

MiniReview

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Bear Necessities: Exploring the Intricate Relationship of Black Bears and Humans in North America

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Abstract

With conservation, reintroduction' or rewilding projects in constant development, wildlife and humans increasingly interact and coexist. The black bear (*Ursus americanus*) in North America is one of such species benefitting from numerous successful conservation initiatives, resulting in an increase in the number of interactions with humans. To comprehensively understand this relationship, a review of the scientific literatures has been conducted. The objectives were to identify the drivers of the bear-human interactions and their consequences, along with various management practices implemented to mitigate conflicts. The results of the review showed that one common underlying factor in human and black interactions was the availability of anthropogenic food sources, which thus serves as the principal driver of conflicts. As of consequences of these interactions, bears may become habituated to humans, alter their habitat use, or adjust their diel activity pattern. Similarly, humans can also be influence by these interactions as people living closer to black bear populations may perceive them as a greater risk compared to urban dwellers. Finally, management practices such as increasing hunting pressure or relocating black bears have shown limited effectiveness in reducing interactions. However, addressing the primary driver of these encounters — anthropogenic food source — appears to be the most effective strategy to control and reduce conflicts. Furthermore, educational programs aimed at altering human behavior regarding anthropogenic food management have shown promise in reducing interactions with bears. In conclusion, this review underscored the importance of accurately assessing the drivers and consequences behind a human-wildlife interaction to implement appropriate management practices, not only for black bears, but could also be useful for other large mammals in North America undergoing successful conservation.

Introduction

In today's world, wildlife frequently provides humans with various ecosystem services, yet conflicts between humans and wildlife are also common, highlighting the ongoing and continuous interaction between the two. Nyhus describes this intricate relationship as a «defining experience of human existence (Nyhus, 2016), showing the importance of wildlife in a human life. Therefore, management and conservation practices are increasingly complex due to the multitude of interactions and conflicts involved, necessitating consideration of multiple stakeholders and the complexity of wildlife (Kaltenborn and Linnell, 2022). Moreover, wildlife tourism is gaining more and more popularity with recent research reflecting this growing interest (Dybsand, 2020). Consequently, complex management practices in combination with an increase in wildlife activity accentuate the need and the importance to improve the understanding of humans-wildlife interaction.

The black bear (*Ursus americanus*) in North America is one of such species gaining conservationists and managers attention as it begins to reclaim its historical range (Cleary et al., 2021). As a large mammal, black bear can be perceived as dangerous for and by humans, hence spreading fear into the public where black bears are becoming more common. This phenomenon mirrors observations made by Ordiz et al. (2019) regarding brown bear (*Ursus arctos*) in Sweden. Furthermore, previous successful reintroduction projects have resulted in rising black bear numbers across North America, even near to densely populated areas (Alston et al., 2022). This constant increase of a black bear population following reintroduction efforts has been observed and illustrates in previous studies (Fig. 1; Alston et al., 2022). However, this resurgence in black bear populations has led to a significant increase in conflicts between black bears and humans (Gaushalas et al., 2020).

Therefore, this MiniReview aim to understand the interaction between black bear and humans by providing a review of the scientific literature. The objectives will hence involve an assessment of the drivers

and their impacts, followed by a review of past and ongoing management and conservation practices to adequately understand and assess the situation between black bears and humans.

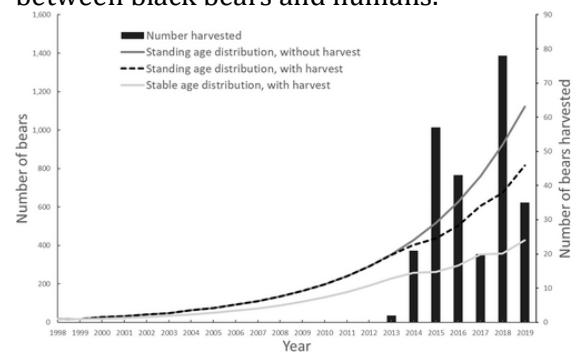


Figure 1: Population growth rates for black bears reintroduced to Cumberland Plateau study area, Kentucky and Tennessee, USA, 1998–2019. Projections include those with hunter harvest, with no hunter harvest, and with hunter harvest but with a stable age and sex distribution in 1998 (Alston et al., 2022).

Drivers of Interactions

Driver of humans-wildlife interactions are varied, but several key factors can be identified. One primary reason is the ongoing and continuous increase in human encroachment into natural habitats, leading to competition for resources, food, and an increase in confrontational events (Manfredo, 2008). Moreover, urban development emerges as a significant driver of interactions with black bears. Indeed, for example, the probability of conflicts between 2011 and 2017 increased with urban-wildlife interface in British Columbia (Van Bommel et al., 2020).

Furthermore, agriculture fields can also contribute to human-wildlife interactions, particularly during autumn when black bears seek additional resources to prepare for winter hibernation (Van Bommel et al., 2020). Hence, two drivers of human and black bear interactions in North America are a result of anthropogenic developments, which are rural and urban, as bears are foraging for food in these novel ecosystem (Van Bommel et al., 2020).

Some more specific drivers can be identified, such as road density, forest cover and human density (Fig. 2; Van Bommel et al., 2020). Notably, conflicts between bears and humans peaked at medium human density levels (Fig. 2; Van Bommel et al., 2020).

Another driver of increased interactions between black bears and humans is the rise in wildlife tourism. Indeed, wildlife recreation practices saw a 17.7% increase from 1999 to 2009 and is still likely increasing (White et al., 2016).

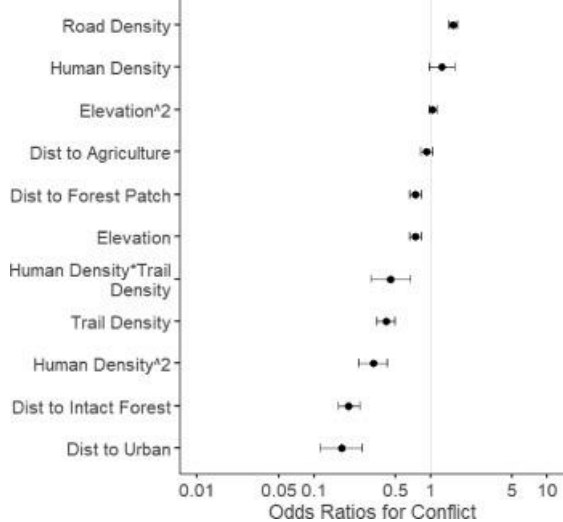


Figure 2: Estimated effects of anthropogenic and environmental variables on human-black bear conflict in the Capital Regional District (CRD), BC, Canada. Coefficient estimates (mean and 95% confidence intervals) from best-supported resource selection function of conflict locations between 2011 and 2017, back transformed from the logit scale to odds ratios (OR). Predictor variables have been standardized to a mean of zero and standard deviation of one to allow for direct comparison. Distance-to coefficients <1 OR represent selection for that feature (Van Bommel et al., 2020).

To sum up, food availability often plays a crucial role and is often the underlying reason behind these human and black bear interactions (Powell et al., 2022; Northrup et al., 2023), explaining the interest of black bears in urban, rural, and tourism areas. Indeed, across 48 management agencies in North America, garbage or food attraction was reported as the main driver of interactions (Fig. 3; Spencer et al., 2007).

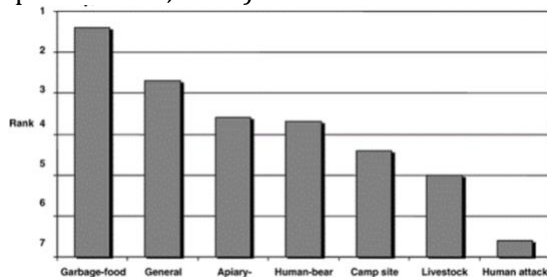


Figure 3: Comparative frequency of reasons given for complaints of black bear-human conflicts as reported by North American wildlife agencies (ranking 1-7, 1 most common), 2006 (Spencer et al., 2007).

It is noteworthy that human attacks were the least reported reason for black bear

and human conflicts (Fig. 3; Spencer et al., 2007).

Impacts of The Interactions

These multiple drivers of human-black bear interaction result in different impacts on black bears as well as humans. First off, these interactions can affect the spatial use of black bears. They may start avoiding certain areas with high human density, as previously discussed (Van Bommel et al., 2020). Another study has shown that black bears tend to spatially avoid areas with increase anthropogenic activities more than they alter their temporal activity (Hubbard et al., 2022). This indicates a preference to relocate to other areas with lower human presence (Hubbard et al., 2022). As depicted in Fig. 3, black bear occupancy probability is highly decreased when human density increases (Fig. 4; Hubbard et al., 2022)

Human-black bear interaction can also affect the temporal activity of bears. During hunting season, black bears exhibited more nocturnal behavior than usual (Hubbard et al., 2022). Additionally, when accompanied by cubs, they may adjust their temporality pattern to minimize encounters with humans (Hubbard et al., 2022).

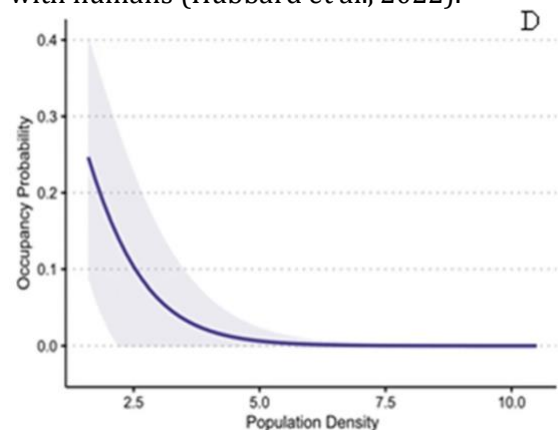


Figure 4: Top occupancy model results for detection and occupancy probability. Graph shows the relationship between estimated occupancy probability human population density. Shaded region represents the standard error (Hubbard et al., 2022).

Interactions with humans can also result to the habituation of black bears to human presence. Black bears can learn to associate humans with food availability (Hopkins, 2013). They also recognized that the anthropogenic food source is not always available, but it can be an option when natural food sources are scarce (Powell et al.,

2022). However, human food is still not their primary source of nutrition as they tend to avoid it when other resources are available (Johnson et al., 2015). For example, as shown in Fig. 5, black bears tend to utilize resources near anthropogenic structures more when habitat quality is poor compared to when it is good (Fig. 5; Johnson et al., 2015).

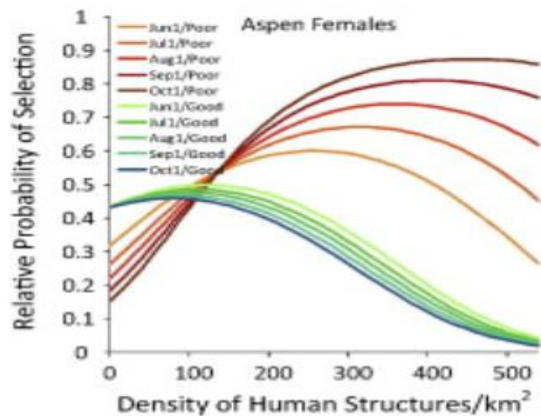


Figure 5: Black bear relative probabilities of selection for density of human development from May to October in Aspen, USA. Warm colors depict selection during poor natural food years and cool colors depict selection in good natural food years. Aspen had maximum densities of 540 structures/km². Shaded region represents the standard error (Johnson et al., 2015).

Humans can also be affected by increased interactions or conflicts with black bears, particularly in terms of their attitudes and perceptions towards bears. Perceptions of bear risk may vary depending on individuals' likelihood of encountering black bears. Urban residents tend to perceive black bears as lower risk than those living in proximity to bear habitats (Cleary et al., 2021).

To conclude, humans and black bear interactions in North America can have diverse consequences for both parties, leading to various changes to their behaviors.

Management Practices

Furthermore, the increasing black bear population in North America, leading to more frequent interactions with humans, necessitates interventions. Consequently, effective management strategies are needed to mitigate conflicts and prevent problematic situation arising from anthropogenic activities such as wildlife recreation, roads, agriculture and others. One of the management ideas involve

harvesting or hunting black bears to control their population numbers. This practice is appealing as it can achieve multiple management goals simultaneously (e.g., satisfying hunters, population control, increasing permit sale, reducing humans-wildlife interactions). The rationale behind this method is that by reducing the bear population, there would be less conflicts with humans. However, as it can be understood in the next paragraph, the outcomes of this practice often have been mixed, with some studies showing positive results while others no effect (Garshelis et al., 2020; Adrian et al., 2010; Obbard et al., 2014).

To evaluate the efficiency of this technique, a new hunting season was introduced in Canada, Ontario to assess whether a reduction in bear number would indeed decrease interactions with humans (Northrup et al., 2023). In fact, the substantial increase in black bear harvest did not lead to a corresponding decrease in interactions between them and humans (Northrup et al., 2023). On the contrary, it could even be suggested that the new hunting season may have led to an increase in interactions and conflicts (Fig. 6; Northrup et al., 2023).

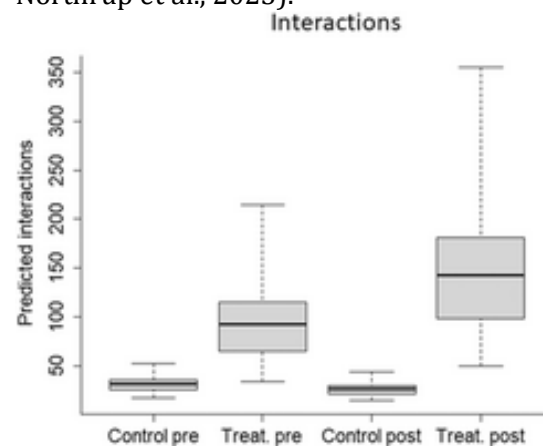


Figure 6: Predicted median (black line), interquartile range (box), and 95% credible intervals (whiskers) of human-black bear interactions per year in the average district as a function of time period (pre- or post-initiation of a spring season in selected wildlife management units [WMUs]). Treatment predictions (treat.) are the predicted number for a district with 50% overlap with spring hunt WMUs. We derived predictions from hierarchical Poisson regression fit to data from 2012 through 2015 in Ontario, Canada (Northrup et al., 2023).

Alternatively, another management method that appears to be more efficient in reducing humans and black bear interactions is controlling food availability

for bears as it is the primary driver of these interactions. Hence, managing conflicts by controlling food sources is a promising approach. A study by Northrup et al. (2023) showed that bottom-up drivers like food availability were the main factors explaining humans and black bear conflicts (Northrup et al., 2023). They found that when natural food availability was low, conflicts increased, as bears turned to anthropogenic food sources (Fig. 7; Northrup et al., 2023). Thus, managing these unnatural food sources is essential to assure at least a reduction in humans and black bear interactions. Another study modeled different management controls on unnatural food sources and concluded that eliminating anthropogenic food sources was the most effective strategy for reducing conflicts (Crevier et al., 2021). Adding deterrence measures and considering the spatial configuration of those practices also contributed to success (Crevier et al., 2021).

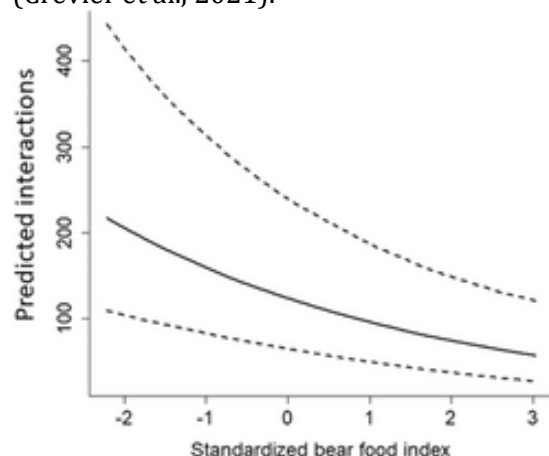


Figure 7: Predicted median (solid line) and 95% credible intervals of human-black bear interactions per year in the average control district prior to the implementation of the spring hunt as a function of bear food availability. We derived predictions from hierarchical Poisson regression fit to data from 2012 through 2015 in Ontario, Canada (Northrup et al., 2023).

Furthermore, it is crucial to note that humans can also be managed and their trust can be gained, enhancing management and conservation efforts. Nationwide educational campaigns focused on removing food attractant can help reduce interactions (Spencer et al., 2007). Additionally, building strong and positive relationships with rural residents, who perceive a higher risk of black bear encounters and have lower trust in agencies, is essential for successful management (Cleary et al., 2021). Moreover,

agencies need to demonstrate competence in their management practices to effectively reduce black bear and human interactions (Cleary et al., 2021).

Finally, it is important to mention that other methods to reduce interactions exists, such as bear relocation. However, this technique did not seem to be effective, with only few successful cases of success and numerous failures (Spencer et al., 2007).

In summary, a variety of management practices exists to control, or at least try to, and reduces human and black bear interactions. These practices target either the bear population or humans, some more successful than others, with managing anthropogenic food source as seemingly the best way.

Discussion

In this MiniReview, the objectives were to investigate the drivers of humans and black bears interactions in North America, assess the resulting impacts, and, finally, examine the management practices aimed at reducing conflicts.

The main drivers identified were the increasing urban and rural development and wildlife tourism, with anthropogenic food sources and food availability underlying the principal reasons. The consequences of these interactions have significant implications for both parties. Black bears may become habituated, alter their habitat use, or change their diel activity patterns, while human perceptions of risk may be influenced by the proximity to these interactions. This can pose challenges for bear conservation efforts, as avoidance of human-occupied areas may lead to loss of vital habitats and territories for black bears. Thus, even though the previous conservation projects were successful, in the future, their populations might start declining again due to this avoidance. Additionally, more visitors in wildlife areas can significantly impact large mammals, like the black bear, as they are highly sensitive due to their large territories, low density and low birth rate (Sytsma et al., 2022). For humans, individuals residing closer to bear habitats often express heightened fear. Therefore, targeted educational campaigns focusing on proper

disposal methods of food sources, such as waste, to deter bear attraction should be prioritized for this particular demographic. Moreover, showcasing successful management practices to the public can serve as an effective means to demonstrate the efficacy of conservation efforts, potentially inspiring greater respect for and adherence to such measures (Cleary et al., 2021). Finally, various management practices have been employed to mitigate these interactions. Among these, direct control of anthropogenic food source (i.e., removal) seems to be most efficient, as it has shown promise in diminishing interactions.

This MiniReview emphasizes the importance of better understanding the background of human-wildlife interactions to accurately assess and manage the situation. Given that food availability is the main driver of interactions between humans and black bears, management practices should prioritize addressing this issue rather than pursuing less effective methods such as increasing harvesting. Furthermore, increasing the killing of a large mammal like the black bear often faces strong opposition from the human population, whereas focusing on anthropogenic food source presents a more socially acceptable approach with less controversies.

These findings also have broader implications for wildlife conservation as managing the food availability may be a more effective strategy than increasing hunting for other species as well, such as wolves, which remains a topic of ongoing debate worldwide, precisely in Norway (Krange et al., 2022). Nonetheless, there is still a need for a better interdisciplinary approach to managing humans and black bears interactions. Indeed, this conflict involve not just wildlife, but also human societies, cultures, socioeconomic statuses, and even different countries, given that black bears are found across the world. Additionally, there are various stakeholders and laws that must be taken into account. Therefore, an interdisciplinary approach would provide a more comprehensive understanding of this complex issue, enabling afterwards the implementation of precise management practices tailored to specific situations. For example, as

investigated by Fisher et al. (2020), socioeconomic status can influence the people's perspectives on human-wildlife conflicts (Fisher et al., 2020).

Thus, future research on black bear and human interactions should primarily focus on food availability. Indeed, given its role as the main underlying driver of these interactions, management authorities should prioritize studying how both natural and anthropogenic food availability influence conflicts and interactions, leading to the development of more effective management practices.

Conclusion

In conclusion, human and black bear interactions in North America are of significant concern, given the widespread distribution of black bears across the continent and their increasing due to successful conservation efforts, among other things. Driving these interactions is food availability, principally anthropogenic food sources, which leads to bear habituation, changes in their spatio-temporal behavior, and alterations in human tolerance and perceptions. To effectively manage these interactions, it is crucial to focus on controlling anthropogenic food sources, as this approach have shown positive results.

Moving forward, it is imperative to extend the focus of managing anthropogenic food source beyond National Parks to urban and rural areas, where more and more black bears are venturing. Further studies and reviews should also explore how managing anthropogenic food sources could benefit other large mammals in North America, such as cougars, which are also experiencing population growth and conflicts.

In reflection, it is essential to recognize the importance of the interconnectedness between humans and wildlife, including black bears. Understanding that both parties play a role in these interactions is crucial, as black bears are simply attempting to survive and adapt like humans do. By acknowledging this mutual dependence, it is possible to work towards a more sustainable coexistence with wildlife.

References

- Adrian, T., J. K. Kirsten, and M. M. David. 2010. American black bear nuisance complaints and hunter take. *Ursus* 21:30-42.
- Alston, J. D., J. D. Clark, D. B. Gibbs, and J. Hast. 2022. Density, harvest rates, and growth of a reintroduced American black bear population. *The Journal of Wildlife Management* 86:e22298.
- Cleary, M., O. Joshi, and W. S. Fairbanks. 2021. Mapping and modeling the components of human tolerance for black bears in eastern Oklahoma. *Journal of Environmental Management* 288:112378.
- Crevier, L. P., J. H. Salkeld, J. Marley, and L. Parrott. 2021. Making the best possible choice: Using agent-based modelling to inform wildlife management in small communities. *Ecological Modelling* 446:109505.
- Dybsand, H. N. H. 2020. In the absence of a main attraction – Perspectives from polar bear watching tourism participants. *Tourism Management* 79:104097.
- Fisher, J. A., H. Dhungana, J. Duffy, J. He, M. Inturias, I. Lehmann, A. Martin, D. M. Mwayafu, I. Rodríguez, and H. Schneider. 2020. Conservationists' perspectives on poverty: An empirical study. *People and Nature* 2:678-692.
- Garshelis, D. L., K. V. Noyce, and V. St-Louis. 2020. Population reduction by hunting helps control human-wildlife conflicts for a species that is a conservation success story. *Plos one* 15:e0237274.
- Hopkins, J. B., III. 2013. Use of genetics to investigate socially learned foraging behavior in free-ranging black bears. *Journal of Mammalogy* 94:1214-1222.
- Hubbard, T., M. V. Cove, and D. J. R. Lafferty. 2022. Human recreation impacts seasonal activity and occupancy of American black bears (*Ursus americanus*) across the anthropogenic-wildland interface. *Scientific Reports* 12:12201.
- Johnson, H. E., S. W. Breck, S. Baruch-Mordo, D. L. Lewis, C. W. Lackey, K. R. Wilson, J. Broderick, J. S. Mao, and J. P. Beckmann. 2015. Shifting perceptions of risk and reward: Dynamic selection for human development by black bears in the western United States. *Biological Conservation* 187:164-172.
- Kaltenborn, B. P., and J. D. C. Linnell. 2022. The Coexistence Potential of Different Wildlife Conservation Frameworks in a Historical Perspective. *Frontiers in Conservation Science* 2.
- Klees van Bommel, J., M. Badry, A. T. Ford, T. Golumbia, and A. C. Burton. 2020. Predicting human-carnivore conflict at the urban-wildland interface. *Global Ecology and Conservation* 24:e01322.
- Krange, O., E. von Essen, and K. Skogen. 2022. Law Abiding Citizens: On Popular Support for the Illegal Killing of Wolves. *Nature and Culture* 17:191-214.
- Manfredo, M. J. 2008. Who Cares About Wildlife? Pages 1-27 in M. J. Manfredo, editor. *Who Cares About Wildlife? Social Science Concepts for Exploring Human-Wildlife Relationships and Conservation Issues*. Springer US, New York, NY.
- Northrup, J. M., E. Howe, J. Inglis, E. Newton, M. E. Obbard, B. Pond, and D. Potter. 2023. Experimental test of the efficacy of hunting for controlling human-wildlife conflict. *The Journal of Wildlife Management* 87:e22363.
- Nyhus, P. J. 2016. Human-Wildlife Conflict and Coexistence. *Annual Review of Environment and Resources* 41:143-171.
- Obbard, M. E., E. J. Howe, and C. J. Kyle. 2010. Empirical comparison of density estimators for large carnivores. *Journal of Applied Ecology* 47:76-84.
- Ordiz, A., G. K. Moen, S. Sæbø, N. Stenset, J. E. Swenson, and O.-G. Støen. 2019. Habituation, sensitization, or consistent

behavioral responses? Brown bear responses after repeated approaches by humans on foot. *Biological Conservation* 232:228-237.

Powell, R. A., S. A. Mansfield, and L. L. Rogers. 2022. Comparison of behaviors of black bears with and without habituation to humans and supplemental research feeding. *Journal of Mammalogy* 103:1350-1363.

Sytsma, M. L. T., T. Lewis, B. Gardner, and L. R. Prugh. 2022. Low levels of outdoor recreation alter wildlife behaviour. *People and Nature* 4:1547-1559.

White, E. M., Bowker, J. M., Askew, A. E., Langner, L. L., Arnold, J. R., & English, D. B. K. (2016). Federal outdoor recreation trends: Effects on economic opportunities. Gen. Tech. Rep. PNW-GTR-945. U.S. Department of Agriculture, Forest Service, Pacific Northwest Station. 46 p.