**Supporting Material**

The first change in census methods involved tripling the number of wolf census-takers by recruiting citizen volunteers to count wolves independently with variable, undocumented verification by the WDNR biologists who had conducted censuses alone previously (WDNR 1999; Wiedenhoeft et al. 2003; Wydeven 1994, 1996; Wydeven and Megown 1995); for further details see the official USFWS peer review (Treves 2019). The second change was actually three changes in methods involving screening and verifying more of the volunteers’ data, setting minimum requirements for training and census efforts, and preliminary statistical analyses of differences between volunteers, WDNR biologists, and standardized tests of accuracy for both parties (Wiedenhoeft et al. 2003; Wydeven et al. 2006; Wydeven et al. 2004). Finally, in 2004, the author who designed the wolf census introduced the public to the author who designed the population model. “Between October 2003 and March 2004,… agency personnel were asked to report wolf observations to Tim Van Deelen with DNR Science Bureau.” p.8, (Wydeven et al. 2004). Therefore, the authors seemed to have been intimately familiar with the changes in methods and the resulting changes in mean annual growths and variances that resulted from those changes (Treves 2019).

The changes in census methods seem particularly relevant to efforts to understand individual survival and predict the growth of the Wisconsin wolf population (Chapron and Treves 2017; Santiago-Ávila et al. 2020). The census period or method was shown to correlate with hazards for radio-collared wolves (Santiago-Ávila et al. 2020). The above changes in census methods seemed unaccounted for in the three presentations of the state wolf population models (Van Deelen 2009; WDNR 1999, 2007) and subsequent peer-reviewed scientific articles (Olson et al. 2017; Olson et al. 2015; Stenglein et al. 2015a; Stenglein and Van Deelen 2016; Stenglein et al. 2018; Stenglein et al. 2015b). The first peer-reviewed article confused the issue of change in census methods by conflating them with undocumented policy changes, when it stated,

“The population grew slowly from 1980 to 1995 at which point the winter count surpassed **the endangered status of 80 wolves** **[sic, a]** (Wydeven et al. 2009). Since 1995, the wolf population increased dramatically, and management policy **changed with respect to the degree to which managers may kill wolves to address depredation problems [sic, b]**. Hence, policy changes and population growth interacted to define three recovery periods… **During 1996–2002, wolves were listed as endangered under the US Endangered Species Act** **[sic, c]** and protected from all hunting and trapping. In 2003, wolves were downgraded to threatened status and lethal control actions [followed]…. The period 2003–2012 was dominated by this on-again and off-again lethal control management...” internal citations relating to lethal control omitted, emphasis added, p. 371, (Stenglein et al. 2015b).

The paper does not mention the changes in census methods described above and the boldface passages contain errors **[sic a–c]** below.

**(sic a)** Reclassification is a legal designation, not a biological one, and no change in federal policy was implemented before 2003, as described fully in (Refsnider 2009). Moreover, the architect of the census change and a co-author on the above passage had written, “The 1994-1995 wolf population was 66% above the wolf population present in 1993-1994 (50-57 wolves). This increase probably represents more than just natural reproduction. Some wolves were probably missed in 1993-1994 surveys.” p. 10, (Wydeven and Megown 1995). That spike in the population estimate was detected in the winter of 1994-1995 before the observation that wolves had exceeded 80 individuals in April 1995. Therefore, any ostensible change in state or federal management policies (for which there is no record) follows the change in methods, not the other way around.

**(sic b)** Authority for killing wolves was not granted to the state of Wisconsin until 1 April 2003 (Refsnider 2009). Moreover, lethal methods were only permitted on 1 April 2003, which means 95.9% of that wolf-year (15 April 2002–14 April 2003) should be assigned to the prior policy period without lethal management (Chapron and Treves 2016).

**(sic c)** Similarly, wolves were federally listed as endangered since the late 1970s, so identifying a break in policy relating to lethal control in 1995 or 1996 is inaccurate.

The errors or inaccuracies noted above were not insignificant given the population modeling used the three recovery periods as parameters, “…we fit a model with three correction factors that were constant within each recovery period (1980–1995, 1996–2002, and 2003–2011).” p.372, (Stenglein et al. 2015b). The first period should have ended in April 1994, before volunteers’ data suggested an impossibly large one-year spike in the wolf population and not actual growth. The second period should have ended sometime between summer 2000 and winter 2003–2004 (Wiedenhoeft et al. 2003; Wydeven et al. 2006; Wydeven et al. 2004). Furthermore, the latter authors showed that lethal management changed 5 more times in the period under question, so we cannot understand why Stenglein et al. (2015b) did not define more policy periods by their own stated rationale for defining periods.

Subsequent work by the architects continued to omit serial changes in wolf census methods described above (Stenglein and Van Deelen 2016; Stenglein et al. 2018).

**References cited**

Chapron, G., Treves, A., 2016. Blood does not buy goodwill: allowing culling increases poaching of a large carnivore. Proceedings of the Royal Society B 283, 20152939.

Chapron, G., Treves, A., 2017. Reply to comments by Olson et al. 2017 and Stien 2017. Proceedings of the Royal Society B 284, 20171743.

Olson, E.R., Crimmins, S., Beyer, D.E., MacNulty, D., Patterson, B., Rudolph, B., Wydeven, A., Van Deelen, T.R., 2017. Flawed analysis and unconvincing interpretation: a comment on Chapron and Treves 2016. Proceedings of the Royal Society of London B 284, 20170273.

Olson, E.R., Stenglein, J.L., Victoria Shelley, Adena R. Rissman, Christine Browne-Nuñez, Zachary Voyles, Wydeven, A.P., Deelen, T.V., 2015. Pendulum swings in wolf management led to conflict, illegal kills, and a legislated wolf hunt. Conservation Letters 8, 351-360.

Refsnider, R., 2009. The Role of the Endangered Species Act in Midwest Wolf Recovery, In Recovery of gray wolves in the Great Lakes region of the United States: An endangered species success story. eds A.P. Wydeven, T.R. Van Deelen, E.J. Heske, pp. 311-330. Springer, New York.

Santiago-Ávila, F.J., Chappell, R.J., Treves, A., 2020. Liberalizing the killing of endangered wolves was associated with more disappearances of collared individuals in Wisconsin, USA. Scientific Reports 10, 13881.

Stenglein, J.L., Gilbert, J.H., Wydeven, A.P., Van Deelen, T.R., 2015a. An individual-based model for southern Lake Superior wolves: A tool to explore the effect of human-caused mortality on a landscape of risk. Ecological Modelling 302, 13-24.

Stenglein, J.L., Van Deelen, T.R., 2016. Demographic and Component Allee Effects in Southern Lake Superior Gray Wolves. PLos ONE 11, 10.1371/journal.pone.0150535

Stenglein, J.L., Wydeven, A.P., Van Deelen, T.R., 2018. Compensatory mortality in a recovering top carnivore: wolves in Wisconsin, USA (1979–2013). Oecologia 187, 99–111.

Stenglein, J.L., Zhu, J., Clayton, M.K., Van Deelen, T.R., 2015b. Are the numbers adding up? Exploiting discrepancies among complementary population models. Ecology and Evolution 5, 368-376.

Treves, A., 2019. Peer review of the proposed rule and draft biological report for nationwide wolf delisting, ed. U.S.F.W.S. Department of Interior. Department of Interior, U.S. Fish & Wildlife Service, Washington, D.C. https://www.fws.gov/endangered/esa-library/pdf/Final%20Gray%20Wolf%20Peer%20Review%20Summary%20Report\_053119.pdf, accessed.

Van Deelen, T.R., 2009. Growth Rate and Equilibrium Size of a Recolonizing Wolf Population in the Southern Lake Superior Region, In Recovery of Gray Wolves in the Great Lakes Region of the United States: an Endangered Species Success Story. eds A.P. Wydeven, T.R. Van Deelen, E.J. Heske, pp. 139-154. Springer, New York.

WDNR, 1999. Wisconsin Wolf Management Plan. Wisconsin Department of Natural Resources, Madison, WI.

WDNR, 2007. Wisconsin Wolf Management Plan Addendum 2006 and 2007, p. 57. Wisconsin Department of Natural Resources, Madison. https://dnr.wi.gov/files/PDF/pubs/ER/ER0099.pdf, accessed 19 May 2018.

Wiedenhoeft, J.E., Boles, S.R., Wydeven, A.P., 2003. A Volunteer Carnivore Tracking Program and its Potential Use in Monitoring the Timber Wolf (Canis lupus) Population in Northern and Central Wisconsin, In World Wolf Congress 2003: Bridging Science and Community. p. abstract only, Banff, Alberta, Canada. accessed.

Wydeven, A.P., 1994. Wisconsin Endangered Resources Report #102: Status of the timber wolf in Wisconsin, performance report 1 July 1993 through 30 June 1994, ed. B.o.E. Resources. Wisconisin Department of Natural Resources, Madison, WI. accessed.

Wydeven, A.P., 1996. Wisconsin Timber Wolf Population Monitoring #113: March 31, 1995 - June 31(sic), 1996 report for U.S. Fish & Wildlife Service Region 3, Endangered Species Grant Program Section 6, p. 11 pp. Wisocnisin Department of Natural Resources. accessed.

Wydeven, A.P., Megown, R.A., 1995. Wisconsin Endangered Resources Report #104: Status of the timer wolf in Wisconsin, performance report 1 July 1994 through 30 June 1995, ed. B.o.E. Resources. Wisconsin Department of Natural Resources, Madison, WI. accessed.

Wydeven, A.P., Wiedenhoeft, J.E., Schultz, R.L., Thiel, R.P., Boles, S.H., Heilhecker, E., 2006. Progress Report of Wolf Population Monitoring in Wisconsin for the Period October 2005 - March 2006, ed. W.D.o.N. Resources. Wisconsin Department of Natural Resources, Park Falls, Wisconsin PUB-ER- 2006. accessed.

Wydeven, A.P., Wiedenhoeft, J.E., Schultz, R.L., Thiel, R.P., Boles, S.H., Heilhecker, E., Hall, W.H.J., 2004. Progress Report of Wolf Population Monitoring in Wisconsin for the Period October - March 2004, ed. W.D.o.N. Resources. Wisconsin Department of Natural Resources, Park Falls, Wisconsin PUB-ER- 2004. accessed.