



May 6, 2013

California Department of Fish and Wildlife  
1812 Ninth Street  
Sacramento, California 95811  
Attn: Gray Wolf Status Report

**RE: Comments of the Society for Conservation Biology on the Listing of the Gray Wolf as a Threatened or Endangered Species under the California Endangered Species Act.**

The Society for Conservation Biology<sup>1</sup> (SCB), on behalf of its North America Section and its Humboldt State University Chapter, would like to offer the following comments on the California Department of Fish and Wildlife's (CDFW) review process to protect the gray wolf in California by listing the species as threatened or endangered under the California Endangered Species Act (CESA).<sup>2</sup> SCB supports the listing of the gray wolf as an endangered species under the CESA given its current status as nearly extirpated from the State of California. As apex predators, gray wolves play an important role in many ecosystems. The removal of wolves has been shown to result in significant changes to species' compositions in diverse ecosystems across their former range, and the return of wolves has been shown to result in cascading effects that often result in increased biological diversity. Because large areas of suitable wolf habitat exist in California, it is likely that wolves will continue to disperse into the State from source populations in Oregon and Washington. Therefore, it is important that the CDFW develop a management plan under the auspices of the CESA with the goal of recovery of gray wolves within California.

SCB believes that listing under the CESA will provide the CDFW with the necessary policy and material support to protect and restore this once-widespread species that has been extirpated from most of its historic range within California. The protection, conservation, and restoration of the gray wolf are consistent with the goals and purposes of the CESA, as well as its statutory text. SCB recognizes the significant challenges involved in managing a species that is nearly extirpated from the state. However, SCB is concerned about CDFW's evaluation of the petition to list the gray wolf, its apparent discounting of historic and anecdotal information regarding the former distribution of wolves in California, its discounting of the utility and applicability of habitat-based modeling regarding wolves derived from similar habitats and ecosystems in other portions of the western United States,

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<sup>1</sup> SCB is an international professional organization whose mission is to advance the science and practice of conserving the Earth's biological diversity, support dissemination of conservation science, and increase the application of science to management and policy. The Society's 5,000 members include resource managers, educators, students, government and private conservation workers in over 140 countries.

<sup>2</sup> California Fish and Game Code §§ 2050–2115.5.



and statements suggesting that species without a currently successful wild breeding population are not listable under the CESA. The roaming of a single gray wolf, resident in California from December 2011 through the March of 2013, certainly does not represent the historic range of the species within California. However, the movement patterns of this animal, known as OR-7, do help corroborate peer-reviewed models of suitable wolf habitat.

## **I. The Historic Range of the Gray Wolf in California and the Existence of Current Suitable Habitat Supports Listing of Wolf Under the CESA.**

The gray wolf historically occurred across most of North America, from as far north as the Arctic tundra, south through the high mountains and plateaus of Mexico, and from the maritime provinces of Canada, west to the Pacific. Wolves are habitat generalists, occupying diverse habitat types based largely on the abundance of prey, availability of den sites, ease of travel, and topography.<sup>3</sup> It is likely that gray wolves occupied a variety of habitats in California, where there was sufficient ungulate prey. In part, because of the extirpation or near extirpation of prey species such as the bison, Tule elk (*Cervus canadensis nannodes*), and pronghorn, it will always be difficult to precisely determine the historic range of wolves in the State.

Nevertheless, there is some consensus that gray wolves were present in the northern part of California and the Sierra Nevada mountains (Young and Goldman 1944, Hall 1981, Nowak 1995, USFWS 2008).<sup>4</sup> Schmidt (1987, 1991) reviewed the historical record of gray wolves in California back to the 1750s and determined that wolves likely were present in the Coastal range, the Central Valley, and the western slope of the Sierra Nevada at the time of European settlement.<sup>5</sup> Likewise, Shelton and Weckerly (2007) compared four early accounts of wolf distribution throughout the West to identify where wolves likely had occurred. These records indicate that wolves were likely to have occupied significant portions of California, including the Sierra Nevada mountains, the Modoc plateau and other mountainous areas of California north of San Francisco and Sacramento.<sup>6</sup> The CDFW report on the historic distribution of gray wolves in California indicates that wolves were present in the northern

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<sup>3</sup> Paquet, P.C. and L.N. Carbyn. 2003. Gray wolf: *Canis lupus* and allies. Pp. 482-510 in Feldhamer, G.A., B.C. Thompson, and J.A. Chapman, eds., *Wild Mammals of North America*. 2nd edition. Baltimore: Johns Hopkins University Press.

<sup>4</sup> Young, S.P. and E.A. Goldman. 1944. *The Wolves of North America*. Washington, DC: The American Wildlife Institute; Hall, E.R. 1981. *Mammals of North America*. New York: Wiley; Nowak, R.M. 1995. Another look at wolf taxonomy. Pp. 375-398 in *Ecology and conservation of wolves in a changing world: Proceedings of the second North American symposium of wolves*. Edmonton CA. Canadian Circumpolar Institute, University of Alberta. *Final rule designating the northern Rocky Mountain population of gray wolf as a distinct population segment and removing this distinct population segment from the federal list of endangered and threatened wildlife*. 73 Fed. Reg. 10514 (Feb. 27, 2008).

<sup>5</sup> Schmidt, R.H. 1987. Historical records of wolves in California. *WOLF!* 5(2): 31-35; Schmidt, R.H. 1991. Gray wolves in California: their presence and absence. *California Fish and Game* 77(2):79-85.

<sup>6</sup> Shelton, S. L., and F. W. Weckerly. 2007. Inconsistencies in historical geographical range maps: the gray wolf as an example. *California Fish and Game* 93:224-227.



portion of the State, and potentially as far south as the Santa Monica Mountains, north of present-day Los Angeles.<sup>7</sup>

While much of the gray wolf's historic habitat in California has likely been altered to the point it no longer is suitable (e.g., the Central Valley and other portions of the state that have been converted to agricultural purposes), large areas remain suitable for wolves. A substantial amount of scientific research demonstrates that the presence of public lands, and other lands with low road densities, is often a predictor of suitable wolf habitat (Thiel 1985, Mech 1988, Fuller et al. 1992).<sup>8</sup> This is primarily because roads allow for human access, which often results in greater wolf mortality. Likewise, the U.S. Fish and Wildlife Service has concluded that road density (as a surrogate for protected public lands, density of livestock, and human presence) is the best single predictor of habitat suitability for wolves.<sup>9</sup> Road density is a useful parameter because it is easily measured and mapped, and because it correlates directly and indirectly with human-related wolf mortality. Furthermore, roads directly increase wolf mortality through increased collisions with motor vehicles, intentional or accidental shootings, and the spread of infectious diseases from domestic dogs (Mech and Goyal 1993, Mladenoff et al. 1995).<sup>10</sup>

Carroll et al. (2006) used a spatially-explicit population model as a tool for addressing appropriate recovery goals and strategies for the gray wolf in the western U.S.<sup>11</sup> That model included an analysis of California and linked estimates of survival and fecundity for individual animals with GIS data on mortality risk and habitat productivity to predict "occupiable habitat." Model results identify large areas of habitat that are likely suitable for wolves, and suggest that much of the suitable wolf habitat will persist into the future, although the amount of available habitat will depend on the extent of future road infrastructure. Specifically, the 2006 model predicts that if current habitat trends continue, the central and southern Sierra Nevada will provide the largest area for a potential wolf population in California. Other areas of potentially suitable habitat include California's southern Cascades,

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<sup>7</sup> California Department of Fish and Game. 2012. Report to the Fish and Game Commission: Evaluation of the Petition from the Center for Biological Diversity, Big Wildlife, the Environmental Protection Information Center, and the Klamath-Siskiyou Wildlands Center to list Gray Wolf (*Canis lupus*) as an Endangered Species Under the California Endangered Species Act. Aug. 1, 2012. The California Department of Fish and Game was renamed the California Department of Fish and Wildlife on January 1, 2013.

<sup>8</sup> Thiel, R.P. 1985. Relationship between road densities and wolf habitat suitability in Wisconsin. *American Midland Naturalist* 113: 404-407; Mech, L. D. 1988. *The arctic wolf: living with the pack*. Stillwater, MN: Voyageur Press; Fuller, T.K., et al. 1992. A history and current estimate of wolf distribution and numbers in Minnesota. *Wildlife Society Bulletin* 20: 42-55.

<sup>9</sup> Final Rule to revise the list of endangered and threatened wildlife for the gray wolf (*Canis lupus*) in the Eastern United State, Initiation of Status Reviews for the Gray Wolf and for the Eastern Wolf (*Canis lycaon*). 76 Fed. Reg. 26086 (May 5, 2011).

<sup>10</sup> Mech, L.D., and S.M. Goyal. 1993. Canine parvovirus effect on wolf population change and pup survival. *Journal of Wildlife Diseases* 22:104-106; Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. *Conservation Biology* 9:279-294.

<sup>11</sup> Carroll, C., et al. 2006. Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. *BioScience* 56:25-37.



the Modoc Plateau, and the Klamath Mountains. These areas have low human population density and few year-round or heavily traveled roads, and are predominantly public land. Carroll et al. (2006) noted the model's predictive limitations, especially with respect to making predictions in semiarid areas where the minimum threshold of prey availability would need to be determined with greater accuracy. See Figure One.

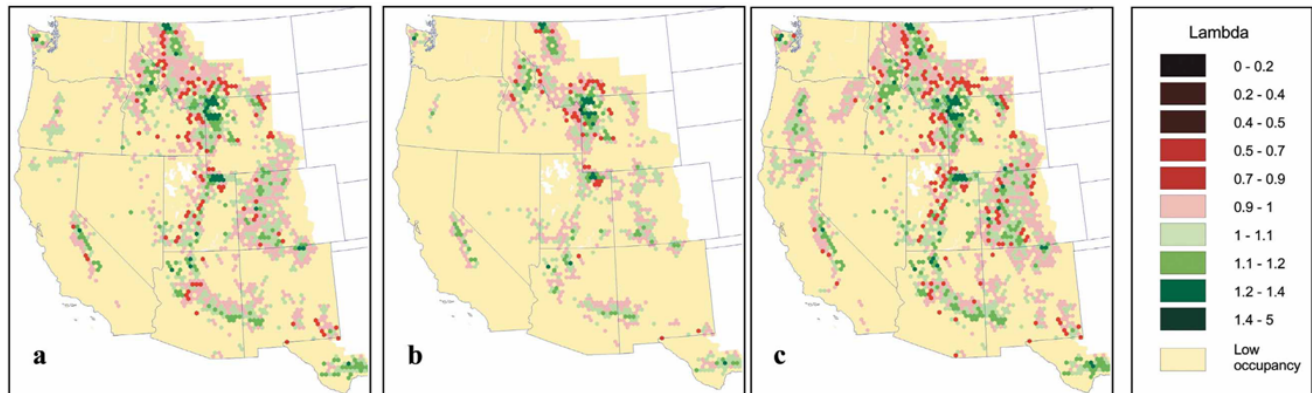


Figure One. Potential distribution and demography of wolves under three landscape scenarios: (a) current conditions; (b) future conditions, with projected human population in 2025 and increased road development on both private and unprotected public lands; and (c) current conditions with reduced road density on public lands. Source: Carroll, C., et al. 2006. Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. *BioScience* 56:25-37.

Subsequent studies have also concluded that significant areas of potentially suitable wolf habitat occur in California. In the process of evaluating the status of the gray wolf in the Pacific Northwest, the USFWS overlaid predictions from 3 habitat models: Carroll et al. (2006), Oakleaf et al. (2006) as extended to the Pacific Northwest, and Larsen and Ripple (2006).<sup>12</sup> Extensive areas in the regions described above are identified as suitable habitat by at least 2 of the 3 models. See Figure Two.





<sup>12</sup> Carroll, C., et al. 2006. Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. *BioScience* 56:25-37; Oakleaf, J.K., et al. 2006. Habitat Selection by Recolonizing Wolves in the Northern Rocky Mountains of the United States, *Journal of Wildlife Management* 70(2):554-563; Larsen T. and W.J. Ripple. 2006. Modeling gray wolf (*Canis lupus*) habitat in the Pacific Northwest. U.S.A. *Journal of Cons. Planning*, 2(1):30-61.

# FIGURE TWO




## Defining a potential boundary of the Pacific Northwest Distinct Population Segment (DPS) for the Gray Wolf

**- DRAFT -**

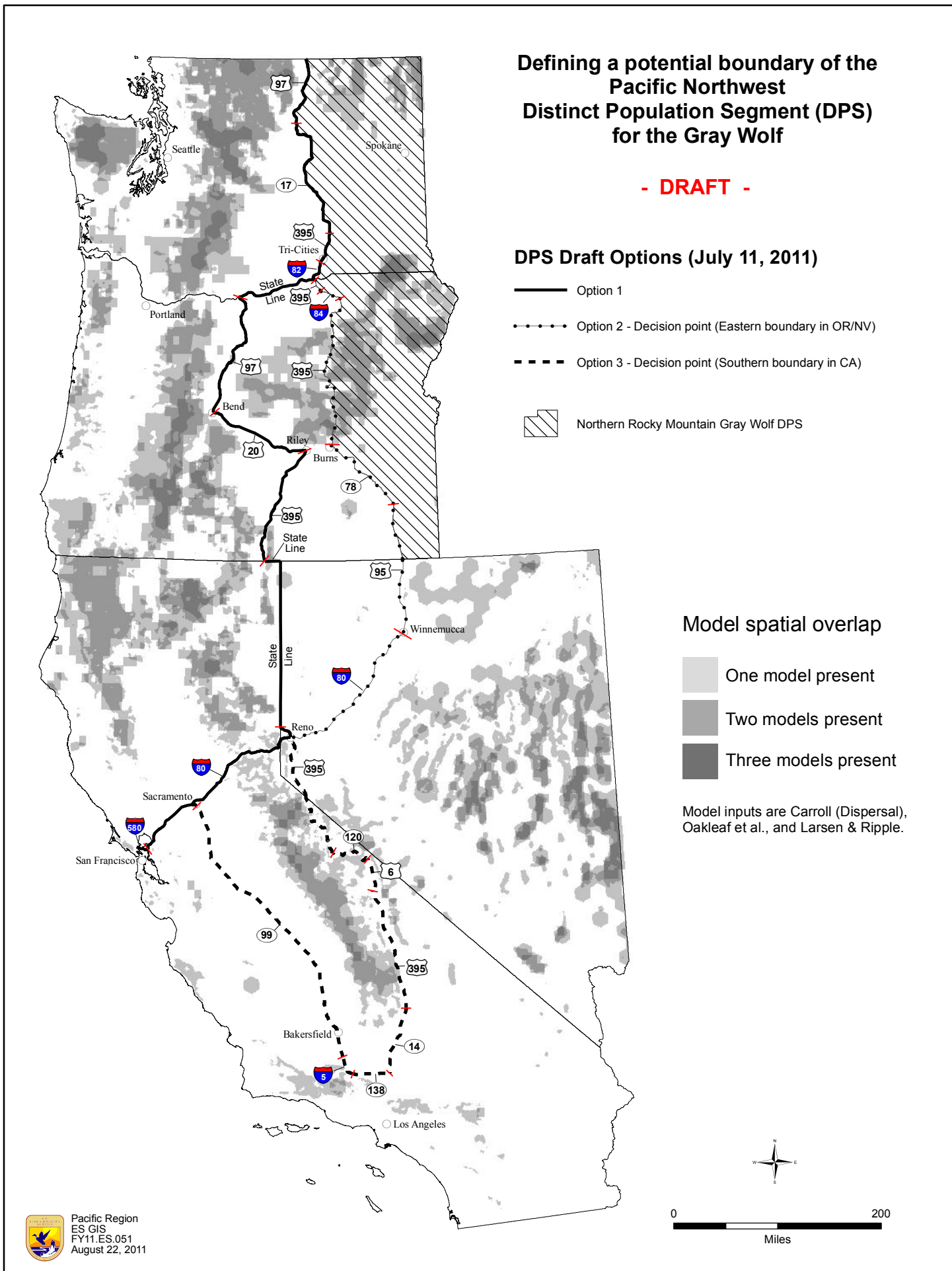
### DPS Draft Options (July 11, 2011)

-  Option 1
-  Option 2 - Decision point (Eastern boundary in OR/NV)
-  Option 3 - Decision point (Southern boundary in CA)
-  Northern Rocky Mountain Gray Wolf DPS

### Model spatial overlap

-  One model present
-  Two models present
-  Three models present

Model inputs are Carroll (Dispersal), Oakleaf et al., and Larsen & Ripple.







SCB is concerned by the CDFW's response to the listing petition, which either ignores or discounts several important peer-reviewed publications on habitat suitability in California. For example, the conclusions of Carroll et al. (2006) are treated as "speculation" because the models employed "have no certainty applied to them and have not been validated with scientific data to support or refute them."<sup>13</sup> SCB agrees that using models to project the number of wolves requires eventual verification. But, for a species that is as well studied as the gray wolf, there is little reason that the CDFW could not reasonably extrapolate, based on peer-reviewed models and experiences in other nearby States, and assess whether suitable habitat still remains in California. Using habitat models to guide reintroduction and restoration efforts is standard practice in modern wildlife management. And as explained by Oakleaf et al. (2006), these habitat-based models are validated with scientific data to support or refute them; though in this situation the data are derived from outside of California. For the CDFW to wait on taking protective actions for wolves until empirical data concerning habitat selection by wolves currently resident in California become available would defeat the purposes of the CESA because the CESA is designed to protect species in a precautionary manner, notwithstanding that science is always uncertain in some degree. SCB agrees that CDFW should continue to investigate the factors that impact gray wolf population size. However, these additional data are not necessary in order to make initial assessments of where suitable habitat remains. For example, the CDFW has determined that there are over 455,000 mule deer in California, and 12,000 elk in the State. Other relevant information, such as human population density and land use in California, is readily available, as are data regarding snow-pack conditions and road-density.

The approach employed by the FWS, Carroll et al. (2006), Larsen and Ripple (2006), and others represents a valid scientific approach for predicting the possible distributions of the gray wolf. Given the species' status as all but extirpated from California, an approach based on predictive modeling likely represents the best-available science with respect to wolf recovery in California. As noted above, SCB is concerned by several statements in the CDFW's response to the listing petition, which appear to articulate an incorrectly high burden for determining an endangered species' range. For example, the CDFW response to the petition states:

- Historical documentation and current data on a single known wolf in California do not provide enough information to analyze and determine the species range with any scientific certainty.<sup>14</sup>
- Historical range of wolves in California is inconclusive and there is no scientific evidence that establishes or supports hypotheses regarding specific range boundaries.<sup>15</sup>

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<sup>13</sup> CDFW, 2012. Report to the Fish and Game Commission: Evaluation of the Petition at 14.

<sup>14</sup> *Id.* at 15.

<sup>15</sup> *Id.* at 16.



- There is not enough information available about wolf abundance, either historically or currently, to analyze the abundance of wolves in California with scientific certainty.<sup>16</sup>
- Indirect information from other states with wolf populations may provide some insight into the potential habitat(s) necessary for the survival of wolves in California. However, unless wolves become established and are studied, some related details will remain scientifically uncertain.<sup>17</sup>

A requirement of scientific “certainty” or on-the-ground “evidence” regarding wolves’ historical range or abundance prior to taking action to conserve a previously extirpated species would virtually preclude achieving the goal of recovering native species formerly occurring in California. The CDFW does not need to determine the precise current or former abundance of wolves or the habitat requirements of wolves in California with “scientific certainty,” a standard that is generally unachievable and whose pursuit runs counter to the scientific method (which typically increases knowledge through refutation and inference based on probabilities and rigorous assessment of uncertainty). Furthermore, such a standard conflicts with the text of the CESA, which does not require scientific certainty prior to listing a species as threatened or endangered within the State, but rather an assessment based upon “the best scientific information available to the department.”<sup>18</sup> SCB has concluded that the approaches for assessing potential habitat developed by Carroll et al., Larsen and Ripple, and the FWS represent the best scientific information available regarding gray wolves and their potential for recovery in California. SCB notes that the movements of the single male wolf known as OR-7 from December 2011 through March of 2013 help to corroborate these models, given the fact that OR-7’s travels throughout Northern California were concentrated on public lands, where road densities and human presence are generally lower than on other, nearby lands. The movements of OR-7 also demonstrate that this area of northern California still retains sufficient habitat connectivity to allow dispersing wolves from Oregon or Washington to find sufficient suitable habitat to establish themselves in the State.

## **II. The CESA Provides the Needed Tools to Protect and Recover a Species That Has Been Extirpated or Nearly-Extirpated from California.**

Given the growing source populations in Oregon and Washington, and the connectivity between areas of suitable habitat in Oregon and California, it is likely that gray wolves will continue to disperse into California in the foreseeable future. As the CDFW acknowledges, based on the current distribution of wolves and the predicted distribution of suitable habitat in Oregon, it is most likely that dispersing wolves will first arrive and reside in Modoc or Siskiyou counties. However, SCB is concerned by the statement by CDFW in response to the listing population that states “there is no scientific certainty that the wolf population in Oregon will continue to increase and expand or that the population will disperse to California.”<sup>19</sup> While this statement is literally correct, it again appears that the CDFW is

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<sup>16</sup> *Id.* at 18.

<sup>17</sup> *Id.* at 20.

<sup>18</sup> California Fish and Game Code § 2074.6.

<sup>19</sup> CDFW, 2012. Report to the Fish and Game Commission: Evaluation of the Petition at 14.



improperly raising the threshold for listing the gray wolf based on an unreasonable, indeed unachievable standard of scientific certainty. The travels of the gray wolf OR-7, if nothing else, show that it is likely that wolves will continue disperse to California in the future.

A separate question has been raised about whether the CESA is designed to protect species that have been extirpated from California. At the public hearing regarding the listing of the gray wolf in California, the general counsel for the California Fish and Game Commission (CFG) recommended that the CDFW reject the listing petition, and stated the following to support this recommendation:

The concern I have [is] whether or not the existence of a single individual of a species in California establishes a population that can reproduce and establish itself... How do you manage and recover a species that in its current form is unable to reproduce at all?

The petition fails on its face because there isn't a population of that particular species in the State that can be managed for recovery... The petition fails to meet the goals of the legislature to protect it.<sup>20</sup>

The general counsel went on to present a hypothetical argument about whether or not California would have to protect the polar bear (*Ursus maritimus*) as an endangered species under the CESA if someone brought a single polar bear into California and let it roam wild, comparing that scenario to the listing of the gray wolf.

SCB is concerned about this analogy and, more generally, the legal and policy arguments made by the general counsel regarding the structure and purpose of the CESA. As an initial matter, a polar bear being dropped into California by a person is not in any way analogous to the situation facing gray wolves, which are in the early stages of recolonizing their historic range in the State, unaided. As a species that is native to California,<sup>21</sup> that was extirpated through non-natural mechanisms, and that has returned via natural dispersal, gray wolves present a fundamentally different situation than that of a non-native species being deliberately introduced into unsuitable habitat in a novel location.

SCB believes that the listing standard suggested by the CFGC counsel, hinging on the current ability of a population to breed in the wild is not consistent with the CESA, and ignores the urgent need for conserving critically endangered species. It is of course true that a single wolf does not represent a breeding population; nor would the presence of any number of male wolves in the State without a female member of the species. But, even the presence of both male and female wolves in California, a possibility that the CDFW acknowledges

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<sup>20</sup> California Fish and Game Commission October 3, 2012 Public Meeting at 5:58. Video available at: <http://www.cal-span.org/cgi-bin/media.pl?folder=CFG>

<sup>21</sup> As noted by the CDFW, gray wolves receive minimal protections under Fish and Game Code Section § 4152(a), which authorizes take of nongame mammals only by owners of the lands on which they are found (or their agents) and only if damaging property; *see also* § 4150: "All mammals occurring naturally in California which are not game mammals, fully protected mammals, or fur-bearing mammals, are nongame mammals."





given the difficulty in detecting wolves,<sup>22</sup> would still not guarantee that they would be able to locate each other or even, if they did, successfully reproduce. This is a problem that many critically endangered species face when their numbers fall to very low levels. When a species population falls to very low numbers, declining reproductive success can lead to a substantial risk of extinction (in addition to such factors as increased vulnerability to stochastic events).<sup>23</sup> However, there is nothing in the CESA that restricts listing to *breeding* populations of critically endangered species, let alone to those breeding naturally in the wild. In fact, such a standard would violate the intent of the CESA because the goal of the Act is to recover all endangered species, especially those at critically low population levels. For example, the California condor (*Gymnogyps californianus*) is listed as an endangered species under the CESA and the federal ESA. In 1987, the last 22, wild condors were brought in to captivity as a last-ditch effort to save the species from extinction.<sup>24</sup> In 1992, the U.S. Fish and Wildlife Service, the then California Department of Fish and Game (renamed in 2013 as the Department of Fish and Wildlife), and other cooperators began reintroductions of condors. But, it was not until 2006, in Big Sur, California, that the first re-introduced condors successfully hatched a wild-born chick.<sup>25</sup> It would make little sense to interpret the CESA to exclude protections for California Condors between 1986 and 2006 because there was no wild *breeding* population. By the logic of the CFGC counsel, the condor should have been removed from the list of endangered species because the species no longer possessed a wild breeding population within the state.

Likewise, it makes little sense that the CESA would only be able to provide protection to gray wolves once the species establishes a breeding population inside California. The CESA is designed to conserve native wildlife within California's state boundaries. The CESA defines "conservation" to mean the use of:

all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary. These methods and procedures include, but are not limited to, all activities associated with scientific resources management, such as research, census, law enforcement, habitat acquisition, *restoration* and maintenance, propagation, live trapping, and *transplantation*...<sup>26</sup> (emphasis added).

Thus, a species like the gray wolf can be conserved within the meaning of the CESA any time it is or could be present in the State, and its recovery can be promoted in California, including

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<sup>22</sup> CDFW, 2012. Report to the Fish and Game Commission: Evaluation of the Petition at 14, 17.

<sup>23</sup> See generally, Soulé, M. 1987. Viable Populations for Conservation. Cambridge, UK: Cambridge University Press.

<sup>24</sup> USFWS. 1986. California Condor Recovery Plan, available at: <http://www.fws.gov/hoppermountain/CACORecoveryProgram/PDF%20Fact%20Sheets/Recovery%20Plan%20of%20the%20California%20Condor,%20April%201996.pdf>.

<sup>25</sup> CDFW. 2013. California Condor. Available at [http://www.dfg.ca.gov/wildlife/nongame/t\\_e\\_spp/condor/](http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/condor/) (last visited April 19, 2013).

<sup>26</sup> California Fish and Game Code § 2061.



using procedures such as the translocation of individual wolves to locations within the State that provide suitable habitat. Restoring the gray wolf to its historic habitat meets the larger goal of the CESA to protect endangered species that are “of ecological, educational, *historical*, recreational, esthetic, economic, and scientific value to the people of this state, and the conservation, protection, and enhancement of these species and their habitat is of statewide concern”<sup>27</sup> (emphasis added).

Notably, the CDFW has a history of taking proactive measures to restore endangered species protected under the CESA. In April of 2013, the CDFW reintroduced 10 female and four male Sierra Nevada bighorn sheep (*Ovis canadensis californiana*), a species protected as endangered since 1999, into the Sierra Nevada mountains.<sup>28</sup> The CDFW has also worked to restore the Tule elk and, as noted above, California Condor, the latter through the auspices of the CESA. Thus, the theoretical possibility that the recovery of wolves might someday require the CDFW to take similar actions is no bar to listing the species now.

## **CONCLUSION**

SCB supports the listing of the gray wolf as an endangered species under CESA given its current status as nearly extirpated from California, with occasional animals dispersing into the state. As apex predators, gray wolves could play important functional roles in many ecosystems in California. Because large areas of likely suitable habitat exist in California, and given that wolves are likely to naturally recolonize the State from source populations in Oregon and Washington, it is clear that there is potential for the reestablishment of breeding populations of the gray wolf. Therefore, the CDFW should develop a management plan, under the auspices of the CESA, with the goal of the recovery of gray wolves within California. Respectfully submitted on behalf of SCB, its North America Section, and its Humboldt State University SCB Chapter.

Sincerely,

John Fitzgerald, J.D.  
Society for Conservation Biology Policy Director

Niel Lawrence, J.D.  
North America Section Policy Committee Vice-Chair

Tom Sisk, Ph.D.  
North American Section Policy Committee Chair

Carlos Carroll, Ph.D.  
Society for Conservation Biology Policy Committee Vice Chair

Robert Shearer  
Humboldt State University Chapter President

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<sup>27</sup> California Fish and Game Code § 2051 (emphasis added).

<sup>28</sup> Cart, J. Bighorn herd reintroduced to Sierra Nevada area. Los Angeles Times. April 17, 2013. Available at: <http://articles.latimes.com/2013/apr/17/local/la-me-0418-bighorn-herd-20130418>.



## **SCIENTIFIC LITERATURE CITED**

California Department of Fish and Wildlife. 2012. Report to the Fish and Game Commission: Evaluation of the Petition from the Center for Biological Diversity, Big Wildlife, the Environmental Protection Information Center, and the Klamath-Siskiyou Wildlands Center to list Gray Wolf (*Canis lupus*) as an Endangered Species Under the California Endangered Species Act. Aug. 1, 2012.

Carroll, C., et al. 2006. Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. *BioScience* 56:25-37.

Fuller, T.K., et al. 1992. A history and current estimate of wolf distribution and numbers in Minnesota. *Wildlife Society Bulletin* 20: 42-55.

Hall, E.R. 1981. *Mammals of North America*. New York: Wiley.

Larsen T. and W.J. Ripple. 2006. Modeling gray wolf (*Canis lupus*) habitat in the Pacific Northwest. U.S.A. *Journal of Cons. Planning*, 2(1):30-61.

Mech, L.D. 1988. *The arctic wolf: living with the pack*. Stillwater, MN: Voyageur Press.

Mech, L.D., and S.M. Goyal. 1993. Canine parvovirus effect on wolf population change and pup survival. *Journal of Wildlife Diseases* 22:104-106.

Mladenoff, D.J., T.A. Sickley, R. G. Haight, and A. P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. *Conservation Biology* 9:279–294.

Nowak, R.M. 1995. Another look at wolf taxonomy. Pp. 375-398 in *Ecology and conservation of wolves in a changing world: Proceedings of the second North American symposium of wolves*. Edmonton, CA. Canadian Circumpolar Institute, University of Alberta.

Oakleaf, J.K., et al. 2006. Habitat Selection by Recolonizing Wolves in the Northern Rocky Mountains of the United States, *Journal of Wildlife Management* 70(2):554-563.

Paquet, P.C. and L.N. Carbyn. 2003. Gray wolf: *Canis lupus* and allies. Pp. 482-510 in *Wild Mammals of North America*. 2nd edition. Baltimore: Johns Hopkins University Press.

Schmidt, R.H. 1987. Historical records of wolves in California. *WOLF!* 5(2): 31-35.



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Shelton, S.L., and F.W. Weckerly. 2007. Inconsistencies in historical geographical range maps: the gray wolf as an example. *California Fish and Game* 93:224-227.

Soulé, M. 1987. *Viable Populations for Conservation*. Cambridge, UK: Cambridge University Press.

Thiel, R.P. 1985. Relationship between road densities and wolf habitat suitability in Wisconsin. *American Midland Naturalist* 113: 404-407.

Young, S.P. and E.A. Goldman. 1944. *The Wolves of North America*. Washington, DC: The American Wildlife Institute.