

Note

Observations of Long-distance Post-release Dispersal by Reintroduced Bison (*Bison bison*)

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Key objectives of wildlife reintroduction projects should include encouraging post-release site fidelity and high survival rates of founding individuals. Yet, few studies empirically evaluate these performance metrics for released individuals. Bison (*Bison bison*) restoration is receiving renewed interest by wildlife managers. To inform new bison reintroduction projects, we provide an observation of a 375-km (straight-line distance) post-release movement of three bison bulls from a release site in Yukon, Canada, in 1988. In addition, we note 250-km and 155-km post-release movements of bison in the Northwest Territories, Canada, in 1980 and 1998, respectively. These observations demonstrate the dispersal ability of bison encountering new environments. Wildlife managers planning for new bison reintroductions should consider means to enhance post-release site fidelity to limit long-distance dispersal and mortality and maximize initial population growth.

Key Words: Bison; *Bison bison*; dispersal; movements; post-release; reintroduction; Yukon

The universal goal of reintroduction projects is to establish a viable population in the wild. As such, key objectives should be to encourage post-release site fidelity and high survival rates of founding individuals. Field studies (e.g., Spinola *et al.* 2008; Ryckman *et al.* 2009; Yott *et al.* 2011) and simulation modeling (Mihoub *et al.* 2011) have both demonstrated that post-release survival is negatively correlated with dispersal distance for species capable of long-distance movements. Banks *et al.* (2002) found the opposite for species with limited dispersal ability. For species with high dispersal ability, ensuring post-release site fidelity may be challenging because founding individuals lack experience with their new environment (Stamps and Swaisgood 2007) and lack resident conspecifics to encourage social attraction to a new range (Mihoub *et al.* 2011). A primary method used to increase post-release site fidelity is a soft release, where individuals are temporarily held in an *in situ* enclosure before release, in an effort to acclimatize, familiarize, and bond them to their new range. In contrast, a hard release entails releasing individuals directly onto the landscape.

Here, we report an observation of long-distance post-release dispersal among reintroduced bison (*Bison bison*) of the Aishihik population (Jung *et al.* 2015a,b) that were soft released in Yukon, Canada, during 1988–1993, and note other occurrences from the adjacent Nahanni population, which were hard released in 1980 and 1998 (Larter and Allaire 2007).

Most bison reintroductions occurred during the 1980s and early 1990s; however, there is currently renewed interest in further restoring the species to their native range (Freese *et al.* 2007; Sanderson *et al.* 2008). For

example, bison were reintroduced to Alaska in March 2015 (C. T. Seaton, personal communication) and Banff National Park in February 2017 (Steenweg *et al.* 2016; K. Heuer, personal communication). As such, historical observations of long-distance post-release dispersal may be informative for wildlife managers working on, or planning, the establishment of new bison populations.

On 17 March 1988, 20 adult bison (11 male, 9 female) were released from an enclosure 55 km west of Carmacks, Yukon, Canada (62.089°N, 136.289°W), where they had been held *in situ* since they were yearlings (1 year old in 1984) to acclimatize to local environmental conditions. This was the first release of bison into southwestern Yukon and constituted the founding of the Aishihik population (Jung *et al.* 2015a,b). Included in the inaugural release of Aishihik bison were three adult (5 year old) male bulls that were each equipped with a VHF radio-collar (Telonics, Mesa, Arizona, USA) and an individually numbered yellow ear tag (#82, #83, and #85). Their relatedness was unknown.

On 11 May 1988, the three bulls were observed together in an alpine area during an aerial telemetry flight, about 45 km west of their release site (Figure 1; P. J. Merchant, personal communication). The bulls were next seen together on 20 June 1988 about 20 km south of Beaver Creek, Yukon, on the verge of the Alaska Highway. This movement was approximately 140 km northwest of their last known location. This was the last record of #85, which was rumoured to have been killed illegally (D. R. Drummond, personal communication). During the winter of 1988–1989 the remaining two bulls, recognizable from their ear tags, were ob-

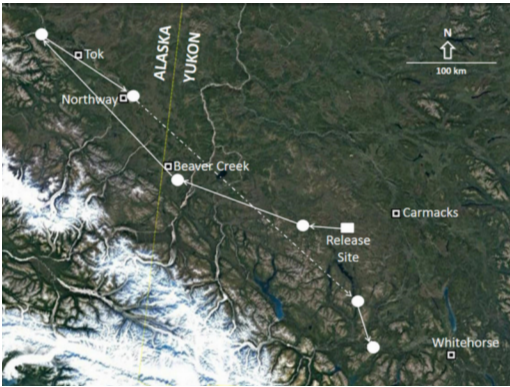


FIGURE 1. Release site (closed square), immediate post-release movements (solid lines with arrows), and subsequent translocation (dashed line) of three, then two, adult bison (*Bison bison*) bulls in Yukon and Alaska, from March 1988 to September 1989.

served variously along the Alaska Highway between the communities of Northway Junction and Tok, Alaska. During this time, they were observed by Alaskan wildlife officials as far from the release site as 45 km west of Tok (Figure 1; D. G. Kellyhouse, personal communication). Subsequently, the bulls moved back eastward along the Alaska Highway toward Northway Junction. The longest recorded straight-line distance of the bulls from their release site was about 375 km (Figure 1), which they traversed in about 6 months post-release.

While wintering near Northway Junction, the two bulls remained close to a highway roadhouse and were a concern to local residents. In late April 1989, one of the bison killed a pet dog in Northway Junction, and Alaskan wildlife officials asked their counterparts in Yukon to retrieve the two bulls. On 4 May 1989, Yukon wildlife officials captured the bulls (via chemical immobilization) in Northway Junction and transported them by truck to a release site 115 km northwest of Whitehorse, Yukon, and approximately 42 km north of the Alaska Highway (Figure 1; P. J. Merchant, personal communication). Bison #82 was last seen with #83 on 12 May 1989, near the translocation site. On 22 August 1989, #83 was seen on the Alaska Highway with a group of about 20 other bison of various sex and age classes. This bison group remained on, or adjacent to, the roadside verge for several weeks, posing a threat to highway travellers. On 13 September 1989, an adult female from the group was killed on the highway in a bison-vehicle accident. The next day, #83 was shot by wildlife officials because he would not leave the accident scene and posed a collision hazard and in an attempt to deter the rest of the group from loitering on the roadside verge (D. R. Drummond, personal communication).

Although not as well documented, similar long-distance post-release dispersals of bison from the Nahanni population apparently occurred in 1980 and 1998. In 1980, eight of 28 bison released to found the population reputedly dispersed from the release site near Nahanni Butte, Northwest Territories, southward to near Fort Nelson, British Columbia—a distance of approximately 250 km (Harper *et al.* 2000). In 1985, caribou harvesters from Trout Lake, Northwest Territories, came across tracks from what were believed to be bison on a winter road about 150 km east of the 1980 release site (Larter and Allaire 2007). In April 1998, 59 bison were released near Fort Liard, Northwest Territories, to augment the small Nahanni population, and 17 of these 59 animals also dispersed to near Fort Nelson, British Columbia, after release—a distance of approximately 155 km (Larter and Allaire 2007). The 1980 initiative was a hard release; that in 1998 was meant to be a soft release to reduce the potential for the long-distance dispersal observed in 1980, but the animals escaped from the pen shortly after arrival. The fate of these long-distance dispersing bison is unknown.

These observations are of value because they point to the extraordinary dispersal ability of post-release bison. Bison may be nomadic and, when they have not yet established their range, they may disperse long distances to areas not anticipated by wildlife managers. As remarkable as maximum recorded post-release dispersal distances of 375 km and 250 km for Aishihik and Nahanni bison may be, this behaviour is not unique to bison. For example, Yott *et al.* (2011) documented a maximum post-release dispersal distance of 142 km for reintroduced Elk (*Cervus canadensis*) in Ontario and reported other incidents involving reintroduced Elk apparently dispersing more than 300 km in Ontario-Quebec, and over 600 km in Alberta.

In addition, these observations emphasize that long-distance dispersal is risky (Bartón *et al.* 2012; Jung 2017) and may result in losses that may be costly to the viability of small, reintroduced populations. Similarly, Yott *et al.* (2011) reported that long-distance dispersal by post-release Elk was also associated with high mortality rates, which may contribute to slow population growth. Although only a few individuals may make extreme post-release dispersals, their impact on the growth of founding populations may be pronounced. For Nahanni bison, the functional loss of eight of the founding 28 individuals likely created a lag in growth of the new population (Larter and Allaire 2007). However, long-distance dispersal is important for the long-term viability of reintroduced populations because it may facilitate range expansion into vacant habitats (Larter *et al.* 2000; Jung 2017) and gene flow among neighbouring populations.

In conclusion, anticipated bison restoration projects (e.g., Freese *et al.* 2007; Sanderson *et al.* 2008; Steenweg *et al.* 2016) should consider the post-release dis-

persal capability of bison and plan accordingly, particularly where dispersing bison may conflict with people and compromise reintroduction objectives. As suggested for Elk, wildlife managers planning bison reintroductions should consider means to enhance post-release site fidelity to limit long-distance dispersal and mortality and maximize initial population growth (Yott *et al.* 2011; Bleisch *et al.* 2017). Ryckman *et al.* (2009) suggested that post-release site fidelity may be improved for species with long-distance dispersal ability by an extended conditioning period before release (i.e., soft releases). Post-release conditioning, such as supplemental feeding over the first year or so, may also help to bond animals to a new range. Even with efforts to prevent long-distance dispersal, managers should be prepared with protocols in place to address such movements and the conflicts with humans that may ensue when bison move into areas where they are not wanted (Clark *et al.* 2016; Jung 2017). Finally, to help improve the science of reintroduction biology (Seddon *et al.* 2007; Armstrong and Seddon 2008), projects involving the release of bison onto the landscape should strive to learn more about the relationship between post-release dispersal distances, survival, and initial population growth.

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