

## Troubleshooting GPS Data

### Introduction

GPS data can appear in a variety of formats (.txt, .csv, .gpx, .xls, .xlsx, .tab, etc.) and coordinate units resulting in ‘messy’ data that must be cleaned up before it can be used in ArcGIS. This document attempts to address some common issues encountered with GPS data.

If the data hasn’t been loaded from the GPS, follow the steps for getting waypoints from the GPS to GIS using DNRGPS utility. This is the optimal method for plotting GPS data.

If the data is already in .gpx format, run the conversion tool “GPX to Features” in ArcGIS.

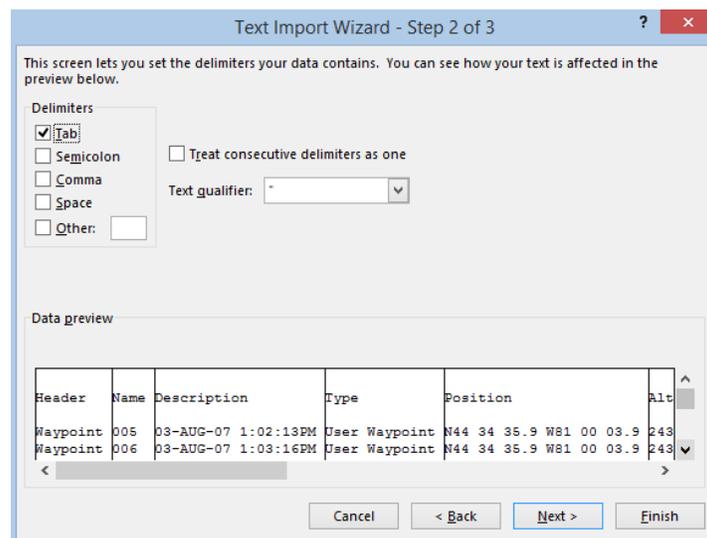
### GPS Data in Degrees, Minutes, Seconds

Ideally, latitude/longitude coordinate pairs are most useful in decimal degree format (hddd.dddd). However, some cases have data in degrees and decimal minutes or even degrees, minutes and decimal seconds. The data file (.txt or .csv) will be fixed using Microsoft Excel.

1. Run Excel.
2. Select File > Open. Navigate to the location of the text file (if necessary, change the file type to “Text Files” in order to see all files of this type).

#### Text Import Wizard

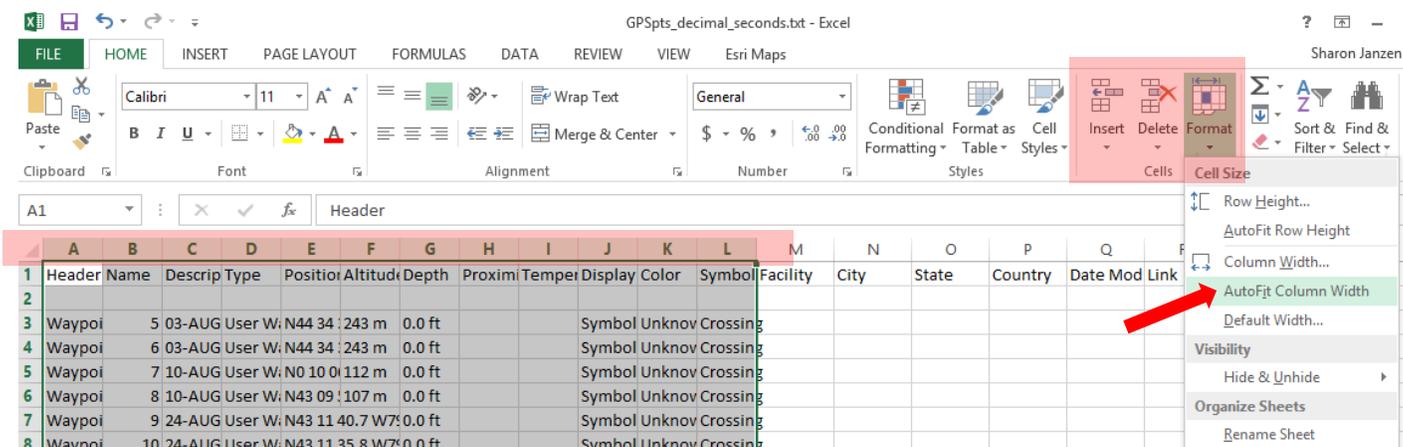
- Step 1:
  - Identify the data as delimited (tab or comma) or fixed width
  - Identify the ‘start import at row’
  - click Next
- Step 2:
  - Choose delimiter (preview indicates how your choice affects the data)
  - Click Next



- Step 3:
  - Set the data format for each column (this can also be done later, if necessary).
  - Click Finish.

The table appears squished.

- To expand columns, click and drag across all column headers (A through L) to select the affected data.
- From the HOME ribbon and CELLS > Format section, choose **AutoFit Column Width**.



In the above example, Lat/Long coordinates are found in column E under the name "Position". This format shows both latitude and longitude in a single column as degrees, minutes and decimal seconds. Unfortunately, this format is unacceptable for GIS. We will convert them to decimal degrees.

### Converting to Decimal Degrees

#### Remove unwanted columns

GPS data sometimes includes a lot of extra data not pertinent to your specific study.

- Identify columns and/or rows to delete and tidy up the table.
- When all changes are made, copy/paste the POSITION column so that it is the last populated column, if necessary.

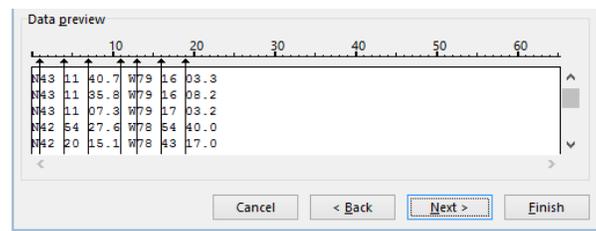
#### Splitting the Column

- Activate the DATA ribbon.
- Select the column containing the coordinate pairs.
- From Data Tools, select **Text to Columns**. The 3 step wizard will guide us to split this column such that we will be able to calculate decimal degrees.

Step 1: select Fixed Width. Click Next.

Step 2: Identify breaklines within the column. Each piece of the coordinates will need to have separate columns. Click Next.

Step 3: default data format is acceptable. Click Finish.



- The coordinate pairs have been parsed into 8 separate columns.
- Save your work in a new Excel workbook (.xlsx).

#### Calculating Latitude

- Enter a new column with the name "Latitude".
- Click the cell directly below and enter the following equation using corresponding cells

= Degrees + ((Minutes / 60) + (Seconds / 3600)) HIT ENTER

=D2+((E2/60)+(F2/3600))      RESULTS IN      43.19319

- Click the cell containing the equation and click/drag the black handle in the lower right down the entire column to apply the equation to the whole column.

### Calculating Longitude

- Click the first row cell of the first vacant column and enter the name "Latitude".
- Click the cell directly below and enter the following equation using corresponding cells

= -1\*(Degrees + ((Minutes / 60) + (Seconds/ 3600))) **HIT ENTER**

=-1\*(H2+((I2/60)+(J2/3600))) **RESULTS IN -79.2661111**

- Click the cell containing the equation and click/drag the black handle in the lower right down to apply the equation to the whole column.
- Save the Excel file.

### Deleting redundant columns

- At this point, the latitude and longitude columns are reliant on the 8 columns we created earlier. If we tried to delete the seemingly meaningless columns, we would lose the calculated values.
- To make the calculated values permanent, select the 2 columns, hit Ctrl-C on the keyboard or right-click and select Copy.
- Highlight two empty columns, right-click and from the paste options, choose the second option called "paste values".

ssi	tio	n					Latitude	Longitude	Latitude	Longitude
43	11	35.5	W	79	15	58	43.19319444	-79.26611111	43.19319444	-79.26611111
43	11	40.7	W	79	16	3.5	43.19463889	-79.26763889	43.19463889	-79.26763889
43	7	15.5	W	79	15	7.9	43.12097222	-79.25219444	43.12097222	-79.25219444
43	6	52.7	W	79	15	27.4	43.11463889	-79.25761111	43.11463889	-79.25761111
43	10	52.7	W	79	16	18.7	43.18130556	-79.27186111	43.18130556	-79.27186111
43	11	23.5	W	79	15	9.3	43.18986111	-79.25258333	43.18986111	-79.25258333
43	7	19.8	W	79	15	37.7	43.12216667	-79.26047222	43.12216667	-79.26047222
43	12	46.2	W	79	14	32.9	43.21283333	-79.24247222	43.21283333	-79.24247222
43	10	9	W	79	11	47.8	43.16916667	-79.19661111	43.16916667	-79.19661111

IT is now safe to highlight and delete the 8 parsed columns plus the first 2 calculated lat/long columns resulting in a tidy Excel table.

	A	B	C	D
1	Name	Description	Latitude	Longitude
2	GC10119	OH CANADA, EH?	43.19319444	-79.26611111
3	GC102QC	WEeping WILLOW CACHE	43.19463889	-79.26763889
4	GC11EPM	BROCK BASEMENT CACHE	43.12097222	-79.25219444
5	GC11EQ2	A TRIBUTE TO SCRATCH N WIN	43.11463889	-79.25761111
6	GC11N0K	GRANDPA'S CACHE	43.18130556	-79.27186111
7	GC11X9Y	THE 3 AMIGO'S CACHE	43.18986111	-79.25258333
8	GC12PQ0	OH GEOCACHE! WHERE MIGHT YOU B	43.12216667	-79.26047222
9	GC1312Y	CALM	43.21283333	-79.24247222

- Save the Excel file.
- Save a second copy in CSV format to be used in ArcGIS. If prompted with a warning, click continue.
- Close all Excel windows before proceeding.

If this section was useful, move on to the instructions for [Plotting X,Y Data in ArcGIS](#), found on page 7.

## GPS Data in UTM

Sometimes GPS data has coordinates described by UTM eastings and northings in a single column. Before these coordinates can be plotted, they must be parsed into separate fields.

Sample text file with UTM coordinates (this is a very messy file)

Header	Name	Description	Type	Position	Altitude	Depth	Proximity	Temperature	Display Mode	Color	Symbol	Facility
Waypoint	005	03-AUG-07 1:02:13PM	User	Waypoint	17 T 499914 4935922	243 m	0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	006	03-AUG-07 1:03:16PM	User	Waypoint	17 T 499915 4935922	243 m	0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	007	10-AUG-07 6:38:25PM	User	Waypoint	17 N 691735 18635	112 m	0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	008	10-AUG-07 6:54:21PM	User	Waypoint	17 T 640318 4780537	107 m	0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	009	24-AUG-07 5:43:36PM	User	Waypoint	17 T 640760 4783885		0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	010	24-AUG-07 5:45:23PM	User	Waypoint	17 T 640655 4783732		0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	024	25-SEP-07 9:42:03AM	User	Waypoint	17 T 639431 4782830	70.3 m	0.0 ft		Symbol & Name	Unknown	Crossing	
Waypoint	025	24-OCT-07 3:52:51PM	User	Waypoint	17 T 670520 4752678	162 m	0.0 ft		Symbol & Name	Unknown	Crossing	

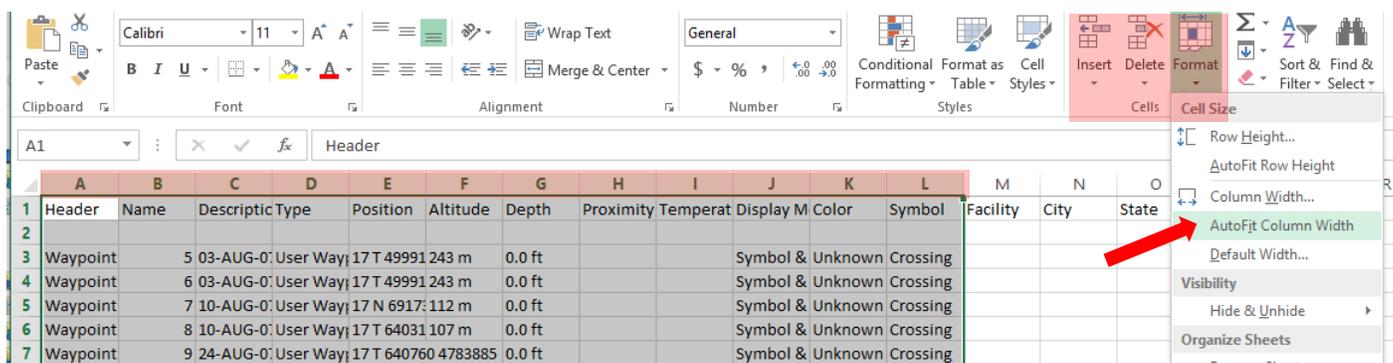
1. Run Excel.
2. Select File > Open. Navigate to the location of the text file (if necessary, change the file type to "Text Files" in order to see all files of this type).

### Text Import Wizard

- Step 1:
  - Identify the data as delimited (tab or comma) or fixed width
  - Identify the 'start import at row'
  - click Next
- Step 2:
  - Choose delimiter (preview indicates how your choice affects the data)
  - Click Next
- Step 3:
  - Set the data format for each column (this can also be done later, if necessary)
  - Click Finish.

The table appears squished.

3. To expand columns, click and drag across all column headers (A through L) to select the affected data.
4. From the HOME ribbon and CELLS > Format section, choose **AutoFit Column Width**.



In the above example, UTM coordinates are found in column E under the name "Position". This format shows eastings and northings in a single column. GIS requires they be in separate columns.

## Splitting the Column

1. Before splitting the column, it is a good idea to clean up the table by deleting redundant columns and rows.
2. Make sure the Position column has 3 blank columns to the right where parsed data will be saved.
3. Activate the DATA ribbon.
4. Select the column containing the UTM coordinates.
5. From Data Tools, select **Text to Columns**. The 3 step wizard will guide us to split this column.

Step 1: select Fixed Width. Click Next.

Step 2: Identify breaklines within the column. Each piece of the coordinates will need to have separate columns. Click Next.

Step 3: default data format is acceptable. Click Finish.

6. The coordinate pairs have been parsed into 4 separate columns. In the example below, columns G and H include eastings and northings, respectively. Change the name of these columns accordingly.

	A	B	C	D	E	F	G	H
1	Header	Name	Description	Type	Position			
2	Waypoint	GC10119	OH CANADA, EH?	User Waypoint		17 T	640885	4783727
3	Waypoint	GC102QC	WEeping WILLOW CACHE	User Waypoint		17 T	640757	4783886
4	Waypoint	GC11EPM	BROCK BASEMENT CACHE	User Waypoint		17 T	642183	4775732
5	Waypoint	GC11EQ2	A TRIBUTE TO SCRATCH N WIN	User Waypoint		17 T	641757	4775020
6	Waypoint	GC11N0K	GRANDPA'S CACHE	User Waypoint		17 T	640445	4782398
7	Waypoint	GC11X9Y	THE 3 AMIGO'S CACHE	User Waypoint		17 T	641991	4783380

7. Clean up the table by deleting unwanted columns and rows.
8. Save your work in a new Excel workbook (.xlsx). Then save as a CSV file (say YES to prompt) and close Excel.
9. Follow the steps for Plotting X,Y Data in ArcGIS.

	A	B	C	D
1	Name	Description	Easting	Northing
2	GC10119	OH CANADA, EH?	640885	4783727
3	GC102QC	WEeping WILLOW CACHE	640757	4783886
4	GC11EPM	BROCK BASEMENT CACHE	642183	4775732
5	GC11EQ2	A TRIBUTE TO SCRATCH N WIN	641757	4775020
6	GC11N0K	GRANDPA'S CACHE	640445	4782398
7	GC11X9Y	THE 3 AMIGO'S CACHE	641991	4783380

## Field data represented by 6 digit UTM references

Data gathered in the field using a 6 digit UTM grid reference system must be expanded to reflect more complete UTM coordinate pairs. In a 6 digit grid reference, the first 3 digits represent the easting and the last 3, the northing. The 6 digit reference must be split in two then expanded.

### Splitting the Column

1. Activate the DATA ribbon.
2. Select the column containing the 6-digit reference.
3. From Data Tools, select **Text to Columns**. The 3 step wizard will guide us to split this column.

Step 1: Select Fixed Width. Click Next.

Step 2: Identify breaklines within the column by clicking between the 3<sup>rd</sup> and 4<sup>th</sup> character.

Click Next.

Step 3: Default data format is acceptable. Click Finish.

4. The coordinate pairs have been parsed into 2 separate columns.
5. Save the document in Excel (.xlsx) format.

Before continuing, you must confirm the geographic area where the points were gathered. Refer to a 1:50k topographic map of the area to identify the expanded values of northings/eastings, as well as the UTM Grid Zone (Niagara is in 17N).

6. Enter a new column title for **Easting**. Click in the first cell and enter the following equation to expand the grid reference (assuming a Niagara location):

**=CONCATENATE("6",B2,"00") HIT ENTER**

RESULTS IN 661500

7. Click in the cell where you entered the equation and drag the black handle down to apply the function to the rest of the list.
8. Enter a new title for **Northing**. Click the first cell and enter the following equation to expand the grid reference:

**=CONCATENATE("47",C2,"00")**

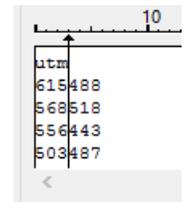
RESULTS IN 4748800

The table should look like this:

	A	B	C	D	E
	site	utm		Easting	Northing
	1	615	488	661500	4748800
	2	568	518	656800	4751800
	3	556	443	655600	4744300
	4	503	487	650300	4748700
	5	588	565	658800	4756500
	6	586	470	658600	4747000

9. Save the Excel file and save a second copy in CSV format.
10. Close Excel before continuing with steps to plot X,Y data in ArcGIS.

	A	B
1	site	utm
2	1	615488
3	2	568518
4	3	556443
5	4	503487
6	5	588565
7	6	586470



	A	B	C
	site	utm	
	1	615	488
	2	568	518
	3	556	443
	4	503	487
	5	588	565
	6	586	470

## Plotting X,Y Data in ArcGIS

It is simple to plot X,Y locations if the data table (ideally in CSV format) has two separate fields for coordinate pairs such as, latitude and longitude (decimal degrees) or UTM eastings and northings. The table may look similar to this:

	A	B	C	D
1	Name	Description	Latitude	Longitude
2	GC10119	OH CANADA, EH?	43.19319444	-79.26611111
3	GC102QC	WEeping WILLOW CACHE	43.19463889	-79.26763889
4	GC11EPM	BROCK BASEMENT CACHE	43.12097222	-79.25219444
5	GC11EQ2	A TRIBUTE TO SCRATCH N WIN	43.11463889	-79.25761111
6	GC11N0K	GRANDPA'S CACHE	43.18130556	-79.27186111
7	GC11X9Y	THE 3 AMIGO'S CACHE	43.18986111	-79.25258333

	A	B	C	D
1	Name	Description	Easting	Northing
2	GC10119	OH CANADA, EH?	640885	4783727
3	GC102QC	WEeping WILLOW CACHE	640757	4783886
4	GC11EPM	BROCK BASEMENT CACHE	642183	4775732
5	GC11EQ2	A TRIBUTE TO SCRATCH N WIN	641757	4775020
6	GC11N0K	GRANDPA'S CACHE	640445	4782398
7	GC11X9Y	THE 3 AMIGO'S CACHE	641991	4783380

1. Run ArcMap.
2. Click Add Data and navigate to the CSV file, select it and click Add. The table appears in the Table of Contents. NOTE that the file must be closed in all other applications or you will receive error messages.
3. Right-click the table and select **Display XY Data...**
4. In the Add XY Data dialog, specify the fields that contain the X and Y coordinates, with X corresponding to longitude (easting) values and Y corresponding to latitude (northing) values.

**\*\*TIP: the following table summarizes X, Y formats.\*\***

Latitude	43 degrees	UTM-Y	4,763,000 metres N
Longitude	-79 degrees	UTM-X	623,000 metres E

5. Under *Coordinate System of Input Coordinates*, click **Edit...**
6. Identify the spatial reference according to your data:

### **For Latitude/Longitude use:**

**Geographic Coordinate Systems > North America > NAD 1983**

### **For UTM Eastings/Northings in most of Southern Ontario use:**

**Projected Coordinate Systems > UTM > NAD 1983 > NAD 1983 UTM Zone 17N**

7. Click OK.
8. The *Display XY Data* dialogue box is now complete. Click OK.
9. A message box will appear stating that the table does not have an Object-ID field. This field will automatically be created in the next steps.
10. Click OK. The XY data is displayed as points on the map.
11. This point data file is called an "event" file. To make a permanent shape file, right-click on the point data layer and choose **Data > Export Data**.
12. Ensure the *Save as type:* is **shapefile** and the location is your student space. Click Save.
13. Accept the rest of the defaults and click OK.
14. When prompted to add the exported data to the map as a layer, click Yes.

The layer is now a permanent shape file including an Object-ID field meaning the data may be used in analysis.