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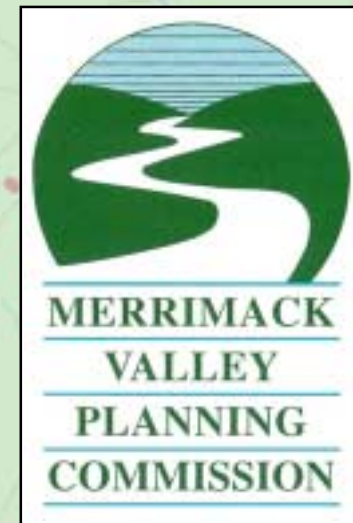
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Volunteer Handbook

for

GPS Trail Data Collection



Produced for the
*Merrimack Valley Regional Offroad
Trails Advisory Committee*

How to use this Handbook...

This Handbook was developed for volunteers interested in assisting the Merrimack Valley Planning Commission (MVPC) in collecting GPS data for mapping trails located in the lower Merrimack Valley. The Handbook will not necessarily help you operate your own GPS unit. Instead, it provides specifications for the collection and conversion of GPS data so the MVPC can readily utilize your data for mapping purposes. Specifically, the Handbook covers:

- What data MVPC needs
- Which trail attributes to note
- Tips on how to export data
- Things to consider prior to collecting data

Before Collecting Data

Please contact MVPC if you are interested in collecting GPS trail data for our trail mapping effort. It is important for us to know which trails you are interested in so that we can better coordinate the MVPC Offroad Trails Advisory Committee's overall regional trail mapping initiative.

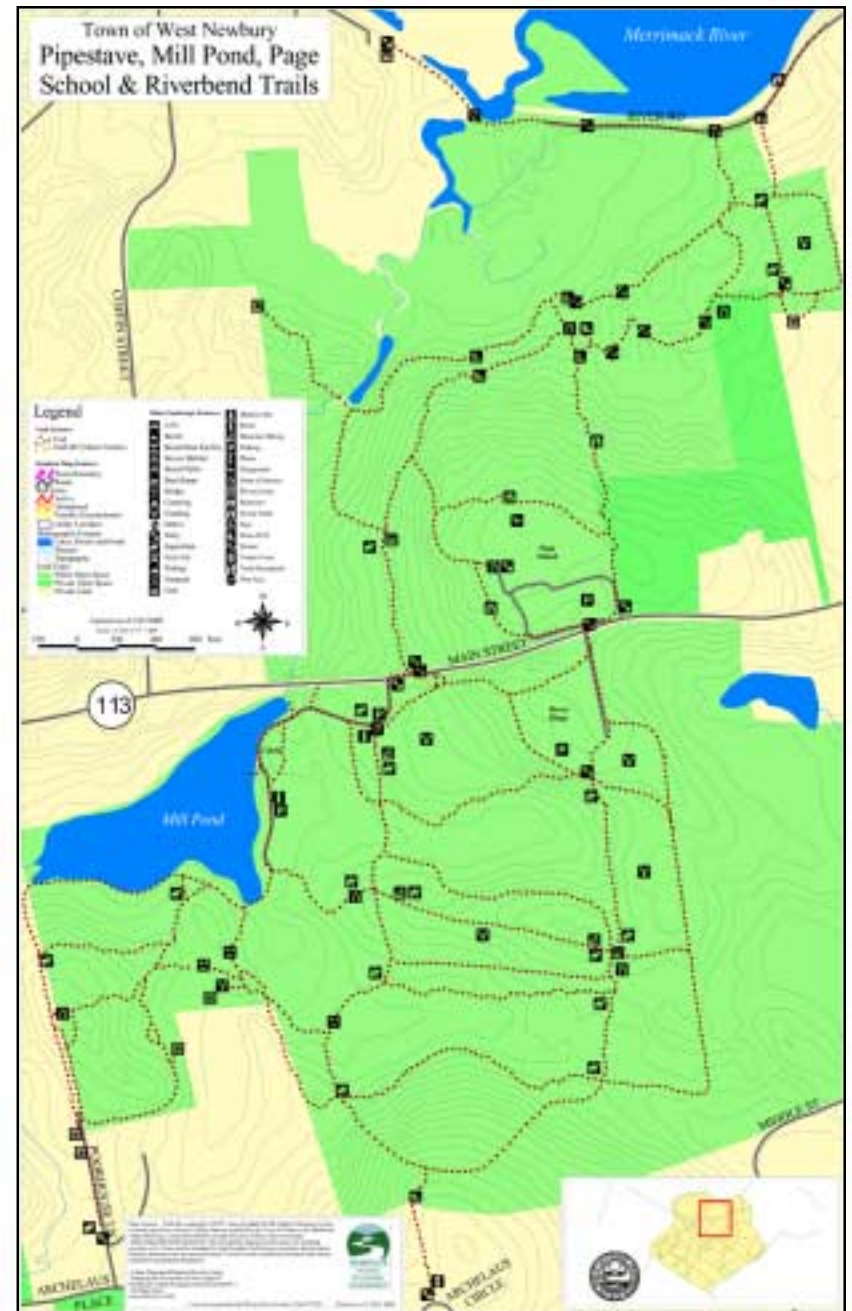
We also welcome you to join the Offroad Trails Advisory Committee if you are not already a participant!

For more information, please contact:

Jane Healey
Transportation Planner
978-374-0519 x27
jhealey@mvpc.org

Existing MVPC trail maps can be found at:

http://www.mvpc.org/transport_sec/trails.htm



Example of an MVPC Trail Map

Merrimack Valley Planning Commission Regional GIS Service Center

The Merrimack Valley Planning Commission (MVPC) GIS department is responsible for producing the trail maps developed for the Offroad Trails Advisory Committee. In existence since 1991, MVPC serves as the State-designated Regional GIS Service Center for Northeastern Massachusetts and is continually developing and obtaining spatial data relevant to the fifteen communities of the Merrimack Valley. MVPC's GIS Department produces datalayers using data provided by MassGIS, the Department of Environmental Protection, the Massachusetts Highway Department, as well as other data sources.

Examples of GIS applications include:

- Assessors/Property Parcels Maps
- Municipal Zoning Maps
- Environmental Issues Maps (e.g. stormwater runoff points)
- Transportation Maps
- Trail Data Collection and Mapping
- Habitat & Ecosystems Maps
- Geocoding (e.g. historic housing resources)

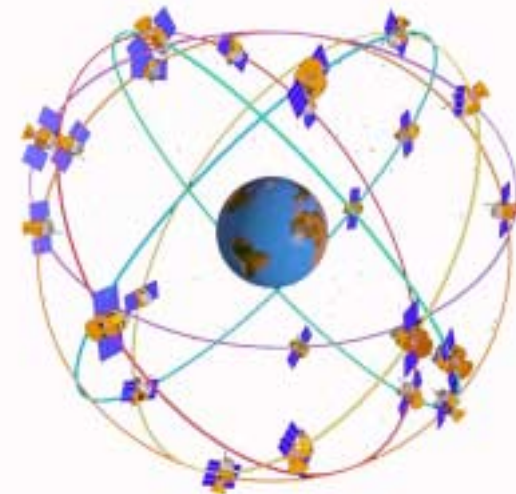
For more information on products and services provided by MVPC, contact us via phone at (978)374-0519 or email at gis@mvpc.org.

What GPS Is and How It Works

GPS stands for Global Positioning System, a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. These satellites are orbiting the earth about 12,000 miles above earth at a speed of 7,000 miles an hour, making two complete orbits in less than 24 hours.

GPS receivers take the information transmitted by these satellites and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. It is typical for GPS receivers to collect data in the World Geodetic System 1984 (WGS84) coordinate system.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. A fourth satellite allows a GPS receiver to calculate a 3D position (latitude, longitude, and altitude). There are no subscription fees or setup charges to use GPS.¹



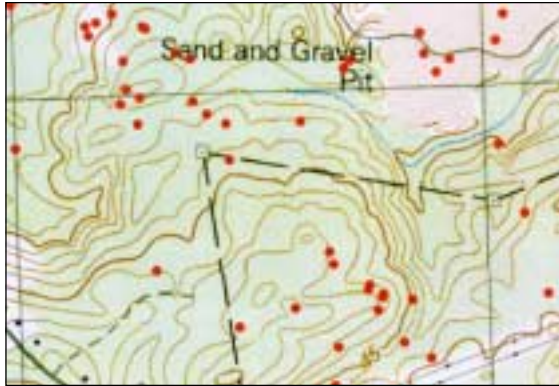
¹Garmin® website. <http://www.garmin.com/aboutGPS/>

Collecting Data

In order to produce a trails map, MVPC needs the following information:

- Longitude and Latitude Points
- Attribute Notes
- Coordinate System Used During Data Collection

Make sure that your GPS unit **is collecting all the track points** along your route, not just waypoints. Waypoints alone do not provide enough data to produce a trail route – instead your trail will look like intermittent dots on a map! Map 1 below was produced using only waypoints, while Map 2 was produced using both waypoints and track points.



Map 1: Waypoint Data Collection/Export Only



Map 2: Full Track Collection/Export

Data Collection Check List

- Track points collected and exported, not just waypoints
- Coordinate system used during data collection is noted
- Trail attributes are noted in the data set (see legend symbols on page 5)
- Data is exported to one of the formats listed on page 6
- Data is exported to columns
- Data for longitude and latitude have six places of precision

For additional information on MVPC's Offroad Trails Advisory Committee, or if you would like to collect GPS data for the MVPC Offroad Trail Advisory Committee, please contact:

Jane Healey
Transportation Planner
(978)374-0519
jhealey@mvpc.org

Things to Consider Prior to Collecting Data



Satellite Positioning

Satellite positioning varies throughout the day and can effect a signal. Often your individual GPS software will provide a “Quick Plan” feature which plots the available satellites and corresponding precision for any day collection is planned. It is often useful to consult the “Quick Plan” prior to organizing GPS data collection for a particular day/time.



Weather

Heavy cloud cover can hinder a signal.



Leaves

Too many leaves on the trees can also block a signal.



Speed

Walking a trail too fast may leave gaps in the recorded trail data.

Noting Trail Attributes

While walking along the trail, please note in your data set any attributes from the following list that you want delineated on the trail map. Attributes can be stored as waypoints.

Figure 1 shows the attributes that MVPC utilizes when producing the trails maps. Please use these when noting features on the trail that you would like shown on your map.

	ATV		Historic Site
	Beach		Kiosk
	Beach/Boat Facility		Mountain Biking
	Beaver Habitat		Parking
	Bench/Table		Phone
	Boat Ramp		Playground
	Bridge		Point of Interest
	Camping		Private Entry
	Clearing		Restroom
	Debris		Scenic Point
	Entry		Sign
	Equestrian		Stone Wall
	First Aid		Stream
	Fishing		Tennis Court
	Fountain		Trash Receptacle
	Gate		Wet Area

Figure 1: Symbol Set and Features to Note

Glossary

Track	Direction of travel relative to ground position
Waypoint	A navigaion fix, usually a destination or point of reference.

Exporting Data

In order for MVPC to use your data for mapping, you will need to download and convert the data into one of the following formats:

- ASCII
- Comma Delimited
- Comma Separated Variable (CSV)
- Text

Free-access software is available on the Web that allows users to import data collected by their GPS unit to their PC and then export the data in one or more of the above listed formats. A few of these programs are listed below.

GPS to PC Freeware

ExpertGPS
Supports most GPS receivers and runs on Windows 95 and above.
<http://www.expertgps.com>

GPS TrackMaker®
Supports most GPS receivers and runs on Windows 95 and above.
<http://www.gpstm.com>

Waypoint+
Supports Garmin GPS receivers and runs on Windows 95 or NT.
<http://www.tapr.org/~kh2z/Waypoint/>

Exporting Data

As discussed above, it is important that you export all of the points that you collected during your trail walk – not just waypoints!

The exported information should be separated into columns. Data for longitude and latitude needs to be at least **6 decimal places** of precision.

Please don't round!

Your final data set should look similar to Figure 2.

Latitude	Longitude	Translation Info
42.7351106,	-070.8795620,	"BF Tom 6Jan02", ff
42.7352232,	-070.8797766,	"BF Tom 6Jan02", ff
42.7353198,	-070.8803774,	"BF Tom 6Jan02", ff
42.7354539,	-070.8812250,	"BF Tom 6Jan02", ff
42.7355076,	-070.8816220,	"BF Tom 6Jan02", ff
42.7356041,	-070.8820082,	"BF Tom 6Jan02", ff
42.7357972,	-070.8826841,	"BF Tom 6Jan02", ff
42.7361137,	-070.8832742,	"BF Tom 6Jan02", ff
42.7361459,	-070.8837517,	"BF Tom 6Jan02", ff
42.7358401,	-070.8841969,	"BF Tom 6Jan02", ff
42.7355076,	-070.8844222,	"BF Tom 6Jan02", ff
42.7353413,	-070.8842827,	"BF Tom 6Jan02", ff
42.7351589,	-070.8842935,	"BF Tom 6Jan02", ff
42.7347994,	-070.8843257,	"BF Tom 6Jan02", ff
42.7344883,	-070.8845188,	"BF Tom 6Jan02", ff
42.7341182,	-070.8848836,	"BF Tom 6Jan02", ff
42.7339036,	-070.8851303,	"BF Tom 6Jan02", ff
42.7335871,	-070.8848943,	"BF Tom 6Jan02", ff
42.7332867,	-070.8849694,	"BF Tom 6Jan02", ff
42.7329058,	-070.8848460,	"BF Tom 6Jan02", ff
42.7325571,	-070.8845778,	"BF Tom 6Jan02", ff
42.7323372,	-070.8849640,	"BF Tom 6Jan02", ff
42.7320475,	-070.8853610,	"BF Tom 6Jan02", ff
42.7320636,	-070.8853503,	"BF Tom 6Jan02", ff
42.7322567,	-070.8851249,	"BF Tom 6Jan02", ff
42.7325142,	-070.8846207,	"BF Tom 6Jan02", ff
42.7327610,	-070.8846207,	"BF Tom 6Jan02", ff

Figure 2: Data Set with 6 Decimal Places of Precision