APPENDIX 3

Trail Class and Design Parameter Matrices

Trail Class Matrix

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.

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%
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

Trail Class Matrix courtesy of the USDA

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[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	Trail Class 4	Trail Class 5
Design Tread Width	Single Lane	0" – 12"	6" – 18"	18" – 36"	24" – 60"	36" – 72"
	Double Lane	36"	36"	36" – 60"	48" – 72"	72" – 120"
	Structures (Minimum Width)	18"	18"	18"	36"	36"
Design Surface	Type	Native, ungraded. May be continuously rough.	Native, limited grading. May be continuously rough.	Native, with some on-site 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	Target Grade	5% – 25%	5% – 18%	3% – 12%	2% – 10%	2% – 5%
	Short Pitch Maximum	40%	35%	25%	15%	5% – 12%
	Maximum Pitch Density	20% – 40% of trail	20% – 30% of trail	10% – 20% of trail	5% – 20% of trail	0% – 5% of trail
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'

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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	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 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, 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	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%
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'

Chugach State Park Trail Management Plan, 2016

Mountain Bike Design Parameters:
The following are design parameters authored by the Bikewood, specifically for Girdwood mountain bike trails. These parameters are based on the US Forest Service Bicycle Designed Use Parameters, shown on the previous page.

Machine-built, single-use, one-way, downhill bike trail:
The design parameters of this trail are most similar to a Class 4/5 bike trail listed above.

Design Tread Width: 48" – 72"
Design Surface: Firm, smooth, hardened tread, well drained, bike features
Design Grade: 5%-8% avg.; increased grades over short distances
Design Cross-slope: 3%-5%; increased cross-slopes for bike features
Design Clearing: 12' wide; 8'-10' feet high
Design Turn Radius: 12'- 18'

Hand-built, one-way, single-use, downhill bike trail:
The design parameters of this trail are most similar to a Class 2/3 bike trail listed above.

Design Tread Width: 18" – 48"
Design Surface: Native surfaces and obstacles, natural bike features, well drained
Design Grade: 8%-10% avg.; increased grades with more difficult trail rating
Design Cross-slope: 3%-5%; increased cross-slopes due to natural terrain
Design Clearing: 12' wide; 8'-10' feet high
Design Turn Radius: 6' – 12'

Machine-built, two-way, multi-use trail:
The design parameters of this trail are most similar to a Class 4/5, two-way bike trail listed above. Even though this is multi-use trail, the bike user group will set the design parameters.

Design Tread Width: 72" – 96"
Design Surface: Firm, smooth, hardened, well drained
Design Grade: 5%-8% avg; 10-12% max grade over short sections, when needed
Design Cross-slope: 3%-5%; increased cross-slopes for bike specific features
Design Clearing: 14' wide; 8'-10' feet high
Design Turn Radius: 12' – 18'

Design Parameters courtesy of the Girdwood Bike Park Master Plan Proposal, Land Use Committee February 2019 meeting packet

Designed Use CROSS-COUNTRY SKI (Diagonal/Classic ski)		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Groomed Width	**Single Lane**	Typically not designed or actively managed for cross-country skiing, although use may be allowed	24" – 48" Typically not groomed	72" – 96" Or width of grooming equipment	96" – 120" Or width of grooming equipment	Typically not designed or actively managed for cross-country skiing, although use may be allowed
	Double Lane		72" – 96"	96" – 144"	144" – 192"	
	Structures (Minimum Width)		36"	36"	36"	
Design Grooming and Surface	**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	**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%	
Design Clearing	**Height** (Above normal maximum snow level)		6' – 8'	8' Or height of grooming equipment	8' – 10'	
	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'	

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Designed Use NORDIC SKI (Skate Ski)		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Groomed Width	**Single Lane**	Typically not designed or actively managed for skate skiing, although use may be allowed	Typically not designed or actively managed for skate skiing, although use may be allowed	72" – 96" Or width of grooming equipment	96" – 144" Or width of grooming equipment	144" - 192" Or width of grooming equipment
	Double Lane[1]			96" – 144"	144" – 192"	168" - 288"
	Structures (Minimum Width)			36"	36"	36"
Design Grooming and Surface	**Type**			May receive occasional machine grooming for snow compaction and track setting	Smooth compaction using implements designed for creating skate lanes.	Smooth compaction using implements designed for creating skate lanes.
	Protrusions			No protrusions	No protrusions	No protrusions
	Obstacles (Maximum Height)			8" Uncommon (no obstacles if machine groomed)	No obstacles	No obstacles
Design Grade	**Target Grade**			2% – 10%	0% – 8%	0% – 6%
	Short Pitch Maximum			20%	20%	20%
	Maximum Pitch Density			5% – 15% of trail	5% - 10% of trail	5 - 8% of trail
Design Cross Slope	**Target Cross Slope**			0% – 5%	0% – 5%	0% – 5%
	Maximum Cross Slope (For up to 50')			15%	12% Minimum cross-slope (crowned or one side) should be 2% to promote drainage	10% Minimum cross-slope (crowned or one side) should be 2% to promote drainage
Design Clearing	**Height** (Above normal maximum snow level)			8' Or height of grooming equipment	8' – 10' Or height of grooming equipment	At least 10' Or height of grooming equipment
	Width			72" – 168" Light vegetation may encroach into clearing area	96" – 216" Widen clearing at turns or if increased sight distance needed	96" – 312" Widen clearing at turns or if increased sight distance needed
	Shoulder Clearance			0" - 12"	0" – 24"	0" – 24"
Design Turn	**Radius**			15' – 20' Or to accommodate grooming equipment	≥ 25' Or to accommodate grooming equipment	25' - 30' Or to accommodate grooming equipment

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Designed Use **Dog Sled: Snow Trail**		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Groomed Width*	Single Lane	N/A not designed or managed for dog sleds as primary user.	3'- 4'. If groomed, width of grooming equipment.	6'- 8' (or minimum width of grooming equipment).	8' -10', but typically managed to accommodate two-way passage.	N/A not designed or managed for dog sleds as primary user.
	Double Lane		Typically not designed for two-lane travel. Employ 6'-8' passing areas in steeper sections.	>8' (or minimum width of grooming equipment) and/or accommodate with passing areas 8'-12' wide.	12'-14'	
Design Surface	Type		Coarse compaction. Occasional or no grooming (may be ski-packed). Snowmobile packing is sufficient. Track layer is optional.	Groomed or compacted using implements and/or tracklayer when packed surface is snow-covered, drifted, melted, or skied out.	Well-groomed with tiller and/or other implements. Groomed frequently, and when groomed surface becomes degraded or buried.	
	Obstacles (Max. Height) Caused by use, lack of grooming, melt or surface/subsurface protrusions)		Dips, bumps, or ruts to 12" common and may be tightly spaced. Surface obstacles may occasionally require off-trail bypass.	Generally smooth, dips bumps, or ruts to 8" uncommon and widely spaced. Surface obstructions not present.	Consistently smooth. Small, rolling bumps, dips and rises. Surface obstructions not present.	
Design Grade	Target Grade (> 90% of trail)		< 15%	0% – 10%	0% – 8%	
	Short Pitch Maximum (Up to 200' lengths)		25%	20%	12%	
	Maximum Pitch Density		< 10% of trail	< 5% of trail	< 5% of trail	
Design Cross Slope	Target Cross Slope		< 10%	< 5%	< 5%	
	Maximum Cross Slope		15%	10%	5%	
Design Clearing	Height (Above normal maximum snow level)		6'-8' or height of grooming machinery, if used.	> 8' or height of grooming machinery	10'	
	Width		4'-6' (or minimum width of grooming equipment, if larger). Light vegetation may encroach into clearing area.	>1'outside of groomed edge. Light vegetation may encroach slightly into clearing area.	>2' outside of groomed edge. Widen clearing at turns or if increased sight distance is needed.	
Design Turns	Radius (Use climbing turn versus switchbacks)		8'-10' if Cat-groomed. OR; minimum based on turning limits of grooming machine.	15' – 20' (Provide sufficient radius for grooming equipment).	> 25'	

Nancy Lakes State Recreation Area Management Plan, 2013

Designed Use Skijoring		**Trail Class 1**	**Trail Class 2**	**Trail Class 3**	**Trail Class 4**	**Trail Class 5**
Design Groomed Width		Typically not designed or actively managed for skijoring, although use may be allowed.	Typically not designed or actively managed for skijoring, although use may be allowed.	8' – 14' May be wider to accommodate width of grooming equipment.	12' -18' May be wider to accommodate width of grooming equipment.	16' -24'
Design Grooming and Surface	**Type**			May receive occasional machine grooming for snow compaction and track setting.	Smooth compaction using implements designed for creating skate lanes.	Smooth compaction using implements designed for creating skate lanes.
	Protrusions			No protrusions.	No protrusions.	No protrusions.
	Obstacles (Maximum Height)			8" Uncommon (no obstacles if machine groomed).	No obstacles.	No obstacles.
Design Grade	**Target Grade**			<10%	<8%	6-8%
	Short Pitch Maximum			<20%	15%	12%
	Maximum Pitch Density			<10% of trail	<5% of trail	<5% of trail overall; up to 8% for short stretches (50' max.)
Design Cross Slope	**Target Cross Slope**			<5%	<5%	<5%
	Maximum Cross Slope (For up to 50')			15%	12% Minimum cross-slope (crowned or one side) should be 2% to promote drainage.	8% Minimum cross-slope (crowned or one side) should be 2% to promote drainage.
Design Clearing	**Height** (Above normal maximum snow level)			8' Or height of grooming equipment.	8' – 10' from top of anticipated snowpack or height of grooming equipment.	At least 10' from top of anticipated snowpack or height of grooming equipment.
	Width			>1' outside groomed edge.	Minimum of 1' outside groomed edge.	Minimum 2' outside groomed edge.
	Shoulder Clearance			0" - 12"	0" – 24"	0" – 24"
Design Turn	**Radius**			50' or the minimum needed to accommodate grooming equipment.	75' or the minimum needed to accommodate grooming equipment.	75' or the minimum needed to accommodate grooming equipment.

Nancy Lakes State Recreation Area Management Plan, 2013

Designed Use NON-MOTORIZED WATERCRAFT*		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Structures**	Water route shown on maps and used to access other trails or portages, but with no trail structures, facilities, signs, or recurring maintenance needs along route. Signs and/or parking facilities at initial access points only, and likely associated with other trails or sites.	Few markers or route designators. Low profile structures or facilities occasionally present; primarily to reduce beach and bank impacts. Structures typically consist of native material hardening of portage/water entry points. Signs and/or parking facilities at initial access points only, and likely associated with other trails or sites.	Buoys or markers possible to identify route Typically, facilities provide for improved access and to reduce beach and bank impacts. Well-developed parking and launch facilities at primary access points, but facilities and structures rare along the trail. Interpretive and informational displays typically present at primary access points	Buoys or markers are high profile and may be inter-visible and or route is readily followed. Highly developed launch facilities, docks, and amenities typically proved for user convenience. Well-marked approaches to facilities and portages. Interpretative displays, maps, information kiosks and signs typically present at access points and along route	Typically not designed or actively managed for watercraft, although use may be allowed
Design Surface	**Protrusions**	May be common and continuous	May be common and continuous	May be common, but not continuous	Uncommon and not continuous	
	Obstacles	May be common or placed for increased challenge	May be common or placed for increased challenge	May be common and left for increased challenge	Uncommon	
Design Clearing		In densely vegetated areas, users will commonly need to lift vessels over logs, shoals, or matted vegetation.	Path is typically narrow, shallow, and may occasionally require user to lift over obstacles or break path through some vegetation and duck under overhanging branches	Path is typically cleared wide enough for ready passage and maneuvering of at least one vessel, and usually two-way vessel passage, with only occasional low overhanging vegetation	Path is consistently cleared wide enough for unhindered, easy passage of two or more vessels.	

Chugach State Park Trail Management Plan, 2016

APPENDIX 4

List of Trail Term Definitions

The following is a list of trail term definitions that are used throughout this plan. They parallel terminology used by the U.S. Forest Service, Alaska State Parks, the U.S. Fish and Wildlife Service, the National Park Service, and the Bureau of Land Management.

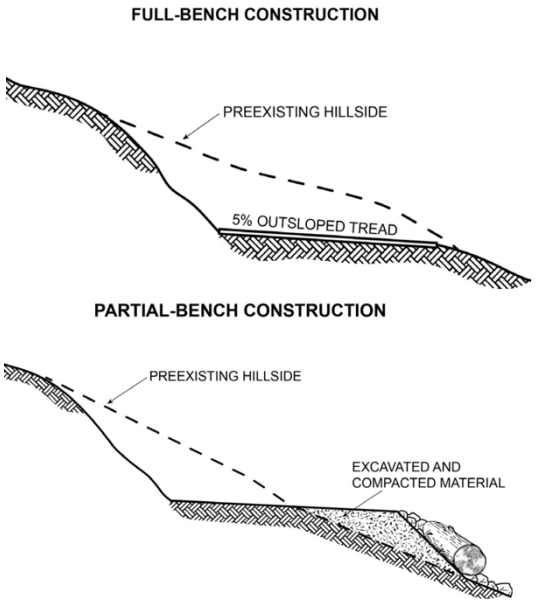
Definitions and sketches were drawn from a variety of sources, including:

a) USFS Trail Fundamentals Definitions: https://www.fs.usda.gov/recreation/programs/trail-management/documents/trailfundamentals/USFS_Trail_Fundamentals_Definitions.pdf
b) American Trails Trail Terms: https://www.americantrails.org/resources/trail-terms
c) USFS Trails Construction and Maintenance Handbook: https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/trail-maintenance-notebook.pdf
d) USFS Wetland Trail Design and Construction: https://2296f903-e219-47d7-a925-87eb3d67b503.filesusr.com/ugd/5679f1_5e0aa1780ba54c17b4fdf1e48c5bfa70.pdf

Access, Public: The right of passage, established by law, over another's property. Can be created by an easement dedicated or reserved for public access. Legal public access exists on public land, public waters, public rights-of-way, and public easements.

Armoring (Hardening, Flag Stoning, Paving, Stone Pitching, Boulder Causeway): Reinforcement of a surface with rock, brick, stone, concrete, or other "paving" material to improve the durability. May be used to prevent soil loss in steep or soft/wet tread and around roots.

Backslope (Backcut, Cutbank, Cutslope): The cut bank along the uphill side of the trail, extending upward from the tread, and transitioning into native hillside by varying degrees, depending on bank composition and slope stability.



Bench (Full, Partial) Cut: The excavation cut into a slope to provide support for the trail tread surface. "Full" refers to the bench being constructed entirely on an excavated surface and is the preferred method of bench construction on trails construction on side slopes >30%.. "Partial" refers to the bench being constructed in part on compacted fill. Partial bench cuts are not recommended on side slopes greater than 30% because the filled portion is susceptible to slope failure and/or may require higher levels of maintenance.

Berm: The ridge of material formed on the outer edge of the trail that projects higher than the center of the trail tread. When improperly designed or unintentionally caused by tread compaction and soil displacement during trail use, a berm can trap water on the trail and lead to erosion.

Best Trail Management Practices (BTMPs): A series of management components developed to reflect the current "state-of-the- art" practices for effective and efficient trails management.

Bike Trail Berm: A berm or bermed corner is built up higher on the outside of the corner than on the inside.

Braided Trail: Problem areas along a trail where multiple parallel paths develop, usually around steep, wet, or otherwise degraded areas.

Check (or Check Dam): A small earthen, stone, or log dam placed across deeply eroded or gullied fall line trails or erosion channels to slow the flow of water enough to allow accumulation of fine fill material behind the structure. Recommended primarily for use in trail reclamation or revegetation.

Climbing Turn: A wide, ascending curve that gradually reverses the direction of the trail while gaining elevation. Used in place of Switchbacks on side slopes of less than 22% when possible.

Clinometer: A small, hand-held device used to measure grade (or slope) in terms of degrees or percent. In trails and roads, grade or slope is referred to in percent (%).

Compaction: The compression of aggregate, soil, or fill material by tamping or trail traffic.

Contour Trail (Curvilinear Trail Layout): A concept whereby the trail is designed to rise and/or descend gradually along natural contours. The alignment crosses the contours at a shallow angle so that the natural drainage patterns are easily maintained during the construction process.

Control Point: A specific point, area, or feature that is important in trail layout. Positive Control Points are places you want the trail to go to or near (such as trailheads, scenic points, good water crossings, other trails, etc.). Negative Control Points are places you want to stay away from (such as hazards, sensitive habitat, private property, etc.).

Crib (Retaining Wall): A retaining device used to support the trail tread or backslope, typically composed of wood or rock.

Crown (Crowning): A method of trail construction where the center portion of the tread is raised to allow water to disperse to either side of the trail.

Culvert: A pipe or box-like structure of wood, metal, plastic, concrete, or rock that conveys a water course under a tread.

Cyclometer (Milewheel): Typically a hand-held or pushed wheel that measures linear distance along the ground.

Design Parameters: Specific guidelines for the survey, design, construction, maintenance, and assessment of trails that are based on the intended users, trail class, and difficulty level of the trail.

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.

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

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 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 Managed Use of a trail requires the most demanding design, construction, and maintenance parameters and that determines which design, construction, and maintenance parameters will apply to a trail. While there may be many Managed Uses on a trail, there is only **one** Designed Use per trail or trail segment. For example, if a trail has a Managed Use of both Hiker and Mountain Bike (MTB), then MTB would be the Designed Use since it requires more stringent trail design, construction, and maintenance parameters.

Difficulty Level: The degree of challenge that a trail presents to an average user's physical ability and skill, based on trail condition and route location factors such as alignment, steepness of grades, gain and loss of elevation, and amount and kind of natural barriers that must be crossed.

Drainage, Integrated: Integrate water control in the design and construction of the trail using outslope, grade reversals, and rolling grade dips to maintain the terrain's natural patterns of waterflow.

Easement: Grants the right to use a specific portion of land for a specific purpose or purposes. Easements may be limited to a specific period of time or may be granted in perpetuity; or the termination of the easement may be predicated upon the occurrence of a specific event. An easement agreement survives transfer of land ownership and is generally binding upon future owners until it expires on its own terms.

Easement, Conservation: Places permanent restrictions on property in order to protect ecological or historical resources that an owner passes to a state agency or nonprofit land trust to hold and manage in perpetuity. They are recorded with the deed, so all future owners and lenders learn of the restrictions when they file for title reports.

Easement, Construction: An additional temporary area or corridor needed to construct a trail or facility.

Easement, Recreation: Provides public access to private property while limiting or indemnifying the owner's public liability.

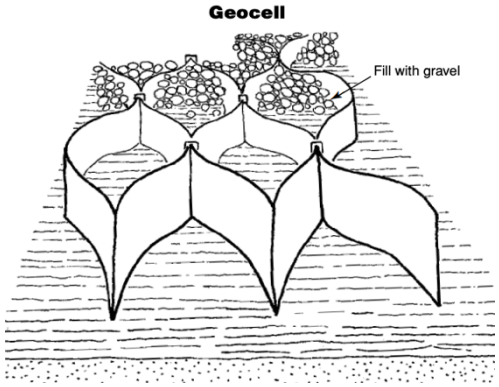
Fall-line: The path water flows down a slope under most circumstances. Trails that approximate the fall-line are prone to erosion and this alignment should be avoided.

Flow Trail: Flow trails create a terrain-induced roller coaster experience for bikers, with little pedaling and braking necessary. Typical features include banked turns, rolling terrain, various types of jumps, and consistent and predictable surfaces. Conspicuously absent are abrupt corners or unforeseen obstacles.

Gabion (Gabion Baskets): Rectangular containers (usually made of heavy galvanized wire) that can be wired together, and then filled with gravel or cobble to make quick retaining walls for erosion control.

Gateway: Where a trail is clearly constrained on two or three sides. The tighter the "squeeze", the stronger the gateway—a sense of entrance, such as between large rocks, trees at the edge of a meadow, etc.

Geocell (Geogrid, GeoBlock): Polyethylene sheeting configured into an open grid with high tensile strength. They are used for reinforcement and often placed on top of a layer of geotextiles to provide separation. (see Porous Pavement Panel)

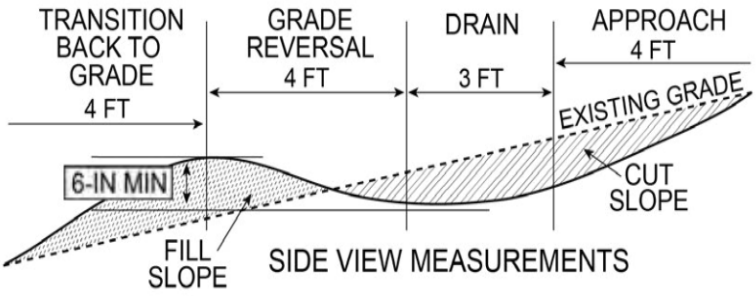


G**eotextile (Geofabric, Filter Fabric):** A pervious, woven or non-woven, petrochemical fabric that provides a stable base for the application of gravel and excludes smaller sediment from penetrating.

Grade: Relative steepness (rise and fall) of the trail as compared to a flat horizontal plane. Trail steepness is measures in grade as a percentage. Grade is different than angle; angle is measured with a straight vertical as 90º and a straight horizontal as 0º. A grade of 100% would have an angle of 45º.

Grade Control: Fundamental part of Sustainable Trail construction whereby strict trail grade restrictions are placed in the design parameters, primarily to minimize erosion due to natural forces and trail users.

Grade Reversal (Grade Dip): A reverse in the trail grade—usually a short dip followed by a rise—that forces water off the trail. Grade reversals are subtle and typically designed into the alignment of the trail. When designed into the alignment they can prevent the future need for more artificial water diversion structures such as waterbars.



Green Infrastructure: An interconnected network of green space (hubs + corridors) that conserves natural ecosystem values and functions. It provides associated benefits to human populations.

Ground Truthing: Verification and validation of geospatial data through field work.

Half Rule: Laying out a trail so that the prevailing grade is less than half the grade of the side slope. If the trail grade is steeper than half the grade of the side slope, it is considered a fall-line trail and gravity will pull water down the trail instead of across it. This leads to erosion of the trail tread. This rule of thumb works for trails on side slopes below 20 percent; when the side slope is steeper than 20 percent, trails designed using the half rule can be too steep.

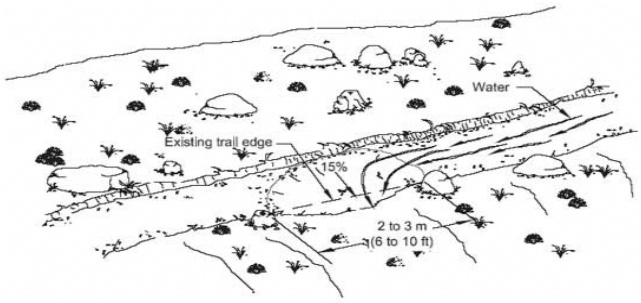
Hardening: Any number of methods of strengthening a tread surface in response to degradation or to better accommodate a particular type of use. Examples include: aggregate capping, boardwalk or puncheon construction, turnpiking, or the use of porous pavement panels.

HLB: Heritage Land Bank, the real estate management arm of the MOA

Integrated Water Control: Instituting water management into basic trail design, usually during construction. Primary components include **Grade Reversals** and **Outslope**.

Inslope: The inward cant of the tread surface, where the outside edge of the trail is higher than the inside edge. Most commonly used on the upper leg of a switchback or to direct water into an inside ditch.

Knicks: A semi-circular, shaved down section of trail, 6-10 feet in length, with an exaggerated outslope. Like a rolling grade dip, a knick is used to shed water off a trail and is a useful remedy for wet spots on relatively flat trails.A knick is smooth and subtle, often an unnoticeable feature to users.



Logging Out: Clearing a trail of fallen trees.

Managed Trail: A trail that has some type or level of actively managed use. To qualify as a managed trail, one or more of the following must apply: 1) The trail is depicted on a map distributed for public use; 2) The trail is maintained on a regular schedule (up to several years interval) for public use purposes; 3) The trail is, or was, constructed for public use; 4) The trail is abandoned or closed to public use but is used for administrative purposes; or 5) The trail is signed or marked for public use.

Managed Use: The type of use that is actively managed and appropriate on a trail considering its design and management intent. There may be more than one managed use per trail or trail segment. For example, a shared-use trail's managed uses could include hiker, bicycle, wheelchair, cross-country ski, pack and saddle.

Maximum Trail Grade (Short Pitch Maximum): A defined value for the steepest allowed section of trail grade that is longer than approximately 10 feet, but less than 50 feet in length. Maximum trail grade is determined by evaluating local environmental conditions such as soil, hydrology, and trail use characteristics.

Memorandum of Understanding/Agreement (MOU/MOA): A signed, written agreement entered into by various governmental agencies and nonprofit groups to facilitate the planning, coordination, development, and maintenance of a trail or trails system.

MOA: Municipality of Anchorage

MTB: Mountain Bike

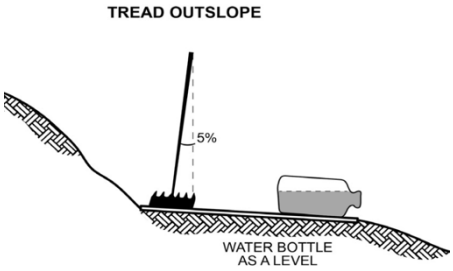
Multi-Use Trail: A trail that is designed to accommodate multiple user groups.

National Historic Trail (NHT): Federally designated extended trails, which closely follow original routes of nationally significant travel (explorers, emigrants, traders, military, etc.). NHTs do not have to be continuous, can be less than 100 miles in length, and can include land and water segments. The **Iditarod**, the Lewis and Clark, the Mormon Pioneer, and the Oregon trails were the first to be designated as NHTs in 1978.

National Recreation Trail (NRT): Existing trails that provide a variety of outdoor recreation uses in or reasonably accessible to urban areas recognized by the federal government (Secretary of Interior or Secretary of Agriculture, not Congressional action) as contributing to the National Trails System. The **Bird-to-Gird** bike trail is a NRT.

Obstacles (Natural): Objects that add challenge by impeding travel. They include: rocks, roots, logs, holes, ledges, drop-offs, etc.

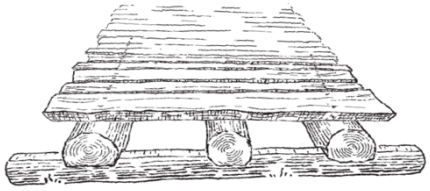
Outslope: A method of tread grading that leaves the outside edge of a hillside trail lower than the inside to shed water. The outslope should be barely noticeable—usually no more than about one inch of outslope for every 18 inches of tread width.



Porous Pavement Panel: A permeable, rigid, multi-pocketed structural geogrid, typically plastic, that is used to harden areas of saturated or unstable soils without the use of gravel infill, bridges, or boardwalks, e.g. GeoBlock and Geogrid.

Pump Track: A continuous loop of berms and smooth bumps (called rollers). Riders gain speed by "pumping" the terrain—absorbing the front side of rollers and compressing the back.

Puncheon: A log or timber structure built directly on the ground or on sills, used for crossing degraded or boggy areas where the soil is wet but does not contain enough water to seriously hamper trail work.



Right-of-Way: A linear corridor of land held in fee simple title, or as an easement over another's land, for use as a public utility (highway, road, railroad, trail, utilities, etc.) for a public purpose. Usually includes a designated amount of land on either side that serves as a buffer for adjacent land uses.

Sheet Flow: The more or less even disbursement of water flowing on low gradient slopes. Controlled grade and integrated water control in sustainable trail design seeks to maintain sheet flow over and across constructed trails to prevent concentrated water flow along the tread that would focus and accelerate erosion.

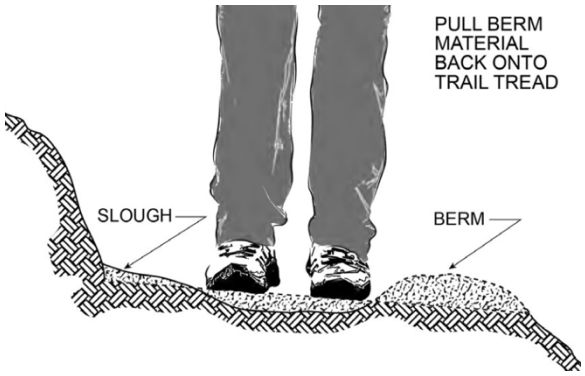
Sill (Sleeper): A crosswise member (stone or timber) that supports the stringers, beams, or trusses of a bridge or boardwalk from contacting the ground. A horizontal log or timber laid in a shallow trench to support a plank or log.

Single-Track Trail: A narrow trail typically requiring passage by users in a single file. Commonly used to describe all-terrain (mountain) bicycle trails.

Single-Use Trail: One that is designed and constructed for only one intended use (i.e. hiking only).

Slope: Rising or falling natural (or created) incline of the land, as shown on contour maps. Generally refers to the hillside (land) and not the trail, as trail "slope" is called the grade. Slope can be calculated by determining the vertical rise over a given horizontal distance, but it is more often directly read from a slope measurement instrument called a Clinometer. Slope can be expressed in degrees, but for trail use, it is more commonly expressed as a percentage. For example, a 10% slope has 10 feet of rise over 100 feet of horizontal distance. A 10 foot rise over a 10 foot distance would be a 100% slope, which is equivalent to a 45° angle.

Slough (pronounced "Sluff"): Material removed from the backslope by erosion or other means that has been deposited on the trail tread. Silt and debris collecting on the uphill (inside) edge of the trail tread. Slough may raise the height of the tread relative to the original level and result in water pooling on the trail or be sufficient to block the trail.



Social Trail – An unplanned, usually unmaintained trail alignment that develops informally as a result of public route pioneering, overuse, or degraded trail avoidance.

Soil, Mineral: A combination of sand, silt, clay, and gravel that is typically found as the undisturbed layer of soil below the surface layer of organic material and debris. Local mineral soil is the most common medium for tread construction.

Soil, Organic: A soil that is made up of decomposed leaves, wood, needles, roots, bark, and other organic material in various stages of decay. A "true" organic soil has an organic surface layer at least 20" thick. The term is also used to refer to the upper most layer of dark surface soil that has a high organic material content. Organic soils have a propensity of readily absorbing and holding water and are poorly suited as a trail-tread material.

Sustainable Trail: A trail that conforms to its terrain and environment, is capable of handling its intended use without serious resource degradation, and requires minimal maintenance.

Swamping: Technical term referring to the physical removal of slash or downed trees on a trail. A swamper usually works in cooperation with a sawyer removing slash and lugging fuel and oil.

Switchback: A sharp turn in the tread alignment, often 180 degrees, used to gain elevation on steep side slopes (typically required on slopes above 22%). Switchbacks are a highly technical trail structure and should be avoided in favor of Climbing Turns located on slopes below 22% when possible. See illustration at right.

Technical Trail Features (TTF): Objects that have been introduced to the trail to add technical challenge. Examples include: rocks, logs, elevated bridges, jumps, and drop-offs.

Ten-Percent Average Grade Guideline: Generally, an average trail grade of 10% or less is most sustainable. This does not mean that all trail grades must be kept under 10%. Many trails will have short sections steeper than 10%, and some unique situations will allow average trail grades of more than 10%.

Trail Class: A rating indicating the level of development of a given trail. It is based on many factors including the land through which it passes, the intended users for whom it is designed and built, the resulting design parameters and its likely level of maintenance. US Forest Service Trail Classes are 1 to 5 with 1 being most primitive, such as a faint wilderness trail, and 5 most developed, such as a paved trail.

Trail Corridor: The full dimensions of the trail, including the area (2 to 3 feet) on either side of the tread and the space overhead (10 to 12 feet) from which brush and obstacles need to be cleared. The area of passage of the trail, including all cleared and managed parts above, below, and adjacent to the tread.

Trail Hardening: A technique to modify the surface characteristics of a tread. Usually applied in wet or boggy ground or to enhance ADA characteristics. This ranges from aggregate capping to boardwalk or planking to turnpike construction to the use of porous pavement.

Trail Management Objective (TMO): Documentation of the intended purpose and management strategies of a trail based on its designed use, design parameters, and special considerations.

Trail Standards: Trail maintenance specifications that define the level of quality and service the trail manager will provide for the trail user.

Trail Type: A category that reflects the predominant trail surface and general mode of travel accommodated by a trail. There are three trail types: terra (standard), water, and snow trails.

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.

Tread: The wear surface of the trail upon which a user travels. The tread, or treadway, is the most fundamental component of a trail.

Tread Creep: Areas along a contour trail where the tread is sliding downslope due to compaction, slope failure, or fill failure of a partial bench cut. May be caused by trailside features such as trees, bushes, roots, or another projection that forces traffic onto the outside edge, compacting it downslope.

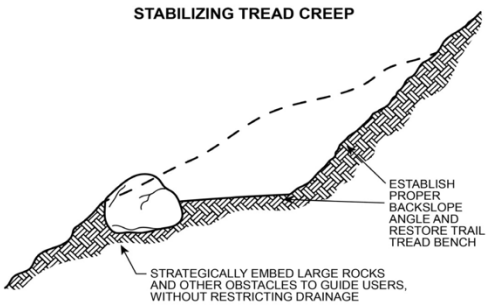
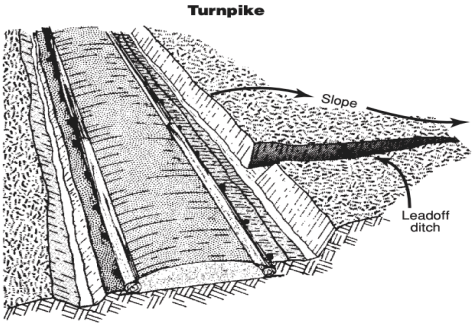


Figure 3–14. A properly installed guide rock or log end can help prevent tread creep. Do not create a continuous barrier that impedes water drainage.

Turnpike: An elevated tread feature constructed of mineral material excavated from adjacent ditches. The ditches run the length of the turnpike for water drainage. May have log, timber, or rock curbing. Typically used for crossing degraded or boggy areas. May also be partially backfilled with imported mineral soil or capped aggregate. (A causeway is an elevated tread without side ditches.)



Vehicle, All-Terrain (ATV, Quad, Four-Wheeler): Small four wheeled motorized vehicle 50" or less in width used for off-highway use. ATV's are equipped with gasoline powered engines, handlebars, and a seat designed for one driver only to straddle. ATV's were designed in the late 1960's and first sold in the United States in the early 1970's. This type of vehicle is very popular and is commonly used for recreation, rescue efforts in emergency situations, and agricultural maintenance.

Vehicle, Off-Highway (OHV, Unlicensed Vehicle): Any motorized vehicle used for travel in areas normally considered inaccessible to conventional highway vehicles. OHVs generally include dirt motorcycles, dune buggies, jeeps, 4-wheel drive vehicles, snowmobiles, and ATVs. Used to be referred to as Off-Road Vehicles.

Waterbar: A trail structure typically constructed of wood, rock, or reinforced rubber and soil that is set at an angle across tread to direct water off the treadway. Generally being phased out in favor of Grade Reversals and Outslope integrated into new construction, and Outslope and Rolling Grade Dips retrofit into existing construction.

Width, Clearing: The outer edges of clearing areas (cleared of trees, limbs, and other obstructions) as specified by trail use.

Width, Design: The width specification that a trail was designed to meet, generally considered part of the trail (the beaten path or tread width).

Width, Tread: The width of the surface portion of the trail used for travel.

APPENDIX 5

Trail Project Priority List, 2025-2035

Projects are not listed in any order of priority.
Trail numbers correspond to proposed trails in the 2024 Trails Master Plan.

2025-2030

- Reroute of Middle Iditarod near Phase 1 of Holtan Hills
- Continued improvements to Middle Iditarod Trail between the Girdwood School, Crow Creek Road and the boundary of the USFS portion of the trail.
- Easement secured for Middle Iditarod Trail
- Trail T4: Ruane Road Trail Connection to Lower Iditarod. There is a low spot that gets flooded near the trailhead by the AWWU plant. Either the drainage needs to be improved to drain the water away or the trail raised to get the tread above water level.
- Bridge B6: Glacier Creek Trail Bridge – Upper Valley and Interpretive kiosk
- Trail T6: Barren Avenue to Alyeska Highway
- Improvements to Lower Virgin Creek Trail (TH post, establish route to the bench from the TH)
- Easement secured for Lower Virgin Creek Trail
- Improve tread and drainage on the Shortcut Trail from Alyeska Hwy to Davos
- Trail T1: Work with the Alaska RR to get permission to build a trail connection between the Lower Iditarod Trail and the Girdwood RR Depot.

2025-2035

- Trail 2.3: Timberline-Barren Ave Connection
- Trail T5: Beaver Pond Trail to Alyeska Highway Bike Path
- Trail T10: Forest Loop Trail
- Trail T11: Arlberg Connection to Winner Creek Trail
- Trail T12: Canyon Rim Trail
- Trail T14: Snowcat Trail Improvements
- MB2: Bikewood trails with the 5K Nordic Loop zone.
- Trail Head 5: Karolius Trailhead
- Trail Head 11: Arlberg Trailhead Expansion

APPENDIX 6

Adopted Planning Documents that Affect Girdwood Trails

Alyeska Resort Master Plan, 2025

Anchorage Park, Greenbelt and Facility Recreation Plan, Vol. 3: Turnagain Arm, 1987

Assessment of Ecological & Socio-Economic Conditions and Trends for the Chugach National Forest, 2014

Chugach National Forest: Land Management Plan, 2020

Chugach State Park Access Plan, 2010

Chugach State Park Management Plan, 2016

Chugach State Park Trails Management Plan, 2016

Crow Creek Neighborhood Land Use Plan, 2006

Girdwood Commercial Areas and Transportation Master Plan, 2001

Girdwood Comprehensive Plan, 2025

Girdwood Iditarod Trail Route Study, 1997

Girdwood South Townsite Master Plan, 2009, amended 2014

Girdwood Trails Plan, 2024

Iditarod National Historic Trail Comprehensive Management Plan, 1986 (BLM)

MOA Area-wide Trails Plan, 1997

MOA Title 21, Chapter 9 Girdwood Land Use Plan, 2005, amended with MOA Assembly approval on an ongoing basis

Winner Creek Trails Feasibility Study, 2007

APPENDIX 7

Trail Partnerships

Documents outlining partnership agreements for trail work, such as interagency land management agreements, memoranda of understanding, and contracts made through Alaska Trail Volunteers and other organizations are available at the Girdwood Parks and Recreation Office.

Established Partnerships with Government Organizations:

- Alaska Department of Natural Resources
- Alaska State Parks, Chugach State Park
- Girdwood Board of Supervisors
- Municipality of Anchorage, Heritage Land Bank
- US Forest Service, Glacier Ranger District

Grant Organizations:

- Alaska Community Foundation: ACF Trail Care Fund and private donations
- Alaska Trails
- American Hiking Society
- Anchorage Park Foundation
- Kenai Mountain–Turnagain Arm National Heritage Area
- Land and Water Conservation Fund
- National Forest Foundation
- Rasmuson Foundation
- Recreational Trails Program (RTP)

Volunteer Organizations:

- Alaska Trails Volunteers (Adopt-A-Trail)
- Bikewood
- Friends of Girdwood Trails
- Girdwood Nordic Ski Club
- Student Conservation Association (SCA)
- Youth Employment in Parks (YEP)

Other:

- Greatland Trust
- Private donations through Girdwood, Inc.
- Various service organizations assist with work on Girdwood Trails under the supervision of the Girdwood Parks and Recreation office.