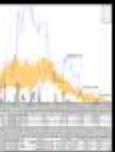




Open the APT



Antecedent
Precipitation
Tool

Validating Desktop shortcut...

++++ +++ +++
hNNN +NNNy hNNm
hMMNhMMMyhMMN
sNMMMMMMMMMMMd
+mMMMMMMMMMs
dMMMr++MMMM+
dMMMr MMM+
dMMMr MMM+
dMMMo oMMMyyyyyy hMMMMMMMMMyyyyyy dMMMsodMMMs
dMMMs
dMMMs
dMMMNyyMMMMMyymMMh+ hMMMNyyMMMMMyhmMMs
dMMMr MMMMM dMMN
dMMMr MMMMM+ dMMm
+dMMMr++MMMMMdNNM
hMMMMMNMMMMMMMMNm
hMMMMMMMMMMMMMMNMhhhhhhhNMMMMMMMMMMMMMMMMMo
ymm+

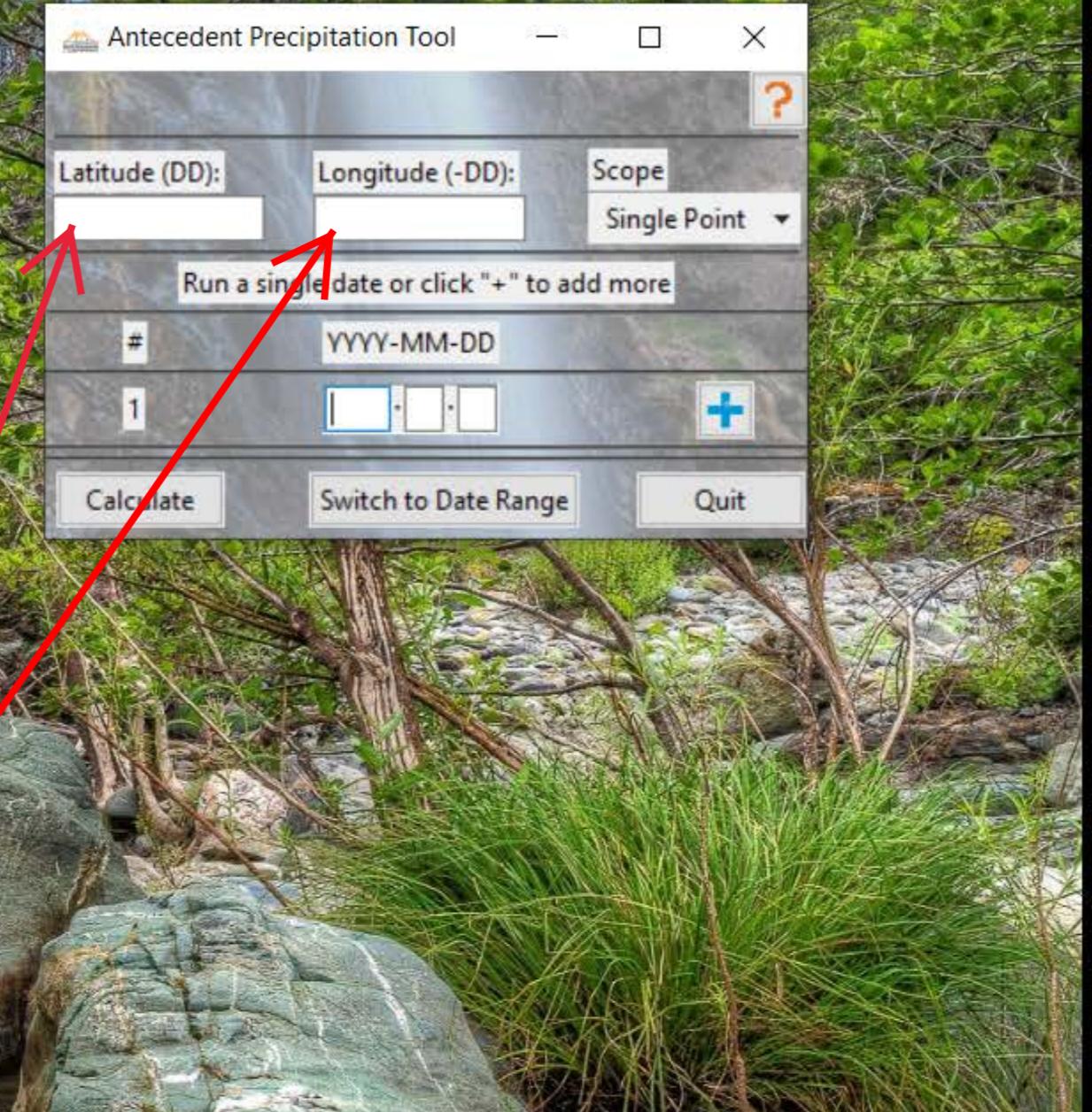


-Written by:
Jason C. Deters,
U.S. Army Corps of Engineers.

Launching Graphical User Interface...

Enter the Latitude and Longitude of the location to be analyzed in Decimal Degree format (DD.dddddd)

NOTE: Longitudes in the U.S. are negative, so your entry should start with a minus "-" symbol.



Validating Desktop shortcut...

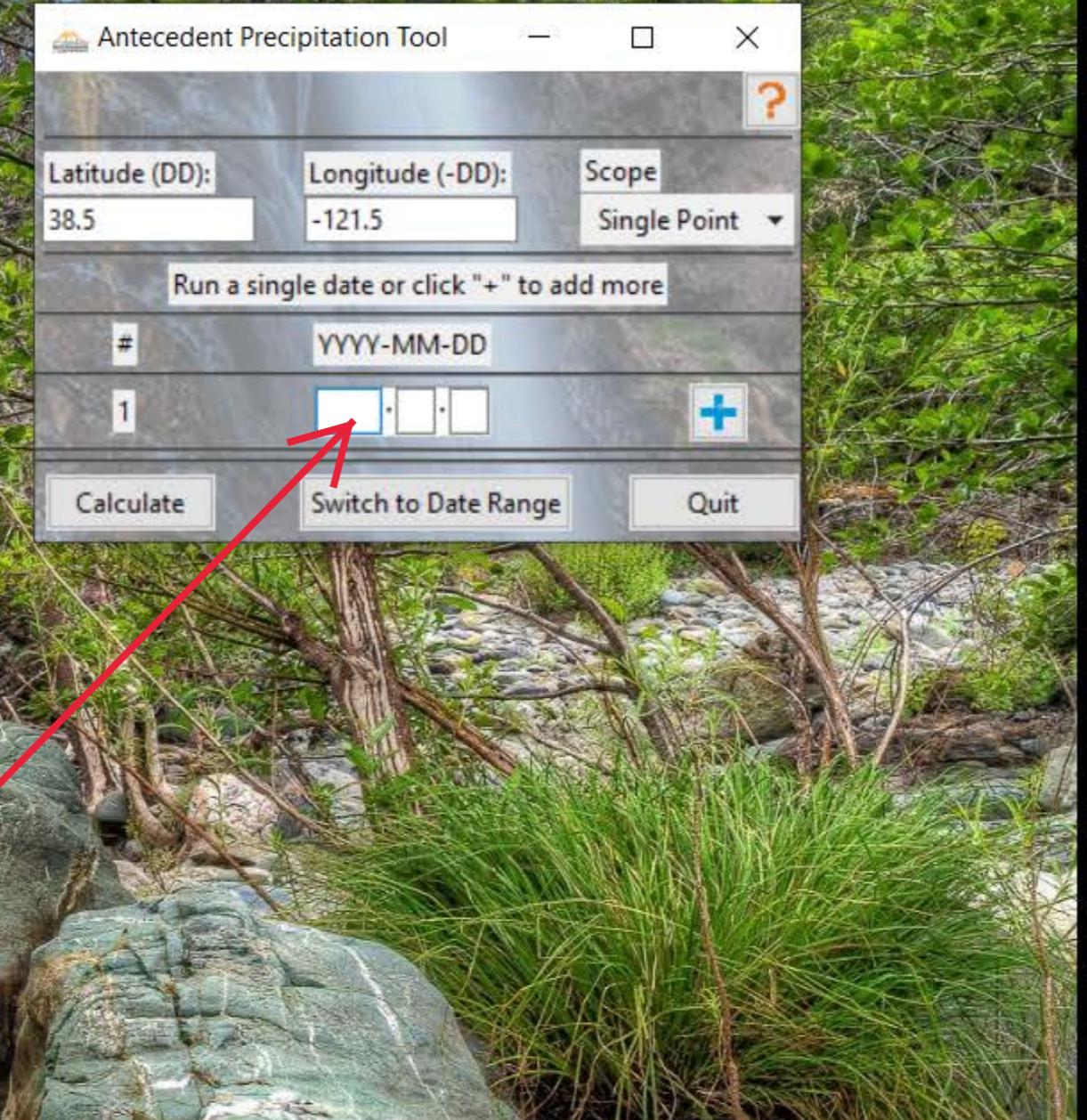
++++ +++ +++
hNNN +NNNy hNNm
hMMNhMMMyhMMN
sNMMMMMMMMMMMd
+mMMMMMMMMMs
dMMMr++MMMM+
dMMMr MMM+
dMMMr MMM+
dMMMo oMMMyyyyyy hMMMMMMMMMyyyyyy dMMMsodMMMs
dMMMs
dMMMs
dMMMNyyMMMMMyymMMh+
dMMMr MMMMM dMMN
dMMMr MMMMM+ dMMm
+dMMMr++MMMMMdNNMm
hMMMMMNMMMMMMMMNm
hMMMMMMMMMMMMMMMMNhhhhhhhNMMMMMMMMMMMMMMMMMo
ymm+



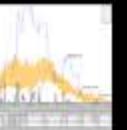
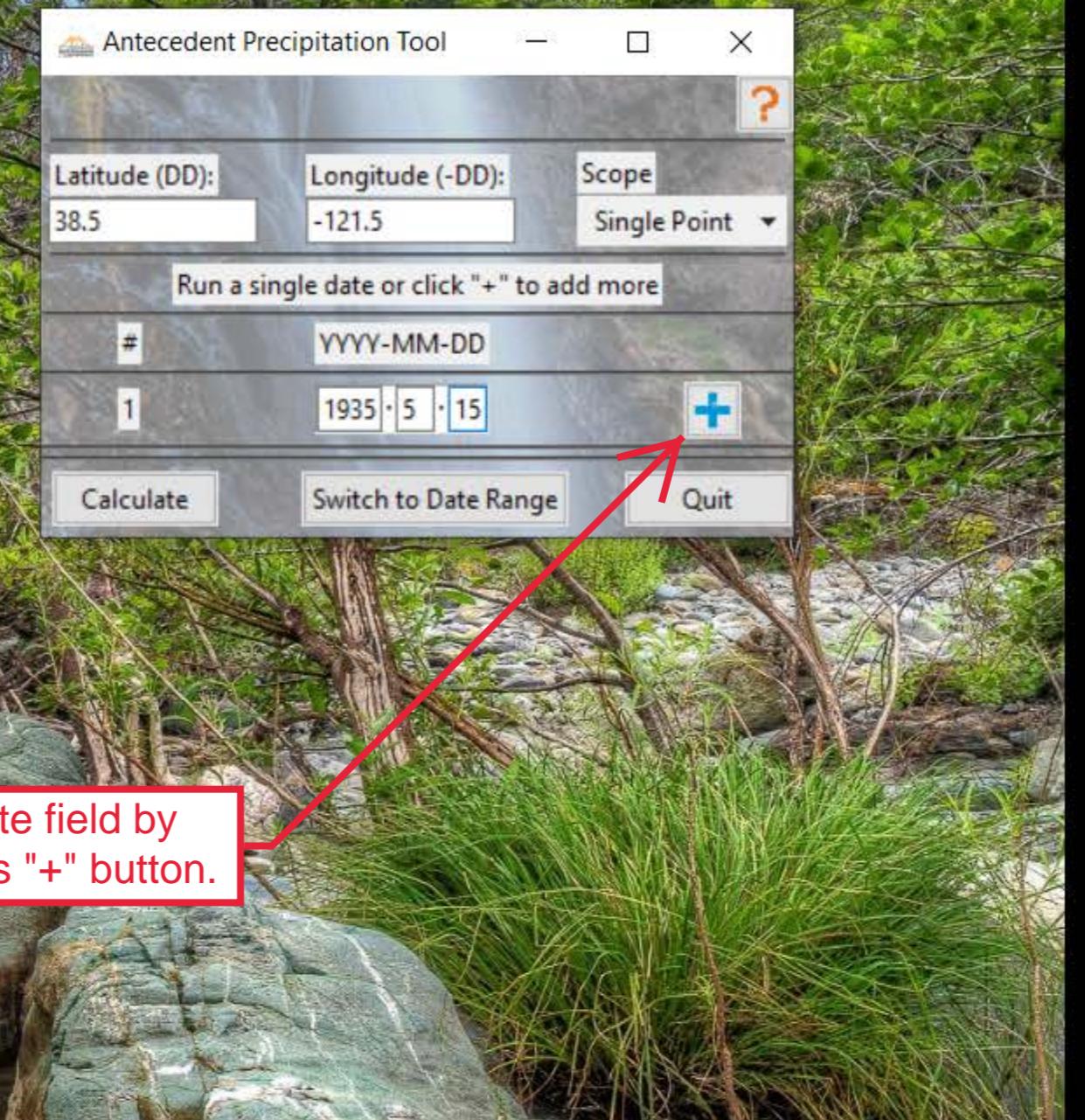
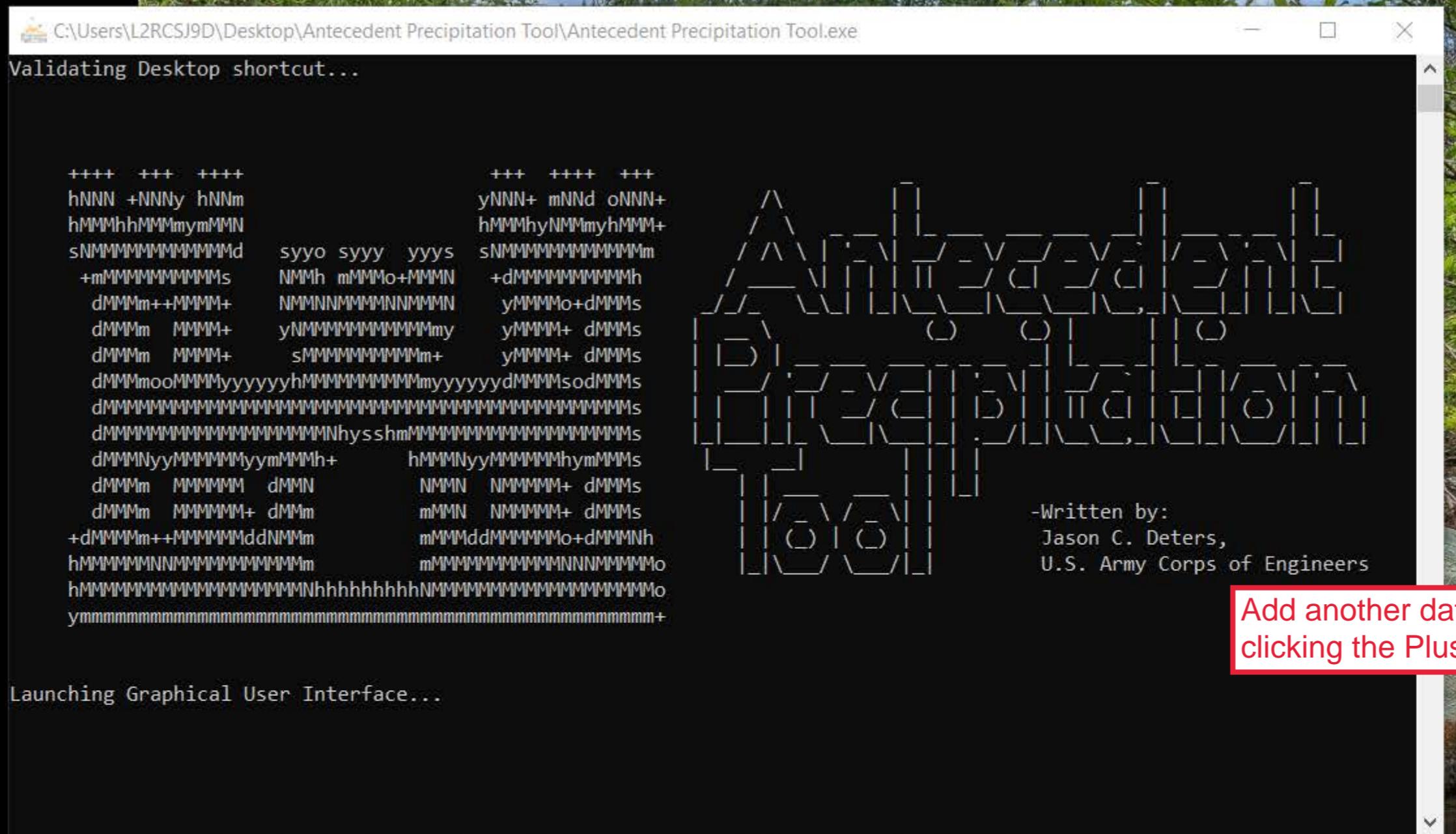
-Written by:
Jason C. Deters,
U.S. Army Corps of Engineers

Launching Graphical User Interface...

Enter the first date you wish to analyze in YYYY-MM-DD format.

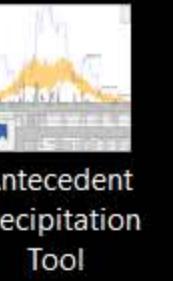
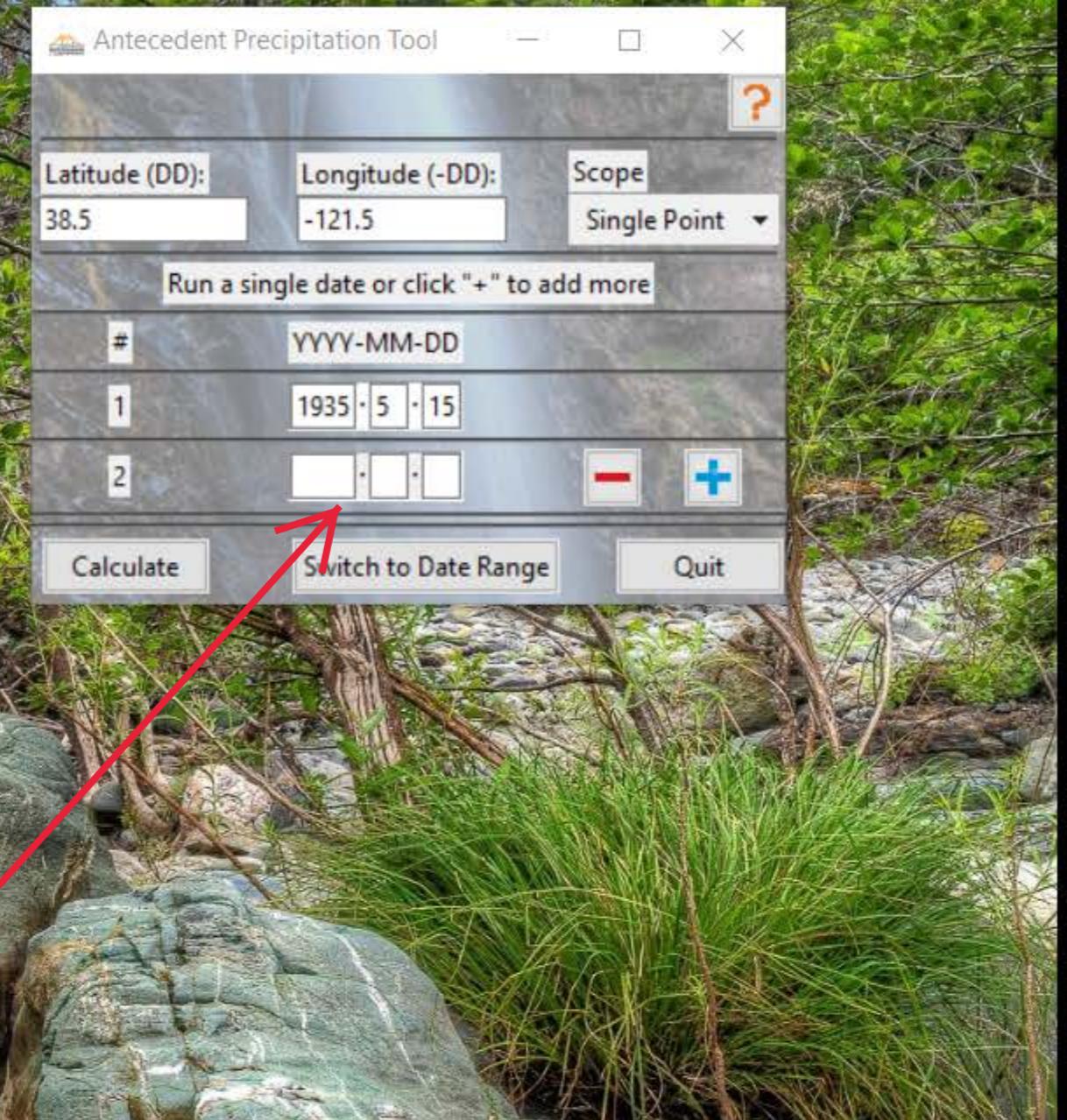
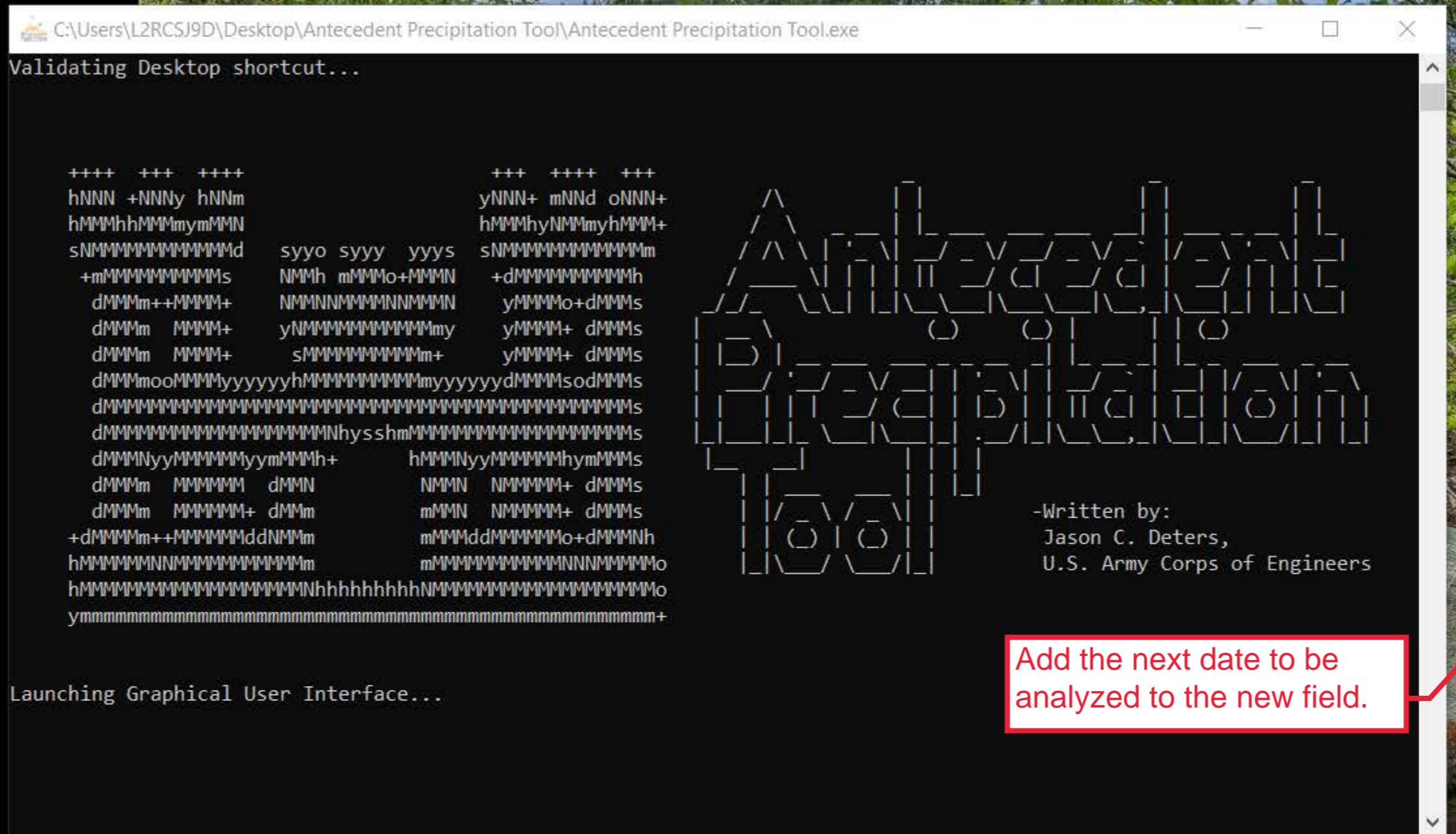


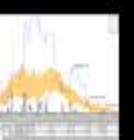
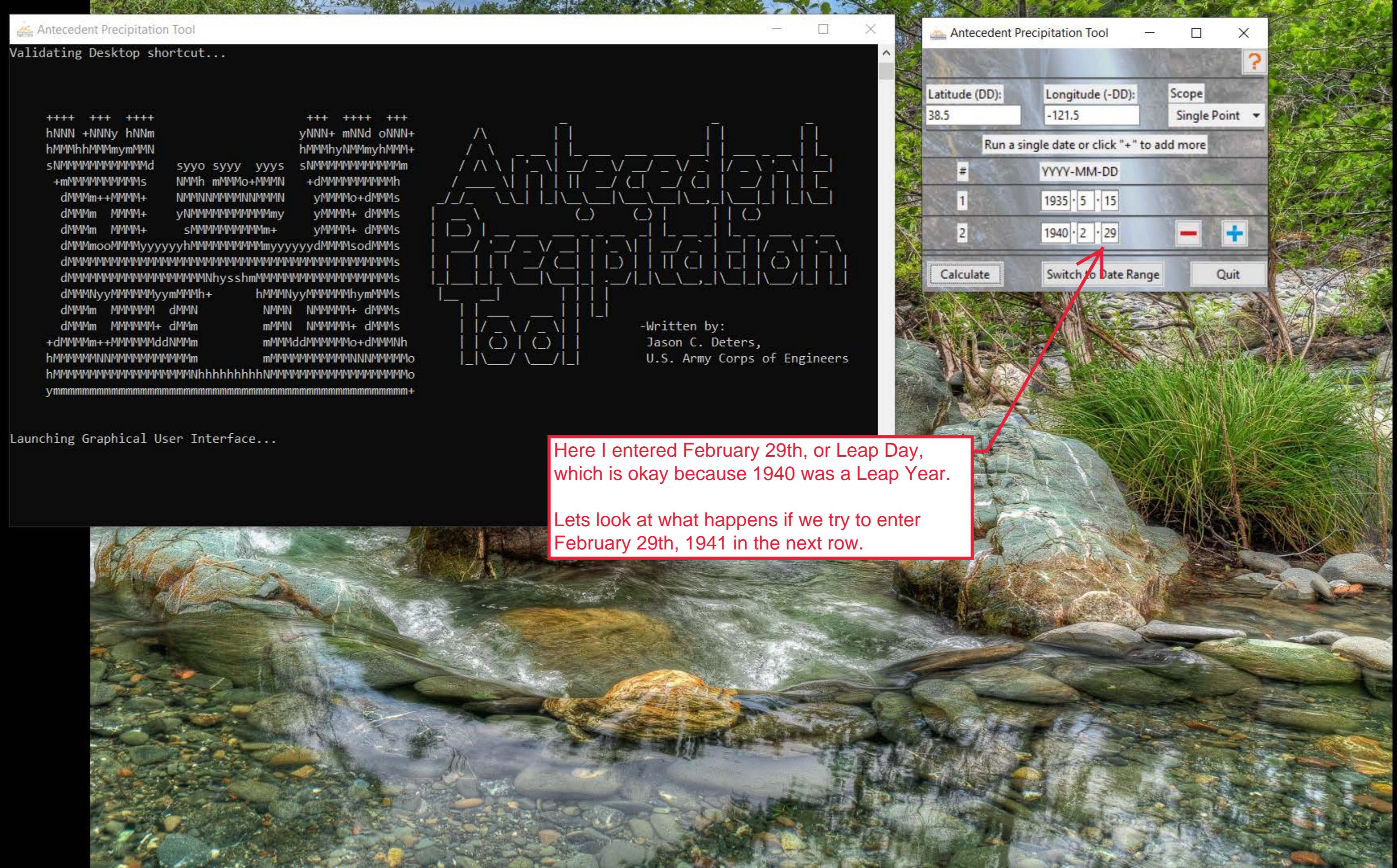
Antecedent
Precipitati...



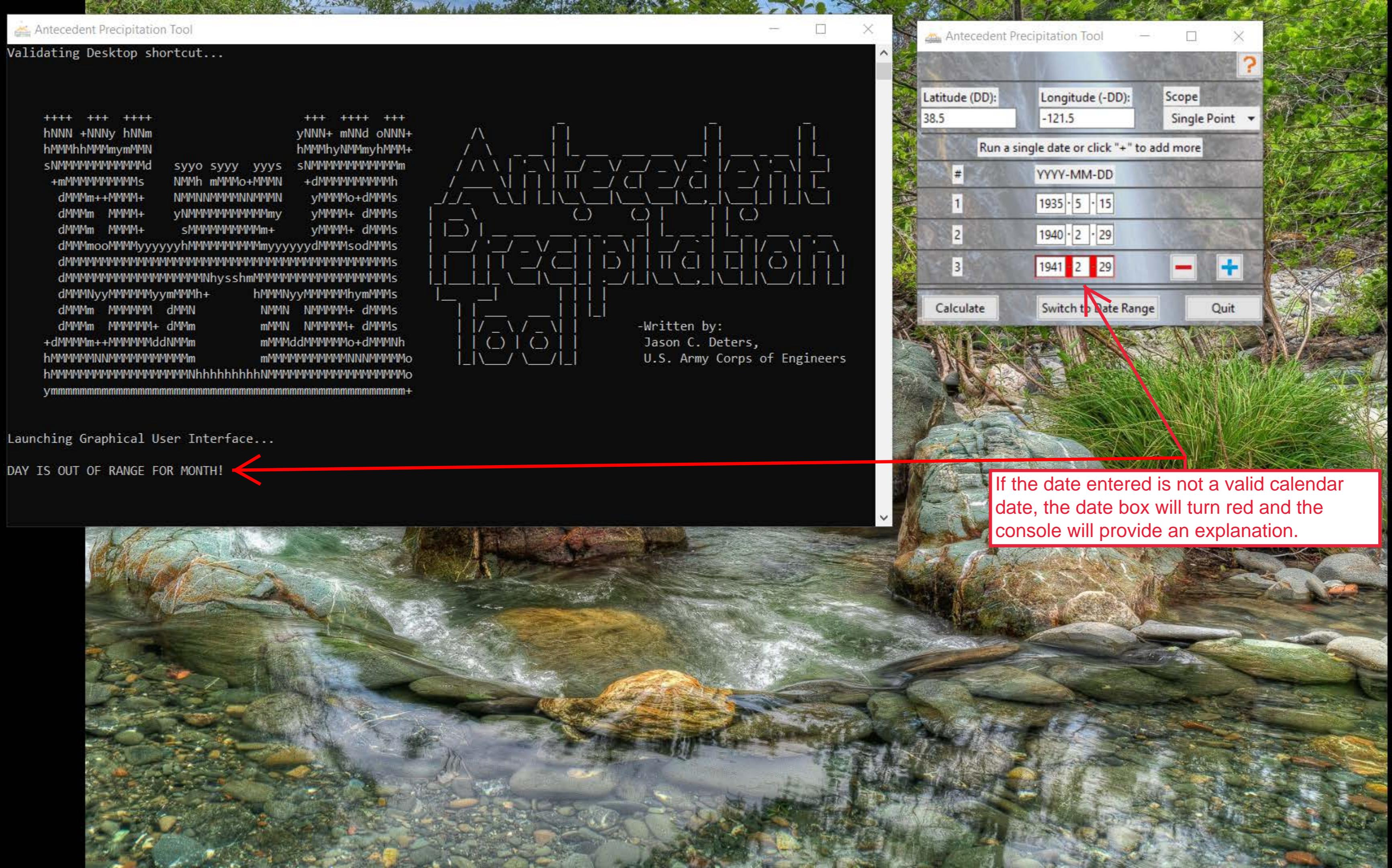
Antecedent Precipitation

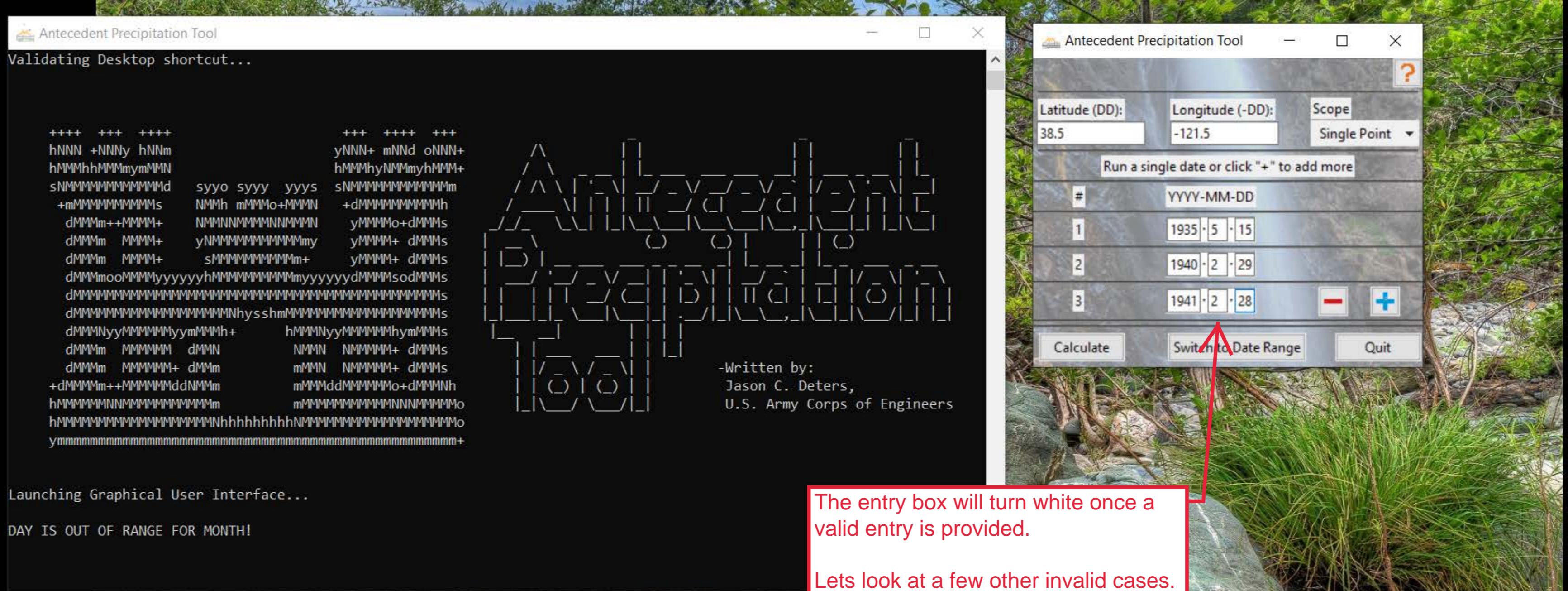
Add another date field by clicking the Plus "+" button.





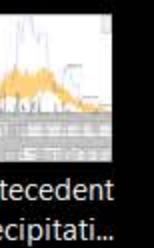
Antecedent Precipitati...





The entry box will turn white once a valid entry is provided.

Lets look at a few other invalid cases.





Validating Desktop shortcut...

++++ +++ +++
hNNN +NNNy hNm
hMMhhMMmymMN
sNMMMMMMMMMMMd
+mMMMMMMMMMs
dMMMm++MMMM+
dMMMm MMM+
dMMMm MMM+
dMMMmooMMMyyyyyyhyhMMMMMMMMMyyyyyydydMMMsodMMs
dMMs
dMMMMMMMMMMMMMMMMNhysshMmmMMMMMMMMMMMMMMMMs
dMMMNyyMMMMMyymMMh+ hMMMNyyMMMMMyymMMs
dMMMm MMMMM dMMN
dMMMm MMMMM+ dMMm
+dMMMm++MMMMMdNMM
hMMMMMMNMMMMMMMM
hMMMMMMMMMMMMMMNhhhhhhhhNMMMMMMMMMMMMMo
ymm+



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

Launching Graphical User Interface...

DAY IS OUT OF RANGE FOR MONTH!

Year cannot be less than 1910! ←

The screenshot shows the graphical user interface of the Antecedent Precipitation Tool. At the top, there are input fields for Latitude (DD) set to 38.5, Longitude (-DD) set to -121.5, and a Scope dropdown set to Single Point. Below these are instructions: "Run a single date or click "+" to add more". A list of four dates is shown in a table:

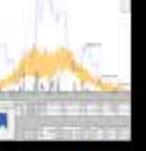
#	Date
1	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1909

At the bottom are buttons for Calculate, Switch to Date Range (which has a red arrow pointing to it), and Quit.

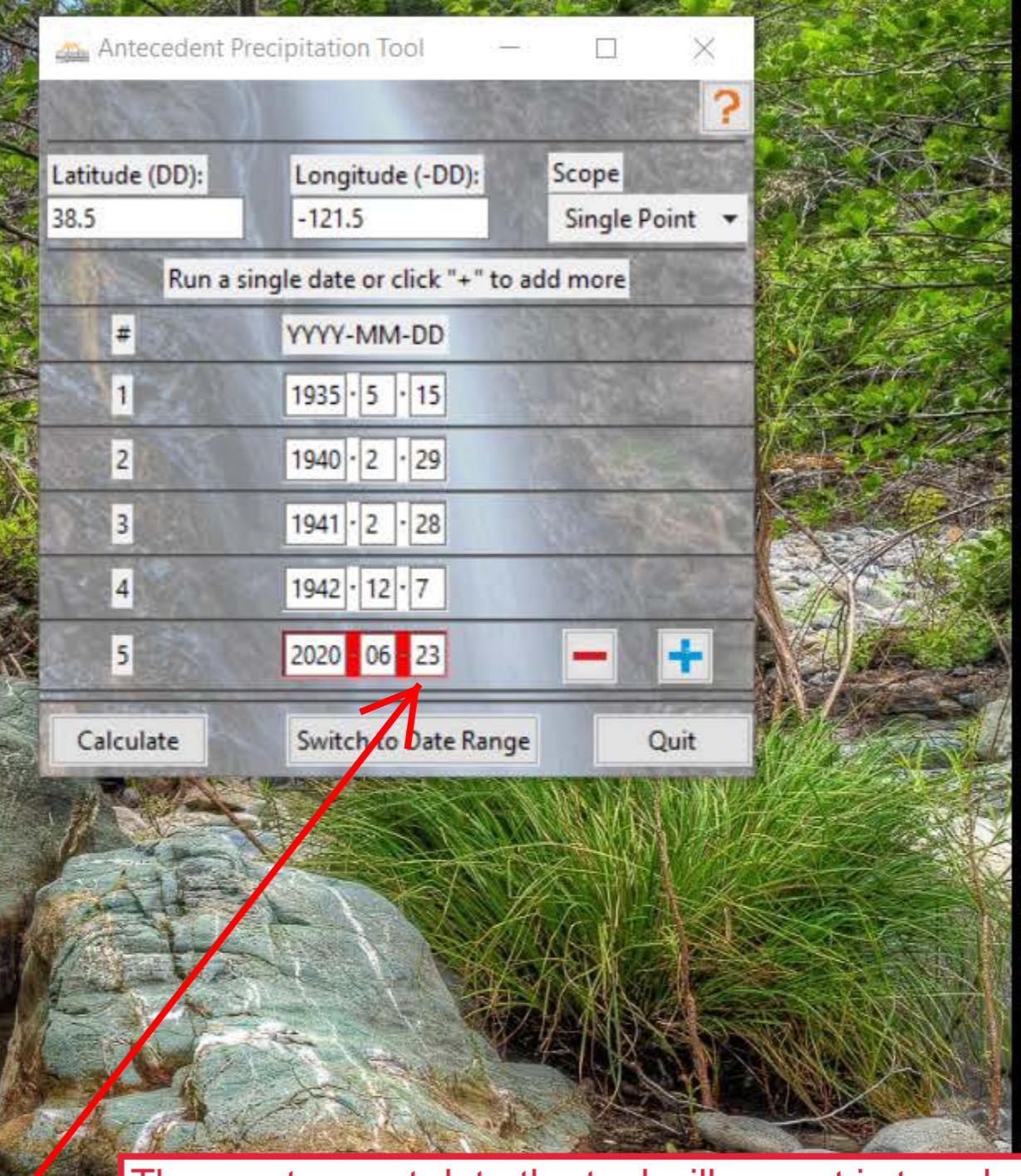
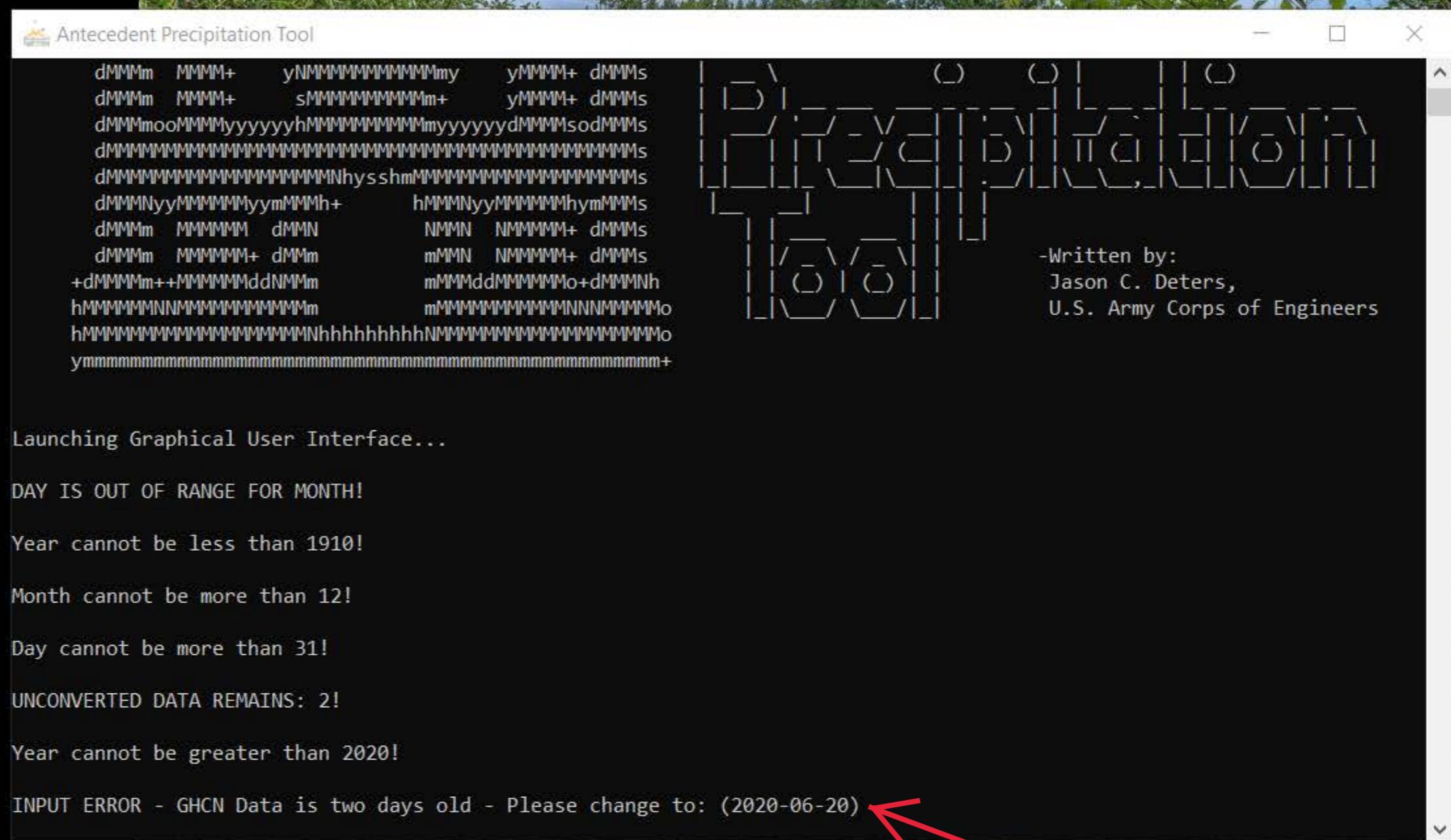
The tool will not accept dates below 1910.

NOTE: 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.



Antecedent
Precipitati...



The most recent date the tool will accept is two days prior to the current date.

This is because it usually takes at least two days for a new precipitation measurement to make it into the Global Historic Climatology Network (GHCN) database on which the APT relies.

Antecedent Precipitation Tool

+mMMMMMMMMMs NMMh mMMMo+MMMN +dMMMMMMMMh
dMMMm++MMM+ NMMNNMMMMNNMMN yMMMMo+dMMMs
dMMMm MMM+ yNMMMMMMMMMMMy dMMMs
dMMMm MMM+ sMMMMMMMMMm+ yMMMM+ dMMMs
dMMMmooMMMyyyyyyhyMMMMMMMMMyyyyyydMMMsodMMMs
dMMMs
dMMMMMMMMMMMMMMMMMMMMNhysshMmmMMMMMMMMMMMMMs
dMMMNyyMMMMMyymMMh+ hMMMNyyMMMMMyhmMMs
dMMMm MMMMM dMMN NMMN NMMMM+ dMMMs
dMMMm MMMMM+ dMMm mMMN NMMMM+ dMMMs
+dMMMMm++MMMMMdNMMm mMMddMMMMMo+dMMNh
hMMMMMMNNMMMMMMMMm mMMMMMMMMNNNNMMMo
hMMMMMMMMMMMMMMMMNhhhhhhhhhNMMMMMMMMMMMMMMMo
yMM+

Launching Graphical User Interface...

DAY IS OUT OF RANGE FOR MONTH!

Year cannot be less than 1910!

Year cannot be less than 1910!

Year cannot be less than 1910!

Month cannot be more than 12!

INPUT ERROR - GHCN Data is two days old - Please change to: (2020-06-20)



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	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1942 · 12 · 7
5	1943 · 6 · 12
6	1944 · 7 · 19
7	1945 · 8 · 21
8	1950 · 3 · 15
9	1951 · 6 · 16
10	1952 · 7 · 04
11	1965 · 1 · 1
12	1971 · 5 · 28
13	1973 · 7 · 4
14	1978 · 11 · 21
15	1981 · 12 · 2
16	1984 · 4 · 24
17	1985 · 9 · 13
18	1989 · 5 · 18
19	1998 · 12 · 01
20	2020 · 06 · 20

Calculate

Switch to Date Range

Quit



Antecedent
Precipitati...

Antecedent Precipitation Tool

+mMMMMMMMMMs NMMh mMMMo+MMMN +dMMMMMMMH
dMMMm++MMMM+ NMMNNMMMMNMMMN yMMMMo+dMMMs
dMMMm MMMM+ yNMMMMMMMMMMMy dMMMs
dMMMm MMM+ sMMMMMMMMMm+ yMMMM+ dMMMs
dMMMmooMMMyyyyyyhyMMMMMMMMMyyyyyydMMMsodMMMs
dMMMs
dMMMMMMMMMMMMMMMMMMMMNhysshMmmMMMMMMMMMMMMMs
dMMMNyyMMMMMyymMMh+ hMMMNyyMMMMMyhmMMs
dMMMm MMMMM dMMN NMMN NMMMM+ dMMMs
dMMMm MMMMM+ dMMm mMMN NMMMM+ dMMMs
+dMMMMm++MMMMMdNMMm mMMddMMMMMo+dMMNh
hMMMMMMNNMMMMMMMMm mMMMMMMMMNNMMMMMo
hMMMMMMMMMMMMMMMMNhhhhhhhhhNMMMMMMMMMMMMMMMo
yMM+

Launching Graphical User Interface...

DAY IS OUT OF RANGE FOR MONTH!

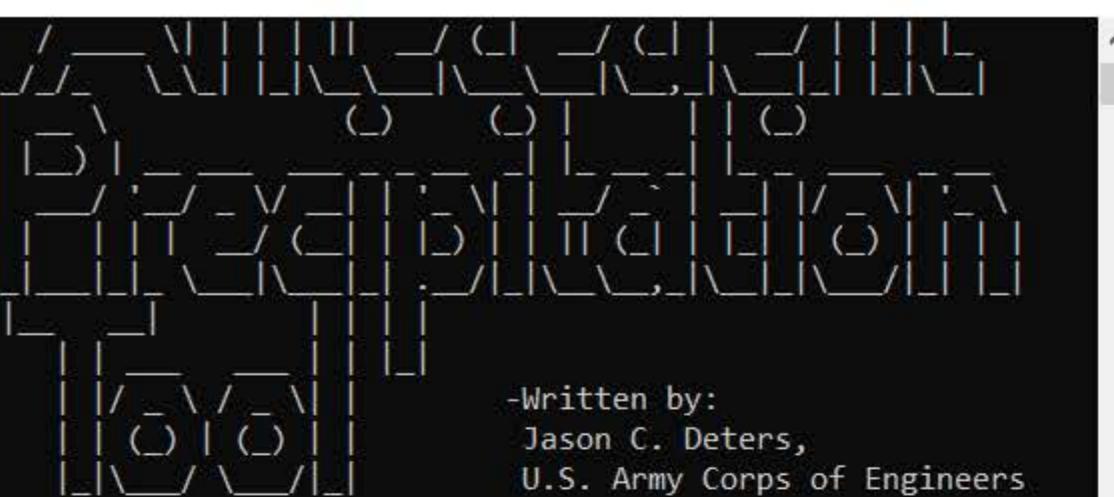
Year cannot be less than 1910!

Year cannot be less than 1910!

Year cannot be less than 1910!

Month cannot be more than 12!

INPUT ERROR - GHCN Data is two days old - Please change to: (2020-06-20)



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

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	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1942 · 12 · 7
5	1943 · 6 · 12
6	1944 · 7 · 19
7	1945 · 8 · 21
8	1950 · 3 · 15
9	1951 · 6 · 16
10	1952 · 7 · 04
11	1965 · 1 · 1
12	1971 · 5 · 28
13	1973 · 7 · 4
14	1978 · 11 · 21
15	1981 · 12 · 2
16	1984 · 4 · 24
17	1985 · 9 · 13
18	1989 · 5 · 18
19	1998 · 12 · 01
20	2020 · 06 · 20

Calculate

Switch to Date Range

Quit



Antecedent
Precipitati...



Once you have entered all of the dates you wish to analyze, click the "Calculate" button to start the batch process.

NOTE: To analyze more dates than will fit on the screen, you can use the CSV Input method. For more info, click the orange question mark in the upper-right corner to open the "Help Menu," and then select "How to generate a single-point analysis for many dates using a spreadsheet."

Antecedent Precipitation Tool

```
Rain Batch 4 - ['PRCP', '38.5', '-121.5', 1942, '12']  
Rain Batch 5 - ['PRCP', '38.5', '-121.5', 1943, '06']  
Rain Batch 6 - ['PRCP', '38.5', '-121.5', 1944, '07']  
Rain Batch 7 - ['PRCP', '38.5', '-121.5', 1945, '08']  
Rain Batch 8 - ['PRCP', '38.5', '-121.5', 1950, '03']  
Rain Batch 9 - ['PRCP', '38.5', '-121.5', 1951, '06']  
Rain Batch 10 - ['PRCP', '38.5', '-121.5', 1952, '07']  
Rain Batch 11 - ['PRCP', '38.5', '-121.5', 1965, '01']  
Rain Batch 12 - ['PRCP', '38.5', '-121.5', 1971, '05']  
Rain Batch 13 - ['PRCP', '38.5', '-121.5', 1973, '07']  
Rain Batch 14 - ['PRCP', '38.5', '-121.5', 1978, '11']  
Rain Batch 15 - ['PRCP', '38.5', '-121.5', 1981, '12']  
Rain Batch 16 - ['PRCP', '38.5', '-121.5', 1984, '04']  
Rain Batch 17 - ['PRCP', '38.5', '-121.5', 1985, '09', '13', None, None]  
Rain Batch 18 - ['PRCP', '38.5', '-121.5', 1989, '05', '18', None, None]  
Rain Batch 19 - ['PRCP', '38.5', '-121.5', 1998, '12', '01', None, None]  
Rain Batch 20 - ['PRCP', '38.5', '-121.5', 2020, '06', '20', None, None]
```

```
#####
##### ----- Single Point Batch Analysis - Date 1 of 20 ----- #####
#####
Running: ['PRCP', '38.5', '-121.5', 1935, '05', '15', 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
```



The tool will iterate through all of the selected dates.

More detail about the specifics of the process is shown in the "How to generate a single-point analysis for a given date" PDF Instructions, available in the Help Menu.

A complete narrative description of the process can be found in the User Guide, and a step-by-step outline of the entire process can be found in the Detailed Methodology document, both of which are also in the Help Menu.

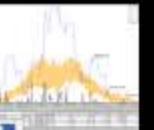
Antecedent Precipitation Tool

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

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

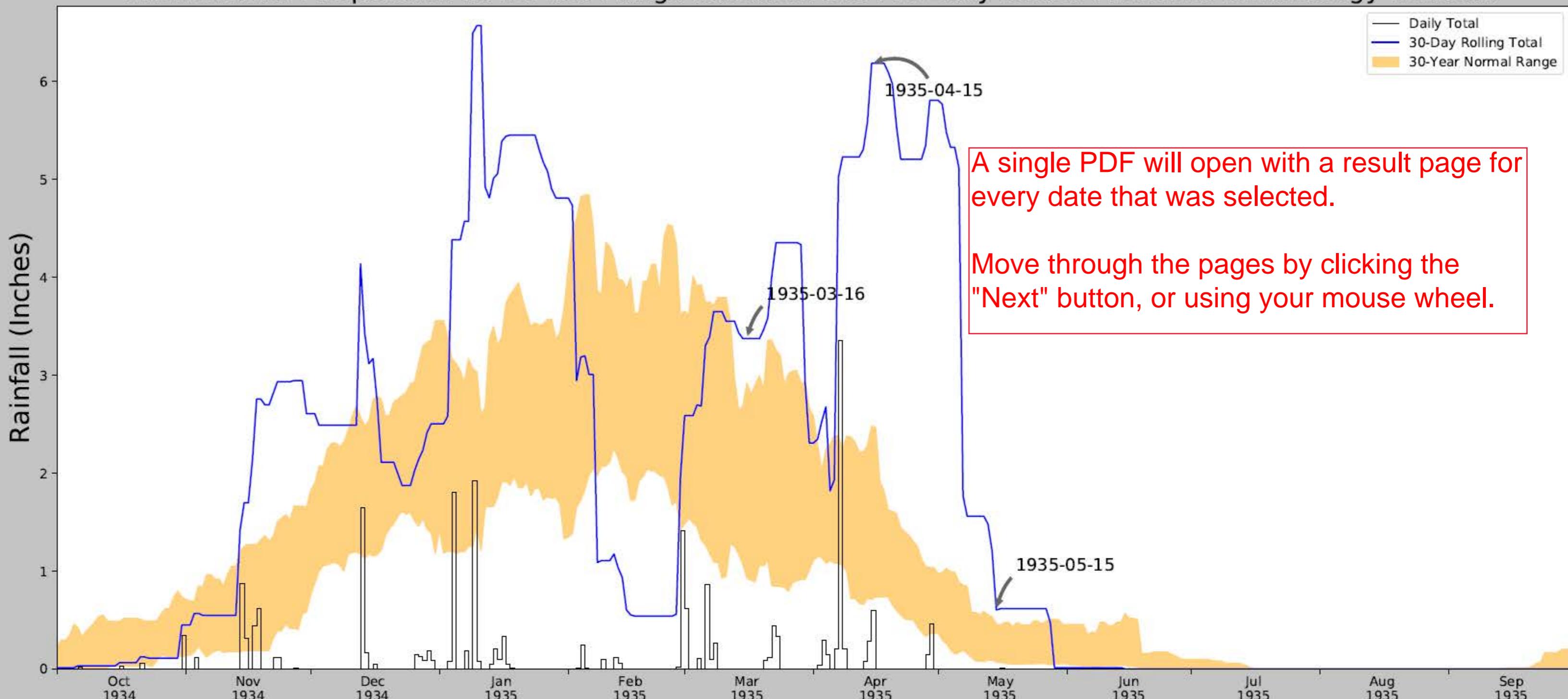
#	YYYY-MM-DD
1	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1942 · 12 · 7
5	1943 · 6 · 12
6	1944 · 7 · 19
7	1945 · 8 · 21
8	1950 · 3 · 15
9	1951 · 6 · 16
10	1952 · 7 · 04
11	1965 · 1 · 1
12	1971 · 5 · 28
13	1973 · 7 · 4
14	1978 · 11 · 21
15	1981 · 12 · 2
16	1984 · 4 · 24
17	1985 · 9 · 13
18	1989 · 5 · 18
19	1998 · 12 · 01
20	2020 · 06 · 20

Calculate Switch to Date Range Quit



Antecedent
Precipitati...

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



Coordinates	38.5, -121.5
Observation Date	1935-05-15
Elevation (ft)	7.14
Drought Index (PDSI)	Normal
WebWIMP H ₂ O Balance	Dry Season

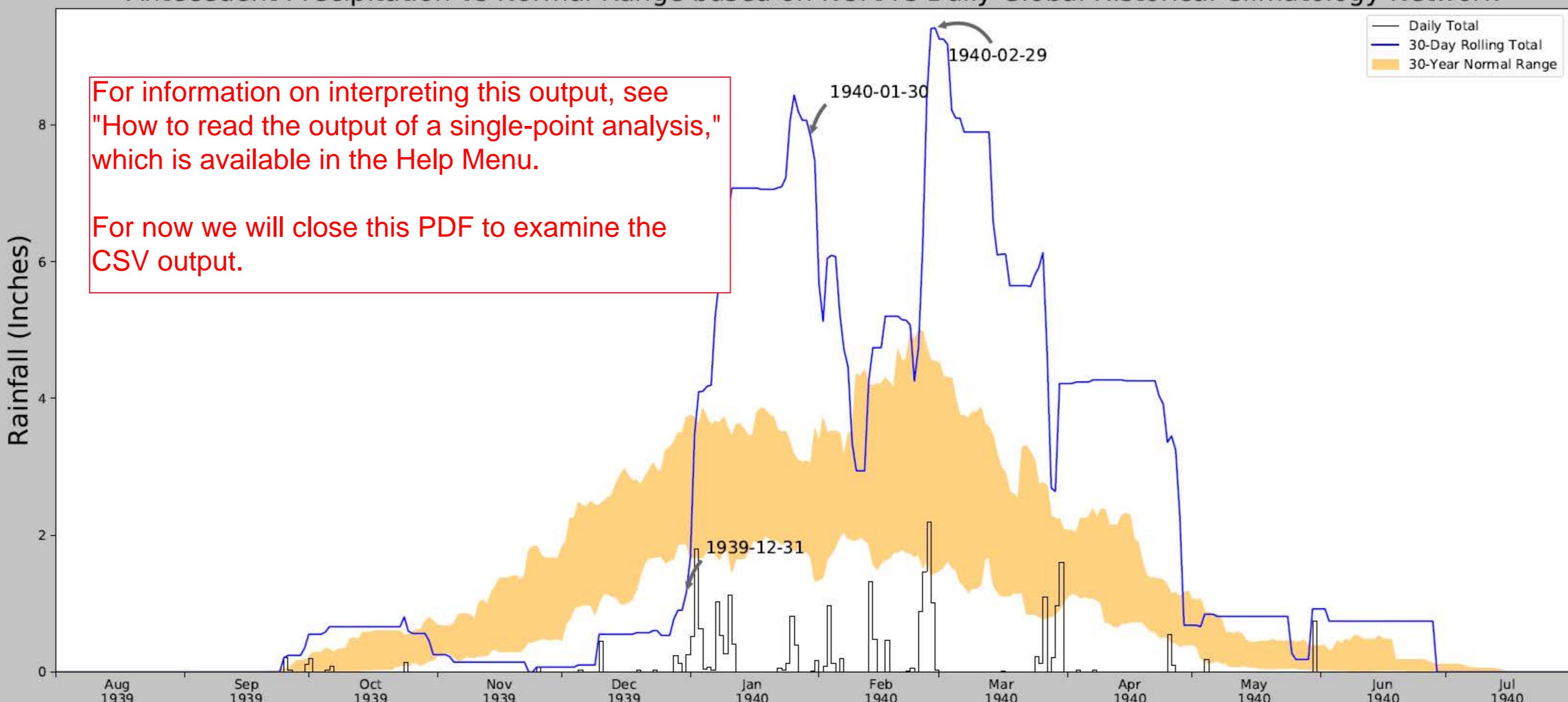
30 Days Ending	30 th %ile (in)	70 th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
1935-05-15	0.066142	0.459055	0.602362	Wet	3	3	9
1935-04-15	0.711024	2.482677	6.18504	Wet	3	2	6
1935-03-16	0.926378	2.920866	3.374016	Wet	3	1	3
Result							Wetter than Normal - 18



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)
SACRAMENTO 5 ESE	38.5556, -121.4169	38.058	5.91	30.918	2.842	11289	90
DAVIS 2 WSW EXP FARM	38.535, -121.7761	60.039	15.121	52.899	7.604	64	0

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



Coordinates	38.5, -121.5
Observation Date	1940-02-29
Elevation (ft)	7.14
Drought Index (PDSI)	Moderate wetness
WebWIMP H ₂ O Balance	Wet Season

30 Days Ending	30 th %ile (in)	70 th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
1940-02-29	1.450197	4.535827	9.413386	Wet	3	3	9
1940-01-30	1.677165	3.046063	7.822835	Wet	3	2	6
1939-12-31	1.875591	3.710236	1.153543	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)
SACRAMENTO 5 ESE	38.5556, -121.4169	38.058	5.91	30.918	2.842	11289	90
DAVIS 2 WSW EXP FARM	38.535, -121.7761	60.039	15.121	52.899	7.604	63	0

38.5, -121.5

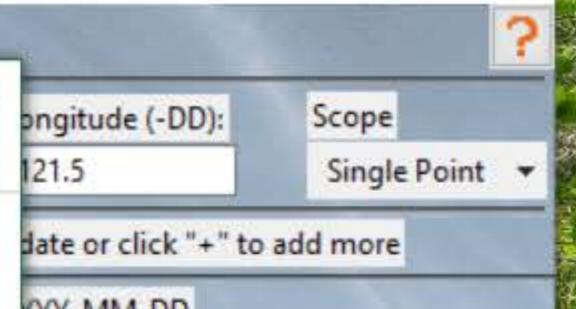
(38.5, -121.5) Batch Result.csv - Excel

	A	B	C	D	E	F	G	H
1	Latitude	Longitude	Date	PDSI Value	PDSI Class	Season	ARC Score	Antecedent Precip Condition
2	38.5	-121.5	5/15/1935	-0.32	Normal	Dry Season	18	Wetter than Normal
3	38.5	-121.5	2/29/1940	2.54	Moderate wetness	Wet Season	16	Wetter than Normal
4	38.5	-121.5	2/28/1941	2.84	Moderate wetness	Wet Season	18	Wetter than Normal
5	38.5	-121.5	12/7/1942	1.86	Mild wetness	Wet Season	14	Normal Conditions
6	38.5	-121.5	6/12/1943	0.39	Normal	Dry Season	14	Normal Conditions
7	38.5	-121.5	7/19/1944	1.08	Mild wetness	Dry Season	18	Wetter than Normal
8	38.5	-121.5	8/21/1945	1.3	Mild wetness	Dry Season	12	Normal Conditions
9	38.5	-121.5	3/15/1950	0.5	Incipient wetness	Wet Season	11	Normal Conditions
10	38.5	-121.5	6/16/1951	-0.65	Incipient drought	Dry Season	10	Normal Conditions
11	38.5	-121.5	7/4/1952	2.16	Moderate wetness	Dry Season	14	Normal Conditions
12	38.5	-121.5	1/1/1965	2.23	Moderate wetness	Wet Season	18	Wetter than Normal
13	38.5	-121.5	5/28/1971	0.8	Incipient wetness	Dry Season	13	Normal Conditions
14	38.5	-121.5	7/4/1973	-2.53	Moderate drought	Dry Season	9	Drier than Normal
15	38.5	-121.5	11/21/1978	-1.11	Mild drought	Wet Season	11	Normal Conditions
16	38.5	-121.5	12/2/1981	2.86	Moderate wetness	Wet Season	17	Wetter than Normal
17	38.5	-121.5	4/24/1984	-1.82	Mild drought	Dry Season	9	Drier than Normal
18	38.5	-121.5	9/13/1985	1.13	Mild wetness	Dry Season	15	Wetter than Normal
19	38.5	-121.5	5/18/1989	0.84	Incipient wetness	Dry Season	15	Wetter than Normal
20	38.5	-121.5	12/1/1998	-0.79	Incipient drought	Wet Season	12	Normal Conditions
21	38.5	-121.5	6/20/2020	-1.75	Mild drought (2020-05)	Dry Season	9	Drier than Normal
22								

(38.5, -121.5) Batch Result

READY

23 items



The Batch Result.csv contains the key values from each of the PDF outputs in tabular format. This format is especially useful for quickly sorting through a list of dates for which satellite or aerial imagery is available.

943 · 6 · 12
944 · 7 · 19
945 · 8 · 21
950 · 3 · 15
951 · 6 · 16
952 · 7 · 04
965 · 1 · 1
971 · 5 · 28
973 · 7 · 4
978 · 11 · 21
981 · 12 · 2
984 · 4 · 24
985 · 9 · 13
989 · 5 · 18
998 · 12 · 01



Antecedent
Precipitati...

Antecedent Precipitation Tool

File Home Share View Pin to Quick access Copy Paste Cut Paste Special Paste New Open Select

Clipboard Organize New Open Select

38.5, -121.5

Open - Select all Edit Select none History Invert selection

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

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

YYYY-MM-DD

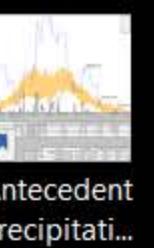
#	YYYY-MM-DD
1	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1942 · 12 · 7
5	1943 · 6 · 12
6	1944 · 7 · 19
7	1945 · 8 · 21
8	1950 · 3 · 15
9	1951 · 6 · 16
10	1952 · 7 · 04
11	1965 · 1 · 1
12	1971 · 5 · 28
13	1973 · 7 · 4
14	1978 · 11 · 21
15	1981 · 12 · 2
16	1984 · 4 · 24
17	1985 · 9 · 13
18	1989 · 5 · 18
19	1998 · 12 · 01
20	2020 · 06 · 20

Calculate Switch to Date Range Quit

Below the PDF and CSV outputs, we find the output folder, which the tool opens to ensure the user can see where their data was saved.

Open the "Station Data" folder.

The screenshot shows the Antecedent Precipitation Tool interface. At the top, there are two windows: one for file management and one for calculating precipitation dates. Below these is a file explorer window showing the contents of a folder named 'Outputs' for version 'v1_0_3' at coordinates '38.5, -121.5'. The folder contains several files: a 'Station Data' folder (highlighted with a red arrow), a 'Batch Result.csv' file, and multiple 'Batch Result.pdf' files corresponding to different dates from 1935 to 2020. A red box with the text 'Open the "Station Data" folder.' points to the 'Station Data' folder. The background of the interface features a photograph of a stream flowing through a forest.



The "Station Data" folder contains:

- The relevant records for each contributing weather station
- The "merged_stations.csv," which is the complete record.
- The another copy of the complete record after it was converted to the units used in figure and tables of the output PDF.

File Home Share View

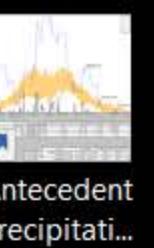
Pin to Quick access Copy Paste Cut Copy path Move to Copy to Delete Rename New item New folder New Open Select all Properties Easy access History Select

Clipboard Organize New Open Select

Search Station Data

#	Date (DD)	Longitude (-DD)	Scope
1	1935 · 5 · 15	-121.5	Single Point
2	1940 · 2 · 29		
3	1941 · 2 · 28		
4	1942 · 12 · 7		
5	1943 · 6 · 12		
6	1944 · 7 · 19		
7	1945 · 8 · 21		
8	1950 · 3 · 15		
9	1951 · 6 · 16		
10	1952 · 7 · 04		
11	1965 · 1 · 1		
12	1971 · 5 · 28		
13	1973 · 7 · 4		
14	1978 · 11 · 21		
15	1981 · 12 · 2		
16	1984 · 4 · 24		
17	1985 · 9 · 13		
18	1989 · 5 · 18		
19	1998 · 12 · 01		
20	2020 · 06 · 20		

Calculate Switch to Date Range Quit



The image shows a composite view of the Antecedent Precipitation Tool software. On the left, a large window displays a terminal-like interface with command-line output. The output includes a table of monthly precipitation values and season definitions, followed by messages about graph and table generation, file saving, and task completion times. A red box highlights the terminal window.

Antecedent Precipitation Tool

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\v1_0_3\38.5, -121.5\2020-06-20.pdf
Closing figure...

-----#
Opening Batch Results CSV in new process...
Opening finalPDF in new process...
Attempting to delete temporary files...
All tasks took 5 minutes and 57 seconds to complete
-----#
Ready for new input.
```

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	1935 · 5 · 15
2	1940 · 2 · 29
3	1941 · 2 · 28
4	1942 · 12 · 7
5	1943 · 6 · 12
13	1973 · 7 · 4
14	1978 · 11 · 21
15	1981 · 12 · 2
16	1984 · 4 · 24
17	1985 · 9 · 13
18	1989 · 5 · 18
19	1998 · 12 · 01
20	2020 · 06 · 20

Calculate Switch to Date Range Quit

A green arrow points from the top right towards the help icon in the software interface.

That's all there is to this walkthrough.

To learn how to sample even more dates at one time, look in the Help Menu under "How to generate a single-point analysis for many dates using a spreadsheet."