

Denali National Park Trails Program

Routine Maintenance, Repair, and Operating Standards

December 2018 – December 2023



Work described in this document will serve as the scope of work for compliance with the National Environmental Protection Act (NEPA) under Categorical Exclusion C.11: Minor trail relocation, development of compatible trail networks on logging roads or other established routes, and trail maintenance and repair. *Any work not outlined in this document will require separate NEPA compliance.*

The following mitigation measures are the responsibility of the Project Leader:

Cultural Resources

- Each project completed under this plan will require compliance under Section 106 of the National Historic Preservation Act. Project Leader is responsible for coordinating this process and ensuring that compliance is completed prior to the start of the project.
- If any previously unknown remains or artifacts are found at any time during a project, work will stop and the park archeologist will be notified.

Wilderness

- Each project in wilderness completed under this plan will require a Minimum Requirement Analysis (MRA). Project Leader is responsible for coordinating this process and ensuring that compliance is completed prior to the start of the project.
- Use of mechanized equipment in the wilderness not authorized in a programmatic MRA must be presented to Denali Management Team (DMT) on a case by case basis for decision.

Visitor Experience/Viewshed

- Project Leader will work to minimize cut edges from downed trees visible from trails.
- Special consideration will be given to visitor viewshed and aesthetic; tree and brush removal will be done selectively to maintain a natural characteristic and prevent the creation of a linear trail edge.
- Projects with larger visitor impacts will be done outside of peak visitation season if possible.

Natural Resources

- Project Leader will prepare an annual work plan and present it to the DMT in order to identify resource concerns.
- Small trees and limbs that are within 2' of the trail edge and within an 8' height may be removed between May 1 and August 1.
- Project leads work directly with Denali bird biologists to discuss the trail projects ahead of time so we can determine if early nesting species might occur in project areas.
- In the event an occupied nest is detected, NPS staff will establish a small buffer around the nest that would stay in place until the nestlings have left the nest.
- Any equipment that comes in contact with vegetation or soil used on the east end of the park (mile 0-15) will be washed prior to use in a different area of the park.
- Gravel sources outside of the park will be inspected and deemed weed/seed free before use in park.
- When revegetating an area by reseeding or tundra mat, the underlying soil must be scarified.
- Trail crew must obtain seeds from revegetation staff or they can collect seeds on site as long as invasive seeds are not collected and used.

- Top soil from the east end of the park cannot be used anywhere else in the park.
- Top soil from outside the park must be inspected by revegetation staff to ensure that it is weed/seed free.
- All operations will cease if wildlife are observed to be disturbed or displaced by trail work. Operations may resume when wildlife have moved out of range.
- Appropriate resource management personnel should be contacted immediately if nesting waterfowl are observed near project area.

Introduction and Purpose

The Denali National Park Trails Maintenance Plan defines the standards and methods for maintenance of trails in Denali National Park. These standards outline the types of cyclic upkeep necessary to maintain the function and safety of Denali's trails in accordance with their different classifications, as outlined in the 2011 Federal Trail Data Standards. Denali's trails are classified according to their user groups, accessibility, terrain, and general character. These classifications permit quantification of trails features and associated actions necessary to maintain trails. Older trails may be classified such that repairs to the trail are necessary to improve conditions such that the desired class is achieved, whereas newer trails have been built with trail standards and classifications in mind.

The purpose of this document is to identify which maintenance activities and procedures are considered part of normal maintenance for existing trails and are to be covered by a Categorical Exclusion in accordance with the Denali's compliance process and Director's Order 12. These routine activities take place on existing trails and do not alter the character of Denali National Park or its trail system. Normal cyclic maintenance permits annual upkeep, stabilization, and spot-improvements to trails. These maintenance activities are completed such that the trail class remains unchanged. Normal maintenance also includes repairs and rehabilitation activities performed in response to acute deterioration of trails resulting from weather or geophysical events. Activities that extend beyond this routine maintenance require subsequent management approval and National Environmental Policy Act (NEPA) compliance.

Denali Trails Character

Effective management of the Denali Trail System meets the following objectives:

- Adherence to planning and compliance documents which address the Park's trails
- Protection of Park resources
- Access to safe and meaningful visitor hiking experiences

Recent documents including the General Management Plan (GMP, 1986), the Backcountry Management Plan (BCMP, 2006), and the Entrance Area and Road Corridor Development Concept Plan (EADCP, 1996) all speak to the character of trails in Denali, noting the existence of and creation of trails throughout Denali National Park. Whereas Denali "intends to maintain primarily a 'no formal trails' policy for the designated Denali wilderness area," (GMP, 65) established trails do exist in the park and constitute a resource to be managed and maintained. The GMP documents the entrance area trails and road-corridor trails and the need for ongoing maintenance and upgrades to those existing trails (GMP, 65-66). Outside of the realm of established trails, both the GMP and the BCMP highlight two aspects of trail management required to protect Park Resources in terms of impact to vegetation and other resource impacts resulting from social trail formation.

- 1.) "Trails will also be designed and maintained to discourage social (informal, user created) trail development" (Consolidated General Management Plan, 100).
- 2.) "The second aspect of trail development needed to reduce vegetative impacts is a commitment to annual maintenance of the trail system. Annual maintenance will reduce the potential for trail deterioration and additional vegetation loss from erosion, groundwater disturbance, trail widening, and slope failure. Maintenance reviews could also determine whether trail

modifications are necessary to reduce the number of social trails that have developed or may develop” (CGMP, 101).

The Denali Trails Program operates with knowledge of the Park’s commitment to both maintain few trails juxtaposed with the need for trails to provide resource protection and visitor access in certain portions of the park. With this in mind, the Trails Program strives to work deliberately, providing a durable product constructed with the respect for Wilderness, Park history, visitor experiences and expectations, and the very elements of Denali National Park that make it special, wild, and beloved.

Legal Requirements

Trail construction and maintenance in National Parks are subject to a variety of federal laws and regulations.

National Environmental Policy Act (NEPA)

NEPA (1969) requires that federal agencies consider environmental impacts resulting from any federal action including the construction of infrastructure such as roads, trails, and buildings. Trail projects in Denali National Park are subject to NEPA review. NEPA covers actions that do not have an individual or cumulative significant impact on the environment and are thus not subject to further environmental review as Categorical Exclusions (42 U.S.C. §4321 et seq. (1969)).

National Historic Preservation Act (NHPA)

Section 106 of NHPA (1966) requires that federal agencies consider impacts to historic properties and artifacts. Denali’s trail projects are subject to Section 106 and special attention must be paid when excavation takes place as part of trail construction in maintenance. Denali Trails employees work with park staff to ensure adherence to Section 106 regulations.

The Wilderness Act

The 1964 Wilderness Act established the National Wilderness Preservation System and identified the National Park Service as one of the four federal agencies responsible for protecting and preserving the nation's wilderness resource. The Wilderness Act prohibits construction of roads or structures and the use of motorized equipment and mechanical transport in designated wilderness areas, but provides for exceptions for certain administrative activities through a “minimum requirement” process.

“In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent act.” Sec. 2. (a) of the Wilderness Act.

“All management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine if administrative actions, projects, or programs undertaken by the Service or its agents and affecting wilderness character, resources, or the visitor experience are necessary, and if so how to minimize impacts. The minimum requirement concept will be applied as a two-step process that determines:

- Whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, in accordance with the Wilderness Act; and
- The techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized” (2006 NPS Management Policies, Chapter 6: Wilderness Preservation and Management, 6.3.5 Minimum Requirement).

Alaska National Interest Land Conservation Act (ANILCA)

The Alaska National Interest Land Conservation Act added over 4 million acres to Denali National Park and Preserve in 1980. The act also designated most of the original Mt. McKinley National Park as wilderness, with special considerations beyond those found in the Wilderness Act of 1964.

“The National Park Service will manage all backcountry areas of the national park to protect wilderness resource values and provide opportunities for wilderness recreational activities, consistent with the direction of law and policy, with particular attention to the following:

- ANILCA Section 101 lists “preserve wilderness resource values” as a fundamental purpose of ANILCA.
- ANILCA Section 102(13) states that the term “wilderness” as used in ANILCA has the same definition as in the Wilderness Act.
- ANILCA Section 202(3)(a) states that a fundamental purpose of the Denali park and preserve additions is to provide continued opportunities, including reasonable access, for wilderness recreational activities.

As described in chapter 1[of the BCMP], the Wilderness Act identifies two key components of wilderness character as:

1. generally appearing to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; and
2. having outstanding opportunities for solitude or a primitive and unconfined type of recreation.” (BCMP, 2006)

Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (1918) prohibits the “taking” of any migratory bird including their eggs, feathers, and nests. For trail construction, avoiding disruption to bird habitat and nests as may be found in trees or brush must be undertaken. In order to abide by the MBTA, Denali National Park in coordination with the US Fish and Wildlife Service has outlined the following protocol for activities in Denali NP:

“...we recommend that clearing all vegetation one-meter tall and taller occur between August 1 and May 1, outside of the nesting season for many bird species. Additionally, we recommend removing all cut brush from each site to avoid creating brush piles. Limb-free tree trunks greater than six inches in diameter may be left lying on the ground and removed at a later date” (N1419 DENA).

The Denali Trails Program abides by these guidelines for construction clearing and periodic brushing. Hazard trees and trees blocking pedestrian traffic will be removed immediately and Small trees and limbs that are within 2' of the trail edge and within an 8' height can be removed between May 1 and August 1 to keep the trail corridor safe for visitors; this work is performed under the direction of the trails supervisor.

Architectural Barriers Act (ABA) (1968)

The ABA guides construction and alterations of federal facilities and requires that federal facilities are accessible where reasonable and practicable.

In 2014, the US Access Board issued requirements that are now part of the Architectural Barriers Act (ABA) Accessibility Standards and apply to national parks and other outdoor areas developed by the federal government. The *Accessibility Standards for Federal Outdoor Developed Areas* (Accessibility Standards) address access to trails, picnic and camping areas, viewing areas, beach access routes and other components of outdoor developed areas on federal sites when newly built or altered. The Standards do not apply to trails designed primarily for non-pedestrian use, so that winter trails and OHV trails are exempt. They also provide exceptions for situations where terrain and other factors make compliance impracticable. The new requirements are located in sections F201.4, F216.3, F244 to F248, and 1011 to 1019 of the ABA Standards.

Routine maintenance of trails is exempt from the Accessibility Standards such that tasks such as brushing and erosion control can be undertaken without scoping so long as no significant alterations to the trail are undertaken. The Denali Trails program adheres to Accessibility Standards to the extent possible as permitted by Denali's rugged and remote terrain.

Other Legal Considerations

Other federal and state laws impact Denali's trail logistics, placement, and access. NPS Management Policies, The Organic Act, and Denali-specific policies impact the Trails program. Particularly when considering any trail activity in the Preserve or in parts of the Park adjacent to lands managed by other entities, consideration must be given to rights-of-way, easements, private property, wetlands impact, etc. The Denali Trails program considers these implications and coordinates with other Park work groups, agencies, and governing bodies to ensure compliance.

Denali National Park Trail Classification System

Denali National Park’s hiking trail system can be divided into five distinct classes based on user type, need for access, and terrain; this system is based on the 2011 Federal Trail Data Standards, National Trail Management Classes. Class 5 trails are the most developed and provide access to the most important visitor facilities. Class 1 trails are the least used, access remote areas of the park, and receive no maintenance. Table 1 highlights the differences between the constructed features of the given trail classes.

For the purposes of this document, the designed construction standards of the distinct trail classes will determine the extent to which improvements will be made during routine maintenance and repair. Work that would upgrade or degrade the standards of the trail from one class to another would require separate, project specific compliance.

Table 1. Denali National Park Trail Classification System

Trail Attributes	Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Tread and Traffic Flow	User created trail or game trail. May require route finding. Native materials only.	Constructed tread 18"-36" of native materials when possible.	Constructed tread 24"-48" of native and imported materials.	Constructed tread 36"-72" wide of compacted gravel. Designed to meet Accessibility Standards.	Constructed tread at least 60" wide of a hardened surface such as asphalt. Designed to meet Accessibility Standards.
Obstacles	Obstacles common. Narrow passages, brush, steep grades, rocks and logs present. Downed trees and vegetation cleared from trail corridor.	Obstacles occasionally present. Downed trees and vegetation cleared from trail corridor.	Obstacles present only to insure proper drainage. Vegetation cleared from trail corridor.	No protrusions higher than 2" and no gaps wider than 1/2". Grades typically <5%. Vegetation cleared from trail corridor.	No protrusions higher than 2" and no gaps wider than 1/2". Grades typically <5%. Vegetation cleared from trail corridor.
Constructed Features	No constructed features.	Structures protect trail infrastructure and resources. Drainage is functional.	Retaining walls, steps, turnpike, etc. may be substantial. Trail bridges at water crossings.	Drainage structures frequent, may include road-like designs. Trailside amenities may be present.	Drainage structures frequent, may include road-like designs. Trailside amenities may be present.
Signs	Minimum required.	Signs for basic direction.	Directional signs as needed. Informational and interpretive signs outside of Wilderness.	Wide variety of directional and interpretive signs.	Wide variety of directional and interpretive signs.

Denali National Park Trail Design Standards

The following are design standards for five distinct trail classes.

Class 5 Trails:

Access Trails between MSLC, DVC, Morino Grill, Alaska Geographic Book Store, Train Depot, and WAC Access Trails

Class 5 Standards:

Class 5 trails are designed to provide universal access between the Park's most highly used visitor facilities. Trails and trail features are designed to comply with the *Accessibility Standards for Federal Outdoor Developed Areas*.

Tread is paved asphalt or other hardened surface, at least 60" wide with gravel shoulders. Trail is built using turnpike or bench cut construction, and grades are 5% or less. Outslope on the trail is 2% or less. Trail tread is elevated through wet areas; ditches and culverts are used to provide the necessary trail drainage. Fabric underlayment and well-drained sub-grade materials are utilized to mitigate poor soil types underlain with permafrost.

Bridge structures are constructed of Alaskan yellow cedar wood when possible. Stringer construction with 3"-thick rough-cut decking is used. Log handrails are made using mortise and tenon joinery. Benches are built of Alaskan yellow cedar using saddle notch joinery. Log arm and back rests are built using mortise and tenon joinery. Log bollards are used to keep vehicle traffic off the trail with 8"-16" diameter logs buried 1/3 into the ground. Removable bollards are made to insert into a culvert buried vertically. Fill slopes and retainers are covered with vegetation and evidence of constructed and imported features is hidden.

The trail corridor is cleared of all vegetation 8' high, as well as 2' beyond the width of the trail tread. Large trees on the edge of the trail are limbed, not removed, to provide clearance, so long as no more than half the total height of the tree is cleared of limbs. Trees are limbed to ensure hikers have at least 100' sight distance down the trail to be able to avoid wildlife (See Section 1.0 Brushing).

Trail maps and information, as well as regulatory information are posted at all trail heads. Trail junctions have signs indicating directions to other trails and facilities. All sign design and installation is in accordance with the *Denali National Park Trail Signs Plan*.

Class 4 Trails:

Bike Trail, Mountain Vista Trail, McKinley Station Trail, Morino Trail, Savage Alpine (ABA), Savage Cabin Interpretative Loop Trail, Spruce Forest Trail, Tundra Spur Trail, Triple Lakes Trail (ABA)

Class 4 Standards:

Class 4 trails enable visitors universal access to recreational hiking in the natural environment, and connect important visitor facilities in the park's frontcountry. Trails are designed to comply with the *Accessibility Standards for Federal Outdoor Developed Areas*.

Tread is 36"—72" wide, built using turnpike or bench cut construction. Where the tread width is less than 60" for long sections, passing spaces (minimum 60"x 60") are provided at a minimum of every 200'. Running slope on Class 4 trails is 5% or less, although steeper sections exist over shorter runs: 8% for up to 200', 10% for 30', and 12.5% for 10'. Crowned or outsloped tread surface is maintained up to 2%. 15% grade and 5% cross slope are allowed for runs up to 5' to allow for proper drainage. Trail tread is elevated through wet areas, and ditches and culverts are used to provide the necessary trail drainage and mitigate dewatering the native vegetation. Fabric underlayment and well-drained sub-grade materials are utilized to mitigate poor soil types, especially those underlain with permafrost.

No checks or steps are present to create barriers in the hiking surface. Retaining structures—rock, log, gabion or other design—may be used to reduce the need for long fill slopes of imported material to traverse across steeper hillsides and to support switchbacks. Bridge structures are constructed of Alaskan yellow cedar wood when possible; stringer construction with 3"-thick rough-cut decking is typical. Log handrails are made using mortise and tenon joinery. Benches are built of Alaskan yellow cedar using saddle notch joinery. Log arm and back rests are built using mortise and tenon joinery. Log bollards are used to keep vehicle traffic off the trail. 8"-16" diameter logs are buried 1/3 into the ground. Removable bollards are made to insert into a culvert buried in the ground. Fill slopes and retainers are covered with vegetation and evidence of constructed and imported features is hidden. Informal trails causing resource damage are rehabilitated.

The trail corridor is cleared of all vegetation 8' high, as well as 2' beyond the width of the trail tread. Large trees on the edge of the trail are limbed, not removed, to provide clearance, so long as no more than half the total height of the tree is cleared of limbs. Trees are limbed to ensure hikers have at least 100' sight distance down the trail to be able to avoid wildlife. (See Section 1.0 Brushing).

Trail maps and information, as well as regulatory information are posted at all trail heads. Trail junctions have signs indicating directions to other trails and facilities. All sign design and installation is in accordance with the *Denali National Park Trail Signs Plan*.

Class 3

Horseshoe Lake Trail, Jonesville Trail, Meadowview Trail, MSLC Access Trail, Mt. Healy Overlook Trail, Polychrome Loop Trail, Rock Creek Trail, Roadside Trail, Taiga Trail, Savage Canyon Trail, Triple Lakes Trail (ABA), Tundra Loop Trail

Class 3 Standards:

Class 3 trails provide recreational hiking opportunities in the frontcountry developed area, accessing scenic views and destinations. Class 3 trails also provide an alternative to driving or busing between visitor facilities.

These trails are generally built with compacted gravel tread 24"—48" wide and roots are removed from tread surface. Running slope on class 3 trails is 15% or less when possible, in order to maximize the accessibility of the trail and provide the most sustainable hiking surface. Steeper sections of trail exist when the natural environment or destination requires it. When feasible, trails comply with the *Standards for Federal Outdoor Developed Areas*. Trail construction is full bench construction along curvilinear alignment, with grade reversals and outsloping tread providing cross-slope drainage. Across

flat ground and poor soils, turnpike construction is underlain with engineering fabric and filled with imported gravel. Turnpike may be unbound, rock, gabion, or log bound. Ditching, culverts, and open rock culverts are installed as needed to provide drainage and mitigate dewatering the native vegetation.

Boardwalk is installed to cross areas of permafrost and bogs. Rough-cut Alaska Yellow Cedar planks are set on sills to provide an elevated walking surface and allow water to flow under the trail. Bridges are constructed of Alaskan yellow cedar using stringer construction with 3" x 10" decking and log handrails using mortise and tenon joinery. Log handrails are made using mortise and tenon joinery. Benches are Alaskan yellow cedar using saddle notch joinery; log arm and back rests are built using mortise and tenon joinery. Log bollards are used to keep vehicle traffic off the trail. 8"-16" diameter logs are buried 1/3 into the ground. Removable bollards are made to insert into a culvert buried in the ground.

The trail corridor is cleared of all vegetation 8' high, as well as 2' beyond the width of the trail tread. Large trees on the edge of the trail are limbed, not removed, to provide clearance, so long as no more than half the total height of the tree is cleared of limbs. Trees are limbed to ensure hikers have at least 100' sight distance down the trail to be able to avoid wildlife (See Section 1.0 Brushing). Fill slopes and retaining structures are covered with vegetation and evidence of constructed and imported features is hidden when possible. Informal trails causing resource damage are rehabilitated.

Trail maps and information, as well as regulatory information are posted at all trail heads. Trail junctions have signs indicating directions to other trails and facilities. All sign design and installation is in accordance with the *Denali National Park Trail Signs Plan*.

Class 2 Trails

Blueberry Hill Trail, Gorge Creek Trail, Cloudberry Pond Trail, Reflection Pond Trail, Otter Pass Trail, Washburn Trail, Friday Ridge Trail, Quigley Ridge Trail, Camp Ridge Trail, Brooker Mountain Trail, Skyline Drive, Moose Creek Access Route, El Dorado Creek Access Route

Class 2 Standards:

Class 2 trails provide sustainable routes for recreational hiking in the backcountry and concentrate visitor use in highly impacted areas. This is the standard for most maintained trails in Denali's designated wilderness.

Trail tread is of native materials, with imported gravel as needed. Materials used for construction are procured locally whenever possible. Full bench construction is preferred, with partial bench construction supported by rock or log retaining walls. Long sections of step and run (rough cut planks on buried sills) are used to cross areas of bog and/or thickly vegetated permafrost. Maximum grades will vary depending on the durability of the tread surface. Rocks and roots less protruding into the tread are removed if they pose tripping hazards or will cause tread erosion.

Tread surface is outsloped or crowned. Steeper cross slope dictates steeper outslope on full bench construction, but not to exceed 5%. Ditches are used to carry water alongside the trail, and open rock culverts and swale drains are used to mitigate dewatering the tundra, as well as to move heavy runoff across the trail.

Rock and log retaining walls are used to stabilize the tread surface and backslope at switchbacks and across substandard soils. Only bridges and structures necessary to protect the natural environment are constructed. Trail waysides, benches, and vista clearing are minimal. Corridor is cleared 8' high, as well as 2' beyond the width of the trail (See Section 1.0 Brushing). Informal trails causing resource damage are rehabilitated.

Trail maps and information, as well as regulatory information are posted at all trail heads, but directional signage along the trails is minimized. All sign design and installation is in accordance with the *Denali National Park Trail Signs Plan*.

Class 1 Trails:

Cloudberry Pond Trail, Reflection Pond Trail, Otter Pass Trail, Grassy Pass Trail, Thorofare River Trail, and Washburn Trail, Polychrome Trail (beyond maintained trails), Cathedral Mountain Trail, Thorofare Ridge Trail (beyond maintained trail), Tattler Creek, Cabin Creek/Cabin Peak Trail, Primrose Trail, Thorofare Cabin Trail, Upper West Toklat Trail, Upper Stony Creek Trail, Lower Stony Creek Trail, Healy Overlook (beyond maintained trails), Friday Ridge Trail, Quigley Ridge Trail, Camp Ridge Trail, Brooker Mountain Trail, Windy Creek Trail (beyond OHV subsistence trail), Teklanika Rest Stop Trail, Teklanika West Trail.

Class 1 Standards:

Class 1 trails are user-created trails that provide visitors access to the park backcountry from the Park Road in high use areas. These trails may require route finding. No formal construction occurs on Class 1 trails. These trails have characteristic narrow passages, steep grades, with vegetation and brush present, and rocks and logs present frequent obstacles. There are no constructed features or signage. Trail maintenance is not required, however the park has identified these trails as areas in need of ongoing resource impact monitoring.

Trails in Designated Wilderness

The following established trails pass through the designated Denali National Park wilderness:

- Eielson Alpine Trail
- McKinley Bar Trail
- Savage Alpine Trail
- Triple Lakes Trail
- Polychrome Loop Trail
- Savage Canyon Trail
- Savage Bar Loop Trail
- Savage Cabin Interpretative Loop Trail
- Gorge Creek Trail

A Minimum Requirement Analysis (MRA) is required for all work on wilderness trails.

An accompanying programmatic MRA may be completed to streamline compliance for routine maintenance on wilderness trails including maintaining drains, repairing tread surface, brushing and clearing downed trees with hand tools, use of a grip hoist pulley machine, use of hand powered wheelbarrow or wheeled litter to transport material, repair and replacement of boardwalk, causeway, and running planks, use of a motorized rock drill and explosives to remove large rock fall or hazards, use of hand tools and pulley systems for bridge repair and maintenance. Use of a motorized plate compactor

or roller compactor for tread maintenance as needed on the first ¼ mile of the Savage Canyon Trail, the Savage Bar Loop Trail, the Savage Cabin Interpretive Loop Trail, and the first mile on the north end of Triple lakes Trail.

A separate MRA is required for work on wilderness trails beyond routine maintenance including use of chainsaws or power brushers, all helicopter material flights, and importing of tread material.

Kantishna Area Trails

Denali Park acquired many miles of roads, trails, and winter travel routes when the park expanded in 1980 under ANILCA. Kantishna area lodges identify many of these trails and old roads as hiking opportunities for guests at the Kantishna area lodges. These trails do not receive any regular maintenance, and how they are incorporated into Denali's trails management will eventually be decided through a Kantishna area trails plan. Compliance approval for specific maintenance needs on these trails and routes will be dealt with on a case by case basis.

- Jauhola Trail
- Cloudberry Pond Trail, near North Face Lodge
- Otter Pass Trail, from North Face Lodge to Wonder Lake
- Camp Ridge Trail
- Wickersham Dome Loop Trail
- Moose Creek Road East of Kantishna
- Busia Mountain/Eldorado Creek
- Skyline Drive/Glen Creek/Moose Creek Loop
- Quigley Cabin Trail
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Off Highway Vehicle Trails

Windy Creek Subsistence OHV Trail, Pyramid Peak Subsistence OHV Trail, Cantwell Airstrip Subsistence OHV Trail, Windy Creek (17b) Easement OHV Trail, Cantwell Creek Floodplain Subsistence Route

Off Highway Vehicle (OHV) Trail System

OHV trails in Denali National Park exist to mitigate the impacts of motorized vehicle use for subsistence purposes. Due to the prevalence of boggy and permafrost covered terrain in subsistence-use areas, motorized access can damage park resources. Trails on park lands and park managed easements are maintained to the minimum standard necessary to concentrate use to a single trail and protect surrounding vegetation from braided trails. OHV Routes are designated to allow for subsistence access across durable surfaces where no trail designation is necessary.

Trail tread is of native materials, with imported gravel as needed. Routes along rocky flood plains are used when available. Improvements beyond route definition are minimal, existing only to keep motorized users on the designated trail. Maximum grades vary depending on the durability of native soils. Broad climbing turns are used to reduce mechanical erosion of off-road tires.

Seasonal mud and water puddles are acceptable. Drain dips, parallel ditches, and running planks are constructed to mitigate boggy areas that deteriorate to unusable levels. Brushing and clearing is kept to

a minimum, with improvements made only in an effort to keep users on the established trails. Trail improvements are made primarily to avoid the formation of braided social trails around failing sections of trail. Routes are selected to focus use to a single path, to the point where use is so dispersed that resource damage is minimized to acceptable levels.

Winter Trail System

The Spring Trail from park headquarters to Mile 7 of the Park Road and the Aufeis Trails north of the Park Road to Mile 7 are the only sections of the park's winter trail system approved for maintenance. Other routes follow the Park Road, open areas of tundra, creeks and rivers, or incorporate year-round travel routes, such as the McKinley Bar and Windy Creek Trails, or the Stampede and Moose Creek Roads. Many of the Park's frontcountry trails are utilized by winter and springtime hikers, skiers, and snowshoers.

Backcountry ski and snowshoe routes have been identified on visitor information maps, but they are not marked, cleared, or maintained. Closed loops of campgrounds and frontcountry trails with flat grades may be scraped for hikers, or groomed for cross country skiers with DMT approval, and temporary signs may be added.

Winter snowmachine use is limited to travel on sufficient snowpack, and routes are not marked or defined. With the exception of administrative purposes, snowmachine use is not allowed in the former Mt McKinley National Park and is subject to closure depending on snow conditions in all other portions of the park.

National Historic Trails

Denali has no trails designated as historic at this time. Horseshoe Lake Trail, Triple Lakes Trail, Savage Canyon Trail, McKinley Bar Trail, and Mt. Healy Overlook Trail are all older than 50 years and may be eligible for National Historic Trail consideration. Routine trail maintenance is allowed under this document.

Denali National Park Trails Maintenance Plan

Section 1.0 BRUSHING

All brushing activities will comply with Superintendent's Memo N1419 DENA regarding the park's obligations under the Migratory Bird Treaty Act (MTBA) of 1918, unless specific authorization is obtained from park management. Corridor clearing for new construction, reroutes and brush cutting more than 2' from the trail edge will be conducted during the shoulder season in order to comply with the MTBA and to keep from interfering with visitor use.

1.1 Corridor Clearing

Brush, branches, and downed trees may interfere with pedestrian traffic and limit hikers' visibility of one another and wildlife. All trees and brush more the 12" above ground would be removed from within 2' of the trail tread. All brush greater than 6" tall will be removed within 1' of the trail tread, ditches and culverts. Trees would be cut low to the ground with hand saws or chainsaws. Brush would be removed with loppers, weed whips, or power brushers. See diagram 1.1. Special consideration will be given to

visitor view shed and aesthetic; tree and brush removal will be done selectively to maintain a natural characteristic and prevent the creation of a linear brush line.

Limbs which must be removed from trees would be cut flush with the trunk, leaving no stubs, and shall be undercut to prevent tearing of bark. Trees that are limbed over 50% of their height should be removed completely. See diagram 1.1.

1.2 Backslope Clearing

The backslope of bench cut trail will be cleared of all brush that interferes with the flow of traffic. On trails 24" wide or narrower, the backslope may be cleared to mineral soil to prevent overgrowth and lengthen the maintenance cycle. When possible, native old growth tundra vegetation - tundra or vegetation that has never been altered by man during the original trail building process - is maintained on the backslope as its growth rate is slower than early succession species. In areas where the surface vegetation is creeping down the backslope or into the tread, the vegetation will be cut off the backslope and dispersed or used for rehabilitation projects.

1.3 Tread Encroachment

Vegetation and root matter that creeps into the trail tread will be removed. Vegetated berms on the downslope of the trail will be grubbed and removed with hand tools or during the mechanical re-grading process. Organic matter will be separated from the tread material and removed before the tread is reshaped and compacted.

1.4 Vista / View shed Maintenance Brushing

This maintenance activity preserves and protects existing vistas and viewpoints along the park's trails with routine maintenance brushing. Established waysides, vistas, and stopping points along the trails shall be brushed as needed to preserve intended views for the visitor. Additional vistas shall be brushed only after compliance and review approval.

Old growth vegetation shall never be removed unless authorized through the compliance process. Cut vegetation will be removed completely from the viewshed and from visibility at the wayside, as described in section 1.6.

1.5 Downed and Leaning Tree Removal

Trees that have fallen on back-country trails and are blocking pedestrian traffic shall be removed as soon as possible. Trees fallen on high use front country trails will be removed immediately using any qualified park personnel and equipment. Leaning or fallen trees blocking an 8' trail height corridor will be removed or trimmed to provide clearance. Special consideration will be given to the use of hand tools in wilderness areas.

Those trees showing visible signs of deterioration, damage, *ie.* splits, uplifted roots, excessive leaning, will be considered for removal. Prior to felling any tree impeding or threatening a trail or facility, the Trails Foreman will consult with the park's avian biologist regarding MBTA compliance.

1.6 Slash Dispersal

Slash collected during felling, limbing and brush cutting operations is either back hauled or dispersed out of sight of the trail. Backhauled vegetation that is free of dirt and roots is taken to one of the designated brush piles that Fire Management Personnel manage for disposal. Slash may be hand carried, wheelbarrowed, or machine hauled to the trail head and trucked to the brush piles.

Slash collected in areas that are not feasible for backhauling due to distance from the trailhead is dispersed out of sight of the trail and scattered to reduce piling and disturbance to vegetation and wildlife.

BRUSHING MAINTENANCE

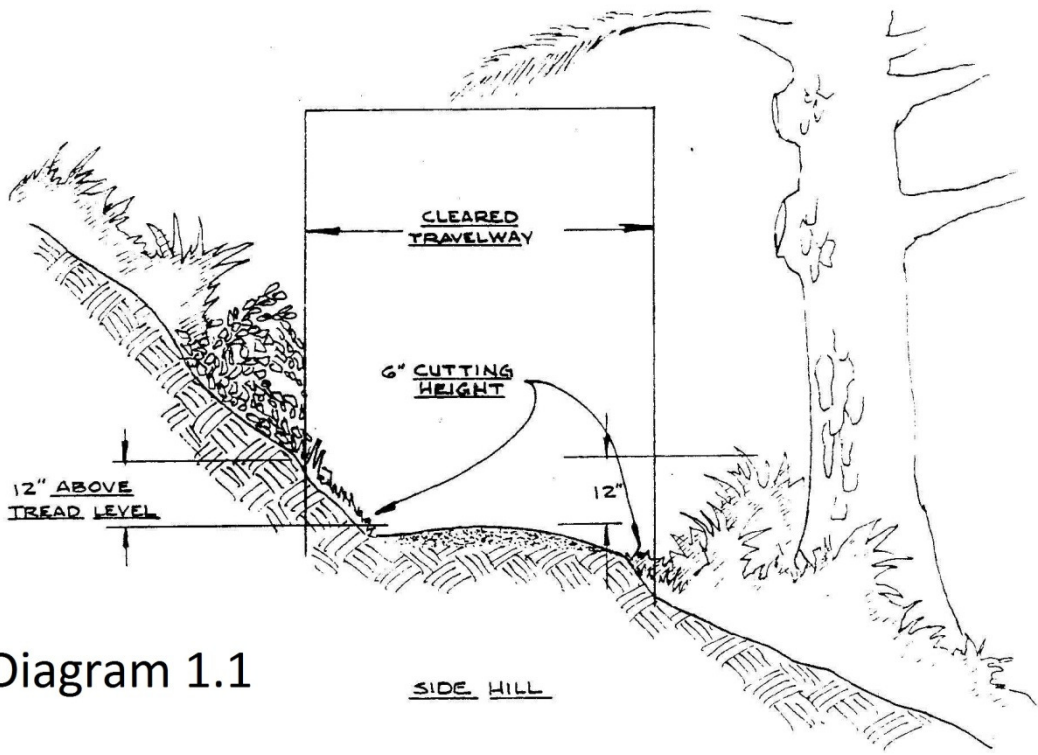
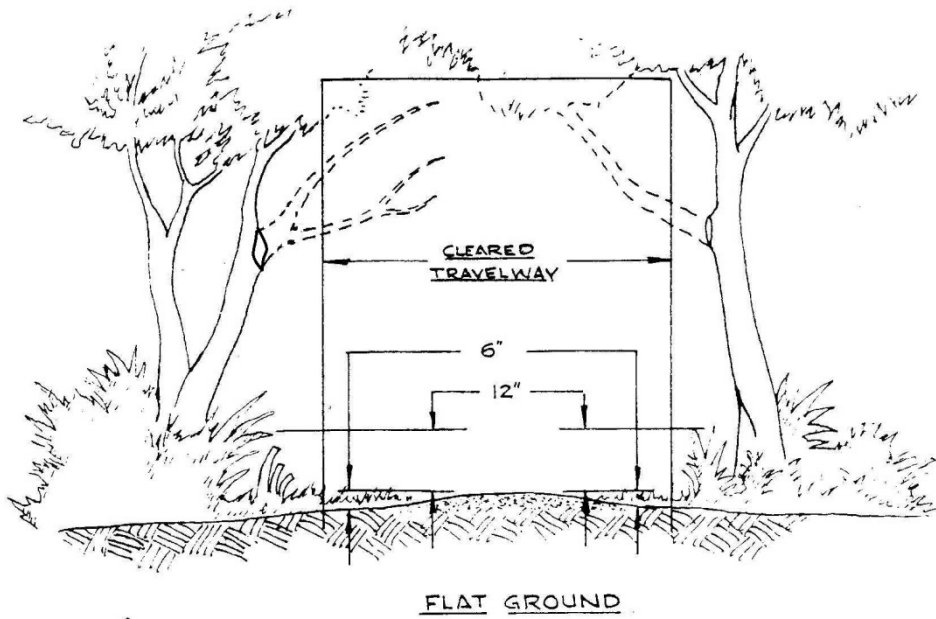


Diagram 1.1

Section 2.0 TREAD MAINTENANCE

This section governs the methods of tread repair and maintenance; material grading and replacement, preparation of native soil and imported sub-grades, importation of aggregates, and compaction.

2.1 Tread Surface:

The goal of surface maintenance, replenishment and compaction is to provide the Park's trails with a firm, tractionable and maintainable surface free from washouts, puddling, loose gravel accumulation or any deviation in grade or outslope beyond the trail design standards.

Material for trails east of the Toklat River will be replaced in kind with Trail Mix (Teklanika Pit gravel screened to 3/4"). Trails west of the Toklat River will be surfaced with D-1 crushed gravel from the Denali National Park stockpiles. Surface materials shall be free of organic matter, high proportions of clays or silts, or other deleterious matter. In instances where gravel composition is not conducive to good compaction or durability, additives may be utilized to improve soil stability.

Additive test sections on the Bike Trail include ResinPave, a non-toxic additive yielding a concrete-like surface with natural color. 100% bentonite was also added in different levels to increase the "fines" content of the gravel mix to assist in water retention and firmness. Test sections with additives have been inconclusive and it has been determined that Trail Mix is the best material for use in meeting the Accessibility Standards. In order to maintain a firm and stable tread, cross slope on Trail Mix-surfaced trails may exceed Accessibility Standards.

Tread material in backcountry settings is primarily native soil. In many areas, native soils with high mineral and aggregate content appropriate for trail surfacing are not readily available. Re-grading the existing tread surface to designed standard for outslope and tread width will minimize the need to import new tread material. Durable tread material will be imported from borrow pits or gravel acquisition by following means: bags, wheelbarrows, power wheelbarrows, skid steers, dump trucks, or helicopters. Any use of mechanized equipment in designated wilderness areas will adhere to the MRA process.

Borrow pit locations with appropriate material will be selected to minimize impacts to the natural and cultural environment and visual impacts to visitors. Locations are close enough to the deficient trail to be economical and to reduce environmental impacts from trampling.

2.2 Surface Preparation:

Scarifying or rough grading to the lower depth of surface irregularities will be done across the entire travel surface width in the area to be worked. Excess subgrade material exposed in the rough grading process will be redistributed along the trail or transported and stockpiled for future trail projects.

In areas where removal and stockpiling of subsurface material is not feasible, the material will be side cast or dispersed. Proper disposal minimizes the visual impacts to visitors and disturbance to the natural environment. No materials will be cast or dispersed into watersheds.

This work will be done with skid steer equipment on Class 4 and Class 5 trails built to withstand such traffic. Hand picks and grubbing tools will be used as needed on all other trails.

Trail width shall conform to the trail design standard.

2.3 Aggregate Placement:

Imported aggregates will be added to the subsurface layers of the trail to compensate for material lost due to erosion and subsidence. Aggregate placed on organic or permafrost soils will be isolated using geotextile underlayment.

2.4 Compacting:

Mechanical compaction will be achieved using vibratory rollers or plate compactors. Hand held plate compactors will be used when mechanical compaction is not possible. Whenever possible the moisture content will be brought to optimum by the addition of water or by the drying of existing material. Water may be added to stockpiles or directly to the surface material if waiting for rain is neither feasible nor prudent.

2.5 Water Use:

Water for compaction and revegetation shall be obtained from the nearest approved source using approved methods.

2.6 Asphalt Surfaces:

This section shall govern the methods of asphalt surface maintenance and repair procedures, addressing application of new asphalt pavement placed in repairs on a prepared base or over existing pavement; pothole patching, crack sealing and surface sealing.

The goal of asphalt surface maintenance and repair is to provide the paved pathways with a firm, hard and maintainable surface free from open cracks, alligating, potholes, shoulder unraveling, and uneven pavement surfaces. Asphalt repairs to uneven pavement surfaces due to subgrade frost activity and subgrade spring runoff saturation will not be attempted unless the problem will not correct itself through normal thaw and drainage, or it presents an immediate safety problem.

This activity shall commence when the above mentioned elements increase to the following levels: Cracking which widens to a gap sufficient to accept application of sealant (approximately 1/8" in width), or which extends through the asphalt depth; alligating, potholing and shoulder unraveling whenever such areas are discovered; uneven pavement surfaces whenever abrupt deflections occur at depths of 2" or more along a linear run of 10'.

Removed asphalt will be stockpiled and recycled by crushing methods then reused in areas with low volume traffic.

2.7 Crack Sealing:

A rubberized liquid emulsion of adequate resiliency to withstand Arctic environments shall be applied by methods which treat each crack as an individual repair. An emulsion of ASTM D-3405 (or equal) is recommended. The emulsion will be applied in such a manner as to provide a uniformly bonded seal

from bottom to top, with a 100% bond along each side. The top of the repair will be no more than 1/8" above adjacent road grade and will be installed by means which approximately matches the top crack width without allowing accumulation or runoff of excessive material. Traffic will be kept off the repair site until such time as 0% of the product is susceptible to footwear pickup or tracking; a light sand blotter may be applied in areas where adequate traffic control cannot be achieved, prior to release for traffic use.

2.8 Larger Asphalt Pavement Repairs:

Repairs to asphalt pavement section failures or re-leveling shall consist of one or more courses of mixed paving asphalt and graded aggregate placed either cold or hot upon the section to be repaired. Pavement that is removed will be recycled using crushing methods and reused in areas with low volume traffic or stockpiled temporarily on park land, used as a rough fill which shall be 100% covered within approved sites, or removed from the park.

Areas to be repaired will have site preparations made to provide a vertical and clean repair edge. If the asphalt pavement is constructed directly upon an existing hard-surfaced pavement, a tack coat of either AR1000 paving asphalt or Grade SS-lh emulsified asphalt (or equal) will be uniformly applied to the area of repair at a rate of 0.5 gal. per sq. yard surface area prior to applying the asphalt pavement. The contact surfaces of all other cold pavement joints will be similarly treated. Surfaces where a tack coat is to be applied shall be free of water, foreign material or dust.

Asphalt pavement shall not be placed when temperatures are below 40°F or during unstable weather. The depositing, distributing and spreading of the asphalt within the repair will be a single and continuous operation which, once started must be continued until completed. During spreading and leveling of the asphalt material care shall be used to prevent separation of aggregates and fines due to over handling. No greater amount of asphalt shall be applied in one day than can be properly distributed and rolled during that day.

Specified thickness of each course will not exceed 4" without applying uniform compaction. Asphalt pavement will be compacted thoroughly by static steel drum rolling whenever possible. All rolling shall be commenced at the lower edge and gradually be advanced evenly to the crown. No rolling operations shall allow jerking, stopping on the repair or excessive speeds. No petroleum products shall be allowed to come into contact of the repair through either leakage or contamination. Upon completion the pavement will be true to grade and cross section. Grade will be verified by a 10' straight edge laid on the finished surface parallel to the centerline. The finished surface will not be at variance by more than 1" from straight edge alignment, except at intersections and changes in grade. Where areas exist that are not within tolerances, they will be brought to grade immediately following initial rolling. All loose aggregate shall be swept off the pathway and excess asphalt material removed from the work area within 24 hours after completion of the repairs to the section.

Section 3.0 TRAIL STRUCTURE MAINTENANCE

The goal of structural trail maintenance and repair is to provide the Park's trails with safe and maintainable hiking surfaces. Trail Design Standards and Trail Maintenance Objectives determine the user type, use level, and construction techniques needed to bear the intended use. Trails are open throughout the year and exposed to above normal wear and tear during spring break-up, with increased surface runoff and saturated substrate materials, along with aufeis buildup and snow cover on the hardened walking surface.

Maintenance or repair activities which address these elements are as follows: surface and base materials, engineered cloths and hardening structures; sub-surface drainage (e.g. use of crush), down slopes and stabilization structures including crib walls, gabions, turnpikes, etc. Surface materials and maintenance are also addressed in Section 2.

Drainage structures including drains, ditches, culverts, etc., are another integral part of trail structure. Common drainage structures found on Denali's trails and maintenance of these structures is covered in this section.

3.1 Surface Materials:

Surface material used on Denali's trails is typically either native material or Tek "Trail Mix." The application of surface materials provides the walking surface for the trail and is approximately 1" thick. Native tread either occurs in situ, comes from nearby construction of backslope, ditches, and drains, or comes from borrow pits. Imported tread material is delivered using gravel bags, litters, wheelbarrows, toters, helicopters, or some combination of these vessels. Surface completion of trail mix benefits from compaction as compaction helps to adhere the "fines" in the mixture, resulting in a hardened surface. Compaction is completed using hand tampers and/or compactors.

Maintenance to tread materials involves the raking and re-shaping of existing materials and/or the importation of new volumes. The combination of use, settling, and erosion requires improvements to tread periodically on most trails. Maintaining trail tread ensures longevity and safety of the trail. Trail tread is to be shaped for appropriate sheet flow and drainage, including outslope, inslope (into ditches), and crowning.

3.2 Base/Subgrade materials:

Whenever possible, native materials at the site of the trail construction or repair will be used as the trail's base. Ideally these materials are free of clays, organic matter, excessive moisture, or other structurally unsound material. The depth of base materials will vary significantly by location, but is ideally no less than 2" thick. In high moisture areas, crushed rock may be added to the base as a type of buried drainage assist. Also, when needed, gravel (1" minus or similar) may be imported (using the same tools and techniques for import of tread material) to establish a more sound base in areas with moist and unstable soils. Gravel acquisition sites and policies are addressed in Section 2.

Depending on the location of the need, quantity of material needed and the quality of material available, borrow pits may be developed to provide a source of native material beyond what is readily available at the tread surface. Borrow pit site selection will be based on the quality of sub-surface materials, visible disturbance, and ability to rehabilitate the site. Borrow pits will be filled with organic

matter and debris from trail construction activities, and covered with vegetation to minimize lasting disturbance. Qualified park staff will evaluate all proposed borrow pit locations for compliance under Section 106 of the NHPA.

In-place material that is unsuitable for the planned use shall be excavated and disposed of based on surrounding terrain. In some cases, widespread casting is appropriate using shovels, litters, or gravel-hauling bags. In some cases, materials may be removed from the site and used elsewhere (example, filling in borrow pits, etc.)

3.3 Aggregate Fillers and Binders:

See 2.1 for description of Trail Crew use of binders, etc.

3.4 Engineered/Geotechnical Products

The Denali Trails program has installed and experimented with engineering fabric, Typar, Geo-web, and other engineered products over the years. Some of these attempts have been successful, permitting trail construction in moist areas. At other times, these products have become visible in the trail tread, requiring removal. The use of these products has diminished in recent years. In the future, consideration of these types of treatments and hardening will be assessed on a case-by-case basis. Minimum depths should be no less than 6" below the surface.

3.5 Tread and Slope Stabilization Structures:

In order to maintain stable tread in areas with side slopes and in wet areas, different types of structures are employed. These structures require occasional maintenance as wood rot, erosion, or wear and tear alters trail tread.

3.6 Turnpikes & Causeways

Turnpikes and causeways elevate the trail above the surrounding landscape, often serving to keep the tread drier than the surrounding terrain. Turnpikes, in particular, are bound by logs or stones and may employ the use of lateral ditches and cross drains. Original construction of bound turnpikes may require transport of materials using either human-power or machinery (helicopters, totes, etc.). Hardware such as re-bar or spikes may also be used in the construction of these structures. Upkeep of turnpikes and causeways may occasionally require complete replacement as rocks and logs disconnect from the structure through either erosion or rotting.

3.7 Retaining Walls:

Retaining walls can be built using a variety of different techniques and materials and are used to keep materials in place that might otherwise quickly erode (e.g. downslope areas with sandy soils). Whenever possible, less obtuse solutions for effective trail construction should be employed and more significant construction of these types of structures should be used whenever conditions demand or Trail Class absolutely require such structures.

Denali Trails have used or considered the use of log crib walls, gabion walls (metal cubed shaped "nets" filled with durable rock), and rock retaining walls in a variety of locations throughout the park. Generally, these structures are to be built durably using adequately sized materials (e.g. logs measuring greater than 8"). Retaining structures are also to be built such that they are not a focal point, but rather

blend in to the landscape as much as possible. Local materials should be used whenever possible. Pressure treated materials, concrete, and milled products should be avoided.

3.8 Slope Maintenance:

All slopes adjoining trails or on which trails sit collect and direct water flow. All slopes function best and avoid collapse if built to no more than 45% slope. Back slopes and adjoining uphill ditches will be designed to adequately handle foreseeable water volumes within that specific area. Contingent on soils in the area, hardening of some slopes (with large cobbles, etc.) may be advantageous. Back slopes will be maintained to allow for unrestricted drainage to an established drainage structure. This will include yearly periodic grading, shaping, and clearing to maintain a smoothly uniform ditch system which is free from obstruction, ponding, or areas of settlement. Back slopes and downslopes shall, with rare exception, be comprised of local, native material. Fill slopes may be native material or imported gravel based on trail class and location. Where beneficial (for slope stabilization) and where revegetation will not impede proper drainage, tundra mats or reseeded may take place on slopes adjoining a trail.

Additionally, effective delineation of the downslope is important to keep hikers on the actual trail and to prevent the perception that one is to walk where the downslope begins. Re-shaping downslope sections and fill slopes may be periodically necessary to clarify the proper trail tread location.

3.9 Drainage Structures

This section governs the methods of repair, installation and maintenance of drainage systems and their components. The goal of drainage system repair and maintenance, including installation of components such as culverts, is to provide trails with management of water flow type, volumes and rates affecting Denali's trails.

Routine maintenance shall occur annually to prevent build-up of sediments, debris and encroaching vegetation as well as to provide site specific structural inspections. Additionally, maintenance of failing structures must be undertaken as needed.

3.91 Ditches

Ditches located alongside trails are used to catch water traveling on either side of the trail in an effort to keep the water from pooling/running on the trail tread. Where a side slope is present, ditches are most often placed on the uphill side of the trail in order to catch water as it sheds downhill and direct water to established drains or culverts along the trail. Ditching may also be installed to catch water as it sheet flows off the side of a trail built with a 2% outslope or exits a drain. Ditches should be constructed such that they are ample in volume (up to 2' wide and 18" deep). As pertinent, ditches may be hardened with crush or other material and/or revegetated with tundra and other plants to allow roots to add stability to the ditch's back slope. Ditches require routine maintenance to clear organic and soil debris that sloughs into the ditches periodically.

3.92 Open Drains, Grade Dips & Swales

Interruptions to the prevailing grade of the trail tread permit fall-line bound water to exit the trail surface. Simple open drains are shallow trenches placed in the tread perpendicular to (or near-perpendicular to) the tread that permits the water to depart the trail. Grade dip structures "reverse" the prevailing grade of the trail temporarily, halting the flow of water and directing the water off the

tread and should be a part of initial construction. At times, drains and dips may require hardening, including the installation of crush, rip rap, or large stones. Drains and grade dips may require periodic cleaning, tread work, and re-shaping.

3.93 Waterbars

Waterbars utilize either rocks or wood to form an “apron” that catches water and directs water to a ditch next to the trail. Waterbars tend to require maintenance as tread material erodes around either the wood or rocks out of which the “bar” is constructed. Installing additional material, maintaining the appropriate shape of the drain/apron, and clearing ditches associated with water bars are all parts of routine upkeep.

3.94 Culverts

Culverts can be open (trail tread is interrupted) or closed (trail travels over culvert relatively uninterrupted) and can be made of metal culvert material, rocks, or wood. Metal culverts make for quick installation, but in Denali’s permafrost, they tend to move back toward the trail surface, requiring that they be dug back in every few years. All culverts require seasonal cleaning both in and around the entrance and exits to the culverts.

Section 4.0 REVEGETATION

Efforts to revegetate closed trails and rehabilitate disturbed areas are done to minimize the risk of non-native species taking root within the park, and to reduce the visual impact of human presence to visitors. Maintenance efforts to this end on the park’s trail system will follow the guidelines and protocols established in the *Native Plant Revegetation Manual for Denali National Park and Preserve*.

Revegetation as contemplated in this document will be limited to rehabilitation of failed sections of trail, and to mitigate the effects of trampling and creation of social trails redundant to the designated trail system.

4.1 Transplants

Due to the slow rate of growth of many native plant species, every effort will be made to salvage old growth vegetation intact and transplant it into disturbed areas. Tundra mats will be cut by hand or with the digging bucket of a machine and transported and placed on the disturbed areas. When possible, the whole organic layer down to mineral soil should be collected and transplanted, to ensure sufficient nutrition.

Moisture retention has proven crucial to survival rates of transplants. To that end, the soils receiving the vegetation will be scarified to allow roots to grow into the native subsoils. Vegetation will be planted slightly below grade to increase water absorption to the roots. Organic soils will then be packed around the vegetated mats to diminish water loss through evaporation and runoff.

When shrubs or trees are transplanted, as much of the root system as possible will be harvested intact. Sufficient excavation to receive the entire root system below grade will help retain moisture.

4.2 Seeding

When sufficient transplants are not available to cover a disturbed area, seeds approved for use within the park may be planted on the affected areas.

Soils will be scarified prior to seeding to help seeds take root. When possible, topsoil or peat will be imported to the area to give the new plants soil to grow in. Materials brought in to support seeding efforts will be weed free, and approved by a revegetation technician.

4.3 Watering

Revegetation plots in highly visible or ecologically important areas will be watered to help ensure plant survival and regeneration. Water may be collected from the park's water systems, or from streams or rivers identified in *the Stipulations for Water Drafting for Road Maintenance Purposes* document, in Section 2.5.

Section 5.0 REROUTES

This section governs the methods of repair and maintenance to sections of trail that fail to meet design criteria and the trail structure and surface has become unmaintainable. Erosion from changing stream channels or mass movement from heavy runoff may make the routing unusable.

Reroutes to trails as contemplated in this document would be limited to replacing failed trail sections. The best design and construction methods possible are incorporated into the new work, but improvements are limited to the design criteria for the given trail class. Upgrading the trail to a higher design standard or changing the destination would require approval beyond the scope of this document.

All reroute work must be approved by the Trails Foreman.

5.1 Alignment:

Curvilinear design with bench cut construction and cross slope drainage is employed wherever possible. Grade reversals and swale drains are constructed to maintain natural drainage patterns.

5.1 Corridor Clearing:

Brush, trees, stumps, vegetation, and organic materials will be harvested from the reroute corridor and disposed of through revegetation efforts or dispersed according to Section 1.6 or Section 3.2. Vegetation and roots will be removed from impacted soils under the trail tread and in the back slope with picks, pulaskis, griphoists, winches, or heavy equipment. Trees near enough to the trail tread to have roots severed over 30% of the circumference of the tree will be removed completely. All other vegetation will be removed according to standards in Section 1.1.

5.2 Tread Construction:

Techniques and standards for reroute construction are the same as in Section 2.0 Tread Maintenance. New construction will generate larger amounts of vegetation, organic matter, and mineral soils; especially during bench cut construction. This quantity of material is used to stabilize and revegetate the failed sections of trail, as per Section 4.1. If a surplus of material is generated during excavation, the

mineral soil may be used to repair other sections of tread. If the material cannot be used on the trail, it will be dispersed as discuss in Section 3.2.

6.0 BRIDGES, PUNCHEON, and BOARDWALKS:

This section governs the methods of maintenance and repair of bridge structures on the park's trails. The goal of bridge maintenance and repair is to provide the traveling public with safe and adequately maintained bridges.

6.1 Inspection:

Repair needs shall be identified during annual condition assessment inspections and repairs made on a scheduled or as needed basis. All components of the bridge, including approaches, abutments, stringers, decking, hardware, towers, and railings will be inspected for functionality. Rotten materials will be noted, assessed, and replaced as needed.

6.2 Repairs:

The Park's trail bridges are designed to bear the appropriate visitor traffic and snow load. Accordingly, any repair shall not reduce the bearing capacity of the structure. Park engineers will be consulted as needed to determine if changes may impact the load bearing capacity of the structure.

6.3 Maintenance:

Abutments and pilings may be protected as needed to prevent stream erosion occurring alongside the bridge structure. River rock selected locally will be placed to prevent structural erosion. Work will not change the stream flow or create new channels.

Alaska Yellow Cedar will not be treated with wood preservative, as it has been chosen as the preferred material because of the natural rot resistant characteristics. Sill logs will be replaced when rot has significantly reduced the structural integrity. Sills that have been eroded may be elevated or stabilized with rock, gravel, or replacement sills. Boardwalk sills will be adjusted to compensate for settling and jacking and maintain a level walking surface. Rotten decking will be replaced as needed and hazards will be removed. Log hand rails and bull rails will be reinforced or reattached with new hardware as needed, and they will be replaced when they are no longer functional.

6.4 Replacement

When bridges, boardwalks, and puncheon reach the end of their service life, they will be replaced in kind with structures of similar material, size and style.

6.5 Emergency repairs

In the event that structures are damaged or destroyed by earthquakes, landslides, flooding, or other acts of God, emergency repairs may be necessary. Repairs and replacement will follow this plan and the Trails Forman will pursue an MRA to authorize helicopter and motorized tool use in wilderness areas if the trail needs to be opened immediately.

7.0 TRAIL SIGNS AND MARKERS

This section governs the maintenance and repair of signs and markers at trailheads and along the park's trails. The goal of sign and marker maintenance and repair is to provide the park's visitors with appropriate directional information, maps, as well as safety and regulatory information.

Repair and maintenance to these elements shall be done on a periodic basis to stay accurate and accessible. As the trail system changes, accurate signs will replace outdated ones. Changes will be recorded in the *Denali National Park Trail Signs Plan*, developed in conjunction with the Office of NPS Identity at the Harper's Ferry Center.

7.1 Signs and Markers:

Temporary signs in addition to those in the *Trail Signs Plan*, will meet the following standards: signs shall be printed with NPS symbols and backs and posts shall be painted NPS brown. Construction will be 1/2" plywood backing and 2"x2" posts.

Work zone safety marking will be employed at the direction of the Trails Foreman, and signage will comply with standards set in the *Manual on Uniform Traffic Control Devices*.

7.2 Pavement Marking:

Marking on Class 5 trails near the Visitor's Center on the asphalt surfaces will be installed under direction from park management to help visitors find the MSLC and Dog Demo Bus Stop.

Reapplication of spray paint on paw prints will take place on a semiannual basis, and dinosaur tracks will be replaced when needed.

8.0 SNOW AND ICE CONTROL

The park's trail system is open for use year round. Skis and snowshoes are permitted on trails as conditions permit. No snow removal from recreational hiking trails takes place. Trails are not closed due to snow and ice conditions, however visitor services' staff may advise users to execute caution or avoid certain areas given hazardous conditions.

Snow is removed from trails that provide access between visitor and staff facilities and parking areas.

9.0 TRAIL EMERGENCY CLOSURES PROCEDURES

Emergency procedures shall take effect when extraordinary situations or conditions that present an immediate hazard to visitors or staff are present such as trail washouts, rock slides or mudslides, erosion from high water events, heavy summer snow storms. Trails that are unsafe will be closed until sufficient repairs are made that allow for safe passage. Visitors will be notified at the Visitor's Center and through signage at the trailhead. If it is determined that trail tread materials are saturated with water and excessive erosion is imminent with normal traffic, seasonal or conditional closures of trail sections could be enforced.

Emergency wildlife closures will be under the control of the Resources Division.

Trails maintenance personnel observing, participating or responding to these situations will work the Ranger Division to assess the need for trail closures.

10.0 TRAIL MAINTENANCE METHODS AND TOOL USE

The trails foreman will supervise all trail maintenance work performed by NPS Staff, volunteers, or contractors.

Trail crew staff will use the safest and most efficient tools available to complete all maintenance tasks. Along with the standard tools for landscaping and road construction in Alaska, tools and transport

means may include helicopters, power wheelbarrows, skid steers, dump trucks, excavators, chainsaws, power brushers, rock drills, plate compactors, vibratory rollers, chain and cable hoists.

11.0 OHV TRAIL SPECIFICATIONS

Maintenance is performed on subsistence OHV trails to concentrate use to identified routes through subsistence use areas. Trail crew will use 4-wheeled and 6-wheeled OHV's per NPS and Park Policies. Skid steer loaders, mini excavators, and small dozers may be used to perform maintenance work. Crews may establish backcountry camps for up to 8 days at a time, following park backcountry operations protocols. Fill material for trail construction would come from either the trail alignment itself or from the nearby un-vegetated gravel floodplain.

OHV trail maintenance may include the following:

- Clean, repair, align and install existing water diversion features including rock or log water bars, ditches, drains, or other drainage related structures
- Replace, install or repair worn or broken soil retention structures including checks (yellow cedar, ACQ pressure treated lumber, native spruce logs, etc.), cribbing, geotextile fabric, hexagonal underlayment or other structures to aid in soil retention
- Replace, repair or resurface tread materials with like materials to ensure trail is passable
- Remove brush, down trees, and debris or rubble from trail corridor to ensure trail is passable
- Repair, replace, or install wood running plank (sills, stringers, decking, hardware)
- Minor realignment of trail to replace failed trail segments, within existing trail standards

References

Native Plant Revegetation Manual for Denali National Park and Preserve (2000)

Denali National Park and Preserve General Management Plan (GMP), 1986 (also Consolidated GMP; page #s cited here are from the Consolidated plan)

Denali National Park and Preserve Backcountry Management Plan (BCMP), 1996

Denali National Park and Preserve Entrance Area and Road Corridor Development Concept Plan, (EADCP), 1996

National Environmental Protection Act (NEPA), 1969

National Historic Preservation Act (NHPA), 1966, Section 106

Migratory Bird Treaty Act (MBTA), 1918

N1419 (DENA), in Memo to USFWS, correspondence from Paul Anderson, April 20, 2006; re: MBTA protocol in Denali NP

Americans with Disabilities Act (ADA), 1990

Architectural Barriers Act (ABA), 1968

NEPA, Section 102: Directors Orders 12, Chapter 3, "Categorical Exclusions, Interim Guidance," Categorical Exclusion Form available at:
<http://www.nature.nps.gov/protectingrestoring/do12site/appendix2/apndx2.htm>

Manual on Uniform Traffic Control Devices, 2009

Accessibility Standards for Federal Outdoor Developed Areas, 2014
The Wilderness Act, 1964, Section 4(c), Minimum Tool Use

Denali National Park Trails Signs Plan, developed in conjunction with the Office of NPS Identity at the Harpers Ferry Center

Federal Trail Data Standards, Standards Development Group, Federal Geographic Data Committee. 2010

2006 NPS Management Policies