# **Having Fun with GPS**

By Anton Ninno, N2RUD, and Jim Kuhl, N2STK

Imost everyone has heard of the Global Positioning System by now, and many radio hobbyists own a handheld GPS receiver. For the uninitiated, the GPS system works with a network of 24 satellites orbiting some 12,500 miles up in the sky. Each one has an atomic clock to set the precise timing that is part of the math used by a land-based a GPS receiver to triangulate its location on the face of the earth. GPS satellites continuously transmit signals and data. Those signals are picked up by GPS receivers, with up to 12 satellites being received simultaneously.

A calculator in the GPS receiver crunches the data, and shows it to us as latitude and longitude. The GPS term for a set of latitude and longitude coordinates is *waypoint*. If you connect the waypoint dots, you have what's called a *route*. As you move with a GPS in your hand, it generates a virtual breadcrumb trail called a *track*. Waypoints, routes and tracks can be saved in a GPS memory. Now you have the basic GPS vocabulary.

There many websites that will tell you how GPS works, like "How Stuff Works," but the best site for new GPS users is The GPS Information Site at **http://www.joe.mehaffey.com**. The owners, Joe Mehaffey and Jack Yeazel, are ham radio operators who provide expert reviews of GPS products and useful GPS links. They make it clear that people who love radios can



have fun with GPS receivers, too.

### Got a Map in Your Hand?

When people want to know how much to spend on a GPS receiver, we ask if they want to see a map in their hand. Entry-level GPS receivers display basic geographic information: latitude, longitude, elevation, direction, and bearing. They calculate the distance between points and estimate your arrival time. They will also have a screen that shows a graphic representation of the points you marked with the GPS, as if you had drawn a sketch, but that isn't a scale map. For that, you have to spend more, and most GPS users think it's worth the expense.

Better quality GPS receivers come with a base map of North America, but with such a large area to cover, the maps don't include much detail. Spend a little more, and you get map memory, up to 24mb, to upload more maps and a higher level of detail: city maps, topographic maps, and "points of interest" such as hotels, restaurants, museums, and so on. Garmin and

Magellan, perhaps the most popular makers of handheld GPS units, produce software for this purpose.

Although you will see maps on your PC screen during the process of uploading them to your GPS, they aren't meant to compete with real desktop mapping software.

## Got a Map on Your PC?

Desktop mapping programs, like those from Delorme, Inc., are designed to provide high-quality maps to display on a PC monitor. These applications allow you to build custom maps with your own labels and save them as files. You can print them, too, if you don't mind burning up paper and ink.

With the boom in GPS sales, some map programs now include a GPS menu. The GPS functions in map software include downloading waypoints, routes, and tracks from your GPS to the map software, and uploading those items to your GPS. How many of those functions are available will depend on the specific GPS and map software you own. Two popular map software producers are Delorme and MapTech.

Be aware that you will need to check the specific GPS receiver and map software for compatibility. As new GPS models appear on the marker, as the system software on GPS receivers is upgraded, and as map software is upgraded, some incompatibility will occur. Class, close your books! Let's go outside and play!

#### **Degree Confluence Project**

Like to travel and take pictures? Enjoy visiting places that are well off the beaten track? Drive a 4WD vehicle? Then get ready for an



Anton Ninno documents a GPS adventure on the Historic Forts web page



exciting geographical adventure! The Degree Confluence Project **http://www.confluence.org** is a delightful way to combine all the latest technology: a GPS, a digital camera, and access to the Internet for some serious fun! By serious, we mean that aside from having fun, you will be contributing to a remarkable set of data for geography education.

All over the world, people just like you are using a GPS receiver to become explorers. The object is to navigate to a point where latitude and longitude intersect as integers, meaning without fractions. We visited the confluence at 43N, 76W, and you can see the report listed under New York State. At this site, you can explore the whole planet, or visit your own neck of the woods. In all, there are more than 12,000 confluences to document, so there's plenty of opportunity get involved. Even if you don't participate, go see the beautiful photos being contributed by intrepid confluence hunters worldwide.

#### Geocaching: the GPS Treasure Hunt

When the Clinton Administration turned off "selective availability" (the random error factor built into GPS data by the military to prevent our enemies from using the system against us), back on May 2, 2000, the accuracy of GPS receivers was increased from 100 feet to about 20 feet. The next day Dave Ullmer created a new scavenger hunt game for GPS owners. He hid a box in the woods, posted the coordinates on the Satellite Navigation newsgroup, and challenged readers to find it. Within months the game was christened Geocaching by other players, and a website sprang up at http://www.geocaching.com.

Geocaching has been spreading like wildfire. New geocache categories being created by enthu-



The confluence of 49N22E was found in the Slovak Republic by Hans Augdoppler and Klaus Baumgartner.

siastic players keep the game fresh. Several alternative sites, like Navicache http:// www.navicache.com have appeared, and Buxley's Geocaching Waypoint http://www.brillig.com/ geocaching offers players clickable geocaching maps. The GPS giant, Garmin, Inc. is introducing GPS owners to the game, and has even added an icon to their operating system for geocaching waypoints.



#### The Further Adventures of GPS

Think geocaching needs more spice? Like to compete in sports? Then Geodashing http:// www.geodashing.home.attbi.com may be your game. The entire planet is your playing field. The dashpoints you will be challenged to find are much like the control points in orienteering, except they are selected at random. Get the most dashpoints, and you win. The trick will be to find all of them!

If you need an adrenalin rush to get motivated, you can go all-out playing Minute War http:/ /www.seaotters.net/~scout/MinuteWar, another form of global competition. Here, players compete at the same time, no matter where they live, using their own local maps. All the maps have been combined for the big game. Each map square is one square minute of latitude and longitude, and it contains a virtual flag. Players use a GPS to visit the exact spots required to capture flags and control the squares. Confused? Visit the site to read the rules and see for yourself – it's incredible!

Or maybe your interest is closer to geography than sporting events. You might find a Boundary Point http://www.groups.yahoo.com/group/ BoundaryPoint expedition to be closer to your speed. In a more relaxed manner, "pointers and bounders" visit spots where geopolitical boundaries meet. Think of the "Four Corners" point between Utah, Wyoming, Arizona, and New Mexico. Tri-state and other multipoint locations are your targets. Just like your confluence hunting cousins, you will take photographs and record your adventures to share on the Net. It's no coin-





A boundary point on the US/Mexico border across from Tijuana (photographer unknown)

cidence that many recreational GPS websites are linked to each other!

#### Having fun without a GPS

We cannot tell a lie. Yes, you can have fun without a GPS. In fact, there's group of people who do just that playing a game called Letterboxing at http://www.letterboxing.org. Just imagine



geocaching with no GPS. Instead, players use only clues, compass directions, pacing by foot, and sheer brainpower to find letterboxes. If you're English, you know that's the common English

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Anton's GPS documents his visit to 43N 76W.

word for a mailbox. The game began with a guide who left his calling card on the Dartmoor Heath in 1854. (It was a dark and stormy night!) Letterboxing has become a national pastime in the UK. In April 1998, an article in Smithsonian magazine brought it to America. It's good fun for the low-tech fellow who enjoys the thrill of the hunt, the challenge of a three-pipe problem, and a long walk in the woods. Have compass. Will travel.

Outdoorsmen who enjoy photography will find that hitting trails for a little geo-graphing http:/ /groups.yahoo.com/group/geographing/ will put a new spin on their old habit of shooting up rolls of film when faced with a spectacular landscape. We take pictures to re-experience the joy of those occasions and to share it with others. The same fellow who started geocaching, Dave Ullmer, came up with this new concept: add GPS coordinates to your photographs! If you take a 360degree photography, you'll really nail down the experience of being in that particular spot. Then you can share it with the group at Dave's website, if you like. The waypoint will help you find the spot again, if once was not enough.

#### **GPS Goes to School**

Get ready for a pop quiz. What looks like a GameBoy, is fun to use, and gets you off the couch and out into the world? Right – a GPS receiver! Can you think of a better way to teach geography? We can't either. GPS is being used from 5<sup>th</sup> grade up to investigate topics in math, science, and social studies. Jim and I are teachers who have been borrowing this multi-billion dollar instructional tool for homework assignments for several years. It's a good thing the GPS system hasn't been charged to our school budgets!

Actually, when you compare the cost of a basic GPS at \$100 to the cost of a computer, GPS is a cheap deal. Students pay almost \$100 for a graphing calculator that doesn't even receive any radio signals, let alone signals from satellites. Why not volunteer to take a GPS to your neighborhood school and demonstrate its amazing powers to



kids? You'll be a hit in any classroom. We're living proof!

While you ponder that possibility, help us spread the word to educators by passing along our NYGPS website. It's a mailing list for teachers who are exploring the use of GPS in school. They will also find a treasure chest of resources there, including activities, books, lesson plans, bookmarks, and photographs. They're all free. Here's an example of a virtual geocache for history teachers, called Historic Forts: http:// w w w.geocach ing.com/seek/ cache\_details.asp?ID=21378.Geocachers from all over are contributing GPS coordinates, photos, and stories about all kinds of forts. A player in Sweden shares a fort called Kastellet in his log report.

#### Having Fun Yet?

Try these GPS activities. Archaeologists use GPS to mark dig sites and the locations of artifacts. Genealogists use it to mark gravesites and abandoned cemeteries. Historians use GPS to mark the movements of armies on battlefields. There are all the common uses for GPS like hiking, hunting, fishing, boating, cross-country skiing, cycling, and mountain biking. Spelunkers use a GPS to mark cave entrances and share them with friends. If you've ever looked for a cave using directions from a looney caver, you'll appreciate having GPS coordinates that guide you right to the spot. The same goes for crazy rock climbers.

Take a GPS and a laptop computer with map software on your next business trip or family vacation. It's not only fun, it'll save you time and money as you plan your route for the best possible outcome. Make lots of waypoints, and send them to friends and family by email as you go. They can plot your waypoints with their own map software, and see exactly where you are on every leg of the journey.

Most people like funky old diners. Are we right? Well, here's a little gift for GPS travelers. We've created a virtual geocache called "Diners Club" where players share their favorite diner. We had no idea it would be so popular! See for yourself right here: http://www.geocaching.com/seek/ cache\_details.asp?ID=21289. If you don't think the adventure of finding good food, recommended by total strangers, isn't having fun with a GPS, then we give up. You're lost.

## GPS in the Classroom By Jim Kuhl, N2STK

GPS receivers are gradually catching on in classrooms. I began experimenting with GPS when a social studies teacher on my middle school team brought a GPS to school. Her husband used it in his boat for fishing. She taught latitude and longitude to her students and thought it would have more meaning if she could show her students the way parallels and meridians intersected near the school. She took her class outside and using the GPS lined them up along a parallel and a meridian that intersected in the school's parking lot.

Many of the concepts you must teach kids (example: latitude and longitude are measured with imaginary lines) were taught by the experience. Measuring latitude and longitude took on special meaning as the kids found their place on the lines using the handheld device that reminded them of their favorite portable game. We find kids are more open to learning about latitude and longitude when you throw interesting technology into the lesson.

From social studies we graduated to science and math. In science class we were observing and identifying the plants and animals on a plot of land near the school. We traditionally used this activity to involve math students with science class. Groups in math class would measure the perimeter of our property using meter sticks and tape measures. They could use the measurements of length and width to calculate the area of the plot of land. In the past, groups of students would compare their measurements to determine reasonable dimensions for the property.

With the GPS we had another way to measure the dimensions of the property. Students found the latitude and longitude of the corners of the property. In the early days I had them walk 10 yards on a football field with a GPS to equate change in latitude and longitude with yardage. There is a site on the Internet that does that conversion for you. We used these measurements to determine the difference in density of plant and animal species on the property. Interest in science, math, latitude and longitude (geography) soared using these high interest, and hands-on activities. From tests given after the activities and other lessons, we found that students were understanding these concepts better than when we had used traditional methods to teach them.

After a major change in curriculum in my school district, I found myself teaching earth science which included the topics of topographic maps and (you guessed it) latitude and longitude. Enter Geocaching. Students were now learning to use GPS receivers and interpret topographic maps so they could go on a 21<sup>st</sup> century treasure hunt. In addition to finding parallels and meridians near the school, they used the GPS to find the coordinates of familiar objects near the school. They also learned to enter waypoints into the GPS and navigate to them. Carrying a topographic map with the GPS gave them a better understanding of the meaning of contour lines.

The activity that really excited students was plugging a GPS into a laptop computer displaying a topographic map. The GPS plotted their every move on the map. It happened that the school was built after the map was drawn, so using the GPS, students were able to draw the school on the map. As a result of these activities some students became so good at reading and interpreting topographic maps that they were finding Geocaches without the aid of a GPS receiver.