



## Design Parameters

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<sup>1</sup>. 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 <sup>2</sup>	Trail Class 4 <sup>2</sup>	Trail Class 5 <sup>2</sup>
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 <sup>3</sup>	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, occasional grading Intermittently rough	Native with improved sections of borrow or imported material, routine grading Minor roughness	Likely imported material, 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 <sup>3</sup>	Target Grade	5% – 25%	5% – 18%	3% – 12%	2% – 10%	2% – 5%
	Short Pitch Maximum	40%	35%	25%	15%	5% FSTAG: 5% – 12% <sup>2</sup>
	Maximum Pitch Density	20% – 40% of trail	20% – 30% of trail	10% – 20% of trail	5% – 20% of trail	0% – 5% of trail

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

<sup>1</sup> For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

<sup>2</sup> 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).

<sup>3</sup> The determination of trail-specific design grades, 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.



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Designed Use <b>PACK AND SADDLE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Tread Width</b>	<b>Wilderness</b> (Single Lane)	Typically not designed or actively managed for equestrians, although use may be accepted	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 accepted
	<b>Non-Wilderness</b> (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	
	<b>Non-Wilderness</b> (Double Lane) <b>Structures</b> (Minimum Width)		60" Other than -bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	60" – 84" Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	84" – 120" Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	
<b>Design Surface<sup>2</sup></b>	<b>Type</b>		Native, limited grading May be frequently rough	Native with some onsite borrow or imported material where needed for stabilization, occasional grading Intermittently rough	Native, with improved sections of borrow or imported material, routine grading Minor roughness	
	<b>Protrusions</b>		≤ 6" May be common and continuous	≤ 3" May be common, not continuous	≤ 3" Uncommon, not continuous	
	<b>Obstacles</b> (Maximum Height)		12"	6"	3"	

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Designed Use <b>PACK AND SADDLE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Grade</b> <sup>2</sup>	Target Grade		5% – 20%	3% – 12%	2% – 10%	
	Short Pitch Maximum		30%	20%	15%	
	Maximum Pitch Density		15% – 20% of trail	5% – 15% of trail	5% – 10% of trail	
<b>Design Cross Slope</b>	Target Cross Slope		5% – 10%	3% – 5%	0% – 5%	
	Maximum Cross Slope		10%	8%	5%	
<b>Design Clearing</b>	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"	
<b>Design Turn</b>	Radius		4' – 5'	5' – 8'	6' – 10'	

<sup>1</sup> For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

<sup>2</sup> The determination of trail-specific design grades, 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.



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

Designed Use <b>BICYCLE</b>		<b>Trail Class 1</b>	<b>Trail Class 2</b>	<b>Trail Class 3</b>	<b>Trail Class 4</b>	<b>Trail Class 5</b>
<b>Design Cross Slope</b>	<b>Target Cross Slope</b>	5% – 10%	5% – 8%	3% – 8%	3% – 5%	2% – 3%
	<b>Maximum Cross Slope</b>	10%	10%	8%	5%	5%
<b>Design Clearing</b>	<b>Height</b>	6'	6' – 8'	8'	8' - 9'	8' - 9'
	<b>Width</b>	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"
	<b>Shoulder Clearance</b>	0' – 12"	6" – 12"	6" – 12"	6" – 18"	12" – 18"
<b>Design Turn</b>	<b>Radius</b>	2' – 3'	3' – 6'	4' – 8'	8' – 10'	8' - 12'

<sup>1</sup> For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

<sup>2</sup> The determination of trail-specific design grades, 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.



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

Designed Use <b>MOTORCYCLE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Cross Slope</b>	<b>Target Cross Slope</b>		5% – 10%	5% – 8%	3% – 5%	
	<b>Maximum Cross Slope</b>		15%	10%	10%	
<b>Design Clearing</b>	<b>Height</b>		6' – 7'	6' - 8'	8' - 10'	
	<b>Width</b> (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"	
	<b>Shoulder Clearance</b>		6" – 12"	12" – 18"	12" – 24"	
<b>Design Turn</b>	<b>Radius</b>		3' – 4'	4' – 6'	5' – 8'	

<sup>1</sup> For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

<sup>2</sup> The determination of trail-specific grades, 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 trail sustainability.





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

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Designed Use <b>ALL-TERRAIN VEHICLE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Cross Slope</b>	Target Cross Slope		5% – 10%	3% – 8%	3% – 5%	
	Maximum Cross Slope		15%	10%	8%	
<b>Design Clearing</b>	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"	
<b>Design Turn</b>	Radius		6' – 8'	8' – 10'	8' – 12'	

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

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Designed Use FOUR WHEEL DRIVE VEHICLE > 50"		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Cross Slope</b>	Target Cross Slope		8% – 15%	5% – 12%	5% – 8%	
	Maximum Cross Slope		15%	12%	8%	
<b>Design Clearing</b>	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"	
<b>Design Turn</b>	Radius		10' – 15'	15' – 20'	20' – 30'	

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