

BEFORE THE SECRETARY OF INTERIOR

**PETITION FOR EMERGENCY CLOSURE OF, AND PERMANENT BAN ON,
BROWN BEAR HUNTING IN THE KENAI NATIONAL WILDLIFE REFUGE**



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CENTER FOR BIOLOGICAL DIVERSITY, PETITIONER

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The Center for Biological Diversity (“Center”) hereby petitions the U.S. Department of the Interior (“Interior”) to initiate a rulemaking pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(e), and 7 C.F.R. § 1.28, to permanently prohibit brown bear hunting on the Kenai National Wildlife Refuge (“Refuge”), as authorized by 50 C.F.R. § 36.42(a). The Center further requests that while this rulemaking is pending Interior enact an emergency closure of the fall 2014 hunt of brown bears on the Refuge. *Id.*

The Kenai Peninsula’s population of some 600 brown bears faces an uncertain future. The Refuge’s emergency closure of the 2013 fall brown bear hunt highlighted the precarious situation in which the State of Alaska’s predator control policies have placed this unique population of brown bears. At least 70 Kenai Peninsula brown bears were killed in 2013, 26 of which were on the Refuge. In the spring 2014 state-sanctioned hunt at least 51 Kenai brown bears were killed. These high harvest levels are unsustainable. A recent study shows that if human-caused mortality of adult female bears on federal lands continues at the rates recorded in 2013, Kenai brown bears face a 33 percent probability of extinction on federal lands in the next 25 years (Morton 2013). Further, continued human-caused mortality at 2013 levels through the year 2015 will lower the Kenai Peninsula brown bear population to less than 500 bears, at which point the population loses evolutionary viability (Traill et al. 2010, Flather et al. 2011, Morton 2013). Pushing Kenai Peninsula brown bears toward extinction is incompatible with the purposes of the Refuge.

Pursuant to its duty to conserve bear “populations and habitats in their natural diversity,” ANILCA § 303(4)(B), the Interior Department must issue an emergency closure of the fall 2014 brown bear hunt on the Refuge and immediately initiate a rulemaking process to permanently ban brown bear hunting on the Refuge. Interior is empowered to close brown bear hunting on the Refuge in the interests of “resource preservation” and “endangered or threatened species conservation,” and in order to ensure “that the activity or area is being managed in a manner compatible with the purposes for which the Alaska National Wildlife Refuge area was established.” 50 C.F.R. § 36.42.

This petition (1) describes the legal framework for banning brown bear hunting on the Refuge; (2) offers proposed language for the ban; and (3) supports the proposed ban with evidence of the incompatibility of brown bear hunting with the Refuge’s mission to conserve bear populations.

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Legal background

The Kenai National Wildlife Refuge was established to, among other things:

- (i) . . . conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, moose, bears, mountain goats, Dall sheep, wolves and other furbearers, salmonoids and other fish, waterfowl and other migratory and nonmigratory birds; [and]
- (v) . . . provide, in a manner compatible with these purposes, opportunities for fish and wildlife-oriented recreation.

Alaska National Interest Lands Conservation Act (ANILCA) § 303(4)(B).

The Secretary of Interior is authorized to “permit the use of any area within the [Refuge] System for any purpose, including but not limited to hunting, fishing, public recreation and accommodations, and access *whenever he determines that such uses are compatible with the major purposes for which such areas were established.*” 16 U.S.C. § 668dd (emphasis added). However, “the Secretary shall not initiate or permit a new use of a refuge or expand, renew, or extend an existing use of a refuge, *unless the Secretary has determined that the use is a compatible use* and that the use is not inconsistent with public safety.” *Id.* (emphasis added). A “compatible use” is a “wildlife-dependent recreational use or any other use of a refuge that . . . will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge. 16 U.S.C. § 668ee.

Interior, through the Refuge Manager, is empowered to initiate an emergency, temporary or permanent ban on brown bear hunting in the Refuge. 50 C.F.R. § 36.42(a). In doing so,

the Refuge Manager shall be guided by factors such as public health and safety, resource protection, protection of cultural or scientific values, subsistence uses, endangered or threatened species conservation, and other management considerations necessary to ensure that the activity or area is being managed in a manner compatible with the purposes for which the Alaska National Wildlife Refuge area was established.

Id. at (b). Emergency closures relating to the taking of wildlife “shall be accompanied by notice with a subsequent hearing.” *Id.* at (c)(2). Permanent closures “shall be made only after notice and public hearings in the affected vicinity and other locations as appropriate, and after publication in the *Federal Register.*” *Id.* at (e).

The Administrative Procedure Act (APA) gives interested persons “the right to petition for the issuance, amendment, or repeal of a rule.” 5 U.S.C. § 553(e). The petition must “provide the text of a proposed rule or amendment and include reasons in support of the petition.” 43 C.F.R. § 14.2. Interior must give the petition “prompt consideration” and notify the Center “promptly of action taken.” *Id.* at 14.3.

Proposed language for permanent closure

Pursuant to the APA, 5 U.S.C. § 553(e), and 43 C.F.R. § 14.2, the Center offers the following proposed text to be added to the Kenai National Wildlife Refuge regulations at 50 C.F.R. 36.39(i)(5):

Hunting of brown bears is prohibited. This does not include Defense of Life and Property kills, as defined in 5 AAC 92.410.

Support for petition

Pursuant to the APA, 5 U.S.C. § 553(e), and 43 C.F.R. § 14.2, the Center offers the following support for the petitioned rulemaking. This section also supports the Center's request for an emergency closure of the fall 2014 hunt.

I. The Center is an "Interested Person" under the APA

The Center is a national, nonprofit conservation organization with more than 775,000 online activists and members in Alaska and throughout the United States. The Center's mission is to work through science, law and creative media to secure a future for all species, great or small, hovering on the brink of extinction. The Center accomplishes its mission through scientific and legal advocacy, public education, and grassroots organizing. The Center and its members are "interested persons" within the meaning of 7 C.F.R. § 1.28, and have aesthetic, moral, scientific, recreational, and procedural interests in Kenai Peninsula brown bears.

II. Kenai Peninsula Brown Bears: Population Trends, Genetic Isolation and Extinction Risk

Kenai Peninsula brown bears are vulnerable to population decline and eventual extinction because of their small population, physical isolation from other bears, and genetic distinctness. Because of the bears' unique characteristics and vulnerabilities, the only way for the Refuge to ensure that it is complying with its mandate to conserve the bears is to ban hunting on the Refuge.

A. Population Estimate

The current population estimate for Kenai Peninsula brown bears is 624 bears, 428 of which are estimated to be on federal lands. The Kenai Peninsula is heavily forested, making aerial surveys impossible. There was therefore no accurate population estimate for Kenai Peninsula brown bears before 2010. A 2010 collaborative study between the U.S. Forest Service and the Fish and Wildlife Service used a combination of non-invasive DNA sampling and information on radio-collared bears to estimate Kenai Peninsula Brown bear abundance. This study estimated that 428 brown bears were present on the Kenai National Wildlife Refuge and Chugach National Forest, with 624 bears on the entire Kenai Peninsula. Based on known demographic parameters, this

translates to roughly 200 adult females, 200 adult males, and 224 dependent young (Morton et al. 2013). There is no information on whether the population is increasing, decreasing, or stable.¹

B. Evidence of Genetic Isolation

The Kenai Peninsula brown bear population is exceptionally susceptible to rapid decline due to almost complete isolation from mainland brown bear populations through a combination of geographic and anthropogenic factors (Robinson et al. 2007). Since the end of the last ice age, the 24,300 km² Kenai Peninsula has been separated from the Alaska mainland by a 16 km-wide isthmus of ice, rock, and mountains, effectively restricting bear emigration or immigration to very low numbers. More modern impediments to movement through this narrow strip of land include two communities, two airstrips, 13 km of roads, two campgrounds, railroad tracks, a 30 km-long lake, and several glaciers (Farley 2005). Combined, these factors create a functional barrier to brown bear movement and connectivity between the Kenai Peninsula and the Alaska mainland.

Studies to date support the genetic isolation of the Kenai Peninsula brown bear population. Microsatellite and mitochondrial DNA analysis show that the Kenai Peninsula brown bears are less genetically diverse than mainland Alaska brown bears, and that the Kenai Peninsula brown bears do not breed with bears from the Alaska mainland (Jackson et al. 2008, Talbot and Farley 2009). This isolation places the Kenai Peninsula brown bears at risk of extinction, not only due to genetic factors including genetic drift and inbreeding, but also because a loss of genetic diversity reduces a population's ability to evolve and adapt to climate change (Visser 2008).

C. Population Viability of the Kenai Peninsula Brown Bear

Recent analysis shows that the state Board of Game's (BOG's) current hunting regulations threaten the long-term viability of the Kenai Peninsula brown bear, making hunting of the bears on the Refuge incompatible with the Refuge purpose of preserving them.

Populations prone to extinction are generally characterized by large body size, large home ranges, low densities, low recruitment rates, and limited dispersal—all attributes of the Kenai Peninsula brown bear population (Woodroffe 2001, Morton et al. 2013). For such populations, human-caused habitat degradation and fragmentation and restricted immigration or emigration exacerbate the risks of demographic stochasticity, disease, and inbreeding and genetic drift (Laikre et al. 1996, Frankham 1998, O'Grady et al. 2006, Boitani and Powell 2012). Extinction risks for Kenai Peninsula brown bear are amplified by high levels of human-caused mortality,

¹ Prior Kenai Peninsula brown bear population estimates were not empirically based and were likely inaccurate. Based on calculations using the bear density in the Susitna area of 20 bears per 1,000 km², Jacobs estimated the Kenai Peninsula brown bear population at 150 to 250 bears in 1989 (Jacobs 1989, Farley 2005). ADF&G subsequently increased the estimate to 277, based on a larger area of suitable bear habitat (Del Frate 1993). These estimates should carry no weight for management purposes because they were based on a completely separate population, and bear densities can vary greatly among populations (Miller and Schoen 2002, Morton et al. 2013).

including legal hunting, defense-of-life-and-property (DLP), illegal killings, and road kill (Suring et al. 1998, Suring and Del Frate 2002, Morton 2013, Morton et al. 2013).

Population viability analysis (PVA) is the most common tool used to determine the probability that a population will go extinct within a certain amount of time² (Boitani and Powell 2012). A PVA is an especially useful tool to determine a sustainable yearly mortality quota for a population such as the Kenai Peninsula brown bear, where anthropogenic factors play a large role in the number of bears killed each year, the animals are difficult to accurately census, and where the population faces additional stressors due to reduced genetic variability (Chesser et al. 1993).

Based on input and output parameters developed by Farley (2013), Morton (2013) calculated the population trend of Kenai Peninsula brown bears using a reproducible, scientifically-based PVA. The scientists inputted empirical data from the 2010 population census and from long-term studies on the bears to determine the future population trajectory of Kenai Peninsula brown bears under the current regulatory framework and various levels of human-caused mortality of adult female bears.

The model showed that if human-caused mortality of adult female bears on federal lands continues at the rates recorded in 2013 in which 12 percent (24) of adult females were killed, half (12) of which were on federal lands, this raises the probability of extinction on federal lands over 25 years to 33 percent (Morton 2013). Further, continued human-caused mortality at 2013 levels through the year 2015 will lower the Kenai Peninsula brown bear population to less than 500 bears, at which point the population loses evolutionary viability (Traill et al. 2010, Flather et al. 2011, Morton 2013).

Human-caused disturbance and range-contraction is a significant factor leading to the extinction of a population, and these factors are rapidly increasing on the Kenai Peninsula, increasing the relative risks of low population size (Channell and Lomolino 2000, Boitani and Powell 2012). Human activity and development may especially impact the most important group for population viability of the Kenai Peninsula brown bear—females with young. For example, females with cubs modify their movements based on perceived risk, assuming subdominant status and frequenting less productive salmon streams when risks increase (Suring et al. 2006).

Taken together, these factors—including small population size, genetic isolation and proximity to humans—make careful management and protection of Kenai Peninsula brown bears essential to preserving them on the Refuge and throughout the Kenai Peninsula. Unfortunately, as

² The PVA process is widely accepted as the most scientifically valid means by which to establish a long-term conservation plan for a species. The International Union for Conservation of Nature (IUCN) recommends quantitative analyses using PVAs for Red List conservation status assessments when adequate data is available. The Fish and Wildlife Service routinely uses PVAs to determine extinction risk of a species.

explained below, current bear management is focused on culling the bears rather than preserving them and is incompatible with the purposes of the Refuge.

III. Mismanagement of Kenai Peninsula Brown Bears

A. Kenai Peninsula Brown Bear Management: 1990s

The Kenai Peninsula is a popular tourist destination, and the human population has been rapidly increasing by about 10,000 people every ten years. The Kenai is the second fastest growing area of Alaska. Both human recreation and population growth have been identified as major conservation concerns for the Kenai Peninsula brown bear, resulting in various conservation strategy proposals and measures by the Alaska Department of Fish and Game (ADF&G) and federal agencies.

In 1998, ADF&G listed the Kenai Peninsula brown bear as a “population of special concern,” warranting special management measures to help ensure its continued survival (ADF&G 2000). This listing identifies a population that “is vulnerable to significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance” (ADF&G 2000). The Kenai Peninsula brown bear specifically meets the standards as “an isolated population in an area experiencing steady human population growth and increased human activity” (ADF&G 2000).³

Also in the late 1990s, in response to public concern about salvage logging and expanding roads on the Kenai, ADF&G, federal agencies and representatives of private interests on the Kenai Peninsula formed a stakeholder group, and the Kenai Brown Bear Conservation Strategy was finalized and approved in 2000 (ADF&G 2000). State and federal agencies also formed an Interagency Brown Bear Study Team, which developed the 2001 Conservation Assessment of the Kenai Peninsula Brown Bear (Farley et al. 2001). Both documents laid a foundation for conserving the Kenai Peninsula brown bear population through proactive action and research efforts.

B. Current Mismanagement of Kenai Peninsula Brown Bears

BOG’s recent actions are in stark contrast to the collaboration among federal agencies, state agencies, nonprofit environmental groups, and local groups that was once a hallmark of Kenai Peninsula brown bear management (ADF&G 2000). In 2013, BOG substantially relaxed hunting regulations on the Kenai. It began allowing a general registration hunt, with an extended season from September 1 to May 31. It increased the bag limit from one bear every four years to one bear per year, and it put no cap on the number of bears that could be killed. In 2014 there is a 70-bear cap, and hunters are allowed to kill brown bears at bait stations outside the Refuge. According to former ADF&G biologist John Schoen and former Alaska governor Tony

³ In 2011, Alaska eliminated the “population of special concern” list. The bears’ status is footnoted in Appendix 7 of the Alaska State Wildlife Action Plan (Morton et al. 2013).

Knowles, “[i]t is almost unconceivable that these extreme changes will not lead to overharvest of Kenai Brown Bear” (Knowles and Schoen 2013).

In 2013, there were at least 70 human-caused mortalities in the Kenai Peninsula brown bear population, with roughly 45 of these bears killed from sport hunting. This is a jump from 32 bears killed in the sport hunt of 2012, and a major increase from an average of 11.3 bears killed in sport hunts annually from 1973 through 2011 (Morton 2013). Of the bears killed in 2013, 54 percent (38) were killed on federal lands, with 37 percent (26) of those bears killed on the Refuge. Especially troublesome were the deaths of 24 adult female bears, including 19 percent of GPS-collared sows. On the Refuge, 10 adult sows were killed, which is roughly 42 percent of total sow mortality. As explained above, if female mortality continues at that rate, Kenai Peninsula brown bears on the Refuge face a 33 percent chance of extinction in the next 25 years (Morton 2013).

BOG has repeatedly refused to exclude Refuge lands from its predator control measures, despite requests by the Fish and Wildlife Service to work toward a solution (e.g., Loranger 2013). BOG has adopted measures designed to increase the harvest of bears, with the intent of increasing moose and other ungulate populations in Game Management Units 7 and 15. In 2014, for the first time in the history of the Kenai, hunters have been allowed to kill brown bears over bait. 51 bears have already been legally killed in the spring 2014 hunt (ADF&G 2014). Thus it is likely the number of bears killed will continue to exceed that required to maintain population viability.

C. The Kenai Brown Bear Hunt is Incompatible with Refuge Purposes

The high level of mortality in 2013 prompted the Refuge to enact an emergency closure of the fall hunt pursuant to 50 C.F.R. § 36.42. As the Refuge noted in enacting the closure, “[a]ctual human-caused mortalities are higher than the documented number” (USDOI 2013). The Refuge explained that along with the emergency closure it would “develop and implement a longer term brown bear harvest management strategy on the Refuge” (*Id.*).

Interior has not made a compatibility determination pursuant to 16 U.S.C. § 668ee for the current high level of brown bear hunting on the Refuge. When Interior made a compatibility determination for hunting on the Refuge in 2007, the brown bear hunt was significantly more restrictive, with a 16-day season (October 15-31), a quota of one bear every four years and a management goal of no more than 20 human-caused mortalities per year (KNWR 2007). The current high harvest level described above far exceeds the 20 bear mortalities contemplated in 2007 and is putting the Kenai Peninsula brown bear at risk of extinction. Brown bear hunting on the Refuge therefore “materially interfere[s] with or detract[s] from the fulfillment of the . . . purposes of the refuge,” 16 U.S.C. § 668ee, which include conservation of bears, ANILCA § 303, and is incompatible.

Regulations provide that the Refuge may institute an emergency or permanent closure in the interests of “resource preservation,” “endangered or threatened species conservation,” or in order to ensure “that the activity or area is being managed in a manner compatible with the purposes for which the Alaska National Wildlife Refuge area was established.” 50 C.F.R. § 36.42. Among

its other purposes, the Refuge was explicitly established to conserve bear populations and habitats. ANILCA § 303(4)(B). Because hunting of this small, isolated population of brown bears is likely to eventually lead to its extinction, this hunt is incompatible with Refuge purposes and must be closed.

Conclusion

The Kenai Peninsula brown bear is an iconic figure on the landscapes of Southcentral Alaska and a huge draw for tourists and residents alike. The State of Alaska's predator control policies threaten the viability of this unique and important bear population and are incompatible with Refuge purposes. We therefore ask that Interior institute an emergency rulemaking banning brown bear hunting on the Refuge in fall 2014. We further ask that Interior promptly initiate a rulemaking process to permanently ban all brown bear hunting on the Refuge. Without protections on the Refuge, this small, isolated and genetically distinct population of brown bears faces extinction.

References

- Alaska Department of Fish and Game. 2000. Kenai Peninsula Brown Bear Conservation Strategy. Page 86 (ADF&G 2000).
- Alaska Department of Fish and Game. Press Release: Kenai Peninsula Spring Brown Bear Harvest Suggests New Rules May Be Working (June 13, 2014) (ADF&G 2014).
- Alaska Board of Game. 2013. Alaska Board of Game Meeting Summary March 15-19 2013:1–5.
- Boitani, L., and R. Powell. 2012. Carnivore Ecology and Conservation: A handbook of techniques. Page 506. Oxford University Press.
- Channell, R., and M. V Lomolino. 2000. Trajectories to extinction : spatial dynamics of the contraction of geographical ranges. *Journal of Biogeography* 27:169–179.
- Chesser, R. K., O. E. Rhodes, D. W. Sugg, and a Schnabel. 1993. Effective sizes for subdivided populations. *Genetics* 135:1221–32.
- Farley, S. 2005. Ecological studies of the Kenai Peninsula brown bear. Federal Aid Final Research Report, Alaska Department of Fish and Game:1–11.
- Farley, S. 2013. Kenai Peninsula brown bear population demographics. Alaska Department of Fish and Game.
- Farley, S., G. Hildebrand, G. Del Frate, T. Bailey, R. Ernst, L. Suring, W. Shuster, M. Tetreau, and J. Schoen. 2001. A conservation assessment of the Kenai Peninsula brown bear. Interagency Brown Bear study Team, Alaska Dept. Fish and Game, Juneau, AK:48.
- Flather, C. H., G. D. Hayward, S. R. Beissinger, and P. a Stephens. 2011. Minimum viable populations: is there a “magic number” for conservation practitioners? *Trends in ecology & evolution* 26:307–16.
- Frankham, R. 1998. Inbreeding and extinction: island populations. *Conservation Biology* 12:665–675.
- Jackson, J. V., S. L. Talbot, and S. Farley. 2008. Genetic characterization of Kenai brown bears (*Ursus arctos*): microsatellite and mitochondrial DNA control region variation in brown bears of the Kenai Peninsula, south central Alaska. *Canadian Journal of Zoology* 86:756–764.
- Jacobs, M. 1989. An initial population analysis and management strategy of Kenai Peninsula brown bears. W. Va. Univ., Morgantown.

- Kenai National Wildlife Refuge. 2007. Compatibility Determination: Hunting. Available at: http://www.fws.gov/alaska/nwr/planning/compatibility/kenai_Hunting_cd.pdf.
- Knowles, T., and J. Schoen. 2013, October 30. State leans on poor science, bad management to kill Kenai brown bears. *Alaska Dispatch*. Anchorage.
- Laikre, L., R. Andren, H.-O. Larsson, and N. Ryman. 1996. Inbreeding depression in brown bear *Ursus arctos*. *Biological Conservation* 76:69–72.
- Loranger, A. 2013. USFWS Comment BOG Proposals March 2013.
- Miller, S. D., and J. Schoen. 2002. Status and management of the brown bear in Alaska. Pages 39–54 *Brown bear conservation action plan for North America*.
- Morton, J. 2013. Why Kenai National Wildlife Refuge closed the Fall 2013 Kenai brown bear hunt. Page 26 USFWS Public Hearing.
- Morton, J., M. Bray, G. Hayward, G. White, and D. Paetkau. 2013. The Kenai brown bear population on Kenai National Wildlife Refuge and Chugach National Forest. Pages 1–39.
- O’Grady, J. J., B. W. Brook, D. H. Reed, J. D. Ballou, D. W. Tonkyn, and R. Frankham. 2006. Realistic levels of inbreeding depression strongly affect extinction risk in wild populations. *Biological Conservation* 133:42–51.
- Robinson, S. J., L. P. Waits, and I. D. Martin. 2007. Evaluating Population Structure of Black Bears on the Kenai Peninsula using Mitochondrial and Nuclear DNA Analyses. *American Society of Mammalogists* 88:1288–1299.
- Suring, L., K. Barber, C. Schwartz, T. Bailey, W. Shuster, and M. Tetreau. 1998. Analysis of cumulative effects on brown bears on the Kenai Peninsula, southcentral Alaska. *Ursus* 10:107–117.
- Suring, L. H., and G. Del Frate. 2002. Spatial analysis of locations of brown bear killed in defense of life or property on the Kenai Peninsula, Alaska, USA. *Ursus* 13:237–245.
- Suring, L. H., M. I. Goldstein, S. Howell, and C. S. Nations. 2006. Effects of spruce beetle infestations on berry productivity on the Kenai Peninsula, Alaska. *Forest Ecology and Management* 227:247–256.
- Talbot, S., and S. Farley. 2009. Brown bears of the Kenai Peninsula are genetically isolated from mainland south central and southwestern Alaskan populations. Alaska Science Center, Anchorage, AK: United States Geological Survey.
- Trall, L. W., B. W. Brook, R. R. Frankham, and C. J. a. Bradshaw. 2010. Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143:28–34.

- U.S. Department of the Interior. News Release: U.S. Fish and Wildlife Service Issues Emergency Closure of Brown Bear Sport Hunting on Kenai National Wildlife Refuge (Oct. 25, 2013) (USDOI 2013).
- Visser, M. E. 2008. Keeping up with a warming world; assessing the rate of adaptation to climate change. *Proceedings. Biological sciences / The Royal Society* 275:649–59.
- Woodroffe, R. 2001. Strategies for canivore conservation lessons from contemporary extinctions. *in* J. Gittleman, R. Wayne, D. Macdonald, and S. Funk, editors. *Carnivore Conservation*. Cambridge University Press, Cambridge, Cambridge.