Appalachian Search and Rescue Conference, Inc.
Wilderness Emergency Medical Services Institute

ASRC GRID SYSTEM EXPLANATION

*Version 3.1, April 13, 1997. Original concept and article by the ASRC's Yorke Brown, Ph.D.**
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Grid Systems for WEMT Classes

Any grid system can be used for the above-ground field exercises of a WEMSI Wilderness EMT class. If all students are from a team that is familiar with a particular grid system, it makes sense to use that system.

For most WEMSI classes, though, the students come from a variety of backgrounds, and may not all be familiar with any one particular grid system. We therefore recommend using the ASRC Grid System. It is simple, quick to learn, and works well in practice. By photocopying Figures 5 and 6 onto a transparency, you may easily produce grid overlays for your own classes. A computer-readable version of the grid overlay may also be found in the version of the Course Guide available on the WEMSI Web site at **www.wemsi.org**.

Figure 4 illustrates the use of the ASRC Grid System to prepare a map for the field exercises of a WEMT class. The original version of this map was made simply by using a standard USGS 7.5' topographic quadrangle map. Trails were mapped by simple field inspection by mountain rescue team members and drawn on the map with a sharp pencil. This map was then enlarged using a photocopier, and then recopied with the ASRC Grid Master placed over it. The version you see here was prepared by computer as follows. The appropriate portion of the USGS topo map was scanned with a scanner (UMAX S-12). This base map was then aligned and cropped with a bitmap editor (Picture Publisher). This base map was then imported into a vector drawing program (MicroGrafx Designer) and used as the base layer. The drawing of the ASRC Grid Overlay was then superimposed on a second layer, and trails drawn on a third layer. This was then exported as a Windows bitmap file, and the result imported into Word for Windows.

* Historical Note: many versions of the ASRC Grid Overlay have appeared over the years. The text in this article is taken almost verbatim from Yorke Brown's original gospel. The only additions are the introduction about the use of the ASRC Grid System in WEMT training, and Figures 4, 5 and 6. Also, note that it is possible to print figures 4 and 5 on paper, cut out the central portions, and then paste them on either side of a transparency copy of either one -- this provides a single overlay than can be used in either portrait or landscape mode. The only changes from the original are that boxes for Quadrangle Name and UTM 0,0 have been added to the grid overlay, and a slightly different map is used for Figure 3. UTM 0.0 specifies the UTM coordinates of the lower-left corner of the map, and thus allows calculation, with a bit of math, of the UTM coordinate of any point on the map.

The ASRC Grid System

In order to assure accurate, unambiguous, and efficient reporting of positions in the field, the ASRC uses a grid coordinate system similar to that employed by the U.S. Army. Since gridded maps are unavailable in large quantities to the ASRC, gridded photocopies of a single original map are used. An 8-1/2"x11" acetate overlay with a coordinate grid drawn or photographed on it is placed on the original during photocopying so that all the copies carry identical grids. Since the use of photocopy maps is the norm, this step poses little inconvenience to the person procuring maps. Using the grid system, a position report accurate to within 70 meters may unambiguously be made with only five figures, and a position report accurate to seven meters may be made using seven figures. Although the system is designed for use with maps at a scale of 1:24000 (e.g. the USGS 7.5' topographic quadrangles), it may be used effectively with any kind of map.

A sample gridded map is attached. The hachures on the borders are spaced 500 meters apart and labeled every kilometer. The hachures on the map itself are spaced one kilometer apart. Note that the origin of the grid is always in the southwest corner of the map. The overlay is reversible to get the long axis of the sheet north-south or east-west, whichever is more appropriate. On the left margin is a box containing the name of the map, which is a letter designating which run of photocopying from which the map was taken. All maps with the same letter designator are thereby assured of having the same grid. The declination is given in the box below the letter designator. When the copies are made, the overlay is best placed so that grid north and true north are identical, but this is not absolutely essential. In any event, the deviation between grid north and magnetic north must be checked for each run of photocopying and noted on each sheet.

Above the name block is a conversion table from meters on the ground to millimeters on the map. This table is calculated for a map with a scale of 1:24000. Photocopy machines generally enlarge slightly (usually less than 1%), so the table will not precisely match the photocopy map, but it will be close enough for all practical work. No attempt is made to correct for this enlargement because different machines may enlarge to a different degree, and the correction is negligible over 500 meters anyway. The purpose of the scale is to allow more precise plotting than can be done by eye, although the grid can be interpolated by eye to within 100 meters quite accurately.

A position report has three parts comprising a total of either five or seven figures. A five figure coordinate group plots a position to lie within a 100 meter square and a seven figure group plots the position to lie inside a 10 meter square. Figure 1 illustrates an example plotted on the attached map.

It should be noted that any position within the 100 meter square will be described by the coordinate group B3527. Consequently the maximum error will be 70 meters. To specify the position to within a 10 meter square (which is only 0.42 x 0.42 mm on the map!), the coordinates can be taken to seven figures as shown in figure 2.

To keep the order of the figures correct, remember the mnemonic "read right up"; alternatively, one may view the coordinates as Cartesian X-Y coordinates, where the X coordinate customarily comes first: (X,Y). Five figure coordinates are accurate enough for almost all field work.

A typical radio position report might go like this:

B 3 5 2 7

MAP B

3 km + 500 m	2 km + 700 m
East of west	North of south
edge of map B	edge of map B

Figure 1. Sample 5-figure coordinate group. This coordinate group plots a position to lie within a 100 meter square centered on the point described.

"TEAM CHARLIE, THIS IS BASE."

"BASE, THIS IS TEAM CHARLIE. GO AHEAD."

"WHAT IS YOUR LOCATION? OVER."

"STAND BY." (Field Team Charlie members consult their map and compass.)

"BASE, THIS IS TEAM CHARLIE. OUR LOCATION IS, FIGURES, BRAVO, THREE, TWO, TWO, SEVEN. OVER."

"ROGER. BASE CLEAR."

"TEAM CHARLIE CLEAR."

When 7.5' quads are not available, the grid may still be superimposed on any map and used to plot and report positions, but the grid squares will not be one kilometer wide.

Some search and rescue agencies, particularly military ones, use the Military Grid Reference System (MGRS), which employs the metric Universal Transverse Mercator (UTM) grid. Most local quads do not have a UTM/MGRS overprint, but their borders do have blue UTM tick marks each kilometer (1000 meters), with the MGRS coordinate: meters north of the equator or east of the MGRS reference. It is possible to align an ASRC grid overlay on a 7.5 minute quad so that the ASRC grid is in register with the UTM grid, using these blue UTM ticks. It is important to note, however, that the UTM/MGRS north coincides neither with the true north of the map edge grid ("neat lines") nor with magnetic north. If a map is photocopied with the ASRC grid in register with the UTM grid, the declination specified on the photocopied map should be that from UTM grid north to magnetic north. This is easily calculated (in the ASRC geographic area) by adding the UTM declination and the magnetic declination, since they are of opposite direction. Both UTM and magnetic declination are specified at the bottom of each USGS quadrangle map.

B 2 7 6 4 3 2

MAP B

2 km + 700 m + 60 m East of west edge of map B	4 km + 300 m + 20 m North of south edge map B

Figure 2. Sample 7-figure coordinate group. This coordinate group plots a position to lie within a 10 meter square centered on the point described.

Figure 3. Sample topographic map section with ASRC grid overprint (reduced to fit on page).

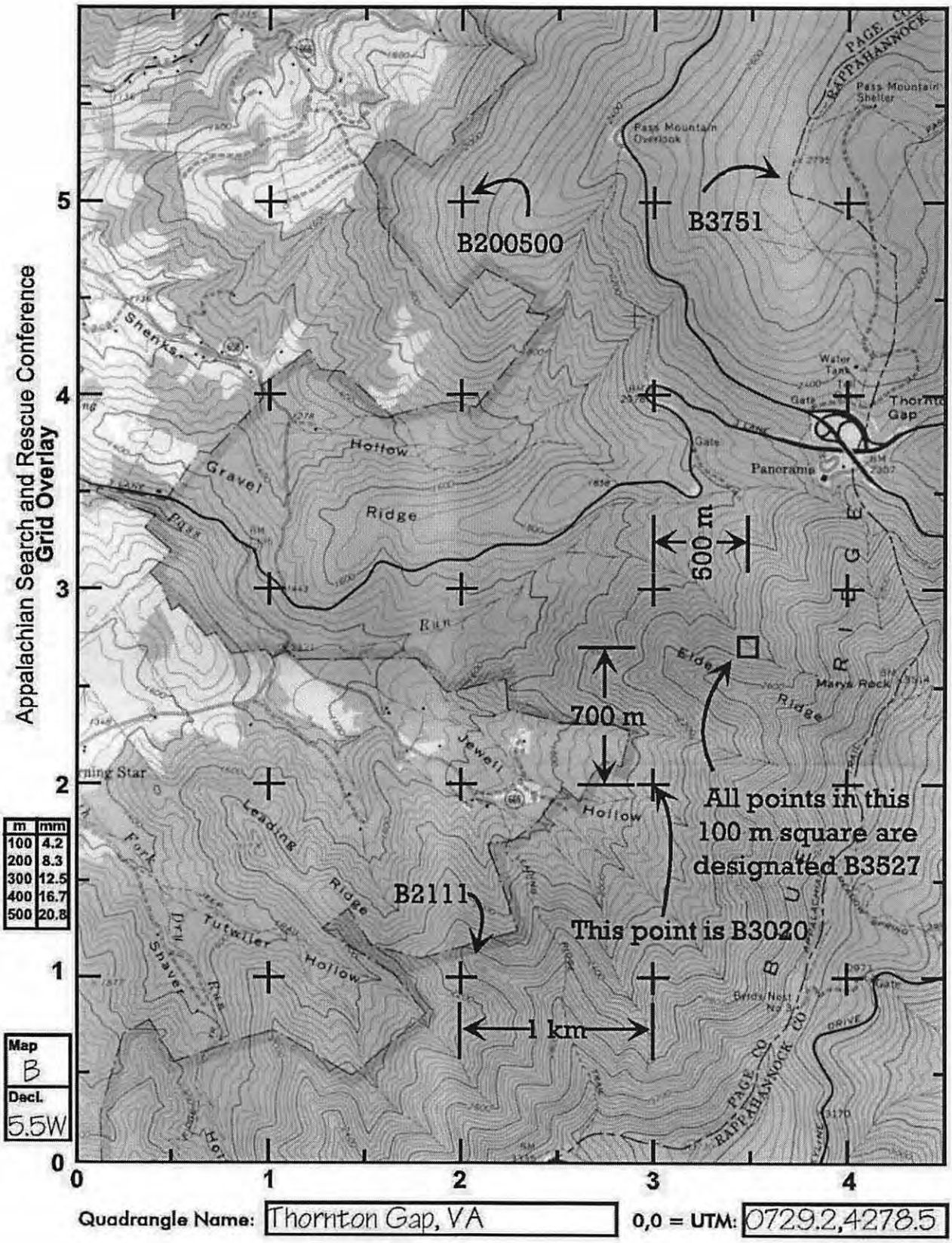


Figure 4. Sample WEMT Field Exercise Map (reduced to fit on page; see text)

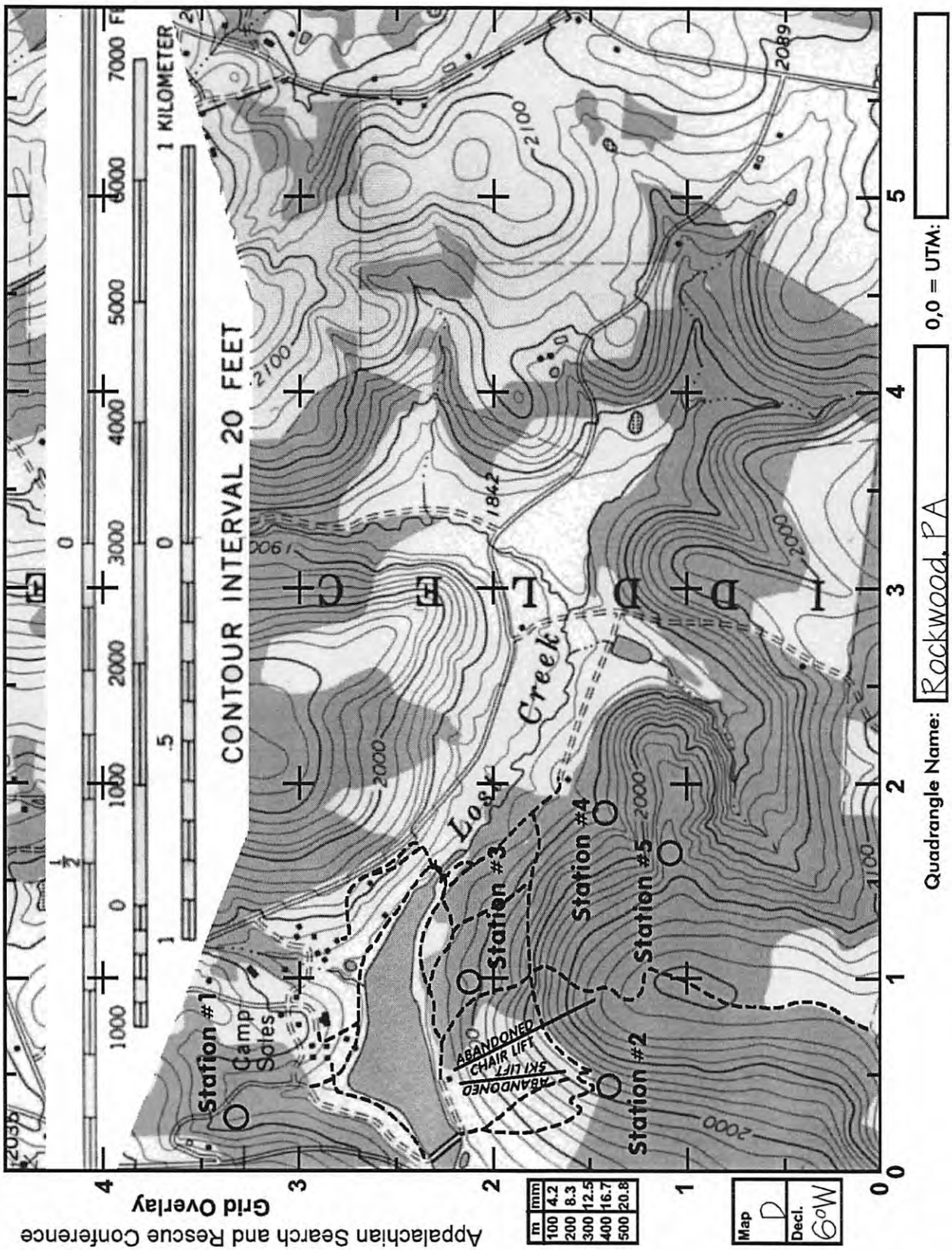
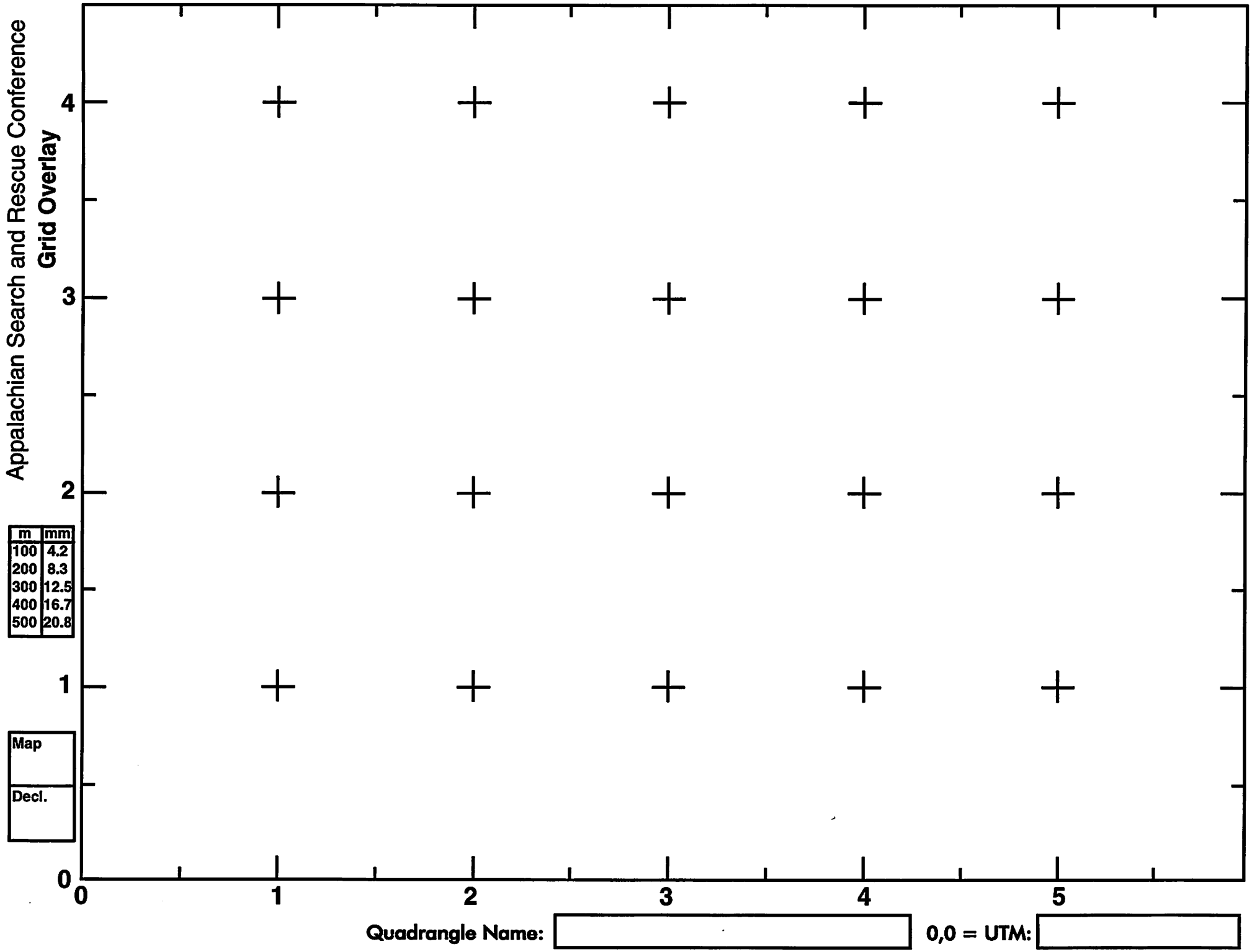
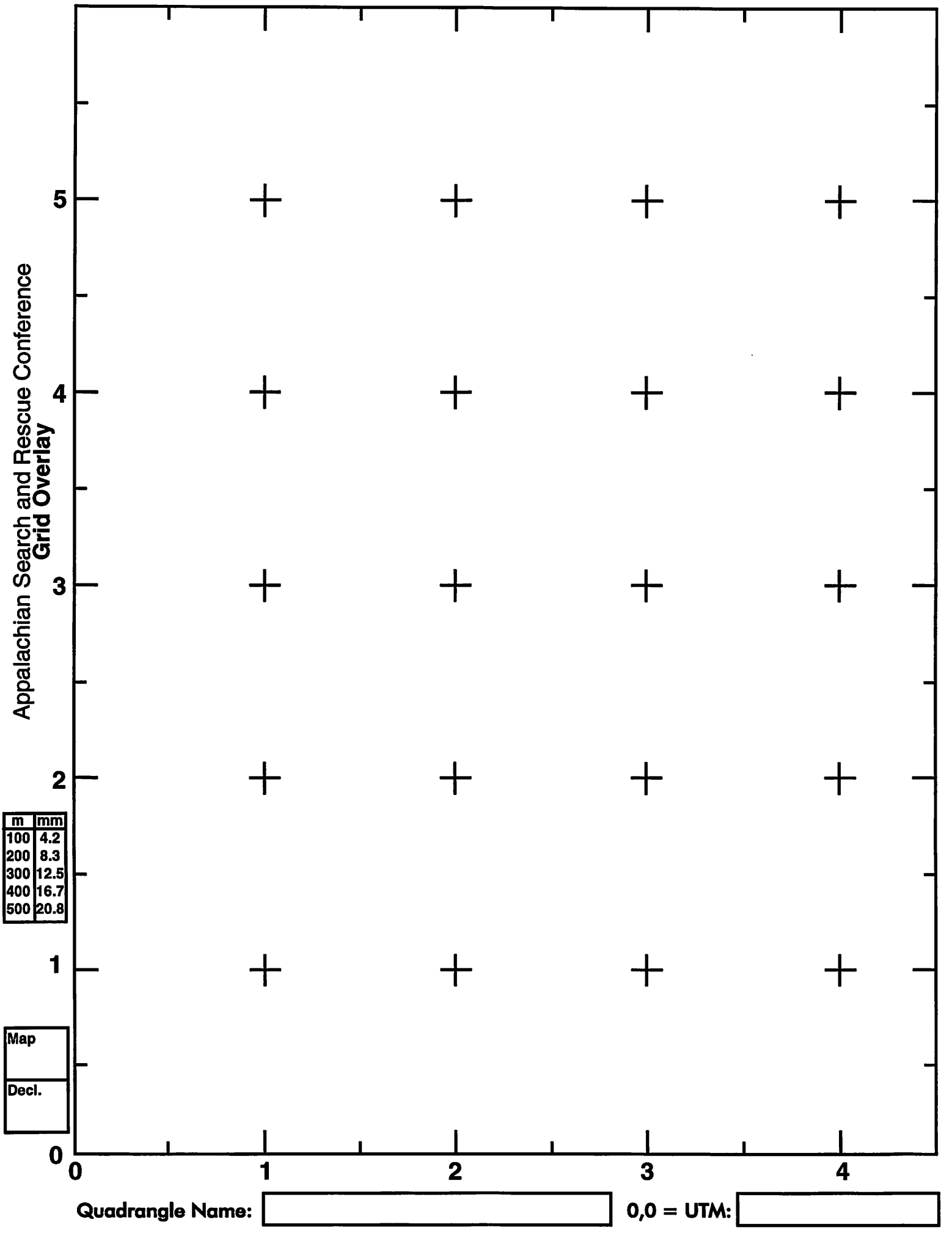


Figure 5. ASRC Grid Overlay Master, Landscape Orientation, and
Figure 6. ASRC Grid Overlay Master, Portrait Orientation,
appear on the next two pages without page marks.


Appalachian Search and Rescue Conference
Grid Overlay
m
mm
100
4.2
200
8.3
300
12.5
400
16.7
500
20.8
Map
Decl.
0
1
2
3
4
5
Quadrangle Name:
0,0 = UTM:


Appalachian Search and Rescue Conference
Grid Overlay
m
mm
100
4.2
200
8.3
300
12.5
400
16.7
500
20.8
Map
Decl.
0
1
2
3
4
5
Quadrangle Name:
0,0 = UTM: