APPENDIX E.

TRAIL CONSTRUCTION CRITERIA

BACK COUNTRY AND PRIMITIVE TRAIL DESIGN INFORMATION

HIKING TRAILS

	Easiest	More Difficult	Most Difficult 1/
Grade			
Max. Pitch Grade	20%	30%	+30%
Length	100'	300'	500'
Clearing 2/ **Width**	48"	36" to 48"	36"
Height	8'	8'	8'
Tread 3/ Width	18" to 24" Obstacle-free	12" to 18" If needed, depending on volume and drainage.	12"
Surface	Spot gravel surfacing.	Not surfaced-- leave roots, imbedded rocks, and some logs.	No graded tread except on side slopes over 50% where safety or resource damage is a problem.

1/ Upper limit of grade and pitch length for most difficult trails depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Curve alignment to avoid cutting large trees.

3/ Increase tread width 6 inches on switchbacks or where side slopes exceed 60 percent.

MOUNTAIN BICYCLE TRAILS

	Easiest	More Difficult	Most Difficult1/
Grade			
Max. Pitch	10%	30%	+30%
Max. Sustained Pitch	5%	10%	15%
Length	100'	300'	500'
Turning Radius	6'	3'	2'
Length of Trip			
Day	10-20 mi	20-40 mi	40-50 mi
One-half Day	5-10 mi	15-20 mi	20-25 mi
Clearing2/			
Width	48"+	36"-48"	36"
Height	8'	8'	Max. 8'
Tread3/			
Width	24"+	12"-24"	12"
Surface	Relatively smooth	Sections of relatively rough surface	Varied--Some portage required

1/ Upper limit of grade and pitch length depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Curve alignment to avoid cutting large trees.

3/ Increase tread width 6 inches on switchbacks or where side slopes exceed 60 percent.

EQUESTRIAN TRAILS

	Easiest	More Difficult	Most
Difficult 1/			
Grade			
Max. Pitch Grade	15%	25%	+30%
Length	200'	300'	500'
Clearing 2/			
Width	8'; 6' between large trees. Pack clearance must be 3' from a point 30" above grade of tread.	6' Pack clearance must be 3' from a point 30" above a grade of tread.	3' to 4' wide
Height	10'	8'	Maximum 8'
Tread 3/			
Width	24"	24"	18"
Surface	Surfacing as needed for stability. Reinforce cross drains with logs or rocks on steep gradients (greater than 10%). Special emphasis on puncheon or turnpikes in bog holes. Construct extra trailbed width in steep terrain.	Leave roots and imbedded rocks. Cross drains permanent with natural roots, rocks, or imbedded logs.	Not graded except on side slopes greater than 30%.

1/ Assume pack animals normally are not accommodated on most difficult trails, so less clearing width is needed. Same holds true for day-use horse trails. The upper limit for most difficult saddle animal trails depends on the soil type, amount of rock, vegetation types, and other conditions affecting stability of the trail surface. The skill of the rider and the condition of the animal also are important considerations.

2/ Along a precipice or hazardous area, the trail clearing width should be at least 48 to 60 inches to provide safety to the riders and their animals.

3/ Increase tread width 12 inches on switchbacks. Tread width on special sections, such as fords or turnpikes, should be at least 36 inches.

CROSS-COUNTRY SKI TRAILS

	Easiest 1/	More Difficult 1/	Most Difficult 1/
Greatest Single Climb (elevation gain of single continuous climb)	35'	70'	140'
Elevation Differential (lowest to highest point on trail)	100'	250'	500'
Total Climb (sum of all elevation gains)	150'	400'	650'
Greatest Sustained Gradient (over 300' trail distance)	7.5%	12%	17%
Greatest Short Gradient (under 100' trail distance)	10%	20%	--

1/ Based on a 3-mile loop. These are maximum guides for smooth, wide, straight trails with good outruns. Correlate grade with distance to avoid excessive speed buildup.

ATV TRAILS

	Easiest	More Difficult	Most Difficult
Grade			
Max. Sustained	15%	25%	35%
Length	200'	300'	500'
Max. Pitch	20%	30%	50%
Clearance (1-Way Traffic)			
Wooded			
Downhill side	2'	1.5'	1.0'
Uphill side	3'	3'	3'
Level	3.1' each side	2.6' each side	2.5' each side
Open			
Downhill side	2'	1.5'	1.0'
Uphill side	3'	3'	3'
Level	3.1' each side	2.6' each side	2.4' each side
Height	6'	6'	5'
Tread Width			
Minimum	6.2'	5.2'	4.8'
Maximum	7.2'	6.2'	5.8'
Surface	Relatively smooth, no roots or rocks protruding more than 3", tread plane flat, sweeping curves, no holes wider than 24" nor deeper 6", lose sand OK	Section of relatively rough surface,no roots or rocks protruding more than 3", tread plane can be insloped 5% max, climbing turns	Relatively rough w/very rough short sections, no protruding rocks 3", tread plane can be insloped or outsloped
Obstacles2/ (Optional)	Wet xings 6" deep, 10' long max, draindips OK, no waterbars	Wet xings 10" deep, 25' long, waterbars downHill OK	Same as more difficult except waterbars may go uphill & down
Exposure (Sideslope)	0% to 20%	20% to 30%	30% to 40%
Length	Less than 300'	300' to 500'	More than 500'
Traffic Flow	One-way, or two-way w turnouts	One-way, or two-way w turnouts	One-way, or two way w turnouts
Length of Trip			
One-half day	3 miles	10 miles	15 miles
Full day	6 miles	20 miles	30 miles

1/ Increase tread width 6 inches on switchbacks or where side slopes exceed 30 percent.

2/ Avoid any type of sharp peaks in vertical alignment.

OFF-HIGHWAY MOTORCYCLE TRAILS

	Easiest	More Difficult	Most Difficult 1/
Grade			
Max. Pitch	15%	30%	50%
Clearing			
Width			
Wooded			
Downhill Side	2'	1-1/2'	1-1/2'
Uphill Side	3'	3'	3'
Level	1-1/2' each side	1-1/2' each side	1-1/2' each side
Open			
Downhill Side	2'	1-1/2'	1-1/2'
Uphill Side	3'	3'	2-1/2'
Level	2'	2' each side	1-1/2' each side
Height	8'	8'	8'
Tread			
Width			
Minimum	18" 2/	18"	12"
Maximum	30"	24"	24"
Surface	Relatively smooth throughout, no roots or rocks protruding more than 3". Avoid sand and loose materials.	Sections of relatively rough surface, some loose material such as sand.	Relatively rough with very rough short sections. Long stretches of loose rock, sand, and mud desirable where available.
Obstacles (optional)	None	1 to 5 small logs (up to 6" in diameter) per mile on flat terrain.	1 to 5 logs (up to 6" in diameter) per mile lying on flat terrain.
Turns			
Per 1/4 Mile	2	6	11

1/ Upper limit of grade and pitch length for most difficult trails depends on soil type, amount of rock, vegetation type, and other conditions affecting stability of the trail surface.

2/ Increase tread width 6 inches on switchbacks or where side slopes exceed 50 percent.

SNOWMOBILE TRAILS

	Easiest	More Difficult	Most Difficult
Length of Trip			
Full Day	30 - 50 mi.	50 - 75 mi.	75 - 100 mi.
Half Day	15 - 25 mi.	25 - 40 mi.	40 - 50 mi.
Grade			
Max. Sustained	8%	--	15%
Max. Pitch	25%	--	35%
Clearing Width			
One-Way	12'	--	9'
Two-Way	16'	--	14'

Clearing Height Minimum 7' above normal maximum snow depth or 10' above ground, whichever is greater (measured to snow-loaded branches).

Groomed Width			
One-Way	8'	--	5'
Two-Way	12'	--	10'
Turning Radius		25'	
Surface		Minimum: 4" of snow.	
Cross slope			
Maximum for over 50'	15%	30%	40%

4X4 TRUCK ROUTES

	Easiest 1/	More Difficult 2/	Most Difficult
Grade			
Max. Sustained (200-300)	20%	20%	30%
Max. Pitch	20%	30%	50%
Clearance			
Width	Ample clearance for logging truck.	12.5'	8'
Height	Ample clearance For logging truck.	9'	8'
Travel Way			
Width	10'	5.0' for 70" Vehicle width	5.0' for 70" vehicle width
Surface	Rough, irregular. Travel w low Clearance difficult	Some sections are rough, large rocks, mud loose materials,	Rough to very rocks, mud, winching area
Obstacles	None	1 to 5 small logs (up to 6" diameter) per mile on flat terrain	1 to 5 logs (up to 10" 10" diameter) per mile, large rocks
Flow	Two-way traffic difficult and require backing to pass	Two lock-to-lock turns within 150'	Five lock-to-lock turns within 150'
Travel Way Plain (outslope)	Level only as necessary for drainage.	20%	30%
Average Speed	Some slow-speed sections	4-10 mph	2-4 mph
Length of Day Trip	30 to 40 miles	10 to 15 miles	10 miles

1/ Easiest trails usually are built for other purposes.

2/ Most difficult for long-wheelbase vehicles. Short-wheelbase vehicles have maximum hub-to-hub length of 100 inches (for example, Blazers, CJ4's, and Jeeps, which have a 90-inch length).