

ES322 Geomorphology
 Estimating Historic Weathering Rates in Western Oregon from Tombstone Morphology
 Chandra Drury and Jessica Smith

Observations	Stone #1	Stone #2	Stone #3	Stone #4	Stone #5
Observation Date	10/5/2004	10/5/2004	10/5/2004	10/5/2004	10/5/2004
Date of Death	5/4/1873	10/4/1903	3/9/1882	12/13/1924	6/18/1948
Exposure Time (Yrs)	131	101	122	80	56
Rock Type	Marble	Marble (Wh/Gry)	Marble	Granite	Granite
Crystal/Grain Size	>1mm	>1mm	>1mm	>1mm	>1mm
Mineral Composition	Calcite	Calcite	Calcite	Hornblend, Quartz	Hornblend, Quartz
Surface Roughness	Slightly Rough-2	Slightly Rough-2	Highly Rough-4	Smooth-1	Rough Sides-4
Polish Condition	Poorly Polished-3	Poorly Polished-3	Poorly Polished-3	Highly Polished-1	Polished Front-3
Epitaph Inscription Quality	2	2	3	0	Two
Inscription Aspect Azimuth	West	West	West	West	West
Inscription Height (mm)	61	96	37	44	78
Top Stone Thickness-right(mm)	8	4.4	10.2	20.7	21.2
Top Stone Thickness-middle(mm)	8	4.4	10.2	20.6	20.9
Top Stone Thickness-left(mm)	8	4.4	10.2	20.7	21.1
Average Top Stone Thickness (mm)	8	4.4	10.2	20.66	21.06
Basal Stone Thickness-right(mm)	8	4.6	10.2	20.7	20.7
Basal Stone Thickness-left(mm)	8	4.7	10.2	20.7	20.7
Average Basal Stone Thickness (mm)	8	4.65	10.2	20.7	20.7
Weathering Loss (Avg. bottom-Avg. top (mm))	0	0.25	0	0.04	0.366
Lichen Diameter (mm)	2	4	0	0	2
Percent Cover of Stone and Base(%)	95	90	80	0.5	40

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Observations	Stone #6	Stone #7	Stone #8	Stone #9	Stone #10
Observation Date	10/5/2004	10/5/2004	10/5/2004	10/5/2004	10/5/2004
Date of Death	5/12/1942	3/17/1951	4/4/1921	5/8/1943	2/17/1932
Exposure Time (Yrs)	62	53	83	61	72
Rock Type	Granite	Granite	Granite	Granite	Granite
Crystal/Grain Size	>1mm	>1mm	>1mm	>1mm	>1mm
Mineral Composition	Quartz, Plagioclase	Quartz, Plagioclase	Hornblend, Quartz	Mica, Quartz	Quartz, Plagioclase
Surface Roughness	Smooth-1	Slightly Rough-2	Rough Sides-4	Smooth-1	Slightly Rough-2
Polish Condition	Polish-1	Poorly Polished-3	Polished Front-1	Polish-1	Moderately Polished-2
Epitaph Inscription Quality	0	2	2	1	2
Inscription Aspect Azimuth	West	West	West	West	West
Inscription Height (mm)	55	55	57	80	80
Top Stone Thickness-right(mm)	20.3	21.6	20.6	19	24.7
Top Stone Thickness-middle(mm)	20.6	21.7	20.6	19	26
Top Stone Thickness-left(mm)	20.6	22	20.6	19	26
Average Top Stone Thickness (mm)	20.5	21.76	20.6	19	25.56
Basal Stone Thickness-right(mm)	21.1	22	21	19	25
Basal Stone Thickness-left(mm)	21.7	21.7	21	19	26
Average Basal Stone Thickness (mm)	21.4	21.85	21	19	25.5
Weathering Loss (Avg. bottom-Avg. top (mm))	0.9	0.09	0.4	0	0.06
Lichen Diameter (mm)	0	0	0	0	0
Percent Cover of Stone and Base(%)	1	0.5	0	1	2

10/5/04

Mark Spiering

Shelby Collins

Meredith Grossen

① - October 5th, 2004

- Aug 26th, 1895

- EX. TIME - 109 yrs

- sed. sandstone w/calcite

- coarse grained

- calcite, quartz

- top: moderately rough sides: smooth

- moderately polished

- 3 - inscription

- 180°

- 86 cm

- 30.3 cm, ^{top:} 30.15 cm, ^{bottom:} 30.25, 30.35

- ~ .15 cm difference

- 3 cm, 2.75 cm, 2 cm,

- 55%.

② 2004

- Sept. 6th, 1888 - EX. TIME - 116 yrs

- sed. sandstone w/calcite

- coarse grained

- calcite, quartz

- top: ^{med.} rough, sides: medium

- polished moderately

- 270°

- 42 inches

- top: 36.5 cm, ; bottom: 36.5

5.5 cm 5.5 cm

- no difference

- 8 cm, 8.5 cm, 3 cm

- 60%

- ③ - 2004
- Dec. 20, 1876
- EX. TIME - 128 yrs
- sed. sandstone w/ calcite
- coarse grained
- calcite, quartz
- moderate roughness
- poorly polished
- #5
- 27 cm high
- top: 5.6 cm, 5.5 cm, 5.56 cm middle: 34.4 cm bottom: 34.4 cm
 34.5
- difference: .1 cm
- 3 cm, .75
- 80%.

- ④ 2004
- 1897 - EX. TIME - 107 yrs
- igneous
- phaneritic
- biotite, plagioclase, quartz, hornblende
- moderate
- highly polished
- #2
- 60 cm
- top: 21 cm, 21.4 cm bottom: 56.3 cm
 54.3 cm
- 2 cm difference
- 6 cm, 6 cm, 7 cm
- 60%

⑤ 10/5/04
1918

Ex. Time - 86 yrs

igneous

large grained ~ 3 mm

hornblende, feldspar?

1 - smooth

Inscription - 1

270°

3.5 cm off ground

30.2 cm }
30.1 cm } TOP
30.2 cm }

1) Avg = 40.15 cm - top

29.3 cm }
29.4 cm } bottom

Avg. = 29.35 cm - bottom

Weather loss = 9.8 cm

75-80% covered

⑦ 10/5/04
12/27/1916

Ex. time - 88 yrs

igneous

large grained ~ 3 mm

quartz, feldspar, hornblende

1 - smooth

Inscription - 1

270

50 cm off ground

top thickness - 20.75 cm Avg.
bottom thickness - 21.5 cm Avg.

Avg. loss - .75 cm

2.5 cm, 4.5 cm

60% covered

⑥ 10/5/04
1/17/1912

Ex. time - 92 yrs

sed. sand stone

coarse grained

calcite, quartz

roughness - 3 - moderate

poorly polished

Inscription - 2

270°

Ht. - 62 cm

top - 15.55 cm Avg.

bottom - 15.56 cm Avg.

Avg. Loss - 0.01 cm

36 cm, 20 cm, 28 cm

85% covered

⑧ 10/5/04

1938

EX. Time - 66 yrs

igneous

large grained ~ 2-3 mm

quartz, plagioclase, hornblende, feldspar

Z - slightly rough

Z - moderately polished

Inscription - 1

90°

Ht. - 28 cm

top - 21.2 cm Aug.

bottom - 21 cm Aug.

Avg. loss - .2 cm

60% covered

⑨ 10/5/04

1941

EX. Time - 63 yrs

igneous

med. grained ~ 1-2 mm

quartz, plagioclase, ?

Z - moderately rough

Z - poorly polished

Inscription - 1

90°

Ht. - 16 cm

top - 16.8 cm Aug.

bottom - 16.9 cm Aug.

Avg. loss - .1 cm

80% covered

⑩ 10/5/04

1917

EX. time - 87 yrs

Sedimentary

sandstone / limestone

small grain

Z - slightly rough

Z - moderately polished

Inscription - 1

270°

Ht. - 35 cm

top - 20.57 cm Aug.

bottom - 21 cm Aug.

Avg. loss - .43 cm

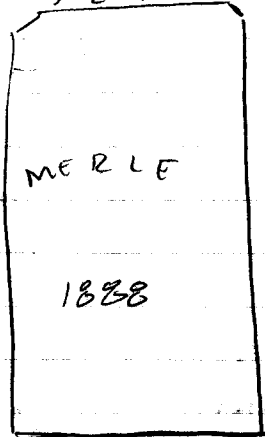
50% covered

1015

#1
MAR. 20 1888

Rock Marble
 fs Medium
 min Calcite
 SR Moderate 3
 Pol. Porphy 4
 Encl. 2
 Azimuth West
 height 55 cm
 Lichen/moss 25%
 Lichen size 7.50 cm

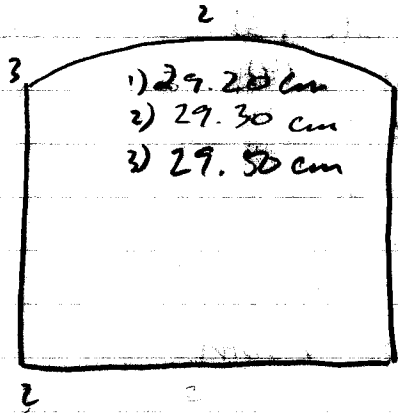
1) 20.03 cm
 2) 20.01 cm



1) 20.04 cm
 2) 20.040 cm

#2
1865

Rock granite
 fs Coarse
 Min Quartz, Felds, Hornblende
 SR 2
 Pol. 2
 Encl. 3
 Azimuth. West
 height 69 cm
 Lichen/moss: 10%
 Lichen size: 2.7 cm



1) 29.80 cm

2) 30.03 cm

→ 7 weigh cut 105%
 Lichen Smooth none.

#3
1946

Rock: Granite

xl size: Coarse

SR: 1

Pol: Highway 1

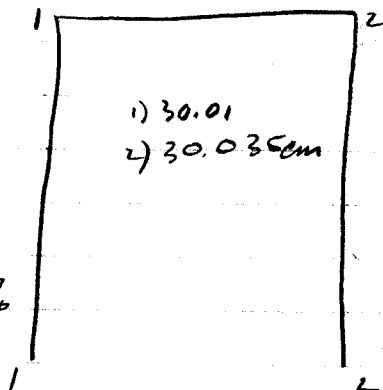
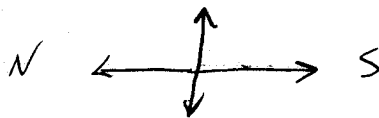
Epithaph: 1

Azimuth: West

height: 35 cm

Lichen/Moss: Very little: 10%

Lichen size: .02 cm



- 1) 30.05 cm
- 2) 30.04 cm

#4

1928

Marble

Medium

Calcite

SR Moderate (3)

Pol: 4th pol (4)

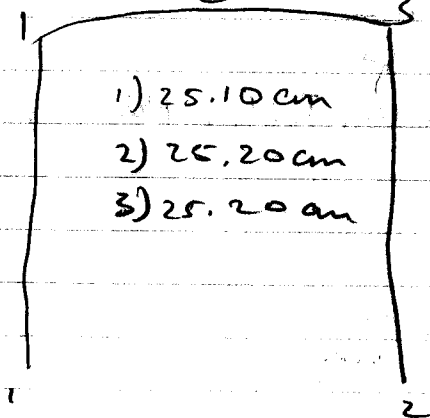
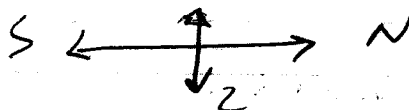
Enscrup: 2

Az: EAST

height 25 cm

Lichen/Moss: 60%

Lichen size: .3 cm



- 1) 25.15 cm
- 2) 25.10 cm

5

1915

gne granite

SEE course

Camp. Q, F, Horn.

SZ: 1

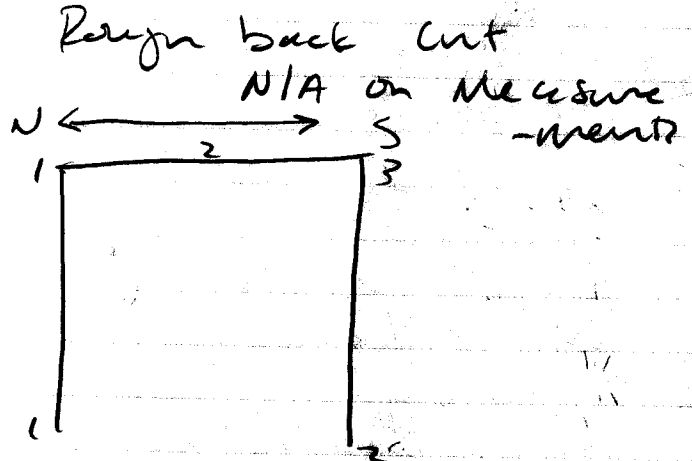
Pol: 1

Ep Ense: 1

Az. West

mass/area: 30% - 40%

diameter: 1.5cm



6

1960

Granite

very coarse faceted

Q, F, hornblende

Q: 1

Pol: 1

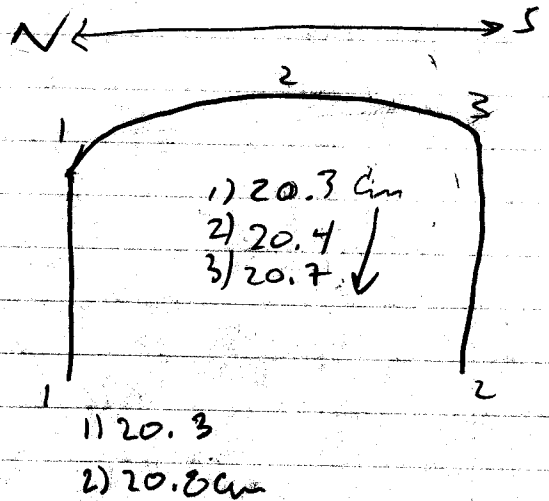
Ep Ense: 1

Az. West

height 38cm

Li. h/m 5%

Li. size 2cm



#7

1927

Granite

Course finished

SR: 2

Pol: 2

Ep. Enscrip: 1

Az: EAST

Height 15cm

Lichen/moss: 80%

Lichen size: 5cm

Range cut no thickness.

#8

1916

Granite

Course

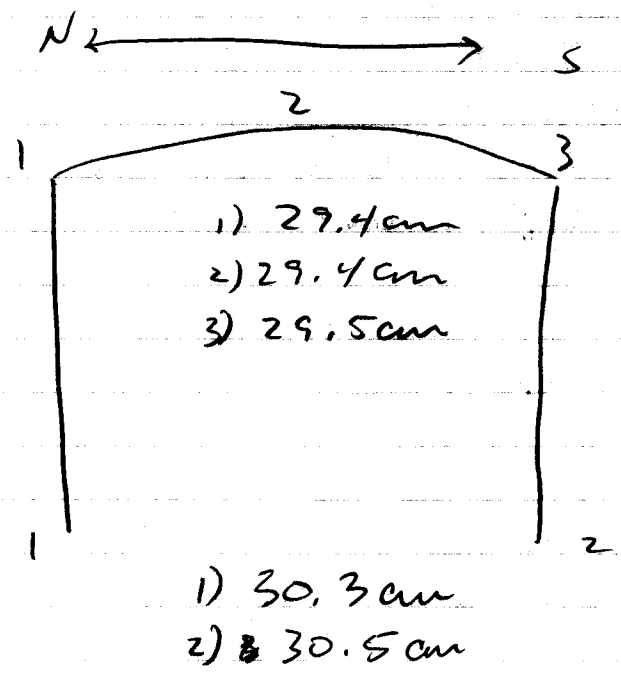
Q, F, H

SR: 1

Pol: 1

Ep. Enscrip: 1

Az: West



#9

1954

Granite

X1: Course

Camp: Q, F, Plag. F, Hxm

SZ: 1

Pol: 1

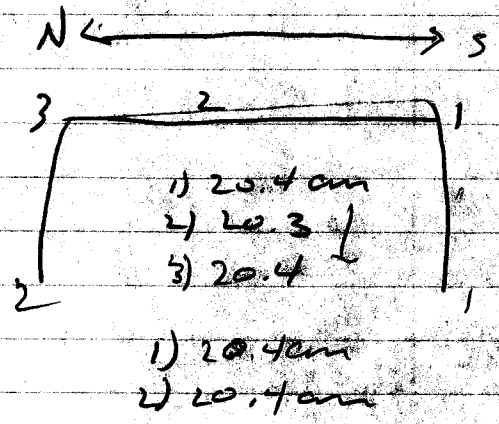
Ep Ensrup: Ø

AZ: West

Height 22cm

Lichen/Moss: 10%

Lichen: 1.5cm



NO lichen growth on smooth surfaces

A10

1919

Granite

Coarse

Camp: Q, F, H

SZ: 1

Pol: 1

Ep Ensrup: 2

AZ: West

Height: 35cm

Lichen/Moss: 5%

Lichen: N/A

