Topic 4: Coordinate Systems.

Coordinate systems assign a unique address to every point on earth. Coordinate systems are expressed relative to a datum and you can really think of a datum as sort of the point of origin of a map's coordinate values. It's a lot like the 0,0 point on an x,y graph if you wanna think of it that way. This datum really provides a, a spatial starting point to which all of those coordinates are, are referenced. The 2 most common U.S. map datums in North America are the North American datum of 1927, sometimes called NAD27 and the North American datum of 1983, usually referred to NAD83. Your GPS has its own kind of special datum referred to as the world geodetic system of 1984 or WGS84.

Carl, I just wanted to point out that on your GPS unit, if you are selecting a datum that NAD27 would show up as NAD27 Con US.

That's right, Aaron. One other mention we should make of the NAD27 datum is there are quite a few different, uh varieties of those. There's ones for Central America and for Cuba and for Alaska, so if you're working in those areas and happen to be working in NAD27 be sure to pick the right, uh datum. There are 2 general types of, uh coordinate systems. The first one is called the geographic coordinate system, which most people know commonly as latitude and longitude and there are uh, projected coordinate systems. The most common examples of those would be things like state plane or universal transverse mercator.

So let's take a quick look at, at how latitude and longitude are actually laid out on the, on the globe itself. Latitude is described really as a series of kinda equally-spaced horizontal circles that parallel the equator. So in this figure here, the equator is going right across the, uh center of the Earth horizontally and the lines of latitude are the equally-spaced lines that are parallel to the equator. Latitude is, is describes as either being north of the equator or south of the equator and are referenced by, by the degrees that they are north or south of the equator. So for instance this line here would be 39 degrees south latitude. Longitude, by comparison are a series of converging vertical meridians that connect the north and south poles, so here is the North Pole and we have these meridians going vertically down around to the South Pole. The prime meridian, which is the one that I'm pointing to right here is the, the reference point from which longitude is, is referenced. So longitudes to the east of that line would be east longitudes. Longitudes to the west of that line, which brings us to longitudes in the U.S., are west longitudes. You'll notice a significant difference here in that the lines of longitude converge as they approach the poles whereas lines of latitude are always parallel. This brings us to a major, uh you, you, shortfall in using latitude and longitude for mapping purposes because the units are not the same. Units of latitude are always the same because they are parallel and those lines never converge. Units of longitude get smaller and smaller as they approach the poles because those lines of longitude approach each other and at the North Pole or the south pole 1 degree of longitude is 0 feet, so it's a real conundrum.

So, a second in longitude is not always the equivalent to a second in latitude.

That's right. It really depends where on the surface of the earth you are. If you're at the equator 1 second of longitude is equivalent to 1 second of latitude because they're both in the same proportion. As you approach the poles latitude still has the same amount of, of uh distance associated with it but the distance associated with a unit of longitude gets smaller and smaller and smaller as those converging lines of, of longitude approach the poles.

There are 3 ways to express latitude and longitude on your Garmin GPS receiver. When you go into the locations tab you'll see these 3 choices available for you. This 1st one is referred to as decimal degrees. It just gives you the, um the degree and a decimal point and the fractional portion of that degree. The 2nd option that you have is called degrees minutes and the 3rd option is degrees minutes and seconds. Depending on the sort of work that you're doing or the sort of people that you're interacting with you may want to set your GPS receiver, uh differently to display those on screen in a format that those people are expecting or that fit in with the particular kind of work that you're doing.

So let's just take one more quick look at latitude and longitude and how you actually put those two pieces together. Remember that latitude and longitude coordinates are really expressed as that pair of an angular distance from that known reference point and that known reference point is gonna be where the prime meridian and the equator cross, right out here at the 0,0 point just off the coast of west Africa. So if we wanted to find where the location that was 74 degrees west, 27 degrees north was we would travel from that 0,0 point 74 degrees west and when we got to that 74 degrees west location we would

move 27 degrees north and that would put us just off the coast of Florida. So that's how those latitude and longitude coordinate pairs work when you're actually trying to locate a position.