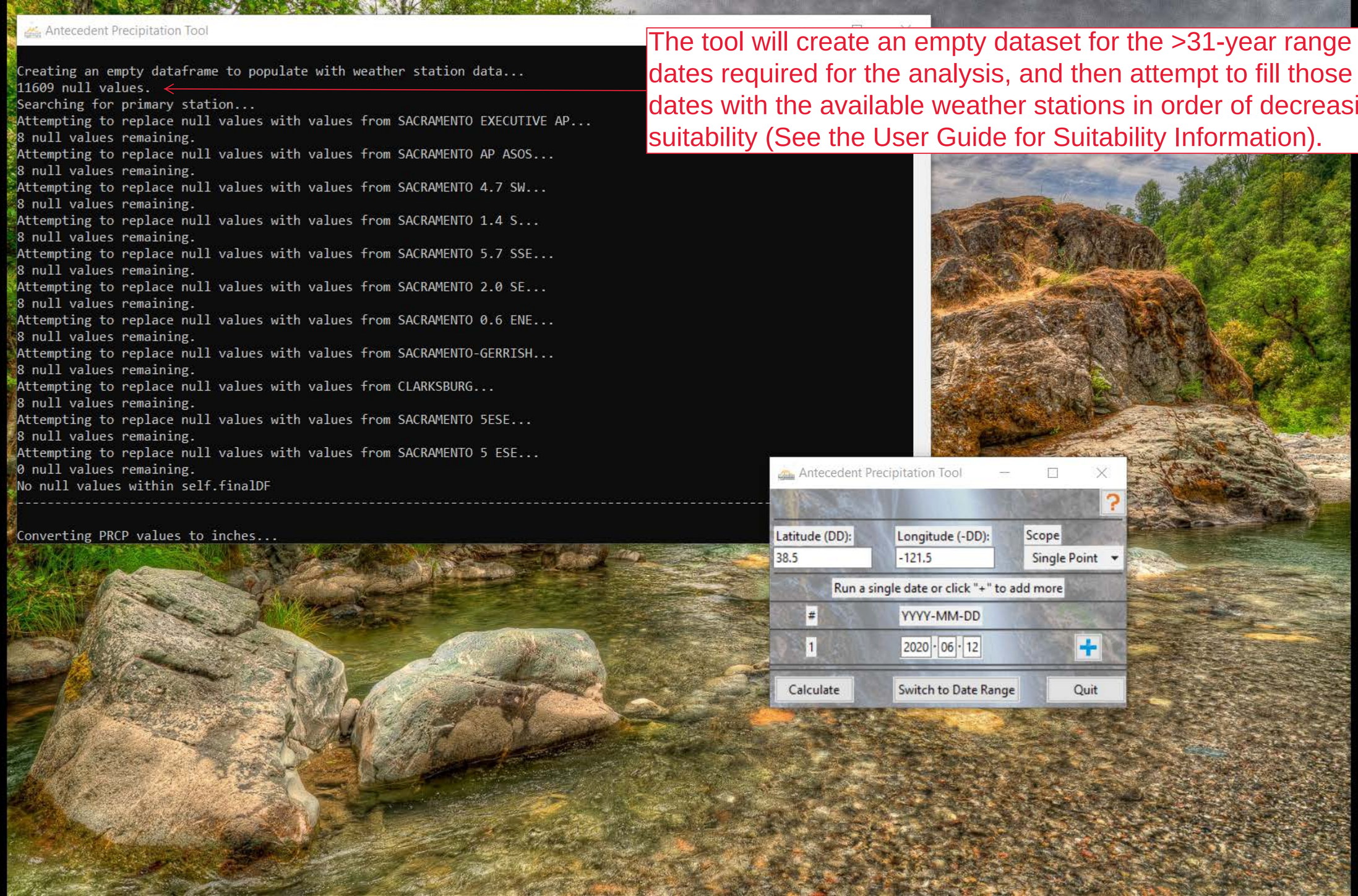
While we continue to wait for stations to download, the tool will use data from the Web-Based Water-Budget Interactive Modeling Program (WebWIMP) to determine whether the selected month falls within the Dry Season or the Wet Season for selected location.

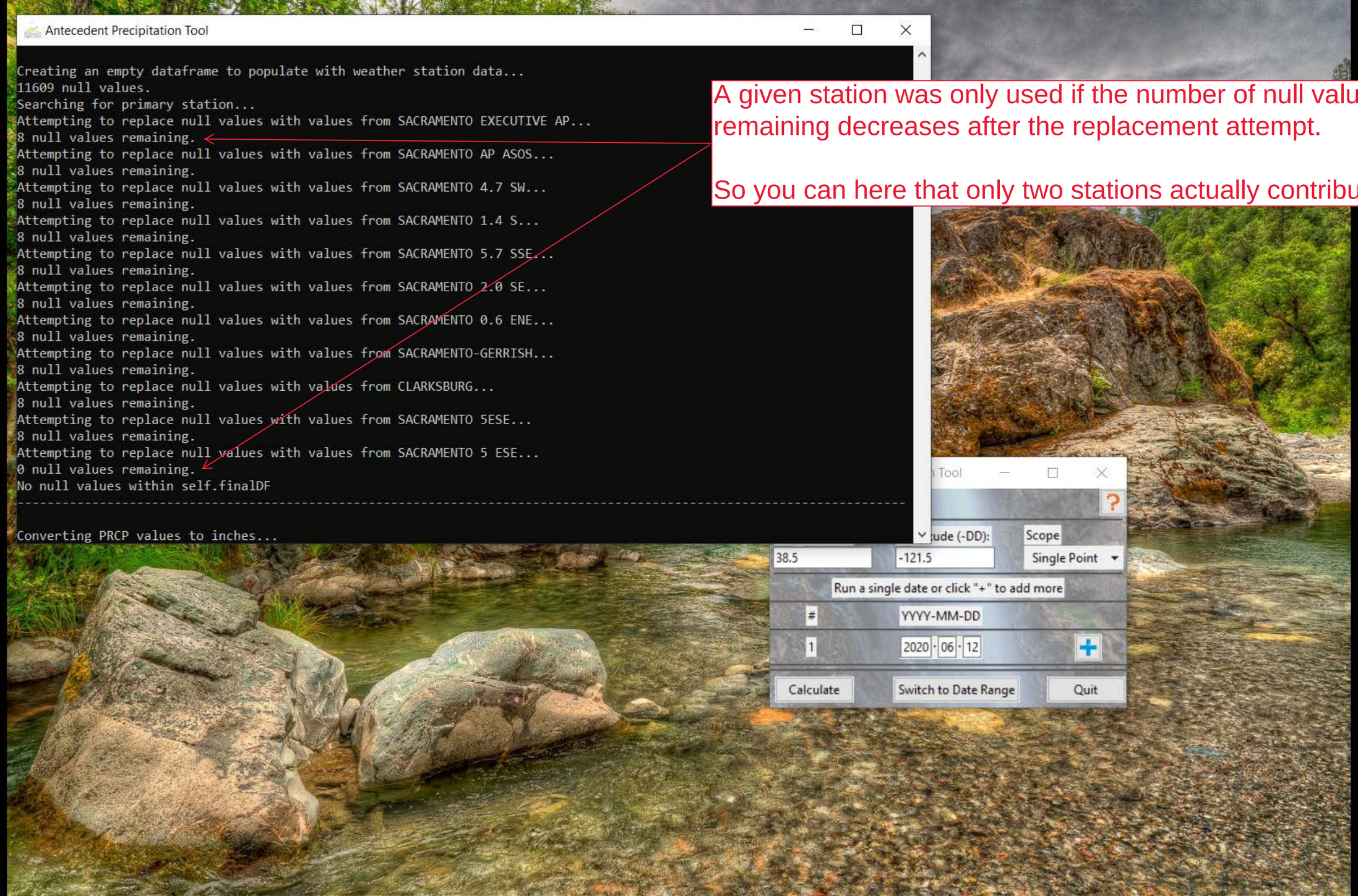
To learn more, please see the definitions above the table and the following:

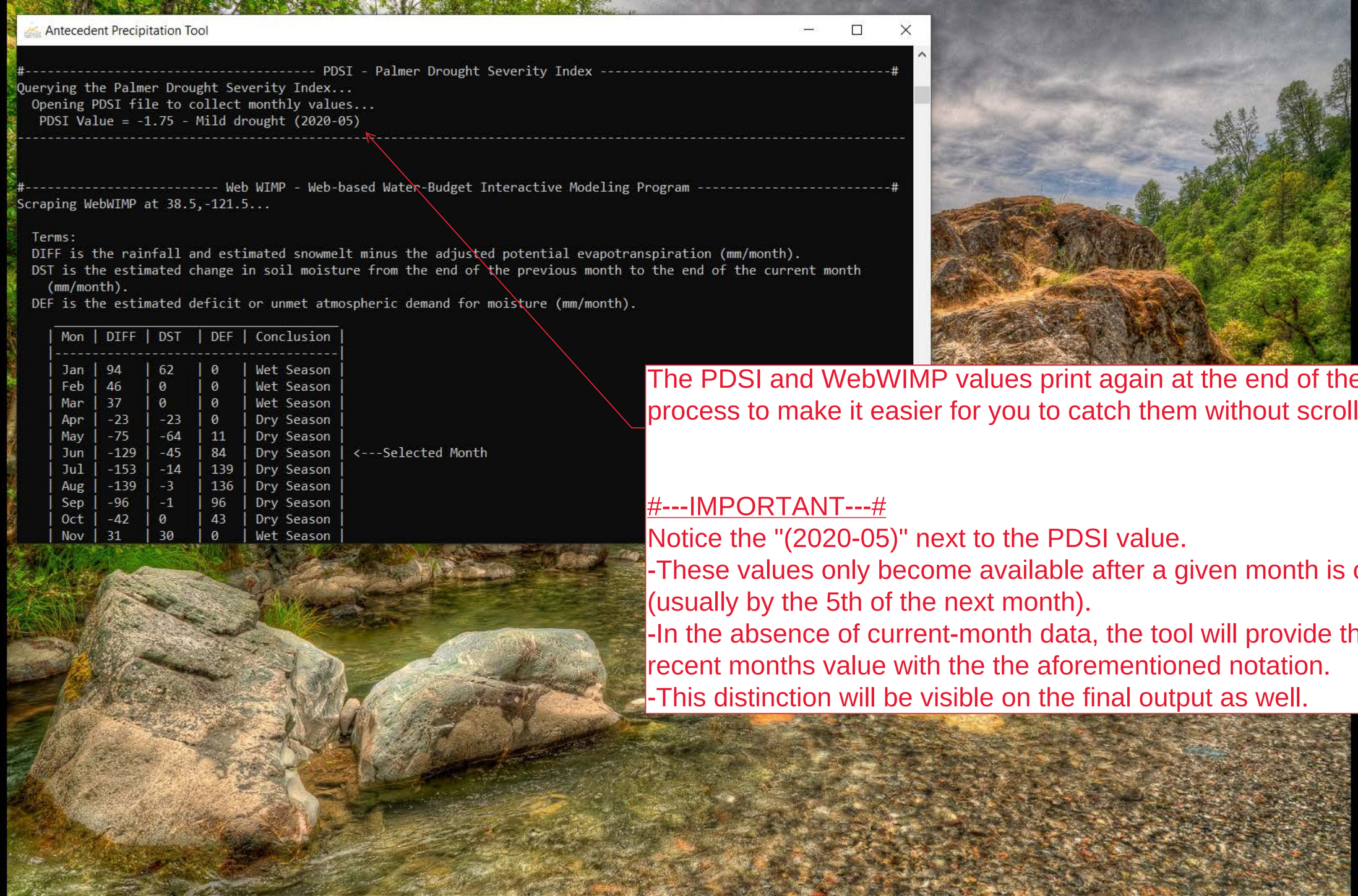
Excerpt from ERDC/EL TR-08-28
Regional Supplement to the Corps of Engineers Wetland Delineation Manual
Arid West Region (Version 2.0)
Section 5 - Difficult Wetland Situations in the Arid West
Wetlands that periodically lack indicators of wetland hydrology:

"...
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	<---Selected Month
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:
69 stations remaining...
Tool
ude (-DD):
Scope
38.5
-121.5
Single Point
Run a single date or click "+" to add more
#
YYYY-MM-DD
1
2020 · 06 · 12
ulate
Switch to Date Range
Quit
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...


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...
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
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


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.
Scope
Single Point
38.5
-121.5
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.

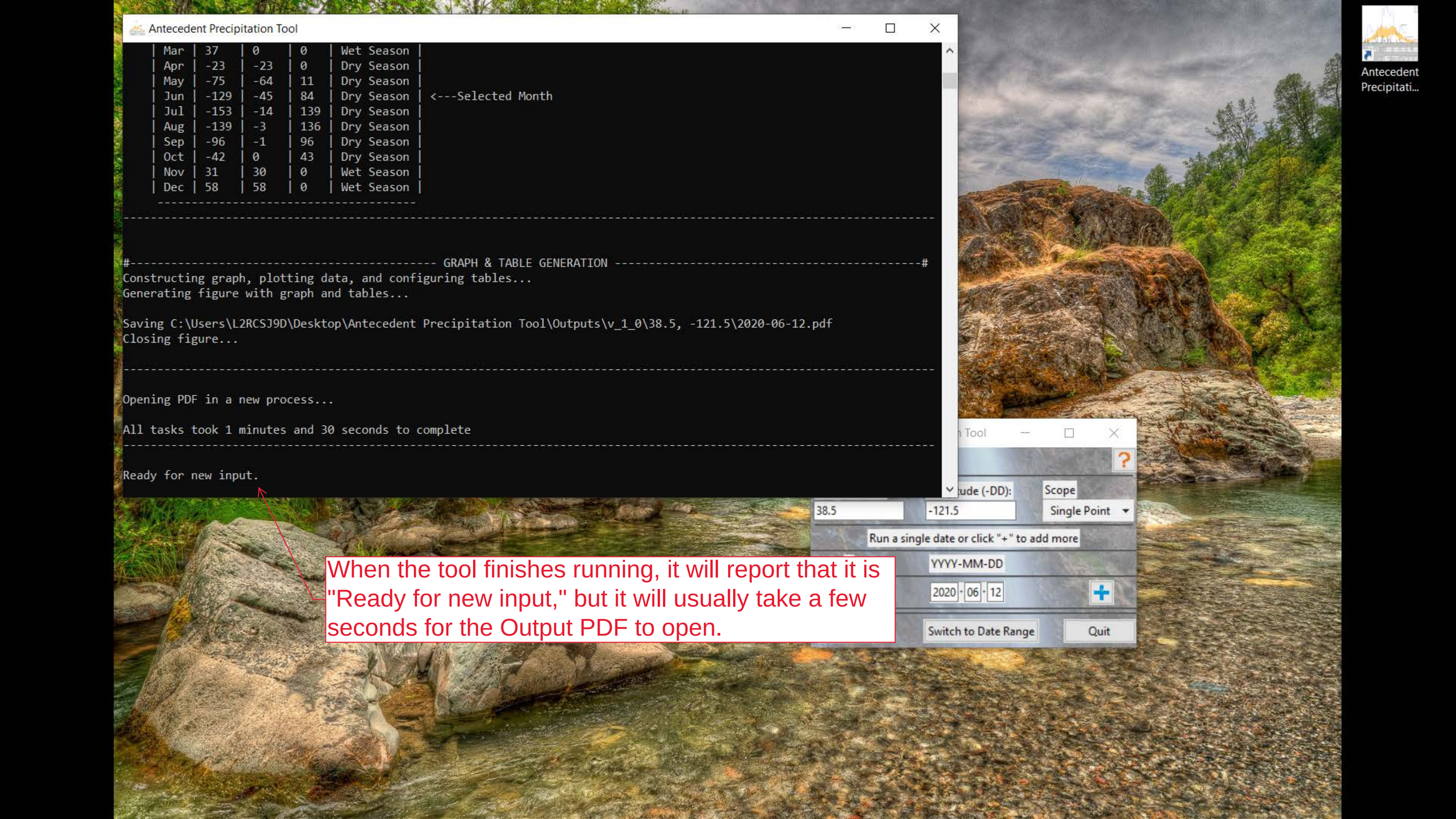
#---IMPORTANT---#

Notice the "(2020-05)" next to the PDSI value.

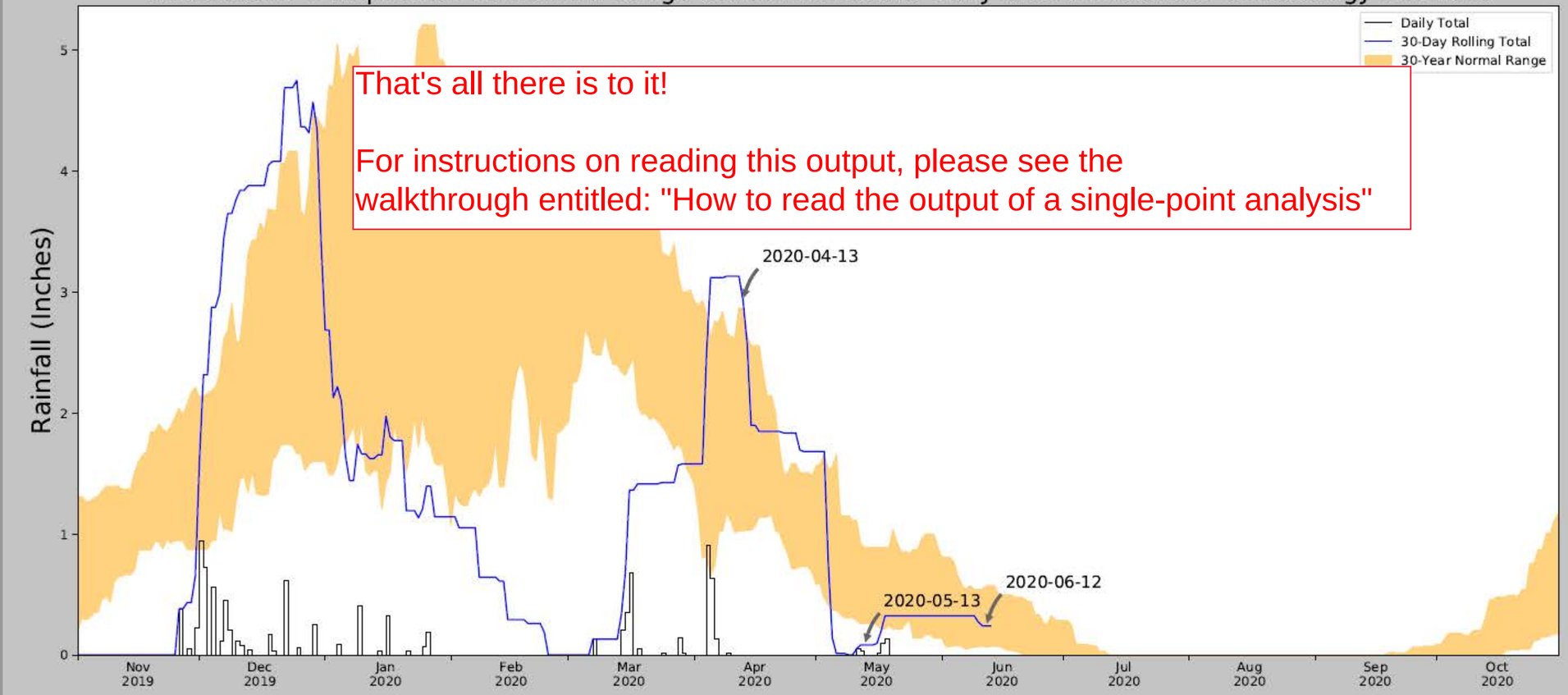
-These values only become available after a given month is over (usually by the 5th of the next month).

-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	<---Selected Month
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
#---------- 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.
Scope
Single Point
38.5
-121.5
Run a single date or click "+" to add more
YYYY-MM-DD
2020 · 06 · 12
Switch to Date Range
Quit
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...

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



That's all there is to it!

For instructions on reading this output, please see the walkthrough entitled: "How to read the output of a single-point analysis"

Coordinates	38.5, -121.5
Observation Date	2020-06-12
Elevation (ft)	7.14
Drought Index (PDSI)	Mild drought (2020-05)
WebWIMP H_2O Balance	Dry Season

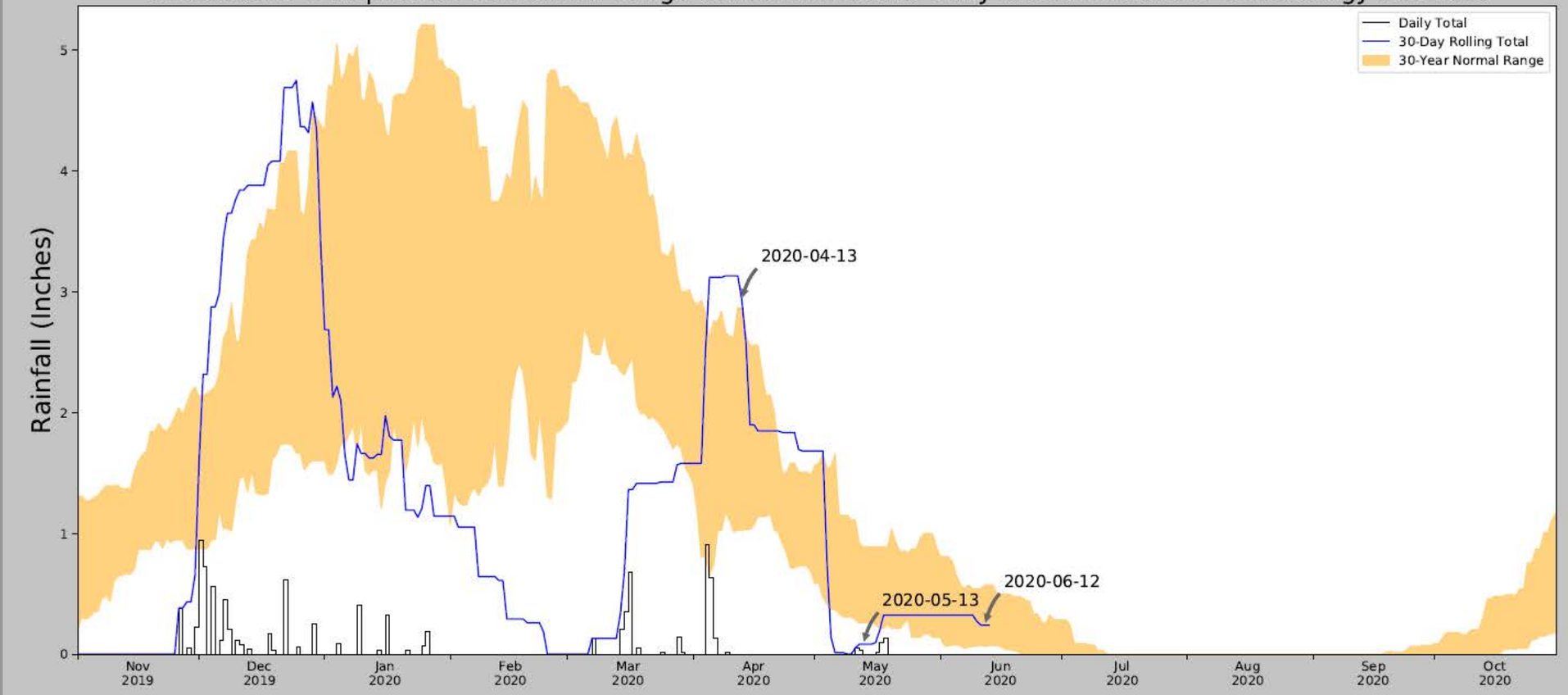
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2020-06-12	0.064961	0.572047	0.240157	Normal	2	3	6
2020-05-13	0.260236	0.887795	0.082677	Dry	1	2	2
2020-04-13	1.027559	2.866536	2.929134	Wet	3	1	3
Result							Normal Conditions - 11

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)
SACRAMENTO EXECUTIVE AP	38.5069, -121.495	15.092	0.548	7.952	0.251	11344	90
SACRAMENTO 5 ESE	38.5556, -121.4169	38.058	5.91	30.918	2.842	8	0

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



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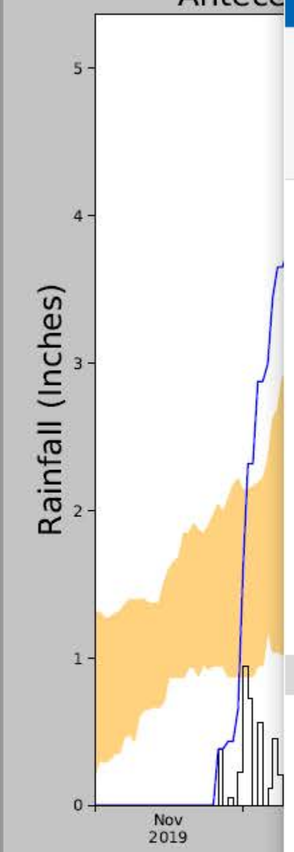
2020-06-12.pdf - Adobe Acrobat Pro DC

File Edit View Window Help

Home Tools 2020-06-12.pdf



38.5, -121.5

File Home Share View

Pin to Quick access | Copy | Paste | Cut | Copy path | Paste shortcut — Clipboard

Move to | Copy to | Delete | Rename — Organize

New folder | New item | Easy access — New

Properties | Open | Edit | History — Open

Select all | Select none | Invert selection — Select

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Search 38.5, -121.5

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Pictures

This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
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DATA (D:)
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Name	Date modified	Type	Size
Station Data	6/15/2020 12:24 A...	File folder	
2020-06-12.pdf	6/15/2020 12:26 A...	Adobe Acrobat D...	90 KB

2 items

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Observation Da
Elevation (
Drought Index (PD
WebWIMP H_2O Balan

Version 1.0

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U.S. Army Corps of Engineers

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2020-06-12.pdf - Adobe Acrobat Pro DC

File Edit View Window Help

Home Tools 2020-06-12.pdf

Station Data

File Home Share View

Pin to Quick access | Copy | Paste | Cut | Copy path | Paste shortcut — Clipboard

Move to | Copy to | Delete | Rename — Organize

New folder | New item | Easy access — New

Properties | Open | Edit | History — Open

Select all | Select none | Invert selection — Select

« Desktop › Antecedent Precipitation Tool › Outputs › v_1_0 › 38.5, -121.5 › Station Data

Search Station Data

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- Downloads
- Music
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- Videos
- OSDisk (C:)
- DATA (D:)
- Regulatory (\\coe-spknv00

Name	Date modified	Type	Size
merged_stations.csv	6/15/2020 12:24 A...	Microsoft Excel Co...	184 KB
merged_stations_converted_to_in.csv	6/15/2020 12:24 A...	Microsoft Excel Co...	199 KB
SACRAMENTO 5 ESE.csv	6/15/2020 12:24 A...	Microsoft Excel Co...	184 KB
SACRAMENTO EXECUTIVE AP.csv	6/15/2020 12:24 A...	Microsoft Excel Co...	184 KB

4 items

Antece

Rainfall (Inches)

0 1 2 3 4 5

Nov 2019

Coordinat	
Observation Da	
Elevation (	
Drought Index (PDS	
WebWIMP H_2O Balan	

Version 1.0

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U.S. Army Corps of Engineers

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