DATE: 11 June 2020

SUBMITTED BY: David J. Mattson, Ph.D.

Effects of Proposed Expansion of the Bull Mountains Mine on Grizzly Bears
With Specific Reference to Cumulative Effects of Train Strikes and Railway Infrastructure

My following comments address cumulative effects of coal trains and associated railway infrastructure on endangered grizzly bears in the contiguous United States, with specific reference to additive effects arising from the proposed AM3 expansion of the Bull Mountains Mine by Signal Peak Energy. The scope of my comments include direct effects arising from lethal train strikes as well as indirect effects arising from modifications of railway environments, alienation of habitats impacted by railway operations, and resulting broader-scale impairment of population connectivity.

These comments are based on a comprehensive review of research related to effects of trains and railways on grizzly and brown bears (both of the same species, *Ursus arctos*) as well as publicly-available data specific to operations of Burlington Northern-Santa Fe (BNSF) and Montana Rail-Link. Results of this review for years up through 2018 are covered in the report entitled "Effects of Trains and Railways on Grizzly Bears" (Mattson, 2019a). Results updated to include 2019 are detailed in my following comments.

The referenced corpus of scientific research together with issue-specific data provide an unimpeachable basis for reaching conclusions about how current and proposed future railway operations arising from transport of coal through western Montana have impacted and will foreseeably affect grizzly bears in contiguous United States

My Background and Credentials

I am a scientist and retired wildlife management professional with extensive experience in grizzly bear research and conservation spanning four decades. My educational attainments include a B.S. in Forest Resource Management, an M.S. in Plant Ecology, and a Ph.D. in Wildlife Resource Management. My professional positions prior to retirement from the U.S. Geological Survey (USGS) in 2013 included: Research Wildlife Biologist, Leader of the Colorado Plateau Research Station, and Acting Center Director for the Southwest Biological Science Center, all with the USGS; Western Field Director of the Massachusetts Institute of Technology-USGS Science Impact Collaborative; Visiting Scholar at the Massachusetts Institute of Technology; and Lecturer and Visiting Senior Scientist at the Yale School of Forestry & Environmental Studies.

My dissertation focused on the ecology of grizzly bears in the Greater Yellowstone Ecosystem (GYE) during 1977-1996 (Mattson, 2000), which encompassed the 1979-1993 period during which I intensively studied grizzly bears in this ecosystem and the 1985-1993 period during which I was charged with designing and supervising field investigation for the Interagency Grizzly Bear Study Team (IGBST).

Of particular relevance to effects of trains and railways on grizzly bears in Canada and in the Cabinet-Yaak (CYE) and Northern Continental Divide (NCDE) Ecosystems: during 1993-2001 I served variously as reviewer, expert, and advisor for Parks Canada, the Alberta East Slopes Grizzly Bear Project, the Secretariat for the Banff-Bow Valley Task Force, and the Natural Resources Conservation Board of Alberta on matters touching on or directly related to impacts of the Canadian Pacific Railway and Canadian National Railway. As a matter of professional practice, I am also intimately familiar with grizzly bear-relevant research in the NCDE and CYE—for the NCDE summarized and critiqued in a recent report (Mattson 2019b) and filmed presentation; for the CYE, summarized and critiqued in a series of five recorded presentations (Introduction, Causes of Death, Population Trend, Potential and Threats, Metavision).

In what follows I reference Mattson (2019a), which summarizes and evaluates scientific research pertaining to the effects of railways and trains on grizzly and brown bears worldwide. Given that brown and grizzly bears are both of are of the same species, and that there is no plausible reason to differentiate the two when it comes to effects of trains and railways, I use the term "grizzly bear" throughout the following comments.

Train Strikes are a Significant Cause of Grizzly Bear Mortality Worldwide

Collisions with trains (i.e., train strikes) are a substantial documented cause of grizzly bear mortality in the United States, Canada, Croatia, Slovenia, Italy, and Iran. Where estimated, train strikes account for roughly 10-25% of the total known and likely grizzly bear mortality in occupied grizzly bear habitat transected by transportation corridors with railways. The involved railways are characteristically used by around 15 to 100 trains per day traveling at average and maximum speeds of approximately 20-35 and 30-50 mph, respectively (Mattson, 2019a: 4-5). In the Bow Valley of Alberta, Canada, transected by roughly 100 trains per day, train strikes are a leading cause of mortality that has long threatened the grizzly bear population occupying Banff National Park (Mattson, 2019a: 5).

Most train strikes occur during spring or fall, when foods along railways are comparatively more abundant and attractive (Mattson, 2019a: 9 figure 4b-4c). In Canada and the United States, these attractive foods most notably include grain spilled from hopper cars transporting harvests east to west during fall; carrion from ungulates struck by trains during winter and spring; and abundant herbaceous foods during spring resulting from greater comparative heat-loadings along railways (Mattson, 2019a: 6-7). Grizzly bears correspondingly tend to select for, forage, and die in areas near railways after and prior to denning (Mattson, 2019a: 8-9, Figure 4a).

Nearby Highways Elevate the Risk of Train Strikes

Worldwide, the effects of railways on grizzly bears are almost invariably coupled with the effects of nearby parallel highways. Railways and heavily-trafficked highways naturally align with the few navigable valleys and passes in mountainous topography where most grizzly bears still survive (Mattson, 2019a: 2).

Grizzly bears actively avoid heavily-trafficked highways during daylight, which is when traffic tends to be concentrated (Mattson, 2019a: 10-11, Figures 5-6). Bears are consequently displaced towards foraging in and crossing transportation corridors during nighttime hours when and where they are more vulnerable to strikes by unabated train traffic operating under low-light conditions (Mattson, 2019a: 12, Figure 7). When highway traffic exceeds roughly 100-vehicles per hour, crossings by bears drop to near nil and, as the window of heavy highway traffic intrudes into crepuscular hours, bears are forced to use an ever-narrowing window of ever-darker and more hazardous conditions for crossing railways (Mattson, 2019a: 11, Figure 6).

Avoidance of Highways and Mortality from Train Strikes Increase Population Fragmentation

The combined effects of mortality and active avoidance predictably result in impeded movements as well as impeded demographic and genetic connectivity of grizzly bear populations across transportation corridors with railways. These effects give rise to fracture zones that can cause population fragmentation and even isolation, as evident in Europe, Canada, and the United States (Mattson, 2019a: 13). If perpetuated, this sort of fragmentation alone can become a severe threat to survival of increasingly isolated grizzly bear populations, as is the case for grizzly bears in the Cabinet Mountains of northwestern Montana (Servheen et al., 1987; Kasworm et al., 2007).

Trains Already Kill a Significant Number of Grizzly Bears in the Contiguous United States

Train strikes have killed 67 grizzly bears in the NCDE and CYE since 1997, amounting to a non-trivial 9% of total known and probable grizzly bear deaths in these ecosystems. One grizzly bear was killed in the Selkirk Ecosystem (SE) (Mattson, 2019a: 4 figure 3; Chaney 2019). Of the total, 64 occurred along the Burlington Northern-Santa Fe (BNSF) railway through the NCDE and 3 along the Mountain Rail Link railway along the southwest boundary of the highly-threatened Cabinet Mountain grizzly bear population. The rate at which grizzly bears die from train strikes has remained roughly the same since 2000: 2.2 versus 1.8 per year respectively for 2000-2009 compared to 2010- 2019 (Mattson, 2019a: 4, 7; and see below).

An Unprecedented Number of Grizzly Bears Were Killed by Trains During 2019

During 2019 train strikes killed an unprecedented 8 grizzly bears on the BNSF railway in the NCDE (Costello & Roberts, 2020; see Figure 1 which augments Mattson, 2019a: 4, Figure 3). The only other years with train-caused grizzly bear fatalities approaching this number were 5 during 2001 and 4 during 2007. The 8 grizzly bears killed by trains during 2019 amounted to an equally unprecedented 16% of total known and probable grizzly bear mortalities in the NCDE.

Of the grizzly bears killed by trains during 2019, a minimum of 5 were females (Costello & Roberts, 2020). One bear was of undetermined sex and so, if a female, would raise the toll for this sex to 6. This high proportion of females is problematic given the contingency of population growth in the NCDE on high survival and recruitment rates of females (Costello et al., 2016).

Five of the train-caused fatalities during 2019 occurred during October; the other 3, consisting of an adult female and her two yearling offspring, occurred during June. At least two of the bears killed during October were scavenging carcasses of domestic cattle that had been killed by earlier train strikes and not removed from the railway (Byron, 2019; Peterson, 2020). A third bear may have also been killed for this reason. The adult female and two yearlings were killed while grazing along the railway (Montana Fish, Wildlife & Parks, 2019a). Figure 2 shows two cubs that were killed near Trego, Montana on or about October 14th (Montana Fish, Wildlife & Parks, 2019b; photo courtesy of Montana Fish, Wildlife & Parks).

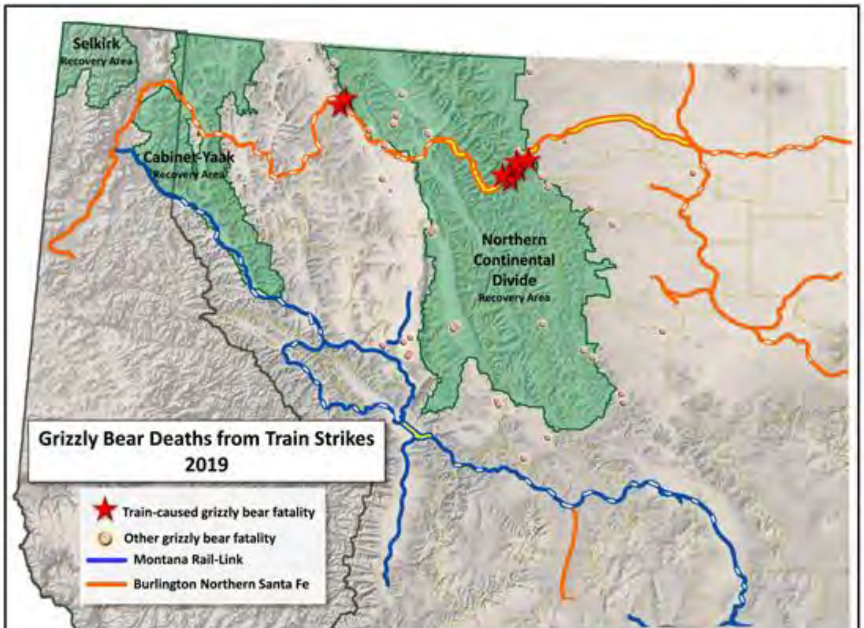

Figure 1. Locations of grizzly bear fatalities caused by train strikes during 2019 in northwestern Montana and northern Idaho. Bear fatalities are denoted by red stars whereas railways are shown as orange (BNSF) and blue (Montana Rail-Link) lines.

Figure 2. Remains of two cubs killed by trains along the BNSF railway during 2019 near Trego, Montana.

Trains Already Cause Significant Harm to Grizzly Bears in the Contiguous United States

In summary, data pertaining to train strikes during 1997-2019 together with research specific to the Highway 2-BNSF railway corridor unambiguously show that: (1) grizzly bears avoid Highway 2 and do not cross it when traffic levels are >100 vehicles per hour (Mattson, 2019a: 10-11, Figures 5-6); (2) traffic levels on Highway 2 have increased substantially, with resulting likely attrition of crepuscular hours previously used by grizzly bears to cross the Highway 2-BNSF transportation corridor (Waller & Miller, 2015); (3) grizzly bears continue to die from train strikes primarily during spring and fall, coincident with probable peak abundance of rail-side attractants (Mattson, 2019a: 8); (4) grain spills, carrion, and herbaceous vegetation were, and continue to be, primary rail-side foods (Mattson, 2019a: 6-8); and (5) the Highway 2-BNSF transportation corridor is already an impediment to grizzly bear movements, a nascent fracture zone, and a human feature with the potential to more seriously threaten conservation and recovery of the NCDE grizzly bear population (Mattson, 2019a: 13-14, Figure 8).

Research specific to the CYE has also revealed major existing fracture zones that already reduce grizzly bear movements to near nil across the Highway 2-BNSF corridor separating the Yaak from Cabinet Mountains populations, and across the Highway 200-Montana Rail Link corridor separating the Cabinet Mountains population from suitable habitat farther south and west (Mattson, 2019a: 13-14, Figure 8; Mattson & Merrill, 2005).

AM3 Expansion of the Bull Mountains Mine Will Significantly Increase Train Traffic

Expansion of the Bull Mountains Mine will result in 3.6 trains per day traveling to and from the mine each day for 9 years (Office of Surface Mining Reclamation and Enforcement [OSMRE], 2018: 51, Table 4.1-1). This will result in a total of approximately 11,800 trains traveling to and from the mine during this 9-year period. Virtually all of these trains will travel between the Mine, south of Roundup, Montana, across Montana, and onward to the Westshore coal export terminal in southern British Columbia, Canada (OSMRE, 2018: 16-17, 28).

There are only two train routes across Montana, a southern route and a northern route (OSMRE, 2018: Appendix A, Figure 2.1-3). The southern line travels along the southwestern boundary of the CYE ecosystem in northwestern Montana (OSMRE, 2018: Appendix A, Figure 2.1-3). The northern route travels through the NCDE, the CYE, and the SE (OSMRE, 2018: Appendix A, Figure 2.1-3). The trains may travel on either route (OSMRE, 2018: 16).

Of relevance to appraisal of Cumulative Effects, transport of coal from the AM3 expansion of the Bull Mountains Mines would increase current traffic from an average 2.1 to an average 3.6 trains per day, and comprise as much as 25 percent of future rail traffic between Laurel, Montana, and Sandpoint, Idaho (OSMRE, 2018: 54). This traffic from the Mine would, if all routed north along the BNSF line, also amount to a non-trivial approximate 10% increase in numbers of trains traveling through occupied grizzly bear habitat, from roughly 30 to nearer 34 trains per day. If all trains were routed south, along the Montana Rail Link line, the increase would be a more substantial 25%, from roughly 14-15 per day to 17-19 per day.

Research from Banff National Park Predicts the Impacts of Increased Train Traffic

Conditions along the Canadian Pacific Railway (CPR) in Banff National Park, Canada, offer a basis for predicting the impacts on grizzly bears arising from increased train traffic along the BNSF because the physical and other environmental contexts of the CPR in Banff, the BNSF in the NCDE, and Montana Rail Link along the Cabinet Mountains are strikingly similar (Mattson, 2019a: 3, Figure 2).

Approximately 100 trains travel the Canadian Pacific Railway (CPR) every day, causing nearly 25% of all grizzly bear deaths in Banff National Park (Mattson, 2019a: 5). Of relevance, the ratio of train traffic along the CPR and the BNSF (3.3:1) is roughly the same as the ratio of proportional deaths caused by train strikes in the two transected areas (2.8:1). Given this proportionality, it is reasonable to conclude that a 10% in train traffic would likely result in an approximate 8% increase in numbers of grizzly bears dying from train strikes in the NCDE and CYE along the BNSF, or an approximate 20% increase in number of mortalities in the CYE along Montana Rail Link.

Notably, the fracturing associated with displacement and mortality of grizzly bears along the Trans-Canada Highway-CPR corridor in Banff National Park is severe enough to have substantially impaired demographic and genetic connectivity (Mattson, 2019a: 13). As with rote increases in train strikes, it is reasonable to expect that nascent fracturing along the Highway 2-BNSF travel corridor, and demonstrable fracturing along the Highway 200-Montana Rail Link corridor, will be accentuated as a result of increased train traffic (Mattson, 2019a: 14). More certainly, increased train traffic will *not* ameliorate existing levels of fragmentation.

AM3 Expansion of the Bull Mountains Mine Will Cause Additional Harm to Grizzly Bears

These facts and the abundant research and data relevant to effects of trains and railways on grizzly bears in the contiguous United States and elsewhere, summarized above, are the basis for the following well-substantiated conclusions:

High volumes of train traffic that include cars transporting coal from the AM3 expansion of the Bull Mountains Mine—whether routed along either or both the BNSF and Montana Rail Link railways—will almost certainly cause additional train strikes and resulting injuries and mortalities to grizzly bears in the NCDE, CYE, and SE. These trains will also harass bears using areas near the BNSF and Montana Rail Link railways, resulting in further alienation of habitat. Taken together, elevated mortality and diminished movements will also likely further fragment the NCDE grizzly bear population, and perpetuate the isolation of bear populations in the Cabinet Mountains and Yaak region of the CYE.

More to the point, the approximate 11,800 trains deployed to transport coal from the AM3 Bull Mountains Mine expansion during the next 9 years—across Montana to West Coast terminals—will harm grizzly bears in the NCDE, CYE, and SE. Continuation of current levels of coal-related train traffic along railways located in either nascent (NCDE) or demonstrable (NCDE-CYE, SE-CYE, and intra-CYE) fracture zones will perpetuate problematic impediments to bear movements. The available evidence shows that train strikes have killed non-trivial numbers of grizzly bears in these ecosystems, and that bears are attracted to the hazards of rail-side foods and/or displaced to railways by vehicle traffic on nearby parallel highways. A 10% increase in train traffic, on top of current levels, will almost certainly result in more grizzly bears being killed, displaced, and impeded than would otherwise be the case. To conclude otherwise—that train traffic from the AM3 expansion would *not* harm grizzly bears in these ecosystems—would require the dismissal of available evidence and deployment of untenable logic.

The 30% increases in vehicle traffic predicted for US Highway 2 during the next 10 years through the NCDE and CYE (Rutherford et al., 2014)—less certainly on Montana Highway 200 along the southwestern boundary of the CYE—will compound the harm caused by the approximate 11,800 trains deployed to transport coal from the AM3 Bull Mountains Mine expansion. Substantial increases in vehicular traffic will continue to encroach on the remaining limited hours of natural light during which grizzly bears cross transportation corridors (Waller & Miller, 2015), displacing crossings increasingly to nighttime hours when risk of train strikes is greater. This indirect effect of traffic on nearby highways will predictably increase, *not* reduce, odds of train strikes intrinsic solely to increases in train traffic.

Mitigation of Impacts is Possible

There are several promising methods for mitigating the adverse effects of railways and trains on grizzly bears, with potential application to the BNSF and Montana Rail Link railways. Coal trains could depart from the Bull Mountains Mine to the east and from coastal terminals to the west so that they travel through occupied grizzly bear habitat during daylight hours (Waller, 2017). Train speeds could be reduced while traveling through areas used by grizzly bears (Dorsey et al., 2017). Given that bears attracted to rail-side foods can be killed by trains regardless of cargo, rapid removal of attractants would be beneficial, including carcasses of ungulates killed by train strikes and grain spilled from derailments or leakage (Pissot, 2007; Waller, 2017). Vacuum trucks have been used effectively along both the BNSF and CPR railways to retrieve grain spilled during derailments (Waller, 2017), although with less benefit for collecting grain leaked from ill-maintained or poorly loaded hoppers (Pissot, 2007). Deterrents and warning systems involving lights, bells, or acoustic systems have also been advocated, whether prepositioned at high-risk locations, or mounted on locomotives (Babińska-Werka et al., 2014; Backus et al., 2017; Pollock et al., 2019).

Regardless of potential, poor implementation of any method can negate effectiveness. Object lessons can be found with the CPR in Banff National Park and the Great Northern Environmental Stewardship Area (GNESA) along the BNSF in the NCDE. Despite claims of success (Pissot, 2007; Waller, 2017), there are little or no public data pertaining to on-the-ground performance, and little evidence of success in reducing grizzly bear displacement or mortalities in either location (Mattson, 2019a: 7).

David J. Mattson, Ph.D.

Literature Cited

Babińska-Werka, J., Krauze-Gryz, D., Wasilewski, M., & Jasińska, K. (2015). Effectiveness of an acoustic wildlife warning device using natural calls to reduce the risk of train collisions with animals. Transportation Research Part D: Transport and Environment, 38, 6-14.

Backs, J. A. J., Nychka, J. A., & Clair, C. S. (2017). Warning systems triggered by trains could reduce collisions with wildlife. Ecological Engineering, 106, 563-569.

Byron, E. (2019). Six NW Montana grizzly bears killed in a single week. Missoulian, October 12, 2019. https://missoulian.com/news/local/six-nw-montana-grizzly-bears-killed-in-single-week/article_8f71c8fb-5f81-53e5-a318-233cae08a519.html

Chaney, R. (2019). Train kills mother grizzly and two yearling cubs. Missoulian, June 19, 2019. https://missoulian.com/news/local/trains-kill-mother-grizzly-and-two-yearling-cubs/article_51917373-d66e-5e54-8b09-f436a86d58d0.html

Costello, C.M., R.D. Mace, & L. Roberts (2016). Grizzly bear demographics in the Northern Continental Divide Ecosystem; research results (2004-2014) and suggested techniques for management of mortality. Montana Fish, Wildlife & Parks, Helena, Montana.

Costello, C.M., & Roberts, L. L. (2020). Northern Continental Divide Ecosystem Grizzly Bear Monitoring Team Annual Report, 2019. Montana Fish, Wildlife & Parks, Kalispell, Montana.

Dorsey, B.P., A. Clevenger, & L.J. Rew (2017) Relative risk and variables associated with bear and ungulate mortalities along a railroad in the Canadian Rocky Mountains. Pages 135-154 in Borda-de-Água, L., R. Barrientos, P. Peja, & M. Pereira (eds). Railway Ecology. Springer Open, Cham, Switzerland.

Kasworm, W. F., Proctor, M. F., Servheen, C., & Paetkau, D. (2007). Success of grizzly bear population augmentation in northwest Montana. Journal of Wildlife Management, 71(4), 1261-1266.

Mattson, D. J. (2000). Causes and consequences of dietary differences among Yellowstone grizzly bears. Ph.D. Dissertation, University of Idaho, Moscow, Idaho.

Mattson, D. J. (2019a). Effects of trains and railways on grizzly bears: An evaluation of the effects of increased train traffic on the Burlington Northern Santa Fe & Montana Rail-Link Railways, Montana-Idaho. The Grizzly Bear Recovery Project, Report GBRP-2019-1, Livingston, Montana.

Mattson, D. J. (2019b). Heart of the Grizzly Bear Nation: an evaluation of the status of Northern Continental Divide Grizzly Bears. The Grizzly Bear Recovery Project, Report GBRP-2019-2, Livingston, Montana.

Mattson, D. J., & Merrill, T. (2004). A model-based appraisal of habitat conditions for grizzly bears in the Cabinet–Yaak region of Montana and Idaho. Ursus, 15(1), 76-90.

Montana Fish, Wildlife & Parks (October 16, 2019a). Grizzly bear cubs killed in train collision near Trego. http://fwp.mt.gov/news/newsReleases/fishAndWildlife/nr_1283.html

Montana Fish, Wildlife & Parks (June 17, 2019a). Three grizzly bears hit by trains east of Marias Pass. http://fwp.mt.gov/news/newsReleases/fishAndWildlife/nr_1231.html

Office of Surface Mining Reclamation and Enforcement (2018). Bull Mountains Mine No. 1, Federal Mining Plan Modification, Environmental Assessment, Musselshell County and Yellowstone County, Montana Federal Coal Lease MTM 97988. Office of Surface Mining Reclamation and Enforcement, Denver, Colorado.

Peterson, C. (2020). 2019 saw another 50-plus grizzly mortalities. Hungry Horse News, February 12, 2020. https://hungryhorsenews.com/news/2020/feb/12/2019-saw-another-50-plus-grizzly-mortalities/

Pissot, J. (2007). Trains, grains, and grizzly bears: reducing wildlife mortality on railway tracks in Banff National Park. Pages 64–66 in Proceedings of the 2007 International Conference on Ecology and Transportation (ICOET), North Carolina State University, Raleigh Center for Transportation and the Environment, Raleigh, North Carolina, USA.

Pollock, S. Z., Whittington, J., Nielsen, S. E., & St Clair, C. C. (2019). Spatiotemporal railway use by grizzly bears in Canada's Rocky Mountains. Journal of Wildlife Management, 83(8), 1787-1799.

Rutherford, A., Ellis, C., McGowen, P., McClure, M., Ament, R., & Grebnec, J. (2014). Highway mitigation for wildlife in northwestern Montana. Sonoran Institute, Northern Rockies Office, Bozeman, Montana.

Servheen, C., Kasworm, W., & Christensen, A. (1987). Approaches to augmenting grizzly bear populations in the Cabinet Mountains of Montana. International Conference of Bear Research & Management, 7, 363-367.

Waller, J.S., & C.S. Miller (2015). Decadal growth of traffic volume on US Highway 2 in northwestern Montana. Intermountain Journal of Science 21(1-4): 29-37.

Waller, J.S. (2017). Commerce and conservation in the Crown of the Continent. Pages 293-307 in Borda-de-Água, L., R. Barrientos, P. Peja, & M. Pereira (eds). Railway Ecology. Springer Open, Cham, Switzerland.