STAYING FOUND

A HUNTER'S PRIMER ON GLOBAL POSITIONING SYSTEM UNITS

Tenth in a series...

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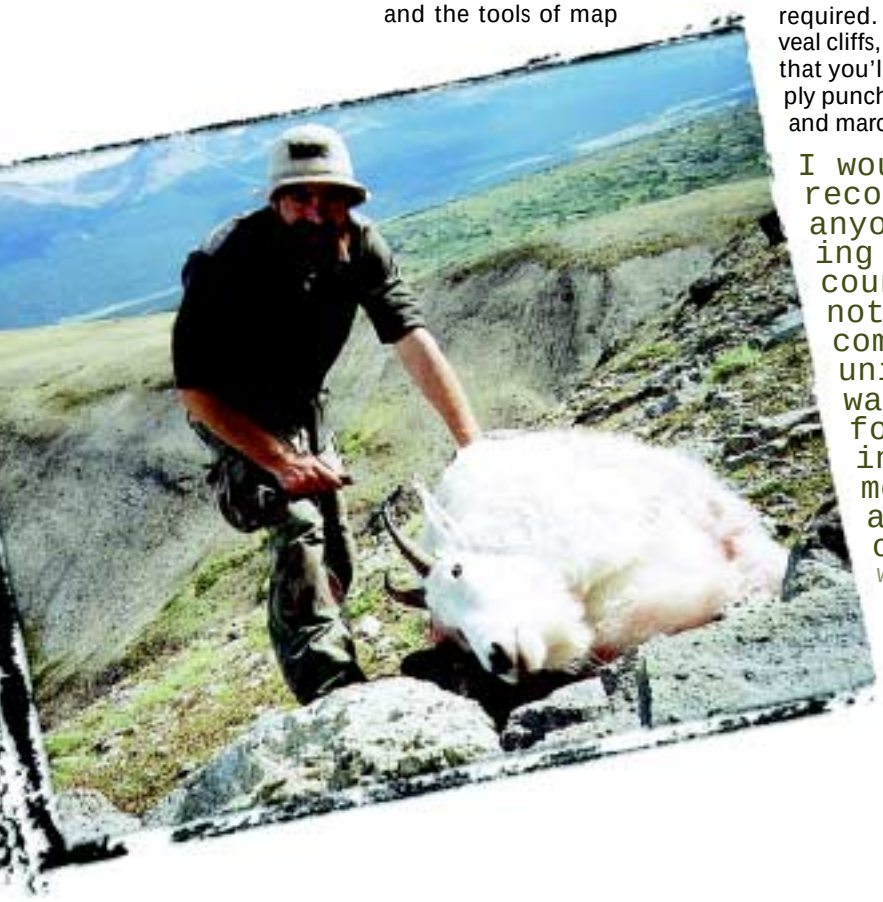
John Harrison understood that if he knew the time, he would know his longitude. His chronometer clocks eventually convinced the British Admiralty that knowing the time could be used to calculate a ship's location. More than 200 years later we can do the same. Global Positioning System units use the time that satellites send via signal to calculate where the unit and its holder are. Yet, even with the use of satellite technology, staying found while out hiking, hunting, or generally exploring is still much as it has always been. An engaged mind and the tools of map and compass are the mainstays, and they've been made even better by the advent of the GPS. A Global Positioning System receiver uses the signals from an array of satellites to calculate its position. The position is then displayed on a small screen.

Unfortunately, that isn't all there is to it. If that was it, then we'd just place our maps in the keepsake drawer and trade in our compasses on extra batteries. The map is as necessary as it has always been. Some modern GPS units do have some maps built in, but the screen on a hand-held GPS unit is small. To see at a single glance what the surrounding countryside looks like, a full-sized topographic map is still required. The topo map will reveal cliffs, bogs, or other obstacles that you'll want to avoid and simply punching in some coordinates and marching off in a straight line is often the last thing you want to do. To use a GPS unit effectively, you'll need to pay more attention to the map than ever before.

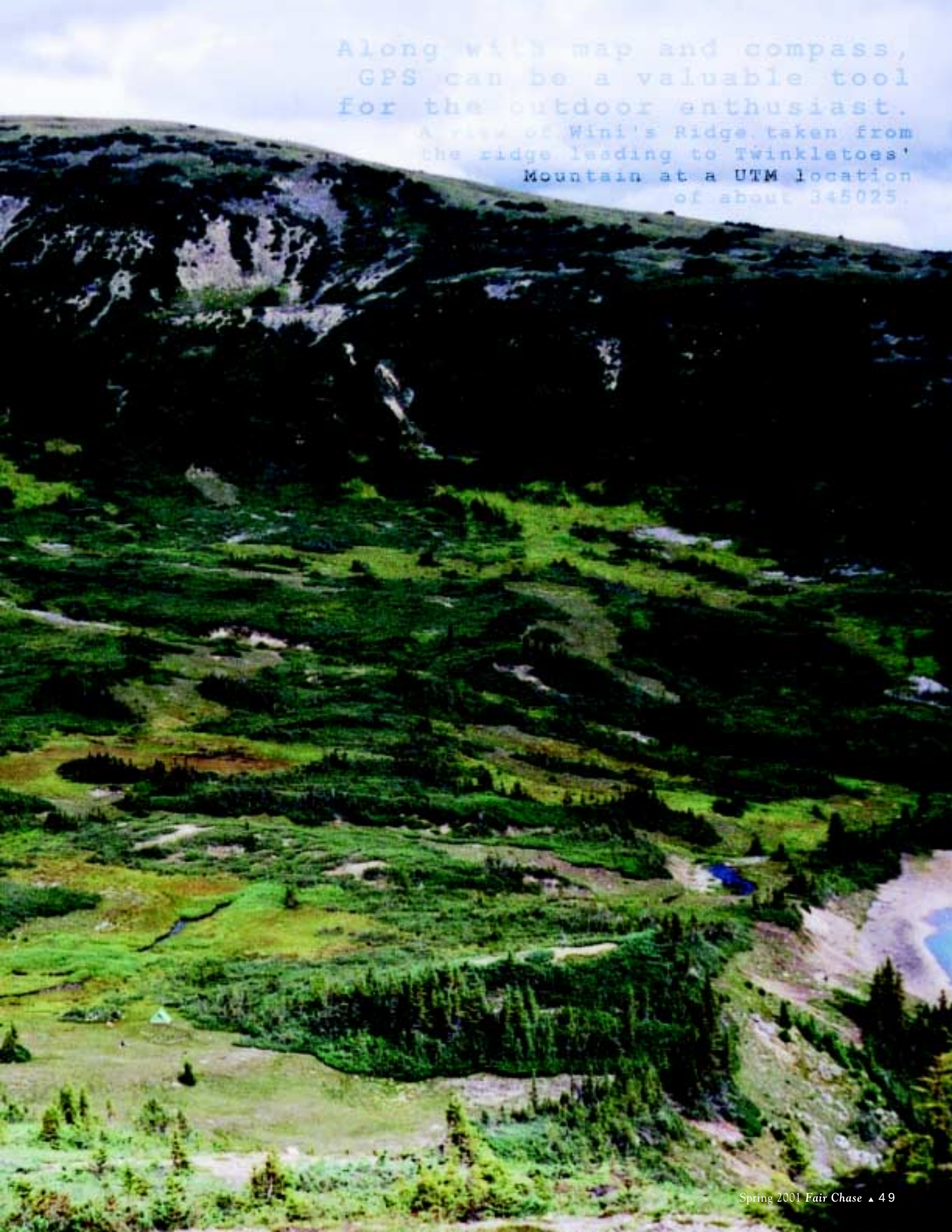
GPS is technology that has come of age. It is readily and inexpensively available, and it is useful. It is not a replacement for map and compass, nor is it a panacea for all navigational problems. The use of GPS technology by hunters for navigation is not inherently unethical. It will not guide the user to a live animal, nor will it allow the user to move through the dark of night without danger. It is something, though, that can make participation in hunting a bit safer for those in unfamiliar places when the danger of becoming a mite bewildered is increased, or when the features around you and those on the map just won't line up.

Along with map and compass, GPS can be a valuable tool for the outdoor enthusiast. Recently, I was out scouting a potential new hunting area. I parked at a small turnout, then turned my GPS on and set it on the roof of my Jeep while I checked to make sure that the rest of my normal paraphernalia was stowed in my day pack. I saved the location of the Jeep in the GPS and packed it away, then headed into the woods. According to the map, the flat area between a couple of steep mountains extended back some five miles or more to where I might be able to find a good way up into the high country. The contour interval of the map was 100 feet and the flat area was mostly blank, so it should have been easy walking. The map didn't show the thickets of devil's club, the alder jungles, or the bogs. It was anything but easy walking. After a bit more than three hours, I stopped at one of the increasingly rare dry spots and sat for a rest. I looked at the map



I would never recommend that anyone go hunting in strange country with nothing but a compass and GPS unit, but it was good enough for us to go in, get a mountain goat, and get back out...

Warren Eastland preparing to cape his Rocky Mountain goat. "Wini's Ridge" is in the background.


Along with map and compass,
GPS can be a valuable tool
for the outdoor enthusiast.
A view of Wini's Ridge taken from
the ridge leading to Twinkletoes'
Mountain at a UTM location
of about 345025

We set up our base camp in the forest at the base of the mountain and took a GPS reading, then set out exploring. In the evening, I looked at my list of locations and drew my own working map of the country. The author at Middle Mountain glassing Goat Mountain.

and realized that I had no idea how far up the old delta I had gone. There were no topographic features to guide me, and I couldn't see either of the bordering mountains because of the thick trees that blocked my view. I turned my GPS on and let it work while I finished my snack. I wrote down my location in my notebook and marked my location by a dot on my map.

I hadn't made it nearly as far as I'd expected. It was obvious that I was not going to make it to the high country on this day. If I did slog through on some future date, I had better pack myself an extra ration of salt and pepper, because the only way I was going to be able to pack a mountain goat through this jungle was in my stomach. My problem was now to get back to my vehicle before nightfall.

A few long ovals on the map suggested that there was a low ridge to my east, nearly at the foot of the mountain. That ridge led about halfway back towards where my Jeep was parked, then forked. One fork continued on toward my vehicle, the other led away.

The ridge wasn't as easy walking as I'd hoped, but at least it was dry. The large trees and tangled undergrowth made keeping a straight path impossible, but I didn't have to worry about straying off the ridge because the bordering bogs were obvious. When I got along to about where I figured the ridge split, I got out my GPS. With the tree cover above and the horizon blocked by the mountain at my back, I could get no more than two satellites' signals. It takes three, preferably four, satellites for the GPS to calculate a location.

I could see the mountain top opposite me across the delta, though its lower levels were blocked by alders. On my map I could identify a gully and a cliff on the mountain that I could see. It was a simple matter of taking two bearings with my compass to find my location on my map. I was at the fork and an hour's more clambering among the roots and brush brought me to the road and to my Jeep.

The ABCs of UTMs

How did the GPS tell me where I was on the map? GPS units display a location in relation to a user grid. In North America, the two most common grids are the traditional latitude and longitude, or the UTM system. The grid systems are based on mathematical models of the earth's shape, and the particular model is indicated by a datum. A location given in one datum may be far away from the same position given in another datum. Traditional map users haven't had to pay much attention to datums. Using any datum, a person can stand at a known point, sight with a compass at another point, then use the bearing to locate the second point on the map. Using GPS, however, the map's datum becomes important. The datum is given in the legend of the map and is either North American Datum 27 or NAD 83. For the GPS to provide the correct map location, it must first be told which datum corresponds with the map. All current GPS units have datums built in that will cover nearly any map anywhere in the world.

The grid system of latitude and longitude is the classical degrees-minutes-seconds system that has been used for centuries. This coordinate system is also one of the worst for the map-using foot traveler. The grid lines are not straight on a map with a mercator projection, which is the projection used by most countries for topo maps, and the distance between ticks of longitude and latitude are not the same. Lines of longitude have equally spaced degrees and minutes; the meridians pass through both poles and therefore are all the same length. Each line of latitude gets shorter as they move toward the poles, so a degree at 37° North is longer than a degree at 47° North. Dealing with these quirks is difficult enough with a map on the kitchen table. Trying to determine a point's exact location in the field with the wind howling and the snow blowing is definitely an exercise in frustration.

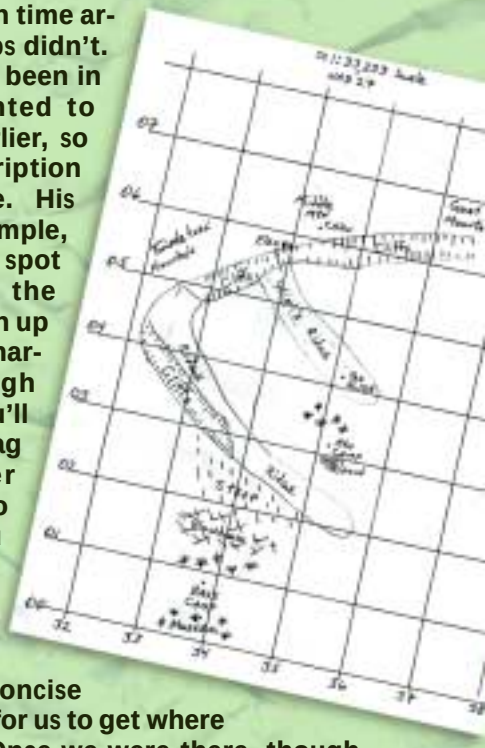
The Universal Transverse Mercator grid system, also known as the Military Grid Reference System, is different. Like latitude and longitude, it is centered at the Greenwich Meridian and the equator, but all similarities end there. It is a truly square grid where the distance between two tick marks is the same north-to-south as east-to-west, and it is read Right Up. Traditional latitude and longitude are read from south-to-north (or north-to-south if you are below the equator), the latitude, and then west or east from the Prime Meridian, depending upon which hemisphere you are in. UTMs are always read west-to-east, then south-to-north from the lower left corner of the map.

UTM locations are used from 84° North to 80° South latitude and completely around the world. UTM grid zones are divided into blocks 6° of longitude and 8° of latitude, with the exception of the northernmost strip which is 12° tall. With so many blocks, the UTM system wasn't designed to designate anyplace in the world on a single map as was the latitude longitude system, but rather for the foot traveler who would rarely hike so far that the change in grid zones would be a problem.

A complete UTM location consists of a number and a letter that designates the grid zone, and

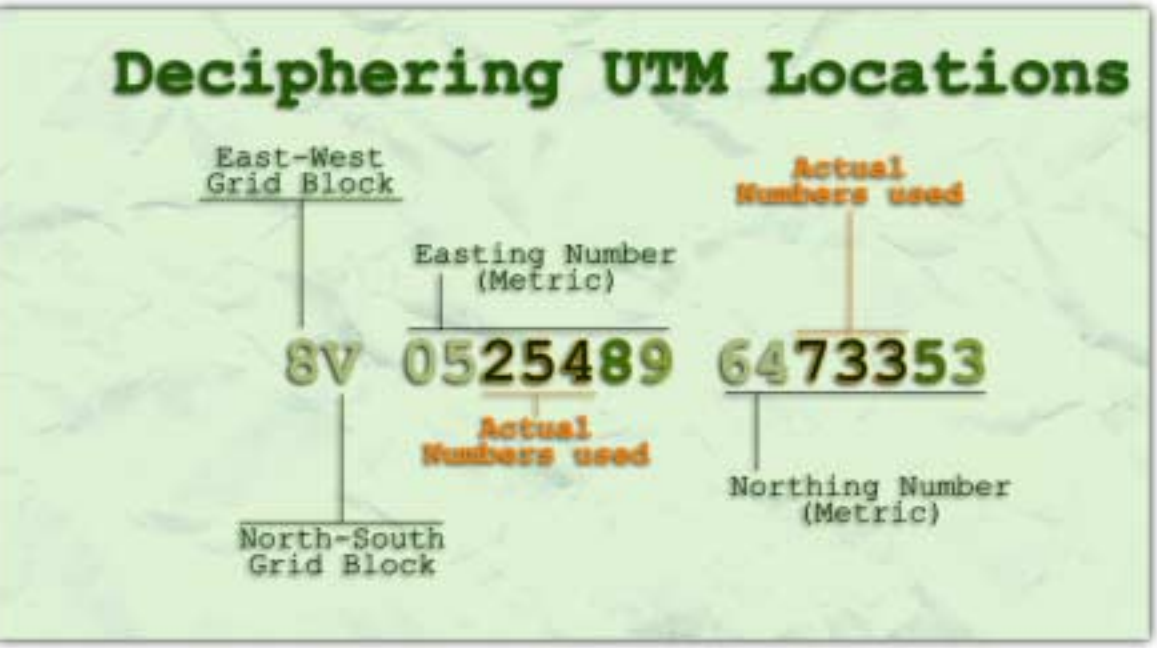
Goats Aloft

The most common use of a GPS by the hunter or hiker is to supplement a good set of topo maps. There are situations, however, when GPS can serve as the primary navigation tool. I experienced this on a goat hunt in British Columbia with my wife, for which I had to use the UTM grid locations indicated by my GPS to make my own map. I had topographic maps on order, but Maps Canada apparently didn't sense my urgency. After five weeks of waiting, our scheduled vacation time arrived, but the maps didn't. Our neighbor had been in the area we wanted to hunt six years earlier, so we used his description as our basic guide. His directions were simple, "Park at the wide spot in the road near the lake, then canoe on up to where it gets narrow. Push through the grass and you'll find a sandbar. Drag your canoe over that, then just go upstream until you run out of water. The cliffs are straight uphill from there." His directions were concise and good enough for us to get where we were going. Once we were there, though, we had no idea what we'd find.



We set up our base camp in the forest at the base of the mountain and took a GPS reading, then set out exploring. In the evening, I looked at my list of locations and drew my own working map of the country. The UTM locations were based on a square grid, so my map consisted of nothing more than labeled dots, but the dots were as accurately placed on a hand-drawn grid as I could do. When we were in the high country operating from our spike camp, we could see enough of the area to travel, hunt, and stay found. But in the lower wooded country around the base camp, each day's observations were added to my map, and it served to keep us from getting truly lost in the woods. I would never recommend that anyone go hunting in strange country with nothing but a compass and GPS unit, but it was good enough for us to go in, get a mountain goat, and get back out in time to meet our obligations. The maps were waiting for me when we returned and I was able to reconstruct our explorations from my list of grid locations. We might have been able to do it without a GPS, but certainly not as easily.

a string of two numbers that designate where the location is within the grid zone. For example, 8V 0525489 6473353 is a location in the east-west row of grid blocks designated with the number 8 and in the north-south grid blocks designated by the letter V. That 6° x 8° block includes the vicinity of Juneau, Alaska. The first number after the grid zone designator is the easting, and the second number is the northing. They are metric, so that location indicates to the nearest meter where my driveway ends. It also says that I am some 6473 kilometers north of the equator.



Few hunters or hikers bother with the entire UTM location. The grid zone designator is dropped as are the leading two numbers of the easting and northing—they are only used on maps of such large area and small scale that they are useless to foot travelers. And the last digit or two can be dropped. Handheld GPS units are only accurate to about 15 meters or so, and the last digit of the location is to the nearest meter, or far more precise than the accuracy of the unit. A dot drawn on a 1:24,000 scale map with a standard 0.7mm mechanical pencil will cover an area about the size of the average error of a GPS unit. The next to last digit, the ten-meter number, then, can be used with the recognition that it is only providing ballpark accuracy.

My UTM location is thus reduced to 254733, or at best, 25487335. Knowing what map is being referenced and that the UTM location is always an even-numbered string of digits, I can quickly find my location. Reading from the bottom left of the map, I am to the east in strip 25 and north of the bottom edge of the map in strip 73. That designates the block 2573, which is 1,000 meters on a side. Using the next two digits, I am four-tenths of the way from easting 25 to 26 and three-tenths of the way from northing 73 to 74. Rarely do I need to locate myself on a map closer than to the nearest 100 yards, but if I have the fourth digits of the location, I can do so.

Take a Read on Accuracy

The general accuracy of any consumer grade hand-held GPS unit is about 50 feet, but several things can interfere with the accuracy, or block the satellite signals altogether. The GPS receiver needs a minimum of three satellite signals for it to compute a location. This location is called 2D (two dimensional) because it cannot calculate an altitude, which requires four or more satellites, and is often less accurate than a 3D location. The difference in accuracy often is not large, just a few yards, but it is there and the GPS user should be aware of it. These 2D locations occur most often in areas where parts of the horizon are blocked from view, such as in dense forest. Luckily for hunters, most hunting doesn't take place in the middle of large tracts of old growth forest, where the problem is the worst. In southeast Alaska where I live, I often have to move several times until I get lucky and the signals can find a straight shot through the trees to my GPS. If I relied solely on GPS to keep me found, I'd be lost a lot more than I usually am.

A bigger problem is multipath. A GPS unit is designed to operate with a direct line-of-sight from the satellite to the unit. Occasionally the signal from a satellite is reflected off a cliff, a dense stand of trees, or other object and the extra time involved for the signal to follow its convoluted path causes the unit to miscalculate the location. The indicated location may be off a little, less than the normal 50-foot radius of error, or a lot, perhaps several hundred yards. If the indicated speed (GPS units have built-in speedometers) is greater than zero or takes a longer time than usual to settle down to zero, then there may be a multipath error. The easiest way I've found to see if there's a multipath problem is to get a location on the GPS, then move a few yards. If the last two digits of the UTM location jump more than a few meters, I know I have a problem and need to find a better place to get a location.

Overall, how good is the location determined by GPS? Is it good enough to lead me back to a deer I have cached? If I'm in the ponderosa pine parklands of Montana where visibility is good and I have a deer hung in a tree awaiting my next backpack load, the GPS location alone is probably good enough to lead me back to my deer. Even more so if I've got it bagged in game bags that contrast with the surrounding vegetation. If I'm in a Southeast Alaskan rainforest and my blacktail is hung up in a spruce out of sight of the ever-hungry ravens, I wouldn't trust the GPS position alone. In addition to the normal 50-foot error, there might well be a bit of multipath error added in, and visibility is measured in feet, not yards. I could get close to my cache following the GPS indications, but if I don't festoon a few surrounding trees with surveyor's flagging tape, I might be awhile searching for my deer.

Choosing your GPS

So what GPS unit is best for the hiking hunter? Just about all current GPS units are similar in their hardware abilities. None is ex-

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empt from signal interception by trees nor against multipath nor other error. The biggest difference among GPS units is the software. No currently available GPS units are made specifically with the hunter-hiker in mind, but all are usable. The one unit that was made with the foot traveler in mind is now out of production and has been technologically eclipsed by newer units.

Consider carefully the features you consider necessary before you go shopping, and settle for nothing less:

- The unit must be able to show locations in at least two grid systems: lat/lon and UTM, because those are the most common on topographic maps. It needn't show the location in both systems simultaneously, although some do, but the grids must be user-selectable. No GPS unit uses the Township-Range system, so we can only hope that land management agencies will update their maps' grid systems.
- GPS units have from a dozen to over a hundred datums built in; both the number and which ones a unit has depends upon the unit. In North America, both NAD 27 and NAD 83 are used on topo maps while aeronautical charts often use World Geographic System 1972. The others you might want depend on where you are likely to wander. The datums built into a unit are always listed in the user's manual, so check that before you buy.
- Current GPS units operate on AA batteries. A GPS unit uses up batteries at a rate dependent upon how much the backlight is on, how long the unit is active, and other hardware-driven features. Check the user's manual for an estimate of how long a set of batteries will last and how many batteries the unit needs to operate.

Know what you want before you walk into the store, because the clerk is not likely to be of great help. It isn't that the clerk is necessarily ignorant; rather, there are so many units available that only a specialist in GPS units can keep track of them all. Garmin and Magellan are the two manufacturers with the most different models available, and their machines are comparable. Garmin's customer support is acknowledged to be faster and friendlier than Magellan's, but there is little difference among their units. It is simply a case of looking at the many features offered by the different units and deciding which features you will use most. The websites for the various manufacturers are a good place to start your search. The website www.joe.mehaffey.com is a good place to read about features and side-by-side comparisons of GPSs.

Map, compass, and GPS are all part of land navigation. Each has their strengths and weaknesses. Maps are the most useful when visibility is good and there are definite topographic features to see, and less so in other conditions. Compasses tell the direction no matter the weather, but unless you know just which way you need to go, a compass merely identifies your plethora of options. A GPS will, when conditions aren't too extreme, tell you where you are, but not where you need to go unless you've already entered that point into its memory. A GPS will only give you straight line directions, it will not warn you about cliffs or bogs. Used in concert and allowing each tool to take its place when most appropriate, land navigation is now just a bit easier. ▲▲▲

Wild Chicken Chases

The far side of beyond isn't the only place GPS units come in handy. I well recall a hunt in southwest Kansas for lesser prairie chickens. My friend and I had a photocopied Forest Service map that listed all the windmills, and the land was flat. We were able to follow the dog until the day's hunt was done, then just look around for the nearest windmill. We'd walk over to it and, while the dog was refreshing herself, read the number off the tower and find it on the map. A quick check of our compass would point us in the direction that would end up at our vehicle. All went well until dense fog moved in one morning after we'd been hunting for a couple of hours. Those windmills that were so easy to find and then locate on the map disappeared in the fog. Wandering around out there and hoping to bump into a windmill was kind of like flock shooting; we discovered how much space those windmills didn't occupy. We finally stumbled across a road, and we even agreed on which road it was. We didn't agree on which way our vehicle might be. My partner had more faith in my sense of direction than in his own, so we went to the south. After a half-hour's walking, a farmer drove by in a pick-up. Unfortunately, he was headed south, too, or he'd have given us a ride back to the north — the direction we should have been going in the first place.

A few years later, almost the exact same thing happened in Nebraska, again while I was out after prairie chickens. I watched the fog bank come rolling in from the east, but I didn't worry about it at all. I knew from the map that there was a barbed wire fence to the west of me, so I just kept following the dog in that direction. After reaching the fence, the dog and I reversed direction and hunted back through the fog to the east. I checked my compass occasionally to maintain a generally easterly heading. The fog didn't interfere with my dog's nose and the prairie grouse held tighter because of the fog. When we finally made our way back to the twin tracks we called a road, it only took my GPS a minute or so to tell me that I was south of my vehicle.

Wini Kessler with a prairie chicken taken in tall grass prairie at Ft. Riley Kansas. Reggae the Brittany spaniel is to her left.