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Natural Resource Stewardship and Science

Winter Road Plowing in Denali National Park and Preserve

Monitoring Results 2017

Natural Resource Report NPS/DENA/NRR—2018/1579

ON THIS PAGE
Visitor gets out of their car to photograph caribou in drainage off the Park Road in March 2015. NPS Photo (R. Anderson)

ON THE COVER
Mountain Vista Rest Area parking lot at Mile 12.6 of the Park Road in March 2015. NPS Photo (J. Toubman)

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Natural Resource Report NPS/DENA/NRR—2018/1579

William C. Clark, Julien A. Appignani, Anna S. Kirk, and Taylor A. Bracher

National Park Service
Denali National Park and Preserve
PO Box 9
Denali National Park, AK 99755

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Abstract

Denali National Park and Preserve completed an Environmental Assessment in February 2013 that evaluated opening the park road to private vehicle traffic earlier than the typical mid-March date to increase the range of recreational opportunities along the Denali Park Road during winter months. The Finding of No Significant Impact, signed in June 2013, identified the alternative which allows road plowing from mile 3 to mile 12.6 (Mountain Vista Rest Area) as the preferred alternative. The Early Road Opening (ERO) period begins annually near February 1 and will occur for three to five years while the park monitors effects on natural resources, park program finances, and visitor experience and opportunities. Here we report findings from the 2017 ERO.

Principal findings include:

1. The average number of vehicles that traveled the Denali Park Road during ERO 2017 was greater than any other ERO year – 45 vehicles per day.
2. Total road use during ERO decreased by 29% compared to 2016 because the road was closed for ten days due to icy conditions.
3. Road users travel the road most in the early afternoon. Private vehicles access the Denali Park Road most on weekend days.
4. Sixty-one percent of ERO traffic was from private vehicles.
5. Commercial use continues to be very low.
6. Moose were the most frequently observed species. The only other target species observed was caribou. Most animal sightings occurred west of mile eight.
7. No significant negative wildlife-vehicle interactions were observed in 2017.
8. No significant safety or law enforcement incidents were reported in 2017.
9. Parking at the Mountain Vista Rest Area decreased in 2017. We observed an average of 4.5 compared to 5.0 and 3.6 average vehicles in 2016 and 2015, respectively.
10. Expenditure to the park is greater than what was estimated within the Environmental Assessment.

Introduction

The sub-arctic winter imposes rigorous constraints on human use of the landscape at Denali National Park and Preserve (DENA). This has advantages and disadvantages. For example, field biologists can gather data under the most undisturbed conditions, recreationists can experience the full range of subarctic winter wilderness, while visitors accessing the park by motor vehicle are likely to have a much more limited experience.

Until 2014, private vehicles could access the Denali Park Road (hereafter, park road) as far as the Teklanika Rest Stop (mile 30) starting in mid-September until as long as conditions permitted safe passage (maintenance is suspended at Park Headquarters (HQ; mile 3.3) in mid-September). The first significant snow fall closed the road to private vehicles at HQ. Until mid-March, one lane beyond mile 3.3 was machine-packed to allow administrative access to facilities and to manage aufeis accumulation while the other lane was unmaintained. Both lanes were cleared for Spring Road Opening (SRO) by mid-March and opened to the public to the Mountain Vista Rest Area (MV) or Savage River (mile 14.8) around April 1 and then to Teklanika by mid-April.

In June 2013, the National Park Service (NPS) approved the Preferred Alternative in the Winter Road Plowing Environmental Assessment (EA) to open the park road to MV at mile 12.8 by mid-February for a three- to five-year trial period (National Park Service, 2013)[1]. The action intends to expand winter park access by allowing visitors to drive an additional nine miles of the park road and to park at MV. The EA also allows for expanded Commercial use of the newly vehicle-accessible areas.

Expanding winter access to the park necessarily entails expense, effort, and impact to park operations. Thus, during the Early Road Opening (ERO) trial period (2014-2018), park staff will monitor visitor use levels of the expanded opportunities, wildlife-vehicle interactions (including behavior), and local soundscapes. Staff will also estimate costs directly related to the ERO. This report summarizes the fourth year of ERO monitoring, 2017. Monitoring will continue for the duration of the trial period. At the end of the trial period, the NPS will determine whether to continue or not the ERO and develop a Winter Operations Plan; additional NEPA compliance may be required.

The following mitigation measures were included in the EA to address potential negative effects to wildlife caused by increased vehicle traffic:

- Park staff will monitor incidents of wildlife caught on the road between snow-berms and motor vehicles.

[1] The finding of no significant impact (FONSI) can be found at the National Park Service's planning site at: https://parkplanning.nps.gov/document.cfm?parkID=9&projectID=39554&documentID=54352

- A seasonal reduction in speed limit may be implemented if wildlife use the plowed road as a primary travel route.
- Resource staff will notify park management if wildlife-vehicle conflicts develop. Park management and resource staff will work together to determine if a road closure is needed.

Methods

The study area is a segment of the park road from the HQ gate (mile 3.3) to the parking area at Savage Cabin (the "musher's parking lot" (MPL)) just west of MV (Figure 1). In 2017, plowing began approximately February 1. The road opened on February 18 and closed due to snow and/or ice from February 24 to March 6 (opened midday March 6) and closed the morning of March 11. To maintain comparable datasets between years, the Road Ecology Program (REP) used a common monitoring period of 30 days. For 2017: Saturday, February 18 to Sunday, March 19.

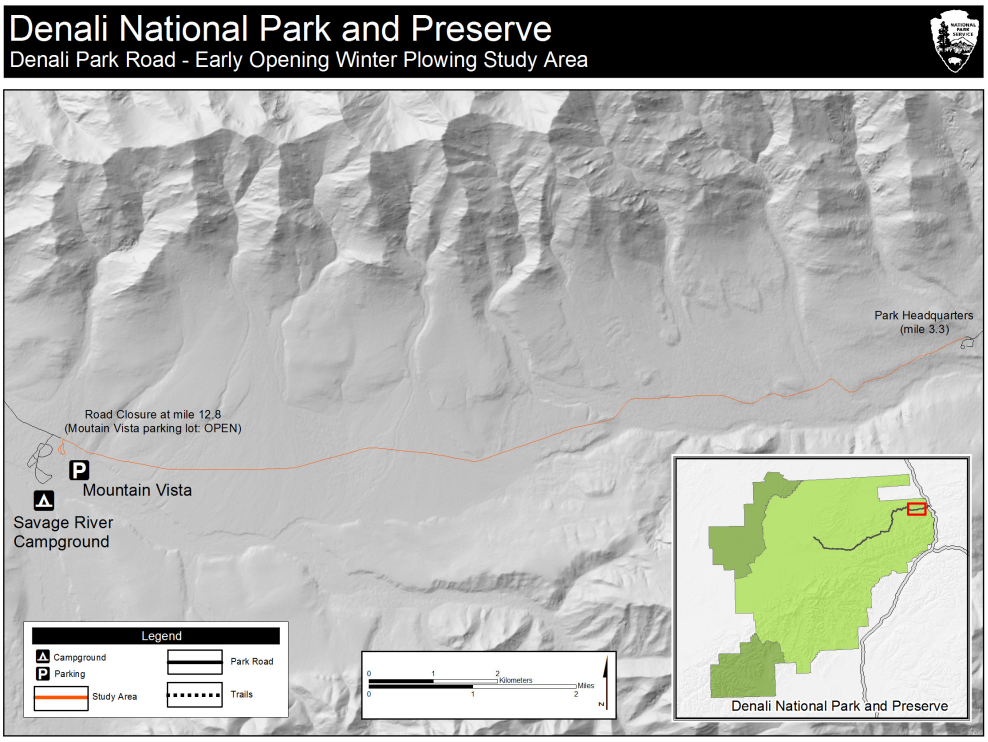

Figure 1. The Early Road Opening study area of the Denali Park Road, Denali National Park and Preserve (Denali Park, Alaska). The study area is a 9.5-mile segment of road that begins at Park Headquarters and ends just west of the Mountain Vista parking area.

Weather

March and February temperature and snow accumulation data for DENA from 2014-2017 and from 1981-2010 (the latest climate period) were compiled by the NPS Central Alaska Network Inventory and Monitoring Program (Pam Sousanes, pers. comm.).

Park Visitation

Visitor Center Statistics

The Murie Science and Learning Center (MSLC, mile 1.4) functions as Denali's winter visitor center from mid-September to mid-May. MSLC staff have counted visitors since the Center opened in 2005. Counting methods have changed over time. Through 2014, staff counted the number of visitors entering the door regardless of whether they had entered earlier. Since 2015, staff counted each

visitor only once. Thus, counts that are more recent represent a more accurate estimate of unique winter visitors at the MSLC. NPS and MSLC staff were not counted if entering for work purposes.

Total Vehicle Traffic Estimates

From February 7 to March 19, REP staff deployed one Reconyx Hyperfire License Plate Camera (Reconyx, Holmen, WI) on a tree angled acutely toward the park road at mile 3.3 to collect data on vehicle traffic. This differed from 2016, where the same model camera was angled obtusely along the park road from a traffic sign (since removed) and different from 2014-2015, where a Reconyx Hyperfire Professional Covert Camera faced northwest from the aforementioned tree. For all years, the camera took three rapid-fire photos for each motion trigger. Results were ground-truthed in 2015 and 2016, not in 2017.

We classified camera captures in Excel by type and direction of travel. Vehicles were grouped as: privately owned vehicle (POV), government-owned vehicle (GOV), heavy equipment (Equip), commercial vehicle (Commercial), indeterminate (Ind), or pedestrian (Ped), which included skiing, skijoring, snowshoeing, walking, and dog walking. Direction of travel was either west (W), east (E), or indeterminate (Ind). If presence of a vehicle was inferred (e.g., from snow blown by tires or from shine made by lights) but identification was not possible, the capture was recorded as "indeterminate". Where a capture occurred without a visual indicator, "no capture" was indicated. The camera recorded temperature (Fahrenheit) for every capture.

All vehicles on the park road must travel west and east (dead-end road). Thus, we used the higher of the two figures as the basis for the vehicle count.

Mountain Vista Vehicle Counts

From February 19 to March 18, REP staff recorded number and type (POV, GOV, Equip, bus, van, or idling) of vehicles parked at MV. MV has stripping for approximately 12 vehicles. We used a random number generator (RNG; www.random.org) to determine dates and times of observation periods. Vehicles were counted when staff first arrived (time=0), after 15 minutes, and after 30 minutes. Total MV counts included vehicles in the MPL but did not include the monitoring vehicle. We did not count vehicles observed driving through the parking lot without stopping.

Commercial Use and Interest

The DENA Concessions Management Specialist provided a list of the CUAs issued to companies for 2017. This year's commercial activity reports will not be available before January 2018; last year's (2016) reports, however, are available and described.

Wildlife

Wildlife Sightings and General Observations

REP staff used Apple iPads (Apple, Cupertino, CA) to gather data on wildlife sightings along the park road between HQ and MV. Visitor and Resource Protection (VRP) rangers recorded observations during patrols using a similar analog template. Wildlife sighting data included species, count, age (adult vs. young), sex, behavior, change in behavior, milepost, side of road, and distance from road. Target wildlife species included moose (*Alces alces*), caribou (*Rangifer tarandus*), wolf

(*Canis lupus*), Dall sheep (*Ovis dalli*), and grizzly bear (*Ursus arctos*). We considered different species occurring in the same location as different events.

Because more than one observer may have gathered data on a given day and because we gathered data on both westbound and eastbound trips, wildlife sightings do not represent unique counts of individuals. The goal of wildlife sightings data was to document the occurrence of wildlife viewable from the park road and describe their behavior with respect to vehicle presence.

Fifteen-minute Wildlife Behavioral Observations

To assess potential impacts of vehicle traffic on wildlife, REP staff conducted 15-minute behavioral observations of target wildlife species within 500 meters of the park road. We used Bushnell rangefinders (Bushnell, Overland Park, KS) to determine distances. Wildlife beyond 500 meters of the park road was deemed too distant to be accurately described. (Presumably, too, vehicles are less likely to pause for and less likely to impact wildlife at that distance.) Behavioral observations collected by REP staff were based on protocols modified from Fortier and Tomkiewicz, 1995. By design, VRP staff did not collect 15-minute behavioral observations.

Fifteen-minute observation periods began once REP staff sighted one of the target species. Observers recorded initial behavior as well as behavior associated with the approaching monitoring vehicle. We documented all stimuli (e.g., vehicles passing, vehicles stopping, visitors exiting vehicles) and responses. For groups of animals, the behavior of the individual closest to the road was recorded. If this proved impossible (e.g. due to group bunching), observers recorded behavior of the group collectively. Behavioral observations lasted 15 minutes or until wildlife moved out of view.

Soundscape

From 2012-2014 we monitored the soundscape near mile 7.5 (Betchkal, 2014) but not in 2015-17.

VRP Response

Alaska Region Communication Center (ARCC) provided data on VRP activity on the park road (law enforcement and visitor assistance).

Monetary and Non-monetary Costs

We estimated both monetary and non-monetary (e.g. opportunity) costs of ERO to the Resources, Maintenance, Interpretation, and VRP divisions. Monetary costs across divisions included wages, housing, materials, fuel, and equipment. Non-monetary costs are operations lost or foregone due to the requirements of ERO. Non-monetary costs can translate to further expenditure (i.e. a monetary cost) or savings to park operations.

Visitor Survey

Denali implemented a winter visitor survey that aimed to determine visitor's knowledge of the ERO prior to arriving in DENA, motivations for their visit, activities in which they planned to engage, and demography. This effort is a two-year study that has evolved the REP ERO monitoring into an interdisciplinary study on winter visitor use of DENA. The results of this survey, though related, are beyond the scope of resource monitoring for the ERO EA. Thus, we will publish this report separately as *Denali National Park and Preserve Winter Visitor Use: Winter Visitor Experience*

Survey and Early Road Opening Rove Collaborative Study, Keller & Clark, 2017. This report will be available for public view from the Integrated Resource Management Applications (IRMA) website – a portal for all published NPS documents (www.irma.nps.gov). Results of this survey will improve DENA's understanding of winter visitor demographics, needs, and expectations, which are imperative to providing high quality experiences.

Results

Weather

Winter 2017 was snowy and cold – good conditions for skiing, mushing, and fat tire biking (Table 1). A total accumulation of 65.8 cm of snow fell in February – 44.5 cm above the 1981-2010 average. Temperatures were close to average, exceeding 1981-2010 by only 1.7° C. Snow accumulation and temperatures in March were both below average, -8.9 cm and -7.9° C, respectively.

Table 1. Summary of average temperatures and snow accumulation during Early Road Opening months from 2014 to 2017 at Denali National Park and Preserve (Denali Park, Alaska).

Month	Temperature (°C)		Snow Accumulation (cm)		
	Average	Deviation	Total	Deviation	Daily Average Snow Depth
1981-2010 February Average	-13.6	–	21.3	–	–
February 2014	-17.4	-3.8	14.9	-6.4	38.6
February 2015	-12.3	+1.3	2.3	-19.1	30.2
February 2016	-6.7	+6.9	6.9	-14.5	60.0
February 2017	***-11.9***	***+1.7***	***65.8***	***+44.5***	***40.4***
1981-2010 March Average	-10.3	–	17.3	–	–
March 2014	-9.3	+1.0	6.4	-10.9	39.6
March 2015	-8.3	+2.0	10.3	-6.4	31.1
March 2016	-6.4	+3.9	31.5	+14.2	62.6
March 2017	***-18.2***	***-7.9***	***8.4***	***-8.9***	***55.1***

Park Visitation

Visitor Center Statistics

February and March visitation at the MSLC has increased steadily and substantially since at least 2012 (Figure 2). In 2017, the MSLC recorded 1,355 visitors in February and 3,110 visitors in March. Visitation in February 2017 was 16% higher than visitation in February 2016[2]. Visitation in March 2017 was 12% higher than visitation in March 2016. February and March 2017 visitation increased 200% and 347% from 2012.

[2] Visitor numbers for February 2016 are only available from the 10th to 28th.

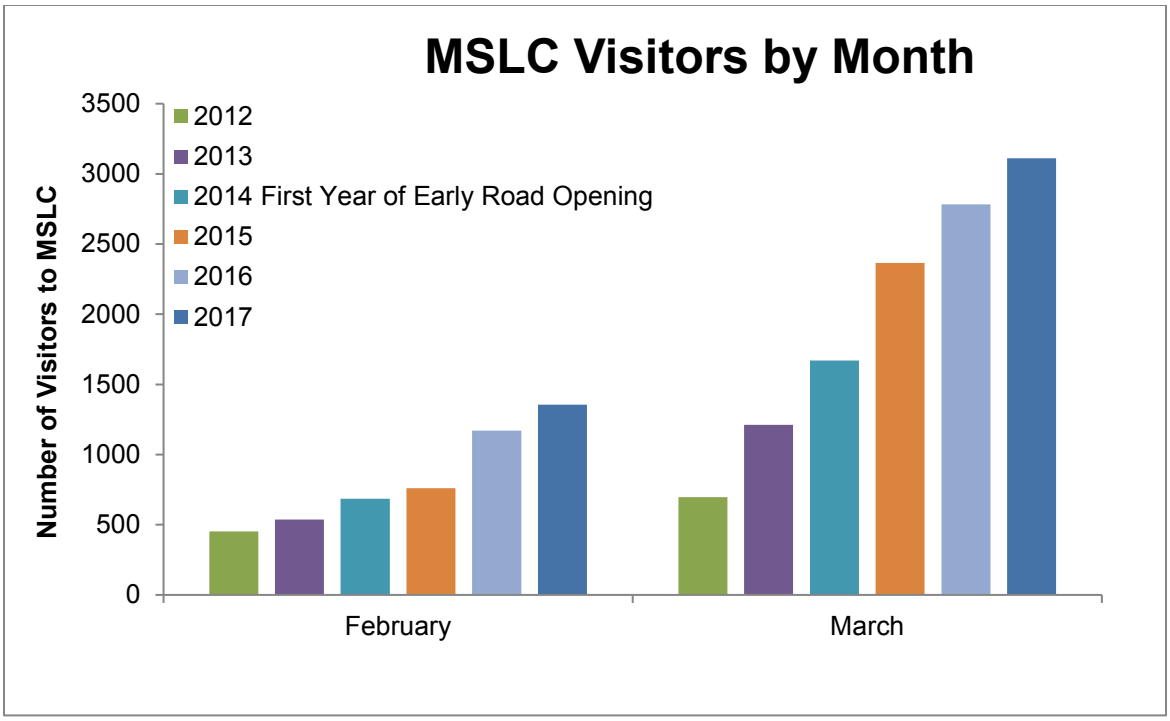

Figure 2. Number of visitors recorded at the Murie Science and Learning Center (MSLC) in Denali National Park and Preserve (Denali Park, Alaska) during Early Road Opening months.

Total Vehicle Traffic Estimates

The 30-day monitoring period includes 10 full days and two ½ days that the road was closed. During this time, the camera captured 899 total vehicles traveling west on the park road (Figure 3). POVs represented the highest number of vehicles on the park road; nearly 61% of park road traffic were POV (n = 547), 14% Ind (n = 127), 14% GOV (n = 123), 10% Equip (n = 89), and 1% commercial (n = 13).

Camera data show that 2017 ERO traffic patterns broadly resembled those of 2014-2016. POV use of the road peaked at 73 vehicles on Saturday, February 18, the first day of ERO. Peak time of day for POVs was between 1300 and 1400 hours (Figure 4). Generally, weekends were busier than weekdays (Figure 5). Generally, as POV use of the road increased, pedestrian use of the road decreased. Maximum pedestrian occurred on February 24 (ERO day 8), which coincided with a road closure due to snowfall.

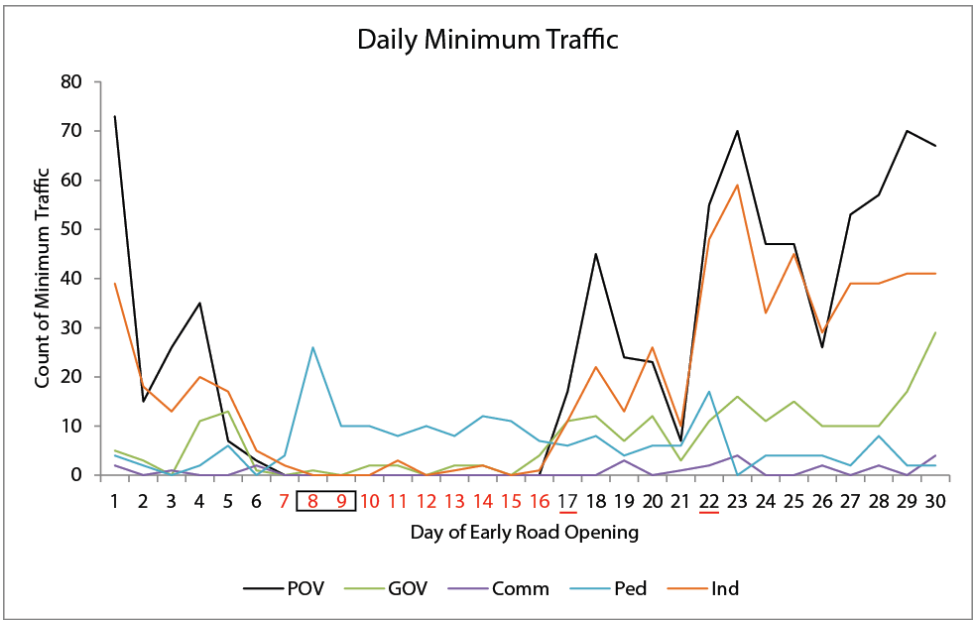

Figure 3. Road use by day during Early Road Opening as captured by a traffic camera on the Denali Park Road, Denali National Park and Preserve, Denali Park, Alaska, USA. The number of indeterminate (Ind) counts was greater in 2017 compared to past years. Red days indicate the road was closed all day due to driving conditions (snow and ice); underlined days indicated partial-day closures, days in the box indicate Denali Winterfest.

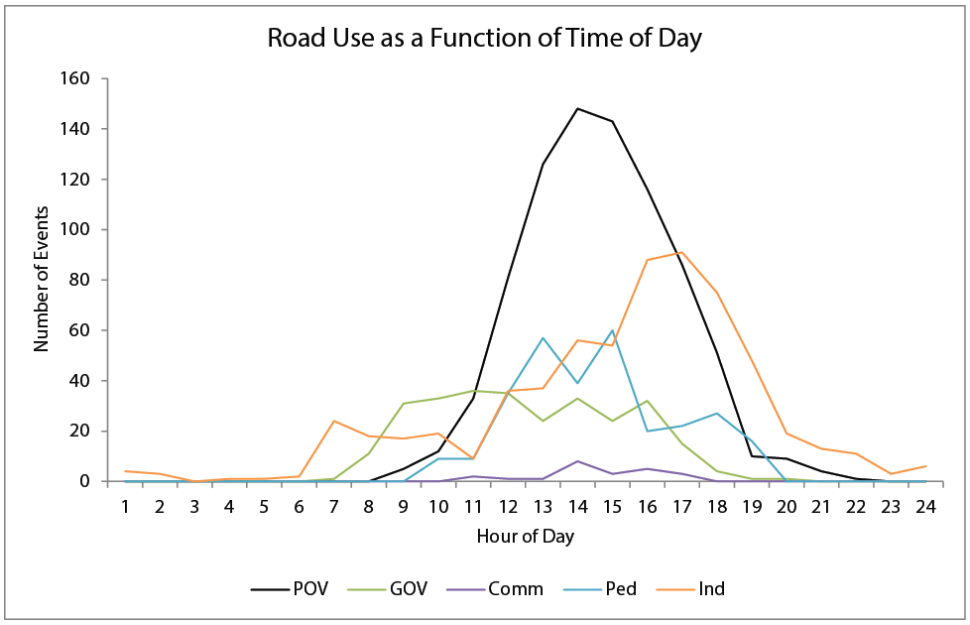

Figure 4. Road use by hour of day during Early Road Opening captured by a traffic camera on the Denali Park Road, Denali National Park and Preserve, Denali Park, Alaska, USA. Private vehicles accessed the road during the peak of daylight hours, indeterminate (Ind) captures were skewed toward twilight hours, and government road use occurred earlier in the day compared to most other user groups.

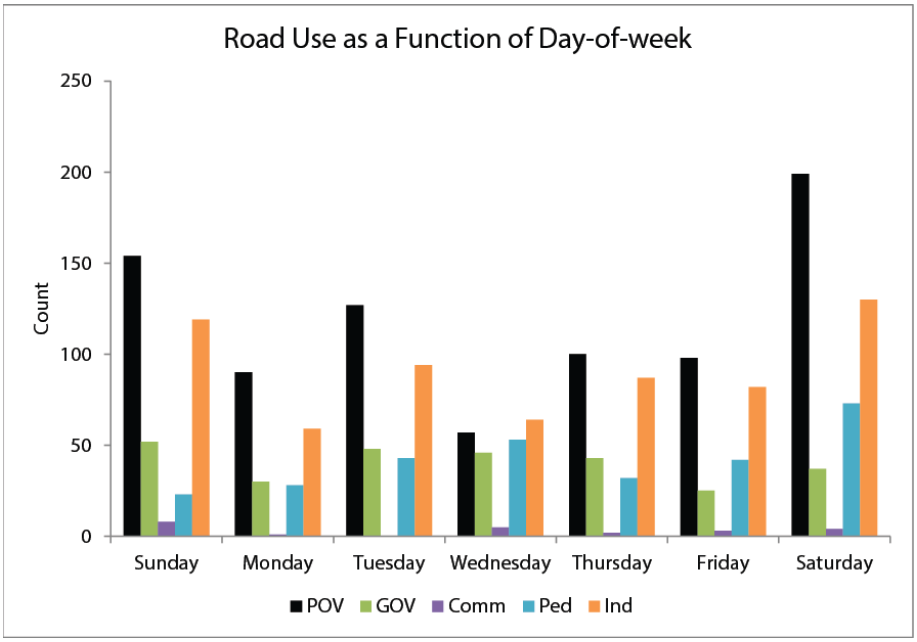

Figure 5. Road use by day of week during Early Road Opening of the Denali Park road as captured by a traffic camera, Denali National Park and Preserve, Denali Park, Alaska, USA. Private vehicles access the road most frequently during weekend days; however, all days are popular for driving. The pattern of indeterminate captures closely resembles the pattern of POVs. Pedestrian use is relatively popular most days.

MV Vehicle Counts

Park staff made 55 vehicle counts at MV. We roved 14 days of the ERO (25 trips) and cancelled 7.5 days of roves (15 trips) because the road was closed due to weather conditions (Appendix 1). We sampled every day of the week except Monday. The average number of vehicles observed was 4.5 (σ = 3.9). The maximum number of vehicles observed was 14. This maximum occurred twice, both on Saturdays: February 18 (the first day of ERO) and March 11. On February 18, there were 13 POVs and 1 GOV. On March 11, there were 12 POVs, 1 GOV, and 1 van (commercial). These figures are broadly representative of weekend traffic patterns, with POVs outnumbering all other vehicle types by a large margin.

Saturday and Sunday had the highest mean number of parked vehicles; Wednesday and Thursday had the lowest mean number of parked vehicles (Table 2). Fourteen observations included vehicles idling. We did not observe heavy equipment or buses at MV.

Table 2. Mean (with standard deviation) and maximum vehicles at Mountain Vista, by day of week during the Early Road Opening period on the Denali Park Road, Denali National Park and Preserve, Denali Park, Alaska, USA. Due to road closures, Monday went unobserved. Weekend days had by far the most traffic at Mountain Vista.

2017	POV		GOV		Total Vehicles		
	Mean (SD)	Max	Mean (SD)	Max	Mean (SD)	Max	*n*
Sunday	5 (4.04)	10	0.17 (0.37)	1	5.17 (3.89)	10	6
Tuesday	1.93 (2.43)	9	0.60 (0.49)	1	2.93 (3.04)	11	15
Wednesday	2 (2)	4	0 (0)	0	2.00 (2.00)	4	6
Thursday	1.33 (0.94)	3	0.67 (0.47)	1	2.00 (1.15)	4	6
Friday	1.57 (1.84)	4	1.43 (0.49)	2	3.00 (1.51)	5	7
Saturday	7.4 (3.65)	13	0.73 (0.44)	1	8.33 (3.91)	14	15

Commercial Use and Interest

Reporting of winter tour operators to MV is asynchronous with this report – 2017 data will be available by January 2018. However, we report 2016 data.

One authorized winter tour operator self-reported activity on the park road during ERO. Great Land Adventures, on two days (March 21-22), took seven clients by sprinter van along the park road.

Wildlife

Wildlife Sightings and General Observations

Of an estimated 65 trips during ERO (ten by REP staff, 55 by VRP rangers), 28 recorded wildlife sightings of moose or caribou. We did not observe any other targeted species. The majority of sightings were of moose (64%; 18 of 28). The maximum group size for moose and caribou were six and 22, respectively. We analyzed wildlife sightings spatially and temporally. Most wildlife sightings occurred west of mile eight, where tree cover is less abundant (Figure 6). The gap in wildlife sightings from February 23 through March 5 reflects days where no observations were made (Figure 7). Wildlife sightings occurred uniformly temporally over the ERO period. POVs were observed at five of the 28 wildlife sightings.

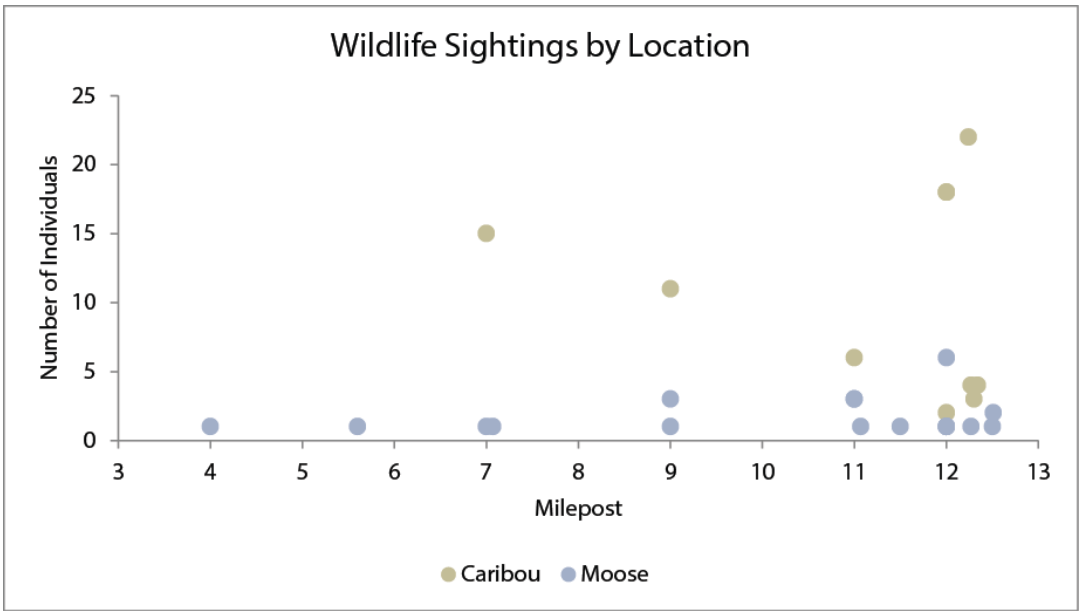

Figure 6. Wildlife sightings by location along the Denali Park Road during Early Road Opening 2017 (Denali National Park and Preserve, Denali Park, Alaska, USA). Most observations of wildlife occur furthest from the headquarters area. Moose are not herd ungulates and tend to be seen in smaller groups; caribou are herd ungulates and are seen in larger groups.

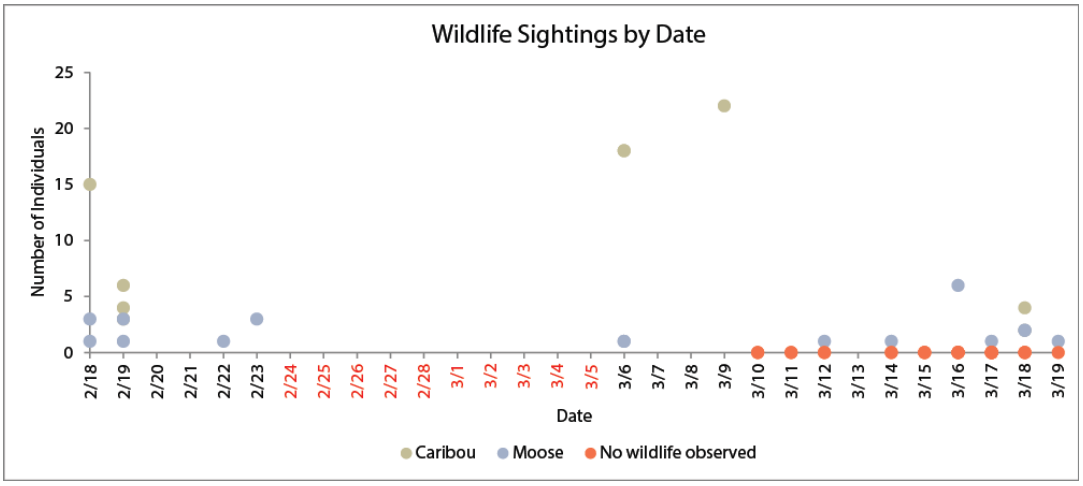

Figure 7. Wildlife sightings by date along the Denali Park Road during Early Road Opening 2017 (Denali National Park and Preserve, Denali Park, Alaska, USA). On some days, more than one observer conducted a rove. Thus, there are days with no wildlife observation and wildlife observation concurrently. Red dates indicated full-day road closures.

Fifteen-minute Wildlife Behavioral Observations

Fifteen-minute wildlife behavior observations were not well captured in 2017. Whether the challenge was technology or training is not clear. We observed one caribou (as the closest member of a larger group) run away from the road approximately 10 m before lying down during vehicle stimulus. VRP

made several behavior observations: 14 instances with no observed effect, two instances of the animal moving or running away from the road, and one instance of the animal(s) staring.

Soundscape

Acoustical monitoring did not take place during 2017 ERO. However, the effects of noise on the soundscape in this area are well documented (Toubman et al., 2015).

Visitor and Resource Protection

VRP rangers responded to the following eight incidents on the park road during 2017 ERO:

1. Total of four vehicles stuck in soft shoulder, ditch, snow or off the road
2. Verbal warning for speed
3. Verbal warning for speed and no insurance
4. Lost dog

Monetary Costs

Across divisions, estimated monetary costs of ERO totaled $44,892 (Table 3). Resources costs comprised two pay periods (one month, or the duration of the monitoring period) for one staff member to monitor MV ($2,806). Maintenance costs, by far the largest, included Equipment operator and laborer wages, material, and fuel ($40,803). Interpretation costs pertained exclusively to Kennels and described as non-monetary. VRP costs consisted of patrolling rangers' wages ($1,283).

Table 3. Estimated monetary costs of ERO for the Resources, Maintenance, Interpretation (Kennels), and VRP Divisions. Kennels reported costs better described as non-monetary costs.

Division	2014	2015	2016	2017
Resources	$8,284	$10,648	$5,220	$2,806
Maintenance	$13,155	$22,000	$26,020	$40,803
Interpretation	$9,599	$1,745	$606	--
VRP	$1,868	$2,140	$2,912	$1,283
Total	**$32,906**	**$36,533**	**$34,758**	**$44,892**

Non-monetary Costs

Kennels (Interpretation) reported non-monetary costs in the form of lost opportunities and negative impacts to operations. Traditionally, Kennels has used the unplowed park road for training, travel, media, and outreach. Additionally, the unplowed park road offers the safest arena for skijoring opportunities for the public and as a training method for young sled dogs. The alternate route for Kennels to access the Denali backcountry from the historical route (the unplowed park road) has been the Spring Trail. In 2017, the Spring Trail remained usable well into April. However, typically the Spring Trail is less safe, less efficient, and less dependable. Not having the ability to use the unplowed park road has interrupted VIP opportunities with Alaska Native elders and film crews.

Discussion

Overview

The 10-day road closure had a significant impact on all our sampling sizes, which limits the interpretative power and confidence of our 2017 data. Additionally, we documented very few protracted animal behavior observations in 2017, further limiting our ability to describe consequences of vehicle presence on animal behavior. However, if we put 2017 data into the context of 2014-2016 datasets, we observe the same trends: winter visitation is growing, when the road is open and during daylight hours private vehicles are accessing it, and wildlife are tolerant of vehicles within reason (fast moving cars tend to push animals further from the road).

Wildlife-Vehicle Interactions

We did not observe any significant wildlife-vehicle interactions in 2017. VRP and REP did observe instances of animals moving further from the road in the presence of vehicle stimuli. Moose were the most commonly observed species but we observed more caribou in total (because of group size). Most wildlife sightings occurred at the west end of the road between mile 10 and 12.6.

Visitation and Park Use during Early Road Opening

Winter visitation at DENA's continues to increase and has been increasing since at least as early as 2012 (two years prior to the ERO EA). ERO monitoring data show that when the road is open, visitors use it. A 10-day road closure was an opportunity to observe a shift in user groups when the road is closed: pedestrian use greatly increased during the closure period.

Vehicle use of the park road during ERO decreased from previous years to at least 899 vehicles. However, a 10-day road closure, that included DENA's busiest winter weekend, Winterfest, makes 2017 less comparable to previous years. In fact, on average there was more traffic than any other ERO year (~45 vehicles per day compared to ~42 in 2016) in 2017. Additionally, because a traffic sign had been used that is no longer on the road, REP used a worse position for the traffic camera. Camera orientation (i.e. angle to the road) affects capture results. Acute angles narrow the effective field of view, which reduces the time a vehicle is within view. Consequently, more captures in 2017 were indeterminate than in past years.

Sixty-one percent of traffic was private use. While traffic tends to peak on weekends, the sample size of weekends is too small to determine if the increase is statistically significant. This is the first year where we identified more than five commercial vehicles using the traffic cameras: 13. However, there continues to be little commercial use observed during ERO (18 total commercial vehicles from 2014-2017). It is difficult to distinguish commercial vans from privately-rented ten-passenger vans, a popular rental choice in Alaska. Commercial interest through the CUA program is steady but low.

Data collected by the DENA social science group, suggest that the majority of non-Alaska visitors did not know the park road would be open when planning their trip (Keller & Clark, 2017, in review). We will expand upon this dataset during the final year of the ERO trial period (2018). While it is clear that February and March visitation at the MSLC has increased steadily and substantially since at least 2012, the degree to which ERO contributed to this increase is not clear.

Weather

February was snowier than normal while March was colder than normal. This contributed to both the long road closure period and good conditions for backcountry users. Even with significant snowfall, our data fail to show significant negative interactions between wildlife and vehicles.

Weather likely affects the amount and kind of visitor use in the park. For example, though traffic was greater, on average, than 2016, it did not translate to more vehicles observed at MV. Perhaps the colder-than-normal temperatures resulted in fewer visitors stopping at MV. In colder weather, park visitors may prefer a driving tour rather than hiking or stopping. Warm, dry winters may be more inviting to certain users groups and could be helping to drive the observed increase in use. Alternatively, warm, dry winters are typically poor years for many wintertime activities such as skiing, snowshoeing, and mushing. This demographic may seek other locations for such activities.

Expense

Costs associated with ERO are higher than approximated ($25,203) by the EA, which did not consider any costs to the Resources and Interpretation divisions. It is difficult for park divisions to estimate cost of operations differences between if the road was plowed and open versus not plowed and closed. All costs provided in this report are only estimates. Non-monetary costs, especially those incurred by the Kennels operation, are also difficult to estimate but are acknowledged.

Safety

No major incidents occurred during ERO in 2017 that required the assistance of VRP staff. Though they attended to more traffic violations than in previous years, there were fewer visitor assistance requests. Additionally, there were no safety incidents reported related to NPS staff related to ERO. However, staff are exposed to more risk with increased winter operations.

Recommendations for Management

- Improve communication regarding current road conditions and the plowing schedule as it greatly affects mushing conditions and has implications on safety and Kennels operations.
- Continue the second year of the winter visitor use survey conducting motivation and demographic studies out of the MSLC and MV.
- Collect and evaluate the comment cards from visitors regarding winter and shoulder season recreation (October-April).
- Find effective means to mitigate increased risk associated with Kennels staff and increased public use of Spring Trail.
- There may be a series of secondary effects and associated costs and benefits associated with ERO that have not yet been assessed for example, changes to infrastructure such as warming huts or trail construction, emergency communication upgrades, decreased opportunities for solitude, increased CUA opportunities, and increased staffing requirements.

Literature Cited

Betchkal, D. 2014. Natural Soundscapes/Opportunities for Solitude in Wilderness (Winter Road Opening Report 05 06 2014). National Park Service Unpublished Report, Denali National Park, Alaska.

Fortier, K. and C. Tomkiewicz. 1995. Park Road Use/Wildlife Interaction Monitoring: A Pilot Effort. Denali National Park (unknown if published).

National Park Service. 2013. Winter Road Plowing in Denali National Park, Finding of No Significant Impact, Denali National Park and Preserve, Alaska

Sousanes, P. and K. Hill. (NPS). Central Alaska Network Weather Summaries web site http://science.nature.nps.GOV/im/UNITS/CAKN/vitalsign.cfm?vsid=36 (accessed April 2015)

Toubman, J., B. Borg, and D. Schirokauer. 2015. Winter road plowing in Denali National Park and Preserve: Monitoring 2014-2015. Natural Resource Data Series NPS/DENA/NRDS—2015/790. National Park Service, Fort Collins, Colorado.

Appendix 1. 2017 Sampling Schedule

February/March 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						FEBRUARY 18 1100 1500
19 1100 1300	20 President's Day	21 0900 1200	22 1000 1400	23	road closed 24	road closed 25 Winterfest ~~1000~~ ~~1300~~
road closed 26 Winterfest ~~1000~~ ~~1500~~	road closed 27 ~~1000~~ ~~1300~~	road closed 28	MARCH 1 road closed ~~1000~~ ~~1400~~	road closed 2	road closed 3	road closed 4 ~~1000~~ ~~1300~~
road closed 5 ~~1000~~ ~~1500~~	road closed 6 ~~0900~~ ~~1400~~	7 1000 1400	8	9 ~~1200~~ 1600	10 1100 1600	closed AM 11 ~~1000~~ 1500
12 ~~1100~~ 1600	13	14 0900 1400	15	16 0900 1500	17 1100 1600	18 0900 1500
19 1100 1500						

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525