Determining Correct Locations for Fuels Projects and Fires

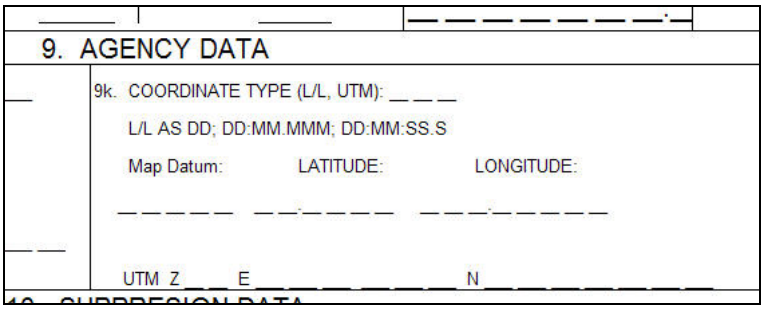
How to answer question 9k on a 1202 form:

Question 9 k has three parts:

1. Coordinate system: either L/L (latitude and longitude) or UTM (Universal Transverse Mercator) coordinates

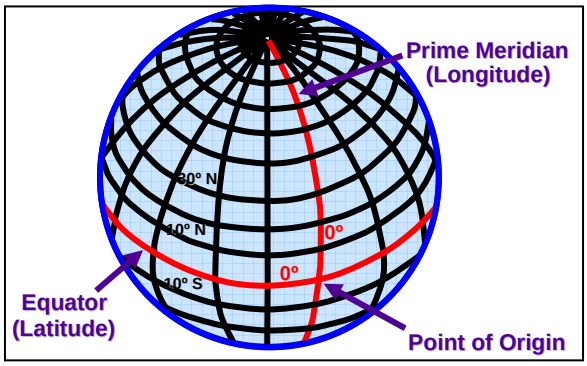
2. L/L coordinates: you must record the map datum*, in addition to the latitude and longitude in decimal degrees, degrees, decimal minutes or degrees, minutes, and seconds (circle lat/long format and enter coordinates).

3. UTM coordinates: must record the map datum*, you must record the UTM zone, in addition to the Easting and Northing coordinates.



L/L: What's Latitude and Longitude? What are the three the Latitude and Longitude formats? How do you convert between them? What are DD, DD:MM.MMM, and DD:MM:SS.S on the 1202 form?

Latitude always measures north and south, and longitude always measures east and west. Latitude lines run east and west and are parallel across the earth's surface so think of them as the rungs of a ladder (as in "ladder"-tude). Think of lines of longitude that stretch from the North Pole to the South Pole as "long."



*Note: Map Datum is determined from data source. USGS topographic map usually displays map datum in bottom corner. Web-based tools let the user choose datum. GPS set-up menu lets the user choose datum. In ArcView, calculated and displayed coordinates are the same datum as the base GIS data in the view.

There are three formats for latitude and longitude: The DI-1202 fire report (and SACS fire occurrence) lets us choose any of the three formats of L/L. NFPORS requires L/L in Decimal Degrees (DD).
How to convert to decimal degrees from degrees, minutes and seconds?
See jeEep.com, great for conversion. OR follow these steps…

1. To convert from degrees, minutes, and seconds to degrees and decimal minutes

- Divide the number of seconds by 60 and add that value to the number of minutes – do not change the number of whole degrees
- Example
    - To convert 40º 05' 18" N to degrees and decimal minutes do the following
        - We are converting the seconds to a decimal part of a minute
        - Divide the seconds (18) by the number of seconds in a minute (60) this will give the decimal part of a minute that 18 seconds represents
        - 18/60 = 0.3
        - Add the decimal minutes to the minutes and "discard" the seconds
        - 05 + 0.3 = 5.3
        - So the answer is 40º 05.3' N

2. To convert from degrees and decimal minutes to decimal degrees

- Divide the number of minutes by 60 and add that value to the number of degrees – do not change the number of whole degrees
- Example
    - To convert 40º 05.3' N to decimal degrees do the following
        - We are converting the minutes to a decimal part of a degree
        - Divide the minutes (5.3) by the number of minutes in a degree (60) this will give the decimal part of a degree that 5.3 minutes represents
        - 5.3/60 = 0.08833
        - Add the decimal degrees to the degrees and discard the minutes
        - 40 + 0.08833 = 40.08833
        - So the answer is 40.08833º

NOTE: To convert from degrees minutes seconds to decimal degrees do the task in two steps as shown above, first go to degrees and decimal minutes, then convert to decimal degrees

What about the reverse? Reverse the steps and the math…

1. To convert from decimal degrees to degrees and decimal minutes

- Multiply the decimal part (the numbers to the right of the decimal point) times 60, that will give the number of minutes and add that value to the whole degrees – do not change the number of whole degrees
- Example
    - To convert from 40.08833º N to degrees and decimal minutes do the following

- We are converting from decimal degrees to minutes
- Multiply the decimal part (0.08833) times the number of minutes in a degree (60) and replace the decimal degrees with the minutes
- 0.08833 x 60 = 5.3
- So the answer is 40º 05.3' N

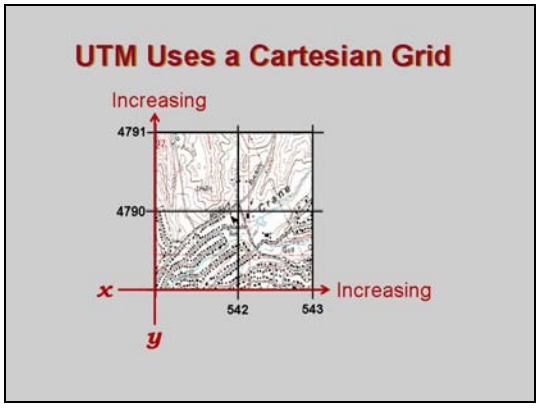
2. To convert from degrees and decimal minutes to degrees minutes seconds

- Multiply the decimal part of the minutes(the number to the right of the decimal) times 60, that will give the number of seconds and add that value to the whole minutes
- Example
  - To convert from 40º 05.3' N to degrees minutes seconds do the following
  - We are converting the decimal minutes to seconds
  - Multiply the decimal part (0.3) times the number of seconds in a minute (60) and replace the decimal minutes with seconds
  - 0.3 x 60 = 18
  - So the answer is 40º 05' 18" N

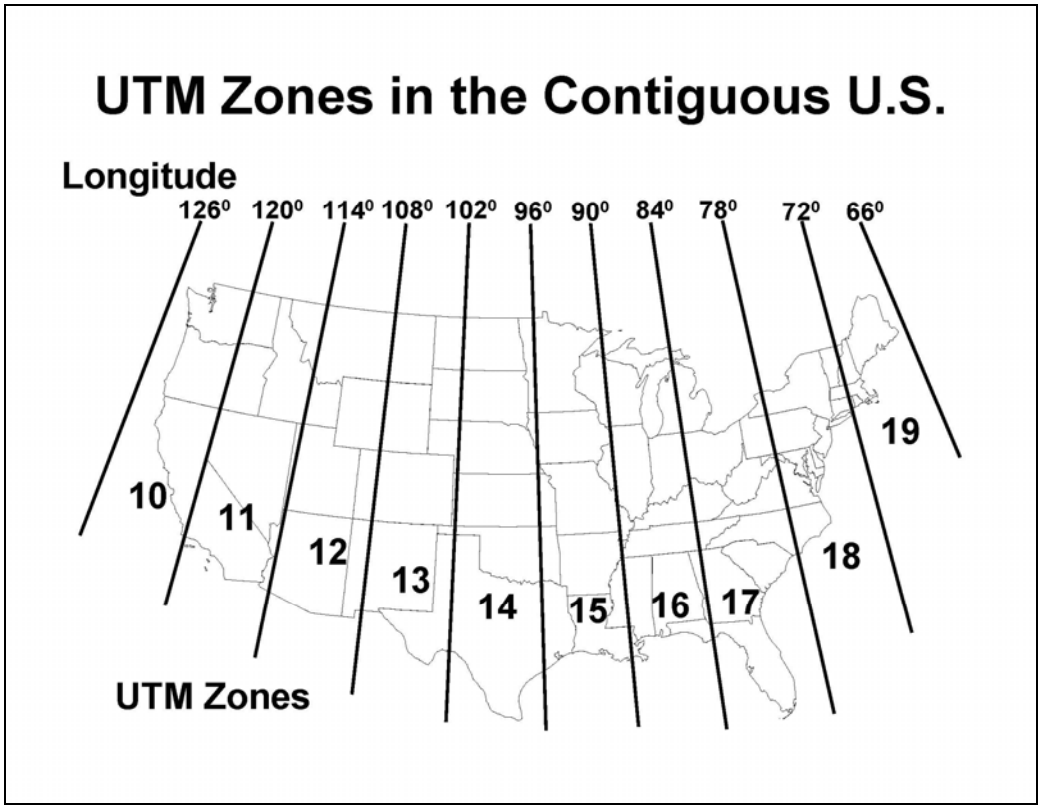
NOTE: To convert from decimal degrees to degrees minutes seconds do the task in two steps as shown above, first go to degrees and decimal minutes, then convert to degrees minutes seconds

UTM: What is UTM? What UTM zone are you in? What are Eastings and Northings?

Universal Transverse Mercator (UTM) is a rectangular (planar) coordinate system based on the latitude and longitude (geographic) coordinate system. Eastings are akin to lines of latitude (X axis), while Northings are akin to lines of longitude (Y axis) but are a grid system made up of perfectly shaped squares. Each square has a starting point (x,y). Coordinates increase along the x-axis as they move right (east) and along the y-axis as they move up (north). E/N are measured in meters, not decimal degrees.



The UTM coordinate system divides the earth into 60 Zones to project in each zone and minimize distortion. For Easting and Northing to be meaningful, you must know what zone you are in.



How can I report location with good coordinates?

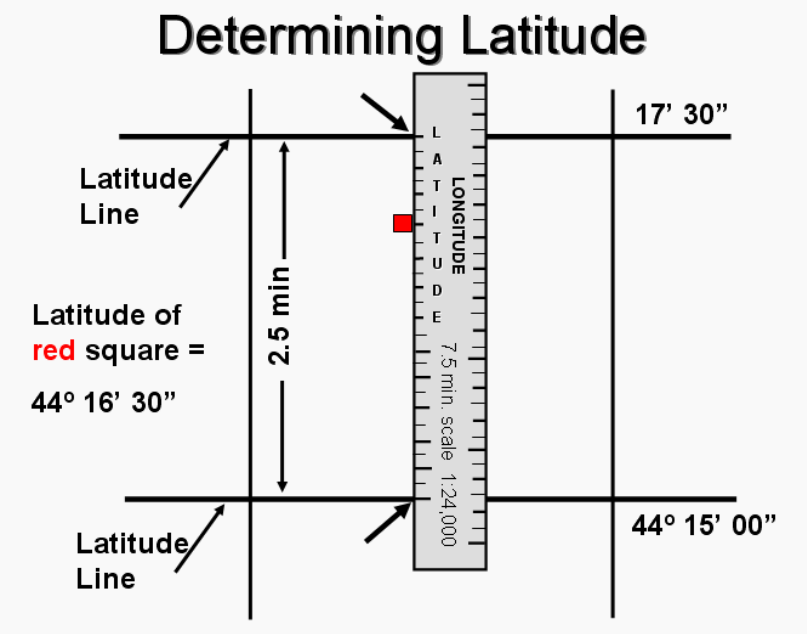
1. **Reading a paper map with the proper tool (ruler)**
2. **Using the internet (www.topozone.com)**
3. **Using a GPS receiver**
4. **Using ArcView GIS 3.3**
5. **Using ArcMap 8.3 (see your GIS Specialist)**

Reading a paper map

In order to determine the locational coordinates for any point you must determine: 1. the latitude, and 2. the longitude or 1. northing, and 2. easting.

The following exercises will detail how to obtain these coordinates for a *1:24,000 scale map* using a *Quad Map Tool ruler*.

Determining Latitude



Step 1. Locate and record the two latitude lines above and below the point you want to plot.

Above the point: _____ ° _____ ' _____ "
Below the point: _____ ° _____ ' _____ "

In the example above these lines are identified as:
Above the point: 44° 17' 30"
Below the point: 44° 15' 00"

Step 2: Position the Quad Map Tool ruler next to the point to be plotted, making sure to line up the top and bottom tick marks on the ruler with the lines of latitude as shown by the arrows pointing at the ruler. The ruler may have to rotated slightly to get the ruler to line up precisely with the latitude lines.

Step 3: Once the ruler is in place as shown in the example, count the tick marks from the lower latitude line upward until you reach the one closest to the point. Depending on the

ruler being used, the ruler tick marks may be in seconds, or tenths of a minute. Remember, there are 60 seconds in a minute, and 60 minutes in a degree.

Record the amount measured on the ruler.
Amount measured: _____ º _____ ’ _____ ”

In the example on the previous page, the number of tick marks counted equals:
Amount measured: 0º 1’ 30”

Step 4: Add the amount measured in step 3 to the location of the lower latitude line in step 2.

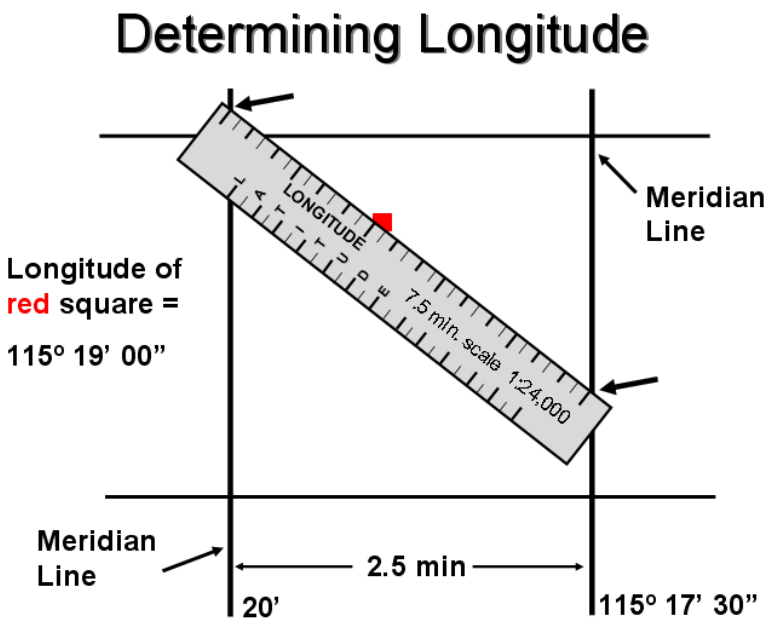
Below the point: _____ º _____ ’ _____ ”
Amount measured: _____ º _____ ’ _____ ”

Latitude of point: _____ º _____ ’ _____ ”

In the example above:
Below the point: 44º 15’ 00”
Amount measured: 0º 1’ 30”

Latitude of point: 44º 16’ 30”

Determining Longitude

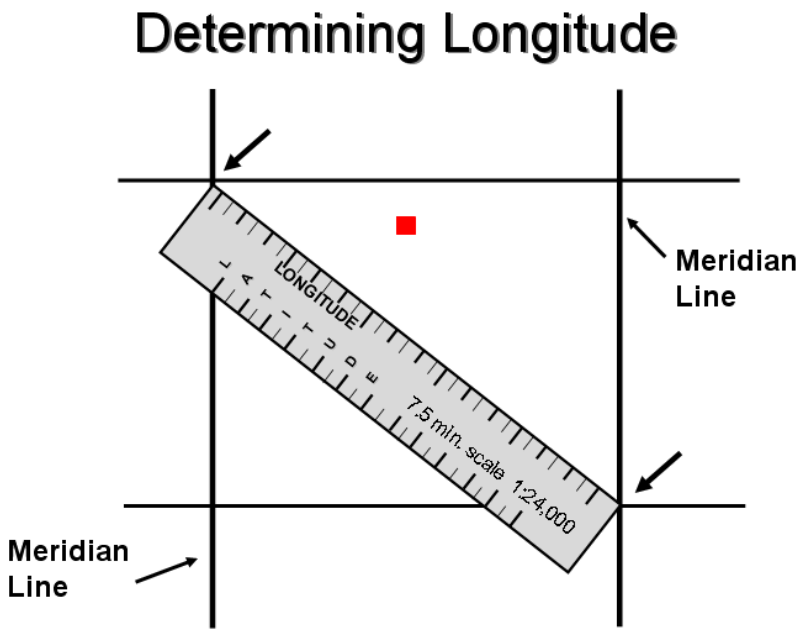


Step 1. Locate and record the two meridian lines left and right of the point you want to plot.

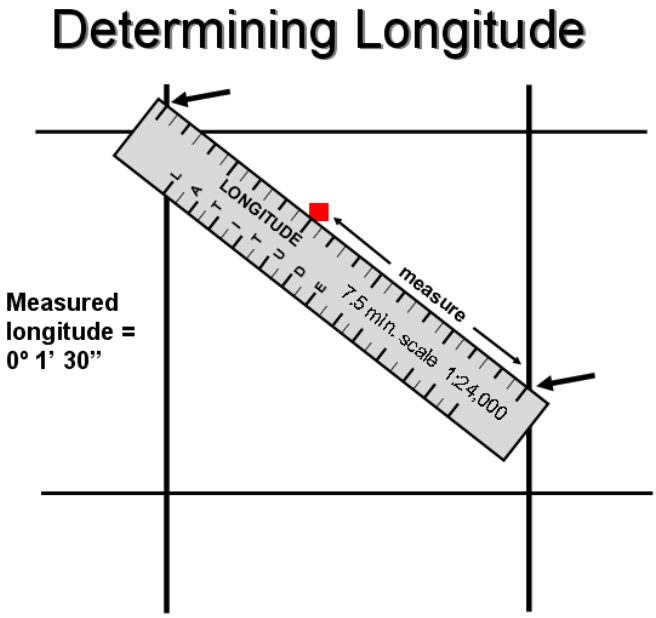
Left of the point: _____ º _____ ’ _____ ”
Right of the point: _____ º _____ ’ _____ ”

In the example on the previous page these lines are identified as:
Left of the point: 115º 20' 00"
Right of the point: 115º 17' 30"

Step 2. Place the ruler diagonally on the map so that the tick marks on the ruler line up with the two meridians on either side of the point being plotted. As sown the below, when the ruler is properly placed it connects the two meridians along the diagonal.



Then slide the ruler up or down until it is adjacent to the point to be plotted.



Step 3. Count and record the number of tick marks from the right meridian to the point (be careful to count from right to left, or east to west). Remember, there are 60 seconds in a minute, and 60 minutes in a degree.

Record the amount measured on the ruler.
Amount measured: _____º _____’ _____”

In the example above, the number of tick marks counted equals:
Amount measured: 0º 1’ 30”

Step 4: Add the amount measured in step 3 to the location of the right meridian line in step 2.

Right of the point: _____º _____’ _____”
Amount measured: _____º _____’ _____”

Longitude of point: _____º _____’ _____”

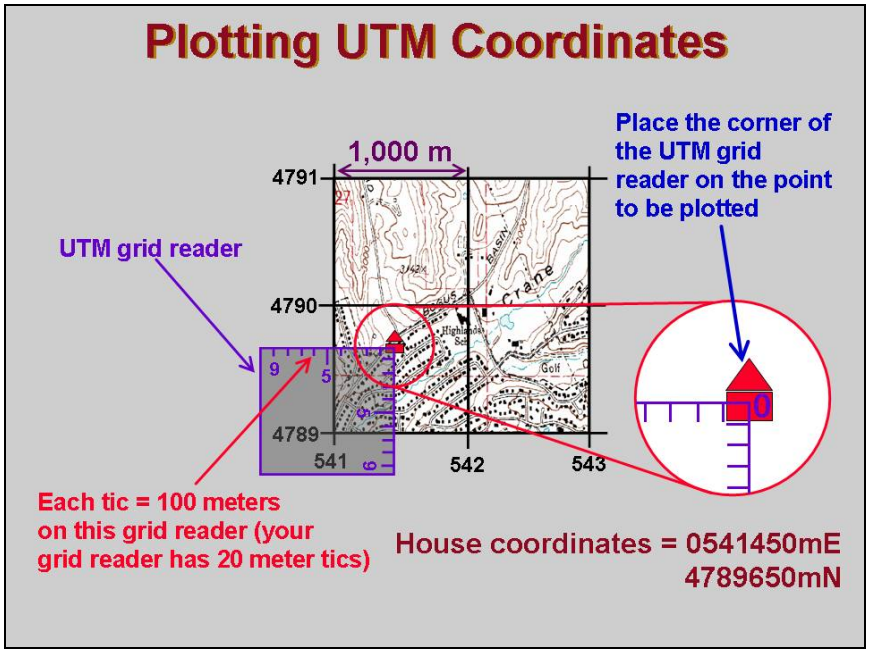
In the example above:
Right of the point: 115º 17’ 30”
Amount measured: 0º 1’ 30”

Longitude of point: 115º 19’ 00”

The complete location of the point expressed in both latitude and longitude is:
Latitude: N 44º 16’ 30”
Longitude: W 115º 19’ 00”

It is important to note that all locations in the United States of America are north of the Equator (north latitude), and west of the Prime Meridian (west longitude).

Determining UTM Coordinates (Easting and Northing) From a Map



Place the UTM grid reader so that the "0" corner mark is over the point you want to determine the coordinates of. Read the easting value from the point where the grid overlaps the first UTM grid line to the west (left) of the point being plotted. Add the numeric value derived from the grid reader to the three digit easting value for that grid line printed on the map. In the example above, the first three digits for the easting value for the house are found on the map for the grid line identified as "541." The gird reader in the example shows that the house is 450 meters east of the first grid line to the left of the house. Append (don't add the two together) 450 to the end of 541 to establish the easting coordinate for the house: 541450E.

Do the same for the northing coordinate, using the UTM grid line found just below the point being plotted. In the example that grid line is identified as "4789." The grid reader shows that the house is about 650 meters to the north of grid line 4789. Put the two numbers together to get 4789650N. Add the zone number found in the map legend and the complete coordinates for house are: 541450E 4789650N.

Using the Internet

TopoZone is an excellent internet tool that can help you to quickly find the coordinates of a fire in both Lat/Long and UTM: http://www.topozone.com

Step 1: Enter a place name (either park or nearby city name or physical feature), and choose the state from the drop down list. Click on the search button to get a list of available maps.

Step 2: As pictured below, a list of maps that contain the park/city/feature name is produced. Choose a map from the list that most closely matches the area you are searching for. If Topozone.com can not find the place you search for, repeat the search with another name.

Place	County	State	Type	Elevation*	USGS Quad	Lat	Lon
Los Alamos	Los Alamos	NM	town/city	7320 feet	Guaje Mountain	35.888ºN	106.306ºW
Los Alamos	San Miguel	NM	town/city	6737 feet	Las Vegas NW	35.732ºN	105.151ºW

* Elevation values are often subject to error. If in doubt, check the actual elevation on the map.

Before you continue with locating a fire, take a moment to orient yourself with the Topozone.com interface.

Notice that there are several viewing options on bar at the side of the page:

1. Data

Topozone.com contains three data sets with different levels of detail for each.

1:24K: high detail, includes individual buildings and all streets
1:100K moderate detail
1:250K low detail, includes major streets and physical features

2. Map Size

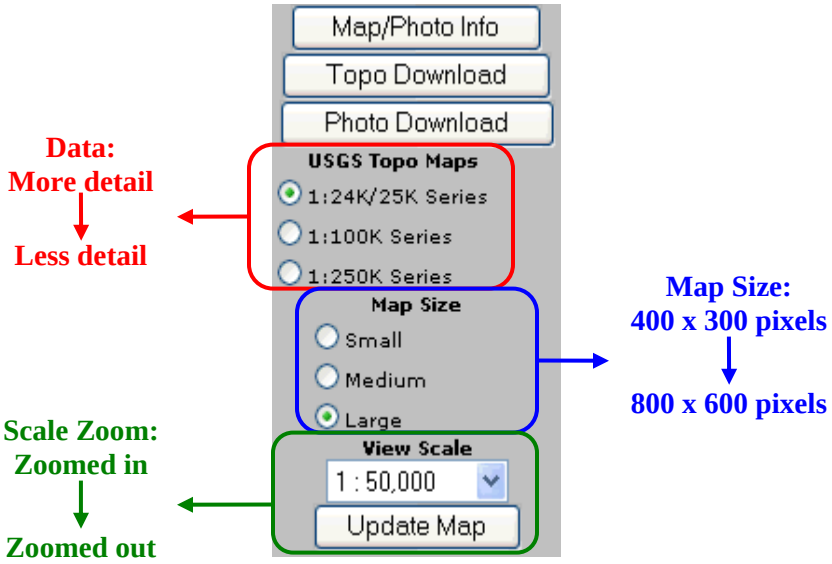
Topozone.com contains maps in three sizes; large is recommended for locating fires.

Small: 400 by 300 pixels
Medium
Large: 800 by 600 pixels

3. Scale Zoom

Topozone.com allows you to zoom into a map at 8 different scales. It is helpful to choose a zoom level that is *larger than* the topo map series scale (e.g. a 1:24K map series should be viewed at 1:50,000 view scale).

1:10,000	1:100,000	1:500,000
1:24,000	1:200,000	1:1,000,000
1:50,000	1:250,000	

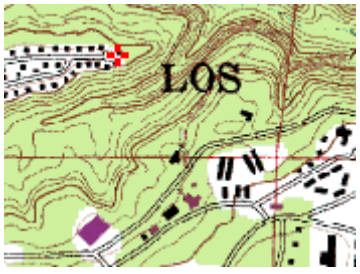


Remember: After you change your map view you must click on the *update map* button to change the map displayed on screen.

There are also two important interactive features on the map:

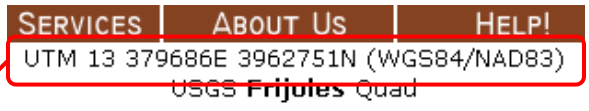
1. Pan: You can easily *pan* around the map by clicking on the bright green arrow buttons on the map border.

2. Re-center: The center of the map is denoted by a red crosshair, as shown below. Clicking on the map will *re-center* it to the location where you clicked.



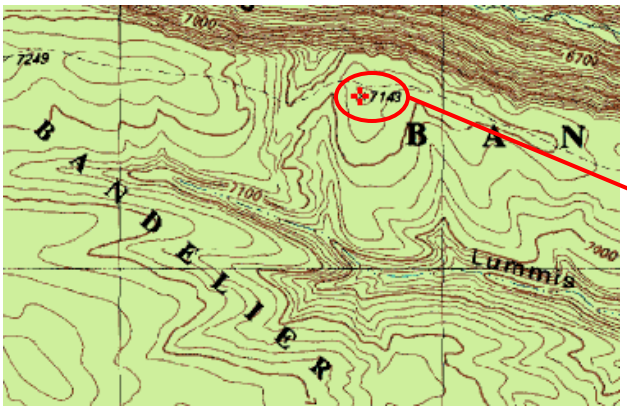
Step 3. Use the interface tools described above (map size/zoom/pan/zoom) to find the location of a fire. Keep in mind that you may need to pan and zoom out several times in order to obtain your bearings within the region surrounding the park.

Step 4. Once you have found the location of a fire on the map, click to make the location of the fire the center of the map. You can then find the coordinates for the center of the map (the fire location) at the top of the webpage.



Map center coordinates

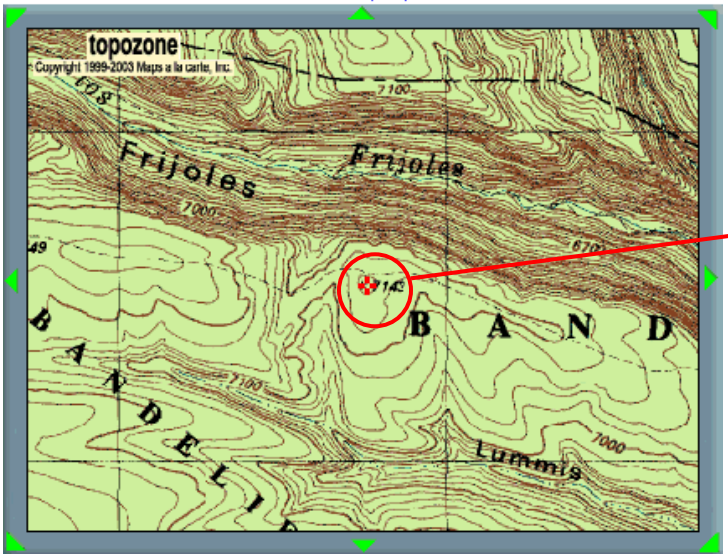
Every time you re-center the map by clicking on the display new coordinates are listed at the top of the page. This easy-to-use tool makes Topozone.com ideal for locating fires!



UTM Coordinates for the mountain top:

Zone 13
379,686 meters E
39,622,751 meters N
NAD ‘83

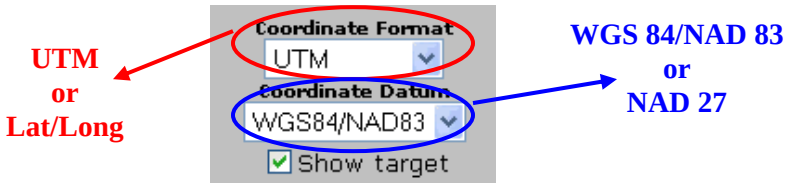
35° 48' 05"N, 106° 19' 51"W (NAD27)
USGS **Frijoles** Quad
View *TopoZone Pro* aerial photos, shaded relief, street maps, interactive coordinate display, and elevation data



Lat/Long Coordinates for the mountain top:

35º 48’ 05” N
106º 19’ 51” W
NAD ‘27

You can easily change the change the coordinate system and datum that is used to describe the location of your fire by using the tool shown below:

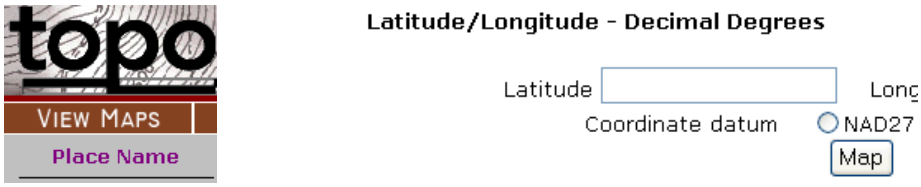


Try it: Find the locational coordinates in Lat/Long (DMS, NAD27) for Mount Rainier in Washington.

Answer: 46º 51’ 10” N Latitude
121º 45’ 31” W Longitude

Not only is Topozone.com an ideal tool for finding the coordinates of a fire, but it is also a great tool for validating locations.

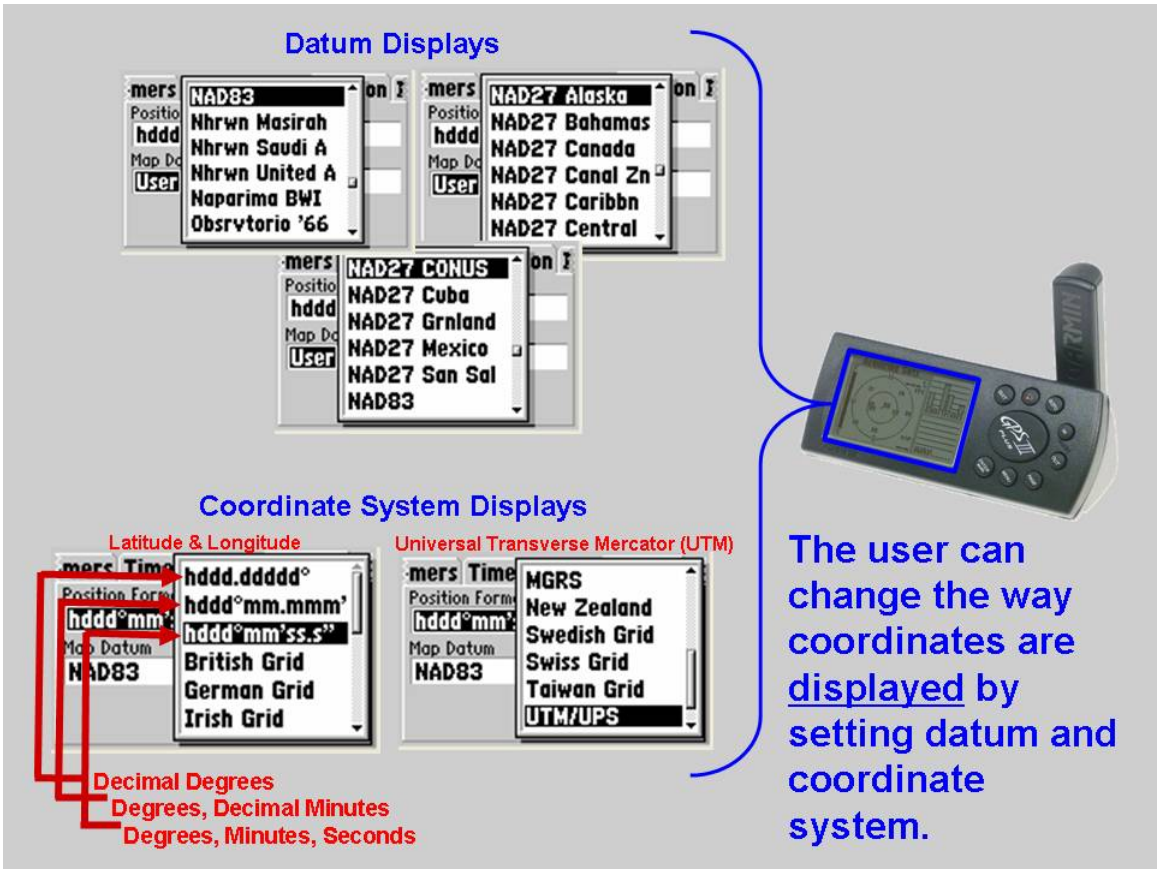
If a fellow firefighter has given you coordinates for a location of a fire you can quickly see where the fire burned by using Topozone.com. Simply click o the *View Maps* button on the toolbar and enter the coordinates into the correct form to validate the location.



Try it: Enter the following locational coordinates to validate the fire location:
44º 27’ 07” N Latitude, 110º 08’ 32” W Longitude, NAD 27.

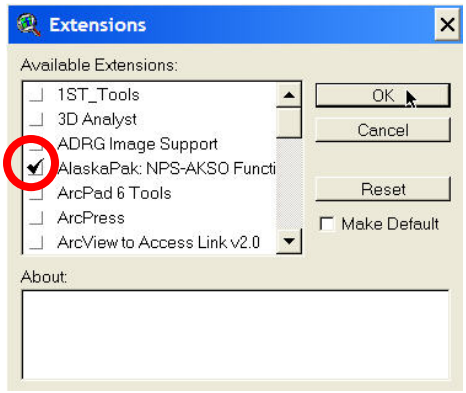
Answer: Top Notch Peak, location of the Arthur Fire in Yellowstone National Park, July 29, 2001

Using a GPS receiver

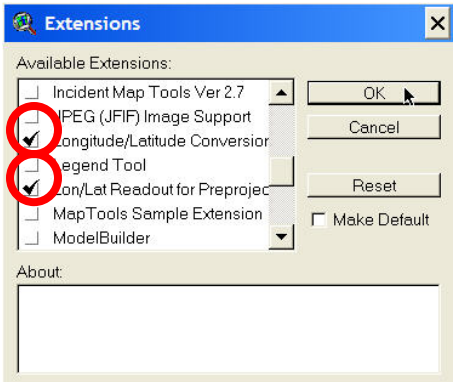


Using ArcView GIS 3.3

AlaskaPak Extension

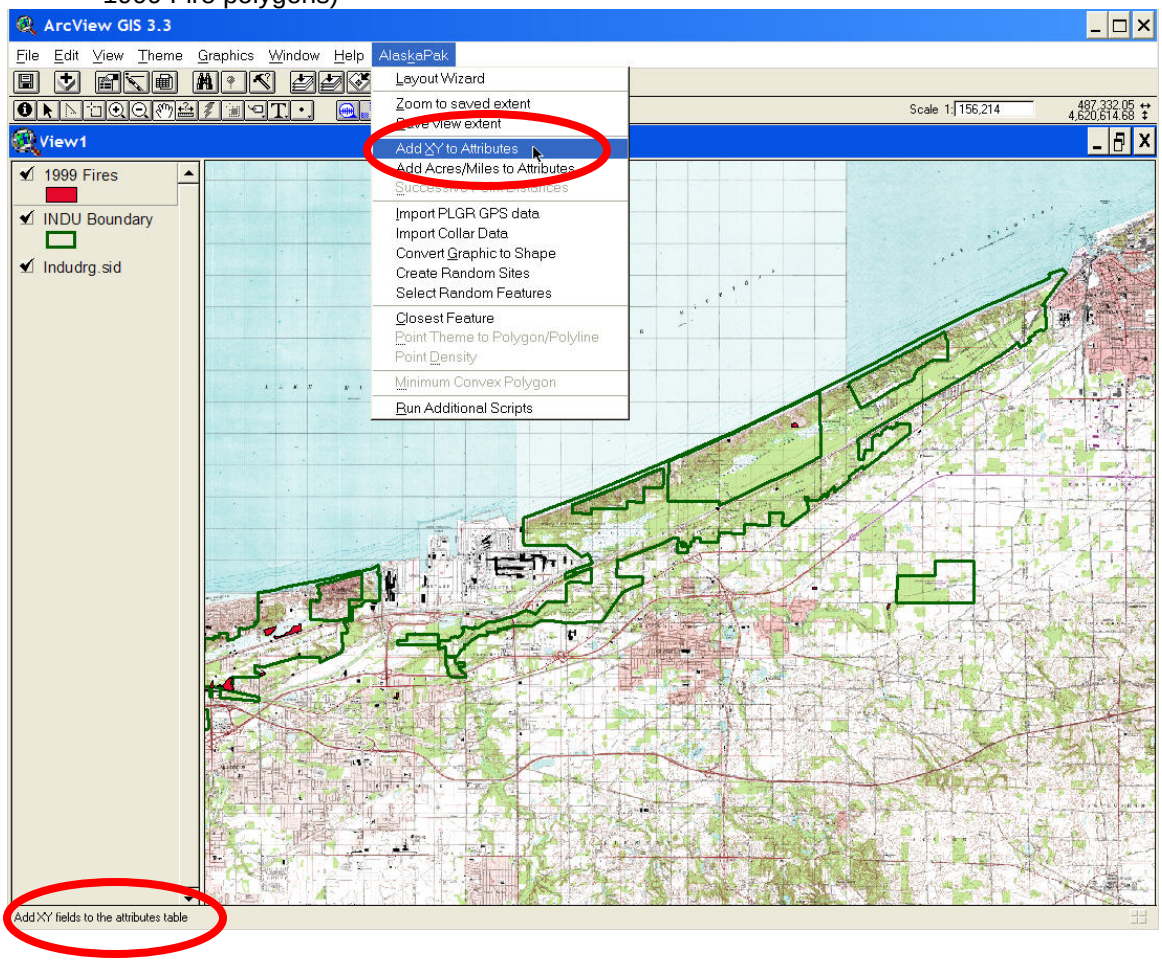


Long/Lat Extensions: Conversion or Readout



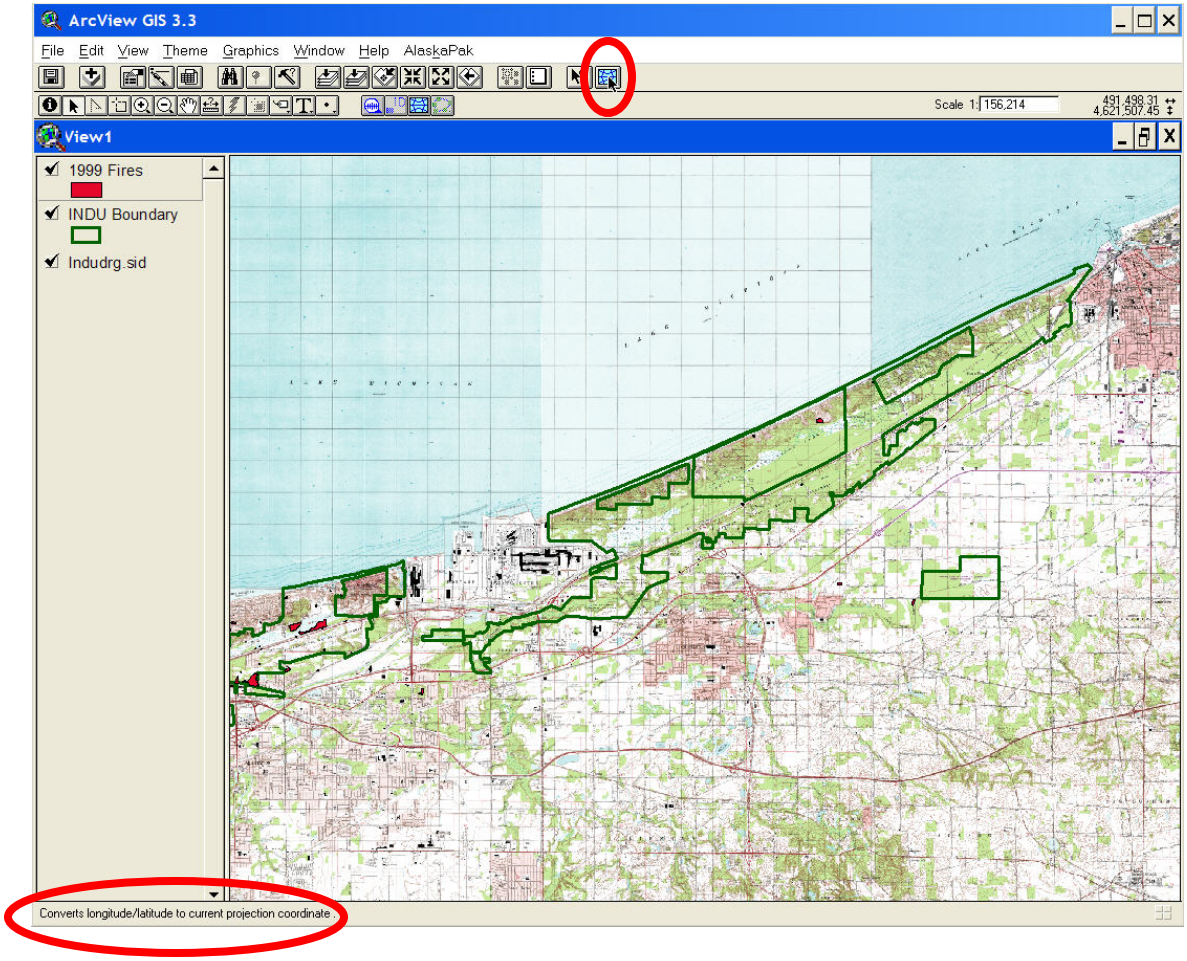
AlaskaPak (aksopack.avx): Add XY to Attributes

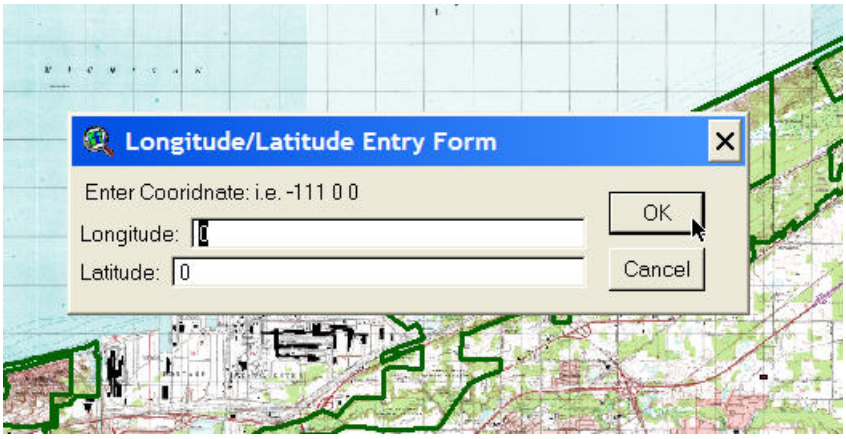
- Adds UTM Easting and Northing Coordinates to Attribute table for Active Theme (e.g. 1999 Fire polygons)



Longitude/Latitude Conversion Extension (latlong.avx):

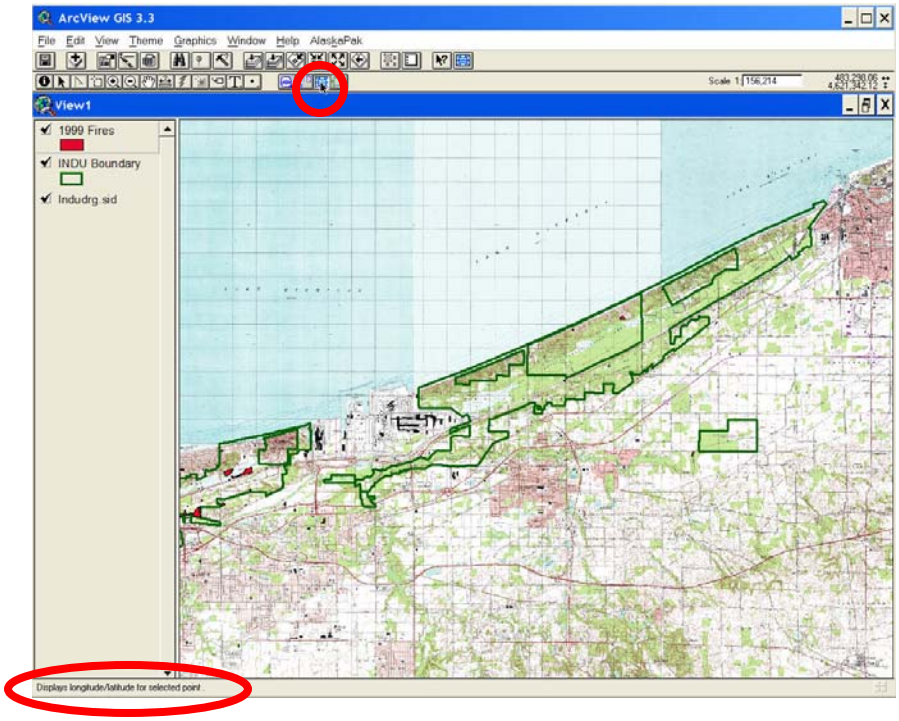
- Top row button
- Converts longitude and latitude to a graphic point on your map
- Enter longitude and latitude as degrees, minutes, and second

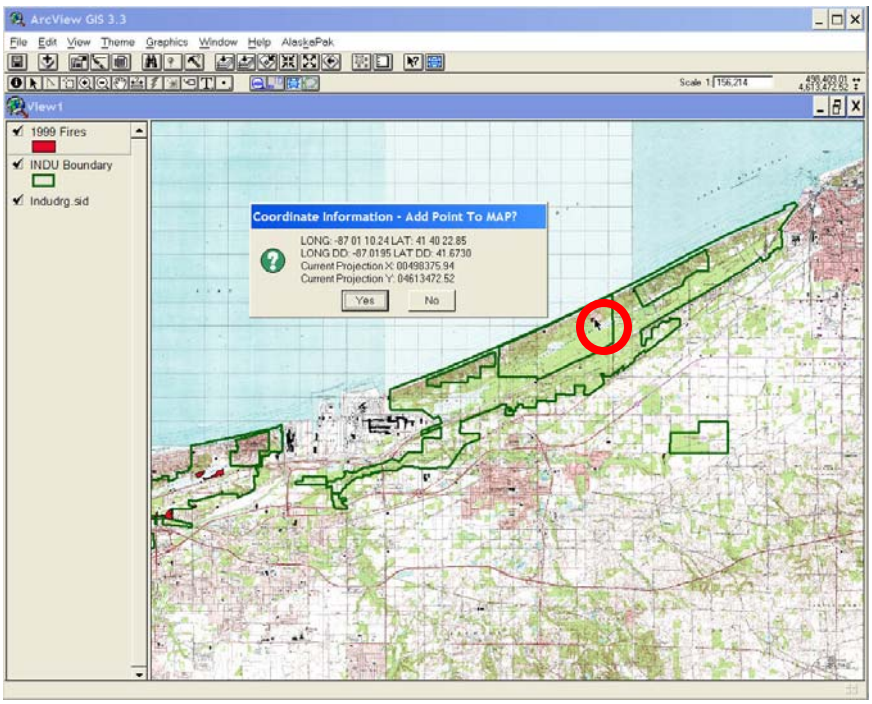




Longitude/Latitude Conversion Extension (lonlat_display_PreProjected.avx):

- Lower row button
- Displays 3 types of coordinate information for a point you click on your map
  - Longitude & Latitude in Degrees, Minutes, Seconds
  - Longitude & Latitude in Decimal Degrees
  - UTM Easting (X) & Northing (Y)
- Option to create a graphic on map with label





Lon/Lat Readout for Preprojected Data Extension:

- Click on XY button
- Displays longitude and latitude for projected data (i.e.UTM)
- Cursor scroll displays ALL longitude and latitude types at bottom of window
    - Decimal Degrees
    - Degrees, Decimal Minutes
    - Degrees, Minutes, Seconds