



Condition Assessment Survey Matrix (CASM) *Survey Accuracy and Specificity*

How Much Information to Collect?

Trail condition surveys provide an important opportunity for managers and technicians to get a first-hand look and gather current information on trail inventory and conditions. The decision to send a survey crew into the field and the subsequent need to update and maintain the collected data, however, isn't cheap.

Before beginning a trail condition survey, it is important to assign the task to qualified TRACS surveyors and choose the right tools for the job. It is equally important to identify the survey expectations in terms of accuracy and specificity. How much information is too much or too little, too detailed or too general, useful or not? Should all trails be surveyed equally, from minimally developed to highly developed trails?

What Is CASM?

CASM is an acronym for Condition Assessment Survey Matrix and is the Forest Service's guide to recommended trail condition survey methods and accuracies. The Forest Service developed CASM to help ensure the effective and efficient use of limited personnel, time, and funding for trail condition surveys and the collection of quality data.

CASM is a common-sense approach that identifies appropriate survey methods and expected data accuracy and specificity, based on the level of trail development or Trail Class, investment in trail structures, and visitor expectations. The higher the level of trail development, investment, and visitor expectation, the higher the expectation for survey accuracy and specificity. For instance, on a very primitive Trail Class 1 with little-to-no development, it usually makes sense to complete an adequate but basic condition survey in terms of detail and accuracy. However, on a fully developed Trail Class 5 with extensive trail structures, financial investment, and high visitor expectations for user accommodations and convenience, there is usually a need for greater data specificity, detail, and accuracy.

The Forest Service has incorporated the CASM approach for trail condition survey accuracy and specificity into the USFS Trail Deferred Maintenance Protocols since 2001. Infra Trails also reflects CASM in terms of the expected data accuracy and specificity expected by Trail Class, and in the resulting information available for managers and other internal and external customers.

CASM Matrix

A Guide to Recommended Survey Methods and Accuracies

CASM is the Forest Service’s guide for conducting efficient and appropriate trail inventory and condition surveys, based on the level of trail development or Trail Class, investment in trail structures, and visitor expectations. The Forest Service recommends CASM values as minimums for data accuracy and specificity. Local managers may select more rigorous frequencies, methods, or accuracies as determined necessary.

Assessment Factors	Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Survey Method¹	Walk through and make notes on map or GPS ²	Cyclometer or GPS ²	Cyclometer or GPS ²	Cyclometer	Tape or cyclometer and hand level with digital readout
Recommended Survey Accuracy and Specificity					
Measurement Interval³	Major physiographic changes	Minor physiographic changes or ½ mile	Typical Grade changes of 10% or 500 feet	Typical Grade changes of 10% or 500 feet	Intervisible alignment changes, 2% grade changes, or 25 feet
Typical Grade⁴	+/- 10%	+/- 10%	+/- 5%	+/- 5%	+/- 1%
Typical Width⁵	Not measured	Optional +/- 6"	+/- 6"	+/- 6"	+/- 3"
Obstacles⁶	Not measured	Not measured	Optional	Formidable Obstacles (for example, narrow width with steep drop off)	All those defined as Obstacles
Typical Cross Slope⁷	Not measured	Not measured	+/- 1%	+/- 1%	+/- 0.1%
Features and Tasks⁸	Maximum grouping of Features and Tasks	Grouping of Features and Tasks	Grouping of Features and Tasks optional	Each Feature and Task inventoried and assessed individually	Each Feature and Task inventoried and assessed individually

¹ **Survey method**—Most efficient method that accomplishes identified CASM accuracies.

² **GPS**—TRACS data collected via Global Positioning System (GPS) must meet agency Geographic Information System (GIS) spatial standards. This usually includes differential correction and editing for multipathing, spiking, and degraded satellite coverage.

³ **Measurement interval**—Maximum interval between collecting a full set of survey points for Typical Grade, Typical Width, Obstacles, Typical Cross Slope, and applicable Features and Tasks. If an element (for example, Typical Grade) changes more frequently than the maximum interval, record those changes based on the CASM accuracy identified for that element.

⁴ **Typical Grade**—Initiate new survey segment when Typical Grade changes by this amount.

⁵ **Typical Width**—Initiate new survey segment when Typical Width changes by this amount.

⁶ **Obstacles**—For those defined (see FSM/FSH, Forest Service Trail Accessibility Guidelines, and Infra Business Rules).

⁷ **Typical Cross Slope**—Accuracy of rise-over-run measurement across Typical Tread Width.

⁸ **Grouping Features and Tasks**—Features and Tasks can be grouped within survey segment.