SUPPORTING DOCUMENTATION FOR SNOWMACHINE REGULATION

INTRODUCTION

The fundamental mandate of our national parks is to preserve unimpaired natural and cultural resources for the enjoyment of present as well as future generations. It is an unavoidable consequence of the human use of these resources that these interactions must frequently be managed to meet this overall mandate or the specific purposes for which a particular park area was established.

Scientific study and administrative history clearly establish that the use of snowmachines, like any other use, has the potential to aversely impact certain resources that are the critical components of the fundamental purpose of Denali NP & P. Therefore, it is the responsibility of park management to make decisions on when, where, who, how, and how much use can be allowed in order to insure that the areas resources are unimpaired for future generation.

This document describes the special factors and scientific data that were considered in the formulation of the proposed regulation to close the area within the boundary of the former Mt. McKinley National Park to recreational snowmaching. The NPS believes this action is justified at this time because .

1) This use, while allowed in ANILCA, conflicts with the longstanding purposes, special values, historic uses, and public planning decisions for the area
2) The severity of resources impacts that are known for snowmachines are likely to be more severe in northern environments such as this area of Denali NP & P
3) It is reasonable to suspect that there are additional types of impact from snowmachine use that have not been examined to date that will result from the type of snowmachine use that is typical of the area in and around Denali NP & P
4) If action is not taken now, there is strong possibility for significant harm because of the potential for a rapid increase in impact over a large area due to recent and projected technological advances in snowmachines, the growing popularity of snowmachining, and the proximity to two of Alaska's major urban centers. The following sections of this document provide further information on these concerns

DISCUSSION

Park Purpose

The primary purpose of Denai NP & P and in particular the area of the former Mt. McKinley National Park, is to protect an intact and naturally functioning subarctic ecosystem and outstanding wilderness recreation opportunities for current and future generations. The legislative foundation for this interpretation is found in the National Park Service's Organic Act, the enabling legislation for Mt. McKinley National Park, discussions in legislation which added lands to the former Mt. McKinley National Park, ANILCA and related documents, and the Wilderness Act. (detail these out with quotes if we want) It has been repeatedly supported in discussions with the public during the development of recent, critical park planning documents such as the General Management Plan, Statement for Management, FCEIS, and SSEIS. This interpretation of park purpose has also been the foundation for over 80 years of administrative decisions for portion of the current Denali NP & P which was formerly Mt. McKinley NP.

Need some discussion on how allowing snowmachines is LESS consistent with this purpose/history then allowing it. (any thing in regs language??)

Denali NP & P's Important Contribution to the Spectrum of Recreational Opportunities in Alaska

The evolution of different land use designations is the confirmation of the benefit provided to the public by the preservation of a full spectrum of recreational opportunities in a region. The development of this broader perspective and zoning approach represents a recognition by the public that it is impossible to successfully provide the entire range of recreational experiences within a single conservation unit in an area. The reality is that certain uses must take priority in order to fulfill the specific purposes of a unit. This is particularly true for wilderness recreation opportunities, which are at one end of the spectrum, and are easily compromised by many other more mechanized or facility oriented types of activities.

The NPS believes the area within the former boundaries of Mt. McKinley NP is the most appropriate location to provide an area where nonmotorized wilderness dependent uses have priority over motorized uses such as snowmachines. No area in the entire 900 million acres (?) of the state of Alaska that clearly favors nonmotorized uses over motorized use. The area proposed for this use in Denali NP & P is a special case relative to other NPS areas in Alaska, decision here not precedent setting for other areas because:

-This area always managed for traditional Wilderness Act type wilderness values
-snowmachine use not legal prior to ANILCA
-recent increased in numbers and spatial distribution of use over this area now is a function of technological advances, NOT a pattern of preANILCA use
-As a result there is NOT a major preANILCA right of access that is being removed in this case as would be the case in other park areas if similar regulations proposed.

Given the amount of multiple use lands of similar geographic character and accessibility, the NPS believes that motorized users will not be significantly affected by this regulation Similar lands of equally quality are available in the rest of Denali NP & P and the surrounding region. In sharp contrast, non motorized users have no other opportunities at this time and their opportunities are likely to be further deminished in the future because these other lands are likely to managed for multiple use. . Studies show opportunities for nonmotorized/traditional wilderness recreation opportunities are lost under multiple use management approaches. Motorized users, by virtue of the speed at which they travel, the area thatthey can cover, and the noise and other impacts they create, effectively displace many non-motorized users. As a consequence, areas that are designated for use by both motorized and non-motorized users cannot be considered to be available equally to both. Opportunities for nonmotorized, traditional wilderness uses in Alaska are not likely to protected unless action taken at Denali by this regulation. State and other federal agencies do not have an area where nonmotorized use was given legal priority prior to ANILCA and thus it will be difficult for them to establish nonmotorized use areas in the face of increasing demand for motorized use

The NPS believes adequate opportunities for economic development of winter tourism exist without compromising the one area of the state where the tradition and potential exists for market nonmotorized traditional wilderness recreational opportunities. As Alaska and the rest of the Circumpolar north develop in the next few years, these opportunities which are taken for granted now, will be lost as population and technology increase the peneratration of motorized uses further and further into remote areas.

Natural Resources of National and International Significance

The area of the former Mt. McKinley NP is one of the most important protected areas in the world. It has been protected from consumptive uses for over 75 years and functions as a naturally regulated system. The ecological importance of this area and its relationship to the surrounding ANILCA additions has been internationally recognized with its designation as an International Biosphere Reserve. Denali NP & P is also one of only 4 parks in the national park system that has been selected for long term monitoring. It was selected above other Alaska parks largely because of the level of protection and historic integrity of this core area. Denali NP & P, and in particular this core area, is regularly referred to as a control site for scientific studies throughout the circumpolar region. The longstanding ecological integrity of this core area is clearly an important concern in ANILCA and lands were specifically added on the north side of the Alaska Range and in the Dunkle Hills area for the expressed purpose of protecting it. (ref. 1972 EIS for D-2)

It would be a significant loss to the public if this highly valued natural condition was compromised. For this reason, the NPS feels it is reasonable to set a conservative standard for evaluating the possible impacts of a use such as snowmaching, which has the potential to expand rapidly across the landscape, and about which there are many indications for concern.

Environmental and Social Conditions Specific to Northern Areas such as Denali NP & P

The NPS believes that there is good evidence to suspect that several of the impacts that have been linked to snowmachines in the Lower 48 will be more pronounced in northern environment such as Denai NP & P. This concern is supported by other recent evaluations of snowmachine impacts such as a major study sponsored by snowmachine clubs in Ontario Canada. The potential for more severe impacts in northern environments further justifies the need for a cautious interpretation of the results of scientific studies on snowmachine impacts.

Snowmachine use occurs in a season when animals are already under significant stress. The degree of this natural stress is likely to be more pronounced in the extreme conditions found throughout Denali NP & P relative to location where many of the studies on snowmachine use were conducted. A similar situation is expected to exist for vegetation and soils. Vegetation impact studies have noted that the potential for recovery is less in arctic and alpine environments. Physical damage to vegetation from snowmachine use in low snow cover conditions is frequently mentioned in the scientific literature. Sufficient snow cover to prevent this damage is regularly not available throughout much of the area under consideration by this proposed regulation. Several studies have documented that the compaction of snow caused by snowmachine use can alter vegetation composition and soil processes, but there has been little study of the interaction with permafrost soils which are common throughout the north and in Denali NP & P. The phenomenon of soil subsidence is regularly visible along winter trails in this area, but has not been noted in the literature due to the lack of studies in the far north. The NPS is concerned that there may be other poorly described impacts that will appear and hence there is the need for a conservative approach until more work is done on far northern environments.

One such area of concern is the effects on subsistence users by increased recreational activity in an area that nurtures resources which they utilize. The increase importance of this cultural connection has been noted in Canadian studies (Ontario work), and must also be factored into evaluation of snowmachine impacts in and Alaska park areas such as Denali which are mandated to protect subsistence lifestyles and the resources on which they are dependent.

Type of Snowmachine Use Pattern in Denali Region Increases Impact Potential

The snowmachine use pattern that is prevalent and sought out in the region around Denali NP & P is quite different than the one that has been considered in most research or that has been evaluated in documents such as Montana Programmatic EIS, Ontario Snowmachine clubs evaluation, or winter use planning around Yellowstone and Tetons NP. These works have focused almost exclusively on impacts related to single trails through an area. They have not evaluated the cumulative impacts that result from the regular and extensive cross country travel which is typical of snowmachine use in and around Denali NP & P. These works do note this weakness in current knowledge of snowmachine impacts and recommend conservative measures and regional planning approaches until there is a better understanding of them.

Typically, these studies assume mitigation is possible because impacts are localized. Physical impacts can be controlled and have limited spacial implications. Wildlife disturbance studies assume some habitation can take place and there will be use of other habitats away from a trail. These factors will minimize the overall impact. This assumption may not be a reasonable one where extensive crosscountry travel means there is disturbances throughout virtually all critical habitat areas. Areas such as river corridors, which frequently correspond with preferred snowmachine travel routes. The removal from just one area maybe insignificant, but removal from several preferred areas in a period of high stress is a situation that is quite possible in the Denali situation.

This pattern of crosscountry travel seems greatly preferred by most users. Attempts to confine use to set trails within the proposed closure are would be present significant enforcement problems, management costs, and administrative presence that would further diminish the wilderness character of the area.

The last five years of technological advances and increased popularity has clearly demonstrated that this use pattern can quickly move into new areas and reach a high density. The potential for such rapid change coupled with the lack of information places valuable resources at risk of damage before change can be detected and protective actions taken. Given the special character of the resource that would be placed at such risk, the NPS believes controls are needed now to prevent areas that have only seen recent use or areas that are free of use from being damaged until more information is known about the interaction or northern environments and these more random patterns of snowmachine use.

IMPACT LITERATURE REVIEW

Wildlife

The use of snowmachines occurs when food supplies are low and an animals ability to conserve energy may be critical to survival (McCool 1978). Impacts on wildlife exposed to snowmachine activity may result in a change of behavior leading to modification of daily movements (Soom et. al. 1972), an increased physiological stress level through flight or reduction in food intake, increased mortality, and changes at the population level (Jarvinen and Schmid 1971).

Caribou require a large home range to locate optimum conditions of snow and forage and to maintain space from predators (Simpson 1987). Snowmachine activity and subsequent loss of usable range may increase costs of obtaining food (White et al. 1981), affect reproduction and survival, disrupt cow-calf bonds and increase calf mortality (Shea 1979). During winter, caribou are sedentary 32-74 % of the day (Thomson 1971, Gaare, et al. 1975) and may expend more energy fleeing from snowmachines. Simpson (1987) found that sound from snowmachines elicited mean flight distances of 286 meters, but if caribou also sighted snowmachines, flight distances decreased to 136 meters. Groups of snowmachines roaming throughout an area may panic caribou because they may be unable to locate multiple sounds (Moen et al. 1982). Negative impacts from snowmachines

documented for other ungulates such as white-tailed deer (Moen et al. 1982) and elk (Morgantini and Hudson 1978, Lieb 1981) may also apply to ungulates on arctic ranges. The effect of snowmachine activity on moose is poorly understood, although displacement from and significant damage to browse plants would be expected to have negative impacts. Snowmachines have been implicated in the decline of a bighorn sheep population in Montana (Berwick 1968). Stress from human disturbance and harassment has negative impacts on bighorn sheep survival (Berwick 1968, DeForge 1976, DeMarchi 1975), therefore snowmachines may be debilitating to winter-stressed Dall sheep on low elevation ranges that are easy to access.

The impacts on grizzly and black bears from snowmachine activity are largely unknown, although den abandonment has been reported (Goodrich and Berger 1994, Jonkel 1980, Reid et al. 1983). The greatest impacts to bears would coincide with late fall and early spring snowmachine use. Den site selection and the accumulation of fat reserves occurs during fall and early winter. Following den emergence in April and May, bears depend on spring ranges, winter-killed carrion, and winter-weakened animals to replenish lost body weight and should not be disturbed. Denning disturbance of wolverines by winter recreationists in high altitude cirques had been a concern of biologists in Montana (Caslick, J. W. 1997).

Purves et. al. (1992) documented grizzly bear and gray wolf habitat use and displacement in Banff, Yoho, and Kootenay National Parks in Canada and concluded that wolves showed aversion to regions where winter human use exceeded 10,000 visitors per month. During a 4 year study at Voyageurs National Park, 93% of monitoring intervals recorded no wolf activity in the same interval with snowmachine activity (Voyageurs National Park, 1996). Impacts to wolves can also result in den abandonment (Goodrich and Berger 1994, Reid et al. 1983). The availability of energy-efficient travelways for ungulates may reduce winter kill of these species, and has the potential to reduce the availability and change the distribution of carrion for bears and wolves (Meagher 1993, Meagher et al. 1994) .

Unregulated use of snowmachines was a prime factor for habitat loss of the white-tailed ptarmigan in Colorado (Braun 1971), and destruction of habitat may negatively affect willow ptarmigan on arctic ranges. Newmann and Merriam (1972) reported that snowshoe hares avoid snowmachine trails and that red foxes were more active near and in trails perhaps because of easier travel. Conversely, Huff et. al. (1972) reported that red fox avoided snowmachine trails

Snowmachines can cause negative impacts to wildlife because of their noise alone (Brattstrom and Bondello 1983, Harrison 1974, Narins 1982, Ryan 1988), can cause direct mortality to wildlife (Lazan 1969) and snowmachiners are known to deliberately harass wildlife (Corbet 1970) .

Impacts from snow compaction

Snow compaction causes severe negative impacts on wildlife that resides in subnivean spaces during some of the winter. Compaction causes reductions in subnivean space temperatures which lead to increased metabolic rates, restrictions in movement, and mortality of small mammals (Bury 1978, Corbet 1970, Jarvinen and Schmid 1971, Neumann and Merriam 1972, Tongstad 1980). Compaction also results in reduced soil temperatures which may have implications for hibernating arctic ground squirrels. Compaction can significantly increase energy expenditures by ungulates digging for vegetation (Fancy and White 1985) and change thermal regimes which force deer into less desirable habitat (Huff and Savage 1972).

Indirect and Cumulative Impacts

Continued stress from snowmachine exposure could accumulate over the course of seasons and years resulting in increased wildlife mortality, habitat loss (Bury 1978) and changes at the population level (Jarvinen and Schmid 1971). Reduced ungulate populations due to habitat loss may be more susceptible to predation (Bergerud, et. al., 1974). Mortality of small mammals due to snow compaction could affect populations of species that prey on them, such as hawks, owls, and foxes (Brander 1974).

Vegetation

Direct Impacts of Exposure

Snowmachines can cause direct mechanical damage to vegetation at or above the snow surface, including death of saplings, breakage or abrasion of woody stems and trunks, and bruising and stripping of bark (Foresman et al. 1976, Pesant 1985, Rongstad 1980, Ryerson et al. 1977). Snowmachine use is also responsible for collision damage to young trees (Wanek 1971, Wanek and Schumacher 1975). These kinds of impacts can lead to increased susceptibility to desiccation and mortality (Neumann and Merriam 1972). Snowmachine access to high elevations through riparian zones may cause widespread and extensive damage to vegetation. Spinning and sliding of snowmachines on steep slopes can remove snow resulting in damage to newly exposed vegetation (Banff National Park), including injury to shallow roots and rhizomes resulting in loss of surface organic matter and in some cases the loss of the entire upper soil layers (Boucher and Tattar 1974/75). Use of trails early or late in the season when snow cover is inadequate also leads to contact between snowmachine tracks, surface vegetation, and soil. Contact with the soil is also known to reduce soil and rock lichens (Greller et al. 1974).

Subnivean Impacts Due to Snow Compaction

It is well known that snowmachines cause considerable below-surface vegetation damage. Snow compaction can lower the soil temperature to the point where roots of perennial plants may be destroyed (Neumann and Merriam 1972), seed germination suitability of a site is reduced (Keddy et al. 1979), and seed dispersal is negatively affected (Keddy et al. 1979). Snow structure changes can cause significant damage to browse plants with negative effects to wildlife (Neumann,and Merriam 1972). The subnivean effects of snowmachine induced snow compaction include negative impacts to plant phenology and vigor characteristics (Evans and Fonda 1990, Foresman et al. 1976, Neumann and Merriam 1972), and is also known to negatively affect spring flower viability (Wanek 1974; Wanek and Schumacher 1975; Rongstad 1980). Compacted snow persists longer, shortening the growing season, which is critical in tundra regions. Delay in snowmelt can also change the duration and timing of moisture release to plants (see, for example, Neumann and Merriam 1972).

Indirect and Cumulative Impacts of Exposure

Snowmachine use causes numerous indirect and cumulative impacts. Over time, ground structure damage caused by snowmachine use can set back seral stage (Aasheim 1980, Wanek and Schumacher 1975). Snowmachine use can lead to changes in plant density and species composition (Evans and Fonda 1990, Ryerson et al. 19.77) and is known to cause diminished yields of forage grass and significant reductions in yields of some plants (Foresman 1973, Whittaker and Wentworth 1972). Snowmachine use also causes changes in wildlife foraging patterns which result in over-utilization of forage species (Neumann and Merriam 1972, Schmid 1972, and Simpson 1987). Loss of vegetation can increase erosion. The use of leaded gasoline in snowmachines can cause lead contamination in vegetation (Ferrin and Coltharp 1974). Tundra vegetation is the lowest of terrestrial ecosystems in biomass and productivity, thus recovery will be slow if damage occurs. Long term impacts may

eventually eliminate certain plant species from trails and areas used by snowmachines (Neumann and Merriam 1972).

Soils

Reduction in Soil Temperatures

Snow compaction leads to reductions in soil temperatures (Aasheim 1980, Boucher and Tattar 1974/75, Rongstad 1980, Ryerson et al. 1977, Whittaker 1971). Lower soil temperatures retard microbial activity (Aasheim 1980, Rongstad 1980, Ryerson et al. 1977, Whittaker 1971), which can lead to severe reductions in soil fauna (Meyer 1981). These temperature decreases also negatively affect the soil surface microstructure that can greatly reduce the seed germination suitability of a site (Keddy et al. 1979). Snow compaction also increases surface runoff and reduces infiltration resulting in lower soil moisture. Areas of compaction become impermeable to air, which impedes the exchange of gases, causing unfavorable conditions for root growth and soil organisms.

Erosion

Snowmachines cause soil erosion due to snow compaction and blockage of runoff and destruction of vegetative cover (Montana 1993). Areas susceptible to erosion include steep slopes with a southern exposure. Snow melt is accelerated on these slopes, resulting in insufficient snow cover or exposure of the ground surface (Aasheim 1980). As the steepness of the grade increases, frictional pressures of snowmachine treads on the ground surface are greatly increased (Boucher and Tattar 1974/75). Use of areas early or late in the season when snow cover is inadequate also leads to erosion.

Other Impacts

Snowmachine use leads to soil compaction (Walejka et al. 1973, Pesant 1987). The use of leaded gasoline in snowmachines can lead to lead soil contamination (Ferrin and Coltharp 1974). Refueling, accidental spills, and on-trail maintenance of snowmachines can all lead to chemical contamination of soil.

Water and Riparian/Wetland Areas

Snowmachine use has negative impacts on water quality and hydrologic processes. Snowmachine engines emit high amounts of unburned hydrocarbons and carbon monoxide. Hydrocarbons, ammonium, and sulfate have been detected in snow pack chemistries (Ingersoll et al. 1997, Adams 1975). Refueling, accidental spills, and on-trail maintenance of snowmachines can also contribute to snow pack pollution. When snow melt and runoff occur, pollutants will accumulate in water resources. This is of particular concern if riparian zones are consistently used by snowmachines as travel corridors or as access routes to higher elevations. Water pollution can negatively affect aquatic organisms and in turn the species that feed on them.

Snowmachine damage to vegetation, and impacts to temperature gradients, water holding capacity, and the melting rate of snow can alter runoff and discharge regimes and contribute to soil erosion (Neumann and Merriam 1972, Montana 1993). These effects can negatively impact aufwucks communities (periphyton, bacteria, and fungi on rock surfaces) which lead to reductions in arthropod, amphibian, and fish populations (Cordone and Kelly 1961, Murphy et al. 1981). Soil erosion also leads to increased sedimentation and turbidity

in waterways which in turn cause negative impacts to fish populations and entire aquatic ecosystems (Gardner 1981, Newcome and MacDonald 1991).

Air Quality Impacts

Snowmachine use has negative impacts on air quality. The EPA has documented the amounts of different types of snowmachine-caused pollutants (Montana 1993). Snowmachine emissions include HAPS (hazardous air pollutants) and VOCs (volatile organic compounds). Hydrocarbon emissions from snowmachines are known to far exceed emissions from most other motor vehicles. Such pollution is particularly significant where there are temperature inversions and/or high concentrations of snowmachine use (Montana 1993). There are concerns about localized visibility effects of this air pollution in addition to other short- and long-term vigor and reproductive success impacts. Refueling, accidental spills, and on-trail maintenance of snowmachines can all contribute to air pollution. It is well known that lichens are hypersensitive to sulfur dioxide and are therefore good indicator organisms for air pollution.