

Data fields required for Trail Access Information

The purpose of this document is to set forth the minimum data fields required to provide Trail Access Information (TAI) summary information for any trail within trail databases. The most important pieces of data that need to be added to every trail database include the following:

- 1 Trail **length**
- 2 Typical **grade**
- 3 Maximum **grade**
- 4 Trail **grade** profile
- 5 Typical **cross slope**
- 6 Maximum **cross slope**
- 7 Typical **tread width**
- 8 Minimum **tread width**
- 9 **Surface** type
- 10 **Surface** quality
- 11 **Obstacle** type
- 12 **Obstacle** magnitude
- 13 **Obstacle** location
- 14 Assessment **date**

Introduction

Trail databases contain information about trails. Objective information about a trail is necessary in order to make informed decisions about how and whether or not to hike the trail based on the equipment being used on the trail and the personal abilities of the trail user. The US Access Board and the US Forest Service have established a minimum set of information for public disclosure of objective trail characteristics. Such Trail Access Information (TAI) is essential for the inclusion of potential trail users of all abilities. Disclosure of TAI represents the best practice for providing access to trails and avoiding discrimination on the basis of disability. Without TAI, potential trail users are left unaware of trail conditions and their ability to hike the trail.

Trail Access Information is being collected around the world. In order to allow this critical trail information to be accessible to the public, all trail databases must include a standard set of data fields to receive and display the objective trail data.

The purpose of this document is to provide the minimum data fields that should be included in every trail database so that TAI is readily accessible to all types of trail users. Until placeholders for these attributes are added to all new and existing trail databases, this critical trail information will be unavailable to the public, along with the many potential trail users who rely on it. All entities involved in the public disclosure of trail information should begin collecting and disclosing the data specified in this document as a subset of their normal trail data and seek creative and effective ways of providing Trail Access Information for all.

Trail Access Information (TAI) summary data

Trail Access Information (TAI) summary data provides potential trail users with the most essential, objective characteristics about the trail being considered. The TAI summary data may be calculated to describe a limited section of a single trail, a full trail, or a combination of trails.¹ For example, a quarter-mile trail would likely require TAI summary data for the entire trail, while the Pacific Crest Trail, which passes through Washington, Oregon, and California, would require TAI summary data for multiple smaller sections of the trail in each state.

In order to provide Trail Access Information (TAI) for a trail, the following fields are needed. These fields should be able to be populated into a trail database from assessment summary data or automatically calculated from station and feature data collected on the trail. **The following data fields must be included for each trail in every trail database to enable collection and documentation of objective trail data and the creation of Trail Access Information.** If trail management entities do not currently have Trail Access Information, **the data placeholders will allow (and motivate) other interested individuals or organizations to provide this crucial information in the future.**

Trail Access Information (TAI) summary fields

The following tables represent TAI fields that are required for compliance with US Access Board and US Forest Service trail signage requirements, as well as additional recommended fields. The provision of these fields is necessary for a minimum disclosure of objective information regarding the level of access provided by a trail.

Minimum TAI Summary Fields for ABA Standards		
Field	Description	Field Type
Length	Unit (mi or km) decided by unit field	Number field
Typical Grade	Percent	Number field
Maximum Grade	Percent	Number field
Typical Cross Slope	Percent	Number field
Maximum Cross Slope	Percent	Number field
Typical Tread Width	Unit (in. or cm) decided by unit field	Number field
Minimum Tread Width	Unit (in. or cm) decided by unit field	Number field
Surface Type		Dropdown
Assessment Date		Date field

¹ For the purposes of Trail Access Information, the term “trail” may represent a section of trail, a single trail, or a combination of trails. In many assessments, the trail for which TAI is made available may be a section of a long-distance trail or a connector between two or more trails.

Additional TAI Summary Fields for US Forest Service

Field	Description	Field Type
Obstacle ² Type	Worst obstacle type 1	Dropdown
Obstacle Location Description		
Trail Grade Profile	If available, provide a link to the trail grade profile	Text field

Additional Recommended TAI Summary Fields

Field	Description	Field Type
Trail ID	Unique identification	Number field
Trail Name		Text field
State/Province	List	Dropdown
County		Text field
Agency		Text field
Park Name		Text field
Contact Person		Text field
Contact Phone		Number field
Contact Email		Text field
Trail Type		Dropdown
Destination	To where does the trail lead?	Text field
Trailhead	Identify trailhead name and/or location	Text field
User Groups Allowed		Dropdown
Users Groups Prohibited		Dropdown
Elevation Change	Unit (ft or m) decided by unit field	Number field
Intermediate Grades	Percent—A range can be shown with a total length of the percent(s) within the range	Text field
Intermediate Cross Slopes	Percent—A range can be shown with a total length of the percent(s) within the range	Text field
Typical Surface Quality	Paved, Hard, Firm, Soft, Very Soft	Dropdown
Worst Surface Quality	Paved, Hard, Firm, Soft, Very Soft	Dropdown
Objective Typical Firmness	Unit (in. or mm) decided by unit field (only for Instrumented Surface Indenter measurements)	Number field
Objective Worst Firmness	Unit (in. or mm) decided by unit field (only for Instrumented Surface Indenter measurements)	Number field
Objective Typical Stability	Unit (in. or mm) decided by unit field (only for Instrumented Surface Indenter measurements)	Number field

² Three separate obstacle types representing the most inaccessible obstacles are recommended, though more obstacles may be identified. The location of maximum obstacles may be shown in maps. An additional obstacle layer can be added to include individual obstacle attributes.

Objective Worst Stability	Unit (in. or mm) decided by unit field (only for Instrumented Surface Indenter measurements)	Number field
Obstacle Typical Magnitude	Unit (in. or cm) decided by unit field	Number field
Obstacle Maximum Magnitude	Unit (in. or cm) decided by unit field	Number field
Assessment Method	Manual Universal Trail Assessment Process (MUTAP), High-Efficiency Trail Assessment Process (HETAP), or any other process should be specified and described	Text field
Unit	Imperial or Metric	Dropdown

Field data for TAI summaries

The provision of Trail Access Information (TAI) summary data requires an assessment to be performed that systematically collects objective trail attributes, including trail length, running slope, cross slope, tread width, surface type, surface firmness and stability, and features and obstacles.

The Universal Trail Assessment Process (UTAP), a proven method of trail assessment, whether manual, semi-automated, or automated, divides each trail into segments for assessment. Within a single segment, the trail is evaluated at reference points along the best path of travel that are referred to as stations.

While segment and station data are not required to be included in trail databases for the provision of TAI summary data, storing and providing segment and station data can provide the ability to display a greater amount of information that will assist all user groups with more detailed trail information. For more information, see the section below titled Public access to station and feature data.

Segments

Segments are the building blocks of trails and are necessary for the assembly and rerouting of trails and TAI. Before assessment, each endpoint or intersection within the trail system is labeled as a unique node, which divides the trail network into individual segments. Each segment is named according to the starting and ending node. A single trail may be composed of only one segment or an assembly of multiple segments. Segments may be associated with more than one trail where multiple trails overlap.

The assessment data from each segment included in the trail to be summarized are combined and processed to calculate the final TAI summary data. The Beneficial Designs UTAP and High-Efficiency Trail Assessment Process (HETAP) software can split, reverse, and combine trail segments to process the data and create TAI for the desired trail. The same can be done in Microsoft Excel using macros and the formulas presented in this document.

Segment fields

When segments are collected during a trail assessment, the following fields are recorded for each segment.

Segment fields		
Field	Description	Field Type
Segment ID	Must be auto-generated	Number field

Segment Name³	Typically, node to node (A-B) describing the beginning and end of the segment	Text field
State/Province		Dropdown
County		Text field
Agency		Text field
Park		Text field
Start Point Latitude	GPS (North/South)—ArcGIS converts to a default geodatabase (y field)	Number field
Start Point Longitude	GPS (East/West)—ArcGIS converts to a default geodatabase (x field)	Number field
Start Point Description	It is important to describe the starting location not just in terms of GPS coordinates, but location description accurate to within 1 foot so that the assessment may be repeated.	Text field
End Point Latitude	GPS (North/South)—ArcGIS converts to a default geodatabase (y field)	Number field
End Point Longitude	GPS (East/West)—ArcGIS converts to a default geodatabase (x field)	Number field
End Point Description	It is important to describe the ending location not just in terms of GPS coordinates, but location description accurate to within 1 foot so that the assessment may be repeated.	Text field
Design Tread Width	36 in. default—Unit (in. or cm) decided by unit field	Number field
Minimum MCW Boundary Height	Unit (in. or cm) decided by unit field	Number field
Vertical Obstacle Design Height	80 in. default—Unit (in. or cm) decided by unit field	Number field
Minimum Obstacle Height	Unit (in. or cm) decided by unit field	Number field
Date of Last Rainfall	Prior to assessment	Date field
Quantity of Last Rainfall	Prior to assessment—Unit (in. or cm) decided by unit field	Number field
Assessment Weather Condition	Description of weather during assessment	Text field
Assessment Temperature	Unit (F or C) decided by unit field	Number field
Comments	About the assessment	Text field
Assessment Coordinator		Text field
Assessment Coordinator Cert. Number	Certification number	Number field
Assessment Coordinator Email		Text field
Assessment Coordinator Phone		Text field

³ For long distance trails, it is important to disclose segment names in addition to the primary trail name. Some long-distance trails include the Pacific Crest Trail, the Tahoe Rim Trail, the Continental Divide Trail, the Appalachian Trail, the Ice Age Trail, the Arizona Trail, the Florida Trail, the North Country Trail, the American Discovery Trail, and the TransAmerica Trail.

Assessment Date		Date field
Units of Measurement	Imperial or Metric	Dropdown
Trail Name 1	Primary trail the segment covers	Text field
Trail Name 2⁴	Additional trail the segment covers	Text field
Trail Name 3	Additional trail the segment covers	Text field
Trail Name 4	Additional trail the segment covers	Text field

Stations

Stations are the building blocks of segments. A station represents a continuous portion of trail with consistent trail attributes. Each station must, at a minimum, document the grade, cross slope, tread width, surface type, and surface quality of the best path of travel, starting from the beginning of the station up to, but not including, the next station. A new station is recorded when one or more trail attributes significantly change or when a maximum station distance is reached. Depending on the mode of collection, a station may be entered as a single data point and converted to a data line on the backend, or initially collected as a data line associated with the starting point of the line in the direction it was recorded.

In order to calculate Trail Access Information (TAI) and to display specific trail characteristics spatially, such as grade, cross slope, or tread width, station data must be repeatedly measured across the entirety of each segment of trail.

Station fields

The station database for each segment should include the following data for each station point or line.

Station fields		
Field	Description	Field Type
Station ID	Ideally auto-generated and tied to the Segment ID	Number field
Timestamp		Date Field
State/Province		Dropdown
County		Text field
Agency		Text field
Park Name		Text field
Length	Unit (ft or m) decided by unit field	Number field
Cumulative Distance	Unit (ft or m) decided by unit field	Number field
Grade	Percent	Number field
Cross Slope	Percent	Number field
Tread Width	Unit (in. or cm) decided by unit field	Number field

⁴ Where multiple overlapping trails share a segment, each trail should be listed for the segment.

Clearance Width	Yes/No—Minimum clearance width (inches) recorded when the passage on the trail is narrower than the specified design (typically 36") and there is no alternate path.	Dropdown
Surface Type		Dropdown
Surface Quality		Dropdown
ISI Firmness	Unit (in. or mm) decided by unit field—Only for Instrumented Surface Indenter measurements.	Number field
ISI Stability	Unit (in. or mm) decided by unit field—Only for Instrumented Surface Indenter measurements.	Number field
Photo		Text field
Comments		Text field
Start Point Latitude	GPS (North/South)—ESRI converts to a default geodatabase (y field)	Number field
Start Point Longitude	GPS (East/West)—ESRI converts to a default geodatabase (x field)	Number field
Elevation	Unit (ft or m) decided by unit field	Number field
Unit	Imperial or Metric	Dropdown
Segment ID		Number field

Calculation of TAI from station data

Trail Access Information (TAI) summary data for each trail can be populated into the appropriate TAI summary fields.

Formulas

The following table provides the formulas for calculating TAI summary data for typical and maximum running slope, typical and maximum cross slope, and typical and minimum tread width, based on station data collected in the field. These trail characteristics, which are required by both the 2015 ABA Standards and the 2013 US Forest Service Trail Accessibility Guidelines, are essential for each trail user to be able to determine their personal ability to use the trail described.

The typical value formulas calculate a weighted average and can be automated in an Excel or ArcGIS data table. For example, to calculate the weighted average running slope, each station length is multiplied by the absolute value of that station's running slope. These values are added up and the sum is then divided by the total length of the trail or trail segment.

Running Slope (Typical)	$\frac{\sum (R \times L)}{\sum L}$	R = Station running slope (average if using a clinometer) L = Station length
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Cross Slope (Typical)	$\frac{\sum (C \times L)}{\sum L}$	C = Station cross slope L = Station length
Tread Width (Typical)	$\frac{\sum (W \times L)}{\sum L}$	W = Station tread width L = Station length
Surface Firmness (Typical)	$\frac{\sum (F \times L)}{\sum L}$	F = Station stability L = Station length
Surface Stability (Typical)	$\frac{\sum (S \times L)}{\sum L}$	S = Station stability L = Station length

Typical obstacle magnitudes represent unweighted averages.

Maximum, minimum, or worst values for trail attributes are based on the most extreme absolute value collected along the entire trail.

Features

Section 7.4.11 of the US Forest Service Trail Accessibility Guidelines requires disclosure of the location and identification of specific trail features and obstacles that do not comply with accessibility requirements. All features, regardless of compliance, should be documented. Feature points should ideally be included in a trail database and displayed along trail lines to provide managers and potential users the ability to determine the location, identification, magnitude, and remaining tread width of each feature.

Feature fields

Data for features encountered during a trail assessment should be documented with the following fields.

Feature fields		
Field	Description	Field Type
Feature ID	Ideally auto-generated	Number field
Feature Type		Dropdown
Timestamp		Date field
State/Province		Dropdown
County		Text field
Agency		Text field
Park		Text field
Zone	Trail Bed Zone or Visual Field Zone	Dropdown
Length	Unit (in. or cm) decided by unit field	Number field

Width	Unit (in. or cm) decided by unit field	Number field
Height or Depth (+ / -)	Unit (in. or cm) decided by unit field—negative values represent depth below ground surface	Number field
Remaining Tread Width	Unit (in. or cm) decided by unit field—minimum of 36 inches required for access	Number field
Compliant	Yes/No—if No and the feature is in the trail bed zone, the feature is considered an obstacle	Dropdown
Recommended Action		Text field
Materials Needed		Text field
Photo		Text field
Comments		Text field
Segment Distance	Unit (ft or m) decided by unit field	Number field
Latitude	GPS (North/South)—ESRI converts to a default geodatabase (y field)	Number field
Longitude	GPS (East/West)—ESRI converts to a default geodatabase (x field)	Number field
Elevation	Unit (ft or m) decided by unit field	Number field
Unit	Imperial or Metric	Dropdown
Segment ID	Unique ID	Number field

Public access to station and feature data

A recommended best practice for Trail Access Information (TAI) disclosure is to provide comprehensive TAI through online interactive maps, charts, and trail profiles that spatially display the station data for running slope, cross slope, tread width, surface type, and surface firmness and stability, as well as feature points with associated attributes. Allowing the user to control data symbology and attribute thresholds while visualizing the location of actual trail characteristics and features will provide enhanced capabilities in determining which parts of the trail are personally accessible. Being able to visually analyze the location of all trail conditions is the ideal solution to the need for objective trail information.

Station attributes (grade, cross slope, tread width, surface type, surface firmness and stability), can be split into individual layers to produce a multi-layer trail line. Each layer can be isolated and reviewed with color combinations that identify the different data thresholds, as shown in **Figure 1**. In the sample map, areas where the trail is 60 inches or greater are shown in cyan, tread widths less than 60 inches but greater than or equal to 36 inches are shown in orange, while values less than 36 inches are shown in magenta. Alternatively, the user could also be provided the ability to manually set the thresholds and color parameters to visually identify the exact conditions suitable to their personal needs. If the individual decided that they were capable of traversing through a tread width of 20 inches, they could set tread widths 20 inches or more to cyan, with intermediate and extreme thresholds customized as well.

Station photos can be linked to corresponding station lines, allowing users to visually preview the trail before arrival. Panorama photos may also be utilized and stitched together to provide a 360-degree trail simulation. Photogrammetry and LiDAR technology might also be used, which could be combined with the station data to produce a three-dimensional simulation of the trail, along with color identification of trail attribute values.

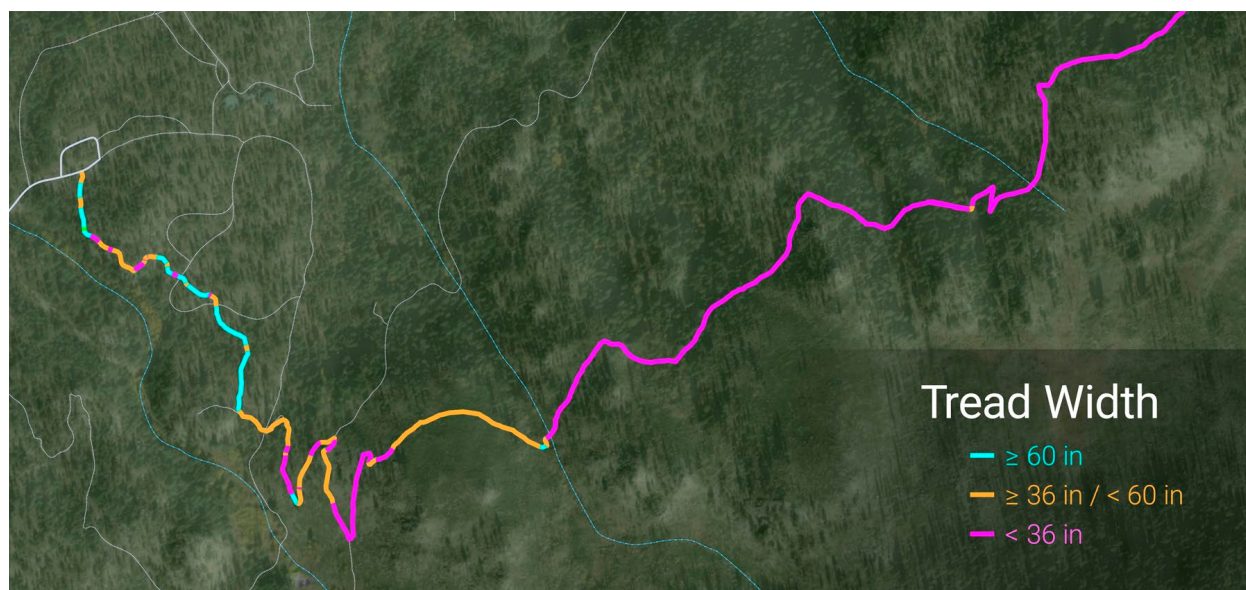


Figure 1 Sample of trail station data map

Feature data may also be displayed as data points along the trail. These points can include all feature attributes and photos to provide a comprehensive preview of the obstacle or object.

By displaying station and feature data visually and spatially across a trail map, users will understand the location of all documented conditions and features throughout the trail. This would allow users to determine which parts of a trail they will be able to hike or at which point they will need extra assistance.

Appendix: Dropdown Lists

Feature Type

1. Abutment	40. Fence	78. Parking
2. Amphitheater	41. Fire Ring/Grill	79. Picnic Area
3. Archeological	42. Ford	80. Picnic Table
4. Armoring	43. Forest	81. Pier
5. Bathroom	44. Future Trail	82. Pit Toilet
6. Beach	Access	83. Pond
7. Bench	45. Gap	84. Ponding
8. Berm	46. Gate	85. Post
9. Bike Rack	47. Glacier	86. Prairie
10. Bird House	48. Graffiti	87. Puncheon
11. Blaze	49. Grove/Orchard	88. Rail Tracks
12. Bollard	50. Hazard	89. Railing
13. Bridge	51. Headwall	90. Raised Edge
14. Cabin	52. Historical	91. Reservoir
15. Campground	53. Hitching Rail	92. Restroom
16. Canopy	54. Hole	93. Rest Area
17. Canyon	55. Information	94. Retaining Wall
18. Causeway	Center	95. Ridge
19. Cave	56. Interpretive	96. Riprap
20. Climbing Area	Center	97. River
21. Climbing Turn	57. Intersection	98. Road
22. Corral	58. Kiosk	99. Rock
23. Crack	59. Ladder	100. Root(s)
24. Creek/Stream	60. Lake	101. Rut
25. Culvert	61. Landslide	102. Rutting
26. Curb	62. Light	103. RV Hookup
27. Deck	63. Lip	104. Scenic Viewpoint
28. Detectable	64. Manhole	105. Service
Warning Surface	65. Marker	106. Shade
29. Dip	66. Marsh/Fen	107. Shelter
30. Ditch	67. Meadow	108. Shower
31. Drainage	68. Mid-Span	109. Sign
32. Drainage Dip	Support	110. Sink Area
33. Drainage Lens	69. Minimum	111. Sinkhole
34. Drinking Fountain	Clearance Width	112. Ski Trail
35. Drop-off	70. Mound	113. Social Path
36. Edge Protection	71. Mountain	114. Spalling
37. Entrenchment	72. Noxious Plant	115. Spring
38. Environmental	73. OHV Area	116. Staging Area
Education Center	74. Other	117. Stairs
39. Erosion	75. Outcrop	118. Step(s)
	76. Overgrown	119. Stepstone
	77. Overlook	Crossing

120. Stile
121. Stringer
122. Stump
123. Summit
124. Surface
125. Swale
126. Swimming Area
127. Switchback
128. Telephone
129. Trail
130. Trail Access
131. Information
132. Trailhead
133. Trash Disposal
134. Tree
135. Tree - Downed
136. Trenching
137. Trip hazard
138. Tunnel
139. Turnpike
140. Valley
141. Vegetation
142. Vertical
Discontinuity
143. Vertical Obstacle
144. Viewing Area
145. Visitor Center
146. Wash
147. Washed Out Trail
148. Water
149. Water Crossing
150. Water - All others
151. Water - Potable
152. Water Catchment
153. Waterbar
154. Waterfall
155. Way Trail
156. Wetland

Surface Type

1. Aggregate/Gravel
2. Asphalt
3. Bedrock
4. Brick/Paver
Stone
5. Concrete
6. Crushed Stone
(Fines)
7. Duff
8. Engineered Wood
fiber
9. Ice
10. Ladder
11. Other
12. Rock/Boulder
13. Rubber
14. Sand
15. Scree
16. Shell
17. Snow
18. Soil
19. Stairs
20. Vegetation -
Mown
21. Vegetation -
Natural
22. Water
23. Wood -
Chip/Mulch
24. Wood - Decking

Surface Quality

1. Paved
2. Hard
3. Firm
4. Soft
5. Very Soft