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- Brief presenter biography (25 words or less)

Emmor Nile has been the GIS Coordinator for the Oregon Department of Forestry since 1995. Emmor is a certified GIS Professional, and holds an Incident Command System (ICS) qualification as a GIS Specialist (GISS). He is also the chair of the Geospatial Training Advisory Group (GTAG), a National Wildfire Coordinating Group subcommittee that provides geospatial training to support fire incidents.

- Abstract (150 words or less)

The primary concern for Incident Management Teams (IMT) is that of firefighter safety. The standard for aircraft communication of location is degrees and decimal minutes of latitude and longitude. In the 1990's the Federal Geographic Data Committee (FGDC) adopted a standard for the US National Grid (USNG). The push behind this effort was to standardize the map based coordinates used on an incident to enable communication about locations. This standard is not widely known, and even less often implemented. Since the end of Selective Availability (SA) for GPS satellites the use of civilian GPS receivers has grown exponentially. The practical side of using latitude and longitude is that the centuries of describing a location in these terms is that the average person does not need special training to use lat/long coordinates. There is not enough time or money to train firefighters and volunteers in the use of USNG, new firefighters are able to effectively read maps and GPS receivers and communicate their location to other individuals. For these and other reasons the geographic location standard for the wildfire community is to follow the aviation community and use latitude and longitude.

In the 1930's firefighter communication took a giant leap forward with the implementation of radio communication. Today radios continue to enable forces on the ground and in the air to communicate key information, one of the most important being location. Whenever a "where" question comes up a Geographic Information System (GIS) is the best way to manage that information. The geographic information may be imbedded in a portable device such as a PDA or GPS receiver, printed on a hardcopy map, or in a GIS application on a computer.

Increasingly position communication will take place via wireless signal, and unlike most Automated Vehicle Location (AVL) in use today, all resources on an incident with a device will be positionally aware of all other resources rather than just dispatch or incident command. Until these portable devices and applications are implemented resources will need to communication location information via verbal or text means. The challenge for firefighting resource unfamiliar with the local area is to describe a specific spot on the ground. The simplest tool for this need has been employed by cartographers for years in the form of a "BINGO grid", that is, rows and columns identified by letters and numbers to cross reference B7, G15 and so on. While this system is intuitive, easy to use, requires no training it is only suitable in localized areas due to cell values repeating and the fact that the earth is a spheroid and Cartesian coordinates to not work over large areas.

There are numerous systems that have been developed to identify unique locations on our planet. The coordinate system employed to track satellites is that of the geocentric X, Y, & Z from the center of the earth. This system works very well for machine communication, however, humans don't readily understand these values and the number of digits is large which makes communication a problem.

The most universal earth measurement system is latitude and longitude. Latitude is determined by the globe itself, starting at the equator and ending at the poles. By convention the prime meridian of longitude is based in Greenwich England which puts North America in the negative X quadrant. Latitude/Longitude is commonly expressed in three formats; decimal degrees (DD), degrees and decimal minutes (DM), and degrees minutes and seconds (DMS).

The problems associates with Latitude/Longitude usage stem from the large number of formats which can be employed to describe a system that divides a circle into 360 parts (degrees), each degree into 60 minutes, and each minute into 60 seconds. While ocean going navigators have always understood this system with the removal of geography from core education courses in the US in the 1930's the general population had very little understanding of geographic coordinates of Latitude/Longitude. The most common misunderstanding involved treating DMS as decimal values, or vice versa.

In the late 1990's a group of retired military individuals renamed the Military Grid Reference System (MGRS) as the US National Grid (USNG) and convinced the Federal Geographic Data Committee (FGDC) to approve this as a standard for coordinates in the United States.

The MGRS is based on the UTM coordinates substituting letters for the zone numbers and major block coordinates. Higher resolution on the ground is achieved by adding the meter Cartesian values for the local UTM zone, to create an identifier like this:

11SMS8443418544 (32° 42.272', -117° 9.965').

There are several significant issues with the USNG that make it difficult for the average citizen to understand. Because the earth is a spheroid a regular grid which works fine on a flat surface has irregular truncated or triangular cells at the edges of the grid zones. There are 18 of these seams in the United States and they fall in 42 states and 84 urban areas, including Atlanta, St Louis, New Orleans, and Memphis. Since the UTM zones all converge at the poles the northern latitudes have numerous seams. The method of mixing cells and X and Y coordinate values into a single USNG value is not intuitive or readily obvious to the casual user. Because of these issues it is imperative that users of this system be extensively trained in the use of this system.

This system is well suited for military use due to the top down orientation of chain of command and the extensive training that the military conducts to ensure that all forces are communicating in the same way.

In 2000 "Selective Availability" (SA) of the GPS signal was turned off which led to a revolution in the way that individuals are able to navigate autonomously. The number of GPS enabled consumer devices has grown exponentially with few downturns. Today, virtually every hunter, fisherman, and outdoor sports enthusiast use GPS receivers to navigate to and from a given location. Geocaching is an outdoor activity that has increased the geographic literacy of the public. Geocaching is an outdoor game played worldwide using GPS receivers to navigate to a specific Latitude/Longitude coordinate location where a 'cache' is hidden.

Because of this proliferation of navigation devices the firefighters entering the workforce today have a much greater understanding and familiarity with Latitude/Longitude. The generation of wildland firefighting individuals that entered the workforce in the 1980's and 1990's has educated themselves with Latitude/Longitude and are now comfortable sharing "GPS locations", which for virtually every GPS user is Latitude/Longitude. With the exception of efforts in isolated places common use of USNG has not taken place, this is exemplified by entering USNG values into Google maps, the returned answer is "We could not understand the location …..".

The amount of training required to ensure that a new firefighter is prepared to safely conduct their job is significant. As budgets get tighter agencies and contractors are looking for ways to maximize their training dollars. Because this generation of younger firefighters is experienced with GPS and Latitude/Longitude coordinates training of this material can be minimal with the remaining training focused on other critical safety issues.

If wildland firefighting were organized like the military the USNG might be a practical means of working. However, wildland firefighting is a cooperative effort between numerous Federal

departments and agencies, multiple agencies within each state, local and tribal agencies, contractors, and non-governmental organizations. All of these agencies cooperate under the Incident Command System (ICS), but perform their functions in different ways. The one common thread between these organizations is communicating with aircraft. By convention pilots communicate Latitude/Longitude by using the degrees and decimal minutes format. While there is nothing inherently better about this format, the fact that it is a standard convention that is commonly used is more important than a 'better' system. To change to another unfamiliar format will lead to confusion, possible errors, injury, or worse.

In the early days of radio communication the use of Morse code reduced communication errors; however, as radio quality improved direct voice communication replaced the use of Morse code. In the same way that English is the common language to communicate in the United States the use of Latitude/Longitude to communicated position on wildland fires is the common convention.

Because of these issues the better trained individuals entering the workforce, reduced budgets for training, the impossible task of training all individuals that can and do respond to an incident, the future use of devices that communicate location wirelessly, and the possibility of misunderstanding when using the USNG the use of this system has not been adopted by the wildland fire community.

References:

http://www.fgdc.gov/standards/projects/FGDC-standards-projects/usng/fgdc_std_011_2001_usng.pdf

www.xyproject.org (Defunct)