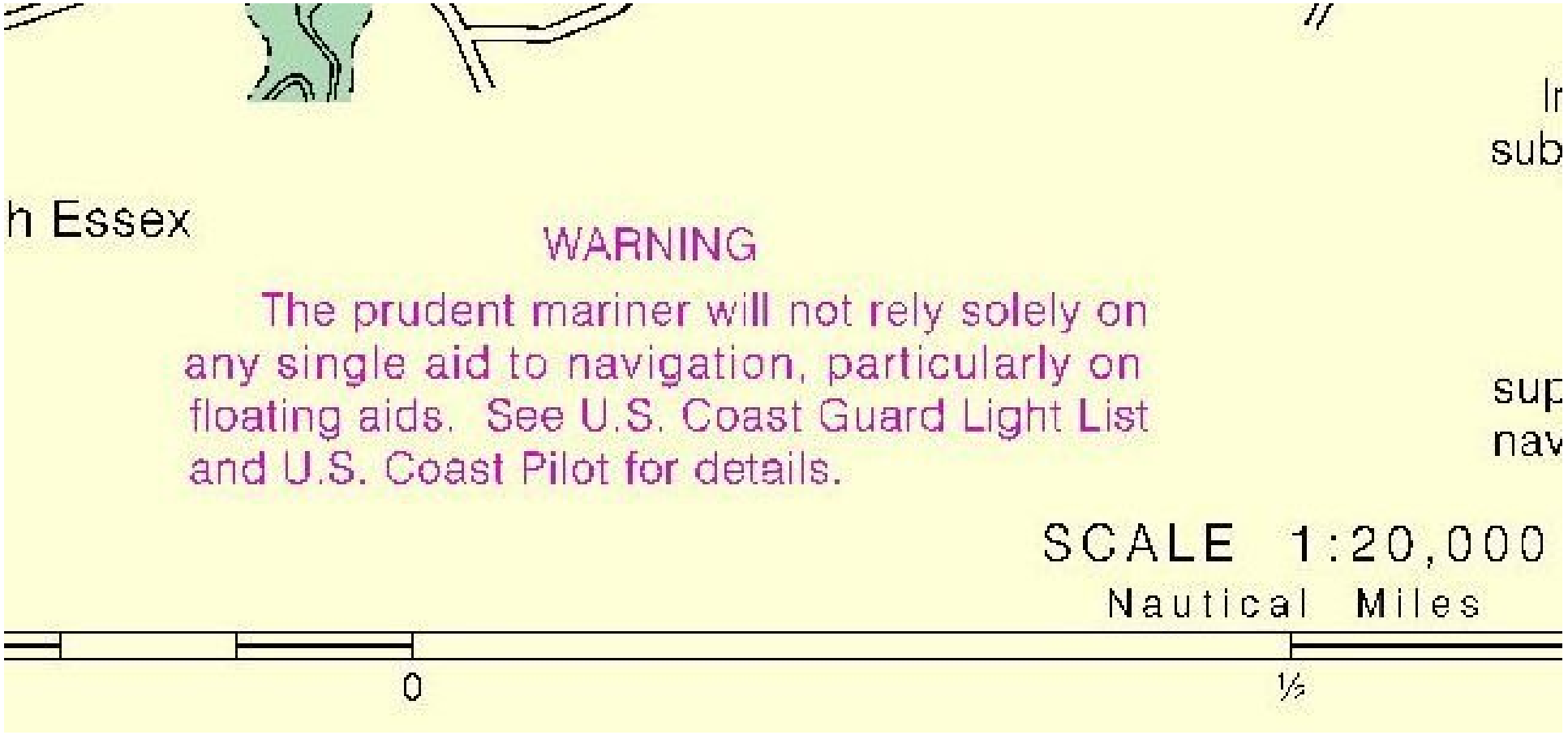
Land Navigation III
Wayfinding, Telling North



"The prudent mariner will not rely solely on any single aid to navigation"

Sorts of navigational Knowledge

- Landmarks
- Route Knowledge
- Survey Knowledge

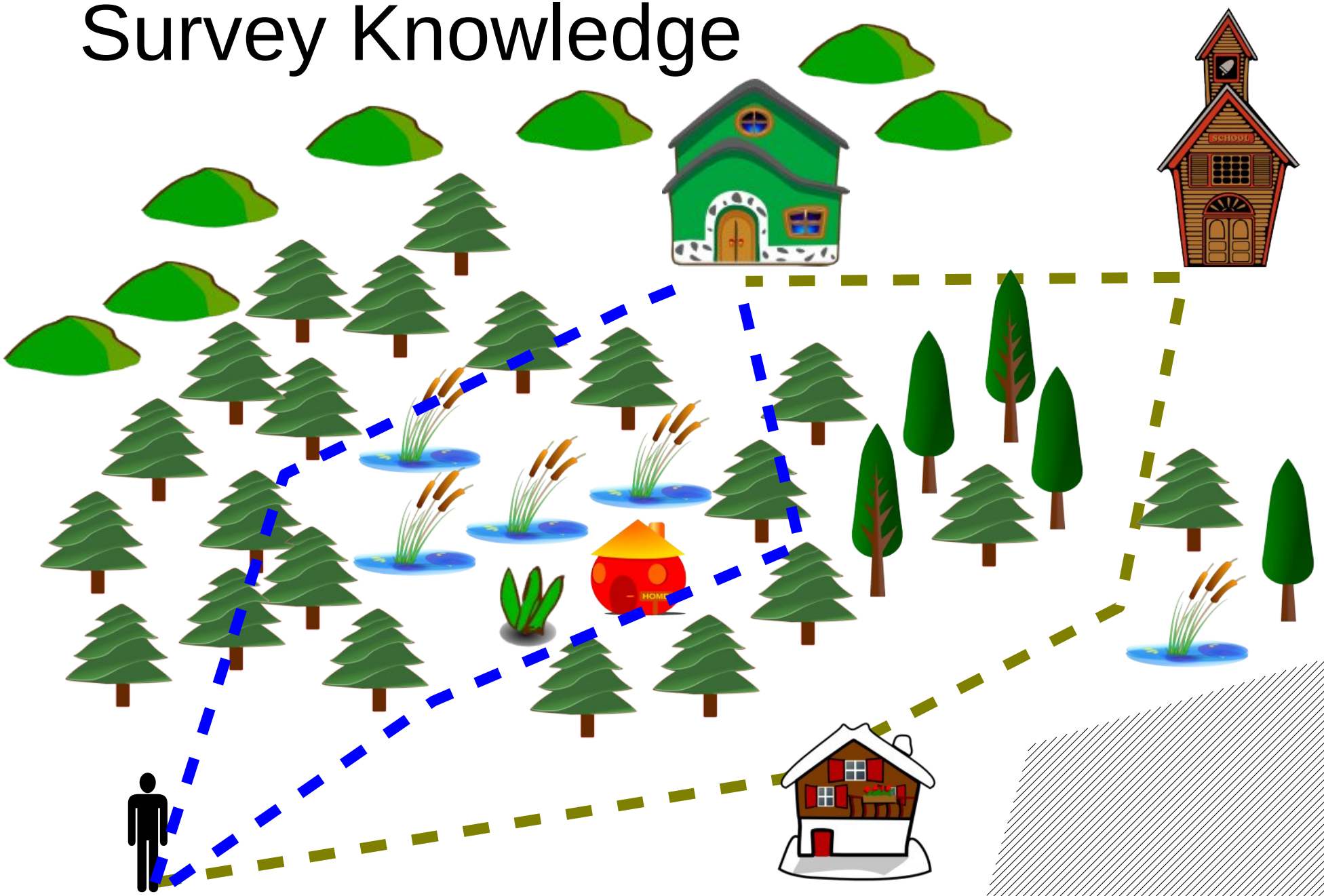
Route Knowledge

Turn Left

Turn Left

Bear Left

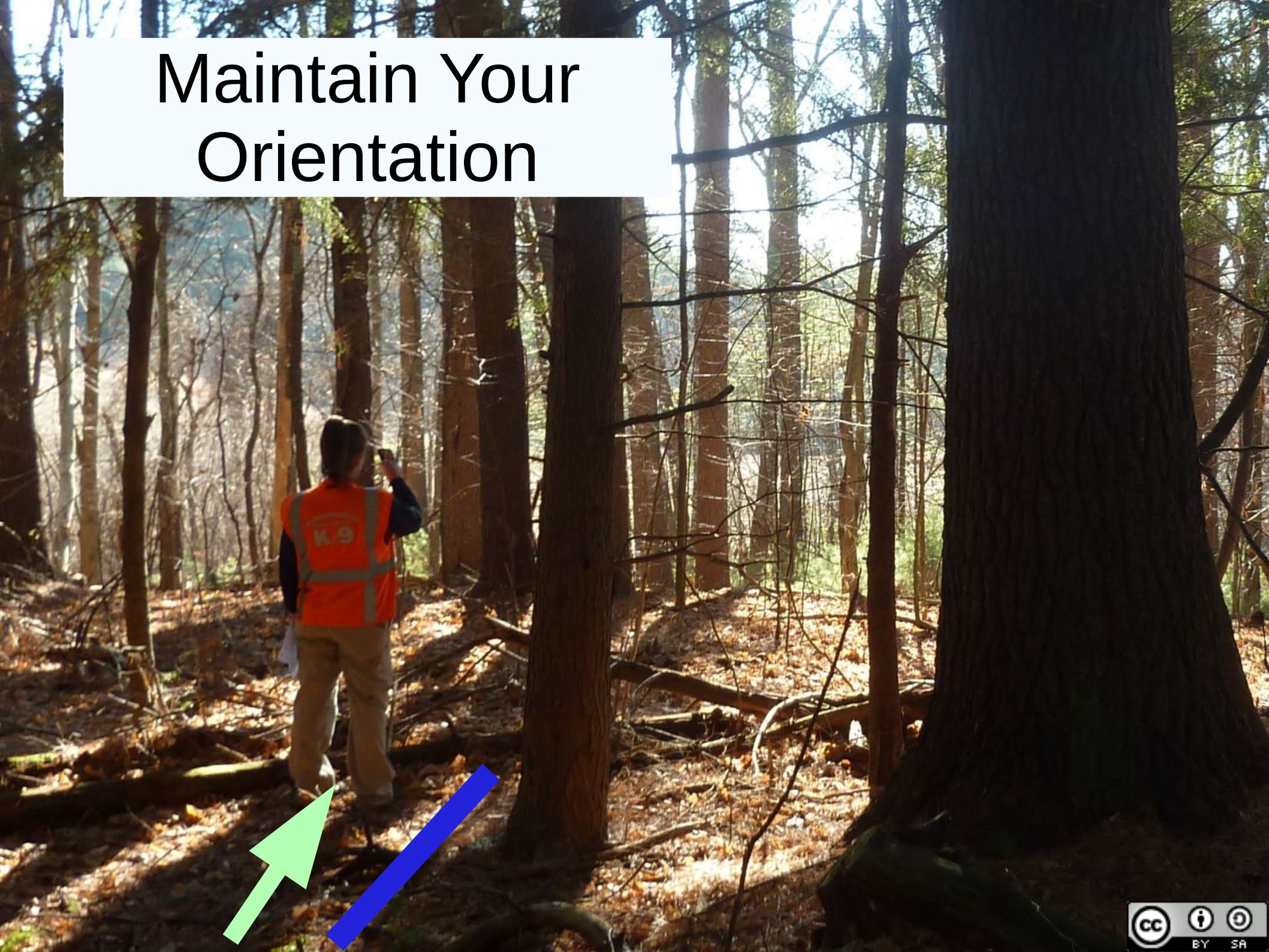
Survey Knowledge



Wayfinding

- **Maintain orientation**
- **Plan a Route – pick a course towards your destination**
- **Route Monitoring – keep evaluating that you are on course**
- **Recognize your destination, or that you've gone past it.**

Maintain Your Orientation



Maintain Orientation?

Practical Evolution

Wayfinding

- **Recognize your destination, or that you've gone past it.**
- **Route Monitoring – keep evaluating that you are on course**
- **Maintain orientation**
- **Plan a Route – pick a course towards your destination**

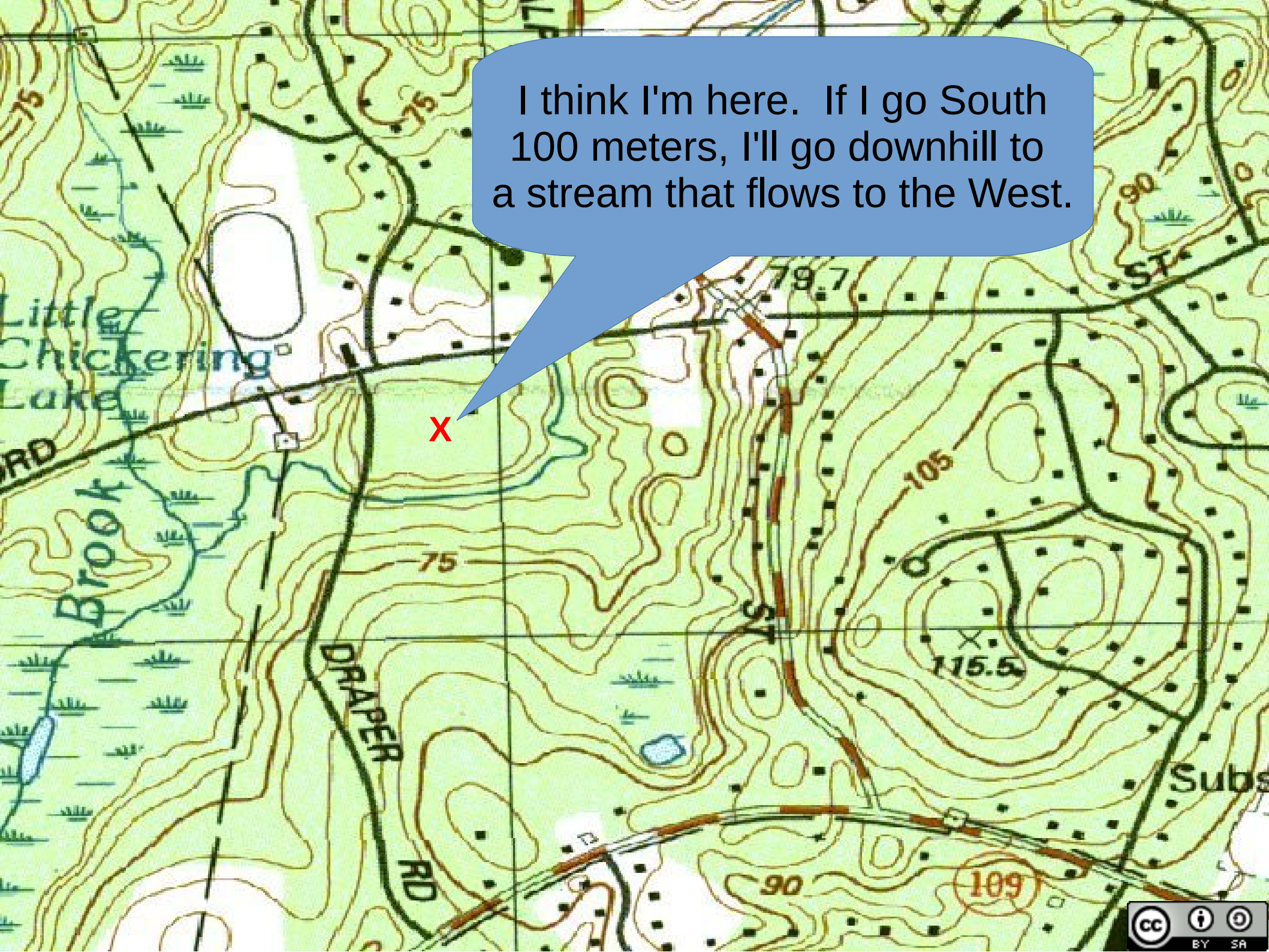
Wayfinding Errors

- Mental maps are fluid.
- Confirmation Bias
  - You tend to only notice things that confirm what you already believe.
  - You tend to ignore things that don't fit in with your belief about where you are.
- Bending The Map
  - You tend to warp the map in your mind to make it fit with what you see around you.

Treat your location as a hypothesis, continually test it.

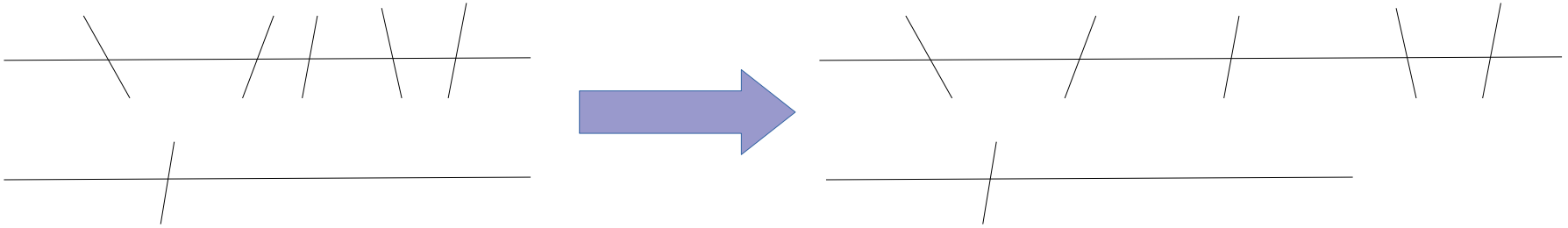
- **Bending The Map:**
  - **I'm next to a swamp, I need to turn left after it.**

- **Avoiding Confirmation Bias:**
  - **The swamp should be on my left, it is on my right. I went too far west.**

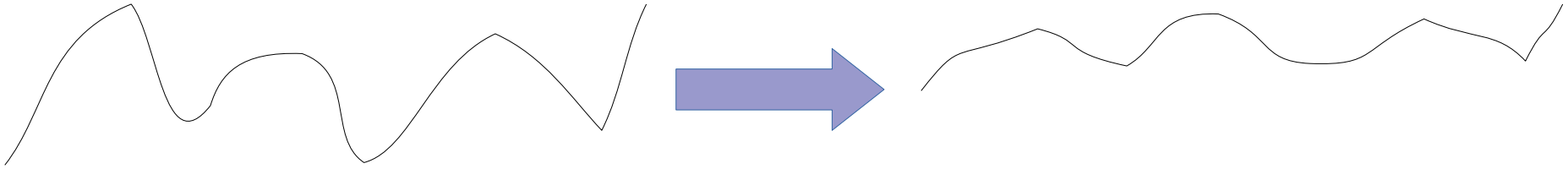

I think I'm here. If I go South 100 meters, I'll go downhill to a stream that flows to the West.
X
Little Chickering Lake
Brook
DRAPER RD
79.7
105
115.5
109
90
75

Some Spatial Mental Illusions

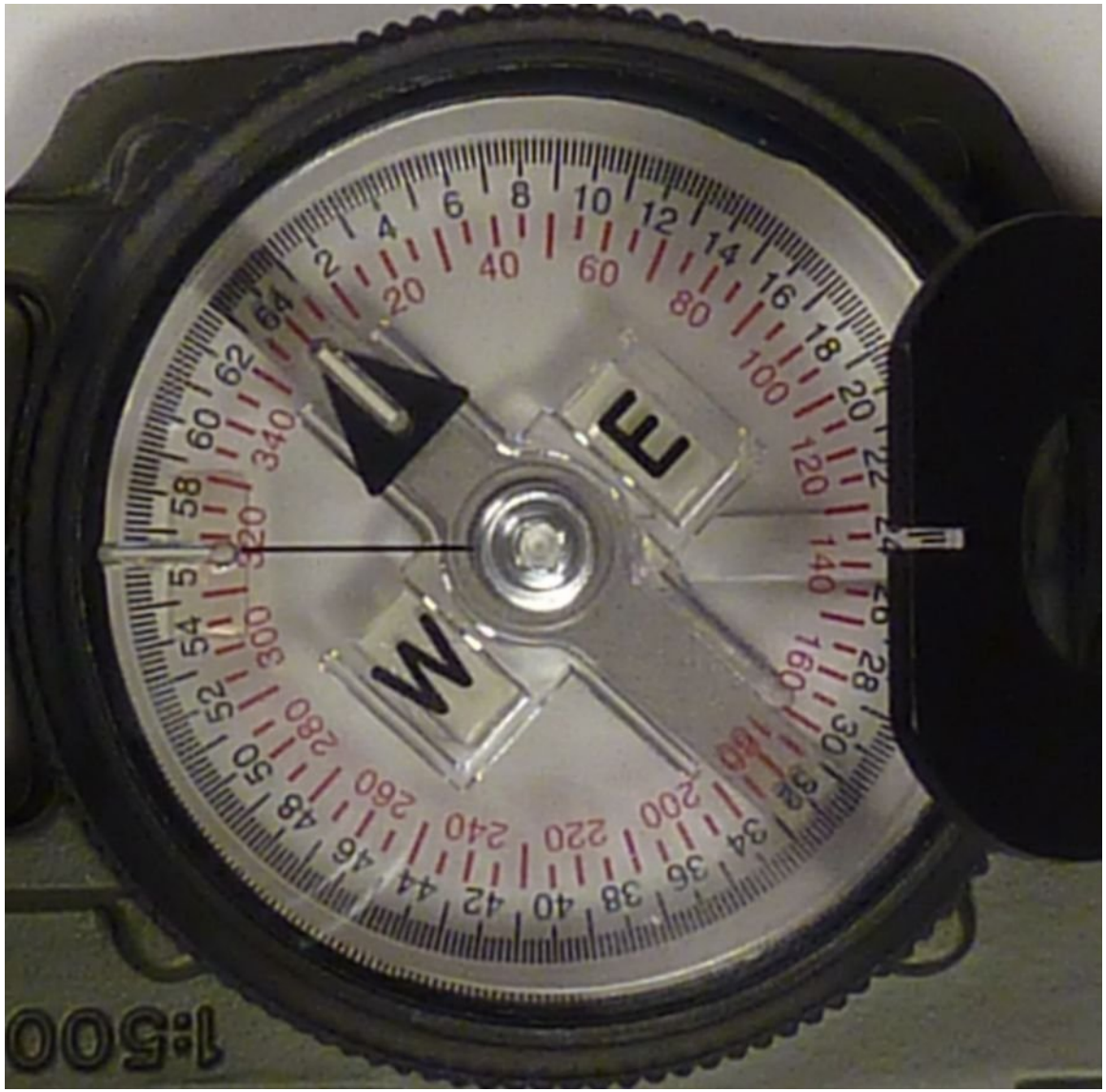
- More intersections (falsely) remembered as a longer path.

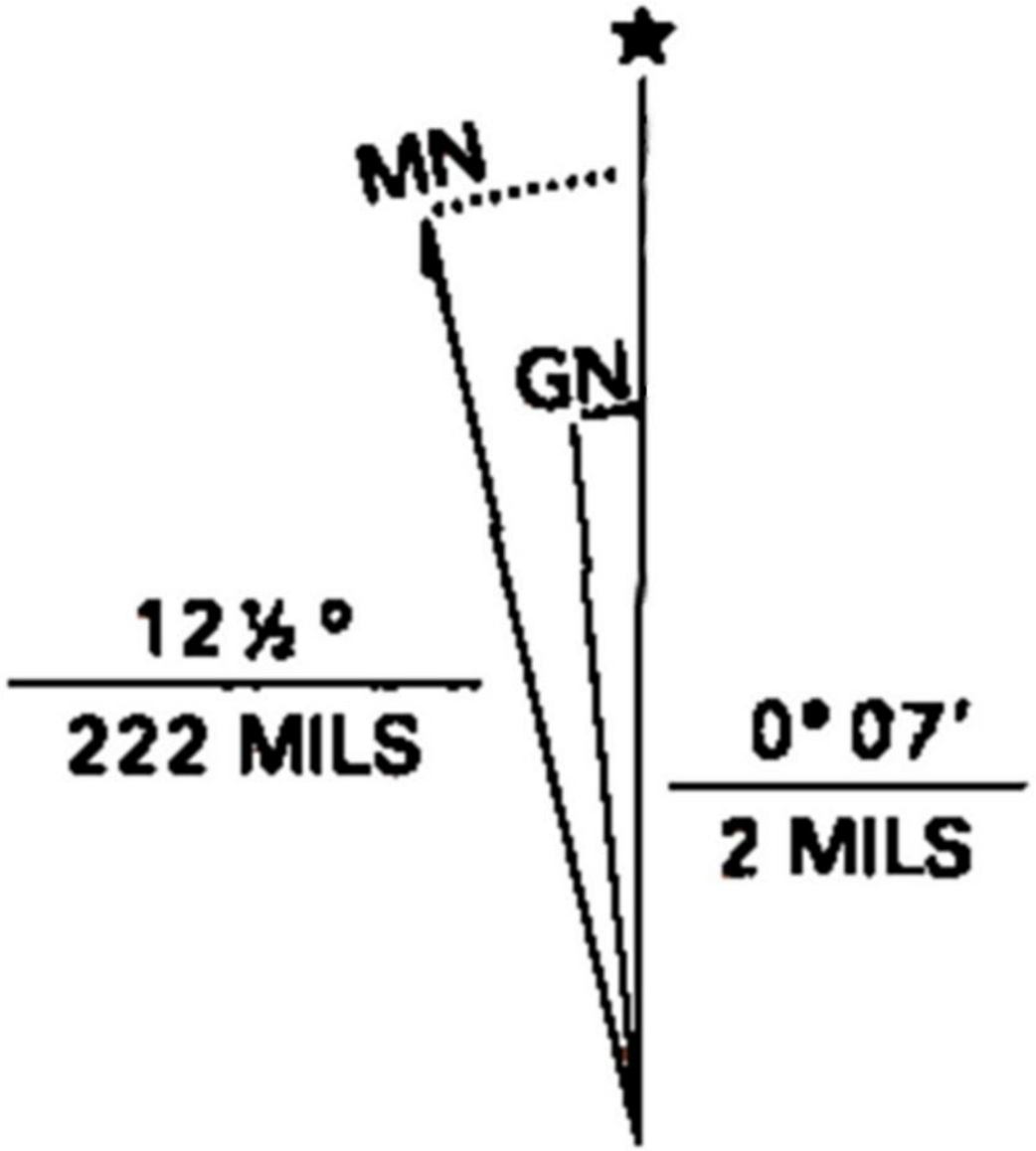


- Winding routes (falsely) remembered as straighter.



Where does the compass needle point?



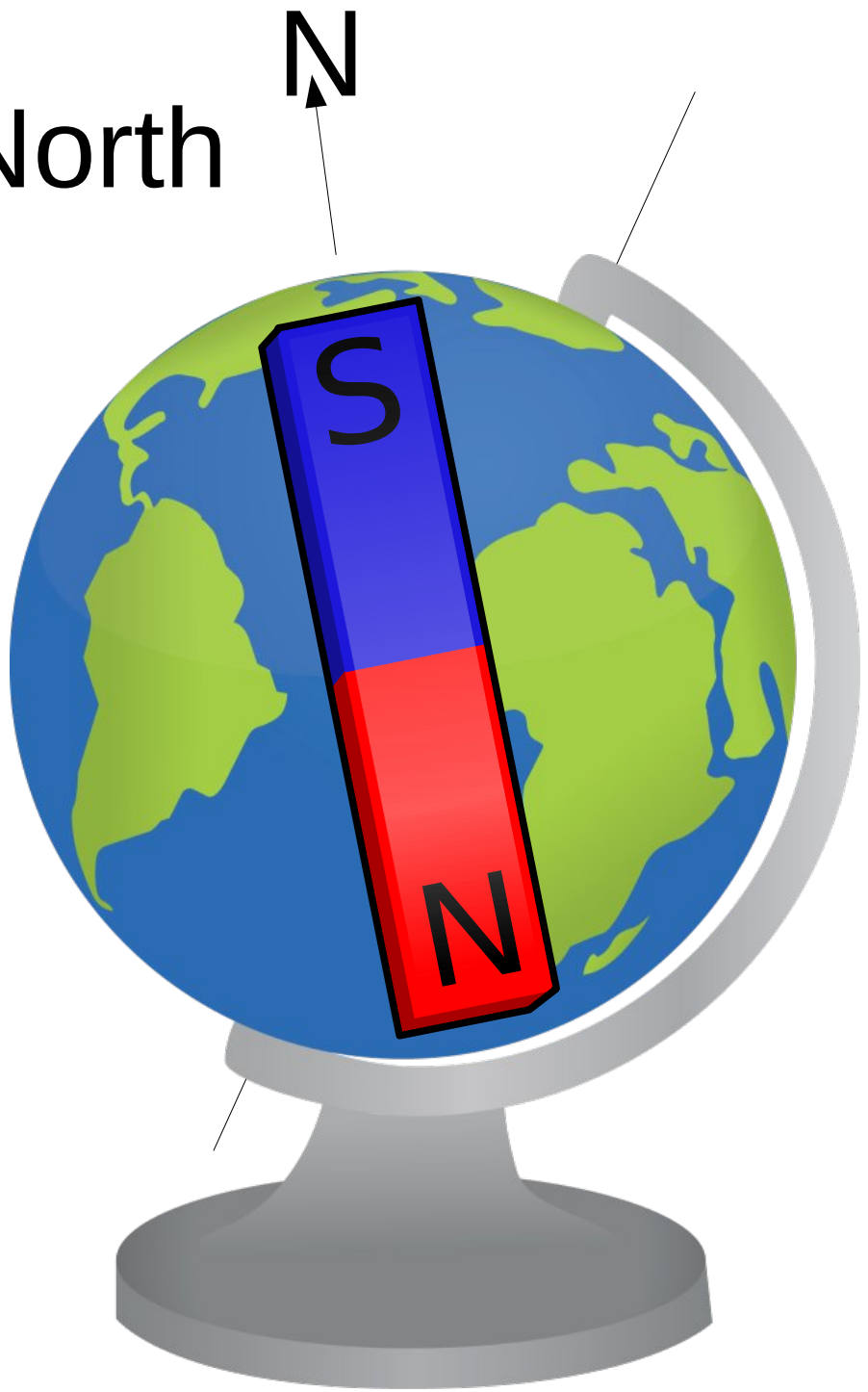


UTM GRID AND 1998 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

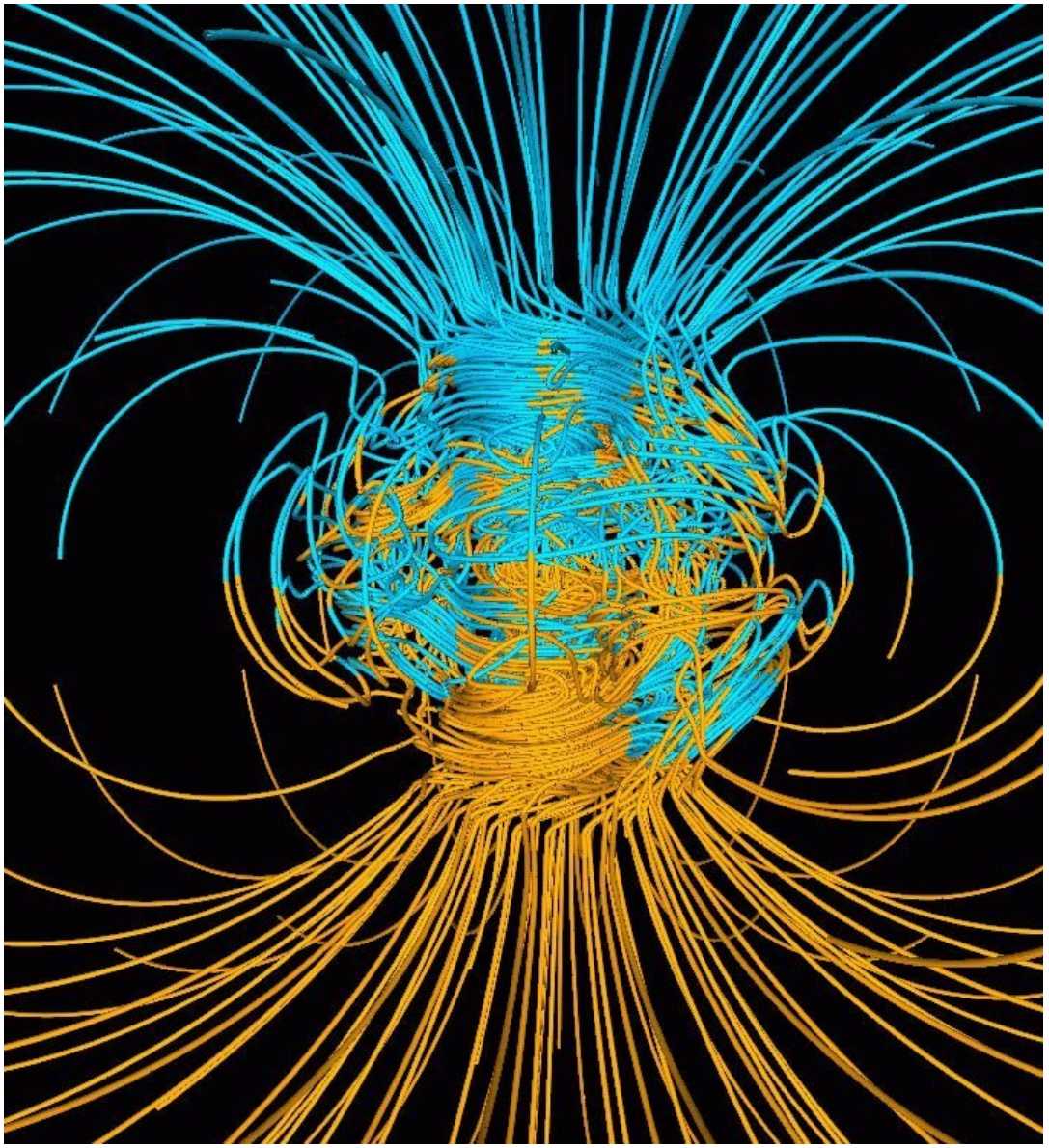
True North

Magnetic North

Magnetic North



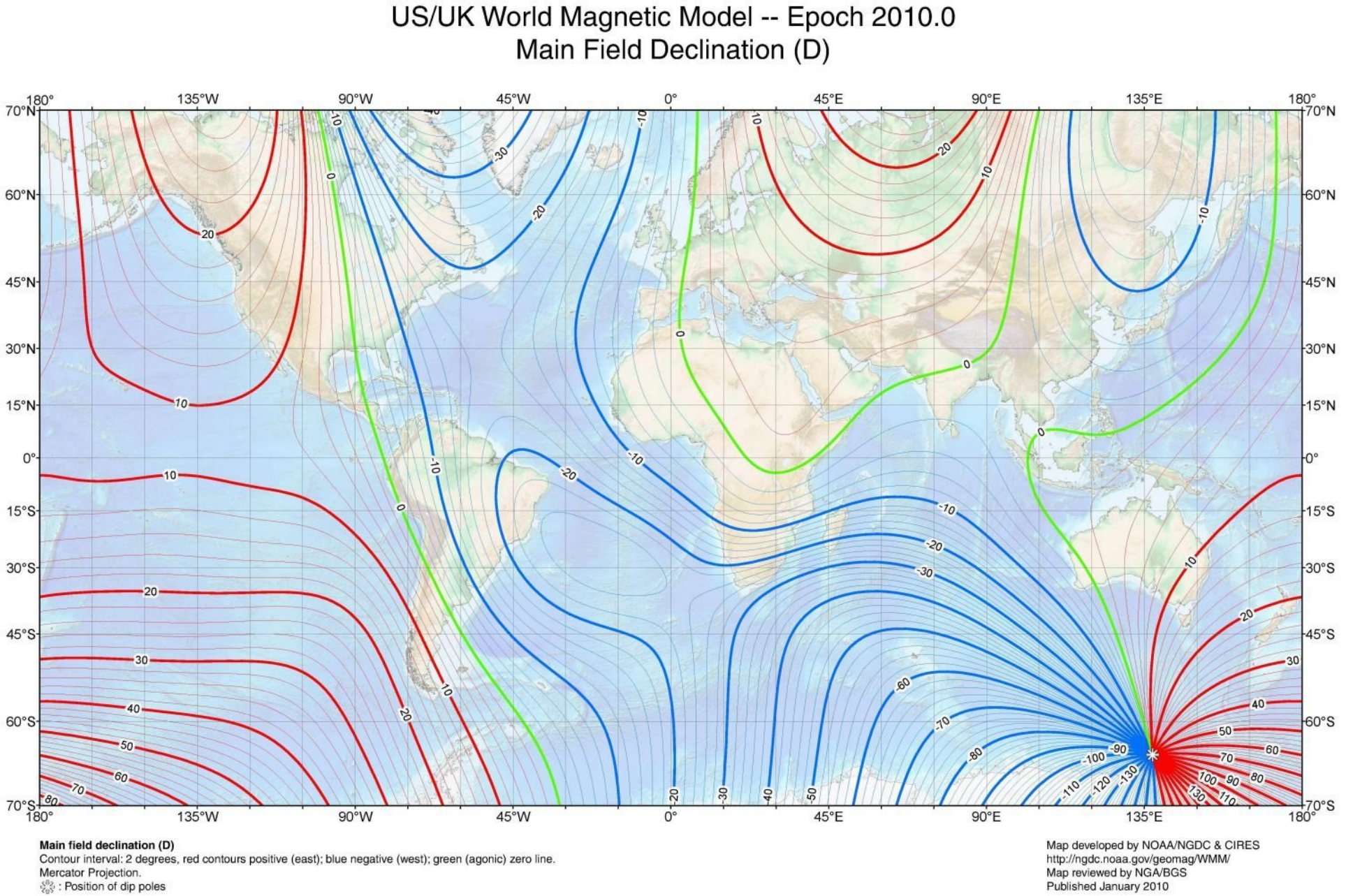
Not quite that simple...

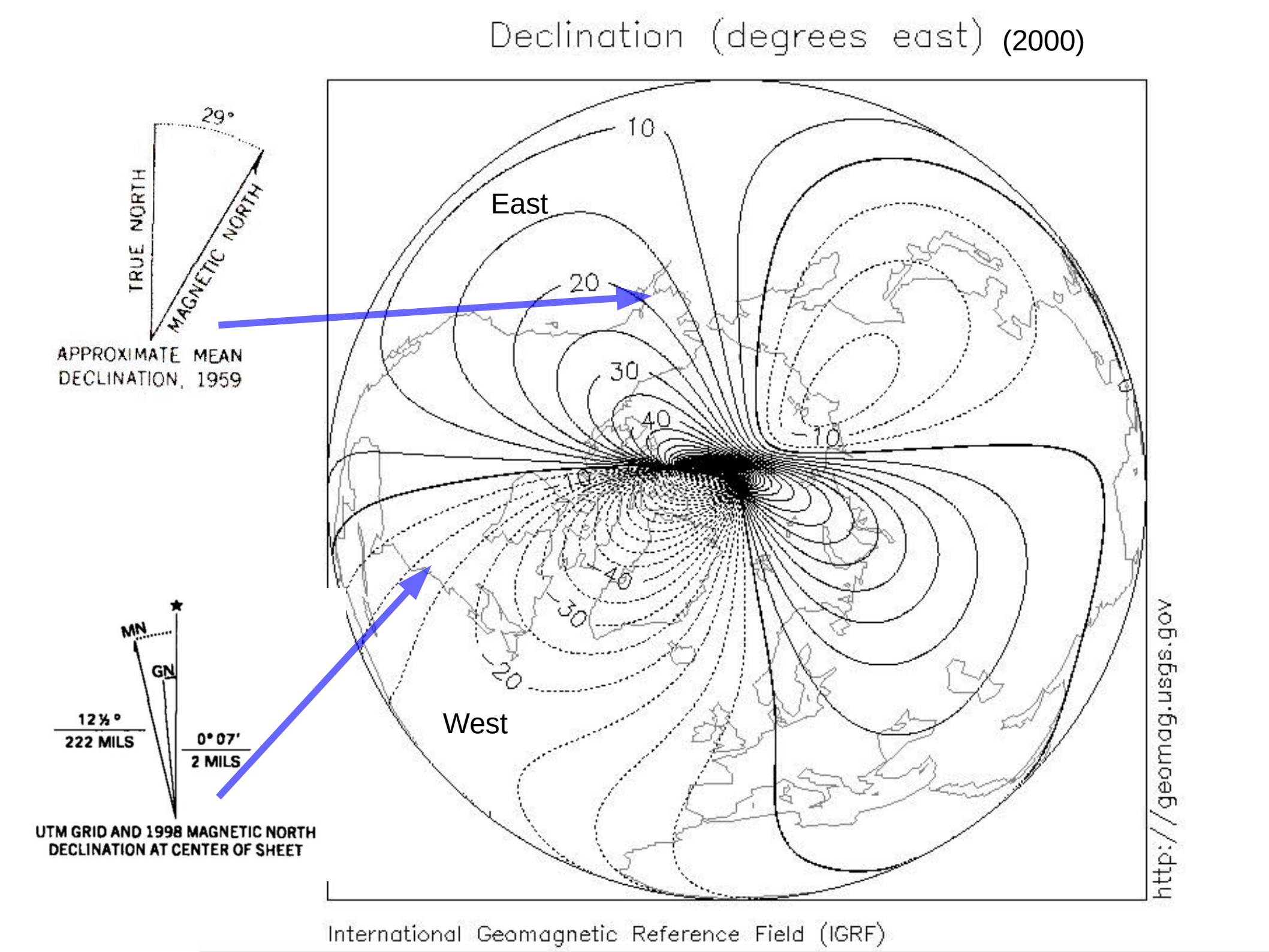


Geodynamo magnetic field line model: NASA

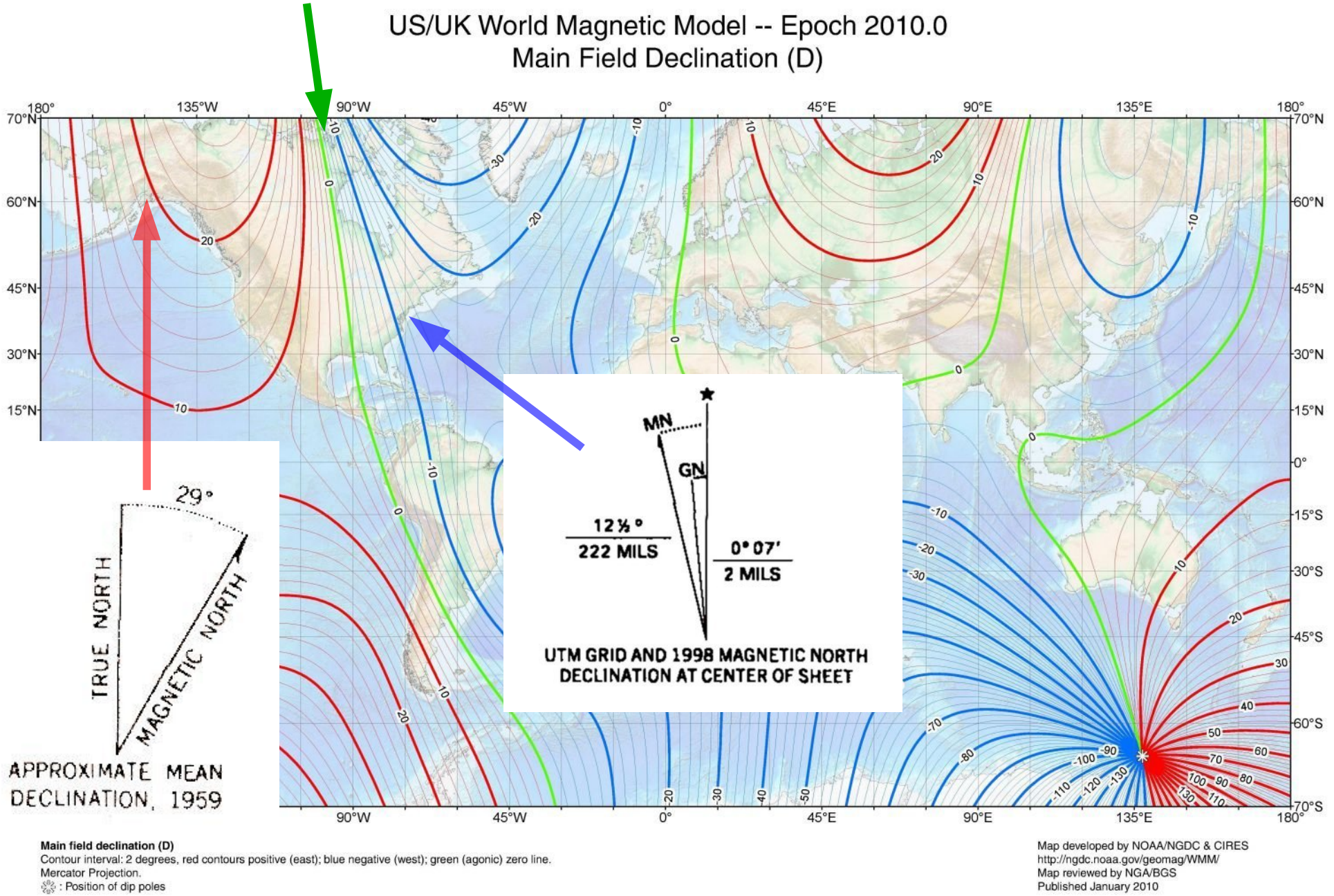
Flow rolls in the outer core: USGS

The Earth's magnetic field is messy



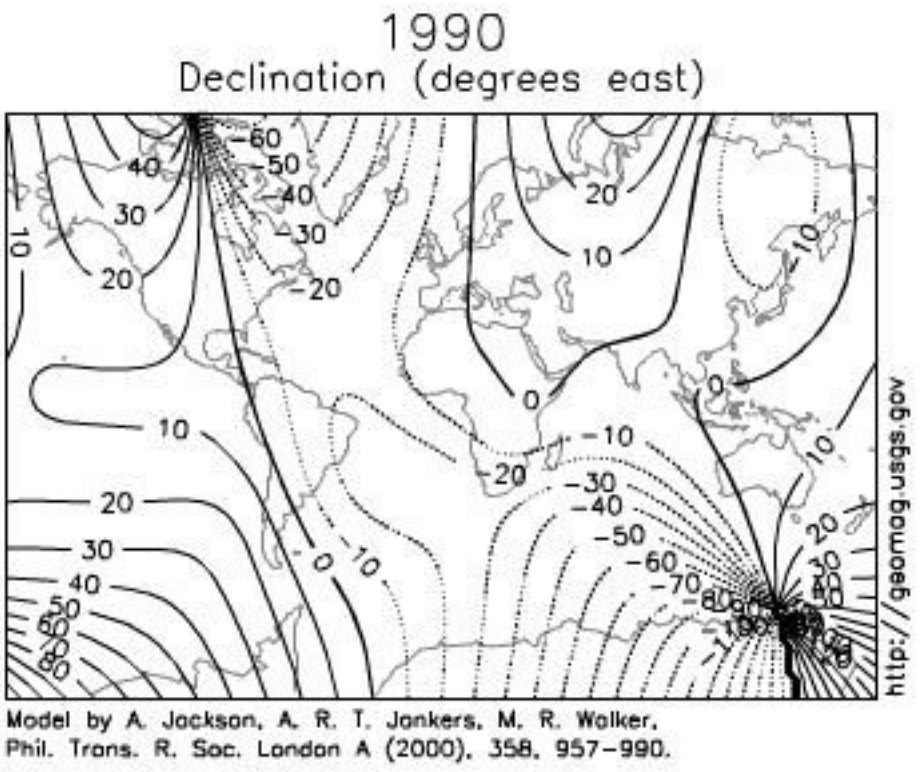

Declination (degrees east) (2000)
29°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN
DECLINATION, 1959
10
20
30
40
-10
East
West
MN
GN
12½°
222 MILS
0°07'
2 MILS
UTM GRID AND 1998 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET
http://geomag.usgs.gov
International Geomagnetic Reference Field (IGRF)

Agonic line = declination is zero

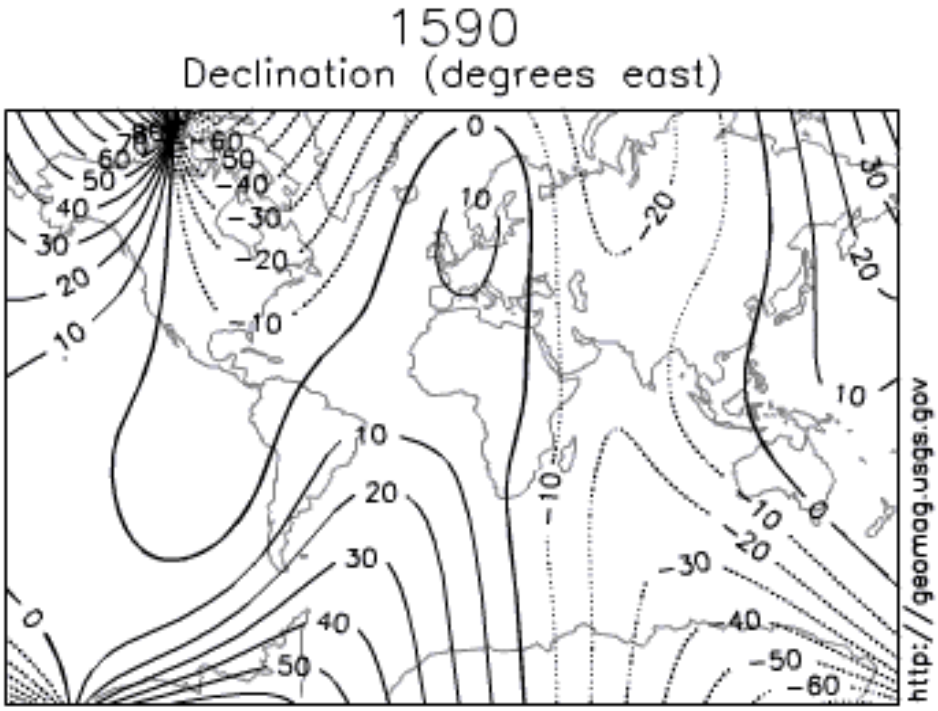


Main field declination (D)
Contour interval: 2 degrees, red contours positive (east); blue negative (west); green (agonic) zero line.
Mercator Projection.
: Position of dip poles

Map developed by NOAA/NGDC & CIRES
http://ngdc.noaa.gov/geomag/WMM/
Map reviewed by NGA/BGS
Published January 2010



Model by A. Jackson, A. R. T. Jonkers, M. R. Walker,
Phil. Trans. R. Soc. London A (2000), 358, 957–990.



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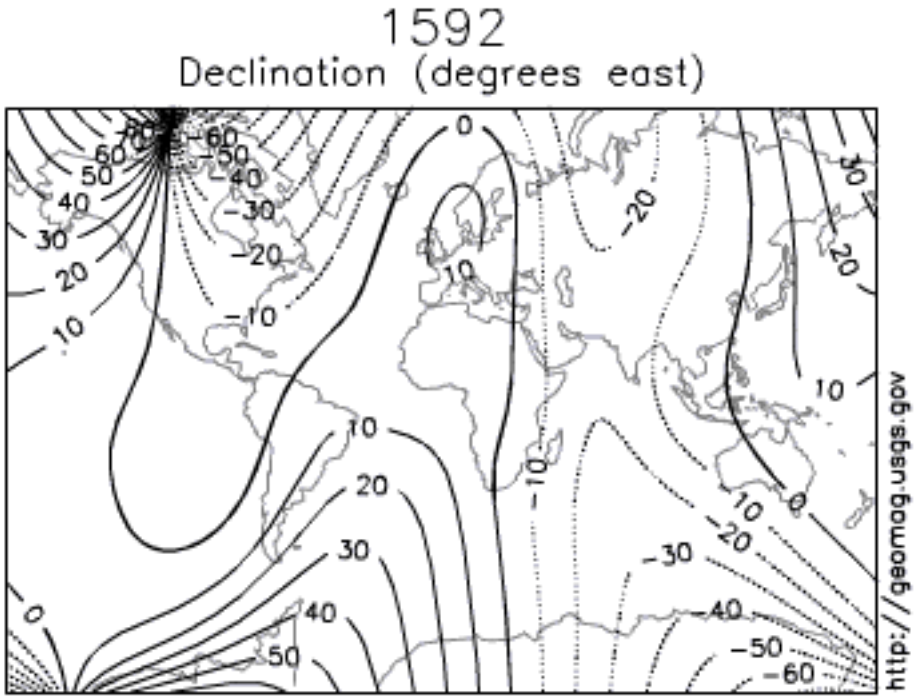

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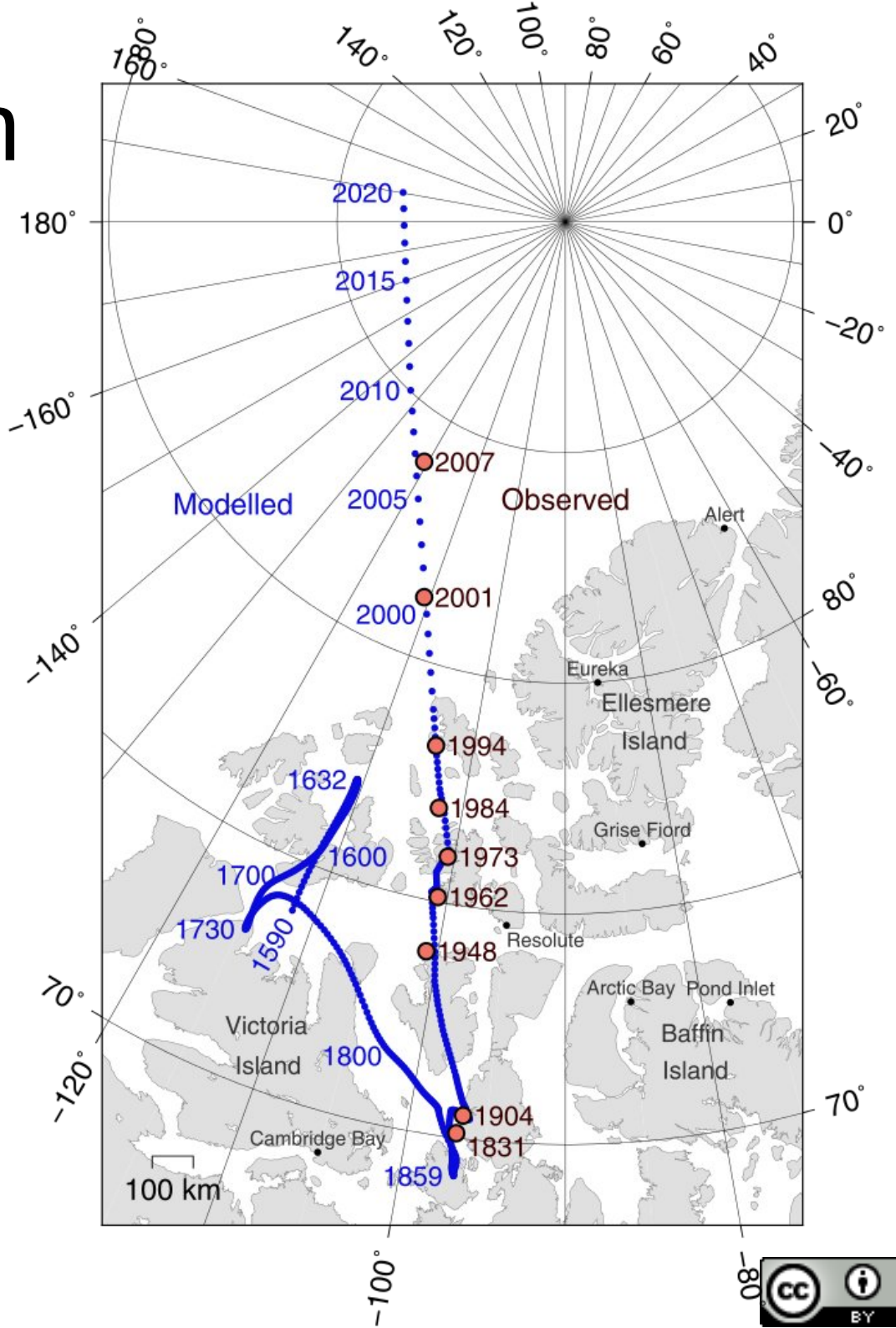
The Earth's magnetic field changes

Changing position of the North Magnetic Pole




Earth, Worcester, 152m
FOV 60°
30.4 FPS
9/19/14 19:57:40


Polaris (α UMi) - HIP 11767
Magnitude: 1.95 (B-V: 0.63)
Absolute Magnitude: -3.66
RA/DE (J2000): 2h31m50.1s/+89° 15'51.3"
RA/DE (of date): 2h49m45s/+89°19'36"
Hour angle/DE: 16h18m3s/+89°19'36"
Az/Alt: +0°49'03"/+41°58'39"
Spectral Type: F7:Ib-IIv_SB
Distance: 431.42 Light Years
Parallax: 0.00756"
Lacerta
Draco
Cepheus
Ursa Minor
Cassiopeia
Canes Venatici
Camelopardalis
Ursa Major
Earth, Worcester, 152m
FOV 60°
30.4 FPS
9/19/14 19:59:48

True North

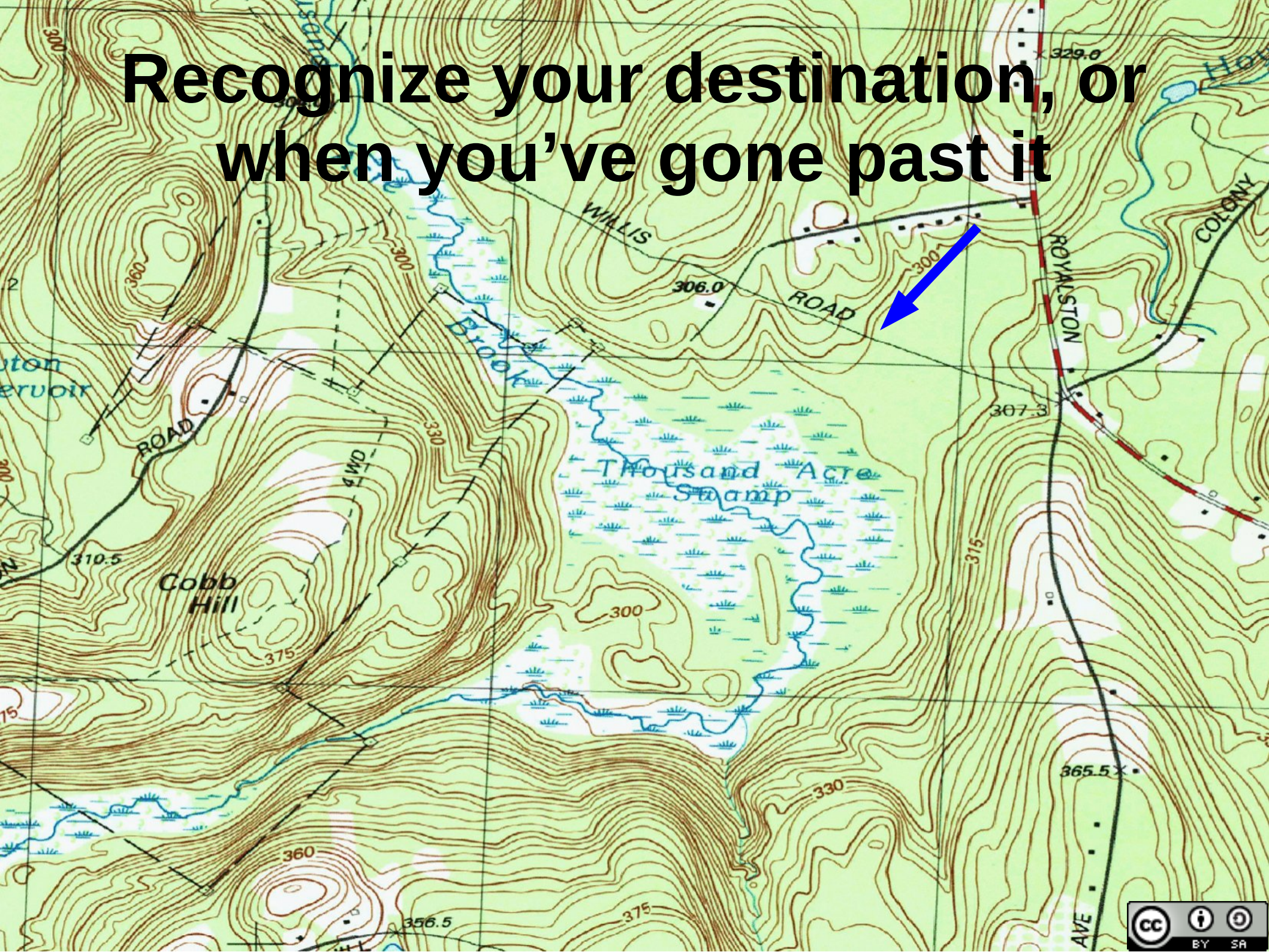
Telling North

- Sun
- Moon
- Stars

Avoiding Getting Lost

- Maintain a straight course, use environmental cues for direction
- Identify backstops (recognize when you've gone past your destination)
- Pay close attention to landmarks
  - Pay close attention to your surroundings (terrain, vegetation, smells, etc)
  - Remember the identity of locations you travel through (give places memorable identities).
  - Look behind you regularly (particularly at trail junctions).
- Track times and directions
- Structure your path

Recognize your destination, or when you've gone past it



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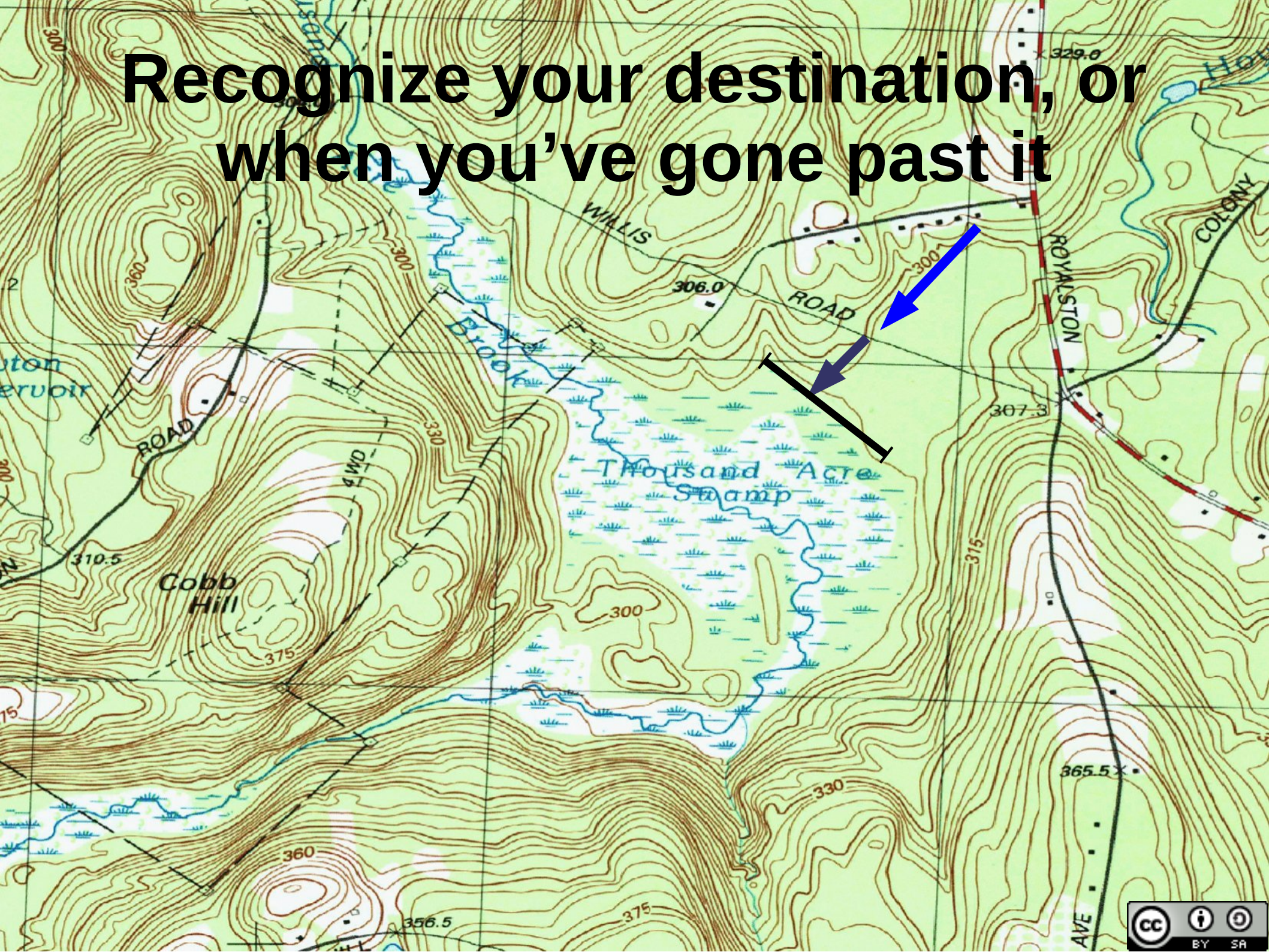

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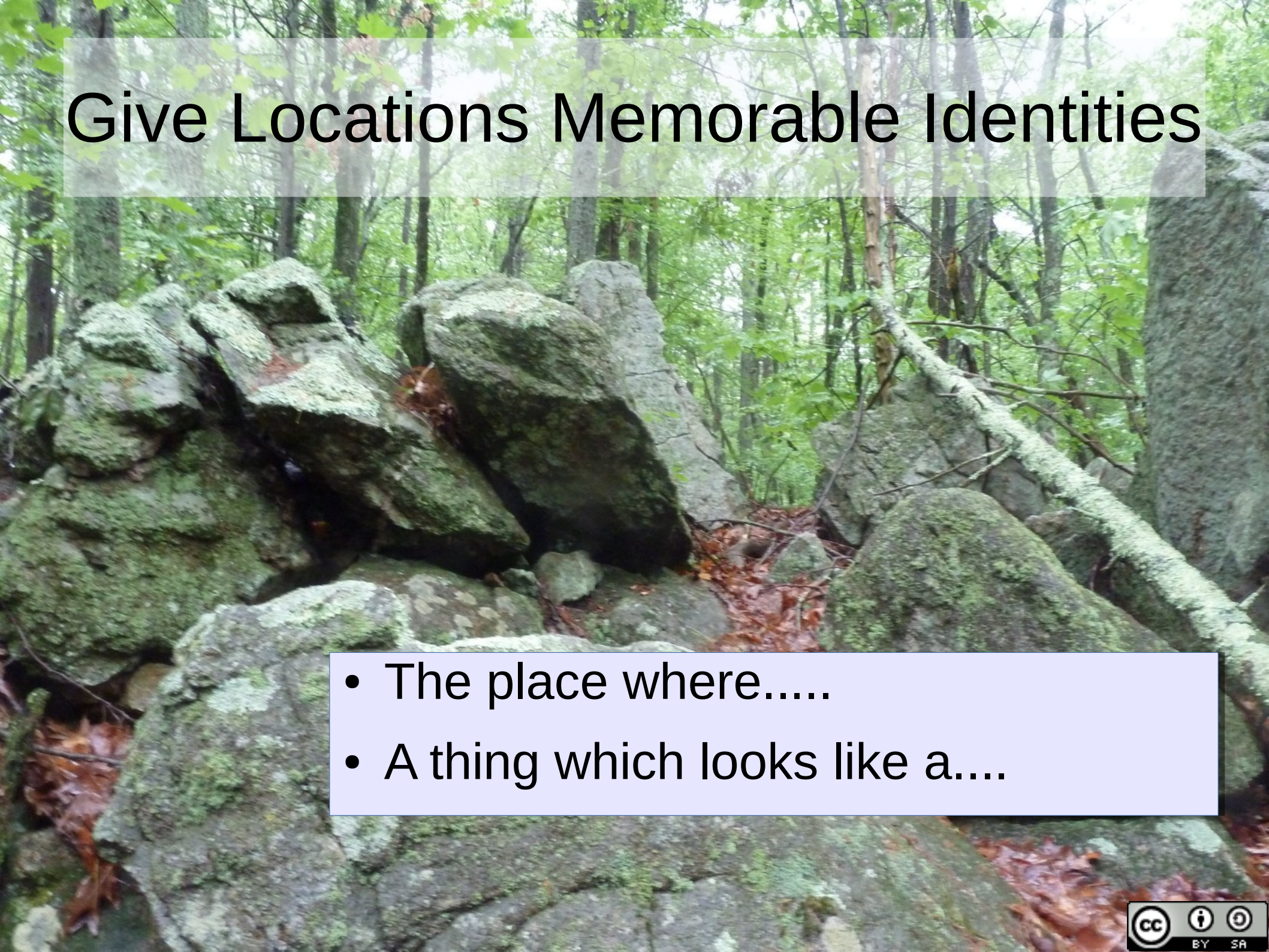
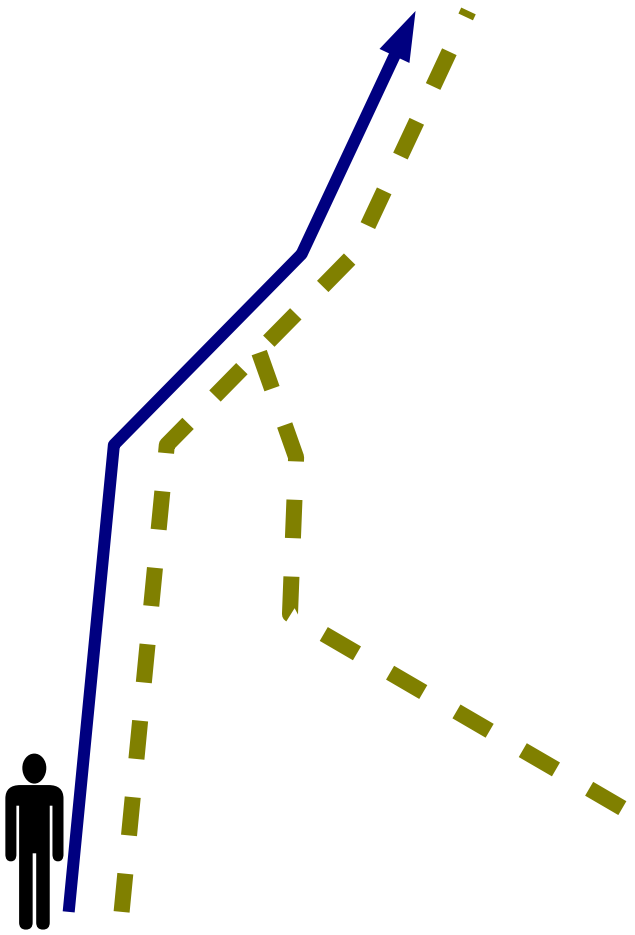
Give Locations Memorable Identities

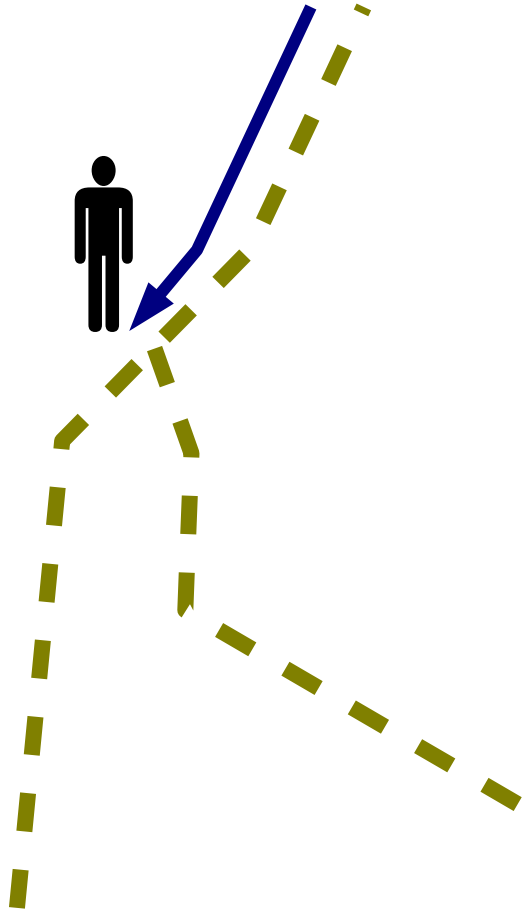


- The place where.....
- A thing which looks like a....

Look behind you regularly (particularly at trail junctions)

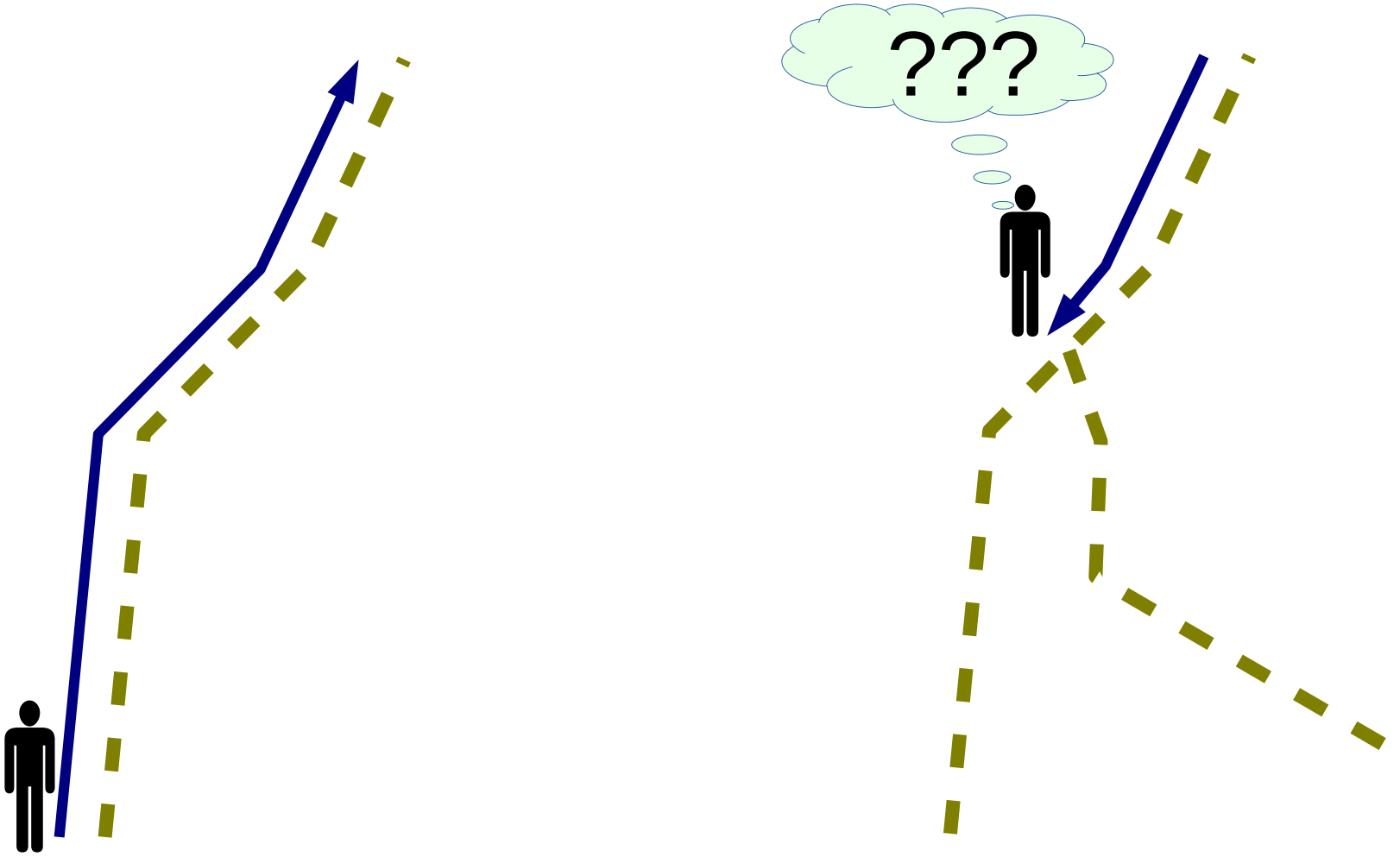


Going Out



Coming Back

Look behind you regularly (particularly at trail junctions)

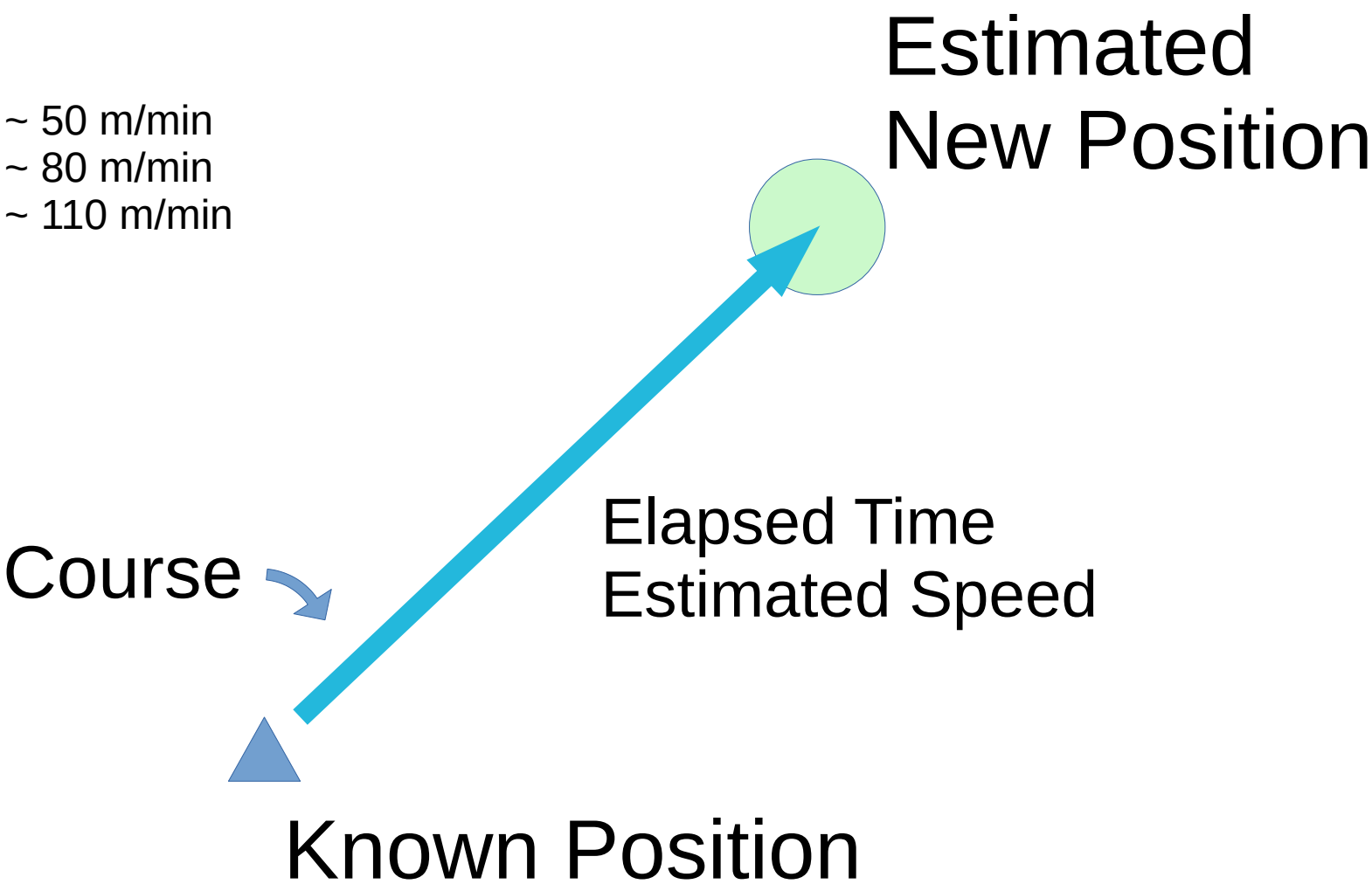


Going Out

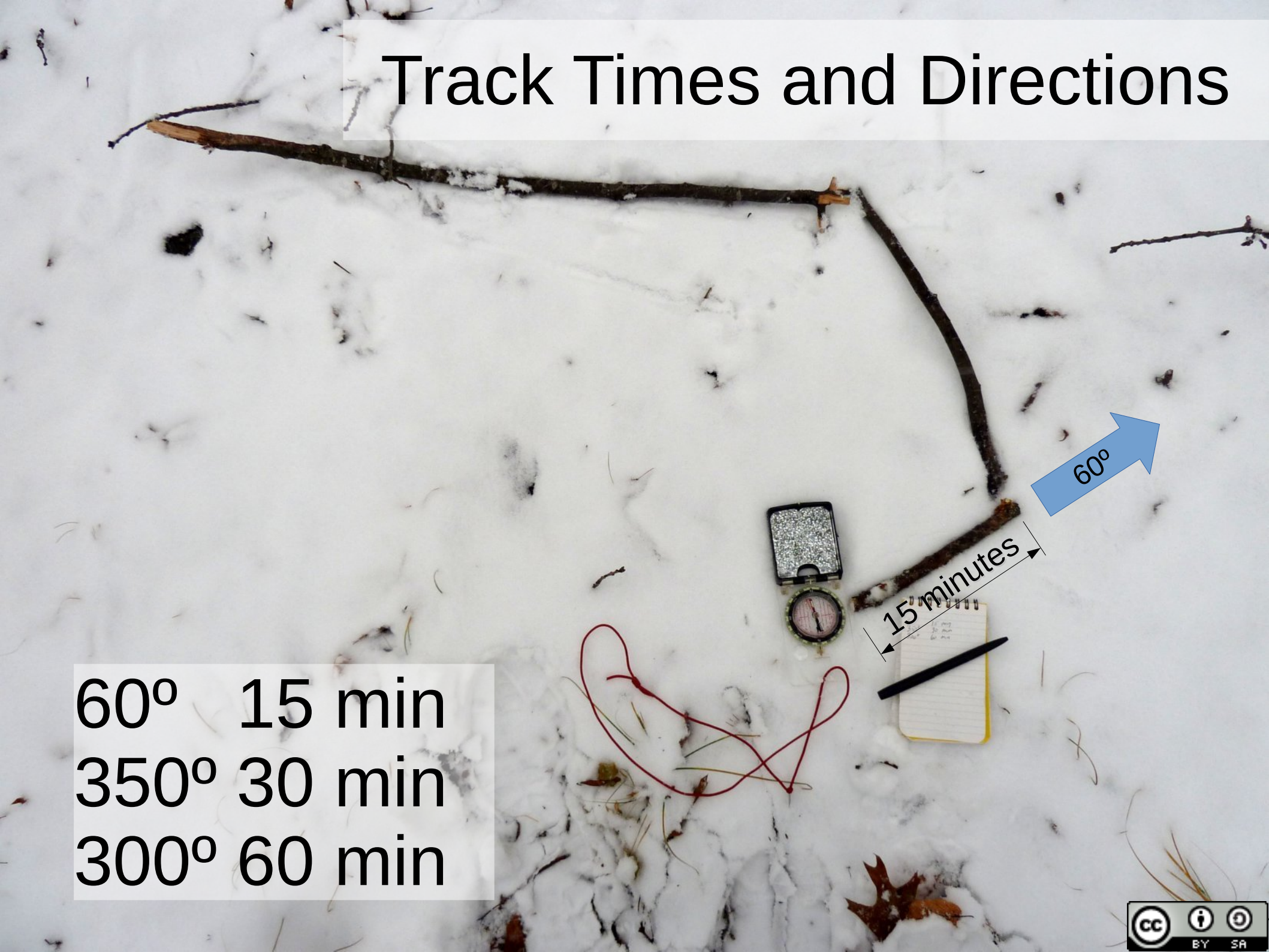
Coming Back

Dead Reckoning

2 mph ~ 50 m/min
3 mph ~ 80 m/min
4 mph ~ 110 m/min

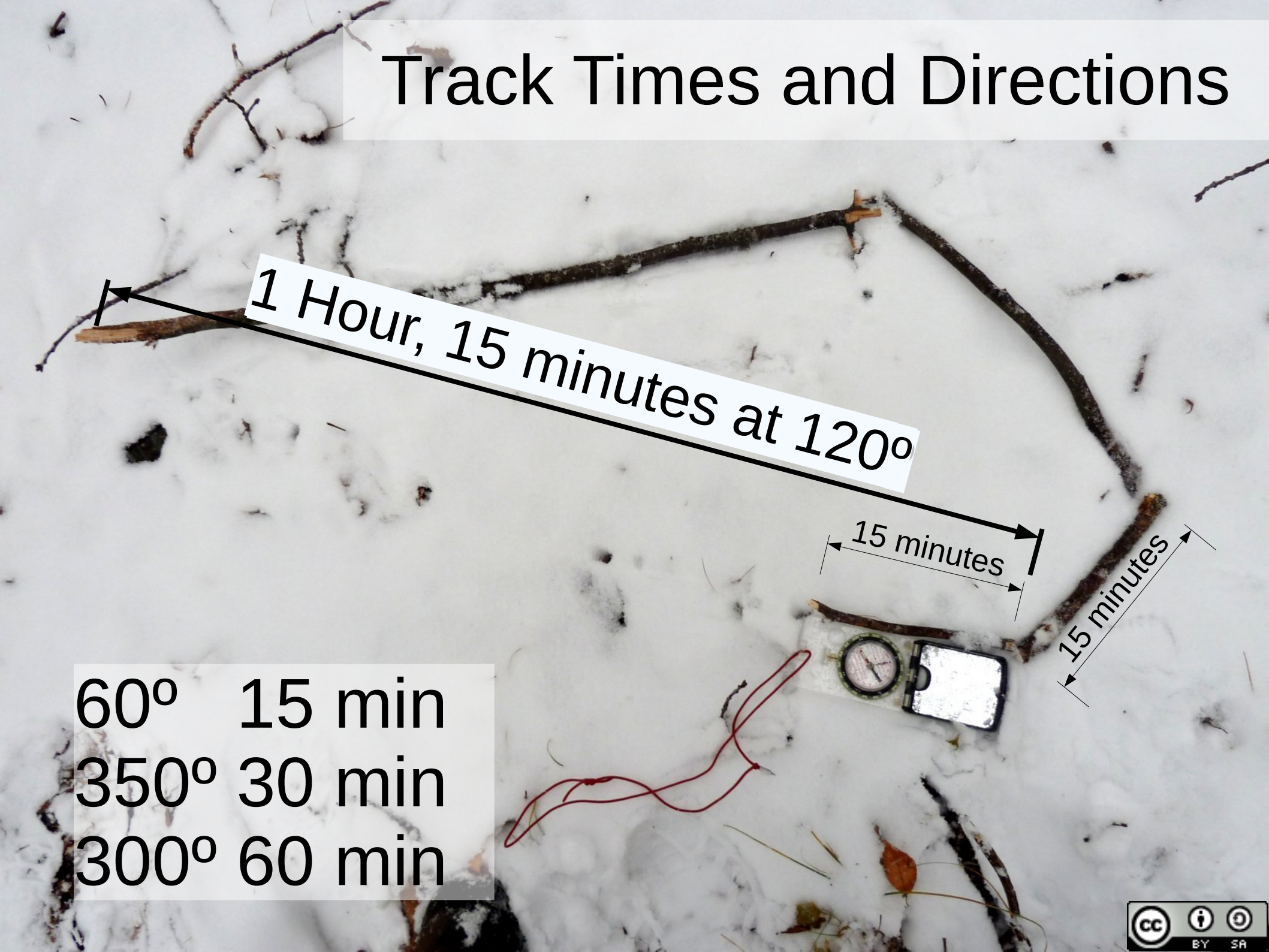


Track Times and Directions



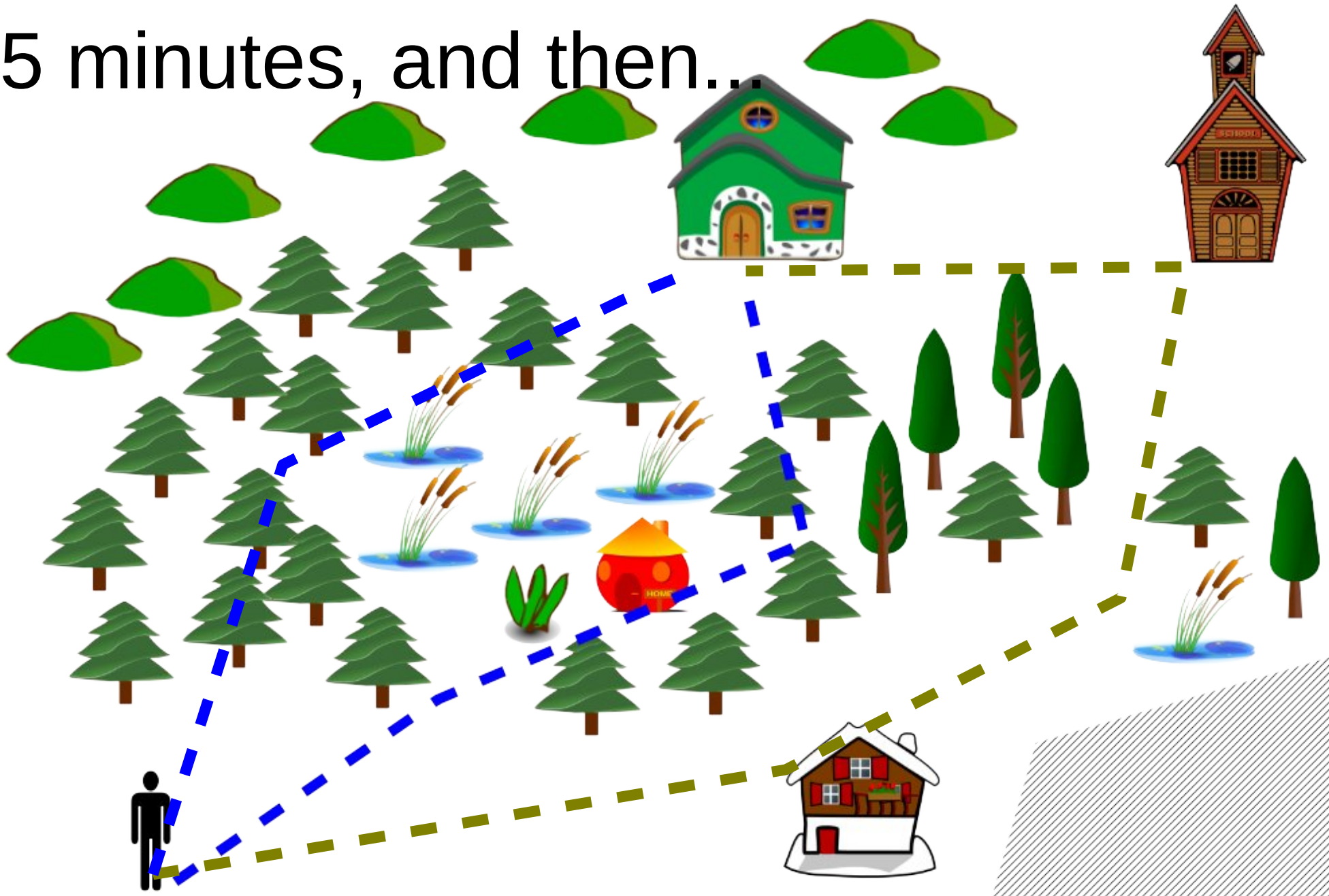
60º 15 min
350º 30 min
300º 60 min

Track Times and Directions



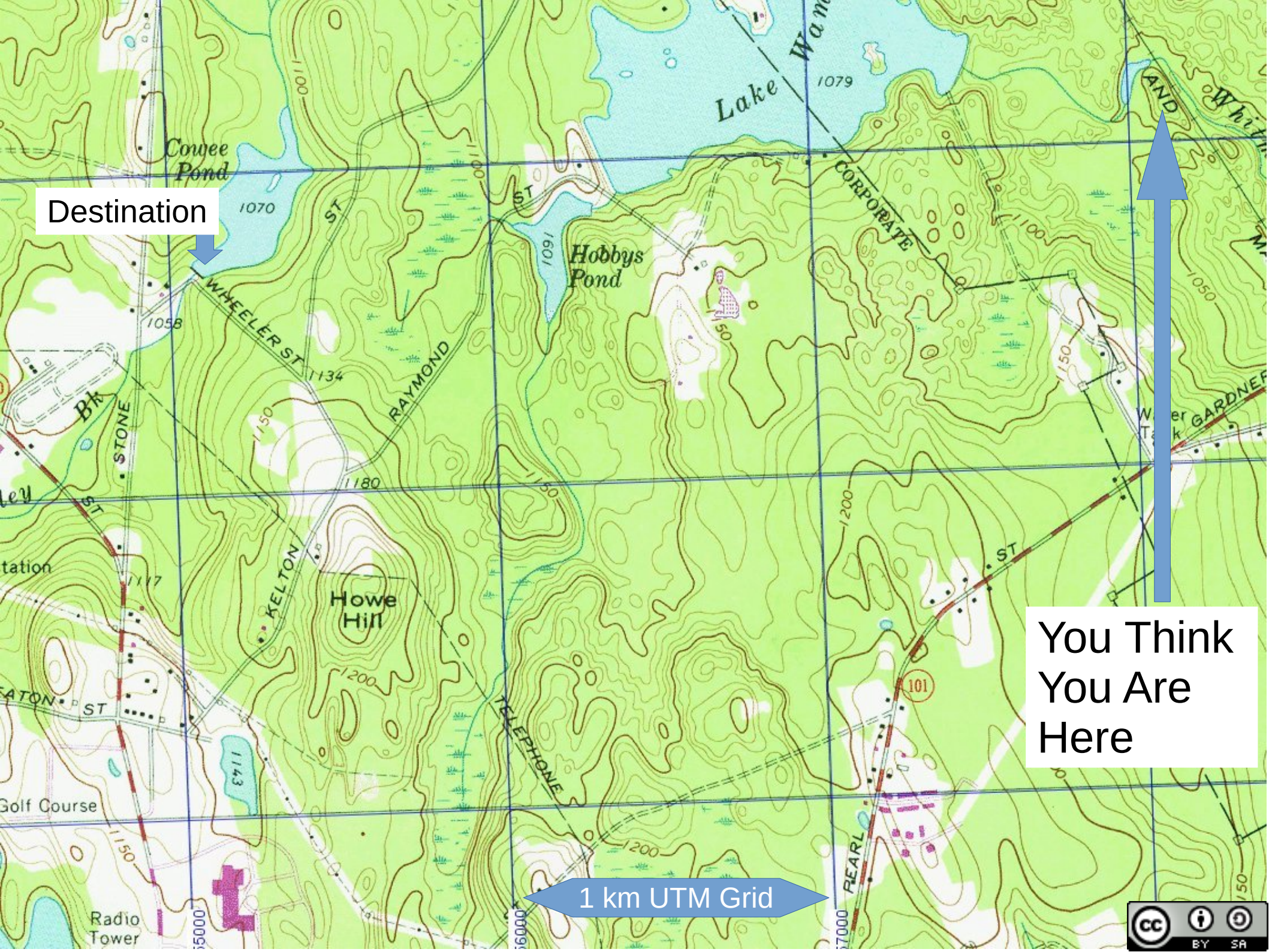
60º 15 min
350º 30 min
300º 60 min

I'll walk North into the woods for 5 minutes, and then...



Structure your Path
Connect places with memorable identities

- **Plan a Route – plan your path – give yourself a structure to follow.**
- **Route Monitoring – keep evaluating that you are on your path.**
- **Recognize your destination, or that you've gone past it.**


Destination
You Think You Are Here
1 km UTM Grid
Lake
Hobbys Pond
Howe Hill
Golf Course
Radio Tower
WHEELER ST
RAYMOND
KELTON
TELEPHONE
CORPORATE
PEARL
GARDNER
STONE
ST
101