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Trail Fundamentals and Trail Management Objectives

Forest Service

Washington Office
Recreation, Heritage and Volunteer Resources

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Cover photo—Spring flowers bloom along the Middle Fork Trail, a Class 3 trail in the Frank Church-River of No Return Wilderness in the Salmon-Challis National Forest.

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The U.S. Department of Agriculture, Forest Service, updated the Trail Fundamentals and Trail Management Objectives in September 2016 to improve readability and layout, and to reflect agency printing guidelines.

Contents

Trail Fundamentals 1
Trail Management Objectives (TMOs) 5
National Quality Standards for Trails 31
Trail Class Matrix (FSH 2353, Section 14.2, Exhibit 01) 33
Trail Design Parameters 49
Condition Assessment Survey Matrix (CASM) 67
Appendix A—Federal Trail Data Standards 69
Appendix B—References 71
Appendix C–Glossary 73

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Trail Fundamentals

Trail Fundamentals are five concepts that are the cornerstones of U.S. Department of Agriculture, Forest Service, trail management:

- Trail Type*
- Trail Class*
- Managed Use*
- Designed Use*
- Design Parameters

Identify the five Trail Fundamentals for each National Forest System (NFS) trail or trail segment based on applicable land management plan direction, travel management decisions, trail-specific decisions, and other related direction (FSM 2353.13).

Trail Fundamentals provide an integrated means to consistently record and communicate the intended design and management guidelines for trail design, construction, maintenance and use. Before completing documentation for Trail Management Objectives (TMO), Trail Assessment and Condition Surveys (TRACS), or applying Trail Fundamentals in trail management, it is essential to clearly understand their intent.

Trail Type (Forest Service Handbook [FSH] 2309.18, Section 14.1)

The Trail Type is a category that reflects the predominant trail surface and general mode of travel accommodated by a trail.

There are three Trail Types (FSH 2353.05):

- **Standard/Terra Trail—**A trail that has a surface consisting predominantly of the ground and that is designed and managed to accommodate use on that surface.
- **Snow Trail—**A trail that has a surface consisting predominantly of snow or ice and that is designed and managed to accommodate use on that surface.
- **Water Trail—**A trail that has a surface consisting predominantly of water (but may include land-based portages) and that is designed and managed to accommodate use on that surface.

This management concept allows managers to identify trail-specific Design Parameters, management needs, and the cost of managing the trail for particular uses and/or seasons by trail or trail segment.

1. Inventory trails and identify the appropriate Design Parameters, management needs, and management costs for NFS trails using the Trail Types.
2. Identify only one Trail Type per trail.
3. Identify the Trail Type for each NFS trail based on applicable land management plan direction, travel management decisions, trail-specific decisions, and other related direction.
4. Inventory both trails and Trail Types in the Infra Trails Module when two National Forest System trails overlap, for example, when a Snow Trail overlaps a Standard Terra Trail.

*This management concept/attribute is included in the Federal Trail Data Standards, published by the Federal Geographic Data Committee, and developed by the U.S. Department of Agriculture, Forest Service, and Department of the Interior, National Park Service, Bureau of Land Management, and Fish and Wildlife Service.

Trail Class (FSH 2309.18, Section 14.2)

The Trail Class is the prescribed scale of development for a trail, representing its intended design and management standards.

Trail Classes are general categories reflecting trail development scale, arranged along a continuum.

There are five Trail Classes, ranging from the least developed (Trail Class 1) to the most developed (Trail Class 5):

- **Trail Class 1—**Minimally Developed
- **Trail Class 2—**Moderately Developed
- **Trail Class 3—**Developed
- **Trail Class 4—**Highly Developed
- **Trail Class 5—**Fully Developed

Use Trail Classes to inventory NFS trails and to identify the applicable Design Parameters and costs for meeting the National Quality Standards for Trails.

1. Identify only one Trail Class per trail or trail segment.
2. Trail Class descriptors reflect typical attributes of trails in each class. Local deviations from any Trail Class descriptor may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.
3. There is a direct relationship between Trail Class and Managed Uses (FSH 2309.18, Section 14.3): generally, one cannot be determined without consideration of the other.
4. Identify the appropriate Trail Class for each NFS trail or trail segment based on the management intent in the applicable land management plan, travel management decisions, trail-specific decisions, and other related direction. Apply the Trail Class that most closely reflects the management intent for the trail or trail segment, which may or may not reflect the current condition of the trail.

Multnomah Falls Trail, Oregon, in the Columbia River Gorge National Scenic Area is an iconic and well-known Class 4 trail.

For specifics on each Trail Class, refer to the Trail Class Matrix (FSH 2309.18, Section 14.2, Exhibit 01) on pages 33 and 34 and USFS Trail Class photo examples on pages 35 through 48 in this publication.

Managed Use (FSH 2309.18, Section 14.3)

Managed Use is a mode of travel that is actively managed and appropriate on a trail, based on its design and management.

1. Managed Use indicates management intent to accommodate a specific use.
2. There can be more than one Managed Use per trail or trail segment.
3. The Managed Uses for a trail are usually a small subset of all the allowed uses on the trail, that is, uses that are allowed unless specifically prohibited. For example, on a trail that is closed to all motorized use but open to all non-motorized use, the Managed Uses could be Hiker/Pedestrian and Pack and Saddle. The allowed uses, however, would also include bicycles and all other non-motorized uses.
4. Identify the Managed Uses for each NFS trail or trail segment based on applicable land management plan direction, travel management decisions, trail-specific decisions, and other related direction.
5. There is a direct relationship between Managed Use and Trail Class: generally, one cannot be determined without consideration of the other. Not all Trail Classes are appropriate for all Managed Uses. For guidance on the potential appropriateness of each Trail Class to each Managed Use, see FSH 2309.18, Section 14.3, Exhibit 01.

Designed Use (FSH 2309.18, Section 14.4)

Designed Use is the single Managed Use of a trail that requires the most demanding design, construction, and maintenance parameters and that, in conjunction with the applicable Trail Class, determines which Design Parameters will apply to a trail.

1. There is only one Designed Use per trail or trail segment. Although a trail or trail segment may have more than one Managed Use and numerous uses may be allowed, only one Managed Use is identified as the design driver or Designed Use.
2. Determine the Designed Use for a trail or trail segment from the Managed Uses identified for that trail. When making this determination, consider all Managed Uses that occur during all seasons of use of the trail or trail segment. Assess any essential or limiting geometry for the Managed Uses of the trail or trail segment to determine whether any trail-specific adjustments are necessary to the applicable Design Parameters.
    a. In some situations, when there is more than one Managed Use identified for a trail, the Designed Use may be readily apparent. For example, on a trail with Managed Uses of all-terrain vehicle and motorcycle, all-terrain vehicle use would be the Designed Use because this use requires wider tread widths and has lower tolerances for surface obstacles and maximum trail grades.
    b. In other situations involving more than one Managed Use, the Designed Use may not be readily apparent, as is often the case when there are fewer differences between the applicable sets of Design Parameters than in the example above. For example, on a trail that is actively managed for hiker and pedestrian, pack and saddle, and bicycle use, pack and saddle use would likely be the Designed Use because of the three Managed Uses, pack and saddle use generally has the most limiting design requirements. While the Bicycle Design Parameters are very similar to the Pack and Saddle Design Parameters, the Design Parameters for this trail may need to be adjusted to accommodate bicycles.

Managed Use and Designed Use Types

- Hiker/Pedestrian
- Pack and Saddle
- Bicycle
- Motorcycle
- All-Terrain Vehicle
- Four-Wheel Drive Vehicle > 50 Inches in Width
- Cross-Country Ski
- Snowshoe
- Snowmobile
- Motorized Watercraft
- Nonmotorized Watercraft

Design Parameters (FSH 2309.18, Section 14.5)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of a trail, based on its Designed Use and Trail Class.

1. Design Parameters reflect the design objectives for NFS trails and determine the dominant physical criteria that most define their geometric shape. These criteria include:
   a. **Design Tread Width—**Design Tread Width is expressed in terms of single lane, double lane, and the minimum tread width on trail structures.
   b. **Design Surface—**Design Surface is expressed in terms of surface type, protrusions, and obstacles.
   c. **Design Grade—**Design Grade is expressed in terms of Target Grade, Short Pitch Maximum Grade, and Maximum Pitch Density.
   d. **Design Cross Slope—**Design Cross Slope is expressed in terms of Target Cross Slope and Maximum Cross Slope.
   e. **Design Clearing—**Design Clearing is expressed in terms of width, height, and shoulder clearance.
   f. **Design Turns—**Design Turns are expressed in terms of the turning radius.
2. Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, and other factors (for example, mitigation of site-specific safety concerns and adjustments to accommodate other Managed Uses), provided that the deviations are consistent with the general intent of the applicable Trail Class.
3. Identify the Design Parameters for a NFS trail or trail segment based on its Trail Class and Designed Use. For a Design Parameter such as Design Tread Width, Design Clearing Width, and Design Turns that is expressed as a range of values, identify a specific value for each trail or trail segment.

For the complete set of Design Parameters, refer to FSH 2309.18, Section 23.11, Exhibit 01, through Section 23.33, Exhibit 01 and pages 49 through 66 of this publication.

Trail Management Objectives (TMOs)

Setting the Standard

TMOs are documentation of the intended purpose and management of an NFS trail based on management direction, including access objectives.

Manage each trail to meet the TMOs identified for that trail based on applicable land management plan direction, travel management decisions, trail-specific decisions, and other related direction, and based on management priorities and available resources. For each NFS trail or NFS trail segment, identify and document its TMOs, including the five Trail Fundamentals, Recreation Opportunity Spectrum classifications, design criteria, travel management strategies, and maintenance criteria (Forest Service Manual [FSM] 2353.12).

Why TMOs?

TMOs are fundamental building blocks for trail management. They synthesize and document the management intention for the trail, and provide basic reference information for subsequent trail planning, management, condition surveys, and reporting.

The documentation of TMOs for each NFS trail makes good management sense and is a prerequisite for completing an effective trail condition assessment survey and documenting the prescription of the work needed to meet standard.

Effectively managing a trail and determining what is necessary to meet standard first requires answering some basic questions:

- What is the purpose of the trail?
- What is the intended level of development of the trail (Trail Class)?
- What is the intended type or types of uses for the trail (Managed Use)?

In the past, some trails have been managed based largely on the type or amount of use they were currently getting, without sufficient consideration of the intended use or future trends and needs. This sometimes resulted in managing a trail for a type or level of use that was not compatible with the trail management direction, design, or location. Establishing and communicating the intended TMOs for each system trail is a proactive step that prevents this from occurring.

Developing Effective TMOs

District Rangers are responsible for approving TMOs, unless that responsibility has been reserved by the Forest Supervisor (FSM 2353.04j).

A line officer needs to approve each TMO after a unit trail manager prepares and recommends the TMO for approval. For districts, the forest trail coordinator and forest planning group should also review TMOs prior to district ranger approval. This ensures that TMOs for a trail are consistent with the forest plan, district and forest travel management plans, and anticipated future land management actions. The review and approval process also helps to avoid inconsistencies between units, and prevents districts from unintentionally assigning

conflicting TMO prescriptions for segments of a continuous trail (for example, it avoids designation of a trail as motorized on one district and changing to nonmotorized at the district boundary).

TMOs are not static documents. They reflect the management intent and special considerations that are important for effective management of the trail. Trail managers should update TMOs if the management intent for the trail, special considerations, or other factors change.

The following pages of this section provide instructions and reference materials for developing TMOs. The USFS internal Web site for Recreation and Heritage Resources Integrated Business Systems <http://fsweb.wo.fs.fed.us/rhwr/ibsc/tr-cost.shtml> and the USFS external Web site for Trail Management <http://www.fs.fed.us/recreation/programs/trail-management/index.shtml> are additional useful resources. Review these materials for step-by-step instructions, examples, and basic guidance on documenting TMOs.

Instructions for electronically recording TMOs in Infra Trails are available on the National Resource Manager support Web page <http://fsweb.nrm.fs.fed.us/support/index.php> and via Infra Online Help from within the Infra Trails module.

Based on the Trail Management Objectives prescription, Forest Service employees survey a route for the extension of the Breezy Hill Trail complex in the Kisatchie National Forest.

TMO Excel Form

This TMO Excel form is for reference to discuss TMO terminology and data fields. For instructions on completing the TMO Excel form refer to the TMO Form Instructions section of this publication for instructions on completing the TMO form. For instructions on using the Infra Trails electronic TMO form, refer to NRM Infra Trails Online Help <http://fsweb.nrm.fs.fed.us/support/index.php>.

TRACS Trail Management Objectives

Region: Forest: District:

Trail Name: Trail Number:

Trail Beginning Termini: Beg. Milepost:

Trail Ending Termini: End. Milepost:

Trail Inventory Length: Miles Trail Mileage Source: Wheel GPS Map Unknown

TMO Trail Section

Sec.# Section Beg. Termini: Beg. Milepost:

Section End. Termini: End. Milepost:

Designed Use Objectives

Trail Type (Check one)
- Standard Terra Trail
- Snow Trail
- Water Trail

Trail Class (Check one)
- 1 (Primitive/Undeveloped)
- 2 (Simple/Minor Development)
- 3 (Developed/Improved)
- 4 (Highly Developed)
- 5 (Fully Developed)

ROS/WROS Class (Check one)

ROS (Non-Wilderness)
- Urban
- Rural
- Roaded Modified
- Roaded Natural
- Semi-Primitive Motorized
- Semi-Primitive NonMotorized
- Primitive

WROS (Wilderness)
- WROS 1
- WROS 2
- WROS 3
- WROS 4
- WROS 5
- WROS 6

Designed Use

(Check one)
- Hiker / Pedestrian
- Pack & Saddle
- Bicycle
- Motorcycle
- All Terrain Vehicle (ATV)
- Four-Wheel Drive Vehicle > 50"
- _____
- _____
- Cross-Country Ski
- Snowshoe
- Snowmobile
- _____
- Watercraft - NonMotorized
- Watercraft - Motorized

Design Parameters

(Fill in all that apply)
- Tread Width (inches)
- Target Grade (%)
- Short Pitch Maximum (%) (up to 200' lengths)
- Target Cross-Slope (%)
- Clearing Width (feet)
- Clearing Height (feet)
- Switchback Radius (feet)
- _____

Target Frequency

Per Year

(Fill in all that apply)
- Trail Opening
- Tread Repair
- Drainage Cleanout
- Logging Out
- Brushing
- Snow Trail Grooming
- Condition Survey
- _____

TRACS TMO Form v5 - Side 1 (10/1/2008) Page ____ of ____

TRACS Trail Management Objectives

Trail Name: _____ **Trail Number:** _____

Travel Management Strategies FSM 2353.19

Managed Use

(Fill in all that apply)*

	From Date (mm/dd)	To Date (mm/dd)
Hiker / Pedestrian		
Pack & Saddle		
Bicycle		
Motorcycle		
All Terrain Vehicle (ATV)		
4WD Vehicle > 50"		
_____		
_____		
Cross-Country Ski		
Snowshoe		
Snowmobile		
_____		
Watercraft-NonMotorized		
Watercraft - Motorized		

Prohibited Use

(Check if applicable)

	From Date (mm/dd)	To Date (mm/dd)
All Motorized Use		

(Or, fill in all that apply)

Hiker / Pedestrian		
Pack & Saddle		
Bicycle		
Motorcycle		
All Terrain Vehicle (ATV)		
4WD Vehicle > 50"		
_____		
_____		
Cross-Country Ski		
Snowshoe		
Snowmobile		
_____		
Watercraft - NonMotorized		
Watercraft - Motorized		

Other Use

(Optional: Check any that apply)*

	Accept	Discourage	Eliminate
Hiker / Pedestrian			
Pack & Saddle			
Bicycle			
Motorcycle			
All Terrain Vehicle (ATV)			
4WD Vehicle > 50"			
_____			
_____			
Cross-Country Ski			
Snowshoe			
Snowmobile			
_____			
Watercraft - NonMotorized			
Watercraft - Motorized			

Special Considerations

(Check any that apply. Underline appropriate clarifier in parenthesis. Provide specifics and reference information below.)

- Shared System (shared with other system road or trail)
- Accessible per Current Agency Guidelines
- Mechanized Tools or Equipment Prohibited
- T&E or Sensitive Species Present (Plant / Wildlife)
- Heritage Resource Present
- Easement across Non-FS Land (Existing / Needed)
- Existing Permit or Agreement (Trail-Specific / Area)
- _____

Remarks / Reference Information

Line Officer: Name _____ Signature _____

Title _____ Date _____

TRACS TMO Form v5 - Side 2 (10/1/2008) Page _____ of _____

TRACS Trail Management Objectives

Trail Name: **Trail Number:**

Remarks / Reference Information (Continuation Sheet)

(Type notes over this message. To insert spaces between lines of text in Excel, press Alt and Enter.)

TRACS TMO Form v5 - Continuation (10/1/2008) Page of

Russell Creek Trail is a remote and scenic Class 3 trail, shown here climbing through a steep rock section high in the Custer Gallatin National Forest.

TMO Form Instructions

Establishing and documenting Trail Management Objectives (TMOs) prior to doing a trail condition survey is essential for getting high quality results—results that will benefit trail management efforts for years to come. The instructions below explain how to complete each field on the TMO Form. Refer also to the attached TMO Form and TMO Examples on the following pages. Find additional guidance and TMO reference materials in FSM 2353 and FSH 2309.18, the TRACS User Guide, Infra Trails documentation, the internal USFS Web site for Recreation & Heritage Resources Integrated Business Systems <http://fsweb.wo.fs.fed.us/rhwr/ibsc/tr-cost.shtml>, and the external USFS external Web site for Trail Management <http://www.fs.fed.us/recreation/programs/trail-management/index.shtml>.

General Trail Information

- ❑ **Region, Forest, and District—**Enter the region number, forest name (or number), and district name (or number).
- ❑ **Trail Name and Trail Number—**Enter the official trail name and trail number. These should correspond exactly with the Trail Name and Trail Number recorded in Infra Trails. Double check for correct spelling and use of spaces.
- ❑ **Trail Beginning and Ending Termini—**Enter a brief narrative description identifying the location of the beginning and ending trail termini. These should correspond exactly as recorded in Infra Trails.
- ❑ **Beginning and Ending Mileposts—**Enter the beginning milepost or measure point, and the ending milepost for the trail. These should correspond exactly as recorded in Infra Trails.
- ❑ **Trail Inv entory Length—**Enter the length of the trail in miles. This mileage should correspond exactly as recorded in Infra Trails. Mileage accuracy recorded on the TMO should correspond to the method of collection (Trail Mileage Source):
  - **Wheel—**If the source of the length measurement was a cyclometer, use three decimal places (for example, 3.641). Note: 0.001 miles equals about 5 feet.
  - **GPS—**If the source of the length measurement was a GPS unit, use two decimal places (for example, 3.64).
  - **Map or Unknown—**If the actual length is unknown, or if the source of the length estimate was a cartographic feature file (CFF) or a vehicle, use no more than one decimal place of accuracy (for example, 3.6).
- ❑ **Trail Mileage Source—**Check the box that corresponds to the source of the mileage above. This is the mileage metadata for reference.

TMO Trail Section

Some trails may have more than one set of objectives. Normally this occurs when a TMO variable changes along distinct segments of the trail, such as between junctions or destinations. Examples can include changes in Trail Class, Recreation Opportunity Spectrum (ROS), Design Parameters, or Prohibited Uses.

If applicable, use the TMO Trail Section block to identify multiple TMOs by trail section. If not applicable, leave this section blank.

- ❑ **Section Number—**Enter a number or letter to sequentially identify the trail section and corresponding TMO (for example, Section: 1, 2, 3, and so on).
- ❑ **Section Beginning and Ending Termini—**Enter a brief narrative description identifying the location of the beginning and ending termini for this trail segment.
- ❑ **Section Beginning and Ending Milepost—**Enter the beginning milepost or measure point, and the ending milepost for this trail segment.

Designed Use Objectives

Trail Type

The Trail Type is a category that reflects the predominant trail surface and general mode of travel accommodated by a trail (FSH 2309.18, Section 14.1).

The Trail Type differentiates between the three basic kinds of trails: Standard Terra Trail, Snow Trail, or Water Trail. Each Trail Type is stored in the Infra Trails database as a separate record, even when, for example, a Snow Trail mostly or totally overlaps a Standard Terra Trail.

- ❑ **Trail Type—**Assign one Trail Type for the trail.

Trail Class

The Trail Class is the prescribed scale of development for a trail, representing its intended design and management standards (FSH 2309.18, Section 14.2).

The Trail Class Matrix (FSH 2309.18, Section 14.2, Exhibit 01 and included on pages 33 through 34 of this publication) summarizes the National Trail Management Classes.

- ❑ **Trail Class—**Assign the most appropriate Trail Class for the trail or trail segment. If a trail has more than one Trail Class, identify each Trail Class by individual trail segment (see TMO Trail Section above).

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) helps ensure consistency between the desired setting and management objectives, and the transportation system. ROS and Wilderness ROS (WROS) classes are mutually exclusive. NOTE: Pending finalization of nationally standardized definitions for WROS categories, refer to regional protocols for WROS definitions, with WROS 1 representing the most pristine and WROS 5 representing the most modified end of the WROS spectrum. The WROS 6 category can be used for Other.

- ❑ **ROS/WROS Class—**
  - Locate and refer to the forest ROS and/or Wilderness classification maps.

- Assign the appropriate ROS/WROS for this segment of the trail. If multiple ROS/WROS classes exist along the trail, consider either segmenting the trail or using the dominant class (see TMO Trail Section).

Designed Use

The Designed Use is the single Managed Use of a trail that requires the most demanding design, construction, and maintenance parameters and that, in conjunction with the applicable Trail Class, determines which Design Parameters will apply to a trail (FSH 2309.18, Section 14.4).

Determine the Designed Use for each trail or trail segment. The Designed Use identifies the single use or limiting factor that drives technical Design Parameters for the trail (such as Design Tread Width, Design Grade, Design Clearing, and so forth). Identification of the Designed Use is necessary to establish the trail's geometric design standards. These standards form the basis for the trail's design, construction, operation, and maintenance. While several Managed Uses may occur on the trail, there is only one Designed Use for any given trail or trail segment.

❑ **Designed Use—**Assign only one Designed Use per trail or trail segment.

Design Parameters

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of a trail, based on its Designed Use and Trail Class (FSH 2309.18, Section 14.5).

Design Parameters reflect the design objectives for NFS trails and determine the dominant physical criteria that most define their geometric shape.

For each combination of Designed Use and Trail Class, there is a corresponding set of nationally established Design Parameters. Use these nationally established Design Parameters (FSH 2309.19, Section 23.11 through Section 23.33) as a basis for determining specific Design Parameters for a trail or trail segment. Additional design criteria are also important (for example, back slope angle) but are not included in the national Design Parameters because they tend to be very site specific and require sound engineering judgment to define.

In each set of national Design Parameters, the Forest Service presents some of the attributes as specific values or narrative descriptions, and an approximate range of values for other attributes. For those attributes presented as numeric ranges of values, identify and record a trail-specific value that falls within the range on the TMO form. For instance, on a Hiker/Pedestrian Trail Class 4, the nationally established Design Tread Width for nonwilderness segments is 24 to 60 inches. However, you should record the trail-specific Design Tread Width value that is appropriate for the trail (for example, 48 inches).

Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, and other factors (for example, mitigation of site-specific safety concerns and adjustments to accommodate other Managed Uses), provided that the deviations are consistent with the general intent of the applicable Trail Class.

❑ **Design Parameters—**

- Assign a specific value for each Design Parameter variable listed. This is not an all-encompassing list of specifications, but rather a list of only the dominant criteria that most define the geometric shape of the trail.
- Footnote any trail-specific deviations from the national Design Parameters in the corresponding Design Parameter field, and explain or justify the deviation in the Remarks/Reference Information section of the TMO.
- Add any additional Design Parameter factors and corresponding values that are important and necessary for achieving the trail objectives for this specific trail or trail segment.

Target Frequency

The Target Frequency indicates how often trail maintenance personnel should complete a routine task in order to maintain the trail to standard. Each trail requires a recurring interval for routine maintenance tasks in order to keep the trail functional, stable and usable. For example, brush grows at a certain rate and to keep a trail operational, trail maintenance personnel must cut the brush at fairly regular intervals. These intervals, which vary by trail and by task, are generally site or area specific and require local experience to define.

❑ **Target Frequency—**

- For the applicable tasks, define the maintenance interval that best reflects the frequency necessary to keep this trail or trail segment to standard. Consider any period within that interval "to standard."
- Record the interval in years. Table 1 shows some examples of how to record target frequencies.

Table 1–Examples of how to record target frequencies.

Task	Frequency	Record As
Trail opening	Once every year	1.0
Brushing	Once every 3 years	0.33
Logging out	Two times per year	2.0

Travel Management Strategies

Travel Management Strategies are very important for effective and efficient trail management. Establishing Travel Management Strategies helps the manager balance the needs of conflicting uses, guides the manager on operational tradeoffs, and assists maintenance crews to efficiently target maintenance efforts to only necessary tasks. This section of the TMO form documents basic information that should also be recorded in the Access and Travel Management (ATM) portion of Infra Trails.

Managed Use

A Managed Use is a mode of travel that is actively managed and appropriate on a trail, based on its design and management.

A Managed Use indicates a management intent to accommodate a specific use. Accommodating the Managed Use frequently results in user-specific trail maintenance and/or signing needs and costs.

Managed Use—

- Record each actively Managed Use on the trail or trail segment. There may be more than one Managed Use per trail or trail segment.
- For each Managed Use, document the dates during which the trail is actively managed for that use. If there is more than one season of use for a particular Managed Use, use the blank space provided under the list of Managed Uses to record additional dates.

❑ **Managed Season of Use (From Date/To Date)—**The Managed Season of Use specifically defines the period of time that the trail is available and managed in a safe and sufficient state for the defined user. The intent is to bracket the times that the Forest Service is responsible for providing that opportunity.

- Here are two examples:
  - One obvious example would be when snow typically covers a Standard Terra Trail outside of the

Managed Season of Use. During this time, the Forest Service does not intend to provide an accessible tread as this would require snow removal and is not part of the managed trail opportunity. Conversely, during the Managed Season of Use, the Forest intends to maintain the accessible tread in a safe and functional condition.

- A less obvious example would be if a trail has a Hiker/Pedestrian Travel Management Strategy of Manage with a Managed Season of Use from March 1 to November 15. In this case, the Forest Service could be responsible for providing stream crossings during high water in June (for example, trail bridges). Changing the Managed Season of Use for this example from June 30 to November 15 bypasses the June runoff and alleviates this conflict.

Prohibited Use

A Prohibited Use is a mode of travel prohibited by a legal order.

❑ **Prohibited Use**

- Record any use that an official prohibition or closure order prohibits.
- Footnote and cite the specific Code of Federal Regulations (CFR) in the Remarks/Reference Information section of the form.

❑ **Prohibited Season of Use (From Date/To Date)—**Document the dates during which the use is prohibited.

Other Use

The Other Use section provides a space to document additional trail-specific information and Travel Management Strategies as needed.

❑ **Other Use—**If applicable, record any other Travel Management Strategies for the trail that you did not cover under Managed Use or Prohibited Use. Check whether the use is Accepted (allowed, while not actively managed for), Discouraged, or Eliminated.

Special Considerations

Use this section to identify any additional trail-specfic considerations that trail managers, design, construction or maintenance personnel should be aware of.

❑ **Special Considerations—**

- Check any applicable special consideration for the trail or trail segment, and underline the appropriate clarifier shown in parentheses.
- Footnote the consideration, and provide details and/or reference for corresponding direction or decision documents in the Remarks/Reference Information section.

Remarks/Reference Information

Use this area to provide additional information or clarification, or to cite reference decisions and materials.

❑ **Remarks/Reference Information—**Document any additional information. To clarify information from previous sections of the TMO, add a footnote reference number, letter, or symbol next to the TMO entry, and write an explanation of the footnote in the Remarks/Reference Information section.

Here are a few examples:

Design Parameters
(Fill in all that apply)

24[1]	Tread Width (inches)
	Target Grade (%)
	Short Pitch Maximum (%) (up to 200' lengths)
	Target Cross-Slope (%)
	Clearing Width (feet)
	Clearing Height (feet)
	Switchback Radius (feet)
	_____

Target Frequency
Per Year
(Fill in all that apply)

1[2]	Trail Opening
	Tread Repair
	Drainage Cleanout
	Logging Out
	Brushing
	Snow Trail Grooming
	Condition Survey
	_____

Special Considerations

(Check any that apply. Underline appropriate clarifier in parenthesis. Provide specifics and reference information below.)

	Shared System (shared with other system road or trail)
	Accessible per Current Agency Guidelines
	Mechanized Tools or Equipment Prohibited
X[3]	T&E or Sensitive Species Present (Plant / Wildlife)
	Heritage Resource Present
	Easement across Non-FS Land (Existing / Needed)
	Existing Permit or Agreement (Trail-Specific / Area)
	_____

Remarks / Reference Information

[1] Tread width; exceptions allowed at existing wood trail structures.
[2] Complete annual Trail Opening by 6/15.
[3] Goose grass sedge, sensitive plant, located along first mile of trail, refer to 3/15/1999 BE for Smith Ridge Trail for mitigation specifications.

Line Officer Approval

District Rangers are responsible for approving TMOs, unless that responsibility has been reserved by the Forest Supervisor (FSM 2353.04j).

Having the line officer approve Trail Management Objectives is essential. The TMO documents management direction and expectations for the trail. A documented, approved TMO provides the trail manager, trail technicians, and trail maintenance crews with the key tool they need to confidently work on the trail without having to second-guess operational and maintenance choices.

The TMO establishes the base standards for measuring and completing trail condition surveys. It also ensures a management framework of continuity and consistency over time and through personnel changes. Succinctly put, the TMO pulls it all together.

- ❑ **Line Officer—**After line officer review and concurrence, record the Line Officer's Name and Title and have them review, sign, and date the form.

TMO Excel Form—Example 1

TRACS Trail Management Objectives

Region: 01 **Forest:** Gallatin **District:** 011001 Big Timber District

Trail Name: Sweet Grass Trail **Trail Number:** 122

Trail Beginning Termini: West Boulder Trailhead **Beg. Milepost:** 0.0000

Trail Ending Termini: Continental Divide NST **End. Milepost:** 10.7000

Trail Inventory Length: 10.7000 Miles **Trail Mileage Source:** [X] Wheel [ ] GPS [ ] Map [ ] Unknown

TMO Trail Section

Sec.# **Section Beg. Termini:** **Beg. Milepost:**

Section End. Termini: **End. Milepost:**

Designed Use Objectives

Trail Type (Check one)

- [X] Standard Terra Trail
- [ ] Snow Trail
- [ ] Water Trail

Trail Class (Check one)

- [ ] 1 (Primitive/Undeveloped)
- [ ] 2 (Simple/Minor Development)
- [ ] 3 (Developed/Improved)
- [X] 4 (Highly Developed)
- [ ] 5 (Fully Developed)

ROS/WROS Class (Check one)

ROS (Non-Wilderness)

- [ ] Urban
- [ ] Rural
- [ ] Roaded Modified
- [X] Roaded Natural
- [ ] Semi-Primitive Motorized
- [ ] Semi-Primitive NonMotorized
- [ ] Primitive

WROS (Wilderness)

- [ ] WROS 1
- [ ] WROS 2
- [ ] WROS 3
- [ ] WROS 4
- [ ] WROS 5
- [ ] WROS 6

Designed Use

(Check one)

- [ ] Hiker / Pedestrian
- [X] Pack & Saddle
- [ ] Bicycle
- [ ] Motorcycle
- [ ] All Terrain Vehicle (ATV)
- [ ] Four-Wheel Drive Vehicle > 50"
- [ ] _____
- [ ] _____
- [ ] Cross-Country Ski
- [ ] Snowshoe
- [ ] Snowmobile
- [ ] _____
- [ ] Watercraft - NonMotorized
- [ ] Watercraft - Motorized

Design Parameters

(Fill in all that apply)

48	Tread Width (inches)
10	Target Grade (%)
15	Short Pitch Maximum (%) (up to 200' lengths)
5	Target Cross-Slope (%)
8	Clearing Width (feet)
10	Clearing Height (feet)
6	Switchback Radius (feet)
	_____

Target Frequency

Per Year

(Fill in all that apply)

1	Trail Opening
0.5	Tread Repair
0.5	Drainage Cleanout
0.5	Logging Out
0.5	Brushing
NA	Snow Trail Grooming
0.2	Condition Survey
	_____

TRACS TMO Form v5 - Side 1 (10/1/2008) Page 1 of 2

TRACS Trail Management Objectives

Trail Name: Sweet Grass Trail **Trail Number:** 122

Travel Management Strategies FSM 2353.19

Managed Use

(Fill in all that apply)*

		From Date (mm/dd)	To Date (mm/dd)
X	Hiker / Pedestrian	05/01	10/31
X	Pack & Saddle	05/01	10/31
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
	Cross-Country Ski		
	Snowshoe		
	Snowmobile		
	Watercraft-NonMotorized		
	Watercraft - Motorized		

Prohibited Use

(Check if applicable)

		From Date (mm/dd)	To Date (mm/dd)
	All Motorized Use		

(Or, fill in all that apply)

	Hiker / Pedestrian		
	Pack & Saddle		
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
	Cross-Country Ski		
	Snowshoe		
	Snowmobile		
	Watercraft - NonMotorized		
	Watercraft - Motorized		

Other Use

(Optional: Check any that apply)*

		Accept	Discourage	Eliminate
	Hiker / Pedestrian			
	Pack & Saddle			
	Bicycle			
	Motorcycle			
	All Terrain Vehicle (ATV)			
	4WD Vehicle > 50"			
	Cross-Country Ski			
	Snowshoe			
	Snowmobile			
	Watercraft - NonMotorized			
	Watercraft - Motorized			

Special Considerations

(Check any that apply. Underline appropriate clarifier in parenthesis. Provide specifics and reference information below.)

- [ ] Shared System (shared with other system road or trail)
- [ ] Accessible per Current Agency Guidelines
- [ ] Mechanized Tools or Equipment Prohibited
- [ ] T&E or Sensitive Species Present (Plant / Wildlife)
- [ ] Heritage Resource Present
- [ ] Easement across Non-FS Land (Existing / Needed)
- [ ] Existing Permit or Agreement (Trail-Specific / Area)
- [ ] _____

Remarks / Reference Information

(Use continuation sheet if needed.)

Line Officer: Name Grant Marnier Signature *Grant Marnier*

Title District Ranger Date 10/16/2008

TRACS TMO Form v5 - Side 2 (10/1/2008) Page 2 of 2

TMO Infra Trails Form—Example 1

Trail Management Objectives

Sweet Grass Trail #122 (Standard/Terra)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 10.7000
Trail Length : 10.7000

Beginning Termini : West Boulder Trailhead (# 12905)
Ending Termini : Continental Divide NST
Mileage Source : Measuring Wheel (0.0000 to 10.7000)

TMO **BMP (mi):** 0.0000 **EMP (mi):** 10.7000

This TMO documents the intended purpose and management of National Forest System trail segments, and may or may not reflect the current condition of the trail.

Travel Management Strategies

ATM Managed Use

Strategy	Travel ID	Mode of Travel	BMP (mi)	EMP (mi)	Length	From	To	Comment
Manage	2.1	HIKER/PEDESTRIAN	0.0000	10.7000	10.7000	05/01	10/31	
Manage	2.2	PACK AND SADDLE	0.0000	10.7000	10.7000	05/01	10/31	

Designed Use Objectives

ROS/WROS Class

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	10.7000	10.7000	RN - ROADED NATURAL	

Trail Class

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	10.7000	10.7000	TC4 - HIGHLY DEVELOPED	

Designed Use

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	10.7000	10.7000	PACK - PACK AND SADDLE	

Oct 16 2008 03:37 PM Page 1 of 3

Trail Management Objectives

Sweet Grass Trail #122 (Standard/Terra)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 10.7000
Trail Length : 10.7000

TMO	BMP (mi): 0.0000	EMP (mi): 10.7000

Design Parameter Segment

BMP (mi)	EMP (mi)	Length	Trail Class - Designed Use
0.0000	10.7000	10.7000	TC4 - PACK AND SADDLE

Design Parameter	Trail DP Value	Exceptions
Design Tread Width - Wilderness (Single Lane)	24" May be up to 48" along steep side slopes 48" - 60" or greater along precipices	N/A
Design Tread Width - Non-Wilderness 1 (Single Lane)	48" 48" - 60" or greater along precipices	
Design Tread Width - Non-Wilderness 2 (Double Lane)	Not applicable	
Design Tread Width - Structures (Minimum Width)	Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	
Design Surface - Type	Native, with improved sections of borrow or imported material, routine grading Minor roughness	
Design Surface - Protrusions	3" Uncommon, not continuous	
Design Surface - Obstacles (Maximum Height)	3"	
Design Grade - Target Grade	10%	
Design Grade - Short Pitch Maximum	15%	
Design Grade - Maximum Pitch Density	5% of trail	
Design Cross Slope - Target Cross Slope	5%	
Design Cross Slope - Maximum Cross Slope	5%	
Design Clearing - Height	10'	
Design Clearing - Width	96"	
Design Clearing - Shoulder Clearance	12" Pack clearance: 36" x 36"	
Design Turn - Radius	6'	

Target Task Frequency

Routine Tasks

Task ID	Description	BMP (mi)	EMP (mi)	Length	Frequency	TMO Reference Information
TW-CLR-01F	Trail Opening	0.0000	10.7000	10.7000	1.000	
TW-TRD-01A	Tread Maintenance	0.0000	10.7000	10.7000	0.500	
TW-TRD-01B	Tread Drainage	0.0000	10.7000	10.7000	0.500	
TW-CLR-01A	Logging Out	0.0000	10.7000	10.7000	0.500	
TW-CLR-01B	Brushing Or Mowing	0.0000	10.7000	10.7000	0.500	
TW-S&D-01A	Tracs Survey	0.0000	10.7000	10.7000	0.200	

Trail Management Objectives

Sweet Grass Trail #122 (Standard/Terra)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 10.7000
Trail Length : 10.7000

TMO	BMP (mi): 0.0000	EMP (mi): 10.7000

TMO Status :	APPROVED		
Line Officer : Name :	Grant Marnier	**Signature :**	
Title :	District Ranger	**Date :**	10/16/2008

Gentle grades, puncheon, and paved surfacing provide an accessible Class 5 trail experience at Cape Perpetua Scenic Area in the Siuslaw National Forest.

TMO Excel Form—Example 2

TRACS Trail Management Objectives

Region: 01 **Forest:** Gallatin **District:** 011001 Big Timber District

Trail Name: Sweet Grass X-Ski Trail **Trail Number:** SNO-122

Trail Beginning Termini: West Boulder Trailhead (#12905) **Beg. Milepost:** 0.0000

Trail Ending Termini: Dead End **End. Milepost:** 2.8700

Trail Inventory Length: 2.87001 Miles **Trail Mileage Source:** [X] Wheel [ ] GPS [ ] Map [ ] Unknown

TMO Trail Section

1 **Sec.#**

Section Beg. Termini: West Boulder Trailhead **Beg. Milepost:** 0.000

Section End. Termini: Wilderness Boundary **End. Milepost:** 2.260

Designed Use Objectives

Trail Type (Check one)

- [ ] Standard Terra Trail
- [X] Snow Trail
- [ ] Water Trail

Trail Class (Check one)

- [ ] 1 (Primitive/Undeveloped)
- [ ] 2 (Simple/Minor Development)
- [X] 3 (Developed/Improved)
- [ ] 4 (Highly Developed)
- [ ] 5 (Fully Developed)

ROS/WROS Class (Check one)

ROS (Non-Wilderness)

- [ ] Urban
- [ ] Rural
- [ ] Roaded Modified
- [X] Roaded Natural
- [ ] Semi-Primitive Motorized
- [ ] Semi-Primitive NonMotorized
- [ ] Primitive

WROS (Wilderness)

- [ ] WROS 1
- [ ] WROS 2
- [ ] WROS 3
- [ ] WROS 4
- [ ] WROS 5
- [ ] WROS 6

Designed Use

(Check one)

- [ ] Hiker / Pedestrian
- [ ] Pack & Saddle
- [ ] Bicycle
- [ ] Motorcycle
- [ ] All Terrain Vehicle (ATV)
- [ ] Four-Wheel Drive Vehicle > 50"
- [ ] _____
- [ ] _____
- [X] Cross-Country Ski
- [ ] Snowshoe
- [ ] Snowmobile
- [ ] _____
- [ ] Watercraft - NonMotorized
- [ ] Watercraft - Motorized

Design Parameters

(Fill in all that apply)

72	Tread Width (inches)
10	Target Grade (%)
15	Short Pitch Maximum (%) (up to 200' lengths)
5	Target Cross-Slope (%)
8	Clearing Width (feet)
8	Clearing Height (feet)
15	Switchback Radius (feet)
	_____

Target Frequency

Per Year

(Fill in all that apply)

1	Trail Opening
NA	Tread Repair
NA	Drainage Cleanout
0.5	Logging Out
0.5	Brushing
9	Snow Trail Grooming
0.2	Condition Survey
	_____

TRACS TMO Form v5 - Side 1 (10/1/2008) Page 1 of 4

TRACS Trail Management Objectives

Trail Name: Sweet Grass Trail **Trail Number:** SNO-122

Travel Management Strategies FSM 2353.19

Managed Use

(Fill in all that apply)*

		From Date (mm/dd)	To Date (mm/dd)
	Hiker / Pedestrian		
	Pack & Saddle		
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
X	Cross-Country Ski	12/01	03/31
X	Snowshoe	12/01	03/31
	Snowmobile		
	Watercraft-NonMotorized		
	Watercraft - Motorized		

Prohibited Use

(Check if applicable)

		From Date (mm/dd)	To Date (mm/dd)
	All Motorized Use		

(Or, fill in all that apply)

	Hiker / Pedestrian		
	Pack & Saddle		
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
	Cross-Country Ski		
	Snowshoe		
	Snowmobile		
	Watercraft - NonMotorized		
	Watercraft - Motorized		

Other Use

(Optional: Check any that apply)*

		Accept	Discourage	Eliminate
	Hiker / Pedestrian			
	Pack & Saddle			
	Bicycle			
	Motorcycle			
	All Terrain Vehicle (ATV)			
	4WD Vehicle > 50"			
	Cross-Country Ski			
	Snowshoe			
	Snowmobile			
	Watercraft - NonMotorized			
	Watercraft - Motorized			

Special Considerations

(Check any that apply. Underline appropriate clarifier in parenthesis. Provide specifics and reference information below.)

		Shared System (shared with other system road or trail)
		Accessible per Current Agency Guidelines
		Mechanized Tools or Equipment Prohibited
		T&E or Sensitive Species Present (Plant / Wildlife)
		Heritage Resource Present
		Easement across Non-FS Land (Existing / Needed)
1	X	Existing Permit or Agreement (Trail-Specific / Area)

Remarks / Reference Information

[1] Special use permit with Big Timber Cross Countrty Ski Club to maintain the trail for x-skiing.

Line Officer: Name Grant Marnier Signature *Grant Marnier*

Title District Ranger Date 10/16/2008

TRACS TMO Form v5 - Side 2 (10/1/2008) Page 2 of 4

TRACS Trail Management Objectives

Region: 01 **Forest:** Gallatin **District:** 011001 Big Timber District

Trail Name: Sweet Grass X-Ski Trail **Trail Number:** SNO-122

Trail Beginning Termini: West Boulder Trailhead (#12905) **Beg. Milepost:** 0.0000

Trail Ending Termini: Dead End **End. Milepost:** 2.8700

Trail Inventory Length: 2.87001 Miles **Trail Mileage Source:** [X] Wheel [ ] GPS [ ] Map [ ] Unknown

TMO Trail Section

Sec.# 2

Section Beg. Termini: Wilderness Boundary **Beg. Milepost:** 2.260

Section End. Termini: Dead End **End. Milepost:** 2.870

Designed Use Objectives

Trail Type (Check one)

- [ ] Standard Terra Trail
- [X] Snow Trail
- [ ] Water Trail

Trail Class (Check one)

- [ ] 1 (Primitive/Undeveloped)
- [X] 2 (Simple/Minor Development)
- [ ] 3 (Developed/Improved)
- [ ] 4 (Highly Developed)
- [ ] 5 (Fully Developed)

ROS/WROS Class (Check one)

ROS (Non-Wilderness)

- [ ] Urban
- [ ] Rural
- [ ] Roaded Modified
- [ ] Roaded Natural
- [ ] Semi-Primitive Motorized
- [ ] Semi-Primitive NonMotorized
- [ ] Primitive

WROS (Wilderness)

- [ ] WROS 1
- [ ] WROS 2
- [X] WROS 3
- [ ] WROS 4
- [ ] WROS 5
- [ ] WROS 6

Designed Use

(Check one)

- [ ] Hiker / Pedestrian
- [ ] Pack & Saddle
- [ ] Bicycle
- [ ] Motorcycle
- [ ] All Terrain Vehicle (ATV)
- [ ] Four-Wheel Drive Vehicle > 50"
- [ ] _____
- [ ] _____
- [X] Cross-Country Ski
- [ ] Snowshoe
- [ ] Snowmobile
- [ ] _____
- [ ] Watercraft - NonMotorized
- [ ] Watercraft - Motorized

Design Parameters

(Fill in all that apply)

36	Tread Width (inches)
15	Target Grade (%)
20	Short Pitch Maximum (%) (up to 200' lengths)
5	Target Cross-Slope (%)
4	Clearing Width (feet)
6	Clearing Height (feet)
8	Switchback Radius (feet)
	_____

Target Frequency

Per Year

(Fill in all that apply)

1	Trail Opening
NA	Tread Repair
NA	Drainage Cleanout
0.5	Logging Out
0.5	Brushing
NA	Snow Trail Grooming
0.2	Condition Survey
	_____

TRACS TMO Form v5 - Side 1 (10/1/2008) Page 3 of 4

TRACS Trail Management Objectives

Trail Name: Sweet Grass Trail **Trail Number:** SNO-122

Travel Management Strategies FSM 2353.19

Managed Use

(Fill in all that apply)*

		From Date (mm/dd)	To Date (mm/dd)
	Hiker / Pedestrian		
	Pack & Saddle		
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
X	Cross-Country Ski	12/01	03/31
X	Snowshoe	12/01	03/31
	Snowmobile		
	Watercraft-NonMotorized		
	Watercraft - Motorized		

Prohibited Use

(Check if applicable)

		From Date (mm/dd)	To Date (mm/dd)
X	All Motorized Use	01/01	12/31

(Or, fill in all that apply)

	Hiker / Pedestrian		
	Pack & Saddle		
	Bicycle		
	Motorcycle		
	All Terrain Vehicle (ATV)		
	4WD Vehicle > 50"		
	Cross-Country Ski		
	Snowshoe		
	Snowmobile		
X	All Mechanized	01/01	12/31
	Watercraft - NonMotorized		
	Watercraft - Motorized		

Other Use

(Optional: Check any that apply)*

		Accept	Discourage	Eliminate
	Hiker / Pedestrian			
	Pack & Saddle			
	Bicycle			
	Motorcycle			
	All Terrain Vehicle (ATV)			
	4WD Vehicle > 50"			
	Cross-Country Ski			
	Snowshoe			
	Snowmobile			
	Watercraft - NonMotorized			
	Watercraft - Motorized			

Special Considerations

(Check any that apply. Underline appropriate clarifier in parenthesis. Provide specifics and reference information below.)

		Shared System (shared with other system road or trail)
		Accessible per Current Agency Guidelines
2	X	Mechanized Tools or Equipment Prohibited
		T&E or Sensitive Species Present (Plant / Wildlife)
		Heritage Resource Present
		Easement across Non-FS Land (Existing / Needed)
1	X	Existing Permit or Agreement (Trail-Specific / Area)

Remarks / Reference Information

[1] Special use permit with Big Timber Cross Countrty Ski Club to maintain the trail for x-skiing.

[2] Primitive tools only.

Line Officer: Name Grant Marnier Signature *Grant Marnier*

Title District Ranger Date 10/16/2008

TRACS TMO Form v5 - Side 2 (10/1/2008) Page 4 of 4

TMO Infra Trails Form—Example 2

Trail Management Objectives

TMO Status : APPROVED 10/16/2008

Sweet Grass X-Ski Trail #SNO-122 (Snow)

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 2.8700
Trail Length : 2.8700

Beginning Termini : West Boulder Trailhead (#12905)
Ending Termini : Dead End

TMO	BMP (mi): 0.0000	EMP (mi): 2.8700

This TMO documents the intended purpose and management of National Forest System trail segments, and may or may not reflect the current condition of the trail.

Travel Management Strategies

ATM Managed Use

Strategy	Travel ID	Mode of Travel	BMP (mi)	EMP (mi)	Length	From	To	Comment
Manage	3.2.1	CROSS COUNTRY SKI	0.0000	2.8700	2.8700	12/01	03/31	
Manage	3.2.2	SNOW SHOE	0.0000	2.8700	2.8700	12/01	03/31	

ATM Prohibited Use

Strategy	Travel ID	Mode of Travel	BMP (mi)	EMP (mi)	Length	From	To	Primary Reason
Prohibit	2.3	MECHANIZED	2.6700	2.8700	0.2000	01/01	12/31	PROTECT WILDERNESS ENVIRONMENT/VALUES
Prohibit	1	MOTOR VEHICLE	2.6700	2.8700	0.2000	01/01	12/31	PROTECT WILDERNESS ENVIRONMENT/VALUES
Prohibit	3.1	MTR OVER-SNOW VEHICLE	2.6700	2.8700	0.2000	01/01	12/31	PROTECT WILDERNESS ENVIRONMENT/VALUES

Designed Use Objectives

ROS/WROS Class

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	2.2600	2.2600	RN - ROADED NATURAL	
2.2600	2.8700	0.6100	WROS 3	

Trail Class

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	2.2600	2.2600	TC3 - DEVELOPED	
2.2600	2.8700	0.6100	TC2 - MODERATELY DEVELOPED	

Designed Use

BMP (mi)	EMP (mi)	Length	Value	Comments
0.0000	2.8700	2.8700	XSKI - CROSS COUNTRY SKI	

Oct 16 2008 03:50 PM Page 1 of 4

Trail Management Objectives

Sweet Grass X-Ski Trail #SNO-122 (Snow)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 2.8700
Trail Length : 2.8700

TMO **BMP (mi):** 0.0000 **EMP (mi):** 2.8700

Design Parameter Segment

BMP (mi)	EMP (mi)	Length	Trail Class - Designed Use
0.0000	2.2600	2.2600	TC3 - CROSS COUNTRY SKI

Design Parameter	Trail DP Value	Exceptions
Design Groomed Width - Single Lane	6' (or width of grooming equipment)	
Design Groomed Width - Double Lane	Not applicable	
Design Groomed Width - Structures (Minimum Width)	36"	
Design Grooming And Surface - Type	May receive occasional machine grooming for snow compaction and track setting	
Design Grooming And Surface - Protrusions	No protrusions	
Design Grooming And Surface - Obstacles (Maximum Height)	8" Uncommon (no obstacles if machine groomed)	
Design Grade - Target Grade	10%	
Design Grade - Short Pitch Maximum	15%	
Design Grade - Maximum Pitch Density	5% of trail	
Design Cross Slope - Target Cross Slope	5%	
Design Cross Slope - Maximum Cross Slope (For up to 50')	15%	
Design Clearing - Height (Above normal maximum snow level)	8' (or height of grooming machinery)	
Design Clearing - Width	96" Light vegetation may encroach into clearing area	
Design Clearing - Shoulder Clearance	12"	
Design Turn - Radius	15' (or to accommodate grooming equipment)	

Design Parameter Segment

BMP (mi)	EMP (mi)	Length	Trail Class - Designed Use
2.2600	2.8700	0.6100	TC2 - CROSS COUNTRY SKI

Trail Management Objectives

Sweet Grass X-Ski Trail #SNO-122 (Snow)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 2.8700
Trail Length : 2.8700

TMO **BMP (mi):** 0.0000 **EMP (mi):** 2.8700

Design Parameter	Trail DP Value	Exceptions
Design Groomed Width - Single Lane	3' Typically not groomed	
Design Groomed Width - Double Lane	Not applicable	
Design Groomed Width - Structures (Minimum Width)	36"	
Design Grooming And Surface - Type	Generally no machine grooming	
Design Grooming And Surface - Protrusions	No protrusions	
Design Grooming And Surface - Obstacles (Maximum Height)	12" Uncommon	
Design Grade - Target Grade	15%	
Design Grade - Short Pitch Maximum	20%	
Design Grade - Maximum Pitch Density	10% of trail	
Design Cross Slope - Target Cross Slope	5%	
Design Cross Slope - Maximum Cross Slope (For up to 50')	20%	
Design Clearing - Height (Above normal maximum snow level)	6'	
Design Clearing - Width	48" Light vegetation may encroach into clearing area	
Design Clearing - Shoulder Clearance	6"	
Design Turn - Radius	8'	

Target Task Frequency

Routine Tasks

Task ID	Description	BMP (mi)	EMP (mi)	Length	Frequency	TMO Reference Information
TW-CLR-01F	Trail Opening	0.0000	2.8700	2.8700	1.000	
TW-CLR-01A	Logging Out	0.0000	2.8700	2.8700	0.500	
TW-CLR-01B	Brushing Or Mowing	0.0000	2.8700	2.8700	0.500	
TW-TRD-01D	Trailway-Tread And Prism-Snow Grooming - Track-Setting With Snowmobile	0.0000	2.2600	2.2600	9.000	
TW-S&D-01A	Tracs Survey	0.0000	2.8700	2.8700	0.200	

Special Considerations

Consideration	BMP (mi)	EMP (mi)	Length	Comments
Existing permit requirements/considerations (specify in Comments)	0.0000	2.2600	2.2600	Special Use permit with Big Timber Cross Country Ski Club to maintain the trail for x-skiing

Trail Management Objectives

Sweet Grass X-Ski Trail #SNO-122 (Snow)

TMO Status : APPROVED 10/16/2008

Region : 01 **Forest :** Gallatin National Forest **District :** 011101 - Big Timber Ranger District

Beginning Milepost : 0.0000
Ending Milepost : 2.8700
Trail Length : 2.8700

TMO	BMP (mi): 0.0000	EMP (mi): 2.8700

TMO Status : APPROVED

Line Officer : Name : Grant Marnier **Signature :**

Title : District Ranger **Date :** 10/16/2008

National Quality Standards for Trails

National Quality Standards are national criteria that establish the level of quality in terms of health and cleanliness, resource setting, safety and security, responsiveness, and condition of facilities for National Forest System trails managed at a full-service level.

Apply the National Quality Standards for Trails in planning, constructing, and managing National Forest System trails and related trail projects (FSH 2353.15 and FSH 2309.18, Section 15).

1. The National Quality Standards for Trails establish desired outcomes for National Forest System trails managed at a full-service level. These standards also form the baseline for estimating the cost of managing NFS trails. The National Quality Standards for Trails consist of five key measures: health and cleanliness, safety and security, condition of facilities, responsiveness, and resource setting.
2. The complete set of National Quality Standards for Trails is contained in FSH 2353.15, Exhibit 01 and is also shown on page 32 of this publication.
3. Critical National Quality Standards are identified with an asterisk [identified by footnote 1 on page 32 of this publication]. If any of these standards is not met, the resulting conditions pose a high probability of immediate and permanent injury to persons or property. If any of the critical standards cannot be met due to budget or other constraints, take action as soon as practicable to correct or mitigate the problem. Corrective or mitigating measures may include closing the trail, portions of the trail, or associated trail structures to public use.
4. Take mitigating steps if conditions, facilities, or services addressed by noncritical standards decline to the point where visitor's health or safety is threatened. Examples include repairing the trail, portions of the trail, or associated trail structure or removing trail structures that are in disrepair and no longer needed.
5. The National Quality Standards for Trails apply to NFS trails and associated trail structures. The National Quality Standards for Trails do not apply to trailheads. The Forest Service considers trailheads with the primary purpose of providing visitor amenities as developed sites. The agency considers trailheads with the primary purpose of protecting resources as concentrated use areas within General Forest Areas.

A step-and-run boardwalk provides hiker access, while protecting fragile muskeg, along this Class 2 segment of Upper Winner Creek Trail in the Chugach National Forest in Alaska.

National Quality Standards for Trails (FSH 2309.18, Section 15, Exhibit 01)

Key Measure: HEALTH AND CLEANLINESS

1. Visitors are not exposed to human waste along trails.
2. The trail and trailside are free of litter.
3. The trail and trailside are free of graffiti.

Key Measure: RESOURCE SETTING

1. Effects from trail use do not conflict with environmental laws (such as the Endangered Species Act, National Historic Preservation Act, and Clean Water Act).[1]
2. Resource management adjacent to and along the trail corridor is consistent with ROS objectives and desired conditions of adjacent management areas.
3. Trail opportunities, trail development, and trail management are consistent with Recreation Management System (ROS, SMS [Scenery Management System], and BBM [Benefits-Based Management]) objectives and the applicable land management plan.
4. The trail, use of the trail, and trail maintenance do not cause unacceptable damage to other resources.
5. Trail use does not exceed established trail capacity.

Key Measure: SAFETY & SECURITY

1. Hazards do not exist on or along the trail.[1]
2. Applicable laws, regulations, and special orders are enforced.

Key Measure: RESPONSIVENESS

1. When a trail is signed as accessible, it meets current agency policy and accessibility guidelines.[1]
2. Information is posted in a clear and professional manner.
3. Visitors are provided opportunities to communicate their expectations for and satisfaction with NFS trails.

Key Measure: CONDITION OF FACILITIES

1. **Annual/Routine Maintenance—**The trail and its structures are serviceable and in good repair throughout their designed service life.[2]
2. **Deferred Maintenance—**Trails that are in disrepair due to lack of scheduled maintenance, are in violation of applicable safety codes or other regulatory requirements (such as applicable accessibility guidelines), or are beyond their designed service life are repaired, rehabilitated, replaced, or decommissioned, as appropriate.[2]
3. **Capital Improvement—**New, altered, or expanded trails meet Forest Service design standards and are consistent with standards and guidelines in the applicable land management plan.[2]

[1] Indicates a Critical National Quality Standard. If it cannot be met, action must be taken as soon as practicable to correct or mitigate the problem. Refer to FSH 2309.18, Section 15.

[2] For definitions of Annual Maintenance, Deferred Maintenance, and Capital Improvement, refer to Appendix C of this publication.

Trail Class Matrix (FSH 2353, Section 14.2, Exhibit 01)

Trail Classes are general categories reflecting trail development scale, arranged along a continuum. The Trail Class identified for a National Forest System (NFS) trail prescribes its development scale, representing its intended design and management standards.[1] Local deviations from any Trail Class descriptor may be established based on trail-specific conditions, topography, or other factors, provided that the deviations do not undermine the general intent of the applicable Trail Class.

Identify the appropriate Trail Class for each National Forest System trail or trail segment based on the management intent in the applicable land management plan, travel management direction, trail-specific decisions, and other related direction. Apply the Trail Class that most closely matches the management intent for the trail or trail segment, which may or may not reflect the current condition of the trail.

Trail Attributes	Trail Class 1 Minimally Developed	Trail Class 2 Moderately Developed	Trail Class 3 Developed	Trail Class 4 Highly Developed	Trail Class 5 Fully Developed
Tread & Traffic Flow	• Tread intermittent and often indistinct • May require route finding • Single lane with no allowances constructed for passing • Predominantly native materials	• Tread continuous and discernible, but narrow and rough • Single lane with minor allowances constructed for passing • Typically native materials	• Tread continuous and obvious • Single lane, with allowances constructed for passing where required by traffic volumes in areas with no reasonable passing opportunities available • Native or imported materials	• Tread wide and relatively smooth with few irregularities • Single lane, with allowances constructed for passing where required by traffic volumes in areas with no reasonable passing opportunities available • Double lane where traffic volumes are high and passing is frequent • Native or imported materials • May be hardened	• Tread wide, firm, stable, and generally uniform • Single lane, with frequent turnouts where traffic volumes are low to moderate • Double lane where traffic volumes are moderate to high • Commonly hardened with asphalt or other imported material
Obstacles	• Obstacles common, naturally occurring, often substantial and intended to provide increased challenge • Narrow passages; brush, steep grades, rocks and logs present	• Obstacles may be common, substantial, and intended to provide increased challenge • Blockages cleared to define route and protect resources • Vegetation may encroach into trailway	• Obstacles may be common, but not substantial or intended to provide challenge • Vegetation cleared outside of trailway	• Obstacles infrequent and insubstantial • Vegetation cleared outside of trailway	• Obstacles not present • Grades typically < 8%

Trail Attributes	Trail Class 1 Minimally Developed	Trail Class 2 Moderately Developed	Trail Class 3 Developed	Trail Class 4 Highly Developed	Trail Class 5 Fully Developed
Constructed Features & Trail Elements	• Structures minimal to non-existent • Drainage typically accomplished without structures • Natural fords • Typically no bridges	• Structures of limited size, scale, and quantity; typically constructed of native materials • Structures adequate to protect trail infrastructure and resources • Natural fords • Bridges as needed for resource protection and appropriate access	• Structures may be common and substantial; constructed of imported or native materials • Natural or constructed fords • Bridges as needed for resource protection and appropriate access	• Structures frequent and substantial; typically constructed of imported materials • Constructed or natural fords • Bridges as needed for resource protection and user convenience • Trailside amenities may be present	• Structures frequent or continuous; typically constructed of imported materials • May include bridges, boardwalks, curbs, handrails, trailside amenities, and similar features
Signs[2]	• Route identification signing limited to junctions • Route markers present when trail location is not evident • Regulatory and resource protection signing infrequent • Destination signing, unless required, generally not present • Information and interpretive signing generally not present	• Route identification signing limited to junctions • Route markers present when trail location is not evident • Regulatory and resource protection signing infrequent • Destination signing typically infrequent outside of wilderness; generally not present in wilderness • Information and interpretive signing not common	• Route identification signing at junctions and as needed for user reassurance • Route markers as needed for user reassurance • Regulatory and resource protection signing may be common • Destination signing likely outside of wilderness; generally not present in wilderness • Information and interpretive signs may be present outside of wilderness	• Route identification signing at junctions and as needed for user reassurance • Route markers as needed for user reassurance • Regulatory and resource protection signing common • Destination signing common outside of wilderness; generally not present in wilderness • Information and interpretive signs may be common outside of wilderness • Accessibility information likely displayed at trailhead	• Route identification signing at junctions and for user reassurance • Route markers as needed for user reassurance • Regulatory and resource protection signing common • Destination signing common • Information and interpretive signs common • Accessibility information likely displayed at trailhead
Typical Recreation Environs & Experience[3]	• Natural, unmodified • ROS: Typically Primitive to Roaded Natural • WROS: Typically Primitive to Semi-Primitive	• Natural, essentially unmodified • ROS: Typically Primitive to Roaded Natural • WROS: Typically Primitive to Semi-Primitive	• Natural, primarily unmodified • ROS: Typically Primitive to Roaded Natural • WROS: Typically Semi-Primitive to Transition	• May be modified • ROS: Typically Semi-Primitive to Rural • WROS: Typically Portal or Transition	• May be highly modified • Commonly associated with visitor centers or high-use recreation sites • ROS: Typically Roaded Natural to Urban • Generally not present in wilderness

[1] For National Quality Standards for Trails, Potential Appropriateness of Trail Classes for Managed Uses, Design Parameters, and other related guidance, refer to FSM 2353, FSH 2309.18, and other applicable agency references.

[2] For standards and guidelines for the use of signs and posters along trails, refer to the Sign and Poster Guidelines for the Forest Service (EM-7100-15).

[3] The Trail Class Matrix shows the combinations of Trail Class and Recreation Opportunity Spectrum (ROS) or Wilderness Recreation Opportunity Spectrum (WROS) settings that commonly occur, although trails in all Trail Classes may and do occur in all settings. For guidance on the application of the ROS and WROS, refer to FSM 2310 and 2353 and FSH 2309.18.

USFS Trail Class Photo Examples

The following photos provide visual examples of typical Trail Class scenarios. Remember that Trail Classes are general categories reflecting development scale, arranged along a continuum, with no hard and fast lines drawn between the classes. Use the photos as visual aids to assist in consistent application of trail classification.

Trail Class 1

Trail Class 1: Tread—The tread is intermittent and indistinct.

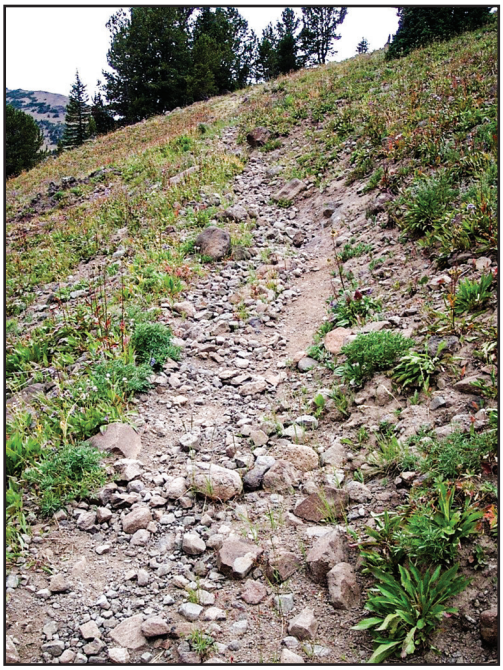
Trail Class 1: Obstacles—Obstacles are common, naturally occurring, and often substantial.

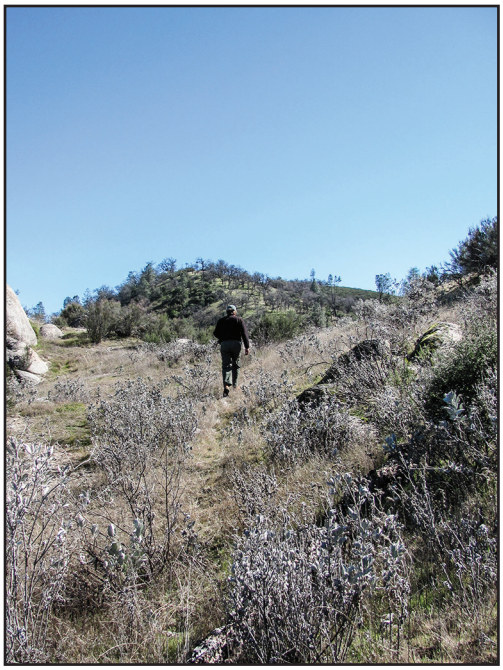
Trail Class 1: Constructed Features—Constructed features are minimal to nonexistent.

Trail Class 1: Signs—Route identification signing is limited to junctions. Route markers are present when the trail location is not evident.

Trail Class 1: Typical Recreation Environment/Experience—The typical recreation environment/experience is natural and unmodified.

Trail Class 2





Trail Class 2: Tread—The tread is continuous and discernible, but narrow and rough.

Trail Class 2: Obstacles—Obstacles may be common and substantial. Blockages are cleared to define the route and protect resources. Vegetation may encroach into the trailway.

Trail Class 2: Constructed Features—Constructed features are of limited size, scale, and quantity.

Trail Class 2: Signs—Route identification signing is limited to junctions. Route markers are present when the trail location is not evident.

Trail Class 2: Typical Recreation Environment/Experience—The typical recreation environment/experience is natural and essentially unmodified.

Trail Class 3

Trail Class 3: Tread—The tread is continuous and obvious.

Trail Class 3: Obstacles—Obstacles may be common. Vegetation is cleared outside of the trailway.

Trail Class 3: Constructed Features—Constructed features such as walls, steps drainage, and raised trail, may be common and substantial.

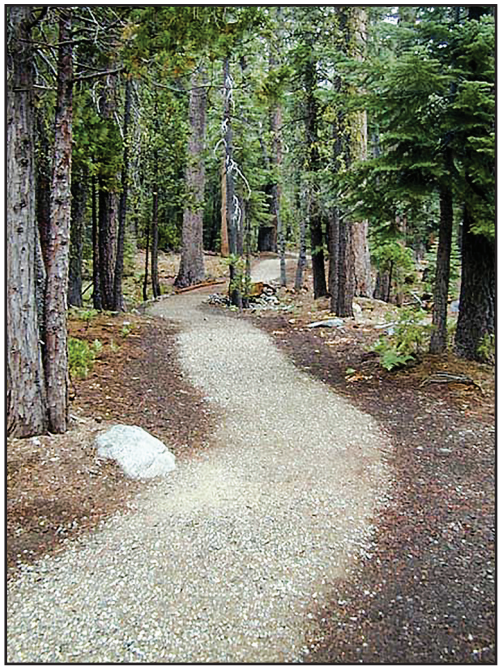
Trail Class 3: Signs—Route identification signing is present at junctions and as needed for user reassurance. Destination signing is likely outside of wilderness areas.

Trail Class 3: Typical Recreation Environment/Experience—The recreation environment/experience is natural and primarily unmodified.

Trail Class 4

Trail Class 4: Tread—The tread is wide and relatively smooth, with few irregularities.

Trail Class 4: Obstacles—Obstacles are infrequent and insubstantial. Vegetation is cleared outside of the trailway.



Trail Class 4: Constructed Features—Constructed features are frequent and substantial. Trailside amenities may be present.

Trail Class 4: Signs—A wide variety of signing is likely present. Informational signs are likely and interpretive signs are possible.

Trail Class 4: Typical Recreation Environment/Experience—The recreation environment/experience may be modified.

Trail Class 5

Trail Class 5: Tread—The tread is wide, firm, stable, and generally uniform. Trails are commonly hardened with asphalt or other imported material.

Trail Class 5: Obstacles—Obstacles are not present. Grades are typically less than 8 percent.

Trail Class 5: Constructed Features—Constructed features are frequent or continuous. Structures may include bridges, boardwalks, curbs, handrails, trailside amenities, and similar features.

Trail Class 5: Signs—A wide variety of signing is present. Informational and interpretive signs are common.

Trail Class 5: Typical Recreation Environment/Experience—The recreation environment/experience may be highly modified.

Trail Design Parameters

Hiker/Pedestrian (FSH 2309.18, Section 23.11, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use HIKER/PEDESTRIAN		Trail Class 1	Trail Class 2	Trail Class 3[2]	Trail Class 4[2]	Trail Class 5[2]
Design Tread Width	**Wilderness** (Single Lane)	0″ – 12″	6″ – 18″	12″ – 24″ Exception: may be 36″ – 48″ at steep side slopes	18″ – 24″ Exception: may be 36″ – 48″ at steep side slopes	Not applicable
	Non-Wilderness (Single Lane)	0″ – 12″	6″ – 18″	18″ – 36″	24″ – 60″	36″ – 72″
	Non-Wilderness (Double Lane)	36″	36″	36″ – 60″	48″ – 72″	72″ – 120″
	Structures (Minimum Width)	18″	18″	18″	36″	36″
Design Surface[3]	**Type**	Native, ungraded May be continuously rough	Native, limited grading May be continuously rough	Native, with some onsite borrow or imported material where needed for stabilization and occasional grading Intermittently rough	Native with improved sections of borrow or imported material, and routine grading Minor roughness	Likely imported material, and routine grading Uniform, firm, and stable
	Protrusions	≤ 24″ Likely common and continuous	≤ 6″ May be common and continuous	≤ 3″ May be common, not continuous	≤ 3″ Uncommon, not continuous	No protrusions
	Obstacles (Maximum Height)	24″	14″	10″	8″	No obstacles
Design Grade[3]	**Target Grade**	5% – 25%	5% – 18%	3% – 12%	2% – 10%	2% – 5%
	Short Pitch Maximum	40%	35%	25%	15%	5% FSTAG: 5% – 12%[2]
	Maximum Pitch Density	20% – 40% of trail	20% – 30% of trail	10% – 20% of trail	5% – 20% of trail	0% – 5% of trail

Designed Use HIKER/PEDESTRIAN		Trail Class 1	Trail Class 2	Trail Class 3[2]	Trail Class 4[2]	Trail Class 5[2]
Design Cross Slope	**Target Cross Slope**	Natural side slope	5% – 20%	5% – 10%	3% – 7%	2% – 3% (or crowned)
	Maximum Cross Slope	Natural side slope	25%	15%	10%	3%
Design Clearing	**Height**	6′	6′ – 7′	7′ – 8′	8′ – 10′	8′ – 10′
	Width	≥ 24″ Some vegetation may encroach into clearing area	24″ – 48″ Some light vegetation may encroach into clearing area	36″ – 60″	48″ – 72″	60″ – 72″
	Shoulder Clearance	3″ – 6″	6″ – 12″	12″ – 18″	12″ – 18″	12″ – 24″
Design Turn	**Radius**	No minimum	2′ – 3′	3′ – 6′	4′ – 8′	6′ – 8′

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] Trail Classes 3, 4, and 5, in particular, have the potential to provide accessible passage. If assessing or designing trails for accessibility, refer to the Forest Service Trail Accessibility Guidelines (FSTAG) for more specific technical provisions and tolerances (FSM 2350).

[3] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Pack and Saddle (FSH 2309.18, Section 23.12, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use PACK AND SADDLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Wilderness** (Single Lane)	Typically not designed or actively managed for equestrians, although use may be allowed	12″ – 18″ May be up to 48″ along steep side slopes 48″ – 60″ or greater along precipices	18″ – 24″ May be up to 48″ along steep side slopes 48″ – 60″ or greater along precipices	24″ May be up to 48″ along steep side slopes 48″ – 60″ or greater along precipices	Typically not designed or actively managed for equestrians, although use may be allowed
	Non-Wilderness (Single Lane)		12″ – 24″ May be up to 48″ along steep side slopes 48″ – 60″ or greater along precipices	18″ – 48″ 48″ – 60″ or greater along precipices	24″ – 96″ 48″ – 60″ or greater along precipices	
	Non-Wilderness (Double Lane)		60″	60″ – 84″	84″ – 120″	
	Structures (Minimum Width)		Other than bridges: 36″ Bridges without handrails: 60″ Bridges with handrails: 84″ clear width	Other than bridges: 36″ Bridges without handrails: 60″ Bridges with handrails: 84″ clear width	Other than bridges: 36″ Bridges without handrails: 60″ Bridges with handrails: 84″ clear width	
Design Surface[2]	**Type**		Native, with limited grading May be frequently rough	Native, with some onsite borrow or imported material where needed for stabilization and occasional grading Intermittently rough	Native, with improved sections of borrow or imported material and routine grading Minor roughness	
	Protrusions		≤ 6″ May be common and continuous	≤ 3″ May be common, not continuous	≤ 3″ Uncommon, not continuous	
	Obstacles (Maximum Height)		12″	6″	3″	

Designed Use PACK AND SADDLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Grade[2]	Target Grade	Typically not designed or actively managed for equestrians, although use may be allowed	5% – 20%	3% – 12%	2% – 10%	Typically not designed or actively managed for equestrians, although use may be allowed
	Short Pitch Maximum		30%	20%	15%	
	Maximum Pitch Density		15% – 20% of trail	5% – 15% of trail	5% – 10% of trail	
Design Cross Slope	Target Cross Slope		5% – 10%	3% – 5%	0% – 5%	
	Maximum Cross Slope		10%	8%	5%	
Design Clearing	Height		8′ – 10′	10′	10′ – 12′	
	Width		72″ Some light vegetation may encroach into clearing area	72″ – 96″	96″	
	Shoulder Clearance		6″ – 12″ Pack clearance: 36″ x 36″	12″ – 18″ Pack clearance: 36″ x 36″	12″ – 18″ Pack clearance: 36″ x 36″	
Design Turn	Radius		4′ – 5′	5′ – 8′	6′ – 10′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Bicycle (FSH 2309.18, Section 23.13, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use BICYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	6″ – 12″	12″ – 24″	18″ – 36″	24″ – 48″	36″ – 60″
	Double Lane	36″ – 48″	36″ – 48″	36″ – 48″	48″ – 84″	72″ – 120″
	Structures (Minimum Width)	18″	18″	36″	48″	60″
Design Surface[2]	**Type**	Native, ungraded May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, with limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common	Native, with some onsite borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present, but not common	Native, with improved sections of borrow or imported materials and routine grading Stable, with minor roughness	Likely imported material and routine grading Uniform, firm, and stable
	Protrusions	≤ 24″ Likely common and continuous	≤ 6″ May be common and continuous	≤ 3″ May be common, but not continuous	≤ 3″ Uncommon and not continuous	No protrusions
	Obstacles (Maximum Height)	24″	12″	10″	8″	No obstacles
Design Grade[2]	**Target Grade**	5% – 20%	5% – 12%	3% – 10%	2% – 8%	2% – 5%
	Short Pitch Maximum	30% 50% on downhill segments only	25% 35% on downhill segments only	15%	10%	8%
	Maximum Pitch Density	20% – 30% of trail	10% – 30% of trail	10% – 20% of trail	5% – 10% of trail	0% – 5% of trail
Design Cross Slope	**Target Cross Slope**	5% – 10%	5% – 8%	3% – 8%	3% – 5%	2% – 3%
	Maximum Cross Slope	10%	10%	8%	5%	5%

10/16/2008

Designed Use BICYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Clearing	**Height**	6′	6′ – 8′	8′	8′ – 9′	8′ – 9′
	Width	24″ – 36″ Some vegetation may encroach into clearing area	36″ – 48″ Some light vegetation may encroach into clearing area	60″ – 72″	72″ – 96″	72″ – 96″
	Shoulder Clearance	0″ – 12″	6″ – 12″	6″ – 12″	6″ – 18″	12″ – 18″
Design Turn	**Radius**	2′ – 3′	3′ – 6′	4′ – 8′	8′ – 10′	8′ – 12′

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Motorcycle (FSH 2309.18, Section 23.21, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use MOTORCYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	Typically not designed or actively managed for motorcycles, although use may be allowed	8″ – 24″	18″ – 36″	24″ – 48″	Typically not designed or actively managed for motorcycles, although use may be allowed
	Double Lane		48″	48″ – 60″	60″ – 72″	
	Structures (Minimum Width)		36″	48″	48″	
Design Surface[2]	**Type**		Native, with limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, with some onsite borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present	Native, with imported materials for tread stabilization likely and routine grading Minor roughness Sections of soft tread not common	
	Protrusions		≤ 6″ May be common and continuous	≤ 3″ May be common, but not continuous	≤ 3″ Uncommon and not continuous	
	Obstacles (Maximum Height)		18″ May be common or placed for increased challenge	12″ Common and left for increased challenge	3″ Uncommon	
Design Grade[2]	**Target Grade**		10% – 25%	5% – 20%	3% – 10%	
	Short Pitch Maximum		40%	25%	15%	
	Maximum Pitch Density		20% – 40% of trail	15% – 30% of trail	10% – 20% of trail	

Designed Use MOTORCYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Cross Slope	**Target Cross Slope**	Typically not designed or actively managed for motorcycles, although use may be allowed	5% – 10%	5% – 8%	3% – 5%	Typically not designed or actively managed for motorcycles, although use may be allowed
	Maximum Cross Slope		15%	10%	10%	
Design Clearing	**Height**		6′ – 7′	6′ – 8′	8′ – 10′	
	Width (On steep side hills, increase clearing on uphill side by 6″ – 12″)		36″ – 48″ Some light vegetation may encroach into clearing area	48″ – 60″	60″ – 72″	
	Shoulder Clearance		6″ – 12″	12″ – 18″	12″ – 24″	
Design Turn	**Radius**		3′ – 4′	4′ – 6′	5′ – 8′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

All-Terrain Vehicle (FSH 2309.18, Section 23.22, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use ALL-TERRAIN VEHICLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	Typically not designed or actively managed for ATVs, although use may be allowed	48″ – 60″	60″	60″ – 72″	Typically not designed or actively managed for ATVs, although use may be allowed
	Double Lane		96″	96″ – 108″	96″ – 120″	
	Structures (Minimum Width)		60″	60″	60″	
Design Surface[2]	**Type**		Native, with limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, with some onsite borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present	Native, with imported materials for tread stabilization likely and routine grading Minor roughness Sections of soft tread uncommon	
	Protrusions		≤ 6″ May be common and continuous	≤ 3″ May be common, but not continuous	≤ 3″ Uncommon and not continuous	
	Obstacles (Maximum Height)		12″ May be common or placed for increased challenge	6″ May be common and left for increased challenge	3″ Uncommon	
Design Grade[2]	**Target Grade**		10% – 25%	5% – 15%	3% – 10%	
	Short Pitch Maximum		35%	25%	15%	
	Maximum Pitch Density		20% – 40% of trail	15% – 30% of trail	10% – 20% of trail	

Designed Use ALL-TERRAIN VEHICLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Cross Slope	**Target Cross Slope**	Typically not designed or actively managed for ATVs, although use may be allowed	5% – 10%	3% – 8%	3% – 5%	Typically not designed or actively managed for ATVs, although use may be allowed
	Maximum Cross Slope		15%	10%	8%	
Design Clearing	**Height**		6′ – 7′	6′ – 8′	8′ – 10′	
	Width (On steep side hills, increase clearing on uphill side by 6″ – 12″)		60″ Some light vegetation may encroach into clearing area	60″ – 72″	72″ – 96″	
	Shoulder Clearance		0″ – 6″	6″ – 12″	12″ – 18″	
Design Turn	**Radius**		6′ – 8′	8′ – 10′	8′ – 12′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Four-Wheel Drive Vehicle > 50″ (FSH 2309.18, Section 23.23, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use FOUR-WHEEL DRIVE VEHICLE > 50″		**Trail Class 1**	**Trail Class 2**	**Trail Class 3**	**Trail Class 4**	**Trail Class 5**
Design Tread Width	**Single Lane**	Typically not designed or actively managed for 4WD vehicles > 50″, although use may be allowed	72″ – 84″	72″ – 96″	96″ – 120″	Typically not designed or actively managed for 4WD vehicles > 50″, although use may be allowed
	Double Lane		16′	16′	16′	
	Structures (Minimum Width)		96″	96″	96″	
Design Surface[2]	**Type**		Native, with limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, with some on-site borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present	Native, with imported materials for tread stabilization likely and routine grading Minor roughness Sections of soft tread uncommon	
	Protrusions		≤ 12″ May be common and continuous	≤ 8″ May be common and continuous	≤ 4″ May be common and continuous	
	Obstacles (Maximum Height)		36″ May be common or placed for increased challenge	24″ Common and left for increased challenge	12″ Uncommon	
Design Grade[2]	**Target Grade**		10% – 21%	5% – 18%	5% – 12%	
	Short Pitch Maximum		25%	20%	15%	
	Maximum Pitch Density		20% – 30% of trail	10% – 20% of trail	5% – 10% of trail	

Designed Use FOUR-WHEEL DRIVE VEHICLE > 50″		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Cross Slope	**Target Cross Slope**	Typically not designed or actively managed for 4WD vehicles > 50″, although use may be allowed	8% – 15%	5% – 12%	5% – 8%	Typically not designed or actively managed for 4WD vehicles > 50″, although use may be allowed
	Maximum Cross Slope		15%	12%	8%	
Design Clearing	**Height**		6′ – 8′	6′ – 8′	8′ – 10′	
	Width		72″ – 84″ Some light vegetation may encroach into clearing area	72″ – 96″	96″ – 144″	
	Shoulder Clearance		0″ – 6″	6″ – 12″	12″ – 18″	
Design Turn	**Radius**		10′ – 15′	15′ – 20′	20′ – 30′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Cross-Country Ski (FSH 2309.18, Section 23.31, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use CROSS-COUNTRY SKI		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	Typically not designed or actively managed for cross-country skiing, although use may be allowed	2′ – 4′ Typically not groomed	6′ – 8′ Or width of grooming equipment	8′– 10′ Or width of grooming equipment	Typically not designed or actively managed for cross-country skiing, although use may be allowed
	Double Lane		6′ – 8′	8′ – 12′	12′ – 16′	
	Structures (Minimum Width)		36″	36″	36″	
Design Surface[2]	**Type**		Generally no machine grooming	May receive occasional machine grooming for snow compaction and track setting	Regular machine grooming for snow compaction and track setting	
	Protrusions		No protrusions	No protrusions	No protrusions	
	Obstacles (Maximum Height)		12″ Uncommon	8″ Uncommon (no obstacles if machine groomed)	No obstacles	
Design Grade[2]	**Target Grade**		5% – 15%	2% – 10%	0% – 8%	
	Short Pitch Maximum		25%	20%	12%	
	Maximum Pitch Density		10% – 20% of trail	5% – 15% of trail	0% – 10% of trail	
Design Cross Slope	**Target Cross Slope**		0% – 10%	0% – 5%	0% – 5%	
	Maximum Cross Slope (For up to 50″)		20%	15%	10%	

Designed Use CROSS-COUNTRY SKI		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Clearing	**Height** (Above normal maximum snow level)	Typically not designed or actively managed for cross-country skiing, although use may be allowed	6′ – 8′	8′ Or height of grooming equipment	8′ – 10′	Typically not designed or actively managed for cross-country skiing, although use may be allowed
	Width		24″ – 60″ Light vegetation may encroach into clearing area	72″ – 120″ Light vegetation may encroach into clearing area	96″ – 168″ Widen clearing at turns or if increased sight distance needed	
	Shoulder Clearance		0″ – 6″	0″ – 12″	0″ – 24″	
Design Turn	**Radius**		8′ – 10′	15′ – 20′ Or to accommodate grooming equipment	≥ 25′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Snowshoe (FSH 2309.18, Section 23.32, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use SNOWSHOE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	Typically not designed or actively managed for snowshoe, although use may be allowed	36″	36″ – 48″	36″ – 60″	Typically not designed or actively managed for snowshoe, although use may be allowed
	Double Lane		60″	72″	72″ – 96″	
	Structures (Minimum Width)		36″	48″	48″	
Design Surface[2]	**Type**		Generally no machine grooming	May receive occasional machine grooming for snow compaction	Likely to receive occasional machine grooming for snow compaction	
	Protrusions		No protrusions	No protrusions	No protrusions	
	Obstacles (Maximum Height)		12″ Uncommon	8″ Uncommon (no obstacles if machine groomed)	No obstacles	
Design Grade[2]	**Target Grade**		10% – 20%	5% – 15%	0% – 10%	
	Short Pitch Maximum		30%	20%	15%	
	Maximum Pitch Density		5% – 20% of trail	5% – 25% of trail	0% – 10% of trail	
Design Cross Slope	**Target Cross Slope**		0% – 10%	0% – 5%	0% – 5%	
	Maximum Cross Slope		20%	15%	10%	

Designed Use SNOWSHOE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Clearing	**Height** (Above normal maximum snow level)	Typically not designed or actively managed for snowshoe, although use may be allowed	6′ – 8′	8′	8′ – 10′	Typically not designed or actively managed for snowshoe, although use may be allowed
	Width		48″ Some light vegetation may encroach into clearing area	72″ Light vegetation may encroach into clearing area	72″ – 96″	
	Shoulder Clearance		0″	12″	12″ – 24″	
Design Turn	**Radius**		3′ – 4′	3′ – 6′	4′ – 8′ Or to accommodate grooming equipment	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Trail Design Parameters

Snowmobile (FSH 2309.18, Section 23.33, Exhibit 01)

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent.[1] Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use SNOWMOBILE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	Typically not designed or actively managed for snowmobiles, although use may be allowed	4′ – 6′ Typically not groomed	6′ – 8′ Or width of grooming equipment On turns with tight radius, increase groomed width to ≥ 10′	8′ – 10′ Or minimum width of grooming equipment On turns with tight radius, increase groomed width to ≥ 12′	Typically not designed or actively managed for snowmobiles, although use may be allowed
	Double Lane		10′ Typically not groomed	10′ – 12′	12′ – 20′	
	Structures (Minimum Width)		6′	12′	18′	
Design Surface[2]	**Type**		Generally no machine grooming Commonly rough and bumpy	May receive occasional machine grooming for snow compaction and conditioning Frequently rough and bumpy	Regular machine grooming for snow compaction and conditioning Commonly smooth	
	Protrusions		No protrusions	No protrusions	No protrusions	
	Obstacles (Maximum Height)		12″ Uncommon	6″ Uncommon (no obstacles if machine groomed)	No obstacles	
Design Grade[2]	**Target Grade**		0% – 12%	0% – 10%	0% – 8%	
	Short Pitch Maximum		35%	25%	20%	
	Maximum Pitch Density		15% – 30% of trail	10% – 20% of trail	5% – 10% of trail	

Designed Use SNOWMOBILE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Cross Slope	**Target Cross Slope**	Typically not designed or actively managed for snowmobiles, although use may be allowed	0% – 10%	0% – 5%	0%	Typically not designed or actively managed for snowmobiles, although use may be allowed
	Maximum Cross Slope		15%	10%	5%	
Design Clearing	**Height** (Above normal maximum snow level)		6′	6′ – 8′ Provide sufficient clearance for grooming equipment	8′ – 12′ Provide sufficient clearance for grooming equipment	
	Width		6′ – 12′ Some light vegetation may encroach into clearing area	8′ – 14 ′ Light vegetation may encroach into clearing area	10′ – 22′ Widen clearing at turns or if increased sight distance needed	
	Shoulder Clearance		6″ – 12″	12″ – 18″	12″ – 24″	
Design Turn	**Radius**		8′ – 10′	15′ – 20′ Or sufficient radius for grooming equipment	25′ – 50′	

[1] For definitions of Design Parameter attributes (for example, Design Tread Width and Short Pitch Maximum) see FSH 2309.18, Section 05.

[2] The determination of trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

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 Method[1]	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 Interval[3]	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 Grade[4]	+/- 10%	+/- 10%	+/- 5%	+/- 5%	+/- 1%
Typical Width[5]	Not measured	Optional +/- 6″	+/- 6″	+/- 6″	+/- 3″
Obstacles[6]	Not measured	Not measured	Optional	Formidable Obstacles (for example, narrow width with steep drop off)	All those defined as Obstacles
Typical Cross Slope[7]	Not measured	Not measured	+/- 1%	+/- 1%	+/- 0.1%
Features and Tasks[8]	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.

Federal Trail Data Standards

Which Trails?

The Federal Trail Data Standards (FTDS) are applicable to all trails managed by the U.S. Department of Agriculture, Forest Service (USFS), and U.S. Department of the Interior National Park Service (NPS), Bureau of Land Management (BLM) and Fish and Wildlife Service (FWS), including National Scenic Trails (NSTs) and National Historic Trails (NHTs). State or local governments and other entities can also apply the FTDS to trails they manage.

What?

The FTDS are a core set of 51 standardized trail data attributes with corresponding definitions and values applicable to tabular and spatial data. They include 3 additional attributes applicable only to NSTs and NHTs, and 13 attributes specific to NHTs. The FTDS reflect a core set of questions and data selection criteria, and are not intended to cover all possible trail data or agency-specific data needs.

Why?

The FTDS enable trail managers and the public to use mutually understood terminology for recording, retrieving and applying spatial and tabular information. This makes it easier for more than one individual, agency, or group to access, exchange, and use trail information. Ease in sharing data increases the capability for enhanced and consistent mapping, inventory, monitoring, condition assessment, costing, budgeting, information retrieval, and reporting.

Who?

The USFS, NPS, BLM, and FWS developed the FTDS at the request of the Federal Interagency Council on Trails. These agencies and other trail management entities and partners use the FTDS.

How?

Agencies are incorporating the FTDS into their databases and geographic information systems (GIS) spatial layers to support a wide variety of trail inventory, planning, management, and public information needs.

Status?

In 2010, the Federal Geographic Data Committee published the FTDS as federal-level data standards. Subsequent steps may include identification of any additionally needed FTDS attributes specific to NSTs, followed by the potential expansion of the FTDS to reflect a core set of public information and trail use attributes.

Info?

Access the Federal Trail Data Standards and find out more at <http://www.nps.gov/gis/trails/>.

Federal Trail Data Standards—Data Attributes

Below is a list of FTDS attributes by functional category. For complete attribute definitions, corresponding values, and data parameters, refer to the Federal Trail Data Standards Web site <http://www.nps.gov/gis/trails/>.

Basic Trail Information

- Trail Length
- Trail Name
- Trail Number
- Trail Status
- Trail Surface
- Trail Type
- Interagency Identification Code (if applicable)
- Shared System (if applicable)

Trail Administrative Unit and Location

- Administrative Organization
- Managing Organization
- Congressional District
- County
- Jurisdiction
- Municipality
- State

Trail Management and Use

- Accessibility Status
- Designed Use
- Land Use Plan
- Managed Use
- Motorized Prohibited
- Primary Trail Maintainer
- Prohibited Use
- Road System
- Trail Class
- Trail System

Trail Management Considerations

- Historic Significance
- National Trail Designation
- Rights-of-Way
- Special Management Area

Trail Condition and Cost

- Cost Annual/Cyclic Maintenance
- Cost Annual/Cyclic Operations
- Cost Deferred Maintenance
- Cost Improvement/Construction
- Cost Last Updated
- Trail Condition

NHT and NST Information (applicable only to National Scenic and Historic Trails)

- NHT NST Trail Administrator
- NHT NST Visitor Center Name
- Visitor Facility Type

NHT Heritage Resource Information (applicable only to NHT routes or associated heritage resource sites)

- NHT Auto-Tour Surface
- NHT Certification Status
- NHT Condition Category
- NHT High Potential Segment
- NHT High Potential Site
- NHT Public Use Segment
- NHT Public Use Site
- NHT Site Name
- NHT Site Number
- National Register of Historic Places (NRHP) Criteria
- NRHP Property Category
- Type of Route
- Type of Site

Appendix B—References

Trail Fundamentals and Related References

- **Available via the Internet (public Web sites)**
  - USFS Trail Management Web site
    <http://www.fs.fed.us/recreation/programs/trail-management/index.shtml>.
    Find the most current versions of the following reference materials:
    - Trail Fundamentals
    - Trail Classes
    - Design Parameters
    - CASM—Condition Survey Accuracy Matrix
    - TRACS User Guide
  - Federal Trail Data Standards (USFS, BLM, NPS, FWS) Web site <http://www.nps.gov/gis/trails/>.

- **Available via the Intranet (internal USFS Web sites)**
  - USFS Recreation & Heritage Resources Integrated Business Systems Web site
    <http://fsweb.wo.fs.fed.us/rhwr/ibsc/tr-cost.shtml>.
    Find the most current versions of the following reference materials:
    - Trail Fundamentals
    - Trail Classes
    - Design Parameters
    - CASM—Condition Survey Accuracy Matrix
    - TRACS User Guide
    - Trail Bridge Matrix
  - USFS Natural Resource Manager Web site
    <http://fsweb.nrm.fs.fed.us/>.
    Access the Infra Trail database and related documentation, user support, and training information.

General Trail Resources

- **FSM 2350** Trail, River, and Similar Recreation Opportunities [and amendments].
  Access via <http://www.fs.fed.us/im/directives/dughtml/fsm2000.html>.
- **FSH 2309.18** Trails Management Handbook [and amendments].
  Access via <http://www.fs.fed.us/im/directives/dughtml/fsh2000.html>.
- Forest Service Standard Trail Plans and Specifications, 2016.
  Access at <http:/www.fs.fed.us/recreation/programs/trail-management/trailplans/index.shtml>.
- Trail Construction and Maintenance Notebook (0723–2806–MTDC), 2007 edition.
  Access at <http://www.fs.fed.us/t-d/pubs/pdfpubs/pdf07232806/pdf07232806dpi72.pdf>.
- Forest Service Trail Accessibility Guidelines (FSTAG).
  Access via <http://www.fs.fed.us/recreation/programs/accessibility/>.
- Forest Service Trail Bridge Catalog Web site.
  Access at <http://www.fs.fed.us/eng/bridges/>.
- **Forest Service National Technology and Development Program**
  - Missoula Technology and Development Center
    Access at <http://fsweb.mtdc.wo.fs.fed.us>.
  - San Dimas Technology and Development Center
    Access at <http://fsweb.sdtdc.wo.fs.fed.us>.

Appendix C–Glossary

This glossary contains excerpts from the Forest Service Manual, Forest Service Handbook, and the Code of Federal Regulations.

All-Terrain Vehicle (ATV)—A type of off-highway vehicle that travels on three or more low-pressure tires; has handlebar steering; is less than or equal to 50 inches in width; and has a seat designed to be straddled by the operator.

Annual Maintenance—Preventative and/or cyclic maintenance performed in the year it is scheduled (maintenance schedules are identified in TMOs and Infra Trails).

Bicycle—A pedal-driven, human-powered device with two wheels attached to a frame, one behind the other.

Capital Improvement—The construction of a new fixed asset, or the significant alteration, expansion, or extension of an existing fixed asset to accommodate a change of purpose. Capital improvement includes trail alteration, expansion or new construction. Note: Capital improvement (CI) does not include deferred maintenance. Do not confuse capital improvement with the Capital Investment Program (CIP), which may include capital improvement and/or deferred maintenance.

a. **Alteration—**Work to change the function of an existing fixed asset. The capacity or size of the fixed asset is not significantly changed. Deferred maintenance of the original fixed asset may be reduced or eliminated by an alteration.
b. **Expansion—**Increasing the capacity or size of an existing fixed asset to serve needs different from, or significantly greater than, those originally intended.
c. **New Construction—**The erection, construction, installation, or assembly of a new fixed asset.

Clearing Limit—The area over and beside the trail tread that is cleared of trees, limbs, and other obstructions.

a. **Clearing Height—**The height of the clearing limit measured vertically from the trail tread.
b. **Clearing Width—**The width of the clearing limit measured perpendicular to the trail.

Climbing Turn—A reverse in direction of the trail grade without a level landing that is used to change elevation on a steep slope.

Cross-Country Skiing—Skiing on unmarked routes or marked trails that may be packed and groomed with set tracks.

Cross Slope—The percentage of rise to length when measuring the trail tread from edge to edge perpendicular to the direction of travel.

Deferred Maintenance—Maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. Deferred maintenance includes repair, replace or decommission.

a. **Repair—**Work to restore a damaged, broken, or worn-out fixed asset or component to normal operating condition.
b. **Replace—**Substitution or exchange of an existing asset or component with one having essentially the same capacity and purpose.
c. **Decommission—**Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work.

Design Clearing—The clearing limit determined to be appropriate to accommodate the Managed Uses of a trail.

a. **Design Clearing Height—**The minimum clearing height determined to be appropriate to accommodate the Managed Uses of a trail.
b. **Design Clearing Width—**The minimum clearing width determined to be appropriate to accommodate the Managed Uses of a trail.
c. **Design Shoulder Clearance—**The minimum horizontal and vertical clearance of obstructions (for example, removal of bicycle pedal or motorcycle peg bumpers) immediately adjacent to the trail tread that is determined to be appropriate to accommodate the Manages Uses of a trail.

Design Cross Slope—The cross slope determined to be appropriate to accommodate the Managed Uses of a trail.

a. **Target Cross Slope—**The cross slope that is determined to be appropriate over most of a trail to accommodate its Managed Uses.
b. **Maximum Cross Slope—**The steepest cross slope that is determined to be appropriate based on the Managed Uses of a trail and that exceeds the target cross slope of the trail.

Design Grade—The trail grade determined to be appropriate to accommodate the Managed Uses of a trail.

a. **Target Grade—**The trail grade that is determined to be appropriate over most of a trail to accommodate its Managed Uses.
b. **Short Pitch Maximum—**The steepest grade that is determined to be appropriate based on the Managed Uses of a trail, that generally occurs for a distance of no more than 200 feet, and that does not exceed the maximum pitch density.
c. **Maximum Pitch Density—**The maximum percentage of a trail with grades that exceed the Target Grade and that are less than or equal to the short pitch maximum, which is determined to be appropriate based on the Managed Uses of the trail.

Design Parameters—Technical guidelines for the survey, design, construction, maintenance, and assessment of a trail, based on its Designed Use and Trail Class.

Design Surface—The trail tread surface, defined in terms of surface type, surface protrusions, and surface obstacles, that is determined to be appropriate to accommodate the Managed Uses of a trail.

a. **Surface Type**—A characteristic of the design surface expressed in terms of material type, grading, compaction, and roughness of the trail tread.
    1. **Native—**A surface composed of soil, rock or other naturally occurring materials found on or near the trail.
    2. **Firm—**A surface that is not noticeably distorted or compressed during the seasons for which it is managed, under normally occurring weather conditions, by the passage of a device that simulates a trail user in a wheelchair.
    3. **Stable—**A surface that is not permanently affected by normally occurring weather conditions and able to sustain normal wear and tear caused by the uses for which the trail is managed between planned maintenance cycles.
b. **Surface Protrusions—**Trail tread imperfections, such as rock, roots, holes, stumps, steps, and structures, that are within the acceptable range of tread roughness and challenge level for the trail and that do not obstruct the Managed Uses of the trail.

c. **Surface Obstacles—**Trail tread imperfections, such as rocks, roots, holes, stumps, steps, downed logs, and structures, that are beyond the acceptable range of tread roughness and challenge level for the trail and that obstruct one or more Managed Uses of the trail.

Design Tread Width—The tread width determined to be appropriate to accommodate the Managed Uses of a trail.

Design Turn Radius—The minimum horizontal radius required for a Managed Use to negotiate a curve (for example, a switchback, climbing turn, or horizontal turn) in a single maneuver.

Designed Use—The single Managed Use of a trail that requires the most demanding design, construction, and maintenance parameters and that, in conjunction with the applicable Trail Class, determines which Design Parameters will apply to a trail.

Four-Wheel Drive Vehicle Greater Than 50 Inches in Width—An off-highway vehicle greater than 50 inches in width that operates on four wheels and with a drive train that allows all four wheels to receive power from the engine simultaneously.

Full Bench—A trailbed constructed entirely on undisturbed material.

Infra Trails—Forest Service corporate database for National Forest System Trail inventory and management information.

Managed Use—A mode of travel that is actively managed and appropriate on a trail, based on its design and management.

Motorcycle—A two-wheeled motor vehicle on which the wheels are situated in a line, rather than side by side.

Motor Vehicle—Any vehicle which is self-propelled, other than:

a. A vehicle operated on rails
b. Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion, and is suitable for use in an indoor pedestrian area (36 CFR 212.1)

National Quality Standards for Trails—National criteria that establish the level of quality in terms of health and cleanliness, resource setting, safety and security, responsiveness, and condition of facilities for National Forest System trails managed at a full-service level.

Off-Highway Vehicle (OHV)—Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain (36 CFR 212.1).

Pack Clearance—The area on either side of the centerline of a trail, measured 30 inches above the trail tread, that is cleared of trees, limbs, and other obstructions that would interfere with passage by a loaded pack animal.

Side Slope—The natural slope of the ground, usually expressed as a percentage.

Snowmobile—An over-snow vehicle that operates on a track, uses one or more skis for steering, and has handlebar steering and a seat designed to be straddled by the operator.

Switchback—A reverse in direction of the trail grade with a level landing that is used to change elevation on a steep slope and that usually involves special treatment of approaches, barriers, and drainages.

Trail—Forest Service Definitions (36 CFR 212.1)

a. **Trail—**A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.
b. **Forest Trail—**A trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.
c. **National Forest System Trail—**A forest trail, other than a trail which has been authorized by a legally documented right-of-way held by a state, county, or other local public road authority.

Trail—Federal Trail Data Standards Definition. Defined by the Federal Trail Data Standards, the interagency definition is based on and encompasses individual agency definitions of a trail, and includes "standard" trails, National Scenic Trails and National Historic Trails.

- **Trail—**A linear route managed for human-powered, stock, or off-highway vehicle (OHV) forms of transportation or for historic or heritage values.

  NOTE: Trails provide public access for opportunities of outdoor recreation as well as access to many significant prehistoric and historic sites. Some portions of historic trails are accessible today, and provide recreational and other benefits, while others, more 'virtual' in nature, provide a cultural and/or historic experience, but are not physically capable of being traversed or accessed. Historic trails can consist of a path, a route, a corridor, a road, a river/stream, and so forth.

Trail Assessment and Condition Surveys (TRACS)—The Forest Service's approach for the field collection of trail inventory and condition assessment information, and the documentation of tasks needed to meet standard.

Trail Class—The prescribed scale of development for a trail, representing its intended design and management standards.

Trail Fundamentals—The five concepts that are the cornerstones of Forest Service trail management, including Trail Type, Trail Class, Managed Use, Designed Use, and Design Parameters.

Trail Grade—The ascent or descent of a trail segment expressed as a percentage of its length.

Trail Management Objective (TMO)—Documentation of the intended purpose and management of a National Forest System trail based on management direction, including access objectives.

Trail Type—A category that reflects the predominant trail surface and general mode of travel accommodated by a trail.

a. **Standard Terra Trail—**A trail that has a surface consisting predominantly of the ground and that is designed and managed to accommodate use on that surface.
b. **Snow Trail—**A trail that has a surface consisting predominantly of snow or ice and that is designed and managed to accommodate use on that surface.
c. **Water Trail—**A trail that has a surface consisting predominantly of water (but may include land-based portages) and that is designed and managed to accommodate use on that surface.

Trailhead—The transfer point between a trail and a road, water body, or airfield, which may have developments that facilitate transfer from one mode of transportation to another.

For purposes of the FSTAG (FSM 2353.27), a trailhead is a site designed and developed to provide staging for trail use and does not include:

a. Junctions between trails where there is no other access
b. Intersections where a trail crosses a road or users have developed an access point, but no improvements have been provided beyond minimal signage for public safety

Trailway—The portion of a trail within the limits of the excavation and embankment.

a. **Trailbed—**The surface on which the base course or surfacing may be constructed and which for trails without surfacing serves as the trail tread.
b. **Trail Tread—**The portion of a trail upon which traffic moves.

Wheelchair or Mobility Device—A device, including one that is battery-powered, designed solely for use by a mobility-impaired person for locomotion; that is suitable for use in an indoor pedestrian area; and that may be used by a person whose disability requires its use anywhere that foot travel is permitted (Title V, Section 507c, of the Americans With Disabilities Act and 36 CFR 212.1).

Library Card

U.S. Department of Agriculture, Forest Service. 2016. Trail fundamentals and trail management objectives. 1623–3801–MTDC. Tech. Rep. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 76 p.

This guidebook will help users understand the U.S. Department of Agriculture, Forest Service, Trail Fundamentals and Trail Management Objectives (TMOs). Trail Fundamentals are five concepts that are the cornerstones of Forest Service trail management. Trail Fundamentals provide an integrated means to consistently record and communicate the intended design and management guidelines for trail design, construction, maintenance and use. Trail Management Objectives synthesize and document the management intention for National Forest System trails and provide basic reference information for subsequent trail planning, management, condition surveys, and reporting. This guidebook reflects Forest Service policy related to Trail Fundamentals, TMOs, and National Quality Standards for Trails. It contains instructions on how to apply Trail Fundamentals and how to prepare a TMO form, including associated examples; and includes information on the Trail Class Matrix and photo examples of the various Trail Classes, Trail Design Parameters, and the Condition Assessment Survey Matrix.

Keywords: Condition Assessment Survey Matrix, CASM, Federal Trail Data Standards, FTDS, interagency, multiple use, National Forest System, planning, recreation, Trail Class Matrix, Trail Design Parameters, Trail Fundamentals, Trail Management Objectives, TMO, trail use.

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