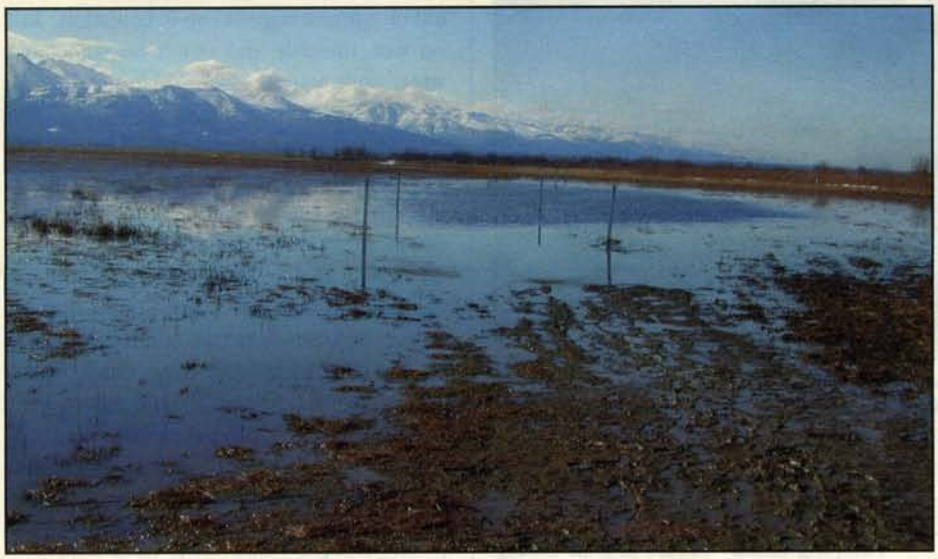
Hard Trails in Alaska

Responding to ATV Impacts on the Last Frontier



Alaska is a land of vast mountain ranges and extensive wetland landscapes. Access across these landscapes presents challenges to users and to resource managers charged with protecting them.

by Professor Tom Hunt

ALASKANS depend on all-terrain vehicles (ATV) like most rural Americans depend on their pickup trucks. They are the utilitarian vehicle of choice. Some homesteaders simply have no other practical and affordable means of accessing their remote cabins.

In Alaska, the land divides while the trails unite. Trails connect, convey and create corridors of passage. Trails are part of the storied cultural geography of the Northland where passages like the Iditarod and Chilkoot Trails pierce and traverse an untamed and impenetrable backcountry. In the north, air and water travel is limited, there are few roads, and apart from ATV trails, the interior is generally inaccessible to the average citizen.

Few trails were planned to serve as ATV trails, in fact, very few are specifically constructed for ATV use. They typically follow preexisting foot and game trails or they develop where individual riders follow natural corridors to remote sites. In winter, snow machines and dog sleds provide sensible and functional transportation. Winter users, familiar with their snow covered routes, often return during the summer season to traverse the same routes. When ATV trails develop along traditional winter routes across snow covered meadows, the landscape is not as forgiving, even for those conscientious of landscape beauty and ecological integrity. The winter routes melt away in springtime to vulnerable wetlands and alpine tundra areas that do not readily sustain summer ATV traffic.

Even in the immensity and remoteness of the Alaskan landscape, it's hard to find places devoid of the tell-tale signs of humanity. For some time, the myriad visual clues resulting from the impacts of recreational and utilitarian ATV use escaped the attention of natural resource managers. But eventually, fisheries biologists began to notice habitat impacts associated with ATVs, especially at stream crossings. Wave action, bank erosion, bed disturbance, and runoff were accelerating the sediment loading and habitat destruction of critical spawning and rearing areas. The long-term cumulative impacts of ATV use, they claimed, were no different than the impacts caused by an industry such as timber harvest. Whereas timber harvest impacts could be mitigated through controls on the industry, ATVs were largely unmanaged.

Resource managers now understand that degraded trails are a significant environmental liability due to their impacts on vegetation, soils, site hydrology, wildlife and fisheries habitats, and site aesthetics. For trail users, degraded trails decrease the utility of trail systems and devalue the trail use experience. With increased use of backcountry resources by ATVs, the mileage of degraded trails is increasing at a rapid rate, and until recently, few management options have been available to counter those impacts.

Today, resource managers from around the state are working in cooperation with ATV manufacturers and distributors, recreational and utilitarian ATV operators, local governmental and nongovernmental organizations, and environmental groups to develop management options that limit environmental degradation, but still allow for a quality trail use experience. One such veteran resource manager is Kevin Meyer, a soil scientist with the National Park Service – Rivers, Trails and Conservation Assistance Program (NPS – RTCA). Meyer is a front line player in the development of Best Management Practices (BMPs) for trail development and maintenance options, a pioneer in the field of developing scientific solutions to the trail degradation dilemma in critical habitats.

According to Meyer, "Environmental impacts associated with ATV trails in Alaska have developed into a serious concern. Where ATV trails cross alpine areas, wetlands, steep slopes, and areas with sensitive soil conditions, their cumulative use often

An ATV rider confronts a degraded wetland trail segment.

Kevin Meyer, a specialist with the NPS Rivers and Trails Program traverses a newly installed section of hardened trail at the Palmer Hay Flats. Photo credit: Erik Hill, Anchorage Daily News

leads to degraded trail segments. Degraded trails develop when trail use exceeds the carrying capacity of a given landscape. Environmental damage is both direct and indirect. The surface traffic directly impacts a site's vegetation and soil resources, and indirectly disrupts adjacent hydrology and leads to soil erosion and sedimentation. Both direct and indirect impacts degrade habitat, water, and aesthetic resources. The challenge facing Alaska's natural resources managers is to develop, test and employ management responses for the source as well as the effects of the problem."

Meyer's simple progression of trail degradation goes like this:

Abrasive loss of protecting surface vegetation and root mass

▼

Compaction and surface subsidence

▼

Hydraulic disruption

▼

Breakdown of soil structure from shearing and pumping

▼

Soil particle erosion and sedimentation

While most of the elements in his model are readily familiar, "shearing" and "pumping" may not be. Shearing results in ruts that form from the passage of a wheeled vehicle. The wheel forces the soil beneath it to bulge up and out as it passes. Fine-textured soils under wet conditions are vulnerable to shearing, whereas shearing is uncommon on course-texture soils.

Pumping usually occurs in soils during spring thaw, or periods of high rainfall or anytime water is at or near the soil surface. The weight of a moving wheeled vehicle forces water out of soil pores only to have it sucked backed in when the vehicle passes. The force of this rapid pumping erodes the internal structure of the soil. Pumping occurs in both fine and coarse textured soils, but is most damaging to fine textured soils.

Under ideal conditions, many soil surfaces can handle some use and intensity of travel without significant degradation. But on wet, unstable and otherwise vulnerable sites, soils usually fail and trails readily degrade with relatively light use.

Meyer says that trail degradation typically follows one of two paths: surface erosion, or surface failure. Surface erosion occurs as degraded trail surfaces are washed or blown away. This usually occurs on steep slopes or highly erosive soils. Surface failure occurs when trail surfaces degrade into muddy tracts with deep muck holes. This usually occurs on flat-lying areas with organic or fine-textured soils, both common to Alaska's permafrost dominated landscape. Either course leads to impacts that are difficult to stabilize or reverse. Without stabilization, a destructive cycle of degradation can expand the impact to adjacent surfaces. That cycle begins when riders first widen a trail surface, expand it, and finally develop parallel multiple trails, - a process known as trail braiding.

According to Meyer's model of trail braiding, degradation follows one of two pathways:

Surface vegetation and roots are stripped by surface traffic

⇓

Exposed soil is compacted and the trail surface subsides relative to the adjacent surface

⇓

Compaction and subsidence destroy soil structure and disrupt internal drainage patterns

⇓

[from this point, impact follows one of two paths]

SURFACE EROSION PATHWAY	SURFACE FAILURE PATHWAY
Exposed surface is eroded by wind scour,	Water collects on trail surface
↓	↓
Water collects on trail surface	Water pools in low areas
↓	↓
Water is channeled along trail surface	Pooled water saturates soil
↓	↓
Water erodes trail surface	Shear and pumping damage soil
↓	↓
Deep erosion ruts form	Muddy deep muck holes form

[from this point, a common cycle of impact develops]

Trail segments develop impassible sections

⇓

Trail users abandon impassable sections

⇓

New routes are pioneered on adjacent soils

⇓

New traffic strips surface vegetation and roots

⇓

Soil is compacted and soil structure destroyed leading to surface erosion and/or surface failure

[and so the cycle repeats itself]

Gravel ballast is used at pond crossings.

Pioneering a trail across sensitive landscapes can initiate trail braiding. The first passages strip surface vegetation, abrade the roots, and destroy soil structure making the landscape more vulnerable to erosion and surface subsidence. As the original trail degrades due to erosion or the formation of muck holes, trail users seek out new routes, usually on adjacent soils where environmental conditions are likely identical to the original impact site. As this second route degrades and is abandoned, a third route is pioneered, then a fourth until finally an area is braided with a number of routes in various stages of use and abandonment.

Abandoned trails can slowly recover from impact through natural re-vegetation, but the composition and structure of the regrowth is often different from the original plant community due to changes in site characteristics. For example, a site that supported shrubs and grass before disturbance may only support sedges or other water tolerant plants after disturbance. Full impacts of this ecological disruption are unknown; perhaps abandoned routes may recover enough to support trail use again. It is not uncommon for trail users to re-use old abandoned trail alignments, but they are generally more sensitive to re-impact than a site with no previous injury.

Open grid cell allows for vegetation re-growth.

Impacts associated with braiding are a major concern for resource managers because of the increased amount of area associated with trail use. Studies conducted in Alaska's Wrangell-St.Elias National Park and Preserve documented that the average ATV trail width impact area was 34.6-feet wide, six times the width necessary for a single ATV track. On average, each mile of braided trail within the preserve generates 4.2 acres of impact versus 0.72 acres from a single-track of the same length across the state. Resource managers routinely discover braided trails sections in excess of 400-feet wide and document that trail braiding significantly accelerates resource destruction, habitat loss and aesthetic impacts.

Responding to and keeping up with the cycle of degradation has been difficult because of rapidly expanding ATV use and increasing trail mileage. The Bureau of Land Management documented a 76

Trail Hardening System for Degraded Trails

DAMAGE from ATVs has become an increasing concern in Alaska as the four-wheelers have become more and more popular. In some areas, hundreds of miles of ATV trails cut across wetlands and streambeds, causing extensive damage to natural preserves and the environment.

At the Palmer Hay Flats State Game Refuge, ATV riders have caused the loss of vegetative cover and habitat values. A 6.5-mile trail winding through the northern edge of the refuge is the only legal access for ATVs. Rather than ban the use of four-wheelers, state officials sought a trail-hardening solution that would benefit both riders and preserve the wetland's natural vegetation. Working with experts from the NPS Rivers, Trails and Conservation Assistance program, they experimented with a variety of protective trail materials they hoped would reduce impacts associated with ATV use.

The test material chosen for this site was the Presto Geoblock® system. The Geoblock units are an open-celled, light-weight plastic material, measuring 20-in by 40-in by 2-in. This porous system has been typically used with topsoil/vegetative infill for emergency and utility access lanes, auxiliary parking areas and trails. The interlocking units create a load-distribution system, designed to support heavy loads and protect the vegetative root zone within its cells. The open cells of the Geoblock system allow water to pass through, but keep the damaging tires of an all-terrain vehicle away from the ground and plants. The cells can also confine and stabilize aggregate infill in non-vegetated systems.

Because the cost and accessibility of infill material was prohibitive at many similar locations, no infill was used on the trail except in areas where the units were applied underwater. In those wet areas, 3/4 - to 2-inch washed gravel was spread into the units' cells, adding weight to a system that otherwise would float when submerged in water. The stabilized area runs through two shallow ponds near the beginning of the trail – an area so wet it was typically crossed wearing hip boots.

Installation was a cooperative effort by the AK Dept of Fish & Game and the National Park Service Rivers Trails and Conservation Assistance Program. Crews laid the Geoblock units across an 800-foot stretch of the boggy trail, a main route into the refuge, in five days. An optimum laying pattern was tested and finally implemented to provide the best resistance to movement under wheel loading. To secure the mat system, adjacent units were fastened together with 3/4" screws and 120 lb tensile strength plastic cable ties.

The trail hardening system is being used to improve trails all over Alaska, including sites near Homer, Slana, Sitka, Willow, Yakatat, Fairbanks and Glenallen. This reclamation project was funded by the state of Alaska. Future work is planned by Ducks Unlimited and ATV dealers hoping to find a solution before four-wheeler restrictions are applied. As planned, indigenous grasses quickly regenerated through the permeable system, ultimately camouflaging the product with the natural environment. **L&W**

Information obtained from the Anchorage Daily News and National Park Service project reports. For more information, contact Patricia Stelter, Presto Products Co., 670 N. Perkins St., Appleton, WI 54914-3161, (800)558-3525, fax (920)738-1222 or e-mail: pjstelter@prestogeo.com.

Responding to ATV related impacts - a long term challenge for Alaska's resource managers.

percent increase in trail miles between the early 1970s to the late 1990s in the Tangle Lakes Archeological District, located along the Denali Highway. This increase is reflective of many other areas in the state and has created a sense of urgency among resource managers like Meyer to develop response options and BMPs.

Response options to trail degradation include a combination of re-routing trails away from sensitive areas, instituting seasonal or type of use restrictions, hardening trail surfaces (soil surface stabilization), or as a last resort, trail closure. Aided by technology such as GPS and GIS, improved environmental data on soils, vegetation and hydrologic resources, and advances in bio-engineering and geo-synthetic materials, resource managers are developing a number of tools to assist them in managing degraded ORV trails. Meyer notes that trail management is not simply a design/build process, but includes location documentation, condition assessment, improvement prescriptions, improvement implementation, and monitoring and maintenance. "In an ideal world, every trail in Alaska would be planned and have a staff dedicated to its management, Meyer says. "But, we've coined the phrase – orphaned trails – to describe the hundreds of active ORV trails that receive no management oversight at all."

Meyer understands that science alone won't solve the problem...that solutions are partly social as well. He believes that forming coalitions within a broad trail community is the key to success. Effective coalitions with federal, state and local land managers, the ATV industry and the users themselves need to focus on a broad approach including education, engineering, enforcement, and evaluation. The absence of any one of the four components decreases the likelihood of truly resolving trail degradation issues, and may even compromise local support. By evaluating options and developing a forum with users, advocacy groups and the environmental community, resource managers can begin to resolve many of the conflicts that exist between ATV trail impacts and environmental resources.

Meyers Associates, with NPS-RTCA, incorporate proven techniques and adapt new methods to combat trail degradation. In addition to new investigations, ongoing work is documenting past trials, experiments, tests, and jerry-rigged fixes. RTCA recognizes that a wealth of information is available from those who have worked in the field over the years. It is common to have different strategies and solutions in different locales based on the people involved and the resources available.

For example, in the Palmer Flats State Game Refuge, a duck hunting and bird watching paradise, a combination of seasonal use restrictions and the installation of synthetic materials such as Geoblock and SolGrid as trail hardening materials were the chosen strategy. In the Caribou Lakes region on the Kenai Peninsula, a coalition of conservation professionals, recreational riders and an enterprising homesteader are working to hardened trails with planks of salvaged white spruce killed by a bark beetle epidemic.

Research on responses to trail impact issues is an on-going effort. NPS- RTCA, is researching various aspects including BMPs, trail condition documentation, prescription development, and trail hardening, but there has been a limited forum to document that information, exchange ideas, and share experiences. One of the goals of the Alaska RTCA program is to create such a forum. RTCA is cosponsoring state-wide workshops, conducting research, documenting work on the ground, and distributing information to meet that goal.

Without the focus of resource managers like Meyer; without the support of local agencies (like BLM and ADF&G) and individuals like those in the Caribou Lakes region; without significant funding; and without a decrease in the phenomenal surge of ATV backcountry use, this important issue in America's last frontier could explode into an environmental dilemma of pandemic proportion. **L&W**

Meyer has recently written a manual on trail hardening in Alaska entitled "An Introduction to the Management of Degraded ORV Trails On Wet, Unstable & Sensitive Environments". The manual, based on work conducted in South-Central and Interior Alaska, has application to degraded ATV trails in other regions of the US.

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