

MORRILL COORDINATES AND ERRORS

Dana Morong, Madbury, N.H.

Philip Morrill, in his *New Hampshire Mines and Mineral Localities* (1960, 2nd edition) used a coordinate system to locate sites upon 15' U.S.G.S. topographic maps, a system which is actually a modified version of the Kemp Ninth Coordinate System (Kemp, 1905; this was also mentioned by Ives, 1947). Morrill, however, used a system in which the rectangles were numbered from 1 to 9 beginning in the northwest corner and going in a reversed "S" pattern to the opposite corner. Each rectangle was further divided into nine, and a continuation of the system resulted in a five digit index in which the area of the last digit is placed by judgment. This used a plastic template, marked out in 3x3 sections, to fit within a ninth of the map, each section divided into 3x3, and so on, yielding a precision of the last numeral locating a site within a box of about 275 x 375 feet as scaled on the map. This was about as good as one could get with the 15' topographic sheets.

Map coordinates were given by this method: Name of the 15' quadrangle, then a series of five numerals separated by hyphens. These were given in parentheses, after the name of the locality, which was listed under the town.

Morrill's coordinates were pretty good for most localities; in fact most of them were remarkably good considering the limitations of the materials then available. However, a few coordinates and directions are in error. Some (uncommonly) came from erroneous directions (possibly donated by another person), a few from now outdated directions (a route junction has been moved and hence changed a distance to next turning point), but most of them apparently came from a typist misreading handwritten numerals, so that a 3 looked like a 9, a 1 looked like a 7, a 7 looked like a 2, etc. This is understandable when one considers that electronic word processors were not available at the time (and hence the first draft might be handwritten), and proofreading of numbers is difficult at best. I have also seen this type of error in references in a town history (as few town histories have any source referencing, I did not blame the one that did; at least the few erroneous numerals referring to volumes or pages can be tracked down and found, and the reference checked). I suspect that Morrill's draft was written by hand using pencil or pen, and that someone else may have typed it, and therefore misread a few of the numerals.

In some cases it looks as if someone had accurately plotted the site on a topo map, and then after its coordinates had been written down, had copied erroneously one or more of the numerals (usually numerals that look alike in handwriting), then someone else had made directions based upon the erroneous coordinates. In other cases it appears that erroneous coordinates were based upon erroneous directions. A few sites appear, by their coordinates, to have been actually plotted from erroneous directions, and in at least one case (the Smith mine in Newport) Morrill must have known where the mine was; apparently someone else had introduced the error. Fortunately there are few examples of such blatant errors.

As such a project can be a massive undertaking, Morrill may very well have had help in the project, and some of the help may have contributed errors.

Some examples of errors in Morrill's book:

Albany: Passaconway Gravel Pit (Mt. Chocurua 2-2-2-3-7). This is said to be where the road crosses Downes Brook, but if one plots it on the 1958 edition of the quadrangle map, that comes out to 2-2-2-5-5. However, Morrill likely used the 1931 edition, in which the road (then ending at Downes Brook) would have crossed it at exactly 2-2-2-3-7. Thus the edition of the topo map used at the time may have made a slight difference. The 1958 map actually shows a "Gravel Pit" (which plots at about 2-2-3-6-6) at about a quarter mile east of the brook. Further research may someday clarify the matter about exactly where this pit was.

Alstead: Big Mine ... ("Bellows Falls 8-9-7-8-4 to 9-3-1-1-1"). The first set given is clearly in error, being way out of town, but the second set is pretty close. Actually, if the first coordinates instead were 4-9-7-8-7, this would be correct.

Gilsum: Nichols mine (Bellows Falls "9-3-7-1-7") should be 9-3-7-1-2.

Conway: White Mt. Granite Quarry. (North Conway "8-6-8-7-1"). "West of Saco River on W side of Birch Hill at 700 ft elev." The coordinates are not on Birch Hill, and so are clearly in error. They could have been 8-6-9-6-1, which is closer to the west side of Birch Hill. The topo map seems to indicate a steep side, and possible quarry, at that point.

Lovejoy Gravel Pit. (Ossipee Lake 2-2-1-2-6) seems also to be in error, as maps show it to be where 2-1-3-2-7 is (2-1-3-2-6 is admissible, so it may have been a copying error).

Francestown Soapstone Quarry. (Peterboro "3-2-6-3-4"). As this quarry is clearly shown on the topo map, it should have been 3-2-4-1-6. The error may have been in the road distance, and if the coordinates had been based upon that error, that might account for it.

Jackson (Bartlett?): Iron Mt. Mine (North Conway "6-6-2-3-3") may be erroneous, as this places the mines on a northeast spur of the mountain within Jackson, whereas Barton & Goldsmith (1968) definitely place and map them southwest of a southeast spur of the mountain, well within the bounds of Bartlett, as does Smith (2001) by his apparent directions (although his article said "Jackson" in its title, the South Peak on the map, and the mines, are actually within the bounds of Bartlett). The lower mine should be at about 6-6-7-3-3, which makes one suspect misread handwritten numerals in the manuscript.

Lisbon (the former part of it that is now the town of Sugar Hill): Franconia Iron Mine (Moosilauke "3-8-3-2-2"). The erroneous coordinates place it east of Ore Hill nearly half a mile from its true location. The true coordinates are 3-8-2-2-2.

Littleton: Quint Copper Mine ("Moosilauke 8-1-6-7-4") is clearly in error, as that would place it in Benton, several townships away. It should be *Littleton* 8-1-6-7-4, which coincides with a mine symbol within that township on a geological map of that quadrangle.

Lyman: Pattuck Copper Mine ("Littleton 7-5-7-5-8 and 7-5-7-1-6"): of the two coordinate sets listed, the first one may be in error, as a mine symbol on the 7½' topo map matches up with what would have been 7-5-7-8-5; the numerals may have been misplaced.

Madison: Madison Lead Mine (Ossipee Lake “5-7-2-8-5”) had simply a small positioning error, and should have been 5-7-2-7-5, which places it within the jog of the road where the road jogs to go around the mine. This type of error is common but hardly avoidable with the scale of maps then available.

Newmarket: Silver mine (Dover “6-9-8-6-9”): both its coordinates and its directions are wrong by much; evidently the North and South, and East and West directions got mixed up and then the coordinates based upon those make the site impossible to find in that part of town. However, if one reverses all the directions, but keeps the distances, it may come out close. The mine is easy to find if you know where to stop and park (very few safe places to park on the road along there), and walk a short distance up Great Hill (upon which is a water tank or tower), which is south (not north) of town; the mine coordinates should be 7-3-6-8-2. Curiously enough, there is a symbol very close to the spot on the 1918 edition of the topo map, but not on the 1956 edition.

Newport: G.E. Smith mine (“Sunapee 6-7-2-3-2”), and Chandler Mills mine (which is across the road to the south and uphill of it); their coordinates were evidently based upon their directions. First, the “2.5 mi” may be closer to 2.8 (a road changed since then), and the “0.7 mi” should have been 1.7 miles (down the road from Rt. 11). The mine map in Cameron, et al. (1954) shows the G.F. Smith mine (yes, they called it the “G.F. Smith” mine) as south of the river, and north of the road (between the road and the river), whereas an old railroad grade ran parallel to and just south of the road at that time. Further south of the road up the hill is the Chandler Mills mine. These are about a quarter mile west of the junction of roads marked on the map as Chandlers Mills south of the river. However, if one used Morrill’s distance, the old railroad grade had crossed the river and was on the north side of the river. It is evident that here Morrill’s directions and coordinates were in error, and should be “(Claremont 4-9-3-3-8).” This would then agree with Cameron, et al. (1954) which is correct. It is notable that Gallup, 1970, is also in error here; he evidently copied Morrill’s directions.

In Morrill’s 1963 booklet, page 21, he gives the distance (from Route 103) as 1.3 miles, which is too short, but does give a crude map with the railroad grade shown in approximate position. (It is interesting that in comparing photocopies of parts of the two 7½’ topographic maps of that area, the Newport 1:25,000 scale map, and the South Claremont 1:24,000 scale map, that their grid lines didn’t match up. I copied a piece of the Newport map, enlarged it to make it same scale as the other map, and then their topography matched, but their grid lines did not. This is because the Newport map that I had used at the time was based on datum NAD83, whereas the other was NAD27 - more on these datums later).

Nottingham: Pawtuckaway Mt. Road Metal Quarries (Mt. Pawtuckaway “6-4-8-6-4, 6-4-8-7-3”) were actually in Deerfield, as the 1.25 mile (in the directions) should have been 2.25 mile, and the coordinate (the one to the south) should have then been 6-8-3-4-1. It took a lot of research to learn this, and as the location has been since filled and graded, it is no longer visible as a quarry.

Raymond: McGal mine (Mt. Pawtuckaway “7-9-2-1-9”) is in error, it should be 7-9-2-7-3. One can see the quarry right on the newer 7½’ topo map, which topography also correlates with the mine map in Page & Larrabee (1962).

Wakefield: Mineral Hill mine (Wolfeboro “9-9-9-1-4”) coordinates should have been 3-9-9-1-4 (although 3-9-9-1-5 may be closer to the actual location; it is hard to get the exact last coordinate in a map of the scale then used). In this case a typist evidently had a difficult time with the numeral, which may have been misread from the handwritten (numerals are difficult to proofread, especially when written), and the error in the first number threw it off by quite a bit. Gallup (1970) evidently used these coordinates to misplace, in his book, the mine from the north part of town to the south part of town, which I once confused with an old shaft several hundred feet southwest of Jug Hill Road in Milton (and which site turned out to have no mineralization, but had been once a stock swindle, though a deep shaft, and is located actually in the quadrangle to the south). However, Morrill’s directions to Mineral Hill were fairly decent. They were accurate at least at the time of my first visit to that site. (Note that the “Carrol Silver Mine” listed in Wakefield with coordinates as “9-9-9-1” near Mineral Hill should also have been 3-9-9-1).

Other types of errors:

Although Morrill’s book, as compared with many others, is remarkably good, there are a few other types of error in Morrill’s book. Some are nearly unavoidable, such as those listings taken from ancient references (such as Jackson, 1844), in which a town afterward split into two, and the portion split off assumed a new name. When a mine occurred within the area of the new town, listings often remain of it as within the old town. An example of this is in Eaton, which once encompassed what is now Madison as well as Eaton, but which in 1852 split, the western portion assuming the name of Madison. Therefore the Eaton lead mine (and a few other listings under Eaton) is now called the Madison lead mine, although listings for the mine as in Eaton still exist (a comparison of the Eaton lead mine referenced by Jackson in 1844, and the Madison lead mine referenced by Hitchcock in 1878, show that these are one and the same site). Another example is when the eastern part of Lisbon split off to become what is now called Sugar Hill. These sites in Sugar Hill are listed as in Lisbon, as it was still evidently part of Lisbon at the time of the preparation of Morrill’s book.

Another source of error may have been collectors who confused towns. One possible example is the listing of beryl in Ossipee – it may have been at a site in nearby Wakefield but which got attributed to Ossipee as being close to that town. For more information on the general subject of mislocations, see that section in the article by Bentley, Wilson, & Dunn (1986).

There is more than one example of a mix-up in directions, one example already cited as being the directions to the sites in Newport. The directions to the Pike Whetstone Quarry in Haverill may be in error; they have no definite starting point and so may not match the coordinates; but the coordinates appear to match up with depressions shown on the topo map which may be the site. Another example are the driving directions to the Parker Mt. mine in Strafford, which directions are outdated as well as erroneous, as it gives Route 9 as in Strafford, whereas a look at the U.S.G.S. topographic map, Alton quadrangle, of the edition of 1957 (three years before Morrill’s second edition of 1960) shows that Route 9 never went through Strafford. The coordinates, however, appear to be correct. Hence it is wise to check directions against the topo map before trusting to the directions on the road.

Another example, although it did not appear to affect the accuracy of the coordinates, is that for Hurricane Mountain in Conway. The “800 yards” in the directions are obviously an error, for who would walk 800 yards (half a mile) down the road again to reach the trail, which is only a short way from the parking area at the road summit. 80 yards may have been the correct amount, which is within the range of the actual distance. This error may have come from an article about the locality in a club yearbook (Putnam, 1951), as it has the same “800 yards” which was in error; Morrill’s helper may have copied that distance. Of course, references which copied the “800 yard” error from Morrill (examples of this have been seen) simply carry the error farther.

Species listings errors can be of various sorts. One is the misidentification, usually done by collectors. One example of this is a listing for a fibrous form of tourmaline within an area in which that species cannot, by the principles of geology and geochemistry, occur; the specimen may have been some sort of amphibole.

Another type of error is a mix-up or confusion of a species between two different sites within the same town. One example of this occurred under the heading for the town of Strafford: the inclusion of diopside in the species listing for Parker Mt. mine, whereas it actually occurred in a “lost” locality within the same town. A study of original references, such as those by Stewart, helps to clear this confusion. It should be noted that the reference by Stewart, 1939, does not refer to the famous mica mine in Strafford, but to a find in a gravel pit some miles to the southeast of the famous site, within the same town. It is too easy to mislocate this due to the presence of the words “Center Strafford” within the article’s title, when it actually refers to another site.

Using GPS receivers with translations of Morrill’s coordinates:

One can use a GPS (Global Positioning System) receiver at a site to get modern coordinates, provided that decent data are obtained (the number and spacing of satellites available can make a big difference in accuracy). If one uses lists of coordinates, be aware that some (such as one said to have been a government project) may have been made by enlargement of small-scale maps, with resultant enlargement of error; the presence of coordinates with a precision to only a few meters does not mean that the error may not be tens or hundreds of times the precision; precision is not the same as accuracy. One should also be aware that some coordinates, in any list of such coordinates, if such were merely converted from a previous source (*e.g.*, Morrill), may be only as accurate as those of the previous source. It might be helpful if such lists came with a note, or even only a letter, indicating which ones were translations (t) and which were also corrections.

I like to follow directions scaled upon a topo map to see how they compare before searching for a site. Having a set of the old 15’ topo maps is useful, but these are also available, for viewing, online (see under Topographic Maps). The newer 7½’ topo maps are also useful, particularly those that come on compact disks and viewable on computer.

For several years I used a system (later written in a spreadsheet file) to convert Morrill’s coordinates (provided they are correct) to latitude/ longitude, then if I want conversion to UTM coordinates, I can use the GPS receiver to do that (remembering the inherent error of the Morrill coordinate system which is only within about 300 feet, so the actual accuracy of most UTM coordinates based on these may be only within about 100 meters).

It is useful to check a GPS receiver periodically. An easy way to do it is to compute coordinates from a topo map for a few easily seen points, then go and see how they compare. A note on datums: If a GPS receiver is set on the wrong datum it can be confusing. Many topo maps have used NAD27 (North American Datum of 1927) such as used on the old 15' topo maps, and on many 7½' topo maps; this is usually noted somewhere in the bottom margin of the map. Usually the older ones with no grid lines are in NAD27, and many with the UTM grid lines are also in NAD27, although some newer maps use NAD83. If in the corners there is an extra little tick-mark for latitude/longitude, one refers to NAD83 and the other to NAD27. In New Hampshire the NAD27 corner is the one to the east and the NAD83 is the one just next to and west of it. Note also that not only do the latitude/longitudes differ in the two systems, but the UTM grids can also differ. And while it may not seem as so much of a difference in latitude/ longitude (due to its precision to the nearest arc-second), it can seem more a difference in the UTM coordinates (given to the meter, although the accuracy of the receiver is at best about 10 meters plus or minus, and for translations of Morrill coordinates up to 100 meters). If you save a position in a GPS receiver, you can have it translate between the two systems, and even between the datums.

A GPS receiver may not show NAD83 in its list of available datums. That is because it may use WGS84 (World Geodetic System of 1984), instead of NAD83. However, the two (NAD83 and WGS84) are very close indeed – for our purposes practically congruent – as in most of North America they differ, by area and report, by under 2 meters maximum. That might be much in geodesy, but is less than the inherent error in our hobby receivers. So for our uses (hiking and geology) we can use WGS84 for NAD83. However, many set theirs for NAD27, used with many of the older topo maps.

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 - Topographic Maps, at <http://docs.unh.edu/nhtopos/nhtopos.htm> [old 15’ topo maps for New England and much of New York available for viewing, although not printable at scale].
 - TOPO!™©2001 National Geographic (www.nationalgeographic.com/topo) [7½’ U.S.G.S. topographic maps on a set of compact disks, with program.]
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A few corrections to Morrill's New Hampshire (1960) guidebook:
(handy brief insert to fold in back of book)

- Alstead – Big Mine: “Bellows Falls 8-9-7-8-4” is completely out of town. This should have been 4-9-7-8-7, which translates to 43-05-02, 72-16-27.
- Conway – Hurricane Mountain: The walking directions of the “800 yards” (half a mile!) back, are in error; it should be closer to 80 yards.
- Conway – White Mt. Granite Quarry: “North Conway 8-6-8-7-1” should have been 8-6-9-6-1, which translates to 44-01-58, 71-08-51.
- Francestown – Soapstone Quarry, coordinates of “Peterboro 3-2-6-3-4” should have been 3-2-4-1-6, which translates to 42-59-21, 71-47-12. There was a road distance error; take the next road to the east (this can be seen on an aerial photo).
- Jackson – Iron mine is actually in Bartlett. “North Conway 6-6-2-3-3” (lower workings) should have been 6-6-7-3-3, which translates to 44-07-12, 71-14-29.
- Lisbon (now in the town of Sugar Hill) – Franconia Iron Mine: “Moosilauke 3-8-3-2-2” should have been 3-8-2-2-2 which translates to 44-11-38, 71-47-30.
- Lyman – Pattuck Copper Mine: “Littleton 7-5-7-5-8” should have been 7-5-7-8-5 which translates to 44-16-45, 71-58-04.
- Newmarket – Silver Mine: both the directions and coordinates (“Dover 6-9-8-6-9”) are way off; the directions had been completely reversed. It is actually south of town, west of the road, halfway up Great Hill. Coordinates should have been Dover 7-3-6-8-2, which translates to 43-04-02, 70-56-23.
- Newport – the sites are erroneous both in coordinates and in directions. The G.F. Smith mine, listed as “Sunapee 6-7-2-3-2” should have been “Claremont 4-9-3-3-8”, which the latter coordinates translate to 43-21-31, 72-15-08.
- Raymond – McGal mine, coordinates “Mt. Pawtuckaway 7-9-2-1-9” should have been 7-9-2-7-3, translates to 43-01-16, 71-10-57. One can see the quarry on the 7½’ topo map.
- Strafford – Parker Mountain mine: The coordinates are close, but the driving directions are out of date and erroneous. One now starts at Center Strafford, at the junction of Routes 126 and 202A west (the 202A which runs downhill to the southwest), and drives northwest on Rt 126 (toward Barnstead) for 2.4 miles, to a gravel parking area on the left. Cross road and find trail down embankment to the mine.
- Wakefield – Mineral Hill: the erroneous coordinates “Wolfeboro 9-9-9-1-4” misplace it miles away in another part of the map. Coordinates should instead have been 3-9-9-1-4, or even 3-9-9-1-5, the latter which translates to 43-40-28, 71-00-31.