

***BASIC MAP & COMPASS SKILLS***  
*for Conservation Easement Monitoring*

**1. Introduction**

- Locating and maintaining boundaries is essential to easement monitoring
- Knowledgeable use of a compass, survey, and maps is essential
- Use common sense and prepare properly so your visit is done safely

**2. Boundary Survey Maps – *what to look for***

- Locus map showing general location of the property
- Legend that explains the symbols used
- Names and locations of different places and features
- Bar scale, and/or 1"= a certain distance (note: if the map was photo reduced only the bar scale will remain accurate)
- Orientation, shown as North arrow, usually magnetic north (if grid or true north observation, adjust compass accordingly)
- Surveyor information: name, license #, type of survey, degree of accuracy, certification, plan date / revised
- Reference Plans, Notes
- Show boundaries of a property, monumentation of corners, shown as distance and bearing (usually quadrant, rarely azimuth)
- Extra features may include field and forest edges, trails, interior stone walls, structures, physical features of the land
- Cross reference with USGS topos for physical features

**3. The Compass**

*Types:*

- i. Quadrant or Azimuth
- ii. Base plate / mirrored
- iii. Circle over circle
- iv. Know your compass: Read instructions that it came with

*Terminology:*

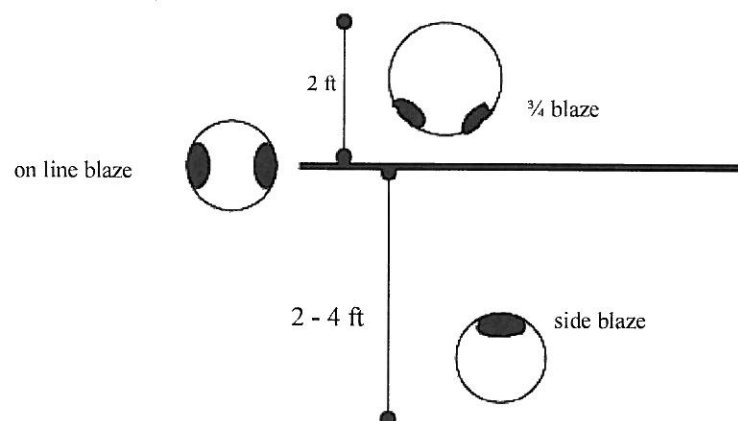
- i. Base or baseplate: flat rectangular clear plastic portion of compass, usually with scales, sometimes magnifier.
- ii. Housing: raised round portion which rotates and marked by degrees and bearings and with "red shed" north needle match
- iii. Direction of Travel Line or Arrow: line or arrow through top middle of compass and center of mirror used to determine or sight direction of object or travel.
- iv. Magnetic needle: always points toward magnetic north

#### 4. Pace and Distance Determination

- Provides simple tool to approximate walking distance
- Never hurts to carry a long tape especially if addressing a more critical issue and exact location is necessary
- Pace = 2 steps *or* each time your left foot hits (if started with right)
- Measure your pace over the course of 100 feet
- Count the paces, divide distance (100 ft) by number of paces (ex. 20 paces over 100 feet = a 5 foot pace)
- Do this more than once to get a good average
- Do this on different terrains to see difference
- Maps show only horizontal distance
- Adjust for different terrains or conditions
- To calculate # of paces divide distance to travel by pace (ex. to travel 445 ft. with a 5 ft pace requires 89 paces)









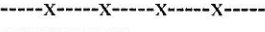


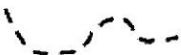
#### 5. Boundary Line Markings

- *Corner marking*: Corner monuments (set pin/rod/pipe, stone pile, cement/granite post) are usually circled by one to three “witness” trees. Witness trees are near the corner and are blazed/painted with three marks, vertically, facing *in* toward the point.
- *On line blaze*: two blazes that are on opposite sides of a tree indicate a line going directly through the tree, and its direction.
- *$\frac{3}{4}$  blaze*: two quarter blazes on side of trees facing line that are no more than two feet from the boundary line
- *side blaze*: singular blaze facing line on trees that are offset between two and four feet from the boundary line.
- *Witness tree*: triple blaze (vertical) facing the exact corner; multiple trees allow triangulation to locate corner.



## 6. Map symbols

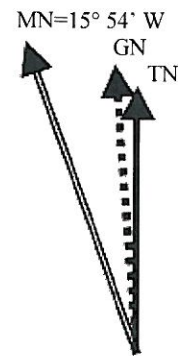
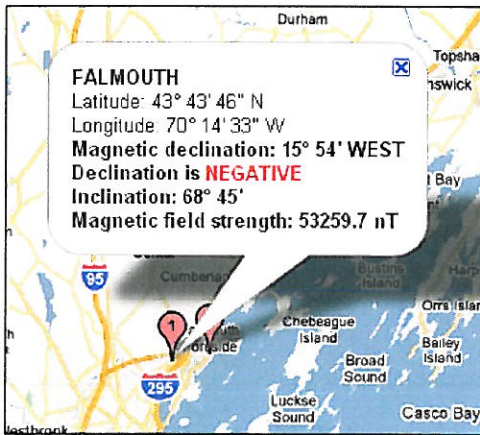
Below is a partial list of the most commonly used symbols on a survey. When reading surveys be advised that symbols sometimes vary. Check the legend if there is one. Evidence in the field is sometimes missing, was never set, has been obliterated by road or site construction, etc. Wooden stakes, spikes, flagging that are used to conduct a survey and often left in place can be confusing. They do not always indicate a boundary or corner as in the case of a tie line. It is illegal to tamper with, move, or remove survey markers.

Map Symbols	Meaning
set	Suffix indicating surveyor "set" a new monument
fld.	Suffix indicating surveyor "found" an existing monument
tbs	Suffixing indicating monument "to be set" at a later time
d.h. / DH	 d.h. found A small to finger size hole usually in a large rock or boulder, sometimes shallow and obscure or buried by debris
IP	 IP set  IP found Iron pin or pipe, used loosely it can mean a variety of materials from old axles to rebar
GB	 GB set  GB found Granite or cement monument, sometimes with height indicated
RB	 Rebar or reinforcing bar, now commonly used to mark corners
S/S	 Stake and stones or stone pile
	 Utility Pole, several variations are used
	 Barbed wire fence
	 Stone wall
	 "Tie line", technique used to cross wetlands, connect corners, closure
	 Trail, footpath, woods road

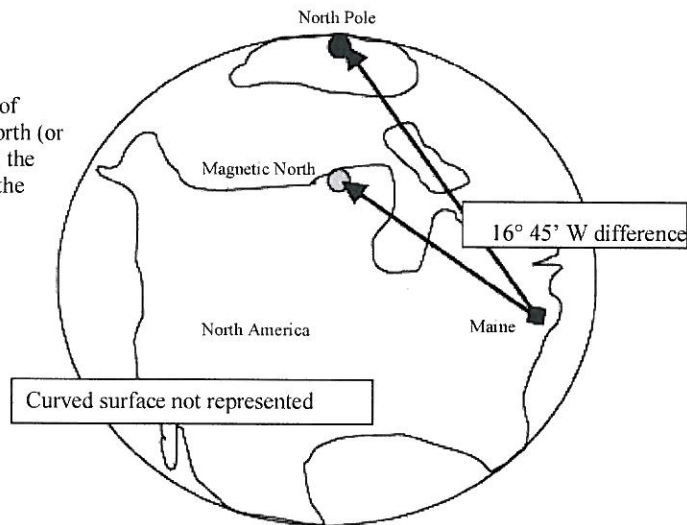
## 7. Declination

*Maine has a western declination:*

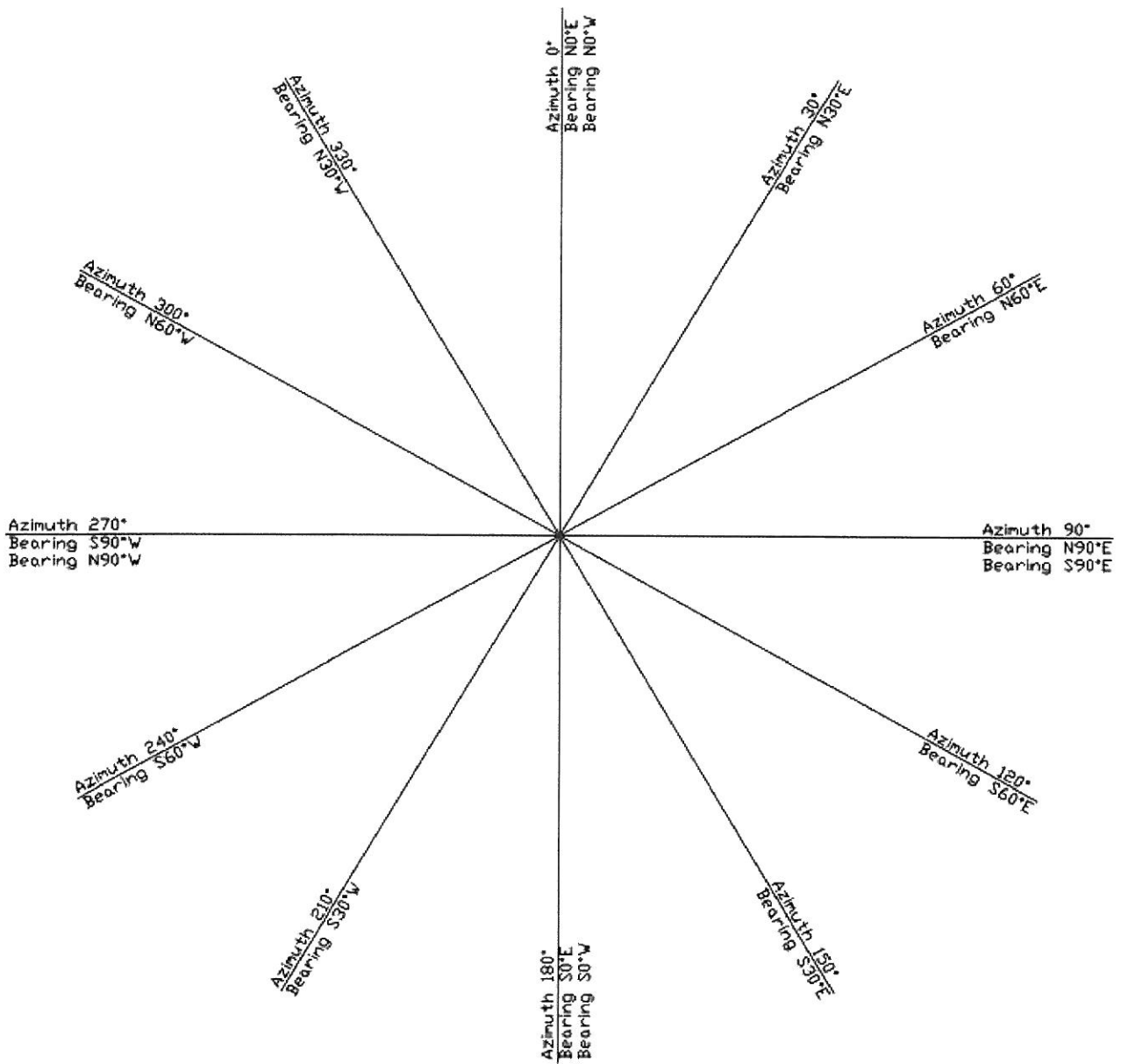
- If the survey bearings are based on **True North (TN)** you will need to adjust your bearings to Magnetic North (MN) by twisting the compass housing *counterclockwise* (or adding) the magnetic declination amount for your area ( $16^{\circ} 54' W$  is the current magnetic declination for Falmouth Maine.) For your current declination, go to: <http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp> or <http://www.magnetic-declination.com/>.
- If the survey bearings are based on **Grid North (GN)**, you can essentially adjust your bearings the same way you would for TN. Although there is a slight difference between the two, it is not enough to notice for monitoring purposes.
- Some recent surveys are based on **Magnetic North (MN)**, for which you don't have to adjust for declination. If you do, most good compasses can be adjusted for easily. See your compass instructions for details.



The illustration on the right is a representation of the geographic differentiation between True North (or the North Pole) and Magnetic North, located to the south of True North. This difference results in the Magnetic Declination.



## 8. Converting between Azimuths and Bearings



### Quadrant 1: Northeast quadrant

Azimuth=Bearing

Bearing=Azimuth

### Quadrant 2: Southeast Quadrant

Azimuth=180-Bearing

Bearing=180-Azimuth

### Quadrant 3: Southwest Quadrant

Azimuth=180+Bearing

Bearing=Azimuth-180

### Quadrant 4: Northwest Quadrant

Azimuth=360-Bearing

Bearing=360-Azimuth