Live Sessions Week 4:

Essential Skills 7 and 8: Slopes and their measurements, and Soils

NRTG
NATURAL RESOURCES TRAINING GROUP

Importance of these skills

- Slope measurement and soils very important in all forms of terrestrial work
  - Forestry, vegetation, wildlife, road engineering, construction activities…
  - Controlling unwanted silt introduction to waterways.
  - Slopes and soils affect vegetation distribution and growth, which in turn affects wildlife presence

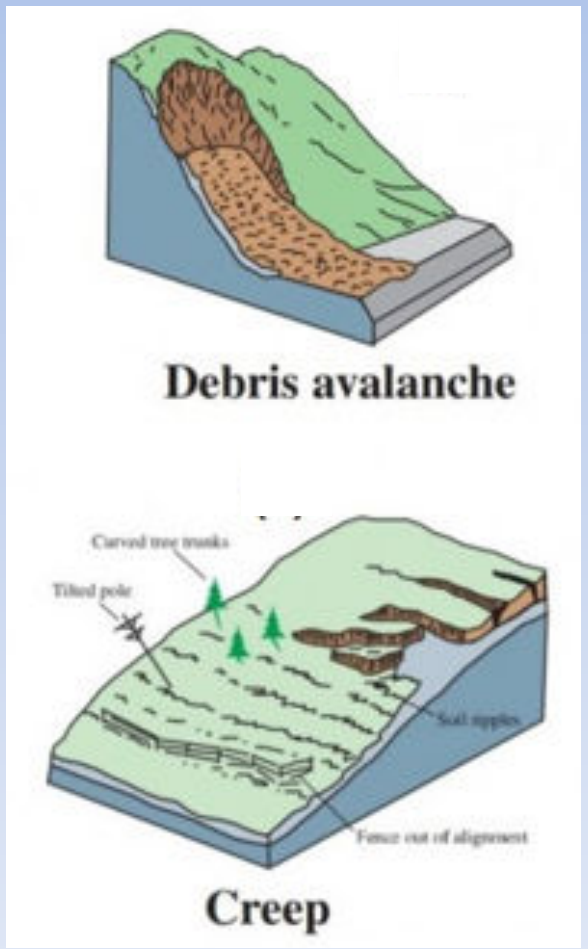
Essential Skill #7: Slopes and their measurements

NRTG
NATURAL RESOURCES TRAINING GROUP

Why is slope important?

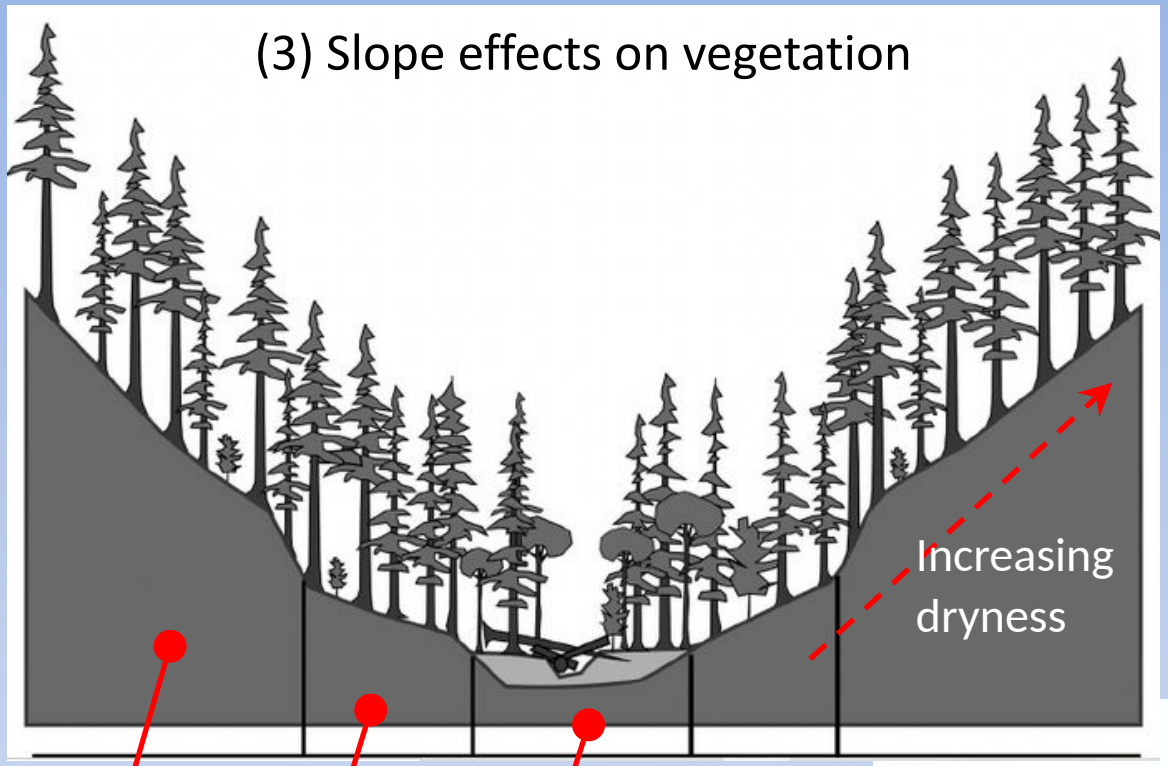
(1) Slope failure and roadbuilding

(2) Interaction of slope and soil texture



NRTG
NATURAL RESOURCES TRAINING GROUP

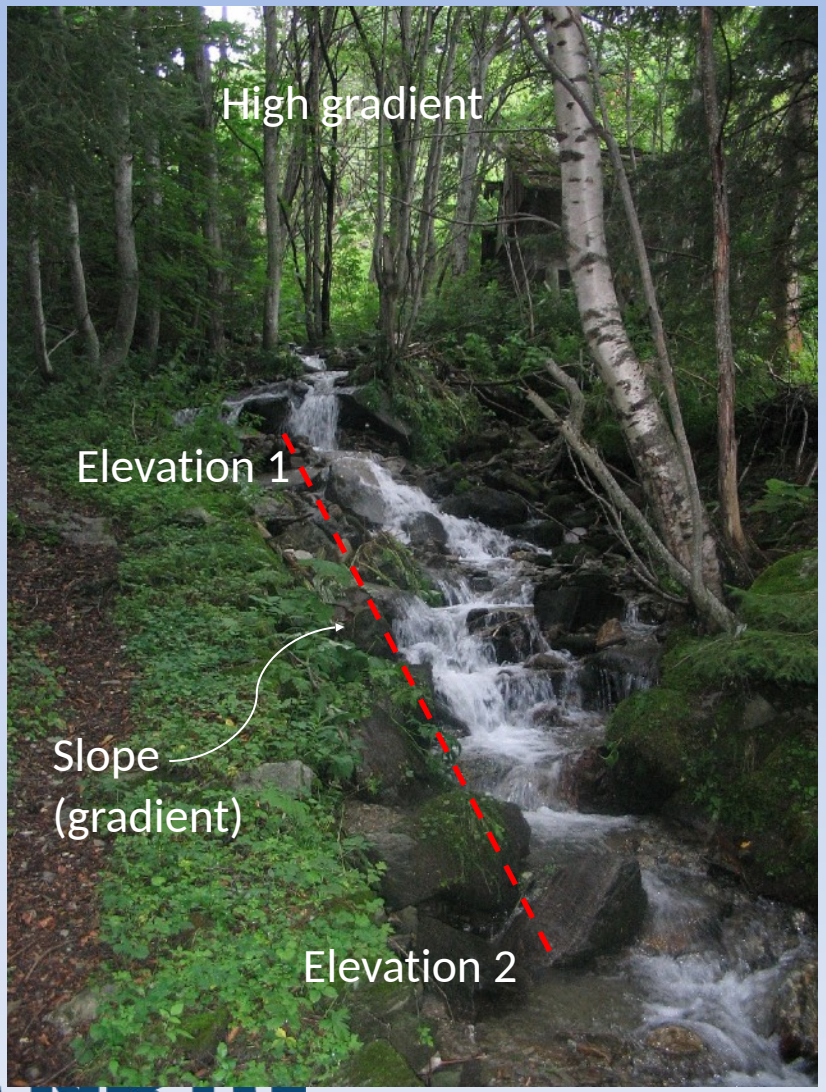
(3) Slope effects on vegetation



(4) Aspect

NRTG
NATURAL RESOURCES TRAINING GROUP

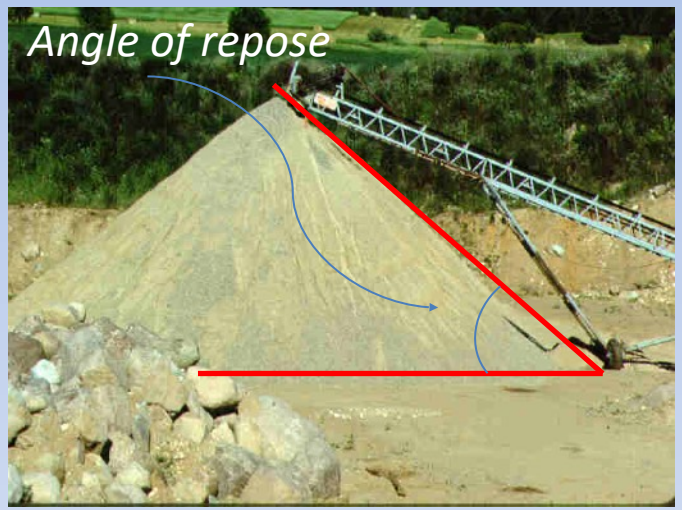
(5) Slopes are important in water as well (gradient)



NATURAL RESOURCES TRAINING GROUP

Interaction of slope and soils

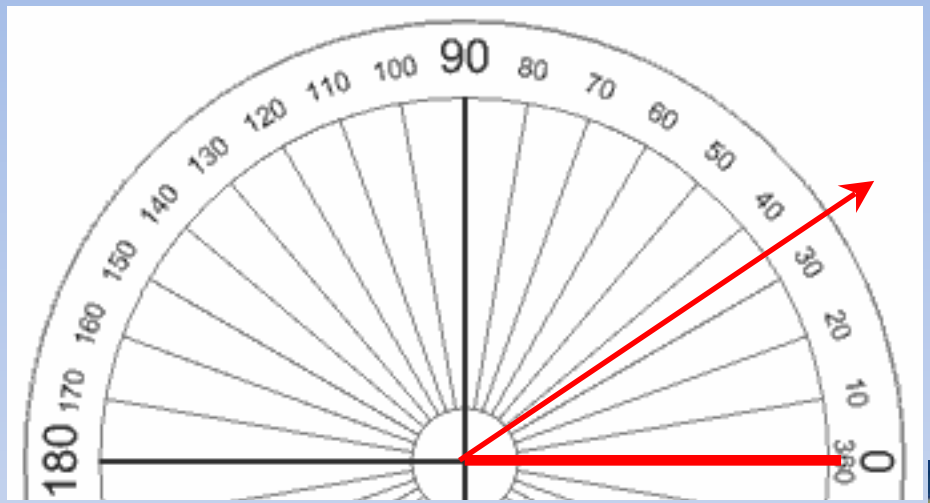
Angle of repose

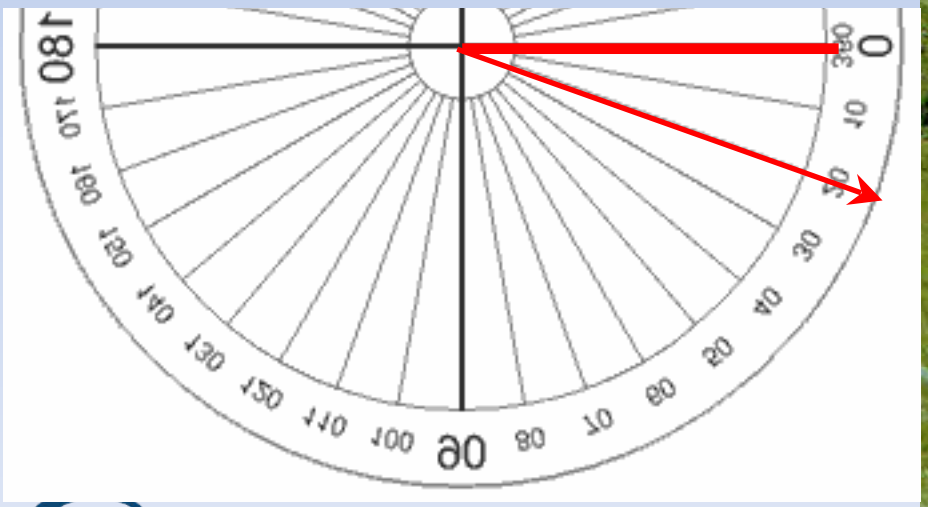


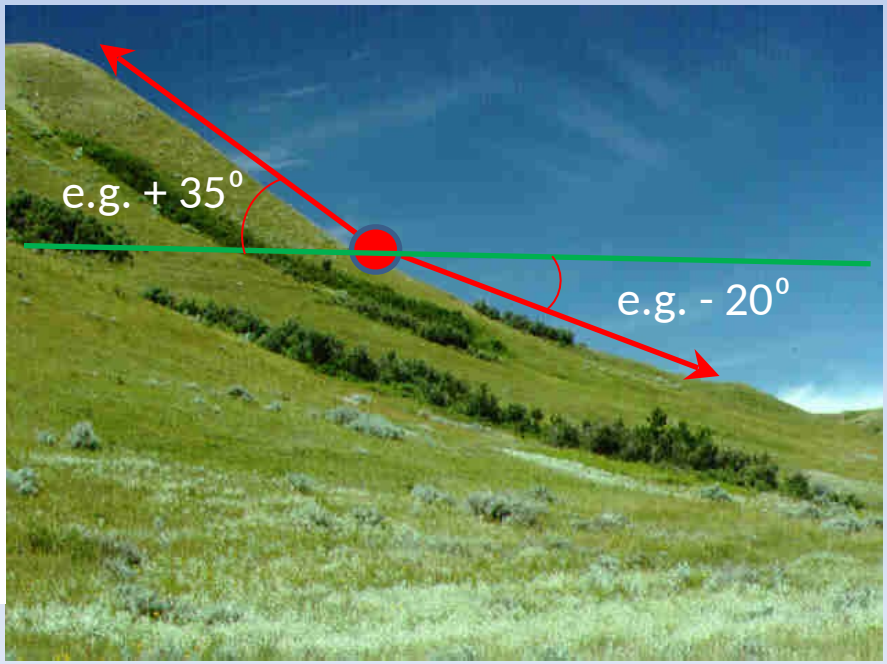
Material	Angle of repose (degrees)	
Clay	35	
Dry earth	32	5 degree difference
Moist earth	37	
Gravel	35	
Dry sand	25	12 degree difference
Moist sand	37	

NRTG
NATURAL RESOURCES TRAINING GROUP

Slope measurements

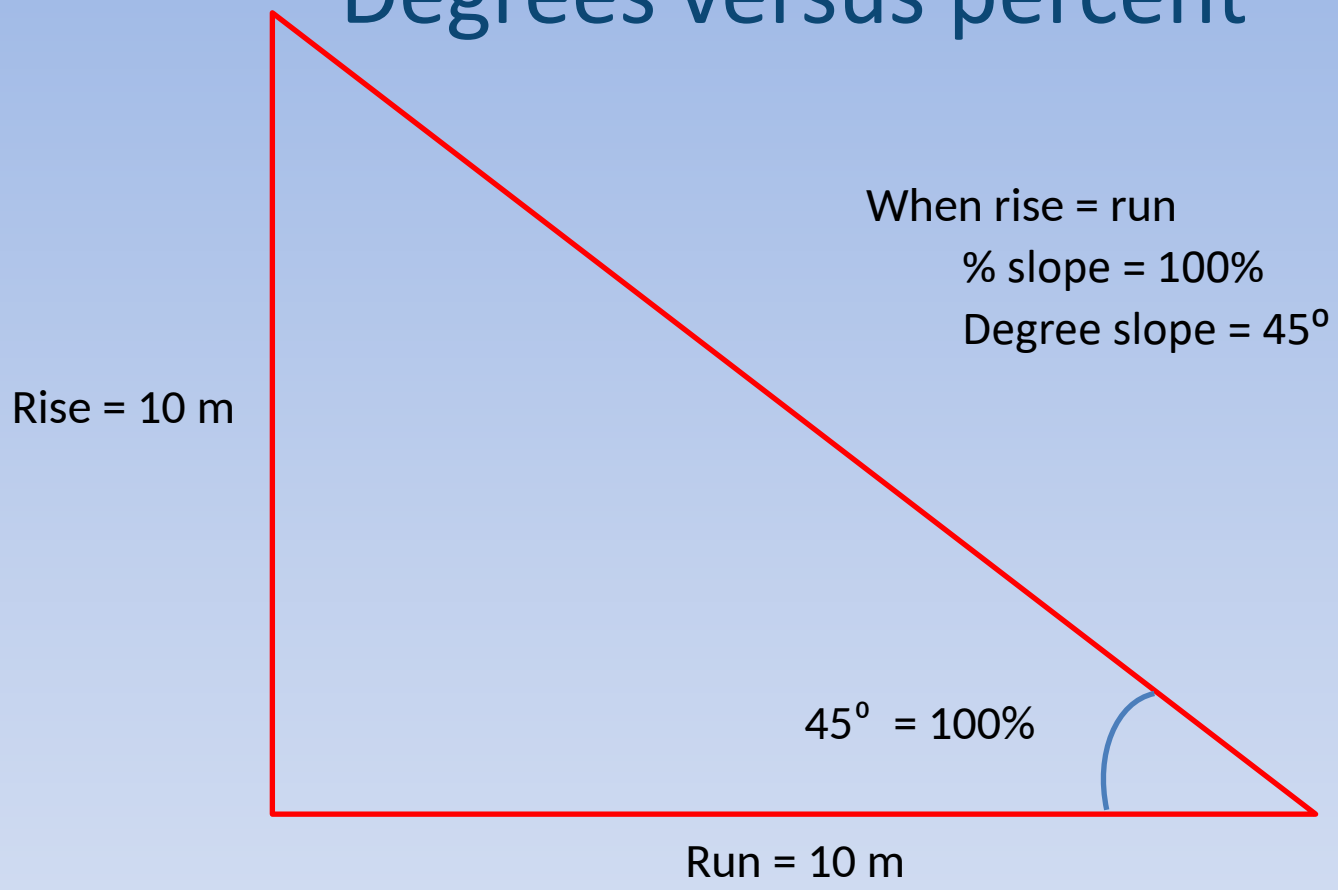






NRTG
NATURAL RESOURCES TRAINING GROUP

Degrees versus percent



- Do not confuse the units you are using
- Always include the units you are using when recording slope values.

NRTG
NATURAL RESOURCES TRAINING GROUP

Tools to measure slope

Clinometer

Abney level

Compass

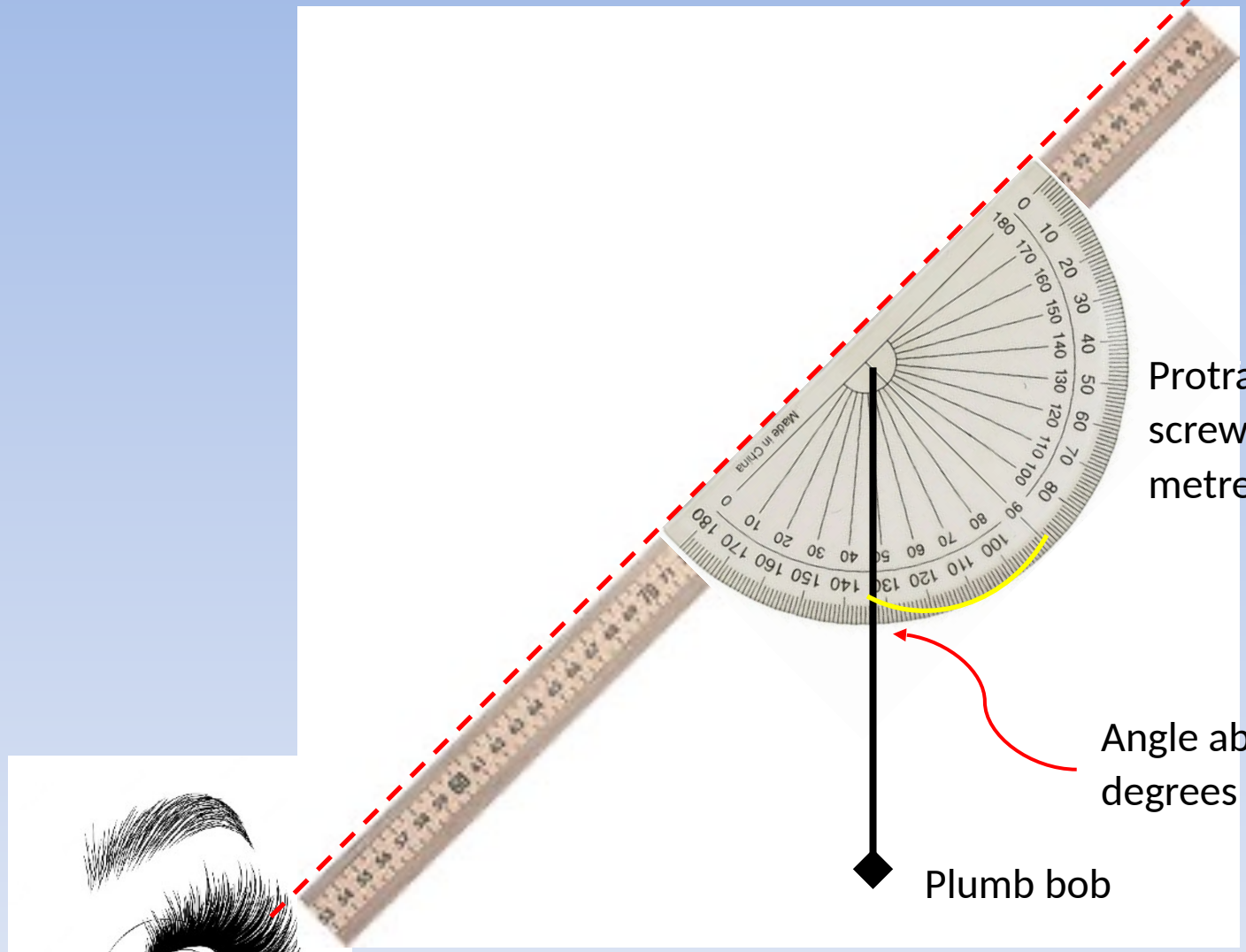
NRTG
NATURAL RESOURCES TRAINING GROUP

Measuring slope without these sophisticated tools

- Protractor on a stick
- Modified Jacob's staff
- Water level

NRTG
NATURAL RESOURCES TRAINING GROUP

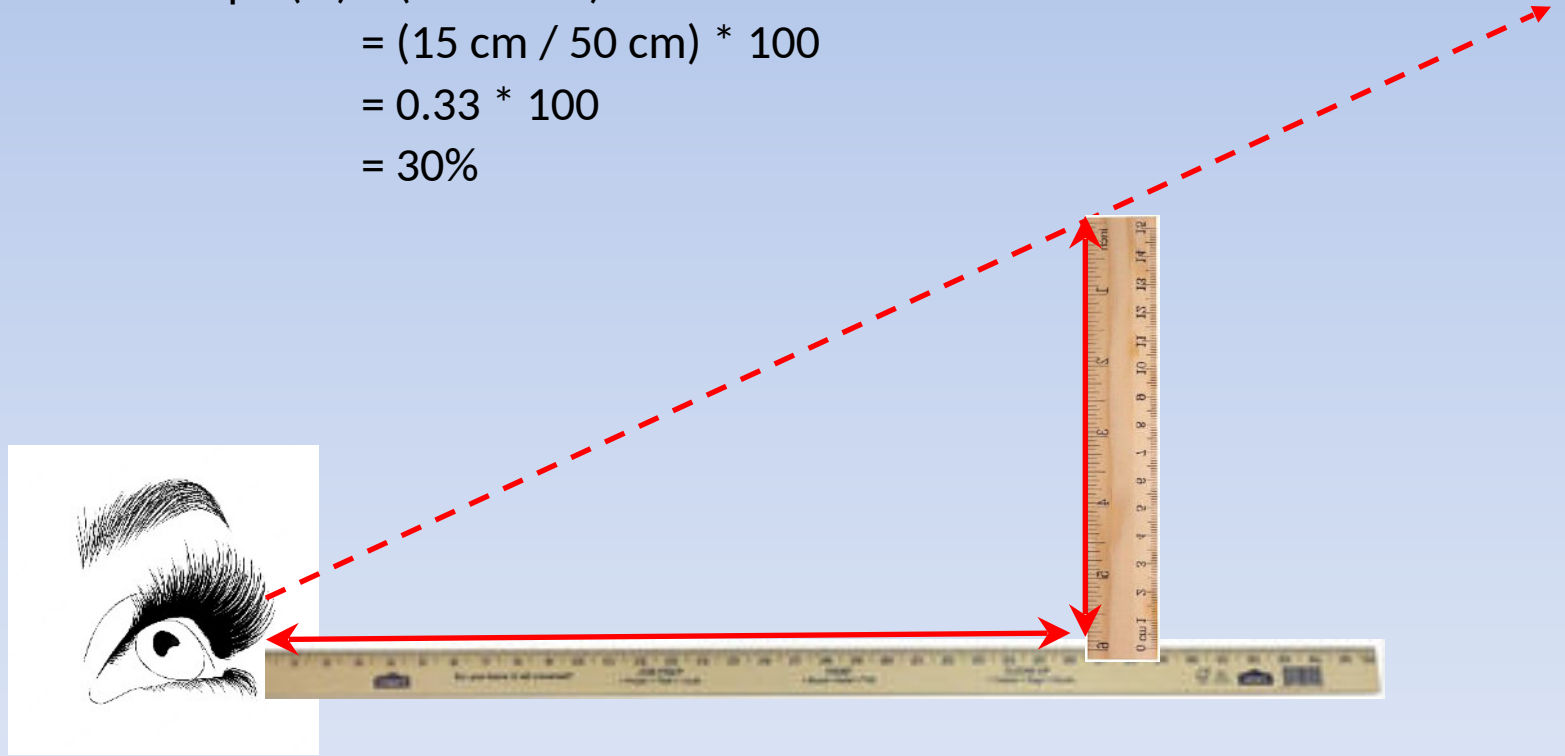
Protractor on a stick



Modified Jacob's Staff

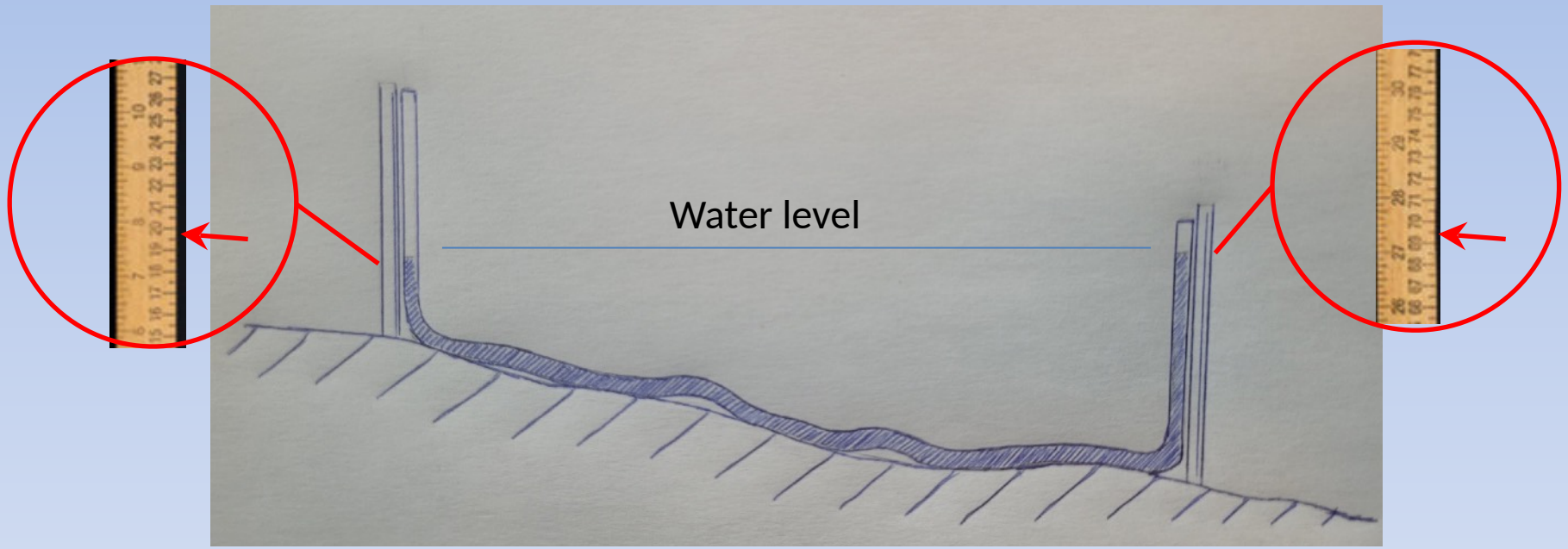
Rise = 15 cm
Run = 50 cm

Slope (%) = (rise / run) * 100
= (15 cm / 50 cm) * 100
= 0.33 * 100
= 30%



NRTG
NATURAL RESOURCES TRAINING GROUP

Water level



10 m distance

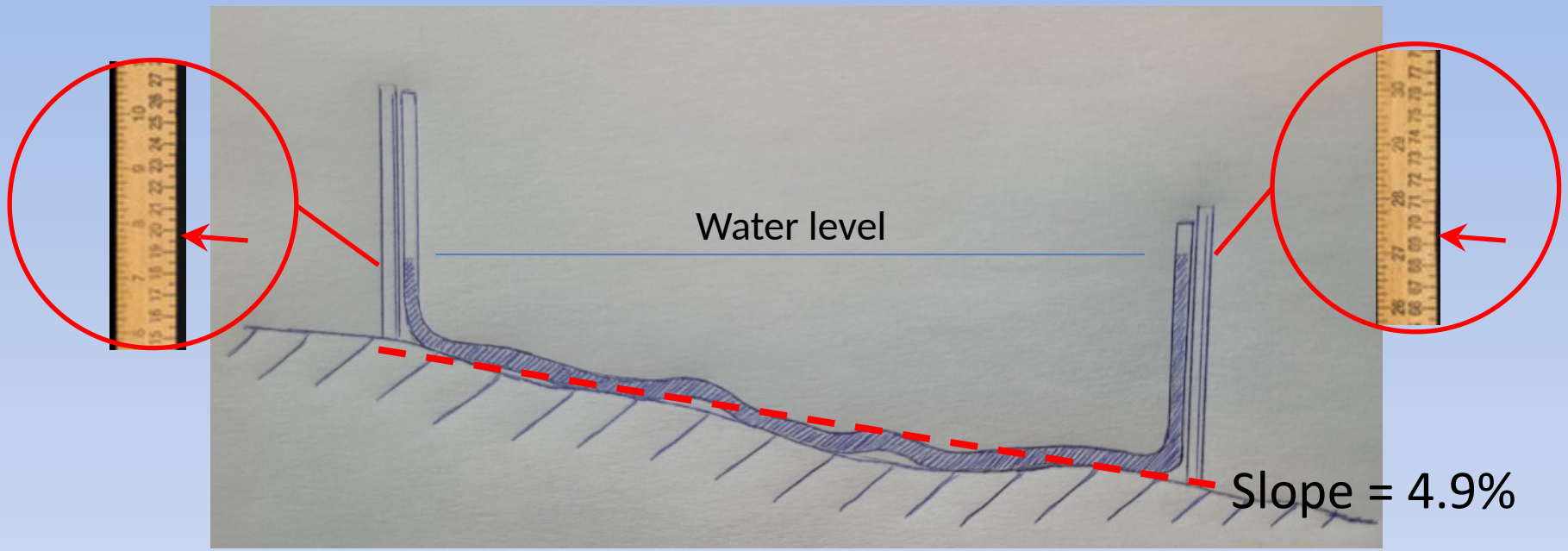
At this end: water height above ground = 20 cm

At this end: water height above ground = 69 cm

Difference in height between two ends
69 cm – 20 cm = 49 cm

NRTG
NATURAL RESOURCES TRAINING GROUP

Water level



Rise = 49 cm

Run = 10 m (1000 cm)

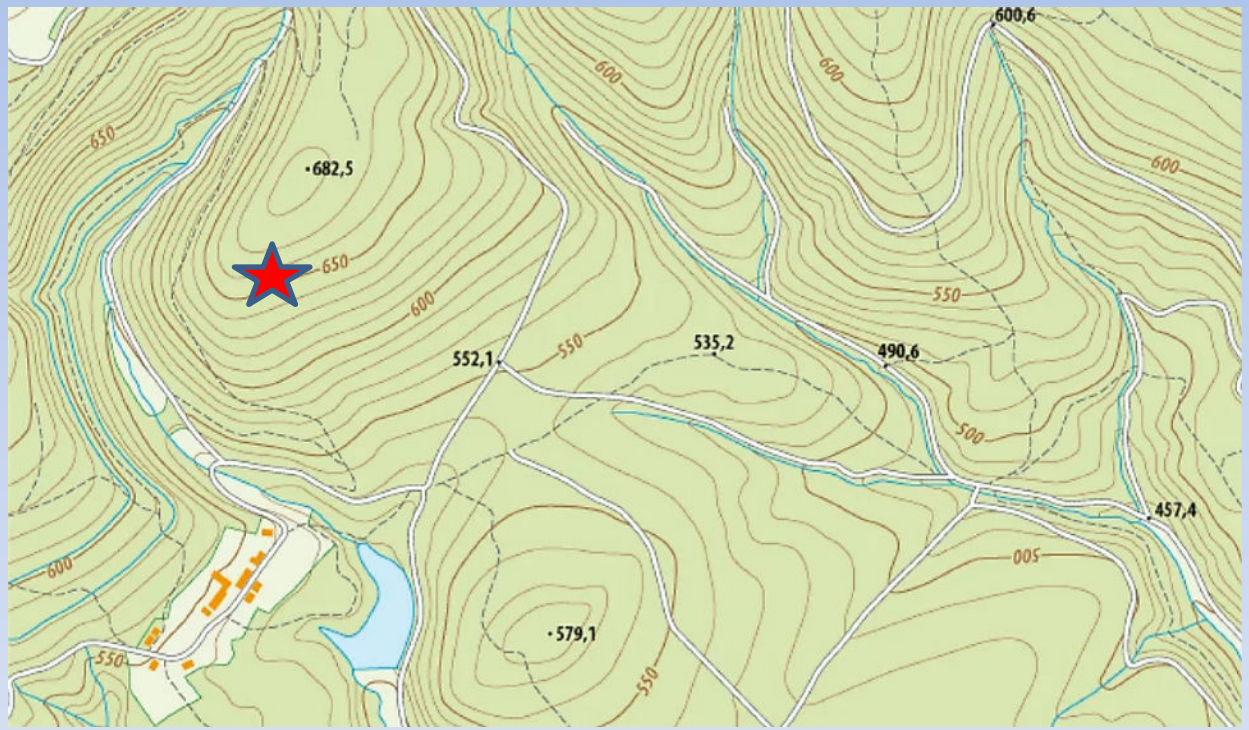
Slope (%) = (rise / run) * 100

=(49 cm / 1000 cm) * 100

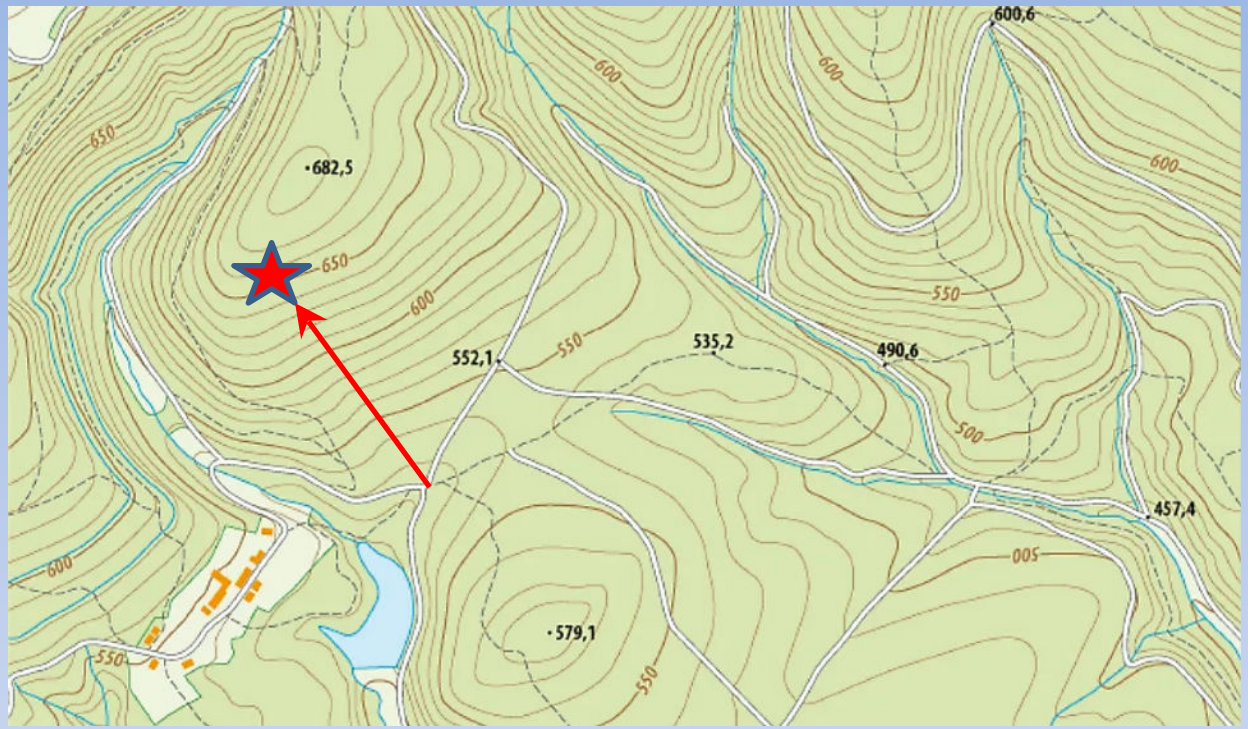
= <u>4.9%</u>

NRTG
NATURAL RESOURCES TRAINING GROUP

Slope distance vs horizontal distance



NRTG
NATURAL RESOURCES TRAINING GROUP



Distance from junction of roads

Map distance 5.0 cm

Map scale 1:10,000

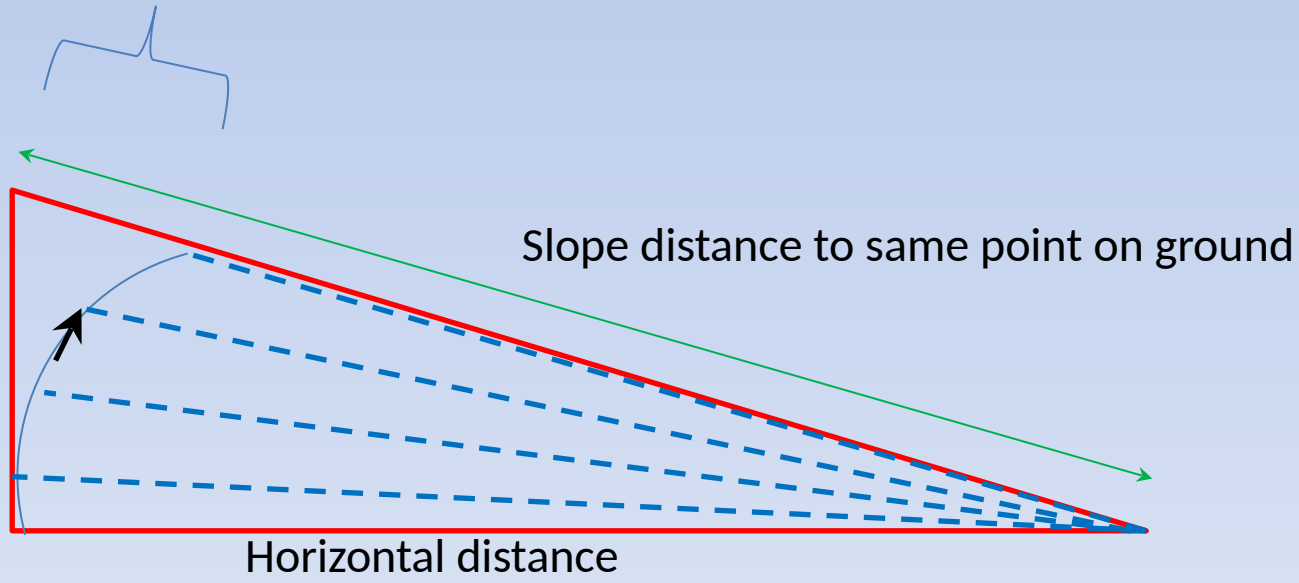
Ground distance is = 500 m

Elevation change = 655 m – 525 m = 130 m

Slope = 26.0%

NRTG
NATURAL RESOURCES TRAINING GROUP

This bit the extra ground distance beyond the horizontal distance

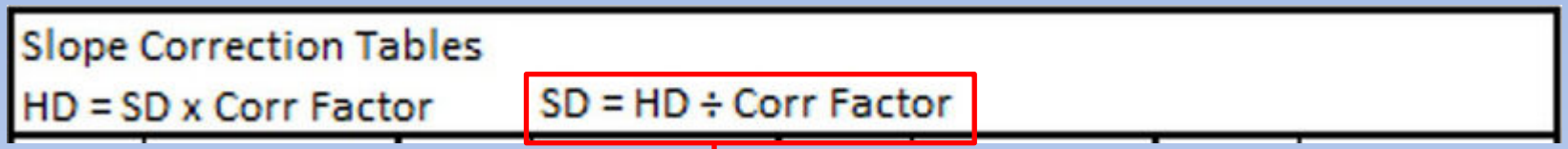


NRTG
NATURAL RESOURCES TRAINING GROUP

How to do the correction

Slope Correction Tables HD = SD x Corr Factor				SD = HD ÷ Corr Factor			
%	Corr Factor	%	Corr Factor	%	Corr Factor	%	Corr Factor
1	1.0000	26	0.9678	51	0.8908	76	0.7962
2	0.9998	27	0.9654	52	0.8872	77	0.7923
3	0.9996	28	0.9630	53	0.8836	78	0.7885
4	0.9992	29	0.9604	54	0.8799	79	0.7847
5	0.9988	30	0.9578	55	0.8762	80	0.7809
6	0.9982	31	0.9552	56	0.8725	81	0.7771
7	0.9976	32	0.9524	57	0.8688	82	0.7733
8	0.9968	33	0.9496	58	0.8650	83	0.7695
9	0.9960	34	0.9468	59	0.8613	84	0.7657

NRTG
NATURAL RESOURCES TRAINING GROUP



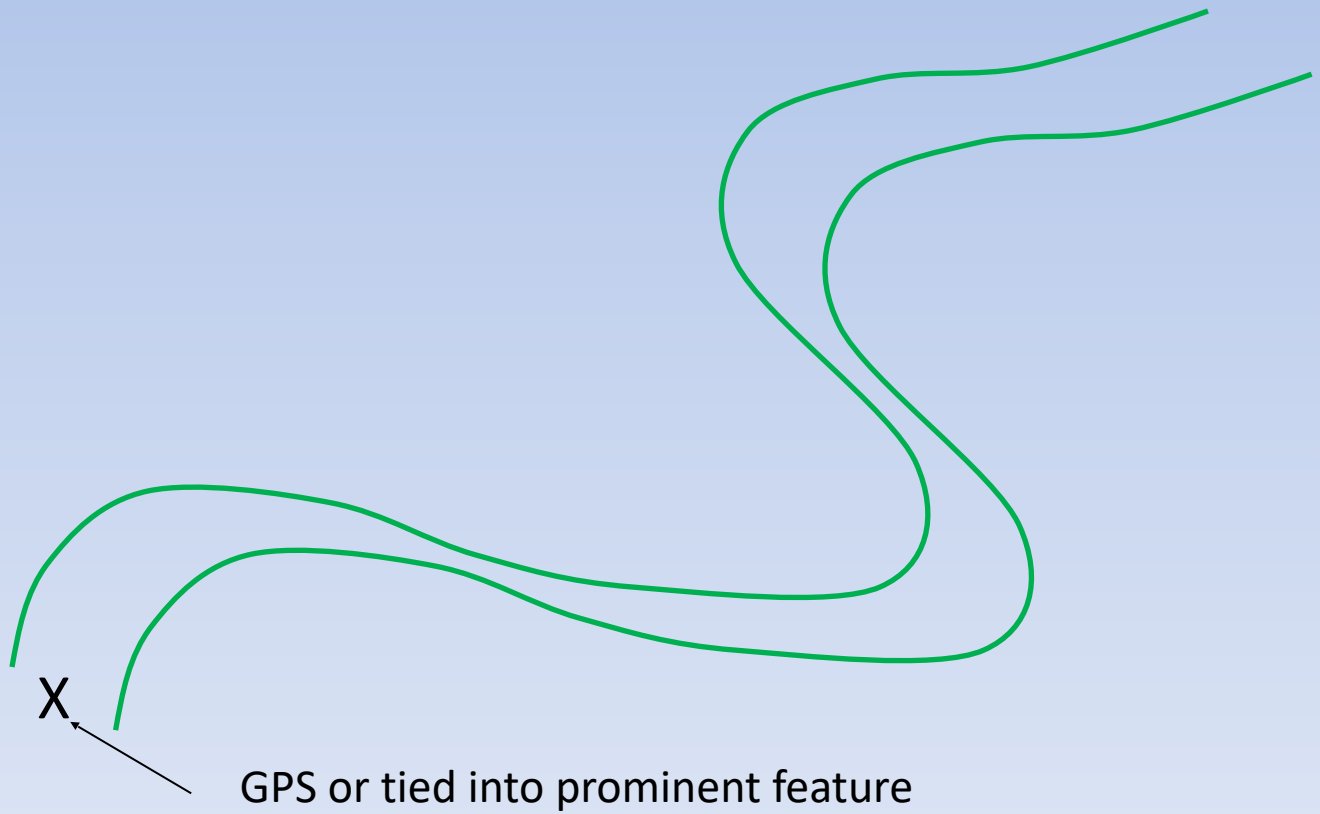
Horizontal distance = 500 m
Correction factor = 0.9678

Slope distance = horizontal distance ÷ correction factor
= 500 m ÷ 0.9678
= 516.6 m

So, we actually must hike in 516.6 m to dig our pit exactly where it is to go, not 500 m.

NRTG
NATURAL RESOURCES TRAINING GROUP

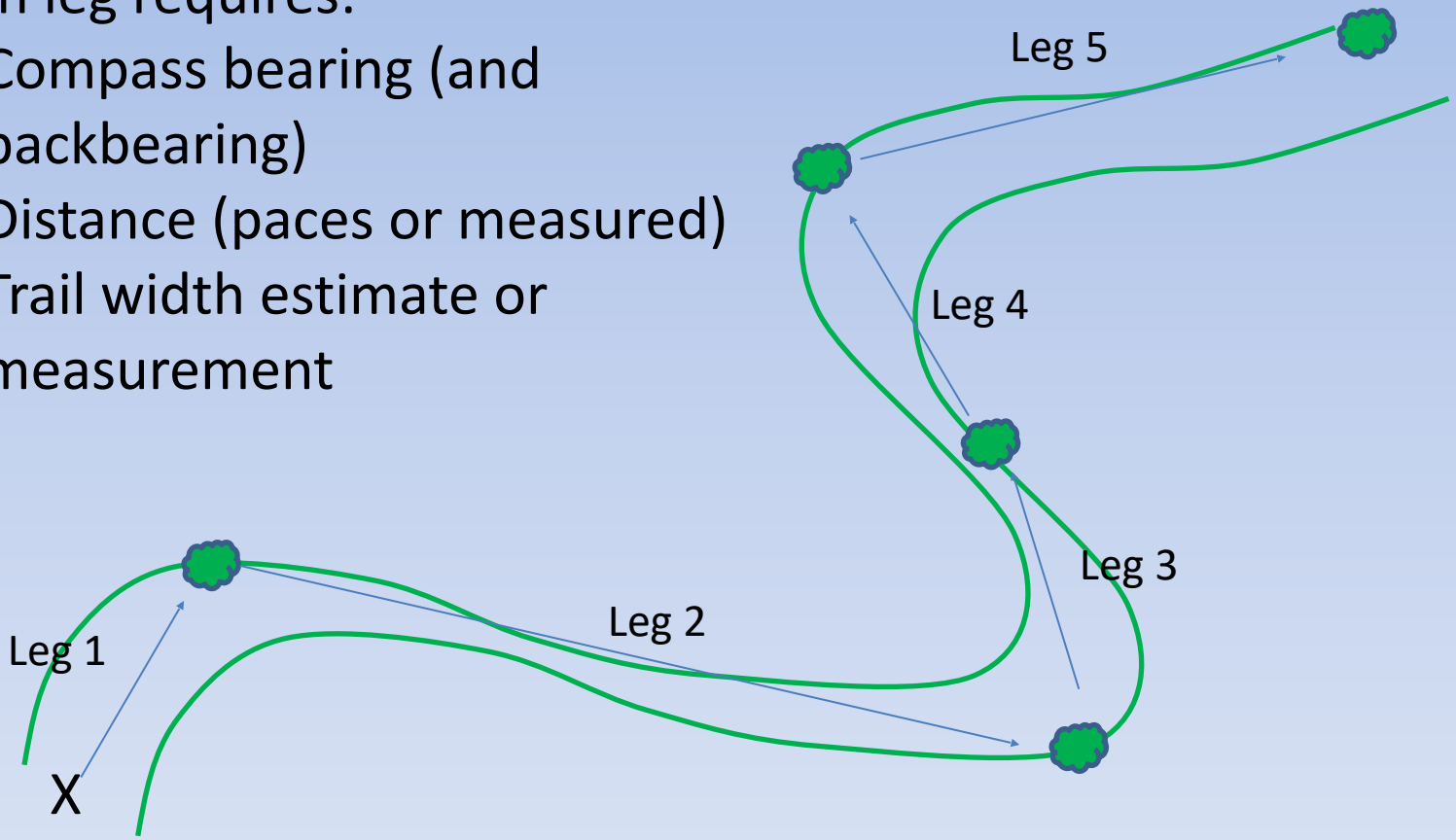
An interlude
Overview of Integrative exercise: Assignment 2



NRTG
NATURAL RESOURCES TRAINING GROUP

Each leg requires:

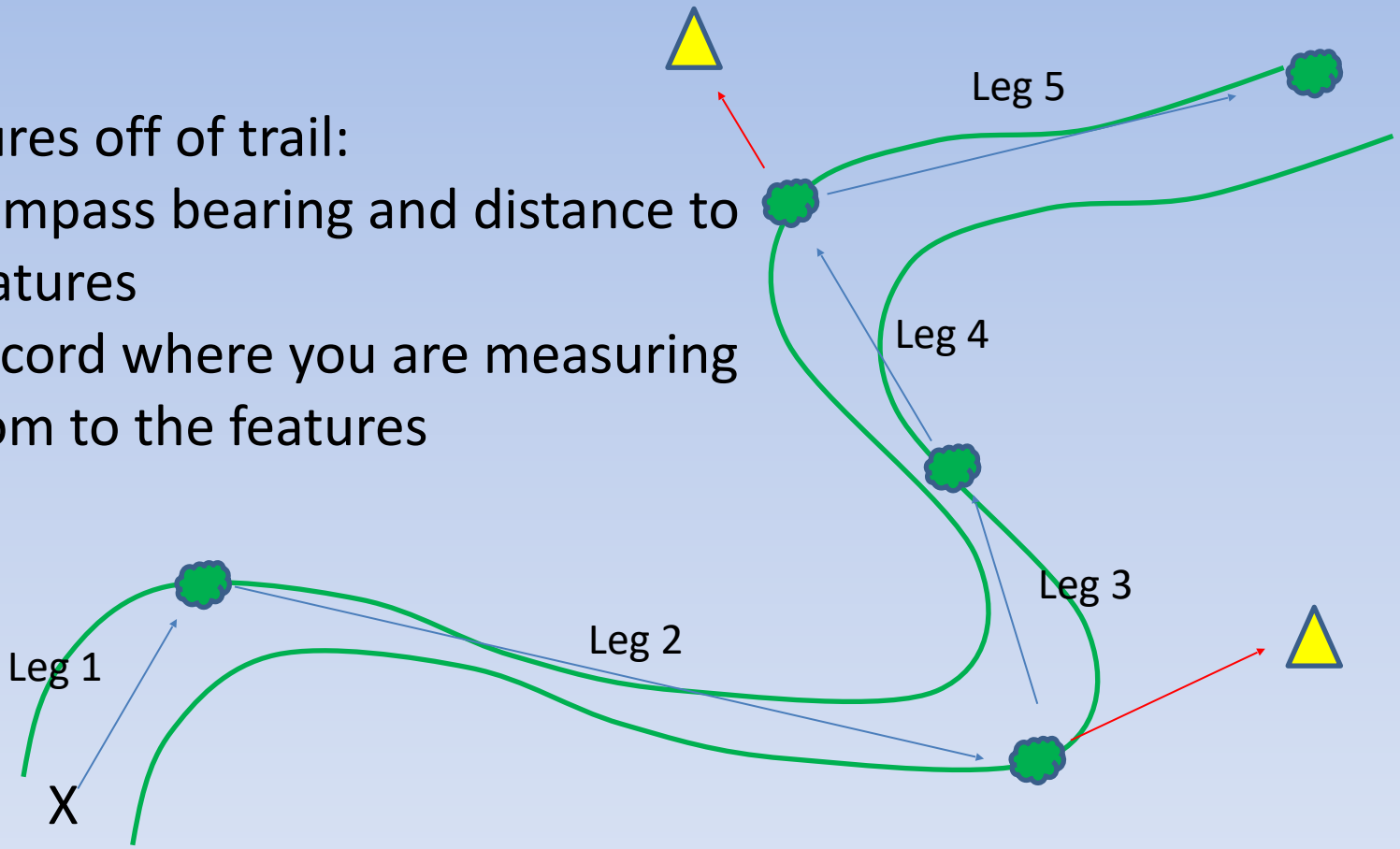
- Compass bearing (and backbearing)
- Distance (paces or measured)
- Trail width estimate or measurement



NRTG
NATURAL RESOURCES TRAINING GROUP

Features off of trail:

- Compass bearing and distance to features
- Record where you are measuring from to the features



NRTG
NATURAL RESOURCES TRAINING GROUP

Data tables to record data (from assignment description)

Leg number	Front bearing	Back bearing	Length of leg (m)	Width of trail (m)
1				
2				
3				

(you want 7-10 legs)

Feature	Front bearing	Distance to feature (m)	Description of feature	Leg which feature is adjacent to
1				
2				

NRTG
NATURAL RESOURCES TRAINING GROUP

Essential Skill #8: Soils

NRTG
NATURAL RESOURCES TRAINING GROUP

Mineral vs organic soil

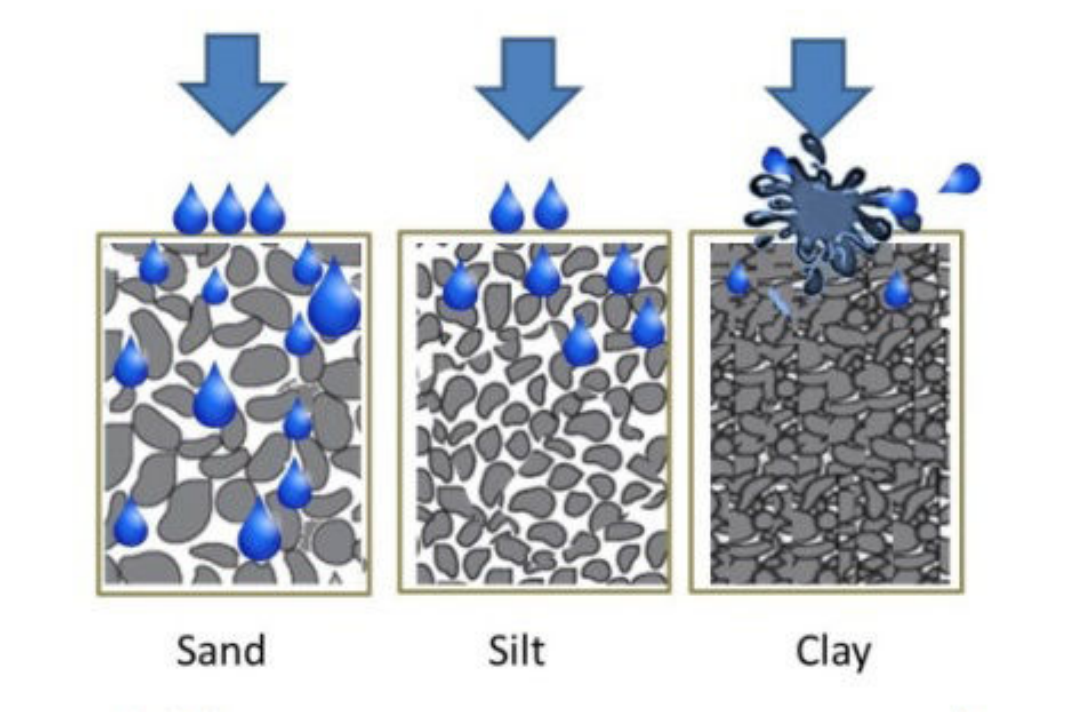
A continuum

- Nutrient poor
- Good drainage
- High permeability allowing movement of air and water into soil

- Nutrient rich
- Poor drainage
- Low permeability preventing movement of air and water into soil

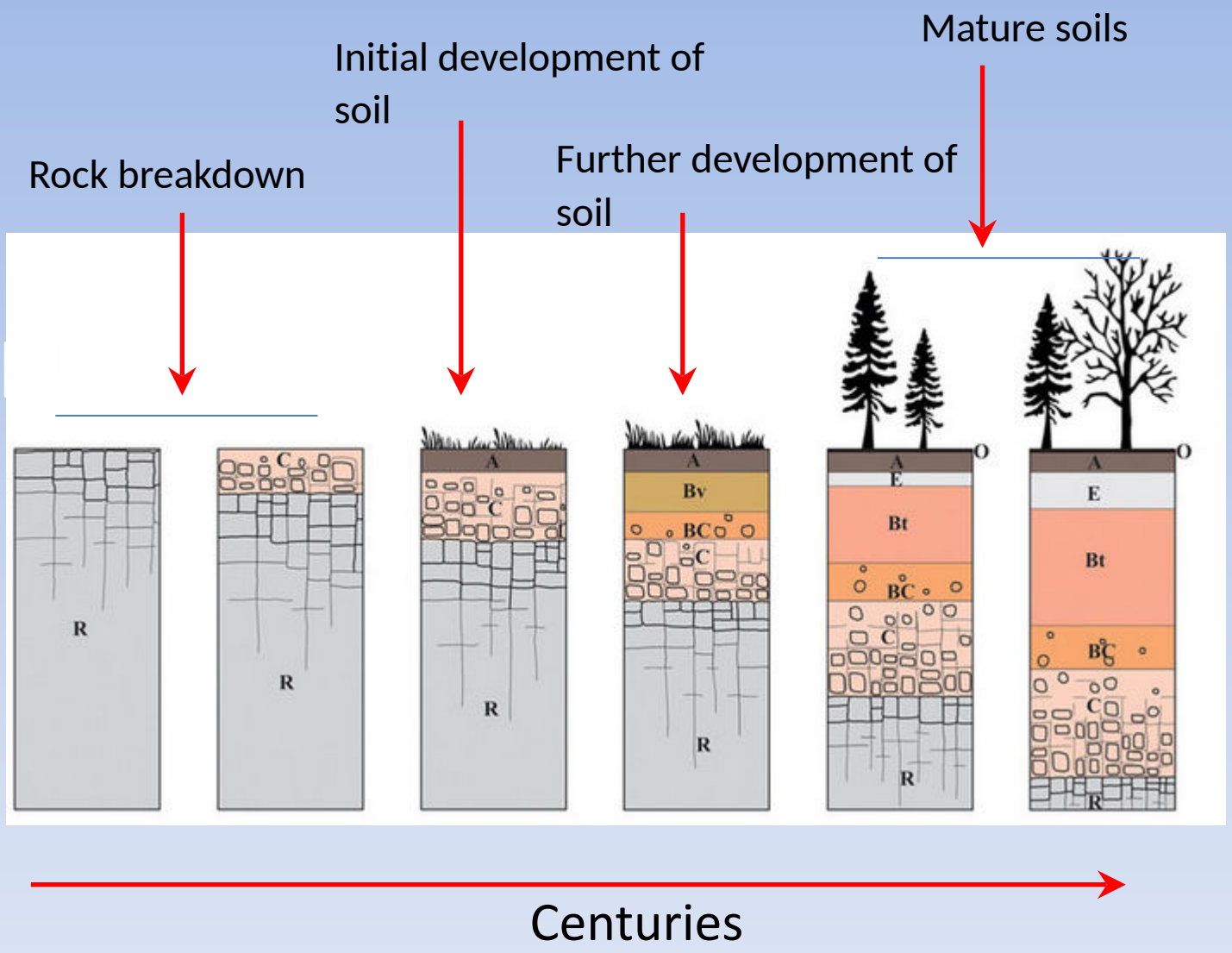
NRTG
NATURAL RESOURCES TRAINING GROUP

NRTG
NATURAL RESOURCES TRAINING GROUP



NRTG
NATURAL RESOURCES TRAINING GROUP

Soil development



NRTG
NATURAL RESOURCES TRAINING GROUP

Soil forming processes

Topography

Time

Biota

Climate

Parent material

NRTG
NATURAL RESOURCES TRAINING GROUP

Parent Material

feldspar

lava

granite

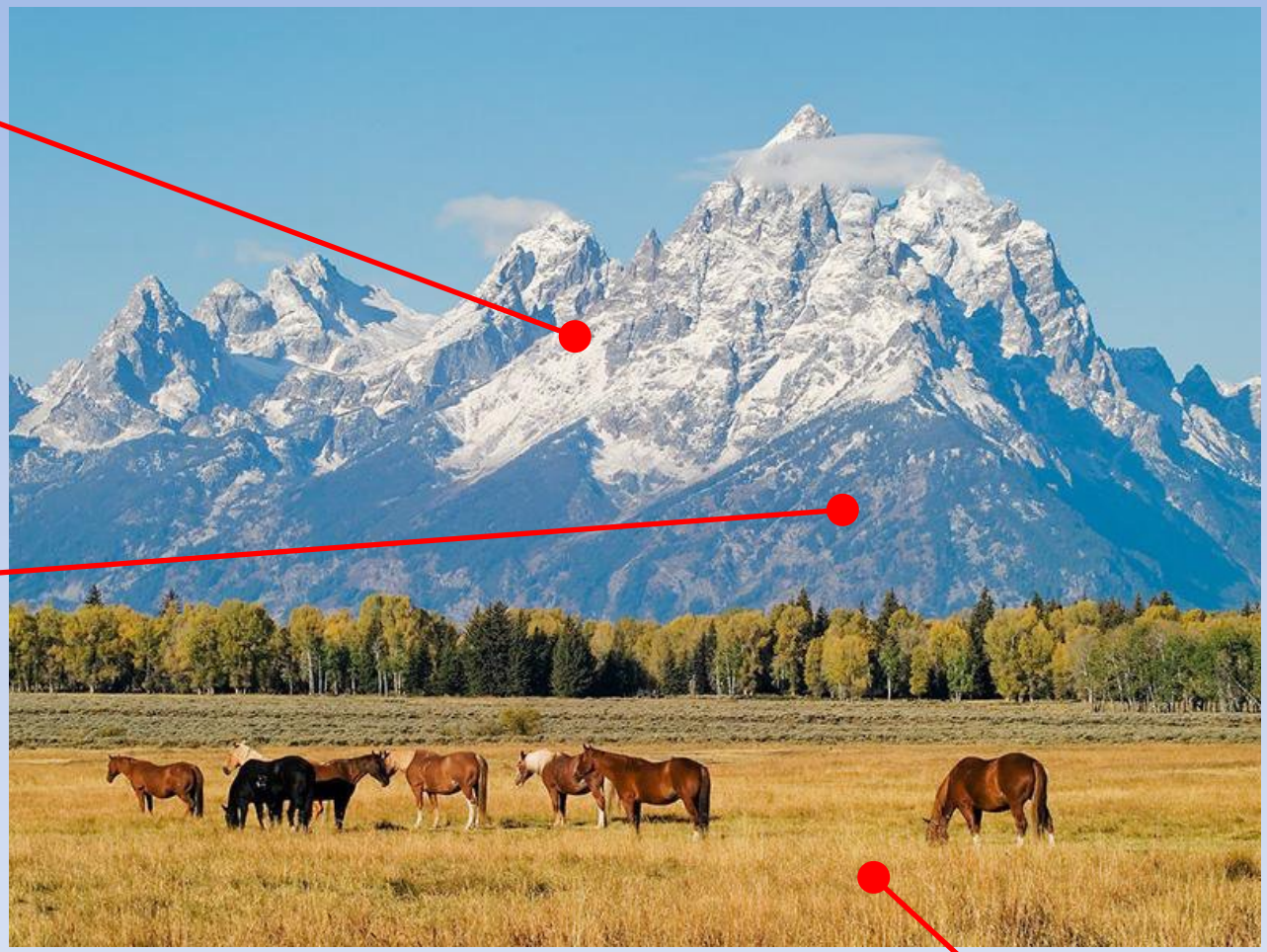
NRTG
NATURAL RESOURCES TRAINING GROUP

Climate

NRTG
NATURAL RESOURCES TRAINING GROUP

Topography

Erosion and transport of materials



Development of soils; early development at top; mature soils near bottom

Rich deep soils in valley

NRTG
NATURAL RESOURCES TRAINING GROUP

Biota

NATURAL RESOURCES TRAINING GROUP

Time

NRTG
NATURAL RESOURCES TRAINING GROUP

Soil conservation

Dust Bowl, Oklahoma, 1930s

NRTG
NATURAL RESOURCES TRAINING GROUP

Some principles of soil conservation

- Keep soil vegetated to prevent erosion
- Avoid compacting soils
- Keep soils in place
- Avoid depleting fertility of soils

NRTG
NATURAL RESOURCES TRAINING GROUP

(1) Keep soil vegetated to prevent erosion

slopes and exposed soils = High risk of erosion

NRTG
NATURAL RESOURCES TRAINING GROUP

(2) Avoid compacting soils

NRTG
NATURAL RESOURCES TRAINING GROUP

(3) Keep soils in place


Silt fences


Rolled erosion control blanket

Covering soil stockpiles


Windbreaks

NRTG
NATURAL RESOURCES TRAINING GROUP

(4) Avoid depleting fertility of soils

Essential Skills 7 and 8: summary

This week we focused on:

- Slopes
  - Why documenting and understanding slopes is important
  - A variety of methods for measuring slopes
  - The importance and difference between slope distance and horizontal distance
- Soils
  - What soil is, why we should care, and a few ways to conserve it.

NRTG
NATURAL RESOURCES TRAINING GROUP