CANADIAN WILDLIFE BIOLOGY & MANAGEMENT

CWBM 2021: Volume 10, Number 1 *ISSN: 1929–3100*

Point to Ponder

Should Governments Provide More Sanctuaries for Grey Wolves (*Canis lupus*)?

L. David MECH

U.S. Geological Survey, Northern Prairie Wildlife Research Center, 8711 – 37th St. SE, Jamestown, North Dakota 58401, USA. Mailing address: 1704 D Pleasant St., St. Paul, Minnesota 55113, USA. Email: mechx002@umn.edu

Abstract

As the grey wolf (*Canis lupus*) was removed from the U.S. Endangered Species List in several states, management authority reverted to those states, and some promptly allowed regulated public hunting and/or trapping, with a few aggressively trying to reduce populations. European countries are also increasingly facing growing wolf numbers and an expanding distribution as well as pressure to control their populations while the species is protected by the European Commission's Habitats Directive. In the U.S., the abrupt change from total species protection to authorized public exploitation angered much of the public, fostered lawsuits resulting in wolf relisting, and engendered a movement for further protection. As governments such as those in the Pacific Northwest states gain experience managing wolves, they might need to consider the wishes of an increasing citizenry that desires more protection for wolves. While wolf management includes lethal control in some areas, zoning certain wild lands as wolf sanctuaries could be a useful approach for ensuring some protection. Areas in several U.S. states are discussed as examples of possible wolf sanctuaries that can potentially serve as models for sanctuaries in other countries.

Correspondence: L. David Mech, 1704 D Pleasant St., St. Paul, Minnesota 55113, USA.
Email: mechx002@umn.edu

Key Words: *Canis lupus*, Endangered Species, Grey Wolf, Management, Protection, Sanctuaries.

Introduction

Grey wolf (*Canis lupus*) populations have recovered in many areas (Chapron *et al.* 2014; Mech 2017), and in the United States (U.S.) their management has reverted from federal to some states. Those states are faced with strong, disparate public attitudes toward wolves (Treves *et al.* 2009; Schreoder *et al.* 2020). Similarly, countries in Europe are increasingly faced with controversial wolf management issues (Boitani 2003; Boitani and Ciucci 2009; Gula 2020). In the contiguous U.S., wolves recovered in the northern Rockies and the Upper Midwest based on government-recovery-plan-population criteria and were removed from the federal Endangered Species List there, although they were later relisted in the Upper Midwest due to litigation (Mech 2017). When wolves were delisted, states promptly began managing them as game species, thus allowing regulated public harvesting − At this writing, they were recently delisted throughout the contiguous U.S., and pro-wolf organizations had announced plans to litigate that decision.

Background

At least part of the reason for the immediate public-hunting issue is related to the litigation over legal technicalities that had twice overturned delisting while grey wolf populations continued to increase and expand far beyond original delisting criteria (Mech 2010). In the northern Rockies, wolf numbers had reached a minimum of 1,750 wolves compared to the > 300 or > 30 breeding packs required for delisting. In the Upper Midwest, the recovery criteria were >100 wolves in Wisconsin and Michigan combined and >1,250 in Minnesota versus population estimates at delisting of 1,500 for Wisconsin and Michigan (U. S. Fish and Wildlife Service, undated,a), and 2,211 in Minnesota (Erb and Sampson 2013). Wolf depredations on livestock had also been increasing commensurate with wolf numbers (Mech 1998; Ruid *et al.* 2009), as did complaints about wolves competing with human hunters.

Many citizens interested in wolves were astonished and upset that wolves suddenly reverted from endangered (and therefore federally protected) to hunted and trapped almost overnight (Earthjustice 2019). Members of the litigating animal-protection organizations were chagrined that, despite 6 courtroom victories from 2002 to 2014 (U.S. Fish and Wildlife Service, undated, b), wolves were suddenly being legally exploited − State managers reasoned that wolf populations can sustain high rates of regulated taking (Fuller *et al.* 2003).

These factors fostered action by animal-protection and environmental groups that became passionate about protecting wolves from public hunting and trapping. On the internet and in media interviews (e.g., Anderson 2012), these citizens rationalized their anti-wolf-hunting views with erroneous and/or highly speculative and unfounded assertions about wolves and what would happen to wolf populations if publicly exploited. For example, it was not unusual to hear the sentiment that wolves would be extirpated by public harvesting, a view promoted by some biologists (Bergstrom 2014, but see Mech 2014). This fear demonstrated the lack of knowledge that widespread poisoning plus bounties, den digging, and year-around, unregulated killing by agency personnel and others were required to accomplish extirpation originally (Young and Goldman 1944; Thiel 1993).

At least in the Upper Midwest of the U.S., 29 to 58% of citizens oppose public wolf harvesting for sport, pelts, or trophies (Treves *et al.* 2009; Schroeder *et al.* 2020). This group includes Native Americans in some states who revere the wolf for cultural or religious reasons (David 2009; Shelley *et al.* 2011). In addition, a disproportionate percentage of women (27−40%) in the United States eschew hunting in general (Kellert and Berry 1987; Kellert 1997; Americans' Attitudes Toward Hunting, Fishing, Sport Shooting, and Trapping 2019). These people feel disenfranchised because, despite their strong passion for wolves, they believe they have little or no influence on government natural resource departments because they are not hunters themselves (Jacobson and Decker 2006, 2008).

Even some social scientists interested in conservation have suggested a recourse for those who would preserve wolves. Bruskotter *et al.* (2011) proposed that such folks invoke the Public-Trust Doctrine in litigation against the states. Although their proposal was criticized (Mech 2012), it is clear that there is sympathy among some scientists for the concept of protecting wolves (and other large carnivores) from public exploitation (Way and Bruskotter 2012).

Wolf Management Controversy

From a wildlife-management standpoint, wolves have historically and universally been viewed as needing management, mostly removal by humans (Young and Goldman 1944; Mech 1970; Fritts *et al.* 2003). During the last several decades, public sentiment changed, laws protecting wolves were passed, and the species began to recover (Fritts *et al.* 2003). "Until recently, consensus on wolf management was automatic in that it consisted essentially of killing wolves or, at best ignoring them. But recently, with the increased urbanization, interest in the environment and prominence of the media . . . wolf management has become far more complex and

controversial" (Boitani 2003:333). This is true not only in North America but also in Europe (Boitani 2003; Fritts *et al.* 2003; Boitani and Ciucci 2009).

Lethal control remains the most common management tool for wolf depredations on livestock despite all manner of alternate methods that are only partly effective (Fritts *et al.* 2003, Breitenmoser *et al.* 2005; Bangs *et al.* 2006). Although the effectiveness of lethal control depends on the specific wolf killed (Harper *et al.* 2008 but see Treves *et al.* 2016; Bradley *et al.* 2015), lethal control most directly deals with the problem (but see Treves 2009), and when appropriately focused in the right area, public wolf exploitation could assist with lethal livestock-depredation control (DeCesare *et al.* 2018).

The other rationale that some governments use for public taking of wolves is to reduce the population and minimize predation on livestock and big game. Although Mech (2001) is skeptical as to whether any wolf population of hundreds or thousands can be permanently reduced with fair-chase, regulated public taking, Montana (Lewis *et al.* 2012) and Idaho have been attempting it. As of this writing, Idaho's wolf population remains at about 1,000 despite regulated hunting and trapping since 2012. To improve its chances of reducing the population, the state has resorted to relaxing its regulations to allow a year-around open season in some areas (Gray Wolf Hunting & Trapping Seasons & General Rules 2019-2020 & 2020-2021). Minnesota, Wisconsin, and Wyoming set more conservative quotas during their first public hunting seasons.

On the other hand, animal and environmental-protection groups successfully sued to stop or alter public wolf taking in Wyoming, Wisconsin, and Minnesota. This approach, however, could backfire and result in Congressional action similar to that which delisted wolves in Montana, Idaho, and parts of Washington, Oregon, and Utah legislatively (Boyce 2011).

This extreme polarization in public attitudes toward wolves and the appropriate management of them has persisted for decades (Fritts *et al.* 2003; Boitani 2003; Mech 2012, 2017), and there is no reason to believe that it will dissipate anytime soon (Manfredo *et al.* 2020). Therefore, it seems reasonable to find a way to help mollify, or at least grant due consideration to, both viewpoints to whatever extent that might be possible.

The Role of Management Zones

One way to appease multiple entities is through each government wolf management agency zoning its wolf range into various regions where wolf management could differ, at least in large-enough states or countries (Mech 1995, 2017; Way and Bruskotter 2012). Zoning was recommended in IUCN's (World Conservation Union) "Manifesto on Wolf Conservation" (Manifesto 2000) adopted in 1973. It was also used in wolf recovery plans (USFWS 1978, 1992) and considered in some state wolf management plans in the U.S. (Wisconsin Department of Natural Resources 1999; Minnesota Department of Natural Resources, 2001). Zoning has also been used in Europe (Boitani 2003).

Because wolves can live in wild lands and agricultural areas of varying degrees, zoning allows more prescriptive management for various areas. In some zones, wolves might not be allowed to live at all, for example, suburbs and highly agricultural areas where conflict with humans would be so great that the public would not tolerate their presence. In semi-agricultural zones, lethal livestock-depredation control could be applied, and elsewhere, regulated public harvest. Given this flexibility, states or other government entities could actually zone parts of their wolf range such as to totally protect wolves in some regions, i.e., providing sanctuaries (Mech 1995; Way and Bruskotter 2012). Although such zoning might not satisfy all stakeholders, it probably would go a long way toward mollifying many citizens who now feel that their viewpoints toward wolves have not been given adequate consideration (Decker and Brown 1987; Way and Bruskotter 2012; Decker *et al.* 2016).

In addition, establishing wolf sanctuaries would allow those parts of the wolf populations to maintain pack and population structures and relations with their prey as natural as possible in keeping with The Wildlife Society's position on wolf restoration and management in the contiguous United States (The Wildlife Society 2012). Although a completely natural wolf population is no more necessary for wolf conservation than maintaining a natural deer (*Odocoileus* spp.) population is for deer conservation, it would tend to gratify a growing segment of the public (Manfredo *et al.* 2020).

The only current wildlife sanctuaries in most countries are some national parks and limited areas of national and state wildlife refuges and reserves. Thus, there is not a strong precedent for special wolf sanctuaries. They might even be seen as unnecessary, especially in the western U.S., when few other state-managed large carnivores are specially protected year-around. Still, public opinion toward protectionism in some places could grow strong enough as in California where public hunting of cougars (*Puma concolor*) is prohibited (Wolch *et al.* 1997). Areas that would best qualify as wolf-protection zones would be those several thousand km^2 in extent (Mech 1979; Soulé 1980; Fritts and Carbyn 1995) and without livestock. National Parks (NP), where large enough, already afford wolves protection. Other areas, such as most wilderness areas or other public forests

in the U.S. Upper Midwest might not reach this ideal size, but could still function to protect at least a few packs, for pack territories there are smaller, averaging roughly 115-175 km^2 (Fuller *et al.* 2003). Some hunters and guides might still argue that even in wilderness areas and national forests wolves compete with them for natural prey animals. Those considerations could be partly met by allowing regulated public wolf taking in some wilderness areas or public forests as is usually done but not in designated wolf sanctuaries.

Whether legislatures, parliaments, or other governing bodies would agree to such zoning would depend on how much public pressure they received by both the pro- and anti-wolf hunting public. The general public is much in favour of wolf recovery and conservation, as indicated by various polls (Center for Biological Diversity 2019; Current attitudes about wolves 2020). Zoning does possess an inherent compromise logic that might appeal to legislators with an eye towards satisfying a disparate constituency. Perhaps it would take time and continued public wrangling over the issue, but in the long term the logic of such a compromise could become apparent.

In any case, it is useful to examine some areas in various U.S. states as examples of where protecting wolves from public taking might be most feasible. In Eurasian wolf range, similar types of areas might be feasible as wolf sanctuaries such as combinations of smaller natural areas there (Boitani 2003).

Possible Wolf Sanctuaries

Wyoming already includes Yellowstone NP (9,025 km^2) and Grand Teton NP (1,255 km^2) where all wildlife (except elk *Cervus canadensis* in Grand Teton) is protected. States could extend wolf protection to some of the federal wilderness areas and/or national forests adjacent to national parks. If livestock grazing there was a problem, an exception could be made for depredation control only. Such protection would also function to shield some of Yellowstone's packs that are regularly observed by the public and thus have a strong public constituency but live only partly in the park. Montana has already extended some protection to certain areas adjacent to Yellowstone NP and Glacier NP by restricting wolf-taking quotas to 1 and 2 wolves respectively (FWP Wolf Hunting and Trapping Regulations 2020).

Glacier NP serves as a wolf refuge but is only half the size of Yellowstone. Adding the Bob Marshall Wilderness Area, roughly 3 times the size of Glacier, would afford a reasonable amount of additional protection in Montana. Furthermore, Glacier adjoins 500 km^2 of Waterton NP in Alberta where wolves are also protected.

Idaho hosts no national parks but does include large wilderness areas. The Frank Church/River-of-No-Return Wilderness Area is larger than Yellowstone, and the Selway-Bitterroot Wilderness is about two-thirds the size of Yellowstone. Both would qualify as wolf sanctuaries and probably already function somewhat as such because of the inaccessibility of much of the area. Similar areas could also be established in Washington, Oregon, and California if their federal and state protections are ever lifted.

The other primary U.S. region where wolves would be subject to state management if delisted, is the Upper Midwest, primarily Minnesota, Wisconsin, and Michigan. The only sizeable wilderness national parks there are Voyageurs NP in Minnesota and Isle Royale NP which is legally part of Michigan. Each, however, is less than a tenth the size of Yellowstone. However, 1 prominent area of Minnesota that might serve as a major sanctuary for midwestern wolves is the Boundary Waters Canoe Area Wilderness (BWCAW) in the Superior National Forest. The BWCAW (4,400 km^2) has long been well-delineated and is revered by users as a motorless wilderness. It is also relatively inaccessible during white-tailed deer (*Odocoileus virginianus*) and moose (*Alces americanus*) hunting seasons depending on freeze-up dates, and interior parts of it rarely see hunters and trappers (Barber-Meyer *et al.* in review). Although deer are scarce in much of the area during fall and winter (Nelson and Mech 2006), wolves feed on moose and beavers (*Castor canadensis*). The BWCAW wolf population is contiguous with the Ontario wolf population which is contiguous with the entire Canadian wolf population. Lastly, the BWCAW has the distinction of having hosted the world's first wolf study (Olson 1938) as well as follow-up studies by Stenlund (1955), Mech and Frenzel (1971), and various collaborators and students of Mech (2009), whose investigations continue (Mech and Barber-Meyer 2019).

Conceivably the BWCAW could gratify a large portion of the Upper Midwest wolf-protection constituency, given that neither mainland Michigan nor Wisconsin possesses such extensive wilderness free of livestock operations. In Michigan, the Ottawa National Forest (ONF) comprises about 4,000 km^2, but several major state highways cross through it. Nevertheless, the ONF borders Wisconsin, so if wolf protection was important to enough citizens of Wisconsin and Michigan, the ONF and perhaps the northern parts of the Chequamegon-Nicolet National Forest in Wisconsin would probably be the best area available.

Under current regulations in Wisconsin, public wolf hunting and trapping is not allowed within boundaries of formal Indian reservations (Note: an Indian reservation is a legal designation for an area of land managed by a federally recognize Indian tribe under the U.S. Bureau of Indian

Affairs rather than the state governments of the United States in which they are located) (Wisconsin Department of Natural Resources 2012:8). As cultural groups, some Indian (Aboriginal or Indigenous) tribes are especially protective of wolves (David 2009; Shelley *et al.* 2011). Chippewa tribes in Wisconsin have also proposed that 10-km buffer strips be created around reservations to protect wolves on reservations (Smith 2012). Both Wisconsin and Minnesota include sizeable Indian reservations that can support 1 to many packs and could serve as core areas for wolf sanctuaries where these lie adjacent to large blocks of public forest land. Such sanctuaries would provide cultural benefits to the tribes as well as benefit wolves.

These areas represent places within current wolf ranges in the 48 contiguous U.S. that could serve as wolf sanctuaries. Each state might find that other areas are more suitable either biologically or politically. Other countries could use these places as models that might provide insights into where they might institute wolf sanctuaries.

Ultimately, wolf management decisions will be up to the citizens of each state or country and their legislative bodies. Because wolves in most of the northern U.S. and Europe are increasing and expanding their ranges to such an extent (Chapron *et al.* 2014; Mech 2017), conflicts with humans could create adverse public sentiment. That change could prevent wolves from ever being totally protected except in national parks, Indigenous people's lands, or other special preserves. On the other hand, public attitudes toward wildlife in general are quickly becoming more sympathetic (Manfredo *et al.* 2020). Thus, wolf sanctuaries might be appropriate at certain times and places.

Management Considerations

Although at least some state wildlife agencies use elaborate methods to consider their citizens' disparate attitudes toward wolves, litigation by the wolf-protection constituency persists. Wolf sanctuaries and zone management, while not biologically necessary to maintain wolf populations, could help mitigate some controversy (Way and Bruskotter 2012). Thus, this proposal for possible wolf sanctuaries is not so much a recommendation. Rather, it is an idea that governments might find useful as they gain their first experience with managing a charismatic species with a recent history of protection, a longer history of public controversy and population suppression, and a growing wolf-protectionist constituency.

Acknowledgements

I was supported by the Biological Resources Division, U.S. Geological Survey while preparing this article. I thank the following for critiquing it and making suggestions for improving it: Ed Bangs, Shannon Barber-Meyer, Bob Ream, Adrian Wydeven, and three anonymous reviewers.

Literature Cited

Americans' Attitudes Toward Hunting, Fishing, Sport Shooting, and Trapping. 2019. National Shooting Sports Foundation, Newtown, Connecticut. USA.

Anderson, D. 2012. Wolf activists strike up aggressive campaign. Star Tribune, August 19, 2012.

Bangs, E., M. Jimenez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krischke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D. Smith, V. Asher, and S. Stone. 2006. Non-lethal and lethal tools to manage wolf-livestock conflict in the northwestern United States. Proceedings of the Vertebrate Pest Conference 22: 7−16.

Barber-Meyer, S. M., Tyler Wheeldon, and L. D. Mech. In review. The importance of wilderness to wolf (*Canis lupus*) survival and cause-specific mortality over 50 years.

Bergstrom, B. 2014. Wolf recovery: a response to Mech. Wildlife Professional 8 (2): 7.

Boitani, L. 2003. Wolf conservation and recovery. Pages 317−340 *in* L. D. Mech and L. Boitani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago, Illinois, USA.

Boitani, L., and P. Ciucci, 2009. Wolf management across Europe: species conservation without boundaries. Pages 5−39 *in* M. Musiani, L. Boitani, L., and P. Paquet, editors. A new era for wolves and people: wolf recovery, human attitudes, and policy. University of Calgary Press, Alberta, Canada.

Boyce, M. 2011. Wolf hysteria: is the conservation community losing credibility? Alberta Outdoorsmen 12 (12): 12−14.

Bradley, E. H., H. S. Robinson, E. E. Bangs, K. Kunkel, M. D. Jimenez, J. A. Gude, and T. Grimm. 2015. Effects of wolf removal on livestock depredation recurrence and wolf recovery in Montana, Idaho, and Wyoming. Journal of Wildlife Management 79: 1337–1346.

Breitenmoser, U., C. Angst, J. Landary, C. Breitenmoser-Wursten, J. D. C. Linnell, and J. Weber. 2005. Non-lethal techniques for reducing depredation. Pages 49−71 *in* R. Woodroffe, S. Thirgood, and A. Rabinowitz, editors. People and wildlife conflict or coexistence? Cambridge University Press, London, England.

Bruskotter, J. T., S. A. Enzler, and A. Treves. 2011. Rescuing wolves from politics: wildlife as a public trust resource. Science 333: 1828−1829.

Center for Biological Diversity. 2019. https://biologicaldiversity.org/w/news/press-releases/

majority-of-americans-oppose-trump-plan-to-end-wolf-protections-2019-05-28/. Accessed October 2020.

Chapron, G., P. Kaczensky, J. D. C. Linnell, M. von Arx, D. Huber, H. Andrén, J. V. López-Bao, M.Adamec, F. Álvares, O. Anders, L. Balčiauskas, V. Balys, P. Bedő, F. Bego, J. Carlos Blanco, U. Breitenmoser, H. Brøseth, L. Bufka, R. Bunikyte, P. Ciucci, A. Dutsov, T. Engleder, C. Fuxjäger, C. Groff, K. Holmala, B. Hoxha, Y. Iliopoulos, O. Ionescu, J. Jeremić, K. Jerina, G. Kluth, F. Knauer, I. Kojola, I. Kos, M. Krofel, J. Kubala, S. Kunovac, J. Kusak, M. Kutal, O. Liberg, A. Majić, P. Männil, R. Manz, E. Marboutin, F. Marucco, D. Melovski, K. Mersini, Y. Mertzanis, R. W. Mysłajek, S. Nowak, J. Odden, J. Ozolins, G. Palomero, M. Paunović, J. Persson, H. Potočnik, P.-Y. Quenette, G. Rauer, I. Reinhardt, R. Rigg, A. Ryser, V. Salvatori, T. Skrbinšek, A. Stojanov, J. E. Swenson, L. Szemethy, A. Trajçe, E. Tsingarska-Sedefcheva, M. Váňa, R Veeroja, P. Wabakken, M. Wölfl, S. Wölfl, F. Zimmermann, D. Zlatanova, L. Boitani. 2014. Recovery of large carnivores in Europe's modern human-dominated landscapes. Science 346 (6216): 1517−1519.

Current Attitudes about Wolves. 2020. https://www.dnr.state.mn.us/mammals/wolves/attitudes-about-wolves.html. Accessed October 2020.

David, P. 2009. Ma'iingan and the Ojibwe. Pages 267−277 *in* A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. Recovery of gray wolves in the Great Lakes Region of the United States: an endangered species success story. Springer, New York, New York, USA.

DeCesare, N. J., S. M. Wilson, E. H. Bradley J. A. Gude, R. M. Inman, N. J. Lance, K. Laudon, A. A. Nelson, M.S. Ross, and T. D. Smucker 2018. Wolf-livestock conflict and the effects of wolf management. Journal of Wildlife Management 82: 711–722.

Decker, D. J. and T. L. Brown. 1987. How animal rightists view the "Wildlife management-hunting system." Wildlife Society Bulletin 15: 599−602.

Decker, D., C. Smith, A. Forstchen, D. Hare, E. Pomeranz, C. Doyle-Capitman, K. Schuler, and J. Organ. 2016. Governance principles for wildlife conservation in the 21st century. Conservation Letters 9: 290–295.

Earthjustice 2019. https://earthjustice.org/features/campaigns/wolves-in-danger-timeline-milestones. Accessed September 2020.

Erb, J., and B. Sampson. 2013. Distribution and abundance of wolves in Minnesota, 2012-13. Minnesota Department of Natural Resources. St. Paul, Minnesota, USA.

Fritts, S. H., and L. N. Carbyn. 1995. Population viability, nature reserves, and the outlook for gray wolf conservation in North America. Restoration Ecology 3: 26−38.

Fritts, S. H., R. O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pages 289–316 *in* L. D. Mech and L. Boitani, editors. Wolves: behavior, ecology, and conservation University of Chicago Press, Chicago, Illinois, USA.

Fuller, T. K., L. D. Mech, and J. Fitts-Cochrane. 2003. Wolf population dynamics. Pages 161−191 in L. D. Mech and L. Boitani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago, Illinois, USA.

FWP Wolf Hunting and Trapping Regulations. 2020. Montana Department of Fish Wildlife and Parks. File:///C:/Users/david_mech/Documents/2020%20Wolf%20Regs,%20MT.pdf. Accessed October 2020.

Gray Wolf Hunting & Trapping Seasons & General Rules 2019-2020, 2020-2021. https://idfg.idaho.gov/sites/default/files/seasons-rules-big-game-2019-2020-wolf.pdf. Accessed October 2020.

Gula, R., Bojarska, K. Theuerkauf, J. Król, and W. Okarma. 2020. Re-evaluation of the wolf population management units in central Europe. Wildlife Biology 2020 (2): https://doi.org/10.2981/wlb.00505

Harper, E. K., W. J. Paul, L. D. Mech, and S. Weisberg. 2008. Effectiveness of lethal, directed wolf depredation control in Minnesota. Journal of Wildlife Management 72: 778−784.

Jacobson, C. A., and D. J. Decker. 2006. Ensuring the future of state wildlife management: understanding challenges for institutional change. Wildlife Society Bulletin 34: 531−536.

Jacobson, C. A and D. J. Decker. 2008. Governance of state wildlife management: reform and revive or resist and retrench? Society & Natural Resources, 21: 441−448.

Kellert, S. 1997. Kinship to mastery: biophilia in human evolution and development. Island Press. Washington, DC, USA.

Kellert, S. R., and J. K. Berry. 1987. Attitudes, knowledge, and behaviors toward wildlife as affected by gender. Wildlife Society Bulletin 15: 363−371.

Lewis, M. S., G. Pauley, Q. Kujala, J. Gude, Z. King, and K. Skogen. 2012. Selected results from four separate surveys of resident Montanans regarding Montana's wolf hunt. Montana Fish, Wildlife and Parks, HD Unit Research Summary No. 33.

Manfredo, M. J., E. G. Urquiza-Haasb, A. W. Don Carlos, J. T. Bruskotter, A. M. Dietsch. 2020. How anthropomorphism is changing the social context of

modern wildlife conservation. Biological Conservation 241: :108297 DOI: 10.1016/j.biocon.2019.108297

Manifesto 2000. ww1.nina.no/lcie_new/pdf/634991502778171292_IUCN%20Wolf%20Manifesto.pdf. Accessed September 2020.

Mech, L. D. 1970. The wolf: the ecology and behavior of an endangered species. Natural History Press, Doubleday Publishing Co., New York, New York, USA.

Mech, L. D. 1979. Some considerations in re-establishing wolves in the wild. Pages 445−457 *in* E. Klinghammer, editor. The behavior and ecology of wolves. Garland, STPM Press, New York, New York, USA.

Mech, L. D. 1995. The challenge and opportunity of recovering wolf populations. Conservation Biology 9: 270 −278.

Mech, L. D. 1998. Estimated costs of maintaining a recovered wolf population in agricultural regions of Minnesota. Wildlife Society Bulletin 26: 817−822.

Mech, L. D. 2001. Managing Minnesota's recovered wolves. Wildlife Society Bulletin 29: 70−77.

Mech. L. D. 2009. Long-term research on wolves in the Superior National Forest. Pages 15-34 *in* A. P. Wydeven, E. J. Heske, and T. R. Van Deelen, editors. Recovery of gray wolves in the Great Lakes Region of the United States: an endangered species success story. Springer, New York, New York, USA.

Mech, L. D. 2010. Considerations for developing wolf harvesting regulations in the contiguous United States. Journal of Wildlife Management 74: 1421−1424.

Mech, L. D. 2012. Rescuing wolves: threat of misinformation. Science 335: 794−795.

Mech, L. D. 2014. Wolf recovery: a response to Bergstrom. The Wildlife Professional 8 (2): 8.

Mech, L. D. 2017. Where can wolves live and how can we live with them? Biological Conservation 210: 310−317.

Mech, L. D. and S. M. Barber-Meyer. 2019. Sixty years of deer migration in a wolf-deer system. Canadian Field-Naturalist 133: 343–351.

Mech, L. D., and L. D. Frenzel, Jr., editors. 1971. Ecological studies of the timber wolf in northeastern Minnesota. USDA Forest Service Research Paper NC-52. North Central Forest Experiment Station, St. Paul, Minnesota, USA.

Mech, L. D., and P. D. Karns. 1977. Role of the wolf in a deer decline in the Superior National Forest. USDA Forest Service Research Report. NC-148. North Central Forest Experiment Station, St. Paul, Minnesota, USA.

Minnesota Department of Natural Resources. 2001. Wolf Management Plan. Minnesota Department of Natural Resources, St. Paul, Minnesota, USA.

Nelson, M. E. and L. D. Mech. 2006. Causes of a 3-decade dearth of deer in a wolf-dominated ecosystem. American Midland Naturalist 155: 373−382.

Olson, S. F. 1938. Organization and range of the pack. Ecology 19: 168−170.

Ruid, D. B., W. J. Paul, B. J. Roell, A. P. Wydeven, R. C. Willing, R. L. Jurewicz, and D. H. Lonsway. 2009. Wolf-human conflicts and management in Minnesota, Wisconsin, and Michigan. Pages 279− 295 *in* A. P. Wydeven, T. R. Van Deelen, and E. J. Heske, editors. Recovery of gray wolves in the Great Lakes Region of the United States: an endangered species success story. Springer, New York, New York, USA.

Schroeder, S. A., A. C. Landon, L. Cornicelli, L. McInenly, and D. Stark. 2020. Minnesotans' attitudes toward wolves and wolf management: summary report. Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries, Wildlife, and Conservation Biology. University of Minnesota, St. Paul, Minnesota, USA.

Shelley, V., A. Treves, and L. Naughton. 2011. Attitudes to wolves and wolf policy among Ojibwe tribal members and non-tribal residents of Wisconsin's wolf range. Human Dimensions of Wildlife 16: 397−418.

Smith, P. 2012. Wisconsin DNR approves wolf hunting proposal. Milwaukee Journal Sentinel, July 17, 2012.

Soulé, M. E. 1980. Thresholds for survival: maintaining fitness and evolutionary potential. Pages 151−169 *in* M. E. Soulé and B. A. Wilcox, editors. Conservation biology: an evolutionary-ecological perspective. Sinauer Association, Sunderland, Massachusetts, USA.

Stenlund, M. H. 1955. A field study of the timber wolf (*Canis lupus*) on the Superior National Forest, Minnesota. Minnesota Department of Conservation Technical Bulletin 4. St. Paul, Minnesota. USA.

The Wildlife Society. 2012. Wolf restoration and management in the contiguous United States. Final Position Statement, May 2012. The Wildlife Society, Bethesda, Maryland, USA. http://wildlife.org/ documents /position-statements /wolf.restoration.05.29.12.pdf

Thiel, R.P. 1993. The timber wolf in Wisconsin: the death and life of a majestic predator. University of Wisconsin Press, Madison, Wisconsin, USA.

Treves, A., R. L. Jurewicz, L. Naughton-Treves, and D. S. Wilcove. 2009. The price of tolerance: wolf damage payments after recovery. Biodiversity Conservation 8: 4003–4021.

Soulé, M. E. 1980. Thresholds for survival: maintaining fitness and evolutionary potential. Pages 151−169 *in* M. E. Soulé, and B. A. Wilcox, editors. Conservation biology: an

evolutionary-ecological perspective. Sinauer Association, Sunderland, Massachusetts, USA.

U.S. Fish and Wildlife Service. 1978. Recovery plan for the eastern timber wolf. U.S. Fish and Wildlife Service, Twin Cities, Minnesota, USA.

U.S. Fish and Wildlife Service. 1992. Recovery plan for the eastern timber wolf. U.S. Fish and Wildlife Service, Twin Cities, Minnesota, USA.

U.S. Fish and Wildlife Service. Undated, a. https://www.fws.gov/midwest/wolf/population/mi_wi_nos.html Accessed November 2020.

U.S. Fish and Wildlife Service. Undated, b. https://www.fws.gov/midwest/wolf/history/timeline.html. Accessed October 2020.

Way, J. G., and J. T. Bruskotter. 2012. Additional considerations for gray wolf management after their removal from Endangered Species Act Protections. Journal of Wildlife Management. 76: 457−461.

Wisconsin Department of Natural Resources. 1999. Wisconsin wolf management plan. Wisconsin Department of Natural Resources, Madison, Wisconsin, USA.

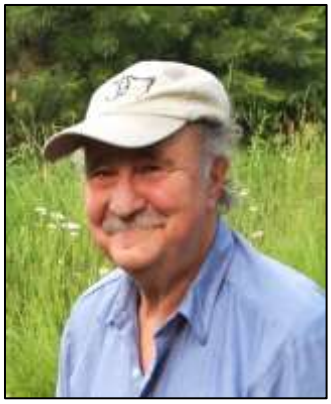
Wisconsin Department of Natural Resources. 2012. Wisconsin 2012 Wolf Hunting and Trapping Regulations. Wisconsin Department of Natural Resources, PUB-WM-538_2012, Madison, Wisconsin. http://dnr.wi.gov/files/PDF/pubs/wm/WM0538.pdf

Wolch, J. R., A. Gullo, and U. Lassiter. 1997. Changing attitudes toward California's cougars. Society and Animals 5: 95−116.

Young, S. P., and E. A. Goldman. 1944. The wolves of North America. American Wildlife Institute, Washington, DC, USA.

About the Author

L. David Mech is a Senior Research Scientist with the U.S. Geological Survey and an Adjunct Professor in the Department of Fisheries, Wildlife and Conservation Biology and the Department of Ecology, Evolution and Behavior at the University of Minnesota. He received his BSc degree from Cornell University, and a PhD degree and an honorary doctorate from Purdue University. He has studied wolves since 1958 in places such as Isle Royale, Minnesota, Italy, Alaska, Yellowstone National Park, and Ellesmere Island, Canada.



Received 28 October 2020 – Accepted 14 December 2020