Universal Trail Assessment Process (UTAP)
&
High Efficiency Trail Assessment Process (HETAP)

Making the Measurements

American Trails
Ensuring Trails for Our Future
25 YEARS

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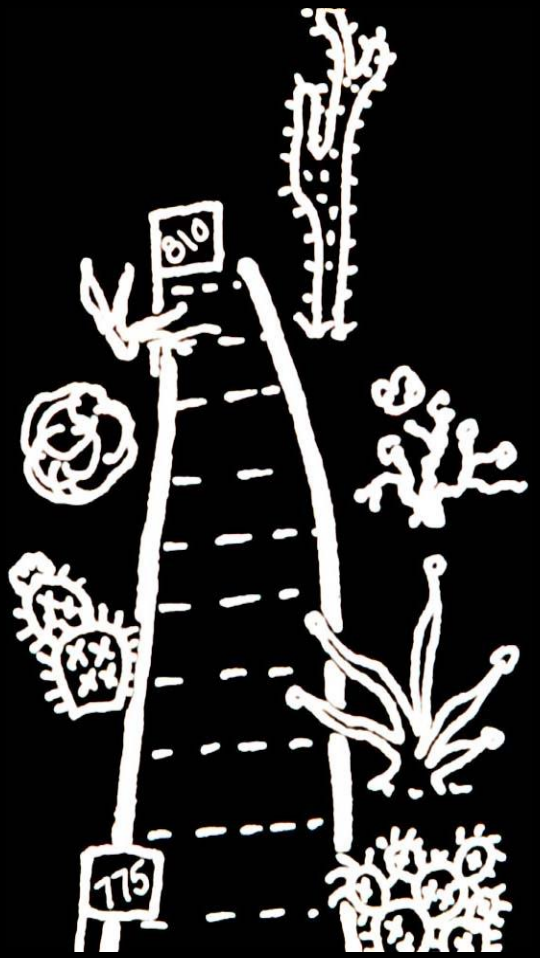
Making the Measurements Objective

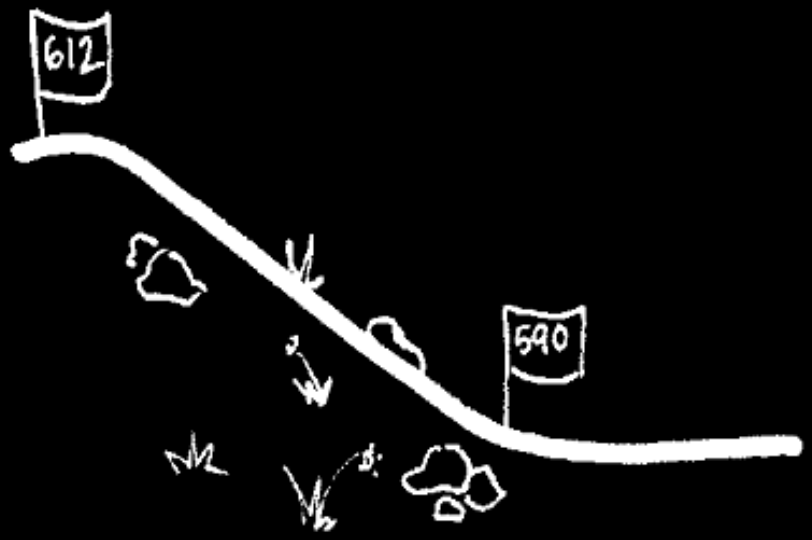
- Learn techniques for making measurements
- Describe where and when measurements are taken on the trail

Goals for Measurements

- Consistent techniques
- Accurate records
- Standardized methods
- Typical and extreme data
- Spectrum of information



UTAP: TAI Stations



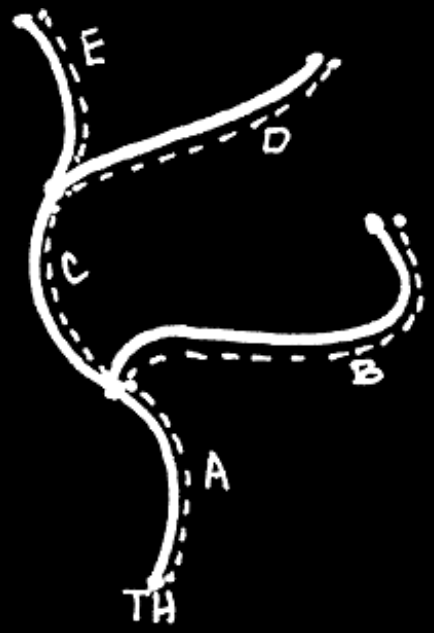
- Visual change in direction, grade, or cross slope
- Sightline to previous station
- Intersection, trailhead or destination
- Change in surface or tread width
- Temporary mark at station
- 100 feet (30 m) maximum

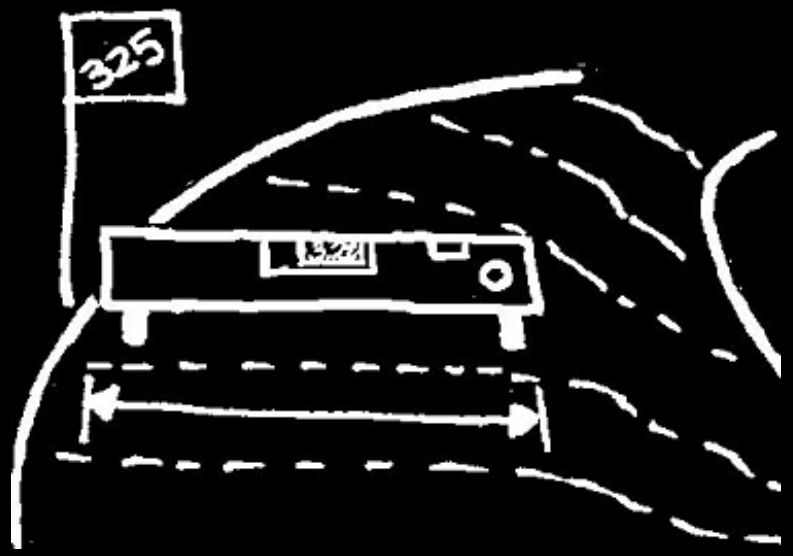
UTAP: Measurement Intervals

- At each station
  - length
- From one station to the next
  - trail direction, typical grade
- Between consecutive stations
  - typical & maximum cross slope, maximum grade, surface firmness and type, typical & minimum clearance width

Key UTAP Concepts

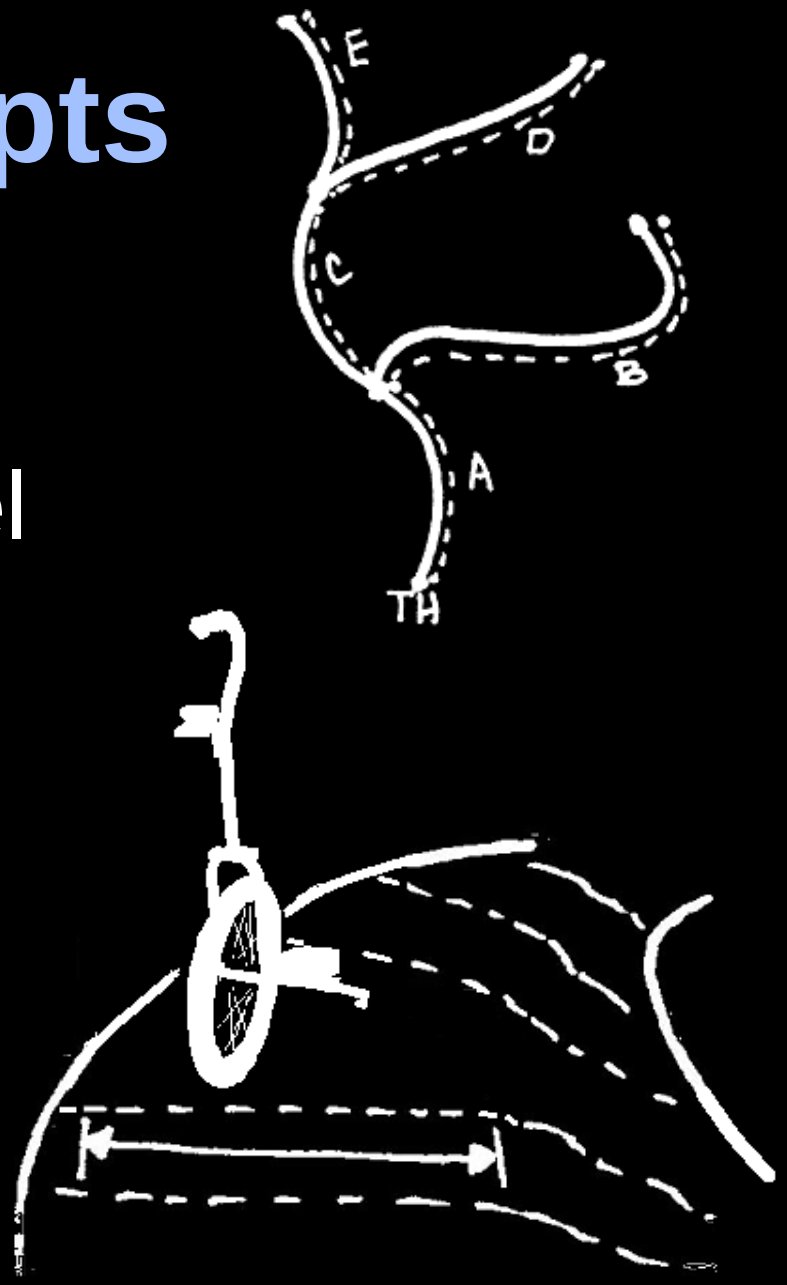
- Divide trail into segments
- Measure best path of travel
- Typical measures for all stations
- Extreme measures where they occur





Key HETAP Concepts

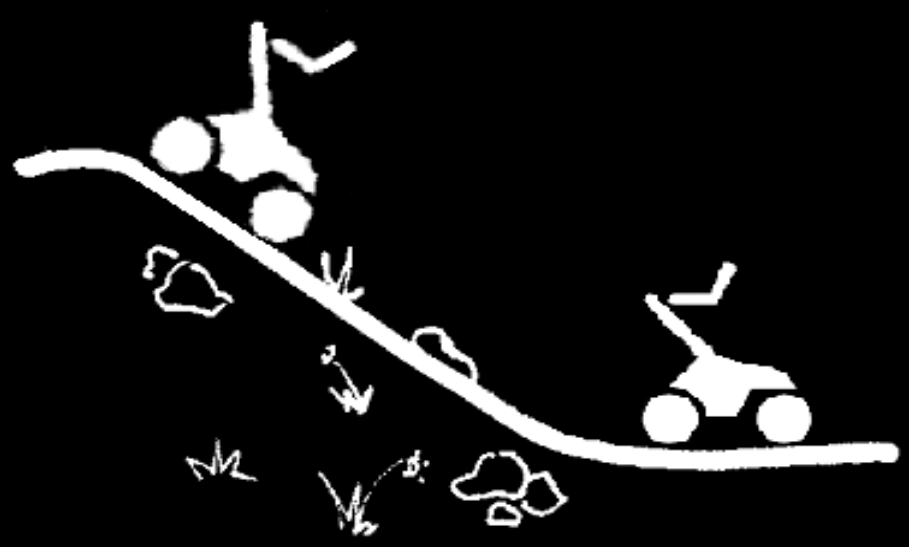
- Divide trail into segments
- Measure best path of travel
- Typical measures for all stations
- Record Stations where Extreme conditions occur



Taking Stations

- Visual change in trail direction
- Visual change in grade or cross slope
- Significant change in tread width
- Surface type change
- Trail intersection

- Start and end of trail segment
- No more than 25 feet apart*



UTAP: Distance

Rolla-wheel

- Zero at the start of each trail segment
- Peg should be in front of counter arm
- Avoid measuring features
- Measure center of best path
- Record at each station and feature

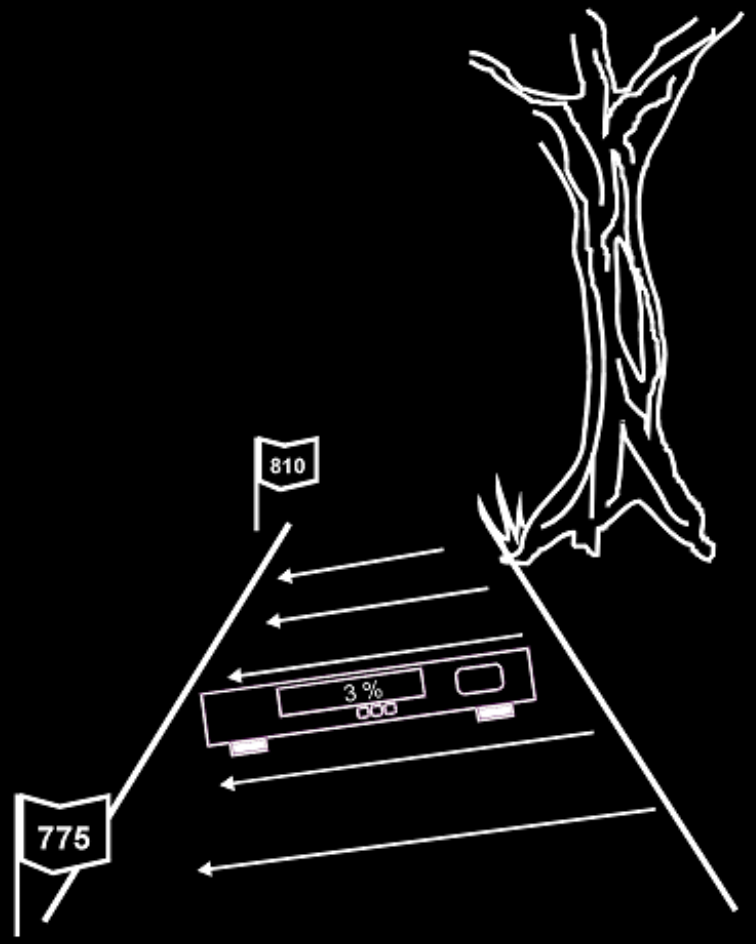
UTAP & HETAP:
Typical Tread Width - tape measure

Clear path of travel or visible trail surface

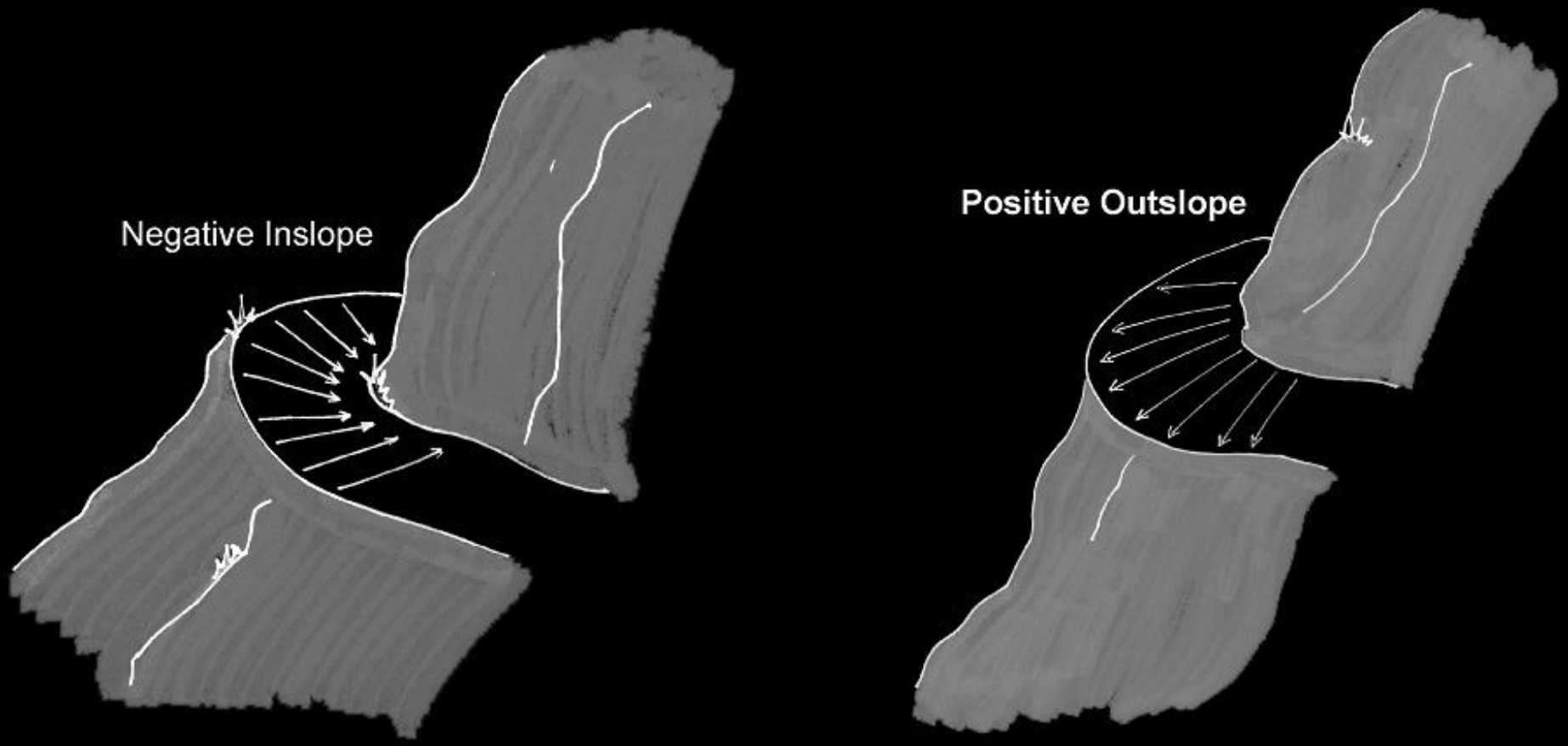
Take a new station whenever there is a significant change in tread width

UTAP: Typical Cross Slope - Inclinometer

- 2 ft. space perpendicular to path of travel
- Representative measure of cross slope between stations
- Record to nearest 1% or as displayed
- Record in slope as negative (-%)

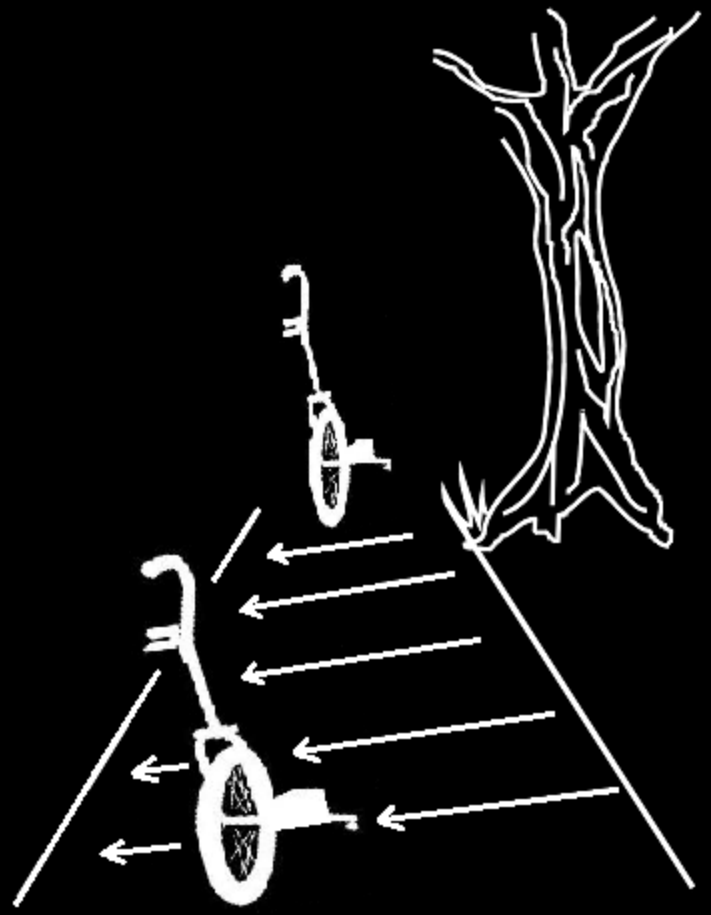


Inslope and Outslope



HETAP: Typical Cross Slope

- 2 ft. space perpendicular to path of travel
- Best path of travel
- Records to nearest .1%
- Record in slope as negative (-%)



ADA Compliance

Standards for Outdoor Developed Areas now part of the Architectural Barriers Act (ABA) Accessibility Standards and apply to national parks and other outdoor areas developed by the federal government.

They do not apply to outdoor areas developed with federal grants or loans.

Outdoor Developed Areas

- Picnic/Camping
- Viewing Areas
- Outdoor Recreation Access Routes (ORAR)
- Trails
- Beach Access Routes


Yosemite
Wilderness Center

Format and organization

Chapter 10: Recreation Facilities

1011 Outdoor Constructed Features

1012 Parking Spaces within Accessible Camping Units and Picnic Units

1013 Tent Pads and Tent Platforms

1014 Camp Shelters

1015 Viewing Areas

1016 Outdoor Recreation Access Routes

1017 Trails

1018 Beach Access Routes

1019 Conditions for Exceptions

Pedestrian Routes

Trails

Outdoor Recreation Access Routes (ORAR)

Beach Access Routes

Trail

- Pedestrian route developed primarily for outdoor recreational purposes
- Newly constructed/altered trail directly connected to a trailhead or another trail that substantially complies with guidelines

Trail

Grade

1:20 (5%) to 1:12 (8.33%) 200 feet max

1:12 (8.33%) to 1:10 (10%) 30 feet max

1:10 (10%) to 1:8 (12%) 10 feet max

Cross Slope

1:20 (5%) maximum unless concrete, asphalt or boards, then 1:48 (2%)

Trail

Width

36 in minimum width

Passing spaces – every 1,000 feet where less than 60 inches in width

Tread obstacles

2 inches maximum, except concrete, asphalt, or board = ½ inch

Openings

½ inch maximum

ORAR - Outdoor Recreation Access Routes

Connecting recreation facilities

Outdoor Recreation Access Routes

Grade

Between 1:20 (5%) and 1:12 (8.33%), 50 feet maximum

Between 1:12 (8.33%) and 1:10 (10%), 30 feet maximum

Cross Slope

1:33 (3%) maximum unless concrete, asphalt or boards, then 1:48 (2%)

Outdoor Recreation Access Route

Surface

firm and stable

Width

36 inches min

Passing space

required where width is less than 60 inches - 200 ft. max

Openings

< 0.5 inch sphere

Beach Access Route

Beach Access Route

- Permanent or removable
- **Minimum number**
  - at least one for each ½ mile of shoreline managed by the entity
- Not required to exceed the number of pedestrian access points to a beach provided by the entity

Beach Access Route

Grade

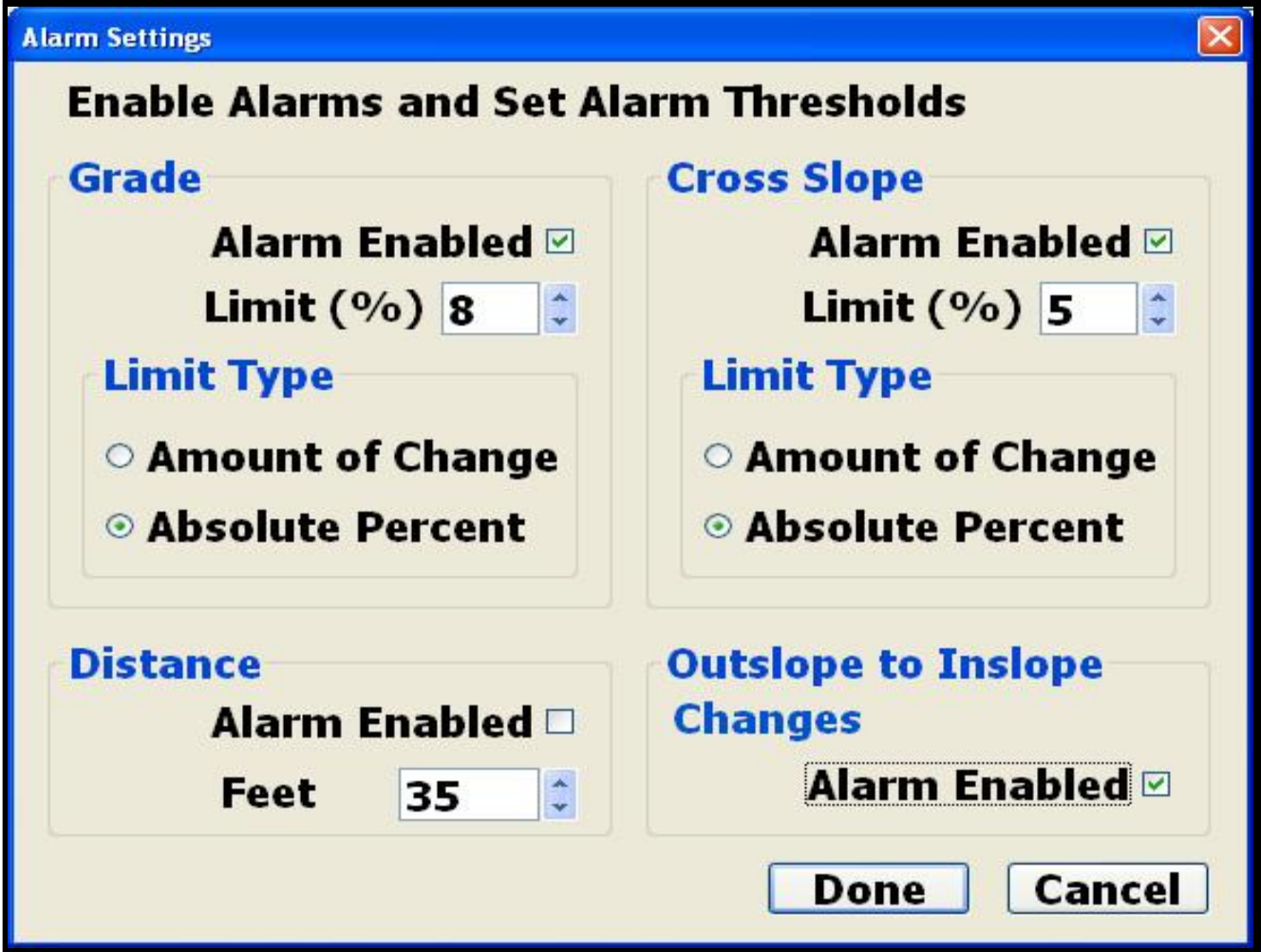
Between 1:20 (5%) and 1:12 (8.33%), 50 feet maximum

Between 1:12 (8.33%) and 1:10 (10%), 30 feet maximum

Obstacles

1 inch max, except concrete, asphalt, or boards = ½ inch

HETAP: Alarm Thresholds



Threshold numbers can be set for compliance with accessibility guidelines

page 107-108

Surface

… shall be firm and stable.

Surface Firmness Category

- Paved
- Hard
- Firm
- Soft
- Very Soft

Rotational Penetrometer

Objective surface measurement device

Draft Standard for measure of firmness and stability under development

Available from Beneficial Designs

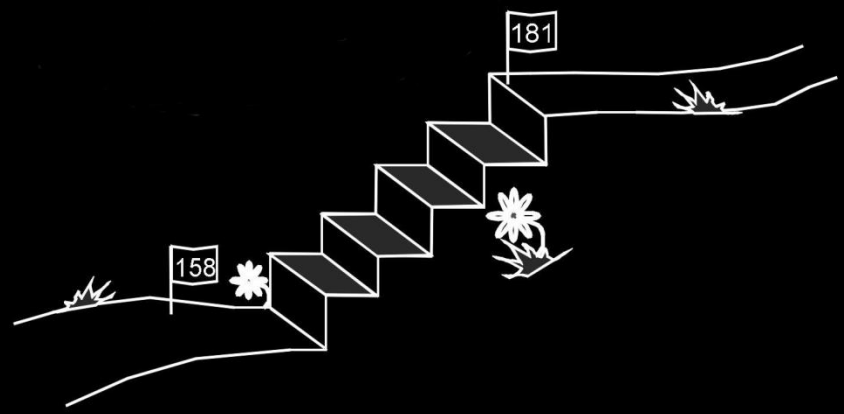
What are some examples of surface material types?

Surface Type

Examples:

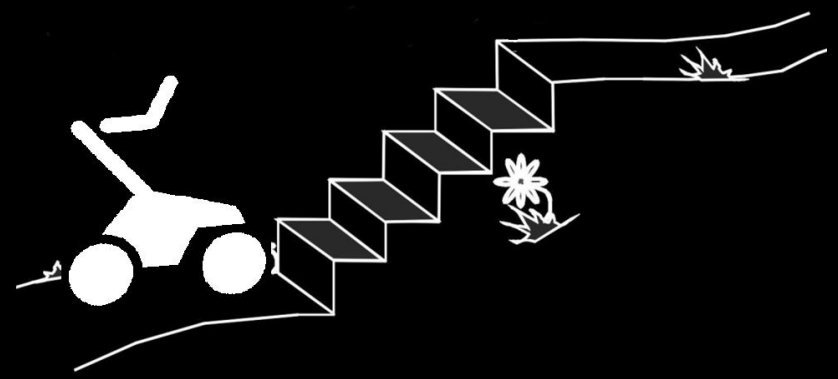
- Aggregate
- Asphalt
- Crushed Stone
- Grass
- Sand
- Shell
- Soil
- Snow
- Water
- Wood chip

Stairs and Ladders
UTAP



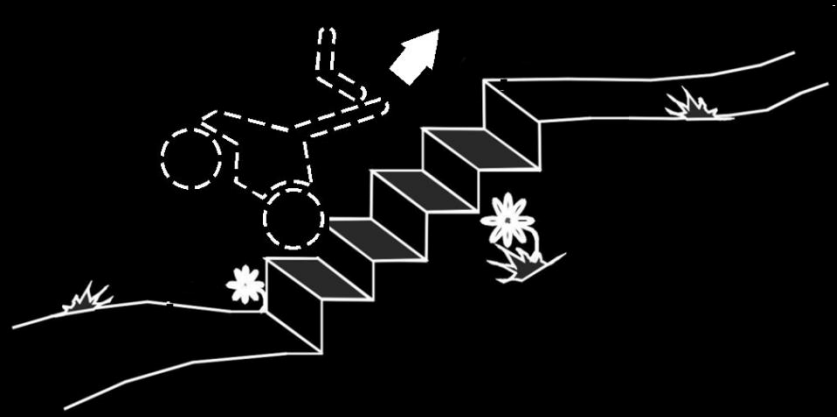
- Stairs recorded as a surface type “stairs” or ladders
- Station at beginning and end
- Grade not in typical grade calculation
- Also record as a feature
- Recommend to disclose on TAI reports
- Single or long/deep steps only recorded as features

Stairs and Ladders
HETAP



- Record Station at the bottom with surface type set to Stairs
- **Record a feature for the Stair Feature**
- Select “Backwards”, rotate the WISP
- Select the flashing Distance Hold (Turn off Pause) and pull the WISP up the stairs

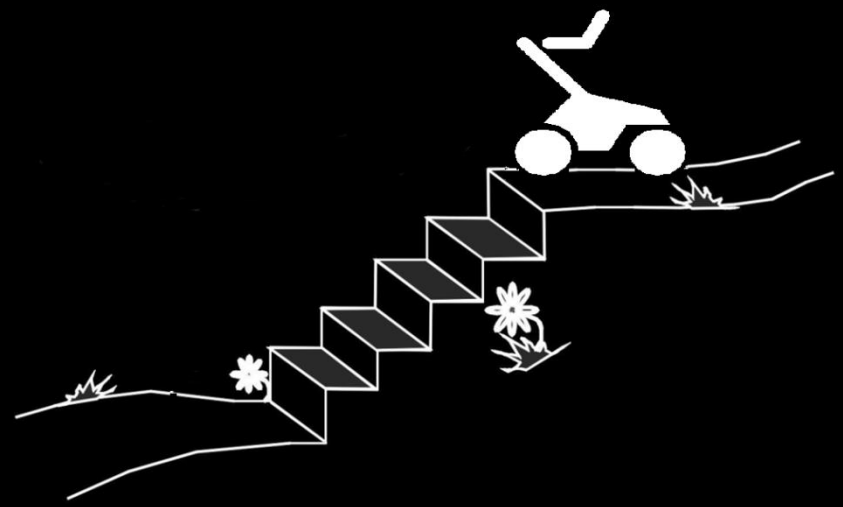
Stairs and Ladders
HETAP



The WISP is recording a forward distance even though it is being pulled

- Once at the top, Record Station with Surface Type returned to current surface
- Select “Forwards”, and Rotate the WISP back around.

Stairs and Ladders
HETAP

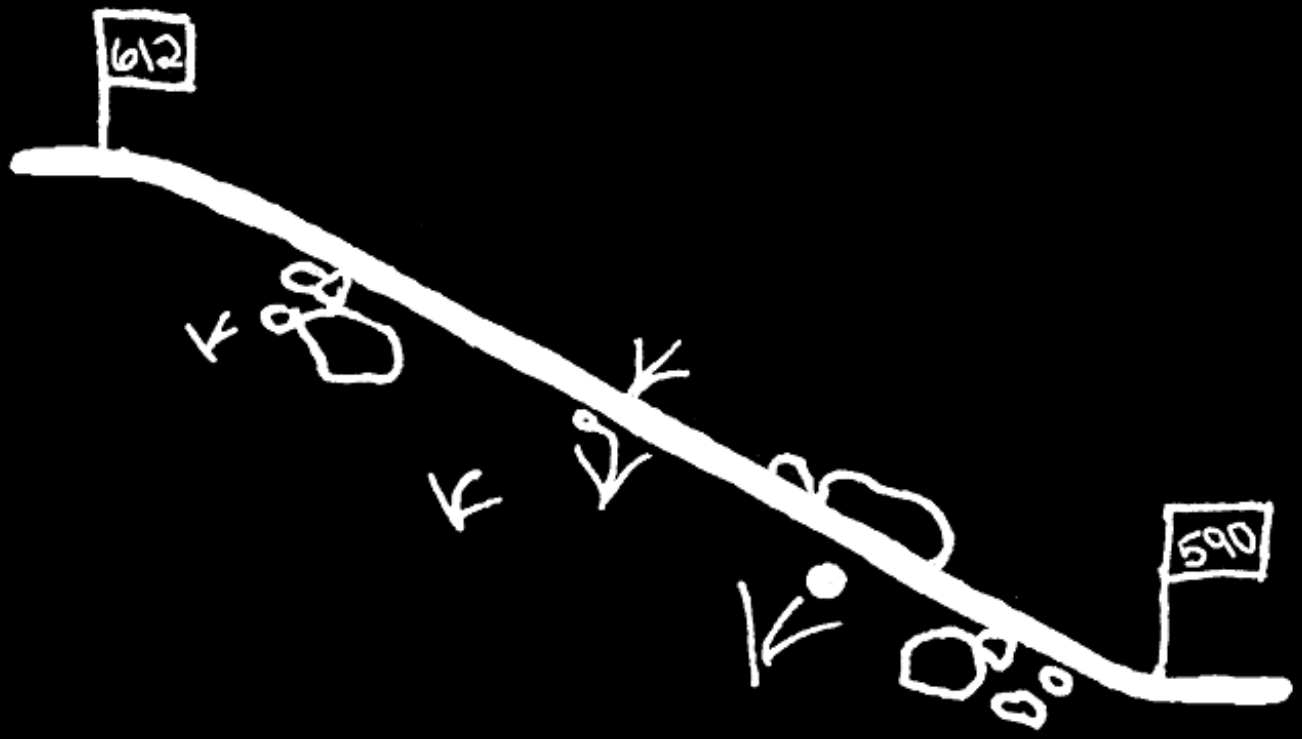


- Select the flashing “Distance Hold” and continue assessing the trail

UTAP: Typical Grade - Clinometer

Align hairline with eye level target

Read %, forward & backward within 1%



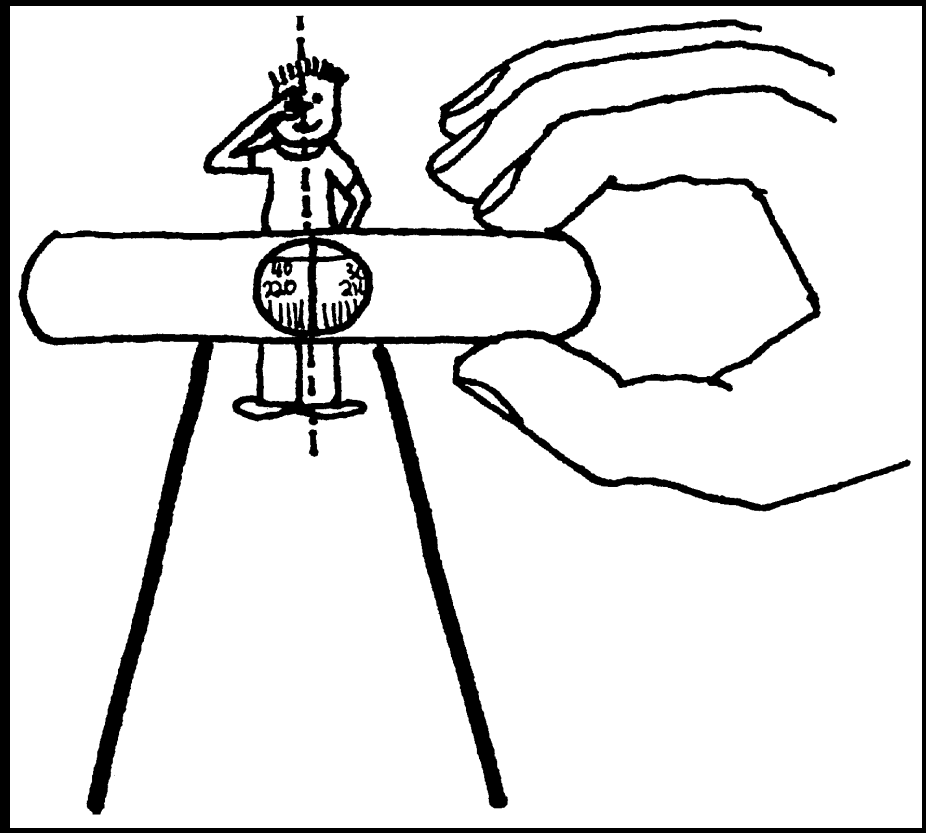
Record forward sign

\+ = uphill

– = downhill

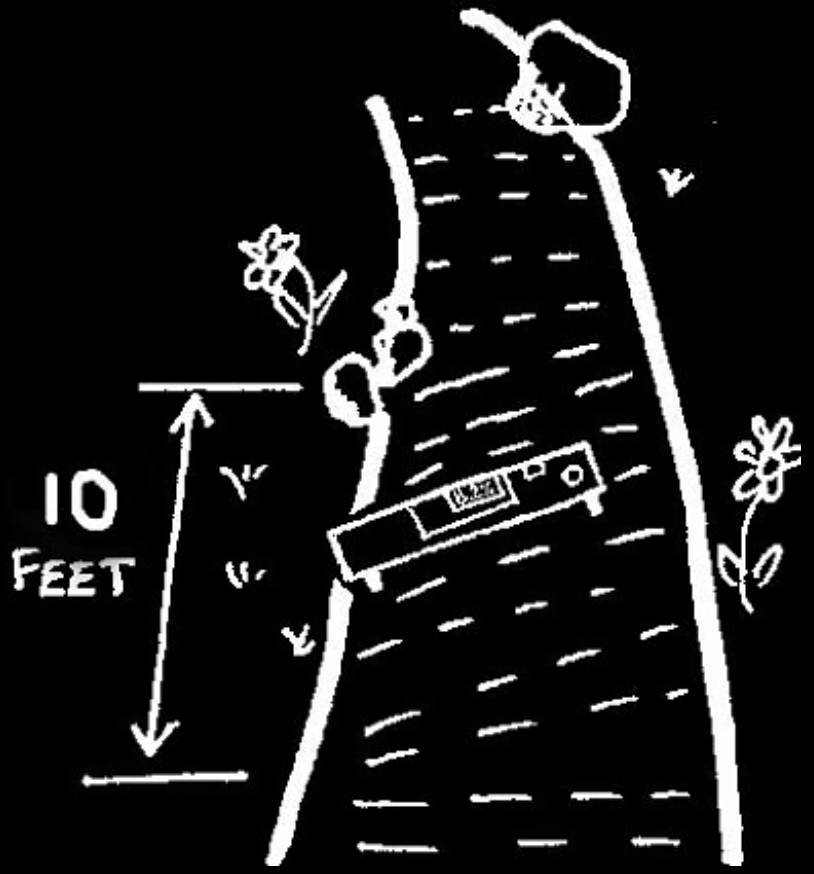
Direction - Compass

- Align hairline with center of tread/partner
- Forward reading – larger print on bottom
- Backward reading – smaller print on top
- Beware of metal objects
- Use dominant eye



Maximum Cross Slope - Inclinometer

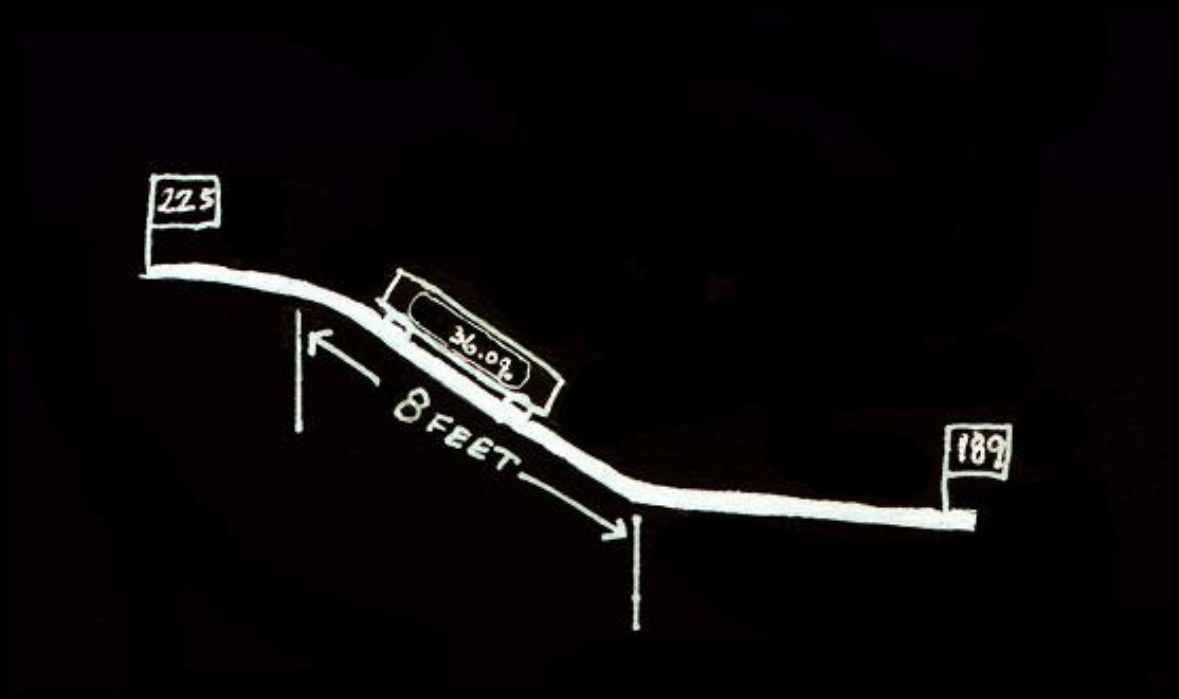
- Visually greater than typical
- Magnitude to nearest 1%
- Inslope is negative (-%)
- Length is the distance within the maximum tolerance
- Report magnitude and length



Maximum Grade - inclinometer

Sections visually greater than typical

Magnitude to nearest 1%



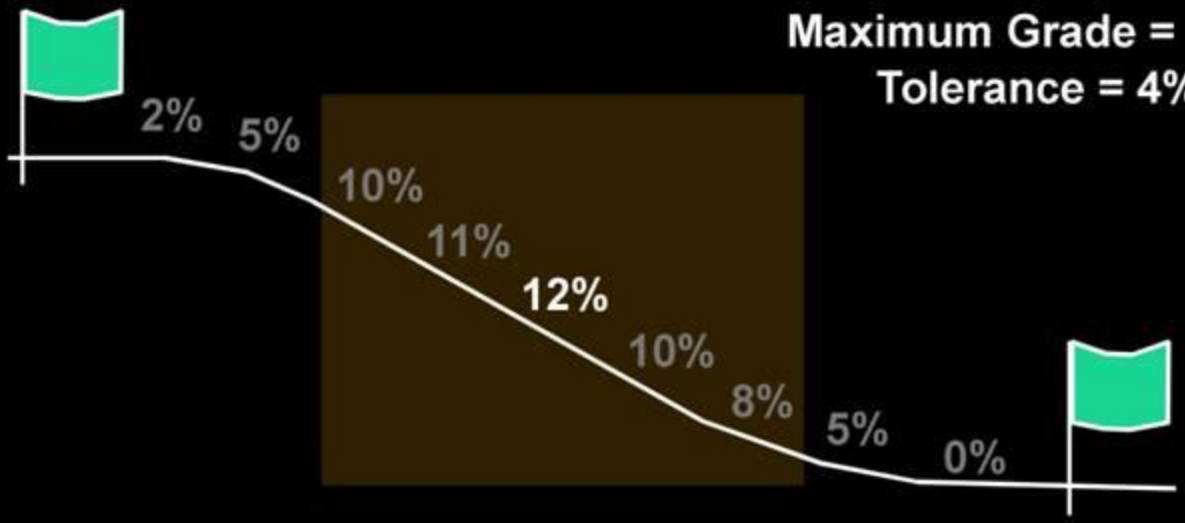
Length is total distance within maximum tolerance

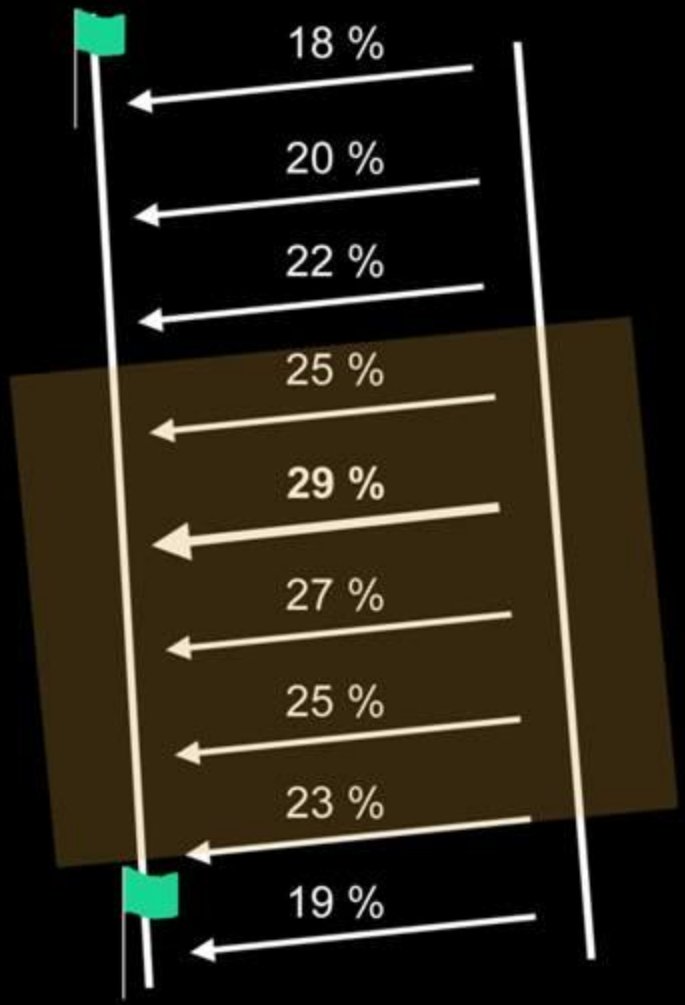
Report magnitude and length

Maximum Tolerance

Maximum	Tolerance	Example	Range
≤ 10%	2%	7%	5 - 7%
11% - 20%	4%	16%	12 - 16%
21% - 30%	6%	23%	17 - 23%
31% - 40%	8%	34%	26 - 34%
≥ 41%	10%	60%	50 – 60%

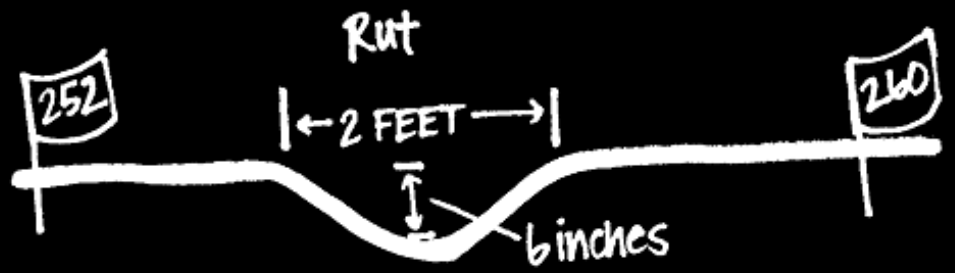
Maximum Tolerance





UTAP: Ruts and Bumps, Dips and Mounds

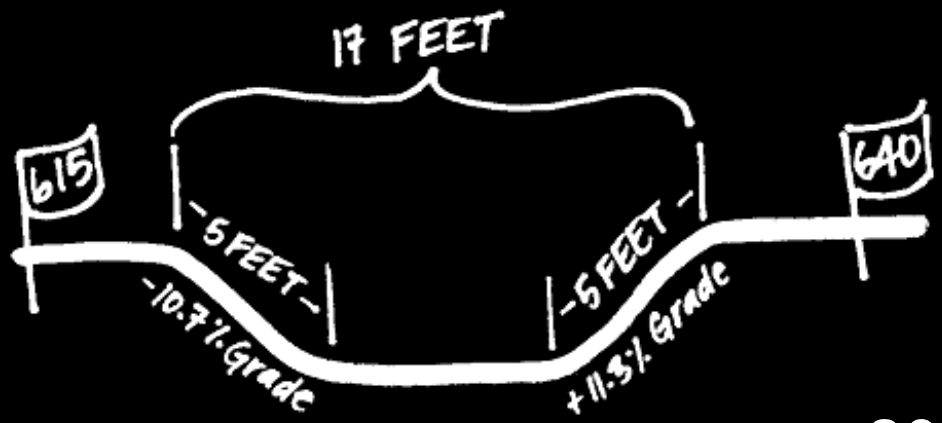
Ruts, bumps, dips and mounds are recorded as features



Do not record a maximum grade in a rut/bump

Record maximum grades into and out of a dip or on a mound

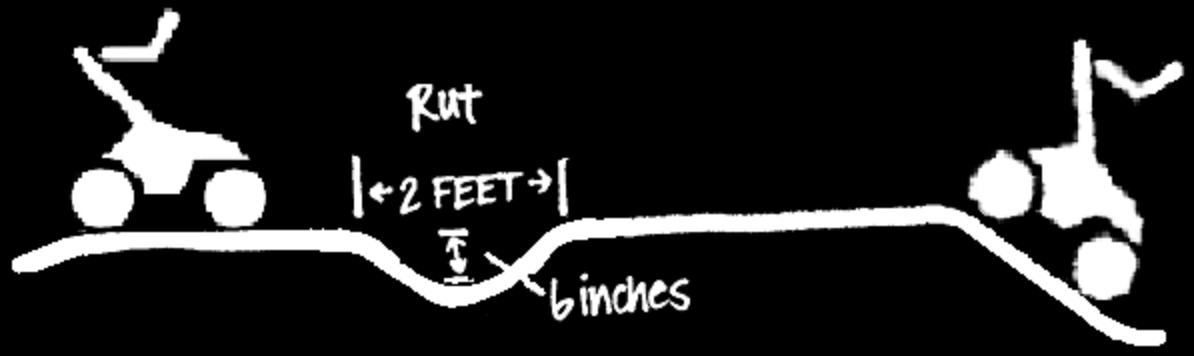
Put a station at the bottom of long dips or on top of long mounds



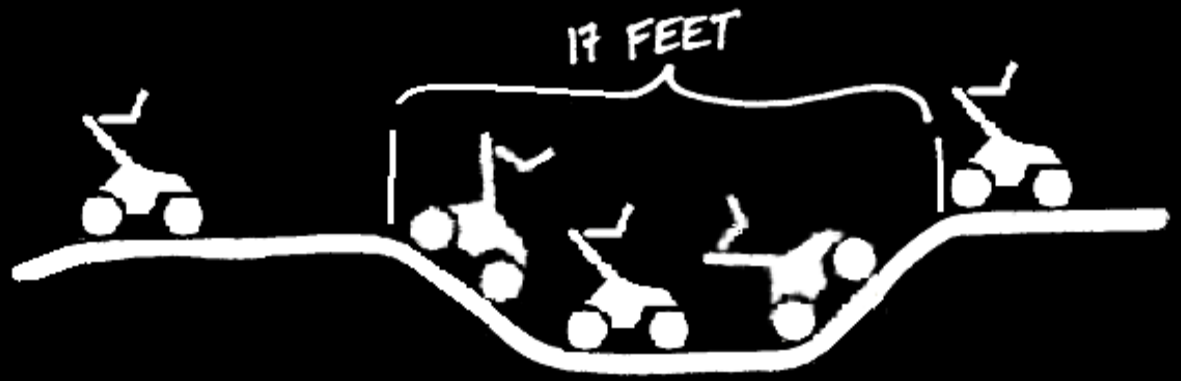
HETAP: Ruts and Bumps, Dips and Mounds

Measure wherever there is a visual change in the grade

Also record as a feature



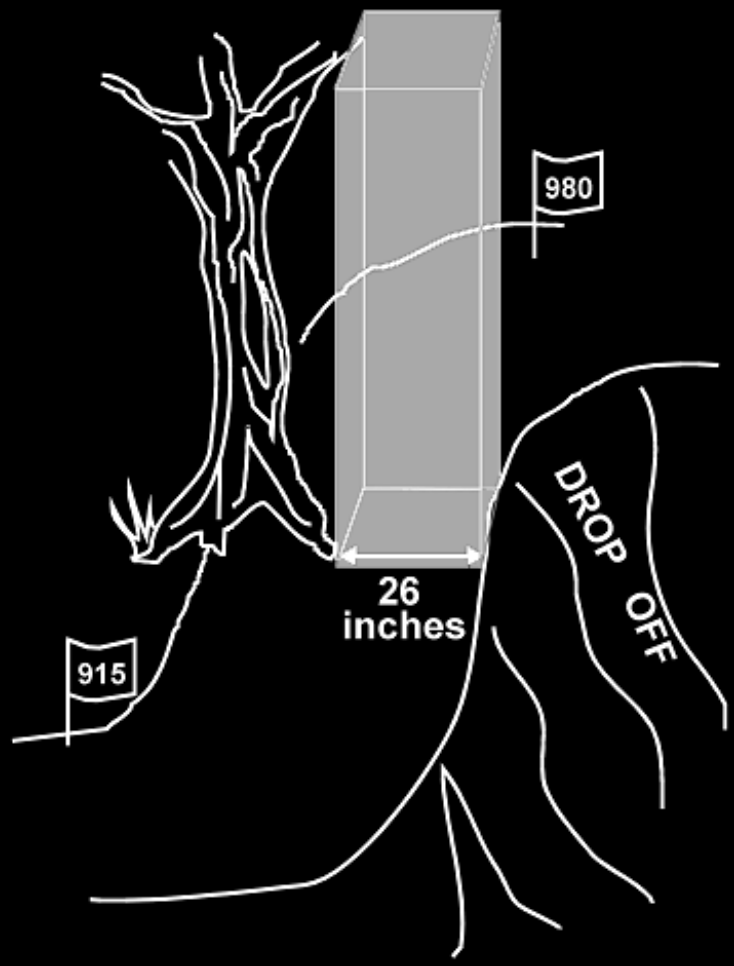
Where would you record a station here?

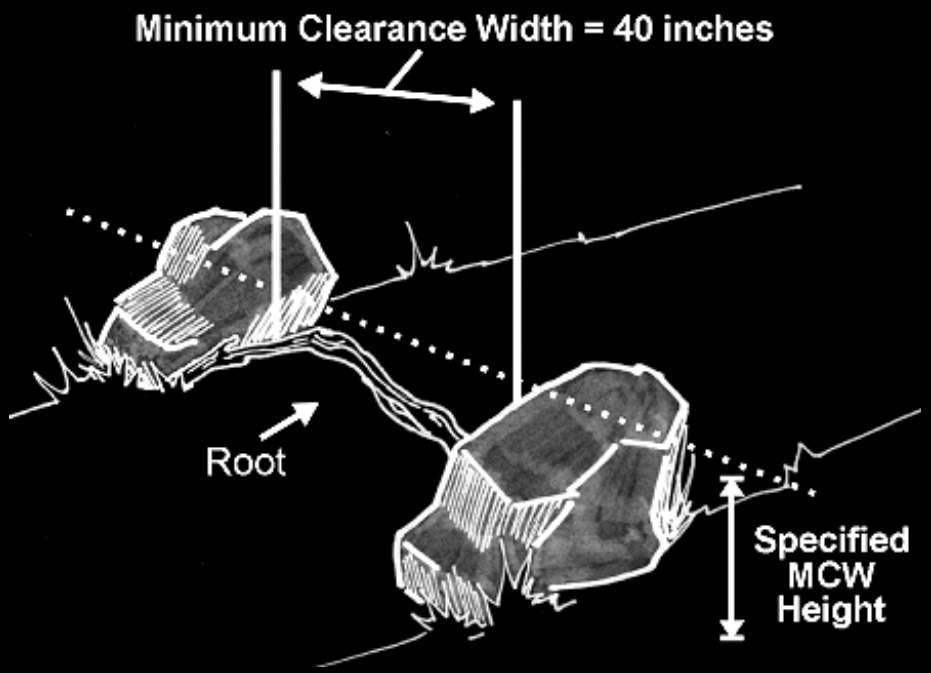


When in doubt, record a station.

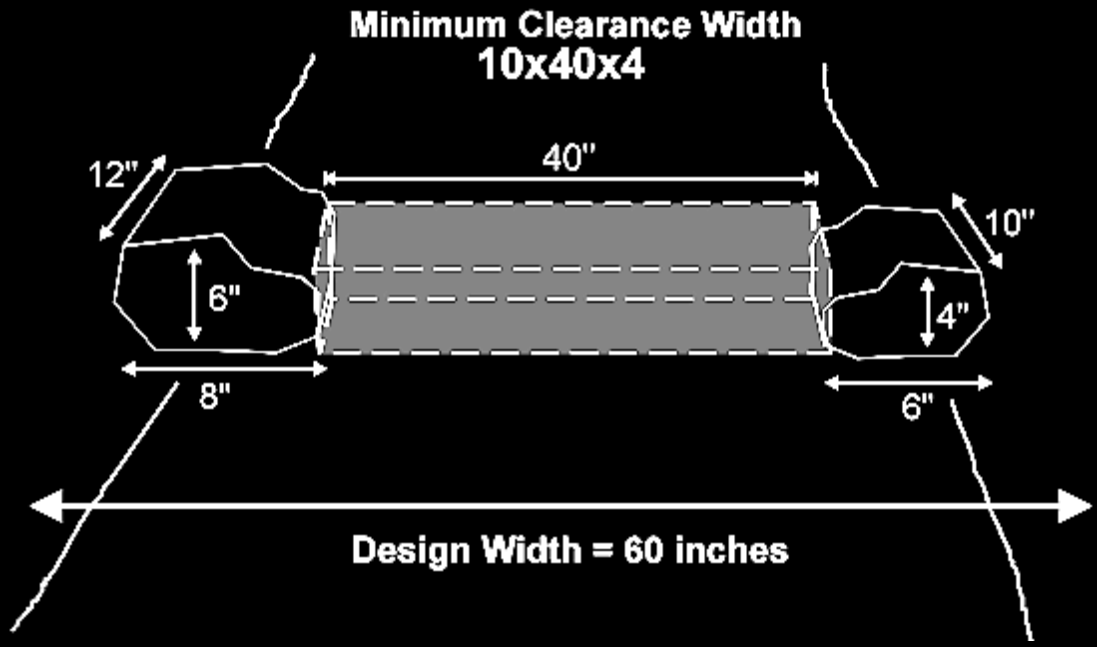
Minimum Clearance Width - Tape Measure

- Measure when obstructions on both sides of trail reduce tread to less than the design width
- Specified obstruction height based on trail user group
- No alternative path around the constriction
- Size is L x W x H of clear path
- Record features that create MCW





Size of MCW

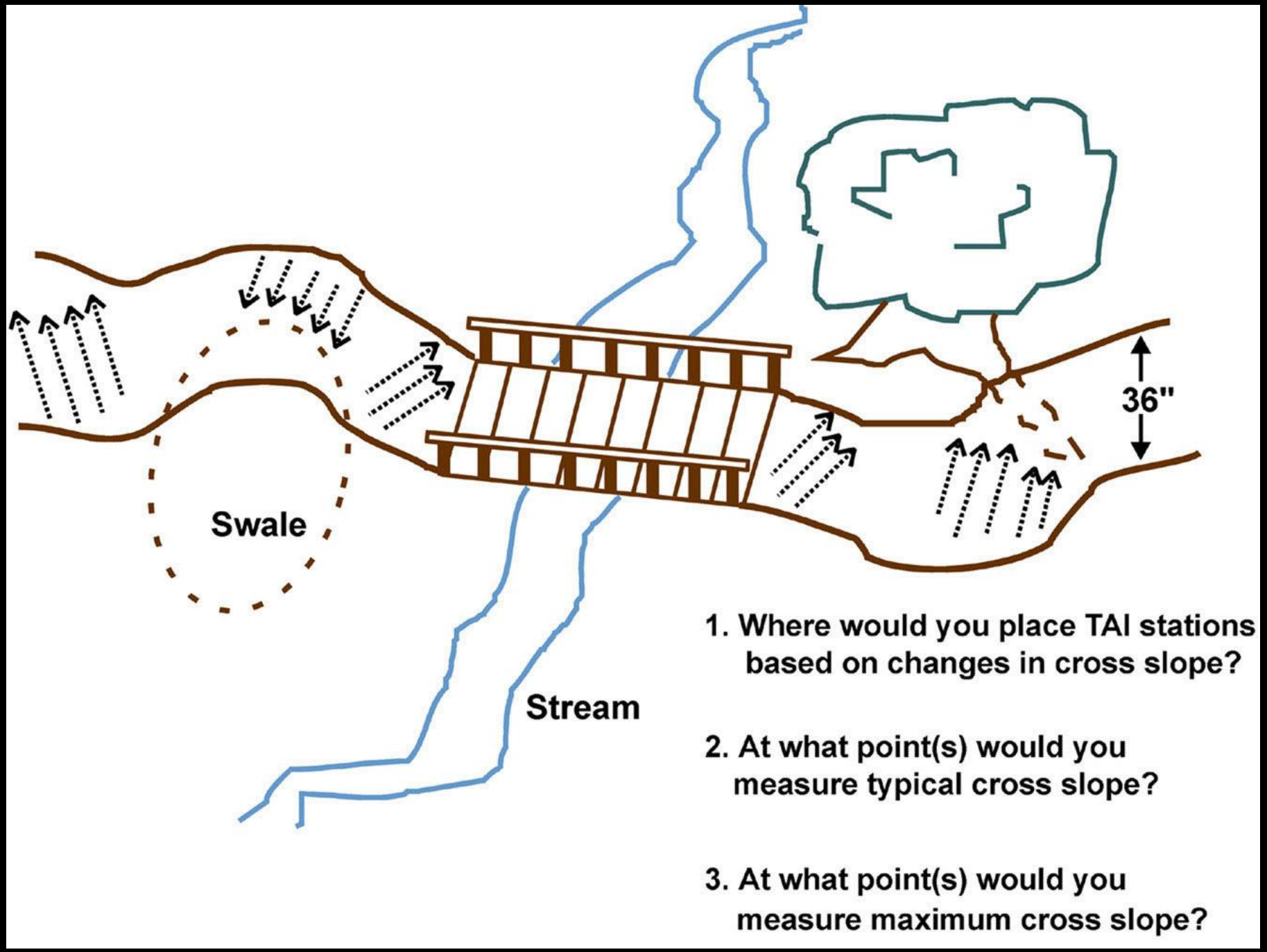


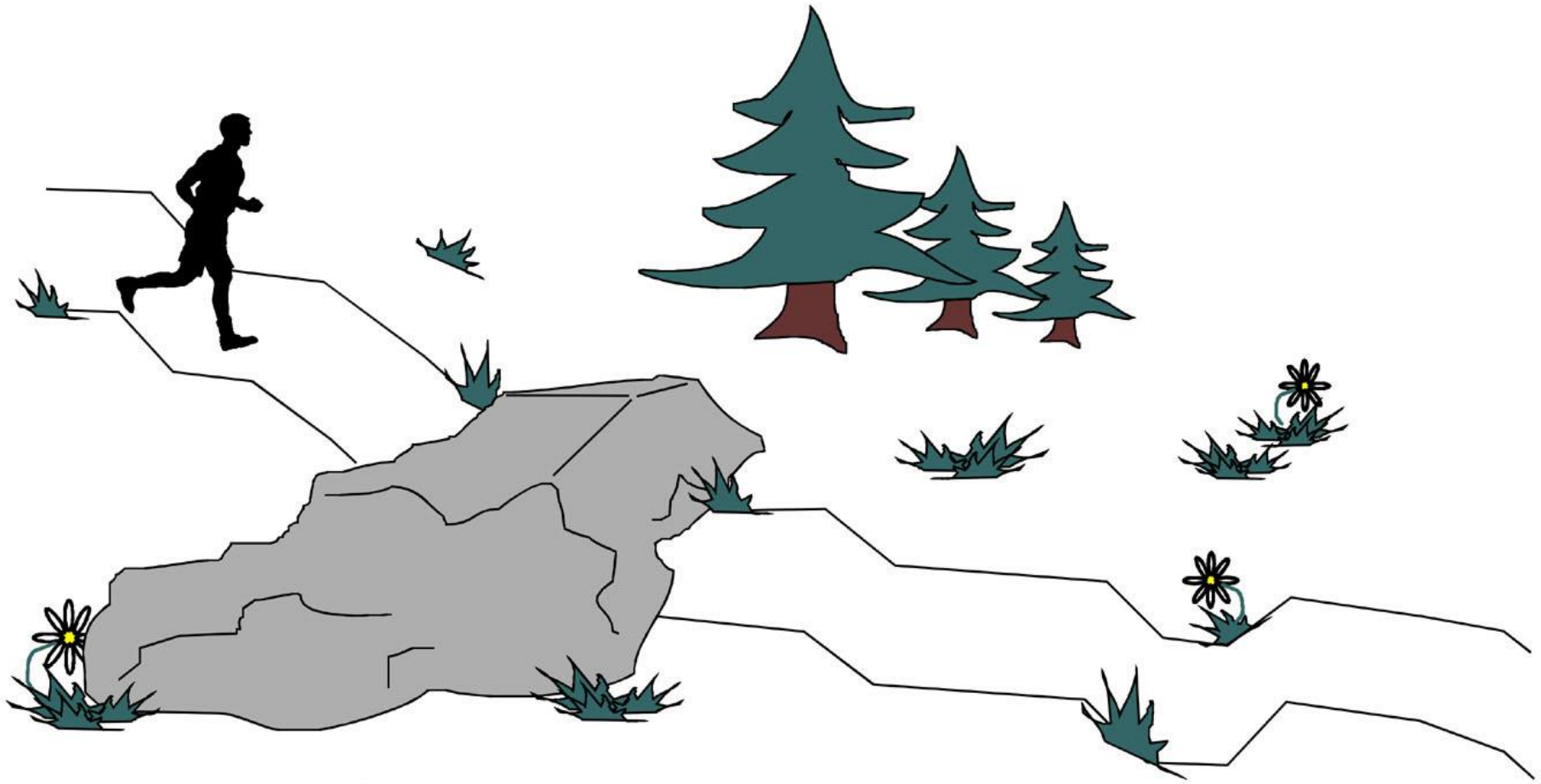
MCW Height

Not an MCW

Suggested MCW Heights

0.25”	Shared use path/bike path
0.5”	Access Route
1.0”	Outdoor Recreation Access Route
2” - 3”	Accessible recreation trail
6” - 8”	Pedestrian recreation trail
12”	Equestrian trail
Vary	Snow/Ski/Snow machine trail


Swale
Stream
36"
1. Where would you place TAI stations based on changes in cross slope?
2. At what point(s) would you measure typical cross slope?
3. At what point(s) would you measure maximum cross slope?

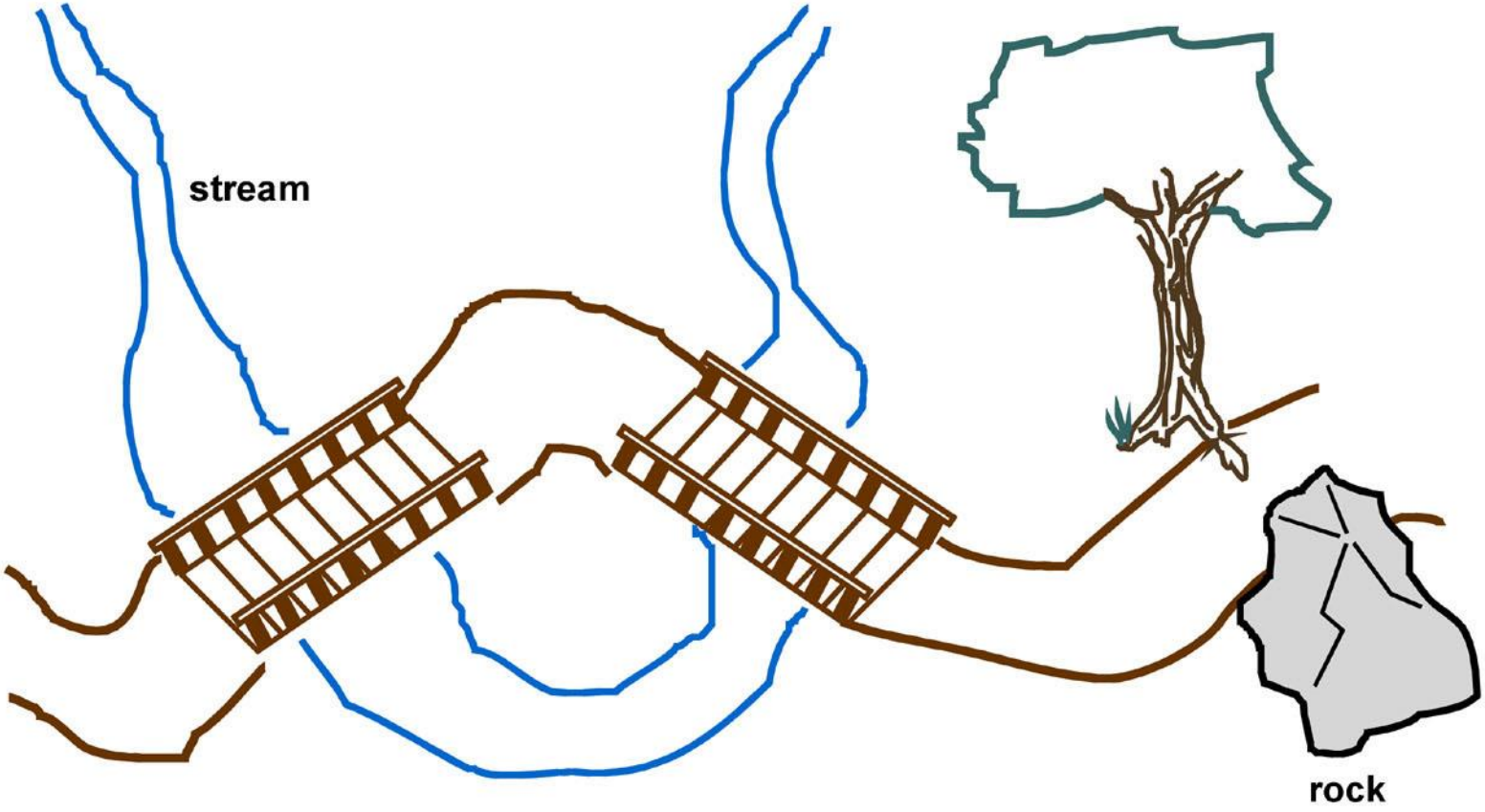


Bedrock Outcrop

1. Where would you place TAI stations based on changes in grade?

2. At what point(s) would you measure typical grade?

3. At what point(s) would you measure maximum grade?



1. Where would you place TAI stations based on changes in compass direction?
2. At what point(s) would you measure compass direction?
3. Where would you place TAI stations based on changes in tread width?
4. At what point(s) would you measure tread width?
5. At what point(s) would you measure minimum clearance width?

Features

- Natural or human made
- On, accessed, or seen from the trail

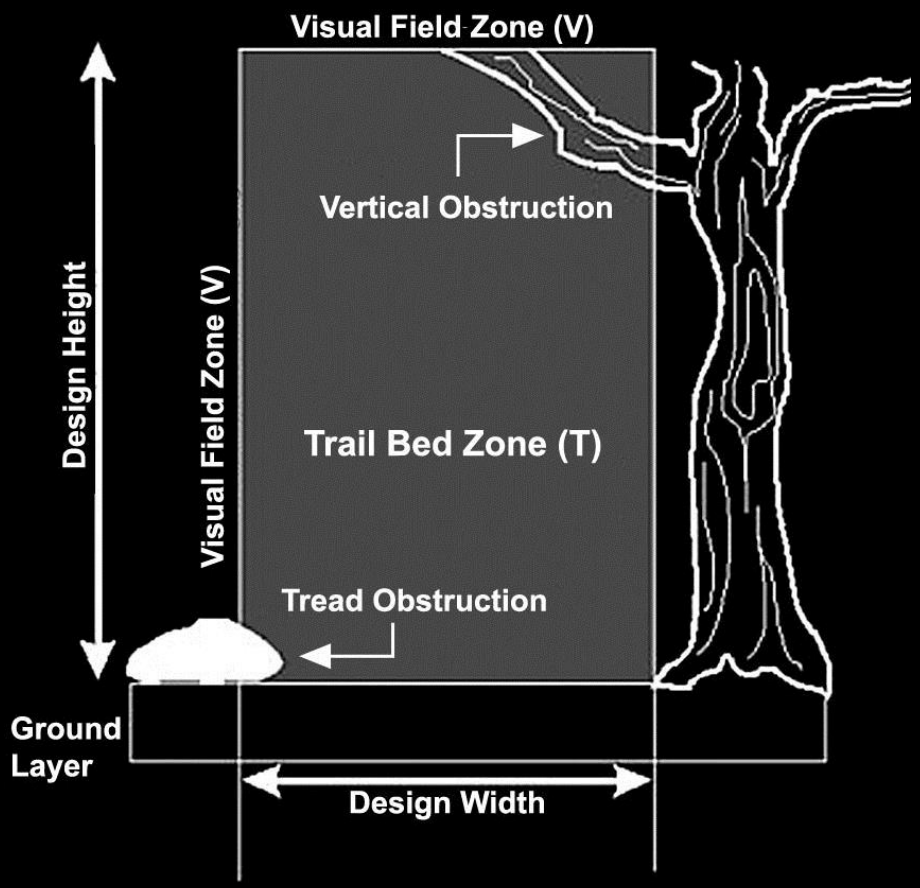
What are some examples of features?

User enjoyment and comfort

Construction and maintenance

Health and Safety

Zone



Trail Bed Zone

- visible right-of-way
- smaller of tread or design width
- height based on user groups or design height
- may vary by season

Visual Field Zone

- outside Trail Bed Zone
- easily accessed from trail
- significant features visible from trail

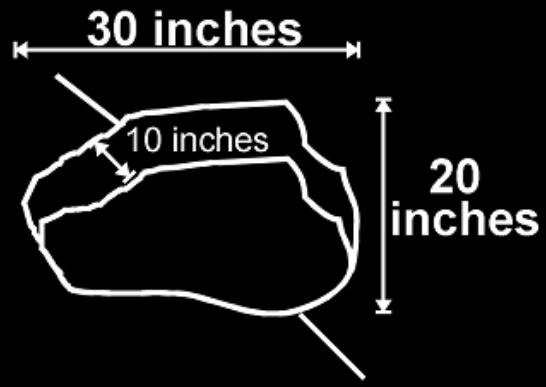
Size and Quantity

Length x Width x Height

- Length parallel
- Width perpendicular
- Height is vertical

All three recorded in inches or feet

Count for repeated features



L = 10 inches
W = 30 inches
H = 20 inches

Feature Information

Type and Description
e.g., Tree - Torrey Pine

Actions (trained personnel)
e.g., construct, monitor, rehab

Accessibility
feature or facility built to accessible standards

HETAP: Recording Features

Location – auto recorded from start of segment

Zone - trail bed or visual field

Feature Information - type and description

Size, Quantity and Units - L x W x H

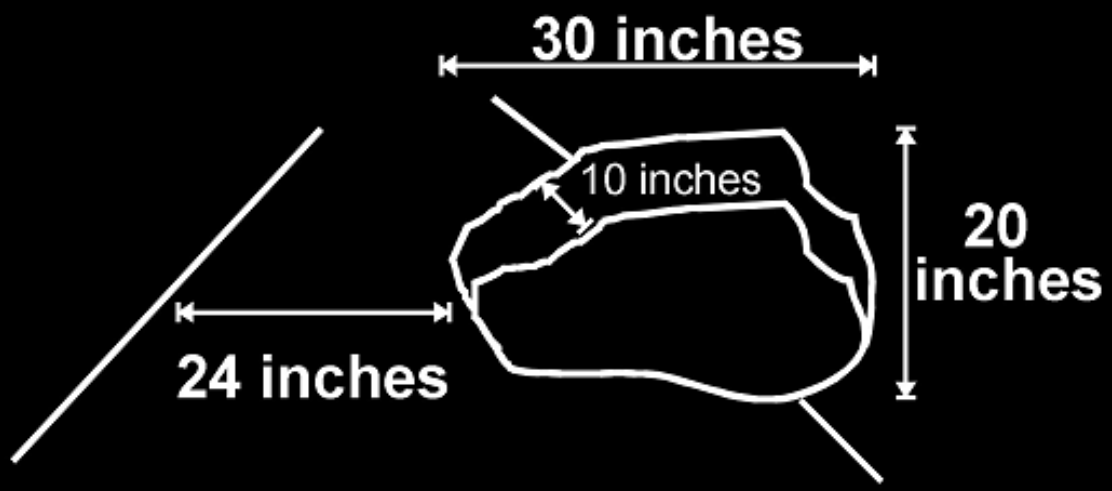
Obstruction - measure remaining tread

Obstructions

- Features in the Trail Bed Zone that may be a barrier or hazard to users
- Two types of obstructions - tread and vertical
- Objects easily pushed out of the way are not obstructions

Tread Obstructions

- Feature on the trail tread
- Height exceeds the specified tread obstruction height



- Record the feature type and dimensions
- Remaining tread is space around the obstruction

Vertical Obstructions

- Feature overhanging or lateral to the trail that does not contact the tread
- Feature type is vertical obstruction
- Size is the dimensions of the clear passage space underneath the obstruction
- Remaining tread is space beside the obstruction

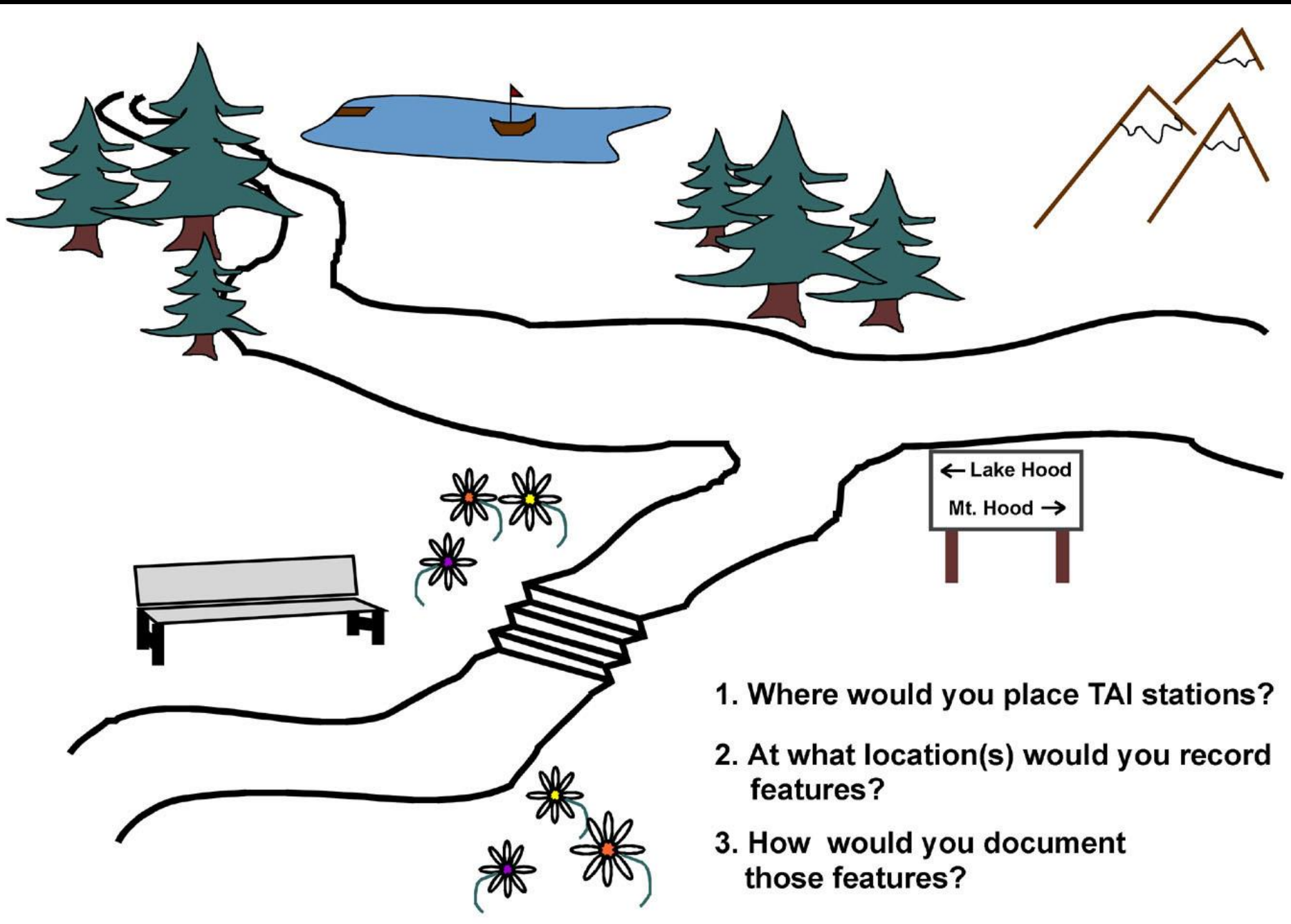
Multiple Features

Access barriers or hazards may result when two or more moderate features occur at the same point

Record as “Hazard” in the feature section

Examples

- tread obstruction & very soft surface
- max. grade & max. cross slope
- max. cross slope towards a drop off
- max. grade & soft surface


← Lake Hood
Mt. Hood →
1. Where would you place TAI stations?
2. At what location(s) would you record features?
3. How would you document those features?

How many people would you need on your assessment team?

Team Options

3 – Person team is ideal

2 – Person team is ok if skilled

4 – Person team or more with volunteers

Trail Assessment Coordinator is responsible for safety and data quality

Consider including:

- Person with mobility impairment
- Land management personnel

Example 3 Person Team

1 – Trail Assessment Coordinator, data form, surface category & type

2 – rollawheel, TAI stations, features, clinometer, compass, tread width

3 – inclinometer, compass, clinometer

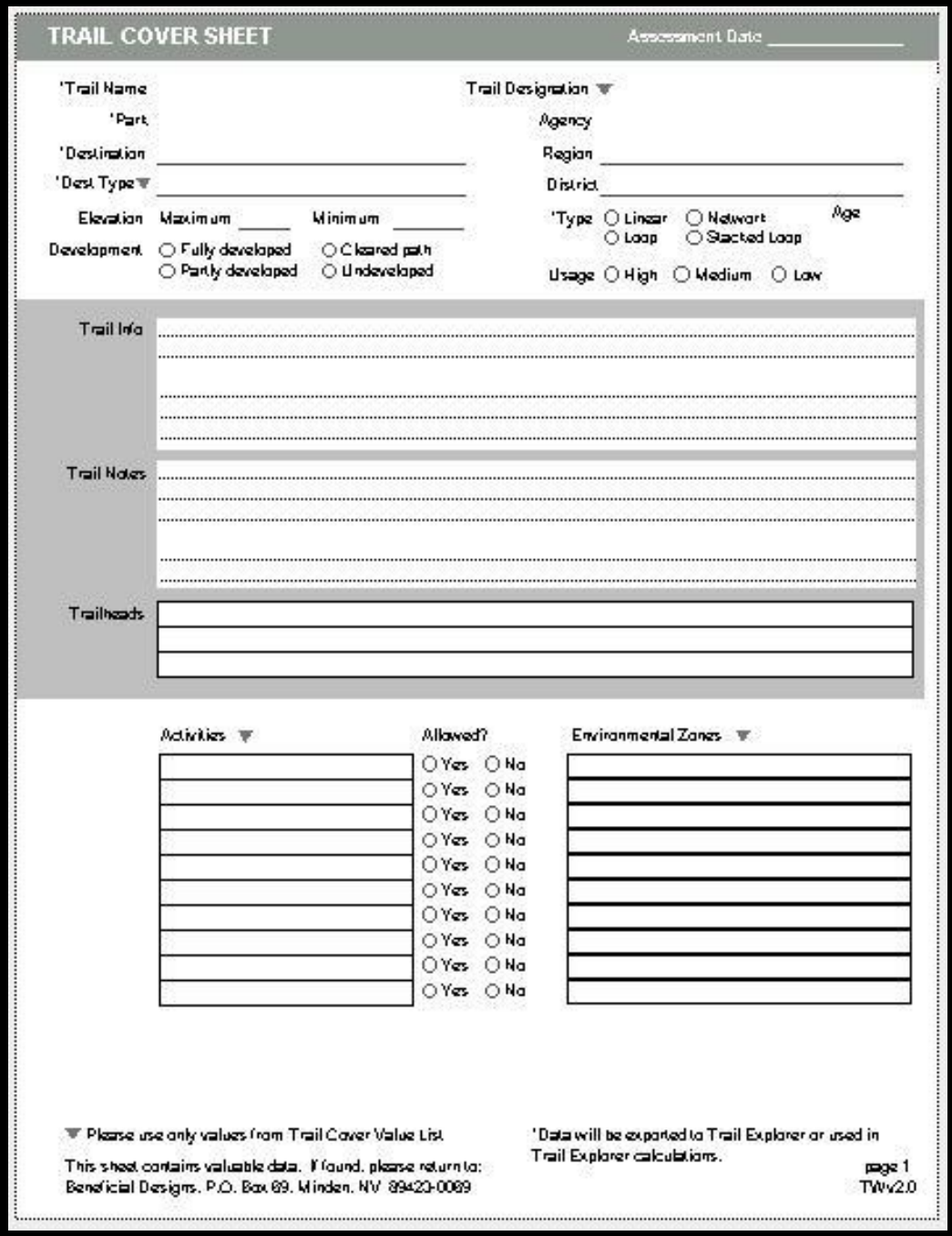
Measurements Summary

- Keep the HETAP goals in mind during all assessments to guide your decisions
- Measure the best path of travel
- Accurately represent the conditions that the user will be required to negotiate
- Typical measurements for all stations
- Extreme measurements where they occur
- Land manager determines feature detail

UTAP: Data Recording Objectives

- Identify each data form used during the UTAP
- Determine where data are recorded on each form
- List tips for recording data

Trail Cover Sheet



TRAIL COVER SHEET

Assessment Date _____

*Trail Name

*Part

*Destination

*Dest. Type ▼

Trail Designation ▼

Agency

Region

District

Elevation Maximum _____ Minimum _____

Development ○ Fully developed ○ Cleared path ○ Partly developed ○ Undeveloped

*Type ○ Linear ○ Network ○ Loop ○ Stacked Loop

Age

Usage ○ High ○ Medium ○ Low

Trail Info

Trail Notes

Trailheads

Activities ▼	Allowed?	Environmental Zones ▼
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	

▼ Please use only values from Trail Cover Value List

This sheet contains valuable data. If found, please return to:
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*Data will be exported to Trail Explorer or used in Trail Explorer calculations.

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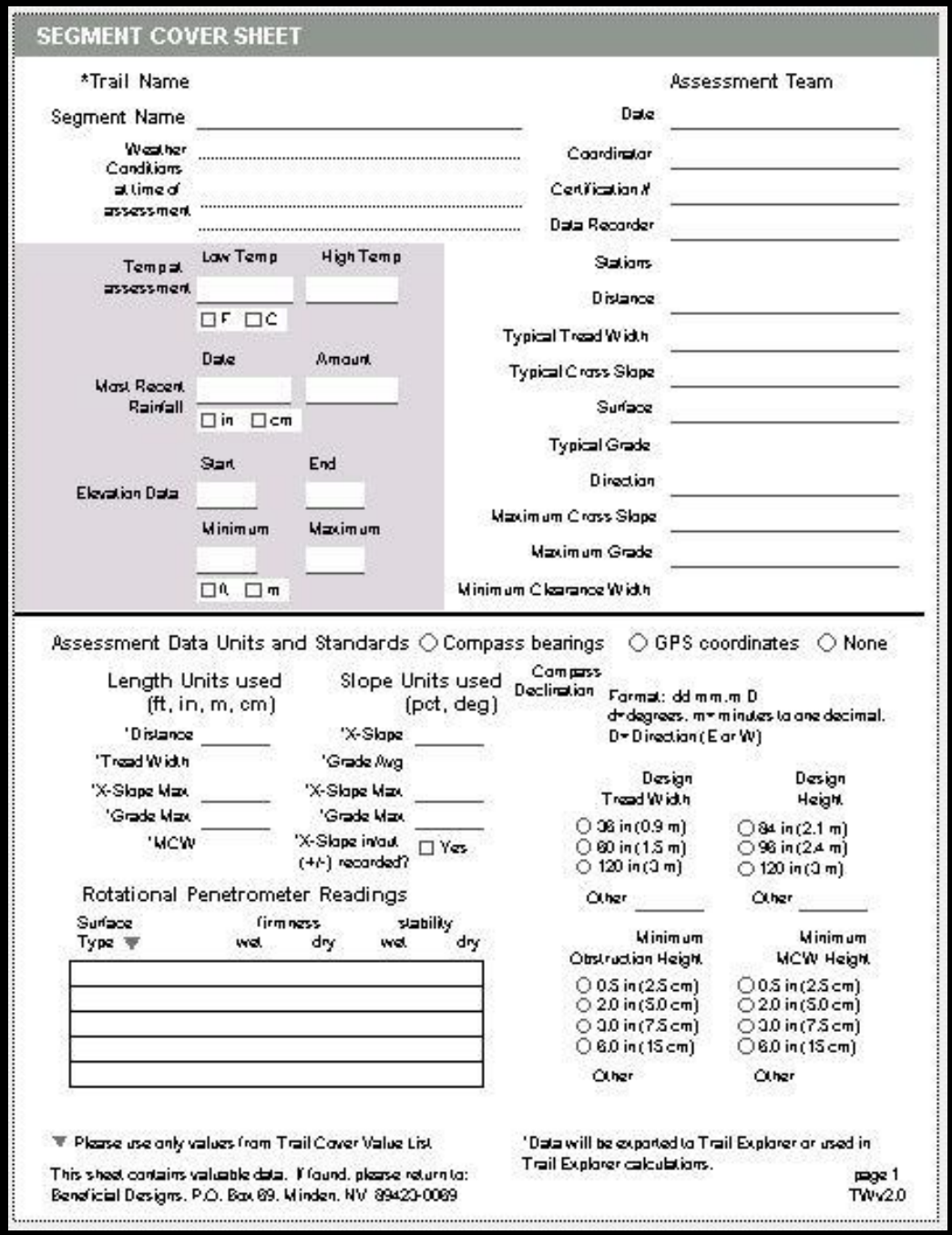
Segment Cover Sheet



SEGMENT COVER SHEET

*Trail Name

Segment Name _____

Weather Conditions at time of assessment .....

.....

.....

Assessment Team

Date _____

Coordinator _____

Certification # _____

Data Recorder _____

Temp at assessment — Low Temp _____ High Temp _____ ☐F ☐C

Most Recent Rainfall — Date _____ Amount _____ ☐in ☐cm

Elevation Data — Start _____ End _____ Minimum _____ Maximum _____ ☐ft ☐m

Stations

Distance _____

Typical Tread Width _____

Typical Cross Slope _____

Surface _____

Typical Grade

Direction _____

Maximum Cross Slope _____

Maximum Grade _____

Minimum Clearance Width

Assessment Data Units and Standards ○ Compass bearings ○ GPS coordinates ○ None

Length Units used (ft, in, m, cm)

'Distance _____

'Tread Width

'X-Slope Max _____

'Grade Max _____

'MCW

Slope Units used (pct, deg)

'X-Slope _____

'Grade Avg

'X-Slope Max _____

'Grade Max _____

'X-Slope in/out (+/-) recorded? ☐ Yes

Compass Declination

Format: dd mm.m D
d=degrees, m=minutes to one decimal.
D=Direction (E or W)

Rotational Penetrometer Readings

Surface Type ▼	firmness wet	firmness dry	stability wet	stability dry

Design Tread Width
○ 36 in (0.9 m)
○ 60 in (1.5 m)
○ 120 in (3 m)
Other _____

Design Height
○ 84 in (2.1 m)
○ 96 in (2.4 m)
○ 120 in (3 m)
Other _____

Minimum Obstruction Height
○ 0.5 in (2.5 cm)
○ 2.0 in (5.0 cm)
○ 3.0 in (7.5 cm)
○ 6.0 in (15 cm)
Other

Minimum MCW Height
○ 0.5 in (2.5 cm)
○ 2.0 in (5.0 cm)
○ 3.0 in (7.5 cm)
○ 6.0 in (15 cm)
Other

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Segment Data Collection Form

Segment Data Collection Trail Name: ____________ Segment Name: ____________ Page ____ of ____ Assessment Date ____________

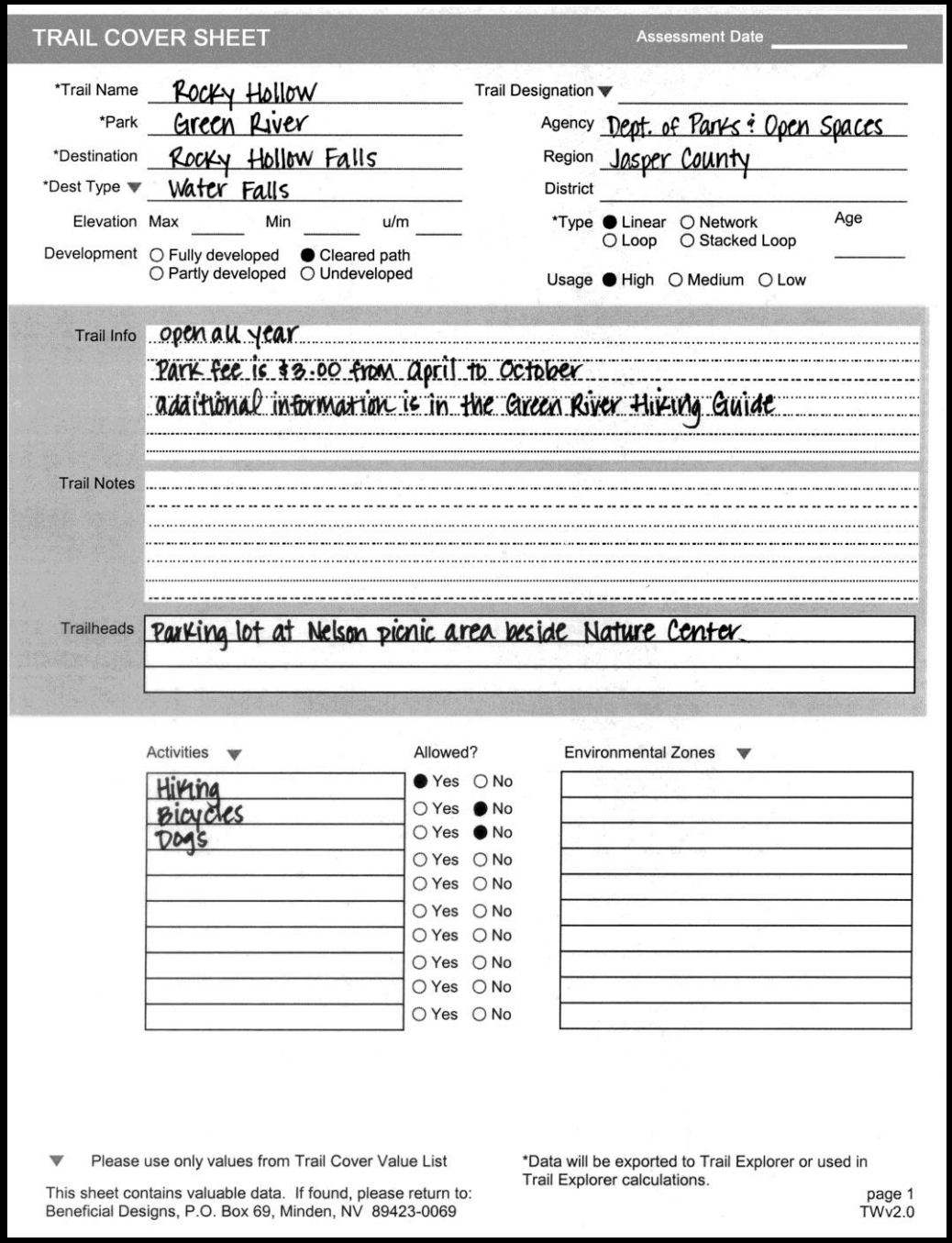
Station Distance	Tread Width	Typ X-Slope	Surface (p,h,f,s,v) Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Compass / GPS Bk/long	Max X-Slope Magnitude	Max X-Slope Length	Max Grade Magnitude	Max Grade Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												
	Tread Width	Typ X-Slope	Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Bk/long	Max X-Slope Magnitude	Length	Max Grade Magnitude	Length	MCW
Distance												

Feature Distance	T/V Zone	Feature Type*	Feature Description	Size LxWxH	U/M	Count/ Qty	End Distance	Remain. Tread	Built Feature Access	Action Req'd

* Please use only values from data lists

This sheet contains valuable data. If found, please return to: Beneficial Designs, P.O. Box 69, Minden, NV 89423-0069

Trail Cover Sheet with Data



TRAIL COVER SHEET

Assessment Date _____

*Trail Name: Rocky Hollow
*Park: Green River
*Destination: Rocky Hollow Falls
*Dest Type ▼: Water Falls
Elevation: Max ____ Min ____ u/m ____
Development: ○ Fully developed ● Cleared path ○ Partly developed ○ Undeveloped

Trail Designation ▼: _____
Agency: Dept. of Parks & Open Spaces
Region: Jasper County
District: _____
*Type: ● Linear ○ Network ○ Loop ○ Stacked Loop
Age: _____
Usage: ● High ○ Medium ○ Low

Trail Info:
open all year
Park fee is $3.00 from April to October
additional information is in the Green River Hiking Guide

Trail Notes:

Trailheads:
Parking lot at Nelson picnic area beside Nature Center

Activities ▼	Allowed?	Environmental Zones ▼
Hiking	● Yes ○ No	
Bicycles	○ Yes ● No	
Dogs	○ Yes ● No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	
	○ Yes ○ No	

▼ Please use only values from Trail Cover Value List

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Segment Cover Sheet with Data

SEGMENT COVER SHEET

*Trail Name: Rocky Hollow
Segment Name: Trailhead to Falls
Weather Conditions at time of assessment: sunny and cool

Temp at assessment — Low Temp: 48 ☒F ☐C — High Temp: 55

Most Recent Rainfall — Date: 15/3/00 — Amount: 0.25 ☒in ☐cm

Elevation Data — Start: — End: — Minimum: — Maximum: — ☐ft ☐m

Assessment Team

Date	19/3/00
Coordinator	F. Jones
Certification #	
Data Recorder	F. Jones
Stations	J. Cash
Distance	J. Cash
Typical Tread Width	S. Banks
Typical Cross Slope	M. Smith
Surface	F. Jones
Typical Grade	P. Henry & C. Cross
Direction	P. Henry & C. Cross
Maximum Cross Slope	M. Smith
Maximum Grade	M. Smith
Minimum Clearance Width	G. Banks

Assessment Data Units and Standards ● Compass bearings ○ GPS coordinates ○ None

Length Units used (ft, in, m, cm)

*Distance	ft
*Tread Width	in
*X-Slope Max	ft
*Grade Max	ft
*MCW	in

Slope Units used (pct, deg)

*X-Slope	pct
*Grade Avg	pct
*X-Slope Max	pct
*Grade Max	pct
*X-Slope in/out (+/-) recorded?	☐ Yes

Compass Declination: _____
Format: dd mm.m D
d=degrees, m=minutes to one decimal, D=Direction (E or W)

Rotational Penetrometer Readings

Surface Type ▼	firmness wet	firmness dry	stability wet	stability dry

Design Tread Width
● 36 in (0.9 m)
○ 60 in (1.5 m)
○ 120 in (3 m)
Other _____

Design Height
○ 84 in (2.1 m)
○ 96 in (2.4 m)
○ 120 in (3 m)
Other 80 in

Minimum Obstruction Height
○ 0.5 in (2.5 cm)
● 2.0 in (5.0 cm)
○ 3.0 in (7.5 cm)
○ 6.0 in (15 cm)
Other _____

Minimum MCW Height
○ 0.5 in (2.5 cm)
○ 2.0 in (5.0 cm)
○ 3.0 in (7.5 cm)
● 6.0 in (15 cm)
Other _____

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Segment Data Collection Trail Name: Rocky Hollow Segment Name: Trailhead To Falls Page 1 of 1 Assessment Date

Station Distance	Tread Width	Typ X-Slope	p,h,f,s,v Surface Cat*	Surface Type*	+/- Typ Grade	Compass / GPS Fwd/Lat	Compass / GPS Bk/long	Max X-Slope Magnitude	Max X-Slope Length	Max Grade Magnitude	Max Grade Length	MCW
0												
Distance	50	0	F	Soil	-4	101	101	10	6	—	—	—
75												
Distance	48	1	F	Soil	-6	52	50	—	—	—	—	33
101												
Distance	48	5	F	Soil	-9	18	16	—	—	12	6	—
193												
Distance	48	5	F	veg-mow	-4	53	51	—	—	20	2	28
226												
Distance	45	4	F	veg-mow	-15	123	123	—	—	—	—	—
287												
Distance	45	2	F	veg-mow	-7	175	173	—	—	22	2	—
309												
Distance	45	3	F	veg-mow	-2	192	191	7	5	16	8	—
391												
Distance												
Distance												
Distance												
Distance												

Feature Distance	T/V Zone	Feature Type*	Feature Description	Size LxWxH	U/M	Count/ Qty	End Distance	Remain. Tread	Built Feature Access	Action Req'd
41	T	Rock	embedded	12X20X7	in	1		28		
105	V	Bench	arms & backrests			1				
50	V	Bench	no arms no backrests			2				
218	T	Roots	Multiple	5X5	in		224			
337	T	Roots	Multiple	4X4	in		347			
175	T	Water Bar	wood	4X60X4	in	1		0		
261	T	Rut		12X48X8	in	1		0		
391	V	Scenic View								
391	V	Bench	arms & backrests			3				
391	V	Water-potable	fountain			1				

Segment Data Collection Form with Data

* Please use only values from data lists

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Data Recording Summary

- Trail Cover Sheet information from land management agency
- Segment Cover Sheet information specific to assessment conditions
- Segment Data Collection Form is a combination of the Station Log and Feature Log

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through research, design & education