April 15, 2022

Charlton H. Bonham, Director, California Dept. of Fish and Wildlife
California Fish and Game Commission
715 P Street, 16th floor, Sacramento, 95814
P.O. Box 944209, Sacramento, CA 94244-2090

Re: Black bear petition 2021-027, Response to Sportsmen's letter to Dir. Charlton Bonham

Dear Director Bonham and California Fish and Game Commissioners:

We, the 18 undersigned biologists and scholars, agree that the California Department of Fish and Wildlife must update its 1998 black bear management plan, obtain a rigorous statewide population estimate with adequate precision for California's black bears (*Ursus americanus*), and plan for the catastrophic effects that the climate crisis is already having on black bears, including from drought, wildfire, loss of food and the spread of parasites. Operating in the dark, the CDFW cannot pretend that a quota of 1,700 bears applied to populations of unknown size in the state is without risk. It makes sense, both scientifically and from a values-based perspective, to place a moratorium on the recreational hunting of bears until statewide population estimates are obtained for California's black bears. Considering the substantial uncertainty about the densities, sizes, and growth trajectories of California's bear populations, continuation of recreational bear hunts unequivocally imposes risks that cannot yet be quantified because of a dearth of demographic data. Taking a more cautious approach of halting bear hunts until reliable bear population demographic estimates are obtained and evaluated is warranted (i.e., applying the precautionary principle).[1]

In their letter to Director Bonham, sportsman's organizations (hereinafter "Sportsmen") posit that California's black bear populations are flourishing and falsely claim that black bear numbers are at "historic levels," which, on its face makes no sense.[2] Black bears have been extirpated from approximately 70% of their historic range in North America, and no data exist to prove Sportsmen's claims about California's bear populations. Curiously, they gloss over the California Department of Fish and Wildlife's own derived bear population figures – both the ones that appear in the bear take reports (15,934 ± 6,000) and on the website (30,000 - 40,000).

In an attempt to plaster over the dearth of black bear population studies in California, Sportsmen provide incomplete information about previous and current CDFW black bear projects, including a project on teeth extractions from dead bears, a den-site study involving 55 bears in one region, and a study of encephalitis (a viral brain infection that may be plaguing some California black bears), none of which provide information for estimation population size, density, or growth rates. Then Sportsmen cite a litany of historical study projects but offer no study conclusions, reports or analysis to the California Fish and Game Commission ("Commission"). Curiously, Sportsmen cite numerous studies (also without any scrutiny) to suggest that from those studies, we know a lot about California's black bears. Finally, Sportsman distort the petition at issue here. Sportsmen's letter, while lengthy, fails to convey how well black bears are faring in California because no data to bolster their claims exist. The studies cited speak only to human-bear conflict, predator-prey interactions, foraging and disease ecology, and habitat selection and use. From the literature Sportsman provided, we learn nothing about the current demographic statuses of California's black bear populations. The literature provided instead serves to confirm the arguments in the Humane Society of the United States' petition before the Commission: No reliable science underlying California's derived (not estimated) black bear population numbers exist. To assist the Commission and the CDFW, we provide context to some of the studies the Sportsman cite.

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[1] D Kriebel et al., "The Precautionary Principle in Environmental Science," *Environmental Health Perspectives* 109, no. 9 (2001).
[2] Black bears were likely more numerous prior to white settlement. The dominant culture had believed that mammalian carnivores were in competition with humans and were dangerous. As a result, black bears and other carnivores were killed with alacrity during the past two centuries and their habitats converted (see, e.g., Lisa Mighetto, *Wild Animals and American Environmental Ethics* (Tucson: University of Arizona Press, 1991).
According to California's 1998 black bear management plan, bears have been classified as a game species since 1948—meaning they were killed by market hunters and others without restrictions until that time.

1. **Disease ecology studies cited by Sportsmen suggest threats to California black bear populations that the Commission should consider.**

In their letter to the director, Sportsmen provide three disease studies that the Commission should consider:

- Alex, C. E., E. Fahsbender, E. Altan, R. Bildfell, P. Wolff, L. Jin, W. Black, K. Jackson, L. Woods, B. Munk, T. Tse, E. Delwart, and P. A. Pesavento. 2020. Viruses in unexplained encephalitis cases in American black bears (Ursus americanus). PLOS ONE 15:e0244056.

- Stephenson, N., J. M. Higley, J. L. Sajecki, B. B. Chomel, R. N. Brown, and J. E. Foley. 2015. Demographic characteristics and infectious diseases of a population of American black bears in Humboldt County, California. Vector-Borne and Zoonotic Diseases 15:116–123.

- Munk, B. A., J. C. Turner, and M. K. Keel. 2013. Mediastinal teratoma in a free-ranging American black bear (*Ursus americanus*). Journal of Zoo and Wildlife Medicine 44:1120–1122.

For example, Alex et al. (2020) suggest that California black bears face novel viruses, likely in significant proportions.

> "Circovirus infection was detected in 10/16 (62.5%) of cases tested, but the clinical significance of these infections remains to be established…. In summary, we identified diverse novel viruses infecting black bears from California . . . and several of the identified viruses warrant further investigation as potential pathogens."

The three referenced studies bolster the HSUS' petition and their two supplemental documents to the Commission concerning the climate crisis. Accordingly, the studies should be included in the Commission's analysis. In addition to drought and fires, disease can harm California's black bear populations, and disease is worsening because of climate change. With warmer winters and extended fall and spring seasons, climate change is predicted to drive the expansion of ticks and tick-borne diseases into more northerly latitudes and higher elevations.[3] Increases in temperatures facilitate the proliferation of parasitic organisms.[4] Climate warming will change trophic effects that include the profusion of parasites and disease.[5] For instance, Lyme disease has expanded to northern climes, including into Canada, as a result of climate change-associated warming trends.[6] We are at the nexus of climate change: Pervasive species loss along with the diversification of parasites and pathogens.[7] Hoberg and Brooks (2015) write: "Within this matrix of change, an epidemiological crisis emanates from the interactions between climate warming and the abiotic and biotic influences determining geographical distributions for diverse species assemblages and their associated pathogens..."[8]

The acceleration of a warming climate threatens the integrity and function of ecosystems, biological diversity, and will influence patterns of disease. Emerging infectious disease outbreaks may occur with more frequency and across broader geographical areas. Most parasites are highly specialized to use one type of host species within restricted ranges, but mounting evidence indicates that this is rapidly changing. Therefore, Sportsmen's referenced disease studies are pertinent to the CDFW's considerations as they propose to study and manage California's black bears.

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[3] Filipe Dantas-Torres, *Climate Change, Biodiversity, Ticks and Tick-Borne Diseases: The Butterfly Effect*, vol. 4 (2015).
[4] Erica E. Short, Cyril Caminade, and Bolaji N. Thomas, "Climate Change Contribution to the Emergence or Re-Emergence of Parasitic Diseases," *Infectious Diseases: Research and Treatment* 10 (2017).
[5] K. S. McKelvey and P. C. Buotte, "Climate Change and Wildlife in the Northern Rockies Region," in *Climate Change Vulnerability and Adaptation in the Northern Rocky Mountains*, ed. Jessica E. Halofsky, et al. (Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain, 2018).
[6] Kristie Ebi, L. et al., "Detecting and Attributing Health Burdens to Climate Change," *Environmental Health Perspectives* 125, no. 8 (2017).
[7] Eric P. Hoberg and Daniel R. Brooks, "Evolution in Action: Climate Change, Biodiversity Dynamics and Emerging Infectious Disease," *Philosophical Transactions of the Royal Society B: Biological Sciences* 370, no. 1665 (2015).
[8] Ibid., p. 1.

2. The Commission should consider the newest black bear genetic studies.

Sportsmen cite Brown et al. (2009) without conveying any findings of the study. At the population scale (i.e., for delineating among populations), Brown et al. (2009) found that as of 2004, four distinct populations of black bears existed in California. Although the authors noted that moderate levels of gene flow existed among some of the populations, two populations were disjunct, likely reproductively isolated from the other populations, and had low genetic diversity (heterozygosity = 0.41-0.48; allelic richness = 2.9-3.4). However, considering this study was based on data collected during 1990–2004, the results apply to at least 18 years ago, which represents approximately 3–6 black bear generations because bears are iteroparous and have overlapping generations[9] and is therefore terribly outdated.

Nevertheless, CDFW maintains outdated black bear genetic information on its website, which states: "Two subspecies of black bear are recognized in California, the northwestern black bear (*Ursus americana altifrontalis*) and the California black bear (*U. a. californiensis*). These subspecies are thought to be geographically distinguished by the crest of the Klamath Mountains."[10] However, results from two recent, range-wide, species-level black bear genomics studies indicate just five subspecies of black bears exist in North America, rather than the 16 subspecies that had been historically used.[11] Black bear subspecies are geographically separated from each other and are grouped as follows: Kenai Peninsula, southeast Alaska (SEAK); Northwest, Southwest, East and Mexican.[12] These two studies arrived at similar conclusions for the West and Southwest, which suggested that all bears in California likely are either the Southwest clade/cluster/subspecies, the Northwest clade/cluster/subspecies, or an admixture of the two.

In short, California black bears are likely genomically an admixture of Northwest and Southwest clades of black bears, but contemporary information on genetic population structuring, isolation, genetic diversity, and genetic effective population sizes remains unclear for bear populations in the state and further analyses using more recent genetic data are warranted. Furthermore, none of these studies addressed the matter that is the focus of the HSUS's petition: The lack of credible science underlying the state's black bear population numbers. Additionally, it appears that the Black Bear Population Information page on CDFW's website was written nearly 30 years ago and never updated. The newest reference on CDFW's site is a paper published in 1994. Multiple California bear papers have been published since then that refute multiple points on the Department's website.

3. Sportsmen cite studies concerning wild ungulate and tortoise predation; issues not before the Commission.

- Elbroch, L. M., P. E. Lendrum, M. L. Allen, and H. U. Wittmer. 2015. Nowhere to hide: pumas, black bears, and competition refuges. Behavioral Ecology 26:247–254.

- Lovich, J. E., D. Delaney, J. Briggs, M. Agha, M. Austin, and J. Reese. 2014. Black bears (*Ursus americanus*) as novel potential predator of Agassiz's desert tortoises (Gopherus agassizii) at a California wind energy facility. Bulletin, Southern California Academy of Sciences 113:34–41.

As exciting and interesting as these predation studies are, the issues of black bear predation are not before the Commission as part of this citizen petition process and have little bearing on bear population demographic analyses, how the climate change may be affecting bears, and the need to update a quarter-century-old black bear management plan.

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[9] Dave P. Onorato et al., "Phylogeographic Patterns within a Metapopulation of Black Bears (Ursus Americanus) in the American Southwest," *Journal of Mammalogy* 85, no. 1 (2004); S. Murphy et al., "Rapid Growth and Genetic Diversity Retention in an Isolated Reintroduced Black Bear Population in the Central Appalachians," *Journal of Wildlife Management* DOI: 10.1002/jwmg.886 (2015); Emily E. Puckett et al., "Phylogeographic Analyses of American Black Bears (Ursus Americanus) Suggest Four Glacial Refugia and Complex Patterns of Postglacial Admixture," *Molecular Biology and Evolution* 32, no. 9 (2015).

[10] California Department of Fish and Wildlife, "Black Bear Biology," *https://wildlife.ca.gov/Conservation/Mammals/Black-Bear/Biology* (2021).

[11] Mikkel Winther Pedersen et al., "Environmental Genomics of Late Pleistocene Black Bears and Giant Short-Faced Bears," *Current Biology* 31, no. 12 (2021); Puckett et al., "Phylogeographic Analyses of American Black Bears (Ursus Americanus) Suggest Four Glacial Refugia and Complex Patterns of Postglacial Admixture."

[12] Pedersen et al., "Environmental Genomics of Late Pleistocene Black Bears and Giant Short-Faced Bears."

4. The Commission should consider the climate crisis with all its perturbations including drought, wildfire and disease transmission.

In one section of their letter, Sportsmen cite one study concerning fires, a study that petitioners already provided to the Commission and evaluated in their January 24, 2022 supplement to petition, "The climate crisis and California black bears . . ." Furnas, B. J., B. R. Goldstein, and P. J. Figura. 2022. *Intermediate* fire severity diversity promotes richness of forest carnivores in California. Diversity and Distributions 28:493–505. Furnas et al. (2022) found that fires confer some benefits to carnivores when fires occur at low or intermediate severities, but Furnas et al. did not consider the severe fires of 2021, which turned some places into moonscapes and killed bears and other wildlife. In fact, Furnas et al (2022) note that "…factors such as climate change, fire suppression and timber harvesting have increased the relative extent of high versus low severity fires in western North American forests (Millar et al. 2007).", adding that "Modern wildfires are also more often larger in size than was the case historically…", and "Additionally, the effects of climate change and recent drought-induced tree mortality throughout large portions of the Sierra Nevada mountains are likely to alter the ecology of future forests in part by favouring regeneration of shade-tolerant species and further increasing the size of high severity fires (Stephens et al. 2018)."

The climate science is clear: Bears will be affected by drought and by fires, with greater concerns with severe fire regimes. The extent of climate change impacts on black bears must be considered as part of the CDFW's new black bear management plan, and given that the agency does not have these assessments at this time, imposing a moratorium on black bear hunting makes sense given the uncertainties of risk.

5. Estimating California's black bear populations must be conducted using the best available science and not a reliance on harvested bears.

Sportsmen cite a handful of black bear population studies that should be considered as part of this record, to the extent that they are helpful:

- Fusaro, J. L., M. M. Conner, M. R. Conover, T. J. Taylor, and M. W. Kenyon. 2017. Best management practices in counting urban black bears. Human-Wildlife Interactions 11:64–77.
    - This study could help inform the methods CDFW could use to obtain data for estimating population sizes, densities, and growth rates. However, the study was conducted in two very small areas (44 km^2 and 70 km^2 each) that collectively represented less than 1% of black bear range in the state; and the data were collected 10-12 years ago (2010-2012) and do not represent the contemporary status of bears in those study areas.

- Fusaro, J. L., M. M. Conner, M. R. Conover, T. J. Taylor, M. W. Kenyon, J. R. Sherman, and H. B. Ernest. 2017. Comparing urban and wildland bear densities with a DNA-based capture-mark-recapture approach. Human-Wildlife Interactions 11:50–53.
    - This study used the exact same 10-12 year-old data as the study above and therefore has the same issues. Additionally, the authors used analytical methods (nonspatial capture-recapture models) that very are well-known to substantially overestimate black bear population densities (often by >200%), and researchers have developed newer techniques (spatial capture-recapture models) that do not have this issue.[13]

- Matthews, S. M., R. T. Golightly, and J. M. Higley. 2008. Mark-resight density estimation for American black bears in Hoopa, California. Ursus 19:13–21.
    - Similar to both studies above, this study could help inform the methods CDFW could use to obtain data for estimating population sizes, densities, and growth rates. However, the study was conducted in two extraordinarily small areas (5 km^2 and 5 km^2 each); the data were collected 24 years ago and therefore the estimates apply only to the year 1998; and the authors used analytical methods (nonspatial mark-resight models) that are very well-known to substantially overestimate

[13] M. E. Obbard, E. J. Howe, and C. J. Kyle, "Empirical Comparison of Density Estimators for Large Carnivores," *Journal of Applied Ecology* 47, no. 1 (2010).

black bear population densities, and researchers have developed newer techniques (spatial mark-resight and generalized spatial mark-resight models) that do not have this issue.[14]

Notably, Sportsmen omitted studies of bears injured or killed in vehicular collisions on highways as a result of bears searching for food during drought and wildlife despite being reported in statewide media. The *Los Angeles Times* quoted U.C. Davis Prof. Fraser Shilling as saying, "'I can't think of a worse situation for wildlife — bears running for their lives from fire and then getting whacked by cars. It's a biological tragedy compounded by the fact that humans are responsible for the climate changes that set the stage for these increasingly immense and deadly wildfires.'" Prof. Shilling noted that record numbers of bears were struck on California highways last year.[15]

To reliably estimate population sizes, densities, and growth rates of California bear populations statewide, and monitor the impacts of human-caused mortalities and climate change on bear population demographics, we provide the following contemporary studies to CDFW (available upon request):

- Humm, J. and Clark, J.D. (2021), Estimates of Abundance and Harvest Rates of Female Black Bears Across a Large Spatial Extent. Jour. Wild. Mgmt., 85: 1321-1331.[16]

- Hooker, M.J., Chandler, R.B., Bond, B.T. and Chamberlain, M.J. (2020), Assessing Population Viability of Black Bears using Spatial Capture-Recapture Models. Jour. Wild. Mgmt., 84: 1100-1113.[17]

- Humm, J.M., McCown, J.W., Scheick, B.K., and Clark, J.D. (2017), Spatially explicit population estimates for black bears based on cluster sampling. Jour. Wild. Mgmt., 81: 1187-1201.[18]

CDFW's population model that uses dead bears to project derive abundance of the live bear populations is worthy of substantial critique. Kill levels are not a valid means to index a live population and tell one nothing about the demographics or trajectory of a population, particularly the fates of adult females, the most important demographic of a bear population.[19]

6. Sportsmen cite numerous California human-bear interaction studies without explaining their pertinence to the issue at hand: That is "control kills" contribute enormously to California's black bear mortality. Here are some sample studies cited by Sportsmen.

- Gore, M. L., B. A. Knuth, P. D. Curtis, and J. E. Shanahan. 2006. Education programs for reducing American black bear-human conflict: indicators of success? Ursus 17:75–80.

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[14] Rahel Sollmann et al., "A Spatial Mark–Resight Model Augmented with Telemetry Data," *Ecology* 94, no. 3 (2013); R. Sollmann et al., "Using Multiple Data Sources Provides Density Estimates for Endangered Florida Panther," *Journal of Applied Ecology* 50, no. 4 (2013); Jesse Whittington, Mark Hebblewhite, and Richard B. Chandler, "Generalized Spatial Mark–Resight Models with an Application to Grizzly Bears," ibid.55, no. 1 (2018); Sean M. Murphy et al., "Improving Estimation of Puma (Puma Concolor) Population Density: Clustered Camera-Trapping, Telemetry Data, and Generalized Spatial Mark-Resight Models," *Scientific Reports* 9, no. 1 (2019).

[15] Louis Sahagun, "Mother Bears and Cubs Battle for Survival as Wildfire, Drought and Traffic Take Heavy Toll," *Los Angeles Times*, Jan. 16, 2022.

[16] Jacob Humm and Joseph D. Clark, "Estimates of Abundance and Harvest Rates of Female Black Bears across a Large Spatial Extent," *The Journal of Wildlife Management* 85, no. 7 (2021).

[17] Michael J. Hooker et al., "Assessing Population Viability of Black Bears Using Spatial Capture-Recapture Models," ibid.84, no. 6 (2020).

[18] Jacob M. Humm et al., "Spatially Explicit Population Estimates for Black Bears Based on Cluster Sampling," ibid.81, no. 7 (2017).

[19] Keita Fukasawa, Yutaka Osada, and Hayato Iijima, "Is Harvest Size a Valid Indirect Measure of Abundance for Evaluating the Population Size of Game Animals Using Harvest-Based Estimation?," *Wildlife Biology* 2020 (2020). D. L. Garshelis and H. Hristienko, "State and Provincial Estimates of American Black Bear Numbers Versus Assessments of Population Trend," *Ursus* 17, no. 1 (2006); Cougar Management Guidelines, *Cougar Management Guidelines* (Bainbridge Island, WA: WildFutures, 2005); Kenneth A. Logan and Linda L. Sweanor, *Desert Puma: Evolutionary Ecology and Conservation of an Enduring Carnivore* (Washington, DC: Island Press, 2001).

- Greenleaf, S. S., S. M. Matthews, R. G. Wright, J. J. Beecham, and H. M. Leithead. 2009. Food habits of American black bears as a metric for direct management of human–bear conflict in Yosemite Valley, Yosemite National Park, California. Ursus 20:94–101.
- Mazur, R. L., R. M. Leahy, C. J. Lee-Roney, and K. E. Patrick. 2018. Using Global Positioning System technology to manage human-black bear incidents at Yosemite National Park. Human–Wildlife Interactions 12:8.

7. **Much of Sportsmen's critique refers to a single study, Johnson et al. (2018).**

In fact, Heather Johnson, a former CPW black bear biologist, co-authored multiple studies on black bears in Colorado,[20] including Laufenberg et al. (2018).[21] Using these studies, the HSUS petition states:

> Because of erratic weather events from the climate crisis, including late season frosts or droughts, natural foods are increasingly unavailable to bears. For instance, in a Colorado bear study, the female cohort of the population declined by 57% because of human-caused mortalities from vehicle collisions, hunting, and predator control, which coincided with widespread unavailability of natural foods. This would not have been detected by wildlife managers without the rigorous population monitoring study in place.

Contrary to Sportsmen's assertions, Laufenberg et al.'s (2018) actual words are:

> We documented a 57% decline in female bear abundance immediately following the natural food shortage coinciding with an increase in human-caused bear mortality (e.g., vehicle collisions, harvest, and lethal removals) primarily in developed areas. We also detected a change in the spatial distribution of female bears with fewer bears occurring near human development in years immediately following the food shortage, likely as a consequence of high mortality near human infrastructure during the food shortage. Given expected future increases in human development and climate-induced food shortages, we expect that bear dynamics may be increasingly influenced by human-caused mortality, which will be difficult to detect with current management practices. To ensure long-term sustainability of bear populations, we recommend that wildlife agencies invest in monitoring programs that can accurately track bear populations, incorporate non-harvest human-caused mortality into management models, and work to reduce human-caused mortality, particularly in years with natural food shortages.

The HSUS petition also states:

> Climate change has resulted in a warmer climate, which causes bears to spend less time in their dens. Because of all these factors, black bear biologists warn that wildlife managers must limit recreational black bear killing to reduce total mortality, and especially during years of poor natural food production, which is readily predicted by weather events.[22]

Contrary to Sportsmen's assertions, Johnson et al.'s (2018) own words are:

> The key results of our study, that increases in temperature and use of anthropogenic foods additively reduce the duration of hibernation, have important implications for both human–black bear conflicts and bear mortality.

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[20] Heather Johnson et al., "Assessing Ecological and Social Outcomes of a Bear-Proofing Experiment," *The Journal of Wildlife Management* (2018); H. E. Johnson et al., "Shifting Perceptions of Risk and Reward: Dynamic Selection for Human Development by Black Bears in the Western United States," *Biological Conservation* 187 (2015); Heather E. Johnson, David L. Lewis, and Stewart W. Breck, "Individual and Population Fitness Consequences Associated with Large Carnivore Use of Residential Development," *Ecosphere* 11, no. 5 (2020); H. E. Johnson et al., "Human Development and Climate Affect Hibernation in a Large Carnivore with Implications for Human-Carnivore Conflicts," *Journal of Applied Ecology* 55, no. 2 (2018).

[21] Jared S. Laufenberg et al., "Compounding Effects of Human Development and a Natural Food Shortage on a Black Bear Population Along a Human Development-Wildland Interface," *Biological Conservation* 224 (2018).

[22] Johnson et al., "Human Development and Climate Affect Hibernation in a Large Carnivore with Implications for Human-Carnivore Conflicts.".

> Delayed hibernation could also negatively affect black bear survival. Nearly all black bear mortality occurs when bears are active (i.e. non-hibernating; Hebblewhite, Percy, & Serrouya, 2003), with the greatest risk occurring during fall when bears increase their movements to find food, and are more susceptible to harvest, vehicle collisions and lethal conflict management. Bears that hibernate for shorter periods of time will be subject to additional mortality risk and could experience reduced survival. For example, in Colorado, the primary bear hunting season occurs during September, prior to the onset of hibernation, but CPW has additional hunting seasons in late-October and November after the median hibernation start date (20 October). Currently, fewer bears are available for harvest during these late-season hunts, but a 1-or 2-week delay in denning, due to warmer weather and/or increased bear use of development, could alter the harvest risk for a significant portion of the bear population . . .

Colorado bear researchers have suggested that, rather than lethally removing bears (all sources of mortality, including conflict removals and sport hunting), *managers must limit black bear mortalities* to avoid creating population sinks and to aid in black bear survival, population growth, and long-term viability. Part of those removals must include reducing or eliminating a recreational hunting season on bears, because it is among the most significant sources of mortality for bears in both Colorado and California.

Large-bodied mammals, including black bears, have delayed primiparity and low reproductive rates and are subject to effects from humans as the HSUS petition documents. Authors of the HSUS petition wrote:

> In sum, around the world and in California, large carnivores face extinction from human factors,[23] thus it is incumbent upon the Commission to conserve California's black bears now, so they are not extirpated like grizzly bears had been. Expanded human development into bear habitats during the climate crisis (including wildfires) exacerbates bear mortalities; thus, the Commission should act to curb black bear mortalities and especially by hunting.[24]

The HSUS did not write, "black bears face extinction" as claimed by Sportsmen. Their petition is more nuanced. Numerous indigenous species vanished from California because of human folly, including grizzly bears.

8. Sportsmen misunderstand the terms "super-additive mortality" and "sexually selected infanticide"

Sportsmen erroneously claim that *only* threatened or endangered species face "super-additive mortality." Additive mortality can increase the total death rate of a population.[25] Whereas, "super-additive mortality" describes a population decline larger than expected from documented mortality. This can occur through the killing of some individuals (by humans), which then indirectly increases the risk of death for others (e.g., infanticide in bears) or through failures of immigration and births to compensate.[26]

Finally, Sportsmen suggest that no infanticide occurs in black bear populations based upon one "well known" paper: Norton et al. (2018), Female American black bears do not alter space use or movements to reduce infanticide risk.[27]

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[23] J. A. Estes et al., "Trophic Downgrading of Planet Earth," *Science* 333, no. 6040 (2011); Chris T. Darimont et al., "The Unique Ecology of Human Predators," ibid.349, no. 6250 (2015); William J. Ripple et al., "Extinction Risk Is Most Acute for the World's Largest and Smallest Vertebrates," *Proceedings of the National Academy of Sciences* 114, no. 40 (2017); Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), "Nature's Dangerous Decline 'Unprecedented' Species Extinction Rates 'Accelerating': Current Global Response Insufficient. 'Transformative Changes' Needed to Restore and Protect Nature; Opposition from Vested Interests Can Be Overcome for Public Good. Most Comprehensive Assessment of Its Kind; 1,000,000 Species Threatened with Extinction," news release, May 6, 2019, 2019.

[24] Laufenberg et al., "Compounding Effects of Human Development and a Natural Food Shortage on a Black Bear Population Along a Human Development-Wildland Interface."

[25] Scott Creel and Jay Rotella, "Meta-Analysis of Relationships between Human Offtake, Total Mortality and Population Dynamics of Gray Wolves (*Canis Lupus*)," *PLoS ONE* 5, no. 9 (2010).

[26] Ibid.

[27] D. C. Norton et al., "Female American Black Bears Do Not Alter Space Use or Movements to Reduce Infanticide Risk," *PLoS One* 13, no. 9 (2018).

However, in their abstract, Norton et al. (2018) conclude with this statement, "As female bears do avoid potentially infanticidal males in populations with greater levels of infanticide, female black bears may exhibit variation in avoidance behavior based on the occurrence of infanticide."

9. Conclusion

Record numbers of hunters have killed fewer bears in recent years, suggesting fewer bears are on the landscape in California. On top of that, California is facing the worst drought since 800 A.D. Given the lack of a credible, contemporary black bear management plan and the absence of reliable population estimates, we counsel the California Fish and Game Commission to set a moratorium on the black bear hunt until the risks and benefits of such a hunt can be evaluated with far more certainty.

Sincerely,

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Sources:

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